

1992 NORTON SOUND AREA SHELLFISH REPORT

to the

Alaska Board of Fisheries

By

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## INTRODUCTION

### Norton Sound

The Norton Sound section of the Northern district in Area Q is described in the shellfish regulations as all waters east of 168 degrees W. long., between the latitudes of Cape Romanzof and Cape Prince of Wales (Figure 1). The only shellfish fishery in Norton Sound is for red king crab (Paralithodes camtschatica). Blue king crab (P. platypus) and Tanner crab (Chionoecetes opilio) also occur within this section but are very seldom caught by commercial or subsistence fishermen. Red king crab have been utilized for subsistence purposes by local residents for many years, but the commercial fishery was not initiated until 14 years ago. In April 1977, the Alaska Board of Fisheries opened an "exploratory" commercial fishery in order to increase the knowledge and commercial utilization of Norton Sound king crab. Since 1976 there have been five National Marine Fisheries Service (NMFS) research trawl studies in Norton Sound. The most recent survey was conducted in 1991 and has not been finalized yet. In addition, the State of Alaska Department of Fish and Game (ADF&G) has conducted four research pot fishing studies. Data from population studies, from winter research studies, mining impact studies, and from 13 commercial fishing seasons has greatly increased the knowledge of the Norton Sound king crab. There are two seasons during which crab may be taken commercially: November 15 - May 15 and August 1 - September 3. The 1991 summer commercial season did not take place due to severe budget cuts and the resulting inability to manage the fishery.

### St. Lawrence Island

The St. Lawrence Island section lies immediately west and north of the Norton Sound Section. The St. Lawrence Island section has been managed by Westward Region's Dutch Harbor office since the Bering Sea crab fleet bases there and has been open to commercial fishing for the same amount of time as the Norton Sound section. The only reported commercial catches to date in the St. Lawrence Island section were made in 1983 when 52,557 pounds of blue king crab were delivered from 13 landings and in 1989, when 3,603 pounds of red king crab and 984 pounds of blue king crab were delivered from 8 landings.

In 1983 the commercial crab fleet concentrated near the southeast shore of St. Lawrence Island. The following year a regulation proposal to close the waters within 10 miles of all inhabited islands within the section was adopted in an attempt to protect stocks targeted by local fishermen and reduce impacts on subsistence marine mammal harvests during the winter. During the 1989 season, relatively few blue king crab were taken near rocks and shoals still open to commercial fishing but red king crab were discovered in low densities near Kivalina, the northern boundary of the section. The villagers of Little Diomed Island have also traded and sold blue king crab with residents of Nome and other villages for years. The Department has not been able to obtain an accurate record of the magnitude of this trade. The remoteness of this village is also a factor contributing to the lack of catch records. Current regulation allows the commercial harvest and sale of king crab near shore during the winter.

However, local residents of St. Lawrence Island had decided not to export any of their winter catch for commercial sale.

## COMMERCIAL FISHERY

### Norton Sound Summer Commercial Fishery

As stated in the introduction, the 1991 summer red king crab commercial season did not take place. The following discussion will pertain primarily to the most recent 1990 season.

The 1990 guideline harvest was 200,000 pounds. This conservative quota was set prior to the season using preliminary data from the fall 1988 National Marine Fisheries Service (NMFS) trawl survey, which placed the current population size at less than 1/3 of the historic population level. The population of legal male crab has remained fairly stable since 1985, with no apparent improvement, while exploitation levels have been maintained near 15% until 1988. A mandate to maintain adequate abundance for the local subsistence fishery and a concern that funding for population monitoring will decline had caused the staff to reduce the guideline harvest level to 200,000 pounds. That equated to an exploitation rate of approximately 10%. Authority for establishing a lowered exploitation rate was set by the Alaska Board of Fisheries during the spring 1988 meeting, which amended the existing harvest strategy regulation 5AAC 34.080.

Other Board of Fisheries regulations specific to the Norton Sound Section are:

- 1) 5AAC 34.915, which directs the Department to manage the Norton Sound summer king crab fishery for a harvest of one-half the exploitation rate determined under 5AAC 34.080.
- 2) 5AAC 34.935, which created a closed area with a defined boundary approximating 15 miles from the beach in the Norton Sound Section, to protect a long established winter subsistence fishery (Figure 2).

Regulation 5AAC 34.935 (CLOSED WATERS) also allows the Department the flexibility to reduce the closed waters area to allow an efficient harvest of red king crab during the summer fishery. However, at no time had this action been taken nor considered due to availability of commercial quantities of legal male red king crab well outside of the closed area in 1990.

Another regulation in effect during the 1990 summer season was 5AAC 30.141 which established the onboard observer program for catcher-processors. This was the second season the program was in affect for Norton Sound and was again very frustrating to the managers. Preparation was made prior to orientation in order to prevent observer problems similar to the previous year from happening again. Observer materials (manuals, codes, forms, etc.), and program coordination was provided by the Dutch Harbor staff member Alan Quimby. Additional documentation and substitute forms were provided to the observers by the Nome staff in order to obtain pertinent information specific to the fishery.

Orientation for all observers took place in the Nome office prior to the fishery where sampling methods and data documentation was reviewed. In addition, the observers had been provided with a comprehensive addendum in the observer manual and prior training by the observer brokers. Some observers were very conscientious and turned in comprehensive and complete data at the end of the season. Yet, other observers did less than the minimum and had questionable or unusable data.

