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Northern Shrimp in Russian Catches from Flemish Cap Bank (NAFO Division 3M) in 1995-1996

by

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INTRODUCTION

The material presented was collected by Russian observers onboard vessels of OAO "Rybprognoz" in the frames of "Pilot Project for Observers Coverage and Satellite Tracking". For 1995 only catch data are presented while for 1996 both catch and biological data are available.

MATERIAL AND METHODS

Vessels of OAO "Rybprognoz" have been caught shrimp in the area of Flemish Cap Bank since April 1995. In 1996 shrimp fishery was started 20 days earlier, i.e. in the end of the second ten day period of March.

The fishery was carried out in the broader area (Fig. 1) due to inclusion of areas at the eastern and north-eastern slopes, however, the most intensive fishery was performed at the western slope, as in 1995.

The bulk of hauls were carried out in the depth range of 260-320 m, and few hauls - at 350-460m.

Catch statistics is based on log-book data from fishing vessels of SRTM type (54.8 m in length, main engine of 1160 h.p.). The above type of vessels is the most numerous one in Russian shrimp fishery.

Shrimp was caught with a bottom trawl, equipped with sorting grate of 22 mm bar spacing as required by "Conservation and Enforcement Measures". Average mesh size of the trawl cod-end varied from 40.6 mm to 44.2 mm. Trawlings of 3-5 hours were carried out at speed of 2.4-3.0 knots.

Biological observations were performed onboard trawlers "Liublino", "Maltsevo", "Torok", "Tava" and "1500 Let Kievu" and included the following:

1. Random sampling of shrimp of 1.0-1.5 kg in total weight (approximately 200-300 individuals).

2. Measurements of oblique carapace length (OCL, by Rasmussen, 1953) to the nearest 0.5 mm.

3. Sex determination based on the shape of endopodit of the first pair of pleopods.

4. Females were divided into 2 large groups relative to sternal spines condition (Mc.Crarry, 1971).

5. Females maturity (by Rasmussen, 1953) was assessed within the groups specified:

mg	} with sternal spines (SS+)	without headroes	
gm		with headroes	
ag	} without sternal spines (SS-)	without headroes	
ga		with headroes	
ca		with eggs on pleopods	} eggs without eyes eggs with eyes eggs with eyes+
em			
eg			

Female with headroes was specified when gonades occupied more than a half of carapace length and acquired greyish-green colour. In the case when only unfertilized roes of white - opaque and grey colour are found on pleapods, the female is classified as stage ag or ga, depending on the headroes conditions. Specimen with soft shell were specified when carapace walls were very thin or revealed pergameneous features.

RESULTS

Catches, effort and CPUE

In April-July 1995 the total catch obtained by "Rybprognoz" vessels amounted above 1.2 thous.t. Catch rates increased from April to May, approached a peak in June and subsequently decreased in July.

In March-August 1996 the total catch amounted about 1.6 thous.t. The period of highest catch rates was observed in May-June. Night catches amounted mostly to 0.1-0.4 t, while day-time ones, were 0.5-1.2 t. Maximum day-time catches approached 2.1-2.8 t. Diurnal catches were in general 1.8-2.5 t, and approached 4.5-6.7 t in May-June. In spite of the fishing area extension and fishing depth range increase, catch rates was at the lower level in 1996. Its average value was 83% of 1995 level in April-July 1996 (Table 1)

Length and age

Data of biological observations summarized by months were presented in Table 2.

Figure 2 shows length composition of shrimp caught by 3 groups: males, females with sternal spines and females without sternal spines.

Shrimp age by length assessed on the basis of Canadian researches approach (Parson and Veitch, 1993). The pattern of curve distribution by length (Fig. 2) allows to make the following conclusions:

1. The bulk of Russian catches in 1996 consisted of males of 3 years old (modal length 19-20 mm) and of 2 years old (13-15 mm).
2. Two-year old males proportion increased with time and dominated in catches in July-August.
3. No four-year males (modal length of 23-24 mm) were observed.
4. Insignificant number of one-year shrimp (modal length of 9.5-10.0 mm) was found in late June-July.
5. Two modal lengths (22 mm and 24-25 mm) were recorded in primiparous females.

Multiparous females were represented by 3 modal length: 24-25 mm, 26-27 mm and 28-29 mm. In the modal class 24-25 mm, primiparous and multiparous females constituted approximately equal proportions.

