

Fishery Management Report No. 11-54

**Recreational Fisheries in the Prince William Sound
Management Area, 2008–2010**

by

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November 2011

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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

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MANAGEMENT AREA 2008–2010**

by

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ABSTRACT

This report provides a detailed summary of sport fisheries in the Prince William Sound Management Area for which the Alaska Board of Fisheries is considering proposals in December 2011. Included are a description and historical overview of each fishery, how the fishery is managed, and sport fishery performance and escapement for the years 2008–2010.

Key words: Prince William Sound Management Area, Alaska Board of Fisheries, sport fisheries.

INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) Prince William Sound Management Area (PWSMA) includes all waters of the Gulf of Alaska and its drainages west of the longitude of Cape Suckling (long 143° 53'W), and east of the longitude of Cape Fairfield (long 148° 50'W), including waters of the Copper River drainage downstream of Haley Creek (Figure 1). Principal land managers in PWSMA include the U.S. Forest Service, various native corporations, the cities of Valdez, Cordova, and Whittier, the Bureau of Land Management, and the state of Alaska. Data pertaining to effort, catch, and harvest within the recreational fisheries of Prince William Sound (PWS) are collected by the Statewide Harvest Survey (SWHS) (Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006 a-b, 2007, 2009 a-b, 2010 a-b, 2011, *In prep*). For reporting purposes, catch and harvest estimates are separated into four geographical areas: Western PWS, Eastern PWS, Valdez Arm, and the Cordova road system/Copper River Delta (CRD) (Figure 1). Angler effort is reported by geographical area as listed above and by port of landing for boat anglers. Throughout this report, PWS refers to all geographical areas excluding CRD.

PWSMA offers recreational anglers some of the most diverse angling opportunities available in Southcentral Alaska. Readily-accessible marine waters with complex physical habitat provide anglers with opportunities to target halibut (*Hippoglossus stenolepis*), lingcod (*Ophiodon elongatus*), and rockfish (*Sebastes* spp.) in day trips from any of the 4 ports that provide access to PWSMA (Whittier, Valdez, Seward, and Cordova). Hundreds of streams and lakes throughout PWS combined with large-scale hatchery operations (e.g. Prince William Sound Aquaculture Corporation; PWSAC) provide angling opportunities for 4 species of Pacific salmon (coho salmon [*Oncorhynchus kisutch*], sockeye salmon [*O. nerka*], pink salmon [*O. gorbuscha*], and chum salmon [*O. keta*]) during May through October. A mixed stock fishery for king salmon (*O. tshawytscha*) occurs year-round in the salt water of PWS. PWS supports a noncommercial shrimp (*Pandalus* spp.) fishery, and provides opportunities to harvest several species of hardshell clams (Pacific razor clam [*Siliqua patula*], Pacific littleneck [*Protothaca staminea*], and Washington butter clam [*Saxidomus giganteus*]). Salmon sharks (*Lamna ditropis*) are present in PWS throughout the summer months and are targeted by a small number of anglers, annually. PWSMA represents the northern edge of the range of coastal cutthroat trout (*O. clarki lewisi*), providing anglers with unique trout fishing opportunities. Rainbow trout (*O. mykiss*) and Dolly Varden (*Salvelinus malma*) are available year round throughout PWSMA.

Access to PWSMA is diverse and includes 3 road-accessible ports (Valdez, Whittier, and Seward); commercial aircraft and ferry services to Valdez, Cordova, Chenega, and Tatitlek; and chartered float plane and boat shuttle services for remote drop-offs out of Whittier and Valdez. With the exception of some road-accessible streams in Cordova and Valdez, virtually all PWSMA sport fisheries are remote and relatively difficult to access.

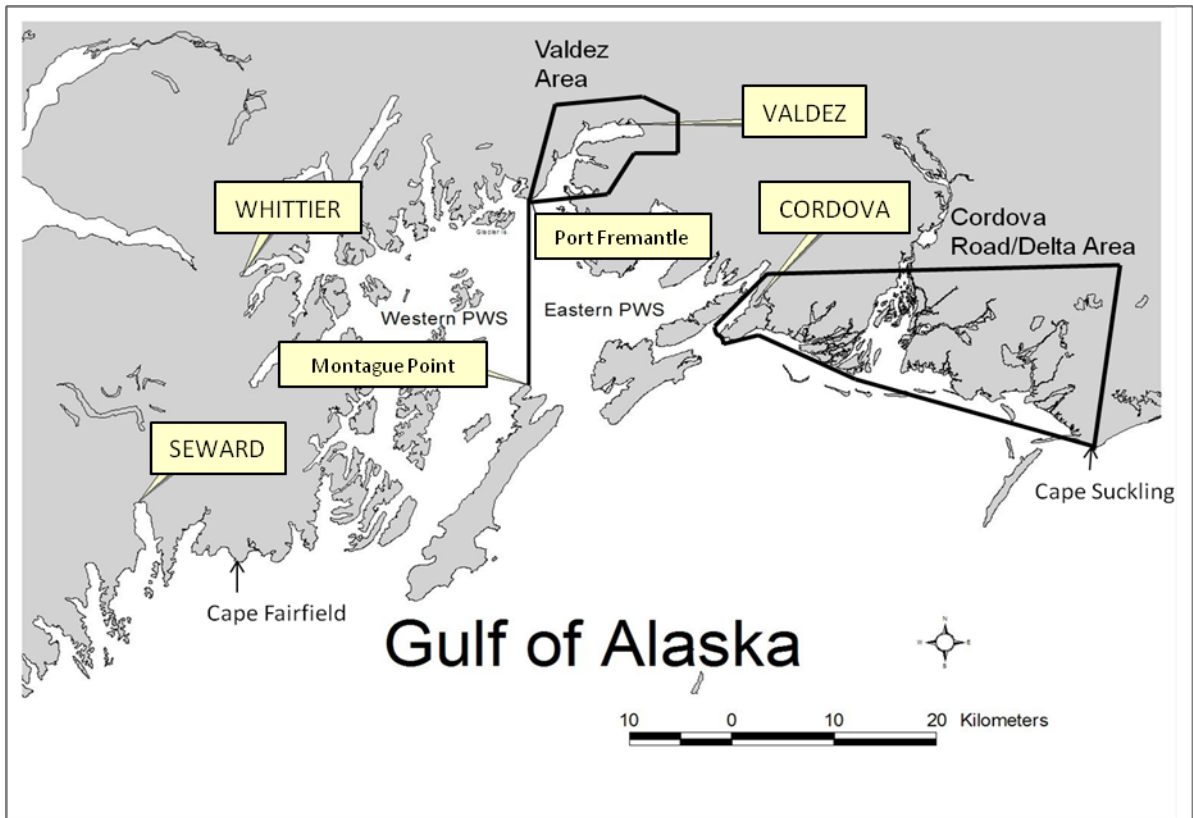


Figure 1.– Map of the Prince William Sound Management Area with defined reporting areas.

Stocking of hatchery-raised fish has increased fishing opportunities available to recreational anglers. These stocking activities consist of 2 types of programs. The goal of the first type is to increase harvest for commercial fisheries, and incidentally enhance the availability of fish for sport anglers. The goal of the second type is to enhance sport fisheries. However, all hatchery salmon releases contribute to the common property of all fisheries, and are thus available to any fishery regardless of the target group. Releases of resident trout or grayling, while common property, are exclusively harvested by sport anglers.

ADF&G's stocking program provides stocked fisheries for rainbow trout and Arctic grayling (*Thymallus arcticus*) in lakes near Valdez. ADF&G also provides a king salmon stocking program that aims to increase opportunities for recreational anglers near Valdez, Cordova, and Whittier. Additionally, 2 private non-profit (PNP) hatchery corporations release coho salmon to provide sport fishing opportunities in Valdez Arm (Valdez Fisheries Development Association [VFDA]), in Passage Canal near Whittier (PWSAC), and at Fleming Spit near Cordova (PWSAC). These PNPs also release pink, sockeye, and chum salmon at various locations throughout PWSMA, primarily to enhance commercial fisheries, but some of these fish are also harvested by sport anglers. Pink salmon are released from 3 PWSAC hatcheries and 1 VFDA hatchery. Sockeye salmon are reared in 2 PWSAC hatcheries and are released from several sites in PWSMA. Chum salmon are reared in 2 PWSAC hatcheries, and released directly from those 2 hatcheries, as well as from 2 remote locations. The king salmon stocking program, conducted by PWSAC until 1998, has been continued to the present by ADF&G with releases at Valdez, Whittier, and Cordova, though Whittier releases were temporarily halted due to budgetary

constraints and reduced hatchery production from 2005 through 2008. Rainbow trout and grayling releases by ADF&G occur periodically at Thompson Lake, Blueberry Lake, and Ruth Pond, all near Valdez.

SPORT FISHING EFFORT

Angler effort in PWSMA increased steadily from 97,448 angler days in 1996 to a high of 206,490 angler days in 2007 (Figure 2). Since 2007, angler effort has declined to 161,412 angler days in 2010. The contribution of PWSMA angler effort to the total regional and statewide effort has increased annually since 1994, accounting for 12% and 8% of the regional and statewide angler effort in 2009, respectively.

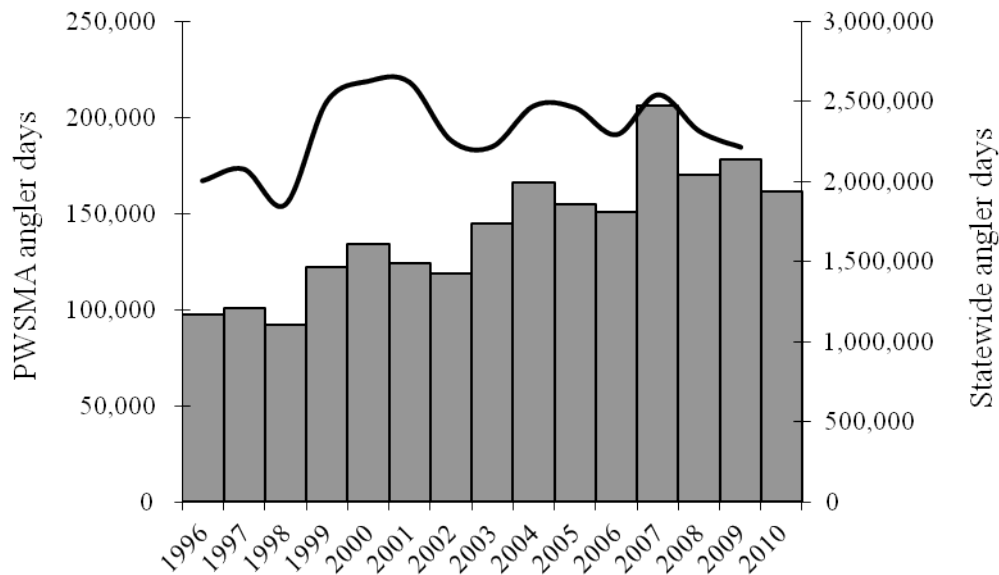


Figure 2.— Angler effort expended in PWSMA (bars) and statewide in Alaska (line), 1996–2010.

Historically, Valdez was the only road-accessible port in the management area and was the port through which most anglers accessed PWSMA (Figure 1). In 2000, the port of Whittier was linked to the road system with the reconstruction of the Anton Anderson Memorial Tunnel. Angler effort by boat anglers, expressed as a percent of total effort within PWSMA, has increased in Whittier since 2001 (29% in 2001 to 41% in 2010; Table 1). The port of Valdez has retained a large percentage of angler effort by PWSMA boat anglers (average 46%; range 39–54%). The port of Cordova constitutes a relatively small portion of total effort expended by boat anglers (average 5.5%; range 4–8%). Angler effort expended in eastern PWS has remained relatively constant since 2001, with an average of 79,256 days of effort (range 63,481–95,625 days of effort; Table 2). Angler effort in western PWS increased from 35,281 angler days in 2001 to a peak of 96,209 angler days in 2007 and then fell to 65,420 angler days in 2010. Between 2001 and 2010, angler effort on CRD has increased from a low of 8,436 angler days in 2002 to a high of 20,886 angler days in 2010 (Table 2).

Table 1.—Angler days of effort expended by boat anglers by port of landing, Prince William Sound Management Area (PWSMA), 2001–2010.

Year	Valdez		Whittier		Cordova		Seward		Other		Total
	effort ^a	% ^b	effort	%	effort	%	effort	%	effort	%	
2001	41,090	(54%)	22,373	(29%)	6,321	(8%)	6,231	(8%)	21	(0%)	76,036
2002	38,441	(46%)	29,301	(35%)	6,290	(8%)	7,961	(10%)	515	(1%)	82,508
2003	53,332	(54%)	28,761	(29%)	6,061	(6%)	9,616	(10%)	367	(0%)	98,137
2004	59,060	(48%)	47,229	(38%)	7,571	(6%)	9,967	(8%)	162	(0%)	123,989
2005	52,840	(44%)	49,940	(42%)	4,622	(4%)	11,388	(10%)	0	(0%)	118,790
2006	54,910	(49%)	42,343	(38%)	4,912	(4%)	9,760	(9%)	103	(0%)	112,028
2007	65,353	(42%)	71,967	(46%)	6,623	(4%)	11,632	(8%)	98	(0%)	155,673
2008	53,346	(40%)	57,648	(44%)	7,104	(5%)	13,310	(10%)	180	(0%)	131,588
2009	52,330	(39%)	61,733	(46%)	8,209	(6%)	10,756	(8%)	1,183	(1%)	134,211
2010	51,753	(44%)	47,998	(41%)	4,999	(4%)	11,701	(10%)	513	(0%)	116,964

^a Effort in angler days.

^b Percentages are percent of total angler days of effort for all of Prince William Sound.

Table 2.—Number of angler-days expended by geographical region, PWSMA, 1991–2010.

Year	Cordova road system	Southwest PWS	Northwest			Valdez Arm area	Outer islands	Total
			PWS (Whittier)	Eastern PWS				
1991	16,070	3,021	13,646	1,903	68,794	1,627	113,062	
1992	19,222	4,524	8,980	2,599	60,952	4,061	113,418	
1993	14,943	4,354	16,917	1,535	53,658	3,658	104,577	
1994	19,401	6,008	16,286	2,669	56,329	4,194	121,944	
1995	14,918	4,626	16,548	3,200	76,429	5,121	138,194	
1996	16,456	2,676	13,124	1,905	50,896	2,951	97,448	
1997	13,842	3,969	13,511	2,809	47,516	5,468	101,079	
1998	15,039	4,433	13,752	1,135	46,571	4,307	92,503	
1999	19,907	4,151	17,265	1,515	59,080	5,810	122,447	
2000	16,150	3,044	24,567	1,672	71,484	4,398	134,288	
Average 1991–2000	16,595	4,081	15,460	2,094	59,171	4,160	113,896	

-continued-

Table 2.–Page 2 of 2.

Year ^a	Western PWS ^b	Eastern PWS ^c	Cordova Road/Delta ^d	Other/unknown in PWS ^e	Total
2001	35,281	77,490	11,468	0	124,239
2002	46,909	63,481	8,436	0	118,826
2003	49,594	81,800	13,556	0	144,950
2004	70,084	82,825	13,255	0	166,164
2005	66,876	78,209	9,762	0	154,847
2006	61,035	80,368	9,671	0	151,074
2007	96,209	95,625	14,656	0	206,490
2008	79,473	79,733	10,955	0	170,161
2009	81,798	79,574	15,654	1,094	178,120
2010	65,420	73,452	20,886	1,654	161,412
5-year average 2006–2010	76,787	81,750	14,364	550	173,451
10-year average 2001–2010	65,268	79,256	12,830	275	157,628

^a To increase precision in data collection, SWHS changed from reporting area of harvest to port of landing in 2001. This had no effect on data for "PWS totals."

^b Includes effort of anglers on the western side of PWS.

^c Includes effort of anglers for trips on the eastern side of PWS.

^d Includes angler effort on Cordova road system and delta and for saltwater trips returning to Cordova.

^e Includes effort of anglers in unknown and other areas of PWS.

COHO SALMON FISHERIES

Area-wide Historical Harvest

The PWSMA coho salmon fishery is among the largest sport fisheries for coho salmon in the state of Alaska. Anglers target coho salmon in salt water and fresh water, and the fishery is supported by both wild and hatchery stocks. Hatchery coho salmon smolt are released in Whittier and Cordova as part of a recreational fishery enhancement program run by PWSAC. Large-scale hatchery releases of coho salmon occur annually in Port Valdez (by VFDA) and Lake Bay (by PWSAC) that support both commercial and recreational fisheries.

Recreational harvest of PWSMA coho salmon increased from 65,143 in 1996 to a high of 129,287 in 2007 (Table 3, Figure 3). Coho salmon catch has shown a small downward trend since 2003 (Figure 3). The ADF&G SWHS relies on a sufficient number of responses for any given site to generate reliable estimates of catch and harvest. As such, estimates are generally reported by larger areas, and stream-specific catch and harvest estimates are only available for a few of the more popular streams on CRD.

Table 3.–Coho salmon catch and harvest by geographical regions, PWSMA, 1991–2010.

