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DIVISION OF COMMERCIAL FISHERIES

NORTON SOUND AREA
SHELLFISH REPORT
to the
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ABSTRACT

Summaries of the commercial and subsistence red king crab (Paralithodes camtschatica) fisheries are presented. The methods used to derive the 1985 population estimates by both ADF&G and NMFS are discussed within the section describing stock status and research in Norton Sound. Based on available information on stock status, the 1988 harvest is not expected to exceed 200,000 pounds.

INTRODUCTION

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 the 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 11 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 four National Marine Fisheries Service (NMFS) research trawl studies in Norton Sound as well as four Alaska Department of Fish and Game (ADF&G) research pot fishing studies. Data from these studies, from winter research studies, mining impact studies, and from eleven commercial fishing seasons have 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 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. The section 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. 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 islands within the section was adopted in an attempt to protect stocks targeted by local fishermen during the winter. 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. There is a proposal to legalize the commercial sale of crab from the St. Lawrence Island section during the winter. If this winter fishery is legalized the Nome office will attempt to monitor catches from each village as funding and other assignments allowed.

COMMERCIAL FISHERY

Summer Commercial Fishery

Prior to the beginning of the 1987 summer season the legal male population was thought to be stable and could therefore support a harvest similar to the previous 4 years. The last population estimate had been made in 1985. Recruitment information was too old to be considered reliable so the decision was made to continue the same magnitude of harvest until the next population estimate could be made. The 1987 management plan announced a quota of 400,000 pounds.

The Norton Sound commercial red king crab season opened by regulation at noon, August 1. Five vessels present on the grounds received onboard registrations on July 31. Tank inspection stickers were handed out to these five vessels on the morning of August 1. Three additional vessels which arrived during the night before the opening received onboard registrations and tank checks shortly before noon on August 1. Another fishing vessel arrived on the grounds on August 3, and was given a verbal registration over VHF radio due to rough sea conditions which prevented boarding at that time. Thus, the 1987 fleet was comprised of three catcher-processors and six fishing

vessels. In addition, a processing vessel was on the grounds to buy crab from the fishermen. The average vessel brought 159 pots to fish in Norton Sound.

By August 6 the Nome office was receiving reports of poor recruitment and a higher than normal average weight per crab. These reports were verified by the two Department observers onboard catcher-processor vessels the following day. A few more days information indicated that recruit crab comprised only 25% of the commercial catch as compared to the average of 47% for the previous 5 years.

Using the apparent recruitment level from the fishery, the 1985 population estimate adjusted to account for subsequent mortality, and recruitment through August of 1986, the harvest goal was reduced to 290,000 pounds. Regulation 5 AAC 34.915 states the Department will manage the Norton Sound section king crab fishery to harvest one half the exploitation rate determined under 5 AAC 34.080. In accordance with 5 AAC 34.080, the harvest strategy for depressed populations of king crab with declining levels of prerecruits and moderate to high levels of postrecruits allows no more than a 25% exploitation rate. Under these two regulations exploitation rate in the Norton Sound section during 1987 was limited to 12.5% or 290,000 pounds of the legal king crab.

There is another regulation (5 AAC 34.935) which closes the waters nearshore to the summer commercial fishery (Figure 2). Originally this closure was made to protect the subsistence crab stocks but evidence now suggests that female and sublegal crab tend to be less likely to migrate beyond the line while the larger legal males migrate further offshore. It is possible that the crab migrated less during 1987 and this may explain the poor catch rate and apparent poor recruitment. However, the poor catches and size distribution observed during the previous winter pot study also indicated poor recruitment.

The season was open for 11 days. The season was closed by emergency order at noon, August 12 when it was anticipated a harvest of 290,000 pounds would be reached. A 48-hour advance notice was given prior to the closure.

All fish tickets were received prior to the vessels departing the Norton Sound section. Computer analysis of fish tickets indicated a total of 327,121 pounds of red king crab was harvested. No deadloss was reported. Higher catches during the final 2 days of the fishery accounted for the higher than anticipated total harvest.

The catches this season were reported from 4 stat areas (656330, 656401, 666330, 666401) (Figure 2). No portion of the nearshore closed area was opened during the fishery. The average catch per

pot pull for the season was 10.1 legal male crab, and ranged from a reported low of 7.4 on August 7 and 10, to 12.5 crabs per pot pull on August 4.

The average weight for the season was 3.17 pounds (Table 2). This was verified by onboard Department observers. The average price advanced to the fishermen on the grounds was \$1.50 per pound.

The Department observers were on the grounds during the entire fishery; both were placed on catcher-processor vessels. A total of 1,985 legal males was measured for carapace lengths; the mean carapace length was 121.7 mm (Figure 3). The recruit to post-recruit ratio was 22% to 78%. A total of 2,270 pot lifts was observed. The incidence of sublegal and female crab was highest in stat area 656401 which also yielded the highest harvest of legal male crab. A total of 8,511 and 360 sublegal male and female crab was observed, respectively. Complete observer data summaries are available under separate cover in a project report.

Compliance with the daily verbal catch reports was good. Fish and Wildlife Protection Officers stationed in Nome were on hand for answering regulatory questions.

Winter Commercial Fishery

Regulation allows a commercial fishery in the Norton Sound Section from December 15 through May 15. During the winter season, crab are taken through the ice near Nome. During the winter of 1986-87, 51 landings were reported by 7 commercial fishermen ranging from January 5 through May 4. No deliveries were reported from February 7 to March 5 when unstable ice conditions precluded fishing.

A total of 1,040 crab was sold commercially. The weight of the catch was 2,590 pounds indicating the average crab weighed 2.5 pounds. The average price per pound was \$2.60 and the total sales brought \$6,734.00.

