

Kamishak District King Crab Index of Abundance Survey,
June 7 - 15, 1989

Regional Information Report¹ 2H89-06



by
Al Kimker
Area Shellfish Biologist

Alaska Department of Fish and Game
Division of Commercial Fisheries Central Region
333 Raspberry Road
Anchorage, Alaska 99518-1599

Don W. Collinworth - Commissioner
Ken Parker - Director of Commercial Fisheries

July 1989

¹Contribution 89-06 from the Homer area office. The Regional Information Report Series was established in 1987 to provide an information access system for all the unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate needs for up to date information, reports in this series may contain preliminary data.

TABLE OF CONTENTS

LIST OF TABLES.....iii
LIST OF FIGURES.....iv
INTRODUCTION.....1
METHODS.....2
RESULTS.....4
DISCUSSION.....6
LITERATURE CITED.....9
EEO STATEMENT.....10

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Description of stations fished during the June 1989 Kamishak District king crab index of abundance survey.....	11
2. Total catch of king crab from the Kamishak District index of abundance surveys, 1975-1989.....	12
3. Average catch per pot of male king crab by size class captured in the Kamishak District index of abundance surveys, 1975-1989.....	13
4. Relative fecundity by shell age for mature female king crab from the June 1989 Kamishak District index of abundance survey.....	15
5. Total catch of Tanner crab from the Kamishak District index of abundance surveys, 1975-1989.....	16
6. Average catch per pot of male Tanner crab by size class and shell age captured in the June Kamishak District index of abundance surveys, 1979-1989.....	17
7. Relative fecundity by shell age for mature female Tanner crab from the June 1989 Kamishak District index of abundance survey.....	19

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Cook Inlet area district location chart.....	20
2. Male king crab catch distribution by age class, June, 1989 Kamishak District index of abundance.....	21
3. Average catch per pot by station of legal male king crab, Kamishak District index, June 7-15, 1989.....	22
4. Average catch per pot by station of pre-recruit one king crab, Kamishak District index, June 7-15, 1989....	23
5. Average catch per pot by station of legal male Tanner crab, Kamishak District index, June 7-15, 1989.....	24
6. Average catch per pot by station of true pre-recruit one Tanner crab, Kamishak District index, June 7-15, 1989.....	25
7. Average catch per pot of pre-recruit-1 and recruit male king crab, June Kamishak District index of abundance surveys, 1982-89.....	26

INTRODUCTION

The Department began conducting a survey for red king (Paralithodes camtschatica) and Tanner crabs (Chionoecetes bairdi) in the Kamishak and Barren Islands Districts of the Lower Cook Inlet Management Area (H) in 1975 (Figure 1).

This survey, which has been conducted during the month of June since 1980, is no longer used as an index of abundance for Tanner crabs. On any given year the male Tanner crabs can be in a soft shell condition in June, indicating the molt may still be in progress. Without full recruitment of the recruit year class into the gear successive valid comparable index numbers cannot be established.

The purposes of the June 1989 survey were to:

1. Establish an index of abundance for both legal and sublegal male king crabs, which in turn is utilized to establish a guideline harvest range for the ensuing commercial season.
2. Tag sublegal male king crabs to determine movement and growth per molt.
3. Evaluate reproductive success of both king and Tanner crabs as measured by incidence of egg bearing mature females and relative fecundity.

This year the survey data were also used to determine any adverse effects caused by oil contamination resulting from the March 24, 1989 Exxon Valdez oil spill. Possible effects on Tanner crabs as documented by earlier research include:

1. Increased mortality;

2. Reduced molting success;
3. Increased limb autotomy (Karinen and Rice, 1974); and
4. Increased egg loss (Karinen et Brodersen).

There is no documented evidence that oil contamination has the same adverse effect on king crab that it has on Tanners. There does not appear to be any unfavorable short term effect on juvenile king crabs when they feed on oil contaminated food (Gharrett et al., 1985). Similarly there does not appear to be any detrimental effect on juvenile red king crab in a portion of Auke Bay, Alaska where the major source of hydrocarbons is marine activity (Karinen, 1985).

METHODS

The State research vessel Pandalus was utilized to conduct the survey from June 7 through June 15, 1989. The Pandalus is 66 feet in overall length and carries 12 pots, although 24 pots were fished. The pots were 700 pound 7' x 7' commercial king crab pots. They were covered with 3 inch stretch mesh as one of the goals of the survey is to capture and retain small crabs. The two tunnel opening dimensions were 35" x 8". Pots were baited with two 2 quart jars three quarters filled with chopped herring. Thawing time for the bait was kept consistent. A 24 hour period was the initial soak time goal.

This year the pots were further modified in order to conduct a biodegradable twine study. Normally 120 untreated cotton twine is installed in the gear which is identical to the regulatory requirement for commercial pots. If the gear is lost, the twine will eventually degrade thereby allowing captured crabs and fish to escape. However, through experience with the commercial fisheries it has become apparent that 120 thread takes too long to

degrade thus causing significant mortality of trapped animals. This current experiment will test 30, 42 and 60 thread untreated cotton twine in order to determine whether one of these smaller sizes will degrade in less time than 120 thread. Results of this test will be incorporated into a regulatory proposal seeking to reduce the size of the biodegradable twine and reported at the spring 1990 Alaska Board of Fisheries Meeting.

Selection of survey stations was based on review of historical survey and commercial catch data as well as discussion with experienced fishermen and field staff. A slight alteration in the systematic station choice was necessitated by a desire to look for juvenile king and Tanner crab. The established 5 square nautical miles per station grid pattern was used. Depths less than 10 fathoms and any significant indication of gravel or hard bottom were the two other strata eliminated from station selection criteria. Six pots were fished per station. Pots were equally spaced over a 1.5 mile string. A Loran C and video plotter were used to record station and pot locations for future reference and replication.

The stations in the 100 fathom waters east of Cape Douglas were not fished. This area has produced significant amounts of Tanner crabs during previous commercial fisheries; however, the time allocated for the survey was invested in sampling likely areas for juvenile king and Tanner crab abundance along with the mature king crabs. A second survey is planned for July which will include the omitted stations.

