

Weatherwane Scallop Fishery In The Westward Region

A Report To The Alaska Board Of Fisheries

by

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INTRODUCTION

Weathervane scallops *Patinopecten caurinus* in Alaska range from Southeastern Alaska to the Bering Sea. Scallops are found in elongated beds along the continental shelf. The majority of the commercial fishing effort occurs in 40-60 fathoms, although scallops are found to at least 109 fathoms.

Weathervane scallops are dioecious. Males are distinguished by the white coloration of the testes and females by the bright orange/red of the ovaries. It was believed that scallops spawn once annually generally from mid May through mid June (Hennick 1970). Recently examined onboard observer collected data shows spawning extends into July. Weathervanes exhibit external fertilization, eggs and spermatazoa are released directly into the water column (Figure 1). Fertilized eggs settle to the bottom where they remain until they hatch several days later. The newly hatched larvae become free floating planktonic larvae, but are capable of swimming using cilia. They drift with the tides and currents in the upper water column for two to three weeks gaining shell weight prior to dropping to the bottom where they attach to the substrate by means of byssal threads. While attached to the substrate the scallop foot develops. At this point they become mobile and may move about the substrate or remain attached. The juveniles, at this stage, are nearly transparent. Within a few months the transparent shell becomes pigmented, and they assume the adult form (Kaiser 1986).

Hennick (1970) suggested that weathervane scallops become sexually mature at age three or older. Studies conducted in Oregon showed weathervane scallops less than 70 mm in shell height contained gonads without gametes (Starr 1983).

Natural mortality, growth, and biological reference points have been estimated for weathervane scallops in Alaska. Fishing mortality targets were recommended in the range of 11-14% with overfishing rates that correspond to 16-22% annually (Kruse 1995).

The Alaska scallop fishery began in 1967 and evolved by the early 1990's from a sporadic, low intensity fishery to one characterized by a highly specialized fleet. An influx of larger, more efficient vessels from 1990 through 1993 increased harvests and altered the character of the fishery (Shirley and Kruse 1995).

There are 9 scallop registration areas in Alaska (Figure 2). This report describes fisheries occurring in the Westward Region including registration areas K, M, O, Q, and R.

KODIAK REGISTRATION AREA

Historic Background

The Kodiak Registration Area, designated Area K, includes the waters of the Pacific Ocean south of the latitude of Cape Douglas and east of the longitude of Cape Kumlik (Figure 3).

Commercial fishing for weathervane scallops in Alaska began in 1967 when 2 vessels explored the east and northeast parts of Kodiak Island, harvesting 778 pounds of scallop meats. During 1968, the first full year of fishing, 8 vessels harvested 734,084 pounds of scallop meats in the Kodiak Registration Area. The Kodiak scallop fishery peaked in 1970 when 7 vessels landed over 1.4 million pounds of scallop meats. Catches declined to no harvest in 1977 and 1978. Since 1980, landings have fluctuated from a low of 46,971 pounds to a high of 689,402 pounds of scallop meats, except 1995 when the season was closed by federal emergency rule (Table 1).

Concern about the impact of scallop dredging on the crab resources dates from 1969 when the department closed the south end of Kodiak Island and Marmot Bay to scallop fishing by emergency order due to the observed high bycatch of king crab. Subsequently, the Board of Fisheries (BOF) made the closure permanent. During the early 1970's the regulatory season ending date was also changed to March 31 to protect king crab. In 1990, the BOF closed areas to scallop fishing that had previously been closed to non-pelagic trawls in order to protect depressed king and Tanner crab populations. This included Kodiak's Westside bays. Crab resources in the Kodiak Area remain depressed. The commercial Tanner crab fishery in Kodiak failed to open in 1995 for the first time in 28 years. The king crab fishery has not opened since 1983.

1996 Fishery

The 1996/1997 scallop fishing season was open from August 1, 1996 to February 15, 1997. No effort occurred during the August 1 - August 28 or January - February time periods. Scallop fishing in state waters of the Westward Region was scheduled to open on July 1, 1996, however Federal scallop fishing regulations opening Exclusive Economic Zone (EEZ) waters were not implemented until August 1, 1996. The state water fishery was therefore delayed until August 1, when federal and state waters opened simultaneously. To facilitate distribution of fishing effort and crab bycatch limits, king crab districts as described in 5AAC 34.405 were applied.

Shelikof District. The Shelikof District of the Kodiak Registration Area includes all waters north of a line from the westernmost tip of Cape Ikolik to the southernmost tip of Cape Kilokak, west of a line from the northernmost tip of Inner Point to the southernmost tip of Afognak Point, west of 152° 30' W. long., in Shuyak Strait, and west of the longitude of the northernmost tip of Shuyak Island (152° 20' W. long.).

Initial Kodiak effort began in the Shelikof Strait. All vessels were required to carry observers who reported three times each week the scallop harvest, crab bycatch, and area fished. An emergency order was issued October 18 closing the Shelikof District to scallop fishing. Harvest rates in the Shelikof had declined by approximately 50% since the beginning of the fishery. This indicated that fishing mortality may be exceeding prudent limits for this long lived species. Observer reports showed four vessels harvested 218,000 pounds of shucked scallop meats at the time of the closure. Preliminary Tanner crab bycatch numbers indicate approximately 10,500 Tanners were taken from a bycatch cap of 16,100.

Vessels shifted their effort to the Semidi District of the Kodiak Registration Area as well as the Alaska Peninsula Registration Area after the Shelikof District closed. Vessels returning to the port of Kodiak from these areas commonly stopped en route to explore the Northeast District of the Kodiak Registration Area.

Semidi District. The Semidi District of the Kodiak Registration Area includes all Pacific Ocean waters west of the longitude of Cape Kilokak and east of the longitude of Cape Kumlik.

There are no crab bycatch caps established for the Semidi Islands since the department does not conduct surveys in this area. The department closely monitors the scallop harvest and crab bycatch in-season to determine appropriate catch levels. The Semidi area remained open until February 15, 1997 when it closed by regulation although no effort occurred after December 3, 1996. Preliminary data shows three vessels harvested approximately 37,810 pounds of scallop meats. Approximately 6,558 Tanner crab and 9 king crab were taken as incidental bycatch.

Northeast District. The Northeast District of the Kodiak Registration Area includes all waters northeast of a line extending 168° from the easternmost tip of Cape Barnabas, east of a line from the northernmost tip of Inner Point to the southernmost tip of Afognak Point, east of 152° 30' in Shuyak Strait, and east of the longitude of the northernmost tip of Shuyak Island (152° 20' W. long).

The 1996/1997 scallop fishing season in the Northeast District was open from August 1, 1996 to February 15, 1997 when it closed by regulation. Scallopers did not begin fishing the Northeast District until October 4, 1996. No fishing effort occurred after mid December 1996. Preliminary data indicates three vessels harvested 14,500 pounds of scallop meats. The incidental catch included 23,646 Tanner crab from a bycatch cap of 130,000 Tanner crab.

ALASKA PENINSULA REGISTRATION AREA

Historic Background

The Alaska Peninsula Registration Area, designated Area M, includes the waters of the Pacific Ocean west of the longitude of Cape Kumlik and east of the longitude of Scotch Cap Light, excluding the waters of the Bering Sea (Figure 4).

Closed areas include waters within three miles of shore and the offshore waters of Unimak Bight and around Mitrofanina Island. The Unimak closure was adopted in the early 1970's to protect king crab habitat. The Mitrofanina Island closure was adopted in the mid-1980's to protect Tanner crab populations.

Historic fishing effort for scallops in the Alaska Peninsula Registration Area has been sporadic. Most catch and effort information is confidential due to less than three vessels participating. Years that are not confidential include 1982, 1993, and 1994. The highest harvest was in 1982 when six vessels landed 205,691 pounds of scallop meat (Table 2).

