

A Pictorial Key for the Identification of the Mosquitoes
Associated with Yellow Fever in Africa¹

Yiau-Min Huang² and Ronald A. Ward³

ABSTRACT. A pictorial key was developed as a training aid for the identification of the adults of 15 species of mosquitoes involved in the transmission of yellow fever virus in Africa. Included are 14 species of *Aedes* (subgenera *Aedimorphus*, *Diceromyia* and *Stegomyia*) and one species of *Eretmapodites*. Introductory figures display the taxonomic features used in the key.

INTRODUCTION

This pictorial key to the adult mosquito species known to be actual or suspect vectors of yellow fever was prepared as a part of a training course on the identification of yellow fever vectors in Africa⁴. The selection of species for inclusion was based upon a review of the medical entomology literature and information furnished by Dr. M. Cornet and Dr. J. Mouchet. The following species are included:

1. *Aedes (Aedimorphus) stokesi* Evans
2. *Aedes (Aedimorphus) vittatus* (Bigot)
3. *Aedes (Diceromyia) furcifer* (Edwards)
4. *Aedes (Diceromyia) taylori* Edwards
5. *Aedes (Stegomyia) aegypti* (Linnaeus)
6. *Aedes (Stegomyia) africanus* (Theobald)
7. *Aedes (Stegomyia) luteocephalus* (Newstead)
8. *Aedes (Stegomyia) metallicus* (Edwards)
9. *Aedes (Stegomyia) neoafricanus* Cornet, Valade and Dieng
10. *Aedes (Stegomyia) opok* Corbet and Van Someren
- 11.-13. Simpsoni Complex
11. *Aedes (Stegomyia) simpsoni* (Theobald)
12. *Aedes (Stegomyia) lili* (Theobald)
13. *Aedes (Stegomyia) bromeliae* (Theobald)
14. *Aedes (Stegomyia) strelitziae* Muspratt
15. *Eretmapodites chrysogaster* Graham

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⁴Through the auspices of the World Health Organization, a training course on yellow fever vectors was conducted at the National Arbovirus and Vectors Research Unit, Enugu, Nigeria from March 20-29, 1980. This course included lectures, laboratory and field demonstrations covering vector ecology, collection, rearing and preservation of specimens; taxonomic morphology and use of keys.

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Geographically, this key includes all of Africa south of Morocco, Algeria, Libya and Egypt. The island of Madagascar is excluded.

Figures 1,2 illustrate the adult structures of the head, thorax and leg which are used in the key. The terminology follows that of Harbach and Knight (1980), with the exception of the "tarsal claw" which is retained for "unguis". Since this differs in some respects from that of Belkin (1962), Edwards (1941) and Huang (1979a), the list below will indicate those names of structures in figures 1,2 and the illustrations on p. 144 for the male genitalia which differ from those traditionally used.

NEW NAME	OLD NAME
antepnotum	anterior pronotum
gonocoxite	basimere
gonostylus	distimere
hypostigmal	hypostigial
lateral scutal fossa	lateral prescutal area
maxillary palpus	palpus
mesokatepisternum	sternopleuron
mesopostnotum	postnotum
pedicel	torus
posterior scutal fossa	posterior fossal
postpronotum	posterior pronotum
prescutellar area	prescutellar space
prespiracular area	spiracular area
scutal fossa	fossal area
postprocoxal membrane	postcoxal membrane

A few additional characters indicated by a double asterisk (**) were added to certain species or species groups in the key wherever necessary, to facilitate identification and to avoid confusion with very similar and/or common species in the area. Unfortunately, at present, the identification of certain species can only be made by examination of the male genitalia. Therefore, it is advisable that this examination be performed not only for routine confirmation of identification but also for the detection of new species in the area. On p. 144 are illustrations of the male genitalia of *Ae. (Dic.) furcifer* and *Ae. (Dic.) taylori* to assist in their separation.

The recent "Catalogue of the Diptera of the Afrotropical Region" which has a chapter on Culicidae by White (1980) will serve as a guide to the literature for the identification of these vectors. Additional references on *Aedes (Stegomyia)* species published subsequent to the completion of the above catalogue include Huang 1979b, 1981.