Once each pot was pulled, the entire catch, crabs and fish, was dumped into totes (34"x18"x14"). King and Tanner crabs were separated by species only. All male crabs and all female king crabs were measured to the nearest millimeter of carapace length (king crabs) or width (Tanner crabs), and shell aged. Relative

fecundity of all king crab females was determined. Only the first 25 Tanner females handled were measured, aged and had egg assessments made. The remaining female Tanners were counted only.

Only pre-recruit one and those pre-recruit two male king crabs equal to or greater than 115 mm in carapace length were tagged using the spaghetti tag. The tag was sewn through the isthmus and the ends were secured with a metal sleeve. Sub-legal crabs were chosen for tagging as there is a greater probability that they will live longer than legal males, therefore yielding greater opportunity to collect growth and movement data.

No Tanner crab were tagged. Historically, male Tanners have often been soft shelled during the June survey thereby significantly reducing the probability of tag retention. Tanner crab males will be tagged during the July Kamishak Tanner index of abundance survey.

Black mat syndrome incidence, affecting Tanner crab and caused by the fungus Trichomarix invadens, was recorded.

All halibut (Hippoglossus stenolepis) were counted and returned immediately to the water. All Pacific cod (Gadus macrocephalus) were counted. Periodic sampling of cod stomachs was done to ascertain presence of shrimp or crabs. Other fish were identified to a common family name only and returned to the sea.

RESULTS

A total of 126 pots were lifted from 21 stations. No gear was lost. Fishing depths ranged from 14 to 70 fathoms with an average of 31 fathoms. The average soak was 1.0 days with a range of 0.8 to 2.0 days (Table 1).

Four hundred eighty seven legal male king crabs were captured. This yielded an index number of 3.9 legal males per pot (Table 2). Of the 487 legal males, 245 were recruits and 242 were post recruits (Figure 2).

There were no legal males caught in 3 of the 21 stations. The range for the remaining 18 stations was 0.2 to 17.0 with the high catch of 17.0 legals per pot coming from a station approximately 13 miles east of Augustine Island in a depth range of 31 to 36 fathoms (Figure 3). A station 10 miles east northeast of Augustine had the greatest catch of pre-recruit ones at 9.7 per pot (Figure 4).

A total of 330 sublegal males were caught. Pre-recruit ones and twos numbered 193 and 75, respectively, for an average catch per pot of 1.5 and 0.6. Pre-recruit threes totalled 58 for an average catch per pot of 0.5 (Table 3 and Figure 2). Four pre-recruit fours were also captured. A total of 63 pre-recruit one and two male king crab were tagged.

Four hundred thirty six female king crabs were taken. Matures and immatures numbered 373 and 63, respectively. All mature females were new shell. Two were barren while 70 had full clutches (Table 4). The average clutch was 67% full.

None of the male and 14 (3%) of the female king crabs were in a soft shell condition.

Legal male Tanner crab catch, including all classes of recruits and post-recruits, totalled 1,001 out of the 126 pot lifts yielding an average catch of 7.9 legals per pot (Table 5). True recruits averaged 4.8 per pot. Two of the 21 stations had no legal crabs. The highest average catch per pot of legal males was 18.3 taken from a station approximately 15 miles east southeast of Augustine

Island in a depth range of 58-65 fathoms (Figure 5). The average size of all the legal males sampled was 145.5 mm (5.7 inches) in carapace width.

True pre-recruit ones and twos averaged 8.5 and 2.3 per pot respectively. Pre-recruit threes and smaller averaged 0.2 per pot (Table 6). The highest catch per station of true pre-recruit ones was 44.5 taken from a station seven miles south of Augustine Island (Figure 6).

Female Tanner catch equalled 607. Of these, 593 were mature and 14 were immature. Seventy two percent of the mature females had full clutches. Primiparous females comprised eight percent of the mature female catch (Table 7).

No females and 837 (14%) of the males were in a soft shell condition. Of the true recruits, 399 (67%) of the 600 caught were soft.

Black mat was observed on 13 male and one female Tanner crab.

Incidental halibut and Pacific cod catches were 159 and 532 respectively.

The three different sizes of biodegradeable twine showed no deterioration.

DISCUSSION

It is encouraging that the total catch of legal male king crabs was the largest since 1981 (Table 2). However, close inspection of the age and size frequency distribution of the male crabs which make up the legal segment of the stock indicates that the recovery in

numbers may be attributed at least in part to a build up of post recruits and not as much to significant improvement in annual recruitment. Recruit and post recruit king crabs both comprise approximately 50 percent of the legal index number, 1.9 and 2.0, respectively (Table 3).

Nevertheless, disregarding the 1987 index, when long soaks resulted in high catches, which are virtually useless for comparative purposes, the index of both recruit and pre-recruit one males is the highest since 1982, the period of time during which the stock has been at a historical recorded low (Figure 7). This, coupled with the continued improved female fecundity (Table 4) indicates that the king crab stock condition is improving, albeit slowly.

A limited commercial harvest in 1990 may be reasonable in order to remove some of the post recruits that will soon be lost to natural mortality caused by senescence. Results of the 1990 pot and trawl surveys will play a major role in determining whether or not to have a fishery as well as provide data for the guideline harvest range.

The distribution of this stock, relative to time of year, between the Kodiak Management Area to the south of Cape Douglas and the Cook Inlet Management Area to the north of Cape Douglas needs to be reviewed prior to another commercial fishery. There are significant observations which indicates that this is the same stock such as: 1) tag recovery from the early 1960's (Powell and Reynolds, 1965); 2) comments by both fishermen and experienced staff biologists and 3) a meaningful reduction in both distribution and abundance of king crabs between the Department's current June and subsequent July surveys, which reinforces the theory that king crabs move south of Cape Douglas during this time period. If a fishery is to occur, fishing mortality must be very conservative

in order to allow continued utilization of the stock by fishermen in both management areas.

Finally, if historical survey data is to be used in harvest level determinations, it must be reviewed relative to soak times for the respective surveys. As stated earlier, long soaks severely reduce the utility of the data for comparative purposes. Review of survey reports indicate that in many instances long soaks were commonplace, however the data was all reported as unadjusted relative to soak, which was justifiable since no satisfactory analytical method to quantify catches from long soaks has been devised. This must be taken into consideration when comparing the earlier high survey catches of years ago with the current surveys. Lengthy soaks may have attributed to the large catches in the 1970's as much as the abundance of crabs (Table 2).

