

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF COMMERCIAL FISHERIES

COOK INLET AREA
ANNUAL SHELLFISH MANAGEMENT REPORT

1991-92



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1991-92



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Alaska Department of Fish and Game
Division of Commercial Fisheries Central Region
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INTRODUCTION

The Cook Inlet Management Area, Statistical Area H, has as its eastern boundary the longitude of Cape Fairfield ($148^{\circ} 50'$ W. long.) and its southern boundary the latitude of Cape Douglas ($58^{\circ} 52'$ N. lat.). The management area is divided into six shellfish districts: Southern, Kamishak, Barren Islands, Outer, Eastern and Central (Figure 1).

A discrete management area (G) has been established specifically for the trawl and pot shrimp fisheries in the Outer and Eastern Districts (Figure 2). Area G has as its boundaries the longitude of Cape Fairfield on the east and a line drawn from the westernmost tip of Point Adam to the westernmost tip of Cape Elizabeth and south along $151^{\circ} 53'$ W. longitude on the west.

This report covers the most recent shellfish fisheries in Cook Inlet: 1992 Tanner crab (Chionoecetes bairdi), 1991 razor clam (Siliqua patula), hardshell clams, blue mussels (Mytilus edulis), octopus (Octopus dofleini), 1991-92 green sea urchins (Stronglyocentrotus droebachiensis) and the 1991-92 Area G trawl and pot shrimp fisheries. The 1991 seasons for scallops (Pecten caurinus) and sea cucumbers (Parasitichopus californicus) were open but no one fished. The 1991 seasons for Dungeness crab (Cancer magister), red king crab (Paralithodes camtschaticus), and the 1991-92 Area H trawl and pot shrimp fisheries were closed due to low stock conditions. A summary of the king crab, Dungeness crab, sea cucumbers, scallop and shrimp stocks as well as historic fisheries are given in this report. Emergency orders affecting these fisheries are listed on Table 1.

Shellfish landings from the Cook Inlet Management Area (H) included 407,917 pounds of Tanner crab, 201,320 pounds of razor clams, 47,571 pounds of hardshell clams, 20,445 pounds of green urchins

and 2,088 pounds of octopus. Landings for Area G included 7,315 pounds of pot caught shrimp. Area G trawl shrimp harvest and Cook Inlet mussel catches are confidential since three or less fishermen participated in the respective fisheries.

The approximate exvessel value by species was \$877,000 for Tanner crabs, \$93,000 for razor clams, \$2,600 for octopus, \$60,000 for hardshell clams and \$20,000 for green urchins. Exvessel values for Area G pot and trawl shrimp were \$33,000 and \$6,000, respectively. Total estimated exvessel value of all shellfish species for the Cook Inlet Management Area was approximately \$1.1 million.

TANNER CRAB FISHERY

Introduction

Tanner crab fishing has occurred in six of the districts of the Cook Inlet Management Area (H): Southern, Kamishak, Barren Islands, Central, Outer and Eastern (Figure 1). Historical catch, since inception of the minimum legal size in 1976, has ranged from 408,000 pounds in 1992 to 5.7 million pounds in 1978-79 (Figure 3, Appendix A). The number of participating vessels has ranged from 7 in 1990 to 137 in the 1988 season. The entire management area was closed for the 1989 season due to depressed stock conditions.

The Southern District is fished by both small and large vessels. The fishery occurs in the relatively protected waters of Kachemak Bay. Approximately 50 percent of the vessels do not have circulating crab tanks. The Homer and Seldovia boat harbors, home ports to most of the fleet, are no more than a three hour run from the geographic extremes of the district. Fishing depths range from 5 to 95 fathoms, but generally are between 30 and 55. Historical annual harvests have ranged from 270 thousand to 2.9 million

pounds. The fishery was closed in both 1989 and 1990 due to depressed stock conditions. Recent vessel effort has been high with 127 boats fishing during the 1988 season and 110 boats in the 1992 season (Appendix A).

The Kamishak Bay and Barren Islands Districts are often considered one management unit because survey, fishery and tag recovery information show that these two districts contain a single stock of Tanner crabs. The fishery in the Kamishak and Barren Islands Districts occurs in open waters subject to severe weather and icing conditions, as well as extreme tides and seasonal ice flows from upper Cook Inlet and Kamishak Bay itself. All participating vessels have circulating sea water systems. The smallest vessels are generally 50 feet in keel length. These smaller vessels are often extremely limited in fishing time due to the weather conditions. Many fishermen generally fish around the clock; the boats jog while the gear soaks. Safe anchorage from storms is located behind Augustine Island or in Iniskin Bay. Fishing occurs in a 15 to 90 fathom depth range. Historical catch since full development of the fishery and implementation of the legal minimum size has ranged from 0.4 to 3.3 million pounds. The fishery was closed in 1989 and 1992 due to depressed stock conditions. Vessel effort has ranged from 7 to 28 boats (Appendix A).

The Outer and Eastern Districts are located in the Gulf of Alaska bordering the Prince William Sound Management Area (E) on the east at Cape Fairfield. Recently this fishery has occurred in or near the mouths of the many fjord like bays along the outer coast of the Kenai Peninsula; however, the exposed open waters in the Gulf of Alaska portion of these districts once provided significant portions of the catch. The fleet in these districts is characterized by both small and large vessels, the smaller boats fishing the bays and the larger vessel fishing the bays and the open ocean. Poor weather conditions impact all of the boats since the smaller vessels must negotiate open ocean waters to reach gear

placed in the bays both east and west of Seward, which is the delivery point for most of the crabs. Some crabs, however, are delivered to Homer resulting in an equally rough trip from the bays of the outer Kenai Peninsula to Homer.

This crab stock has suffered the same severe decline in abundance as the stocks as far east as Yakutat. Historical catch since implementation of the minimum legal size in 1976 has decreased from 800,000 to 50,000 pounds. The fishery was closed from 1989 through 1991 due to depressed stock conditions. Vessel effort has ranged from 7 to 25 boats (Appendix A).

The regulatory season for the entire management area is from January 15 through March 31. The season may be terminated earlier by emergency order. The opening date of January 15 was first implemented in 1987. The season opening was November 1 from the periods 1983 to 1986 and 1972 to 1974. It was December 1 from 1974 to 1983. The opening of the Southern District fishery may be delayed if weather conditions indicate potential damage to exposed crabs.

In the Southern and Kamishak/Barren Islands Districts the emergency order is utilized to close the fishery once the guideline harvest level is achieved. The Outer and Eastern Districts close either based on decline in catch per unit of effort (CPUE) or by regulation on March 31.

The Department has been tagging Tanner crabs for the past five years in the Southern, Kamishak Bay and Barren Islands Districts. Thus far there has been no interchange of legal males between the Southern District and the Kamishak/Barren Islands; however, tag recovery has indicated the Kamishak Bay and Barren Islands Districts' Tanner crabs are one stock. Furthermore the legal males tagged in these two districts have been captured in Kodiak's North

Mainland Section, but only on a regular basis as far south as Douglas Reef, which is approximately 5 miles south of Cape Douglas (Figure 1).

Regulations distinctive to the Cook Inlet commercial Tanner crab fishery are:

- 1) Superexclusive registration.
- 2) Registration prior to the season opening.
- 3) Gear storage in the Kamishak and Southern Districts in 15 fathoms or less, except in the eastern portion of the Southern District where it is 10 fathoms or less.
- 4) A 75 pot limit in the Southern District if the guideline harvest level is greater than 800,000 pounds. A 40 pot limit if it is less.
- 5) Buoy identification tags are required in the Southern District to assist with the pot limit enforcement.
- 6) A requirement for two 4 3/4 inch escape rings on all gear.

1992 Season Summary

The Southern, Outer and Eastern Districts were opened to commercial fishing in 1992. The total catch was 407,917 pounds taken by 121 vessels. The Central, Barren Islands and Kamishak Districts remained closed due to low stock abundance.

Southern District

The 1992 season harvest for the Southern District was 354,868. The preseason quota was 350,000 pounds. The bulk of the catch came from the waters west of Homer Spit where 80 vessels harvested 316,600 pounds (89%) of Tanner crabs. The catch east of the Spit was 38,268 pounds (11%) taken by 39 boats (Table 2).

The overall Southern District crab catch was taken by 110 vessels which made 194 landings. The average size of participating vessels was 44 feet with a range of 18 to 79 feet. Fifty six vessels (51%) were tanked and 54 (49%) were dry. The fishery was executed in two separate periods totalling 18 hours: 1) January 15 from 1200 to 2200 hours (10 hours) and 2) January 19 from 0900 hours to 1700 hours (8 hours).

There were one major and three minor processors that purchased 350,224 pounds of crabs from the Southern District fishery. Fourteen catcher/sellers sold 4,644 pounds of Tanner crabs to individual markets.

Overall catch per unit of effort (cpue) was 17.6 legal males per pot. Cpue east and west of Homer Spit was 6.9 and 21.7, respectively. Mean soak time was 4.6 hours. The average weight of the crabs was 2.57 pounds and the average width was 153 mm (6.02 in.) (Appendix B). True recruits (new shells) comprised 53 percent of the catch. Thirty-three percent of all legal crabs were skipmolts (old shells) in the recruit size class. Ten percent were new shells in the postrecruit size class, and the remaining 4 percent were skipmolts in the postrecruit size class (Figure 4).

Similar to the 1991 season, the 1992 commercial season in the Southern District was unique from previous fisheries in three ways:

- 1) There was a 40 pot limit with an accompanying buoy tag requirement.
- 2) Ambient air temperature and wind speed were determining factors for the opening of the fishery.
- 3) The length of the season was set prior to the opening.

Although a pot limit for the Southern District has been in place since 1986, the 1992 season was only the second year that buoy tags were required. These tags aid in enforcement of the pot limit. A series of 40 tags unique to each vessel were issued at the time of registration. A fee sufficient to recover the cost of the tags was charged to each registrant. Prior to the fishery the department issued suggestions from commercial fishermen regarding application procedures for tags. There were no complaints about tags not adhering to buoys. Fish and Wildlife Protection officers, who patrolled the fishing grounds aboard the State Vessel Pandalus, felt compliance with the pot limit was excellent due primarily to the buoy tags.

Justification for opening the fishery based on air temperature was a result of research completed by National Marine Fisheries Service (NMFS) (Carls and O'Clair, 1989). This work showed that as temperature declined, damage to Tanner crabs increased. The department's management goal therefore was to harvest Tanner crabs within a temperature regime that minimizes the damage to sublegals and females that are sorted from the legal male segment of the catch. This was accomplished by extrapolating the NMFS data to fit the real weather and fishing conditions in the Southern District which resulted in a minimum of 15 degrees Fahrenheit and a 0 to 10 knot wind necessary to allow fishing.

The length of the season was set prior to the opening in order to avoid overharvest. Prior to 1991 the department had used inseason

fishery performance data, such as catch per unit of effort, to determine the closure. Due to the increase in effort and the reduction in harvestable crabs, the resource had often been overfished by the time the staff collected the cpue data and implemented the closure. With an enforceable pot limit and a registration deadline, however, effort can be anticipated and the rate of harvest estimated, therefore allowing for the determination of season length prior to the actual fishery.

Processing capacity was limited during the 1991 season. The department responded by reducing the open period to a point where the limited catch could be handled by the processors. As a result no dry boats would be turned away at the dock therefore avoiding loss of their crabs to deadloss.

In December 1991 the department contacted processors regarding their capacity for handling the 350,000 pound 1992 season quota in one period. Based on processor response the capacity was calculated to be between 225 and 250 thousand pounds. The department estimated a 10 hour fishery would be required to obtain this harvest level.

The fishery opened by regulation at 12 noon January 15 and closed via emergency order at 2200 January 15, a period of 10 hours. The January 15, 0500 temperature and wind at the Homer Harbormaster's was 37 degrees fahrenheit and 10 knots out of the east northeast. The 0400 National Weather Service forecast for Kachemak Bay was for temperature in the 30's and wind out of the east at 15 to 25 knots. These temperature and wind conditions were favorable for crab survival therefore the fishery was allowed to open by regulation at 12 noon January 15, 1992.

The catch for the January 15 fishery was approximately 210,000 pounds taken by 107 vessels. One ring netter, fishing from a pot vessel, also made a delivery. An additional 4 vessels set gear,

but did not deliver any crabs due to either breakdown or lack of crabs. Catch per unit of effort averaged 18.6 legal males per pot with an mean soak time of 4.75 hours.

The second opening took place January 19 from 0900 to 1700 hours, a period of eight hours. The guideline harvest level was 135,000 to 140,000 pounds, which was the remainder of the original 350,000 pound quota. The fishery was postponed until January 19 due to both time required to process the catch from the first opening and a delay in gear/bait jar removal which was a regulatory provision necessary to guarantee a fair start for the second period.

The National Weather Service 0400 forecast for January 19 was northeast winds to 20 knots decreasing to 10 knots accompanied by temperatures to 30 degrees fahrenheit.

The catch was approximately 149,000 pounds harvested by 89 boats and one ring netter who fished from a pot vessel. Catch per unit of effort averaged 16.4 legal males per pot with a mean soak time of 4.4 hours.

Outer and Eastern Districts

The season opened in the Outer and Eastern Districts by regulation on January 15, 1992 and closed by emergency order on February 15, 1992, a period of 31 days. The total catch for both districts was 53,049 pounds taken by 16 vessels which made 35 landings. Harvests by district were 15,244 pounds for the Outer District taken by six vessels, and 37,805 pounds from the Eastern District caught by 10 vessels (Table 2). The majority of the crabs were delivered to Seward with a small percentage coming to Homer.

Overall cpue was 6.0 crabs per pot, 5.5 from the Outer District and 6.2 from the Eastern. Average width of the crabs was 145 mm (5.72

in.). Average weight was 2.16 pounds per crab (Appendix B). True recruits comprised 41 percent of the catch with skipmolts in the recruit size class making up the remaining 59 percent. Less than one percent of the catch included crabs that were in the post-recruit size class (greater than 6.5 in.) (Figure 5).

Dockside sampling data showed a significant number of the new shells (< 50%) were half full of meat indicating that these animals molted in the fall well after the normal spring molting period.

Although the geographic area covered by these two districts is large, the 16 boats involved included many fishermen with long term fishing experience in these districts. Interviews with these fishermen indicated that all of the traditional fishing areas were explored, both in the bays and the open ocean, with the same poor results. Interviews further indicated a negligible catch of any prerecruits except at the heads of some of the bays such as Day Harbor and Nuka.

1993 SEASON MANAGEMENT OUTLOOK

Southern District

The department will conduct a trawl survey in July 1992 to assess the Tanner crab stock in the Southern District. The results of this survey will, in a large part, determine the guideline harvest level for the 1993 season. Reviewing prerecruit one numbers and subsequent recruitment for both 1990 and 1991, it appears that the potential exists for another improvement in recruitment after the 1992 molt resulting in an increase in the ensuing 1993 commercial guideline harvest level. The survey will assess both recruitment from the 1991 prerecruit one class and survival from the 1992

commercial fishery (Figure 6 and Appendix C). The commercial harvest rate will remain conservative for 1993 since this stock is still in a recovering stage.

Weather conditions and processing capacity will again be significant factors in determining the exact opening date and duration of the 1993 fishery.

Kamishak and Barren Islands Districts

A trawl survey will be conducted in the Kamishak and Barren Islands Districts in 1992. The results of this survey will be compared to the trawl survey conducted by the Kodiak ADF&G staff south of Cape Douglas. These two surveys allow the department to sample the entire stock.

The number of true (new-shell) prerecruit ones identified by both 1991 trawl surveys, Cook Inlet's and Kodiak's, will likely result in poor recruitment in 1992. Furthermore the skipmolting phenomenon in the prerecruit one size class continues to reduce potential commercial harvest from given year classes. For example the largest single class of males estimated by the 1991 Kamishak and Barren Islands trawl survey is the old and very old shell (skipmolt) prerecruit ones at a level of one million animals (Figure 7). This compares to 350,000 true prerecruit ones (Appendix C). In both the Cook Inlet and Prince William Sound Management Areas skip molt male Tanners rarely if ever molt again once they skip a molt.

The skip molting phenomenon at smaller sizes also accounts for the smaller average weights and sizes of the legal crabs harvested in the 1991 fishery. For example the average size and weight of the crabs taken in the 1991 fishery were 146 mm (5.74 in.) and 2.10 pounds per crab. For comparative purposes, the average size and

weight of the commercially harvested crabs from the 1991 Southern District fishery were 156 mm (6.15 in.) and 2.57 pounds (Appendix B).

Based on the likelihood of poor recruitment in 1992 coupled with little chance of significant immigration from that portion of the stock south of Cape Douglas, the probability of sufficient numbers of legal males to justify a fishery is limited.

The importance of conserving large males for reproductive purpose has become increasingly meaningful in light of recent information that suggest allowing small males to accomplish the majority of the mating may eventually lead to a population with reduced growth capabilities. If this is true for Tanner crabs, it would be disastrous to allow the sublegal skip molts to occupy the male component of the brood stock, since the skip molting trait would be passed along to the progeny.

Outer, Eastern and Central Districts

The Department does not conduct stock assessment surveys in the Outer, Eastern and Central Districts. As this stock has been on a long, steady decline, there is no reason to expect a miraculous recovery. This decline was further exemplified by the 1992 fishery when a record low harvest was taken. Since commercial fishermen saw very few sublegal Tanners during the 1992 fishery, the likelihood for significant recruitment is very limited for the 1993 fishery and probably the 1994 season as well. Although survey and fishery information from adjacent areas will be reviewed prior to determining a 1993 season, there are no data available now that indicates a harvest is justified.

Summary

In summation, recruitment will likely improve only in the Southern District in 1992. The prospect for a season in this district is excellent with a high probability of a significant increase in the guideline harvest level. On the other hand the chances of improved recruitment in the remaining districts are poor. The prospects of justifying commercial harvests therefore are very limited.

KING CRAB FISHERY

Introduction

There are two species of king crab found in the Cook Inlet Management Area (H), red and brown (Lithodes aequispina). Red is the dominant species with brown found only in a scattered distribution in the outer Gulf of Alaska. Most of the red king crab fishery has occurred either in the Southern District or the Kamishak/Barren Islands Districts. Very little catch has come from the Outer District and none has been documented from the Eastern District (Figure 1).

Earliest recorded commercial landings of king crab occurred in 1937 when crabs were canned at a Halibut Cove packing facility. Commercial fishing for this species remained at a relatively low level through the 1940's. By the mid-1950's harvest levels rose to approximately 2 million pounds per year. During the 1960's fishing expanded to the Kamishak Bay District and boats were harvesting up to 8 million pounds per year. During 1964-65 a significant drop in catch occurred in the Kamishak District primarily due to lack of processing facilities in the Seldovia area which was a result of earthquake damage in 1964. From the late 1960's through 1976 the seasonal catches ranged from 2.5 to 4.8 million pounds. Since that

time catches have generally declined (Figure 8 and Appendix D). The commercial fishery has been closed due to low abundance since the 1981-82 season in the Southern District and the 1983-84 season in the Kamishak/Barren Islands Districts.

The current season opens by regulation on August 1. From 1983 to 1987 the season opening date was July 15. Prior to 1983 the season opened on August 1.

The minimum legal size for all species of king crab is seven inches in carapace width with a provision for an eight inch season. The eight inch season, which may be opened and closed by emergency order, has been in effect since 1976. It was used during the 1976-77 season in all districts and during the 1977-78 season in the Kamishak/Barren Islands Districts only. The seven inch minimum legal size has been in effect since 1963.

Cook Inlet is a superexclusive registration area for king crab. The current pot limit is 75 if the management area guideline harvest level is greater than 1.5 million pounds. If the guideline is less than 1.5 million, then the pot limit is 40. Similar to the Tanner crab fishery, there is a buoy tag requirement accompanying the pot limit.

1991 Season Summary

Southern District

No king crab harvest has been allowed in the Southern District since the 1981-82 season. Extreme low abundance as well as heavy infestation of egg predators in the female clutches necessitated maximum protection of the stock. Although the incidence of egg parasitism seems to have abated, the overall measurable abundance of king crabs remains very low.

The 1991 department trawl survey indicated that the aggregation of large males off Barabara Point still exists. Excluding the Barabara Point catch of 90 male king crabs from a single station, the remaining trawl survey catch totalled 15 males from 19 stations. Further evidence of the depressed condition of the Southern District king crab stock was illustrated by the historical low catch of 8 females.

For comparative purposes, the aforementioned trawl survey caught 3,393 male and 1,667 female Tanner crabs. Given that the trawl survey is a new stock assessment tool, and that the aggregating nature of king crab may not lend itself to measurement by trawl surveys when the stocks are small, the trawl catch nevertheless indicated that the stock is not large.

Kamishak Bay and Barren Islands Districts

The Kamishak/Barren Islands Districts were first closed to commercial fishing due to low abundance prior to the 1984-85 season. The commercial fishery has remained closed through 1991.

Department pot index data from 1991 continue to show the presence of large old postrecruit males. Recruitment into the adult segment of the stock, however, is not improving.

The 1991 trawl survey catch of king crabs indicates a depressed stock. There is an apparent disparity however between the numbers documented by the pot index versus the trawl survey, 116 males and 60 females in the pot survey versus seven males and no females in the trawl survey. Survey timing seems to be key to these differences. The trawl survey occurs in late July, at a time after the major portion of the king crab stock has emmigrated from the the Kamishak and Barren Islands Districts. The pot survey occurs in mid June just prior to the migration. The king crab movement

has been documented by commercial fishermen, early department pot surveys and a department tag and recapture study conducted in the 1960's. The crabs return sometime in the fall or early winter. They are caught as a bycatch to the commercial Tanner crab fishery which occurs in January.

