

**UNUSUAL EGGSHELL STRUCTURES IN *ICTINOGOMPHUS AUSTRALIS* (SELYS) (ANISOPTERA: GOMPHIDAE)**

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Eggs of *I. australis* carry a well developed surface reticulation and a posterior cone of filaments forming an attachment organ. The eggs are somewhat similar to those previously recorded from *I. ferox* (Rambur), but are seen here in greater detail using scanning electron microscopy.

**INTRODUCTION**

The majority of odonate eggshells are entirely smooth, or carry faint impressions of follicle cells (TILLYARD, 1917; CORBET, 1962; HINTON, 1981). Known exceptions are limited to trabeculate structures of possible respiratory function in subaerial eggs of two libellulid species (MILLER & MILLER, 1985; MILLER, 1987), to egg strand structures of probable extrachorionic origin in one libellulid and six corduliid species (cf. WINSTANLEY, 1981) and, amongst Gomphidae, to hexagonal surface patterning and coiled posterior filaments in *Lestinogomphus africanus* (Fraser) (GAMBLES, 1956; GAMBLES & GARDNER, 1960) and in *Ictinogomphus ferox* (Rambur) (CORBET, 1962 pp. 41-43). A further report (TILLYARD, 1911; CORBET, 1962) of surface sculpturing in eggs of *Cordulephya pygmaea* Selys (Corduliidae: Cordulephyainae) is in error, eggs of this species have extremely thin outer shells which often crumple in an irregular manner when subjected to stress, but the eggshell itself is smooth, without markings (TRUEMAN 1989). Discovery of complex surface sculpturing and coiled posterior filaments in a third ictinogomphine species is therefore significant.

## METHOD

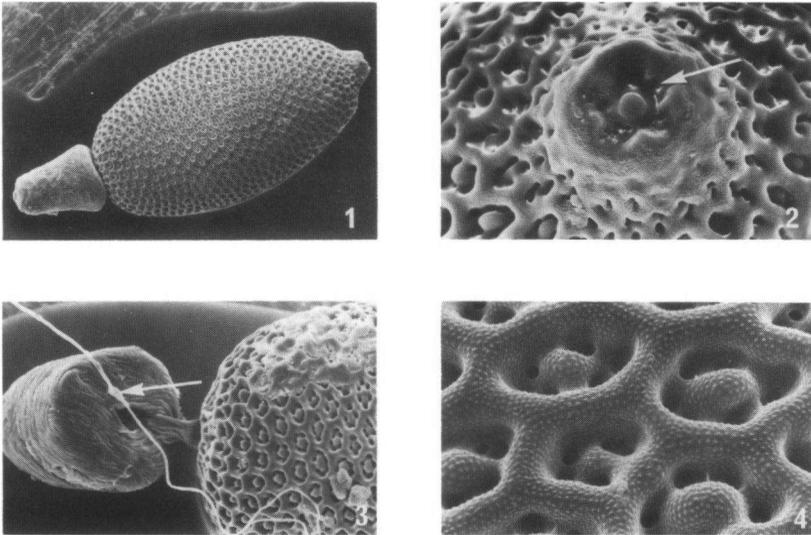
Eggs were obtained as dried specimens attached to the terminal segments of a pinned adult female. Eggs were soaked off in water, dehydrated in ethanol, air dried, mounted on stubs, gold coated and examined in a Cambridge 360 scanning electron microscope (SEM). Some eggs were sectioned and some broken with tweezers to reveal structural detail.

## SPECIMENS EXAMINED

Eggs (N=22) from a single female in the Australian National Insect Collection (ANIC), Canberra; label data "Island Lagoon. Magela Ck. NT. 18-XII-1978, J.F. Hutchinson".

