

WESTWARD REGION REPORT ON 1997
STATE MANAGED PACIFIC COD FISHERY

By
David Jackson
and
Dan Urban

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INTRODUCTION

Groundfish harvest in the Gulf of Alaska (GOA) and Bering Sea/Aleutian Islands (BSAI) are primarily managed by the National Marine Fisheries Service (NMFS) under guidelines developed by the North Pacific Fishery Management Council (NPFMC). The council establishes the groundfish Acceptable Biological Catch (ABC) specifications. The ABC may be reduced somewhat due to biological considerations to the level available for directed fishing, the Total Allowable Catch (TAC).

Authorization for federal control of resources from 3-200 miles (EEZ) came from the Magnuson Act passed by the United States Congress in 1976. The State of Alaska has management authority for groundfish resources within territorial waters from zero to three miles, but for most groundfish fisheries the Alaska Department of Fish and Game (ADF&G) issues a global emergency order (EO) at the beginning of each year, making state management coincide with the federal inseason management decisions. This establishes parallel state and federal groundfish seasons.

Some exceptions to the parallel seasons occur where the state has established separate harvest quotas and seasons for state waters. In the Westward Region these include the nearshore rockfishes, sablefish, lingcod and the new state water Pacific cod fisheries. The state has also established registration areas which differ from the federal management areas. These are designated as the Eastern Gulf of Alaska, Prince William Sound, Cook Inlet, Kodiak, Chignik, South Alaska Peninsula, Bering Sea-Aleutian Islands and Chukchi-Beaufort (Figure 1). The latter five registration areas are within the Alaska Department of Fish and Games' (ADF&G) Westward Region. The federal management areas are shown in Figure 2.

PACIFIC COD

Biology and Distribution

The Pacific cod *Gadus macrocephalus* occurs on the continental shelf and upper slope waters throughout the Gulf of Alaska, Aleutian Islands and Bering Sea to the northern parts of the Yellow Sea (Hart 1973). Grant et al. (1987) found no genetic differences in any of their North American samples, but a genetically distinct stock was detected in the Asian cod. This genetic homogeneity over large areas of the North Pacific may be due to the large scale migrations found in cod. Cod tagged in the Bering Sea have been found as far east as Kodiak, with substantial movement of fish from the Bering Sea to the Shumagin Islands and from the Aleutian Islands to the Bering Sea (Shimada and Kimura 1994). The council manages the Gulf of Alaska and Bering Sea/Aleutian Islands as separate stocks because so little is known of the magnitude and regularity of these long distance migrations (Thompson et al. 1996).

Besides large scale movements, Pacific cod also exhibit seasonal onshore/offshore migrations. At the high latitudes of the Bering Sea, the stimulus for offshore migration appears to be avoidance of the intense cooling of inshore waters that follow ice formation in favor of warmer waters at depth. The spring migration, shoreward, is most likely timed to the warming of the coastal shelf environment (Bakkala 1984). At lower latitudes, seasonal migrations are reversed. Pacific cod migrate to deep offshore waters during summer months to avoid excessively heated ($>10^{\circ}$ C) coastal waters. A returning inshore spawning migration occurs each winter (Karp 1982, Mishima 1984).

Part of the seasonal migration includes the formation of spawning aggregates, usually during the first third of the calendar year. The spawning aggregates are densely congregated and typically cod are more dispersed during the remainder of the year. Females first mature at about 40 cm in length (16 inches) at age 2; 50% of females are mature at about 55 cm (22 inches). Fecundity varies with length; each female releases 200,000 to 3.0 million eggs. Juvenile cod are thought to occupy nearshore, coastal waters during the first year of life and grow to 8-13 cm (3-5 inches) by their first fall. Age 1 cod are about 25 cm (10 inches) and are found in slightly deeper water. Age 2 (about 40 cm; 16 inches) and age 3 (50cm; 20 inches), and older fish tend to winter in progressively deeper waters. Abundance of cohorts declines rapidly, and fish older than age 8 are relatively uncommon (Bechtol 1995). One of the oldest cod documented is a 19 year old whose otolith was aged by the the Alaska Fisheries Science Center of NMFS. Cod occasionally reach about 115 cm (45 inches). The NMFS assumes an annual natural mortality rate of 37% (Thompson et al. 1996). Cod begin to enter the fishery in large numbers by age three.

Historic Background

Fishery statistics compiled by NMFS show landings from the Gulf of Alaska beginning in 1964 with the highest harvests occurring during the early 1990's. The average catch since 1977 has been approximately 83.8 million pounds (38,000 mt)¹. Preliminary 1997 harvest figures show a Gulf of Alaska catch of 151.7 million pounds (68,825 mt) with nearly two-thirds coming from the Central Gulf and one-third from the Western Gulf (Figure 3). Since 1989, the harvest of Pacific cod from GOA state waters has ranged from 12.1 million pounds (5500 mt) in 1989 to 35.5 million pounds (16,100 mt) in 1997 (Table 1).

The Alaska Board of Fisheries in 1996 adopted state water Pacific Cod Management Plans for fisheries in 5 groundfish areas, Prince William Sound, Cook Inlet, Kodiak, Chignik and South Alaska Peninsula (Figure 4). Fishing would not be restricted to vessels qualified under the federal moratorium program. Included within the plans were season, gear and harvest specifications. The fishing seasons were subsequent to the parallel federal season which generally closed in the spring. Exclusive registration areas

¹ All poundages are in round weight.

were established and the fishery was limited to pots or jig gear. No more than 60 pots or 5 jig machines could be used. The harvest level was based on the estimate of allowable biological catch (ABC) of Pacific cod as established by the NPFMC. The initial harvest levels were set at 15% of the Western Gulf ABC to be reserved for the South Alaska Peninsula Area, 15% of the Central Gulf ABC to be apportioned between the Kodiak, Chignik and Cook Inlet Areas and 25% of the Eastern Gulf ABC for the Prince William Sound Area. Harvest levels from the Central and Western Gulf are scheduled to step up to 20% and 25% of the area ABC's if production levels can be achieved.

Additional regulations included a 58' vessel size limit in the Chignik and South Alaska Peninsula Areas and allocations between gear types in Kodiak, Cook Inlet and Prince William Sound. The fishery management plans also provided for removal of restrictions on exclusive area registrations, vessel size and gear limits after October 31 to increase late season production.

The first year of fishing under the state water Pacific Cod Management Plan was 1997. Two hundred ten vessels caught over 18 million pounds (8,200 mt) worth approximately \$3.6 million. Highest catches came from Sanak Island, the area just south of Sand Point, Chignik Bay, and from the west side of Kodiak Island (Figure 5).

Harvest Monitoring

ADF&G in the Westward Region actively monitored the 1997 state waters cod harvest. Dockside samplers were in place at Kodiak, Chignik, Sand Point, and King Cove during most of the season. Samplers interviewed skippers, measured cod lengths, determined average weights, assessed the reproductive state of the fish, and collected otoliths of cod from the commercial catch.

