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Population Structure of *Illex illecebrosus* on the Scotian Shelf in the Summer of 1979

by

C. Maxim  
Institutul Roman de Cercetari Marine  
Bulevardul Lenin 300, Constanta, Romania

Introduction

This paper presents the population structure of the squid-*Illex* on the basis of data obtained from Romanian squid catches in Div. 4W on the Scotian Shelf during 1 July-7 August 1979.

Materials and Methods

Biological data were collected from catches of the Romanian trawler *Iezer*, which operated in Div. 4W on the southwest part of Sable Island Bank in depths ranging from 135 to 190 m. The otter trawl had a codend mesh size of 60 mm.

Random samples of 200 *Illex* were collected immediately after the catch was taken on board. Mantle length measurements were made to the nearest 0.5 cm, from the tip of the anterodorsal protuberance on the mantle to the apex of the tail-fin. Body weights were recorded in grams. Sex and stage of maturity determinations were made by cutting the mantle along the mid-ventral line. Mercer's (MS 1973) criteria by gross visual inspection of the vas deferens, testes and spermatophoric organ were used to estimate the stage of maturity in males. For females, maturity stages were determined by gross visual inspection of the ovary, oviducal funnel and gland and estimation of the nidamental gland length.

Length-weight relationships were determined by the standard equation,  $W = aL^b$ , where W is body weight (g), L is mantle length (cm), and  $a$  and  $b$  are constants derived from fitting the least squares regressions. The analyses are based on 8,942 males and 6,173 females sampled during the 6-week period of observation.

Results

The length composition of male and female *Illex* by week and sex are illustrated in Fig. 1 and listed in Table 1. The mantle length range of the frequencies was 12.0-25.5 for males and 13.0-29.0 for females. During the 6-week period of observations, there was a gradual increase in the mean mantle length from 18.04 cm to 21.31 cm for males and from 18.52 cm to 21.94 cm for females, the average length for the whole period being 19.81 cm for males and 20.32 cm for females. The corresponding increase in mean weight was from 110 g to 180 g for males and from 119 g to 189 g for females.

From a total of 3,181 specimens examined for maturity stages, 4% were stage I, 74% were stage II, 20% were stage III, and 2% were stage IV (Table 2). The distribution of maturity stages by week is shown in Fig. 2, indicating that the great majority of both males and females were in stage II during July with a shift to stage III in late July and early August. Some males in stage IV occurred mainly in the latter part of the observation period.

The length-weight relationships by sex and for sexes combined (Fig. 3) are as follows:

Male:  $W = 0.014458 L^{3.0907}$

Female:  $W = 0.011922 L^{3.1500}$

Total:  $W = 0.012446 L^{3.1390}$

The relationships indicate that body weight in *Illex* is approximately proportional to the cube of the mantle length. The exponents are only slightly larger than values reported by Tibbetts-Lange and Johnson (MS 1979) for the summer period of 1975-77 in Div. 4W. The correlation coefficient (r) was the same (0.999) for males and females.

Males were numerically dominant in all samples taken in July and August 1978 (Table 3), the average composition being 59.2% for males and 40.8% for females.

#### Discussion

The analysis of length frequency data for *Illex* on the Scotian Shelf in July-August 1979 showed that squid were on the average smaller than in 1977 (Amaratunga and Durward, MS 1978) and in 1978 (Panait, 1979). However, the length distributions in 1979 indicated the presence of a homogeneous population in the summer period.

With reference to the life-cycle of *Illex* suggested by Mesnil (1977), one can consider that the majority of the squid with mantle length up to 25 cm, which in fact formed the basis of the catches in the summer of 1979, were spawned in July-August 1978 (12 months old); to which can be added mature females with mantle length to 29 cm which may have been spawned in January-February 1978 (18 months old).

There appeared to be no difference in the maturity of squid in 1978 and 1979, as the majority of *Illex* (both males and females) during the summer of 1978 were in stage II (ICNAF, 1979).

