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Some Field Data on Fecundity of *Illex illecebrosus* (LeSueur)

by

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Introduction

There are few records from nature of sexually mature female *Illex illecebrosus* because the major concentrations of maturing animals usually migrate away from their feeding grounds in late fall to unknown areas to spawn. Late stages of maturing individuals have been observed in late autumn surveys and early winter surveys (Amaratunga, 1980) on the Scotian Shelf edge before this migration. On the other hand, few late maturing stages have been observed in late summer (Dupouy, 1981) while a few fully mature females have been recorded from spring and early summer cruises (Squires, 1967; Mercer and Paulmier, 1974, Lipinski, 1979; reviewed by Dawe and Drew, 1981). From nature, there are only two records of mated females, in June (Mercer and Paulmier, 1974) and in July (Hamabe *et al.*, 1974).

Estimations of fecundity have been reported from laboratory observations on captive populations (O'Dor *et al.*, 1980) and on two mature females caught in the field (Lipinski, 1979; Dawe and Drew, 1981). There is considerable variation between fecundity estimates from laboratory and field mature females. The effect of laboratory conditions on the animal and the effects of inducing precocious maturity are unknown and it is generally accepted that estimations of fecundity from field specimens is more desirable.

During the August/September 1981 squid survey on the Scotian Shelf on the French R/V *Thalassa* (Dupouy and Minet, 1982) some advanced maturity stages of females were encountered. In this paper we examine fecundity and size of eggs by two different methods and compare them with data reported by other authors.

Material and Methods

Six, maturing and mature, females were encountered in the cruise, one of them being mated. Table 1 gives locations of capture and size of animals. After standard morphometric measurements, samples of 20 fresh eggs, were removed and measured from the proximal, medial and distal end of the ovary and oviduct from female No. 6 on board the vessel.

The balance of the intact gonads were then fixed in seawater Bouin's. After the cruise, analyses of the ovary and oviducts were made in 70% alcohol as follows:

a) First method - one specimen (female No. 5 in Table 1), with mantle length 206 mm and NGL 95 mm was dissected submersed in 70% alcohol (Pl. 1) to remove ovary and oviducts. The ovary and the two oviducts were allowed to dry for 5 minutes on filter paper and each weighed separately. Representative thin sections were then taken from each and weighed taking care to avoid excessive evaporation. These sections taken from the ovary and both oviducts were then carefully teased out into small pieces and allowed to dry in a petri dish for 24 hours. The eggs were then easily separated on a filter paper and placed in 70% alcohol before counting them under a binocular microscope.

b) Second method - females No. 1 to 4 were entirely fixed in seawater Bouin's. Left and right oviducts and the ovary were subsequently dissected in 70% alcohol and weighed separately after drying for 5 minutes on filter paper. Fifty eggs were measured from each of the proximal, medial and distal areas from each oviduct and the ovary. Mean measurements were provided for eggs from each area in the oviducts and ovary.

A sample of tissue from the proximal, medial and distal areas of each oviduct and the ovary were removed and weighed separately. The number of eggs in each of these samples were then counted. Mean size of eggs, number of eggs in a sample of known weight and total weight of oviducts and ovary were then used to obtain number of eggs in each oviduct and ovary.

Results

Characteristics of the females under this study and the location of their capture are shown in Table 1. Locations of capture are also shown in Fig. 1. Table 2 lists the measurements of the eggs obtained from the ovary and oviducts.

Size from ovary fresh eggs ranged from 0.61 to 0.91 mm. Size of fixed eggs from ovary ranged from 0.58 to 0.76 mm. Method (A) animal No. 5 gave a size range from 0.4 to 0.9 mm. Pl. 2 shows some fixed eggs from animal No. 5. Similar results were obtained from oviduct, and egg sizes ranged from 0.58 to 0.84 mm.

Table 3 shows the estimated number of eggs, from ovary and both oviducts as well as the number of eggs per gram of body weight.

Discussion

All mature females encountered were somewhat smaller than the asymptotic sizes reported for female *I. illecebrosus* (Amaratunga, 1980). Thus they were probably precociously mature females in the population or they represented a group of late spawners. However, since very few such females were encountered these were considered to be unusual to the major component of the population.

