ALASKA DEPARTMENT OF FISH AND GAME
SUMMARY OF THE 2000 MANDATORY SHELLFISH OBSERVER PROGRAM DATABASE FOR THE OPEN ACCESS FISHERIES

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ABSTRACT

Data collected by mandatory observers onboard vessels participating in five 1999-2000 Bering Sea/Aleutian Islands open access crab fisheries are summarized. Estimates of CPUE and standard error of legal retained crabs for targeted species as well as bycatch of females, sublegal males, and selected nontarget species are provided. Sample pot locations are provided in separate charts for each fishery. Catch rates of targeted species are displayed by depth and soak time.

CPUE for retained snow crabs was down from the previous season; bycatch rates of female and sublegal male snow crabs were also down. The percentage of new-shelled male snow crabs was similar to the previous two seasons; females were nearly absent in the bycatch samples.

CPUE for retained legal red king crabs in the Bristol Bay fishery was up slightly from the 1999 season, and bycatch of females and sublegal males also increased. The number of recruit-sized males decreased in the 2000 samples, reversing an increase apparent in the 1999 season.

Data from the Aleutian Islands golden king crab management area are summarized separately for the areas east and west of 174° W longitude. Mean CL for male golden king crab east of 174° W in 2000 was similar to the 1999 fishery; the CL mode was a post recruit size class as in 1999. Approximately 75% of all golden king crabs caught in both the 1999 and 2000 fishery east of 174° W and in the 1999/2000 fishery west of 174° W were females and sublegal males. New-shell was the predominant shell age class for both male and female golden king crabs throughout the Aleutian Islands.

The Bering Sea hair crab fishery was discontinued by the participating vessels due to very low catch rates of legal crabs.

INTRODUCTION

In the spring of 1988, the Alaska Board of Fisheries (BOF) mandated at-sea observer coverage for all vessels processing red king crabs *Paralithodes camtschaticus*, blue king crabs *Paralithodes platypus*, golden king crabs *Lithodes aequispina* and Tanner crabs *Chionoecetes bairdi* in state waters. In 1990 the BOF amended observer coverage regulations to include at-sea processors in the Bering Sea snow crab *C. opilio* fishery, and in 1995 observer requirements were adopted for vessels fishing king crabs in Aleutian Island waters. In addition to establishing fixed levels of observer coverage in these fisheries, the BOF has granted the Alaska Department of Fish and Game (ADF&G) authority to place observers on commercial fishing vessels participating in other shellfish fisheries. This is primarily in circumstances when such action constitutes the only practical means for gathering data or enforcing regulations. Observer coverage implemented in recent years under this provision has included all vessels fishing for hair crabs *Erimacrus isenbeckii*, scarlet king crabs *Lithodes couesi, Paralomis multispina* (a deep-water king crab species), grooved Tanner crabs *C. tanneri* and triangle Tanner crabs *C. angulatus*. Observer coverage has also been required on most vessels participating in crab fisheries occurring under the recently implemented Community Development Quota (CDQ) Program. This report does not include data collected during the CDQ fisheries; however, that information is available from ADF&G Westward Region.

During most deployments their primary duties are to collect biological data and record vessel catch, bycatch and effort, however, in some situations an observer's activities are prioritized to monitor and document fishing vessel activities for regulatory compliance. These data are used for a number of applications including the development of models for estimating relative stock abundance, defining male and female crab size/age distributions, chronicling species reproductive cycles, quantifying levels of incidental bycatch, and producing preseason projections of fishery performance. Ultimately, the shellfish observer database provides a source of information crucial to the comprehensive management of Alaska's shellfish resources.

ADF&G Westward Region staff maintains the database of biological and regulatory compliance information generated by observer deployments. Archived information ranges from gear types fished, pot locations and soak times, to the species composition, size distribution and reproductive condition of the sampled catches.

Data compiled in this report were collected primarily within the 2000 calendar year for open access fisheries only. Due to the substantial volume of available information, the scope of the data presented has been narrowed to include the size and shell ages of targeted crabs, the documented incidence of illegally retained crabs, and general catch and effort information resulting from sampled pots. Since 1995, statistical estimates of catch per pot pull and total catch of selected species and fisheries using harvest data have also been included. Additionally, a summary of all species encountered in pots sampled from each fishery has been included.

Any inconsistencies between previously published shellfish observer database reports and findings presented in this document are the result of updated databases and summaries, and interpretation of historical data.

METHODS

Comprehensive shellfish observer sample methods are outlined in the most recent edition of the ADF&G Shellfish Observer Field Manual (ADF&G 1998). Methods described in this report correspond only to the data presented and are not inclusive of all observer sampling duties.

Terms

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

Carapace Length (CL) – the straight line distance from the posterior margin of the right eye orbit to the medial-posterior carapace margin; CL is the biological size measurement of hair crabs and all species of king crabs

Carapace Width (CW) – the straight line distance at greatest width forming a right angle to a line midway between the eyes to the medial-posterior margin, not including the spines; CW is the biological size measurement of all species of Tanner crab

Legal Measurement – the straight line distance across the carapace of male crabs forming a right angle to a line midway between the eyes to the medial-posterior margin, including the spines

Catch per unit effort (CPUE) - the value (or estimated value) representing the mean catch of crabs for a standardized unit of fishing effort; in this report CPUE represents the mean catch per pot

Mature – male and female crabs that have attained a biological size where at least 50% 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 where at least 50% or more of a random sample of individuals are physiologically capable of mating

Soft-shell – exoskeletons that are newly molted (zero to two weeks old) and not yet hardened

New pliable-shell – exoskeletons which are thin, and flexible, and not fully calcified (two to eight weeks old)

New-shell – exoskeleton eight weeks to 12 months old (8 weeks to eighteen months for golden king crabs).

Old-shell –	exoskeleton more than 12 months and up to 24 months old (up to 36 months for golden king crabs).
Very old-shell –	exoskeleton more than 24 months old (more than 36 months old for golden king crabs)
Uneyed eggs–	early developmental stages of an egg with no distinguishing marking
Eyed eggs –	later developmental stages of an egg distinguished by dark eye spots
Ovigerous –	female crabs bearing eggs, either eyed or uneyed
Mated/barren –	female crabs not carrying eggs but displaying evidence of previous mating activity
Non-mated/barren –	female crabs not carrying eggs and not displaying evidence of previous mating activity
Recruit –	a new-shelled male crab of legal size in its first year of availability to the commercial fishery
Post-recruit –	a male crab of legal size and not classified as a recruit

Sampling Duties

During the 2000 Bering Sea/Aleutian Islands shellfish fisheries, observers were deployed on catcher-processor vessels, floater-processor vessels and catcher-only vessels. Observers deployed on floater-processors had access only to pre-sorted, retained catches, while those placed on catcher-processor and catcher-only vessels were able to examine the contents of fished pots prior to sorting.

Floater-Processors

Principal observer sampling duties onboard floater-processors (FP's) include monitoring deliveries from catcher-only vessels for compliance with regulations regarding legal retention of crabs by species, size and sex. Sampling procedures consist of randomly selecting and examining up to 600 crabs from each vessel's catch. This sample type is referred to as a 'legal tally'. Additional data collected from deliveries to floater-processors include biological measurements of 100 crabs randomly selected from each delivery to determine carapace size distribution, and average weights of crabs determined by counting the number of crab in weighed brailers. This type of sampling is referred to as 'biological measurements of retained crabs'.

Catcher-Processors

Observers deployed on catcher-processors (CP's) conduct a legal tally and take average weights and biological measurements of retained crabs each day the vessel retains catch. They also sample randomly selected pots for catch composition. This is referred to as 'bycatch sampling'. Methods for collecting bycatch samples include identifying and enumerating all species in the pot and recording legal and retention status, biological size, shell age, sex, and general health and vitality of all commercially important crabs. Female crabs in sampled pots are also evaluated for reproductive condition.

On occasions when catcher-only vessels make deliveries to catcher-processors, the observer samples the catch as if they were deployed on a floater-processor.

Catcher-Only Vessels

Data collection objectives for observers onboard catcher-only vessels are similar to those for catcher-processors, although bycatch sampling is usually the prioritized activity. Average weight determinations, legal tally and biological measurements of the retained crabs are only conducted when the vessel delivers to a processing facility. If deliveries are made at-sea, the legal tally, biological measurements of retained crabs, and average weight samples are collected concurrently by the observer deployed on each vessel.

Daily sampling goals for observers on board catcher-processor and catcher-only vessels (e.g., quantity of fished pots examined and number of crabs measured) are dependent upon a number of variables anticipated during the fishing season. These variables include special data collection projects and the order of sampling priorities established by ADF&G. Fishery-specific sample goals are discussed in subsequent sections where appropriate.

Ad hoc research data collection projects were assigned to observers deployed on catcher-processors and catcher-only vessels during several of the 2000 fishing seasons. These projects included

recording morphometric measurements for size-at-maturity of snow crabs,
pot escape mechanism studies,
collecting individual weights from non-retained hair crabs and red king crabs,
tag recoveries from king crabs in Bristol Bay and the Aleutian Islands,
sampling crabs in all observed fisheries for handling injuries, and
on-deck air exposure resulting from catch sorting.

The results from these investigations have not been included in this report, however, that information is available from ADF&G Westward Region.

Estimation of CPUE and Total Fishery Catch

Estimates for CPUE and their standard errors were generated using weighted mean and variance formulas for stratified sampling (Cochran 1977). These formulas are listed in Appendix A-1. With this technique each vessel-day is considered a separate stratum. The weights (w_{ij}) reflect

the relative importance of a vessel's daily effort (pots pulled) compared to all the days on which fishing occurred for that vessel. The result is the greater the number of pots fished on a given day, the greater the weight for the samples collected on that day. Variances were calculated for each vessel-day and then summed over all days and all vessels for the entire fishery.

As can be seen in the tables displaying CPUE estimates and their standard error estimates, there are several ways to calculate CPUE. Multiple estimates are included to provide a range of information and a basis for comparison. The 'sample CPUE' is generated from observer data and is based solely on the sampled bycatch pots. This is the estimate that has been reported in past observer reports (Tracy 1994, 1995a, 1995b). It is calculated as total catch from sampled pots divided by total pots sampled. The 'weighted CPUE' uses the Cochran stratified technique as described above and in Appendix A-1. The 'actual total fishery (ATF) CPUE' is based on fish ticket information as reported in the Regional Information Reports for commercial crab fisheries in the Bering Sea and Aleutian Island Management Areas. The 'actual observed fleet (AOF or CI) CPUE' is generated from information collected during confidential interviews with the vessel's captain, which are performed by onboard observers or dockside samplers. The ATF and CI CPUE's are generated for retained legal crabs only. Both provide information on total catch of retained crab, total pots pulled and fishing locations. Information from confidential interviews is often recorded on a daily basis and is generally considered more accurate than information obtained from fish tickets (fish tickets reflect an entire trip between deliveries).

An estimated total catch is derived by multiplying an estimated CPUE by the total number of pots pulled in the fishery. For those fisheries with 100% observer coverage the total pots pulled information is taken from confidential interviews. Otherwise the total pots pulled data is generated from fish ticket summaries.

When viewing CPUE and total catch estimates for both the directed catch and bycatch, the reader should note the precision and accuracy of the estimates. Precision is indicated by the standard errors. Accuracy is gauged by the comparability of the estimates for legal retained crabs obtained from observer data with those obtained from confidential interviews and fish tickets. The reader should also take note of whether the CPUE and total catch estimates provided here were based on data gathered by observers deployed on all participating fishing vessels or by observers deployed on catcher-processor vessels only. Application of CPUE estimates obtained from catcher-processor vessels to the entire fishing fleet assumes that catch rates for that distinct portion of the fleet are comparable to the remaining catcher-only vessel component of the fleet.

RESULTS

Bering Sea Snow Crab

During the 2000 fishing season observers were deployed on 9 catcher-processor and 11 floater-processor vessels. The fishery took place in early April instead of the usual mid-January opening due to extensive sea-ice coverage on the fishing grounds. The bycatch-sampling goal for observers on catcher-processors was 4 pots during each day of fishing activity. Due to cold weather conditions typically associated with the timing of the snow crab fisheries, the large number of crabs per pot routinely taken, and the corresponding potential for excessive handling

mortality attributable to sampling, catches in 3 of 4 pots were identified to species and enumerated but not measured or otherwise assessed for ancillary characteristics. Concerns over cold weather exposure did not result in modification of sample protocols for legal tallies and biological measurements of retained crabs, which were collected both from catcher-processors and from deliveries to floater-processors. In addition, observers deployed on both vessel types obtained individual vessel daily catch and effort statistics and an average weight of retained crabs. A total of 173 pots selected for bycatch sampling accounted for well below one percent (0.1%) of the 170,064 pot lifts reported by vessel operators during the 7 day season (ADF&G Westward Region, *in press*). Locations of pots sampled by observers during the 2000 Bering Sea snow crab fishery are displayed in Appendix B-1.

Measurements of nearly 26,000 retained snow crabs were taken throughout the 2000 season by onboard observers and by ADF&G staff stationed at shore-side processing locations. A summary of these measurements and those taken at processors during the preceding 3 fishing seasons is provided in Table 1. At 111.3 mm the mean CW of crabs harvested in 2000 was similar to the 1998 and 1999 seasons and a slight increase from the 1997 season. Since 1993 the mean CW of retained snow crabs has varied annually by 4 mm or less.

Measurements of CW were also taken from 7,561 male snow crabs (including legal-sized, retained and non-retained males and sublegal males) in bycatch samples. A 5 mm-interval histogram of these size measurements revealed a single mode between 105 and 110 mm (Figure 1). These results are similar to results of samples collected in 1999 and 1998, which indicated a slight upward shift in CW from the 1997 season toward a greater proportion of legal males in the size distribution of crabs sampled in bycatch pots. There also appears to be a corresponding upward shift in the CW size frequencies of old-shell crabs from 1998 to 2000.

A very small number of female snow crabs (n = 6) observed in bycatch samples produced a mean CW of 76 mm (Figure 2). This CW is 15 mm more than the female average in 1999 and 10 mm more the 1997 and 1998 female averages. The discrepancy in female CW is likely due to the small number of individuals in the sample rather than an increase in CW in the population. These results do continue to indicate that, like males, most pot-caught females are mature crabs.

The stratified estimates of CPUE for targeted and non-targeted crabs encountered in the 2000 Bering Sea snow crab fishery are presented in Table 2. These estimates, derived from observer pot samples, are weighted by the daily total number of pots pulled by a vessel and may vary somewhat from non-stratified estimates of CPUE found in Figure 3. The weighted CPUE estimate of 114.3 legal retained snow crabs per pot represents a 9% decrease from the results of the 1999 fishery (126.0) and a 32% decrease from the 1998 fishery (167.2). It is similar to CPUE estimates from the 1995 and 1996 snow crab fishery seasons of 110.0 and 117.9, respectively. The estimated weighted CPUE for legal retained crabs (snow and tanner/snow hybrids combined) is nearly 13% less than the fish ticket CPUE estimate (136.8) and 14% less than the confidential interview CPUE estimate (139.1). As discussed in the 'Accuracy and Precision of CPUE Estimates' section (page 16), precision of the weighted estimate appears to be quite good as the standard error of the estimate accounts for less than 6% of the estimated mean CPUE. About 18% of the total catch of snow crabs was discarded as bycatch, most of which were legal crabs of less than 4 inches (102 mm) CW. Although the legal size for snow crabs is 3.1 inches (79 mm) CW, processing plants do not generally accept crabs less that 4 inches CW.

The 'sample' CPUE's of legal-sized, retained, male snow crabs for the 2000 fishery increased by 10.6 crabs per sampled pot compared to the 1999 fishery (Figure 3). With the exception of Tanner/snow crab hybrids, overall non-target crab catch rates have decreased steadily from the 1997 to the 2000 season. Most notable was the decline in catches of legal-sized but non-retained male snow crabs, which dropped to a four-year low CPUE of 25.2 (Figure 3). The Tanner/snow hybrid CPUE was 6.3, the lowest since 1996. Total catches of all animals identified in sampled pots during the 2000 season are provided in Table 3.

Catch rates of snow crabs by soak hours from sampled pots varied by the sex and size of the crabs. The mean CPUE's by six-hour intervals for female and sublegal male crabs remained low and mostly constant over time (Table 4). Catch rates of legal-sized retained male crabs were the highest and the most variable. Peak CPUE's for legal retained crabs occurred for pots soaked for about 24 to 48 hours. A similar pattern occurred for legal non-retained male crabs, but the rates were an order of magnitude lower. Plots depicting male snow crab mean CPUE's by soak hours are provided in Figure 4. In these plots the mean catch by hours soaked is plotted along with a LOWESS line. LOWESS stands for LOcally WEighted Scatter plot Smother. This is a statistical procedure that calculates smooth line relationships for the points on a bivariate plot (Minitab, 2000). It can be thought of as a moving average. The plots for legal male snow crabs, both retained and not retained, show peak CPUE's at around 30 hours of soak time. The peak CPUE for sublegal male crabs is slightly less than that for legal males. There were too few females in the 2000 bycatch samples to warrant plotting.

Mean CPUE's by two-fathom intervals for legal-sized retained and non-retained male snow crab peaked at fishing depths of around 63-64 fathoms while sublegal male mean catch rates were relatively constant over the depth ranges fished (Table 5). Mean catch rates for females were quite low at all depths. Eighty-five percent of the pots sampled were fished at depths from 60 to 75 fathoms. Plots depicting snow crab mean CPUE by depth are provided in Figure 5. Plots for legal males indicate peak catch rates at around 62 fathoms for legal/retained male crabs and slightly deeper at around 68 fathoms for legal/not retained crab. Catch rates for sublegal male crabs had a similar pattern to legal crabs but in general were much lower.

Snow crab shell age statistics summarized from bycatch samples showed very similar percentages of new-shelled male snow crabs for the 1998, 1999 and 2000 seasons (Table 6). These represent a slight decrease in the percentage of new-shelled male crabs from the peak value from the 1997 season (Figure 6). New-shelled snow crab females have been absent or nearly absent from samples taken from 1997 to 2000. In contrast, new-shelled females accounted for 36% of crabs sampled during the 1996 fishing season.

One (16.7%) of the 6 female snow crabs sampled from the bycatch during the 2000 season was carrying uneyed eggs, 1 was barren but previously mated and 4 (66.7%) were barren and unmated. The numbers of female snow crabs carrying eggs in 1999 samples had a large increase from the 1998 season and were also the highest percentage since 1995. (Table 7). However, the small sample sizes of females for the last 3 seasons make these results less reliable.

Legal tallies conducted on catcher-processors and on catcher-only vessels delivering to shore-based and floating processors totaled over 90,000 crabs by the end of the 2000 season and comprised less than 1% of the cumulative reported harvest (Table 8). Just 0.3% of sampled

crabs were deemed illegal due to size, sex or species, the same proportion of total landed crabs as during the 1997 season and only 0.1% more than the previous two consecutive years.

Bristol Bay Red King Crab

At-sea observers were deployed on 7 catcher-processors and 14 catcher-only vessels during the 2000 Bristol Bay red king crab season. The bycatch sample goal for observers on catcher-processors was 10 pots during each day of fishing activity. Whenever possible the contents of all pots sampled were identified to species, counted, measured and otherwise assessed for ancillary characteristics. A total of 673 pots selected for bycatch sampling accounted for 0.7% of 98,694 pot lifts reported by vessel operators during the 4 day season (ADF&G Westward Region, *in press*). Locations of pots sampled by observers during the 2000 Bristol Bay red king crab fishery are displayed in Appendix B-2.

Measurements of more than 14,000 red king crabs delivered to catcher-processors and floater-processor and shore-side processing locations produced a mean CL of 150.6 mm, which is 2.6 mm more than the mean for the 1999 season and 1.2 mm less than the mean CL for the 1998 season (Table 9). Similar to past seasons, retained crab CL was grouped tightly around five 5 mm intervals falling between 136 and 160 mm. Crabs in this size range accounted for 81.7% of all retained crabs in 2000.

Mean CL of male red king crabs from pots sampled in 2000 was 132.4 mm, 7.9 mm less than in 1999 (Figure 7). Recruit-sized crabs (137 to 154 mm CL) which comprised the predominant sizes during the 1997 season and had decreased substantially in 1998 appeared to increase in 1999 and 2000. Recently matured (pre-recruit) males appeared to decrease from 1998 to 2000. Notable in the length frequency histograms are the increases in the proportions of old-shell males in the pre-recruit and recruit sizes and the appearance of a immature mode which is reminiscent of the 1996 male length frequency histogram (see Moore et al. 2000a).

Nearly 1,500 female red king crabs were observed in sampled pots in 2000 representing a dramatic increase from the 36 females sampled in 1999. The mean CL of 93.4 mm was nearly 31 mm smaller than the mean CL estimated from sample measurements taken during 1999 and 19 mm smaller than the 1998 mean (Figure 8). Notable in these histograms is the appearance of a dominant mode for females in the 80-90 mm CL range in the 2000 samples.

The stratified estimates of mean CPUE for selected targeted and non-targeted crabs in the 2000 Bristol Bay red king crab fishery are presented in Table 10. The weighted estimate of 12.8 legal retained males per pot lift represents a 4.5% decrease from the 1999 season estimate and a 20% decrease from the 1998 estimated CPUE. The weighted estimate is close to estimates generated from fish tickets (11.8) and confidential interviews (12.4). This estimate is fairly precise as the standard error of the weighted estimate for legal retained males represents 10% of the mean CPUE estimate. The estimate for sublegal males is less precise, with the standard error accounting for about 13% of the estimated mean. Bycatch rates of sublegal males increased substantially as did the bycatch rate of females. An estimated 50% of all male red king crabs captured during the 2000 fishery were discarded as bycatch.

The sample CPUE estimate for legal male red king crabs increased in 2000 by more than 1 crab per pot from 1999, but was still greater than 3 crabs per pot less than the 1998 season (Figure 9). The catch rates of sublegal red king crab males increased by 7 crabs per pot from the 1999 season, but it was still less than the 21.5 sublegal crabs per pot in 1998. Female red king crabs were more common in pots in 2000 after being nearly absent in sampled pots in the 1997 and 1999 seasons, but still noticeably less than the 28 female crabs per pot in 1998. CPUE's of all other commercially important crabs remained at the low bycatch levels seen in 1999. Catches of all animals encountered in sampled pots are provided in Table 11.

Soak periods for sampled pots ranged from 8 to 48 hours and averaged 21.9 hours. Catch rates of legal-sized male red king crabs generally increased with the hours soaked (Table 12 and Figure 10). Plots of mean estimated CPUE's for sublegal male crabs showed a maximum around 20 to 24 hours but the mean estimated catches were generally 10 to 20 crabs per pot over the range of sample soak hours for both legal and sublegal males. CPUE of female red king crabs was negligible for all soak times (Figure 10).

The fished depth of sampled pots ranged from 17 to 51 fathoms. Mean estimated CPUE's for legal male crabs were three crabs in depths less than 25 fathoms but increased to CPUE's of 13 to 16 crabs at 25 to 40 fathoms (Table 13 and Figure 11). This trend was similar for sublegal male crabs. For female red king crab, the mean estimated CPUE in sampled pots was generally five crabs or less for depths more than 25 fathoms. In depths less than 25 fathoms the mean estimated catch was as high as 15 female crabs per pot.

Shell-age compositions for the 2000 season were different from results from the 1996 through 1999 seasons. Shell-age composition of red king crab males sampled in 2000 included 78.5% new-shell crab, a decline of about 10% from the previous four years (Table 14 and Figure 12). The proportion of very-old shelled crabs in the sample were similar to the 1998 and 1999 fisheries and the 10% difference was principally due to an increase in the number of old-shelled crabs in 2000. The increase in old-shelled male crabs was also noted in the discussion of Figure 7. Unlike 1996 to 1999 where all female crabs sampled during each of the three seasons were characterized as new-shelled, eight old-shelled females (0.5%) and one (0.1%) very-old-shelled female were found in the 2000 fishery bycatch samples.

Adequate numbers of female red king crab were present in the bycatch samples from the 2000 Bristol Bay fishery to assess their reproductive condition. Unlike the previous 3 seasons, a large proportion of the females examined (73.2%) were barren and non-mated (Table 15). Twenty-six percent of the female crabs observed during the fishery were carrying clutches of eggs and, of those, 15% were eyed eggs. Only 7 (0.5%) of the females were classified as barren and mated.

Legal tallies conducted on catcher-processors and on catcher-only vessels delivering to shore-based and floating processors totaled over 32,000 crabs by the end of the 2000 season and accounted for almost 3% of the reported harvest from catcher-processors and floater-processors (Table 16). Less than one percent of sampled crabs were illegally harvested due to size, sex or species, similar to sample proportions calculated for each of the preceding 4 years.

Aleutian Islands Golden King Crab

In March 1996, the BOF established the Aleutian Islands King Crab Registration Area by combining two existing areas, Dutch Harbor and Adak. The BOF established September 1 as the season opening date for the new area, and an annual closure by emergency order. The Board subsequently changed the season opening to 15 August. In addition, the BOF directed the department to manage golden king crab of the Aleutians Islands found east and west of 174° W longitude as two distinct stocks (ADF&G Westward Region, 1999). In the past data collected east and west of 174° W longitude were reported as a unit. However, the data included in this report are separated by area (east and west of 174° W longitude). Included are the 2000/2001 fishery for east of 174° W longitude and the entire 1999/2000 season west of 174° W longitude. Legal tally sampling data from the Aleutian fishery remain combined for the entire registration area but will be reported separately in the future.

Aleutian Islands East of 174° W Longitude

The 2000 Aleutian Islands golden king crab fishery east of 174° W longitude began on 15 August 2000 and concluded on 24 September 2000 (ADF&G Westward Region, *in press*). Current regulations stipulate 100% observer coverage for this fishery. During the 2000 fishing season observers were deployed on 15 catcher-only vessels. The bycatch sampling goal for observers on catcher-only vessels was to identify to species, measure and count the contents of 4 randomly selected pots per day. In addition, the contents of 10 additional pots were to be identified to species and counted. The 5,041 pots selected for bycatch sampling accounted for 7% of the 71,551 pot lifts reported by vessel operators during the 39 day season (ADF&G Westward Region, *in press*). Locations of pots sampled by observers during the 2000 Aleutian Islands golden king crab fishery east of 174° W longitude are displayed in Appendix B-3.

A total of more than 5,000 measurements of retained golden king crabs were taken throughout the season by onboard observers and by ADF&G staff stationed at shore-side processing locations. A summary of these measurements and those taken during the three previous fishing seasons are provided in Table 17. At 147.0 mm the mean CL of crabs harvested in 2000 differs by 1 mm or less than the previous three seasons

Measurements of CL were also taken from more than 30,000 male golden king crabs (including legal-sized, retained and non-retained males and sublegal males) in bycatch samples. These measurements are displayed in a 5 mm-interval histogram (Figure 13). The mean CL of 131 mm is 1 mm smaller than that from the 1999 fishing season. The histograms for the 2000 season and the previous three seasons are all very similar in distribution and shell composition. Measurements from approximately 13,615 female golden king crabs showed a mean CL of 113 mm, which is 3 mm smaller than the mean CL from the 1999 season (Figure 14). The histograms of the female CL for the past 4 seasons are also quite similar in distribution and shell age.

