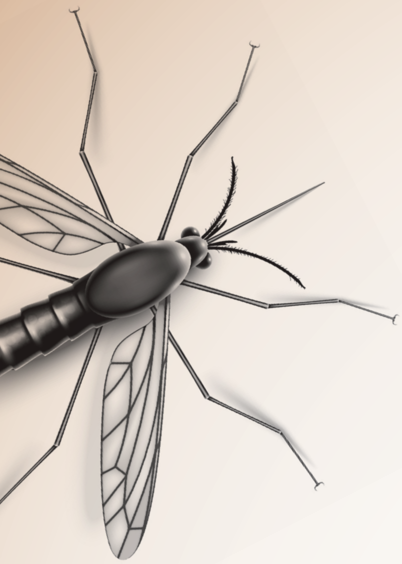
Mosquito Genera

Identification Key

Africa Command Area of Responsibility and Egypt

APHC TG 369. Approved for public release; distribution is unlimited. March 2016

APHC
ARMY PUBLIC HEALTH CENTER (Provisional)



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Introduction

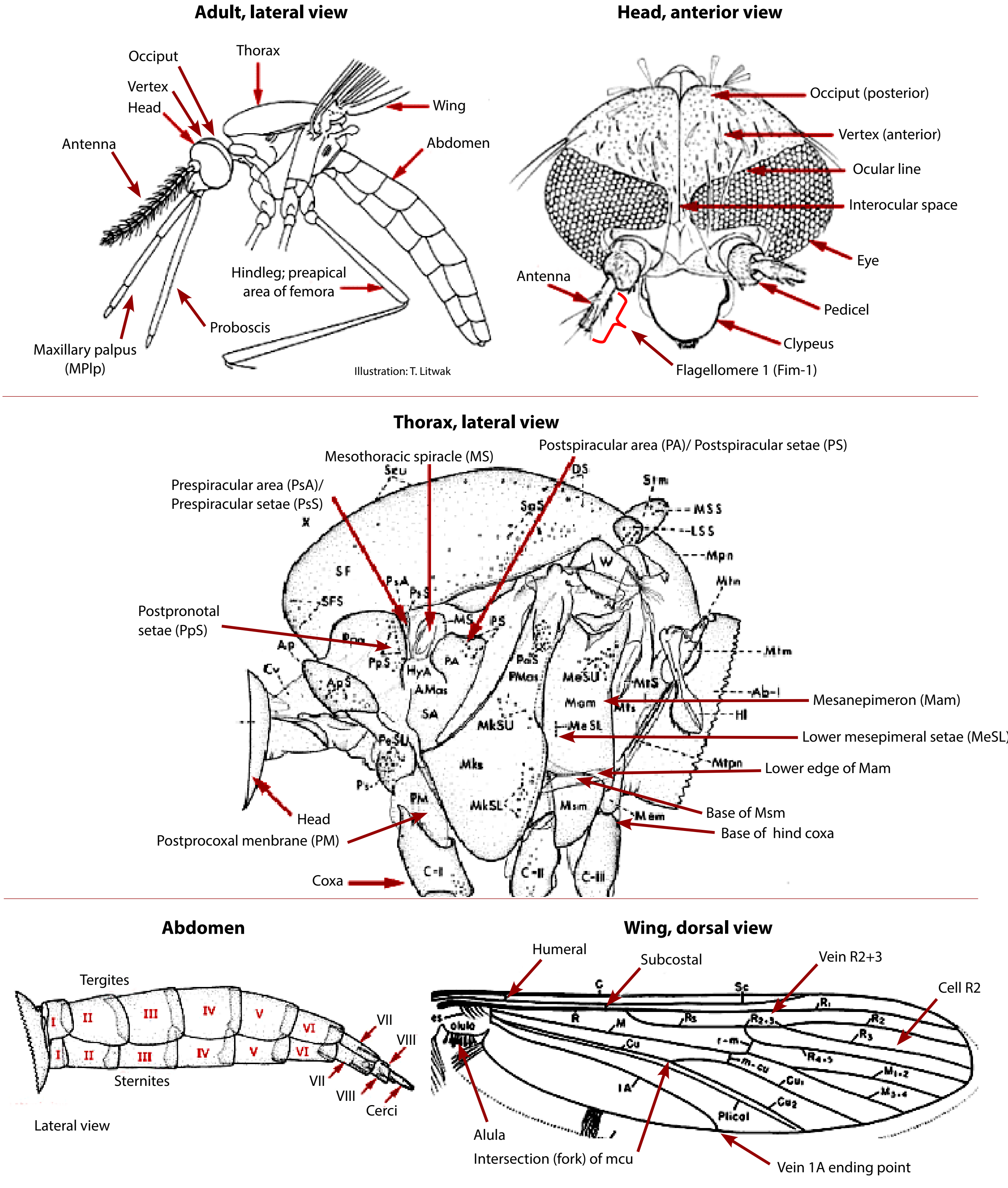
Identifying local **mosquito genera is essential** when establishing and carrying out control measures. This key uses characteristics, or characters, to differentiate between mosquito genera found in the U.S. Africa Command (AFRICOM) and Egypt and insects that are not mosquitoes. Start at step 1 on page 7, and select the choice that matches your insect specimen. Each selection will lead you to a specific mosquito genus or will send you to a new set of choices. Every step is followed by a number in parentheses (see pages 7 through 15). This number in parentheses is the step number that sent you to your current choice. Continue through the key until you have identified your specimen.

Limitations

Characteristics in this key **must be viewed** with a **dissecting microscope**. This key is intended for field use; it separates mosquito specimens into genera but does not identify mosquitoes to the species level. Mosquito genera contain both medically important species and species that do not transmit disease. Additional keys are required to identify the species within genera. Photos of characteristics used in this key have been selected for clarity of the character and may not be images of the actual genus. Images of all mosquitoes are not readily available. When photos of characteristics are not available for a specific genera, photos of other genera have been substituted. Substituted images may not be representative of the actual genera or from a genera found in AFRICOM.

Fig. 1. Map of Africa

Fig. 2. Mosquito Morphological Structures



Source: WRBU website (2015); illustration adapted from Darsie & Ward (1981)

Key to Female Mosquito Genera in AFRICOM and Egypt, with Figures

Genera covered in this key:

Aedeomyia
Aedes
Anopheles
Coquillettidia
Culex
Culiseta
Eretmapodites
Ficalbia
Hodgesia
Lutzia
Malaya
Mansonia
Mimomyia
Orthopodomyia
Toxorhynchites
Uranotaenia

Step: 01

A fly with needle-like mouthparts (**fig. 3)**; scales covering the body (**fig. 4**); and scales on the wings (**fig. 5**)	**Mosquito** - go to step **2**
No needle-like mouthparts (**figs. 6 & 7)**; body without scales (**fig. 8**); wings usually without scales (**fig. 9**)	**Not a Mosquito**

Fig. 3. Needle-like mouthparts: *Cq. crassipes*

Fig. 4. Lateral view of thorax: *Cx. tritaeniorhynchus*

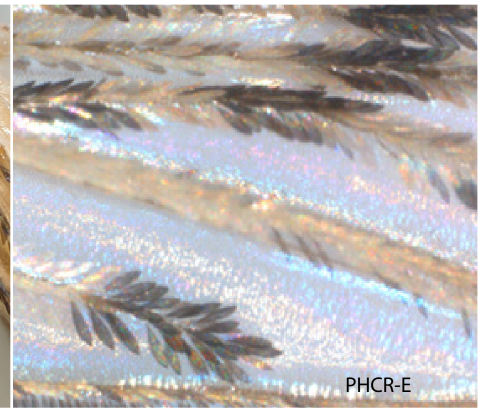


Fig. 5. Wing with scales

Fig. 6. No needle-like mouthparts

Fig. 7. Sand fly

Fig. 8. Body without scales

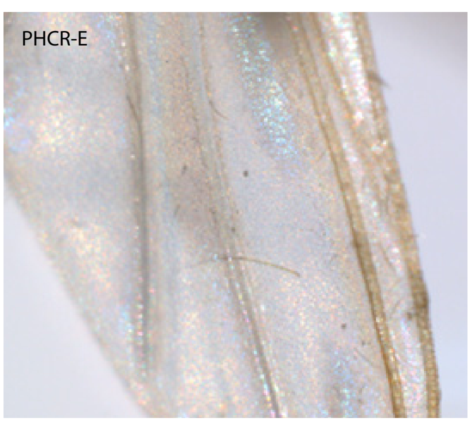


Fig. 9. Wing usually without scales

KEY: **APHC** - Army Public Health Center **PHCR-Europe** - Public Health Command Region Europe **WRBU** - Walter Reed Biosystematics Unit

