

ALASKA DEPARTMENT OF FISH AND GAME
SUMMARY OF THE 1994 MANDATORY SHELLFISH
OBSERVER PROGRAM DATABASE

By

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INTRODUCTION

During the spring of 1988, the Alaska Board of Fisheries (BOF) mandated at sea observer coverage for all vessels commercially processing king and *C. bairdi* (Tanner) crab in Alaskan waters. Since then, the BOF has amended state shellfish regulations to include observer coverage in the Bering Sea *C. opilio* fishery. In addition, board members granted authority to the Alaska Department of Fish and Game (ADF&G) to place observers on commercial vessels participating in other Alaskan shellfisheries when such action would facilitate the only means to collect biological and fishery management data.

Historically the primary purpose of deploying at-sea observers has been to utilize their presence onboard vessels as an enforcement monitoring tool. Although observers devote a considerable amount of effort toward monitoring and documenting commercial vessel fishing activities, they also collect a significant amount of biological data. These data have been useful for applications such as developing models for estimating relative stock abundance, defining male and female crab size/age distributions on an annual basis, chronicling species reproductive cycles, and quantifying levels of incidental bycatch. Ultimately, the shellfish observer biological database provides a source of information to aid in comprehensive management of Alaska's shellfish resources.

The databases of biological and regulatory compliance information collected by observers is maintained by Westward Region ADF&G staff members. Archived information includes a variety of commercial fishing and shellfish biology statistics ranging from pot locations, gear types and soak periods, to species composition of catches, biological and legal crab carapace size distributions, and the reproductive status of female crabs.

In this report, compiled data was collected during fisheries primarily occurring within the 1994 calendar year. Due to the substantial volume of available statistics, the scope of data presented has been narrowed to include only size composition and molt stages of commercially retained crabs, the documented incidence of illegally retained crabs, and the general results of random pot sampling. Topical statistics from the 1990, 1991, 1992, and 1993 seasons have occasionally included for comparative purposes. Any inconsistencies between findings presented in this document and previously published reports regarding the shellfish observer database are the result of updated summaries and interpretation of historical data.

Size distributions of retained crabs presented often include those collected in a number of fisheries at shoreside processing locations by ADF&G personnel. Additional information, including Bering Sea/Aleutian Islands fishery catch statistics, has been provided by Morrison et al. 1995.

METHODS

Comprehensive shellfish observer sampling methodologies are outlined in the most recent publishing of the ADF&G Shellfish Observer Field Manual (ADF&G 1993).

For the purposes of this report, terms related to the discussion of sampled crabs are as follows:

- Carapace Length (CL)* - the straight line distance across the carapace from the posterior margin of the right eye orbit to the medial-posterior margin of the carapace; the biological size measurement of Korean hair crabs and all king crab species.
- Carapace width (CW)* - the straight line distance across the carapace at a right angle to a line midway between the eyes to the medial-posterior margin of the carapace not including the spines; the biological size measurement of *C. bairdi*, *C. opilio* and *C. tanneri* crabs.
- Legal Size* - the straight line distance across the carapace of male crabs at a right angle to a line midway between the eyes to the medial-posterior margin, including the spines.
- Mature* - male and female crabs that have at least attained a biological size at which 50 percent or more of a random sample of individuals are physiologically capable of mating.
- Immature* - male and female crabs that have not attained a biological size at which 50 percent or more of a random sample of individuals are physiologically incapable of mating.
- Soft shell* - crabs that have molted within the previous two months.
- New shell* - crabs that have molted between the preceding two to twelve months.
- Old shell* - crabs that have molted between the preceding twelve to twenty-four months.
- Very old shell* - crabs that have not molted within the preceding twenty four months.
- Eyed Eggs* - embryoid eggs.
- Uneyed Eggs* - non-embryoid eggs.
- Mated/Barren* - female crabs not carrying eggs but showing signs of previously mating (based on evidence of egg clutch extrusion).
- Non-mated/Barren* - female crabs not carrying eggs and not exhibiting signs of prior mating activity (including immature crabs).
- Recruit* - male crabs at an age/size within one growth cycle beyond the minimum legal size established for the species which includes old shelled crabs at the legal size.

Post-Recruit - male crabs at an age/size greater than one growth cycle beyond the minimum legal size established for the species including old shelled crabs above the legal size.

During the 1994 Bering Sea/Aleutian Islands shellfisheries, observers were deployed on catcher-processor, floater-processor, and catcher vessels. Observers onboard floater-processors have access only to pre-sorted and retained catches, while those placed on catcher-processor and catcher vessels are able to examine total pot contents prior to any catch sorting.

Floater-Processors

Catch deliveries to floater-processors are monitored by observers for commercial fishing regulations compliance with regard to retention of legal crab species, sex and size. Sampling procedures consist of surveying 600 crab taken from individual vessel catches to ascertain a percentage, if any, of illegally retained animals. This sample type is sometimes referred to as a Legal Tally.

Biological data collected by observers onboard floater-processors includes the measurement of 100 randomly selected crabs from each catch delivery to determine carapace size distribution and shell age condition. The mean weight of harvested crabs is also calculated from a vessel's catch.

Normally, observers on floater-processors are directed to monitor all catch deliveries to their vessel. On limited occasions, this convention necessitates a work schedule in excess of 24 hour intervals.

Catcher-Processors

In addition to collecting the carapace size distribution, Legal Tally and average catch weight samples from retained crabs, observers deployed on catcher-processors routinely examines randomly selected pots for species composition. This exercise is often referred to as Bycatch sampling. Methodology includes enumerating all species in a pot, recording the carapace size frequency of all commercially important crabs observed, determining shell age composition, and evaluating the reproductive condition of female crabs.

Catcher Vessels

Routine data collection objectives for observers onboard catcher vessels are similar to those assigned personnel deployed on catcher-processors, except that pot contents assessment is often the primary sampling activity. Retained catches are formally inspected for regulations compliance (consisting of a Legal Tally sample) only on occasions when the vessel delivers to a processing facility. When a vessel transfers harvested crabs to an at-sea processor, Legal Tally and biological carapace measurements are collected concurrently by observers deployed on each vessel.

Daily observer sampling goals on catcher-processors and catcher vessels (regarding quantity of fished pots examined, crabs measured, etc.) are dependent on a number of variables, such as factors such as whether an individual has been assigned any special data collection projects, the anticipated duration of the fishery in which the observer is deployed, and the data collection priorities established by ADF&G. Fishery specific sampling goals will be discussed in subsequent sections when appropriate.

Special shellfish research assignments carried out by observers onboard catcher-processors and catcher vessels have ranged from Genetic Stock Inventory (GSI) sampling of brown, blue and red king crabs, to collecting morphometric measurements from male and female *C. tanneri*, and Korean hair crabs, used to validate an index of sexual maturity for the species. Investigation of these data has not been included in this report.

RESULTS AND DISCUSSION

Bering Sea C. opilio

In recent years, the *C. opilio* fishery has become the principal revenue source of the commercial crabbing fleet. The largest annual harvests of this stock on record have occurred since at-sea observer coverage was authorized by the BOF in the spring of 1990. The immense harvests and extended seasons have generated some of the larger data sets amassed by observers since the program's inception.

In the 1994 fishery a total of 41 observers were placed on catcher-processor and floater-processor vessels (Ward et al. 1995). By the conclusion of the season on March 15, nearly 1.7 million male and female *C. opilio* had been examined by observers for biological/legal descriptive characteristics.

Samples of retained crabs taken from catcher-processors, floater-processors, and shoreside locations revealed an average carapace width of 110.4 millimeters (mm) (Table 1). More than 173,000 crabs were examined throughout the course of the season; the majority of measurements were collected by observers onboard catcher-processors. The overall size distribution of retained *C. opilio* has varied slightly over the past seasons; nearly 40 percent of all crabs examined since 1991 have ranged between 106mm and 115mm CW (Table 2). The mean carapace width of harvested crabs has also remained relatively constant during the same period, varying by less than 2mm between seasons.

The carapace width distribution of all male *C. opilio* measured by observers showed an apparent increase in numbers of recruit-sized crabs in comparison to the previous three year's data (Figure 1). The mean size of all observed *C. opilio* males decreased 3mm from the prior season as well, from 108mm to 105mm CW. Juvenile crabs below 65 mm CW are not commonly documented in fished pots, which may account in part for the somewhat static annual nature of these data.

Observations of female *C. opilio* were also relatively rare in pots sampled during the 1994 fishery. From a total of more than 2,400 pots examined for contents, less than 1,300 females were enumerated and measured. Histograms depicting the size distribution of *C. opilio* females measured over several seasons reveal a progressive predominance of large, mature, and old shelled crabs (Figure 2). Since the 1991 fishery, the mean CW of captured females has not fallen below 65mm. The occurrence of females observed in sampled pots during the 1994 season was comparable to data summarized in 1992 and 1993, although, in terms of average catches per pot, the abundance of female *C. opilio* has decreased by greater than 90 percent over the past four years.

Retention of illegal crabs appeared insignificant during the 1994 season. Random tallies of 600 crabs harvested daily by catcher-processors, combined with legal measurements collected from catches delivered to floating-processors, produced a total sample of more than 850,000 retained animals examined for legal size, sex and species (Table 3). Approximately .5 percent of the sample was comprised of unlawfully retained catch, most of which were pre-recruit sized *C. bairdi* males. Data summarized from the 1993 fishery also revealed a comparably low percentage of illegal catch (Tracy, 1995).

Legal *C. opilio* males dominated the catches in sampled pots at an average of 241 individuals (Table 4). Catches of incidental species were minor compared to the abundance of legal crabs. Sub-legal sized *C. bairdi* constituted the largest proportion of bycatch crabs, and an estimated 6,400,000 were captured and released over the course of the season (Table 4). Other commercially valuable species observed included small numbers of blue king crab, pacific cod and halibut. A comparison of pot sampling conducted over several seasons indicates the occurrence and composition of incidental catch in the *C. opilio* fishery has remained consistent with the exception of an increased abundance in numbers of non-retained legal sized *C. opilio* males during the 1994 season (Figure 3).

Shell age classifications of male *C. opilio* remained consistent with findings from prior seasons (Table 5). Ninety percent of all males examined were classified as new shell; the balance consisting almost exclusively of old shelled crabs. Very old shelled crabs (those failing to molt for two or more consecutive growth cycles) have been nearly absent from samples.

Comparison of female *C. opilio* shell condition assessment to data collected in previous seasons seems to represent a progressive pattern of decreasing numbers of new shelled (pre-pubescent) crabs (Table 5). In the 1991 fishery, approximately 30 percent of all females observed were characterized as new shells; during the 1994 season the numbers of new shelled crabs constituted less than 5 percent of the total sample. These findings seem to indicate a continued reduction in the abundance of immature females in the areas commercially fished.

At the time of the 1994 fishery, 64 percent of the *C. opilio* females inspected for signs of mating activity possessed clutches of eyed eggs (Table 6). A very small percentage (4.8) carried uneyed eggs. All other females were devoid of eggs, and greater than 20 percent were described as non-mated. Summarized results of female *C. opilio* reproductive condition assessments during the last several seasons are given in Table 6.

Bering Sea C. bairdi (Tanner Crab)

Data compiled from the 1991 and 1992 Bering Sea *C. bairdi* fishery is presented in this report using two chronological parameters. Pot composition statistics have been limited to statistics obtained prior the onset of the *C. opilio* season, due to the overlap in directed harvest of both species in each of the respective years. Since most vessels retained both *C. bairdi* and *C. opilio* during concurrent seasons, it was difficult to identify pot content samples collected while a vessel exclusively directed effort on *C. bairdi*. *C. bairdi* size distributions, shell age and reproductive condition assessments, have been summarized from data collected throughout the course of both fisheries.

Also, BOF amendments to shellfish regulations in 1993 resulted in the *C. bairdi* fishery opening on November 1, concurrent with the Bristol Bay red king crab season. Ten days following the Bristol Bay fishery closure on November 10 (Morrison et al. 1995), the *C. bairdi* season reopened. Because no directed Tanner effort was documented by observers onboard catcher-processors during the period in which both species were legally retained, catch composition information only includes data collected between the subsequent *C. bairdi* opening and the ultimate conclusion of the season.

In 1994, the Bristol Bay fishery remained closed due to a low estimated abundance of female red king crabs. However, the *C. bairdi* fishery opened as scheduled by regulation on November 1 (Morrison et al. 1995), and all observer data collected during the season has been included.

More than 27,000 retained *C. bairdi* measurements were obtained from a combination of observer sampling effort on catcher-processors and ADF&G personnel stationed at shoreside locations. Floating-processors did not participate in the 1994 fishery. Combined measurements from both sample locations produced an average width of 150 mm (Table 7). The annual size distribution of *C. bairdi* harvested over the previous seasons has remained virtually unchanged with approximately 50 to 70 percent of measured crabs ranging between 141mm and 155mm CW (Table 8).

Carapace width measurements of *C. bairdi* males (retained and released crabs) derived from pot sampling revealed a mean size of 136mm (Figure 4). Data results seem to indicate limited recruitment into the stock, which correlates to size distribution histograms depicting the previous years' data (Figure 4). In 1994 shellfish observers collected slightly less than 6,000 size frequencies from *C. bairdi* males, in comparison to sample sizes of 30,000 to 40,000 crabs in 1991, 1992 and 1993.

The size distribution of *C. bairdi* females observed in sampled pots was also consistent with data summarized from the 1991, 1992 and 1993 seasons. Histograms from each respective year are provided in Figure 5. The average sized crab measured in 1994 was 4 percent smaller than the previous year and appeared to be the result of a slight increase in the numbers of crabs in the 62mm to 72mm CW range.

Less than one percent of the 68,000 retained *C. bairdi* examined during Legal Tally sampling were documented as illegal harvest (Table 9). Undersized *C. bairdi* males comprised almost 100 percent of unlawfully retained crabs. As mentioned previously, floating-processors did not participate in the 1994 fishery. Consequently, all crabs were tallied by observers onboard catcher-processors. The cumulative number of crabs inspected represented approximately 27 percent of the catcher-processor harvest.

A total of 415 pot samples were collected during the 1994 season. Undersized *C. bairdi* males were the most prevalent documented catch, averaging nearly 24 individuals per pot (Table 10). Extrapolation of these data indicates an estimated 6,000,000 sub-legal crabs were caught and released throughout the season. The average catch of legal sized males was slightly greater than 15 per pot. Observations of red and blue king crabs were infrequent; thirty-one individuals of mixed size and sex were documented in the 415 pot sample.

Outcomes of pot sampling during the 1994 season appear to represent a reduction in the overall abundance of male *C. bairdi* in the areas commercially fished. Between 1992 and 1994, the average catch of legal males declined by 50 percent; the prevalence of undersized males decreased by 45 percent in the same period (Figure 6). Prior to regulatory changes in 1992 affecting geographic areas open to commercial harvest and allowable gear types in the *C. bairdi* fishery, the incidental capture of red king crabs averaged between 8 and 9 animals per pot. Summarized data from the 1994 season indicated that the mean frequency of king crabs caught in directed *C. bairdi* pots had dropped to well below 1 crab. Significant bycatch of other species are listed in Table 10.

Shell age classification of *C. bairdi* males indicated little change in composition as compared to sampling results from previous years. Eighty-five percent of a 5,791 crab sample were described as new shelled, which corresponds closely to data collected in 1991, 1992 and 1993 (Table 11). Old shelled *C. bairdi* females comprised the majority of crabs observed in sampled pots. Summaries of shellfish observer data from the last four seasons reveal an increasing number of mature (old shelled) crabs in the samples. In 1991, 1 out of every 5 females captured were characterized as old shelled; in the 1994 season, this ratio was reduced to 9 of 10 crabs examined.

Gravid *C. bairdi* females have typically comprised the majority of those examined for reproductive condition during the last several seasons. In 1994, nearly 96 percent of the females surveyed possessed egg clutches (Table 12). Females carrying uneyed eggs outnumbered those carrying eyed eggs by a ratio of nearly 4 to 1. The vast majority of clutches examined during the 1991 and 1992 seasons contained uneyed eggs. The disparity between respective years may be attributable to the shift in timing and duration of the fishery in 1993 and the additional reduction in geographic area open to commercial fishing effort. The small numbers of barren females observed in 1994 (just over 4 percent of the total sample) were essentially divided evenly between previously mated individuals and those exhibiting no signs of annual reproductive activity.

St. Matthew District Blue King Crab

A total of 94 vessels participated in the 1994 St. Matthew district fishery (Morrison et al. 1995). At the conclusion of the season on September 21, shellfish observers had been deployed on 6 catcher-processors and 6 floater-processors (Ward et al. 1995).

A sample of slightly over 11,000 blue king crabs (measured at all processing locations) revealed an average carapace length of 133mm (Table 13). Sixty-five percent of sampled crabs ranged between 126mm and 140mm CL. The cumulative size distribution of harvested males has remained virtually constant since 1991 (Table 14). Accordingly, the mean size of sampled crabs during this period has fluctuated by less than 2mm CL.

A histogram representing approximately 6,000 legal and sub-legal male blue king crab measurements derived from observer pot sample data (depicted in Figure 7), appears to represent recruitment into the stock in 1994. A reduction in the average carapace length by 5mm, in comparison to data collected in the 1993 season, also indicates a slight shift in the overall age composition of males.

Blue king crab females constituted the largest incidental catch in the 1994 St. Matthew fishery. A mean carapace length of 88mm was generated from measurements of more than 5,000 crabs observed in Bycatch samples. The size dispersion of captured females ranged between 50mm and 122mm CL. Histograms of blue king crab female size and shell age composition from the 1991, 1992, 1993, and 1994 seasons are provided in Figure 8 for comparative purposes.

Ten percent of the 1994 blue king crab harvest (totaling 57,719 crabs) processed at-sea was monitored for illegally retained catch (Table 15). Prohibited animals documented during Legal Tally sampling primarily consisted of undersized males. Comparison of data derived from catcher-processor and floating-processor locations were similar, with unlawfully retained crabs comprising less than 1 percent of the aggregate sample. Application of this percentage to the entire at-sea processor catch in 1994 indicates that a total of approximately 5,000 undersized male, and female crabs were harvested.

Over the past four seasons, summaries of observer pot content sampling have shown that non-target animals caught and released in the St. Matthew fishery have been largely limited to undersized blue king males and females (Figure 9). The average catch per pot of female blue king crabs has fluctuated between a low of 8.4 crabs in 1990, to as many as 60.4 crabs in 1992. An average of 37 females per pot were observed in the 1994 season. Catches of undersized male blue king crabs were also significant in numbers totaling 5,183 crabs recorded in 203 sampled pots (Table 16). An interesting consideration in reviewing these data is pot soak times in the St. Matthew fishery rarely exceed 24 hours. Other incidental species documented consisted primarily of small numbers of pacific cod and yellowfin sole.

The shell age composition of male and female blue king crabs during the commercial harvest period have been well documented in observer data sets over the past four years (Table 17). In respective seasons, nearly 90% of all males examined have been categorized as new shells; the remainder almost exclusively being described as single year skip molts (old shell). Shell age classification of blue king females has varied to a somewhat greater degree over the same

interval, but numbers of those recorded as new shelled have repeatedly comprised 60 to 80 percent of the total sample (Table 17).

Several years of summarized pot sample results have consistently shown ovigerous female blue king crabs are nearly absent from the geographic area targeted in the St. Matthew fishery (Table 18). Two gravid female crabs, both carrying clutches of uneyed eggs, were documented in data collected during the 1994 season. Two of every 3 barren females examined by onboard observers exhibited evidence of prior mating activity, and comprised 67 percent of the aggregate sample.

Pribilof District Red King Crab

Catcher-processor vessels did not participate in the 1994 Pribilof district red king crab fishery (Morrison et al. 1995). Total observer deployments during the season were limited to several floater-processors (Ward et al. 1995). Consequently, discussion of relevant data is confined to size distribution and shell age statistics of retained crabs (mostly collected by ADF&G personnel), and the results of Legal Tally sampling.

Shell age assessments of retained red king males were characterized by large numbers of new shell crabs; males described as old shelled constituted less than 25 percent of the sample (Table 19). The corresponding sample of retained males averaged 162mm CL, which represented a 5 percent size increase compared to results of similar data collected in the 1993 season (Table 20). Ninety-nine percent of crabs measured in 1994 ranged between 131mm and 185mm CL, although less than 17 percent of the total sample could be classified as recruits.

Legal Tally samples collected in the Pribilof district fishery revealed a high incidence of illegally harvested crabs. Five and one-half percent of the 7,500 crabs (representing 12 percent of the total catch delivered to at-sea processors) inspected by shellfish observers were unlawfully retained (Table 21). It should be noted, however, that the majority of prohibited animals consisted of *C. bairdi* males. The unusually high occurrence of non-target species in the harvest may warrant further investigation of data sources.

Bristol Bay Area Red King Crab

In accordance with federal fisheries regulations, the Bristol Bay fishery remained closed in 1994 due to a critically low estimated abundance of female red king crabs. Published summaries of shellfish observer data collected in this fishery prior to 1994 are available from the Alaska Department of Fish and Game.

