2A99-17

REVIEW OF THE KING AND TANNER CRAB FISHERIES IN PRINCE WILLIAM SOUND

Report to the Alaska Board of Fisheries

by

Robert Berceli
Charles Trowbridge
and
William R. Bechtol

REGIONAL INFORMATIONAL REPORT[1] NO. 2A99-17

Alaska Department of Fish and Game
Division of Commercial Fisheries, Central Region
333 Raspberry Road
Anchorage, Alaska 99581

March 1999

[1] This is contribution 2C99-02 from the Cordova area office. The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Division of Commercial Fisheries.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) has management responsibility for crab resources in and adjacent to the Gulf of Alaska. This report summarizes commercial fisheries for Tanner *Chinoecetes bairdi*, red king *Paralithodes camischaticus*, blue king *Paralithodes platypus*, and golden or brown king *Lithodes aequispina* crabs in Area E, the Prince William Sound Management Area (PWS). The management area includes waters of PWS and the Gulf of Alaska bounded by the longitude of Cape Suckling (143° 53'W) on the east and Cape Fairfield (146°50'15"W) on the west (Figure 1). The report will also review current assessment information, as well as management actions taken to conserve these crab resources in PWS.

TANNER CRAB

Commercial Fishery

The PWS area is divided into four Tanner crab management districts (Figure 2). The Northern and Hinchinbrook Districts include most of the waters inside PWS proper, while the Eastern and Western Districts encompass waters of the Gulf of Alaska and southwestern PWS. Historically, the commercial Tanner crab harvest was equally divided between the Gulf of Alaska and PWS portions of the management area.

The PWS Tanner crab fishery is classified as "superexclusive". A vessel registered to fish Tanner crab in PWS may not participate in any other Tanner crab fishery within the state during that registration year. Conversely, a vessel registered to fish in another registration area may not fish in PWS during that registration year.

Other regulations distinctive to the PWS Tanner crab fishery include a gear limit not to exceed 75 king and Tanner pots per vessel, a buoy tag requirement, a harvest restricted to male crab, and a minimum carapace width limit of 5.3 inches (135mm) for all retained crab. Only male Tanner crab may be taken. The regulatory fishing season opens January 15 and closes March 31.

The PWS commercial Tanner crab fishery began in 1968 when 1.2 million pounds were landed (Table 1). The harvest peaked in 1972-1973 at 13.9 million lb, season prior adoption of the minimum legal size restriction in 1976. Harvests decreased during the late 1970's and early 1980's, followed by district closures during 1984 and 1985. Small postrecruit fisheries occurred from 1986 to 1988 during which harvests remained relatively stable at approximately 500,000 pounds (Table 1;Figure 3). However,

harvest patterns among districts changed with dramatic declines in Western District harvests and no catches in the Eastern District.

Three reasonable explanations for the decline in abundance of the PWS Tanner crab stock exist, two of which concern fishing effects. First, overharvest of immature and mature males may have occurred along with increased fishing mortality of females prior to the creation of a male-only fishery with a minimum carapace size limit of 5.3 inches in 1976. For example, the 3.8 million pound harvest in 1974 included 2.7 million pounds of crab smaller than the current minimum size limit. Second, fishing related crab mortality was probably greater prior to 1982 when seasons were longer. From 1974 through 1981, fishing was allowed seven months each year, so crabs were exposed to a greater chance of being harvested as well as more handling of undersized and female crabs. Third, environmental conditions may have changed, causing greater mortality of Tanner crab larvae and their forage base as well as increased production of crab predators such as gadoid fishes.

Non-commercial Fisheries

Sport, personal use, and subsistence Tanner crab fisheries have remained open throughout much of PWS despite low abundance. There are no closed seasons and daily possession and bag limits are 20 male crabs. Only male Tanner crab having a carapace width of 5.3 inches (135mm) or larger may be retained in personal use and subsistence fisheries while male crab 5.5 inches (140mm) or larger may be retained in sport fisheries. Legal gear for sport and personal use fishing includes pots, ring nets, diving gear, dip nets, and hooked or hookless hand lines. Pot gear is limited to 5 pots per person and 10 pots per vessel for all non-commercial fisheries. However any legal gear type defined in regulation (5 AAC 39.105) may be used in the subsistence harvest of Tanner crabs. All pots are required to have a biodegradable escape mechanism but there is no requirement for escape rings.

There is no mechanism in place to directly monitor effort or harvest in non-commercial Tanner crab fisheries of PWS. Data from Sportfish Division's most recent mail-out survey indicated a harvest of 729 Tanner crab in 1997. Subsistence Division staff collect limited information on Tanner crab harvests through interviews conducted sporadically among communities within PWS. These data are available under a separate report prepared by ADF&G's Subsistence Division(ADF&G 1999).

