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ALASKA DEPARTMENT OF FISH AND GAME  
DIVISION OF COMMERCIAL FISHERIES

COOK INLET AREA  
ANNUAL SHELLFISH MANAGEMENT REPORT

1993-94



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<sup>1</sup>Contribution from the Homer area office. The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Division of Commercial Fisheries Management & Development.

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## INTRODUCTION

The Cook Inlet Management Area, Statistical Area H, is bounded on the east by the longitude of Cape Fairfield ( $148^{\circ} 50'$  W. long.) and on the south by 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, Outer Cook Inlet, Statistical Area G, has been established specifically for the trawl and pot shrimp fisheries in the Outer and Eastern Districts (Figure 2). Area G has its eastern boundary at the longitude of Cape Fairfield and western boundary at 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.

This report covers the most recent shellfish fisheries in Cook Inlet: 1994 Tanner crab (Chionoecetes bairdi), 1993 razor clam (Siliqua patula), hardshell clams, octopus (Octopus dofleini), 1993-94 green sea urchins (Stronglyocentrotus droebachiensis), 1993 scallops (Patinopecten caurinus), 1993-94 sea cucumbers (Parasitichopus californicus), and the 1993-94 Area G trawl and pot shrimp fisheries. The 1993 seasons for red king crab (Paralithodes camtschaticus), and the 1993-94 Area H trawl and pot shrimp fisheries were closed due to low stock conditions. The catch data from the 1993 Dungeness crab (Cancer magister), blue mussels (Mytilus edulis), and Area G trawl shrimp fisheries are confidential. This is due to department policy making catch information confidential when the catch is taken by two or less fishermen. The Southern District, which has yielded virtually all of the historic commercial Dungeness harvest, remained closed in 1993. A summary of the king crab, Dungeness crab, 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 284,676 pounds of Tanner crab, 310,000 pounds of razor clams, 63,676 pounds of hardshell clams, 195,403 pounds of green urchins, 32,005 pounds of sea cucumbers, 20,115 pounds of scallops and 1,292 pounds of octopus. Area G pot shrimp harvest was 8,356 pounds. Area G trawl shrimp harvest, Cook Inlet Dungeness and blue mussels are confidential because two or less fishermen participated in the respective fisheries.

The approximate exvessel value by species was \$612,000 for Tanner crabs, \$155,000 for razor clams, \$1,300 for octopus, \$127,000 for hardshell clams (including mussels), \$225,000 for green urchins, \$32,000 for sea cucumbers, \$120,000 for scallops, \$500,000 for trawl shrimp, \$33,000 for pot shrimp, and \$20,000 for Dungeness. Total estimated exvessel value of all shellfish species for the Cook Inlet Management Area for the 1993-94 seasons was approximately \$1.83 million.

## TANNER CRAB FISHERY

### Introduction

Tanner crab fishing has occurred in six of the districts in 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 285,000 pounds in 1994 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 65. 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 136 boats fishing during the 1993 season and 110 boats in both the 1992 and 1994 seasons (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 through 1994 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 (Statistical

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 both the bays and the open ocean. Poor weather conditions impact all of the boats because 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.

The crab stock in the Outer and Eastern Districts 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, and 1993 through 1994 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. The opening was December 1 from 1974 to 1983. The season for 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 tagged Tanner crabs for a number of 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 40 pot limit in the Southern District if the guideline harvest level is less than 800,000 pounds. A 75 pot limit if it is more.
- 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.

## 1994 Season Summary

Only the Southern District was opened to commercial fishing in 1994. The total catch in the Southern District was 284,676 pounds taken by 110 vessels. Due to continued low stock abundance the Kamishak Bay, Barren Islands, Central, Outer and Eastern Districts were not opened.

### Southern District

The 1993 department Tanner crab trawl survey in the Southern District indicated that recruitment and fishery survival justified a guideline harvest level of 275,000 pounds for the 1994 season. This figure represented an estimated fishing mortality of 20 to 30 percent of the legal segment of the stock at the time of the survey. Actual fishing mortality at the time of the fishery was likely higher because natural mortality of the older crabs could have been substantial in the 6 month period between the survey and the fishery. The department survey indicated that 46 percent of the legal crabs were postrecruits.

The Southern District fishery is a short term and intense characterized by a large number of boats fishing for a limited number of crabs in a relatively small area; the department therefore cannot rely on in-season fishery data such as catch per unit of effort to manage the fishery. It takes too long to collect these data and subsequently implement a closure without running a severe risk of overharvest. To remedy this situation the department sets the length of the season three days before the opening date. The ultimate fleet composition is estimated based on the vessels registered by this time. This information is then used in conjunction with historical catch per unit of effort data to determine how long it will take to harvest the quota. The resultant time is subsequently utilized as a season length.

By January 12, 1994, 87 vessels had registered for the fishery. The department estimated that another 20 percent would register between January 13 and noon January 15, which is the registration deadline. Therefore the estimated effort for the fishery was approximately 104 boats. These effort data indicated that the 275,000 pound quota could be taken in a 12 hour period.

Management of the 1994 Southern District fishery was somewhat complicated by a strike by fishermen due to a failure to negotiate a price with processors. Initially the department managed the fishery based on weather conditions and resultant crab survival. Based on weather, the fishery was scheduled to open by emergency order at 0900 hours January 15, 1994. The public was informed that if the weather did not justify a fishery and the industry had not settled on a price, the next possible opening would have been 3 days later, January 18, weather permitting. The 3 day delay was a direct result of fishery management costs to both the Departments of Fish and Game, and Public Safety (Fish and Wildlife Protection Officers). Fiscal restraints mandated careful expenditure of available funds, i.e., money could not be wasted on deployment of the department's vessel Pandalus with a crew of four, including protection officers, if the fishermen were not going to fish.

The season did not open on either January 15 or 16 due to weather. Weather conditions improved significantly by January 17; the fishery therefore was opened at 0900 hours January 17 for a period of 12 hours. The department made the following announcement to the industry regarding the fishery and price negotiations:

- 1) *If anyone fishes during the open season, the fishery will remain closed for one day after the initial 12 hour period and then reopen again provided weather conditions permit and sufficient crabs remain on the quota to avoid overharvest.*

2) *If no one participates in the fishery, the season will remain closed for two days after the initial 12 hour period unless the industry informs the department that a price settlement has been reached. The fishery will likely open within 24 hours of an announcement of an agreement, weather permitting.*

No one fished during the open period due to price disparity between fishermen and processors. The next possible opening therefore was 0900 hours January 20 unless a price settlement occurred before that time.

A price agreement was reached prior to January 20; however, the department, in response to a joint crab industry request, delayed the opening of the fishery until January 21. There was no industry objection to the delay.

Weather conditions on January 21 were conducive to survival of bycatch crabs, therefore the fishery was opened by emergency order at 0900 hours January 21. The forecasted weather was variable winds to 15 knots increasing to variable 20 in the outlook, and temperatures around freezing. The actual temperature and winds at the Homer Harbormaster's prior to the announcement to open the fishery were winds east southeast to 5 knots and temperature at 0.0 C (32 F).

The season closed by emergency order at 2100 January 21. Of the total 111 registrants, 110 vessels fished and made deliveries. Total catch was 284,676 pounds. Deadloss accounted for only 14 pounds of the total. Overall catch per unit of effort was 19.4 legal crabs per pot. During the open period the 110 vessels made 5,686 pot lifts which means that each vessel pulled their 40 pots an average of 1.4 times during the 24 hour opening (Table 2). Only 4,131 individual pots were deployed during the fishery because 18 vessels did not fish a full complement of gear. One of the vessels

reporting catch may not have been used to fish. If, after investigation, this is proven to be true, the actual number of participating boats will be 109.

True recruits accounted for 53 percent of the catch. Postrecruits in the recruit size class (skipmolts) made up 32 percent of the catch and the remaining 14 percent were postrecruits by virtue of both size and age (Figure 4). The average weight was 2.58 pounds per crab (Appendix B) and the average width was 153 mm (6.0 inches).

The majority of the crabs (94%) were purchased by two major processors, Icicle and Cook Inlet Processors, and deliveries were made both to the communities of Seldovia and Homer. Four small processors and seven catcher/sellers accounted for the remaining crabs.

Sixty four (58%) of the boats were dry and 46 (42%) were tanked. Eighty (73 %) of the fishermen were from the Homer/Anchor Pt. area; 8 were from Seldovia; 1 from Seward and the remaining 21 were mostly from Kenai Peninsula communities ranging from Ninilchik to Anchorage. A single fisherman was from North Pole. None were from Kodiak.

#### 1995 Season Management Outlook

The Department will conduct a trawl survey for Tanner crabs during 1994 in the Southern, Kamishak Bay and Barren Islands Districts. The results of this survey will determine the status of the 1995 seasons in the respective districts.

The number of prerecruit ones caught in the 1993 trawl survey in the Southern District indicates that 1994 recruitment will be poor (Figure 5). It likely will be below the level of the past 4 years.

It is difficult to be more precise about the 1994 recruitment because the level of skipmolting cannot be predicted prior to the molt. If a significant percentage of the prerecruit ones fail to molt (skipmolt), and natural mortality of the existing legal animals is anything but minimal, the probability of a commercial season in 1995 is small. Even with minimal skipmolting and natural mortality, the guideline for the 1995 fishery will be in the 250,000 to 300,000 pound range. The fishery would once again be characterized by large crabs and postrecruits. Unless there is a total price collapse, vessel effort will remain high and the subsequent season length will therefore be in the 12 hour range.

The true prerecruit ones found by the 1993 trawl survey did not indicate that any near term recovery is likely for the stock in the Kamishak and Barren Islands Districts. Furthermore the trawl surveys conducted by the Kodiak office indicate that the stock condition south of the Cape Douglas management area dividing line is equally depressed.

A negative characteristic of the stock of Tanners in the Kamsishak/Barren Islands Districts is skipmolting in the prerecruit one size class. It appears that once these animals skip a molt, the likelihood of them molting again is very small. Therefore the documented buildup of old shell (skipmolt) crabs will not produce any future recruitment into the fishery, but will instead remain as sublegals until succumbing to natural mortality (Figure 6 and Appendix C).

Although the Department does not survey the stocks in the Outer, Eastern and Central Districts, there is no reason to expect a miraculous recovery. Surveys in the remainder of Cook Inlet, as well as adjacent management areas, Prince Williams Sound and Kodiak, will continue to be utilized to determine conditions of the stocks in the Outer, Eastern and Central Districts.

In summation, there is a limited chance of a small fishery in the Southern District in 1995. Survey and commercial catch data also indicate a very limited probability of a fishery in the remaining districts. All 1994 Department surveys from Cook Inlet and adjacent areas will be reviewed prior to final determination of the 1995 season.

## KING CRAB FISHERY

### Introduction

There are two species of king crabs 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. In 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 7 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 crabs 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.

### 1993 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 1993 department trawl survey continued to identify a small group of post recruit males. These animals are a function of survival of successive weak year classes that have been subjected to little fishing mortality.

#### 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 1993.

The 1993 trawl survey catch of king crabs indicated a depressed stock. Similar to the Southern District, the stock of king crabs in the Kamishak/Barren Islands Districts was characterized by weak recruitment and continued small increases in the post recruit segment of the stock, which is a function of good survival due to no fishing mortality.

#### Outer and Eastern Districts

Brown king crabs have never been found in high concentrations in the Outer and Eastern Districts. Regulatory fishing for brown king crabs 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.

## 1994 SEASON MANAGEMENT OUTLOOK

### Southern District

The department will conduct its annual Southern District king and Tanner crab trawl survey in July of 1994. 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 in 1994. The Department will conduct the 1994 trawl survey in mid June.

There will be no further effort to justify an eight inch king crab season as provided for by regulation because 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 which is critical to the stock rebuilding process.

## DUNGENESS CRAB FISHERY

### Introduction

The majority of the commercial, sport and personal use Dungeness crab (Cancer magister) fishing in Cook Inlet has occurred in the Southern District which includes Kachemak Bay (Figure 1). A small amount of crabs have been harvested in the Central and Kamishak Districts. 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 opportune market conditions created by fluctuation in the catches from the west coast Dungeness crab fisheries.

Although low level, sporadic effort has occurred since statehood, catch and effort first 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 has been closed in the Southern District from 1991 through 1993 due to low overall abundance. The average annual harvest for the entire management area since 1978 was 1.01 million pounds (Figure 8). Effort has ranged from one vessel in 1993 to 108 vessels in 1982 (Appendix E). After 1978, 92 percent of the crabs were harvested between the months of June and October (Figure 9), and 59 percent of the annual harvest was taken from the waters east of Homer Spit; however the proportion changed considerably on an annual basis, which was a result of varying recruitment between the waters east and west of the Spit (Appendix F).

Ninety percent or more of the Dungeness fleet were residents of Kachemak Bay communities of Homer and Seldovia. The fishing vessels were in the 40 foot and less size class. Smaller vessels without circulating tanks generally fished the waters east of Homer Spit while larger vessels with circulating tanks fished the deeper somewhat rougher waters west of the Spit.

Current regulations that are specific to the Cook Inlet Management Area are:

- 1) For the Southern District a two part regulatory season which opens the waters east of Homer Spit by emergency order on or after June 1 and closes no later than November 1, and opens the waters 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.

Statewide biological regulations for the commercial Dungeness fisheries consist of a males only harvest and a minimum legal size of 6.5 inches carapace width. Gear regulations include a provision for two 4 3/8 inch escape rings per pot and a biodegradable twine escape mechanism requirement.

The Cook Inlet Dungeness fishery has evolved into a summer event 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.
- 4) Recruitment (the molt) occurs.

Historically some level of fishing has occurred throughout the year. Catch and effort, however, increase significantly after the major molt, which provides new recruit crabs. The period of significant molting for adult males in Kachemak Bay can occur from late April through mid-September in any given year although the peak months are June and July. The molt is stimulated by water temperature and physiological condition of the crabs. 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.

Outside of natural population fluctuations, three fishing related factors have had a notable negative impact on this fishery:

- 1) Depression of the stock due to handling and trapping mortality that was the result of fishing during and immediately after the molting period.

- 2) Extremely high effort due to ease of access by both commercial and recreational fishermen.
- 3) Violation of the 150 pot limit by a portion of the fleet.

Bycatch mortality of Dungeness crabs during the China Poot Bay salmon seine fishery has also been of concern to the public including the 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 consensus 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 within China Poot Bay during the commercial seine season. This prohibition will eliminate a historical gear conflict.

The combination of extended heavy fishing pressure, and fishing during and immediately after the major molting period for adult males has played the most 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 accelerated not only in amount of vessels and pots, but also in the amount of time each year that the gear was deployed.

In 1990 the department began a survey to further document the molt timing of the catchable Dungeness crabs and to establish an index of abundance. This survey in tandem with the crab trawl survey

indicated one or two significant year classes moving toward the fishery (Figure 10). Although these animals appear numerous, particularly when compared to the surrounding weak year classes, the following must be weighed when considering the magnitude of this group of crabs: 1) the crabs were only located in the portion of Kachemak Bay east of Homer Spit, and 2) they exhibited an extremely high level (approximately 50 %) of skipmolting in 1992 and 1993, the years when they should have fully recruited into the fishery and provided significant numbers of both recruits and postrecruits available for harvest.

Considering the aforementioned two points and the absence of any other significant catchable year classes, the stock remains in a condition that will not tolerate a high level of fishing mortality given that a substantial degree of reproductive success is necessary to take full advantage of this relatively large group of adult crabs in the upper portion of Kachemak Bay.

#### 1993 Season Summary

The commercial fishery was not opened in the Southern District (Kachemak Bay) in 1993 due to: 1) a relatively low number of legal males particularly in the area west of Homer Spit, and 2) the necessity to protect the remaining non-legal catchable crabs in the district from handling and trapping mortality.

Limited entry was adopted into the Cook Inlet Management Area Commercial Dungeness Fishery in 1993. The limit was set at 103 pot fishermen and two ring net fishermen. Limiting entry to this large number of participants will be of no in-season management value.

## 1994 Management Outlook

The department will begin the 1994 Dungeness pot survey in late May 1993. The survey will be conducted on at least a monthly basis. If this survey, in association with the crab trawl survey, indicates that both a high level of the skipmolt crabs have molted resulting in substantial recruitment into both the recruit and post-recruit size classes, and that another substantial year class has recruited into the adult population both east and west of Homer Spit, then a limited commercial fishery may take place. In the meantime the commercial fishery will remain closed until department surveys signify that the aforementioned growth and recruitment have occurred.

If a fishery is warranted, it will be based on March, 1994 Board of Fisheries action on regulatory proposals and the following factors: 1) the timing of the molt and subsequent soft-shell period, 2) substantial recruitment, and 3) the presence of another size class of adults to replace those that may be harvested in a fishery.

