THE EARLY LARVAL DEVELOPMENT OF *MEMBRANIPORA SEURATI* (CANU) and *ELECTRA CRUSTULENTA* (PALLAS), POLYZOA

by

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Résumé

Des observations sur des colonies vivantes d'*Electra crustulenta* (Pallas) et *Membranipora seurati* (Canu) montrent qu'elles diffèrent, non seulement par leurs caractères adultes mais aussi par leur développement larvaire. Les deux espèces diffèrent par la date du début de la période de reproduction en Grande-Bretagne et par la taille des œufs. La capsule de l'œuf d'*E. crustulenta* se rompt à la seconde division embryonnaire, celle de *M. seurati* reste intacte jusqu'à la libération de la larve qui est différente de forme dans les deux espèces. Il est vraisemblable que la larve de *M. seurati* diffère également de celle d'*E. crustulenta* par sa taille plus petite, l'absence d'une coquille bivalve et une vie pélagique plus courte.

Membranipora seurati differs from *E. crustulenta,* with which it has been frequently confused, in its adult characters (Hastings MS), and there have been indications that it might also differ in its reproduction (Cook, 1961). Specimens of both species found growing together on the same substrates at two localities were taken, alive, to the British Museum (Natural History) and kept at an average temparature of 17°C in tanks of aerated water from their original habitats. The specimens were obtained: 1. In June 1960, on mussel shells, from water intake tanks at Roosecote Power Station, Barrow-in-Furness (temperature 16°C, salinity 8.45‰). 2. In July 1960 and June 1961, on *Ruppia,* from New England Creek, Essex (temperature 17.4°C and 15°C, salinity 22.7‰ and 22.5‰ respectively). The colonies of the two species were watched regularly and eggs were pipetted, immediately on extrusion, into separate series of glass dishes for observation of development.

1. *Membranipora seurati.* In 1960 the majority of the intertentacular organs seen were not fully developed and egg laying was not seen until 4 days after collection from both localities; in 1961 the colonies were in full reproduction when collected. During extrusion of the egg the tentacular crown was rarely and only slightly deflected from the normal open position. Eggs passed singly into the base of the intertentacular organ and were extruded at intervals of approximately

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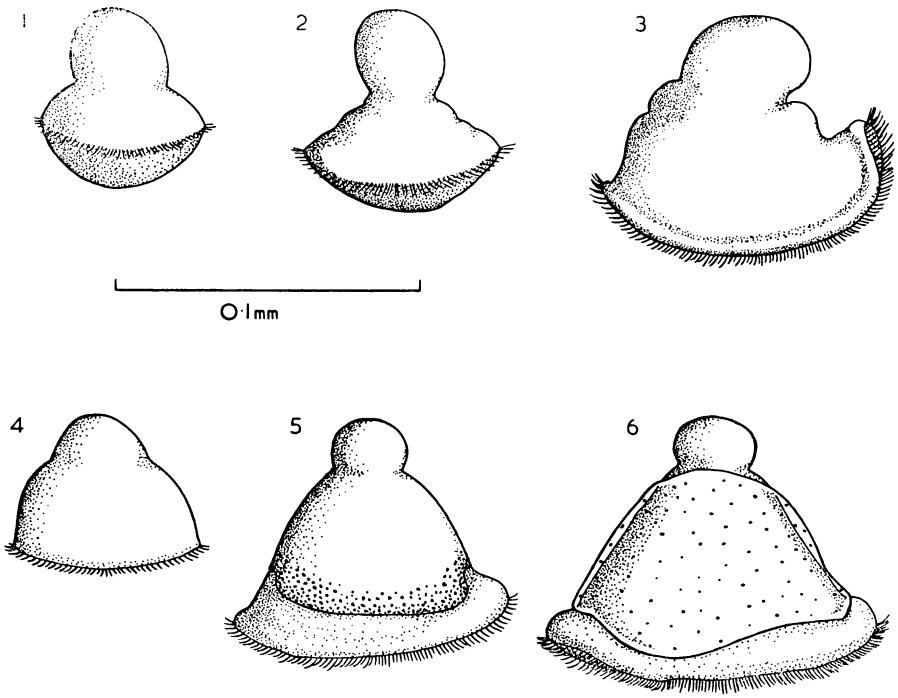
5 minutes. The eggs (average length 85μ) were oval and were contained by a transparent capsule; they sank immediately to the bottom of the container. On 4 occasions eggs were readily ingested by neighbouring polypides, although they were larger than the particles normally accepted as food.

