

Fishery Management Report No. 95-1

Area Management Report for the North Gulf of Alaska Recreational Groundfish Fisheries

by

Doug Vincent-Lang

February 1995

Alaska Department of Fish and Game

Division of Sport Fish



Symbols and Abbreviations

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Weights and measures (metric)		General		Mathematics, statistics, fisheries	
centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	alternate hypothesis	H_A
deciliter	dL	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
gram	g	and	&	catch per unit effort	CPUE
hectare	ha	at	@	coefficient of variation	CV
kilogram	kg	Compass directions:		common test statistics	F, t, χ^2 , etc.
kilometer	km	east	E	confidence interval	C.I.
liter	L	north	N	correlation coefficient	R (multiple)
meter	m	south	S	correlation coefficient	r (simple)
metric ton	mt	west	W	covariance	cov
milliliter	ml	Copyright	©	degree (angular or temperature)	°
millimeter	mm	Corporate suffixes:		degrees of freedom	df
Weights and measures (English)		Company	Co.	divided by	÷ or / (in equations)
cubic feet per second	ft ³ /s	Corporation	Corp.	equals	=
foot	ft	Incorporated	Inc.	expected value	E
gallon	gal	Limited	Ltd.	fork length	FL
inch	in	et alii (and other people)	et al.	greater than	>
mile	mi	et cetera (and so forth)	etc.	greater than or equal to	≥
ounce	oz	exempli gratia (for example)	e.g.,	harvest per unit effort	HPUE
pound	lb	id est (that is)	i.e.,	less than	<
quart	qt	latitude or longitude	lat. or long.	less than or equal to	≤
yard	yd	monetary symbols (U.S.)	\$, ¢	logarithm (natural)	ln
Spell out acre and ton.		months (tables and figures): first three letters	Jan,...,Dec	logarithm (base 10)	log
Time and temperature		number (before a number)	# (e.g., #10)	logarithm (specify base)	log ₂ , etc.
day	d	pounds (after a number)	# (e.g., 10#)	mideye-to-fork	MEF
degrees Celsius	°C	registered trademark	®	minute (angular)	'
degrees Fahrenheit	°F	trademark	™	multiplied by	x
hour (spell out for 24-hour clock)	h	United States (adjective)	U.S.	not significant	NS
minute	min	United States of America (noun)	USA	null hypothesis	H_0
second	s	U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)	percent	%
Spell out year, month, and week.				probability	P
Physics and chemistry				probability of a type I error (rejection of the null hypothesis when true)	α
all atomic symbols				probability of a type II error (acceptance of the null hypothesis when false)	β
alternating current	AC			second (angular)	"
ampere	A			standard deviation	SD
calorie	cal			standard error	SE
direct current	DC			standard length	SL
hertz	Hz			total length	TL
horsepower	hp			variance	Var
hydrogen ion activity	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

FISHERY MANAGEMENT REPORT NO. 95-1

**AREA MANAGEMENT REPORT FOR NORTH GULF OF ALASKA
RECREATIONAL GROUND FISH FISHERIES**

by

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February 1995

The Fishery Management Reports series was established in 1989 for the publication of an overview of Division of Sport Fish management activities and goals in a specific geographic area. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Distribution is to state and local publication distribution centers, libraries and individuals and, on request, to other libraries, agencies, and individuals. This publication has undergone regional peer review.

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SECTION I: OVERVIEW

Management Arena

The subject of this Area Management Report (AMR) is the recreational fisheries for groundfish, specifically those for halibut, rockfish, and lingcod, that occur in the North Gulf of Alaska. In this report, the North Gulf of Alaska includes all state waters of the Gulf of Alaska west of Cape Suckling including the waters of Prince William Sound and Cook Inlet and those waters surrounding the Kodiak Island Archipelago, Alaska Peninsula, and Aleutian Islands (Figure 1). The North Gulf of Alaska management area crosses several Region II sport fish management areas including the Central Gulf, Kenai Peninsula, and Kodiak/Alaska Peninsula management areas. Major communities that support significant recreational groundfish fisheries that occur along the North Gulf Coast include: Valdez, Whittier, and Cordova in Prince William Sound; Seward along the North Gulf of Alaska coast; Homer, Deep Creek, Ninilichik, and Anchor Point along Lower Cook Inlet; and Kodiak on the Kodiak Island Archipelago. The state's roadways and marine highway system provide relatively good access to these locations and thus most of the North Gulf of Alaska recreational groundfish fisheries. At present, little directed recreational effort or groundfish harvest occurs along the Alaska Peninsula or Aleutian Islands.

Regulations governing North Gulf of Alaska recreational groundfish fisheries are found in Chapters 55 (Prince William Sound), 58 (Cook Inlet - Resurrection Bay Saltwater), 64 (Kodiak), and 65 (Alaska Peninsula - Aleutian Islands) of Title 5 of the Alaska Administrative Code. Statewide regulations and provisions, some of which apply to North Gulf of Alaska recreational groundfish, are found in Chapter 75.

Management and research functions for North Gulf of Alaska recreational groundfish fisheries are the responsibility of the Groundfish Management Biologist (Doug Vincent-Lang) stationed in Anchorage. An assistant (Scott Meyer) supervises ongoing research projects and provides management assistance to the management biologist. This position is scheduled to be transferred to Homer during the spring of 1995. Numerous seasonal biologists and technicians assist these positions.

Fisheries Overview

The marine waters of the North Gulf of Alaska support numerous stocks of marine groundfish. Although many groundfishes are harvested by recreational anglers, the most commonly harvested species include various flatfishes (halibut *Hippoglossus stenolepis*, arrowtooth flounder *Atheresthes stomias*, and starry flounder *Platichthys stellatus*), rockfishes species of the genera *Sebastes* and *Sebastes*, and greenlings (lingcod *Ophiodon elongatus*, kelp greenling *Hexagrammos decagrammus*, and rock greenling *Hexagrammos lagocephalus*). In addition, Pacific cod (*Gadus macrocephalus*), walleye pollock (*Theragra chalcogramma*), Pacific herring (*Clupea harengus*), and sablefish (*Anoplopoma fimbria*) are commonly caught by recreational anglers. Given current angler interest, the primary groundfish species of management importance at present are halibut, rockfish, and lingcod.

All fisheries are supported solely on wild stocks. Although accessible by road, all North Gulf of Alaska recreational groundfish fisheries are considered remote in that they require a boat or guide to participate in; thus, the cost to participate is relatively high. Guides make up a significant component of the North Gulf of Alaska groundfish fishery (particularly the halibut fishery). Because of the availability of guides, these fisheries offer a range of angling opportunities for both experienced and inexperienced anglers.

Angling Effort

Recreational angler effort in Alaska has been estimated annually since 1977 using a mail survey (Mills 1979-1994). This survey is used to generate estimates of the number of angler-days of sport fishing effort expended by recreational anglers fishing in Alaska and adjacent marine waters and their harvest and release of select sport fishes. The survey is designed to provide these estimates on a site-by-site basis. Mills and Howe (1992) and Meyer (1994) have reviewed the postal survey and suggests that the estimates are sufficiently precise and accurate for management of "large" marine fisheries, such as those for halibut or rockfish.

The postal survey is not designed to provide estimates of effort directed towards a single species. Based on port sampling and creel survey results, the estimated effort generated using the mail survey has been apportioned to

effort directed at select species. Although the accuracy of these apportionments cannot be checked at present, it is felt that they can be used to index the relative growth of fisheries targeting select species. In 1993, North Gulf of Alaska halibut, rockfish, and lingcod stocks supported just over 300,000 days of angling effort (*Table 1*). In comparison, these fisheries supported just over 135,000 days of recreational angling effort in 1987. Effort has risen near annually (*Figure 2*) and is projected to increase over the next several years as demand increases.

The most popular of the North Gulf of Alaska recreational groundfish fisheries are those for halibut. During 1993, recreational anglers expended just over 256,000 angler-days fishing halibut in the North Gulf of Alaska (*Table 1*), representing about 85% of the total recreational groundfish effort during 1993. Most (60%) of this effort was expended in Lower Cook Inlet, with the remainder having been expended along the North Gulf Coast (28%) and the outer areas of Prince William Sound (12%). Only a small amount of effort (<5,000 angler-days) has been expended along the Alaska Peninsula and Aleutian Islands. Rockfish have been the second most targeted groundfish species by recreational anglers, accounting for 11% (32,013 angler-days) of the recreational effort for groundfish during 1993 (*Table 1*). Most (74%) of the fishing effort for rockfish has occurred along the North Gulf Coast, in Prince William Sound, and Lower Cook Inlet. Lingcod have become an increasing target of recreational anglers since 1987 and accounted for nearly 4% (13,486 angler-days) of the recreational groundfish effort during 1993 (*Table 1*). Most of the fishing effort for lingcod has occurred along the exposed coastline of the North Gulf of Alaska accessed from Seward. The amount of effort directed at other groundfish stocks has not been estimated to date.

A significant component of the annual effort expended in North Gulf of Alaska recreational groundfish fisheries is guided, particularly the halibut fishery. At present, guides are not required by the State of Alaska to register in all areas of the North Gulf of Alaska, thus accurate estimates of the numbers of guides operating in this area are unavailable at present. During 1994, 1,694 vessels were licensed by the International Pacific Halibut Commission (IPHC) for halibut sport charter fishing in Alaska. Some of these vessels are inactive and do not offer charter services. At present, it is estimated that about 525 guides are actively offering marine charter services in ports along the North Gulf of Alaska (*Table 2*). In addition, about 25 guides are offered by the United States (U.S.) military for recreation in Seward and Valdez.

Chartered anglers accounted for an average of about 26% of the 1993 sport effort at Seward, 36% in Central Cook Inlet, and 37% in Lower Cook Inlet (*Table 3*). Direct estimates of guided effort are unavailable for other areas of the North Gulf of Alaska; however, it is known that regional differences exist. It is estimated that between 25% to 40% of the annual effort expended in this overall area is guided. Roth and Delaney (1989) have shown that catch rates of chartered anglers can be as much as five times higher than for nonchartered anglers.

Economic Value

The recreational fishery for groundfish is important to the economy of southcentral Alaska. In 1986, sport anglers spent \$18.6 million in pursuit of halibut in southcentral Alaska (excluding the Kodiak Island Archipelago; Jones and Stokes 1987). In addition, they indicated a net willingness to pay an additional \$25.2 million to ensure for the continued availability of halibut fishing opportunities. The economic value of other recreational groundfish fisheries has not been directly estimated.

Most port communities sponsor halibut derbies that offer lucrative prizes. These derbies attract anglers and support growing charter boat industries. The charter boat industry is an important economic component of the recreational fishery. For example, the Homer charter boat industry generated \$9.1 million in gross income for the Homer economy as well as an equivalent of 64 full-time, year-round jobs in 1985 (Coughenower 1986). Two-thirds of the chartered anglers surveyed stated they would not have come to Homer if charter services had not been available.

Management Authorities

Halibut and their fisheries are managed under an international treaty, the Halibut Convention of 1953 and its 1979 Protocol. Under this treaty, the International Pacific Halibut Commission (IPHC) was formed to assure for the optimal sustained yield of the North Pacific halibut resource. For purposes of management, the IPHC has divided the North Pacific halibut fishery into 10 regulatory areas, stretching from northern California to Alaska. Each year, the IPHC establishes separate catch quotas for each of these regulatory areas that assures for the halibut stock's

optimal sustained yield. These catch quotas represent the *maximum* number of halibut that can be harvested from each area annually and, under the treaty, total harvest by all users groups cannot exceed these quotas. The IPHC does not, however, have the authority to allocate the catch quota amongst the various fisheries exploiting the halibut stock in U.S. waters. In U.S. waters, the responsibility for allocation falls to the North Pacific Fishery Management Council (NPFMC) via the Magnuson Fisheries Conservation and Management Act of 1976. The Alaska Department of Fish and Game, Division of Sport Fish, provides technical data and other information to both the IPHC and the NPFMC to aid in making management and allocation decisions. The State of Alaska does not have direct management authority over halibut and their fisheries off Alaska.

Harvest of nearshore rockfishes by recreational and commercial anglers fishing North Gulf of Alaska waters primarily occurs in state waters. Responsibility for management and allocation of rockfish in state waters lies with the Alaska Board of Fisheries. The Division of Sport Fish takes the lead in managing the recreational fishery for rockfish while the Division of Commercial Fisheries Management and Development manages commercial rockfish fisheries. In adjacent federal waters, rockfish are managed under several federal fishery management plans adopted by the NPFMC. Management of rockfish fisheries in federal waters follows policies in these management plans. The National Marine Fisheries Service (NMFS) has the lead management responsibility in federal waters.

Like rockfish, lingcod are primarily harvested in state waters. Responsibility for management and allocation of lingcod in state waters lies with the Alaska Board of Fisheries. The Division of Sport Fish takes the lead in managing the recreational fishery for lingcod while the Division of Commercial Fisheries Management and Development manages commercial lingcod fisheries. Lingcod are not currently managed under a federal fishery management plan. Management of the species in federal waters by the NMFS closely follows state management.

Fishery Objectives

Under the Halibut Convention of 1953 and its 1979 Protocol, North Pacific halibut stocks are managed for *optimum sustained yield*. Therefore, the objective of current management is to assure harvests do not exceed optimal sustained yields as established annually by the IPHC and remain within allocation schemes established annually by the NPFMC. For purposes of management, the IPHC has divided the North Pacific halibut fishery into 10 regulatory areas, stretching from northern California to Alaska. The North Gulf of Alaska falls within Regulatory Areas 3A, 3B, and 4.

The goal of current lingcod management is to assure depressed stocks in and near to Resurrection Bay can rebuild to permit sustainable harvests and to assure that harvests on healthy stocks do not exceed sustained yields and remain within established allocation schemes. The objective of current rockfish management is to assure harvests do not exceed sustained yields and remain within established allocation schemes.

Fishery Evaluation Program

The Division of Sport Fish conducts a port sampling program aimed at assessment of North Gulf of Alaska groundfish stocks and their recreational fisheries. The objectives of this research program are to estimate the species, age, sex, and size compositions of the groundfish harvests at select North Gulf of Alaska ports and to characterize the recreational groundfish fisheries that occur at these ports. Ports sampled include Homer and Deep Creek in the Lower Cook Inlet area, Seward along the North Gulf Coast, Valdez in Prince William Sound, and Kodiak along the Kodiak Island Archipelago. The Division of Sport Fish also conducts fishery-independent sampling of lingcod near Seward. The primary objective of this research program is to assess recruitment of lingcod near Seward. The division provides data collected from this research to the Alaska Board of Fisheries, the IPHC, and the NPFMC to aid decisions regarding management and allocation of North Gulf of Alaska groundfish resources.

Major Issues

A proposal has been submitted to the NPFMC to establish a quota for the sport charter industry in Alaska. The proposal was submitted by the Alaska Longline Fishermen's Association (ALFA) to address what the ALFA perceives to be "rapid, uncontrolled growth of the guided sport halibut charter industry" in Alaska. The ALFA

believes that further growth of the sport fishery is inevitable and that without some type of restriction, this growth will result in a reallocation of halibut from the traditional directed longline fishery, given that the resource is currently fully utilized. The ALFA believes this will result in economic and social costs to their traditional fisheries. The objective of their proposal is to minimize such impacts. Although not done off Alaska, there is precedence for establishing an allocation for the sport fishery. In regulatory area 2A (off the coasts of Washington, Oregon, and California) the sport fishery has been allocated an annual catch quota. This catch quota applies to the overall sport fishery, both guided and unguided. The NPFMC has yet to adopt separate allocations for any species for specific components of the sport fishery. This proposal, submitted in 1992, is currently under consideration by the NPFMC.

Lingcod in Resurrection Bay are severely depressed and are closed to both commercial and recreational fisheries until the stocks recover to permit a sustainable harvest, likely many years to come. Lingcod near Resurrection Bay are depressed and recreational fisheries operating in these areas have been restricted to permit stocks to recover. Lingcod stocks in other areas of the North Gulf of Alaska are healthy, but targeting fisheries are managed under restrictive regulations given the susceptibility these stocks have shown to overharvest. Depressed stocks are being monitored to evaluate their recovery. Recovery of stocks is being evaluated through collection of fishery-independent length statistics to evaluate time-series trends in recruitment. Healthy stocks are being monitored through the port sampling program to evaluate trends in age and length compositions.

Rockfish stocks of the North Gulf of Alaska are managed primarily for commercial and recreational uses. In recent years, commercial harvests have exceeded sport harvests in most areas of the North Gulf of Alaska. However, in some areas, notably along the North Gulf of Alaska near Seward, recreational harvests in some years exceed commercial harvests. Unfortunately, there is a lack of historic data to assess either the sustained yields or current status of North Gulf of Alaska rockfish stocks; thus, it is unknown at present whether current harvest levels are sustainable. Concern has been raised that some demersal rockfish species, particularly the longer-lived species such as yelloweye rockfish, are being overfished. Given the lack of data, recreational fisheries targeting North Gulf of Alaska rockfish stocks are managed under relatively restrictive regulations. In addition, data are being collected to form a long-term data base of selected fishery and stock assessment parameters that hopefully can be used to assess the sustained yields of North Gulf of Alaska rockfish stocks. The Division is also considering establishing marine fishing reserves to protect demersal rockfishes.

Concern has been raised that commercial rockfish and lingcod harvests may increase as a result of a new Individual Fishery Quota (IFQ) system to be enacted for the Alaskan commercial halibut fishery during 1995. Under the new IFQ system, commercial halibut fishermen will have up to 8 months to catch their annual individual halibut quota. Under the old system, commercial halibut fishermen had, at maximum, up to two 24-hour periods to catch an area quota. This resulted in an incentive to fish clean, as bycatch during severely time-restricted openings resulted in reduced landing of halibut. Because bycatch in nearly all cases is lower in value than halibut, this resulted in a reduced value of the landing. There is a fear under the new system that because time is not limited, bycatch will increase. For fishes with high exploitable biomasses, this is not viewed as a problem. However, for fishes such as rockfish that have very low exploitable biomasses or lingcod for which there are identified stock conservation concerns, increased bycatch may result in over-harvest. Department managers are considering asking the Board for permission to close areas in which rockfish or lingcod quotas have been achieved to commercial longline fishing to avoid further rockfish or lingcod bycatch.

Concern has also been raised that an IFQ system will result in increased competition on the fishing grounds between commercial fishermen and sport anglers. Competition was minimal in the past because the commercial fishery operated far offshore where the abundance of large halibut was higher during spring and fall commercial openings. The long season permissible under the IFQ system will allow overlap of commercial and sport fishing times. In addition, the commercial fleet will likely fish closely to port. Implementation of an IFQ system in Canada resulted in a significant number of vessels fishing closer to port, despite lower catch rates. These concerns have caused some recreational fishing groups to discuss establishment of exclusion zones for the commercial fishery that encompass their traditional fishing areas near major sport ports. As can be expected, such proposals have not been well received by commercial fishermen.



Figure 1. Area of management responsibility for marine groundfishes in the North Gulf of Alaska.

Table 1. Number of angler-days expended by recreational anglers fishing for halibut, rockfish, and lingcod in the North Gulf of Alaska, 1987-1993.