The presence of another size class of adult males is important during this era of depressed stocks because one of the management goals, other than precluding the trapping and handling soft-shell crabs, is to rebuild these weak year classes by maximizing the reproductive potential of the strong year classes. If no additional adults are identified by the 1994 stock assessment, other than the ones documented in previous surveys, then permitting a commercial fishery will result in an excess harvest of the males which may cause females in the same cohort to go unfertilized thereby failing to maximize the reproductive potential of these animals.

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

because the large males are harvested by the fishery. If barren females occur in large numbers, the eventual weak recruitment will result in a continuation of 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 the major portion of the adult Cook Inlet Dungeness population at this point in time.

The commercial season in the remaining districts of the management area will be open in 1994. The only district likely to see any effort is the Central District which is in central Cook Inlet north of the Southern District. 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.

#### **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).

All of the commercial trawl shrimp fisheries in Area H have occurred in the Southern District. Harvests reached the five million pound level in the late 1960's and remained near that point through the early 1980's (Figure 11 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 fishing occurred west of

Homer Spit, but between 1983 and 1986 virtually all effort shifted to the area east of Homer Spit. The fishery has been closed from 1986 through 1993.

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

Also, two areas are closed to trawl shrimp fishing: 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.

Pink shrimp (Pandalus borealis) historically made up the bulk of the commercial harvest, with sidestripes (Pandalopsis dispar) seasonally making up a smaller 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; 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. 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 12). These declines led to the aforementioned commercial closures from 1986 to 1993.

#### **1993-94 Season Summary**

The fishery remained closed for the 1993-94 season based on the results of the 1993 department trawl shrimp survey. The 120,000 pound population estimate generated by the survey documented the smallest population of pandalid shrimp since the inception of the survey (Figure 12). To put these survey data into perspective: the commercial fishery averaged over five million pounds annual harvest during its peak, the 1993 population estimate of 120,000 pounds is two percent of that peak. Despite some shift in size composition and distribution, all information collected during this survey indicated that the stocks remained depressed by historical standards. The commercial fishery was therefore closed for the entire 1993-94 season.

#### **1994-95 Management Outlook**

The department will not conduct the Southern District trawl shrimp survey in 1994. Data from the 1993 survey conclusively indicated that there was no chance for a stock recovery that would produce a harvestable surplus therefore justifying a commercial fishery. The trawl survey will occur again in 1995.

## 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). The first year of significant harvest occurred in the 1982-83 season when four vessels caught 239,584 pounds (Figure 13 and Appendix H). 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. Before 1992, pink shrimp comprised 90 percent of the harvests; the remaining 10 percent was sidestripes. In 1992 and 1993 the catch was comprised entirely of sidestripes as the vessels targeted on these more valuable animals.

Prior to 1985, the season for shrimp trawling in Area G was open year-round. A regulatory season, beginning June 1 and ending February 28, was adopted by the Board for Area G in the spring of 1985.

Although surveys were not conducted in Area G, fishery performance data indicated that the stocks were not characterized by a dense distribution. Even in the very early years of this fishery, trawl catch per unit of effort 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.

### 1993-94 Season Summary

The Area G season opened by regulation on June 1, 1993 and closed by emergency order in two parts: Eastern District closed on September 20, 1993, and the Outer District closed on November 16, 1993. Because there were two vessels, Alaska statute requires that catch information remain confidential. The entire catch was sidestripe shrimp.

In order to avoid overfishing of the sidestripe shrimp stock, the department set a quota for each district which was equal to the estimated sidestripe bycatch from the directed pink shrimp fishery that occurred in Area G during the mid 1980's. These quotas were 100,000 pounds of whole sidestripes per district. En route to the quota the department collected logbooks, fisherman interviews and catch samples. Catch per unit of effort data did not decline over the course of the fishery. Furthermore, shrimp samples indicated that the stock was composed of substantial percentages of both adult sexes. The fishery was therefore permitted to proceed to the preseason quotas.

### 1994-95 Management Outlook

Initial guideline harvest levels for the 1994-95 season will be set at last year's level of 100,000 pounds per district, or 200,000 pounds for Area G. The department plans to implement the first Area G trawl shrimp survey in June 1994. If this survey appears to be successful, it will be expanded into Prince William Sound where it will also be used to assess the sidestripe shrimp stock. Data from this survey may be used in setting the ultimate fishery guidelines for the 1994-95 fishery. Fishery performance and dockside samples will again be significant factors in determining the status of the stock.

## AREA H POT SHRIMP FISHERY

### Introduction

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

Commercial catch figures show that the fishery suffered steep declines in annual harvest until the closure in 1988 (Figure 14 and Appendix I). Pot shrimp fishing in Kachemak Bay was 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 began June 1 and ended March 31, was 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. The department trawl surveys and information from local personal use fishermen continued to indicate that stock of coonstripe shrimp in Kachemak Bay was depressed. The fishery has been closed to commercial harvest since 1988.

### 1993-94 Season Summary

To determine the status of the coonstripe shrimp stock the department relies on data obtained from the trawl shrimp surveys and voluntary information from personal use fishermen. For the fourth successive year results from the spring trawl survey indicated a population estimate of less than 20,000 pounds of coonstripe shrimp for Kachemak Bay. These results showed a depressed stock when compared to historical catches that generated population estimates up to 1.0 million pounds. 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 1993-94 season.

### 1994-95 Management Outlook

All information collected during 1993 indicated that stocks of pandalid shrimp continue to be depressed in Kachemak Bay. The fishery will remain closed for the entire 1994-95 fishing season in order to facilitate growth, recruitment and reproduction in the coonstripe shrimp stock.

## AREA G POT SHRIMP FISHERY

### Introduction

Similar to the trawl shrimp fishery, Area G, or Outer Cook Inlet, includes the Outer and Eastern Districts (Figure 2). Currently there are neither season restrictions nor biological regulations governing the pot shrimp fishery. The target species is the spot shrimp; coonstripes and pinks are harvested to a lesser extent. Spot shrimp have comprised 57 to 94 percent of the catch averaging 83 percent. Since 1977, catch and effort have remained low, never exceeding a reported annual harvest of 20,500 pounds whole shrimp caught by 8 participating vessels in 1989 (Figure 15 and Appendix J). Despite the extensive coastal area, historical information collected from this fishery indicates that the measurable stocks of spot and coonstripe shrimp occur within some (but not all) bays and are of limited abundance.

### 1993 Season Summary

The commercial season was open by regulation for the entire 1993 calendar year. The total catch was 8,356 pounds taken by three fishermen. Catch by species was: spots - 6,058 pounds (72%), coonstripe - 2,142 pounds (26%), and pinks - 156 pounds (2%). Fishing occurred from April into December. The bulk of the harvest was landed in Seward and served Kenai Peninsula markets. Because no more than two vessels fished in each district, Alaska statute requires that district catch information remains confidential.

## 1994 Management Outlook

Fish ticket and voluntary fisherman interview information are the only sources of data used to evaluate the Area G pot shrimp fishery. The information collected during 1993 gave no indication to expect either an increase in harvest or effort in the near future.

### SCALLOP FISHERY

#### Introduction

The commercial scallop fishery in the Cook Inlet Management Area (H) began in 1983. The target species of the fishery is the Pacific weathervane scallop. The Alaska Board of Fisheries responded to a public proposal by directing the department to allow restricted exploratory fisheries for scallops 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.

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 almost the entire harvest since the fishery began in 1983 (Figure 1). Using the state research vessel Pandalus, the department conducted an assessment survey in August, 1984 to 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. Commercial fishery performance has been used inseason to adjust guideline harvest levels. Harvest and effort peaked fishery during 1993 when 3 vessels took 20,115 pounds of shucked meats (Figure 16 and Appendix K).

By regulation the Southern District has remained closed to scallop fishing in order to protect crab stocks, while the Outer and Eastern Districts were opened year round to encourage exploratory fishing.

In 1987 review of inseason fishery performance data clearly demonstrated that the Kamishak District stock had taken an unexpected decline. Substantial undocumented information indicated that the Kamishak scallop bed had been fished illegally between the 1986 and 1987 season. Regardless of the reason for the sharp decline in abundance, the department closed the fishery for the remainder of the 1987 season.

Although the season was open, no commercial effort occurred in Cook Inlet from 1988 through 1992. Some local fishermen expressed interest in fishing during these years, however the potential of a fishery closure after one trip did not warrant the investment in time and effort because the department told fishermen that their catch data would be used to justify continuance of the fishery. Fishermen speculated that the probability of good catches were low. Information required of the fishermen would have included logbooks, shell samples, interviews, and a potential for observers.

### 1993 Season Summary

Scallop regulations adopted in 1985 remained in effect through 1993 with the exception of the guideline harvest range in the Kamishak District which was reduced to a range of 0 to 20,000 pounds from the previous level of 10,000 to 20,000 pounds. The department intended to closely monitor fishery performance within this district in order to justify continued fishing or closure of the fishery.

Three vessels registered for the 1993 Kamishak District fishery. These were the first boats to register for this fishery since 1987. The first vessel began fishing shortly after the season opened by regulation on August 15. The remaining two vessels began fishing in early September. The fishery closed by emergency order on September 23 with a final harvest of 20,115 pounds of scallop meats taken by three boats that made 15 deliveries. The entire catch was delivered to Homer for fresh market sales.

The department monitored the fishery via mandatory logbooks, shell samples, skipper interviews and a trip by a staff biologist aboard one of the vessels. Interviews occurred at the end of each trip. Catch per unit of effort data (cpue) and shell samples indicated that this stock of scallops compared favorably to the density and

distribution of the stock prior to decline in 1987, which was due to illegal fishing. Pounds per hour towed from the single six foot dredge vessels averaged 33.3 for the month of August and 38.8 for September. Overall cpue of 38.1 pounds per hour towed compared favorably to the 1985 and 1986 cpue of 39.5 and 36.2 pounds per hour, respectively. Shell sampling indicated that approximately 40 percent of the harvest was composed of two major age classes with significant contribution (25 percent) from two others (Figure 17). Analysis of shells representing the unsorted catches indicated smaller animals were present in significant numbers, but were sorted out of the catch by the fishermen because the size of the meats was too small for their markets.

Crab bycatch limits were set at 15,900 Tanners and 40 king crabs. These limits were a function of one half of one percent of the 1993 population estimate which was based on the 1993 department trawl survey. Actual bycatch from the 1993 Kamishak District fishery was 1,802 Tanner, 18 kings and one Dungeness crab. Bycatch data collected directly by the department observer verified the logbook bycatch documentation from trips where no observer was present. These bycatch data were also very similar to that from the Kamishak scallop fisheries in the mid 1980's.

Although scallop fishing was on an upswing in the Gulf of Alaska in general, no scallopers requested permits in 1993 to fish the open waters of the Gulf of Alaska portion of the Cook Inlet Management Area which essentially includes the area between Cape Fairfield and Cape Douglas. Only one documented landing from this area has occurred: in 1987 a single vessel delivered 1,128 pounds of scallops from the Outer District. Likely these waters had been further explored in prior years with negative results.

## 1994 Management Outlook

Given Board of Fisheries approval, the department will follow the same management strategy in 1994 that was utilized in 1993. The department will monitor the fishery via mandatory logbooks, shell samples, skipper interviews and if necessary a trip by a staff biologist aboard one of the vessels.

The probable strength of the market for scallops coupled with the apparent abundance, size and age distribution of the animals remaining on the Kamishak District scallop bed, signify that the 1994 fishery may achieve the 20,000 pound upper limit of the guideline again. Although a population estimate cannot be generated at this point for the Kamishak scallop bed, other indicators of abundance such as the stable 1993 catch per unit of effort and the presence of a size class of small scallops indicate a small, but healthy stock available for the 1994 fishery.

Although the fishery in outer Cook Inlet remains open on a year round basis, significant effort is not likely to occur because minimal historical catch indicates that scallop abundance is low. As of February 9, 1994, two scallop vessels have made exploratory trips into outer Cook Inlet. No scallops were caught and retained for market, although a few were taken by one boat and subsequently discarded.

## **HARDSHELL CLAMS AND MUSSELS**

### Introduction

Commercial hardshell clam and mussel harvests in the Cook Inlet Management Area began in 1986. Some level of harvest occurred prior to statehood, but specific catch data are not available. The

generic term, hardshell clams, generally refers to littleneck (Protothaca staminea) and butter clams (Saxidomus giganteus). From 1986 through 1993, the annual harvest of hardshell clams has ranged from 14,500 pounds to 63,676 pounds. In 1989 the bulk of the clam harvest went to sea otter food for a rehabilitation project resulting from the Exxon Valdez oil spill. In the remaining years the majority of the harvest was Pacific littleneck clams that went to Kenai Peninsula and Anchorage markets. Effort has ranged from 2 to 33 hand diggers (Figure 18 and Appendix L). The entire documented commercial harvest has come from Kachemak Bay (Figure 1).

Before harvesting clams or mussels for human consumption, an area must be certified for water quality by the Alaska Department of Environmental Conservation (DEC) in accordance with the National Shellfish Sanitation Program. DEC must also check for paralytic shellfish poisoning (PSP). Lot sampling is the method that DEC utilizes to check for PSP. In 1986 DEC 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 Kachemak Bay, were certified for lot sampling. At the end of 1989 Tutka Bay was also certified by DEC (Figure 19).

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

Currently there are neither closed season nor closed area regulations for harvesting hardshell clams with forks and shovels. A Commissioner's permit is required to use hydraulic diggers. Minimum sizes were established by the Alaska Board of Fisheries in the spring of 1990 for Pacific little neck clams at 1.5 inches and

butter clams at 2.5 inches. Market conditions seem to be the dominant factor affecting the harvest of clams and mussels in Cook Inlet, although this should not be interpreted as indicating that a large abundance of clams are available for harvest.

The department began a hardshell clam assessment program on two beaches in Jakalof Bay during 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 both commercial and personal use harvesting. It soon became apparent that population assessment of littleneck clams was too time consuming if the data were to be representative of Jakalof Bay. Subsequently the department began a limited test dig program at Chugachik Island which is characterized by a single significant clam beach therefore simplifying the population assessment.

#### 1993 Season Summary

Total 1993 hardshell clam harvest was 63,621 pounds hand-dug by 32 permit holders. Littlenecks comprised 100% of the hardshell catch (Table 3). Harvesting occurred in every month except January when there was no catch and February when only one harvester dug clams. Although the remainder of the monthly catch was spread across the year, 57 percent of the total harvest came from the four month period of April through July. Chugachik Island provided 70 percent of the catch. Tutka and Jakalof Bays accounted for 9 and 20 percent of the harvest, respectively.

Blue mussel harvest for 1993 totalled 1,083 pounds taken by two diggers. The entire catch came from the Tutka, Jakalof and Kasitsna Bay area.

## 1994 Management Outlook

Board of Fisheries action on clam proposals, DEC beach certification, and clam abundance will all play a role in determining the 1994 Cook Inlet hardshell clam harvest.

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 fishery dependence on recruitment into the legal segment of the stock. The department population estimate for legal clams on the Chugachik beach has declined from an estimate of 250,000 pounds in July of 1992 to 166,000 pounds in May of 1993. If fishing pressure and subsequently harvest rates continue to increase, the fishery may be dependant on annual recruitment, an event that can be highly variable for mollusks in Alaska.

Furthermore, the recreational user is becoming increasingly concerned about the escalation of commercial utilization of the littleneck clams and to a lesser extent the blue mussel resource. Not only is the recreational clam harvester interested in development in the commercial fishery, the public utilizing Kachemak Bay State Park are also worried about a decrease in the quality of their recreational opportunity.

In response to these concerns the staff has submitted proposals to the Board of Fisheries which serve as the basis of the department's management strategy for the hardshell clam fishery. First, DEC must certify additional beaches for commercial harvest. Thereafter, the key to the management plan is an alternate year commercial harvest strategy which opens half of the certified beaches on one year, and the other half during the following year. Other features of the plan will include the following commercial restrictions:

- 1) areas of high recreational value will be closed,
- 2) ~~weekends~~ weekends will be closed from May 15 through September 15, and
- 3) a registration deadline of April 1.

If the aforementioned parts of the management strategy area adopted it will serve to spread the catch and effort over a larger area, allow for a year of unfished growth and recruitment, provide noninvasive recreational opportunity, and permit the department to anticipate effort.

The plan also includes two options for the Board to consider which affect the recreational users:

- 1) a minimum legal size for littleneck and butter clams of 1.5 and 2.5 inches, respectively (both of these are the same as the commercial size limits), and
- 2) a bag and possession limit of 1,000 littleneck clams and 700 butter clams.

These recreational fishery proposals will reduce waste of the resource, aid in maintenance of the reproductive segment of the stock, and most importantly allow for enforcement of commercial closures.

