

**Fishery Management Report No. 14-44**

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**Recreational Fisheries in the Prince William Sound  
Management Area, 2011–2013**

by

**Mike Thalhauser**

November 2014

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



## Symbols and Abbreviations

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

***FISHERY MANAGEMENT REPORT NO. 14-44***

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MANAGEMENT AREA 2011–2013**

by  
Mike Thalhauser  
Alaska Department of Fish and Game, Division of Sport Fish, Anchorage

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

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*Mike Thalhauser,  
Alaska Department of Fish and Game, Division of Sport Fish,  
333 Raspberry Rd., Anchorage, Alaska, 99518, USA*

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## ABSTRACT

This report provides a detailed summary of the sport fisheries in the Prince William Sound Management Area for which the Alaska Board of Fisheries is considering proposals in December 2014. Included are a description and historical overview of each fishery, how the fishery is managed, and sport fishery performance and escapement for the years 2011–2013.

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 United States 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) (e.g., Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep*; Romberg et al. *In prep*) and all data presented in this report are obtained from the SWHS except where noted. For reporting purposes, catch and harvest estimates are separated into 4 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.

In 2014, just prior to the drafting of this report, changes were made to the coding methodology and area definitions used to summarize SWHS data. These changes made it possible to include catches from Prince William Sound fisheries that were landed in Seward (main port in Area J); these catches had been previously listed as “unknown area J.” Anglers using the port of Seward often travel to Prince William Sound to harvest fish and so it is appropriate that these data are included in PWSMA fisheries. Tables in this report indicate instances where this “unknown area J” catch was either included or not. The changes made in methodology and definitions make recreation of past data possible and inter-year comparisons more robust, and table entries in this report may differ from previous reports (e.g., Hochhalter et al. 2011) due to these changes.

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 Chinook salmon (*O. tshawytscha*) occurs year-round in the salt waters 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 clarki*), 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 Bay, 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.

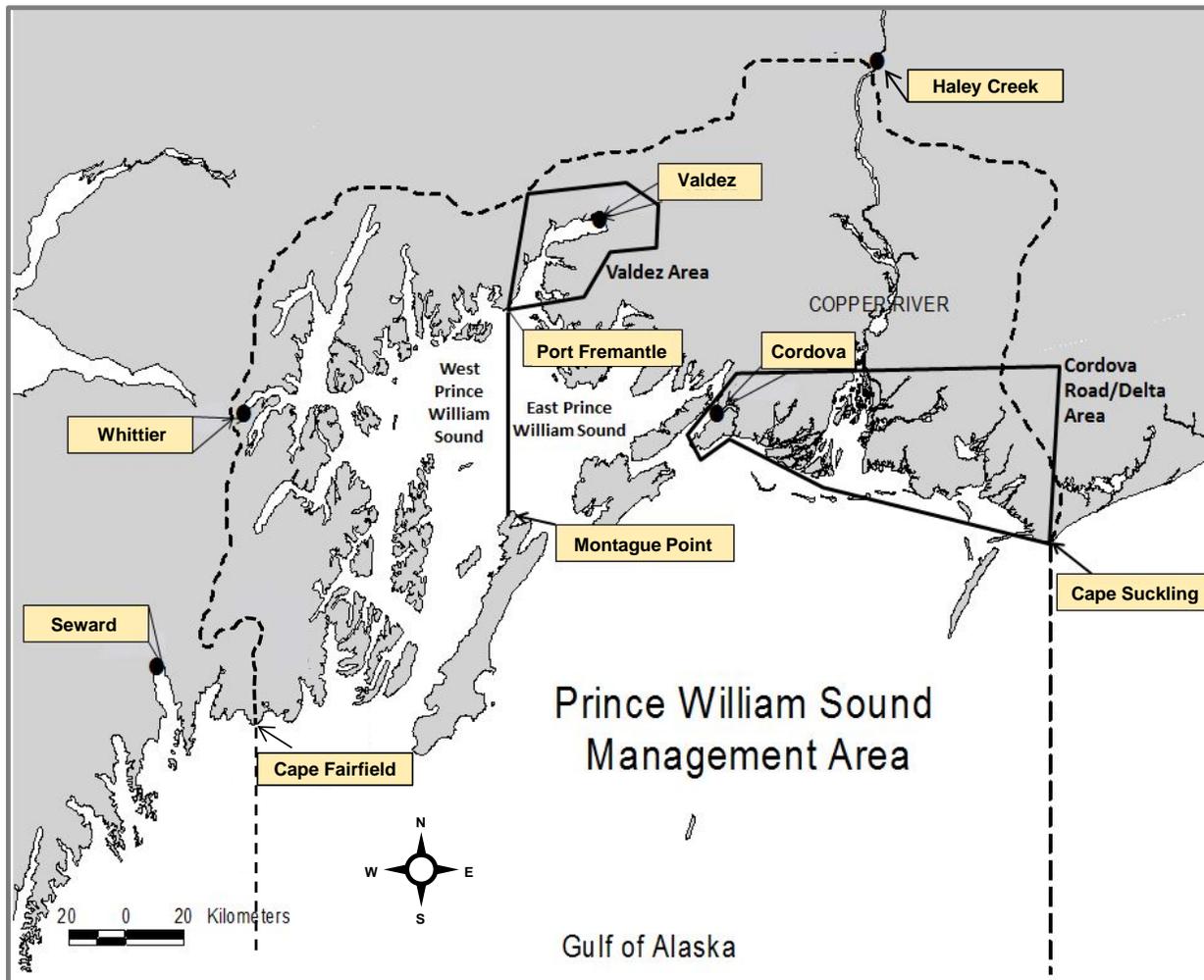


Figure 1.–Map of the Prince William Sound Management Area with defined reporting areas.

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 just to enhance sport fisheries. However, all hatchery-released salmon are the common property of all fisheries and are thus available to any fishery regardless of the target group. Freshwater releases of resident trout or Arctic grayling (*Thymallus arcticus*) are exclusively harvested by sport anglers.

ADF&G's stocking program provides stocked fisheries for rainbow trout and Arctic grayling in lakes near Valdez. ADF&G also provides a Chinook salmon stocking program that aims to increase opportunities for recreational anglers near Valdez, Cordova, and Whittier. The ADF&G Valdez Chinook salmon stocking program was put on hold in 2014, until a new release site is developed. Additionally, 2 private nonprofit (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), on Evans Island near the village of Chenega Bay (PWSAC), and at Fleming Spit near Cordova (PWSAC). ADF&G also provides PWSAC with 50,000 eyed Chinook salmon eggs to rear to smolt size and release near Chenega Bay. 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 one VFDA hatchery. Sockeye salmon are reared in 2 PWSAC hatcheries and 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 Chinook salmon stocking program, conducted by PWSAC until 1998, has continued to the present by ADF&G with releases at Valdez, Whittier, and Cordova, although the Whittier releases were temporarily halted due to budgetary constraints and reduced hatchery production from 2005 through 2008. Rainbow trout and Arctic grayling releases by ADF&G occur annually at Thompson Lake, Blueberry Lake, and Ruth Pond, all near Valdez.

## **SPORT FISHING EFFORT**

Angler effort in PWSMA increased from 124,093 angler-days in 2002 to a high of 210,188 angler-days in 2007 (Figure 2). Since 2007, angler effort declined to 135,852 angler-days in 2012 but then showed an increase in 2013 to 177,434 angler-days. The contribution of PWSMA angler effort to the total statewide effort has remained steady since 2003, accounting for 7–9% of statewide effort annually.

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 (27% in 2001 to 45% in 2013; Table 1). The port of Valdez has retained a large percentage of PWSMA boat angler effort, averaging 43% since 2001, although there has been a decrease in percentage of effort since 2011 (average 2011–2013: 36%). The port of Cordova constitutes a relatively small portion of total effort expended by boat anglers (average 6% since 2001; range 4–8%). Angler effort expended in eastern PWS has remained relatively constant since 2001, with an average of 73,969 days of effort (range 61,228–91,401 days of effort; Table 2). Angler effort in western PWS increased from 35,281 angler-days in 2001 to a peak of 96,228 angler-days in 2007 and then fell to 54,415 angler-days in 2012 with a spike back to 84,685 angler-days in 2013, mirroring statewide trends in effort. Between 2001 and 2013, angler effort on CRD has increased from a low of 10,330 angler-days in 2002 to a high of 21,300 angler days in 2010 (Table 2).

## Angler Effort

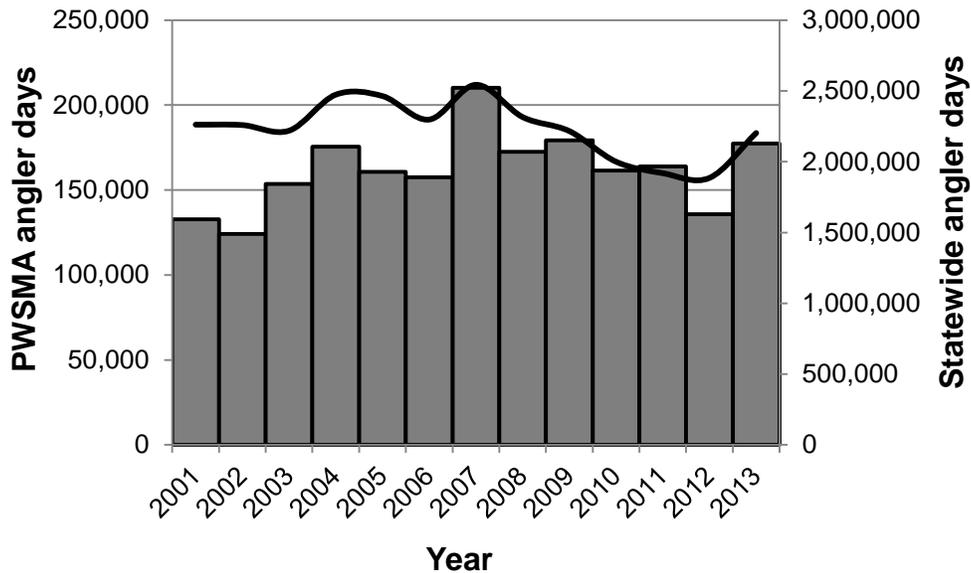


Figure 2.—Angler effort expended in PWSMA (bars) and statewide in Alaska (line), 2001–2013.

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

Table 1.—Angler-days of effort expended by boat anglers in Prince William Sound Management Area (PWSMA) by port of landing, 2001–2013.

Year	Port										PWSMA total
	Valdez		Whittier		Cordova		Seward		Other-unknown <sup>a</sup>		
	Effort <sup>b</sup>	% <sup>c</sup>	Effort <sup>b</sup>	% <sup>c</sup>							
2001	43,442	52%	22,373	27%	6,658	8%	6,231	7%	5,107	6%	83,811
2002	40,850	46%	29,301	33%	6,528	7%	7,961	9%	3,941	4%	88,581
2003	54,351	52%	28,761	28%	6,222	6%	9,616	9%	4,795	5%	103,745
2004	60,713	46%	47,229	35%	7,907	6%	9,967	7%	7,317	5%	133,133
2005	53,994	43%	49,940	40%	4,640	4%	11,388	9%	4,860	4%	124,822
2006	56,689	48%	42,343	36%	4,912	4%	9,760	8%	5,224	4%	118,928
2007	66,867	42%	71,967	45%	7,108	4%	11,632	7%	2,412	2%	159,986
2008	55,784	41%	57,648	42%	7,840	6%	13,310	10%	1,487	1%	136,069
2009	53,396	39%	61,733	46%	8,269	6%	10,756	8%	1,183	1%	135,337
2010	51,753	44%	47,998	41%	4,999	4%	11,701	10%	569	0%	117,020
2011	44,252	36%	46,563	38%	5,429	4%	23,476	19%	3,189	3%	122,909
2012	37,420	38%	33,812	35%	8,095	8%	15,614	16%	2,387	2%	97,328
2013	45,733	33%	61,632	45%	5,435	4%	20,615	15%	4,045	3%	137,460
Average											
2001–2013	51,173	43%	46,254	38%	6,465	6%	12,464	10%	3,578	3%	119,933
2011–2013	42,468	36%	47,336	39%	6,320	6%	19,902	17%	3,207	3%	119,232

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

<sup>a</sup> Unknown from North Gulf Coast (Seward).

<sup>b</sup> Effort in angler-days.

<sup>c</sup> Percentages are percent of total angler-days of effort for all of Prince William Sound.

Table 2.—Number of angler-days by geographical region expended in the PWSMA, 2001–2013.

Year <sup>a</sup>	Geographic region				PWSMA total
	Cordova road–delta <sup>b</sup>	Eastern PWS <sup>c</sup>	Western PWS <sup>d</sup>	Other-unknown <sup>e</sup>	
2001	15,841	73,117	35,281	8,555	132,794
2002	10,330	61,587	46,946	5,230	124,093
2003	18,240	77,116	49,644	8,686	153,686
2004	15,005	81,075	70,467	9,017	175,564
2005	11,911	76,060	66,911	5,813	160,695
2006	12,179	77,860	61,035	6,502	157,576
2007	18,980	91,401	96,228	3,579	210,188
2008	13,095	77,593	79,473	2,287	172,448
2009	17,022	78,206	81,798	2,324	179,350
2010	21,300	73,038	65,491	1,654	161,483
2011	18,282	61,880	80,286	3,409	163,857
2012	17,328	61,228	54,415	2,881	135,852
2013	16,298	71,433	84,685	5,018	177,434
Average					
2009–2013	18,046	69,157	73,335	3,057	163,595
2004–2013	16,140	74,977	74,079	4,248	169,445

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

- <sup>a</sup> 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 “PWSMA totals.”
- <sup>b</sup> Includes effort of boat and shore anglers on the western side of PWS.
- <sup>c</sup> Includes effort of boat and shore anglers on the eastern side of PWS.
- <sup>d</sup> Includes angler effort on Cordova road system and delta and for saltwater trips returning to Cordova.
- <sup>e</sup> Includes effort of anglers in unknown and other areas of PWS.

## COHO SALMON FISHERIES

### AREAWIDE COHO SALMON FISHERY

#### 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 90,436 in 2002 to a high of 136,434 in 2007 (Table 3, Figure 3). Coho salmon catch has shown a small downward trend since 2005 (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, 2001–2013.

Year	Geographical region											
	Western		Eastern		Valdez		Cordova road–delta		Other-unknown <sup>a</sup>		Total <sup>a</sup>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
2001	24,738	16,767	51,223	34,377	60,836	43,786	35,504	14,517	8,679	5,198	180,980	114,645
2002	33,729	24,109	62,041	48,898	7,823	6,568	16,435	7,896	5,554	2,965	125,582	90,436
2003	35,000	22,759	24,722	16,241	90,792	70,041	47,157	16,828	9,739	3,309	207,410	129,178
2004	33,294	21,374	27,966	19,301	70,346	49,680	54,602	17,052	9,146	3,834	195,354	111,241
2005	55,286	38,485	24,256	18,111	86,018	57,944	30,112	12,043	6,509	3,569	202,181	130,152
2006	28,151	20,891	22,176	17,586	70,833	52,505	16,674	8,014	5,142	3,543	142,976	102,539
2007	50,663	35,292	41,011	30,021	77,467	59,605	19,394	9,530	2,856	1,986	191,391	136,434
2008	26,335	22,119	28,647	21,724	60,022	48,451	21,301	9,351	1,525	457	137,830	102,102
2009	23,264	18,981	20,926	16,379	48,278	35,461	28,143	14,532	3,716	2,742	124,327	88,095
2010	28,480	23,277	19,768	15,800	80,199	62,631	30,535	16,663	2,057	1,084	161,039	119,455
2011	43,056	30,180	13,821	8,699	56,773	46,451	30,068	15,087	2,443	1,357	146,161	101,774
2012	11,486	8,953	5,428	4,450	11,717	10,648	28,123	15,654	1,218	751	57,972	40,456
2013	33,048	23,906	17,946	12,938	62,960	49,375	31,409	18,462	2,789	1,685	148,152	106,366
Average												
2009–2013	27,867	21,059	15,578	11,653	51,985	40,913	29,656	16,080	2,445	1,524	127,530	91,229
2004–2013	33,306	24,346	22,195	16,501	62,461	47,275	29,036	13,639	3,740	2,101	150,738	103,861

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

<sup>a</sup> Includes unknown areas from all of Area J, including North Gulf Coast.