Outer and Eastern Districts

Brown king crab have never been found in high concentrations in the Outer and Eastern Districts. Regulatory fishing for brown king crab was authorized, via commissioner's permit, coincidental to the Tanner crab season in the Outer and Eastern Districts in 1988. No catch occurred due to lack of abundance of this species. Two vessels received brown king crab permits incidental to the 1992 commercial Tanner crab fishery in the Outer and Eastern Districts. Neither vessel delivered brown king crabs.

1992 SEASON MANAGEMENT OUTLOOK

Southern District

The department will conduct its annual Southern District king and Tanner crab trawl survey in July of 1992. It is improbable that the results from this assessment will indicate any significant increase in the legal segment of the stock, thereby justifying opening of the commercial, sport and personal use fisheries.

Kamishak Bay and Barren Islands Districts

The number of prerecruits caught in recent surveys does not indicate that recruitment will justify an opening of the commercial fishery on August 1, 1992. The Department will conduct the 1992

trawl survey in both June and July. Surveys will be conducted in both months in an effort to document the difference in abundance in distribution which seems to evolve as the summer months progress. A single June survey has some problems since on given years both the king and Tanner crabs may be in a soft-shell condition resulting in significant trawl damage. Although a July survey allows for sampling crabs in a harder shell condition, it appears that the king crab stock emmigrates out of the districts in that month. The department's goal therefore is to conduct a trawl survey that will allow for accurate stock assessment while minimizing damage to the resource. Dual surveys will provide data to achieve this goal.

There will be no further effort to justify an eight inch king crab season as provided for by regulation since research on the reproductive capabilities of male king crabs, conducted by the Institute of Marine Science in Seward, indicates that the large males are more important to the brood stock than small males. Although large skip molt males may appear to be too old to mate, the only conclusive method to determine breeding capability is examination of the gonads, which can only be achieved by killing the crab.

Outer and Eastern Districts

These districts will remain closed to the harvest of red king crabs until the overall stock in the remainder of the Cook Inlet Management Area recovers. Permits for brown king crab will be issued only if the Tanner crab season is opened.

Summary

The condition of the red king crab stock in the Southern District is severely depressed. Although the fecundity of the females is improving, the overall number of catchable crabs is at a historic low. It does not appear that a commercial, sport or personal use fishery is likely to occur at least for another three or four years, or more.

The buildup of postrecruits in the Kamishak District does not by itself justify a commercial harvest of these animals even if it is limited to an eight inch season. Available data indicate that these older, large males are essential in maintaining the highest possible reproductive capacity. This is essential to rebuilding the stock.

DUNGENESS CRAB FISHERY

Introduction

The majority of the commercial, sport and personal use Dungeness crab fishing in Cook Inlet has occurred in the Southern District (Figure 1), which includes Kachemak Bay. During the 1960's and early 70's commercial catch and effort were usually not a function of resource abundance. The harvest instead was a result of market conditions created by fluctuation in the catches from the west coast Dungeness crab fisheries.

Catch and effort increased significantly in 1978 to 1.2 million pounds taken by 49 vessels. Subsequently, favorable market conditions and the need of fishermen to find alternative fisheries have kept effort high. Since 1978 annual harvests have ranged from a low of 29,502 pounds in 1990 to a high of 2.1 million pounds in

1979. The commercial fishery was closed in the Southern District in 1991 due to low abundance. The average annual harvest since 1978 was 930,000 pounds (Figure 9). Effort has ranged from 23 vessels in 1990 to 108 vessels in 1982 (Appendix E). Since 1979, 92 percent of the crabs have been harvested between the months of June and October (Figure 10).

Biological regulations for the commercial Dungeness fishery consist of a males only harvest and a minimum carapace width of 6.5 inches (165 mm). Gear regulations include a provision for two 4 3/8 inch escape rings per pot and a biodegradable twine requirement. Regulations that are specific to the Cook Inlet Management Area are as follows:

- 1) A two part regulatory season for the Southern District which opens the water east of Homer Spit by emergency order on or after June 1 and closes no later than November 1, and opens the water west of Homer Spit on June 1 and closes no later than November 1. The opening east of Homer Spit is contingent on department test fishing data indicating that the molt of adult crabs is over. This regulation was adopted by the Board of Fisheries in 1990.
- 2) Closure of Southern District waters in depths of 10 fathoms or less from January 15 through April 30. This regulation is irrelevant due to the adoption of the previous regulation.
- 3) A regulation adopted by the Board of Fisheries in 1986 that closed the entire Cook Inlet Management Area to Dungeness fishing during the 15 day period prior to the opening of the Tanner season, allowing for the removal of delinquent gear and a fair start for the Tanner crab fishery.

- 4) A 150 pot limit in the Southern District (not in effect in either 1979 or 1980).
- 5) A gear regulation that requires consecutive numbering of all buoys.

Historically some level of fishing has occurred throughout the year. Effort, however, increased significantly after the major molt, which provided new recruit crabs. The significant molting times for adult males in Kachemak Bay can occur from late April through mid-September in any given year although the peak periods are June, July and August. The molt is stimulated by water temperature and physiological condition of the crab. The inconsistency in molt timing between years is partially explained by the significant annual spring-summer temperature variation in the shallower north temperate and sub-arctic waters of Alaska.

Within Kachemak Bay itself, molting generally occurs somewhat earlier in the waters east of Homer Spit than in the waters west of the Spit, where the influence of Cook Inlet proper is much greater. Newly molted legal crabs are often caught east of Homer Spit one month or more before appearing in the gear west of the Spit. Crabs east of Homer Spit are most likely resident from the first post-larval instar up to legal size. Those legal crabs captured west of the Spit, however, may actually be reared as juveniles in the waters of Cook Inlet north of Anchor Point. Catches of small crabs by upper Cook Inlet salmon set netters and casual observations of molted exoskeletons by the general public indicate significant numbers of Dungeness reside in upper Cook Inlet.

Ninety percent or more of the Dungeness fleet are residents of Kachemak Bay communities of Homer and Seldovia. The fishing vessels are in the 40 foot size class and smaller. Smaller vessels without circulating tanks generally fish the waters east of Homer

Spit while larger vessels with circulating tanks fish the deeper somewhat rougher waters west of the Spit.

Two major problems have had a negative impact on this fishery:

- 1) Depression of the stock due to handling and trapping mortality which was the result of fishing during and immediately after the molting period.
- 2) Violation of the 150 pot limit by a portion of the fleet.

Fishing during and immediately after the major molting period for adult males has played a significant part in the recent sharp decline in the Dungeness crab harvest. Mortalities associated with handling and trapping may not have been significant during the 1960's and early 70's when effort levels were low and stock abundance was high; however, since then the level of fishing has accelerated not only in amount of vessels and pots, but also in the amount of time each year that the gear is deployed.

In addition to the recruitment event, the Cook Inlet Dungeness fishery has evolved into a summer fishery for the following reasons:

- 1) Salmon fishermen are occupied with salmon fishing, thus creating a niche for fishermen who do not hold permits for limited entry fisheries.
- 2) The weather is better.
- 3) The catcher/seller sales to the tourist industry are at their peak.

Bycatch mortality of Dungeness crabs during the China Poot Bay salmon seine fishery has been of concern to the public, both

recreational users and commercial Dungeness crab fishermen. The department and the Cook Inlet Seiner's Association met in 1991 to determine if a solution to the Dungeness seine mortality could be worked out while still allowing seiners reasonable access to the fish. Based on a common concensus the department issued an emergency order closing the upper portion of China Poot Bay for the entire seine season. This was the reported locale of the major portion of the seine mortalities. The seine season for sockeye salmon generally runs from the last week in June through the third week in July while the season for pink salmon extends to the first or second week in August. The department further agreed to prohibit future commercial Dungeness crab fishing with China Poot Bay during the commercial seine season. This prohibition eliminated a historical gear conflict.

1991 Season Summary

The commercial, sport and personal use fisheries were not opened to harvest in the Southern District (Kachemak Bay) in 1991 due to a low number of legal males and the necessity to protect the substantial size class of adults in the bay from handling and trapping mortality. These animals have been identified by the department crab trawl survey since 1989 (Figure 11). They have the reproductive potential to begin filling the weak year classes that began to appear in the commercial fishery as early as 1989.

1992 Management Outlook

Given the current structure of the Southern District Dungeness stock as identified by department pot and trawl surveys, there will be a limited commercial harvest in 1992. The timing of the fishery will be set no sooner than the completion of the July trawl survey and will be based heavily on the following three factors: 1) the

timing of the molt and subsequent soft-shell period, 2) the presence of another size class of adults to replace those that may be harvested in a fishery, and 3) the marketability of the crabs. The latter consideration will involve industry review of the test fish crabs once the department has determined that the major molt has occurred and the crabs are in a biologically hard shell condition.

The presence of another size class of adult males is important during this era of depressed stocks since one of the management goals, other than precluding the harvest, trapping and handling soft-shell crabs, is to rebuild these weak year classes by maximizing the reproductive potential of the strong year class(es). If no additional adults are identified, other than the ones documented in previous surveys, an excess harvest of the males may cause females in the same cohort to go unfertilized.

Furthermore, recent research published by the Canadian Department of Fisheries and Oceans indicates that large female Dungeness would have difficulty finding a mate in intensively exploited fisheries since the large males are harvested by the fishery. If barren females occur in large numbers, eventual recruitment of their progeny will be poor thus continuing the cycle of weak year classes. Moreover, there are no stocks of nearby Dungeness to provide recruitment via larval drift: the Dungeness in Kachemak Bay appear to be major portion of the Cook Inlet Dungeness population at this point in time.

It is difficult to establish a guideline harvest level with current information. The pot survey will not provide those data; it will only serve as an index of abundance, requiring subsequent commercial catch information for comparison. The trawl survey will provide a population estimate. It must however be capable of sampling the entire portion of the population that needs to be

estimated. This is not possible since shallow waters cannot be successfully trawled.

The only source of data to estimate a harvest rate is historical catch (Appendix F). These data have been further broken down into weekly catch and effort. The highest weekly catch documented from the fishery east of Homer Spit was in 1981 when 105,000 pounds were taken by 35 vessels. West of the Spit, the largest weekly catch was 162,000 pounds taken in 1978 by 30 boats. Both of these catches were taken during years when the 150 pot limit was in effect. Utilizing these data, the duration of the 1992 season will be preset based on anticipated effort. Since there is no registration deadline, effort will be gauged by permit sales, registrations and fishermen input.

The 1992 management strategy will therefore be to conduct a minimum seven day fishery, close the season, remove bait containers and secure lids open, tally the harvest and execute another pot survey to ascertain what effect the commercial harvest had on the relative pot survey catch. Following the closure, dockside sample, observer and fisherman interview data will be compiled. Catch and effort distribution as well as catch per unit of effort will be reviewed. A subsequent second opening may occur depending on the fishery and pot survey results. This set period option will be applicable both east and west of Homer Spit, thereby allowing for distinct fisheries if necessary.

The fishery will close for the balance of the season once 40 - 50 percent of the legal males have been harvested. This conservative harvest rate has been established in response to concerns regarding the aforementioned recruitment into the adult stock and the documented need for large males to mate with large females.

For the long term, the pot survey in combination with fishery performance data may provide a relative index of abundance which in

turn may allow a preseason quota to be set. High effort levels may still, however, require a pre-set season length since, as previously mentioned, actual catch often exceeds the quota before catch reported to the department allows appropriate action. This situation is analagous to the current management strategy for the Southern District commercial Tanner crab fishery where a quota is determined on the basis of a department trawl survey. The subsequent season duration is established based on the quota and the anticipated effort.

The commercial season in the remaining districts of the management area will be open in 1992. The only district likely to see any effort is the Central District which is north of the Southern District in central Cook Inlet. Although there are crabs resident at least part of the year in this area, fishing effort has been light as it is a difficult location to retrieve gear due to the tidal action and nature of the general outflow of Cook Inlet. Extreme siltation tends to cause gear to become imbedded in the bottom therefore making it impossible to recover pots. Only those few areas out of the extreme water flow are fishable.

AREA H TRAWL SHRIMP FISHERY

Introduction

Cook Inlet is separated into two shrimp registration areas: Area H, which includes the Southern, Kamishak, and Barren Islands Districts; and Area G, which includes the Outer and Eastern Districts (Figure 2). The primary trawl shrimp fishery has occurred in the Southern District of Area H.

The Southern District (Kachemak Bay) trawl shrimp fishery is characterized by superexclusive registration and definitive

management under the Kachemak Bay Trawl Shrimp Management Plan. This plan has three basic features:

- 1) An annual guideline harvest level determined from stock assessment surveys.
- 2) Annual harvest spread out over the entire fishing season utilizing three separate regulatory sub-seasons.
- 3) Sub-season harvest spread out in equal weekly guideline harvests.

Such characteristics allow practical use of fishery performance as an inseason management tool and maximize monitoring of the shrimp stock status throughout the year in an attempt to avoid overfishing. Also, two areas closed to trawl shrimp fishing are maintained throughout the year (Figure 12): the first includes the majority of upper Kachemak Bay east of Homer Spit, originally established because this area consistently contained small, juvenile pink shrimp; the second includes Tutka Bay and Sadie Cove, established because the area encompassed by these bays lent itself to the potential of overharvest.

Commercial trawl shrimp harvests in Kachemak Bay reached the five million pound level in the late 1960's and remained near that level through the early 1980's (Figure 13 and Appendix G). Low stock abundance resulted in partial closures of the fishery during the mid-1980's and total closure beginning in the fall of 1986. Effort has varied from a low of one vessel during 1968 to a high of 23 in 1981. Prior to 1983, most commercial harvest and effort occurred west of Homer Spit, but between 1983 and 1986 virtually all effort shifted to the area east of the Homer Spit. The fishery has been closed from 1986 through 1991.

Pink shrimp (Pandalus borealis) historically made up the bulk of the commercial catch, with sidestripes (Pandalopsis dispar) seasonally making up a lower but often significant portion of the catch. Humpy shrimp (Pandalus goniurus) have at times comprised up to half of the harvest, but this species appears to undergo erratic population fluctuations and contributions to the most recent fisheries have been negligible. Coonstripe shrimp (P. hypsinotus) consistently made up less than five percent of the catch.

Trawl shrimp surveys have been conducted in Kachemak Bay since 1971, with two yearly surveys (spring and fall) occurring since 1976. These surveys, which determine each season's guideline harvest level, have indicated significant declines in abundance and distribution of all pandalid shrimp stocks in Kachemak Bay since the late 1970's (Figure 14 and Appendix H). These declines led to the aforementioned commercial closures of the 1980's.

1991-92 Season Summary

The fishery remained closed for the 1991-92 season based on the results of the 1991 department trawl shrimp survey. The survey occurred during the month of May. Results of that survey indicated a slight decrease in estimated abundance of shrimp in Kachemak Bay over the 1990 spring survey, from 1.7 and 1.3 million pounds (Figure 14 and Appendix G). As has been the case during recent years, the majority of shrimp caught during this survey came from the area north and east of Glacier Spit (commercially closed area). Interestingly the size of the shrimp in the closed area in the upper bay was the largest documented in 10 years. Conversely the shrimp in the waters west of Homer Spit were considerably smaller than recent surveys. At this point no conclusions can be withdrawn from these changes in size and distribution.

All information collected during this survey indicated that, despite some shift in size composition and distribution, the stocks remained depressed by historical standards. The commercial fishery was closed therefore for the entire 1991-92 season.

1992-93 Management Outlook

The department will conduct the annual trawl shrimp survey in May 1992. A decision to reopen commercial fishing for the upcoming regulatory year beginning July 1 will rest primarily on the results of this survey. Based on the known life history information regarding growth and age of shrimp, the Department has seen no evidence to justify a commercial trawl shrimp fishery in Kachemak Bay during 1992-93.

An analysis of historical pink shrimp length frequencies collected during Kachemak Bay trawl shrimp surveys is occurring at this time. In addition to providing a compilation of historical information, this study could help to determine annual growth and survival of pink shrimp in Kachemak Bay, thus expanding the existing knowledge of this species and facilitating management decisions.

AREA G TRAWL SHRIMP FISHERY

Introduction

Area G is a nonexclusive shrimp registration area, encompassing the Outer and Eastern Districts of Cook Inlet (Figure 2) and established by the Board of Fisheries in the spring of 1977. The first year of significant harvest occurred in the 1982-83 season when four vessels harvested 239,584 pounds (Figure 15 and Appendix I). The catch increased steadily for the next two seasons to a

peak harvest of just under 2.0 million pounds taken by 11 vessels during the 1984-85 season. Prior to 1985, the season for shrimp trawling in Area G was open year round. A regulatory season was adopted by the Board for Area G in the spring of 1985, beginning June 1 and ending February 28.

Although surveys are not conducted in Area G, the stocks are not characterized by a dense distribution. Even in the very early years of this fishery, trawl cpue was never high, rarely approaching 1,000 pounds per hour. Logbook information collected over time indicates that fishermen in Area G must make long tows, often with extremely low catch results. Although pink shrimp constituted the bulk of the harvest, the bycatch of sidestripes was often large enough to economically justify the overall low catch per unit of effort.

1991-92 Season Summary

The Area G season opened by regulation on June 1, 1991 and closed by regulation on March 31, 1992. Since only two vessels made landings during the season, catch data remain confidential.

1992-93 Management Outlook

No trawl surveys are planned by the Department for any portion of Area G. The commercial fishery is therefore the sole source of information concerning stock status. The poor historical fishery performance in terms of catch per unit of effort would suggest low abundance levels of pink shrimp. Fishermen can sometimes overcome the low catch rates if they can locate and harvest a higher percentage of larger, more marketable shrimp, such as sidestripes, and subsequently receive a higher price for the product, an event which occurred on a small scale in 1988-89. However, both the

abundance and the location of these more valuable species seems to be inconsistent from year to year, therefore making it difficult to target on these individuals.

Although no specific management strategy exists for Area G beyond the implementation of a biological season, the Department will continue to collect voluntary logbooks from vessels fishing the area and will monitor catches through fish ticket information and log book analysis.

AREA H POT SHRIMP FISHERY

Introduction

Similar to trawl shrimp, the Cook Inlet Management Area is separated into two distinct registration areas for pot shrimp: Area H, consisting of the Southern, Kamishak, and Barren Islands Districts; and Area G, consisting of the Outer and Eastern Districts (Figure 2). Traditionally the major pot shrimp fishery has occurred in the Southern District.

Pot shrimp fishing in Kachemak Bay of the Southern District is primarily undertaken by small vessel fishermen that develop their own markets. The target species is the coonstripe shrimp, the most abundant pot caught shrimp in Kachemak Bay. Spot shrimp (Pandalus platyceros) also occur in the bay but their contribution to the fishery is generally negligible. Each regulatory fishing season, which begins June 1 and ends March 31, is managed via three separate sub-seasons with appropriate guideline harvest levels set for each sub-season.

Prior to 1986, guideline harvest levels were determined by the Department's two annual pot shrimp surveys as well as by voluntary

commercial fishery performance information. All pot shrimp surveys were subsequently eliminated in the Cook Inlet Area. Fishery performance data in the form of voluntary logbooks were collected consistently during 1986 and 1987 and were the sole criteria used to judge stock status during those years. This information, along with that from the most recent Department trawl surveys and from local personal use fishermen, suggested that stocks of pot shrimp in Kachemak Bay continue to be depressed. Commercial catch figures show that the most recent harvests are well below those of the 1970's and early 1980's (Figure 16 and Appendix J). The fishery has been closed to commercial harvest since 1987.

1991-92 Season Summary

With no assessment surveys specifically directed at coonstripe shrimp in Kachemak Bay, and with no commercial pot shrimp fishery during 1990-91, the Department relied on data obtained in the spring 1991 trawl shrimp survey and voluntary information from personal use fishermen. Results from the spring trawl survey indicated an average catch of 5.6 pounds of coonstripe shrimp caught per one nautical mile towed east of the Homer Spit, and an average of 13.5 pounds of coonstripes per nautical mile in the Tutka Bay/Sadie Cove area. These results indicated a continued depressed stock when compared to historical catches ranging from 10 to 40 pounds per tow. Furthermore voluntary information offered by personal use fishermen since 1988 has indicated very poor catches when compared to historical averages.

The aforementioned trawl survey and personal use fishery information demonstrated that the coonstripe stock in Kachemak Bay remained depressed, therefore the fishery was closed by emergency order for the entire 1991-92 season.

1992-93 Management Outlook

All information collected during 1991 indicated that stocks of pandalid shrimp continue to be depressed in Kachemak Bay. Prior to the scheduled June 1, 1992 regulatory opening, information from the May 1992 trawl shrimp survey and from any personal use shrimp fishermen will be reviewed. Should stock status be evaluated as still depressed, the commercial fishery will not be opened. In that instance, the fishery would be closed for the entire fishing year in order to facilitate growth, recruitment, and reproduction in the pot shrimp stocks.