1996 Fishery

The 1996 fishery opened August 1, however no effort occurred in the Alaska Peninsula Registration Area until October 23, 1996. Tanner crab bycatch rates were high in this fishery. The area was closed by emergency order at 12 noon October 31, 1996 based on the projected achievement of the 22,000 Tanner crab bycatch cap. The scallop harvest is confidential because less than three vessels participated in the fishery.

BERING SEA REGISTRATION AREA

Historic Background

The Bering Sea scallop registration area, designated as Area Q, has a southern boundary at a line from the latitude of Cape Sarichef to 171° W. long, north to 55° 30' and west to the U.S. - Russia Convention Line of 1867 and encompasses all waters of the Bering Sea north of this line (Figure 5). Area Q was established as the Bering Sea Area by the BOF in 1994. Prior to this change Area Q included water of Adak, Area R.

Closed waters are shown in figure 5. The area around the Pribilof Islands is closed to protect blue king crab. The square shaped, unshaded area between 162° W. long. and 164° W. long. within the dark border was established to protect the female red king crab population. The third area between 160°00' W. long. and 162° 00' W. long. and south of 58° 00' N. lat. was established as a halibut savings area.

Department of Fish and Game records indicate scallops were first harvested from the Bering Sea in 1987, and then again in 1991 (Table 3). During those years fewer than three vessels participated, consequently catch and effort information is confidential. No additional landings were made from this area until the 1993 fishing year when 10 vessels harvested 605,953 pounds of scallop meats. In the 1994 fishery nine vessels harvested 505,439 pounds of scallop meats.

1996 Fishery

the 1996 fishery opened August 1, 1996. Catch and effort information is confidential because less than three vessels participated. The last effort occurred in October and the fishing season closed by regulation on February 15, 1997.

DUTCH HARBOR REGISTRATION AREA

Historic Background

The Dutch Harbor Registration Area, designated Area O, includes the waters west of the longitude of Scotch Cap Light, east of the longitude of 171° W. long., and south of the latitude of Cape Sarichef. The southern boundary extends 200 miles seaward from the territorial sea baseline (Figure 6).

Closed waters were established as a protective measure for crab nursery areas. Through the 1992 season the Dutch Harbor Registration Area was open year around to scallop dredging.

Alaska Department of Fish and Game records show the first harvest of weathervane scallops from the Dutch Harbor Registration Area took place in 1982 when 5 vessels landed 62, 105 pounds of scallop meats (Table 4). The average annual catch from 1985 through 1992 was 250,000 pounds of scallop meats. In 1993 three vessels landed 39,346 pounds of scallop meats declining further in 1994 when 1,931 pounds of scallop meats were landed by three vessels. During the 1995 season only state waters were open to scallop fishing. Catch and effort information is confidential because less than three vessels participated in the fishery.

1996 Fishery

The 1996 fishery opened August 1, 1996 and closed by regulation on February 15, 1997. No vessels participated in this fishery.

ADAK REGISTRATION AREA

Historical Background

The Adak Registration Area, designated area R, includes all of the Bering Sea waters west of 171° W. Longitude and east of the U.S. - Russia Convention Line of 1867 and south of 55° 30' N. latitude (Figure 7). At the March 1994 BOF meeting, area R (Adak) was established as a separate registration area. Prior to that time it was included in area Q (Adak-Bristol Bay-Bering Sea)

The Petrel Bank, north of 51° 30' N. Latitude, south of 54° 30' N. Latitude, west of 179° W. Longitude and east of 179° E. Longitude was closed by emergency order on March 21, 1991 due to concerns about king crab bycatch in the *Chlamys* (pink scallop) fishery. On November 1, 1991 before the initial emergency order expired, a second emergency order was issued closing this area until June 1, 1994 providing time for the department to bring the situation to the attention of the BOF. In 1993 the BOF made the closure permanent.

Alaska Department of Fish and Game records indicate three years of reported harvest, the first in 1979 then again in 1992 and 1995. Catch and effort information remains confidential because less than three vessels participated in any year.

Little is known about the scallop population in area R, but it is thought to be limited. The continental shelf adjacent to the Aleutian Islands is narrow, with little weathervane scallop habitat.

1996 Fishery

The 1996 fishery opened August 1, 1996 and closed by regulation on February 15, 1997. No vessels participated in this fishery.

OBSERVER PROGRAM

ADF&G commissioner Rosier declared the scallop fishery to be a high impact and emerging fishery on May 21, 1993 in order to address concerns about crab bycatch. This action required the department to implement an interim management plan prior to reopening the fishery. The interim management plan became effective June 27, 1993 and included an onboard observer program to monitor bycatch in the scallop fishery. Four registration areas were established in the Westward Region including: Kodiak (K), Alaska Peninsula (M), Dutch Harbor (O), and Adak-Bristol Bay-Bering Sea (Q). Scallop Area R (Adak), was established at the March 1994 BOF meeting.

An onboard observer is required when taking scallops in Alaska, unless the department, in its discretion, determines that carrying an onboard observer will not serve the purposes of the onboard observer program (ADF&G 1994). Observer requirements have been waived in the Cook Inlet scallop fishery. Vessels participating in that fishery are limited to a single six foot dredge and are required to maintain logbooks. Periodic onboard observations are conducted by department personnel. In the Yakutat fishery vessels under 65 feet are generally not required to have an observer (Barnhart et al 1996).

The management plan contained provisions for king and Tanner crab bycatch caps for most areas within the Westward Region. Limits were based on the same percentages for bycatch of crabs in groundfish fisheries around Kodiak. A bycatch cap of one percent of the surveyed crab population was used in areas where a directed commercial crab fishery occurred in the same year. If an area had not opened to commercial crab fishing, a cap of one-half of one percent was applied. Bycatch caps are based on crab population estimates derived from trawl surveys with the exception of the Bering Sea. The Bering Sea crab bycatch caps were determined by historical bycatch rates in the fishery.

Initial data collection efforts in 1993 and 1994 were aimed at collecting baseline information relative to scallop biology. Detailed examination of incidental crab bycatch was also emphasized. Data collection has evolved and expanded to focus more on scallop biology and stock assessment in an effort to answer critical management questions. Observer collected data will be used to estimate the abundance of scallops under a fishery based stock assessment program. The analysis of biological reference points based on historical scallop data will be updated using recently collected data. Ongoing work in scallop age analysis from shells collected by observers is expected to increase the departments understanding of population dynamics and fishery effects.

Scallop Fishing Locations

The scallop fleet can be described as mobile and wide ranging. During the 1993/1994 scallop season the fleet fished in 86 different statistical areas statewide (Figure 8, Urban et al. 1994). The fleet fished 77 different statistical areas during the 1994/1995 scallop season in the Westward Region, extending from the Bering Sea to the Gulf of Alaska (Figure 9, Barnhart et al 1996).

Incidental Bycatch

Incidental bycatch of Dungeness crab *Cancer magister*, king crab *Paralithodes* spps, Tanner crab *Chionoecetes bairdi*, snow crab *C. opilio*, and halibut *Hippoglossus stenolepis* was estimated from data collected by onboard observers (Table 5). Yearly differences of incidental crab bycatch is dependent upon several factors including number of days fished, crab populations, location of crabs in relation to the scallop beds, and avoidance of crabs by the scallop fleet.

Density changes of *C. opilio* in the Bering Sea between 1994 and 1996 is reflected in the dramatic change in the crab bycatch composition. During the 1993 and 1994 scallop seasons the majority of the Tanner crabs caught in the Bering Sea were *C. bairdi* with over 200,000 taken each year. The incidental bycatch of *C. opilio* was only 15,000 in 1993 and 17,000 in 1994. By contrast, during the 1996 scallop season over 100,000 *C. opilio* were taken as incidental bycatch, in conjunction with less than 20,000 *C. bairdi*.