Adak Area Brown King Crab

Shellfish observers onboard catcher-processors in the Adak fishery have traditionally been the primary means for ADF&G to collect descriptive biological information on brown king crab stocks inhabiting the Western Aleutians. Data compiled from this fishery encompasses a 9

month regulatory period beginning on November 1 and concluding on August 15 the following year. At the conclusion of the 1994 season, 4 observers had completed trips on one catcher-processor and a single floater-processor (Ward et al. 1995).

The combination of data gathered by ADF&G personnel at shoreside facilities and measurements of retained males collected by observers on the at-sea processors produced an aggregate sample of approximately 20,500 crabs, and a mean CL of 148mm (Table 22). Over the last several seasons, a constant size distribution of harvested crabs has ranged between 126mm and 175mm (Table 23).

Juvenile crabs as small as 60mm CL routinely occurred as bycatch in sampled pots; mature crabs exceeding 180mm CL were also documented. The mean size of all males (128mm) was identical to the average calculated from observer data collected in the 1991, 1992 and 1993 season (Figure 10). The size dispersion of 31,000 female brown king crabs measured during the same four year period appeared to represent potential recruitment into the population, although the mean carapace length has fluctuated moderately between 120 mm and 122 mm (Figure 11).

Numbers of unlawfully retained crabs consisted entirely of brown king females and undersized males. Legal and prohibited crabs tallied in samples amounted to 15 percent of the total catch processed at-sea. Approximately 1 illegal animal was discovered for every 124 crabs examined (Table 24).

The species composition of pots sampled annually in the Adak fishery include a wide variety of invertebrate and fish species. Nevertheless, male and female brown king crabs constitute the predominant incidental catch. In 1994, the mean catch of 6.7 legal males per pot was considerably less than the overall average number of legal crabs landed in the prior three seasons (Figure 12). Catches of female and undersized male brown king crabs respectively averaged 11.2 and 11.7 animals per pot in 1994. An estimated 5 million of these crabs were captured and released by the conclusion of the season on August 15 (Table 25).

Classification of male and female brown king crab shell condition produced virtually identical results between sexes, and compared favorably with the prior several year's data. In 1994 more than 97 percent of male crabs examined were characterized as new shelled; ninety-nine percent of the females inspected were also similarly described (Table 26). Observers have annually reported the periodic occurrence of large brown king males described as having discolored, highly abraded shells with a soft, "leathery" texture. These crabs comprise an insignificant portion of shell age samples.

Ovigerous crabs accounted for 46 percent of the 3,461 brown king females assessed for signs of reproductive activity (Table 27). No evidence of prior mating was observed in approximately 1 of every 3 crabs described as barren.

Adak Area Red King Crab

Descriptive biological characteristics of red king crabs landed in the Adak fishery has historically been collected by observers deployed onboard catcher processors that alternately target brown

king crabs. As a partial result, available information is derived from data sets that are relatively small in comparison to those collected in other fisheries. Because of the difficulty in separating pots directed at red king crabs from those targeting brown king crabs, discussion of species composition has been eliminated in reference to pot samples collected antecedent to 1993.

In the 1994 season, shellfish observers were deployed on 3 catcher-processors and 1 floater-processor (Ward et al. 1995). Poor landings of legal sized red king crab males prompted an emergency closure of the fishery following 3 weeks of commercial effort (Morrison et al. 1995). Summarized catch statistics collected by observers appeared to corroborate this evidence of depressed stocks in the area.

Retained red king crab males averaged 157mm CL (Table 28). The sample size consisted of slightly over 1,000 individuals harvested by catcher-processors or delivered to shoreside processing locations. Seventy-five percent of these crabs were identified as having new shells. Landed males surveyed in 1994 predominately fit into a size distribution of 146mm to 165 mm CL; while in the 1993 season, the majority ranged between 151mm and 170mm CL (Table 29).

The median size (156mm CL) of males observed in pot content samples, and representative of both harvested and discarded crabs, signified a probable lack of recruitment into the stock prior to the 1994 fishery. Length frequency histograms of similar data collected previously also yielded evidence of recent recruitment failure (Figure 13). However, it should be noted that variables potentially affecting sampling results, including the total numbers and geographic domicile of landed crabs, were discounted during data summary.

An aggregate of 88 female red king crabs examined by observers in 1994 revealed a mean size of 122mm CL (Figure 14). The overall length disbursement of females ranged between 80mm and 140mm CL, although just 7 crabs measured less than 120mm CL.

A significant proportion of the 1994 red king crab harvest (13.6 percent) processed at-sea was monitored for illegally retained animals (Table 30). An average of 1 undersized male was detected in every 340 crabs tallied.

A total of 140 pots targeting red king crabs were examined for contents. Summarized catch statistics indicated a reduced abundance of legal crabs in comparison to the data collected in 1993; numbers of harvestable males averaged 21.2 and 3.2 per pot during respective years (Figure 15). Thirty-nine sub-legal males and 88 females were documented in sampled pots, and extrapolation of the data indicated approximately 12,000 crabs were caught and released by the fishing fleet during the 3 week season (Table 31).

Most of the 571 male and female red king crabs assessed for molting condition in 1994 were characterized as new shelled. Old shell males comprised 25 percent of sampled crabs; less than 1 percent of females examined were categorized similarly (Table 32).

Fifty-four of the 88 females observed in sampled pots were bearing clutches of uneyed eggs, and another 26 carried eyed eggs (Table 33). Barren crabs comprised 9 percent of the total sample, the slight majority of which exhibited no sign of prior mating activity.

Dutch Harbor Area Brown King Crab

The absence of catcher-processor participation in the Dutch Harbor fishery in 1993 and 1994 has significantly curtailed the amount of obtainable biological information pertaining to brown king crabs inhabiting the areas commercially fished. A small number of retained male brown king crab measurements were collected during the 1994 season by two observers deployed on a single floater-processor (Ward et al. 1995), and by ADF&G personnel sampling catches delivered to shoreside facilities.

A total of 1,681 retained males measured at both processing locations revealed an average size of 147.6mm CL, and new shell crabs constituted 99 percent of the sample (Table 34). The size distributions of landed crabs over the last 4 year interval has remained virtually constant with approximately 75 percent ranging between 136mm and 155mm CL (Table 35). Accordingly, the median size has fluctuated by less than 2mm.

Nearly 2 percent of crabs tallied by observers monitoring the single at-sea processor were illegally harvested (Table 36). Seventy-three under sized males and 7 female brown king crabs were recorded in samples collected from a total of 6 catcher vessel deliveries.

Bering Sea Korean Hair Crab

Prior to the onset of the 1992 Bering Sea fishery, the general lack of established life history and other biological knowledge of the hair crab species, and concerns over possible excessive reeling crab and *C. bairdi* bycatch, prompted ADF&G to include observer coverage as a permit requirement for all applicants. In 1994, 11 shellfish observers were deployed on catcher vessel (Ward et al. 1995). Catcher-processor and floater-processor vessels did not participate in the fishery.

A combined total of nearly 6,500 carapace length measurements from retained hair crabs were taken over the season by observers and ADF&G personnel. A correlation between the data from both sampling sources (shown in Table 37) suggests that resulting statistics are representative of the harvest. Crabs landed in the 1992 and 1993 seasons were somewhat smaller than those surveyed in 1994; mean sizes ranged from 83mm to 91mm CL between the respective seasons (Table 38).

The length dispersion of more than 4,000 measured male hair crabs observed in pot samples showed little variation from the size distribution of the retained catch. Landed crabs in these data averaged 88mm CL; a 10 percent increase over the median calculated from 1993 sampling results (Figure 16). Male crabs larger than 110mm CL have been absent in data collected during the past 3 seasons.

Less than 100 female hair crabs were measured during the 1994 fishery. Carapace length distribution varied between 30mm and 100mm, although size frequencies predominately range within a 61mm to 75mm interval (Figure 17). Females averaged 66mm CL in 1994; a 3mm increase over the median sized crab observed in 1993.

Results of observer Legal Tally sampling on catcher vessels indicated a relatively small number of undersized male hair crabs were harvested. Just under 51,000 crabs were inspected, which amounted to nearly 6 percent of total processed catch in 1994 (Table 39). Prohibited animals comprised less than 1 percent of the crabs sampled; the majority of which were *C. bairdi* males and females.

Vessels targeting hair crabs typically deploy large numbers of pots on a daily basis. In order to obtain representative catch composition statistics from the 1994 fishery, individual observers were directed to examine a minimum of 20 pots for contents within each 24 hour interval of fishing activity onboard their respective vessels. The resulting archive of more than 8,300 Bycatch samples amounted to 3 percent of the total number of pots pulled during the season.

Summary of the data indicated that legal hair crabs were landed more frequently (at 3.2 per pot) than undersized males, and females (Table 40). Other species observed included approximately 6,500 male and female *C. bairdi*, as well as nearly 5,000 red and blue king crabs of mixed sizes and sexes. Comparisons of average pot catches between the 1992, 1993 and 1994 seasons displayed evidence of progressive declines in legal hair crab abundance (Figure 18). A concurrent decrease in the catches of females and undersized males was also apparent.

In contrast to the 1993 fishery, in which approximately 5% of the hair crab males assessed for shell age had recently molted, data results from the 1994 season indicated that soft shelled crabs were virtually absent in the sampled catch (Table 41). Variance between respective years was likely due to the fact that the 1994 fishery concluded in late December, whereas in 1993, the area was closed by emergency order on April 15 (Morrison et al. 1995). Soft shelled female hair crabs were not observed in 1994, although close to 95 percent of those examined were characterized as having molted in the preceding year (Table 41).

A small number of landed female hair crabs were ovigerous at the time of the fishery. Of those examined, 1 of 7 carried clutches of eyed eggs. Females described as non-mated comprised 80 percent of the total sample (Table 42).

Bering Sea C. tanneri

Over the last two years, significant commercial interest in marketing *C. tanneri* (commonly referred to as "Deep Sea Tanner Crab") has resulted in directed fishing effort in the Bering Sea, Aleutian Island, Alaska Peninsula and Kodiak areas. Little is known with regard to the life history and population dynamics of these previously unexploited stocks. In order to establish a baseline archive of biological descriptive characteristics, and initiate research activities aimed at enhancing fisheries management, ADF&G mandated observer coverage on all vessels targeting *C. tanneri* in Alaskan waters prior to the 1994 fisheries.

The commercial harvest of *C. tanneri* in the Bering Sea has primarily occurred between the months of May and August (Morrison et al. 1995). In 1994, shellfish observers were deployed on 4 catcher vessels during this period (Ward et al. 1995).

The biological carapace width of 1,361 retained males measured by observers and ADF&G personnel at shoreside processing locations averaged 142.6mm (Table 43). The total sample was comprised of crabs ranging approximately between 121mm and 170mm CW; sizes dispersed in 5mm intervals revealed the highest frequency at 146 - 150mm CW (Table 44).

The size distribution of male *C. tanneri* observed in sampled pots also extended over a broad range, between 70mm and 180mm CW (Figure 19). At 136mm, the mean width of all landed males was considerably less than that of harvested crabs. Female *C. tanneri* width frequencies were moderately dispersed in comparison to male crabs; only varying between 75mm and 125mm (Figure 20). Accordingly, the 4,451 females measured during the fishery averaged 102mm CW.

A small number of unlawfully retained crabs were documented in observer Legal tally sampling. Two and one-half percent of the fishery harvest was monitored, in which a total of 3 female and 19 undersized male *C. tanneri* were observed (Table 45).

In addition to landings of *C. tanneri*, several other species of commercially significant crabs appeared in sampled pots. These included small numbers of *C. angulatus*, *Lithodes couesi*, and brown king crabs (Table 46). Still, legal size *C. tanneri* constituted the predominant catch, averaging 10.5 crabs per pot. Comparison of these data to other areas fished in 1994 (discussed in subsequent sections), indicates that the abundance of legal males in the Bering Sea fishery was moderate (Figure 21).

Shell age assessments of *C. tanneri* proved difficult for observers, mostly due to little evidence of integument abrasion and decay, commonly observed in other crab species. A small proportion of sampled males were ultimately identified as soft shelled, and of the remainder, slightly less than 90 percent were judged to have completed a molt cycle within the preceding 12 months (Table 47).

Assessing the shell condition of females was also somewhat troublesome for observers, although 98 percent of the 3,899 crabs inspected were characterized as old shell (Table 47).

Nearly 95 percent of the female *C. tanneri* landed in sampled pots were gravid; and most clutches were comprised of uneyed eggs (Table 48). Of the 251 barren females observed, 192 exhibited no evidence of prior reproduction.

Dutch Harbor Area C. tanneri

In the 1994 Dutch Harbor registration area fishery, vessel effort targeted on *C. tanneri* continued at varying levels from March through late December (Morrison et al. 1995). By the conclusion of the season, 9 observers completed deployments on 4 separate catcher vessels (Ward et al. 1995). Processing vessels did not participate in the 1994 season.

Legal sized males landed in the Dutch Harbor fishery appeared to be relatively similar in size to those harvested in the Bering Sea, averaging 139mm CW (Table 44). A total of 5,456

retained crab measurements were recorded by observers and ADF&G personnel sampling shoreside catch deliveries (Table 49).

The combined size disbursement of both retained and discarded *C. tanneri* males ranged between 90mm and 175mm CW. The grouping of width frequencies in a 5mm interval histogram (depicted in Figure 19), revealed a notable number of crabs measuring less than 135mm. The overall average size calculated from these data equaled 133mm CW.

The carapace width distribution of *C. tanneri* females observed compared favorably with size frequencies of female crabs collected in the Bering Sea fishery (Figure 20). Median sizes also showed close association, at 99mm and 101mm CW respectively.

Summarized Legal Tally data indicated that illegal crabs comprised less than 1 percent of the 1994 harvest (Table 50). A total of 107 undersized males, and 3 females were detected during sampling conducted on approximately 23 occasions (amounting to 13,672 inspected crabs) over the season.

A total of 1,310 pots were sampled for contents. Legal *C. tanneri* males dominated catches, averaging 9.4 landed per pot (Table 51). Generally, 1 female or undersized male was captured and released per legal crab harvested. A comparison of mean pot sample catches from all 1994 *C. tanneri* fisheries, provided in Figure 21, indicated that legal males were least abundant in the Dutch Harbor area.

Shell age assessments of male *C. tanneri* were similar to those of the Bering Sea fishery; new shelled crabs comprised 93 percent of the sample (Table 47). One hundred percent of *C. tanneri* females examined in the Dutch Harbor area were characterized as old shell. Soft shelled male and female crabs were not observed during the season.

Nearly all inspected female *C. tanneri* carried eggs; the majority of which were uneyed (Table 48). Of the 26 females identified as barren, 9 displayed evidence of prior mating.

Alaska Peninsula Area C. tanneri

The 1994 Alaska Peninsula fishery was characterized by modest effort. Participating vessels consisted of 2 catcher-processors actively targeting *C. tanneri* during respective 2 week periods in July and August (Morrison et al. 1995). Consequently, the volume of observer data collected from this area was small in comparison to the other fisheries.

A total of 2,700 retained *C. tanneri* CW measurements were obtained by observers, and summary of these data produced an average width of 130mm (Table 52). Crabs harvested from the Alaska Peninsula area were generally smaller in size than those landed in other *C. tanneri* fisheries, with more than 26 percent of sampled males measuring less than 126mm CW (Table 52).

Male *C. tanneri* observed in sampled pots were also noticeably smaller (averaging 124mm CW) than those landed in the Bering Sea and Dutch Harbor fisheries. Comparative illustrations of these data are given in Figure 19.

The general size distribution of female *C. tanneri* ranged between 75mm and 125mm CW, although less than 275 crabs were sampled (Figure 20). Females landed in the Alaska Peninsula fishery were also smaller than females observed in the Bering Sea and Dutch Harbor areas, though less conspicuously than in comparison of male size frequencies.

Nearly 14 percent of harvested *C. tanneri* were surveyed during Legal Tally sampling. Retention rates of prohibited animals were minimal, at well below 1 percent of crabs landed; males accounted for 99 of the 103 illegal crabs detected (Table 53).

The composition of pot catches were dominated by *C. tanneri* males. An average of 54.3 legal crabs were landed in 196 sampled pots; undersized males averaged 26 per pot (Table 54). Other commercially significant species observed included small numbers of *Lithodes couesi*, brown king crabs and sable fish, although none were recorded in large quantities.

More than 90 percent of all male and female *C. tanneri* inspected during the season were categorized as new shelled (Table 47). Slightly less than 1 percent of the total sample was comprised of soft shelled male crabs.

All female *C. tanneri* assessed for reproductive condition during the fishery were ovigerous. In addition, all but one of the examined crabs carried clutches of eyed eggs (Table 48).

Kodiak Area C. tanneri

Interest in harvesting *C. tanneri* from the Kodiak area in 1994 was primarily exploratory in nature during the 1994 season. Total fishing effort consisted of one catcher-processor; the resulting observer deployment onboard this vessel lasted approximately 2 weeks (Ward et al. 1995).

Retained *C. tanneri* males averaged 135mm CW. A total of 1,806 crabs were measured, most of which were also characterized as new shelled (Table 55). Nearly 5,00 males observed in sample pots were also measured, ranging between 90mm and 165mm CW (Figure 19).

A small number of female *C. tanneri* measurements were also collected during the fishery, producing an average size of 103mm CW (Figure 20).

Thirty-seven percent of harvested *C. tanneri* were surveyed during Legal Tally sampling. The documented incidence of illegal animals equaled 45 undersized males and 5 females, or .5 percent of the total sample (Table 56).

Data results of 140 Bycatch samples revealed the following average catch rates: 34.7 legal males per pot; 12 undersized males per pot; and 21.7 *C. tanneri* females per pot (Table 57).

Incidental catches of *L. couesi*, brown king crabs, sable fish, and arrowtooth flounder were also documented.

Evaluation of more than 5,800 male and female *C. tanneri* for shell condition indicated most that at the time of the fishery, most crabs had molted within the previous year (Table 47). Small numbers of soft shelled male and female crabs were also observed in the sample.

Ninety-nine percent of sampled female *C. tanneri* carried egg clutches, the majority of which were uneyed (Table 48). Only 2 barren crabs were documented, and both showed evidence of previous mating activity.

CONCLUSION

The collection of management information and descriptive biological data by shellfish observers continues to be an important component of monitoring the short and long term dynamics of the Bering Sea/Aleutian Islands crab populations. Facts and figures pertinent to potential recruitment, incidental bycatch of other species, and fishing operations have been utilized extensively by research biologists and fishery managers in the period since the inception of the program.

Although the established sampling methodologies used by observers are largely based on the principles of inferential analysis, summarized data presented in this report are generalized statistics and should only be regarded within that context. Because of the considerable volume of information contained in the databases, a standard summary format was utilized for each fishery. There are countless variables such as pot soak times, gear types, fishing depths and locations, and the chronology of data collection that can affect the outcome of sampling, none of which were considered. The application of mathematical evaluation or multiple perspectives in examining the shellfish observer databases might lead to dissimilar results.

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Table 1. Retained *C. opilio* carapace width frequency statistics by processor type from the 1994 Bering Sea season.

Sample Type	Sample Size	Avg. Width	Shell Age Percentages			
			Soft	New	Old	Very Old
Catcher processor	86,912	110.0mm	-	94.9	4.7	0.3
Floater processor	70,682	110.6mm	-	91.4	8.1	0.6
Shoreside processor	15,373	110.6mm	-	90.7	9.0	0.2
Totals	173,078	110.4mm	-	93.1	6.5	0.4

Table 2. Bering Sea retained *C. opilio* carapace width distributions from the 1991, 1992, 1993, and fishery.

Width (mm)	1991		1992		1993		1994	
	Num. crab	Percent						
086-090	146	.4	860	.5	752	.3	1,590	.9
091-095	784	1.9	2,095	1.7	1,194	.8	4,333	2.5
096-100	3,179	7.9	8,895	5.3	5,196	2.1	13,435	7.8
101-105	7,619	18.9	21,925	13.0	14,474	5.8	29,095	16.8
106-110	9,895	24.5	33,285	19.8	33,958	13.6	37,902	21.9
111-115	8,761	21.5	37,814	22.5	51,358	20.5	37,157	21.5
116-120	5,928	14.7	31,869	18.9	59,911	23.9	27,721	16.0
121-125	3,028	7.5	19,315	11.5	47,999	19.2	14,512	8.4
126-130	904	2.2	8,131	4.8	24,657	9.8	5,127	3.0
131-135	148	.4	2,343	1.4	7,952	3.2	1,080	.6
Totals	40,302	99.9	167,342	99.4	247,451	99.2	171,952	99.4
	Avg. width = 111.0mm		Avg. width = 112.2mm		Avg. width = 111.6mm		Avg. width = 110.4mm	

Table 3. Illegally retained crabs observed during the 1994 Bering Sea *C. opilio* fishery.

Sample Location	Sample Size	Males		Females		Other ^a Crabs	Cum. Percent Illegal	Num. Crabs ^b Harvested	Est. Num. ^c Illegal	Percent Harvest Sampled
		Num.	Percent	Num.	Percent					
Catcher Processor	459,766	629	.1	71	<.1	2,451	.5	16,393,370	81,967	2.8
Floater Processor	408,939	343	<.1	117	<.1	1,482	.4	62,962,810	251,851	.6
Totals	868,705	972	.1	188	<.1	3,993	.5	79,356,180	396,781	1.1

^a Other illegal crabs primarily consist of male *C. bairdi*.

