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Provisional Data Summaries
for the
NPFMC Pilot Domestic
Observer Program,
Winter 1988

July 1988

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PROVISIONAL DATA SUMMARIES FOR THE NPFMC
PILOT DOMESTIC OBSERVER PROGRAM, WINTER 1988

by

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Provisional Data Summaries for the NPFMC
Pilot Domestic Observer Program, Winter 1988

by Steven R. Hare and Janet M. Wall

OVERVIEW

Introduction

The North Pacific Fisheries Management Council's Pilot Domestic Observer Program was initiated in September, 1987 when the first group of domestic observers were deployed. Alaska Sea Grant was contracted to administer the \$200,000 program, which, at present, is scheduled to continue through 1988.

Stated objectives for the program are:

- 1) Provide observer coverage of the emerging totally U.S. (DAP) groundfish fisheries in order to obtain harvest information on species composition, age composition, and catch per unit effort in directed fisheries by various gear types.
- 2) Obtain bycatch information, particularly on catches of other fully utilized species.

This Processed Report provides initial summaries of data collected by observers during the second installment of observer cruises¹.

Observer Coverage

The four Pilot Program observers made 20 sampling cruises between February 5th and June 12th, 1988. Observers sampled on 148 of their 224 days at sea (66.1%). The vast majority of the non-sampling sea days was due to no fishing (travel to grounds, rough weather). Of the 148 sampling days, 82 took place in the Bering Sea and 66 in the Gulf of Alaska. In one other case, an observer made a trip on a vessel, but did not sample the one haul made, thus the trip did not constitute a cruise.

Total catch by vessels while carrying observers was 5435 metric tons (MT), or approximately 2.3% of the DAP harvest between February 1st and June 11th. Area breakdown was:

¹ Preliminary data summaries for the first set of pilot program observer cruises are contained in a Memorandum to Dr. Richard Marasco of the NWAFC from Janet M. Wall and Steven R. Hare, dated 23 May, 1988.

- Bering Sea - 3961.21 MT (2.5% of BSA DAP 2/1 - 6/11 harvest)
- Gulf of Alaska - 1473.23 MT (1.9% of GOA DAP 2/1 - 6/11 harvest)

Distribution of Cruises

- 16 different vessels were covered
- 11 cruises (9 vessels) were on shoreside delivery trawlers
- 3 cruises (2 vessels) were on shoreside delivery longliners
- 1 cruise was on a longliner catcher/processor
- 2 cruises (2 vessels) were on trawler catcher/processors
- 2 cruises (1 vessel) were on floating processor motherships
- 1 cruise was on a mothership tender
- 14 cruises took place in the Gulf of Alaska, four in the Bering, and two cruises in both areas.

A comparison between the Fall 1987 and Winter 1988 portions of the Pilot Program of sea days, sampling days, number of cruises, total catch monitored and several other items of interest is presented in Figure 1.

Data Summaries

Federal confidentiality restrictions prevent public release of fisheries data that is not aggregated across three or more companies. Additionally, we do not feel it is valid to sum across gear and vessel type, nor, in many instances, fishery, area or season. Within these limits, we have prepared two sets of summaries, which are presented separately in two reports.

Pilot Program Comparisons

Fall 1987 vs. Winter 1988

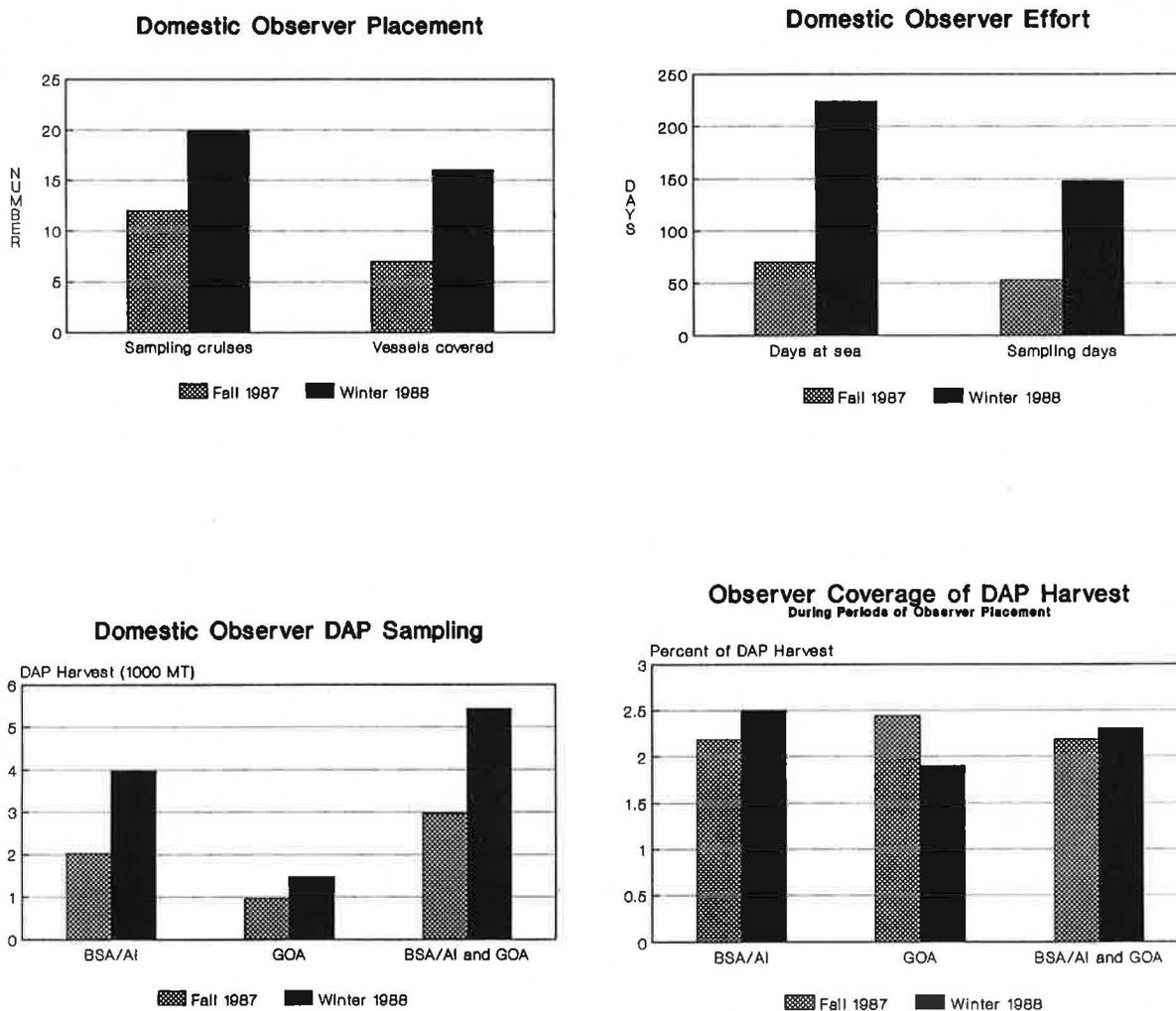


Figure 1. Comparison of several indicators for the Fall 1987 and Winter 1988 periods of the NPFMC Pilot Observer Program.

KODIAK ISLAND PACIFIC COD TRAWL FISHERY

Description of Fishery and Observer Coverage

During the Winter portion of the Pilot Program, observers made nine cruises on seven vessels that targeted on Pacific cod in the vicinity of Kodiak Island. The cruises took place between February 5th and April 1st. In addition, we added the data from two Fall Pilot Program cruises (one vessel) that fished cod September 26 - 29, 1987. Despite our preference not to combine data from different seasons, we decided to add the two earlier cruises for two reasons:

- Species composition, incidence and catch per unit effort (CPUE) data were similar to the Winter cod data
- Comparatively little of the Fall collected data have been released, due to confidentiality rules, and this allows more of the Pilot Program data to be made public.

The Pacific cod fishery operated on both sides of Kodiak Island (Figure 2), with observer coverage of fishing effort distributed over 10 ADF&G statistical areas. Of the 66 observed hauls, 16 were retrieved in the Shelikof Strait, and 50 from the east side of Kodiak.

<u>ADF&G statistical area</u>	<u>Number of hauls retrieved</u>
505800	17
515700	6
515730	5
515802	18
525702	3
525731	1
535733	1
535734	9
535802	2
535803	4

Fishery Data for the Major Species

On the average, vessels proved fairly successful at targeting on Pacific cod (Table 1 and Figure 3). Pacific cod constituted 86.62% of the sampled catch, with bycatch split among many species. Flatfish, not including halibut, accounted for 6.04% of the catch, Pacific halibut 2.65%, walleye pollock 2.21%, rockfish 0.58%, other fish (including salmon) 1.81% and invertebrates (including crab) 0.09%.

Catch per unit effort, in metric tons of catch per hour of trawling time, was calculated for each species. Pacific cod CPUE was almost 4.8 MT/hour, while the CPUE for all species combined was slightly greater than 5.5 MT/hour.

Biological Data for Major Species

As Pacific cod made up such a large fraction of the catch, observers concentrated their efforts on collecting biological data on cod. No other non-prohibited species occurred frequently enough to warrant extra sampling.

Observers collected over 2000 Pacific cod length frequencies and 121 otoliths. The otoliths have not yet been read, however a length frequency plot is provided in Figure 4. Male cod, which averaged 55.8 cm in length, showed a normal distribution, with a single mode at 51-54 cm. Females averaged 56.0 cm in length and also had a unimodal distribution (mode at 51-54 cm), though the existence of a weak second mode centered at 60 cm might be inferred from the length frequency plot.

Several hundred cod were measured but not sexed per request from vessel captains. These unsexed cod, which were included in the plot of sexes combined, had a greater average length than the sexed cod, therefore this average length is greater than the average length of either sex individually.