Step: 02 (1)

Antennae bushy or feather-like, palpi (MPlp) as long as proboscis and bushy, or with paddles **(figs. 10-12)**.	**Male**
Antennae not bushy or feather-like, palpi (MPlp) shorter than proboscis, proboscis with apical half not strongly recurved and not more slender than basal half (not tapering to a point) **(figs. 13-15)**.	**Female** Subfamily Culicinae - **3**
Antennae not bushy or feather-like, palpi (MPlp) as long as proboscis, not bushy and without paddles. Proboscis not tapering to a point (**figs. 16-18)**.	**Female - *Anopheles***
Antennae not bushy or feather-like, proboscis (P) with apical half strongly recurved and more slender than basal half (tapering to a point) (**fig. 19**)	**Female - *Toxorhynchites***
Antennae not bushy or feather-like, proboscis (P) with the tip distinctly swollen, upturned and hairy (**fig. 20**).	**Female - *Malaya***

Fig. 10. Palpi as long as proboscis: Male *Ae. caspius*

Fig. 11. Palpi with paddles: Male *An. dthal*

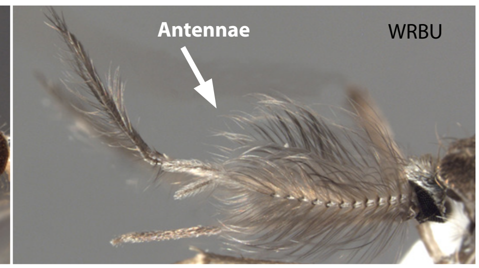


Fig. 12. Antennae featherlike: Male *Cx. univittatus*

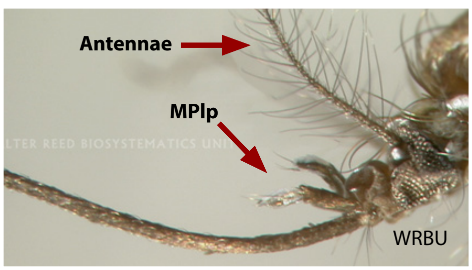


Fig. 13. Palpi shorter than proboscis: *Ae. aegypti*

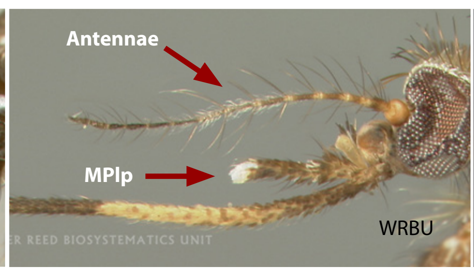


Fig. 14. Antennae not bushy or feather-like: *Ma. africana*

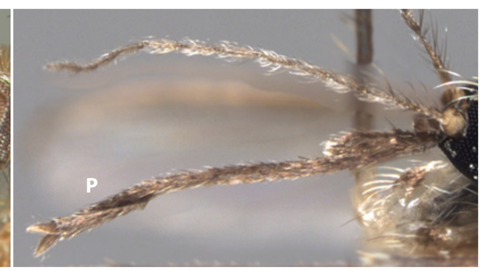


Fig. 15. Proboscis not tapering to a point: *Mi. mimomyiaformis*

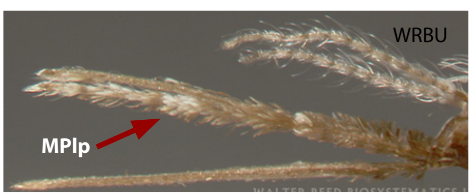


Fig. 16. Palpi as long as proboscis: *An. aquasalis*

Fig. 17. Palpi without paddles: *An. aztecus*

Fig. 18. Antennae not bushy or feather-like: *An.dirus*

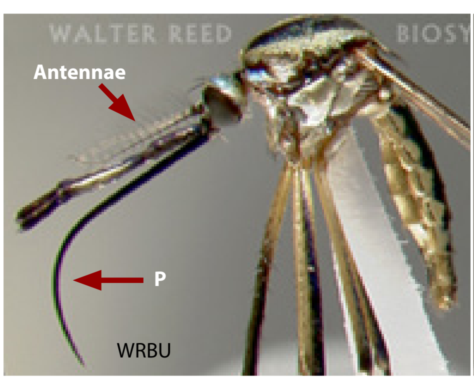


Fig. 19. Proboscis strongly bent and tapering to a point: *Tx. rutilus*

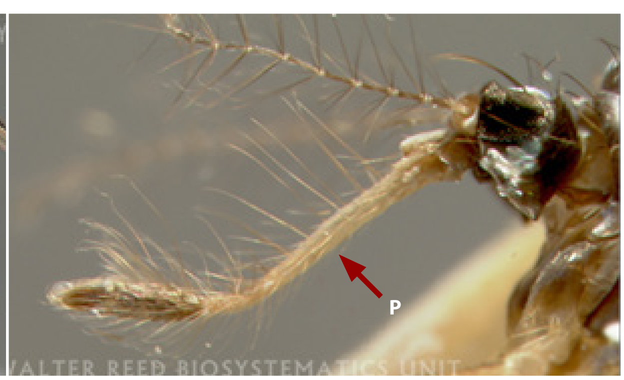


Fig. 20. Proboscis with the tip distinctly swollen, upturned and hairy: *Malaya spp.*

Step: 03 (2)

Vein 1A ending beyond intersection (fork) of mcu (**fig. 21**)	**4**
Vein 1A ending before or at level with intersection (fork) of mcu (**fig. 22**)	**12**

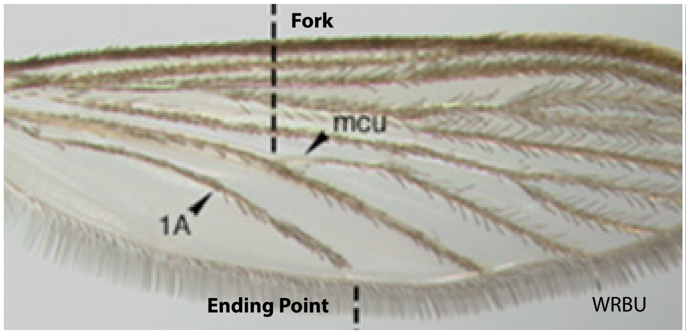


Fig. 21. Vein 1A ending beyond intersection (fork) of mcu : *Culex spp.*

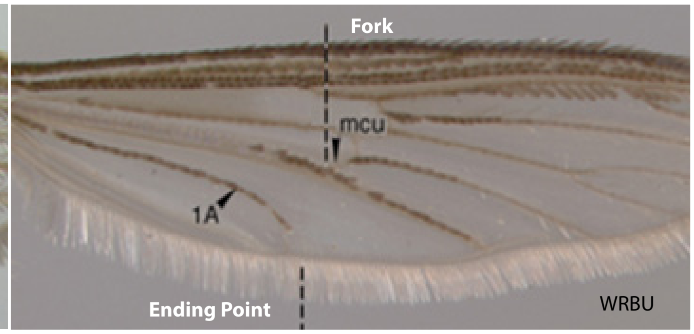


Fig. 22. Vein 1A ending before intersection (fork) of mcu : *Uranotaenia spp.*

Step: 04 (3)

Prespiracular setae absent [no setae in the prespiracular area (PsA)] AND postspiracular setae (PS) present (**fig. 23**)	**5**
Prespiracular setae absent [no setae in the prespiracular area (PsA)] AND postspiracular setae absent [no setae in the postspiracular area (PA)] (**fig. 24**)	**7**
Prespiracular setae (PsS) present AND postspiracular setae absent [no setae in the postspiracular area (PA)] (**fig. 25**)	***Culiseta***
Prespiracular setae (PsS) present AND postspiracular setae (PS) present (**fig. 26**)	**No African species with this set of characters**