## RESULTS

Egg (Fig. 1) ellipsoidal, length 0.69-0.70 mm from base of posterior cone to tip of micropylar projection, width 0.36-0.37 mm. Micropylar projection (Fig. 2) about 38  $\mu\text{m}$  high, diameter 85  $\mu\text{m}$  basally, 50  $\mu\text{m}$  apically; micropyles 5 (one arrowed in Fig. 2), arranged radially around a central boss on the distal surface. A sessile; truncate cone (Figs 1, 3), of approximately 12-15 coiled filaments, located at posterior pole. Filament length about 30  $\mu\text{m}$  when fully uncoiled; filament diameter 3.0  $\mu\text{m}$ ; filaments circular in cross section and of uniform thickness,



Figs 1-4. Scanning electron micrographs of the egg of *Ictinogomphus australis* (Selys): (1) Egg with posterior cone intact; — (2) Apical view of micropylar region, one micropyle arrowed; — (3) Posterior cone detail with filaments partially uncoiled, part of one filament from a second egg arrowed; — (4) Surface reticulation.

occasional irregularities in examined material (e.g., the notch on the overlying filament seen in Fig. 3; arrowed) attributable to deposits of extrachorionic material. Uncoiling takes place from the inside and base of cone, progressing toward tip; the outer, distal part is last to unwind.

Whole egg surface, except micropylar projection, with a strongly developed hexagonal reticulation, each cell containing 3-8 irregular, and/or irregularly spaced, deep indentations around a central boss (Fig. 4). Indentations do not penetrate chorion and do not form a connected meshwork either within or between cells. Exposed surfaces finely denticulate (Fig. 4); boundaries of follicle cells visible, especially in the micropylar region, as narrow lines of smoother texture (Fig. 2).

## DISCUSSION

Eggs of *I. australis* appear similar to those of *I. ferox* figured from light microscopy by CORBET (1962, p. 43), but are distinguishable by the shorter and more rounded micropylar projection and the truncate, sessile posterior cone. The egg of *I. ferox* figured in CORBET (1962) shows a more complete, stalked cone, while a brief note on this species in GAMBLES & GARDNER (1960) describes the posterior structure as a fringe of filaments around a central boss. Eggs of *Lestinogomphus africanus* have a single filament coiled against the eggshell and a somewhat different micropylar structure (GAMBLES & GARDNER, 1960), which suggests that this species is less closely related to either of the *Ictinogomphus* species than the *Ictinogomphus* species are to each other. The eggshells of *I. ferox* and *L. africanus* should be reexamined under SEM to allow detailed comparison with the present findings, but indications are that eggshell morphological characters may be of taxonomic interest in these three species and possibly more widely within Ictinogomphinae.

GAMBLES & GARDNER (1960) suggested the posterior filaments may function as a current resisting organ, which presumably means as a holdfast or as a means for limiting the speed of movement of the egg through water, and explained their unlikely presence in *I. ferox*, a pool and large river breeder, by suggesting a rheophilic ancestry. *I. australis* is also thought to be a pool breeder, being "usually met with on the borders of billabongs and lagoons" (FRASER, 1960 p. 37), which suggests that current resistance is of no greater significance for eggs of *I. australis* than for those of many other species. An attachment function for the posterior filaments seems probable from the morphology, and it seems unlikely that the degree of filament development seen in *I. australis* would be maintained if function had been lost, so an alternative to the current resistance hypothesis may be necessary. The function of the egg surface reticulation is equally unclear. GAMBLES & GARDNER (1960) suggested the reticulation in *L. africanus* may serve to provide footholds for the emerging larva, either to

facilitate its escape from the egg or to prevent it being washed downstream, but the latter is again inappropriate for pool breeding species. One alternative hypothesis, that reticulation in *I. australis* has a respiratory function similar to that suggested by MILLER & MILLER (1985) and MILLER (1987) for the libellulid eggs which they described, can be rejected because the surface indentations do not join to form an intrachorionic meshwork. Alternative explanations or confirmation of functions for both the filaments and the surface reticulation thus await further observation using live material.

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