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 most hold other jobs. During many years, two or three fishermen sell the bulk of the crab. A lack of market has never limited this fishery. Because of the low volume of crab involved, no local processor has found it profitable to operate. The crab sold locally are all sold fresh as are those shipped to Anchorage 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. Catches are presented in Tables 1 and 3. After the first commercial harvest of about 1/2 million pounds in the summer of 1977, a successful winter fishery was conducted in 1977-78 when the average subsistence catch was 84 crab and the average winter commercial catch was 260 legal sized crab. The winter 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 nearshore 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 offshore 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 past four seasons, the winters of 1982-83 through 1984-85, has improved due to a rebuilding of the population and increased use of more efficient gear (pots instead of handlines). During this time period the average harvest per fisherman has been approximately 80 crab (Table 1).

The winter crab fisheries are limited by the extent that stable shorefast ice extends over nearshore areas. Ice stability seems to have a greater effect in the winter catches than the population size does. Some of the highest winter catches occurred at relatively low population levels (Table 1). The winter of 1986-87 was no exception; although the season extended over a relatively long season, the ice was blown offshore during early February, and fishing was not feasible again until early March.

Since the winter of 1983-84, the permits issued have been more detailed than past years, asking for the gear type used, the sex of the catch, the number of crab caught and the number of crab kept (Table 3). Permit information again showed that pots were by far the most commonly used gear type. Gear type information is not available from past permits; however, it has been observed that historically the major gear type was handlines. During the season of 1982-83, fishermen began to use pots more frequently.

During the 1985-86 season, the total reported harvest was 7,052 crab, 167 of which were female (Tables 1 and 3). A total of 1,935 male and 1,764 female crab was captured but released. The 1985-86 subsistence permits documented a very high incidence of female crab captures which contrasted with an average to slightly below average catch of male crab. It seems likely that unstable ice conditions and changes in crab distribution contributed to a slightly lower effort and harvest when compared to the previous three seasons (Table 1).

The 1986-87 winter subsistence catches were lower than normal due to several factors. Shorefast sea ice was late forming so that subsistence fishing did not begin until January 22. Winds blew the ice offshore from January 29 to January 31. Stable ice did not re-form over deep water until mid-February. Over 100 pots were lost when the winds took the ice out beyond the 45 foot

isobath. The spring of 1987 was a relatively unstable period for ice, which may partially account for the poor catch.

Unstable ice probably accounted for poor fishing but it is interesting to note that the Department pot index had roughly 1/4 the catch rate of the previous 4 years. The idea that recruitment was poor during the winter fishery is supported by the pot study catch, which noted an increased average size, a higher percentage of skip molt shells, and a decline in recruit sized crab.

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, Figure 4). This first population assessment survey by the NMFS estimated the legal male king crab population at 8.1 million pounds (Table 4). 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 (Table 4). The Department of Fish and Game conducted their first population assessment survey in 1980, with subsequent surveys in 1981 and 1982 (Figure 5). These

survey assessments documented a similar decline of 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 an historic low of 10% in 1981 to 59% in 1984 (Table 5).

In 1985 both NMFS and the Department conducted population assessment surveys in Norton Sound (Table 4, Figure 6). 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 4). 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 6).

The final quota for the 1987 season was derived by subtracting the 1986 catch from the 1986 preseason estimated legal population, applying a 25% mortality factor, applying the observed 25% recruitment level, and applying a 12.5% exploitation rate. The exploitation rate was arrived at by using the harvest strategy (5AAC 34.080) and the Norton Sound amendment (5AAC 34.920) which together state that a depressed and declining population should be exploited at less than 12.5%. Because there was no recent population estimate and the fishery was prohibited in the nearshore waters where a higher percentage of recruit crab was likely, the management biologists elected to exploit the population at the high end of the allowable range.

From February 11 to March 30, 1987, the Department conducted winter studies. Crab pots were fished through the ice near Nome at previously established locations, when ice conditions permitted, as in previous years. The study was conducted by an ADF&G project biologist with assistance provided by students of the local high school and local public volunteers. A total of 151 male and 6 female king crab was captured in 26 pot lifts. The average pot lift caught only 5.8 male and 0.2 female king crab. A total of 144 male and 5 female king crab was measured for carapace length and categorized by shell condition.

Sublegals comprised 44% of the catch of male crab; legals comprised 56% of the catch (Table 6). Of the 81 legal crab captured, 18.5% were recruits and 81.5% were postrecruits. The average carapace length of all male crab caught was 103.6 mm. A total of 60 male crab (25 sublegal, 35 legal) was tagged and released.

Females made up only 3.8% of the catch in the 1987 winter study. Of the six females captured five were measured; all were juvenile females. The mean carapace length was 71 mm.

The 1986 and 1987 winter crab studies documented the lowest male king crab catches per pot lift since the project began using standardized stations and baiting techniques. From 1983-1985, the average catch per pot was 24 male crab. In 1986 and 1987, the average catch per pot was 19.2 and 5.8 male crab, respectively.

Subsistence fishermen and winter commercial fishermen also reported decreased catches in the vicinity of Nome during 1986 and 1987. The 1986 study documented the largest average female catch per pot lift; the 1987 study documented few female captures. Since 1983, few females have been captured ranging from 0.2 in 1983 and 1987 to 2.4 females per pot lift in 1986.

FUTURE INVESTIGATIONS

The winter crab studies began as an index of nearshore 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.

The preliminary data from the 1987 winter study documented the lowest catch of crab per pot lift since the project methods were standardized in 1983. From this information, it is apparent that the abundance of crab in the vicinity of Nome was very low in 1987 when compared to the previous 4 year's studies. It is not known whether the 1987 study catch data is reflecting merely a different distribution of crab than in past winters, or if it is reflecting a trend of decreasing recruitment and crab population as a whole. The information gathered in the 1987 winter study does, however, seem to indicate the need for reassessment of the Norton Sound red king crab population. Without current research studies such as the ADF&G pot surveys conducted in 1980-82, and

1985, and the NMFS trawl surveys conducted in 1976, 1979, 1982 and 1985, 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. Therefore, it is imperative a large vessel stock assessment project be conducted to determine the current population size and structure for continued proper management of the Norton Sound red king crab stock.

