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A BOTTOM TRAWL SURVEY FOR CRABS AND GROUNDFISH IN THE SOUTHERN, KAMISHAK BAY, AND BARREN ISLANDS DSTRICTS OF THE COOK INLET MANAGEMENT AREA 19-23 JULY AND 16-23 AUGUST 1999

by
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ABSTRACT

During 19-23 July and 16-23 August 1999, the Alaska Department of Fish and Game conducted bottom trawl surveys to assess Tanner crab (*Chionoecetes bairdi*), red king crab (*Paralithodes camtschaticus*), and commercially important groundfish in the Southern, Kamishak, and Barren Islands Districts of the Cook Inlet Management Area. The surveys were conducted with the state research vessel *Pandalus*, overall length 20.1 m (66 ft), making 1-nautical mile (nmi) tows with a 400-mesh Eastern otter trawl.

The 20 successful tows in the Southern District yielded a population estimate of 2,845,544 male Tanner crab vulnerable to the trawl survey gear. Legal males comprised only 3% of the population estimate. The Southern District was also estimated to contain 1,624,450 female Tanner crab, with mature female crab comprising 31% of the surveyed population. The 1999 Southern District survey yielded two male and no female red king crab. Seventeen male and 27 female Dungeness crab were caught. Other species caught during the Southern District survey included weathervane scallop (454 lb), octopus (81 lb), Pacific cod (1,595 lb), walleye pollock (4,731 lb), Pacific halibut (1,180 lb), rockfish (339 lb), sablefish (1 lb), lingcod (21 lb), and skate (1,964 lb).

The 19 successful tows in the Kamishak and Barren Islands Districts yielded a population estimate of 2,509,619 male Tanner crab, with legal male crab comprising only 3% of the population vulnerable to the trawl survey gear. The 1999 survey also produced an estimated population abundance of 852,068 female Tanner crab, with mature female crab comprising 5% of the surveyed population. A total of two male and no female red king crab were caught in the Kamishak and Barren Islands Districts survey. Other species caught during the 1999 survey included weathervane scallops (1,644 lb), Pacific cod (1,977 lb), walleye pollock (3,294 lb), Pacific halibut (1,680 lb), rockfish (16 lb), sablefish (351 lb), spiny dogfish (233 lb), Pacific sleeper shark (161 lb), and skate (1,983 lb).

The legal segments of both Tanner and red king crabs in the Southern District and the Kamishak and Barren Islands Districts continue to be insufficient to support commercial fisheries. In addition, estimated abundance of prerecruit males, although highly variable over time, remains at a low level with little evidence of stock rebuilding at this time.

INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) has been conducting bottom trawl surveys for red king (*Paralithodes camtschaticus*) and Tanner (*Chionoecetes bairdi*) crabs in the Cook Inlet Management Area since 1990 (Kimker 1996; Bechtol 2000*b*). Data from these surveys are used to generate crab population estimates, monitor trends in stock abundance, and set quotas for the commercial fisheries (Bechtol and Trowbridge 1999).

The trawl surveys superseded the crab pot surveys that were used by ADF&G prior to 1991 to assess crab stocks (Kimker 1991*a,* 1991*b*). The pot survey data established an index of abundance that was correlated with commercial catch information. The shortcomings of the pot surveys, such as soak variation, dependence on the commercial fishery, and the relative nature of the indices themselves, induced the Department to use a trawl survey to eliminate the influence of these variables and allow direct stock enumeration. Trawl surveys conducted by the National Marine Fisheries Service (NMFS) in the Bering Sea by ADF&G in the Westward Region have historically proven satisfactory in determining stock conditions and fisheries management strategies for king and Tanner crabs.

Many species of groundfish are captured during the trawl surveys. Enumerating the groundfish catch was inconsistent for the first few years of surveys due to personnel limits. Beginning in 1993, the regional groundfish biologist regularly participated in the trawl survey and provided a vehicle for collection and analysis of groundfish data that will be documented in this and other reports. Sampling methods were further modified beginning in 1998 to provide a more comprehensive documentation of all groundfish and shellfish catches (Bechtol 2000*b*).

Objectives

The 1999 survey goals were:

1. Determine the abundance of Tanner king crab stocks and relative abundance of red king crab stocks in the Southern, Kamishak, and Barren Islands Districts of the Cook Inlet Management Area.

2. Document the size and shell age of all Tanner, king and Dungeness (*Cancer magister*) crabs captured. Determine egg condition of all female crabs.

3. Document the relative catch rates and population biomass of other important invertebrates and key groundfish species including weathervane scallop (*Patinopecten caurinus*), octopus (*Octopus dofleini*), Pacific Cod (*Gadus macrocephalus*), walleye pollock (*Theragra chalcogramma*), sablefish (*Anoplopoma fimbria*), rockfish species (*Sebastes* spp.), spiny dogfish (*Squalus acanthias*), and skate (order *Rajiformes*).

4. Document the abundance, size, sex, maturity, and age of these key groundfish species. These data are will be reported in a separate data report.

METHODS

Study Area and Survey Stations

Survey area selection was based on historical pot indices, commercial catch information, and previous survey catch history. The two general survey areas included (Figure 1): (1) in the Southern District, that portion of Kachemak Bay extending west to 152° W. longitude (Figure 2), and (2) in the Kamishak and Barren Islands Districts, often referred to as Kamishak Bay and including waters of Kamishak Bay extending east to 152° 40' W. longitude (Figure 3).

Initially, Southern District survey stations were 2.5 nautical mile squares (6.25 nmi^2) and Kamishak Bay stations were approximately 5.1 nautical miles squares (26.1 nmi^2; Kimker 1991*a*). However, individual station size and shape varied somewhat due to irregular coastline and depth. Depths shallower than 18 m (10 fathoms) were subsequently precluded from the survey and analysis to reduce potential gear loss problems and to better represent Tanner and king crab habitat. Southern District stations were further delineated into strata deeper and shallower than 92 m (50 fathoms). Individual stations were also re-evaluated with respect to results of previous surveys and commercial fisheries, occasionally resulting in an increase or decrease in the size allocated to a given survey station.

The trawl path was selected within the station grid by the vessel skipper wherever it appeared that a good tow could be made. The initial goal for tow length was 1.0 nautical miles (nmi), which required approximately 26 minutes of towing at an average of 2.5 kts. All tows were made during daylight hours. Because irregular bottom or bottom hang-ups occasionally reduced the duration of a given tow, data analysis was restricted to those tow lengths ≥0.5 nmi. Data from shorter tows were discarded and the tows repeated if time allowed.

Vessel and Gear

The state research vessel *Pandalus*, overall length 20.1 m (66 ft), was used for the survey. A 400-mesh Eastern otter trawl with a 21.3 m (70 ft) headrope and a 29.0 m (95 ft) footrope fished with 363 kg (800 lb), 1.5 m x 2.1 m, Nor'Eastern Astoria V trawl doors. The net opening was estimated to be 2.7 m (9 ft) high and 12.2 m (40 ft) wide. The trawl mesh was 1.6 cm (4 inch) in the wings and body, 1.4 cm (3½ inch) in the intermediate and cod end, and 0.5 cm (1¼ inch) in the cod end liner. Bottom temperature was recorded with a time specific temperature logger attached to the trawl headrope. This temperature logger was typically attached once daily on a tow where the likelihood of gear loss or a bottom hang-up was thought to be minor.

Catch Sampling

Successful tows were brought aboard and weighed (Appendices A and B). All Tanner, king, and Dungeness crabs were weighed and measured by sex and species. Carapace sizes were measured as widths for Tanner and Dungeness crabs and lengths for king crabs. Shell age was recorded as soft, new, old, or very old for all crab (Table 1; Kimker 1991*a)*. Soft-shell and new-shell crabs are believed to have molted after the most recent winter. In contrast, old shells and very old shells are believed to have been retained for one or more years, thereby having avoided molting for at least one year. Female crabs were also assessed for egg condition and clutch size. All target groundfish, Pacific halibut, and non-crab invertebrates were counted and weighed by species. The remaining catch was either sorted in its entirety or a subsample of 1-3 bushel baskets sorted into species or taxonomic groups. Abundance and aggregate weight was determined for each species or taxonomic group. Pacific Cod (*Gadus macrocephalus*), walleye pollock (*Theragra chalcogramma*), sablefish (*Anoplopoma fimbria*), and rockfish species (*Sebastes* spp.) were further sampled for individual weight, length, sex, maturity, and age. These size, age, and maturity data will be described in separate reports (Bechtol 1995, 1998).

Data Analysis

For each district and target species, the population abundance N_i and population biomass B_i were estimated from the following area swept equations (Appendices C-F):

$$N_i = 151.9 \times \sum_{i=1}^{n} \left(A_i \times \frac{C_i}{l_i} \right)$$

$$B_i = 151.9 \times \sum_{i=1}^{n} \left(A_i \times \frac{C_i}{l_i} \right)$$

where

151.9 = a factor to convert the catch per nautical mile towed to catch per square nautical miles

= 6,076 feet per nautical mile/40 feet (fishing width of the net)

A_i = the surface area of station i in square nautical miles

C_i = the tow catch in area i measures as either number or weight of animals

l_i = the distance towed in area i in nautical mile

Because only survey stations that were sampled with a successful tow were included in the aggregated estimate, these are minimum population estimates. Population numbers were not estimated for king or Dungeness crabs because of the low abundance and patchy distribution of this species.

Crab growth rates often vary by area across the geographic distribution of a given species but tend to be consistent within a given management area. Crab carapace widths were classified into estimated "age" categories based on previous observations of the Cook Inlet crab resources. For

analysis purposes, soft-shell and new-shell crabs were pooled into a single "new" category whereas old-shell and very old-shell crabs were pooled into a single "old" category (Table 1; Kimker 1991*a)*. Mean carapace sizes were calculated by weighting size frequency distributions in a survey station by the surface area of the survey station.

RESULTS

Southern District

A total of 20 successful tows, ranging in depth from 16-92 fathoms (29-169 m), were made in the Southern District during 19-23 July 1999 (Figure 2; Appendix A). One tow was repeated after the net ripped on a derelict crab pot. Aggregate catch from all successful tows was 33,630 lb. After being standardized to catch per nautical mile, target fish and invertebrate species comprised 13,243 lb among all Southern District tows (Table 2). Mean catch among the 20 tows was 662.1 lb/nmi. Target invertebrate catches totaled 2,806 lb of Tanner crab, 28 lb of king crab, 44 lb of Dungeness crab, 454 lb of weathervane scallop, and 81 lb of octopus. Pacific halibut catches totaled 1,180 lb and target groundfish species totaled 8,650 lb, comprised of 1,595 lb of Pacific cod, 4,731 lb of walleye pollock, 339 lb of rockfish, 1 lb of sablefish, 1,964 lb of skate, and 21 lb of lingcod. Estimated population biomasses within surveyed stations are shown in Appendix C for all species captured in the 1999 Southern District trawl survey.

Tanner Crab

A total, standardized for tow distance, of 4,049 male Tanner crab was caught in 1999 in the Southern District (Table 4). Prerecruit-1 and –2 crab comprised a total of 29% of all males caught. Catch of legal male crab (≥140 mm) was only 3% of all male size classes combined. New recruits comprised just 1% (54 crab) of the legal male population; 135 postrecruit males (>165 m) were caught. The Southern District population estimate was 2,845,544 male Tanner crab vulnerable to the trawl survey gear (Tables 5 and 6). Legal males were estimated to total 91,737 Tanner crab, or 3% of the surveyed population (Figures 4 and 5). Carapace widths ranged from 18-170 mm (0.7-6.7 inch; Table 7). Mean male carapace width, weighted by population abundance within stations, was 90.4 mm (3.6 inch); mean width of legal males was 150.3 mm (5.9 inch).

A total, standardized for tow distance, of 2,379 female Tanner crab was caught in the 1999 Southern District survey (Table 8). The Southern District was estimated to contain 1,624,450 female Tanner crab vulnerable to the trawl survey gear (Tables 9 and 10). Mature females were estimated to total 377,276 Tanner crab, or 23% of the surveyed population. Juvenile crab comprised 69% (n=1,642) of the catch. New shells were observes on 89% of the total female population and 86% of adult females (Figure 6). Only 4 of the mature females were barren and 99% of the mature female population had full clutches. Eggs in all clutches were uneyed. Female carapace width ranged from 23-129 mm (0.9-5.1 inch; Table 11). Mean carapace width, weighted by population estimates

within stations, was 78.5 mm (3.1 inch) and mean width of all mature females was 92.4 mm (3.6 inch).

King Crab

Two male red king crab were caught in the 1999 Southern District survey (Tables 12 and 13). An old shell, recruit-size male, caught in station 13, measured 159 mm and an old-shell, postrecruit male, caught in station 8, measured 243 mm (Table 7). No female red king crab were caught in the 1999 survey (Tables 14).

Dungeness Crab

Seventeen male Dungeness crab were captured in the 1999 Southern District survey (Table 15 and 16). Male carapace widths ranged from 136-178 mm (5.3-7.0 inch), with a mean width of 165.9 mm (6.5 inch; Table 7). Eleven legal-size males were caught, comprising 65% of all male Dungeness captures. All legal males were recruits, six with new shells and five with old shells. Five prerecruit crab had new shells and one prerecruit had an old shell.

The Southern District survey caught 27 female Dungeness crab (Tables 17 and 18). Six of the female crab had new shells. Based on the observed carapace widths, all female Dungeness were assumed to be mature, although all except three were barren. Carapace widths ranged from 114-160 mm (4.5-6.5 inch), with a weighted mean of 135.8 mm (5.3 inch; Table 11).

Weathervane Scallop

An aggregate of 454 lb of weathervane scallops was caught among nine tows in the Southern District survey (Table 2). The largest catch rates were 222 lb/nmi at station 12 and 176 lb/nmi at station 3 (Figure 2; Appendix C). Scallops sampled for shell height (n=250) ranged from 59-180 mm (2.3-7.1 inch) and mean height was 133.1 mm (5.2 inch); the most abundance size class was 15 cm (Figure 7). Age composition of sampled scallops (n=150) ranged from 1-18 years and mean age of sampled scallops was 5.5 years (Figure 7). The population estimate for weathervane scallops in the surveyed stations was 396,315 lb (Appendix D).

Groundfish and Halibut

Pacific halibut were caught in 95% of the Southern District tows; mean halibut catch was 59.9 lb/nmi (Table 2). Catch biomass of Pacific halibut was greatest in stations 3 (272 lb/nmi) and 71 (139 lb/nmi; Figure 2). Estimated population biomass was 943,247 lb of Pacific halibut in the surveyed area. Pacific cod were caught in 90% of the stations and mean catch rate was 63.3 lb/nmi among all stations. The largest catch rates occurred in stations 16 (873 lb/nmi) and 9 (180 lb/nmi: Figure 2). Estimated population biomass was 995,776 lb of Pacific cod in the surveyed area. Walleye pollock were caught in 16 (80%) of the surveyed stations. Pollock catch totaled

4,731 lb among all tows, with a mean catch rate of 258.6 lb/nmi. Catch rates ranged from none to over 1,572 lb/nmi, with the greatest catch rate occurring in station 12 (Figure 2). Estimated population biomass was 4.1 million lb of walleye pollock in the surveyed area. Standardized rockfish catches totaled 339 lb, comprised of 314 lb of dusky, 21 lb of rougheye, and <1 lb of black rockfishes, and 3 lb of Pacific Ocean perch (Table 2). Mean rockfish catch was 16.9 lb/nmi, with a maximum catch rate of 198 lb/nmi for dusky rockfish in station 16. Sablefish were caught in station 4 (5%) at a rate of 0.8 lb/nmi. Skates were caught in 90% (n=18 stations) of the Southern District survey tows and among stations produced catches totaling 1,960 lb, comprised of 1,235 lb of big skate, 713 lb/nmi of longnose skate, and 13 lb/nmi of Aleutian skate (Table 2; Appendix C). Skate catches averaged 98.0 lb/nmi among tows, with station 71 producing the largest catch of 396.0 lb/nmi and also the greatest individual species catch rate of 317.2 lb/nmi of big skate. Southern District biomass among all skate species totaled 1.4 million lb. Flatfish species produced some of the largest groundfish catch rates (Appendix D). For example, flathead sole was caught in 90% of the stations and produced a mean catch rate of 242.8 lb/nmi and a maximum catch rate of 1,740 lb/nmi at station 71. Butter sole was only caught in 45% of the stations, but produced a mean catch rate of 259.5 lb/nmi and a maximum catch rate of 1,545 lb/nmi at station 14. Arrowtooth flounder, caught in all Southern District tows, produced a mean catch rate of 107.0 lb/nmi and a maximum catch rate of 313 lb/nmi at station 11. Although most flatfish were caught east and west of the Homer Spit, yellowfin sole were only caught at stations 1-6 located toward the head of Kachemak Bay (Figure 2).

Kamishak and Barren Islands Districts

A total of 19 successful tows were made in the Kamishak and Barren Islands Districts during 16-23 August1999, and an additional eight tows were discarded due to gear problems (Appendix B; Table 3; Figure 3). Aggregate catch from all tows was 37,542 lb and mean catch among the 19 tows was 1,976 lb. After being standardized to catch per nautical mile, target species comprised 11,772 lb among all tows, with a mean catch rate of 619.6 lb (Appendix E). Target invertebrate catch rates totaled 416 lb of Tanner crab, 16 lb of king crab, 1,644 lb of weathervane scallop, and no Dungeness crab. Pacific halibut catches totaled 1,680 lb and target groundfish species totaled 8,016 lb, comprised of 1,977 lb of Pacific cod, 3,294 lb of walleye pollock, 351 lb of sablefish, 16 lb of rockfish, 233 lb of spiny dogfish, 161 lb of Pacific sleeper shark, and 1,983 lb of skate. Estimated population biomass within surveyed stations are shown in Appendix F for all species captured in the 1999 trawl survey of the Kamishak and Barren Islands Districts.

