

A morphological key to the common mosquito species in the Pacific including medically important vectors

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Authors

Narayan Gyawali¹, Tanya L. Russell², Nigel W. Beebe³, Thomas R. Burkot², Gregor J. Devine¹

Affiliation:

¹Mosquito Control Laboratory, QIMR Berghofer Medical Research Institute, Herston, QLD 4006, Australia

²Australian Institute of Tropical Health and Medicine, James Cook University, Cairns, QLD 4870, Australia.

³School of Biological Sciences, University of Queensland, St Lucia, QLD 4072, Australia.

Acknowledgment

Images used in the identification keys are sourced from the Walter Reed Biosystematics Unit (WRBU), Robert D. Cooper (consultant), Rueda (2004), World Health Organisation (WHO), Mosquito Control Laboratory QIMRB, Rattanaarithikul (2006), Huang (1977, 1980), Disa Eklöf and Anders Lindstrom, National Veterinary Institute, Sweden and UpToDate, Inc. and its affiliates and/or licensors.

Introduction

The Pacific is home to over 400 mosquito species. A small number of mosquitoes, particularly those in the *Aedes*, *Anopheles* and *Culex* genera (Table 1) are responsible for transmitting pathogens that cause disease in humans. These diseases include dengue, malaria, Zika, chikungunya, Ross River, Japanese encephalitis and lymphatic filariasis (Matthews, et al., 2014). Each mosquito species differs in its behaviour, distribution and competency to transmit pathogens with the distributions for many species overlapping (Figure 1). It is therefore essential that mosquitoes collected as a part of vector surveillance are correctly identified so that their distributions and abundance are understood. This information is critical for predicting the risk of pathogen transmission and to inform vector control operations that target interventions at mosquitoes whose behaviours make them vulnerable to the control tools being deployed. For example, mosquitoes that bite indoors at night can be targeted by long-lasting insecticidal nets while mosquitoes that rest outdoors might be better controlled with harborage spraying of insecticides on vegetation (Sinka et al., 2016).

Medically important mosquitoes in the Pacific Island Countries and Territories

Malaria remains an important vector-borne disease in the Pacific Island Countries and Territories (PICs) from PNG through the Solomon Islands to Vanuatu (Beebe et al., 2013). The malaria vectors in the region are composed of groups and complexes of closely related, morphologically similar, cryptic or sibling *Anopheline* species. The primary vectors of malaria throughout the PICs are members of the *Cellia* sub-genus, *Punctulatus* group (Beebe et al., 2013). *Aedes* vectors, principally *Aedes aegypti* and *Aedes albopictus* are responsible for transmitting dengue, and the emerging arboviral diseases Zika and chikungunya whose burden has dramatically increased in recent years in the PICs (WHO, 2016). Some *Aedes* species also vector other public health pathogens such as Ross River virus and the helminths responsible for lymphatic filariasis (WHO, 2016). Medically important *Aedes* vectors are in the subgenera *Finlaya*, *Ochlerotatus*, *Rampamyia* and *Stegomyia*. In the Pacific region, *Culex* species can transmit arboviruses such as Ross River and Japanese encephalitis, as well as the helminth worms that cause lymphatic filariasis (Wilkerson et al., 2021). The mosquitoes that transmit human pathogens in the Pacific are listed in Table 1 and their distribution by PICs are shown in Figure 1.

This pictorial key provides a practical reference for identifying common, medically important mosquito species or species complexes across the PICs by referencing their physical (morphological) features. Correctly identifying specimens using physical characteristics is practical when the specimen is in ideal or near ideal condition. Comparing morphological characteristics and known geographical distributions can accurately identify some mosquito species. However, other species are extremely difficult or even impossible to differentiate using morphology alone. Closely related species, often referred to as species complexes, species groups or sibling species, may require analysis of their DNA to confirm their identification. It is important to note that many molecular identification tools require that the specimen is first identified to the level of complex or group, based on their morphological features. This ensures that the correct primers (short segments of DNA that vary between members of a complex) are used in the subsequent molecular assays.

The key was purposely designed for use by non-specialists in mosquito taxonomy. The user is cautioned that many mosquito species not included in this key may also be collected from the same habitats as disease vector species. Remember that trap collections are often in poor condition, and specimens may be missing body parts or characters (e.g., scales, legs) that will impede accurate identification. Mosquitoes being examined should not, therefore, be forced into an identity. When verification of species identity is required, countries may consult with the PacMOSSI team or WHO for advice. The target audience of this mosquito identification key are entomologists and environmental health officers who conduct vector surveillance across the PICs. The resource is also useful for guiding vector biology students, researchers and other public health officers in mosquito identification.

Table 1. List of *Anopheles*, *Aedes* and *Culex* species and complexes identifiable with this morphological key

Genus	Subgenus	Group	Complex	Species or complex name ¹
<i>Anopheles</i>	<i>Anopheles</i>	<i>bancroftii</i>	<i>bancroftii</i>	<i>An. bancroftii</i> s.l. (genotype A, B, C, D)
		<i>barbirostris</i>	<i>barbirostris</i>	<i>An. barbirostris</i>
				<i>An. campestris</i>
	<i>Cellia</i>	-	<i>longirostris</i>	<i>An. longirostris</i> s.l. (genotype A, B, C1, C2, D, E, F, G, H)
			<i>subpictus</i>	<i>An. subpictus</i>
		<i>annulipes</i>	<i>annulipes</i>	<i>An. annulipes</i>
		<i>lungae</i>	<i>lungae</i>	<i>An. lungae</i> s.l. (<i>lungae</i> s.s.)
		<i>punctulatus</i>	-	<i>An. punctulatus</i>
			<i>farauti</i>	<i>An. farauti</i> s.l. (<i>farauti</i> s.s. ² , <i>farauti</i> 4, <i>farauti</i> 5, <i>farauti</i> 8, <i>hinesorum</i> , <i>irenicus</i> , <i>oreios</i> , <i>torresiensis</i>)
			<i>koliensis</i>	<i>An. koliensis</i> s.l. (genotype 1, 3)
		-	-	<i>An. vagus</i>
		-	-	<i>An. litoralis</i>
		-	-	<i>An. karwari</i>
<i>Aedes</i>	<i>Finlaya</i>	<i>kochi</i>	-	<i>Ae. fijiensis</i>
				<i>Ae. kochi</i>
				<i>Ae. samoanus</i>
	<i>Ochlerotatus</i>	-	-	<i>Ae. normanensis</i>
		<i>empihals</i>	-	<i>Ae. vigilax</i>
	<i>Rampamyia</i>	<i>notoscriptus</i>	-	<i>Ae. notoscriptus</i>
	<i>Stegomyia</i>	<i>aegypti</i>	-	<i>Ae. aegypti</i>
		<i>scutellaris</i>	-	<i>Ae. albopictus</i>
				<i>Ae. cooki</i>
				<i>Ae. hebrideus</i>
				<i>Ae. hensilli</i>
				<i>Ae. kesseli</i>
				<i>Ae. marshallensis</i>
				<i>Ae. polynesiensis</i>
				<i>Ae. pseudoscutellaris</i>
				<i>Ae. rotumae</i>
				<i>Ae. scutellaris</i>
				<i>Ae. upolensis</i>
			<i>tongae</i>	<i>Ae. tongae</i> s.l. (<i>tongae</i> s.s., <i>tabu</i>)
<i>Culex</i>	<i>Culex</i>	<i>pipiens</i>	-	<i>Cx. pacificus</i>
				<i>Cx. pervigilans</i>
			<i>pipiens</i>	<i>Cx. australicus</i>
				<i>Cx. quinquefasciatus</i>
		<i>sitiens</i>	-	<i>Cx. annulirostris</i>
				<i>Cx. gelidus</i>
				<i>Cx. palpalis</i>
				<i>Cx. sitiens</i>
				<i>Cx. tritaeniorhynchus</i>
				<i>Cx. vishnui</i>
				<i>Cx. whitmorei</i>
	<i>Oculeomyia</i>	-	<i>bitaeniorhynchus</i>	<i>Cx. bitaeniorhynchus</i>

¹ s.l. (*sensu lato*, used to denote complex); ² s.s. (*sensu stricto*, used to denote species)