<i>Fishery</i>	<i>1987</i>	<i>1988</i>	<i>1989</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>
<i>Halibut</i>							
Lower Cook Inlet	50,220	87,570	79,200	92,610	95,670	111,582	152,964
Kodiak	23,203	17,855	15,209	13,382	23,802	18,884	31,793
Central Gulf	37,862	41,131	43,605	53,056	55,476	58,277	71,618
<i>Combined</i>	<i>111,285</i>	<i>146,556</i>	<i>138,014</i>	<i>159,048</i>	<i>174,948</i>	<i>188,743</i>	<i>256,375</i>
<i>Rockfish</i>							
Lower Cook Inlet	3,906	6,811	6,160	7,203	7,441	8,679	11,897
Kodiak	6,187	4,761	4,056	3,568	6,347	5,036	8,478
Central Gulf	8,835	9,597	7,267	8,843	9,246	9,713	11,638
<i>Combined</i>	<i>18,928</i>	<i>21,169</i>	<i>17,483</i>	<i>19,614</i>	<i>23,034</i>	<i>23,428</i>	<i>32,013</i>
<i>Lingcod</i>							
Lower Cook Inlet	1,674	2,919	2,640	3,087	3,189	3,719	5,099
Kodiak	1,547	1,190	1,014	892	1,587	1,259	2,120
Central Gulf	1,262	2,742	4,360	5,306	5,548	5,828	6,267
<i>Combined</i>	<i>4,483</i>	<i>6,851</i>	<i>8,014</i>	<i>9,285</i>	<i>10,324</i>	<i>10,806</i>	<i>13,486</i>
<i>Combined</i>							
Lower Cook Inlet	55,800	97,300	88,000	102,900	106,300	123,980	169,960
Kodiak	30,937	23,807	20,278	17,842	31,736	25,178	42,391
Central Gulf	47,959	53,470	55,232	67,205	70,270	73,818	89,523
<i>Combined</i>	<i>134,696</i>	<i>174,576</i>	<i>163,511</i>	<i>187,947</i>	<i>208,306</i>	<i>222,977</i>	<i>301,874</i>

Number of Angler-Days

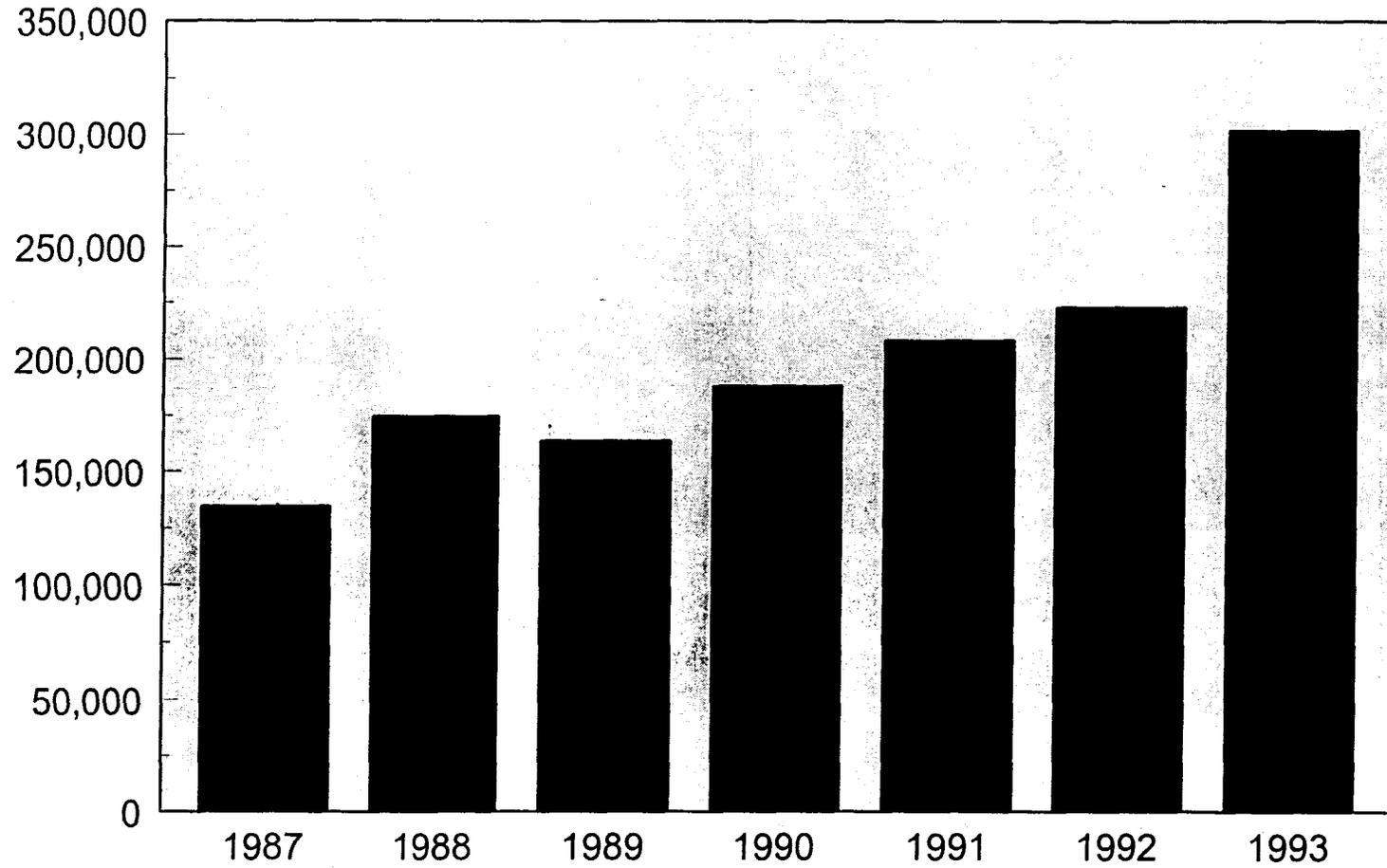


Figure 2. Number of angler-days expended by recreational anglers fishing for halibut, rockfish, and lingcod in the North Gulf of Alaska, 1987-1993 .

Table 2. *Estimated number of vessels actively offering marine charter services in ports along the North Gulf of Alaska during 1994.*

<i>Fishery</i>	<i># of Vessels</i>
Central Cook Inlet (Deep Creek, Anchor Point, Ninilichik)	275
Lower Cook Inlet (Homer, Seldovia)	150
North Gulf Coast (Seward)	
Civilian	50
Military	20
Prince William Sound (Cordova, Whittier, Valdez)	
Civilian	30
Military	5
Alaska Peninsula - Aleutian Islands (Cold Bay, Adak)	5
Kodiak (Kodiak)	15
Total	
Civilian	525
Military	25

Table 3. Number of angler-days expended by private and chartered anglers fishing Seward, Central Cook Inlet, and Lower Cook Inlet area waters, 1986-1993 (Mills 1987-1994).

<i>Fishery</i>	<i>Private</i>	<i>Chartered</i>	<i>Total</i>	<i>% Chartered</i>
Seward				
1986	39,796	13,211	53,007	24.9
1987	31,115	12,423	43,538	28.5
1988	40,454	10,587	51,041	20.7
1989	39,080	10,759	49,839	21.6
1990	52,950	17,869	70,819	25.2
1991	51,879	20,976	72,855	28.8
1992	60,712	21,903	82,615	26.5
1993	66,595	22,903	89,498	25.6
Central Cook Inlet (north of Anchor Point)				
1986	65,143	1,662	66,805	2.5
1987	79,221	1,600	80,821	2.0
1988	52,729	2,197	54,926	4.0
1989	60,382	2,284	62,666	3.6
1990	79,105	4,406	83,511	5.3
1991	73,483	12,176	85,659	14.2
1992	66,205	29,465	95,670	30.8
1993 ^a				
Lower Cook Inlet (south of Anchor Point)				
1986	51,819	22,962	74,781	30.7
1987	69,003	35,599	104,602	34.0
1988	84,242	43,651	127,893	34.1
1989	60,830	38,092	98,922	38.5
1990	82,320	51,618	133,938	38.5
1991	67,123	50,892	118,015	43.1
1992	82,268	45,703	127,971	35.7
1993 ^a				
Central & Lower Cook Inlet				
1993	144,582	83,723	228,305	36.7

a

Unable to distinguish between Lower and Central Cook Inlet.

SECTION II: FISHERIES

NORTH GULF OF ALASKA RECREATIONAL HALIBUT FISHERY

Halibut and their fisheries are managed under an international treaty, the Halibut Convention of 1953 and its 1979 Protocol. Under this treaty, the International Pacific Halibut Commission (IPHC) was formed to assure for the optimal sustained yield of the North Pacific halibut resource. Under the treaty, the IPHC annually recommends harvest levels to the governments of the United States and Canada that assure for the optimal sustained yield of the North Pacific halibut resource.

For purposes of management, the IPHC has divided the North Pacific halibut fishery into 10 regulatory areas stretching from northern California to Alaska (*Figure 3*). Regulatory Area 3A, which extends from Cape Spencer eastward to Cape Trinity on the southern end of Kodiak Island, encompasses most of the North Gulf of Alaska. The southside of the Alaska Peninsula south of Cape Trinity falls into Regulatory Area 3B. The waters surrounding the Aleutian Islands fall into Regulatory Area 4.

In United States (U.S.) waters the responsibility for allocation of catch amongst fisheries falls to the North Pacific Fishery Management Council (NPFMC) via the Magnuson Fisheries Conservation and Management Act of 1976. The IPHC **does not** have the authority to allocate catch amongst the various fisheries exploiting the halibut stock in U.S. waters. It does, however, through agreements with the NPFMC, maintain some management authority over various fisheries, notably the directed longline fisheries. The State of Alaska **does not** have direct management or allocative authority over halibut and their fisheries off Alaska. The Alaska Department of Fish and Game - Division of Sport Fish does, however, provides technical data and other information to both the IPHC and the NPFMC to aid in making stock assessment and allocation decisions.

The limits for the halibut sport fishery off Alaska are currently 2 fish per day, 4 fish in possession coastwide. The fishery is open year round with the exception of January, during which time the fishery is closed to protect spawning halibut. The January closure is essentially meaningless, given that few anglers currently fish halibut during January in the North Gulf of Alaska. Unlike the commercial fishery which has a 32 inch minimum size limit, there are no size restrictions placed on the recreational fishery.

The halibut sport fishery is of major importance to the economy of southcentral Alaska. In 1986, anglers spent \$18.5 million in southcentral Alaska in the pursuit of halibut, and indicated a willingness to pay an additional \$25 million to ensure the continued availability of halibut fishing opportunities. In addition, many charter services provide guided sport fishing opportunities for halibut. In 1985, the Homer halibut charter industry generated over \$9 million in gross income for the Homer economy as well as an equivalent of 64 full-time, year-round jobs. Two-thirds of chartered anglers surveyed said they would not have come to Homer if charter services had not been available. In addition, proceeds from halibut derbies are often donated to support a variety of community projects and organizations.

Management Objective and Approach

A constant exploitation strategy is employed by the IPHC to manage North Pacific halibut stocks for *optimum sustained yield*. The IPHC meets annually in January to calculate the exploitable biomass (yield) available for harvest in each of the 10 regulatory areas. Constant exploitation yield (CEY) is calculated for each regulatory area as the estimated exploitable biomass available times a 0.30 exploitation rate. Each CEY thus represents the total allowable harvest (in pounds) for each regulatory area. The IPHC also estimates the sport (based on a 2 fish daily bag limit and 4 fish possession limit and February 1 through December 31 open season) and personal-use/subsistence harvests and wastage and bycatch mortalities for each regulatory area. These are subtracted from the CEY on a regulatory area basis. The remainder is then "allocated" to the directed commercial halibut fishery.

This factoring of the catch has, to the present, been done by the IPHC and the final numbers "approved" by the NPFMC on an annual basis. Under this management approach CEY changes annually, reflective of the estimated

biomass of exploitable halibut present (i.e., quotas are lower during years of low exploitable biomass and higher during years of high exploitable biomass). Currently, the North Pacific halibut stock is fully utilized.

There are currently no catch quotas for the recreational halibut fishery in Alaska. Although not done off Alaska, there is precedence for establishing an allocation for the sport fishery. In regulatory area 2A (off the coasts of Washington, Oregon, and California) the sport fishery has been allocated an annual catch quota. This catch quota applies to the overall sport fishery, both guided and unguided.

Stock Status

Estimated abundance of the exploitable halibut stock in Alaska peaked in 1988 and has declined at a rate of 5% to 10% per year; this decline is expected to continue for several years (Sullivan 1993). Recruitment and stock biomass are believed to be cyclical and recruitment is expected to remain low for several years. However, the mean size of sport caught halibut at several major ports throughout southcentral Alaska decreased for the first time in several years during 1994, suggesting that some new recruitment is occurring. If this is true, recruitment may have reached its low point and exploitable biomass should begin growing by the latter part of the 1990s. This will result in more fish being available for harvest.

Fishery Overview

Regulatory Area 3A

Halibut are a popular target of recreational anglers fishing Regulatory Area 3A waters. During 1993, recreational anglers expended about 256,000 angler-days fishing for halibut in this regulatory area (*Table 4*). In comparison, recreational anglers spent about 113,000 angler-days fishing halibut in these waters during 1987. Growth has been near annual (*Figure 4*) and is projected to increase over the next several years as demand increases; however, the rate of growth may decrease due to a variety of factors (Vincent-Lang and Meyer 1993). The waters of Lower Cook Inlet account for about 60% the annually expended effort (*Table 4*).

As with directed effort, the sport harvest of halibut from Regulatory Area 3A waters has also grown steadily, from about 18,000 halibut in 1977 to about 225,000 halibut in 1993 (*Table 5, Figure 5*). The 1993 harvest was a record for Area 3A waters. Halibut appear to be increasing in popularity; halibut made up 45% (in number) of the Area 3A finfish harvest in 1992 compared with 33% in 1987 (Mills 1988-1993).

The Area 3A recreational fishery is important on a statewide as well as coastwide basis. Recent Area 3A sport harvests made up about 70% (in number) of the total Alaskan recreational halibut harvest (*Table 5; Mills 1979-1993*). On a larger scale, the 1992 sport harvest in Area 3A made up about 60% (by weight) of the entire recreational halibut harvest on the North American west coast (IPHC 1994).

Most halibut are harvested from May through September. During 1993 and 1994, some charter services began offering charters during April and October. However, only a few charters were booked: weather and lack of interest were the likely reasons for the low bookings.

The IPHC estimates harvest based on pounds rather than numbers of fish harvested. Numbers of fish recreationally harvested are annually converted to pounds of fish harvested based on sampling of recreational harvests to estimate the mean weight of harvested fish at various ports throughout southcentral Alaska (Meyer 1994). Because the mean weight of recreationally harvested halibut has increased over time, the number of pounds of halibut removed has increased at a faster rate than numbers of halibut removed (*Table 6, Figure 6*). However, if recruitment is increasing, mean weight of recreationally landed halibut will likely begin to stabilize, and may even drop, as the availability (abundance) of younger halibut increases. Data collected as part of the port sampling program during 1994 indicates that the mean length of sport caught halibut at most ports decreased, indicating that recruitment due to a strong 1987 year class may have occurred.

Area 3A anglers released an estimated 31% to 49% of the halibut they caught during the period 1990-1992, or 86,000-218,000 fish per year (*Table 7*). In support of this estimate, an onsite creel survey estimated that 37% of halibut caught by the Valdez fleet were released in 1988 (Roth and Delaney 1989). Assuming a 5% release mortality for sport caught halibut, this amounts to a maximum of about 11,900 more halibut being killed annually in Area 3A.

The Alaska Department of Fish and Game, in conjunction with the IPHC, have projected the growth of the sport harvest through the year 2000. While projections into the future are difficult, the most likely pattern is a continued increase in the numbers of halibut landed, but little change in the mean size of harvested halibut. These projections suggest that sport harvest will continue to grow (*Figure 7*). Actual harvest during 1992 was below the projection while the actual estimated harvest during 1993 was above the projection. It is likely that harvest will decrease during 1994 given that weather limited fishing time and the mean length of sport caught halibut decreased at many Area 3A ports.

Although recreational harvests have increased in recent years, other sources of removals (e.g., commercial harvests and bycatch and wastage in other fisheries) continue to vastly outnumber recreational harvests in Area 3A. For example, during 1993, 22.9 million pounds of halibut were harvested in the directed longline fishery and bycatch and wastage in various commercial fisheries was estimated to be 5.8 million pounds; in comparison, the Area 3A recreational harvest was only 3.9 million pounds (*Figure 8*).

Regulatory Area 3A is composed of many regional and local recreational fisheries that are conducted in more or less separate geographic areas and possess distinctive patterns of harvest and use. The vast majority of harvest is taken in four major fisheries: Cook Inlet, Kodiak, North Gulf Coast (Seward), and Prince William Sound (*Figure 9*). A local fishery based in Yakutat harvests an insignificant number of fish and will not be discussed. The following descriptions of these fisheries is taken from Meyer (1994).

Cook Inlet: The Cook Inlet fishery is the largest local recreational halibut fishery in North America and has grown rapidly. Estimated harvest in this fishery has increased from 13,500 fish in 1977 to over 162,400 fish in 1993 (*Table 8*). Since 1977, the Cook Inlet fishery has accounted for 72% to 83% (in number) of the Area 3A recreational harvest. The 1993 Cook Inlet harvest made up about 70% (by number) of the Area 3A harvest (*Table 5*) and about 50% (by weight) of the entire North American sport harvest of halibut (IPHC 1994). The proportion of the sport harvest caught by chartered anglers in Cook Inlet has steadily risen since 1986 (*Figure 11*). During 1993, chartered anglers accounted for 55% of the reported sport harvest from Cook Inlet waters

The Cook Inlet fishery can be divided into two areas: Central Cook Inlet (CCI) consisting of waters north of the latitude of Anchor Point, and Lower Cook Inlet (LCI) consisting of waters south of Anchor Point, west to Cape Douglas, and east to Gore Point (*Figure 10*). Major access points in CCI include boat ramps and beach launch sites at Deep Creek, Ninilchik and Anchor Point. The Homer harbor is the primary access point for the LCI fishery, with relatively small numbers of boats also originating from Seldovia and other communities on the south side of Kachemak Bay. Boats based out of Homer fish primarily south of Anchor Point (Meyer 1992; pp. 46-50) but may range as far south as the Barren Islands and as far east as Port Dick. Boats launching in CCI generally fish the eastern half of Cook Inlet north of Anchor Point. Halibut are rarely caught north of the mouth of Kenai River.

Recent growth in the CCI fishery has offset declines in the LCI fishery (*Table 8*). Harvest in CCI has increased every year since 1987, while LCI harvest has been stable or decreasing since 1988¹. Most of the increase in CCI has been due to a rapidly expanding charter fleet, particularly at Deep Creek. Until recently, the Deep Creek fishery has been dominated by unguided anglers. During the past 2-3 years, however, increasing number of guides have been operating out of CCI, particularly Deep Creek, as improved boat launching facilities have been constructed.

The decrease in harvest in LCI is probably not due to a proportional decrease in fish abundance. More likely, the Deep Creek and Anchor Point fisheries are capturing the business of anglers that formerly fished at Homer. Kenai

¹ Due to a change in the way the mail survey was designed during 1993, it was impossible to distinguish the breakdown between LCI and CCI.

River guides are reportedly moving to Deep Creek to circumvent restrictions on the Kenai River chinook salmon fishery. In addition, the CCI saltwater fishery offers opportunities to harvest halibut as well as chinook salmon, is a shorter drive from Anchorage than Homer, and is a shorter and often smoother boat ride to the fishing grounds. Use of tractors has reduced competition at boat ramps and allowed launching of larger boats on any tide.

Kodiak: Halibut are harvested from numerous locations surrounding Kodiak and Afognak Islands, but the vast majority of the harvest is taken in Chiniak Bay and other waters close to the port of Kodiak. Most boats based in Kodiak fish north of Cape Chiniak and only occasionally venture farther west than Whale Island and as far north as the north side of Marmot Bay (*Figure 12*). The most heavily fished waters are in the vicinity of Buoy 4, Spruce Cape, Woody Island, and Long Island, all less than 20 km from port.

Although Kodiak is the hub of a thriving commercial longline fishery for halibut, the sport fishery is of much lower magnitude. Harvest in the Kodiak area, including waters surrounding Kodiak, Afognak, and the Barren Islands, grew from about 1,000 fish in 1977 to 14,169 in 1992 (*Table 5*). The 1992 Kodiak harvest made up only 6% (in number) of the Area 3A total harvest. The port of Kodiak supports an active charter fleet of about a dozen boats, but most effort and harvest is by unguided anglers. Growth of the fishery will probably be limited by geographic isolation and the high cost of transportation.

North Gulf Coast: Although the port of Seward is the only access point, this fishery ranges over an extremely large geographic area. Boats occasionally fish as far west as Nuka Bay and as far east as Cape Cleare, a maximum distance of 110 km from Seward (*Figure 13*). Most of the halibut effort and harvest, however, is distributed outside of Resurrection Bay between the Chiswell Islands and Cape Puget. A net redistribution of effort outward from Seward has occurred in the last 20 years (Meyer 1992).

Harvest in the Seward fishery has risen from 1,700 fish in 1977 to 25,500 fish in 1993 (*Table 5*). Most of the growth has occurred since 1985. The proportion of the harvest by chartered anglers has generally increased since 1986, but has fallen since 1991 even though more guides offer charter services (*Figure 11*). The reasons for the decline in the proportion of the harvest by chartered anglers are unknown.

Although the Seward harbor is overcrowded and has a long waiting list for slips, some growth of the fishery is likely. Seward is only a two hour drive from Anchorage, and the City of Seward is currently planning construction of an additional launching ramp.

