

1992
NORTON SOUND DISTRICT
SHELLFISH REPORT
to the
Alaska Board of Fisheries

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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 (Table 3, Figures 3 & 4). In addition, the State of Alaska Department of Fish and Game (ADF&G) has conducted five research pot fishing studies. Data from population studies, from winter research studies, mining impact studies, and from 15 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.

St. Lawrence Island

The St. Lawrence Island section lies immediately west and north of the Norton Sound Section. Until recently, 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, in 1989, when 3,603 pounds of red king crab and 984 pounds of blue king crab were delivered from 8 landings and in 1992 when 53 pounds of blue crab were landed.

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 winter caught 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. The Board provided the same provisions in the regulation as are in effect for Norton Sound to allow a commercial winter fishery. However, local residents of St. Lawrence Island have decided not to export any of their winter catch for commercial sale.

COMMERCIAL FISHERY

Norton Sound Summer Commercial Fishery

The Norton Sound section commercial red king crab season opened by regulation at noon, August 1. The 1992 commercial crab fleet consisted of five catcher-processor vessels which were all present for the scheduled tank inspection and registration, July 30 to the morning of August 1. Twenty-seven vessels, including the five catcher processors brought a total of 3,055 pots to fish in Norton Sound, but only reported fishing 2,635. All but 20 of the excess pots were onboard a single vessel which planned to participate in a brown king crab fishery immediately after the closure of the Norton Sound fishery. The season was open for 2 days and was closed by emergency order at noon ADT, Monday, August 3, when it was anticipated a harvest of 300,000 pounds of legal male king crab would be reached. The closure announcement was made as the tank inspection stickers were issued, between 8:00 and 10:00 a.m. August 1.

All but one of the fish tickets were received prior to vessel departures. The total reported harvest was 74,029 pounds with an estimated 1,800 pounds of deadloss. The average price per pound of landed crab is thought to be \$1.75 per pound, although a majority of vessels did not report price. The catches this season were reported from five statistical areas (656401, 666330, 666401, 636401 and 656330) (Figure 2). The fleet averaged 4.3 legal crab per pot pulled; a total of 24,902 crab were captured in 5,746 potlifts. The average weight of legal male crab was 3.0 pounds, 0.1 less than the previous two seasons. This small decline in average weight is most likely due to the water content of crab being reduced as they were transported by brailer from the catcher boat to the processing vessel, unlike earlier years when catcher processors composed the bulk of the fleet.

The single Department of Fish and Game and the five industry observers observed a total of 733 pot lifts during the fishery for catch composition. A total of 1,420 legal male, 459 sublegal male, and 147 female crab were recorded. A total of 2,566 legal male crab were measured for carapace length and condition; the mean carapace length was 119.7mm; the recruit and postrecruit proportions were respectively 28% to 72%.

The Norton Sound guideline harvest level of legal male red king crab for the 1992 season was 300,000 pounds. This conservative quota was set prior to the season using preliminary data from the fall 1991 National Marine Fisheries Service (NMFS) trawl survey, which placed the current population size at about 1/3 of the historic population level. The population of legal male crab has remained fairly stable since 1985, with only a limited increase in the number of legal king crab. Exploitation levels were maintained near 15% until 1988 when a decline in the number of legal males caused the exploitation rate to be reduced. The guideline harvest level of 300,000 pounds equated to an exploitation 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.

Board of Fisheries regulations specific to 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 established 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.

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, this action was not taken during the 1992 season due to the high potential harvest of both legal male and sublegal red king crab thought to be just inside the closed line.

- 3) 5AAC 39.141 which established the on board observer program for catcher-processors. Thus, all five catcher-processors were required by regulation to have an observer on board their vessels during the 1992 Norton Sound summer king crab fishery.

This was the third season that regulation 5AAC 39.141, the mandatory observer program, was in effect for the Norton Sound fishery. Preparation was made prior to orientation in order to prevent observer problems similar to previous seasons from happening again. Observer materials (manuals, codes, forms, etc.), and program coordination was provided by the Dutch Harbor staff member, Rance Morrison. Additional documentation and substitute forms were provided to the observers by the Nome staff in order to obtain pertinent information specific to the Norton Sound fishery. In addition to the required observers, the Department placed an observer on one catcher boat. Orientation for all observers took place in the Nome office the morning of July 31, prior to tank inspections.

During past years, there was a wide range of professionalism among observers; some collected less than the preferred data while others performed all tasks acceptably. Paperwork turned in ranged from very complete and comprehensive, to unusable. The quality of the observers during the 1992 season was good. This is the first season we were satisfied with the observer data.

- 4) 5 AAC 34.925 (i) and (j), requiring pot tags and limiting each vessel to 100 pots.

This new regulation, 5AAC 34.925, was responsible for the redistribution of fishing effort experienced during the 1992 season. The limit of 100 pots was only one-third the average number of pots fished per vessel during 1990, the last season held in Norton Sound. Apparently, many people felt their vessel would be able to compete economically under the new limit; however, neither the Department staff nor the fishing fleet anticipated the number of vessels making that same judgement.

