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Re-analysis of Tanner Crab TACs for the  
Eastern Bering Sea Stocks

An analysis of total allowable catch (TAC) for Tanner crab stocks in the eastern Bering Sea was presented in the Preliminary Fishery Management Plan for King and Tanner Crabs of the Eastern Bering Sea, August 1976. This analysis was concerned with Tanner crab stocks as far north as 58°N latitude since data on distribution and abundance of crabs was not available farther north. With this limitation, TAC estimates for mature male C. bairdi and C. opilio were calculated by multiplying abundance estimates for these stock components by an exploitation rate of 0.15, which was chosen as a reasonable value based on the historic reaction of the eastern Bering Sea red king crab stock to exploitation. Estimates of TAC for mature male C. bairdi and C. opilio of <sup>108</sup>95 million (5½") and <sup>333</sup>128 million pounds respectively, were given in the Preliminary Management Plan.

In response to a request for further analyses of data on Tanner crab stocks in the eastern Bering Sea, the following items are addressed in this report:

1. Review of the distribution of U. S. and foreign fishing patterns to evaluate whether a line can be established which would minimize the the impact of Japanese Tanner crab fisheries on U. S. crab operations in the eastern Bering Sea.
2. Examination of the distribution of the two major species of Tanner crabs in the eastern Bering Sea to see if the populations can be geographically separated.

3. Determination of whether or not area quotas for the two species can be established.

4. Presentation of figures on TACs by 5 mm carapace width size groups.

Since the preparation of the Preliminary Management Plan, new data on the distribution and abundance of Tanner crabs in the eastern Bering Sea has become available. The analysis of Outer Continental Shelf (OCS)-related NMFS survey data for 1975 has provided information on the Tanner crab stocks to 62°N latitude. This information is used in this report to re-assess TAC estimates for C. opilio. Additionally, an estimate of the 1976 abundance of C. bairdi is now available from the NMFS Oregon survey and has been used to re-assess the TAC for this species.

Regarding the first item, Figure 1 shows the current distribution of catches for the Japanese and U. S. Tanner crab fisheries in relation to the distribution of the stocks to 62°N latitude. Blackened areas represent grounds fished during the March-October period in 1975 and 1976 by the Japanese under the U. S.-Japan bilateral agreement of 1974. Areas enclosed in the dashed lines represent grounds fished by the U. S. fleet during the 1975 and 1976 seasons (January-July). Cross-hatched portions within the dashed-line bounds represent high-catch areas for the U. S. fleet. From the figure it is apparent that the two fisheries operate in overlapping and adjacent areas in which both species of Tanner crabs occur. The notable exception is the extensive region to the northwest, where 21% of the Japanese Tanner crab quota is taken. One other small area fished by the Japanese fleet is outside the current areas fished by the

U. S. , and is located in the southeastern corner of Area "B" of the 1974 bilateral agreement (about 168°W, 56°N). Thus, a straight-forward line to reduce the impact of the mothership fleet on the U. S. fishery does not appear feasible without a northward displacement of the Japanese fishery.

Regarding items two and three, Figure 2 is presented to show the distribution of Tanner crabs by species and one-degree sections of latitude. From this it can be seen that almost all the stock of large male C. bairdi (> 129 mm carapace width) occurs below 58°N latitude and that the stock of large male C. opilio (> 109 mm carapace width) is divided equally by a line at this same degree of latitude. Thus, a line projected from the outer edge of the continental slope eastward into Bristol Bay at 58°N latitude would effectively isolate half the stock of C. opilio from the stock of C. bairdi, assuming that there is little migration of crabs across the line.

Estimates of TAC for C. bairdi and C. opilio are given in Tables 1 and 2. Virtually all large male C. bairdi occur south of 58°N latitude and it is estimated that only about 5% of the small mature male C. bairdi stock are found north of this latitude. Thus, no adjustment in the TAC is needed because of increased survey coverage of the stock. However, 1976 data on abundance is available and is used to estimate a more current TAC than that given in the Preliminary Management Plan. The new estimate, given in Table 1, is 69 million pounds.