Preliminary results of the length measurements show that the Kodiak average length is significantly larger than that of the Chignik fish, which in turn was larger than the South Alaska Peninsula average (Figure 6, z test, $p < .0002$, Devore and Peck 1993). These length differences are also reflected in the average weights of the fish from the three areas. Kodiak fish were heaviest, averaging 9.0 lbs., Chignik fish averaged 7.4 lbs. and South Alaska Peninsula fish 7.0 lbs. These length and weight differences may mirror actual differences in the cod of these areas, but could also be associated with seasonal differences in the fisheries and sampling in the different areas. The average size of the jig caught fish was larger than pot caught fish (Figure 7, z test, $p < .0002$, Devore and Peck 1993).

Research Projects

In addition to monitoring the harvest, ADF&G has initiated several research projects relating to Pacific cod. A comparative gear study conducted with NMFS in October 1997

was designed to assess the differences between the nets and catch sampling procedures used by each of the agencies when they survey in the Gulf of Alaska. The ADF&G trawl surveys are designed primarily to assess crab stocks while the NMFS surveys focus on groundfish. It is hoped this study will allow the integration of results from the past and in the future allowing more overall accuracy in groundfish assessment.

Little is known of cod migrations in the Gulf of Alaska. A cod tagging study was begun in the Gulf with the goal of complementing the Shimada study (Shimada and Kimura 1994) which did most of its tagging in the Bering Sea. Nearly 1,000 fish were tagged during the summer and fall of 1997 in the area from False Pass to Kodiak Island. Tagging is scheduled to continue at least for two more years. Several tags have already been returned but too few to reach any conclusions.

The cod pot fishery has been one of the major sources of Tanner crab bycatch in the Gulf of Alaska. ADF&G has a study underway looking at pot modifications which will best exclude Tanner crabs without decreasing the cod catch. Industry was invited to submit designs which were subjected to initial testing on the grounds in November 1997. Further testing is scheduled for March 1998.

An additional cooperative study is planned between ADF&G and NMFS which will trawl the same area off Kodiak Island every third month for one year, starting in June 1998. While this study is still in the planning stages, some of the tentative goals for relating to Pacific cod include investigation of the seasonal distribution of stocks, timing of spawning, size of maturity, and seasonal changes in food habits.

KODIAK AREA

A preseason guideline harvest level of 8.5 million pounds of Pacific cod was set for the Kodiak area and announced by news release on January 28, 1997. The catch was to be equally divided between pot gear and jig gear. A delay in regulatory approval caused the season opening to be delayed from March 25 to April 4. Fishing with pot gear was successful during the first month with landings of up to 1.4 million pounds per week. By May 4, the fleet had taken the 4.25 million pound harvest allocated to pot gear and the harvest was then restricted to jig gear only. Interest in fishing with jig gear increased steadily throughout the spring with the peak in landings during late May and June. There were over 200,000 pounds per week landed during the last part of June (Figure 8).

The jig fleet had landed approximately 2.0 million pounds of Pacific cod by the end of August. Success with jig gear was dwindling as the fish moved into deeper water and very little production was achieved thereafter. In accordance with the management plan the fishery was reopened to pot gear on September 1. Fewer fishermen participated than during the spring and landings averaged only 86,000 pounds per week throughout the fall.

Restrictions on exclusive registration areas and gear limits were removed beginning October 31 but this did not noticeably increase the low harvest rate.

The fishing season continued to the regulatory closure date of December 31. The 1997 harvest of Pacific cod in the state managed fishery was 7.60 million pounds taken by 105 vessels. There were 5.6 million pounds taken by 36 pot vessels and 2.0 million pounds taken by 71 jig vessels (Table 1). Two vessels fished both gear types. Forty-one separate statistical areas were fished with biggest poundage coming from off the capes on the west side of the island and from Chiniak Bay near the city of Kodiak (Table 2, Appendix A).

Since the 1997 harvest did not achieve the preseason guideline harvest level of 8.5 million lbs., the step up provisions will not be in effect for the 1998 fishery. The guideline harvest level for the Kodiak Area in 1998 will remain 7.5% of the Central Gulf ABC. With the reduction of the Federal ABC to 49,080 mt, the resulting Kodiak 1998 state waters guideline harvest level will be 8.1 million pounds.

CHIGNIK AREA

A preseason guideline harvest level (GHL) of 5.9 million pounds of Pacific cod was set for the Chignik Area and announced by news release on January 28, 1997. The fishery opened by regulation on April 15, 1997; however, there were no landings until the week ending May 18 (Figure 8). Registrations for the season included 12 vessels using pot gear and 6 vessels fishing jig gear. By the regulatory summer closure of June 15, the small fleet had landed nearly 1.0 million pounds of Pacific cod (Table 2). Only six of the 12 registered pot vessels made landings. Four statistical areas were fished with most poundage coming from Chignik Bay (Table 5, Appendix B).

Interest in the fishery was low after the season reopened on August 1. Through the months of August and September there were approximately 160,000 pounds taken in 15 landings. Most of this harvest was processed at locations outside of the area.

There was no activity in the state water Pacific cod fishery after October. The emergency order eliminating the restrictions on exclusive registration, vessel size and gear limits did not have any effect increasing production from this area. As the 1997 fishery did not achieve preseason harvest levels, the step up provisions will not be in effect for 1998. The guideline harvest level for the Chignik Area in 1998 will remain 5.25% of the Central Gulf ABC for Pacific cod, resulting in a GHL of 5.7 million pounds.

SOUTH ALASKA PENINSULA AREA

The GHL of 9.4 million pounds for the South Alaska Peninsula area was announced by news release on January 28th. The fishery began April 4, 1997. Catches were good at the start of the season with the fleet landing over 1.0 million pounds per week (Figure 8). Effort declined with the onset of salmon season and landings were generally less than 100,000 pounds per week throughout the summer. By mid October the catch was 7.2 million pounds. On October 31, the Department removed restrictions on exclusive registration, vessel size limit and gear limits. The harvest pace increased with landings exceeding 200,000 pounds per week as larger vessels participated during November and December. The majority of this late season production came from the south side of the Aleutians and was landed in Dutch Harbor.

By December 14, the Department estimated 9.1 million pounds had been landed from the state water fishery. A closure was announced for 12:00 noon on December 22, 1997. The season harvest of 9.37 million pounds was taken by 53 vessels using pot gear and 40 vessels using jig gear. The jig fishermen landed 350,000 pounds or 3.7% of the catch. Forty-nine statistical areas were fished with major catches in the Sanak Island area, and in the Shumagin Islands near Sand Point (Table 6, Table 7, Appendix C).

Since the 1997 production achieved the preseason GHL, the step up provisions of the Pacific Cod Management Plan will be effective for 1998 fishery. The guideline harvest for the South Alaska Peninsula Area will be 20% of the Western Gulf ABC for Pacific cod which equates to a 12.0 million pound allocation.

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Table 1. Pacific Cod harvest from the Central and Western Gulf, 1989-1997.

