Mosquito Eggs VI

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Genera Eretmapodites and Culex

Genus Eretmapodites Theobald

Although both yellow fever virus and rift valley fever virus have been recovered from mosquitoes of this genus, and two species, at least, have been colonized, the eggs (like those of Haemagogus) have been described only in the most general terms.

E. chrysogaster Graham

Bauer[102] describes the eggs as laid in small numbers, at frequent intervals, at the water margin. When detached they quickly sank. They were light brown in color and failed to hatch after being kept "dry" (i.e., presumably, at room humidity) for 4 days. Haddow[103] found that the observations regarding deposition, sinking and resistance to desiccation applied also to E. semisimplicipes Edw., E. grahami Edw., E. inornatus Newst., E. penicillatus Edw., E. dracaenae Edw. (= ferox Haddow), E. oedipodius parvipluma Edw. and E. leucopus productus Edw. Gillett[104] observed a very strong preference for oviposition in banana bracts, moist paper and cotton wool proving unattractive. The eggs were laid either just above the waterline or on the water surface. The same author[105] indicates that the difficulties encountered in securing oviposition on wet fabric in large cages did not apply when the mosquitoes were kept in small containers. Burgess[106] obtained some hatching after 4 days of "drying" on paper toweling. Hylton[107] records survival of a small proportion of eggs for 20 days at 81% R. H., this being particularly marked in later (3rd) depositions from older females. It seems possible that females subjected to reduced humidities might produce somewhat more resistant eggs but this possibility does not seem to have been explored.

E. quinquevittatus Theobald

Fig. 1a is based on eggs kindly sent me by Dr. W. K. Hartberg from Tanzania. The general resemblance to eggs of Aedes is marked (transparent, papillate outer chorion, small apical corolla, reticulation of most of the surface). The reticulated pattern covers the whole of the upper surface of those eggs which I have examined. Part of the lower surface is without reticulation. The color varies from off white to dark brown. The British Museum has a slide with some eggs, attributed to this species, sent by Bacot from Freetown in 1916 (Fig. 1b). They differ from the Tanzanian eggs in having the reticulated area much reduced. Dehiscence (not seen in the Tanzanian eggs) is transverse and apical as in Aedes. It is possible that they may be eggs of E. dracaenae which was confused with E. quinquevittatus until Edwards[108] separated them, in 1916, on the basis of material of both

species sent by Bacot from Freetown. I think it would be unwise to assume this without further evidence regarding individual, seasonal and geographical variation. At the same time diagnostic egg characters would be particularly welcome in this group, members of which are notoriously difficult to identify, particularly the females.

It seems clear that the eggs of Eretmapodites, despite their appearance, are much less resistant to desiccation than those of most Aedes. In this respect they are closer to the sabethines which they resemble as adults in some striking characters.

Genus Culex Linnaeus

Ever since the classic description by Réaumur[109] the egg raft of Culex pipiens Linnaeus has been a familiar object and it has been widely assumed that all members of this genus compact their eggs into rafts and that these rafts are formed directly on the water surface. Neither supposition is correct. Current work on the egg masses of subgenus Melanoconion at the Regional Virus Laboratory in Trinidad and at the University of Texas, kindly brought to my attention by Dr. J. B. Davies and Prof. Scanlon respectively, has prompted the following notes on known exceptions.

Subgenus Melanoconion Theobald

Coad[110] describes and figures an egg mass attributed to C. abominator Dyar & Knab (Fig. 2a). The egg masses were black in color and were found on the upper surface of Lemna fronds, near the edge, as in the figure. On hatching the young larvae were seen to wriggle off immediately into the water. The resemblance to the egg masses of Mansonia (Mansonioides) is very striking though with the important difference that the egg masses of the latter are laid on the under side of the leaf.

Howard, Dyar & Knab[12] figure an egg mass of C. erraticus (Dyar & Knab). In contrast to the above this is long and narrow. The individual eggs have sharply pointed apices turned outwards from the major axis much as in Neoculex.