The 1990 commercial crab fleet consisted of four catcher-processor vessels and a total of 1388 pots. The season opened at noon ADT, August 1 and closed by emergency order at noon ADT, August 5, when it was anticipated a harvest of 200,000 pounds would be reached. The closure announcement was made following the second catch report August 3 which gave the fleet a 26 hour notice.

The total reported harvest was 192,831 pounds with no significant deadloss. The average price per pound of landed crab was unknown because all vessels processed their own catches. The fleet caught a total of 61,563 crab in 3,255 pot lifts for an average of 18.9 legal crab per pot pulled (Table 1). The average legal male crab weight was 3.1 pounds and the recruit to postrecruit ratio was 21% to 79% (Table 1). Catches were reported from four statistical areas (656401, 666330, 666401 and 676400) during the 1990 season.

#### St. Lawrence Island Summer Commercial Fishery

The St. Lawrence Island Section includes the American portion of the Bering and Chukchi Seas between Cape Romanzof and Point Hope except the Norton Sound Section. A natural division of the St. Lawrence Island Section occurs at the Bering Strait. In 1983 the commercial harvest was taken near St. Lawrence Island. Concern over the activity affecting sea mammal abundance near subsistence hunting sites caused the most productive areas to be closed. In 1984 several boats explored north of the Bering Strait but failed to find commercial quantities of crab. From 1984 until 1989 the St. Lawrence Section had virtually no commercial effort.

Immediately after the 1989 Norton Sound closure 5 catcher processors began reexploring the St. Lawrence Island Section. Five boats spent several days each in the Bering Sea. Their combined catch totaled 29 pounds of red and 940 pounds of blue king crab. The average harvest was roughly .2 crabs/pot lift. As expected the best catches came from shoals and rocks outside the closed areas.

Fishing success was only slightly better in the Chukchi Sea. Four boats spent several days exploring that area. Catch rates approached one legal crab per pot lift along the coast in the northern portion of the section. A total of 3,574 pounds of red king crab and 44 pounds of blue king crab were harvested in the Chukchi Sea.

Five vessels landed 3,603 pounds of red king crab and 984 pounds of blue king crab during the 1989 season from the St Lawrence Island Section. The value of the harvest is estimated to be \$13,761 assuming the price remained at \$3.00 per pound. Fishing began about August 7 and continued to about August 18. Observers were debriefed in Nome.

## Norton Sound Winter Commercial Fishery

Regulation allows a winter thru-the ice commercial fishery in the Norton Sound Section from December 15 through May 15 which typically takes place near Nome. During the winter of 1990-1991, eleven commercial fishermen reported selling a total of 3,800 red king crab (Table 2). The market is split between local Nome residents who buy crab directly from the fishermen and Anchorage or non local markets. Crab sell in Nome for five dollars a piece and Anchorage prices are around four dollars a pound. The 1990-1991 winter catch was estimated to be worth about 31,000 dollars.

The winter crab fishermen generally use crab pots but some use hand lines to "prospect". Most fishermen consider commercial crabbing to be a sideline and hold other jobs. Usually, two or three fishermen sell the bulk of the crab. Because of the low volume of crab involved, no processor has found it profitable to operate locally. The crab sold locally are all sold fresh as are those shipped to Anchorage or other non local markets. During the mid-winter months fishermen find it difficult keeping the crab from freezing. Many Nome residents prefer to buy frozen crab since they are able to extract the meat prior to cooking. Fresh frozen crab are easily marketed in Nome but are not accepted in Anchorage.

## SUBSISTENCE FISHERY

Red king crab are utilized by Norton Sound residents mainly during the winter. Fishing occurs through holes or cracks in the ice with the use of handlines and pots. In order to document trends in the subsistence harvest, the Board of Fisheries enacted a regulation in 1977 requiring subsistence fishermen in Norton Sound to obtain a permit prior to fishing and record daily effort and catches on these permits (Table 2).

The first year subsistence permits were required had the highest number of permits issued to date with a relatively high harvest rate. The fishery declined sharply the following year and remained at very depressed levels through the 1981-82 season. The lack of success in the winter crab fishery during some past years has been attributed to a declining crab population caused by removal of crab in the summer commercial fishery together with low recruitment, low effort due to poor ice conditions, and changes in the near shore winter distribution of crab. All of these factors probably had some effect on the success of the winter fishery in varying degrees. During the 1978-79 winter fishery, the king crab population was still relatively high. Despite this relatively large population, winter catches were the poorest on record indicating that the major factors limiting winter catches during 1978-79 were probably poor ice conditions and the distribution of crab. During the winter of 1981-82, poor winter catches could more reasonably be attributed to a declining crab population resulting from poor recruitment rather than the effects of commercial catch removals since the crab population was at its lowest documented level. Subsistence fishing success during the winters of 1982-83 through 1986-87 had improved due to a rebuilding

of the population and increased use of more efficient gear (pots instead of handlines). Unstable ice conditions and record snowfalls adversely effected the 1987-88 and 1988-89 catches. In the last two years approximately 125 fishermen have averaged 100 crab each (Table 2).

The winter crab fishery is limited by extreme weather conditions. Shorefast ice can become unstable where crab pots may be carried away or fishermen are unable to cross open leads to get to their pots. Low air temperatures, wind and drifting snow are the primary factors that determine effort levels rather than crab densities.