^b Morrison et al. 1994.

^c Estimates derived from percentage of illegal crabs multiplied by number of crabs harvested during the fishery.

Table 4. Catch per pot of selected species during the 1994 Bering Sea *C. opilio* fishery.

Species	Total Pot ^a Sample Catch	Avg. Catch Per Pot	Estimated Total ^b Catch
<u><i>C. opilio</i></u>			
legal male	596,995	240.8	172,539,000
sub-legal male	16,000	6.5	4,657,400
female	3,991	1.6	1,146,400
<u><i>C. bairdi</i></u>			
legal male	1,450	.6	429,900
sub-legal male	22,222	9.0	6,448,700
female	8,006	3.2	2,292,900
<u>hybrid Tanner crab</u>			
legal male	2,850	1.1	788,200
sub-legal male	479	.2	143,300
female	116	<.1	33,500
<u>blue king crab</u>			
legal male	6	<.1	1,700
sub-legal male	38	<.1	11,000
female	4	<.1	1,200
<u>pacific cod</u>	2,728 ^c	1.1	788,200
<u>halibut</u>	268	.1	71,700

^a Total pot contents derived from 2,479 random samples conducted on catcher processors during the fishery.

^b Estimated catch derived from pot sample CPUE multiplied by 716,524 total reported pot pulls (Morrison et al. 1994) during the fishery.

^c All fish species mixed size and sex.

Table 5. Shell age distributions of *C. opilio* males and females observed in the 1991, 1992, 1993, and 1994 Bering Sea fishery.

Fishery Year	Sample Size ^a	Shell Age Classes					
		New	% Total	Old	% Total	Very old	% Total
<u>1991</u>							
Males	116,430	106,107	91.1	8,845	7.6	1,478	1.3
Females	8,565	2,739	32.0	4,981	58.2	845	9.8
<u>1992</u>							
Males	121,432	115,095	94.8	5,613	4.6	724	.6
Females	1,367	231	16.9	873	63.9	263	19.2
<u>1993</u>							
Males	135,989	121,809	89.6	13,227	9.7	953	.7
Females	1,919	199	10.4	1,123	58.5	597	31.1
<u>1994</u>							
Males	166,993	156,555	93.7	9,492	5.7	946	.6
Females	1,273	62	4.9	929	72.9	282	22.2

^a Derived from random pot samples collected on catcher processors during the fisheries.

Table 6. Reproductive state of female *C. opilio* observed in the 1991, 1992, 1993 and 1994 Bering Sea fishery.

Year	Eyed Eggs	Percent Total	Uneyed Eggs	Percent Total	Mated/barren	Percent Total	Non-mated	Percent Total
<u>1991</u>	687	8.1	6,119	72.4	806	9.5	837	9.9
<u>1992</u>	827	64.0	150	11.6	215	16.8	100	7.7
<u>1993</u>	979	51.0	172	9.0	455	23.7	312	16.3
<u>1994</u>	800	64.1	60	4.8	116	9.3	273	21.9
Totals	3,293	25.5	6,501	50.4	1,592	12.3	1,522	11.8

Table 7. Retained *C. bairdi* carapace width frequency statistics by processor type from the 1994 Bering Sea season.

Sample Type	Sample Size	Avg. Width	Shell Age Percentages			
			Soft	New	Old	Very Old
Catcher processor	13,046	150.6mm	-	89.1	9.9	0.9
Floater processor	0	-	-	-	-	-
Shoreside processor	14,612	149.3mm	-	95.5	4.5	-
Totals	27,658	150.0mm	-	92.5	7.0	0.5

Table 8. Bering Sea retained *C. bairdi* carapace width distributions from the 1991, 1992, 1993, and 1994 fishery.

Width (mm)	1991		1992		1993		1994	
	Num. crab	Percent						
131-135	723	.6	577	.5	306	.1	115	.4
136-140	13,281	10.6	16,787	13.5	7,270	.4	3,073	11.1
141-145	29,846	23.9	35,110	28.0	15,047	10.2	6,173	22.3
146-150	26,226	21.0	30,799	24.6	15,507	21.0	6,202	22.4
151-155	20,401	16.3	21,999	17.6	13,838	21.7	5,284	19.1
156-160	14,997	12.0	12,063	9.6	10,156	19.3	3,678	13.3
161-165	9,775	7.8	5,001	4.0	5,717	14.2	2,125	7.7
166-170	5,520	4.4	1,662	1.3	2,467	8.0	761	2.8
171-175	2,522	2.0	510	.4	1,010	3.4	185	.7
176-180	804	.6	166	.1	196	1.4	30	.1
Totals	124,095	99.2	124,774	99.6	71,622	99.7	27,514	99.5
	Avg. width = 150.4mm		Avg. width = 148.0mm		Avg. width = 150.7mm		Avg. width = 150.0mm	

Table 9. Illegally retained crabs observed during the 1994 Bering Sea *C. bairdi* fishery.

Sample Location	Sample Size	Males		Females		Other Crabs	Cum. Percent Illegal	Num. Crabs ^a Harvested	Est. Num. ^b Illegal	Percent Harvest Sampled
		Num.	Percent	Num.	Percent					
Catcher Processor	68,247	373	.5	9	<.1	1	.5	250,617	1,253	27.2
Floater Processor	0	-	-	-	-	-	-	-	-	-
Totals	68,247	373	.5	9	<.1	1	.5	250,617	1,253	27.2

^a Morrison et al. 1994.

^b Estimates derived from percentage of illegal crabs multiplied by number of crabs harvested during the fishery.

Table 10. Catch per pot of selected species during the 1994 Bering Sea *C. bairdi* fishery.

Species	Total Pot ^a Sample Catch	Catch Per Unit Effort	Estimated Total ^b Fishery Catch
<u><i>C. bairdi</i></u>			
legal male	6,349	15.2	3,793,000
sub-legal male	9,879	23.8	5,939,100
female	6,059	14.6	3,643,300
<u><i>C. opilio</i></u>			
legal male	88	.2	49,900
sub-legal male	27	<.1	16,200
female	0	-	-
<u>hybrid Tanner crab</u>			
mixed size/sex	106	.3	74,900
<u>red king crab</u>			
legal male	6	<.1	3,600
sub-legal male	24	<.1	14,400
female	1	<.1	600
<u>blue king crab</u>			
legal male	0	-	-
sub-legal male	0	-	-
female	0	-	-
<u>halibut</u>	16	<.1	9,600
<u>pacific cod</u> ^c	353	.9	224,600

^a Total pot contents derived from 415 random samples taken on catcher processors during the fishery.

^b Estimates are numbers of animals derived from pot sample CPUE x 249,543 total reported pot pulls (Morrison et al. 1994) during the fishery.

^c All fish species mixed size and sex.

Table 11. Shell age distributions of *C. bairdi* males and females observed in the 1991, 1992, 1993, and 1994 Bering Sea fishery.

Fishery Year	Sample Size ^a	Shell Age Classes					
		New	% Total	Old	% Total	Very old	% Total
<u>1991</u>							
Males	31,253	27,818	89.0	3,162	10.1	273	.9
Females	5,639	2,515	44.6	2,507	44.5	617	10.9
<u>1992</u>							
Males	36,943	30,991	83.8	5,411	14.6	491	1.3
Females	5,162	475	9.2	3,643	70.6	1,044	20.2
<u>1993</u>							
Males	40,385	30,991	83.8	5,411	14.6	491	1.3
Females	10,471	1,248	11.9	7,054	67.4	2,169	20.7
<u>1994</u>							
Males	5,791	4,948	85.4	777	13.4	66	1.1
Females	2,132	218	10.2	1,720	80.7	194	9.1

^a Derived from random pot samples collected on catcher processors during the fisheries.

Table 12. Reproductive state of female *C. bairdi* observed in the 1991, 1992, 1993, and 1994 Bering Sea fishery.

Year	Eyed eggs	Percent total	Uneyed eggs	Percent total	Mated/barren	Percent total	Non-mated	Percent total
<u>1991</u>	1,274	22.6	4,205	74.5	118	2.1	47	.8
<u>1992</u>	440	8.6	4,447	86.5	196	3.8	56	1.1
<u>1993</u>	7,596	72.5	2,395	22.9	197	1.9	286	2.7
<u>1994</u>	423	20.0	1,602	75.8	51	2.4	38	1.8
Totals	9,733	40.0	12,649	54.1	562	2.4	427	1.8

Table 13. Retained blue king crab carapace length frequency statistics by processor type for the 1994 St. Matthew district season.

Sample Type	Sample Size	Avg. Length	Shell Age Percentages			
			Soft	New	Old	Very Old
Catcher processor	3,387	131.3mm	-	97.8	2.2	-
Floater processor	6,895	134.3mm	-	80.0	19.5	.5
Shoreside processor	925	134.0mm	-	96.4	3.6	-
Totals	11,207	133.3mm	-	86.7	13.0	.3

Table 14. St. Matthew district retained blue king crab carapace length distributions from the 1991, 1992, 1993, and 1994 fishery.

Length (mm)	1991		1992		1993		1994	
	Num. crab	Percent						
111-115	13	.1	22	.2	13	.1	15	.1
116-120	387	2.7	429	3.0	201	1.7	315	2.8
121-125	1,663	11.5	2,112	14.9	1,193	9.9	1,445	12.9
126-130	2,749	19.0	3,120	22.0	2,168	18.1	2,505	22.4
131-135	3,571	24.6	3,247	22.8	2,666	22.2	2,735	24.4
136-140	3,111	21.5	2,683	18.9	2,478	20.6	2,209	19.7
141-145	1,740	12.0	1,576	11.1	1,842	15.4	1,228	10.9
146-150	860	5.9	746	5.3	976	8.1	533	4.8
151-155	310	2.1	202	1.4	333	2.8	147	1.3
156-160	72	.5	57	.4	74	.6	48	.4
Totals	14,476	99.9	14,194	100.0	11,994	99.4	11,180	99.7
	Avg. length = 134.1mm		Avg. length = 133.2mm		Avg. length = 135.4mm		Avg. length = 133.3mm	

Table 15. Illegally retained crabs observed during the 1994 St. Matthew district blue king crab fishery.

Sample Location	Sample Size	Males		Females		Other Crabs	Cum. Percent Illegal	Num. Crabs ^a Harvested	Est. Num. ^b Illegal	Percent Harvest Sampled
		Num.	Percent	Num.	Percent					
Catcher Processor	20,670	113	.5	27	.1	1	.7	77,271	540	27.0
Floater Processor	37,049	221	.6	75	.2	-	.8	520,190	4,162	7.1
Totals	57,719	334	.6	102	.2	1	.8	597,911	4,702	9.7

^a Morrison et al. 1994.

^b Estimates derived from percentage of illegal crabs multiplied by number of crabs harvested during the fishery.

Table 16. Catch per pot of selected species during the 1994 St. Matthew district blue king crab fishery.

Species	Total Pot ^a Sample Catch	Avg. Catch Per Pot	Estimated Total ^b Catch
<u>blue king crab</u>			
legal male	2,553	13.0	791,180
sub-legal male	5,183	26.0	1,582,360
female	7,551	37.0	2,251,820
<u>C. opilio</u>			
legal male	10	<.1	3,000
sub-legal male	1	<.1	300
female	0	-	-
<u>red king crab</u>			
legal male			
sub-legal male	0	-	-
female	0	-	-
<u>pacific cod</u> ^c	145	.7	42,600
<u>yellowfin sole</u>	268	1.3	79,120

^a Total pot contents derived from 203 random samples conducted on catcher processors during the fishery.

^b Estimated catch derived from pot sample CPUE multiplied by 60,860 total reported pot pulls (Morrison et al. 1994) during the fishery.

^c All fish species mixed size and sex.

Table 17. Shell age distributions of blue king crab males and females observed in the 1991, 1992, 1993, and 1994 St. Matthew district fishery.

Fishery Year	Sample Size ^a	Shell age classes					
		New	% Total	Old	% Total	Very old	% Total
<u>1991</u>							
Males	3,960	3,539	89.4	364	9.2	14	.4
Females	2,037	1,505	73.9	481	23.6	9	.4
<u>1992</u>							
Males	2,099	1,906	90.8	179	8.5	14	.7
Females	3,083	2,928	80.3	603	19.6	3	.1
<u>1993</u>							
Males	2,797	2,555	91.3	239	8.5	3	.1
Females	2,721	1,734	63.7	968	35.6	19	.7
<u>1994</u>							
Males	6,054	5,960	98.5	90	1.5	0	-
Females	5,107	4,285	83.9	818	16.0	4	.1

^a Derived from random pot samples collected on catcher processors during the fisheries.

Table 18. Reproductive state of female blue king crabs observed in the 1991, 1992, 1993 and 1994 St. Matthew district fishery.

Year	Eyed eggs	Percent Total	Uneyed Eggs	Percent Total	Mated/barren	Percent Total	Non-mated	Percent Total
<u>1991</u>	1	<.1	7	.3	821	38.9	1,281	60.7
<u>1992</u>	4	.1	6	.2	1,642	53.6	1,409	46.1
<u>1993</u>	0	-	0	-	1,957	71.9	763	28.1
<u>1994</u>	0	-	2	<.1	3,443	67.0	1,661	32.6
Totals	5	.1	15	.2	7,683	59.8	5,114	39.9

Table 19. Retained red king crab carapace length frequency statistics by processor type for the 1994 Pribilof district season.

Sample Type	Sample Size	Avg. Length	Shell Age Percentages			
			Soft	New	Old	Very Old
Catcher processor	0	-	-	-	-	-
Floater processor	270	159.6mm	-	71.9	26.6	1.5
Shoreside processor	2,641	162.1mm	-	87.8	11.8	0.4
Totals	2,911	161.8mm	-	86.3	13.2	0.5

Table 20. Pribilof district retained red king crab carapace length distributions from the 1993 and 1994 fishery.

Length (mm)	1993		1994	
	Num. crab	Percent	Num. crab	Percent
131 - 135	24	.4	28	1.0
136 - 140	242	3.6	83	2.8
141 - 145	713	10.5	143	4.9
146 - 150	1,336	19.7	264	9.1
151 - 155	1,548	22.7	362	12.4
156 - 160	1,365	20.1	408	14.0
161 - 165	899	13.2	416	14.3
166 - 170	427	6.3	484	16.6
171 - 175	158	2.3	360	12.4
176 - 180	60	.9	241	8.3
181 - 185	16	.2	92	3.2
Totals	6,788	99.9	2,881	99.0
	Avg. length = 154.4mm		Avg. length = 161.8mm	

Table 21. Illegally retained crabs observed during the 1994 Pribilof district red king crab fishery.

Sample Location	Sample Size	Males		Females		Other Crabs	Cum. Percent Illegal	Num. Crabs ^a Harvested	Est. Num. ^b Illegal	Percent Harvest Sampled
		Num.	Percent	Num.	Percent					
Catcher Processor	0	-	-	-	-	-	-	-	-	-
Floater Processor	7,527	13	.2	6	.1	397	5.5	60,509	3,328	12.4
Totals	7,527	13	.2	6	.1	397	5.5	60,509	3,328	12.4

^a Morrison et al. 1994.

^b Estimates derived from percentage of illegal crabs multiplied by number of crabs harvested during the fishery.

Table 22. Retained brown king crab carapace length frequency statistics by processor type for the 1994 Adak Area season.

Sample Type	Sample Size	Avg. Length	Shell Age Percentages			
			Soft	New	Old	Very Old
Catcher processor	12,917	147.3mm	.2	96.5	2.8	.5
Floater processor	4,551	150.6mm	-	92.1	7.4	.5
Shoreside processor	2,953	145.6mm	<.1	95.3	4.3	.3
Totals	20,421	147.8mm	.1	95.4	4.0	.4

Table 23. Adak Area retained brown king crab carapace length distributions from the 1991, 1992, 1993, and 1994 fishery.

Length (mm)	1991		1992		1993		1994	
	Num. crab	Percent						
126-130	65	.4	174	.3	146	.4	35	.2
131-135	1,626	9.3	3,571	6.2	2,069	5.4	793	3.9
136-140	4,740	27.1	11,185	19.4	7,836	20.3	3,456	16.9
141-145	4,409	25.2	13,102	22.7	9,346	24.2	5,006	24.5
146-150	2,958	16.9	11,436	19.8	7,717	20.0	4,471	21.9
151-155	1,728	9.9	8,121	14.1	5,201	13.5	3,048	14.9
156-160	1,017	5.8	4,677	8.1	3,054	7.9	1,691	8.3
161-165	556	3.2	2,712	4.7	1,655	4.3	1,038	5.1
166-170	261	1.5	1,443	2.5	856	2.2	539	2.6
171-175	99	.6	746	1.3	434	1.1	224	1.1
Totals	17,459	99.9	57,167	99.1	38,314	99.3	20,301	99.4
	Avg. length = 144.7mm		Avg. length = 147.2mm		Avg. length = 147.0mm		Avg. length = 147.8mm	

Table 24. Illegally retained crabs observed during the 1994 Adak Area brown king crab fishery.

Sample Location	Sample Size	Males		Females		Other Crabs	Cum. Percent Illegal	Num. Crabs ^a Harvested	Est. Num. ^b Illegal	Percent Harvest Sampled
		Num.	Percent	Num.	Percent					
Catcher Processor	41,912	200	.5	30	<.1	0	.5	129,889	649	32.3
Floater Processor	24,156	123	.5	28	.1	0	.6	310,962	1,866	7.8
Totals	66,068	323	.5	58	.1	0	.6	440,851	2,515	15.0

^a Morrison et al. 1994.

^b Estimates derived from percentage of illegal crabs multiplied by number of crabs harvested during the fishery.

Table 25. Catch per pot of selected species during the 1994 Adak Area brown king crab fishery.

Species	Total Pot ^a Sample Catch	Avg. Catch Per Pot	Estimated Total ^b Catch
<u>brown king crab</u>			
legal male	2,087	6.8	1,442,700
sub-legal male	3,605	11.7	2,482,300
female	3,463	11.2	2,376,200
<u>C. tanneri</u>			
legal male	42	.1	21,200
sub-legal male	10	<.1	7,000
female	10	<.1	7,000
<u>Lithodes couesi</u>			
legal male	96	.3	63,600
sub-legal male	10	<.1	7,000
female	30	<.1	20,700
<u>pacific cod^c</u>	7	<.1	4,800
<u>halibut</u>	4	<.1	2,800

^a Total pot contents derived from 308 random samples conducted on catcher processors during the fishery.

^b Estimated catch derived from pot sample CPUE multiplied by 212,164 total reported pot pulls (Morrison et al. 1994) during the fishery.

^c All fish species mixed size and sex.

Table 26. Shell age distributions of brown king crab males and females observed in the 1991, 1992, 1993, and 1994 Adak Area fishery.

Fishery Year	Sample Size ^a	Shell age classes					
		New	% total	Old	% total	Very old	% total
<u>1991</u>							
Males	7,469	7,057	94.5	288	3.9	37	.5
Females	5,061	4,834	95.5	212	4.2	4	.1
<u>1992</u>							
Males	16,731	15,675	93.7	933	5.5	90	.5
Females	8,001	7,491	93.5	499	6.2	15	.2
<u>1993</u>							
Males	19,944	19,350	97.0	574	2.9	20	.1
Females	15,000	14,484	96.6	510	3.4	6	<.1
<u>1994</u>							
Males	5,578	5,424	97.2	154	2.8	0	-
Females	3,462	3,429	99.0	32	.9	1	<.1

^a Derived from random pot samples collected on catcher processors during the fisheries.

Table 27. Reproductive state of female brown king crabs observed in the 1991, 1992, 1993 and 1994 Adak Area fishery.

Year	Eyed eggs	Percent total	Uneyed eggs	Percent total	Mated/barren	Percent total	Non-mated	Percent total
<u>1991</u>	1,309	26.6	1,219	24.8	571	11.6	1,814	36.9
<u>1992</u>	1,690	25.1	2,710	34.8	1,060	13.6	2,336	30.0
<u>1993</u>	3,456	23.2	4,684	31.5	1,674	11.3	5,064	34.0
<u>1994</u>	507	14.6	1,075	31.1	757	21.9	1,122	32.4
Totals	6,962	22.4	9,688	31.2	4,062	13.1	10,336	33.3

Table 28. Retained red king crab carapace length frequency statistics by processor type for the 1994 Adak Area season.

Sample Type	Sample Size	Avg. Length	Shell Age Percentages			
			Soft	New	Old	Very Old
Catcher processor	485	160.1mm	-	59.4	36.7	3.9
Floater processor	0	-	-	-	-	-
Shoreside processor	552	155.1mm	-	86.6	13.0	.4
Totals	1,037	157.2mm	-	73.9	24.1	2.0

Table 29. Adak area retained red king crab carapace length distributions from the 1992, 1993 and 1994 fishery.

