

Mosquito Eggs XXVII

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Eggs of species belonging to 12 different subgenera of *Culex* have received at least a mention in the literature though detailed descriptions are few. In two previous papers in this series^{127,347} I reviewed some published descriptions and discussed oviposition behaviour which is more varied than some have supposed. Thanks to the generosity of various correspondents I now have eggs of 19 species belonging to 9 different subgenera. The eggs of 6 of these species are described below. It is hoped to describe the others in further papers in the series.

Subgenus *Lophoceraomyia* Theobald*C. (Lopho.) infantulus* Edwards

Bohart & Ingram¹¹⁴ obtained an egg mass in the laboratory, deposited on wet filter paper. The mother was captured while resting on a damp rock and I suggested in a previous paper¹²⁷ that this might be the oviposition site. The same species has since been colonized by Miyagi³³⁷ who found that the eggs are indeed laid above the water line. Eggs, from female adults fed on a turtle, were laid on a partially immersed sponge in a dark container (Fig. 1a). Hatching took place, without immersion, 1.5-2 days after deposition. The eggs were laid in rafts of about 150. No description of the individual eggs is given but Miyagi has kindly sent me eggs from his colony on which the following description is based.

Although the eggs are deposited above the water line their arrangement within the egg masses is precisely the same as in the familiar rafts of, e. g., *Culex pipiens*¹¹. Each egg, except for those at the outer edge, is touched by its neighbours at six points on the circumference giving the closest possible packing (Fig. 1b). I do not have any complete rafts but it is evident from Miyagi's photograph (Fig. 1a) that they show much the same range of variation in size and shape as in *C. pipiens*. The micropylar apparatus resembles that of *pipiens* though differing in detail. The egg spike is similar being strongly developed and dark in colour. It is surrounded by a transparent, slightly pigmented collar around which the base of the corolla appears to fit. The corolla itself is similar to that of *pipiens* but much more elongated when collapsed (Fig. 1c and cp. Christophers¹¹). In most cases the lumen of the corolla is closed by a spherical mass probably derived from the dissolution of the nurse cells as suggested by Christophers for *pipiens*. In all but a few of the eggs available to me the corolla has been lost and many of the remainder have lost the collar as well. Thus the anterior end of the egg presents three different appearances as shown in Fig. 1c.

The egg as a whole is similar in shape to that of *pipiens* but both species show considerable variation. The posterior end is, however, distinctly more pointed than in *pipiens*. The sides are roughly parallel for most of the length but from the presumed lateral aspect one is seen to be more convex, the other more concave on about the posterior one-third. The outer chorion is covered with conspicuous papillae, those towards the equatorial region being smaller and those towards the two poles much larger. There are particularly large papillae surrounding the base of the micropylar apparatus and a small ring of such papillae around the extreme posterior tip. Even in my preserved material occasional eggs are seen to have a drop of fluid at the posterior tip and I presume that this would be the case with all eggs in normally oriented rafts in nature, as in *pipiens*.

Bohart & Ingram have outline drawings of the dorsal and lateral aspects which agree well with my material except that I am unable to orient the eggs as the contained embryos are too imperfectly developed. Nor do I have any hatched eggs.

Subgenus *Culiciomyia* Theobald

C. (Culicio.) pallidothorax Theobald

Bohart & Ingram¹¹⁴ obtained an egg mass in the laboratory from a female collected from a damp rock at Chizuka, Okinawa. About 100 eggs were laid in a circular mass. The individual eggs are described as 0.8 mm. long, uniformly gray, almost straight in lateral view. Their outline figure (Fig. 1d) agrees quite closely with that of the eggs of *C. fragilis* described below.

C. (Culicio.) fragilis Ludlow

The following description is based on 2 eggs kindly sent me by Dr. Shivaji Ramalingam. They are part of a larger batch laid "in raft" in the laboratory. Viewed from one aspect they appear more or less bilaterally symmetrical but in (? lateral) aspect they have one surface distinctly more flattened than the other. At the anterior end is a small "snout" bearing a minute egg spike (Fig. 1e). Neither of my eggs has any corolla and I presume that, as also in the case of Bohart & Ingram's eggs of *C. pallidothorax*, this has been lost. The entire outer chorion is covered with minute papillae (shown to the same scale as those of *C. infantulus* in Fig. 1). These show little variation in size anywhere on the egg but are somewhat more pointed at the anterior end, flat-topped at the posterior. At the posterior pole there is a small snout over which outer chorionic papillae are missing.

