Mosquito Eggs XVI

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Genus Mansonia (Subgenus Coquillettidia Dyar) and Genus Ficalbia Theobald

Ronderos and Bachmann[216,217] raised *Coquillettidia* to generic rank, including *Rhynchotaenia* Brèthes as a subgenus and leaving *Mansonia* Blanchard as a separate genus with included subgenus *Mansonioides* Theobald. In compiling some recent keys to genera[198] I have found it more convenient to retain all four subgenera in *Mansonia* and this treatment is adopted here. The genera most commonly grouped with *Mansonia* are *Mimomyia* and *Ficalbia*. Genus *Hodgesia* shows some resemblances to the latter and might also be included. However, all four genera (apart from one subgenus of *Mimomyia*) share a common type of larval habitat, characterized by abundant aquatic vegetation, so that resemblances could well be due to convergence. This is a problem on which the eggs might reasonably be expected to throw some light. The eggs of *Mimomyia* (still very imperfectly known) have been considered elsewhere in this series[184,219]. Those of *Hodgesia* are not at present available for description but it is hoped that they may soon become so. Those of *Ficalbia* are not available but they have been well described and figured. A résumé of the description and copy of the figure are therefore included here.

Subgenus Coquillettidia

M. (*Coq.*) *richiardii* (Ficalbi)

The eggs of this species were described very briefly, and illustrated in outline, by Marshall[180] (Fig. 1a). His description was based on a raft of 200 eggs laid in the laboratory[220]. The British Museum has 8 of these eggs, mounted on three slides. These are described below. Colas-Belcour[221] gives a fairly full description accompanied by a drawing of a raft, also obtained in the laboratory, (Fig. 1b) and a photograph of two hatched eggs showing the mode of dehiscence but little else (Fig. 1c). The raft is described as deep brownish red in colour and resembling that of *Culex* or *Theobaldia* but shorter. It contained 150 eggs each conical in form with the broader end directed downwards and resting on the water. The eggs adhere strongly to one another but are not stacked in regular rows as in *Culex* or *Theobaldia*. Each egg measures 0.84 x 0.28 mm. The surface is covered by a network of minute punctuations, best seen from the inner aspect. In section it is seen to be surrounded by a colourless, more or less vesiculose sheath with the vesicles most strongly developed towards the poles. At the centre of the apical end is a clear area corresponding to the micropylar apparatus. On hatching the apex is detached and falls to one side (Fig. 1c).

All the eggs available to me are more or less flattened under a coverslip and so appear broader than in Marshall's figure. I can add to Colas-Belcour's description chiefly some details of ornamentation. The network to which he refers has very small, irregular meshes and somewhat recalls the interstitial network in the flange of Orthopodomyia pulchripalpis shown in Fig. 1b of my first paper on Orthopodomyia in this series[184] or in the scalariform thickenings on the sides of the egg of Mimomyia aurea shown in Fig. 2b of the same paper. The vesicles correspond to the outer chorionic papillae found in eggs of various genera. Under appropriate illumination the surface, even of the smaller ones, is seen to be very beautifully sculptured (Fig. 1d). The eggs are by no mean radially symmetrical (cf. M. perturbans below). One surface is much more strongly curved at the posterior end than is the other (Fig. 1c,d) when seen in what I take to be the lateral view. In addition the chorionic papillae are much larger not only towards the poles but also on the more strongly curved surface (Fig. 1d). The reticulum has a larger mesh, with thinner walls, in the region of the smaller papillae on the flatter (? dorsal) surface. The only two pairs of attached eggs available to me are both attached in this general region though in view of the marked departure from radial symmetry this can hardly be universally the case. Owing to flattening under the coverslip the micropylar area is visible only in plane view. In two pieces of detached chorion, however, it appears to have the character of a circular area surrounded by a shallow fringe of upturned and somewhat thickened chorion, the whole being much more rudimentary than either the apical cup found in aedine genera or the corolla of Culex (Fig. 1e). The curling of the detached apical cap shown in Colas-Belcour's photograph (Fig. 1c) recalls Armigeres flavus[222]. It appears to reflect, in both cases, the very small radius of curvature of the anterior end of the egg and the consequent proximity of the line of dehiscence to the tip.

It will be seen that this egg has a number of interesting and unusual features the significance of which is difficult to assess in mounted and flattened specimens. I hope to be able to obtain fresh eggs for myself next summer and to publish a fuller description.