Prince William Sound: Halibut harvest in Prince William Sound (*Figure 14*) grew from 1,250 fish in 1977 to 19,700 fish in 1993 (*Table 5*). The majority of the Prince William Sound recreational halibut harvest is from boats based in Valdez. Valdez currently supports an active civilian charter fleet of about 15-25 boats, and a military charter fleet of 7 boats. Although Whittier is close to Anchorage and supports high recreational boating use, most boaters do not fish for halibut and the harvest is a small percentage of the total for the sound (Mills 1979-1994, Meyer 1992). Likewise, Cordova supports a large and active commercial fleet, but there is relatively little interest in recreational halibut fishing. Planned construction of a road connecting Cordova with the Alaska highway system would probably result in some growth of the recreational fleet and increased harvest.

Valdez-based boats generally fish a north-south corridor between Valdez Arm and Hinchinbrook Entrance, on the eastern side of the sound (Meyer 1992, 1994). Popular sites include Bligh Reef, Knowles Head, Hinchinbrook Entrance, and Seal Rocks (*Figure 14*). Few private boats from Valdez fish sites south of Knowles Head; mostly charter boats are equipped to handle the rougher water often encountered. In contrast, Whittier-based boats concentrate bottom fishing effort in the northwestern corner of Prince William Sound, in Passage Canal, Blackstone Bay, and in waters near Esther and Perry Islands.

Regulatory Area 3B

Few recreational anglers fish halibut in Area 3B waters and as a result reliable estimates of recreational angler effort or halibut harvest are unavailable for these waters from the postal survey. It is believed that less than 2,500 angler-days are expended and less than 1,000 halibut are taken annually from these waters in total. Most of the effort and

harvest occurs in the vicinity of Cold Bay. Significant increases in effort and harvest are not expected in the near future in this area given its remoteness.

Commercial harvests, bycatch, and wastage vastly outnumber sport removals in this regulatory area. During 1993, 7.1 million pounds of halibut were commercially harvested from Area 3B waters and an additional 7.0 million pounds were removed as bycatch and wastage. In comparison, only 28,500 pounds (1,000 halibut @ 28.5 pounds each) were harvested by recreational anglers.

Regulatory Area 4

As with Area 3B, few recreational anglers fish halibut in Area 4 waters and as a result reliable estimates of recreational angler effort or halibut harvest are unavailable for these waters from the postal survey. It is believed that less than 3,000 angler-days and less than 1,500 halibut are taken from these waters in total. Most of the effort and harvest occurs in the vicinity of Adak. Given the announced closure of the military base at Adak, it is expected that halibut effort and harvest will decline in the immediate future.

Commercial harvests, bycatch, and wastage vastly outnumber sport removals in this regulatory area. During 1993, 6.7 million pounds of halibut were commercially harvested from Area 4 waters and an additional 8.4 million pounds were removed as bycatch and wastage. In comparison, only 42,750 pounds (1,500 halibut @ 28.5 pounds each) were harvested by recreational anglers.

Management Issues

The Alaska Longline Fishermen's Association (ALFA) has submitted a proposal to the NPFMC to establish a quota for the sport charter industry in Alaska. The proposal was submitted to address what the ALFA perceives to be "rapid, uncontrolled growth of the guided sport halibut charter industry" in Alaska. The ALFA believes that further growth of the sport fishery, in particular the guided sport industry, is inevitable and that without some type of restriction, this growth will result in a reallocation of halibut from the traditional directed longline fishery, given that the resource is currently fully utilized. The ALFA believes this will result in economic and social costs to their traditional fisheries. The objective of their proposal is to minimize such impacts.

As can be expected, ALFA's proposal has not been well received by the sport charter industry. They argued that, although growing, sport removals in Alaska still represent a relatively small proportion of the total halibut removals in Alaska. Both removals by the directed longline fishery and bycatch and wastage in the directed and other non-directed fisheries (notably the trawl fishery) vastly outnumber sport removals (see above). A result of the proposal was the formation of organized charter boat associations throughout Alaska. Prior to this issue, a few associations were organized, but for the large part most ports were without organized associations.

To address this issue, the NPFMC formed a work group composed of charter boat operators, commercial fishermen, sport anglers, and agency staff. The work group meet on several occasions and received considerable public testimony on a variety of management options put forth by the council. Based on the group's recommendations, the council opted to drop harvest caps or Individual Fishery Quota (IFQ) programs from further consideration at this time. Instead, the council asked the work group to continue meeting and to focus future discussions on evaluating regional differences and forming appropriate regional halibut charter management areas. Based on testimony received, it was apparent that regional differences and varying stages of development are evident in the Alaskan halibut sport charter industry and that a flexible regulatory scheme which could be applied regionally, and not one which would be uniformly applied throughout Alaska, was warranted.

In terms of possible regulatory measures which could be applied to the Alaskan sport charter industry, the council asked the work group to evaluate elements and options of a license limitation or moratorium program which could be applied to 'appropriate' regional management areas (e.g., overcapitalized areas). Because guides are not required to register uniformly across Alaska, there is a lack of information on the number of guides currently operating throughout the state. The lack of such information makes it difficult to evaluate options regarding license limitation or moratorium programs. Alaska has stated its desire to maintain 'regulatory control' of the Alaskan sport charter

industry in case a license limitation or moratorium were to be implemented. Currently, the state does not have the regulatory means to execute such control; however, a bill has been introduced to the Alaska Senate (by Senator Taylor) to give the state regulatory control of the sport charter industry through the Commercial Fisheries Entry Commission (CFEC). The bill also offers a means to require the registration of guides throughout Alaska.

The council also asked the work group to provide additional detail on the following six items identified by the work group in their discussion paper presented to the council:

1. Reduce bycatch in all fisheries. The charter industry has resolved to work with the council in finding ways to reduce halibut bycatch.
2. Evaluate an individual annual catch limit and reporting system for recreational halibut fishermen. The charter industry has resolved to promote the wise use ethic in the sport charter halibut fishery, and suggested analyzing catch limits ranging from 4 to 12 halibut per year.
3. Encourage the Department and the IPHC to improve their collection of catch, effort, and age composition of halibut taken by sport fishermen.
4. Develop a log book program for charter vessels.
5. Recognize that regional differences and varying stages of development in Alaska mandate a flexible regulatory scheme and not one that is uniformly applied throughout Alaska.
6. Request an opinion from NOAA general council about the legality of imposing limits on the number of halibut that can be exported out of state.

The work group was scheduled to present its recommendations to the NPFMC during their April 1994 meeting in Anchorage. However, the council had a full schedule and decided to postpone discussion of this topic until its December 1994 meeting in Anchorage. Given that sport harvest increased during 1993, I believe it is likely this issue will eventually be tasked by the NPFMC to research and prepare a report on. Final action on this proposal is not expected prior to 1996.

Another issue pertaining to the Alaskan sport halibut fishery is an IPHC halibut tagging program in cooperation with sport charter operators. Under the program, instituted in 1994, the IPHC provides operators with tagging equipment paid for by the operators. Charter operators, at the request of guided clients, tag and release halibut and record data. The IPHC believes that tagging, if it becomes popular, could provide limited information on seasonal movements of fish to and from spawning grounds and across management area boundaries. They also believe that a similar tagging program could be implemented for the commercial fishery under the IFQ program, resulting in more information on fish under 32 inches. Enlisting the involvement and support of charter operators, anglers, and commercial fishermen in the management process is also viewed as a primary benefit. The IPHC recognizes that fostering a 'wise-use ethic' through catch and release will not reduce overall harvest; commercial catch quotas would simply be increased to offset reduced sport harvests. The department feels little useful biological data will be collected through this effort, but supports the IPHC conducting the program given current angler interest. It appears that few charters actually participated in this program during 1994.

Another issue regards possible resource competition between sport charter and commercial fishermen. Charter boat operators are concerned that commercial longliners fishing under an IFQ program due to be implemented in 1995 could deplete nearshore halibut stocks currently targeted by charter boat anglers and "crowd" recreational fishermen off their traditional fishing grounds. To alleviate this problem, charter boat operators have suggested that the council consider establishing exclusive recreational fishing zones in their traditional fishing grounds, in which commercial longlining would be prohibited. This type of proposal has not been well received by commercial longliners.

Lastly, the possibility that there may be many smaller discrete stocks of halibut within regulatory areas has been raised. This is contrary to the past theory that there is one large stock with most of the recruitment occurring in the Bering Sea and migrating down the coast. This raises the possibility of localized overfishing within a regulatory area, especially in areas near major ports where sport and commercial fishing effort may be high.

Management History

The Alaska Board of Fisheries does not have direct management authority over halibut in Alaska. The Board has, however, for enforcement reasons, enacted regulations consistent with those enacted by the IPHC or NPFMC. In 1981, the Board of Fisheries adopted a 2 fish daily and in possession regulation for all state waters. In 1988, this regulation was changed to permit 4 fish in possession, the daily bag limit was not changed.

Ongoing Research and Management Activities

A research program to evaluate the age, sex, and size compositions of the recreational halibut harvests from Area 3A waters continued during 1994 and is planned for 1995. Area 3A ports currently being sampled include Valdez and Seward in the North Gulf of Alaska and Kodiak and Homer. Secondary objectives of the study are to provide fishery managers with information regarding characteristics of the fishing fleet operating out of study ports. Staff recommend continuation of the above described research for the immediate future.

Information provided by ADF&G is needed for management of the fishery. Historically, only commercial removals were used to estimate exploitable biomass because other removals such as sport harvest were considered negligible. Recently, the IPHC has attempted to account for all sources of removal, including sport, subsistence, bycatch, and wastage. Incorporation of sport harvest in the 1991 stock assessment led to a 10% to 15% increase in overall harvest and a 10% increase in estimated biomass over recent years (Sullivan et al. 1992). Age composition of the sport harvest will be incorporated into catch-at-age analyses to estimate exploitable biomass after more years of data become available. Estimates of the mean weight of fish taken in the sport fishery are used to obtain the harvest in pounds. Information on length and sex composition can be used to evaluate the effects of traditional management measures, such as size limits. Tallies of harvest per boat trip are used to evaluate the effects of changes in bag limits. Finally, knowledge of areas fished may be useful in evaluating competition on the fishing grounds and localized stock depletion.

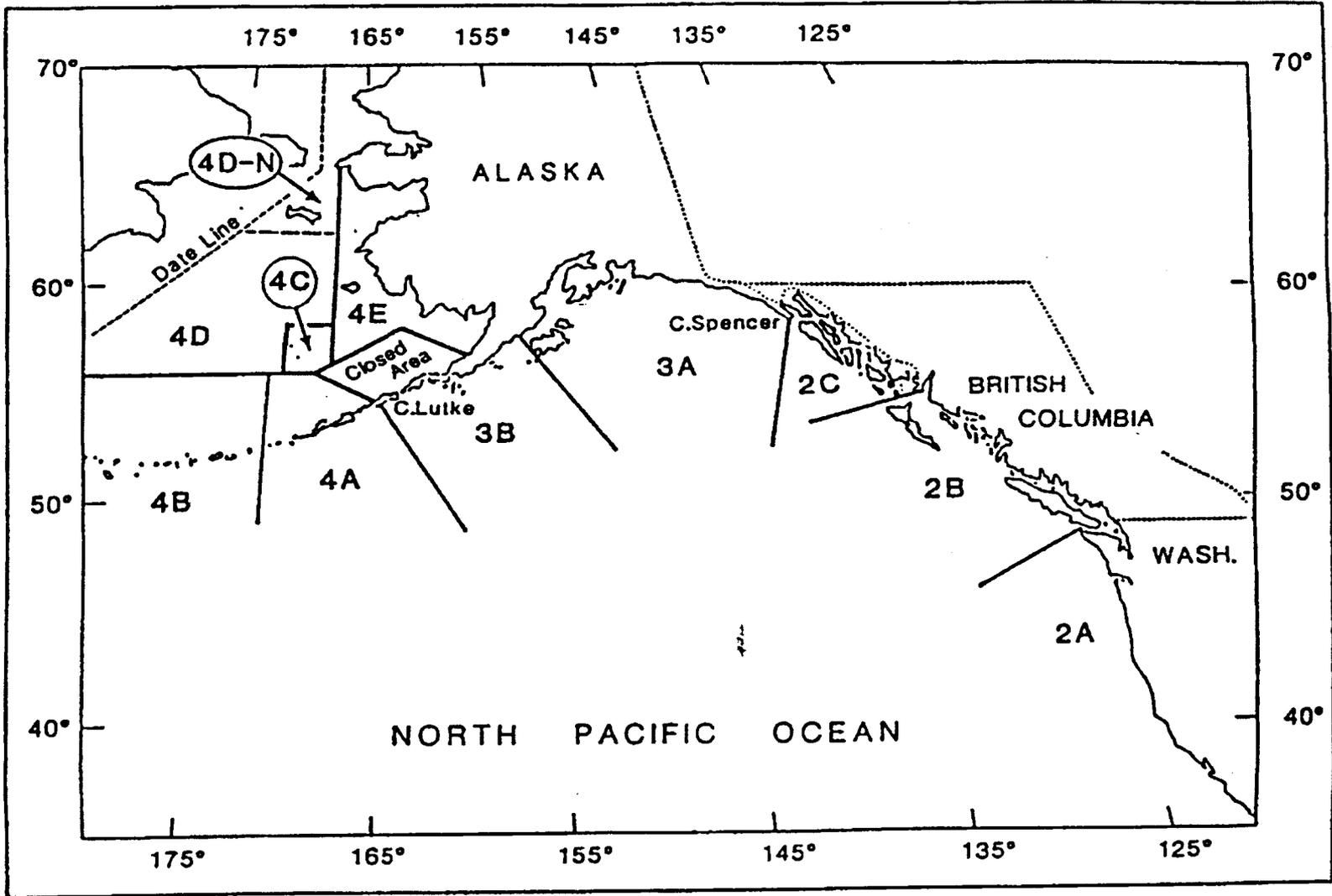


Figure 3. Regulatory areas established by the International Pacific Halibut Commission to manage North Pacific halibut stocks.

Table 4. Number of angler-days expended by recreational anglers fishing for halibut in the North Gulf of Alaska, 1987-1993.

<i>Fishery</i>	<i>1987</i>	<i>1988</i>	<i>1989</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>
Lower Cook Inlet	50,220	87,570	79,200	92,610	95,670	111,582	152,964
Kodiak	23,203	17,855	15,209	13,382	23,802	18,884	31,793
Central Gulf	37,862	41,131	43,605	53,056	55,476	58,277	71,618
<i>Combined</i>	<i>111,285</i>	<i>146,556</i>	<i>138,014</i>	<i>159,014</i>	<i>174,948</i>	<i>188,743</i>	<i>256,375</i>

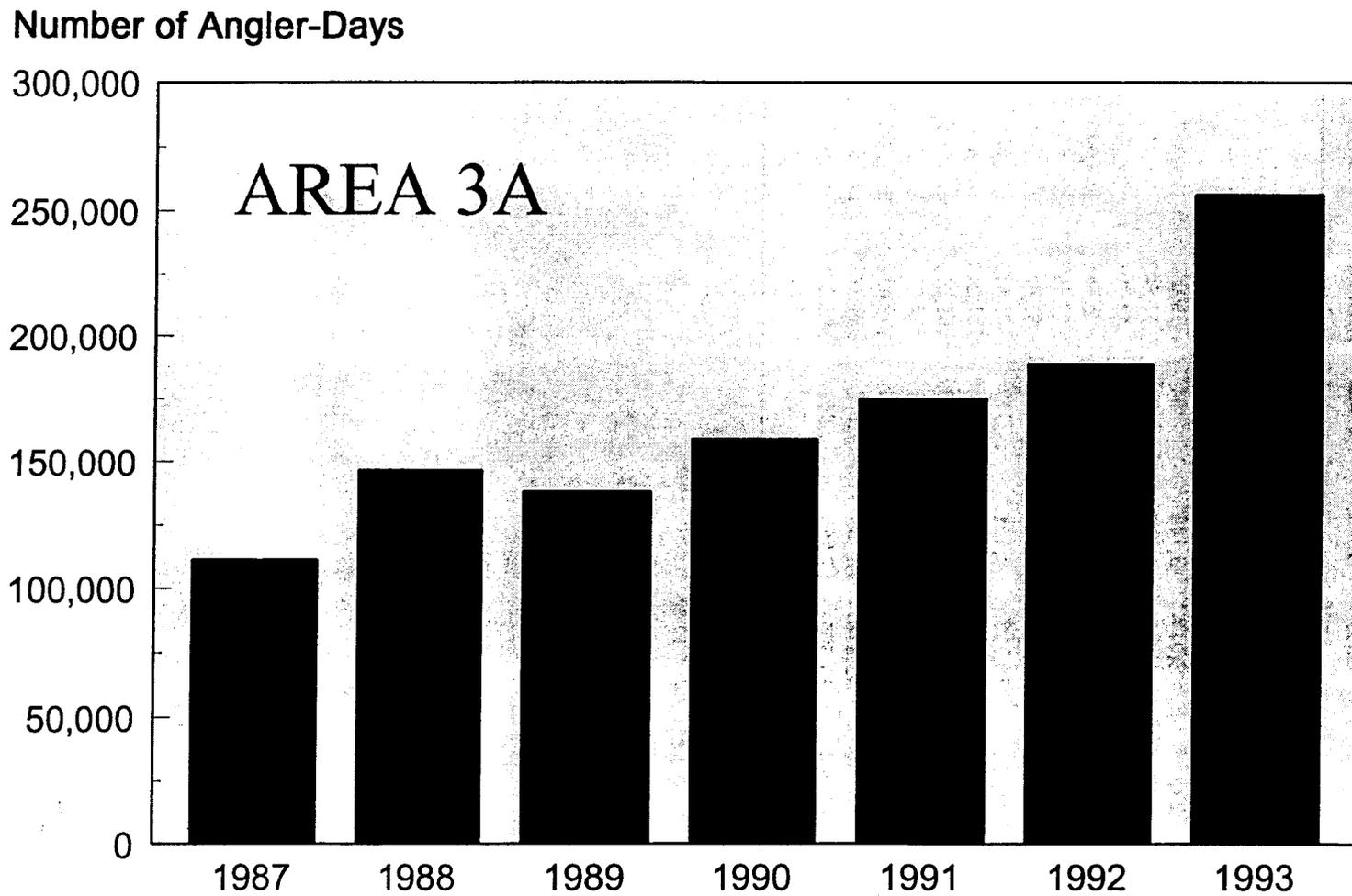


Figure 4. Number of angler-days expended by recreational anglers fishing for halibut in IPHC Regulatory Area 3A, 1987-1993.

Table 5. Number of halibut harvested by recreational anglers fishing in IPHC Regulatory Area 3A, 1977-1993 (Mills 1978-1994).