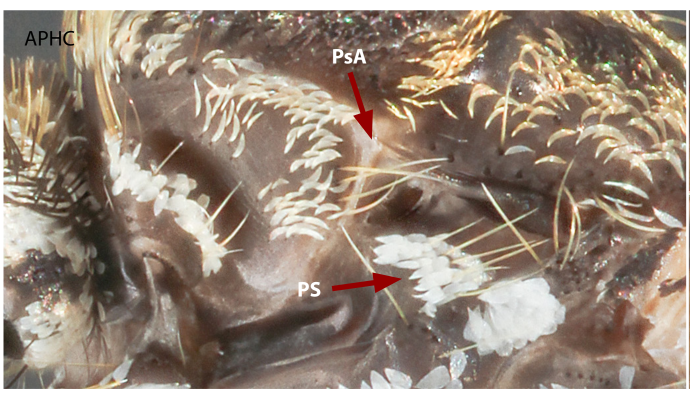


Fig. 23. Prespiracular setae absent and PS present: *Ae. japonicus*

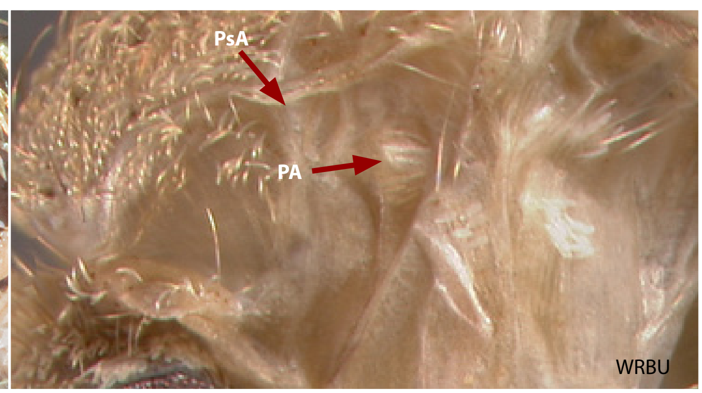


Fig. 24. Prespiracular and postspiracular setae absent: *Cx. quinquefasciatus*

Fig. 25. PsS present and postspiracular setae absent : *Cs. longiareolata*

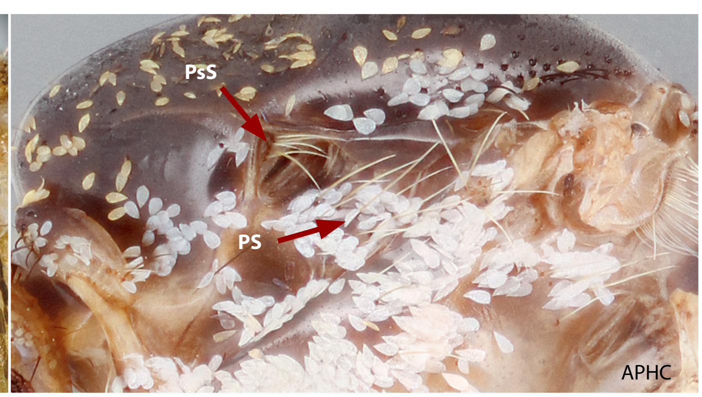


Fig. 26. PsS present and PS present: *Ps. ferox*

Step: 05 (4)

No eye separation above antennae, eyes touching each other (**fig. 27**)	**6**
Narrow eye separation above antennae (**fig. 28**)	***Aedes***
Wide eye separation above antennae, separated by a cover of flat, silver scales (**fig. 29**)	***Eretmapodites***

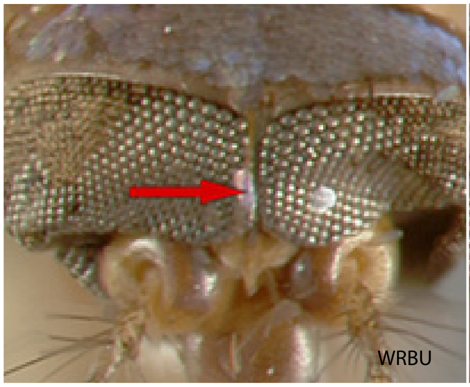


Fig. 27. Eyes touching each other above antennae

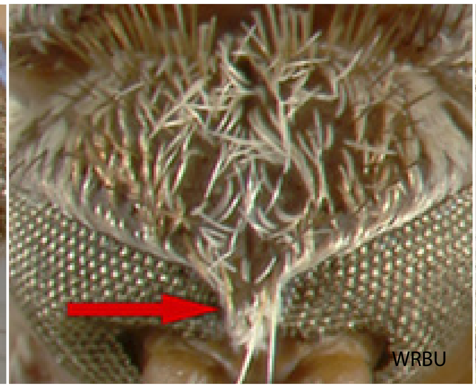


Fig. 28. Narrow eye separation above antennae

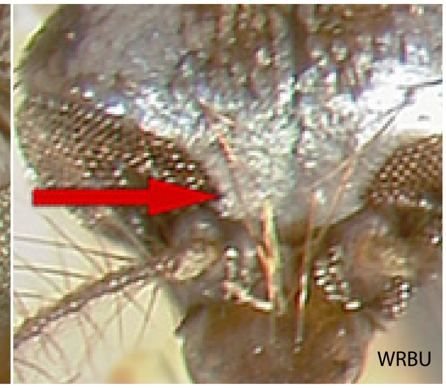


Fig. 29. Wide eye separation above antennae

Step: 06 (5)

Wing scales narrow (**fig. 30**), but if broad, then not strongly asymmetrical (**fig. 31**) (Note: *Ae. fucifer* (**fig. 32**) and *Ae. taylori* have upper surface wing scales that are large, broad and obliquely truncate, much as in *Mansoniodes*)	***Aedes***
Wing scales broad, strongly asymmetrical (**fig. 33**)	***Mansonia***

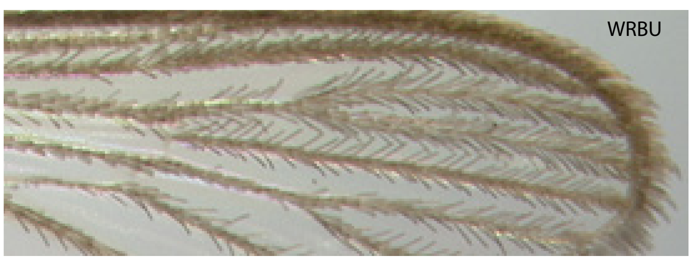


Fig. 30. Wing scales narrow: *Ae. vexans*

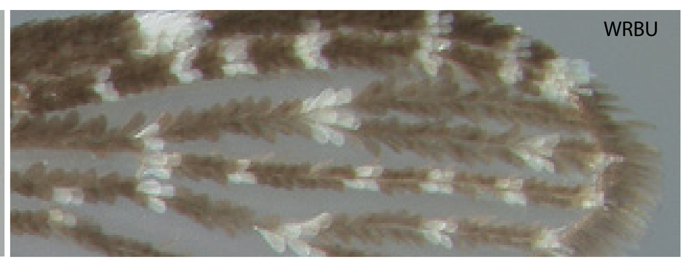


Fig. 31. Wing scales broad: *Ae. poicilius*

Fig. 32. Wing scales broad and obliquely truncate: *Ae. fucifer*

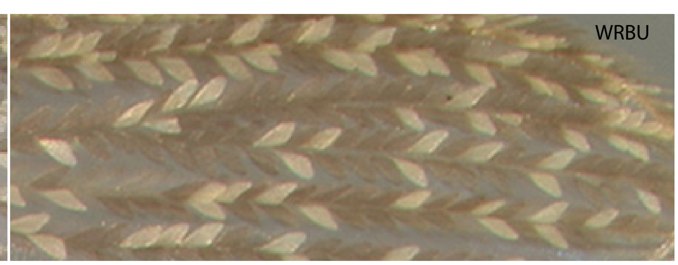


Fig. 33. Wing scales broad, strongly asymmetrical: *Mansonia spp.*

Step: 07 (4)

Tarsomere 1 (Ta1) of all legs as long as, or shorter than, tarsomeres 2-5 (Ta2-5) combined (**fig. 34**)	**8**
Tarsomere 1 (Ta1) of the fore- and midlegs or the hind legs longer than tarsomeres 2-5 (Ta2-5) combined (**fig. 35**) Note: Aedeomyia hind leg Ta1 longer than Ta2-5 combined. Orthopodomyia fore-and midlegs Ta1 longer than Ta2-5 combined	**11**