M. (Coq.) perturbans (Walker)

Eggs of this species were first obtained, by Dyar and Currie[223], from a bloodfed female in the laboratory. The raft is described as "boat-shaped, somewhat pointed at one end, broad and truncated at the other, widest near the middle; containing about 150 eggs adhering loosely together and resting perpendicularly on the water on their larger end thus making the mass narrower above than beneath." The egg is described as "narrowly conical, broad and flatly rounded at the micropylar end, narrow and bluntly pointed at the other. At first pale whitish in color, afterwards becoming brown-black. Surface covered with small granules of varying size, those at the smallest end largest and perceptibly denticulated. Length .8 mm, greatest width .2 mm." No great difference from the eggs of M. richiardii is detectable from this description except possibly in the shape of the raft, the absence of "denticulation" from the smaller "granules" (possibly present but not observed) and the absence of any dorsoventral (or bilateral) asymmetry in the distribution of larger and smaller "granules". I would suspect from the statement that the eggs are loosely adherent that such asymmetry may in fact be present. Mitchell[200] gives a figure of the egg unaccompanied by any description (Fig. 1f). The same figure is reproduced in a somewhat different form by Howard, Dyar and Knab[225]. Differences from M. richiardii include the much smaller number of chorionic papillae, probably a deliberate simplification to avoid obscuring the rest of the pattern, and their more uniform size and the presence of a well marked, large-meshed chorionic reticulation. It appears that the latter may be a transitory feature (see below) and it is possible that it might also be observed in fresh eggs of M. richiardii. However, there is no indication of the small-meshed reticulum which characterises the latter.

Howard, Dyar and Knab[224,226] contribute little more beyond an account of the finding of the first egg raft in nature by Grossbeck. Smith[227] describes the same incident and has a figure of the raft (Fig. 2a) and a sketch showing how one end of the raft is commonly attached to a water plant (Fig. 2b), a feature also noted by Dyar and Knab[228]. Newkirk[229] gives a much fuller description than previous authors and this contains numerous points of interest. The egg is described as radially symmetrical and as ornamented with conical spines set close together and arranged in straight lines. The hexagonal reticulum figured by Mitchell and by Howard, Dyar and Knab was seen only in fresh eggs, not in older ones. The micropylar area is described as smooth and circular, divided into a central and a peripheral area with the central area slightly raised and measuring 9-14 microns in diameter. No micropyle was seen. Black pigment was uniformly distributed in the inner chorion. The anterior end of the egg was markedly larger and flatter than the posterior end, as in Culex and Culiseta. Larger rafts contained 28 x 11 eggs. Hatching took place after 4 days. The line of dehiscence almost completely encircled the egg and the apical cap was often completely detached. When given a choice between water and wet sand a small proportion of eggs (52 out of 2221) were laid in wet sand in contrast to those Culex and Culiseta spp. studied which laid 100% of their eggs on water. Those eggs laid on wet sand were deposited with the posterior end upwards in direct contrast to those of Aedes and Psorophora spp.

It seems from the foregoing that the only differences from the egg of M. richiardii which can at present be confidently postulated concern the shape and arrangement of the chorionic papillae and the absence of a fine meshed reticulum underlying these. The transitory large meshed reticulum may be absent in M. richiardii and there may be differences in the micropylar area. The rafts of M. perturbans may be, on average, larger and they may show some significant difference in shape but all these are matters for speculation.

M. (Coq.) metallica (Theobald)

Wanson[230] figures the egg (Fig. 2c) but defines his description to the raft which is said to be a black, hexagonal mass of 200 eggs with edges slightly raised and centre depressed. Gillett[231] figures the raft (Fig. 2e) and notes that it differs markedly from those of other african species, being broader with 10-14 rows of eggs only 20-30 of which are found in the longest row.

M. (Coq.) aurites (Theobald)

Wanson[230] figures the egg (Fig. 2d) and notes that it has a conspicuous, dark, transverse stripe. The raft is said to be 1.2 to 2 centimetres long and several millimetres wide and yellowish in colour with 300 eggs in regular longitudinal rows. Gillett[231] figures the raft (Fig. 2e) noting that the maximum width is 5-7 eggs, usually 6, and the maximum length 55-85 eggs, rarely less than 60. The length/width ratio is thus approximately 10 as compared to 2 for M. metallica. This author confirms Wanson's description as regards the yellow colour and dark banding of individual eggs but notes that these may exhibit either 1 or 2 dark bands.