Eggs measured from fresh samples were comparable to laboratory observations reported by Durward *et al.* (1980). They were distinctly ovoid in shape, but the micropyle at the animal poles were not discernible. Egg sizes contracted significantly when fixed in Bouin's and alcohol (5 to 8% smaller).

Fecundity estimation among the five animals used for the egg counting varied considerably. Although it is known that egg size is independent of size of animal, the number of eggs produced by a female is independent on the size of female. In captive females they were estimated to produce about 1000 eggs per gram of body weight (O'Dor *et al.*, 1980). In our studies the females ranged from 120 g to 210 g. The number of counted eggs ranged from 13,470 to 71,458, which is in order of 100 to 500 eggs/g of squid body weight. Similar field observations reported by Lipinski (1979) are again from females with 288 g and 231 g (233 mm and 220 mm on mantle length) with estimated egg numbers at 39,400 and 31,100 respectively. These estimations are then considerably lower than those observed in the laboratory.

It is known that mature animals ready to spawn usually stop feeding (Durward *et al.*, 1979). The females observed in this study also showed no gut contents except for animal No. 1 which had a small amount of food in the stomach. However, a cursory observation of all *Illex* caught shows that the most of them had little gut contents.

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Table 1. Location and morphometrics taken for this study.

Anim. No.	Location	Depth (m)	ML (mm)	Total weight (g)	NGL (mm)
1	44°23'N 61°54'W	165	215	150	57
2	44°09'N 63°07'W	172	190	120	68
3	43°28'N 63°32'W	162	220	210	61
4	44°11'N 63°12'W	169	210	-	87
5	43°16'N 65°15'W	145	206	-	95
6	44°24'N 59°52'W	118	210	170	80

Table 2. Measurements made on squid eggs obtained from ovary and oviduct.

Animal No.		Egg Size (mm)								
		Ovary			Left oviduct			Right oviduct		
		prox.	med.	dist.	prox.	med.	dist.	prox.	med.	dist.
1	Fr									
	Fx	0.73	0.70	0.76	0.69	0.70	0.94	0.60	0.75	0.68
2	Fr	0.61	0.66	0.70						
	Fx	0.72	0.66	0.69	0.63	0.58	0.64	0.66	0.60	0.64
3	Fr									
	Fx	0.71	0.65	0.62	0.75	0.75	0.72	0.70	0.75	0.66
4	Fr	0.82	0.91	0.85						
	Fx	0.65	0.64	0.58	0.77	0.70	0.73	0.68	0.67	0.70
5	Fr									
	Fx	0.4 to 0.9								
6	Fr	0.68	0.67	0.62						
	Fx									

Fr = fresh, Fx = Fixed in Bouin's and 70% alcohol.

Table 3. Results of eggs counting in ovary and oviduct.

Animal No.	Length mantle (mm)	Estimate Number of Eggs			No. of eggs per g of body weight
		Ovary	Both oviducts	Total	
1	215	14,594	7,540	22,114	147
2(a)	190	9,188	4,282	13,470	112
3	220	28,536	4,298	32,834	156
4	210	18,510	7,448	25,958	140(c)
5(b)	206	62,536	8,917	71,458	500(c)

(a) A mated female with a bundle of spermatophores inside the mantle near gonoduct outlet.

(b) Egg counting for female No. 5 was made by different method than for female 1 to 4 (see text).

(c) Value estimated after body weight was deducted from a length-weight key.

