

PRINCE WILLIAM SOUND MANAGEMENT AREA
SHELLFISH REPORT TO THE ALASKA BOARD OF FISHERIES

By: Wayne Donaldson



Regional Information Report¹ No. 2C88-02

Alaska Department of Fish and Game
Division of Commercial Fisheries, Central Region
333 Raspberry Road
Anchorage, Alaska 99518

April 1988

¹Contribution 88-02 from the Cordova area office. The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or achive basic uninterpreted data. To accommodate needs for up-to-date information, reports in this series may contain preliminary data.

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TANNER CRAB FISHERY

INTRODUCTION

Prince William Sound and adjacent Gulf of Alaska waters, Area E, are divided into four management districts for the Tanner crab (Chionocetes bairdi) fishery (Figure 1). The Northern and Hinchinbrook Districts include most inside waters while the Eastern and Western Districts encompass the Gulf of Alaska portion of the management area and the southwestern Sound. The area is bounded by Cape Fairfield on the west and Cape Suckling on the east. Depth ranges from intertidal bars to the 400 fathom contour in the Gulf of Alaska. Offshore waters of the area, formerly under the Federal Management Plan for commercial Tanner crab fishing, were subject to State of Alaska jurisdiction during the 1988 season.

Tanner crab fishing began in 1968 when 1.2 million pounds were landed. The fishery peaked during the 1972-73 season when 13.9 million pounds were taken. The entire area experienced decreasing harvests during the late 70's and early 80's. These decreasing harvests preceded large area closures during the 1984 and 1985 seasons (Appendix Table 1). The recent ten year average harvest, excluding 1984 and 1985 fishery closures is 3.2 million pounds. More than 65% of the harvest during this period was from the Gulf of Alaska portion of the management area.

The Tanner crab fishery began again during 1986 with a small harvest of 0.5 million pounds. Subsequent harvests have also been small with most production from waters of Prince William Sound proper.

The decline of Prince William Sound Tanner crab stocks is generally attributed to both the overharvest of immature and mature males and harvest of females prior to the adoption of the minimum size limit of 5.3 inches in 1976 (Figure 2). For example in 1974, 3.8 million pounds were harvested of which 2.7 million pounds were below the current minimum size limit.

Lengthy seasons also had significant adverse effects on the stocks due to excessive trapping, handling and lost gear. Seasons from 1974 through 1981 lasted seven months.

Unfavorable environmental conditions may be responsible for the sharp decline of Tanner crabs in the Gulf of Alaska portion of the management area.

1988 SEASON SUMMARY

Commercial fishing opened by regulation on January 5, 1988 in all portions of the management area except Orca Bay, Port Fidalgo and North Montague Island (Figure 3). Port Fidalgo and North Montague were identified as key production areas for all sizes and sexes of Tanner crab during both the 1986 and 1987 stock assessment surveys conducted by the Department. Orca Bay, long recognized as a key production area has remained closed since 1982,

while Port Fidalgo and North Montague were closed beginning with the 1987 season. The intent is to eliminate handling and trapping effects that the fishery has on all segments of the stock.

Based on the Department's Tanner crab stock assessment surveys a 1988 guideline harvest level of 200,000 - 500,000 pounds with a maximum season length of 30 days was established for inshore waters. Offshore waters of the Eastern and Western Districts were opened for the entire regulatory season of January 5 through May 31 (Figure 3). Surveys have not identified crab of either sex or size which continued fishing would jeopardize.

Twenty-one vessels registered and fished the area. Sixteen were from Cordova, four from Valdez and one from Seward. A harvest of 474,092 pounds was landed during twenty two fishing days. This harvest was distributed by district as follows: Northern - 55,929 pounds; Hinchinbrook - 226,509 pounds; Western - 191,654 pounds and Eastern - zero. Catch by statistical area is listed in Table 1.

Major fishing areas closed on January 27, 1988 by Emergency Order # 2-S-E-01-88 (Table 8). Offshore waters of the area (Figure 3) will remain open to fishing until the regulatory closure of May 31. These areas will remain open as there currently is no reproductive population to protect in the Eastern District. The portion of the Western District remaining open has no known link to the Prince William Sound stock that the Department is trying to protect and rebuild via closures.

Harvest in the Hinchinbrook and Western districts were similar to the 1987 season. The relatively small Hinchinbrook District continues to produce the largest district catch. Crabs from this district generally are larger in size with shells firm and meat content good. The seasonal average catch/pot was 18 crabs compared to 17 during the 1987 season. Tag recovery during the season indicates that the Orca Bay and North Montague section closures provide crabs through migration to this major district. This district has been an important contributor to total harvest during the prior three seasons when stock size was low.

Western District catches were dominated by crab taken from the Montague Strait section of the district. Specific rearing areas have not been identified for Montague Strait thus there are no closed waters for this district. Crabs in this district had softer shells than in the 1987 season. A later molt in western Prince William Sound is not uncommon compared to the eastern Sound. Continued exploratory surveys may show if there are concentrations of sublegal crabs or if all sizes of crab are relatively interspersed throughout the area. Offshore waters of the Western District (Montague Trench and offshore Montague Strait) remain depressed. Crabs from this area were predominantly skip molts with a low level of recruitment compared to inside waters of the Sound. Some vessels fished on very old shelled crabs however there is no indication of a recovery for this section of the management area. The inside waters of Montague Strait and nearby bays have recruitment levels comparable to eastern Prince William Sound. The average seasonal catch/pot in this district was 17 compared to 16 in 1987.

The Eastern District saw no directed effort during the January season. One vessel did explore a part of the area in February with no landing.

The Northern District harvest occurred in the open waters of central Prince William Sound. Little or no effort occurred in peripheral bays. Effort in this district was only one half the 1987 season level as measured by number of vessels or one fourth the effort as measured by total pot lifts. The average seasonal catch/pot was 17 as compared to 11 in 1987. Each of the three closed water sections have contributed crabs to this district as evidenced by tag recovery.

The 200,000 to 500,000 pound guideline harvest range was similar to the guideline harvest range set for the prior two seasons. Department surveys have shown that the stock is maintaining itself at the current low level. The 1987 survey identified a slight decrease in the abundance of prerecruit and recruit crabs from the 1986 survey, however a total legal stock comprised of recruits and postrecruits has remained stable in relative abundance since 1985 for the inside waters of the Sound (Figure 3). Since 1985 the age structure has changed from 75% postrecruit 2+ crabs to approximately 1/3 recruit crabs, 1/3 postrecruit 1 crabs, and 1/3 postrecruit 2+ crabs.

Size frequency analysis of the commercial catch confirmed that there was a decrease in recruitment from the 1987 fishery. The 1988 recruit level was 34% of the harvest compared with 51% in 1987. Average carapace width was 5.6 inches (Figure 4). Slight increases in the geographic distribution of

commercial quantities of crabs was also noted during the fishery in Hinchinbrook Entrance.

Ex-vessel value was \$2.25/lb. making this fishery worth \$1.06 million to the fishermen.

1989 MANAGEMENT OUTLOOK

Based on results of the 1988 fishery and the 1987 stock assessment survey, recruitment is not expected to increase in 1989. Interviews with fishermen indicate improved distribution of sublegal crabs over the prior three years however large numbers of crab have not been reported by the fleet or seen by the Department's survey.

Closure of important rearing areas will eliminate any unnecessary handling of juvenile males and females thereby increasing the probability that these crabs will survive to maturity. Tagging of legal crab shows a general movement pattern from the inner waters towards Hinchinbrook Entrance. This movement provides crabs to the commercial fishery from the rearing area in shallow waters which remain closed to commercial fishing. Movement also occurs out of Prince William Sound proper into the Gulf of Alaska. Historical tag data also shows a relationship of both the crabs from lower Montague Strait to the area southwest of Cape Cleare and the crabs from Hinchinbrook Entrance to those in Montague Trench.

The legal portion of the stock was small but stable during 1987. If a

stable or increasing legal population is detected during the 1988 survey then another limited fishery will be permitted in 1989.

KING CRAB FISHERY

INTRODUCTION

Three species of king crab are found in the Prince William Sound Management Area. Red (Paralithodes camtschatica), blue (Paralithodes platypus) and brown (Lithodes aequispina). Red king crabs have the most extensive distribution, occurring in most inside waters of the Sound. The blue king occurs in the Port Wells - Harriman Fjord area with other small isolated pockets associated with glacial fjords in the western Sound. The brown king is found in the central and western Sound at depths of 150 - 400 fathoms. Waters in the Gulf of Alaska portion of the management area have no known concentrations except for a very sparse distribution of brown king crab.

The abundance of red king crab is ascertained during Tanner crab indexing. A series of annual indices since 1977 is used to track the population abundance. Brown and blue king crab populations are assessed through dockside interviews and size frequency analysis of the commercial fishery.

The highest recorded harvest occurred in 1972 when 300,000 pounds were landed. The lowest harvest occurred in 1965 when 5,500 pounds were taken. Catch reporting by species did not begin until the 1979-80 season (Appendix

Table 2). The recent five year average annual harvest (1983 - 1987) is 60,000 pounds. Over 90% of this average is brown king crab.

The season opens throughout Prince William Sound by regulation on October 1 and closes on December 20. A second season opens on January 5 and closes by regulation March 15. This split season allows a two week period between seasons when gear must be removed from the fishing grounds. This closure was designed to eliminate preemption of grounds prior to the Tanner crab fishery which begins on January 5. King crab have been harvested both in a directed fishery and as an incidental catch during the Tanner crab fishery.

1987-88 SEASON SUMMARY

Fishing opened by regulation on October 1, 1987 to brown king crab in the central and western portion of Prince William Sound (Figure 5). Due to the continued low abundance of the red and blue king crab stocks fishing for these species remained closed.

Brown king crab fishing was open in the entire management area, except for eastern Prince William Sound, for the first fishing season (10-1-87 to 12-20-87) and in offshore waters only during the second season (1-05-88 to 03-15-88). Four vessels registered to fish with the first deliveries occurring in late October. Effort on the grounds did not begin until mid October. The season, for the entire management area, closed by regulation on December 20, 1987. The brown king crab harvest was 68,270 pounds which was harvested by four vessels which made 15 landings. Catch by statistical area

is listed in Table 2.

Inshore waters remained closed by Emergency Order # 2-S-E-15-87 (Table 8). Justification for the closure was based on the declining trend in average size, weight and distribution of commercial quantities of crabs since the inception of this fishery in 1982. In addition, dockside samples during the fishery indicated a decrease in recruitment from the 1986-87 season. Overall 20% of crab sampled in 1987 were recruits whereas during the previous season 38% were recruits. Average catch rates for the first regulatory season were between 1 and 5 crabs/pot.

Dockside sampling data indicates the brown king crab fishery is fully developed. Since the brown king crab fishery began in 1982, average size of commercially caught crabs has declined from 7.3 inches carapace length in 1982 to 6.5 inches in 1987. Average weight also declined from 9.7 pounds in 1982 to 6.6 pounds in 1987 (Figure 6).

The number of legal size classes has also declined. Limited tagging of sublegal males in Prince William Sound indicate a growth/molt of approximately 0.6 inch. When the fishery was initially developed in 1982-83 legal crab length ranged from 5.9 to 8.4 inches. This fishery had four size categories of males. In contrast, the 1987-88 fishery produced crab from 5.9 to 7.5 inches which was two size classes.

Vessel effort over the prior four seasons has remained stable at four vessels/season however the price/pound has increased from \$2.00/lb. in 1985 to \$3.35/lb. in 1987. The ex-vessel value for the 1987 fishery was \$222,000. High ex-vessel value allows profitable fishing to continue at less crabs/pot than in previous years.

In order to allow exploration in offshore waters of the Gulf of Alaska, where there is a known limited quantity of brown king crab, the season remained open until the regulatory closure on March 15, 1988. No effort occurred in this area.

1988-89 MANAGEMENT OUTLOOK

The Department plans to open the brown king crab season on October 1, 1988. The catch is expected to be comprised of crabs similar in size to the 1987-88 season. The Department will continue to monitor landings to assess the recruitment trend. Increased effort is expected during 1988-89 due to the probable increase in ex-vessel value of brown king crab. Some fishermen report decreased amounts of sublegal crabs on the grounds. Long range production levels for this stock are unknown at this time. Fishing is likely to be limited to the first fishing season if recruitment, average size, and weight do not improve.

Blue king crab is scheduled to remain closed for the 1988-89 season based on the 1986-87 season fishery performance. Increased recruitment due to immigration is highly unlikely. There is a low probability that the stock is

related to other blue king crab populations in the state. While fishing during the last regulatory season in 1986-87, fishermen reported few undersize male and female blue king crabs thus a recovery of the stock is not expected for at least two more seasons.

The red king crab stocks will be assessed during the annual Tanner crab survey. Interviews with both brown king crab and Tanner crab fishermen will be used to gain an impression of the strength of the red king crab population. Red king crab survey catches remain very low; no fishery is anticipated until a healthy increase in the red stock occurs.

DUNGENESS CRAB FISHERY

INTRODUCTION

Historically major Dungeness crab harvests have come from two areas of Prince William Sound: (1) Orca Inlet District and (2) Copper River District (Figure 7). Dungeness are also harvested from the Orca Bay portion of the Northern District as well as from small populations in western Prince William Sound. The Northern District harvest is proportionally very small and is either taken incidental to the Tanner crab fishery or by one or two vessels targeting on Dungeness crab.

Orca Inlet, which is immediately adjacent to the community of Cordova, has provided a fishery that allows participation by small vessels in an area

protected from adverse sea conditions. The very largest vessels fishing this area are in the 40 foot seiner class. Most vessels make 1-day trips and deliver each fishing day. This district has a 100 pot limit.