Year	Kodiak	Cook Inlet	North Gulf Coast	PWS	Yakutat	Total Area 3A	Alaska	Percent Area 3A
1977	994	13,466	1,705	1,247	428	17,840	23,244	76.8
1978	1,721	25,577	2,723	933	24	30,978	37,085	83.5
1979	3,013	26,997	2,902	1,691	78	34,681	47,705	72.7
1980	3,651	29,985	3,017	3,143	34	39,830	64,658	61.6
1981	6,858	38,721	3,443	2,495	65	51,582	74,212	69.5
1982	9,180	39,532	2,954	2,735	398	54,799	92,358	59.3
1983	8,545	60,126	2,619	3,493	682	75,465	117,042	64.5
1984	8,179	61,202	3,267	4,428	241	77,317	124,950	61.9
1985	7,303	63,158	5,934	4,527	520	81,442	127,634	63.8
1986	10,960	85,153	10,398	8,331	777	115,619	160,885	71.9
1987	9,869	78,431	7,171	4,379	1,194	101,044	145,829	69.3
1988	7,749	137,252	11,696	9,845	1,673	168,215	225,106	74.7
1989	10,435	126,917	7,251	8,697	772	154,072	229,016	67.3
1990	9,134	148,538	9,500	10,851	1,459	179,482	247,202	72.9
1991	12,089	148,646	13,818	12,733	2,112	189,398	266,523	71.1
1992	10,860	143,094	18,595	17,855	1,861	192,265	264,943	72.6
1993	14,169	162,413	25,525	19,716	2,752	224,575	313,147	71.7

Number of Halibut Harvested

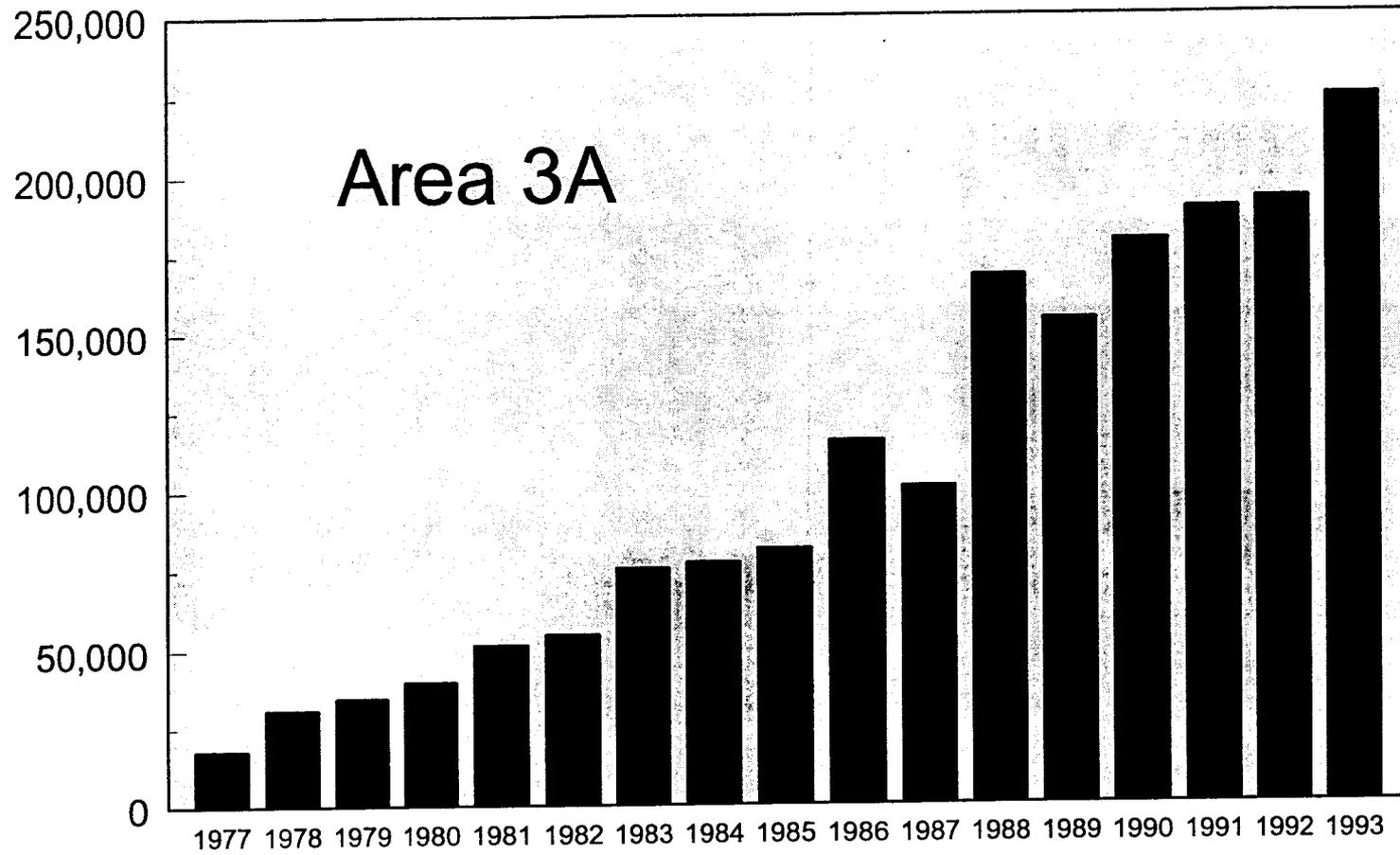


Figure 5. Number of halibut harvested by recreational anglers fishing for halibut in IPHC Regulatory Area 3A, 1977-1993.

Table 6. Number of pounds of halibut harvested by recreational anglers fishing in IPHC Regulatory Area 3A, 1977-1993.

Year	Number	Millions Pounds (net weight)
1977	17,840	0.196
1978	30,978	0.282
1979	34,681	0.365
1980	39,830	0.488
1981	51,582	0.751
1982	54,799	0.716
1983	75,465	0.945
1984	77,317	1.026
1985	81,442	1.210
1986	115,619	1.908
1987	101,044	1.989
1988	168,215	3.264
1989	154,072	3.005
1990	179,482	3.638
1991	189,398	4.236
1992	192,265	3.900
1993	224,575	5.265

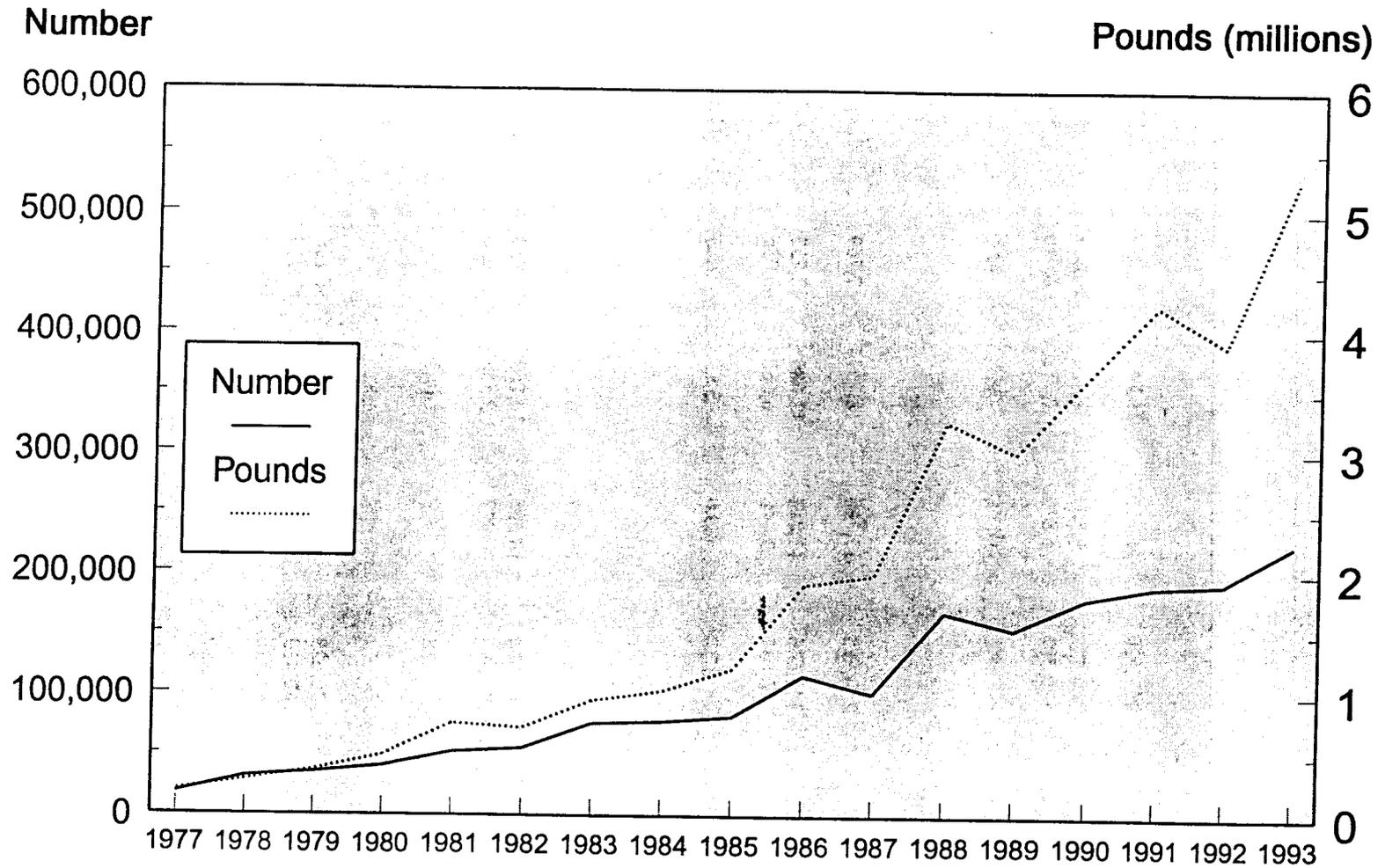


Figure 6. Number and pounds of halibut harvested by recreational anglers fishing for halibut in IPHC Regulatory Area 3A, 1977-1993.

Table 7. Estimated catch, harvest, and percent of catch released in the Area 3A recreational fishery, 1990-1993 (Mills 1991-1994).

Year and Component	Number of Fish by Location					Total
	Cook Inlet ^a	Seward ^b	Kodiak ^c	PWS ^d	Yakutat ^e	
<i>1990:</i>						
Catch	277,920	16,310	16,846	18,897	2,052	332,025
Harvest	148,538	9,500	9,134	10,851	1,459	179,482
Release	129,382	6,810	7,712	8,046	593	152,543
% Released	46.6	41.8	45.8	42.6	28.9	45.9
<i>1991:</i>						
Catch	218,685	17,266	18,757	17,769	2,567	275,044
Harvest	148,646	13,818	12,089	12,733	2,112	189,398
Release	70,039	3,448	6,668	5,036	455	85,646
% Released	32.0	20.0	35.5	28.3	17.7	31.1
<i>1992:</i>						
Catch	254,691	28,537	20,216	27,511	2,597	333,552
Harvest	143,094	18,595	10,860	17,855	1,861	192,265
Release	111,597	9,942	9,356	9,656	736	141,287
% Released	43.8	34.8	46.3	35.1	28.3	42.4
<i>1993:</i>						
Catch	330,623	43,149	29,212	36,136	3,710	442,830
Harvest	162,413	25,525	14,169	19,716	2,752	224,575
Release	168,210	17,624	15,043	16,420	958	218,255
% Released	50.9	40.8	51.5	45.4	25.8	49.3

^a Cook Inlet: waters north of a line from Gore Point to Cape Douglas.

^b Seward: all waters from Gore Point east to Cape Puget.

^c Kodiak: waters surrounding the Kodiak and Afognak Island groups, including the Barren and Trinity Islands.

^d Prince William Sound: waters between Cape Suckling and Cape Puget.

^e Yakutat: Yakutat Bay and adjacent Gulf of Alaska waters.

Million Pounds of Halibut Harvested

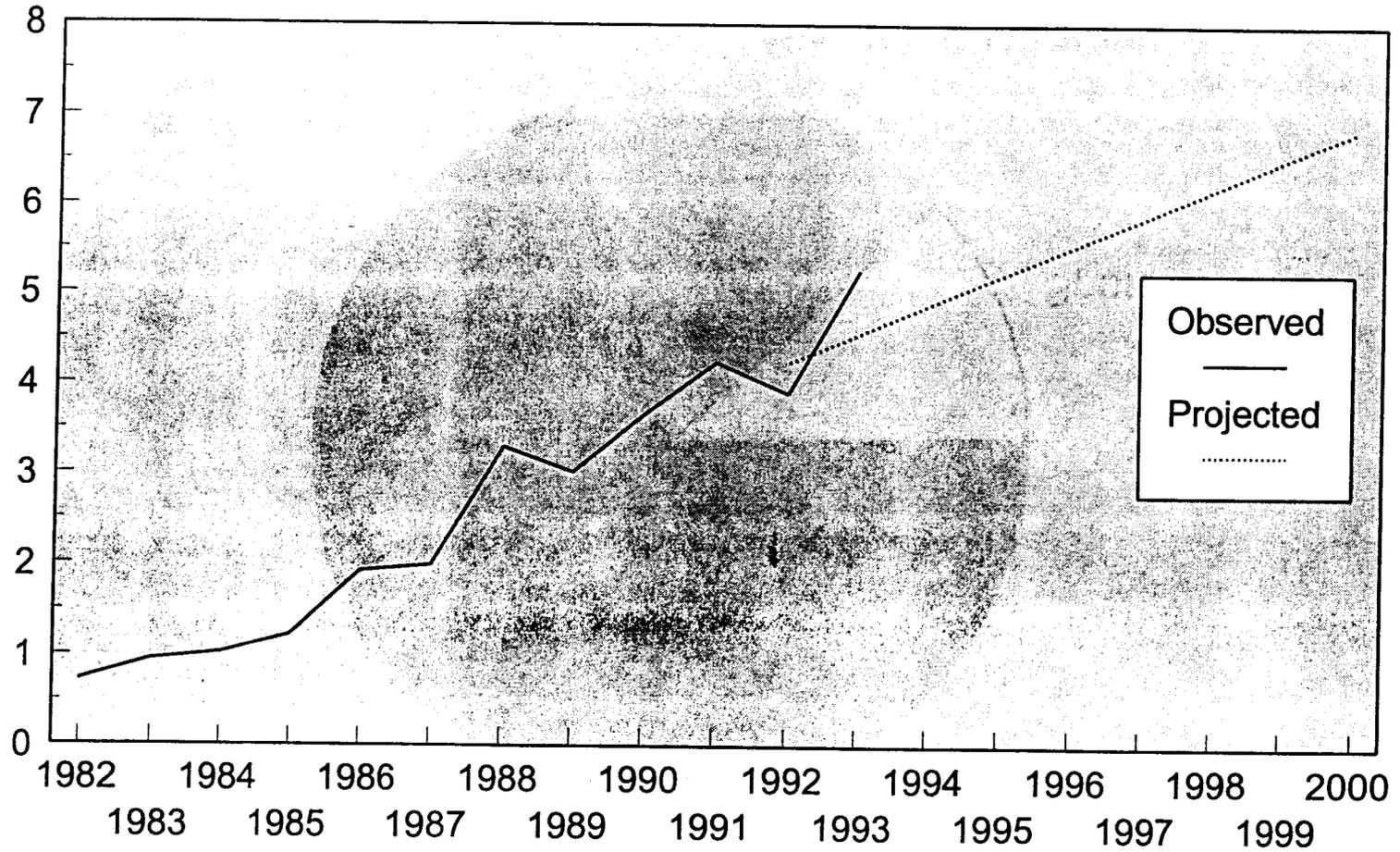


Figure 7. Observed and projected growth in halibut harvests by recreational anglers (chartered and nonchartered) in IPHC Regulatory Area 3A through the year 2000.

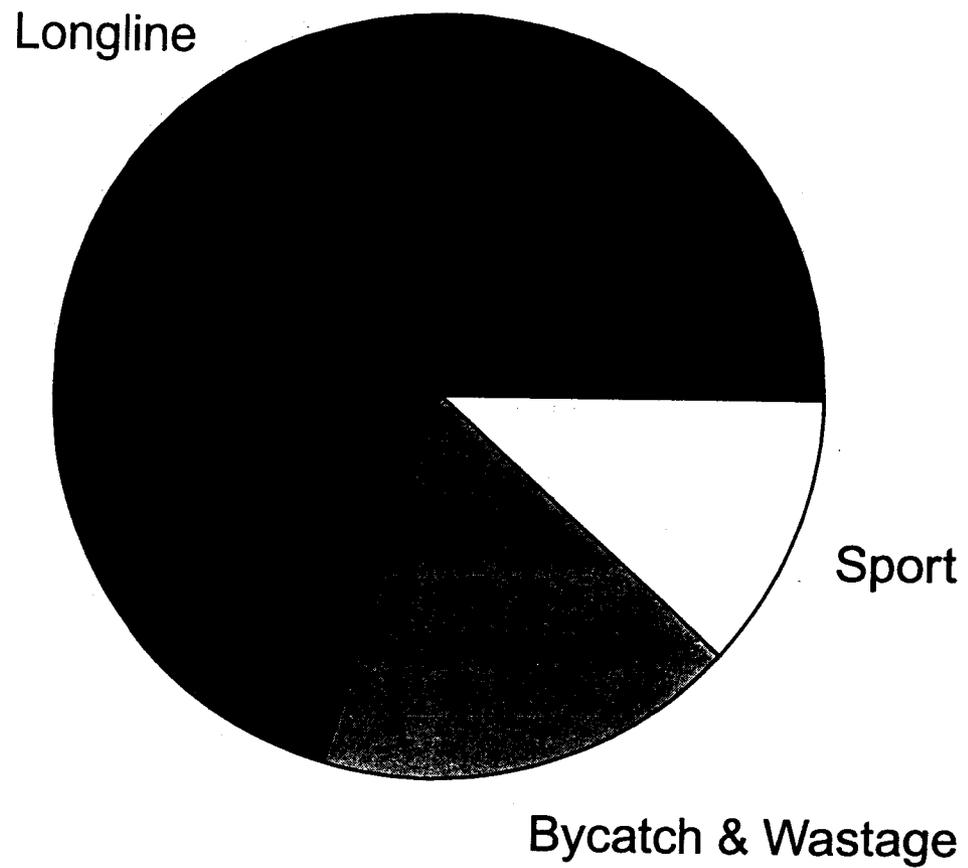


Figure 8. Removals of halibut in IPHC Regulatory Area 3A during 1993.

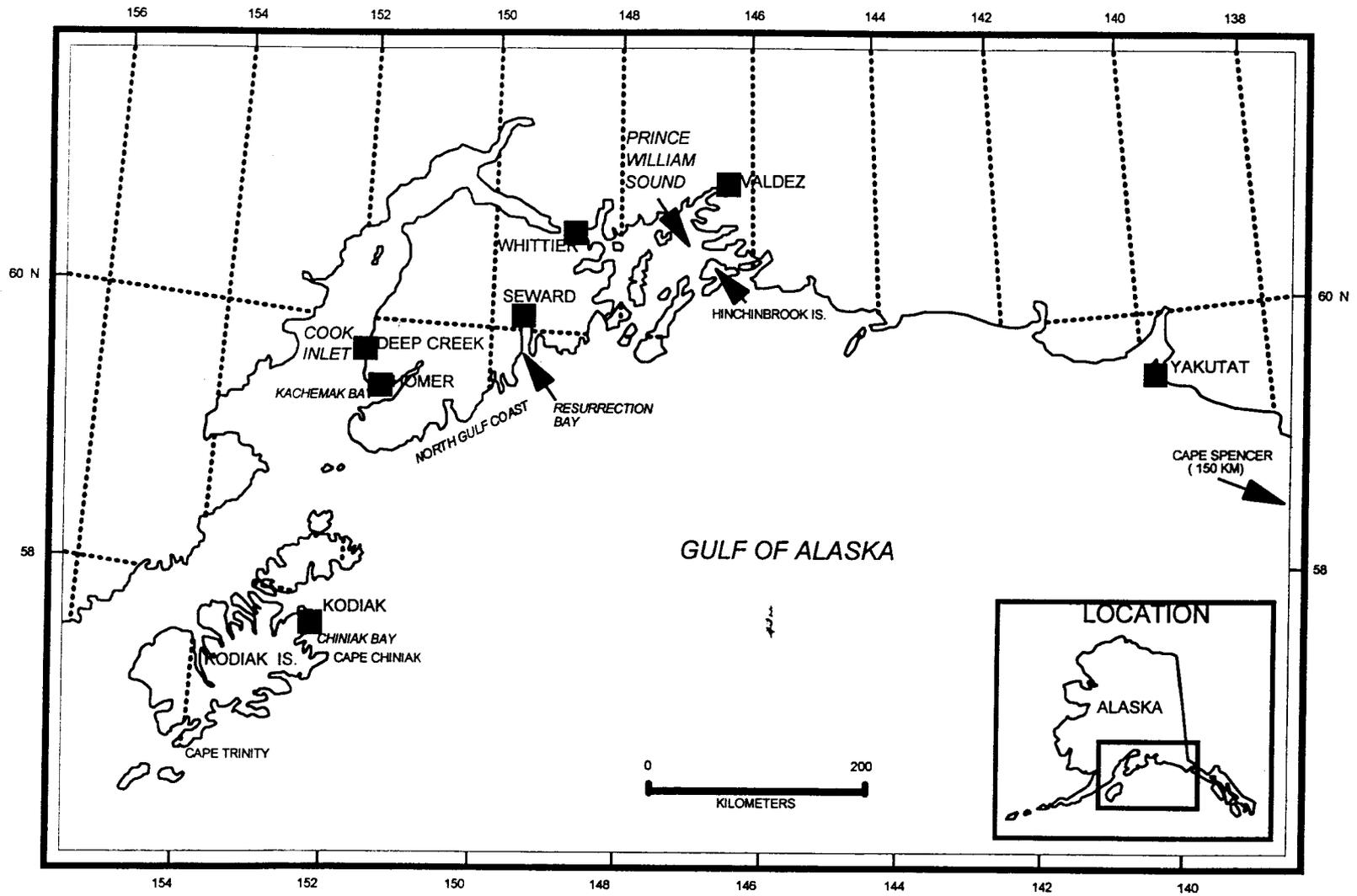


Figure 9. North Gulf of Alaska coastal waters and major ports of recreational halibut landings in IPHC Regulatory Area 3A.