The stratified estimates of mean CPUE for golden king crabs are presented in Table 18. The estimate of mean CPUE for legal retained crabs exceeds that from fish tickets and confidential interviews by no more than one-half crab per pot. The weighted mean CPUE for legal retained male golden king crabs was precise, as the standard error accounted for just 4.8% of the estimated mean CPUE. The precision of the CPUE estimates for females and sublegal males

was also high at 6.3% and 9.0%, respectively. The bycatch of both female and sublegal male crabs exceeded the catch of legal retained male crabs; about 3 of every 4 golden king crabs caught were discarded. Non-targeted crab catch rates from bycatch samples were highest for sublegal golden king crab with a sample CPUE of 15.5 crabs. This was an increase from the 11.4 sublegal crabs per sampled pot during the 1999 fishery (Figure 15). Although in 2000 the CPUE of sublegal males again exceeded that for legal males for the fourth year in a row, CPUE of legal and sublegal crabs were more comparable in 1999 than during the other years shown on the chart. Total catches of all animals identified in sample pots are provided in Table 19.

Almost 70% of the sampled pots were soaked between 24 and 120 hours, while less than 1 percent of the pots had soak time greater than 264 hours (Table 20). Catch rates of golden king crabs were variable over soak time regardless of sex or size. Plots depicting mean estimated golden king crab CPUE by soak time in days are provided in Figure 16. For legal male crabs, CPUE increased steadily up to 240 hours (10 days) of soak time. After ten days the CPUE's were more variable but generally decreased. Sublegal male and female crabs were generally associated with increases in CPUE for the first 96 hours (4 days) after which the CPUE for sublegal male crabs generally remained constant and the CPUE for female crabs generally decreased

Over 71% of the samples were taken from depths ranging between 101 and 250 fm (Table 21). Plots depicting mean golden king crab CPUE by depth are provided in Figure 17. Catch rates of legal male golden king crabs were relatively constant over the depth ranges sampled, especially from 75 to 350 fathoms. Mean CPUE for sublegal-male and female golden king crabs were much more variable, but generally increased with depth until about 350 fathoms and decreased at depths greater than 350 fathoms.

Male and female golden king crab shell age statistics summarized from bycatch samples were similar to sample results from the previous 4 seasons with 95% of male crabs and nearly 99% of female crabs assessed as new-shelled (Table 22). In general the proportion of new-shelled males has decreased by 2.7% over the last 5 years (Figure 18).

Forty-five percent of female golden king crabs carried eggs in 2000. This represents a 2% increase from 1996 and 1999, a 6% increase from 1998, and it is similar to the 1997 season (Table 23). Of the 7,409 females without clutches, 4,666 (63%) showed signs of prior mating.

Legal tallies conducted on vessels participating in the Aleutian Islands golden king crab fisheries both east and west of 174° W longitude totaled nearly 120,000 crabs, almost 9% of the total harvest (Table 24). Less than 1% of the crabs sampled were illegally harvested and these were mostly illegal male golden king crab. These results are similar to those from the preceding three seasons.

Aleutian Islands West of 174° W Longitude

The 1999/2000 Aleutian Islands golden king crab fishery west of 174° W longitude opened 15 August 1999 and closed 15 August 2000; fishing activity occurred during every month of the season. Current observer requirements stipulate 100% coverage in this fishery. During the 1999/2000 fishing season west of 174° W observers were deployed on 1 catcher-processor and 14 catcher-only vessels. Bycatch sampling goals for observers on catcher-processors were 4 pots

per fishing day. The bycatch sampling goal for observers on catcher-only vessels varied from 6 to 10 pots per day fished depending on the type of pots fished and number of animals encountered. Catches in all pots were identified to species, enumerated, measured and assessed for other ancillary characteristics. A total of 4,576 pots selected for bycatch sampling accounted for 4.5% of 101,040 pot lifts reported by vessel operators during the season (ADF&G Westward Region, *in press*). The locations of pots sampled by observers during the 1999/2000 Aleutian Islands golden king crab fishery are displayed in Appendix B-4.

A total of nearly 24,000 measurements of retained golden king crabs were taken throughout the season by onboard observers and by ADF&G staff stationed at shore-side processing locations. A summary of these measurements and those taken during the 1996/1997, 1997/1998 and 1998/1999 fishing seasons are provided in Table 25. At 146.8 mm, the mean CL of crabs harvested in 1999/2000 is within 1 mm of the mean CL's for the previous three seasons.

Measurements of CL were also taken from more than 65,000 male golden king crabs (including legal-sized, retained and non-retained males and sublegal males) in bycatch samples. These measurements are displayed in a 5 mm-interval histogram and show results similar to samples collected in the 1996/1997 through the 1998/1999 seasons (Figure 19). As in the length frequency histograms from the golden king crab fishery east of 174° W, there is little change in the distribution of CL from year to year. The mean CL of 131 mm is the same as the previous fishing season and within 1 mm of the two seasons before that. Measurements from more than 45,000 female golden king crabs showed a mean CL of 124 mm, 2 mm less than the mean CL from the 1996/1997 and 1997/1998 seasons and the same as the 1998/1999 season (Figure 20). There is little change in the distribution of female size over time.

The stratified estimates of mean CPUE for golden king are presented in Table 26. The weighted estimate of mean CPUE for legal retained crabs departs from estimates derived from fish tickets and confidential interviews by less than 1 crab per pot. The weighted CPUE estimate for legal retained male golden king crabs was precise, as the standard error accounted for 4% of the estimated mean CPUE. Weighted estimates for sublegal male crabs and female crabs were slightly less precise at 7% and 8%, respectively. The bycatch of both female and sublegal male crabs exceeded the catch of legal retained male crabs. Similar to the eastern fishery, about 3 of every 4 golden king crabs caught had to be returned to the sea as bycatch.

The 1999/2000 estimated sampled fleet CPUE of legal golden king crabs was nearly 5 crabs per pot less than the 1998/1999 estimate but was similar to the estimates for the 2 previous seasons. The 1998/1999 sample CPUE estimate is nearly double these estimates (Figure 21). Non-target golden king crab catch rates also decreased notably from the 1998/1999 season to levels comparable to the 1996/1997 and 1997/1998 seasons. Catch rates of undersized males was 50% of that in 1998/1999, decreasing from 16 to 8 crabs per pot. Female crabs were caught at a rate of 10 crabs per pot in 1999/2000 compared to the 1998/1999 rate of 16.5 crabs per pot decreasing by 29%. Overall, the sample proportion of non-target and undersize crabs to legal male crabs has remained similar during the 1996/1997through the 1999/2000 seasons. A total of all animals identified in sample pots are provided in Table 27.

Sixty-five percent of sampled pots soaked between 1 and 240 hours (Table 28). Soak periods ranged from 1 to 1,728 hours (72 days). Plots of mean CPUE by soak time in days are found in Figure 22. The CPUE of legal-sized crabs was observed to increase for soak periods ranging

from one to 10 days and generally remained relatively constant across the range of soak times greater than ten days. Catch rates of female and sublegal golden king crabs were more variable but also generally increased over the first ten days of soak time. After ten days CPUE's tended to decrease until about 24 days and were relatively constant thereafter.

Catch rates of legal male, sublegal male and female golden king crabs tended to increase with depth up to 150 fathoms (Table 29 and Figure 23). The CPUE for legal males remained relatively constant from 150 to 300 fathoms. At depths greater than 300 fathoms the catch rate for legal male crabs was variable but generally showed a gradual decrease. Catch rates of sublegal male and female crabs were similar with increases to 150 fathoms and a general decrease at greater depths.

Golden king crab shell age statistics are summarized from bycatch samples in Table 30. New-shelled male crabs decreased slightly by almost 3 percent from the 1998/1999 season. This decrease was accompanied by a corresponding increase in the percentage of old-shelled male crabs (Figure 24). The percentage of new-shelled golden king crab females remained very similar to the previous 2 seasons at almost 98% of the sample. As in the fishery east of 174° W longitude, the percentage of new-shelled crabs was fairly consistent between sexes.

The proportion of female golden king crabs that carried eggs remained for the most part unchanged from the past 4 seasons at approximately half the sampled population (Table 31). Of the more than 22,000 females without clutches in 1999/2000, 8,378 (39%) showed signs of prior mating. This compares to 32% the previous season and 40% in 1997/1998.

Bering Sea Hair Crab

At-sea observers were deployed on the 3 catcher-only vessels that participated in the 2000 season. The bycatch sampling goal for observers was 30 pots during each day of fishing activity. The catches in 15 of the 30 pots were alternately identified to species, measured and enumerated while the contents of the 15 remaining pots were only identified to species and enumerated. Because of an estimated low stock abundance around the Pribilof Islands, fishing was restricted to areas north of 58° 39' N during the 2000 season. The fishery began on 30 October and remained open until the 31 December regulatory closure; however, participating vessels discontinued fishing after 2 November due to very low harvest rates. A total of 192 pots selected for bycatch sampling accounted for 5.8% of the 3,300 pot lifts reported by vessel operators during the four-day season (ADF&G Westward Region, *in press*). The locations of pots sampled by observers during the 2000 Bering Sea hair crab fishery are displayed in Appendix B-5.

Approximately 53 measurements of retained hair crabs were taken throughout the season by observers onboard catcher-only vessels. A summary of these measurements and those taken during the preceding 3 years are provided in Table 32. Sample CL measurements were tightly grouped around the mean of 93 mm, with 92% of the crabs measured ranging between 86 and 105 mm CL.

Measurements of CL were also taken from approximately 51 male hair crabs (including legal-sized, retained and non-retained males and sublegal males) in bycatch samples. A 5 mm-interval histogram of these measurements shows a predominant mode at 90-95 mm CL (Figure 25). The

mean CL of 92.0 mm is very similar to the means from the previous three seasons despite the small sample size and different area fished. No females were observed in bycatch samples during the 2000 fishery. Histograms of hair crab females taken from bycatch samples during the 1997-1999 fisheries are shown in Figure 26.

The stratified estimates of mean CPUE for hair crabs in the 2000 Bering Sea hair crab fishery are presented in Table 33. The estimate of mean CPUE for legal retained crabs is the same as that from fish tickets and confidential interviews. The estimated mean CPUE for legal retained male hair crabs was not precise due to the small sample sizes; the standard error accounted for 67% of the estimated mean CPUE.

Catch rates of non-target crabs were much lower than the 1997, 1998 and 1999 seasons (Figure 27). The short season and overall poor catch rates coupled with the small number of pots sampled produced unreliable results. Total catches of all animals identified in sample pots are provided in Table 34.

Almost 81% of the sampled pots were soaked between 6 and 30 hours (Table 35). Catch rates of legal-sized retained male hair crabs remained at less than 1 crab per pot over all soak periods. Only 1 sublegal male and no female hair crab were caught in the sampled pots. Plots depicting legal male hair crab CPUE by soak hours are provided in Figure 28.

No sampled pots were fished in less than 20 fathoms and catch rates of legal-sized retained male hair crabs were less than one crab per pot over the range of depths to 30 fathoms. Seventy-four percent of the samples were taken from depths ranging between 25 to 30 fathoms (Table 36). Plots depicting legal male hair crab CPUE by depth are provided in Figure 29.

Hair crab shell age statistics summarized from bycatch samples show an increase from the 1999 season in proportion of new-shelled male crabs with a corresponding decrease in abundance of old and very old-shelled males (Table 37). Due to the small sample size, this data may not be reliable.

Legal tallies conducted on catcher-only vessels totaled only 109 crabs by the end of the 2000 season and comprised over 10 percent of the cumulative reported harvest (Table 38). No sampled crabs were deemed illegal due to size, sex or species.

Accuracy and Precision of Catch Per Unit Effort (CPUE) Estimates

In using CPUE estimates based on observer data it is important to have some assessment of their reliability in estimating the catch rates for observed vessels and, especially, for all vessels participating in a fishery. Although the observer data are the only source of information on bycatch rates in the fisheries presented in this report, confidential interviews with the operators of observed and unobserved vessels and fish tickets provide data for independent estimates of the CPUE of retained legal crabs. We can gain some understanding of the reliability of the CPUE estimates computed from observer sample data by comparing the retained legal CPUE estimates with those computed from confidential trip summaries and fish ticket data. Observers on catcher-processors complete weekly trip summaries; confidential interviews are conducted by

both observers deployed on catcher-only vessels and by dockside samplers. The information collected is essentially identical on both forms.

The confidential trip summary data provide estimates of retained legal CPUE from both observed and unobserved vessels participating in a fishery. In this discussion we will refer to the retained legal CPUE estimated from confidential trip summaries data as the "Confidential Interview CPUE" (CI CPUE). Fish ticket data from all landings of all vessels participating in a fishery provide an independent estimate of the total fishery CPUE of retained legal crabs for a fishery in which observers were not required on all vessels. We will refer to the CPUE of retained legal crabs estimated from the fish ticket data for all fishery landings as the "Actual Total Fishery CPUE" (ATF CPUE).

CPUE estimates computed from observer bycatch samples for retained legal crabs are within 6 percent and/or less than one crab per pot of the CI CPUE for all fisheries in which crab observers were deployed except for the Bering Sea snow crab fishery (Table 39). The close agreement between the observer-based and CI CPUE estimates for retained legal crab in each of those 4 Bering Sea/Aleutian Islands crab fisheries indicates that observer bycatch sample data provide highly reliable estimates of CPUE for the observed portion of the fleet. The close agreement between those 2 CPUE estimates also indicates that observer data provide reliable CPUE estimates for the entire Aleutian Islands golden king crab and the Bering Sea hair crab fishery because observer coverage was 100% in each of those fisheries.

Since 1995 when stratified CPUE estimates were first calculated from shellfish observer bycatch data, the snow crab fishery has been the most problematic in terms of stratified estimates agreeing with estimates from fish ticket and confidential interview data. In terms of total crabs, pounds and average catch per pot lift, the harvest of snow crabs is by far the largest of all shellfish fisheries prosecuted in the Bering Sea and Aleutian Islands. This fishery is also characterized by the highest total number of pots pulled. The 172 sampled pots from CP's in 2000 account for just 0.1% of the nearly 170,000 pots pulled.

CPUE estimates computed from observer data for retained legal crabs in the 2000 Bering Sea snow crab fishery (119.2 crabs, both snow and hybrid, Table 2) differed from both the CI and ATF CPUE's by about 20 (14%) and 18 (13%) fewer crabs per pot, respectively. This indicates a lower reliability for observer bycatch sample data in providing catch rate estimates for the observed fleet in that fishery (Table 2). The difference in how Tanner/snow crab hybrids are counted, however, can explain most of the discrepancy between estimates based on observer data and fish ticket estimates (Moore *et al.* 2000b).

Comparison of CPUE estimates based on observer bycatch sample data for retained legal crabs with the CI and ATF CPUE (i.e., from fish tickets) in all the other fisheries with partial observer coverage indicates that partial observer coverage provided adequate data for estimation of mean CPUE for those fisheries. The two Aleutian Islands golden king crab fisheries discussed in this report realized the best over all agreement between estimates, a fact that can largely be attributed to the 100% observer coverage required for vessels harvesting golden king crabs in the Aleutians.

The 'stratified' observer-based CPUE estimator used in this report is different from the 'sample' observer-based CPUE estimate used in past Mandatory Shellfish Observer Database Summaries

(e.g., Tracy 1994, 1995a,b). Although the stratified estimation method can provide more accurate and precise estimates, the stratified and sample CPUE estimates are generally very close to each other. Therefore the stratified estimates presented here are comparable to those CPUE estimates included in previous observer data summaries. The value of using the stratified CPUE estimates is that the estimation method allows for computation of the standard errors of the CPUE estimates.

The standard errors provided in this report give a measure of the precision or repeatability of the CPUE estimates. Generally, the stratified CPUE estimates appear to be precise, as reflected in the relatively small standard errors. We did not compute confidence intervals for the CPUE estimates as the sample size within each stratum (vessel-day) was not large enough to assume an asymptotic normal distribution. However, bootstrap simulation of observer data collected in the 1995 Bering Sea and Aleutian Islands crab fisheries suggests that the stratified CPUE estimates plus or minus two standard errors was adequate to characterize the true CPUE of the targeted species (Byrne and Pengilly 1998).

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Table 1. Carapace size frequency distributions from biological measurements of retained snow crabs sampled during the 1997-2000 Bering Sea snow crab fishery.

	1997		1998		1999		2000	
Width (mm)	Number	Percent	Number	Percent	Number	Percent	Number	Percent
86-90	897	0.7	419	0.2	390	0.3	54	0.2
91-95	3,848	3.0	1,903	1.1	1,848	1.3	244	0.9
96-100	16,168	12.6	10,366	6.0	9,500	6.4	1,389	5.4
101-105	34,763	27.2	31,849	18.5	27,368	18.6	4,099	15.8
106-110	32,027	25.1	43,576	25.2	37,537	25.5	6,085	23.5
111-115	21,544	16.9	40,080	23.2	34,976	23.8	6,619	25.5
116-120	11,487	9.0	26,167	15.2	22,695	15.4	4,574	17.6
121-125	4,905	3.8	12,363	7.2	9,522	6.5	2,158	8.3
126-130	1,459	1.1	4,499	2.6	2,653	1.8	522	2.0
131-135	281	0.2	1,038	0.6	479	0.3	127	0.5
Totals	127,379	99.6	172,260	99.7	146,968	99.8	25,871	99.7
Mean CW (mm)	107.3		110.6		110.3		111.3	

Table 2. Estimated catch per pot (CPUE) of selected crab species from pot lifts sampled by observers deployed on nine catcher-processors during the 2000 Bering Sea snow crab fishery. Standard errors of the CPUE estimates are included in parentheses. The data are from 173 pot lifts.

Species / Sex class	Total Pot Sample Catch	Sampled Fleet Estimated CPUE	Estimated Total Catch[a]
Snow Crab			
Legal males retained	23,283	114.3 (6.31)[b]	19,438,000 [c]
Legal males not retained	4,358	23.1 (2.72)	3,928,000
Sublegal males	272	1.3 (0.18)	221,000
Females	6	0.1 (0.03)	17,000
Tanner / Snow Hybrids			
Legal males retained	882	4.9 (0.60)	833,000
Legal males not retained	163	0.9 (0.18)	153,000
Sublegal males	39	0.1 (0.08)	17,000
Females	0	0	0
Tanner Crabs			
Legal males not retained	5	<0.1 (0.01)	3,000
Sublegal males	313	1.6 (0.29)	272,000
Females	59	0.4 (0.16)	68,000

[a] Estimated CPUE multiplied by 170,064 total pot lifts during the fishery (ADF&G, Westward Region Staff 2001).

[b] Actual CPUE for retained legal crabs for the fishery as reported on confidential interview forms was 139.1 for observed vessels. Actual total fishery CPUE of retained legal crabs was 136.8 for all vessels (ADF&G, Westward Region Staff 2001).

[c] Actual catch of retained legal crabs for the fishery was 23,265,802 (ADF&G, Westward Region Staff 2001).

Table 3. Total pot contents from 173 bycatch samples taken on nine catcher-processors during the 2000 Bering Sea snow crab fishery.

Species	Total Number Observed
Snow Crab	
Legal males	23,555
Sublegal males	4,358
Females	6
Tanner / Snow Hybrids	
Legal males	921
Sublegal males	163
Females	0
Tanner Crabs	
Legal males	314
Sublegal males	5
Females	59
Blue King Crabs	
Legal males not retained	2
Sublegal males	7
Females	0
Snail unidentified	344
Pacific cod	275
Sea star	39
Sculpin unidentified	10
Walleye pollock	9
Hermit crab unidentified	6
Halibut	3
Lyre crab	3
Octopus	3
Neptunea borealis	3
Bigmouth sculpin	1
Jellyfish unidentified	1
Sea anemone	1

Table 4. Estimated CPUE for snow crabs by soak hours from 173 bycatch samples taken on nine catcher-processors during the 2000 Bering Sea snow crab fishery.

	Pots Sampled		Catch Per Sampled Pot				
Soak Hours	Number	Percent	Legal Retained	Legal Not Retained	Sublegal	Female	Total
1-6	0	0	0	0	0	0	0
7-12	2	1.2	32.5	6.0	0	0	38.5
13-18	26	15.0	106.0	26.5	2.2	0	134.6
19-24	29	16.8	114.7	23.3	1.6	0	139.5
25-30	31	17.9	165.6	29.7	1.7	0	197.0
31-36	40	23.1	129.7	22.7	1.3	0.1	153.8
37-42	30	17.3	164.3	29.5	1.8	0.1	195.6
43-48	13	7.5	127.2	13.5	0.5	0.1	141.2
55-60	1	0.6	112.0	61.0	5.0	0	178.0
61-66	1	0.6	122.0	31.0	0.0	0	153.0
Mean Soak: 29.9 hours	Overall CPUE:		134.6	25.2	1.6	<0.1	161.4

Table 5. Estimated CPUE for snow crabs by depth from 173 bycatch samples taken on nine catcher-processors during the 2000 Bering Sea snow crab fishery.

	Pots Sampled		Catch Per Sampled Pot				
Depth (fathoms)	Number	Percent	Legal Retained	Legal Not Retained	Sublegal	Female	Total
53-54	2	1.2	71.0	14.5	4.5	0	90.0
57-58	3	1.7	38.0	8.3	0.3	0	46.7
59-60	15	8.7	138.3	13.6	1.0	0	152.9
61-62	24	13.9	161.0	15.8	0.9	0	177.7
63-64	4	2.3	201.7	42.2	2.0	0	246.0
65-66	12	6.9	111.0	26.3	0.7	0.1	138.2
67-68	31	17.9	114.6	28.0	1.9	<0.1	144.6
69-70	35	20.2	165.9	32.0	1.9	0.1	199.8
71-72	27	15.6	134.2	38.0	2.6	0.1	174.9
73-74	15	8.7	98.0	10.8	0.3	0	109.1
75-76	5	2.9	98.6	12.4	1.6	0	112.6
Mean Depth 67.3 fathoms	Overall	CPUE:	134.6	25.2	1.6	<0.1	161.4

Table 6. Shell ages of male and female snow crabs from bycatch samples taken on catcher-processor and catcher-only vessels during the 1995-2000 Bering Sea snow crab fisheries.

			SHELL AGE CLASSES					
		Sample	NEW		OLD		VERY OLD	
YEAR	Sex	Size	Count	% Total	Count	% Total	Count	% Total
1995	Male	77,302	68,596	88.7	8,083	10.5	621	0.8
	Female	539	74	13.7	328	60.9	137	25.4
1996	Male	76,028	54,249	71.4	18,163	23.9	3,570	4.7
	Female	136	49	36.0	46	33.8	41	30.1
1997	Male	128,429	125,086	97.4	3,123	2.4	219	0.2
	Female	787	2	0.3	466	59.2	319	40.5
1998	Male	120,472	111,909	92.9	7,881	6.5	679	0.6
	Female	89	0	0	53	59.6	36	40.4
1999	Male	56,973	51,038	89.6	4,734	8.3	1,191	2.1
	Female	100	2	2.0	16	16.0	82	82.0
2000	Male	7,561	6993	92.5	520	6.9	48	0.6
	Female	6	0	0	6	100.0	0	0

Table 7. Reproductive condition of female snow crabs in bycatch samples taken on catcher-processor and catcher-only vessels during the 1995-2000 Bering Sea snow crab fisheries.

	Crabs	Eyed Eggs		Uneyed Eggs		Barren, Mated		Barren, Non-mated	
YEAR	Sampled	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1995	423	340	80.4	53	12.5	26	6.1	4	0.9
1996	136	81	59.6	5	3.7	22	16.2	28	20.6
1997	789	323	40.9	5	0.6	240	30.4	221	28.0
1998	90	19	21.1	8	8.9	34	37.8	29	32.2
1999	99	68	68.7	5	5.1	22	22.2	4	4.0
2000	6	0	0	1	16.7	1	16.7	4	66.6

Table 8. Results of legal tally samples taken on catcher-processors and floater-processors during the 1994-2000 Bering Sea snow crab fisheries. Harvest figures include only those catches from catcher-processors and vessels that delivered to floater-processors.

Year	Sample Size	Male		Female		Other Crabs	Total Percent Illegal	Number of Crabs Harvested	Estimated Number of Illegal Crabs	Percent of Harvest Sampled
		number	percent	number	percent					
1994	868,705	972	0.1	188	<0.1	3,993	0.6	79,356,180	470,726	1.1
1995	513,847	1,341	0.3	121	<0.1	2,527	0.8	37,817,595	293,578	1.4
1996	459,978	1,027	0.2	52	<0.1	1,318	0.5	32,990,601	171,918	1.4
1997	603,829	526	0.1	116	<0.1	1,464	0.3	61,061,226	212,966	1.0
1998	795,708	461	0.1	21	<0.1	1,404	0.2	92,011,193	218,086	0.9
1999	400,814	126	<0.1	3	<0.1	799	0.2	68,688,688	155,607	0.6
2000	92,209	74	0.1	17	<0.1	178	0.3	23,265,802	67,873	0.4

Table 9. Carapace size frequency distributions from biological measurements of retained red king crabs sampled during the 1997-2000 Bristol Bay red king crab fisheries.

	1997		1998		1999		2000	
Length (mm)	Number	Percent	Number	Percent	Number	Percent	Number	Percent
131-135	407	2.5	614	3.8	487	2.8	283	2.0
136-140	1,732	10.7	2,263	14.0	3,039	17.2	1,645	11.7
141-145	2,443	15.1	2,468	15.3	4,511	25.5	2,919	20.7
146-150	2,613	16.2	2,391	14.8	3,784	21.4	2,893	20.5
151-155	2,738	17.0	2,300	14.3	2,662	15.1	2,429	17.2
156-160	2,511	15.6	2,238	13.9	1,492	8.4	1,639	11.6
161-165	1,839	11.4	1,809	11.2	829	4.7	1,117	7.9
166-170	1,169	7.2	1,210	7.5	489	2.8	647	4.6
171-175	474	2.9	560	3.5	230	1.3	318	2.3
176-180	158	1.0	178	1.1	102	0.6	139	1.0
Totals	16,084	97.1	16,031	95.5	17,625	97.0	14,029	99.5
Mean length (mm)	152.5		151.8		148.0		150.6	

Table 10. Estimated catch per pot (CPUE) of selected crab species from pot lifts sampled by observers deployed on 7 catcher-processors and 13 catcher-only vessels during the 2000 Bristol Bay red king crab fishery. Standard errors of the CPUE estimates are included in parentheses. Data are from 673 sampled pot lifts.

Species / Sex class	Total Pot Sample Catch	Sampled Fleet Estimated CPUE	Estimated Total Catch[a]
Red King Crab			
Legal males retained	9,061	12.8 (1.29)[b]	1,263,000[c]
Legal males not retained	22	<0.1 (0.02)	3,000
Sublegal males	8,971	13.3 (1.73)	1,313,000
Females	1,486	2.3 (0.83)	227,000

[a] Estimated CPUE multiplied by 98,694 total pot lifts (ADF&G, Westward Region staff 2001) during the fishery.

[b] Actual CPUE for retained legal crabs for the fishery as reported on confidential interview forms was 12.4; actual total fishery CPUE of retained legal crabs was 11.8 for all vessels (ADF&G, Westward Region staff 2001).

[c] Actual catch of retained legal crabs for the fishery was 1,116,796 (ADF&G, Westward Region staff 2001).

Table 11. Total pot contents from 673 bycatch samples taken on 7 catcher-processors and 14 catcher-only vessels during the 2000 Bristol Bay red king crab fishery.

