

## Mosquito Eggs XV

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Genera Heizmannia Ludlow and Haemagogus WillistonGenus Heizmannia

No eggs of this genus have previously been described. Those of two species are described below. The only information previously available is contained in a note by Macdonald and Traub<sup>194</sup>. This reads as follows:

"The eggs are readily laid on damp filter paper, and they are laid scattered individually, not as a raft. Oviposition occurs 3-4 days after the blood-meal, but delays of up to 9 days have been recorded. After being laid the eggs are best kept on moist filter paper for several days and allowed to dry slowly before being immersed in water. On immersion it is unusual for the larvae to hatch immediately, and quite commonly they will not hatch until nearly a week later. The hatching behaviour of the eggs may vary from one specimen to another of the same species, and sometimes among eggs of the same batch. In one case a batch of some 46 eggs was laid by a female stonei four days after feeding; half of the eggs were immersed in water 4 days later, but hatching only began after a further 12 days (14 adults were reared); the remaining eggs were kept dry for 3 weeks and then immersed, but there was no hatching until 17 days later when the first of seven larvae hatched over a period of 3-4 days. A number of egg batches of scintillans have been maintained. In six cases the eggs were retained for a period of 3 days to mature; on immersion in water, hatching commenced on a different day in each case - after 2,3,6,7,9 and 10 days respectively. The most effective period for maturation of the eggs may be 6-7 days."

Heiz. communis (Leicester)

The following description is based on two batches of eggs and a single egg, all from Ulu Langat, Selangor. One batch is accompanied by the parent and one female progeny and the single egg is accompanied by the parent. The eggs (Fig. 1a,b) are pointed at the posterior, more bluntly rounded at the anterior, end with a well developed apical cup (Fig. 1c). One surface, presumably the upper (i.e. ventral), is much flatter and is ornamented with very large, conspicuous chorionic papillae. The presumed dorsal surface is more strongly curved and is ornamented with minute papillae (Fig. 1b,c). Both surfaces are entirely covered by well developed reticulum, thickened and very conspicuous on the

presumed upper, less strongly thickened but still conspicuous on the lower. The inner and outer layers of the chorion are strongly adherent and I have not been able to examine any detached outer chorion. In pieces of chorion from fragmented eggs, examined by transmitted light, the meshes of the reticulum appear to be entirely filled with confluent chorionic papillae. These appear rugose in plane view, more extensively, but more delicately, so in the case of the reticulum on the presumed lower surface. On the upper surface there is a tendency for the individual meshes to break down and become partly confluent in the region midway between the anterior and posterior poles (Fig. 1d).

#### Heiz. indica (Theobald)

The eggs of this species (Fig. 2) differ markedly in ornamentation from those of H. communis. The following description is based on a single batch of eggs from Ampang Forest Reserve, Selangor, accompanied by the parent and two female progeny. The eggs (Fig. 2) resemble those of H. communis in shape and general ornamentation but the chorionic sculpturing, particularly of the upper surface, appears markedly different. At the same time it should be noted that several eggs of the present species are very lightly sclerotized so that the sculpturing can be seen in detail by transmitted light in a manner which is not possible with the available eggs of H. communis. This may tend to exaggerate the difference though I believe it to be a real one and of some taxonomic and diagnostic value. In the present species the whole upper (ventral) surface of the egg is covered with a strongly developed reticulum which extends well down the sides. The walls of the reticular meshes are much thickened and can sometimes be seen to contain air. The interior of each mesh is occupied by a large central chorionic papilla bordered by a number of much smaller ones (Fig. 2a). As in H. communis there is a continuous dorsal reticulum the meshes of which have thinner walls and are on the whole larger. These do not appear to contain any papillae (Fig. 2b). There is a well developed apical cup (Fig. 2c) and a strongly sclerotized micropylar disc (Fig. 2d).

#### Genus Haemagogus

This genus closely resembles Heizmannia of which it may be taken as the New World counterpart<sup>208,209</sup>. Both genera exhibit marked sabethine features in the adult and even more strongly marked aedine features in the early stages including the egg. It is probable that these aedine features extend to the morphology of the egg, as well as to egg physiology and the oviposition behaviour of the adult, in both genera. This still requires confirmation, however, in Haemagogus. It is a remarkable fact that, despite its importance as a maintenance vector of yellow fever and the existence of several studies of egg physiology and oviposition, no description of the eggs of this genus has yet been published. Nor do I have, at present, any material for such a description. Hatching, in those species studied, is dependent on prior conditioning involving maintenance in a semi-dry condition before submergence, about a fortnight generally being given<sup>210-212</sup>. Eggs have been found to remain viable in conditions of partial desiccation for up to 7 months<sup>211, 213</sup>. Delayed hatching, following on successive floodings, has been observed in several species with a proportion of eggs failing, in some cases, to