OUTLOOK FOR 1988

With no large vessel research studies having been conducted since 1985, it is difficult to ascertain exactly what the legal male red king crab population will be prior to the 1988 fishery. A NMFS trawl survey in Norton Sound is scheduled for 1988; however, the results of the survey will not be available to inform management decisions for the 1988 season. Based on the apparent recruitment observed in the offshore commercial fishery and the limited sample from the immediate Nome area during the winter, recruitment during 1988 will probably be similar to that of 1987. The winter index has consistently shown the same recruitment trend as the commercial sampling. Since natural mortality is generally assumed to be roughly 25%, the same rate as the present recruitment in the Norton Sound section, the quota for the summer fishery will be held at significantly lower levels than in the past. A guideline harvest level will be set after the results of the 1988 winter study have been summarized, but is not expected to exceed 200,000 pounds.

Table 1. Winter commercial and subsistence red king crab harvests, Norton Sound 1978-1987. 1/

| Year 2/ | Commercial | | Subsistence | | | | Total Crab Caught 4/ | Crab Harvested 5/ | Average Harvest/fm |
|---------|-------------|------------------|-------------|----------------|------------------|----------------|----------------------|-------------------|--------------------|
| | Fisher- men | # Crab Harvested | Winter 3/ | Permits Issued | Permits Returned | Permits Fished | | | |
| 1978 | 37 | 9,625 | 1977-78 | 290 | 206 | 149 | 6/ | 12,506 | 84 |
| 1979 | 1 | 221 | 1978-79 | 48 | 43 | 38 | 6/ | 224 | 6 |
| 1980 | 1 | 22 | 1979-80 | 22 | 14 | 9 | 6/ | 213 | 24 |
| 1981 | 0 | 0 | 1980-81 | 51 | 39 | 23 | 6/ | 360 | 16 |
| 1982 | 1 | 17 | 1981-82 | 101 | 76 | 54 | 6/ | 1,288 | 24 |
| 1983 | 5 | 549 | 1982-83 | 172 | 106 | 85 | 6/ | 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 |

1/ 1977-1984 represents finalized data; 1985 data is preliminary.

2/ 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.

3/ The winter subsistence fishery occurs during months of two calendar years (as early as December through May).

4/ The number of crab actually caught; some may have been returned.

5/ The number of crab "harvested" is the number of crab caught and kept.

6/ Data unavailable.

Table 2. Commercial harvest of red king crabs in Norton Sound, summer fishery, 1977-1987.

| Year | Legal male pop. est. 1/ | Commercial harvest 3/ | Number of vessels | Crab/ pot | Avg. wt. | Exvessel price | Fishery value millions \$ |
|-----------|----------------------------|--------------------------|----------------------|--------------|-------------|-------------------|------------------------------|
| 1976 2/4/ | 8.1 | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. |
| 1977 5/ | 10.0 | 0.52 | 7 | 36 | 2.7 | 0.75 | 0.229 |
| 1978 5/ | 11.0 | 2.09 | 8 | 64 | 3.0 | 0.95 | 1.897 |
| 1979 4/ | 5.4 | 2.93 | 34 | 28 | 3.0 | 0.75 | 1.878 |
| 1980 | 6.6 | 1.19 | 9 | 29 | 3.6 | 0.75 | 0.890 |
| 1981 | 4.7 | 1.38 | 36 | 11 | 3.7 | 0.85 | 1.172 |
| 1982 | 1.3 | 0.23 | 11 | 6 | 3.6 | 2.00 | 0.405 |
| 1983 | 2.1 | 0.37 | 23 | 12 | 2.8 | 1.50 | 0.537 |
| 1984 | 2.7 | 0.39 | 8 | 14 | 2.8 | 1.02 | 0.395 |
| 1985 | 2.4 | 0.43 | 6 | 11 | 2.9 | 1.00 | 0.427 |
| 1986 6/ | 2.8 | 0.48 | 3 | 38 | 2.9 | 1.25 | 0.600 |
| 1987 | 2.2 | 0.33 | 9 | 10 | 3.2 | 1.50 | 0.491 |

1/ Population estimate prior to fishery in given year in millions of pounds.

2/ No commercial fishery in 1976.

3/ Millions of pounds.

4/ Population estimate derived by National Marine Fisheries Service.

5/ Population estimate derived from catch per pot from commercial fishery.

6/ Population estimate derived from 1985 ADF&G assessment survey.

Table 3. Winter 1986-87 subsistence red king crab catches and effort by gear type, Norton Sound.

| Gear type | # Fish- ermen | # Males Caught | # Males Kept | # Females Caught | # Females Kept | Total Crab Captured | Total Crab Kept | Average 1/ Harvest/fm |
|---------------|------------------|-------------------|-----------------|---------------------|-------------------|---------------------------|-----------------------|--------------------------|
| Pots | 51 | 4859 | 4188 | 5945 | 626 | 5453 | 4250 | 83 |
| Handlines | 31 | 615 | 580 | 103 | 36 | 718 | 616 | 20 |
| Both | 13 | 845 | 753 | 234 | 34 | 1079 | 787 | 61 |
| Unknown | 3 | 122 | 109 | 34 | 10 | 156 | 119 | 40 |
| Totals | 98 | 6441 | 5630 | 965 | 142 | 7406 | 5772 | 59 |

1/ Harvest refers to crab that are kept.