Species	Total number observed
Red King Crab	
Legal males	9,083
Sublegal males	8,971
Females	1,486
Tanner Crab	
Legal males	223
Sublegal males	382
Females	36
Snow Crab	
Legal males	920
Sublegal males	16
Females	1
Tanner/Snow Hybrid	
Legal males	158
Sublegal males	5
Females	1
Hair Crab	
Legal males	8
Sublegal males	0
Females	0
Pacific cod	668
Yellowfin sole	504
Sea star	371
Sculpin (unidentified)	131
Great sculpin	112
Snail (unidentified)	29
Halibut	17
Hermit crab (unidentified)	8
Flatfish (unidentified)	5
Walleye pollock	5
Lyre crab	3
C. angulatus	1
Greenland turbot	1
Octopus	1
Neptunea sp.	1

Table12. Estimated CPUE for red king crab by soak hours from 673 bycatch samples taken during the 2000 Bristol Bay red king crab fishery.

	Pots Sampled		Catch Per Sampled Pot			
Soak Hours	Number	Percent	Legal	Sublegal	Female	Total
7-12	41	6.1	4.8	6.2	1.9	12.8
13-18	211	31.5	9.5	12.0	2.3	23.8
19-24	233	34.6	15.3	17.1	3.0	35.4
25-30	114	16.9	16.2	13.6	1.6	31.5
31-36	50	7.4	19.7	9.3	0.4	29.3
37-42	15	2.2	20.5	7.3	0.5	28.3
43-48	9	1.3	20.8	9.4	0.2	30.4
Mean Soak: 21.9 hours	Overall CPUE:		13.5	13.3	2.2	29.0

Table 13. Estimated CPUE for red king crab by depth from 673 bycatch samples taken during the 2000 Bristol Bay red king crab fishery.

	Pots Sampled		Catch Per Sampled Pot			
Depth (fathoms)	Number	Percent	Legal	Sublegal	Female	Total
16-20	1	0.1	3.0	3.0	0	6.0
21-25	1	0.1	3.0	1.0	15.0	19.0
26-30	38	5.7	13.4	14.8	5.5	33.7
31-35	252	37.4	14.3	15.4	2.2	31.9
36-40	189	28.1	16.4	15.0	1.9	33.3
41-45	120	17.8	10.3	11.3	2.4	24.0
46-50	66	9.8	9.2	4.9	0.8	14.9
51-55	6	0.9	5.3	0.8	0	6.2
Mean Depth 37.7 fathoms	Overall CPUE:		13.5	13.3	2.2	29.0

Table 14. Shell ages of male and female red king crabs from bycatch samples taken during the 1996-2000 Bristol Bay red king crab fisheries.

YEAR	Sex	Sample Size	SHELL AGE CLASSES					
			NEW		OLD		VERY OLD	
			Count	% Total	Count	% Total	Count	% Total
1996	Male	642	539	84.0	97	15.1	6	0.9
	Female	11	11	100.0	0	0	0	0
1997	Male	1,787	1,580	88.4	190	10.6	17	1.0
	Female	68	68	100.0	0	0	0	0
1998	Male	5,556	4,849	87.3	578	10.4	128	2.3
	Female	4,091	4,091	100.0	0	0	0	0
1999	Male	2,768	2,444	88.3	4,734	9.4	62	2.2
	Female	36	36	100.0	0	0	0	0
2000	Male	18,054	14,182	78.5	259	19.0	432	2.4
	Female	1,486	1,477	99.4	8	0.5	1	0.1

Table 15. Reproductive condition of female red king crabs in bycatch samples taken during the 2000 Bristol Bay red king crab fisheries.

YEAR	Crabs Sampled	Eyed Eggs		Uneyed Eggs		Barren, Mated		Barren, Non-mated	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
1996	11	0	0	0	0	0	0	11	100.0
1997	70	46	65.7	13	18.6	0	0	11	15.7
1998	4,091	1,864	45.6	2,119	51.8	1	<0.1	107	2.6
1999	36	0	0	31	86.1	1	2.8	4	11.1
2000	1,486	60	4.0	331	22.3	7	0.5	1,088	73.2

Table 16. Results of legal tally samples taken on catcher-processors and floater-processors during the 1996-2000 Bristol Bay red king crab fisheries. Harvest figures include only those catches from catcher-processors and vessels that delivered to floater-processors.

Year	Sample Size	Male		Female		Other Crabs	Total Percent Illegal	Number of Crabs Harvested	Estimated Number of Illegal Crabs	Percent of Harvest Sampled
		number	percent	number	percent					
1996	26,197	109	0.4	11	<0.1	8	0.5	257,717	1,259	10.2
1997	39,922	185	0.5	6	<0.1	5	0.5	1,603,768	7,874	2.5
1998	55,044	356	0.6	57	0.1	1	0.8	545,297	4,101	10.1
1999	39,965	304	0.8	0	0	3	0.8	288,341	2,215	13.9
2000	32,715	179	0.5	7	<0.1	6	0.6	1,166,796	6,848	2.8

Table 17. Carapace size frequency distributions from biological measurements of retained golden king crabs sampled during the 1997-2000 Aleutian Island golden king crab fisheries east of 174° W longitude.

	1997		1998		1999		2000	
Length (mm)	Number	Percent	Number	Percent	Number	Percent	Number	Percent
116-120	0	0	0	0	0	0	0	0
121-125	5	0.1	1	<0.1	0	0	0	0
126-130	36	0.5	15	0.2	17	0.3	18	0.3
131-135	510	6.7	423	5.2	381	6.1	258	4.9
136-140	1,460	19.2	1,502	18.5	1,401	22.6	1,047	20.0
141-145	1,797	23.7	1,846	22.8	1,537	24.8	1,313	25.1
146-150	1,446	19.1	1,596	19.7	1,148	18.5	1,030	19.7
151-155	990	13.0	1,094	13.5	720	11.6	706	13.5
156-160	648	8.5	713	8.8	454	7.3	406	7.8
161-165	363	4.8	434	5.4	280	4.5	245	4.7
166-170	203	2.7	270	3.3	158	2.6	117	2.2
171-175	83	1.1	147	1.8	71	1.1	57	1.1
176-180	45	0.6	48	0.6	33	0.5	22	0.4
181-185	5	0.1	20	0.3	7	0.1	9	0.2
186-190	1	<0.1	4	0.1	0	0	2	<0.1
Totals	7,592	100.0	8,113	100.0	6,207	100.0	5,228	100.0
Mean length (mm)	147.0		148.0		146.5		147.0	

Table 18. Estimated catch per pot (CPUE) of selected crab species from pot lifts sampled by observers deployed on 15 catcher-only vessels during the 2000 Aleutian Island golden king crab fishery east of 174° W longitude. Standard errors of the CPUE estimates are included in parentheses. Data are from 5,041 sampled pot lifts.

Species / class	Total Pot Sample Catch	Sampled Fleet Estimated CPUE	Estimated Total Catch[a]
Golden King Crab			
Legal males retained	49,484	10.1 (0.48)[b]	723,000[c]
Legal males not retained	314	0.1 (0.03)	72,000
Sublegal males	78,238	15.6 (0.93)	1,116,000
Females	64,967	13.3 (1.20)	952,000

[a] Estimated CPUE multiplied by 71,551 total pot lifts (ADF&G, Westward Region staff 2001) during the fishery.

[b] Actual CPUE for retained legal crabs for the fishery as reported on confidential interview forms was 9.6; actual total fishery CPUE of retained legal crabs was 9.9 for all vessels (ADF&G, Westward Region staff 2001).

[c] Actual catch of retained legal crabs for the fishery was 707,221 (ADF&G, Westward Region staff 2001).

Table 19. Total pot contents from 5,041 bycatch samples taken by 15 catcher-only vessels during the 2000 Aleutian Island golden king crab fishery east of 174° W longitude.

Species	Number observed
Golden King Crab	
Legal Male	49,819
Sublegal Male	78,269
Female	64,981
Scarlet King Crab	
Legal Male	57
Sublegal Male	32
Female	21
Grooved Tanner Crab	
Legal Male	9
Sublegal Male	0
Female	3
Hair Crab	
Legal Male	2
Sublegal Male	0
Female	0
Tanner Crab	
Legal Male	0
Sublegal Male	2
Female	1
Brittle Star	1,704
Sponge (unidentified)	1,137
Halibut	630
Basket Sea Star	301
Snail (unidentified)	295
Pacific Cod	171
Sea Star	141
Sea Urchin (unidentified)	129
Skate (unidentified)	93
Arrowtooth Flounder	74
Greenland Turbot	46
Lyre Crab	39
Sculpin (unidentified)	33
Scallop spp.	28
Sablefish	13
Hairy Triton	9
Grenadier	7
Flatfish (unidentified)	5
Rockfish spp.	5
Sea Pen	5
Octopus	5
Hermit Crab (unidentified)	3
Walleye Pollock	3
Bigmouth Sculpin	3
Chlamys spp.	3
Sea Anemone	3
Great Sculpin	2
Scaled Crab	1
Chionocetes angulatus	1
Rock Sole	1
Turbot (unidentified)	1
Atka Mackerel	1
Shortfin Eelpout	1
Black Rockfish	1
Rougheye Rockfish	1
Snailfish (unidentified)	1
Sea Cucumber (unidentified)	1
Barnacle	1

Table 20. Estimated CPUE for golden king crab by soak hours from 5,041 bycatch samples taken during the 2000 Aleutian Island golden king crab fishery east of 174° W longitude.

	Pots Sampled		Catch Per Sampled Pot				
Soak Hours	Number	Percent	Legal Retained	Legal Not Retained	Sublegal	Female	Total
1-24	6	0.1	1.3	0	2.8	0	4.2
25-48	294	5.8	4.6	<0.1	6.0	4.5	15.1
49-72	973	19.3	8.1	0.1	15.2	12.4	35.8
73-96	1482	29.4	8.1	<0.1	16.9	12.9	38.0
97-120	770	15.3	10.4	0.1	16.0	15.3	41.8
121-144	370	7.3	11.1	0.1	17.1	19.1	47.3
145-168	307	6.1	12.3	0.1	16.9	12.4	41.7
169-192	387	7.7	13.3	0.1	17.6	12.9	44.0
193-216	273	5.4	15.7	<0.1	13.0	8.9	37.7
217-240	99	2.0	19.2	<0.1	11.4	10.6	41.2
241-264	39	0.8	11.1	0.1	17.2	22.7	51.0
265-288	11	0.2	23.2	0.3	15.3	23.1	61.8
289-312	7	0.1	5.4	0	9.6	2.6	17.6
313-336	8	0.2	9.9	0	17.4	6.1	33.4
337-360	1	<0.1	17.0	0	68.0	96.0	181.0
361-384	2	<0.1	24.5	0	11.0	2.5	38.0
409-432	5	0.1	4.6	0	16.4	24.8	45.8
433-456	4	0.1	0.5	0	1.8	0.7	3.0
529-552	3	0.1	6.0	0	23	0.3	29.3
Mean Soak: 110.9 hours	Overall CPUE:		9.8	0.1	15.5	12.9	38.3

Table 21. Estimated CPUE for golden king crab by depth from 5,041 bycatch samples taken during the 2000 Aleutian Island golden king crab fishery east of 174° W longitude.

	Pots Sampled		Catch Per Sampled Pot				
Depth (fathoms)	Number	Percent	Legal Retained	Legal Not Retained	Sublegal	Female	Total
1-25	2	<0.1	0	0	0	0	0
26-50	2	<0.1	0.5	0	0	0	0.5
51-75	16	0.3	9.1	0	20.1	4.9	34.1
76-100	429	8.5	11.6	0.1	22.8	7.5	42.1
101-125	779	15.5	9.4	0.1	13.6	8.2	31.2
126-150	666	13.2	9.3	0.1	9.6	8.4	27.4
151-175	659	13.1	9.0	<0.1	11.5	11.2	31.8
176-200	524	10.4	9.6	<0.1	12.7	13.1	35.4
201-225	492	9.8	10.2	0.1	14.1	17.5	41.8
226-250	462	9.2	9.4	0.1	16.9	16.7	43.1
251-275	470	9.3	10.1	0.1	18.2	15.7	44.1
276-300	262	5.2	11.5	0.2	21.2	16.4	49.2
301-325	176	3.5	10.2	<0.1	27.8	24.5	62.6
326-350	56	1.1	8.8	<0.1	34.2	34.5	77.6
351-375	17	0.3	1.4	0	22.5	23.5	57.4
376-400	16	0.3	11.6	0.1	35.4	33.7	80.6
401-425	7	0.1	11.6	0	36.4	26.0	74.0
426-450	3	0.1	4.3	0	8.0	0.3	12.7
451-475	3	0.1	1.7	0	4.7	2.0	8.3
Mean Depth 184.9 fm	Overall CPUE:		9.8	0.1	15.5	12.9	38.3

Table 22. Shell ages of male and female golden king crabs from bycatch samples taken during the 1996-2000 Aleutian Island golden king crab fisheries east of 174° W longitude.

			SHELL AGE CLASSES					
			NEW		OLD		VERY OLD	
YEAR	Sex	Sample Size	Count	% Total	Count	% Total	Count	% Total
1996	Male	93,386	91,629	98.1	1,623	1.7	110	0.1
	Female	59,259	58,148	98.1	1,068	1.8	18	<0.1
1997	Male	83,708	80,430	96.1	3,127	3.7	89	0.1
	Female	54,375	52,453	96.5	1,865	3.4	2	<0.1
1998	Male	91,162	88,189	96.7	2,163	2.4	210	0.2
	Female	44,410	43,748	98.5	426	1.0	4	<0.1
1999	Male	79,067	76,133	96.3	1,935	2.4	201	0.3
	Female	36,678	36,086	98.4	325	0.9	15	<0.1
2000	Male	30,723	29,321	95.4	1,191	3.9	155	0.5
	Female	13,615	13,467	98.9	88	0.6	2	<0.1

Table 23. Reproductive condition of female golden king crabs in bycatch samples taken during the 2000 Aleutian Island golden king crab fisheries east of 174° W longitude.

	Crabs	Eyed Eggs		Uneyed Eggs		Barren, Mated		Barren, Non-mated	
YEAR	Sampled	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1996	59,210	12,328	20.8	13,339	22.5	10,997	18.6	22,546	38.1
1997	54,383	13,692	25.2	10,514	19.3	11,996	22.1	18,181	33.4
1998	44,352	8,021	18.1	9,333	21.0	10,601	23.9	16,397	37.0
1999	36,695	8,111	22.1	7,714	21.0	8,453	23.1	12,381	33.8
2000	13,615	3,661	26.9	2,545	18.7	4,666	20.1	2,743	34.3

Table 24. Results of legal tally samples taken on catcher-processor and catcher-only vessels during the 1996/1997-1999/2000 Aleutian Island golden king crab fisheries for both the east and west regions.

Year	Sample Size	Male		Female		Other Crabs	Total Percent Illegal	Number of Crabs Harvested	Estimated Number of Illegal Crabs	Percent of Harvest Sampled
		number	percent	number	percent					
1996/1997	178,326	1,098	0.6	79	<0.1	0	0.7	1,343,950	8,870	13.3
1997/1998	182,134	973	0.5	93	<0.1	0	0.6	1,350,159	2,092	13.5
1998/1999	141,459	706	0.5	42	<0.1	0	0.5	1,149,542	6,078	12.3
1999/2000	119,555	475	0.4	42	<0.1	0	0.4	1,383,779	5,984	8.6

Table 25. Carapace size frequency distributions from biological measurements of retained golden king crabs sampled during the 1996/1997-1999/2000 Aleutian Island golden king crab fisheries west of 174° W longitude.

	1996/1997		1997/1998		1998/1999		1999/2000	
Length (mm)	Number	Percent	Number	Percent	Number	Percent	Number	Percent
116-120	0	0	0	0	1	<0.1	0	0
121-125	0	0	3	<0.1	0	0	0	0
126-130	90	0.3	89	0.3	43	0.2	50	0.2
131-135	1,824	6.6	1,651	5.6	1,128	5.6	1,066	4.5
136-140	5,921	21.4	5,741	19.5	4,410	21.8	4,268	17.8
141-145	6,555	23.7	7,196	24.1	5,403	26.7	6,203	25.9
146-150	5,231	18.9	5,563	18.9	4,179	20.7	5,281	22.1
151-155	3,442	12.5	3,785	12.9	2,502	12.4	3,383	14.1
156-160	2,023	7.3	2,353	8.0	1,349	6.7	1,949	8.2
161-165	1,267	4.6	1,442	4.9	660	3.3	1,034	4.3
166-170	750	2.7	859	2.9	324	1.6	448	1.9
171-175	335	1.2	446	1.5	144	0.7	157	0.7
176-180	157	0.6	230	0.8	45	0.2	51	0.2
181-185	36	0.1	99	0.3	18	0.1	16	0.1
186-190	9	<0.1	21	0.1	10	0.1	3	<0.1
Totals	27,640	100.0	29,378	100.0	20,216	100.0	23,911	100.0
Mean length (mm)	146.8		147.5		146.0		147.0	

Table 26. Estimated catch per pot (CPUE) of selected crab species from pot lifts sampled by observers deployed on one catcher-processor and 14 catcher-only vessels during the 2000 Aleutian Island golden king crab fishery west of 174° W longitude. Standard errors of the CPUE estimates are included in parentheses. Data are from 4,576 sampled pot lifts.

Species / class	Total Pot Sample Catch	Sampled Fleet Estimated CPUE	Estimated Total Catch[a]
Golden King Crab			
Legal males retained	10,399	6.4 (0.28)[b]	647,000[c]
Legal males not retained	268	0.1 (0.01)	10,000
Sublegal males	37,237	8.4 (0.59)	847,000
Females	45,645	10.4 (0.85)	1,051,000

[a] Estimated CPUE multiplied by 101,040 total pot lifts (ADF&G, Westward Region staff 2001) during the fishery.

[b] Actual CPUE for retained legal crabs for the fishery as reported on confidential interview forms was 6.2; actual total fishery CPUE of retained legal crabs was 96.7 for all vessels (ADF&G, Westward Region staff 2001).

[c] Actual catch of retained legal crabs for the fishery was 676,558 (ADF&G, Westward Region staff 2001).

Table 27. Total pot contents from 4,576 bycatch samples taken on 1 catcher-processor and 14 catcher-only vessels during the 1999/2000 Aleutian Island golden king crab fishery west of 174° W longitude.

Species	Total Number Observed
Golden King Crab	
Legal males	27,999
Sublegal males	37,237
Females	45,645
Scarlet King Crab	
Legal males	273
Sublegal males	47
Females	54
Red King Crab	
Legal males	1
Sublegal males	11
Females	1
Grooved Tanner Crab	
Legal males	5
Sublegal males	2
Females	1
Hair Crab	
Legal males	3
Sublegal males	3
Females	1
Tanner Crab	
Legal males	0
Sublegal males	2
Females	0
Hybrid Tanner/Snow Crab	
Legal males	0
Sublegal males	0
Females	1
Halibut	135
Sea star unidentified	89
Sponge unidentified	258
Brittle star	134
Pacific cod	123
Basket star	136
Snail unidentified	90
Arrowtooth flounder	16
Sea urchin unidentified	108
Rockfish spp.	20
Greenland turbot	11
Skate unidentified	10
Lyre crab	23
Sculpin unidentified	17
Sablefish	8
Octopus	14
Yellow Irish lord	7

Species	Total Number Observed
Grenadier	10
Weathervane scallop	8
Rougheye rockfish	6
Shortspine thornyhead	7
Atka mackerel	4
Bigmouth sculpin	2
Placetron wosnessenski	4
Hermit crab unidentified	2
Pacific ocean perch	2
Snailfish	2
Great sculpin	1
Prowfish	1
Dover sole	1
Greenling	1
Sea cucumber	1

Table 28. Estimated CPUE for golden king crab by soak hours from 4,576 bycatch samples taken during the 1999/2000 Aleutian Island golden king crab fishery west of 174° W longitude.

Soak Hours (days)	Pots Sampled		Catch Per Sampled Pot			
	Number	Percent	Legal	Sublegal	Female	Total
1-24 (1)	11	0.2	1.4	2.1	6.3	9.7
25-48 (2)	303	6.6	2.7	6.9	9.9	19.6
49-72 (3)	547	12.0	3.2	7.9	9.5	20.7
73-96 (4)	369	8.1	4.4	9.5	9.5	23.4
97-120 (5)	233	5.1	4.5	6.3	8.3	19.0
121-144 (6)	262	5.7	5.3	7.9	11.7	24.9
145-168 (7)	419	9.2	6.2	9.7	12.4	28.4
169-192 (8)	337	7.4	6.0	8.7	11.2	25.9
193-216 (9)	257	5.6	7.6	11.0	14.9	33.5
217-240 (10)	232	5.1	7.1	8.8	12.0	27.9
241-264 (11)	202	4.4	8.6	7.5	10.3	26.3
265-288 (12)	236	5.2	7.2	9.8	9.3	26.3
289-312 (13)	207	4.5	7.5	9.6	8.6	25.6
313-336 (14)	189	4.1	7.4	9.4	11.9	28.7
337-360 (15)	111	2.4	11.4	8.9	7.1	27.4
361-384 (16)	67	1.5	8.2	8.8	5.6	22.7
385-408 (17)	38	0.8	8.4	6.0	4.9	19.3
409-432 (18)	28	0.6	6.8	2.4	6.6	15.7
433-456 (19)	23	0.5	7.0	3.8	12.7	23.5
457-480 (20)	51	1.1	4.6	2.7	4.3	11.6
481-504 (21)	14	0.3	6.1	4.9	3.9	14.9
505-528 (22)	14	0.3	9.6	4.7	8.7	23.0
529-552 (23)	21	0.5	9.4	5.8	3.4	18.6
553-576 (24)	25	0.5	7.4	2.6	5.2	15.2
577-600 (25)	32	0.7	6.5	3.7	4.1	14.4
601-624 (26)	17	0.4	7.4	2.2	2.3	11.9
625-648 (27)	20	0.4	6.0	2.4	1.3	9.7
649-672 (28)	17	0.4	8.8	3.2	8.5	20.5
673-696 (29)	20	0.4	8.1	1.7	3.2	13.1
697-720 (30)	34	0.7	10.7	6.1	7.7	24.5
> 720 (> 30)	237	5.2	9.6	5.7	7.7	23.0
Mean Soak: 110.9 hours	Overall CPUE:		9.8	15.5	12.9	38.3

Table 29. Estimated CPUE for golden king crab by depth from 4,576 bycatch samples taken during the 1999/2000 Aleutian Island golden king crab fishery west of 174° W longitude.

	Pots Sampled		Catch per Sampled Pot			
Depth	Number	Percent	Legal	Sublegal	Female	Total
26-50	2	<0.1	0	0	0	0
51-75	58	1.3	3.2	1.7	1.7	6.6
76-100	261	5.7	4.0	4.7	5.2	13.9
101-125	264	5.8	6.3	7.7	7.4	21.4
126-150	690	15.1	6.7	8.8	8.2	23.7
151-175	822	18.0	5.7	9.6	10.5	25.8
176-200	855	18.7	6.6	8.4	10.5	25.5
201-225	682	14.9	6.4	8.7	14.0	29.1
226-250	473	10.4	6.3	8.1	12.0	26.4
251-275	212	4.6	5.7	6.0	9.3	21.0
276-300	136	3.0	5.9	6.5	8.2	20.6
301-325	69	1.5	7.1	8.9	5.7	21.7
326-350	30	0.7	6.8	5.8	3.1	15.7
351-375	9	0.2	4.8	3.3	5.4	13.5
376-400	4	0.1	2.0	3.5	9.3	14.8
401-425	1	<0.1	0	0	0	0
Mean Depth 183.9 fm	Overall CPUE		6.5	8.4	10.4	25.3

Table 30. Shell ages of male and female golden king crabs from bycatch samples taken during the 1996/1997-1999/2000 Aleutian Island golden king crab fisheries west of 174° W longitude.

YEAR	Sex	Sample Size	SHELL AGE CLASS					
			NEW		OLD		VERY OLD	
			Count	% Total	Count	% Total	Count	% Total
1996/1997	Male	82,600	80,632	97.6	1,762	2.1	116	0.1
	Female	67,495	64,489	95.6	2,869	4.3	14	<0.1
1997/1998	Male	55,643	53,455	96.1	1,862	3.3	280	0.5
	Female	39,322	38,818	98.7	443	1.1	11	<0.1
1998/1999	Male	36,047	35,464	97.2	526	1.4	53	0.1
	Female	22,086	21,906	98.5	172	0.8	5	<0.1
1999/2000	Male	65,235	61,502	94.3	2,836	4.3	233	0.4
	Female	45,645	44,642	97.8	640	1.4	7	<0.1

Table 31. Reproductive condition of female golden king crabs in bycatch samples taken during the 1996/1997-1999/2000 Aleutian Island golden king crab fisheries west of 174° W longitude.

YEAR	Crabs Sampled	Eyed Eggs		Uneyed Eggs		Barren, Mated		Barren, Non-mated	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
1996/1997	67,314	15,907	23.6	17,187	25.5	14,303	21.2	19,917	29.6
1997/1998	39,343	9,456	24.0	10,538	26.8	7,779	19.8	11,567	29.4
1998/1999	22,208	5,202	23.4	5,755	25.9	3,613	16.3	7,638	34.4
1999/2000	45645	9,729	21.3	13,529	29.6	8,738	19.1	13,632	29.9

Table 32. Carapace size frequency distributions from biological measurements of retained hair crabs sampled during the 1997-2000 Bering Sea hair crab fisheries.

Length	1997		1998		1999		2000	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
61-65	0	0	0	0	0	0	0	0
66-70	0	0	5	0.2	0	0	0	0
71-75	9	0.2	7	0.3	1	0.1	0	0
76-80	87	2.0	65	2.4	14	1.4	1	1.9
81-85	303	7.1	195	7.1	64	6.4	3	5.7
86-90	672	15.8	340	12.4	122	12.3	12	22.6
91-95	1,065	25.0	532	19.4	225	22.7	18	34.0
96-100	1,217	28.6	723	26.4	343	34.6	15	28.3
101-105	698	16.4	619	22.6	178	17.9	4	7.5
106-110	190	4.5	222	8.1	44	4.4	0	0
Totals	4,241	99.5	2,708	98.7	991	99.9	53	100.0
Mean Length (mm)	95.0		96.3		96.0		93.2	

Table 33. Estimated catch per pot (CPUE) of selected crab species from pot lifts sampled by observers deployed on 3 catcher-only vessels during the 2000 Bering Sea hair crab fishery. Standard errors of the CPUE estimates are included in parentheses. The data are from 192 pot lifts.

Species / Sex class	Total Pot Sample Catch	Sampled Fleet Estimated CPUE	Estimated Total Catch[a]
Hair Crab			
Legal males retained	72	0.3 (0.20)[b]	990[c]
Legal males not retained	0	0	0
Sublegal males	1	<0.1 (0.01)	11
Females	0	0	0

[a] Estimated CPUE multiplied by 3,300 total pot lifts during the fishery (ADF&G, Westward Region Staff 2001).

[b] Actual CPUE for retained legal crabs for the fishery as reported on confidential interview forms was 0.3 for observed vessels. Actual total fishery CPUE of retained legal crabs was 0.3 for all vessels (ADF&G, Westward Region Staff 2001).