Stock Status and Management Measures

The department has operated assessment programs for Tanner crab within the Prince William Sound Management Area since 1977. Surveys were conducted with pot gear through 1991. The objective of surveys was to provide indices of legal and sublegal male Tanner crab, and to monitor reproductive success of female Tanner crab. This

information was used to determine relative stock condition, as well as to set preseason harvest guidelines for the commercial fishery. Pot survey data indicated a steady decline in the number of male and female Tanner crab (Table 2). During the years pot surveys were conducted, the mean number of Tanner crab captured per pot decreased 86 percent.

Recognizing the inherent weaknesses of pot surveys, such as soak variation and the relative nature of the indices, the department implemented trawl surveys in 1991. An advantage of trawl surveys is that population abundance estimates can be generated by using an area swept equation. Trawl surveys have also been adopted by the National Marine Fisheries Service for the Bering Sea surveys and by the department to assess crab stocks in the Westward Region and Cook Inlet Management Area.

Population estimates generated from ADF&G trawl surveys demonstrate that Tanner crab abundance in PWS is still declining (Table 3, Figure 4). Estimated abundance of legal male crab in the Northern and Hinchinbrook Districts decreased from 108,624 in 1993 to 24,864 in 1995 and 10,674 in 1997. The estimates of legal crab reflect both poor recruitment to the legal segment of the stock and declining numbers of old-shell recruit crabs. Low abundance estimates of new-shell legal male crab are the result of successive weak prerecruit classes and skip molting in the prerecruit-1 and smaller size classes.

The department has closed commercial and subsistence fisheries for Tanner crab by emergency order within the Hinchinbrook Entrance and Orca Bay portions of PWS since 1982. The personal use fishery in this area has also been closed annually since 1987. The waters of Orca Bay and the north Montague area are key production areas for Tanner crab in PWS. Both areas have historically provided newly mature male and female Tanner crabs. The north Montague area has been closed to all harvest of Tanner crabs since 1991 and Orca Bay area since 1984. The closures were effected to rebuild the stock and provide protection to juvenile and newly mature crabs.

The department has also closed the entire PWS Management Area to the commercial harvest of Tanner crab annually since 1989. Despite long term closure of these areas, Tanner crab stocks have continued to decline. Although healthy localized aggregations of Tanner crab may exist, ADF&G is concerned about the need to protect the existing population to maximize reproductive opportunity at a time when ecological conditions have improved.

KING CRAB

Commercial Fisheries

Red king crab are sparsely distributed throughout PWS with historic concentrations occurring in the eastern Sound and Hinchinbrook Entrance (Figure 1). Blue king crab are found in the Port Wells and Harriman Fjord areas; small aggregations may also occur in the glacial fjords of western PWS. Golden king crab are found in central and western PWS at depths of 150-400 fathoms. Waters in the Gulf of Alaska portion of the management area have no documented concentrations of king crab, except for a very sparse distribution of golden king crab.

The PWS king crab fishery is designated as superexclusive. The minimum legal carapace width is 7.0 inches (178 mm) for red and golden male king crabs, and 5.9 inches (150 mm) for male blue king crab. The regulatory season provides two open periods: October 1 to December 20 and January 15 to March 15.

Commercial harvests of king crab from PWS date to 1960 when 246,965 pounds were landed (Table 4). Catch reporting by species did not begin until the 1979-80 season. The harvest of 296,200 lb in 1972 is believed to be primarily blue king crab. During the period 1979-1984, stocks of both blue and red king crabs declined. Fisheries for both species remained closed from the 1984-85 season to the 1991-92 season. This period of closures coincided with the development of the golden king crab fishery from 1982 - 1989 (Figure 5). Fishery performance data indicate the stock of golden crab is relatively small as observed by the low catch per unit of effort coupled with declines in average weight, size, and geographic distribution. The commercial golden king crab fishery remained closed for the 1992-93 and 1993-94 seasons, but was reopened during the 1994-95 season. Two vessels participated in the fishery and the harvest remains confidential due to the number of participants. However, both catches were very low.

Non-commercial Fisheries

The non-commercial king and Tanner crab fisheries share many similarities. The fisheries have remained open year around despite low abundance. Minimum legal sizes are identical to commercial fishery specifications. Legal gear and gear limits are identical to those cited for non-commercial Tanner crab fishing. Similarly, subsistence gear types are very liberal. The daily possession and bag limit is 6 for king crab.

There is no mechanism in place to directly monitor the effort or harvest in the non-commercial king crab fisheries of PWS. Results of the Sportfish Division's most recent

mail-out survey estimate a harvest of 58 king crab. The Subsistence Division collects limited information on king crab harvest through interviews conducted sporadically among communities within PWS. These data are available under a separate report prepared by ADF&G's Subsistence Division(ADF&G 1999)

Stock Status and Management Measures

The department does not assess golden king crab stocks. In 1988, the Alaska Board of Fisheries adopted a guideline harvest range (GHR) of 40,000 - 60,000 lb for golden king crab in Area E. The GHR was adopted to help stabilize the declines in average size, weight, and distribution of the legal segment of the golden king crab stock that had been observed since the fishery began 1982. The GHR was apparently established too late because the 1989-90 and 1991-92 fisheries failed to attain even the low end of the range. Fishery performance data from the 1994-95 season demonstrated that golden king crab stocks in PWS remained at a low level of abundance. The same data provided no indication of impending recruitment to the legal segment of the stock. The reported catch of sub-legal male and female crab was very low. The commercial fishery for golden king crab has remained closed since the 1994–95 season.

