

**TANNER AND KING CRABS  
IN THE COOK INLET MANAGEMENT AREA  
Stock Status and Harvest Strategies**



By

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# TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES .....	v
LIST OF FIGURES .....	vi
LIST OF APPENDICES .....	vi
ABSTRACT .....	vii
INTRODUCTION .....	1
MANAGEMENT AREA .....	1
GENERAL MANAGEMENT APPROACHES .....	2
Alaska Board of Fisheries Proposals .....	3
Basis for Tanner Crab Management Plans .....	3
TANNER CRAB .....	6
Southern District .....	6
Commercial Harvests .....	6
Sport and Personal Use Harvests .....	7
Surveys .....	7
Proposed Management Strategies .....	8
Kamishak and Barren Islands Districts .....	9
Harvests .....	9
Surveys .....	10
Proposed Management Strategies .....	11
Other Districts .....	12
Harvests .....	12
Surveys .....	12
Proposed Management Strategies .....	13
KING CRAB .....	13
Southern District .....	14
Commercial Harvests and Management Strategies .....	14
Sport and Personal Use Harvests .....	14
Surveys .....	14

**TABLE OF CONTENTS (continued)**

	<u>Page</u>
Kamishak and Barren Islands Districts.....	15
Harvests and Management Strategies.....	15
Survey and Stock Status .....	15
CONCLUSION.....	16
LITERATURE CITED.....	17

## LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Tanner crab commercial harvest by district from the Cook Inlet Management Area, 1968-2001. ....	19
2. Mean weight of Tanner crab harvested commercially in districts of the Cook Inlet Management Area, 1974-2001.....	20
3. Stock status of legal-size male Tanner crab and commercial and personal use/sport harvests, Southern District, 1981-2001. ....	21
4. Pot survey catch and subsequent harvest of Tanner crab in the Southern District, 1974-1990. ....	22
5. Estimated population abundance of male Tanner crab by shell and size class from Cook Inlet trawl surveys, 1990-2001.....	23
6. Female Tanner crab population estimates from Cook Inlet trawl surveys, 1990-2001.....	24
7. Pooled population abundance estimates combined from pot and trawl surveys for Kachemak Bay, 1968-2001.....	25
8. Pot survey catch and subsequent harvest of Tanner crab in the Kamishak and Barren Islands Districts, 1975-1990. ....	26
9. Commercial harvest of king crab by fishing season and district from the Cook Inlet Management Area, 1960-2001. ....	27
10. Pot survey catch and subsequent harvest of king crab in the Southern District, 1974-1990. ....	28
11. King crab catch in Cook Inlet trawl surveys, 1990-2001. ....	29
12. Pot survey catch and subsequent harvest of king crab in the Kamishak and Barren Islands Districts, 1975-1990. ....	30

## LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Commercial shellfish fishing districts of the Cook Inlet Management Area.....	31
2. Commercial Tanner crab harvests by district, Cook Inlet Management Area, 1974-2001. ....	32
3. Pot survey and trawl survey estimates of legal male Tanner crab, and subsequent harvest, in the Southern District, 1968-2001. ....	33
4. Pot survey and trawl survey estimates of legal male Tanner crab, and subsequent harvest, in the Kamishak and Barren Islands Districts, 1968-2001.....	34

## LIST OF APPENDICES

	<u>Page</u>
Appendix A. Proposed changes to Cook Inlet Tanner and king crab regulations submitted for the 2001-2002 meeting cycle of the Alaska Board of. ....	35
Appendix B. Draft Tanner crab management plan for the Southern District .....	36
Appendix C. Draft Tanner crab management plan for the Kamishak and Barren Islands Districts .....	38

## ABSTRACT

The Alaska Department of Fish and Game (ADF&G) manages fishing for Tanner *Chionoecetes bairdi* and red king *Paralithodes camtschatica* crab stocks in the Cook Inlet Management Area. The commercial management area is divided into six districts. The Southern, Kamishak, and Barren Islands Districts have historically supported the largest commercial fisheries whereas the Outer, Eastern, and Central Districts have supported smaller fisheries. The noncommercial management area encompasses all waters north of Cape Douglas and west of Cape Puget. Commercial fisheries historically took 98% of the Tanner crab harvest but have been closed since 1995. Approximately 96% of noncommercial Tanner crab harvest occurs in Kachemak Bay. Management of these resources was historically based solely on commercial fisheries performance. , Pot surveys were then used from the 1970s to 1990 to index crab abundance in the Southern, Kamishak Bay, and Barren Island Districts. Trawl surveys have been used annually since 1990 to estimate absolute abundance of Tanner crab and provide an index of abundance for red king crab. Tanner crab stocks in all surveyed districts have been at low abundance levels since the early 1990s, and no commercial harvests will be allowed until abundance increases. Red king crab stocks have been at extremely low abundance levels in all surveyed districts since the mid-1980s, and no commercial, recreational or subsistence harvests will be allowed until stocks recover. To meet an existing regulatory mandate, and to prepare for a future commercial Tanner crab fishery while providing for ongoing noncommercial fisheries, we have developed harvest strategies for Tanner crab in the primary harvest districts of the Cook Inlet Management Area. Strategies include harvest rates that vary in relation to stock abundance estimates and stock abundance thresholds below which fisheries will not open. A plan for king crab will be developed in the future after a stock recovery is evident.

## INTRODUCTION

The Cook Inlet Management Area has supported commercial harvests of Tanner crab *Chionoecetes bairdi* since the 1960s and red king crab *Paralithodes camtschatica* since at least 1937. The Alaska Department of Fish and Game (ADF&G) has management authority for these crab resources. Most crab stocks in Alaska experience large fluctuations in population abundance (Kruse 1993), and harvests of these resources must be adjusted in relation to the level of population abundance. Tanner crab stocks in all surveyed districts of Cook Inlet have been at low abundance levels since the early-1990s; no commercial harvests and restricted noncommercial harvests will be allowed until abundance increases. Red king crab stocks have been at extremely low abundance levels in all surveyed districts of Cook Inlet since the mid-1980s, and no commercial, recreational or subsistence harvests will be allowed until stocks recover. ADF&G has maintained a program of annual surveys to monitor changes in abundance of Tanner and king crabs. Due to changes in assessment techniques, it is important to periodically review and evaluate management strategies for these crab species in the Cook Inlet area. The objectives of this report are to: (1) summarize harvest and survey data on Tanner and king crabs in the Cook Inlet Management Area; (2) describe existing regulations; and (3) recommend management plans for Tanner crab in the primary fishing districts of the management area. Specific management recommendations for Tanner crab include: harvest rates that vary in relation to stock abundance estimates; stock abundance thresholds below which fisheries are closed; measures such as preseason vessel registration to ensure the commercial fishery can be managed for a guideline harvest level (GHL); and bag and possession limits for noncommercial fisheries. A plan for king crab will be developed in the future.

Commercial harvest data for the Cook Inlet Management Area were compiled from historical annual management reports, previous reports to the Alaska Board of Fisheries (board), and data summaries from the ADF&G fish ticket harvest database (Trowbridge 1996). Data on the sport and personal use harvests come from a statewide mail survey dating to 1981 and harvest permit reports that have been required in Cook Inlet since 1996. Survey data were compiled from historical survey reports and annual management reports. Previous draft plans for Tanner crab management in Cook Inlet were reviewed by the board in 1999, but were found to lack sufficient guidelines for recreational fisheries (Bechtol and Trowbridge 1999)

## MANAGEMENT AREA

For commercial, personal use, and subsistence fisheries, the Cook Inlet Management Area, Statistical Area H, includes all waters west of Cape Fairfield (148° 50' W long.) and north of Cape Douglas (58° 51' N lat). Because there is no federal management plan for crab fisheries in federal waters of the Gulf of Alaska, state regulations for king and Tanner crab fisheries also apply to federal waters adjacent to the Cook Inlet Management Area. The management area is divided into six shellfish districts: Southern, Kamishak Bay (hereafter referred to as Kamishak), Barren Islands, Outer, Eastern, and Central (Figure 1). The Southern, Kamishak, and Barren Islands Districts have historically supported the largest commercial fisheries whereas the Outer, Eastern, and Central



Districts have supported smaller fisheries. For king and Tanner crab management, the Kamishak and Barren Island Districts have typically been managed as a single unit and the Outer and Eastern Districts have similarly been managed as a single unit; that is, districts have opened and closed concurrently within units.

For sport fisheries, the Cook Inlet/Resurrection Bay Management Area encompasses all waters north of Cape Douglas and west of Cape Puget (148° 26.50' W).

## **GENERAL MANAGEMENT APPROACHES**

Harvest strategies have changed greatly during the last two decades as assessment tools have improved and computer technology has allowed more comprehensive assessment models to be generated. Kruse (1993) describes four harvest strategies applied to Alaskan crab stocks. First is fishery performance management, which is based on a guideline harvest level (GHL) or range (GHR) determined from past fishery catches or catch-per-unit-of-effort (CPUE) data. This strategy assumes fishery catches over a specific time period are proportional to resource abundance. As the fishery takes place, the GHL or GHR may be adjusted if observed catches or CPUE rates differ substantially from preseason expectations. Because fishery performance management lacks independent estimates of resource abundance, changes in harvest efficiency, as well as crab behavior (e.g., availability, accessibility, and vulnerability), can greatly alter relationships between catch or CPUE and resource abundance. A second strategy, size and sex (2-S) management, is based only on minimum size limits and sex restrictions. A third strategy, size, sex, and season (3-S) management, is based on minimum size limits, sex restrictions, and closed seasons during mating and molting. A fourth strategy, exploitation rate management, is based on use of a preseason GHL or GHR that is the product of a desired exploitation rate and an estimate of the exploitable biomass. Most commercial crab fisheries off Alaska are currently managed using a combination of these strategies whereas noncommercial regulations in the Cook Inlet/Resurrection Bay Management Area rely on the 3-S strategy.

Prior to 1991, all department surveys used pots to provide an index of crab population abundance (Davis 1981; Kimker 1991*b*). Pot surveys attempted to closely replicate the gear and techniques used by the commercial fishing fleet, and, when combined with tagging, could be used to generate population estimates. Bottom trawls have been used to conduct crab assessment surveys in the Cook Inlet Management Area since 1990 (Kimker 1991*a*). Trawls have several advantages over pots as an assessment tool. First, the area sampled by a trawl can be defined, which allows absolute abundance to be estimated for the sampled population (Gunderson 1993). For pot gear, the effective sampling area is difficult to quantify and subject to great variability due to factors such as water currents, crab behavior, and the type and amount of bait used. Second, trawl gear is generally less selective for particular sizes of crab, although pot gear may be modified, such as by closure of any escape rings, to improve retention of small crab. Third, pot saturation can occur when densities of captured crab become high enough to change fishing effectiveness over time. Although trawl saturation can also occur, tow duration can be reduced to maintain catches with a known sampling area. Because of these characteristics, pot surveys provide only a relative measure, or index, of

abundance, while trawl surveys can provide actual population estimates. Particular care must be taken in designing surveys using either gear to avoid overestimating crab abundance, thereby resulting in harvest rates that are not sustainable.

The phenomenon of Tanner crab skip-molting, the failure to molt and grow into a larger size class, confounds assumptions about growth to maturity. Skip molting makes it difficult to set a minimum legal size that provides male crab at least one opportunity to mate before they enter the fishery (Kruse 1993). In addition, studies show larger crab tend to have more mating success, which makes the presence of larger crab important to overall population structure and production (Adams 1985; Paul and Paul 1996). Stock management has historically been based on estimated productivity, so skip-molting complicates fishery management and recruitment expectations. This is particularly true for prerecruit-2 through recruit size classes, which are often used as an important indicator of stock status and to predict future harvests. At some areas and times, skip molting rates are so high that most prerecruit-1 crabs never achieve legal size.