The Copper River District fishery, which has a 250 pot limit, is usually a spring-fall fishery due to a closure for soft crabs during the summer months. This area is not sheltered from the Gulf of Alaska and longer running distances to market generally requires larger vessels. The Alaska Board of Fisheries at their spring 1986 shellfish meeting adopted new season dates for the Copper River District which took effect in 1987. The new season dates were established to prevent fishing during the major molting period. The new season dates are: spring season - March 20 through May 20, and fall season - July 15 through December 31, except for the Controller Bay area which closes on October 15. These dates may be modified by emergency order.

Orca Inlet District opens September 1, by emergency order only, and closes on May 31. The September opening occurs only if an adequate abundance of Dungeness crab exists and if the annual molt has been completed.

The Northern District is open year around.

The fishery was once strongly influenced by the abundance of Dungeness in other west coast fisheries. Good seasons in Washington, Oregon and California drove the ex-vessel price of Alaskan Dungeness down; conversely poor seasons caused the price to increase to a level where significant

fishing occurred. Since 1978 generally adverse shellfish fishery economics have caused intensive effort on Dungeness crab in the Prince William Sound Management Area. For this reason, historical catch records which were once an unreliable indicator of stock abundance, have been a relatively good indicator of stock abundance since 1978.

1987 SEASON SUMMARY

The 1987 catch of Dungeness crab in the Prince William Sound Management Area was 893,174 pounds harvested by 15 vessels (Appendix Table 3). Catch by statistical area is listed in Table 3. Ex-vessel price ranged from \$0.80 to \$1.05 with the majority of crab sold at \$0.95 per pound making the fishery worth approximately \$850,000 to the fishermen. Production for 1987 declined from the prior two seasons when production exceeded one million pounds. Effort declined from 16 in 1986 to 15 vessels in 1987. The number of landings also decreased from 105 in 1986 to 94 in 1987.

Copper River District

The 1987 catch from the Copper River District was 887,713 pounds harvested by 13 vessels. Catch for the spring season was 226,225 pounds taken by two vessels. The fall season harvest was 661,488 pounds taken by 13 vessels.

The spring season opened by regulation on March 20. Effort was light during the spring season with only two participants. Sampling at dockside during the spring indicated three percent of the catch was recruit crabs. Average

size and weight of crabs delivered was nearly identical to the crabs delivered the previous fall indicating the molt was just beginning. The spring season closed by regulation on May 20, 1987.

In late May and early June the Department conducted the annual soft-shell survey of the Copper River District. Overall 12% of male crabs were found to be soft. The majority of these crabs were located in the eastern waters of the district, which is the location where the molt is first detected. A resurvey of the district in late July indicated that the male soft-shell percent had increased to 25 along with an increase in the geographic distribution of soft shells. This prompted the Department to issue Emergency Order # 2-S-E-02-87 (Table 8) delaying the regulatory season opening date of July 25. The Department conducted another survey in mid August and the results from this survey indicated that crabs were in a hard shell condition. The percent of soft crabs in deeper waters remained high, therefore Emergency Order # 2-S-E-03-87 was issued opening the inshore waters only. The emergency order was effective August 20, 1987. A final survey in late August was necessary to evaluate crabs in offshore waters. Results from this survey justified an opening (Emergency Order # 2-S-E-04-87) for the offshore waters on September 10, 1987.

The 1987 molting period was prolonged compared to 1986. The season reopening dates of August 20 and September 10, for inshore and offshore waters respectively are the latest reopening dates since active management of soft shells began in 1985. Based on these surveys the minimum length of time needed for soft shells to sufficiently harden, to prevent injury from

handling, is eleven weeks. This time period does not consider meat yield of Dungeness.

Dockside sampling for the fall season indicated that 45% of the catch was recruit crabs which had entered the legal size range during the summer. For the entire year the estimate of recruitment was 34% of crabs landed were recent entrants to the legal size range (Figure 8). The difference in percentages is due to the fact that the spring season occurred before the molt. The spring season catch was comprised almost entirely of postrecruit crabs. The average weight of crabs sampled was 2.1 pounds and the average size was seven inches, carapace width.

Orca Inlet District

The Orca Inlet District normally opens by emergency order on September 1 or at a time thereafter when the crabs are in a shell condition which would warrant a commercial harvest. The season was not opened in 1987, as it hasn't been since 1980. The preseason population index value has remained less than one legal male per pot. The subsistence fishery has also been closed since September 1981.

The reason for the continued suppression of the Dungeness crab population in Orca Inlet is predation by the sea otter. The otter arrived in large numbers during 1980 and immediately impacted the Dungeness crab stock. According to a recent study, when Dungeness crabs are available, otters are capable of eating 10 crabs per day.

Northern District

A small harvest of 5,461 pounds was taken from this district by two vessels. The district has limited Dungeness habitat and a low production history.

1988 MANAGEMENT OUTLOOK

Vessel effort is anticipated to be moderate in the Copper River District. Spring fishing will harvest postrecruit crabs which escaped the 1987 fishery. The level of recruitment will not be known until the Department completes surveys during the spring and summer regulatory closure. Prerecruit abundance has thus far been difficult to anticipate. The Department plans to begin a tagging program during 1988 which will increase information on this stock.

Orca Inlet will continue to be surveyed, however, a recovery is not anticipated as the sea otter population does not appear to be declining.

The Northern district will remain open year around.

POT SHRIMP FISHERY

INTRODUCTION

The Prince William Sound pot shrimp fishery began in 1960 when 4,100 pounds were harvested. From 1960 until 1977 catches varied from no reported harvest in 1962 and 1966 to a high of 20,000 pounds in 1974 (Appendix Table 4).

The pot shrimp fishery expanded rapidly after 1978 with increases in both catch and participants (Figure 9). Growth of the fishery was most rapid from 1978 through 1982. Catch increased from 12,000 pounds landed in 1978 to 178,000 pounds landed in 1982. Similarly effort increased from 9 to 57 vessels during this period. Harvests were stable from 1982 through 1984 due to a management strategy which employed the following:

- 1) Elimination of year around fishing, and seasons set to avoid fishing during peak egg bearing periods.
- 2) Establishment of a guideline harvest range, based on historical catch figures.

In September of 1984 the Alaska Board of Fisheries established three fishing areas with a management plan for each (Figure 10). These areas were: Traditional Harvest Area, Montague Strait Experimental Harvest Area and the

Eastern Harvest Area.

The Traditional Harvest Area includes most of the known pot shrimp population. This area encompasses the northern and western parts of the Sound. Two regulatory fishing seasons were established: a spring season beginning on March 15 and continuing until June 30 and a fall season from August 15 to December 15. The guideline harvest range is 150,000 - 200,000 pounds split evenly between the two seasons. Either season may be closed earlier by emergency order if the harvest level is achieved. If excessive harvests occur during the spring season the poundage is deducted from the fall season. Additionally any harvest in the Montague Strait Experimental Harvest Area taken during the open Traditional Area season is included into the Traditional Area harvest guideline.

The Montague Strait Experimental Harvest Area was established to gain year around fishery performance data. Some fishermen claimed that catch would increase with year around fishing and that restrictive management was blocking the harvest of large quantities of spot shrimp in the Montague Strait area. Harvest is unregulated and dependent only upon effort and success. Mandatory logbooks allow fishery performance to be tracked. Fishermen are not allowed to concurrently fish both the Traditional and Experimental Areas.

The Eastern Sound which has a very low production history was also designated as a year around fishery. Permits required for this area allow the monitoring of effort and catch.

The western and northern portions of Prince William Sound, which are characterized by numerous steeply cut glacial fjords, comprise the majority of spot shrimp harvesting areas (Traditional Harvest Area). This area is accessed through the ports of Whittier, Valdez and Seward, which have direct transportation ties with the Anchorage metropolitan area. This accessibility has been the key to development of fresh markets for unprocessed spot shrimp. Shrimpers have been able to develop markets where their product can be utilized shortly after capture.

The Prince William Sound pot shrimp fishery is unique in that it draws upon fishermen who fish with widely varying degrees of intensity, from full-time participants to seasonal and weekend fishermen. This heterogeneous mix has often times split the industry as to the desired season of harvest.

1987 SEASON SUMMARY

The 1987 commercial harvest of pot shrimp in the Prince William Sound Management Area was 225,160 pounds (whole shrimp weight). The harvest was taken by 86 vessels which made 498 landings. The number of vessels submitting fish tickets increased slightly from 1986 with a decrease in the number of landings. Catch by statistical area is listed in Table 4.

Ex-vessel value of pot shrimp varies with the count of shrimp tails per pound and the marketing strategy. A greater value is placed on the larger shrimp. Ex-vessel values range from \$3.50/lb. - \$8.00/lb. with a midpoint estimate of the harvest valued at \$735,000 to the fishermen.

The 1987 catch and effort for each of the three pot shrimp harvest areas were:

- 1) Traditional Harvest Area - 197,944 pounds harvested by 80 vessels which made 441 landings.
- 2) Montague Strait Experimental Harvest Area - 22,411 pounds harvested by 12 vessels which made 33 landings.
- 3) Eastern Prince William Sound - 4,805 pounds harvested by 10 vessels.

Traditional Harvest Area

The 1987 spring season for the Traditional Harvest Area opened by regulation on March 15 and closed on May 1, 1987. An initial preseason guideline harvest level of 87,500 pounds was set based on the 75,000 - 100,000 pounds guideline harvest per season established by the Board. The Emergency Order (# 2-S-E-01-87, Table 8) to close the fishery was issued on April 24, 1987 when 66,000 pounds had been reported on fish tickets. Postseason summary shows 106,593 pounds were harvested from the Traditional Area with an additional 2,214 pounds from the Montague Experimental Area taken during the open Traditional Area season for a total of 108,807 pounds. This harvest was taken by 54 vessels making 221 landings. Logbooks are not mandatory however the Department has requested voluntary logbook participation. Thus far noncompulsory participation has been poor. Only four percent of fish tickets

were accompanied by logbooks.

On July 23 the winter season guideline harvest level of 66,000 pounds was announced. This was a reduction of 21,000 pounds from the normal 87,500 pound guideline. This reduction was due to exceeding the spring guideline by 21,000 pounds. The fall season opened on August 15 and closed on September 21 by Emergency Order # 2-S-E-05-87 (Table 8). Fifty four vessels harvested 91,351 pounds during 233 landings. No harvest was reported from the Montague Strait Experimental Area during the fall season.

Montague Strait Experimental Harvest Area

The 1987 harvest of 22,411 pounds was the lowest annual harvest since the area was established to permit year around fishing. Documented annual catches are steadily declining. The 1987 harvest is one half of the 1986 and 1985 harvests (Table 5). Over the past three years the number of vessels fishing this area has declined from 18 to 12. Catch per unit of effort from logbooks ranged from 2.4 pounds/pot to 0.18 pounds/pot during 1987.

Eastern Prince William Sound

Harvest and effort were minimal during 1987. Exploratory fishing was confined to the Port Fidalgo and Orca Bay area. The harvest of 4,805 pounds is similar to the 1986 and 1985 harvests. Thus far no harvests have been reported from the Gulf of Alaska portion of this area.

1988 MANAGEMENT OUTLOOK

The Department will continue to track fishery performance in all fishing areas in 1988. To date the Montague Experimental Area has shown, through total annual harvests, that continuous fishing on pot shrimp stocks does not increase annual yield. The quantity of shrimp produced and interest by vessel operators appears to be declining (Table 5). If harvests continue to decline in 1988 a reevaluation of the Montague Strait Experimental Harvest Area will be made.

Total management area harvest is expected to be near the 1987 level, with similar harvests from each area. The Department is once again requesting voluntary logbook information from fishermen in the Traditional Harvest Area in order to add to the existing data base for this fishery.

Several fishermen expressed concern during the season about the large number of egg bearing females captured during the early portion of the spring season. The current best estimate based on limited logbook information indicates that egg bearing females harvested during the early portion of the spring fishery comprise 30% of the catch. The Department shares this concern of harvesting females before egg release. Many fishermen report that the egg release period generally coincides with the spring season opening and a decrease is noted within two to three weeks of the season opening. A change in the spring season should be considered to allow for larval release.

Figure 11 shows the percent of large females bearing eggs in the Montague Experimental Area by month for the 1986 season. Egg release begins in March continuing through April. During May, June and July almost all large shrimp were non egg bearing.

A conservative approach to season length of the Traditional Area will be taken to alleviate problems with late fish tickets. An example of these problems was the exceeding of the fall 1987 guideline harvest level. Based on catch reports submitted through September 14, 1987 the Department projected that the preseason guideline harvest of 66,000 pounds would be taken on September 21, therefore an emergency order was issued to close the fishery on that date. The final catch was 91,000 pounds which was 25,000 pounds above the preseason guideline. This was due to the continued problem of late catch reporting which makes it difficult to project the final harvest with any degree of accuracy.

TRAWL SHRIMP FISHERY

INTRODUCTION

Recent emphasis in the trawl shrimp fishery has shifted from the harvest of pink shrimp to sidestripe shrimp. Large Kodiak based vessels harvesting pink shrimp were the primary users of this fishery during the 1980's. The increased harvests of sidestripe shrimp began in 1985. Development of markets and gear, by small vessels, on stocks which were previously unfished

is the reason for the sudden expansion. The pink shrimp fishery has declined due to low ex-vessel value of pink shrimp, limited processing capabilities and poor pink shrimp stock conditions. (Appendix Table 5).

The trawl fishery targeting on sidestripe shrimp initially developed around the Icy Bay area in southwestern Prince William Sound. Recent activity has focused on the northwestern Sound (Figure 12). The sidestripe fishery is characterized by smaller vessels than those targeting on pink shrimp. Sidestripes are generally marketed whole and fresh in the Anchorage area. One processor is experimenting with marketing these shrimp in Japan.