[c] Actual catch of retained legal crabs for the fishery was 1,058 (ADF&G, Westward Region Staff 2001).

Table 34. Total pot contents from 192 bycatch samples taken on 3 catcher-only vessels during the 2000 Bering Sea hair crab fishery.

Species	Total Number Observed
Hair Crab	
Legal Males	72
Sublegal Males	1
Females	0
Snow Crab	
Legal Males	0
Sublegal Males	8
Females	1
Red King Crab	
Legal Males	0
Sublegal Males	1
Females	1
Tanner Crab	
Legal Males	0
Sublegal Males	1
Females	0
Blue King Crab	
Legal Males	0
Sublegal Males	1
Females	0
Sea stars	4,418
Snail (unidentified)	252
Lyre crab	159
Hermit crab (unidentified)	40
Pacific cod	7
Rock sole	1
Yellowfin sole	1
Snailfish (unidentified)	1

Table 35. Estimated CPUE for hair crabs by soak hours from 192 bycatch samples taken on 3 catcher-only vessels during the 2000 Bering Sea hair crab fishery.

Soak Hours	Pots Sampled		Catch per Sampled Pot				
	Number	Percent	Legal Retained	Legal Not Retained	Sublegal	Female	Total Crabs
1-6	14	7.3	0.2	0	0	0	0.2
7-12	74	38.5	0.2	0	<0.1	0	0.2
13-18	33	17.2	0.5	0	0	0	0.5
19-24	13	6.8	0	0	0	0	0
25-30	35	18.2	0.8	0	0	0	0.8
31-36	23	12.0	0.3	0	0	0	0.3
Mean Soak: 16.9 hours	Overall CPUE:		0.3	0	<0.1	0	0.3

Table 36. Estimated CPUE for hair crabs by depth from 192 bycatch samples taken on 3 catcher-only vessels during the 2000 Bering Sea hair crab fishery.

Depth	Pots Sampled		Catch per Sampled Pot				
	Number	Percent	Legal Retained	Legal Not Retained	Sublegal	Female	Total Crabs
19-20	6	3.1	0	0	0	0	0
21-22	13	6.8	0.3	0	0.1	0	0.4
23-24	31	16.2	0.2	0	0	0	0.2
25-26	75	39.1	0.6	0	0	0	0.6
27-28	29	15.1	0.2	0	0	0	0.2
29-30	38	19.8	0.2	0	0	0	0.2
Mean Depth: 25.7 fm	Overall CPUE:		0.3	0	<0.1	0	0.3

Table 37. Shell ages of male and female hair crabs from bycatch samples taken on catcher-only vessels during the 1995-2000 Bering Sea hair crab fisheries.

YEAR	Sex	Sample Size	SHELL AGE CLASSES					
			NEW		OLD		VERY OLD	
			Count	% Total	Count	% Total	Count	% Total
1995	Male	13,663	11,755	86.0	1,830	13.4	76	0.6
	Female	708	644	91.0	62	8.8	2	0.3
1996	Male	7,063	4,499	63.7	2,159	30.6	399	5.6
	Female	573	516	90.1	41	7.2	5	0.9
1997	Male	5,257	4,481	85.2	711	13.5	65	1.2
	Female	193	178	92.2	14	7.3	1	0.5
1998	Male	2,222	1,852	83.3	322	14.5	48	2.2
	Female	428	401	93.7	24	5.6	3	0.7
1999	Male	2,361	1,842	78.0	444	18.8	75	3.2
	Female	120	116	96.7	3	2.5	1	0.8
2000	Male	51	46	90.2	5	9.8	0	0
	Female	0	0	0	0	0	0	0

Table 38. Results of legal tally samples taken on catcher-only vessels during the 1994-2000 Bering Sea hair crab fisheries.

Year	Sample Size	Male		Female		Other Crabs	Total Percent Illegal	Number of Crabs Harvested	Estimated Number of Illegal Crabs	Percent of Harvest Sampled
		number	percent	number	percent					
1994	4,160	19	0.5	1	<0.1	3	0.6	165,365	914	2.5
1995	45,527	161	0.4	25	<0.1	60	0.5	1,433,478	7,746	3.2
1996	43,098	133	0.3	18	<0.1	39	0.4	485,722	2,141	8.9
1997	27,133	39	0.1	16	<0.1	36	0.3	420,121	1,409	6.5
1998	13,494	13	0.1	17	<0.1	5	0.3	188,784	490	7.1
1999	13,257	20	0.2	8	0.1	5	0.2	139,894	348	9.5
2000	109	0	0	0	0	0	0	1,058	0	0

Table 39. Observer coverage, pot sampling effort by observers, and relative difference of the weighted CPUE estimates for retained legal crabs from the Actual Observed Fleet (AOF) CPUE and from the Actual Total Fishery (ATF) CPUE. Data is from crab fisheries with mandatory observers.

Fishery (Table referenced)	Vessels		Pot Lifts		Percent difference of the weighted CPUE estimate from:	
	Observed	Total Fishery	Observed	Total Fishery	AOF CPUE[a]	ATF CPUE[b]
Bering Sea snow crab, *C. opilio* only (Table 2)	20	231	173	170,064	-17.8% (139.1)	-16.4 (136.8)
Bering Sea snow crab, with legal hybrids	20	231	173	170,064	-14.3% (139.1)	-12.9 (136.8)
Bristol Bay red king crab (Table 10)	20	246	673	98,694	3.2% (12.4)	8.5% (11.8)
Aleutian Islands golden king crab east of 174° W (Table18)	15	15	5,041	71,551	5.2% (9.6)	2.0% (9.9)
Aleutian Islands golden king crab west of 174° W (Table26)	15	15	4,576	101,040	3.2% (6.2)	-4.5% (6.7)
Bering Sea hair crab (Table 33)	3	3	192	3,300	0% (0.3)	0% (0.3)

[a] AOF CPUE is based on confidential interviews with vessel operators. Percent difference is calculated as:

$$\left[\frac{(weightedCPUE)-(AOFCPUE)}{(AOFCPUE)}\right]\times 100\%.$$ The AOF CPUE is in parentheses.

[b] ATF CPUE is based on fish ticket data on all landings in the fishery. Percent difference is calculated as:

$$\left[\frac{(weightedCPUE)-(ATFCPUE)}{(ATFCPUE)}\right]\times 100\%.$$ The ATF CPUE is in parentheses.

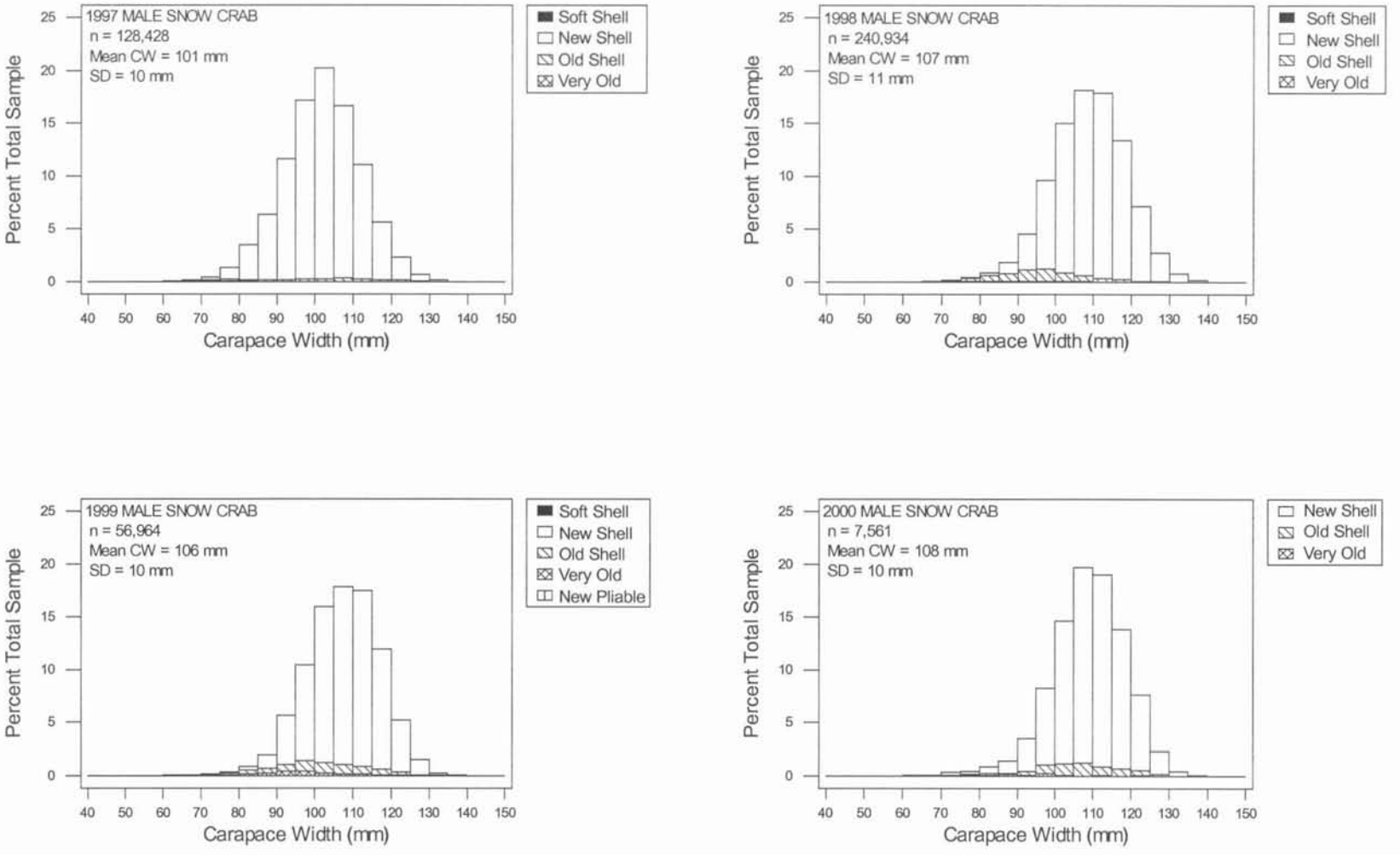


Figure 1. Carapace size frequency distributions with corresponding shell ages for male snow crabs from bycatch samples taken during the 1997-2000 Bering Sea snow crab fisheries.

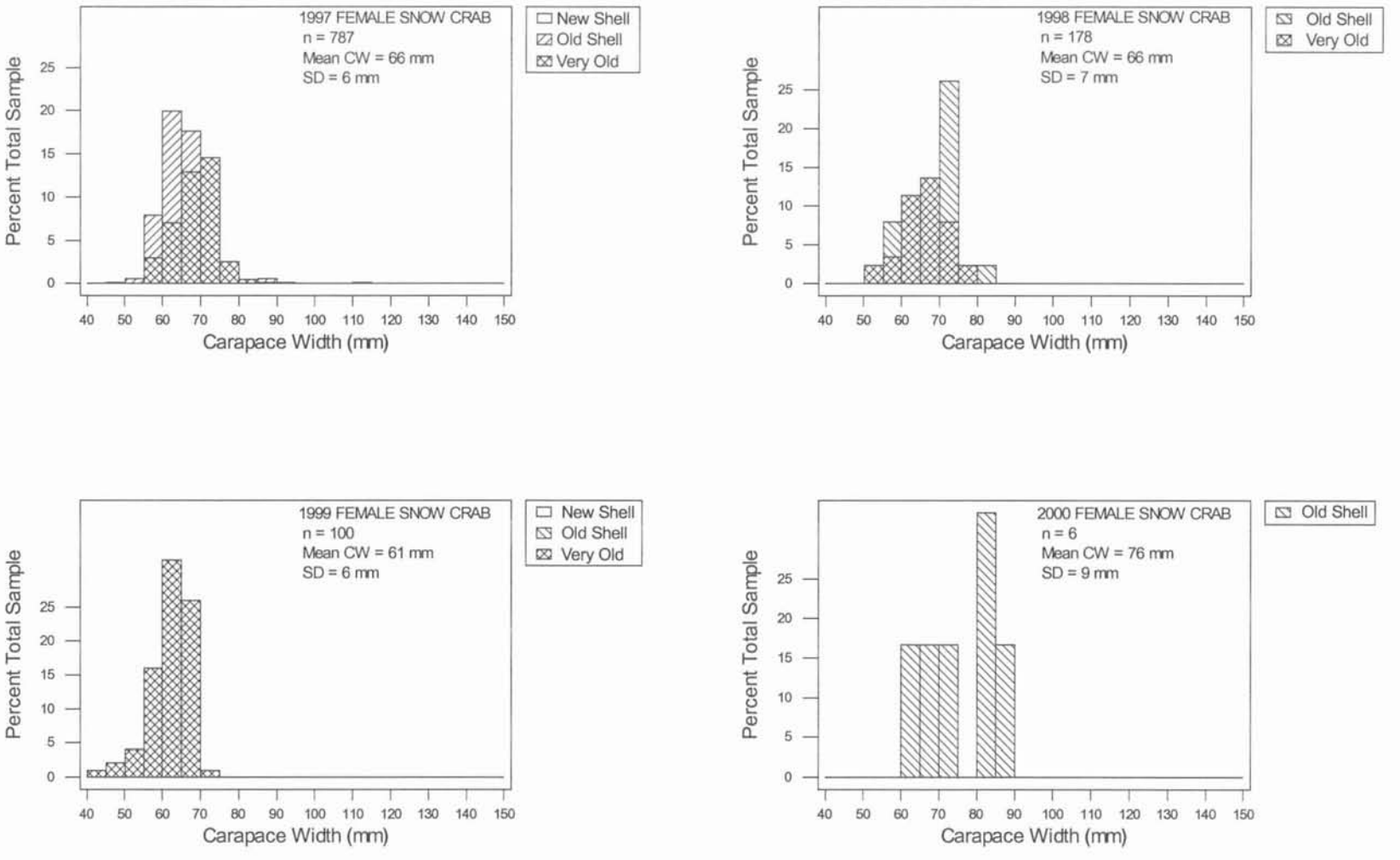


Figure 2. Carapace size frequency distributions with corresponding shell ages for female snow crabs from bycatch samples taken during the 1997-2000 Bering Sea snow crab fisheries.

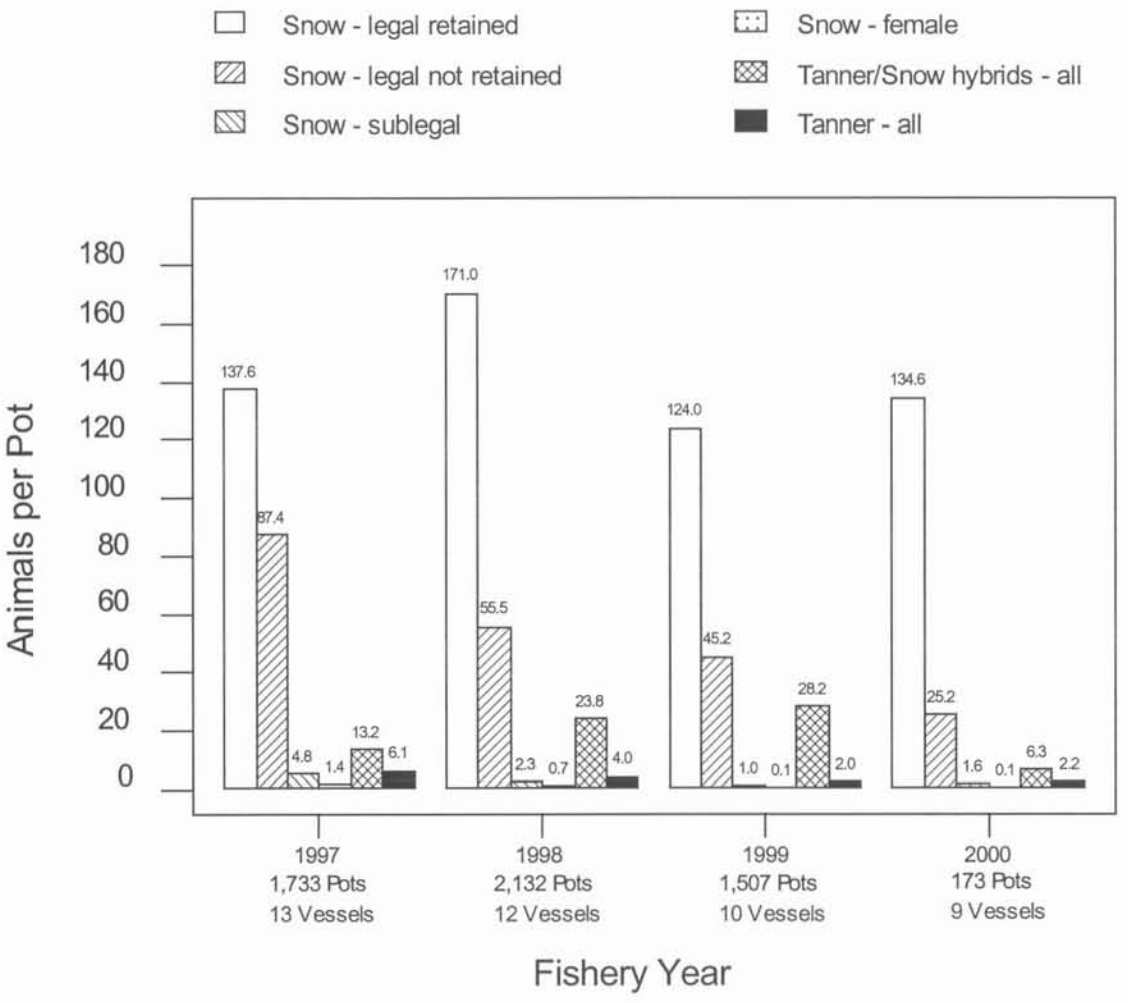


Figure 3. Estimated CPUE of selected species from bycatch samples taken during the 1997-2000 Bering Sea snow crab fisheries.

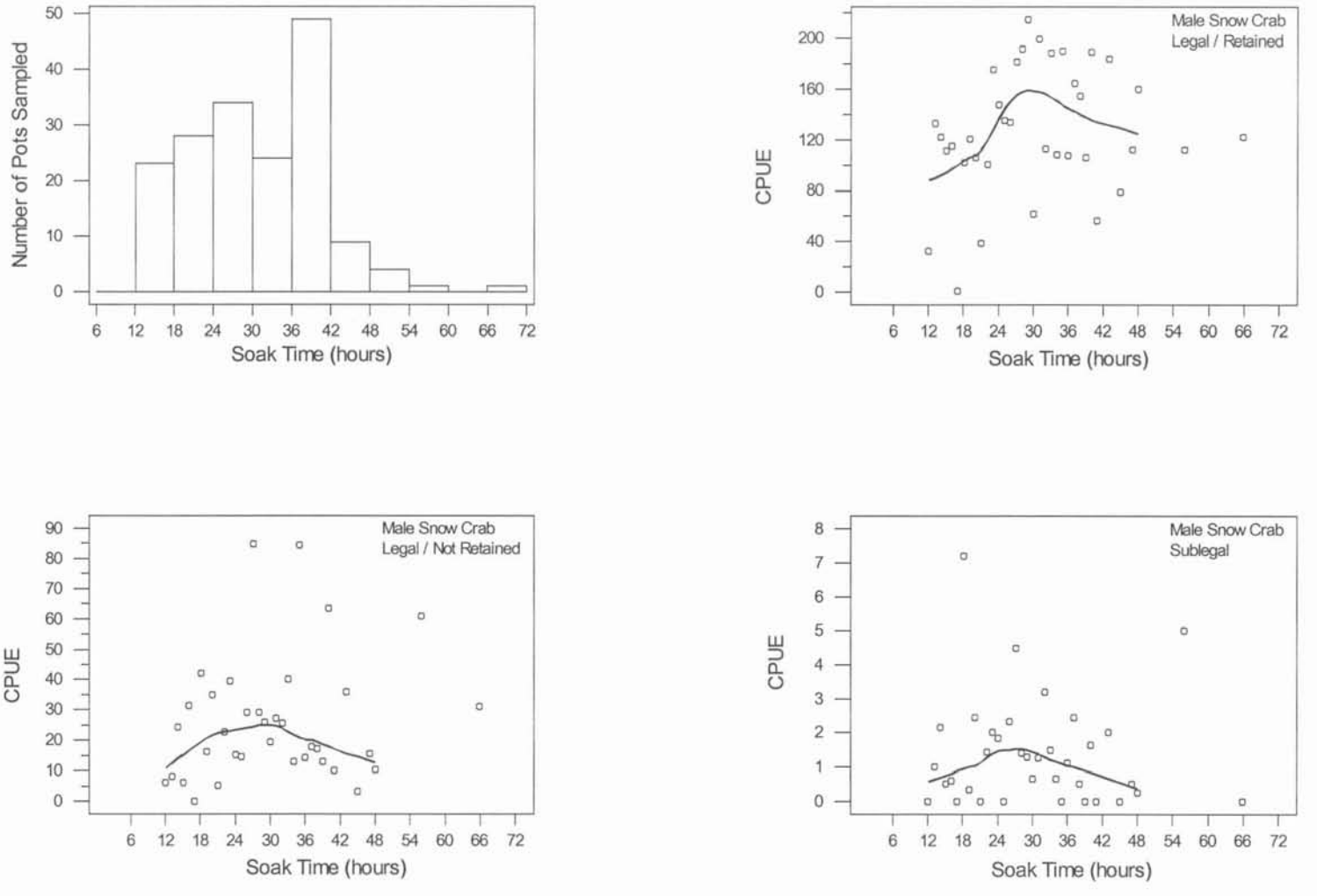


Figure 4. The mean estimated CPUE of legal/retained, legal/not-retained and sublegal male snow crabs by soak hours with LOWESS lines from 173 bycatch samples taken during the 2000 Bering Sea snow crab fishery.

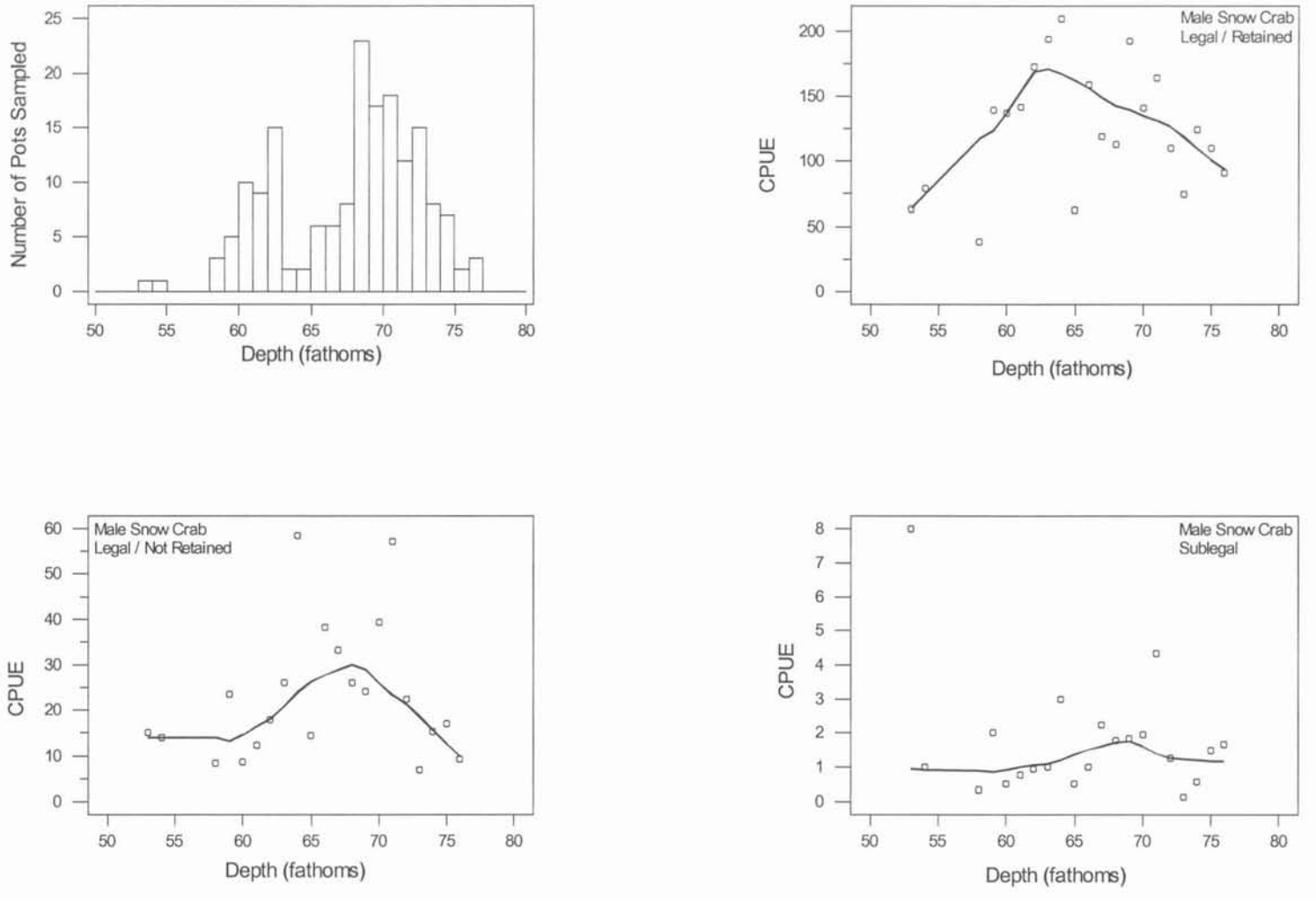


Figure 5. The mean estimated CPUE of legal/retained, legal/not-retained and sublegal male snow crabs by depth with LOWESS lines from 173 bycatch samples taken during the 2000 Bering Sea snow crab fishery.