Mean seasonal weight for Pacific cod was 2.27 kg, individual sex weight variation was not recorded. Overall sex ratio, based on the sexed length-frequency sample of 1726 fish was 47.4% males to 52.6% females.

Incidence of Prohibited Species

Prohibited species incidence rates, in mean number and mean weight per metric ton of groundfish catch, are summarized in Table 2. Pacific halibut was the most commonly caught prohibited species, averaging 8.84 individuals per metric ton of groundfish catch (ind./MT), totaling 26.50 kg per metric ton of groundfish catch (kg/MT). Two species of salmon, chinook and coho, were identified as being caught incidental to the cod trawl fishery. The majority of salmon observed, however, were not identified to species, owing to sampling constraints on some vessels. Chinook salmon averaged 0.63 ind./MT weighing 1.81 kg/MT and coho averaged 0.10 ind./MT weighing 0.45 kg/MT. Unidentified salmon numbered 2.23 ind./MT weighing 6.57 kg per ton of groundfish. Two species of crab, Chionoecetes bairdi Tanner and red king, were encountered in low numbers. C. bairdi crab averaged 0.11 ind./MT (0.05 kg/MT), while red king crab averaged 0.0016 ind./MT and 0.0005 kg/MT.

Biological and Viability Data of Prohibited Species

Observers recorded sex, weight, length and viability data on most prohibited species they encountered in their samples. Viability data is not recorded for salmon, as they are presumed dead when landed. Sex ratios, mean weight and mean length, by sex, of sampled species are summarized in Table 3.

Pacific halibut

Based on a total sample of 1946 individuals, halibut taken incidentally to the cod trawl fishery averaged 55.2 cm in length. Sex differentiation is not performed on halibut. A length-frequency diagram is provided in Figure 5. The distribution was unimodal, centering around 52-53 cm, with overall lengths ranging from 30 cm to 183 cm. Observers also evaluated viability on 2365 halibut (Figure 6). Among these halibut, 48.1% of the halibut were judged to be in excellent condition when returned to the water, 21.9% in poor condition and 30.0% to be dead or with little chance of surviving.

Salmon

The ratio of male to female chinook salmon was 70.8% to 29.2%. Males averaged 2.89 kg in weight and 58.1 cm in length, while females averaged 2.73 kg and 59.2 cm. All coho salmon encountered in the catch were males, averaging 4.41 kg in weight and 62.8 cm in length. The unidentified salmon were weighed only, averaging 2.95 kg.

Crab

C. bairdi Tanner crab were split 72.1% male to 27.9% female. Males were larger than females, outweighing them 0.51 kg to 0.31 kg, and were wider (carapace width is measured in Tanner crab) by 85.3 mm to 61.2 mm. The one red king crab encountered was a female weighing 0.30 kg and measuring 73 mm wide.

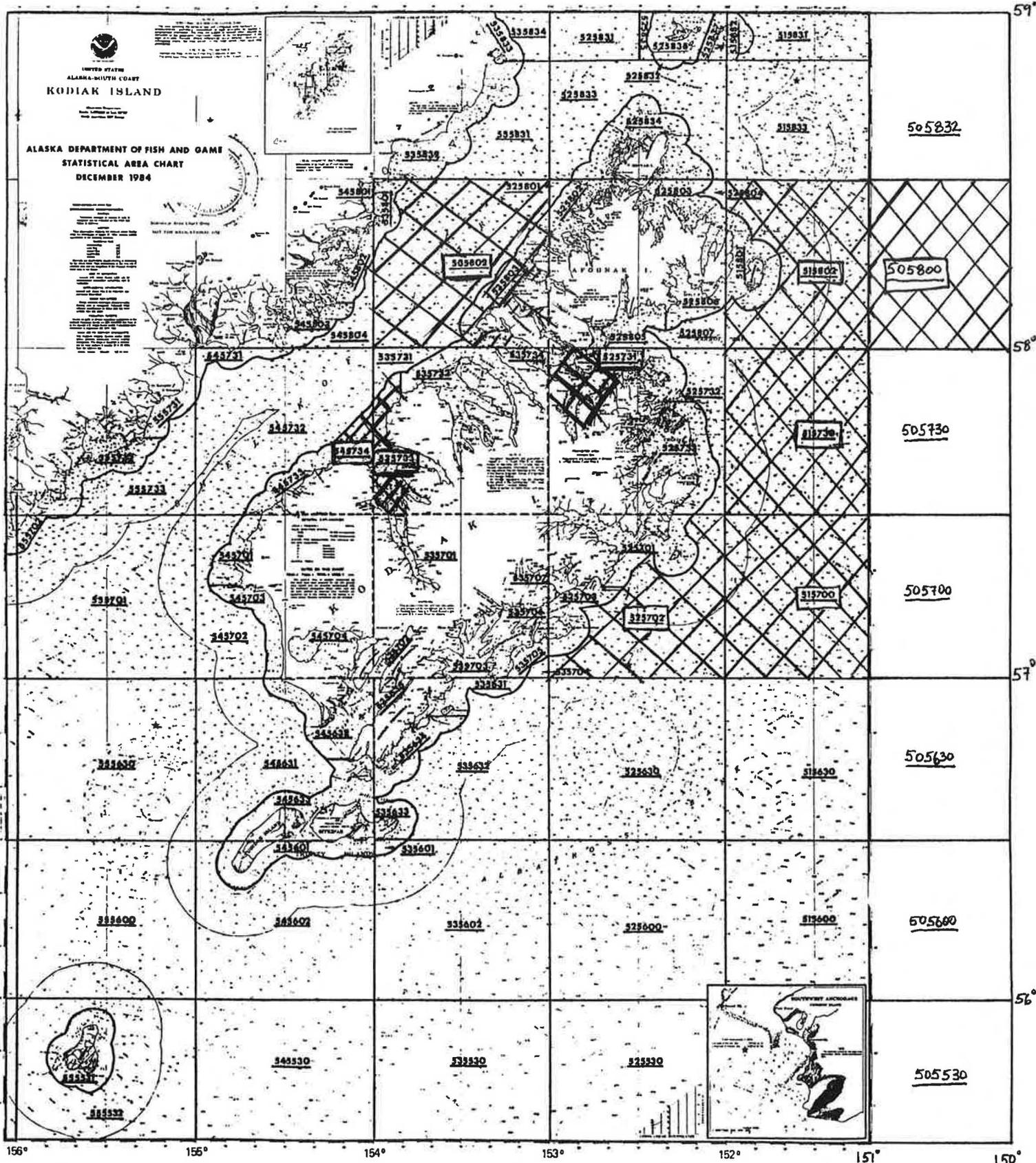


Figure 2. Kodiak Island ADF&G statistical areas sampled during NPFMC Pilot Domestic Observer Program, Winter 1988. Crosshatching indicates actual areas sampled.

Table 1. Species composition of catch during Kodiak Island Pacific cod trawl fishery, Winter 1988.

<u>Species Name</u>	<u>Percent of Total Catch</u>	<u>Catch Per Unit Effort (MT/Hour)</u>
Pacific cod	86.62	4.7870
Flatfish*	6.04	0.3341
Pacific halibut	2.65	0.1464
Walleye pollock	2.21	0.1220
Rockfish	0.58	0.0321
Other fish	1.81	0.1002
<u>Invertebrates</u>	<u>0.09</u>	<u>0.0049</u>
TOTALS	100.00	5.5268

* = Does not include Pacific halibut

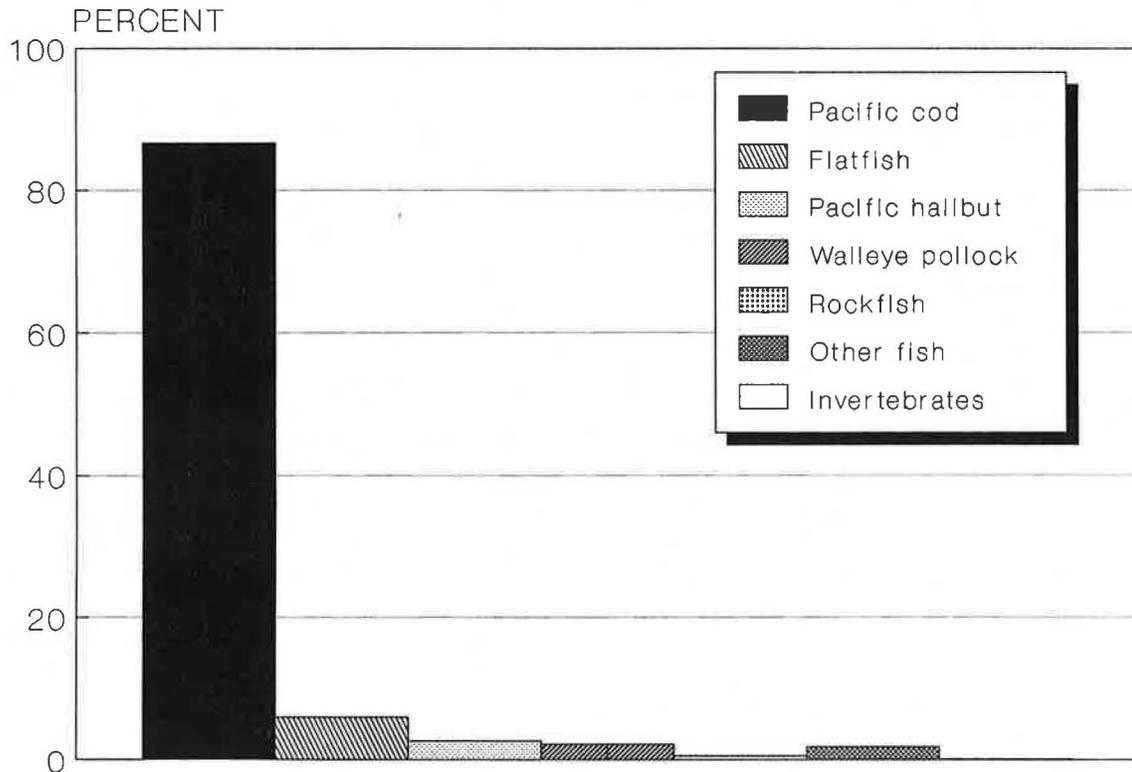


Figure 3. Species composition graph of table data above.