Taking in account that Flemish Cap shrimp sex alteration in fall-winter (Nicolajsen, 1994), the following age structure of females caught may be assumed:

- primiparous females of 22 mm modal length identified as 3 years old were the largest specimen of 1993 year class which changed sex in 1995;
- primiparous females of 24-25 mm modal length identified as 4 years old which changed sex in fall 1995;
- multiparous females of 24-25 mm modal length identified as 4 years old changed sex in fall 1994 and classified by Canadian researches (Parsons and Veitch, 1995) as primiparous females of 22 mm modal length in summer 1995;
- multiparous females of 26-27 mm modal length -(primiparous females specified by Canadian researches in 1995 modal length of 25 mm), females of 5 years old, changed sex in fall 1994, and multiparous females of 5 years old, changed sex one year before;
- multiparous females of 28-29 mm modal length, females of 6 years old,

changed sex before all 1994.

Thus, it may be assumed that sex change in one year-class shrimps occurred by portions during 2-3 years, starting from the age 3 years. Such approach agrees with conclusions by Mena (1992), according to which sex change depends on shrimps length, rather than their age.

Low number of females caught may be explained by the fact that most hauls were carried out in the depth range of 260-320 m. Females number in catches decreased from March to June, probably due to migration of the latter into more depths.

Females maturity and shell condition

Figure 3 shows maturity dynamics of two females groups and variability of proportion of females with soft carapace for observation period of one five-day discrete time.

Intensive hatching of shrimp larvae started in the last five-day period of March and finished in the second five-day period of April (Fig. 3). In multiparous females exempted from external roes the process of new generation roes begins immediately, and by early May actually all multiparous females has transferred into state *ga*.

Development of headroes in primiparous females had begun earlier. After larvae hatching in the early stage of new generation roes development, the moult of multiparous females occur. Maximum number of specimen with soft shells were observed in the second half of April (Fig. 3). In the same period the change of shells was observed in insignificant part of primiparous females.

Individual females with eggs without "eyes" on pleopods were first found in catches during the last five days of June. From the second ten-day period of July the spawning became total and in the third five-day period of August it was actually finished.

Roes transfer to pleopods associated with softening of shell when primiparous females lost their sternal spines. After spawning shell firmness recovered very soon. Thus, the observations show that shrimp larvae hatching in 1996 occurred in late March-early April while spawning started in July and finished in middle August.

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1995	Month	Number of vessels	Catch	Effort	CPUE
	March	3	90196	570	158
	April	6	256024	1987	129
	May	6	351272	2502	140
	June	6	375188	2128	176
	July	6	321631	2703	119
	August 01-20.08	6	184464	1500	123
	March-August		1578775	11390	139

1996	Month	Number of vessels	Catch	Effort	CPUE
	April	5	115268	976	118
	May	5	335258	1733	193
	June	5	466944	2211	211
	July	5	315770	2147	147
April-July		1233240	7067	175	

Table 1. Results of shrimp fishery for group of Russian vessels in 1985-1996.

