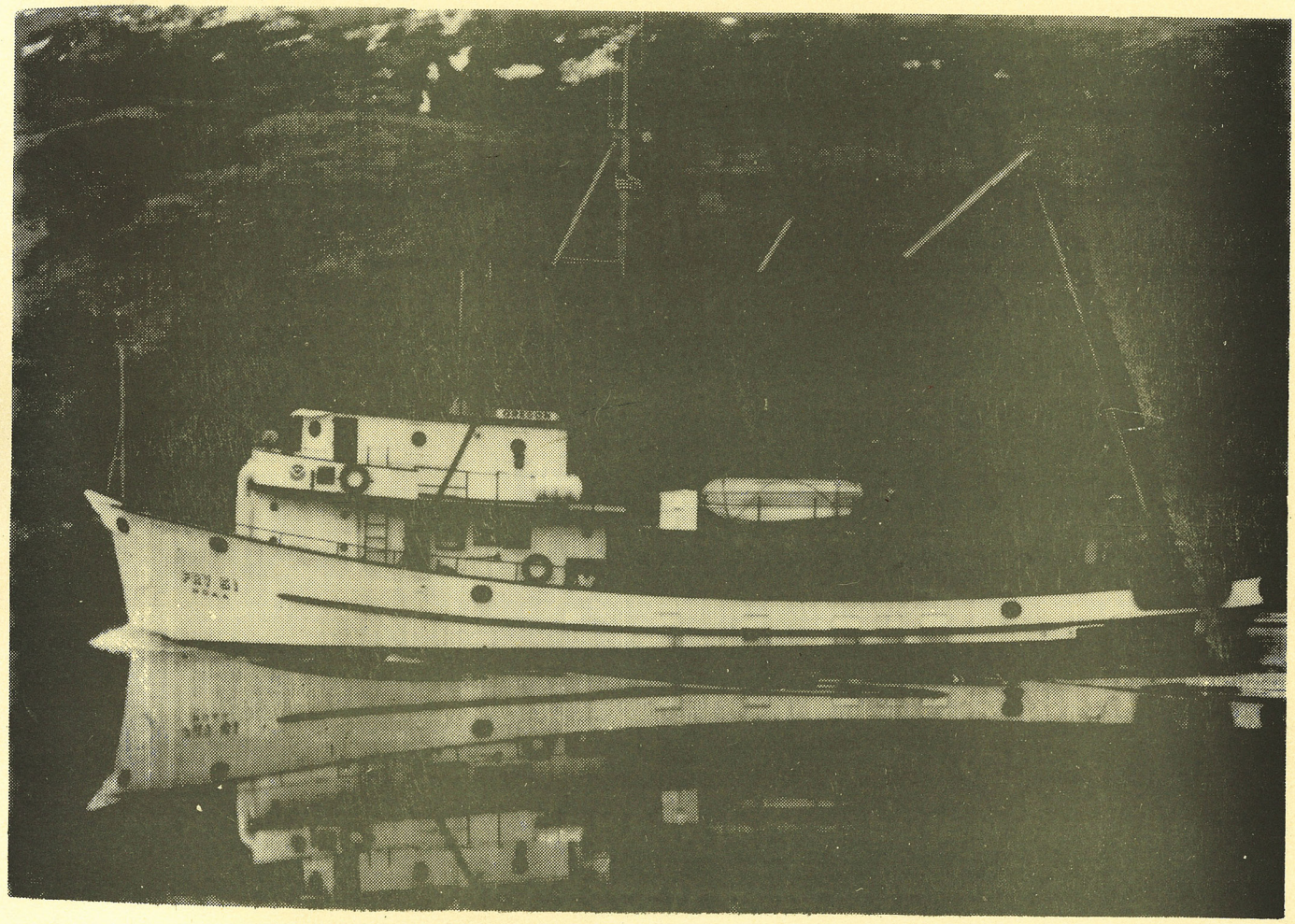
NORTHWEST AND ALASKA FISHERIES CENTER
PROCESSED REPORT
SEPTEMBER 1977

Report to Industry on
1977
EASTERN BERING SEA SURVEY
KING CRAB



SURVEY VESSEL R/V OREGON

Northwest and Alaska Fisheries Center

Kodiak Facility

Kodiak, Alaska

Northwest and Alaska Fisheries Center Processed Report
Report to Industry on
1977
Eastern Bering Sea Survey
King Crab

by

R. S. Otto, Jack McBride and J. A. Burns

National Marine Fisheries Service
Northwest and Alaska Fisheries Center
Kodiak Facility
P. O. Box 1638
Kodiak, Alaska 99615

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NOTICE

This document is being made available in .PDF format for the convenience of users; however, the accuracy and correctness of the document can only be certified as was presented in the original hard copy format. Note page 6 first page of Table 2 is missing.