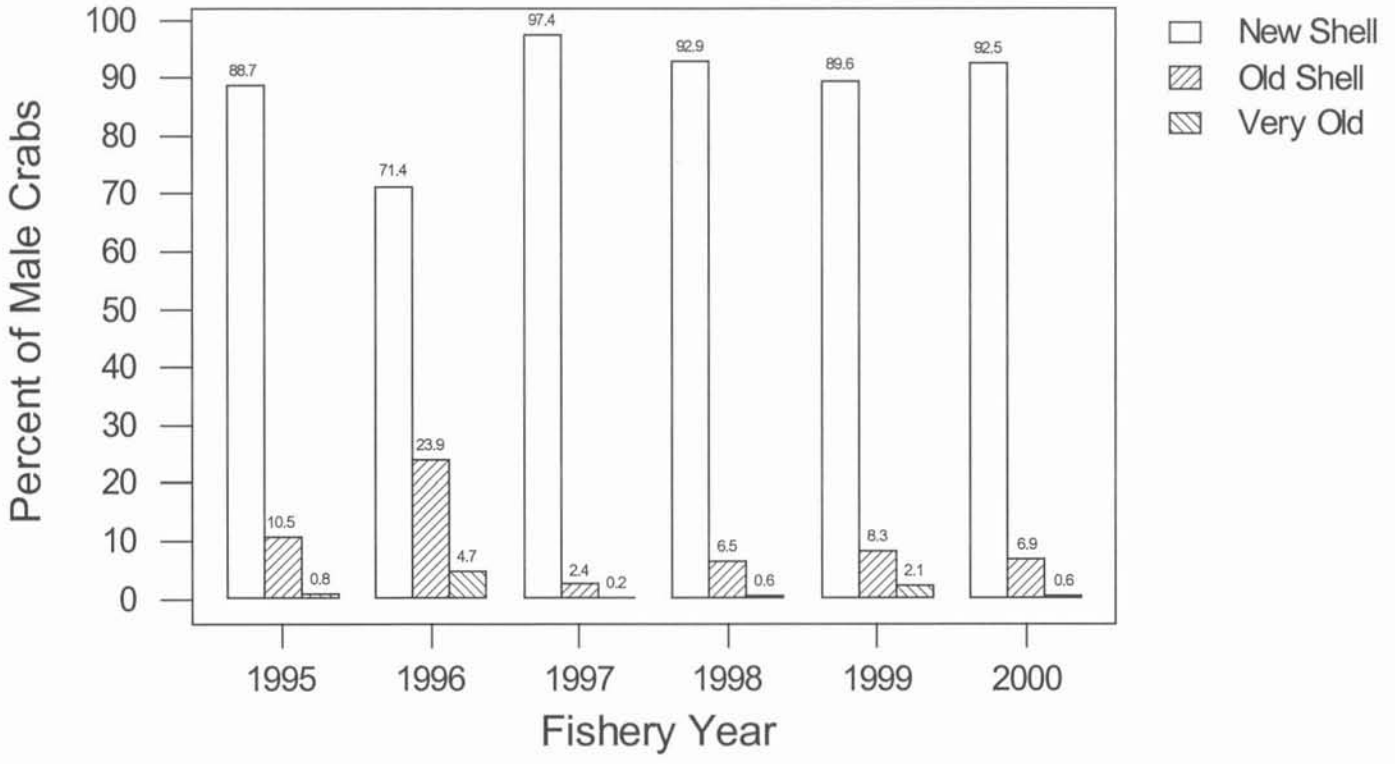


Figure 6. Percent by shell age for male snow crabs from the bycatch samples taken during the 1995-2000 Bering Sea snow crab fisheries.

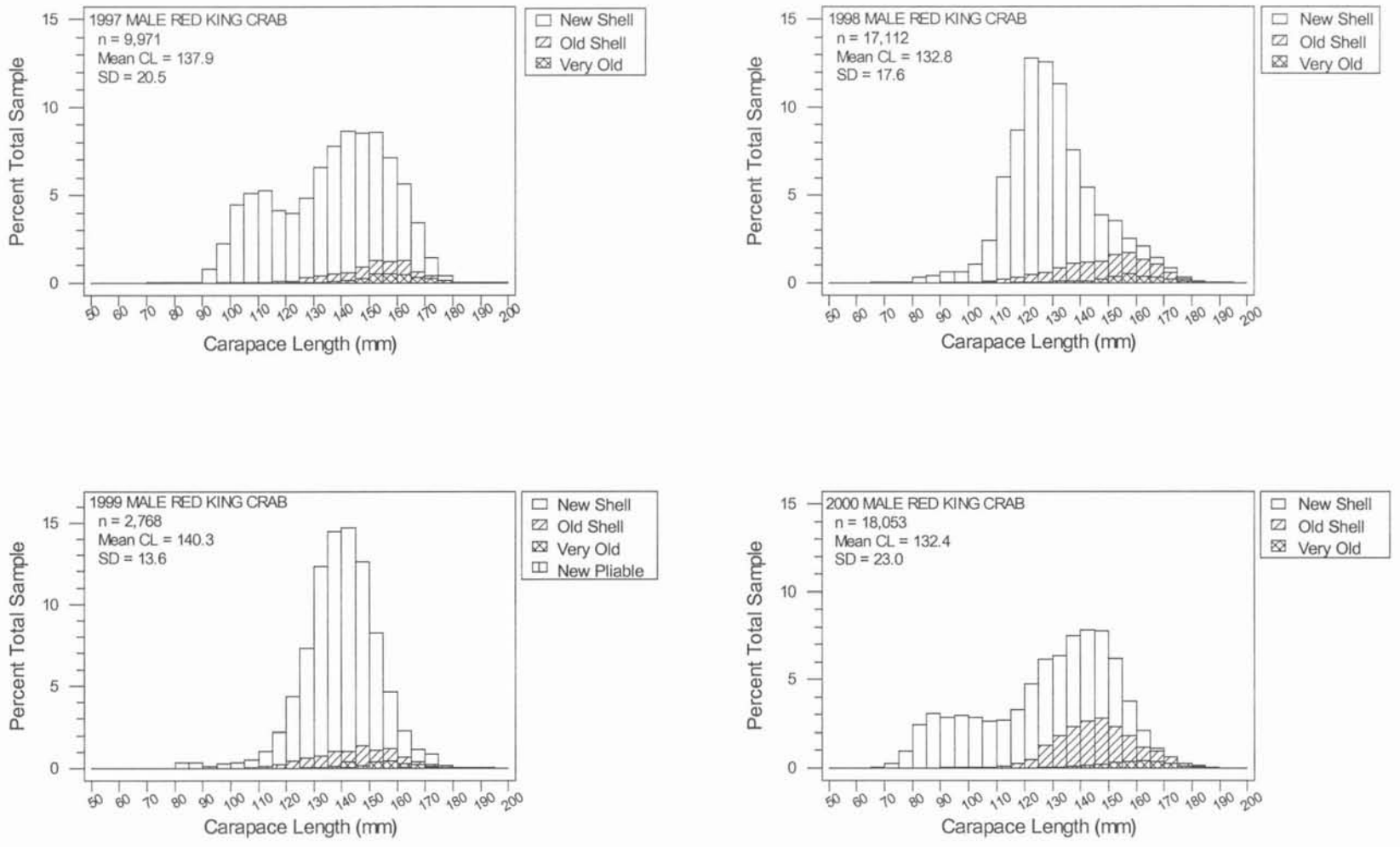


Figure 7. Carapace size frequency distributions with corresponding shell ages for male red king crabs from bycatch samples taken during the 1997-2000 Bristol Bay red king crab fisheries.

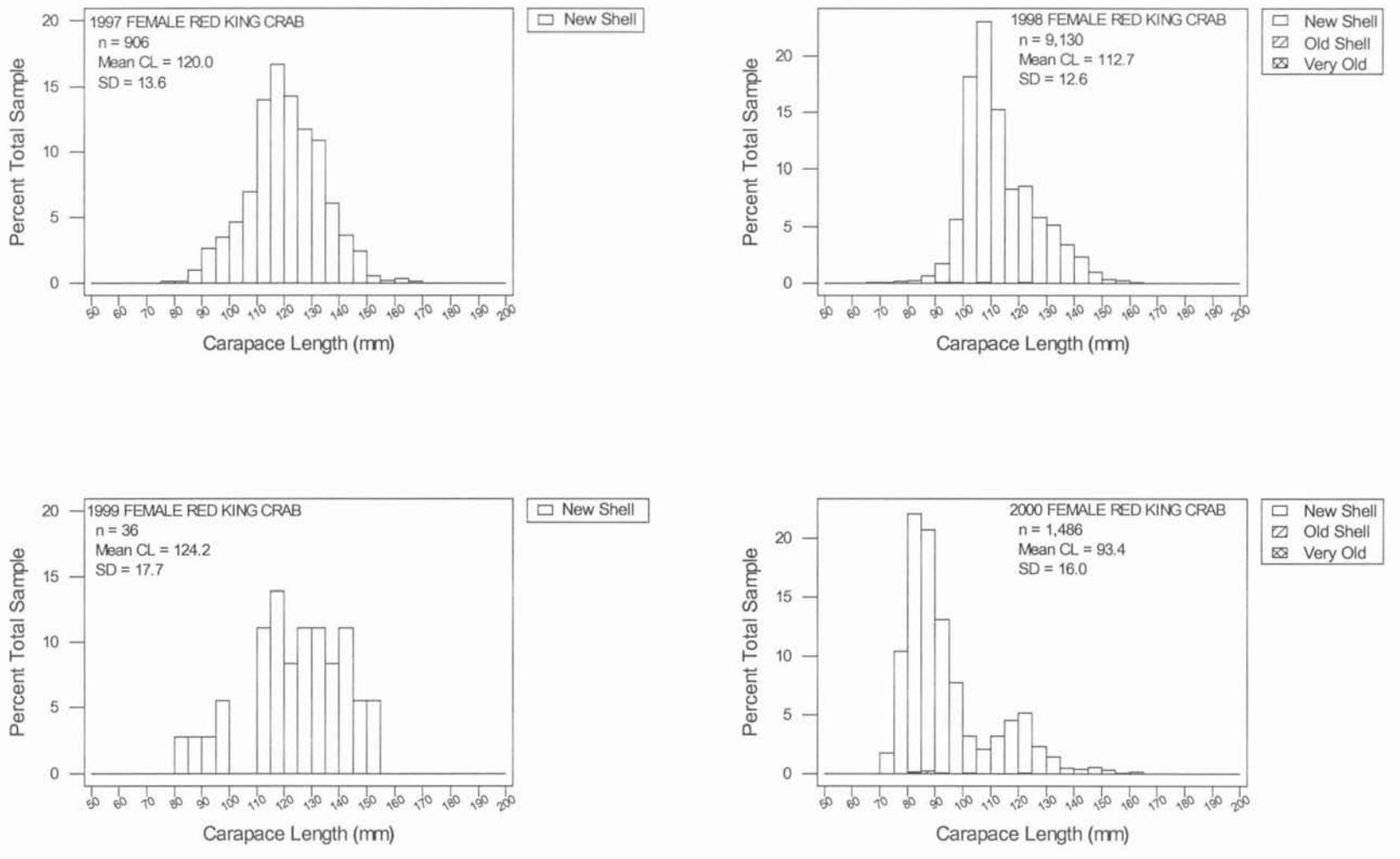


Figure 8. Carapace size frequency distributions with corresponding shell ages for female red king crabs from bycatch samples taken during the 1997-2000 Bristol Bay red king crab fisheries.

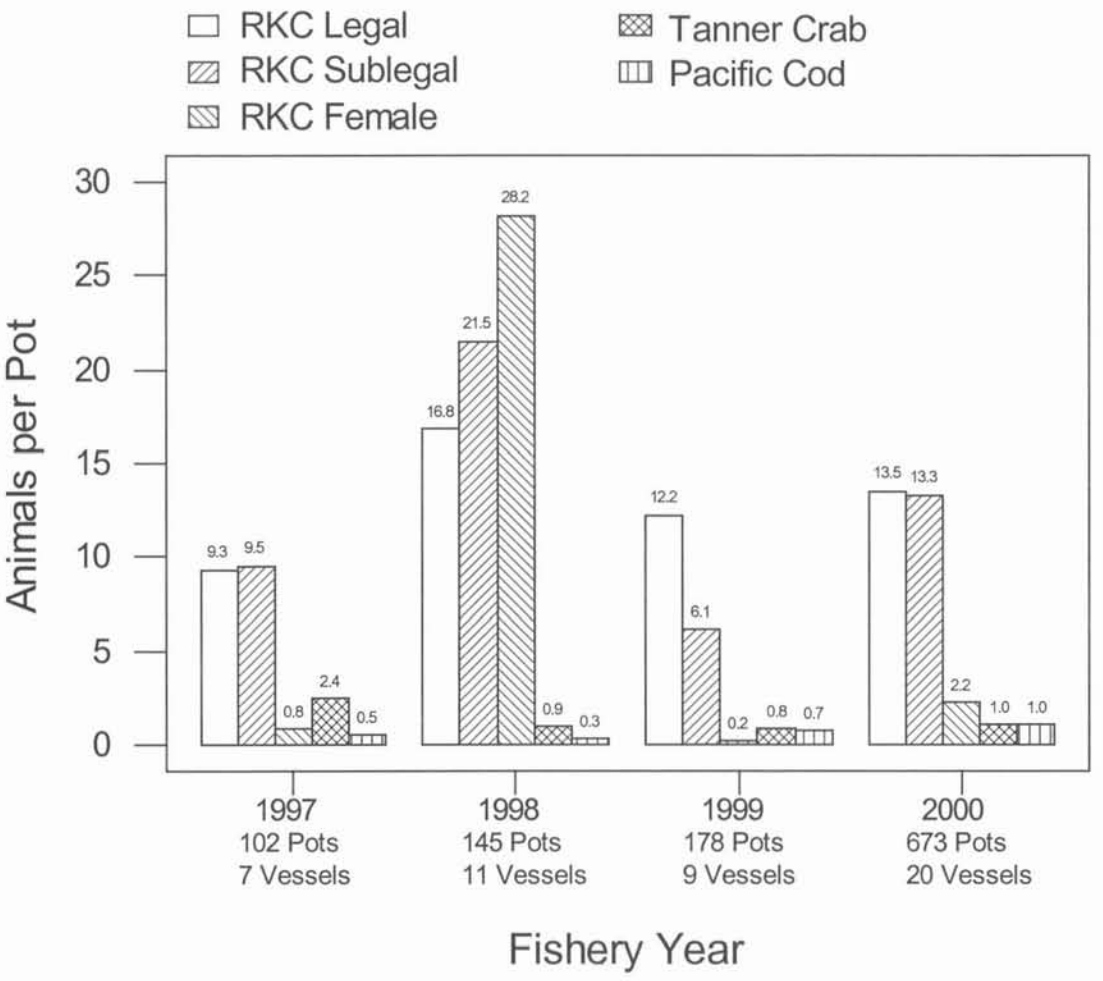


Figure 9. Estimated CPUE of selected species from bycatch samples taken during the 1997-2000 Bristol Bay red king crab fisheries.

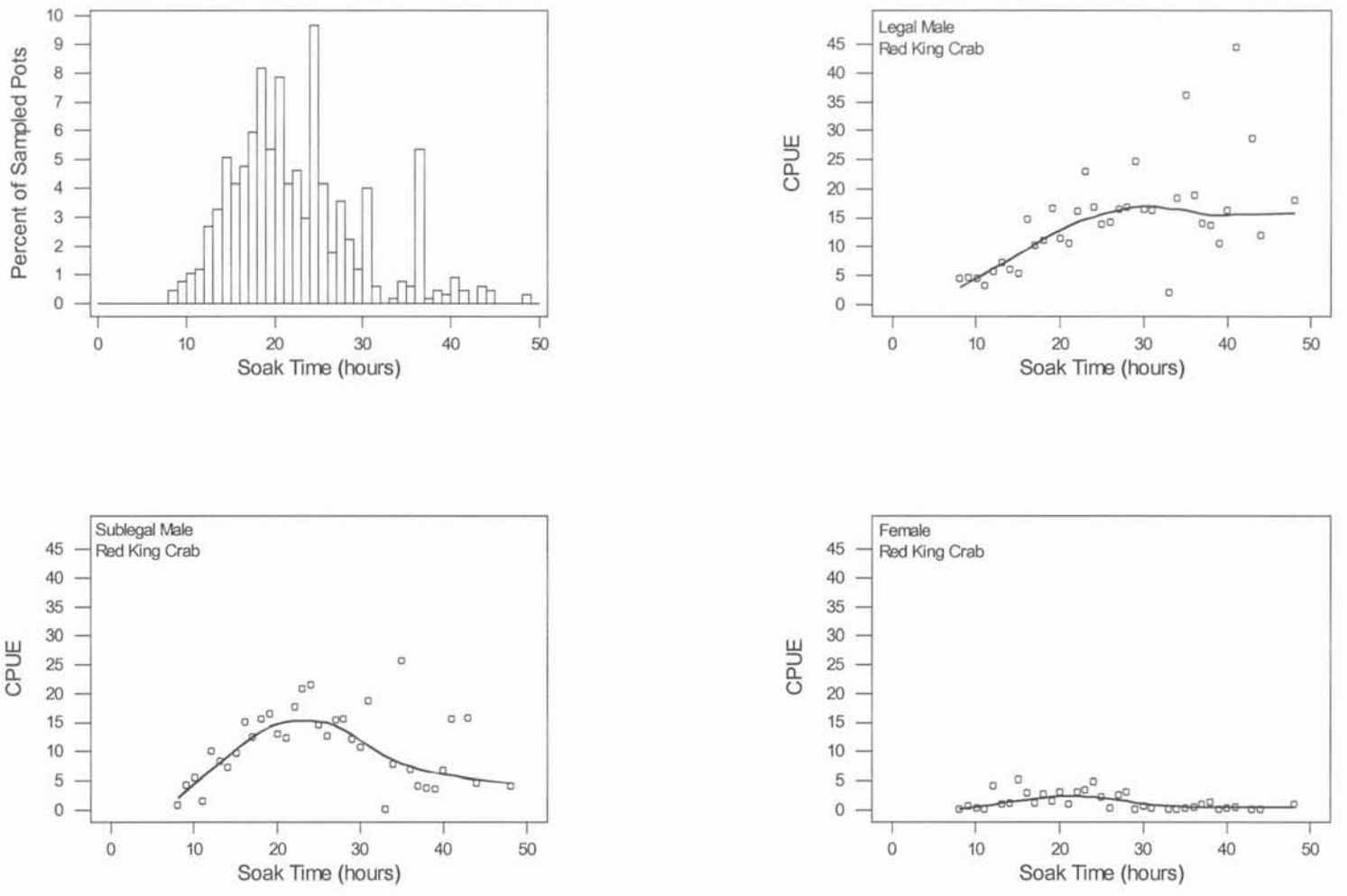


Figure 10. The mean estimated CPUE of legal male, sublegal male and female red king crabs by soak hours with LOWESS lines from bycatch samples during the 2000 Bristol Bay red king crab fishery.

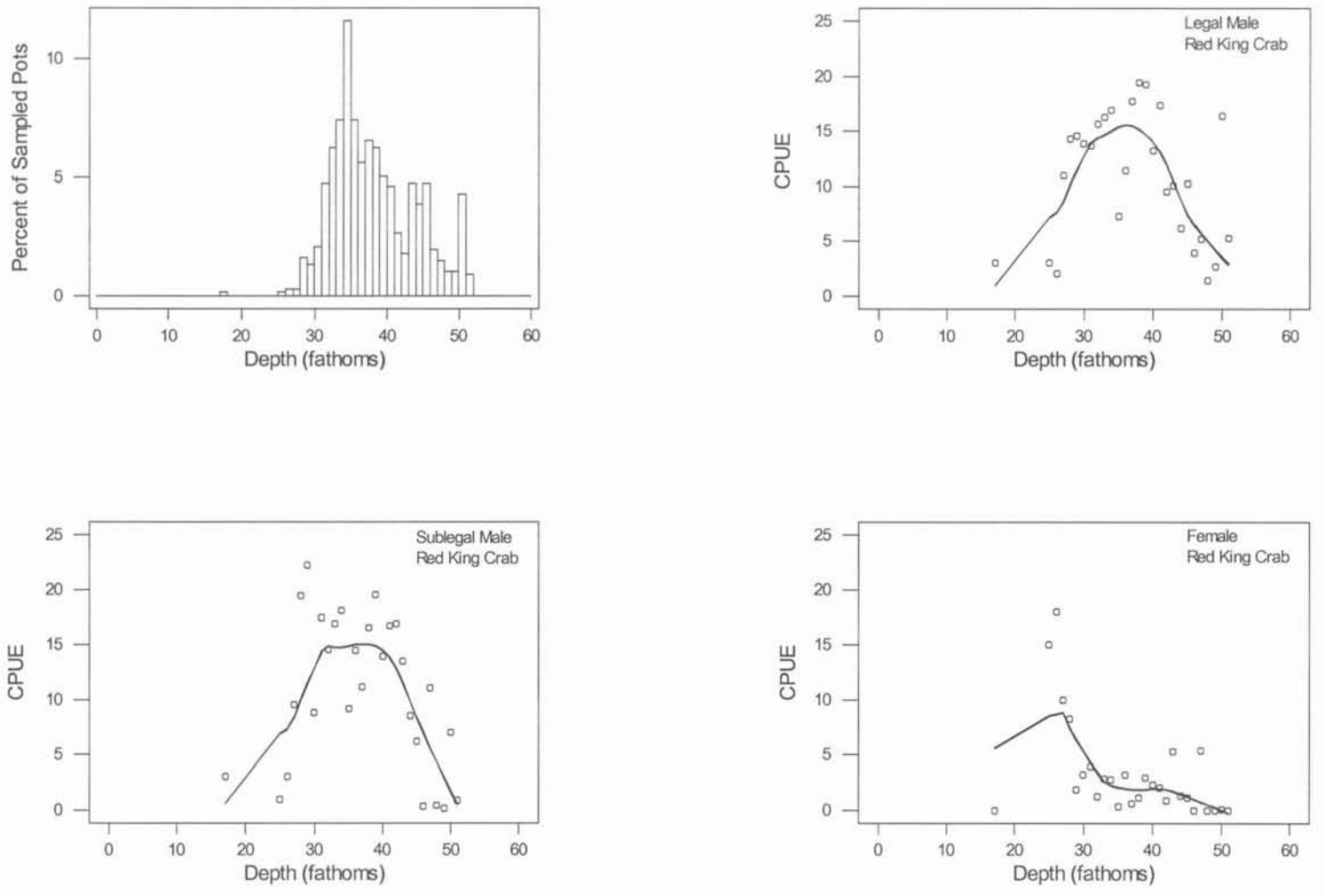


Figure 11. The mean estimated CPUE of legal male, sublegal male and female red king crabs by depth with LOWESS lines from bycatch samples during the 2000 Bristol Bay red king crab fishery.

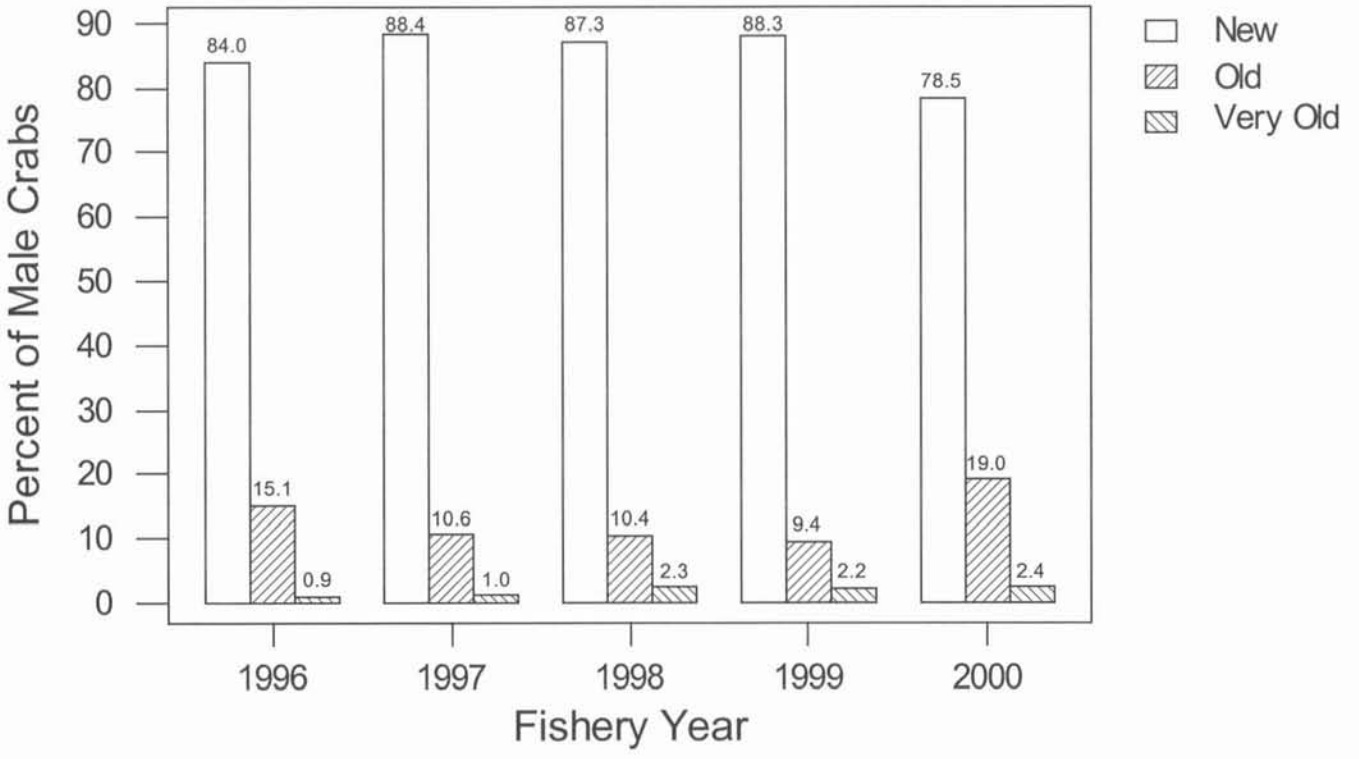


Figure 12. Percent by shell age for male red king crabs from the bycatch samples taken during the 1996-2000 Bristol Bay red king crab fisheries.

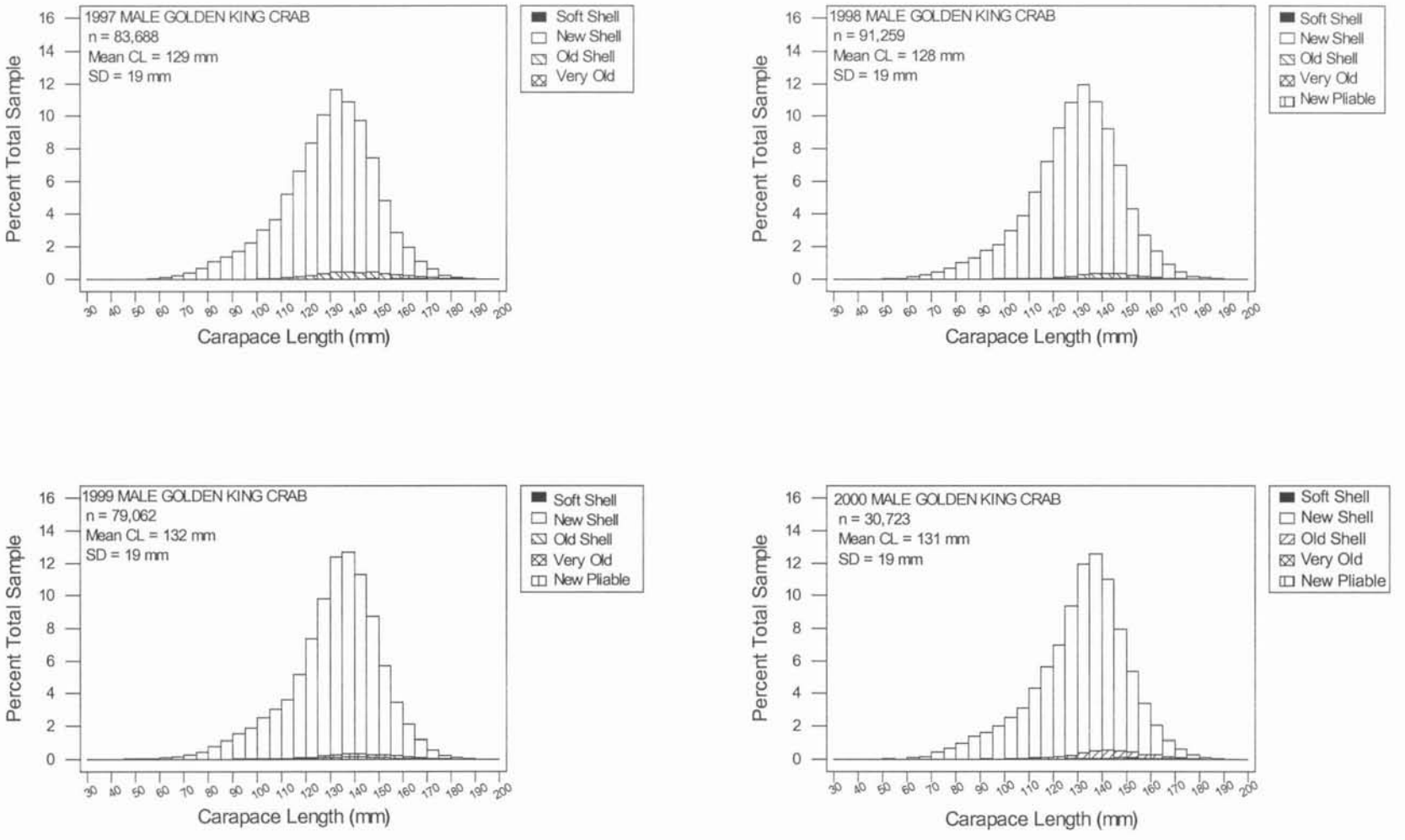


Figure 13. Carapace size frequency distributions with corresponding shell ages for male golden king crabs from bycatch samples taken during the 1997-2000 Aleutian Islands golden king crab fisheries east of 174° W longitude.