Year	<u>Northwestern</u>		<u>Eastern</u>		<u>Valdez Arm</u> <u>area</u>		<u>Cordova Road/</u> <u>Delta</u>		<u>Total</u>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
1991	3,310	2,799	546	286	12,761	10,393	7,798	5,011	28,189	21,363
1992	777	640	1,359	418	22,705	17,580	8,284	5,263	39,016	27,035
1993	1,846	1,558	495	276	14,799	12,841	8,451	5,134	32,348	24,053
1994	2,979	2,317	949	758	22,071	18,633	9,128	6,199	45,146	33,997
1995	1,918	943	730	417	50,907	37,265	8,100	4,318	78,069	51,706
1996	4,616	3,282	2,176	1,290	66,594	42,822	20,531	8,621	115,533	65,143
1997	3,051	1,745	1,021	418	51,429	36,311	21,833	4,877	100,625	55,357
1998	3,994	3,235	132	76	55,222	37,088	8,706	5,145	77,986	50,478
1999	2,991	2,385	997	370	50,045	36,125	17,802	9,340	91,998	58,328
2000	12,385	8,569	4,812	901	95,097	67,563	12,125	6,100	144,653	92,702
Average 1991–2000	3,787	2,747	1,322	521	44,163	31,662	12,276	6,001	75,356	48,016

Year ^a	<u>Western^b</u>		<u>Eastern^c</u>		<u>Valdez^d</u>		<u>Cordova Road/</u> <u>Delta^e</u>		<u>Total^f</u>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
2001	23,969	12,443	49,929	32,829	60,836	43,786	33,491	13,347	172,301	105,842
2002	33,516	21,304	59,492	46,753	7,823	6,568	15,233	7,115	119,989	84,828
2003	34,328	18,070	26,526	16,728	90,792	70,041	43,196	14,752	197,502	121,535
2004	32,134	15,547	28,417	17,618	70,346	49,680	50,451	15,508	185,215	101,735
2005	54,865	30,994	26,158	18,694	86,018	57,944	26,990	10,264	195,648	119,460
2006	27,296	16,841	22,530	17,327	70,833	52,505	13,791	5,798	137,834	95,311
2007	50,244	29,964	41,622	30,495	77,467	59,605	17,202	7,901	188,505	129,287
2008	26,335	14,974	27,251	20,476	60,022	48,451	19,996	8,545	136,305	94,500
2009	23,264	14,753	19,795	15,162	48,278	35,461	27,166	13,915	121,895	82,331
2010	28,456	23,269	20,459	16,491	80,199	62,631	29,844	15,972	161,015	119,447
Average 2006–2010	31,119	19,960	26,331	19,990	67,360	51,731	21,600	10,426	149,111	104,175
Average 2001–2010	33,441	19,816	32,218	23,257	65,261	48,667	27,736	11,312	161,621	105,428

^a To increase precision in data collection, SWHS changed from reporting area of harvest to port of landing in 2001. This had no effect on data for "PWS totals."

^b Includes catch and harvest from saltwater trips where anglers were on the western side of PWS or Copper River Delta area.

^c "Eastern" from 1991–2000 is not the same area as "Eastern" from 2001–2010. Currently, "Eastern" is demarcated by a line drawn from Point Freemantle to the tip of Montague Island at Montague Point (Figure 1).

^d Includes catch and harvest in the vicinity of Valdez including Valdez Arm north of a line drawn from Point Freemantle to Rocky Point.

^e Includes catch and harvest from saltwater and freshwater trips from the Cordova road system and on the Copper River Delta.

^f Includes catch and harvest from unknown locations in PWS.

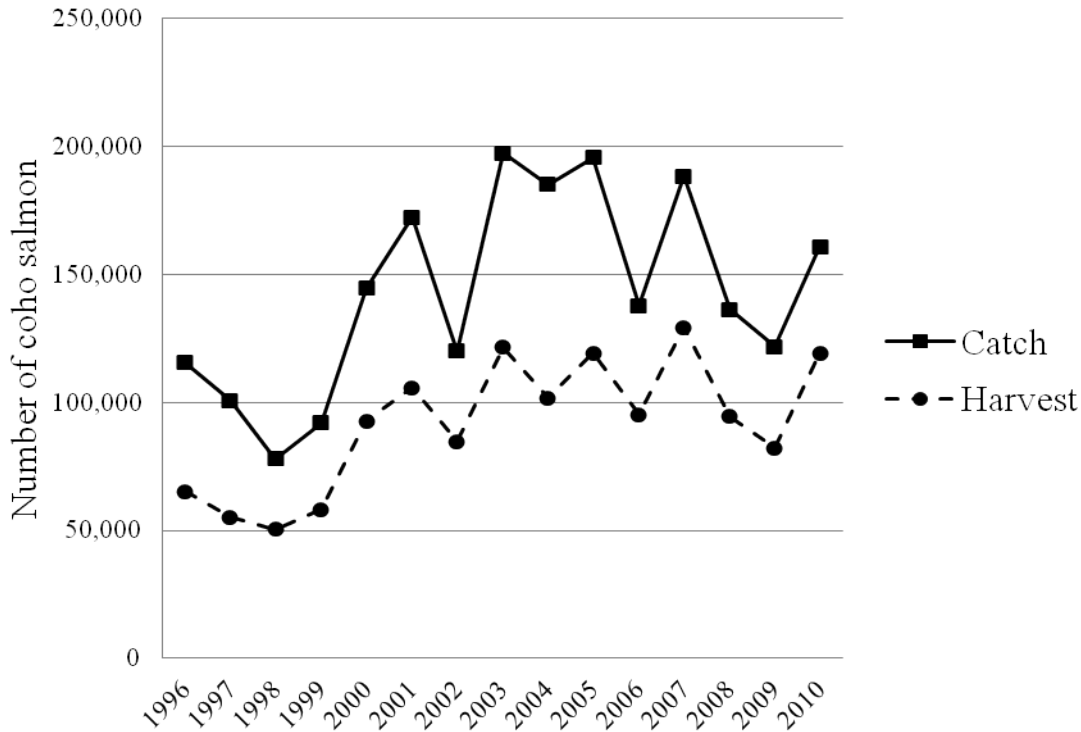


Figure 3.—Total catch and harvest of coho salmon by sport anglers by year, PWSMA, 1996–2010.

Area-wide Fishery Management and Objectives

Most of PWSMA is open to the taking of coho salmon year-round. In all the salt water and fresh water of PWSMA, the bag limit for coho salmon is 3 per day and 3 in possession (established in 1999 for PWS and 1989 for CRD), with the exception of the terminal harvest areas (THA), which encompass the hatchery release sites in Valdez, Cordova, Chenega, and Whittier (Appendix A1). Coho salmon bag limits in the THA are 6 per day and 12 in possession. Regulations restrict coho salmon harvest to 1 per day, 1 in possession in Shelter Bay on Hinchinbrook Island. Several streams or sections of streams in the Cordova area are closed to fishing for coho salmon: Eccles Creek, Eyak Lake and its tributaries, Clear Creek upriver of the Carbon Mountain Bridge, and Hartney Creek above Whitshed Road. Additionally, all freshwater drainages to the Port of Valdez, except for a portion of the Robe River and Solomon Gulch Creek, are closed to fishing for salmon. In the Robe River near Valdez, the bag and possession limit is 1 coho salmon.

There are no stock-specific management objectives for any of the wild coho salmon stocks that are found throughout PWS. Therefore, escapement goals have not been established and there is no monitoring of inseason escapement. The Division of Commercial Fisheries monitors inseason escapement of coho salmon via aerial surveys in several streams on CRD. A delta-wide sustainable escapement goal (SEG) of 32,000–67,000 coho salmon has been met or exceeded every year since 2001 (Munro and Volk 2010; Munro and Volk 2011).

For hatchery-produced coho salmon that are reared at Wally Noerenberg Hatchery and stocked at Whittier and Cordova (Orca Inlet), the management objectives are 1) to produce, through supplemental hatchery production, an annual return of 5,000 coho salmon at each location; 2) to

provide 10,000 angler-days of fishing opportunity annually at each location; and 3) to promote diverse sport fishing opportunities by providing coho salmon to both boat and shore-based anglers. For hatchery-produced coho salmon stocked at Valdez, the management objectives are 1) to produce, through supplemental hatchery production, an annual return of 25,000 coho salmon; 2) to provide 50,000 angler-days of fishing opportunity annually; and 3) to promote diverse sport fishing opportunities by providing coho salmon to both boat and shorebased anglers.

COPPER RIVER DELTA (CRD) COHO SALMON FISHERY

Fishery Description

The coho salmon fishery on CRD is comprised of numerous road-accessible streams west of the Copper River (west delta) and fly-out and/or boat-accessible streams east of the Copper River (east delta). Most angler effort on the west delta is expended on Eyak River, Ibeck Creek, and Alaganik Slough. Smaller streams on the west delta, such as those at 18-mile and 20-mile along the Cordova road, receive angler effort during the coho salmon season but the low number of SWHS respondents fishing these systems precludes precise estimates of catch and harvest of coho salmon in these areas. As such, stream-specific estimates of catch and harvest are only available for Eyak River, Ibeck Creek, and Alaganik Slough. Major streams on the east delta include the Martin and Katalla rivers. Like the smaller systems on the west delta, catch and harvest estimates are not available for the Martin and Katalla rivers due to the low number of SWHS respondents fishing these systems.

Historical Harvest and Escapement

Historically, catch and harvest of coho salmon has increased from an average of 13,384 and 6,389 fish, respectively (1996–2001) to 27,811 and 10,223 fish, respectively (2002–2007). Catch and harvest peaked in 2004 with 50,451 fish caught and 15,508 harvested (Table 4, Figure 4).

Catch and harvest of coho salmon in the recreational fishery on CRD is dependent on 3 variables: angler effort, environmental conditions of the streams during coho salmon season, and the size of the run. For example, low, clear stream conditions on the Eyak River and Alaganik Slough in 2004 coupled with the highest aerial survey counts of coho salmon on record for these streams led to a record catch and harvest of coho salmon in the recreational fishery. Catch and harvest of coho salmon in the recreational fishery can remain low despite large runs of fish if stream conditions are poor during a large portion of the season. Two independent 100-year floods during the coho salmon season of 2006 resulted in poor fishing conditions and the lowest catch and harvest of coho salmon since 2000, despite the coho salmon run being the fourth largest on record (Botz et al. 2010). Differences in stream conditions between the Eyak River, Ibeck Creek, and Alaganik Slough, within a given year, influence the proportional contribution of these streams to the total catch and harvest of coho salmon. For example, Ibeck Creek remained low and clear during the 2003 coho salmon season (B. Marston Pers. comm.), resulting in a large contribution to the total coho salmon catch and harvest in 2003. Conversely, in 2004, Ibeck Creek was highly turbid for most of the coho salmon season (B. Marston Pers. comm.), resulting in a very small contribution to the total coho salmon catch and harvest that year (Figure 5).

Table 4.–Catch and harvest of coho salmon at selected sites of the Cordova road system and Copper River Delta, PWSMA, 1996–2010.

Year	Eyak River		Alaganik Slough		Ibeck Creek		Other Sites		Total	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
1996	5,246	3,107	4,167	1,480	n/a	n/a	8,394	2,051	13,563	6,209
1997	2,222	1,549	1,939	789	n/a	n/a	14,542	977	6,001	3,102
1998	4,880	2,732	659	340	n/a	n/a	1,635	981	7,075	3,954
1999	6,806	4,914	3,592	1,240	n/a	n/a	5,114	1,584	11,974	7,161
2000	5,071	3,037	2,408	1,087	n/a	n/a	2,928	765	8,197	4,563
2001	17,477	10,025	3,188	1,565	726	462	12,100	1,295	33,491	13,347
2002	9,345	5,547	1,681	663	662	297	3,545	608	15,233	7,115
2003	15,604	8,473	4,655	1,708	11,857	3,318	11,080	1,253	43,196	14,752
2004	25,746	10,235	13,100	3,866	377	135	11,228	1,272	50,451	15,508
2005	10,639	5,228	4,064	1,792	4,120	2,437	8,167	807	26,990	10,264
2006	6,579	3,328	2,237	1,236	1,803	913	3,172	321	13,791	5,798
2007	8,141	4,677	1,641	1,052	2,260	927	5,160	1,245	17,202	7,901
2008	8,103	4,714	3,994	1,738	1,811	620	6,088	1,473	19,996	8,545
2009	13,065	8,464	2,425	1,379	7,925	3,780	3,751	292	27,166	13,915
2010	15,052	8,379	3,554	2,208	7,321	4,818	3,917	567	29,844	15,972
Average 1996–2000	4,845	3,068	2,553	987	n/a	n/a	6,523	1,272	9,362	4,998
Average 2006–2010	10,188	5,912	2,770	1,523	4,224	2,212	4,418	780	21,600	10,426
Average 2001–2010	12,975	6,907	4,054	1,721	3,886	1,771	6,821	913	27,736	11,312

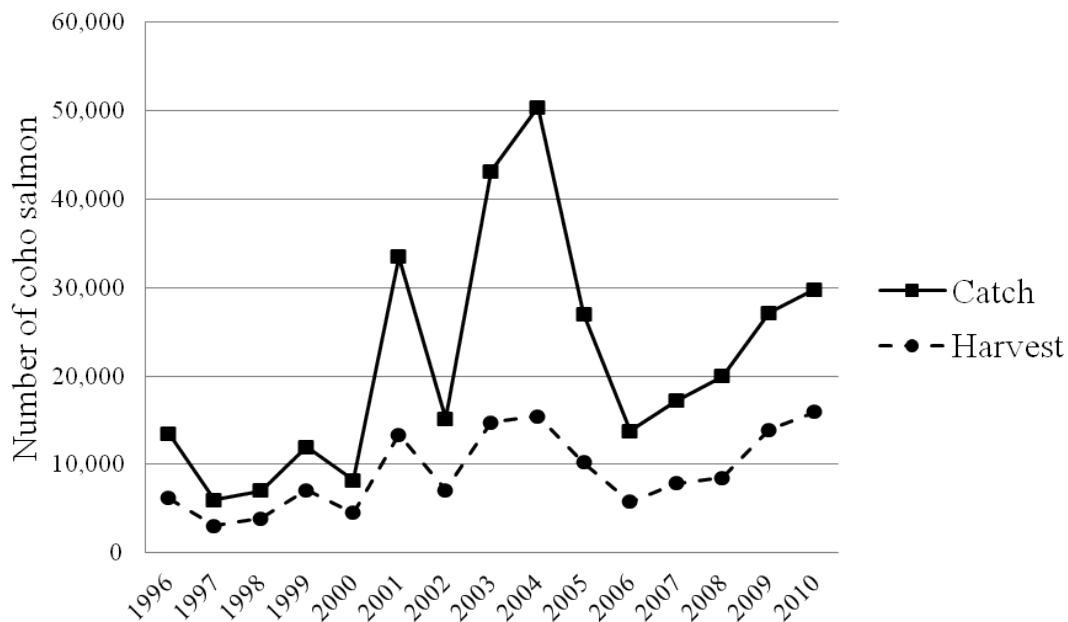


Figure 4.–Catch and harvest of coho salmon by sport anglers from streams on the Copper River Delta by year, 1996–2010.

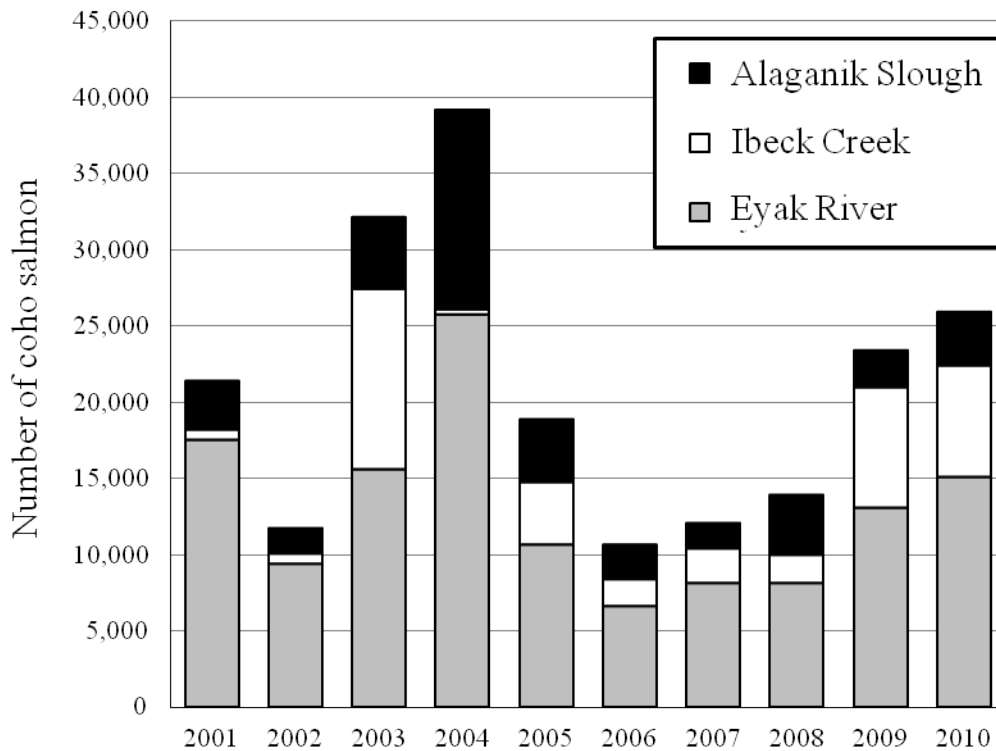


Figure 5.–Catch of coho salmon by sport anglers from selected streams on the Copper River Delta, 2001–2010.

In general, large runs of coho salmon to the west delta (Eyak River, Ibeck Creek, and Alaganik Slough) typically result in an increase in the number of coho salmon caught per angler day of effort ($r^2 = 0.37$, $P = 0.02$; Figure 6) and an increase in catch-and-release angling ($r^2 = 0.44$, $P = 0.007$; Figure 6). Larger runs do not, however, result in an increase in the number of coho salmon harvested per angler day of effort ($r^2 = 0.35$, $P = 0.20$; Figure 6) suggesting that regardless of the run size, anglers are able to catch and harvest their bag limit.

Catch and harvest estimates of coho salmon generated from a creel survey conducted by the U. S. Forest Service (USFS), Cordova Ranger District, were similar to those from SWHS for the Eyak River and Alaganik Slough but were more than 2 times higher for Ibeck Creek (Lang 2010).

The aerial survey component of the USFS project found little overlap between angler distribution and known coho salmon spawning sites (Lang 2010). Exceptions to this finding include overlap on 18-mile Creek and the upper reach of the Alaganik Slough near the confluence of Salmon Creek (Lang 2010). Anglers fishing Ibeck Creek during the years 2004–2006 were distributed well downstream of documented coho salmon spawning habitat (Lang 2010). Angler distribution on Ibeck Creek during the 2009 coho salmon season was similar to the 2004–2006 distribution (Figure 7).