Table 4. Results of the population assessment surveys conducted for red king crab in Norton Sound since 1976.

| Year | Date | Research Agency | Gear/Vessel | Effort | Number of Red King Crab Captured 1/ | | | Population Estimates 3/ of Legal Male crab | |
|------|----------------------------|-----------------|----------------|-------------------|-------------------------------------|----------------|---------|--|--------------|
| | | | | | Sublegal Males | Legal 2/ Males | Females | Numbers | Pounds |
| 1976 | 9/02 - 9/05 9/16 -10/07 | NMFS | Miller-Freeman | Trawl 158 Tows | 768 | 555 | 188 | 3,119,888 | 8,111,488 |
| 1979 | 7/26 - 8/05 | NMFS | Miller-Freeman | Trawl 71 Tows | 46 | 194 | 48 | 837,241 | 2,511,723 |
| 1980 | 7/04 - 7/14 | ADF&G | Altair | Pots 397 Lifts | 443 | 3,298 | 158 | 1,988,888 | 6,688,888 4/ |
| 1981 | 6/28 - 7/14 | ADF&G | Altair | Pots 718 Lifts | 4,897 | 3,415 | 1,933 | 1,285,195 | 4,755,221 |
| 1982 | 7/06 - 7/20 | ADF&G | Aleutian #1 | Pots 689 Lifts | 5,819 | 2,881 | 424 | 353,273 | 1,271,783 |
| 1982 | 9/05 - 9/11 | NMFS | Miller-Freeman | Trawl 58 Tows | 322 | 187 | 265 | 978,646 | 2,628,744 |
| 1985 | 7/01 - 7/14 | ADF&G | Arctic Sea | Pots 642 Lifts | 6,886 | 4,645 | 181 | 987,579 | 2,414,644 |
| 1985 | 9/16 -10/01 | NMFS | Argosy | Trawl 78 Tows | 266 | 163 | 151 | 1,283,888 | 3,369,888 |

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

2/ Legal male red king crab were defined as at least 106 mm in carapace length for the 1976 NMFS survey; 185 mm for the 1979 and 1985 NMFS survey; and at least 121 mm in carapace width for all ADF&G surveys.

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

4/ 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 5. Percent recruit size crab for the Norton Sound male red king crab population from commercial catch samples.

| Length (mm) Category 1/ | Year | | | | | | | | | | |
|----------------------------|------|----|----|----|----|----|----|----|----|----|----|
| | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 |
| Recruits | 53 | 29 | 33 | 15 | 10 | 27 | 55 | 59 | 45 | 49 | 22 |
| Postrecruits | 47 | 71 | 67 | 85 | 90 | 73 | 45 | 41 | 55 | 51 | 78 |

1/ Recruits = All new shell legal size male crab of carapace length <115mm.
 Postrecruits = All other legal sized male king crab.

Table 6. Percentage catch of Norton Sound king crab from winter research pots, by size categories. 1/

| Year | Sublegal | | | Legals | | |
|------|------------------|------|-------|----------|---------------|-------|
| | Pre-recruit twos | ones | total | recruits | Post recruits | total |
| 1983 | 26 | 38 | 64 | 26 | 10 | 36 |
| 1984 | 35 | 31 | 66 | 19 | 16 | 35 |
| 1985 | 25 | 45 | 70 | 20 | 10 | 30 |
| 1986 | 26 | 35 | 61 | 22 | 17 | 39 |
| 1987 | 12 | 31 | 44 | 10 | 46 | 56 |

1/ Sublegals = male king crab less than 4 3/4" carapace width.
 Pre-recruit Ones = Sublegals greater than 89mm in carapace length.
 Pre-recruit Twos = Sublegals smaller than 90mm in carapace length.