#### STOCK STATUS / RESEARCH

In 1976 when monitoring of the Norton Sound king crab population first began, the population was mainly composed of prerecruit and recruit crab (Table 4 and Figure 3). This first population assessment survey by the NMFS estimated the legal male king crab population at 8.1 million pounds. The legal male crab population peaked in 1978 at an estimated 11 million pounds. During the 4 years following 1978, recruitment into the legal male crab population was very low. Subsequent NMFS surveys in 1979 and 1982 documented a population of predominantly postrecruit crab, and estimated a decline in the population to 2.6 million pounds by 1982. The Department of Fish and Game conducted their first population assessment survey in 1980, with subsequent surveys in 1981 and 1982 (Figure 4). These survey assessments documented a similar decline from 6.6 million pounds (1980) to 1.3 million pounds (1982). Beginning in 1981, sublegal crab abundance began to increase, and by 1983 recruitment into the legal male population also began to increase. No assessment work was conducted in 1983 or 1984. However, samples of the commercial catches indicated a significant increase of recruit crab into the legal male population; from a historic low of 10% in 1981 to 59% in 1984 (Table 4).

In 1985 both NMFS and ADF&G conducted population assessment surveys in Norton Sound (Table 3, Figure 5). The Department fished 65 stations throughout Norton Sound capturing 4,645 legal males, of which one-third was tagged. Subsequent recapture of tagged crab by the commercial fleet in August of 1985 provided tag to untagged ratios, and the population prior to the fishery was estimated at 2.4 million pounds (Table 3). After the commercial fishery in 1985 NMFS conducted a population assessment survey using trawl gear over a slightly larger area than that surveyed by the Department. Catches of male king crab by NMFS were in the process of or had just molted with the result being that their estimate of 3.4 million pounds of legal male king crab included some recruitment. Adjusting this estimate for molting, and including the summer commercial harvest, the estimate became 3 million pounds present prior to the 1985 August fishery. Both surveys documented relatively substantial numbers of recruit crab and a healthy percentage of prerecruit crab (Figure 5).

During September of 1988 NMFS conducted a forth population assessment with trawl gear. They swept an area roughly the same as in 1985, but increased sampling frequency in the proposed mineral lease area near Nome. The timing of the study was almost a month earlier than similar surveys in the past, which occurred

during the male molt. Nearly all the 1988 catch was in pre-molt condition. NMFS estimated 3.0 million pounds of legal male and 1.0 million pounds of prerecruit-one male red king crab; totaling 4.0 million pounds (Table 3 and Figure 6). Annual mortality is approximately 20% or in this case 0.8 million pounds. Ignoring growth and the winter harvests the population prior to the 1989 summer fishery would have been 3.2 million pounds, very close to the 1985 trawl estimate of 3.4 million pounds. NMFS conducted a fifth trawl survey of Norton Sound in 1991 with a reduced sample size and we are still awaiting the results of that survey.

#### FUTURE INVESTIGATIONS

In addition to the population surveys, the Department has run a winter crab tagging project through the ice near Nome from 1983 through 1991. The winter crab studies began as an index of near shore crab abundance during the season of heaviest local subsistence use. Today some of the controversy of mining impacts on crab distribution has taken the place of previous controversy over commercial versus subsistence use of the resource. From the perspective of the local management biologist this documentation of crab abundance is important because it is presently the most objective comparison of crab availability to local people. Controversy over this preferred subsistence personal use resource is likely to continue in the future especially if winter crab harvests decline even for a short time. Unfortunately, the winter project was also dropped this year due to budget cuts.

The catch per pot lift had been declining in the winter study until the 1990 season when the CPUE increased to roughly twice the 1987 and 1989 levels. The Department does not have the project in operation this season however, most public comment has been a significant increase in the number of crab and the larger size of crab. Quite possibly this is due to the lack of a summer commercial fishery harvesting legal size crab. Without current research studies such as the ADF&G surveys conducted in 1980-82, and 1985, and the NMFS trawl surveys conducted in 1976, 1979, 1982, 1985, 1988, and 1991 it will be very difficult to determine whether the legal male crab population of Norton Sound is being exploited at a level which will allow the population to stabilize and rebuild. The department has relied on age data collected during both the summer fishery and the winter study to track recruitment during the intervals between surveys since they each sample different portions of the population.

There has been recent work in the Kodiak area on one year old king crab (pre-recruit 6). The Nome staff has been experimenting with adapting similar techniques to try and apply the results of that study to Norton Sound. The hope is to index reproductive success 5 years in advance of recruitment and to document critical habitat that might be impacted by mining.

## OUTLOOK FOR 1992

There is little information at this time on which to base an outlook for 1992. The NMFS trawl survey data has not been worked up yet and the most recent commercial catch data is two years old due to no season in 1991. Recruit percentage has been low since 1987 which would indicate that the fishery would concentrate on relatively old crab again. The harvest goal will be set at 200,000 pounds for 1992 unless the NMFS trawl survey changes the population assessment.

Table 1. Summer commercial red king crab harvest and effort, Norton Sound, 1977-1991.

Year	Days Fished	Number of Vessels	Total Number of Pots	Average # of Pots per Vessel	Range of Pots Per Vessel	Number of Pot Lifts	Crab Per Pot	Commercial Harvest a
1977	60	7				5,457	36	0.52
1978	60	8				10,817	64	2.09
1979	16	34				34,773	28	2.93
1980	16	9				11,199	29	1.19
1981	38	36				33,745	11	1.38
1982	23	11				11,230	6	0.23
1983	3	23	3,583	156	68-290	11,195	12	0.37
1984	13.6	8	1,245	156	70-250	9,706	14	0.39
1985	21.7	6	1,116	186	106-280	13,209	11	0.43
1986	13	3	578	193	85-278	4,284	38	0.48
1987	11	9	1,430	159	75-287	10,258	10	0.33
1988	9.9	2	360	180	110-250	2,350	32	0.24
1989	3	10	2,555	256	67-432	5,149	15	0.25
1990 b	4	4	1,388	347	288-400	3,172	19	0.19
1991 c	0	0	No Season			0		0
Average d	10	8	1,532	204		11,896	23	0.79
Range	0-60	2-23	360-3,583	156-347		2,350-34,773	6-64	0.19-2.93

a Harvest in millions of pounds.

b All vessels participating were catcher/processors.

c No summer season.

d Averages and ranges do not include the 1991 season.