hatch until the tenth flooding<sup>213</sup>. Hovanitz<sup>215</sup> obtained hatching of eggs of H. spegazzinii falco on first submergence but Galindo et al.<sup>213</sup> found them to hatch only when flooded for the third time and were able to correlate this with late appearance vis-a-vis H. equinus after the beginning of the rainy season. Hovanitz observed seasonal differences in the interval between first submergence and hatching and found these to be greater than interspecific differences with respect to the same parameter. Yeast<sup>212-214</sup> and leaf infusion<sup>215</sup> have been employed as hatching stimulants but hatching of eggs of H. equinus was successfully achieved in natural spring water with a pH of 8.2<sup>210</sup>.

Hovanitz stresses the resemblance to Stegomyia with respect to egg physiology and this has been shown to extend also to oviposition behaviour. The latter was observed in some detail in H. spegazzinii by Bates<sup>93</sup>. Eggs laid on filter paper submerged at one end were deposited just above the level at which moisture ceased to be visible. They tended to be deposited whenever the tip of the abdomen touched another egg previously laid. This was interpreted as a response to surface irregularities. Many eggs were fitted neatly into the groove where the edge of the filter paper met the inside wall of the glass vial in which oviposition took place. The same author has some notes on the effect of temperature on egg development in the gravid female<sup>214</sup>. Galindo et al.<sup>212,213</sup> noted marked preference among Haemagogus spp. for ovipositing in bamboo traps with large horizontal openings in contrast to those with small vertical bore holes in the sides preferred by some Sabethes spp.

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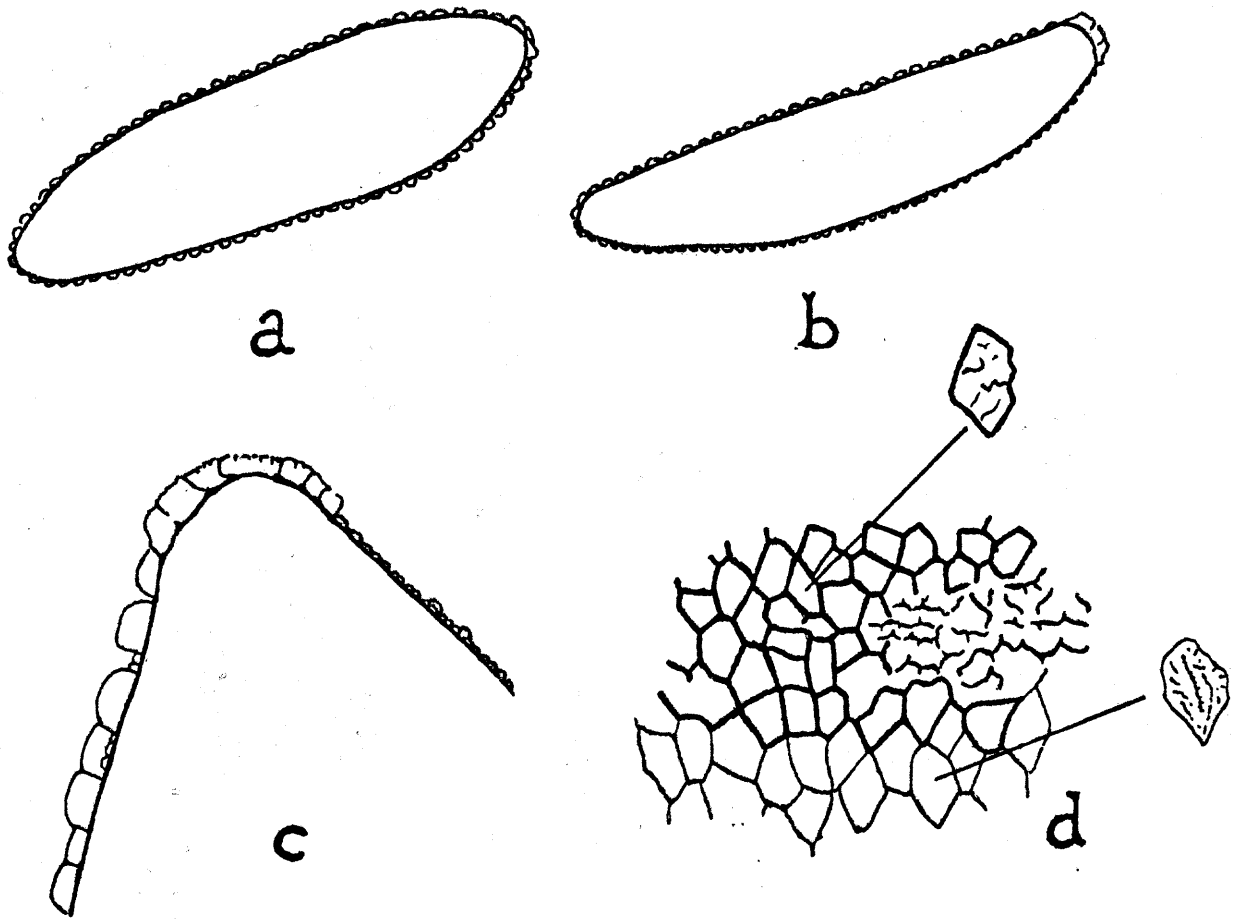