Blue king crab primarily occur in the extreme northwest portion of PWS. The department does not assess the abundance of blue king crab. The blue king crab fishery has remained closed by emergency order following poor fishery performance during the 1991-92 season. Fishermen targeting blue king crab during the 1991–92 season reported few undersize male or female crab. Increased recruitment from immigration is unlikely because even historic aggregations were small and widely dispersed. Therefore, a recovery of the blue king crab stock is not expected in the near future.

Red king crab were widely distributed within the inside waters of PWS. The department assessed the abundance of red king crab within the eastern portion of PWS in conjunction with Tanner crab surveys since 1977. The frequency of king crab captures is believed to be an index of their abundance. During the years pot surveys were conducted, king crab catches ranged from a high of 193 crab in 1978 to 0 crab in 1991 (Table 2). Low catches of red king crab in the more recent trawl survey suggest that trawl gear may compare with pot gear in sampling efficiency for red king crab. Taken collectively the data demonstrate that red king crab populations within this area have been depressed since 1983 and are unlikely to recover in the near future.

Since the early 1980s, the department has issued numerous emergency order closures to conserve king crab stocks. All fishing in Hinchinbrook Entrance and Orca Bay was closed by emergency order from 1982 to the present due to low abundance and to protect low king and Tanner crab stocks. Likewise, the north Montague area has been closed to all fishing since 1991. Aside from the very low-level harvests in the "informational" fishery in 1991-92, commercial fisheries for red and blue king crab

were closed from 1984-85 to the present. Similarly, except for the fishery in 1994-95, the commercial golden king crab fishery was closed from 1992 to the present. These closures were effected to rebuild the stock and provide protection to juvenile and newly mature crabs. Despite the long term closure of these areas, king crab stocks have continued to decline.

LITERATURE CITED

Alaska Department of Fish and Game, Division of Subsistence, 1999, Customary and Traditional Use Worksheet, Marine Invertebrates Including King crab and Tanner Crab: Prince William Sound Management Area, Anchorage.

Table 1. Commercial Tanner crab harvests from the Prince William Sound Management Area, 1968-1999.

Season	Vessels	Landings	Harvest by Area (lb)					Mean Weight (lb/crab)	Number of crabs	Percent New-shell Recruits
				Inside	Outside		Total			
1968-69							1,235,613			
1969-70							1,284,597			
1970-71							4,159			
1971-72							7,788,498			
1972-73							13,927,868			
1973-74				1,658,000	8,500,000		10,158,000			
1974-75				1,187,000	2,667,000		3,854,000			
1975-76				3,322,482	3,810,262		7,132,744			
			Northern	Hinchinbrook	Western	Eastern	Total			
1976-77 [a]	23	316	782,048	766,650	701,725	70,925	2,321,348			
1977-78	38	591	994,721	1,161,831	2,079,549	570,573	4,806,674	2.2	2,184,852	
1978-79	51	783	649,977	708,562	2,248,545	3,443,471	7,050,555	2.1	3,357,408	
1979-80	49	561	140,228	332,583	1,462,059	4,057,847	5,992,717	2.0	2,996,359	
1980-81	30	304	152,196	812,352	1,561,207	250,076	2,775,831	2.1	1,321,824	
1981-82	29	216	351,139	722,834	1,503,253	288,425	2,865,651	No Data		
1982-83	40	304	471,422	31,447	921,663	45,308	1,469,840	2.1	699,924	
1985 [b]	0	0	Closed	Closed	No Effort	No Effort	0			
1986	14	35	137,720	236,241	160,829	587	535,377	2.1	254,941	26
1987	23	65	152,834	222,052	196,246	0	571,132	2.1	271,968	51
1988	21	46	55,929	226,509	191,654	0	474,092	2.1	225,758	34
1989	0	0	Closed	Closed	Closed	Closed	0			
Closed from 1989 to Present										

[a] New districts established as well as a minimum legal size.

[b] Calendar year season established.

Table 2. Tanner and king crab catches by pot and trawl surveys of traditional survey stations in Prince William Sound, 1977-1997.