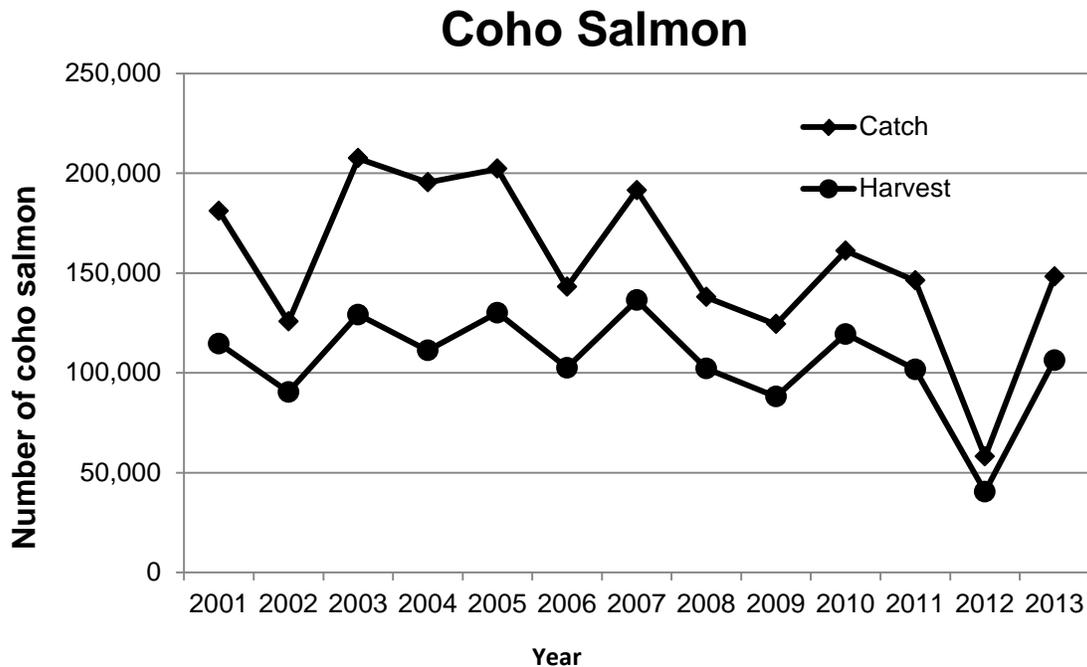


Figure 3.—Total catch and harvest of coho salmon by sport anglers by year, PWSMA, 2001–2013. Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

### Management and Objectives

Most of PWSMA is open to the taking of coho salmon year-round. In all the salt and fresh waters 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 Bay, 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. Coho salmon removed from fresh waters crossed by the Copper River Highway must be retained and become part of the daily bag limit of the person who originally hooked the fish. A person may not remove a coho salmon from the water before releasing it.

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—an indexed level of escapement known to provide sustained yield) of 32,000–67,000 coho salmon (Sheridan et al. 2013: Table 6) has been met or exceeded every year since 1989 (Donaldson et al. 1995: Appendix B15; Ashe et al. 2005: Appendix A12; Sheridan et al. 2013: Appendix A20).

## **COPPER RIVER DELTA (CRD) COHO SALMON FISHERY**

### **Fishery Description**

The coho salmon fishery on CRD is composed of numerous road-accessible streams west of the Copper River (west delta) and both fly-out and 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 Copper River Highway, receive angler effort during the coho salmon season but the low number of SWHS respondents fishing these systems precludes viable 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. Streams east of the delta became less accessible in 2011 when a bridge crossing the Copper River washed out at approximately mile 37 of the Copper River Highway. These streams are now accessible only by airboat and plane and receive even less fishing pressure as a result.

### **Historical Harvest and Escapement**

Historically, catch and harvest of coho salmon on CRD have increased from an average of 13,384 and 6,389 fish, respectively (1996–2001; SWHS database <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>) to 29,656 and 16,080 fish, respectively (2009–2013; Table 4). Catch and harvest peaked in 2004 with 54,602 fish caught and 17,052 harvested (Table 4, Figure 4). Catch and harvest of coho salmon in the recreational fishery on CRD is most likely 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 (Sam Hochhalter, Fishery Biologist, ADF&G, Anchorage, personal communication) coupled with the highest aerial survey counts of coho salmon on record for these streams (Botz et al. 2010: Appendix A19; Sheridan et al. 2013: Appendix A20) led to a record catch and harvest of coho salmon in the recreational fishery (Figures 4–5). 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 2001 (Figures 4–5), despite the coho salmon run being the fourth largest since 1999 (Botz et al. 2010: Appendix A19; Sheridan et al. 2013: Appendix A20). Differences in stream conditions between the Eyak River, Ibeck Creek, and Alaganik Slough, within a given year, seem to 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, Sport Fish Biologist, ADF&G, Cordova, personal communication), and it contributed largely to the total coho salmon catch and harvest in 2003 (Figure 5). Conversely, in 2004, Ibeck Creek was highly turbid for most of the coho salmon season (B. Marston, personal communication), and there was very little 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, 2001–2013.

Year	Cordova area sites								Total	
	Eyak River		Alaganik Slough		Ibeck Creek		Other Cordova sites			
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
2001	17,477	10,025	3,188	1,565	726	462	14,113	2,465	35,504	14,517
2002	9,345	5,547	1,681	663	662	297	4,747	1,389	16,435	7,896
2003	15,604	8,473	4,655	1,708	11,857	3,318	15,041	3,329	47,157	16,828
2004	25,746	10,235	13,032	3,843	377	135	15,447	2,839	54,602	17,052
2005	10,639	5,228	4,049	1,777	4,120	2,437	11,304	2,601	30,112	12,043
2006	6,579	3,328	2,237	1,236	1,803	913	6,055	2,537	16,674	8,014
2007	8,141	4,677	1,641	1,052	2,260	927	7,352	2,874	19,394	9,530
2008	8,103	4,714	3,994	1,738	1,811	620	7,393	2,279	21,301	9,351
2009	13,065	8,464	2,425	1,379	7,925	3,780	4,728	909	28,143	14,532
2010	15,052	8,379	3,554	2,208	7,321	4,818	4,608	1,258	30,535	16,663
2011	8,633	5,206	2,303	1,332	12,223	7,351	6,909	1,198	30,068	15,087
2012	11,775	7,010	949	623	10,345	7,430	5,054	591	28,123	15,654
2013	10,260	7,229	4,698	2,752	13,204	6,986	3,247	1,495	31,409	18,462
Average										
2009–2013	11,757	7,258	2,786	1,659	10,204	6,073	4,909	1,090	29,656	16,080
2004–2013	11,799	6,447	3,888	1,794	6,139	3,540	7,210	1,858	29,036	13,639

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

### Coho Salmon Catch and Harvest for Copper River Delta Streams

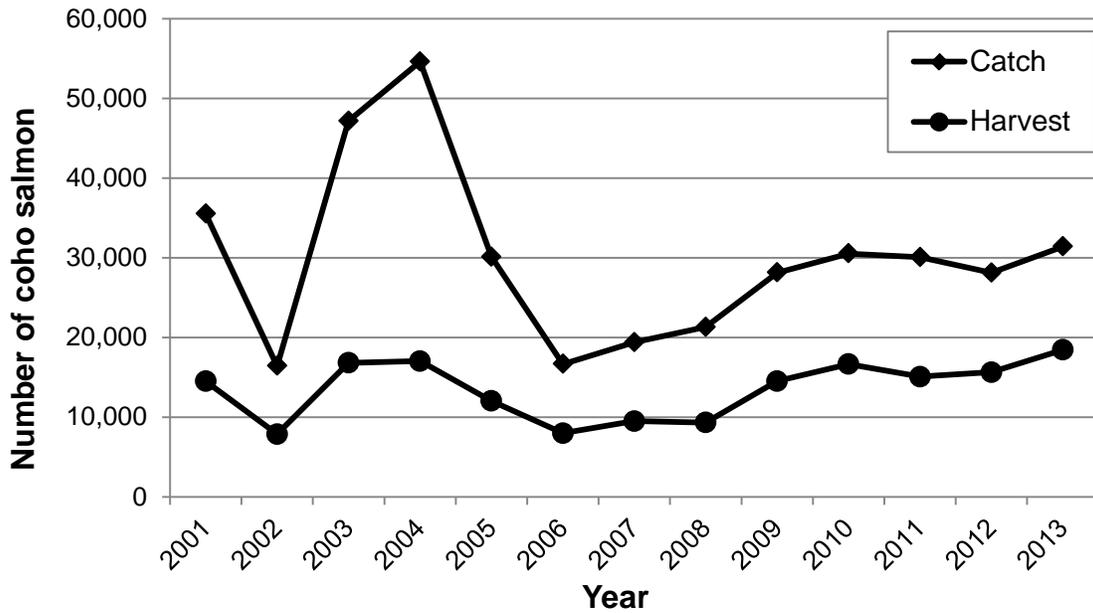


Figure 4.—Catch and harvest of coho salmon by sport anglers from streams on the Copper River Delta by year, 2001–2013.

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

### Coho Salmon Catch

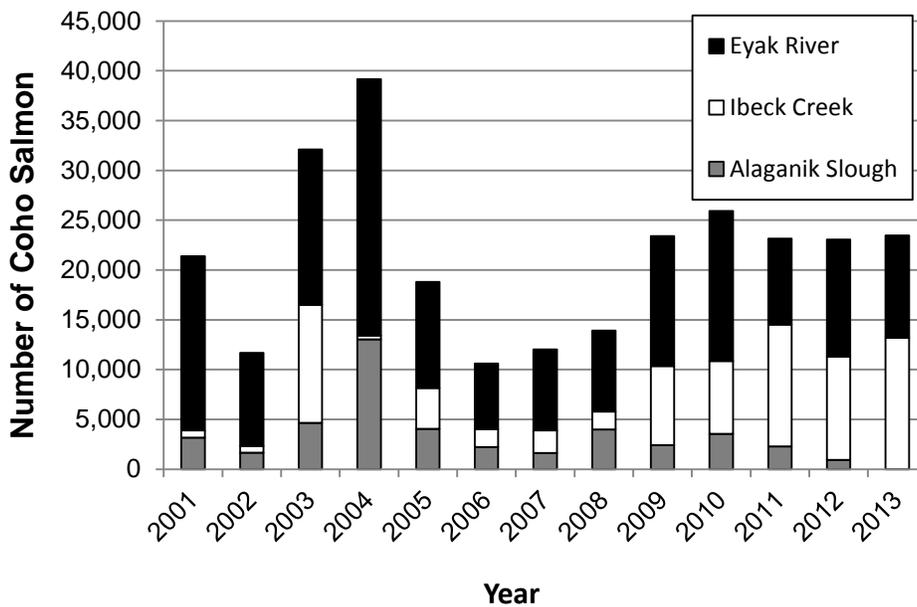


Figure 5.—Catch of coho salmon by sport anglers from selected streams on the Copper River Delta, 2001–2013.

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

## **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 (Sheridan et al. 2013: Table 6). Escapement for a given year is the sum of the peak aerial survey counts for index streams on the west and east sides of CRD (Sheridan et al. 2013). There are no stream-specific escapement goals for coho salmon on CRD.

## **Fishery Performance and Escapement 2011–2013**

The recent average total annual catch of CRD coho salmon (2011–2013) of 29,867 fish is very close to the previous 10-year average (2001–2010) of 29,986 of fish. The recent average total annual harvest of CRD coho salmon (2011–2013) of 16,401 fish was higher than the previous 10-year average (2001–2010) of 12,643 fish (calculated from Table 4). The 2011, 2012, and 2013 CRD coho salmon escapement indices of 37,900, 35,295, and 34,680 (average 35,958) are based on aerial surveys that were affected by poor environmental conditions, so these results represent a minimum escapement to CDR streams (J. Botz, Fishery Biologist, ADF&G, Cordova, personal communication).

# **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 2001 (Table 5, Figure 6) with an average harvest (2001–2013) of 7,940 fish (range 4,678–13,220 fish). Peak catch (19,052) and harvest (13,220) occurred in 2007.

Table 5.–Sockeye salmon catch and harvest by geographical location, PWSMA, 2001–2013.

Year	Geographical region											
	Western		Eastern		Valdez		Cordova road–delta		Other-unknown <sup>a</sup>		Total <sup>a</sup>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
2001	6,305	3,992	1,428	1,055	1,677	923	919	340	747	133	11,076	6,443
2002	7,872	5,448	1,150	837	1,398	358	1,393	731	945	220	12,758	7,594
2003	11,155	6,469	862	541	1,074	289	1,565	441	482	270	15,138	8,010
2004	9,003	7,151	780	409	1,690	1,493	1,633	919	34	34	13,140	10,006
2005	4,941	4,029	404	292	2,641	1,155	974	668	229	168	9,189	6,312
2006	4,507	3,923	387	246	1,741	651	385	158	191	191	7,211	5,169
2007	11,398	9,500	800	660	2,695	764	3,073	1,748	1,086	548	19,052	13,220
2008	5,987	4,852	1,556	995	1,795	554	2,162	1,251	183	183	11,683	7,835
2009	8,900	7,473	1,005	465	1,063	470	1,961	993	170	170	13,099	9,571
2010	4,464	3,973	781	745	1,310	900	2,354	1,342	579	579	9,488	7,539
2011	5,692	4,645	1,281	940	1,690	1,105	1,206	838	77	77	9,946	7,605
2012	4,480	3,171	394	345	173	162	1,802	764	236	236	7,085	4,678
2013	9,091	7,599	336	274	1,178	240	424	386	744	744	11,773	9,243
Average												
2009–2013	6,525	5,372	759	554	1,083	575	1,549	865	361	361	10,278	7,727
2004–2013	6,846	5,632	772	537	1,598	749	1,597	907	353	293	11,167	8,118

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

<sup>a</sup> Includes unknown areas from all of Area J, including North Gulf Coast.

## Sockeye Salmon Catch and Harvest

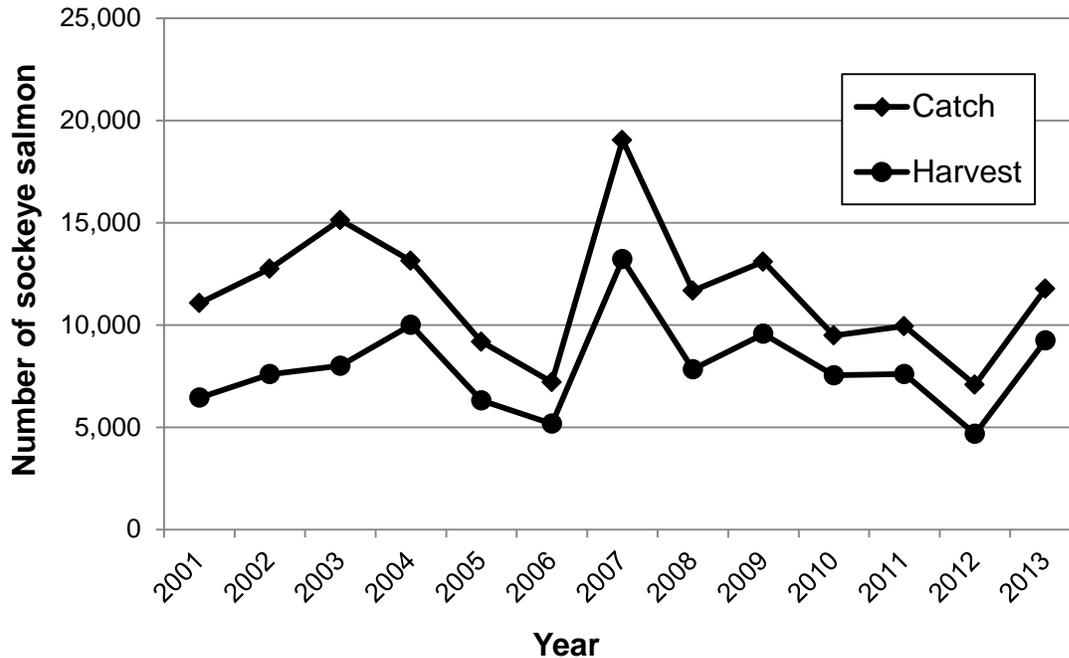


Figure 6.—Total catch and harvest of sockeye salmon by sport anglers by year, PWSMA, 2001–2013.

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

### 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 salmon other than Chinook 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—based on best biological information, set for maximum sustained yield) for Eshamy Creek is 13,000–28,000 sockeye salmon, and the SEG for Coghill River is 20,000–60,000 sockeye salmon (Sheridan et al. 2013: Table 6). The SEG for CRD is 55,000–130,000 sockeye salmon (Sheridan et al. 2013: Table 6). The BEG for sockeye salmon in the Eshamy system has been within or above the existing goal in 19 of 20 years the weir was in operation between 1991 and 2011 (Sheridan et al. 2013: Appendix C3). Sockeye salmon escapement into the Coghill system has been above the lower bound of the existing SEG every year since 1991, with the exception of 1993 and 1994 (Sheridan et al. 2013: Appendix B3) and 2013 (R. Brenner, Fishery Biologist, ADF&G, Cordova, personal communication). Sockeye salmon escapement into index streams on CRD has been within the SEG every year since 1999 (Botz et al. 2010: Appendix A12; Sheridan et al. 2013: Appendix A13; R. Brenner, Fishery Biologist, ADF&G, Cordova, personal communication).

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.

## **FISHERY PERFORMANCE AND ESCAPEMENT 2011–2013**

Total catch and harvest of sockeye salmon in PWSMA in 2011 (9,946 and 7,605 fish, respectively) was slightly below the 10-year average (11,167 and 8,118 fish, respectively, 2004–2013); catch and harvest were below average in 2012 (7,085 and 4,678 fish, respectively), and slightly above average in 2013 (11,773 and 9,243 fish, respectively) (Table 5). Because there are usually fewer than 12 SWHS respondents per system within the PWSMA, system-specific catch and harvest estimates are not reliable (Mills and Howe 1992).