YEAR	NMFS AREA	VESSELS	LANDINGS	POUNDS ^a	STATE WATERS	
					POUNDS ^a	%
1989	CENTRAL	236	1460	60.4	4.4	7%
	WESTERN	137	598	31.1	7.8	25%
1990	CENTRAL	595	3222	92.4	11.8	13%
	WESTERN	165	985	85.7	13.1	15%
1991	CENTRAL	908	4389	101.2	19.4	19%
	WESTERN	280	1380	76.5	4.8	6%
1992	CENTRAL	1093	5115	89.9	16.3	18%
	WESTERN	296	1452	73.7	13.2	18%
1993	CENTRAL	727	3347	72.1	11.5	16%
	WESTERN	166	987	39.8	1.9	5%
1994	CENTRAL	632	2825	63.5	12.9	20%
	WESTERN	208	1150	32.4	7.4	23%
1995	CENTRAL	907	4369	97.1	21.7	22%
	WESTERN	266	1115	42.3	9.0	21%
1996	CENTRAL	655	3916	91.7	16.9	18%
	WESTERN	231	1336	46.2	12.9	28%
1997 ^b	CENTRAL	799	4310	84.3	19.8	23%
	WESTERN	211	1223	55.3	15.6	28%

^a Total round weight catch in millions of pounds for all gear types. Source: ADF&G fish ticket database.

^b Database through 11/13/97.

Table 2. Catch and effort, Kodiak Area state water Pacific cod fishery, 1997.

Gear	Vessels	Landings	Pounds	Price/ pound	Avg. Weight (lbs)
Pot	36	229	5,608,326	0.23	8.99
Jig	71	481	1,992,245	0.23	10.78
Total	105 ^a	710	7,600,571	0.23	9.13

^aTwo vessels fished both gear types.

Table 3. Catch by statistical area from the 1997 state water Pacific cod fishery in the Kodiak area.

Stat-area	Pounds	Vessels	Landings ^a
515801	10,867	4	4
525701	560,643	29	114
525703	186,742	11	26
525731	326,147	22	70
525732	76,107	5	7
525733	648,385	47	186
525802	252,486	3	7
525803	147,591	10	15
525805	33,759	3	5
525806	37,358	7	13
525834	385,642	3	6
535631	377,620	24	58
535633	40,212	4	7
535634	331,528	21	48
535705	44,310	5	9
535732	997,944	11	36
535733	138,488	6	16
535734	73,326	7	9
535803	393,103	8	19
545632	106,744	7	15
545633	55,619	4	7
545701	410,644	4	11
545703	336,162	3	9
545733	757,020	6	21
545802	174,795	5	9
545803	272,020	3	10
Other ^b	425,308	17	28
	7,600,571	105	710

^aPartial landings from a statistical area are counted as one.

^bTotal of 14 statistical areas.

Table 4. Catch and effort, Chignik Area state water Pacific cod fishery, 1997.

Gear	Vessels	Landings	Pounds	Price/ pound	Avg. Weight (lbs)
Pot	6	56	1,106,042	0.18	7.48
Jig	6	18	37,219	0.18	(not available)
Total	12	74	1,143,261	0.18	7.48

Table 5. Catch by statistical area from the 1997 state water Pacific cod fishery in the Chignik area.

Stat-area	Pounds	Vessels	Landings
595531	142,293	3	13
585601	946,766	9	57
Other ^a	54,202	3	5
	1,143,261	12	74 ^b

^a Total of two statistical areas.

^b Partial landings from a statistical area are counted as one.

Table 6. Catch and effort statistics, South Alaska Peninsula Area state water Pacific cod fishery, 1997.

Gear	Vessels	Landings	Pounds	Price/ pound	Avg. Weight (lbs)
Pot	53	469	9,022,346	0.19	7.02
Jig	40	173	348,152	0.18	7.25
Total	88 ^a	642	9,370,498	0.18	7.02

^aFive vessels fished both gear types.

Table 7. Catch by statistical area from the 1997 state water Pacific cod fishery in the South Alaska Peninsula area.

Stat-area	Pounds	Vessels	Landings
595533	116,898	3	7
605501	129,668	14	36
605502	893,580	9	34
605504	1,117,078	41	195
605505	21,060	3	3
605506	415,447	7	41
605507	341,443	11	54
605531	10,465	5	8
605532	24,292	5	13
615508	587,306	6	35
615531	97,699	3	6
625401	1,714,926	7	44
625431	233,725	7	25
625437	123,163	4	8
625501	161,152	7	21
625502	12,309	4	5
635432	467,984	5	26
665332	745,119	10	54
665333	259,062	7	8
other ^a	1,898,121	20	85
	9,370,498	88	642 ^b

^a Total of 30 other statistical areas.

^b Partial landings from a statistical area are counted as one.

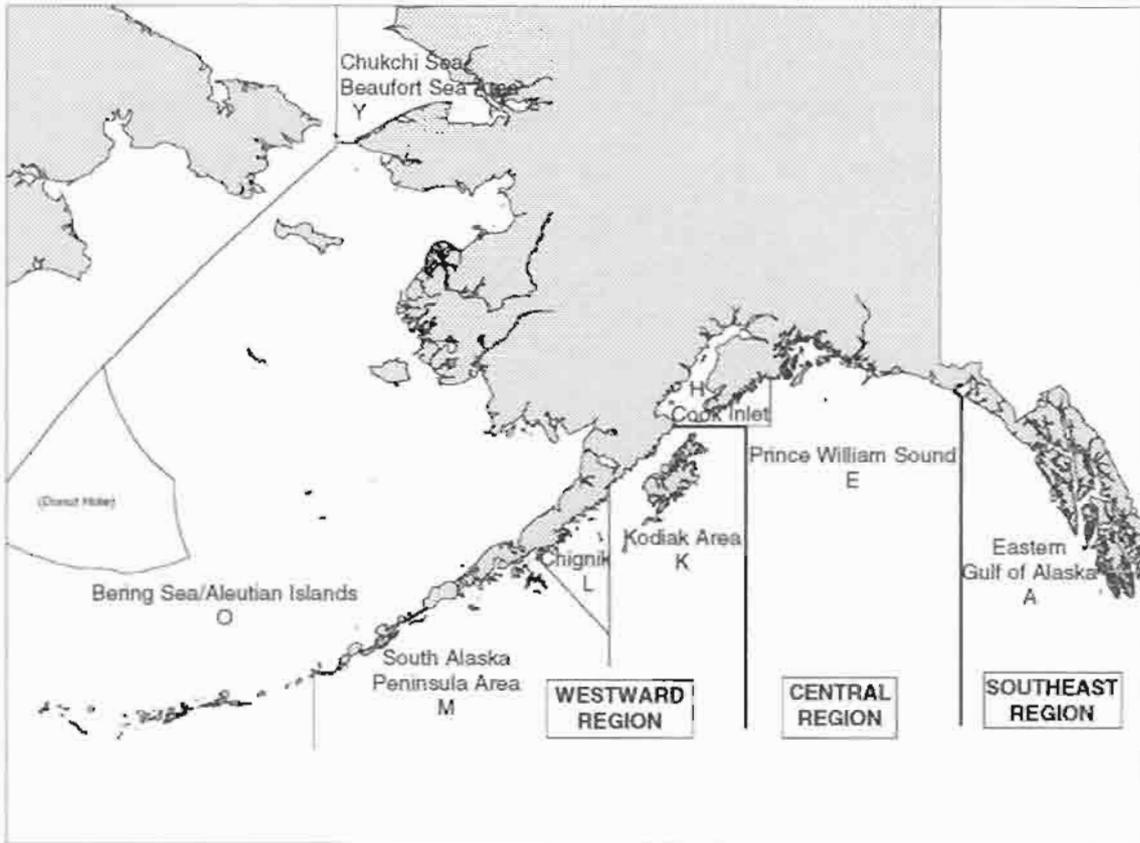


Figure 1. State of Alaska groundfish registration areas and regions.