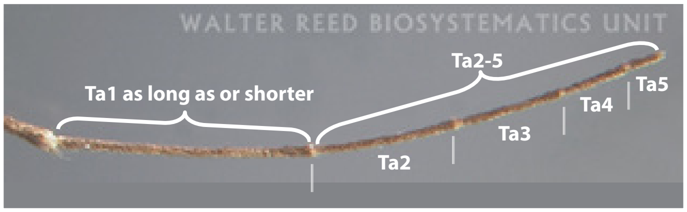


Fig. 34. Tarsomere 1 shorter than tarsomeres 2-5 combined, tarsomere Ta4 longer than Ta5: *Cx. quinquefasciatus*

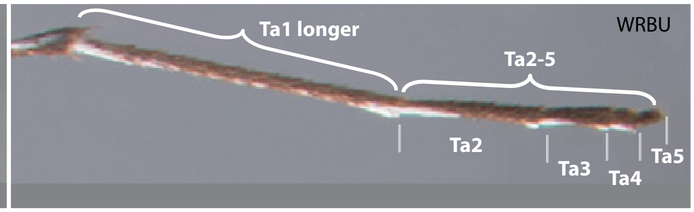


Fig. 35. Tarsomere 1 longer than tarsomeres 2-5 combined, tarsomere Ta4 shorter than Ta5: *Orthopodomyia spp.*

Step: 08 (7)

Pulvilli (Pv) present (**figs. 36 & 37**)	***16***
Pulvilli absent (**fig. 38)**	**9**
Pulvilli not clearly visible or unable to determine if they are present/absent	**13**

Fig. 36. Pulvilli (Pv) present : *Cx. duttoni*

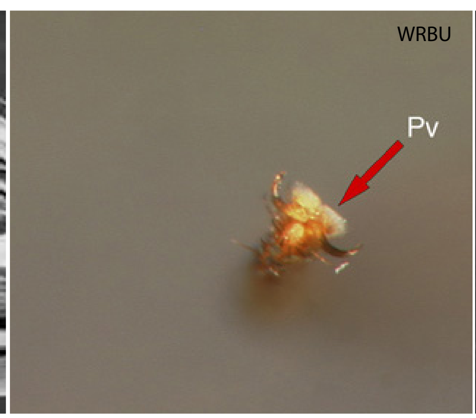


Fig. 37. Pulvilli (Pv) present: *Lutzia fuscana*

Fig. 38. Pulvilli absent: *Ae. aegypti*

Step: 09 (8)

Antennal flagellomere 1 (Flm-1) elongate, one-and-a-half times or more as long as flagellomere 2 (Flm-2) (**fig. 39**)	**10**
Antennal flagellomere 1 (Flm-1) about the same length as flagellomere 2 (**fig. 40**)	***Coquillettidia***

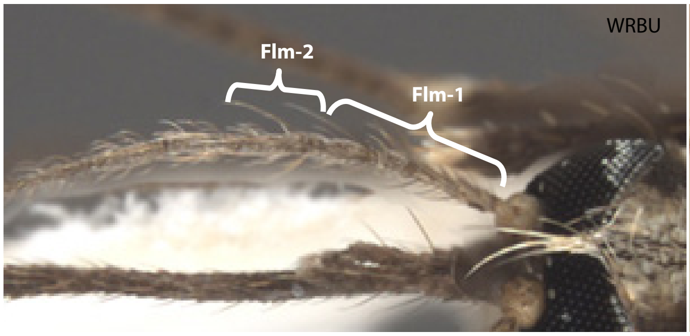


Fig. 39. Antennal flagellomere 1 (Flm-1) elongate, one-and-a-half times or more as long as flagellomere 2 (Flm-2): *Mi. mimomyiaformis*

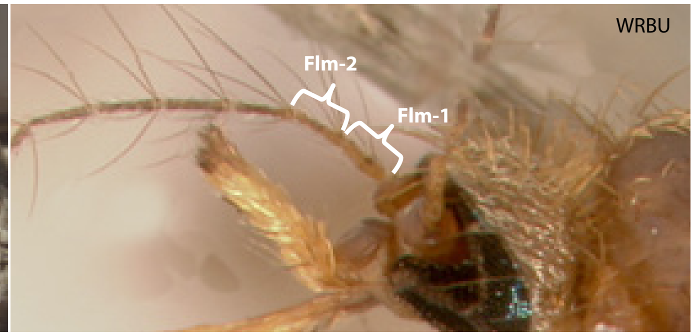


Fig. 40. Antennal flagellomere 1 (Flm-1) about the same length as flagellomere 2 (Flm- 2): *Cq. fuscopennata*

Step: 10 (9)

Broad, flat scales on alula (Al) (**fig. 41**)	***Mimomyia***
Fringe of narrow scales or setae on alula (Al) (**fig. 42**)	***Ficalbia***
Scales or setae absent from alula (Al) (**fig. 43**)	***Mimomyia***

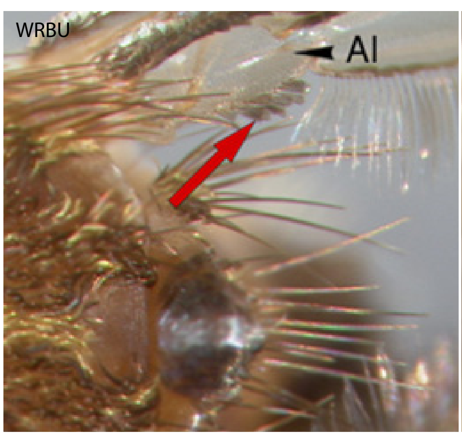


Fig. 41. Broad, flat scales on alula (Al)

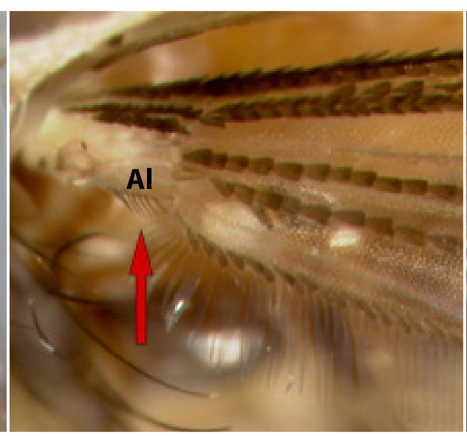


Fig. 42. Fringe of narrow scales or setae on alula (Al) *Ficalbia minima*

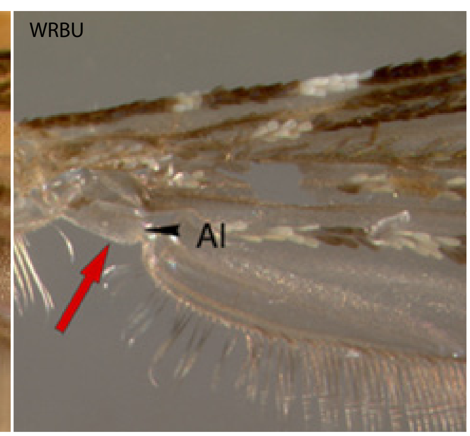


Fig. 43. Scales or setae absent from alula (Al)

Step: 11 (7)

All antennal flagellomeres of females are unusually short and thick (**fig. 44**). Hindfemur with a tuft of suberect scales at apex (**fig. 46**) ***Aedeomyia***

All antennal flagellomeres of females not short and thick. Normal female mosquito antennae (**fig. 45**). Hindfemur without a tuft of suberect scales at apex ***Orthopodomyia***

Fig. 44. All antennal flagellomeres of females are unusually short and thick: *Ad. catasticta*

Fig. 45. Normal female mosquito antennae: *Ae. tormentor*

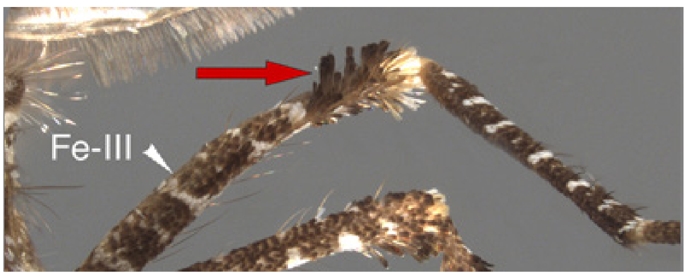


Fig. 46. Hindfemur with a tuft of suberect scales at apex: *Ad. furfurea*

Step: 12 (3)