The Eshamy Creek BEG was met for 2011 (24,129 sockeye salmon; Sheridan et al. 2013: Appendix C3). In 2012, no weir was installed on Eshamy Creek due to budget constraints, and counts from a newly installed video weir were incomplete in 2013. No formal estimates for sockeye salmon escapement were made for Eshamy Creek in 2012 and 2013. CRD escapement goals were met for the years 2011–2013 (Sheridan et al. 2013: Appendix A13). Coghill sockeye salmon counts exceeded the current escapement goal in 2011 and 2012 (Sheridan et al. 2013: Appendix B3) and fell just short in 2013 (Botz et al. *In prep*<sup>1</sup>).

## **CHINOOK SALMON FISHERIES**

### **AREAWIDE CHINOOK SALMON FISHERY**

#### **Fishery Description**

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

Chinook 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 Chinook 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 Chinook salmon stock downstream of Haley Creek (i.e., within PWSMA).

Stocking of hatchery Chinook salmon at Fleming Spit in Cordova began in 1990 and has occurred every year since. Chinook 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 Chinook salmon have been released at various locations around Whittier since 2000. In 2013, efforts were suspended in Valdez due to extremely low returns. ADF&G is currently working with local officials to identify a new site that may improve returns. The village of Chenega Bay is attempting to develop a Chinook salmon fishery by releasing smolt. This stocking venture is too new to assess.

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<sup>1</sup> Botz, J., et al. *In prep*. 2013 Prince William Sound area finfish management report. Alaska Department of Fish and Game. Fishery Management Report. Anchorage.

## **Fishery Management and Objectives**

There are no management objectives for the recreational Chinook salmon fishery in PWS. The saltwater and freshwater bag limits for Chinook 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 Chinook salmon in PWSMA have remained relatively stable since 2001 (Table 6, Figure 7) despite an overall reduction in the performance of the hatchery enhancement program beginning in 2002 (Hochhalter et al. 2011). Historical harvest of Chinook salmon from 2001 through 2013 peaked in 2006 at 4,910 fish and has been as low as 1,770 in 2002 (Table 6). Chinook salmon harvest in western PWS has increased from 986 fish in 2001 to 2,328 in 2013. Annual harvest of Chinook salmon in eastern PWS and the Valdez area has shown variability (Table 6).

### **Fishery Performance and Escapement 2011–2013**

Chinook salmon harvest in PWSMA during the years 2011–2012 (1,990 and 2,074, respectively) was below the 10-year average of 3,412, but harvest in 2013 (3,609) was above the 10-year average (Table 6). After 2001, total harvest of Chinook salmon in PWSMA gradually increased for almost 10 years, but harvests dipped below average in 2011 and 2012 (Table 6, Figure 7).

## **STOCKED CHINOOK SALMON FISHERIES**

### **Historical Harvest**

The success in terms of sport fishing catch and harvest of the Chinook salmon enhancement programs has varied since the first returns from the recent stockings were expected in 1996 near Cordova, in 1997 near Valdez, and in 2000 near Whittier (Figures 8–10). Catch and harvest of Chinook salmon in salt water and fresh water in the Cordova vicinity peaked in 1997 at 946 and 534 fish, respectively (Figure 8). Since that time, catch and harvest have declined precipitously; catch and harvest were estimated to be zero in all except one year between 2006 and 2012 (Figure 8). Catch and harvest of Chinook salmon in the Valdez and Whittier vicinities has been variable through time (Figures 9 and 10, respectively).

A creel sampling program during the 2006 and 2007 Chinook salmon season (1 May–15 July) was aimed at identifying the proportion of hatchery Chinook 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 Chinook 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 Chinook 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.

Between 2005 and 2010, ADF&G was unable to heat water at the Elmendorf and Ft. Richardson hatcheries, resulting in few, small Chinook salmon smolt for stocking. In 2011, ADF&G completed construction of the William Jack Hernandez Sport Fish Hatchery in Anchorage. This new hatchery uses well water, 95% recirculation, and heated water. This gives ADF&G the ability to rear Chinook salmon to smolt size in less than one year and rear to a target release size. Larger, healthier Chinook salmon smolt have been released into PWSMA since 2012.

Table 6.–Chinook salmon catch and harvest by geographical region, PWSMA, 2001–2013.

Year	Geographical region											
	Western		Eastern		Valdez		Cordova road-delta		Other-unknown <sup>a</sup>		Total <sup>a</sup>	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
2001	1,283	986	2,551	907	555	378	153	129	542	235	5,084	2,635
2002	1,397	852	1,142	464	291	125	607	204	370	125	3,807	1,770
2003	963	713	3,403	769	2,903	1,648	806	530	147	98	8,222	3,758
2004	2,891	1,166	391	174	1,879	922	499	152	548	404	6,208	2,818
2005	1,522	1,025	1,941	893	2,709	1,087	530	345	323	180	7,025	3,530
2006	1,989	1,576	350	209	4,666	2,846	16	16	532	263	7,553	4,910
2007	1,773	1,311	2,697	828	2,324	974	80	80	105	89	6,979	3,282
2008	2,732	2,027	966	748	1,883	1,069	606	42	152	91	6,339	3,977
2009	1,972	1,334	2,430	1,576	4,268	1,264	265	205	74	59	9,009	4,438
2010	1,896	1,429	1,241	435	1,980	1,455	158	158	13	13	5,288	3,490
2011	1,224	959	829	466	2,818	514	83	51	17	0	4,971	1,990
2012	1,395	1,148	639	516	489	265	0	0	145	145	2,668	2,074
2013	3,672	2,328	1,127	627	851	633	42	21	0	0	5,692	3,609
Average												
2009–2013	2,032	1,440	1,253	724	2,081	826	110	87	50	43	5,526	3,120
2004–2013	2,107	1,430	1,261	647	2,387	1,103	228	107	191	124	6,173	3,412

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

<sup>a</sup> Includes unknown from all of Area J, including North Golf Coast.

## Chinook Salmon Catch and Harvest

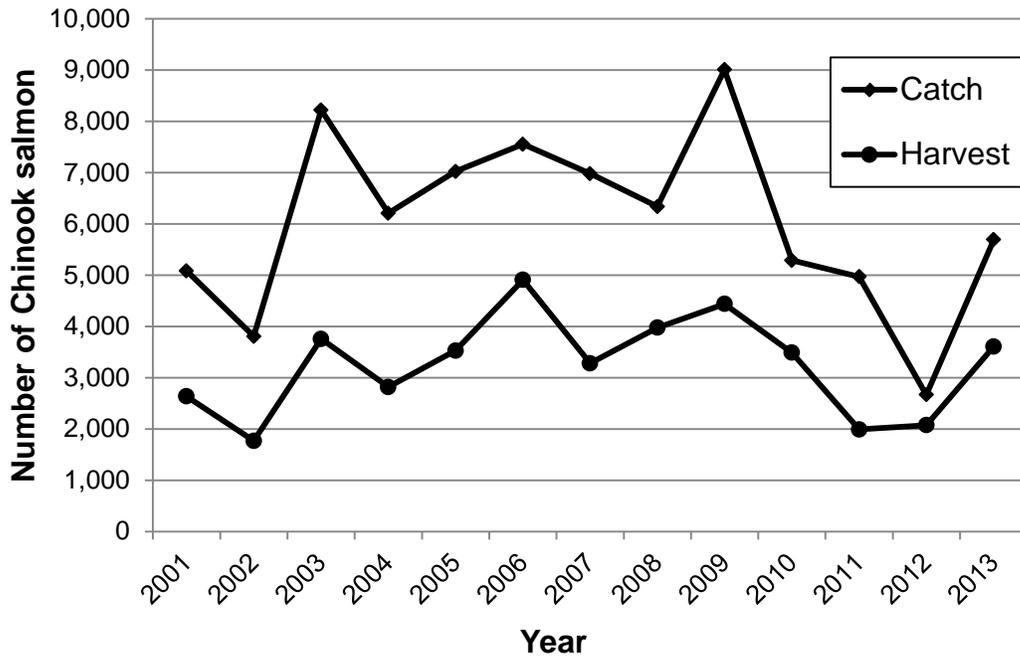


Figure 7.—Total catch and harvest of Chinook salmon by sport anglers by year, PWSMA, 2001–2013.  
 Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

## Chinook Salmon - Cordova

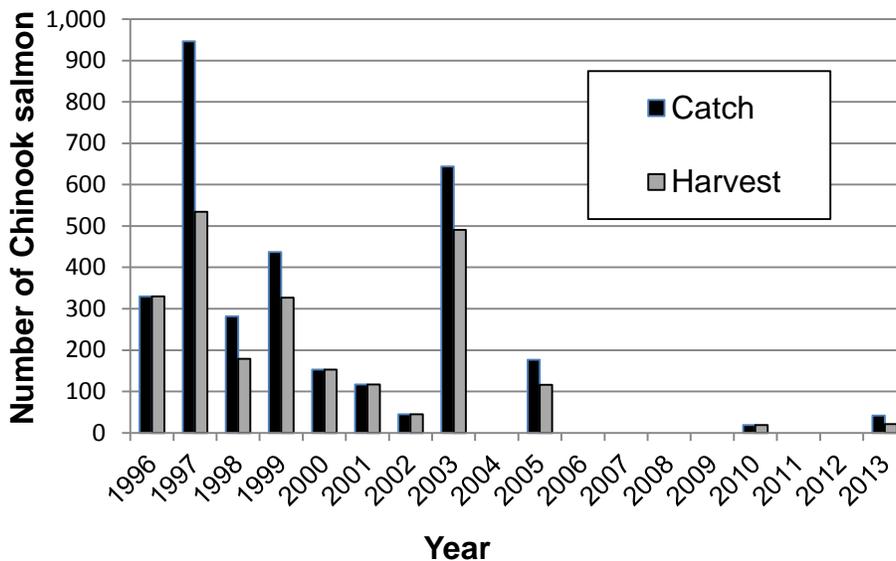


Figure 8.—Catch and harvest of Chinook salmon by shoreline anglers along Orca Inlet and at Fleming Spit near Cordova, 1996–2013.  
 Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

## Chinook Salmon-Valdez

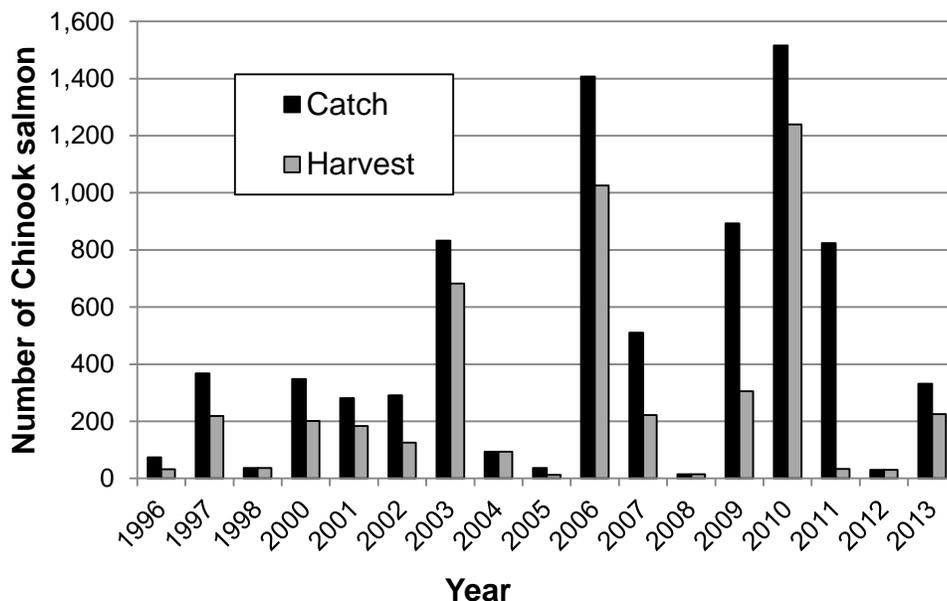


Figure 9.—Catch and harvest of Chinook salmon by shoreline anglers near Port Valdez, 1996–2013.  
 Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

## Chinook Salmon-Whittier

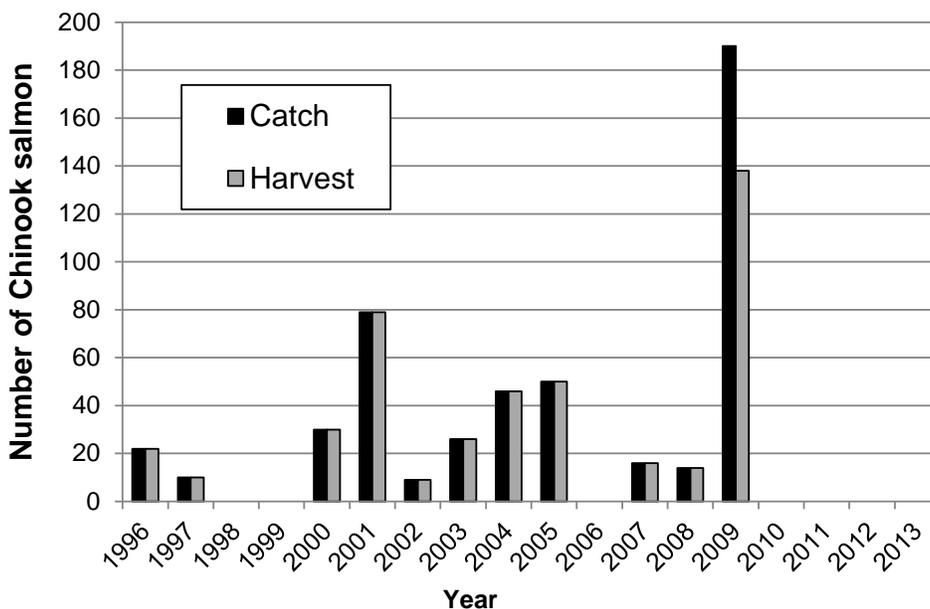


Figure 10.—Catch and harvest of Chinook salmon by shoreline anglers in Passage Canal near Whittier, 1996–2013.  
 Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

## Fishery Management and Objectives

Originally, the management objectives for each of the 3 stocked Chinook salmon fisheries in PWSMA were 1) to produce a return of 2,000 Chinook salmon to each location, and 2) to provide 3,500 angler-days of effort at each location. In 2010, the objectives for each of the 3 fisheries were changed: 1) produce a return of 200 Chinook salmon to each location, and 2) provide 500 angler days of effort. The number of Chinook 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 2011–2013

Poor performance of the enhanced Chinook salmon fisheries continued through the 2011–2013 seasons, although few statewide harvest surveys are returned to ADF&G mentioning use of these areas, making them difficult to track. Zero Chinook salmon were reported caught and harvested at Fleming Spit near Cordova in 2011 and 2012, and 42 were caught with 21 harvested in 2013 (Figure 8). Angler effort that was expended during the Chinook salmon and coho salmon seasons at Fleming Spit and along Orca Inlet from 2011 to 2013 was well below average and now represents 2 of the lowest seasons on record (Figure 11). Anecdotal information from anglers indicates more Chinook salmon returned in 2013 than 2012 and that local anglers spent more time targeting Chinook salmon in this fishery.

Angler effort (expended for all species) by shoreline anglers in Port Valdez has generally varied between 5,000 and 15,000 angler-days from 2001 to 2013 (Figure 12). In 2012, 30 Chinook salmon were caught and harvested, and in 2013, 332 Chinook salmon were caught and 225 harvested (Figure 9). The origin of these fish is unknown.

Angler effort (expended for all species) along the Passage Canal shoreline near Whittier has decreased nearly every year since 2007 through 2013 (Figure 13). No Chinook salmon were reported caught or harvested from 2011 to 2013 (Figure 10).

## Angler-days Fished - Cordova

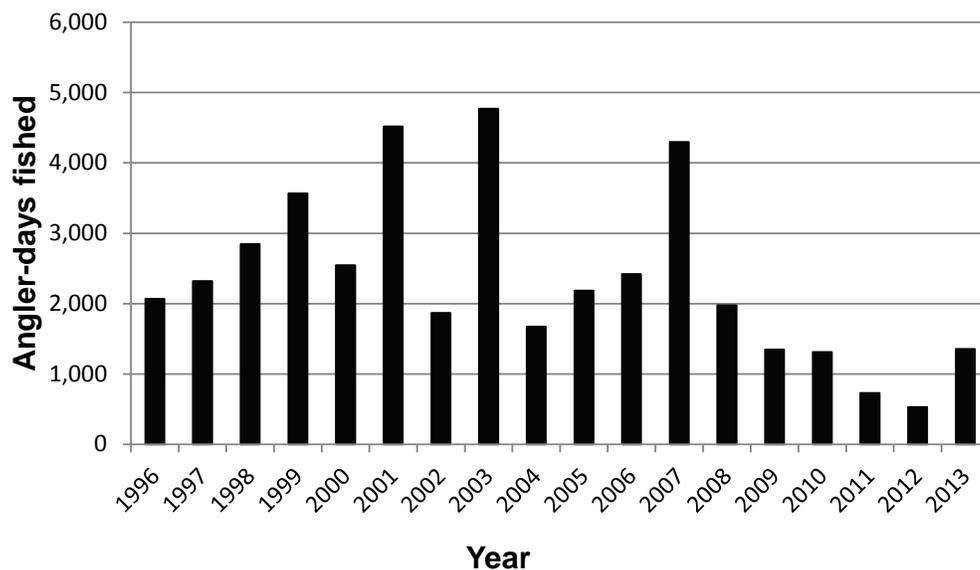


Figure 11.—Angler-days of effort by shoreline anglers along Orca Inlet and at Fleming Spit near Cordova, 1996–2013.