The TAC for C. opilio has been re-assessed based on the expanded OCS data<sup>a</sup> and is estimated in Table 2 to be 333 million pounds for the mature male

stock of C. opilio occurring in the OCS survey region northward to 62°N latitude. The relative distribution of male C. opilio smaller than 110 mm carapace width is similar to that shown for large males in Figure 2. Thus, an estimate of the TAC for mature male C. opilio north of 58°N latitude can be obtained by multiplying the value given above for the entire stock of mature males by 0.5, i.e., 167 million pounds (Table 2).

Regarding Item 4, TACs for C. bairdi and C. opilio are presented by 5 mm carapace width groups, and for the mature male populations by 5 mm decrements, in Tables 1 and 2.

Table 1.--Total allowable catch for mature male *C. bairdi* Tanner crabs in the eastern Bering Sea, calculated from 1970 data from the NMFS RV Oregon survey.

Width group (mm)	Midpoint (mm)	Population estimate (millions of crabs)	Average individual weight (lbs.)	Population estimate (millions of pounds)	TAC* (millions of pounds)	Percent of total	TAC accumulated (for crabs > width group)	Percent of total
100-104	102	14	0.70	10	2	3	69	1
105-109	107	13	0.81	11	2	3	67	1
110-114	112	14	0.93	13	2	3	65	1
115-119	117	15	1.06	16	2	3	63	1
120-124	122	18	1.21	22	3	4	61	1
125-129	127	22	1.37	30	5	7	58	1
130-134	132	23	1.55	36	5	7	53	1
135-139	137	26	1.74	45	7	10	48	1
140-144	142	21	1.94	41	6	9	41	1
145-149	147	24	2.16	52	8	12	35	1
150-154	152	21	2.40	50	8	12	27	1
155-159	157	18	2.65	48	7	10	19	1
160-164	162	13	2.92	38	6	9	12	1
165-169	167	9	3.21	29	4	6	6	1
170-174	172	2	3.51	7	1	1	2	1
175-179	177	1	3.84	4	1	1	1	1
180-184	182	0						
<b>Total</b>		<b>254</b>		<b>452</b>		<b>69</b>		

\* Population estimate (million of pounds) X 0.15

Table 2.--Total allowable catch for mature male C. opilio Tanner crabs in the eastern Bering Sea, calculated from data from the 1975 OCS survey.

Width group (mm)	Midpoint (mm)	Population estimate (millions of crabs)	Average individual weight (lbs.)	Population estimate (millions of pounds)	TAC* (millions of pounds)	Percent of total	Accumulated TAC (for crabs > width group) (millions of pounds)	Percent of total	TAC X .5* (millions pounds)
75-79	77	260	0.40	104	16	5	333	100	8.0
80-84	82	215	0.49	105	16	5	317	95	8.0
85-89	87	202	0.59	119	18	5	301	90	9.0
90-94	92	202	0.70	141	21	6	283	85	10.5
95-99	97	195	0.83	162	24	7	262	79	12.0
100-104	102	253	0.97	245	37	11	238	71	18.5
105-109	107	234	1.12	262	39	12	201	60	19.5
110-114	112	236	1.30	307	46	14	162	49	23.0
115-119	117	190	1.49	283	42	13	116	35	21.0
120-124	122	147	1.69	248	37	11	74	22	18.5
125-129	127	77	1.92	148	22	7	37	11	11.0
130-134	132	29	2.17	63	9	3	15	5	4.5
135-139	137	8	2.44	20	3	1	6	2	1.5
140-144	142	2	2.73	5	1	0	3	1	0.5
145-149	147	1	3.04	3	1	0	2	1	0.5
150-154	152	1	3.37	3	1	0	1	0	0.5
155-159	157	0							
Total		2,252		2,218	333				167