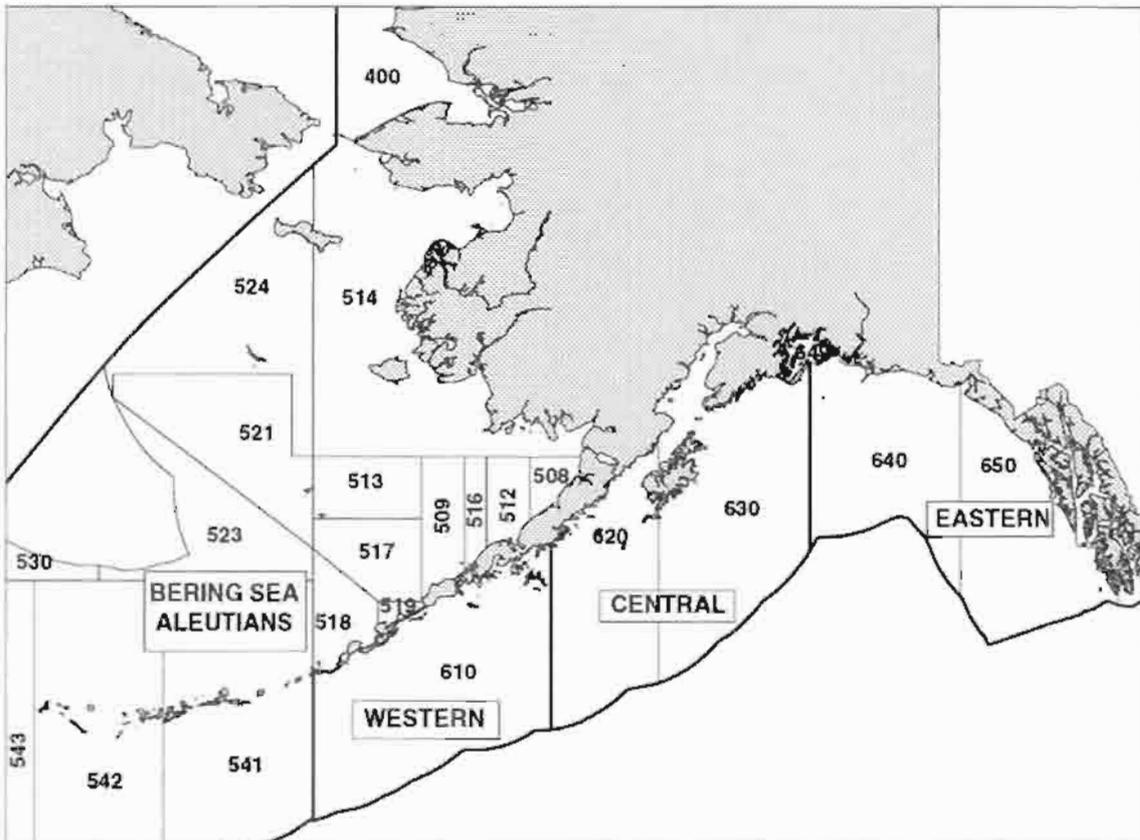


Figure 2. Federal groundfish management areas.

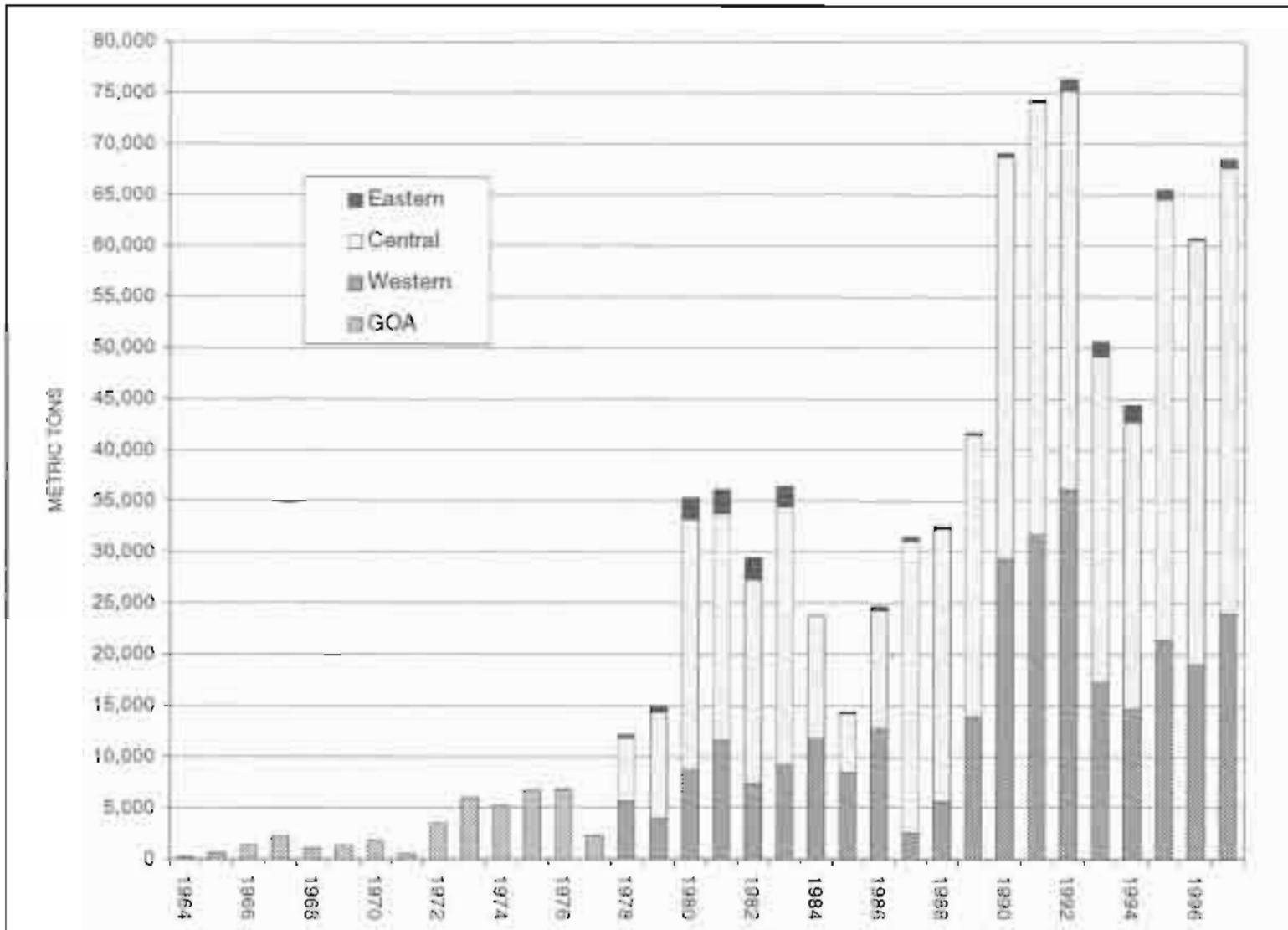


Figure 3. Pacific Cod landings in the GOA 1964-1997. Source: NPFMC SAFE report, Nov. 1997.