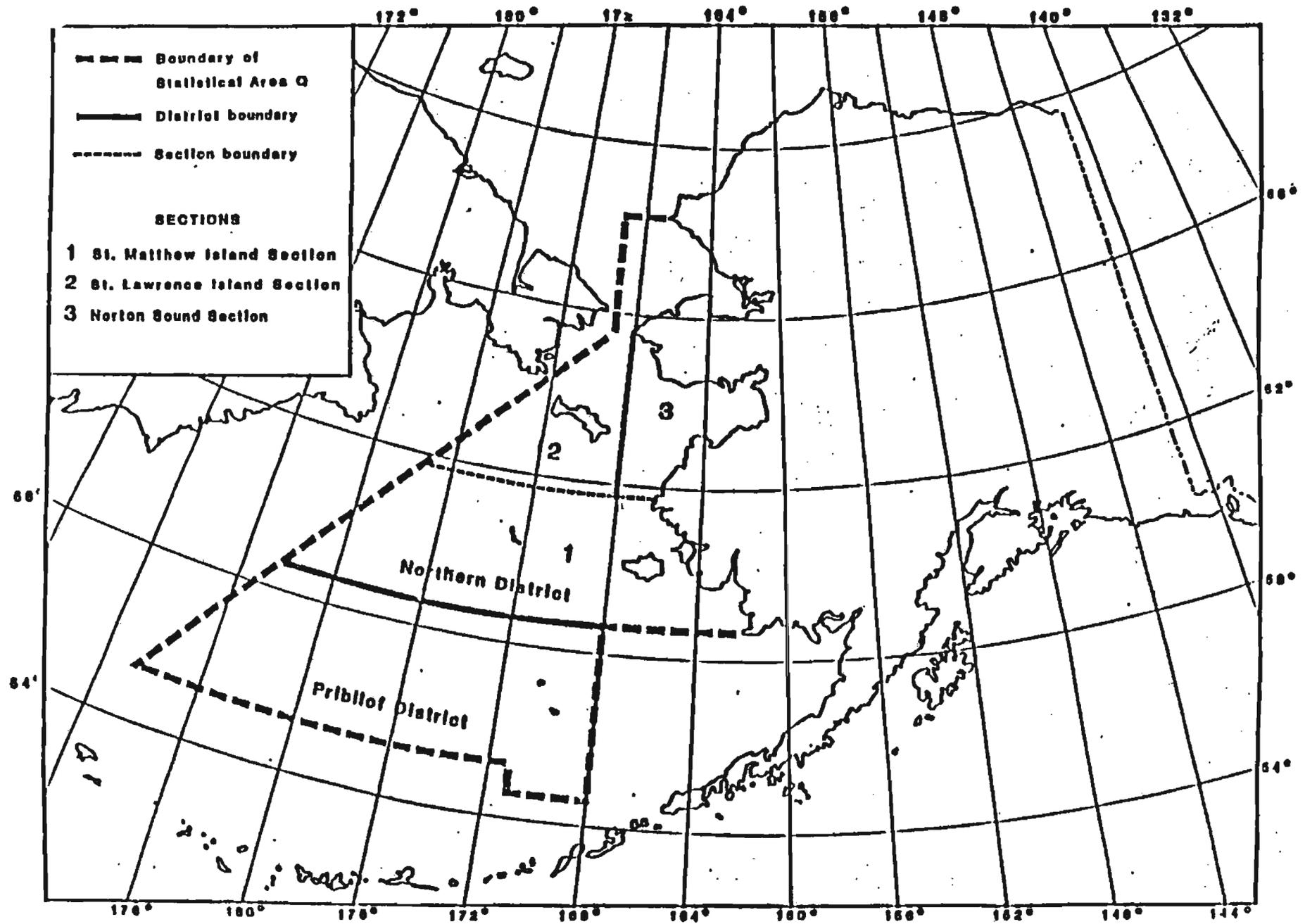
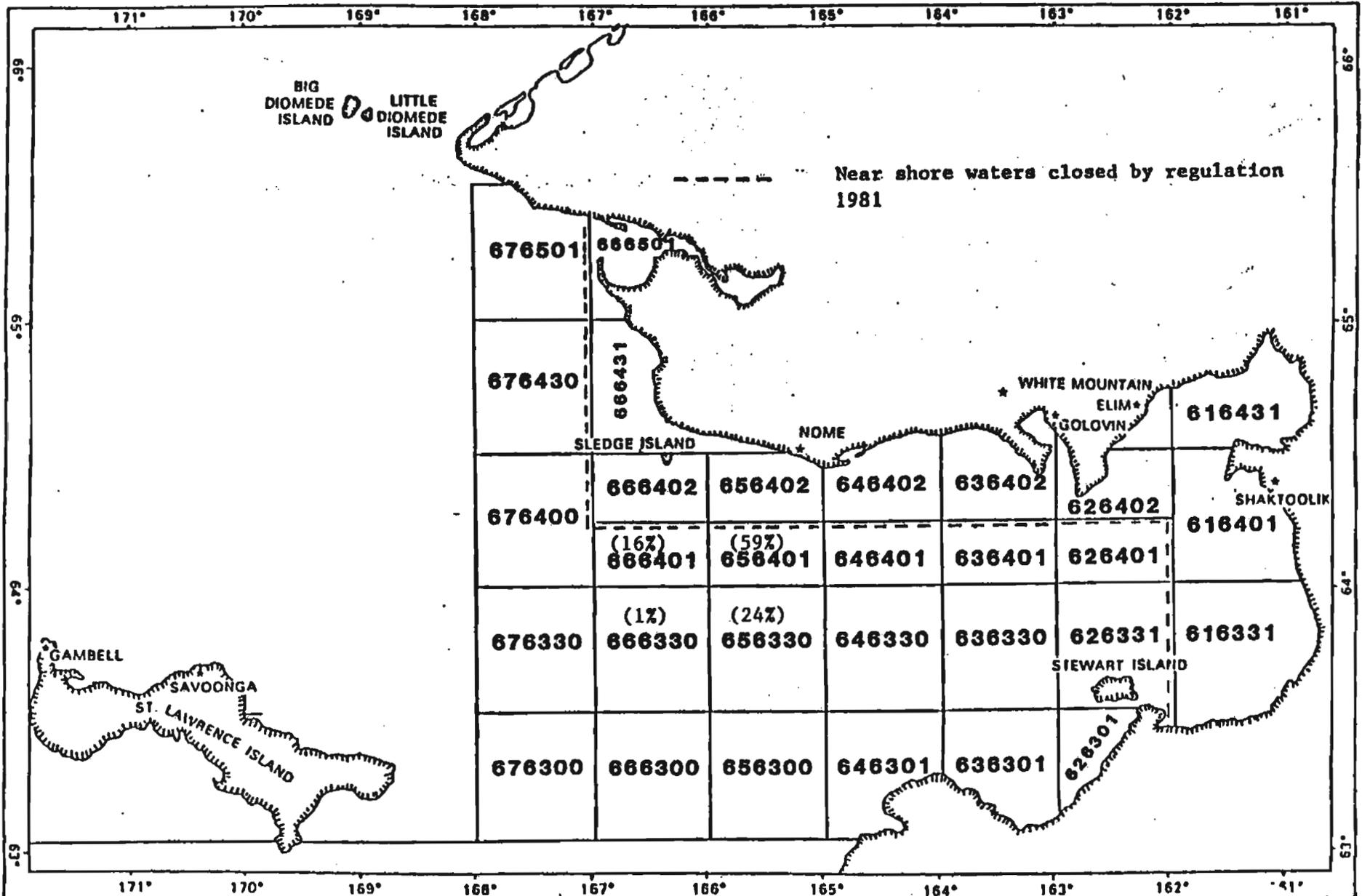


Figure 1. King crab fishing districts and sections of Statistical Area Q



2. Statistical areas for the Norton Sound region crab fishery and the associated percentages of the 1987 commercial catch.