Table 2. Incidence data on prohibited species taken during Kodiak Island Pacific cod trawl fishery, Winter 1988.

<u>Species Name</u>	<u>Mean number/MT</u>	<u>Mean kg/MT</u>
Pacific halibut	8.84	26.50
Unidentified salmon*	2.23	6.57
Chinook salmon	0.63	1.81
Coho salmon	0.10	0.45
C. bairdi Tanner crab	0.11	0.05
Red king crab	0.0016	0.0005

Note

* = Due to sampling constraints, no species differentiation done for these salmon

Table 3. Biological data from prohibited species taken incidentally during the Kodiak Island Pacific cod trawl fishery, Winter 1988.

<u>Species Name</u>	<u>Sex ratio</u>		<u>Mean wt. (kg)</u>			<u>Mean length (cm)*</u>		
	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>Total</u>	<u>M</u>	<u>F</u>	<u>Total</u>
Pacific halibut	***		***		3.00	***		55.2
Chinook salmon**	70.8	29.2	2.89	2.73	2.92	58.1	59.2	58.6
Coho salmon	100.0	0.0	4.41		4.41	62.8		62.8
Unidentified salmon****					2.95			
C. bairdi Tanner crab	72.1	27.9	0.51	0.31	0.45	85.3	61.2	78.7

Notes

- * = Crab sizes are in mm. Carapace width is measured on Tanner crab
- ** = Average weight of unsexed Chinook salmon was greater than average weight of sexed Chinook salmon
- *** = Sex determination not performed on Pacific halibut
- **** = Due to sampling constraints, only weight data taken from these salmon

PACIFIC COD

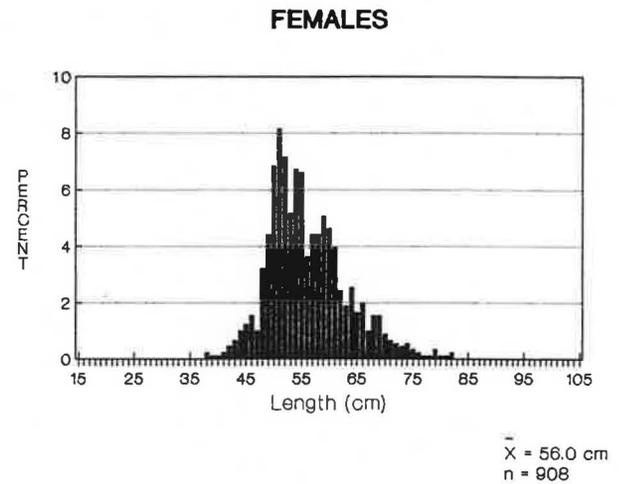
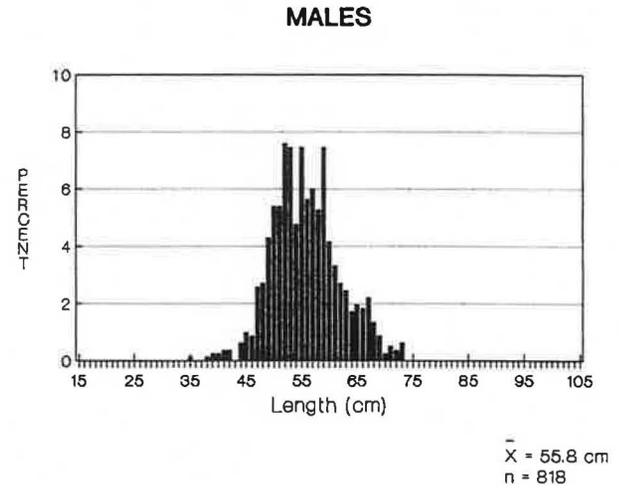
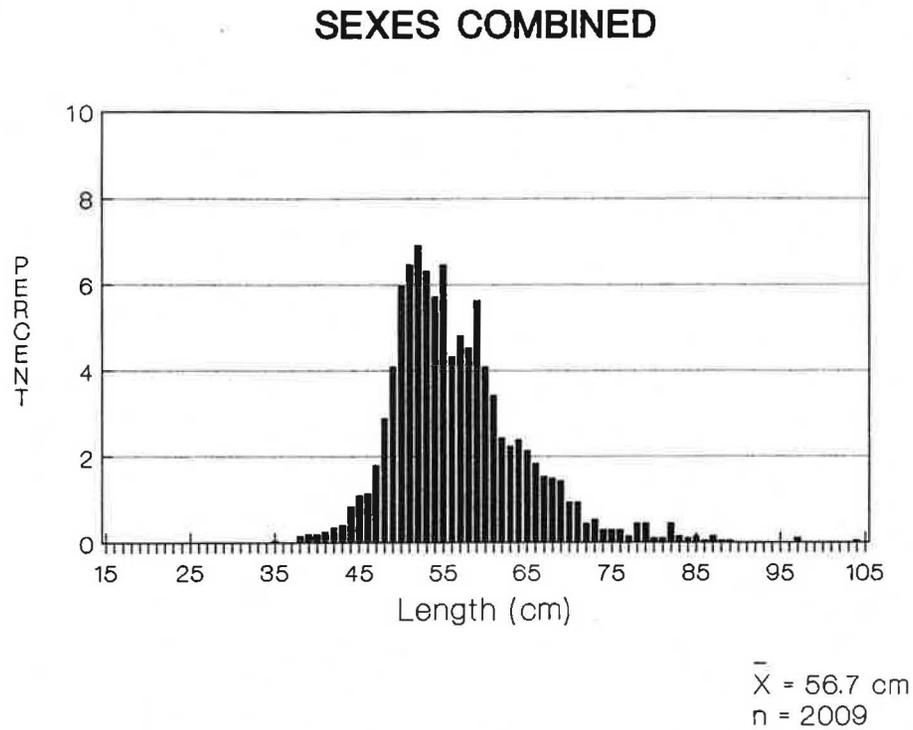


Figure 4. Pacific cod length frequencies, Kodiak Island Pacific cod trawl fishery, Winter 1988.

PACIFIC HALIBUT

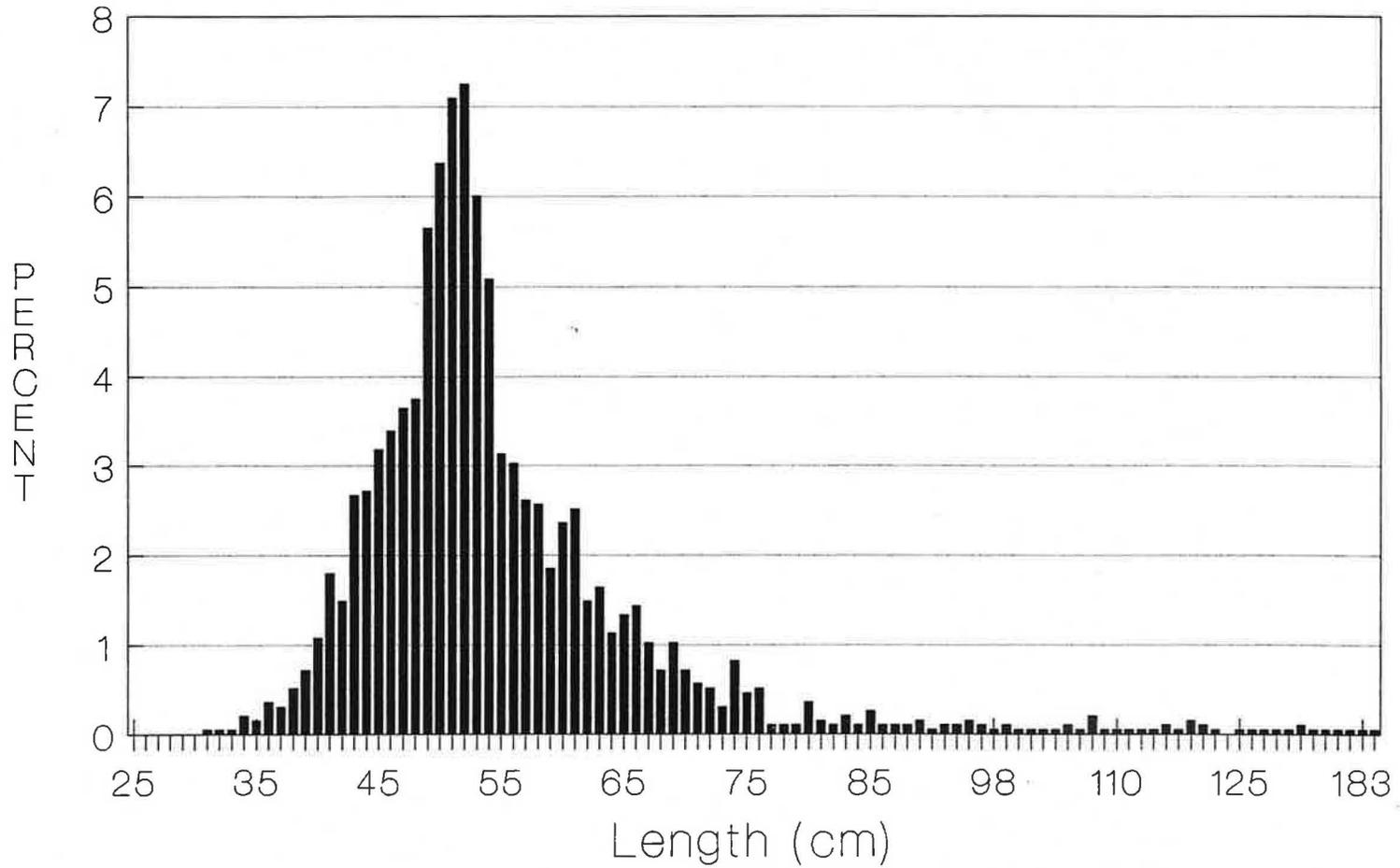


Figure 5. Pacific halibut length frequencies, Kodiak Island Pacific cod trawl fishery, Winter 1988.