Table 8. Number of halibut harvested in Cook Inlet recreational fisheries, 1977-1993 (Mills 1979-1994).

Year	Lower Cook Inlet	Central Cook Inlet	West Cook Inlet ^a	Total Cook Inlet	Percent Of Area 3A
1977	9,416	4,050	-	13,466	75.5
1978	20,756	4,821	-	25,577	82.6
1979	20,479	6,518	-	26,997	77.8
1980	21,808	8,177	-	29,985	75.3
1981	29,294	9,427	-	38,721	75.1
1982	28,851	10,681	-	39,532	72.1
1983	36,623	23,503	-	60,126	79.7
1984	37,747	23,455	-	61,202	79.2
1985	41,450	21,198	510	63,158	77.5
1986	44,250	39,831	1,072	85,153	73.6
1987	45,707	31,855	869	78,431	77.6
1988	93,878	42,182	1,192	137,252	81.6
1989	76,606	49,087	1,224	126,917	82.4
1990	93,941	52,912	1,685	148,538	82.8
1991	89,998	57,072	1,576	148,646	78.5
1992	81,451	60,659	984	143,094	74.4
1993	159,906 ^b		2,507 ^b	162,413	72.3

^a No halibut harvest was recorded in West Cook Inlet until 1985.

^b Cannot distinguish between Lower and Central Cook Inlet.

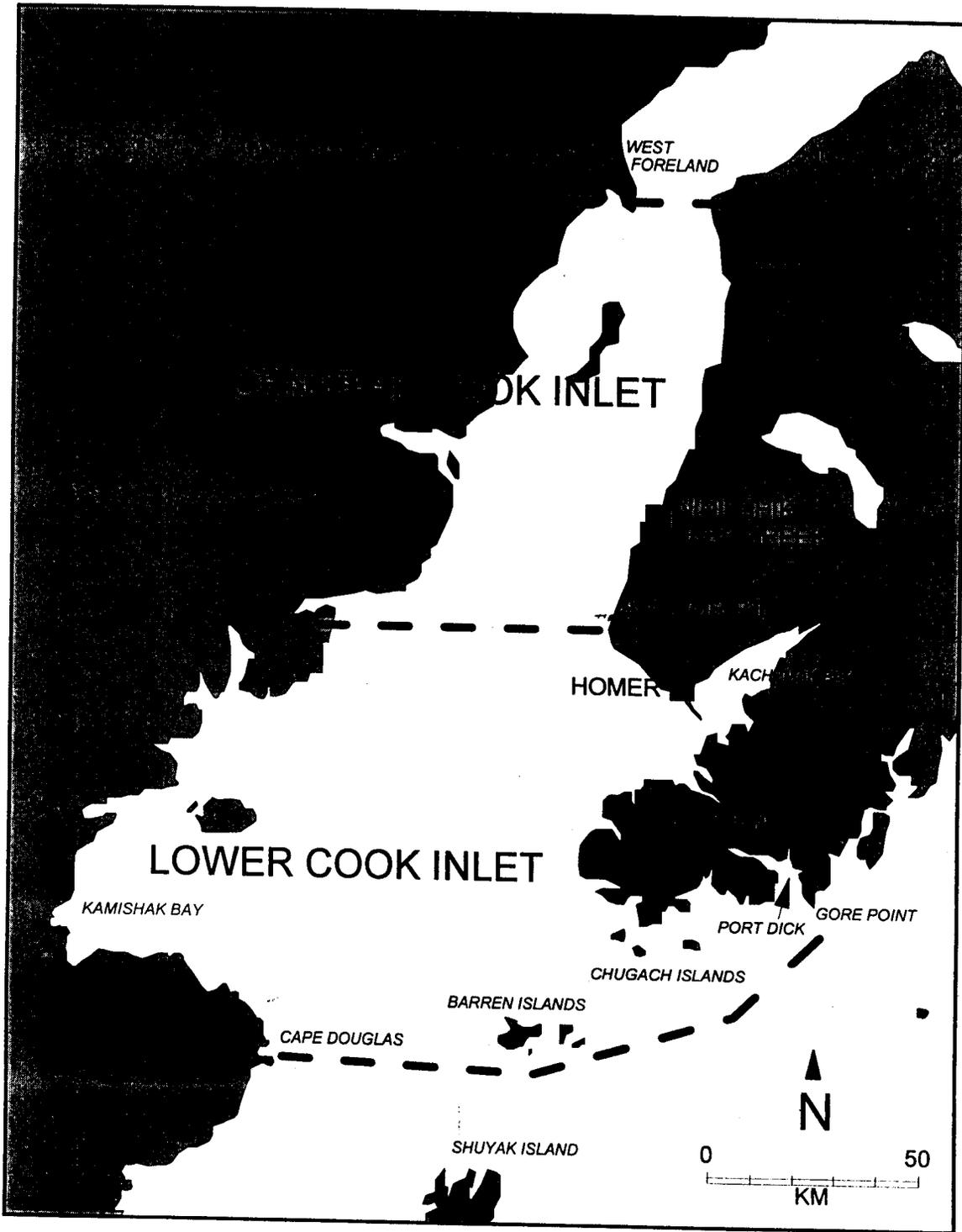


Figure 10. Approximate areas fished in the Central and Lower Cook Inlet recreational halibut fisheries.

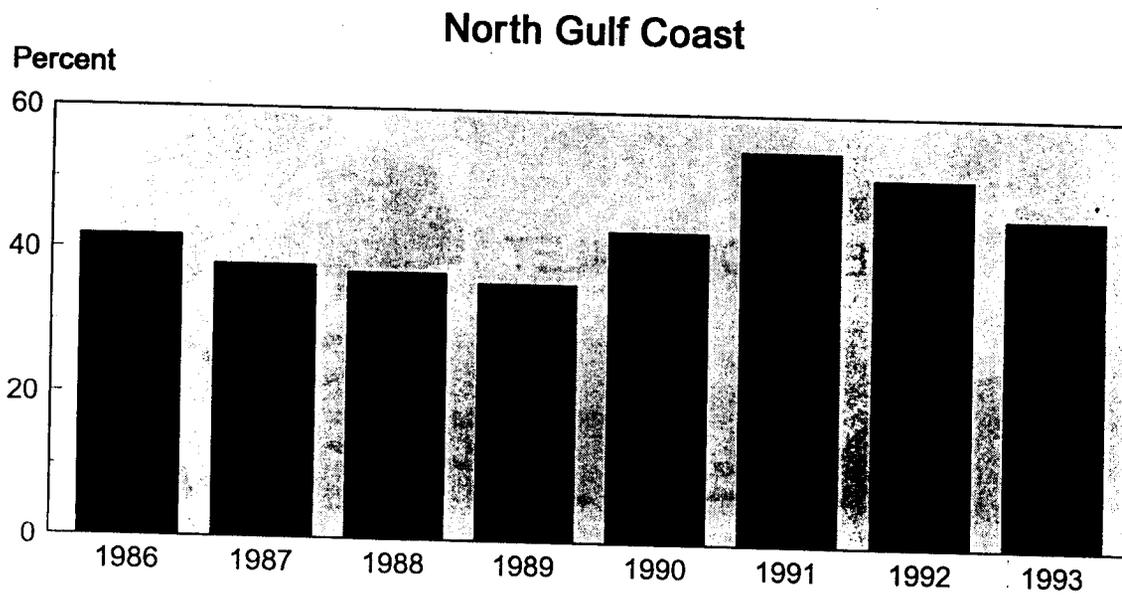
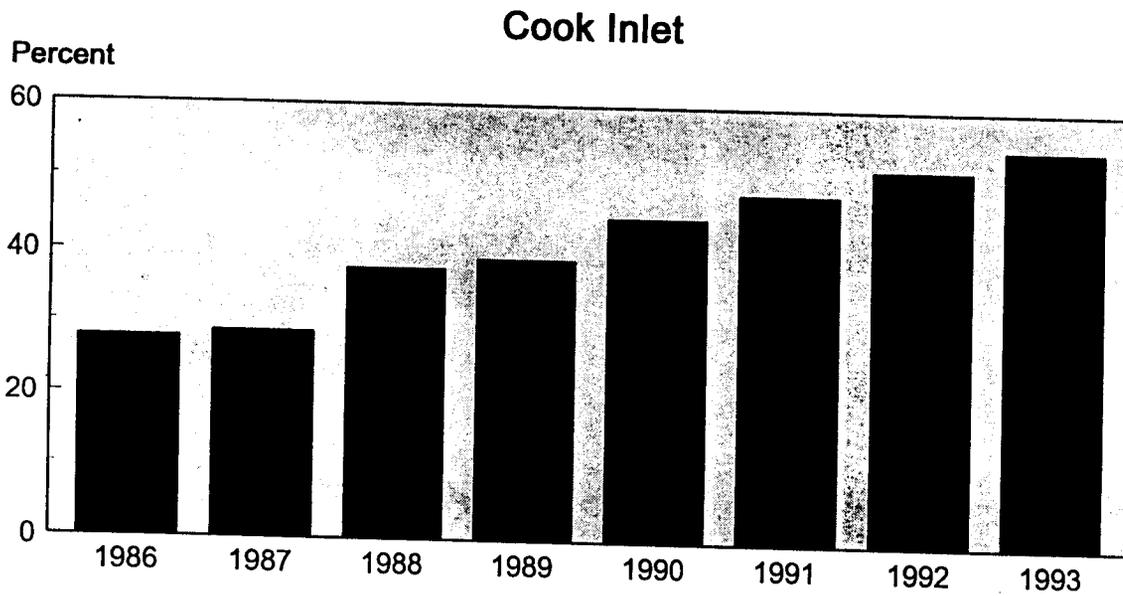


Figure 11. Percentage of the total recreational halibut harvests by chartered and nonchartered anglers in Kenai Peninsula fisheries, 1986-1992

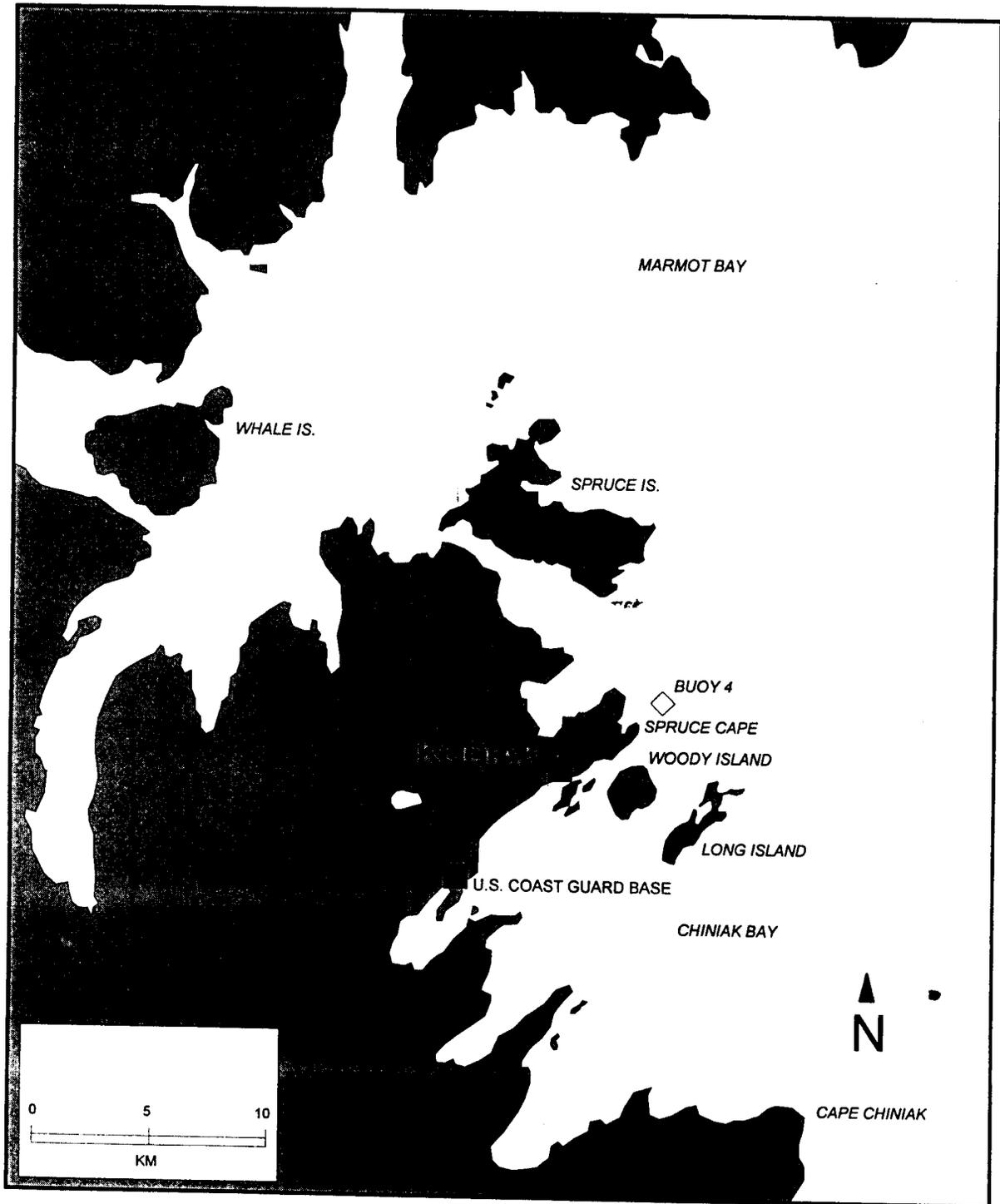


Figure 12. Approximate waters fished by the Kodiak-based recreational halibut fleet.

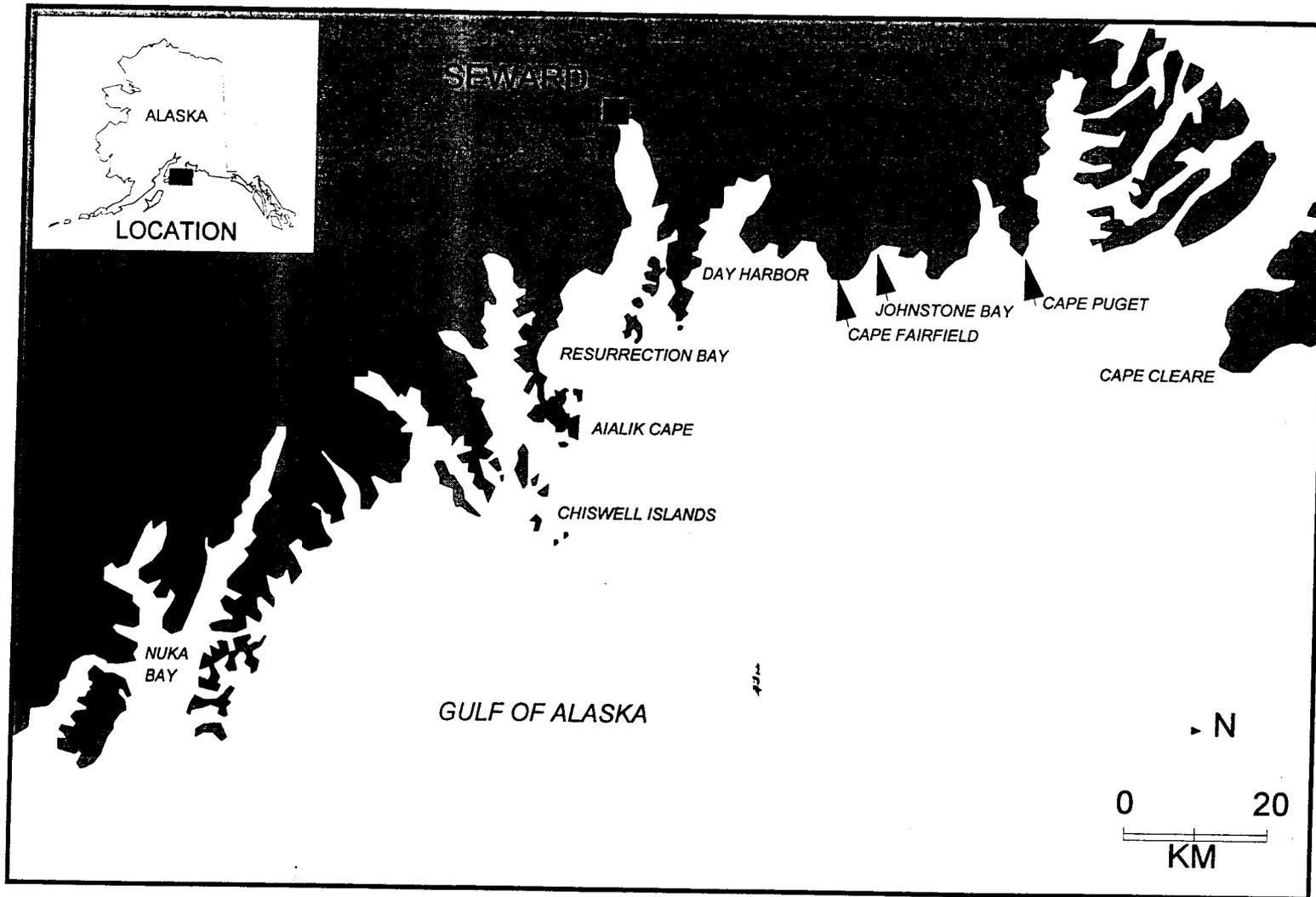


Figure 13. Approximate waters fished along the North Gulf Coast by the Seward-based recreational halibut fleet.

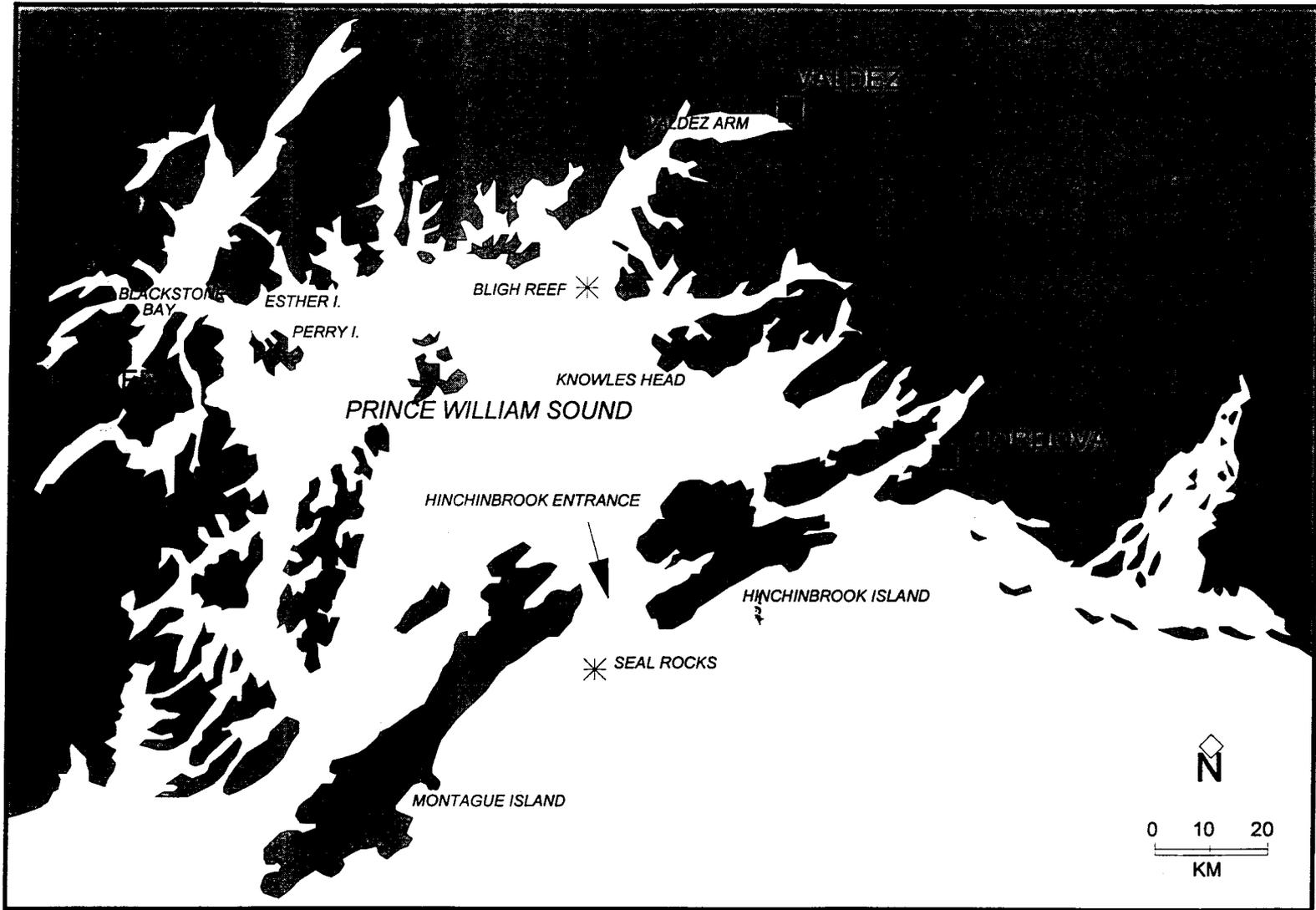


Figure 14. Prince William Sound and adjacent waters fished by recreational halibut fleets based out of Whittier, Valdez, and Cordova.