Primary division occured within 1 hour of extrusion, divisions thereafter up to the 32-cell stage at approximately half-hourly intervals. Further development of the embryo was difficult to follow, but after gastrulation, and about 8 hours after extrusion, the embryo rotated within the capsule. The embryo then became pear-shaped and across the diameter of the larger end a groove developed which widened and finally became circular, forming a ciliated ring, the cilia of which were active before release of the larva. At this stage the capsule ruptured and the young larva, similar in shape to a "button mushroom" was released (fig. 1). During the next 6-8 hours the apical region enlarged and elongated (fig. 2), 4 hours later the ciliated rim had developed the curious turned up edge behind the exhalant aperture. After a further 12 hours, the average dimensions were 100μ broad and 75μ high (fig. 3), and the apical region was large and not ciliated. The larva was less flattened from side to side than the usual membraniporine *Cyphonautes,* and had no shell; the gut was visible, but little detail could be seen. The general organisation appeared very similar to that shown in the figures of shell-less Ctenostomatous *Cyphonautes* reproduced by Marcus (1940, text-figs. 181-183). The larval life may be shorter than that of previously known *Cyphonautes*; after three days swimming and feeding, during which it grew no larger, the shape of the larva altered to a rounded mass with rotary movement, the cilia still being active. This stage had a duration of 24 hours. In 3 cases there was an apparent attempt at settlement, with an extrusion of gelatinous material on to the substrate, upon which the apical region rested. It is not yet known whether this was normal or morbid behaviour, as none of the settled larvae metamorphosed successfully. It is possible that the larva of *M.seurati* may develop further before settlement under natural conditions, but it does not appear to have been described before, probably having been overlooked because of its small size.

2. *Electra crustulenta.* Although fully grown larvae identified with *Cyphonautes barroisi* Lohmann were known to metamorphose into *Electra crustulenta* (Cook, 1961), the early development of the larva had not been seen. In Britain, *E.crustulenta* begins breeding early, fully developed intertentacular organs and larvae being found in March. In June and July 1960 few intertentacular organs or eggs were seen, but in 1961 the specimens were still in full reproduction in June. The polypide was deflected during extrusion of the eggs, but not to such a marked degree as noted in 1960 (Cook, 1961). The eggs (average length 110μ) were extruded at intervals of approximately 10 minutes.

Primary division occurred within the first hour, secondary division half an hour later. The capsule containing the egg then ruptured, but by the time a 64-cell blastula was formed a second

capsule had appeared round the embryo. Further development was very similar to that seen in *M.seurati*. The larva released after rupture of the second capsule 12 hours after extrusion was 60μ broad and 50μ high, and had no shell (fig. 4). At 15 hours the apical region was distinct and the larva had become flattened from side to side. At 63 hours a dark brown chitinous layer had been differentiated from the part of each lateral surface beside the ciliated rim (fig. 5). The larva was then 95μ broad and 80μ high. 48 hours later the chitinous area had extended further toward the apical region, and 116 hours



FIGURES 1 à 6.

Development of *Cyphonautes* larvae, from sketches of narcotised specimens.

1-3, *Membranipora seurati* 1, 9 hours. 2, 16 hours. 3, 32 hours after extrusion of the egg.

4-6, *Electra crustulenta* 4, 12 hours. 5, 63 hours. 6, 116 hours after extrusion of the egg.

after extrusion the dark chitinous bivalve shell of *C.barroisi* was nearly completely developed (fig. 6). The larva was then 105μ broad and 95μ high, the height being proportionally greater than in fully grown larvae from the plankton (Cook, 1961, text-fig. 2). Atkins (1955: 442 and 444, text-figs. 1 and 3) described a similar change in shape in the growing larvae of *Electra pilosa* Linn. and *Membranipora membranacea* (Linn.). Neither the protuberances on the edge of the valves nor the minute sand grains present on the surface of *C.barroisi* larvae obtained from tow-nettings were seen.

These observations confirm the discrimination of *M.seurati* and *E.crustulenta* on the characters of the adult zooecia, and may be summarised as follows:—The two species differ in the time of onset of the breeding season (in Britain); the eggs of *E.crustulenta* are larger than those of *M.seurati,* which, as the intertentacular organs of the two species are of similar dimensions, may account for the apparent greater ease with which the eggs of *M.seurati* are extruded. The primary egg capsule of *E.crustulenta* ruptures at the second division, whereas that of *M.seurati* remains intact until release of the larva, which is different in shape in the two species. If the attempted settlement of the *Cyphonautes* of *M.seurati* was normal and not premature its larva further differs from that of *E.crustulenta* in its small size, absence of shell and shorter free-swimming life.

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Summary

Observations on live colonies of *Electra crustulenta* (Pallas) and *Membranipora seurati* (Canu) show that they differ not only in their adult characters but also in larval development. The two species differ in the time of onset of the breeding season (in Britain), and in the size of the eggs. The primary egg capsule of *E. crustulenta* ruptures at the second embryonic division, that of *M. seurati* remains intact until release of the larva, which is different in shape in the two species. There is some evidence that larva of *M. seurati* may also differ from that of *E. crustulenta* in its smaller size, absence of bivalve shell, and shorter free-swimming life.

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