### *Alaska Board of Fisheries Proposals*

Management strategies for crab resources have been developed over time in response to improvements in assessment techniques, knowledge of crab biology in different geographic areas, and efficiency and effectiveness of the fishing fleet. Several proposals to modify management strategies for Tanner and king crabs have been submitted for consideration during the 2001-2002 meeting cycle of the Alaska Board of Fisheries (Appendix A). Of particular note, Proposal 457 would bring management for Tanner crab in the Cook Inlet Management Area into compliance with Regulation 5AAC 35.080 by establishing Tanner crab harvest strategies. Draft language in Appendix B considers impacts of both commercial and recreational harvests on Southern District Tanner crab stocks; Appendix C addresses only commercial fisheries in the Kamishak and Barren Islands Districts.

### *Basis for Tanner Crab Management Plans*

Management of Tanner crab in the Cook Inlet Management Area was historically based on commercial fisheries performance, using CPUE as an index of stock abundance. Initially, harvest was limited to males. As commercial fisheries developed further, fishing pressure intensified and gear efficiency improved. This led to adoption of additional regulations to improve fishery management and provide for stock conservation. Seasonal closures for commercial fisheries were first implemented in 1973, and minimum size regulations were established in 1976. Beginning in 1987, the commercial fishing season was changed so that it no longer overlapped two calendar years; the new season opened by regulation on January 15 and closed by emergency order when the guideline harvest level was attained. Several additional regulations that have been adopted for commercial Tanner crab fisheries in the Cook Inlet Management Area include:

- 1) Superexclusive vessel registration;

- 2) Vessel registration prior to the season opening;
- 3) Gear storage for 30 days before and 30 days after a season in waters 15 fathoms or less;
- 4) A 75-pot limit per vessel;
- 5) Buoy identification tags to assist with pot limit enforcement;
- 6) A minimum of four 4 <sup>3</sup>/<sub>4</sub> inch escape rings on all pots;
- 7) Retention of only male Tanner crab with a carapace width of 5 <sup>1</sup>/<sub>2</sub> inches (140 mm) or larger;
- 8) Biodegradable escape mechanisms on crab pots.

The noncommercial fishery was open all year prior to 1989; in 1989 the fishery was closed for conservation reasons. Fishery openings were established by emergency order during 1990-1992. The noncommercial season east of a line from Anchor Point to Point Pogibshi has subsequently been July 15 through December 31 and January 15, or the opening of the commercial season, through March 15. In other Cook Inlet waters the noncommercial season has been June 15 through March 15. Noncommercial harvests are restricted to male Tanner crab with a 5 <sup>1</sup>/<sub>2</sub>-inch (140-mm) or larger carapace width. Pot buoys must identify the name and address of the vessel operator, and U.S. Coast Guard vessel number; pot gear must be equipped with biodegradable escape mechanisms. Due to low stock size, the daily bag and possession limits was reduced from 20 to 5 Tanner crab in 2001; pot limits were also reduced from four per person, four per vessel to one per person, two per vessel. Each pot must have two escape rings 4 <sup>3</sup>/<sub>8</sub> inches in diameter.

Subsequent to the establishment of most existing regulations, assessment techniques changed for Tanner and king crabs off Alaska. The most important change for the Cook Inlet Management Area has been the use of trawl gear to estimate absolute abundance. Concurrent trawl and pot surveys were conducted in only one year, 1990, and preliminary analysis failed to show a direct correlation between trawl and pot survey data sets based solely on that year. Thus, it is difficult to develop a time series of absolute population abundance estimates using pot survey data. However, models that track cohort strength based on annual changes in crab size composition have had some success estimating past and present population abundances for Bristol Bay Tanner crab (Zheng et al. 1998).

The Policy on King and Tanner Crab Resource Management Goal and Benefits, adopted through regulatory reference in 5 AAC 35.080 for Tanner crab and 5AAC 34.080 for king crab, specifies elements to consider in managing these species. These regulations also require that the Alaska Board of Fisheries review harvest strategy changes prior to allowing fishing.

Adoption of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) produced several changes in management practices for marine resources (NPFMC 1998) that may be applicable to Cook Inlet crab stocks. MSFCMA defines maximum sustainable yield (MSY) as the largest long-term average harvest that can be taken from a stock or stock complex under prevailing ecological or environmental conditions. MSY stock size can be defined as the long-term average size of the stock, measured in terms of spawning biomass or other appropriate units. In the absence of a comprehensive time series of biomass estimates, proxy estimates of MSY and MSY stock size may be used. Additionally, a minimum stock threshold, below which no commercial fishing would occur, is defined as the greater of either one half the MSY stock size or the minimum stock size at which rebuilding to the MSY stock size would be expected to occur within 10 years if the stock were exploited at the maximum fishing mortality threshold ( $F_{msy}$ ). Lacking other information to estimate  $F_{msy}$ , it is generally assumed to equal the instantaneous

natural mortality rate.

The Environmental Assessment for Amendment 7 to the Fishery Management Plan for commercial king and Tanner crab fisheries in the Bering Sea/Aleutian Islands Management Area defines three tiers of data for development of management standards (NMFS 1998). Cook Inlet Tanner crab data are consistent with Tier 2, used for stocks having limited or inconsistent survey data but moderately comprehensive harvest data. Alternative 2 under Tier 2 allows MSY to be estimated from a proxy of the mature biomass and the stock utilization rate.

In the case of Cook Inlet Tanner crab, a proxy of mature biomass was calculated using historical abundance data for legal male crab. For the years following development of the commercial fishery and prior to the trawl surveys, population abundance of legal males was estimated from mean annual harvest abundance divided by the assumed exploitation rate. Exploitation rates of Tanner crab in the Cook Inlet Management Area are unknown prior to 1990. Historically, many Tanner crab fisheries in Alaska were managed for a 40% harvest rate (Zheng and Kruse 1999). Given the history of the Cook Inlet fisheries, it is reasonable to assume that Tanner crab exploitation was at least 40% of the legal male population. Thus, estimates of the annual underlying population prior to 1990 were calculated as the annual commercial harvest abundances divided by the assumed 40% exploitation rate. It is possible the exploitation rate exceeded 40% of the available legal male population in some years. However, the implication of assuming an exploitation rate of no greater than 40% is to make the population model more conservative. Given the history of decline in the Cook Inlet Tanner crab resources, a more conservative model should better provide for long-term, sustained yield.

Population estimates for the years 1990-2001 were obtained from trawl survey data (Bechtol and Trowbridge 1999; Bechtol 2001). MSY stock size was then calculated as mean annual abundance of legal male crab from the time the fishery was developed to the present. This approach encompasses the wide range of variability exhibited by the stock. Recent years of low abundance are included, as are the years of very large harvests in the 1970s, to provide an average representation of the population and average yield from that population. Although a sustainable yield approach should be the largest long-term average catch that can be expected, it is reasonable to include both high and low population years so that the estimated of MSY stock size is not skewed by either historically high or low population levels. Use of historical harvest abundance data, adjusted by the exploitation rate and combined with trawl survey data, results in a mean legal male abundance that is based on average population performance over the longest possible time series. This makes the best use of all available data.

Kruse (1993) suggested  $F_{msy}$  for Tanner crabs in Alaska be set at 0.3, which corresponds to an annual exploitation rate of 26%. However, this exploitation rate, assumed to equal average natural mortality, may be excessive under some environmental conditions or for particular stocks. Of special concern are populations which are declining in abundance, since spawning stock biomass may be driven to levels insufficient to provide adequate and consistent recruitment (referred to as recruitment overfishing; Gulland 1983). Thus, following a precautionary approach (e.g., United Nations 1994; Caddy 1995), it is appropriate to reduce the exploitation rate as population abundance declines. Given the harvest history and collapse of Cook Inlet Tanner crab populations, it is also prudent to keep instantaneous fishing mortality below estimated  $F_{msy}$  even when stocks are

estimated to have reached or exceeded MSY stock size. The department recommends the maximum annual fishing mortality for the combined commercial and recreational fisheries not exceed 25%, which corresponds to an instantaneous fishing mortality of 0.29. Although harvest rates as high as 50% have been suggested for Tanner crab in the Eastern Bering Sea, the history of Cook Inlet stocks suggests a much more precautionary approach is appropriate (Zheng and Kruse 1999).

## **TANNER CRAB**

### *Southern District*

#### Commercial Harvests

The Southern District Tanner crab fishery occurs in the relatively protected waters of Kachemak Bay. Both small vessels less than 50 ft keel length and larger vessels participate; approximately 50% of the vessels do not have circulating sea water capacity. Homer and Seldovia, home ports to most of the fleet, are less than 3-hours travel from the geographic extremes of the district. This proximity to port allowed daily fishing trips and participation by untanked vessels. Fishing depths range from 5 to 95 fathoms, but generally are between 30 and 65 fathoms. Commercial Tanner crab fishing began in the mid-1960s when this species was harvested incidentally to red king crab (Davis 1981). Greater fishing effort was directed toward Tanner crab during the 1970s when price and demand increased. The first large harvest of Tanner crab was 1.4 million lb from the Southern District in the 1968-1969 season (Table 1). Fishing effort quickly expanded to other Cook Inlet districts, and a peak harvest of 8.0 million lb from all districts in the management area occurred during the 1973-1974 season (Figure 2). Southern District catches peaked with large harvests of 2.9 million lb in 1972-1973, 2.8 million lb in 1977-1978, 1.2 million lb in 1984-1985, and 0.5 million lb in 1993 (Kimker 1996). Mean Southern District harvest was 1.2 million lb during 1968 to 1994. Effort ranged from 35 vessels in 1976-1977 to 136 vessels in 1993. Commercial fishing for Tanner crab in the Southern District was closed in the 1989 and 1990 seasons, and has remained closed since 1995 due to depressed stock levels. The Southern District produced the largest crabs in the management area with mean weight ranging from 2.30 lb in 1985-1986 to 2.85 lb in 1974-1975 (Table 2).

Regulations for the commercial harvest of Tanner crab in the Southern District are generally consistent with other Cook Inlet Area regulations. One exception is a cold weather provision. Research by the National Marine Fisheries Service indicated increased mortality and reduced molt probability in Tanner crab temporarily exposed to extreme cold weather conditions (Carls and O'Clair 1990). Therefore, regulations were adopted that allowed the department to suspend or delay the Southern District fishery during weather conditions that are likely to increase crab discard mortality. Weather conditions under which the department has conducted a fishery have been a minimum air temperature of 15°F combined with a wind speed not exceeding 10 mph.

Two other regulations distinctive to the Southern District commercial Tanner crab fishery are:

- (1) Gear storage in the eastern portion of the district is restricted to water depths of 10 fathoms or less; and
- (2) A limit of 40 pots per vessel is imposed, if the Southern District GHL is less than 800,000 lb.

### Sport and Personal Use Harvests

Cook Inlet supports sport and personal use Tanner crab fisheries, particularly within Kachemak Bay (Table 3; Figure 1). Prior to 1996, harvest information was available only from a statewide mail survey. Beginning in 1996, additional harvest information has become available through a harvest permit required for recreational crab harvesters in the Cook Inlet Management Area. Permits are available from department offices and fishing license vendors. Mean annual harvest from 1981 to 2000, estimated from the mail survey for 1981-1995 and from permits thereafter, was 8,393 crab (20,982 lb) in the sport and personal use fisheries of the Southern District (Szarzi and Begich *in press*). Annual harvests ranged from 1,142 crab (2,855 lb) in 1991 to 19,672 Tanner crab (49,180 lb) in 2000 (Table 3).

### Surveys

Tagging studies with Tanner crab were conducted from 1974 to the mid-1980s (Davis 1981; Kimker et al. 1985). Results indicated that legal male Tanner crab did not migrate between the Southern District and the Kamishak and Barren Islands Districts (Figure 1).

Beginning in 1974 in the Southern District, annual pot surveys were used to develop an index of abundance and set the harvest level for subsequent commercial fisheries (Figure 3; Kimker 1991*b*). Mean catch of legal male Tanner crab in Southern District pot surveys ranged from 39.8 crab per pot in 1977 to 11.4 crab per pot in 1988 (Table 4). Catch rates of sublegal males ranged from 36.5 crab per pot in 1980 to 3.6 crab per pot in 1989. Sublegal male catch rates from 1988 to 1990 were the lowest in the history of the pot survey. Female catch rates also declined steadily from 1987 to 1990. A relatively large survey catch of 24.6 legal males per pot obtained in 1990 is somewhat misleading. Only 68 pot hauls were made in 1990, compared to over 200 pot hauls in preceding years, and the 1990 survey was conducted only at stations that had historically yielded large numbers of crab (Kimker 1991*b*). Pot surveys were discontinued after 1990.