Size	March							April										
	Males	Females						Males	Females									
		SS +			SS -				SS +			SS -						
mg	gm	ag	ga	cm	eg	mg	gm	ag	ga	cm	eg	mg	gm	ag	ga	cm	eg	
8.0																		
8.5																		
9.0																		
9.5																		
10.0																		
10.5	1							6										
11.0	2							44										
11.5	3							75										
12.0	10							185										
12.5	8							211										
13.0	9							290										
13.5	13							208										
14.0	8							224										
14.5	6							121										
15.0	6							119										
15.5	15							63										
16.0	25							89		1	5							
16.5	68							115	3	0	3	1						
17.0	150							267	3	1	4	1						
17.5	245							458	1	1	3	1						
18.0	455	1						927	6	1	2	1						
18.5	579	2		1				1359	2	3	2	0						
19.0	906	1		0				2098	4	3	2	0						
19.5	668	8	1	0	1			2246	6	2	4	0						
20.0	915	16	4	0	1	1		2646	34	22	3	1						
20.5	380	21	5	0	1	0		1558	33	44	2	2						
21.0	356	23	5	3	0	1		1348	56	81	5	5						
21.5	63	20	7	1	1	11		481	76	122	13	8						
22.0	25	33	35	4	1	16		312	56	163	21	15						
22.5	3	16	24	17	2	19	1	52	48	151	27	36	1					
23.0	1	36	43	9	10	44	0	24	40	176	49	70	2					
23.5	0	23	65	8	4	47	0	7	24	164	48	109	3					
24.0	1	29	82	5	8	51	2	8	29	212	59	148	4					
24.5		14	61	11	8	26	0	8	10	173	46	121	3	1				
25.0		11	102	13	22	40	0		8	227	45	127	1	0				
25.5		4	39	13	1	46	0		1	82	37	109	2	0				
26.0		1	35	11	15	80	4		2	69	63	163	6	1				
26.5			2	12	11	63	1		0	22	57	123	6	1				
27.0			3	7	15	142	6		1	12	79	186	10	2				
27.5				6	7	62	5		0	1	61	97	5	0				
28.0				3	7	98	9		0	4	64	134	9	4				
28.5				5	5	41	2		1		37	74	10	4				
29.0				4	8	83	6				30	77	10	2				
29.5				1	3	36	9				27	53	8	2				
30.0				1	6	52	3				38	62	6	3				
30.5					4	22	0				4	23	4	2				
31.0					0	15	1				8	14	3					
31.5					1	4	1				4	9	1					
32.0						4					2	8	2					
32.5											2	0	1					
33.0											1	0						
33.5											5	0						
34.0											2	1						
Total	4921	259	513	135	142	1004	50	15549	444	1737	864	1779	97	22				

Table 2. Shrimp length distribution by males and females of different maturity stages.

Size	May					June				
	Males	Females				Males	Females			
		SS +		SS -			SS +		SS -	
		mg	gm	ag	ga		mg	gm	ag	ga
8.0						1				
8.5						4				
9.0						5				
9.5						7				
10.0	2					0				
10.5	6					4				
11.0	20					15				
11.5	28					64				
12.0	94					185				
12.5	215					526				
13.0	455					1079				
13.5	697					1653				
14.0	898					1924				
14.5	699			1		1548				
15.0	657			1		1403			2	
15.5	265			5		723			3	
16.0	249		1	3	1	536			4	3
16.5	145	4	0	2	2	223	2	1	5	9
17.0	377	4	1	6	5	227	3	3	2	13
17.5	542	2	2	6	5	197	1	2	2	5
18.0	1285	4	3	3	7	446	0	2	1	10
18.5	1803	2	4	3	5	738	0	5	2	12
19.0	2880	4	6	0	12	1267	0	6	0	11
19.5	2861	2	9	2	9	1604	0	7	0	4
20.0	3215	0	24	0	7	2162	0	31	0	12
20.5	1521	1	47	1	4	1478	3	55	1	1
21.0	1189	8	138	0	4	1117	1	139	0	2
21.5	326	5	179	0	8	470	3	200	0	6
22.0	145	9	278	2	20	205	4	284	2	13
22.5	17	4	183	1	22	37	4	194	0	19
23.0	11	1	196	1	76	7	3	211	0	68
23.5	2	0	144	1	100	5	1	119	0	78
24.0	4	2	228	1	164	2	3	138	0	130
24.5			212	0	162	2		109	0	131
25.0			264	1	215			193	1	168
25.5			108	0	117			86		67
26.0			89	2	170			98		79
26.5			16	0	100			29		51
27.0			11	1	184			14		62
27.5			2	1	100			9		42
28.0			3		167			4		59
28.5			0		87			1		29
29.0			1		99			2		31
29.5					65					20
30.0					85					28
30.5					20					11
31.0					30					7
31.5					5					6
32.0					3					3
32.5					0					
33.0					1					
33.5										
34.0										
Total	20608	52	2149	44	2061	19864	28	1942	25	1190