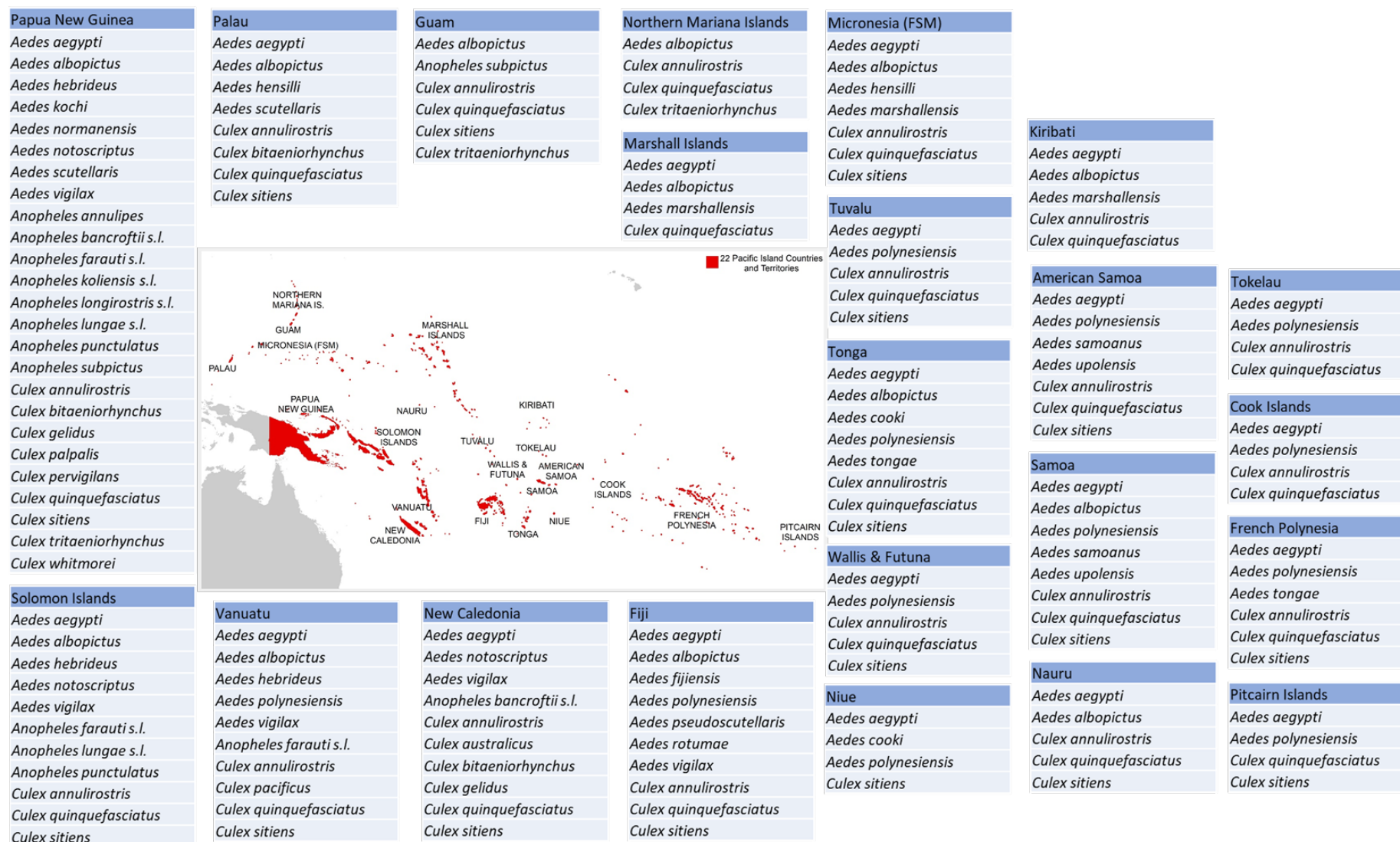


Figure 1. Distribution of mosquito species by country

Method for using this morphological identification key of medically important mosquito species in the Pacific Island Countries and Territories

While both larvae and adult mosquitoes can be identified using their physical characteristics (their morphology), this key identifies only adult female mosquitoes using physical characteristics including variations in size, colour, scale patterns and wing vein patterns.

A mosquito is different from other similar insects by having the following characteristics:

- a long proboscis (piercing organ) protruding from the head that is several times longer than the head itself,
- one pair of wings, usually not longer than the body; and
- scales present on the veins of the wings and forming a fringe along the wing's hind edge (visible only with magnification).

Identifying adults to genus or species/complex requires specimens in good condition with minimal damage. A stereomicroscope is needed to see the key features, as many are impossible to differentiate with the naked eye. Mosquito specimens may be manipulated with forceps or pinned into position in petri dishes. Good reference specimens preserved as pinned adults or larvae mounted in resins and preservatives are useful to compare to the specimens you are trying to identify.

Mosquito body

Morphological identification is based on features of the mosquito body parts (head, thorax, abdomen, wings and legs) shown in the Figure 2.

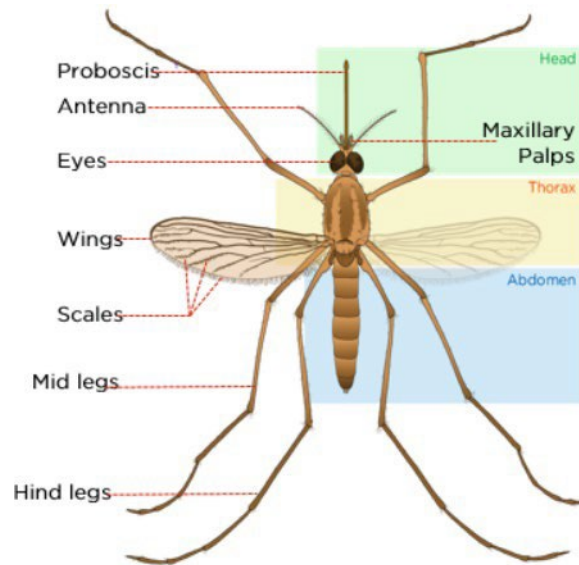


Figure 2. General anatomy of an adult mosquito (Source: <https://freesvg.org/mosquito-parts>)

Head and thorax

The major structures of the head include the maxillary palps, antennae and proboscis. Behind the head is the thorax to which the legs, abdomen and a single pair of wings are attached. The dorsal part of the thorax (Figure 3a) includes the scutum and scutellum. The lateral side (Figure 3b) of the thorax has the postspiracular area and mesepimeron.

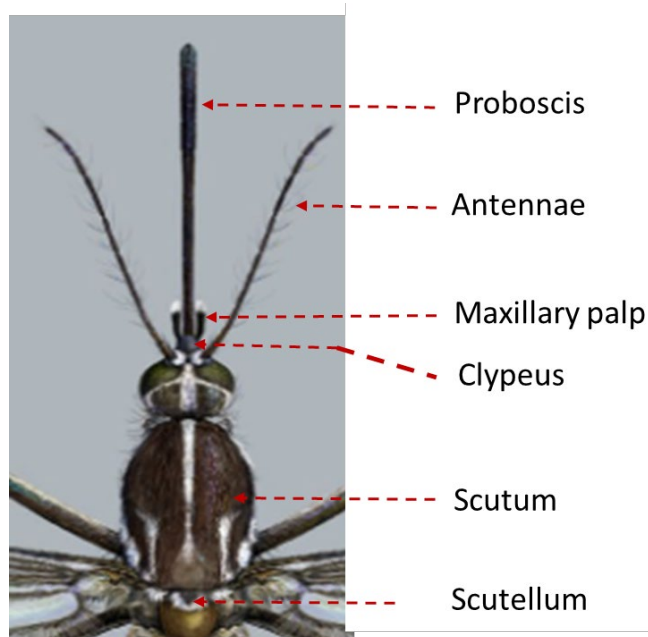


Figure 3a. Head and thorax (dorsal view) of an adult mosquito (Source: Disa Eklöf and Anders Lindstrom, National Veterinary Institute, Sweden)

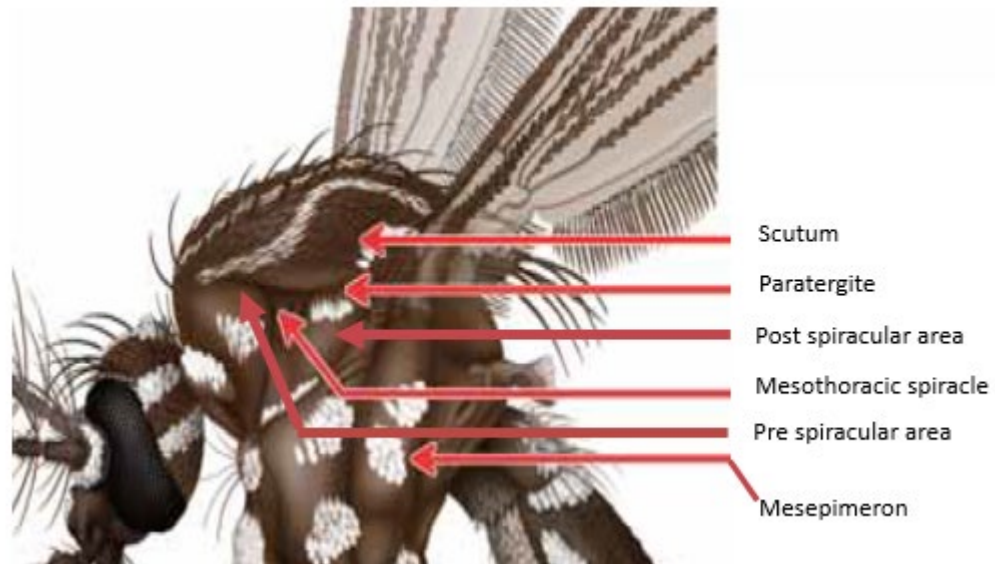


Figure 3b. Thorax (lateral view) of an adult mosquito (Source: modified from Rueda, 2004)

Wings

The wings of mosquitoes (Figure 4) are long and slender, and the wing veins are covered with scales. The principal longitudinal veins of mosquitoes (from anterior to posterior) are the costa, subcosta, radius, media, cubitus and anal vein. The branches of these veins are indicated by numbers, thus the anterior branch of the media is media-one (M1) and the posterior branch is media-two (M2).