Length (mm)	1992		1993		1994	
	Num. crab	Percent	Num. crab	Percent	Num. crab	Percent
131 - 135	39	3.8	1	<.1	16	1.5
136 - 140	170	16.7	31	.7	66	6.7
141 - 145	183	18.0	186	4.2	99	9.6
146 - 150	163	16.1	545	12.3	146	14.1
151 - 155	166	16.4	813	18.4	145	14.0
156 - 160	109	10.7	889	20.1	153	14.8
161 - 165	95	9.4	811	18.3	146	14.1
166 - 170	48	4.7	590	13.3	119	11.5
171 - 175	25	2.5	339	7.7	65	6.3
176 - 180	16	1.6	146	3.3	39	3.8
181 - 185	0	-	0	-	23	2.2
186 - 190	0	-	0	-	14	1.4
Totals	1,014	99.9	4,426	98.3	1,031	100.0
	Avg. length = 151.3mm		Avg. length = 154.6mm		Avg. length = 157.5mm	

Table 30. Illegally retained crabs observed during the 1994 Adak Area red king crab fishery.

Sample Location	Sample Size	Males		Females		Other Crabs	Cum. Percent Illegal	Num. Crabs ^a Harvested	Est. Num. ^b Illegal	Percent Harvest Sampled
		Num.	Percent	Num.	Percent					
Catcher Processor	3,367	11	.3	0	-	2	.4	14,736	59	22.8
Floater Processor	1,057	2	.2	0	-	2	.4	17,725	71	6.0
Totals	4,424	13	.3	0	-	4	.4	32,461	130	13.6

^aMorrison et al. 1994.

^bEstimates derived from percentage of illegal crabs multiplied by number of crabs harvested during the fishery.

Table 31. Catch per pot of selected species during the 1994 Adak Area red king crab fishery.

Species	Total Pot ^a Sample Catch	Avg. Catch Per Pot	Estimated Total ^b Catch
<u>red king crab</u>			
legal male	449	3.2	43,400
sub-legal male	39	.3	4,000
female	88	.6	8,000
<u>C. bairdi</u>			
legal male	0	-	-
sub-legal male	22	.1	1,400
female	19	.1	1,400
<u>brown king crab</u>			
legal male	9	<.1	900
sub-legal male	1	<.1	100
female	0	-	-
<u>Korean hair crab</u> ^c	26	.2	2,700
<u>pacific cod</u> ^d	51	.4	5,000

^a Total pot contents derived from 140 random samples conducted on catcher processors during the fishery.

^b Estimated catch derived from pot sample CPUE multiplied by 13,575 total reported pot pulls (Morrison et al. 1994) during the fishery.

^c Mixed size and sex.

^d All fish species mixed size and sex.

Table 32. Shell age distributions of red king crab males and females observed in the 1991, 1992, 1993, and 1994 Adak Area fishery.

Fishery Year	Sample Size ^a	Shell age classes					
		New	% total	Old	% total	Very old	% total
<u>1991</u>							
Males	2,602	2,315	89.0	266	10.2	21	.8
Females	685	665	97.1	20	3.9	0	-
<u>1992</u>							
Males	2,411	2,086	89.3	235	10.1	90	.6
Females	1,377	1,371	99.6	6	.4	0	-
<u>1993</u>							
Males	485	435	89.7	42	8.7	8	1.6
Females	260	259	99.6	1	.4	0	-
<u>1994</u>							
Males	484	339	70.0	122	25.2	23	4.8
Females	88	86	97.7	2	.3	0	-

^a Derived from random pot samples collected on catcher processors during the fisheries.

Table 33. Reproductive state of female red king crabs observed in the 1991, 1992, 1993 and 1994 Adak Area fishery.

Year	Eyed eggs	Percent total	Uneyed eggs	Percent total	Mated/barren	Percent total	Non-mated	Percent total
<u>1991</u>	193	33.0	368	63.1	7	1.2	16	2.7
<u>1992</u>	1,141	82.8	212	15.4	6	.4	19	1.4
<u>1993</u>	58	22.2	198	73.8	5	1.9	1	.4
<u>1994</u>	26	29.5	54	61.4	3	3.4	5	5.7
Totals	1,418	61.3	832	36.0	21	.9	41	1.8

Table 34. Retained brown king crab carapace length frequency statistics by processor type for the 1994 Dutch Harbor Area season.

Sample Type	Sample Size	Avg. Length	Shell Age Percentages			
			Soft	New	Old	Very Old
Catcher processor	0	-	-	-	-	-
Floater processor	502	147.5mm	-	99.4	.6	-
Shoreside processor	1,092	148.1mm	-	98.7	1.1	.2
Totals	1,681	147.6mm	-	98.9	.9	.1

Table 35. Dutch Harbor area retained brown king crab carapace length distributions from the 1991, 1992, 1993, and 1994 fishery.

Length (mm)	1991		1992		1993 ^a		1994	
	Num. crab	Percent						
126-130	82	.1	69	.5	5	1.0	12	.7
131-135	996	6.4	1,105	7.5	36	6.7	97	5.8
136-140	2,730	17.5	2,467	16.6	82	15.2	298	17.7
141-145	3,291	21.1	3,182	21.5	104	19.3	348	20.7
146-150	3,028	19.4	2,786	18.8	96	17.8	386	23.0
151-155	3,240	14.4	2,118	14.3	69	12.8	222	13.2
156-160	1,545	9.9	1,498	10.1	51	9.5	138	8.2
161-165	881	5.6	872	5.8	51	9.5	88	5.2
166-170	411	2.6	459	3.1	29	5.4	44	2.6
171-175	212	1.4	182	1.2	9	1.7	34	2.0
176-180	109	.7	58	.4	3	.6	8	.5
Totals	15,525	99.1	14,796	99.8	535	99.5	1,675	99.6
	Avg. length = 147.9mm		Avg. length = 147.8mm		Avg. length = 149.1mm		Avg. length = 147.6mm	

^a All samples collected by ADF&G personnel.

Table 36. Illegally retained crabs observed during the 1994 Dutch Harbor Area brown king crab fishery.

Sample Location	Sample Size	Males		Females		Other Crabs	Cum. Percent Illegal	Num. Crabs ^a Harvested	Est. Num. ^b Illegal	Percent Harvest Sampled
		Num.	Percent	Num.	Percent					
Catcher Processor	0	-	-	-	-	-	-	-	-	-
Floater Processor	4,144	73	1.8	7	.2	-	1.9	384,353	7,303	1.1
Totals	4,144	73	1.8	7	.2	-	1.9	384,353	7,303	1.1

^a Morrison et al. 1994.

^b Estimates derived from percentage of illegal crabs multiplied by number of crabs harvested during the fishery.

Table 37. Retained Korean hair crab carapace length frequency statistics by processor type for the 1994 Bering Sea season.

Sample Type	Sample Size	Avg. Length	Shell Age Percentages			
			Soft	New	Old	Very Old
Catcher processor	0	-	-	-	-	-
Floater processor	0	-	-	-	-	-
Catcher vessel	5,518	91.0mm	<.1	93.4	6.3	.3
Shoreside processor	897	90.6mm	-	90.7	8.9	.3
Totals	6,415	91.0mm	<.1	93.1	6.7	.3

Table 38. Bering Sea retained Korean hair crab carapace length distributions from the 1992, 1993, and 1994 fishery.

Length (mm)	1992		1993		1994	
	Num. crab	Percent	Num. crab	Percent	Num. crab	Percent
061 - 065	3	.2	0	-	0	-
066 - 070	19	1.3	8	.1	0	-
071 - 075	141	9.3	126	.9	19	.3
076 - 080	339	22.4	1,337	9.2	321	5.0
081 - 085	425	28.0	3,263	22.5	945	14.7
086 - 090	339	22.4	4,760	32.9	1,603	25.0
091 - 095	153	10.1	3,563	24.6	1,913	29.8
096 - 100	43	2.8	1,237	8.6	1,191	18.6
101 - 105	24	1.6	161	1.1	392	6.1
106 - 110	16	1.1	12	.1	31	.5
Totals	1,502	99.2	14,468	100.0	6,415	100.0
	Avg. length = 83.6mm		Avg. length = 88.0mm		Avg. length = 91.0mm	

Table 39. Illegally retained crabs observed during the 1994 Bering Sea Korean hair crab fishery.

Sample Location	Sample Size	Males		Females		Other Crabs	Cum. Percent Illegal	Num. Crabs ^a Harvested	Est. Num. ^b Illegal	Percent Harvest Sampled
		Num.	Percent	Num.	Percent					
Catcher Processor	0	-	-	-	-	-	-	-	-	-
Catcher vessel	50,829	106	.2	3	<.1	190	.6	897,070	5,382	5.7
Floater Processor	0	-	-	-	-	-	-	-	-	-
Totals	50,829	106	.2	3	<.1	190	.6	897,070	5,382	5.7

^a Morrison et al. 1994.

^b Estimates derived from percentage of illegal crabs multiplied by number of crabs harvested during the fishery.

Table 40. Catch per pot of selected species during the 1994 Bering Sea Korean hair crab fishery.

Species	Total Pot ^a Sample Catch	Avg. Catch Per Pot	Estimated Total ^b Catch
<u>Korean hair crab</u>			
legal male	27,575	3.2	920,300
sub-legal male	3,534	.4	115,000
female	851	.1	29,000
<u>C. bairdi</u>			
legal male	230	<.1	8,000
sub-legal male	2,064	.2	57,500
female	4,480	.5	143,800
<u>red king crab</u>			
legal male	44	<.1	1,500
sub-legal male	74	<.1	2,600
female	2,657	.3	86,300
<u>blue king crab</u>			
legal male	132	<.1	4,600
sub-legal male	406	<.1	14,000
female	1,473	.2	57,500

^a Total pot contents derived from 8,331 random samples conducted on catcher processors during the fishery.

^b Estimated catch derived from pot sample CPUE multiplied by 287,594 total reported pot pulls (Morrison et al. 1994) during the fishery.

Table 41. Shell age distributions of Korean hair crab males and females observed in the 1992, 1993 and 1994 Bering Sea fishery.

Fishery year	Sample size ^a	Shell Age Classes					
		Soft	% total	New	% total	Old	% total
<u>1992</u>							
Males	1,815	-	-	1,681	92.6	134	7.3
Females	21	-	-	10	47.6	11	52.4
<u>1993</u>							
Males	55,552	2,659	4.8	43,394	78.1	9,499	17.1
Females	4,418	21	.5	4,089	92.6	308	7.0
<u>1994</u>							
Males	4,088	1	<.1	3,437	84.1	650	15.9
Females	91	0	-	86	94.5	5	.6

^aDerived from random pot sampling conducted on catcher catcher vessels during the fisheries.

Table 42. Reproductive state of female Korean hair crabs observed in the 1992, 1993 and 1994 Bering Sea fishery.

Year	Eyed eggs	Percent total	Uneyed eggs	Percent total	Mated/barren	Percent total	Non-mated	Percent total
<u>1992</u>	1	5.3	3	15.8	1	5.3	14	73.7
<u>1993</u>	117	2.7	24	.5	842	19.1	3,414	77.6
<u>1994</u>	2	2.3	14	16.3	1	1.2	69	80.2
Totals	120	2.7	41	.9	846	18.8	3,497	77.6

Table 43. Retained *C. tanneri* carapace width frequency statistics by processor type for the 1994 Bering Sea season.

Sample Type	Sample Size	Avg. Width	Shell Age Percentages			
			Soft	New	Old	Very Old
Catcher processor	0	-	-	-	-	-
Floater processor	0	-	-	-	-	-
Catcher vessel	725	142.0mm	16.1	77.4	5.4	1.1
Shoreside processor	636	143.1mm	-	89.9	9.9	0.2
Totals	1,361	142.6mm	8.6	83.2	7.5	0.7

Table 44. Retained *C. tanneri* carapace width distributions from the 1994 Bering Sea, Dutch Harbor, Alaska Peninsula, and Kodiak area fisheries.

Width (mm)	Bering Sea		Dutch Harbor		Alaska Peninsula		Kodiak	
	Num. crab	Percent						
121-125	61	4.5	373	6.8	741	26.6	242	13.4
126-130	161	11.8	525	9.6	657	23.6	250	13.8
131-135	213	15.6	776	14.2	449	16.1	354	19.6
136-140	241	17.7	1,219	22.3	380	13.6	393	21.8
141-145	188	13.8	1,232	22.6	216	7.7	303	16.8
146-150	137	10.1	803	14.7	92	3.3	140	7.8
151-155	131	9.6	295	5.4	19	.7	43	2.4
156-160	101	7.4	131	2.4	8	.3	8	.4
161-165	70	5.1	42	.8	2	.1	3	.2
166-170	44	3.2	15	.3	0	-	2	.1
Totals	1,347	99.0	5,410	99.1	2,564	92.0	1,738	96.3
	Avg. width = 142.6mm		Avg. width = 139.3mm		Avg. width = 130.3mm		Avg. width = 135.1mm	

Table 45. Illegally retained crabs observed during the 1994 Bering Sea *C. tanneri* fishery.

Sample Location	Sample Size	Males		Females		Other Crabs	Cum. Percent Illegal	Num. Crabs ^a Harvested	Est. Num. ^b Illegal	Percent Harvest Sampled
		Num.	Percent	Num.	Percent					
Catcher Processor	0	-	-	-	-	-	-	-	-	-
Catcher Vessel	4,160	19	.5	1	<.1	3	.5	165,365	827	2.5
Floater Processor	0	-	-	-	-	-	-	-	-	-
Totals	4,160	19	.5	1	<.1	3	.5	165,365	827	2.5

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^a Morrison et al. 1994.

^b Estimates derived from percentage of illegal crabs multiplied by number of crabs harvested during the fishery.

Table 46. Catch per pot of selected species during the 1994 Bering Sea *C. tanneri* fishery.

Species	Total Pot ^a Sample Catch	Avg. Catch Per Pot	Estimated Total ^b catch
<u><i>C. tanneri</i></u>			
legal male	4,659	10.5	144,300
sub-legal male	1,191	2.7	37,100
female	3,806	8.6	118,200
<u><i>C. angulatus</i></u>			
legal male	63	.1	1,400
sub-legal male	763	1.7	23,400
female	18	<.1	600
<u><i>Lithodes couesi</i></u>			
legal male	77	.2	2,700
sub-legal male	290	.7	9,600
female	177	.4	5,500
<u>brown king crab</u>			
legal male	10	<.1	300
sub-legal male	35	<.1	1,100
female	4	<.1	100

^a Total pot contents derived from 442 random samples conducted on catcher-processors during the fishery.

^b Estimated catch derived from pot sample CPUE multiplied by 13,739 total reported pot pulls (Morrison et al. 1994) during the fishery.

Table 47. Shell age distributions of *C. tanneri* males and females observed in the 1994 Bering Sea, Dutch Harbor, Alaska Peninsula and Kodiak Area fisheries.

Fishery year	Sample size ^a	Shell Age Classes					
		Soft	% total	New	% total	Old	% total
<u>Bering Sea</u>							
Males	5,747	122	2.1	5,112	89.0	513	8.9
Females	3,899	5	<.1	632	16.2	3,262	83.7
<u>Dutch Harbor</u>							
Males	16,012	0	-	15,004	93.0	1,008	7.0
Females	5,044	0	-	3,465	68.7	1,579	31.3
<u>Alaska Peninsula</u>							
Males	9,366	73	.8	8,905	95.1	386	4.1
Females	273	0	-	237	86.8	36	3.2
<u>Kodiak area</u>							
Males	5,495	84	1.5	5,093	92.7	309	5.6
Females	430	1	.2	410	95.3	19	4.4

^a Derived from random pot sampling collected on catcher-processors and catcher vessels during the fisheries.

Table 48. Reproductive state of female *C. tanneri* observed in the Bering Sea, Dutch Harbor, Alaska Peninsula and Kodiak Area fisheries.

Year	Eyed eggs	Percent total	Uneyed eggs	Percent total	Mated/barren	Percent total	Non-mated	Percent total
<u>Bering Sea</u>	343	8.8	3,303	84.7	63	1.6	188	4.8
<u>Dutch Harbor</u>	219	4.3	4,798	95.1	9	.2	17	.3
<u>Ak Peninsula</u>	272	99.9	1	.1	0	-	0	-
<u>Kodiak</u>	19	4.4	410	95.1	2	.5	0	-
Totals	853	8.8	8,512	88.3	74	.8	205	2.1

Table 49. Retained *C. tanneri* carapace width frequency statistics by processor type for the 1994 Dutch Harbor Area season.

Sample Type	Sample Size	Avg. Width	Shell Age Percentages			
			Soft	New	Old	Very Old
Catcher processor	0	-	-	-	-	-
Floater processor	0	-	-	-	-	-
Catcher vessel	4,770	139.3mm	-	94.3	5.7	-
Shoreside processor	622	139.6mm	-	98.2	1.6	.1
Totals	5,456	139.3mm	-	94.8	5.2	<.1

Table 50. Illegally retained crabs observed during the 1994 Dutch Harbor Area *C. tanneri* fishery.

Sample Location	Sample Size	Males		Females		Other Crabs	Cum. Percent Illegal	Num. Crabs ^a Harvested	Est. Num. ^b Illegal	Percent Harvest Sampled
		Num.	Percent	Num.	Percent					
Catcher Processor	0	-	-	-	-	-	-	-	-	-
Catcher Vessel	13,672	107	.8	3	<.1	2	.8	416,674	3,333	2.6
Floater Processor	0	-	-	-	-	-	-	-	-	-
Totals	13,672	107	.8	3	<.1	2	.8	416,674	3,333	2.6

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^a Morrison et al. 1994.

^b Estimates derived from percentage of illegal crabs multiplied by number of crabs harvested during the fishery.

Table 51. Catch per pot of selected species during the 1994 Dutch Harbor Area *C. tanneri* fishery.

Species	Total Pot ^a Sample Catch	Avg. Catch Per Pot	Estimated Total ^b Catch
<u><i>C. tanneri</i></u>			
legal male	12,415	9.4	352,400
sub-legal male	3,871	2.9	108,700
female	6,872	5.2	194,900
<u><i>Lithodes couesi</i></u>			
legal male	197	.2	7,500
sub-legal male	122	.1	3,700
female	155	.1	1,800
<u><i>C. angulatus</i></u>			
legal male	5	<.1	200
sub-legal male	380	.3	11,000
female	1	<.1	30
<u>sable fish</u> ^c	388	.3	11,200
<u>octopus</u>	54	<.1	1,500

^a Total pot contents derived from 1,310 random samples conducted on catcher-processors during the fishery.

^b Estimated catch derived from pot sample CPUE multiplied by 37,490 total reported pot pulls (Morrison et al. 1994) during the fishery.

^c Fish species mixed size/sex.

Table 52. Retained *C. tanneri* carapace width frequency statistics by processor type for the 1994 Alaska Peninsula Area season.

Sample Type	Sample Size	Avg. Width	Shell Age Percentages			
			Soft	New	Old	Very Old
Catcher processor	2,789	130.3mm	.5	96.8	2.7	-
Floater processor	0	-	-	-	-	-
Catcher vessel	0	-	-	-	-	-
Shoreside processor	0	-	-	-	-	-
Totals	2,789	130.3mm	.5	96.8	2.7	-

Table 53. Illegally retained crabs observed during the 1994 Alaska Peninsula Area *C. tanneri* fishery.

Sample Location	Sample Size	Males		Females		Other Crabs	Cum. Percent Illegal	Num. Crabs ^a Harvested	Est. Num. ^b Illegal	Percent Harvest Sampled
		Num.	Percent	Num.	Percent					
Catcher Processor	14,717	99	.7	3	<.1	1	.7	107,745	754	13.7
Catcher Vessel	0	-	-	-	-	-	-	-	-	-
Floater Processor	0	-	-	-	-	-	-	-	-	-
Totals	14,717	99	.7	3	<.1	1	.7	107,745	754	13.7

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^a Morrison et al. 1994.

^b Estimates derived from percentage of illegal crabs multiplied by number of crabs harvested during the fishery.

Table 54. Catch per pot of selected species during the 1994 Alaska Peninsula Area *C. tanneri* fishery.

Species	Total Pot ^a Sample Catch	Avg. Catch Per Pot	Estimated Total ^b Catch
<u><i>C. tanneri</i></u>			
legal male	10,646	54.3	67,100
sub-legal male	5,105	26.0	32,100
female	482	2.5	3,000
<u><i>Lithodes couesi</i></u>			
legal male	12	<.1	80
sub-legal male	15	<.1	100
female	39	.2	300
<u>brown king crab</u>			
legal male	0	-	-
sub-legal male	6	<.1	40
female	2	<.1	10
<u>arrowtooth flounder</u> ^c	189	.9	1,000
<u>sable fish</u>	64	.3	400

^a Total pot contents derived from 196 random samples conducted on catcher processors during the fishery.

^b Estimated catch derived from pot sample CPUE multiplied by 1,236 total reported pot pulls (Spalinger et al. 1994) during the fishery.

^c Fish species mixed size/sex.

Table 55. Retained *C. tanneri* carapace width frequency statistics by processor type for the 1994 Kodiak Area season.