The unexpectedly large number of vessels participating in the Norton Sound king crab fishery complicated fisheries management. Not since 1983 have as many crab pots been deployed in the Norton Sound red king crab fishery. Given the number of pots the fishermen intended to use and the average catch rate from the past fisheries, the 300,000 pound harvest goal was expected to be taken in 48 hours. Because of the large number of vessels and gear participating in this year's fishery and the short length of the anticipated opening, the closure was announced prior to the fishery's start. The harvest was anticipated to closely approach the harvest goal, so catch reporting was not expected to provide accurate enough data to finely tune the season closure. As a consequence, the closure was announced with no possibility of an extension. Even at the closure it was not apparent how poor the harvest had been. An extension was considered, however, the slow catch rate indicated that only a small portion of the population was in open waters, continuing the fishery with a very slow catch rate did not seem appropriate. Relaxing the closure line was considered. The crab were necessarily in very high density just inside the closure line in about a ten mile wide band. Relaxing the line by a small amount was not feasible and the sublegal population would have been subject to significant handling mortality. The only enforcement available was a chartered aircraft of which 50% of the bills would be charged to the Department's limited Norton Sound crab budget. The decision was made to allow the closure to stand. There was a high potential harvest, the most pots since 1983 fishing on a concentrated mass of both legal and sublegal crab. Had the risk been less, an extension with a relaxed closure line would have been more appropriate.

Several crabbers expressed the opinion that they were cycling through their pots too frequently. Most operators checked all their pots in roughly 12 hours in contrast to past years when pots were allowed to "soak" roughly 30 hours. It must take crab some time to detect the scent of the bait and then find the pot. If pots are cycled too quickly the majority of the crab will not reach the pot before it is pulled, thus reducing the catch rate. The fact that several operators reported a high percentage of their harvest to be "riders", crab that came up on the outside of the pot, is evidence to suggest the pots were cycled too fast.

The late break-up and ice-out in Norton Sound during 1992 had an effect on the crab fishery as well as the salmon and herring fisheries. Egg development was delayed this year by roughly one month. Only a few females were carrying eyed eggs this season. Three boats fishing in eastern Norton Sound near Rocky Point lost crab in their holds due to temperature and possibly salinity shock. Surface temperatures were quite warm while water was quite cold at depth. The sea ice had been gone only one month and relatively calm weather had not mixed the waters much. It seems that the crab's annual migration was either delayed or shortened by these same climactic factors. The main concentration of king crab was apparently just north of the closure line.

The good weather allowed boarding for tank inspections and registrations of all vessels. Skipper cooperation and compliance with the verbal catch report was good. Fish and Wildlife enforcement support was only available when the Department assisted with logistical support during the season.

St. Lawrence Island Summer Commercial Fishery

On August 5, four vessels traveled to the St Lawrence Island Section and did some prospecting for about three days. Only one vessel reported a harvest of sixteen crab. Verbal reports indicated pots were deployed along the eastern boundary of the section and near the village of Gambell. Only small amounts of blue king crab were found near King Island and Gambell.

Norton Sound Winter Commercial Fishery

Regulation allows a winter thru-the ice commercial fishery in the Norton Sound Section from November 15 through May 15 which typically takes place near Nome. During the winter of 1991-1992, thirteen commercial fishermen reported selling a total of 7,478 red king crab (Table 2). For the first time, a commercial fisherman operated from Unalakleet during the spring of 1992. With the one exception, the harvest 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 \$3.50 per pound. The 1991-1992 winter catch of 21,177 pounds was estimated to be worth about 76,000 dollars, more than twice the previous year's harvest and value.

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 three years approximately 100 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 (Figures 4 & 5). 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 (Table 3). 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.

During September of 1988 NMFS conducted a fourth population assessment with trawl gear. They swept an area roughly the same size 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. 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 during late August 1991 with a reduced number of tows. Each station had only a single sampling tow as compared to each station having both a day and night tow during previous surveys. This reduction in sampling has the affect of introducing more variability into the estimate. The legal crab biomass in the summer fishing area was estimated to be 3,400,000 pounds and the total Norton Sound legal biomass was estimated to be 4,009,000 pounds. Since the survey occurred prior to the molt, a mortality of 10% was assumed for the year following the estimate. With no summer or winter fishery data to compare with the survey results, a conservative biomass of 3,400,000 pounds was used as the basis for the 1992 harvest guideline. The Norton Sound red king crab population is thought to be quite stable when harvested near 10%.

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. Documentation of crab abundance is important because it provides an objective comparison of crab availability to an important subsistence fishery. Controversy over the availability of the crab resource to the local subsistence fishery is likely to continue in the future especially if winter crab harvests decline even for a short time. Unfortunately, the winter project was dropped prior to the past winter due to budget cuts. The staff is currently working with past year's data to demonstrate how winter age/length data compares to commercial catch data.

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. Although the Department has not had the project in operation these last two seasons, most public comment indicates a significant increase in the number of

crab and a 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.

OUTLOOK FOR 1993

The outlook for 1993 is good in comparison to the past ten years. The NMFS trawl survey data indicates the Norton Sound red king crab population is stable and gradually rebounding. The fact that the commercial harvest has been minimal over the last two years would indicate the legal crab population should be strong. Recruitment is expected to be weak during 1993, but to be stronger the following year. It is expected that the fishery would concentrate on relatively old crab during 1993. The harvest goal will be set at 340,000 pounds for 1993.

Table 1. Summer commercial red king crab harvest and effort, Norton Sound, 1977–1992.

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*
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
1992	2	27	2,635	98	35–100	5,746	4	0.07
Average ^d	21	12	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

* 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 and 1992 seasons.

Table 2. Winter commercial and subsistence red king crab harvests, Norton Sound, Bering Sea, 1978–1992.