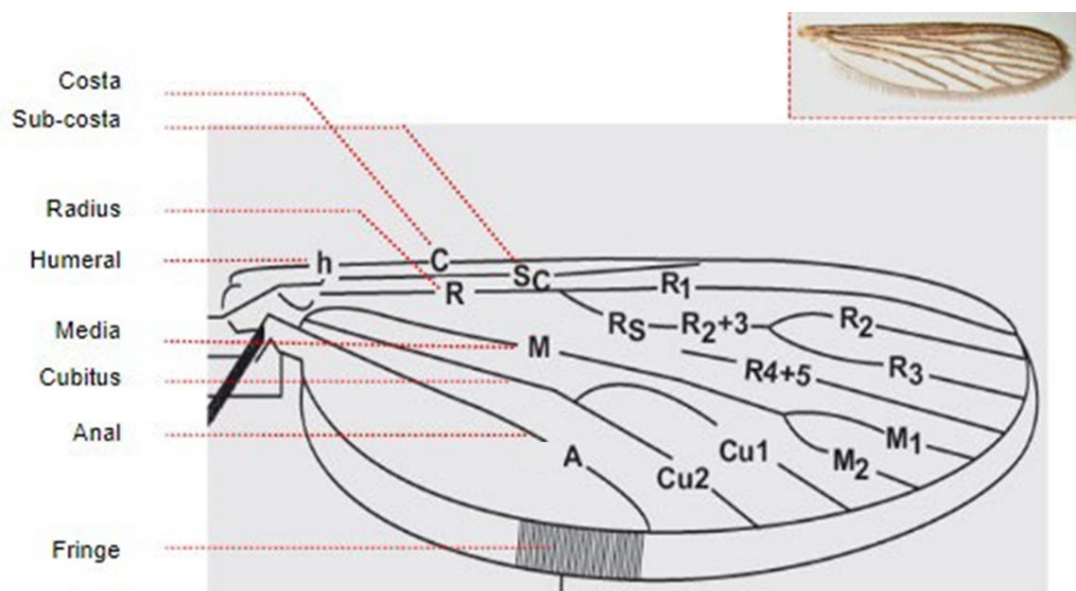


Figure 4. Mosquito wing and its venation (Becker et al., 2010)

Abdomen

The abdomen is behind the thorax. There are 10 segments in a female mosquito's abdomen (Figure 5a). The segments 1 to 8 are easily identified under a stereomicroscope. The eighth segment, called the tergum, is very narrow. Segments 9 and 10 are very small and modified as external genitalia. Each segment consists of a dorsal sclerite, "**the tergum**" (plural terga). The ventral sclerite is called the "**sternum**" (plural sterna). Each tergum or sternum is divided into plates called tergites or sternites (Figure 5b). These may have basal, apical or lateral patches of pale scales which provide useful taxonomic characters.

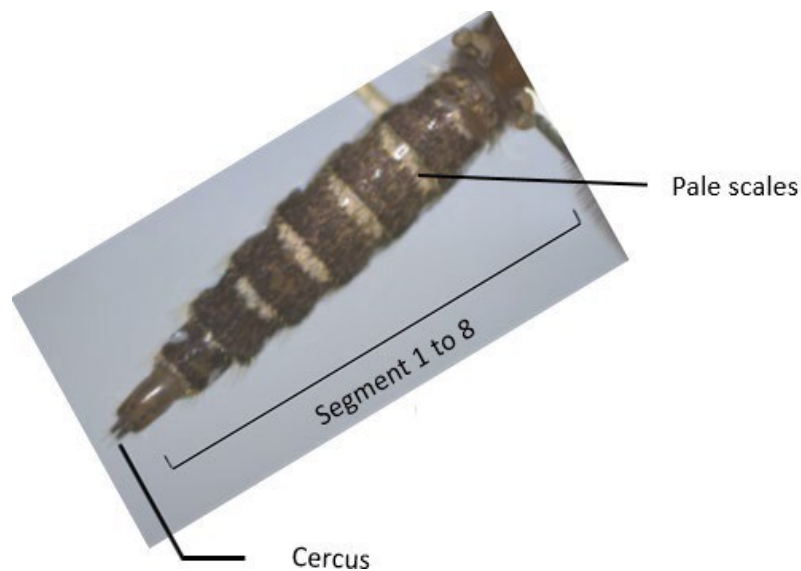


Figure 5a. Abdominal segment of an adult mosquito (Source: Narayan/QIMRB)

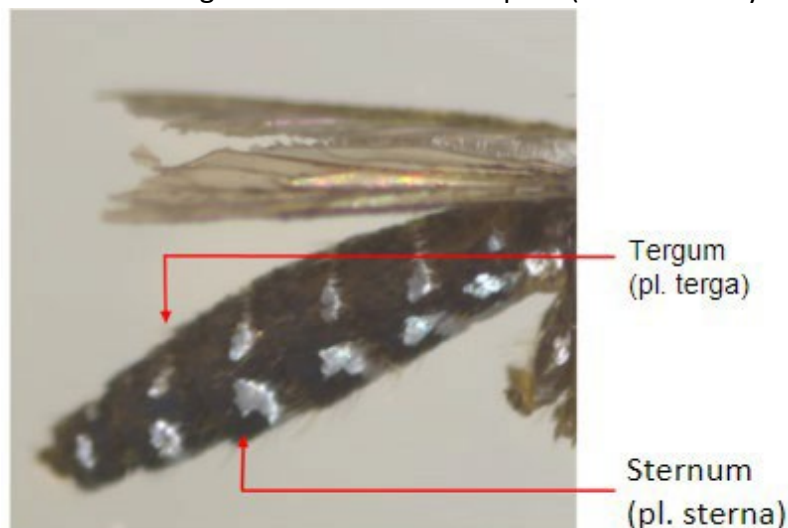


Figure 5b. Abdomen of an adult mosquito (Source: Narayan/QIMRB)

Legs

Adult mosquitoes have three pairs of jointed legs, composed of a femur, tibia and tarsomeres 1 through 5 (Figure 6). The banding patterns on these body parts are often used in taxonomic keys to identify mosquitoes. The identification key mentions some terminologies such as “Ta-III4” or Ta-III5”. “Ta” refers to the tarsus, “III” refers to the third set of legs (hind legs) and 4 and 5 refer to tarsal segments (i.e., tarsomere 4 or tarsomere 5).