Subgenus *Thaiomyia* Bram

Culex (Thaio.) dispectus Bram

Three eggs of this species were kindly sent me by Dr. Ramalingam. They came from a batch of 62 laid in the laboratory by a female caught in a chicken baited trap at Ulu Langat, Selangor and said to have been laid in a raft.

The individual eggs resemble in shape those of *C. infantulus* but the anterior "snout" is broader, and therefore less conspicuous, and the egg spike is much more strongly developed. All three lack the corolla which has presumably been lost. The chorionic papillae on the anterior part of the egg resemble in size those of *C. infantulus*. (They are drawn to the same scale in Fig. 1). They differ markedly however, in being arranged in a quite conspicuous reticular pattern. On this part of the egg they are relatively uniform in size but on the posterior part they become much less uniform with a few quite large papillae, surrounded by numerous very small ones, to each mesh of the reticulum. Individual papillae are flat topped and squarish. The extreme posterior tip is without papillae.

Subgenus *Micraedes* Coquillett

C. (Micraedes) conservator Dyar & Knab

Howard et al.²²⁶ state that the eggs of this species are laid in raft-shaped masses floating on the surface of the water. This is all the information available.

C. (Micraedes) antillumagnorum Dyar

Eggs of this species were kindly sent me by Prof. J. N. Belkin, accompanied by the female which laid them. They were obtained in Puerto Rico in October, 1971 and were evidently laid in the laboratory as they were sent to me loosely attached to a paper strip. It is possible that in nature they are laid in a raft though their general appearance seems inconsistent with this. They are oval in shape, quite unlike any other *Culex* eggs which I have seen (Fig. 2a). The anterior pole carries a small micropylar collar ornamented with minute spicules and some radial markings, suggestive of a greatly reduced corolla. The entire outer chorion is covered with similar minute spicules except where these are replaced by much larger scattered papillae. The latter are themselves ornamented with spicules and are virtually identical with the papillae found in some *Toxorhynchites*. Other resemblances to this genus consist in the oval shape, small apical collar, pale colour, the inner chorion being only lightly sclerotized, and may include the mode of dehiscence. I do not have any hatched eggs but I have one or two, presumably unfertilized, in which the chorion has split with total or partial discharge of the contents. In these the splitting is more or less spiral, recalling the spiral dehiscence of *Toxorhynchites* and in strong contrast to the longitudinal splitting of unfertilized eggs of the aedine genera²²². It is hard to believe that these eggs are correctly attributed despite the fact that they were sent in the same tube as the female alleged to have laid them. If they are indeed those of a *Culex* then this must be a most remarkable case of convergent adaptation to the toxorhynchitine mode of oviposition on the wing.

Subgenus *Barraudius* Edwards*C. (Barr.) modestus* Ficalbi

The eggs of this species were described and figured by Callot & Dao Van-Ty³⁴⁹ who obtained them in the laboratory. They are stated to have been laid in rafts either on the water surface or on damp cotton, wood or clay. Hatching took place 3-4 days after deposition. These authors' figure, reproduced here in part as Fig. 2b, shows neighbouring eggs attached to one another at two separate points on the surface, an unusual feature which I am unable to confirm as the eggs available to me are mostly hatched while the few unhatched are all detached from the rafts. However, the unhatched eggs show the swollen anterior end which is responsible for the phenomenon. The most conspicuous feature of the individual eggs is the very large corolla with 30 radial filaments, rather than a continuous frill, which is figured in various aspects by Callot and Dao Van-Ty. My own material consists of eggs from Gosport, England, laid in the laboratory 5 days after a blood meal³⁵⁰. These have enabled me to figure the hatched egg, which Callot and Dao Van-Ty do not show, and the chorionic ornamentation which they also failed to describe or illustrate (Fig. 2c). The latter consists of very numerous minute papillae uniformly distributed over the entire surface except for the bare circular area which underlies the corolla. At the centre of the latter is a strongly sclerotized, dark spot which Callot & Dao Van-Ty figure as an egg spike but which, in my material, is so depressed as to be barely perceptible as such (Fig. 2d). The chorionic papillae are slightly larger at the posterior end of the egg but otherwise show little variation.