The number of legal male Tanner crabs caught is the second highest since 1980 (Table 5); however, continued documentation of the molt timing of the Kamishak Tanner crabs has indicated that the crabs in any given year are often molting in June, therefore not fully recruited to the gear. Sixty seven percent of the recruits were soft from this survey. This fact in itself limits the use of the June surveys for a relative index of abundance of Tanner crabs. The late July Kamishak survey, which will be conducted after the molt is complete, will give a truer relative indication of Tanner crab stock abundance.

Due to Department policy, no statements will be made regarding any observed adverse effects on the crabs caused by oil contamination. This does not mean that effects were or were not observed, simply that no statement can be made.

LITERATURE CITED

- Gharrett, J.A., S.D. Rice and M.S. Stekoll. 1985. Influence of oil contaminated diet on feeding rates, growth and molting success of juvenile red king crabs, Paralithodes camtschatica. Proc. Int. King Crab Symp. Anchorage, AK. p 371-375.
- Karinen, J.F. 1985. Occurrence of juvenile king crab, Paralithodes camtschatica (Tilesius), in Auke Bay, Alaska, on sediments with relatively high concentrations of aromatic hydrocarbons. Proc. Int. King Crab Symp. Anchorage, AK p 377-387.
- Karinen, J.F. and C.C. Brodersen. (No date). Effects of Oil Exposure on the Genus Chionoecetes. Unpublished U.S. Dept. of Commerce, NOAA, memo. Auke Bay.
- Karinen, J.F. and S.D. Rice. 1974. Effects of Prudhoe Bay crude oil on molting Tanner crabs, Chionoecetes bairdi. U.S. National Marine Fisheries Service., Mar. Fish. Rev. 36 (7): 31-37.
- Powell, G.C. and R.E. Reynolds. 1965. Movements of tagged king crabs Paralithodes camtschatica (Tilesius) in the Kodiak Island - Lower Cook Inlet Region of Alaska, 1954-1963. Alaska Dept. of Fish and Game. Informational leaflet 55. Juneau.

The Alaska Department of Fish and Game administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information please write to ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; U.S. Fish and Wildlife Service, 4040 N. Fairfax Drive, Suite 300 Webb, Arlington, VA 22203 or O.E.O., U.S. Department of the Interior, Washington DC 20240.

For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-6077, (TDD) 907-465-3646, or (FAX) 907-465-6078.

Table 1. Description of stations fished, during the June 1989 Kamishak District king crab index of abundance survey.

Station Number	Pots Fished	Depth Range (fms)	Soak (days)
3-54	6	37-49	1.0
3-55	6	16-17	0.9
4-52	6	25-30	0.8
4-53	6	20-25	0.9
4-54	6	22	0.8
5-56	6	23-25	0.8
5-57	6	18-19	0.9
5-58	6	14-15	2.0
6-55	6	29-31	1.0
6-56	6	25	0.9
6-57	6	21-22	1.8
6-58	6	20	1.0
7-54	6	58-65	0.9
7-55	6	36-46	0.8
7-56	6	31-36	1.0
7-57	6	25-26	1.9
7-58	6	21-22	0.9
8-54	6	68-70	1.0
8-55	6	38-48	0.9
8-56	6	39-41	1.0
9-58	6	34-40	1.0

Total stations = 21
 Total pots = 126
 Depth range = 14 - 70 fathoms (31 avg.)
 Soak range = 0.8 - 2.0 days (1.0 avg.)

Table 2. Total catch of king crab from Kamishak District index of abundance surveys, 1975-1989.

Year	Survey Dates	Pots Pulled	No. Females	Number Sublegal Males	Number Legal Males	Legal Males per Pot ^a	Average Commercial Harvest lbs.
1975	6/02-11	96	Not Available	1,529	2,593	27.0	1,832,484
1976	6/29-7/23	159	7,488	1,301	768	4.8	3,103,865
1977	7/08-23	199	8,164	4,326	698	3.5	1,099,279
1978	6/29-7/20	224	6,123	7,774	883	3.9	480,261
1979	7/08-27	261	920	7,553	1,109	4.2	489,365
1980	6/06-16	171	1,337	1,098	602	3.5	1,635,922
1981	6/23-7/07	173	357	1,191	1,202	7.2	1,371,821
1982	6/24-7/04	70	407	504	296	4.2	807,079
1983	6/15-25	192	315	250	150	0.8	188,027
1984	6/22-7/02	185	247	206	73	0.4	Closed
1985	6/17-27	182	565	100	314 ^b	1.7	Closed
1986	6/10-19	184	1,169 ^b	444	51	0.3	Closed
1987	6/16-25	108	172	1,374 ^b	429 ^b	4.0 ^b	Closed
1988	6/14-22	168	436	226	259	1.5	Closed
1989	6/07-15	126		330	487	3.9	Closed

^a Unstandardized soak times.

^b Relatively high catches were in a large part due to 2 to 4 day soaks on the gear which caught most of the crabs.

Table 3. Average catch per pot of male king crab by size class captured in the Kamishak District index of abundance surveys, 1975-1989.

		1975	1976	1977	1978
Size Class ^a	Total Males =	3,546	2,069	5,024	8,657
	Pots Pulled =	96	159	199	224
Fours		2.7	2.3	1.9	1.9
Threes		3.0	2.1	11.1	7.3
Twos		3.0	1.6	6.1	15.3
Ones		6.4	2.2	2.7	10.2
Recruits		3.7	1.5	1.4	2.0
Post-Recruits		18.2	3.3	2.1	1.9
		1979	1980	1981	1982
Size Class	Total Males =	8,662	1,700	2,393	800
	Pots Pulled =	261	171	173	70
Fours		2.3	0.2	0.1	0.1
Threes		5.5	0.7	1.9	0.5
Twos		8.1	1.9	1.6	3.1
Ones		13.0	3.6	3.3	3.5
Recruits		3.5	2.3	4.3	1.8
Post-Recruits		0.7	1.2	2.6	2.5