The Board of Fisheries at their spring 1986 shellfish meeting established new season dates of March 1 through November 30 for sidestripe shrimp fishing in northwestern Prince William Sound based on a difference in egg bearing period of sidestripe shrimp in this area. In addition gear requirements for March and April require a minimum mesh size of 1 5/8 inch stretched mesh, throughout the cod end, hung horizontal and perpendicular to the mouth of the trawl. The season dates and gear requirements were adopted as a result of a public proposal.

Management measures for trawl shrimp include:

- 1) A March-April closure during the peak egg release period in southwestern and central Prince William Sound for pink shrimp.
- 2) A December - February closure during peak egg release period

in the northwestern sound for sidestripe shrimp.

- 3) Cod end mesh restriction during March and April along with a 10% maximum limit on pink shrimp per landing during this time.
- 4) A 250,000 - 600,000 lb guideline harvest range for the Icy Bay District.
- 5) A year around closure in the eastern Prince William Sound (Port Fidalgo, Orca Bay and Hinchinbrook Entrance) to minimize mortality of king and Tanner stocks in this key production area.
- 6) A June through August season in the Northern Herring Fishing District to avoid conflict with herring season closures.

1987 SEASON SUMMARY

Landings of sidestripe shrimp have continued to increase. The 1987 harvest was over three times the amount harvested in 1986. Two vessels, which made 109 landings, delivered 95,718 pounds of shrimp. Sidestripes totalled 95,043 pounds or 99% of the harvest. Minor amounts of spot (400 pounds) and pink shrimp (275 pounds) were also taken. Catch by statistical area is listed in Table 6.

Sidestripes were harvested from late March through October in the northwestern Sound. Both the molting and egg bearing period were reported to be occurring in August and September which is similar to 1986. Catch rates in the sidestripe fishery were reported to be 70 - 170 pounds of whole shrimp weight/hour.

The average ex-vessel value for sidestripe shrimp was \$1.26 per pound whole shrimp weight yielding a total ex-vessel value of approximately \$120,000 to the fishermen.

The customary pink shrimp fishery in Icy Bay and Port Bainbridge located in southwestern Prince William Sound had no landings during the previous fishery. The season was open from May 1 through February 28.

The traditional trawl fishery in Simpson Bay, which is in eastern Prince William Sound, was open from January 1, 1988 through January 30, 1988 to commercial trawling. No shrimp harvest occurred during the opening, however, miscellaneous bottomfish was caught and sold as hanging bait to the Tanner crab fleet.

1988 MANAGEMENT OUTLOOK

The outlook for 1988 is a continuation of the sidestripe fishery with effort and landings at or above the 1987 level.

The Department does not survey pink shrimp in the southwestern Sound. Stock information formally provided through commercial catch sampling is unavailable. The Department will monitor logbook data if landings begin again.

Registration requirements and logbook participation will continue to be employed to monitor catch per unit of effort, bycatch and molting and mating periods.

RAZOR CLAM FISHERY

INTRODUCTION

Beginning in 1916 and continuing until the mid 1950's Cordova was known as the "razor clam capital of the world". Although historical fishery statistics are sketchy, it appears that the majority of clams were harvested from Orca Inlet and the western Copper River Delta (Figure 13). The eastern Copper River Delta, which includes Kanak Island, was not a substantial contributor to the early harvests. Catches in this era ranged from 3.6 million pounds in 1917 to a frequent harvest of over one million pounds. Most of the product was canned and ultimately used for human consumption.

The razor clam industry began to decline in the 1950's for a number of reasons: economic - the east coast clam fishery gained economic dominance;

biological - substrate change caused largely by alteration in the Copper River outflow, which severely affected juvenile survival; and perhaps overutilization by the commercial fishery. In the late 50's and early 60's commercial demand for razor clams shifted from human consumption to Dungeness crab bait. The "Good Friday Earthquake" in 1964 caused significant uplift in prime razor clam habitat in Orca Inlet. This additional loss of habitat resulted in record low harvests in the 70's and early 80's (Appendix Table 6). The bulk of the production since the mid 70's has come from the eastern Copper River Delta which includes Kanak Island.

The demand for razor clams for human consumption increased again in 1983. A decline in clam abundance in Washington led to an expanded fishery in Prince William Sound. During the past four seasons almost all clams have been taken at Kanak Island Beach with minor amounts harvested from Softuk and Katalla beaches on the eastern delta.

A guideline harvest range of 100,000 to 150,000 pounds is in effect for both commercial and subsistence harvests from Kanak Island. The Department tracks the subsistence harvest through a permit system. Subsistence use varies in that clams are taken for home use, and by commercial crab fishermen digging their own bait for Dungeness crab fisheries in Icy Bay and the Copper River Delta. The minimum legal size of clams is 4.5 inches in length.

1987 SEASON SUMMARY

Commercial harvest in 1987 was 40,954 pounds. The majority of this years harvest was sold for Dungeness crab bait (29,307 pounds). Katalla beach accounted for 97% of the bait harvest and Softuk beach the remainder. Food clams were harvested exclusively from Kanak Island beach (11,647 pounds). Catch by statistical area is listed in Table 7.

Kanak Island annually receives certification by the Alaska Department of Environmental Conservation. The certification by D.E.C. allows bivalves to be sold for human consumption. Certification consists of periodic monitoring of the paralytic shellfish poison levels and bacteria counts in the surf zone. This year the Island received certification on April 14.

A total of 12 diggers worked the beaches from mid March to early September. Bait clams sold for \$1.00 per pound while food clams sold for \$0.85 per pound resulting in a fishery value of \$39,000. Reported seasonal catch rates for Kanak Island was 60 pounds per hour while diggers at Katalla beach reported 36 pounds per hour.

The reported subsistence harvest was 6,225 pounds. Subsistence harvest from Kanak Island was 3,802 pounds. Subsistence reporting was poor during 1985 and 1986 with less than 25% of permittees reporting. In October 1987 reminder notices were sent to all outstanding 1987 permit holders. Results of this mailing increased the reporting percentage to 75%.

Historically crab fishermen have dug subsistence clams for use as bait during their commercial operations. During 1987 there was no reported harvest by crab fishermen which may be due to either non reporting of subsistence use or availability of bait clams through commercial facilities.

1988 MANAGEMENT OUTLOOK

Effort is expected to remain near the 1987 level. Ex-vessel value has not increased for several years. Bait and food clams command a similar price per pound. The local bait clam market appears stable and unless an increased demand for food clams occurs the harvest should remain well below the guideline harvest range of 100,000 to 150,000 pounds set for the beach at Kanak Island. If effort increases at Kanak Island the Department will monitor the beach via catch per unit of effort data.

MISCELLANEOUS SHELLFISH

OCTOPUS

No directed fishery occurred for octopus in 1987 however 429 pounds was taken incidental to miscellaneous pot shrimp fishing.

SQUID

There were no reported landings of squid during the previous year.

Table 1. 1988 Commercial Tanner Crab Catch by Statistical Area.

Statistical Area	Number Of Vessels	Total Pounds
201-00	3	2,100
201-01	5	35,400
201-02	8	100,600
201-03	2	5,100
201-04	1	14,600
201-05	4	33,800
203-00	2	13,900
203-02	1	1,700
203-03	1	200
203-05	4	18,800
203-06	2	900
203-07	1	1,900
203-10	3	18,500
204-00	9	212,600
204-01	3	13,900
Total	21	474,000

Table 2. Commercial harvest of brown king crab from Prince William Sound by statistical area 1982-83 through 1987-88 season.

	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88
201-00	30,100	9,500	14,900	14,400	38,700	21,700
201-01	6,900	300		1,000		
201-02	2,900	1,300		700		9,700
201-05				100		
203-00	47,700	3,400				
203-01	5,900	1,800				
203-02	100					
203-03	2,200	5,500	100	11,600		
203-04	45,700	25,200	20,300		17,800	29,400
203-05	5,300	3,500	4,900	24,000	9,200	7,500
203-06	100					
203-07	100					
Total Lbs.	147,000	50,500	40,200	51,800	65,700	68,300

Table 3. 1987 Commercial Dungeness Crab Catch by Statistical Area.

Statistical Area	Number Of Vessels	Total Pounds
201-00	1	1,300
201-02	1	1,400
202-02	4	48,500
202-03	8	196,100
202-04	11	349,700
202-05	10	291,300
202-09	1	2,100
203-00	1	8
203-10	1	1,400
203-11	1	1,400
Total	15	893,208

Table 4. 1987 Commercial Pot Shrimp Catch by Statistical Area.

Statistical Area	Number Of Vessels	Lbs. Spot	Lbs. Coon	Lbs. Other	Total Pounds
201-00	23	37,504	810		38,314
201-01 - Exp.	12	22,383	28		22,411
201-01 - Trad	3	5,387			5,387
201-02	6	12,855			12,855
203-00	16	30,512	61		30,573
203-01	17	32,860	525	27	33,412
203-02	4	3,883			3,883
203-03	18	30,629	1,370	47	32,046
203-04	18	41,226	196	52	41,474
203-06	7	3,928	134		4,062
203-07	2	579			579
203-08	2	119	45		164
Total	86	221,865	3,169	126	225,160

Table 5. Catch and effort in the Montague Strait Experimental Harvest Area by month, 1985-1987.

	1985			1986			1987		
	Vssls.	Lndgs.	Pounds	Vssls.	Lndgs.	Pounds	Vssls.	Lndgs.	Pounds
Jan.	8	10	5,681	2	2	1,441	2	2	3,435
Feb.	10	13	7,784	5	9	6,979	4	6	8,911
March	10	12	6,824	6	7	7,314	2	3	3,285
April	2	2	2,179	3	3	3,956	1	1	1,132
May	1	1	1,470	0	0	0	3	4	1,924
June	3	5	2,116	4	5	1,553	3	4	1,246
July	4	10	3,302	5	14	5,911	4	7	1,179
Aug.	3	5	2,226	2	3	1,166	3	4	799
Sept.	1	1	810	0	0	0	0	0	0
Oct.	1	1	1,453	6	10	6,131	0	0	0
Nov.	1	1	1,561	7	8	11,216	1	1	324
Dec.	5	9	11,578	2	2	680	1	1	176
Total	18	69	46,984	15	63	46,347	12	33	22,411

Table 6. 1987-88 Commercial Trawl Shrimp Catch by Statistical Area.

Statistical Area	Number Of Vessels	Lbs. Pink	Lbs. Stripes	Lbs. Other	Total Pounds
201-00	1		143	440	583
203-00	1	275	94,900		95,175
Total	2	275	95,043	440	95,758

Table 7. 1987 Commercial Razor Clam Catch by Statistical Area.

Statistical Area	Number Of Diggers	Total Pounds
202-04	1	1,011
202-05	12	39,943
Total	12	40,954

Table 8. Shellfish Emergency Orders issued, Prince William Sound Management Area, 1987-88.

Fishery	Emergency Order #	Effective Date	Explanation
Tanner	2-S-E-06-87	10/01/87	Subsistence - Closed Orca Bay to subsistence fishing due to low stock abundance.
	2-S-E-09-87	10/08/87	Personal Use - Closed Orca Bay to personal use fishing due to low stock abundance.
	2-S-E-14-87	01/05/88	Commercial - Closed three sections to prevent unnecessary handling on non-marketable crabs. Established guideline harvest range and season length for inshore waters. Opened offshore area for entire regulatory season.
	2-S-E-01-88	01/27/88	Commercial - Closed inshore waters due to recruitment percentage, harvest level and catch/pot. Offshore waters remain open.
King	2-S-E-07-87	10/01/87	Subsistence - Closed Hinchinbrook Entrance and Orca Bay due to low stock abundance for all species.
	2-S-E-08-87	10/01/87	Commercial - Closed entire management area to red and blue king crab fishing due to low stock abundance.
	2-S-E-10-87	10/08/87	Personal Use - Closed Hinchinbrook Entrance and Orca Bay due to low stock abundance for all species.
	2-S-E-15-87	01/05/88	Commercial - Closed inshore waters to fishing for brown king crab during the second regulatory season.
Dungeness	2-S-E-02-87	07/25/87	Commercial - Delayed the regulatory opening of the Copper River District season due to high levels of male soft shells.
	2-S-E-03-87	08/20/87	Commercial - Opens inshore waters to fishing due to a reduction of male soft-shell crabs. Offshore waters remain closed.
	2-S-E-04-87	09/10/87	Commercial - Opened all waters of the Copper River District to fishing due to acceptable percentages of soft shells.
	2-S-E-12-87	01/01/88	Subsistence - Closed the Orca Inlet District due to low stock abundance.

Table 8. (Continued)

Fishery	Emergency Order #	Effective Date	Explanation
Pot Shrimp	2-S-E-01-87	05/01/87	Commercial - Closed the Traditional Harvest Area, spring season. Guideline harvest level achieved.
	2-S-E-05-87	09/21/87	Commercial - Closed the Traditional Harvest Area, fall season. Guideline Harvest level achieved.
Trawling	2-S-E-13-87	01/01/88	Commercial - Opened the waters of Simpson Bay to commercial use for 30 days.
Razor Clams	2-S-E-11-87	01/01/88	Commercial - Closed Orca Inlet due to low stock abundance.

Table 9. Prince William Sound shellfish ex-vessel value.

Fishery	Pounds	Price/lb.	Total Value
1988 Tanner Crab	474,092	\$2.25	\$1,066,707
1987-88 King Crab			
Brown	68,270	\$3.25	221,878
1987 Dungeness	893,174	\$0.95	848,515
1987 Pot Shrimp	225,160	\$3.26	734,594
1987-88 Trawl Shrimp			
Pink	275	\$0.30	83
Sidestripes	95,443	\$1.26	120,258
1987 Razor Clams	40,954	\$0.95	38,914
1987 Miscellaneous Shellfish			
Octopus	429	\$1.05	450
Total			\$3,031,399

All shrimp prices are based on whole shrimp weight.