		Pot Survey Catch Abundance				
Year	Number Of Pots	Female TannerCrab	Male Tanner Crab	Total Tanner Crab (both sexes)	Mean Tanner Crab Per Pot	King Crab (both sexes)
1977	51	1,972	2,773	4,745	93.0	30
1978	146	1,099	6,376	7,475	51.2	193
1979	237	3,210	16,831	20,041	84.6	161
1980	240	2,092	11,012	13,104	54.6	103
1981	216	1,064	8,114	9,178	42.5	36
1982	224	849	4,734	5,583	24.9	30
1983	180	573	3,225	3,798	21.1	3
1984	178	610	3,440	4,050	22.8	18
1985	163	212	2,191	2,403	14.7	15
1986	168	570	2,473	3,043	18.1	18
1987	138	1,010	2,336	3,346	24.2	1
1988	119	750	1,195	1,945	16.3	2
1989	114	459	1,640	2,099	18.4	5
1990	109	255	1,336	1,591	14.6	5
1991	81	331	724	1,055	13.0	23

		Trawl Survey Catch Abundance				
Year	Number Of Tows	Female TannerCrab	Male Tanner Crab	Total Tanner Crab (both sexes)	Mean Tanner Crab Per Tow	King Crab (both sexes)
1991	35	1,786	1,884	3,670	104.9	0
1992	38	1,514	1,783	3,297	86.8	2
1993	38	761	1,254	2,015	53.0	2
1994	38	905	1,098	2,003	52.7	2
1995	33	358	534	892	27.0	0
1996		Biennial survey schedule initiated				
1997	37	341	380	721	19.5	1
1998		Survey not conducted.				

Table 3. Tanner crab population abundance estimates based on trawl survey catches in the Northern and Hinchinbrook Districts, Prince William Sound, 1991-1998.

Male Tanner Crab

Carapace Width (mm)	Shell Age	Survey Year 1991	1992	1993	1994	1995	1996	1997	1998
<73	New	620,890	522,363	406,364	581,695	249,368		214,853	
73-92	New	537,060	287,565	95,881	70,772	31,681	N	56,792	N
							O		O
93-112	New	215,572	367,261	98,978	34,103	16,820		32,361	
	Old	40,529	90,965	92,826	85,066	46,709	S	16,946	S
							U		U
113-134	New	70,933	135,806	108,525	18,154	4,797	R	10,161	R
	Old	145,542	9,474	134,404	155,455	79,397	V	22,852	V
							E		E
135-157	New	20,280	53,397	54,420	4,015	0	Y	1,776	Y
	Old	81,057	843	51,453	46,562	24,864		8,898	
>157	New	935	1,600	0	0	0		0	
	Old	2,773		2,751	627	0		0	
Legal Males		105,045	55,840	108,624	51,204	24,864		10,674	
Total Males		1,735,571	1,469,274	1,045,602	996,449	453,636		364,639	

Female Tanner Crab

Juvenile Females		1,128,480	613,447	403,803	609,771	216,771		154,775	
Mature Females		516,811	808,266	296,547	211,894	106,640		339,719	
Total Females		1,645,291	1,421,713	700,350	821,665	323,411		494,494	

Table 4. Commercial king crab harvests from the Prince William Sound Management Area, 1960-1998.

Season	Harvest Biomass (pounds) All King Crab
1960	246,965
1961	236,081
1962	31,478
1963	43,569
1964	14,028
1965	5,500
1966	11,000
1967	41,800
1968	200,000
1969	48,100
1970	94,300
1971	144,200
1972	296,200
1973	207,916
1974	85,379
1975	53,423
1976-77	17,087
1977-78	86,595
1978-79	114,000

Season	Vessels	Landings	Harvest Biomass (pounds) Red King	Blue King	Golden King	All King Crab	Avg. wt. Golden
1979-80	18	109	52,026	13,662	0	65,688	
1980-81	14	65	32,433	7,282	20	39,735	No Data
1981-82	11	43	25,358	5,634	0	30,992	
1982-83	31	187	30,809	10,433	147,016	188,258	9.7
1983-84	18	69	16,467	5,324	50,535	73,226	8.8
1984-85	4	14	235	closed	40,232	40,467	No Data
1985-86	4	11	closed	closed	51,800	51,800	5.8
1986-87	4	11	closed	closed	65,674	65,837	6.1
1987-88	4	15	closed	closed	68,270	68,270	6.6
1988-89	5	14	closed	closed	48,442	48,442	6.6
1989-90	0	0	closed	closed	closed	0	
1990-91	2	2	closed	closed	2,180	2,180	No Data
1991-92	2	2	60	0	780	840	No Data
1992-93	0	0	closed	closed	closed	0	
1993-94	0	0	closed	closed	closed	0	
1994-95	1	**	closed	closed	**	**	
1995-96			closed	closed	closed		
1996-97			closed	closed	closed		
1997-98			closed	closed	closed		

(**) Harvest data is confidential due to the limited number of participants.