Continued

Table 3. Continued

		1983	1984	1985	1986
Size Class	Total Males =	400	279	414	500
	Pots Pulled =	192	185	182	184
Fours		0.01	0.8	0.3	0.7
Threes		0.1	0.1	0.1	1.0
Twos		0.2	0.03	0.03	0.6
Ones		1.0	0.2	0.1	0.2
Recruits		0.3	0.3	0.3	0.04
Post-Recruits		0.5	0.1	1.4	0.2
		1987 ^b	1988 ^b	1989 ^b	
Size Class	Total Males =	1,803	485	817	
	Pots Pulled =	108	168	126	
Fours		1.1	0.03	0.03	
Threes		3.8	0.2	0.5	
Twos		4.0	0.5	0.6	
Ones		3.8	0.7	1.5	
Recruits		1.7	1.0	1.9	
Post-Recruits		2.3	0.6	2.0	
^a	Fours -	(<90 mm, 4 or more years from legal)			
	Threes -	(91 - 108 mm, 3 years from legal)			
	Twos -	(109 - 126 mm, 2 years from legal)			
	Ones -	(127 - 144 mm, 1 year from legal)			
	Recruits -	(145 mm - 163 mm new shells, enter commercial fishery)			
	Post-Recruits -	(all old shell males \geq 145 mm plus new shell males \geq 164 mm)			

^b June survey.

Table 4. Relative fecundity by shall age for mature female king crab from the June 1989 Kamishak District index of abundance survey.

Percent Full ^a	Number of crabs Shell Age					
	New Shell No.	(%) ^b	Old Shell No.	Very Old Shell No.	Total No.	(%)
0	2	(1)	0	0	2	(1)
25	30	(8)	0	0	30	(8)
50	124	(33)	0	0	124	(33)
75	147	(39)	0	0	147	(39)
100	70	(19)	0	0	70	(19)
Total	373	(100)	0	0	373	(100)

^a Percent full = relative fecundity.

^b % = percent of the total number of females captured from all shell age classes.

Table 5. Total catch of Tanner crab from the Kamishak District index of abundance surveys, 1975 - 1989.

Year	Survey Dates	Pots Pulled	Number Females	Number Sublegal Males	Number Legal Males	Average Legal Males per Pot ^a	Commercial Harvest (lbs.) ^b
1975	6/02-11	96	Data		2,666	27.8	3,281,084
1976	6/29-7/23	159	Unavailable		1,537	7.7	1,765,926
1977	7/08-23	199	1,867	7,553	1,547	7.8	2,077,092
1978	6/29-7/20	224	1,672	13,926	3,309	14.8	2,713,339
1979	7/08-27	261	2,004	7,826	3,044	11.7	3,338,623
1980	6/06-16	171	711	6,187	1,470	8.6	1,757,331
1981	6/23-7/07	173	871	5,738	857	5.0	1,286,332
1982	6/24-7/04	70	37	1,098	238	3.4	1,693,794
1983	6/15-25	192	358	3,160	359	1.9	1,373,674
1984	6/22-7/02	185	196	2,429	771	4.2	1,535,547
1985	6/17-27	182	574	3,662	781	4.3	1,288,711
1986	6/10-19	184	1,226	6,709	1,290	7.0	1,111,300
1987	6/16-25	108	691	3,372	210	1.9	417,182
1988	6/14-22	168	664	5,419	766	4.6	Closed
1989	6/07-15	126	607	4,923	1,001	7.9	

^a Unstandardized soak times.

^b Subsequent season.

Table 6. Average catch per pot of male Tanner crab by size class and shell age captured in the June Kamishak District index of abundance surveys, 1979-1989.

Size Class ^a	Index Year							
	1979		1980		1981		1982	
	<u>Shell Age</u>		<u>Shell Age</u>		<u>Shell Age</u>		<u>Shell Age</u>	
	New ^b	O&VO ^c	New	O&VO	New	O&VO	New	O&VO
51 - 87	0.08	0.04	0.2	0.05	0.1	0.1	0.01	0.01
88 - 114	1.4	5.8	2.3	4.8	5.3	5.0	2.9	2.5
115 - 139	7.0	15.7	3.2	25.6	11.9	14.6	6.6	3.5
140 - 165	8.0	3.3	2.0	6.5	3.7	1.2	3.2	0.2
≥ 166	0.2	0.04	0.1	0.05	0.1	0.0	0.0	0.0
Pots Pulled	261		271		173		70	

Size Class	Index Year							
	1983		1984		1985		1986	
	<u>Shell Age</u>		<u>Shell Age</u>		<u>Shell Age</u>		<u>Shell Age</u>	
	New	O&VO	New	O&VO	New	O&VO	New	O&VO
51 - 87	0.1	0.02	0.0	0.03	0.03	0.02	1.6	0.1
88 - 114	2.5	2.7	0.9	2.6	1.3	3.6	5.5	5.9
115 - 139	5.5	5.7	4.2	5.4	4.8	10.2	10.4	12.9
140 - 165	1.5	0.3	3.7	0.4	3.0	1.2	5.8	1.1
≥ 166	0.02	0.0	0.1	0.0	0.05	0.0	0.1	0.0
Pots Pulled	192		185		182		184	

Continued

Table 6. Continued.

Size Class	Index Year					
	1987		1988		1989	
	<u>Shell Age</u> New	O&VO	<u>Shell Age</u> New	O&VO	<u>Shell Age</u> New	O&VO
51 - 87	0.7	0.0	0.03	0.0	0.15	
88 - 114	14.0	2.5	3.7	2.9	2.3	5.8
115 - 139	6.2	7.8	17.8	7.8	8.5	22.3
140 - 165	1.6	0.3	3.5	1.0	4.8	3.2
≥ 166	0.01	0.0	0.01	0.03	0.01	0.02
Pots Pulled	108		168		126	

^a Carapace width in millimeters
 Pre-recruits 3 = 51 - 87
 Pre-recruits 2 = 88 - 114
 Pre-recruits 1 = 115 - 139
 Recruits = 140 - 165
 Post-recruits ≥ 166

^b New carapace pink or light in color, minimal scratching and epifauna on exoskeleton, spines sharp.

^c O & VO - Old shell = carapace hard and brownish, scratches present, epifauna may be present, spines worn.

Very old shell = carapace hard, dark brown to blackish scratches present, epifauna present, spines very worn.