Appendix Table 1. Prince William Sound Area historical Tanner crab catch in pounds, by season.

Season	Inside	Outside	Total	Vssls.	Lndgs.	X Re- cruit	Avg. Wt.	# Crab
1968-69			1,235,613					
1969-70			1,284,597					
1970-71			4,159					
1971-72			7,788,498					
1972-73			13,927,868					
1973-74	1,658,000	8,500,000	10,158,000					
1974-75	1,187,000	2,667,000	3,854,000					
1975-76	3,322,482	3,810,262	7,132,744					
	Northern	Hinchinbrook	Western	Eastern				
1976-77(1)	782,048	766,650	701,725	70,925	2,321,348	23	316	
1977-78	994,721	1,161,831	2,079,549	570,573	4,806,674	38	591	2.2 2,184,852
1978-79	649,977	708,562	2,248,545	3,443,471	7,050,555	51	783	2.1 3,357,408
1979-80	140,228	332,583	1,462,059	4,057,847	5,992,717	49	561	2.0 2,996,359
1980-81	152,196	812,352	1,561,207	250,076	2,775,831	30	304	2.1 1,321,824
1981-82	351,139	722,834	1,503,253	288,425	2,865,651	29	216	--- ---
1982-83	471,422	31,447	921,663	45,308	1,469,840	40	304	2.1 699,924
1984 (2)	Closed	Closed	Closed	No Effort	0	0	0	-- --- ---
1985	Closed	Closed	No Effort	No Effort	0	0	0	-- --- ---
1986	137,720	236,241	160,829	587	535,377	14	35	26 2.1 254,941
1987	152,834	222,052	196,246	0	571,132	23	65	51 2.1 271,968
1988 (3)	55,929	226,509	191,654	0	474,092	21	46	34 2.1 225,758

(1) New districts established and first season of the minimum legal size.

(2) Calendar year season established.

(3) Preliminary

Appendix Table 2. King crab catch in pounds, Prince William Sound Management Area
1960 - 1987-88 season.

Year/Season	Pounds all species
1960	246,965
1961	236,081
1962	31,478
1963	43,569
1964	14,028
1965	5,500
1966	11,000
1967	41,800
1968	200,000
1969	48,100
1970	94,300
1971	144,200
1972	296,200
1973	207,916
1974	85,379
1975	53,423
1976-77	17,087
1977-78	86,595
1978-79	114,000

Seasons	Red	Blue	Brown	Avg. Wt. Brown	Total	Vessels	Landings
1979-80	52,026	13,662	0		65,688	18	109
1980-81	32,433	7,282	20		39,735	14	65
1981-82	25,358	5,634	0		30,992	11	43
1982-83	30,809	10,433	147,016	9.7	188,258	31	187
1983-84	16,467	5,324	50,535	8.8	73,226	18	69
1984-85	235	closed	40,232	--	40,467	4	14
1985-86	closed	closed	51,800	5.8	51,800	4	11
1986-87	closed	163	65,674	6.1	65,837	4	11
1987-88	closed	closed	68,270	6.6	68,270	4	15

Appendix Table 3 Prince William Sound Area Dungeness Crab Catch, 1960 - 1987.

Year	Copper River			# Crab	Avg. Wt.	Percent Recruits	Orca Inlet		Northern District		Total Pounds
	Pounds	Lndgs.	Vessels				Pounds	Vessels	Pounds	Lndgs.	
1960	—	—	—	—	—	—	1,524,326	—	—	—	1,524,326
1961	—	—	—	—	—	—	990,242	—	—	—	990,242
1962	—	—	—	—	—	—	1,353,190	—	—	—	1,353,190
1963	—	—	—	—	—	—	1,216,846	—	—	—	1,216,846
1964	—	—	—	—	—	—	1,290,929	—	—	—	1,290,929
1965	—	—	—	—	—	—	1,240,372	—	—	—	1,240,372
1966	—	—	—	—	—	—	999,341	—	—	—	999,341
1967	—	—	—	—	—	—	NO DATA AVAILABLE		—	—	NO DATA AVAILABLE
1968	—	—	—	—	—	—	579,279	—	—	—	579,279
1969	336,696	—	—	—	—	—	541,822	—	—	—	878,518
1970	78,223	—	—	—	—	—	660,411	—	—	—	738,634
1971	78,848	—	—	—	—	—	430,976	—	—	—	509,824
1972	437,865	—	—	—	—	—	286,808	—	—	—	724,673
1973	458,613	—	—	—	—	—	347,764	—	—	—	806,377
1974	290,149	—	—	—	—	—	269,015	—	—	—	559,164
1975	654,410	—	—	—	—	—	163,631	—	—	—	818,041
1976	254,933	—	4	—	—	—	35,399	3	—	—	290,332
1977	506,751	—	4	—	—	—	228,858	23	—	—	735,609
1978	1,319,451	—	12	—	—	—	648,439	34	49,571	—	17 2,053,461
1979	504,770	—	19	—	—	—	123,245	32	20,924	—	16 652,924
1980	659,667	—	10	—	—	—	NO FISHING	—	31,152	—	5 690,819
1981	1,503,574	202	18	—	—	25	NO FISHING	—	5,683	11	5 1,509,257
1982	757,911	139	16	332,417	2.2	26	NO FISHING	—	4,221	4	2 762,182
1983	379,094	86	9	184,026	2.1	49	NO FISHING	—	511	14	2 379,605
1984	826,778	88	10	413,394	2.0	92	NO FISHING	—	150	2	2 826,938
1985	1,006,196	124	17	483,748	2.1	63	NO FISHING	—	1,233	5	1 1,007,429
1986	1,090,477	105	16	531,940	2.1	58	NO FISHING	—	0	—	— 1,090,477
1987	887,713	92	13	438,974	2.1	34	NO FISHING	—	5,461	2	2 893,174

Appendix Table 4. Pot shrimp harvest, Prince William Sound Management Area.

Year	Vessels	Landings	Pounds (Whole Weight)
1960			4,165
1961			---
1962			2,986
1963			919
1964			3,547
1965			3,637
1966			---
1967			625
1968			5,733
1969			4,297
1970			16,513
1971			10,916
1972			5,802
1973			5,319
1974			20,857
1975			3,465
1976			2,012
1977			6,276
1978	9	17	12,914
1979	17	98	43,594
1980	23	155	75,173
1981	51	509	144,903
1982	57	397	178,507
1983	71	646	178,206
1984	79	513	173,079
1985	78	528	231,050
1986	80	540	242,678
1987	86	498	225,160

Appendix Table 5. Trawl shrimp harvest, Prince William Sound Management Area.

Year	Vessels	Pounds
1972		5,153
1973		4,243
1974		1,345
1975		26,961
1976		134,115
1977		170,757
1978	8	440,684
1979	4	634,518
1980	6	557,328
1981	4	70,560
1982	9	346,517

Year	Vessels	Landings	Pink	Sidestripes	Other	Total
1983	13	46	420,275	1,058	2,345	423,678
1984	14	55	1,292,643	8,842	1,155	1,302,640
1985	6	44	432,514	15,696	440	448,650
1986	3	44	218,156	27,701	13	245,870
1987	2	109	275	95,043	400	95,718

Appendix Table 6 Razor clam harvest in pounds, Prince William Sound Area,
1960 - 1987.

Year	Commercial Diggers	Commercial Pounds	Subsistence Users	Subsistence Pounds
1960		433,930		
1961		261,628		
1962		208,698		
1963		86,340		
1964		39,275		
1965		86,477		
1966		27,063		
1967		98,446		
1968		72,806		
1969		26,887		
1970		27,909		
1971		37,972		
1972		30,326		
1973		30,318		
1974		29,747		
1975		15,443		
1976		1,516		
1977	11	2,160		
1978	54	29,865		
1979	26	12,904		
1980	21	5,881		
1981	7	28,970		
1982	12	15,275		
1983	41	124,835		
1984	41	168,426		
1985	25	60,274	37	4,930
1986	17	13,122	38	4,831
1987	12	40,954	83	6,225

1. A subsistence permit is required to harvest razor clams from the Copper River Delta.
2. 1985 22% of all subsistence permits were returned.
1986 24% of all subsistence permits were returned.
1987 75% of all subsistence permits were returned.

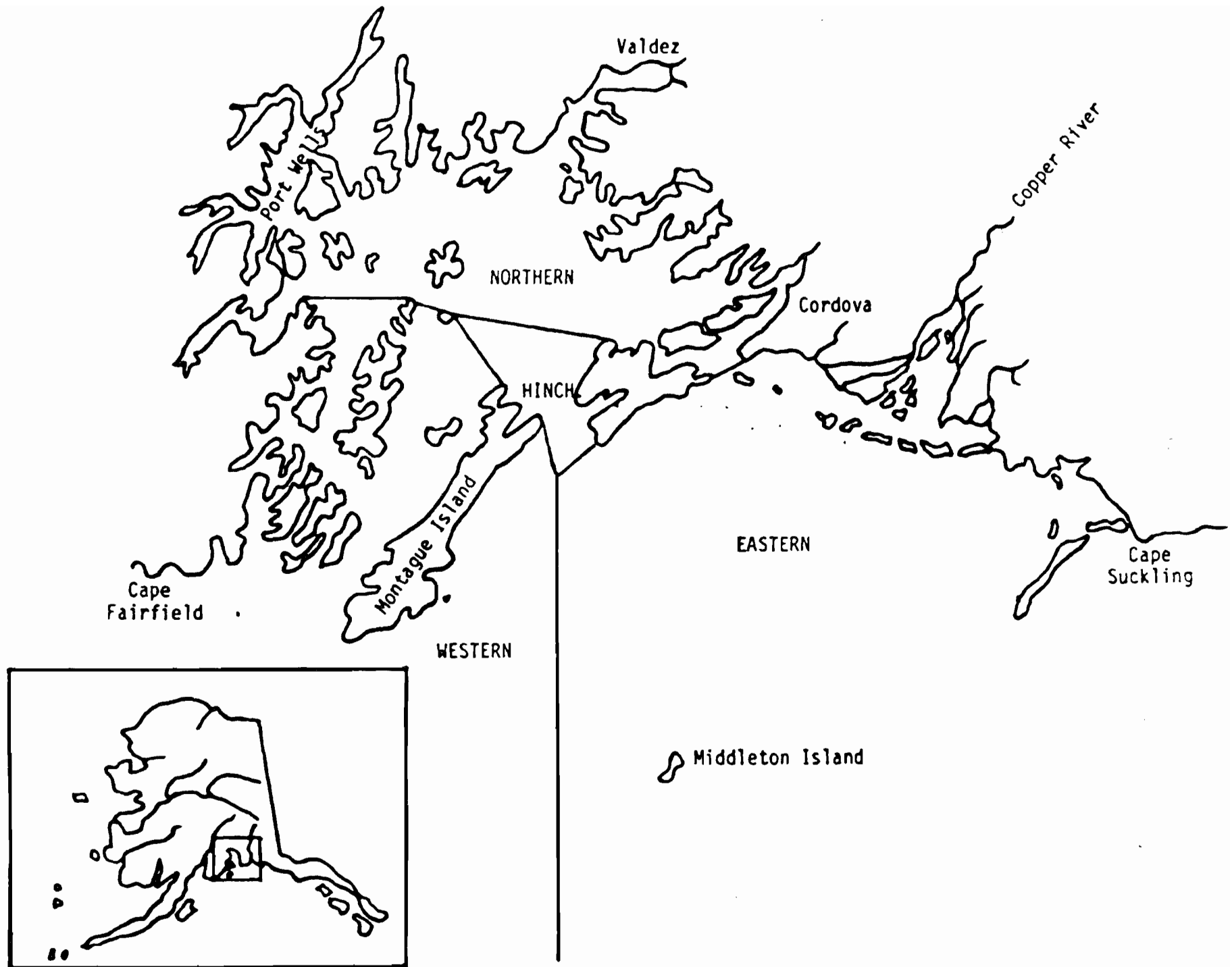
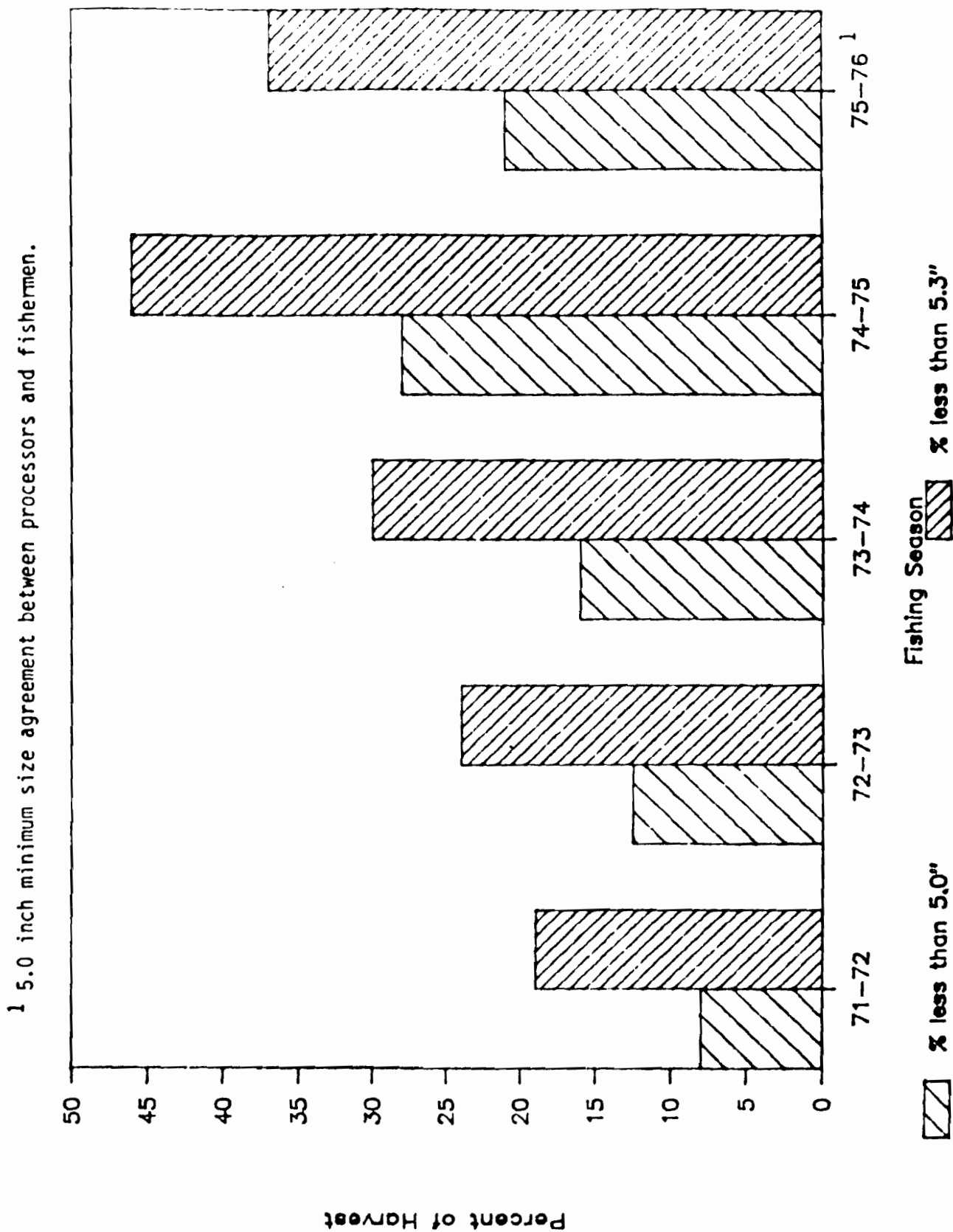