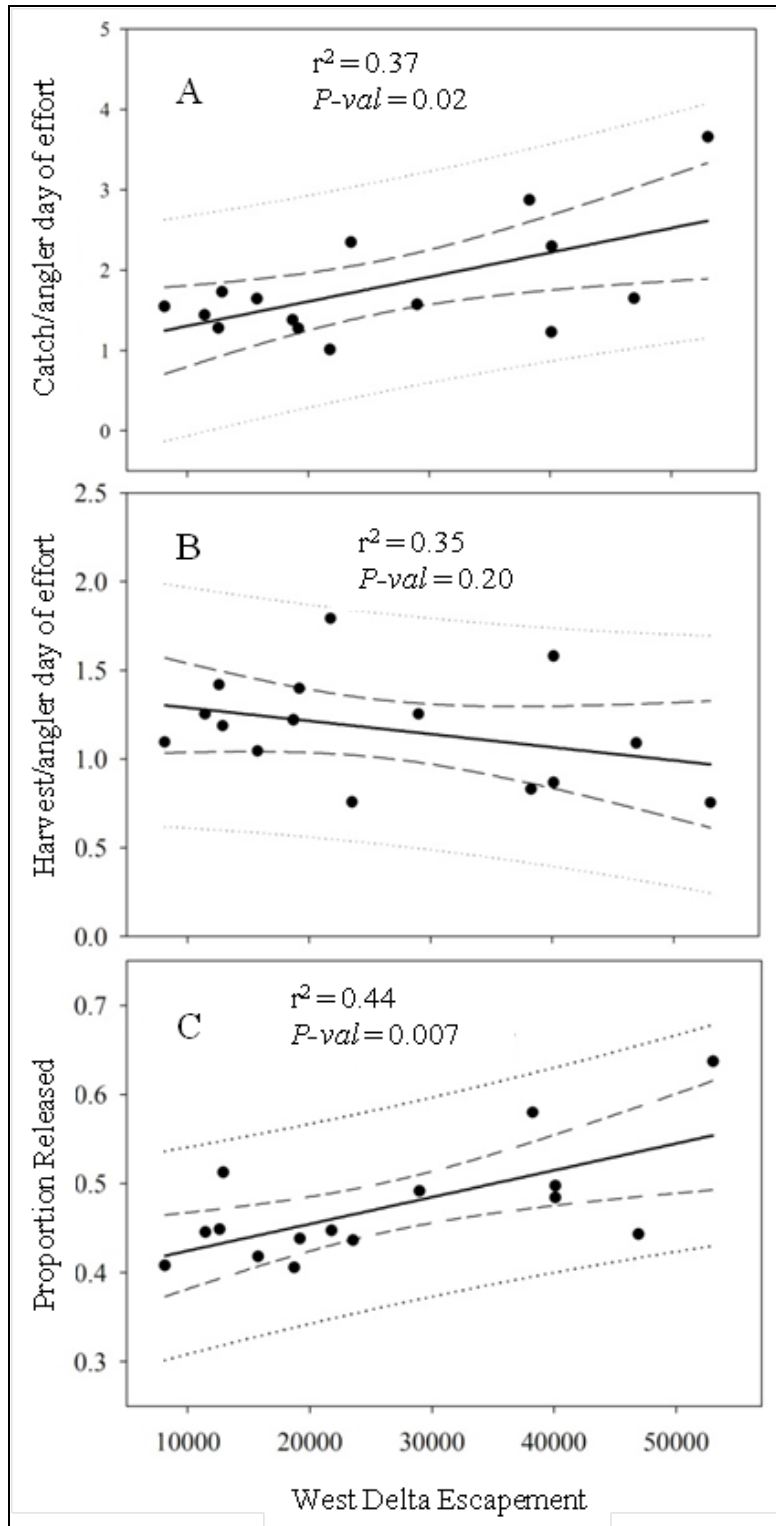


Figure 6.—The number of coho salmon caught (A), harvested (B), and the proportion released (C) by sport anglers versus escapement size as determined from peak aerial survey counts on the west side of the Copper River Delta.

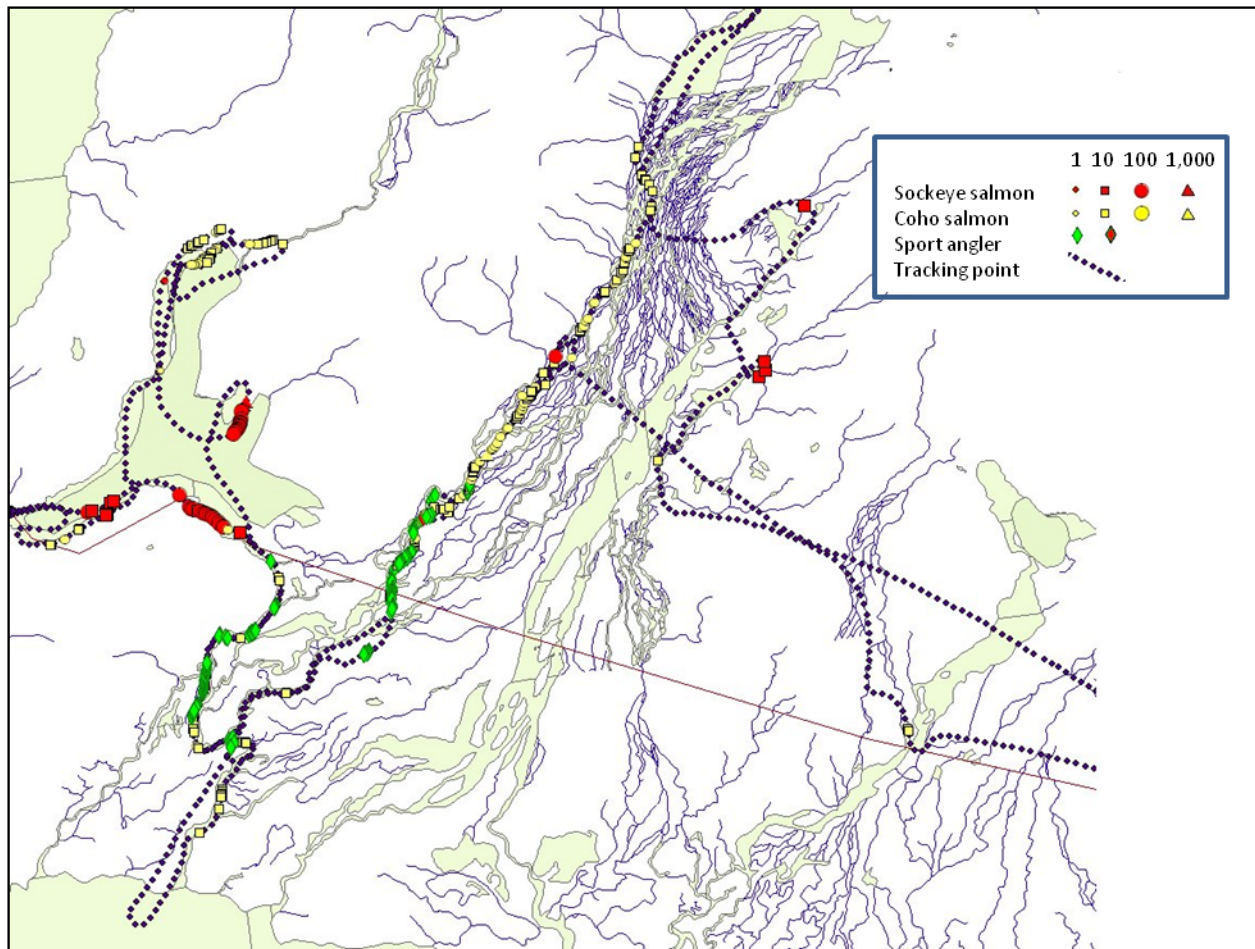


Figure 7.—Angler, coho salmon, and sockeye salmon distributions along the Eyak River and Ibeck Creek, 4 September 2009.

Note: Ibeck Creek and Eyak River were surveyed at approximately 10:30 AM and 3:45 PM.

Fishery Management and Objectives

The management objective for the CRD coho salmon fishery is to achieve the sustainable escapement goal (SEG) of 32,000–67,000 fish. Escapement for a given year is the sum of the peak aerial survey counts for 14 index streams on the west and east sides of CRD. As such, there are no stream-specific escapement goals for the coho salmon on CRD.

Fishery Performance and Escapement 2008–2010

Total catch and harvest of CRD coho salmon in 2008 (19,996 and 8,545 fish, respectively) was below the previous five-year average (2003–2007) of 30,326 and 10,845 fish, respectively (Table 4, Figure 4), despite a larger than average coho salmon run to CRD index streams in 2008 (Appendix A17 in Botz et al. 2010). The 2009 and 2010 CRD coho salmon escapement indices of 41,294 and 41,077, respectively, were well below the previous 10-year average of 70,864 (Botz et al. 2010; Botz et al. In prep) Likewise, precipitation in 2009 and 2010 was below-average (www.wcc.nrcs.usda.gov), accessed 10/12/2011) which resulted in low, relatively clear stream conditions during the coho salmon fishing season (S. Hochhalter, Sport Fish Biologist,

ADF&G, Anchorage, personal observation). Catch and harvest of coho salmon in 2009 and 2010 exceeded the previous five-year average (2004–2008) of 25,686 and 9,603 fish, respectively (Table 4); and harvest of coho salmon in 2010 (15,879) is the highest on record (Table 4, Figure 4). The 2009 and 2010 coho salmon seasons exemplify how angler effort and environmental conditions of the streams may drive catch and harvest patterns in the recreational fishery regardless of coho salmon run size.

SOCKEYE SALMON FISHERIES

Fishery Description

The major sockeye salmon fisheries in PWS include freshwater fisheries for wild stocks in the Coghill River and Eshamy Creek, and a saltwater fishery for hatchery stock at Main Bay. The sockeye salmon fishery on CRD is focused on wild stocks in the Eyak River and Alaganik Slough. Numerous small streams throughout PWS support relatively small runs of sockeye salmon and anglers target these runs as fish stage in the estuaries. SWHS relies on a sufficient number of responses for any given site to generate reliable estimates of catch and harvest. As such, estimates are generally reported by larger areas, and stream-specific catch and harvest estimates are only available for a few of the more popular streams. Catch and harvest estimates are reported by geographical region (Table 5).

Historical Harvest

Historical harvest of sockeye salmon in PWSMA has been relatively stable since 1996 (Table 5, Figure 8) with an average harvest (2001–2010) of 7,651 fish (range 4,512–11,559 fish). Peak catch (17,892) and harvest (11,559) occurred in 2007.

Fishery Management and Objectives

Current bag and possession limits for sockeye salmon were established in 1973 and are 6 per day, 12 in possession (Appendix A1). In all freshwater drainages crossed by the Copper River Highway, the bag and possession limits for sockeye salmon are 3 fish (established in 1989). In the Eshamy Creek drainage, the limits are 3 sockeye salmon per day, 6 in possession (established in 1989). In the Robe River near Valdez, the bag and possession limit is 1 sockeye salmon (established in 1989).

The ADF&G Division of Commercial Fisheries monitors inseason escapement of sockeye salmon into Eshamy Creek and Coghill River via weirs, and into index streams on CRD via aerial surveys. The biological escapement goal (BEG) for Eshamy Creek is 13,000–28,000 sockeye salmon and the SEG for Coghill River is 20,000–40,000 sockeye salmon. The SEG for CRD sockeye salmon is 55,000–130,000 fish. The BEG for sockeye salmon in the Eshamy system has been within the existing goal 11 out of last 20 years (1991–2011). Sockeye salmon escapement into the Coghill system has been within the existing SEG every year since 1991, with the exception of 1991, 1993, and 1994 (Appendix B3 in Botz et al. 2010). Sockeye salmon escapement into index streams on CRD has been within the SEG every year since 1999 (Appendix A12 in Botz et al. 2010).

The management objectives for the Eshamy Creek, Coghill River, and CRD stocks are to meet the escapement goal. For all other sockeye salmon stocks in PWSMA, there are no stock-specific management goals and no inseason monitoring of escapement.

Table 5.—Sockeye salmon catch and harvest by geographical location, PWSMA, 1991–2010.

Year	<u>Northwestern</u>		<u>Eastern</u>		<u>Valdez area</u>		<u>Cordova Road/Delta</u>		<u>Total</u>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
1991	871	444	0	0	1,746	1,471	2,050	806	5,795	3,754
1992	2,752	1,947	0	0	2,506	2,153	3,740	1,677	12,656	8,358
1993	1,505	1,152	0	0	1,706	1,235	2,248	1,330	7,625	5,269
1994	1,707	601	28	28	4,159	2,368	6,167	3,075	13,301	6,948
1995	1,365	739	0	0	1,791	1,358	2,472	590	7,797	3,711
1996	2,295	1,246	463	8	2,600	1,367	5,212	2,253	12,058	5,496
1997	3,039	1,374	31	20	1,669	1,077	3,749	1,076	10,654	5,086
1998	4,311	2,328	64	64	1,595	566	5,600	2,015	16,478	8,312
1999	4,366	2,942	107	0	3,510	2,220	5,584	2,887	16,891	10,666
2000	4,085	2,447	190	127	7,101	3,550	3,887	2,238	17,350	9,830
Average 1991–2000	2,630	1,522	88	25	2,838	1,737	4,071	1,795	12,061	6,743

Year ^a	<u>Western^b</u>		<u>Eastern^c</u>		<u>Valdez^d</u>		<u>Cordova Road/Delta^e</u>		<u>Total^f</u>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
2001	5,976	3,815	1,124	702	1,677	923	724	291	10,329	6,218
2002	7,872	4,755	1,150	837	1,398	358	1,393	731	11,813	6,681
2003	11,081	6,308	834	513	1,074	289	1,530	406	14,656	7,653
2004	7,587	5,547	473	326	1,690	1,493	1,396	784	13,106	9,457
2005	4,885	3,845	416	304	2,641	1,155	962	656	8,960	6,016
2006	4,474	3,424	254	162	1,741	651	385	158	7,020	4,512
2007	11,398	8,387	850	660	2,695	764	2,949	1,748	17,892	11,559
2008	5,950	4,643	1,455	894	1,795	554	2,136	1,225	11,500	7,480
2009	8,900	7,297	1,005	465	1,063	470	1,961	993	13,099	9,395
2010	4,464	3,973	781	745	1,310	900	2,354	1,342	9,488	7,539
Average 2006–2010	7,037	5,545	869	585	1,721	668	1,957	1,093	11,800	8,097
Average 2001–2010	7,259	5,199	834	561	1,708	756	1,579	833	11,786	7,651

^a To increase precision in data collection, SWHS changed from reporting area of harvest to port of landing in 2001. This had no effect on data for "PWS totals."

^b Includes catch and harvest from saltwater trips where anglers were on the western side of PWS as demarcated by a line drawn from Point Freemantle to the tip of Montague Island at Montague Point.

^c Includes catch and harvest from saltwater trips that were on the eastern side of PWS as demarcated by a line drawn from Point Freemantle to the tip of Montague Island at Montague Point.

^d Includes catch and harvest in the vicinity of Valdez including in Valdez arm north of a line drawn from Point Freemantle to Rocky Point.

^e Includes catch and harvest from saltwater and freshwater trips from the Cordova road system or Copper River Delta area.

^f Includes catch and harvest from unknown locations in PWS.

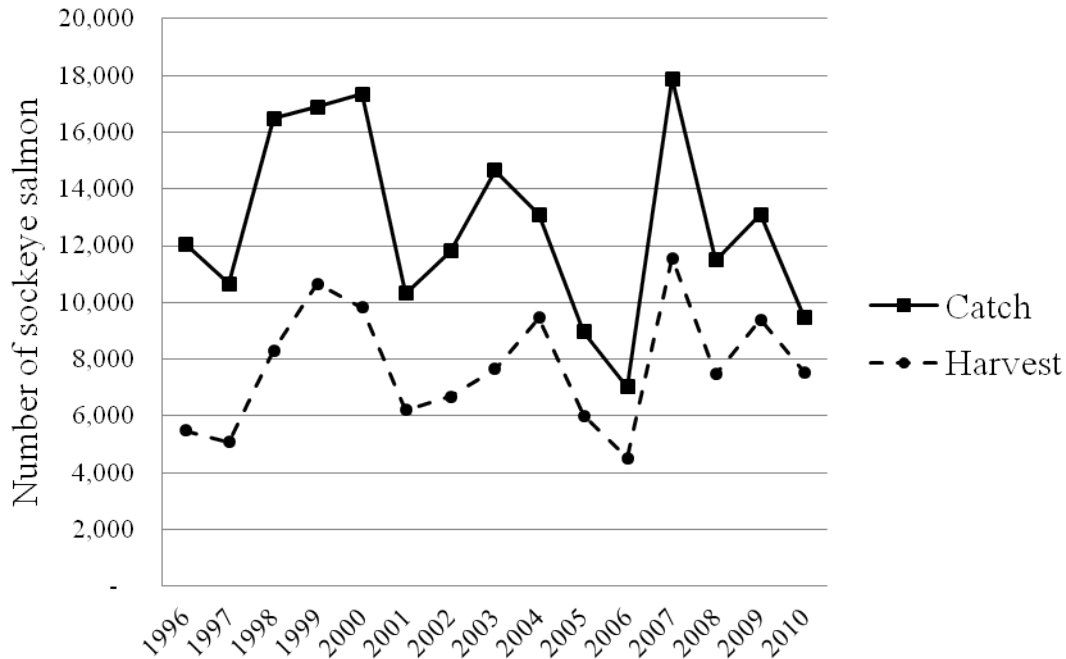


Figure 8.—Total catch and harvest of sockeye salmon by sport anglers by year, PWSMA, 1996–2010.

Fishery Performance and Escapement 2008–2010

Total catch and harvest of sockeye salmon in PWSMA was slightly below the 10-year average (11,786 and 7,651 fish, respectively, 2001–2010) in 2008 (11,500 and 7,480 fish), above average in 2009 (13,099 and 9,395 fish), and below average in 2010 (9,488 and 7,539 fish, Table 5). Because there are usually less than 12 SWHS respondents, system-specific catch and harvest estimates are not reliable (Mills and Howe 1992).

The Eshamy, Coghill, and CRD escapement goals were met for all 3 systems for the years 2008–2010 (Botz et al. 2010).

KING SALMON FISHERIES

Fishery Description

The saltwater fishery for king salmon in PWSMA occurs year-round, although most directed effort occurs during winter months. King salmon harvested in the winter fisheries of Southcentral Alaska are suspected to be from stocks outside of the management area (e.g., other Alaska management areas, British Columbia, Washington, and Oregon).

King salmon have been found periodically in several streams throughout PWS (Botz et al. 2010); however, with the exception of the Copper River stock, there are no known wild populations of king salmon within PWSMA. Highly turbid water combined with seasonal restrictions on the use of bait (artificial lures only allowed from 15 April–14 June) prevent appreciable angler effort directed at the Copper River king salmon stock downstream of Haley Creek (i.e., within PWSMA).

Stocking of hatchery king salmon at Fleming Spit in Cordova began in 1990 and has occurred every year since. King salmon have been stocked periodically in the Valdez area since 1985, with the most recent efforts conducted by ADF&G near the Old Town site. Hatchery king salmon have been released at various locations around Whittier since 2000.

