

Informational Leaflet 46

MEAT CONTENT OF KING CRABS
(Paralithodes camtschatica, Tilesius)
FROM KODIAK ISLAND, ALASKA

By:

Guy C. Powell

and

Richard B. Nickerson

Division of Biological Research
Kodiak, Alaska

January 10, 1965

STATE OF ALASKA
WILLIAM A. EGAN - GOVERNOR
DEPARTMENT OF
FISH AND GAME
WALTER KIRKNESS - COMMISSIONER
SUBPORT BUILDING, JUNEAU



MEAT CONTENT OF KING CRABS (*PARALITHODES CAMTSCHATICA*, Tilesius)
FROM KODIAK ISLAND, ALASKA

INTRODUCTION

The purpose of this investigation was twofold: first, to obtain indices of the monthly meat yield from male king crabs and by doing so, to compare months of high and low meat content, with the post-molt period of particular interest; and second, to compare the percentage of meat yielded during March from immature crabs, and adults of varying shell age.

Little advantage was realized by comparing the data collected during this study with those studies of Sakuda (1957) and Bright (1960) because objectives and techniques differed. Sakuda did not record the exoskeletal age of his specimens and Bright did not mention the time periods of his study, both of which are important in determining monthly meat yield. Sakuda's purpose was to simplify future meat content estimates by establishing a relationship of the weight of one body part to the total so that he could eliminate the necessity of extracting all body meat. He found that the merus may be used as a suitable standard for meat content estimates. Bright's purpose was similar to Sakuda's but he concluded that the propodus of the right third walking leg gives a better index to total meat content than the merus. Both biologists concluded that smaller crabs yielded a higher percent of meat than larger ones.

METHODS

Periodic Variation in Meat Content

At least once each month from October 16, 1961 to June 27, 1962 five crabs, ranging from 150 to 159 millimeters in carapace length, were selected for similarity of exoskeletal age in a manner that individuals were sampled as they progressed from post-molt "new-shells" to pre-molt "old-shells". Seriously injured crabs were excluded.

Before obtaining live weight, the water was allowed to drain from each crab for 22 minutes. Whole crabs were cooked at a local cannery for 15 minutes, then all meat from the three pairs of walking legs were extracted by hand, excluding only that meat within the coxopodite and basi-ischiopodite. Coagulated blood was not weighed, and chelae were excluded. During the first three months only the total weight of extracted meat was recorded; however, beginning January 1962, merus sections were weighed separately before obtaining total meat weight.

Comparison of Meat Content of Immatures and Matures in March

During the March 1960 study, all meat was extracted from the chelae; the walking legs, including the ischia and coxa; and the abdomens of six juveniles, 12 pre-molt "old-shells", and four aneuvivants. The procedures for cooking and extract-

ing meat were the same as stated above, except that the juvenile crabs were cooked only eight minutes. Four of the "old-shell" males were cooked March 18, 1960 and eight were cooked March 21. Each group was retained in sea water tanks for two days prior to weighing and cooking. Weight loss during this time was not determined, but considered negligible because of the short duration of confinement. Juvenile crabs 37 to 64 millimeters in carapace length were captured by skin divers on March 23, 1960 and cooking occurred the following day. Four anexuviant crabs were taken from a boat and cooked March 25, 1960. Only total meat yield was obtained for each crab.

DISCUSSION

Total Yield from Walking Legs - 1961

Meat yield was considerably greater from specimens captured prior to molting than for those captured afterwards. Greatest yields were found to occur during October, November, December, January, and February while low yields occurred during November, April, and June. Measurements for each specimen are listed in Table 1. November samples showing both high and low yields are difficult to explain, indicating the need for future studies with larger samples and improved laboratory conditions.

Variation among specimens from the same sample was considerable, further indicating that a sample size of five species is inadequate. Months which averaged high meat yield commonly had specimens with low meat content and vice versa. Table 2 lists for 53 crabs the average live weight, meat weight, carapace length, and variation for each sample period. The percent yield of merus meat to total leg meat remained relatively uniform from the pre-molt through the post-molt period (Table 3). The percent of merus weight in relation to total weight, and the weight of leg meat to total weight was considerably lower for new-shell crabs in April and showed a moderate increase during June (Table 4). Also shown is a loss in weight of two old-shell and one anexuviant crab during the breeding season.

Meat of Merus Sections - 1961

The weight of meat extracted from each merus of the 26 crabs captured from January 1962 through June 1962 is recorded in Table 5.