Wing vein R2+3 is longer than cell R2 (**fig. 47**) and veins R3, R2 and R2+3 with plume scales that are not forked (**fig. 49**) ***Uranotaenia***

Wing vein R2+3 is shorter than cell R2 (**fig. 48**) and veins R3, R2 and R2+3 with forked (notched) plume scales (**fig. 50**) ***Hodgesia***

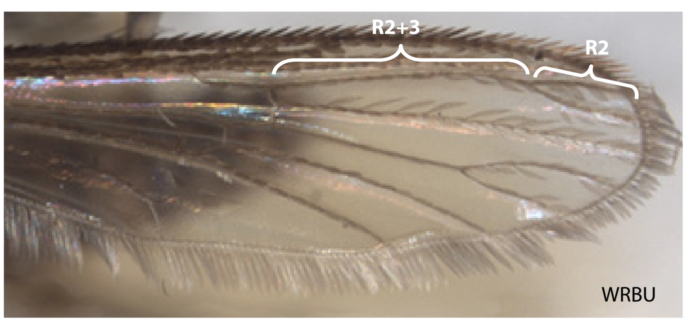


Fig. 47. Vein R2+3 is longer than cell R2: *Uranotaenia spp.*

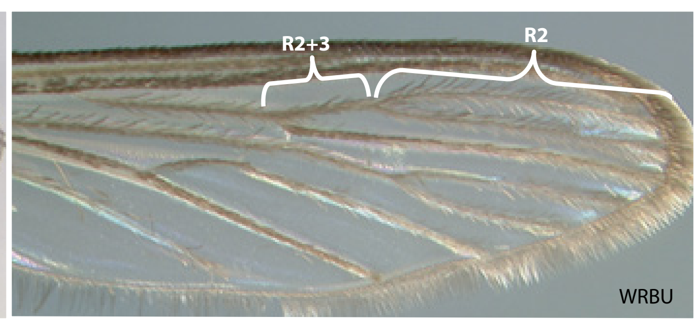


Fig. 48. Vein R2+3 is shorter than cell R2

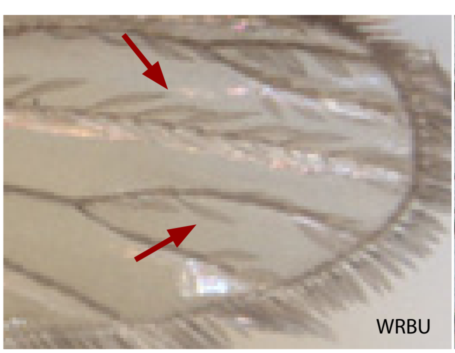


Fig. 49. Plume scales not forked (not notched): *Uranotaenia spp*

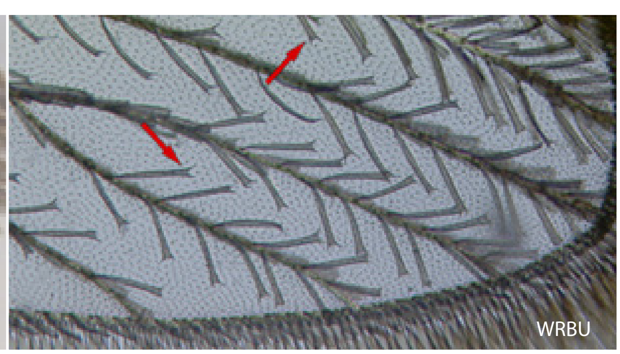


Fig. 50. Forked (notched) plume scales: *Hodgesia spp.*

Step: 13 (8)

Broad, flat scales on alula (Al) (**fig. 51**)	***Mimomyia***
Fringe of narrow scales or setae on alula (Al) (**fig. 52**)	**14**
Scales or setae absent from alula (Al) (**fig. 53**)	***Mimomyia***

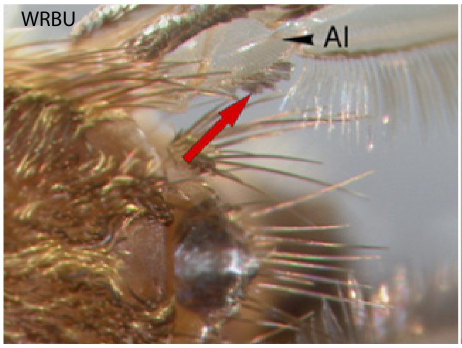


Fig. 51. Broad, flat scales on alula (Al)

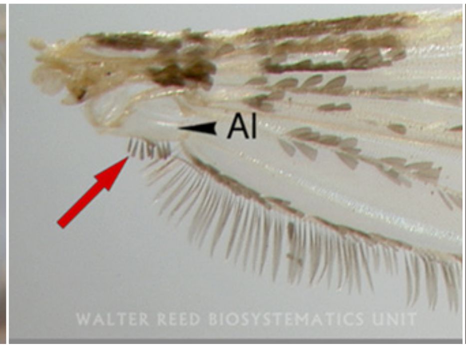


Fig. 52. Fringe of narrow scales or setae on alula (Al)

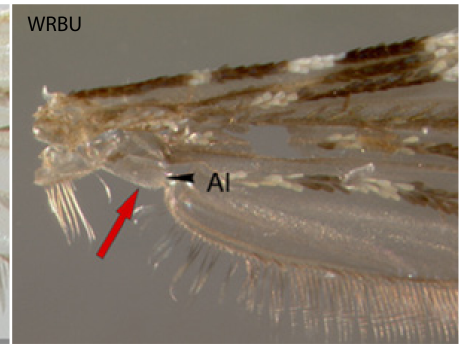


Fig. 53. Scales or setae absent from alula (Al)

Step: 14 (13)

Erect, forked scales numerous on vertex and usually occiput (**figs. 54 & 55)**	**15**
Erect, forked scales restricted to occiput (**fig. 56**)	***Ficalbia***

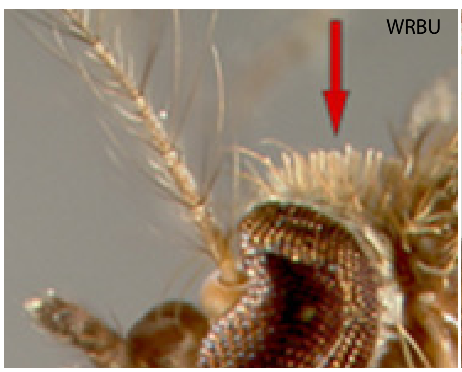


Fig. 54. Erect, forked scales numerous on vertex and occiput: *Cx. vishnui*

Fig. 55. Erect, forked scales numerous on vertex and occiput: *Ma. dives*

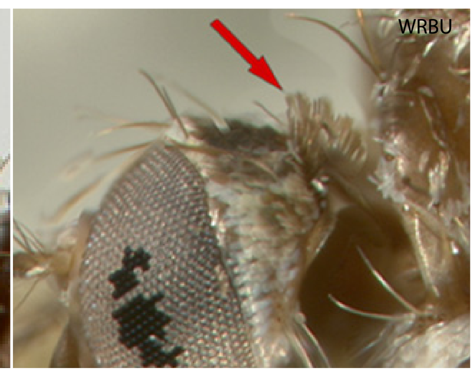


Fig. 56. Erect, forked scales restricted to occiput

Step: 15 (14)

Proboscis about as long as, or shorter than, forefemur (**fig. 57**)	***16***
Proboscis distinctly longer than forefemur (**fig. 58**)	***Coquillettidia***