Table 7. Relative fecundity by shell age for mature female Tanner crab from the June 1989 Kamishak District index of abundance survey.

Percent Full ^a	Number of Crabs Shell Age							
	New Shell No.	(%) ^b	Old Shell No.	(%)	Very Old Shell No.	(%)	Total No.	(%)
0	0		0		48	(8)	48	(8)
25	0		2	(<1)	32	(5)	34	(6)
50	0		1	(<1)	20	(3)	21	(4)
75	1	(<1)	14	(2)	47	(8)	62	(10)
100	45	(8)	262	(44)	121	(20)	428	(72)
Total	46	(8)	279	(47)	268	(45)	593	(100)

^a Percent full = relative fecundity.

^b % = percent of the total number of females captured from all shell age classes.

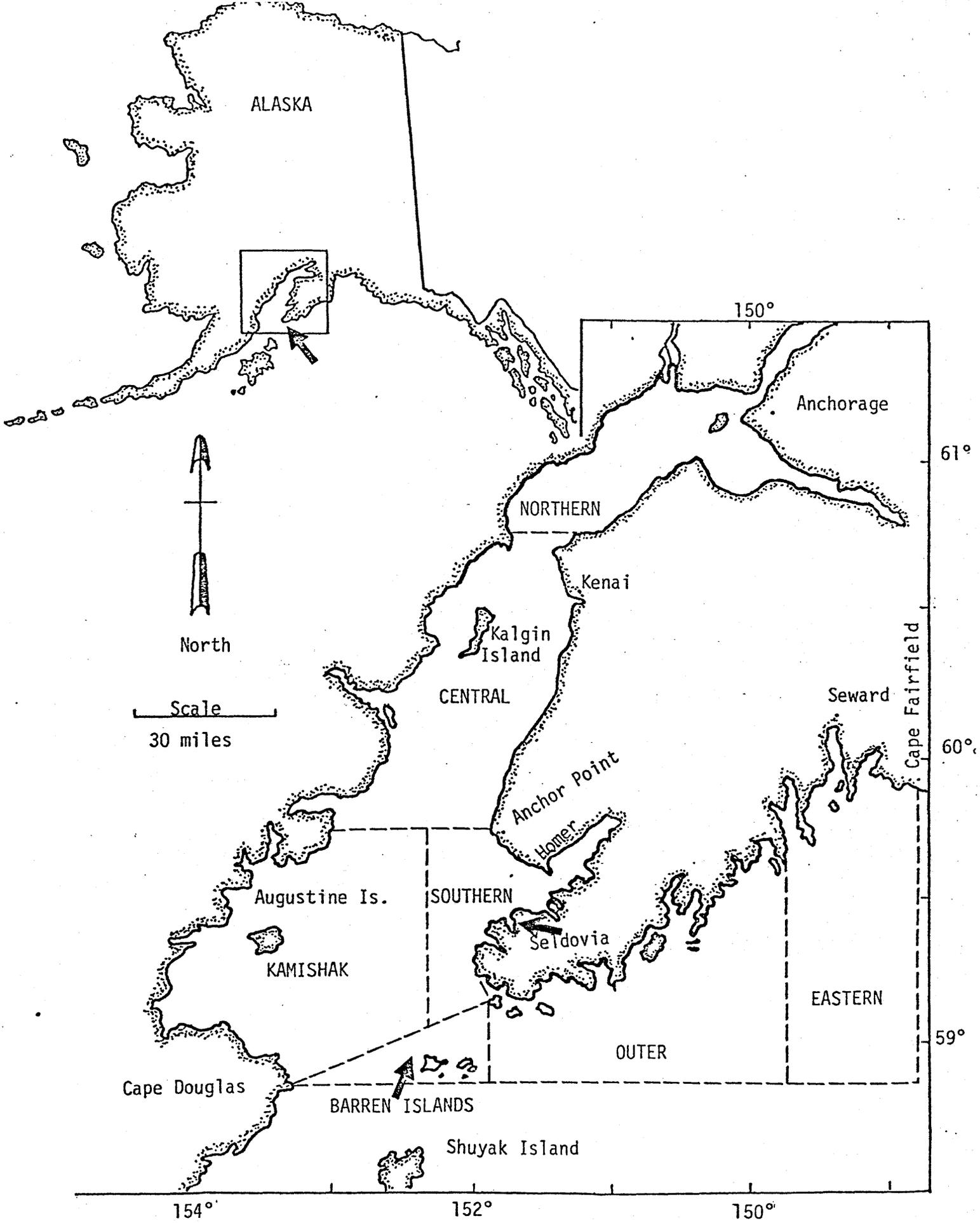
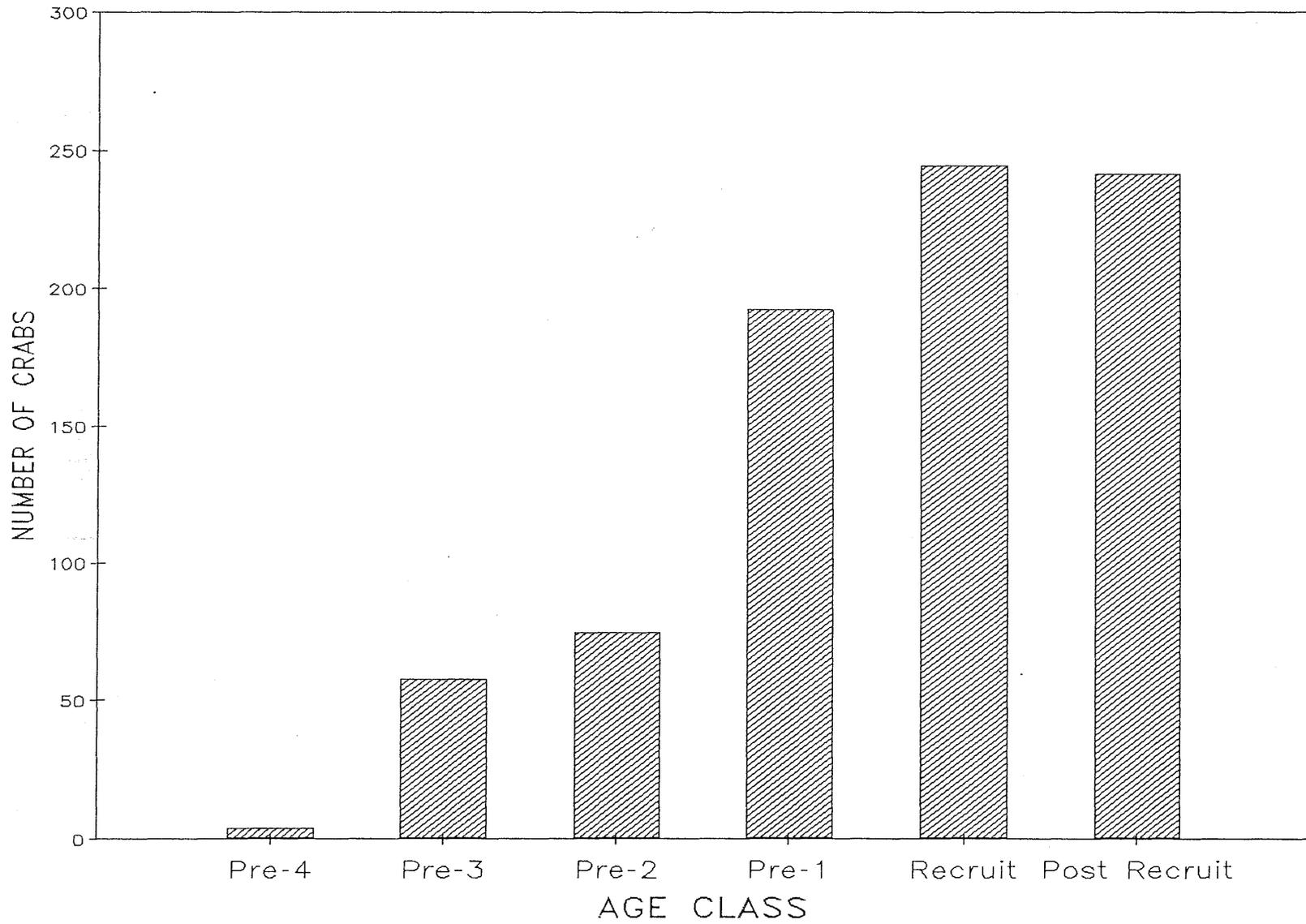