M. (Coq.) maculipennis (Theobald), fraseri (Theobald) and fuscopennata (Theobald)

The individual eggs have not been described but Gillett[231] figures the rafts (Fig. 2e). Rafts of M. fuscopennata resemble those of M. aurites. They were found to have a maximum width of 3-5 eggs and maximum length of 30-55. They could, however, usually be distinguished by their relative shortness and narrowness (maximum width usually 4-5 eggs, maximum length rarely more than 50). M. maculipennis rafts closely resemble those of M. fraseri but were found to be partially distinguishable at Entebbe by the fact that the maximum length rarely exceeded 35 eggs with l/w ratio of 4 whereas in M. fraseri the maximum length might reach 60 eggs with a l/w ration of 5-6. Egg maturation is noted as taking 7 days, at 23°C, in M. fuscopennata[232,233]. This cited as an example of the general sluggishness of this genus but it contrasts forcibly with the highly aggressive mating behaviour which I have observed for myself in the australasian M. (Coq.) xanthogaster (Edwards)[218] and with the highly active and aggressive feeding behaviour which must be familiar to anyone who has encountered Mansonioides spp. in the field.

M. (Coq.) pseudoconopas (Theobald)

Gillett[231] includes this species in his key to rafts but does not figure it. No description of the individual eggs is available. The raft is apparently indistinguishable from that of M. fraseri. In comparing the rafts of the african species Gillett points out that they reflect in concrete form the behaviour of the mother and makes a plea for the more extensive use of behaviour characters in taxonomy. Egg rafts do not appear to differ in principle, however, from the 'work' of an insect, e.g. a nest or leaf mine, which is not currently admissible as type material. I have discussed the use of behaviour characters in mosquito taxonomy elsewhere[234] and shall not pursue the matter any further here.

M. (Coq.) aureosquammata (Ludlow), crassipes (Van der Wulp), nigrosignata (Edwards), ochracea (Theobald) and hodgkini Wharton

Wharton[235] has a figure of an egg raft and two isolated eggs, reproduced here as Fig. 2f, which is apparently intended to cover all five of these species except that the unhatched egg is clearly referable to M. aureosquammata or crassipes, both of which have the egg unicolorous, dark brown to black, while the hatched egg is referable to one of the other three species all of which have the egg marked with irregular dark patches. Eggs of the three last named are somewhat longer than those of M. aureosquammata and crassipes (about 0.85 mm as compared to 0.7 mm) and apparently taper rather more abruptly at the posterior end. The ornamentation is said to consist of cuticular bosses and it would appear from the figure that they are arranged in regular longitudinal lines as in M. perturbans.

M. (Coq.) aurata Dobrotworsky

Dobrotworsky[236] has a photograph of the raft from which the accompanying sketch (Fig. 2g) was made. It was laid in the laboratory and obtained only after a second blood meal. No other information is given except that the eggs are circular in section and deposited on the water surface.

M. (Coq.) linealis (Skuse)

Dobrotworsky[236] gives an outline drawing (Fig. 2h) and notes that the eggs are circular in section and laid in rafts on the water surface.

Genus Ficalbia

F. minima (Theobald)

Iyengar[237] gives a good description of the egg and mode of oviposition, accompanied by figures reproduced here, in part, as Fig. 2i. The eggs were found in clusters above the water line on the lower surface of the outer leaves of floating Pistia plants. They were later deposited in the same manner by gravid females in the laboratory. Individual eggs were purple when first laid, turning black later. They were 0.47-0.52 mm. long and 0.1 and 0.15 mm broad at base and apex respectively. Dehiscence was incomplete. A micropyle is said to have been observed in the centre of the apical cap.

The resemblance in shape and ornamentation to eggs of Coquillettidia is striking. The broad anterior end and flat apical cap are characteristic of raft forming species in general but the ornamentation contrasts markedly with that seen in Culex and Culiseta, less so with some Uranotaenia[155]. Attachment to the leaf surface by the posterior end recalls Mansonia s. str. and Mansonioides but contrasts, apparently, with the situation in Culex spp. depositing their eggs in this manner[127]. The failure to develop a sharply pointed free end as in Mansonia s. str., Mansonioides and some Culex is interesting.

