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A pictorial key to the species of the *Aedes* (*Zavortinkius*) in the Afrotropical Region (Diptera: Culicidae)

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Abstract. Six species of the subgenus *Zavortinkius* of *Aedes* Meigen in the Afrotropical Region are treated in a pictorial key based on diagnostic morphological features. Images of the diagnostic morphological structures of the adult thorax and leg are included.

Key words: Culicidae, *Aedes*, mosquitoes, identification key, Africa

Introduction

In "Mosquitoes of the Ethiopian Region, in the Subgenus ***Finlaya*** Theobald", Edwards (1941: 119) noted that the African species of this subgenus belong to two very distinct groups: the Wellmanii Group without metallic markings, and the Fulgens Group of black species with silvery markings on the thorax and abdomen.

Edwards (1941: 120), in his "Key to Ethiopian Species of *Finlaya*", included three species in the **Couplet 1a.** "**Metallic silvery markings on thorax and abdomen, including a double row of silver scales extending nearly whole length of scutum in middle**": (1) *longipalpis* (Grunberg, 1905: 383), from Duala (Hafen), Cameroon; (2) *fulgens* (Edwards, 1917: 213), from Zanzibar (Tanganyika), Tanzania; and (3) *monetus* Edwards (1935a: 132), from Maevatanane, Madagascar. Edwards (1941: 120) also included six species from Africa in the **Couplet 1b.** "**No metallic silvery scales on thorax or abdomen"**: (1) *wellmanii* (Theobald, 1905b: 103) from Bihe, Angola; (2) *ingrami* Edwards (1930a: 296) from Aburi, (Gold Coast) Ghana; (3) *embuensis* Edwards (1930a: 295) from Embu, Kenya; (4) *nyasae* Edwards (1930a: 296) from Fort Johnston, (Nyasaland) Malawi; (5) *barnardi* Edwards (1924a: 161) from Oudebosch, Cape Province, Republic of South Africa (Union of South Africa); and (6) *pulchrithorax* Edwards (1939a: 17) from Nairobi, Kenya. Reinert (1999) removed *Aedes longipalpis* (Grunberg, 1905) from the Fulgens Group of the subgenus *Finlaya* Theobald (1903) and defined a new subgenus, *Zavortinkius* for that species and its relatives. Reinert (1999) included 11 species (4 new species, and 7 species previously assigned to the subgenus *Finlaya*) in his new subgenus, *Aedes* (*Zavortinkius*).

To assist entomologists and other field workers in the identification of mosquitoes from Africa, we provide a pictorial key as an add-on to the key of Huang (2001). A few additional characters, indicated by a double asterisks (**), were added as needed to facilitate identification. Images of the diagnostic morphological structures of the adult thorax and leg are also included in the supplemental pictorial key.

Material and methods

This study is based on specimens in the mosquito collection of the Department of Entomology, National Museum of Natural History (USNM), Smithsonian Institution. Other specimens were borrowed from individuals and institutions noted in the acknowledgments. The terminology follows Harbach and Knight (1980, 1982) with the exception of "tarsal claws," which is retained for "ungues."Terminology for wing venation follows Belkin (1962).

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In this paper, we follow Edwards' (1932) classification of the genus *Aedes*, retaining *Zavortinkius* as its subgenus.

Results and discussion

Huang (2001) published a key to the *Aedes* mosquitoes of the Afrotropical Region. This paper provides "A Pictorial Key to the Species of the *Aedes* (*Zavortinkius*) in the Afrotropical Region" (Appendix 1). This key was formatted to merge with the key of Huang (2001). The following steps should be followed in using the key of Huang (2001) with the merged supplemental key (Appendix 1): A Pictorial Key to the Species of the *Aedes* (*Zavortinkius*) in the Afrotropical Region (Diptera: Culicidae). From Page 34 of Huang (2001) key, with "**Part 3. Key to Subgenera of *Aedes***", **ADULTS,** follow the key to Page 48, then to Page 49, to Page 50b (** Thorax. Acrostichal setae absent, and ** Head. Pedicel with very few (1–3) scales and short fine setae on mesal surface), to key out to ***Zavortinkius***. Using Appendix 1, the supplemental key, add Page 50bA (1st page), Page 50bB (2nd page), Page 50bC (3rd page A and 3rd page B), Page 50bD (4th page A and 4th page B), to key out to ***Aedes* (*Zavortinkius***), for six species.