Fundamental to this plan is the expansion of the fishery, via additional certified areas. If the Board does not permit expansion, particularly into the likely productive beaches encompassed by Kachemak Bay State Park, then the department will severely restrict harvest on the remaining certified beaches in order to sustain a small commercial fishery. These restrictions may include:

- 1) A harvest quota for the remaining certified beaches based on the department's population estimate (Chugachik) and historical catch (Jakalof). A very negative aspect of a restrictive quota is the likelihood of underreported catch.
- 2) Monthly open periods which will include only the first 15 days of the month. This will allow for harvesting through one low tide cycle. This option, possibly in tandem with some total monthly closures, is the preferred option because it provides a small, but steady flow of clams to market, and does not motivate under or nonreporting of catch.
- 3) Establish an April 1 registration deadline which will allow the department to anticipate effort and plan additional restrictive management actions if necessary.
- 4) Continue to assess populations where possible and monitor cpue on a monthly basis. If meaningful declines are identified by either of these tools, then the fishery may be closed for the year.
- 5) Opening the remaining certified areas, Chugachik and Jakalof, on an every other year cycle is not a viable option because Jakalof would not meet minimal market demands by itself. Furthermore Jakalof provides harvesting opportunity for diggers from Seldovia who do not have access to substantial boats that will allow transportation to Chugachik.

The above mentioned alternate strategies will be further developed with public and advisory committee input.

## SEA URCHINS

### Introduction

The green sea urchin (Strongylocentrotus droebachiensis), the smallest of the commercial urchins, is the only urchin species in Cook Inlet which occurs in quantities sufficient to support a commercial fishery. Green urchins, and commercial fisheries for them, occur along the U.S. and Canadian coasts including the Province of British Columbia, the Maritime Provinces of Eastern Canada and the States of Maine and Alaska. Fisheries also occur in the north temperate and subarctic waters of Europe including the Soviet Union. Green urchins are harvested solely for their gonads, considered a delicacy in the Orient.

Although red urchins (Strongylocentrotus franciscanus) do occur in small, isolated beds within the Cook Inlet Management Area, their sparse abundance and distribution does not justify a commercial fishery; therefore, no permits are issued.

No commercial harvest for green urchins occurred in Cook Inlet prior to 1987. From 1988 to 1992 the harvest has ranged from 224 to 20,445 pounds of whole urchins. Catch and effort surged during the 1993-94 season when 195,403 pounds were taken by 29 divers (Figure 20 and Appendix N).

By regulation 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 for green urchin harvest within Cook Inlet:

- 1) A minimum legal size of 2.0 inches measured across the test, which does not include the spines. The minimum size is intended to protect the broodstock and sufficient numbers of large urchins, which in turn may 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 are made available to the department.
- 3) Alternate year harvest strategy between that portion of Kachemak Bay east of Homer Spit and that portion west of the Spit, in order to reduce the probability of a recruits only fishery.

Although the historical harvest database is composed of only seven years, an alternate year pulse in catch can be detected. The years of low harvest or no effort are the result of the alternate year closure that includes China Poot Bay, which up to this point is the most productive bay for green urchins in Cook Inlet. It also appears that the urchins are capable of larger sizes in China Poot, and the gonads are of a high quality.

To this point, logistics have played a significant role in determining where urchin harvest occurs. Virtually all the fishing effort and all the reported harvest have come from Kachemak Bay. Because the season is during the fall/winter storm months, harvesting among the bays of the outer coast presents not only problems for the divers themselves, but also difficulty getting the urchins to market regularly. Timing of delivery to the processor

is important because urchin buyers are very particular regarding both recovery percentage and overall quality.

### 1993-94 Season Summary

Twenty nine divers harvested 195,403 pounds of whole green urchins during the months of October and December, 1993 and January, 1994. The product was purchased by three companies. That portion of the Kachemak Bay that includes China Poot Bay was open for the 1993-94 season. Initial diving effort occurred in October, but the results were not encouraging; both recovery and quality were not optimal. The season closed by emergency order on January 13 when diver interviews and a dockside sample indicated that the urchins were in the pre-spawn condition.

Permits expiring on February 28 were issued for the waters of outer Cook Inlet after the Kachemak Bay fishery closed. The department has no data regarding distribution, abundance and spawning timing for this area. Mandatory logbooks and close cooperation with the buyers and divers will allow the department to began assessing green urchin abundance in outer Cook Inlet. No catch was reported by the February 28 permit expiration date.

### 1994-95 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. The waters west of Homer Spit, which do not include China Poot Bay, will be opened by permit to commercial urchin fishing beginning September 15, 1994. All other waters of the management area, other than the area east of Homer Spit, will also be opened by permit. Historical harvest data do not indicate the potential of substantial commercial harvest. Worldwide green

urchin growth data, however, demonstrate the probability that substantial recruitment could have occurred since the last commercial fishery in these waters (1992-93).

All other permit restrictions in Cook Inlet will remain in effect for 1994. Season extensions will be determined, as in the past, on a case by case basis using the best available information.

## SEA CUCUMBERS

### Introduction

Prior to 1990, the Cook Inlet Management Area had no documented harvest history of the sea cucumber (Parastichopus californicus). In 1990 two divers harvested 22,525 pounds of cucumbers. The entire catch was taken from Sadie Cove in Kachemak Bay.

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, the limited fishery for this species is managed via Commissioner's Permit. The major provisions of the permit are mandatory logbooks, time and area restrictions.

Although sea cucumbers have been reported in Cook Inlet, particularly within Kachemak Bay, the limited commercial harvest as well as exploratory effort indicate that the stocks are neither dense nor extensive. There is another genus of sea cucumber, Cucumaria sp., which exists in noticeable abundance in portions of the Southern District. This animal however is of no commercial value.

### 1993-94 Season Summary

The 1993-94 cucumber harvest occurred during the months of November, December, February and March when 15 divers took 32,005 pounds mostly from Sadie Cove. Kachemak Bay, which includes Sadie Cove, was closed by emergency order on March 4, 1994. Diver logbooks indicated that catch per unit of effort was declining and as a result, dive area and depth were expanding. Exploratory effort in the remainder of Kachemak Bay and portions of outer Cook Inlet have not yielded substantial harvestable quantities of sea cucumbers. All of Cook Inlet was closed by emergency order effective April 30, which, based on the best available information, is the beginning of the sea cucumber spawning period. This closure coincides with both the Westward Regions and PWS.

### 1994 Management Outlook

Based on recent exploratory dives by experienced divers, it does not appear that a significant fishery for sea cucumbers will occur in 1994. Permits will be issued if there is any commercial interest. Initially effort will likely concentrate in Sadie Cove. If logbook data indicate the abundance has declined from 1993, the fishery in Sadie Cove will be closed immediately.

## 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, groundfish pot and trawl fisheries. Cook Inlet octopus harvest records are currently available only since 1983. Catches have ranged from 435 to 48,000 pounds with effort

fluctuating from 8 to 41 boats (Appendix O). The catch from the high harvest years was the result of bycatch from groundfish and shellfish fisheries. In the past five years increased interest has occurred in directing effort specifically towards octopus. Many different gear types have been tried but the resultant harvest has been negligible. Most of the effort has focused on Kachemak Bay.

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

#### 1993 Season Summary

Directed fishing by three vessels resulted in a catch of 475 pounds, all taken within the waters of Kachemak Bay. Octopus bycatch and effort from the groundfish fishery are reported in the 1993 annual groundfish management report for Cook Inlet.

#### 1994 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 1994. The extent of this resource in Cook Inlet outside Kachemak Bay is undetermined and could ultimately affect any directed fishery. In the absence of an effective method of harvest, the Cook Inlet octopus catch is not expected to increase significantly in 1994

unless it is a result of bycatch from a groundfish pot or trawl fishery.

## RAZOR CLAMS

-Note- The razor clam chapter of this report is a contribution of the Soldotna Office, CFM&D Division, ADF&G.

The commercial razor clam fishery in Upper Cook Inlet dates back to 1919 with sporadic harvests occurring until 1977 when a stable fishery developed that has harvested an average of 250,000 pounds annually. Since 1959 the east side of Upper Cook Inlet south of the Kenai River has been closed to commercial clam harvest. The remainder of the Upper Cook Inlet Management Area has no closed season and no overall harvest limits. Currently this fishery occurs primarily on the west side of Cook Inlet between the Crescent River and Redoubt Point. All clams harvested in this area are directed by regulation to be sold for human consumption, except for the small percentage (less than 10%) of broken clams which may be sold for bait. In the remainder of the Upper Cook Inlet Management Area there are no restrictions on the amount of clams that can be sold for bait. The minimum legal size for razor clams is four and one-half inches (114mm) in shell length.

The 1993 fishery began on May 18 and the last reported deliveries were made on September 3. The season's harvest of 310,289 pounds was taken primarily from the Polly Creek/Crescent River area (Appendix P). A total of 29 diggers made 1,928 landings over the course of the season. Diggers were paid an average of \$0.50 per pound for their harvest making the total fishery exvessel value \$155,000. Beginning in 1993 the Department of Environmental Conservation certified additional area for human consumption, north of the existing Polly Creek certified beach to Redoubt Creek.

Plans for the 1994 season would extend this certification north to Harriet Point.

Table 1. Numeric listing of shellfish emergency orders, including personal use, issued for the Cook Inlet Management Area for the fisheries listed in the 1993-94 Cook Inlet Area Shellfish Annual Management Report.

Emergency Order Number	Effective Date	Explanation
2-S-H-01 to 02-93		Listed in 1992-93 Annual Management Report
2-S-H-03-93	06/01/93	Closed commercial Dungeness crab fishery in the Southern District
2-S-H-04-93	06/01/93	Closed commercial pot shrimp fishery in Kachemak Bay
2-S-H-05-93	07/01/93	Closed commercial trawl shrimp fishery in Kachemak Bay
2-S-H-06-93	08/15/93	Closed commercial king crab fishery in the Cook Inlet Management Area
2-S-H-07-93	09/20/93	Closed commercial trawl shrimp fishery in the Eastern District of Outer Cook Inlet
2-S-H-08-93	09/23/93	Closed commercial scallop fishery in the Kamishak District
2-S-H-09-93	11/16/93	Closed commercial trawl shrimp fishery in the Outer District of Outer Cook Inlet
2-S-H-01-94	01/15/94	Closed commercial Tanner crab fishery in the Central, Kamishak, Barren Islands, Outer and Eastern Districts
2-S-H-02-94	01/13/94	Closed commercial green urchin fishery in Kachemak Bay
2-S-H-03-94	01/17/94	Opened and closed commercial Tanner crab fishery in the Southern District
2-S-H-04-94	01/21/94	Opened and closed commercial Tanner crab fishery in the Southern District
2-S-H-05-94	03/04/94	Closed commercial sea cucumber fishery in the Southern District on 3/4/94 and the remainder of Cook Inlet on 4/30/94.

Table 2. Tanner crab catch by district and statistical sub-area, Cook Inlet Management Area, 1994 season.

District	Stat. sub-area	Vessels	Landings	Crabs	Pounds	Average weight	Pot lifts	Average no. crabs per pot
Southern	241-11	28	28	37,783	97,586	2.58	1,476	25.6
	241-12	60	67	58,761	150,830	2.56	3,096	20.0
	241-13	7	9	3,118	8,044	2.57	261	12.0
	241-14	1	1	65	195	3.00	39	1.7
	241-15	20	21	10,446	27,073	2.59	794	13.2
	241-16	1	1	367	948	2.58	20	18.4
Southern District Totals		110	123	110,540	284,676	2.58	5,686	19.4

Table 3. Hardshell clam harvest by statistical area, Cook Inlet Management Area, 1993.

District	Stat. sub-area	No. permits	No. landings	Butter	Little-neck	Total hardshell	Pounds per hour (avg) dug
Southern	241-14	21	98	0	44,313	44,313	23.3
	241-16	16	59	0	19,308	19,308	18.7
	Total	32	157	0	63,621	63,621	-

Statistical sub-area 241-14 includes Chugachik Island.

Statistical sub-area 241-16 includes Jakalof and Tutka Bays.

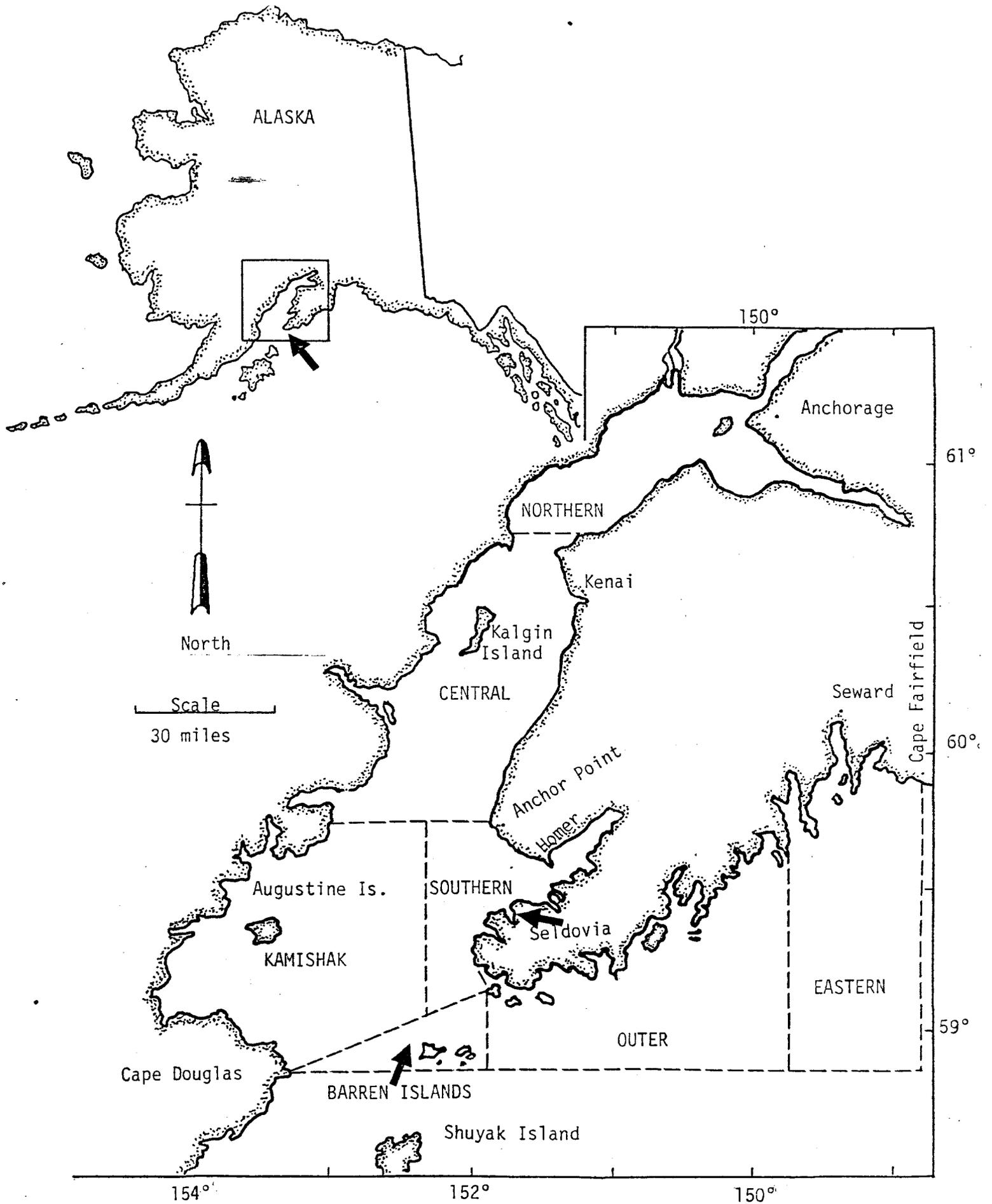


Figure 1 Cook Inlet area district location chart.