Trawl surveys have been used annually since 1990 in the Southern District to estimate population abundance of Tanner crab and to provide a relative abundance index for red king crab (Table 5; Kimker 1991*a*; Bechtol 2001). Most individual survey stations encompass 6.3 square nautical miles (maximum of 8.9 square nautical miles), with the area of an individual station represented by a single trawl tow (Bechtol 2001). From 18 to 23 stations, with an average of 20.5 stations, have been sampled annually, yielding a mean estimate of 1.7 million sublegal male crab and 292,000 legal male crab. Annual abundance of legal male crab has remained substantially below the historical mean since 1994 with a trend of declining male crab abundance. Legal male crab comprised from 2.6% to 34.6% of the male population, with a mean of 14.9%. Skip molt Tanner crab occur in the Southern District, as evidenced by the abundance of old shell male crab in the trawl survey, but

annual incidence of skip molts has been highly variable (Table 5). Recent studies revealed the importance of large male crab for mating with large, and more fecund, female crab (Paul and Paul 1996), and the lack of postrecruit male crab in recent years could suggest a systematic lack of suitable mates for the most productive component of the female populations. Abundance of female Tanner crab has ranged from 388,000 in 1998 to 2.7 million in 2001, with a mean of 1.1 million crab among years (Table 6). Mature crab comprised an average of 39.7% of the female population, representing an abundance of 452,000 crab, among survey years. The 2001 survey was notable for yielding an estimated population abundance of juvenile female crab and prerecruit-4 male crab that was substantially greater than any previous trawl survey (Tables 5 and 6). Although the Tanner crab abundance observed in the 2001 survey generates guarded optimism for future stock increases, sufficient abundance to support any commercial fishery likely remains several years into the future even under the most aggressive population growth scenarios.

### Proposed Management Strategies

Existing regulations should continue to be included as components of the management strategies for Tanner crab in the Southern District. The department also recommends inclusion of the following: (1) a harvest rate scaled relative to population biomass; (2) a minimum stock threshold; (3) establishment of a preseason commercial registration deadline so that fishing potential can be evaluated to ensure fishing pressure does not force the population biomass below the minimum stock threshold; and (4) reduced pot and/or bag limits at lower resource harvest levels. Because the potential harvest rate and short-term harvest capacity of the current commercial fleet is less than the recreational fleet, greater crab resource abundance is needed to conduct a manageable commercial fishery without forcing the crab population below the commercial minimum stock threshold. Therefore, recreational fishing opportunity is provided at a resource level well below this threshold. As resource abundance increases above the commercial threshold, and noncommercial harvesters are unable to fully utilize available surplus crab production, commercial harvests increase, complementing noncommercial harvests, up to the plan's maximum allowable harvest rate.

The Southern District Tanner crab commercial fishery was considered fully developed by the 1968-1969 season, and the last fishery occurred in 1994 (Table 1). A proxy of MSY stock size was calculated using a combination of historical fishery data and more recent trawl survey data (Table 7). Annual population abundance of legal male crab during 1968 to 1988 was estimated from harvest abundance adjusted by an assumed 40% exploitation rate. Estimated population abundance was then averaged with annual trawl survey estimates of legal male crab during 1990-2001. The long-term average of 1.0 million crab corresponds to a MSY stock size of 2.5 million lb, using a weighted mean of 2.59 lb/crab to estimate harvest abundance for years in which specific abundance or size data was lacking (Table 7). The minimum stock threshold, at one half of MSY stock size, is 0.5 million crab and approximately 1.3 million lb. The application of a smaller mean exploitation rate in this model would have resulted in larger estimated annual population abundances. In contrast, it is possible that actual harvest rates exceeded 40% in some years. However, application of higher exploitation rates would result in smaller estimated annual populations and, ultimately, lower thresholds for commercial fishing. Given the continued history of low abundance in this stock in the absence of commercial fishing, it is unlikely that a

lower commercial threshold will either be manageable or provide sufficient stock conservation for long-term sustained yield. Noncommercial harvest guidelines in the proposed plan should produce sustainable harvests based on recent fishery performance and management actions.

Under the proposed Southern District harvest strategy (Appendix B), if the estimate of legal males equals or exceeds the MSY stock size of 1.0 million crab, the stock may be harvested in aggregate among commercial and recreational users at an annual exploitation rate of 25% of estimated legal male abundance. If the legal male population equals or exceeds the minimum stock threshold of 500,000 crab for a commercial fishery but is less than MSY stock size, the stock may be harvested in aggregate among commercial and recreational users at an annual exploitation rate of 15% of estimated legal male abundance. Implicit in this strategy is that a commercial fishery will not occur if commercial harvests would drive the population below the minimum stock threshold. In addition, it is assumed that as the allowable aggregate harvest rate increases, the commercial proportion of the harvest will increase because of relatively reduced efficiency of noncommercial users. When estimated legal male Tanner crab abundance, including fishery removals, is less than 500,000 crab, no commercial harvest will occur. The non-commercial exploitation rate will be 10% when the five-year average stock size is less than 500,000 legal male crab. When the five-year mean of estimated legal male Tanner crab population abundance is less than 100,000 crabs, or the most recent three estimates are less than 100,000 crab, or the most recent abundance estimate is less than 50,000 crab, the noncommercial fisheries will be closed. The five-year average is used to provide fishery stability amid high annual crab abundance variability. Noncommercial harvest guidelines in the plan should produce a sustainable fishery based upon recent fishery performance and management actions.

Under this scenario, the Southern District commercial fishery would not have opened to commercial Tanner crab fishing in 1990, 1991 or 1994; fisheries occurred in 1991 and 1994. Although the trawl survey estimate of legal males exceeded the minimum threshold in 1993, the fishery would not have opened under the proposed plan because a harvest would have forced the population below the minimum stock threshold. The recreational fisheries will close if the survey abundance estimate of legal male crab is less than 100,000 crab in 2002.

### *Kamishak and Barren Islands Districts*

#### Harvests

The commercial fisheries in the Kamishak Bay and Barren Islands Districts are managed as a single unit for Tanner crab because survey, fishery, and tag recovery information indicate these two districts contain a single stock of Tanner crab (Davis 1981). This fishery occurs in open waters subject to severe weather and icing conditions, as well as extreme tides and seasonal ice floes from upper Cook Inlet and Kamishak Bay. Safe anchorage from storms is located behind Augustine Island or within Iniskin Bay. Most participating vessels have circulating sea water systems. Vessels smaller than 50 ft in keel length have often been limited by poor weather conditions. Historically, much of the fleet fished around the clock; with boats “jogging” while the gear soaked. Fishing occurred in a 15 to 90 fathom depth range. Historic catch in the Kamishak and Barren



Islands Districts ranged from 12,398 lb during 1968-1969 to 4.7 million lb in 1973-1974 (Table 1; Figure 4). The fishery was closed in 1989 and 1992-2001 due to low crab abundance. Vessel effort ranged from 7 to 28 boats (Table 1). The Kamishak and Barren Islands Districts yielded the smallest crabs from Cook Inlet districts, with annual mean weights ranging from 2.09 to 2.35 lb (Table 2).

Existing commercial regulations for Tanner crab in the Kamishak and Barren Islands Districts are generally consistent with management measures in other portions of the Cook Inlet Management Area. However, cold weather regulations for the Southern District were not adopted for the Kamishak and Barren Islands Districts because transit time from port complicates short-term, inseason fishery changes.

Sport and personal use Tanner crab harvest and effort has been estimated by a mail survey and from permit reporting forms required since 1996. Harvests have been small and sporadic outside of Kachemak Bay, numbering zero to less than 200 crabs. Sport and personal use fisheries are currently restricted by emergency order to 5 crabs daily and in possession per person and a pot limit of one per person and two per vessel.

### Surveys

Tagging studies with Tanner crab were conducted in the Kamishak and Barren Islands Districts from 1975 to the mid-1980s (Davis 1981; Kimker et al. 1985). Results indicated that legal male Tanner crab in these districts comprised a single stock. Although legal male Tanner crab did not migrate between the Southern District and the Kamishak and Barren Islands Districts, legal males tagged in the Kamishak and Barren Islands Districts were recaptured in Kodiak's North Mainland Section, but only on a regular basis as far south as Douglas Reef immediately south of Cape Douglas (Figure 1). Due to the latter finding, survey results from the Kamishak and Barren Islands Districts are often compared to results from surveys conducted immediately south of Cape Douglas by Kodiak ADF&G staff. Based on the tagging studies, it is likely that Tanner crab found north and south of Cape Douglas will exhibit similar changes in stock abundance.

Beginning in 1975 in the Kamishak and Barren Island Districts, annual pot surveys were used to develop an index of abundance and set the harvest level for subsequent commercial fisheries (Figure 4; Kimker 1991*b*). Mean catch of legal male Tanner crab in pot surveys ranged from 27.8 crab per pot in 1975 to 1.9 crab per pot in 1983 and 1987 (Table 8). Mean catch among all survey years was 8.0 legal male crab per pot, although annual catch rates exceeded this mean in only five survey years, all of which were prior to 1981. Catch rates of sublegal males ranged from 62.2 crab per pot in 1978 to 13.1 crab per pot in 1984. Pot surveys were discontinued after 1990 (Kimker 1991*a*).

Trawl surveys have been used annually since 1990 in the Kamishak and Barren Islands Districts to estimate abundance of Tanner crab and provide a relative abundance index of red king crab (Table 5; Kimker 1991*a*; Bechtol 2001). Most individual survey stations encompass 26.1 square nautical miles (maximum of 39.0 square nautical miles); this is the area represented by a single trawl tow. Annual sampling effort of 16 to 28 stations resulted in a mean abundance estimate of 3.1 million sublegal and 230,000 legal male crab among all survey years. Annual abundance of legal male crab

has ranged from 594,000 crab in 1990 to 15,000 crab in 2000. Few postrecruit crab have been captured by trawl surveys in these districts. Male skip molt crab, indicated by the old-shell component, are much more prevalent in the Kamishak and Barren Island Districts than in other portions of the Cook Inlet Management Area (Table 5). For example, old-shell crab comprised an average of 73% (range of 42% to 91%) of the prerecruit-1 size class during the trawl survey time series. Because old-shell crab are assumed to be in terminal molt, these crab are not likely to grow to a larger size class and will never achieve a legal size for harvest. In addition, an average of 76% of the recruit size class among years were old-shell crab. The implications of skip-molting are poorly understood, but a predominance of crab in this condition is likely to hinder recovery of the Kamishak and Barren Island Tanner crab stock. Estimated abundance of female Tanner crab in the Kamishak and Barren Islands Districts has ranged from 305,000 in 1998 to 5.1 million in 2001 (Table 6). Although estimated abundance of mature female crab has increased since the historical low of 7,900 females, the 2.1% contribution of mature female crab to total female abundance in the 2001 survey was the lowest on record.

### Proposed Management Strategies

Existing regulations should continue to be included as components of the management strategy for Tanner crab in the Kamishak and Barren Islands Districts. The department also recommends inclusion of the following: (1) a harvest rate scaled relative to population biomass; (2) a minimum stock threshold; and (3) establishment of a time-certain registration deadline so that fishing potential can be evaluated to ensure fishing pressure does not force the population biomass below the minimum stock threshold. Due to the distance from major ports, noncommercial fisheries are not included in harvest strategies for these districts. Existing management area regulations are considered sufficient for stock conservation given the anticipated low level of noncommercial harvests.

