

Summary of Sexed Length Frequencies for squid (Loligo pealei and Illex illecebrosus)
from the USSR R/V ARGUS squid, mackerel and herring survey, January - March, 1978.

by

Anne M. T. Lange

National Marine Fisheries Service
Northeast Fisheries Center
Woods Hole Laboratory
Woods Hole, MA 02543

Laboratory Reference 79-08
February 8, 1979

INTRODUCTION

The squid, mackerel and herring survey conducted aboard the USSR R/V ARGUS from January through March, 1978, provided biological samples for both squid species (Loligo pealei and Illex illecebrosus). Data obtained included length frequencies by sex and maturity stage. A summary of this data, by area, is presented here. All length frequencies are expressed as per mille values (numbers per thousand) from each area, based on the entire sample from that area (i.e. all sexes and maturities combined).

RESULTS AND DISCUSSION

In the middle Atlantic area (strata 61-76, Figure 1) 861 Illex were sexed and measured. This total included 394 (46%) females and 467 (54%) males. Table 1 presents a breakdown of these length frequencies into maturity stages by sex. Males were generally found to be at a more advanced stage of development, with 56.1% in stages IV and V, while only 0.5% of the females were that developed. Mean lengths of the samples show the progression of size with maturity stage, ranging from 12.1 to 17.7 cm, for stage I to stage V males; and from 13.9 to 20.0 cm for stage I to stage IV females.

Samples of Illex from southern New England (strata 1-12) and Georges Bank (strata 13-25) areas were quite small (6 and 26 individuals respectively), and are not presented here.

Loligo samples were obtained in all three areas; a total of 4,324 (185 juveniles, 2,024 females and 2,115 males) were measured from the middle Atlantic strata; in the southern New England area 219 juveniles, 409 males and 543 females were sampled (1,171 total); and on Georges Bank 141 juveniles, 517 males and 504 females were analyzed (totalling 1,162).

From the middle Atlantic area (Table 2) 6.6% of the males and 0.8% of the females were fully developed; and while 76.7% of the females were immature or just beginning to develop 60.5% of the males were already in stages III and IV of development. Mean lengths of males ranged from 7.8 cm for immature individuals to 20.9 cm at stage V. Females ranged in length from 8.5 to 18.2 cm for maturities I through V, larger than the average of males at corresponding stages of development, in all but the Vth stage.

Loligo from the southern New England area (Table 3) were, overall, less mature than those from the middle Atlantic, with 42% of the males and 67% of the females being immature.

Again, a greater porportion of males were fully developed, than were females (8% versus 0% respectively).

Loligo found on Georges Bank (Table 4) were even less mature than those from southern New England, as would be expected during the winter months. In that area, 55% of the males and 86% of the females were immature. However, the mean size by maturity class was generally greater than comparable stages in the areas further to the south, ranging from 11.0 to 18 (stages I - IV) for males and from 11.3-18.3 (stages I - III) for females.