AREA G POT SHRIMP FISHERY

Introduction

Area G, also known as Outer Cook Inlet, includes the Outer and Eastern Districts (Figure 2). Currently there are no closed season or biological regulations governing the pot shrimp fishery. The target species is the spot shrimp. Since 1977, catch and effort have remained low, never exceeding a reported annual harvest of 20,500 pounds whole weight caught by 8 participating vessels in 1989 (Figure 17 and Appendix K). Despite the extensive coastal area, historical information collected from this fishery suggests that the stocks of shrimp here occur within some (but not all) bays and are of limited abundance.

1991 Season Summary

The commercial season was open by regulation for the entire 1991 calendar year. Eight vessels harvested 7,315 pounds of shrimp whole weight, consisting of 6,345 pounds (87%) of spot shrimp, 946

pounds (13%) of coonstripes, and 24 pounds (<0.1%) of pinks (Table 3). Catch per unit of effort, obtained from fish tickets, showed an overall season average of approximately 0.47 pounds per pot, unadjusted for soak time. Catch and effort were spread throughout the year with even distribution between summer and winter months.

1992 Management Outlook

Collection and review of fish ticket information is the primary form of management strategy employed for Area G pot shrimp. In addition, voluntary logbook information is provided by a few fishermen throughout the season and compared to that of past years. The information collected during 1991 gave no indications to expect either harvest or effort to increase in the near future.

SCALLOP FISHERY

Introduction

The commercial scallop fishery in the Cook Inlet Management Area (H) began in 1983 although sporadic interest had occurred prior to that time. The Alaska Board of Fisheries responded to a public proposal in 1983 by directing the department to allow restricted exploratory fisheries in 1983 and 1984. These initial fisheries were characterized by low effort due to severe permit restrictions when compared with traditional scallop fisheries both inside and outside Alaska. The most important restrictions were:

- 1) Legal gear limited to a six-foot wide dredge with minimum ring size of four inches inside diameter.
- 2) Only one unit of gear allowed on board at any one time.

- 3) Mandatory log book completion.
- 4) Contact with the Homer office prior to and at the completion of each trip.
- 5) An agreement to carry department observers on board if requested.

The target species of the fishery is the Pacific weathervane scallop. Except for some brief exploratory fishing in the Kamishak District in 1984 and in the Outer District in 1987, a single bed of scallops near Augustine Island in the Kamishak District has sustained virtually the entire harvest since the fishery began in 1983. The department conducted an assessment survey in August, 1984, using the state research vessel Pandalus, to better define the extent of this particular bed and to aid in establishing appropriate harvest levels.

Based on information from the 1984 survey as well as data from the initial fisheries, the Board of Fisheries adopted regulations for scallops in Cook Inlet in 1985. These regulations included a season in the Kamishak District from August 15 through October 31, a guideline harvest level of 10,000 to 20,000 pounds of shucked meats, and the restrictions mentioned previously. The Southern District was not opened to scallop fishing in order to protect crab stocks, while the Outer and Eastern Districts were opened year round to encourage exploratory fishing. Commercial fishery performance has been used inseason to adjust guideline harvest levels. Harvest and effort peaked in this fishery during 1986 when 3 vessels took slightly more than 15,000 pounds of shucked meats (Figure 18 and Appendix L).

At the start of the 1987 fishery, several experienced participants demonstrated extremely poor fishery performance during their first trips to the traditional Kamishak bed. Realizing that this bed is

limited in size, and that the recovery rate for heavily exploited scallop stocks in Alaska is slow, the department closed the Kamishak District scallop fishery less than one week after it opened. The significant reduction in cpue demonstrated in the 1987 fishery occurred over only one year's time and appears to have been the result of illegal fishing activity which probably occurred during the fall months of 1986 and winter months of 1987. In an attempt to address the potential problem of illegal fishing, the department required scallop vessels transitting the Cook Inlet area to be inspected prior to and immediately after entering and leaving the area. This requirement may have been implemented too late, however, since the majority of illegal activity may have already occurred.

No commercial effort occurred in Cook Inlet during 1988 through 1991.

1991 Season Summary

Scallop regulations and harvest guidelines adopted in 1985 remained in effect through 1991, with the exception that the harvest guideline range in the Kamishak District was zero to 20,000 pounds. As has been the case during recent years, the department intended to closely monitor fishery performance within this district in order to justify continued fishing or closure of the fishery. No permits were requested for any district in the Cook Inlet area in 1991, subsequently no effort or harvest occurred.

1992 Management Outlook

Without a commercial fishery and cpue data, the Department has no means by which to judge the health of the scallop resource in the Kamishak District. Therefore, the department will allow the 1992

scallop season to open by regulation on August 15 with a zero to 20,000 pound guideline harvest level. Vessel logbooks and skipper interviews will be reviewed in season to determine if the fishery performance justifies continued fishing. Samples of scallops from the fishery will also be analyzed and compared for size and age to those from earlier fisheries. A season closure will occur if catch data indicate that the stock remains depressed. Scallop vessel effort is once again expected to be low in all districts of the Cook Inlet area during the 1992 season.

Although the fishery in the Outer and Eastern Districts remains open on a year round basis, significant effort is not likely to occur since an absence of historical catch indicates that scallop abundance is low. It is probable that the small but mobile Gulf of Alaska scallop vessels have sampled the Outer and Eastern Districts in past years. A rise in exvessel value may renew interest in these districts.

HARDSHELL CLAMS AND MUSSELS

Introduction

Commercial hardshell clam and mussel harvests in the Cook Inlet Management Area were not well documented prior to 1986. The generic term, hardshell clams, generally refers to littleneck and butter clams. Before harvesting clams or mussels for human consumption, an area must be certified for water quality by the Alaska Department of Environmental Conservation (ADEC) in accordance with the National Shellfish Sanitation Program (NSSP).

A limited amount of hardshell clams were harvested in Chinitna Bay in 1985 after the area was certified for lot sampling by ADEC. Lot sampling is a method by which ADEC checks the clams for paralytic

shellfish poisoning (PSP). In 1986 ADEC permitted the use of lot sampling for Chugachik Island (near Bear Cove) in Kachemak Bay. Through 1989, Chugachik Island, Halibut Cove Lagoon, Kasitsna Bay, and Jakalof Bay, all in the Southern District, were certified for lot sampling. At the end of 1989 Tutka Bay was certified by ADEC.

From 1986 through 1991, the total annual harvest of hardshell clams has ranged from 14,500 pounds to 47,500 pounds. In 1989 the bulk of the clam harvest went to sea otter food in a rehabilitation project resulting from the Exxon Valdez oil spill. In the remaining years the majority of the harvest was Pacific littleneck clams (Protothaca staminea) that went to Kenai Peninsula and Anchorage markets. Effort has ranged from 2 to 19 hand diggers (Figure 19 and Appendix M).

Prior to 1990 the majority of the hardshell clam harvest from came from the Bear Cove and the Jakalof/Kasitsna areas. With ADEC certification, effort shifted to Tutka Bay in latter 1990.

Only 102 pounds of blue mussels were harvested commercially prior to 1989. In 1989 the catch rose to over 167,000 pounds due to utilization of the product for otter food in an otter rehabilitation project which was a result of the Exxon Valdez oil spill (Appendix N).

Currently there are no closed season or closed area regulations for harvesting with forks and shovels. Minimum sizes were established by the Alaska Board of Fisheries in the spring of 1990 for Pacific little neck clams at 1.5 inches (38.1 mm) and butter clams (Saxidomus giganteus) at 2.5 inches (63.5 mm). A Commissioner's permit is required to use hydraulic diggers. Currently market conditions seem to be the dominant factor affecting the harvest of clams and mussels in Cook Inlet.

The department began a hardshell clam assessment program on two beaches within Jakalof Bay in 1989. The program was intended to evaluate the populations of clams on these beaches and monitor them over time in an attempt to determine the effects of harvesting, both commercial and personal use. Due to lack of funding this project was suspended after 1990. The data remain to be reported. Analysis is in progress, but remains a low priority due to lack of dedicated funding. Possibly the information obtained from this assessment program can be applied to other beaches in order to provide an overall estimate of the hardshell clam resources in Kachemak Bay.

1991 Season Summary

Total hardshell clam harvest for the year was 47,571 pounds hand-dug by 19 permit holders. Littlenecks comprised 47,586 pounds (99%) of the catch. Butter clam take was only 85 pounds (Table 4). Harvesting occurred in every month except February with 65 percent of the catch coming from the months of April through July. Approximately two thirds, 32,000 pounds, came from the Jakalof/Tutka Bay area while the remaining third came from Chugachik Island.

Since there were three or less harvesters, the blue mussel catch data remain confidential.

1992 Management Outlook

Market demand and economics will probably play the biggest role in determining the 1992 Cook Inlet clam and mussel harvests. The majority, if not all, of the wild stock clam and mussel harvests from Cook Inlet have traditionally been sold within Alaska, primarily in the Anchorage area. High labor and transportation

costs in this fishery and in the state seem to prevent Alaskan products from competing effectively with similar products out of the state.

The department is becoming increasingly concerned with the ability of the resource to sustain expanding commercial and recreational pressure. Although there are minimum sizes applicable to the commercial fishery, they only guarantee dependence on recruitment into the legal segment of the stock should fishing pressure and harvest rates continue to increase. Furthermore the recreational user is becoming increasingly concerned and vocal about the escalation of commercial utilization of the littleneck clams and to a lesser extent the blue mussel resource. In response to these concerns the department will develop a management plan for review by the Board of Fisheries during the 1993-94 cycle. Key to the management plan will be an alternate year commercial harvest strategy which basically will open half of the certified beaches on one year, and the other half during the following year.

RAZOR CLAMS

Introduction

Razor clams are present in many areas of Cook Inlet with particularly dense concentrations occurring near Polly Creek on the western shore of the Central District and from Clam Gulch to Ninilchik on the eastern shore of this district (Figure 1). The eastern shoreline has been set aside exclusively for sport harvest since 1959. All commercial harvests since that time have come from the west shore, principally from the Polly Creek/Crescent River beach, the only such area in Cook Inlet certified by the Alaska Department of Environmental Conservation for human consumption harvest. The harvest of razor clams from this certified beach for

any purpose other than human consumption is specifically prohibited by regulation. Permits issued for this area allow a maximum of ten percent incidental bait harvest, to account for those clams which are broken and cannot be sold for human consumption.

No razor clam harvest limits are in place for any area, but in the spring of 1990 the Alaska Board of Fisheries adopted a regulation requiring a four and one-half inch (114 mm) minimum size for razor clams. At this same meeting, the Board also prohibited the use of hydraulic diggers (dredges) in the Cook Inlet area. Historically the majority of razor clams harvested in Cook Inlet have been hand-dug. Numerous attempts have been made in Cook Inlet to develop a dredge to efficiently and economically harvest this species with minimal incidental damage to non-target animals, but none have been considered successful.

Since 1919, commercial razor clam harvest levels in Cook Inlet have fluctuated from no fishery for as many as eight consecutive years to production in excess of half a million pounds (live weight) in 1922 (Figure 20 and Appendix O). The sporadic nature of the fishery has been a function of effort and market opportunities rather than limited availability of the resource.

1991 Season Summary

The commercial razor clam fishery in Upper Cook Inlet has no closed season and no overall harvest limits. The 1991 fishery got started in late May with the first deliveries on May 24. The last reported deliveries in this fishery were made on August 14. The season's harvest of 201,320 taken by 24 diggers primarily came from the Polly Creek area. This the lowest harvest in this fishery since 1980. All clams harvested in this fishery are directed by regulation to be sold for human consumption, except for the small percentage of broken clams sold for bait.

OCTOPUS

Introduction

The harvest of octopus in the Cook Inlet area has historically occurred incidentally to other directed fisheries such as the commercial Tanner crab fishery. Cook Inlet octopus harvest records are currently available only since 1983 (Figure 21 and Appendix P). A decline in the Tanner crab stocks has manifested itself in a severely reduced octopus bycatch. An increased amount of interest in directing effort specifically towards octopus has occurred in recent years, but actual effort has been minimal and resultant harvest negligible.

There are no closed seasons or size limits on octopus at the present time, but a permit is required prior to fishing a given registration area. Cook Inlet permit restrictions include short permit duration (typically one to four months), strict reporting requirements, and a detailed description of gear to be utilized. This last requirement prevents gear legally defined as king, Tanner, Dungeness, or shrimp pots from being used to capture octopus, in order to reduce or eliminate the probability of bycatch of those species.

1991 Season Summary

The total catch was 2,088 pounds taken by eight fishermen. Only one of the fishermen made a directed effort to catch octopus. The remaining harvest was a bycatch of groundfish fishermen.

1992 Management Outlook

The high prices paid for octopus in recent years, publications promoting the potential octopus fishery in Alaska, and the attraction of an alternative fishery are all expected to produce a continued interest in octopus as a target species during 1992. The extent of this resource in Cook Inlet outside the Southern District is questionable and could ultimately affect any directed fishery. In the absence of a demonstrably effective method of harvest, the Cook Inlet octopus catch is not expected to increase significantly in 1992 unless it is a result of bycatch from a groundfish pot or trawl fishery.

SEA URCHINS

Introduction

Sea urchins, and commercial fisheries for them, occur along the U.S. and Canadian Pacific coast from California to Alaska as well as the Maritime Provinces of Eastern Canada and the State of Maine. The green sea urchin, the smallest of the commercial urchin species, is the only urchin species in Cook Inlet which occurs in quantities sufficient to support commercial effort. Although red urchins (Strongylocentrotus franciscanus) do occur in small, isolated beds within the management area, their numbers and scattered distributions are considered incapable of supporting any form of commercial effort. Green urchins are harvested solely for their gonads, considered a delicacy in the Orient.

No commercial harvest for this species occurred in Cook Inlet prior to 1987. Although limited harvests occurred in 1987 and 1989, three or less permit holders made deliveries therefore the catch data are confidential (Appendix Q).

By regulation in the Cook Inlet management area, each fisherman must obtain a Commissioner's permit prior to harvesting urchins commercially. An additional regulatory requirement limits allowable methods of harvest to hand picking or the use of an abalone iron, both intended to minimize disruption of the substrate. Utilizing available published information on this species as well as the framework of current management practices for the red urchin in southeast Alaska, the department established the following permit restrictions:

- 1) A minimum legal size of 1.75 inches (44.5 mm) and a maximum legal size of 2.50 inches (63.5 mm), measured across the test and not including spines. The minimum size is intended to protect the broodstock, while the maximum size is intended to protect sufficient numbers of large urchins, which in turn provide a canopy that helps protect the smaller urchins.
- 2) Permit duration from mid-September through mid-December, the time period when the gonads are fullest and therefore of highest market quality. The permit period may be extended past mid-December if recovery data is made available to the department. The maximum size may be increased if samples indicate presence of larger urchins.
- 3) Area of harvest in the Southern District alternated each year between that portion of Kachemak Bay east of Homer Spit and that portion west of the Spit, in order to reduce the potential of overharvest in any one given area.

The market demand for urchin gonads appears to be substantial as evidenced by the amount of interest generated towards the harvest of this species. Most of these fishermen, however, assume that the urchins which occur in Cook Inlet are similar to those species

which occur further south. The green urchin, which is smaller in size, must be harvested in larger quantities to be economically profitable. Potential harvesters in the Cook Inlet area have found, through commercial and personal use investigations (collecting with a sport fishing license), that thus far the numbers of marketable urchins, regardless of the size limits, have not justified the investment in time and money necessary to establish a large economical commercial venture.

1991-92 Season Summary

Four divers harvested 20,445 pounds of whole green urchins during the months of November and December, 1991 and January, 1992. In the Southern District only the waters east of Homer Spit were open to commercial harvest. The entire catch came from China Poot Bay. Harvesting did not begin until November as gonad recovery was not sufficiently high until that time. The season closed (permits were not reissued) on January 31 since the urchins developed the pre-spawning condition which limited the marketability.

There were no permits issued or any documented harvest for any portion of the Cook Inlet Management Area outside of the Southern District.

1992-93 Management Outlook

As long as a strong market exists for urchin gonads, the harvest of these invertebrates is expected to generate a considerable amount of interest.

Because the area east of the Homer Spit was open commercially during 1991, the Department intends to open only the area west of the Homer Spit during 1992. This rotational harvest scheme between

areas is not a new management approach directed solely at Cook Inlet harvesters, but rather is a common practice employed in southeast Alaska as well as other Pacific Coast urchin fisheries to help protect against over-exploitation of any one given area. In fact, the Cook Inlet strategy is probably more liberal than most rotational schemes, which are often on a three or four year basis.

All other permit restrictions in Cook Inlet will remain in effect for 1992. Size limit modifications and/or season extensions will be determined, as in the past, on a case by case basis using the best available information.

It must be noted that sea urchin growth rates are highly variable on an annual basis. Should the stocks experience good growth rates during several successive years, an expansion of the commercial fishery remains a distinct possibility. However, present stock conditions suggest that effort will probably remain low in the near term.

SEA CUCUMBERS

Introduction

Prior to 1990, the Cook Inlet Management Area had no documented history of sea cucumber (Parastichopus californicus) harvest. In 1990 two divers harvested cucumbers. Since there were three or less participants, the catch data are confidential.

No information is available regarding the extent, distribution, or life history of this species in the management area. No regulations or harvest guidelines specific to the commercial harvest of cucumbers are in effect for Cook Inlet. In the absence of biological information, any commercial fishery under

consideration would be on an experimental basis only in order to collect fundamental information and establish a preliminary data base on this species in Cook Inlet. Total effort would be severely restricted by permit. Although sea cucumbers had been reported observed in Cook Inlet, especially within the Southern District (Kachemak Bay), the limited commercial harvest as well as exploratory effort indicate that the stocks are not dense or extensive.

1991 Season

There was no commercial harvest during 1991.

1992 Management Outlook

Based on recent exploratory dives by experienced divers, it does not appear that a significant fishery for sea cucumbers will occur in 1992. Limited permits will be issued if there is any commercial interest.

LITERATURE CITED

Carls, M.G. and C.E. O'Clair. 1989. Influence of cold air exposures on ovigerous red king crab (Paralithodes camtschaticus) and Tanner crabs (Chionecetes bairdi) and their offspring. Proc. Int. Symp. King and Tanner Crabs. pp. 329-343.

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Table 1. Numeric listing of shellfish emergency orders, including personal use, issued for the Cook Inlet Management Area for the fisheries listed in the 1991-92 Cook Inlet Area Shellfish Annual Management Report.

Emergency Order Number	Effective Date	Explanation
start here		
2-S-H-01 to 05-91		Listed in 1990-91 Annual Management Report.
2-S-H-06-91	06/01/91	Closed the commercial Dungeness crab fishery in the Southern District.
2-S-H-07-91	06/01/91	Extended the closure of the Kachemak Bay pot shrimp fishery for the entire 1991-92 regulatory season.
2-S-H-08-91	07/01/91	Extended the closure of the Kachemak Bay trawl shrimp fishery for the entire 1991-92 regulatory season.
2-S-H-09-91	08/15/91	Closed Cook Inlet Management Area to commercial harvest of red and blue king crabs.
2-S-H-01-92	01/15/92	Closed the commercial Tanner crab fishery in the Kamishak Bay, Barren Islands and Central Districts.
2-S-H-02-92	01/15/92	Closed the commercial Tanner crab fishery in the Southern District after a 10 hour period.
2-S-H-03-92	01/19/92	Opened the commercial Tanner crab fishery in the Southern District for a period of eight hours.
2-S-H-04-92	02/15/92	Closed the commercial Tanner crab fishery in the Outer and Eastern Districts.
2-PU-H-01-91	06/15/91	Closed the personal use Dungeness crab fishery in Kachemak Bay.
2-PU-H-02-91	08/01/91	Opened the personal use Tanner crab fishery in the Outer and Eastern Districts for three months.

Table 1. Continued.

<u>Emergency Order Number</u>	<u>Effective Date</u>	<u>Explanation</u>
2-PU-H-03-91	08/20/91	Opened the personal use Tanner crab fishery in the Southern, Kamishak Bay and Central Districts through October 31.
2-PU-H-04-91	08/15/91	Closed the personal use king crab fishery in Cook Inlet.

Table 2. Tanner crab (*Chionecetes bairdi*) catch by district and statistical sub-area, Cook Inlet Management Area, 1991-92 season.

District ^a	Stat. sub-area	Date ^b	No. boats	No. crabs	No. pounds	Avg. weight	No. pot lifts	Average no. crabs per pot
Southern	241-11	1/15	37	45,723	117,624	2.57	1,536	29.8
		1/19	39	31,300	80,618	2.58	1,560	20.1
Total			47	77,023	198,242	2.57	3,096	24.9
	241-12	1/15	30	23,560	60,201	2.56	1,186	19.9
		1/19	33	21,667	55,567	2.56	1,279	16.9
Total			46	45,227	115,768	2.56	2,465	18.4
	241-13	1/15	7	3,046	7,787	2.56	337	9.0
		1/19	3	C O N F I D E N T I A L				
Total			10	4,323	11,044	2.55	511	8.5
	241-14	1/15(total)	5	1,391	3,562	2.56	194	7.2
	241-15	1/15	24	5,342	13,657	2.56	940	5.7
		1/19	17	3,929	10,005	2.55	539	7.3
Total			32	9,271	23,662	2.55	1,479	6.3
	241-16	1/15(total)	3	C O N F I D E N T I A L				
Southern District Totals		1/15	107	80,074	205,421	2.57	4,302	18.6
		1/19	89	58,173	149,447	2.57	3,552	16.4
Total			110	138,247	354,868	2.57	7,854	17.6

Table 2. Continued

District	Stat. sub-area	Date	No. boats	No. crabs	No. pounds	Avg. weight	No. pot lifts	Average no. crabs per pot
Eastern	231-05		C O N F I D E N T I A L					
	231-10		C O N F I D E N T I A L					
	231-50		7	11,496	24,673	2.15	1,474	7.8
	231-60		7	4,324	9,516	2.20	707	6.1
	231-70		C O N F I D E N T I A L					
	District Total		10	17,467	37,805	2.16	2,800	6.2
Outer	232-10		5	3,970	8,443	2.13	585	6.8
	232-21		C O N F I D E N T I A L					
	232-23		C O N F I D E N T I A L					
	232-30		C O N F I D E N T I A L					
	District Total		6	7,124	15,244	2.14	1,294	5.5
	Combined Districts' Total		16	24,591	53,049	2.16	4,094	6.0

^a Kamishak Bay, Barren Islands and Central Districts closed.