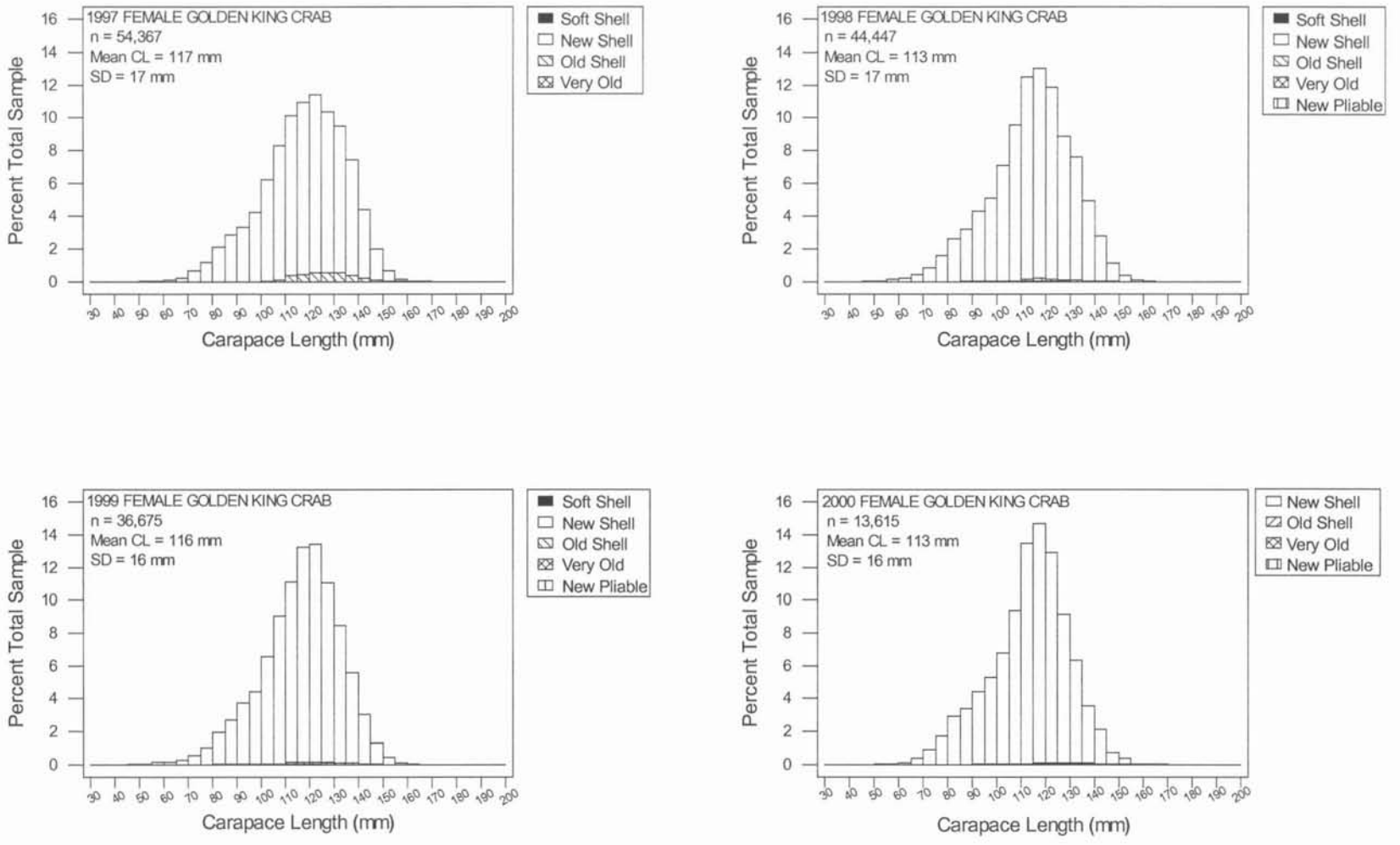


Figure 14. Carapace size frequency distributions with corresponding shell ages for female golden king crabs from bycatch samples taken during the 1997-2000 Aleutian Islands golden king crab fisheries east of 174° W longitude.

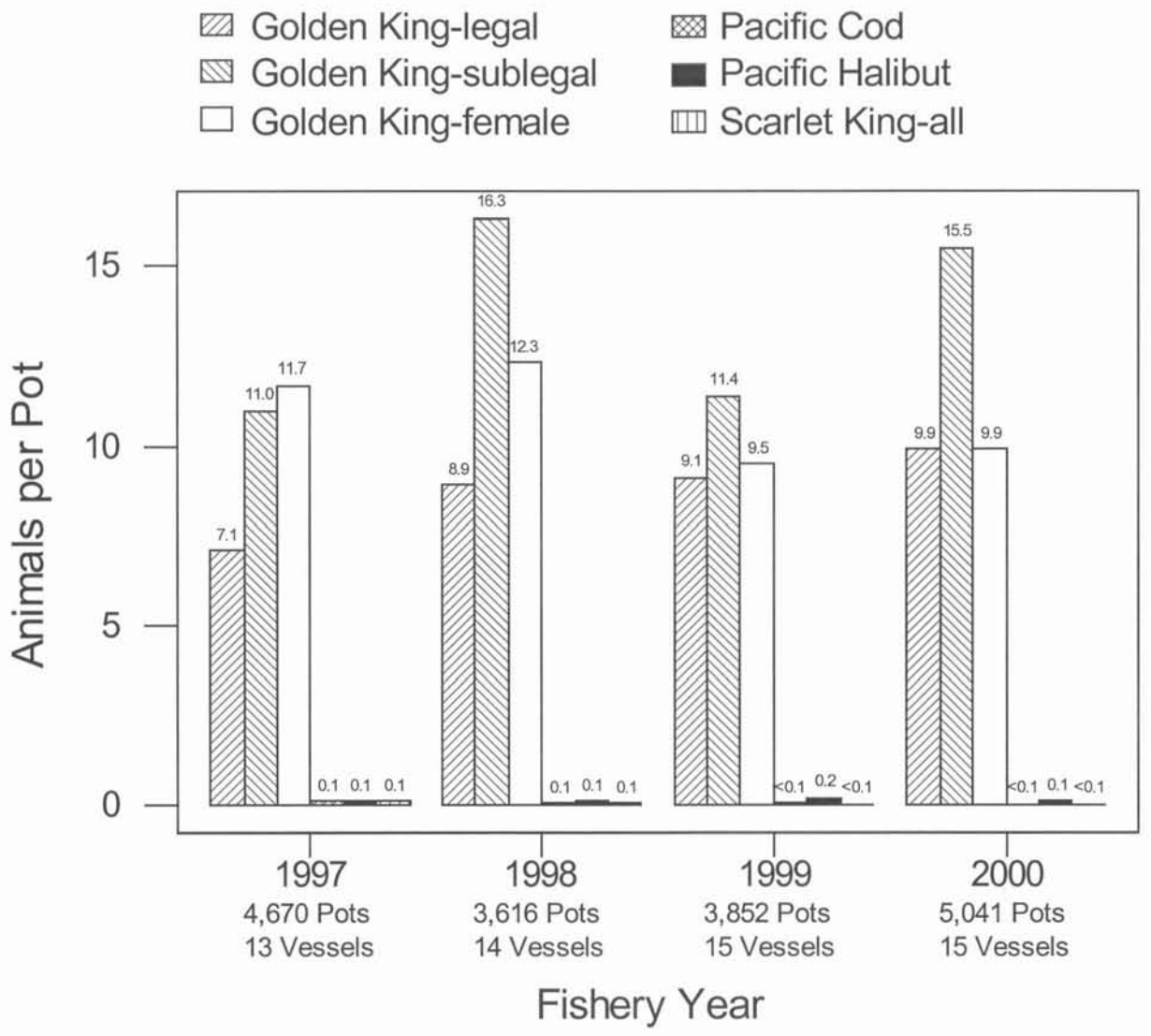


Figure 15. Estimated CPUE of selected species from bycatch samples taken during the 1997-2000 Aleutian Island golden king crab fisheries east of 174° W longitude.

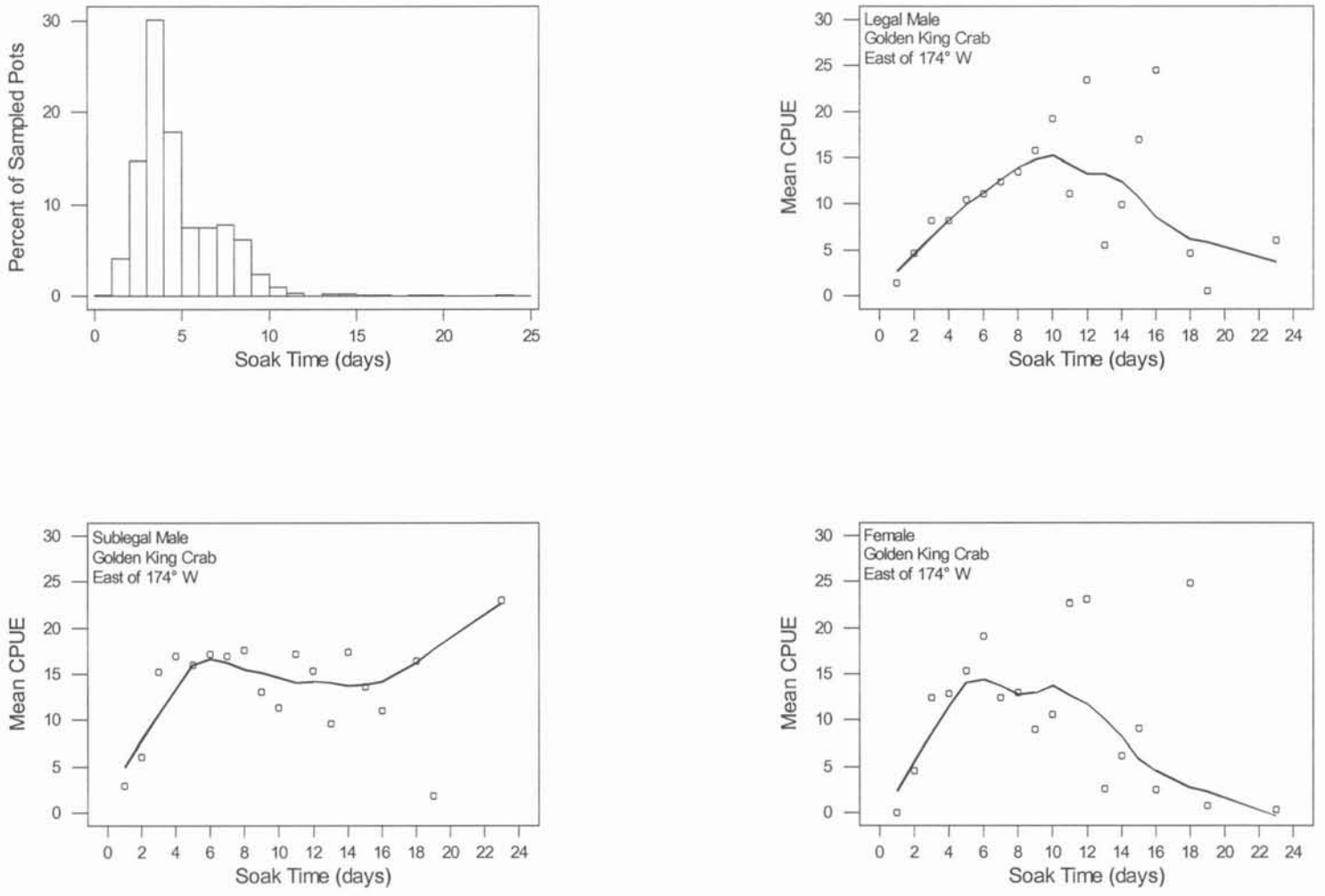


Figure 16. The mean estimated CPUE of legal male, sublegal male and female golden king crabs by soak time with LOWESS lines from bycatch samples taken during the 2000 Aleutian Island golden king crab fishery east of 174° W longitude.

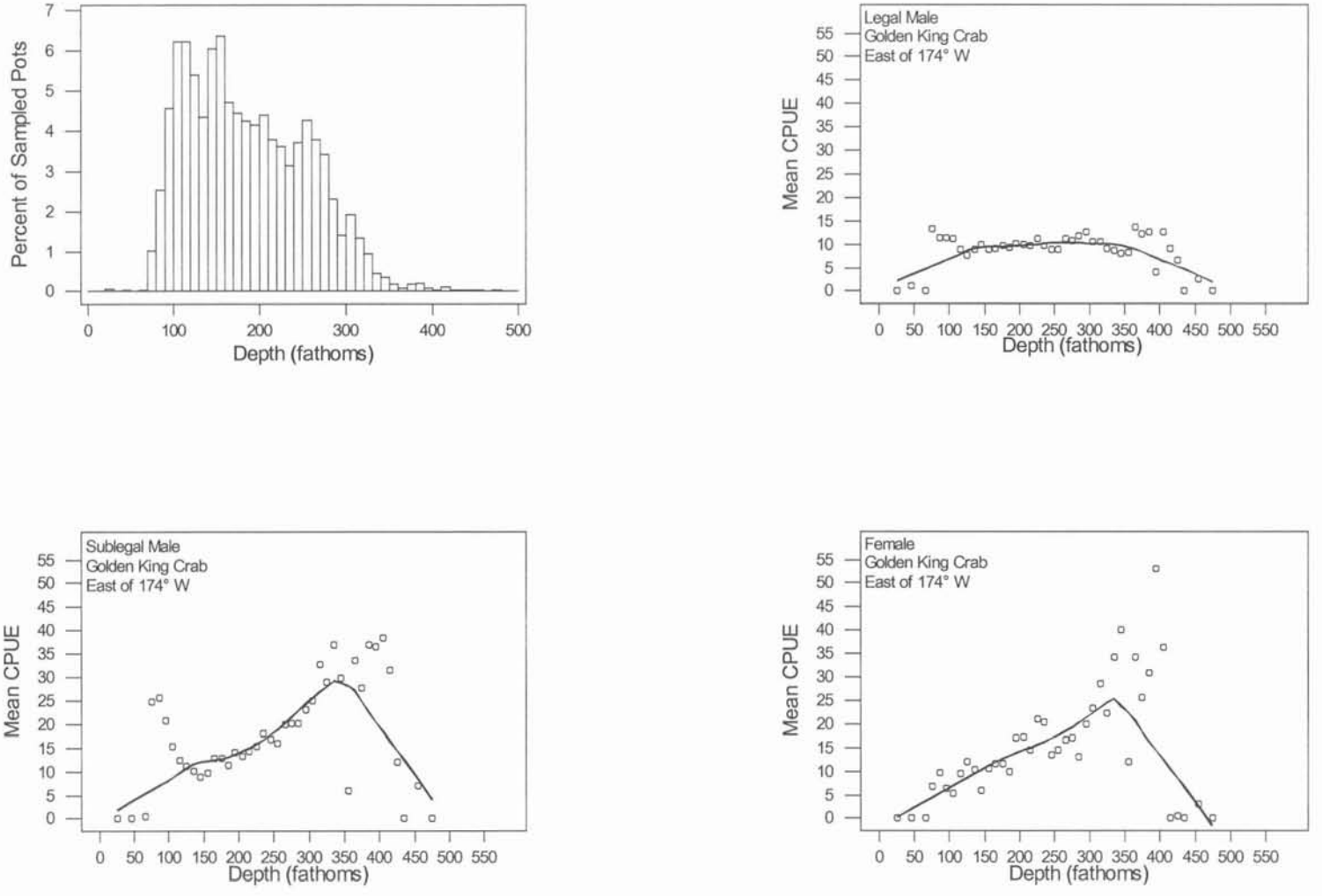


Figure 17. The mean estimated CPUE of legal male, sublegal male and female golden king crabs by 10 fathom depth intervals with LOWESS lines from bycatch samples during the 2000 Aleutian Island golden king crab fishery east of 174° W longitude.

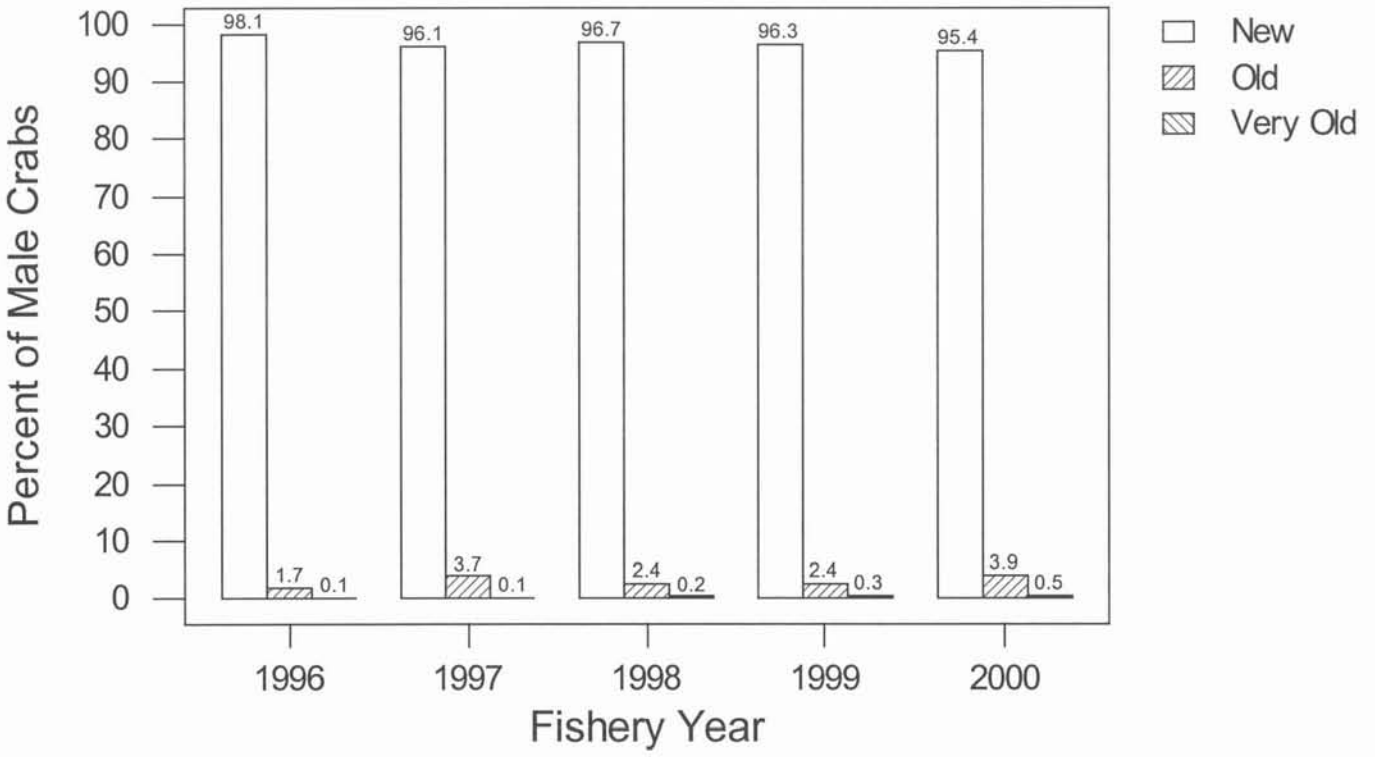


Figure 18. Percent by shell age for male golden king crabs from the bycatch samples taken during the 1996-2000 Aleutian Island golden king crab fisheries east of 174° W longitude.

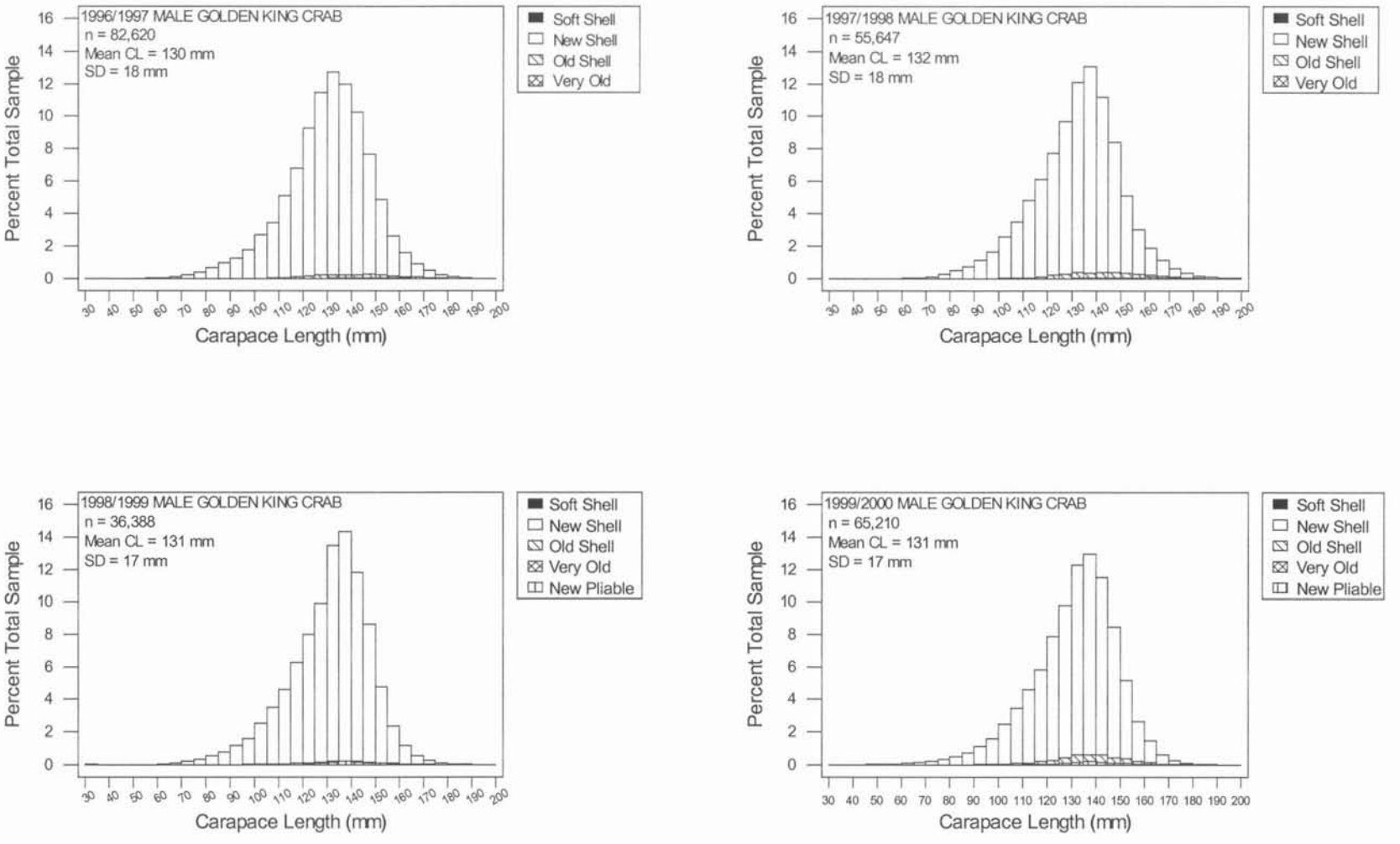


Figure 19. Carapace size frequency distributions with corresponding shell ages for male golden king crabs from bycatch samples taken during the 1996/1997-1999/2000 Aleutian golden king crab fisheries west of 174° W longitude.

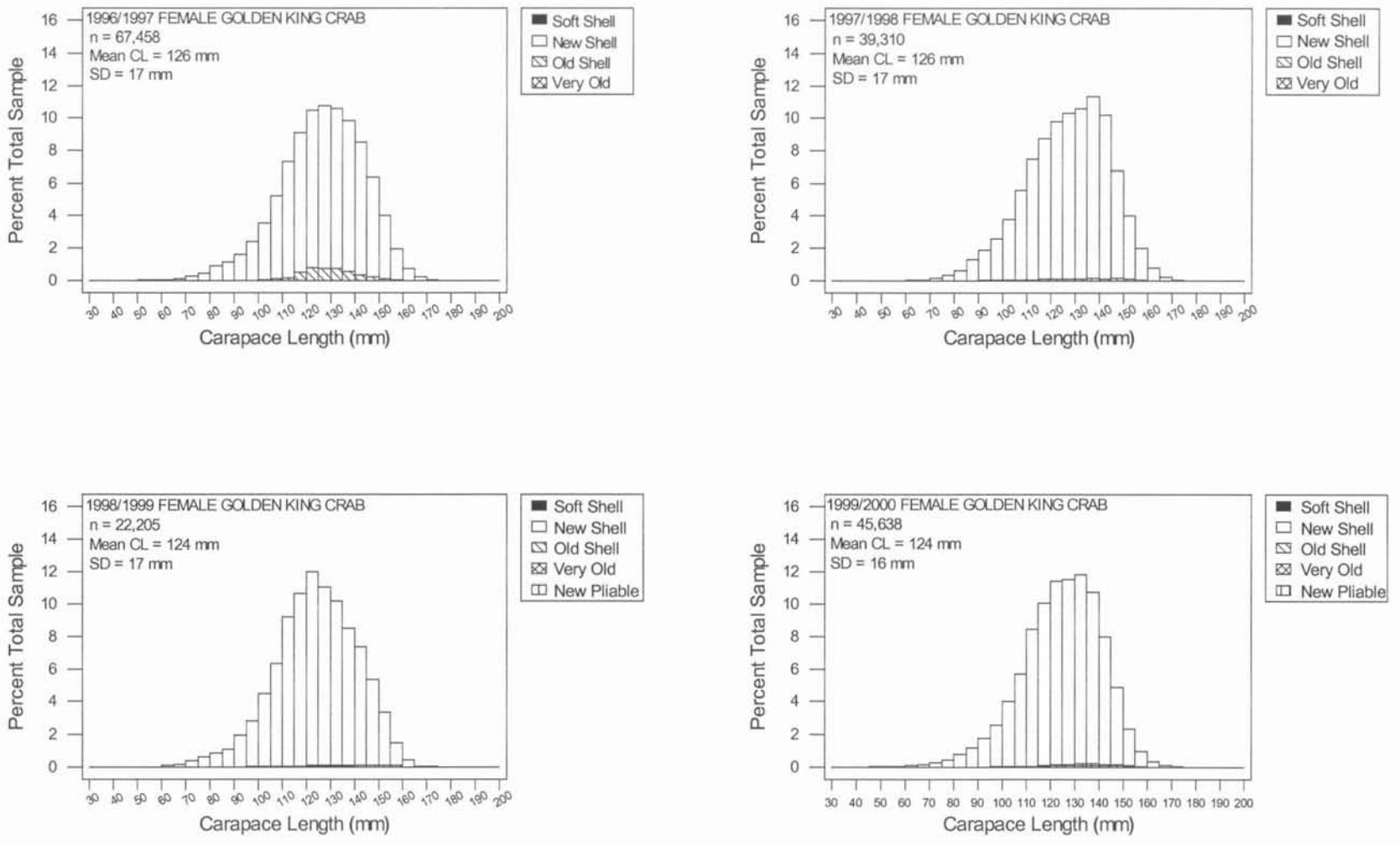


Figure 20. Carapace size frequency distributions with corresponding shell ages for female golden king crabs from bycatch samples taken during the 1996/1997-1999/2000 Aleutian golden king crab fisheries west of 174° W longitude.