Fig. 1

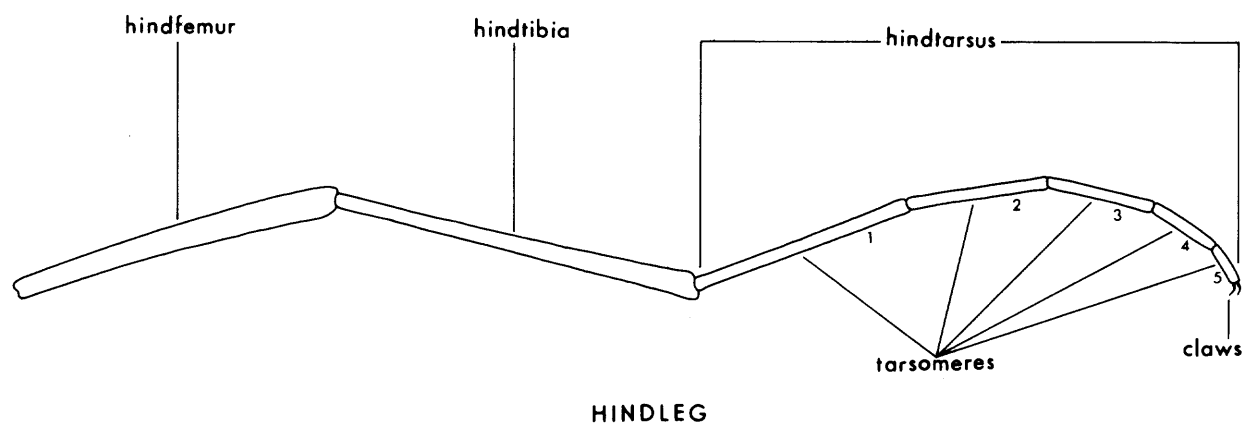
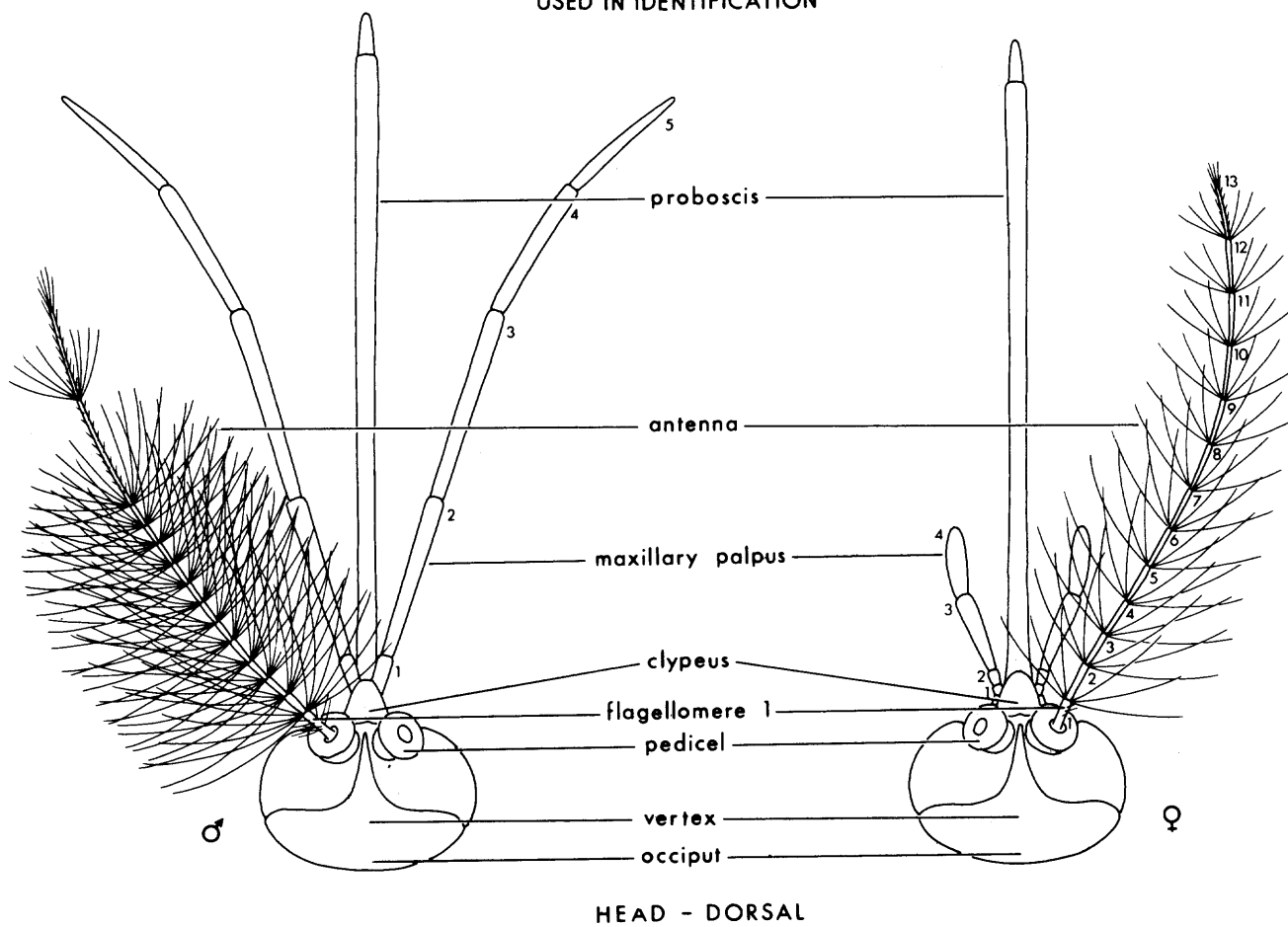
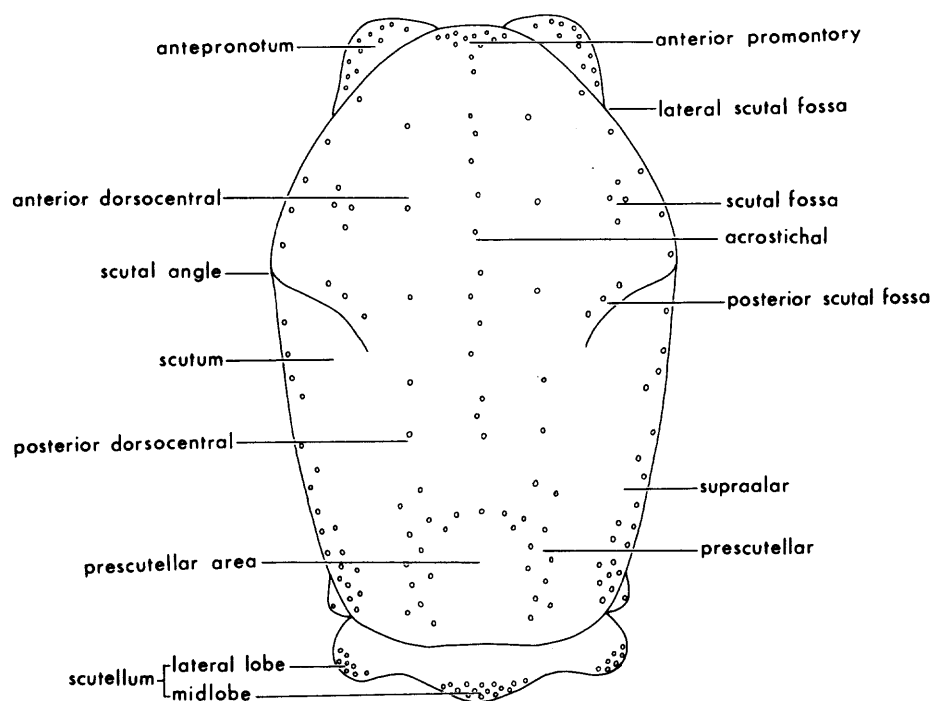
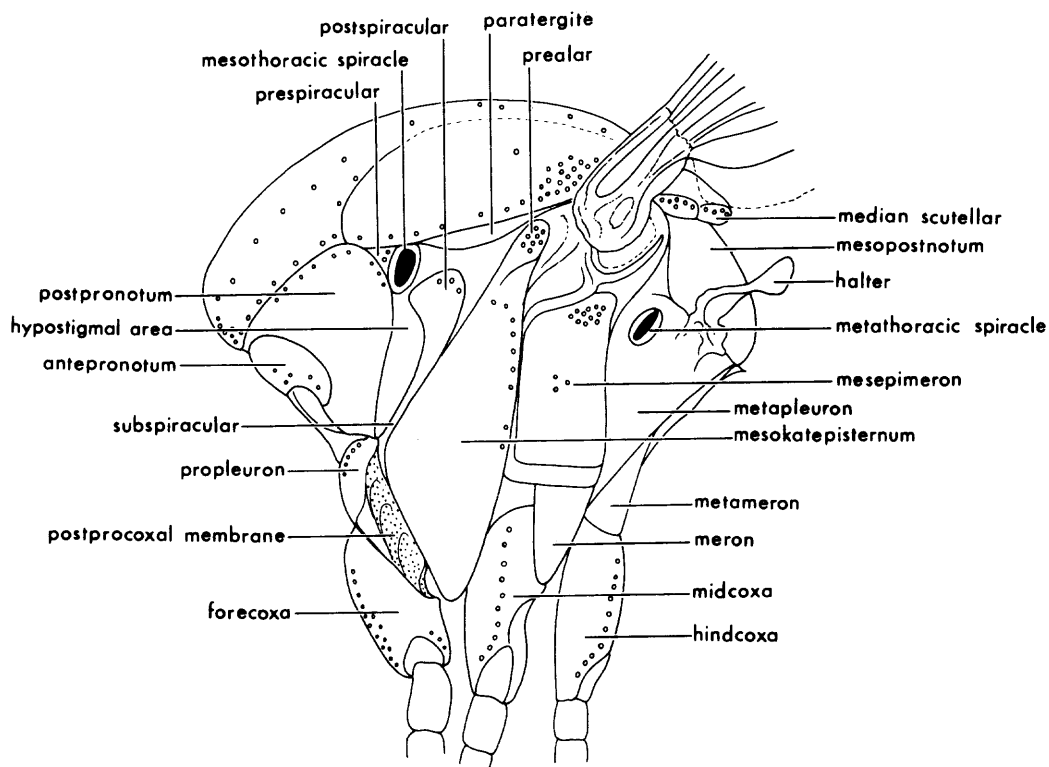
MORPHOLOGICAL FEATURES
USED IN IDENTIFICATION