Table 2. Winter commercial and subsistence red king crab harvests, Norton Sound 1978-1991.

COMMERCIAL			SUBSISTENCE						
Year <sup>1</sup>	Fisher- men	#Crab Harvested	Winter <sup>2</sup>	Permits Issued	Permits Returned	Permits Fished	Total Crab Caught <sup>3</sup>	Total Crab Harvested <sup>4</sup>	Average Harvest/fm
1978	37	9,625	1977-78	290	206	149	5	12,506	84
1979	1	221	1978-79	48	43	38	5	224	6
1980	1	22	1979-80	22	14	9	5	213	24
1981	0	0	1980-81	51	39	23	5	360	16
1982	1	17	1981-82	101	76	54	5	1,288	24
1983	5	549	1982-83	172	106	85	5	10,432	123
1984	8	856	1983-84	222	183	143	15,923	11,220	78
1985	9	1,168	1984-85	203	166	132	10,757	8,377	63
1986	5	2,168	1985-86	136	133	107	10,751	7,052	66
1987	7	1,040	1986-87	138	134	98	7,406	5,772	59
1988	10	425	1987-88	71	58	40	3,573	2,724	68
1989	5	403	1988-89	139	115	94	7,945	6,126	65
1990	13	3,626	1989-90	136	118	107	16,635	12,152	114
1991	11	3,800	1990-91	119	104	79	9,295	7,366	93

<sup>1</sup> Prior to 1985 the winter commercial fishery occurred from January 1 - April 30; as of March 1985, the winter commercial harvest may occur from November 15 - May 15.

<sup>2</sup> The winter subsistence fishery occurs during months of two calendar years (as early as December, through May).

<sup>3</sup> The number of crab actually caught; some may have been returned.

<sup>4</sup> The number of crab "harvested" is the number of crab caught and kept.

<sup>5</sup> Data unavailable.

Table 3. Results of the population assessment surveys conducted for red king crab in Norton Sound since 1976.

Year	Date	Research Agency	Vessel	Gear Effort	Number of Red King Crab Captured <sup>1</sup>			Population Estimates of Legal Male Crab <sup>3</sup>	
					Sublegal Males	Legal <sup>2</sup> Males	Females	Numbers	Pounds
1976	9/02 - 9/05	NMFS	Miller-Freeman	Trawl	768	555	180	3,119,800	8,111,480
	9/16 - 10/07			158 tows					
1979	7/26 - 8/05	NMFS	Miller-Freeman	Trawl	46	194	40	837,241	2,511,723
				71 tows					
1980	7/04 - 7/14	ADF&G	Altair	Pots	443	3,290	158	1,900,000	6,600,000 <sup>4</sup>
				397 lifts					
1981	6/28 - 7/14	ADF&G	Altair	Pots	4,097	3,415	1,933	1,285,195	4,755,221
				718 lifts					
1982	7/06 - 7/20	ADF&G	Aleutian #1	Pots	5,019	2,001	424	353,273	1,271,783
				689 lifts					
1982	9/05 - 9/11	NMFS	Miller-Freeman	Trawl	322	107	265	970,646	2,620,744
				50 tows					
1985	7/01 - 7/14	ADF&G	Arctic Sea	Pots	6,086	4,645	181	907,579	2,414,644
				642 lifts					
1985	9/16 - 10/01	NMFS	Argosy	Trawl	266	163	151	1,203,000	3,369,000
				78 tows					
1988	8/16 - 8/30	NMFS	Miller-Freeman	Trawl	258	141	218	1,037,000	3,038,000
				82 tows					

<sup>1</sup> Number of crab captured on ADF&G surveys represent data standardized for a 24 hour soak.

<sup>2</sup> Legal male red king crab were defined as at least 106mm in carapace length for the 1976 NMFS survey; 105mm for the 1979 and 1985 NMFS survey; and at least 121mm in carapace width for all ADF&G surveys.

<sup>3</sup> Population est. are valid for the date of the survey, ie either before or after the summer commercial fishery.

<sup>4</sup> The 1980 estimate has been revised from the original estimate of 13.4 million pounds. The original estimate was thought inaccurate due to under-reporting of recovered tagged crab.

Table 4. Comparison of percent recruit and post-recruit king crab sampled from the summer commercial fishery and winter research, Norton Sound, 1983-1990.

Year	Winter Research		Summer Commercial	
	Recruits (%)	Post-recruits (%)	Recruits (%)	Post-recruits (%)
1977			53	47
1978			29	71
1979			33	67
1980			15	85
1981			10	90
1982			27	73
1983	73	27	55	45
1984	54	46	59	41
1985	68	32	45	55
1986	55	45	48	52
1987	20	80	22	78
1988 1/			25	75
1989	47	53	23	77
1990	49	51	21	79

1/ No data collected in winter 1988 due to unstable ice conditions

Recruits = All new shell, legal size, male crab of carapace length <116mm.

Postrecruites = All other legal size male king crab.

