Northwest Atlantic Fisheries Organization

SCIENTIFIC COUNCIL MEETING - SEPTEMBER 1997

Northern Shrimp (*Pandalus borealis*) on Flemish Cap in July-August 1997

by

J. L. del Rio

Instituto de Investigaciones Marinas, Eduardo Cabello 6
36208 Vigo, Spain

A stratified random bottom-trawl surveys on Flemish Cap was carried out in July-August 1997 following the same method used since 1988. Results of shrimp population (*Pandalus borealis*) are presented in this paper and compared with those previously observed.

Material and methods

The survey was conducted following the same procedures as in previous years (Vázquez, 1997). Samples of approximately one kilogram shrimp were taken in each tow this specie was present. Samples were frozen for posterior analysis. Males and females was separated according to the endopod of the first pleopod (Rasmussen, 1953). Individuals in the changing sex phase were included with males. Females were further separated as immatures (first time spawners) and matures (spawned previously) based on the condition of the sternal spines (McCrary, 1971). Oblique caparace length (CL): the distance from the base of the eye to the posterior dorsal edge of the caparace (Shumway et al, 1985) were measured to the lower 0.5 mm. 3318 individuals were weighed to the nearest 0.1 g after a little draining time to calculate the length-weight relationship.

Results

Total shrimp biomass estimated by swept area method and average catch per mile from 1988 to 1997 are presented in Table 1. Biomass decreased from 6502 tons in 1996 to 5096 tons in 1997. Length frequencies and percentages by sex from 1997 survey are shown in Table 2. These length frequencies are split in males, immature females, mature females and ovigerous females. The increase in the frecuency of males observed during 1996 survey was followed in 1997 by a pronounced decrease (54.0% in 1996 and 36.3% in 1997). The 63.7% of individuals were females splited as: 34.7% immatures, 25.0% matures and 4.0% ovigerous. Percentage of immature females was 17.6% in the 1996 survey (del Rio, 1996), what indicated a notable increase of the immature group in 1997 compared with 1996. The spawing period in Flemish Cap begins between the end of July and the beginning of August (Mena, 1991). This year survey was carried out from July 16th to August 1st, laster in the season that in previous years, the percentage of ovigerous females was the higher observed since the surveys began. Males presented a CL between 13 and 26.5 mm. Females presented a CL between 17 and 32.5 mm comprising the groups: 18-30.5 mm immature, 17-32.5 mm mature and 20-32 mm ovigerous.

Length frequencies by strata in 1997 (Table 3) indicate that the presence of shrimp is scarce in depths lower than 257 m (140 fathoms) or higher than 554 m (301 fathoms). The shrimp mainly occupy those strata between 257 and 554 m, as in previous years. Minimum length observed was 13 mm CL in strata of depths lower than 360 m (200 fathoms), in those strata between 360 and 545 m (201-300 fathoms) it was 15.5 mm CL and in depths between 545 and 725 m (301-400 fathoms) it was 16 mm CL. This indicated that the minimum shrimp size increases with depth.

Total biomass estimated by strata in 1997 (Table 4) shows a distribution pattern similar to that observed in 1996 survey in most of strata, and a sharp decrease in strata 14 and 15 (201 - 300 fathoms). Shrimp length distribution on Flemish Cap 1988-1997 are provided in Figure 1. It is assumed that modal groups named with the same letter belong to the same year-class. The reduction of biomass from 1996 to 1997 was mainly due to a decrease of abundance of modal group named J (19 - 22 mm CL) in 1996. All individuals of this year-class were males in 1996, when the mode was 20.5 mm CL (del Rio, 1996).

Mean weight by length class of shrimp in years 1996 and 1997 were compared in Table 5; it was observed that shrimp weight decreases for all length-classes in 1997. The mean weight had increased in all length-classes from 1989 to 1992, in the period 1993-1996 the weigth only increases fot sizes greater than 27.5 mm CL (del Rio and Sainza, 1997).

Catch distribution in kg/tow in the survey are provided in Figure 2. Catches do never exceeded 8 kg/tow in central and slope portions of the bank as is previous surveys, but there is a large area of low catches in the North of Flemish Cap, wider than observed in previous year. Few catches were higher than 20 kg/tow.