Fig. 2



THORAX-DORSAL



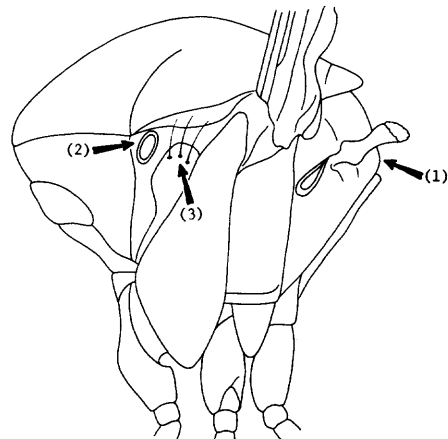
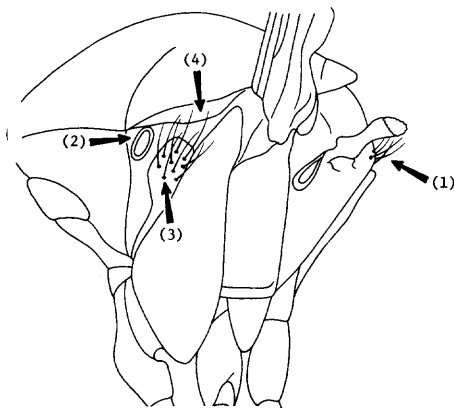
THORAX-LATERAL

PICTORIAL KEY

ADULTS

(1) Mesopostnotum with setae

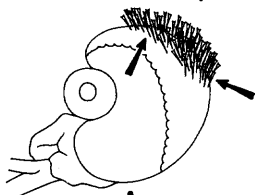
(1) Mesopostnotum bare



** (2) Prespiracular area bare
 (3) Postspiracular setae present
 (4) Paratergite broad and bare

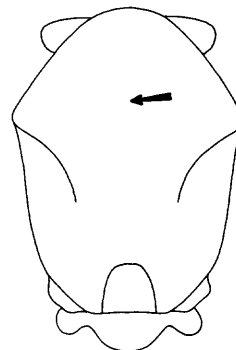
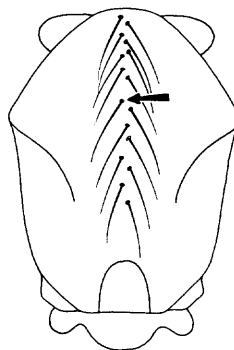
** (2) Prespiracular area bare
 (3) Postspiracular setae present

(5) Erect forked scales numerous,
 not restricted to occiput

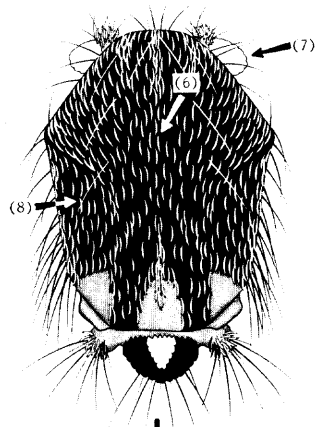


(4) Acrostichal setae present

(4) Acrostichal setae absent

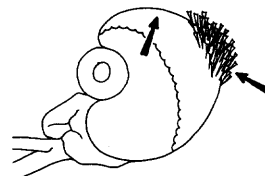
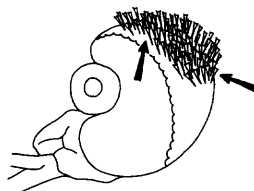