The low yield of total meat during April and June is also indicated by low merus weight during these months as well. April and June meri weighed generally from 167 to 259 grams and those during January and February ranged between 302 and 418. Average merus weight for each sample period is presented in Table 6. In practically all specimens the merus meat content of the middle walking legs was highest; yield from rear and front legs was lighter, respectively (Table 7).

Total Yield from All Body Portions - 1960

Meat recovery from the pereopods, body, and abdomens of the 12 old-shell crabs averaged 36.6 percent. Crabs which had prominent blue hemolymph, brittle shells,

Table 1. Record of the cooked weight of leg meat extracted from 53 king crabs captured from October through June, including carapace size, exoskeletal age, weight of crab, boat, and areas.

Specimen number	Capture date	Carapace length	Carapace width	Exoskeletal age in months	Crab live weight (grams)	Weight of leg meat (grams)	Capture boat	Bay	Remarks
1	10/16/61	157	184	6	2876	371	Copper	Chiniak	None
2	"	154	179	6	3014	405	Prince	"	None
3	"	158	184	6	3222	315	"	"	None
4	"	156	188	6	3260	534	"	"	None
5	"	158	189	6	3210	415	"	"	None
6	10/31/61	154	180	6	3128	421	Copper	Chiniak	None
7	"	156	179	6	3152	482	Prince	"	None
8	"	154	182	6	3041	442	"	"	None
9	"	154	179	6	2840	434	"	"	None
10	"	154	180	6	3000	422	"	"	None
11	11/16/61	154	185	7	2996	474	Georgie	Chiniak	The following 5 crabs were difficult to shuck, meat adhered to shell & a green fluid found inside of leg.
12	"	157	184	7	3100	528	"	"	
13	"	153	174	7	2911	499	"	"	
14	"	156	185	7	3069	474	"	"	
15	"	155	181	7	3049	577	"	"	
16	11/29/61	154	177	6	2763	243	Copper	Chiniak	The following 5 crabs were kept 2 days in a holding sack before cooking. Tendon pulled easily from meat.
17	"	158	180	7	3100	286	Prince	"	
18	"	152	172	6	2606	290	"	"	
19	"	156	182	7	2989	428	"	"	
20	"	151	172	7	2611	295	"	"	
21	12/12/61	156	183	7	3158	542	Copper	Chiniak	Tendons stick to meat
22	"	154	183	8	2598	348	Prince	"	" " " "
23	"	156	182	8	2966	414	"	"	Tendons remove easier
24	"	151	174	8	2986	467	"	"	than other 3.
25	"	155	177	8	3024	328	"	"	Tendon stick to meat

-Continued-

Table 1. Record of the cooked weight of leg meat extracted from 53 king crabs captured from October through June, including carapace size, exoskeletal age, weight of crab, boat, and area (continued).

Specimen number	Capture date	Carapace length	Carapace width	Exoskeletal age in months	Crab live weight (grams)	Weight of leg meat (grams)	Capture boat	Bay	Remarks
26	1/9/62	153	175	9	3100	534	Banshee	Chiniak	None
27	"	157	181	9	3036	502	"	"	Regeneration, advance stage
28	"	156	177	8	2830	290	"	"	Not much meat in shell
29	"	154	180	9	3178	513	"	"	None
30	"	152	174	9	3000	516	"	"	None
31	2/13/62	154	181	10	2952	440	Copper	Chiniak	In live sack 2 days
32	"	155	177	10	3121	456	Prince	"	" " " " "
33	"	151	185	10	3140	422	"	"	" " " " "
34	"	154	177	10	2888	428	"	"	" " " " "
35	"	151	182	10	3000	379	"	"	" " " " "
36	2/26/62	156	178	10	2986	506	Swallow	Monashka	None
37	"	155	178	10	2984	529	"	"	None
38	"	155	180	10	3000	562	"	"	None
39	"	156	187	10	3376	640	"	"	None
40	"	151	174	9	2754	440	Stork	"	None
41	4/5/62	157	185	1	3099	284	Georgie	Chiniak	None
42	"	153	177	1	2770	266	"	"	None
43	"	162	190	1	3300	304	"	"	None
44	"	146	170	1	2546	242	"	"	None
45	"	157	184	1	2604	253	"	"	None
46	4/9/62	148	173	11	2538	354	Georgie	Chiniak	None
47	"	148	174	12	2667	235	"	"	None
48	"	152	174	11	2916	495	"	"	Meat looked poor, regeneration advance stage
49	6/27/62	154	180	2	2662	340	Robbie	Chiniak	None
50	"	151	173	2	2522	332	"	"	None
51	"	157	185	2	2564	342	"	"	None
52	"	155	182	2	3008	389	"	"	None
53	"	155	177	14	2824	366	"	"	None

Table 2. Comparison between the average weight of meat extracted from the legs of 53 male king crabs for various time periods including range of variation.

