Description of *Culex sitiens* eggs from Oman (Diptera: Culicidae)

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ABSTRACT. The eggs of *Culex sitiens* Wiedemann are described for the first time. Scanning electron micrographs are also presented to illustrate the characteristic features of the eggs. The egg rafts of *Cx. sitiens* are also described and compared with five other previously described egg-rafts belonging to the *Culex (Culex)* subgenus.

INTRODUCTION

Culex (Culex) sitiens Wiedemann is an oriental mosquito species distributed throughout the coastal Ethiopian, Palaearctic (excluding Japan) and the Australasian regions and the islands of the Central and South Pacific (Belkin 1962, Zaim and Cranston 1986). Larvae of *Cx. sitiens* have been collected in association with *Anopheles sinensis* Wiedemann, *Culex nigropunctatus* Edwards, *Cx. fuscocephela* Theobald and *Aedes togoi* (Theobald) (Zaim and Cranston 1986, Belkin 1962). In addition, the African, New Guinea and New Hebribes larval types display a high tolerance for salt concentrations in their breeding habitats (Horsfall 1955). The immatures occur primarily in ground pools, rock pools and fallows containing brackish water. However, very little is known about the eggs of *Cx. sitiens.*

The present description of the eggs of *Cx. sitiens* is based on several egg rafts collected from a colony established at the Wellcome Research Laboratories, Ravens Lane, Berkhamsted, Herts, UK (Weifare, pers. comm.). The colony was started from egg rafts and larvae collected from the Muscat Region outside of Oman.

MATERIALS AND METHODS

All eggs of *Cx. sitiens* used for this study were mounted on specimen stubs and coated with gold. Examination and photography were done using a Hitashi S-700 scanning electron microscope. The nomenclature used in the description of the eggs conforms with that outlined by Harbach and Knight (1980).

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DESCRIPTION OF EGGS

The eggs of *Cx. sitiens* measures 448.72 ± 13.6 microns (n=25) in length and 95.20 ± 7.6 (n=25) microns in width at the broadest point (anterior end) (See Fig. 1a). The eggs are subfusiform in shape and circular in cross section, a feature common to most *Culex* eggs (Chadee and Haeger 1986). They are light brown with areas of darker pigmentation not only confined to parts of the anterior and posterior ends, but also on the middle of the eggs giving a "brown striped" appearance under the light microscope.

Parts of the outer chorion are almost transparent especially the upper one-third of the anterior end, but with minute tubercules distributed over most of the egg surface (Fig. 1b). At both the anterior and posterior ends, tubercules are absent (Fig. 1c & d). The posterior end of the egg is tapered, forming a "nipple-like" structure (Fig. 1a & c). This structure is associated with the apical droplet which helps in maintaining the correct orientation of tilted eggs and egg-rafts (Christophers 1945, Chadee and Haeger 1986).

On the anterior end of the eggs is the micropylar apparatus which is composed of a micropylar disk and collar which surrounds the micropyle. This feature appears as a "black spot" on the anterior end of the eggs, very similar to *Cx. nigripalpus* Theobald, *Cx. pipiens* Linneaus, *Cx. quinquefasciatus* Say, (*Cx. molestus* Forskall) and *Cx. gelidus* Theobald at the macro- and microscopic levels (Christophers 1945, Berlin and Subramanian 1974, Chadee and haeger 1986). The micropyle is obstructed by a spike-like projection measuring 6-9 microns (Fig. 1d & e). The corolla, a delicate frill surrounding the micropylar disk is inconspicuous but this structure is frequently lost when eggs are hatched. The micropylar apparatus measures 14-16 microns across. The pattern of dehiscence of *Cx. sitiens* was apical and incomplete.

The egg rafts of *Cx. sitiens* are variable in size comprising 18-170 ± 34.2 (n=25) eggs compiled in a broadly oval shape of 4-6 rows very similar to *Culex nigripalpus* egg rafts.

DISCUSSION

Previously, many mosquito eggs were described using hand drawings based on light microscopy. Consequently numerous morphological features have been examined, but without the necessary magnification to describe certain morphological features. Since many mosquito eggs sometimes fail to survive the trip from the field to the laboratory, hand drawings are the only method available for describing and illustrating the eggs of these species. In addition, many taxonomists do not have access to electron microscopes.

However, when available scanning electron micrographs should be used because important morphological features can be revealed. For example, the micropyle of some *Culex (Culex)* eggs have been described as blocked by an egg spike or plug (Chadee and Haeger 1986). It is clear from the present study that the micropyle

of *Cx. sitiens* is blocked by an egg spike rather than a plug (Fig. 1d & e) and that the egg spike and egg plug are two distinctly different morphological features. Previously, Harbach and Knight (1980) reported that the micropylar plug and egg spike were synonymous. In view of our study, it is suggested that other *Culex (Culex)* eggs should be examined or re-examined to determine what mechanism is used to block the micropyle.

The egg rafts of *Cx. sitiens* are similar in arrangement and structure to some previously described *Culex* egg rafts (Christophers 1945, Berlin and Subramian 1974, Chadee and haeger 1986). In addition, it should be noted that the description of *Cx. sitiens* eggs is very similar to the five *Culex (Culex)* mosquito eggs previously described and compared by Chadee and Haeger (1986).

ACKNOWLEDGEMENTS

We wish to thank Dr. M. Hill, Bill Farrell, Duncan Stewart, Geoffrey Harris and Miss J. Weifare from the Wellcome Research Laboratories, Berkhamsted, Herts, UK for providing the eggs of *Culex sitiens*. In addition, we thank members of the laboratory staff of Insect Vector Control Division, Ministry of Health, Trinidad and Tobago, W.I. for their assistance.

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Legend

Plate
1a - whole egg morphology (x 122.8)
1b - outer chorionic pattern (x 1000)
1c - posterior end of egg (x 1032)
1d - anterior end of egg (x 2,400)
1e - anterior end of egg (x 4,320)
(higher magnification)