Fig. 1. Heizmannia communis. a. Whole egg in ventral view, b. The same in (true) left lateral view, c. Apex of egg, d. Detail of chorionic ornamentation (left lateral view).

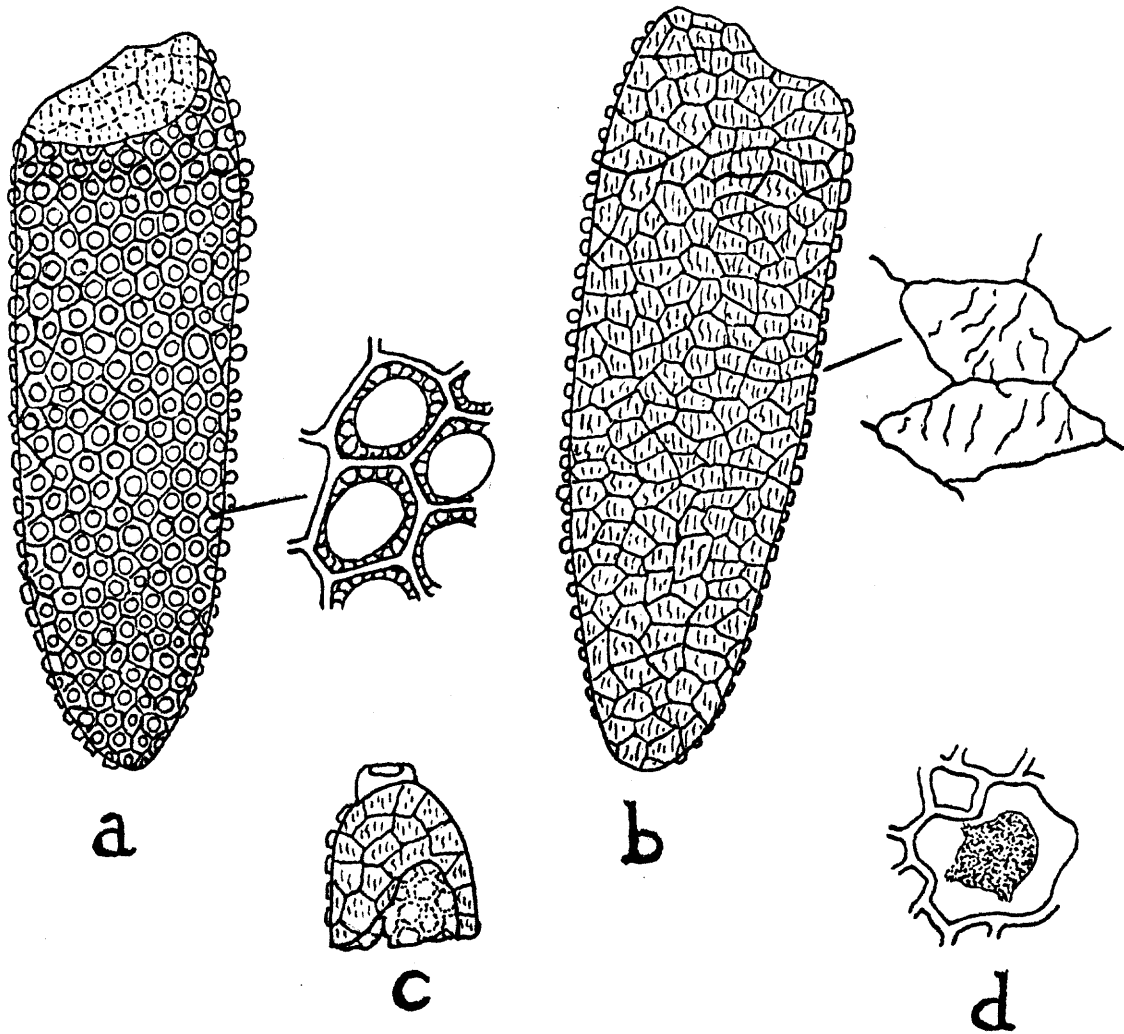


Fig. 2. Heizmannia indica. a. Hatched egg in ventral view, b. The same in dorsal view, c. Detached apical cap, d. Micropylar disc from inner aspect.