#### Summary

Squid-*Illex* sampled in July-August 1979 ranged from 12 cm to 25.5 cm for males and from 13 cm to 29 cm for females. Mantle length increased approximately 1.77 cm for males and 1.80 cm for females between 1 July and 7 August. The sex ratio was 59:41 (male:female) for all specimens sampled during the period. Approximately 75% of the specimens examined were in maturity stage II. Males were found to be slightly heavier at a given mantle length from females.

#### References

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Table 1. Length frequencies of *Illex* by sex and week for the period 1 July-7 August 1979 in Division 4W.

Length group (cm)	Males for week beginning							Females for week beginning						
	Jul 1	Jul 9	Jul 16	Jul 23	Jul 30	Aug 6	Total	Jul 1	Jul 9	Jul 16	Jul 23	Jul 30	Aug 6	Total
12	1						1							
12.5	-						-							
13	2						2	3						3
13.5	2						2	1						1
14	4						4	4						4
14.5	6						6	2	1					3
15	19	2	2	1			24	10	1		2			13
15.5	20	2	2	1	2		27	20	1	3	2			26
16	33	5	2	6	7		53	20	-	1	3	5		29
16.5	93	6	1	3	17		120	36	1	1	6	18		62
17	210	24	4	5	10	1	254	115	11	2	6	5	1	140
17.5	365	71	11	15	7	-	489	219	40	6	4	7	-	276
18	433	233	23	32	15	1	737	282	88	10	11	10	1	402
18.5	298	244	63	81	19	-	705	259	134	24	24	11	-	452
19	181	203	101	160	67	1	713	192	145	67	80	18	1	503
19.5	104	127	131	325	185	6	875	103	130	83	134	55	1	506
20	50	64	89	393	427	10	1033	76	63	81	180	109	2	511
20.5	33	41	59	435	596	14	1178	55	68	67	225	203	10	628
21	16	17	35	311	676	34	1089	56	33	45	199	293	12	638
21.5	14	17	18	192	444	30	715	20	19	25	148	279	16	507
22	9	7	15	143	350	22	546	19	15	21	135	295	16	501
22.5	2	3	12	61	137	11	226	15	10	22	78	181	18	324
23	1	-	8	18	62	9	98	10	6	11	44	176	8	255
23.5	-	1	1	10	25	2	39	2	3	8	34	100	7	154
24	1	-		2	13	1	17	4	2	7	24	70	4	111
24.5	1	1			2		4		2	5	7	40	2	56
25	1				1		2		2	-	7	21	1	31
25.5									1	4	3	10	1	19
26									1		5	3		9
26.5												4		4
27												1		1
27.5												1		1
28												1		1
28.5												1		1
29												1		1
Total	1899	1068	577	2194	3062	142	8942	1523	777	493	1361	1918	101	6173
L̄ (cm)	18.04	18.77	19.66	20.34	20.87	21.33	19.81	18.52	19.33	20.28	20.86	21.69	21.94	20.32
W̄ (g)	110.0	123.0	141.3	161.2	172.7	180.4	148.7	119.4	133.0	152.9	169.5	189.4	184.0	157.7

Table 2. Numbers of squid-*Illex* by sex and stage of maturity in Division 4W, July-August 1979.

Sex	Maturity stage				Total
	I	II	III	IV	
Male	6	1111	192	-	1309
Female	126	1229	451	66	1872
Total	132	2340	643	66	3181

Table 3. Sex ratio of squid-*Illex* by week in Division 4W, July-August 1979.