The Kamishak and Barren Islands Districts commercial Tanner crab fishery was fully developed by the 1970-1971 season and the last fishery occurred in 1991 (Table 1). A proxy for MSY stock size was calculated using a combination of historical fishery data and more recent trawl survey data (Table 7). Annual population abundance of legal male crab during 1970 to 1988 was estimated from harvest abundance adjusted by an assumed 40% exploitation rate. Estimated population abundance was then averaged with annual trawl survey estimates of legal male crab during 1990 to 2001. The application of a smaller mean exploitation rate would have resulted in larger estimated annual population abundances. The long-term average of 1.4 million crab corresponds to a MSY stock size of 3.2 million lb, assuming 2.25 lb/crab (Tables 2 and 7). The minimum stock threshold, at one half of MSY stock size, became approximately 0.7 million crab and 1.6 million lb.

Under the proposed harvest strategy (Appendix C), if the estimate of legal males equals or exceeds MSY stock size, the stock may be harvested at an annual exploitation rate of 25% of the estimated legal males. If the legal male population equals or exceeds the minimum stock threshold but is less than MSY stock size, a maximum fishing mortality of 15% of the estimated legal males is recommended. When the estimated legal male Tanner crab population is below the minimum stock threshold or conducting a fishery would drive the population below the minimum

stock threshold, no commercial harvest will occur. Under this scenario, the Kamishak and Barren Islands Districts would not have opened to commercial Tanner crab fishing in 1990 or 1991.

### *Other Districts*

#### Harvests

The Outer and Eastern Districts are located in the Gulf of Alaska and border the Prince William Sound Management Area on the east at Cape Fairfield (Figure 1). The exposed open waters in the Gulf of Alaska portion of these districts provided significant portions of the catch in the developmental years of the commercial fishery. More recently, the fishery occurred in or near the mouths of the bays along the outer Kenai Peninsula coast. The fleet in these districts is composed of both small and large vessels. Smaller boats typically fished in bays where greater protection is available during poor weather. Most vessels delivered to Seward, although some delivered to Homer.

Tanner crab catches from the Outer and Eastern Districts peaked at 1.9 million lb in the 1973-1974 season (Table 1). Catches subsequently decreased from 824,000 to 53,000 lb following implementation of a minimum legal size in 1976. The fishery was closed by emergency order from 1989 through 1991, and has remained closed from 1993 to the present due to depressed stock conditions. Participation ranged from 7 to 25 boats. Although few data are available, mean crab weight appears to be slightly smaller in the Outer and Eastern Districts than in other districts (Table 2). Tanner crab harvests were reported from the Central District only in 1988 and 1989 (Table 1). In both years the catch was less than 10,000 lb. Existing management regulations for Tanner crab in the Outer, Eastern, and Central Districts are generally consistent with management measures in other portions of the Cook Inlet Management Area.

Sport and personal use harvests of fewer than 200 Tanner crab annually are reported occasionally from the bays along the outer Kenai Peninsula coast from Gore Point east to Cape Puget; most of this harvest is from Resurrection Bay. The daily and possession bag limits have been restricted by emergency order from 20 to five crab; the pot limit was reduced from four per person and four per vessel to one per person and two per vessel.

#### Surveys

Few fishery-independent data exist for Tanner crab resources in the Outer, Eastern, and Central Districts. Fishery performance data indicates these stocks have declined in concert with Tanner crab resources along the northern and western coasts of the Gulf of Alaska. In addition, the smaller mean crab weight recorded for these districts crab resources in the management area indicates a lack of large, postrecruit crab (Table 2).

## Proposed Management Strategies

Tanner crab stocks in the Outer, Eastern, and Central Districts are not anticipated to recover to an extent that would support directed fishing in the near future. The department proposes a regulatory closure of commercial Tanner crab fishing and restrictions for sport and personal use fisheries in these areas (Appendix B). When stocks throughout the management area have shown substantial recovery, the department will approach the board with a management plan. The department proposes placing into regulation the current emergency regulations governing daily bag and possession limits for the sport and personal use fisheries of the North Gulf Coast.

## **KING CRAB**

Both red king crab and golden king crab *Lithodes aequispina* occur in the Cook Inlet Management Area (H), although golden king crab have only been caught infrequently in the outer portion of the management area in the Gulf of Alaska. Most of the red king crab harvest occurred in the Southern, Kamishak, and Barren Islands Districts (Table 9; Figure 1). Very small harvests occurred in the Outer District and no harvests were reported from the Eastern District.

Similar to the Tanner crab fishery, regulations for king crab developed along with the commercial fishery. Most commercial regulations are consistent among all king crab fisheries in the Cook Inlet Area and include:

- 1) Superexclusive vessel registration;
- 2) Vessel registration prior to the season opening;
- 3) Gear storage for 30 days before and 30 days after a season in waters 15 fathoms or less;
- 4) A 75-pot limit, except a 40-pot limit is in effect if the GHL is less than 1.5 million lb;
- 5) Buoy identification tags to assist with pot limit enforcement;
- 6) Only male king crab with a minimum carapace width of 7.0 inches (178 mm) may be retained;
- 7) Biodegradable escape mechanisms on crab pots.

Historically, the commercial season opened on August 1. The season opening date was changed to July 15 during 1983 to 1987, and then moved back to August 1 in 1988. The season closed on March 15, unless closed by emergency order if the GHL was attained. A minimum legal size of 7.0-inches (178-mm) carapace width was established for all king crab species in 1963. A provision adopted in 1976 allows a season to open and close by emergency order for crab 8.0 in (203 mm) or larger. Retention of male golden king crab was allowed only under terms of a commissioner's permit. In 1999, the board formally closed all commercial king crab fishing in the Cook Inlet Management Area until stock recovery and the board adopts a harvest strategy.

The sport and personal use king crab fisheries have been closed since 1985 and are likely to remain closed into the near future due to low stock abundance. An estimated 6,459 king crab were harvested by sport and personal use fisheries in Cook Inlet and the Outer Gulf Coast in 1981 (Szarzi and Begich *in press*). Harvests declined to a low of 111 crab in 1984. Pot buoy marking and pot escape mechanisms would be required if the fishery were open.

### *Southern District*

#### Commercial Harvests and Management Strategies

The earliest recorded commercial landings of king crab occurred in 1937 when crabs were canned at a Halibut Cove facility (Kimker 1996). The proximity to port and processors enabled daily fishing trips. Through the 1940s, commercial fishing for this species remained at relatively low levels and occurred primarily in the Southern District. By the mid-1950s, annual harvests increased to approximately 2.0 million lb. Harvests peaked at 2.8 million lb in the 1962-63 season and reached a low of 0.18 million lb during 1981-82, the last year of commercial harvest. The fishery has subsequently remained closed by emergency order due to low abundance (Tables 10 and 11). The fishery was historically managed for a GHR based upon pot survey indices.

#### Sport and Personal Use Harvests

King crab harvest estimates are not available for years prior to 1981. Sport and personal use fisheries harvested an estimated 6,178 king crab in 1981 (Table 10). Harvests declined to a low of 62 crab in 1984.

#### Surveys

Annual pot surveys were conducted in the Southern District from 1974 until 1990 to develop annual abundance indices used to set the commercial harvest levels for the subsequent fisheries (Kimker 1991*b*). Catch rates of legal male king crab in the Southern District ranged from 0.4 crab per pot in 1982 to 5.3 crab per pot in 1980 (Table 10). A mean catch of 4.8 crab per pot in the 1990 survey is somewhat misleading. Most crab were caught at a single survey station and the 68-pot sampling effort, substantially less than previous surveys, focused on stations that historically exhibited the largest concentrations of king crab. Mean catch among all years was 7.7 sublegal and 1.8 legal king crab. Catches of female king crab also declined from 46.4 crab per pot in 1977 to 0.1 crab per pot in 1990. Mean catch among all years was 9.7 females per pot.

Trawl surveys have been conducted annually in the Southern District since 1990 (Kimker 1991*a*; Bechtol 2001). Red king crab are not abundant and have a patchy distribution, as is evidenced by the variability in trawl survey catches (Table 11). Population abundance estimates have not been calculated and survey results are treated as an index of king crab abundance. Total survey catches of male red king crab have ranged from 105 in 1991 to 0 in 1998. Mean catch among survey years

was 17.4 crab per survey, although annual catches have not achieved this average since 1992. Most king crabs captured during the trawl surveys have been of legal size. The Southern District red king crab population remains severely depressed and all crab are needed to sustain the limited existing productivity. Because a stock recovery is not anticipated in the near term, the board adopted a regulatory closure of all king crab fisheries in the Cook Inlet Management Area in 1999. The department continues to monitor stock status through annual trawl surveys. When recovery of the population is evident, the department will develop a management plan for consideration by the board and user groups. At that time, the department will also evaluate survey options to determine the best alternatives relative to available assessment tools and department resources.

### *Kamishak and Barren Islands Districts*

#### Harvests and Management Strategies

During the 1960s the king crab fishery expanded to the Kamishak and Barren Islands Districts. Harvests peaked at 5.5 million pounds in the 1962-1963 season. However, catch dropped significantly the following year after processing facilities in the Seldovia area were severely damaged by the 1964 earthquake. Catches ranged from 1.4 to 3.0 million lb for the next decade before drastically declining in the early 1980s. The commercial fishery has remained closed due to low stock abundance following a harvest of only 188,000 lb in the 1983-84 season.

King crab fishery regulations are consistent with other districts in the management area. The minimum legal size was increased to an 8.0-inch carapace width for the 1976-77 and 1977-78 seasons. However, research on the reproductive capabilities of male king crabs now indicates that large males are more important to the brood stock than small males (Paul and Paul 1990). Therefore, there will be no further effort to justify an 8.0-inch king crab season.

Sport and personal use fisheries for king crab have remained closed since 1985.

#### Survey and Stock Status

Annual pot surveys were conducted in the Kamishak and Barren Islands Districts during 1975-1990 to develop an index of abundance and set the harvest level for subsequent commercial fisheries (Kimker 1991*b*). Catches of legal male king crab ranged from 0.3 crab per pot in 1986 to 27.0 crab per pot in 1975 (Table 12). The 1975 catch per pot was much greater than the catch obtained in any other survey year. Mean catch among years was 4.6 legal male crab per pot. Catch rates for female king crab also declined from 37.6 crab per pot in 1977 to 1.0 crab per pot in 1988. Mean catch among all years was 10.0 females per pot.

Trawl surveys have been conducted annually in the Kamishak and Barren Islands Districts since 1990 (Kimker 1991*a*; Bechtol 2001). Red king crab are not abundant and have a patchy distribution in trawl survey catches (Table 11). Population abundance estimates are not calculated and the survey is treated as an index of king crab abundance. Catches of male crab in annual trawl surveys

ranged from 2 in 1993 and 1999 to 140 in 2000, with a mean among survey years of 28.3 crab per survey. Although trawl survey catches in the last two years show improvement relative to surveys in the early 1990s, high interannual variability is indicated, likely due to patchy distribution of king crab aggregations. The king crab population in the Kamishak Bay and Barren Islands Districts remains severely depressed; all crab are needed to maintain productivity. Because a stock recovery is not anticipated in the near term, a regulatory closure of all king crab fisheries in the Cook Inlet Management Area was adopted by the board in 1999. The department continues to monitor stock status through annual trawl surveys. When recovery of the population is evident, a management plan will be developed for consideration by the board and user groups. At that time, the department will evaluate a variety of survey options to determine the best alternatives relative to available assessment tools.

## **CONCLUSION**

Tanner crab stocks remain at low levels of abundance in the Cook Inlet Management Area compared to historical harvest levels. The decline in Tanner crab populations continued after commercial fishery closures, and the proposed management plan provides a more conservative and comprehensive management approach by establishing fishing thresholds for noncommercial users. To guide management strategies in anticipation of future increased abundance of Tanner crab stocks, the department has submitted strategic plans to guide future openings and management of Tanner crab fisheries in the Cook Inlet Management Area. These plans use the available data from a wide range of historical stock conditions. The department remains committed to monitoring the status of these resources through fishery-independent surveys.

King crab resources in the Cook Inlet Management Area remain severely depressed despite being closed to all user groups for over 15 years. Recovery of the king crab resource is unlikely in the near future, and the department supports a continued regulatory closure of king crab fishing for all user groups.