Sample Type	Sample Size	Avg. Width	Shell Age Percentages			
			Soft	New	Old	Very Old
Catcher processor	1,806	135.1mm	1.4	93.5	5.0	.1
Floater processor	0	-	-	-	-	-
Catcher vessel	0	-	-	-	-	-
Shoreside processor	0	-	-	-	-	-
Totals	1,806	135.1mm	1.4	93.5	5.0	.1

Table 56. Illegally retained crabs observed during the 1994 Kodiak Area *C. tanneri* fishery.

Sample Location	Sample Size	Males		Females		Other Crabs	Cum. Percent Illegal	Num. Crabs ^a Harvested	Est. Num. ^b Illegal	Percent Harvest Sampled
		Num.	Percent	Num.	Percent					
Catcher Processor	9,497	45	.5	5	<.1	0	.5	27,234	136	37.0
Catcher Vessel	0	-	-	-	-	-	-	-	-	-
Floater Processor	0	-	-	-	-	-	-	-	-	-
Totals	9,497	45	.5	5	<.1	0	.5	27,234	136	37.0

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^a Morrison et al. 1994.

^b Estimates derived from percentage of illegal crabs multiplied by number of crabs harvested during the fishery.

Table 57. Catch per pot of selected species during the 1994 Kodiak Area *C. tanneri* fishery.

Species	Total Pot ^a Sample Catch	Avg. Catch Per Pot	Estimated Total ^b Catch
<u><i>C. tanneri</i></u>			
legal male	4,864	34.7	39,200
sub-legal male	1,682	12.0	13,600
female	3,049	21.7	24,500
<u><i>Lithodes couesi</i></u>			
legal male	35	.3	300
sub-legal male	1	<.1	10
female	53	.4	500
<u>brown king crab</u>			
legal male	0	-	-
sub-legal male	2	<.1	200
female	1	<.1	1
<u>arrowtooth flounder</u> ^c	189	.9	1,000
<u>sable fish</u>	64	.3	400

^a Total pot contents derived from 140 random samples conducted on catcher processors during the fishery.

^b Estimated catch derived from pot sample CPUE multiplied by 1,131 total reported pot pulls (Spalinger et al. 1994) during the fishery.

^c Fish species mixed size/sex.

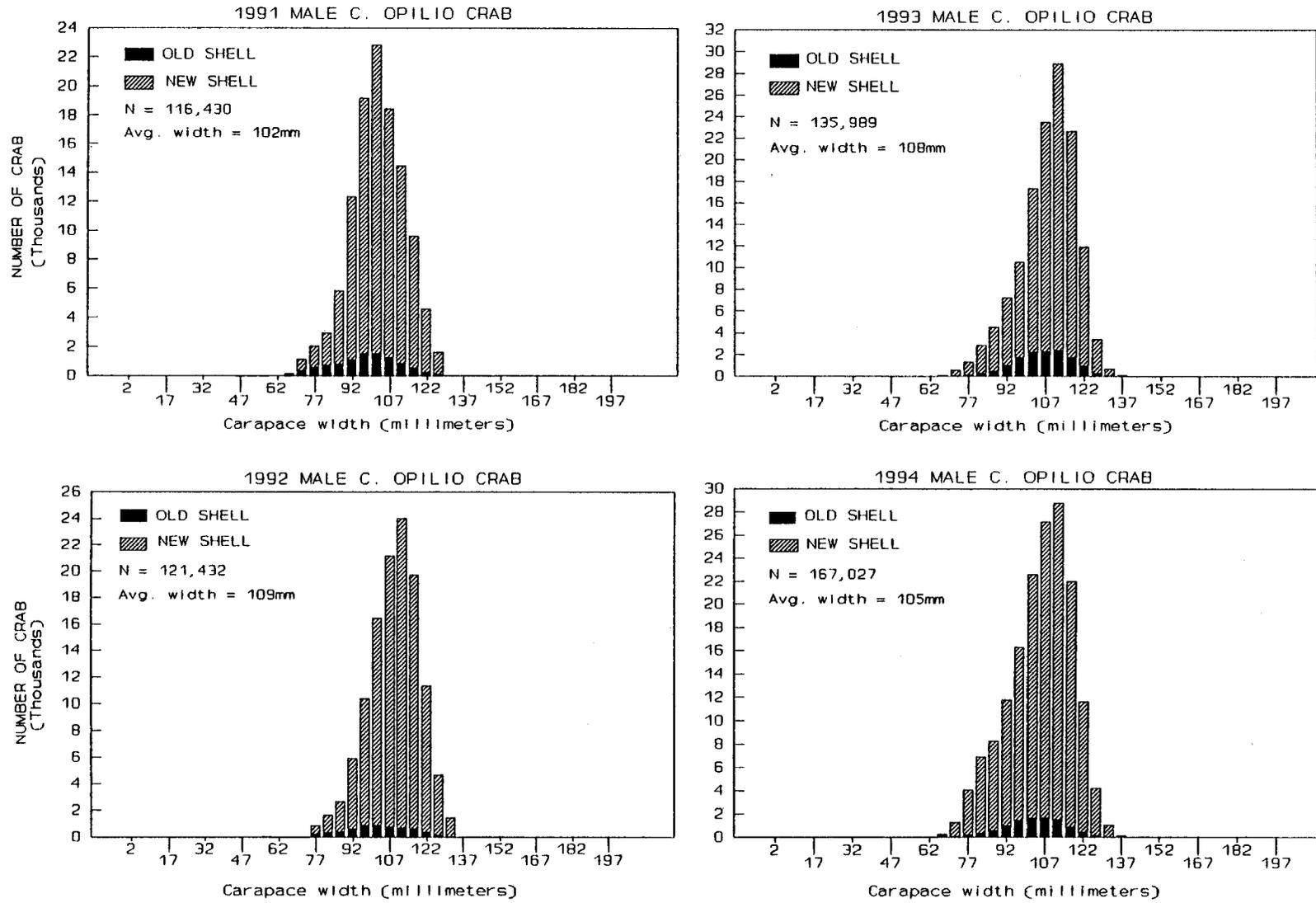


Figure 1. Carapace width distribution histograms of all *C. opilio* males observed in the 1991, 1992, 1993, and 1994 Bering Sea fishery.

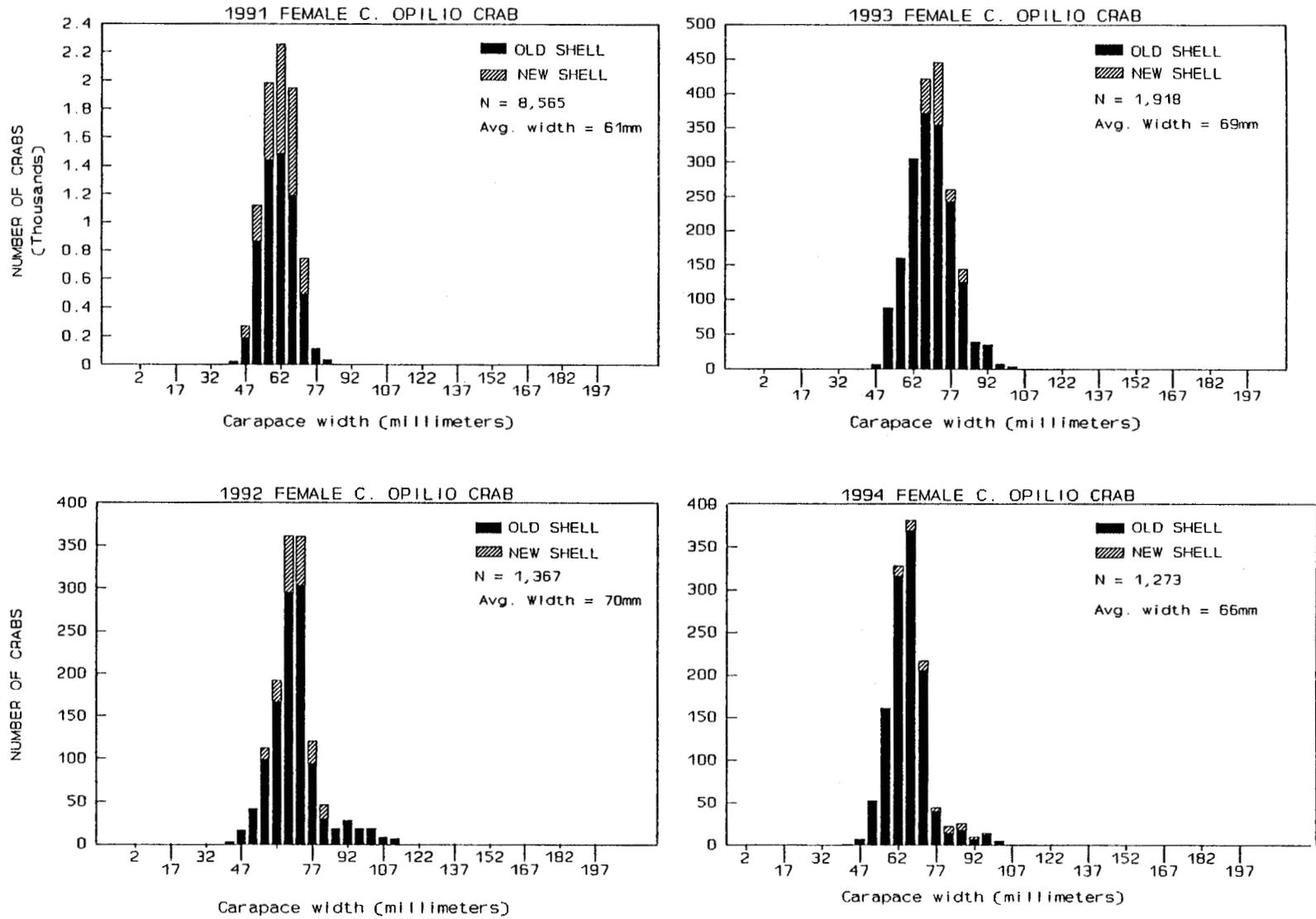


Figure 2. Carapace width distribution histograms of all *C. opilio* females observed in the 1991, 1992, 1993, and 1994 Bering Sea fishery.

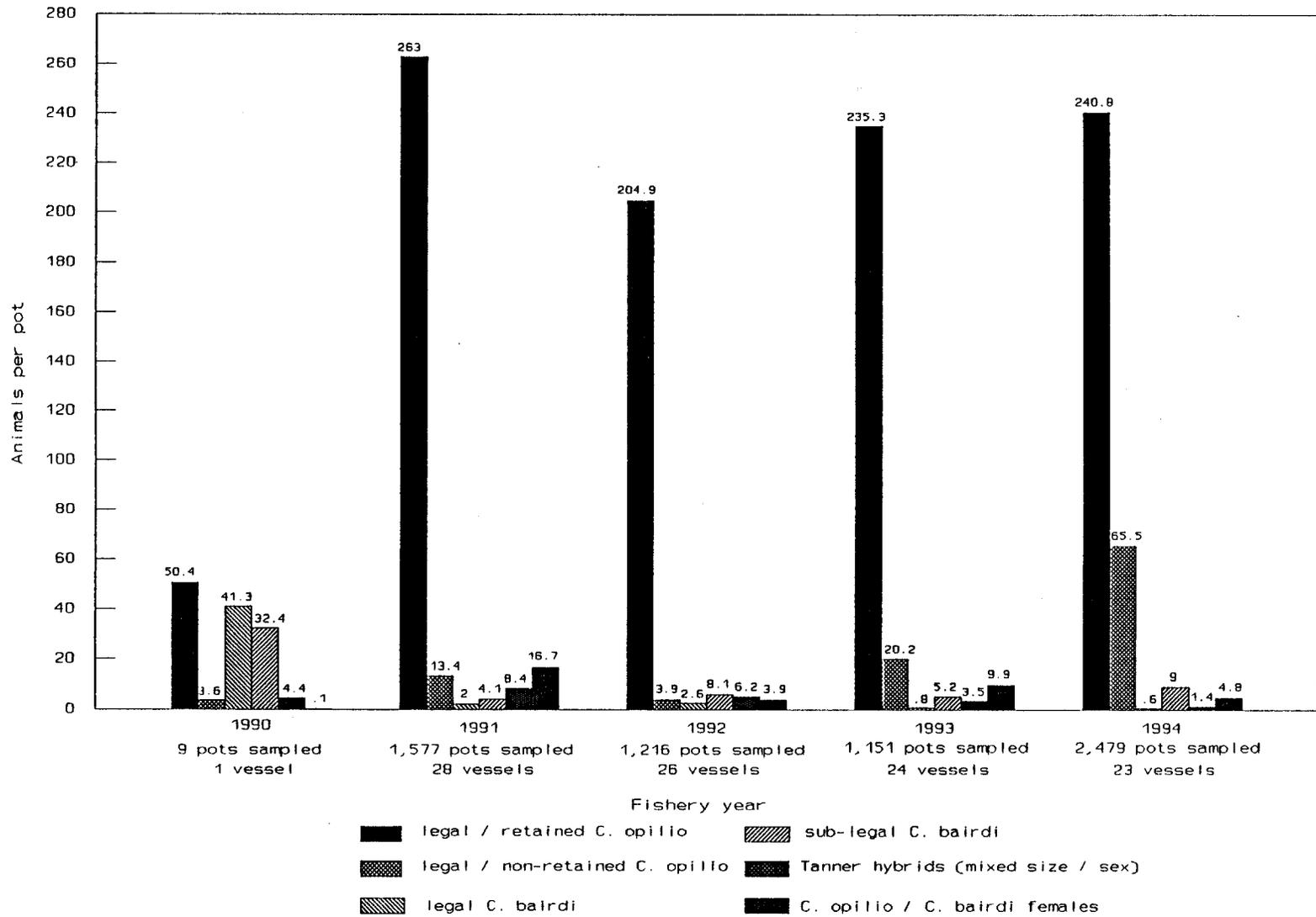


Figure 3. Catch per pot of selected species during the 1990, 1991, 1992, 1993 and 1994 Bering Sea *C. opilio* fishery.

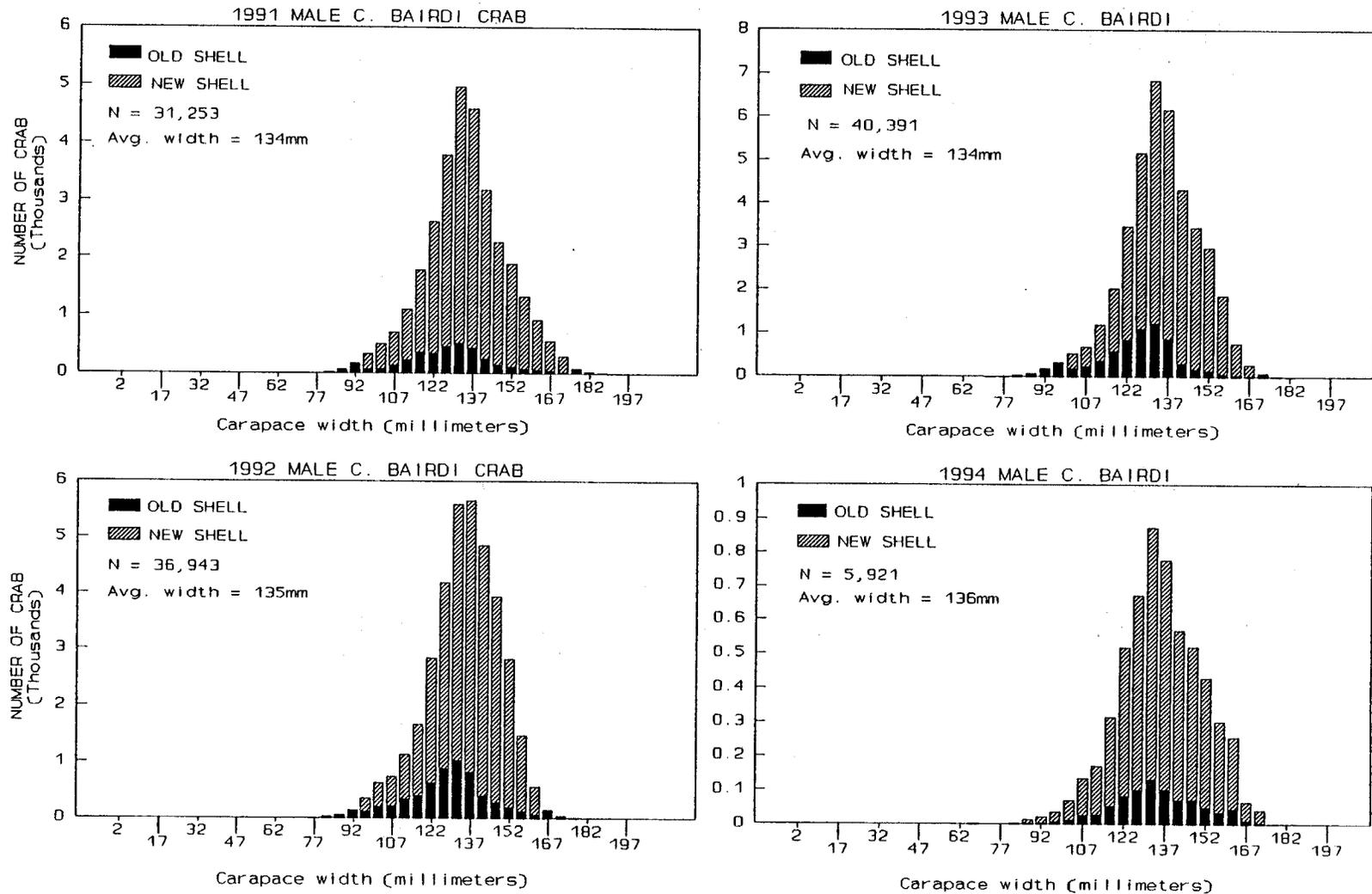


Figure 4. Carapace width distribution histograms of all *C. bairdi* observed in the 1991, 1992, 1993, and 1994 Bering Sea fishery.

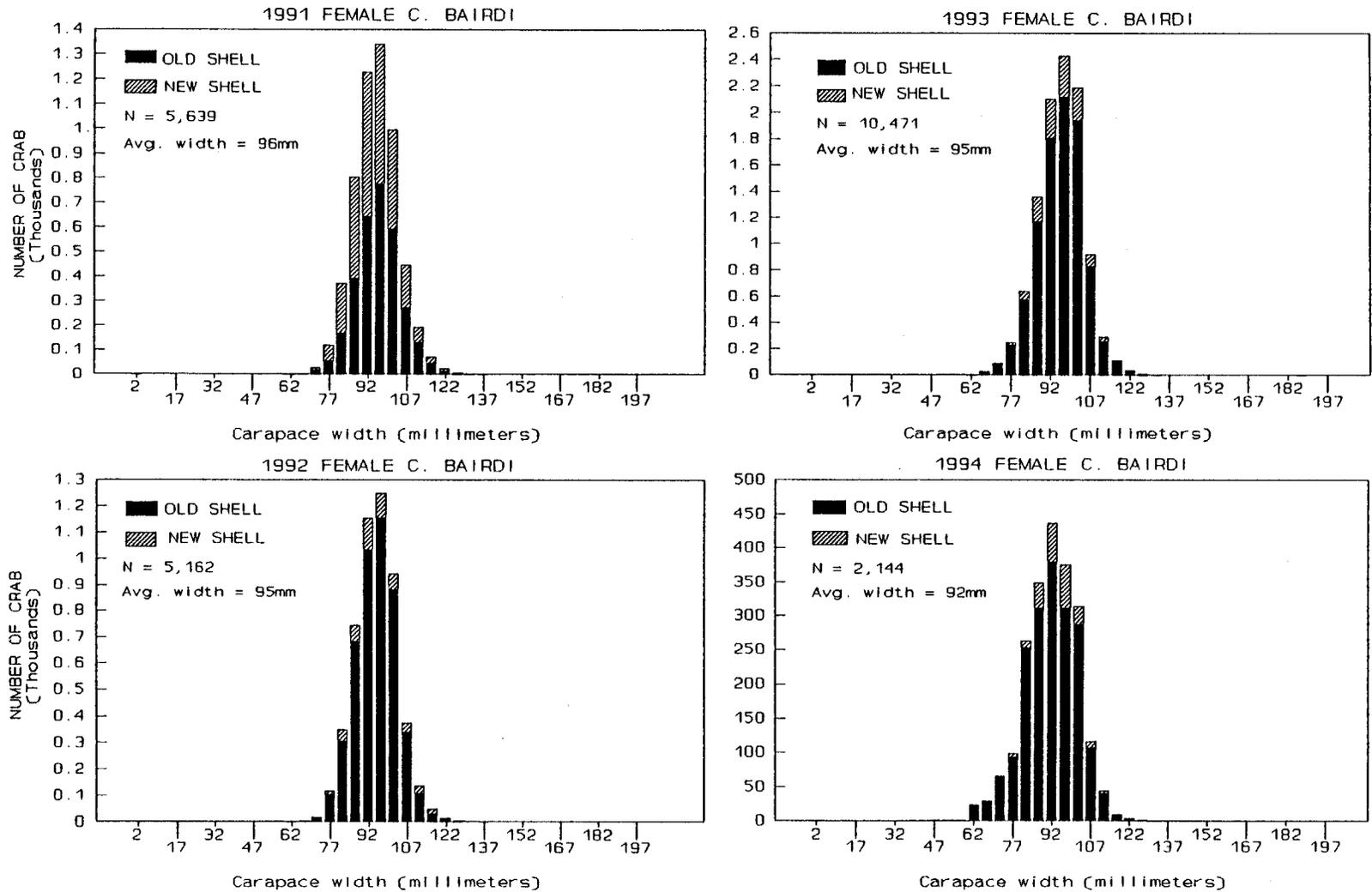


Figure 5. Carapace width distribution histograms of all *C. bairdi* females observed in the 1991, 1992, 1993, and 1994 Bering Sea fishery.