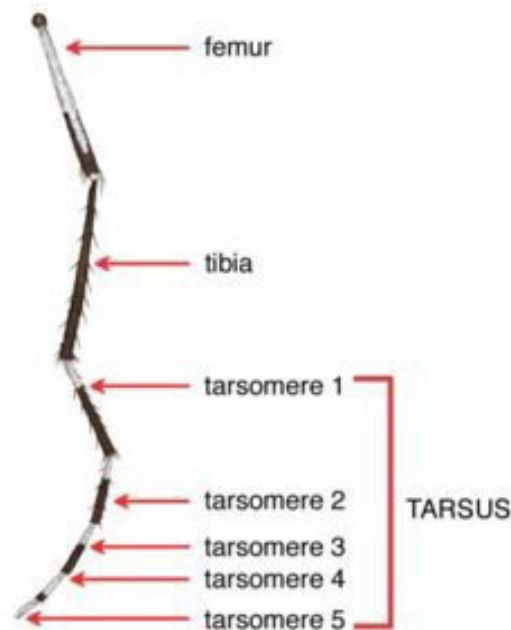


Figure 6. Hind leg of an adult mosquito (Source: Rueda, 2004)

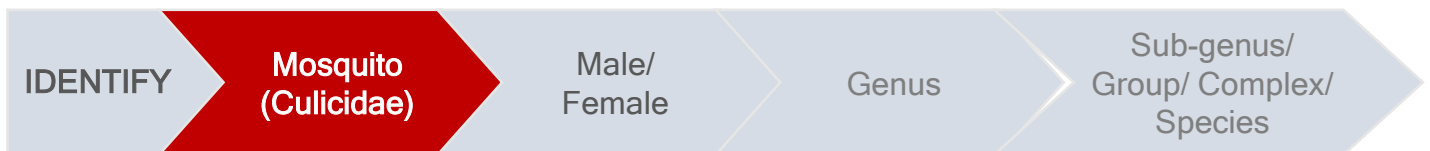
Identification (pictorial key)

To identify an adult mosquito species,

- First identify that the insect is a mosquito,
- Then differentiate whether the mosquito is a male or female (adult morphological keys are usually available only for females),
- Look for morphological characteristics that differentiate genera and sub-genus,
- And finally, based on all of the morphological features, and following a key, identify the mosquito to group, complex, or species level.

For more details on how to identify some of the most important disease vectors in the Pacific see the pictorial keys.

Part A: Identify to mosquito, sex and genus



Size, Proboscis and
Wings



Adult mosquito

Size: small, generally ~0.4– 0.9 cm long

Proboscis: elongated

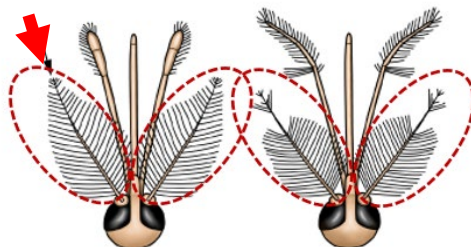
Wings: One pair of wings covered with scales and longer than the body. Scales create a fringe-like border on the hind edge.

Mosquito wings not usually longer than body.



Antenna

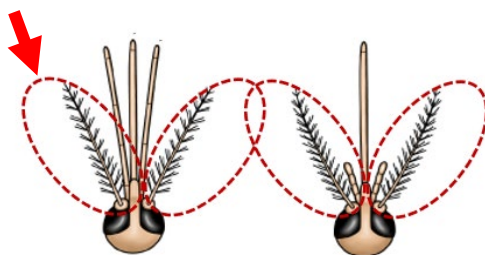
Male



Hairs are numerous and long (plumose)

Antenna used to locate females

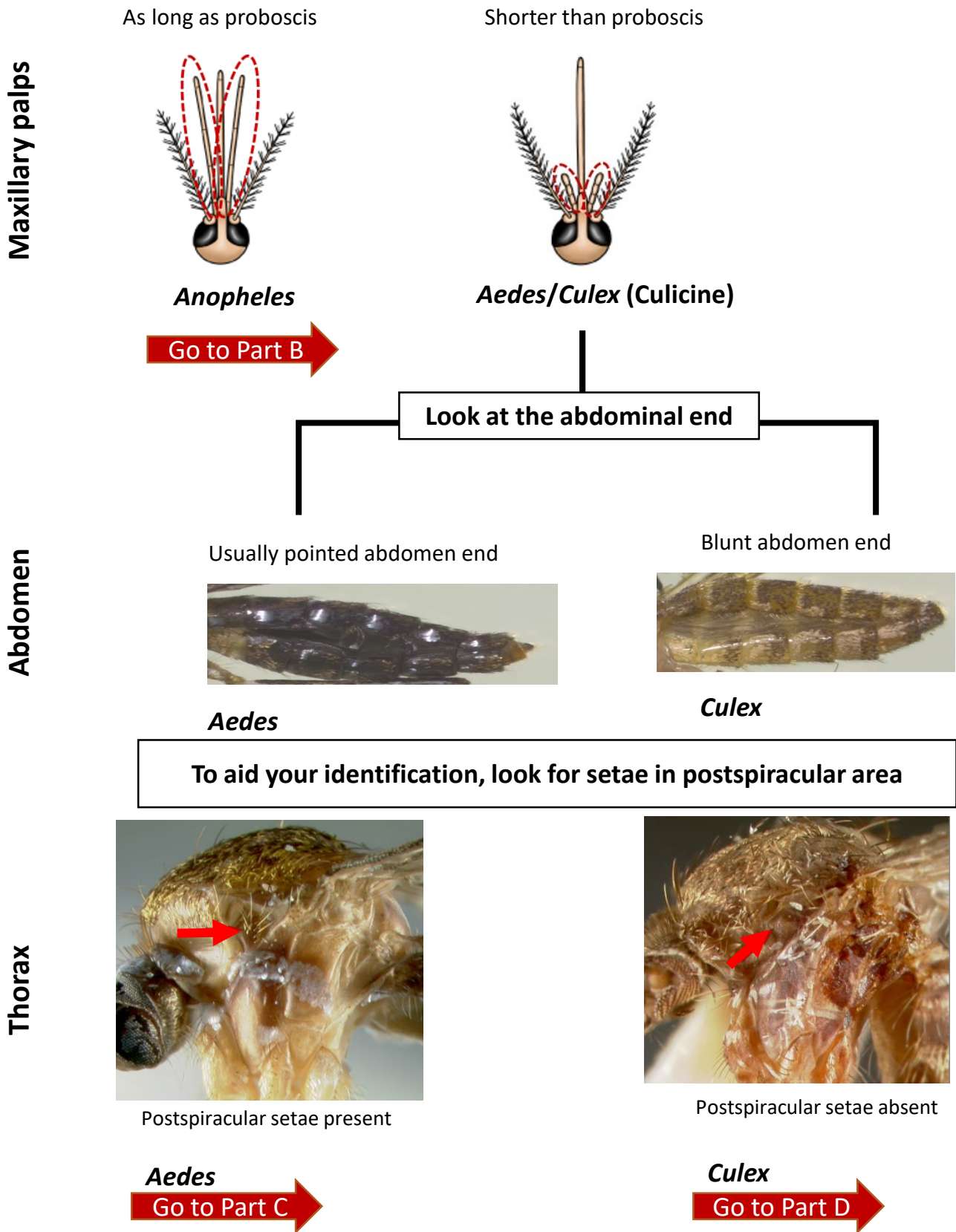
Female



Hairs are few and short (pilose)

Antenna used to find hosts, places to rest, and places to lay eggs

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Part B: Anopheles



Table 2. List of *Anopheles* species and complexes identifiable with this morphological key

Genus	Subgenus	Group	Complex	Species or complex name
Anopheles	<i>Anopheles</i>	<i>bancroftii</i>	<i>bancroftii</i>	<i>An. bancroftii</i> s.l. (genotype A, B, C, D)
		<i>barbirostris</i>	<i>barbirostris</i>	<i>An. barbirostris</i>
				<i>An. campestris</i>
		-	<i>longirostris</i>	<i>An. longirostris</i> s.l. (genotype A, B, C1, C2, D, E, F, G, H)
			<i>subpictus</i>	<i>An. subpictus</i>
	<i>Cellia</i>	<i>annulipes</i>	<i>annulipes</i>	<i>An. annulipes</i>
		<i>lungae</i>	<i>lungae</i>	<i>An. lungae</i> s.l. (<i>lungae</i> s.s.)
			-	<i>An. punctulatus</i>
		<i>punctulatus</i>	<i>farauti</i>	<i>An. farauti</i> s.l. (<i>farauti</i> s.s., <i>farauti</i> 4, <i>farauti</i> 5, <i>farauti</i> 8, <i>hinesorum</i> , <i>irenicus</i> , <i>oreios</i> , <i>torresiensis</i>)
			<i>koliensis</i>	<i>An. koliensis</i> s.l. (genotype 1, 3)
		-	-	<i>An. vagus</i>
		-	-	<i>An. litoralis</i>
		-	-	<i>An. karwari</i>

Part B: Anopheles



Identifying *An. bancroftii* s.l., *An. barbirostris* s.s., *An. campestris*, *An. annulipes*, *An. longirostris* s.l., *An. lungae* s.l., *An. punctulatus*, *An. farauti* s.l., *An. koliensis* s.l., *An. karwari*, *An. litoralis*, *An. subpictus* s.l., *An. vagus*

Wings: count number of pale areas on costa and sub-costa including vein 1

uniformly dark without
pale area



Sub-genus *Bironella*

pale area
(tiny spots to bands) <4

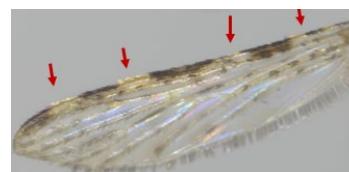


Sub-genus *Anopheles*

An. bancroftii s.l.
An. barbirostris s.s.
An. campestris

Go to 16/34

pale area
≥ 4



Sub-genus *Cellia*.