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Table 1. Tanner crab commercial harvest by district from the Cook Inlet Management Area, 1968-2001.

Season <sup>a/</sup>	Southern			Kamishak/Barren Islands			Outer/Eastern			Central		
	Vessels	Harvest		Vessels	Harvest		Vessels	Harvest		Vessels	Harvest	
		Biomass (lb)	Number		Biomass (lb)	Number		Biomass (lb)	Number		Biomass (lb)	Number
1968-69		1,388,282	540,655		12,398	5,544		816	374			
1969-70		1,147,154	446,750		71,196	31,839		104,191	47,794			
1970-71		1,046,803	407,669		541,212	242,028		3,000	1,376			
1971-72		2,462,956	959,178		974,962	436,000		804,765	369,158			
1972-73		2,935,662	1,143,269		3,361,023	1,503,037		1,266,023	580,744			
1973-74		1,387,535	540,364		4,689,251	2,097,016		1,891,021	867,441			
1974-75		967,762	339,566		2,150,462	961,679		656,660	301,220			
1975-76		1,339,245	505,375	17	3,281,084	1,467,289		850,964	390,350			
1976-77	35	2,009,633	720,299	24	1,765,926	789,716		824,520	378,220			
1977-78	55	2,806,568	1,059,082	28	2,077,092	883,869		502,049	230,298			
1978-79	75	2,323,420	880,083	27	2,713,339	1,205,928		694,728	318,683			
1979-80	68	1,134,940	436,515	24	3,338,623	1,497,140		595,645	273,232			
1980-81	46	1,047,630	380,956	20	1,757,331	798,787		463,201	212,478			
1981-82	41	548,529	219,412	18	1,286,332	561,717	9	524,897	240,778			
1982-83	48	584,908	236,805	20	1,693,794	739,648	20	682,919	313,266			
1983-84	45	996,763	397,117	17	1,373,674	615,997	14	443,384	203,387			
1984-85	83	1,229,298	493,694	19	1,535,547	670,545	7	259,083	118,845			
1985-86	103	1,164,261	506,200	24	1,288,711	593,876	5	177,041	81,963			
1987	87	1,077,379	466,398	21	1,111,339	491,743	13	251,174	112,634	2	7,771	3,485
1988	127	944,763	384,050	24	417,182	182,176	23	168,969	77,866	3	8,396	3,923
1989		Closed			Closed			Closed			Closed	
1990		Closed		7	422,037	198,139		Closed			Closed	
1991	68	271,379	106,007	8	266,106	127,323		Closed			Closed	
1992	110	354,868	138,081		Closed		16	53,049	24,560		Closed	
1993	136	534,003	210,237		Closed			Closed			Closed	
1994	110	284,676	110,340		Closed			Closed			Closed	
1995-2001		Closed			Closed			Closed			Closed	
Average	77	1,249,517	484,504	20	1,642,210	731,865	13	534,195	244,984	3	8,084	3,704

<sup>a/</sup> Fishing seasons overlapped two calendar years prior to 1987.

Table 2. Mean weight of Tanner crab harvested commercially in districts of the Cook Inlet Management Area, 1974-2001.

Season <sup>a/</sup>	District			
	Southern	Kamishak/ Barren Islands	Outer/Eastern	Central
Mean Weight (lb/crab) <sup>b/</sup>				
1968-69				
1970-71				
1971-72				
1972-73				
1973-74				
1974-75	2.85			
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	2.31	2.26	2.23	2.23
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
1995-2001	Closed	Closed	Closed	Closed
Average	2.57	2.24	2.18	2.19

<sup>a/</sup> Fishing seasons overlapped two calendar years prior to 1987.

<sup>b/</sup> No harvest occurred in the Central District prior to 1987; no data are available for other seasons and districts where values are missing.

Table 3. Stock status of legal-size male Tanner crab and commercial and personal use/sport harvests, Southern District, 1981-2001.

Year	Trawl Survey Estimate of Legal Males	Pot Survey Index of Abundance (Crab/pot)	Commercial Harvest		Personal Use and Sport Harvest	
			Weight (lb)	Number	Weight (lb) <sup>a/</sup>	Number
1981		16.9	548,529	219,412	10,800	4,320
1982		16.3	584,908	236,805	10,585	4,234
1983		22.1	996,763	397,117	7,710	3,084
1984		24.9	1,229,298	493,694	5,830	2,332
1985		35.4	1,164,261	506,200	8,755	3,502
1986		20.3	1,077,379	466,398	19,815	7,926
1987		23.8			22,470	8,988
1988		11.4	944,763	384,050	11,673	4,669
1989		11.9	Closed		-	-
1990	366,781	24.6	Closed		-	-
1991	536,723		271,379	106,007	2,855	1,142
1992	953,939		354,868	138,081	10,413	4,165
1993	524,319		534,003	210,237	23,015	9,206
1994	187,172		284,676	110,340	24,120	9,648
1995	235,319		Closed		27,340	10,936
1996	93,662		Closed		30,148	12,059
1997	154,163		Closed		28,440	11,376
1998	185,093		Closed		41,908	16,763
1999	111,206		Closed		42,613	17,045
2000	73,961		Closed		49,180	19,672
2001	80,035		Closed		NA	NA
Average	291,864	20.8	726,439	297,122	20,982	8,393

<sup>a/</sup> Harvest weight calculated from harvest abundance using a mean estimated weight of 2.5 lb/crab.

Table 4. Pot survey catch and subsequent harvest of Tanner crab in the Southern District, 1974-1990.

Year	Pots Fished	Number of Females		Number of Males			Males per Pot <sup>a/</sup>		Subsequent Harvest (Number of Crab)
		Total	per Pot <sup>a/</sup>	Sublegal	Legal	Total	Sublegal	Legal	
1974	240	785	3.3		3,889			16.2	339,566
1975	260	1,840	7.1		5,093			19.6	505,375
1976	227	1,757	7.7		5,014			22.1	720,299
1977	260	3,937	15.1		10,352			39.8	1,059,082
1978	237	2,617	11.0		8,508			35.9	880,083
1979	255	3,075	12.1	1,929	3,721	5,650	7.6	14.6	436,515
1980	219	1,455	6.6	7,995	4,525	12,520	36.5	20.7	380,956
1981	238	1,719	7.2	3,088	4,012	7,100	13.0	16.9	219,412
1982	222	2,772	12.5	3,749	3,628	7,377	16.9	16.3	236,805
1983	230	2,195	9.5	3,130	5,087	8,217	13.6	22.1	397,117
1984	234	1,911	8.2	3,333	5,838	9,171	14.2	24.9	493,694
1985	231	3,540	15.3	7,445	8,171	15,616	32.2	35.4	506,200
1986	237	2,886	12.2	4,497	4,822	9,319	19.0	20.3	466,398
1987	237	3,097	13.1	2,753	5,649	8,402	11.6	23.8	384,050
1988	228	2,333	10.2	1,303	2,591	3,894	5.7	11.4	Closed
1989	212	1,563	7.4	757	2,533	3,290	3.6	11.9	Closed
1990	68	303	4.5	486	1,676	2,162	7.1	24.6	106,007
Average			9.6				12.9	22.5	475,437

<sup>a/</sup> Data not standardized for soak time.

Table 5. Estimated population abundance of male Tanner crab by shell and size class from Cook Inlet trawl surveys, 1990-2001.

<b>Southern District</b>														
Year	No. of Tows	Prerecruit-4	Prerecruit-3	Prerecruit-2		Prerecruit-1		Recruit		Postrecruit		Males		Total
				(new shell)	(old shell)	(new shell)	(old shell)	(new shell)	(old shell)	(new shell)	(old shell)	Legal		
1990	19	453,024	682,569	541,891	9,492	403,015	37,055	137,235	163,961	12,081	53,504	366,781	2,493,827	
1991	20	316,529	295,026	826,589	35,265	790,463	117,838	279,543	187,509	45,587	24,084	536,723	2,918,433	
1992	18	306,159	134,137	438,453	34,688	683,607	205,970	740,136	138,101	49,547	26,155	953,939	2,756,953	
1993	19	599,873	89,299	120,343	12,548	215,292	109,962	280,719	185,496	41,158	16,946	524,319	1,671,636	
1994	20	258,118	169,986	114,102	8,572	95,260	58,967	65,675	94,138	6,726	20,633	187,172	892,177	
1995	20	372,035	356,327	449,225	17,330	386,004	37,399	157,383	62,421	6,049	9,466	235,319	1,853,639	
1996	19	189,773	42,712	312,708	121,332	368,250	156,423	48,546	45,116	0	0	93,662	1,284,860	
1997	23	148,607	111,729	267,005	6,655	311,678	36,110	143,170	10,525	468	0	154,163	1,035,947	
1998	23	267,276	16,323	11,802	11,915	131,082	37,975	154,674	24,420	5,999	0	185,093	661,467	
1999	20	967,083	1,251,769	591,655	81,833	161,674	76,204	66,642	42,056	609	1,899	111,206	3,241,423	
2000	23	515,098	361,622	282,882	14,222	314,006	10,038	64,935	6,968	0	2,058	73,961	1,571,828	
2001	22	1,879,906	531,311	243,588	23,149	234,487	96,045	54,960	23,669	0	1,407	80,035	3,088,522	
Average	20.5	522,790	336,901	350,020	31,417	341,235	81,665	182,801	82,032	14,019	13,013	291,864	1,955,893	

**Kamishak/Barren Islands Districts**

Year	No. of Tows	Prerecruit-4	Prerecruit-3	Prerecruit-2		Prerecruit-1		Recruit		Postrecruit		Males		Total
				(new shell)	(old shell)	(new shell)	(old shell)	(new shell)	(old shell)	(new shell)	(old shell)	Legal		
1990	28	1,831,889	332,005	535,114	429,654	257,792	2,085,775	105,461	488,244	0	0	593,705	6,065,934	
1991	20	230,638	155,084	286,310	91,460	357,887	1,053,779	39,465	330,052	0	0	369,517	2,544,675	
1992	28	251,834	552,348	360,846	233,671	166,434	1,236,465	19,629	193,576	0	3,968	217,173	3,018,771	
1993	16	298,382	151,385	523,487	211,521	137,821	530,615	23,387	87,287	0	0	110,674	1,963,885	
1994	17	200,254	852,801	1,168,971	431,525	916,511	673,005	51,582	126,964	0	3,968	182,514	4,425,581	
1995	27	47,256	422,861	841,368	502,175	733,399	875,308	171,912	71,418	0	0	243,330	3,665,697	
1996	20	681,961	162,180	297,593	366,916	730,491	1,561,542	88,162	315,768	0	3,967	407,897	4,208,580	
1997	20	535,630	23,806	351,709	15,871	214,252	1,388,147	99,191	289,637	0	7,935	396,763	2,926,178	
1998	23	331,580	35,709	0	67,450	31,741	319,968	31,741	87,288	0	0	119,029	905,477	
1999	19	810,879	99,074	1,158,430	55,592	141,854	238,108	3,890	63,457	0	0	67,347	2,571,283	
2000	28	641,624	59,326	31,942	56,234	89,452	85,380	0	15,395	0	0	15,395	979,353	
2001	25	5,750,233	151,500	0	31,405	15,543	101,212	30,729	11,739	0	0	42,468	6,092,361	
Average	22.6	967,680	249,840	462,981	207,789	316,098	845,775	55,429	173,402	0	1,653	230,484	3,280,648	

Class (mm)	Pre-4 (<70)	Pre-3 (70-90)	Pre-2 (91-114)	Pre-1 (115-139)	Recruit (140-165)	Post-recruit (>165)
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Table 6. Female Tanner crab population estimates from Cook Inlet trawl surveys, 1990-2001.

