Table 2. CROSSES AND ANALYSIS OF OFFSPRING TO DEMONSTRATE THE INHERITANCE OF THE ESTERASE ENZYME VARIANTS IN PUPAE OF BEES
Genotypes within parentheses are deductions that fit the results

No. of the queen	Type of cross		Offspring						Drones	
	Queen	Drone	Est^S	Est^S	Est^S	Est^F	Est^F	Est^F	Est^S	Est^F
147-1-68*	(Est^S Est^F)	—	—	—	—	—	—	—	14	15
43-4-69	(Est^S Est^S)	Est^F	0	28	0	28	0	—	—	—
54-7-68	(Est^S Est^S)	Est^F	0	28	0	—	—	—	—	—
146-4-68	(Est^S Est^F)	Est^F	0	16	12	—	—	—	—	—
174-2-68	(Est^S Est^F)	Est^F	0	12	16	—	—	—	—	—
84-4-68	(Est^S Est^F)	Est^F	0	13	15	—	—	—	—	—

* This queen was not artificially inseminated, but her drone analysis indicated she was heterozygous.

of either system, the esterase locus is undoubtedly polymorphic with almost equal allele frequencies.

Other biochemical systems will be studied and we hope to relate the findings to the populational frequency of these genes.

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M. A. MESTRINER

Department of Genetics,
Faculdade de Medicina de
Ribeirão Preto,
Ribeirão Preto, São Paulo, Brazil.

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In corpore Fertilization and Development in the Sea Urchin, *Arbacia punctulata*

HERMAPHRODITISM in echinoids is rare. Rarer still is the occurrence of ovotestes in the bisexual animals. This is the first reported case of *in corpore* fertilization and development in the sea urchin, *Arbacia punctulata*.

In July 1968, 150 *Arbacia punctulata* were collected from the waters near the Osborn Laboratories of Marine Sciences, Brooklyn, New York. When subjected to electric shock, one of the urchins exuded the normally reddish eggs from four of the gonopores and a detectably lighter, pink ooze from the fifth gonopore. The hermaphrodite was normal

Fig. 1. Eggs in various stages of cleavage within the tubules of the ovotestis.

Fig. 2. Gastrula and pluteus larvae developing *in corpore*.

in external appearance and of average size (22.5 mm in diameter, without spines). Using controlled electrical stimulation it was possible to collect the gametes separately from each of the gonopores. Microscopic observations of the liberated eggs from four of the gonads revealed normal looking unfertilized eggs. The fifth gonad released unfertilized eggs, embryos in various stages of development and motile sperm. The unfertilized eggs from the ovotestis were self-fertilized immediately on immersion in seawater and developed normally. Approximately 20 per cent of the released eggs were in stages of development ranging from early cleavage to actively swimming blastulae, gastrulae and plutei. Most of the plutei were abnormally formed, either lacking or having poorly developed anal arms. The crowded conditions in the gonad probably accounted for the malformations observed in the emerging plutei. The released gastrulae, blastulae and cleavage stages developed into normal plutei.

Unfertilized eggs from the other four gonads developed normally when outcrossed with sperm from a male urchin. Sperm was obtained from the ovotestis by allowing the eggs to settle to the bottom in a small amount of seawater and by avoiding swimming forms while pipetting off a small amount of solution. The sperm was used to fertilize eggs from the other four gonads and from another female. Although the percentage of fertilization was low (30 per cent), all fertilized eggs developed normally. The low percentage of fertilization was a consequence of the relative paucity of available spermatozoa.

Histological analyses confirmed these observations. Four of the gonads were pure ovaries and the fifth an ovotestis. The ovotestis portion was not restricted to proximal medial or distal areas but extended the full length of the gonad. Approximately half of the ovotestis consisted of tubules containing only unfertilized eggs. The other half consisted of tubules made up predominantly of eggs, some in various stages of embryogenesis, and a rather diffuse arrangement of sperm. No tubule was observed which was solely testis or consisted predominantly of testis. Every developmental stage, from two cell to pluteus larvae, was observed *in corpore*. Figs. 1 and 2 show cleavage stages, gastrulae and plutei developing within the tubules.

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GEORGE D. RUGGIERI

Osborn Laboratories of Marine Sciences,
New York Aquarium,
New York Zoological Society,
Brooklyn, New York 11224.

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