Other species and items caught incidentally in scallop dredges during the 1994/1995 season are listed in Table 6. Weathervane scallops in all areas were the most frequently caught species. Following weathervane scallops, the three most frequently caught species or items in scallop dredges varied by management area, perhaps indicative of bottom structure and habitat types. Dredge composition in the Northeast District of the Kodiak Management Area included, in descending order, starfish (28%), kelp, rocks, etc. (9%), and skates (5%). Weathervane scallop shells represented (10.1%), kelp, rocks, etc. (9.1%), and starfish (4.2%) of the catch in the Shelikof District. Weathervane shells can be a significant portion of the catch in areas where vessels tow repeatedly over the same scallop bed, at the same time processing the catch and discarding shells overboard. The order of abundance in the Semidi District was starfish (23.7%), kelp, rocks, etc. (13.8%) and weathervane scallop shells (4.6%). Basket stars comprising 5.5%, were the most common species caught in the Alaska Peninsula Management Area followed by weathervane scallop shells (5.2%), and starfish (5.1%). The composition in the Dutch Harbor Management Area was quite different with skates representing (17.5%), rock sole (8.6%), and miscellaneous invertebrates (7.7%). In the Bering Sea Management Area the composition was weathervane scallop shells (7.1%), Tanner crab (2.8%), and skates (2.8%).

Scallop Aging Techniques and Analysis

Scallop shells sampled by observers during the 1993 and 1994 scallop seasons were aged by counting growth rings (annuli) on the exterior of the left (upper) valve. The left valve was chosen because the right valve rests on the bottom and is subject to excessive wear. The right valve also lacks the characteristic difference in shell color of summer versus winter growth, an important aspect of aging scallops.

Scallop shell-aging has not been an exact science. Technique has been examined in conjunction with Dr. Neil Bourne, a Canadian familiar with shell-aging, at the Pacific Biological Station in Nanaimo, British Columbia. Samples of previously aged weathervane scallop shells were sent to Dr. Alla Silina, a scallop aging expert, at the Institute of Marine Biology in Vladivostok, Russia for comparative analysis. An additional sample of previously aged shells were sent to Mr. Ross Chandler at the St. Andrews Biological Station in New Brunswick, Canada. Based on the information provided to the department by the three experts in shell-aging it was determined the shell-aging conducted by the onboard observers was inaccurate and inconsistent. Consequently all shell-aging of observer collected shells will be conducted by the ADF&G scallop biologist.

Shells from the 1994 fishery have been reexamined. Preliminary examination of the shell-ages indicate growth rates and age composition vary across the state. Ages of commercially retained scallops in Yakutat ranged from 6 - 10 years old with the catch dominated by 6 - 7 year olds in some samples and 9 - 10 year olds in others. The oldest scallop aged was 15 years old. In Kodiak the ages ranged primarily from 7 to 12 years old. The oldest scallop aged to date was 20 years old. Samples of Bering Sea scallops ages ranged from 5 to 12 years. One scallop was 13 years old. Some samples were predominately 6 and 7 year olds, while others were primarily 10 and 11 year olds. Observers report size differences by location within a statistical area.

Shell-aging is ongoing. An analysis of age structure of scallop populations statewide as well as the age composition of the commercial harvest is expected to be available later this year. Utilizing the Geographic Information System (GIS) in conjunction with observer data and specific haul information, the department will be able to plot distinct beds and overlay with scallop age and size composition. Appropriate management strategies can be developed to take advantage of this fishery based assessment.

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Table 1. Historic commercial catch, effort, and value of weathervane scallops, Kodiak Management Area, 1967 - 1996.

Year	No Vssls	No Lndgs	Commercial Catch (pounds) ^a	Average Landing (pounds) ^a	Average Price/Lb.	Est. Value Exvessel (dollars)
1967 ^b	2	6	778	130	.70	545
1968 ^b	8	89	734,084	8,248	.85	623,971
1969	11	86	1,012,860	11,777	.85	861,000
1970	7	102	1,417,612	13,898	1.00	1,500,000
1971	5	48	841,211	17,525	1.05	883,000
1972	5	68	1,038,793	15,276	1.15	1,200,000
1973	4	42	935,705	22,279	1.20	1,123,000
1974	3	14	147,945	10,568	1.30	192,000
1975	3	29	294,142	10,143	1.40	412,000
1976	1	6	75,245	12,541	1.59	119,000
1977	0	0	0	0	.00	0
1978	0	0	0	0	.00	0
1979	1	4	24,826	6,206	2.78	69,000
1980 ^b	7	33	355,200	10,763	3.60	1,278,720
1981	15	60	424,394	7,073	4.00	1,698,000
1982	8	62	435,645	7,026	3.25	1,416,000
1983	4	24	147,747	6,156	5.00	739,000
1984	7	37	309,502	8,365	4.00	1,238,000
1985	3	10	46,971	4,697	4.00	188,000
1986	5	21	180,600	8,600	4.25	767,550
1987	3	23	253,451	11,020	3.45	874,406
1988	3	21	197,731	9,416	3.68	727,650
1989	5	29	242,557	8,364	3.87	938,696
1990	7	73	689,402	9,444	3.43	2,364,649
1991	5	60	514,412	8,574	3.82	1,965,054
1992	3	43	389,854	9,066	3.96	1,543,822
1993	10	59	374,908	6,354	5.15	1,930,776
1994	11	36	381,850	10,607	5.79	2,210,911
1995 ^c	0	0	0	0	0	0
1996 ^d	5	18	268,545	14,919	6.00	1,611,270

^aPounds of shucked scallop meats.

^bUnshucked deliveries were converted to shucked meats using a 10% conversion factor.

^cSeason closed

^dPreliminary data

Table 2. Historic commercial catch, effort and value of weathervane scallops, Alaska Peninsula Management Area, 1975 - 1996.

Year	No. Vssls	No. Lndgs	Commercial Catch (pounds) ^a	Average Landings (pounds) ^a	Average Price/Lb	Est. Value Exvessel (dollars)
1975			CONFIDENTIAL			
1976			NO FISHING			
1977			NO FISHING			
1978			NO FISHING			
1979			NO FISHING			
1980			NO FISHING			
1981			NO FISHING			
1982	6	20	205,691	10,284	3.35	689,064
1983			CONFIDENTIAL			
1984			NO FISHING			
1985			CONFIDENTIAL			
1986			NO FISHING			
1987			CONFIDENTIAL			
1988			CONFIDENTIAL			
1989			NO FISHING			
1990			CONFIDENTIAL			
1991			CONFIDENTIAL			
1992			NO FISHING			
1993	6	9	135,487	15,054	4.15	562,271
1994	7	12	66,412	5,534	5.79	384,525
1995			CLOSED			
1996			CONFIDENTIAL			

^aPounds of shucked scallop meats.

Table 3. Historic commercial catch and effort of weathervane scallops, Bering Sea Management Area, 1987 - 1996.

Season	Number of		Pounds		
	Vessels	Landings	Drags	Scallops per Drag	
1987		CONFIDENTIAL			
1988		NO REPORTED CATCH			
1989		NO REPORTED CATCH			
1990		NO REPORTED CATCH			
1991		CONFIDENTIAL			
1992		NO REPORTED CATCH			
1993	10	38	7,289	605,953	83
1994	9	29	6,619	505,439	76
1995		SEASON CLOSED			
1996		CONFIDENTIAL			

Table 4. Historic commercial catch, effort, and value of weathervane scallops, Dutch Harbor Management Area, 1982 - 1996.

Season	Number of		Drags	Pounds of Scallops ^a	Average	
	Vessels	Landings			Pounds/Drag	Price/Pound
1982	5	8	NA	62,105	NA	\$ 3.11
1983			NO REPORTED CATCH			
1984			NO REPORTED CATCH			
1985			CONFIDENTIAL			
1986	5	37	8,752	406,642	47	\$ 3.50
1987			CONFIDENTIAL			
1988			CONFIDENTIAL			
1989			CONFIDENTIAL			
1990			CONFIDENTIAL			
1991			CONFIDENTIAL			
1992			CONFIDENTIAL			
1993	3	6	572	39,346	69	NA
1994	3	3	52	1,931	37	NA
1995			STATE WATER ONLY/CONFIDENTIAL			
1996			NO REPORTED FISHING			

^aShucked meats.