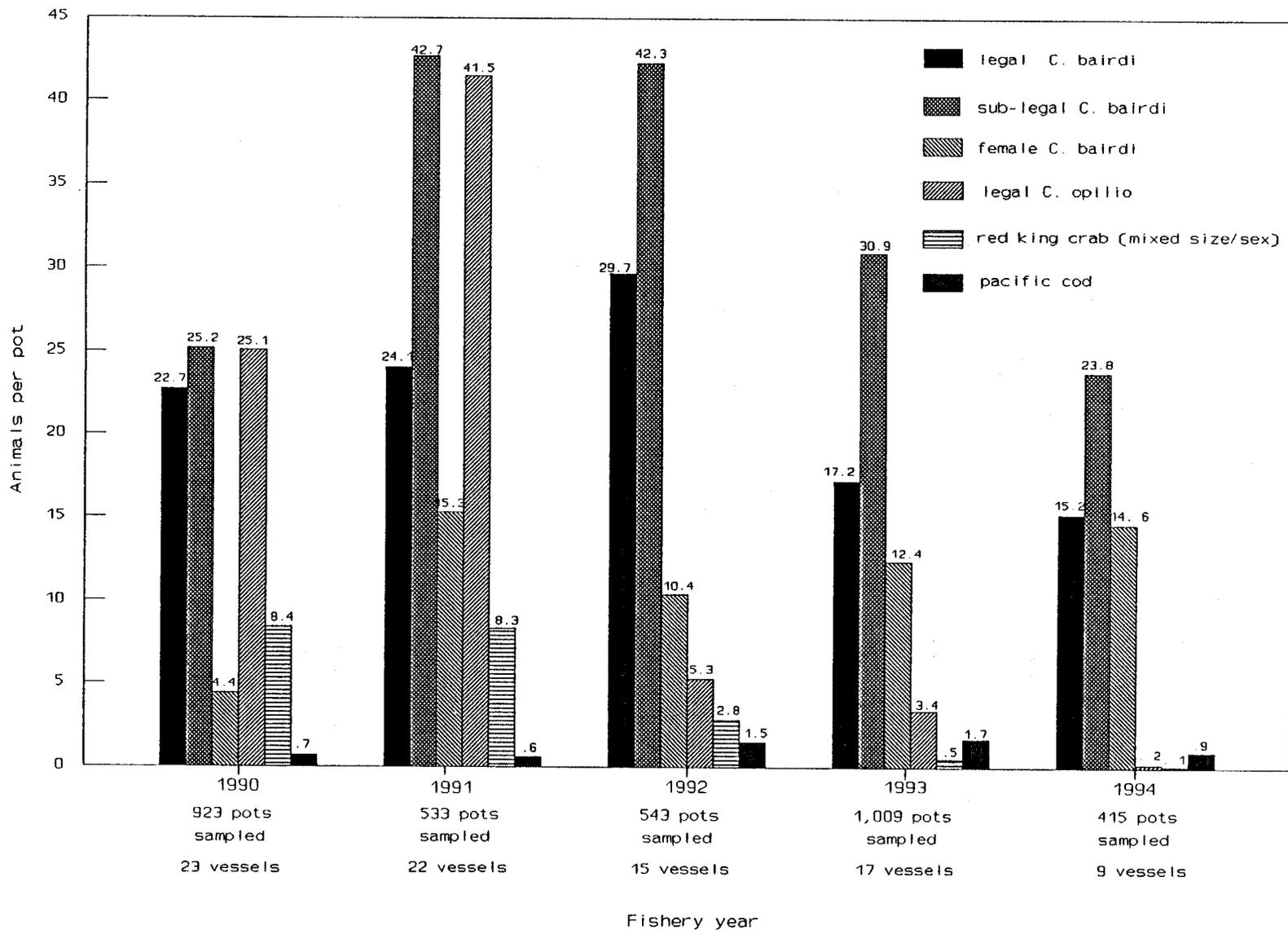


Figure 6. Catch per pot of selected species from the 1990, 1991, 1992, 1993, and 1994 Bering Sea *C. bairdi* fishery.

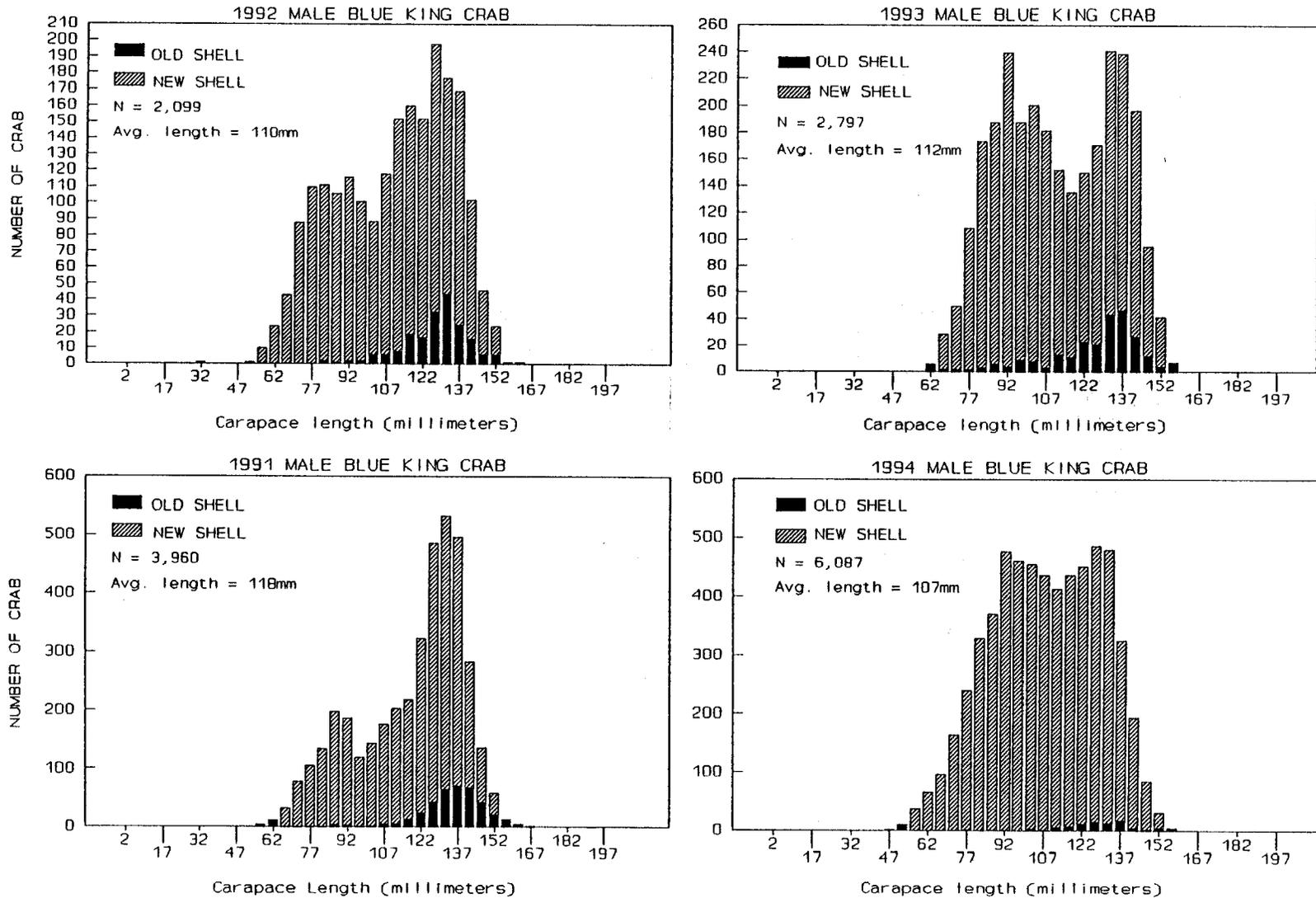


Figure 7. Carapace length distribution histograms of all blue king crab males observed in the 1991, 1992, 1993, and 1994 St. Matthew district fishery.

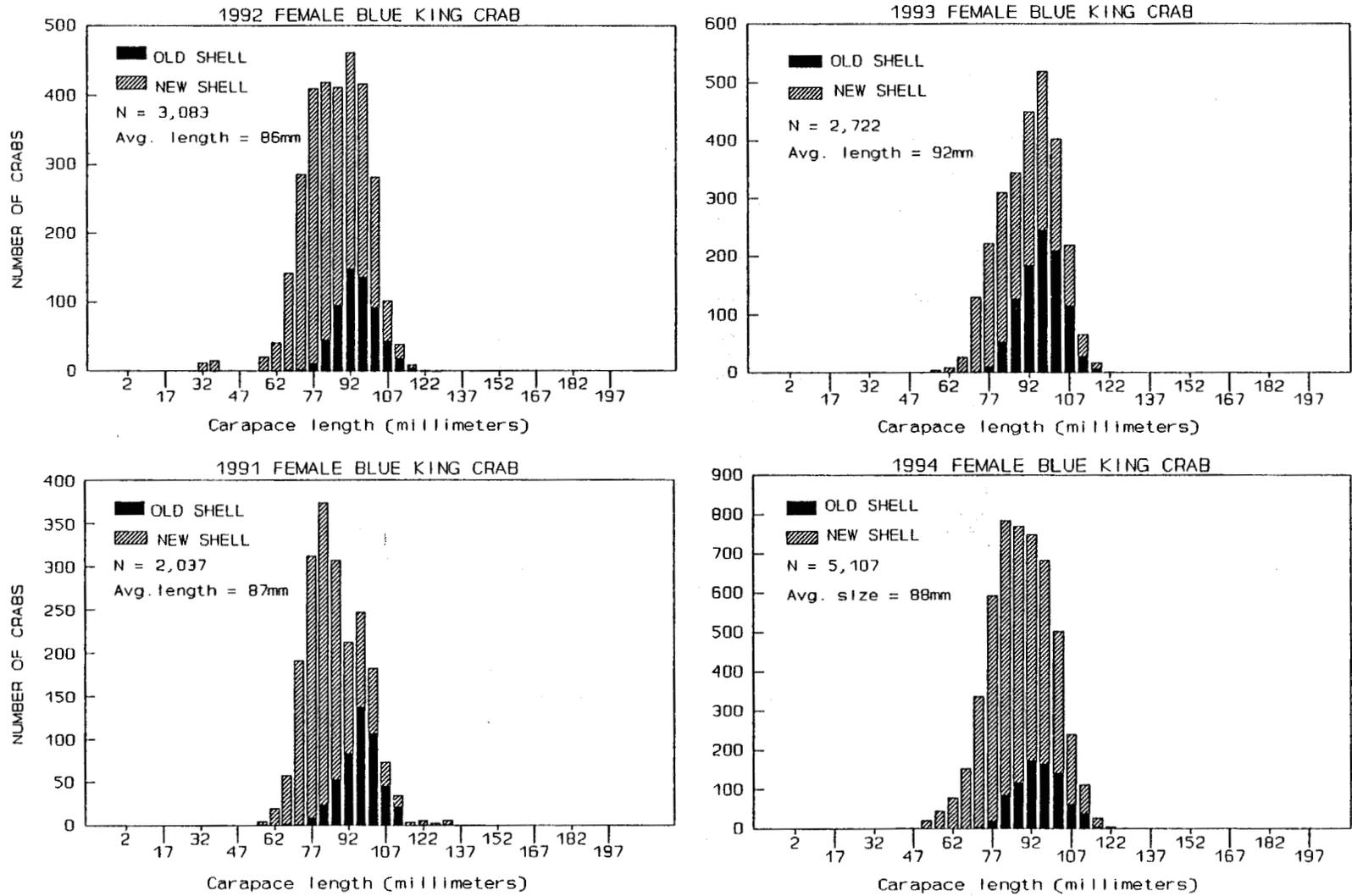


Figure 8. Carapace length distribution histograms of all blue king crab females observed in the 1991, 1992, 1993, and 1994 St. Mathew district fishery.

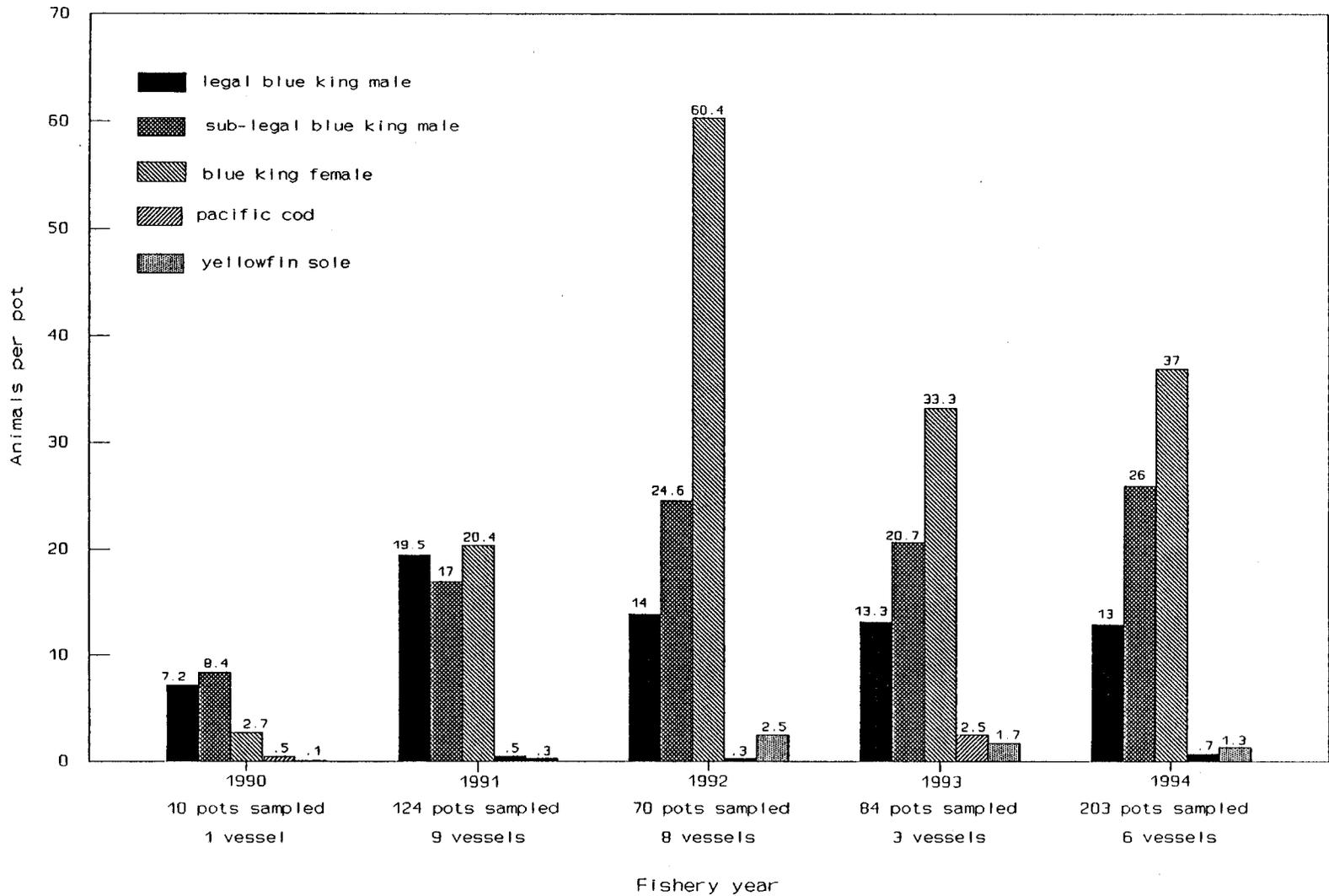


Figure 9. Catch per pot of selected species during the 1990, 1991, 1992, 1993, and 1994 St. Matthew district blue king crab fishery.

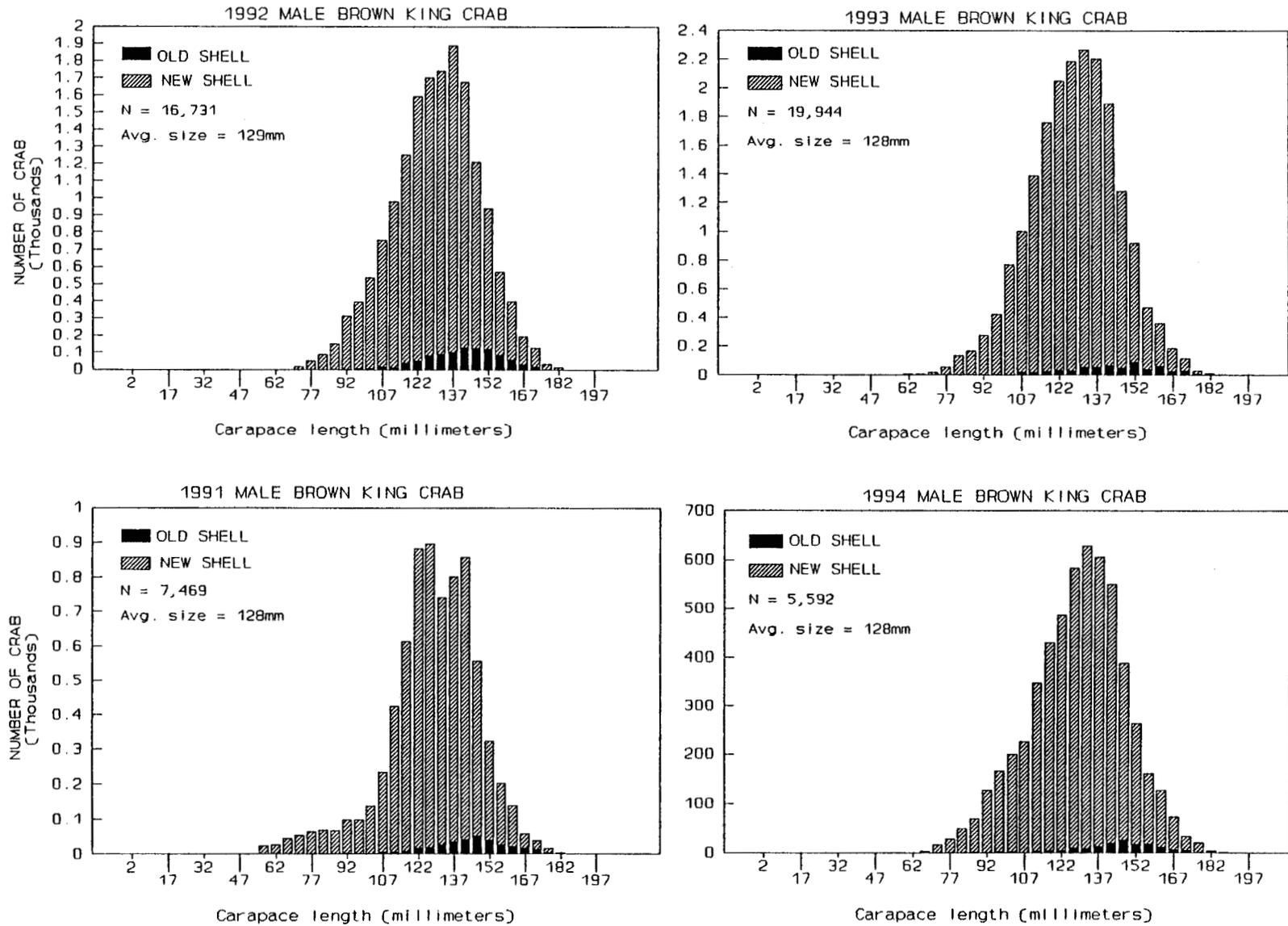


Figure 10. Carapace length distribution histograms of all brown king crab males observed in the 1991, 1992, 1993, and 1994 Adak Area fishery.