Table 2. cont'd

Size	July						August						
	Males	Females					Males	Females					
		SS +		SS -				SS +		SS -			
		mg	gm	ag	ga	ca		mg	gm	ag	ga	ca	
8.0	2												
8.5	22					2							
9.0	58					6							
9.5	128					16							
10.0	159					26							
10.5	76					16							
11.0	34					6							
11.5	50					4							
12.0	177					7							
12.5	445					39							
13.0	1175					131							
13.5	1978					487							
14.0	2998					873							
14.5	3110					1268					1		
15.0	3576					1542					0		
15.5	1895					1076					0		
16.0	1484	2	1	2	1	908			2	1			
16.5	579	3	0	6	4	379			9	2			
17.0	389	1	4	5	17	318			16	3			
17.5	143	3	4	1	14	99			6	3	1		
18.0	239	1	6	3	19	138		1	3	8	0		
18.5	353	1	4	1	19	164		0	4	7	3		
19.0	750	0	7	0	22	1	411		0	0	3	2	
19.5	1050	0	7	0	14	1	607		0	5	8	3	
20.0	1783	0	23	0	16	7	949		0	2	5	4	
20.5	1344	0	44	0	13	14	937		1	1	5	11	
21.0	1117	0	143	0	23	29	924		1	0	2	25	
21.5	488	0	217	1	34	43	518		1	1	7	42	
22.0	263	0	257	0	61	86	335		5	0	7	103	
22.5	31	0	199	1	47	69	99		1	2	9	98	
23.0	8	1	198	2	130	60	38		1	2	7	150	
23.5			88	0	119	64	6		0	0	6	91	
24.0			113	0	207	91	5		2	0	8	142	
24.5			92	0	189	68	1		2	1	7	132	
25.0			139	1	204	129	3		0	1	6	239	
25.5			57	1	85	57			1	1	7	179	
26.0			50	2	106	38			0	2	12	238	
26.5			20	0	62	13			1	0	2	110	
27.0			11	1	77	13			1	1	5	111	
27.5			1		52	3					1	40	
28.0			1		62	7					3	43	
28.5					36	4					0	35	
29.0					43	3					2	25	
29.5					23	1					0	11	
30.0					17	2					1	20	
30.5					6	0					0	9	
31.0					8	1					1	9	
31.5					1						1	2	
32.0					2							1	
32.5												0	
33.0												1	
33.5													
34.0													
Total	25904	12	1686	27	1733	804	12338	0	18	59	140	1880	