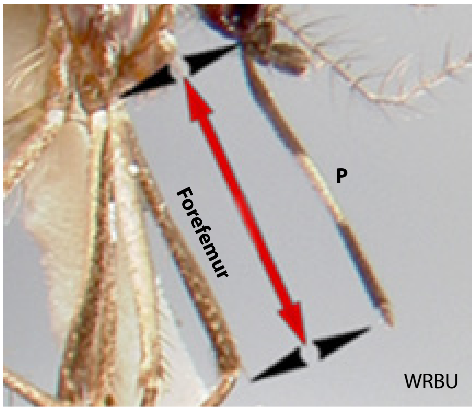


Fig. 57. Proboscis about as long as forefemur

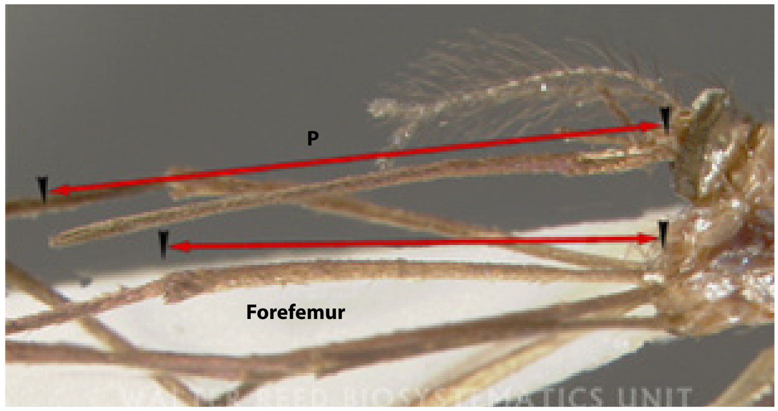


Fig. 58. Proboscis distinctly longer than forefemur

Step: 16 (15)

Zero to three lower mesepimeral setae (MeSL) (**fig. 59**)	***Culex***
Four or more lower mesepimeral setae (MeSL) (**fig. 60**)	***Lutzia***

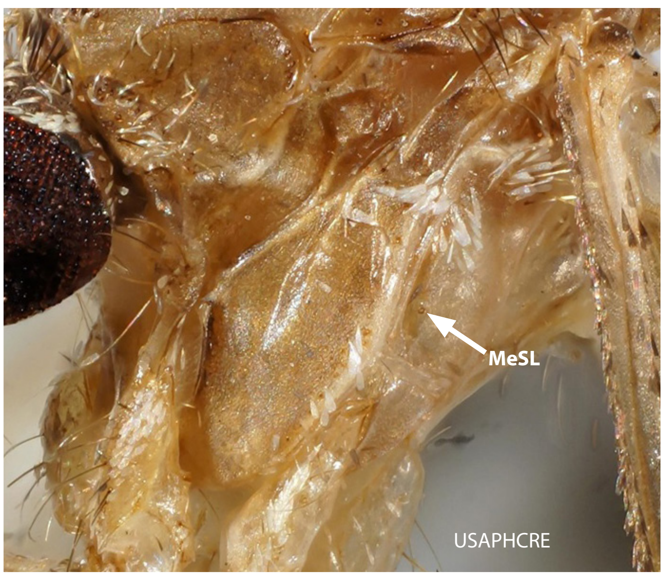


Fig. 59. One lower mesepimeral setae (MeSL) *Cx. quinquefasciatus*

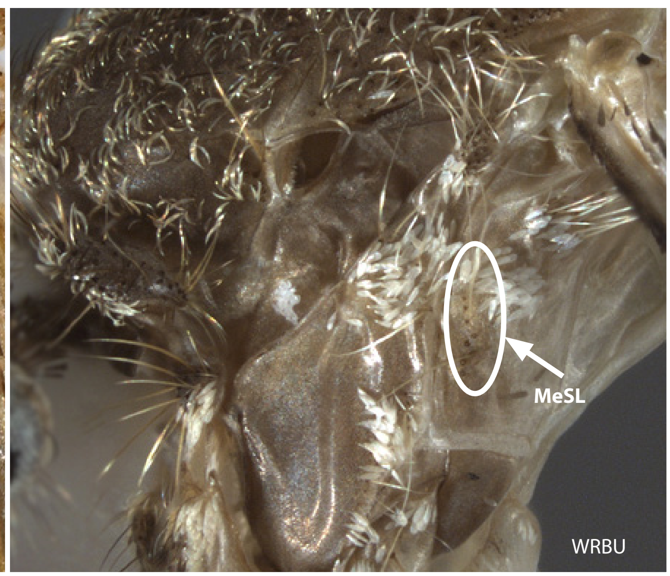


Fig. 60. Four or more lower mesepimeral setae (MeSL) *Lt. tigripes*

Key to Female Mosquito Genera in AFRICOM and Egypt (text only)

1	A fly with needle-like mouthparts **(fig. 3)**; scales covering the body **(fig. 4)**; and scales on the wings **(fig. 5)**	Mosquito - 2
	No needle-like mouthparts **(figs. 6 & 7)**; body without scales **(fig. 8)**; wings usually without scales (**fig. 9)**	Not a Mosquito
2 (1).	Antennae bushy or feather-like, palpi (MPlp) as long as proboscis and bushy, or with paddles **(figs. 10-12)**	Male
	Antennae not bushy or feather-like, palpi (MPlp) shorter than proboscis, proboscis with apical half not strongly recurved and not more slender than basal half (not tapering to a point) **(figs. 13-15)**	Female (Culicinae) - 3
	Antennae not bushy or feather like, palpi (MPlp) as long as proboscis, not bushy and without paddles. Proboscis not tapering to a point **(figs. 16-18)**	Female Anopheles
	Antennae not bushy or feather-like, proboscis (P) with apical half strongly recurved and more slender than basal half (tapering to a point) (**fig. 19**)	Female *Toxorhynchites*
	Antennae not bushy or feather-like, proboscis (P) with the tip distinctly swollen, upturned and hairy (**fig. 20**)	Female *Malaya*
3 (2).	Vein 1A ending beyond intersection (fork) of m-cu (**fig. 21**)	4
	Vein 1A ending before or at level with intersection (fork) of m-cu (**fig. 22**)	12
4 (3).	Prespiracular setae absent [no setae in the prespiracular area (PsA)] AND postspiracular setae (PS) present (**fig. 23**)	5
	Prespiracular setae absent [no setae in the prespiracula area (PsA)] and postspiracular setae absent [no setae in the postspiracular area (PA)] (**fig. 24**)	7
	Prespiracular setae (PsS) present AND postspiracular setae absent (no setae in the postspiracular area (PA)) (**fig. 25**)	*Culiseta*
	Prespiracular setae (PsS) present AND postspiracular setae (PS) present (**fig. 26**)	No African species with this set of characters
5 (4).	No eye separation above antennae, eyes touching each other (**fig. 27**)	6
	Narrow eye separation above antennae (**fig. 28**)	*Aedes*
	Wide eye separation above antennae, separated by a cover of flat, silver scales (**fig. 29**)	*Eretmapodites*
6 (5).	Wing scales narrow (**fig. 30**), but if broad, then not strongly asymmetrical (**fig. 31**) (Note: *Ae. fucifer* (**fig. 32**) and *Ae. taylori* have upper surface wing scales that are large, broad and obliquely truncate, much as in Mansoniodes)	*Aedes*
	Wing scales broad, strongly asymmetrical (**fig. 33**)	*Mansonia*
7(4).	Tarsomere 1 (Ta1) of all legs as long as, or shorter than, tarsomeres 2-5 (Ta2-5) combined (**fig. 34**)	8
	Tarsomere 1 (Ta1) of the fore- and midlegs or the hind legs longer than tarsomeres 2-5 (Ta2-5) combined (**fig. 35**)	11
8 (7).	Pulvilli present (**figs. 36 & 37**)	*16*
	Pulvilli absent (**fig. 38**)	9
	Pulvilli not clearly visible or unable to determine if they are present/absent	13
9 (8).	Antennal flagellomere 1 (Flm-1) elongate, one-and-a-half times or more as long as flagellomere 2 (Flm-2) (**fig. 39**)	10
	Antennal flagellomere 1 (Flm-1) about the same length as flagellomere 2 (**fig. 40**)	*Coquillittidia*
10 (9).	Broad, flat scales on alula (Al) (**fig. 41**)	Mimomyia
	Fringe of narrow scales or setae on alula (Al) (**fig. 42**)	Ficalbia
	Scales or setae absent from alula (Al) (**fig. 43**)	Mimomyia
11 (7).	All antennal flagellomeres of females are unusually short and thick (**fig. 44**). Hindfemur with a tuft of suberect scales at apex (**fig. 46**)	Aedeomyia
	All antennal flagellomeres of females not short and thick. Normal female mosquito antennae (**fig. 45**). Hindfemur without a tuft of suberect scales at apex	*Orthopodomyia*
12 (3).	Wing vein R2+3 is longer than cell R2 (**fig. 47**) and veins R3, R2 and R2+3 with plume scales that are not forked (**fig. 48**)	*Uranotaenia*
	Wing vein R2+3 is shorter than cell R2 (**fig. 49**) and veins R3, R2 and R2+3 with forked (notched) plume scales (**fig. 50**)	*Hodgesia*
13 (8).	Broad, flat scales on alula (Al) (**fig. 51**)	*Mimomyia*
	Fringe of narrow scales or setae on alula (AL) (**fig. 52**)	14
	Scales or setae absent from alula (Al) (**fig. 53**)	*Mimomyia*
14 (13).	Erect, forked scales numerous on vertex and usually occiput (**figs. 54 & 55**)	15
	Erect, forked scales restricted to occiput (**fig. 56**)	*Ficalbia*
15 (14).	Proboscis about as long as, or shorter than, forefemur (**fig. 57**)	*16*
	Proboscis distictly longer than forefemur (**fig. 58**)	*Coquillettidia*
16 (15).	Zero to three Lower mesepimeral setae (MeSL) (**fig. 59**)	*Culex*
	Four or more lower mesepimeral setae (MeSL) (**fig. 60**)	*Lutzia*