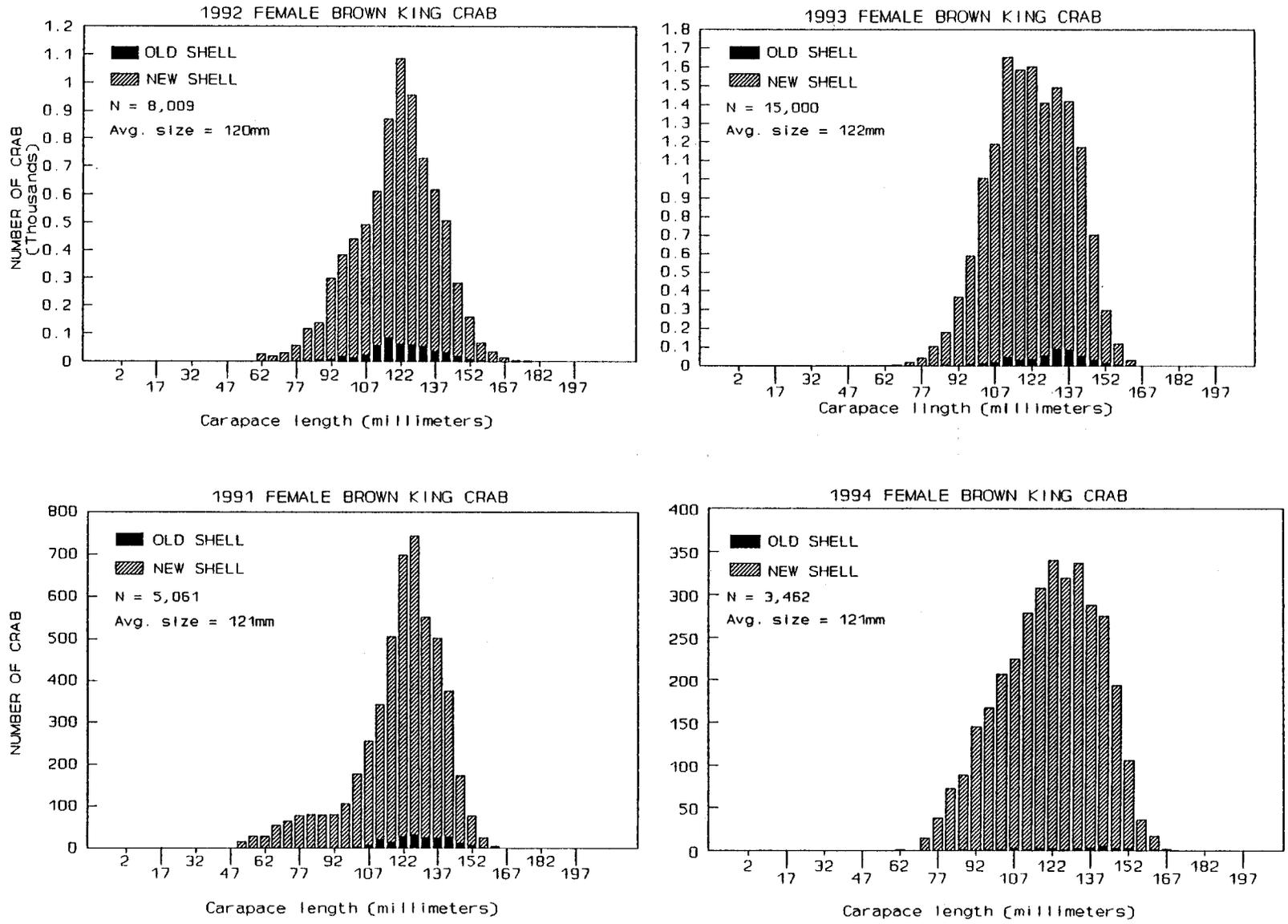


Figure 11. Carapace length distribution histograms of all brown king crab females observed in the 199, 1992, 1993, and 1994 Adak Area fishery.

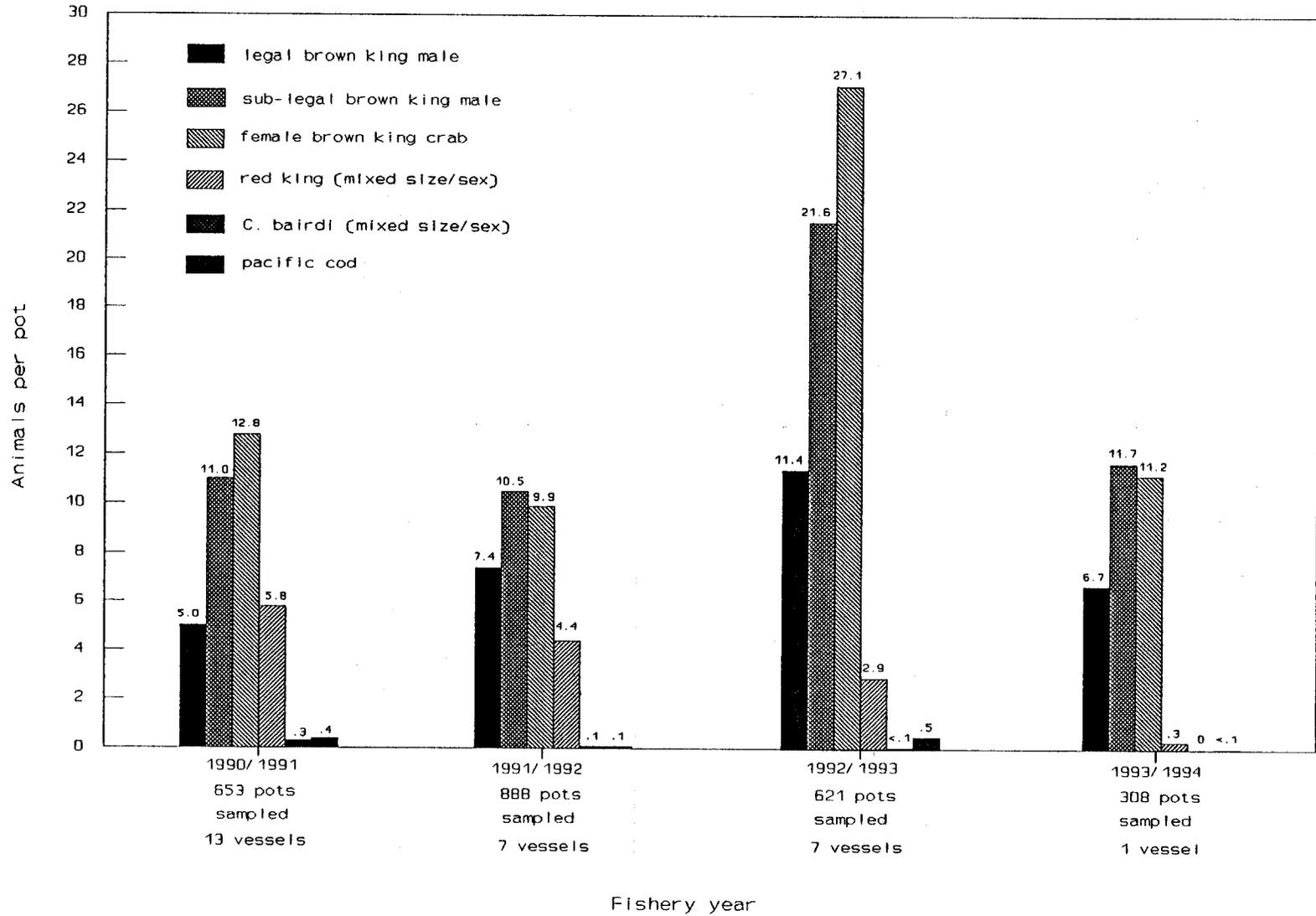


Figure 12. Catch per pot of selected species during the 1991, 1992, 1993, and 1994 Adak Area brown king crab fishery.

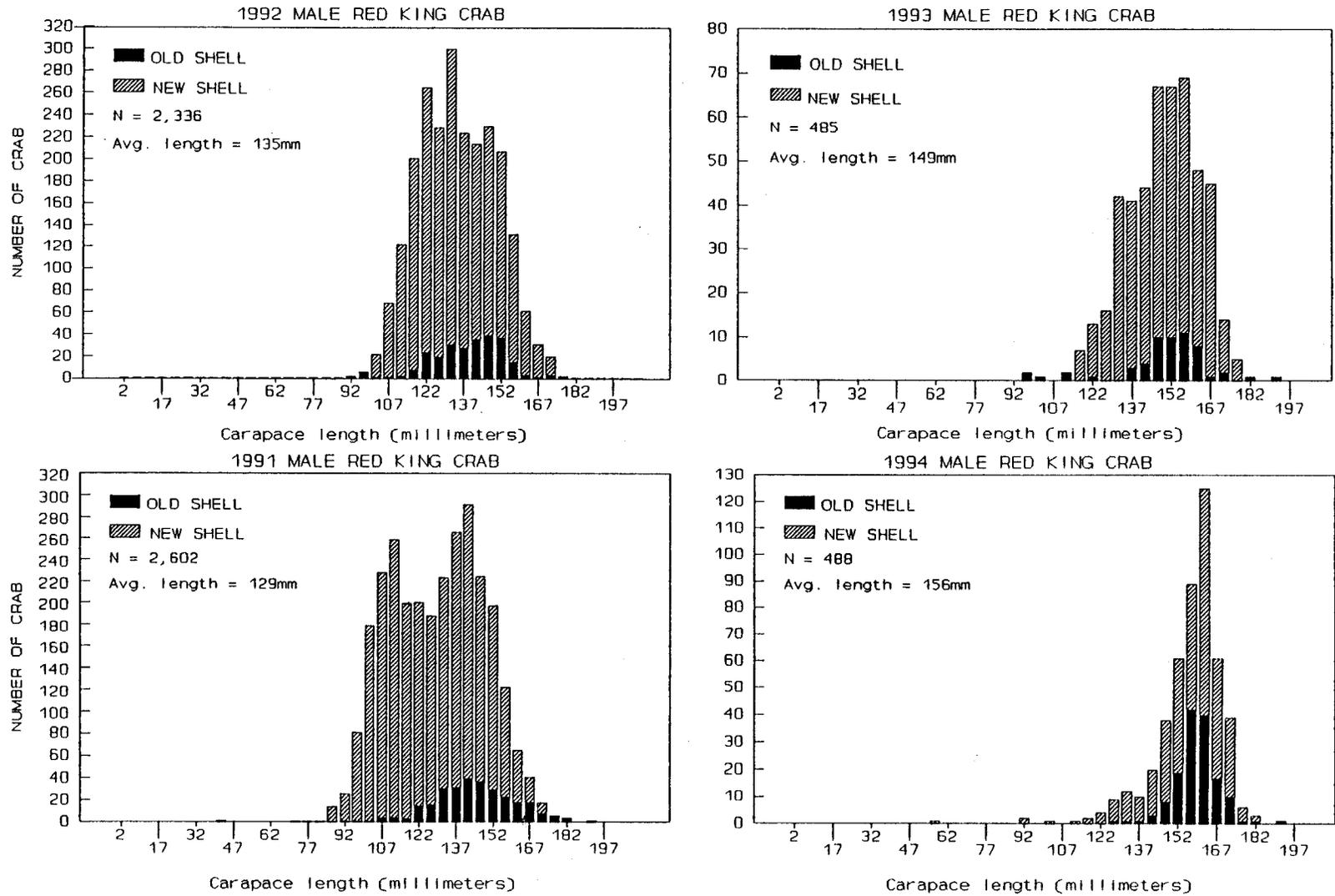


Figure 13. Carapace length distribution histograms of all red king crab males observed in the 1991, 1992, 1993, and 1994 Adak Area fishery.

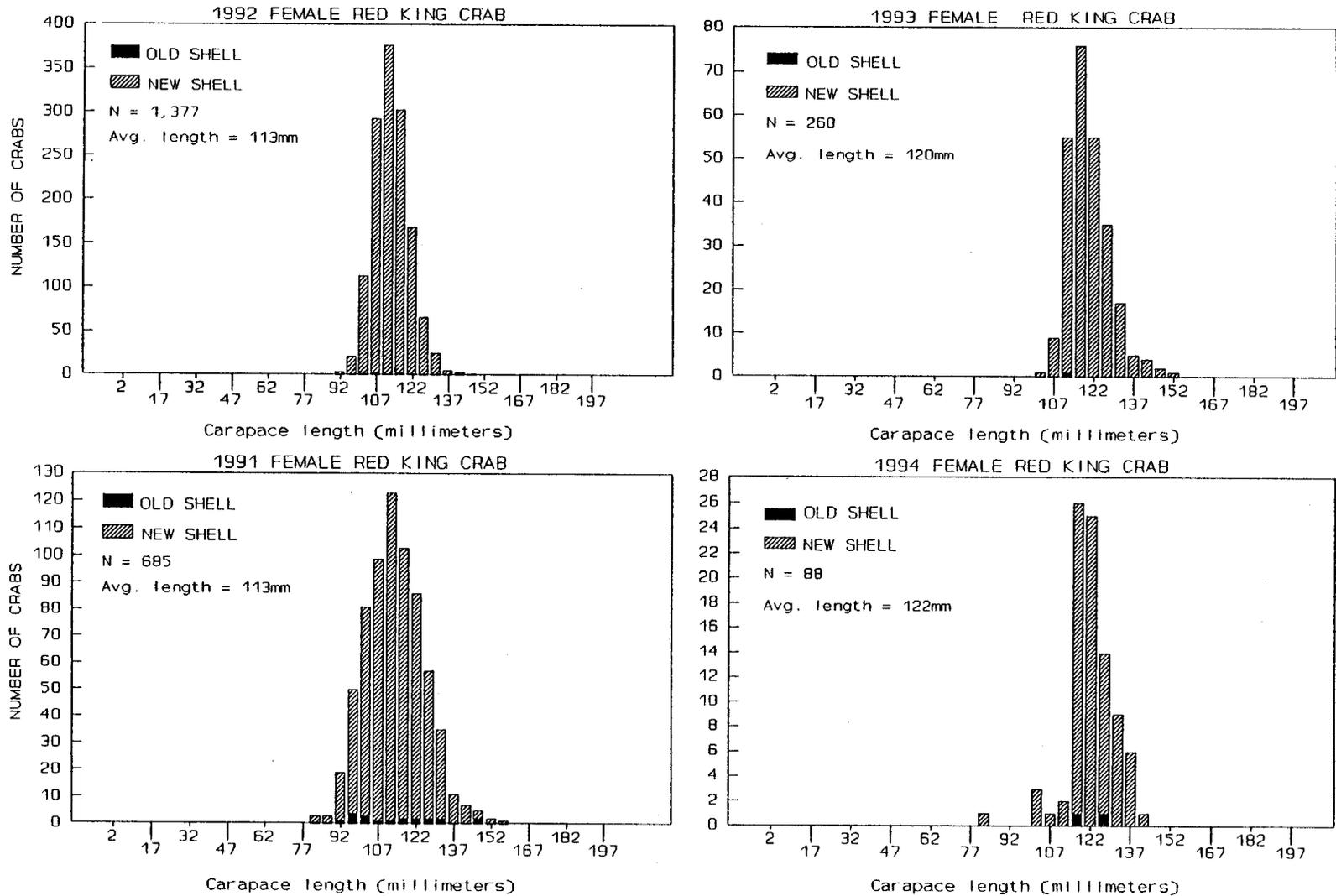


Figure 14. Carapace length distribution histograms of all red king crab females observed in the 1991, 1992, 1993, and 1994 Adak Area fishery.

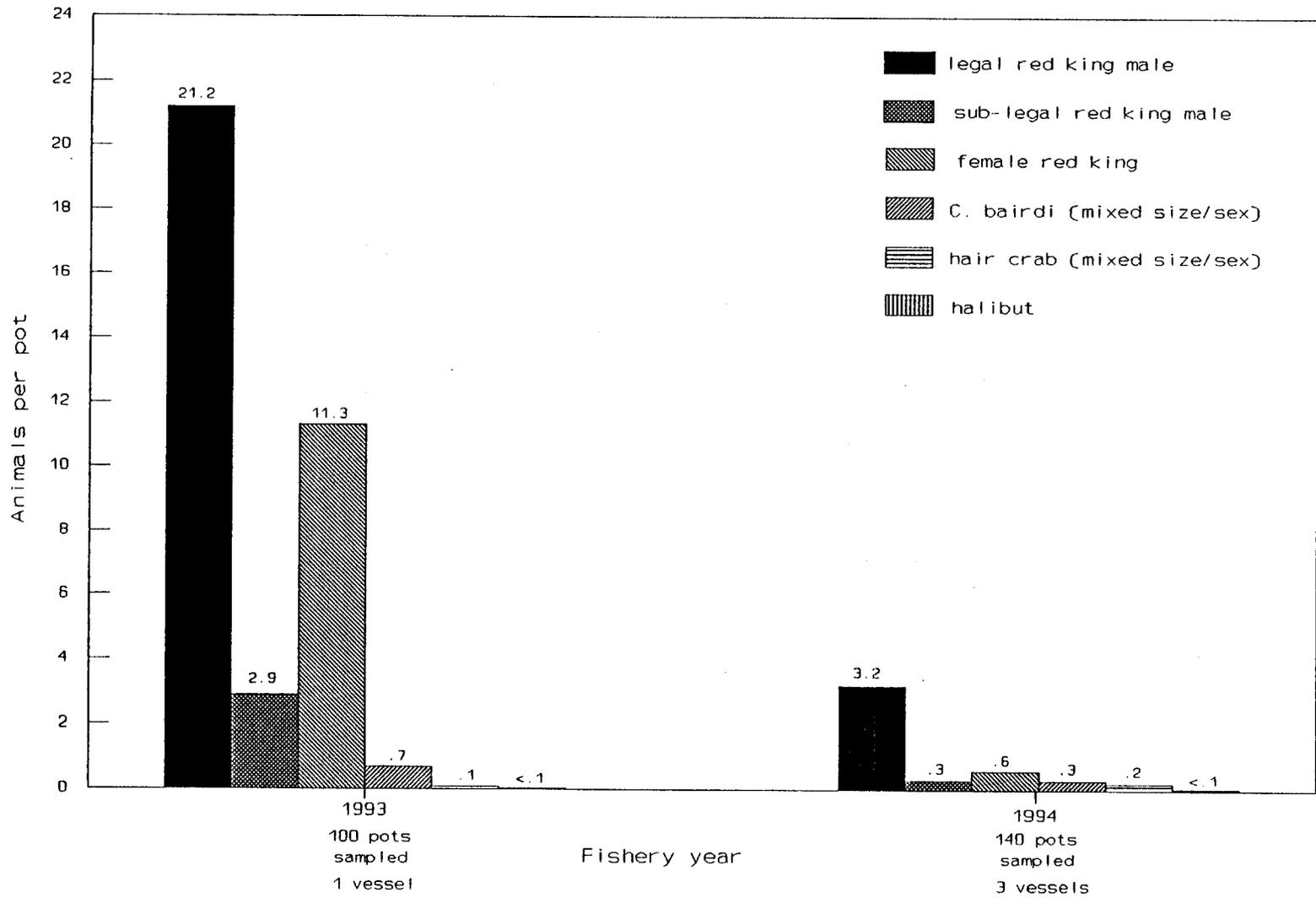


Figure 15. Catch per pot of selected species during the 1993 and 1994 Adak Area red king crab fishery.

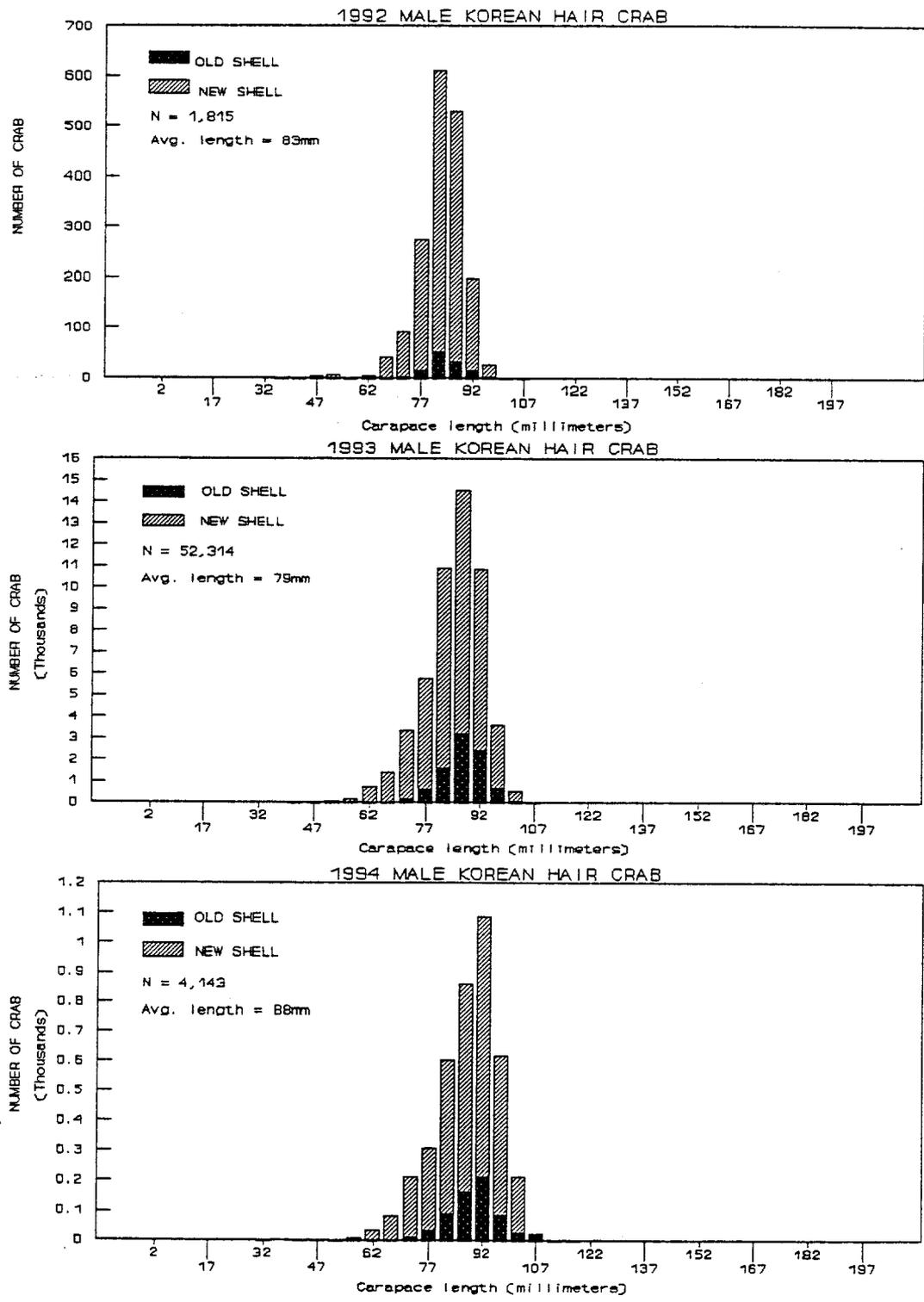


Figure 16. Carapace length distribution histograms of all Korean hair crab males observed in the 1992, 1993 and 1994 Bering Sea fishery.