Tanner Crab

A total, standardized for tow distance, of 634 male Tanner crab was caught in the Kamishak and Barren Islands Districts in 1999 (Table 19). Prerecruit-1 and -2 crabs comprised a total of 61% (n=387) of all males caught. Only 15 legal male crab (≥140 mm), comprising 2% of all age classes combined, were caught. All legal male crab were old shell recruits; no postrecruit males were caught. The population estimate for the Kamishak and Barren Islands Districts was 2,509,619 male Tanner crab vulnerable to the trawl survey gear (Tables 6 and 20; Figures 8 and 9). Estimated

population abundance of legal males was 67,386 Tanner crab, or 3% of the surveyed male population.. Carapace widths ranged from 14-156 mm (0.6-6.1 inch; Table 7). Mean male carapace width, weighted by population abundance within stations, was 88.2 mm (23.5 inch); mean width of legal males was 145.8 mm (5.7 inch).

A total of 216 female Tanner crab was caught in the Kamishak and Barrens Islands Districts survey (Table 21). Juveniles comprised 95% (n=205) of the catch. Ten of the mature females had new shells, one had a very old shell, and the remainder was juvenile crab. None of the mature females were barren. Estimated population abundance for the district was 852,068 female Tanner crab vulnerable by the trawl survey gear, with 74% present in station 68 (Tables 9 and 22; Figure 6). Mature females comprised 5% of the surveyed population, or 43,450 crab. Female carapace width ranged from 17-99 mm (0.7-3.9 inch; Table 11). Mean carapace width, weighted by population abundance within stations, was 39.9 mm (1.6 inch).

King Crab

The 1999 survey of the Kamishak and Barren Islands Districts yielded a total of two male red king crab (Tables 12 and 13). Both males were of legal size; a 156 mm (6.1 inch) old-shell, postrecruit male was caught in station 44 and a 166 mm (6.5 inch) old-shell, postrecruit crab was caught in station 66 (Table 7).

No female red king crab were caught in the 1999 survey of the Kamishak and Barren Islands Districts (Tables 14 and 15).

Weathervane Scallop

A total of 1,649 lb of weathervane scallops was caught among seven tows in the Kamishak and Barren Islands Districts survey. The largest component of the catch biomass occurred at station 52 (862 lb) southeast of Augustine Island (Figure 3). Shell heights for 1,109 measured scallops ranged from 85-201 mm, with a mean height of 162.4 mm; the most abundant scallops were in the 17 and 18 cm size classes (Figure 7). Scallop ages ranged from 2-23 years with the most abundant age class being 14 years.

Groundfish and Halibut

Pacific halibut were caught in all tows in the Kamishak and Barren Islands Districts; mean halibut catch among all tows was 88.4 lb/nmi (Table 3). Catch biomass of halibut was greatest in station 61 (Figure 3), which yielded a catch rate of 352 lb/nmi. Estimated population biomass was 6.6 million lb of Pacific halibut in the surveyed area.

Pacific cod were caught in 17 stations (89% frequency of occurrence) and yielded the third greatest catch among all target species caught in the 1999 survey. Catch of Pacific cod totaled 1,977 lb among all stations, with a mean catch rate of 104.1 lb/nmi among tows. The largest

catch rate occurred in station 60 (1,086 lb/nmi; Figure 3). Estimated population biomass was 7.8 million lb of Pacific cod in the surveyed area. Walleye pollock were caught in 11 (58%) of the surveyed stations. Pollock catch totaled 3,294 lb among all tows, with a mean catch rate of 173.4 lb/nmi. The greatest catch rate was 2,538 lb/nmi from station 56 (Figure 3). Estimated population biomass was 13.0 million lb of walleye pollock in the surveyed area. Standardized rockfish catches totaled 16 lb, comprised of 2 lb of dusky and 14 lb of rougheye rockfishes (Table 3). Mean rockfish catch was 0.9 lb/nmi. Sablefish were caught in 47% of the survey stations (n=9 stations), and catches totaled 351 lb among stations for a mean catch rate of 18.5 lb/nmi. The largest sablefish catch was 214 lb/nmi from station 56. Skates were caught in all survey tows and produced the second largest total catch (1,983 lb) of all target species in the Kamishak and Barren Islands Districts survey (Table 3). Skate catches averaged 104.4 lb/nmi among tows, with station 58 producing the largest catch of 216 lb/nmi. Estimated population biomass was 7.5 million lb of skates within the surveyed area. Spiny dogfish were caught in 37% (n=7 stations) of the survey tows. Catches totaled 233 lb with a mean catch rate of 12.3 lb/nmi and a maximum catch rate of 87 lb/nmi at station 41. Estimated population biomass was 0.8 million lb in the surveyed area. One Pacific sleeper shark, weighing 161 lb, was caught from station 68.

Flatfish species produced some of the largest groundfish catch rates (Appendix E). Arrowtooth flounder, caught in all tows of the Kamishak and Barren Islands Districts, yielded an aggregate catch of 15,503 lb and produced the largest catches among all singles species. With a mean catch rate of 836.8 lb/nmi among stations and maximum catch rate of 5,508 lb/nmi at station 51, the arrowtooth flounder population estimate was 61.5 million lb within the surveyed area. Butter sole yielded the second greatest population biomass estimate, 13.4 million lb, within the Kamishak and Barren Islands Districts. Population estimates for other flatfish species included 2.7 million lb of flathead sole, 2.4 million lb of starry flounder, 2.1 million lb of yellowfin sole, 1.7 million of rock sole, 1.2 million lb of Dover sole, 1.1 million lb of rex sole, 1.0 million lb of Alaska plaice, and 55,700 lb of English sole (Appendix F).

Bottom Temperature

Benthic water temperature along the ocean floor was sampled with the temperature logger at one station in the Southern District in 1999 (Appendix G). The temperature was 7.1°C at a mean depth of 35.5 fathoms during the tow of station 4 on 19 July, 7.5°C at a mean depth of 59.5 fathoms during the tow of station 13 on 22 July , and was 8.2°C at a mean depth of 34.5 fathoms during the tow of station 14 on 23 July (Figure 2). In the Kamishak and Barren Islands Districts, benthic water temperature was recorded during two tows. The temperature was 9.0°C at a mean depth of 26.5 fathoms during the tow of station 54 on 17 August and 11.7°C at a mean depth of 27.0 fathoms during the tow of station 37 on 22 August (Figure 3).

DISCUSSION

Tanner Crab

The legal segment of Tanner crab in both the Southern District and the Kamishak and Barren Islands Districts continued to be insufficient to support a commercial fishery. Limited commercial fisheries occurred most recently in the Southern District from 1991 through 1994 (Kimker 1996; Bechtol and Trowbridge 1999). Trawl surveys in this district documented a decline in the Tanner crab stock from >2.5 million males in the early 1990s to <0.9 million in 1994. Following an increase to 1.9 million males in 1995, male crab abundance steadily decreased to a record low of 0.7 million male crab in 1998 (Table 6; Bechtol and Trowbridge 1999; Bechtol 2000*b*). However, total male abundance increased in 1999 to 2.8 million crab, the second largest estimate in the history of the trawl survey. This increase in 1999 was primarily due to increased abundance of prerecuit-4 and -3 crabs. In contrast, estimated abundance of legal males in 1999 was the lowest in the history of the trawl survey (Figure 5). This trend was most apparent for postrecruit Tanner crab, which comprised <0.1% of the male Tanner crab catch in the Southern District survey. Although the increase in prerecruit males is promising, these cohorts must continue to molt through subsequent size classes to provide evidence of stock rebuilding.

In the Kamishak and Barren Islands Districts, the commercial Tanner crab fisheries remained closed following the 1991 season (Kimker 1996; Bechtol and Trowbridge 1999). Estimated abundance of both total males and legal males has continued to decline and the 1999 survey yielded the lowest estimate in the history of the trawl survey (Bechtol 2000*b*; Table 6). The 1999 survey yielded no postrecruit crab. The total male population estimate substantially increased from 1998 to 1999, largely due to substantial increases in estimates of both prerecruit-4 and prerecruit–2 crabs (Figure 9). Although the existence of a terminal molt in Tanner crab continues to be debated (Paul and Paul 1990; Bechtol 2000*b*), it is apparent that old shell crab have been a significant component of the Cook Inlet prerecruit population, especially in the Kamishak and Barren Islands Districts.

Trawl survey selectivity increases with cohort age due to factors including trawl mesh size and the size- and sex-specific habitat distributions of the crab cohorts. Estimated abundance of prerecruit-4 male crab remains particularly suspect because prerecruit-4 abundance should exceed the subsequent prerecruit-3 abundance in order to accommodate natural mortality (Table 6; Figures 5 and 9). Nonetheless, the trawl survey uses a consistent gear fished in a standard manner that should effectively detect changes in the abundance of particular cohorts, as well as the entire population, over time. Thus, there is little evidence of stock rebuilding to an extent that would allow commercial exploitation at this time (Figure 10).

Another indicator of stock status is the percentage of mature and egg-bearing female Tanner crab, although this percentage has been somewhat variable over time (Table 10). Over 30% of the female population was estimated to be mature in the Southern District in 1999; although an increase over the 1998 survey proportion, this was below the 47% historical average. Similarly, 5% of the female population estimated to be mature in 199 but was well below the 36% trawl survey average. The percentage of mature females bearing eggs in 1999 remained high in all survey areas (Tables 9 and

22). In all areas, estimated abundance of juvenile female Tanner crab in 1999 was greater than in the 1998 survey, notably in the Southern District where estimated juvenile female abundance was the greatest in the trawl survey history (Table 10). Aggregate abundance of mature and juvenile female crabs in 1999 was the greatest estimate (1.6 million crab) in trawl survey history in the Southern District and the fourth greatest (0.9 million crab) in trawl survey history in the Kamishak and Barren Islands Districts.

Historical pot and trawl survey data exhibit a positive bias toward male Tanner crab (Tables 6 and 10; Kimker 1996). This bias likely resulted from two factors: (1) an emphasis on stations that historically yielded the best catches of male Tanner crab in previous surveys and commercial fisheries; and (2) when bad weather caused a loss in survey fishing time, stations that have not shown significant male catches are eliminated from the survey. In addition, Tanner crab exhibit annual migration patterns, particularly given annual variations in water temperatures. Although some consistency in crab distribution can be expected, waters temperatures may affect those distributions and, thus, trawl survey catches.

King Crab

Compared to historical commercial catch data, which only summarized harvests of legal males, survey results in 1999 indicated the overall population level of red king crab remains severely depressed in both the Southern, Kamishak, and Barren Islands Districts (Table 13; Bechtol 2000*b*). For example, the mean commercial catch prior to the final 1984 closure was 3.4 million lb (Bechtol and Trowbridge 1999). Assuming an average weight of 6.5 lb per crab, the 1984 catch represented 0.5 million legal males. In contrast, king crab catches during the 1999 trawl survey, similar to previous years, were considered too low to generate a meaningful estimate of population abundance (Tables 12 and 13). Although some individuals may argue that a bottom trawl survey is not an effective tool to sample king crab, this data has provided a meaningful index of population status (Bechtol and Trowbridge 1999). The lack of any female king crab in any area in 1999 is particularly disconcerting (Table 14). Although low crab catches can also be the result of temporal migration patterns, it is also apparent that the red king crab resources of Cook Inlet remain at very low population levels.

Dungeness Crab

The Southern District trawl surveys recognized a group of Dungeness males as they moved through the successive years beginning in 1990 (Table 16; Bechtol 2000*b*). Trawl data indicated a large reduction of these males by 1994. The presence of a strong cohort was also observed in the 1995 and 1996 trawl surveys, as the catch of both total males and legal males increased. However, the catch of both male and female Dungeness declined after 1996 and has subsequently remained at low levels (Tables 16 and 18). Although the trawl survey was not designed specifically to assess the Dungeness crab stock and provides only a relative index of abundance, trends in the trawl survey data generally agree with the results of the Southern District Dungeness pot survey (Trowbridge et

al. 2000). Based on results of all surveys, the Dungeness crab resource in the Southern District continues to remain depressed with insufficient levels of abundance to support a commercial fishery. In addition to closures of commercial fisheries for Dungeness crab, recreational fisheries were recently closed in an effort to facilitate population rebuilding (Trowbridge, Szarzi, and Bechtol 2000).

Weathervane Scallop

The bottom trawl survey has typically caught weathervane scallops at a variety of locations throughout the Cook Inlet Management Area (Tables 2 and 3). In the Kamishak Bay area, trawl survey data, in conjunction with commercial fishery harvest reports, was used to identify preliminary survey stations for an ADF&G dredge survey for weathervane scallops (Bechtol 2000*a*). Weathervane scallop catches of 454 lb in the Southern District and 1,649 lb in the Kamishak and Barren Islands Districts were some of the largest observed in the trawl survey history. Although not likely to become the primary assessment tool, trawls survey data may provide utility to "tune" an age-structured model for weathervane scallops in Kamishak Bay.

Groundfish and Halibut

Catches of groundfish and halibut have been inconsistently recorded from the historical trawl surveys of the Cook Inlet Management Area. Pacific cod, walleye pollock, and Pacific halibut are the predominant vertebrate species of local commercial importance caught in the trawl survey (Tables 2 and 3). However, a variety of flounder and sole currently comprise the largest catch biomass in the Cook Inlet trawl surveys (Appendices D and F; Bechtol 2000*b*). A more comprehensive review of historical field data forms may reveal additional quantitative information that can be used to document trends in abundance and biomass for some species.

Survey Design

The bottom trawl survey and its predecessor, the pot survey, were intended to assess commercially important crab resources in the Cook Inlet Management Area. As a result, these surveys have focused on the habitat where Tanner and red king crabs have been historically found. To avoid overestimating the population, area-swept estimates have only been extrapolated to those survey stations that were actually sampled in the annual survey. This likely introduced some bias to the population estimates because the actual stations surveyed, and the total number of stations surveyed, has changed slightly each year. Given the low level of crab abundance during the last decade, this bias has not affected the management approach. However, with a greater emphasis upon providing a multi-species approach to the bottom trawl survey data, the survey design may be improved in the future by developing a more standardized approach to estimating the total survey area.

The trawl survey methodology was modified beginning in 1998 to include a more comprehensive approach to sampling the catch approach. First, the defined target species was expanded slightly to include skates and sharks. Second, after removal of vertebrate and invertebrate target species, the remaining catch was either sampled in its entirety or subsampled. This approach has provided a more standardized method of documenting long-term changes in the Cook Inlet ecosystem. In addition to providing a broader assessment of ecosystem health, increased subsampling provides data to monitor changes in a greater variety of species, including some species for which future fisheries may develop. However, some species identification issues remain to be resolved. For example, the 1999 survey classification of skate species, while improved over 1998 survey, remained somewhat inconsistent depending upon the particular sampling crew.

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Table 1. Carapace widths (mm) used to determine crab size classes in Cook Inlet.

Class	Prerecruit				Recruit	Postrecruit
	Pre-4	Pre-3	Pre-2	Pre-1		
	Tanner Crab					
Width	<70	70-91	92-114	115-139	140-165	>165
	King Crab					
Width	<91	92-108	109-126	127-144	145-163	>163
	Dungeness Crab					
Width	<89	90-114	115-139	140-164	165-189	>189

Table 2. Catch biomass of target species per nautical mile tow in a bottom trawl survey of the Southern District, Cook Inlet, 1999.

	Round Weight (lb/nmi)												
Survey Station	Dungeness Crab	Tanner Crab	King Crab	Weathervane Scallop	Octopus	Pacific Cod	Walleye Pollock	Rockfish	Sablefish	Pacific Halibut	Lingcod	Skate	Total
1	0	63	0	12	0	66	230	0	0	106	0	0	478
2	4	14	0	2	0	6	6	0	0	31	0	76	139
3	24	176	0	176	0	0	192	0	0	271	0	91	931
4	8	145	0	4	0	4	113	1	1	10	0	35	320
5	0	1	0	0	0	2	4	0	0	29	0	252	288
6	2	739	0	3	0	32	71	0	0	10	0	220	1,078
7	0	174	0	21	0	8	53	0	0	24	0	196	476
8	2	771	18	0	0	0	4	9	0	72	0	88	963
9	0	345	0	0	0	180	386	5	0	0	0	131	1,048
10	0	75	0	0	41	12	563	6	0	42	0	14	752
11	0	69	0	0	0	49	894	4	0	1	0	23	1,040
12	0	17	0	222	0	18	1,572	12	0	42	0	62	1,945
13	0	82	10	0	30	10	286	14	0	43	0	138	613
14	0	0	0	8	10	28	0	0	0	65	0	44	155
15	0	17	0	6	0	37	324	72	0	39	0	155	650
16	0	2	0	0	0	873	0	201	0	43	21	38	1,178
17	0	1	0	0	0	4	0	0	0	28	0	4	37
19	0	0	0	0	0	63	2	14	0	57	0	0	135
21	4	0	0	0	0	132	0	0	0	127	0	1	264
71	0	115	0	0	0	71	30	1	0	139	0	396	752
Total	44	2,806	28	454	81	1,595	4,731	339	1	1,180	21	1,964	13,243
Mean	2.2	140.3	1.4	22.7	4.1	79.7	236.5	16.9	0.0	59.0	1.1	98.2	662.1
Freq.	<1%	21%	<1%	3%	1%	12%	36%	3%	<1%	9%	<1%	15%	100%

Table 3. Catch biomass of target species per nautical mile tow in a bottom trawl survey of the Kamishak and Barren Islands Districts, Cook Inlet, 1999.