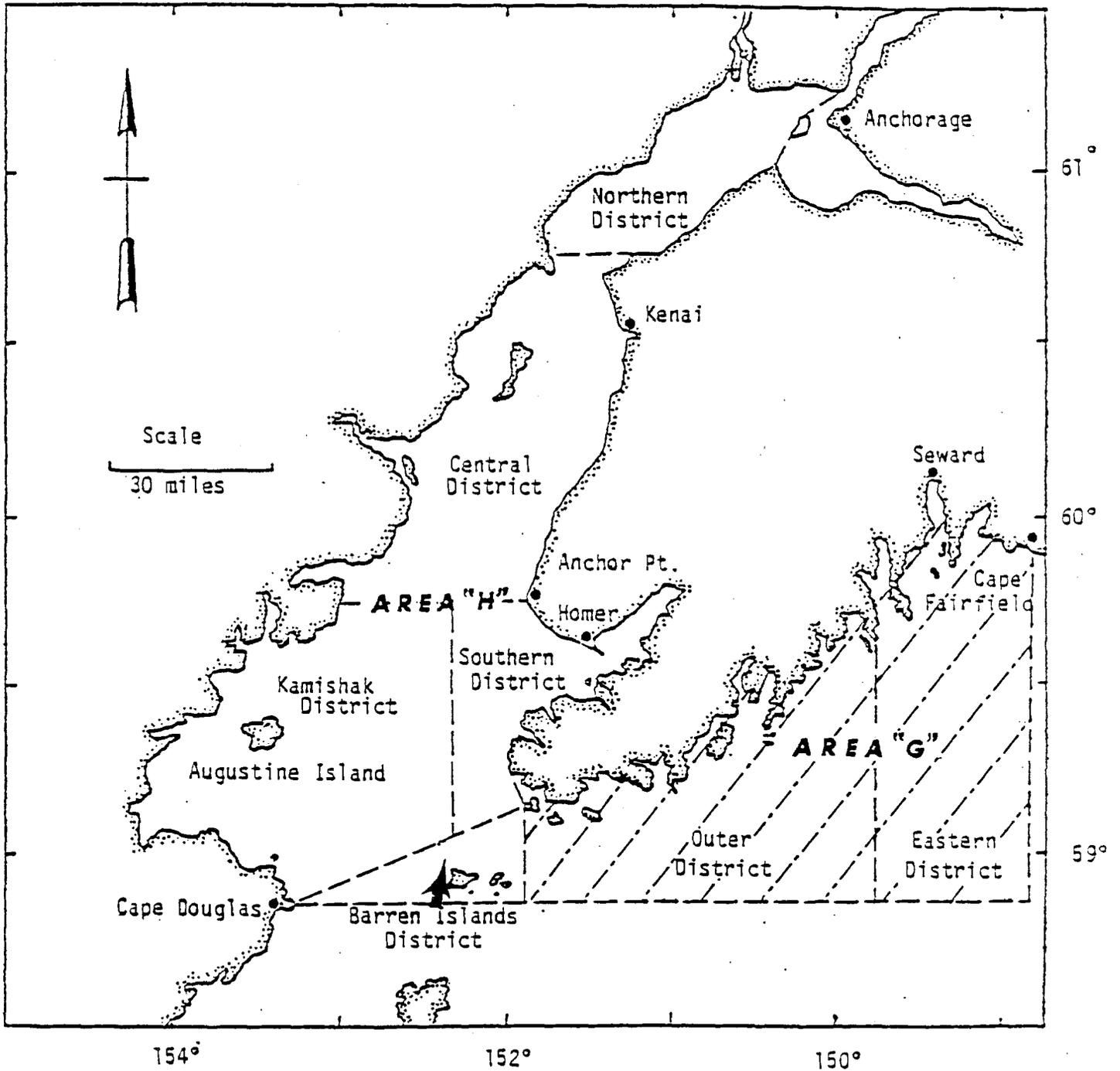


Figure 2. Cook Inlet Area ("H") and Outer Cook Inlet Area ("G") district location chart for shrimp management.

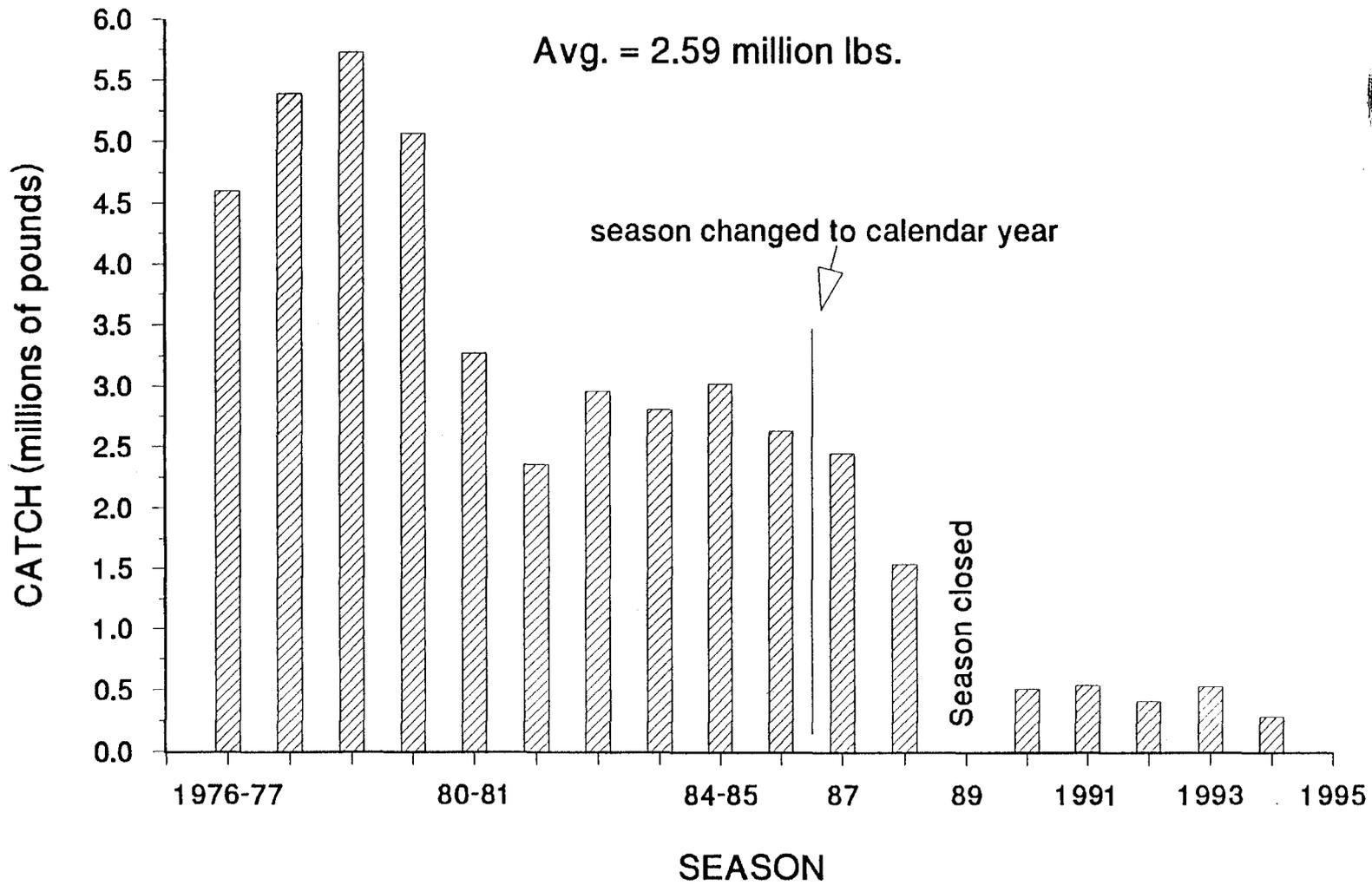


Figure 3. Tanner crab catch by season, Cook Inlet Mgt. Area, 1976 - 1994.

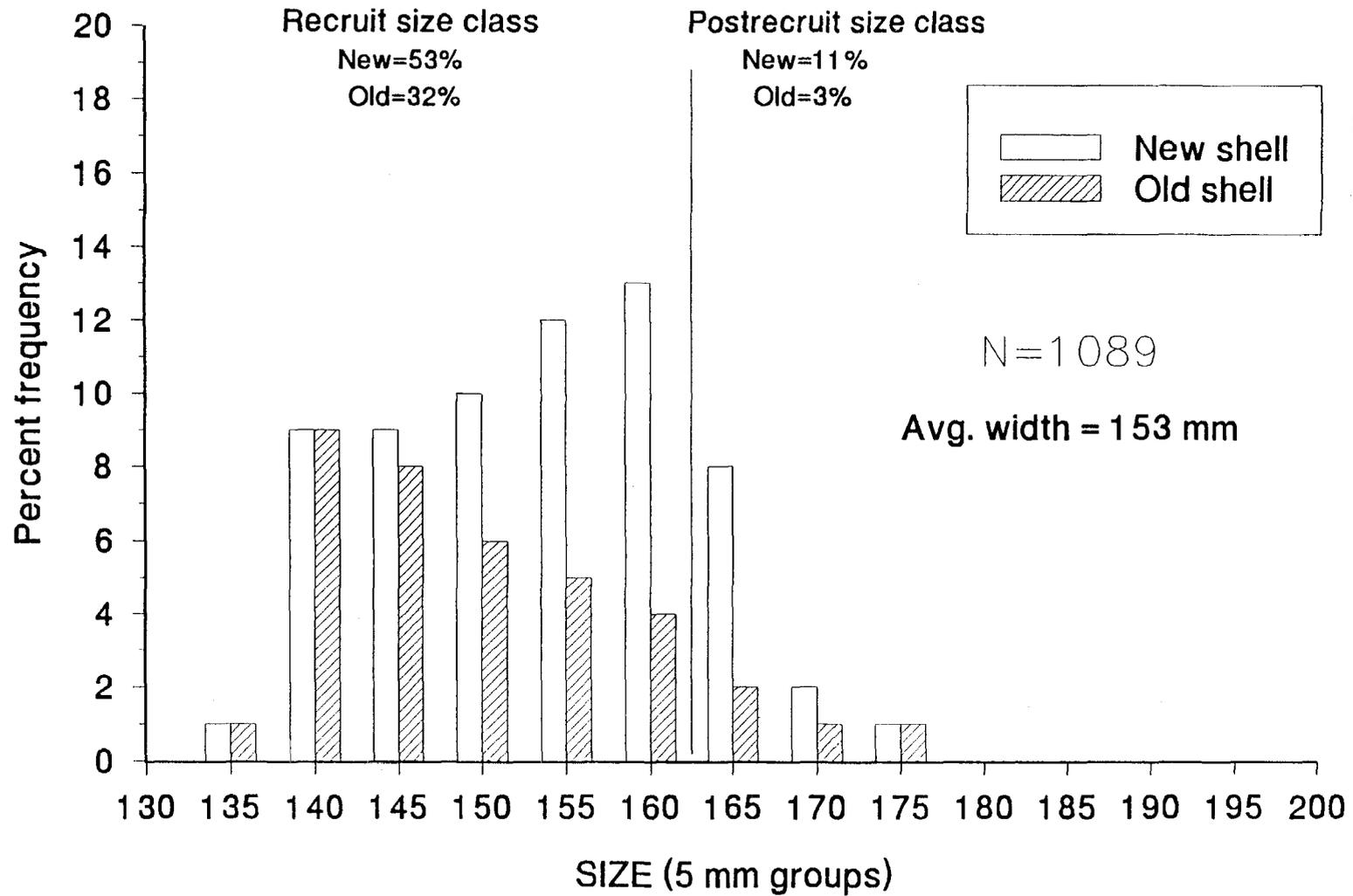


Figure 4. Commercial catch size freq., 1994 Southern Distr., Tanner crabfishery.

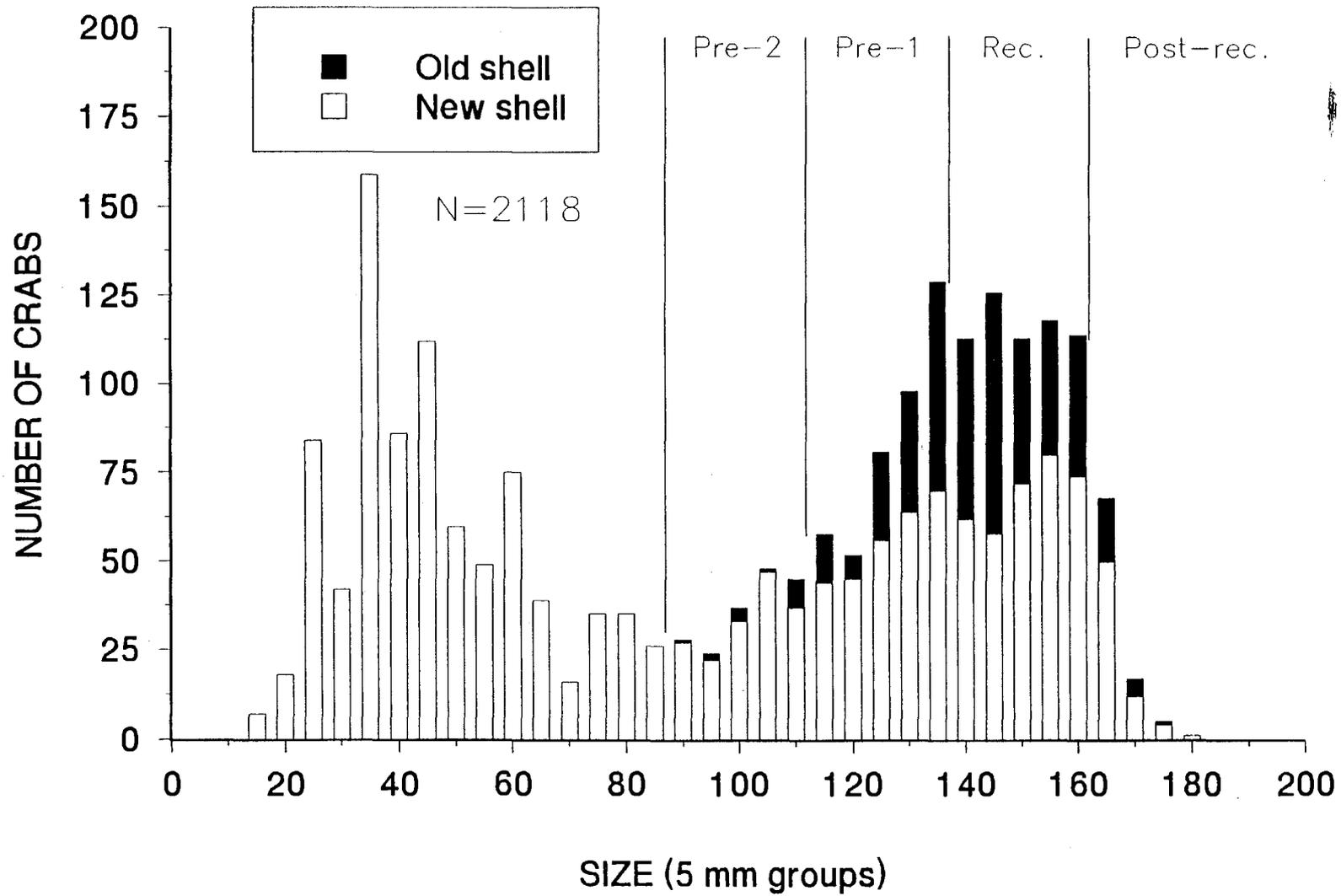


Figure 5. Male Tanner crab catch, Southern Distr., 1993 Cook Inlet trawl survey.