NORTH GULF OF ALASKA RECREATIONAL ROCKFISH FISHERIES

A variety of rockfishes inhabit the marine waters of the North Gulf of Alaska, including species of the genera *Sebastes* and *Sebastolobus*. For management purposes, these rockfishes are usually categorized into the following groups: slope rockfish, demersal shelf rockfish, and pelagic shelf rockfish (Table 9). The recreational fishery primarily targets the demersal shelf and pelagic shelf rockfish groups, with slope rockfish only occasionally being harvested. Although many species of rockfish have been identified as being harvested by recreational anglers fishing in the North Gulf of Alaska (Meyer 1993a), the most commonly harvested rockfish in the recreational fishery are the demersal shelf yelloweye rockfish (*Sebastes ruberrimus*) and the pelagic shelf black (*S. melanops*) and dusky (*S. ciliatus*) rockfishes.

The recreational fishery for rockfish in the North Gulf of Alaska occurs primarily in state waters. In state waters, responsibility for management and allocation of rockfish lies with the Alaska Board of Fisheries. Under Board-adopted regulations, there are no size restrictions for rockfish in any of the North Gulf of Alaska regulatory areas and limits for rockfish in the North Gulf of Alaska vary by regulatory area. In Prince William Sound the limits are 5 per day, 10 in possession from May through September and 10 per day, 10 in possession from September 16 through April 30. There is also a requirement that all rockfish which are removed from the water in this area must be retained as part of the bag limit of the person originally hooking them. In the Cook Inlet - Resurrection Bay Saltwater Area, the limits are 5 per day, 10 in possession year-round. In the Kodiak Regulatory Area, the limits are 10 per day, 20 in possession year-round. There are currently no limits for rockfish in the Alaska Peninsula - Aleutian Islands Regulatory Area. The Department has submitted a proposal to the Board of Fisheries that will be considered during February 1995 that asks the Board to establish a 10 fish daily, 20 fish in possession limit for rockfishes in the Alaska Peninsula - Aleutian Islands Regulatory Area. Although available and open year-round, most recreational rockfish are harvested from May through early September.

The commercial fishery for rockfish in the North Gulf of Alaska occurs both in state and federal waters. In state waters, the Alaska Board of Fisheries has allocative and management responsibility for rockfish. Up until 1993, the Commercial Fisheries Management and Development Division lacked specific strategies for the management of rockfishes in state waters and thus management was consistent with adjacent federal waters via the North Pacific Fishery Management Council management plans (Bechtol 1992). These management plans, based on a management strategy for slope rockfishes, however, appeared insufficient for conservation of nearshore rockfish assemblages which are dominated by pelagic and demersal shelf rockfishes. For this reason, the Board adopted the North Gulf of Alaska Rockfish Management Plan which utilizes trip and bycatch limits and annual harvest guidelines to better protect nearshore rockfish assemblages. The plan became effective during 1993 and was a good first step towards management of this fishery.

Management Objective and Approach

Rockfish stocks of the North Gulf of Alaska are managed for both commercial and recreational uses. In most years, commercial harvests have exceeded sport harvests in most areas of the North Gulf of Alaska. However, in some areas, notably along the North Gulf of Alaska near Seward, recreational harvests in some years exceed commercial harvests. At present, there are no major allocation issues surrounding North Gulf of Alaska rockfish stocks.

Due to a lack of stock assessment data, no specific fishery objectives have been formally established for recreational rockfish fisheries of the North Gulf of Alaska. An assumption of past and current fisheries management, however, has been to assure for the sustained yield of the various rockfish stocks that occur within the area while assuring for continued and, where possible, expanded opportunity to participate in diverse fisheries targeting these stocks. Given the lack of data, recreational fisheries targeting North Gulf of Alaska rockfish stocks are managed under relatively restrictive regulations.

Stock Status

Unfortunately, there is a lack of historic data to assess either the sustained yields or current status of North Gulf of Alaska rockfish stocks; thus, it is unknown at present whether current harvest levels are sustainable. However, based on known life history characteristics, I assume for management purposes that some demersal shelf rockfish, specifically yelloweye rockfish, in the vicinity of Seward are being over-harvested while the pelagic shelf black and dusky rockfishes are likely being harvested at or below sustainable levels.

Fisheries Overview

North Gulf of Alaska rockfish assemblages support popular and diverse recreational fisheries, which in 1993, supported about 32,000 days of angling effort (*Table 1*). In comparison, these fisheries supported just over 20,000 days of recreational angling effort in 1987. Major recreational rockfish fisheries occur out of Valdez, Whittier, and Cordova in Prince William Sound; Seward along the North Gulf of Alaska; Homer in Lower Cook Inlet; and, Kodiak on the Kodiak Island Archipelago. Of these, the most popular fisheries in terms of effort and harvest are those that occur out of Seward along the North Gulf of Alaska.

Although accessible by road, all North Gulf of Alaska rockfish fisheries are considered remote, in that they require a boat or guide to participate in; thus, the cost to participate in these fisheries is relatively high. Guides make up a significant component of the North Gulf of Alaska rockfish fishery. Because of the availability of guides, these fisheries offer a range of angling opportunities for both experienced and inexperienced anglers. Information is not available to estimate the economic value of the North Gulf of Alaska recreational fishery.

The sport harvest of rockfish from North Gulf of Alaska waters has generally increased since 1977 with the 1993 harvest of just over 50,500 rockfish being over double the 1977 harvest of 22,000 rockfish (*Table 10, Figure 15*). Assuming an average weight (round) of 4 pounds per harvested rockfish, the 1993 harvest amounts to a harvest of just over 200,000 pounds, the fourth largest harvest on record since 1977 (*Table 10*). North Gulf Coast waters accessible from Seward have accounted for a majority of the total rockfish harvest in all years (*Table 10*). The Seward area rockfish fishery is one of the largest recreational rockfish fisheries in Alaska (Mills 1991). Areas fished near Seward include waters from the entrances to Prince William Sound to Gore Point; however, most of the fishery occurs in the vicinity of the capes and islands near the entrance to Resurrection Bay.

In addition to the harvest of 55,595 rockfish from North Gulf of Alaska waters during 1993, an additional 45,640 rockfish were estimated to have been caught and released by sport anglers fishing these waters during 1993 (*Table 11, Mills 1993*). In general, the numbers of rockfish released by recreational anglers has been increasing, with the 1993 release being the largest on record (*Figure 16*). Mortality on released rockfish, most notably the demersal shelf rockfishes, is believed to be high.

Harvest and catch estimates for rockfish are not yet available for the 1994 season. Observations of the fishery during 1994 suggest that rockfish harvests may be higher than average due to restrictions placed on North Gulf of Alaska recreational lingcod to assure for the stock's long-term sustained yield. It appears that many anglers redirected effort they would have expended on lingcod towards rockfish, especially in Seward area waters.

North Gulf of Alaska rockfish stocks are also harvested in several commercial fisheries. In the Central Region (extending from PWS eastward through Cook Inlet), commercial harvests generally exceed those of recreational harvests (*Table 12*). An exception is the waters near Resurrection Bay. In these waters, sport harvests have exceeded commercial harvests in some years (*Table 13*).

Management Issues

There has been a great deal of concern voiced by federal and state managers over the past decade regarding the status of North Pacific rockfish stocks and the validity of current practices and approaches used to manage these stocks. Specifically, managers are concerned that many rockfish stocks, specifically demersal shelf rockfishes, in

the North Pacific Ocean are being overharvested and that current management strategies are not protecting rockfish stocks from overharvest and not allowing depressed stocks to rebuild.

Historically, rockfish have been managed based on sustained yield principles using yield or production models based on relatively short-lived and fast-cycling species (less than 15 years). The validity of applying these models to longer-lived species like rockfish which exhibit extreme longevity is questionable, especially given the documented declines in many rockfish stocks over the past decade. Also, due to a lack of species-specific life history information for many rockfish species, rockfish are often grouped into species assemblages which are managed based on assumed or average life history characteristics of the species assemblage. This often leads to more susceptible species in an assemblage being overexploited at the cost of harvesting the less susceptible species in that assemblage.

Much of the concern for rockfish arises from the inherent susceptibility of rockfishes to overexploitation. Rockfish tend to be slow growing and long-lived. Many rockfish do not mature until at least 10 years of age with some rockfish not maturing until age 20. Most rockfish also live to be over 50 years, however, some rockfish can live to over 100 years. Rockfish also display high survival rates. Most rockfish have annual survival rates exceeding 80%, with some rockfish having rates exceeding 95%. Lastly, juvenile survival is often at the mercy of marine environmental conditions. Given these life history characteristics, many rockfish have very low sustained yields. For some species, the acceptable fishing mortalities may be limited to bycatch mortality only, given that survival of released rockfish is low. Additionally, there is a lack of species-specific life history information for many rockfish species and an inability to obtain accurate biomass or abundance estimates for many rockfish species.

Commercial and recreational landings of rockfish have increased over the past decade as many traditional fisheries, such as salmon and crab, have experienced biological or economic declines. Stock composition data to assess the North Gulf of Alaska rockfish resources are limited. While stock data are being collected, efforts to control harvest levels and protect the rockfish resources of this area have involved adopting increasingly restrictive regulations for recreational fisheries and federal management strategies and inseason closures for commercial fisheries. However, this approach has not offered sufficient protection to some heavily exploited nearshore stocks. Limited data from commercial test fishing and sport fishing in marine waters in and near Resurrection Bay suggest that the abundance of older black rockfish has declined since the early 1980s and that some species such as yelloweye rockfish are disappearing (Vincent-Lang 1991).

In past years, the Board of Fisheries has promulgated regulations that have increasingly restricted the bag and possession limits for recreational anglers along the North Gulf coast in an attempt to maintain the sustained yield of these stocks. However, harvests have grown under the more restrictive regulations raising the specter of stock conservation concerns.

During their 1992 meeting, the Board established a series of management plans for Central Gulf of Alaska commercial rockfish fisheries. These management plans (North Gulf Coast 5 AAC 28.465, Prince William Sound 5 AAC 28.265, and Cook Inlet 5 AAC 28.365 Rockfish Management Plans) establish trip limits for allowable rockfish landings during a 5-day period for the North Gulf Coast, Prince William Sound, and Cook Inlet areas. The plans also establish harvest quotas for each area (150,000 pounds) after which the fishery in an area reverts to bycatch only.

If these measures are not sufficient to protect nearshore rockfish and stock declines occur, it may be necessary to adopt an even more restrictive management strategy. One such strategy being considered is setting aside rockfish refuges where no harvest of rockfish is allowed. This strategy has been suggested by several managers in the literature and is currently being employed in California. Implementation of this strategy, however, would significantly reduce fishing opportunity for other species and therefore must be carefully considered prior to implementation. Some refuges already exist through exclusion zones around documented marine mammal haulouts. The effectiveness of these refuges should be evaluated in the future. A white paper discussing the merits and drawbacks of refuges is presented in Appendix A.

The department is also considering submitting a proposal to the Alaska Board of Fisheries asking for a reduction in the daily bag and possession limit for North Gulf Coast waters near Seward. Recent data suggests that demersal shelf rockfish, notably yelloweye rockfish, may be being over-harvested in these waters (*unpublished data*). The State is also considering asking the North Pacific Fishery Management Council for management control of nearshore rockfish fisheries in adjacent federal waters to the North Gulf of Alaska.

Concern has also been raised that commercial rockfish harvests may increase as a result of a new Individual Fishery Quota (IFQ) system to be enacted for the Alaskan commercial halibut fishery during 1995. Under the new IFQ system, commercial halibut fishermen will have up to 8 months to catch their annual individual halibut quota. Under the old system, commercial halibut fishermen had, at maximum, up to two 24-hour periods to catch an area quota. This resulted in an incentive to fish clean, as bycatch during severely time-restricted openings resulted in reduced landing of halibut. Because bycatch in nearly all cases is lower in value than halibut, this resulted in a reduced value of the landing. There is a fear under the new system that because time is not limited, bycatch will increase. For fishes with high exploitable biomasses, this is not viewed as a problem. However, for fishes such as rockfish that have very low exploitable biomasses, increased bycatch may result in over-harvest. Department managers are considering asking the Board for permission to close areas in which rockfish quotas have been achieved to commercial longline fishing to avoid further rockfish bycatch.

Concern has also been raised that an IFQ system will result in increased competition on the fishing grounds between commercial fishermen and sport anglers. Competition was minimal in the past because the commercial fishery operated far offshore where the abundance of large halibut was higher during spring and fall commercial openings. The long season permissible under the IFQ system will allow overlap of commercial and sport fishing times. In addition, the commercial fleet will likely fish closely to port. Implementation of an IFQ system in Canada resulted in a significant number of vessels fishing closer to port, despite lower catch rates. These concerns have caused some recreational fishing groups to discuss establishment of exclusion zones for the commercial fishery that encompass their traditional fishing areas near major sport ports. As can be expected, such proposals have not been well received by commercial fishermen.

Management History

Prior to 1973, the recreational fishery for rockfish along the North Gulf of Alaska was unregulated. In 1973, the Board adopted a 10 daily and 10 in possession limit for rockfish harvested in the Cook Inlet - Resurrection Bay Saltwater Area. In 1989, the Board reduced the daily bag limit for this area to 5, the possession limit did not change. This action was taken to reduce harvest given staff concern for the health of the resource in this regulatory area. Also in 1989, the Board adopted a 20 fish daily/20 fish possession limit for rockfish in the Prince William Sound Regulatory Area, of which no more than 5 rockfish could be *red rockfish*. This action was taken in recognition of rockfish as a sport species requiring management. The special requirement for *red rockfish* was enacted given staff concern for overharvest of these longer-lived rockfish (e.g., yelloweyes). In 1991, the Board reduced the limits in the Prince William Sound Regulatory Area using a seasonal approach, given staff concern for rockfish stocks in this regulatory area. During the summer months (May 1 - September 15), the Board reduced the limits for rockfish in this regulatory area to 5 per day, 10 in possession from May through September 15, and 10 per day and in possession from September 16 through April 30. Additionally, the Board mandated that all rockfish which are removed from the water in this area must be retained as part of the bag limit of the person originally hooking them. These actions were taken in an attempt to assure harvests would remain sustainable. The Board also removed the stipulation that only 5 may be *red rockfish*. This later action was taken over concern that many *black rockfish* were being released to harvest *red rockfish* and that many of the released *black rockfish* were suffering high mortality. In 1993, the Board adopted a 10 fish daily bag limit and 20 fish possession limit for rockfish in the Kodiak Regulatory Area. This action was taken in recognition of rockfish as a sport species requiring management in this regulatory area.

Ongoing Research and Management Activities

A research program to evaluate rockfish stocks in the North Gulf of Alaska is currently underway. The objectives of this program are to collect age, sex, and length composition data and to obtain species composition statistics for

the sport harvest of rockfish in this area. In addition, the distribution of recreational groundfishing effort and harvests are being monitored. Ports currently being sampled include Valdez and Seward in the North Gulf of Alaska and Kodiak and Homer. In combination, these data are being used to determine selected life history characteristics of the commonly harvested rockfish species and to evaluate stock status and validity of current management strategies. Staff recommend continuation of the current research program. Additionally, staff recommend that an aging validation study for rockfish be implemented to determine the validity and magnitude of errors associated with current aging practices. A stock assessment report on rockfish in the North Gulf of Alaska is due to be published during the spring of 1995.

Table 9. Species comprising the slope, pelagic shelf, and demersal shelf rockfish assemblages (NPFMC 1993).

<i>Species Assemblage</i>	<i>Common Name</i>	<i>Scientific Name</i>	
Pelagic Shelf	Dusky rockfish	<i>Sebastes ciliatus</i>	
	Black rockfish	<i>Sebastes melanops</i>	
	Widow rockfish	<i>Sebastes entomelus</i>	
	Blue rockfish	<i>Sebastes mystinus</i>	
	Yellowtail rockfish	<i>Sebastes flavidus</i>	
Demersal Shelf	Canary rockfish	<i>Sebastes pinniger</i>	
	China rockfish	<i>Sebastes nebulosus</i>	
	Copper rockfish	<i>Sebastes caurinus</i>	
	Quillback rockfish	<i>Sebastes maliger</i>	
	Redbanded rockfish	<i>Sebastes babcocki</i>	
	Rosethorn rockfish	<i>Sebastes helvomaculatus</i>	
	Tiger rockfish	<i>Sebastes nigrocinctus</i>	
	Yelloweye rockfish	<i>Sebastes ruberrimus</i>	
	Slope	Pacific Ocean perch	<i>Sebastes alutus</i>
		Shortraker rockfish	<i>Sebastes borealis</i>
Roughey rockfish		<i>Sebastes aleutianus</i>	
Northern rockfish		<i>Sebastes polyspinus</i>	
Sharpchin rockfish		<i>Sebastes zacentrus</i>	
Redstripe rockfish		<i>Sebastes proriger</i>	
Harlequin rockfish		<i>Sebastes variegatus</i>	
Silvergrey rockfish		<i>Sebastes brevispinis</i>	
Yellowmouth rockfish		<i>Sebastes reedi</i>	
Bocaccio		<i>Sebastes paucispinis</i>	
Greenstriped rockfish		<i>Sebastes elongatus</i>	
Darkblotched rockfish		<i>Sebastes crameri</i>	
Pygmy rockfish		<i>Sebastes wilsoni</i>	
Splitnose rockfish		<i>Sebastes diploproa</i>	
Aurora rockfish		<i>Sebastes aurora</i>	
Blackgill rockfish		<i>Sebastes melanostomus</i>	
Chilipepper rockfish		<i>Sebastes goodei</i>	
Shortbelly rockfish	<i>Sebastes jordani</i>		
Stripetail rockfish	<i>Sebastes saxicola</i>		
Vermilion rockfish	<i>Sebastes miniatus</i>		

Table 10. Harvest of rockfish, by area, by recreational anglers fishing North Gulf of Alaska waters, 1977-1993 (Mills 1978-1994).