Figure 1 Cook Inlet area district location chart.

Figure 2. Male king crab catch distribution by age class, June, 1989 Kamishak District index of abundance.



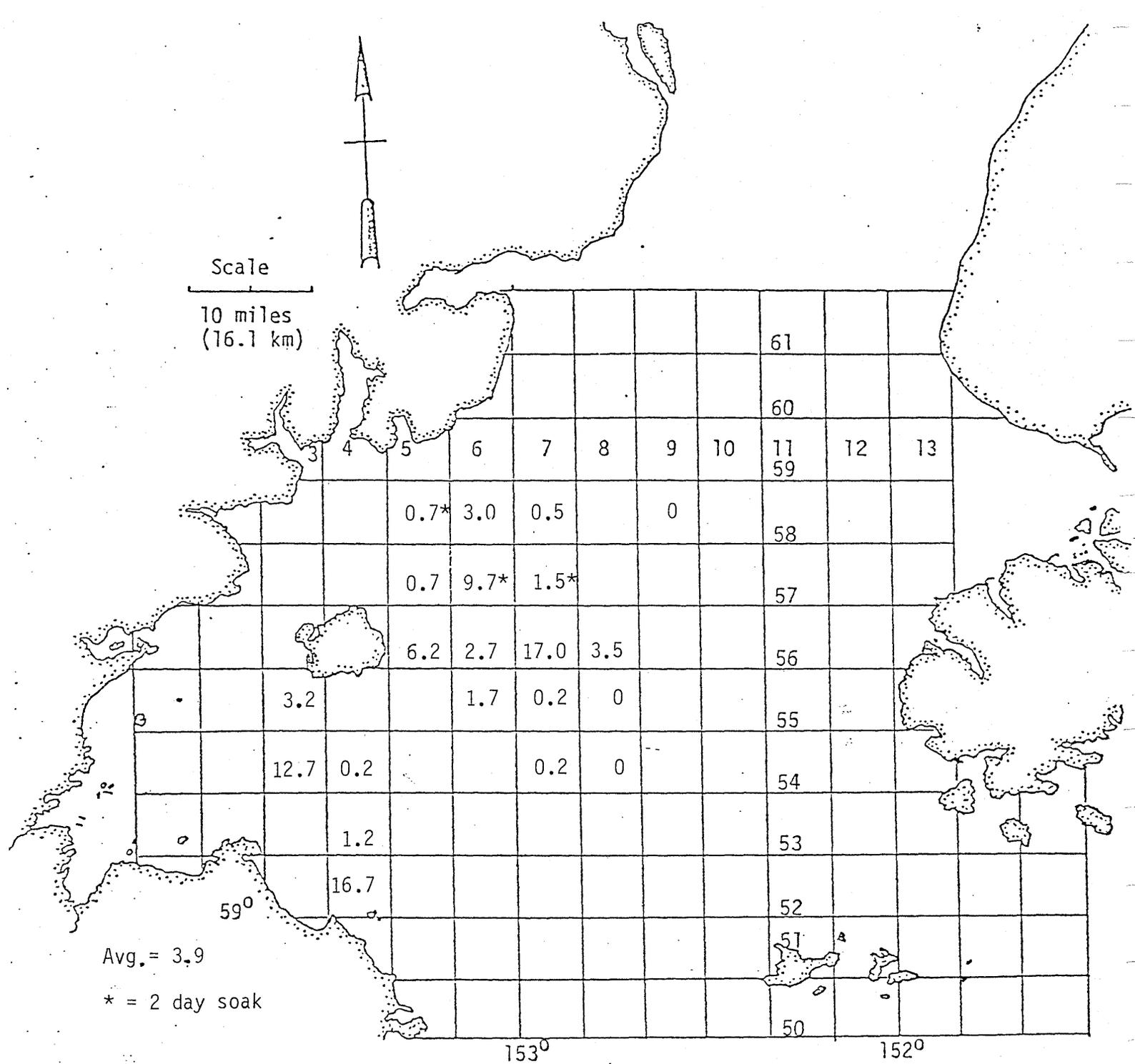


Figure 3. Average catch per pot by station of legal male king crab, Kamishak District index, June 7-15, 1989.