PERCENTAGE OF TOTAL SAMPLE

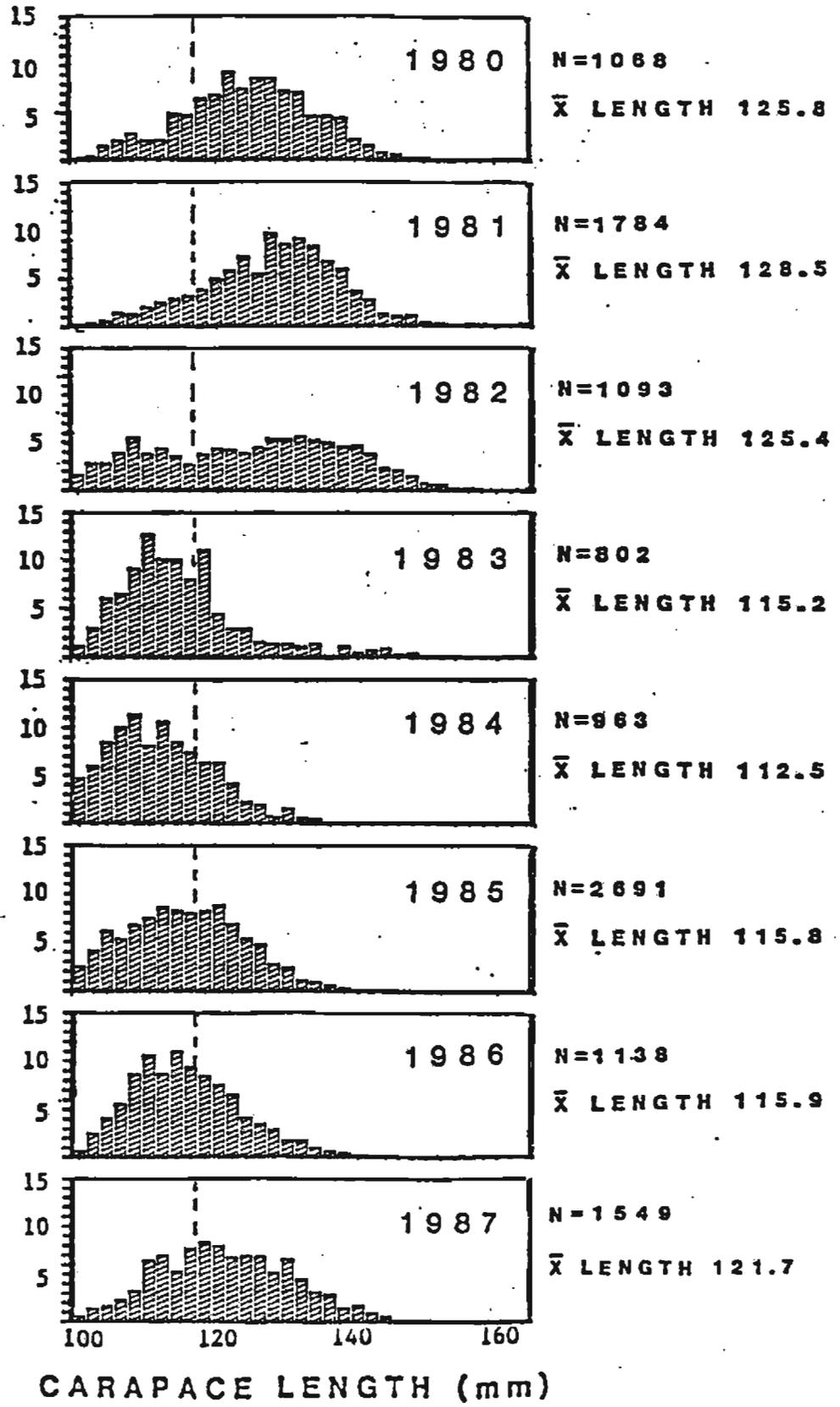
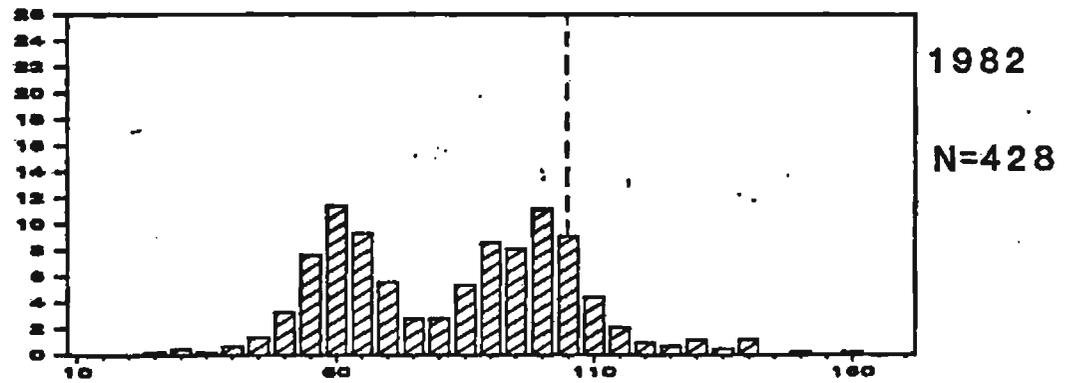
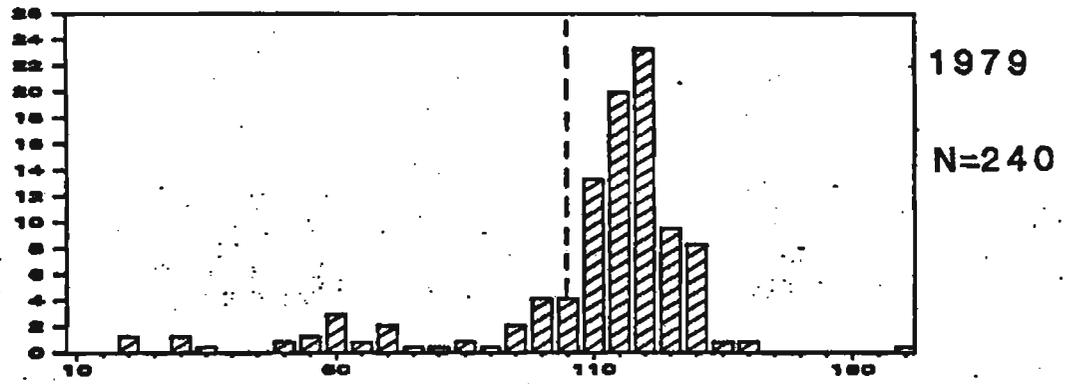
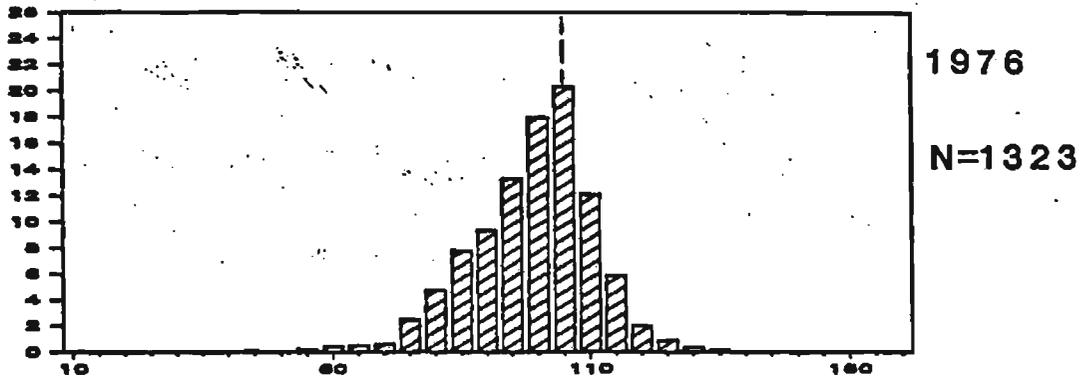