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

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

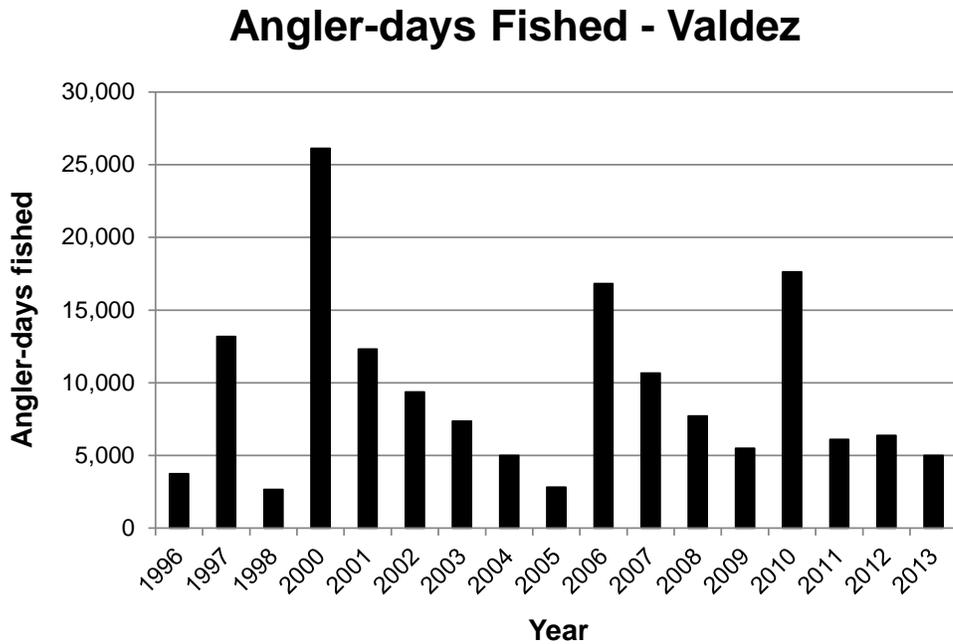


Figure 12.—Angler-days of effort by shoreline anglers, Port Valdez, 1996–2013.

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

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

## Angler-days Fished - Whittier

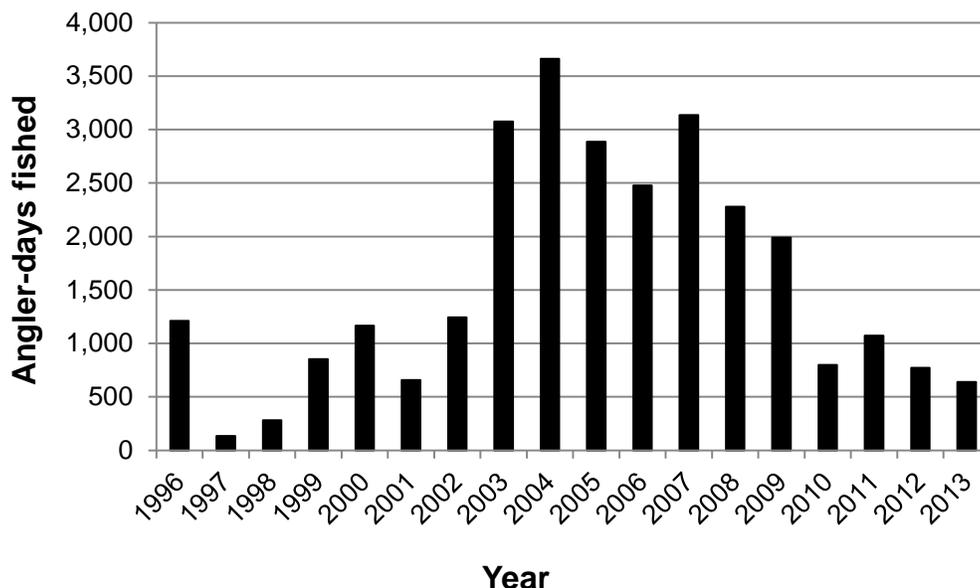


Figure 13.—Angler-days of effort by shoreline anglers in Passage Canal near Whittier, 1996–2013.

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

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 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 CCT within the PWSMA from 2001 through 2013 has ranged from 934 to 4,228 fish (Table 7) with an average harvest of 443 cutthroat trout (range: 180 to 1,062 fish). On average (2001–2013) CRD supports more than a third of the cutthroat trout catch (37%) and harvest (35%) in PWSMA (Table 7). The average harvest rate (calculated as the percent of fish caught that were harvested from the average total harvest and average total catch for 2001–2013) 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 “un-oiled” streams. Weirs were installed in 5 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).

## **FISHERY MANAGEMENT AND OBJECTIVES**

Within PWSMA, CCT are managed under presumed conservative bag limits. Current limits are 2 per day, 2 in possession, with minimum size limit of 11 inches and a maximum limit of 16 inches. There is no retention of trout in CRDSMAT.

## **FISHERY PERFORMANCE AND ABUNDANCE 2011–2013**

Total catch and harvest of CCT in PWSMA in 2012 (1,217 and 301 fish, respectively) and 2013 (934 and 366 fish, respectively) were below the 2001–2010 averages (1,992 and 440 fish, respectively). Total catch and harvest in 2011 (4,228 and 687 fish, respectively) was above the 2001–2010 average (Table 7, Figure 16).

Table 7.–Catch and harvest of coastal cutthroat trout by geographical region, PWSMA, 2001–2013.

Year	Geographical region											
	Western		Eastern		Cordova road–delta (CRD)		Other-unknown <sup>a</sup>		Total <sup>a</sup>		CRD % of total	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
2001	122	46	332	115	661	52	399	212	1,514	425	44%	12%
2002	434	41	387	72	1,196	47	127	20	2,144	180	56%	26%
2003	1,578	298	722	326	1,273	225	648	213	4,221	1,062	30%	21%
2004	551	94	397	52	535	90	176	31	1,659	267	32%	34%
2005	43	33	967	383	358	46	86	33	1,454	495	25%	9%
2006	127	25	306	51	686	84	289	51	1,408	211	49%	40%
2007	720	130	47	18	418	102	35	26	1,220	276	34%	37%
2008	363	107	351	58	360	85	52	39	1,126	289	32%	29%
2009	793	115	324	300	1,127	217	272	0	2,516	632	45%	34%
2010	732	32	573	246	1,323	282	32	6	2,660	566	50%	50%
2011	2,989	192	398	86	706	355	135	54	4,228	687	17%	52%
2012	292	11	39	0	802	257	84	33	1,217	301	66%	85%
2013	119	22	424	129	337	161	54	54	934	366	36%	44%
Average 2001–2013	682	88	405	141	752	154	184	59	2,023	443	37%	35%

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

<sup>a</sup> Includes unknown from all of Area J, including North Golf Coast.

## Cutthroat Trout

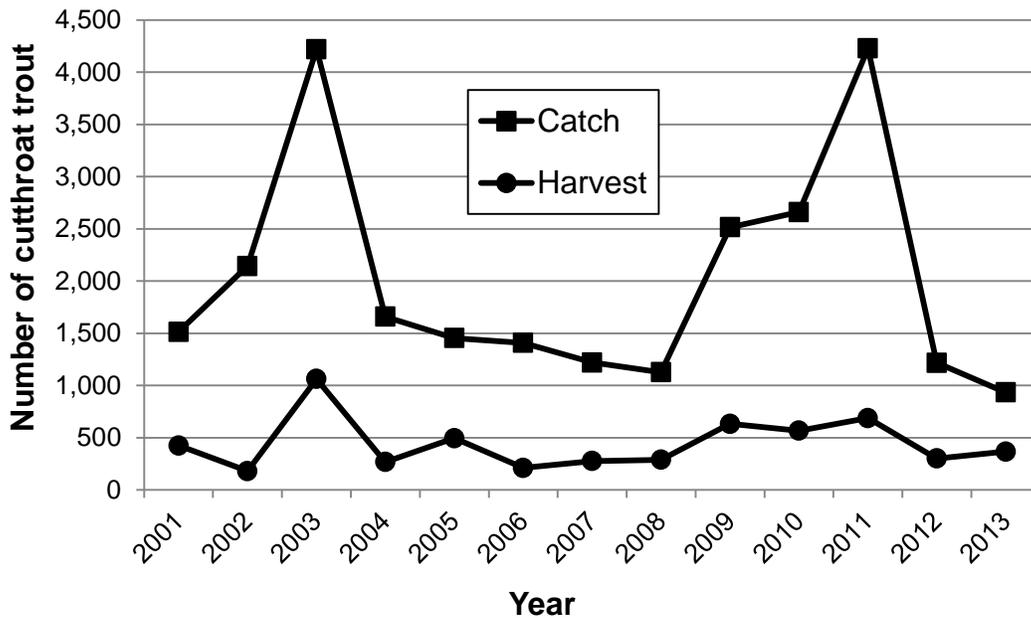


Figure 14.—Total catch and harvest of coastal cutthroat trout by sport anglers in PWSMA, 2001–2013. Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

## 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 (Appendix A1). The fishery is open 11 months of the year. It is closed during January 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 41,479 and 27,279 fish respectively in 2001 to a peak of 92,923 and 58,259 fish respectively in 2007 (Table 8, Figure 15). Coincident with increased angler effort in western PWS (Table 2), halibut harvest in western PWS has increased from 13,412 in 2001 to a peak of 39,078 in 2007 and a 2011–2013 average harvest of 32,545 (Table 8, Figure 16A). Halibut harvest in eastern PWS has remained between 10,000 and 20,000 fish since 2001 (2004–2013 average: 14,071 fish), although there is variability across years (range: 9,893–17,814 fish, Table 8, Figure 16B).

Table 8.—Catch and harvest of halibut by geographical region, PWSMA, 2001–2013.

Year	Geographical region						Total <sup>a</sup>	
	Western		Eastern		Other-unknown <sup>a</sup>		Catch	Harvest
	Catch	Harvest	Catch	Harvest	Catch	Harvest		
2001	19,293	13,412	18,859	11,969	3,327	1,898	41,479	27,279
2002	23,466	16,275	14,021	9,893	2,322	1,483	39,809	27,651
2003	29,046	18,623	19,274	12,584	3,878	2,869	52,198	34,076
2004	48,391	27,173	29,383	17,464	6,878	2,881	84,652	47,518
2005	41,269	24,141	26,390	15,240	3,269	2,322	70,928	41,703
2006	40,200	24,177	21,121	13,588	3,302	2,005	64,623	39,770
2007	60,968	39,078	30,080	17,814	1,875	1,367	92,923	58,259
2008	50,294	31,359	22,486	15,038	499	375	73,279	46,772
2009	43,830	29,859	25,419	16,658	711	467	69,960	46,984
2010	45,045	30,083	18,014	12,046	380	251	63,439	42,380
2011	59,084	34,788	19,495	11,077	861	692	79,440	46,557
2012	49,825	28,709	17,150	11,275	1,053	786	68,028	40,770
2013	50,997	34,138	15,394	10,508	1,150	975	67,541	45,621
Average								
2009–2013	49,756	31,515	19,094	12,313	831	634	69,682	44,462
2004–2013	48,990	30,351	22,493	14,071	1,998	1,212	73,481	45,633

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

<sup>a</sup> Includes unknown from all of Area J, including North Golf Coast.

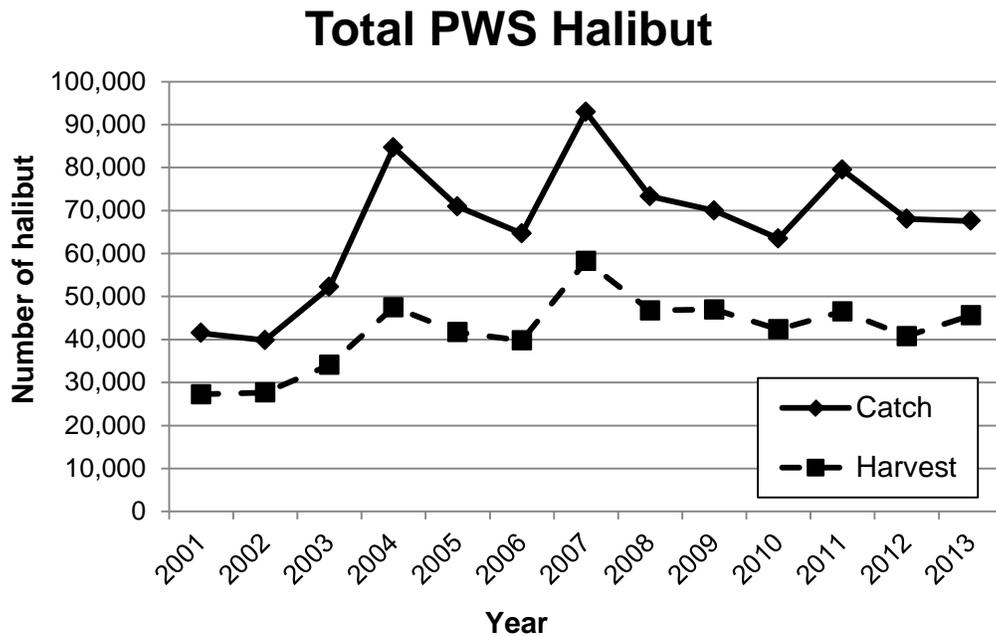


Figure 15.—Total catch and harvest of halibut by sport anglers, PWSMA, 2001–2013.

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

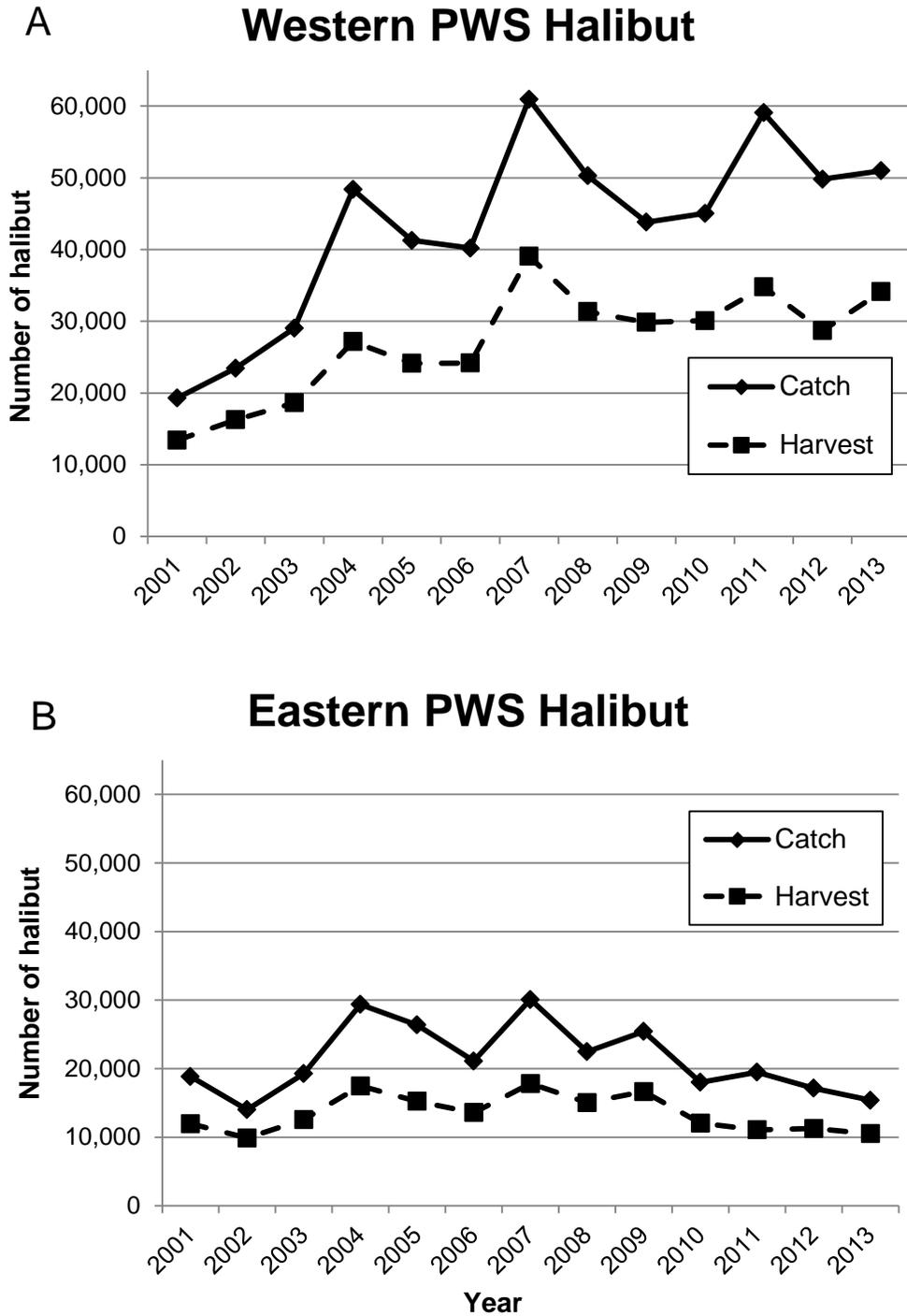


Figure 16.—Catch and harvest of halibut by sport anglers in western PWS (A) and eastern PWS (B), PWSMA, 2001–2013.