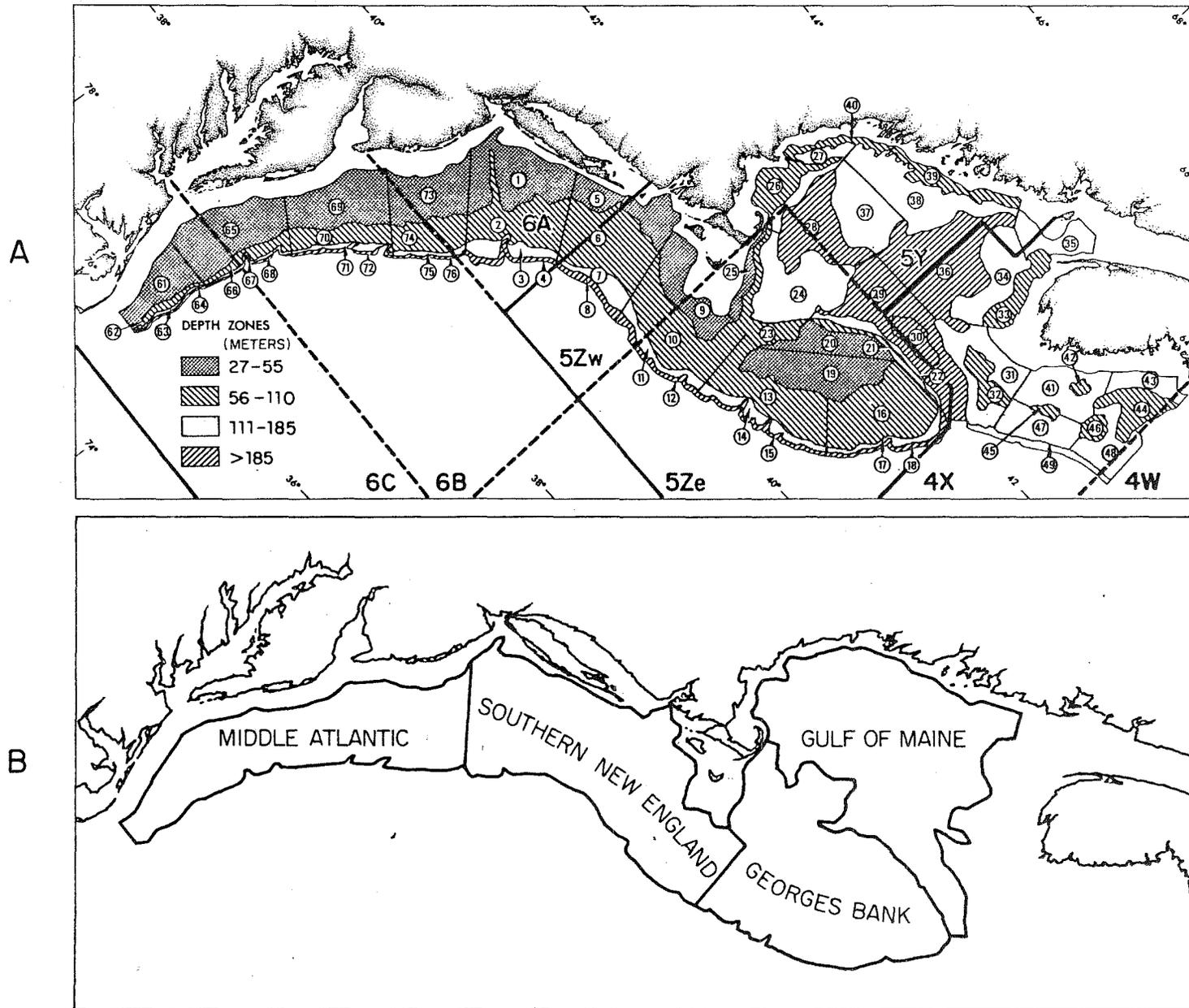


Figure 1. Survey strata (A) and location of areas (B) used in discussion of squid length frequencies.

Table 1. *Illex illecebrosus* length frequencies (per mille) for the Middle Atlantic area⁽¹⁾ by sex and maturity, from USSR R/V ARGUS survey, January-March, 1978.

Maturity stage length (cm)	Males						Females					
	I	II	III	IV	V	Total	I	II	III	IV	V	Total
1												
2												
3												
4												
5												
6												
7												
8							1.2					1.2
9	1.2					1.2						
10	8.1	1.2				9.3	4.6					4.6
11	8.1					8.1	5.8					5.8
12	7.0	4.6				11.6	10.5	1.2				11.7
13	17.4	16.3	7.0			40.7	13.9	3.5				17.4
14	8.1	25.6	25.6	4.6		63.9	18.6	17.4				36.0
15		17.4	24.4	32.5	1.2	75.5	25.6	32.5	1.2	1.2		60.5
16		1.2	40.7	33.7	5.8	81.4	13.9	44.1				58.0
17		2.3	16.3	75.5	37.2	131.3	1.2	68.5				69.7
18		1.2	2.3	59.2	37.2	99.9	2.3	84.8				87.1
19		1.2	1.2	3.5	10.5	16.4	1.2	74.3	2.3			77.8
20					1.2	1.2		11.6	3.5			15.1
21					1.2	1.2		4.6	2.3			6.9
22					1.2	1.2		1.2	2.3			3.5
23								1.2				1.2
24												
25										1.2		1.2
26												
27												
28												
29												
30												
Total (o/oo)	49.9	70.8	117.3	209.1	95.3	542.4	98.7	344.9	11.6	2.3		457.6
Mean length	12.1	14.1	15.4	16.8	17.7	15.9	13.9	17.4	19.9	20.0		16.7