Sex	Week beginning						Total
	Jul 1	Jul 9	Jul 16	Jul 23	Jul 30	Aug 6	
Male	55.5	57.9	53.9	61.7	61.5	58.4	59.2
Female	44.5	42.1	46.1	38.3	38.5	41.6	40.8

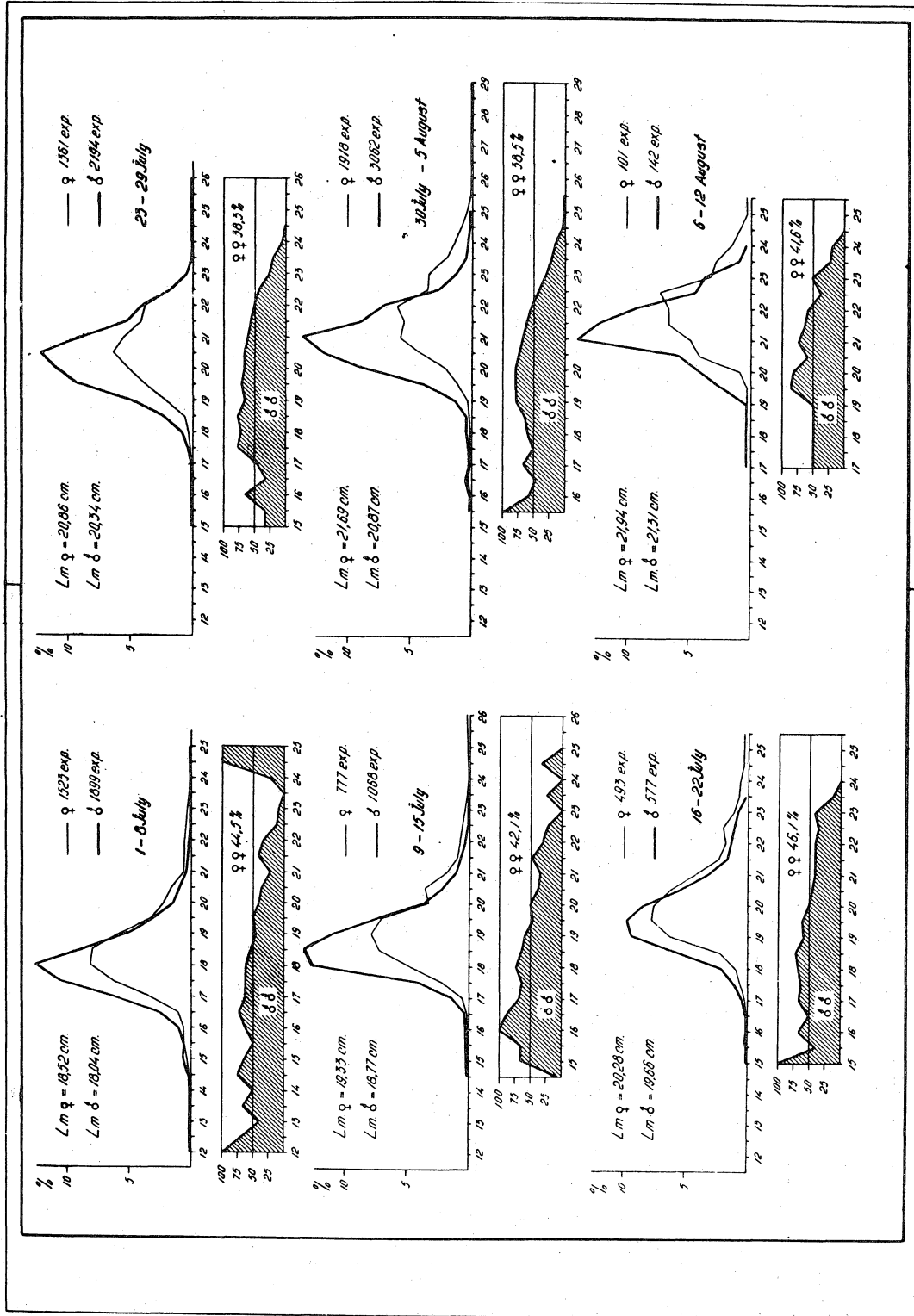


Fig. 1. Length frequency distributions by sex and week of squid-*Illex* in Div. 4W of the Scotian Shelf, July-August 1979.