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The 1977 Eastern Bering Sea Crab Survey

An annual trawl survey is conducted in the eastern Bering Sea to provide information on the condition, distribution and abundance of four species of crabs. This information is provided to fishermen and processors as an aid in locating productive areas and judging the overall availability of crabs. Survey derived information is also used as part of the basis for management decisions. This report deals with the results of the 1977 survey conducted by the NOAA RV Oregon with respect to red (Paralithodes camtchatica) and blue (P. platypus) king crabs. An additional report, dealing with survey results for two species of Tanner (snow) crabs, will be provided later in the year.

Survey Area and Methods

The area covered by the 1977 survey extended from eastern Bristol Bay to the continental shelf edge west of the Priblofs, and from the latitude of Cape Newenham south to that of Unimak Island. The area is shown in the accompanying charts along with the location of survey stations. Each station was at the center of a twenty-mile square, and consisted of a one-half hour tow made with a 400 mesh eastern otter trawl. The trawl was constructed of 36 thread 4-inch mesh in the wings, 60 thread 3 1/2 mesh in the intermediate, and 96 thread 1 1/4 inch mesh codend liner. It was rigged with 18 eight-inch floats on the head rope and 25 fathom dandy lines (10 fathom single, 15 fathom double). The doors were of the Astoria "V" type and measured 5x7 feet. A tracing of the bottom profile was made with a recording echo sounder during each tow. A tracing of the surface to bottom temperature profile was taken with an expendable bath thermograph (XBT) at selected stations. When the trawl was brought aboard, crabs were separated from the rest of the catch and sorted by species and sex. A record was made of the number of crabs taken as well as size, sex, shell condition and egg condition.

Survey information was processed to provide estmates of stock size and descriptions of crab distribution in the area. Estimates of the number of crabs per square were obtained by calculating the number of crabs caught per square nautical mile and expanding this figure to account for the entire 20x20 mile area. Estimated stock size was obtained by summing the number of crab from all 20x20 mile squares within the survey area.

Four charts of station data are included to show distribution of king crab by (1) the number of legal males, (2) the number of females, (3) the number of sub-legal males, and (4) the percentage of legal males in the total catch. These data are presented on a one-half hour tow basis. Data from square B-8 were obtained during a gear comparison experiment. Although not shown in the charts, data from B-8 are shown in Table 2. Bottom temperatures obtained with XBT probes are shown on Chart number 9.

This presentation differs from that of previous reports that showed numbers caught on a per square nautical mile basis as well as numbers caught per trawl haul. In as much as both are measures of relative abundance either could be used. Only one method of presentation was used here in the interest of timeliness and because readers expressed no preference in the questionnaire included in the 1976 report. An additional questionnaire is included at the end of this report so that readers may express their preference for the chart type considered most useful or comment on other aspects of this report. Postage free forms are also included for readers who wish to be added to our mailing list.

Survey Results

King crabs were caught at 89 of 159 stations. By comparison, king crabs were taken at 75 of 150 stations in the 1976 survey. Red king crab were caught at 79 of 159 stations in 1977 and at 66 of 150 stations in 1976. Blue king crab were caught at 10 stations in 1977 and 9 stations in 1976. The two species were found together only once in each year.

Red King Crab. Stock estimates for legal and pre-recruit crabs are shown in Table 1. The abundance of legal crabs shows only a small decrease relative to the high point reached in 1976. Estimates are comparable and should be considered identical. A large number of pre-recruits were available in 1976 and recruitment was evidently sufficient for replacement of a 1976 commercial catch of 10.6 million crabs as well as mortalities due to other causes. More pre-recruit red king crabs are available this year than in 1976, perhaps indicating that harvestable stock abundance will remain high in the near future.