Capture date	Number of crabs in sample	Average			Variation within sample					
		Live weight (grams)	Carapace length (mm)	Meat weight (grams)	Live weight (grams)		Carapace length (mm)		Weight of meat (grams)	
					low	high	low	high	low	high
Oct. 16, 1961	5	3124.4	156.6	403.0	2876	3260	154	158	315	534
Oct. 31, 1961	5	3032.0	154.4	440.2	2840	3152	154	156	421	482
Nov. 16, 1961	5	3025.0	155.0	510.2	2911	3100	153	157	474	577
Nov. 29, 1961	5	2813.8	154.2	308.4	2611	3100	151	158	243	428
Dec. 12, 1961	5	2946.4	154.4	419.8	2598	3158	151	156	328	542
Jan. 9, 1962 ¹	5	3028.8	154.4	471.0	2830	3178	152	157	290	534
Feb. 13, 1962	5	3020.2	153.0	425.0	2888	3140	151	155	379	456
Feb. 26, 1962	5	3020.0	154.6	535.4	2754	3376	151	156	440	640
Apr. 5, 1962	5	2863.8	155.0	269.8	2546	3300	146	162	242	304
Apr. 9, 1962 ¹	3	2707.0	149.3	361.3	2538	2916	148	152	235	495
June 27, 1962	5	2716.0	154.4	353.8	2552	3008	151	157	332	389

¹ One crab with an advance stage regenerating leg is included.

Table 3. Percent of merus-meat weight to total leg meat weight.

Date	Merus Section						Total
	Right middle	Left middle	Right rear	Left rear	Right front	Left front	
Jan. 9, 1962 ¹	12.7	7.6	11.7	10.7	9.6	10.0	62.4
	12.5	10.9	10.7	11.1	10.1	9.5	64.9
	12.4	11.6	10.5	10.8	9.3	9.7	64.3
Feb. 13, 1962	14.5	10.4	12.3	10.2	11.4	9.5	68.4
	13.8	11.8	13.2	11.8	10.5	7.7	68.8
	13.5	13.5	12.8	12.6	9.5	11.8	73.7
	14.5	12.1	11.9	9.8	10.7	11.4	70.5
	12.7	13.2	12.1	10.3	10.6	10.8	69.6
Feb. 26, 1962	12.2	12.4	11.3	10.5	10.3	10.3	67.0
	12.0	12.9	12.9	12.7	10.9	10.7	72.3
	12.8	11.9	11.0	13.8	10.8	10.4	70.7
	10.3	13.0	12.3	11.4	10.3	10.7	68.0
	12.5	8.9	13.0	10.5	10.5	10.0	65.3
Apr. 5, 1962	13.0	12.7	11.6	11.3	10.6	10.2	69.4
	12.8	14.3	12.0	12.4	11.6	11.6	74.8
	10.2	13.1	11.2	12.2	11.2	11.5	69.4
	13.2	11.6	11.6	12.0	11.6	10.7	70.6
	13.4	11.8	11.4	11.4	9.5	10.3	67.9
Apr. 9, 1962	11.6	12.7	12.4	10.7	11.3	11.3	69.9
	14.4	13.2	12.3	10.6	10.2	10.2	71.0
	13.5	13.7	10.7	11.7	10.9	5.7 ²	66.1
June 27, 1962	12.3	11.8	11.8	11.2	8.8	8.8	64.7
	12.3	11.7	11.1	11.7	9.9	9.9	66.8
	12.3	12.0	11.1	10.2	9.9	9.9	65.4
	12.8	11.6	9.8	11.6	8.7	9.0	63.5
	<u>12.0</u>	<u>13.1</u>	<u>11.7</u>	<u>11.5</u>	<u>12.0</u>	<u>10.4</u>	<u>70.7</u>
Average	12.7	12.1	11.7	11.3	10.4	10.1	68.3

¹ Two specimens were omitted because they became out of order.