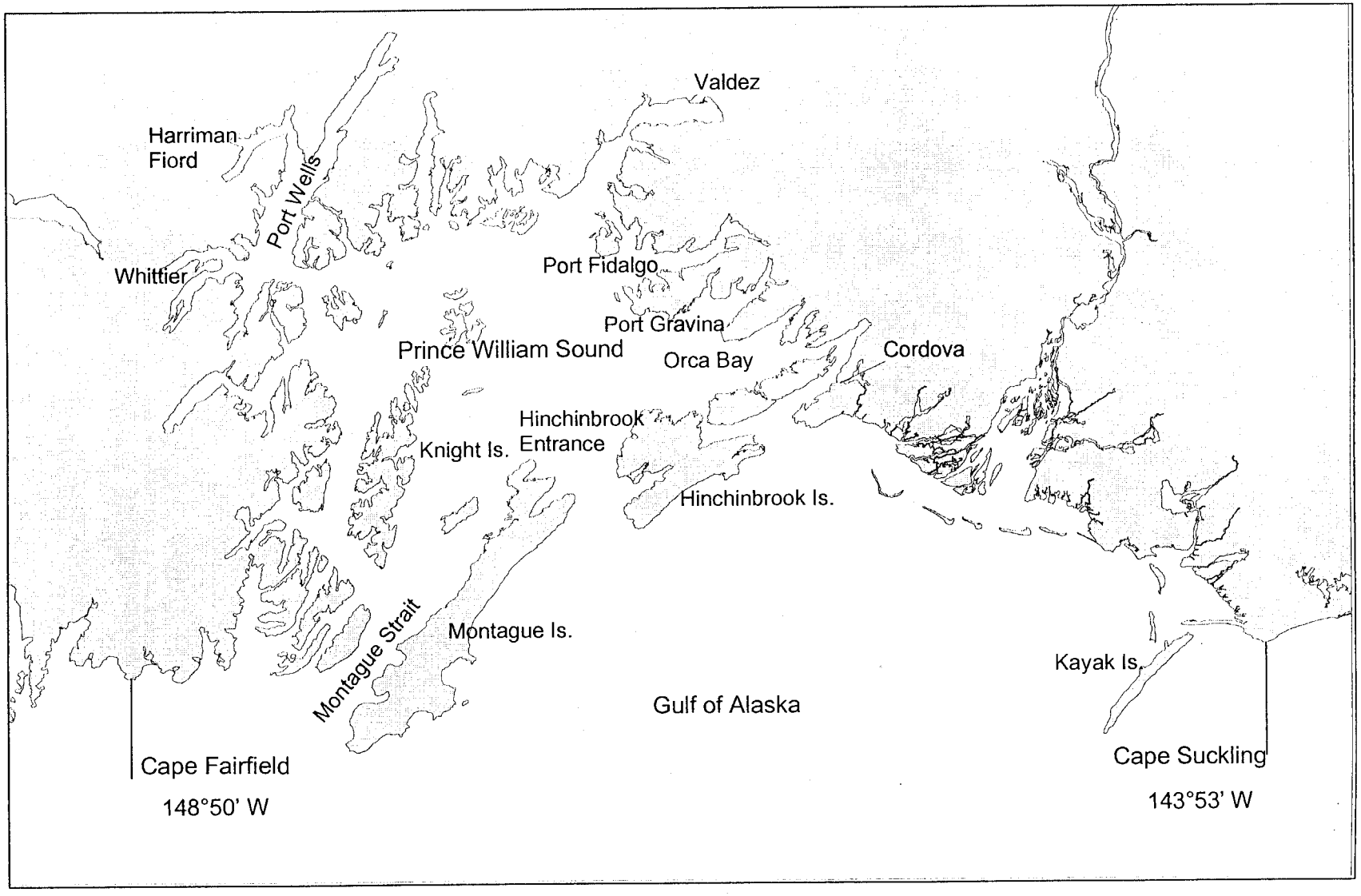

Figure 1. Prince William Sound shellfish registration area.