COMMERCIAL			SUBSISTENCE						
Year ^a	Number of Fishermen	# Crab Harvested	Winter ^b	Permits Issued	Permits Returned	Permits Fished	Total Crab Captured ^c	Total Crab Harvested ^d	Average Harvest/fm
1978	37	9,625	1977 –78	290	206	149	^e	12,506	84
1979	1	221	1978 –79	48	43	38	^e	224	6
1980	1	22	1979 –80	22	14	9	^e	213	24
1981	0	0	1980 –81	51	39	23	^e	360	16
1982	1	17	1981 –82	101	76	54	^e	1,288	24
1983	5	549	1982 –83	172	106	85	^e	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
1992	13	7,478	1991 –92	158	149	105	15,051	11,736	112

^a Prior to 1985 the winter commercial fishery occurred from January 1 thru April 30; as of March 1985, the winter commercial season was open by regulation from November 15 thru May 15.

^b The winter subsistence fishery occurs during months of two calendar years (as early as December, thru May).

^c The number of crab actually caught; some crab may have been released.

^d The number of crab "Harvested" is the number of crab caught and kept.

^e 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 ^a			Population Estimates of Legal Male Crab ^c	
					Sublegal Males	Legal ^b Males	Females	Numbers	Pounds
1976	9/02 - 9/05 9/16 -10/07	NMFS	Miller-Freeman	Trawl 158 tows	768	555	180	3,119,800	8,111,480
1979	7/26 - 8/05	NMFS	Miller-Freeman	Trawl 71 tows	46	194	40	837,241	2,511,723
1980	7/04 - 7/14	ADF&G	Altair	Pots 397 lifts	443	3,290	158	1,900,000	6,600,000 ^d
1981	6/28 - 7/14	ADF&G	Altair	Pots 718 lifts	4,097	3,415	1,933	1,285,195	4,755,221
1982	7/06 - 7/20	ADF&G	Aleutian #1	Pots 689 lifts	5,019	2,001	424	353,273	1,271,783
1982	9/05 - 9/11	NMFS	Miller-Freeman	Trawl 50 tows	322	107	265	970,646	2,620,744
1985	7/01 - 7/14	ADF&G	Arctic Sea	Pots 642 lifts	6,086	4,645	181	907,579	2,414,644
1985	9/16 -10/01	NMFS	Argosy	Trawl 78 tows	266	163	151	1,203,000	3,369,000
1988	8/16 - 8/30	NMFS	Miller-Freeman	Trawl 82 tows	258	141	218	1,037,000	3,038,000
1991	8/22 - 8/30	NMFS	Ocean Hope	Trawl 53 tows	202	178	105	1,384,000	4,009,000

^a Number of crab captured on ADF&G surveys represent data standardized for a 24 hour soak.

^b 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.

^c Population est. are valid for the date of the survey, ie either before or after the summer commercial fishery.

^d 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.