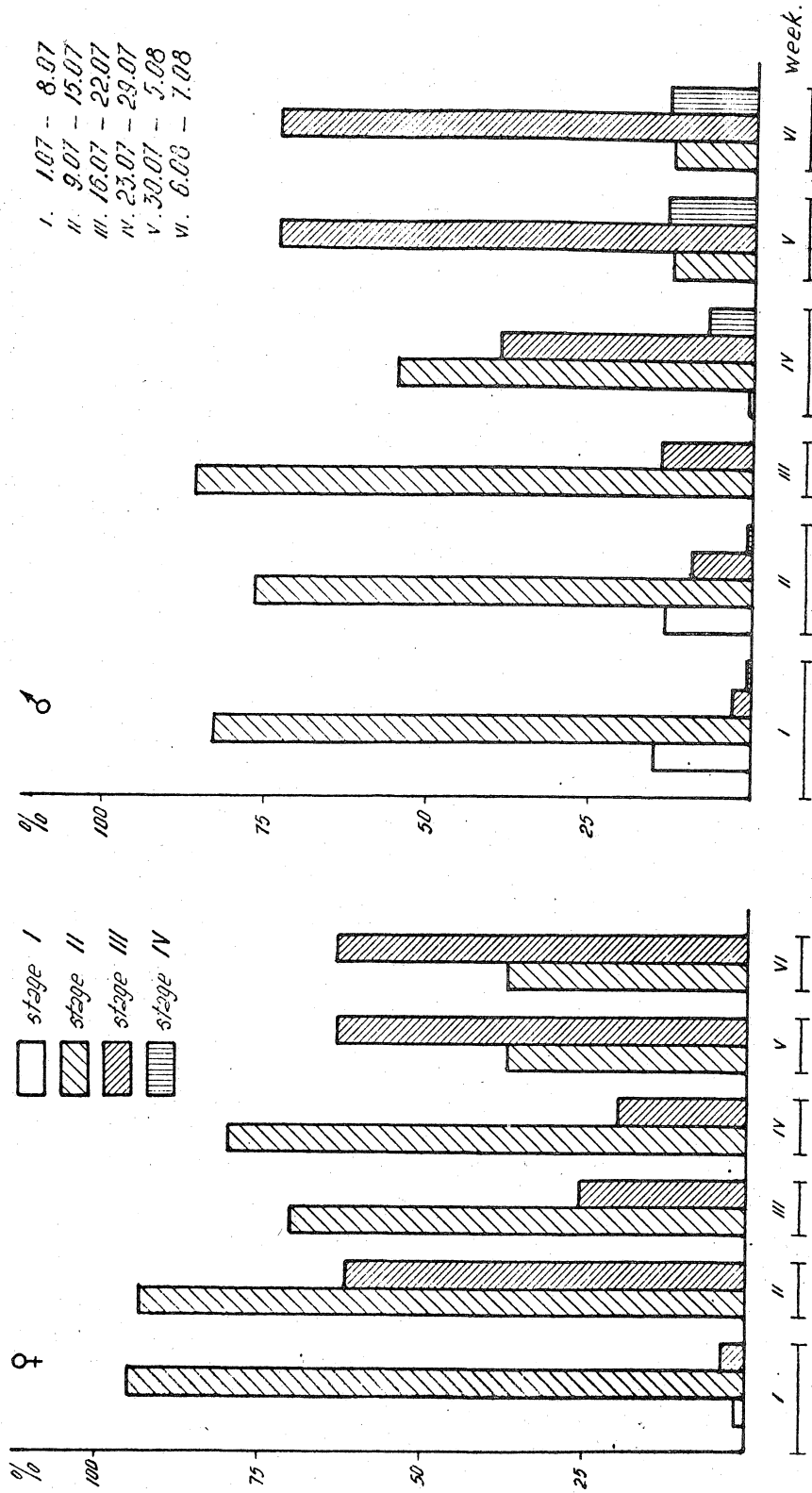


Fig. 2. Distribution of maturity stages for squid-*Illex* in Div. 4W of the Scitian Shelf, July-August 1979.