Fishery Management and Objectives

There are no management objectives for the recreational king salmon fishery in PWS. The saltwater and freshwater bag limits for king salmon greater than 20 inches in length are 2 per day, 4 in possession (established in 1989; Appendix A1).

Historical Harvest

Catch and harvest of king salmon in PWSMA has increased since 1991 (Table 6, Figure 9) despite an overall reduction in the performance of the hatchery enhancement program beginning in 2002. Historical harvest of king salmon from 2001 through 2010 peaked in 2006 at 4,280 fish and has ranged from 1,607 to 4,280. King salmon harvest in western PWS has increased from 872 fish in 2001 to 1,429 in 2010. Annual harvest of king salmon in eastern PWS and the Valdez area has shown variability (Table 6).

Fishery Performance and Escapement 2008–2010

King salmon harvest in western PWS during the years 2008–2010 was greater than the 10-year average and a record harvest of 1,866 fish occurred in 2008 (Table 6). Since 1996, total harvest of king salmon in PWSMA has increased, and during the years 2008–2010, it exceeded the 10-year average (Table 6, Figure 9).

STOCKED KING SALMON FISHERIES

Historical Harvest

The success of the king salmon enhancement program has varied since inception in 1996 (near Cordova), in 2000 (near Whittier), and in 1997 (near Valdez) (Figures 10–12). Catch and harvest of king salmon in salt water and fresh water in the Cordova vicinity peaked in 1997 at 946 and 534 fish, respectively (Figure 10). Since that time, catch and harvest have declined precipitously such that catch and harvest were estimated to be zero for the years 2004, and 2005–2008 (Figure 10). Catch and harvest of king salmon in the Whittier and Valdez vicinities has been variable through time (Figures 11 and 12, respectively).

A sampling program during the 2006 and 2007 king salmon season (1 May–15 July) was aimed at identifying the proportion of hatchery king salmon in the recreational harvest at the ports of Valdez and Cordova. Hatchery fish were identified by thermally marked otoliths. After 2 years of sampling, a total of 50 king salmon were sampled at Valdez and 19 at Cordova. All 50 fish sampled at Valdez were of unknown origin (i.e., none had thermal marks) while all 19 fish sampled at Fleming Spit in Cordova had thermal marks identifying them as ADF&G hatchery fish. This indicates that most king salmon caught by Valdez anglers are of unknown origin, and thus very few hatchery fish are harvested there. Furthermore, despite the presence of hatchery fish at Fleming Spit, few fish have been caught there in recent years.

The reduced performance of the hatchery enhancement programs is juxtaposed by a general increase in catch and harvest of king salmon throughout the remainder of PWS (Table 6, Figure 9).

Table 6.–King salmon catch and harvest by geographical region, PWSMA, 1991–2010.

Year	<u>Northwestern</u>		<u>Eastern</u>		<u>Valdez</u>		<u>Cordova Road/ Delta</u>		<u>Total</u>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
1991	59	59	0	0	400	353	191	59	656	477
1992	609	367	0	0	437	317	416	321	1,653	1,116
1993	585	353	131	18	660	405	558	349	2,275	1,344
1994	296	220	49	29	483	394	1,046	764	2,201	1,724
1995	262	161	0	0	378	333	479	303	1,382	977
1996	470	224	0	0	1,055	971	822	779	2,432	2,027
1997	1,047	548	59	59	1,787	1,193	1,133	692	4,420	2,703
1998	860	444	0	0	998	571	606	470	2,676	1,622
1999	454	299	0	0	848	421	1,085	787	2,753	1,763
2000	410	323	67	0	4,128	1,229	884	505	6,085	2,388
Average 1991–2000	505	300	31	11	1,117	619	722	503	2,653	1,614

Year ^a	<u>Western^b</u>		<u>Eastern^c</u>		<u>Valdez^d</u>		<u>Cordova Road/ Delta^e</u>		<u>Total^f</u>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
2001	1,241	872	2,617	991	555	378	36	12	4,542	2,328
2002	1,391	814	1,117	455	291	125	562	159	3,437	1,607
2003	963	586	4,021	1,234	2,903	1,648	162	39	8,075	3,533
2004	2,868	773	378	161	1,879	922	499	152	5,660	2,044
2005	1,507	771	2,118	1,009	2,709	1,087	353	229	6,702	3,111
2006	1,989	1,209	268	196	4,666	2,846	16	16	7,021	4,280
2007	1,773	945	2,697	828	2,324	974	64	64	6,858	2,811
2008	2,732	1,866	966	748	1,883	1,069	606	42	6,187	3,725
2009	1,972	1,060	2,417	1,563	4,268	1,264	265	205	9,009	4,164
2010	1,896	1,429	1,241	435	1,980	1,455	19	19	5,149	3,351
Average 2006–2010	2,072	1,302	1,518	754	3,024	1,522	194	69	6,845	3,666
Average 2001–2010	1,833	1,033	1,784	762	2,346	1,177	258	94	6,264	3,095

^a To increase precision in data collection, SWHS changed from reporting area of harvest to port of landing in 2001. This had no effect on data for "PWS totals."

^b Includes catch and harvest from saltwater trips where anglers were on the western side of PWS as demarcated by a line drawn from Point Freemantle to the tip of Montague Island at Montague Point.

^c Includes catch and harvest from saltwater trips that were on the eastern side of PWS as demarcated by a line drawn from Point Freemantle to the tip of Montague Island at Montague Point.

^d Includes catch and harvest in the vicinity of Valdez including in Valdez arm north of a line drawn from Point Freemantle to Rocky Point.

^e Includes catch and harvest from saltwater and freshwater trips from the Cordova road system or Copper River Delta area.

^f Includes catch and harvest from unknown locations in PWS.

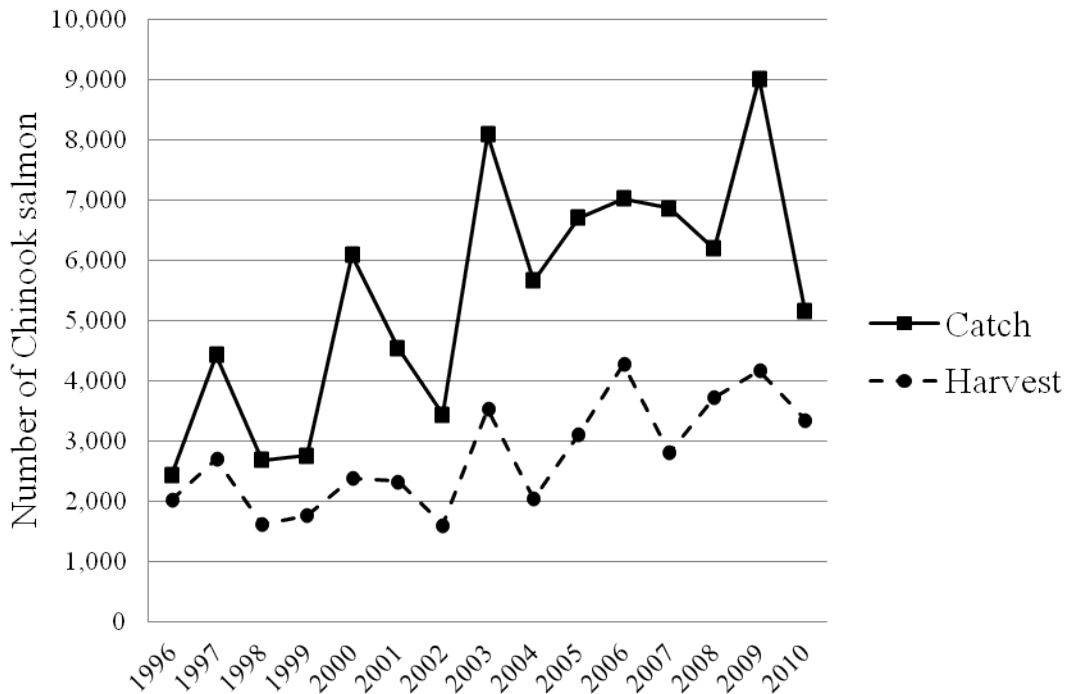


Figure 9.—Total catch and harvest of king salmon by sport anglers by year, PWSMA, 1996–2010.

Fishery Management and Objectives

Originally, the management objectives for each of the 3 stocked king salmon fisheries in PWSMA were 1) to produce a return of 2,000 king salmon, and 2) to provide 3,500 angler days of effort. In 2010, the objectives for each of the 3 fisheries were changed to 1) to produce a return of 200 king salmon, and 2) to provide 500 angler days of effort. The number of king salmon smolt stocked at each location each year has not changed since 1999, when ADF&G took over rearing responsibilities from PWSAC.

Fishery Performance and Escapement 2008–2010

Poor performance of the enhanced king salmon fisheries continued through the 2008–2010 seasons. Zero king salmon were reported caught and harvested at Fleming Spit in 2008 and 2009, and 19 were caught and harvested in 2010 (Figure 10). Angler effort (which includes effort expended during the king salmon and coho salmon seasons at Fleming Spit and along Orca Inlet in 2009 and 2010) were well below the previous low in 2004 and now represent the 2 lowest on record (Figure 13).

Angler effort along Passage Canal shoreline (effort expended for all species) continued to decrease annually from 2007 through 2010 (Figure 14). Catch and harvest of king salmon was low for 2008 and nonexistent in 2010, although catch and harvest were highest on record in 2009, with 138 king salmon caught and harvested (Figure 11). The origin of these fish is unknown.

Angler effort by shoreline anglers in Port Valdez (effort expended for all species) has shown a slight increasing trend from 2000 to 2010 (Figure 15). Angler effort along the Port of Valdez was the highest on record for 2010 (18,635 angler days). Zero king salmon were reported caught and harvested by shoreline anglers in the Port of Valdez in 2008 and 2010, but in 2009, 893 and 305 fish were reported caught and harvested, respectively. The origin of these fish is unknown.

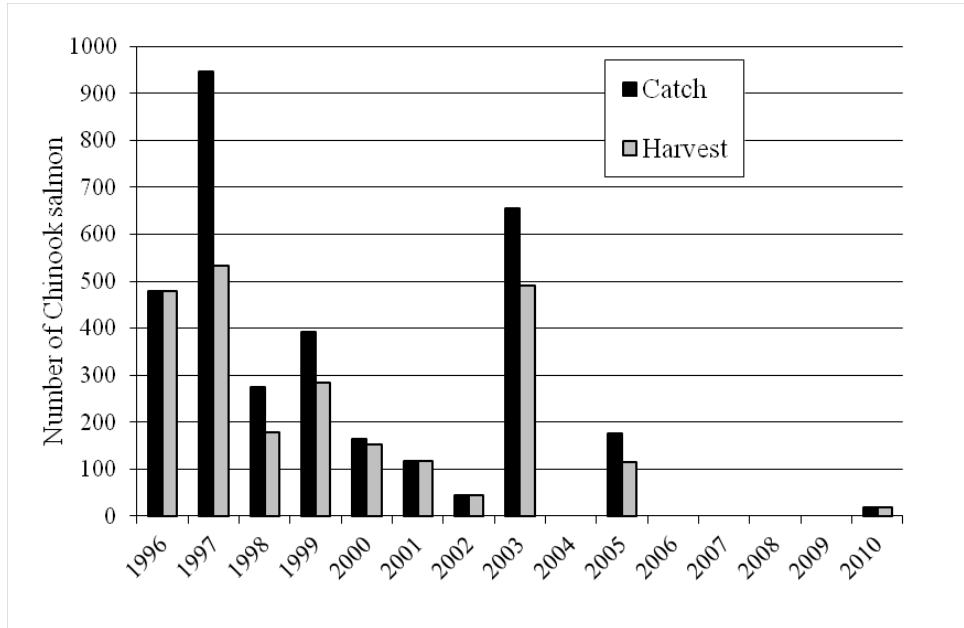


Figure 10.—Catch and harvest of king salmon by shorelines anglers along Orca Inlet and at Fleming Spit near Cordova, 1996–2010.

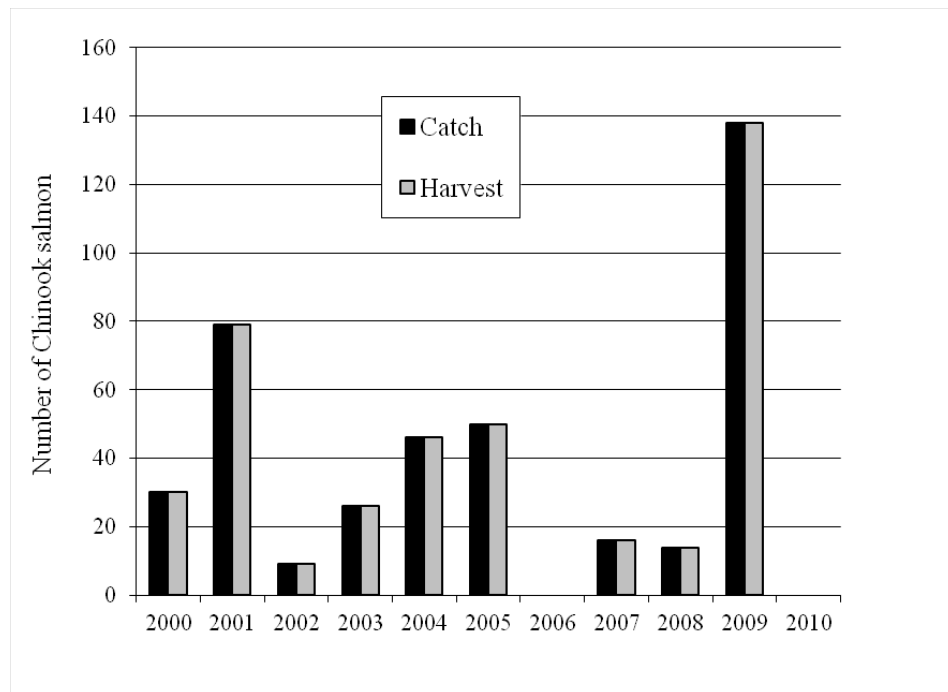


Figure 11.—Catch and harvest of king salmon by shoreline anglers in Passage Canal near Whittier, 2000–2010.

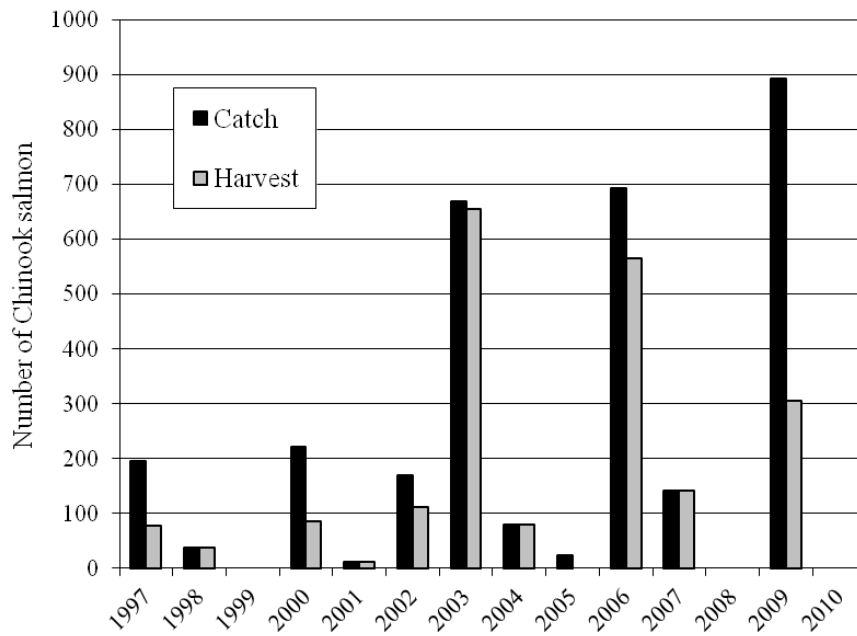


Figure 12.—Catch and harvest of king salmon by shoreline anglers, Port Valdez, 1997–2010.

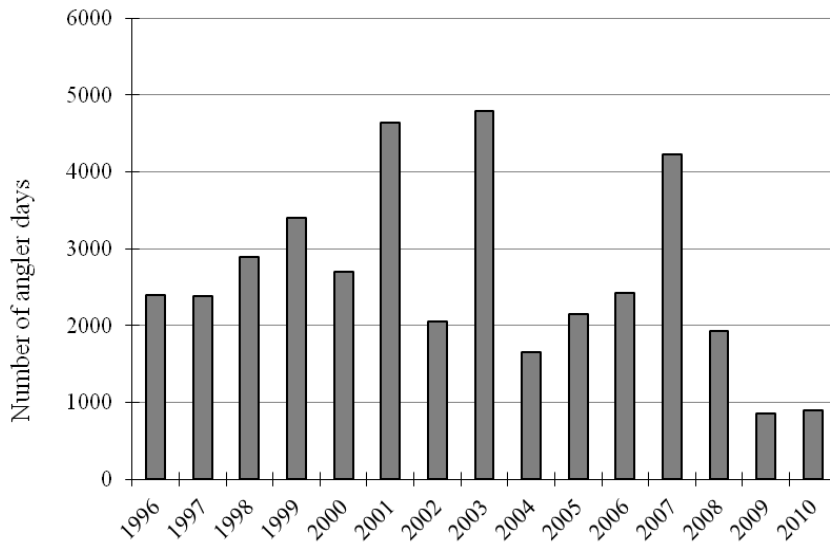


Figure 13.—Angler days of effort by shoreline anglers along Orca Inlet and at Fleming Spit near Cordova, 1996–2010.

Note: Effort includes that exerted on coho salmon and other species.

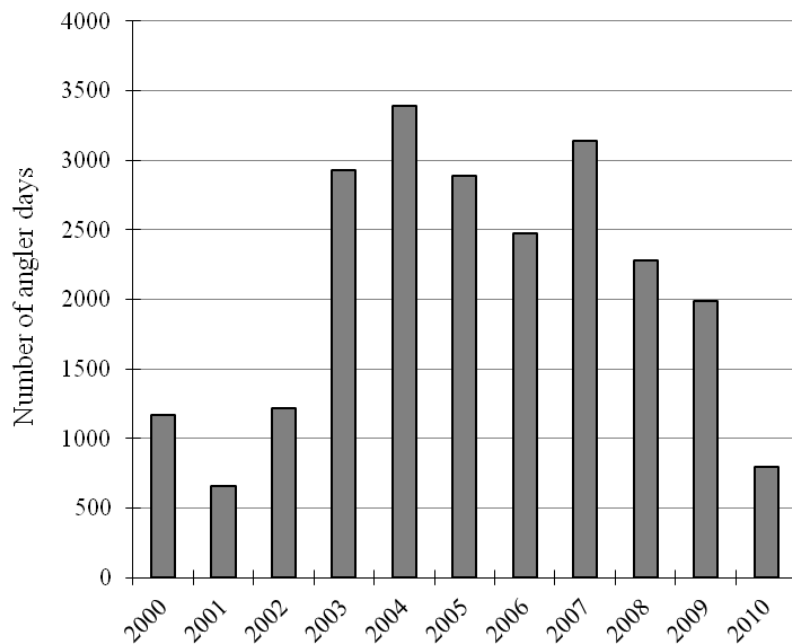


Figure 14.—Angler days of effort by shoreline anglers in Passage Canal near Whittier, 2000–2010.

