ARTICLES

Mosquito Eggs IV

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Tribe Sabethini

Sabethine eggs were the subject of a recent review by Barr and Barr[75]. Nearly all the species with known eggs were included. I can add only the two species of Tripteroides (Rachionotomyia) briefly described, and figured in outline, by Dobrotworsky[76]. These are T. (R.) atripes (Skuse) and T. (R.) tasmaniensis (Strickland). It should also be noted that the egg of Trichoprosopon digitatum (Rondani) was described twice by Pawan, once under the name Psorophora posticata Wiedemann[77] and again, presumably after reidentification, as Joblotia digitatus[78]

From the recent description of the egg of this species by Aitken et al.[79], it seems almost certain that either it or a closely related species was misidentified by Goeldi as Toxorhynchites haemorrhoidalis (see my first note in this series). Aitken et al. do not describe the mode of dehiscence but I have a dried egg mass of Tr. nivipes (=Tr. digitatum) in which it is just as figured by Goeldi (Fig. 1a). It can also be seen, though less clearly, in Pawan's photographs.

Combining the descriptions by Goeldi, Aitken et al. and Pawan the egg is seen to have a posterior cap of outer chorion (Fig. 1b) with an ornamentation of rugose papillae closely resembling that found in some Toxorhynchites. The cap covers most of the posterior two-thirds of the egg except for three tongue-like interruptions through which the inner chorion is exposed (Fig. 1c). The inner chorion is hydrophilic, the outer chorion hydrophobic. This has the effect of inverting the egg so that hatching takes place downwards below the water line in contrast to the situation in Toxorhynchites where the whole surface of the egg is covered with outer chorion and the egg floats with the anterior end uppermost.

Attachment of the eggs to form the egg mass is along the three lines of exposed inner chorion. Consequently each pair of adjacent eggs subtends an angle of 120° (the internal angle of a hexagon) and the egg mass as a whole assumes an open, reticular, hexagonal array (Fig. 1d). Simple geometry dictates that the egg raft of those culicines which form one should also exhibit hexagonal packing and this is in fact the case. In Culex, however, only the inner face of the cup at the anterior end of the egg is hydrophilic. The rest of the egg surface is strongly hydrophobic and attachment of adjacent eggs seems to be possible at any point on the circumference. The eggs are therefore packed solidly in the raft.

The relationship between the eggs of Toxorhynchites and those of Tr. digitatum is apparently a very close one. Either can be readily derived from the other. In contrast, the relation of the Trichoprosopon egg mass to the culicine raft seems more remote. Not all Culex form rafts and not all those which do so lay them directly on the water surface. We need to know more about some of the less familiar species of this genus before the evolution of the egg raft can be profitably discussed.

The eggs of Wyeomyia smithii (Coquillett), as described by Barr and Barr, have other very interesting aspects. Just as the chorionic ornamentation of the egg of Tr. digitatum is strikingly like that of some Toxorhynchites so also the egg of W. smithii has a curious spiral dehiscence found elsewhere, so far as is known, only in the Toxorhynchitini (Fig. 1e and see my first note). In these eggs the dorsal chorion is hydrophobic while the chorion of the upper (morphologically ventral) surface is hydrophilic. The egg thus floats, as in the Anophelini, with the contained pre-larva lying on its back (Fig. 1f, g). Should the egg be stranded above the water line, in the film of moisture on the side of the plant pitcher in which it is laid, air is trapped between the ventral surface and the pitcher wall forming a plastron which no doubt prolongs to some extent the time for which it can survive. No great stretch of imagination is required to see in these eggs a possible foreshadowing of the anopheline egg on the one hand and the eggs of container breeding Aedes on the other.

The oviposition behavior of Sabethes chloropterus (Humboldt) is very different from that of Tr. digitatum, being basically similar to that of Toxorhynchites. In both cases the eggs are projected while hovering on the wing at or near the edge of the breeding place[80]. The eggs of this species (Fig. 1h) are at first sight very unlike those of Toxorhynchites but might be derived from them by loss of the outer layer of the chorion and a change in shape apparently adaptive to their forcible ejection. (Though it must again be emphasized that Toxorhynchites are recorded by more than one author as projecting their eggs from the side, rather than above the middle, of the breeding place). It is noteworthy that a proportion of them sink when laid, though without prejudice to their subsequent laying. Hydrophobe chorion appears to be entirely lacking to judge from the dried eggs available to me for examination. Eggs of Sabethes spp. are said to resemble those of some Wyeomyia[80] but I suspect that only a general resemblance is implied and that the eggs of the latter are in fact similar to those of W. smithii. It is unfortunate that the oviposition behavior of the latter has not been described.

Too little is known about the New World sabethines to permit of any but the most tentative conclusions. However it does seem that the occurrence of three distinctive toxorhynchitine characters (papillate, hydrophobe outer chorion, spiral dehiscence and projection of eggs on the wing) in different sabethine genera would suggest that the toxorhynchitine stock is the stem line.

Even less is known regarding the eggs of the Old World sabethines. Viable eggs of Malaya taeniarostris (Theobald) are said to have been obtained from dry material from plant axils[81]. This recalls earlier claims by Smith[82] regarding the eggs of W. smithii. It may be that Malaya has progressed still further than Wyeomyia in the aedine direction but this must remain a matter for speculation until the eggs have been described. The eggs provisionally attributed to Tripteroides (Tripteroides) spp.[83] (Fig. 1i,j) recall those of Trichoprosopon compressum Lutz as described by Busck[84]. The latter are said to be provided with fringes of short white hairs which assist flotation. This

would seem to provide further evidence for the affinity between the two genera inferred by various authors on other grounds while at the same time relating both to Toxorhynchites. The eggs of Tr. (Rachionotomyia) spp. figured in outline by Dobrotworsky[76] are aedine in shape (Fig. 11, m). No details are given but it appears from his general account that they are laid above the water line.