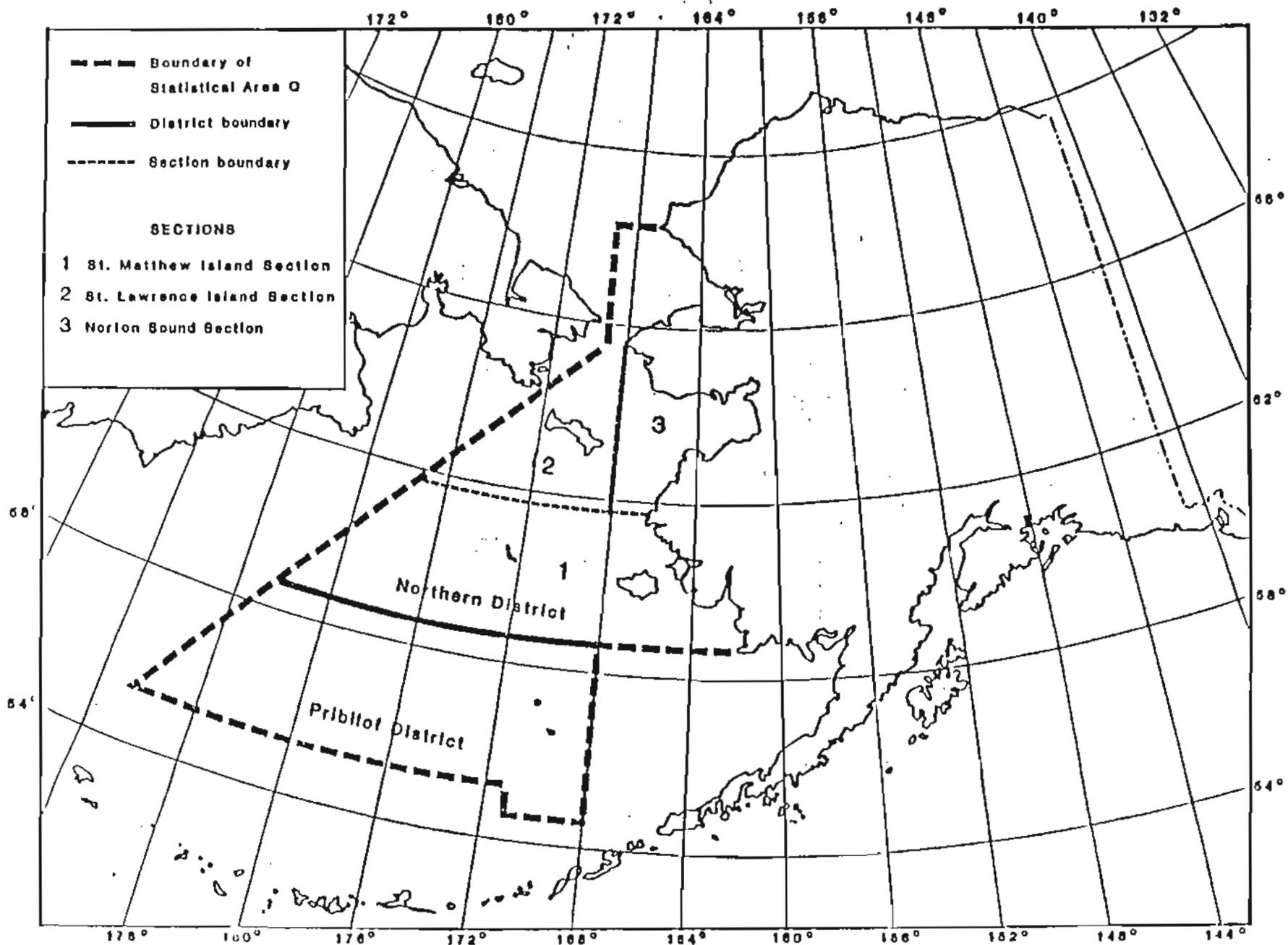
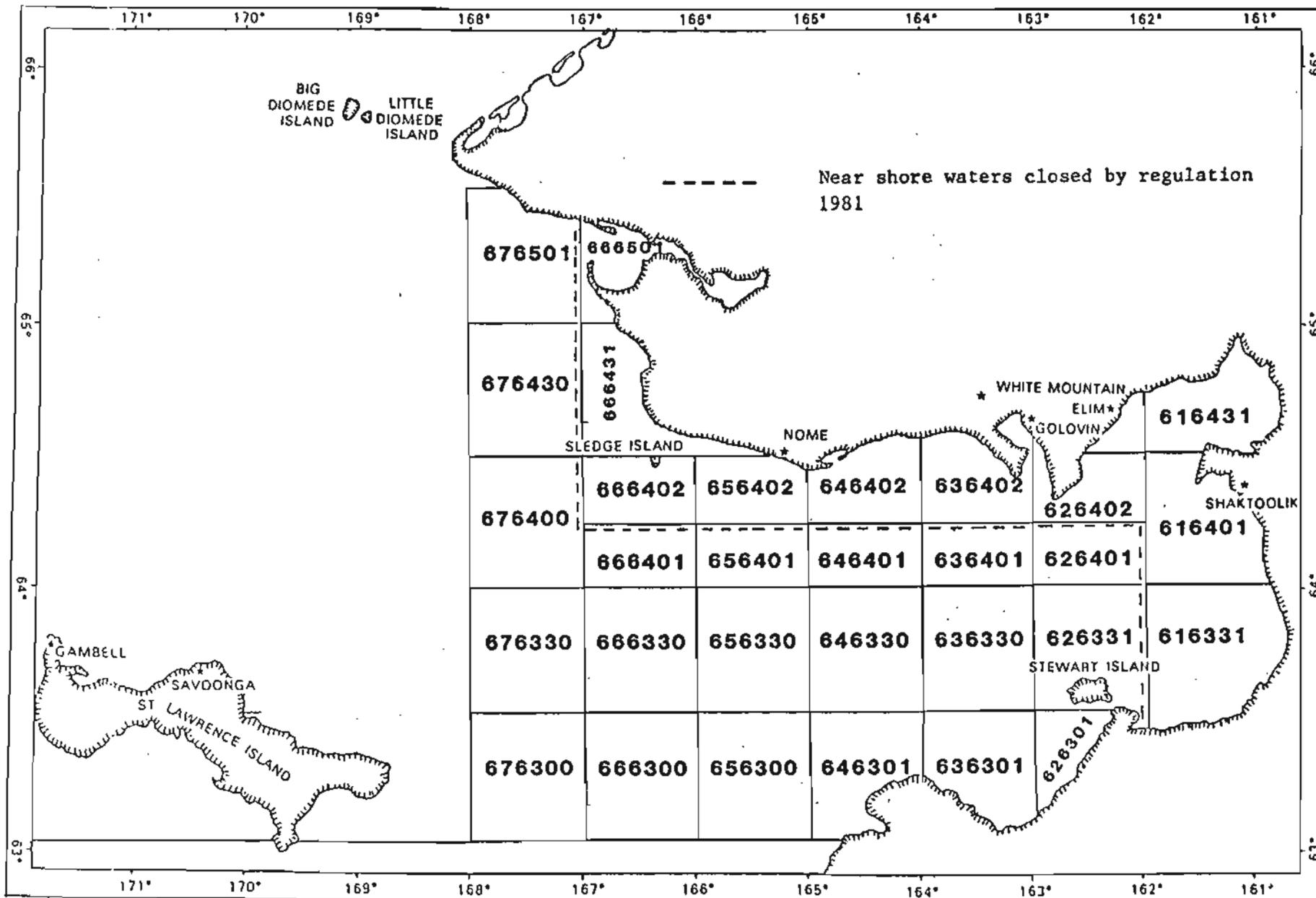