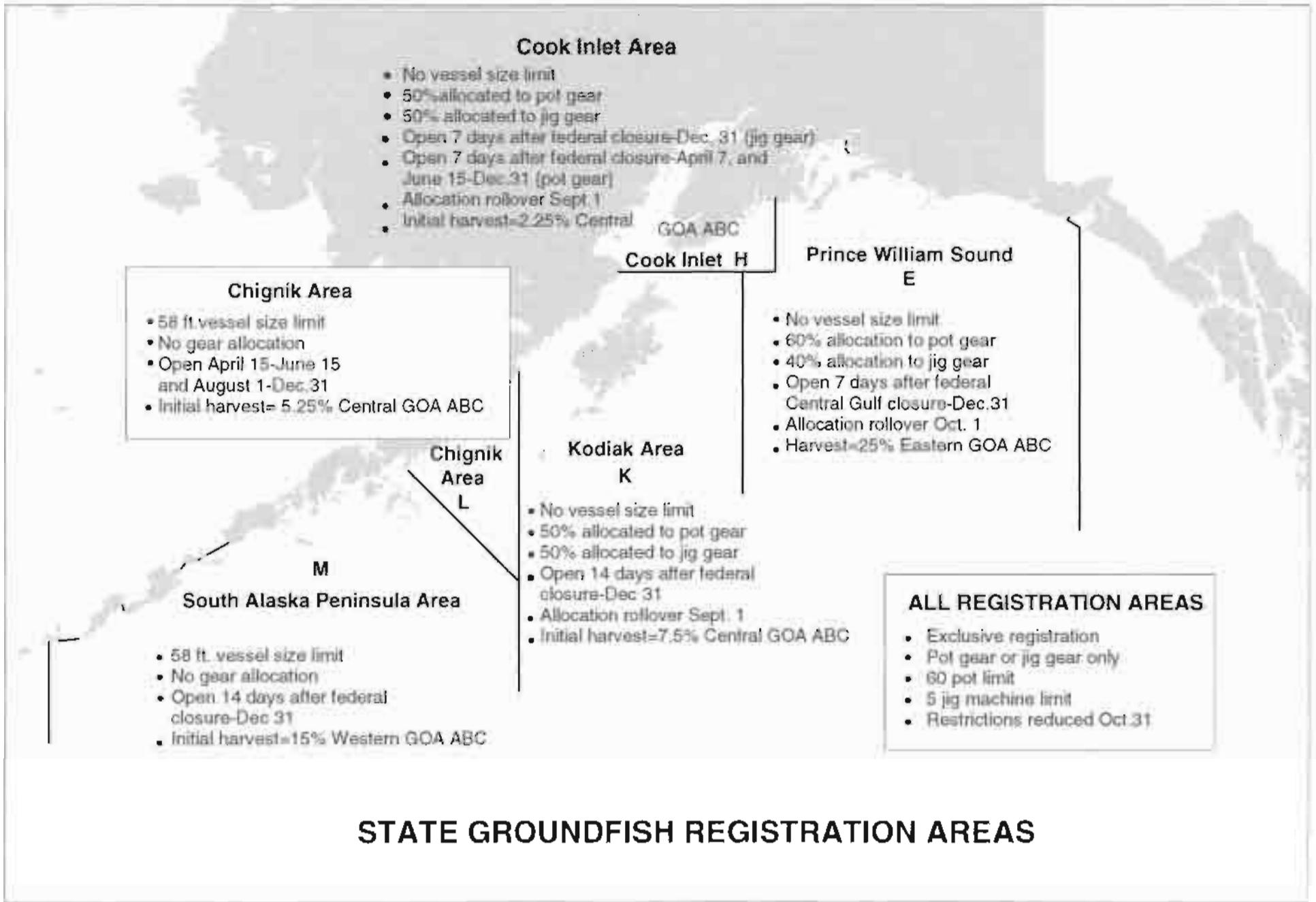


Figure 4: Elements of State Water Pacific Cod Management Plans

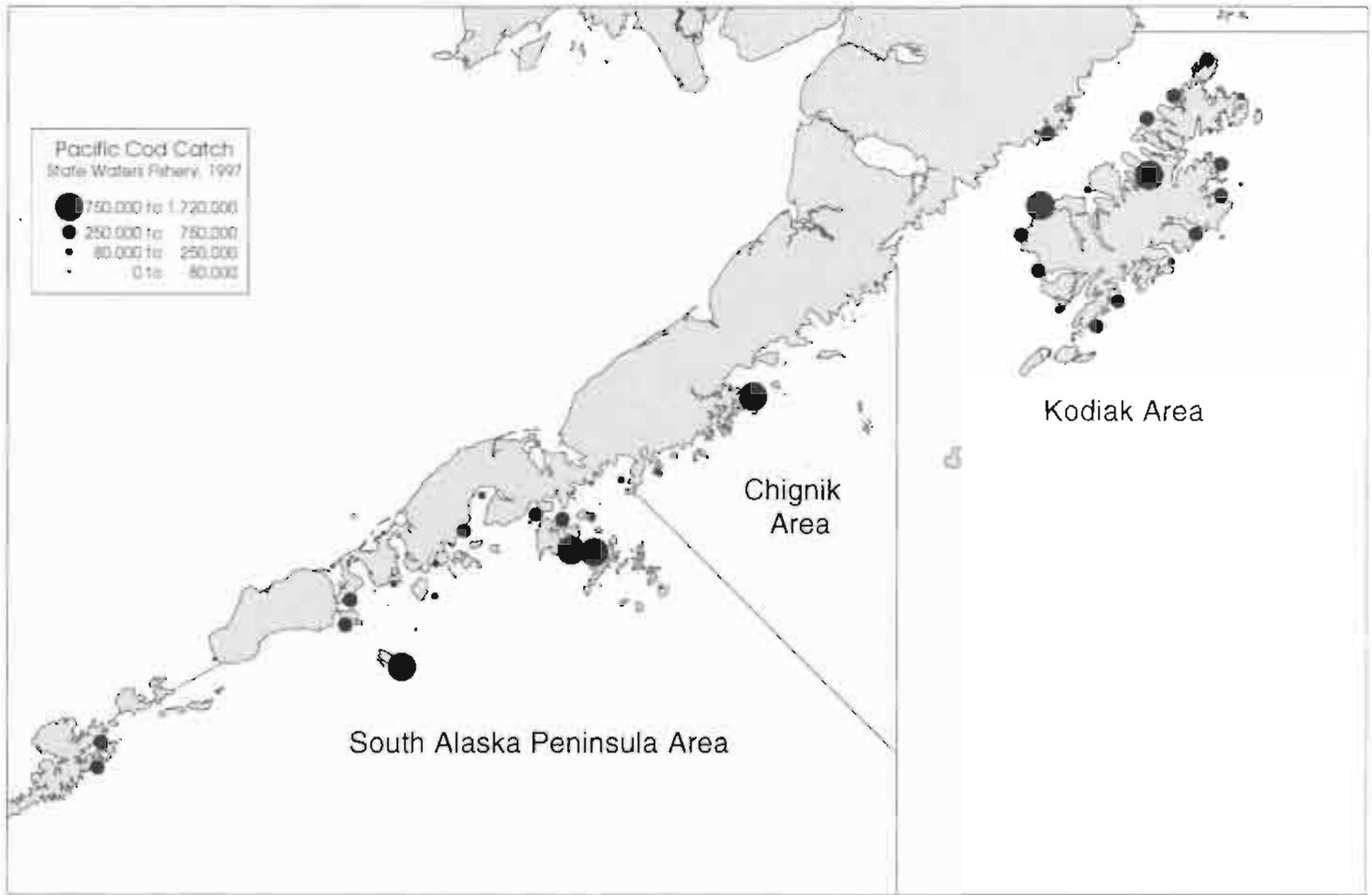


Figure 5. Westward Region state water Pacific cod catches by statistical area. Confidential catches are not shown.