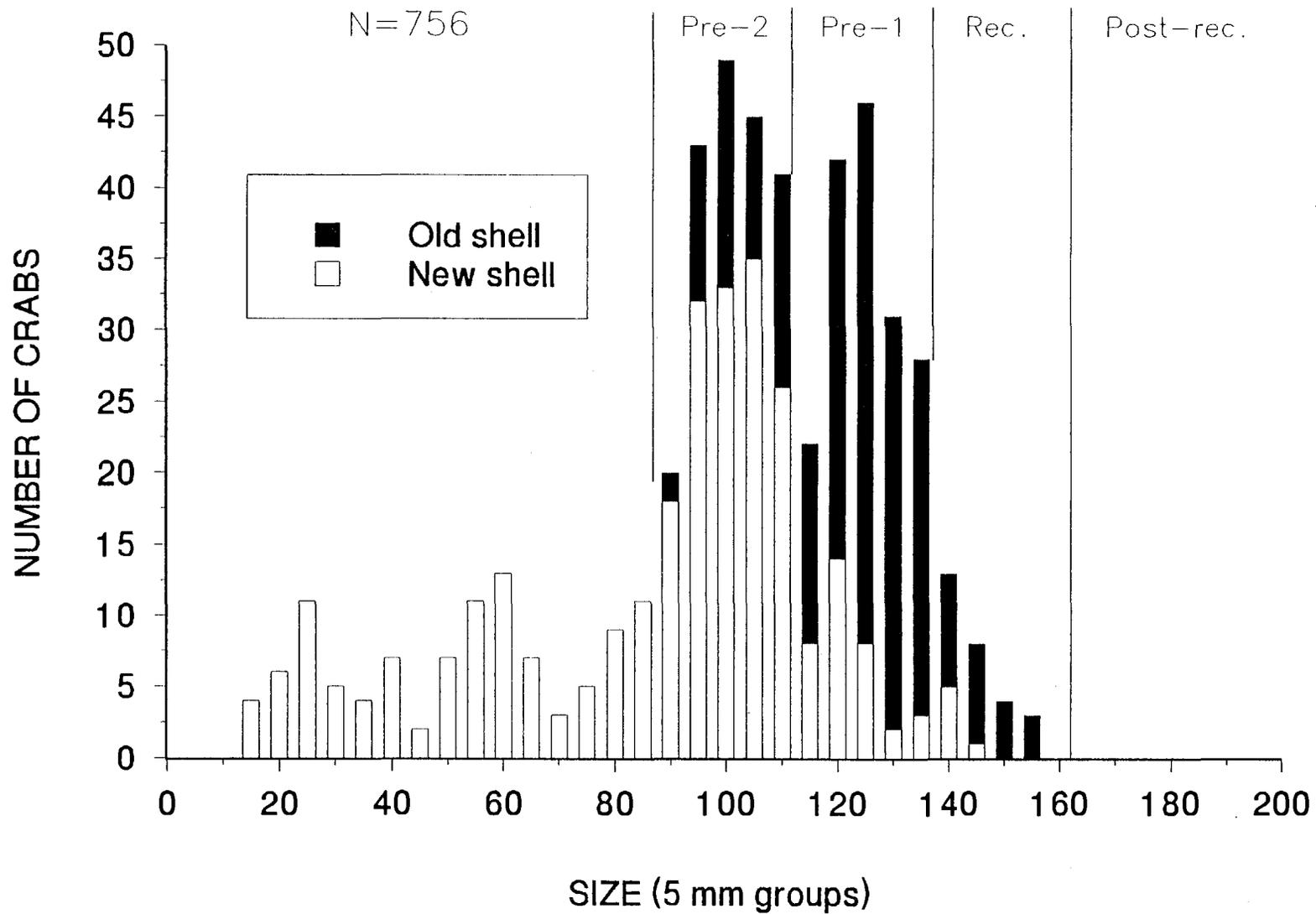


Figure 6. Male Tanner crab catch, Kamishak District, 1993 Cook Inlet trawl survey.

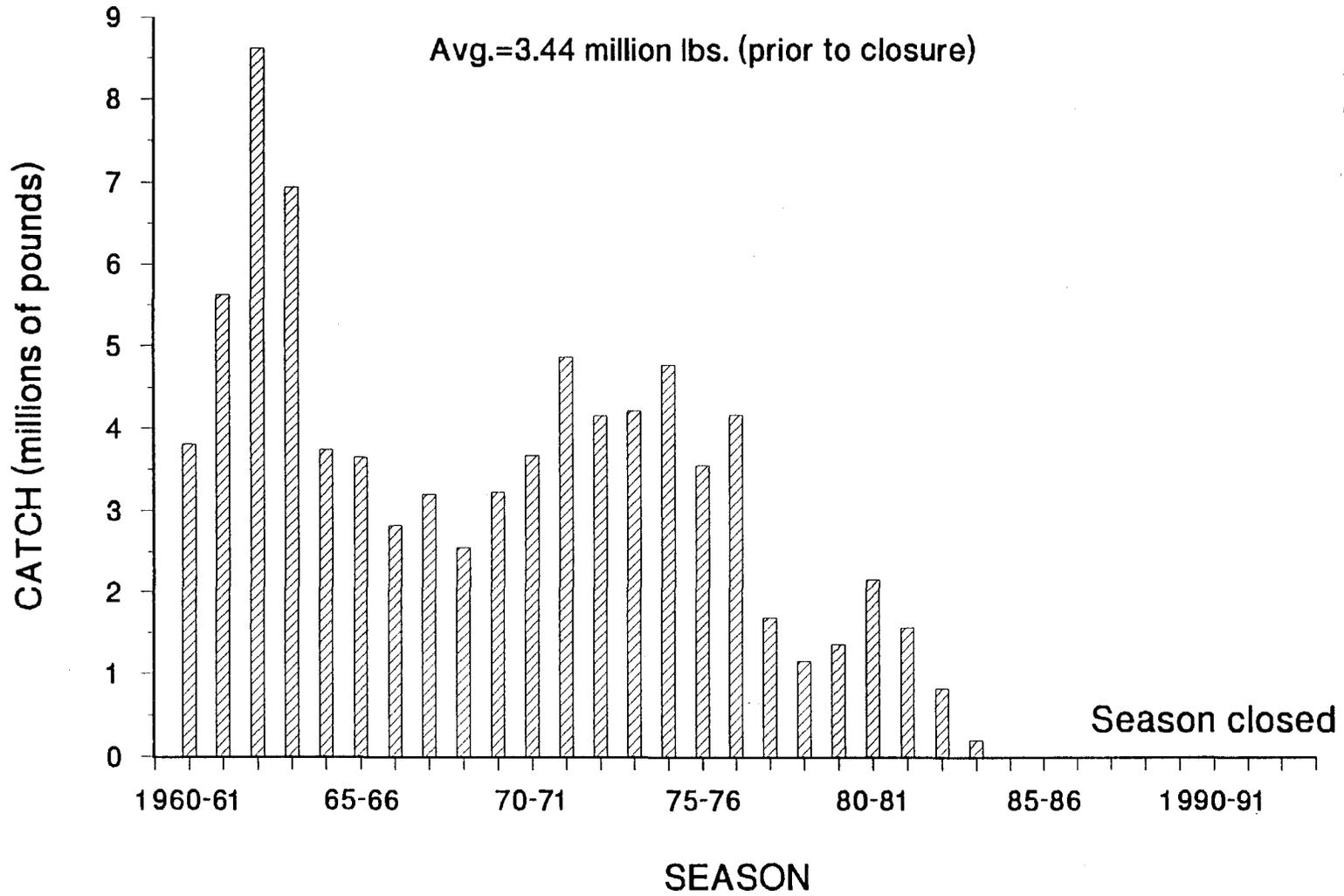


Figure 7. King crab catch by season, Cook Inlet Mgt. Area, 1960 - 1993.

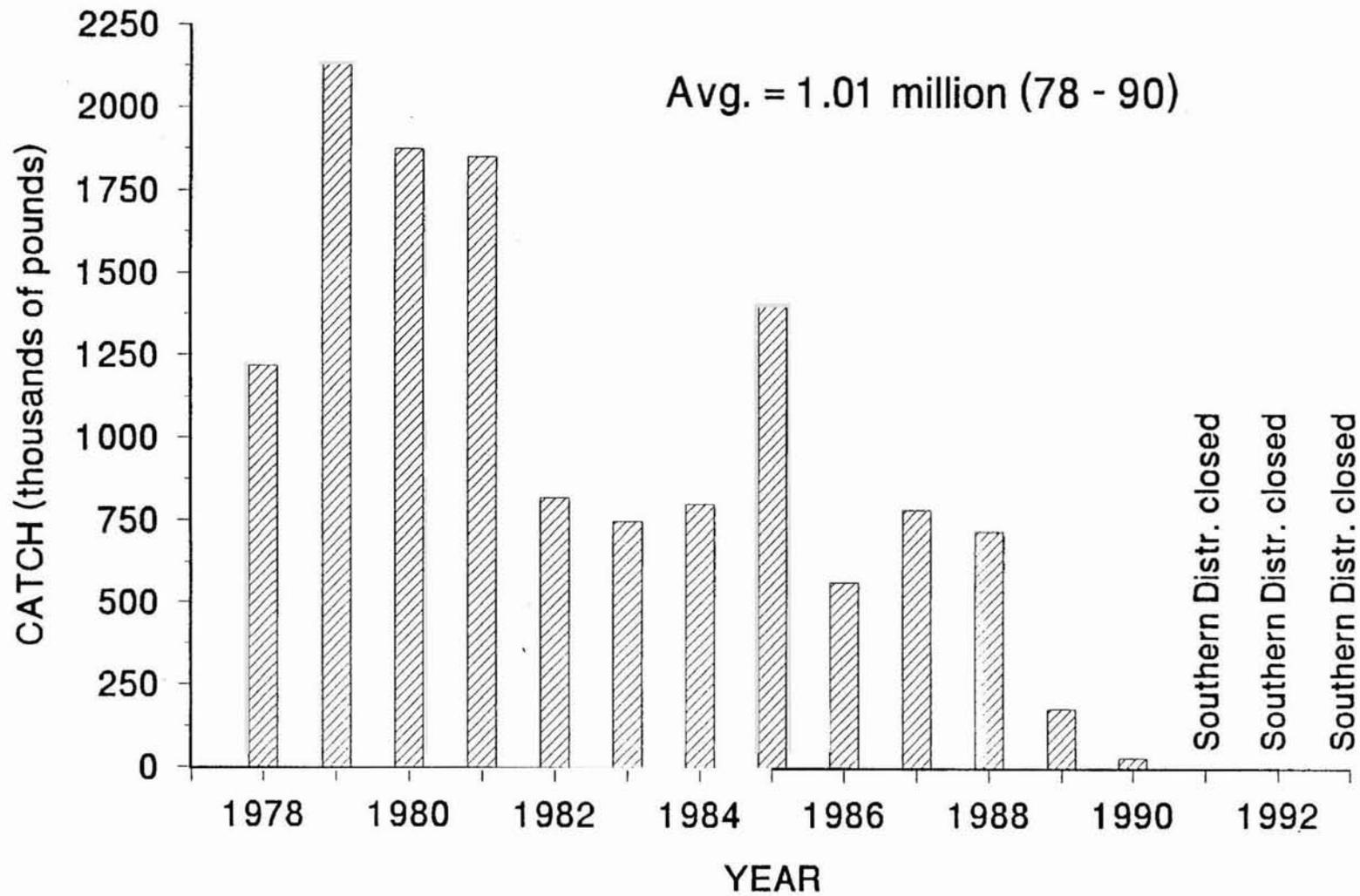


Figure 8. Dungeness crab catch by year, Cook Inlet Mgt. Area, 1978 - 1993

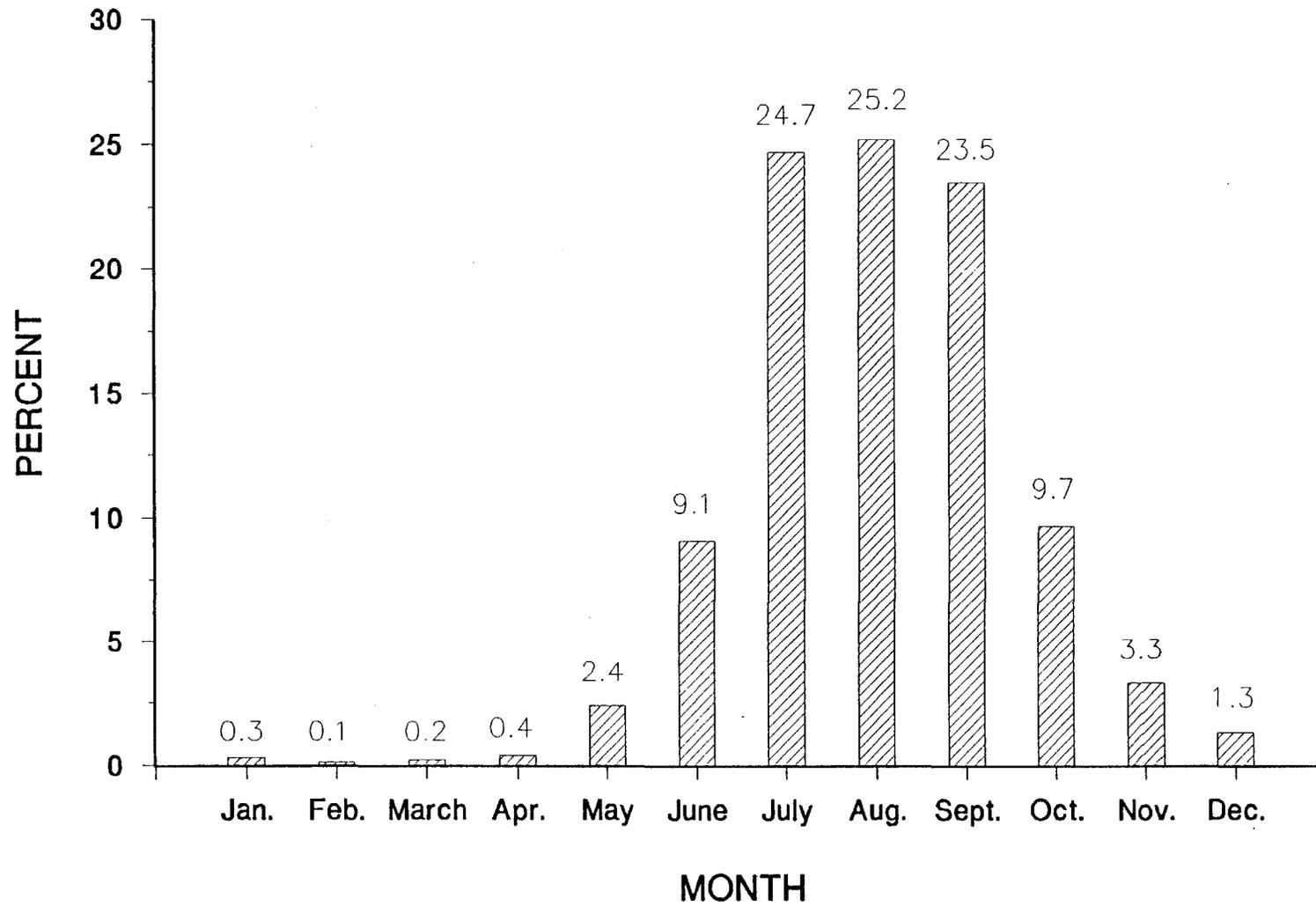


Figure 9. Dungeness crab catch (percent) by month, Cook Inlet Mgt. Area, 1978 - 1990.

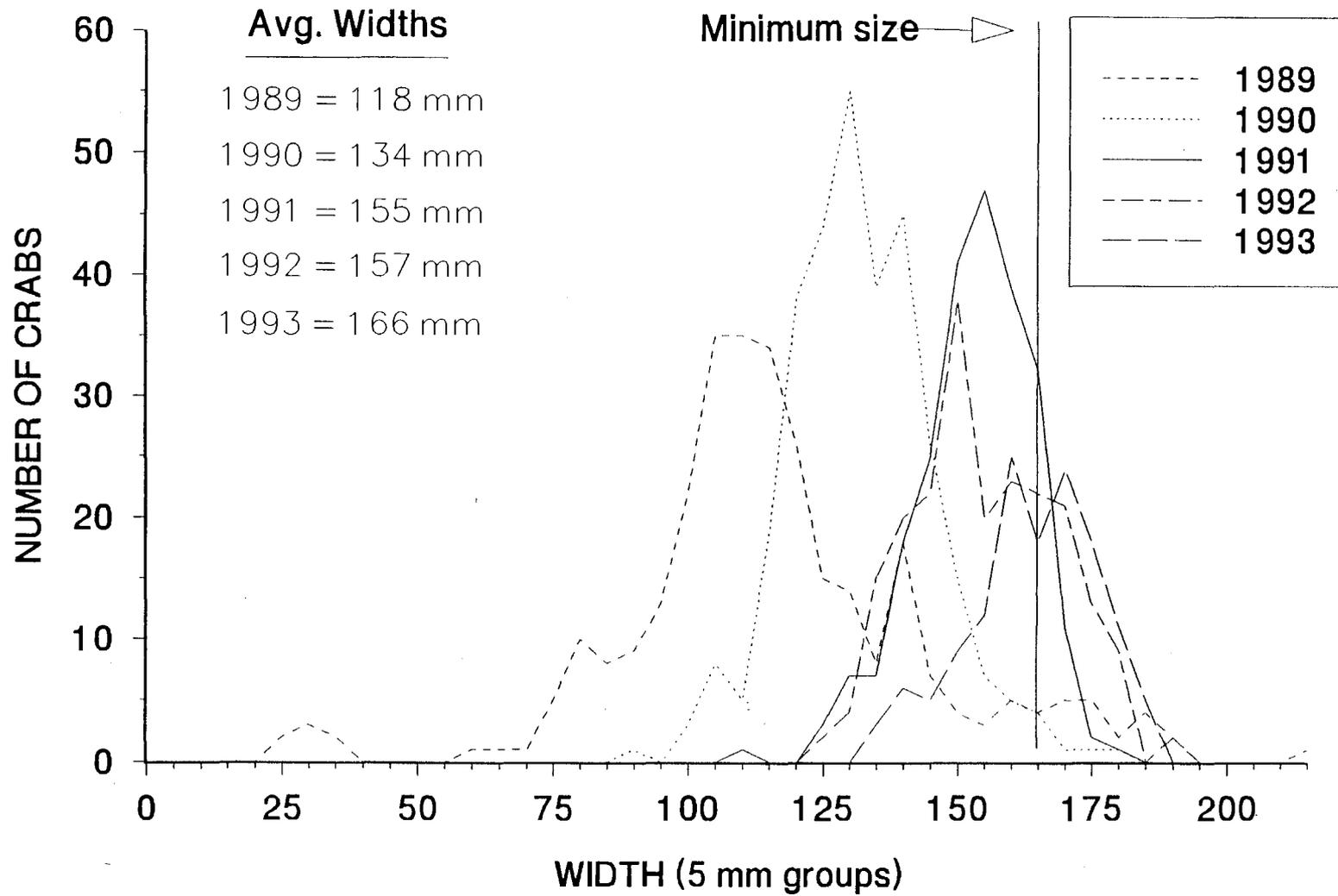


Figure 10. Male Dungeness catch, 1989 - 93, Southern Distr. trawl survey.