^b Southern District by day. Outer and Eastern for the entire season.

Table 3. Pot shrimp catch in pounds by district and statistical sub-area, Area G, Cook Inlet Management Area, 1991.^a

District	Stat. sub-area	No. boats	No. landings	Coonstripe	Pink	Spot	Total	No. pots	Pounds per pot
Eastern	231-05	6	10	498	20	2,132	2,650	5,556	0.48
Outer	232-23		C O N F I D E N T I A L						
	232-30		C O N F I D E N T I A L						
	Total	8	33	946	24	6,345	7,315	15,471	0.47

^a Catch not reported by week or month due to three or less participating fishermen per time period therefore making the data confidential.

Table 4. Hardshell clam harvest by statistical area, Cook Inlet Management Area, 1991.^a

District	Stat. sub-area	No. permits	No. landings	Butter	Little-neck	Total hardshell
Southern	241-14	5	26	0	15,349	15,349
	241-16	16	53	85	32,137	32,222
	Total	19	78	85	47,486	47,571

^a Catch not reported by week or month due to three or less participating fishermen per time period therefore making data confidential.

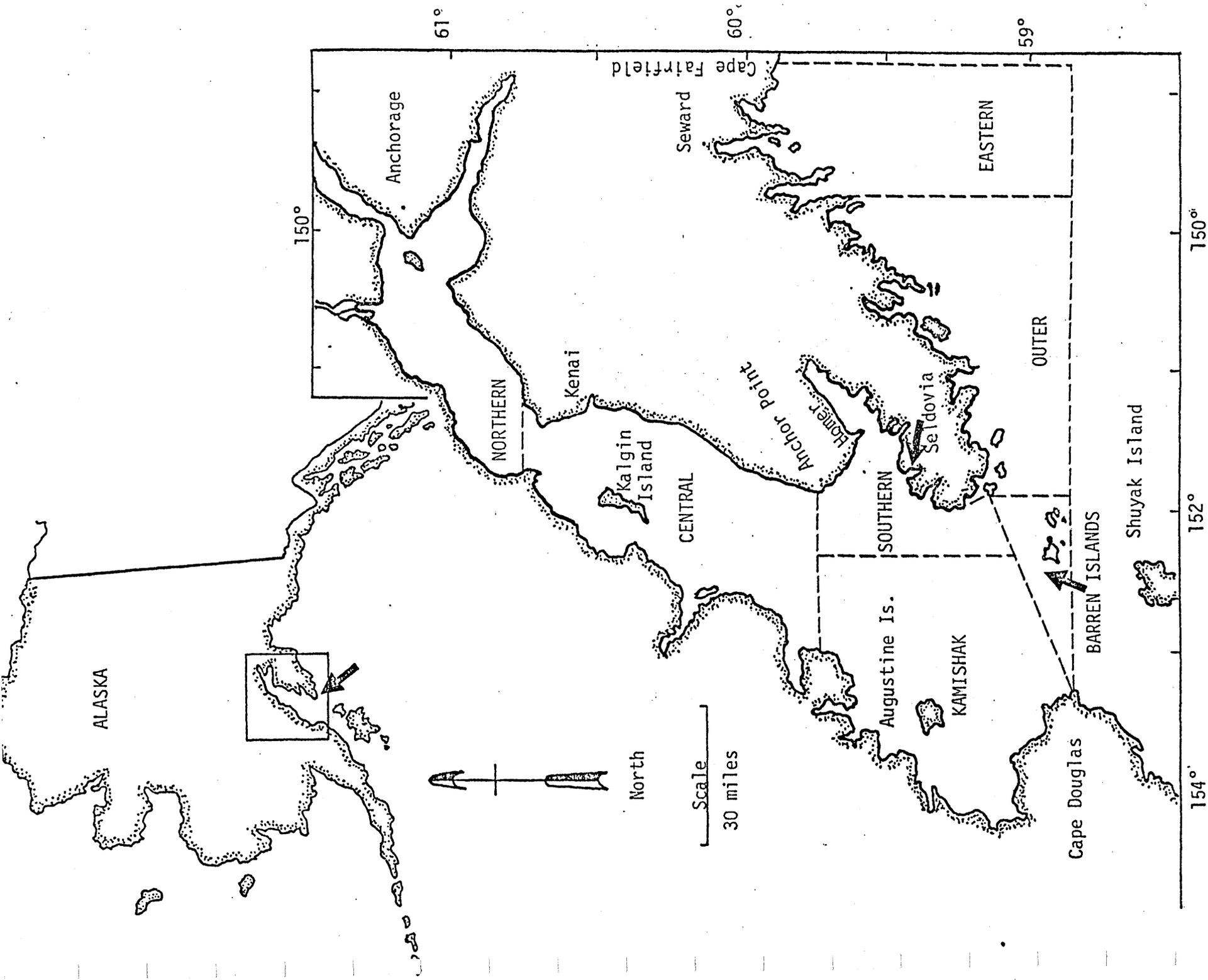


Figure 1 . . . Cook Inlet area district location chart.

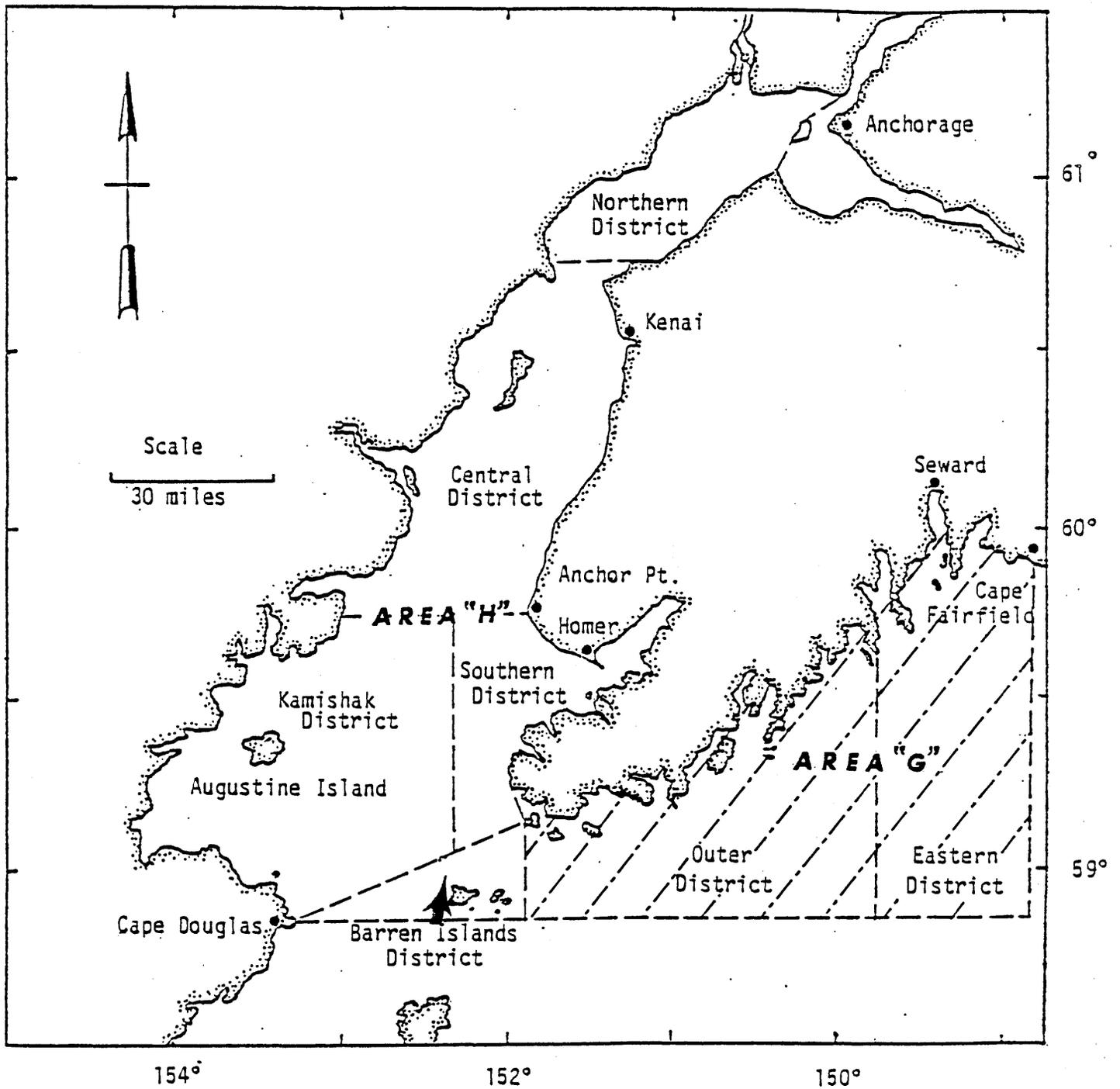


Figure 2. Cook Inlet Area ("H") and Outer Cook Inlet Area ("G") district location chart for shrimp management.

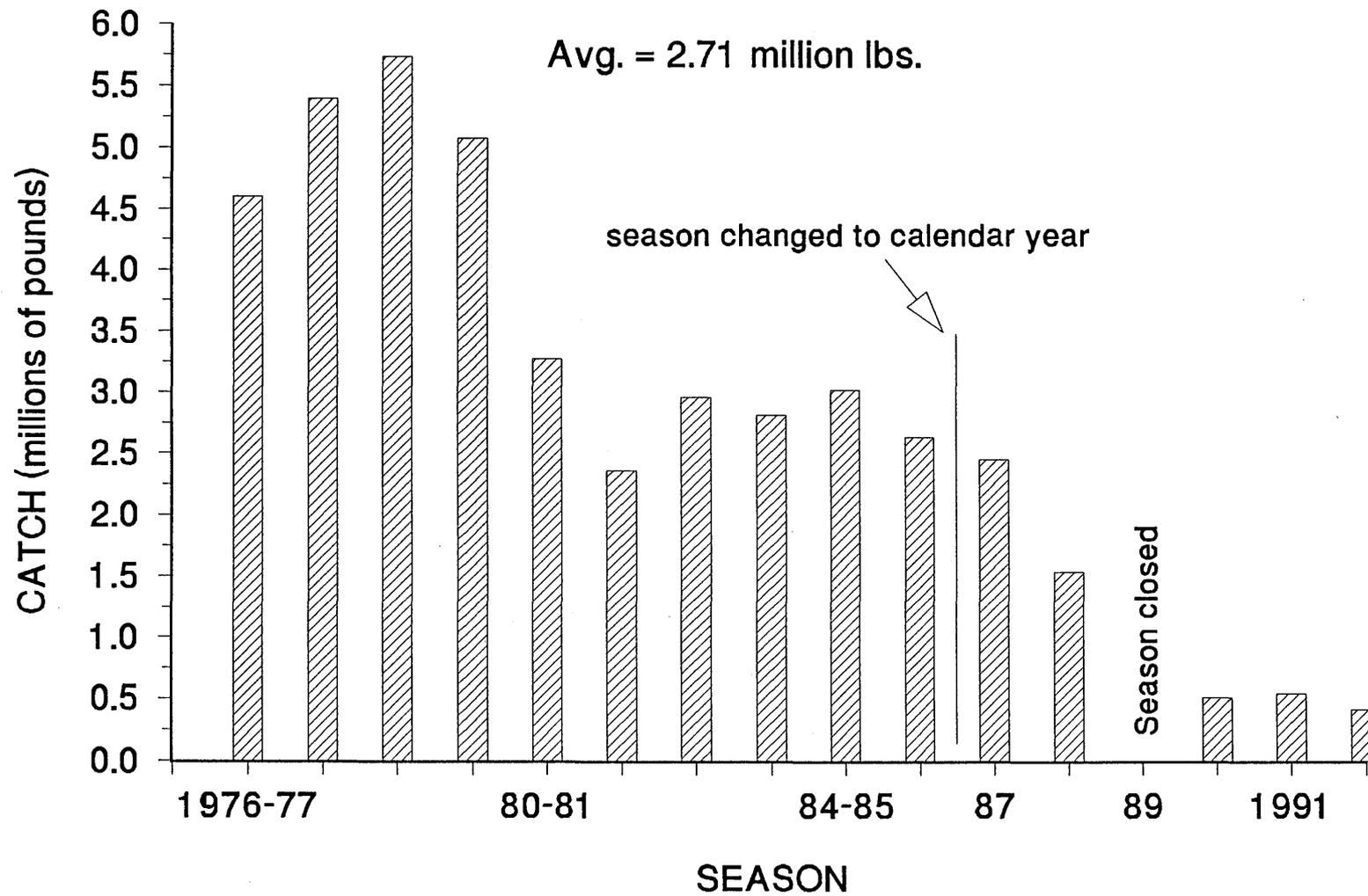


Figure 3. Tanner crab catch by season, Cook Inlet Mgt. Area, 1976 - 1992.

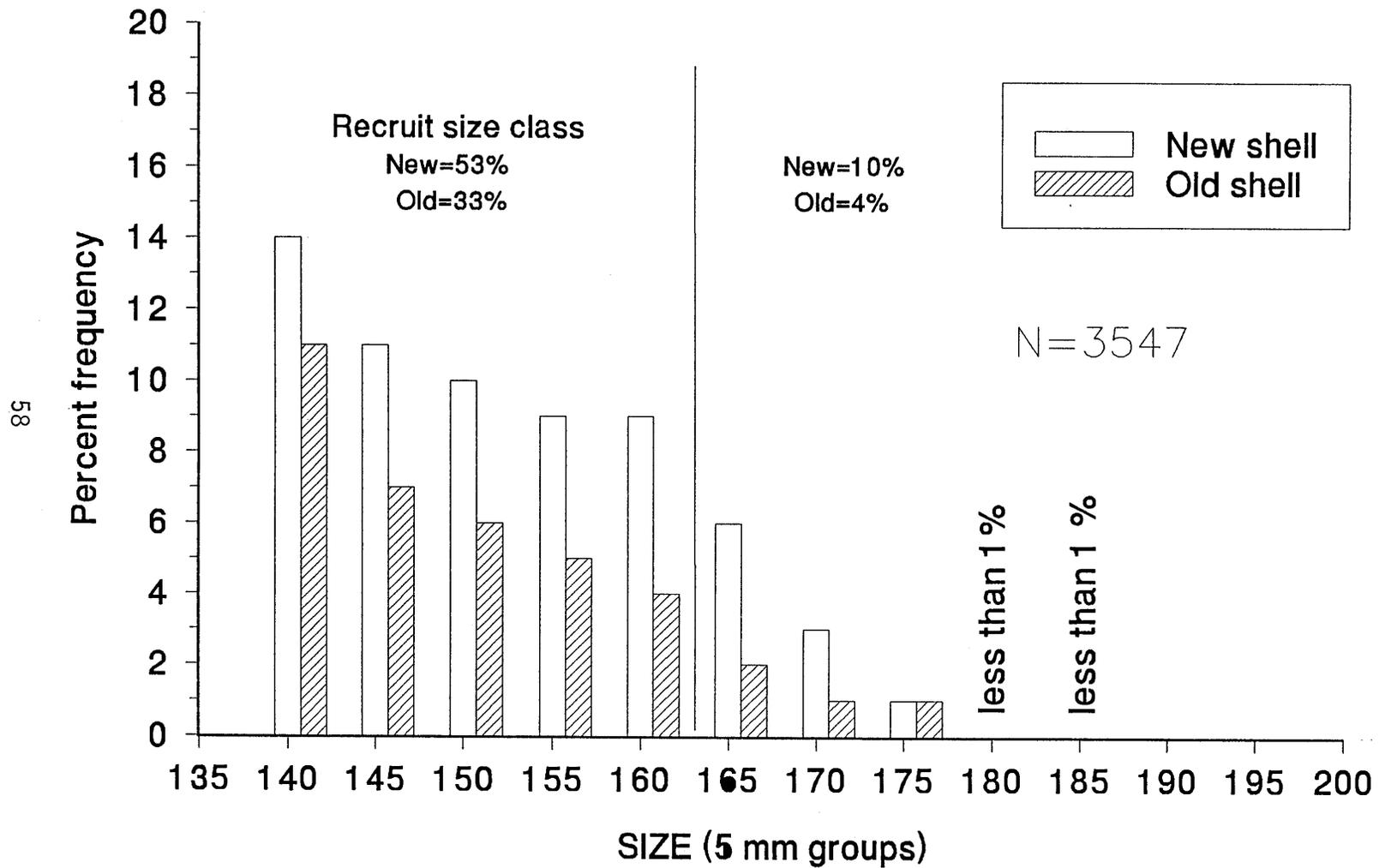


Figure 4. Commercial catch size freq., 1992 Southern Distr. Tanner crab fishery

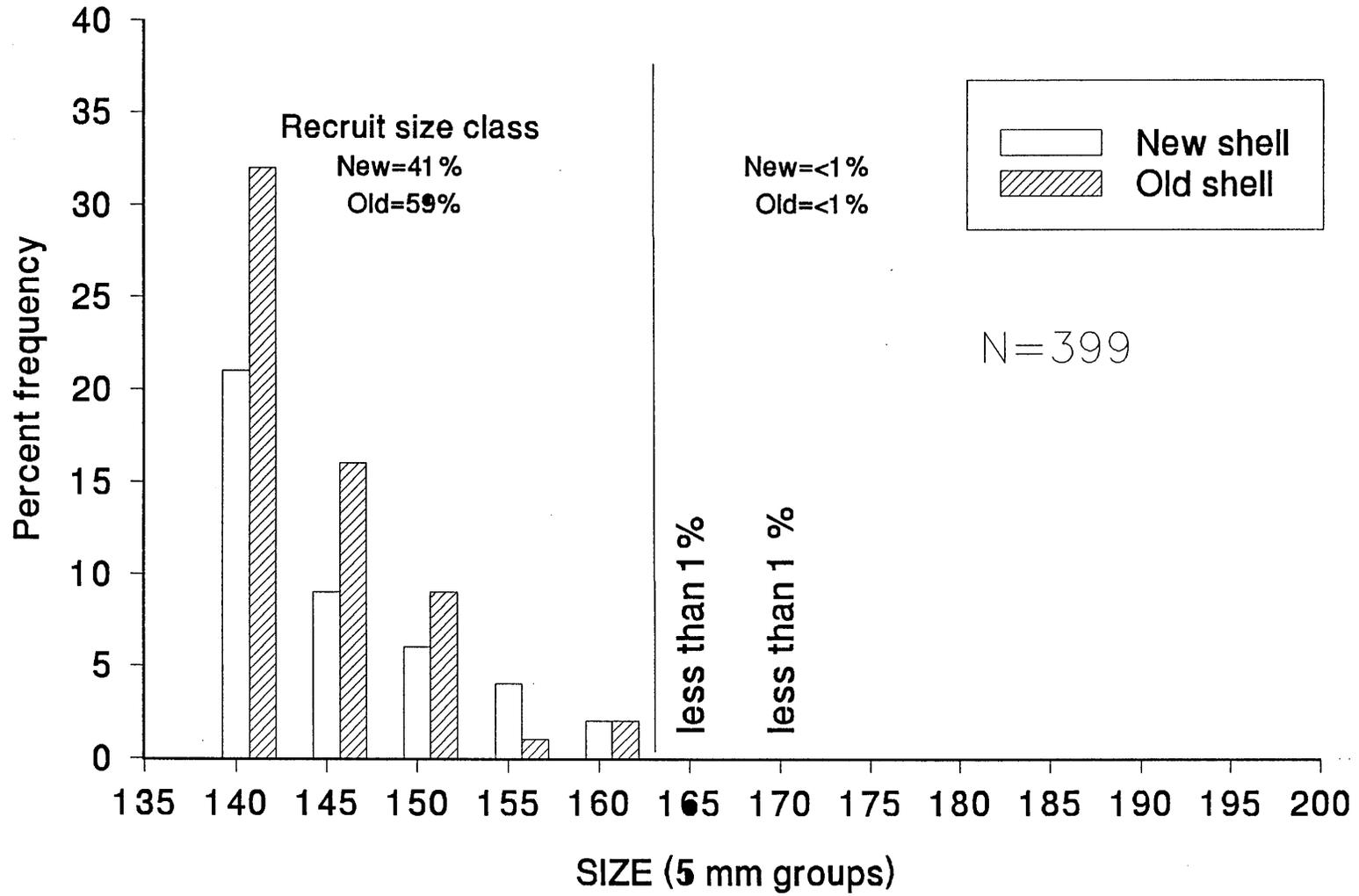


Figure 5. Commercial catch size freq., 1992 Outer and Eastern Dists. Tanner crab fishery.