Table 5. Estimated bycatch for Tanner, Dungeness, king crab, and halibut from the scallop fisheries, 1993-1996.

MANAGEMENT AREA	-----BYCATCH ESTIMATES BY SPECIES-----														
	Vessel Days			Tanner Crab			Dungeness Crab			King Crab			Halibut		
	1993	1994	1996	1993	1994	1996 ^a	1993 ^b	1994	1996	1993	1994	1996	1993	1994	1996 ^b
Kodiak															
Northeast District	532 ^c	66	55 ^a	30,800	2,054	23,644	-	0	-	9	190	0	1750 ^b	577	-
Shelikof District	-	256	115 ^a	50,700	64,444	10,469	-	2,156	-	0	29	0	-	851	-
Semidi District	-	10	59 ^a	61,000	984	6,558	-	129	-	6	22	9	-	21	-
Alaska Peninsula	122	70	* ^d	150,900	25,287	* ^d	-	143	-	26	0	* ^d	327	157	-
Dutch Harbor	62	6	* ^c	50,800	757	* ^c	-	0	-	45	7	* ^c	1,497	0	-
Bering Sea	290	307	* ^d	276,500 opilio-15,000	245,001 (opilio-17,000)	* ^d	-	15	-	212	20	* ^d	327	3,464	-

^aPreliminary

^bNot available

^cKodiak area combined

^dConfidential

^eNo fishing occurred

Table 6. Summary of the most frequently caught species, by percent weight in sampled dredges, as recorded by scallop observers during the 1994/95 scallop fishery in the Westward Region.

SPECIES CATEGORY	MANAGEMENT AREA / DISTRICT					
	Kodiak			Alaska Peninsula	Dutch Harbor	Bering Sea
	Northeast	Shelikof	Semidi			
Weathervane scallops	43.5	64.1	49.3	72.5	55.5	77.2
PROHIBITED SPECIES BYCATCH						
Tanner crab	0.2	1.1	0.6	0.3	0	2.8
snow crab, opilio	0	0	0	0	0	0.5
king crab	<.1	<.1	<.1	<.1	0	<.1
Dungeness crab	<.1	0.1	0.2	<.1	0	<.1
Pacific halibut	1.6	0.4	<.1	0.1	0	<.1
OTHER COMMERCIAL SPECIES						
skates	5	3.5	0.8	0.4	17.5	2.8
arrowtooth flounder	2.2	1.5	0.5	2.1	0	1.2
rock sole	1.1	0.3	0.1	1	8.6	0.3
Dover sole	0.9	0.5	<.1	<.1	0	<.1
yellowfin sole	0.4	<.1	0.6	0.4	0	<.1
rex sole	0.4	<.1	<.1	<.1	0	<.1
flathead sole	1	0.4	0.7	0.4	0	1
butter sole	0.1	<.1	<.1	<.1	0	<.1
Pacific cod	0.4	0.2	<.1	<.1	0	0.5
starry flounder	0.2	<.1	1.3	<.1	0	<.1
walleye pollock	0.1	<.1	<.1	<.1	0	<.1
bay scallops	<.1	<.1	<.1	0.9	0	<.1
sea urchin	<.1	<.1	<.1	0.6	2.2	<.1
octopus	<.1	0.2	<.1	0.2	0	0.2
Alaska plaice	<.1	0.6	0.1	<.1	0	<.1
MISCELLANEOUS						
starfish	28	4.2	23.7	5.1	2.2	1.8
basket star	<.1	<.1	<.1	5.5	0	0.2
weathervane shells	3	10.1	4.6	5.2	5.5	7.1
kelp, rocks, etc.	9	9.1	13.8	2.4	1.3	0.5
fishing gear	0.2	0.5	<.1	<.1	0	0.6
Misc. invertebrates	1.5	1.5	2	1.7	7.7	2
Misc. fish	0.4	<.1	0.8	0.1	0	0

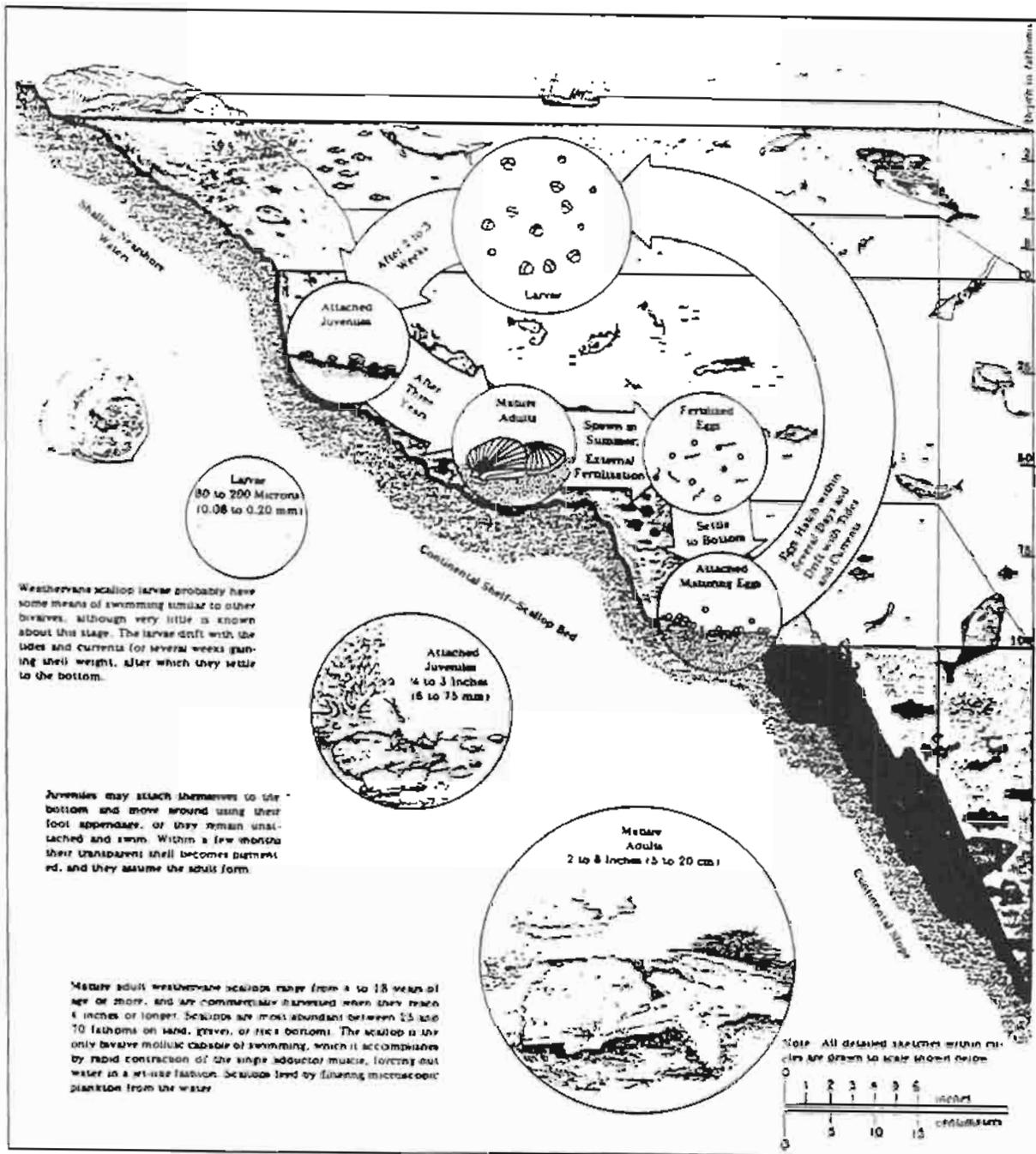


Figure 1. Weathervane scallop life history (U.S. BLM 1980).