	Round Weight (lb/nmi)												
Survey Station	Dungeness Crab	Tanner Crab	King Crab	Weathervane Scallop	Pacific Cod	Walleye Pollock	Rockfish	Sablefish	Pacific Halibut	Spiny Dogfish	Pacific Sleeper	Skate	Total
32		12		40	8	4			40	34		24	161
33		10		29	10	29		4	33	47		112	274
37		12		459	12	<1	2		36			119	640
41					18				37	87		177	319
44		<1	6	124	146				30			30	336
45									55			36	91
49					2				89	36		194	321
50				58	2				223			84	367
51				26	85	1		32	26			119	289
52		4		907	157			45	118			35	1,266
53						65		2	33	8		137	245
54		2			1				82	11		51	147
55		12	10		137			32	129			174	493
56		4			46	2,538		214	352			94	3,248
58					130	50			31	10		216	437
60		330			1,086	434	3		208			156	2,217
65		1			25	96	3	10	43			106	285
67		7			67	71	2	2	59			63	273
68		21			45	6	6	10	57		161	57	362
Total	0	416	16	1,644	1,977	3,294	16	351	1,680	233	161	1,983	11,772
Mean	0.0	21.9	0.8	86.5	104.1	173.4	0.9	18.5	88.4	12.3	8.5	104.4	619.6
Freq.	0%	63%	11%	37%	89%	58%	26%	47%	100%	37%	5%	100%	100%

Table 4. Catch of male Tanner crab by shell age and size per nautical mile towed during a trawl survey of the Southern District, Cook Inlet, 1999.

	Sublegal Males						Legal Males					
	Pre-4	Pre-3	Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station			(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Legal	Males
1	35	69	18	5	2	1	2	0	0	0	2	132
2	7	19	7	3	0	0	0	0	0	0	0	36
3	140	199	29	14	2	2	0	1	0	0	1	386
4	43	126	67	17	3	2	2	0	0	0	2	259
5	6	0	0	0	0	0	0	0	0	0	0	6
6	664	818	183	20	13	16	4	0	0	0	4	1,718
7	155	55	87	16	13	4	1	2	0	0	3	334
8	69	171	267	1	65	1	38	1	1	0	40	615
9	10	13	29	18	9	71	6	38	0	0	44	193
10	15	5	18	9	4	1	3	0	0	0	3	54
11	5	4	4	2	4	5	3	6	0	0	9	32
12	1	0	0	1	1	4	1	1	0	0	2	9
13	29	16	44	9	19	1	13	1	0	1	15	133
14	4	0	0	0	0	0	0	0	0	0	0	4
15	0	0	0	0	1	3	1	3	0	0	4	8
16	0	0	0	0	1	0	0	0	0	0	0	1
17	5	0	0	0	0	0	0	0	0	0	0	5
19	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
71	18	30	52	1	17	1	4	1	0	0	5	124
Southern District Total												
Total	1,204	1,526	805	115	154	112	78	54	1	1	134	4,049
Percent	30%	38%	20%	3%	4%	3%	2%	1%	<1%	<1%	3%	100%

Carapace widths (mm) used for Tanner crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	70-91	92-114	115-139	140-165	>165

Table 5. Population estimate by shell age and size for male Tanner crab in the Southern District, Cook Inlet, 1999.

	Sublegal Males						Legal Males					
	Pre-4	Pre-3	Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station			(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Legal	Males
1	26,214	52,428	13,482	3,745	1,498	749	1,498	0	0	0	1,498	99,613
2	3,014	8,613	3,014	1,292	0	0	0	0	0	0	0	15,933
3	117,056	166,867	24,075	11,623	1,660	1,660	0	830	0	0	830	323,773
4	19,918	58,829	31,499	7,875	1,390	926	926	0	0	0	926	121,364
5	5,256	0	0	0	0	0	0	0	0	0	0	5,256
6	504,032	621,409	138,858	15,343	9,973	12,275	3,069	0	0	0	3,069	1,304,959
7	92,796	33,099	52,013	9,457	7,684	2,364	591	1,182	0	0	1,773	199,186
8	37,168	92,615	145,015	609	35,340	609	20,716	609	609	0	21,935	333,291
9	6,836	8,886	20,507	12,304	6,152	49,216	4,101	26,658	0	0	30,760	134,659
10	19,032	6,344	22,839	11,419	5,075	1,269	3,806	0	0	0	3,806	69,785
11	3,448	2,758	2,758	1,379	2,758	3,448	2,069	4,137	0	0	6,206	22,754
12	949	0	0	949	949	3,798	949	949	0	0	1,899	8,544
13	27,532	15,190	41,773	8,544	18,038	949	12,342	949	0	949	14,241	126,267
14	3,995	0	0	0	0	0	0	0	0	0	0	3,995
15	0	0	0	0	543	1,628	543	1,628	0	0	2,171	4,342
16	0	0	0	0	490	0	0	0	0	0	0	490
17	6,790	0	0	0	0	0	0	0	0	0	0	6,790
19	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
71	9,445	15,742	26,762	525	8,921	525	2,099	525	0	0	2,624	64,544
Southern District Total												
Total	883,481	1,082,78	522,594	85,064	100,471	79,416	52,710	37,469	609	949	91,737	2,845,544
Percent	31%	38%	18%	3%	4%	3%	2%	1%	<1%	<1%	3%	100%

Carapace widths (mm) used for Tanner crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	70-91	92-114	115-139	140-165	>165

Table 6. Historical population estimates by carapace length and age for male Tanner crab caught in trawl surveys of the Cook Inlet Management Area, 1990-1999.

Southern District

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	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	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	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	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	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	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	189,773	42,712	312,708	121,332	368,250	156,423	48,546	45,116	0	0	93,662	1,284,860
1997	148,607	111,729	267,005	6,655	311,678	36,110	143,170	10,525	0	0	153,695	1,035,478
1998	266,684	16,456	11,802	11,915	109,473	59,024	115,128	59,585	8,147	0	182,859	658,213
1999	883,481	1,082,780	522,594	85,064	100,471	79,416	52,710	37,469	609	949	91,737	2,845,544

Kamishak and Barren Islands Districts

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	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	230,638	155,084	286,310	91,460	357,887	1,053,779	39,765	330,052	0	0	369,817	2,544,975
1992	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	298,382	151,385	523,487	211,521	137,821	530,615	23,387	87,287	0	0	110,674	1,963,885
1994	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	47,256	422,861	841,368	502,175	733,399	875,308	171,912	71,418	0	0	243,330	3,665,697
1996	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	519,036	23,800	15,594	342,027	202,073	1,388,968	107,126	282,795	0	7,935	397,856	2,889,354
1998	318,593	34,109	0	66,769	31,689	314,195	31,741	86,221	0	0	117,963	883,318
1999	808,409	99,074	1,146,644	59,520	63,249	265,337	0	67,386	0	0	67,386	2,509,619

Carapace widths (mm) used for Tanner crab size classes in Cook Inlet.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	71-90	91-114	115-139	140-165	>165

Table 7. Maximum, minimum, and mean carapace width (mm) of male Tanner and Dungeness crabs and carapace length (mm) of male king crab caught in trawl surveys of Cook Inlet, 1999.

Southern District										Kamishak and Barren Islands Districts						
	Tanner Crab			Dungeness Crab			King Crab				Tanner Crab			King Crab		
Station	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Station	Min.	Max.	Mean	Min.	Max.	Mean
1	50	152	85.1							32	48	127	91.9			
2	59	104	83.3	136	151	143.5				33	123	147	133.2			
3	23	140	84.0	147	178	168.0				36	128	128	128.0			
4	25	156	88.6	168	173	170.5				37	39	141	125.1			
5	29	66	46.6							41						
6	22	152	85.9							44				156	156	156
7	27	156	83.9							45	147	152	149.5			
8	46	169	105.8	162	162	162.0	243	243	243.0	49						
9	23	164	113.6							50						
10	18	145	90.0							51						
11	55	160	113.5							53	14	14	14.0			
12	68	146	123.0							54	137	137	137.0			
13	22	170	99.2				159	159	159.0	55	52	141	114.8			
14	53	67	57.8							56	31	132	86.0	166	166	166
15	133	163	144.1							58	23	52	33.3			
16	128	128	128.0							60	76	156	110.5			
17	46	60	52.2							65	24	44	35.7			
19										67	18	141	54.0			
21										68	18	156	40.0			
71	28	154	95.9													
Total	18	170	90.4	136	178	165.9	159	243	196.5		14	156	88.2	156	166	161.0

Table 8. Catch per nautical mile towed of female Tanner crab by carapace age and clutch fullness in a trawl survey of the Southern District, Cook Inlet, 1999.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1	38	9	0	0	1	0	0	0	0	0	10	0	0	48
2	8	0	0	0	0	0	0	0	0	0	0	0	0	8
3	172	13	0	0	7	0	0	0	0	0	20	0	0	192
4	73	10	0	0	5	0	0	0	0	0	15	0	0	88
5	4	0	0	0	0	0	0	0	0	0	0	0	0	4
6	648	15	1	0	6	0	0	0	0	0	21	1	0	671
7	184	7	0	0	1	0	0	1	1	0	9	1	0	194
8	306	258	1	8	84	0	3	0	0	2	343	1	13	663
9	35	66	7	39	31	0	4	0	0	0	97	7	43	182
10	16	45	0	0	13	0	0	0	0	0	58	0	0	74
11	29	27	0	14	7	0	1	0	0	0	34	0	15	78
12	2	2	0	3	0	0	0	0	0	0	2	0	3	7
13	20	17	0	1	8	0	1	0	0	0	25	0	2	47
14	2	0	0	0	0	0	0	0	0	0	0	0	0	2
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	1	0	0	0	0	0	0	0	0	0	0	0	0	1
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	104	8	0	0	8	0	0	0	0	0	16	0	0	120
Southern District Total														
Abund.	1,642	478	9	65	171	0	9	1	1	2	650	10	76	2,379
Percent	69%	20%	<1%	3%	7%	0%	<1%	<1%	<1%	<1%	27%	<1%	3%	100%

Table 9. Population estimate by carapace condition and clutch fullness for female Tanner crab in the Southern District, Cook Inlet, 1999.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1	28,461	6,741	0	0	749	0	0	0	0	0	7,490	0	0	35,951
2	3,445	0	0	0	0	0	0	0	0	0	0	0	0	3,445
3	144,452	10,792	0	0	5,811	0	0	0	0	0	16,604	0	0	161,056
4	34,278	4,632	0	0	2,316	0	0	0	0	0	6,948	0	0	41,227
5	3,504	0	0	0	0	0	0	0	0	0	0	0	0	3,504
6	492,524	11,508	767	0	4,603	0	0	0	0	0	16,111	767	0	509,402
7	109,936	4,137	0	0	591	0	0	591	591	0	5,320	591	0	115,847
8	165,731	140,141	609	4,265	45,698	0	1,828	0	0	1,219	185,839	609	7,312	359,491
9	24,608	45,798	4,785	27,342	21,874	0	2,734	0	0	0	67,671	4,785	30,076	127,140
10	20,301	58,365	0		16,495	0	0	0	0	0	74,860	0	0	95,161
11	20,685	19,306	0	9,653	4,827	0	690	0	0	0	24,133	0	10,343	55,161
12	1,899	1,899	0	2,848	0	0	0	0	0	0	1,899	0	2,848	6,646
13	18,988	16,139	0	949	7,595	0	949	0	0	0	23,734	0	1,899	44,621
14	1,997	0	0	0	0	0	0	0	0	0	0	0	0	1,997
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	1,358	0	0	0	0	0	0	0	0	0	0	0	0	1,358
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	54,049	4,198	0	0	4,198	0	0	0	0	0	8,396	0	0	62,445
Southern District Total														
Abund.	1,126,217	323,656	6,161	45,058	114,756	0	6,201	591	591	1,219	439,004	6,752	52,477	1,624,450
Percent	69%	20%	<1%	3%	7%	0%	<1%	<1	<1%	<1%	27%	<1%	3%	100%

Table 10. Historical population estimates for female Tanner crab caught in Cook Inlet bottom trawl surveys, 1990-1999.

Southern District

Year	Juvenile	Mature	Total	% Mature
	Estimated Abundance			
1990	919,907	393,506	1,313,413	30.0%
1991	519,521	914,322	1,433,843	63.8%
1992	350,782	533,748	884,530	60.3%
1993	573,958	600,634	1,174,592	51.1%
1994	515,136	373,041	888,177	42.0%
1995	609,577	676,352	1,285,929	52.6%
1996	223,189	451,068	674,257	66.9%
1997	162,867	209,994	372,861	56.3%
1998	317,679	77,820	395,499	19.7%
1999	1,126,217	498,233	1,624,450	30.7%
			Average	47.1%

Kamishak and Barren Islands Districts

Year	Juvenile	Mature	Total	% Mature
	Estimated Abundance			
1990	2,140,458	499,961	2,640,419	18.9%
1991	326,075	87,484	413,559	21.2%
1992	453,343	217,801	671,144	32.5%
1993	389,426	826,705	1,216,131	68.0%
1994	490,030	944,491	1,434,521	65.8%
1995	195,451	479,970	675,421	71.1%
1996	637,737	150,670	788,407	19.1%
1997	227,905	79,352	307,257	25.8%
1998	283,420	7,935	291,355	2.7%
1999	808,618	43,450	852,068	5.1%
			Average	35.9%

Table 11. Maximum, minimum, and mean carapace width of female Tanner, king, and Dungeness crabs caught in trawl surveys of Cook Inlet, 1999.

Southern District							Kamishak and Barren Islands Districts						
	Tanner Crab			Dungeness Crab				Tanner Crab			King Crab		
Station	Min.	Max.	Mean	Min.	Max.	Mean	Station	Min.	Max.	Mean	Min.	Max.	Mean
1	48	100	76.1	131	131	131.0	32	55	61	58.0			
2	56	90	71.6	114	129	117.8	33					No	
3	27	102	75.9	116	151	131.8	37	63	63	63.0		Catch	
4	23	107	78.9	118	154	136.7	41						
5	28	77	52.5				44	17	17	17.0			
6	23	103	69.1	130	158	144.0	45	18	18	18.0			
7	25	129	70.1				49						
8	27	115	87.1				50						
9	51	113	92.0				51						
10	46	110	89.4				52						
11	52	111	83.5				53						
12	57	105	84.6				54						
13	36	124	81.1				55	48	98	85.5			
14	49	57	53.0				56	30	30	30.0			
15							58	18	45	32.9			
16							60	75	99	92.0			
17	51	51	51.0				65	29	33	31.0			
19							67	31	71	40.0			
21				153	160	154.8	68	25	61	36.8			
71	44	103	79.5										
Total	23	129	78.5	114	160	135.8	Total	17	99	39.9			

Table 12. Station catch per nautical mile by carapace length and age of male king crab caught in trawl surveys of the Cook Inlet Management Area, 1999.

Southern District

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station[a]	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
8	0	0	0	0	0	0	0	1	0	0	1	1
13	0	0	0	0	0	0	0	0	0	1	1	1
Southern District Total												
Abund.	0	0	0	0	0	0	0	1	0	1	2	2
Percent	0%	0%	0%	0%	0%	0%	0%	50%	0%	50%	100%	100%

Kamishak and Barren Islands Districts

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station[a]	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
44	0	0	0	0	0	0	0	1	0	0	1	1
55	0	0	0	0	0	0	0	0	0	1	1	1
Kamishak and Barren District Total												
Abund.	0	0	0	0	0	0	0	1	0	1	2	2
Percent	0%	0%	0%	0%	0%	0%	0%	50%	0%	50%	100%	100%

Carapace lengths (mm) used for king crab size classes in Cook Inlet.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<91	91-108	109-126	127-144	145-163	>163

[a] - Stations not listed had no catch of male king crab.

Table 13. Historical catch per nautical mile by carapace length and age for male king crab caught in trawl surveys of the Cook Inlet Management Area, 1990-1999.

Southern District

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	0	1	0	0	0	0	0	0	1	2	3	4
1991	0	0	0	0	1	0	18	3	69	14	104	105
1992	0	2	2	0	0	0	1	1	11	31	44	48
1993	0	2	5	0	0	0	1	0	5	2	8	15
1994	4	0	0	0	0	0	0	0	1	6	7	11
1995	0	0	0	0	0	0	0	0	1	2	3	3
1996	0	1	0	0	0	0	0	1	1	2	4	5
1997	0	1	0	0	0	0	1	1	3	4	9	10
1998	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	1	0	1	2	2

Kamishak and Barren Islands Districts

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	1	0	0	0	1	0	2	0	1	1	4	6
1991	0	0	0	0	0	0	0	1	2	4	7	7
1992	0	2	1	0	1	0	2	2	8	10	22	26
1993	1	0	0	0	0	0	0	0	1	0	1	2
1994	0	0	0	0	0	0	0	0	1	2	3	3
1995	1	2	0	0	0	0	1	0	1	1	3	6
1996	0	12	14	0	3	0	0	1	1	0	2	31
1997	0	5	19	0	25	0	8	4	0	2	14	63
1998	0	0	0	0	2	0	11	0	1	0	12	14
1999	0	0	0	0	0	0	0	1	0	1	2	2

Carapace lengths (mm) used for king crab size classes in Cook Inlet.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<91	91-108	109-126	127-144	145-163	>163

Table 14. Historical catch per nautical mile of female king crab in trawl surveys of Cook Inlet, 1990-1999.