² One crab with an advance stage regeneration leg is included.

Table 4. Various comparisons of meat yield among 26 similar sized crabs (150-159 millimeters carapace length) from January through June 1962.

Date	Sequence	Weight of meat in the right middle merus in relation to		Total leg meat weight to total live weight (per cent)
		Total live weight (per cent)	Total leg meat weight (per cent)	
January 9, 1962 ¹ Shell age 8 to 9 mo.	1	1.3	12.8	10.2
	2	2.0	12.5	16.1
	3	2.1	12.4	17.2
February 13, 1962 Shell age 10 mo.	4	2.2	14.5	14.9
	5	2.0	13.8	14.6
	6	1.8	13.5	13.4
	7	2.1	14.5	14.8
	8	1.6	12.7	12.6
February 26, 1962 Shell age 9 to 10 mo.	9	2.1	12.2	16.9
	10	1.9	12.0	16.0
	11	2.3	12.8	17.7
	12	1.9	10.3	18.7
	13	2.4	12.5	18.9
April 5, 1962 Shell age 1 month	14	1.2	13.0	9.2
	15	1.2	12.8	9.6
	16	0.9	10.2	9.2
	17	1.3	13.2	9.5
	18	1.3	13.4	9.7
April 9, 1962 ² Shell age 11 to 12 mo.	19	1.6	11.6	13.9
	20	1.3	14.5	8.8
	21	2.3	13.5	17.0
June 27, 1962 Shell age 2 mo. Shell age 14 mo.	22	1.6	12.3	12.8
	23	1.6	12.3	13.2
	24	1.6	12.3	13.3
	25	1.7	12.8	12.9
	26	1.6	12.0	13.0

¹ Two specimens were omitted because they became out of order.

² One crab with an advance stage regenerating leg is included.

Table 5. Weight of cooked meat from each merus of 26 male king crabs collected at six different periods.

Date	Specimen number	Merus meat weight (grams) of each walking leg						Total weight of merus meat	Total weight of leg meat
		Right Middle	Left Middle	Right Rear	Left Rear	Right front	Left front		
January 9, 1962 ¹	1	37	22	34	31	28	29	181	290
	2	64	56	55	57	52	49	333	513
	3	64	60	54	56	48	50	332	516
February 13, 1962	4	64	46	54	45	50	42	301	440
	5	63	54	60	54	48	35	314	456
	6	57	57	54	53	40	50	311	422
	7	62	52	51	42	46	49	302	428
	8	48	50	46	39	40	41	264	379
February 26, 1962	9	62	63	57	53	52	52	339	506
	10	53	57	57	56	48	47	318	440
	11	68	63	58	73	57	55	374	529
	12	58	73	69	64	58	60	382	562
	13	80	57	83	67	67	64	418	640
April 5, 1962	14	37	36	33	32	30	29	197	284
	15	34	38	32	33	31	31	199	266
	16	31	40	34	37	34	35	211	304
	17	32	28	28	29	28	26	171	242
	18	34	30	29	29	24	26	172	253
April 9, 1962	19	41	45	44	38	40	40	248	354
	20	34	31	29	25	24	24	167	235
	21	67	68	53	58	54	28 ²	328	495
June 27, 1962	22	42	40	40	38	30	30	220	340
	23	41	39	37	39	33	33	222	332
	24	42	41	38	35	34	34	224	342
	25	50	45	38	45	34	35	247	389
	26	44	48	43	42	44	38	259	366

¹ Two specimens are omitted because the meri became out of order.

² One crab with an advance stage regenerating leg is included.

Table 6. Average weight of meat from the meri of the legs of 28 male king crabs for six sampling periods.

Date of capture	Number of specimens	Average weight of meat in legs (grams)						Total weight of all meri	Average weight of all meri
		Right middle	Left middle	Right rear	Left rear	Right front	Left front		
Jan. 9, 1962	5	52	49	52	54	47 ¹	51	1536	51
Feb. 13, 1962	5	59	52	53	47	45	43	1492	50
Feb. 26, 1962	5	64	63	65	63	56	56	1831	61
Apr. 5, 1962	5	34	34	31	32	32	29	950	32
Apr. 9, 1962	3	47	48	42	40	39	32 ¹	743	44
June 27, 1962	5	44	43	39	40	35	34	1172	39

¹ One crab with an advance stage regenerating leg is included.