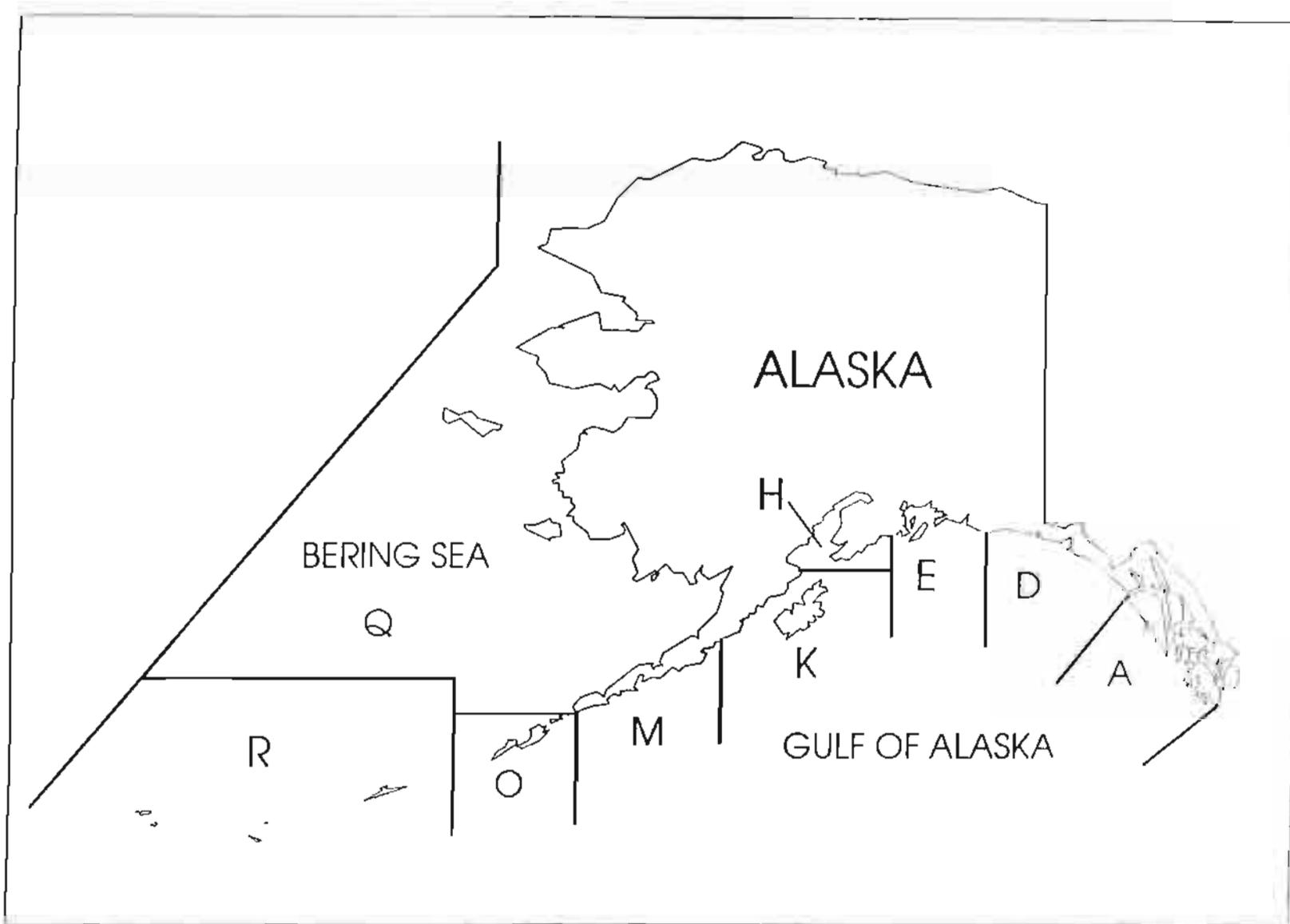


Figure 2. Statewide scallop fishery registration areas.

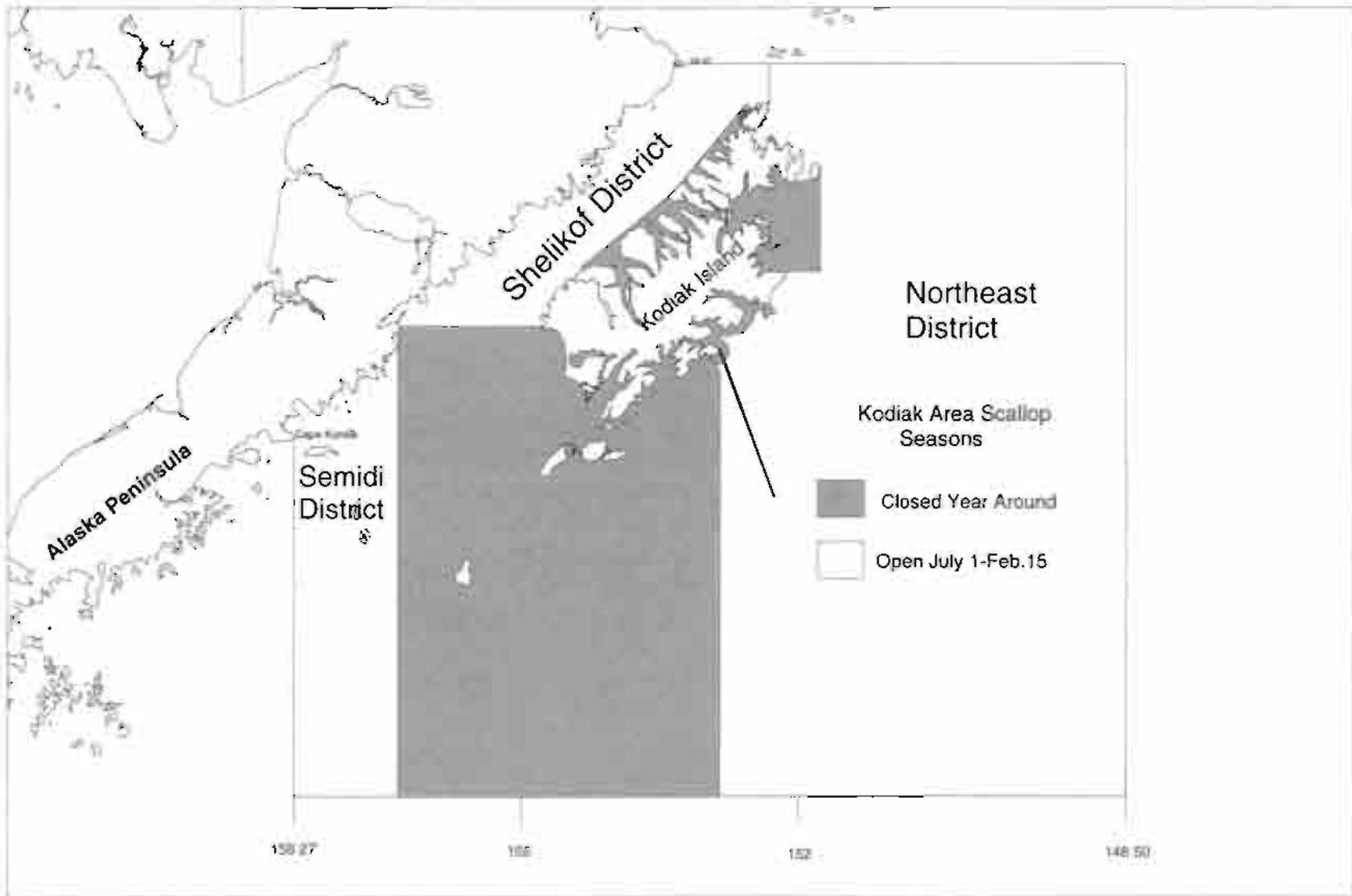


Figure 3. Kodiak scallop fishing registration area and closed waters.