Figure 1 shows the relationship between the catch rate in the eastern Bering Sea fishery and the estimated abundance of red king crabs in the annual trawl surveys. There has been good agreement between estimated abundance and catch per unit effort in the same season, although the 1976 catch rate was lower than would be expected given the general trend line. This difference may have been due to abnormally warm weather last season. Several fishermen have remarked that "the crabs were more dispersed than in previous years."

The distribution of legal male sub-legal male and female red king crabs is shown in Charts 1, 2 and 3. Legal and sub-legal male king crabs were found in the same areas and were also found in deeper water near station E4. Females were less numerous in these areas. There was no appreciable difference in the overall distribution of male crabs when data for 1976 and 1977 were compared. Chart 4 shows the percentage of legal males in the total catch of red king crabs at each station. The highest percentages of legal crabs occurred on the seaward edge of their distribution, but not necessarily in deeper water. Temperatures

at selected stations where red king crabs were taken may be found in Chart 9. Station locations and data for square B-8 are shown in Table 2.

Blue King Crab. Abundance trends for blue king crabs (Table 1) are more difficult to interpret. Estimated abundance for legal blue king crab has more than doubled, in spite of an apparently small population of pre-recruits available in 1976. Perhaps the increase in harvestable stock is best explained by the fact that more than two-thirds of the estimated population of legal blue king crab is attributable to the high catch at station G-20 (see Chart 5). In any event it appears that fishing for blue king crabs should be as good as last year.

The distribution of legal male, sub-legal male, and female blue king crab is shown in Charts 5, 6 and 7. Legal and sub-legal male crabs were found in about the same areas and were distributed slightly to the north of areas having the greatest concentrations of females. Females also were more restricted in their distribution. When compared with 1976, the 1977 distribution of legal males has shifted somewhat westward. Chart 8 shows the percentage of legal males in the total catch of blue king crab. As was true of red king crabs, the highest percentage of legal males was found on the periphery of the stock's distribution. Bottom temperatures at selected stations where blue king crab were taken may be found in Chart 9. Station locations are shown in Table 3.

Table 1.--Population estimates in millions of crabs for eastern Bering Sea king crabs from NOAA/NMFS surveys.

RED KING CRABS

Year	Pre-recruits*	Legals*
1969	19.5	8.9
1970	8.4	5.3
1972**	8.3	5.6
1973	25.9	10.9
1974	31.2	20.8
1975	29.6	17.6
1976	49.3	32.7
1977	64.8	32.4

BLUE KING CRABS

1974	3.1	1.9
1975	8.0	7.5
1976	2.1	3.9
1977	2.6	9.1

*The size groups 5.0"-6.25" and over 6.25" have been used for pre-recruits and legals, respectively, for comparative purposes.