References

del Rio, J. L.- 1996. Northern Shrimp (*Pandalus borealis*) on Flemish Cap in July 1996. NAFO SCR Doc. 96/24, 10 pp.

del Rio, J. L. and Sainza, C.- 1997. Northern Shrimp (*Pandalus borealis*) Stock on Flemish Cap According to 1988-1996 surveys. NAFO SCR Doc. 97/ , 24 pp.

McCrary, J. A.- 1971. Sternal spines as a characteristic for differentiating between females of some pandalidae. J. Fish. Res. Bd. of Canada, 28: 98-100.

Mena, I.- 1991. Northern prawn (*Pandalus borealis*) length distribution and fecundity in Flemish Cap. NAFO SCR Doc 91/29, 7 pp.

Rasmussen, B.- 1953. On the geographical variation on growth and sexual development of the deep sea prawn (*Pandalus borealis*,Kroyer). Fish. Dir. Skr. Ser Hav Unders. 10 (3):pp 1-160.

Shumway, S. E., H. C. Perkins, D. F. Schick and A. P. Stikney.- 1985. Synopsis of biological data on the Pink Shrimp (*Pandalus borealis*, Kroyer 1838). NOAA Techn. Rep. NMFS 30. 57 pp.

Vázquez, A.- 1997. Results from bottom trawl survey of Flemish Cap in July 1996. NAFO SCR Doc 97/28. 30 pp.

Table 1.- Total biomass estimated by swept area method and average catch per mile

Year	Biomass (t)	Average catch per mile (Kg)
1988	2164	1.54 ± 0.28
1989	1923	1.37 ± 0.24
1990	2139	1.53 ± 0.21
1991	8211	5.83 ± 0.71
1992	16531	11.75 ± 1.86
1993	9256	6.57 ± 1.04
1994*	3337	2.37 ± 0.35
1995	5413	3.85 ± 0.44
1996	6502	4.62 ± 0.34
1997	5096	3.62 ± 0.25

* cod-end mesh-size 40 mm

Table 2.- Length frequencies and percentages by sex

Length (mm)	Males	Immature Females	Mature Females	Ovigerous Females
13.0	7			
13.5	46			
14.0	122			
14.5	70			
15.0	95			
15.5	155			
16.0	257			
16.5	137			
17.0	299		9	
17.5	324			
18.0	744	1		
18.5	1192	1		
19.0	2258	13		
19.5	2201	25	1	
20.0	2321	70	1	4
20.5	1523	63	23	19
21.0	1304	317	63	2
21.5	1080	355	113	38
22.0	1381	783	345	71
22.5	1520	896	259	81
23.0	2442	2225	778	173
23.5	1485	2070	736	237
24.0	1557	3152	1145	456
24.5	642	3233	1210	246
25.0	294	3026	1521	333
25.5	117	2438	1480	284
26.0	79	1949	1826	212
26.5	6	1049	1643	165
27.0		627	1624	136
27.5		165	806	33
28.0		133	984	58
28.5			433	10
29.0		49	484	20
29.5			212	2
30.0			237	
30.5		1	138	
31.0			95	2
31.5			84	3
32.0			26	1
32.5			3	
	36.3%	34.7%	25.0%	4.0%