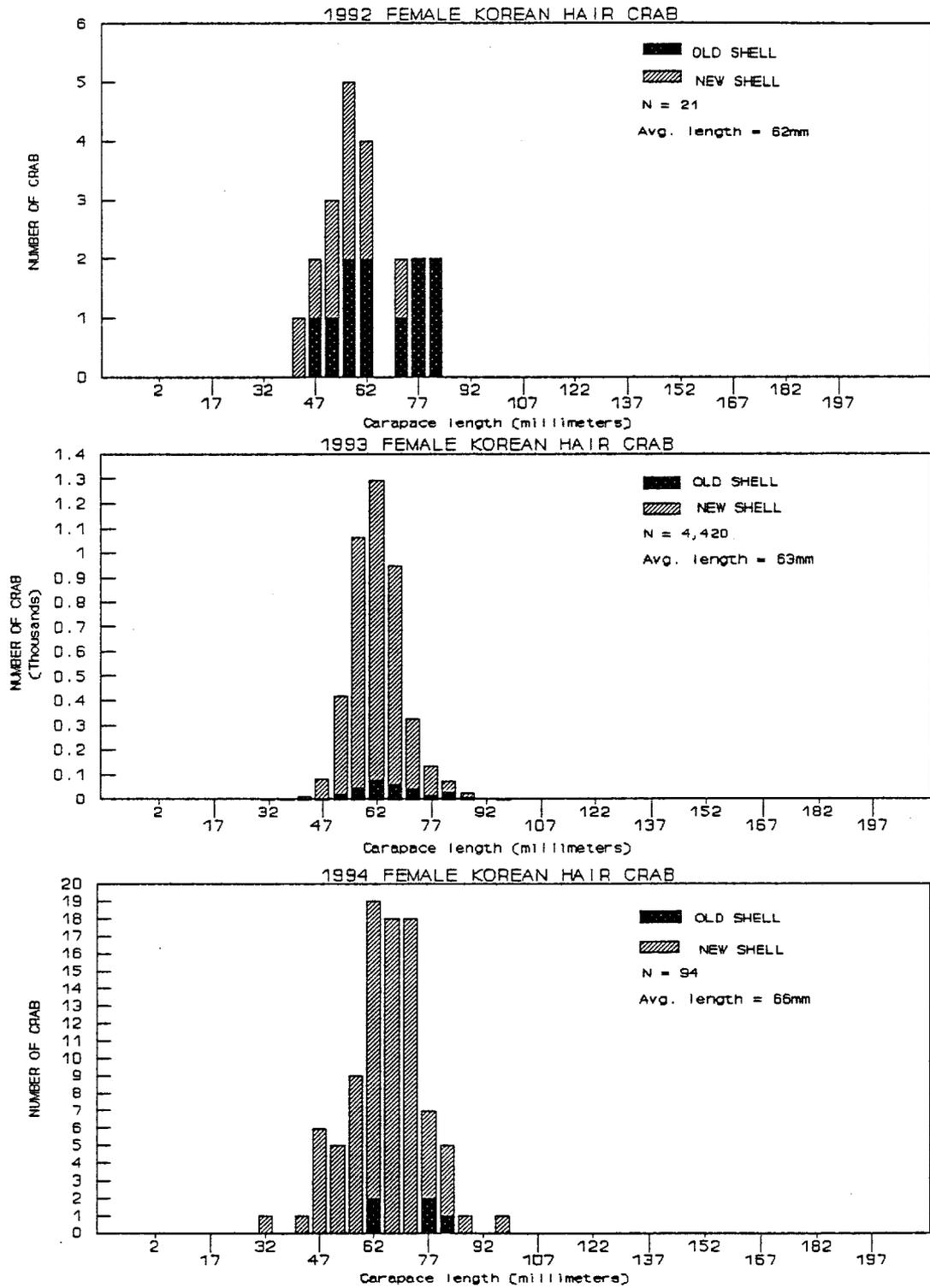


Figure 17. Carapace length distribution histograms of all Korean hair crab females observed in the 1992, 1993 and 1994 Bering Fishery.

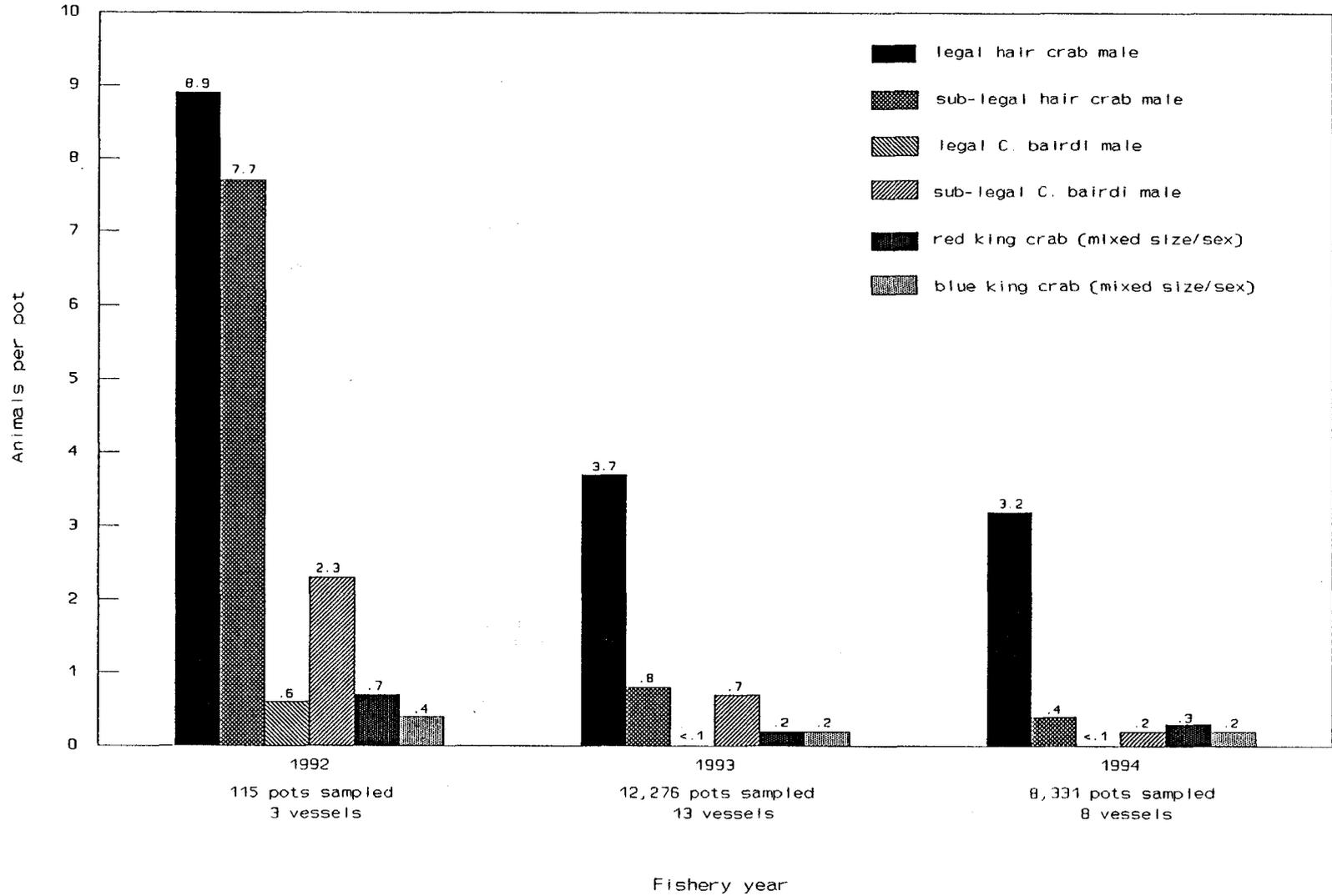


Figure 18. Catch per pot of selected species during the 1992, 1993 and 1994 Bering Sea Korean hair crab fishery.

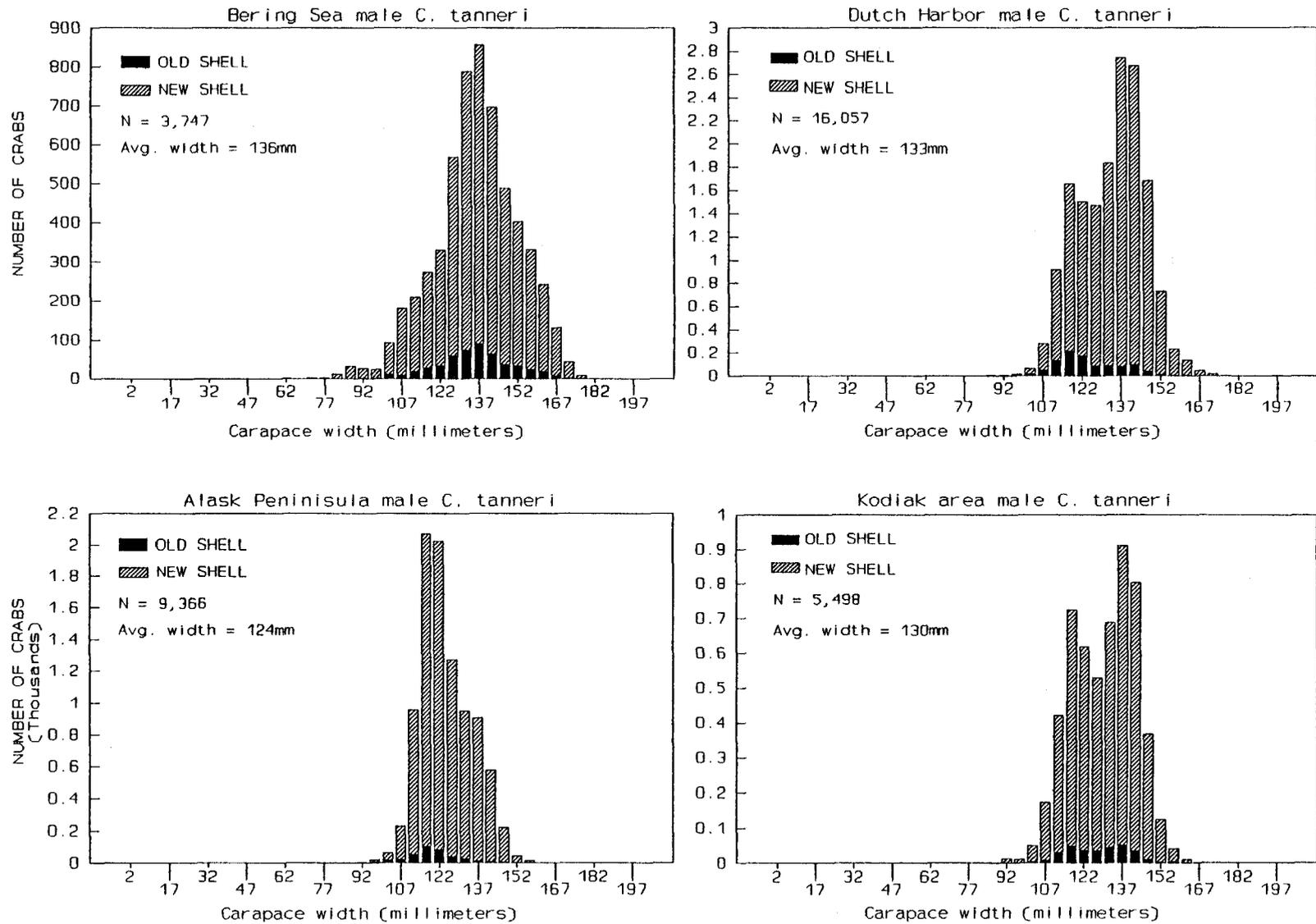


Figure 19. Carapace width distribution histograms of all *C. tanneri* observed in the 1994 Bering Sea, Dutch Harbor, Alaska Peninsula, and Kodiak Area fisheries.

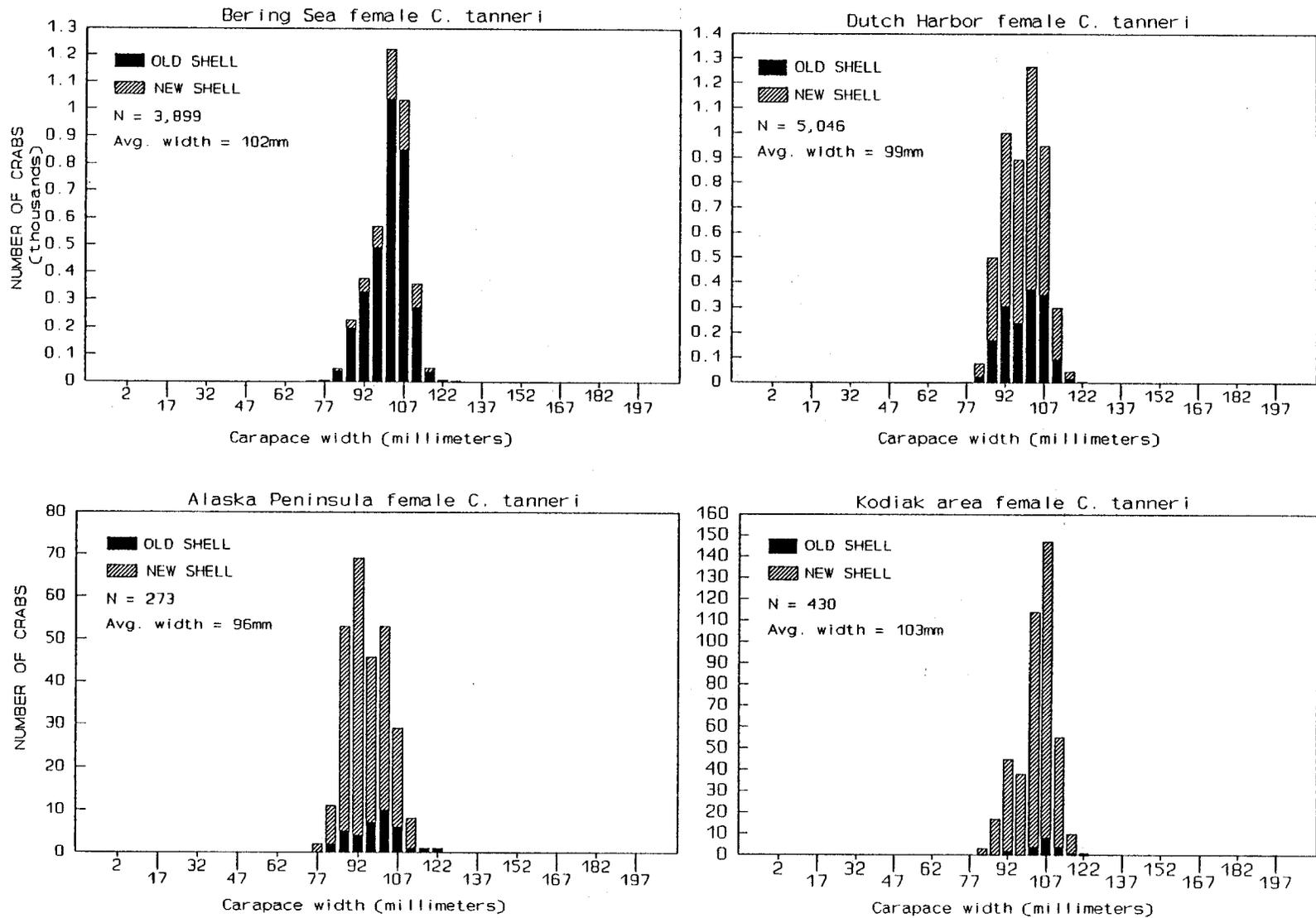


Figure 20. Carapace width distribution histograms of all *C. tanneri* females observed in the 1994 Bering Sea, Dutch Harbor, Alaska Peninsula, and Kodiak Area fisheries.

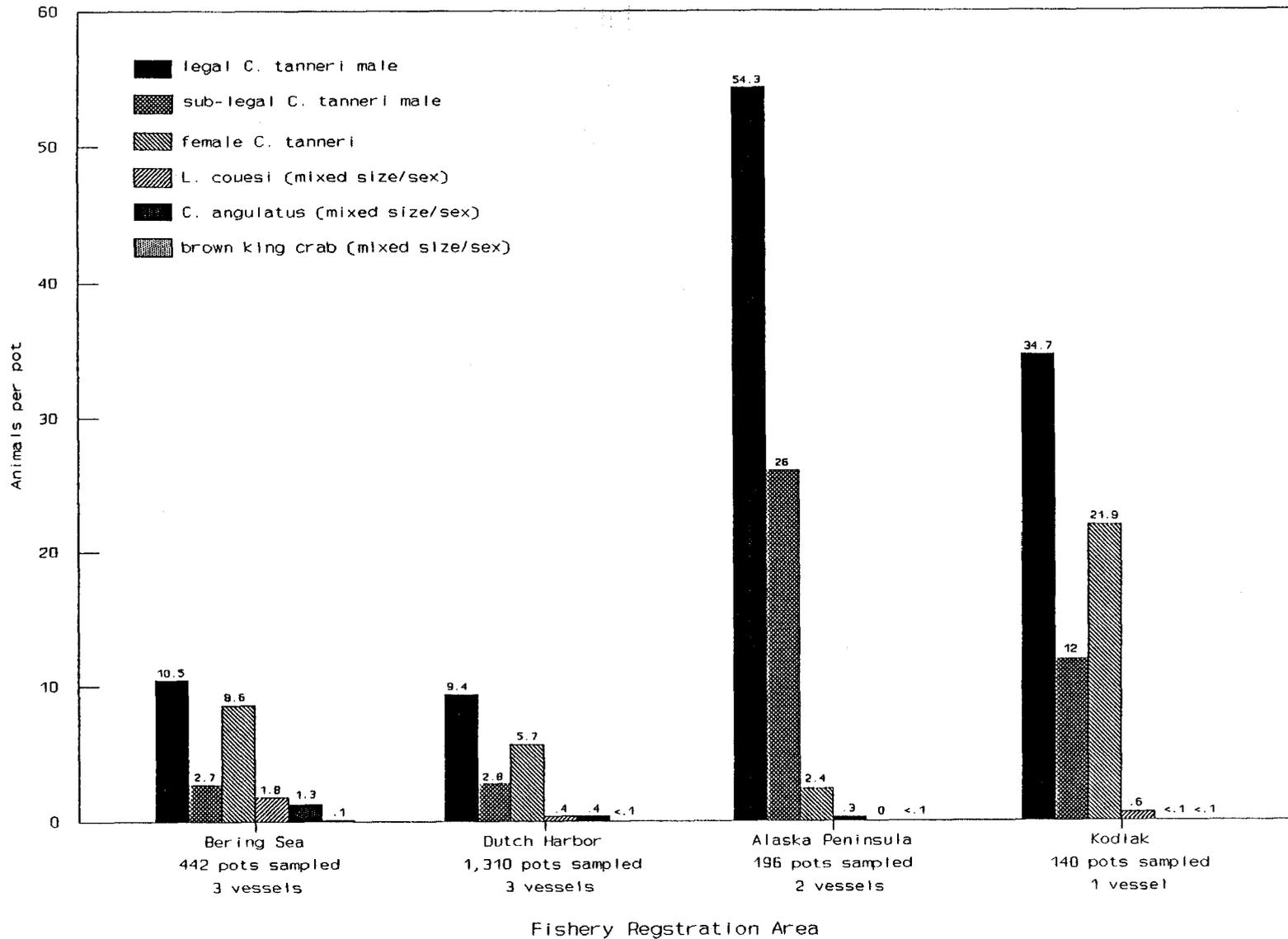


Figure 21. Catch per pot of selected species from the 1994 Bering Sea, Dutch Harbor, Alaska Peninsula, and Kodiak Area *C. tanneri* fisheries.

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