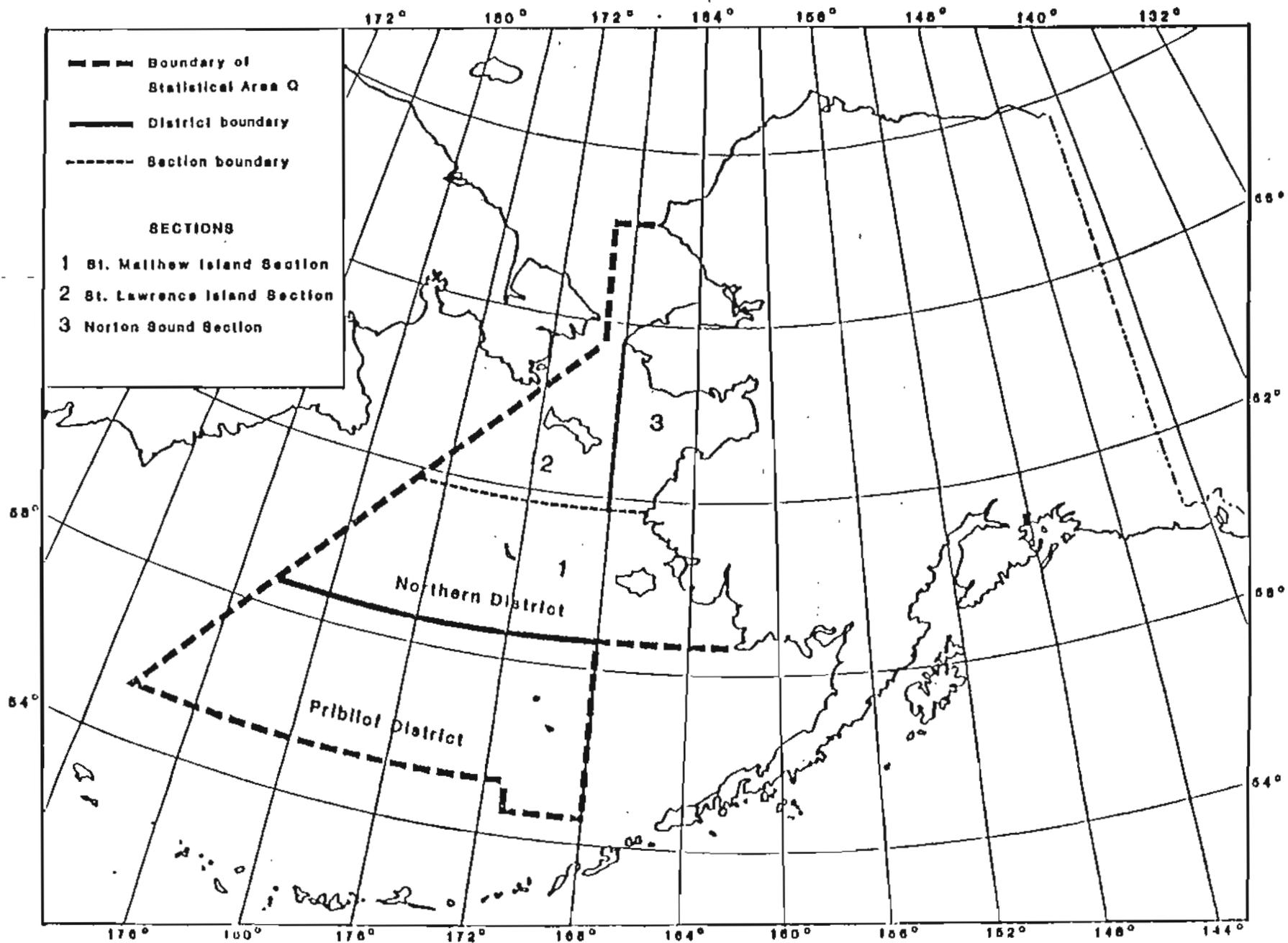
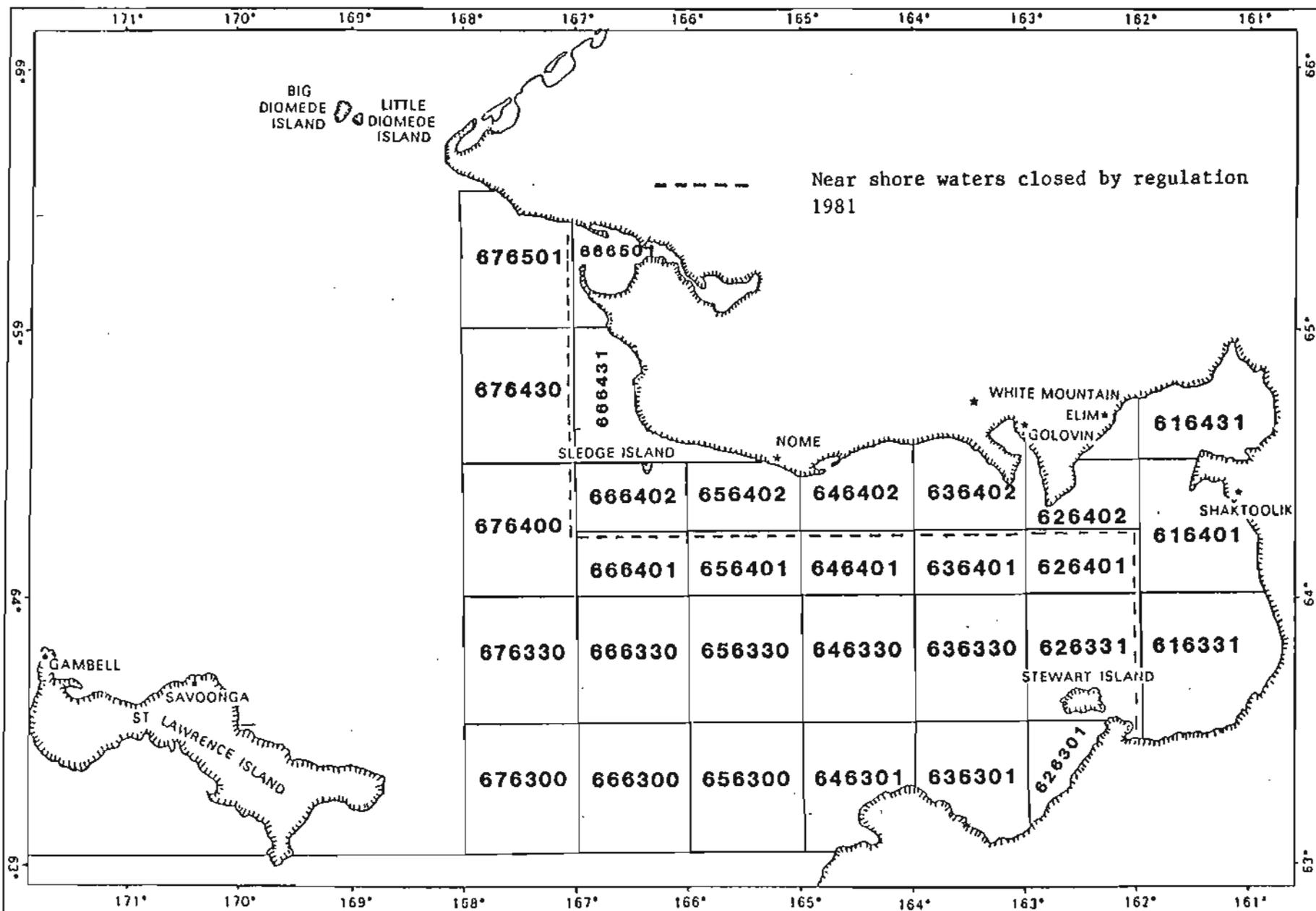