**No survey in 1971.

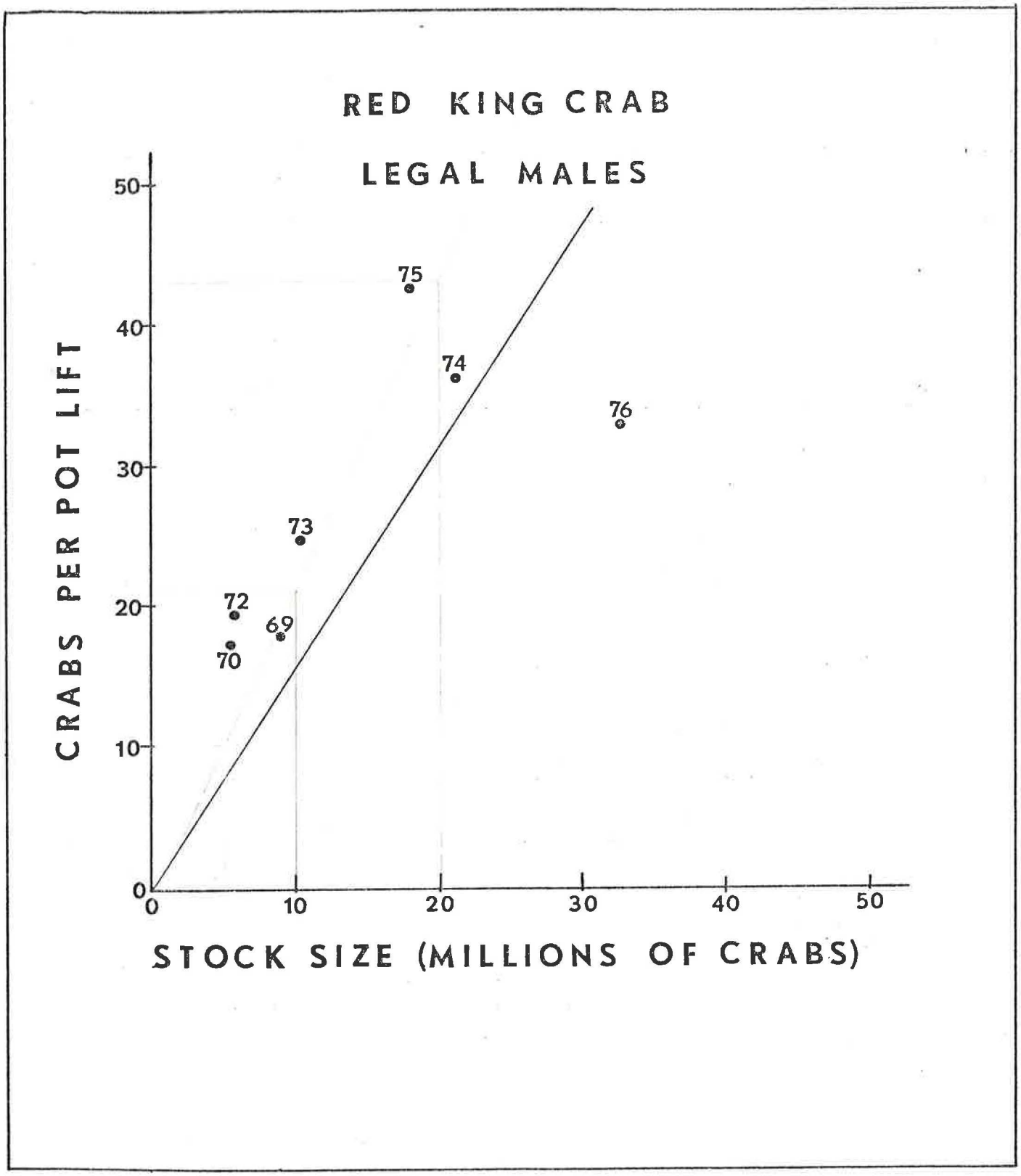

FIGURE 1. RELATIONSHIP BETWEEN THE AVERAGE NUMBER OF CRABS TAKEN PER POT IN THE U.S. FISHERY AND ESTIMATES OF STOCK SIZE FROM NMFS TRAWL SURVEYS

Table 2 Contd.

Station	Date	Latitude	Longitude	Loran C		Depth (fm)	Bot. Temp. (oc)	Pre-recruit (110.0 - 135.0 mm)*		Legal (> 136.0 mm)		
								Catch per ½ hr. tow	No. per sq. mi.	Catch per ½ hr. tow	No. per sq. mi.	% Legal of catch
E-8	6/11	56-20	163-24	Y34013	Z47435	45	3.1	20	2632	2	263	2.6
D-8	6/11	56-00	163-24	Y34097	Z47435	46	3.1	14	1867	12	1600	15.0
B-7	6/11	55-20	163-59	Y34333	Z47649	40		14	1867	12	1600	15.0
B-6	6/12	55-20	164-35	Y34426	Z47872	54	4.0	20	2667	10	1333	8.8
B-5	6/12	55-20	165-10	Y34516	Z48083	58		6	1622	2	541	1.3
B-4	6/12	55-19	165-46	Y34615	Z48309	62		2	263	-	-	-
B-3	6/12	55-19	166-20	Y34702	Z48508	69	4.0	1	152	1	152	50.0
Z-5	6/18	55-04	165-09	Y34608	Z48027	44	5.5	7	921	2	263	7.1
A-5	6/18	55-00	165-09	Y34566	Z48057	57		1	152	3	455	8.3
A-4	6/18	55-00	165-45	Y34655	Z48273	68		82	10709	19	2500	17.3
A-3	6/18	55-00	166-20	Y34737	Z48466	76	3.6	3	395	1	132	10.0
D-3	6/19	56-00	166-24	Y34609	Z48602	66		2	303	2	303	50.0
D-4	6/19	56-00	165-47	Y34501	Z48365	58		2	263	1	132	33.0
C-5	6/20	55-40	165-11	Y34462	Z48110	58	4.0	8	1053	4	526	18.2
D-5	6/20	56-00	165-11	Y34399	Z48136	51		178	24383	94	12876	26.0
D-6	6/20	56-00	164-35	Y34295	Z47900	49		60	7895	22	2895	8.9
C-6	6/20	55-40	164-35	Y34367	Z47889	52	4.5	3	395	5	658	3.0
C-7	6/21	55-40	164-00	Y34271	Z47664	50	4.2	4	606	2	303	4.4
D-7	6/21	56-00	164-00	Y34197	Z47671	48		4	606	10	1515	38.5
E-7	6/21	56-20	164-00	Y34114	Z47677	46		48	7273	-	-	-
F-7	6/21	56-40	164-00	Y34018	Z47679	40	1.5	1	76	4	303	40.0
F-8	6/22	56-40	163-23	Y33917	Z47430	40	2.0	12	1091	14	1273	51.9
F-9	6/22	56-40	162-47	Y33816	Z47188	39		15	1363	10	909	35.7
G-9	6/22	57-00	162-47	Y33712	Z47182	32		57	7727	69	10455	43.1
H-9	6/22	57-20	162-46	Y33591	Z47167	26	2.7	100	7576	46	3485	24.5
H-10	6/23	57-20	162-09	Y33496	Z46920	26		34	5152	6	909	3.7