An. annulipes
An. longirostris s.l.
An. lungae s.l.
An. punctulatus
An. farauti s.l.
An. koliensis s.l.
An. litoralis
An. karwari
An. subpictus s.l.
An. vagus

Go to 17/34

Part B: Anopheles

Subgenus Anopheles

IDENTIFY

Genus

Sub-genus

Group

Complex/
Species

Identifying *An. barbirostris* s.s, *An. campestris*, *An. bancroftii* s.l.

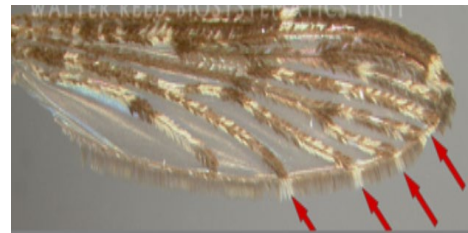
Wings: Look for pale scales at the tip of veins
M1, M2, M3+4 and CuA

None



An. barbirostris s.s, *An. campestris*

Distinct



An. bancroftii s.l.

Arrangement of white
scales between median patch and
lateral rows in abdominal sterna

many & scattered



An. campestris

few & scattered



An. barbirostris s.s.

Part B: Anopheles

Subgenus Cellia

IDENTIFY

Genus

Sub-genus

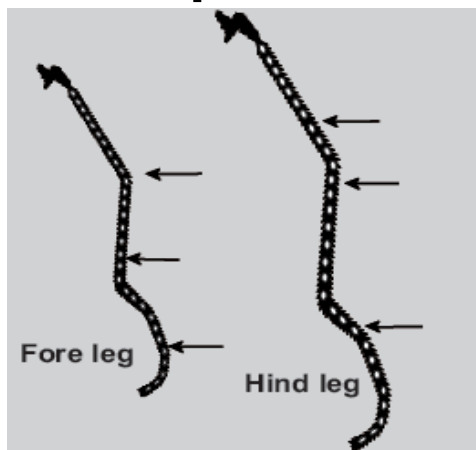
Group

Complex/
Species

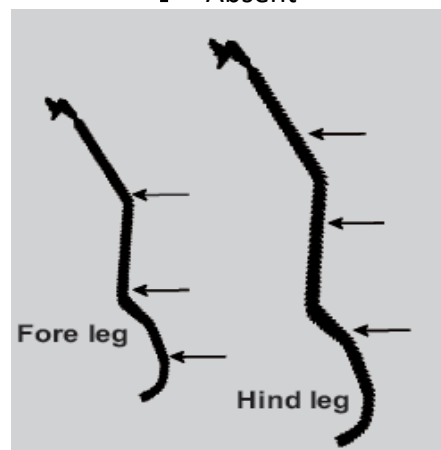
Identifying *An. annulipes*, *An. longirostris* s.l., *An. lungae* s.l., *An. punctulatus*, *An. farauti* s.l., *An. koliensis* s.l., *An. litoralis*, *An. karwari*, *An. subpictus* s.l., *An. vagus*

Legs: Look for pale speckles

Present



Absent



An. annulipes
An. longirostris s.l.
An. lungae s.l.
An. punctulatus
An. farauti s.l.
An. koliensis s.l.
An. litoralis

An. karwari, *An. vagus*, *An. subpictus* s.l.

Maxillary palp: count
the pale bands

with 3 pale bands



An. vagus, *An. subpictus* s.l.

with 4 pale bands

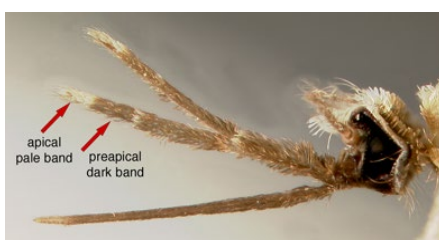


An. karwari

Go to 18/34

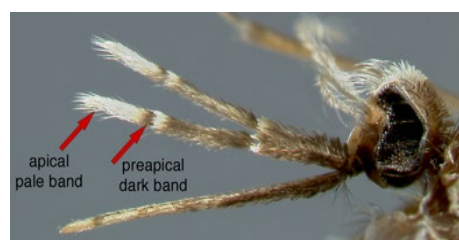
Maxillary palp: look at
length of apical pale band

Almost similar length to
preapical dark band



An. subpictus s.l.

3 times or more length of
preapical dark band



An. vagus

IDENTIFY

Genus

Sub-genus

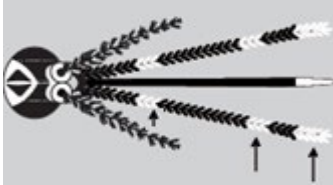
Group

Complex/
Species

Identifying *An. annulipes*, *An. longirostris* s.l., *An. lungae* s.l., *An. punctulatus*, *An. farauti* s.l., *An. koliensis* s.l., *An. litoralis*

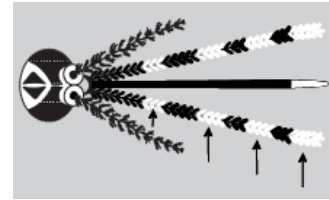
Maxillary palp: count the pale bands

with 3 pale bands



An. litoralis

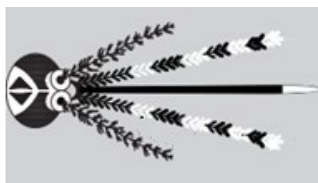
with 4 pale bands



An. annulipes, *An. longirostris* s.l., *An. lungae* s.l.,
An. punctulatus, *An. farauti* s.l., *An. koliensis* s.l.

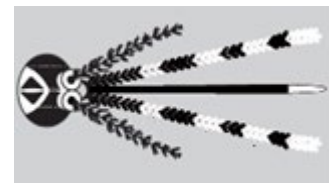
Proboscis: Compare length relative to palps

Proboscis slightly longer
(~1/4th) than palps



An. longirostris s.l.

Proboscis equal in
length to palps



An. annulipes, *An. lungae* s.l., *An. punctulatus*, *An. farauti* s.l., *An. koliensis* s.l.

Halter scales: assess colour

Dark



An. annulipes
An. punctulatus
An. farauti s.l.
An. koliensis s.l.

White



An. lungae s.l.

Proboscis and palps of *An. lungae* s.l.

similar to *farauti* complex, Proboscis, mostly dark with apical pale scaled

Part B: Anopheles

Subgenus Cella

IDENTIFY

Genus

Sub-genus

Group

Complex/
Species

Identifying *An. annulipes*, *An. punctulatus*, *An. farauti s.l.*, *An. koliensis s.l.*

Bands on proboscis and palps: see features of pale and dark bands

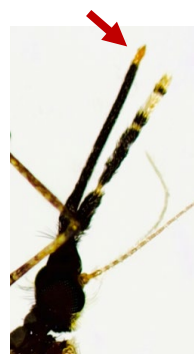
Proboscis

Palps

An. farauti s.l.

Mostly dark, but small apical pale/indistinct band

Apical half of palp (dorsal view) has mostly 4 white and 3 black bands. Distinctive pair of black bands, separated by narrow pale band. Sometimes 4th white band is reduced or completely dark.



An. koliensis s.l.

Ventral pale patch on apical fourth to third. Sometimes extended dorsally and distally to form incomplete ring.

Intermediate between *An. farauti s.l.* and *An. punctulatus* – not distinctive features



An. punctulatus

Apical third to half has complete subapical ring, but often interrupted by dark scales ventrally or dorsally.

Similar to *An. farauti s.l.*, apical half of palpus has mostly 4 white and 3 black bands. 4th white band is usually broader. Occasionally, 3rd and 4th white band fuse together to form a broad pale band (similar to *An. annulipes*)



An. annulipes

Apical half is white band

3 pale/white broader bands on apical half divided by 2 thin black bands.



