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A COMPARISON OF DIFFERENT CHORIONIC ADHESIVE DEVICES IN MAYFLY EGGS (INSECTS, EPHEMEROPTERA)

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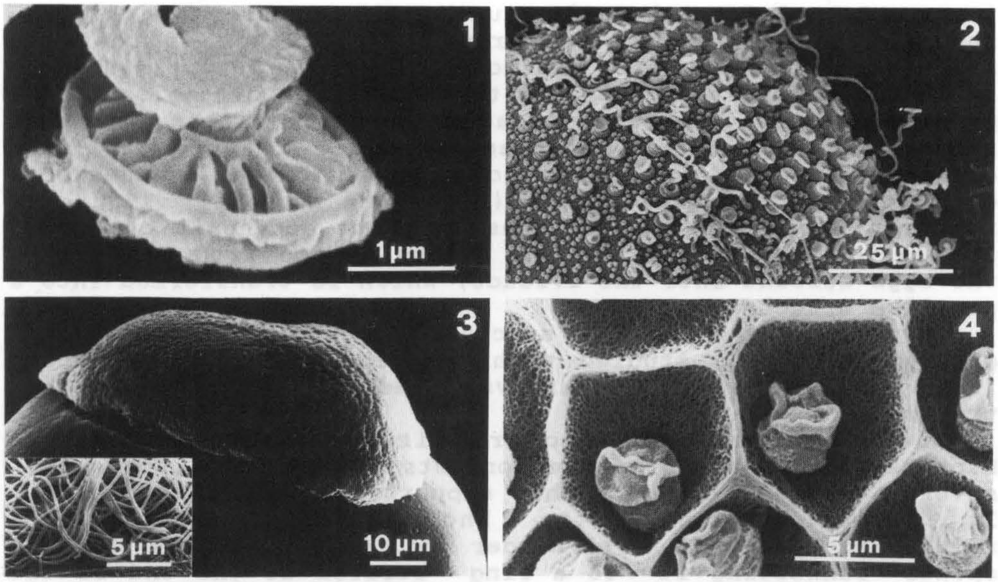
Several studies have been devoted to investigating the egg shell in this ancient insect order (Degrange, 1960; Koss and Edmunds, 1973). Indeed chorionic pattern represents an important tool for taxonomic studies and provides insight into the forward strategies to improve the survival of the eggs after deposition in water (Gaino and Mazzini, 1987; 1988).

In Ephemeroptera, oogenesis takes place in ovarioles of the panoistic type constituted by a series of follicles, arranged in a linear sequence of increasing size, in which follicle cells are involved in egg envelope deposition and synthesis of complex chorionic projections (Gaino and Mazzini, 1990). It is worth stressing that in these insects oogenesis occurs in the larval stage, and, before nymphs emerge from the water, the eggs descend into the oviduct, which is transformed into a sac-like structure.

Eggs of several mayfly species, encompassed in different genera, have been studied with scanning electron microscopy (SEM) after fixation in Karnovsky medium and critical point treatment.

The most complicated chorionic devices are found in Heptageniidae; each of these consists of a thread composed of several twisted filaments that support a terminal knob (KCT). In *Ecdyonurus venosus* the knob has a round shape, is reinforced by a peripheral border and is supported by about 20 spokes connecting it to a ring located at the end of the thread underneath (Fig. 1). Such devices tend to be concentrated at the egg pole whereas on the remnant of the chorionic surface they are more scattered (Fig. 2). KCTs are coiled on their axis and, at egg deposition in water, the terminal knob adheres to the substratum. A similar organization is present in some species of *Rhithrogena* and *Electrogena*. In Ephemerellidae, as in *Ephemerella ignita*, adhesive devices like KCTs are present but they are in reduced number and the threads are very thin. The limited adhesive properties are balanced by the coexistence of a polar structure, the epithema (Fig. 3), composed of a countless number of filaments collectively coiled to form a compact mass. At deposition, epithema swelling allows filament extension and egg adhesion. The presence of epithema at both egg poles is found in Caenidae and Pothamantidae, thus emphasizing the efficiency of such devices in preventing eggs from being dragged away. By contrast, in several other families no specialized chorionic devices are present and egg adhesion is allowed by mucous material contained in chorionic ribs, as in some Leptophlebiidae, or in enveloping shell surface. The occurrence of adhesive strands is observed also in several species of Baetidae, and probably represents a simplified system to assure egg settlement. By contrast, in *Centroptilum* the chorion consists of polygons arranged side by side, each including a protuberance that ends in a thin folded lamina (Fig. 4).

Even though the efficiency of the chorionic devices in preventing mayfly egg drift is an intriguing question, the ultrastructural investigations on chorionic pattern increasingly reveal the high complexity of such devices. Surely they are related to an adaptation strategy.



Different chorionic adhesive devices (Figs 1-4) - A terminal knob of a coiled thread (KCT) (1) and KCT distribution on the egg surface (2); apical epithema (3) constituted by a filamentous network (inset); protuberances, terminating in a thin lamina, are individually lodged in a chorionic cavity (4). 1,2: *Ecdyonurus venosus*; 3: *Centroptilum pennulatum*; 4: *Ephemerella ignita*.

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