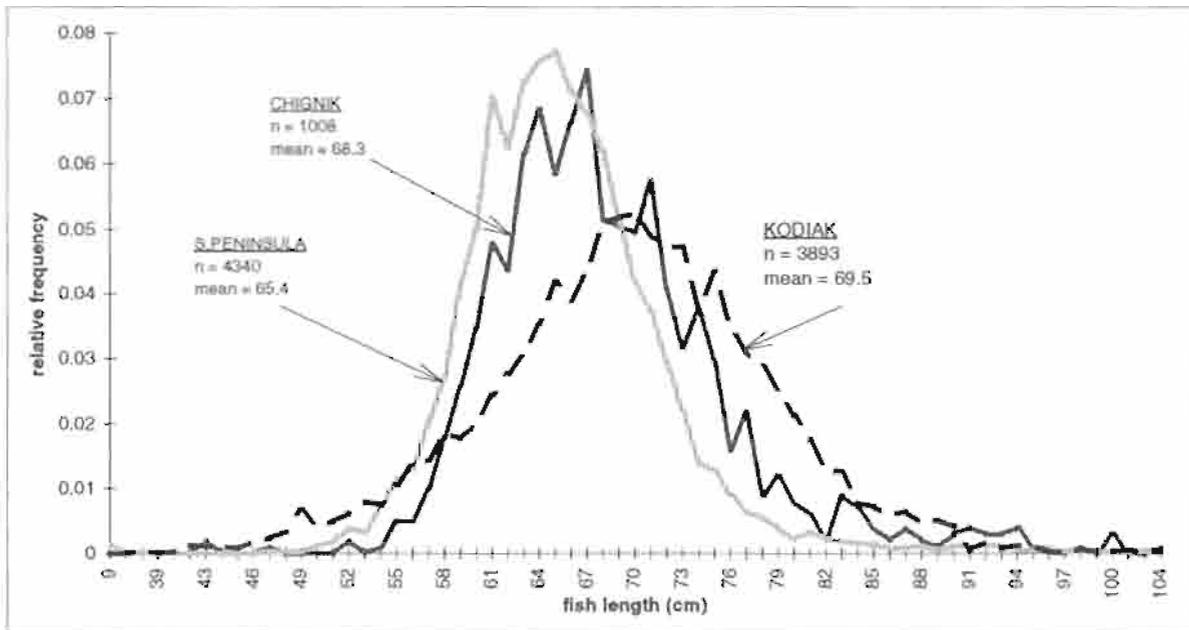


Figure 6. Pacific cod lengths by area collected from the 1997 state water fishery in the Westward Region.

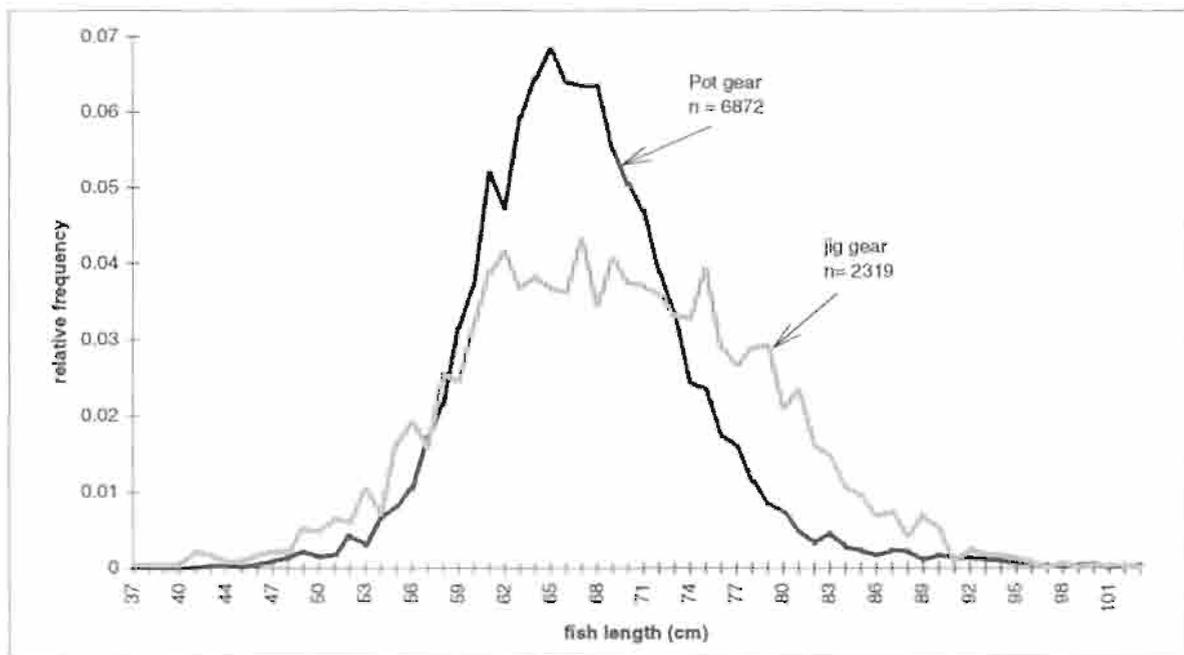


Figure 7. Pacific cod lengths by gear type taken from the 1997 state water fishery in the Westward Region.