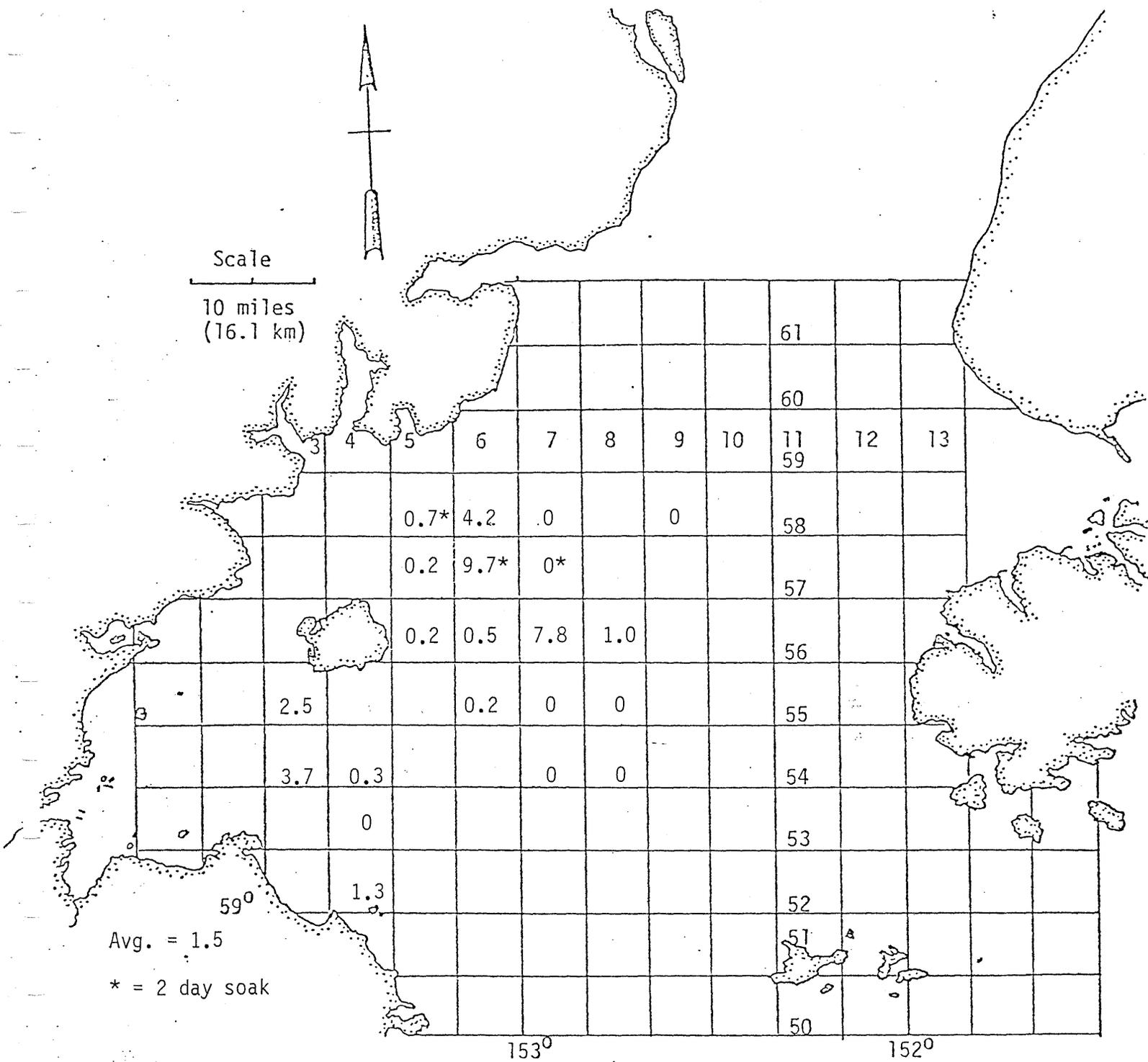


Figure 4. Average catch per pot by station of pre-recruit one king crab, Kamishak District index, June 7-15, 1989.