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

## **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 2011–2013**

Total PWS halibut harvest during 2011–2013 (46,557, 40,770, and 45,621, respectively) remained at or slightly below the previous 5-year average (46,833 fish, 2006–2010) (Table 8). Halibut harvest in eastern PWS during the years 2011–2013 averaged 10,953, which is below the previous 5-year average of 15,029 fish (Table 8, Figure 16B). Halibut harvest in western PWS during the years 2011–2013 averaged 32,545 fish, exceeding the previous 5-year average of 30,911 fish (Table 8, Figure 16A).

# ROCKFISH FISHERY

## FISHERY DESCRIPTION

Over 30 species of rockfish inhabit the Gulf of Alaska, with 6 species—black (*Sebastes melanops*), dusky (*S. variabilis*)<sup>2</sup>, 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 2011).

## HISTORICAL HARVEST

After the Whittier Tunnel was opened in 2000, rockfish catch and harvest in western PWS tripled between 2001 and 2009 and have continued to remain close to 2009 levels (Table 9) despite reductions in angler effort between 2007 and 2012 (Table 1). 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 2010, total catch and harvest of rockfish in PWSMA increased from 28,935 and 19,512 fish, respectively, to 60,296 and 39,953 fish, respectively (Table 9, Figure 17). Most of this increase is attributed to increased angler effort in western PWS where proportion of angler effort increased from 27% (22,373 angler-days) in 2001 to 41% (47,998 angler-days) in 2010 (Table 1) and catch and harvest increased from 16,589 and 11,241 fish, respectively, in 2001 to 43,061 and 27,788 fish, respectively, in 2010 (Table 9, Figure 18A).

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<sup>2</sup> In 2008, the Alaska Board of Fisheries split the species known to ADF&G as dusky (*S. ciliatus*) into 2 groups, dusky (*S. variabilis*) and dark, (*S. ciliatus*) based on recently found differences (Brylinsky et al. 2008; Milani 2008).

Table 9.—Catch and harvest of rockfish by geographical region, PWSMA, 2001–2013.

Year	Geographical region						Total <sup>a</sup>	
	Western		Eastern		Other-unknown <sup>a</sup>		Catch	Harvest
	Catch	Harvest	Catch	Harvest	Catch	Harvest		
2001	16,589	11,241	10,258	6,818	2,088	1,453	28,935	19,512
2002	19,191	12,983	12,059	6,154	2,449	1,059	33,699	20,196
2003	25,656	15,078	10,305	6,327	1,640	700	37,601	22,105
2004	39,638	22,137	17,791	9,190	10,713	2,473	68,142	33,800
2005	37,628	21,226	12,781	9,351	1,032	647	51,441	31,224
2006	34,951	22,002	12,776	9,085	2,256	1,871	49,983	32,958
2007	42,584	23,815	20,471	13,600	1,781	1,191	64,836	38,606
2008	49,482	30,609	14,421	8,785	329	290	64,232	39,684
2009	50,795	33,420	14,370	10,120	436	425	65,601	43,965
2010	43,061	27,788	16,702	11,926	506	239	60,269	39,953
2011	35,723	25,893	13,007	8,674	745	442	49,475	35,009
2012	37,491	26,729	11,777	7,856	282	265	49,550	34,850
2013	42,849	32,312	10,936	8,679	1,984	1,485	55,769	42,476
Average								
2009–2013	41,984	29,228	13,358	9,451	791	571	56,133	39,251
2004–2013	41,420	26,593	14,503	9,727	2,006	933	57,930	37,253

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

<sup>a</sup> Includes unknown from all of Area J, including North Golf Coast.

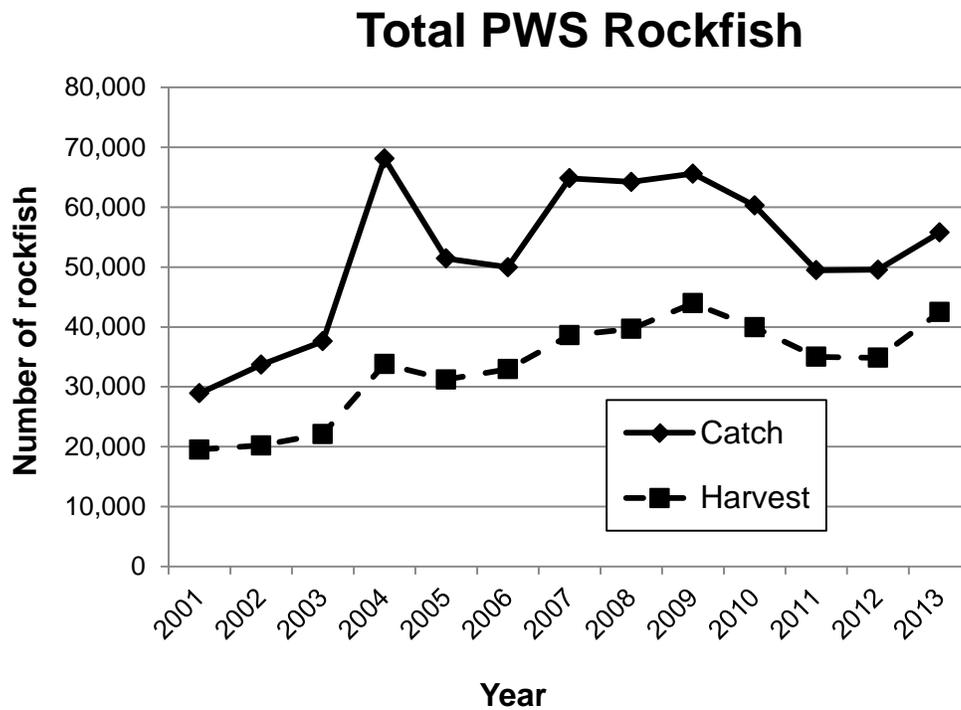


Figure 17.—Total catch and harvest of rockfish by sport anglers by year, PWSMA, 2001–2013.

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

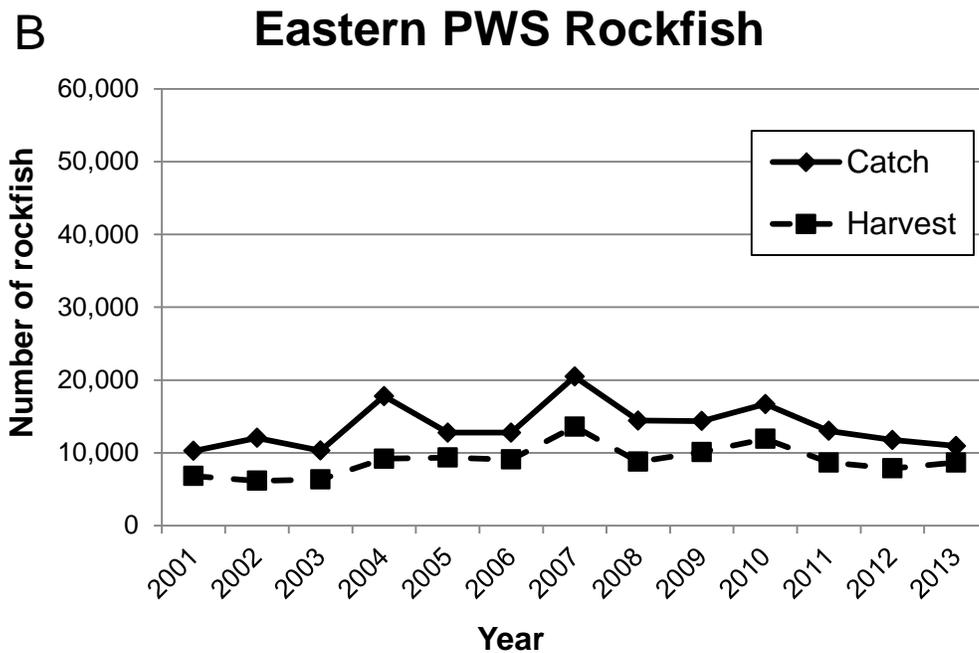
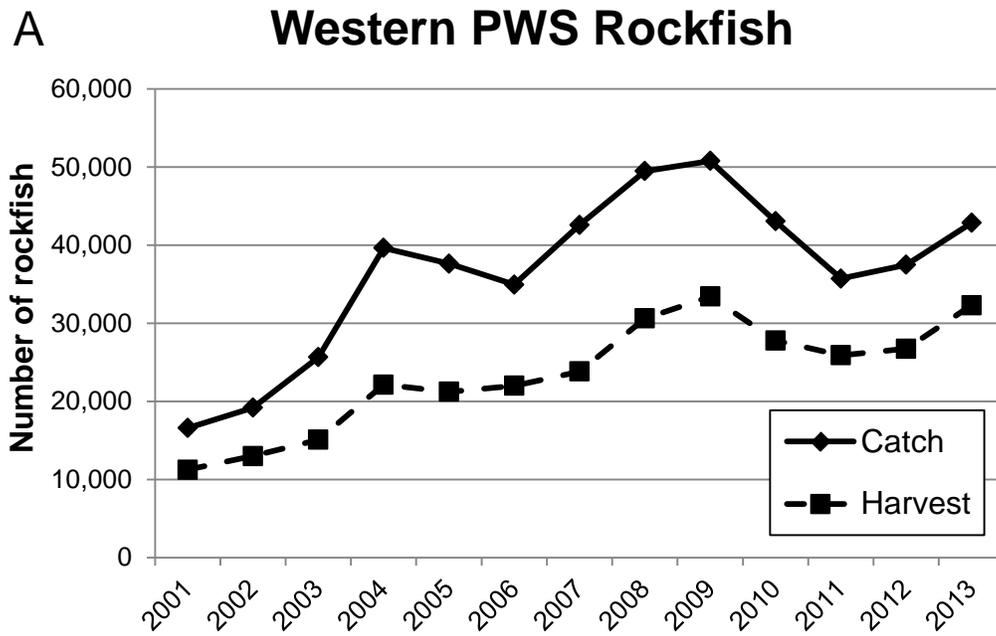


Figure 18.—Catch and harvest of rockfish in western PWS (A) and eastern PWS (B), PWSMA, 2001–2013.

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

## FISHERY MANAGEMENT AND OBJECTIVES

ADF&G and the Alaska Board of Fisheries (BOF) 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 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 (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 BOF adopted limits of 20 fish per day and in possession, only 5 of which could be “red rockfish” (Appendix A1). In 1991, BOF 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, BOF revised the limits such that the total bag limit was unchanged, but the provision was added that for nonpelagic 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, where the first 2 demersal rockfish caught must be retained, regardless of size. Finally, in 1999, BOF revised the limits such that the total limit remained unchanged, but that for nonpelagic 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 19–21) and no truncation in the black rockfish age distribution (Figure 22–24). Therefore, if past levels of harvest have exceeded surplus production, they have probably 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*<sup>3</sup>). Recruitment variability is common in rockfish

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<sup>3</sup> Meyer, S.C., and B.J. Failor. *In prep*. Composition of the recreational rockfish *Sebastes* harvest in Southcentral Alaska, 1996–2008. Alaska Department of Fish and Game. Fishery Data Series, Anchorage.

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.

### FISHERY PERFORMANCE 2011–2013

For the most part, rockfish catch and harvest has continued to increase from 2001 through the 2013 season with a peak harvest of 43,965 fish in 2009 and nearly that much in 2013 (42,476 fish; Table 9, Figure 17). Rockfish catch and harvest has increased annually since 2001 by an average of 1,685 and 1,722, respectively, in PWS (slopes of the regression lines for catch and harvest by year from 2001–2013). On average (2011–2013), 27% of the rockfish caught in PWS were released, as compared with the previous 5 years (2006–2010) when 36% of rockfish were released (calculated from Table 9).

Yelloweye Rockfish Age Composition for Seward

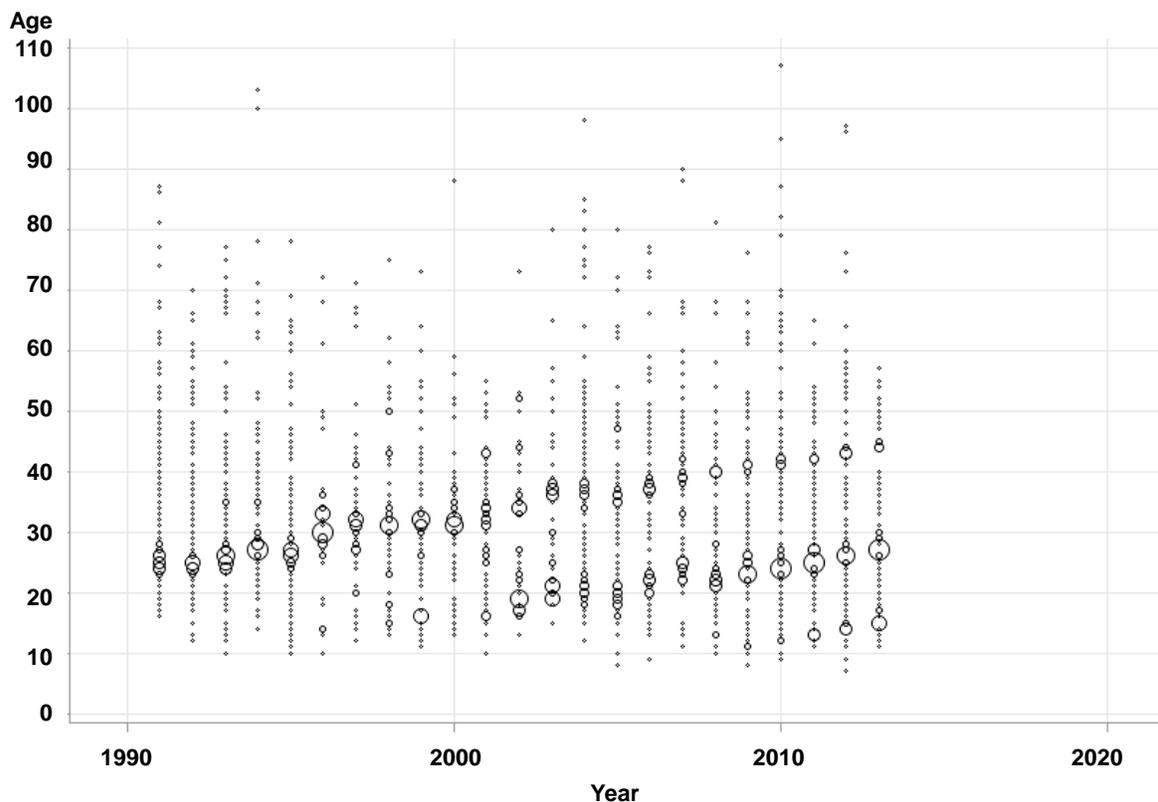


Figure 19.—Age composition of yelloweye rockfish from PWS in the recreational harvest of anglers returning to the port of Seward, 1991–2013.

Source: Failor, B. *In prep.* Assessment of recreational halibut and groundfish harvest in Southcentral Alaska, 2008–2014. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Note: Bubble size gives an indication of relative sample size.