Figure 1. Prince William Sound Management Area and Tanner crab fishing districts.

Figure 2. Percent of commercial Tanner crab harvest beneath 5.0 and 5.3 inches, Prince William Sound Management Area, 1971-72 to 1975-76 season.



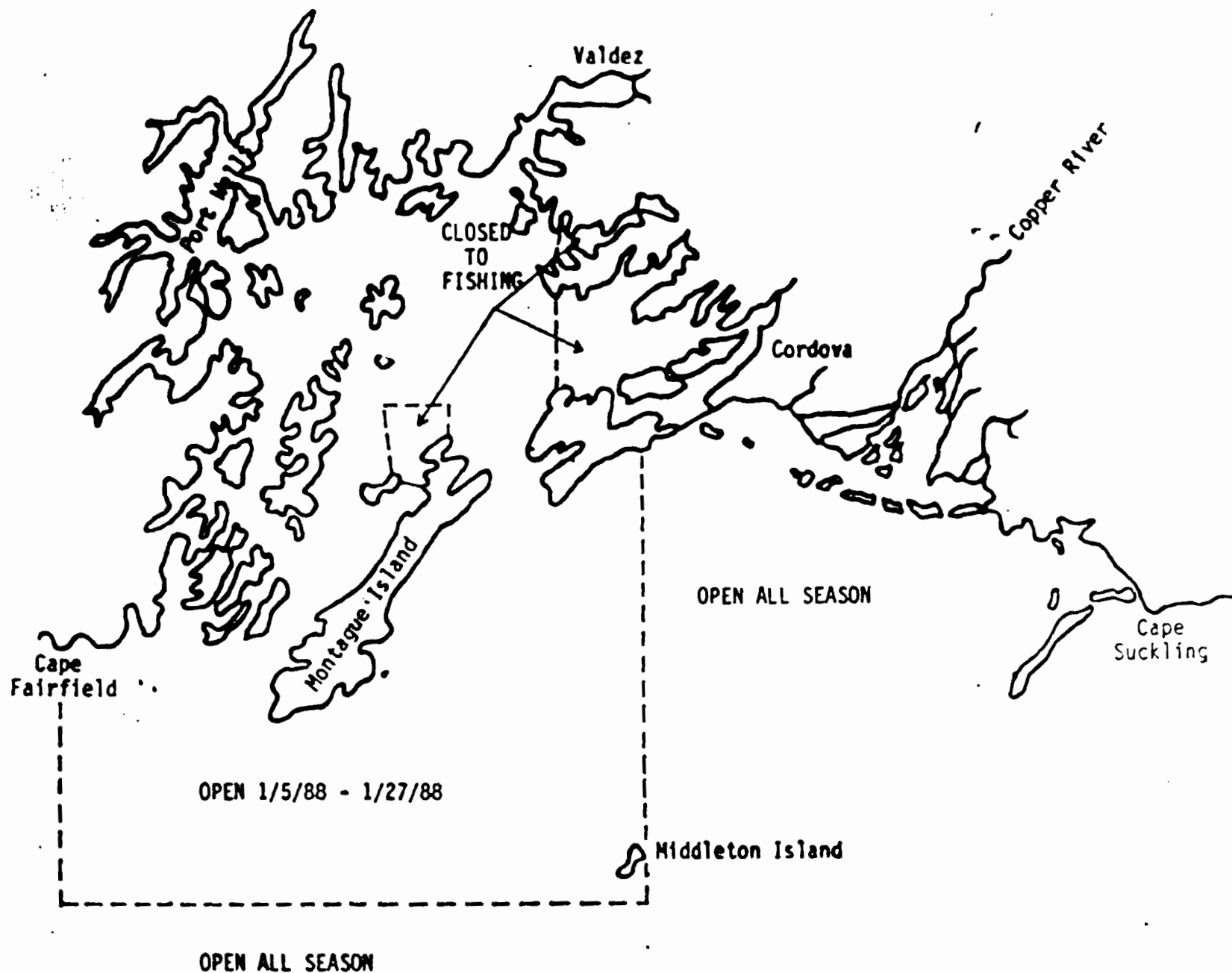
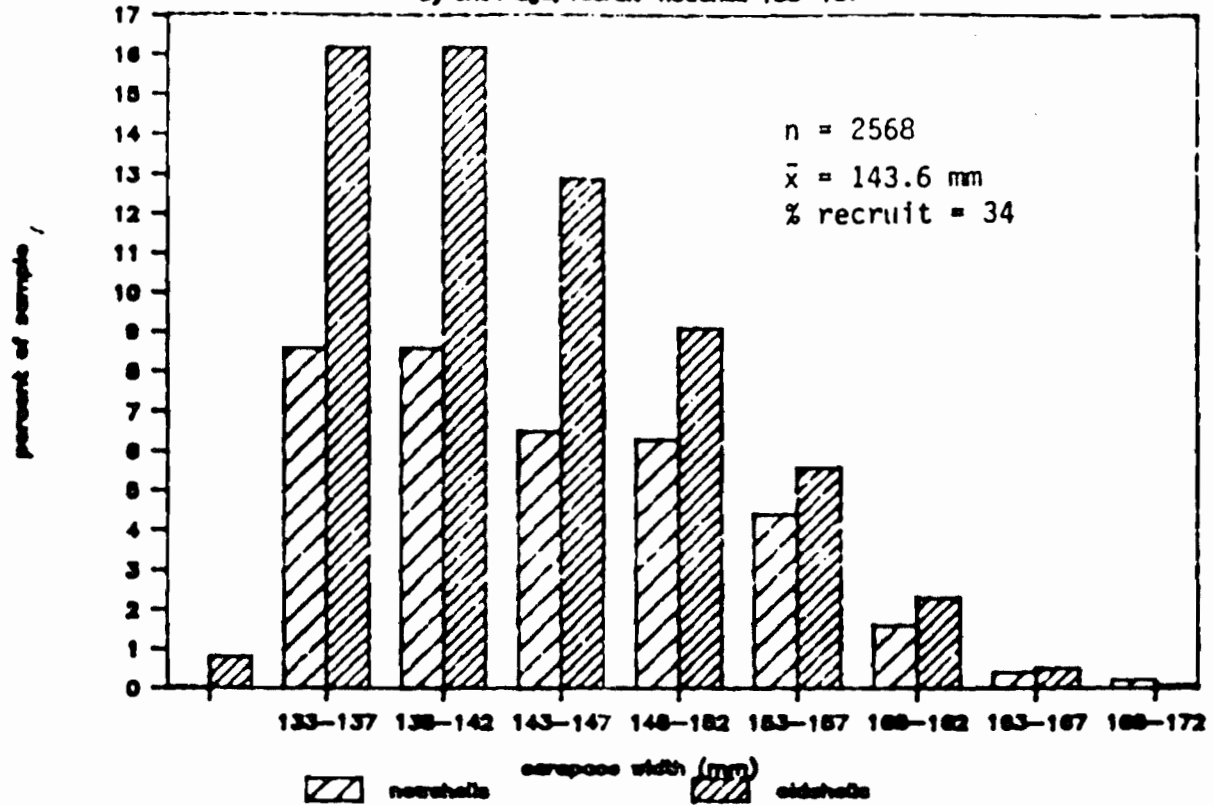


Figure 3. Prince William Sound Management Area and Tanner crab open and closed waters.

1988 PWS Tanner Crab Size Frequency

by shell age, recruit=nonshell 133-157



1988 PWS Tanner Crab Size Frequency

all shell ages

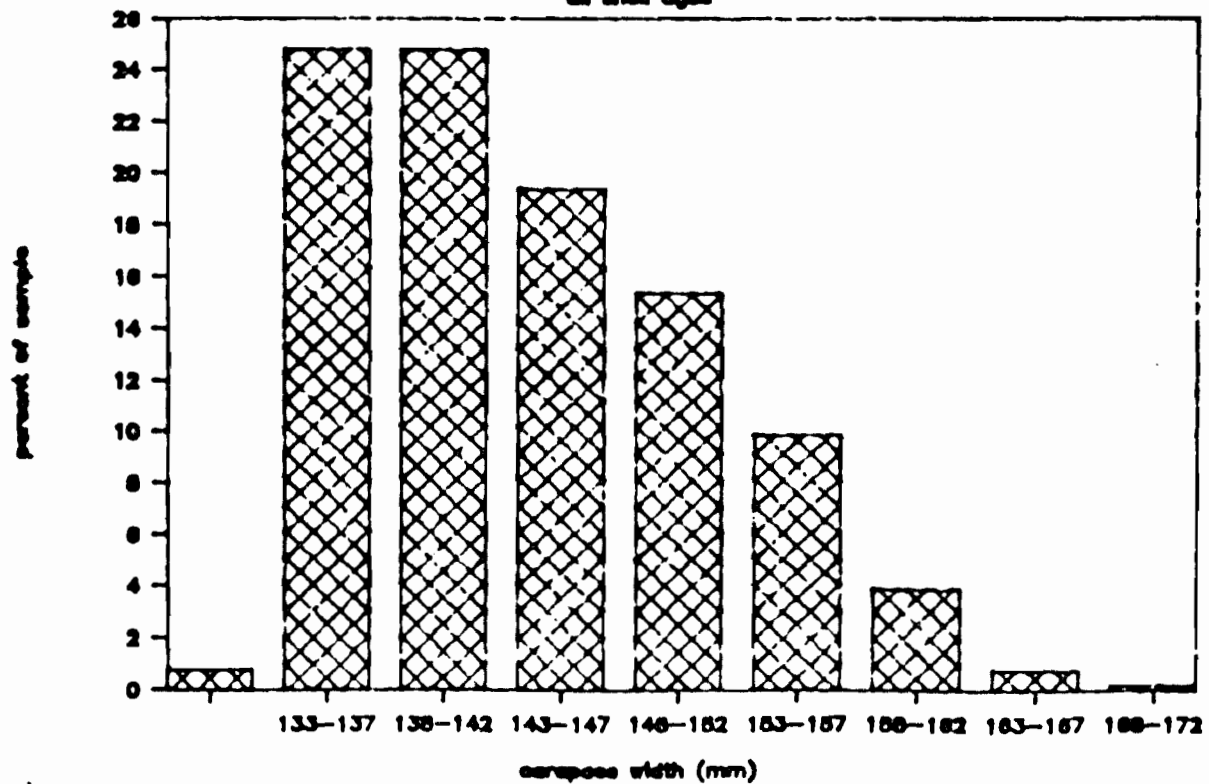


Figure 4.