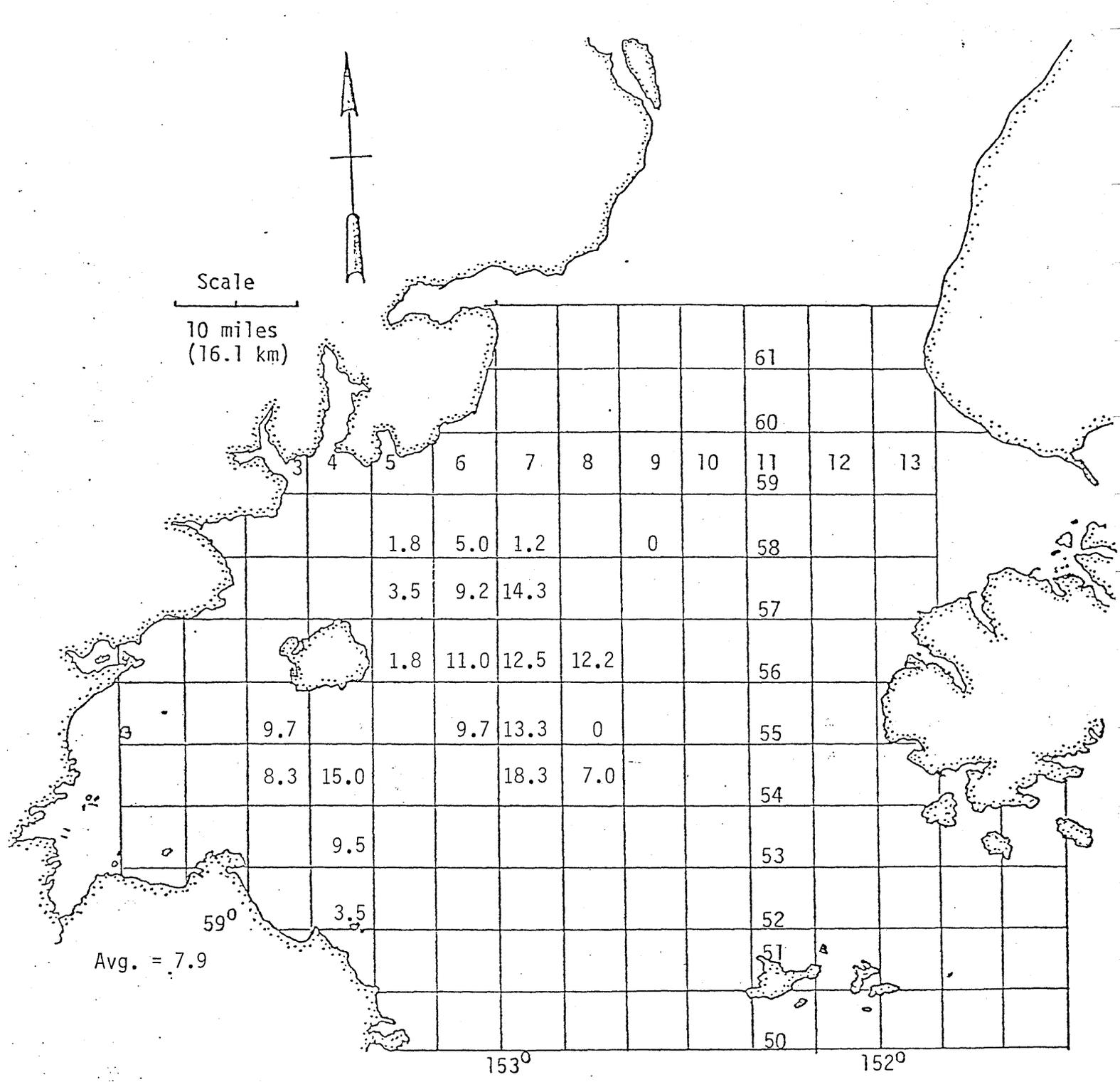


Figure 5. Average catch per pot by station of legal male Tanner crab, Kamishak District index, June 7-15, 1989.

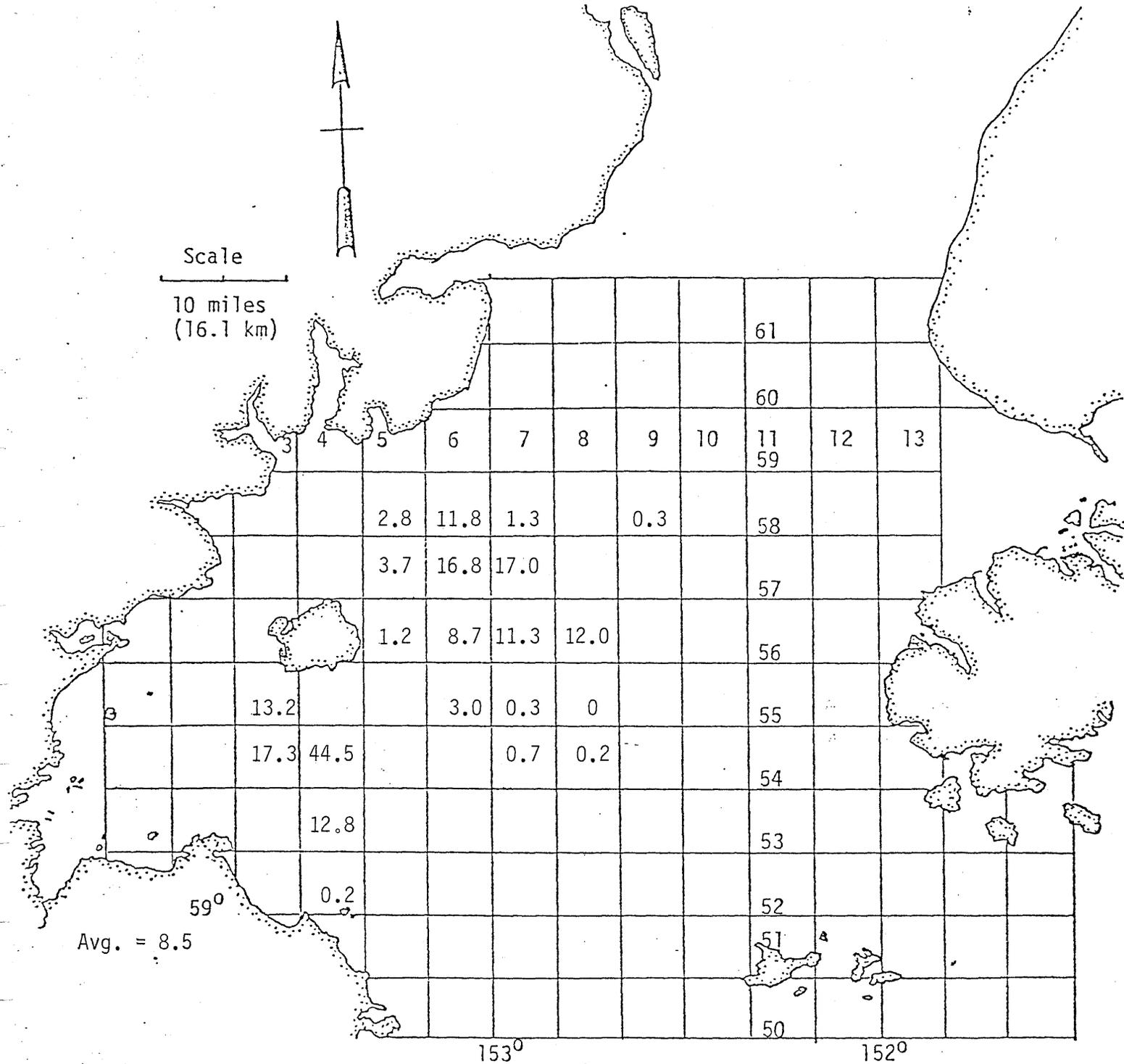


Figure 6. Average catch per pot by station of true pre-recruit one Tanner crab, Kamishak District index, June 7-15, 1989.

Figure 7. Average catch per pot of pre-recruit-1 and recruit male king crab, June Kamishak District index of abundance surveys, 1982-89.