Subgenus *Eumelanomyia* Theobald*C. (Eumel.) hayashii* Yamada

This species and those which follow were formerly included in *Neoculex* but recently restricted to the present subgenus³⁵¹. Bohart & Ingram¹¹⁴ obtained a circular egg mass, with about 75 eggs, laid on damp filter paper by a female taken resting on damp rock. They give outline figures of the dorsal and lateral aspects the latter of which was reproduced in my previous paper¹²⁷ under subgenus *Neoculex*. Thanks to Dr. Ramalingam I am now able to describe the eggs of 3 further species.

C. (Eumel.) brevialpis (Giles)

Dr. Ramalingam kindly sent me 3 egg rafts of this species from Ulu Langat, Selangor, one with 70 eggs, all hatched, another with 68 hatched and 12 unhatched and a third with 31 hatched and 5 unhatched. Viewed from one aspect the eggs appear symmetrical but from another (? lateral) aspect they are seen to be highly asymmetrical (Fig. 2d). The corolla is large, transparent, membranous and devoid of ornamentation. The egg spike is depressed and scarcely visible as such. It is surrounded by a small area devoid of papillae but with some minute reticular sculpturing of the inner chorion.

Posterior to this the entire outer chorion is covered with small papillae except for the extreme posterior tip which is bare. These papillae are largest immediately behind the micropylar area and become smaller posteriorly. On about the posterior three-fifths they are interrupted by patches of quite large papillae giving the general surface a reticulated appearance under low power. The bare posterior tip of the egg forms a very small snout. Surrounding this is a small area of very minute papillae scarcely visible even under high magnification. Hatching is apical, much as in *C. pipiens*.

C. (Eumel.) ? khazani Edwards

Eggs attributed to this species were sent to me by Dr. Ramalingam with a reference number associated on the accompanying data sheet with *C. ? simplicicornis*. I have felt it necessary to query the identity of both sets of eggs since it is evident that some confusion has occurred. The eggs attributed to the present species were laid in a raft by a female caught resting on vegetation at Tanjong Robok, Selangor. I have 5, all in poor condition having lost the corolla and much of the outer chorion. They are highly asymmetrical with a very conspicuous egg spike (Fig. 2e). There are some relatively large chorionic papillae round the micropylar area. Posterior to this the papillae are smaller and part of the anterior surface is covered with very small papillae, perhaps forming an area of attachment. On the posterior half of the egg there are both small and larger papillae forming an indistinct reticular pattern. There are some slightly enlarged, sharp pointed papillae and a single large, flat papilla at the posterior pole.