frequency x 10⁴

Table 3.- Lenght frequencies by strata

							STRATA									
Length	3	5	6	7	8	9	10	11	12	13	14	15	16	18	19	Total
13.0				7												7
13.5	7	5	10				4	20								46
14.0	7	11	11	54			14	25								122
14.5	7	10	1	17			2	34								70
15.0		16	1	19	9		25	25								95
15.5		22	1	39	14	13	43	14			9					155
16.0	13	15	3	85	22	13	30	55		11		5	6			257
16.5		10		19	9	18	28	36		18						137
17.0	7	22	14	98	17	11	35	66			26	11	1			308
17.5		14	16	103	5	18	61	73	13	18		2				324
18.0	13	22	21	195	19	18	106	179	58	18	43	41	11			745
18.5	7	31	29	226	83	55	220	263	90	53	50	88				1193
19.0	20	48	45	442	170	78	441	414	257	81	98	160	18			2271
19.5	20	50	34	315	138	108	414	386	179	179	144	199	34	1	24	2227
20.0	13	35	49	230	96	84	462	434	207	286	219	219	59	3		2396
20.5	27	33	12	89	110	71	341	201	165	162	141	142	42	1	92	1628
21.0	33	39	72	158	73	111	376	193	147	164	135	111	20	1	54	1686
21.5	27	28	54	170	50	167	348	124	255	124	92	72	27	1	47	1586
22.0	40	63	127	400	57	141	394	263	284	175	341	190	37	2	65	2580
22.5	20	75	81	207	113	184	578	331	389	118	283	204	75	4	96	2756
23.0	47	119	170	1041	246	283	872	608	774	259	351	380	111	6	354	5618
23.5	14	97	139	721	250	316	675	657	641	212	281	191	88	4	245	4528
24.0	7	83	145	1106	348	410	929	880	1199	315	222	218	90	5	355	6310
24.5	14	74	195	1020	396	265	829	711	908	270	105	296	53	6	197	5331
25.0	7	22	90	745	494	275	619	806	728	448	210	383	110	3	233	5174
25.5		33	49	516	300	205	439	648	854	432	189	283	97	2	275	4319
26.0		12	32	282	219	292	461	436	925	470	213	304	128	9	285	4066
26.5		4	14	203	63	162	292	358	629	334	150	292	81	5	274	2863
27.0		1	5	151	86	117	254	266	538	290	140	121	94	7	316	2387
27.5			5	10	41	38	119	116	306	58	44	85	54	6	121	1004
28.0			3	57	20	74	142	101	326	133	92	66	36	4	118	1175
28.5			2	28		31	48	37	102	29	25	47	24	3	67	443
29.0			3	13	18	36	46	76	110	47	42	56	38	2	67	553
29.5			1				26	23	39	11	22	5	17	2	68	214
30.0				7		6	35	26	36	40	32	5	31		20	237
30.5			1	3			14	26	32	22	16	3	10		11	139
31.0				3			14	13	16	12	11	6	6		17	97
31.5							5	14	42		14		13			87
32.0						6		11			2		6		3	27
32.5													2	1		3

frequency x 10^4

Table 4.- Total biomass estimated by strata (tons)

Stratum	Depth (fathoms)	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	70-80	0	0	0	0	0	0	0	0	0	0
2	81-100	0	0	0	0	0	0	0	162	0	0
3	101-140	0	0	0	5	0	1	0	2	86	21
4	101-140	0	0	0	0	0	0	0	0	0	0
5	101-140	0	0	0	4	8	0	0	6	12	57
6	101-140	0	0	2	19	3	3	0	11	94	111
7	141-200	18	20	212	713	2134	1404	93	299	684	637
8	141-200	9	51	46	158	1130	545	3	183	412	269
9	141-200	57	47	24	150	88	109	0	506	324	287
10	141-200	115	44	188	1499	2278	972	658	873	707	706
11	141-200	89	0	105	733	2714	794	358	452	699	669
12	201-300	786	582	313	1733	3329	1786	599	778	910	871
13	201-300	64	58	42	63	28	120	0	28	416	394
14	201-300	255	218	407	814	1640	1161	556	632	706	286
15	201-300	404	328	558	1485	2522	2029	916	1021	922	332
16	301-400	308	234	239	171	303	133	44	47	148	121
17	301-400	2	10	0	0	0	0	0	0	0	1
18	301-400	0	0	0	0	0	0	0	1	30	8
19	301-400	56	331	4	663	354	163	111	412	351	327
Total:		2164	1923	2139	8211	16531	9256	3337	5413	6502	5096