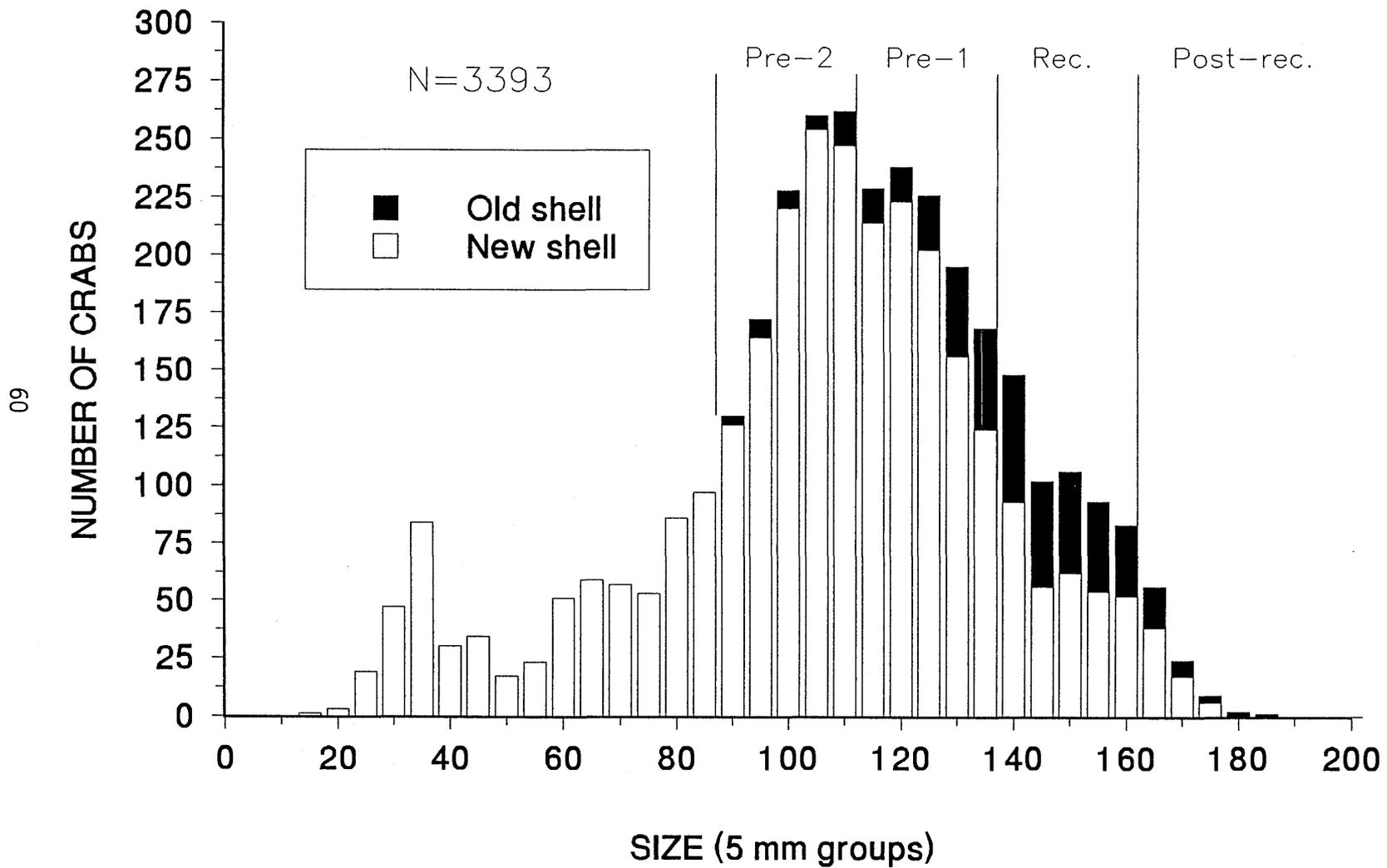


Figure 6. Male Tanner crab catch, Southern Distr., 1991 Cook Inlet trawl survey.

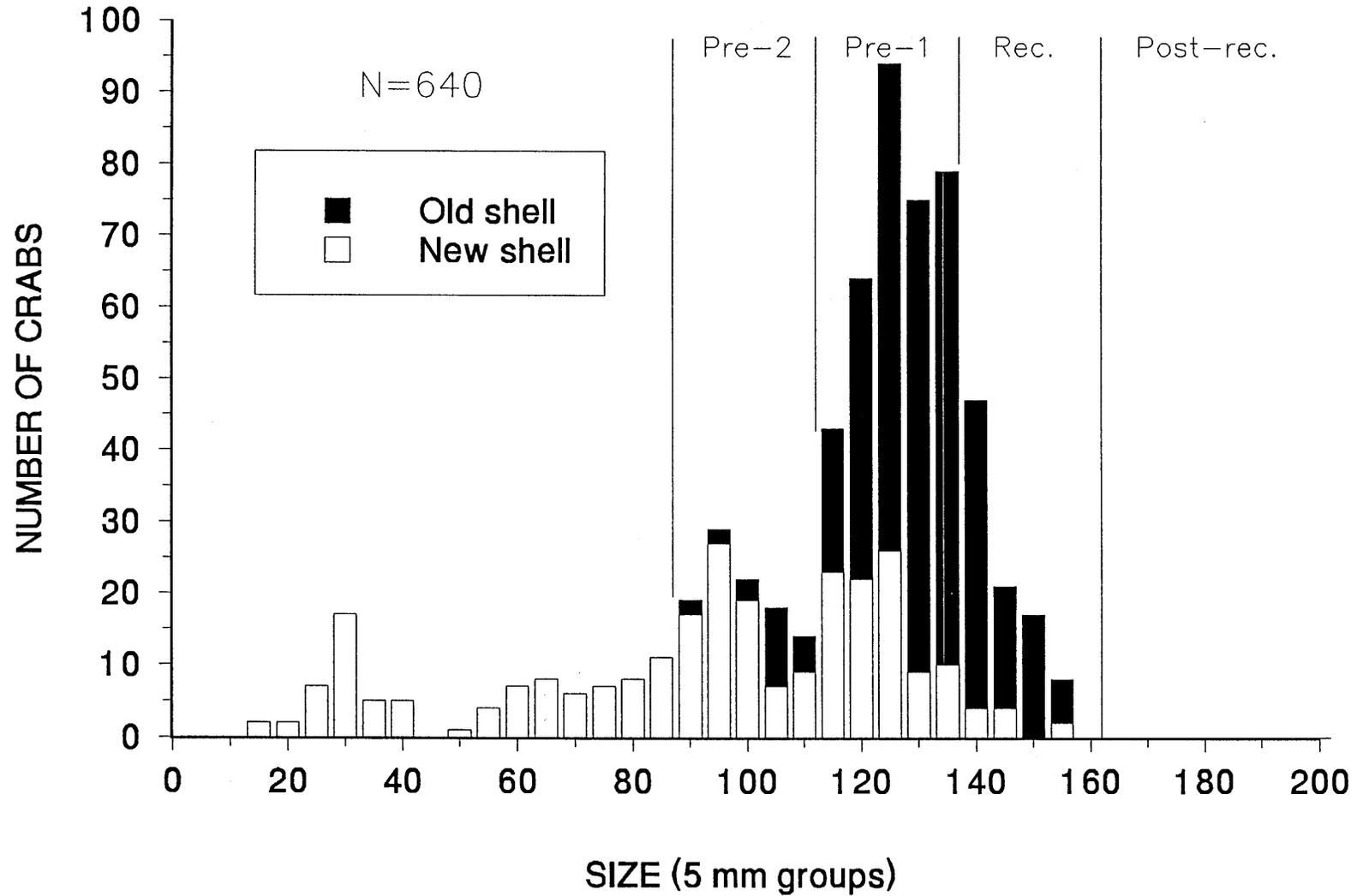


Figure 7. Male Tanner crab catch, Kamishak District, 1991 Cook Inlet trawl survey.

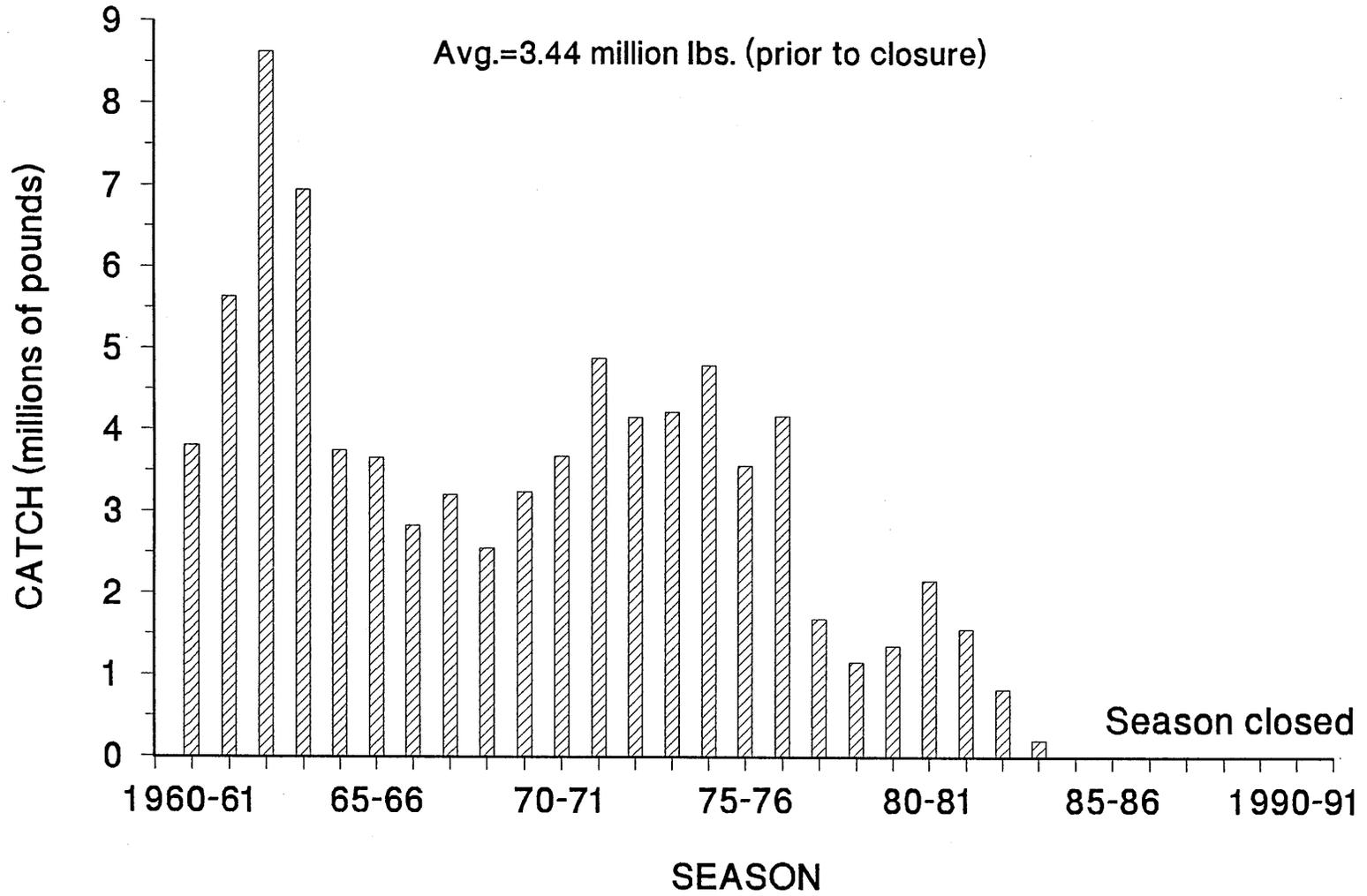


Figure 8. King crab catch by season, Cook Inlet Mgt. Area, 1960 - 1991.

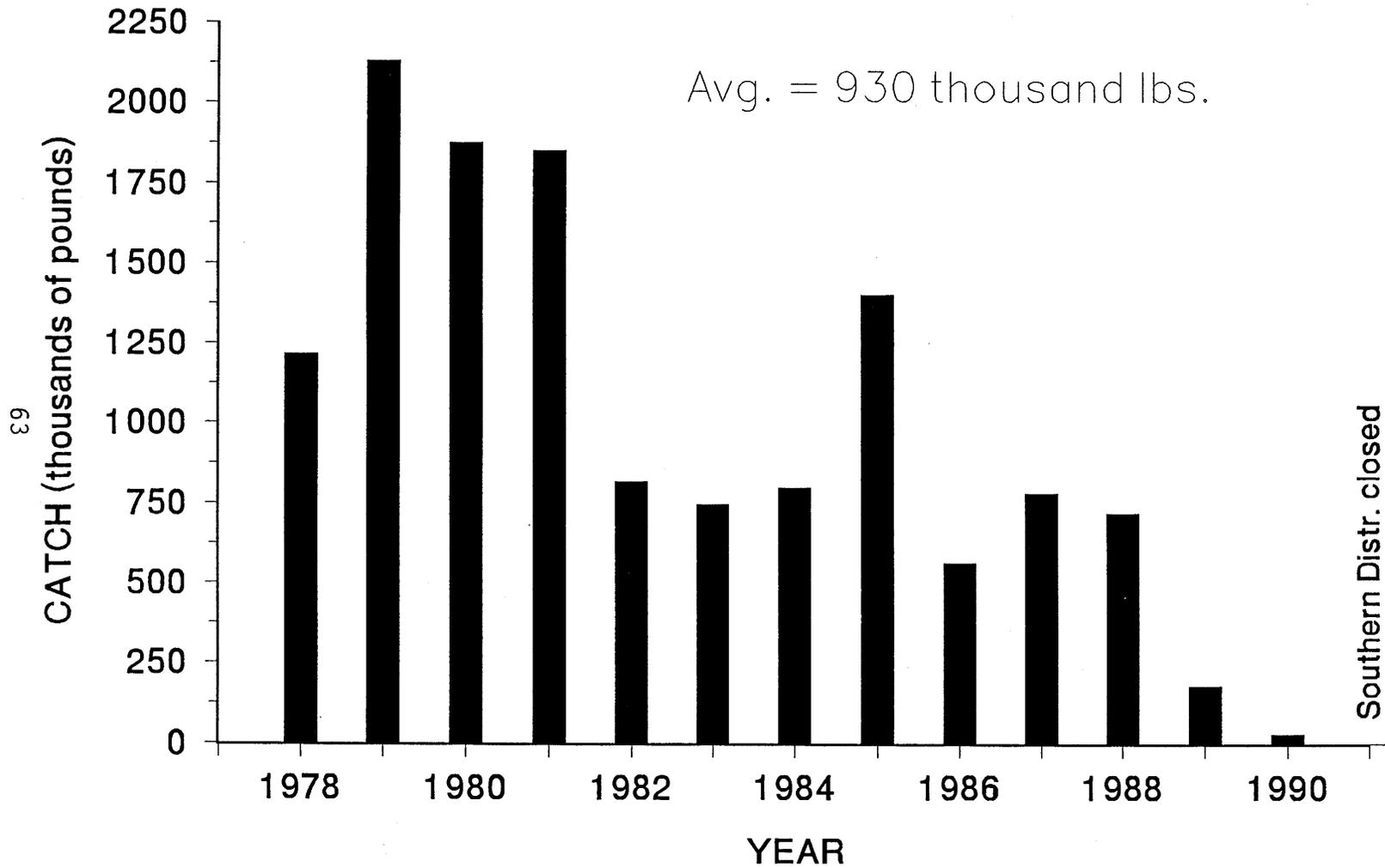


Figure 9. Dungeness crab catch by year, Cook Inlet Mgt. Area, 1978 - 1991.

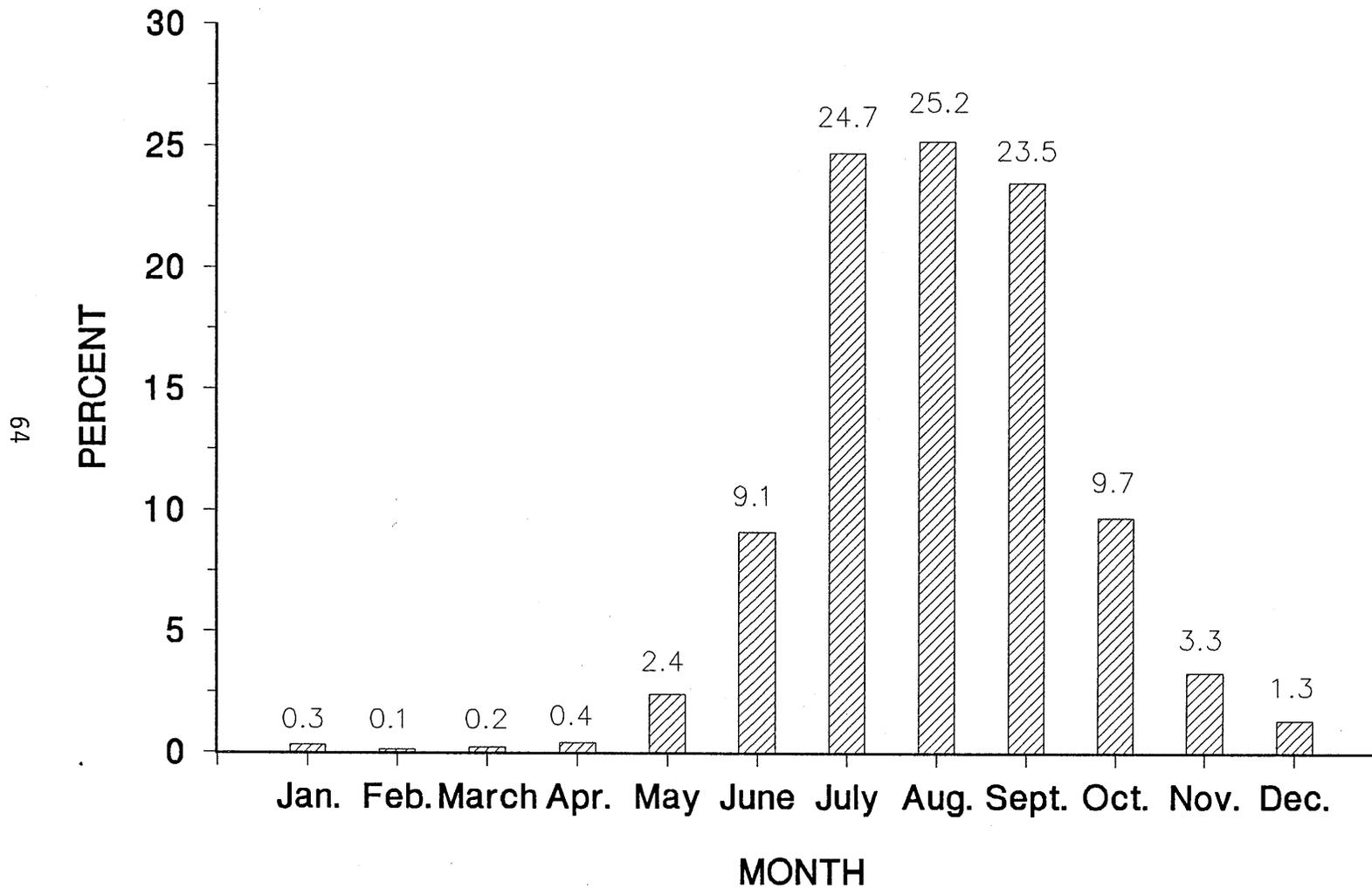


Figure 10. Dungeness crab catch (percent) by month, Cook Inlet Mgt. Area, 1978 - 1990.