Table 7. Comparison between the weight of cooked meat from meri of middle, rear, and front legs of 26 male king crabs collected at six different periods.

Date	Specimen number	Meri meat weight (grams)		
		Middle legs	Rear legs	Front legs
January 9, 1962 ¹	1	59	65	57
	2	120	112	101
	3	124	110	98
February 13, 1962	4	110	99	92
	5	117	114	83
	6	114	107	90
	7	114	93	95
	8	98	85	81
February 26, 1962	9	125	110	104
	10	110	113	95
	11	131	131	112
	12	131	133	118
	13	137	150	131
April 5, 1962	14	73	65	59
	15	72	65	62
	16	71	71	69
	17	60	57	54
	18	64	58	50
April 9, 1962	19	86	82	80
	20	65	54	48
	21	135	111	71 ²
June 27, 1962	22	82	78	60
	23	80	76	66
	24	83	73	68
	25	95	83	69
	26	92	85	82

¹ Two specimens are omitted because the meri became out of order.

² One crab with an advance stage regenerating leg is included.

and whose meat was easily removed were believed to be those preparing for ecdysis. Yield from both aneuviant shell-age classes was similar and averaged 32.9 percent. Recovery from juveniles averaged 25.5 percent. Individual size, weight, shell age, and percent recovery for all crabs is presented in Table 8.

SUMMARY

1. To study periodic variation in meat content, five to ten crabs of similar length (150-159 mm) were selected each month from October 16, 1961 to June 27, 1962, omitting only March and May. The total cooked meat of the three pairs of walking legs was extracted, excluding only the meat from the coxopodites and basi-ischiopodites.
2. The merus meat of the right middle walking leg was a satisfactory index of total leg meat weight because of the high meat content and relative uniformity throughout the molt cycle.
3. In another investigation, conducted during March, 1960, the total cooked meat of the chelae, walking legs, body and abdomen was removed from six juvenile king crabs, and 16 adults of varying shell ages.
4. The percent of meat yield from juvenile crabs was less than that for adults. Aneuviant crabs yielded a lower percent of meat than crabs with 11 month old shells.
5. Total commercial yield can be increased by harvesting crabs during seasons when meat content is high.
6. Methods for determining meat yield should be standardized.

LITERATURE CITED

- Bright, Donald B., Floyd E. Durham, and Jens W. Knudsen. 1960. King crab investigations of Cook Inlet, Alaska. Department of Biology. Allan Hancock Foundation. Univ. of Southern California, Los Angeles 7, Calif.
- Sakuda, Henry M. 1957. Meat content of Pavlof Bay king crabs. Commercial Fisheries Review, November 1957, 19(11) p. 4-5.

Table 8. Comparison of total meat yield by size and shell age for 22 king crabs during March, 1960.

Date	Sequence No.	Length mm.	Width mm.	Live Wgt. Lbs.	Meat Wgt. Lbs.	Recovery Per cent ¹	Shell age Months	Sex
March 24, 1960	1	37	38	0.08	0.03	37.5	3	Female
	2	42	43	0.11	0.03	27.3	3	Male
	3	59	66	0.33	0.08	24.2	3	Male
	4	61	64	0.34	0.07	20.6	5	Male
	5	63	68	0.36	0.07	19.4	5	Female
	6	64	71	0.43	0.09	20.9	5	Male
March 18, 1960	7	166	196	8.20	3.17	38.7	11	Male
	8	167	205	7.99	2.93	36.7	11	Male
March 21, 1960	9	170	206	9.27	3.67	39.6	11	Male
March 18, 1960	10	171	204	7.49	2.52	33.6	11	Male
	11	172	206	9.75	3.75	38.5	11	Male
March 21, 1960	12	175	209	8.85	3.48	39.3	11	Male
	13	181	216	10.77	3.90	36.2	11	Male
	14	181	216	11.19	4.08	36.5	11	Male
	15	182	217	10.69	3.70	34.6	11	Male
	16	184	218	12.28	4.17	34.0	11	Male
	17	185	224	11.93	4.16	34.9	11	Male
	18	191	228	12.56	4.52	36.0	11	Male
March 25, 1960	19	179	223	11.62	3.68	31.7	35	Male
	20	191	234	14.16	4.80	33.9	35	Male
	21	202	248	15.75	5.32	33.8	23	Male
	22	210	248	14.86	4.82	32.4	23	Male

¹ Percent was computed from grams before conversion to pounds.

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.