Part C: Aedes



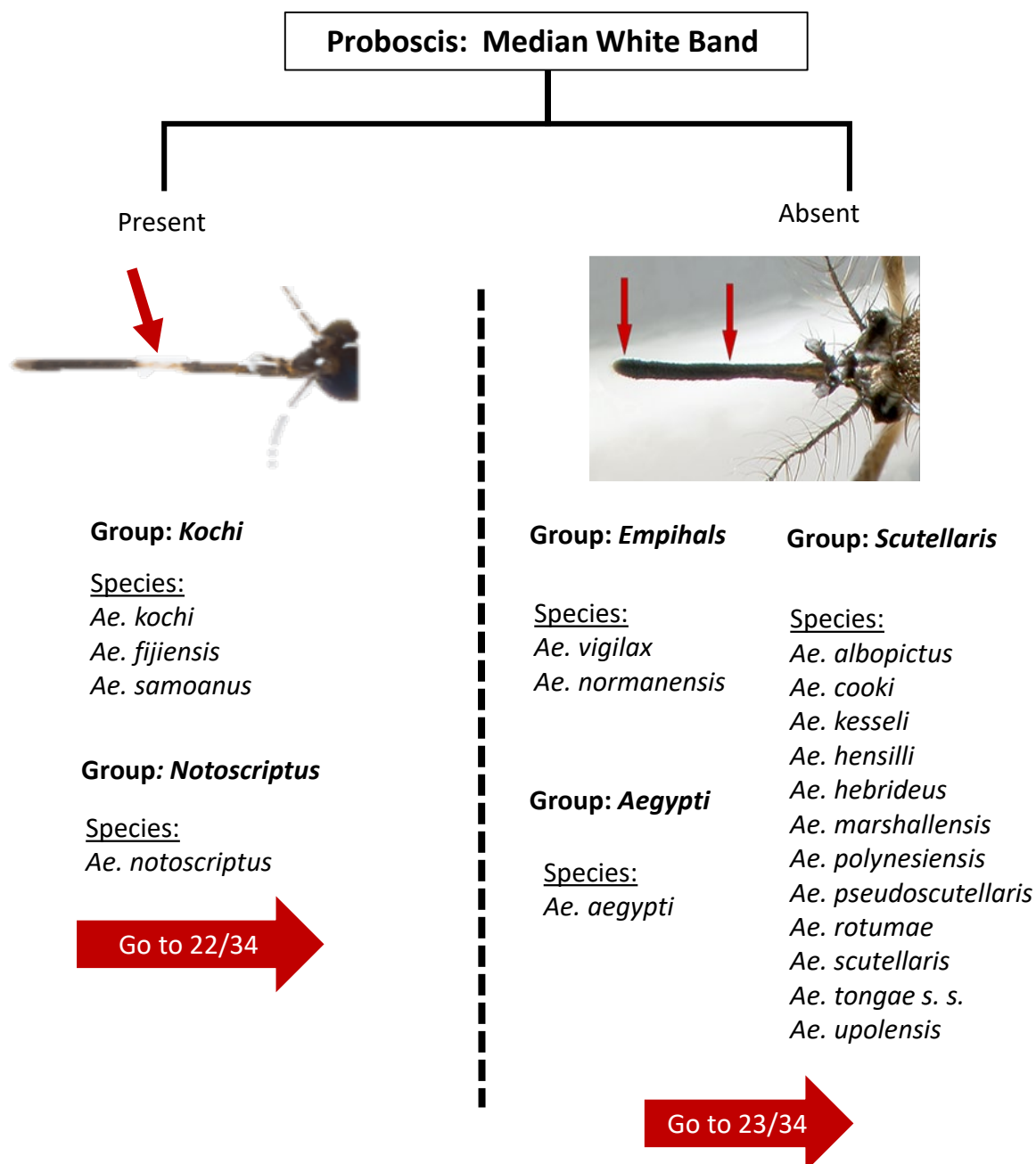
Table 3: List of *Aedes* species and complexes identifiable with this morphological key

Genus	Subgenus	Group	Complex	Species
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				<i>Ae. kochi</i>
				<i>Ae. samoanus</i>
	<i>Ochlerotatus</i>	-	-	<i>Ae. normanensis</i>
		<i>empihals</i>	-	<i>Ae. vigilax</i>
	<i>Rampamyia</i>	<i>notoscriptus</i>	-	<i>Ae. notoscriptus</i>
		<i>aegypti</i>	-	<i>Ae. aegypti</i>
	<i>Stegomyia</i>	<i>scutellaris</i>	-	<i>Ae. albopictus</i>
				<i>Ae. cooki</i>
				<i>Ae. hebrideus</i>
				<i>Ae. hensilli</i>
				<i>Ae. kesseli</i>
				<i>Ae. marshallensis</i>
				<i>Ae. polynesiensis</i>
				<i>Ae. pseudoscutellaris</i>
				<i>Ae. rotumae</i>
				<i>Ae. scutellaris</i>
				<i>Ae. upolensis</i>
			<i>tongae</i>	<i>Ae. tongae</i> s.l. (<i>tongae</i> s.s., <i>tabu</i>)

Part C: Aedes



Identifying *Ae. fijiensis*, *Ae. kochi*, *Ae. samoanus*, *Ae. normanensis*, *Ae. vigilax*, *Ae. notoscriptus*, *Ae. aegypti*, *Ae. albopictus*, *Ae. hebrideus*, *Ae. hensilli*, *Ae. marshallensis*, *Ae. polynesiensis*, *Ae. pseudoscutellaris*, *Ae. rotumae*, *Ae. scutellaris*, *Ae. upolensis*, *Ae. cooki*, *Ae. kesseli*, *Ae. tongae s.s.*



Part C: Aedes

Subgenus Finlaya and Rampamyia

IDENTIFY

Genus

Sub-genus

Group

Complex/
Species

Identifying *Ae. fijiensis*, *Ae. kochi*, *Ae. samoanus*, *Ae. notoscriptus*

Pattern of scales in wings

Regular spots of pale and dark scales



Ae. kochi, *Ae. fijiensis*, *Ae. samoanus*

All dark scales



Ae. notoscriptus

(Lyre-shaped white markings/pair of submedian stripes similar to *Ae. aegypti*)

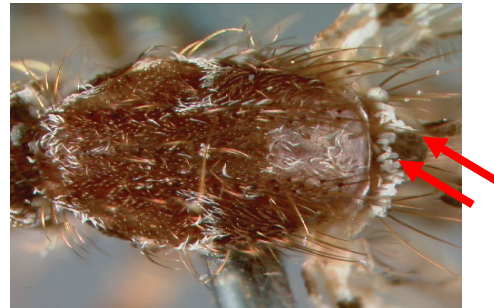
Colour of scutellar scales on midlobe

Apical dark basal few or no white



Ae. kochi

Apical white and basal dark



Ae. fijiensis, *Ae. samoanus*

To further strengthen your identification, look for scales and patch in the abdomen tergum VII

with medial basal pale patch



without medial basal pale patch

These species have non-overlapping distributions. *Ae. kochi* is found in PNG and the Moluccas. *Ae. samoanus* is found in Samoa and American Samoa. *Ae. fijiensis* is found in Fiji only.