(1) See Figure 1.

Table 2. *Loligo pealei* length frequencies (per mille) for the Middle Atlantic area⁽¹⁾ by sex and maturity stage, from USSR R/V ARGUS survey, January-March, 1978.

Maturity stage length (cm)	Males					Total	Females					Total	Juveniles
	I	II	III	IV	V		I	II	III	IV	V		
1													
2													
3													1.6
4													8.1
5	3.9	.7	.2			4.8	9.7					9.7	20.4
6	16.9		.2	.2		17.3	28.4	.2				28.6	11.1
7	21.7	1.4	.5			23.6	38.2					38.2	1.6
8	24.5	6.2		.2	.2	31.1	39.8	.9				40.7	
9	18.7	13.0	1.4	.7		33.8	34.7	6.2				40.9	
10	5.6	19.7	5.8	.9	.2	32.2	26.4	11.8	.2			38.4	
11	3.0	17.1	14.8	1.6	.2	36.7	17.6	23.4				41.0	
12	.9	14.6	17.1	4.9	.9	38.4	7.4	29.8	2.3	.2	.2	39.9	
13	.2	11.6	25.2	8.3	2.1	47.4	4.9	29.6	4.4			38.9	
14		5.1	30.5	7.4	1.4	44.4	3.7	29.6	8.1	.9		42.3	
15	.2	1.9	20.4	7.9	3.0	33.4	1.6	19.9	9.3	2.5	.7	34.0	
16		.9	21.0	8.8	2.1	32.8	.5	13.2	11.1	1.2		26.0	
17		1.4	17.3	8.8	2.3	29.8	.5	7.6	7.9	1.9	.5	18.4	
18		.2	11.3	10.4	1.6	23.5		4.6	4.4	2.3	.2	11.5	
19			7.9	9.0	1.4	18.3		.5	3.5	1.9	.5	6.4	
20			2.5	5.6	1.2	9.3		.7	.9	3.0	1.4	6.0	
21			.7	3.0	.5	4.2		.7	1.4	.9	.2	3.2	
22			.9	2.3	2.3	5.5			.9	.2	.2	1.3	
23			1.2	1.2	1.2	3.6			.9	.5		1.4	
24			.5	4.4	1.4	6.3			.7	.2		.9	
25				2.3	.5	2.8				.2		.2	
26				1.4	.7	2.1							
27				.5	1.2	1.7							
28				.5	.5	1.0				.2		.2	
29	.2				1.4	1.6							
30				.2	.9	1.1							
31					.7	.7							
32					.2	.2							
33					.2	.2							
34					.5	.5							
35					.2	.2							
36					.2	.2							
37					.5	.5							
38													
Total (o/oo)	96.0	93.7	179.5	90.4	29.6	446.3	213.2	178.8	56.0	16.2	3.9	510.9	42.8
Mean Length	7.8	11.5	14.6	17.2	20.9		8.5	13.2	16.1	18.1	18.2		5.1

(1) See Figure 1.

Table 3. *Loligo pealei* length frequencies (per mille) for the southern New England area⁽¹⁾, by sex and maturity stage, from USSR R/V ARGUS survey, January-March, 1978.