Classification. Reinert (1999) divided the subgenus *Zavortinkius* into three species groups: (1) the Longipalpis Group **(***Ae*. (*Zav.*) *fulgens* (Edwards, 1917), *Ae*. (*Zav.*) *geoffroyi* Reinert, 1999, *Ae*. (*Zav.*) *huangae* Reinert, 1999, *Ae*. (*Zav.*) *longipalpis* (Grunberg, 1905), *Ae*. (*Zav.*) *mzooi* Van Someren, 1962, and *Ae*. (*Zav.*) *pollinctor* (Graham, 1910)**)**; (2) the Brygooi Group **(***Ae.* (*Zav.*) *brygooi* Brunhes, 1971, *Ae*. (*Zav.*) *interruptus* Reinert, 1999, and *Ae*. (*Zav.*) *phillipi* Van Someren, 1949**)**; and (3) the Monetus Group **(***Ae*. (*Zav.*) *monetus* Edwards, 1935, and *Ae*. (*Zav.*) *brunhesi* Reinert, 1999**)**. Of the three species groups, only the *Longipalpis* Group of the subgenus *Zavortinkius* occur in the Afrotropical Region. The other two species groups (the Brygooi Group and the Monetus Group) of the subgenus *Zavortinkius* occur in Madagascar.

The *Aedes* (*Zavortinkius*) Longipalpis Group, represented by six species, is briefly characterized by having the subspiracular area without scales. The Brygooi and Monetus Groups (Madagascar) of the subgenus *Zavortinkius*, represented by five species, are characterized by having the subspiracular area with broad white scales.

Medical Importance. *Aedes* (*Zav.*) *fulgens* (Edwards) transmitted chikungunya virus, with high infection rates, to *Mystromys albicaudatus* (Smith) rodents in laboratory experiments (Jupp *et al*. 1981). The Uganda S virus was believed to have been isolated from a pool of 47 *Ae*. (*Zav*) *longipalpis*, 17 *Ae*. (*Fin.*) *ingrami* Edwards, and one *Ae*. (*Aedimorphus*) *natronius* Edwards in Bwamba County, Uganda (Dick & Haddow 1952). Furthermore, Haddow (1961) stated that either *Ae. longipalpis* or *Ae*. *ingrami* was probably the species from which the original isolation of the Uganda S virus was made.

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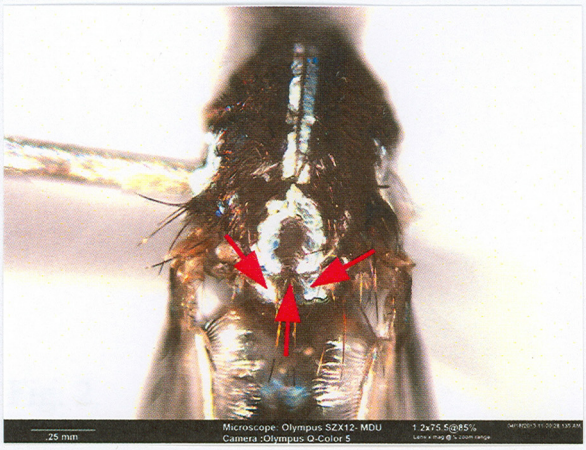
APPENDIX 1. A pictorial key to the species of the Aedes (Zavortinkius) in the Afrotropical Region (Diptera: Culicidae)

(add Page 50bA) (1st page)

Page 50bA (1st page)

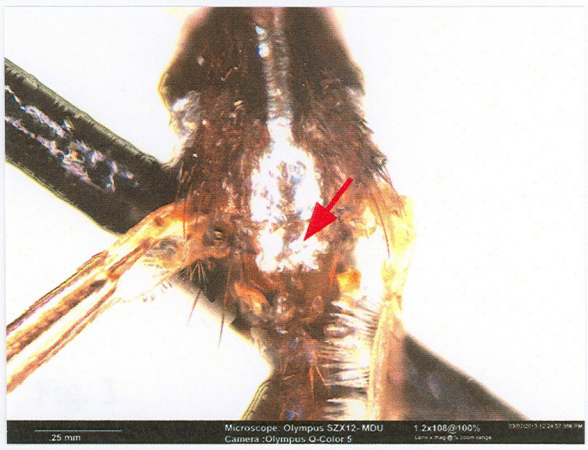
Thorax. Subspiracular area without scales …Longipalpis Group

Thorax. Midlobe of scutellum with dark broad scales in middle and with silvery broad scales laterally on midlobe



to Page 50bB (2nd page)