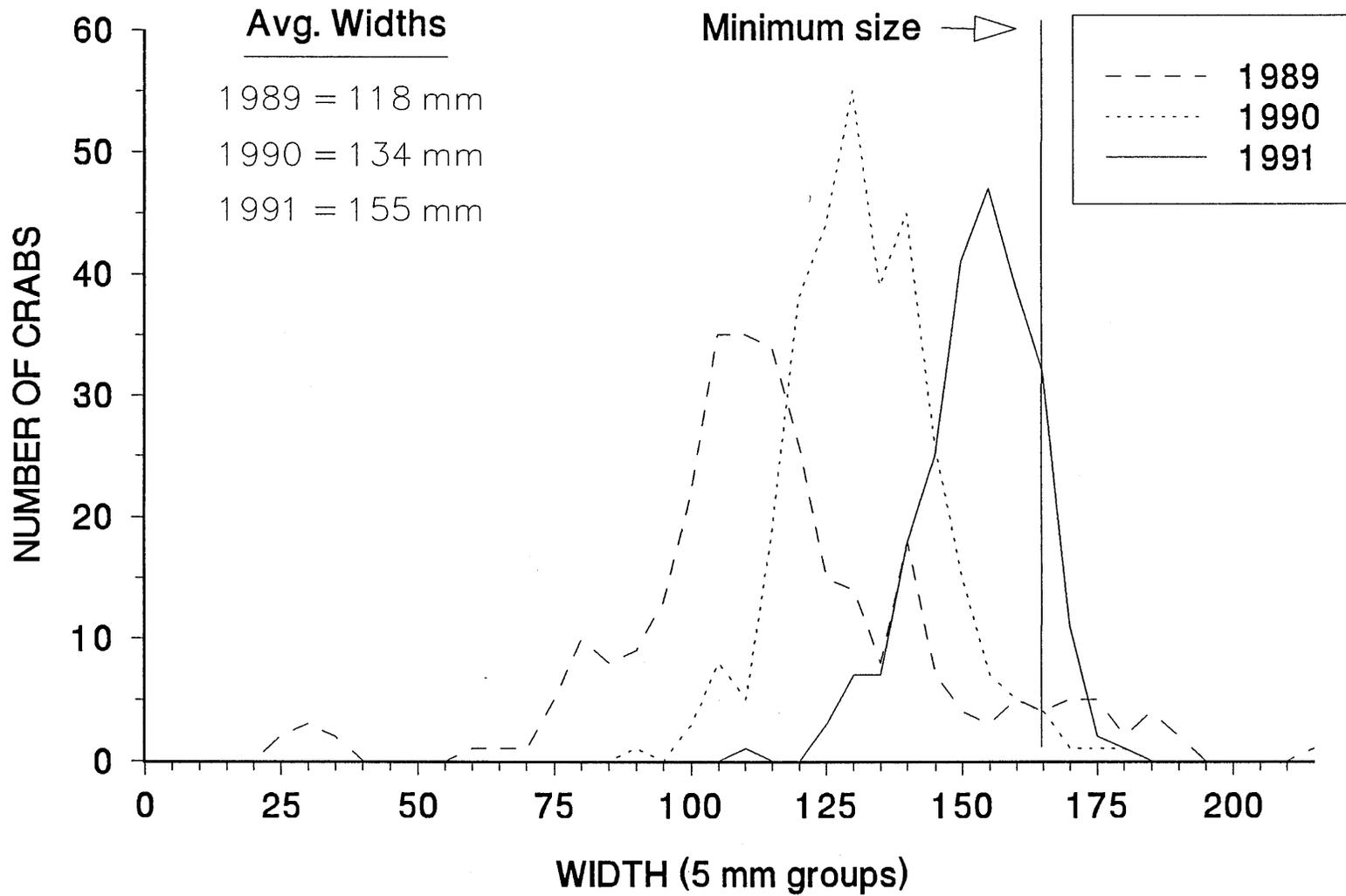


Figure 11. Male Dungeness catch, 1989 - 1991, Southern Distr. trawl surveys.

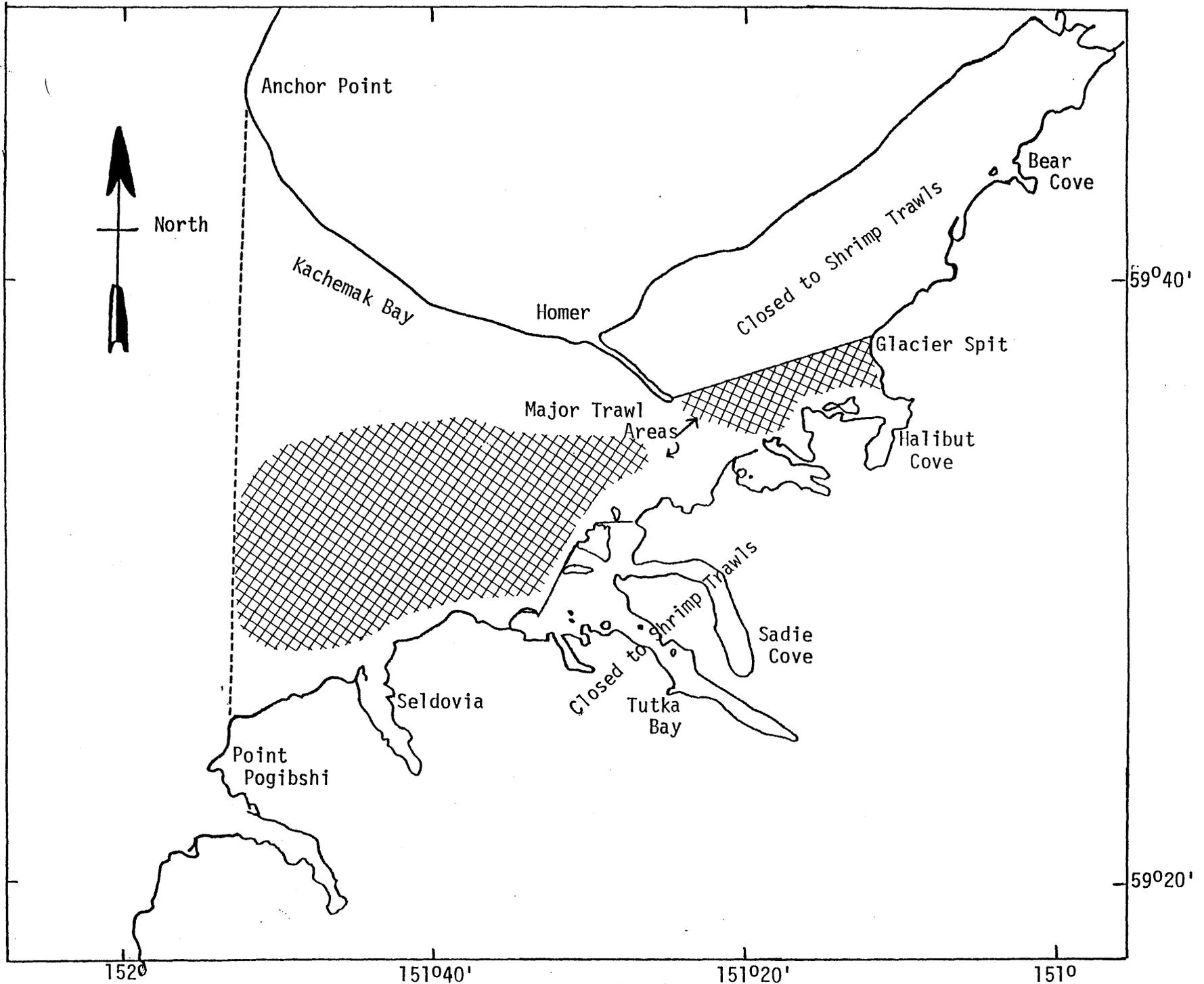


Figure 12. Location of commercial shrimp trawling in Kachemak Bay.

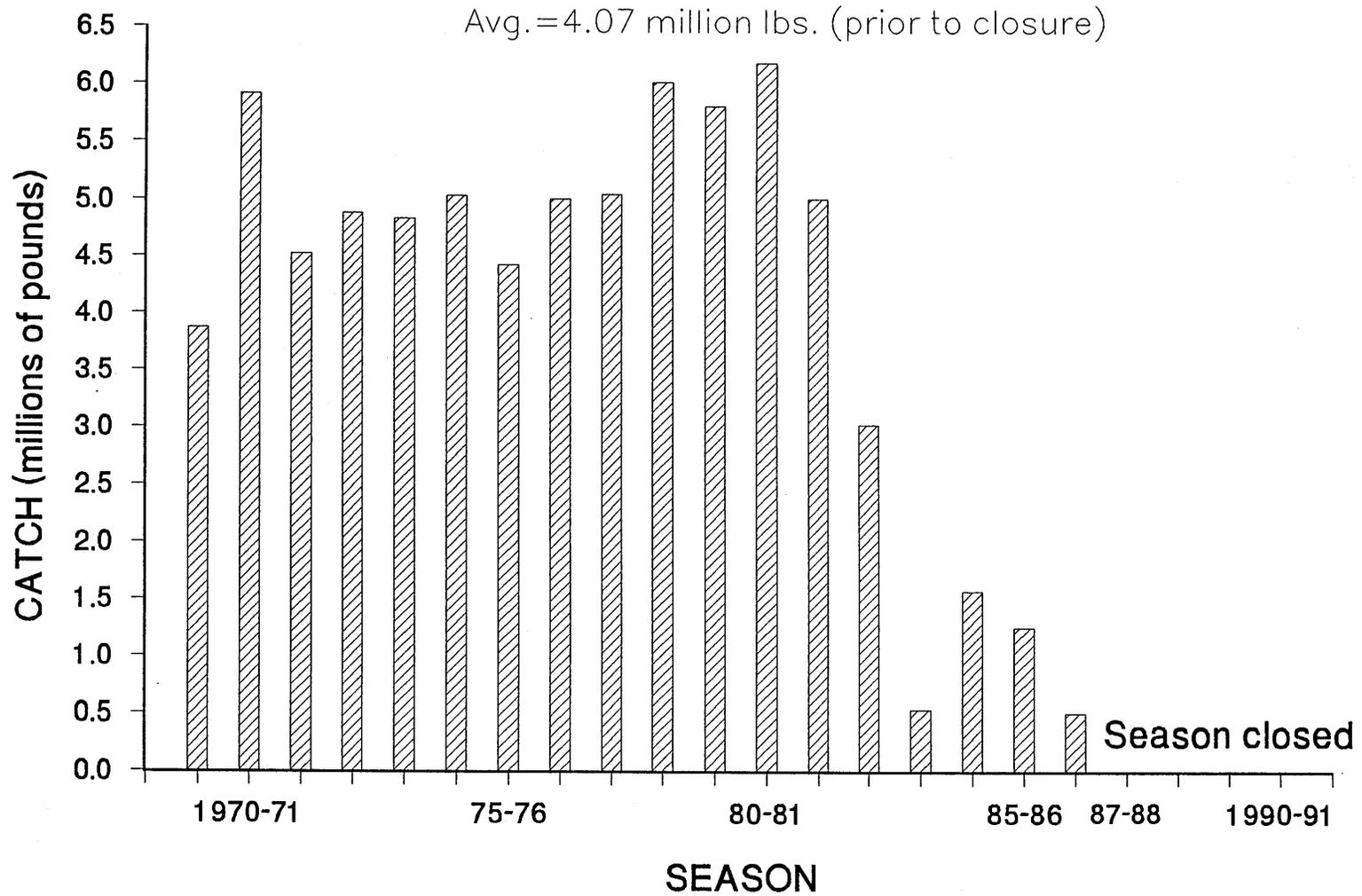


Figure 13. Trawl shrimp catch by season, Kachemak Bay, Cook Inlet Mgt. Area (H), 1969-91.

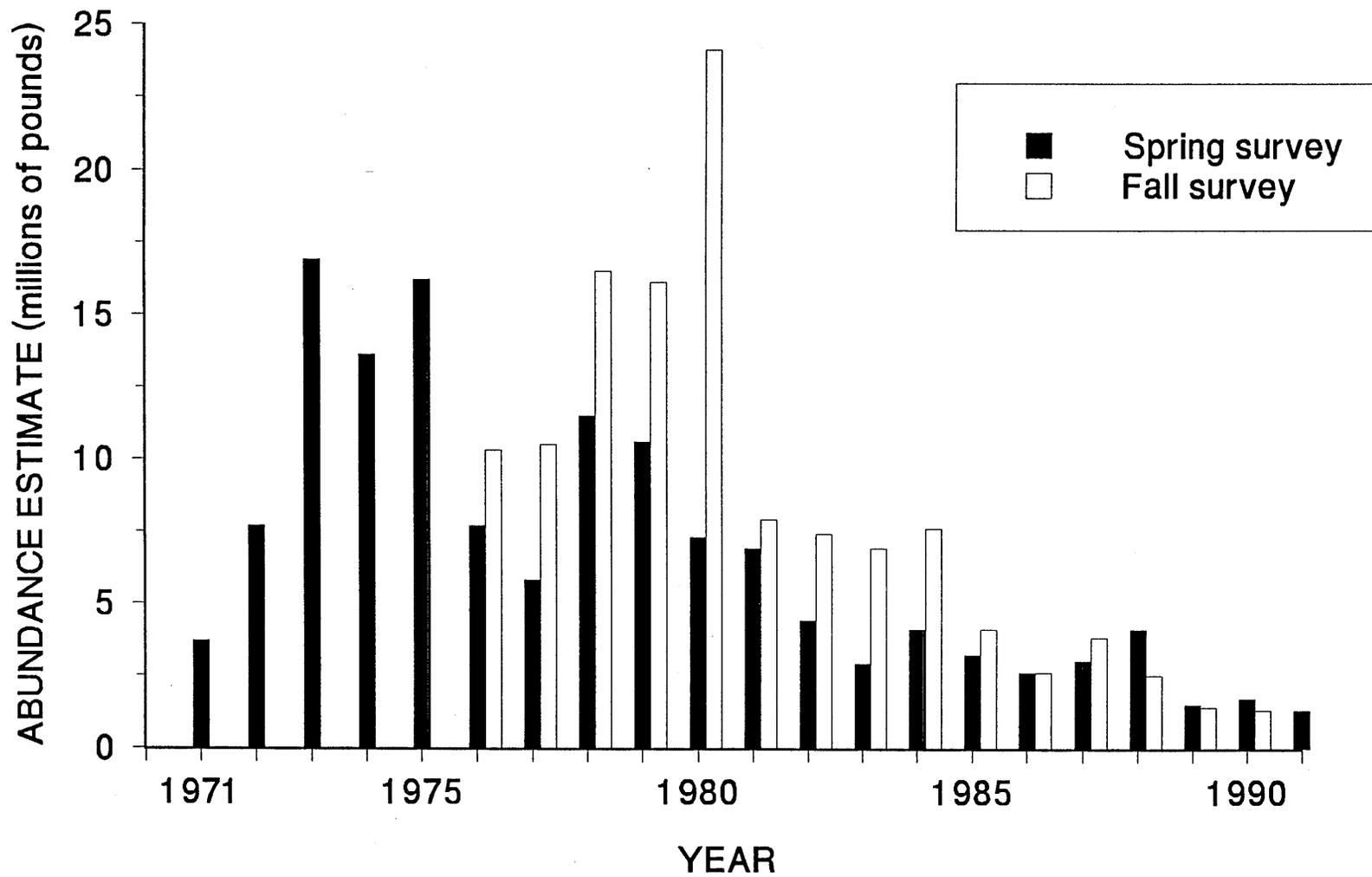


Figure 14. Pandalid shrimp abundance estimates, Kachemak Bay trawl shrimp survey, Cook Inlet Management Area, 1972-91.

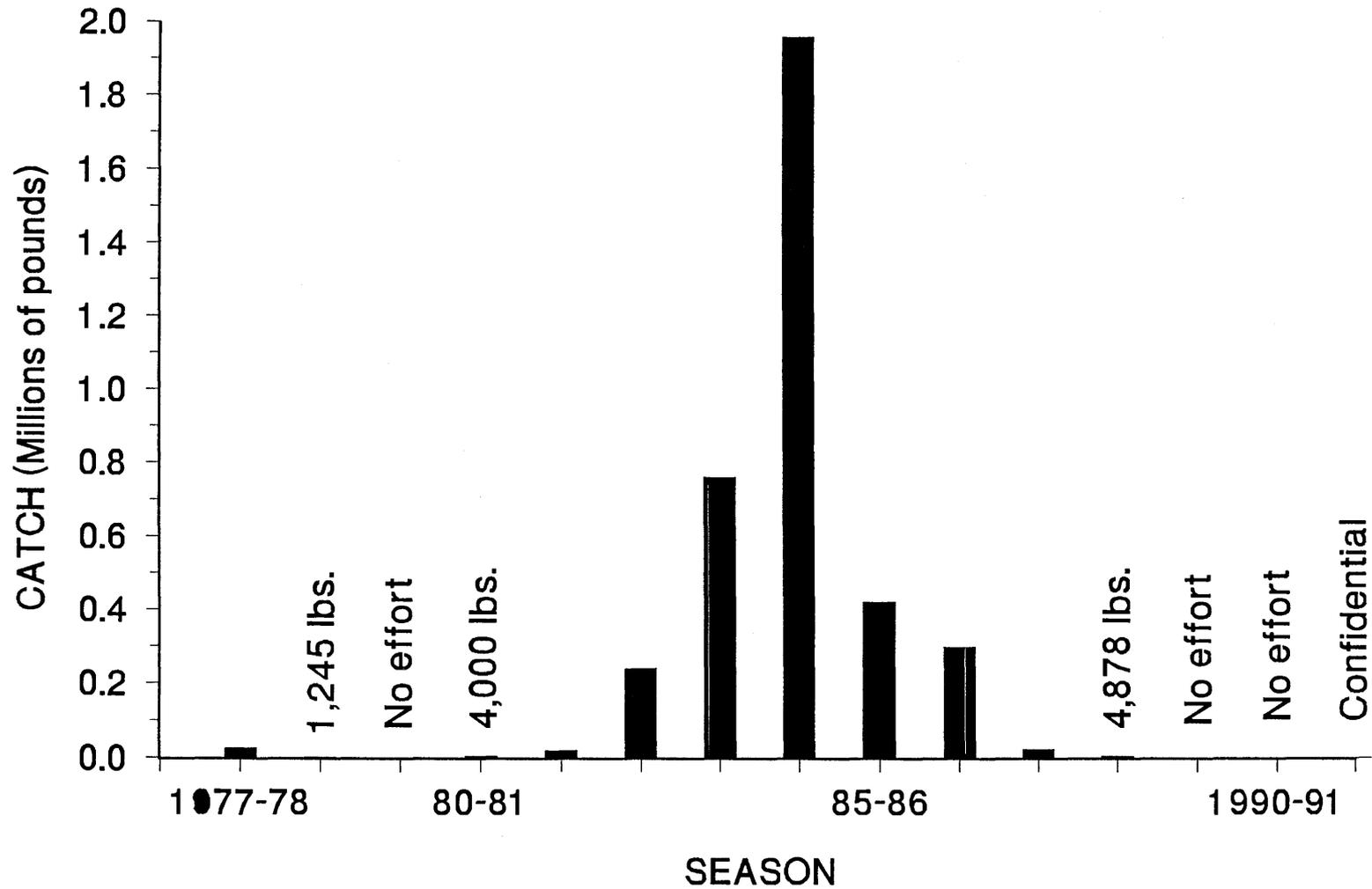


Figure 15. Trawl shrimp catch by season, Outer Cook Inlet, Cook Inlet Mgt. Area (G), 1977-1992

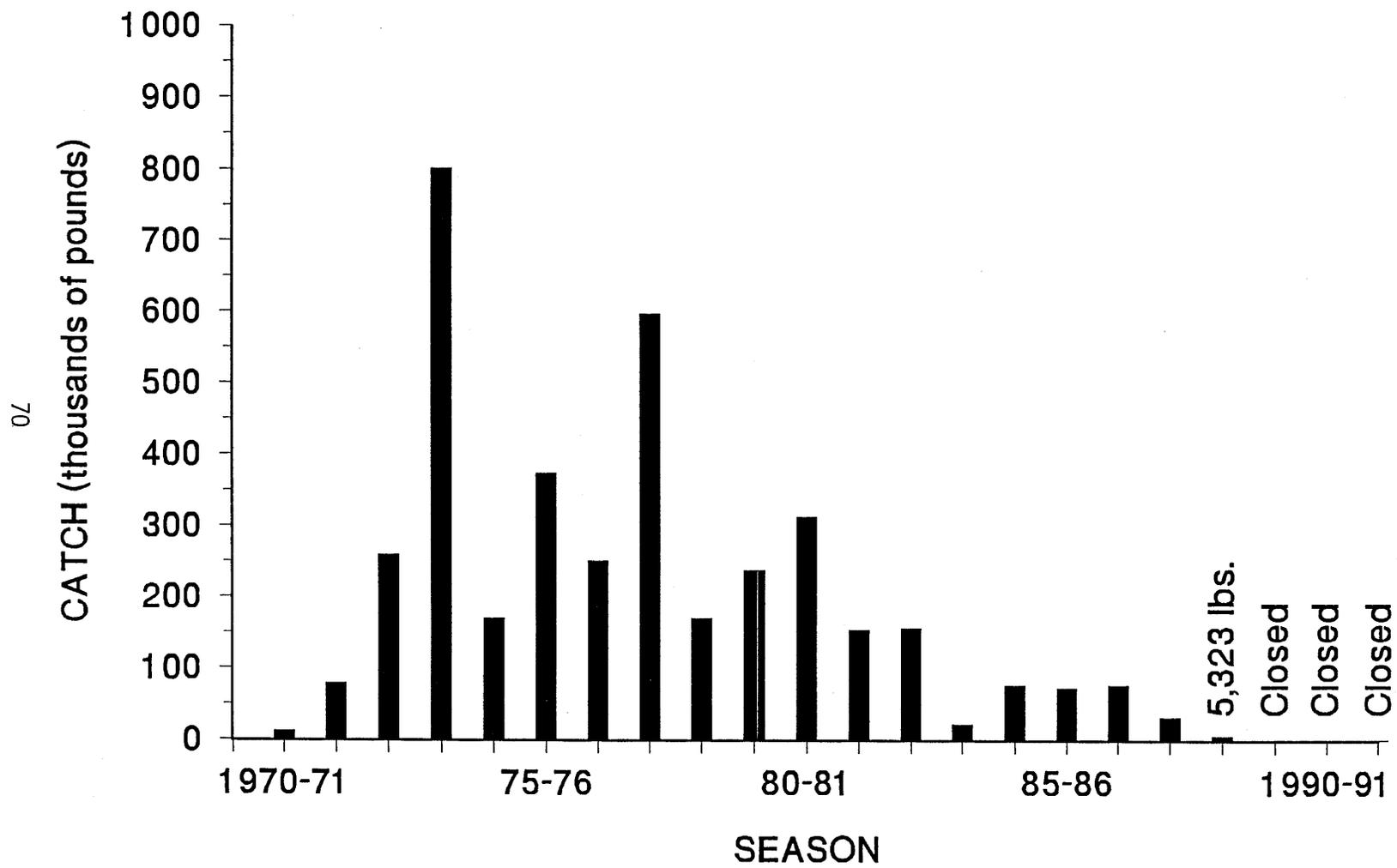


Figure 16. Pot shrimp catch by season, Kachemak Bay, Cook Inlet Mgt. Area (H), 1970-92