Figure 1. King crab fishing districts and sections of Statistical Area Q

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



Norton Sound Red King Crab

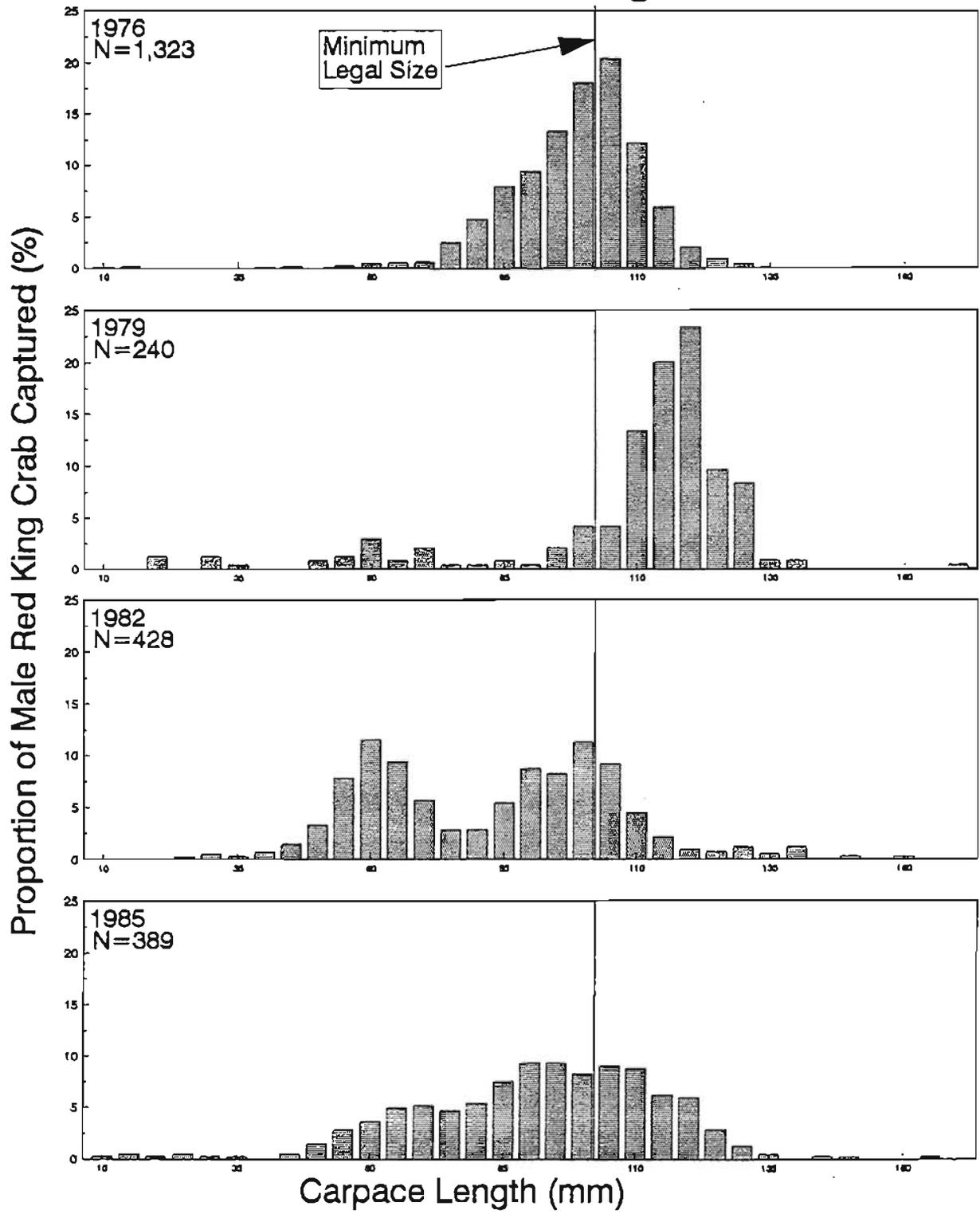


Figure 3. Norton Sound male red king crab size distribution from trawl assessment surveys conducted by the National Marine Fisheries Service, 1976, 1979, 1982, 1985, 1988, and 1991.