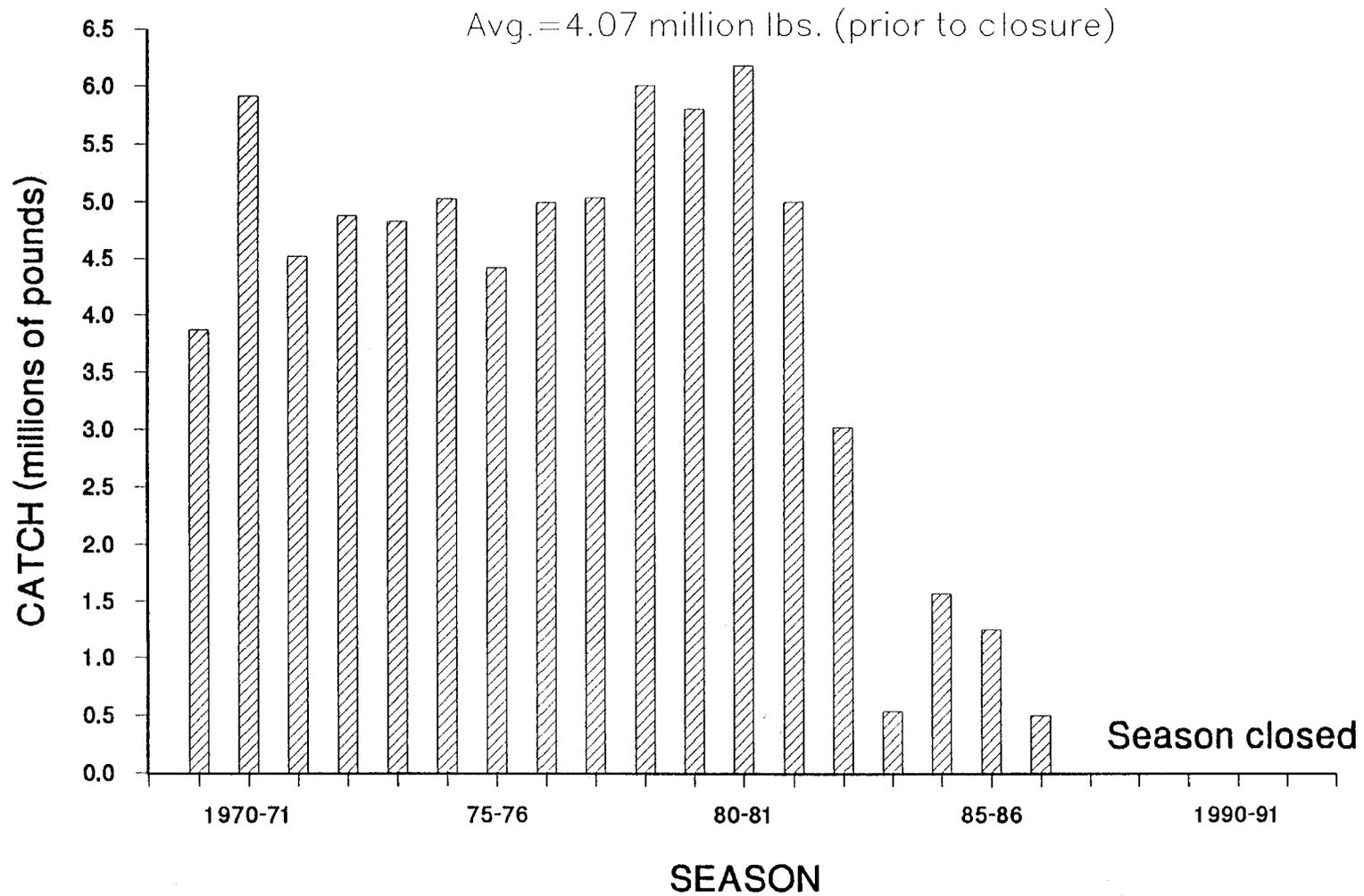


Figure 11. Trawl shrimp catch by season, Kachemak Bay, Cook Inlet Mgt. Area (H), 1969-93.

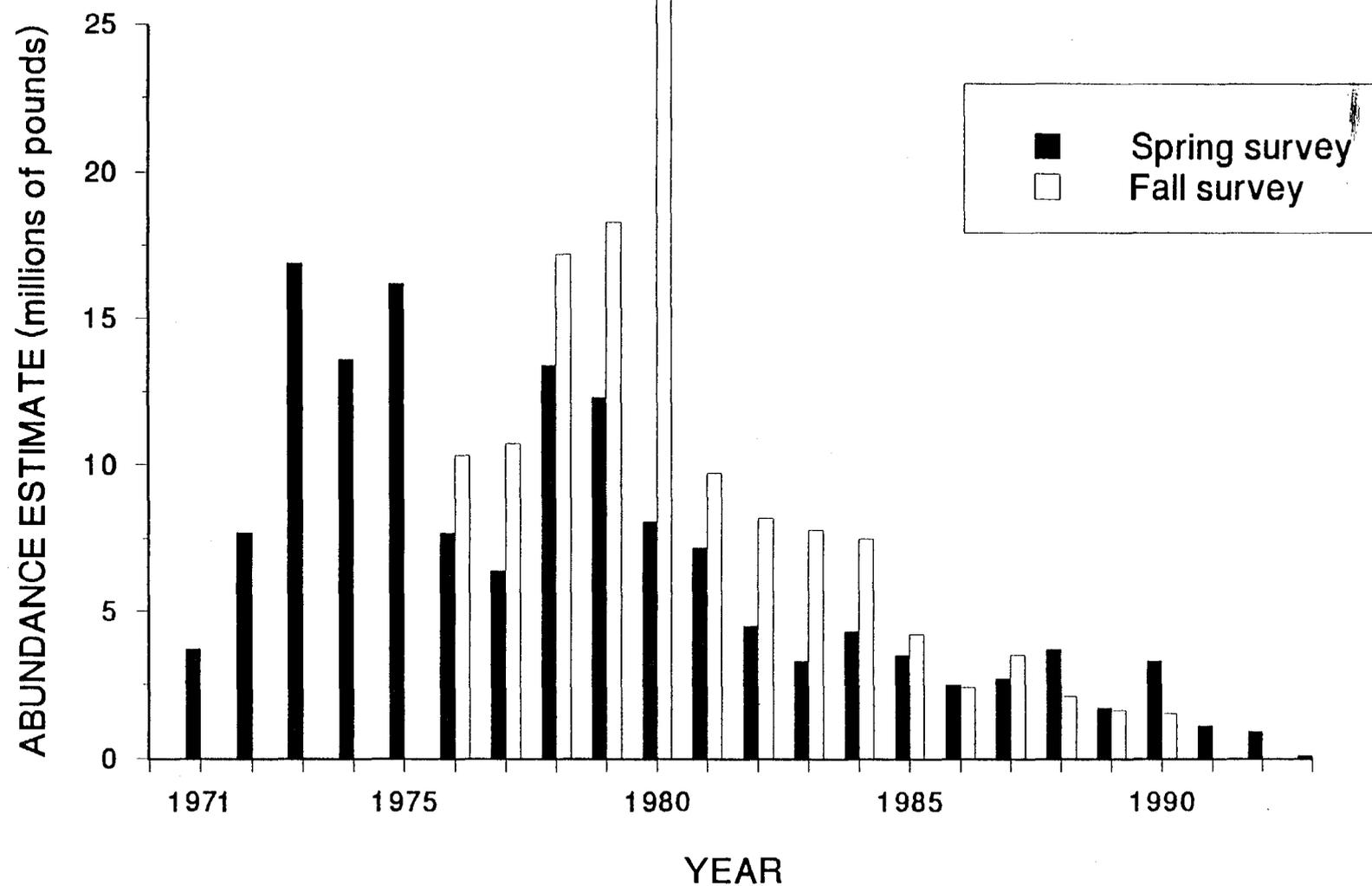


Figure 12. Pandalid shrimp population est., Kachemak Bay trawl shrimp survey, Cook Inlet Management Area, 1972-93.

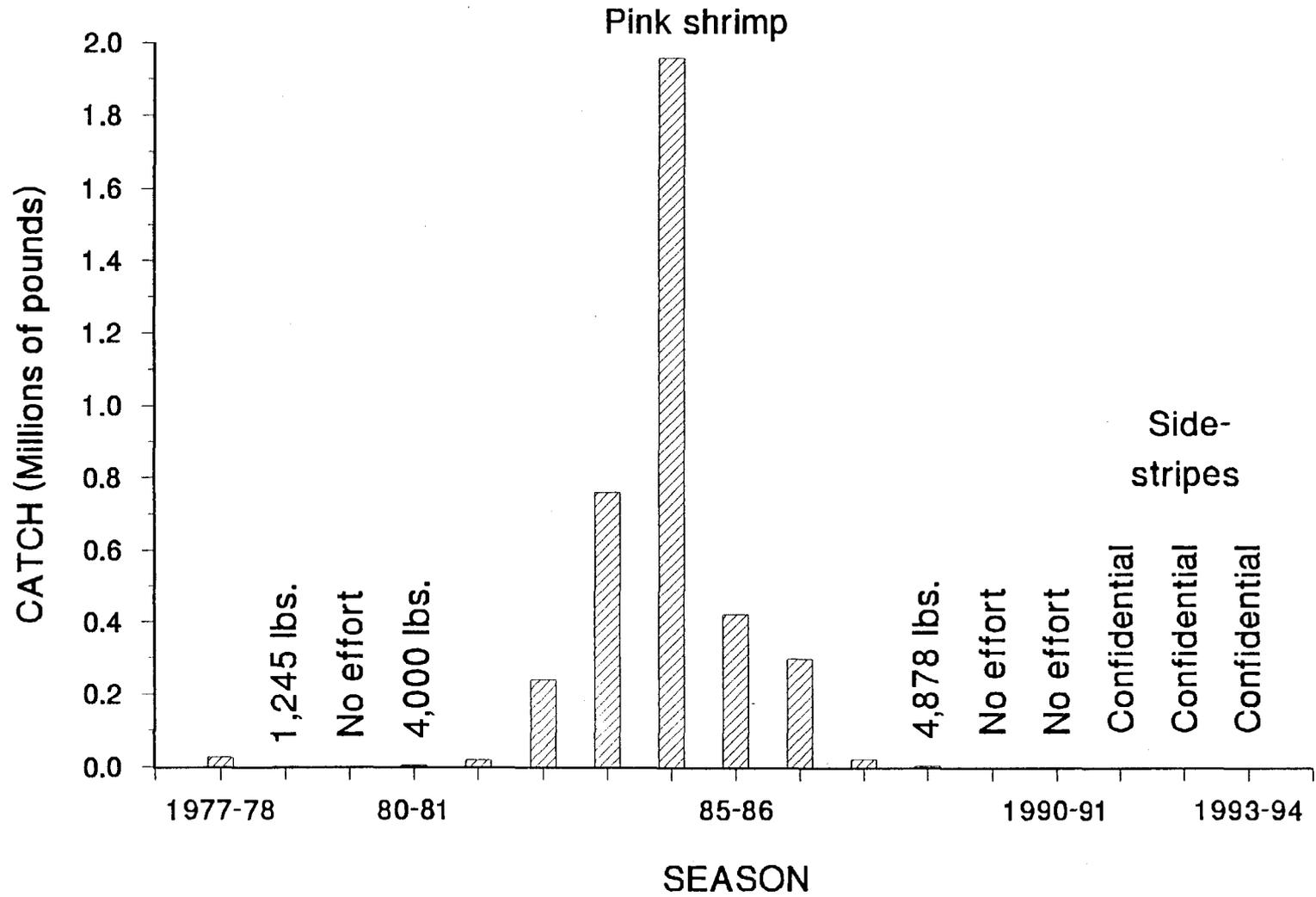


Figure 13. Trawl shrimp catch by season, Outer Cook Inlet, Cook Inlet Mgt. Area (G), 1977-1993

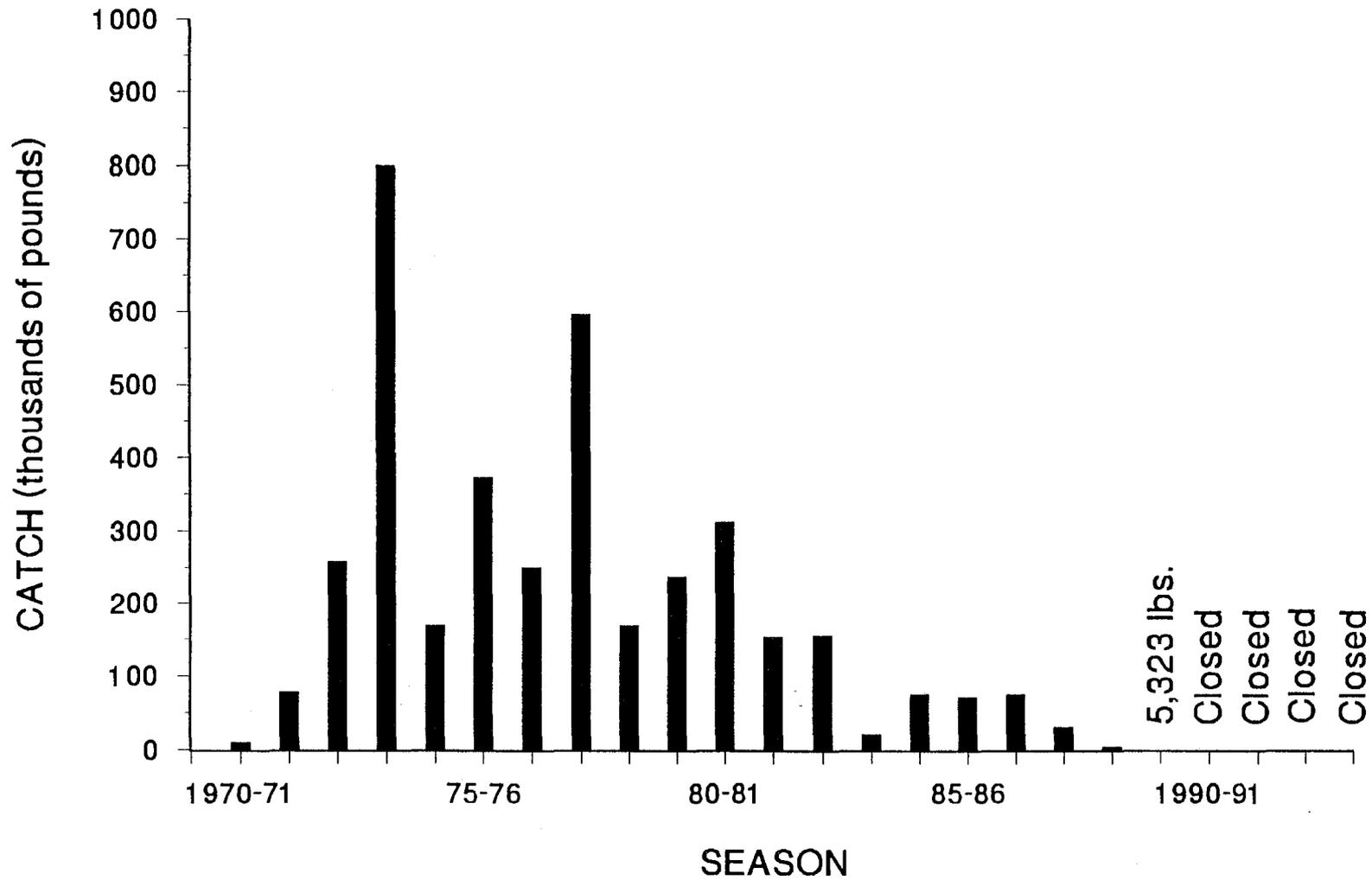


Figure 14. Pot shrimp catch by season, Kachemak Bay, Cook Inlet Mgt. Area (H) 1970-93