Table 2. Cont'd

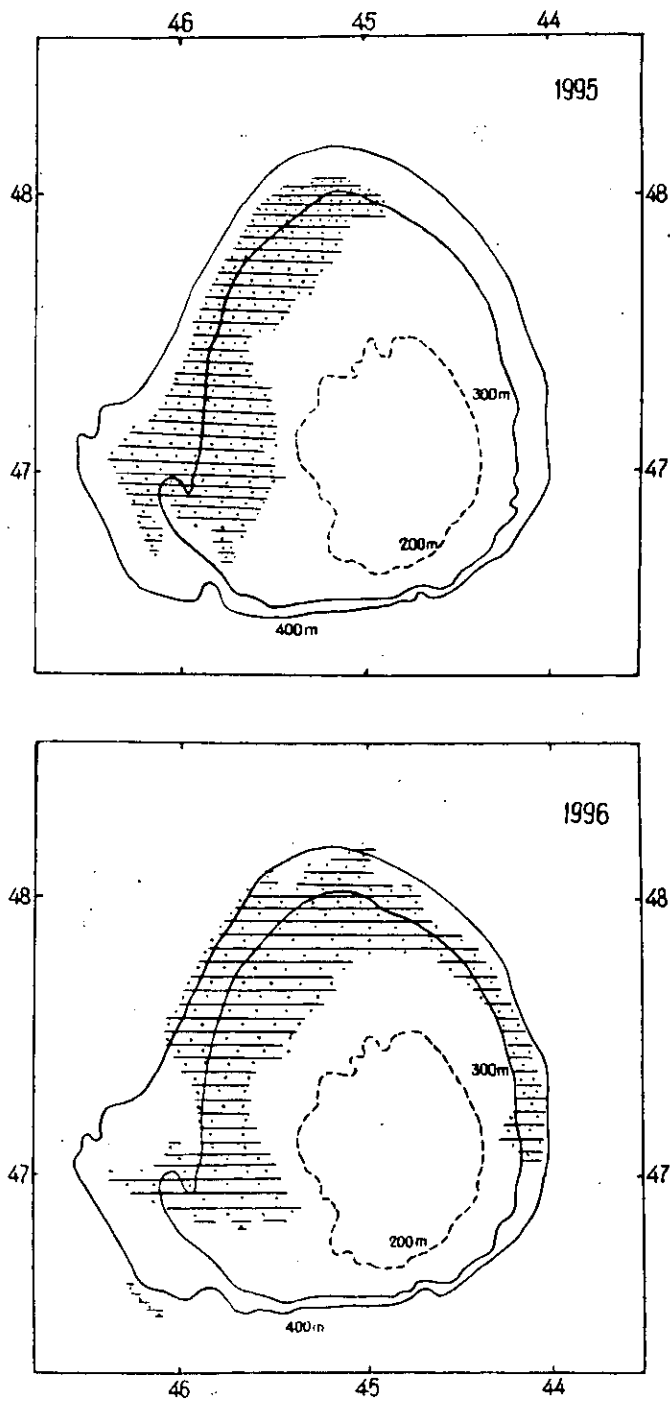


Fig. 1. Shrimp fishing grounds for group of Russian vessels in 1995-1996.

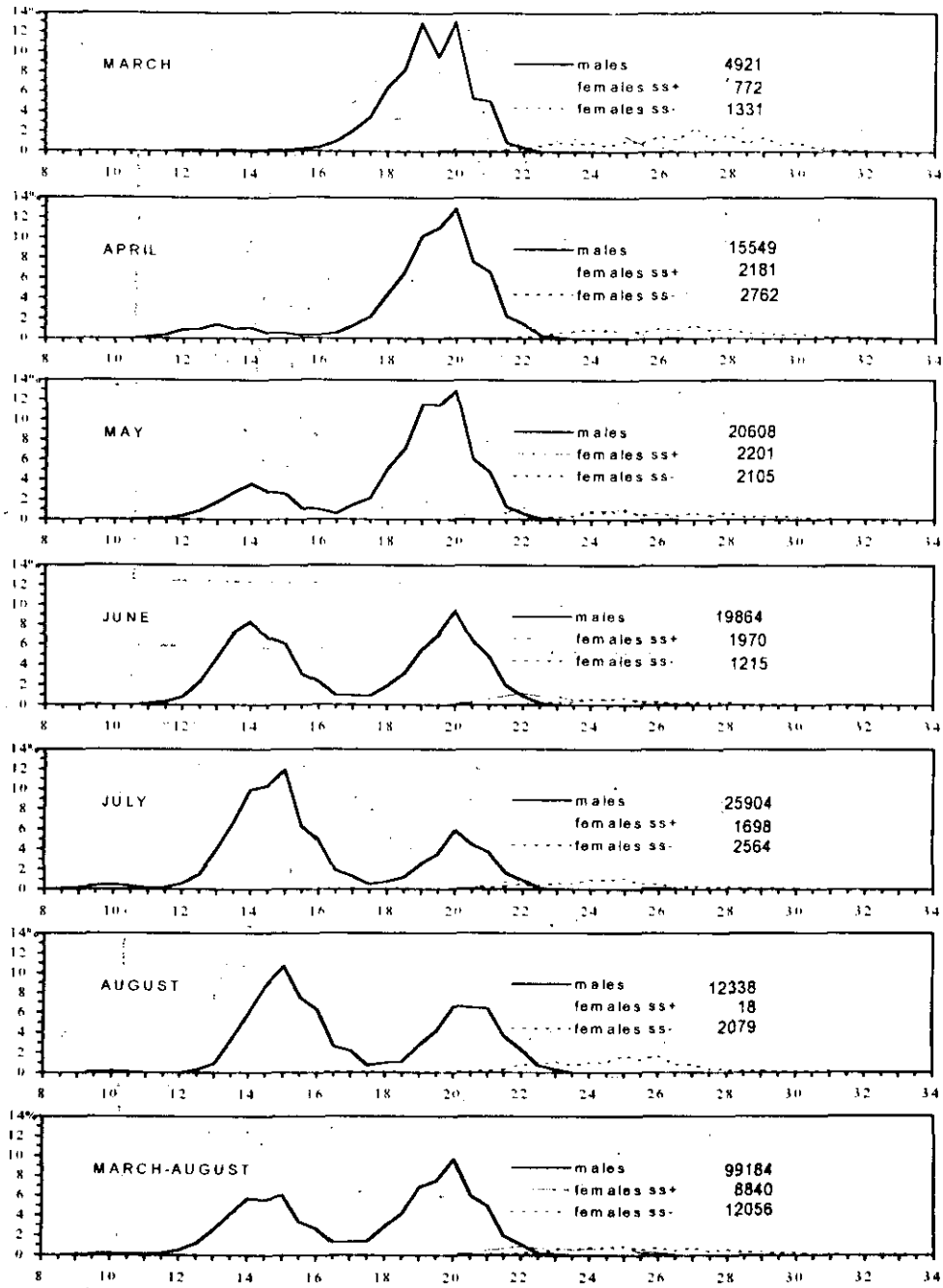


Fig. 2. Shrimp length distribution by males, primiparous and multiparous females.