Note: Effort includes that exerted on coho salmon and other species.

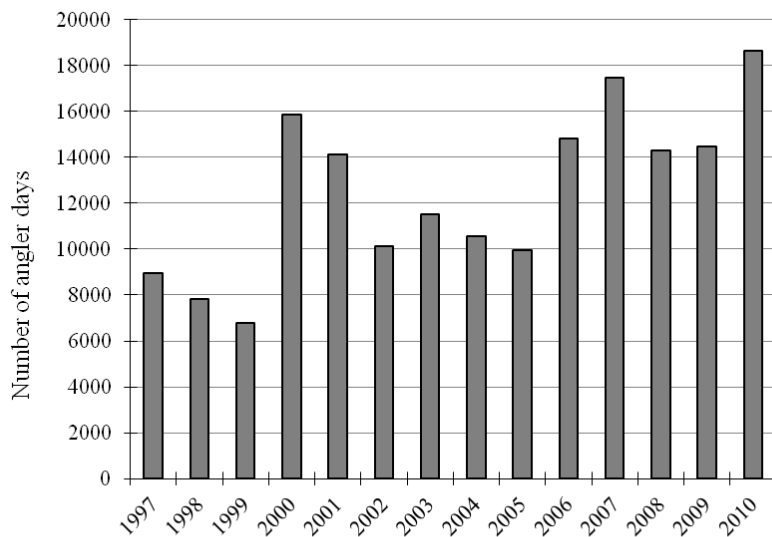


Figure 15.—Angler days of effort by shoreline anglers, Port Valdez, 1997–2010.

Note: Effort includes that exerted on coho salmon and other species.

CUTTHROAT TROUT FISHERIES

Fishery Description

Prince William Sound represents the northern extent of the distribution of coastal cutthroat trout (CCT). Consequently, this provides not only unique fishing opportunities for anglers, but also unique management challenges for fisheries biologists. From the management perspective, CCT in PWS are a sensitive species because fish populations at the edge of their distribution may be more susceptible to environmental events and exhibit more variable vital rates (e.g., survival and recruitment). Additionally, CCT populations in PWS have limited genetic heterozygosity (Currens et al. 2003) and low abundance and density levels (Hepler et al. 1996), which raises concerns for the sustainability of even low levels of harvest.

Cutthroat trout are present in numerous streams and lakes throughout PWS. Although the extent of their distribution remains unknown, there have been no directed efforts to determine the presence or absence of cutthroat trout within most of the freshwater systems in PWS. Estimates of catch and harvest of CCT from specific systems within PWSMA are not feasible, given the limitations of SWHS with small numbers of respondents (Clark 2009). However, occasional reporting of catch and harvest of CCT from Eyak River, Eshamy Creek and Lake, Alaganik Slough, and Green Island Creek suggests anglers either target CCT and/or incidentally catch CCT while targeting other species in these systems.

In 1999, the Alaska Board of Fisheries adopted a proposal submitted by ADF&G to establish the Copper River Delta Special Management Area for Trout (CRDSMAT; all freshwaters south of Miles Lake and east of the Copper River excluding Clear Creek). The special management area regulations include year-round use of only unbaited, single-hook, artificial lures, and no retention of cutthroat trout or rainbow/steelhead trout.

Historical Harvest and Abundance

Total catch of cutthroat trout within the PWSMA from 1996 through 2010 has ranged from 1,074 to 4,115 fish (Table 7) with an average harvest of 390 cutthroat trout (range = 160–1,033 fish). On average (1996–2010) CRD supports more than a third of the cutthroat trout catch (38%) and harvest (33%) in PWSMA (Table 7). The average harvest rate (calculated from total catch and harvest each year as percent of fish caught that were harvested, 1996–2010) was 22% and reflects the catch-and-release nature of the cutthroat trout fisheries in PWSMA.

The abundance of CCT in any system within PWSMA is unknown. The only information gathered to date that pertains to CCT abundance in PWS was collected by the Natural Resource Damage Assessment Program following the Exxon Valdez oil spill in 1989. In 1990 and 1991, ADF&G conducted a study to determine the impacts of exposure to hydrocarbons on CCT growth and survival within “oiled” and “unoiled” streams. Weirs were installed in five streams and outmigrating CCT were enumerated. In general, the project found that the anadromous components of each of these CCT populations were comprised of a few hundred individuals (Hepler et al. 1996).

Table 7.–Catch and harvest of cutthroat trout by geographical region, PWSMA, 1996–2010.

Year ^a	<u>Western^b</u>		<u>Eastern^c</u>		<u>Cordova Road/Delta (CRD)^d</u>		<u>Total</u>		<u>CRD % of total</u>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
1996	884	49	160	125	1,159	376	2,844	669	0.41	0.56
1997	1,117	91	671	146	1,284	252	4,115	642	0.31	0.39
1998	939	227	795	130	774	183	3,525	847	0.22	0.22
1999	29	0	742	652	580	176	1,984	1,033	0.29	0.17
2000	1,075	27	668	198	748	93	2,969	481	0.25	0.19
2001	122	46	235	115	541	52	1,115	213	0.49	0.24
2002	434	41	211	37	1,276	98	2,404	278	0.53	0.35
2003	1,400	104	494	177	1,254	225	3,683	774	0.34	0.29
2004	551	73	182	52	562	90	1,545	250	0.36	0.36
2005	43	33	847	329	358	46	1,555	524	0.23	0.09
2006	127	25	290	51	648	84	1,179	160	0.55	0.53
2007	720	130	47	18	418	102	1,185	250	0.35	0.41
2008	363	107	351	58	271	85	1,074	250	0.25	0.34
2009	793	115	175	119	1,453	217	2,626	632	0.55	0.34
2010	732	32	514	246	1,323	282	2,660	566	0.50	0.50
Average 2001–2010	810	128	335	120	529	71	1,903	390	0.38	0.33

^a To increase precision in data collection, SWHS changed from reporting area of harvest to port of landing in 2001. This had no effect on data for "PWS totals."

^b Includes catch and harvest from saltwater trips where anglers were on the western side of PWS as demarcated by a line drawn from Point Freemantle to the tip of Montague Island at Montague Point.

^c Includes catch and harvest from saltwater trips that were on the eastern side of PWS as demarcated by a line drawn from Point Freemantle to the tip of Montague Island at Montague Point.

^d Includes catch and harvest from saltwater and freshwater trips from the Cordova road system or Copper River Delta area.

Fishery Management and Objectives

Within PWSMA, cutthroat trout are managed under presumed conservative bag limits. Current limits are 2 per day, 2 in possession, only 1 of which may be greater than 20 inches in length. There is no retention of trout in CRDSMAT.

Fishery Performance and Abundance 2008–2010

Total catch and harvest of CCT in PWSMA was below the 10-year average (1,903 and 390 fish, respectively, 2001–2010) in 2008 (1,074 and 250 fish) and exceeded the 10-year average during 2009 (2,626 and 632 fish) and 2010 (2,660 and 566 fish, Table 7, Figure 16).

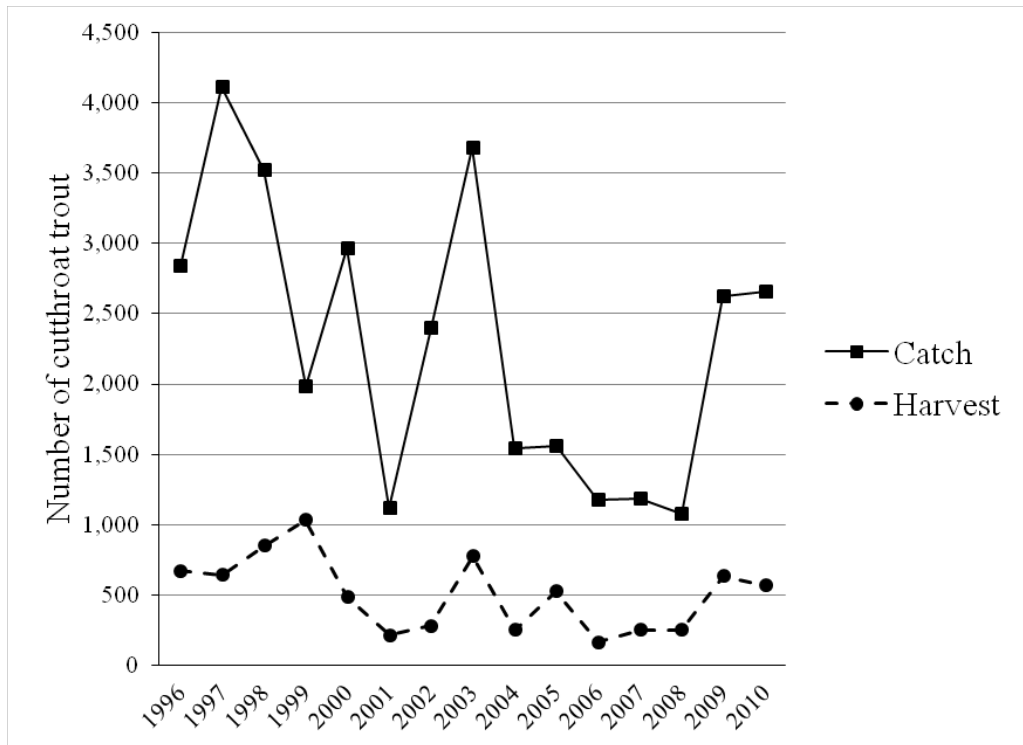


Figure 16.—Total catch and harvest of cutthroat trout by sport anglers by year, PWSMA, 1996–2010.

HALIBUT FISHERY

Fishery Description

Halibut are one of the most popular targets of recreational anglers fishing the marine waters of PWSMA. Most halibut are harvested from May through early September. The current limits for halibut are 2 fish per day, 4 in possession. The fishery is open year-round with the exception of January, when the fishery is closed to protect spawning halibut.

Historical Harvest

Halibut are caught throughout most marine waters of PWS although much of the directed effort and harvest occurs near the ocean entrances. Total catch and harvest of halibut in PWSMA has increased from 39,227 and 21,584 fish, respectively in 1996 to a peak of 91,048 and 45,530 fish, respectively in 2007 (Table 8). Coincident with increased angler effort in western PWS (Table 2), halibut harvest in western PWS has increased from 7,684 in 2001 to 27,457 in 2007 (Table 8, Figure 17B). Halibut harvest in eastern PWS has been relatively consistent since 2001 (2001–2010 average = 13,472 fish) although there is variability across years (range = 9,106–16,852 fish, Table 8, Figure 17C).

Table 8.—Catch and harvest of halibut by geographical region, PWSMA, 1991–2010.

Year	<u>Northwestern</u>		<u>Eastern^a</u>		<u>Other sites^b</u>		<u>Total</u>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
1991	1,890	1,484	11,127	7,823	4,256	3,118	17,273	12,425
1992	1,460	1,151	17,248	11,301	7,902	4,653	26,610	17,105
1993	3,121	1,705	20,229	11,171	11,757	6,149	35,107	19,025
1994	2,991	2,438	16,083	10,709	14,724	8,950	33,798	22,097
1995	4,474	2,639	20,551	12,577	16,560	8,851	41,585	24,067
1996	5,074	3,505	22,257	11,750	11,896	6,329	39,227	21,584
1997	7,239	4,355	23,232	13,316	18,655	9,651	49,126	27,322
1998	4,898	3,786	23,925	13,469	10,478	6,088	39,301	23,343
1999	5,754	4,048	28,358	15,132	12,796	7,531	46,908	26,711
2000	6,919	5,479	29,094	16,037	13,628	8,573	49,641	30,089
Average 1991–2000	4,382	3,059	21,210	12,329	12,265	6,989	37,858	22,377
Year ^c	<u>Western^d</u>		<u>Eastern^e</u>		<u>Other/unknown^f</u>		<u>Total</u>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
2001	18,719	7,684	16,497	10,754	2,936	1,580	38,152	20,018
2002	23,231	9,850	13,149	9,106	1,107	948	37,487	19,904
2003	28,682	10,841	18,463	12,081	1,175	761	48,320	23,683
2004	47,823	17,382	27,835	16,453	2,116	1,409	77,774	35,244
2005	40,925	15,716	25,253	14,642	1,481	844	67,659	31,202
2006	39,765	16,455	19,889	12,709	1,667	1,148	61,321	30,312
2007	60,640	27,457	28,505	16,852	1,903	1,221	91,048	45,530
2008	50,147	19,273	20,446	13,644	2,187	1,512	72,780	34,429
2009	43,830	18,400	25,192	16,431	938	694	69,960	35,525
2010	45,045	30,086	18,014	12,046	380	251	63,439	42,383
Average 2006–2010	47,885	22,334	22,409	14,336	1,415	965	71,710	37,636
Average 2001–2010	39,881	17,314	21,324	13,472	1,589	1,037	62,794	31,823

^a “Eastern” 1991–2000 includes Cordova Road/Delta, Valdez and other eastern areas.

^b “Other sites” 1991–2000 includes northeastern areas and outer islands.

^c To increase precision in data collection, SWHS changed from reporting area of harvest to port of landing in 2001. This had no effect on data for “PWS totals.”

^d Includes catch and harvest from saltwater trips where anglers were on the western side of PWS as demarcated by a line drawn from Point Freemantle to the tip of Montague Island at Montague Point.

^e Includes catch and harvest from saltwater trips that were on the eastern side of PWS as demarcated by a line drawn from Point Freemantle to the tip of Montague Island at Montague Point.

^f Includes catch and harvest from unknown locations in PWS.

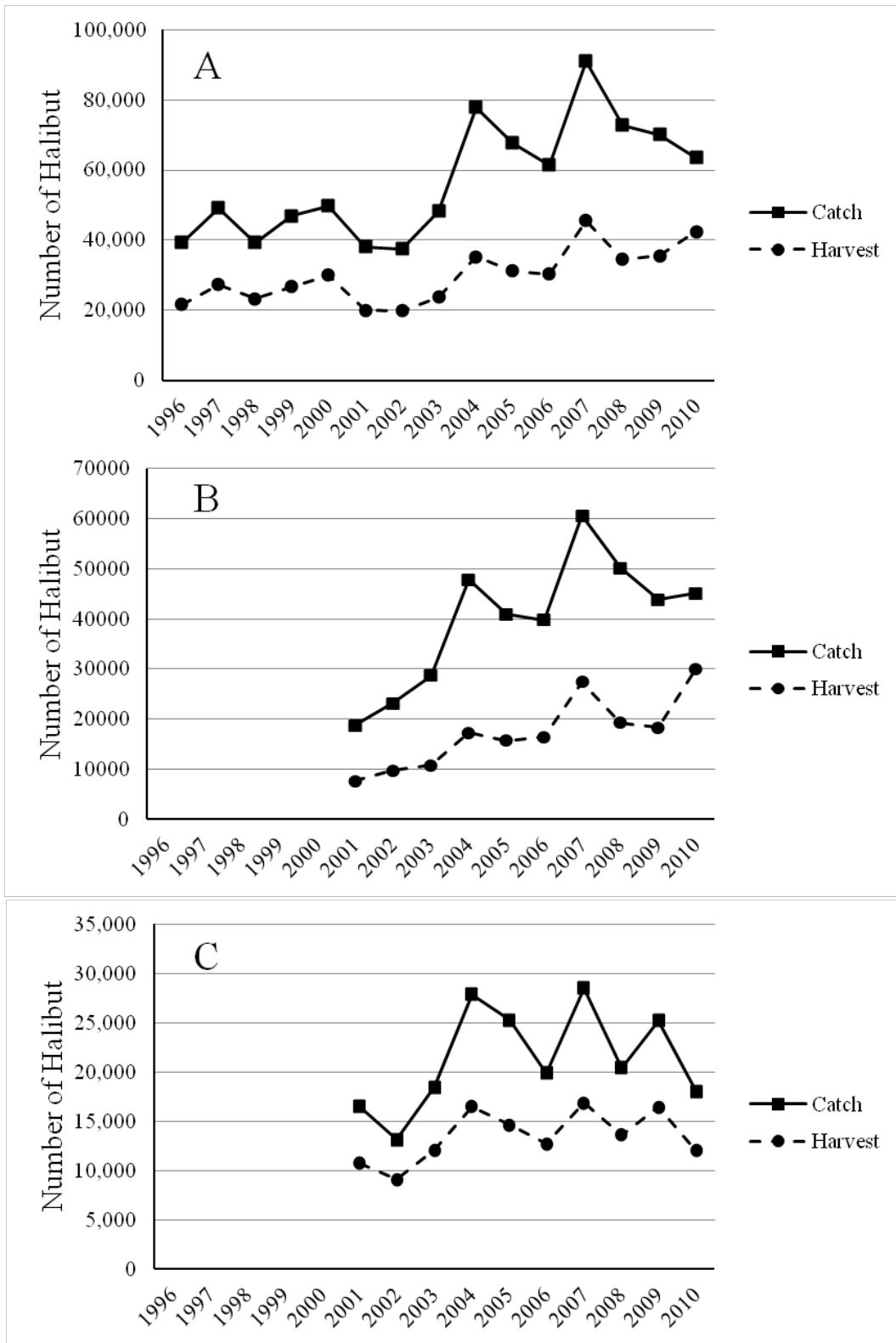


Figure 17.—Total catch and harvest of halibut by sport anglers by year, PWSMA (A); catch and harvest of halibut by year in western PWS (B); catch and harvest of halibut in eastern PWS (C).