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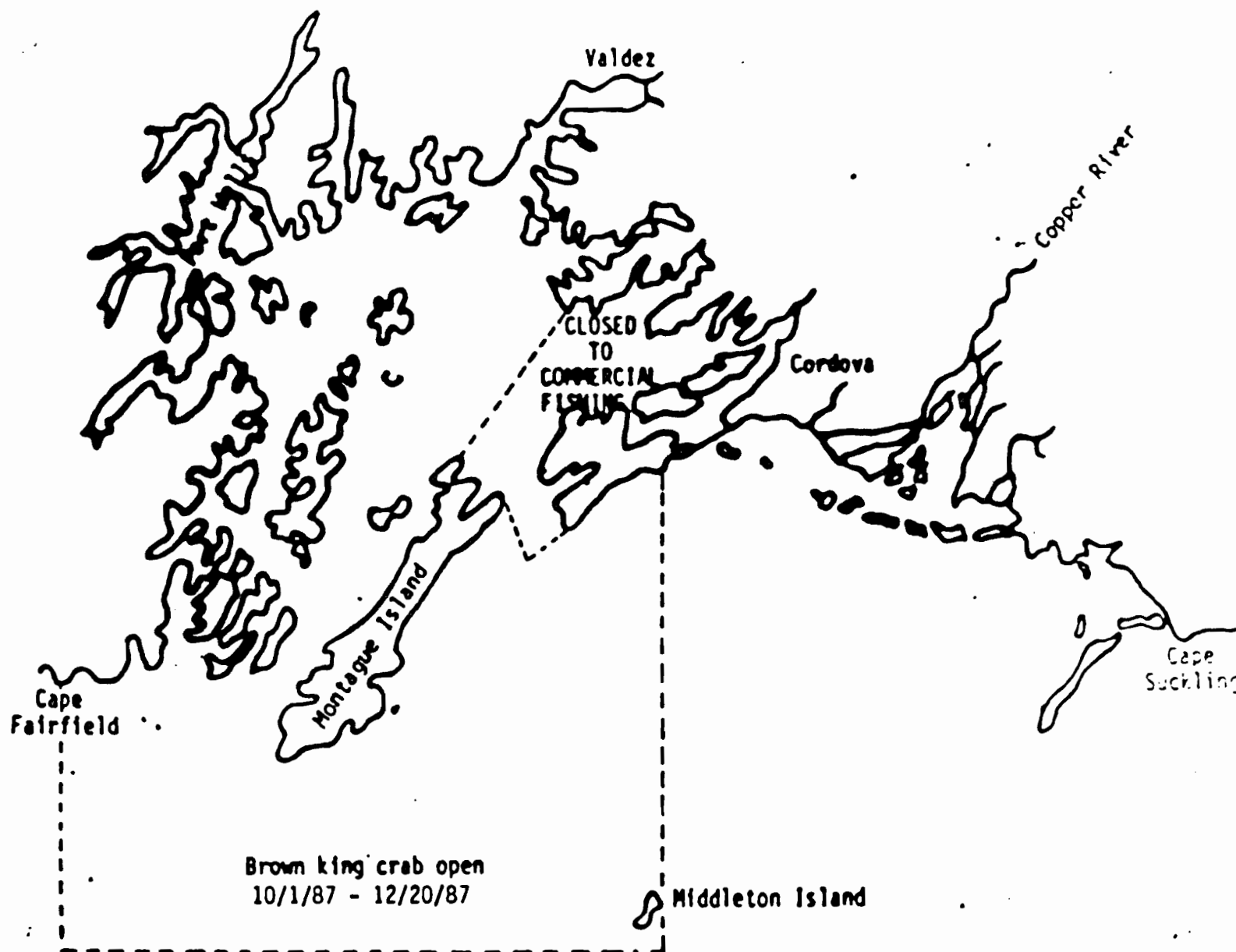


Figure 5. Prince William Sound Management Area showing open and closed waters.

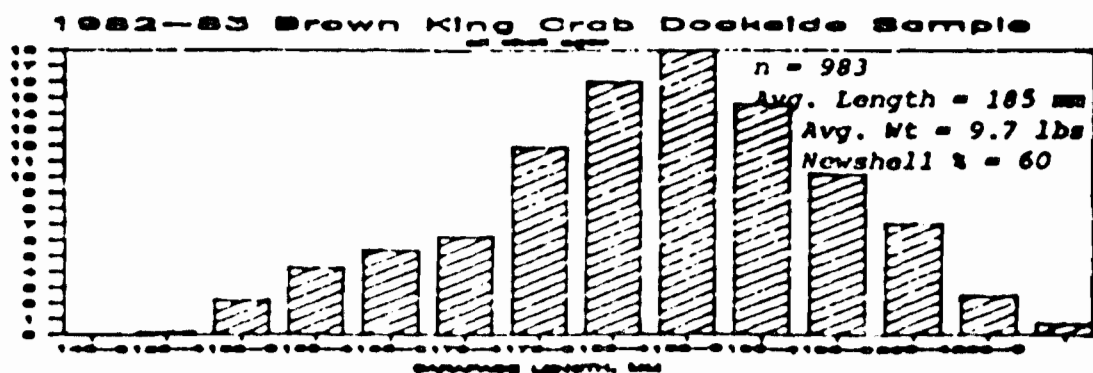
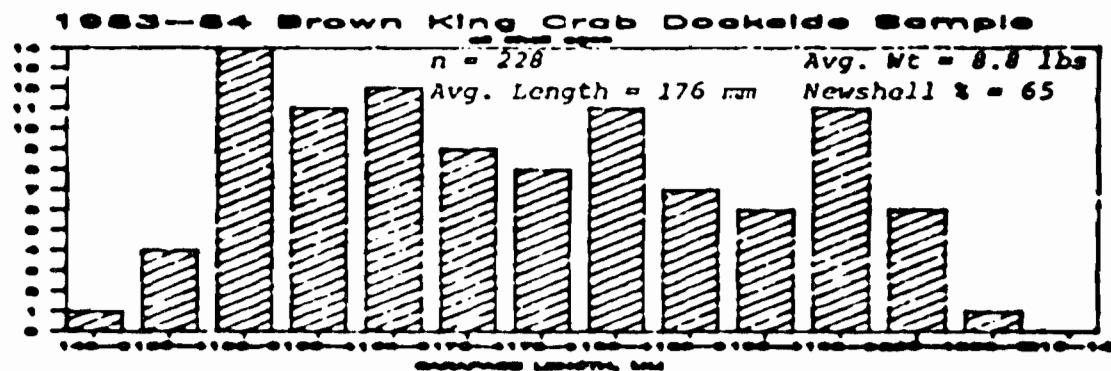
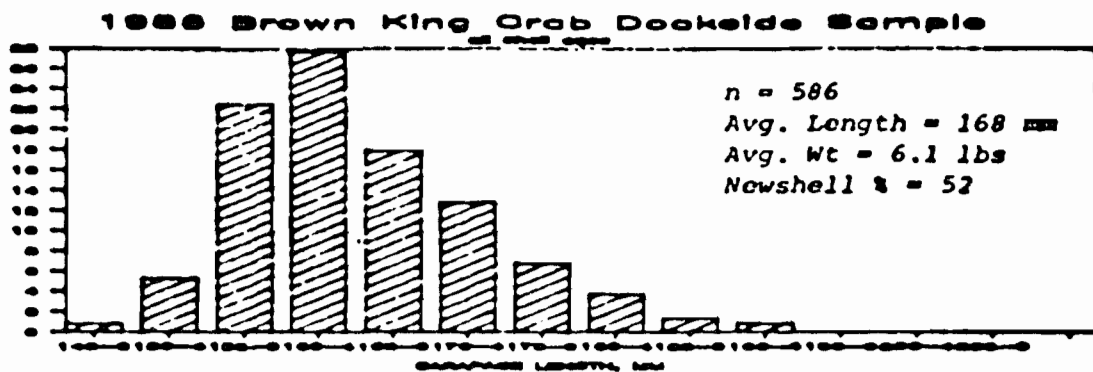
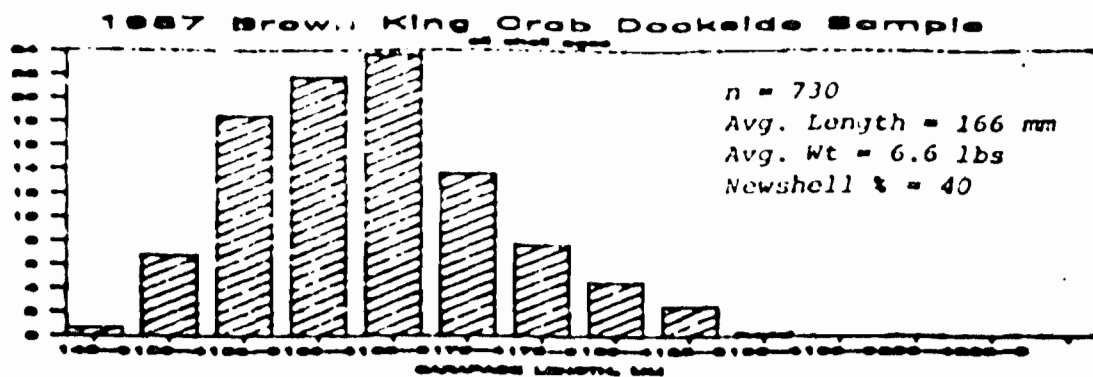


Figure 6 .

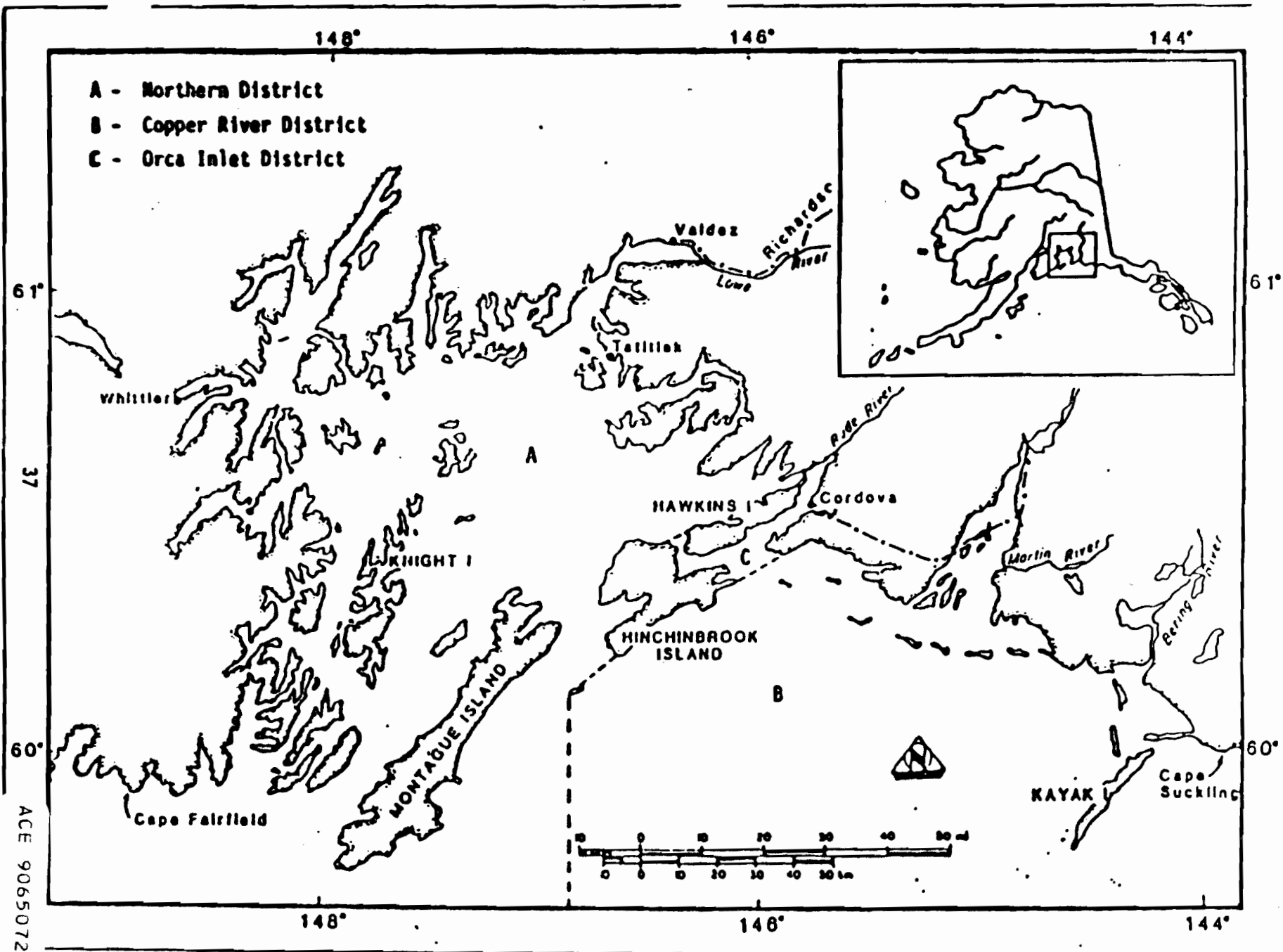
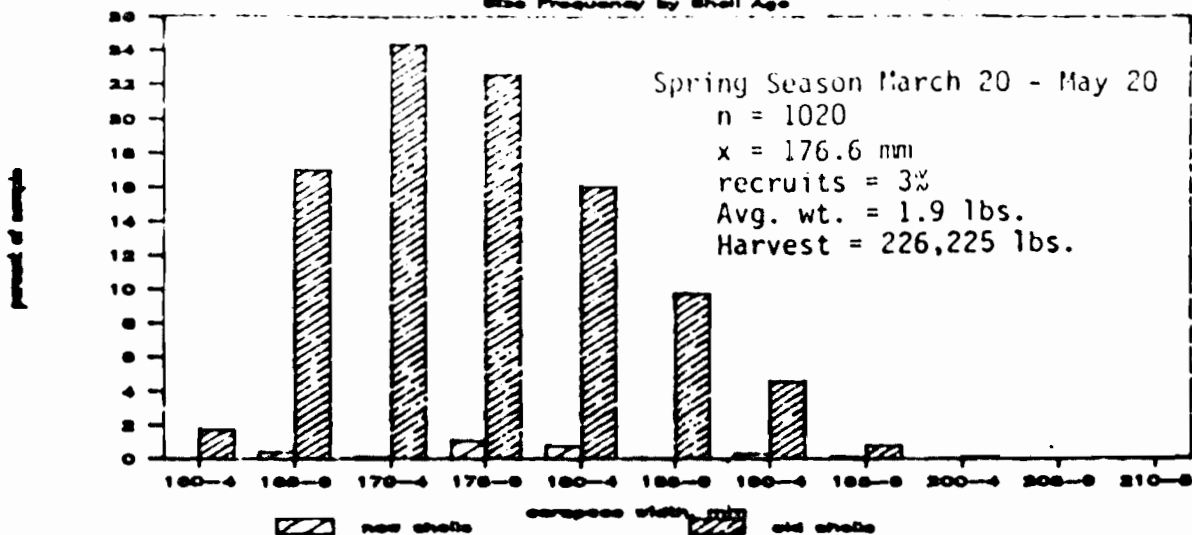