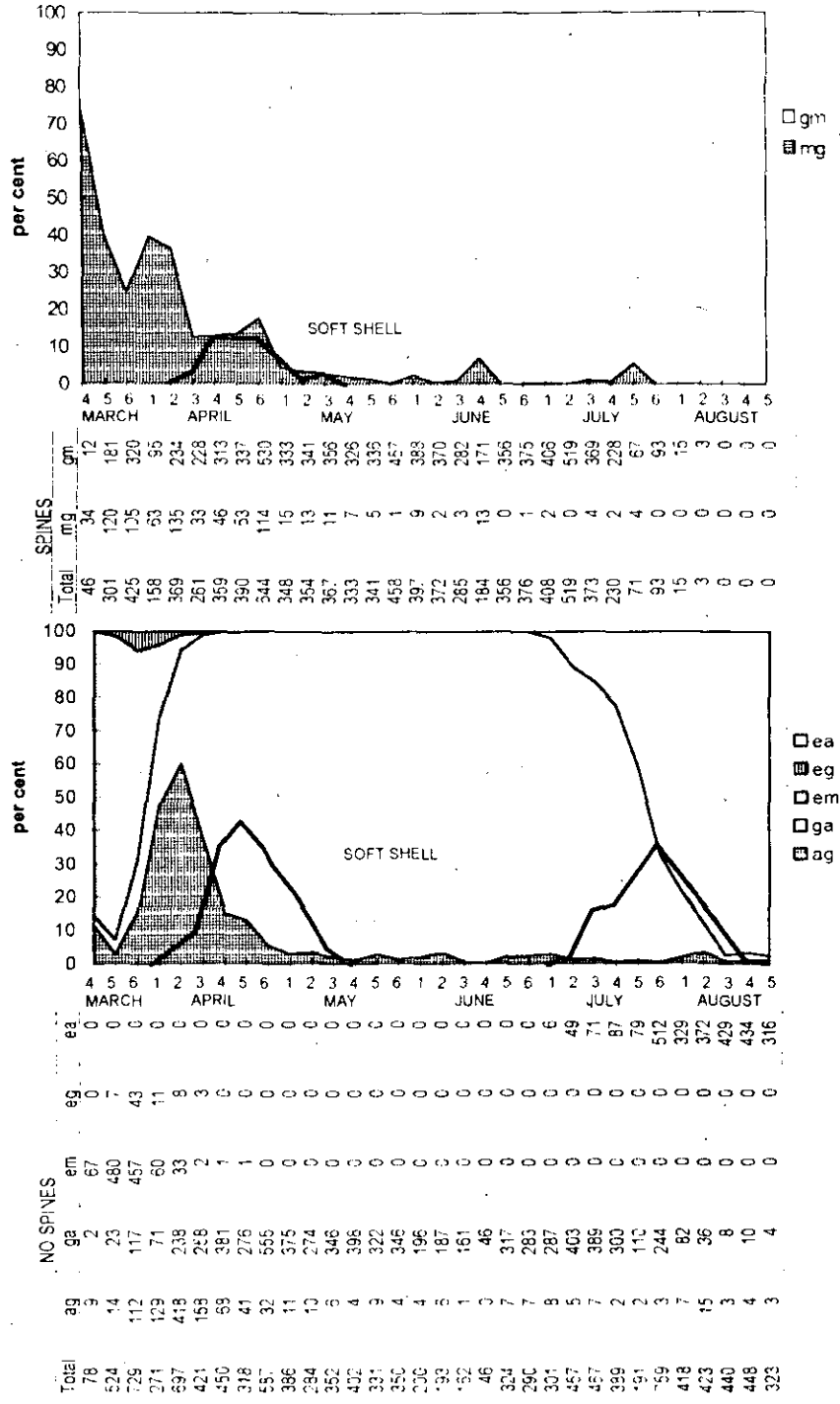


Fig. 3. Dynamics of females maturity and shell condition of shrimp.