Year	Prince William Sound	North Gulf Coast	Kodiak	Alaska Peninsula Aleutian Islands	Cook Inlet	Total	
						Number	Pounds
1977	4,401	12,783	2,810	0	2,098	22,092	88,368
1978	5,035	17,438	1,907	0	4,981	29,361	117,444
1979	11,018	21,752	3,599	0	3,518	39,887	159,548
1980	6,174	27,948	1,489	0	2,014	37,625	150,500
1981	11,610	19,516	6,242	421	3,585	41,374	165,496
1982	5,608	22,878	3,992	178	2,627	35,283	141,132
1983	6,514	17,990	3,252	62	4,710	32,528	130,112
1984	7,993	22,845	8,231	1,116	3,640	43,825	175,300
1985	8,853	17,142	4,691	199	2,686	33,571	134,284
1986	9,762	37,574	4,479	686	7,189	59,690	238,760
1987	6,563	12,333	6,501	2,046	3,821	31,264	125,056
1988	12,711	34,906	11,369	1,875	10,421	71,282	285,128
1989	12,919	24,334	5,070	255	4,694	47,272	189,088
1990	8,157	18,632	3,842	2,677	3,305	36,613	146,452
1991	8,733	19,376	8,036	1,044	3,246	40,435	161,740
1992	15,478	28,031	5,652	914	5,235	55,310	221,240
1993	12,274	23,853	7,569	781	6,118	50,595	202,380

Rockfish Harvested

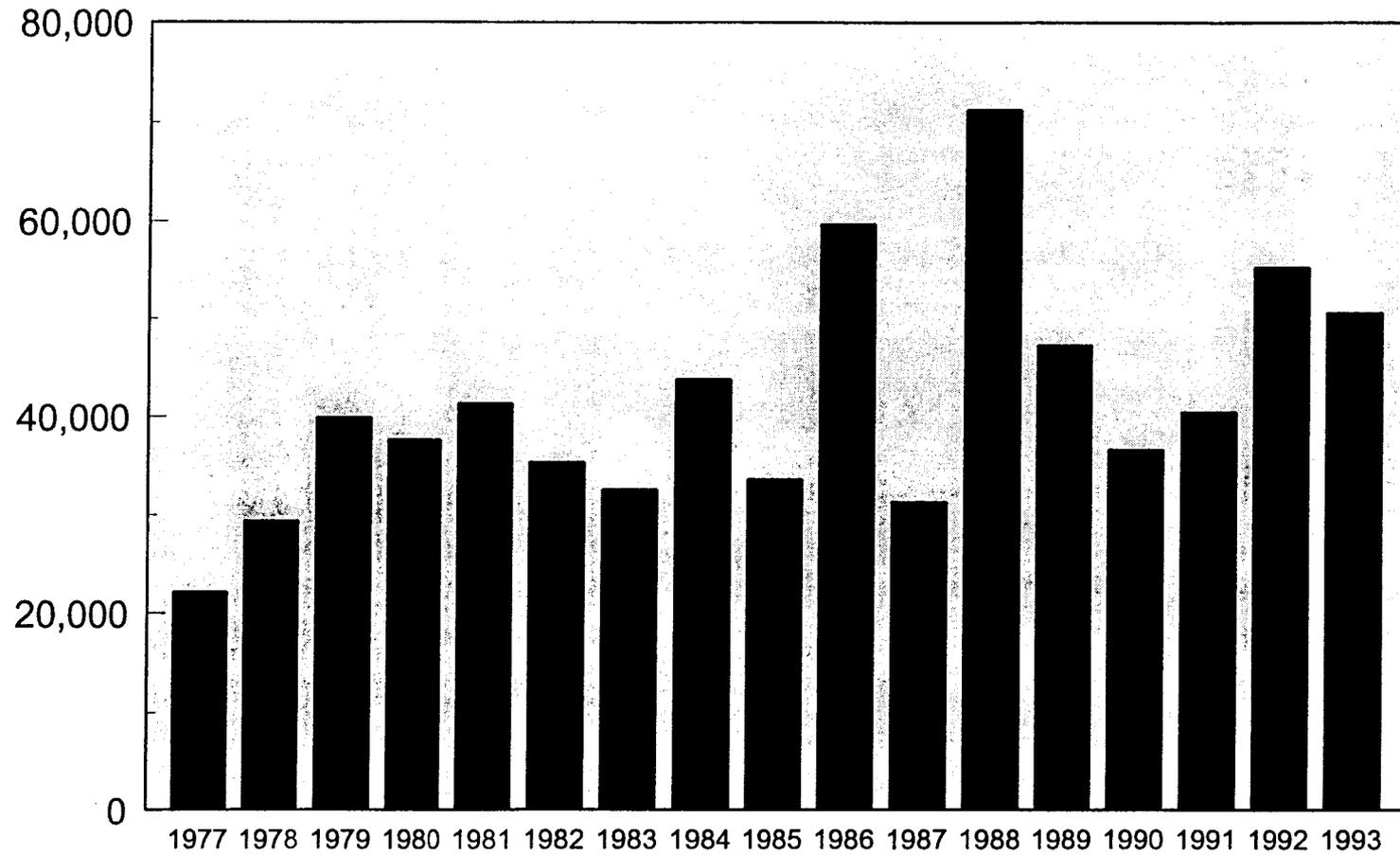


Figure 15. Harvests of rockfish by recreational anglers fishing North Gulf of Alaska waters, 1977-1993.

Table 11. Number of rockfish released, by area, by recreational anglers fishing North Gulf of Alaska waters, 1990-1993 (Mills 1991-1994).

Year	Prince William Sound	North Gulf Coast	Kodiak	Alaska Peninsula Aleutian Islands	Cook Inlet	Total
1990	10,263	13,276	5,064	3,371	7,240	39,214
1991	4,464	7,751	3,020	1,718	2,744	19,697
1992	6,643	11,055	7,384	1,540	9,654	36,276
1993	6,680	15,027	7,985	3,816	12,132	45,640

Number of Rockfish Released

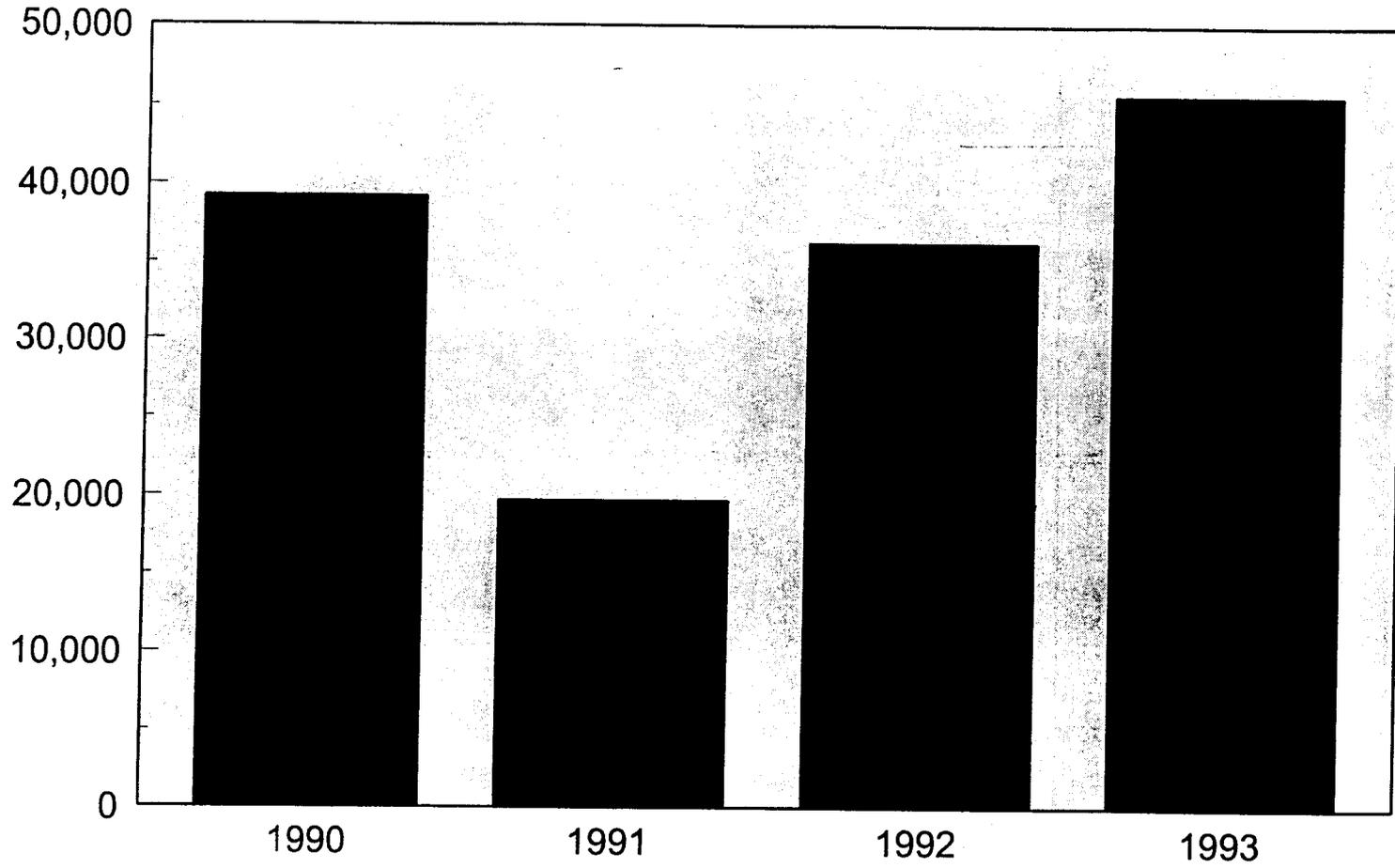


Figure 16. Number of rockfish released by recreational anglers fishing North Gulf of Alaska waters, 1990-1993.

Table 12. Comparison of recreational and commercial harvests of rockfish (pounds, round weight) in the North Gulf of Alaska¹, 1987-1993.

Year	Recreational		Commercial		Total
	Pounds	Percent	Pounds	Percent	
1987	90,868	25%	279,740	75%	370,608
1988	232,152	44%	299,397	56%	531,549
1989	167,788	54%	140,683	46%	308,471
1990	120,376	18%	537,018	82%	657,394
1991	125,420	25%	373,322	75%	498,742
1992	194,976	27%	528,973	73%	723,949
1993	168,980	51%	165,037	49%	334,017

¹ excluding Kodiak and the Alaska Peninsula/Aleutian Islands area harvests.

Table 13. Comparison of recreational and commercial harvests of rockfish (pounds, round weight) in Seward area waters, 1987-1993.

Year	Recreational		Commercial		Total
	Pounds	Percent	Pounds	Percent	
1987	49,332	23%	169,109	77%	218,441
1988	139,624	43%	183,810	57%	323,434
1989	97,336	67%	47,606	33%	144,942
1990	74,528	61%	46,709	39%	121,237
1991	77,504	26%	219,151	74%	296,655
1992	112,124	24%	350,519	76%	462,643
1993	95,412	55%	77,050	45%	172,462

NORTH GULF OF ALASKA RECREATIONAL LINGCOD FISHERY

Lingcod belong to the Hexagrammids, a family of fish unique to the west coast of North America. These fish, which are actually greenlings and not true cods, are predatory and can grow to over 22 kg (50 pounds) and 122 cm (4 ft). Their distribution extends from the Alaska Peninsula/Aleutian Islands south to Baja California. In the North Gulf of Alaska, they are common from Cape Suckling eastward to Cape Trinity on the southern end of Kodiak Island.

Beginning in the mid-1980s, this species became a popular target of recreational anglers fishing North Gulf of Alaska waters, specifically those waters accessible from Seward (*Table 14, Figure 17*). The recreational fishery for lingcod in the North Gulf of Alaska occurs primarily in state waters. In state waters, responsibility for management and allocation of lingcod lies with the Alaska Board of Fisheries. In response to increasing harvests and concern expressed regarding the health of North Gulf of Alaska lingcod resource, the Board adopted new regulations for North Gulf of Alaska recreational lingcod fisheries during 1993. Vincent-Lang and Bechtol (1992) summarize the actions taken by the Board of Fisheries to manage these stocks for sustained yield and the rationale the Board used towards taking these actions. The current regulations governing recreational lingcod fisheries in the North Gulf of Alaska are:

- ✓ Resurrection Bay, enclosed from a line extending from Cape Aialik to Cape Resurrection, is closed to the commercial and recreational harvest of lingcod. All lingcod caught in these waters must be released immediately.
- ✓ The bag and possession limit for sport caught lingcod in the area between Cape Puget and Gore Point is 1. The bag and possession limit for all other waters of the North Gulf of Alaska, except the Alaska Peninsula-Aleutian Islands regulatory area, are 2 and 4, respectively. There are currently no bag or possession limits for lingcod in the Alaska Peninsula-Aleutian Islands regulatory area.
- ✓ In all North Gulf of Alaska regulatory areas except the Alaska Peninsula-Aleutian Islands regulatory area, lingcod may only be taken from July 1 through December 31. There is currently no closed season for lingcod in the Alaska Peninsula-Aleutian Islands regulatory area.
- ✓ Only lingcod 35 inches or more in total length or 28 inches or more with their head off may be retained in the Prince William Sound and Cook Inlet-Resurrection Bay Saltwater regulatory areas. There are currently no size limits for lingcod in the Kodiak or Alaska Peninsula-Aleutian Islands regulatory areas.
- ✓ All sport caught lingcod in the Prince William Sound, Cook Inlet-Resurrection Bay Saltwater, and Kodiak regulatory areas may be landed only by hand or net.

A commercial fishery for lingcod also occurs in state waters of the North Gulf of Alaska (*Table 15*). In all years since 1991, commercial lingcod landings have been lower than recreational lingcod landings along the North Gulf of Alaska (*Table 16*). In state waters, the Alaska Board of Fisheries has allocative and management responsibility for lingcod. Up until 1993, the Commercial Fisheries Management and Development Division lacked specific strategies for the management of lingcod in state waters and the commercial harvest of this species was largely unmanaged. In 1993, the Board adopted several regulations governing the commercial harvest of lingcod in the north Gulf of Alaska. These regulations impose minimum size limits, season and area closures, and trip and bycatch limits to help rebuild depressed stocks and assure for the sustained yield of healthy stocks.

Currently, only limited numbers of lingcod are harvested in federal waters in the North Gulf of Alaska. Because of the limited harvest, lingcod have not been included in any federal fishery management plan and this species is largely unmanaged in these waters.

Management Objective and Approach

Management of north Gulf of Alaska lingcod stocks is directed towards assuring for the sustained yield of the various lingcod stocks that occur within the area while assuring for continued and, where possible, expanded opportunity to participate in diverse fisheries targeting these stocks.

In the marine waters of the North Gulf of Alaska, insufficient data are currently available to estimate exploitable biomass. No research is currently being conducted, nor planned, to collect these data in the near-term future. Thus, recreational lingcod fisheries in the North Gulf of Alaska are managed using a conservative approach aimed at assuring optimal sustained yield. Given that lingcod recruitment has been shown to be highly variable, the current management approach is to assure that sufficient fish are present in the spawning population for future recruitment. This is done in three ways: (1) protect spawning and nest guarding fish - the sport and commercial season is closed from January 1 through June 30, (2) allow fish to spawn at least once before being subject for harvest - a 35 inch minimum size limit for both sport and commercial fisheries, and (3) restrictive catch limits - the sport fishery is currently restricted to a 2 fish daily, 4 fish in possession limit in areas of healthy stock status, in areas of less healthy stock status, the daily bag and possession limit is reduced. The commercial fishery is restricted by closed waters and seasons, minimum size restrictions, and bycatch quotas.

Stock Status

Most lingcod stocks in the North Gulf of Alaska are currently healthy. However, stocks in and near to Resurrection Bay are currently depressed. To rebuild severely depressed stocks in Resurrection Bay, the sport and commercial fishery inside Resurrection Bay is currently closed. Catch rate and size information collected during the summer of 1993 during fishery-independent sampling indicate that these stocks remain severely depressed and recruitment has yet to occur in these stocks. Based on this, these waters will remain closed as currently regulated. To rebuild depressed stocks outside Resurrection Bay, the daily bag limit and possession limit has been reduced to one from Cape Puget to Gore Point.

Fishery Overview

A complete history of the recreational and commercial fisheries for lingcod in the north Gulf of Alaska through 1992 is provided in Vincent-Lang and Bechtol (1992), Meyer (1993b), and Hepler et al (1993).

Since the adoption of the new regulations for lingcod in 1993, both recreational and commercial harvests of lingcod have dropped. Recreational harvest along the North Gulf of Alaska dropped by half between 1992 and 1993 (*Table 14, Figure 17*). Recreational lingcod harvests near Seward, where the most restrictive regulations were enacted to protect and rebuild depressed stocks, dropped the most, decreasing by 62% between 1992 and 1993. This drop was on target with the goal of reducing the recreational harvest by half through the adoption of the new regulations. It appears that recreational anglers are releasing increasing percentages of their catch (*Table 17, Figure 18*). Mortality on released lingcod is considered to be low (likely less than 5%). Commercial harvests also decreased by about 50% between 1992 and 1993 with the adoption of the new regulations (*Table 15*).

Management Issues

Catch rate information from the fishery-independent sampling (Vincent-Lang *in prep.*) indicates that the abundance of lingcod within Resurrection Bay remains extremely low; thus, these waters will remain closed to the commercial and recreational harvest of lingcod. Length data collected during the fishery-independent sampling (Vincent-Lang *in prep.*) indicates that recruitment has yet to occur in Seward area lingcod populations outside Resurrection Bay (*Figure 19*); thus, the reduced bag and possession limits will remain in effect for these waters. If recruitment does not occur in these stocks prior to the next regularly scheduled Board meeting (1995/1996), proposals will be submitted to the Board to further restrict or close the recreational and commercial lingcod fisheries in the Chiswell Island area.

Concern has also been raised that commercial lingcod harvests may increase as a result of a new Individual Fishery Quota (IFQ) system to be enacted for the Alaskan commercial halibut fishery during 1995. Under the new IFQ system, commercial halibut fishermen will have up to 8 months to catch their annual individual halibut quota. Under the old system, commercial halibut fishermen had, at maximum, up to two 24-hour periods to catch an area quota. This resulted in an incentive to fish clean, as bycatch during severely time-restricted openings resulted in reduced landing of halibut. Because bycatch in nearly all cases is lower in value than halibut, this resulted in a reduced value of the landing. There is a fear under the new system that because time is not limited, bycatch will increase. For fishes with high exploitable biomasses, this is not viewed as a problem. However, for fishes such as lingcod, that have identified stock conservation issues and resultant low exploitable biomasses, increased bycatch may result in over-harvest. Department managers are considering asking the Board for permission to close areas in which lingcod quotas have been achieved to commercial longline fishing to avoid further lingcod bycatch.

Concern has also been raised that an IFQ system will result in increased competition on the fishing grounds between commercial fishermen and sport anglers. Competition was minimal in the past because the commercial fishery operated far offshore where the abundance of large halibut was higher during spring and fall commercial openings. The long season permissible under the IFQ system will allow overlap of commercial and sport fishing times. In addition, the commercial fleet will likely fish closely to port. Implementation of an IFQ system in Canada resulted in a significant number of vessels fishing closer to port, despite lower catch rates. These concerns have caused some recreational fishing groups to discuss establishment of exclusion zones for the commercial fishery that encompass their traditional fishing areas near major sport ports. As can be expected, such proposals have not been well received by commercial fishermen.

The North Pacific Fishery Management Council is considering whether to include lingcod as part of the Gulf of Alaska Fishery Management Plan. The rationale for this action is the increased possibility of a directed commercial fishery beginning on this species in federal waters given recent state regulations restricting the commercial harvest of this species in state waters. The state supports adoption of similar regulations for adjacent federal waters, however, would like to maintain active management of this species in these waters through an agreement with the council.

Management History

Prior to 1987, recreational fisheries for lingcod were unregulated in the North Gulf of Alaska. In 1987, the Board adopted a 2 fish daily, 4 fish possession limit for the Cook Inlet - Resurrection Bay Saltwater Regulatory Area to reduce harvest given staff concern that local stocks near Resurrection Bay were being overharvested. In 1991, the Board adopted a 2 fish daily, 4 fish possession limit for the Prince William Sound Regulatory Area. In 1993, the Board revamped the lingcod regulations for the North Gulf of Alaska. Effective for the 1993 season, the Board of Fisheries adopted the following regulations:

- ✓ Resurrection Bay, enclosed from a line extending from Cape Aialik to Cape Resurrection, is closed to the commercial and recreational harvest of lingcod. All lingcod caught in these waters must be released immediately. This regulation was put in place in 1993 to protect and help rebuild severely depressed lingcod stocks in these waters.
- ✓ The bag and possession limit for sport caught lingcod in the area between Cape Puget and Gore Point is 1. This regulation was put in place in 1993 to protect and help rebuild depressed lingcod stocks in these waters.
- ✓ In all North Gulf of Alaska regulatory areas except the Alaska Peninsula-Aleutian Islands regulatory area, lingcod may only be retained from July 1 through December 31. The closed period was put in effect in 1993 to protect spawning and nest guarding lingcod
- ✓ Only lingcod 35 inches or more in total length or 28 inches or more with their head off may be retained in the Prince William Sound and Cook Inlet-Resurrection Bay Saltwater regulatory areas. This regulation was established in 1993 to assure lingcod could spawn at least once prior to being subject to harvest.

- ✓ All lingcod sport caught in the Prince William Sound, Cook Inlet-Resurrection Bay Saltwater, and Kodiak regulatory areas may be landed only by hand or net. This regulation was put in place in 1993 to increase the survival of released lingcod.

Ongoing Research and Management Activities

A research program aimed at estimating the age, sex, and length compositions of the recreational lingcod harvests from Central Gulf of Alaska waters has been annually conducted since 1987. Healthy stocks are being monitored through this port sampling program to evaluate trends in age and size compositions. Depressed stocks in and near Resurrection Bay are being monitored to evaluate their recovery. Recovery of stocks is being evaluated through collection of fishery-independent age and size statistics to evaluate time-series trends in recruitment. With the implementation of minimum size limits, the ability to assess recruitment to these stocks was lost. It is recommended that these two research efforts continue.

Table 14. Harvest of lingcod, by area, by recreational anglers fishing North Gulf of Alaska waters, 1987-1993.