The eggs of C. chrysonotum Dyar & Knab are described by Arnett[111] as "laid on grass or sedge in double rows about fifty to a row, about one inch above the surface of the water". This might seem to be a more primitive arrangement since the advantage of radial orientation, in combination with the sharply pointed apex, as a protection from predators would be lost. The contrasting shape of the egg masses may reflect an inability of the female to orient otherwise than in direct relation to the leaf shape. This should be quite easy to ascertain experimentally. In my experience female Culex once committed to raft formation become concentrated on this task to the point at which they can be lifted from the water surface and replaced without attempting to fly away. Information of this kind regarding orientation could have an important bearing on a number of aspects of mosquito behavior.

Subgenus Neoculex Dyar

Knab[112] observed 2 females of C. territans Walker depositing their eggs immediately above the water line in a half filled dish pan. Other egg clusters were found at varying heights above water, up to six or eight inches, in a barrel and still others at the base of a tussock bordering a small ground pool. It seems that oviposition behavior of this kind is characteristic of all other species of this subgenus since studied. Dobrotworsky[76,113] records C. fergusoni Taylor as laying its eggs in the form of a raft on moist filter paper 2-5 inches above water level. "The rafts were not stuck to the paper for they floated away when the water level was raised. When the water level was kept low, the rafts, if on a vertical surface, dropped into the water as the larvae pushed off the egg caps. When the rafts were placed on an inclined surface, the newly hatched larvae crawled over the moist filter paper to the water." The pointed apical (posterior) end of the egg is shown as directed outwards from the antero-posterior axis (Fig. 2b). Dehiscence is oblique. (It seems difficult to picture this perilous behavior as other than primitive which would be in line with prevailing opinion regarding the position of Neoculex within the genus).

The same author obtained oval or rounded rafts from C. douglasi Dobrotworsky after feeding on human blood in the laboratory. They contained up to 48 eggs but the small number is probably not significant since this subgenus is known to feed on amphibia in nature. The rafts were deposited on moist filter paper from one to three inches above the water surface. "When development of the eggs is complete, the larvae hatch immediately the water level is raised up to the raft. Hatching can occur if the water level remains low. In this case the lifting of the egg cap causes the eggs to become detached from the corolla and the raft then drops into the water". The corolla (Fig. 2c) is filled with a sticky substance causing it to adhere to the substrate in contrast to the previous species. The eggs are described as dark brown with a "granular" chorion. Interestingly the figure shows marked differences in the size of "granule" on opposite (? dorsal and ventral) surfaces.

Bohart & Ingram[114] describe and figure the egg of C. hayashii Yamada (Fig. 2d) from a circular egg mass, containing about 75 eggs, deposited on wet filter paper in the laboratory. The mother was taken from the damp surface of a rock. The corolla is not figured or described but there seems no reason to suppose that the egg or oviposition behavior are greatly different from those already described for the subgenus.

Subgenus Lophoceraomyia Theobald

Bohart & Ingram (loc. cit.) obtained an egg raft of C. infantulus Edwards deposited on damp filter paper in the laboratory by a female taken from a damp rock. It seems possible, therefore, that some species of this subgenus, at least, may oviposit above the water line in nature.

Subgenus Mochlostyrax Dyar & Knab

Galindo et al.[115] note that the eggs of C. alogistus Dyar, C. hesitator Dyar & Knab, C. pilosus (Dyar & Knab) and C. vexillifer Komp "are laid singly instead of in rafts...". Those of C. hesitator and C. pilosus are said by them to be "laid in one layer patches as in the

family Simulidae". They further state that "All these species lay their eggs above the water line of their breeding places and the eggs remain viable under moist conditions for at least one month." All these species are ground pool breeders except C. vexillifer which breeds in treeholes including the enclosures formed by buttress roots[116].

Subgenus Microculex Theobald

There is no indication at present that eggs of this subgenus are laid out of water. Those of the only species for which a description is available do, however, differ very markedly from any other eggs recorded for mosquitoes. The following description of C. gaudeator Dyar & Knab is taken from Busck[117]. "The eggs....are laid in an egg-shaped gelatinous mass about 6 by 10 mm., which suggests a mass of frogs' eggs. The mass contained about twenty-five eggs, each of which is oblong, more pointed at one end and rounded at the other, and each surrounded by its own spherical gelatinous envelope, about 2.5 mm. in diameter. The egg-mass floats at the surface of the water, kept buoyant by small air bubbles, one near the end of each egg. The gelatinous substance is consumed at least partly by the newly hatched larvae."