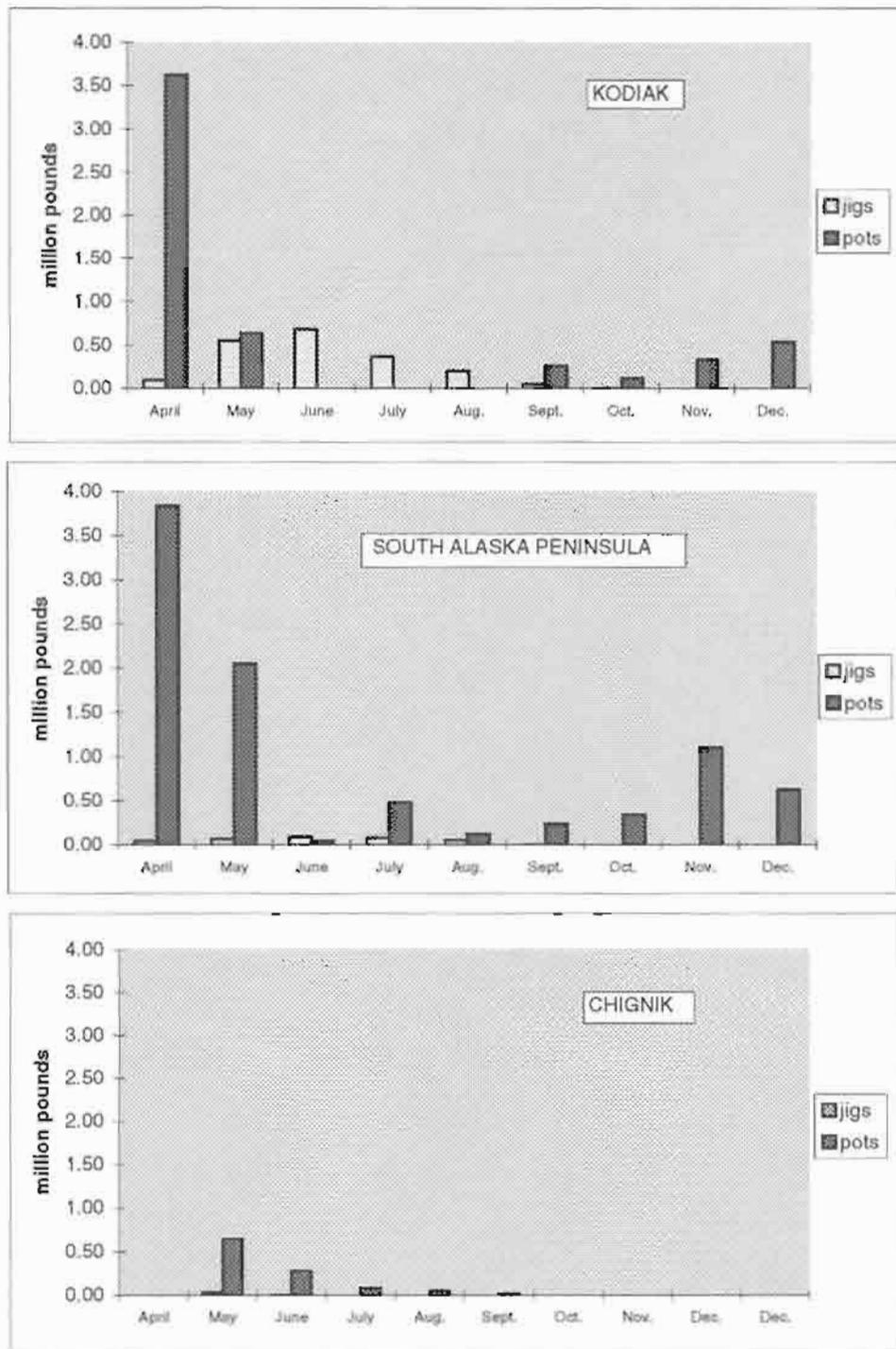
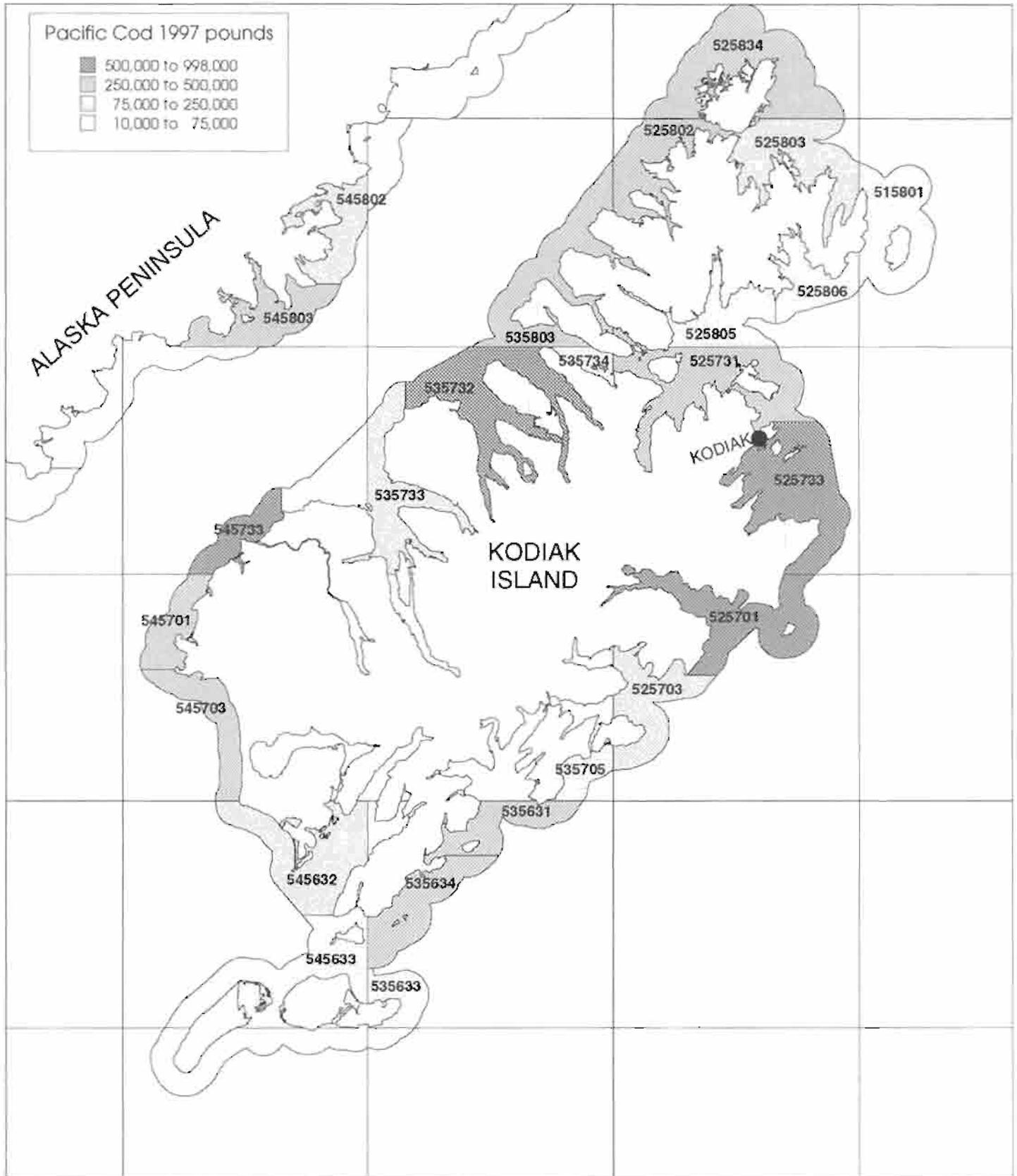
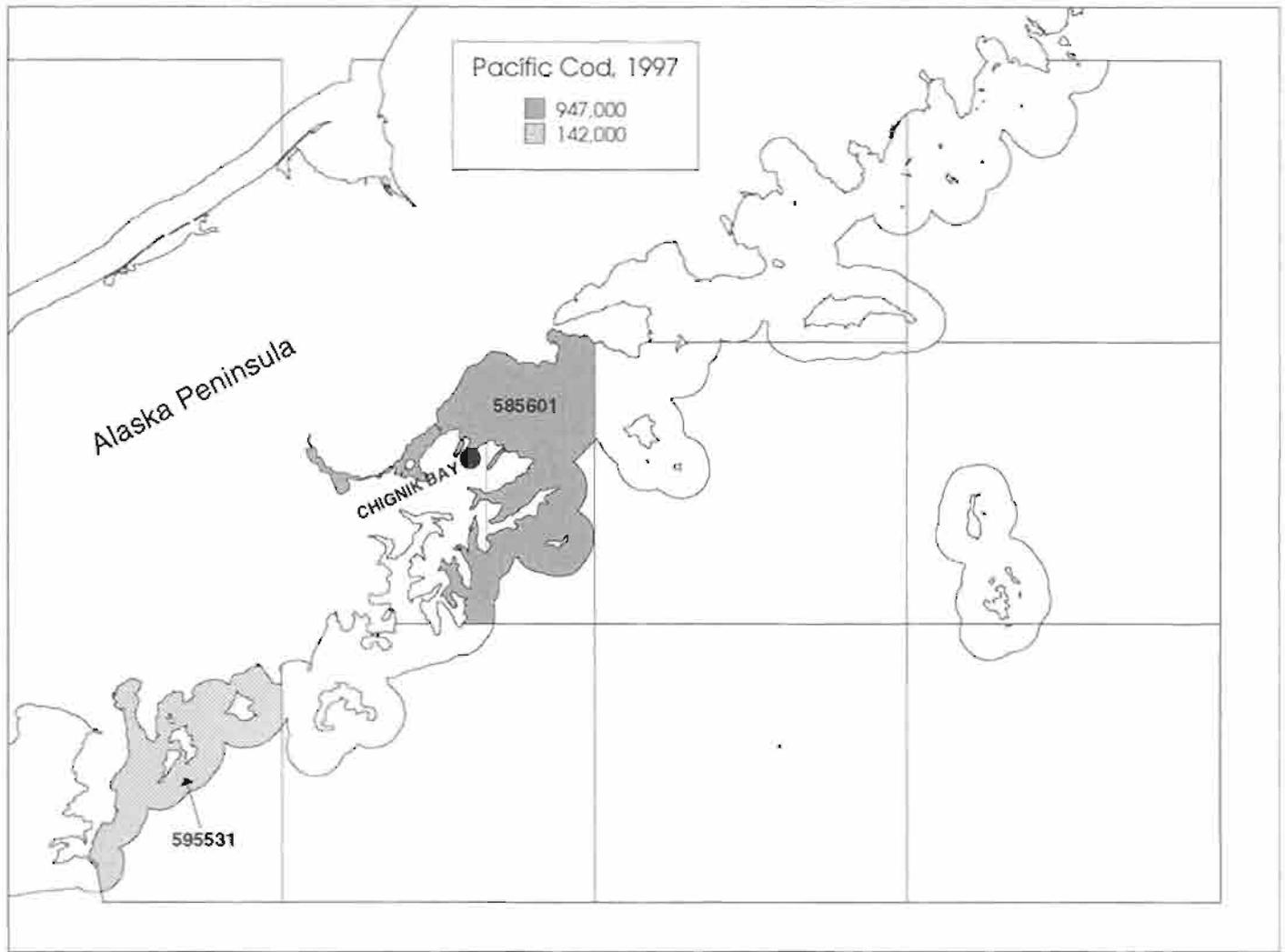