Year	Prince William Sound	North Gulf Coast	Kodiak	Alaska Peninsula Aleutian Islands	Cook Inlet	Total
1987	---	2,142	---	---	---	---
1988	---	4,189	---	---	---	---
1989	---	5,505	---	---	---	---
1990	---	6,955	---	---	---	---
1991	1,979	6,213	1,352	993	2,754	13,291
1992	2,575	7,868	1,454	299	3,505	15,701
1993	2,008	2,983	922	198	1,777	7,888

Lingcod Harvest

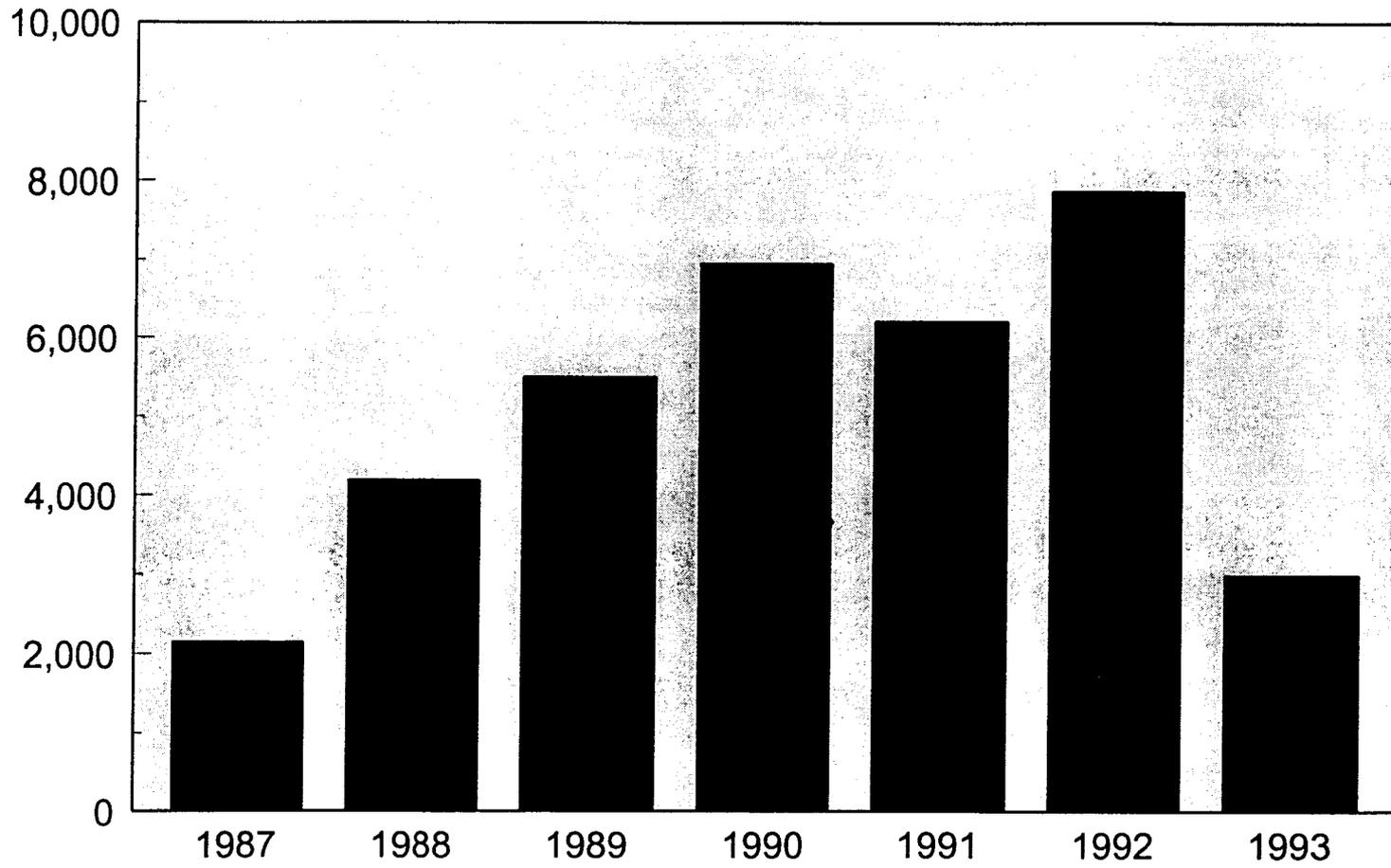


Figure 17. Harvest of lingcod by recreational anglers fishing Seward area waters, 1987-1993.

Table 15. Commercial harvest (pounds, round weight) of lingcod, by area, along the North Gulf of Alaska, 1987-1993 (Bechtol 1994).

Year	Prince William Sound	North Gulf Coast	Cook Inlet	Total
1987	594	25,557	103	26,254
1988	1,338	25,176	127	26,641
1989	1,280	7,026	0	8,306
1990	8,117	5,467	414	13,998
1991	19,357	65,256	0	84,613
1992	2,357	28,337	0	30,694
1993	245	15,087	0	15,332

Table 16. Comparison of recreational and commercial harvests of lingcod from North Gulf of Alaska^a waters, 1987-1993.

Year	Recreational		Commercial ^b		Total
	Pounds	Percent	Pounds	Percent	
1991	10,946	80%	2,820	20%	13,766
1992	13,448	93%	1,023	7%	14,471
1993	6,768	93%	511	7%	7,279

^a Prince William Sound, North Gulf Coast, and Cook Inlet.

^b Based on a 30 pound average weight (round).

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^a Prince William Sound, North Gulf Coast, and Cook Inlet.

^b Based on a 30 pound average weight (round).

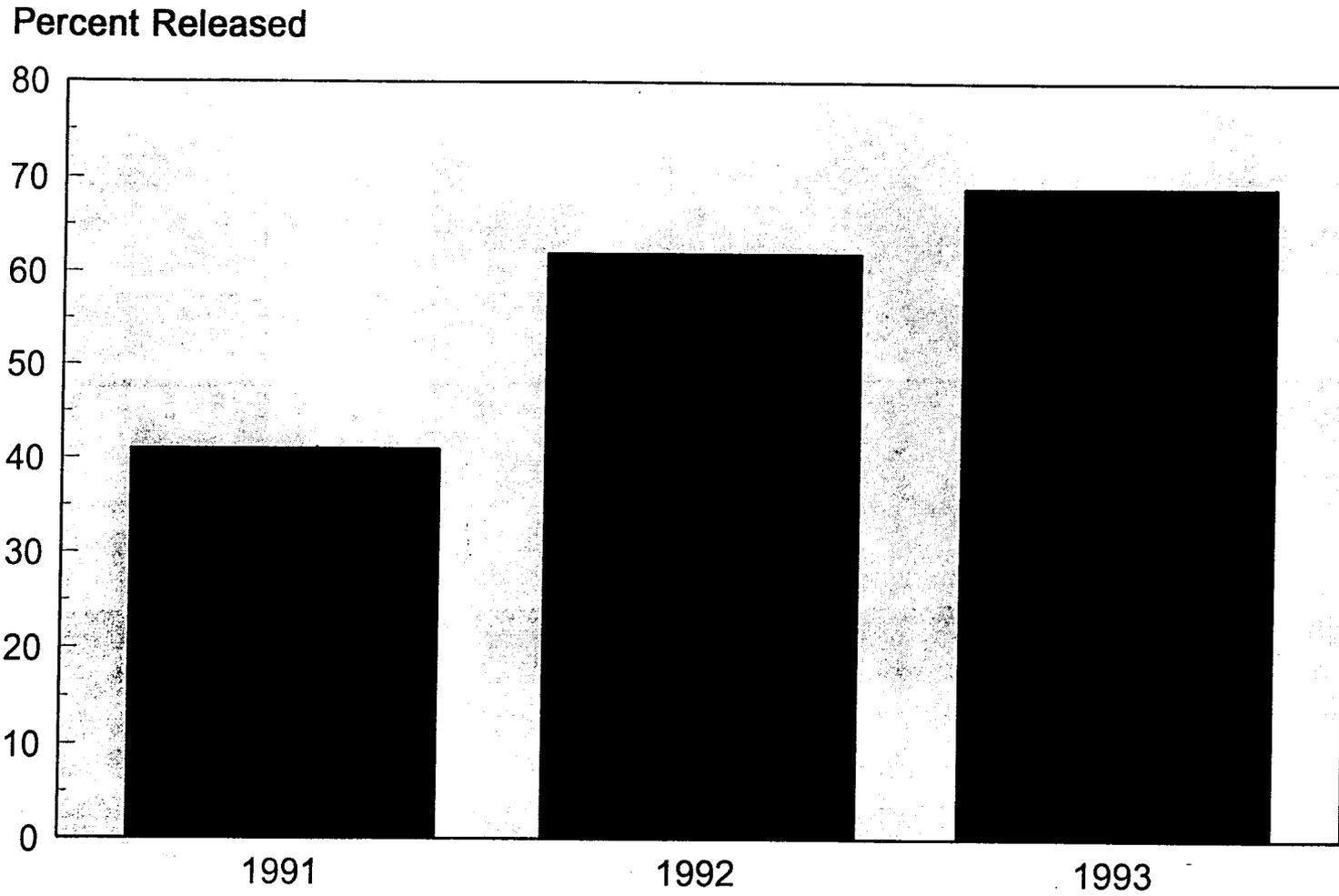


Figure 18. Percent of lingcod caught by recreational anglers fishing North Gulf of Alaska waters that were released, 1991-1993 (Mills 1992-1994)

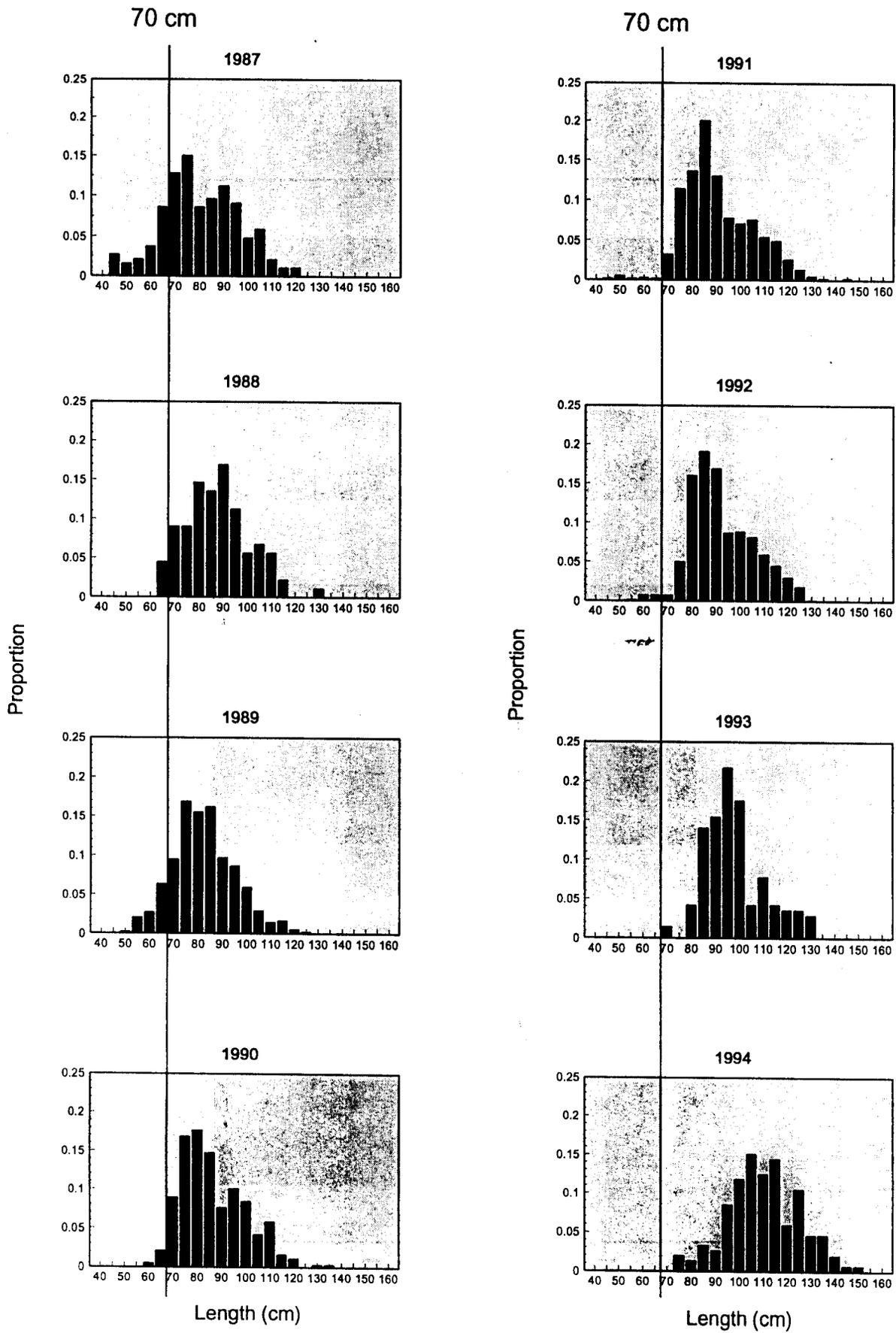


Figure 19. Length frequencies of lingcod sampled near Seward, 1987-1994.

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APPENDIX A

White paper on the establishment of marine refuges along the North Gulf of Alaska coastline.

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**PROPOSAL TO ESTABLISH ROCKFISH & LINGCOD RESERVES
ALONG THE NORTH GULF OF ALASKA**

Compared to many other marine fish, rockfish and lingcod are less productive and as a result have lower sustainable yields. This makes these species relatively susceptible to over-fishing. Experience has shown when a directed fishery for these species has occurred, be it commercial or recreational, stocks have over time become depleted. Unique life history characteristics for these species suggest that over-harvested stocks will take decades to recover. To date, most over-fished rockfish and lingcod stocks along the Pacific Northwest have yet to recover from over-fishing.

Given such experiences, the Alaska Department of Fish and Game has attempted to manage Alaskan rockfish and lingcod fisheries conservatively. A variety of traditional management techniques including placing limits on total annual harvest, single trip harvests (trip limits), allowable fishing gear, open seasons, and sizes and species of fish that can be retained have been employed. As harvests of these species have risen, regulations governing the sport and commercial harvest have generally become increasingly restrictive. In spite of this, rockfish and lingcod in some areas of North Gulf of Alaska, particularly near Seward, have become depressed due to over-fishing and Sitka Sound in southeast Alaska has also been closed to commercial rockfish harvest because of over-fishing.

Biomass or abundance estimates, key indices managers use to assess population health, are largely unavailable for rockfish and lingcod. Given this, managers have not been able to estimate sustainable levels of harvest for these species. Given the difficulty and cost associated with the collection of these data, it is unlikely that these data will become available in the near future. It is therefore necessary to examine new approaches for the management of rockfish and lingcod that assure for the long-term conservation and sustained yield of these stocks.

One such approach is the establishment of *reserve areas*. The concept of using reserve areas as a management tool for marine fisheries is relatively new. Although new for marine fisheries, this concept is one which has proven successful in terrestrial wildlife management. Numerous special-management reserve areas have been established throughout the world to protect critical terrestrial habitats and/or breeding populations.

Given their success on land, reserves have become the subject of increasing interest and discussion for marine stocks that have become depleted under traditional management. To date, marine reserves have been established for a variety of tropical reef fishes as well as abalone and crab. Reserves have

been established in several areas throughout the world including California, Florida, New Zealand, Australia, Belize, Dominican Republic, Philippines, France, Ecuador, and Bermuda.

Specific to the United States, 13 national marine sanctuaries ranging in size from less than one to over 4,000 square nautical miles have been created under the Marine Protection, Research, and Sanctuaries Act passed by the U.S. Congress in 1972. Also in this year, Congress established the National Estuarine Research Reserve System (NERRS) in 1972. Under this program, 21 reserves encompassing about 425,000 acres in 17 states have been protected under the NERRS. These areas have been protected to secure habitat for species that are endangered, to protect historically significant areas from development, and to provide recreational (diving) opportunities. To date, only one marine reserve/sanctuary has been formally established off Alaska. This state sanctuary is located in Bristol Bay around the Walrus Islands and was established to protect walruses and other game.

To date, no reserves/sanctuaries have been specifically established to protect or preserve marine fisheries off Alaska. *De facto* fisheries reserves also currently exist around 37 documented Steller sea lion rookeries throughout Alaska. Under federal regulations, vessels are not allowed transit within three nautical miles of these island rookeries, thus fishing cannot occur.

Reserves have several advantages over more traditional management tools and include: (1) they help maintain genetic diversity and ecosystem biodiversity, (2) they help preserve undisturbed populations and habitats, (3) they act as insurance against management failures, and (4) they simplify enforcement. If properly established, they can also serve as replenishment sources for surrounding harvest zones. Reserves also have drawbacks. Foremost of these is that reserves can reduce fishing opportunity for some species if fishing is not allowed to protect other species. Therefore, reserve areas must be carefully considered prior to establishment.

Given the failure of traditional management tools to protect select North Gulf of Alaska rockfish and lingcod populations from overfishing, the department proposes the establishment of several bottomfish reserves in the marine waters along the North Gulf of Alaska coastline (Figure 1). The primary goal for the establishment of these areas is to help preserve undisturbed populations and habitats so as to maintain genetic diversity and ecosystem biodiversity. This would assure that unfished populations are available for future generations in the event of management failures. A secondary goal would be to evaluate the success of established reserves as replenishment sources for surrounding harvest zones.

Two reserves would encompass *de facto* reserves which currently exist around documented Stellar sea lion rookeries around Outer and Sugarloaf Islands (Figures 2 and 3, respectively). Under federal

regulations, vessels are not allowed transit within three nautical miles of these island rookeries, thus fishing cannot occur. Rockfish and lingcod populations are currently considered healthy in these areas. Regulations would be proposed to the Alaska Board of Fisheries to formally close these areas to fishing so that if the federal regulations restricting vessel transit were to be removed, the areas would continued to be protected from harvest. The regulations would close approximately 37 square nautical miles of state waters at each area to fishing.

The department proposes creating several additional reserves along the North Gulf Coast. To facilitate discussion, several areas have been identified for consideration. These include:

1. *Seal Rocks*, located outside Resurrection Bay along the North Gulf Coast;
2. *Danger Island*, located on Latouche Island off the Montague Strait entrance to Prince William Sound;
3. *Zaikof Point*, located on Montague Island off the Hinchinbrook Island entrance to Prince William Sound
4. *Little Smith Island*, located in western Prince William Sound near Smith Island; and
5. *Fountain Rock*, located just north of Middleton Island in the Gulf of Alaska.

Each reserve is proposed to encompass state waters within 3 nautical miles (Figures 4 - 8). The actual size of each area varies by location, but does not exceed 37 square nautical miles. The above list is not meant to be exclusive, rather a listing of possible sites to facilitate discussion. Final areas selected as reserves may vary and may or may not include the above sites.

The *Seal Rocks*, *Danger Island*, *Zaikof Point*, and *Little Smith Island* areas currently have moderately exploited rockfish and lingcod populations. The areas are currently fished by both commercial and recreational fishers. It is likely that the species composition and age compositions of the areas have been changed. The *Fountain Rock* area has lightly exploited rockfish and lingcod populations and is only occasionally fished by commercial fishers. It receives very little recreational pressure. Available harvest and stock assessment data are currently being compiled for these areas.

Once created, the effectiveness of the reserves need to be evaluated. For example, the optimal size of each reserve needs to be evaluated in order to assure that the reserves are maintaining genetic diversity and ecosystem biodiversity and preserving undisturbed populations and habitats. Depending upon movement patterns, optimal size may vary and need to be changed. It is also necessary to evaluate whether the reserves are acting as recruitment sources for surrounding harvest zones. Lastly, the creation of reserves around both healthy and depressed rockfish and lingcod populations will allow for

comparisons of recovery rates of depressed populations. Healthy populations can be used as a benchmark upon which to evaluate the recovery of depressed populations.

Creating a reserve in any fisherman's backyard is about as popular as having a toxic waste dump nearby one's home. However, we believe that the advantages of establishing some reserves along the North Gulf of Alaska far outweigh any disadvantages, given the susceptibility of rockfish and lingcod to over-harvest and the past inability to successfully manage these fish for sustained yield. Establishment of reserves, in key areas, will assure that genetic diversity and ecosystem biodiversity and undisturbed populations and habitats are maintained. It is important to note that under this proposal, less than 1% of the North Gulf Coast could potentially be regulated as reserves. Over 99% of the area currently open to fishing will remain open to fishing.