Table 2 Contd.

Station	Date	Latitude	Longitude	Loran C		Depth (fm)	Bot. Temp. (oc)	Pre-recruit (110.0 - 135.0 mm)*		Legal (> 136.0 mm)		
								Catch per ½ hr. tow	No. per sq. mi.	Catch per ½ hr. tow	No. per sq. mi.	% Legal of catch
G-10	6/23	57-00	162-10	Y33616	Z46936	32		20	2667	6	800	1.9
H-11	6/23	57-20	161-32	Y33404	Z46670	30		33	5000	3	455	0.8
I-11	6/23	57-40	161-30	Y33280	Z46654	27	3.6	32	4267	1	133	0.8
I-12	6/24	57-40	160-54	Y33196	Z46407	30	2.1	36	3711	9	928	8.1
J-13	6/24	58-00	160-13	Y32985	Z46137	26		9	1286	4	571	19.0
J-12	6/26	58-00	160-51	Y33064	Z46388	23	3.6	12	1714	12	1714	31.6
J-11	6/26	58-00	161-29	Y33153	Z46638	28		2	190	2	190	25.0
J-10	6/26	58-00	162-07	Y33240	Z46885	19		7	933	2	267	10.5
I-10	6/26	57-40	162-08	Y33375	Z46905	24	3.2	36	5455	8	1212	11.8
I-9	6/27	57-40	162-45	Y33468	Z47150	22	2.8	3	400	5	667	35.7
J-9	6/27	58-00	162-45	Y33334	Z47134	21		1	141	1	143	33.3
J-8	6/27	58-00	163-23	Y33428	Z47380	22	2.7	1	133	-	-	-
I-8	7/1	57-40	163-22	Y33564	Z47394	24	3.9	3	429	-	-	-
H-8	7/1	57-20	163-23	Y33688	Z47412	27		-	-	2	556	100.0
G-8	7/2	57-00	163-23	Y33810	Z47420	35	1.7	5	667	7	933	58.3
G-6	7/2	57-00	164-36	Y34020	Z47916	36		1	133	1	133	50.0
F-6	7/2	56-40	164-36	Y34124	Z47916	39	2.9	2	303	1	152	33.3
E-6	7/3	56-20	164-35	Y34215	Z47910	46	2.9	6	822	11	1507	57.9
E-5	7/3	56-20	165-12	Y34324	Z48151	46		2	278	24	3333	92.3
F-5	7/3	56-40	165-13	Y34235	Z48162	40		-	-	1	133	100.0
G-5	7/3	57-00	165-13	Y34133	Z48160	37	2.6	1	152	1	152	50.0
E-4	7/4	56-20	165-48	Y34434	Z48392	48		16	2424	6	909	27.3
E-3	7/4	56-20	166-26	Y34547	Z48634	54	3.6	8	1076	5	677	38.5
F-2	7/6	56-40	167-04	Y34593	Z48905	51	3.5	-	-	1	132	100.0
D-2	7/8	56-00	167-00	Y34716	Z48834	70		2	303	2	303	50.0

Table 2 Contd.