(6) Acrostichal setae absent
 (7) Anteprenotum with broad white scales
 (8) Scutum with narrow yellow and black
 scales rather evenly mixed, without
 yellow scales arranged in stripes

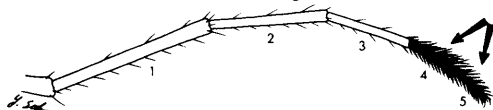


(5) Erect forked scales numerous,
 not restricted to occiput

(5) Erect forked scales not numerous,
 restricted to occiput



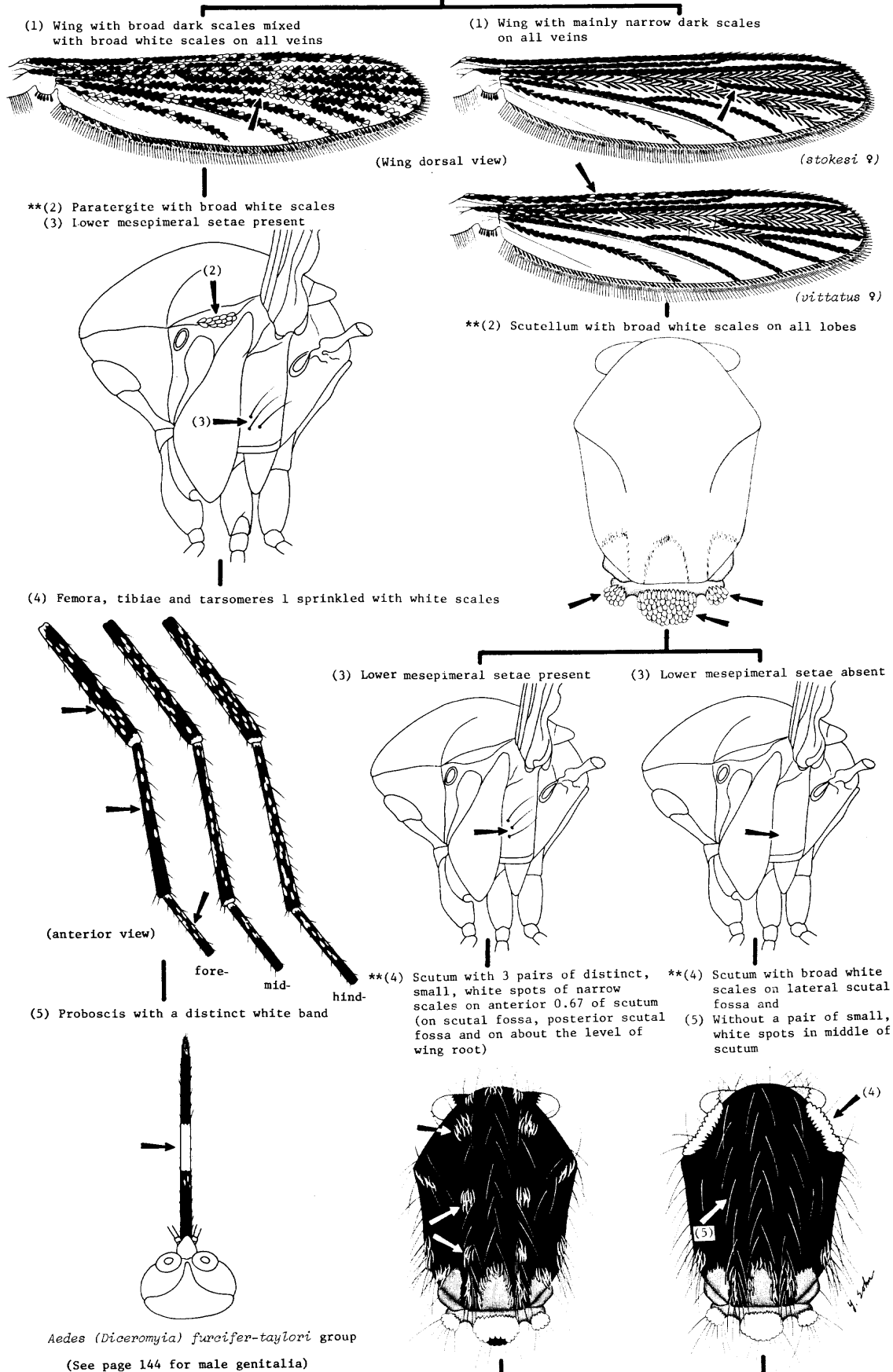
(9) ♂ hindtarsomeres 4,5 with scales
 more or less outstanding



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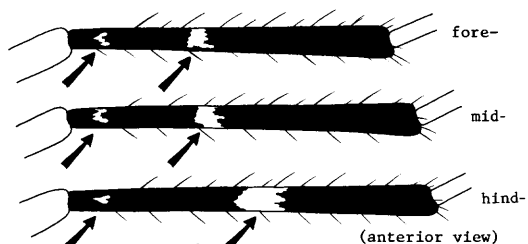
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Eretmapodites chrysogaster group (5 sp.)*chrysogaster* Graham

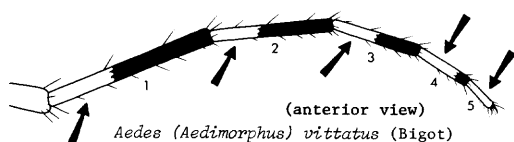


Couplet A

- (1) Tibiae dark, each with a subbasal white spot and a white band at about basal 0.33 on fore- and mid- and at about 0.50 on hindtibia