Figure 7. Prince William Sound Dungeness crab districts

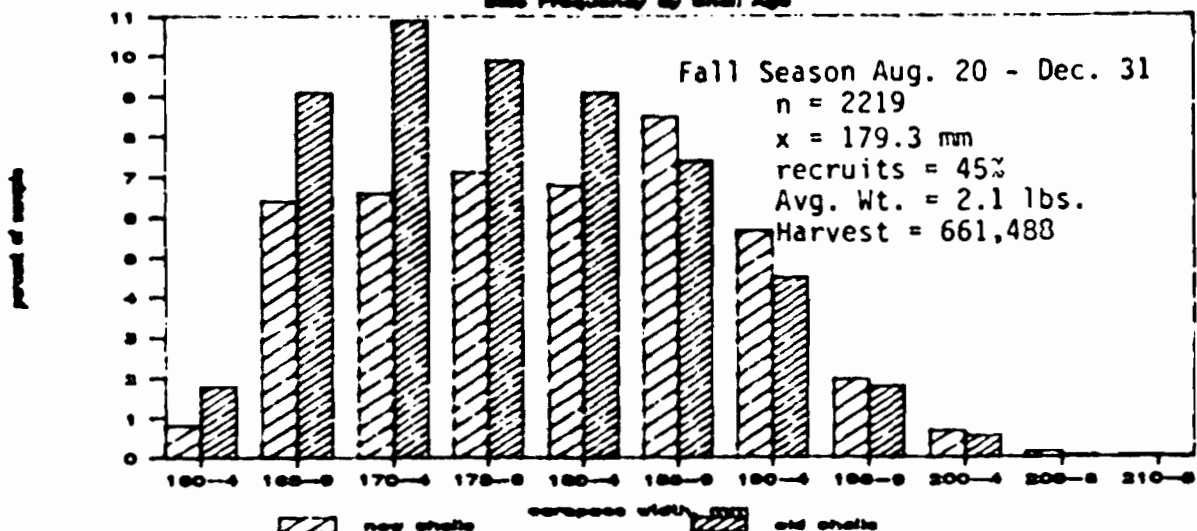
87 COPPER RIVER DISTRICT DUNGENESS

Size Frequency by Shell Age



87 COPPER RIVER DISTRICT DUNGENESS

Size Frequency by Shell Age



87 COPPER RIVER DISTRICT DUNGENESS

width frequencies total season

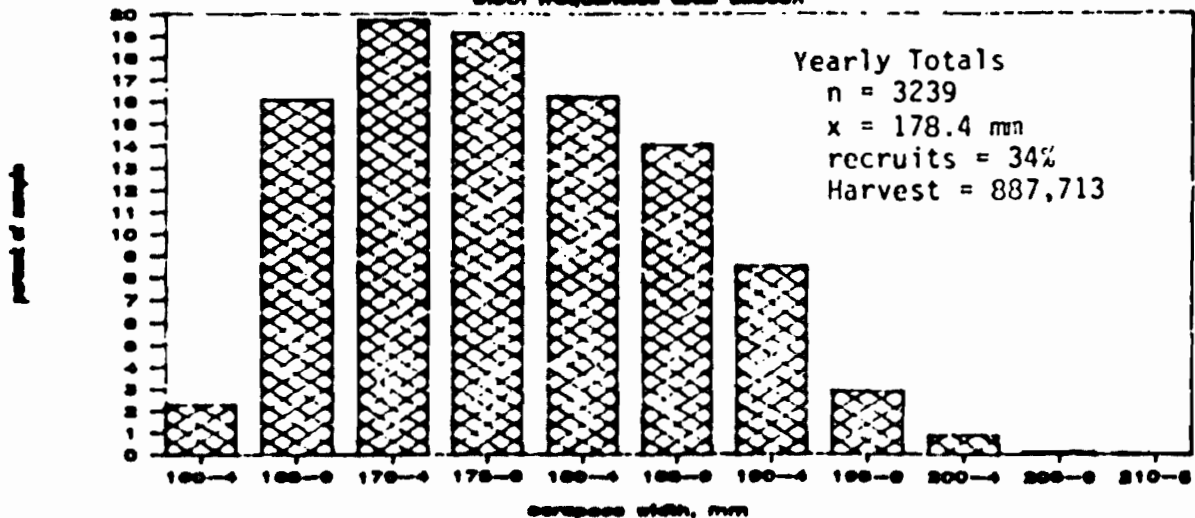


Figure 8.

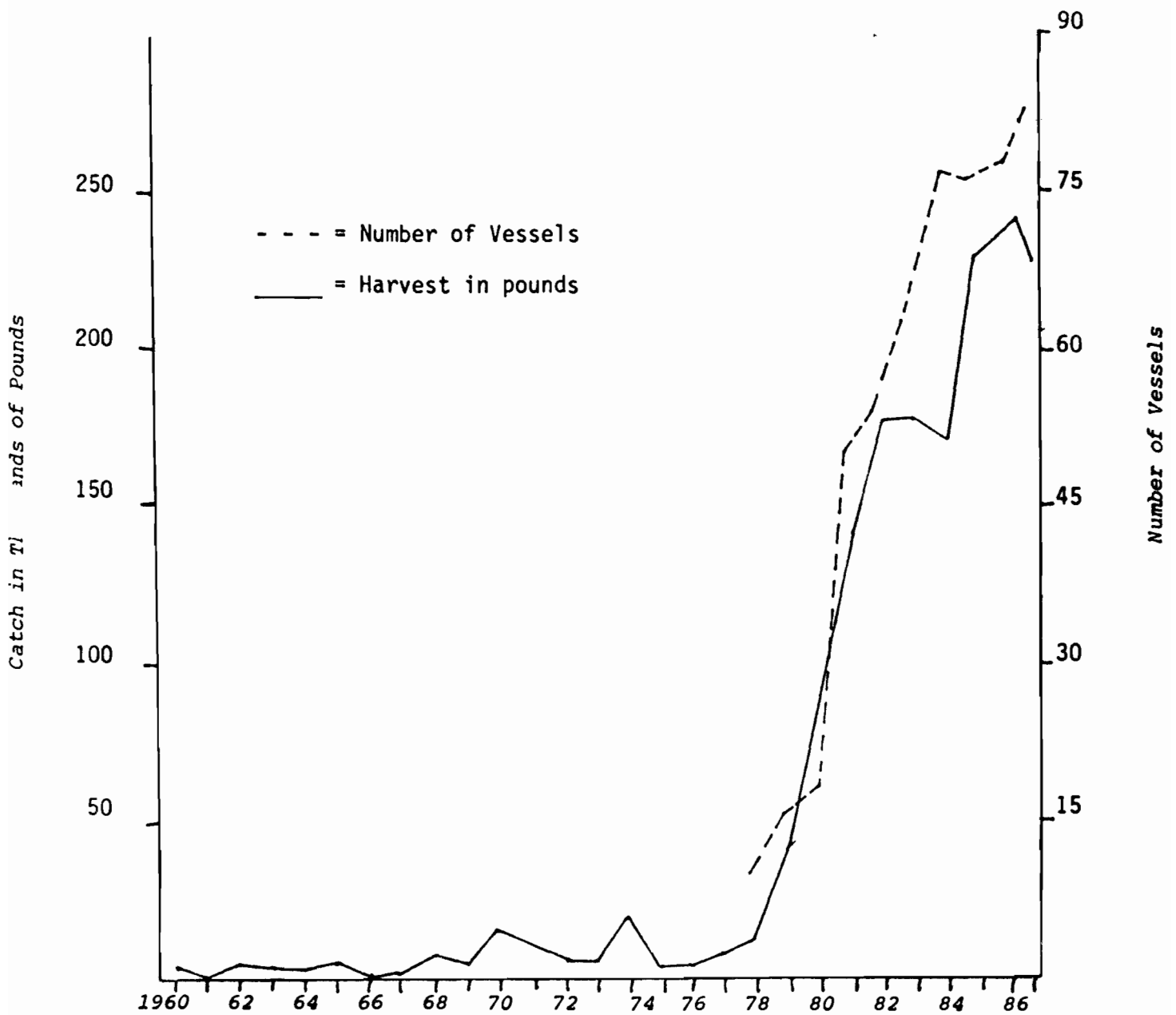


Figure 9. Pot shrimp harvest and vessel effort by year 1960 - 1987, Prince William Sound Management Area.

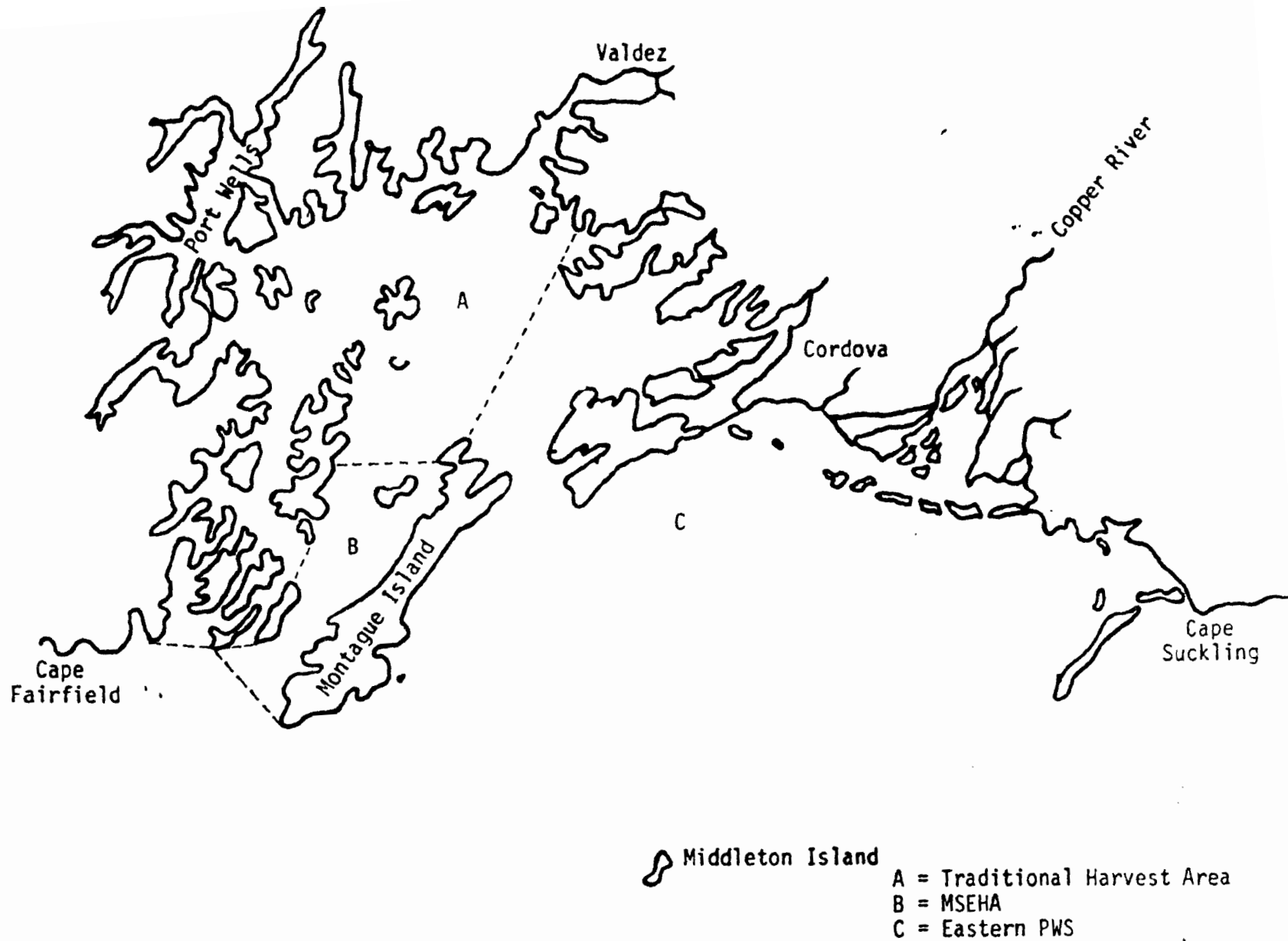


Figure 10. Prince William Sound Management Area Pot shrimp fishing districts.