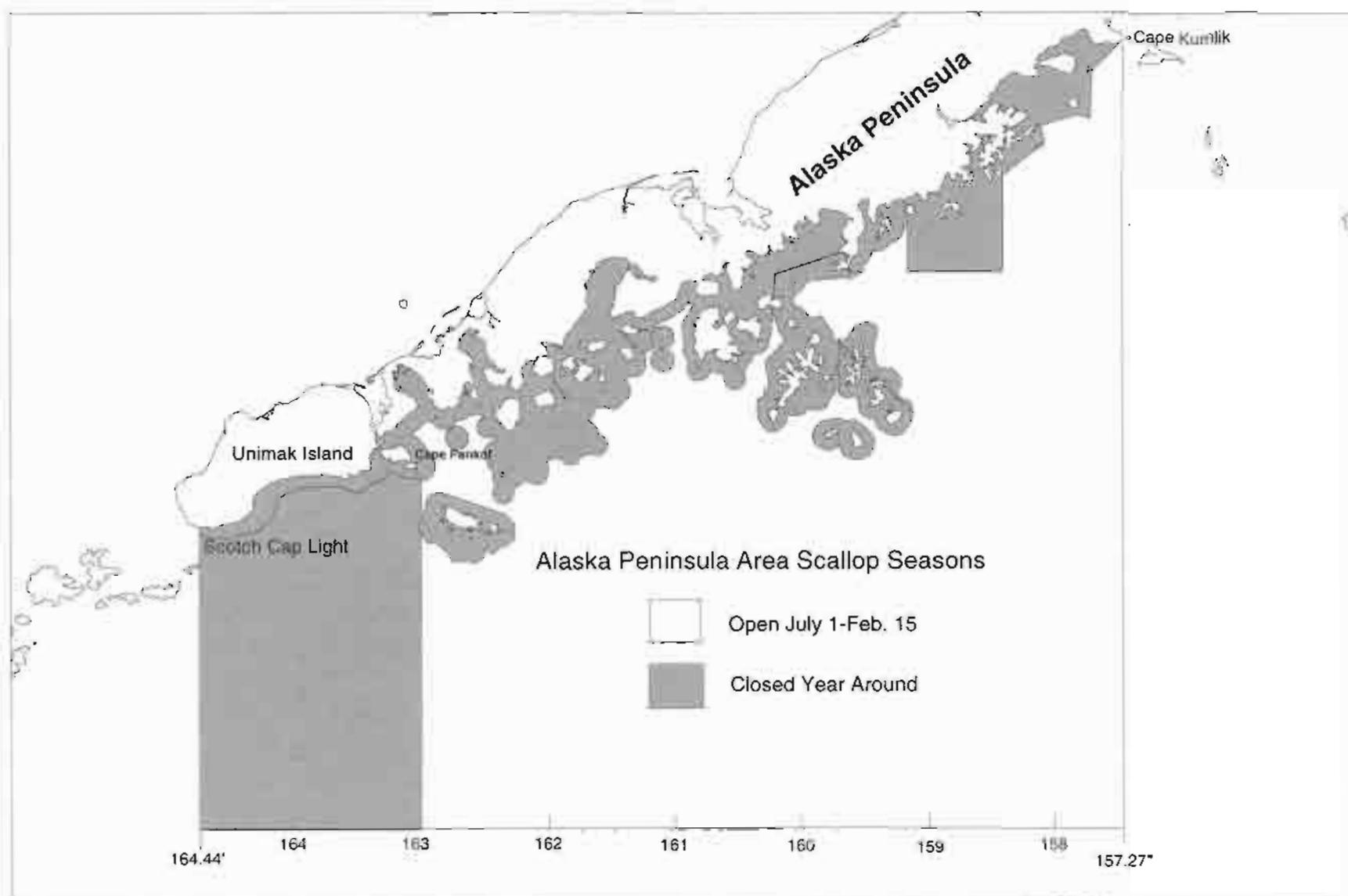


Figure 4. Alaska Peninsula scallop fishery registration area and closed waters.

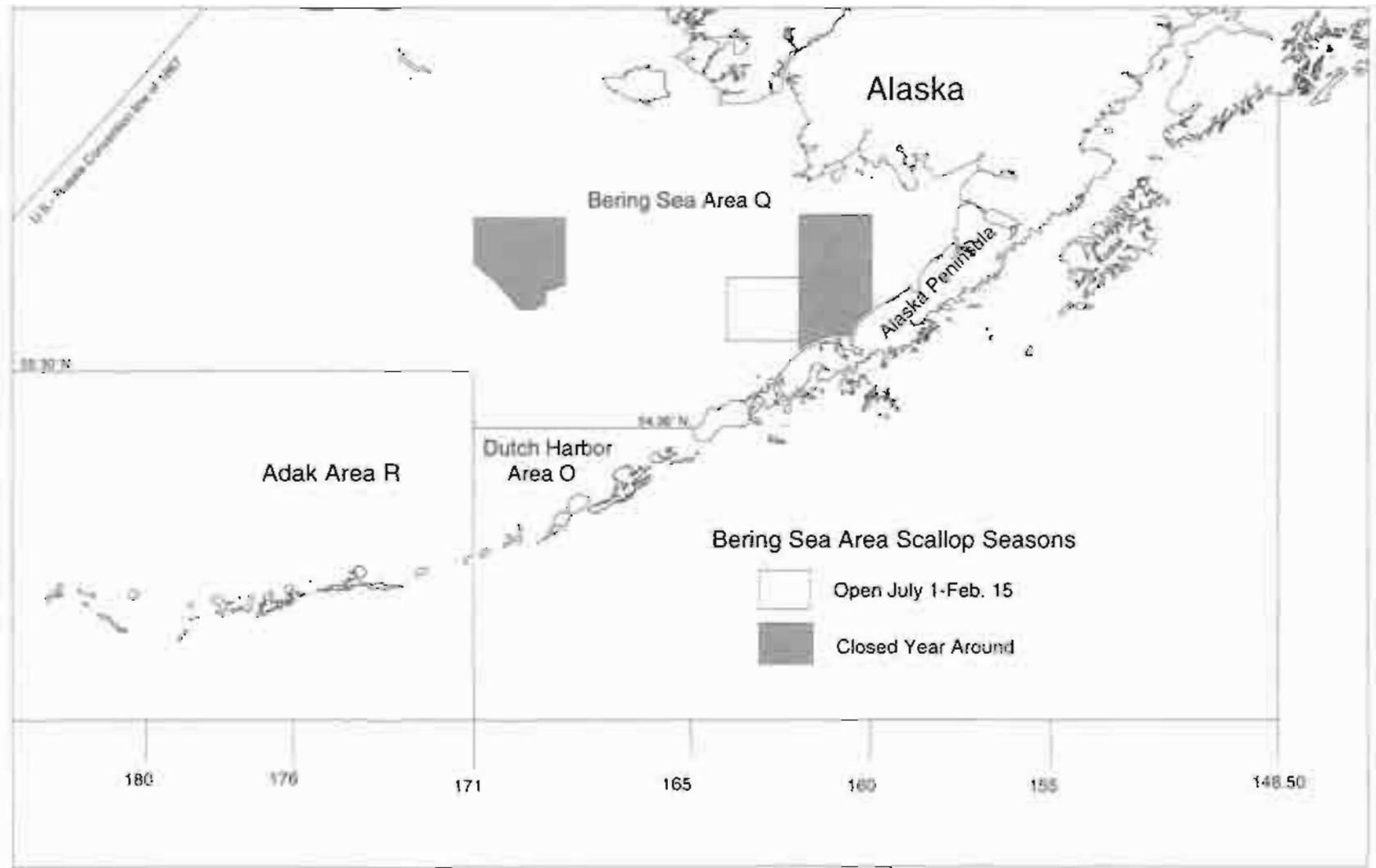


Figure 5. Bering Sea scallop fishing registration area and closed waters.