REFERENCES

102. Bauer, J. H. 1928. The transmission of yellow fever by mosquitoes other than Aedes aegypti. Am. J. trop. Med. 8: 261-282.

103. Haddow, A. J. 1946. The mosquitoes of Bwamba County, Uganda. IV. Studies on the genus Eretmapodites Theobald. Bull. ent. Res. 37: 57-82.

104. Gillett, J. D. 1958. Laboratory colonization of the mosquito Eretmapodites chrysogaster Grah. Bull. ent. Res. 49: 287-290.

105. Gillett, J. D. 1964. Culturing methods for Eretmapodites mosquitoes. Bull. Wld. Hlth. Org. 31:449.

106. Rozeboom, L. E. and R. W. Burgess. 1962. Dry-season survival of some plant-cavity breeding mosquitoes in Liberia. Ann. ent. Soc. Am. 55: 521-524.

107. Hylton, A. R. 1967. Survival of eggs of Eretmapodites chrysogaster Graham (Diptera: Culicidae). J. med. Ent. 4:374-375.

108. Edwards, F. W. 1916. Eight new mosquitoes in the British Museum collection. Bull. ent. Res. 6:357-364.

109. Réaumur, R. A. F. de. 1738. Histoire des Cousins. Mémoire pour servir à l'histoire des Insectes. 4. Mém. 13: 573-636.

110. Coad, B. R. 1913. Oviposition habits of Culex abominator Dyar & Knab Canad. Ent. 45: 265-266.

111. Arnett, R. H. 1948. Notes on the distribution, habits and habitats of some Panama culicines (Diptera: Culicidae). J. N. Y. ent. Soc. 56: 175-193.

112. Knab, F. 1904. The eggs of Culex territans Walker. J. N. Y. ent. Soc. 12: 246-248.

113. Dobrotworsky, N. V. 1956. Notes on Australian mosquitoes (Diptera: Culicidae). I. Some species of the subgenus Neoculex. Proc. Linn. Soc. N. S. W. 81: 105-114.

114. Bohart, R. M. and R. L. Ingram, 1946. Mosquitoes of Okinawa and Islands in the Central Pacific. U. S. Navmed 1055.

115. Galindo, P., Carpenter, S. J. and H. Trapido. 1951. Ecological observations on forest mosquitoes of an endemic yellow fever area in Panama. Am. J. trop. Med. 31: 98-137.

116. Foote, R. H. 1954. The larvae and pupae of the mosquitoes belonging to the Culex subgenera Melanoconion and Mochlostyrax. Tech. Bull. U. S. Dept. Agric. No. 1091.

117. Busck, A. 1908. Report on a trip for the purpose of studying the mosquito fauna of Panama. Smithsonian misc. Collns. 52(i): 49-77.