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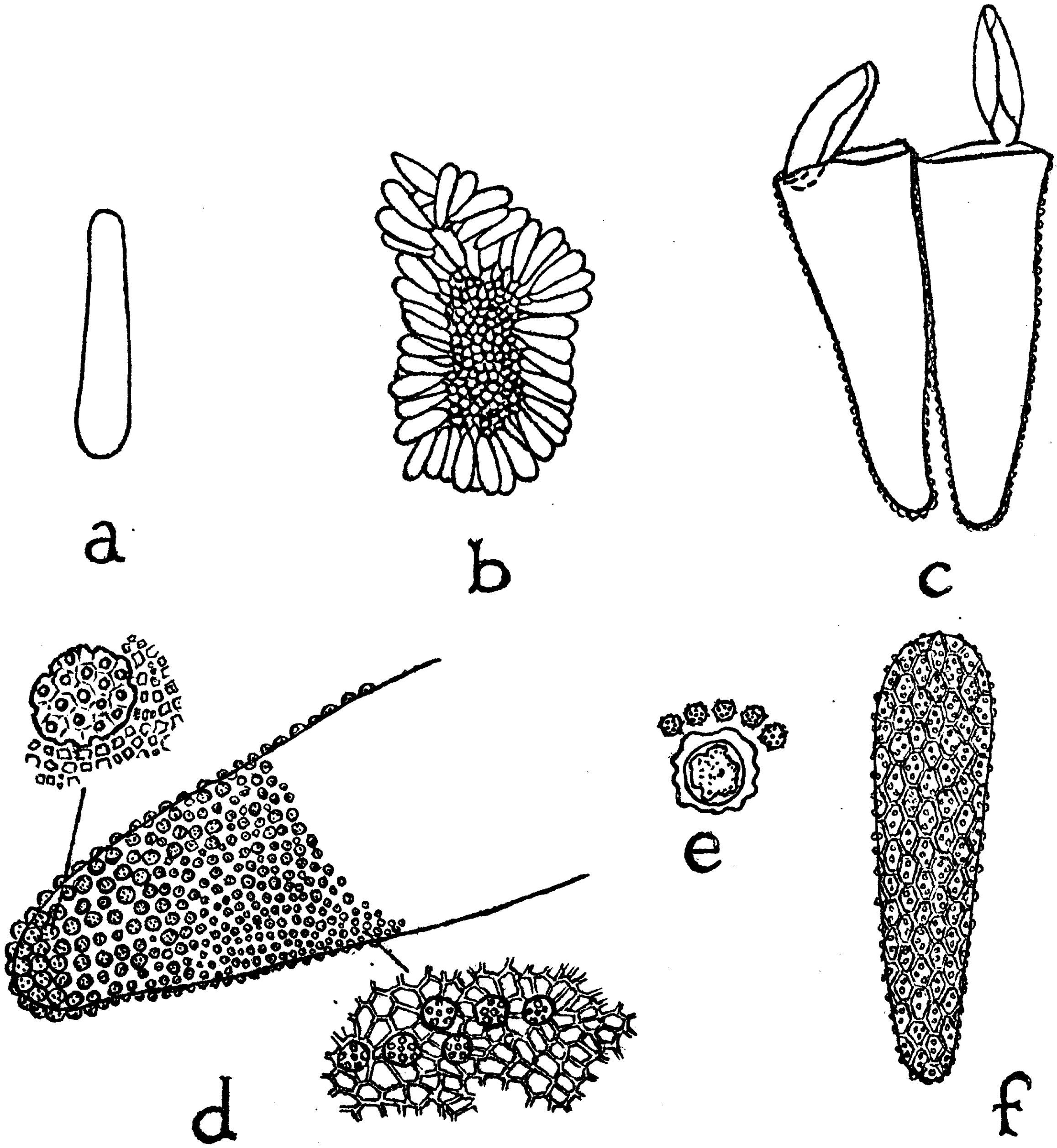

Fig. 1. Eggs of Mansonia subgenus Coquillettidia. a. M. richiardii, whole egg, after Marshall, b,c. Raft and two hatched eggs of M. richiardii, after Colas-Belcour, d,e. M. richiardii, original, d. Details of ornamentation, e. Micropylar area, f. M. perturbans, after Mitchell.