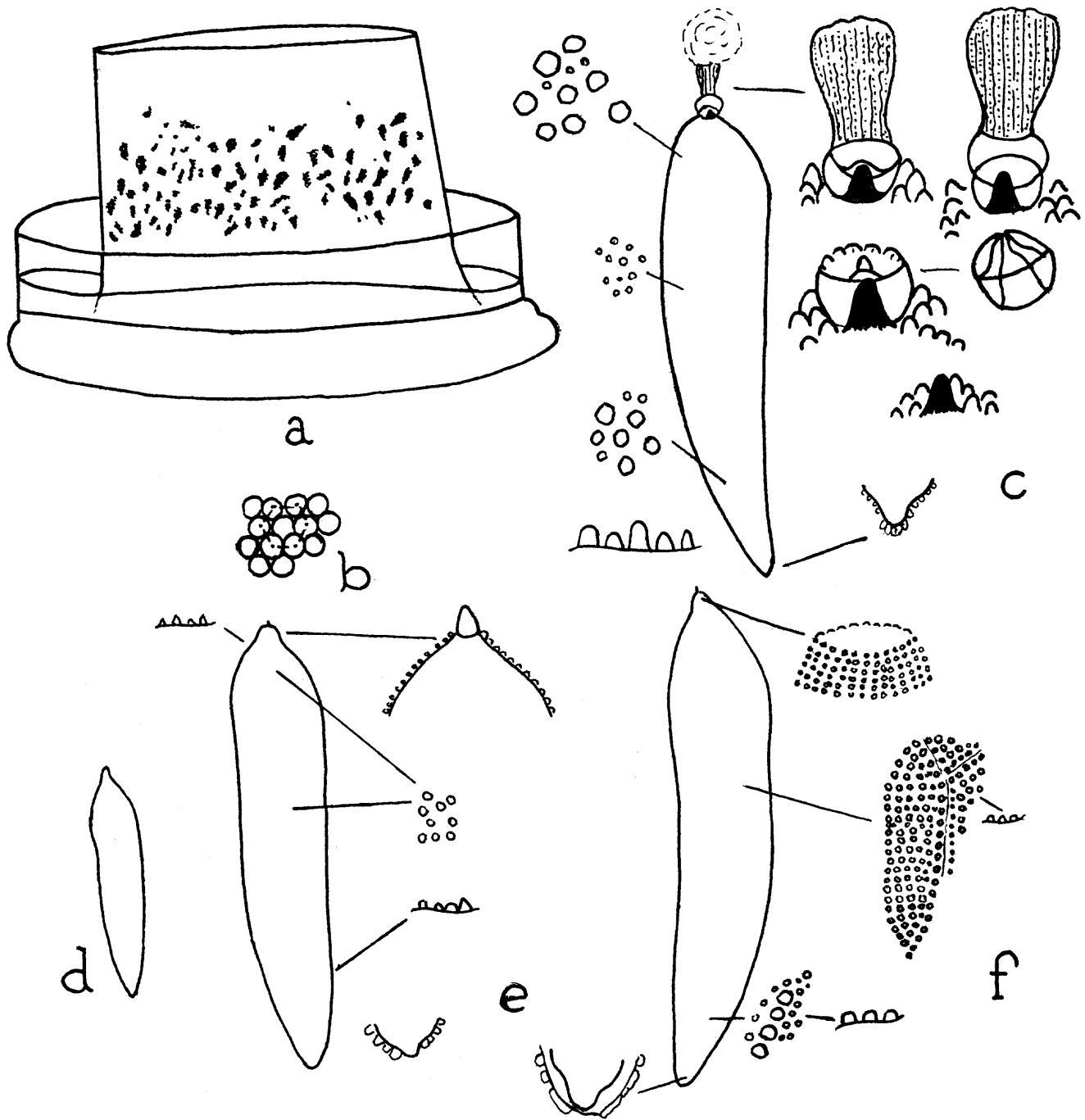
C. (Eumel.) ? simplicicornis Edwards

I have 7 eggs attributed to this species, one hatched, the others unhatched. Their condition is very poor, the outer chorion being largely absent and the corolla entirely so. They are described as laid singly, scattered by a female caught resting on vegetation at Tanjong Robok, Selangor. They appear bilaterally symmetrical when seen in dorsal aspect (as judged by the position of the mouthbrushes in the developing larvae which they contain). In side view it can be clearly seen from the metameric segmentation that the more flattened surface (upper surface in Fig. 2f) is ventral. They have a strongly developed egg spike. Hatching is apical but the egg cap has been lost. The outer chorion is very incomplete but can be seen to be ornamented in the equatorial region with numerous small, and some larger, papillae uniformly distributed with at most some faint indication of a reticular pattern towards the posterior end. Most papillae are sharp pointed as in the previous species and there are some enlarged ones in the vicinity of the micropylar apparatus.

References

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Fig. 1. Eggs of *Culex* spp. a-c. *C. (Lopho.) infantulus*, a. Deposition of rafts above water line (after Miyagi), b. Portion of raft showing hexagonal close packing, c. Details of egg, d. *C. (Culicio.) pallidothorax* (after Bohart & Ingram), e. *C. (Culicio.) fragilis*, f. *C. (Thaio.) dispectus*.