Figure 1. King crab fishing districts and sections of Statistical Area Q

Figure 2. Statistical areas for the Norton Sound Red King Crab Fishery.



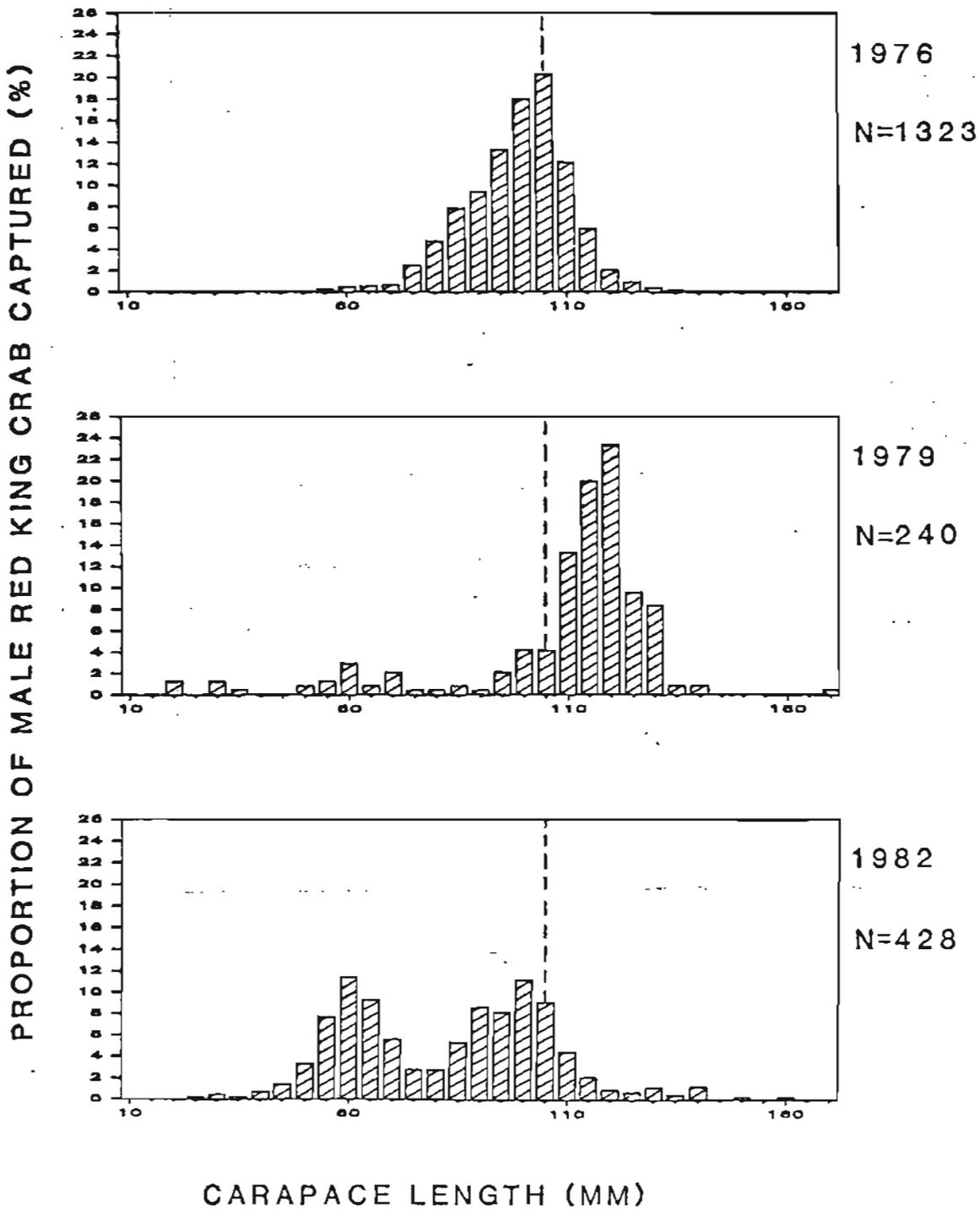


Figure 3. Size structure of the male red king crab population, Norton Sound, Alaska as determined by research fishing, NMFS. Dotted line represents present minimum legal size.