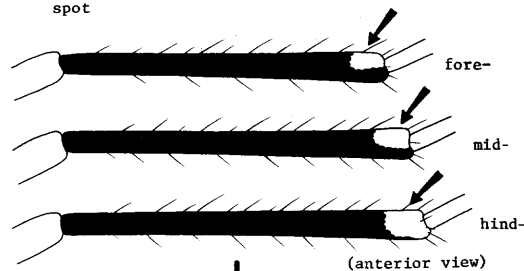


- (2) Hindtarsus with a basal white band on tarsomeres 1-4, the ratio of length of white band to the total length of tarsomere is 0.40, 0.40 0.50 and 0.75; tarsomere 5 all white

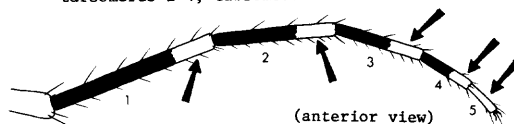


Couplet B

- (1) Tibiae dark, each with a white apical spot



- (2) Hindtarsus with apical white band on tarsomeres 1-4; tarsomere 5 all white



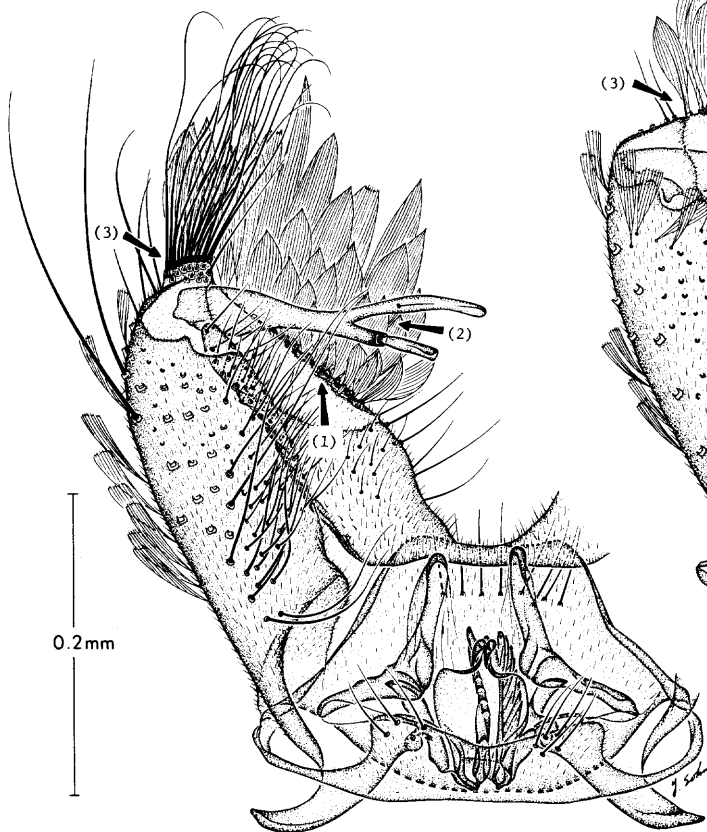
Aedes (Aedimorphus) stokesi Evans

Aedes (Diceromyia) furcifer-taylori group (♂ GENITALIA)

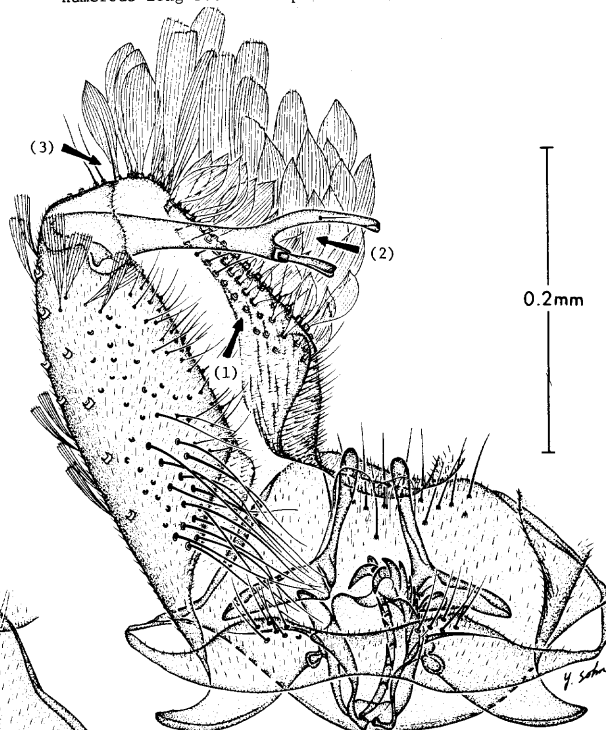
- ** (1) Gonocoxite with dense scales on mesal margin of ventral surface
(2) Gonostylus forked, with a stout, blunt spiniform process apically on the shorter one.

- (3) Gonocoxite with a projecting lobe bearing numerous long setae on apicomasal area

- (3) Gonocoxite without a projecting lobe and without numerous long setae on apicomasal area



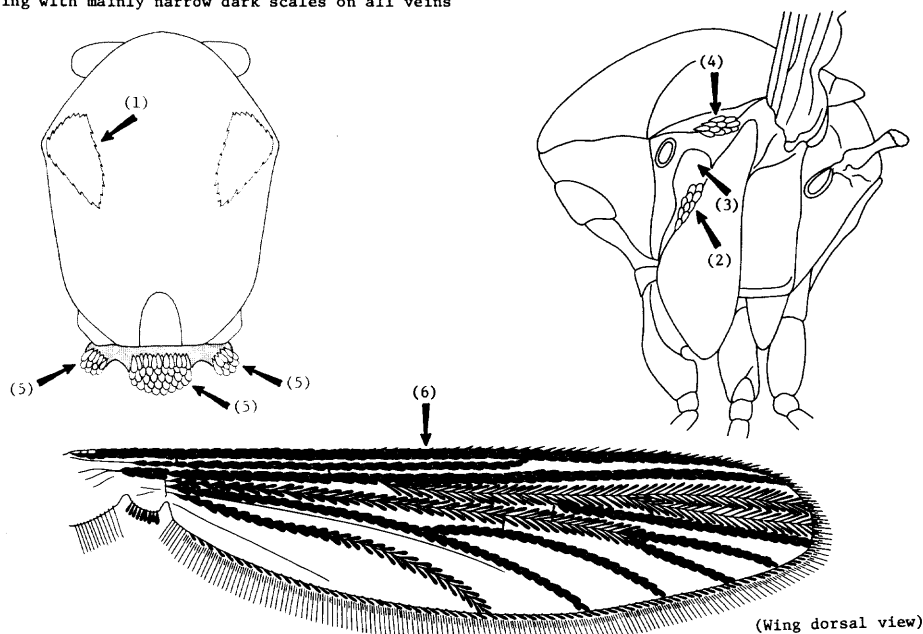
Aedes (Diceromyia) furcifer (Edwards)