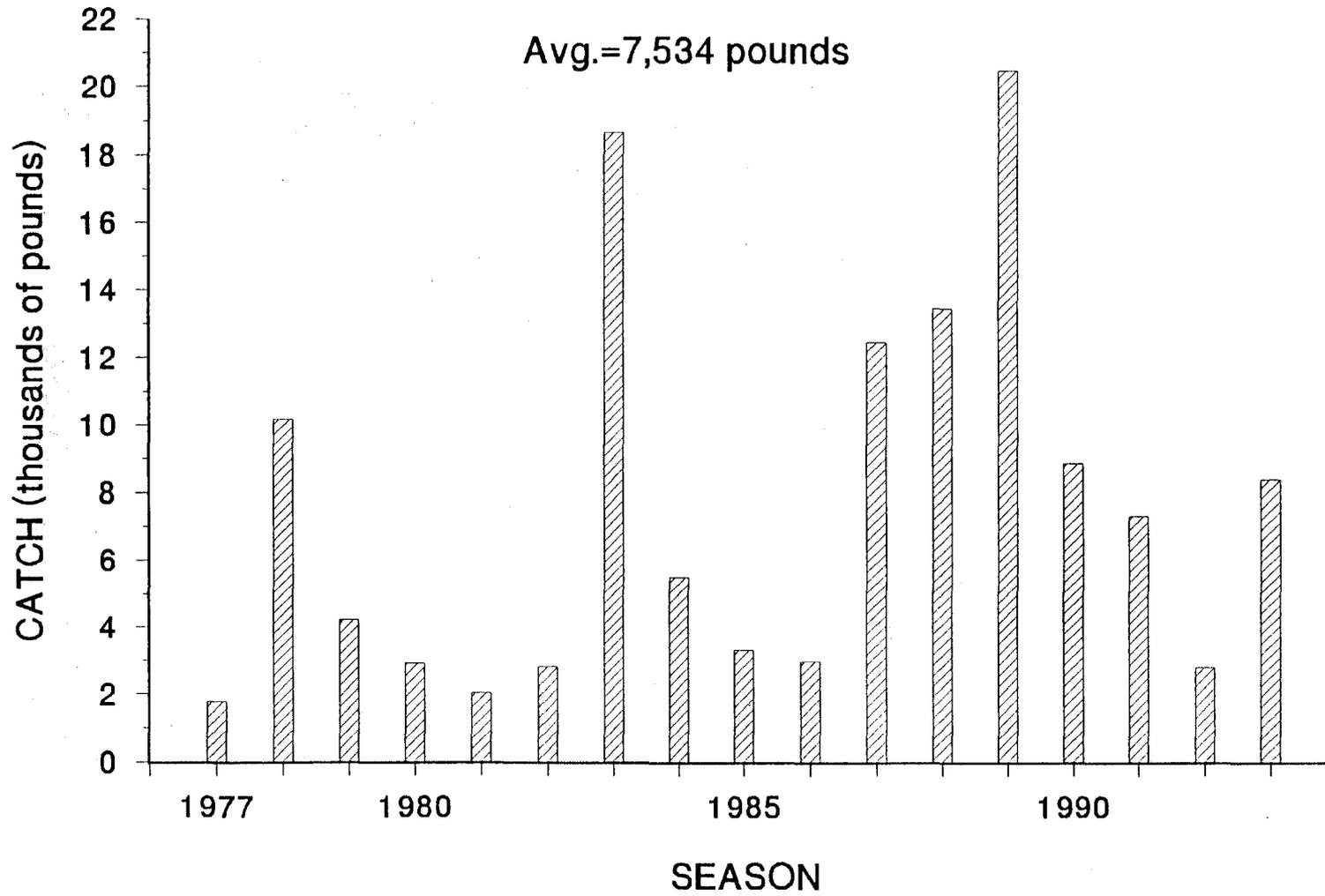


Figure 15. Pot shrimp catch by season, Outer Cook Inlet, Cook Inlet Mgt. Area (G), 1977-93.

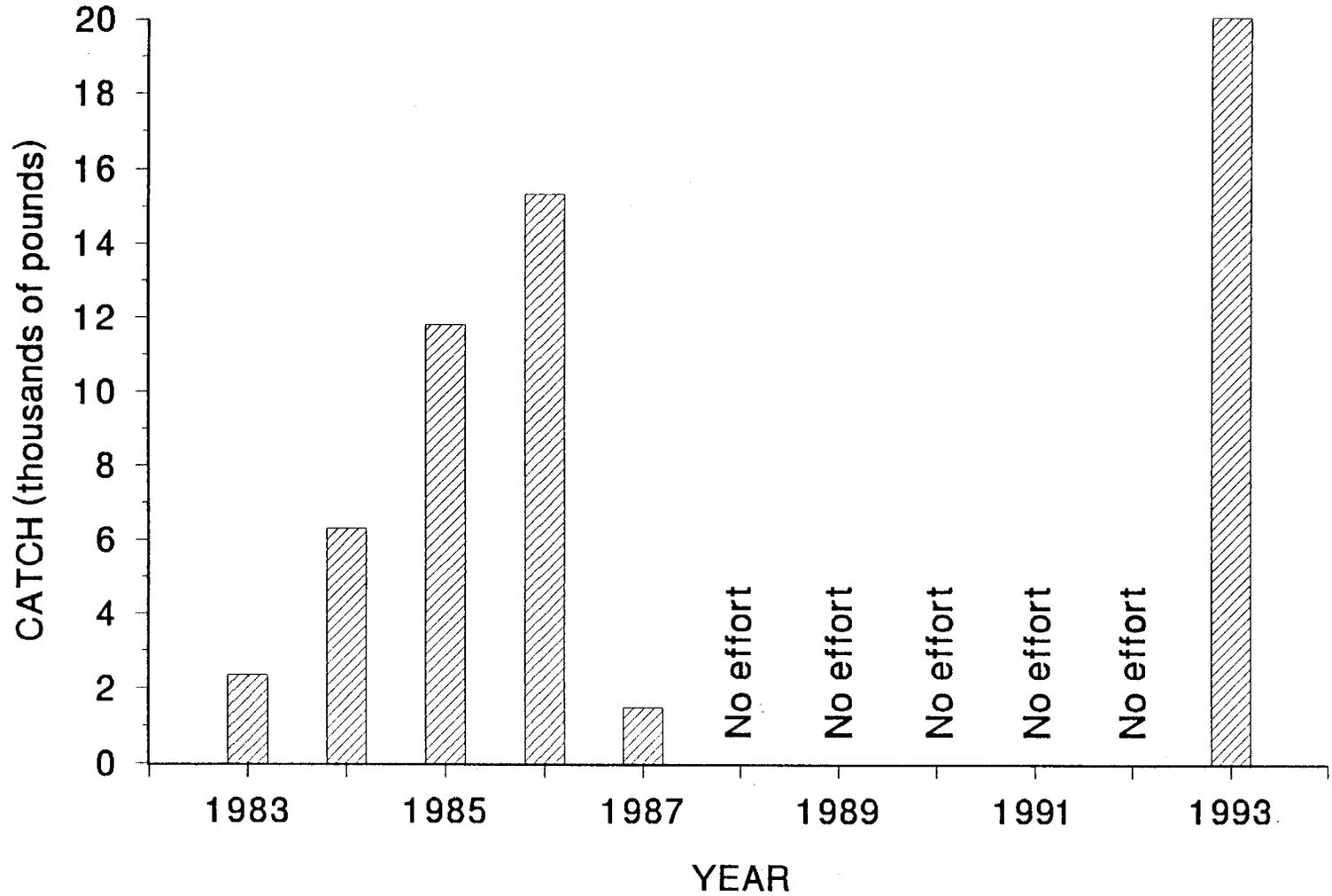


Figure 16. Weathervane scallop harvest by year, Kamishak Distr.,  
Cook Inlet Management Area, 1983-1993.

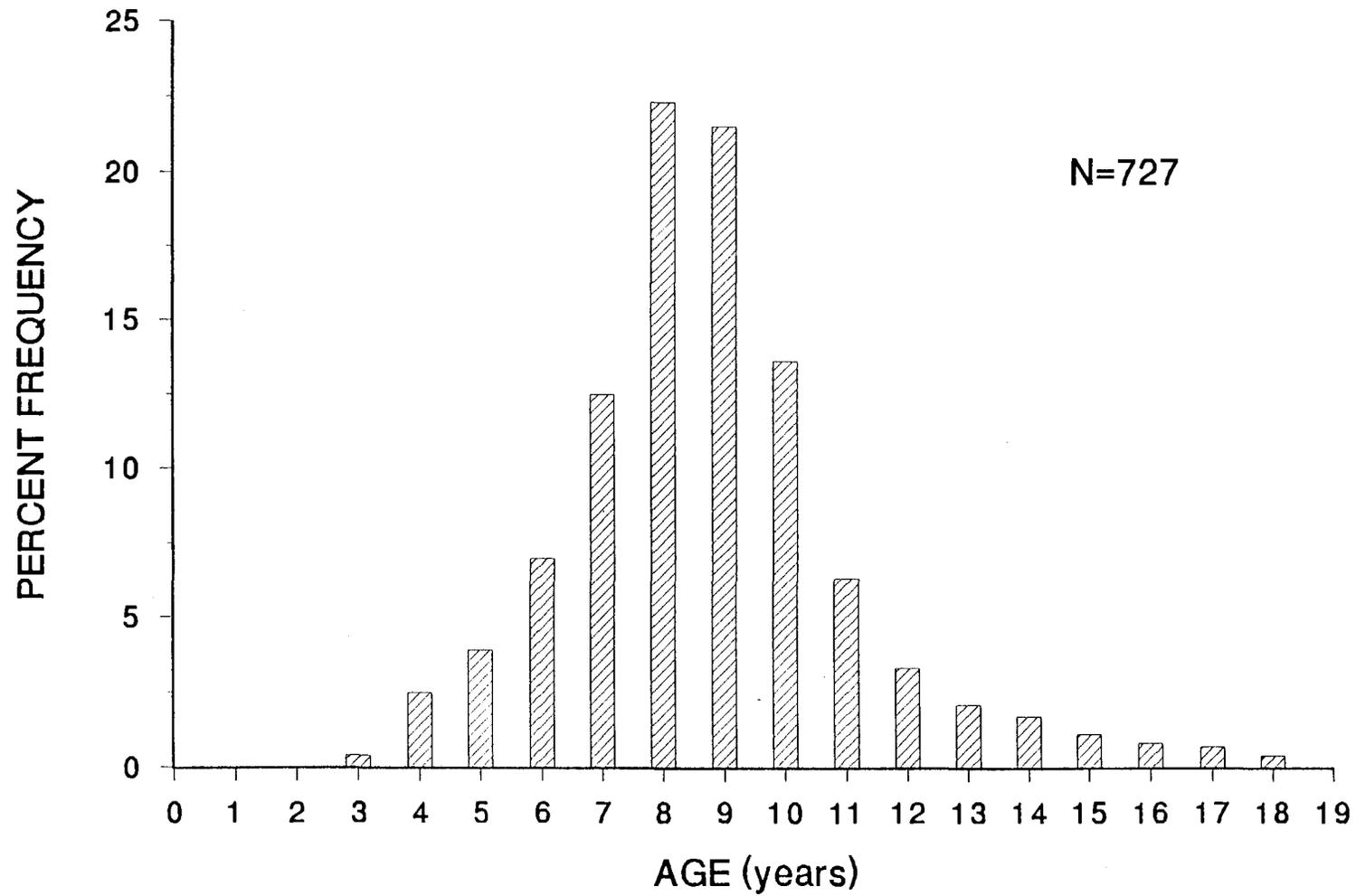


Figure 17. Commercial catch size freq., 1993 Kamishak District weathervane scallop fishery.

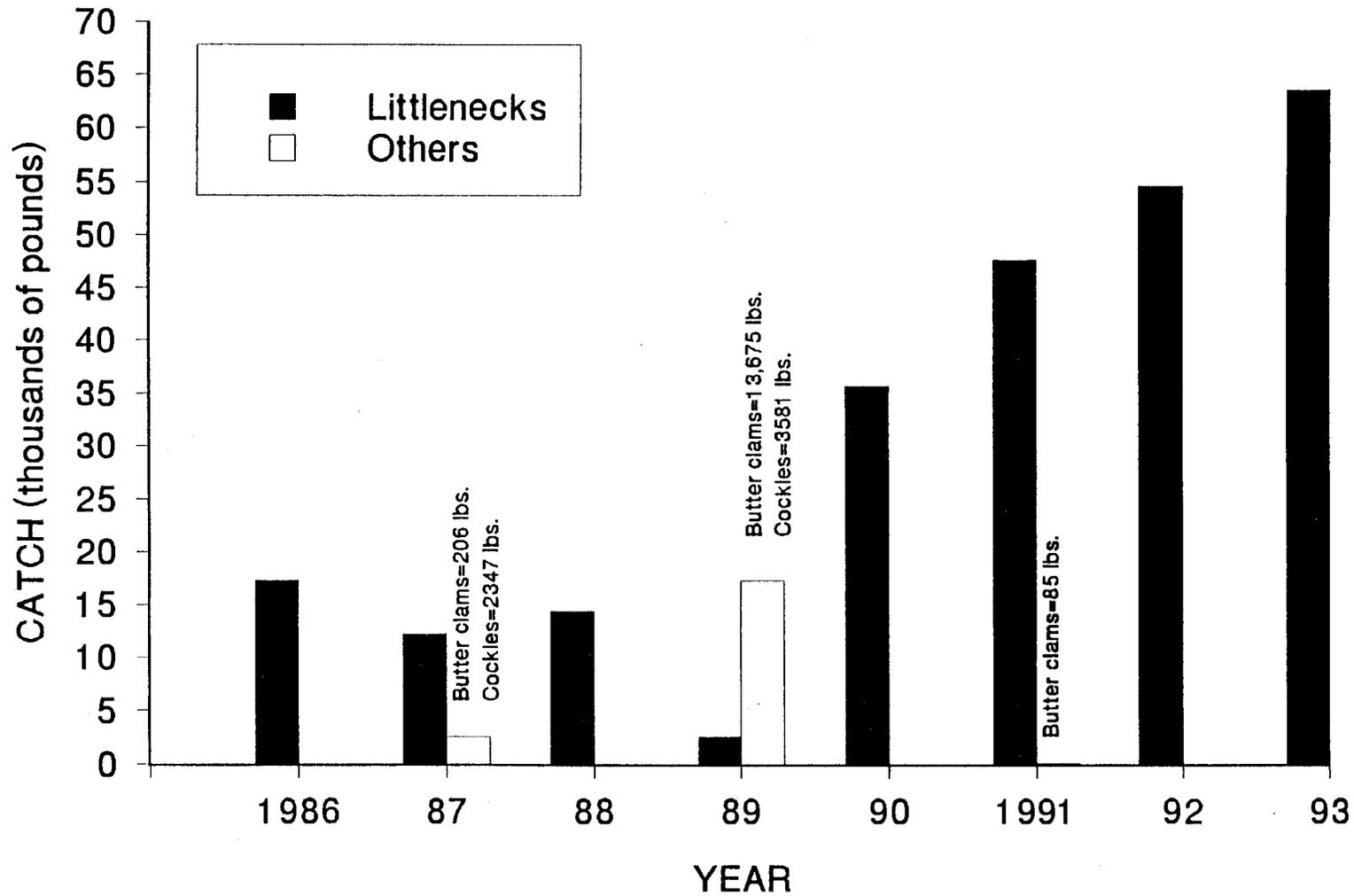


Figure 18. Hardshell clam harvest, Cook Inlet Management Area, 1986-93.