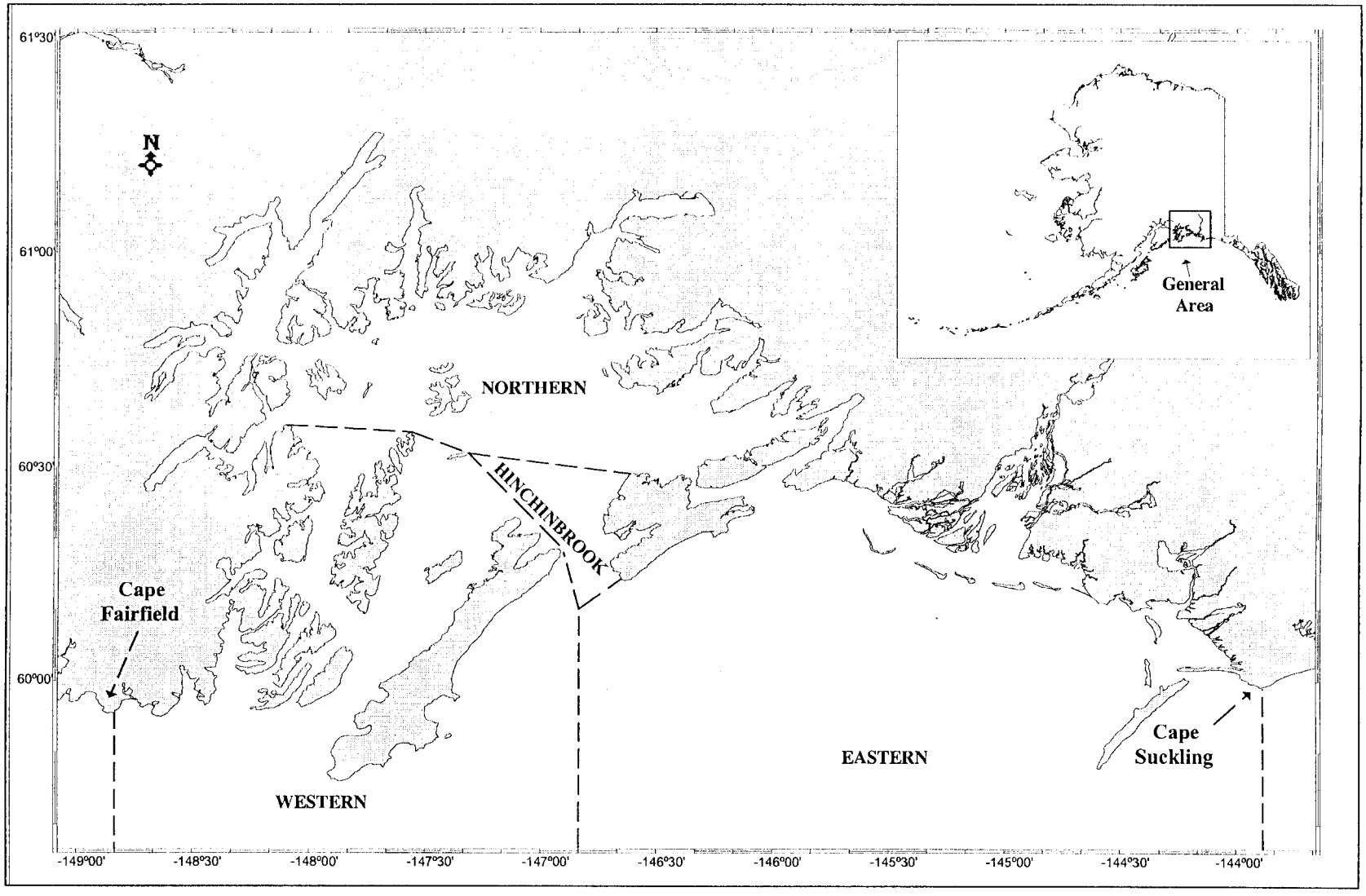

Figure 2. Prince William Sound Tanner crab fishing districts.