Aedes (Diceromyia) taylori Edwards

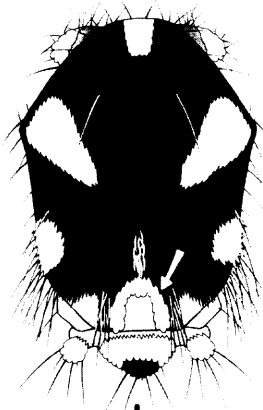
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- ** (1) Scutum with a distinct patch of white marking on scutal fossa
 (2) Subspiracular area with broad white scales
 (3) Postspiracular area without scales
 (4) Paratergite with broad white scales
 (5) Scutellum with broad white scales on all lobes
 (6) Wing with mainly narrow dark scales on all veins

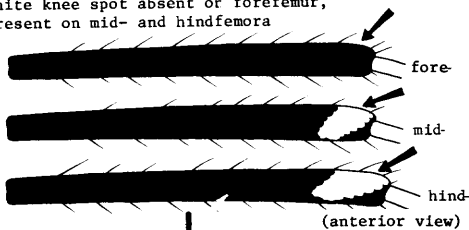


(7) Prescutellar area with all broad, flat, metallic silvery white scales

(7) Prescutellar area without all broad, flat, metallic silvery white scales



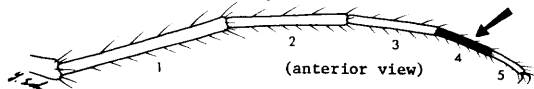
** (8) White knee spot absent or forefemur, present on mid- and hindfemora



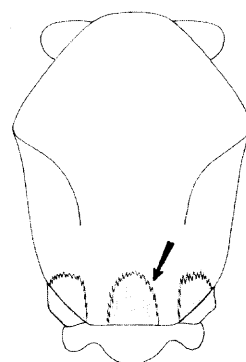
(9) Hindtibia without a white stripe at, or near base



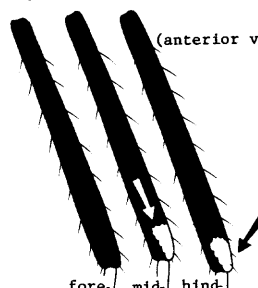
(10) Hindtarsomere 4 entirely dark



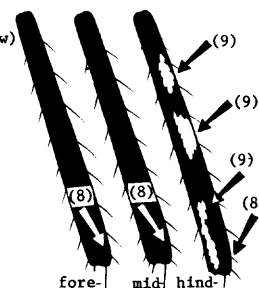
Aedes (Stegomyia) metallicus (Edwards)



(8) White knee spot present at least on mid- and hindfemora



(8) White knee spot absent on all femora

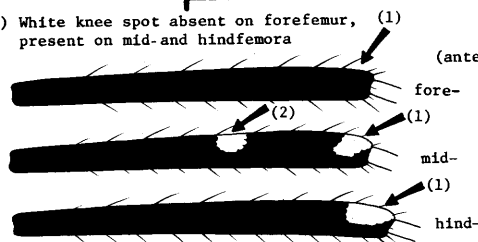


** (9) Hindfemur with 3 large, white patches on anterior surface (on basal, median and apical areas)

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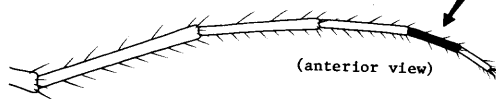
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- (1) White knee spot absent on forefemur, present on mid- and hindfemora

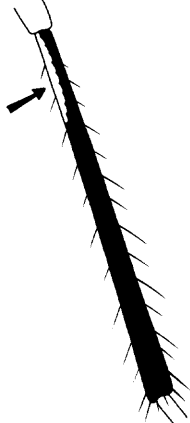


- ** (2) Midfemur with a large white spot on anterior surface

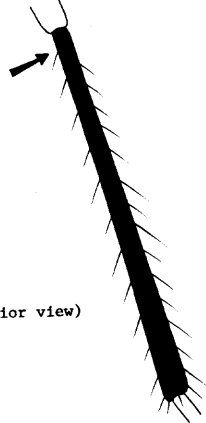
- (3) Hindtarsomere 4 entirely dark



- (4) Hindtibia with a white stripe on about basal 0.25



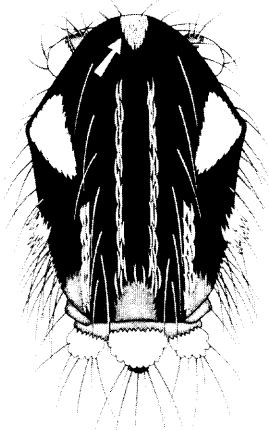
- (4) Hindtibia without a white stripe at, or near base



(anterior view)

Aedes (Stegomyia) simpsoni complex
(*simpsoni*, *lilii*, *bromeliae*)