## Yelloweye Rockfish Age Composition for Valdez

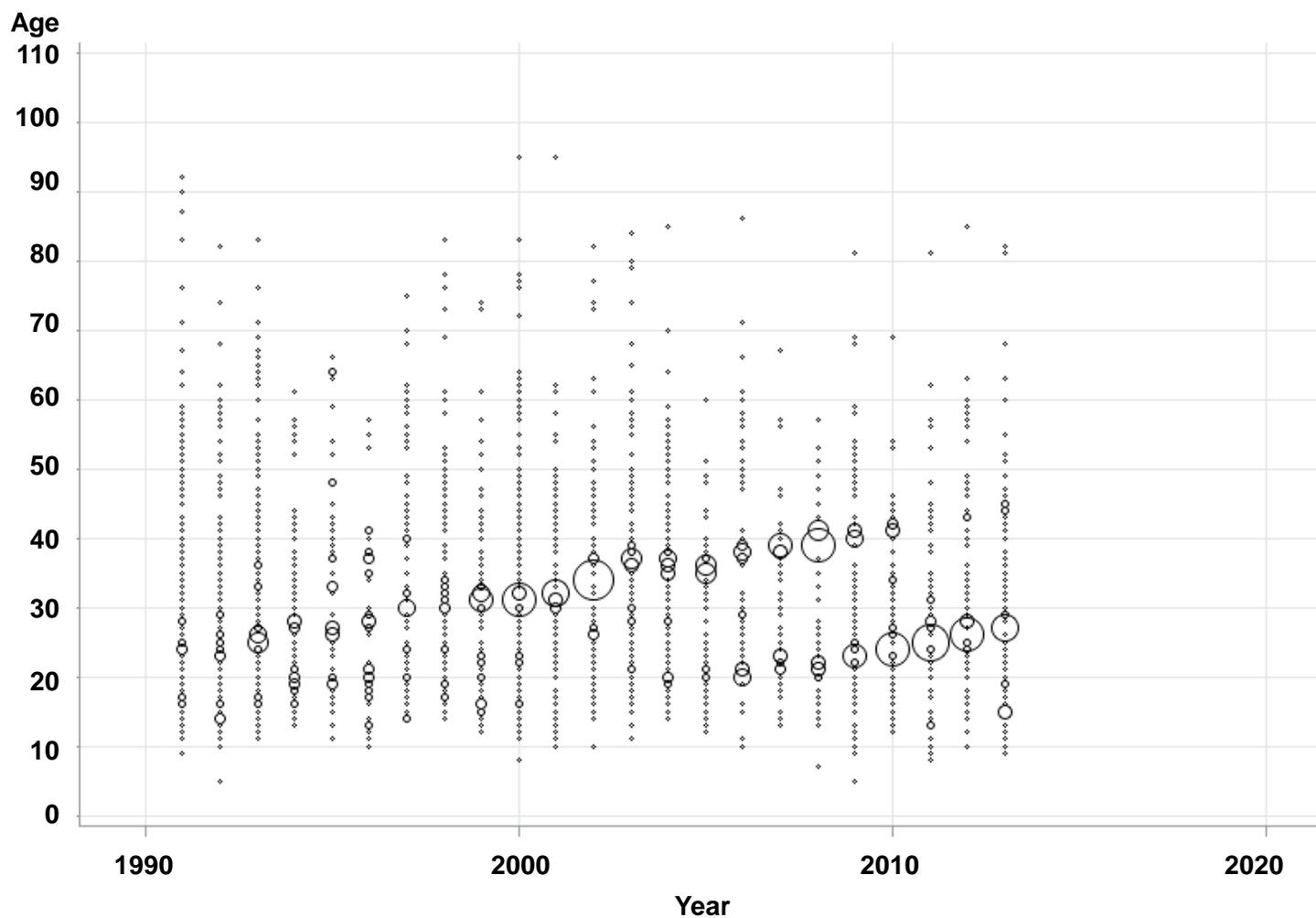


Figure 20.—Age composition of yelloweye rockfish from PWS in the recreational harvest of anglers returning to the port of Valdez, 1991–2013.

Source: Failor, B. *In prep.* Assessment of recreational halibut and groundfish harvest in Southcentral Alaska, 2008–2014. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Note: Bubble size gives an indication of relative sample size.

## Yelloweye Rockfish Age Composition for Whittier

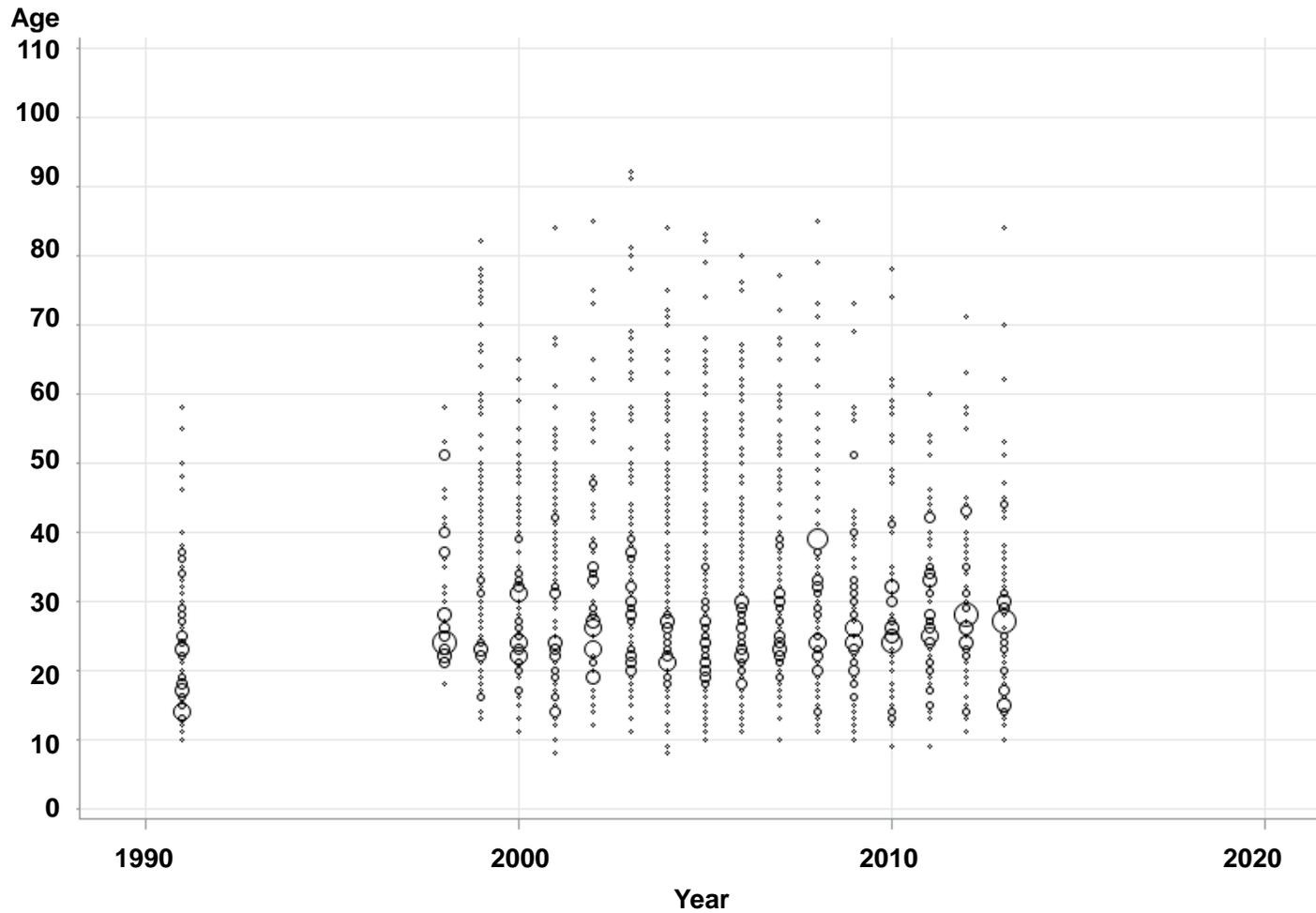


Figure 21.—Age composition of yelloweye rockfish from PWS in the recreational harvest of anglers returning to the port of Whittier, 1991–2013.

*Source:* Failor, B. *In prep.* Assessment of recreational halibut and groundfish harvest in Southcentral Alaska, 2008–2014. Alaska Department of Fish and Game, Fishery Data Series, Alaska.

*Note:* Bubble size gives an indication of relative sample size.

## Black Rockfish Age Composition for Seward

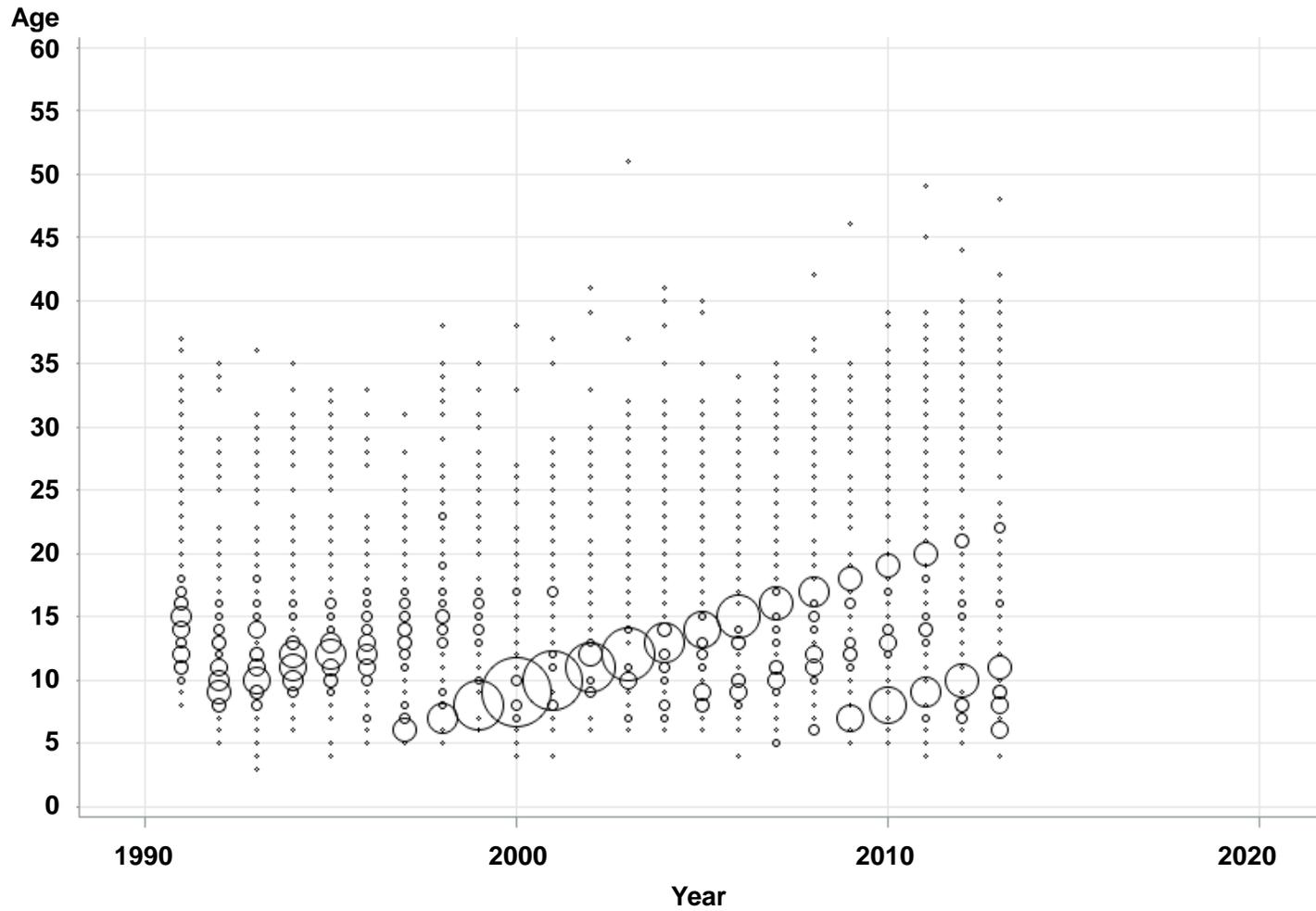


Figure 22.—Age composition of black rockfish from PWS in the recreational harvest of anglers returning to Seward Port, 1991–2013.

Source: Failor, B. *In prep.* Assessment of recreational halibut and groundfish harvest in Southcentral Alaska, 2008–2014. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Note: Bubble size gives an indication of relative sample size.

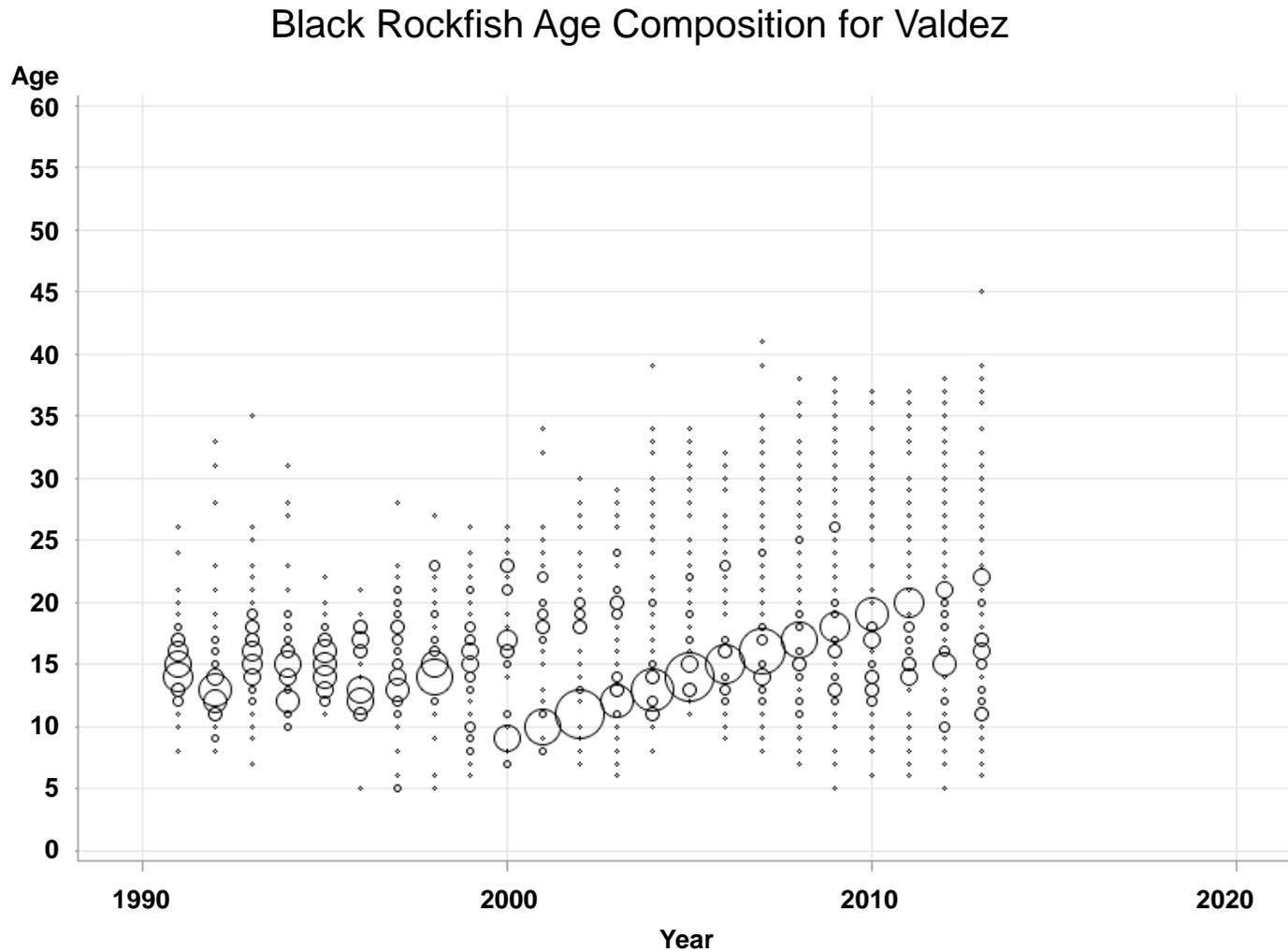


Figure 23.—Age composition of black rockfish from PWS in the recreational harvest of anglers returning to Valdez Port, 1991–2013.

Source: Failor, B. *In prep.* Assessment of recreational halibut and groundfish harvest in Southcentral Alaska, 2008–2014. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Note: Bubble size gives an indication of relative sample size.

## Black Rockfish Age Composition for Whittier

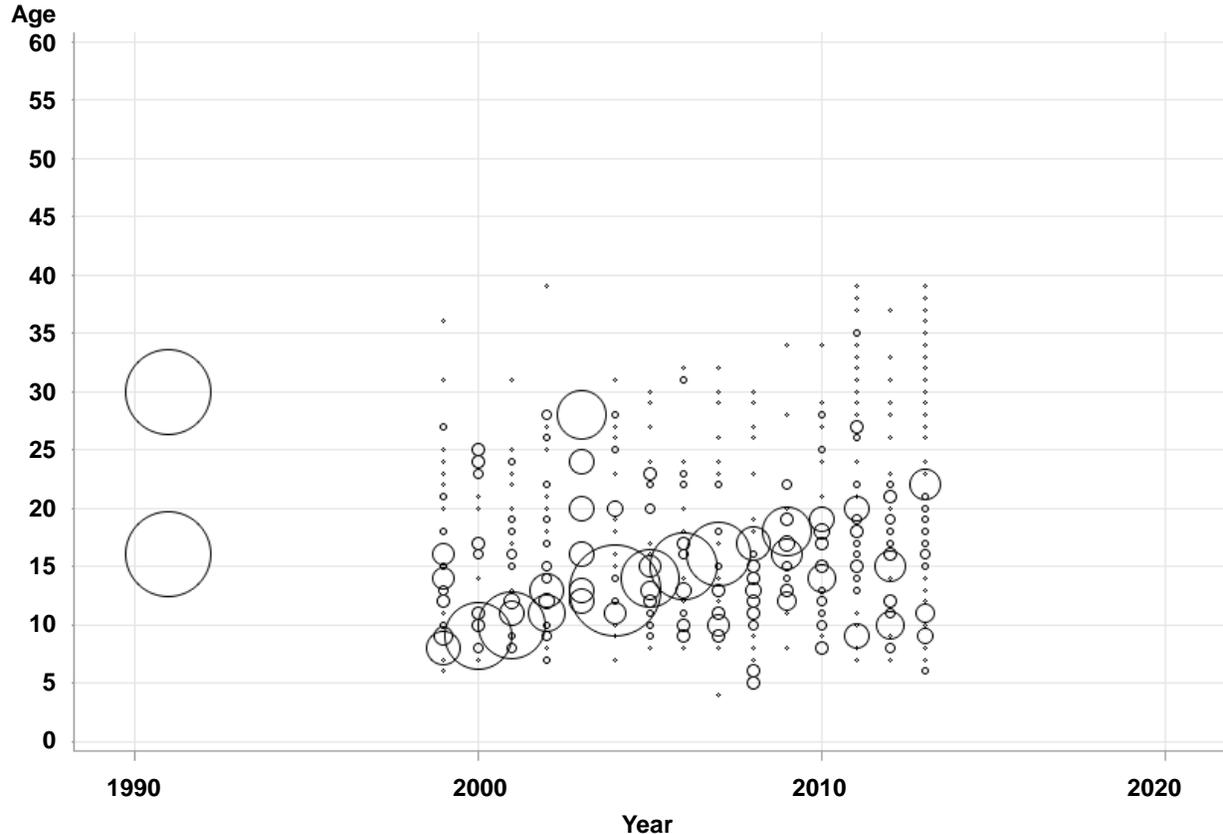


Figure 24.—Age composition of black rockfish from PWS in the recreational harvest of anglers returning to Whittier Port, 1991–2013.