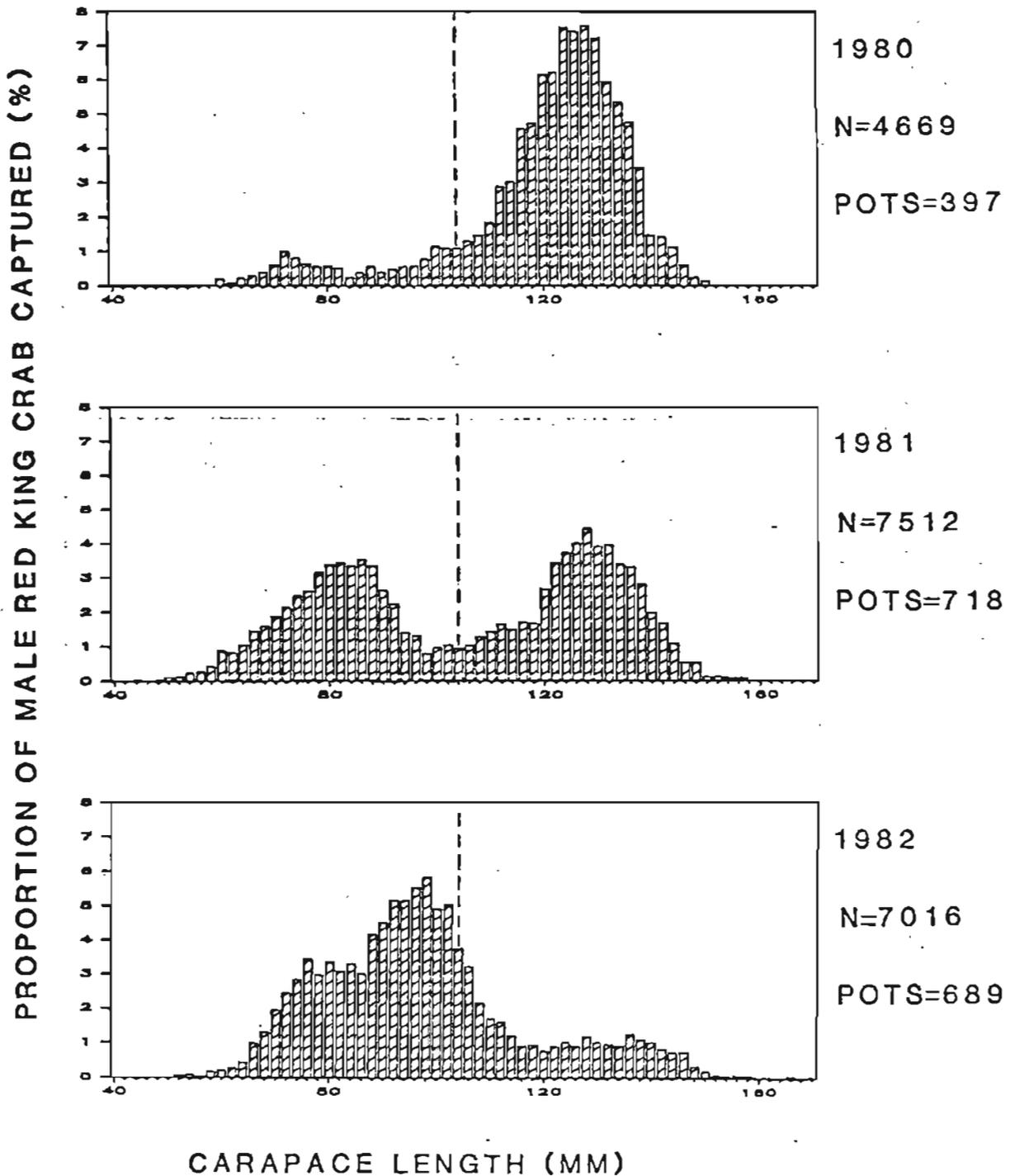


Figure 4. Size structure of the male red king crab population, Norton Sound, Alaska as determined by research fishing, ADF&G, 1980-1982. Dotted line represents present minimum legal size.