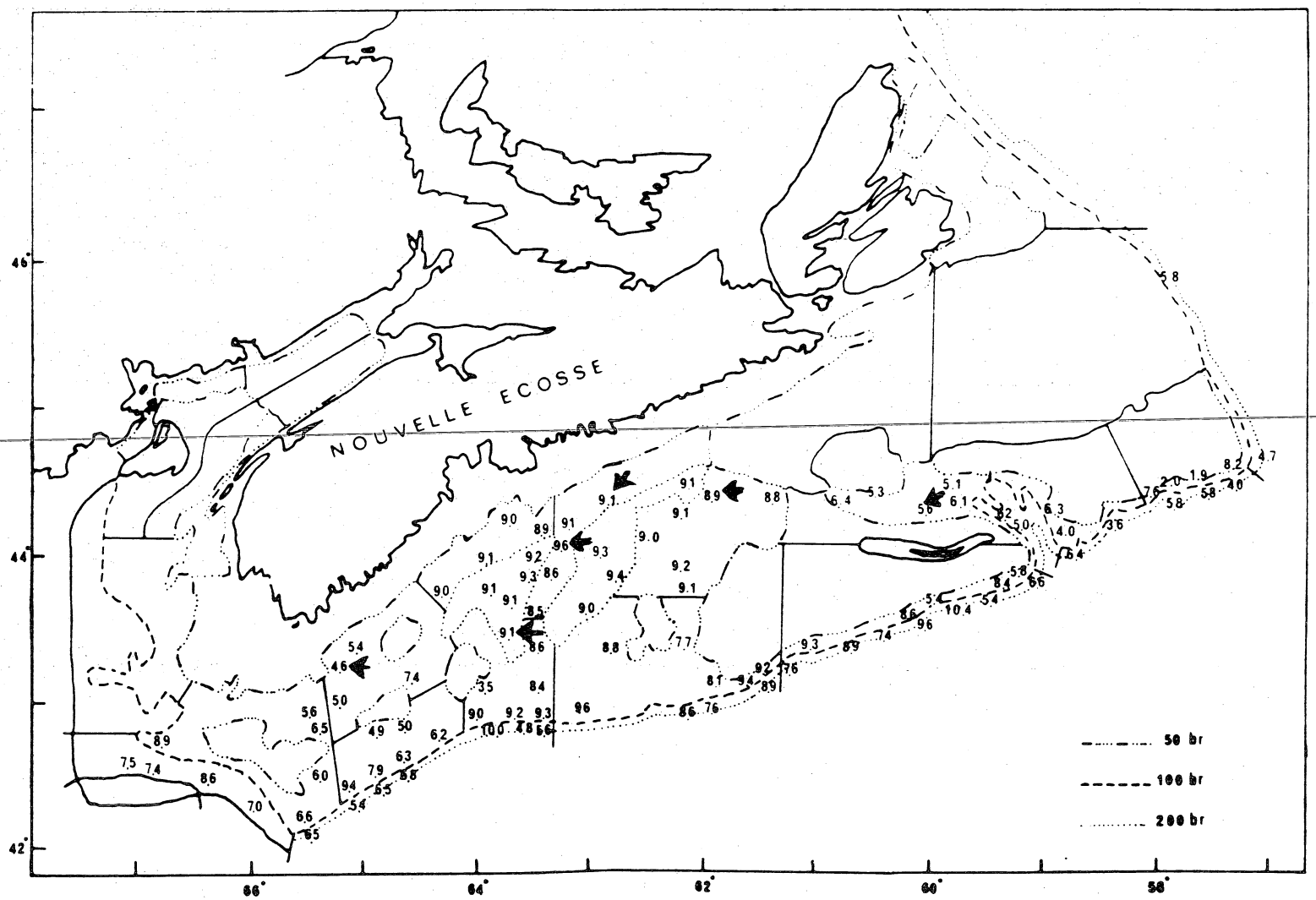

Fig. 1. Locations where mature females were captured (indicated by arrow heads) during the R/V *Thalassa* survey on the Scotian Shelf.