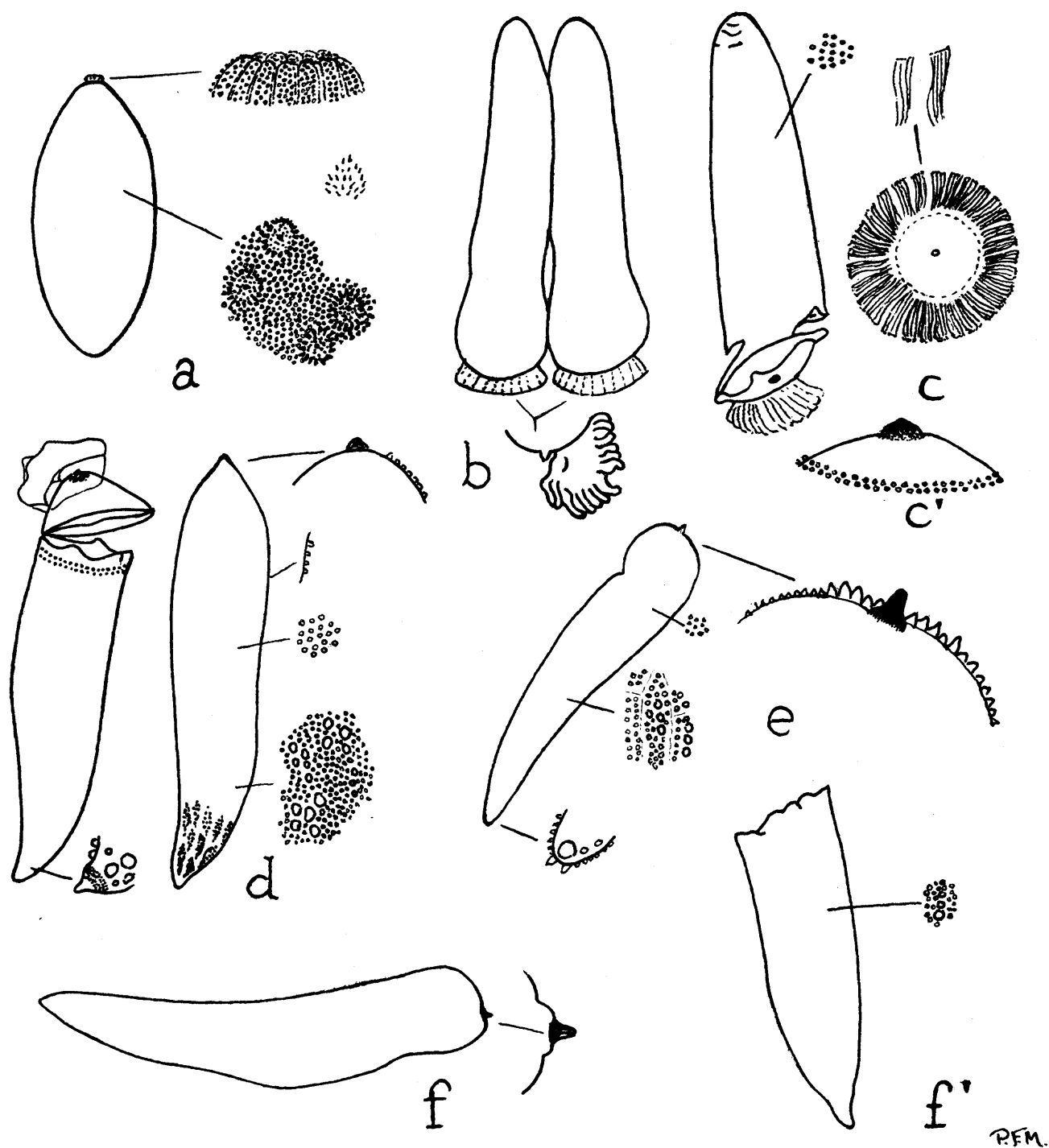


Fig. 2. Eggs of *Culex* spp. a. ? *C. (Micraedes) antillumagnorum*, b-d. *C. (Barr.) modestus*, b. Whole egg (after Callot & Dao Van-Ty), c. Hatched egg, c'. Apex of egg with corolla detached, d. *C. (Eumelano.) brevipalpis*, e. *C. (Eumelano.) ? khazani*, f. *C. (Eumelano.) ? simplicicornis*, unhatched, f. Hatched egg of the same.

RFM.