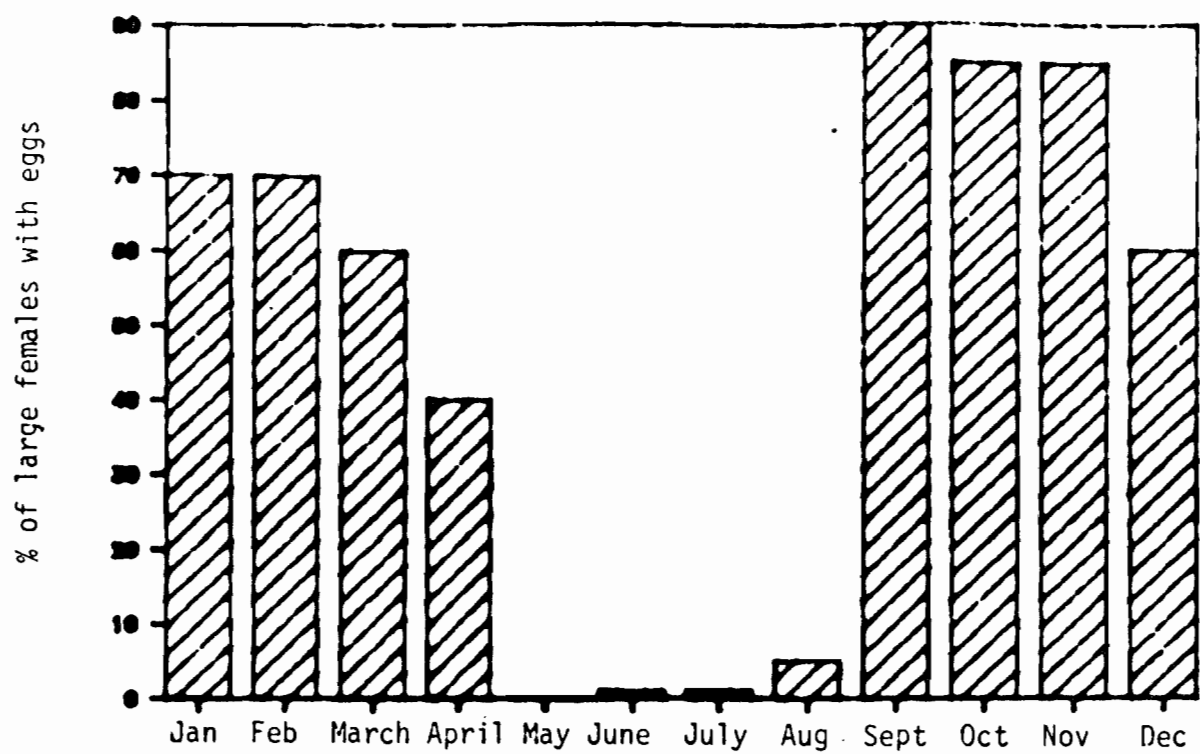


Figure 11 . Percentage of large females with eggs by month, Montague Strait Experimental Harvest Area, 1986.

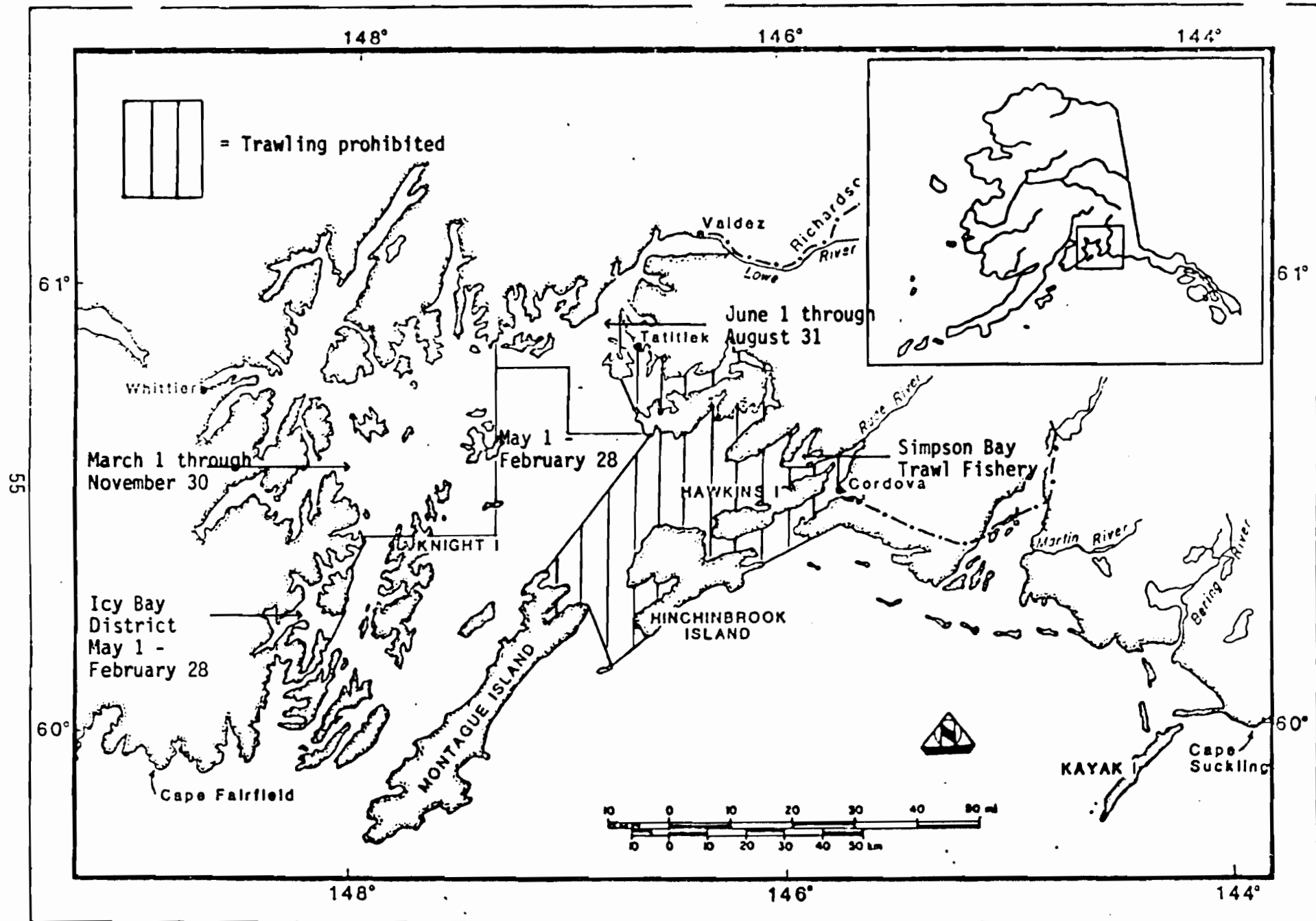


Figure 12. Prince William Sound Management Area, trawl shrimp seasons and trawl closures.

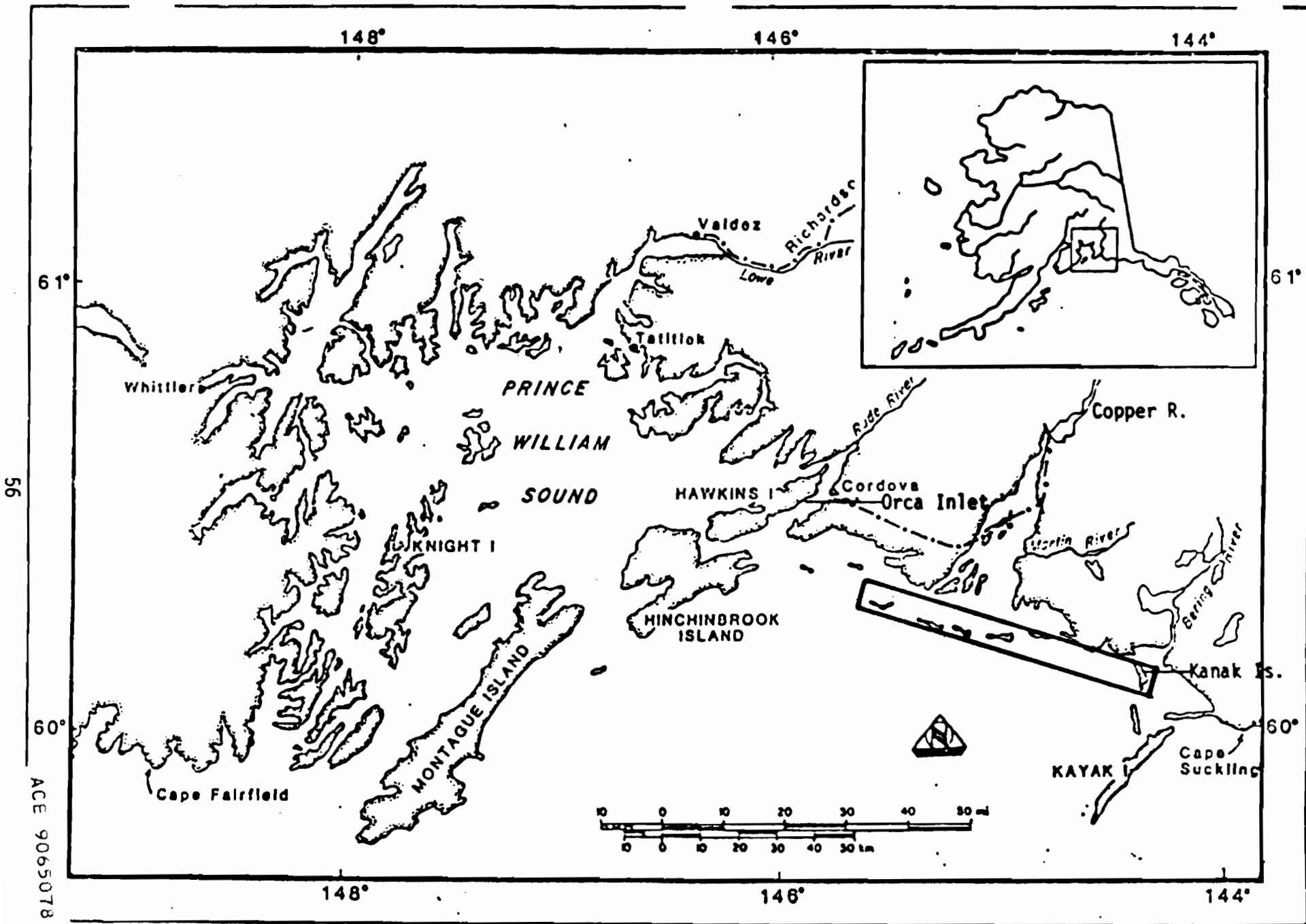


Figure 13. Razor clam harvest area.

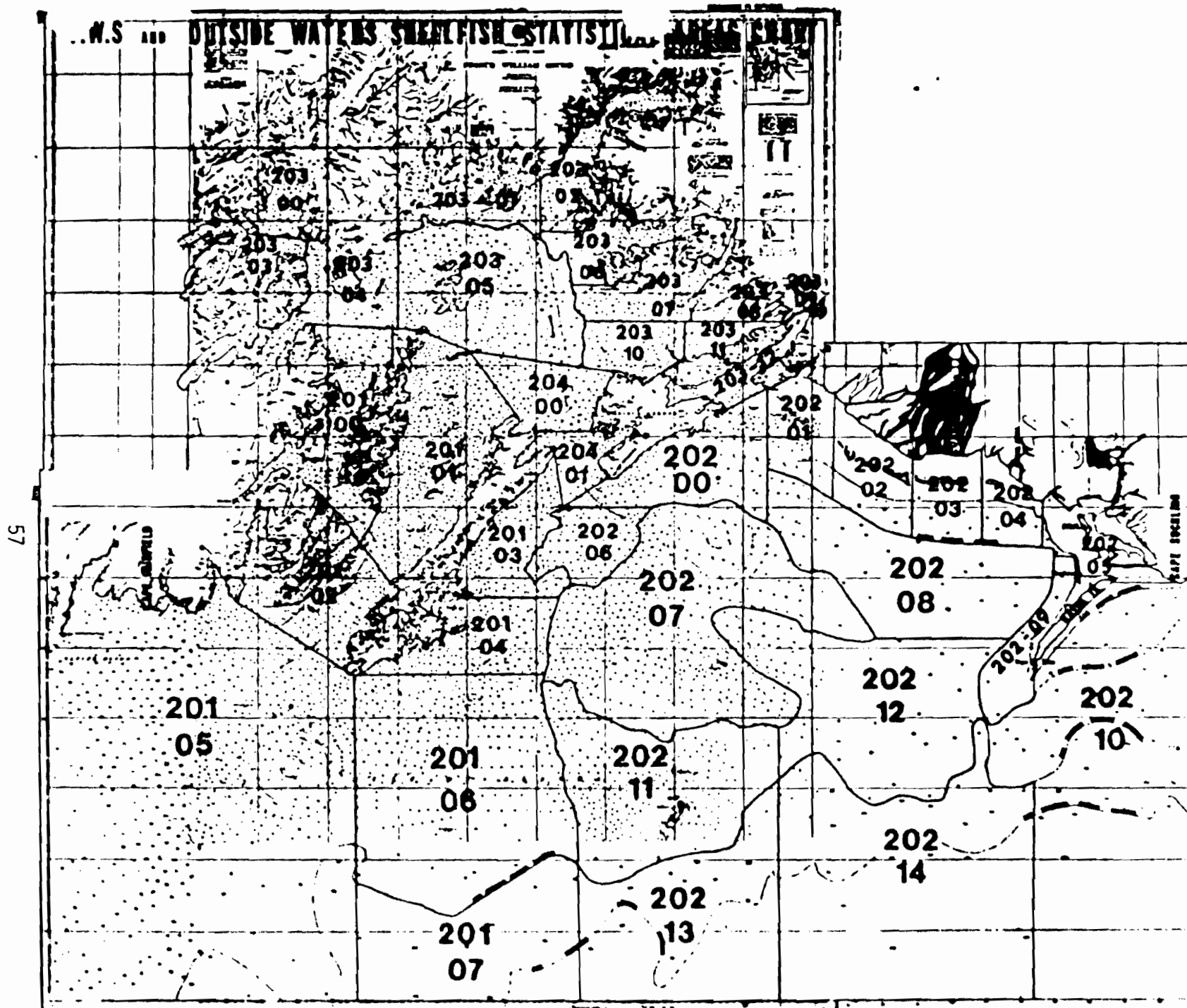


Figure 14. Prince William Sound Shellfish Statistical Areas Chart.

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