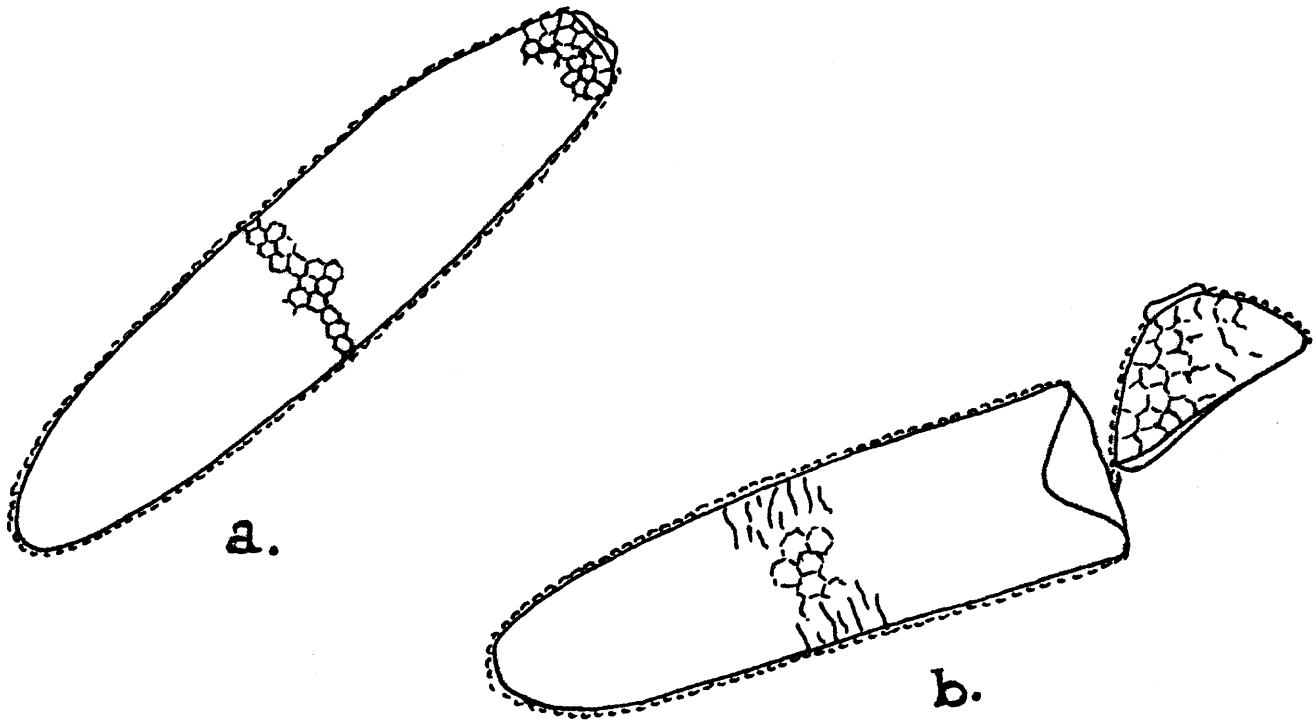

Fig. 1. Eggs. Genus Eretmapodites. a. E. quinquevittatus. Tanzania, b. E. (?) quinquevittatus. Freetown.

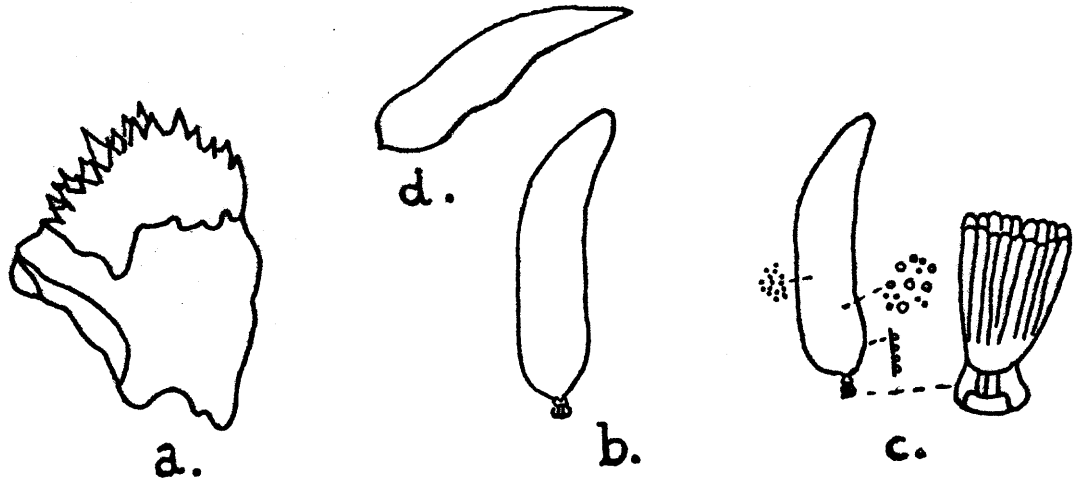

Fig. 2. Culex eggs laid above the waterline. a. C. (Melanoconion) abominator, b. C. (Neoculex) fergusoni, c. C. (N.) douglasi. d. C. (N.) hayashii. a. after Coad, b.,c. after Dobrotworsky, d. after Bohart & Ingram.