Southern District Catches

		Full Clutches			Partial Clutches			Barren			Total Mature			
Year	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1990	2	0	0	0	0	0	0	0	0	0	0	0	0	2
1991	0	0	0	0	8	0	0	0	0	0	8	0	0	8
1992	1	19	0	0	59	0	0	2	0	0	80	0	0	81
1993	3	3	0	0	14	1	0	0	0	0	17	1	0	21
1994	6	2	0	0	2	0	0	0	0	0	4	0	0	10
1995	0	0	0	0	1	0	0	0	0	0	1	0	0	1
1996	0	0	0	0	0	0	0	1	0	1	1	0	1	2
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Kamishak and Barren Islands Districts Catches

		Full Clutches			Partial Clutches			Barren			Total Mature			
Year	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1990	0	3	0	0	1	0	0	0	0	0	4	0	0	4
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	1	0	0	0	2	0	0	1	0	0	3	0	0	4
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	4	0	0	0	0	0	0	0	0	0	0	0	0	4
1996	2	0	0	0	7	0	0	0	0	0	7	0	0	9
1997	7	2	0	0	52	4	0	6	0	0	60	4	0	71
1998	0	1	0	0	2	2	0	0	0	0	3	2	0	5
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 15. Station catch per nautical mile by carapace width and age for male Dungeness crab in a trawl survey of the Southern District, Cook Inlet, 1999.

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Legal	Males
2	0	0	1	0	0	0	0	0	0	0	0	1
3	0	0	0	0	2	1	4	5	0	0	9	12
4	0	0	0	0	0	0	2	0	0	0	2	2
5	0	0	0	0	1	0	0	0	0	0	0	1
8	0	0	0	0	1	0	0	0	0	0	0	1
Southern District Total												
Total	0	0	1	0	4	1	6	5	0	0	11	17
Percent	0%	0%	6%	0%	24%	6%	35%	29%	0%	0%	64%	100%

Carapace widths (mm) used for Dungeness crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<89	90-114	115-139	140-164	165-189	>189

Table 16. Historical catch per nautical mile by carapace length and age for male Dungeness crab caught in trawl surveys of the Southern District, Cook Inlet, 1990-1999.

Southern District

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	1	17	189	5	91	7	6	1	0	0	7	317
1991	0	1	15	2	158	12	45	1	0	0	46	234
1992	0	0	19	2	93	31	54	10	1	1	66	211
1993	0	0	0	3	50	7	67	9	0	0	76	136
1994	0	0	2	0	7	3	13	12	0	0	25	37
1995	0	2	97	1	46	3	5	5	0	0	10	159
1996	0	0	3	16	43	56	1	1	28	28	58	176
1997	0	1	1	1	1	7	3	1	0	0	4	15
1998	0	0	0	0	2	2	0	2	0	1	3	7
1999	0	0	1	0	4	1	6	5	0	0	11	17

Carapace widths (mm) used for Dungeness crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<89	90-114	115-139	140-164	165-189	>189

Table 17. Station catch per nautical mile by carapace age and clutch fullness for female Dungeness crab in a trawl survey of the Southern District, Cook Inlet, 1999.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1	0	0	0	0	0	0	0	0	1	0	0	1	1	2
2	0	0	1	0	0	0	0	4	1	0	6	0	0	6
3	0	1	0	0	0	0	0	0	10	0	0	1	0	1
4	0	0	0	0	0	1	0	1	1	0	0	0	1	1
6	0	0	0	0	0	0	0	0	1	1	0	0	1	1
21	0	0	0	0	0	0	0	0	0	4	0	0	1	1
Southern District Total														
Abund.	0	1	1	0	0	1	0	5	14	5	6	16	5	27
Percent	0%	4%	4%	0%	0%	4%	0%	18%	52%	18%	22%	60%	18%	100%

Table 18. Historical catches of female Dungeness crab in trawl surveys of the Southern District, Cook Inlet, 1990-1999.

Southern District Catches

		Full Clutches			Partial Clutches			Barren			Total Mature			
Year	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1990	NA[a/]	0	8	0	0	0	0	2	13	0	2	21	0	23
1991	0	37	7	0	8	2	0	408	14	0	453	23	0	476
1992	0	0	1	0	0	0	0	397	78	0	397	79	0	476
1993	7	0	0	0	0	0	0	377	150	0	377	150	0	534
1994	0	0	0	0	0	0	0	43	69	2	43	69	2	114
1995	0	8	1	1	0	0	0	105	10	0	113	11	1	125
1996	0	0	0	0	0	0	0	96	167	107	96	167	107	370
1997	0	1	0	0	0	0	0	12	70	7	13	70	7	90
1998	0	0	0	0	0	0	0	6	2	4	6	2	4	12
1999	0	1	1	0	0	1	0	5	14	5	6	16	5	27

[a/] - Juveniles were not distinguished in the 1990 survey.

Table 19. Catch abundance by carapace size and age per mile towed of male Tanner crab during a trawl survey of the Kamishak and Barren Islands Districts, Cook Inlet, 1999.

	Sublegal Males						Legal Males					
	Pre-4	Pre-3	Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station			(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Legal	Males
32	6	0	0	1		7	0	0	0	0	0	14
33	0	0	0	0	0	4	0	1	0	0	1	5
37	1	0	0	0	0	5	0	3	0	0	3	9
41	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	1	0	0	0	0	0	0	1
49	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0
52	0	2	0	0	0	0	0	0	0	0	0	2
53	1	0	0	0	0	0	0	0	0	0	0	1
54	0	0	0	0	0	1	0	0	0	0	0	1
55	1	1	0	1	0	5	0	1	0	0	1	9
56	2	0	2	1	0	1	0	0	0	0	0	6
58	12	0	0	0	0	0	0	0	0	0	0	12
60	0	23	287	9	13	42	0	7	0	0	7	381
65	6	0	0	0	0	0	0	0	0	0	0	6
67	28	0	0	2	0	1	0	1	0	0	1	32
68	149	1	0	1	3	0	0	2	0	0	2	156
Kamishak and Barren Islands Districts Total												
Total	205	27	289	15	17	66	0	15	0	0	15	634
Percent	32%	4%	46%	2%	3%	10%	0%	2%	0%	0%	2%	100%

Carapace widths (mm) used for Tanner crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	70-91	92-114	115-139	140-165	>165

Table 20. Population estimate of male Tanner crab in the Kamishak and Barren Islands Districts, Cook Inlet, 1999.

Station	Sublegal Males						Legal Males				Total Legal	Total Males
	Pre-4	Pre-3	Pre-2 (new)	Pre-2 (old)	Pre-1 (new)	Pre-1 (old)	Recruit (new)	Recruit (old)	Postrecruit (new)	Postrecruit (old)		
32	23,570	0	0	3,928	0	27,498	0	0	0	0	0	54,997
33	0	0	0	0	0	15,559	0	3,890	0	0	3,890	19,449
37	3,928	0	0	0	0	19,642	0	11,785	0	0	11,785	35,355
41	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	3,779	0	0	0	0	0	3,779
49	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	8,181	0	0	8,181	8,181
53	3,928	0	0	0	0	0	0	0	0	0	0	3,928
54	0	0	0	0	0	4,560	0	0	0	0	0	4,560
55	3,928	3,928	0	3,928	0	19,642	0	3,928	0	0	3,928	35,355
56	7,935	0	7,935	3,968	0	3,968	0	0	0	0	0	23,806
58	41,214	0	0	0	0	0	0	0	0	0	0	41,214
60	0	91,255	1,138,70	35,709	51,579	166,640	0	27,773	0	0	27,773	1,511,666
65	23,339	0	0	0	0	0	0	0	0	0	0	23,339
67	109,312	0	0	8,097	0	4,049	0	4,049	0	0	4,049	125,507
68	591,254	3,890	0	3,890	11,669	0	0	7,780	0	0	7,780	618,483
Kamishak and Barren Islands Districts Total												
Total	808,409	99,074	1,146,64	59,520	63,249	265,337	0	67,386	0	0	67,386	2,509,619
Percent	32%	4%	46%	2%	3%	11%	0%	3%	0%	0%	3%	100%

Carapace widths (mm) used for Tanner crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	70-91	92-114	115-139	140-165	>165

Table 21. Catch per nautical mile by carapace age and clutch fullness for female Tanner crab in a trawl survey of the Kamishak and Barren Islands Districts, Cook Inlet, 1999.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
32	2	0	0	0	0	0	0	0	0	0	0	0	0	2
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	1	0	0	0	0	0	0	0	0	0	0	0	0	1
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	1	0	0	0	0	0	0	0	0	0	0	0	0	1
45	1	0	0	0	0	0	0	0	0	0	0	0	0	1
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	1	7	0	0	0	0	0	0	0	0	7	0	0	8
56	1	0	0	0	0	0	0	0	0	0	0	0	0	1
58	10	0	0	0	0	0	0	0	0	0	0	0	0	10
60	1	2	0	0	1	0	0	0	0	0	3	0	0	4
65	4	0	0	0	0	0	0	0	0	0	0	0	0	4
67	24	0	0	1	0	0	0	0	0	0	0	0	1	26
68	159	0	0	0	0	0	0	0	0	0	0	0	0	159
Kamishak and Barren Islands Districts Total														
Abund.	205	9	0	1	1	0	0	0	0	0	10	0	1	216
Percent	95%	4%	0%	<1%	<1%	0%	0%	0%	0%	0%	5%	0%	<1%	100%

Table 22. Population estimate by carapace condition and clutch fullness of female Tanner crab in the Kamishak and Barren Islands Districts, Cook Inlet, 1999.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
32	7,857	0	0	0	0	0	0	0	0	0	0	0	0	7,857
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	3,928	0	0	0	0	0	0	0	0	0	0	0	0	3,928
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	3,968	0	0	0	0	0	0	0	0	0	0	0	0	3,968
45	3,779	0	0	0	0	0	0	0	0	0	0	0	0	3,779
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	3,928	27,498	0	0	0	0	0	0	0	0	27,498	0	0	31,427
56	3,968	0	0	0	0	0	0	0	0	0	0	0	0	3,968
58	34,345	0	0	0	0	0	0	0	0	0	0	0	0	34,345
60	3,968	7,935	0	0	3,968	0	0	0	0	0	11,903	0	0	15,871
65	15,559	0	0	0	0	0	0	0	0	0	0	0	0	15,559
67	97,166	0	0	4,049	0	0	0	0	0	0	0	0	4,049	101,215
68	630,153	0	0	0	0	0	0	0	0	0	0	0	0	630,153
Kamishak and Barren Islands Districts Total														
Abund.	808,618	35,434	0	4,049	3,968	0	0	0	0	0	39,401	0	4,049	852,068
Percent	95%	4%	0%	<1%	<1%	0%	0%	0%	0%	0%	5%	0%	<1%	100%

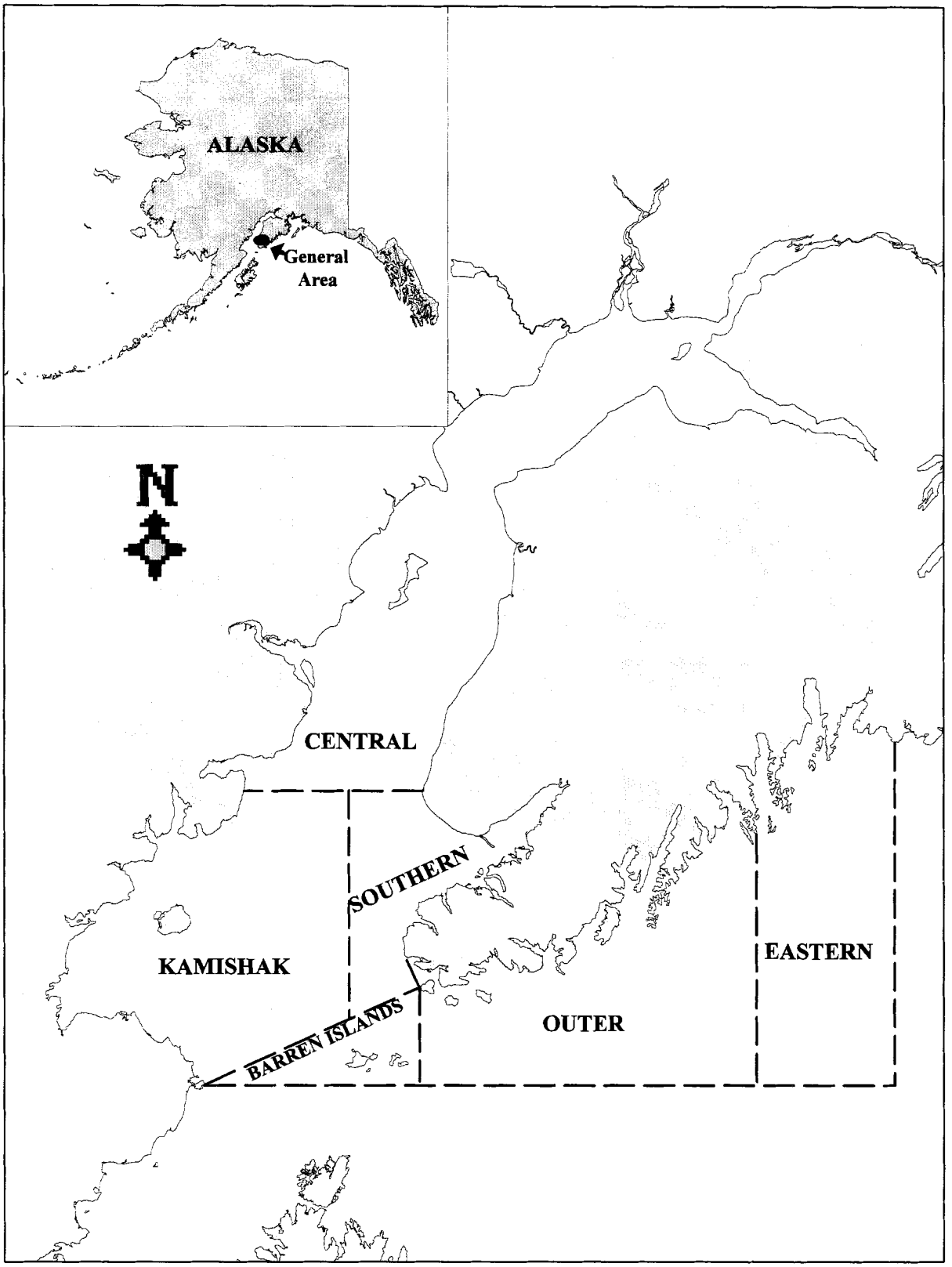


Figure 1. Crab management districts in the Cook Inlet Management Area.

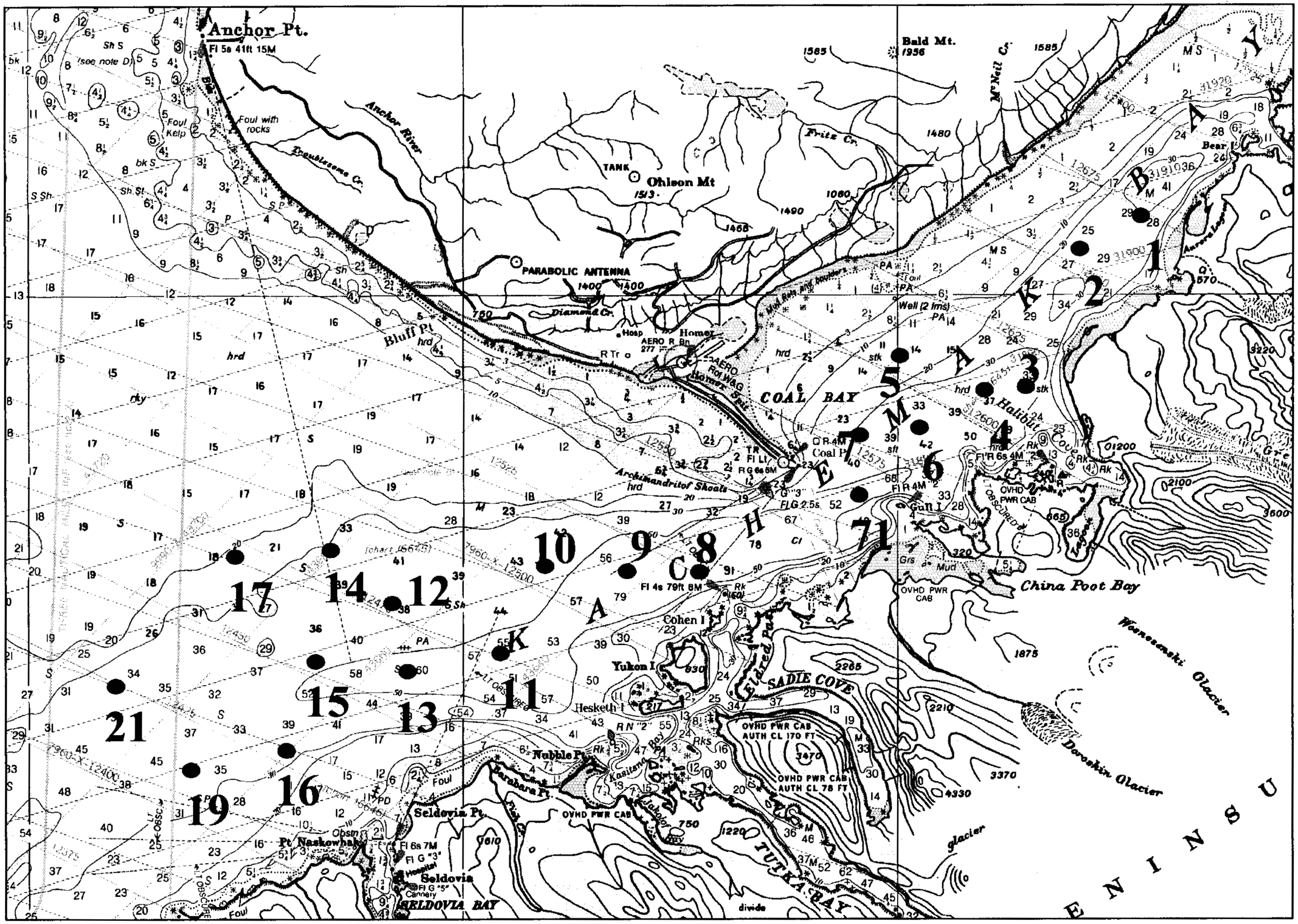


Figure 2. Survey stations in a bottom trawl survey of the Southern District, Cook Inlet, during 19-23 July 1999.