Figure 3 . Red king crab catch samples for the Norton Sound summer fishery, 1980-1987. Crab to the left of dotted lines are recruits.

PROPORTION OF MALE RED KING CRAB CAPTURED (%)



CARAPACE LENGTH (MM)

Figure 4. 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.

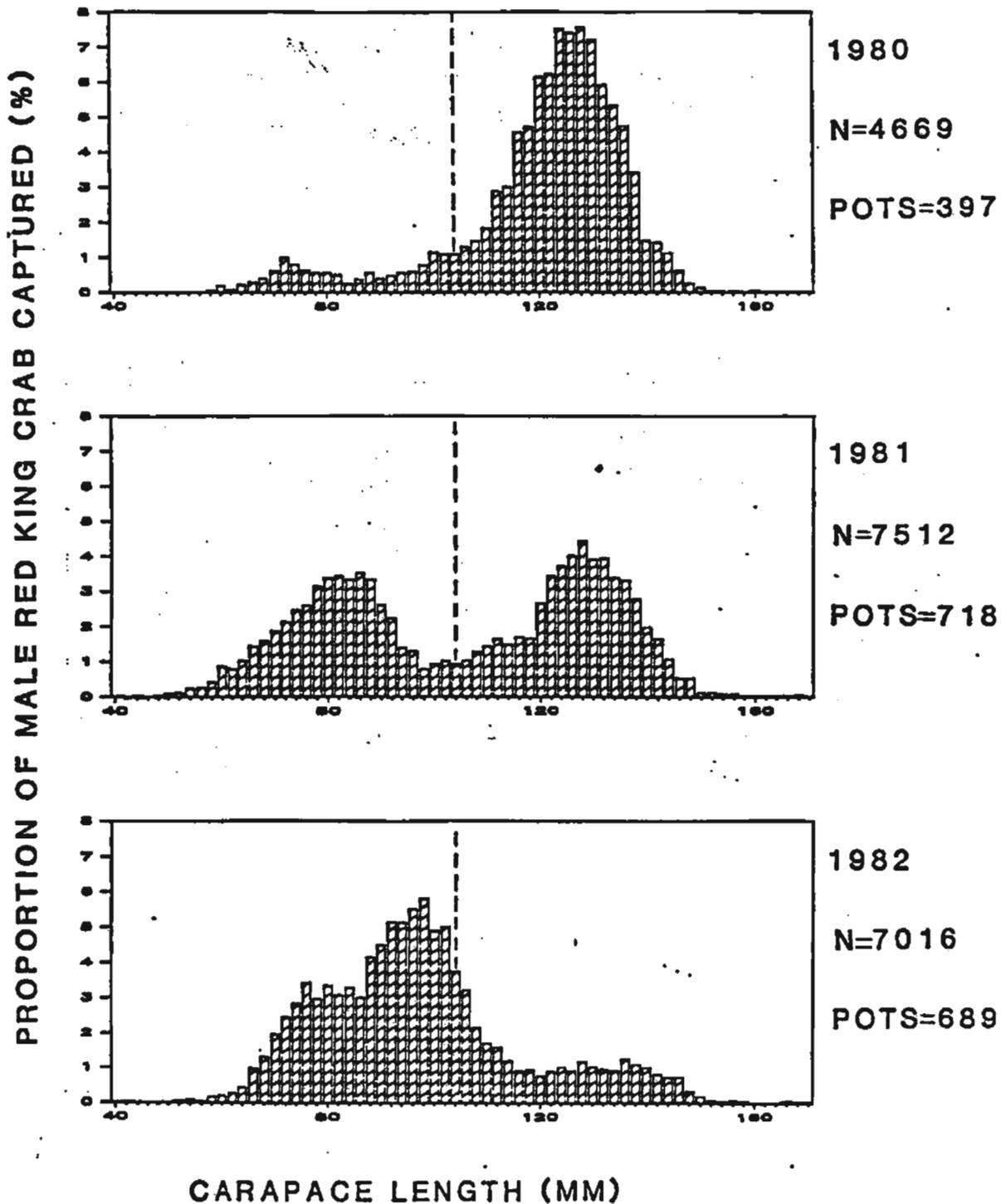


Figure 5. Size structure of the male red king crab population, Norton Sound, Alaska as determined by research fishing, ADF&G, 1980-1982. Dotted line represents present minimum legal size.