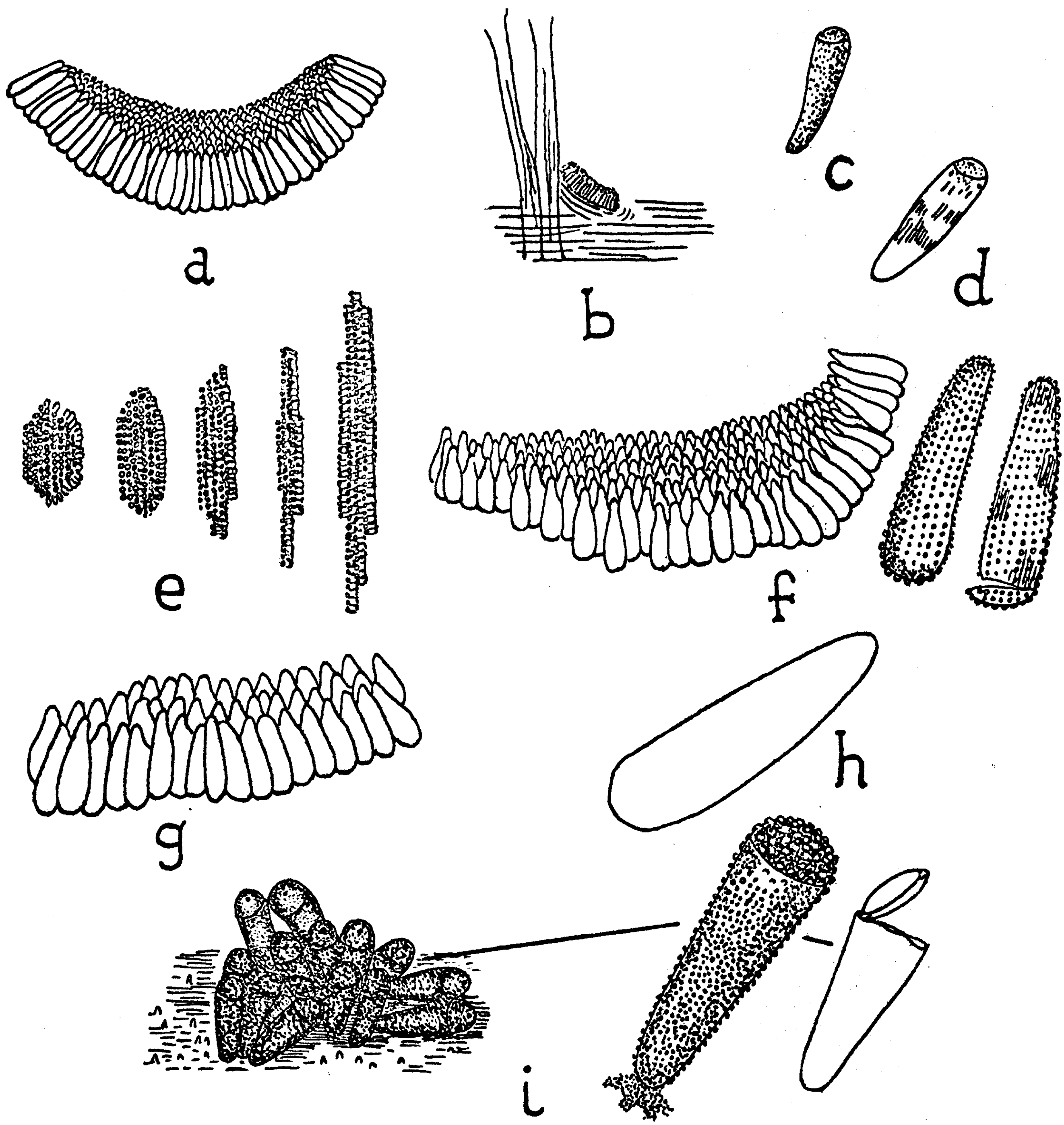

Fig. 2. Eggs of Mansonia subgenus Coquillettidia and of genus Ficalbia. a,b. M. perturbans after Smith, c. M. metallica, d. M. aurites, both after Wanson, e. African spp. after Gillett, from left to right M. metallica, M. maculipennis, M. fraseri, M. fuscopennata, M. aurites, f. Generalized malayan sp. after Wharton, g. M. aurata, h. M. linealis, both after Dobrotworsky, i. F. minima after Iyengar.