Part C: Aedes

Subgenus Ochlerotatus and Stegomyia

IDENTIFY

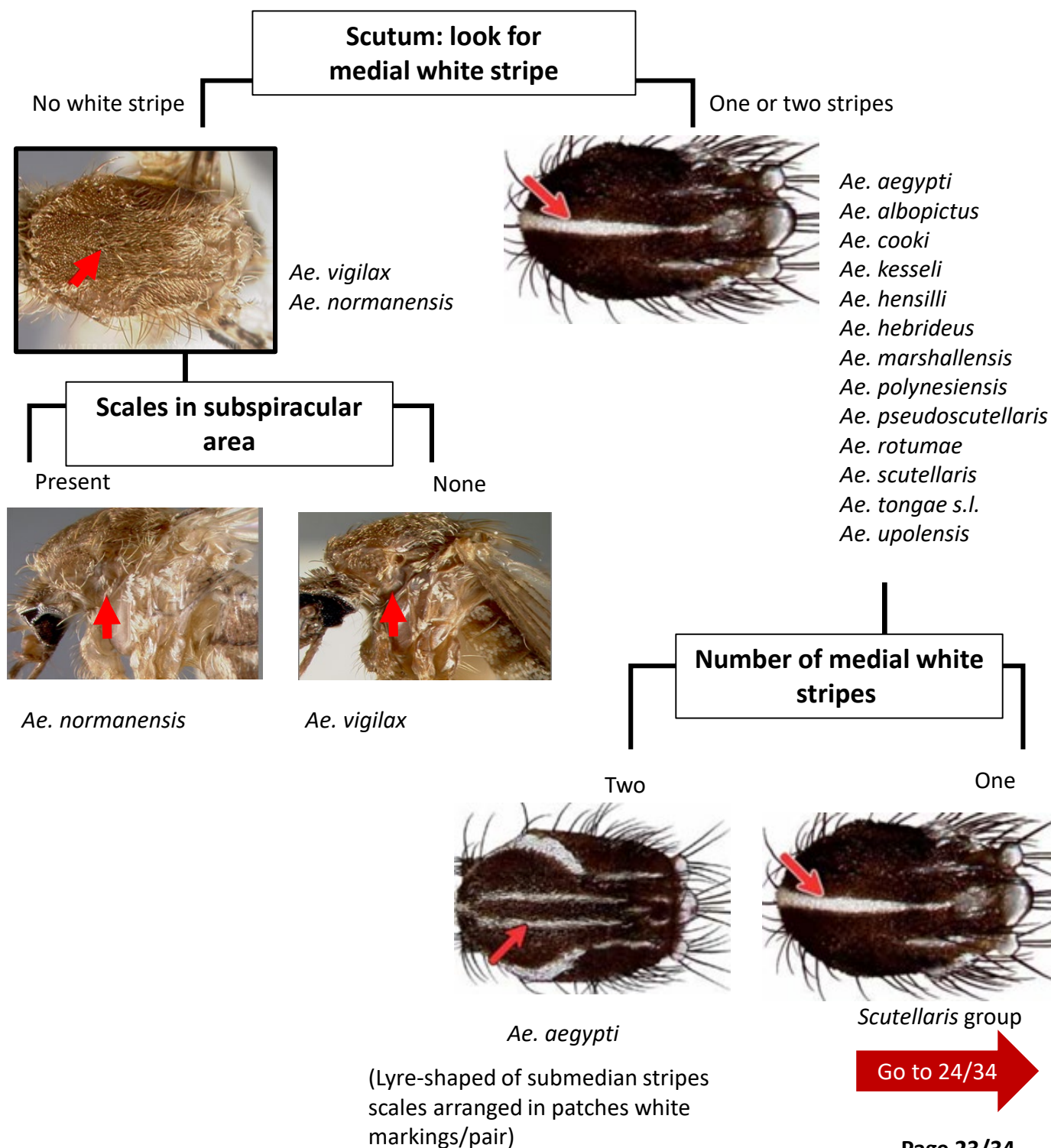
Genus

Sub-genus

Group

Complex/
Species

Identifying *Ae. normanensis*, *Ae. vigilax*, *Ae. aegypti*, *Ae. albopictus*, *Ae. hebrideus*, *Ae. hensilli*, *Ae. marshallensis*, *Ae. polynesiensis*, *Ae. pseudoscutellaris*, *Ae. rotumae*, *Ae. scutellaris*, *Ae. upolensis*, *Ae. cooki*, *Ae. kesseli*, *Ae. tongae s.l.*



Part C: Aedes

Subgenus Ochlerotatus and Stegomyia

IDENTIFY

Genus

Sub-genus

Group

Complex/
Species

Identifying *Ae. albopictus*, *Ae. hebrideus*, *Ae. hensilli*, *Ae. marshallensis*, *Ae. polynesiensis*, *Ae. pseudoscutellaris*, *Ae. rotumae*, *Ae. scutellaris*, *Ae. upolensis*, *Ae. cooki*, *Ae. kesseli*, *Ae. tongae s.l.*

Thorax: supraalar white line

Incomplete, narrow scales
over wing root only



Strengthen your identification by spotting
scales in the lateral thorax that are
arranged in distinctive boomerang



Ae. albopictus

Complete, broad flat scales over wings
root and towards scutellum



Ae. cooki
Ae. kesseli
Ae. hensilli
Ae. hebrideus
Ae. marshallensis
Ae. polynesiensis
Ae. pseudoscutellaris
Ae. rotumae
Ae. scutellaris
Ae. tongae s.l.
Ae. upolensis

**Number and arrangement of white
Scale patches on lower mesepimeron**

Present, well developed, >3 scales



Ae. cooki, *Ae. kesseli*, *Ae. hebrideus*, *Ae. marshallensis*, *Ae. pseudoscutellaris*, *Ae. polynesiensis*, *Ae. scutellaris*, *Ae. tongae s.l.*

Absent or very small, <3 scales



Ae. rotumae, *Ae. upolensis*
(See hindtarsal-4 colour)

Go to 26/34

Go to 25/34

IDENTIFY

Genus

Sub-genus

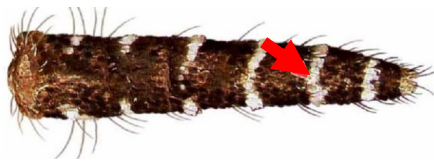
Group

Complex/
Species

Identifying *Ae. hebrideus*, *Ae. hensilli*, *Ae. marshallensis*, *Ae. polynesiensis*, *Ae. pseudoscutellaris*, *Ae. rotumae*, *Ae. scutellaris*, *Ae. upolensis*, *Ae. cooki*, *Ae. kesseli*, *Ae. tongae s.l.*

Pattern of sub-basal white bands on abdominal terga

Tergite bands incomplete, but VII is usually complete or dotted silvery band. One or more additional tergite may be complete



Ae. cooki, *Ae. kesseli*, *Ae. hebrideus*, *Ae. marshallensis*, *Ae. scutellaris*, *Ae. tongae s.l.*

Tergite bands incomplete and not connected



Ae. pseudoscutellaris, *Ae. polynesiensis*

proportional size of silvery band to the length of tarsomere 4 in the hind leg

0.4 to 0.5

0.5 to 0.6

0.75



Ae. tongae s.l.



Ae. cooki, *Ae. kesseli*



Ae. hebrideus
Ae. scutellaris
Ae. marshallensis

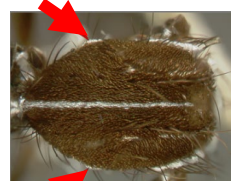
Lateral prescutal white lines

Absent

Present



Ae. polynesiensis



Ae. pseudoscutellaris

Spots in abdominal terga

terga II to VII usually with basal lateral white spots only

- = ≡ ≥ > > ≡



Ae. kesseli

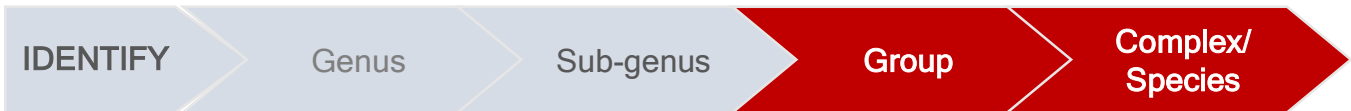
terga III to V usually with sub-basal median pale spots

≡ ≤ < < ≡ = -

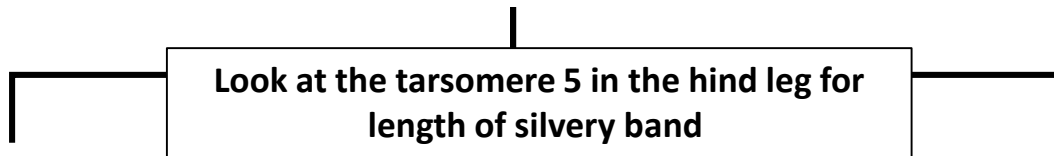


Ae. cooki

Go to 26/34



Identifying *Ae. hebrideus*, *Ae. marshallensis*, *Ae. scutellaris*



Apical half or more white



Ae. hebrideus
Ae. scutellaris

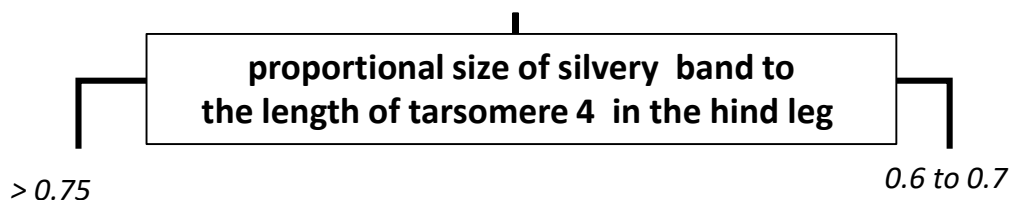
Apical half or more dark



Ae. marshallensis

Ae. scutellaris is in PNG and Palau but not the Solomon Islands or Vanuatu; *Ae. hebrideus* is in Solomon Island and Vanuatu but not Palau or PNG

Identifying *Ae. hebrideus*, *Ae. rotumae*, *Ae. upolensis*



Ae. rotumae



Ae. upolensis

Note: Following *Aedes* species of Scutellaris group are non-overlapping in distribution. Please take this note while making an identification.