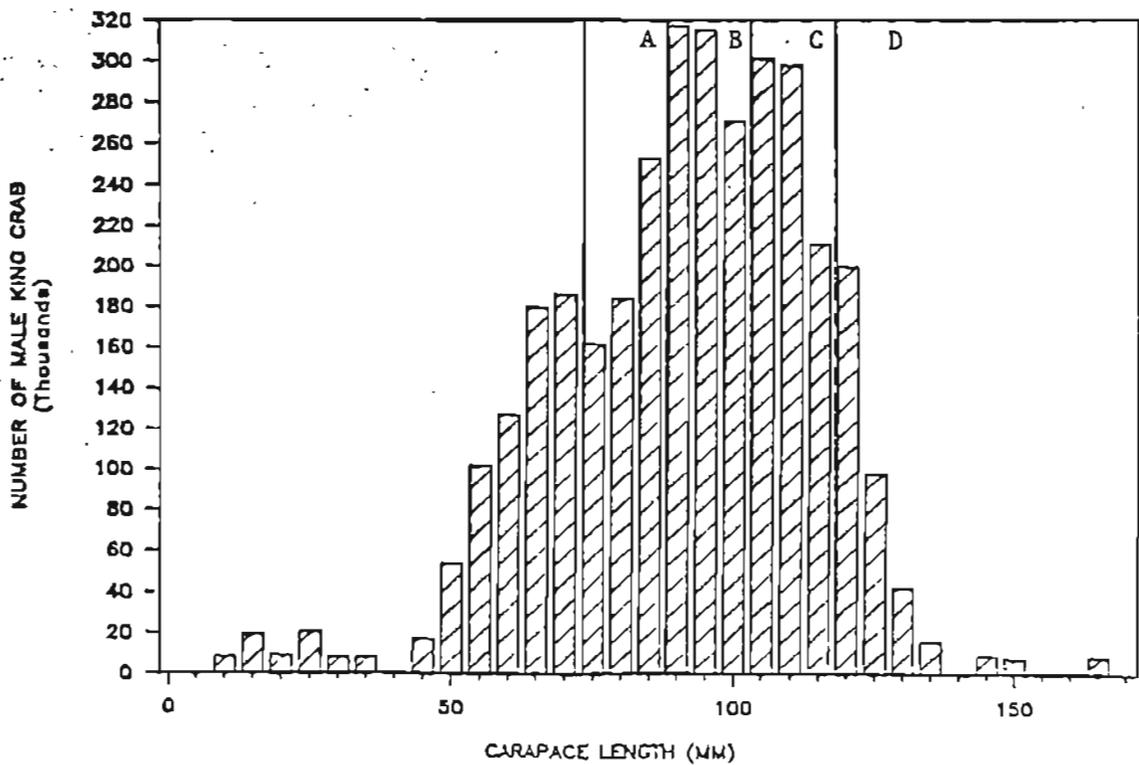
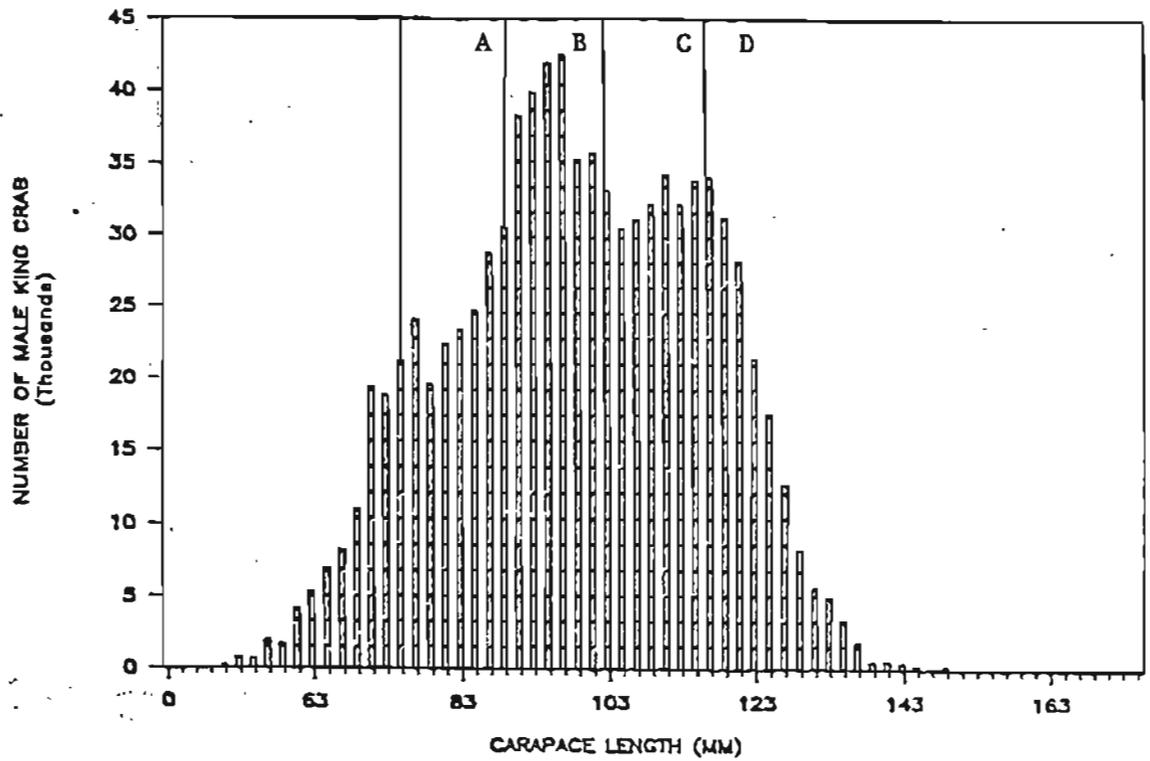


Figure 5. Size distribution of the 1985 Norton Sound male red king crab population from assessment surveys conducted by ADF&G (Top) and NMFS (Bottom). Portions of the graph labeled A are prerecruit two crab (1987 recruitment); B are prerecruit one crab (1986 recruitment); C are recruit crab; D are postrecruit crab.

Figure 6. Size distribution of the 1988 NMFS population assessment survey.

N = 399