Norton Sound Red King Crab

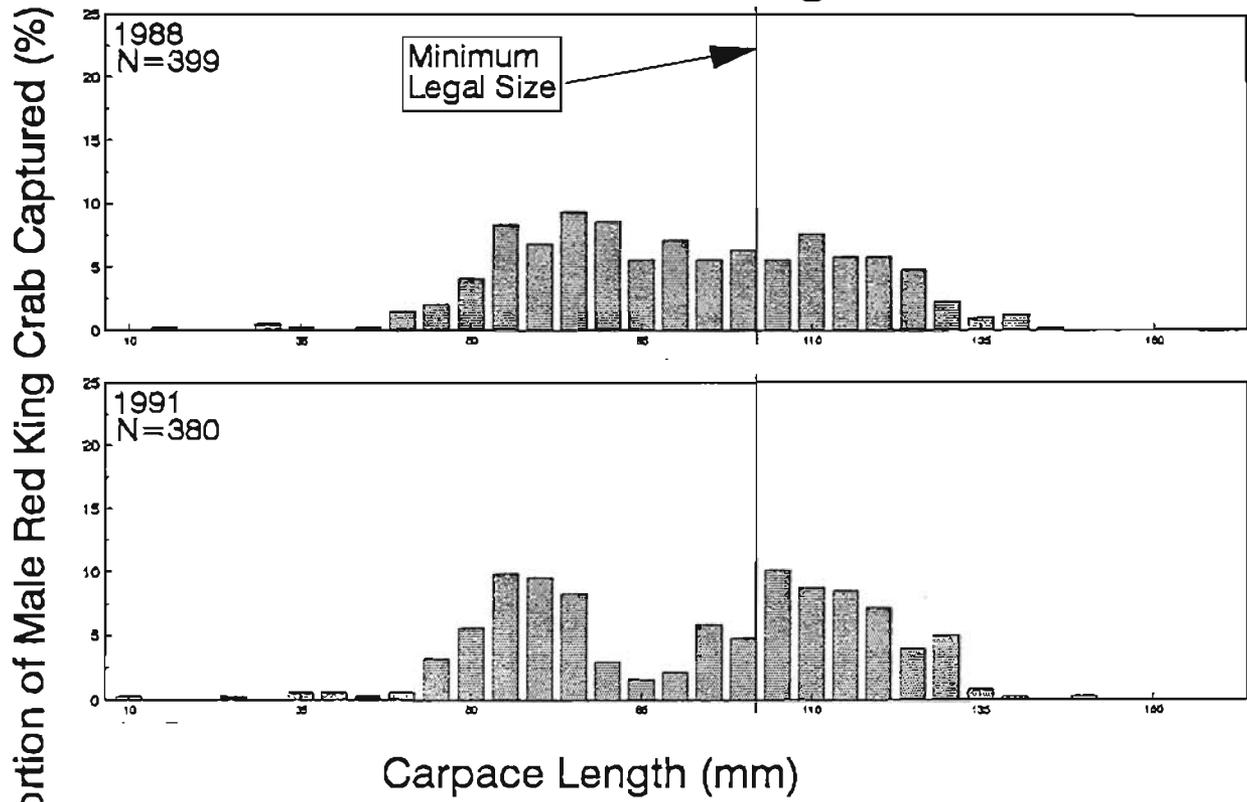


Figure 3. (Page 2 of 2)

Norton Sound Red King Crab

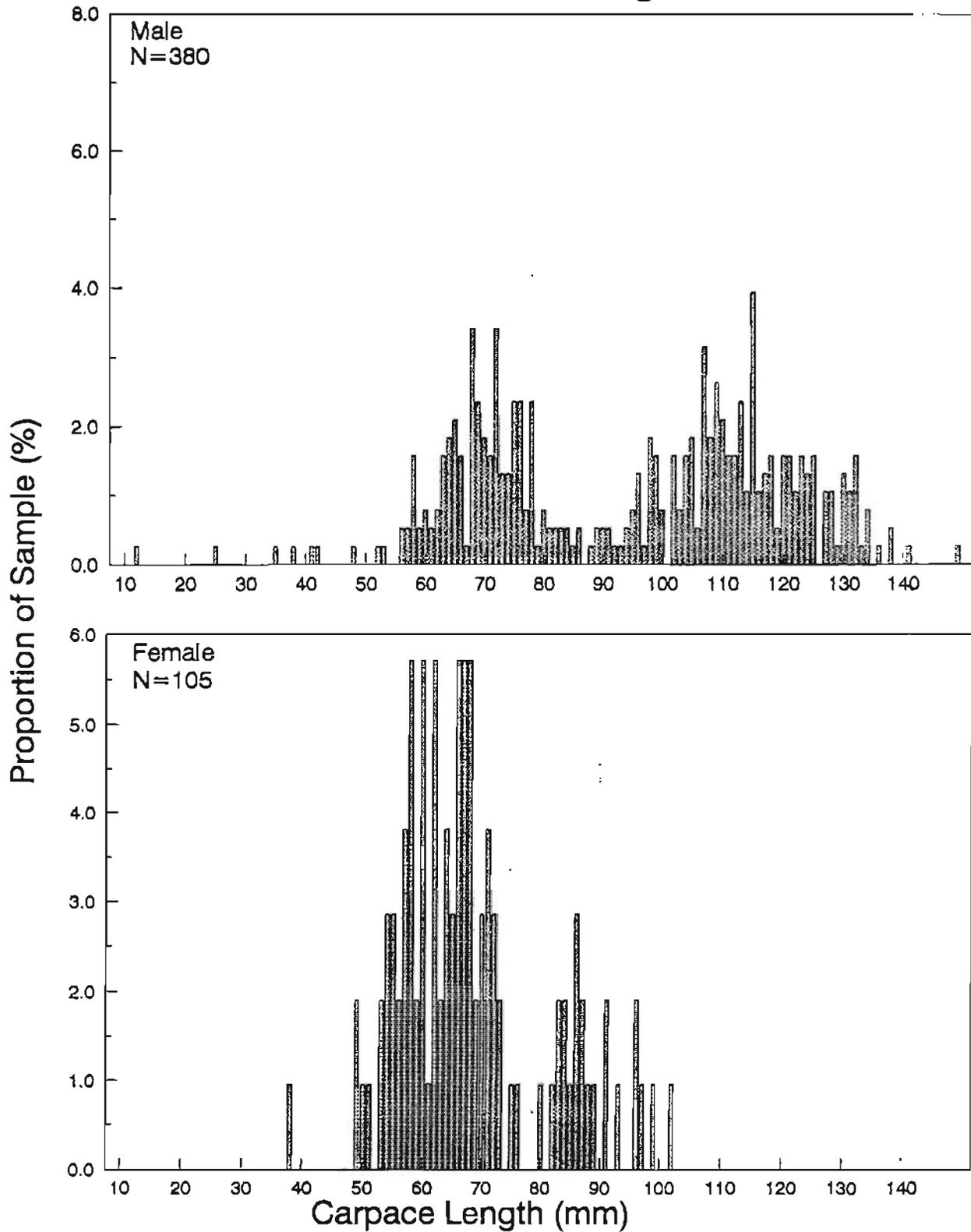


Figure 4. Norton Sound male and female red king crab size distribution from a trawl assessment survey conducted by the National Marine Fisheries Service, 1991.