Table 5.- Mean weight and length class in year 1996 and 1997

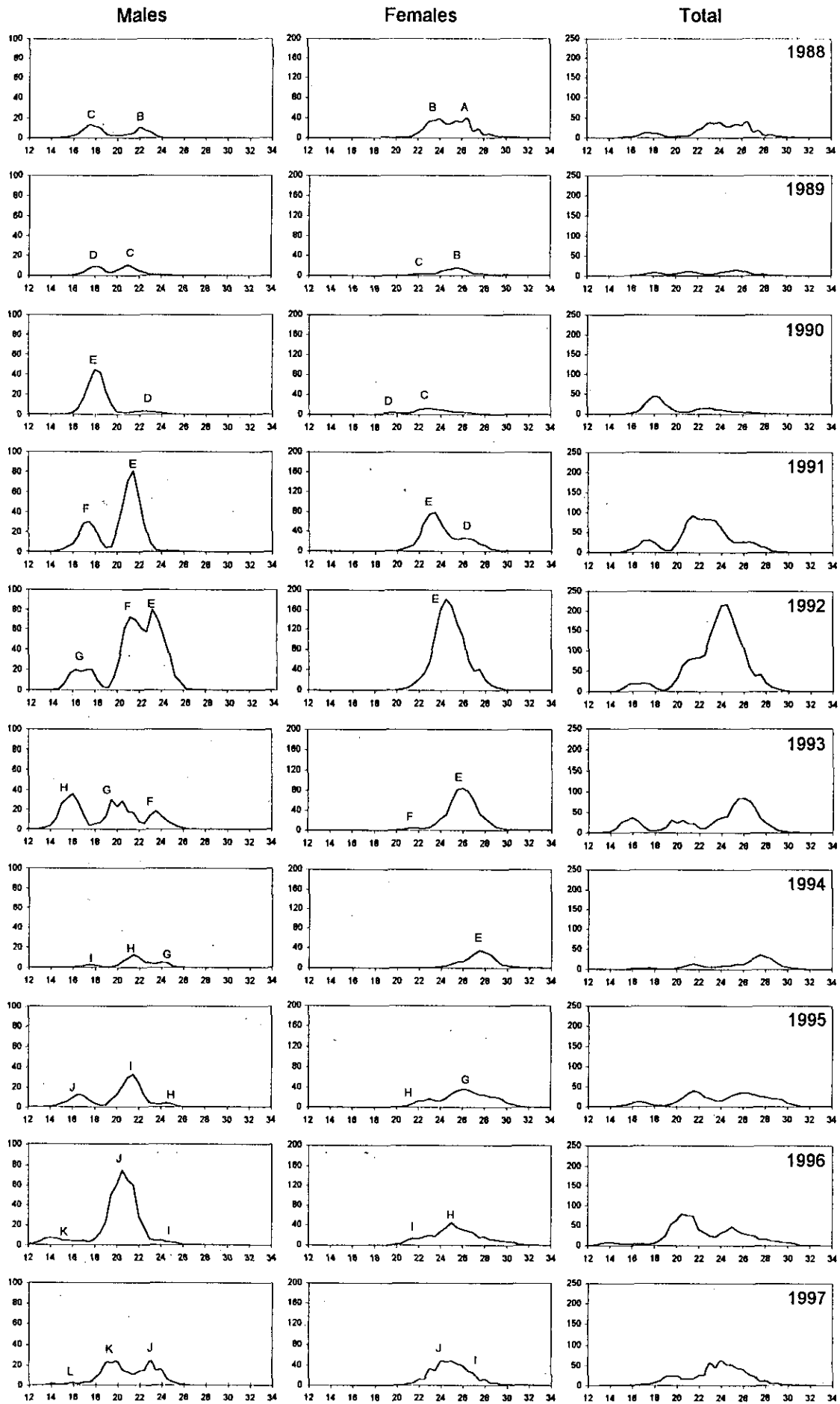| Length (mm)	Mean weight (g)	
	1996	1997
10.0	0.6	0.5
12.5	1.1	1.1
15.0	2.0	1.9
17.5	3.2	3.0
20.0	4.8	4.5
22.5	6.9	6.4
25.0	9.5	8.8
27.5	12.7	11.7
30.0	16.6	15.3
32.5	21.2	19.5
35.0	26.6	24.4