$\bar{X} = 55.2$
 $n = 1946$

PACIFIC HALIBUT VIABILITY

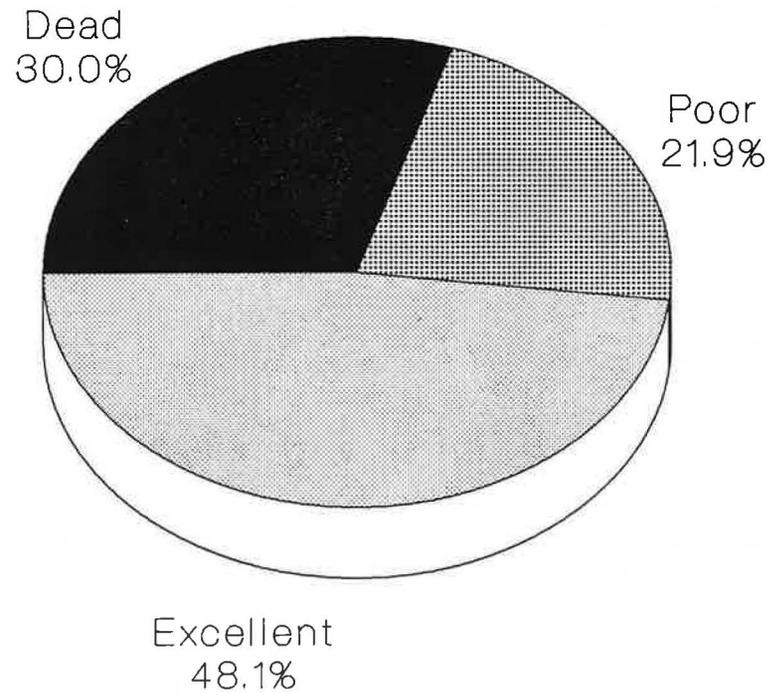


Figure 6. Pacific halibut viability, Kodiak Island Pacific cod trawl fishery, Winter 1988.

Sample size = 2365

BERING SEA GROUND FISH TRAWL FISHERIES

Description of Fisheries and Observer Coverage

For the purpose of releasing the data presented in this summary, we have combined observer data collected aboard four factory trawler and mothership operations in the Bering Sea. The four vessels targeted on different species in different areas (Figure 7), and in addition each vessel targeted on different species during the period the observer was aboard, however all used bottom trawl gear.

Because the data represent different fisheries, the various summaries that follow are of differing utility. While species composition percentages are representative of the catches taken by the vessel during the time the observer was aboard, the combined species composition from these vessels, for instance, should not be taken to be representative of actual species occurrence in the overall DAP Bering Sea groundfish catch from this winter. Length frequency, viability and other biological data are more valid as they describe individual species.

Observers monitored factory trawler/mothership operations between February 12th and April 20th, sampling catches from four statistical subareas, with the following frequency:

<u>statistical subarea</u>	<u>No. hauls observed</u>
511	113
513	59
515	6
540	5

Fishery Data for the Major Species

As the observer species composition data represents several different fisheries mixed together, the diversity of the combined catch (Table 4 and Figure 8) is not surprising. Walleye pollock, Pacific cod and rock sole were encountered in almost equal percentages (26.70%, 26.44% and 26.12%, respectively). The remainder of the catch was primarily composed of flatfish: Yellowfin sole, 5.34%; Alaska plaice, 3.66%; Pacific halibut, 1.11%; and other flatfish, 5.88%. Other fish (including salmon) totalled 3.05% of the catch, while invertebrates (including crab) accounted for 1.70 percent.

For each of the three major species, catch per unit effort averaged just under 1.5 metric tons per trawling hour. CPUE for the total catch was slightly greater than 5.6 MT/hour.

Biological Data for the Major Species

Pacific cod

Pacific cod averaged 2.49 kg in weight and 62.7 cm in length. At the request of vessel captains, cod were not cut open by observers, therefore no information on variation in length or weight between sexes could be obtained. Observers did collect length frequencies on 1629 unsexed Pacific cod. The plot is given in Figure 9. The distribution is trimodal, with peaks centering around 35, 55 and 70 cm. The range of lengths was between 18 and 103 cm.

Yellowfin sole

Based on a sample of 1231 individuals, yellowfin sole averaged 32.0 cm in length, with females (32.7 cm) more than 2 cm larger than males (30.4 cm). The distribution of males (Figure 10) peaked between 30 and 32 cm, while the female distribution peaked between 34 and 35 cm. Sex ratio was very uneven, with females constituting 68.7% of the sexed individuals. Combined average weight for yellowfin sole was 0.36 kg.

Rock sole

Rock also weighed 0.36 kg on the average, with a combined average length of 30.8 cm (Figure 11). Females were substantially larger than males (36.4 cm to 28.4 cm), however males, based on a sample of 1212 sexed rock sole, constituted 70.8% of the population. Both distributions were unimodal, males peaked at 28 cm, while females peaked at 36 cm.

Other species

Among the other species that comprise at least 1% of the total catch, average weights (for sexes combined) were: walleye pollock - 0.79 kg, Alaska plaice - 0.73 kg, arrowtooth flounder - 0.85 kg, flathead sole - 0.38 kg and Atka mackerel 0.93 kg.

Incidence of Prohibited Species

Incidence rates for prohibited species, in mean number and mean weight per metric ton of groundfish catch, are summarized in Table 5. Pacific halibut, which averaged 5.88 individuals (11.09 kg) per metric ton, were the most common prohibited species.

Five species of Tanner crab were caught: C. opilio - 3.95 ind./MT weighing 0.37 kg/MT, C. bairdi - 2.56 ind./MT weighing 0.73 kg/MT, C. tanneri - 0.04 ind./MT weighing 0.01 kg/MT,

C. angulatus - 0.0005 ind./MT weighing 0.00005 kg/MT and hybrid Tanner (between C. opilio and C. bairdi) 0.0022 kg/MT weighing 0.0009 kg/MT.

Two species of king crab were also taken: red king crab incidence averaged 1.74 ind./MT weighing 1.90 kg/MT and golden king crab incidence was 0.03 ind./MT weighing 0.0045 kg/MT.

The only species of salmon that was identified was chinook, which averaged 0.02 ind./MT (0.08 kg/MT). One unidentified salmon was also taken.

Biological and Viability Data of Prohibited Species

Average length, weight and sex ratio for the prohibited species is summarized in Table 6.

Pacific halibut

The halibut taken incidentally to the Bering Sea groundfish fisheries monitored by observers averaged 45.7 cm in length (Figure 12) and 1.89 kg. The length frequency sample represents a sample of 5485 individuals. Lengths ranged from 22 to 181 cm, and the bimodal distribution peaked around 36 cm and 45 cm. Observers also evaluated viability of 7933 halibut as they were returned to the sea (Figure 13). The proportion judged to be dead, or with no chance of survival, was 86.6%. Halibut judged to be in poor condition comprised 8.8% of the sample and excellent halibut 4.6%.

Salmon

Chinook salmon encountered in the catch were 59.1% male to 40.9% female. Females, on the average, were larger than males: 3.85 kg to 3.45 kg in weight, and 66.9 cm to 64.9 cm. The single unidentified salmon weighed 3.20 kg.

Crab

Red king crab were split 48.7% males to 51.3% females. Males were considerably larger (126.8 mm and 1.54 kg to 98.7 mm and 0.67 kg) and the size distribution, which showed no clear modes, ranged from 83 mm to 158 mm (Figure 14). Females ranged in size from 68 mm to 158 mm, with a mode at 103 mm. Viability was similar between the sexes (Figure 15). Among the males, when returned to the sea, 47.6% were evaluated to be dead, 48.8% in poor condition and 3.6% excellent. Among females, 58.5% were dead, 41.5% poor, and none were judged excellent.

Golden king crab showed a 55.0% male to 45.0% female sex ratio. Males averaged 0.18 kg and 52.7 mm in size, while females averaged 0.12 kg and 58.6 mm. Based on small sample

sizes of 46 males and 49 females, golden king crab viabilities were: males - 8.7% excellent, 50.0% poor and 41.3% dead; females - 4.1% excellent, 91.8% poor and 4.1% dead.

The sex ratio of C. opilio Tanner crab was 8.5% male to 91.5% female. Average size of males was 0.36 kg and 93.8 mm, compared to 0.07 kg and 61.4 mm for females. Size distribution was evenly distributed across the size range of 53 mm to 133 mm (Figure 16). Females occurred in a narrow size range of 53 to 78 mm, with 58 mm the most common carapace width. Based on samples of 482 males and 220 females, females appear to withstand trawl capture better than males (Figure 18). Almost 65% of males were considered dead upon return to the sea, among females 13.7% were dead. For the remainder of the males, 19.9% were in excellent condition and 15.1% poor; 13.7% of the females were judged excellent and 72.7% poor.

Male C. bairdi were more common than females, 65.0% to 35.0%. Males averaged 0.38 kg and 84.0 mm in size, females averaged 0.11 kg and 55.9 mm. The 1057 measured males ranged in size from 18 mm to 178 mm, with a pronounced bimodal distribution (Figure 18). Modes centered around 43 and 123 mm. Females occurred between 23 mm and 113 mm; the 729 individuals' unimodal distribution peaked at 48 mm. Survival rates of C. bairdi were judged to be: males - 10.4% excellent, 30.8% poor and 58.8% dead; females - 5.3% excellent, 16.0% poor and 78.8% dead (Figure 19).