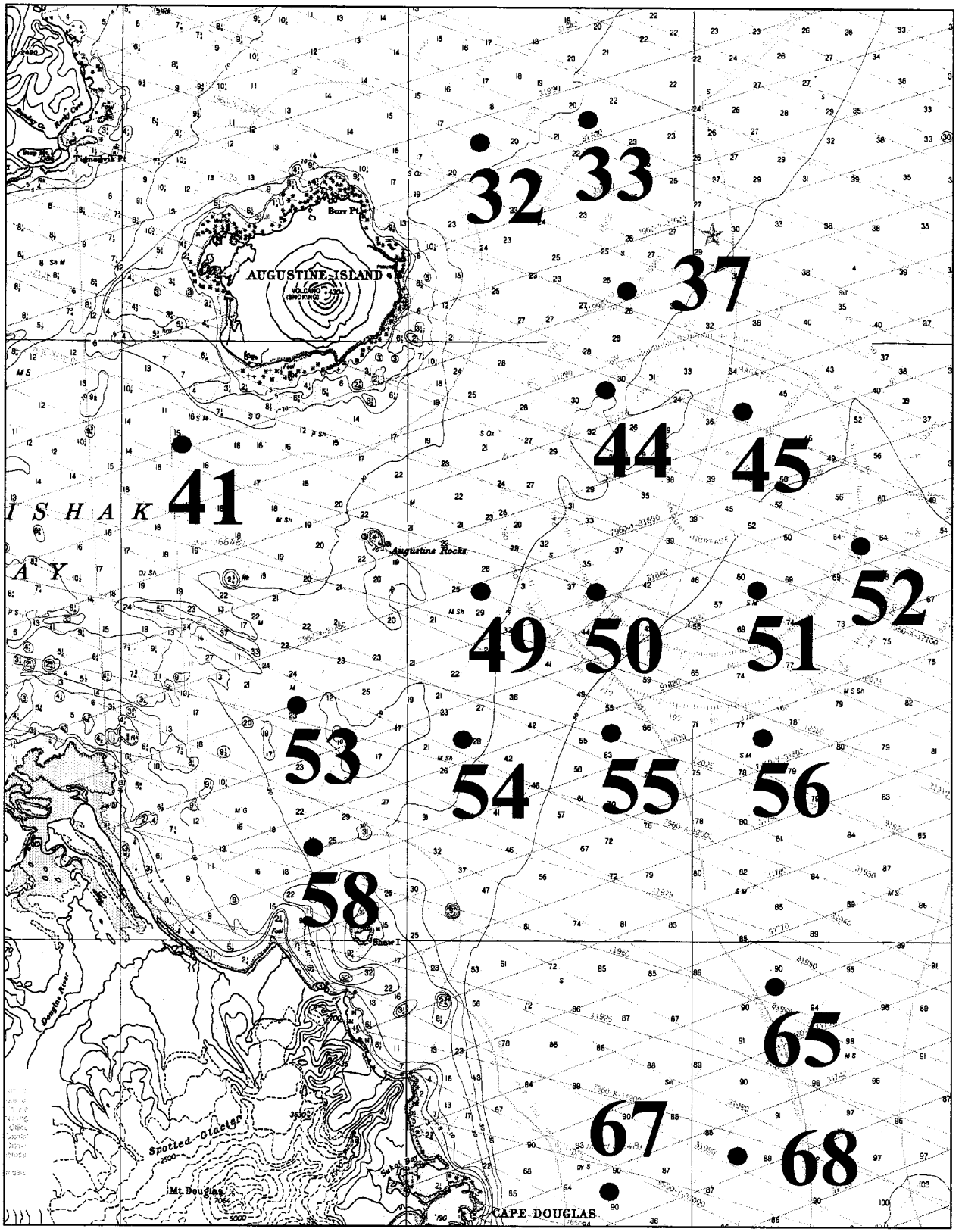
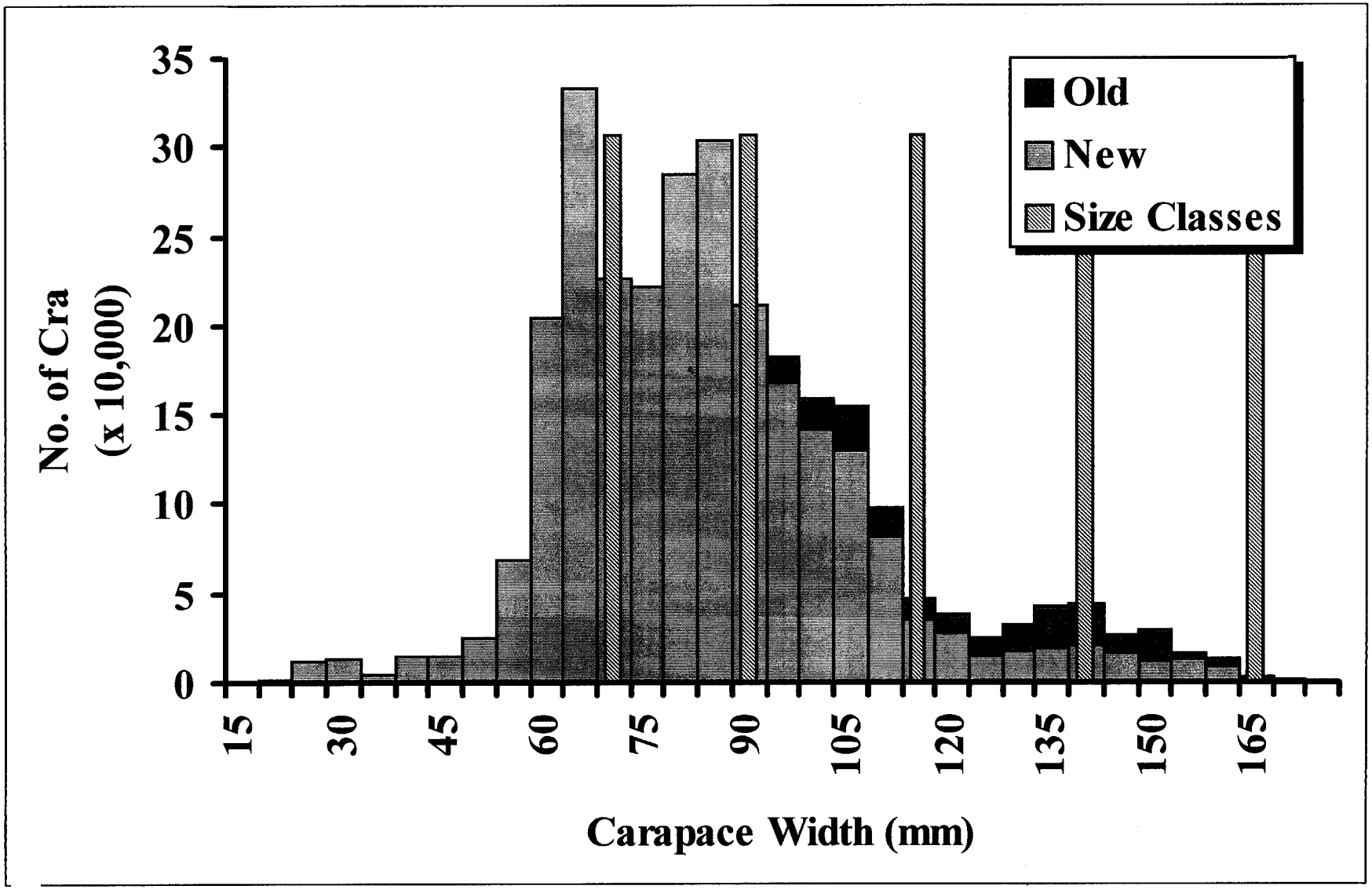


Figure 3. Survey stations in a bottom trawl survey of the Kamishak and Barren Islands District, Cook Inlet, during 16-23 August 1999.



] ure 4. Size and age composition of the male Tanner crab population in the Southern District, Cook Inlet, 1999.

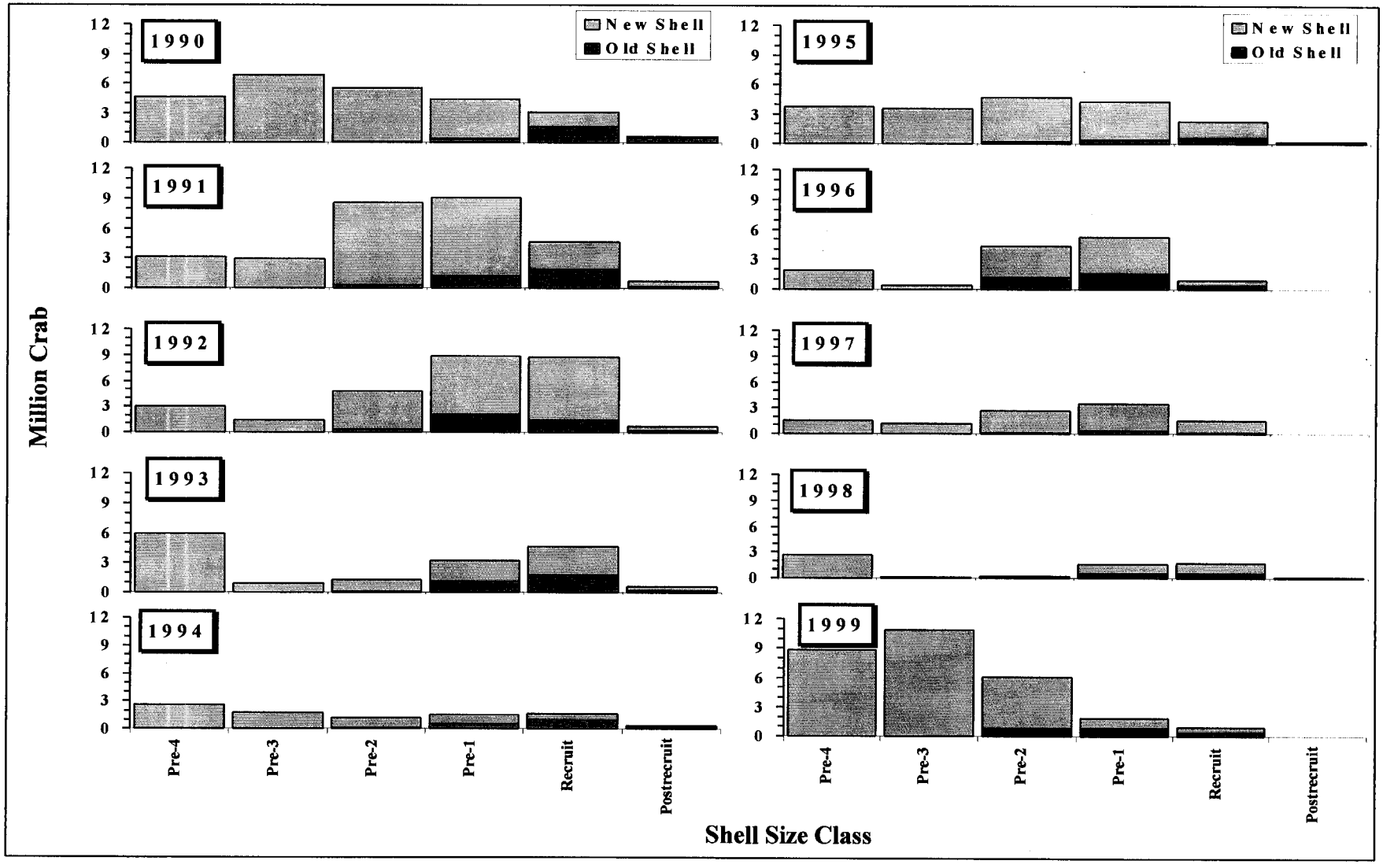


Figure 5. Estimated population abundance, by shell size and age composition, of male Tanner crab in the Southern District, 1990-1999.

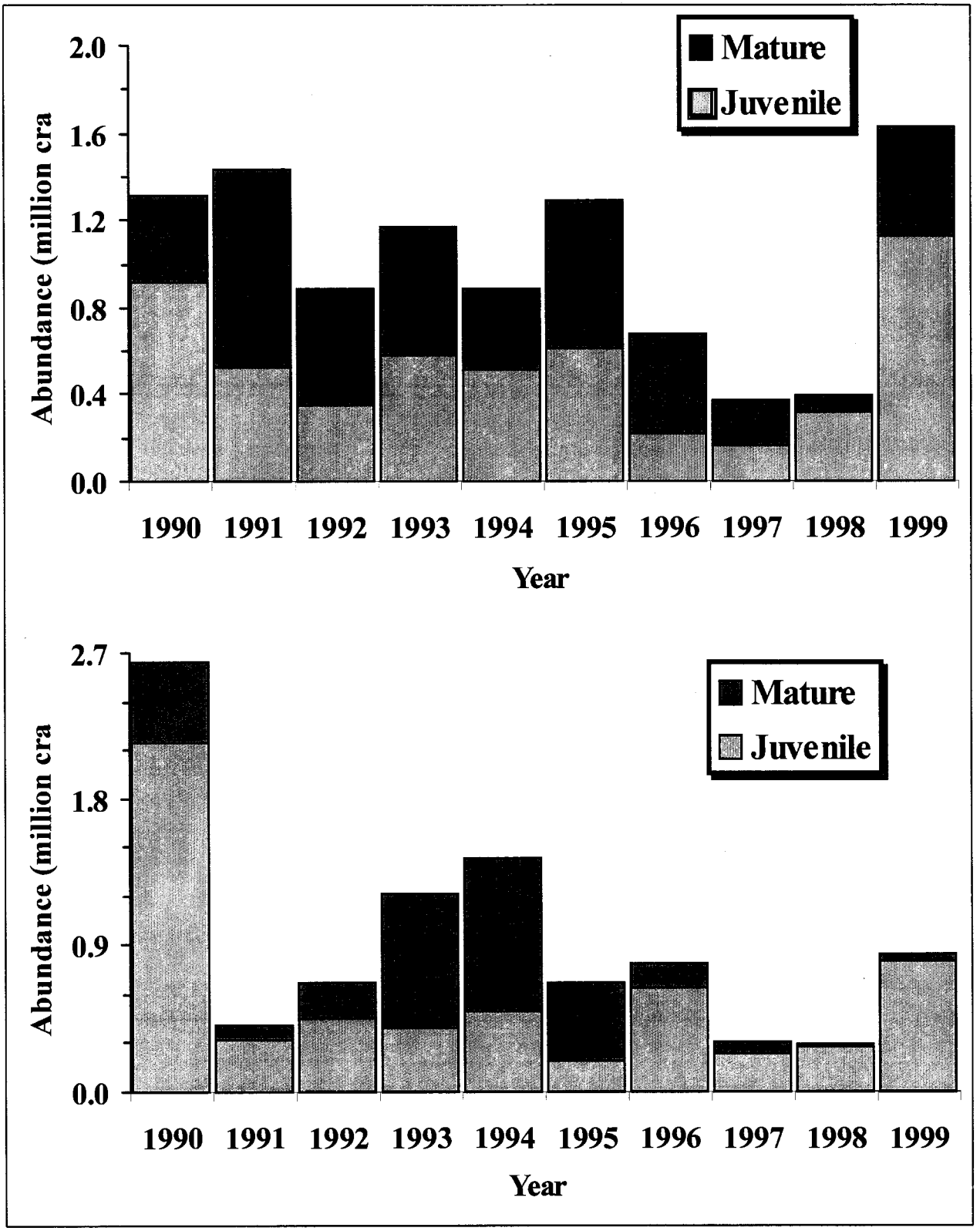


Figure 6. Abundance and maturity of female Tanner crab in the Southern District and the Kamishak and Barren Islands Districts, 1990-1999.