Terms & Abbreviations of Adult Mosquitoes

Anterior—Nearer the front or nearer to the head.

Apical/Apex—Concerning the tip or furthest part from the thorax.

Asymmetrical wing scale— Unlike on either side of a dividing line from the stem of the scale to the tip.

Basal—Region close to the point of attachment to the thorax.

C-III—Hind coxa. The basal segment of the hind pair of legs; coxa are referred to as fore-(C-I), mid-(C-II) or hindcoxa (C-III).

Emarginated wing—V-shaped thickening or cut-out place in hindmargin of wing.

Flm—Fagellomere. An individual unit of the antennal flagellum. Flm-1 is the first segment.

Mam—Mesanepimeron. The large, upper area of the mesepimeron. Contains scales and setae. The group of setae on the lower portion of this structure (MeSL) are often used in keys. Their grouping pattern varies between mosquitoes.

MeSL—The setae occurring in groups on the anterior, middle, and/or posterior area of the mesanepimeron below the level of the metathoracic spiracle.

Mks—Mesokatepisternum. Lower area of the mesepisternum.

MkSL—Lower mesokatepisternal setae. The setae occurring in a more-or-less vertical line along the posterior margin of the mesokatepisternum.

MPlp—Maxillary palpus. Varies in length according to genus and sex. Male MPlp are usually longer than the proboscis, have paddle-like structures, and can be very hairy. Female *Anopheles* MPlp are as long as the proboscis but lack the paddles. MPlp that are shorter than the proboscis indicate a *non-Anopheles* female mosquito.

Msm—Mesomeron. A triangular structure located above and between the mid- and hindcoxa. The base of the Msm is located between the Mam and the Msm.

Mts—Metepisternum. In mosquitoes, the area immediately behind and below the metathoracic spiracle.

MtSc—Metepisternal scales. The scales occurring in a small group on the Mts just below the metathoracic spiracle.

Occ—Occiput. Posterior dorsal part of the cranium; its boundaries with the vertex are not delimited; usually with erect scales.

P—Proboscis.

Pa—Paratergite. Narrow lateral part of the mesonotum just before the wing root; separated from the scutum by the paranotal suture. Scales on this structure are called PaSc.

PA—Postspiracular area. The sclerotized area of the anterior anepisternum lying posterior to the mesothoracic spiracle; connected or continuous with the subspiracular area ventrally; scales **(**PoSc**)** and setae (PS) are borne on this area.

PaSc—Paratergal scales. The scales occurring in a group on the paratergite (Pa).

PM—Postprocoxal membrane. The membrane between the forecoxa and the mesokatepisternum; sometimes bearing scales (PpSc).

PoSc—Postspiracular scales. The scales occurring in a group on the postspiracular (PA) area.

Ppn—Postpronotum. The posterior division of the pronotum generally lying between the antepronotum and the scutum anterior of the scutal angle. In mosquitoes, usually not clearly demarcated ventrally from the proepimeron.

PpSc—Postprocoxal scales. The scales occurring in a small group on the postprocoxal membrane (PM).

PpS—Postpronotal setae. The setae occurring in an arcuate line on the upper posterior margin of the postpronotum (Ppn).

PS—Postspiracular setae. The setae occurring in a group on the postspiracular (PA) area.

PsA—Prespiracular area. A small triangular area above and forward of the mesothoracic spiracle. When setae are present, they are referred to as PsS and, with scales, as PsSc.

PsS—Prespiracular setae. The setae occurring in the small triangular prespiracular area (PsA).

PsSc—Prespiracular scales. The scales occurring on the PsA.

Pv—Pulvillus. Pad-like lobes on the tips of the legs between the tarsal claws. Only *Culex*, *Deinocerites*, *Galindomyia* and *Lutzia* genera have this structure.

Scales—Are flat in cross section, widening from base to apex, with longitudianal ridges, attached to minute socket, called an alveolus (pl. alveoli) on the integument (alveoli not visible when scales have fallen off). They occur in three basic forms: broad and flat, narrow and curved, and erect and apically forked.

Setae—(hairs, hair tufts, and bristles) are round in cross section, taper from base to apex, and arise from a relatively large movable socket called an alveolus (pl. alveoli). This socket is visible even when the setae have fallen off.

Scu—Scutum. The dorsal area of the thorax.

Stm—Scutellum. In Culicinae mosquitoes, except *Toxorhynchites*, it is trilobed. *Anophleles* have an evenly rounded shape except for *Chagasia*, which is trilobed.

Ta—Tarsus. The part of the leg that comes after the tibia. In mosquitoes, it consists of five tarsomeres (Ta1-5); referred to as fore-, mid- or hindtarsus as appropriate.

Ta1—Tarsomere one. An individual sub-segment of a tarsus. In mosquitoes, five tarsomeres comprise each tarsus; referred to as the first through the fifth tarsomeres of the appropriate tarsus and denoted by adding numerical subscripts (1-5) to the abbreviation of the tarsus.

Fig. 61. Pictorial Comparison of the Mosquito Genera

Aedeomyia squamipennis

Aedes (Aedimorphus) vexan

Anopheles (Cellia) gambiae

Coquillettidia (Coq.) fuscopennata

Culex (Culex) pipiens

Culiseta (Culicella) morsitans

Fig. 61 photos are courtesy of the WRBU.

Fig. 61. Pictorial Comparison of the Mosquito Genera

Eretmapodites chrysogaster

Ficalbia minima

Hodgesia bailyi

Lutzia (Metalutzia) fuscana

Malaya jacobsoni

Mansonia uniformis

Fig. 61. Pictorial Comparison of the Mosquito Genera

Mimomyia (Etorleptiomyia) luzonensis

Orthopodomyia albicosta

Toxorhynchites (Lynchiella) rutilus

Uranotaenia (Uranotaenia) sapphirina

Mosquito Genera Covered In This Key

Adapted from the Mosquito Taxonomic Inventory

Aedeomyia - A few arboviruses and avian malarial protozoa have been isolated from species of *Aedeomyia*, but none of the species are considered to be medically important to humans. Females of *Aedeomyia* feed predominantly on birds. *Aedeomyia africana* have been collected from human bait stationed on platforms in forest canopies, but members of the genus are not normally attracted to humans. *Aedeomyia* larvae are found primarily in dense swamps and ground pools with abundant aquatic vegetation, but they have also been collected from river margins.

Aedes - Certain members of the tribe are of great importance in the transmission of viruses and helminths to humans and other animals. The immature stages of *Stegomyia* are found in natural and artificial containers. Typical habitats are tree holes, but many species inhabit small amounts of water contained in dead and fallen plant parts. The immature stages of most species of *Ochlerotatus* are found in various types of temporary fresh-water ground pools, but several species inhabit rock holes, natural and artificial container habitats, and brackish water pools. Females of many species will viciously attack humans and are often very troublesome pests, particularly in northern temperate regions. The majority of species bite in the daytime, particularly during crepuscular periods, but some species also feed during the night. A number of species of *Ochlerotatus* are known to harbor natural infections of arboviruses and microfilariae.