- ** (5) Anterior median white stripe with all narrow scales



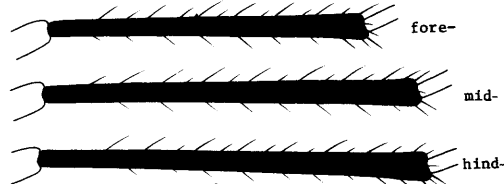
Aedes (Stegomyia) strelitziae Muspratt

- (1) White knee spot present on all femora



- ** (2) Midfemur with a narrow white longitudinal stripe on ventral half of anterior surface

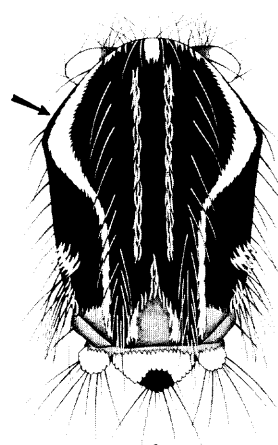
- (3) All tibiae anteriorly dark, without any white band



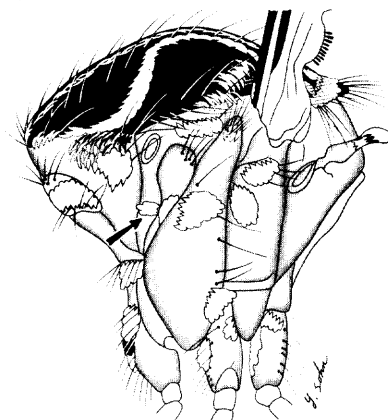
- (4) Hindtarsus with a basal white band on tarsomeres 1-4, tarsomere 5 all white



- (5) Scutum with lyre-shaped white markings



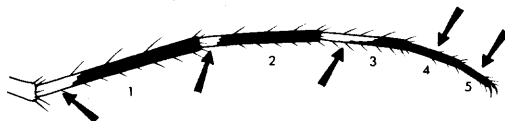
- (6) Hypostigmal area with broad white scales



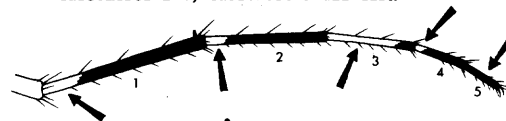
Aedes (Stegomyia) aegypti (Linnaeus)

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- (1) Hindtarsus with a basal white band on tarsomeres 1-3, tarsomeres 4,5 all dark

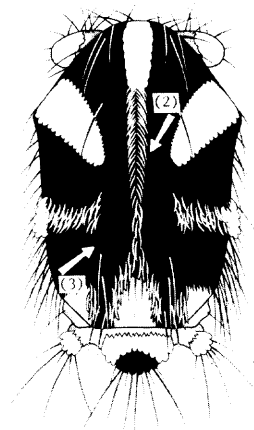


- (1) Hindtarsus with a basal white band on tarsomeres 1-4, tarsomere 5 all dark

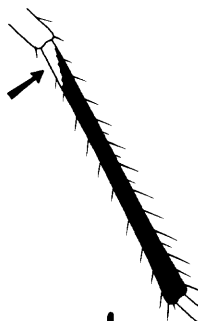


(anterior view)

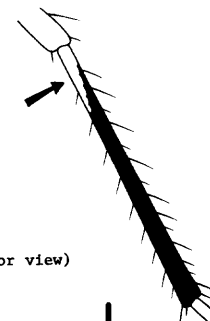
- ** (2) Scutum with a median longitudinal yellow line of narrow scales
(3) Posterior dorsocentral yellow line of narrow scales not developed

*Aedes (Stegomyia) luteocephalus* (Newstead)

- (2) Hindtibia with a white stripe on about basal 0.17 or less



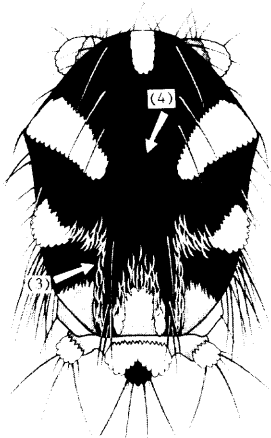
- (2) Hindtibia with a white stripe on about basal 0.25



(anterior view)

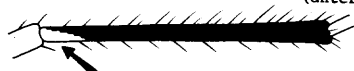
- ** (3) Anterior median white stripe rather short and broad, about 2 times as long as wide
(4) Posterior dorsocentral white line of narrow scales not developed

- (3) Posterior dorsocentral yellow line of narrow scales present

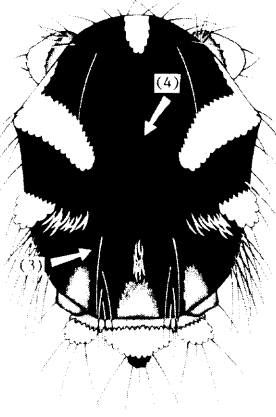


- ** (4) Scutum without a median longitudinal yellow line of narrow scales

- (5) Hindtibia with a white stripe on about basal 0.17

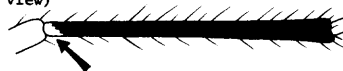
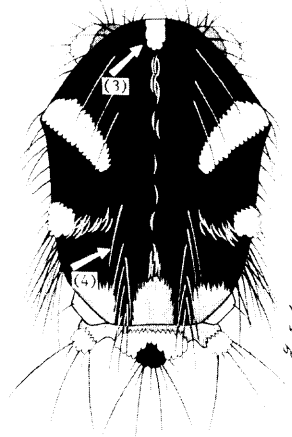
*Aedes (Stegomyia) opok* Corbet and Van Someren