Norton Sound Red King Crab

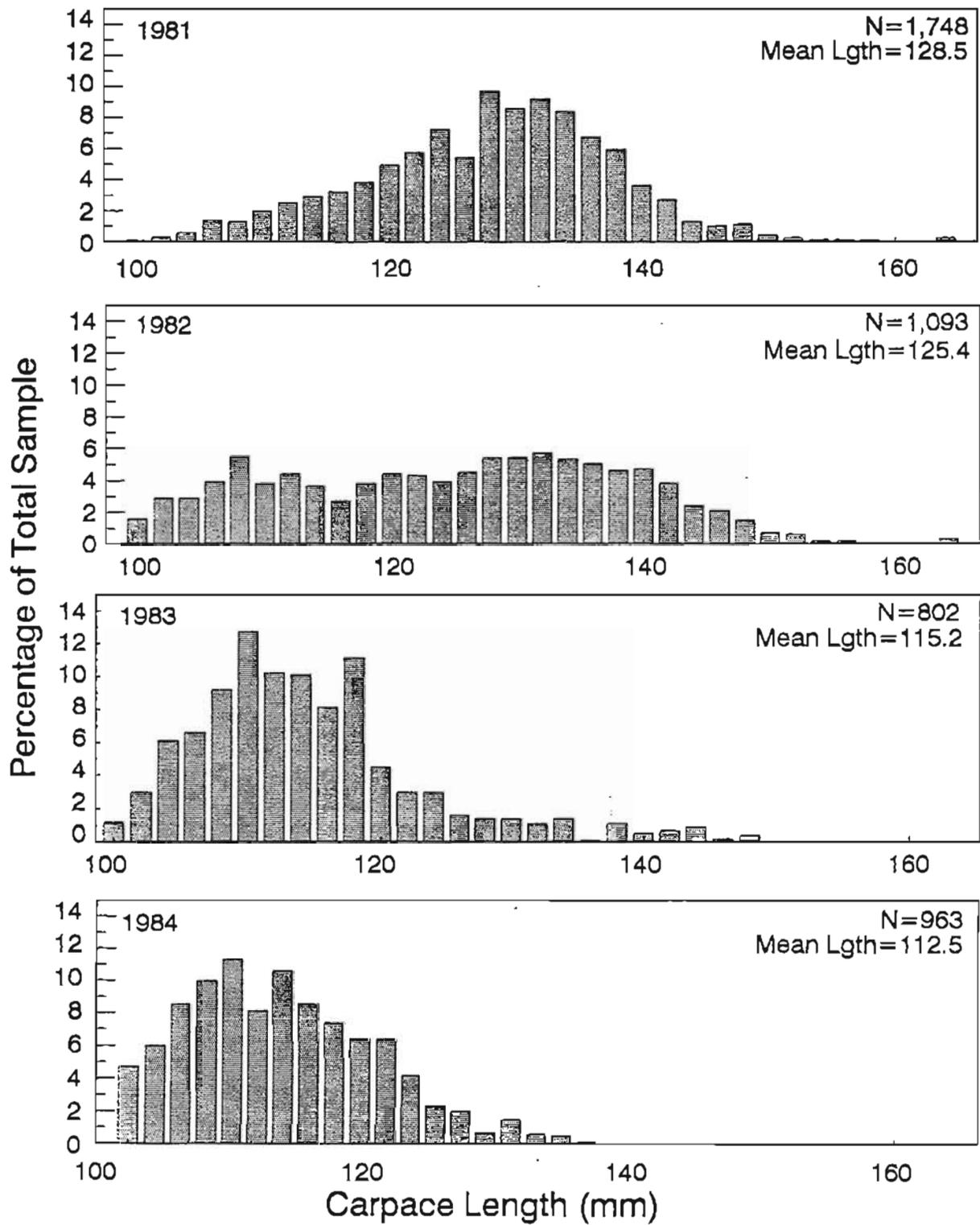


Figure 5. Norton Sound red king crab summer commercial catch samples, 1981-1992 (There was no commercial fishery in 1991).