# LOWER COOK INLET & KACHEMAK BAY AREA

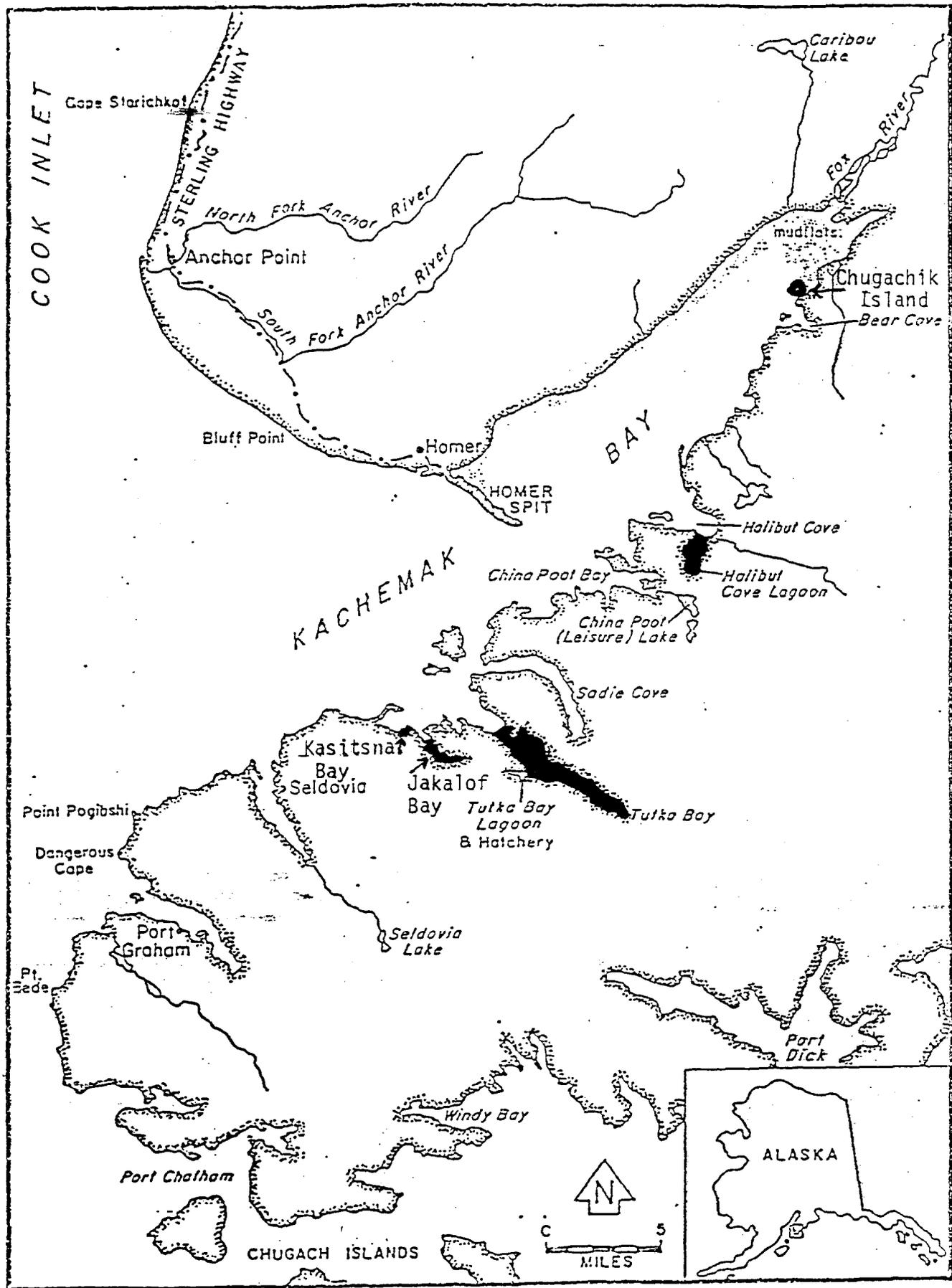


Figure 19. DEC certified commercial clam beaches, 1993.

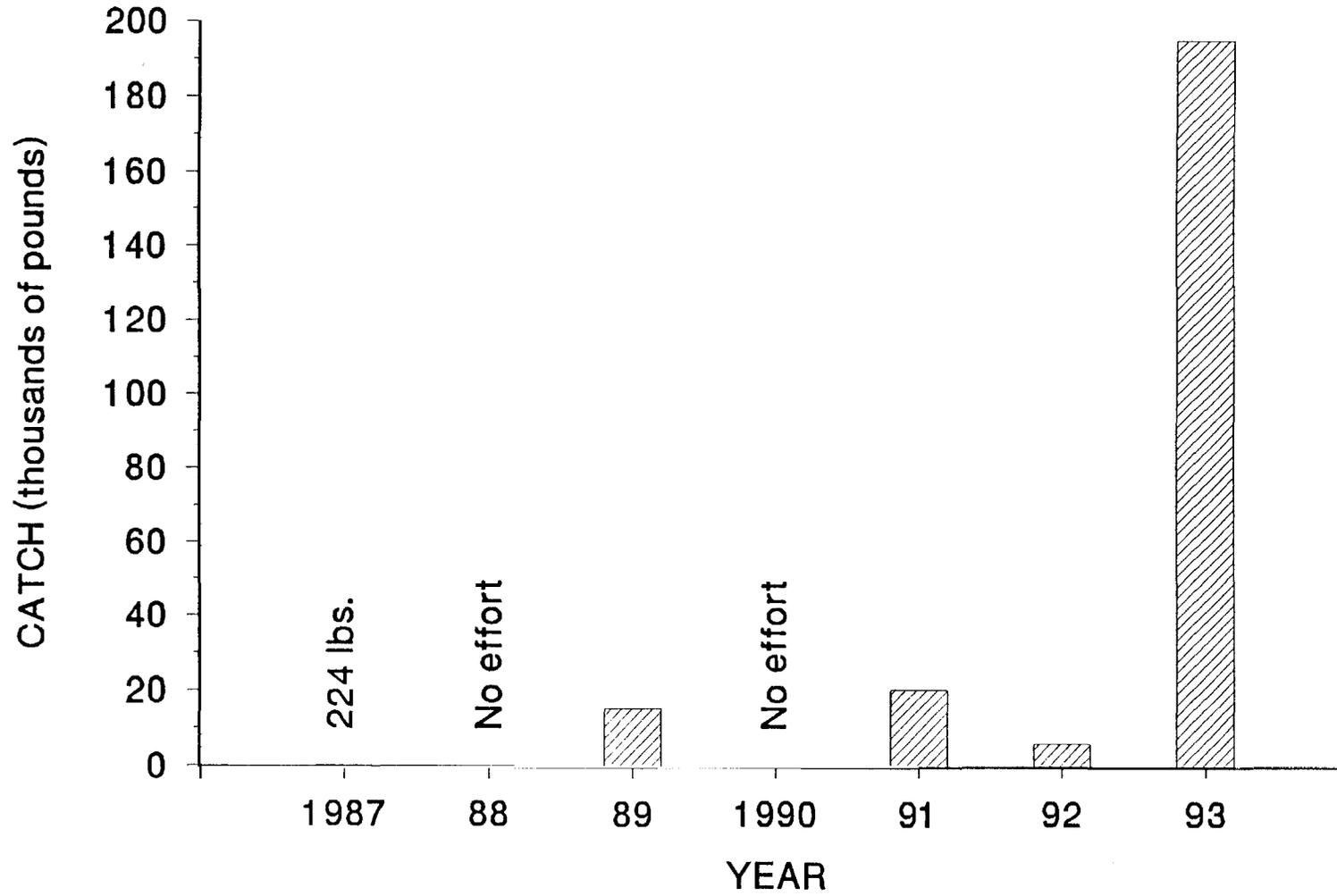


Figure 20. Green sea urchin harvest, Cook Inlet Management Area, 1987-93.

Appendix A. Tanner crab catch (pounds) by season, Cook Inlet Management Area, 1968–94.

Season	Southern	Vessels	Kamishak/ Barren Is.	Vessels	Outer/ Eastern	Vessels	Central	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	--	422,037	7	CLOSED	--	CLOSED	--	422,037	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
1993	534,003	136	CLOSED	--	CLOSED	--	CLOSED	--	534,003	136
1994	284,676	110	CLOSED	--	CLOSED	--	CLOSED	--	284,676	110
Average <sup>a</sup>	1,082,064	77	1,509,645	20	433,897	13	8,084	3	2,594,404	83

a/ Since inception of minimum legal size between the 1976–77 season.  
Does not include closed seasons.

Appendix B. Average weight of Tanner crabs, by district, from the commercial fishery, Cook Inlet Management Area, 1974–1994.

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 <sup>a</sup>	2.31		2.26	2.23 2.33
1988	2.46		2.29	2.17 2.14
1989	CLOSED		CLOSED	CLOSED CLOSED
1990	CLOSED		2.13	CLOSED CLOSED
1991	2.56		2.09	CLOSED CLOSED
1992	2.57		CLOSED	2.16 CLOSED
1993	2.54		CLOSED	CLOSED CLOSED
1994	2.58		CLOSED	CLOSED CLOSED
Average	2.57		2.24	2.19 2.24

<sup>a/</sup> 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 classes, 1993 Cook Inlet trawl survey.

Males	Southern District	Kamishak and Barren Is. District
<u>Sublegal</u>		
<70 mm	599,873	298,382
70 – 91 mm	89,299	151,385
91 – 114 mm		
new	120,343	523,487
o & vo	12,548	211,521
115 – 139 mm		
new	215,292	137,821
o & vo	109,962	530,615
<u>Legal</u>		
140 – 164 mm		
new	280,719	23,387
o & vo	185,496	87,287
≥166 mm		
new	41,158	0
o & vo	16,946	0
<u>Total legals</u>	524,319	110,674
<u>Total Males</u>	1,671,636	1,963,885
<u>FEMALES</u>		
Juveniles	573,958	389,426
Adults	600,934	826,705
<u>Total Females</u>	1,174,592	1,216,131

Appendix D. King crab catch in pounds by season, Cook Inlet Management Area, 1960–94.

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	2,769,343	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	1,117,394	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	2,152,617	50
1981–82	183,899	1,371,821	4,142	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	--
1992–93	CLOSED	CLOSED	CLOSED	0	--
1993–94	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 – 1993.

Year	Southern district catch (lbs.)	Other districts catch (lbs.)	Total catch (lbs.)	No. of vessels	No. of landings
1961	193,683	0	193,683	12	189
1962	530,770	0	530,770	15	269
1963	1,665,599	11,605	1,677,204	50	1,360
1964	417,005	6,036	423,041	22	341
1965	74,211	0	74,211	14	105
1966	12,523	117,037	129,560	5	28
1967	7,168	0	7,168	2	13
1968	484,452	3,407	487,859	7	224
1969	49,894	0	49,894	9	41
1970	209,819	0	209,819	10	50
1971	97,161	0	97,161	22	136
1972	38,930	0	38,930	24	206
1973	308,777	1,271	310,048	54	625
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	Season closed	0	0	0	0
1992	Season closed	Confidential	Confidential		
1993	Season closed	Confidential	Confidential		

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, 1978–1993.

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 <sup>a</sup>		Season Closed		
1992		Season Closed		
1993		Season Closed		
Average	425,746	59	575,269	49

<sup>a</sup>/1991–93 seasons not included in average.

Appendix G. Shrimp catches from the Kachemak Bay trawl shrimp fishery in the Cook Inlet Management Area, 1969-1993.

<u>Season</u>	<u>Number of vessels</u>	<u>Catch (lbs)</u>			
		<u>Jun 1-Oct 31</u>	<u>Nov 1-Mar 31</u>	<u>Apr 1-May 31</u>	<u>Total</u>
1969-70 <sup>a</sup>	7	1,289,656	1,692,854	889,330	3,871,840
1970-71 <sup>a</sup>	3	3,211,924	2,076,228	617,836	5,905,988
1971-72 <sup>a</sup>	7	2,618,630	1,761,569	140,707	4,520,906
1972-73 <sup>a</sup>	10	2,772,422	2,109,660		4,882,082
1973-74 <sup>b</sup>	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
		<u>Jul 1-Sep 30</u>	<u>Oct 1-Dec 31</u>	<u>Jan 1-Mar 31</u>	
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
1992-93	0	CLOSED	CLOSED	CLOSED	0
1993-94	0	CLOSED	CLOSED	CLOSED	0

<sup>a</sup>Catches listed for comparative purposes by seasons established in 1973.

<sup>b</sup>June 1 - October 31 and November 1 - March 31 seasons with respective guidelines established.

Appendix H. Trawl shrimp catches in Outer Cook Inlet  
(Area G), Cook Inlet Management Area, 1977-93.

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 <sup>a</sup>	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
1992-93	2	CONFIDENTIAL
1993-94	2	CONFIDENTIAL

<sup>a</sup> Regulatory season of 1 June through 28 February adopted by the Alaska Board of Fisheries in spring, 1985.

Appendix I. Pot shrimp harvest Cook Inlet Management Area, Area H, 1969-93.

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	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	72,097	25			
1986-87	24,844	18	20,188	11	30,257	19	75,289	37
1987-88	26,216	26	5,416	8	CLOSED	31,632	30	
1988-89	5,323	9	CLOSED	CLOSED	5,323	9		
1989-90	CLOSED	CLOSED	CLOSED	0				
1990-91	CLOSED	CLOSED	CLOSED	0				
1991-92	CLOSED	CLOSED	CLOSED	0				
1992-93	CLOSED	CLOSED	CLOSED	0				

Appendix J. Pot shrimp catch and effort in Outer Cook Inlet  
(Area G), Cook Inlet Management Area, 1977-93.

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 <sup>a</sup>	8	20,500
1990	5	8,853
1991	8	7,315
1992	3	2,804
1993	3	8,356

Average = 7,534

<sup>a</sup> Season closed from April 30 through July 7 due to Exxon Valdez oil spill.

Appendix K. Pacific weathervane scallop catches, Cook Inlet Management Area, 1983-93.

Year	District	Number of vessels	Catch (lbs) of shucked meats
1983	Kamishak	1	2,346
1984	Kamishak	3	6,305
1985 <sup>a</sup>	Kamishak	1	11,810
1986	Kamishak	3	15,364
1987	Outer	1	1,128
	<u>Kamishak<sup>b</sup></u>	<u>2</u>	<u>360</u>
	'87 Total	2	1,488
1988		NO EFFORT	
1989		NO EFFORT	
1990		NO EFFORT	
1991		NO EFFORT	
1992		NO EFFORT	
1993	Kamishak	3	20,115

<sup>a</sup>Season and harvest guideline set by regulation.

<sup>b</sup>Season closed by E.O. on August 21, 1987, one week after opening, due to low cpue.

Appendix L. Harvest of hardshell clams, Cook Inlet Management Area, 1986-93.

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 <sup>a</sup>	3,581 <sup>b</sup>	19,840
1990	19	62	35,744	0	0	35,744
1991	19	78	47,586	85	0	47,571
1992	21	117	54,631	0	0	54,631
1993	33	159	63,676	0	0	63,676

<sup>a</sup> Includes 13,348 pounds sold as otter food as a result of Exxon Valdez oil spill.

<sup>b</sup> Includes 1,981 pounds sold as otter food as a result of Exxon Valdez oil spill.

Appendix M. Harvest of blue mussels, Cook Inlet Management Area, 1986-93.

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 <sup>a</sup>
1990	2	10	10,600
1991	3	11	16,485
1992	3	11	2,501
1993	2	4	1,083

<sup>a</sup>Includes 165,268 pounds sold as otter food as a result of Exxon Valdez oil spill.

Appendix N. Green sea urchin harvest, Cook Inlet Management Area, 1987-93.

Year	No. of divers	Total pounds
1987	1	224
1988	N O	E F F O R T
1989	1	15,181
1990	N O	E F F O R T
1991	4	20,445
1992	7	6,119
1993	29	195,403

Appendix O. Octopus harvests in the Cook Inlet Management Area (H) 1983-93.

Year	No. of vessels	No. of landings	Total pounds
1983	41	101	32,841 <sup>a</sup>
1984	36	77	46,698 <sup>a</sup>
1985	40	70	48,067 <sup>a</sup>
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	3	6	1,343
1991	8	21	2,088
1992	N O	D I R E C T E D	F I S H E R Y
1993 <sup>b</sup>	3	6	475

<sup>a</sup> Bycatch from shellfish pot fisheries.

<sup>b</sup> Directed fishery catch and effort only.

Appendix P. Harvest of razor clams Cook Inlet Management Area, 1919–1993.

Year	Pounds	Year	Pounds
1919	76,963	1954	0
1920	11,952	1955	0
1921	72,000	1956	0
1922	510,432	1957	0
1923	470,280	1958	0
1924	156,768	1959	0
1925	0	1960	372,872
1926	0	1961	277,830
1927	25,248	1962	195,650
1928	0	1963	0
1929	0	1964	0
1930	0	1965	0
1931	No record	1966	0
1932	93,840	1967	0
1933	No record	1968	0
1934	No record	1969	0
1935	No record	1970	0
1936	No record	1971	14,755
1937	8,328	1972	31,360
1938	No record	1973	34,415
1939	No record	1974	No record
1940	No record	1975	10,020
1941	0	1976	No record
1942	0	1977	1,762
1943	0	1978	45,931
1944	0	1979	144,358
1945	15,000	1980	140,240
1946	11,424	1981	441,949
1947	11,976	1982	460,639
1948	2,160	1983	269,618
1949	9,672	1984	261,742
1950	304,073	1985	302,934
1951	112,320	1986	258,632
1952	0	1987	312,349
1953	0	1988	392,610
		1989	222,747
		1990	323,533
		1991	201,320
		1992	296,727
		1993	310,289

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