Figure 1.- Shrimp length distribution on Flemish Cap 1988 -1997 surveys   Y-Axis = Frequency (10⁶)   X-Axis = Length (mm)
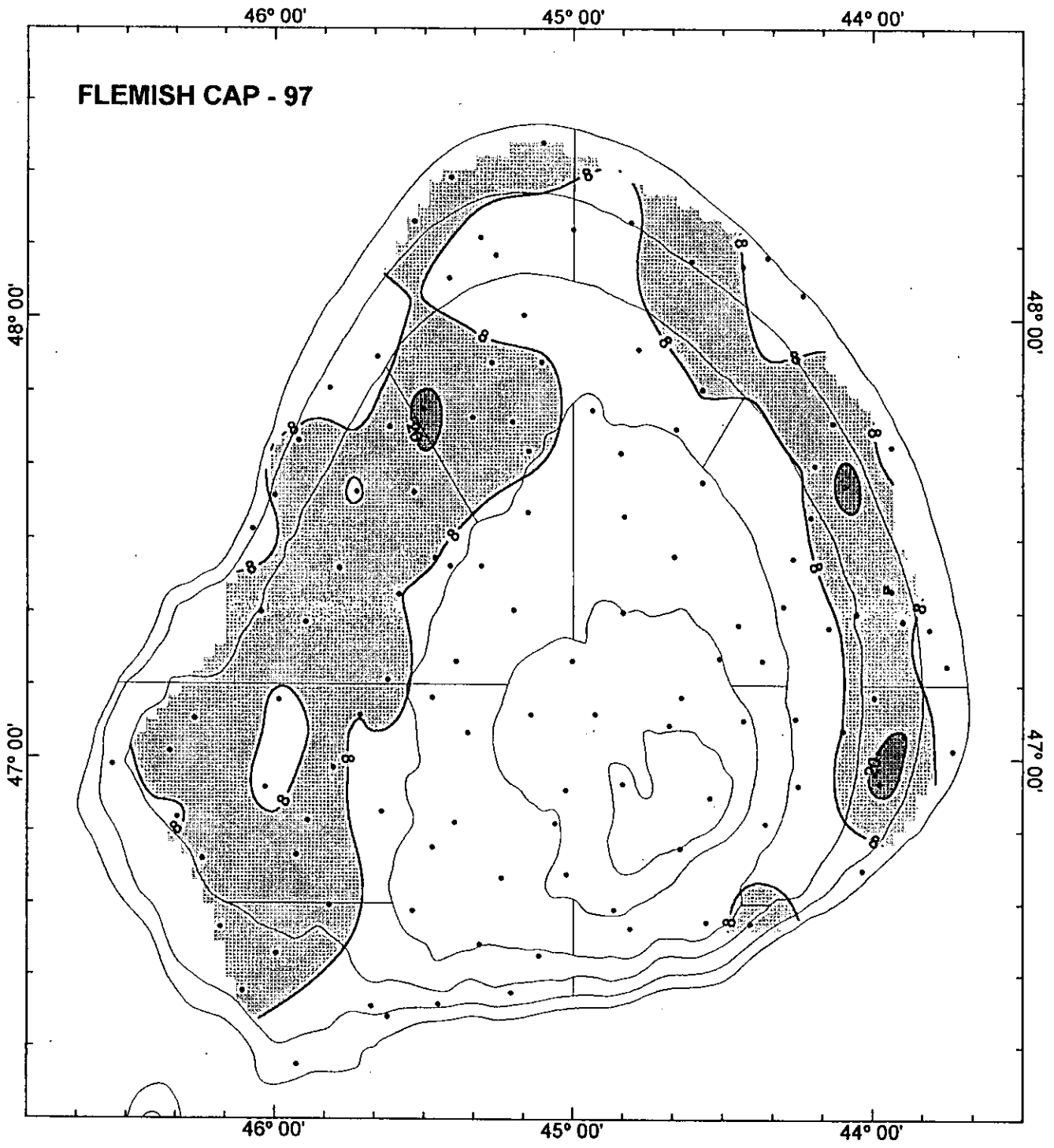
Figure 2 .- Shrimp catch (Kg/tow) distribution in July 1997 on Flemish Cap.