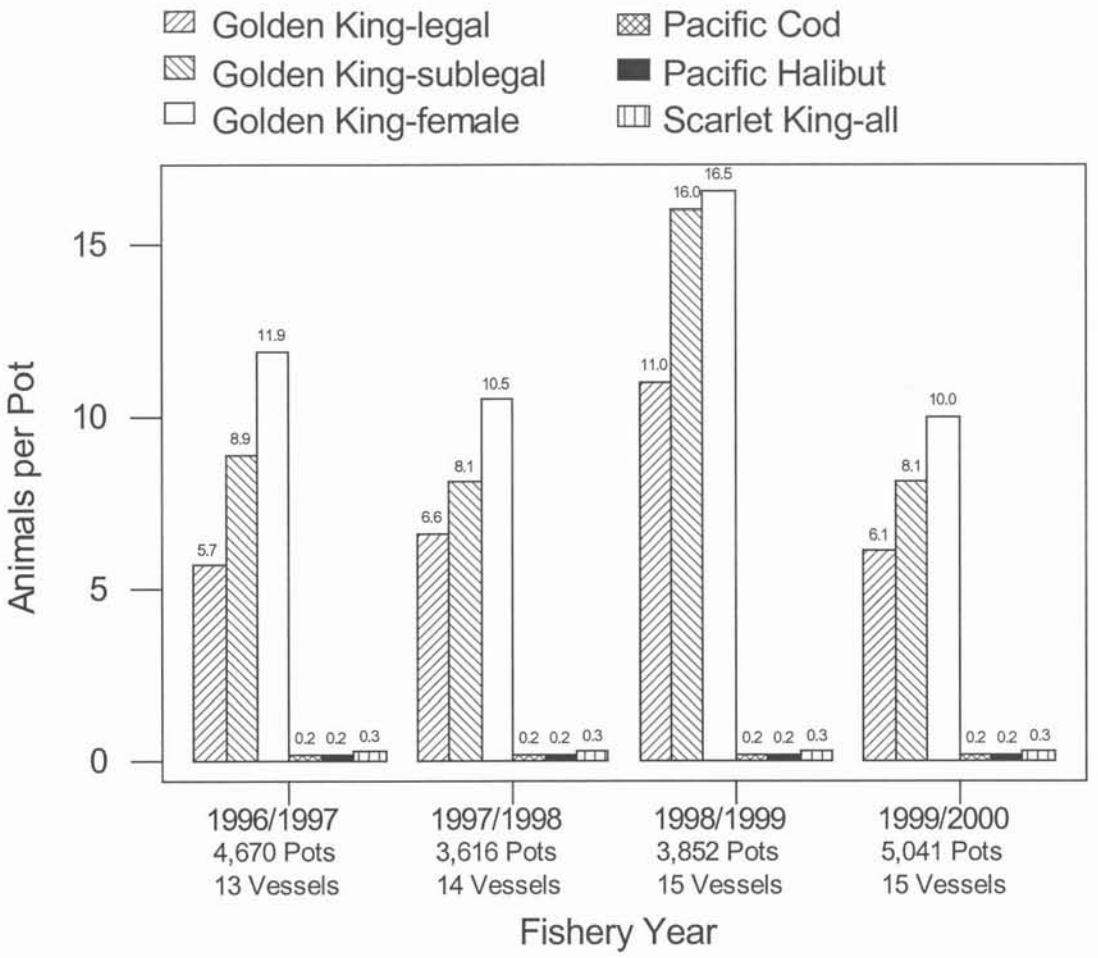


Figure 21. Estimated CPUE of selected species from bycatch samples taken during the 1996/1997-1999/2000 Aleutian Island golden king crab fisheries west of 174° W longitude.

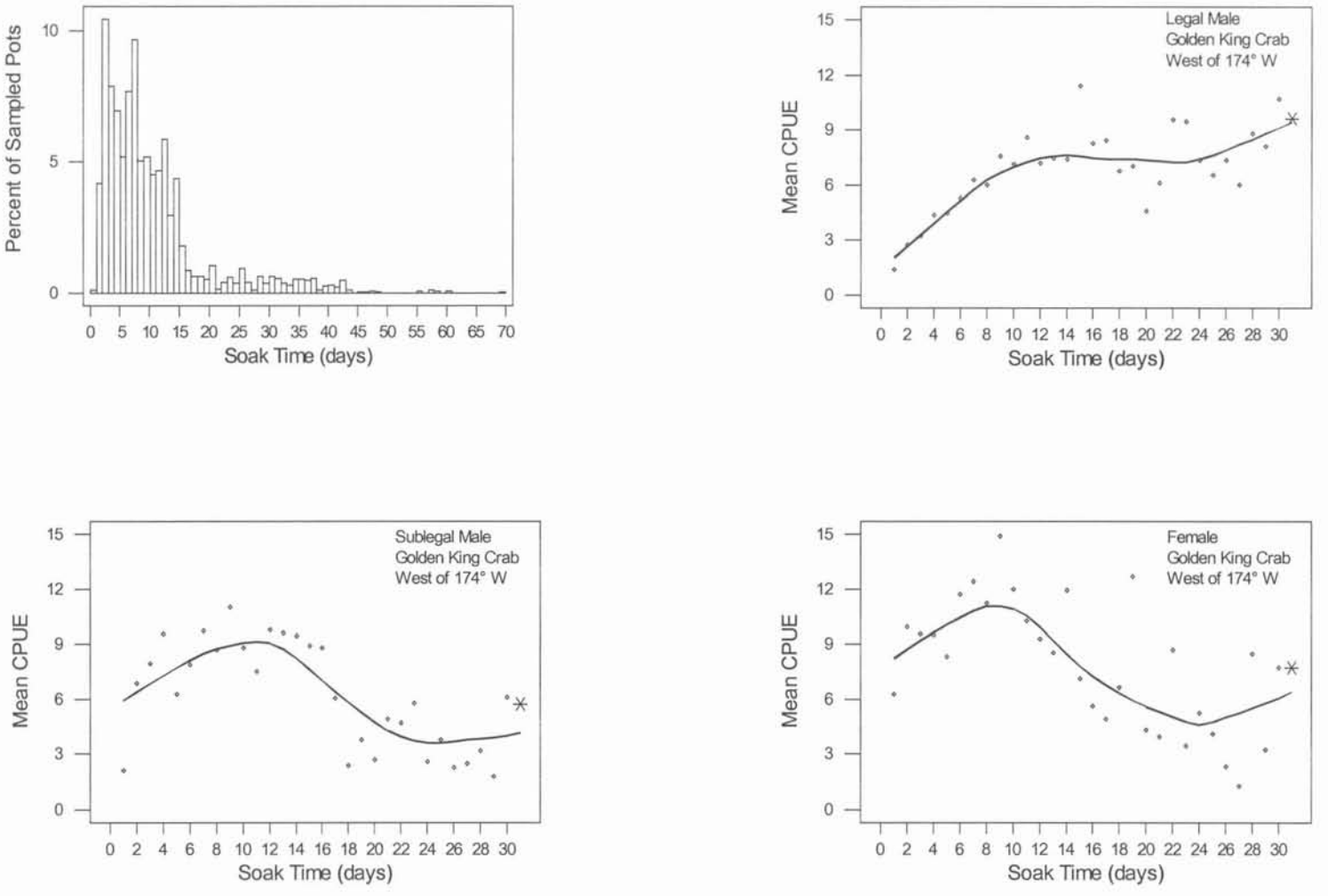


Figure 22. The mean estimated CPUE of legal male, sublegal male and female golden king crabs by soak time with LOWESS lines from bycatch samples taken during the 1999/2000 Aleutian Island golden king crab fishery west of 174° W longitude. The asterisk (*) represents the estimated mean CPUE for all soak times greater than 30 days (720 hours).

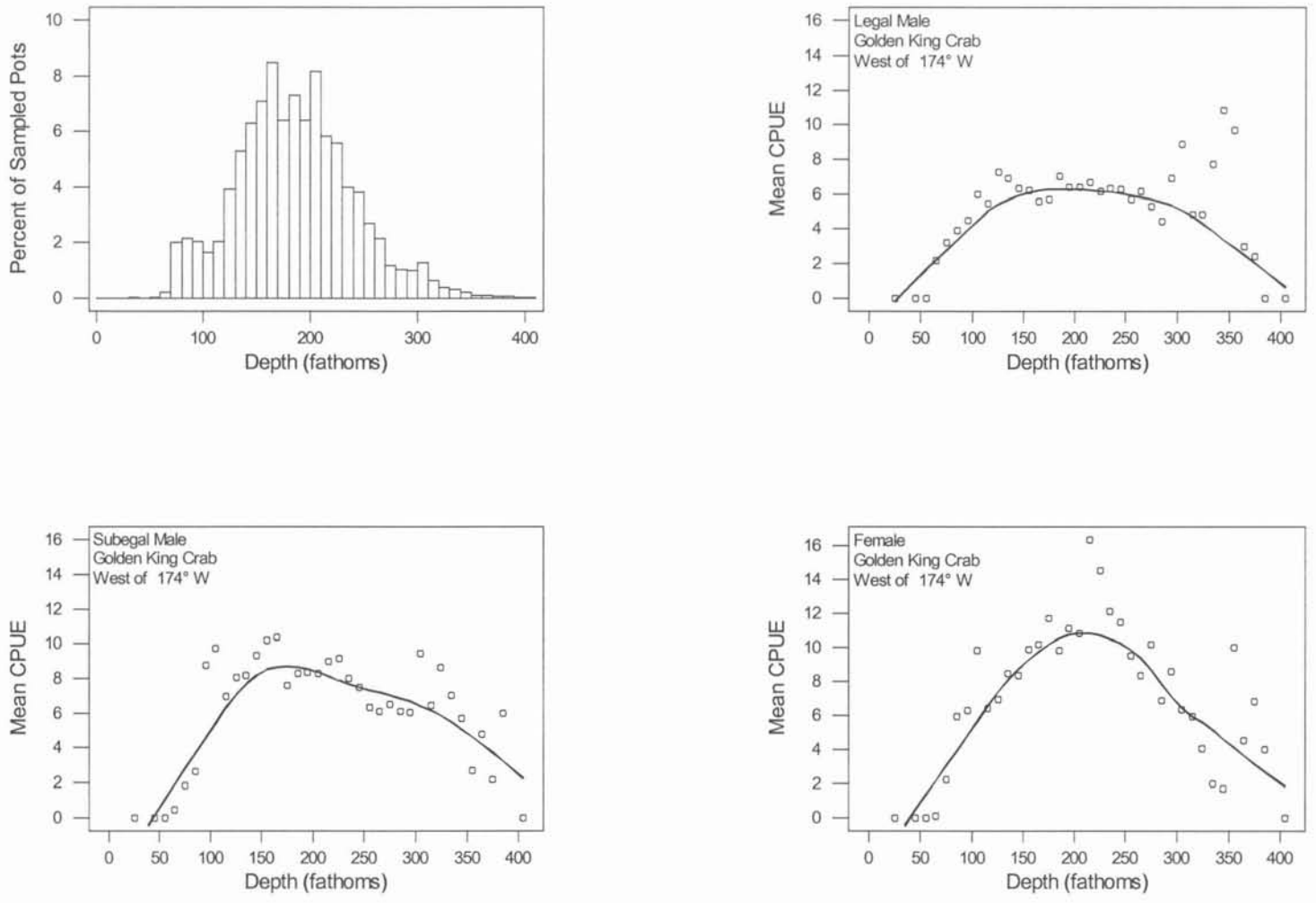


Figure 23. The mean estimated CPUE of legal male, sublegal male and female golden king crabs by 10 fathom depth intervals with LOWESS lines from bycatch samples taken during the 1999/2000 Aleutian Island golden king crab fishery west of 174° W longitude.

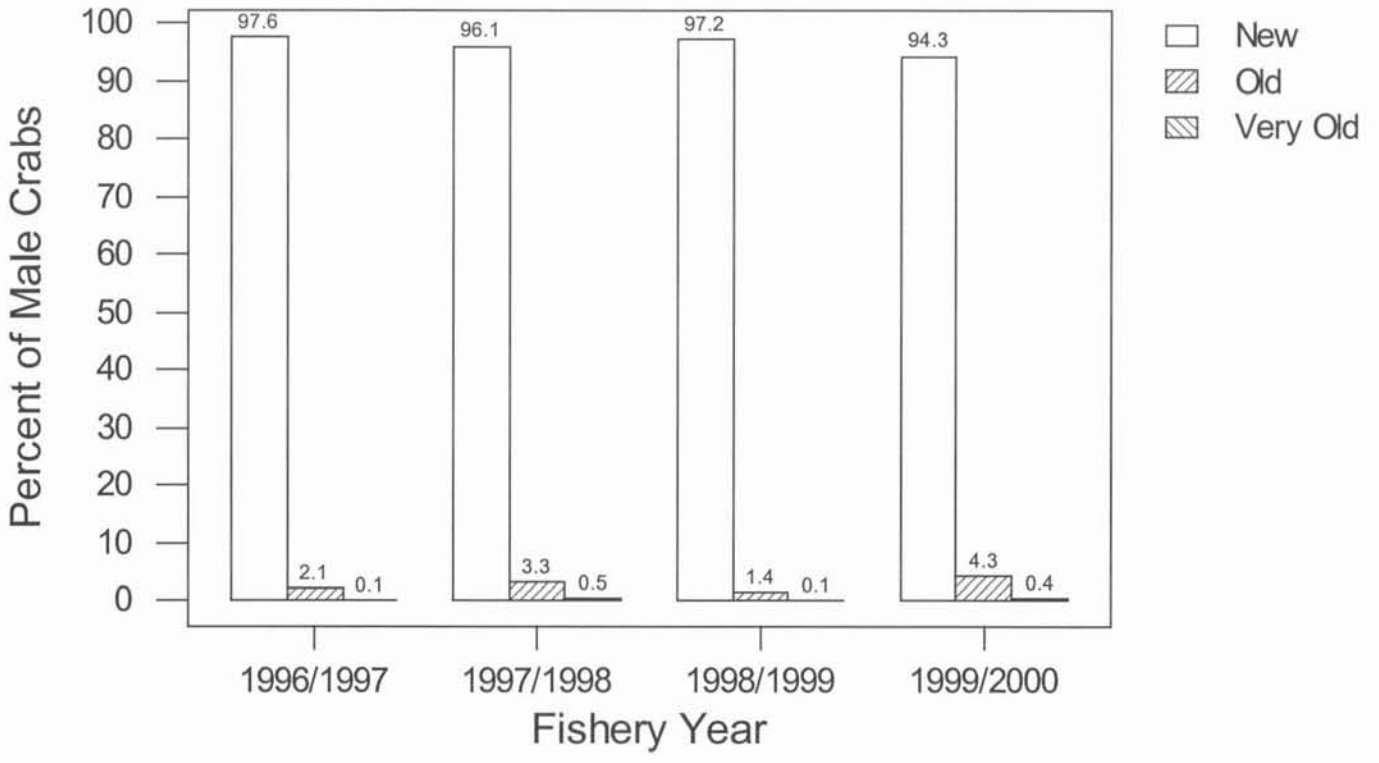


Figure 24. Percent by shell age for male golden king crabs from the bycatch samples taken during the 1996/1997-1999/2000 Aleutian Island golden king crab fisheries west of 174° W longitude.

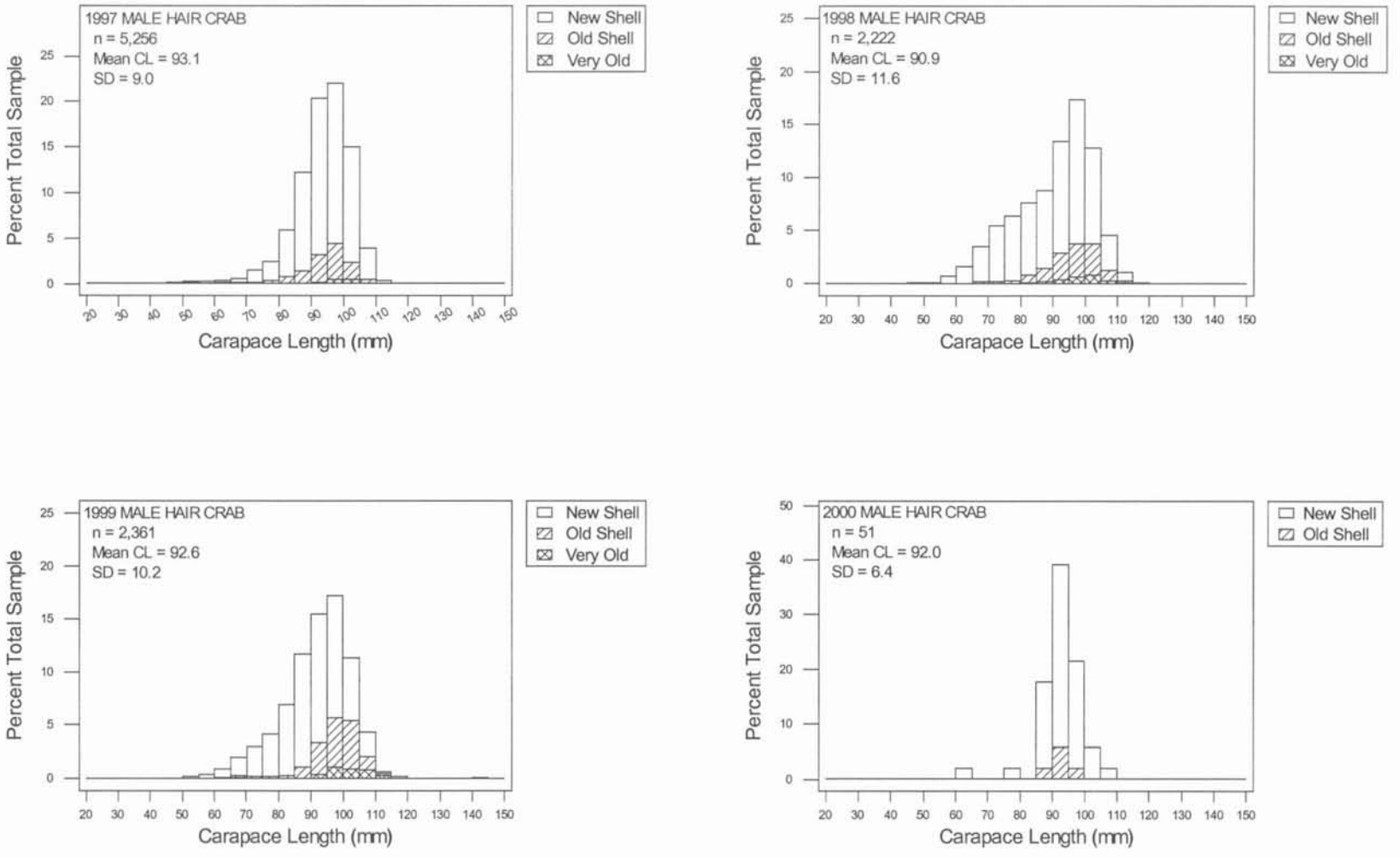
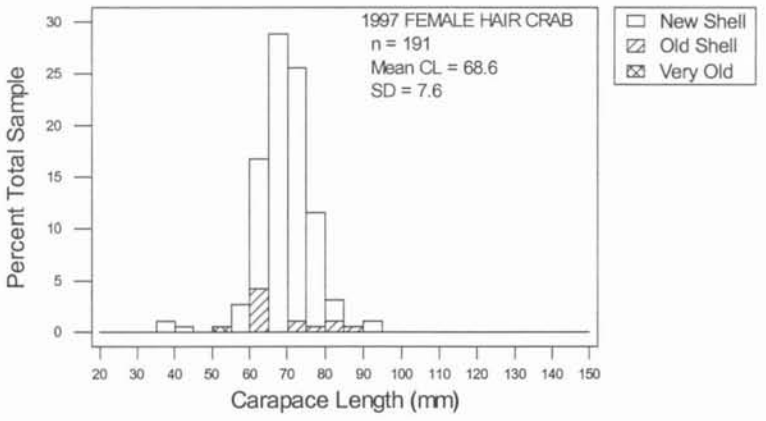
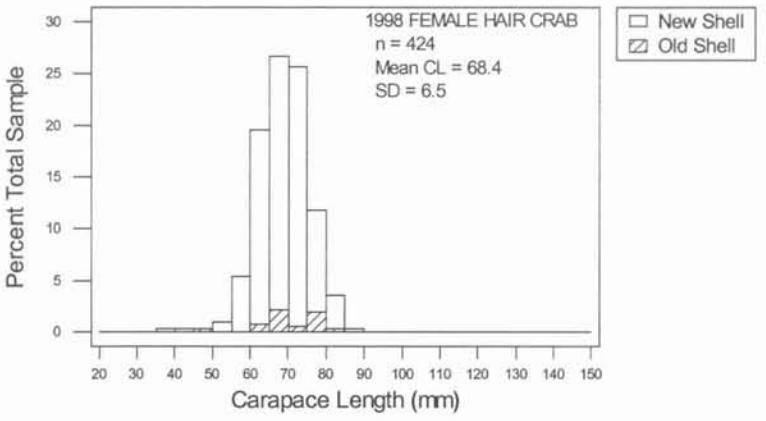


Figure 25. Carapace size frequency distributions with corresponding shell ages for male hair crabs from bycatch samples taken on catcher-only vessels during the 1997-2000 Bering Sea hair crab fisheries.





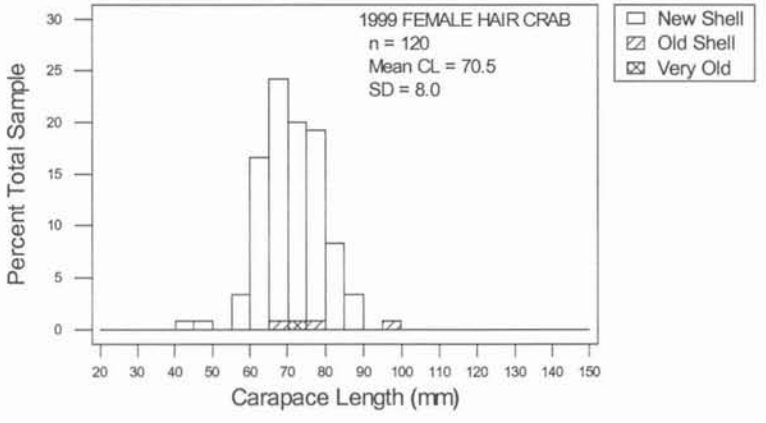


Figure 26. Carapace size frequency distributions with corresponding shell ages for female hair crabs from bycatch samples taken on catcher-only vessels during the 1997-1999 Bering Sea hair crab fisheries.

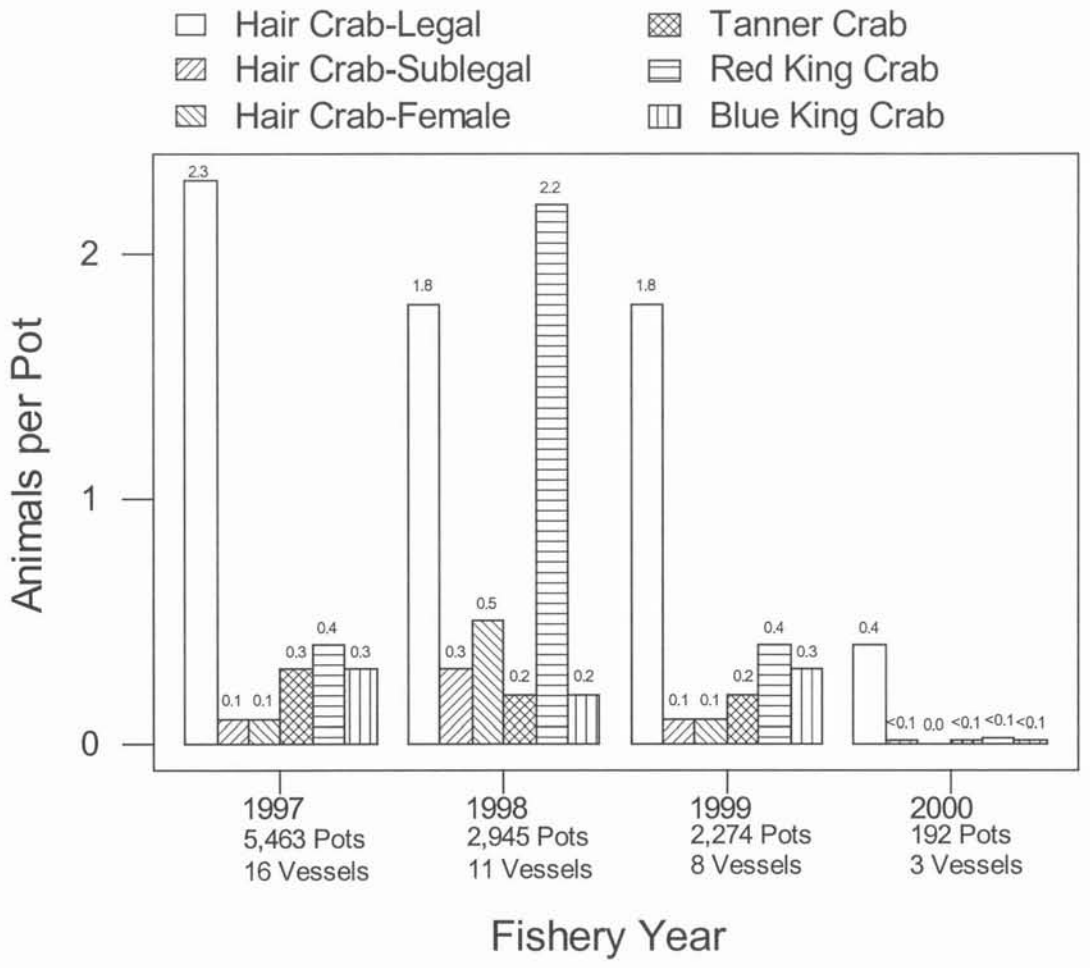


Figure 27. Estimated CPUE of selected species from bycatch samples taken on catcher-only vessels during the 1997-2000 Bering Sea hair crab fisheries.