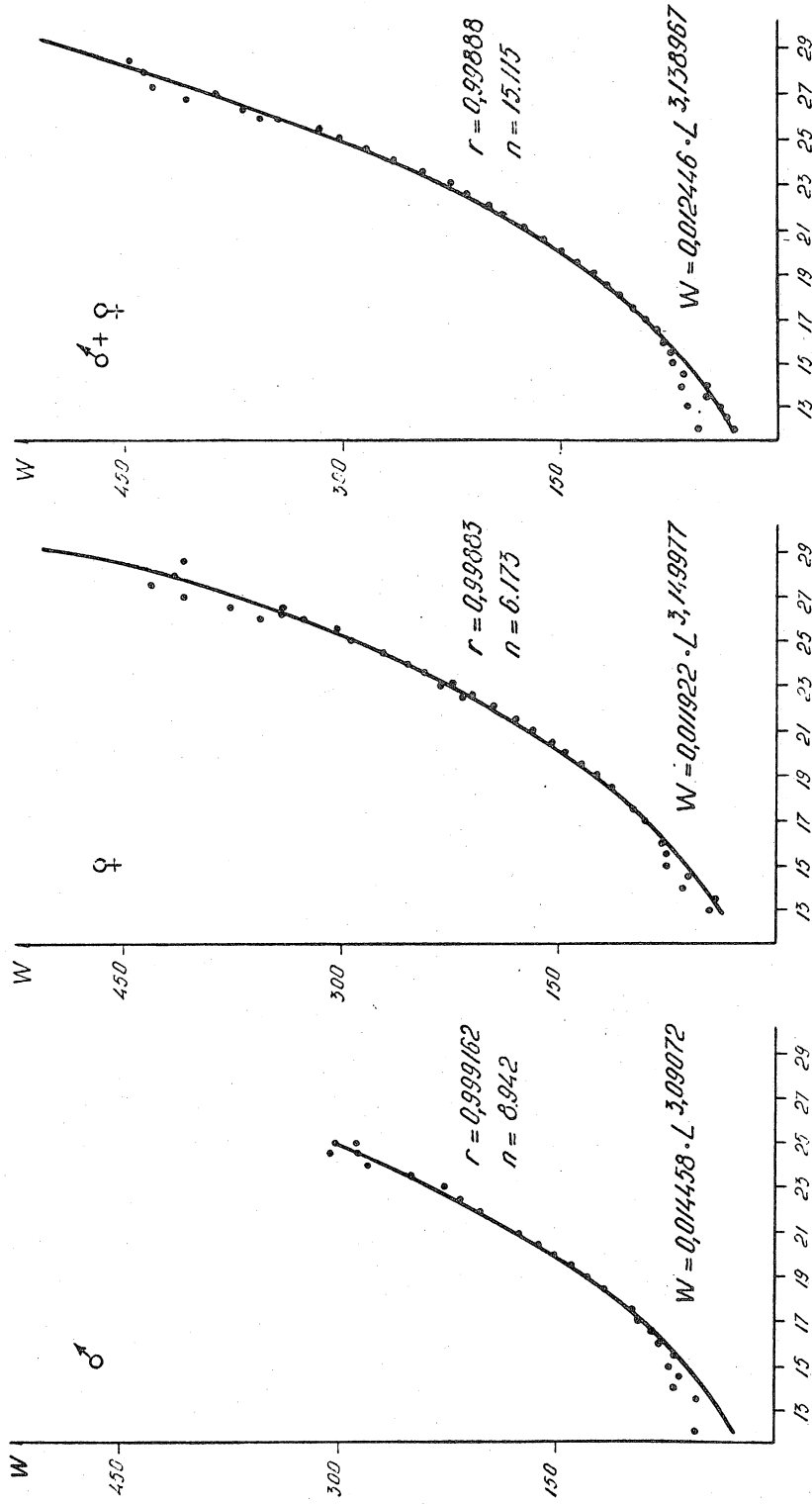


Fig. 3. Length-weight relationships for squid-*Illex* in Div. 4W of the Scotian Shelf, July-August 1979.