Among the other crab species encountered, biological data beyond average weight was collected only on C. tanneri Tanner crab. Sex ratio for C. tanneri was 86.0% male and 14.0% female. Average male size was 0.28 kg and 95.6 mm, average female size was 0.17 kg and 84.0 mm. Viability among males, based on a sample of 65 individuals was: 49.2% poor and the remainder dead. For females, the viability totals, from 10 individuals was 40% poor and 60% dead. The single C. angulatus individual was a female weighing 0.10 kg. All six of the hybrid Tanner crab were males, averaging 0.40 kg in weight.

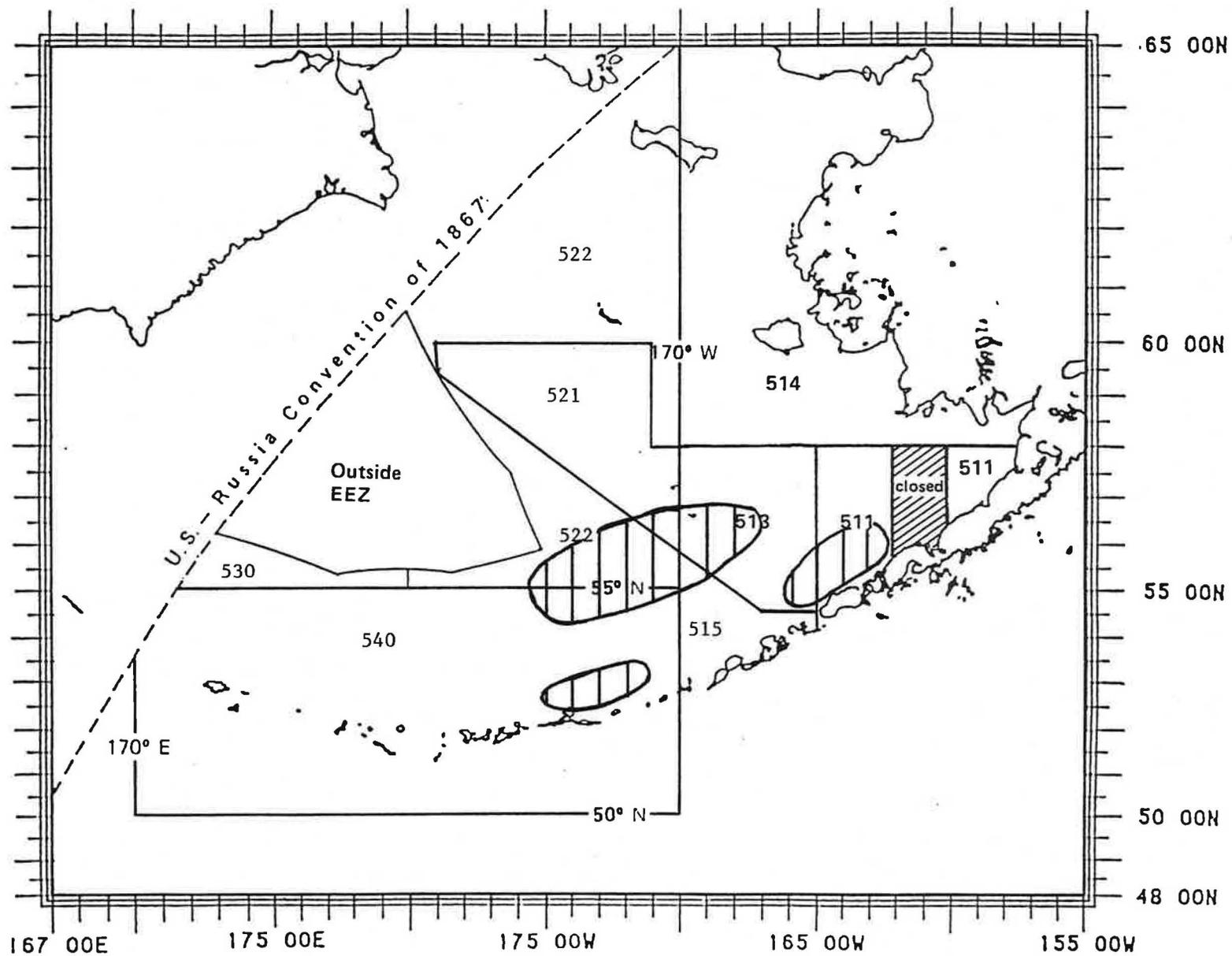


Figure 7. Bering Sea statistical areas sampled during NPFMC Pilot Domestic Observer Program, Winter 1988. Crosshatching indicates actual areas sampled.

Table 4. Species composition of catch during Bering Sea groundfish trawl fisheries, Winter 1988.

<u>Species Name</u>	<u>Percent of Total Catch</u>	<u>Catch Per Unit Effort (MT/Hour)</u>
Walleye pollock	26.70	1.4987
Pacific cod	26.44	1.4837
Rock sole	26.12	1.4661
Yellowfin sole	5.34	0.3000
Alaska plaice	3.66	0.2056
Pacific halibut	1.11	0.0622
Other flatfish*	5.88	0.3297
Other fish	3.05	0.1710
<u>Invertebrates</u>	<u>1.70</u>	<u>0.0954</u>
TOTALS	100.00	5.6124

* = Does not include Rock sole, yellowfin sole, Alaska plaice or Pacific halibut

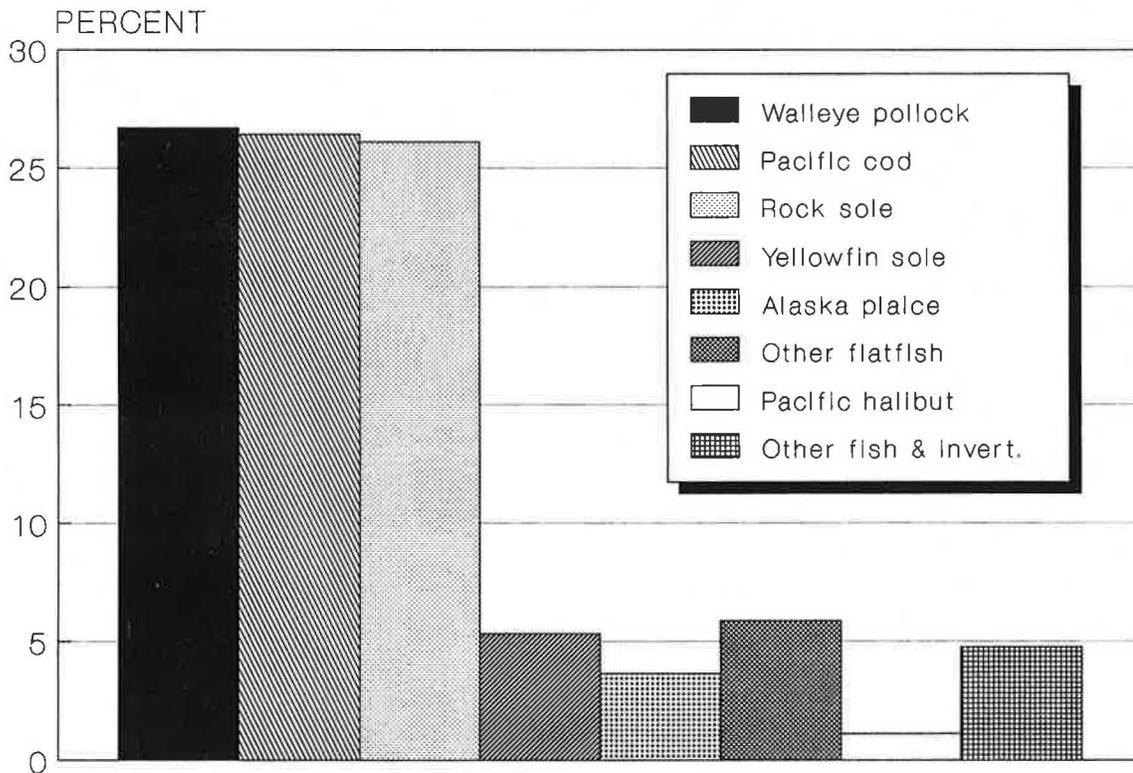


Figure 8. Species composition graph of table data above.

Table 5. Incidence data on prohibited species taken during Bering Sea groundfish trawl fisheries, Winter 1988.

<u>Species Name</u>	<u>Mean number/MT</u>	<u>Mean kg/MT</u>
Pacific halibut	5.88	11.09
C. opilio Tanner crab	3.95	0.37
C. bairdi Tanner crab	2.56	0.73
C. tanneri Tanner crab	0.04	0.01
C. angulatus Tanner crab	0.0005	0.00005
Hybrid Tanner crab	0.0022	0.0009
Red king crab	1.74	1.90
Golden king crab	0.03	0.0045
Chinook salmon	0.02	0.08
Unidentified salmon*	0.0005	0.0015

Note

* = Due to sampling constraints, no species differentiation done for these salmon

Table 6. Biological data from prohibited species taken incidentally during Bering Sea groundfish trawl fisheries, Winter 1988.