Station	Date	Latitude	Longitude	Loran C		Depth (fm)	Bot. Temp. (oc)	Pre-recruit (110.0 - 135.0 mm)*		Legal (> 136.0 mm)		
								Catch per ½ hr. tow	No. per sq. mi.	Catch per ½ hr. tow	No. per sq. mi.	% Legal of catch
C-2	7/8	55-40	166-59	Y34759	Z48785	71		-	-	1	132	100.0
F-20	7/18	56-40	169-28	X18602	Y49832	41	4.5	4	548	-	-	0
B-8**	5/25	55-27	163-33	X18498	Z34242	38		11	1447	24	3158	59.2

* Carapace lengths are measured for biological purposes.

** Note - The results for B-8 are averages of three separate tows.

Table 3.-- Data from eastern Bering Sea trawl survey stations where blue king crab were encountered.

Station	Date	Latitude	Longitude	Loran C		Depth (fm)	Bot. Temp. (oc)	Pre-recruit (110.0 - 135.0 mm)*		Legal (> 136.0 mm)		
								Catch per ½ hr. tow	No. per sq. mi.	Catch per ½ hr. tow	No. per sq. mi.	% Legal of catch
F-20	7/18	56-40	169-28	X18602	Z49832	41	4.5	-	2897	172	16075	80.0
G-20	7/19	57-00	169-31	Y35016	Z49892	32	3.2	31	2897	172	16075	80.0
G-21	7/19	57-00	170-10	X18689	Z50114	36		2	204	8	816	15.0
H-22	7/19	57-20	170-51	X18515	Y34957	43	3.8	18	2535	19	2676	44.2
H-21	7/20	57-20	170-13	Y35004	Z50103	29	4.7	1	103	-	-	-
H-20	7/20	57-20	169-36	Y34904	Z49897	34		1	141	2	282	50.0
H-19	7/20	57-20	168-59	Y34772	Z49654	36		2	267	2	267	20.0
I-21	7/21	57-40	170-16	Y34758	Z49963	38		1	141	2	282	67.0
I-22	7/21	57-40	170-54	Y34744	Z50045	44		2	218	11	1549	25.0
J-22	7/21	58-00	170-59	Y34509	Z49937	45	2.5	-	-	1	81	100.0

*Carapace lengths are measured for biological purposes.