Fishery Management and Objectives

Halibut fisheries are managed under an international treaty: the Halibut Convention of 1982 and the 1979 Protocol. Under this treaty, the International Pacific Halibut Commission (IPHC) was formed to assure the optimal sustained yield of the North Pacific halibut resource. The IPHC does not, however, have the authority to allocate catch quotas amongst the various fisheries that exploit the halibut stock in the United States (U.S.) waters. In U.S. waters, the responsibility for allocation of the catch quota among fisheries resides with the North Pacific Fishery Management Council (NPFMC) via the Magnuson-Stevens Fisher Conservation and Management Act of 1996. ADF&G, Division of Sport Fish provides estimates of catch, harvest, and age and size composition in the recreational fisheries throughout the state to both IPHC and NPFMC to aid in making management and allocation decisions. The state of Alaska does not have direct management authority over halibut and halibut fisheries off Alaska.

From 1982 through 1994, IPHC estimated stock size using an age-structured model fitted to commercial catch-at-age and catch-per-effort data (Clark and Hare 2006). Age-specific commercial selectivity was a constant model parameter. In the late 1980s, halibut growth rates in Alaska declined, and thus age-specific commercial selectivity of catch decreased because selection of larger fish did not necessarily reflect selection of older fish. Because age-specific selectivity remained a constant parameter, the model was underestimating abundance of halibut. This problem was addressed by making commercial selectivity a function of length as well other changes. In 2003, an entirely new assessment model was developed that modeled abundance by sex, parameterized selectivity differently, and accounted for changes in the ageing method (Clark and Hare 2006). In December 2006, IPHC announced that recent information from tagging programs indicated that the halibut stock was more migratory than previously assumed. As a result, they assessed the stock using a coastwide model, and apportioned the overall biomass among regulatory areas based on relative catch rates in the longline survey weighted by bottom habitat area. The coastwide assessment and apportionment was not used to set catch limits for 2007, largely because of objections to assumptions of the apportionment method. IPHC began apportioning the overall biomass using relative catch rates when setting catch limits for the 2008 season. The biomass has been on a downward trajectory since the late 1990s, the result of relatively weak recruitments and lower individual growth rates in recent years. Biomass is expected to increase, however, due to strong recruitments during the years 1998–2000.

Fishery Performance 2008–2010

Halibut harvest exceeded the previous 5-year average (33,194 fish, 2003–2007) during the 2008–2010 seasons (34,429, 35,525, and 42,383 fish, respectively, Table 8). Halibut catch and harvest remained relatively stable in eastern PWS during the years 2008–2010 (Figure 17C). Halibut catch declined over these years in western PWS although harvest in 2010 was the highest on record (30,086 fish, Table 8, Figure 17C).

ROCKFISH FISHERY

Fishery Description

Over 30 species of rockfish inhabit the Gulf of Alaska with 6 species—black (*Sebastes melanops*), dusky (*S. variabilis*)¹, dark (*S. ciliatus*), yelloweye (*S. ruberrimus*), quillback (*S. maliger*), and copper (*S. caurinus*) rockfish—frequently captured in the recreational fishery of PWS. For purposes of management, rockfish are divided into 2 assemblages (pelagic and nonpelagic) based on biological and ecological characteristics of each species. Key life-history characteristics that differ between the 2 assemblages are the greater longevity, later age at first sexual maturity, and higher site fidelity of nonpelagic rockfish.

ADF&G has management authority for all recreational rockfish fisheries in state waters, as well as federal waters of the exclusive economic zone (EEZ). State regulations apply in the EEZ because the NPFMC's Gulf of Alaska Fishery Management Plan does not address any recreational groundfish fisheries. Section 306 of the Magnuson-Stevens Fisheries Conservation and Management Act, amended in 1996, allows the state of Alaska to regulate sport vessels in federal waters in the absence of a plan for the sport fishery. Most recently, ADF&G has developed a web page (<http://www.adfg.alaska.gov/index.cfm?adfg=fishingSportFishingInfo.rockfishconservation>) that addresses the management challenges inherent in rockfish fisheries, and provides recreational anglers with a list of best practices that can be employed to minimize unintentional catch of rockfish and methods to reduce release mortality. Initiation of such public outreach efforts stem from a recent completion of a 3-year study that examined the efficacy of deepwater release at improving the release survival of yelloweye rockfish (Hochhalter and Reed *In press*).

Historical Harvest

Rockfish catch and harvest in western PWS has more than tripled since opening of the Whittier Tunnel in 2000 and continues to increase despite reductions in angler effort since 2007 (Table 1, Table 9). Increased catch and harvest under declining angler effort suggests anglers are targeting rockfish despite the conservative bag limits imposed by current regulations.

Between 2001 and 2007, total catch and harvest of rockfish in PWSMA has increased from 26,847 and 15,396 fish, respectively to 63,055 and 31,359 fish, respectively (Table 9, Figure 18). Most of this increase is attributed to increased angler effort in western PWS where catch and harvest has increased from 15,978 and 8,311 fish, respectively in 2001 to 42,443 and 17,632 fish, respectively in 2007 (Table 9, Figure 18).

Fishery Management and Objectives

ADF&G and the Alaska Board of Fisheries (board) have attempted to take a conservative approach to management of rockfish fisheries in PWS and the rest of Alaska. Sport fish bag limits have been reduced periodically during the last 2 decades in recognition of the failure of several Pacific rockfish fisheries in California, Oregon, Washington, and British Columbia, and because of a life history that makes rockfish susceptible to overharvest. More restrictive bag limits have been set for the longer-lived and less productive nonpelagic species to discourage

¹ In 2008, the Alaska Board of Fisheries split the species known to ADF&G as dusky (*S. ciliatus*) into two groups: dusky (*S. variabilis*) and dark (*S. ciliatus*) based on recently found differences (Brylinsky et al. 2008; Milani 2008).

targeted harvest, while still allowing for retention of incidental catch. Seasons or size limits for rockfish have not been implemented because of concerns regarding high discard mortality attributed to barotrauma (aka decompression trauma). Along with regulation changes, efforts have been made to educate anglers regarding the risks and consequences of rockfish overharvest, and to foster fishing practices that avoid bycatch and waste in the sport fishery.

The sport rockfish fishery in PWS had no bag limit until 1989, when the board adopted limits of 20 fish per day and in possession, only 5 of which could be “red rockfish” (Appendix A1). In 1991, the board revised the bag limit to 5 rockfish per day, 10 in possession from 1 May to 15 September and 10 per day and in possession for the remainder of the year. In 1997, the board revised the limits such that the total bag limit was unchanged, but the provision was added that for non-pelagic rockfish species, between 1 May and 15 September, the bag limits were restricted to 1 rockfish per day and 2 in possession, and between 15 September and 30 April, the bag limits were 2 per day and in possession. Finally, in 1999, the board revised the limits such that the total limit remained unchanged, but that for non-pelagic rockfish species, the bag limits were 2 per day and 2 in possession, year round. This modification was made to reduce bycatch waste in the recreational fisheries for halibut and lingcod in PWS. Even though increasingly conservative steps have been taken to curtail harvest and manage bycatch and waste, it is unknown whether these efforts are providing optimum yield or adequate protection for rockfish populations.

The status of rockfish stocks in PWS is, for the most part, unknown. No surveys have been conducted in PWS in order to obtain a fishery-independent estimate of relative abundance. Information on locations and quantity of rockfish habitat, and spatial or depth distribution by species are also lacking. Cost-effective, fishery-independent surveys for rockfish in PWSMA and the greater Gulf of Alaska are not presently available. There are, however, rudimentary indicators of the condition of the rockfish stock(s). Despite a steady growth in recreational harvest, there is broad representation of ages in the black and yelloweye rockfish harvest, and limited truncation (loss of older or younger individuals) of the yelloweye rockfish age distribution (Figure 19) and no truncation in the black rockfish age distribution (Figure 20). Therefore, if past levels of harvest have exceeded surplus production, they have likely not done so by a large amount.

Age composition data do show, however, that relatively large year-classes are the exception. The 1991 year class of black rockfish was relatively large, but the previous large year-class was at least 10 years earlier (Meyer and Failor *In prep*). Recruitment variability is common in rockfish and reinforces the principle that allowable levels of harvest have to take natural variability into account, and that fisheries should be managed to maintain a diversity of age classes in the population in order to buffer the natural variability in production.

The potential for overfishing is the primary management concern for rockfish in PWSMA. This concern is largely based on rockfish life history characteristics such as extreme longevity, relatively late age at maturity, high recruitment variability, and increased discard mortality attributed to barotrauma. Many species recruit to the fishery before reaching sexual maturity, and fisheries develop on the standing stock rather than on the surplus production. Removal of the older spawning stock reduces spawning biomass, further inhibiting population recovery.

Table 9.–Catch and harvest of rockfish by geographical region, PWSMA, 1991–2010.

Year	<u>Western^a</u>		<u>Eastern^b</u>		<u>Other sites^c</u>		<u>Total</u>		% released ^d
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	
1991	4395	3187	7,089	4,456	716	1,090	12,200	8,733	28%
1992	5767	3441	12,002	9,081	3,316	2,956	21,085	15,478	27%
1993	5219	3166	8,765	5,480	4,574	3,628	18,558	12,274	34%
1994	6317	3974	11,741	7,369	5,941	4,039	23,999	15,382	36%
1995	6651	2889	11,558	7,517	6,357	4,295	24,566	14,701	40%
1996	7027	3589	9,214	5,760	4,361	3,026	20,602	12,375	40%
1997	7656	4024	9,415	5,868	8,152	5,511	25,223	15,403	39%
1998	6796	4710	11,021	5,516	4,647	3,225	22,464	13,451	40%
1999	6506	4201	9,867	5,679	4,574	3,116	20,947	12,996	38%
2000	10491	6537	9,952	6,504	6,472	4,435	26,915	17,476	35%
Average 1991–2000	3,933	3,172	6,192	6,021	2,857	2,570	21,656	13,827	36%
Year ^e	<u>Western^f</u>		<u>Eastern^g</u>		<u>Other/unknown^h</u>		<u>Total</u>		% released ^d
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	
2001	15,978	8,311	9,094	5,877	1,775	1,208	26,847	15,396	43%
2002	19,029	9,809	11,772	5,899	449	404	31,250	16,112	48%
2003	25,290	11,433	9,954	6,053	717	373	35,961	17,859	50%
2004	38,612	15,851	17,557	9,001	1,260	999	57,429	25,851	55%
2005	37,464	15,683	12,290	8,953	655	546	50,409	25,182	50%
2006	34,363	16,394	12,423	8,830	941	792	47,727	26,016	45%
2007	42,443	17,632	19,221	12,687	1,391	1,040	63,055	31,359	50%
2008	49,386	21,402	13,792	8,201	725	680	63,903	30,283	53%
2009	50,795	26,082	14,348	10,098	458	447	65,601	36,627	44%
2010	43,061	27,788	16,702	11,926	506	239	60,269	39,953	34%
Average 2006–2010	44,010	21,860	15,297	10,348	804	640	60,111	32,848	45%
Average 2001–2010	35,642	17,039	13,715	8,753	888	673	50,245	26,464	47%

^a “Western” 1991–2000 includes southwestern and northwestern PWS.

^b “Eastern” 1991–2000 includes Valdez, eastern PWS, and the Cordova Road/Delta.

^c “Other sites” 1991–2000 includes outer islands and northeastern PWS.

^d Calculated as percent of total catch that was not harvested.

^e To increase precision in data collection, SWHS changed from reporting area of harvest to port of landing in 2001. This had no effect on data for “PWS totals.”

^f Includes catch and harvest from saltwater trips where anglers were on the western side of PWS as demarcated by a line drawn from Point Freemantle to the tip of Montague Island at Montague Point.

^g Includes catch and harvest from saltwater trips that were on the eastern side of PWS as demarcated by a line drawn from Point Freemantle to the tip of Montague Island at Montague Point.

^h Includes catch and harvest from unknown locations in PWS.

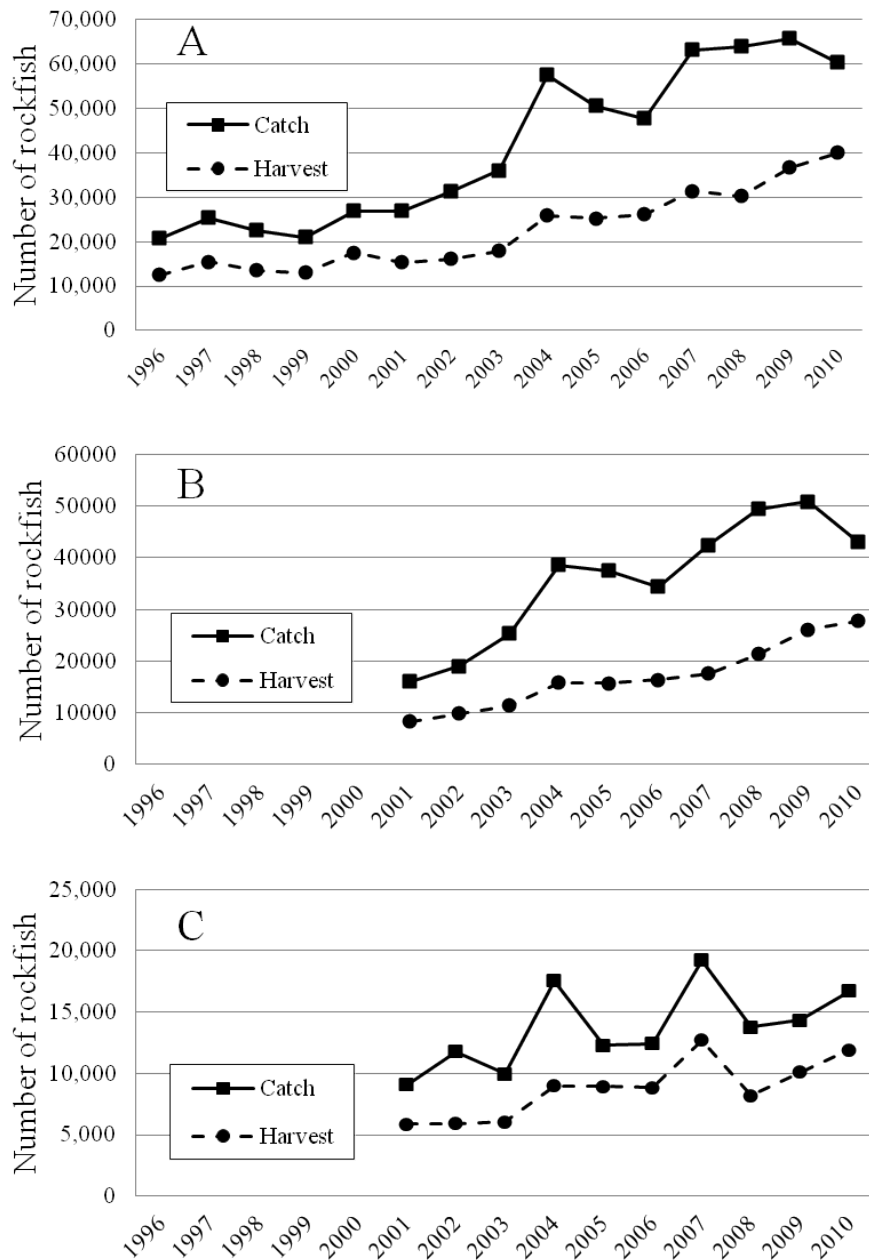


Figure 18.—Total catch and harvest of rockfish by sport anglers by year, PWSMA (A); catch and harvest of rockfish by year in western PWS (B); catch and harvest of rockfish in eastern PWS (C).

Fishery Performance 2008–2010

For the most part, rockfish catch and harvest has continued to increase from 2001 through the 2010 season to the highest harvest on record: 39,953 fish in 2010 (Table 9; Figure 18). Rockfish catch and harvest has increased annually since 2001 by an average (slope of the regression lines for catch and harvest by year from 2001–2010) of 3,606 and 2,092, respectively, in western PWS, and 672 and 640, respectively, in eastern PWS. On average (2006–2010), 45% of the rockfish caught in PWS are released (Table 9).

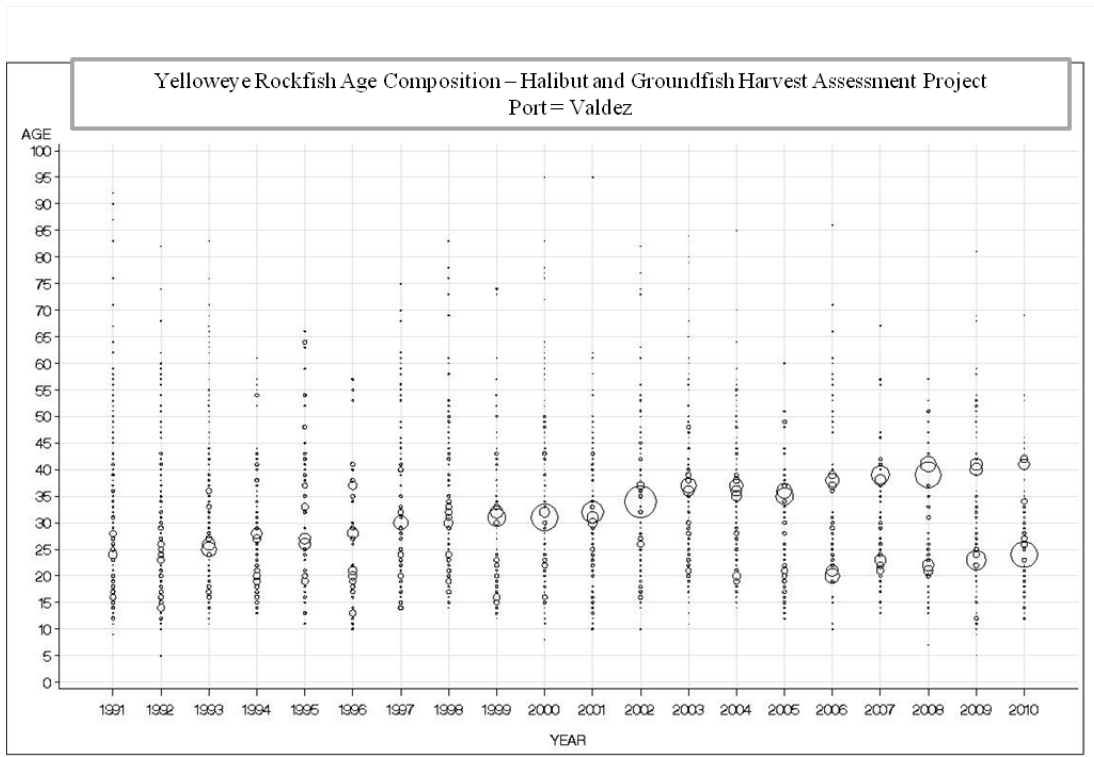


Figure 19.–Age composition of yelloweye rockfish in the recreational harvest of anglers returning to the port of Valdez, 1991–2010.