<u>Species Name</u>	<u>Sex ratio</u>		<u>Mean wt. (kg)</u>			<u>Mean length (cm)*</u>		
	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>Total</u>	<u>M</u>	<u>F</u>	<u>Total</u>
Pacific halibut	***		***		1.89	***		45.7
Chinook salmon	59.1	40.9	3.45	3.85	3.56	64.9	66.9	65.8
C. opilio Tanner crab	8.5	91.5	0.36	0.07	0.09	93.8	61.4	**
C. bairdi Tanner crab	65.0	35.0	0.38	0.11	0.29	84.0	55.9	**
C. tanneri Tanner	86.0	14.0	0.28	0.17	0.26	95.6	84.0	93.9
Red king crab	48.7	51.3	1.54	0.67	1.10	126.8	98.7	113.3
Golden king crab	55.0	45.0	0.18	0.12	0.15	52.7	58.6	**

Notes

- * = Crab sizes are in mm. Carapace width is measured on Tanner crab
- ** = Samples to determine average length/width of C. opilio and C. bairdi Tanner crab and golden king crab were randomly collected within sexes, but not between sexes.
- *** = Sex determination not performed on Pacific halibut

PACIFIC COD

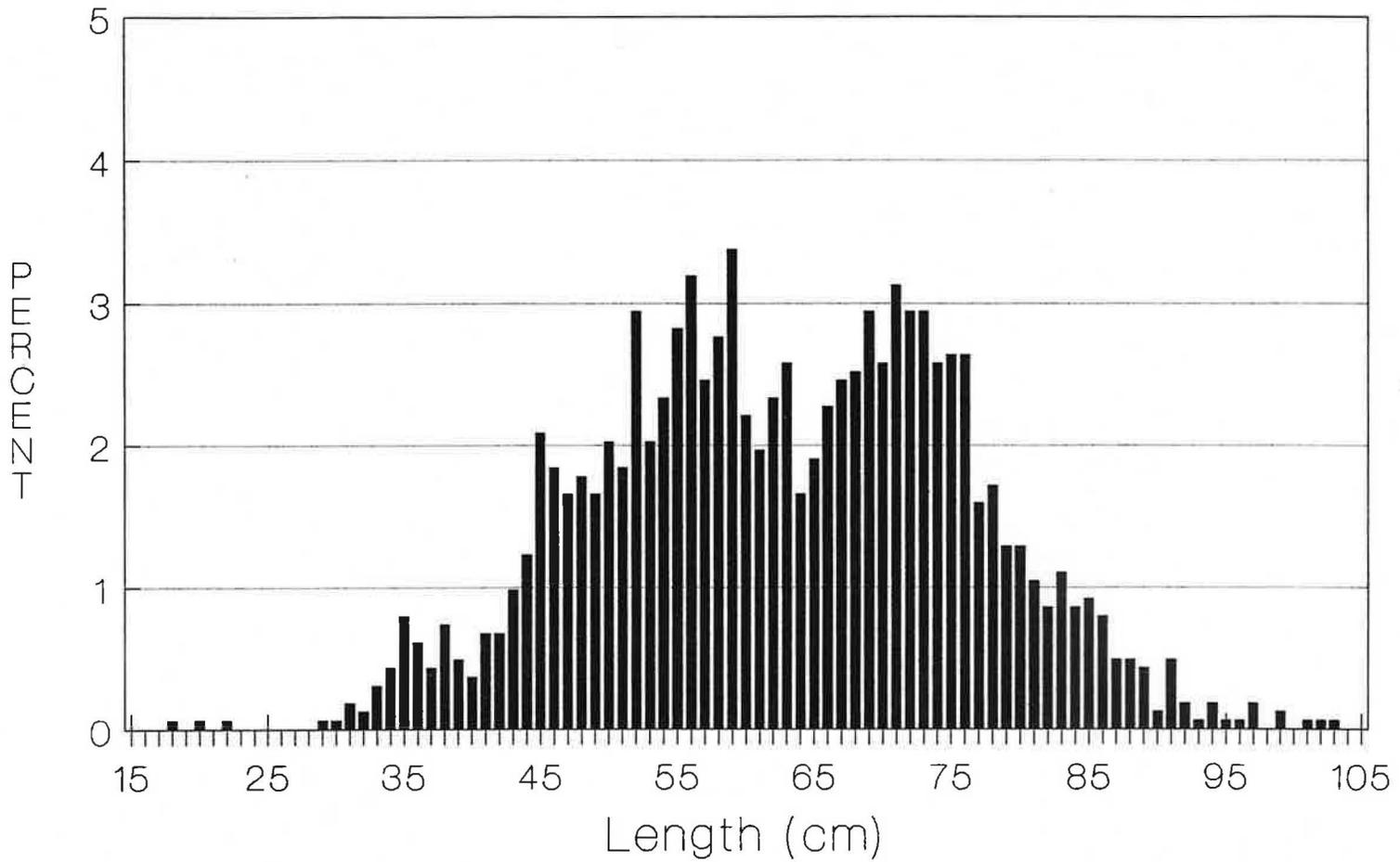


Figure 9. Pacific cod length frequencies, Bering Sea groundfish trawl fisheries, Winter 1988.

$\bar{X} = 62.7$
 $n = 1629$

YELLOWFIN SOLE

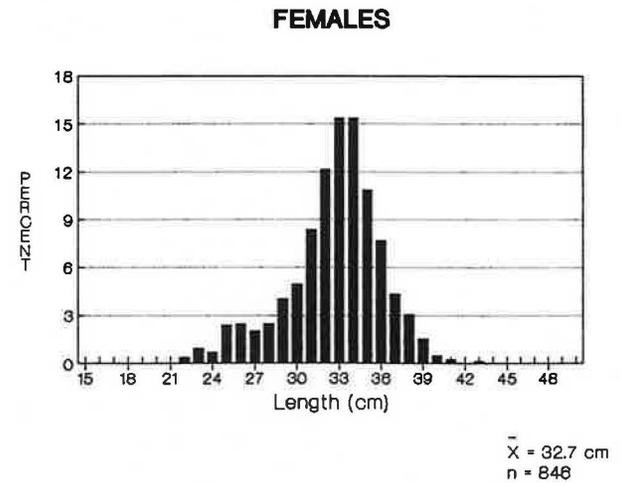
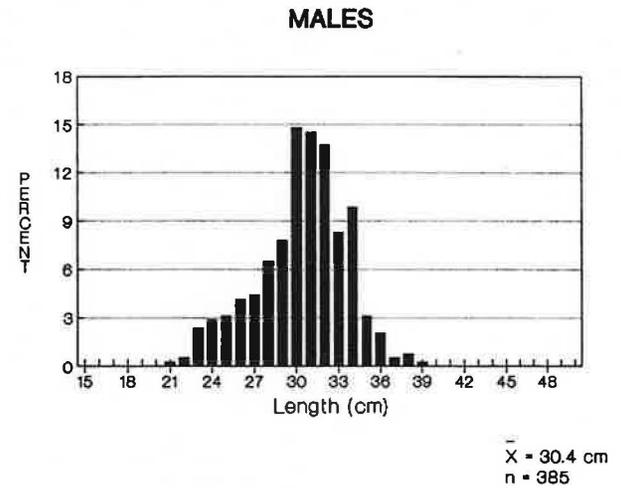
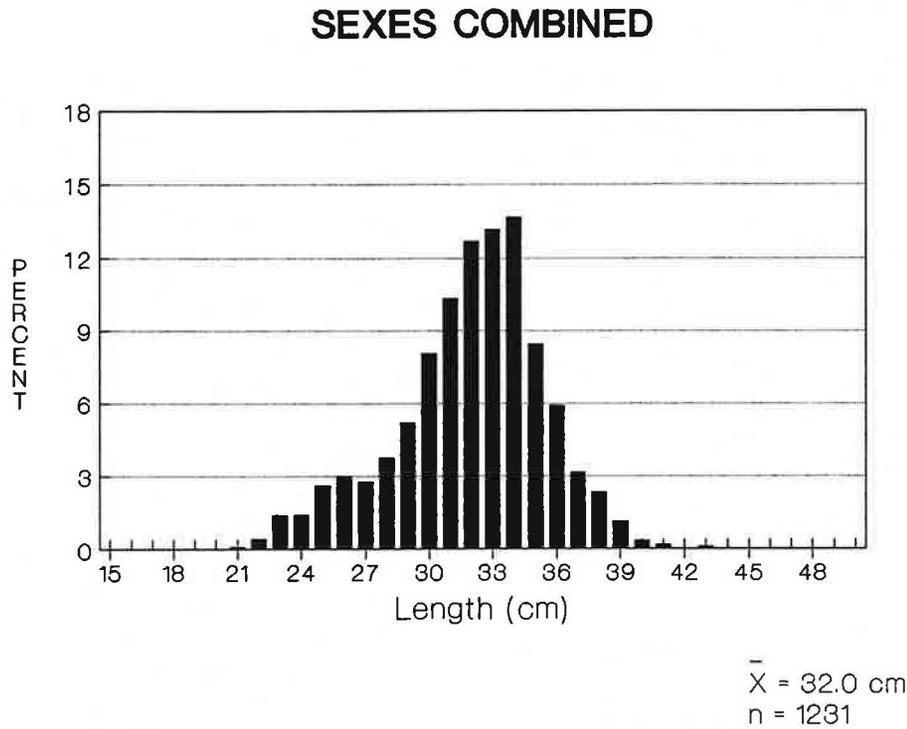


Figure 10. Yellowfin sole length frequencies, Bering sea groundfish trawl fisheries, Winter 1988.