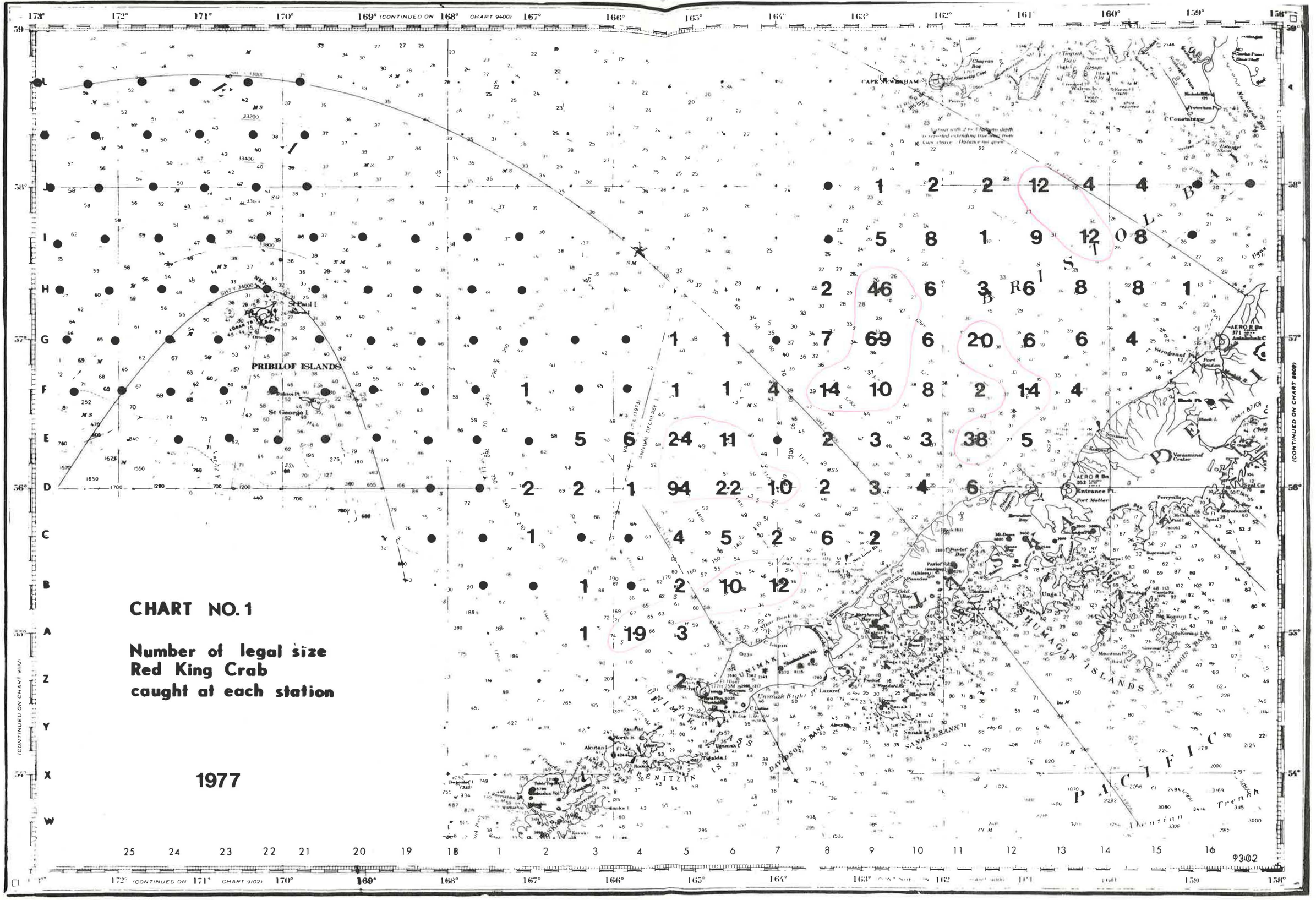

CHART NO. 1

Number of legal size
Red King Crab
caught at each station

1977

CHART NO. 2

Number of sub-legal size Red King Crab caught at each station

1977

PRIBILOF ISLANDS

DANGER AREA (see Note A)

A shoal with 2 to 3 fathoms depth is reported extending two miles from Cape Pearce. Distance not given.

PACIFIC

Aleutian Trench

HUMAGIN ISLANDS

SANAK ISLANDS

DAVIDSON BANK

SHUMAGIN BANK

UNIMAK I.

Unalaska Bight

St Paul I

St George I

(CONTINUED ON CHART 9102)

(CONTINUED ON CHART 9000)