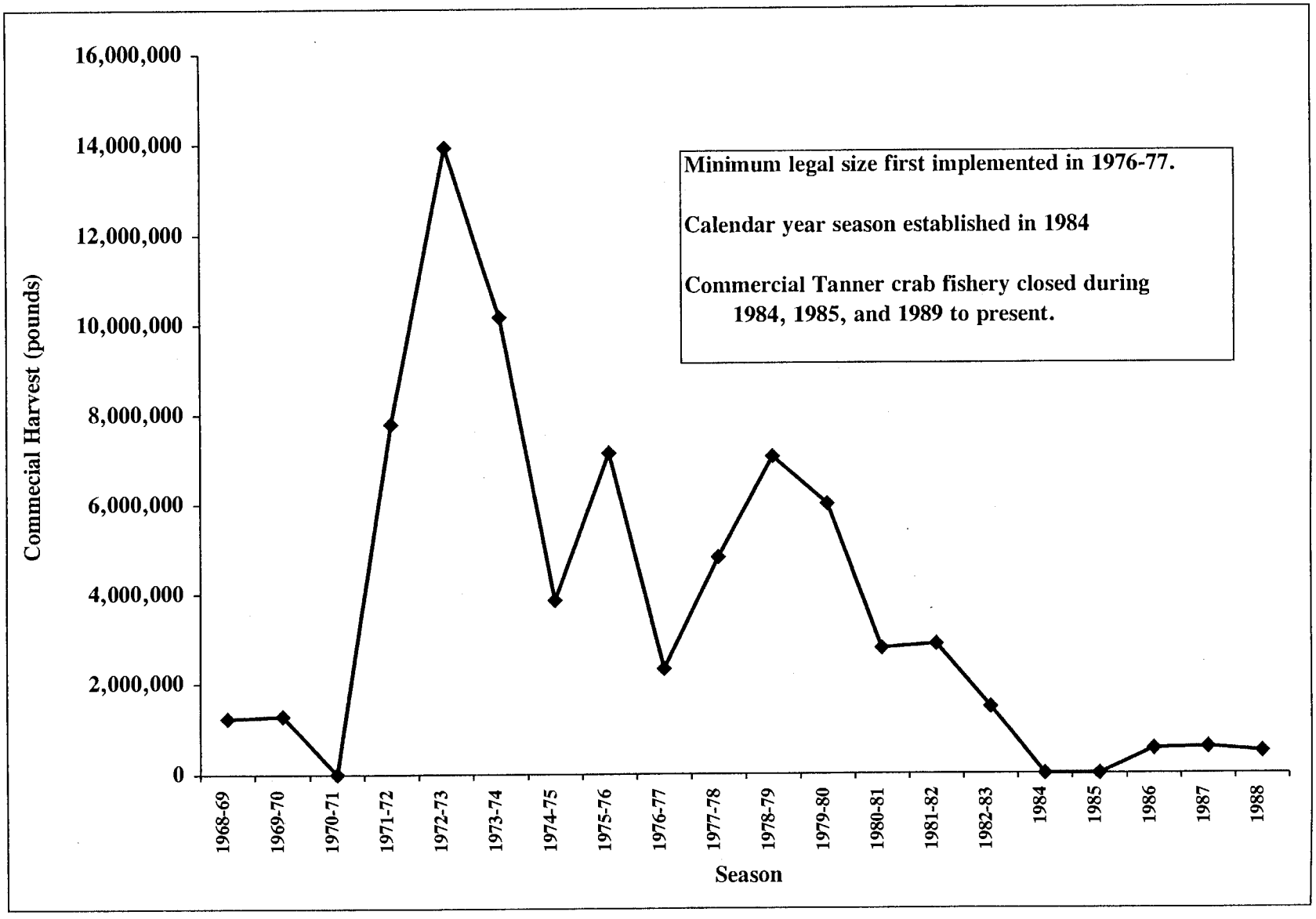

Figure 3. Tanner crab harvest from the Prince William Sound Management Area, 1968 – 1988.

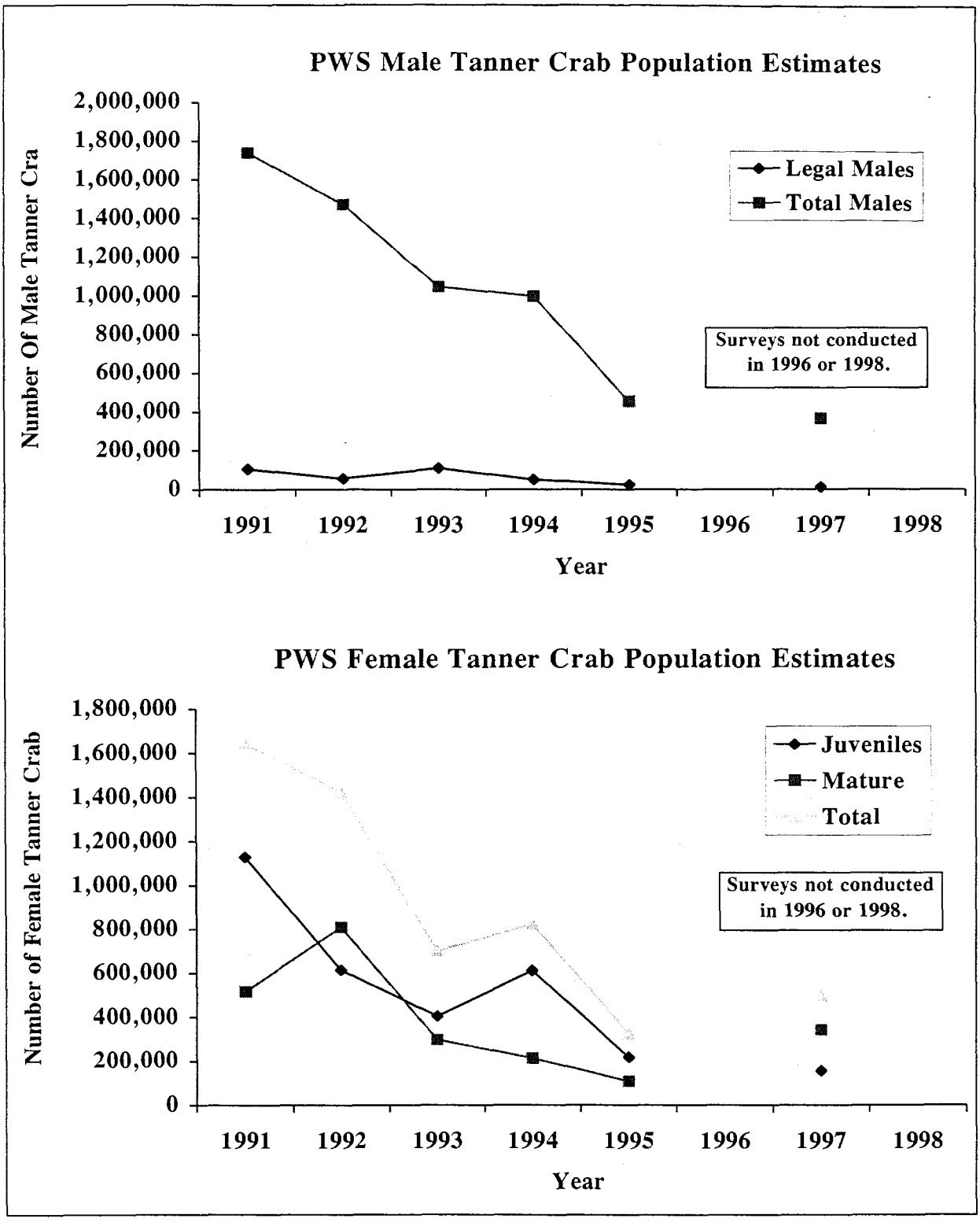

Figure 4. Tanner crab population estimates from Prince William Sound trawl surveys, 1991-1998.