Source: Failor, B. *In prep.* Assessment of recreational halibut and groundfish harvest in Southcentral Alaska, 2008–2014. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Note: bubble size gives an indication of relative sample size.

## 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 Hinchinbrook Entrance. Lingcod are also captured around rocky reefs and underwater pinnacles that are common throughout PWS. Although adult lingcod can be found to depths of 1,200 ft, they 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 fishery-independent stock assessment of lingcod in PWS. Insight into the stock status of lingcod in PWS is available in the form of size and age data of harvested fish. Over the last several years the age composition data for lingcod harvested in PWSMA, across all ports of landing and across both sexes, show fewer young fish recruiting into this fishery (Figures 25–27). This is not the first time ADF&G has detected a pattern of weak age-class recruitment, and the cause is unclear.

The evidence of weak recruitment is supported by reports from the charter boat fleet that lingcod are becoming more and more difficult to find. An increase in the frequency of older individuals in the recreational harvest since 1991 suggests that recent anglers are selectively harvesting larger, older lingcod (Figures 25–27). The recreational fishery is the primary source of lingcod removals in PWSMA.

Between 2001 and 2007, total harvest of lingcod in PWSMA increased from 4,586 fish to a peak of 11,961 fish (Table 10, Figure 28). The increase in harvest was split fairly evenly between western and eastern PWS; harvest in western PWS increased from 2,605 in 2001 to 7,736 in 2007, and harvest in eastern PWS increased from 1,981 in 2001 to 4,225 in 2007 (Table 10, Figure 29). Harvest remained relatively stable the following 3 years before declining after 2010.

## **FISHERY MANAGEMENT AND OBJECTIVES**

Lacking a comprehensive stock assessment, ADF&G and BOF adopted a conservative approach to the management of the sport lingcod fishery. Current regulations for the sport lingcod fisheries in PWSMA were implemented in 1993 and allow for a harvest of 2 fish daily, 4 in possession (Appendix A1). A minimum size limit of 35 inches total length (28 inches without head) 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 on 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, sex composition, and spatial distribution of effort and harvest.

Abundance data are needed for PWSMA to develop a standardized index of abundance. Several potential data sources for this index include interview data, charter logbook data, the International Pacific Halibut Commission longline survey data, and the National Marine Fisheries Service trawl survey data. Assessment should include summaries of sport and commercial removals and spatial distribution, age, length, and sex composition of the harvest. Existing information can be analyzed to estimate growth, natural mortality, and other inputs.

A fishery-independent index of abundance is also 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 use of fishery data as an index of recruitment, and no data are available on the sizes of released fish. A survey could provide data on the undersized portion of the population, which may provide insight on future recruitment.

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

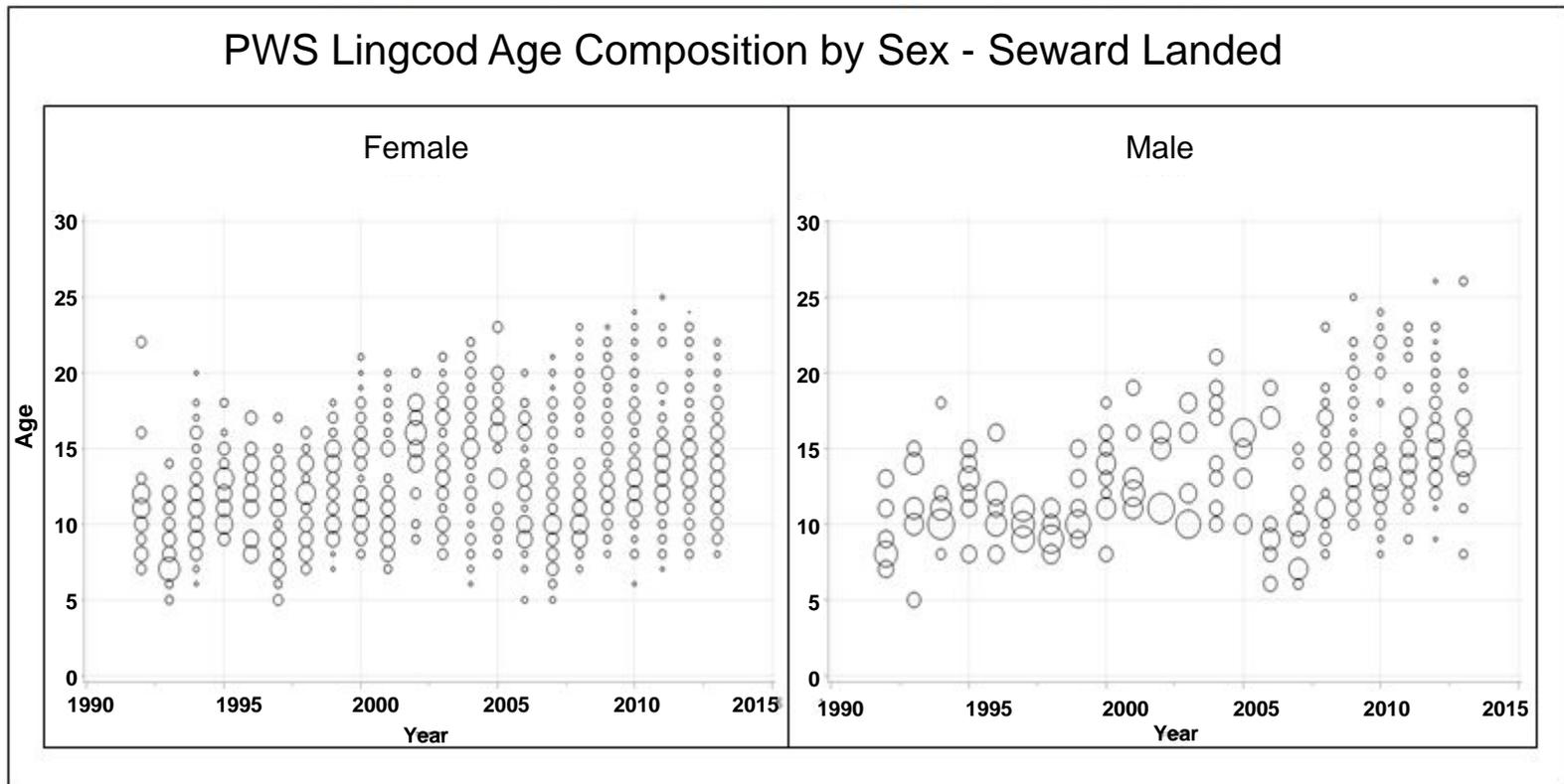


Figure 25.—Age composition by sex of lingcod from PWS in the recreational harvest of anglers returning to the port of Seward, 1992–2013.

Source: Failor, B. *In prep.* Assessment of recreational halibut and groundfish harvest in Southcentral Alaska, 2008–2014. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Note: Bubble size gives an indication of relative sample size.

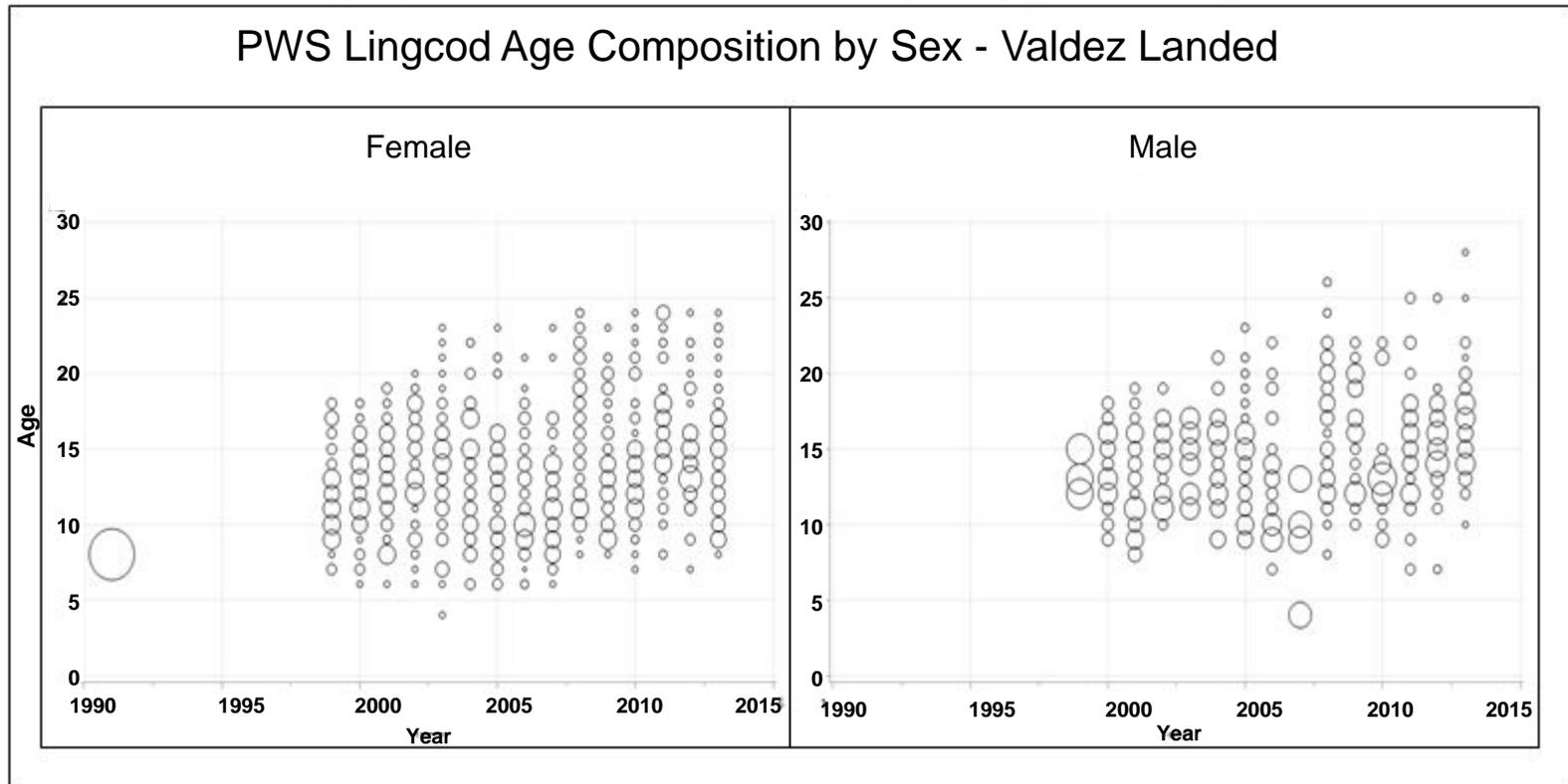


Figure 26.—Age composition by sex of lingcod in the recreational harvest of anglers returning to the port of Valdez, 1999–2013.

Source: Failor, B. *In prep.* Assessment of recreational halibut and groundfish harvest in Southcentral Alaska, 2008–2014. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Note: Bubble size gives an indication of relative sample size.

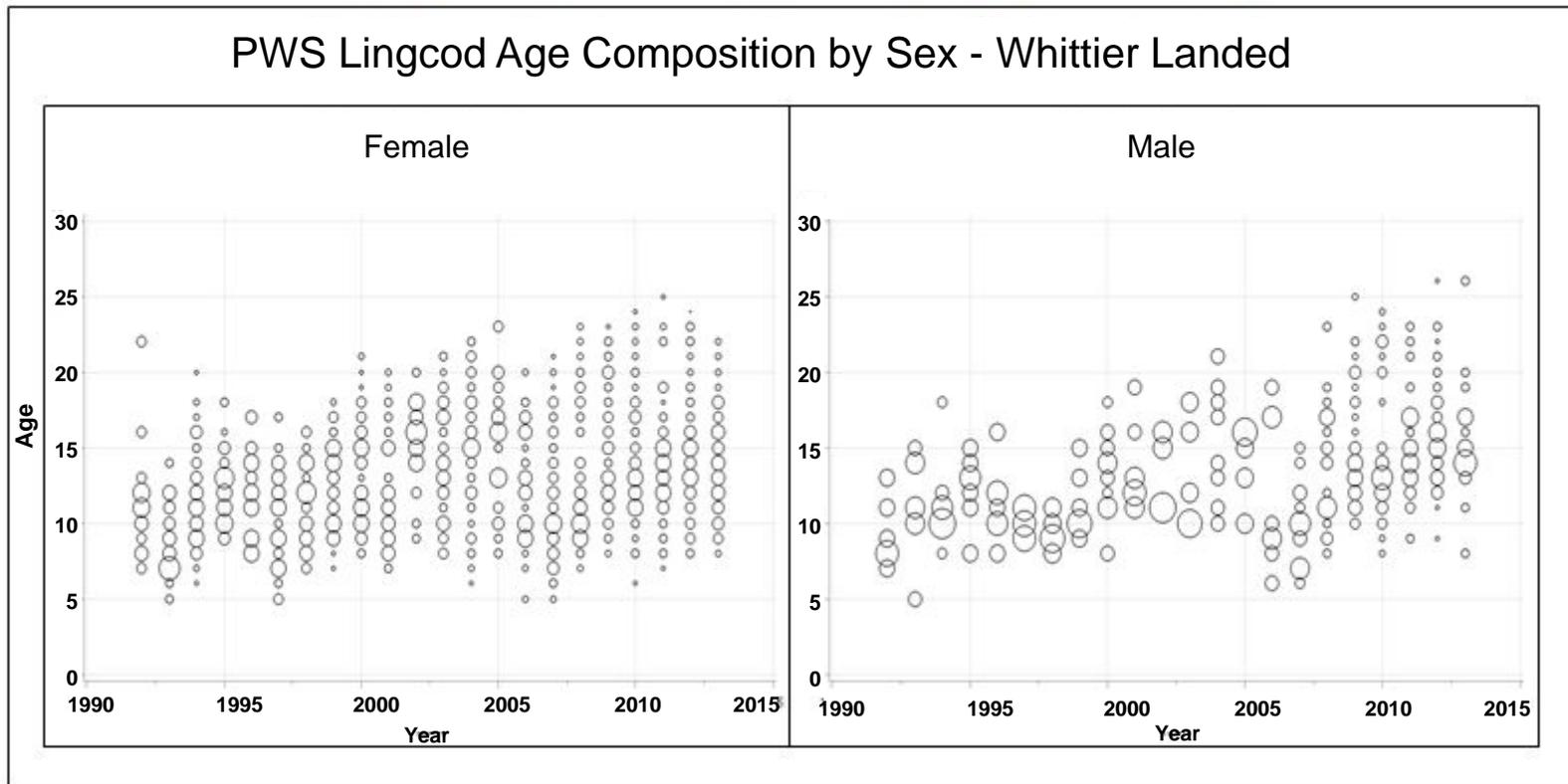


Figure 27.—Age composition by sex of lingcod in the recreational harvest of anglers returning to the port of Whittier, 1992–2013.

Source: Failor, B. *In prep.* Assessment of recreational halibut and groundfish harvest in Southcentral Alaska, 2008–2014. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Note: Bubble size gives an indication of relative sample size.

Table 10.—Catch and harvest of lingcod in the sport fisheries in PWSMA, 2001–2013.

Year	Geographical region					
	Western		Eastern		Total <sup>a</sup>	
	Catch	Harvest <sup>b</sup>	Catch	Harvest <sup>b</sup>	Catch	Harvest <sup>b</sup>
2001		2,605		1,981		4,586
2002		3,092		1,443		4,535
2003	6,692	3,282	3,864	1,811	10,556	5,093
2004	8,216	3,553	4,115	2,477	12,331	6,030
2005	10,172	3,192	5,234	2,888	15,406	6,080
2006	10,232	5,321	5,898	2,635	16,130	7,956
2007	17,546	7,736	8,364	4,225	25,910	11,961
2008	15,578	7,888	5,851	2,980	21,429	10,868
2009	15,252	6,819	5,106	3,437	20,358	10,256
2010	14,230	8,071	5,369	3,357	19,599	11,428
2011	12,340	7,255	3,802	2,344	16,142	9,599
2012	12,815	7,081	3,685	2,001	16,500	9,082
2013	12,009	5,960	2,998	1,672	15,007	7,632
Average						
2009–2013	13,329	7,037	4,192	2,562	17,521	9,599
2004–2013	12,839	6,288	5,042	2,802	17,881	9,089

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

<sup>a</sup> Unknowns from lingcod landed in Seward were apportioned through interview data.