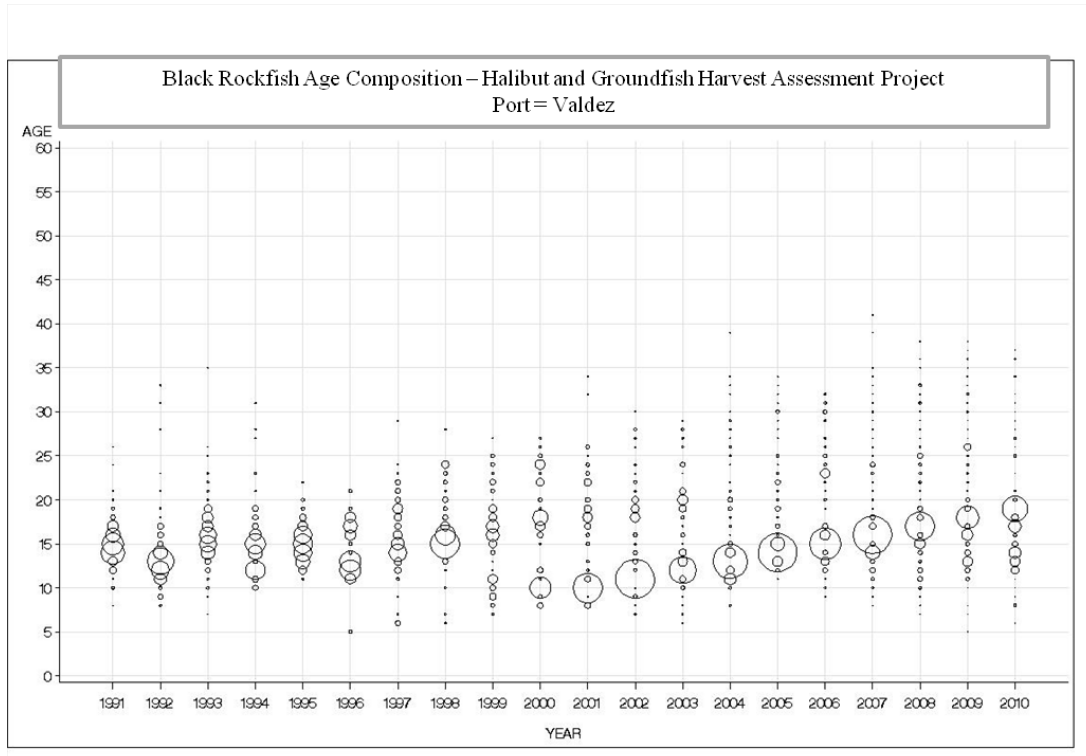


Figure 20.–Age composition of black rockfish in the recreational harvest of anglers returning to the port of Valdez, 1991–2010.

LINGCOD FISHERY

Fishery Description

Lingcod are distributed from the Alaska Peninsula south to Baja California (Cass et al. 1990). In PWS, they are common along the ocean entrances from Cape Fairfield to the Hinchinbrook Entrance. Lingcod are also captured around rocky reefs and underwater pinnacles that are common throughout PWS. While adult lingcod can be found to depths of 1,200 ft, they more typically inhabit nearshore rocky reefs from 30 to 300 ft in depth (Cass et al. 1990).

Historical Harvest and Abundance

The status of the lingcod population in PWS is unknown. Like rockfish, there is no formal stock assessment of lingcod in PWS. Insight into the stock status of the lingcod population in PWS is available in the form of size and age data of harvested fish. The age distribution of harvested lingcod in PWSMA has shown no sign of truncation (loss of older individuals; Failor and Meyer *In prep*). Conversely, an increase in the frequency of older individuals in the recreational harvest since 1991 suggests that recent anglers are selectively harvesting larger, older lingcod (Figure 21). The recreational fishery is the primary source of lingcod removals in PWSMA.

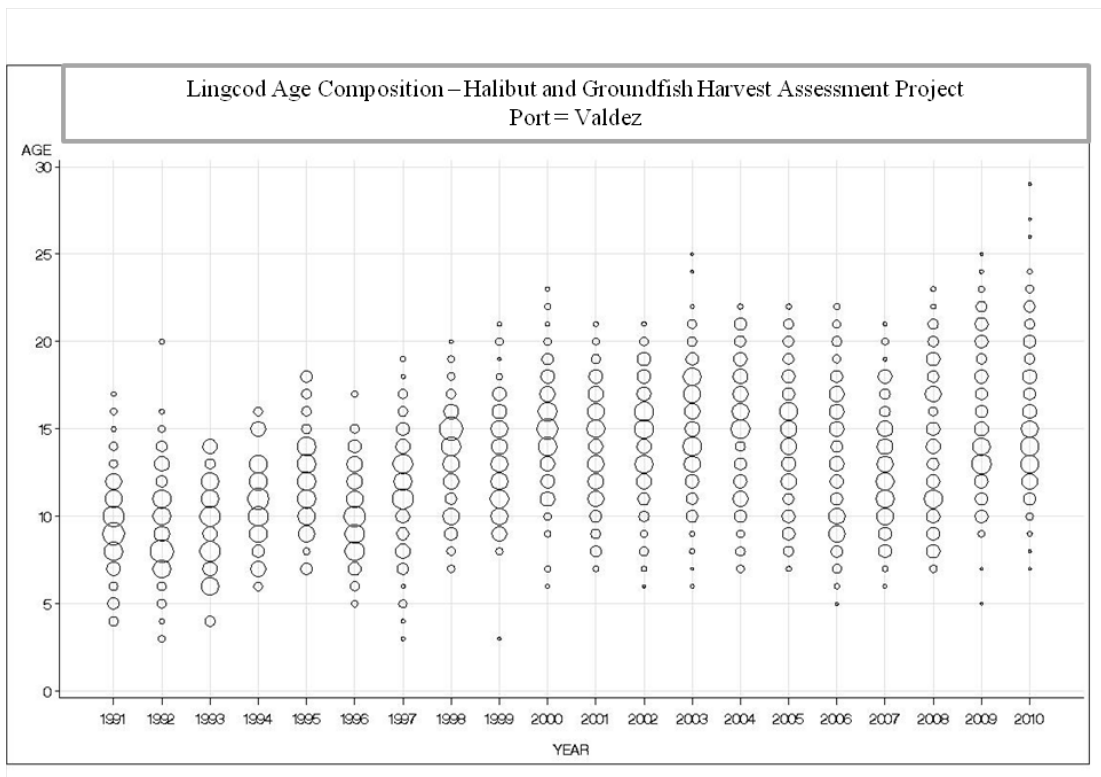


Figure 21.–Age composition of lingcod in the recreational harvest of anglers returning to the port of Valdez, 1991–2010.

Between 2001 and 2007, total catch and harvest of lingcod in PWSMA has increased from 7,801 and 3,018 fish, respectively to 19,990 and 7,175 fish, respectively (Table 10, Figure 22). The increase in harvest is split fairly evenly between western and eastern PWS; harvest in western PWS increased from 1,166 in 2001 to 3,557 in 2007, and harvest in eastern PWS increased from 1,475 in 2001 to 3,420 in 2007 (Table 10, Figure 22).

Table 10.—Catch and harvest of lingcod by sport fisheries in Prince William Sound, 1991–2010.

Year	<u>Northwestern</u>		<u>Eastern^a</u>		<u>Other Sites^b</u>		<u>Total</u>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
1991	345	274	2,531	1,279	581	331	3,457	1,884
1992	522	252	5,322	1,699	2,632	541	8,476	2,492
1993	505	150	4,838	1,238	1,279	472	6,622	1,860
1994	500	303	1,567	396	2,041	735	4,108	1,434
1995	660	243	2,426	1,131	1,696	682	4,782	2,056
1996	1,514	423	2,678	866	1,424	659	5,616	1,948
1997	958	564	2,782	1,059	3,645	1,687	7,385	3,310
1998	602	307	3,226	1,176	1,559	703	5,387	2,186
1999	1,375	333	3,965	1,198	1,474	342	6,814	1,873
2000	1,701	490	3,644	1,175	2,600	1,191	7,945	2,856
Average 1991–2000	868	334	3,298	1,122	1,893	734	6,059	2,190

Year ^c	<u>Western^d</u>		<u>Eastern^e</u>		<u>Other/unknown^f</u>		<u>Total</u>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
2001	3,987	1,166	3,034	1,475	780	377	7,801	3,018
2002	4,974	2,031	2,900	1,183	265	156	8,139	3,370
2003	4,406	1,230	3,210	1,483	452	155	8,068	2,868
2004	5,293	1,445	4,026	2,135	463	109	9,782	3,689
2005	9,830	1,723	4,248	2,274	237	182	14,315	4,179
2006	7,644	2,174	4,582	1,951	404	288	12,630	4,413
2007	13,090	3,557	6,418	3,420	482	198	19,990	7,175
2008	11,869	2,799	5,585	2,818	366	125	17,820	5,742
2009	10,058	3,285	4,082	2,963	148	9	14,288	6,257
2010	10,757	6,230	5,308	3,410	111	38	16,176	9,678
Average 2006–2010	10,684	3,609	5,195	2,912	302	132	16,181	6,653
Average 2001–2010	8,191	2,564	4,339	2,311	371	164	12,901	5,039

^a “Eastern” 1991–2000 includes Cordova Road/Delta, Valdez, and other eastern areas.

^b “Other sites” 1991–2000 includes outer islands and northeastern PWS.

^c To increase precision in data collection, SWHS changed from reporting area of harvest to port of landing in 2001. This had no effect on data for “PWS totals.”

^d Includes catch and harvest from saltwater trips where anglers were on the western side of PWS as demarcated by a line drawn from Point Freemantle to the tip of Montague Island at Montague Point.

^e Includes catch and harvest from saltwater trips that were on the eastern side of PWS as demarcated by a line drawn from Point Freemantle to the tip of Montague Island at Montague Point.

^f Includes catch and harvest from unknown locations in PWS.

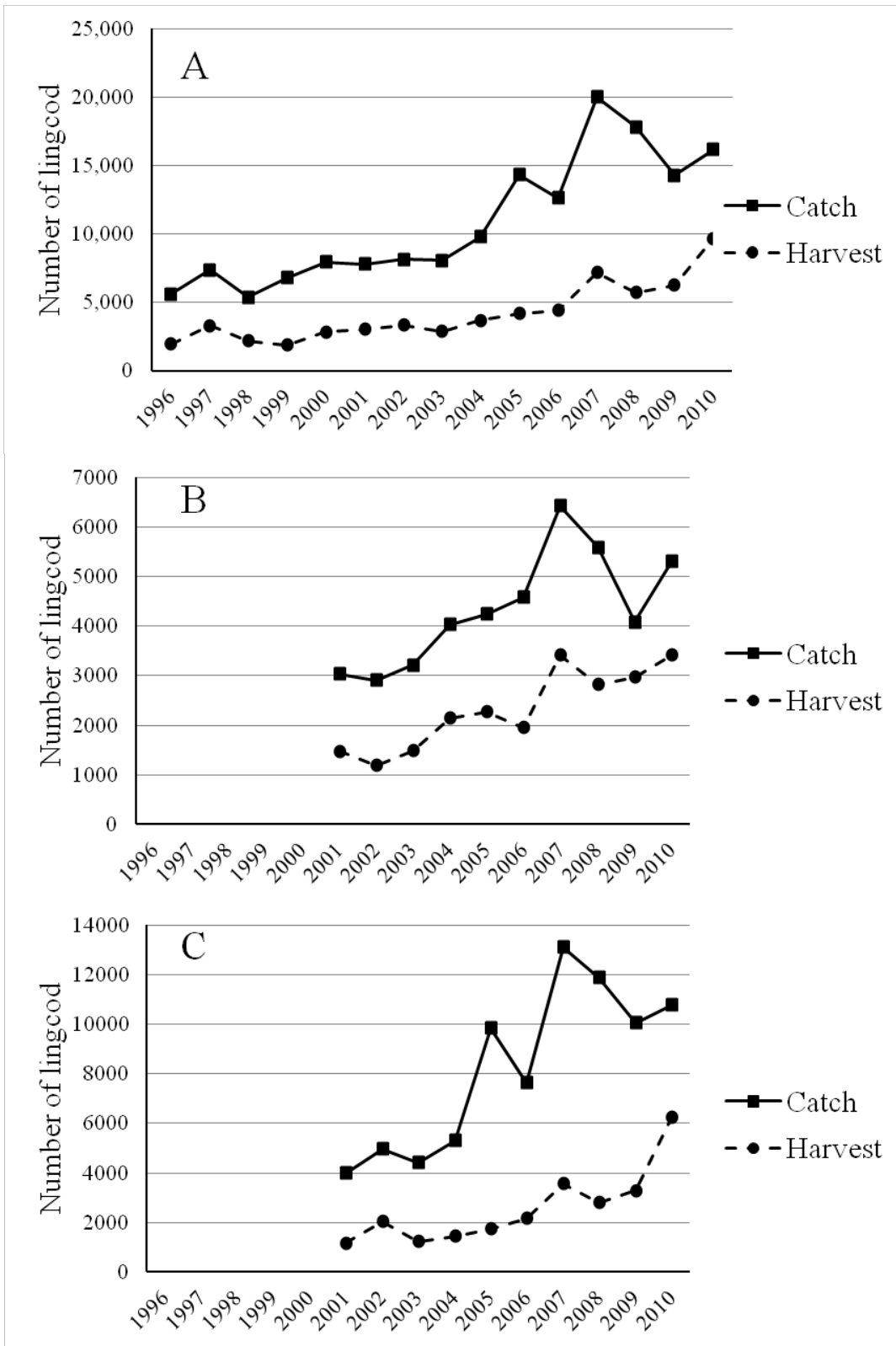


Figure 22.—Total catch and harvest of lingcod by sport anglers by year, PWSMA (A); catch and harvest of lingcod by year in western PWS (B); catch and harvest of lingcod in eastern PWS (C).

Fishery Management and Objectives

Lacking a comprehensive stock assessment, ADF&G and the board have adopted a precautionary approach to the management of the sport lingcod fishery. Current regulations in PWSMA were implemented in 1993 for the sport lingcod fisheries and continue to date. The limits allow for a harvest of 2 fish daily, 4 in possession (Appendix A1). A minimum size limit of 35 inches total length (or 28 inches with the head removed) was implemented to allow for at least 1 reproductive event prior to harvest. Lingcod retention is only allowed from 1 July through 31 December to protect spawning fish and nest-guarding males. In addition, all lingcod caught in the sport fishery may be landed only by hand or net. A gaff may not be used to puncture any fish intended or required to be released. Gaffed lingcod must be retained.

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

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

A fishery-independent index of abundance is highly desirable. A reliable index could be used for management in the absence of a stock assessment, or could be used to tune an age- or size-structured assessment model. Because lingcod do not move much and are generally found in easily-identified rocky habitat, the fishery can maintain stable catch rates even as abundance declines. Work is needed to develop survey methods that provide for an unbiased index of abundance. The minimum size limit of 35 inches also precludes the use of fishery data as an index of recruitment and no data are available on the sizes of released fish. A survey would provide catch data on the sublegal portion of the population, data that may provide insight on future recruitment.

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

Fishery Performance 2008–2010

Total lingcod harvest continued to increase through the 2010 season to the highest harvest on record: 9,679 in 2010. Lingcod harvest in eastern PWS remained relatively stable through the 2008–2010 seasons but nearly doubled in western PWS (Table 10, Figure 22).

SHRIMP FISHERY

Fishery Description

Shrimp are pursued mainly out of the ports of Whittier and Valdez. As such, effort and harvest for Whittier anglers are concentrated in the Passage Canal, Culross Island, and Port Wells areas, and for Valdez anglers, effort and harvest are concentrated near Port Valdez and Valdez Arm.

Historical Harvest and Abundance

Total harvest of shrimp by noncommercial users in PWSMA has increased from 9,288 lbs in 2002 to 87,699 lbs in 2010 (Table 11).

Relative abundance (catch per unit effort [CPUE]) of spot shrimp [*Pandalus platyceros*] in PWS is monitored annually by ADF&G with a pot survey at 9 sampling stations. CPUE of spot shrimp increased annually from 1998 through 2007 but has declined since then (Figure 23).

Table 11.—Number of permits issued, total pot days of effort, and total harvest in pounds of whole spot shrimp in the noncommercial pot shrimp fishery, PWSMA, 2002–2010.

Year	Permits		Effort		Harvest	
	# Issued	SE	Pot-days of effort	SE	Whole spot shrimp lbs	SE
2002	717	(2)	19,387	(734)	9,288	(238)
2003	1,061	(0)	24,094	(350)	13,965	(130)
2004	1,649	(5)	30,694	(572)	25,694	(410)
2005	2,112	(4)	37,271	(279)	31,950	(250)
2009	2,733	(0)	47,631	(1,071)	56,120	(668)
2010	3,181	(0)	78,083	(805)	87,699	(463)

Fishery Management and Objectives

Before 2001, there were no regulatory restrictions on the noncommercial shrimp fishery in PWS. In March 2000, the board adopted regulations to restrict the noncommercial fishery (effective January, 2001). The new regulations required a shrimp permit for all users (sport, personal use, and subsistence; effective during the 2002–2005 seasons), established maximum pot limits (no more than five pots per person, with a maximum of five pots per vessel), and established a shrimp fishing season (open from 15 April through 15 September). In March 2009, the board adopted a PWS Pot Shrimp Management Plan allowing for the possibility of a commercial pot shrimp fishery if the 90% lower confidence limit of the estimate of harvestable surplus reached or exceeded 110,000 lbs. For years that the harvestable surplus met or exceeded 110,000 lbs, the board allocated 40% of the surplus to commercial users and 60% to noncommercial users. In order to manage for a given year's allocation, it became necessary to reinstitute the shrimp permit for the noncommercial fishery beginning in 2009.

The Noncommercial Shrimp Fishery Management Plan (5 AAC 55.055) defines the regulatory actions ADF&G can take to liberalize or restrict the noncommercial fishery in response to increases or decreases in allocation. ADF&G's preferred management action is to increase or decrease the allowable number of pots to ensure the noncommercial allocation is met. Pot limits are established pre-season based on projections of participation and fishery CPUE from the previous year. For example, this approach indicated that a pot limit of eight per person, eight per vessel was warranted for the 2010 season given the previous year's CPUE and effort, and the 2010 noncommercial allocation.