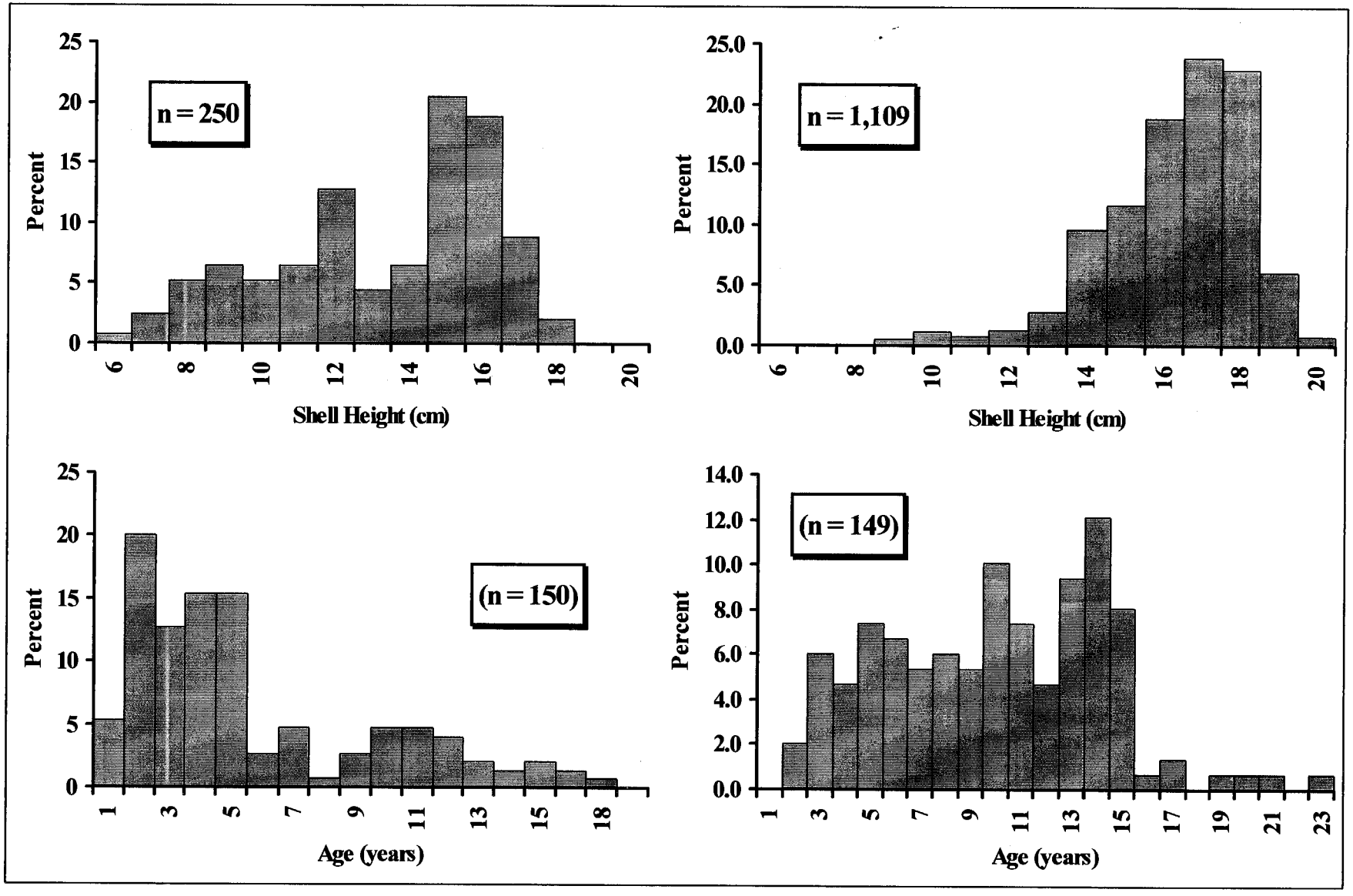


Figure 7. Height and age composition of weathervane scallops caught in the Cook Inlet bottom trawl survey, 1999.

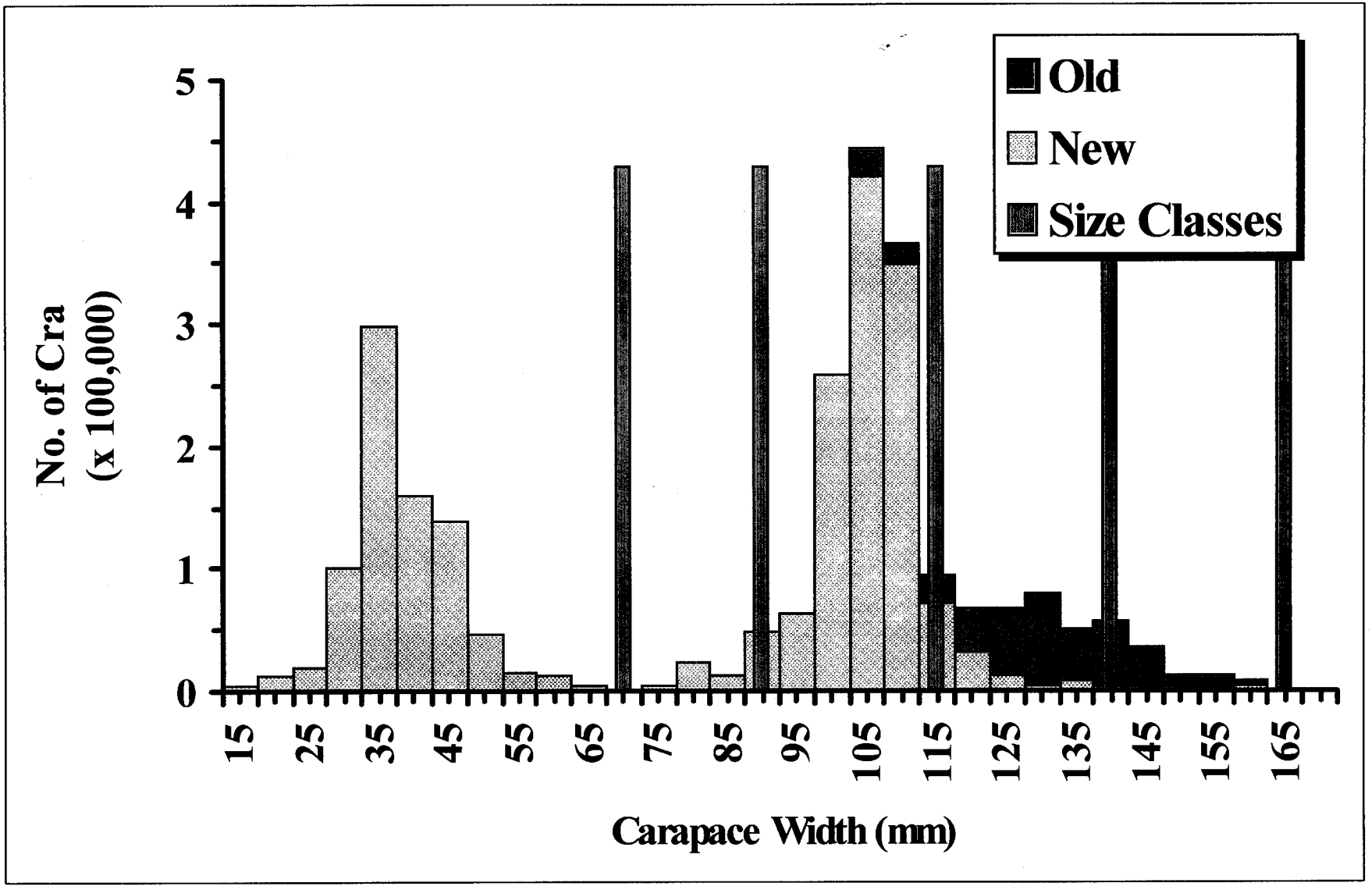


Figure 8. Size and age composition of the male Tanner crab population in the Kamishak and Barren Islands Districts, 1999.

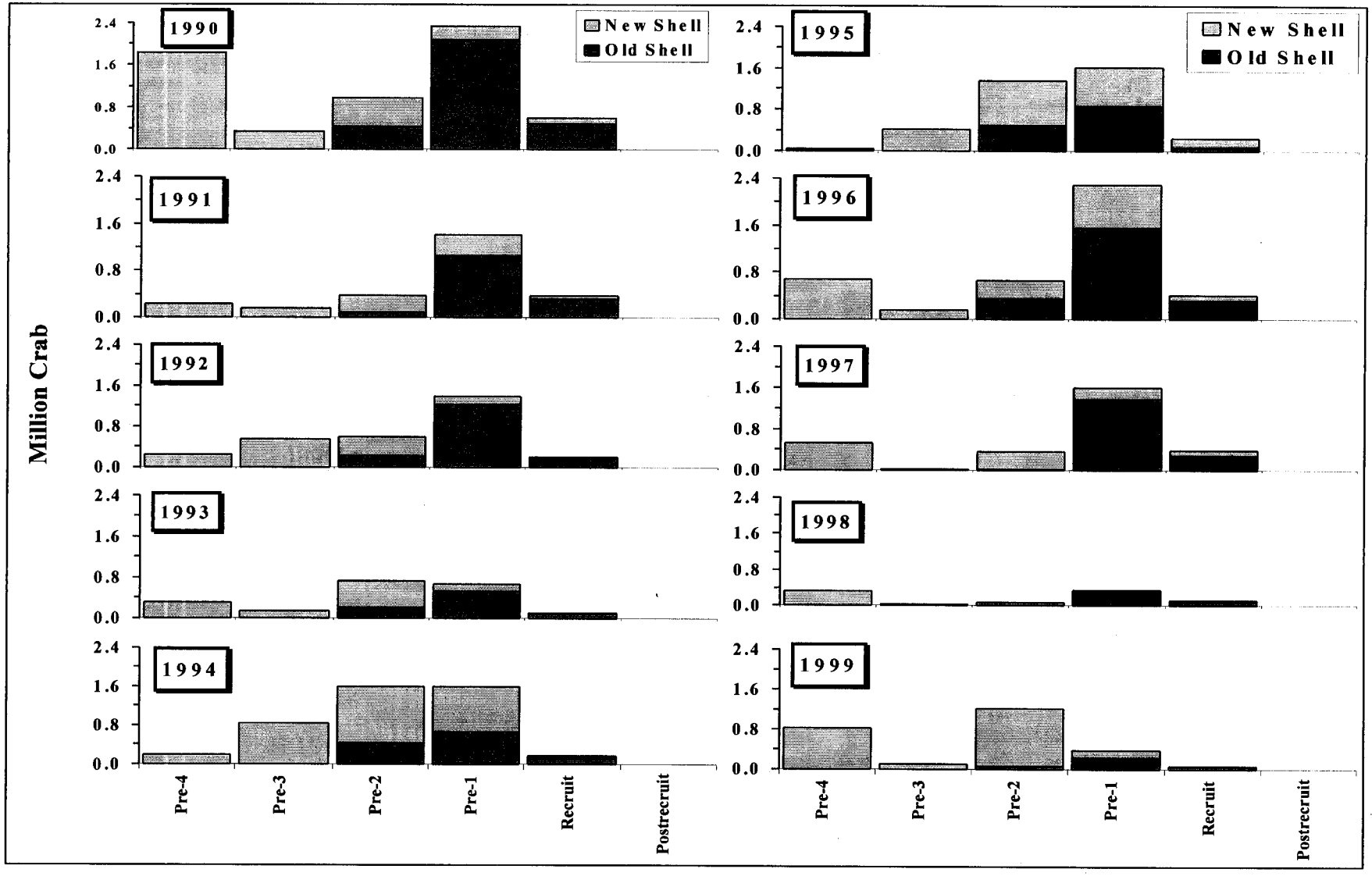


Figure 9. Estimated population abundance, by shell size and age composition, of male Tanner crab in the Kamishak and Barren Islands Districts, 1990-1999.

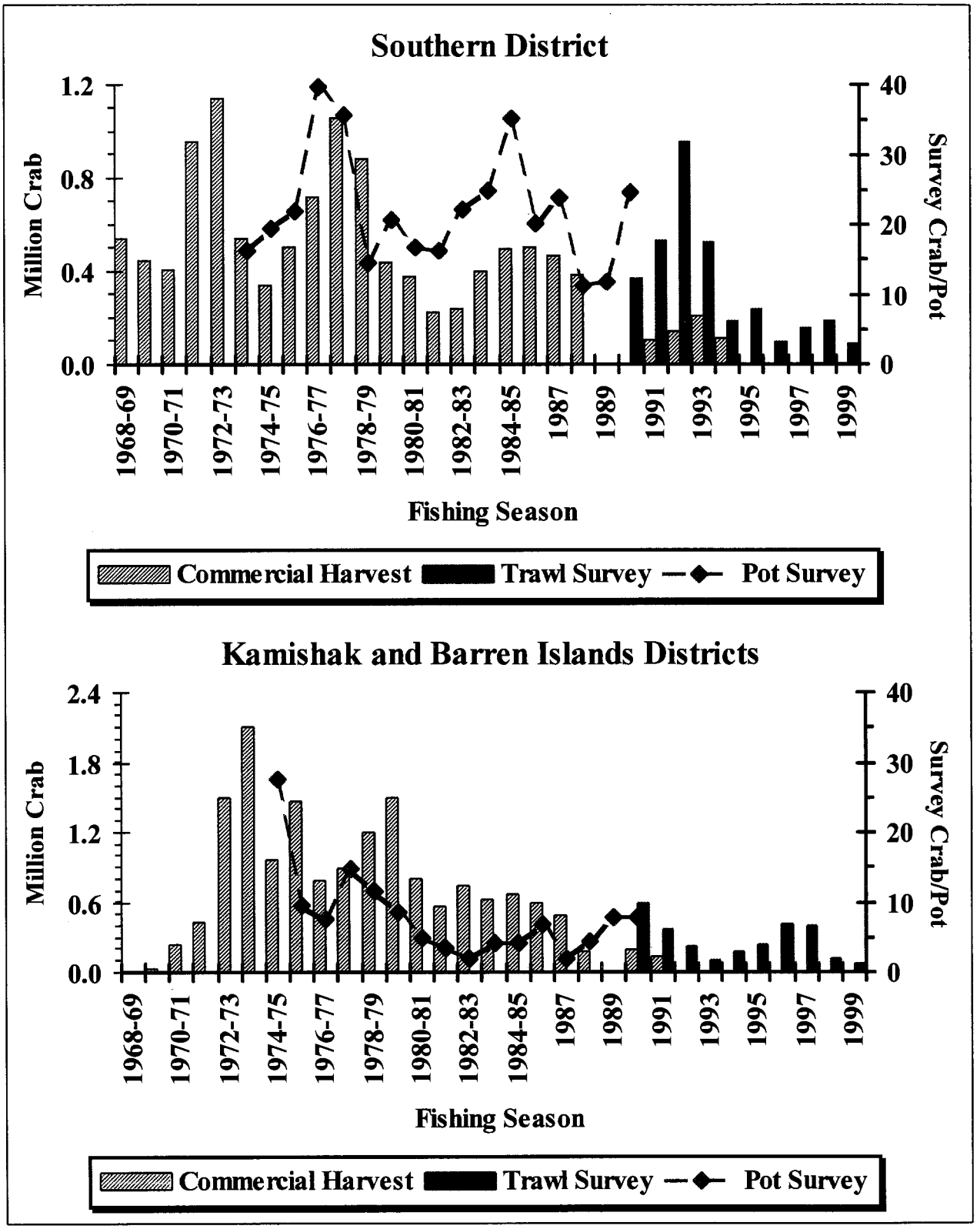


Figure 10. Historical fishery harvests and pot and bottom trawl survey catches of legal male Tanner crab in the Southern, Kamishak, and Barren Island Districts, 1968-1999.

Appendix A. Fishing log and aggregate catch (lb) in the Cook Inlet Southern District trawl survey, 19-23 July 1999.

Station	Area (nmi^2)	Date	Tow Start Location Latitude	Tow Start Location Longitude	Course (deg.)	Duration (minutes)	Distance (nmi)	Scope (fathom)	Depth (fathom) Min.	Depth (fathom) Max.	Catch (lb)
1	4.98	19-Jul	59° 41.43'	151° 09.34'	030	:25	1.01	100	28	36	912
2	2.92	19-Jul	59° 40.79'	151° 12.94'	052	:26	1.03	75	27	27	334
3	5.52	23-Jul	59° 37.40'	151° 14.06'	354	:25	1.01	100	33	35	1316
4	3.08	19-Jul	59° 37.58'	151° 16.89'	060	:26	1.01	100	34	37	886
5	5.94	19-Jul	59° 38.36'	151° 20.26'	060	:26	1.03	50	16	17	1,134
6	5.00	23-Jul	59° 37.18'	151° 18.12'	245	:26	0.99	125	39	39	1,912
7	3.93	19-Jul	59° 37.12'	151° 21.03'	227	:26	1.01	125	32	34	1,265
8	3.57	23-Jul	59° 33.67'	151° 28.29'	258	:24	0.89	275	90	92	1,230
9	4.59	20-Jul	59° 33.90'	151° 31.72'	231	:27	1.02	200	63	67	2,120
10	8.52	20-Jul	59° 33.51'	151° 37.13'	065	:25	1.02	150	47	48	1,216
11	4.63	20-Jul	59° 31.48'	151° 39.19'	065	:26	1.02	175	48	56	1,958
12	6.25	20-Jul	59° 32.80'	151° 44.26'	085	:25	1.00	125	38	44	2,890
13	6.25	22-Jul	59° 31.26'	151° 41.08'	270	:27	1.00	175	58	61	2,026
14	6.64	23-Jul	59° 34.34'	151° 45.24'	241	:26	1.01	100	34	35	3,060
15	3.68	22-Jul	59° 31.38'	151° 47.79'	066	:26	1.03	125	41	42	1,752
16	3.26	22-Jul	59° 29.54'	151° 47.21'	254	:26	1.01	125	37	38	1,798
17	8.94	23-Jul	59° 34.35'	151° 49.94'	215	:27	1.00	75	20	24	1,470
19	6.25	22-Jul	59° 28.81'	151° 53.49'	073	:27	1.02	125	36	40	2,028
21	6.25	23-Jul	59° 31.10'	151° 55.08'	248	:27	1.00	125	35	36	1,606
71	3.42	21-Jul	59° 35.48'	151° 20.82'	260	:29	0.99	175	51	77	2,782
Total							20.10		16	92	33,695

Appendix B. Fishing log and aggregate catch (lb) in the Cook Inlet Kamishak District trawl survey, 16-23 August 1999.