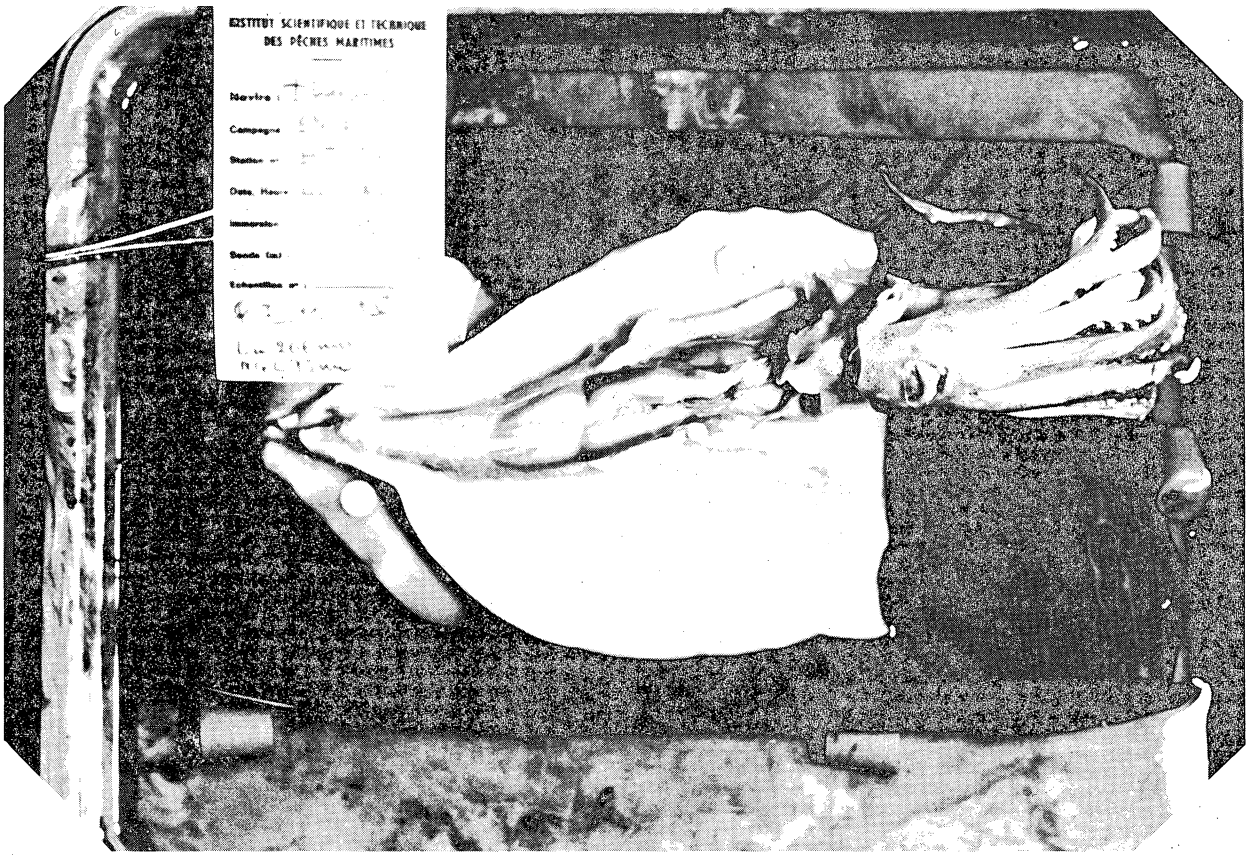

Plate 1. Mature female (No. 5 in text)

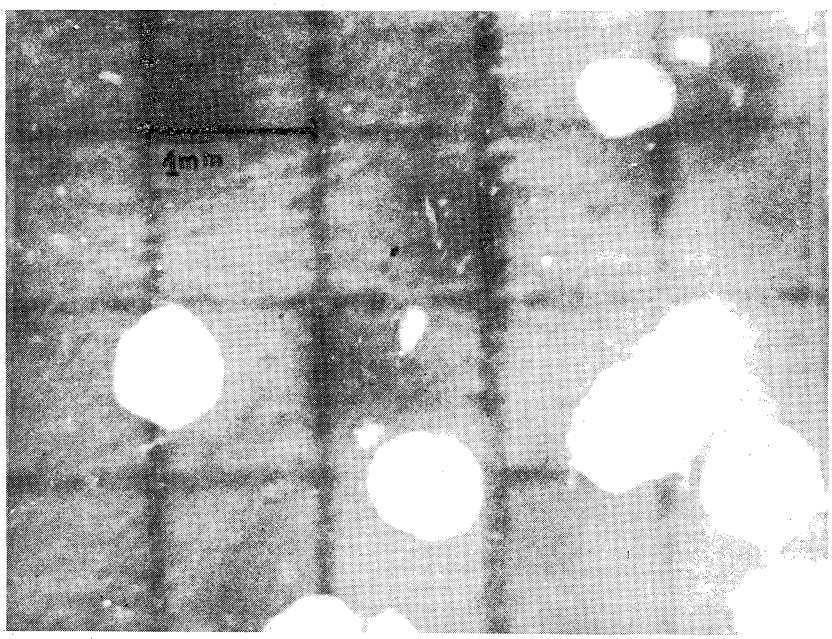

Plate 2. Representative eggs from the mature female No. 5.