Year	Number of Tows	Southern District Crab Abundance			%Mature
		Juvenile	Mature	Total	
1990	19	919,907	393,506	1,313,413	30.0%
1991	20	519,521	914,322	1,433,843	63.8%
1992	18	350,782	533,748	884,530	60.3%
1993	19	573,958	600,634	1,174,592	51.1%
1994	20	515,136	373,041	888,177	42.0%
1995	20	609,577	676,352	1,285,929	52.6%
1996	19	223,189	451,068	674,257	66.9%
1997	23	162,867	287,443	450,310	63.8%
1998	23	317,679	70,650	388,329	18.2%
1999	20	1,126,217	498,233	1,624,450	30.7%
2000	23	630,082	197,249	827,330	23.8%
2001	22	2,270,935	422,663	2,693,598	15.7%
Average	20.5	684,987	451,576	1,136,563	39.7%

Year	Number of Tows	Kamishak and Barren Islands Districts Crab Abundance			%Mature
		Juvenile	Mature	Total	
1990	28	2,140,458	499,961	2,640,419	18.9%
1991	20	326,075	87,484	413,559	21.2%
1992	28	453,343	217,801	671,144	32.5%
1993	16	389,426	826,705	1,216,131	68.0%
1994	17	490,030	944,491	1,434,521	65.8%
1995	27	195,451	479,970	675,421	71.1%
1996	20	637,737	150,670	788,407	19.1%
1997	20	230,122	79,353	309,475	25.6%
1998	23	296,722	7,935	304,657	2.6%
1999	19	819,358	43,644	863,002	5.1%
2000	28	694,448	27,813	722,261	3.9%
2001	25	4,954,877	104,564	5,059,441	2.1%
Average	22.6	969,004	289,199	1,258,203	23.0%

Table 7. Pooled population abundance estimates combined from pot and trawl surveys for Kachemak Bay, 1968-2001.

<b>Southern District</b>				<b>Kamishak and Barren Islands Districts</b>					
Year	Harvest (lb)	Mean Wt (lb) <sup>1/</sup>	Harvest Abundance at F=40%	Pop. Est.	Year	Harvest (lb)	Mean Wt (lb) <sup>1/</sup>	Harvest Abundance at F=40%	Pop. Est.
1968-69	1,388,282		535,297	1,338,242	1968-69	12,398		5,544	
1969-70	1,147,154		442,322	1,105,805	1969-70	71,196		31,839	
1970-71	1,046,803		403,629	1,009,071	1970-71	541,212		240,330	600,824
1971-72	2,462,956		949,672	2,374,180	1971-72	974,962		432,940	1,082,350
1972-73	2,935,662		1,131,939	2,829,847	1972-73	3,361,023		1,492,491	3,731,227
1973-74	1,387,535		535,009	1,337,522	1973-74	4,689,251		2,082,302	5,205,754
1974-75	967,762	2.85	339,566	848,914	1974-75	2,150,462		954,931	2,387,327
1975-76	1,339,245	2.65	505,375	1,263,439	1975-76	3,281,084		1,456,993	3,642,483
1976-77	2,009,633	2.79	720,299	1,800,746	1976-77	1,765,926		784,174	1,960,436
1977-78	2,806,568	2.65	1,059,082	2,647,706	1977-78	2,077,092	2.35	883,869	2,209,672
1978-79	2,323,420	2.64	880,083	2,200,208	1978-79	2,713,339	2.25	1,205,928	3,014,821
1979-80	1,134,940	2.60	436,515	1,091,288	1979-80	3,338,623	2.23	1,497,140	3,742,851
1980-81	1,047,630	2.75	380,956	952,391	1980-81	1,757,331	2.2	798,787	1,996,967
1981-82	548,529	2.50	219,412	548,529	1981-82	1,286,332	2.29	561,717	1,404,293
1982-83	584,908	2.47	236,805	592,012	1982-83	1,693,794	2.29	739,648	1,849,120
1983-84	996,763	2.51	397,117	992,792	1983-84	1,373,674	2.23	615,997	1,539,993
1984-85	1,229,298	2.49	493,694	1,234,235	1984-85	1,535,547	2.29	670,545	1,676,361
1985-86	1,164,261	2.30	506,200	1,265,501	1985-86	1,288,711	2.17	593,876	1,484,690
1987	1,077,379	2.31	466,398	1,165,995	1987	1,111,339	2.26	491,743	1,229,357
1988	944,763	2.46	384,050	960,125	1988	417,182	2.29	182,176	455,439
1989	Closed		Closed		1989	Closed		Closed	Closed
1990	Closed		Closed	366,781	1990	422,037	2.13	198,139	593,705
1991	271,379	2.56	106,007	536,723	1991	266,106	2.09	127,323	369,517
1992	354,868	2.57	138,081	953,939	1992	Closed		Closed	217,173
1993	534,003	2.54	210,237	524,319	1993	Closed		Closed	110,674
1994	284,676	2.58	110,340	187,172	1994	Closed		Closed	182,514
1995	Closed		Closed	235,319	1995	Closed		Closed	243,330
1996	Closed		Closed	93,662	1996	Closed		Closed	407,897
1997	Closed		Closed	154,163	1997	Closed		Closed	396,763
1998	Closed		Closed	185,093	1998	Closed		Closed	119,029
1999	Closed		Closed	111,206	1999	Closed		Closed	67,347
2000	Closed		Closed	73,961	2000	Closed		Closed	15,395
2001	Closed		Closed	80,035	2001	Closed		Closed	42,468
<b>Average 1968-2001</b>					<b>Average 1970-2001</b>				
	1,249,517	2.59	482,837	970,654		1,802,251	2.25	800,552	1,399,326
MSY Stock Size			Biomass 2,517,372	Abundance 970,654	MSY Stock Size			Biomass 3,151,220	Abundance 1,399,326
Minimum Stock Threshold			Biomass 1,258,686	Abundance 485,327	Minimum Stock Threshold			Biomass 1,575,610	Abundance 699,663

<sup>1/</sup> Mean weight calculated from available annual mean weights and harvest biomass. Overall mean weight was used to estimate abundance for 1968-1974 where annual weight was lacking.



Table 8. Pot survey catch and subsequent harvest of Tanner crab in the Kamishak and Barren Islands Districts, 1975-1990.

Year	Pots Fished	Number of Females		Number of Males			Males per Pot <sup>a/</sup>		Subsequent Harvest (Number of Crab)
		Total	per Pot <sup>a/</sup>	Sublegal	Legal	Total	Sublegal	Legal	
1975	96				2,666			27.8	961,679
1976	159				1,537			9.7	1,467,289
1977	199	1,867	9.4	7,553	1,547	9,100	38.0	7.8	789,716
1978	224	1,672	7.5	13,926	3,309	17,235	62.2	14.8	883,869
1979	261	2,004	7.7	7,826	3,044	10,870	30.0	11.7	1,205,928
1980	171	711	4.2	6,187	1,470	7,657	36.2	8.6	1,497,140
1981	173	871	5.0	5,738	857	6,595	33.2	5.0	798,787
1982	70	37	0.5	1,098	238	1,336	15.7	3.4	561,717
1983	192	358	1.9	3,160	359	3,519	16.5	1.9	739,648
1984	185	196	1.1	2,429	771	3,200	13.1	4.2	615,997
1985	182	574	3.2	3,662	781	4,443	20.1	4.3	670,545
1986	184	1,226	6.7	6,709	1,290	7,999	36.5	7.0	593,876
1987	108	691	6.4	3,372	210	3,582	31.2	1.9	491,743
1988	168	664	4.0	5,419	766	6,185	32.3	4.6	182,176
1989	126	607	4.8	4,923	1,001	5,924	39.1	7.9	Closed
1990	99	334	3.4	2,630	782	3,412	26.6	7.9	198,139
Average			4.7				30.7	8.0	897,547

<sup>a/</sup> Data not standardized for soak time.

Table 9. Commercial harvest of king crab by fishing season and district from the Cook Inlet Management Area, 1960-2001.

Year	District			Total Catch
	Southern	Kamishak and Barren Islands	Outer and Eastern	
<b>Harvest (lb)</b>				
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	8,622,556
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	3,240,517
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	4,873,196
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
1978-79	664,388	480,261	1,753	1,146,402
1979-80	853,584	489,365	4,871	1,347,820
1980-81	508,670	1,635,922	8,022	2,152,614
1981-82	183,899	1,371,821	4,142	1,559,862
1982-83	Closed	807,079	15,280	822,359
1983-84	Closed	188,027	4,504	192,531
After 1984	Closed	Closed	Closed	Closed
Average <sup>1/</sup>	1,444,861	2,050,358	63,692	3,438,506

<sup>1/</sup> Average based only on years when fishery occurred.

Table 10. Pot survey catch and subsequent harvest of king crab in the Southern District, 1974-1990.

Year	Pots Fished	Number of Females		Number of Males			Males per Pot <sup>a/</sup>		Subsequent Harvest	
		Total	per Pot <sup>a/</sup>	Sublegal	Legal	Total	Sublegal	Legal	Commercial	Non-Commercial
									(Number of Legal Males) <sup>b/</sup>	
1974	240			494	275	769	2.1	1.1	242,202	
1975	260	432	1.7	552	573	1,125	2.1	2.2	201,759	
1976	227	981	4.3	977	225	1,202	4.3	1.0	126,258	
1977	260	12,075	46.4	9,772	281	10,053	37.6	1.1	82,266	
1978	237	2,944	12.4	5,501	807	6,308	23.2	3.4	100,665	
1979	255	2,555	10.0	2,853	665	3,518	11.2	2.6	125,527	
1980	367	14,855	40.5	10,041	1,941	11,982	27.4	5.3	74,804	
1981	238	2,711	11.4	2,130	519	2,649	8.9	2.2	25,901	6,178
1982	222	1,889	8.5	608	95	703	2.7	0.4	Closed	1,981
1983	230	696	3.0	447	123	570	1.9	0.5	Closed	409
1984	234	2,100	9.0	777	418	1,195	3.3	1.8	Closed	62
1985	231	941	4.1	337	273	610	1.5	1.2	Closed	Closed
1986	237	480	2.0	365	210	575	1.5	0.9	Closed	Closed
1987	237	137	0.6	188	252	440	0.8	1.1	Closed	Closed
1988	228	294	1.3	336	184	520	1.5	0.8	Closed	Closed
1989	212	62	0.3	78	105	183	0.4	0.5	Closed	Closed
1990	68	10	0.1	19	329	348	0.3	4.8	Closed	Closed
Average			9.7				7.7	1.8	122,423	122,423

<sup>a/</sup> Data not standardized for soak time.

<sup>b/</sup> No data on non-commercial harvests before 1981.

Table 11. King crab catch in Cook Inlet trawl surveys, 1990-2001.

Year	Number Of Tows	<b>Southern District</b>					
		Female Crab per Survey			Male Crab per Survey		
		Juvenile	Mature	Total	Sublegal	Legal	Total
1990	19	2	0	2	1	3	4
1991	20	0	8	8	1	104	105
1992	18	1	80	81	4	44	48
1993	19	3	18	21	7	8	15
1994	20	6	4	10	4	7	11
1995	20	0	1	1	0	3	3
1996	19	0	2	2	1	3	4
1997	23	0	39	39	1	8	9
1998	23	0	0	0	0	0	0
1999	20	0	0	0	0	2	2
2000	23	0	0	0	0	4	4
2001	22	0	0	0	0	4	4
Average	20.5	1.0	12.7	13.7	1.6	15.7	17.3

Year	Number Of Tows	<b>Kamishak and Barren Islands Districts</b>					
		Female Crab per Survey			Male Crab per Survey		
		Juvenile	Mature	Total	Sublegal	Legal	Total
1990	28	0	4	4	2	4	6
1991	20	0	0	0	0	7	7
1992	28	1	3	4	4	22	26
1993	16	0	0	0	1	1	2
1994	17	0	0	0	0	3	3
1995	27	4	0	4	3	3	6
1996	20	2	7	9	29	2	31
1997	20	60	7	67	33	13	46
1998	23	0	5	5	14	0	14
1999	19	0	0	0	0	2	2
2000	28	7	9	16	12	128	140
2001	25	1	52	53	0	43	43
Average	22.6	6.3	7.3	13.1	8.2	19.0	27.2

Table 12. Pot survey catch and subsequent harvest of king crab in the Kamishak and Barren Islands Districts, 1975-1990.