ROCK SOLE

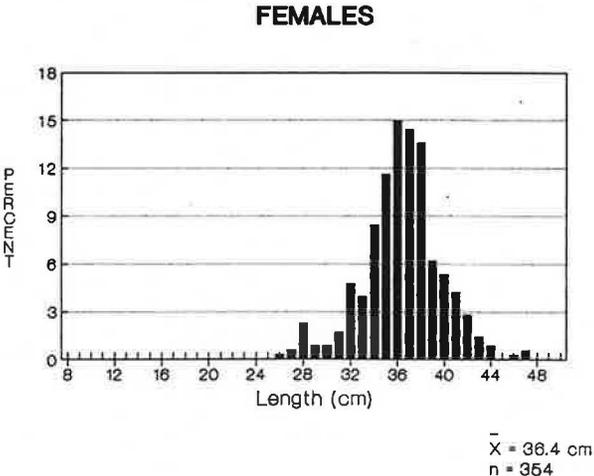
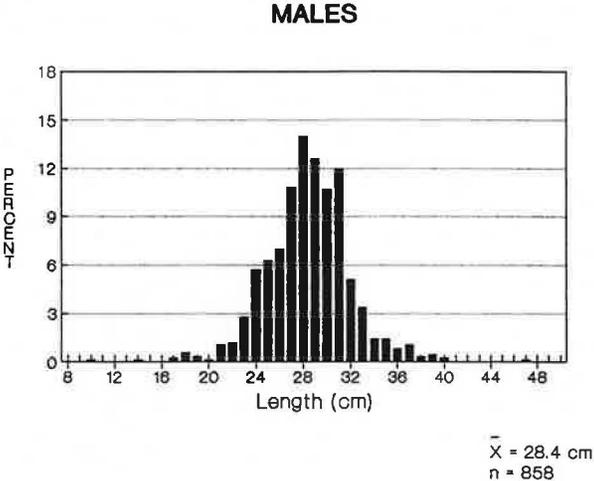
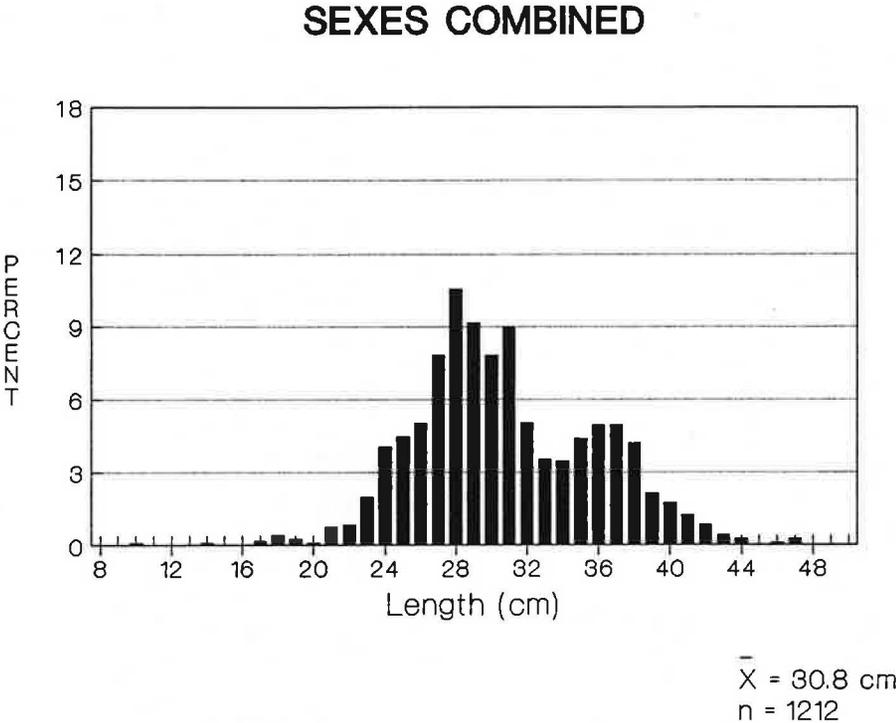


Figure 11. Rock sole length frequencies, Bering sea groundfish trawl fisheries, Winter 1988.

PACIFIC HALIBUT

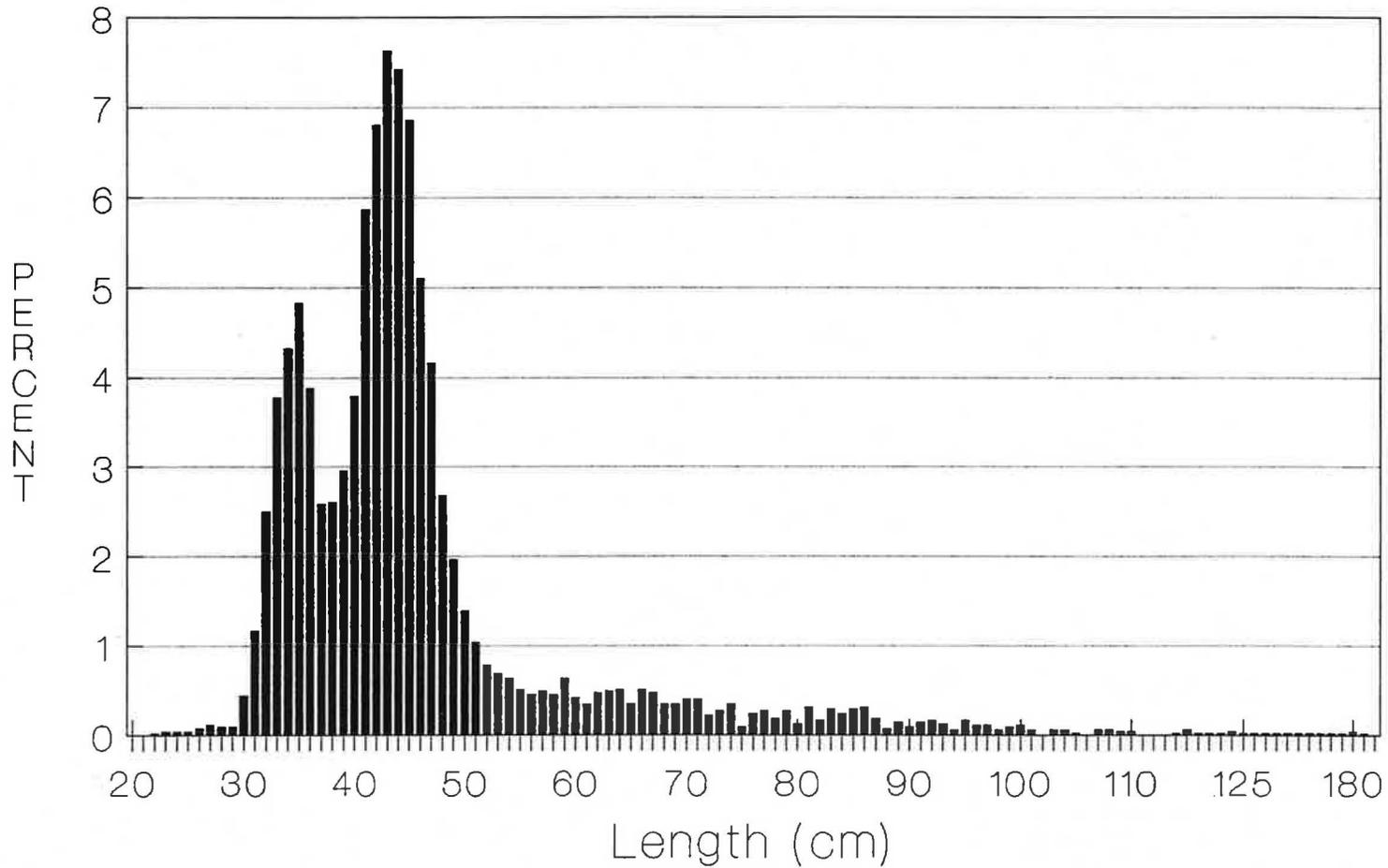


Figure 12. Pacific halibut length frequencies, Bering Sea groundfish trawl fisheries, Winter 1988.

$\bar{X} = 45.7$
 $n = 5485$

PACIFIC HALIBUT VIABILITY

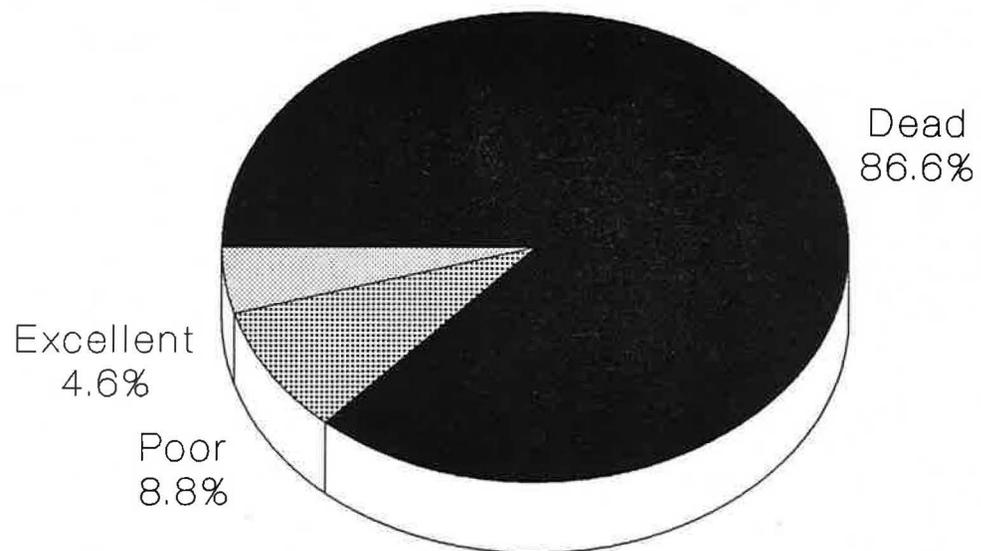
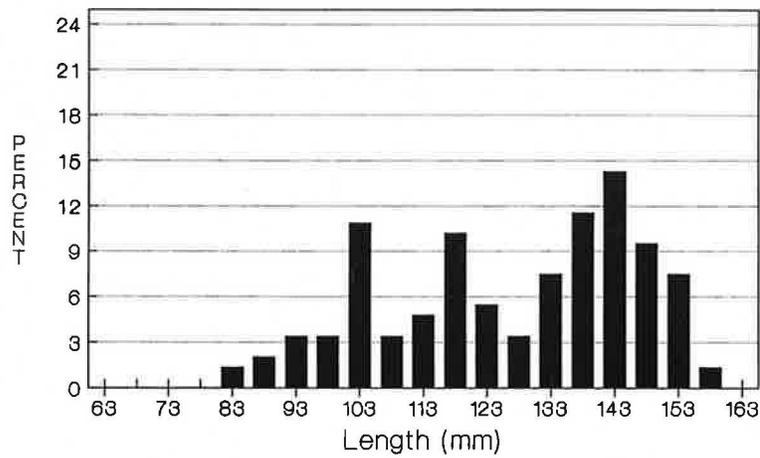


Figure 13. Pacific halibut viability, Bering Sea groundfish trawl fisheries, Winter 1988.