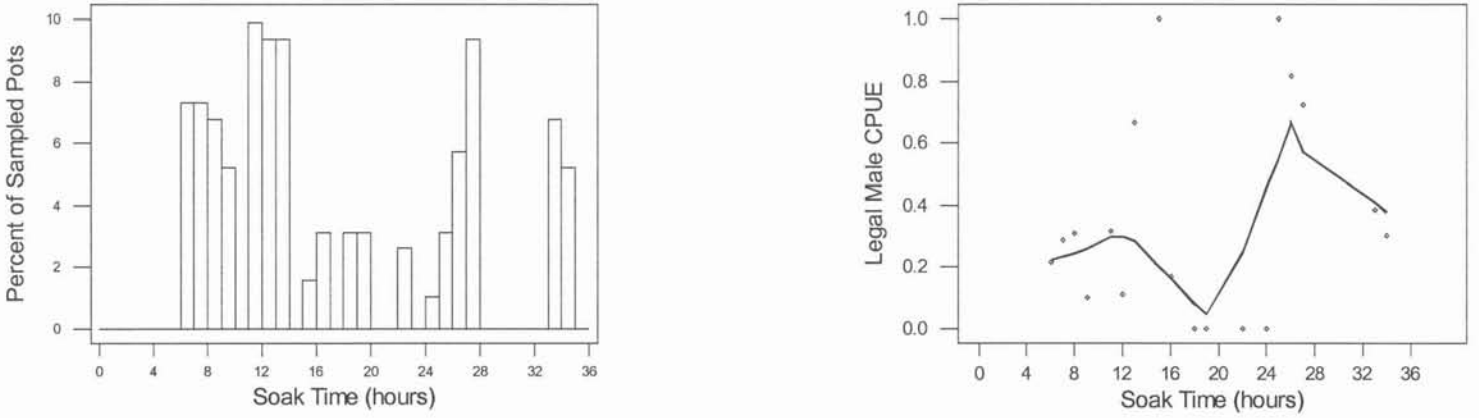


Figure28. The mean estimated CPUE of legal/retained male hair crabs by soak hours with LOWESS lines from 192 bycatch samples taken on 3 catcher-only vessels during the 2000 Bering Sea hair crab fishery.

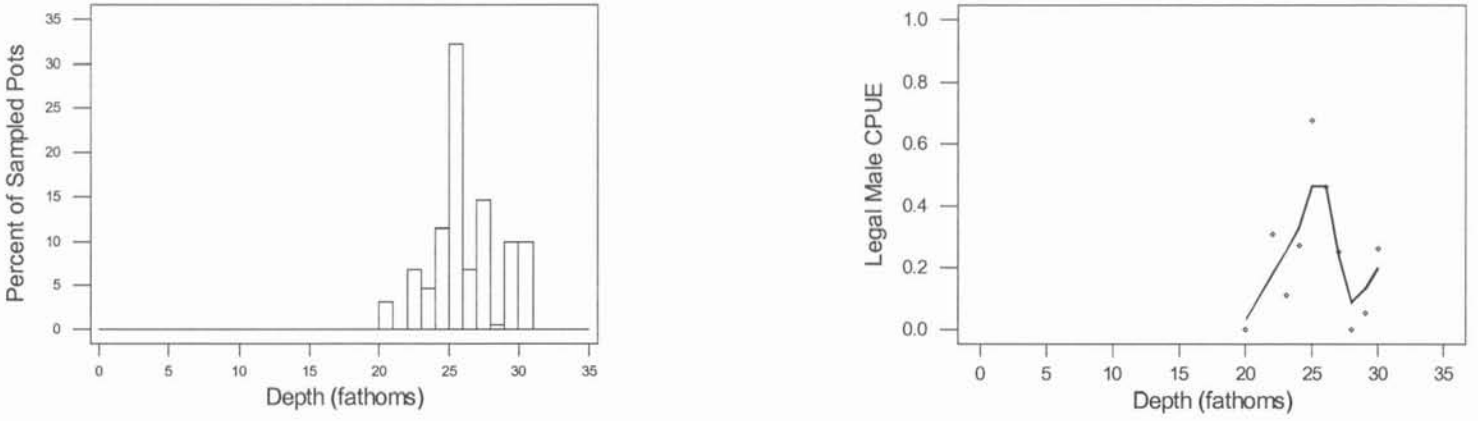


Figure 29. The mean estimated CPUE of legal/retained male hair crabs by depth with LOWESS lines from 192 bycatch samples taken on 3 catcher-only vessels during the 2000 Bering Sea hair crab fishery.

APPENDIX

Appendix A.1. Formulas used to calculate weighted mean and variance estimates for CPUE.

For a given fishery, observers are instructed to randomly sample n potlifts per day. In practice this number will vary by day, vessel and observer. Observers actually sample n_{ij} pots per day from a total of N_{ij} pots pulled by vessel i on day j. Formulas follow Cochran (1977).

The mean cpue for vessel i on day j is $$\bar{x}_{ij.} = \frac{1}{n_{ij}}\left(\sum_k x_{ijk}\right)$$

and the variance for this estimator is $$\hat{\text{var}}\left(\bar{x}_{ij.}\right) = \frac{1}{n_{ij}}\left[\frac{\sum_k \left(x_{ijk} - \bar{x}_{ij.}\right)^2}{n_{ij} - 1}\right]$$

where x_{ijk} is the number of crab in a pot sampled where

i is the vessel
j is the day
k is the pot sampled
n is the number of pots sampled.

It follows that

the estimated total catch by vessel i on day j is $\left(\bar{x}_{ij.} \times N_{ij}\right)$,

the estimated total catch by vessel i over the fishery is $\sum_j \left(\bar{x}_{ij.} \times N_{ij}\right)$,

the estimated weighted mean catch per pot lift by vessel i over the fishery is

$$\frac{1}{N_{i.}}\left[\sum_j \left(\bar{x}_{ij.} \times N_{ij}\right)\right]$$

$$= \sum_j \left(\bar{x}_{ij.} \times w_{ij}\right)$$

$$= \bar{x}_{i..}$$

and $$\hat{\text{var}}\left(\bar{x}_{i..}\right) = \sum_j \left[\hat{\text{var}}\left(\bar{x}_{ij.}\right) \times w_{ij.}^2\right]$$

where $w_{ij} = N_{ij} / N_i$. The weights reflect the importance of a day's sampling based on the number of pots lifted on day j by vessel i relative to the total number of pots lifted by vessel i over the course of the fishery.

-Continued-

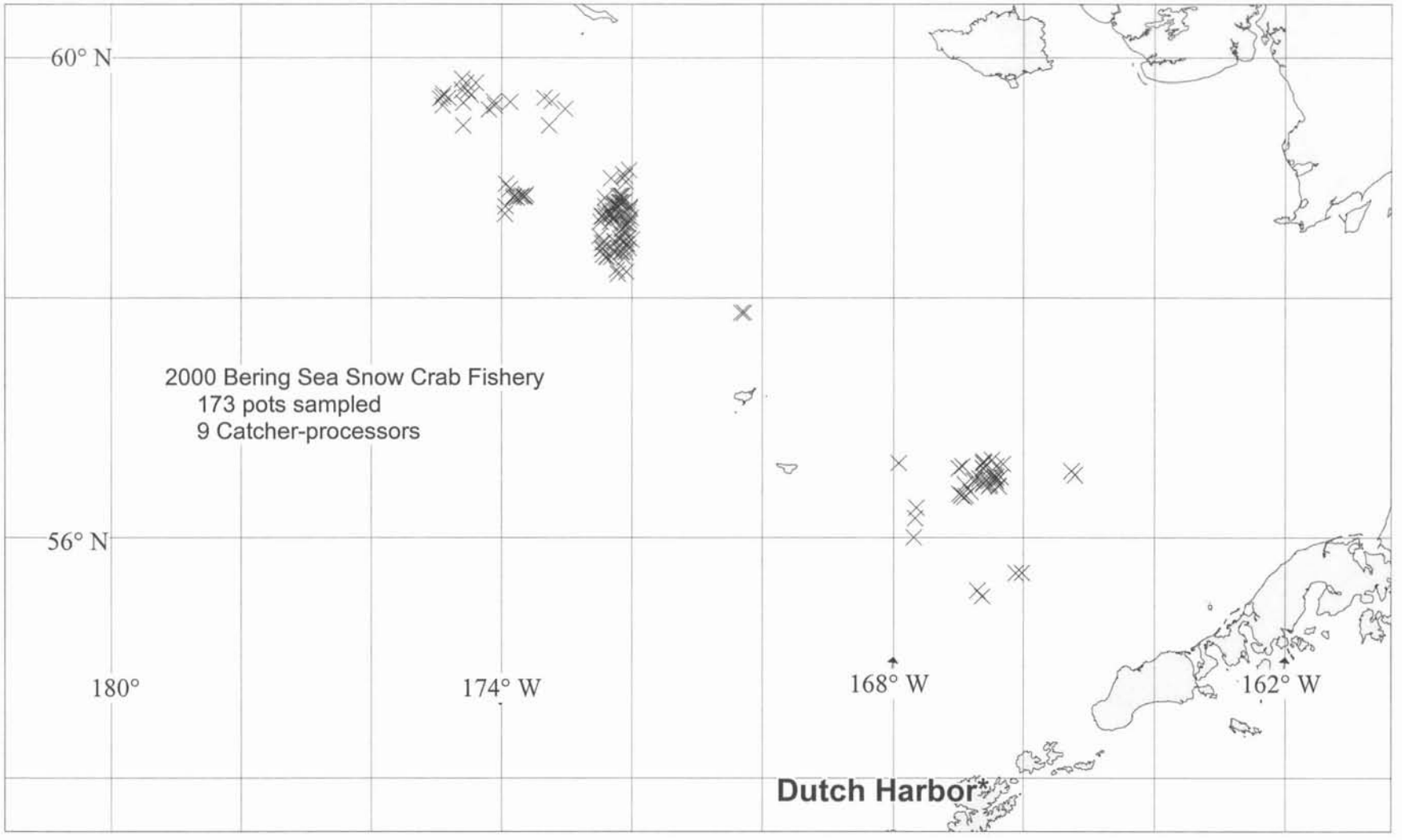
The estimated mean catch per pot lift for all vessels over the fishery is

$$\begin{aligned}\bar{x}_{...} &= \frac{1}{N_{..}}\left[\sum_i \left(\bar{x}_{i..} \times N_{i.}\right)\right] \\ &= \sum_j \left(\bar{x}_{ij.} \times w_{ij}\right) \\ &= \sum_i \left(\bar{x}_{i..} \times w_i\right) \\ &= \frac{1}{N_{..}} \sum_i \sum_j \left(\bar{x}_{ij.} \times N_{ij}\right).\end{aligned}$$

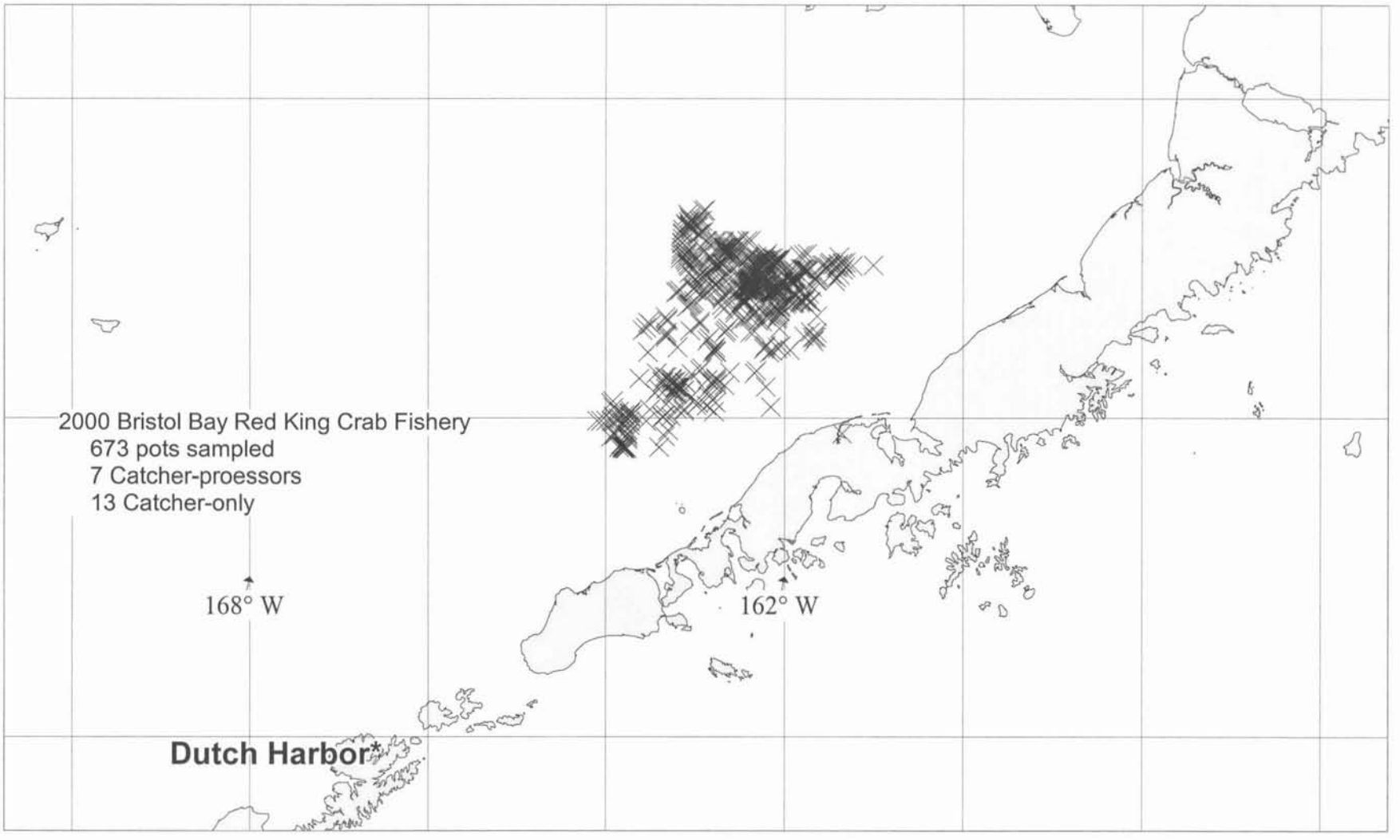
The variance of this estimator is

$$\begin{aligned}\hat{\text{var}}\left(\bar{x}_{...}\right) &= \sum_i \left[\hat{\text{var}}\left(\bar{x}_{i..}\right) \times w_{i.}^2\right] \\ &= \sum_i w_{i.}^2 \left\{\sum_j \left[\hat{\text{var}}\left(\bar{x}_{ij.}\right) \times w_{ij}^2\right]\right\} \\ &= \sum_i \left(\frac{N_{i.}}{N_{..}}\right)^2 \left\{\sum_j \left[\hat{\text{var}}\left(\bar{x}_{ij.}\right) \times \left(\frac{N_{ij}}{N_{i.}}\right)^2\right]\right\} \\ &= \sum_i \left\{\sum_j \left[\hat{\text{var}}\left(\bar{x}_{ij.}\right) \times \left(\frac{N_{ij}}{N_{..}}\right)^2\right]\right\} \\ &= \frac{1}{N_{..}^2} \sum_i \sum_j \left[\hat{\text{var}}\left(\bar{x}_{ij.}\right) \times N_{ij}^2\right]\end{aligned}$$

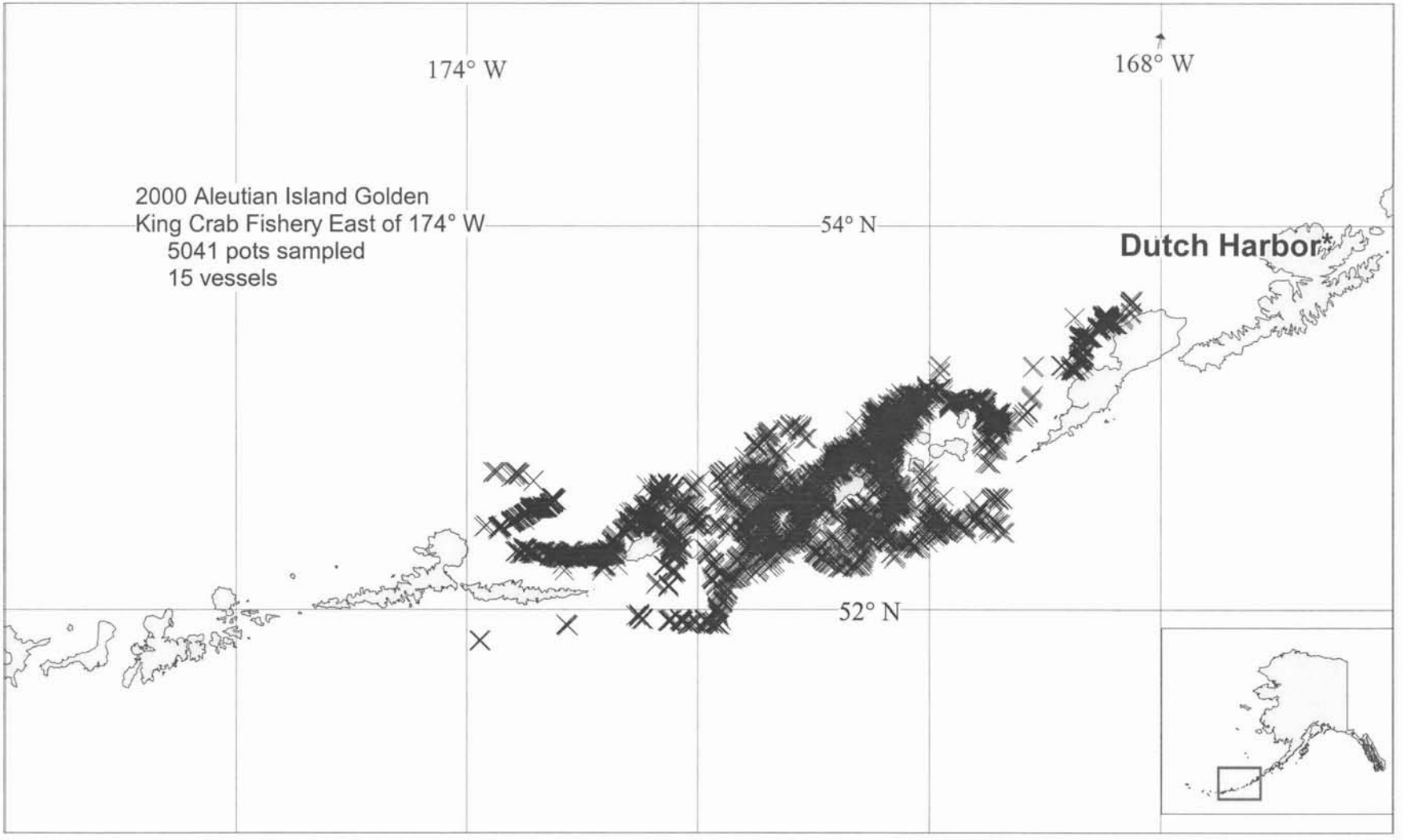
where $w_{i.} = N_{i.} / N_{..}$.



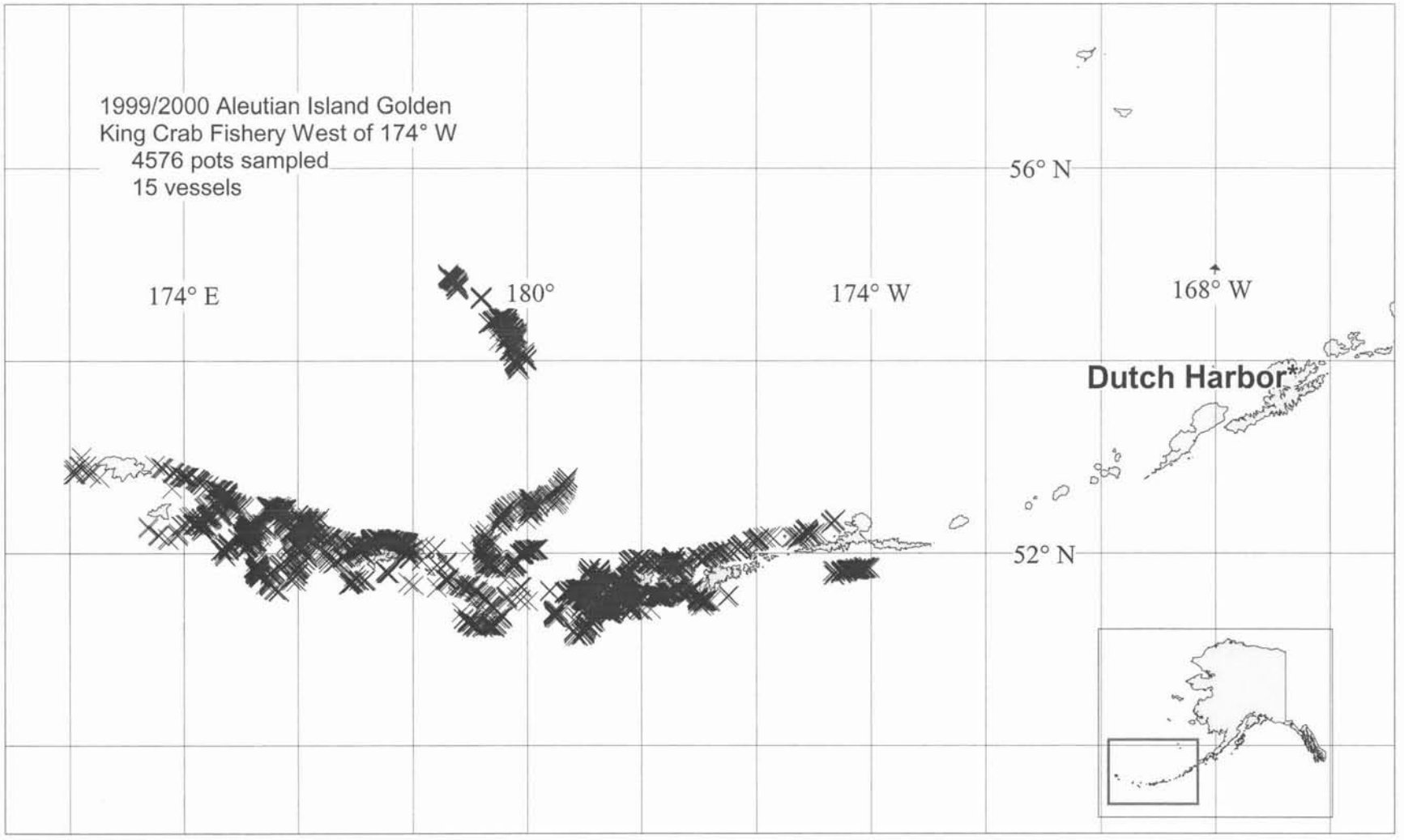
Appendix B-1. Locations of pots sampled by shellfish observers during the 2000 Bering Sea snow crab fishery.



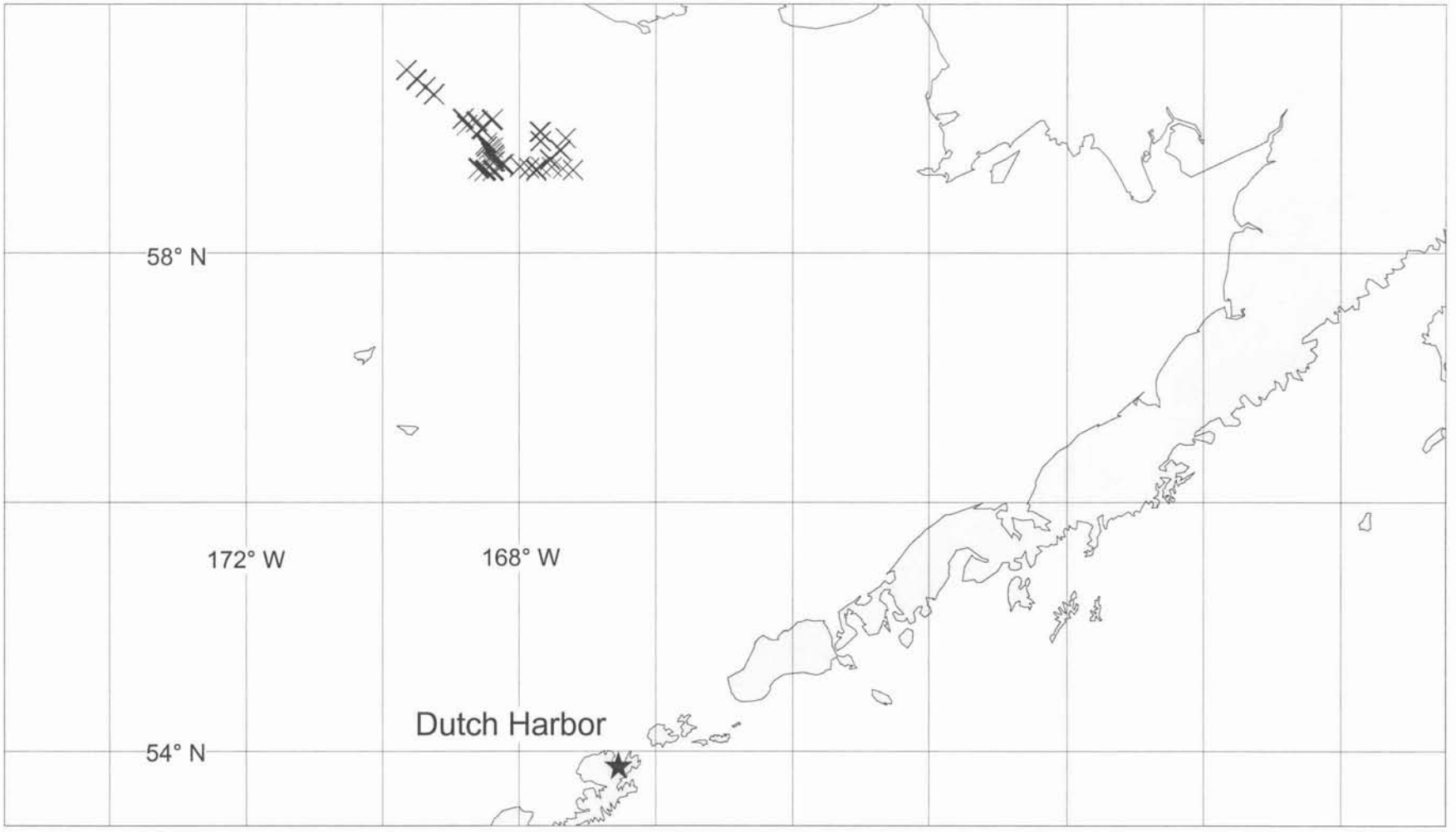
Appendix B-2. Locations of pots sampled by shellfish observers during the 2000 Bristol Bay red king crab fishery.



Appendix B-3. Locations of pots sampled by observers during the 2000 Aleutian Islands golden king crab fishery east of 174° W longitude.



Appendix B-4. Locations of pots sampled by observers during the 1999/2000 Aleutian Islands golden king crab fishery west of 174° W longitude.



Appendix B-5 Locations of pots sampled by shellfish observers during the 2000 Bering Sea hair crab fishery.