Year	Pots Fished	Number of Females		Number of Males			Males per Pot <sup>a/</sup>		Subsequent Harvest (No. of Males)
		Total	per Pot <sup>a/</sup>	Sublegal	Legal	Total	Sublegal	Legal	
1975	96			1,529	2,593	4,122	15.9	27.0	201,759
1976	159			1,301	768	2,069	8.2	4.8	126,258
1977	199	7,488	37.6	4,326	698	5,024	21.7	3.5	82,266
1978	224	8,164	36.4	7,774	883	8,657	34.7	3.9	100,665
1979	261	6,123	23.5	7,553	1,109	8,662	28.9	4.2	125,527
1980	171	920	5.4	1,098	602	1,700	6.4	3.5	74,804
1981	173	1,337	7.7	1,191	1,202	2,393	6.9	6.9	25,901
1982	70	357	5.1	504	296	800	7.2	4.2	Closed
1983	192	407	2.1	250	150	400	1.3	0.8	Closed
1984	185	315	1.7	206	73	279	1.1	0.4	Closed
1985	182	247	1.4	100	314	414	0.5	1.7	Closed
1986	184	565	3.1	444	51	495	2.4	0.3	Closed
1987	108	1,169	10.8	1,374	429	1,803	12.7	4.0	Closed
1988	168	172	1.0	226	259	485	1.3	1.5	Closed
1989	126	436	3.5	330	487	817	2.6	3.9	Closed
1990	99	135	1.4	118	356	474	1.2	3.6	Closed
Average			10.0				9.2	4.6	105,311

<sup>a/</sup> Data not standardized for soak time.

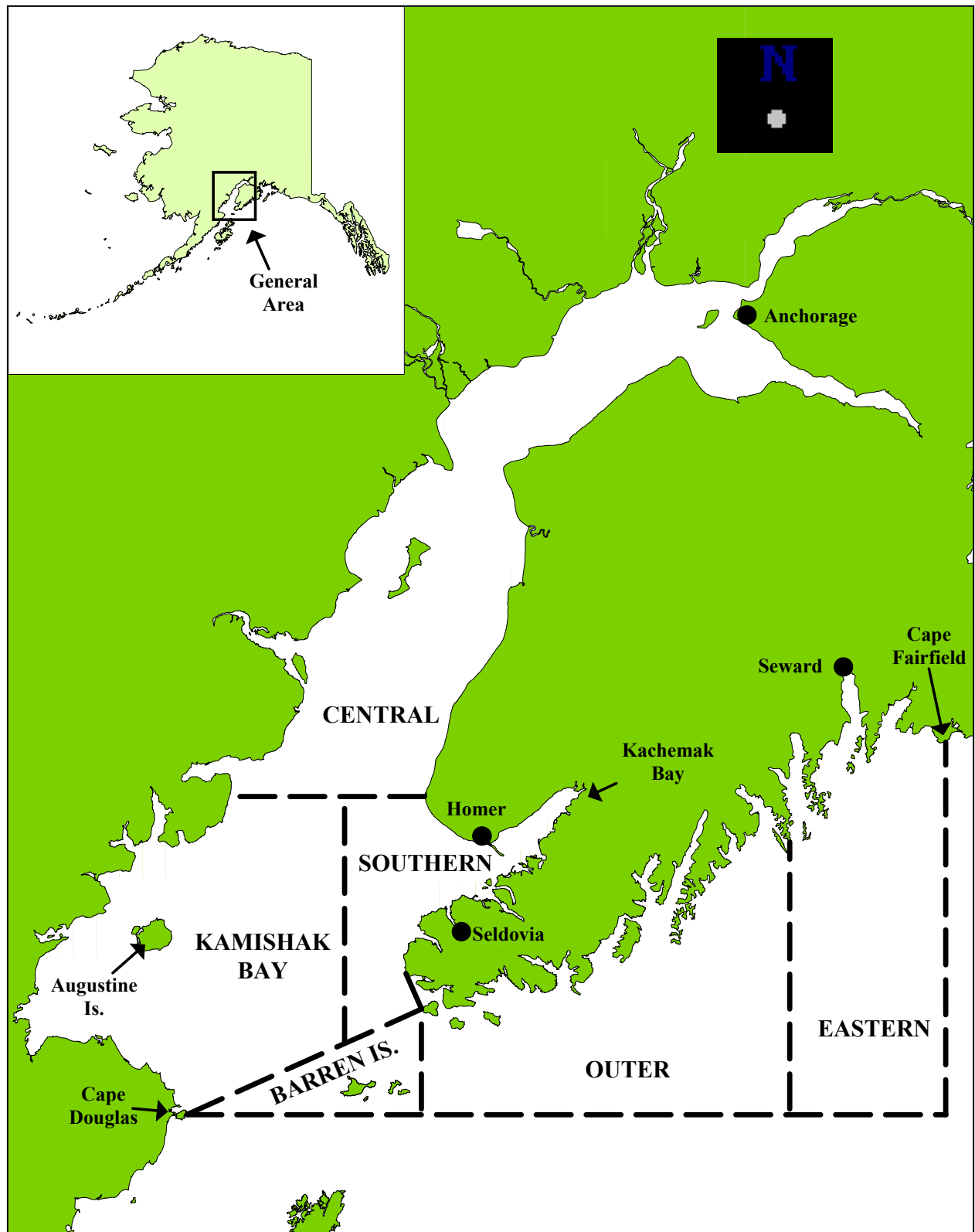


Figure 1. Commercial shellfish fishing districts of the Cook Inlet Management Area.

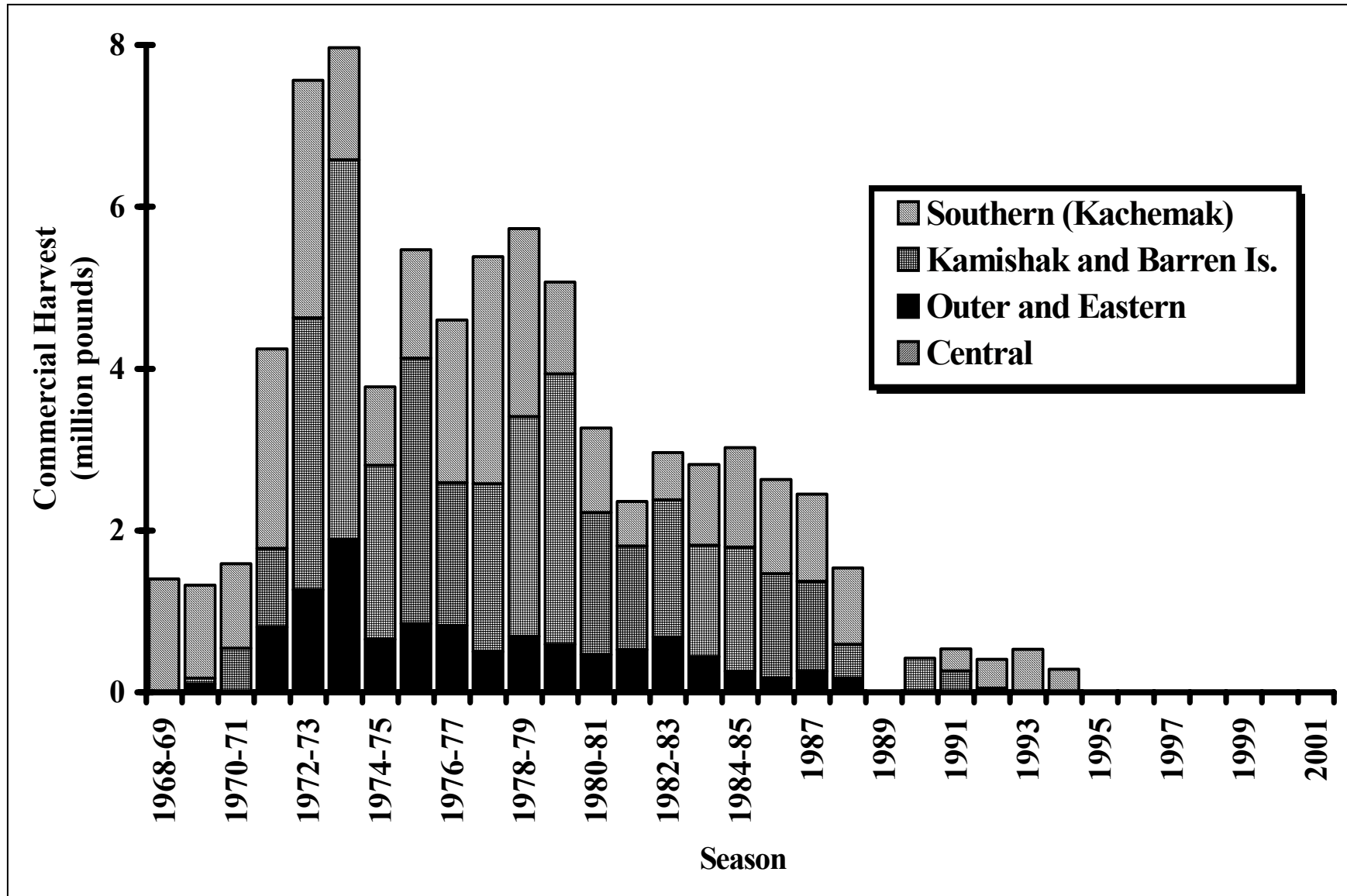


Figure 2. Commercial Tanner crab harvests by district, Cook Inlet Management Area, 1974-2001.

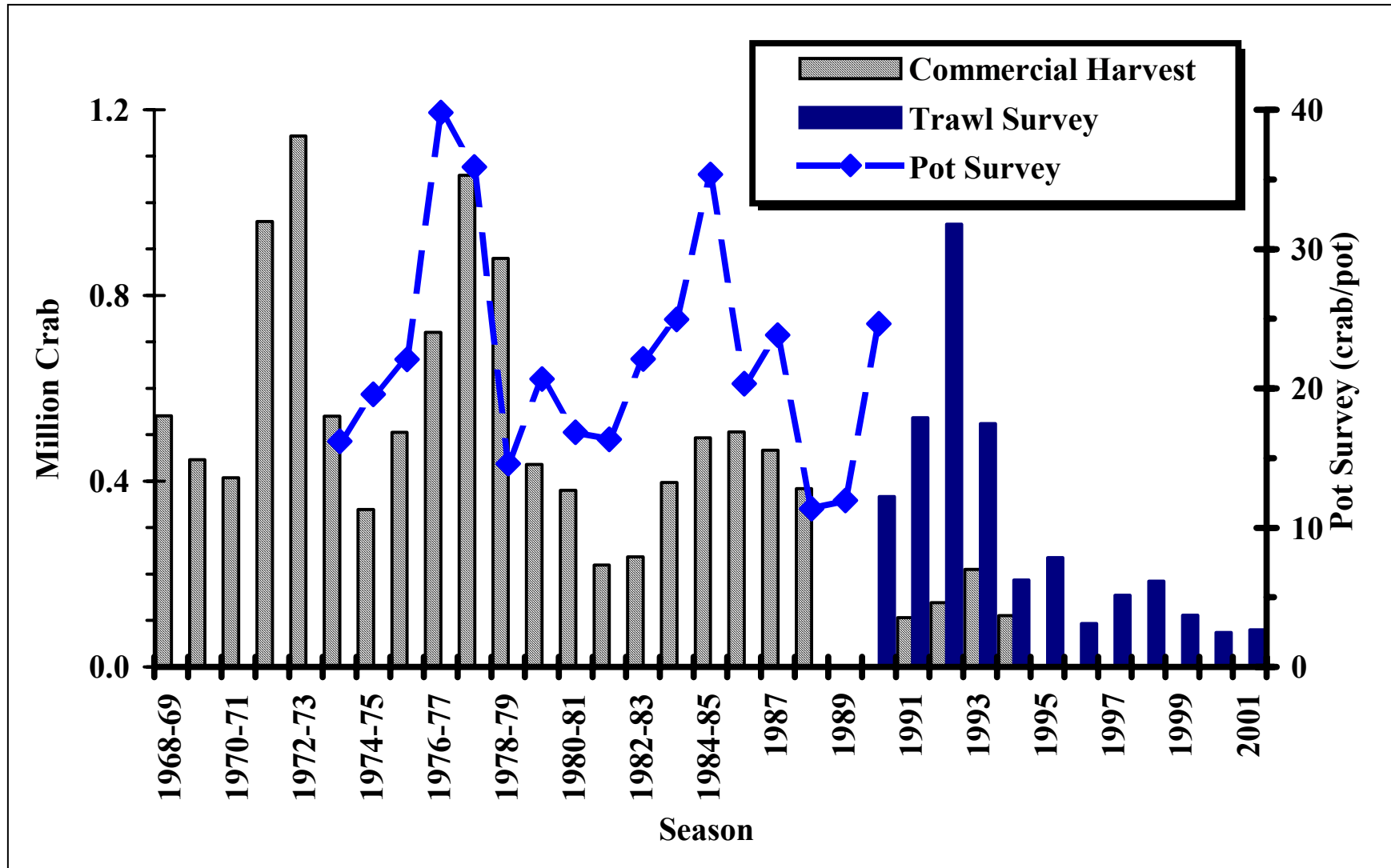


Figure 3. Pot survey and trawl survey estimates of legal male Tanner crab, and subsequent harvest, in the Southern District, 1968-2001.