Anopheles - Mosquitoes of genus *Anopheles* are the sole vectors of human malarial parasites. Some species are effective vectors of microfilariae and some may be involved in the transmission of encephalitis viruses. *Anopheles* are vectors of numerous animal pathogens, including species of malaria protozoa that do not affect humans. *Anopheles* larvae are adapted to a variety of aquatic habitats but occur predominantly in ground waters. The larvae generally rest with the end of the abdomen against objects and are, therefore, found in greatest numbers in areas with emergent vegetation at the margins of the habitats. The adults of most *Anopheles* are active at night or during twilight periods and rest in cool, damp places during the day.

Coquillettidia - Some species are notorious pests of humans and domestic animals in Africa, Europe, and North America. *Coquillettidia aurites, Cq. metallica* and *Cq. pseudoconopas* appear to be important vectors of bird malaria in Africa (Njabo et al., 2009). White & Faust (2014) list *Cq. fuscopennata* as a natural vector of chikungunya and Sindbis viruses; *Cq. metallica* as a natural vector of West Nile virus and *Cq. fuscopennata*; and *Cq. microannulata* and *Cq. versicolor* as natural vectors of Rift Valley fever virus in Africa.

Culex - Several species of subgenera *Culex* and *Melanoconion* are of medical importance. Three closely related species, *Cx. univittatus*, *Cx. neavei,* and *Cx. perexiguus*, transmit West Nile fever virus in Africa. Rift Valley fever virus is transmitted by *Cx. pipiens* in Egypt and *Cx. theileri* in southern Africa. A few species of the subgenus, especially *Cx. quinquefasciatus,* are important vectors of *Wuchereria bancrofti* in the tropics. *Culex pipiens* and *Cx. antennatus* are important vectors of filarial worms in Egypt. Some species of the genus may be involved in the transmission of *Brugia malayi*. *Culex* larvae occur primarily in semi-permanent or permanent bodies of groundwater; some utilize artificial containers. A few species, including the filarial vector *Cx. quinquefasciatus*, are found in organically polluted waters. Females bite at night.

Culiseta - Little is known about the blood-feeding habits of females. Most species feed on birds and mammals, but a few feed on reptiles. Several species attack domestic animals and, occasionally, humans.

Eretmapodites - These are forest mosquitoes, but some have become adapted to life in banana plantations. Larvae are found in water contained in fallen leaves, fruit husks, leaf axils, snail shells, man-made containers, bamboo, and, rarely, tree holes. Larvae of most species are facultative predators. Females bite during the daytime. They will attack humans but prefer other hosts. Some arboviruses, including Rift Valley fever virus, have been isolated from a few species. *Eretmapodites chrysogaster* has been shown to be capable of transmitting yellow fever virus.

Ficalbia - Little is known about the bionomics of *Ficalbia*. Larvae are found in swamps, marshes, ponds, pools, and river margins with abundant vegetation. Adults have been captured on lower vegetation and near the canopy in forest at night. Nothing is known about the biting habits of females. Species of Ficalbia are of no known medical or economic importance.

Hodgesia - Very little is known about the bionomics of *Hodgesia*. Larvae are usually found in swamps and marshes, in water with very dense vegetation, and often in association with species of *Mimomyia*. The feeding habits of most species are unknown. *Hodgesia sanguinae* of Africa has been reported to attack humans, and *Ho. solomonis* is a vicious biter in the vicinity of its larval habitats in the Solomon Islands. Females are so small that they may be mistaken for biting midges (family Ceratopogonidae); hence, it is likely that other species that may feed on humans have not been recognized. A few species of *Hodgesia* bite humans, but none are medically important.

Lutzia - None of the species of *Lutzia* are of medical or economic importance. The immature stages occur in a wide variety of ground-water habitats. Several species are commonly found in artificial containers and either tolerate or prefer water with a high organic content. The larvae of all species are predaceous. They mainly feed on other mosquito larvae but also on other insects. Females attack domestic animals and sometimes humans.

Malaya - Larvae occupy cavities, including the leaf axils of plants, tree holes, and the water-filled nests of arboreal ants. Adults are active during the daytime. Their feeding habits are unique among mosquitoes. They feed on the regurgitation of ants. To accomplish this, the mosquito accosts an ant and brings the tip of its proboscis into contact with the mouth of the ant until a drop of liquid is produced. The regurgitated liquid is rapidly sucked up, and the ant goes away unharmed. *Malaya* are incapable of taking a blood meal; hence, they are of no medical or economic importance.

Mansonia - The larvae of *Mansonia* occur in permanent waters. For respiration, they attach to aquatic plant roots with their siphon to obtain oxygen from plant air cells. Larvae of some species burrow into debris on the bottom; whereas, others cling to the roots of plants in floating masses. Water lettuce is commonly used as a host plant, particularly by species of subgenus *Mansonioides*. Larvae detach and reattach to host plants quite readily. The females of several species are vicious nocturnal biters. *Mansonia uniformis*, which is widely distributed from western Africa through southern Asia to Japan and the Australasian Region, is a vector of *Wuchereria bancrofti* in Western New Guinea.

Mimomyia - Very little is known about the bionomics of *Mimomyia*. The larvae of most species occur in swamps and marshes with dense vegetation. The larval siphon of several species is modified for piercing aquatic plants to obtain oxygen. Larvae of subgenus *Ingramia* are found in the leaf axils of plants. The adults of several species have been reported to bite humans, but none are serious pests. Most species are active at night. The species of *Mimomyia* are of no medical importance.

Orthopodomyia - Little is known about the biology of *Orthopodomyia*. Larvae occur principally in tree holes, but some species are found in bamboo, the axils of bromeliads, and the spathes of *Heliconia* plants. Species are occasionally found in artificial containers. Adults inhabit forests and are active only after dark. The feeding habits of females are largely unknown, but birds are the primary hosts. Two species in the Oriental Region are known to approach and bite humans. None of the species of *Orthopodomyia* are of medical or economic importance to humans.

Toxorhynchites - Species of *Toxorhynchites* are not involved in the transmission of human or animal pathogens. The larvae of a few species have been used with some success to control economically important mosquitoes whose larvae inhabit plant cavities and artificial containers. Males and females both feed exclusively on nectar and other sugary substances. The adults are active during the day.

Uranotaenia - A few species bite humans, but none are involved in the transmission of pathogens. Many species are attracted to light and are occasionally found resting inside houses.

Appendix A.

Genera classification follows the "traditional" mosquito classification as of 2000 from the Walter Reed Biosystematics Unit (WRBU) web site (2013).

The key and the genera list are derived from the WRBU AFRICOM Lucid Key (2015), http://wrbu.si.edu/command_aors_MQkeys.html.

The genera descriptions were adapted from Harbach R. (2014). Mosquito Taxonomic Inventory at http://mosquito-taxonomic-inventory.info/simpletaxonomy/term/6231. License link: http://creativecommons.org/licenses/by/3.0/

The medically important species list was derived from the WRBU medically important species list and from the Mosquito Taxonomic Inventory web site (2014).

Character abbreviations of adult female morphology follow the Darsie and Ward (2005) format.

Other resources used to develop this key:

Darsie, R. F. Jr. and R. A. Ward. 2005. *Identification and Geographical Distribution of the Mosquitoes of North America, North of Mexico.* Gainesville, FL: University of Florida Press.

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Huang, Y.M. 2002. A Pictorial Key to the Mosquito Genera of the World, Subgenera of Aedes and Ochlerotatus (Diptera: Culicidae). *Insecta Koreana,* 19(1): 1-130.

Mosquito Taxonomic Inventory web site 2015, http://mosquito-taxonomic-inventory.info/

Walter Reed Biosystematics Unit (WRBU) web site 2015, http://wrbu.si.edu/

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APHC—Graham Snodgrass— Army Public Health Center

PHCR-E—CPT Brian Knott, U.S. Army—Public Health Command Region Europe
MTI—Mosquito Taxonomic Inventory
http://mosquito-taxonomic-inventory.info/adults-pulvillus-0

APHC

http://phc.amedd.army.mil

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