Station	Area (nmi^2)	Date	Tow Start Location Latitude	Tow Start Location Longitude	Course (deg.)	Duration (minutes)	Distance (nmi)	Scope (fathom)	Depth (fathom) Min.	Depth (fathom) Max.	Catch (lb)
32	26.1	22-Aug	59° 27.09'	153° 15.69'	140	:23	1.01	75	19	20	892
33	26.1	22-Aug	59° 27.83'	153° 08.13'	135	:24	1.02	75	21	23	676
36	22.3	22-Aug	59° 22.10'	153° 13.52'	320	:04	0.14	75	25	25	Discarded
37	26.1	22-Aug	59° 22.06'	153° 05.10'	102	24	1.01	75	26	28	2,052
38	26.1	22-Aug	59° 22.04'	152° 56.99'		:09	0.3	100	30	30	Discarded
38	26.1	22-Aug	59° 22.36'	152° 52.52'		:02	0.1		30	30	Discarded
41	16.8	20-Aug	59° 16.99'	153° 35.95'	303	:24	1.03	75	17	17	740
41	16.8	22-Aug	59° 15.98'	153° 33.68'	300	:13	0.52	50	16	16	Discarded
44	26.1	22-Aug	59° 18.64'	153° 07.03'	50	:27	1	100	29	29	710
45	26.1	23-Aug	59° 17.46'	152° 56.57'	50	:25	1.05	125	37	40	351
49	26.1	18-Aug	59° 11.64'	153° 14.40'	47			100			Discarded
49	26.1	18-Aug	59° 11.70'	153° 13.98'	308	:25	1.06	100	25	29	3,050
50	26.1	18-Aug	59° 11.96'	153° 05.79'	280	:22	1	125	38	39	1,284
51	26.1	18-Aug	59° 12.45'	152° 56.16'	139	:26	0.99	175	61	68	6,364
52	26.1	23-Aug	59° 13.86'	152° 49.01'	130	:27	0.97	200	63	67	6,818
53	26.1	18-Aug	59° 07.79'	153° 27.36'	340	:23	1.01	75	23	24	714
54	26.1	17-Aug	59° 06.85'	153° 16.69'	45	:20	0.87	75	26	27	433
55	26.1	17-Aug	59° 07.79'	153° 06.28'	133	:25	1.01	200	58	64	2,224
56	26.1	17-Aug	59° 06.75'	152° 54.79'	342	:24	1	225	78	79	3,884
58	22.6	18-Aug	59° 03.10'	153° 26.12'	330	:25	1	75	23	24	910
60	26.1	17-Aug	58° 03.05'	153° 05.76'	173	:24	1	225	73	75	2,720
65	26.1	16-Aug	58° 59.39'	152° 53.47'	225	:27	1.02	250	90	92	1,328
67	26.1	16-Aug	58° 52.13'	153° 03.02'	303	:26	1	250	90	93	Discarded
67	26.1	17-Aug	58° 52.33'	153° 04.86'	308	:25	1.05	250	91	94	Discarded
67	26.1	17-Aug	58° 51.75'	153° 05.71'	353	:27	0.98	250	91	91	1,444
68	26.1	16-Aug	58° 53.72'	152° 55.95'	239	:27	1.02	250	91	92	948
Total									16	94	36,650

Appendix C. Catch rates (lb/nmi) of all species or species groups caught in a bottom trawl survey of the Southern District, 1999.

Station	Pacific Cod	Walleye Pollock	Pacific Tomcod	Pacific Ocean Perch	Black Rockfish	Rougheye Rockfish	Dusky Rockfish	Lingcod	Sablefish	Pacific Halibut	Longnose Skate	Big Skate	Aleutian Skate	Arrowtoooth Flounder	Flathead Sole
1	66.3	229.7								106.5				19.8	52.8
2	5.8	5.8								31.1	31.1	44.7		9.7	27.2
3		192.1								271.5	55.4	35.6		43.6	145.4
4	4.0	112.9				0.7			0.8	9.9	35.5			48.8	280.6
5	1.9	3.9								29.1		252.4		46.4	92.7
6	32.3	70.7				0.5				10.1	105.1	115.2		39.4	367.8
7	7.9	53.5								23.8	25.7	170.3		12.0	227.3
8		4.3				9.0				71.9		87.6	4.5	126.5	253.1
9	180.4	386.3				3.0	1.9				131.4			164.6	688.3
10	11.8	562.7				2.6	3.2			42.2	13.9			113.5	227.0
11	49.0	894.1			0.6	2.4	1.4			1.0	22.5			313.8	441.7
12	18.0	1,572.0					12.0			42.0	10.0	36.0	8.0	224.0	316.2
13	10.0	286.0				2.1	12.0			42.9	72.0	66.0		301.1	279.6
14	27.7									65.3	43.6			154.5	231.7
15	36.9	324.3					71.8			38.8	50.5	104.9		113.8	130.0
16	873.3			3.0			198.0	21.1		42.6	37.6			102.6	22.8
17	4.0		2.4							28.0		4.0		1.9	7.2
19	62.7	2.0					13.7	0.2		56.9				88.5	
21	132.0									127.0		1.0		78.3	
71	70.7	30.3				0.7				139.4	78.8	317.2		90.0	1,740.0
Total	1,594.8	4,730.5	2.4	3.0	0.6	21.0	314.2	21.3	0.8	1,179.9	713.1	1,234.8	12.5	2,092.6	5,531.3
Freq	90%	80%	5%	5%	5%	40%	40%	10%	5%	95%	70%	60%	10%	100%	90%
Mean	63.3	258.6	0.2	0.1	0.0	1.0	11.5	0.7	0.0	59.9	32.2	53.4	0.6	107.0	242.8

Appendix C (p 2 of 5).

Station	Rock Sole	Dover Sole	Rex Sole	Butter Sole	Yellowfin Sole	English Sole	Starry Flounder	Alaska Plaice	Sculpin, Unid.	Eulachon	Prickleback	Starsnout	Sturgeon Poacher	Wolffish	Eelpout
1					59.4			105.6	138.6	0.7					4.4
2		298.0			38.8			7.8	25.2						0.2
3		0.4	0.8		36.4			14.5	72.7						6.0
4					12.2			61.0	41.6						0.9
5			3.7		247.3				170.0	0.5				1.0	
6	12.7	4.3	3.5		5.8			144.5	217.4						13.8
7			0.5	4.7	47.9				406.8						
8		4.4	8.0												2.1
9		21.4	19.0					15.0	4.1						1.3
10		14.2	7.1	0.4				14.2	42.6	0.1		0.1			0.2
11		46.5	34.9						1.3						5.8
12		39.5	13.2	263.5					65.9				0.7		0.7
13		172.0	344.1	21.5		118.3			43.0				2.4		
14		10.6	115.8	1,544.6		231.7	115.8	308.9	154.5		5.5				
15			81.3	438.9			146.3	32.5	65.0				2.3		
16	159.6			0.6					126.0						
17	31.0		15.5	931.4		21.7			21.7				2.6		
19	221.2								25.8						
21	58.7		2.2	782.5		58.7	39.1		4.3				5.4		
71		30.0							60.0						
Total	483.3	641.4	649.5	3,988.2	447.7	430.3	301.3	704.0	1,686.6	1.3	5.5	0.1	13.4	1.0	35.4
Freq	25%	55%	70%	45%	35%	20%	15%	45%	95%	15%	5%	5%	25%	5%	50%
Mean	25.2	27.4	37.0	259.5	22.5	27.4	15.0	37.6	80.3	0.1	0.4	<0.1	0.8	0.1	1.7

Appendix C (p 3 of 5).

Station	Prowfish	Pacific Searcher	Snailfish	Dungeness Crab	Red King Crab	Tanner Crab	Hermit Crab	Decorator Crab	Lyre Crab	Pink Shrimp	Sidestripe Shrimp	Humpy Shrimp	Coonstripe Shrimp	Crangon shrimp	Eualid Shrimp
1			1.5			63.4	3.2		0.6	3.3			0.4		
2				3.9		14.3	0.4			0.3			0.0	0.0	
3				23.8		176.2				0.4		0.1	0.2	0.7	
4				7.9		144.6	20.7		6.7	2.7				0.7	
5						0.9				3.4				0.2	0.2
6				2.2		739.4				13.0				0.1	
7						174.3	11.9	0.7	16.4	3.2			0.2		
8				1.8	18.0	770.8	4.8			0.1	0.2				
9			3.2			345.1	23.1		1.0	1.8	1.0				
10						74.5	0.2			0.2					
11						68.6	6.4			2.8					
12						17.0									
13			8.0		10.0	82.0	3.6			2.7					
14						0.3	0.4							0.9	
15						17.5									
16	3.3	1.9				2.0				2.8					
17						0.6			9.6					0.2	
19							12.2			0.0					
21				4.0			19.4								
71						115.2	2.0	1.7	4.3		0.3				
Total	3.3	1.9	12.8	43.6	28.0	2,806.5	108.3	2.3	38.5	36.7	1.5	0.1	0.8	2.8	0.2
Freq	5%	5%	15%	30%	10%	90%	65%	10%	30%	70%	15%	5%	20%	35%	5%
Mean	0.1	0.1	0.7	2.0	1.2	121.0	4.9	0.1	1.9	1.7	0.1	<0.1	<0.1	0.1	<0.1

Appendix C (p 4 of 5).

Station	Weathervane Scallop	Hinds scallop	Octopus	Red Sea Urchin	Green Sea Urchin	Horse Mussel	Sand Dollar	Parastychopus	Cucumaria/football	Cucumaria, Unid.	Pycnopodia	Sea Star, Unid.	Fusitriton Snail	Neptunea Snail	Placetron Wasnasinski
1	12.1				1.1									0.6	
2	2.0											56.3		0.2	
3	176.2														
4	4.0										21.5	12.1		7.7	
5												170.0			
6	2.9								4.3						
7	20.8				6.7									2.1	
8					5.7							0.2	1.6	0.3	
9					3.8								9.1	2.5	
10			41.2									2.3			
11					3.8			2.4					19.2		
12	222.0	1.5			1.5							26.4			
13			30.0	5.9	43.1			3.6				2.6	43.0	7.6	
14	7.9		9.9												
15	5.8				16.3	3.8						1.6	2.3		0.9
16					114.0	22.8						1.5	18.2		
17					1.9		65.0			5.7		130.0			
19					1,283.0						88.5		34.1	11.0	
21					78.3										
71					24.8										
Total	3.8	1.5	81.1	5.9	1,583.9	26.6	65.0	5.9	4.3	5.7	109.9	403.0	127.6	31.9	0.9
Freq	45%	5%	15%	5%	65%	10%	5%	10%	5%	5%	10%	50%	35%	40%	5%
Mean	22.7	0.1	5.8	0.4	90.8	0.9	5.6	0.3	0.2	0.5	6.0	25.0	6.6	1.6	0.0

Appendix C (p 5 of 5).

Station	Snail, Unid.	Snail Egg Mass	Sea Pen	Jellyfish	Anenome	Sponge	Debris	Total
1							33.0	903.0
2							25.2	628.1
3							50.9	1,303.0
4							36.6	877.2
5							77.3	1,101.0
6							26.3	1,931.3
7							35.9	1,252.5
8					7.4		39.5	1,421.6
9		1.3					69.9	2,078.4
10	2.7			2.7	5.5		7.1	1,192.2
11					1.3			1,919.6
12								2,890.0
13					2.6	8.3	43.0	2,068.9
14								3,029.7
15	1.8				4.7	3.4	5.6	1,701.0
16						1.9	24.7	1,780.2
17			1.7		173.3		10.8	1,470.0
19							88.5	1,988.2
21					136.9		78.3	1,606.0
71					14.9		90.0	2,810.1
Total	4.5	1.3	1.7	2.7	346.5	13.6	742.5	33,952.0
Freq	10%	5%	5%	5%	40%	15%	85%	100%
Mean	0.3	0.1	0.1	0.2	24.8	0.7	35.7	1,731.3

Appendix D. Population biomass estimates in surveyed stations for species caught in a bottom trawl survey of the Southern District, 1999.

Station	Pacific Cod	Walleye Pollock	Pacific Tomcod	Pacific Ocean Perch	Black Rockfish	Rougheye Rockfish	Dusky Rockfish	Lingcod	Sablefish	Pacific Halibut	Longnose Skate	Big Skate	Aleutian Skate	Arrowtoooth Flounder	Flathead Sole
1	50,181	173,762								80,555				14,978	39,942
2	2,584	2,584								13,780	13,780	19,809		4,306	12,058
3		161,056								227,637	46,490	29,887		36,575	121,918
4	1,853	52,807				327			357	4,632	16,597			22,832	131,282
5	1,752	3,504								26,280		227,762		41,838	83,677
6	24,549	53,702				372				7,672	79,786	87,458		29,931	279,356
7	4,728	31,917								14,185	15,367	101,662		7,143	135,714
8		2,351				4,874				38,996		47,526	2,437	68,614	137,229
9	125,773	269,319				2,110	1,356				91,596			114,754	479,879
10	15,226	728,298				3,357	4,196			54,559	17,987			146,883	293,767
11	34,475	628,830			456	1,672	988			690	15,859			220,718	310,640
12	17,089	1,492,418					11,393			39,874	9,494	34,178	7,584	212,649	300,210
13	9,494	271,521				1,988	11,393			40,694	68,355	62,659		285,821	265,405
14	27,962									65,910	43,940			155,789	233,683
15	20,623	181,265					40,161			21,708	28,221	58,613		63,607	72,693
16	432,437			1,471			98,058	10,463		21,083	18,631			50,803	11,290
17	5,432		3,242							38,024		5,432		2,594	9,727
19	59,569	1,862					13,031	144		53,984				84,000	
21	125,318									120,571		949		74,291	
71	36,732	15,742				359				72,415	40,930	164,770		46,754	903,903
Total	995,776	4,070,937	3,242	1,471	456	15,059	180,575	10,607	357	943,247	507,033	840,703	10,021	1,684,881	3,822,372

Appendix D (p 2 of 5).

Station	Rock Sole	Dover Sole	Rex Sole	Butter Sole	Yellowfin Sole	English Sole	Starry Flounder	Alaska Plaice	Sculpin, Unid.	Eulachon	Prickleback	Starsnout	Sturgeon Poacher	Wolffish	Eelpout
1					44,935			79,885	104,849	550					3,302
2		132,160			17,225			3,445	11,196						95
3		336	672		30,479			12,192	60,959						5,040
4					5,708			28,540	19,455						408
5			3,382		223,138				153,408	461				876	
6	9,678	3,299	2,639		4,399			109,747	165,131						10,448
7			315	2,834	28,571				242,856						
8		2,364	4,349												1,135
9		14,949	13,224					10,432	2,875						920
10		18,360	9,180	506				18,360	55,081	101		101			304
11		32,699	24,524						901						4,055
12		37,526	12,509	250,175					62,544				689		689
13		163,326	326,653	20,416		112,287			40,832				2,250		
14		10,733	116,841	1,557,88 6		233,683	116,841	311,577	155,789		5,581				
15			45,433	245,340			81,780	18,173	36,347				1,302		
16	79,027			311					62,404						
17	42,149		21,075	1,264,78 1		29,414			29,414				3,534		
19	210,001								24,537						
21	55,718		2,047	742,911		55,718	37,146		4,095				5,118		
71		15,585							31,169						
Total	396,574	431,337	582,844	4,085,160	354,457	431,102	235,767	592,351	1,263,840	1,113	5,581	101	12,894	876	26,395

Appendix D (p 3 of 5).

Station	Prowfish	Pacific Searcher	Snailfish	Dungeness Crab	Red King Crab	Tanner Crab	Hermit Crab	Decorator Crab	Lyre Crab	Pink Shrimp	Sidestripe Shrimp	Humpy Shrimp	Coonstripe Shrimp	Crangon shrimp	Eualid Shrimp
1			1,156			47,934	2,422		440	2,477			275		
2				1,723		6,339	171			142			19	19	
3				19,924		147,773				336		67	134	605	
4				3,706		67,630	9,689		3,146	1,258				315	
5						792				3,075				154	154
6				1,691		561,570				9,898				55	
7						104,026	7,086	394	9,763	1,890			118		
8				967	9,749	417,984	2,600			47	95				
9			2,260			240,610	16,099		690	1,265	690				
10						96,430	304			202					
11						48,265	4,506			1,982					
12						16,139									
13			7,595		9,494	77,849	3,376			2,588					
14						330	429							859	
15						9,769									
16	1,621	933				981				1,369					
17						748			12,969					324	
19							11,574			46					
21				3,798			18,425								
71						59,821	1,031	859	2,233		172				
Total	1,621	933	11,011	31,809	19,243	1,904,990	77,712	1,253	29,242	26,576	956	67	547	2,330	154

Appendix D (p 4 of 5).

Station	Weathervane Scallop	Hinds scallop	Octopus	Red Sea Urchin	Green Sea Urchin	Horse Mussel	Sand Dollar	Parastychopus	Cucumaria/football	Cucumaria, Unid.	Pycnopodia	Sea Star, Unid.	Fusitriton Snail	Neptunea Snail	Placetron Wasnasinski
1	9,189				826									440	
2	883											24,976		104	
3	147,773														
4	1,853										10,036	5,663		3,586	
5												153,408			
6	2,199								3,299						
7	12,412				4,016									1,260	
8					3,073							95	851	142	
9					2,645								6,325	1,725	
10			53,290									3,036			
11					2,703			1,672					13,517		
12	210,761	1,379			1,379							25,017			
13			28,481	5,626	40,958			3,376				2,475	40,832	7,201	
14	7,989		9,986												
15	3,256				9,115	2,103						901	1,302		501
16					56,448	11,290						747	9,022		
17					2,594		88,241			7,781		176,481			
19					1,218,007						84,000		32,408	10,417	
21					74,291										
71					12,884										
Total	396,315	1,379	91,758	5,626	1,428,937	13,393	88,241	5,048	3,299	7,781	94,036	392,799	104,256	24,876	501

Appendix D (p 5 of 5).