Maturity stage length (cm)	Males					Total	Females					Total	Juveniles
	I	II	III	IV	V		I	II	III	IV	V		
1													
2													
3													6.0
4							1.7					1.7	52.1
5	1.7					1.7	23.1					23.1	77.0
6	19.6					19.6	43.6					43.6	46.8
7	33.3	1.7				35.0	57.2					57.2	3.4
8	17.9	2.6				20.5	35.9					35.9	
9	34.2	2.6			.9	37.7	41.8					41.8	
10	23.9	6.8	.9			31.6	46.1					46.1	
11	12.0	13.7	4.3	3.4		33.4	23.1	4.3				27.4	
12	3.4	12.8	6.0	9.4	1.7	33.3	17.9	12.0				29.9	
13		11.1	11.1		2.6	24.8	11.1	15.4	1.7			28.2	
14		9.4	1.7	1.7		12.8	1.7	19.6	1.7			23.0	
15		3.4	5.1		.9	9.4	3.4	19.6				23.0	
16		3.4	8.5	.9	.9	13.7	.9	27.3	1.7			29.9	
17		2.6	9.4		1.7	13.7	.9	21.3	.9			23.1	
18			11.1	.9	1.7	13.7	1.7	8.5				10.2	
19			5.1	1.7	2.6	9.4		6.8				6.8	
20			10.2	.9	.9	12.0		3.4	3.4			6.8	
21			3.4	.9	.9	5.2			2.6	.9		3.5	
22			4.3		3.4	7.7		.9				.9	
23			.9		.9	1.8		.9	2.6			3.5	
24			.9	1.7	2.6	5.2							
25					.9	.9							
26				.9	.9	1.8							
27					.9	.9							
28													
29					.9	.9							
30					1.7	1.7							
31													
32					.9	.9							
33					.9	.9							
34													
35													
Total (o/oo)	146.0	70.0	82.8	22.2	28.2	349.2	310.0	140.1	14.5	.9		465.4	185.3
Mean length	8.4	12.2	16.6	12.1	10.8	12.5	8.6	15.1	18.6	(21.0)		11.0	4.9

(1) See Figure 1.

Table 4. *Loligo pealei* length frequencies (per mille) for the Georges Bank area⁽¹⁾, by sex and maturity stage, from USSR R/V ARGUS survey, January-March, 1978.

Maturity stage length (cm)	Males						Females					Juveniles	
	I	II	III	IV	V	Total	I	II	III	IV	V		Total
1													
2													
3													4.3
4													24.1
5	.9					.9	2.6					2.6	41.3
6	4.3					4.3	12.0					12.0	25.8
7	10.3					10.3	35.3					35.3	21.5
8	25.8	.9				26.7	31.8					31.8	2.6
9	31.8	.9			.9	33.6	32.7					32.7	1.7
10	31.8	4.3	.9			37.0	43.0	1.7				43.0	
11	42.2	8.6	1.7			52.5	55.1	2.6				57.7	
12	37.9	14.6	1.7		1.7	55.9	43.0	5.2				48.2	
13	20.7	20.7	6.9		2.6	50.9	49.9	10.3				60.2	
14	20.7	25.8	4.3			50.8	28.4	7.7				36.1	
15	12.9	19.8	5.2	.9		38.8	31.8	8.6	.9			41.3	
16	6.9	26.7	.9			34.5	6.9	8.6				15.5	
17		11.2	6.9			18.1	6.9	6.0				12.9	
18		7.7	2.6			10.3		5.2				5.2	
19		3.4	5.2			8.6		2.6				2.6	
20			3.4			3.4		.9	1.7			2.6	
21		1.7	3.4	.9		6.0							
22			.9			.9		.9				.9	
23													
24													
25					.9	.9							
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
Total (o/oo)	246.1	146.3	43.9	1.7	6.0	444.0	379.4	60.2	2.6			442.2	121.3
Mean length	11.0	14.4	16.2	18.0	13.9	12.7	11.3	14.9	18.3			11.6	5.4

(1) See Figure 1.