- (3) Posterior dorsocentral yellow line of narrow scales not developed



- ** (4) Scutum without a median longitudinal yellow line of narrow scales

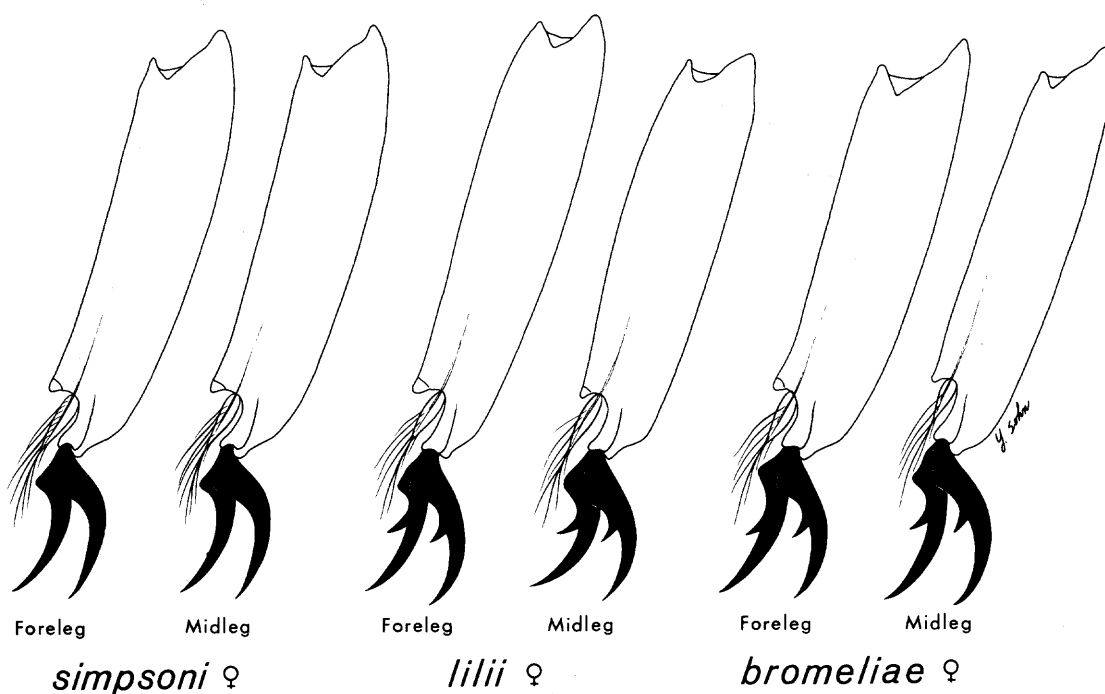
- (5) Hindtibia with a white stripe on about basal 0.08 or less

*Aedes (Stegomyia) neoaffricanus* Cornet, Valade and Dieng*Aedes (Stegomyia) africanus* (Theobald)

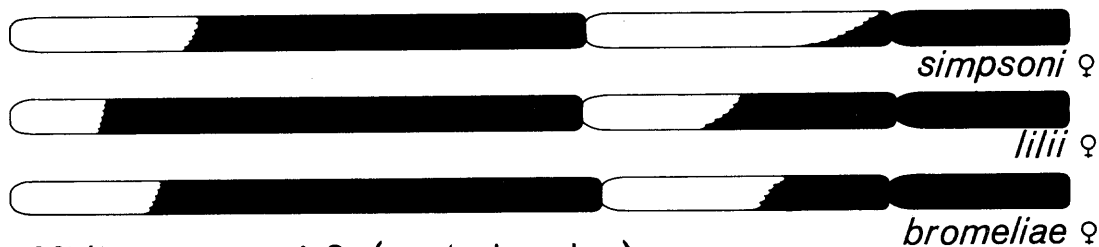
Female diagnostic characters of 3 species
in the *Aedes simpsoni* complex

Species	Female Diagnostic Characters
<i>simpsoni</i> (Theobald, 1905)	1. Fore- and midtarsal claws equal, both simple; 2. Fore- and midtarsomere 2 with basal 0.83-0.90 white on dorsal surface; 3. Midtarsomeres 1 and 2 usually without a white stripe on posterior surface.
<i>lilii</i> (Theobald, 1910)	1. Fore- and midtarsal claws equal, both toothed; 2. Fore- and midtarsomere 2 with at most basal 0.50 white on dorsal surface; 3. Midtarsomeres 1 and 2 usually without a white stripe on posterior surface.
<i>bromeliae</i> (Theobald, 1911)	1. Fore- and midtarsal claws equal, both toothed; 2. Foretarsomere 2 with basal 0.50-0.60 white on dorsal surface; midtarsomere 2 with basal 0.66-0.75 white on dorsal surface; 3. Midtarsomere 1 usually with a white stripe, on basal 0.75-0.83, on posterior surface; midtarsomere 2 with at least basal 0.66 white on posterior surface.

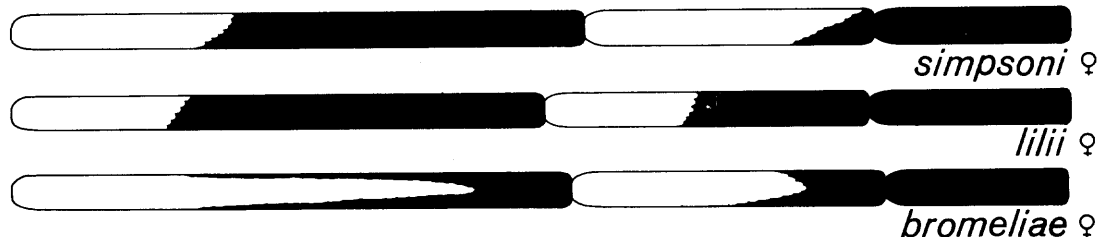
Tarsal claws



♀ Foretarsomeres 1, 2 (posterior view)



♀ Midtarsomeres 1, 2 (posterior view)



ACKNOWLEDGMENTS

We wish to express our sincere appreciation to Dr. J. Hamon, Director and Dr. R. O. Darwish, Scientist/Entomologist, Division of Vector Biology and Control, World Health Organization, for inviting us to participate and contribute in a practical way to their programs. The senior author also wishes to express her sincere thanks to Dr. A. B. Knudsen, WHO, Scientist; Dr. M. O. E. Iwuala and his staff, Arbovirus and Vectors Research Unit, Enugu, Nigeria for their helpful assistance and much kindness received while conducting the training course in Enugu.

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