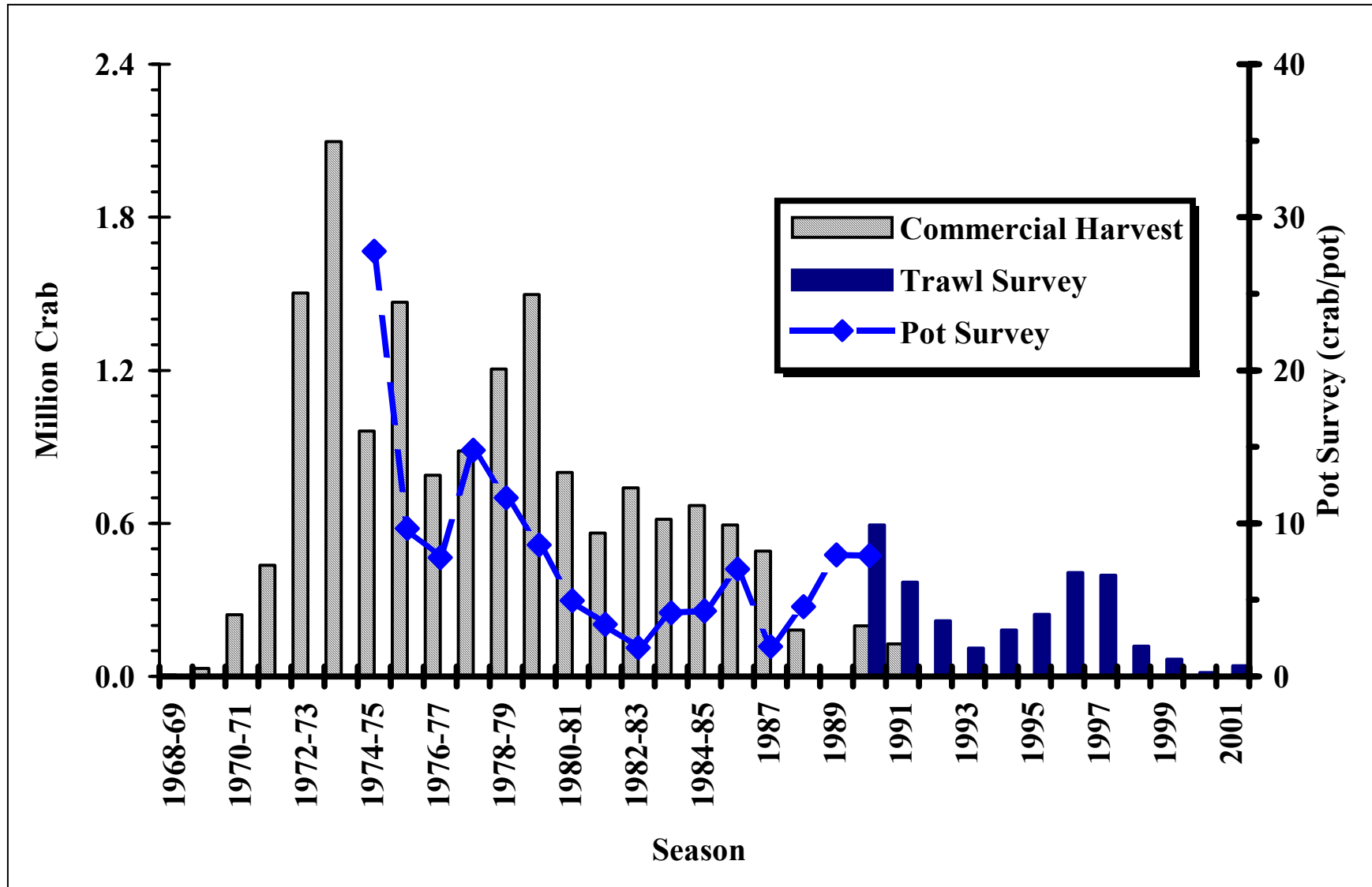


Figure 4. Pot survey and trawl survey estimates of legal male Tanner crab, and subsequent harvest, in the Kamishak and Barren Islands Districts, 1968-2001.

Appendix A. Proposed changes to Cook Inlet Tanner and king crab regulations submitted for the 2001-2002 meeting cycle of the Alaska Board of.

Proposal 457 - This department proposal will develop a management strategy for the Cook Inlet Tanner crab fishery by identifying the parameters under which a fishery would occur. Regulation 5AAC 35.080 requires the establishment of a Tanner crab harvest strategy. This has not been done for the Cook Inlet Management Area. In addition to the current regulatory structure, parameters include a minimum stock size threshold for opening a fishery, and a harvest rate that is stepped relative to stock size.

Proposal 458 - This public proposal would establish a 20-pot limit for the Southern District Tanner crab fishery when the guideline harvest level is 250,000 pounds or less.

Proposal 459 - This advisory committee proposal reduce the daily bag and possession limit to eight male Tanner crab in the Cook Inlet/North Gulf Coast Management Area.

Proposal 460 - This public proposal would restrict the public use fishery for Tanner crab fisheries in the Cook Inlet Area to daylight hours only.

Proposal 461 - This public proposal would establish a regulatory closure of the sport fishery for Tanner crab in the Cook Inlet Management Area.

Appendix B. Draft Tanner crab management plan for the Southern District

**Tanner Crab Commercial Fishing Management Plan**  
Southern District, Cook Inlet

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**5 AAC 35.XXX Cook Inlet Area Tanner Crab Management Plan** This plan establishes the sustained yield stock sizes and abundance thresholds for Tanner crab in the Southern and Kamishak/Barren Islands Districts.

- a) In the Southern District the sustained yield stock size is set to equal to 2.7 million pounds or an abundance estimate of 1.0 million legal male Tanner crab. The minimum stock threshold is set equal to one-half the sustained yield stock size, or 1.3 million pounds or an abundance of 0.5 million legal male Tanner crab. Harvest will occur under the following conditions:
- 1) If estimated abundance of legal male Tanner crab equals or exceeds 1.0 million crab, Tanner crab may be harvested by all user groups in aggregate at a rate not to exceed 25 percent of estimated legal male abundance.
  - 2) If estimated abundance of legal male Tanner crab is at least 0.5 million crab but less than 1.0 million crab, Tanner crab may be harvested by all fisheries in aggregate at a rate not to exceed 15 percent of estimated legal male abundance.
  - 3) No commercial fishery will occur if:
    - A). abundance of legal male Tanner crab is below 0.5 million; or
    - B). attainment of the GHL would cause legal male Tanner crab abundance to fall below 0.5 million; or
    - C). estimated harvest capacity, calculated as the number of registered vessels multiplied by the legal pot limit and the historical catch rate would result in exceeding the GHL during a fishery of a minimum 12 hour duration.
  - 4) If the recent 5-year average abundance of legal male Tanner crab is greater than 100,000, the non-commercial harvest guideline will be 10% of the recent 5-year average abundance of legal male Tanner crab:
  - 5) The non-commercial fisheries will be closed if:
    - A). the recent 5-year average abundance of legal male Tanner crab is less than 100,000; or
    - B). estimated abundance of legal male Tanner crab is less than 100,000 for three consecutive years; or
    - C). estimated abundance of legal male Tanner crabs is less than 50,000 in any given year.

**5 AAC 35.406. AREA H REGISTRATION.**

(c) In Area H, the registration deadline for Tanner crab vessels is January 10.

**5 AAC 35.410. FISHING SEASONS FOR REGISTRATION AREA H.**

(c) The commercial taking of Tanner crab in the Outer, Eastern, and Central Districts is closed until Tanner crab stocks have recovered enough for a harvest strategy to be developed by the department and adopted by the Board of Fisheries.

**5 AAC 35.425. LAWFUL GEAR FOR REGISTRATION AREA H.**

(c) During the commercial Tanner crab season, an aggregate of no more than 75 king and Tanner crab pots may be operated from a vessel registered to fish for Tanner crab, except that in the Southern District, an aggregate of no more than 40 pots may be operated from a vessel registered to fish for Tanner crab if the projected guideline harvest level for Tanner crab in the Southern District [between] is [less than] between 400,000 and 800,000 pounds. If the guideline harvest level for Tanner crab is less than 400,000 pounds, an aggregate of no more than 20 pots may be operated from a vessel registered to fish Tanner crab in the Southern District.

**5 AAC 58.022. WATERS; SEASONS; BAG, POSSESSION, AND SIZE LIMITS; AND SPECIAL PROVISIONS.**

(b) the daily bag and possession limit is 5 [20] male Tanner crab.

**5 AAC 77.516. PERSONAL USE TANNER CRAB FISHERY.**

(2) the daily bag and possession limit is 5 [20] male Tanner crab.

**5 AAC 58.035. METHODS, MEANS, AND GENERAL PROVISIONS – SHELLFISH**

(d) Notwithstanding 5 AAC 75.035 (3), no more than 1 [four] pot[s] per person, regardless of type, with a maximum of 2 [four] pots per vessel, regardless of type, may be used to take shellfish at any time.

**5 AAC 77.509. LAWFUL GEAR AND GEAR SPECIFICATIONS FOR SHELLFISH.**

(a) Notwithstanding 5 AAC 77.010 (i), no more than 1 [four] pot[s] per person, regardless of type, with a maximum of 2 [four] pots per vessel, regardless of type, may be used to take shellfish at any time.

**Tanner Crab Commercial Fishing Management Plan**  
Kamishak and Barren Island Districts, Cook Inlet

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- b) In the Kamishak and Barren Islands District the sustained yield stock size is set to equal to 3.2 million pounds, or an abundance estimate of 1.4 million, legal male Tanner crab. The minimum stock threshold for the commercial fishery is set equal to one-half the sustained yield stock size, or 1.6 million pounds or an abundance of 0.7 million legal male Tanner crab. Commercial harvest will occur under the following conditions:
- 1) If estimated abundance of legal male Tanner crab is greater than 1.4 million crab, Tanner crab may be harvested at a rate not to exceed 25 percent of the estimated abundance of legal males.
  - 2) If the abundance of legal male Tanner crab is less than 1.4 million and greater than 700,000, Tanner crab may be harvested at a rate not to exceed 15 percent of the estimated abundance of legal males.
  - 3) No commercial fishery will occur if:
    - A). abundance of legal male Tanner crab is below 700,000 crab; or
    - B). attainment of the GHL would result in the abundance of legal male Tanner crab to fall below 700,000; or
    - C). estimated harvest capacity, calculated as the number of registered vessels multiplied by the legal pot limit and historical catch rates, for a fishery of a minimum 24 hour duration would result in exceeding the GHL



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