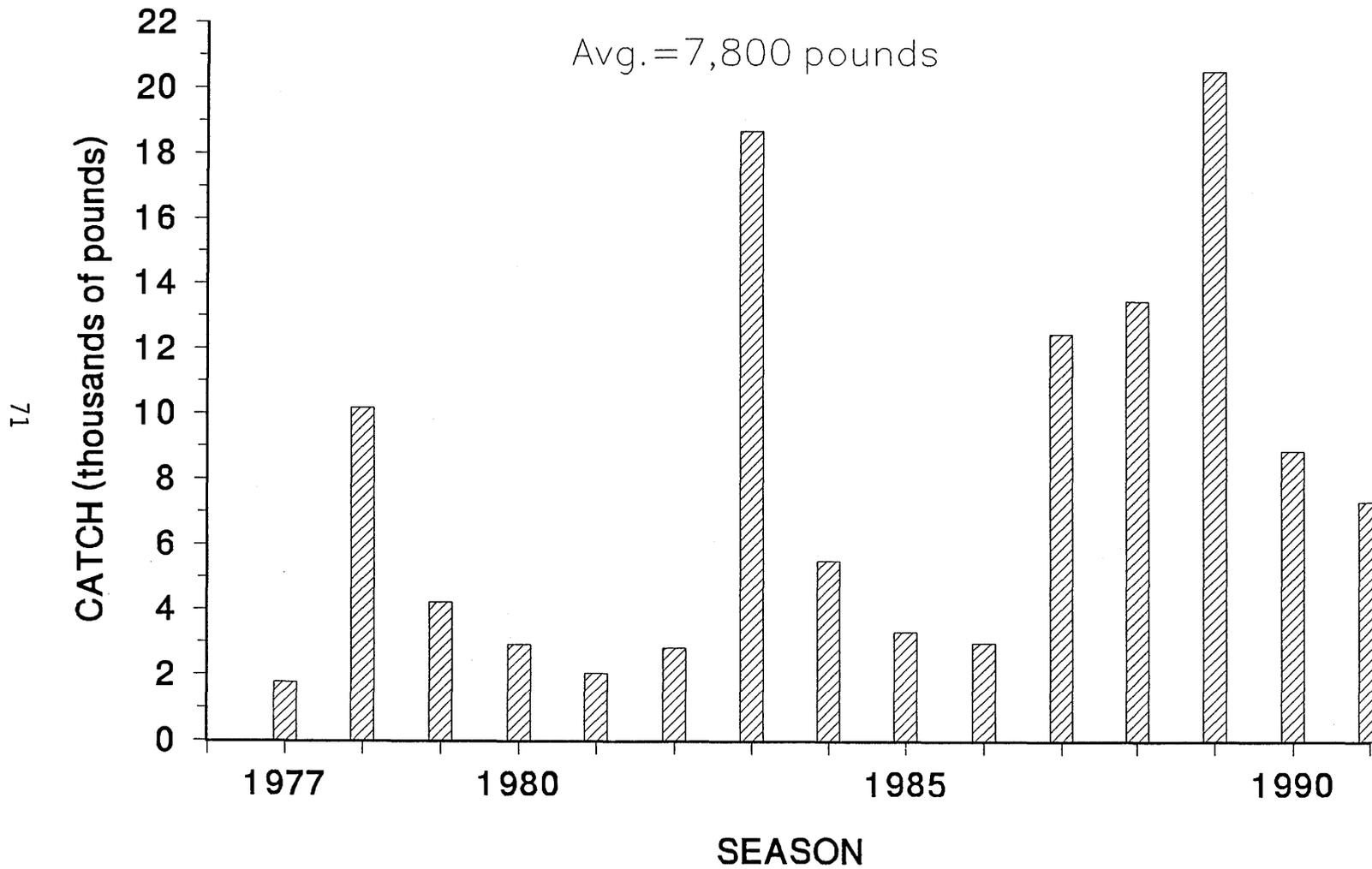


Figure 17. Pot shrimp catch by season, Outer Cook Inlet, Cook Inlet Mgt. Area (G), 1977-91.

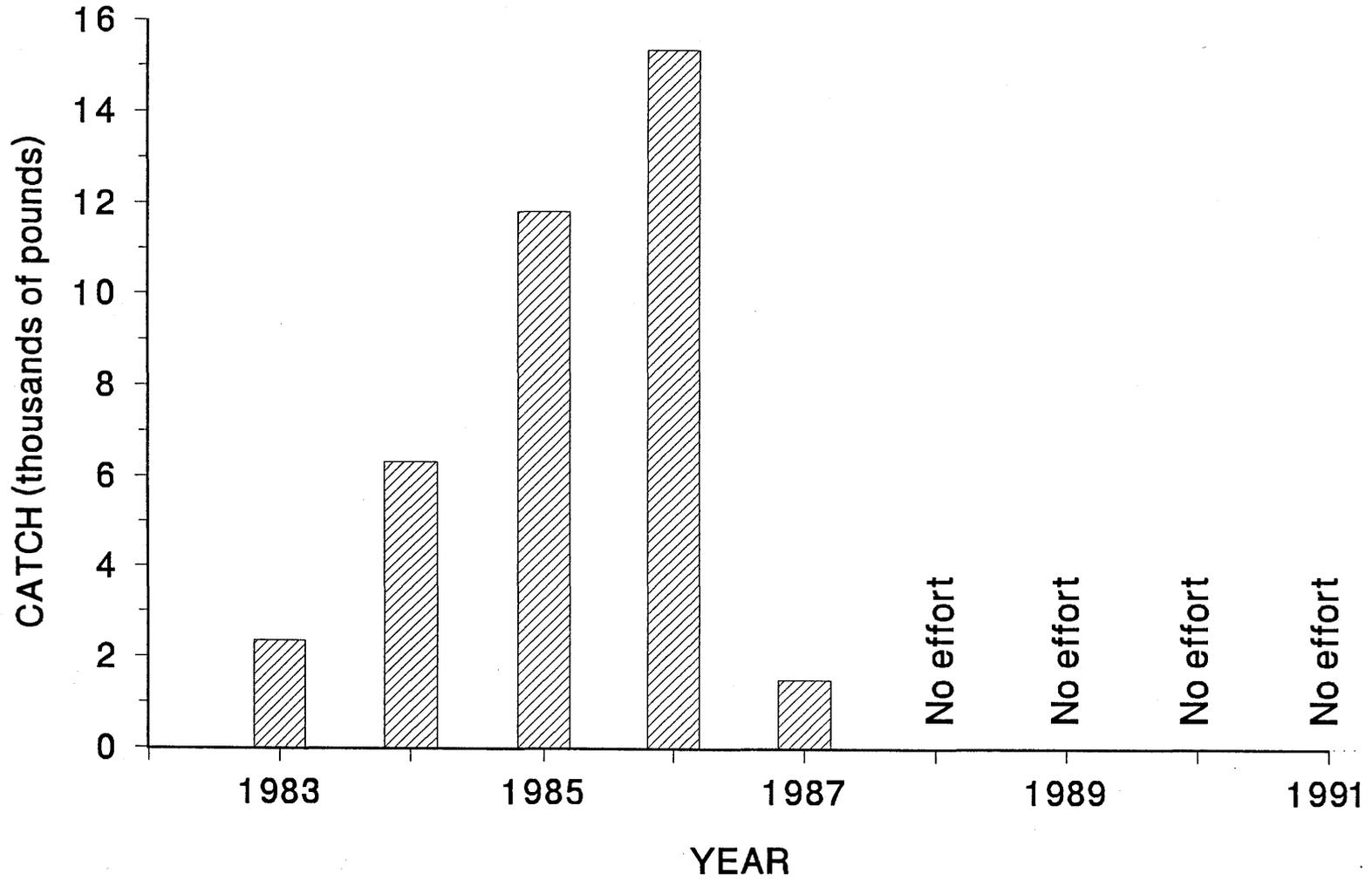


Figure 18. Weathervane scallop harvest by year, Cook Inlet Mgt. Area, 1983-91.

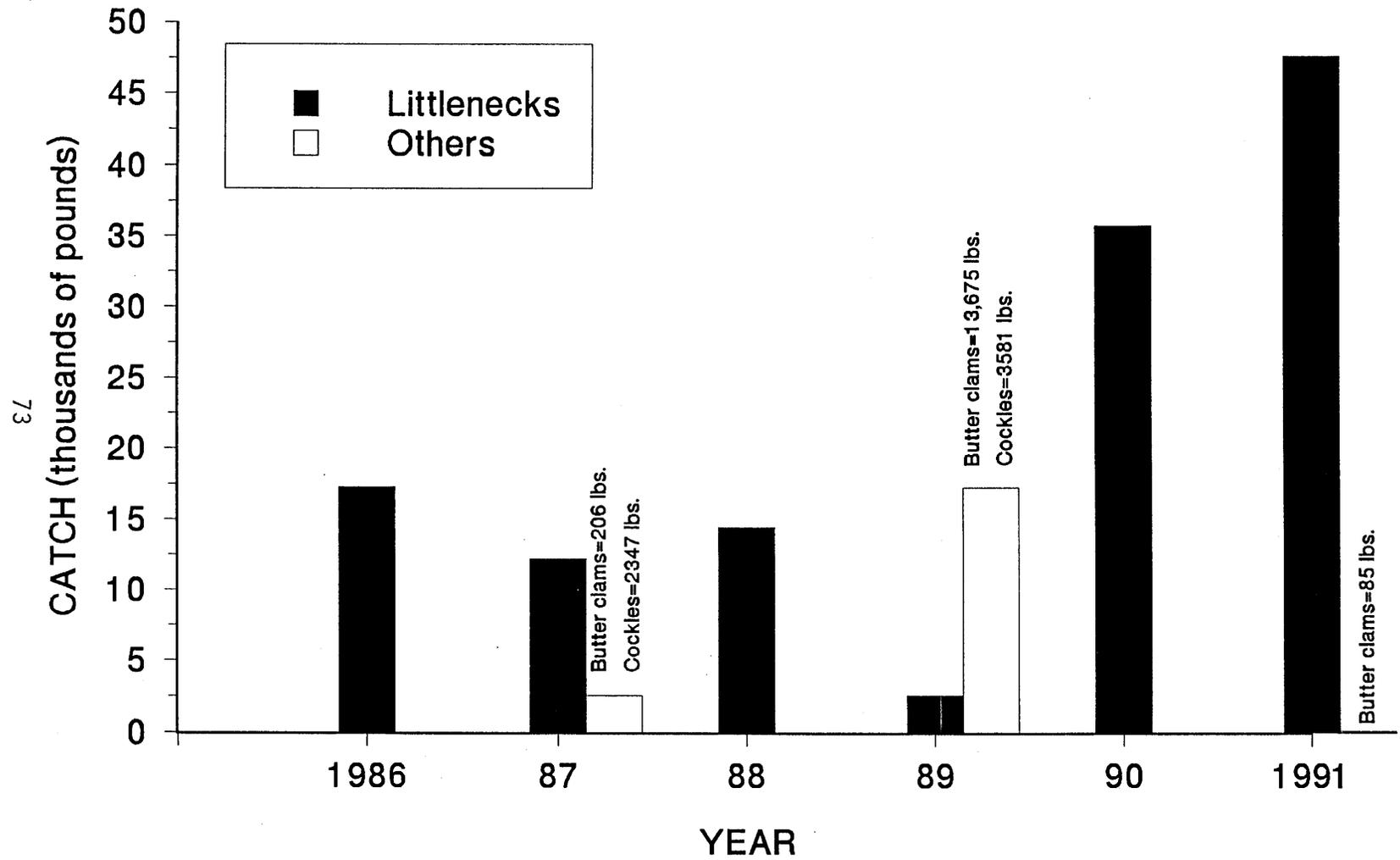


Figure 19. Hardshell clam harvest, Cook Inlet Management Area, 1986-91.

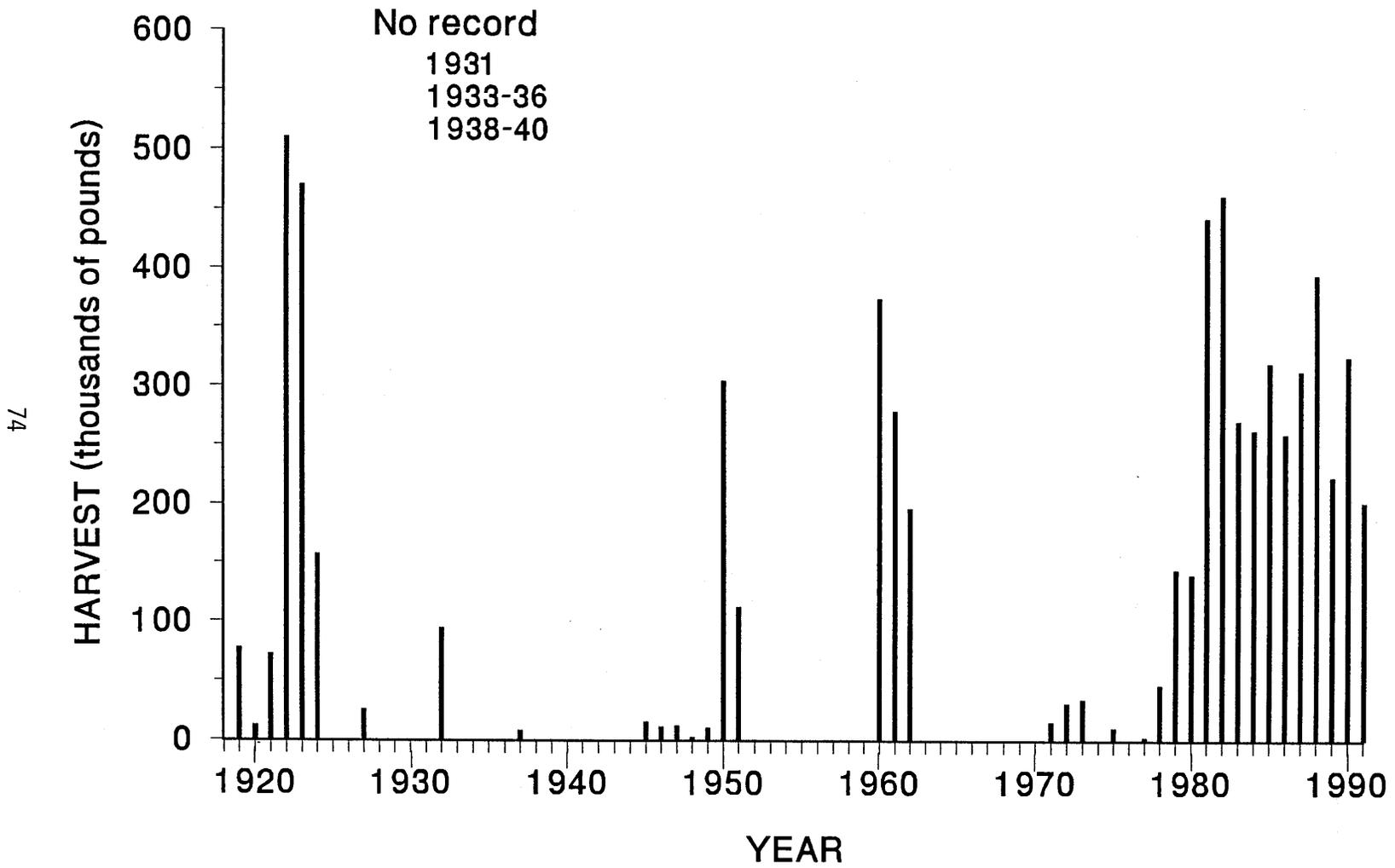


Figure 20. Razor clam harvest, Cook Inlet Management Area, 1919-91.

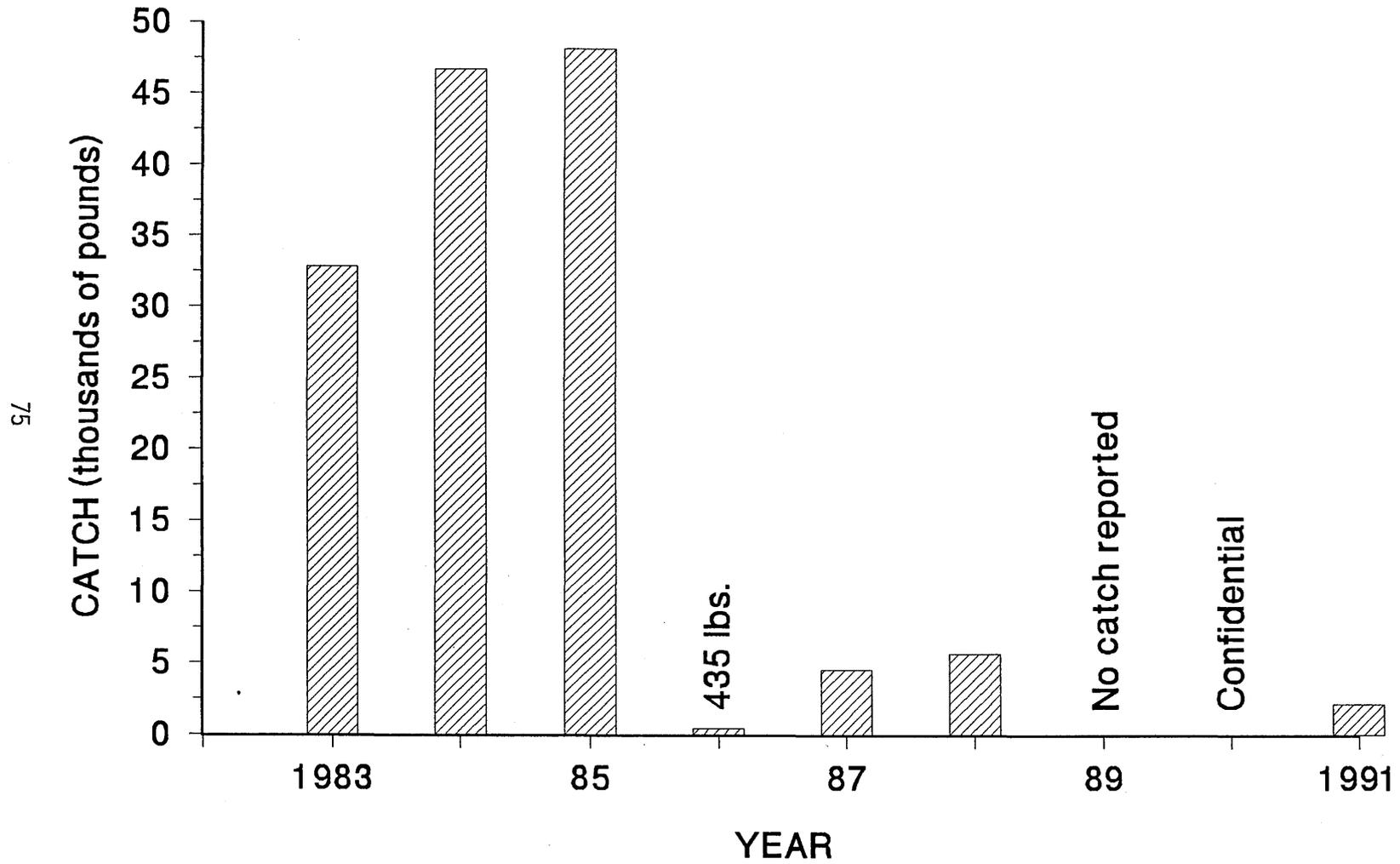


Figure 21. Octopus harvest, Cook Inlet Management Area, 1983-91.

Appendix A. Tanner crab catch (pounds) by season, Cook Inlet Management Area, 1968-92.

Season	Southern District	No. of Vessels	Kamishak/Barren Is. District	No. of Vessels	Outer/Eastern District	No. of Vessels	Central District	No. of Vessels	Total Catch	Total Vessels
1968-69	1,388,282		12,398		816				1,401,496	
1969-70	1,147,154		71,196		104,191				1,322,541	
1970-71	1,046,803		541,212		3,000				1,591,015	
1971-72	2,462,956		974,962		804,765				4,242,683	
1972-73	2,935,662		3,361,023		1,266,023				7,562,708	
1973-74	1,387,535		4,689,251		1,891,021				7,967,807	
1974-75	967,762		2,150,462		656,660				3,774,884	
1975-76	1,339,245		3,281,084	17	850,964				5,471,293	57
1976-77	2,009,633	35	1,765,926	24	824,520				4,600,079	67
1977-78	2,806,568	55	2,077,092	28	502,049				5,385,709	92
1978-79	2,323,420	75	2,713,339	27	694,728				5,731,487	77
1979-80	1,134,940	68	3,338,623	24	595,645				5,069,208	68
1980-81	1,047,630	46	1,757,331	20	463,201				3,268,162	52
1981-82	548,529	41	1,286,332	18	524,897	9			2,359,758	51
1982-83	584,908	48	1,693,794	20	682,919	20			2,961,621	65
1983-84	996,763	45	1,373,674	17	443,384	14			2,813,821	71
1984-85	1,229,298	83	1,535,547	19	259,083	7			3,023,928	86
1985-86	1,164,261	103	1,288,711	24	177,041	5			2,630,013	109
1987	1,077,379	87	1,111,339	21	251,174	13	7,771	2	2,447,663	95
1988	944,763	127	417,182	24	168,969	23	8,396	3	1,539,310	137
1989	CLOSED	--	CLOSED	--	CLOSED	--	CLOSED	--	0	--
1990	CLOSED	--	510,034	7	CLOSED	--	CLOSED	--	510,034	7
1991	271,379	68	266,106	8	CLOSED	--	CLOSED	--	537,485	71
1992	354,868	110	CLOSED	--	53,049	16	CLOSED	--	407,917	121
Average ^a	1,030,896	62	1,112,370	18	352,541	10	2,695	1	2,705,387	73

^a Since inception of minimum legal size between the 1976-77 season. Includes closed seasons.