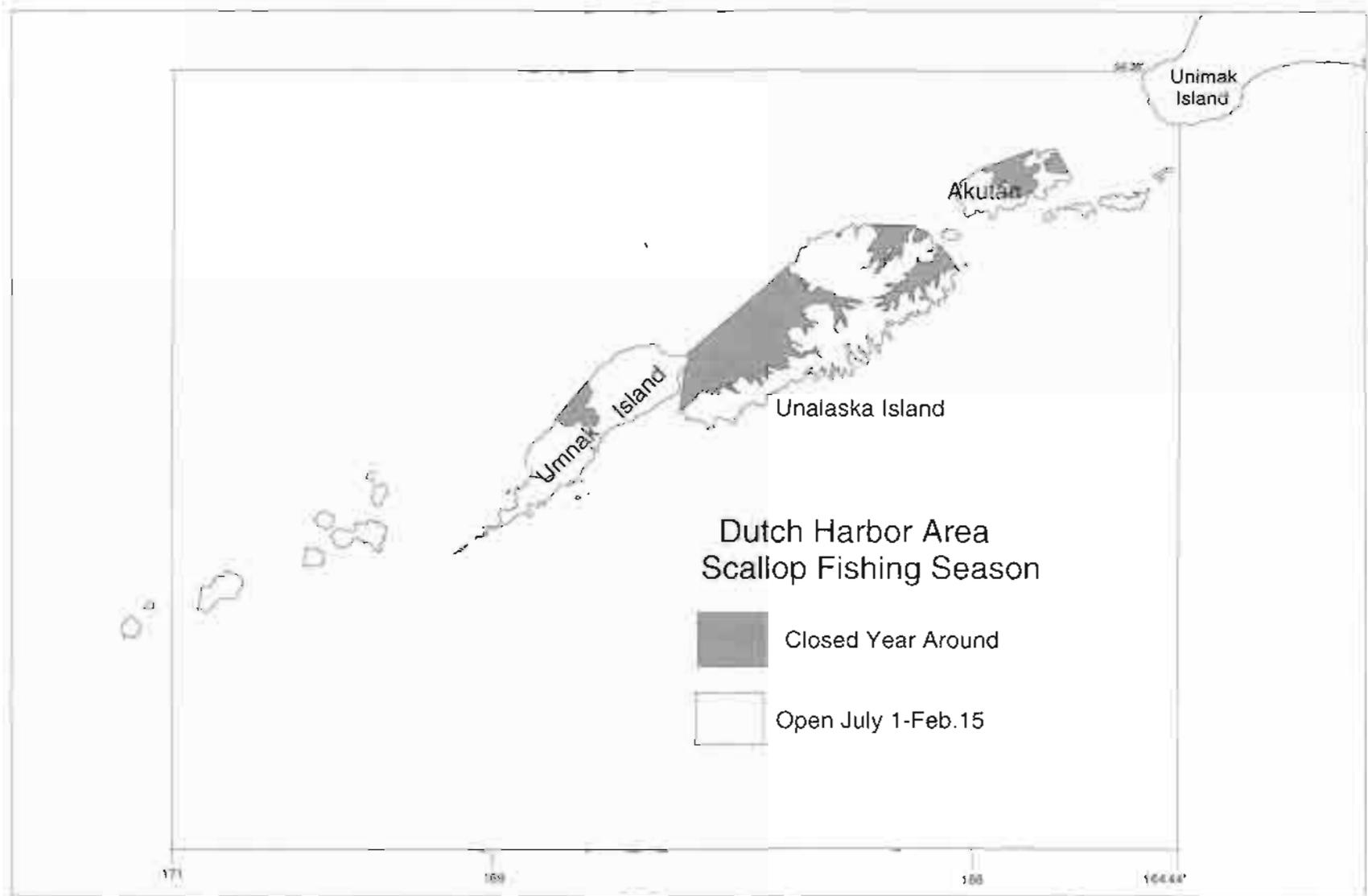


Figure 6. Dutch Harbor scallop fishing registration area and closed waters.

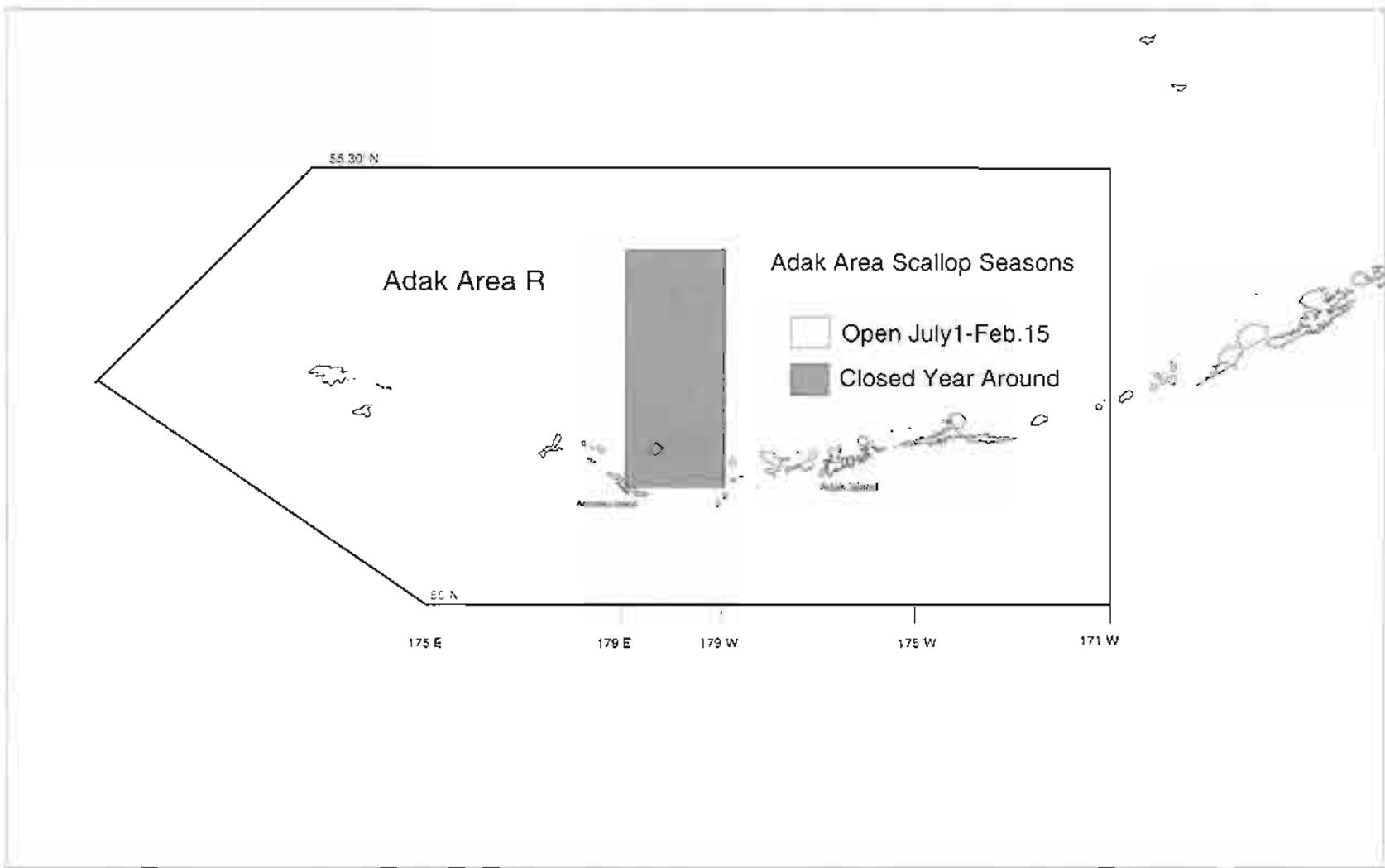


Figure 7. Adak scallop fishing registration area and closed waters.