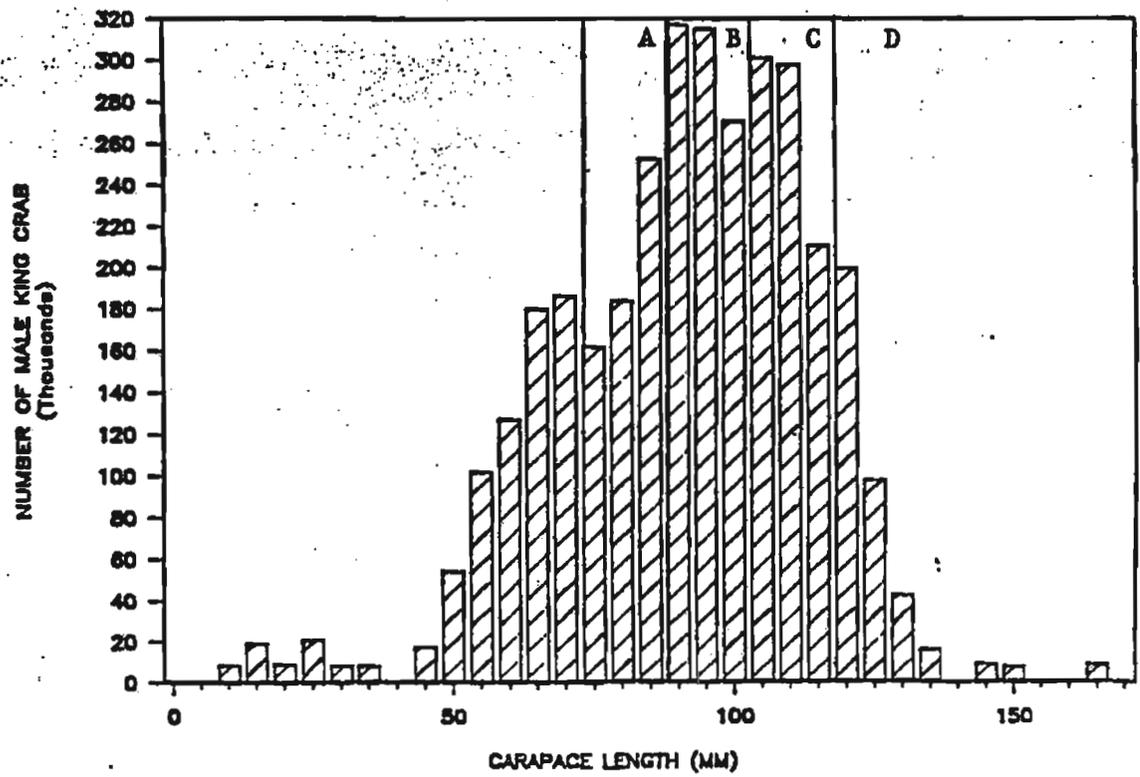
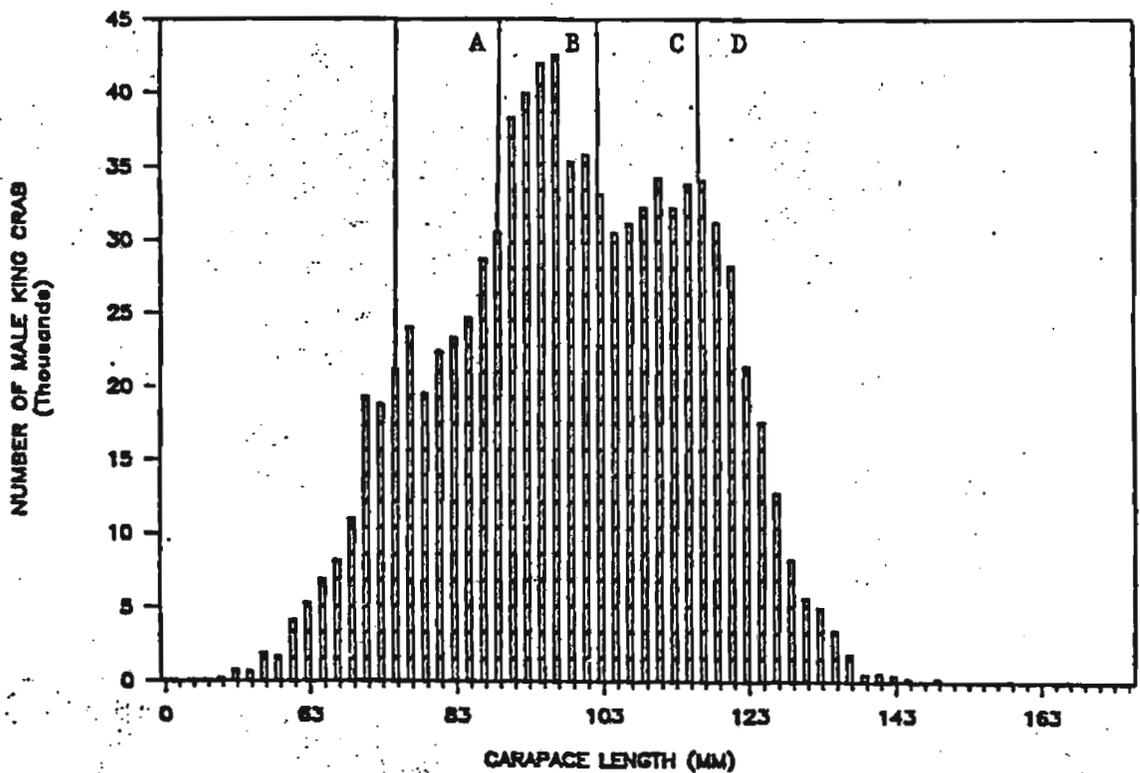


Figure 6. Size distribution of the 1985 Norton Sound male red king crab population from assessment surveys conducted by ADF&G (Top) and NMFS (Bottom). Portions of the graph labeled A are prerecruit two crab (1987 recruitment); B are prerecruit one crab (1986 recruitment); C are recruit crab; D are postrecruit crab.