<sup>b</sup> Harvest includes release mortality of 4.3% (Albin and Karpov 1998) applied to released fish.

### Total PWS Lingcod

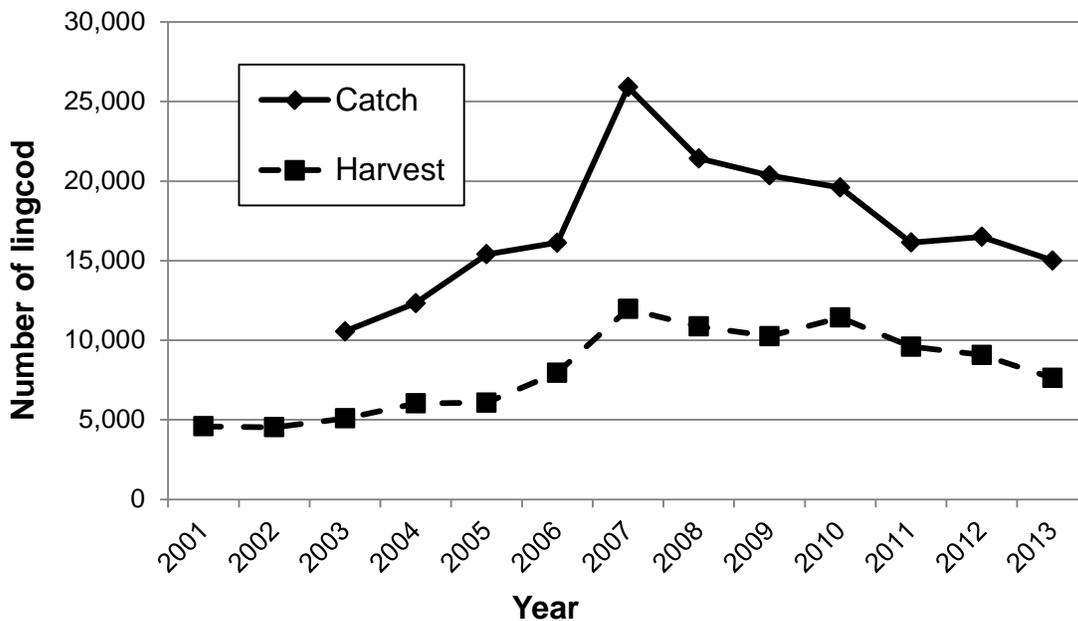


Figure 28.—Total catch and harvest of lingcod by sport anglers, PWSMA, 2001–2013.

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

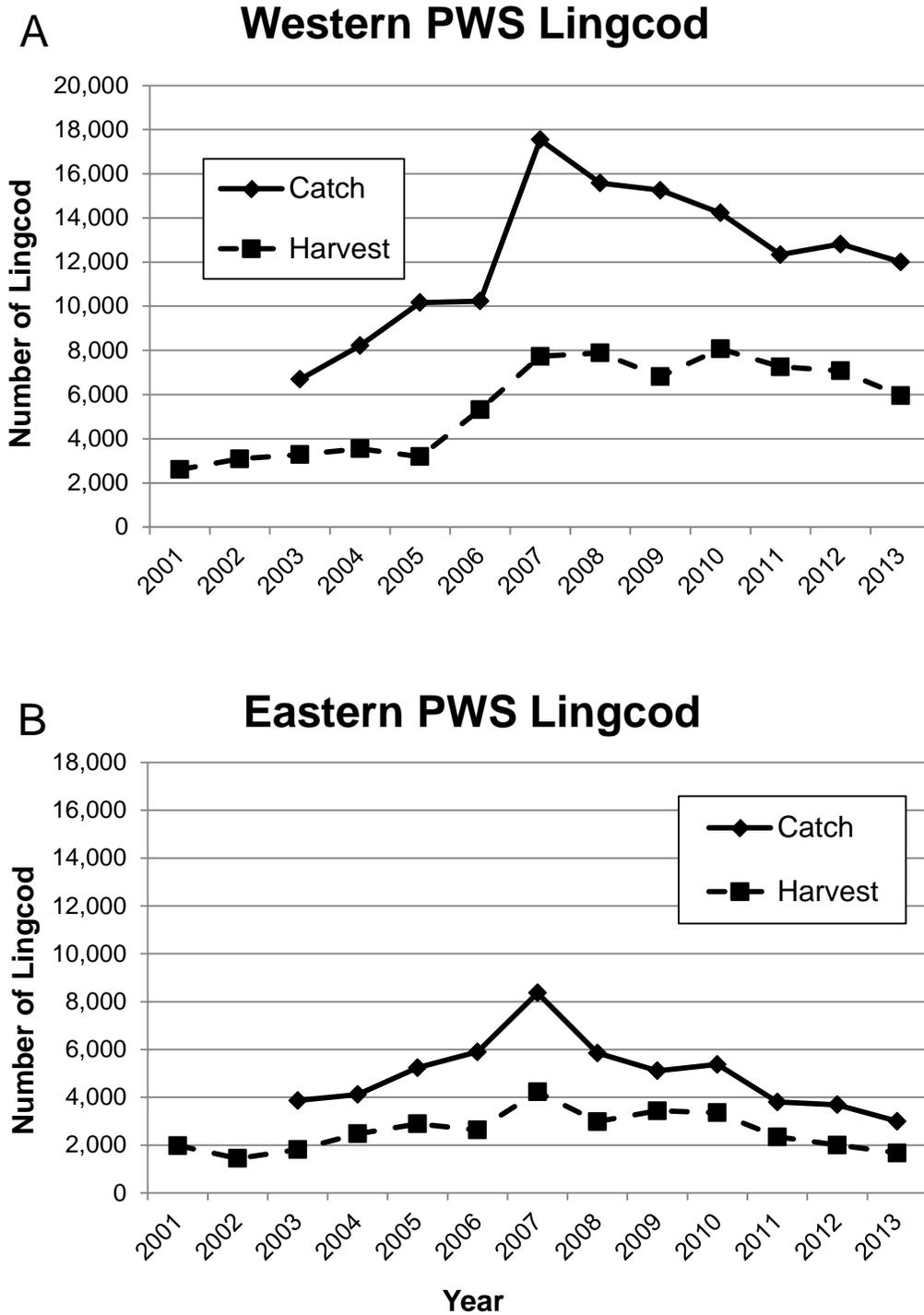


Figure 29.—Catch and harvest of lingcod in western PWS (A) and eastern PWS (B), PWSMA, 2001–2013.

Source: SWHS database (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/> accessed October 2014).

## FISHERY PERFORMANCE 2011–2013

Lingcod harvest in PWS for 2011, 2012, and 2013 (9,599, 9,082, and 7,632, respectively) fell below the previous 5-year (2006–2010) average of 10,494 (Table 10, Figure 28). Average (2011–2013) catch and harvest in western PWS (12,388 and 6,766, respectively) was over 3 times greater than in eastern PWS (3,495 and 2,006, respectively).

## 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 15,054 lb in 2002 to 85,988 lb in 2013; harvest peaked in 2010 at 142,146 lb (Table 11). Effort in the noncommercial fishery has also increased since 2002 from 19,387 pot-days to 44,146 pot-days; effort also peaked in 2010 at 78,083 pot-days (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 located throughout Prince William Sound. CPUE of spot shrimp increased annually from 1998 through 2007 but has declined since then (Figure 30).

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, 2002–2013.

Year	Permits issued	Response (%) <sup>a</sup>	Effort (pot-days)	Harvest (lb)	Number of pots lost
2002	717	84	19,387	15,054	192
2003	1,061	91	24,094	22,635	315
2004	1,649	90	30,694	41,645	323
2005	2,112	90	37,271	51,785	439
2009	2,733	89	47,631	90,961	649
2010	3,181	90	78,083	142,146	890
2011	3,309	88	56,543	95,924	770
2012	3,098	87	52,620	90,385	625
2013	3,101	89	44,146	85,988	768
Average					
2003–2010	2,147		43,555	69,834	523
2011–2013	3,169		51,103	90,766	721

<sup>a</sup> Percent of noncommercial shrimp permit holders responding to harvest survey.

## FISHERY MANAGEMENT AND OBJECTIVES

Before 2001, there were no regulatory restrictions on the noncommercial shrimp fishery in PWS. In March 2000, BOF 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 5 pots per person, with a maximum of 5 pots per vessel), and established a shrimp fishing season (open from 15 April through 15 September). In March 2009, BOF 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 reaches or exceeds 110,000 lb. For years that the harvestable surplus meets or exceeds 110,000 lb, BOF allocates 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 management objective for the noncommercial shrimp fishery is to achieve the allocated harvest for a given year.

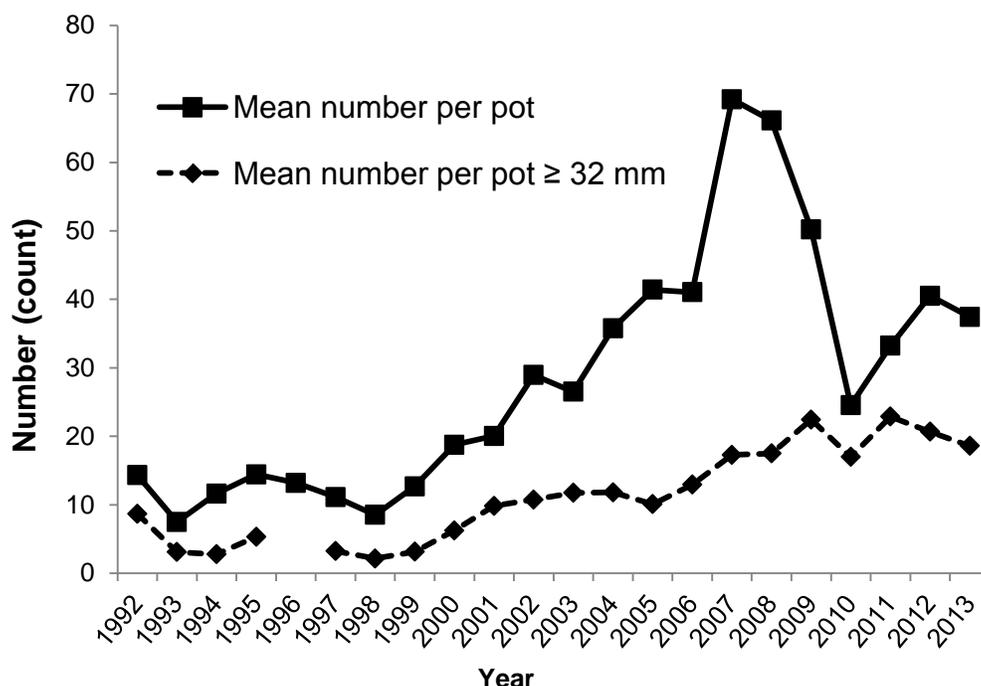


Figure 30.—Mean number of spot shrimp caught per pot in ADF&G surveys, PWSMA, 1989–2013.

## FISHERY PERFORMANCE AND ABUNDANCE 2011–2013

Average effort and harvest of shrimp for 2011–2013 (51,103 pot-days and 90,766 lb, respectively) exceeded average effort and harvest of shrimp in the previous 5 years (2004–2010; 43,555 pot-days and 69,834 lb) despite the peak in 2010 (Table 11).

Catch per unit effort of spot shrimp in ADF&G surveys has increased since 2010, although mean number of shrimp greater than 32 mm has declined (Figure 30). However, current CPUE (2011–2013) of large shrimp (greater than 32 mm) remains above historical levels prior to 2009 (Figure 30).

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## **APPENDIX A: REGULATION HISTORY**

### **Areawide 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 were allowed year-round in all fresh waters south of Miles 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 was 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.
- 2012 Rainbow/steelhead/cutthroat trout bag and possession limits are 2 fish, with a minimum size of 11 inches and a maximum limit of 16 inches. 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 Miles 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.
- 2012 Rainbow/steelhead/cutthroat trout bag and possession limits are 2 fish, with a minimum size of 11 inches and a maximum limit of 16 inches. 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 Arctic char in addition to the trout/grayling limit of 15.
- Mid-1960s (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.

### **Arctic Grayling**

- 1957–1982 Part of an aggregate freshwater limit of trout, grayling, and lake trout (later “Arctic 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 Arctic grayling were set at 15 per day, 30 in possession, no size restrictions.
- 1991 Bag limits 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 waters prior to statehood.
- 1960 The freshwater areas within Valdez Bay are closed to salmon fishing.
- 1961 A saltwater bag limit was set of 8 coho salmon with a 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 were 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 included 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 ADF&G markers placed on the lagoon shore approximately one-half mile on either side of the ADF&G cabin, is closed to snagging until ADF&G announces the escapement goal will be met.
- 1984 The Robe River downstream of the Richardson Highway was established as fly-fishing only 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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**Salmon (continued)**

- 1987 Further restrictions were placed on Robe River, 15 May to 22 June; only 1 salmon of each species was allowed daily and in possession.
- 1989 Further changes were made to Robe River fly fishing area regulations. Dates are extended to year round, the area is defined as extending from the highway downstream to 100 yards below the confluence with the Lowe River, bag limit is 3, only 1 may be a 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 salmon per day and 6 in possession.
- 1989 Lake Bay (Ester Island) and 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 In Cordova and 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 are reduced to 3 salmon other than Chinook salmon (referred to as “king salmon” in the regulations). 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 is added of 2 king salmon (4 in possession) 16 inches or more, and 6 per day, 12 in possession less than 16 inches.
- 1991 Eyak fly-fishing only area gear restrictions: only single-hook, artificial flies with gap between point and shank three-eighths 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.

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### **Salmon (continued)**

- 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.
- 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 are defined as king salmon less than 20 inches in total length.
- 2002 Coho salmon that are to be released cannot 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.

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### **Rockfish (continued)**

- 1997 The total bag limit was unchanged, but a provision was added that for “nonpelagic” rockfish, the limits were only 1 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.
- 1999 The total bag limit is unchanged, but the provision is revised so that for “nonpelagic” rockfish, year-round limits are 2 rockfish per day and 2 in possession. In addition, the first 2 nonpelagic 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 nonpelagic bag limits are unchanged, total bag limit is reduced to 4 per day and 8 in possession from 1 May through 15 September and 8 fish per day and 8 in possession 16 September through 30 April.

### **Lingcod**

- No bag or possession limits prior to 1991.
- 1991 Bag limits are 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 is included, the season is 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.

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### **Areawide Shellfish (continued)**

- 1981 Marking of pots: first initial, last name, and address on a keg or buoy attached to unattended subsistence (after 1990, this includes sport) 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 were adopted as sport regulations.
- 1990 Criteria for escape mechanism are modified. Opening must equal or exceed 18 inches, except in shrimp pots where it must exceed 6 inches. Opening 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 tied 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.

### **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 (adopted as sport fish regulations requiring sport fish license after 1990): no closed season, no bag limit, no size limit except in waters east of longitude 149°W and south of a line from the southernmost tip of Point Bentinck to the southernmost tip of Point Whitshed, only razor clams 4½ 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.

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### **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, seven-eighths inch diameter round wooden peg without deforming the opening, except for the selvage.
- 1999 Established a season from 15 April through 15 September.
- 1999 Reduced the number of pots allowed to 5 per person with a maximum of 5 per vessel.
- 2001 A permit was required to harvest shrimp.
- 2006 A permit was no longer required to harvest shrimp.
- 2009 *Prince William Sound pot shrimp management plan (5 AAC 55.055)* requires a permit for all non-commercial users.
- 2012 *Prince William Sound non-commercial shrimp fishery management plan (5 AAC 55.055)* requires that when ADF&G surveys for spot shrimp estimate a harvestable surplus of 128,100 pounds (or more), a commercial pot fishery is triggered for spot shrimp. Noncommercial 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 noncommercial sector is back in place.
- 2012 Put into regulation a limit of 5 pots per person with a maximum of 5 pots per vessel that cannot be modified by emergency order.

### **Tanner Crab**

- Prior to 1981 there were no closed seasons and no bag limits.
- 1988 Personal use regulations set bag and possession limits at 20, only male crabs could be retained, minimum size limit was 5.3 inches, and there was no closed season.
- 1990 Personal use regulations adopted as sport fish regulations.
- 1999 Closed all waters of PWSMA to the taking of Tanner crab.
- 2012 Opened PWSMA to taking of Tanner crab for subsistence use only (closed to sport fishing). Gear limit of 2 pots per person with no more than 2 pots per vessel with possession limit of 5 legal size (5½ inches or greater in carapace width) male Tanner crab per person per day.

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### **King Crab**

- 1988 Personal use regulations set bag and possession limits to 6, only male crabs could be retained, no closed season, size limits 5.9 inches in width 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.
- 2012 PWSMA waters west of longitude 147.20.00 are open to taking of golden king crab under subsistence use only (closed to sport fishing). Gear limit of 2 pots per person with no more than 2 pots per vessel with annual limit of 3 legal size (7-inch or greater carapace width) male king crab.

### **Dungeness Crab**

- 1981 Subsistence regulations set bag and possession limits to 20 Dungeness crab per day, crabs must be male only, 6½ inches or more in carapace width.
- 1988 Personal use regulations set bag and possession limits to 20 per day, only male crabs, 6½ 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.