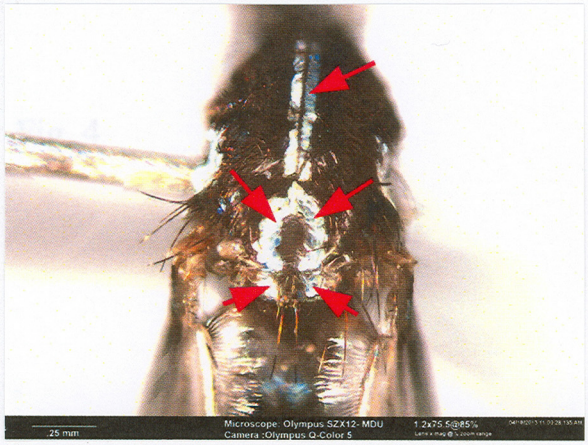
Thorax. Midlobe of scutellum with large patch of silvery broad scales on midlobe



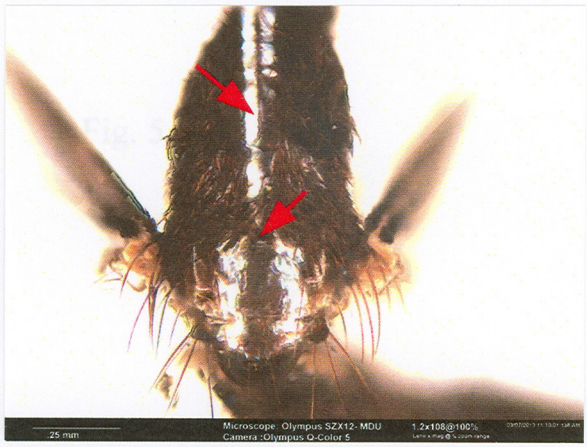
to Page 50bC (3rd page B)

Page 50bB (2nd page)

Thorax. Scutum with median silvery stripe of broad scales extending from anterior margin to prescutellar area, and forks along lateral areas to scutellum

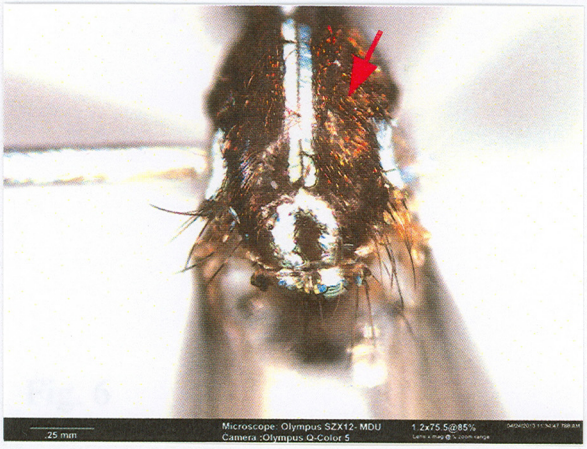


Thorax. Scutum with median silvery stripe of broad scales not reaching to prescutellar area, and with dark scales in front of prescutellar area



to Page 50bC (3rd page A)

Thorax. Posterior dorsocentral area with narrow dark scales or at most few broad dark scales



Aedes* (*Zavortinkius*) *longipalpis

Thorax. Posterior dorsocentral area with large patch of broad dark scales

Aedes* (*Zavortinkius*) *pollinctor

Page 50bC (3rd page A)

Thorax. Mesopostnotum with some broad silvery scales

Thorax. Mesopostnotum without broad silvery scales

Aedes* (*Zavortinkius*) *huangae

Aedes* (*Zavortinkius*) *geoffroyi

Page 50bC (3rd page B)

Thorax. Prescutellar area with largely silvery scales, and with only narrow median bare area

Thorax. Prescutellar area with broader median bare area

to Page 50bD (4th page A)

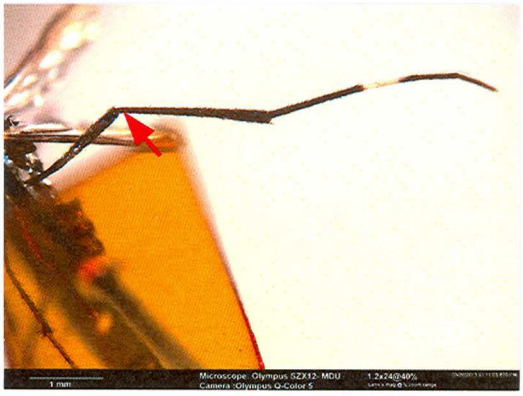
to Page 50bD (4th page B)

Page 50bD (4th page)

(4th page A)

|

Leg. Hindtibia all dark



Aedes* (*Zavortinkius*) *fulgens

(4th page B)

|

Leg. Hindtibia with a white mark at the base

Aedes* (*Zavortinkius*) *mzooi