Appendix B. Average weight of Tanner crabs, by district, from the commercial fishery, Cook Inlet Management Area, 1974-1992.

Season	Southern District	Kamishak/Barren Is. Districts	Outer/Eastern Districts	Central District
Prior to 1974	No	data	available	
1974-75	2.85		N/A	N/A
1975-76	2.65		"	"
1976-77	2.79		"	"
1977-78	2.65		2.35	"
1978-79	2.64		2.25	"
1979-80	2.60		2.23	"
1980-81	2.75		2.20	"
1981-82	2.50		2.29	"
1982-83	2.47		2.29	"
1983-84	2.51		2.23	"
1984-85	2.49		2.29	"
1985-86	2.30		2.17	2.16
1987 ^a	2.31		2.26	2.23 2.33
1988	2.46		2.29	2.17 2.14
1989	CLOSED		CLOSED	CLOSED
1990	CLOSED		2.13	CLOSED
1991	2.56		2.09	CLOSED
1992	2.57		CLOSED	2.16
Average	2.57	2.24	2.19	2.24

^a Season opened by regulation 1/15/87. Prior to 1987, the season overlapped two calendar years.

Appendix C. Tanner crab population estimates in numbers by sex, size and age class, 1991 Cook Inlet trawl survey.

	<u>Southern District</u>		<u>Kamishak District</u>	
	Pop. Est. ^a	CV ^b	Pop. Est.	CV
<u>Males</u>				
<u>Sublegal</u>				
<70 mm	316,529	50	230,638	34
70-91 mm	295,026	35	155,084	62
91-114 mm				
new ^c	826,589	24	286,310	40
o & vo	35,265	39	91,460	38
115-139 mm				
new	790,463	22	357,887	44
o & vo	117,838	37	1,053,779	50
<u>Legal</u>				
140-164				
new	279,543	32	39,765	53
o & vo	187,509	42	330,052	65
≥ 165				
new	45,587	29	0	0
o & vo	24,084	48	0	0
<u>Total legals</u>	536,723	25	369,817	63
<u>Total Males</u>	2,918,434	20	2,544,976	40
<u>FEMALES</u>				
Juveniles	519,521	36	326,075	26
Adults	914,322	45	87,484	57
<u>Total Females</u>	1,433,843	39	413,559	30

^a Data not adjusted to reflect tows of less than 1 nautical mile.

^b CV = coefficient of variation expressed as a percent.

^c Shellage: new - new shell, o & vo - old & very old shell.

Appendix D. King crab catch in pounds by season, Cook Inlet Management Area, 1960-91.

Season	District			Total Catch	Number of Vessels
	Southern	Kamishak/ Barren Is.	Outer/ Eastern		
1960-61	2,699,680	986,551	118,067	3,804,298	
1961-62	1,619,642	3,642,500	368,909	5,631,051	
1962-63	2,763,343	5,509,708	343,505	8,616,556	
1963-64	1,960,426	4,915,303	59,352	6,935,081	
1964-65	1,892,479	1,850,572	963	3,744,014	
1965-66	1,948,012	1,684,346	14,491	3,646,849	
1966-67	1,347,904	1,386,008	89,510	2,823,422	
1967-68	1,117,397	1,883,605	239,518	3,240,520	
1968-69	750,906	1,711,296	87,302	2,549,504	
1969-70	1,464,721	1,688,803	73,644	3,227,168	
1970-71	1,540,018	2,115,991	9,468	3,665,477	
1971-72	1,992,224	2,868,315	12,657	4,873,197	
1972-73	1,391,024	2,756,023	1,966	4,149,013	
1973-74	1,971,841	2,236,131	5,613	4,213,585	
1974-75	1,816,512	2,965,310	2,035	4,783,857	
1975-76	1,674,872	1,832,484	45,293	3,552,649	
1976-77	1,035,316	3,103,895	16,384	4,155,595	
1977-78	584,090	1,099,279	1,350	1,684,719	74
1978-79	664,388	480,261	1,753	1,146,402	89
1979-80	853,584	489,365	4,871	1,347,820	82
1980-81	508,670	1,635,922	8,022	2,152,614	50
1981-82	183,899	1,371,821	4,143	1,559,863	53
1982-83	CLOSED	807,079	15,280	822,359	27
1983-84	CLOSED	188,027	4,504	192,531	17
1984-85	CLOSED	CLOSED	CLOSED	0	--
1985-86	CLOSED	CLOSED	CLOSED	0	--
1986-87	CLOSED	CLOSED	CLOSED	0	--
1987-88	CLOSED	CLOSED	CLOSED	0	--
1988-89	CLOSED	CLOSED	CLOSED	0	--
1989-90	CLOSED	CLOSED	CLOSED	0	--
1990-91	CLOSED	CLOSED	CLOSED	0	--
1991-92	CLOSED	CLOSED	CLOSED	0	--

Note: Average pre 1984-85 closure catch = 3.44 million pounds per year.

Appendix E. Dungeness crab catch by year, Cook Inlet Management Area, 1961 - 1991.

Year	Southern district catch (lbs.)	Other districts catch (lbs.)	Total catch (lbs.)	No. of Vessels	No. of Landings
1961	193,683	0	193,683		
1962	530,770	0	530,770		
1963	1,665,599	11,605	1,677,204		
1964	417,005	6,036	423,041		
1965	74,211	0	74,211		
1966	12,523	117,037	129,560		
1967	7,168	0	7,168		
1968	484,452	3,407	487,859		
1969	49,894	0	49,894		
1970	209,819	0	209,819		
1971	97,161	0	97,161		
1972	38,930	0	38,930		
1973	308,777	1,271	310,048		
1974	718,729	2,514	721,243	38	619
1975	361,893	922	362,815	34	402
1976	118,903	395	119,298	19	123
1977	74,195	510	74,705	18	94
1978	1,212,571	3,208	1,215,779	49	668
1979	2,130,963	0	2,130,963	72	1,485
1980	1,875,281	0	1,875,281	54	1,183
1981	1,850,977	0	1,850,977	88	2,047
1982	818,380	505	818,885	108	2,310
1983	746,585	834	747,419	71	1,194
1984	799,638	570	800,208	102	1,687
1985	1,389,891	12,511	1,402,402	106	1,768
1986	550,968	12,894	563,862	83	1,069
1987	761,423	21,753	783,176	100	1,377
1988	677,334	41,941	719,275	84	1,305
1989	170,266	7,798	178,064	43	455
1990	28,938	564	29,502	23	112
1991	CLOSED	0	0	0	0

Note: Average catch 1978-1990 = 1.01 million pounds per year.

Appendix F. Dungeness commercial catch east and west of Homer Spit, Southern District, Cook Inlet Management Area, 1978-1991.

Year	East of Spit		West of Spit	
	Catch (lbs.)	Vessels	Catch (lbs.)	Vessels
1978	107,470	21	1,105,101	54
1979	290,829	54	1,840,134	81
1980	375,056	44	1,500,225	61
1981	1,237,694	84	613,283	65
1982	636,789	100	181,591	71
1983	463,968	62	282,617	43
1984	563,659	82	235,979	65
1985	783,607	93	606,284	60
1986	249,183	57	301,785	34
1987	291,206	67	470,217	38
1988	426,531	55	250,803	39
1989	98,215	36	72,051	15
1990	10,495	18	18,433	10
1991 ^a		Season Closed		
Average	425,746	59	575,269	49

^a 1991 season not included in average.

Appendix G. Trawl shrimp catches from the Kachemak Bay trawl shrimp fishery in the Cook Inlet Management Area, 1969-1991.

SEASON	NUMBER OF VESSELS	CATCH (lbs)			
		JUN 1-OCT 31	NOV 1-MAR 31	APR 1-MAY 31	TOTAL
1969-70 ^a	7	1,289,656	1,692,854	889,330	3,871,840
1970-71 ^a	3	3,211,924	2,076,228	617,836	5,905,988
1971-72 ^a	7	2,618,630	1,761,569	140,707	4,520,906
1972-73 ^a	10	2,772,422	2,109,660		4,882,082
1973-74 ^b	13	2,502,154	2,323,780		4,825,934
1974-75	4	2,512,764	2,519,148		5,031,912
1975-76	4	1,997,563	2,421,456		4,419,019
1976-77	5	2,545,885	2,453,101		4,998,986
1977-78	7	2,490,969	2,546,977		5,037,946
1978-79	6	2,952,733	3,060,066		6,012,799
		JUL 1-SEP 30	OCT 1-DEC 31	JAN 1-MAR 31	
1979-80	7	2,013,298	2,052,646	1,731,483	5,797,427
1980-81	15	1,780,298	2,691,746	1,704,706	6,177,129
1981-82	23	1,614,868	1,686,781	1,693,850	4,995,499
1982-83	15	998,522	1,012,388	1,009,857	3,020,767
1983-84	10	CLOSED	CLOSED	525,508	525,508
1984-85	10	519,651	528,506	518,529	1,566,686
1985-86	5	488,606	257,782	503,340	1,249,728
1986-87	3	504,206	CLOSED	CLOSED	504,206
1987-88	0	CLOSED	CLOSED	CLOSED	0
1988-89	0	CLOSED	CLOSED	CLOSED	0
1989-90	0	CLOSED	CLOSED	CLOSED	0
1990-91	0	CLOSED	CLOSED	CLOSED	0
1991-92	0	CLOSED	CLOSED	CLOSED	0

^aCatches listed for comparative purposes by seasons established in 1973.

^bJune 1 - October 31 and November 1 - March 31 seasons with respective guidelines established.

Appendix H. Abundance estimates of commercial species of pandalid shrimp (millions of pounds) in the Southern District (Kachemak Bay), by sampling period and year, Southern District trawl shrimp survey, 1971-91.

MONTH	YEAR	MEAN CATCH (lbs/tow)	NUMBER OF STATIONS	% ERROR	ABUNDANCE INDEX (Mill. of lbs.)	RANGE (Mill. of lbs.)
<u>SPRING</u>						
May	1971	130.2 ^a	56	20.0	3.7	3.0 to 4.5
May	1972	271.1 ^a	66	35.5	7.7	5.0 to 10.5
May	1973	592.8 ^a	59	27.8	16.9	12.2 to 21.6
Jun	1974	476.6 ^a	30	22.8	13.6	10.5 to 15.7
May	1975	1,136.9 ^b	37	27.9	16.2	11.7 to 20.7
May	1976	541.3	36	28.3	7.7	5.5 to 9.9
Jun	1977	407.9	40	17.1	5.8	4.8 to 6.8
May	1978	810.9	36	25.2	11.5	8.6 to 14.5
May	1979	743.7	41	20.9	10.6	8.4 to 12.8
May	1980	513.7	39	19.5	7.3	5.9 to 8.7
May	1981	486.1	37	18.4	6.9	5.6 to 8.2
May	1982	306.8	38	21.8	4.4	3.4 to 5.3
May	1983	204.0	37	24.8	2.9	2.2 to 3.6
May	1984	282.3	34	34.2	4.1	3.0 to 5.2
May	1985	197.5	34	39.7	3.2	1.9 to 4.5
May	1986	157.2	34	50.9	2.6	1.3 to 4.0
May	1987	178.8	34	45.2	3.0	1.6 to 4.3
May	1988	247.5	33	45.0	4.1	2.3 to 6.0
May	1989	90.5	31	65.9	1.5	0.5 to 2.5
May	1990	106.5	33	87.1	1.7	0.2 to 3.2
<u>FALL</u>						
Oct	1976	719.8	33	21.6	10.3	8.0 to 12.5
Nov	1977	738.1	36	28.9	10.5	7.5 to 13.5
Oct	1978	1,160.3	32	25.5	16.5	12.3 to 20.7
Oct	1979	1,133.3	32	23.3	16.1	12.4 to 19.9
Oct	1980	1,689.4	37	19.3	24.1	19.4 to 28.7
Oct	1981	604.8	35	26.9	7.9	5.8 to 10.0
Oct	1982	519.2	36	26.3	7.4	5.4 to 9.3
Oct	1983	481.3	36	36.6	6.9	4.9 to 8.8
Oct	1984	531.9	35	26.3	7.6	6.1 to 9.1
Oct	1985	284.9	34	32.0	4.1	2.8 to 5.4
Sep	1986	154.0	34	37.9	2.6	1.6 to 3.6
Sep/Oct	1987	227.0	34	66.1	3.8	1.3 to 6.3
Nov	1988	152.3	28	64.8	2.5	0.9 to 4.2
Sep	1989	84.8	32	49.0	1.4	0.7 to 2.1
Sep/Oct	1990	80.3	34	54.5	1.3	0.6 to 2.1
	1991	C A N C E L L E D				

^a66' Nordby net, 50% assumed net efficiency.

^bFrom this survey to present, a 61' NMFS net with 100% assumed net efficiency has been used.

Appendix I. Trawl shrimp catches in Outer Cook Inlet (Area G),
Cook Inlet Management Area, 1977-92.

Season	Number of Vessels	Catch (lbs.)
1977-78	2	26,556
1978-79	1	1,245
1979-80	0	0
1980-81	1	4,000
1981-82	2	19,454
1982-83	4	239,584
1983-84	7	760,430
1984-85	11	1,957,959
1985-86 ^a	4	421,063
1986-87	2	297,762
1987-88	1	22,231
1988-89	1	4,878
1989-90	0	0
1990-91	0	0
1991-92	2	CONFIDENTIAL

^aRegulatory season of 1 June through 28 February adopted by the Alaska Board of Fisheries in spring, 1985.

Appendix J. Pot shrimp harvest in Area H, Cook Inlet Management Area, 1969-92.

Season	Catch (lbs.)		Total	Vessels				
	JUN 1 - SEP 30	OCT 1 - MAY 31						
1969-70								
1970-71	3,606	7,602	11,208					
1971-72	8,836	70,601	79,437					
1972-73	75,247	184,230	259,477					
1973-74	63,181	738,165	801,346					
1974-75	43,650	126,472	170,122					
1975-76	100,765	273,758	374,523					
1976-77	52,115	199,559	251,674	26				
1977-78	85,511	511,938	597,449	51				
1978-79	49,080	121,234	170,314	41				
1979-80	59,963	177,927	237,890	49				
	<u>JUN 1 - SEP 15 Vessels</u>	<u>NOV 1 - DEC 31 Vessels</u>	<u>FEB 1 - MAR 31 Vessels</u>					
1980-81	74,368	134,275	104,716	313,359	30			
1981-82	56,092	47,859	49,885	153,836	45			
1982-83	54,153	49,130	52,339	155,622	40			
1983-84	21,438	CLOSED	CLOSED	21,438	15			
1984-85	25,874	28,151 ^a	22,080	76,105	22			
	<u>JUN 1 - SEP 15 Vessels</u>	<u>OCT 1 - DEC 31 Vessels</u>	<u>FEB 1 - MAR 31 Vessels</u>					
1985-86	27,312	20,737	24,048 ^b	72,097	25			
1986-87	24,844	18	20,188	11	30,257	19	75,289	37
1987-88	26,216	26	5,416 ^c	8	CLOSED	31,632	30	
1988-89	5,323 ^d	9	CLOSED	CLOSED	CLOSED	5,323	9	
1989-90	CLOSED	CLOSED	CLOSED	CLOSED	0			
1990-91	CLOSED	CLOSED	CLOSED	CLOSED	0			
1991-92	CLOSED	CLOSED	CLOSED	CLOSED	0			

^aSeason extended through 1/31/85.

^bSeason extended through 4/5/86 due to eruptions of Augustine volcano and subsequent ash fallout.

^cSeason closed by E.O. on 11/13/87 due to low CPUE and high incidence of small shrimp.

^dSeason closed by E.O. on 6/22/88 due to limited amount of CPUE information and depressed stocks.

Appendix K. Pot shrimp catch and effort in Outer Cook Inlet
(Area G), Cook Inlet Management Area, 1977-91.

Season	Number of Vessels	Catch (lbs.)
1977	6	1,776
1978	11	10,157
1979	5	4,211
1980	3	2,911
1981	5	2,031
1982	7	2,805
1983	13	18,679
1984	5	5,504
1985	6	3,305
1986	4	2,967
1987	9	12,458
1988	7	13,445
1989 ^a	8	20,500
1990	5	8,853
1991	8	7,315

^aSeason closed from April 30 through July 7 due to Exxon Valdez oil spill.

Appendix L. Pacific weathervane scallop (Pecten caurinus) catches, Cook Inlet Management Area, 1983-91.

Year	District	Number of Vessels			Catch (lbs) of Shucked meats
1983	Kamishak	1			2,346
1984	Kamishak	3			6,305
1985 ^a	Kamishak	1			11,810
1986	Kamishak	3			15,364
1987	Outer	1			1,128
	<u>Kamishak</u> ^b	<u>2</u>			<u>360</u>
	'87 Total	2			1,488
1988	NO	EFFORT	IN	COOK	INLET
1989	NO	EFFORT	IN	COOK	INLET
1990	NO	EFFORT	IN	COOK	INLET
1991	NO	EFFORT	IN	COOK	INLET

^aSeason and harvest guideline set by regulation.

^bSeason closed by E.O. on August 21, 1987, one week after opening, due to low C.P.U.E.

Appendix M. Harvest of hardshell clams, Cook Inlet Management Area, 1986-91.

Year	No. of Permits	No. of Landings	Pacific Little necks	Butter Clams	Cockles	Total Pounds
1986	5	18	17,303	0	0	17,303
1987	8	69	12,214	206	2,347	14,767
1988	2	32	14,449	0	0	14,449
1989	9	41	2,584	13,675 ^a	3,581 ^b	19,840
1990	19	62	35,744	0	0	35,744
1991	19	78	47,586	85	0	47,571

^a Includes 13,348 pounds sold as otter food as a result of Exxon Valdez oil spill.

^b Includes 1,981 pounds sold as otter food as a result of Exxon Valdez oil spill.

Appendix N. Harvest of blue mussels (Mytilus edulis), Cook Inlet Management Area, 1986-91.

Year	No. of Permits	No. of Landings	Blue Mussel Total Pounds
1986	0	0	0
1987	1	2	102
1988	0	0	0
1989	9	98	167,243 ^a
1990	2	10	CONFIDENTIAL
1991	3	11	CONFIDENTIAL

^aIncludes 165,268 pounds sold as otter food as a result of Exxon Valdez oil spill.

Appendix O. Harvest of razor clams (*Siliqua patula*), Cook Inlet Management Area, 1919-1991.

Year	Pounds	Year	Pounds
1919	76,963	1955	0
1920	11,952	1956	0
1921	72,000	1957	0
1922	510,432	1958	0
1923	470,280	1959	0
1924	156,768	1960	372,872
1925	0	1961	277,830
1926	0	1962	195,650
1927	25,248	1963	0
1928	0	1964	0
1929	0	1965	0
1930	0	1966	0
1931	No record	1967	0
1932	93,840	1968	0
1933	No record	1969	0
1934	No record	1970	0
1935	No record	1971	14,755
1936	No record	1972	31,360
1937	8,328	1973	34,415
1938	No record	1974	0
1939	No record	1975	10,020
1940	No record	1976	0
1941	0	1977	1,762
1942	0	1978	45,931
1943	0	1979	144,358
1944	0	1980	140,240
1945	15,000	1981	441,949
1946	11,424	1982	460,639
1947	11,976	1983	269,618
1948	2,160	1984	261,742
1949	9,672	1985	319,034
1950	304,073	1986	258,632
1951	112,320	1987	312,349
1952	0	1988	392,610
1953	0	1989	222,747
1954	0	1990	323,533
		1991	201,320

Appendix P. Octopus (Octopus dofleini) harvests in the Cook Inlet Management Area (H) 1983-91.

Year	No. of Vessels	No. of Landings	Total Pounds
1983	41	101	32,841 ^a
1984	36	77	46,698 ^a
1985	40	70	48,067 ^a
1986	8	16	435
1987	21	57	4,512
1988	17	43	5,569
1989	N O R E P O R T E D L A N D I N G S		
1990	C O N F I D E N T I A L		
1991	8	21	2,088

^a Catches from bycatch of shellfish pot fisheries.

Appendix Q. Green sea urchin (Strongylocentrotus droebachiensis) harvest, Cook Inlet Management Area, 1987-91.

Year	No. of Permits	Total Pounds
1987	1	224
1988	N O	E F F O R T
1989 ^a	1	15,181
1990	N O	E F F O R T
1991 ^b	4	20,445

^aSeason extended from June 1989 through February 1990 (normal season September 15 through December 15).

^bSeason extended to January 31, 1992.