Norton Sound Red King Crab

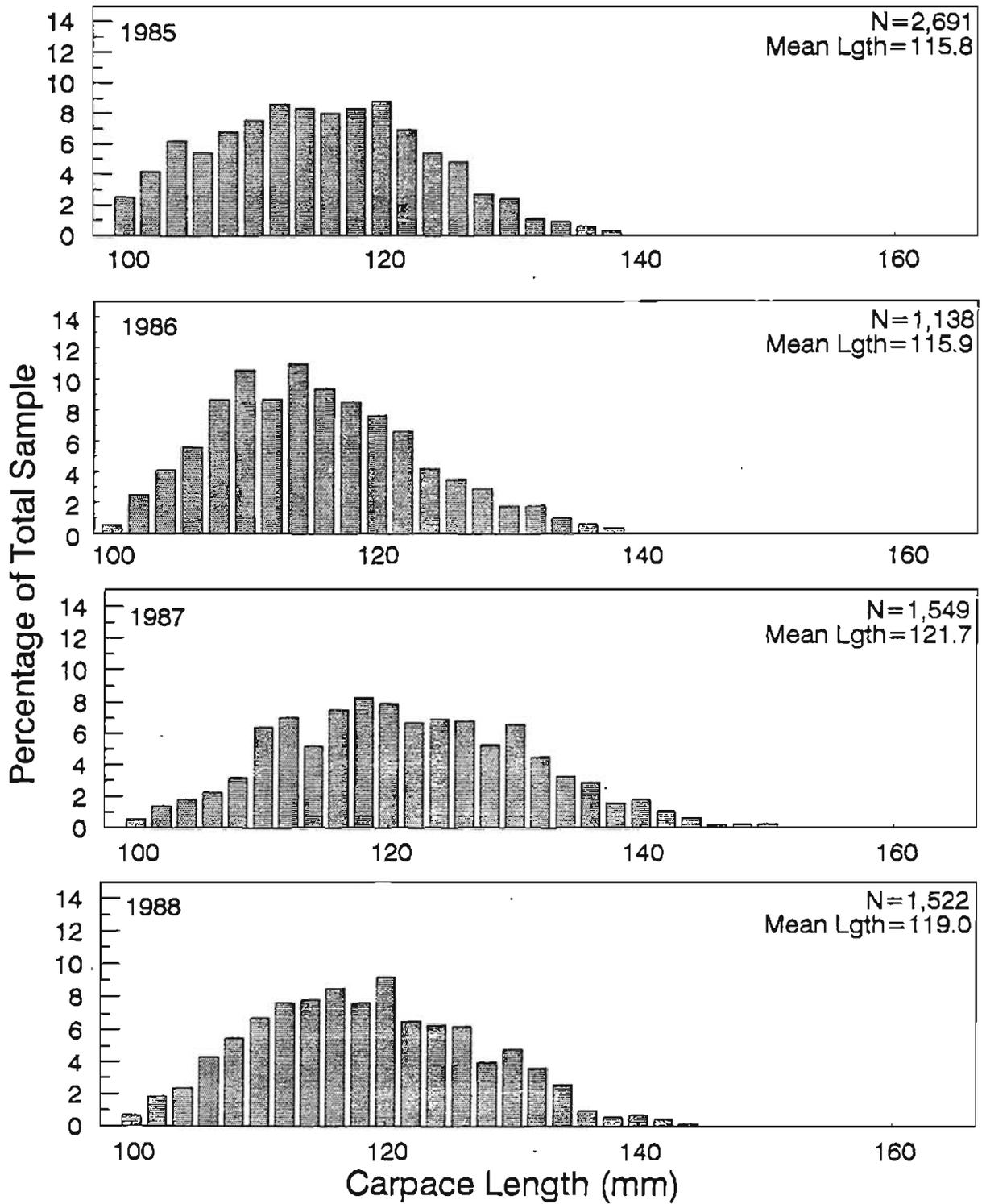


Figure 5. (page 2 of 3)

Norton Sound Red King Crab

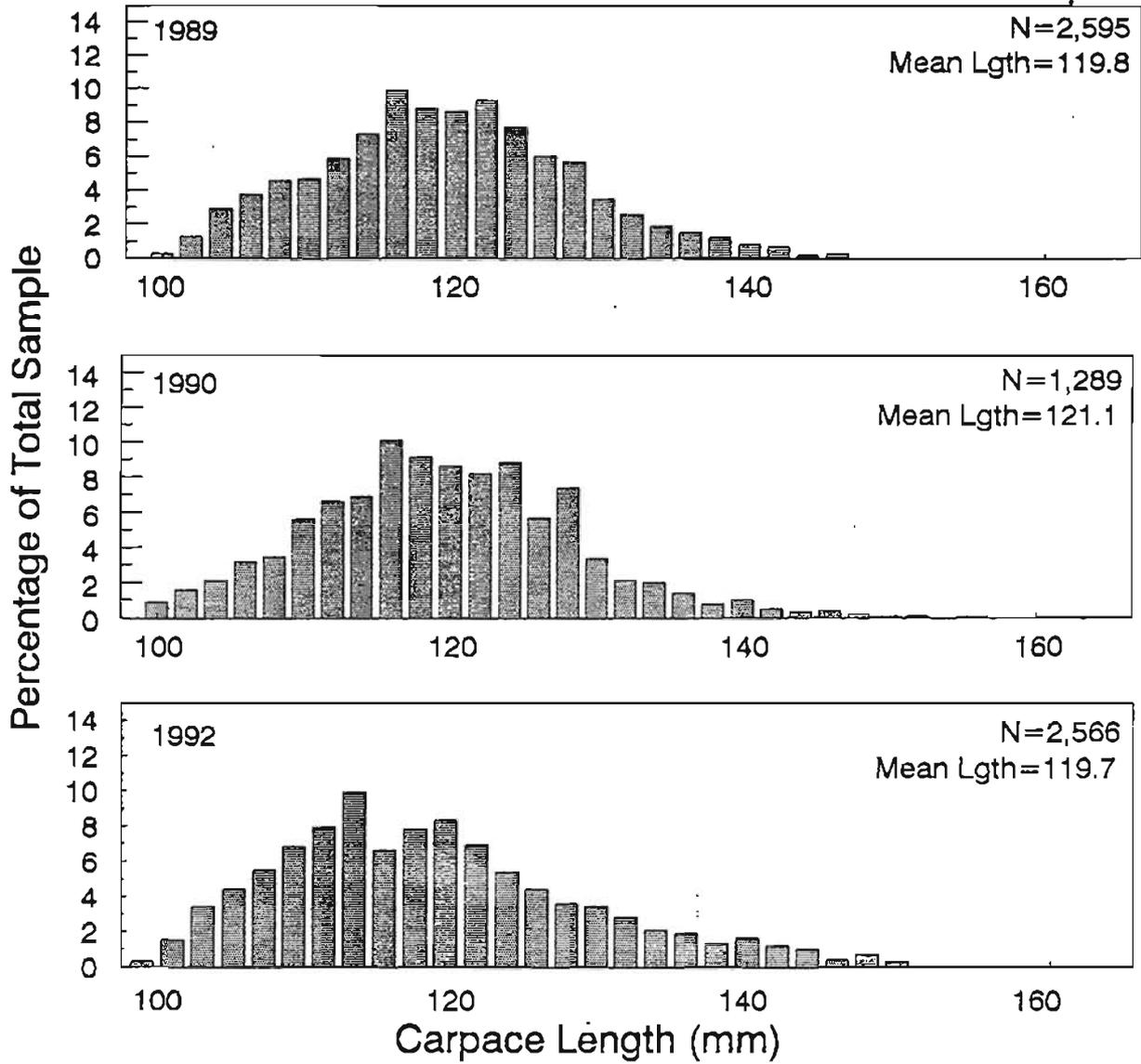


Figure 5. (page 3 of 3)