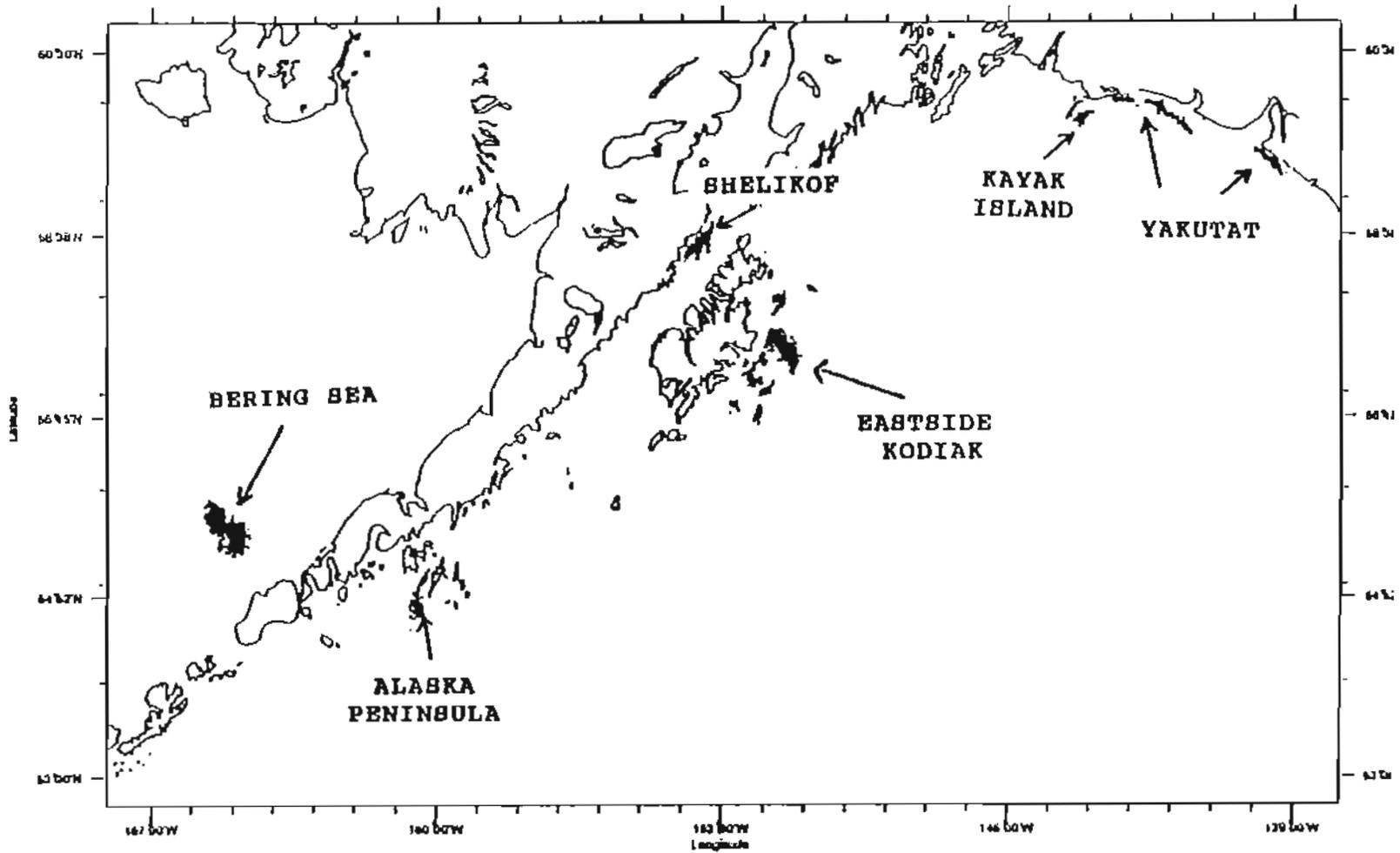


Figure 8. Areas fished statewide during the 1993 scallop fishery. Fishing in Southeast Alaska and parts of the Dutch Harbor area remain confidential.

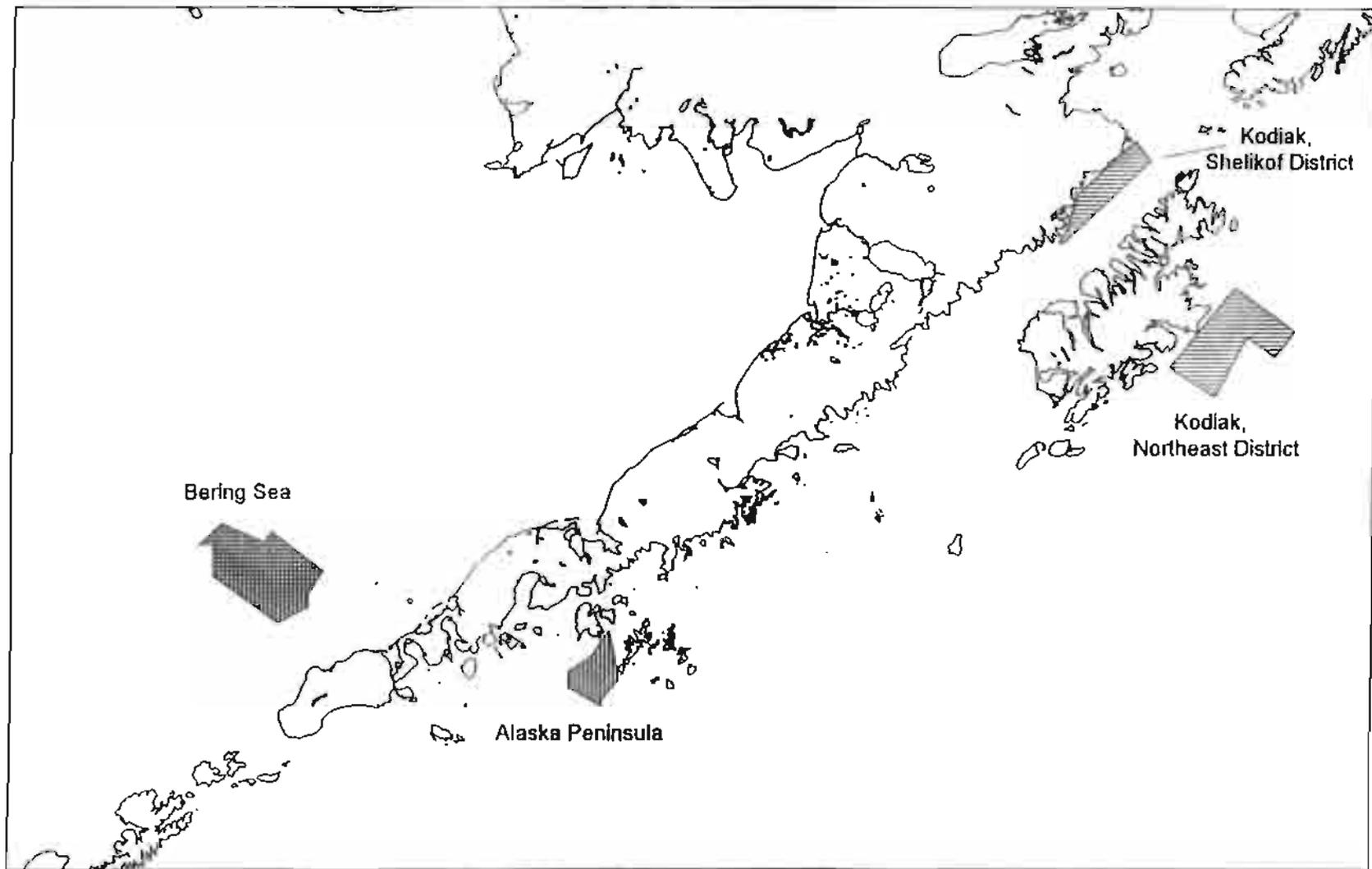


Figure 9 Major fishing areas in the Westward Region during the 1994/1995 scallop fishery. Fishing areas in the Semidi District of the Kodiak Area and In the Dutch Harbor were not shown due to confidentiality requirements.

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