9302

CHART NO. 3

Number of female
Red King Crab
caught at each station

1977

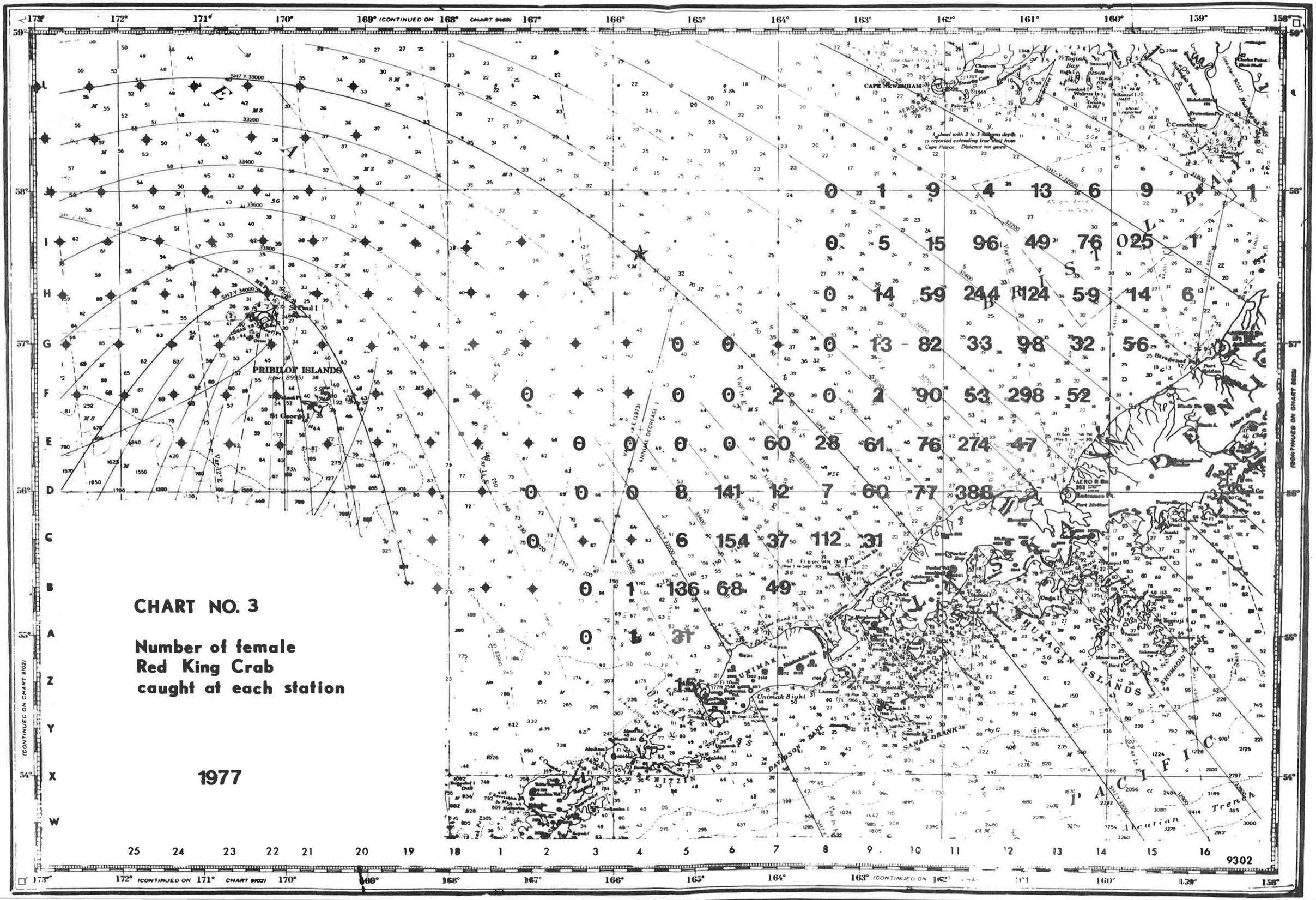

CHART NO. 4

Percent legals of all Red King Crab caught at each station

1977

***-none caught**

PRIBILOF ISLANDS

St Paul I

St George I

UNIMAK I

Unimak Bight

SANAK I

DAVIDSON BANK

SANAK BANK

SHUMAGIN ISLANDS

PACIFIC

Trench

BASIN

CAPE NEWENHAM

Togiak Bay

Birdgood Bay

Port Heiden

Port Moller

Chignik

(CONTINUED ON CHART 9102)

(CONTINUED ON CHART 8602)

(CONTINUED ON CHART 9002)

(CONTINUED ON CHART 9000)

9302

CHART NO. 5

Number of legal male Blue King Crab caught at each station

1977

(CONTINUED ON CHART 9102)

(CONTINUED ON CHART 9000)

9302

CHART NO. 6

Number of sub-legal male Blue King Crab caught at each station

1977

(CONTINUED ON CHART 9102)

(CONTINUED ON CHART 9002)

9302

CHART NO. 6

Number of sub-legal male Blue King Crab caught at each station

1977

(CONTINUED ON CHART 9102)

(CONTINUED ON CHART 9002)

9302

CHART NO. 7

Number of female Blue King Crab caught at each station

1977

PRIBILOF ISLANDS

BERING SEA

PACIFIC OCEAN

(CONTINUED ON CHART 9102)

(CONTINUED ON CHART 9000)

9302

CHART NO. 8

Percent legals of all Blue King Crab caught at each station

1977

PRIBILOF ISLANDS

BERING SEA

PACIFIC

9302

CHART NO. 9

Bottom Temperature C°

1977

(CONTINUED ON CHART 9102)

(CONTINUED ON CHART 9302)

173° 172° (CONTINUED ON CHART 9802) 171° 170° 169° 168° 167° 166° 165° 164° 163° (CONTINUED ON CHART 9080) 162° 161° 160° 159° 158°

59° 58° 57° 56° 55° 54°

25 24 23 22 21 20 19 18 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Z Y X W A B C D E F G H J

CHART NO. 1

Number of legal size Red King Crab caught at each station

1977