\* Population estimate (millions of pounds) X 0.15

\*\* Represents TAC for portion of stock north of 58°N latitude

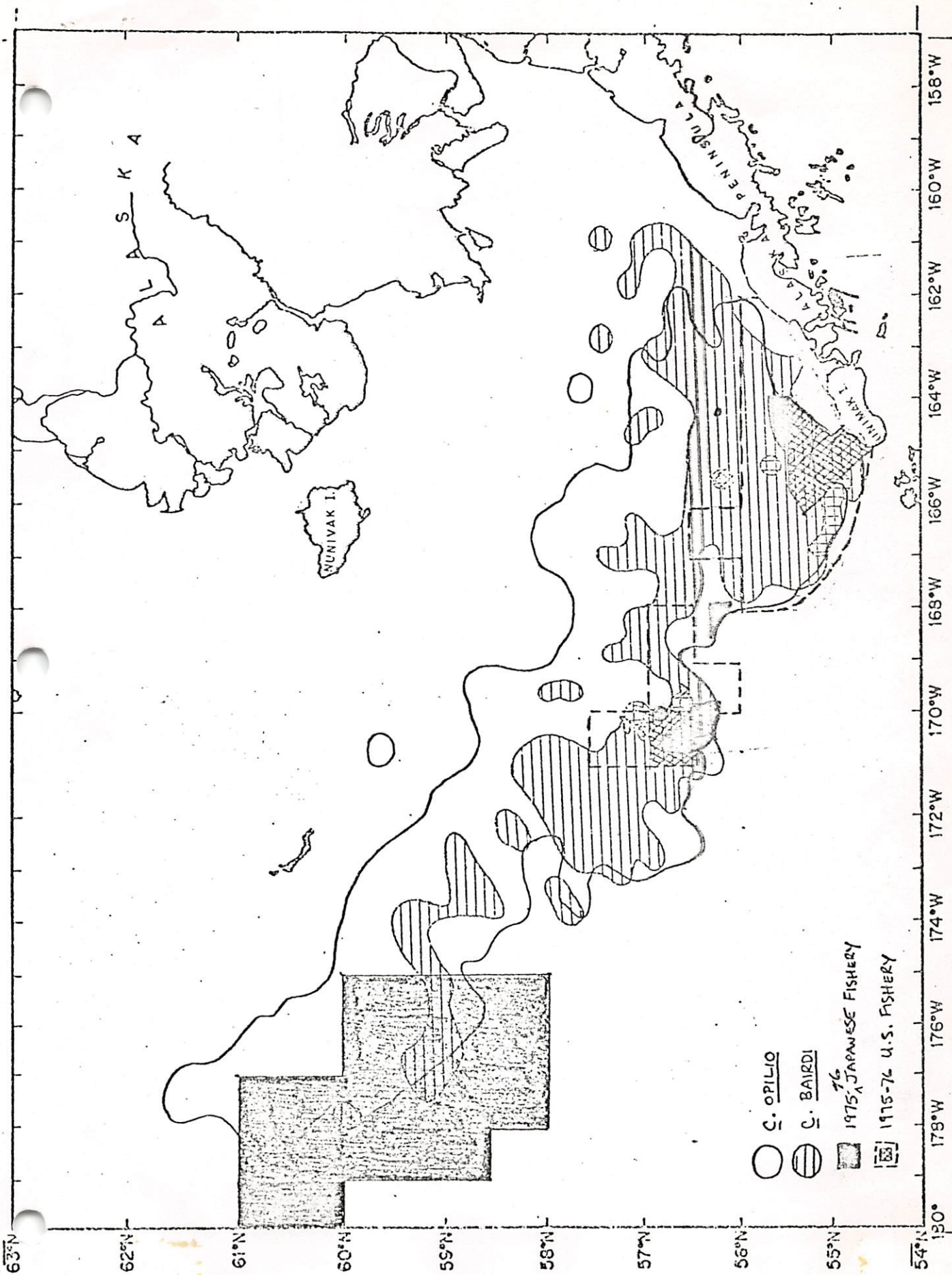


Fig 1

Fig. 2

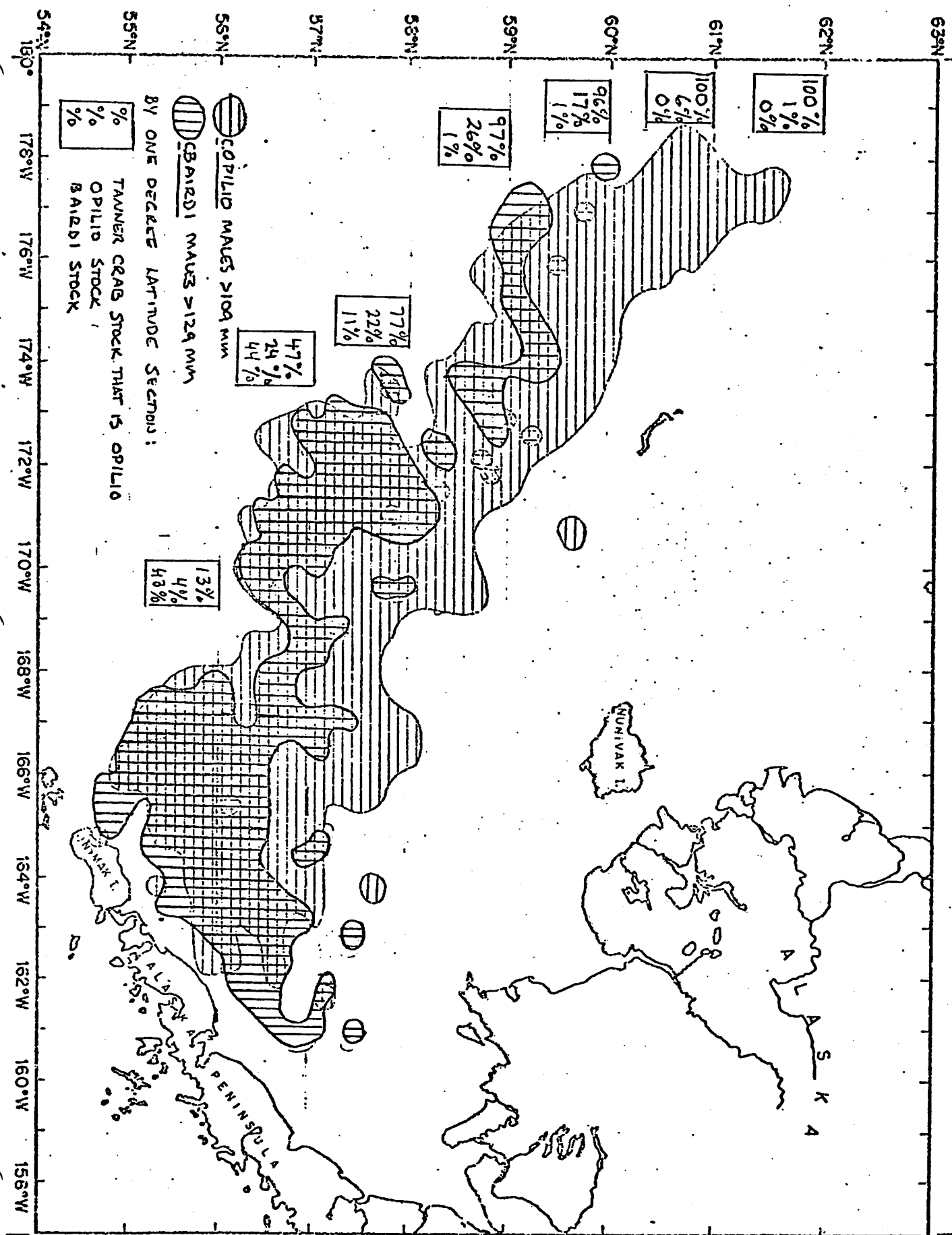




Figure 1.--General distribution of large male Tanner crab stocks and Tanner crab fishing fleets in the eastern Bering Sea.

Figure 2.--Composition of Tanner crab stocks by species and sections of one-degree latitude in the eastern Bering Sea.