Station	Snail, Unid.	Snail Egg Mass	Sea Pen	Jellyfish	Anenome	Sponge	Debris	Total
1							24,964	683,063
2							11,196	278,595
3							42,671	1,092,525
4							17,124	410,413
5							69,731	993,391
6							19,954	1,466,832
7							21,428	747,686
8					4,018		21,442	770,937
9		920					48,711	1,449,126
10	3,542			3,542	7,084		9,180	1,542,875
11					901			1,350,054
12								2,743,694
13					2,475	7,877	40,832	1,964,128
14								3,055,807
15	1,002				2,604	1,903	3,105	950,829
16						933	12,223	881,543
17			2,270		235,308		14,707	1,996,239
19							84,000	1,887,581
21					130,009		74,291	1,524,696
71					7,730		46,754	1,459,842
Total	4,543	920	2,270	3,542	390,130	10,713	562,313	27,249,856

Appendix E. Catch rates of all species or species groups caught in a bottom trawl survey of the Kamishak and Barren Islands Districts, 1999.

Station	Pacific Cod	Walleye Pollock	Pacific Tomcod	Rougheye Rockfish	Dusky Rockfish	Sablefish	Pacific Halibut	Dogfish Shark	Pacific Sleeper Shark	Longnose Skate	Big Skate	Bathyraja sp.	Arrowtoooth Flounder	Flathead Sole	Rock Sole
32	7.9	3.7	3.6				40.3	33.7			23.8		98.1	5.4	
33	9.8	29.1				3.9	32.9	47.1			111.8		70.9	14.2	35.4
37	11.9	0.3	8.6		2.2		35.6			31.7	87.1		58.2	38.8	
41	18.4						36.9	87.4			176.7		25.6		1.1
44	146.0						30.0				30.0		30.8	12.3	3.5
45							55.2				36.2		5.7		76.2
49	1.9						88.7	35.8			188.7	5.7	404.7	89.9	134.9
50	2.0						223.0			34.0	50.0		197.5	28.2	5.4
51	84.8	0.6				32.3	26.3			28.3	34.3	56.6	5,508.2	74.7	
52	156.7					45.4	117.5					35.1	4,870.0	81.2	
53		65.3				2.0	33.3	7.9		27.7	108.9		8.6	34.5	8.6
54	1.4						81.6	11.5		50.6			11.5		163.2
55	136.6					31.7	128.7			55.4		118.8	1,549.9	49.2	
56	46.0	2,537.7				214.0	352.0					94.0	488.0	73.7	
58	130.0	50.0					31.1	10.0			216.0		31.4	41.8	
60	1,086.0	434.0		2.5			208.0			74.0		82.0	359.6	23.0	
65	25.5	96.1		3.5		9.8	43.1			49.0		56.9	536.2	97.5	
67	67.3	71.4		2.4		2.0	59.2			14.3		49.0	819.5		9.0
68	45.1	5.9		5.9		9.8	56.9		160.8	9.8		47.1	429.0	33.0	
Total	1,977.5	3,294.1	12.2	14.2	2.2	350.9	1,680.3	233.4	160.8	374.8	1,063.5	545.0	15,503.4	697.4	437.4
Freq	89.5%	57.9%	10.5%	21.1%	5.3%	47.4%	100.0%	36.8%	5.3%	52.6%	57.9%	47.4%	100.0%	78.9%	47.4%
Mean	105.5	177.6	0.7	0.8	0.1	19.0	89.8	10.9	8.7	20.2	52.5	29.4	836.8	37.4	23.6

Appendix E (p. 2 of 4).

Station	Dover Sole	Rex Sole	Butter Sole	Yellowfin Sole	English Sole	Starry Flounder	Alaska Plaice	Sculpin, Unid.	Rock Greenling	Eulachon	Starsnout	Sturgeon Poacher	Pacific Sandfish	Eelpout	Pacific Searcher	Red King Crab	Tanner Crab	Hermit Crab	Decorator Crab	Lyre Crab	Pink Shrimp
32	2.7	7.2	12.6	163.5			16.2	32.7				3.6					11.9	5.4		16.2	
33		7.0	28.3	141.7				28.3	0.8			3.9		1.6			9.8				
37			893.0	97.1		155.3		58.2		7.5		0.4					11.9				
41		0.1	95.9	32.0		230.2						0.7						0.4			
44		6.2	18.5	30.8		209.4	10.9	24.6						1.7		6.0	0.0			0.7	
45			85.7			43.8						0.4									
49		42.1	404.7			22.5	42.1	22.3		1.2	2.5	8.7		2.5				32.2		7.4	
50		28.2	592.4		11.7													14.0			
51	39.8	64.7	451.5																		
52			811.7														4.1				
53			14.3	69.1	2.4	8.6	172.7	17.3				2.9	0.7					51.8			
54	0.5			0.6		4.6		0.5			0.5				13.8		2.3	11.6			
55	29.8	28.5													16.3	9.9	11.9	5.4			
56	18.4	27.6															4.0	8.6			6.2
58				4.3		10.5	6.3	36.5		2.3	0.1		12.0	2.9				135.9	4.0		
60	14.8	14.6						0.6						1.9			330.1	5.5			7.6
65	146.2	48.7															1.0	64.5			10.7
67	54.6																7.2	136.6			
68										5.3							21.2	8.9			5.8
Total	306.9	275.0	3,408.6	539.0	14.0	685.0	248.3	221.1	0.8	16.3	3.1	20.6	12.7	10.5	30.1	15.9	415.5	480.8	4.0	24.3	30.3
Freq.	42.1%	57.9%	57.9%	42.1%	10.5%	42.1%	26.3%	47.4%	5.3%	21.1%	15.8%	36.8%	10.5%	26.3%	10.5%	10.5%	63.2%	68.4%	5.3%	15.8%	21.1%
Mean	16.6	14.9	182.3	28.5	0.8	32.5	13.4	11.7	0.0	0.9	0.2	1.1	0.6	0.5	1.6	0.9	22.4	25.0	0.2	1.3	1.6

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Station	Sidestripe Shrimp	Yellowleg Shrimp	Crangon shrimp	Eualid Shrimp	Weathervane Scallop	Pink Scallop	Hinds scallop	Green Sea Urchin	P. goniurus	Sand Dollar	Parastychopus	Cucumaria/football	Cucumaria, Unid.	Sea Star. Unid.	Fusitriton Snail
32					39.6									5.4	9.0
33			0.2		29.4										
37					459.4									9.7	
41														6.4	
44					124.0										2.4
45										0.1				2.7	
49						2.2		14.9						32.2	7.7
50					58.0		1.6							6.2	8.6
51					26.3										
52					907.2										
53								8.1					25.9	1.9	2.9
54							0.4	11.5				4.6		23.0	1.4
55								14.9							
56															4.2
58									<0.1				5.8		34.6
60		0.3	0.0	0.1				38.3			4.2			6.3	0.8
65	16.1													48.4	
67	0.3							19.6						27.3	
68	4.5		0.5					10.0						14.6	
Total	21.0	0.3	0.7	0.1	1,643.9	2.2	1.9	117.2	<0.1	0.1	4.2	4.6	31.7	184.1	71.5
Freq	15.8%	5.3%	15.8%	5.3%	36.8%	5.3%	10.5%	36.8%	5.3%	5.3%	5.3%	5.3%	10.5%	63.2%	47.4%
Mean	1.1	0.0	0.0	0.0	88.8	0.1	0.1	6.3	0.0	0.0	0.2	0.2	1.7	9.8	3.6

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Station	Neptunea Snail	Silky Buccinum	Ribbed Sinistral Snail	Snail. Unid.	Greenland cockle	Sea Mouse	Sea Pen	Jellyfish	Anenome	Brachiopods	Debris	Total
32	9.0		4.5								327.0	883.2
33											56.7	662.7
37							6.4				58.2	2,031.7
41	0.4								12.3		6.4	718.4
44	1.7								28.6		8.1	710.0
45									112.4			334.6
49			5.0								1,164.3	2,877.4
50	6.2										17.1	1,284.0
51												6,428.3
52												7,028.9
53	6.2		6.7	1.0	0.4						17.3	706.9
54		0.4	0.3			0.1	0.3		27.6	0.8	73.6	498.0
55				9.5					5.4			2,202.0
56	7.6										2.0	3,884.0
58	27.7		5.8				0.0	5.8	42.6		62.7	910.0
60	1.7								6.3		17.8	2,720.0
65											48.7	1,302.0
67	6.0			0.6		1.2				0.6	125.3	1,473.5
68						5.8					49.5	929.4
Total	66.5	0.4	22.2	11.0	0.4	7.2	6.7	5.8	235.3	1.4	2,034.9	37,584.9
Freq	47.4%	5.3%	26.3%	15.8%	5.3%	15.8%	15.8%	5.3%	36.8%	10.5%	78.9%	100.0%
Mean	3.4	0.0	1.2	0.6	0.0	0.4	0.4	0.3	12.4	0.1	109.4	2,010.1

Appendix F. Population biomass estimates in surveyed stations for species caught in a bottom trawl survey of the Kamishak and Barren Islands Districts, 1999.

Station	Pacific Cod	Walleye Pollock	Pacific Tomcod	Rougheye Rockfish	Dusky Rockfish	Sablefish	Pacific Halibut	Dogfish Shark	Pacific Sleeper Shark	Longnose Skate	Big Skate	Bathyraja	Arrowtoooth Flounder	Flathead Sole	Rock Sole
32	31,427	14,723	14,303				159,732	133,564			94,280		389,277	21,455	
33	38,898	115,652				15,559	130,477	186,712			443,441		281,112	56,222	140,556
37	47,140	1,299	33,961		8,660		141,420			125,707	345,694		231,066	154,044	
41	47,186						94,373	223,514			451,995		65,434		2,705
44	579,274						119,029				119,029		122,208	48,883	14,010
45							219,164				143,590		22,672		302,295
49	7,486						351,846	142,236			748,609	22,458	1,605,841	356,854	535,280
50	7,935						884,781			134,899	198,381		783,451	111,922	21,590
51	336,647	2,209				128,247	104,200			112,216	136,262	224,431	21,854,420	296,190	
52	621,731					179,975	466,299					139,071	19,322,527	322,042	
53		259,271				7,857	132,202	31,427		109,994	432,118		34,264	137,057	34,264
54	5,530						323,795	45,605		200,662			45,605		647,590
55	542,112					125,707	510,685			219,987		471,401	6,149,349	195,217	
56	182,511	10,068,522				849,072	1,396,605					372,957	1,936,240	292,263	
58	446,480	171,723					106,820	34,345			741,843		107,727	143,637	
60	4,308,844	1,721,951		10,059			825,267			293,604		325,345	1,426,611	91,060	
65	101,136	381,203		13,721		38,898	171,153			194,492		225,610	2,127,476	386,814	
67	267,208	283,402		9,372		8,033	234,819			56,680		194,333	3,251,365		35,840
68	178,932	23,339		23,339		38,898	225,610		637,932	38,898		186,712	1,702,305	130,947	
Total	7,750,477	13,043,294	48,264	56,491	8,660	1,392,246	6,598,277	797,402	637,932	1,487,139	3,855,243	2,162,320	61,458,951	2,744,606	1,734,131

Appendix F (p. 2 of 5).

Station	Dover Sole	Rex Sole	Butter Sole	Yellowfin Sole	English Sole	Starry Flounder	Alaska Plaice	Sculpin, Unid.	Rock Greenling	Eulachon	Starsnout	Sturgeon Poacher	Pacific Sandfish	Eelpout	Pacific Searcher
32	10,727	28,607	50,062	648,794			64,365	129,759				14,303			
33		27,888	112,445	562,225				112,445	3,099			15,494		6,197	
37			3,543,008	385,110		616,175		231,066		29,715		1,698			
41		180	245,377	81,792		588,904						1,803			
44		24,517	73,325	122,208		831,015	43,107	97,767						6,736	
45			340,082			173,820						1,666			
49		167,178	1,605,841			89,213	167,178	88,506		4,917	9,834	34,419		9,834	
50		111,922	2,350,352		46,264										
51	157,968	256,698	1,791,346												
52			3,220,421												
53			56,654	274,114	9,442	34,264	685,285	68,529				11,331	2,593		
54	2,011			2,514		18,242		2,011			2,011				54,726
55	118,353	112,974													64,556
56	73,066	109,599													
58				14,646		35,909	21,770	125,255		7,917	396		41,214	9,896	
60	58,553	57,883						2,476						7,361	
65	580,221	193,407													
67	216,758														
68										20,930					
Total	1,217,656	1,090,853	13,388,913	2,091,402	55,707	2,387,543	981,706	857,812	3,099	63,479	12,241	80,714	43,806	40,023	119,282

Appendix F (p 3 of 5).

Station	Red King Crab	Tanner Crab	Hermit Crab	Decorator Crab	Lyre Crab	Pink Shrimp	Sidestripe Shrimp	Yellowleg Shrimp	Crangon shrimp	Eualid Shrimp	Weathervane Scallop	Pink Scallop	Hinds scallop	Green Sea Urchin	P. goniurus
32		47,313	21,455		64,365						157,134				
33		38,898							620		116,695				
37		47,400									1,822,752				
41			902												
44	23,806	44			2,694						491,986				
45															
49			127,842		29,502							8,851		59,004	
50			55,517								230,122		6,169		
51											104,200				
52		16,361									3,599,498				
53			205,586										-	32,104	
54		9,121	45,907										1,508	45,605	
55	39,283	47,140	21,519											59,177	
56		15,871	34,230			24,565									40
58			466,819	13,854											
60		1,309,867	21,748			30,113		1,338	67	335				151,767	
65		3,859	255,831			42,638	63,958				6,522,387				
67		28,754	541,894				1,195							77,653	
68		84,105	35,364			23,095	18,043		2,165					39,694	
Total	63,089	1,648,733	1,834,612	13,854	96,561	120,411	83,195	1,338	2,852	335	13,044,774	8,851	7,677	465,004	40

Appendix F (p 4 of 5).

Station	Sand Dollar	Parastychopus	Cucumaria/football	Cucumaria, Unid.	Sea Star, Unid.	Fusitriton Snail	Neptunea Snail	Silky Buccinum	Ribbed Sinistral Snail	Snail, Unid.	Greenland cockle	Sea Mouse	Sea Pen	Jellyfish	Anenome
32					21,455	35,758	35,758		17,879						
33															
37					38,511								25,470		
41					16,358		902								
44						9,430	6,736								48,883
45	250				10,830										113,361
49					127,842	30,485			19,668						446,067
50					24,674	33,927	24,674								
51															
52															
53				102,793	7,554	11,331	24,550		26,439	3,777	1,511				
54			18,242		91,210	5,530		1,408	1,106			503	1,005		109,452
55										37,658					21,519
56						16,511	30,203								
58				19,791		118,748	94,998		19,791				40	19,791	146,456
60		16,729			25,094	3,346	6,692								25,094
65					191,873										
67					108,379		23,893			2,389		4,779			
68					57,737							23,095			
Total	250	16,729	18,242	122,584	721,517	265,066	248,406	1,408	84,883	43,824	1,511	28,376	26,515	19,791	910,831

Appendix F (p 5 of 5).

Station	Brachiopods	Debris	Total
32		1,297,588	3,504,083
33		224,890	2,629,526
37		231,066	8,060,963
41		16,358	1,837,784
44		32,330	2,817,016
45			1,327,731
49		4,619,496	11,416,288
50		67,854	5,094,434
51			25,505,035
52			27,887,925
53		68,529	2,804,838
54	3,016	291,871	1,975,783
55			8,736,638
56		8,054	15,410,267
58		215,455	3,125,358
60		70,744	10,791,948
65		193,407	5,165,696
67	2,389	497,044	5,846,178
68		196,420	3,687,560
Total	5,406	8,031,108	147,625,053

Appendix G. Bottom temperature recordings during Cook Inlet trawl surveys, 1992-1999.

Southern District				Kamishak and Barren Islands Districts			
Date	Station	Depth (fm)	Temp (°C)	Date	Station	Depth (fm)	Temp (°C)
7/15/92	4	32	7.5	7/10/92	61	82	6.7
7/16/92	7	37	7.5	7/11/92	67	90	6.3
7/17/92	10	47	7.8	7/12/92	53	24	9.3
7/18/92	11	55	7.9				
7/6/93	5	16	6.9	6/28/93	53	22	8.2
7/7/93	7	34	6.7	6/29/93	31	12	10.2
7/8/93	8	67	6.6	6/30/93	67	92	5.5
7/12/93	7	39	7.1	7/1/93	54	23	8.8
7/13/93	18	36	8.4	7/2/93	44	26	8.0
7/14/93	15	41	7.6				
6/27/94	3	30	6.3	6/14/94	67	89	5.9
6/28/94	5	22	6.4	6/15/94	38	29	6.8
6/29/94	8	81	6.0	6/16/94	47	18	7.4
6/30/94	11	54	6.5	6/17/94	51	55	7.1
7/5/94	13	57	6.5				
7/6/94	18	35	7.4				
7/5/95	5	16	6.3	6/19/95	34	27	7.9
7/6/95	2	28	5.7	6/20/95	44	30	7.4
7/7/95	10	49	6.4	6/21/95	67	94	7.1
7/8/95	71	66	6.3	6/22/95	47	19	5.9
7/9/95	8	92	6.0	6/23/95	41	16	7.2
7/10/95	15	39	7.4	6/24/95	23	16	7.1
8/19/96	10	46	9.2	6/20/96	68	91	5.5
8/20/96	18	35	9.7	6/21/96	58	23	7.6
				6/22/96	41	17	8.3
				6/23/96	37	27	7.6
6/27/97	10	49	6.6	6/8/97	61	84	ND
				6/9/97	68	89	ND
				6/12/97	37	27	ND
8/14/98	9	65.6	9.3	6/16/98	61	81.0	5.7
8/17/98	5	16.5	9.6	6/17/98	60	75.5	6.8
				6/28/98	33	21.0	9.0
				6/29/98	44	29.0	8.1
				6/30/98	41	16.5	9.5
7/19/99	4	35.5	7.1	8/17/99	54	26.5	9
7/22/99	13	59.5	7.5	8/22/99	37	27.0	11.7
7/23/99	14	34.5	8.2				