Figure 8. The 1997 Pacific cod catch by month by gear type for the Kodiak, Chignik, and South Alaska Peninsula areas.

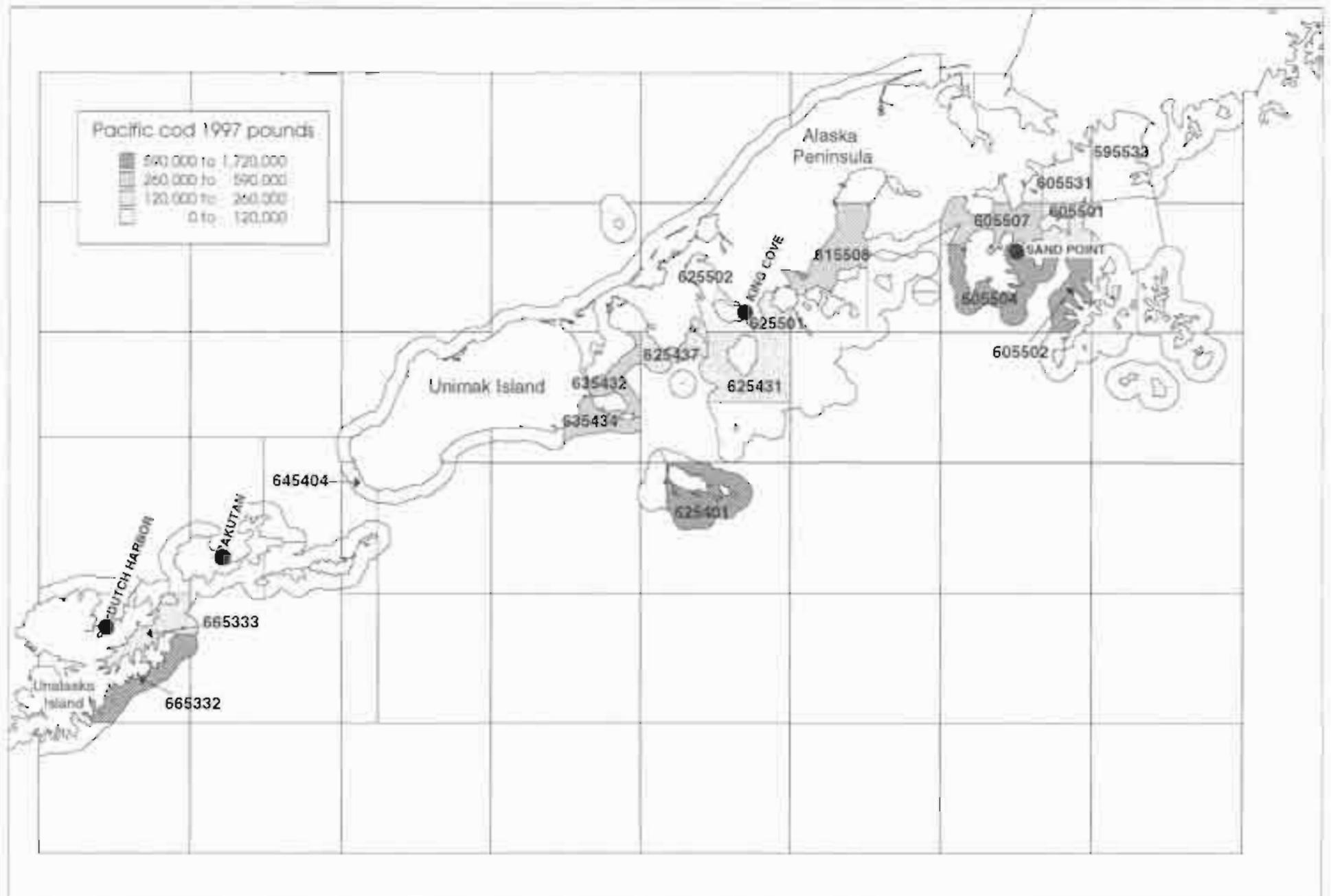
APPENDIX



Appendix A. Catch by statistical area from the 1997 state water Pacific cod fishery in the Kodiak area.



Appendix B. Catch by statistical area from the 1997 state water Pacific cod fishery in the Chignik area.



Appendix C. Catch by statistical area from the 1997 state water cod fishery in the South Alaska Peninsula area.

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