The toxorhynchitine features of the eggs of Maorigoeldia argyropus (Walker) are even more pronounced[85]. These are aedine in shape (Fig. 1k) but they have a longitudinal dehiscence of a kind otherwise known, apparently, only in Toxorhynchites and are said to have a roughened covering which serves to trap a film of air, again very strikingly recalling some descriptions of the latter genus. They are laid directly on the water surface between the hind legs and have no tendency to adhere except as a consequence of surface tension.

Taking the sabethine eggs as a whole the very marked resemblances to those of Toxorhynchites seem to me to raise some doubts as to the advisability of including the Sabethini in the subfamily Culicinae. I prefer therefore to continue to accord all four major groups of mosquitoes equivalent rank as in previous papers in this series.

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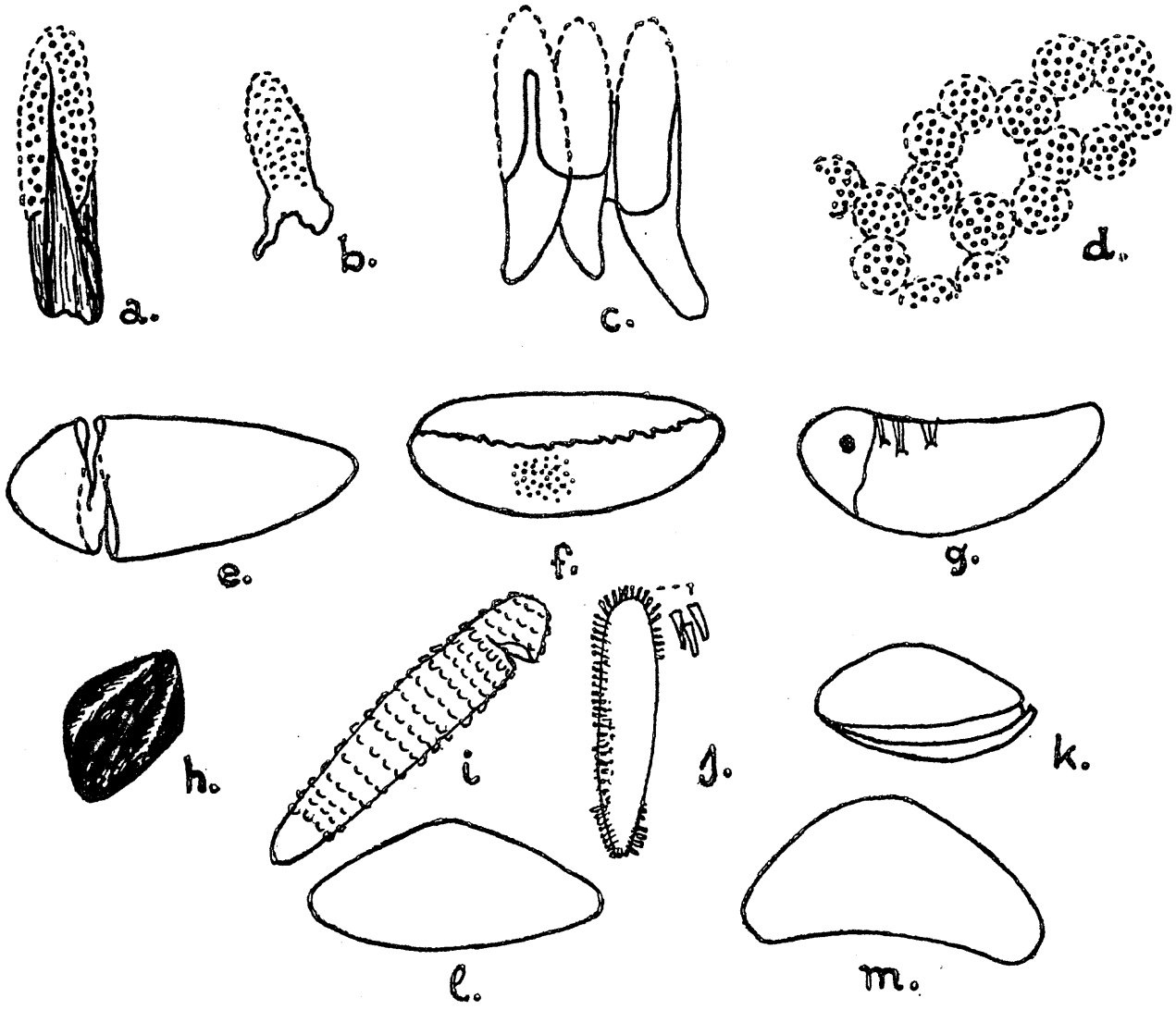

Fig. 1. Eggs of sabethine mosquitos. a. Trichoprosopon digitatum. Original, b. The same showing detached outer chorion. After Pawan, c. The same showing mode of adhesion. After Aitken et al., d. The same showing hexagonal packing. After Aitken et al., e. Wyeomyia smithii showing spiral dehiscence. After Barr & Barr, f. The same showing limits of ventral and dorsal (stippled) chorion. After Barr & Barr, g. The same showing orientation of embryo. After Price, h. Sabethes chloropterus. Original, i. Tripteroides microcala. After Baisas & Pagayon, j. ? Tripteroides sp. After Baisas & Pagayon, k. Maorigoeldia argyropus. After Graham, l. Tripteroides tasmaniensis. After Dobrotworsky, m. Tripteroides atripes. After Dobrotworsky.