The management objective for the noncommercial shrimp fishery is to achieve the allocated harvest for a given year.

Fishery Performance and Abundance 2008–2010

Effort and harvest of shrimp in the noncommercial fishery has increased since 2002 from 19,387 pot days and 9,288 lbs of shrimp to 78,083 pot days and 87,699 lbs (Table 11). Increasing effort and harvest coupled with the concentration of effort and harvest in the Whittier and Valdez areas, raises concerns for localized depletion of shrimp within these areas (Hochhalter and Hansen *In prep*).

Catch per unit effort of spot shrimp in ADF&G surveys has declined each year from 2008 through 2010 (Figure 23).

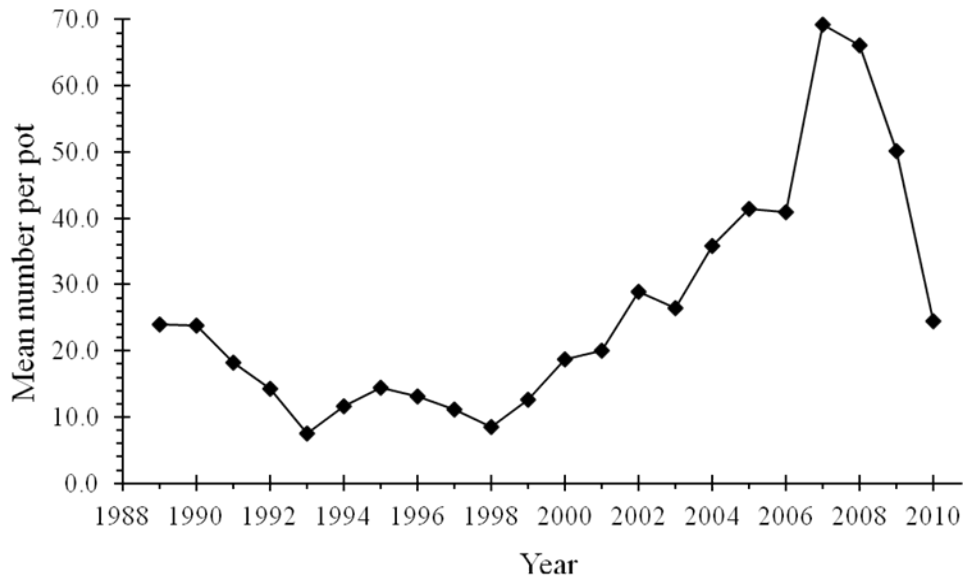


Figure 23.—Mean number of spot shrimp caught per pot by year in ADF&G surveys, PWSMA, 1989–2010.

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APPENDIX A: REGULATION HISTORY

Area wide regulations

- 1994 In all fresh waters, only unbaited artificial lures may be used from 15 April through 14 June.
- 2009 The western sport fish regulatory boundary moved from Cape Puget to Cape Fairfield. Now all regulatory boundaries (Commercial, Sport, Personal Use, Subsistence) have the same western boundary.

Cutthroat Trout

- 1957–1982 Was part of an aggregate freshwater limit of trout, grayling, and lake trout (later “char”) of 15 per day, 30 in possession with a limit of only 3 over 20 inches. No saltwater limits.
- 1983 Limits for each species were established. The limits for “trout” were set at 3 per day, 6 in possession over 20 inches and 15 per day, 30 in possession under 20 inches.
- 1985 Trout limits were set at 5 per day, 10 in possession with only 1 over 20 inches.
- 1991 The bag and possession limits were separated from rainbow trout and were set at 2 per day and in possession except along the Cordova road system where it was 5 per day and in possession, with only 1 per day and in possession over 10 inches.
- 1994 A spawning season closure from 15 April through 14 June was put in place.
- 1999 *Copper River Delta Special Management Area for Trout* was established; Only unbaited, single-hook, artificial lures are allowed year-round in all fresh waters south of Mile Lake Glacier and east of the Copper River (excluding the Clear Creek drainage), and all waters draining into the Gulf of Alaska west of Cape Suckling. In addition, no retention of rainbow/steelhead trout or cutthroat trout is allowed year-round.
- 2002 New limits established that combine rainbow and cutthroat trout as a single bag and possession limit for all trout. For Cordova road system streams, limits are 5 trout per day and in possession, with only 1 per day and in possession over 10 inches. For all other waters, bag and possession limits are 2 fish with only 1 over 20 inches.
- 2006 Rainbow/steelhead/cutthroat trout bag and possession limits are 2 fish, only 1 may be 20 inches or greater per day; an annual limit of 2, 20 inches or greater, must be recorded on license. These regulations do not include the Copper River Delta Special Management Area specified in 5 AAC 55.033, or in stocked lakes.

-continued-

Rainbow Trout

- Prior to 1991 Bag and possession limits were included with cutthroat trout as “trout” limits (see cutthroat trout above).
- 1991 Bag and possession limits were separated from cutthroat trout and set at 5 per day, 10 in possession, only 1 per day and 2 in possession over 20 inches.
- 1999 *Copper River Delta Special Management Area for Trout* was established: Only unbaited, single-hook, artificial lures are allowed year-round in all fresh waters south of Mile Lake Glacier and east of the Copper River (excluding the Clear Creek drainage), and all waters draining into the Gulf of Alaska west of Cape Suckling. In addition, no retention of rainbow/steelhead trout or cutthroat trout is allowed year-round.
- 2002 New limits established that combine rainbow and cutthroat trout as a single bag and possession limit for all trout. For Cordova road system streams, limits are 5 trout per day and in possession, with only 1 per day and in possession over 10 inches. For all other waters, bag and possession limits are 2 fish with only 1 over 20 inches.
- 2006 Rainbow/steelhead/cutthroat trout bag and possession limits are 2 fish, only 1 may be 20 inches or greater per day; annual limit of 2 fish 20 inches or greater must be recorded on license. These regulations do not include the Copper River Delta Special Management Area specified in 5 AAC 55.033, or in stocked lakes.

Dolly Varden/Arctic Char

- Early 1960s Anglers were allowed 30 char in addition to the trout/grayling limit of 15.
- Mid 60s (before 1969) Dolly Varden and Arctic char were made part of the aggregate limit with trout and grayling.
- 1983 Limits for each species were established. The limits for “char” were set at 3 per day, 6 in possession over 20 inches and 15 per day, 30 in possession under 20 inches.
- 1991 Bag limits changed to 10 per day and in possession, with no size restrictions.

Grayling

- 1957–1982 Part of an aggregate freshwater limit of trout, grayling, and lake trout (later “char) of 15 per day, 30 in possession with a limit of only 3 over 20 inches. No saltwater limits.
- 1983 Limits for each species were established. The limits for grayling were set at 15 per day, 30 in possession, no size restrictions.
- 1991 Bag limits are changed to 10 per day and in possession, with no size restrictions.

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Salmon

- There were no salmon limits in fresh or salt water prior to statehood.
- 1960 The freshwater areas within Valdez Bay are closed to salmon fishing.
- 1961 Set saltwater bag limit of 8 coho salmon with possession limit of 3 bag limits.
- 1965 Cordova Road system (Steamship dock to Million Dollar Bridge) freshwater limit was set at 6 salmon daily, with a possession limit of 2 bag limits.
- 1965 Eyak Lake, Power Creek, and Hatchery Creek closed to salmon fishing beyond markers at the east end of Power Creek Arm.
- 1967 A saltwater bag limit of 8 coho, 8 chum, and 15 pink salmon was set; possession limit was 3 daily bag limits.
- 1968 Fishing from the bridge across Eyak River at Mile 3 of the Copper River Highway was prohibited.
- 1969 Upper limit of Cordova area salmon restriction moved from Million Dollar Bridge upstream to the Copper River below Woods Canyon.
- 1970 Limit includes 8 sockeye salmon with possession limit reduced to 2 daily bag limits.
- 1970 The following closures were established: Eccles Creek (Hartney Bay Road) closed to the taking of salmon, Hartney Creek above Hartney Bay Road closed to the taking of salmon.
- 1973 Fresh and saltwater limits were reduced to 6 salmon daily, 12 in possession. Eyak River 200 yards above the weir and 200 yards below the bridge was closed to fishing.
- 1975 Clear Creek closed to the taking of salmon. Eyak Lake and all tributaries closed to the taking of salmon.
- 1979 Closure on Eyak River 200 yards above the weir and 200 yards below the bridge, limited to 15 June through 1 October.
- 1980 Dates of closure on Eyak River changed to 1 June through 1 October.
- 1984 Eshamy Lagoon, inside department markers placed on the lagoon shore approximately ½ mile on either side of the ADF&G cabin, is closed to snagging until the department announces the escapement goal will be met.
- 1984 The Robe River downstream of the Richardson Highway was established as a fly-fishing only water from 15 May through 14 June, with a bag limit of 6 per day and 12 in possession only 1 of which could be a sockeye salmon.

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- 1987 Further restriction on Robe River, 15 May to 22 June, only 1 salmon of each species daily and in possession.
- 1989 Further fine tuning of Robe River fly fishing area. Dates extended to year round, area refined to the highway downstream to 100 yards below the confluence with the Lowe River, bag limit is 3, only 1 may be sockeye salmon and only 1 may be a coho salmon.
- 1989 Valdez Arm closed, area boundary changed to Allison Point to and including Mineral Creek.
- 1989 Eshamy Lagoon, lake, and stream bag limits reduced to only 3 sockeye per day and 6 in possession.
- 1989 Lake Bay (Ester Island) all salt waters inside ADF&G markers located approximately 100 feet seaward of Esther Hatchery brood stock holding facility are closed to all fishing.
- 1989 Cordova in all freshwater drainages crossed by the Copper River Highway from and including Eyak River to the Million Dollar Bridge, and including Clear Creek (Mile 42), excluding the Martin River; the bag and possession limits were reduced to 3 salmon other than king salmon. Clear Creek remains closed to king salmon fishing. In addition, Eyak River 200 yards above the weir and 200 yards below the bridge is opened to fishing year-round and as a fly-fishing only water from 1 June through 30 September.
- 1989 A limit of 2 king salmon (4 in possession) 16 inches or more, and 6 per day, 12 in possession less than 16 inches was added.
- 1991 Eyak fly-fishing only area gear restrictions: only single-hook, artificial flies with gap between point and shank 3/8 inch or less and no additional weight attached to the line may be used.
- 1991 Solomon Gulch Creek, downstream of ADF&G marker located approximately 300 feet downstream of the Valdez Fisheries Development Association weir, opened to salmon fishing.
- 1994 For Cordova, in the marine waters of Orca Inlet between Odiak Inlet and the Orca Cannery on Orca Road, snagging is prohibited from 1 June through 30 September, and in Fleming Spit Creek snagging is allowed from 1 October through 31 May.
- 1994 Salmon bag limits of 3 per day and in possession in Clear Creek and all freshwater drainages crossing the Copper River Highway are changed to include king salmon under 16 inches.
- 1999 Daily limits for coho salmon are 3 per day and 3 in possession, except in designated Terminal Harvest Areas where the saltwater limit remains at 6 per day and 12 in possession.

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- 1999 Daily bag and possession limits for coho salmon at Shelter Bay are 1 per day and 1 in possession.
- 1999 Clear Creek is closed to salmon fishing year-round upstream of the Carbon Mountain Bridge.
- 2001 Statewide Jack king salmon defined as king salmon less than 20” in total length
- 2002 Coho salmon that are to be released can not be removed from the water on streams crossed by the Copper River Highway.
- 2009 Whittier terminal harvest area for salmon now defined as the saltwater west of a line from Trinity Point to Gradual Point.
- 2009 Pink and chum salmon taken in the sport fishery may now be used as bait in sport, personal use, or subsistence fisheries. Fish used as bait are part of the bag limit of the angler that originally hooked the fish.

Halibut

- There was no limit on halibut until 1981 when 2 per day and in possession was allowed and a spawning season closure was put into effect from 1 November through the end of February (regulations established by the International Pacific Halibut Commission).
- 1985 Spawning period closure changed to exclude January only.
- 1988 The halibut possession limit was raised to 4.

Rockfish

- Prior to 1989 there was no limit on the harvest of rockfish by the sport fishery.
- 1989 The bag limits were set at 20 per day and in possession, with only 5 being “red rockfish.”
- 1991 The bag limits were changed to 5 per day, 10 in possession 1 May through 15 September, and 10 per day and 10 in possession 15 September through 30 April, with no species restrictions. In addition, a rockfish, which is removed from the water, shall be retained and becomes part of the bag limit of the person originally hooking it.
- 1997 The total bag limit was unchanged, but the provision was added that only 1 rockfish per day and 2 in possession 1 May through 15 September, and only 2 per day and 2 in possession 15 September through 30 April could be “non-pelagic.”
- 1999 The total bag limit was unchanged, but the provision was revised so that year-round limits of 2 rockfish per day and 2 in possession could be “non-pelagic.” In addition, the first 2 non-pelagic rockfish removed from the water must be retained and become part of the bag limit of the person originally hooking the fish.
- 2009 Seasons and non-pelagic bag limits unchanged, total bag limit reduced to 4 per day and 8 in possession from 1 May through 15 September. Bag limit of 8 fish 16 September through 30 April.

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Lingcod

- No bag or possession limits prior to 1991.
- 1991 Bag limits were set at 2 per day and 4 in possession.
- 1993 A minimum length of 35 inches with head attached or 28 inches with head removed was included, the season was closed from 1 January through 30 June, and lingcod can only be landed by hand or landing net (no gaffs).

Sharks

- Prior to 1997, no season or bag limits.
- 1997 Daily bag and possession limits set at 1, with an annual limit of 2. Harvest must be recorded on license or harvest card.

Areawide Shellfish

- Prior to 1990, shellfish regulations fell under personal use or subsistence management.
- A valid sport fishing license is required to take shellfish.
- Legal gear: Shrimp – pots and ring nets.
Crab – pots, ring-nets, diving gear, dip nets, and hooked or hookless hand lines.
Clams – rakes, shovels, manually operated clam guns.
- 1981 Marking of pots: First initial, last name, and address on a keg or buoy attached to unattended subsistence fishing gear.
- 1988 A side wall of all shellfish pots must contain an opening with a perimeter equal to or exceeding one-half of the tunnel eye opening perimeter. The opening must be laced, sewn or secured together by untreated cotton twine, or other natural fiber no larger than 120 thread. Dungeness crab and shrimp pots may have the pot lid tie-down straps secured to the bottom at one end by untreated cotton twine no larger than 120 thread, as a substitute for the above requirement.
- 1988 No person may mutilate or otherwise disfigure any crab in any manner which would prevent determination of the minimum size restriction until the crab has been processed or prepared for consumption.
- 1988 No more than 5 pots of any type per person and 10 pots of any type per vessel may be used.
- 1990 Personal use regulations adopted as sport regulations.

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- 1990 Criteria for escape mechanism modified. Opening must equal or exceed 18 inches, except in shrimp pot where it must exceed 6 inches. Must be laced with 100% cotton twine no larger than 30 thread, knotted only at the ends, and cannot be tied or looped around the web bars. The opening must be within 6 inches of the bottom and parallel to it. Dungeness pots can substitute the above with the lid tie-down at one end with a single loop of 30 strand cotton twine such that when the twine degrades, the lid is no longer secure.
- 1992 Thread count on cotton twine changed to 60.
- 1994 Thread count on cotton twine changed to 30 thread for sewn opening and 60 thread for Dungeness crab pot lid closure.
- 2009 Prince William Sound non-commercial shrimp fishery management plan (5 AAC 55.055. ADF&G surveys for spot shrimp that estimate a harvestable surplus of 110,000 pounds triggers a commercial pot fishery for spot shrimp. Non commercial users (sport, personal use, and subsistence) are allocated 60% of the surplus and are unrestricted as to where they can set pots. The permit system for the non-commercial sector is back in place.

Razor Clams

- No specific regulations prior to statehood.
- 1961 Season 1 January through 30 June and 15 August through 31 December; no bag limit. No razor clams may be taken with the aid of any device other than manually operated shovel, fork, or clam gun. Sport fishing license is required.
- 1988 Personal use regulations. No closed season, no bag limit, no size limit except: in waters east of 149 west longitude and south of a line from the southernmost top of Point Bentinck to the southernmost tip of Point Whitshed, only razor clams 4 ½ inches or longer in length of shell may be taken or possessed. In that same area a personal use permit from ADF&G is required.
- 1990 Personal use regulations adopted as sport fish regulations.

Shrimp

- 1957 No bag limits, no size limits, and no closed season.
- 1996 All shrimp pots must have at least 2 adjacent vertical or near-vertical sides, excluding tunnels, completely composed of uncovered net webbing or rigid mesh. A pot with no definable side (including round pots) must have net webbing or rigid mesh panels covering at least 50% of its vertical or near-vertical surface area. On all pots, the net webbing or rigid mesh must be large enough to allow unaided passage of a maximum 12-inch long, 7/8 inch-diameter round wooden peg without deforming the opening, except for the selvage.
- 1999 Established a season from 15 April 15 through 15 September.

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- 1999 Reduced the number of pots allowed to 5 per person with a maximum of 5 per vessel.
- 2001 A permit is required to harvest shrimp.
- 2006 A permit is no longer required.
- 2009 A permit is required for all non-commercial users: Prince William Sound pot shrimp management plan (5 AAC 55.055).

Tanner Crab

- Prior to 1981 there were no closed seasons and no bag limits.
- 1988 Personal use regulations. Bag and possession limits were 20, only male crabs may be retained, minimum size limit 5.3 inches, no closed season.
- 1990 Personal use regulations adopted as sport fish regulations.
- 1999 Closed all waters of PWSMA to the taking of Tanner crab.

King Crab

- 1988 Personal use regulations. Bag and possession limits 6, only male crabs may be retained, no closed season, size limits 5.9 inches for blue king crab and 7 inches for red and brown king crabs.
- 1990 Personal use regulations adopted as sport fish regulations.
- 1999 All waters of PWSMA closed to the taking of King crab.

Dungeness Crab

- 1981 Subsistence regulations, 20 Dungeness crab per day, crabs must be male only, 6 ½ inches or more in size.
- 1988 Personal use regulations. Bag and possession limits 20, only male crabs, 6 ½ inches or more may be retained.
- 1990 Personal use regulations adopted as sport fish regulations.
- 1998 All waters of Orca Inlet (see regulation for definition) closed to sport fishing for Dungeness crab.
- 1999 All waters of PWSMA are close to the taking of Dungeness crab.