Sample size = 7933

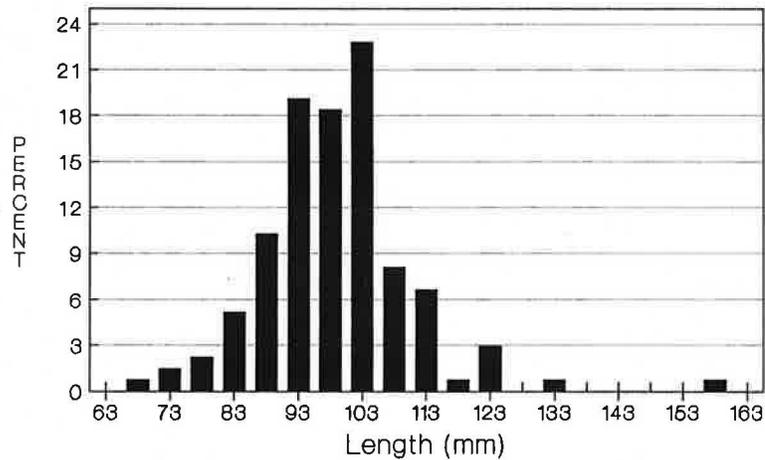
RED KING CRAB

MALES



$\bar{X} = 126.8$ mm
 $n = 147$

FEMALES



$\bar{X} = 98.7$ mm
 $n = 136$

Figure 14. Red king crab length frequencies, Bering Sea groundfish trawl fisheries, Winter 1988.

RED KING CRAB VIABILITY

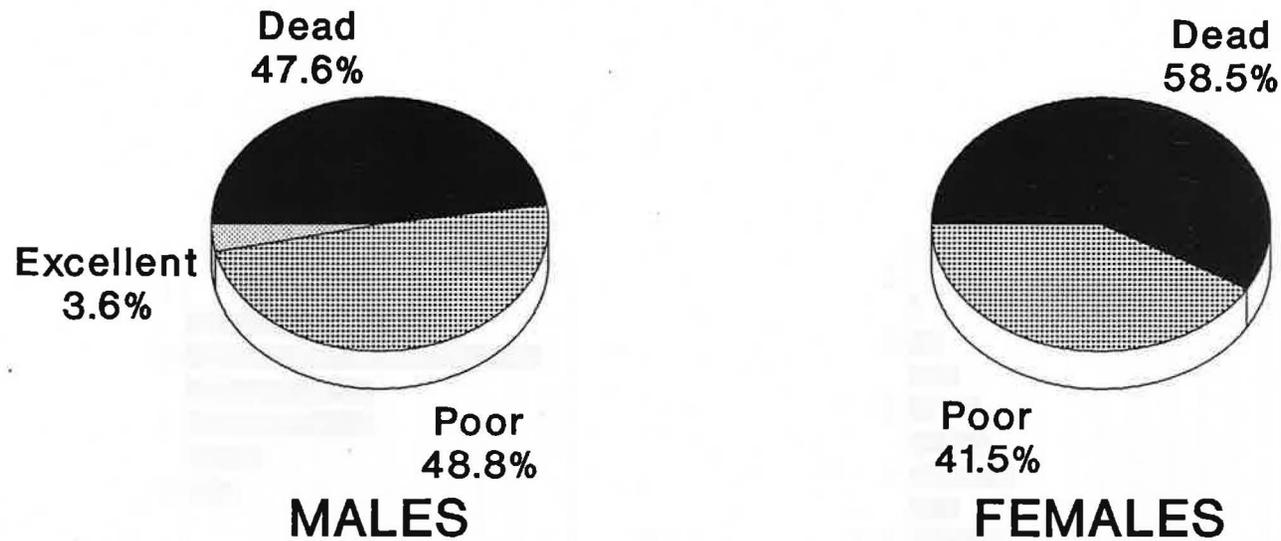


Figure 15. Red king crab viabilities, Bering Sea groundfish trawl fisheries, Winter 1988.

Sample sizes:
Males = 758
Females = 717

C. BAIRDI TANNER CRAB VIABILITY

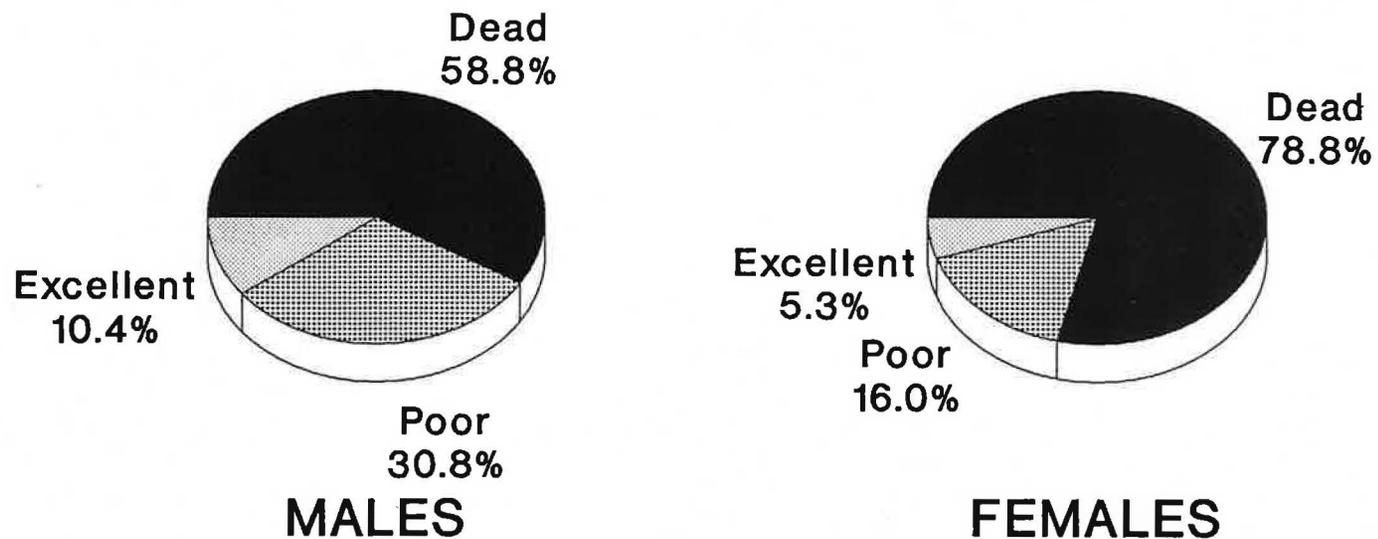
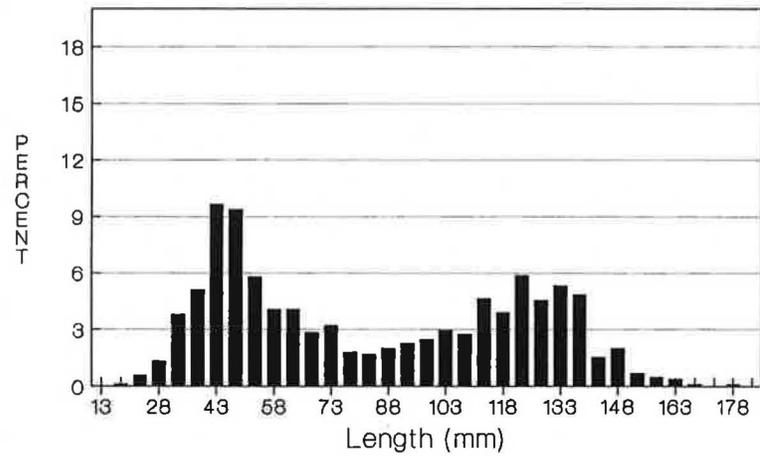


Figure 19. *C. bairdi* Tanner crab viabilities, Bering Sea groundfish trawl fisheries, Winter 1988.

Sample sizes:
Males = 2090
Females = 1272

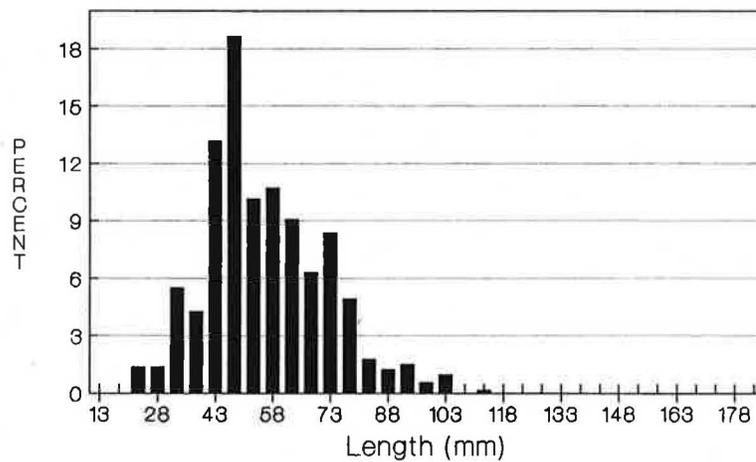
C. BAIRDI TANNER CRAB

MALES



$\bar{X} = 84.0$ mm
 $n = 1057$

FEMALES



$\bar{X} = 55.9$ mm
 $n = 729$

Figure 18. *C. bairdi* Tanner crab length frequencies, Bering Sea groundfish trawl fisheries, Winter 1988.