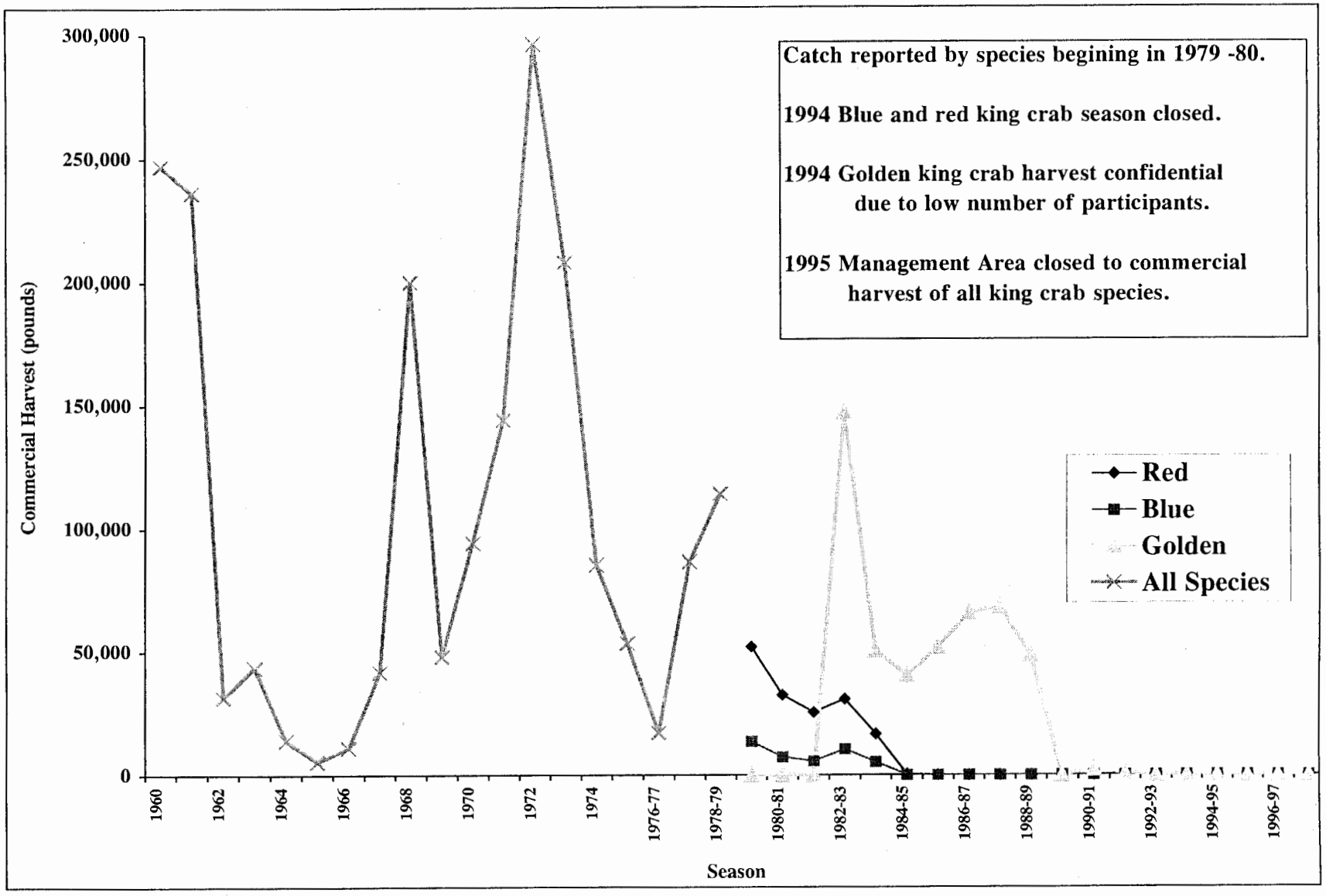

Figure 5. King crab harvest in pounds, Prince William Sound Management Area, 1960 - 1998.

OEO/ADA STATEMENT

The Alaska Department of Fish and Game administers all programs and activities free from discrimination on the basis of sex, color, race, religion, national origin, age, marital status, pregnancy, parenthood, or disability. For information on alternative formats available for this and other department publications, contact the department ADA Coordinator at (voice) 907-465-4120 or (telecommunication device for the deaf) 1-800-478-3648