<i>Ae. tongae s.l.</i>	Only in Tonga
<i>Ae. rotumae</i>	Only in Rotuma island, Fiji
<i>Ae. upolensis</i>	Only in Samoan Islands
<i>Ae. marshallensis</i>	Only in Marshall Island and FSM

Part D: Culex



Table 4: List of *Culex* species and complexes identifiable with this morphological key

Genus	Subgenus	Group	Complex	Species
<i>Culex</i>	<i>Culex</i>	<i>pipiens</i>	<i>pipiens</i>	<i>Cx. quinquefasciatus</i> <i>Cx. australicus</i>
			-	<i>Cx. pacificus</i> <i>Cx. pervigilans</i>
		<i>sitiens</i>	-	<i>Cx. annulirostris</i> <i>Cx. gelidus</i> <i>Cx. palpalis</i> <i>Cx. sitiens</i> <i>Cx. tritaeniorhynchus</i> <i>Cx. vishnui</i> <i>Cx. whitmorei</i>
			<i>bitaeniorhynchus</i>	<i>Cx. bitaeniorhynchus</i>

Part D: Culex

IDENTIFY

Genus

Sub-genus

Group

Complex/
Species

Identifying *Cx. annulirostris*, *Cx. bitaeniorhynchus*, *Cx. gelidus*, *Cx. palpalis*, *Cx. sitiens*, *Cx. tritaeniorhynchus*, *Cx. vishnui*, *Cx. whitmorei*, *Cx. quinquefasciatus*, *Cx. pacificus*, *Cx. pervigilans*, *Cx. australicus*

Position of pale scaled band on
abdominal terga

Apical



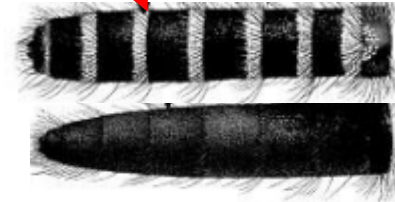
Sub-genus *Oculeomyia*

Cx. bitaeniorhynchus

and

Others non-medically
important sub-genus

Basal or absent



Sub-genus *Culex*

median pale ring in proboscis

Absent or lightly pale-scaled

Present



Group *Pipiens*

Cx. quinquefasciatus
Cx. pacificus
Cx. pervigilans
Cx. australicus

Go to 32/34

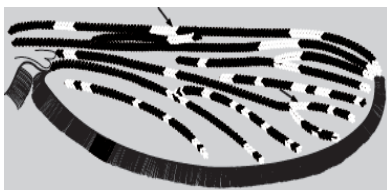
Group: *Sitiens*

Cx. annulirostris
Cx. gelidus
Cx. palpalis
Cx. sitiens
Cx. tritaeniorhynchus
Cx. vishnui
Cx. whitmorei

Go to 29/34

white spots on wings

Present

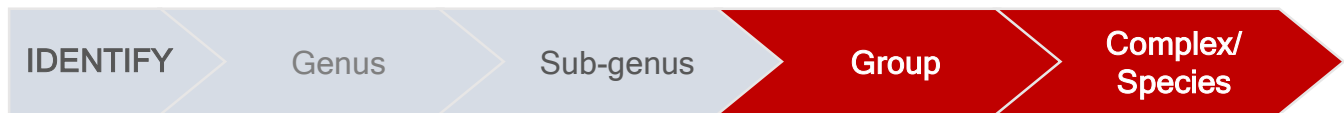


Cx. bitaeniorhynchus

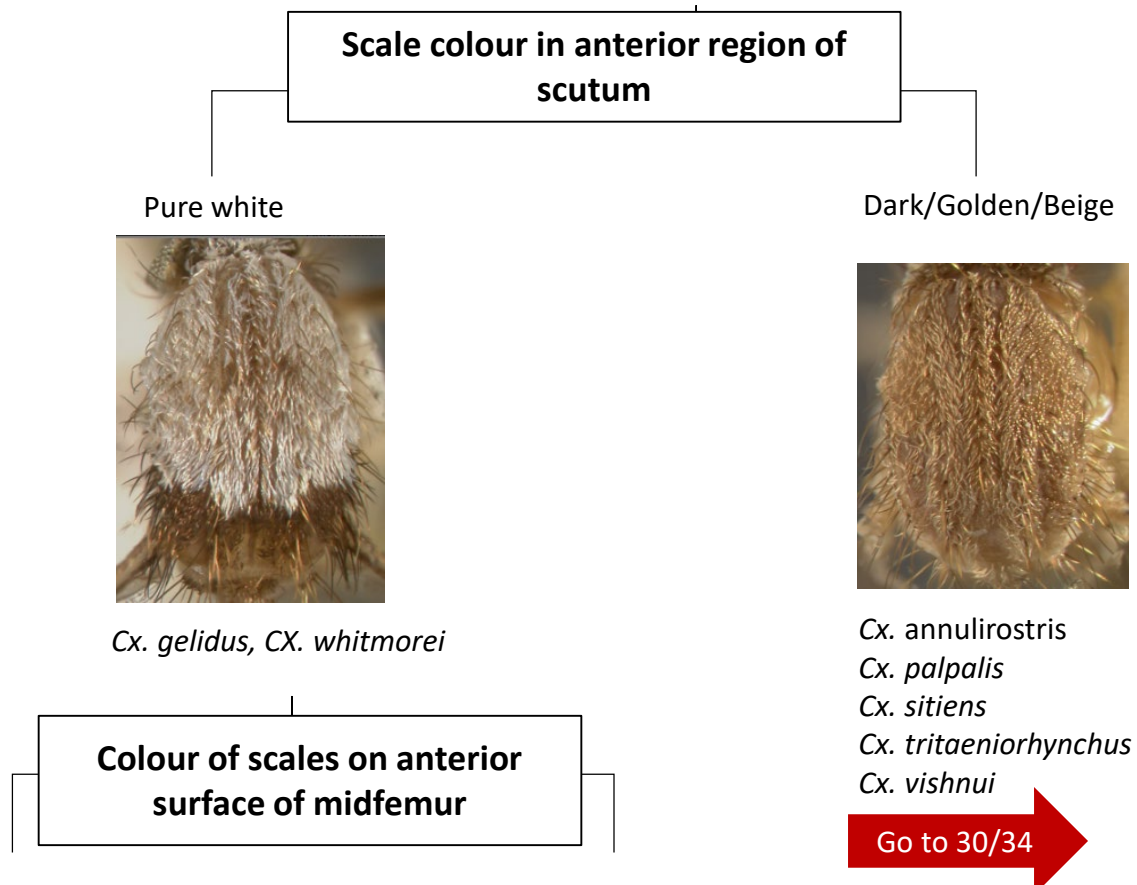
Absent



Others non-medically
important sub-genus



Identifying *Cx. annulirostris*, *Cx. gelidus*, *Cx. palpalis*, *Cx. sitiens*, *Cx. tritaeniorhynchus*, *Cx. vishnui*, *Cx. whitmorei*



IDENTIFY

Genus

Sub-genus

Group

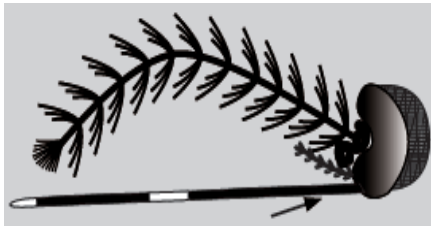
Complex/
Species

Identifying *Cx. annulirostris*, *Cx. palpalis*, *Cx. sitiens*, *Cx. tritaeniorhynchus*, *Cx. vishnui*

Proboscis with accessory pale patches

Absent

Present



Cx. annulirostris, *Cx. palpalis*, *Cx. sitiens*, *Cx. vishnui*



Cx. tritaeniorhynchus

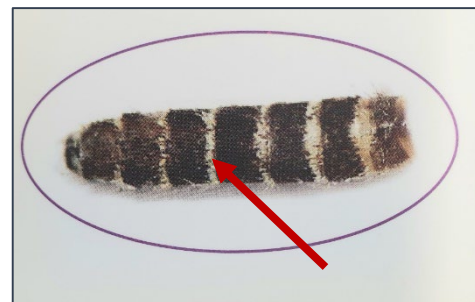
Look for characteristics of abdominal tergal bands

pale tergal bands basally produced in middle (Triangular)

Terga IV –VII; narrow and almost with same width in middle and edges



Cx. annulirostris



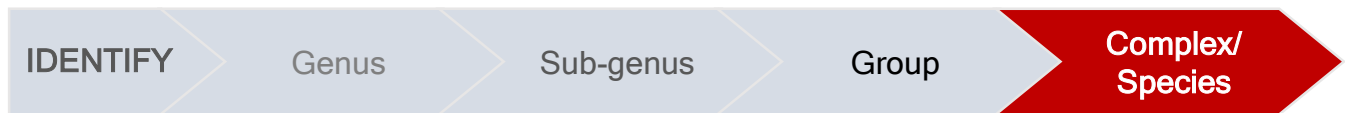
Cx. palpalis, *Cx. sitiens*, *Cx. vishnui*

Look for spots and scales on foretibia to support your identification above

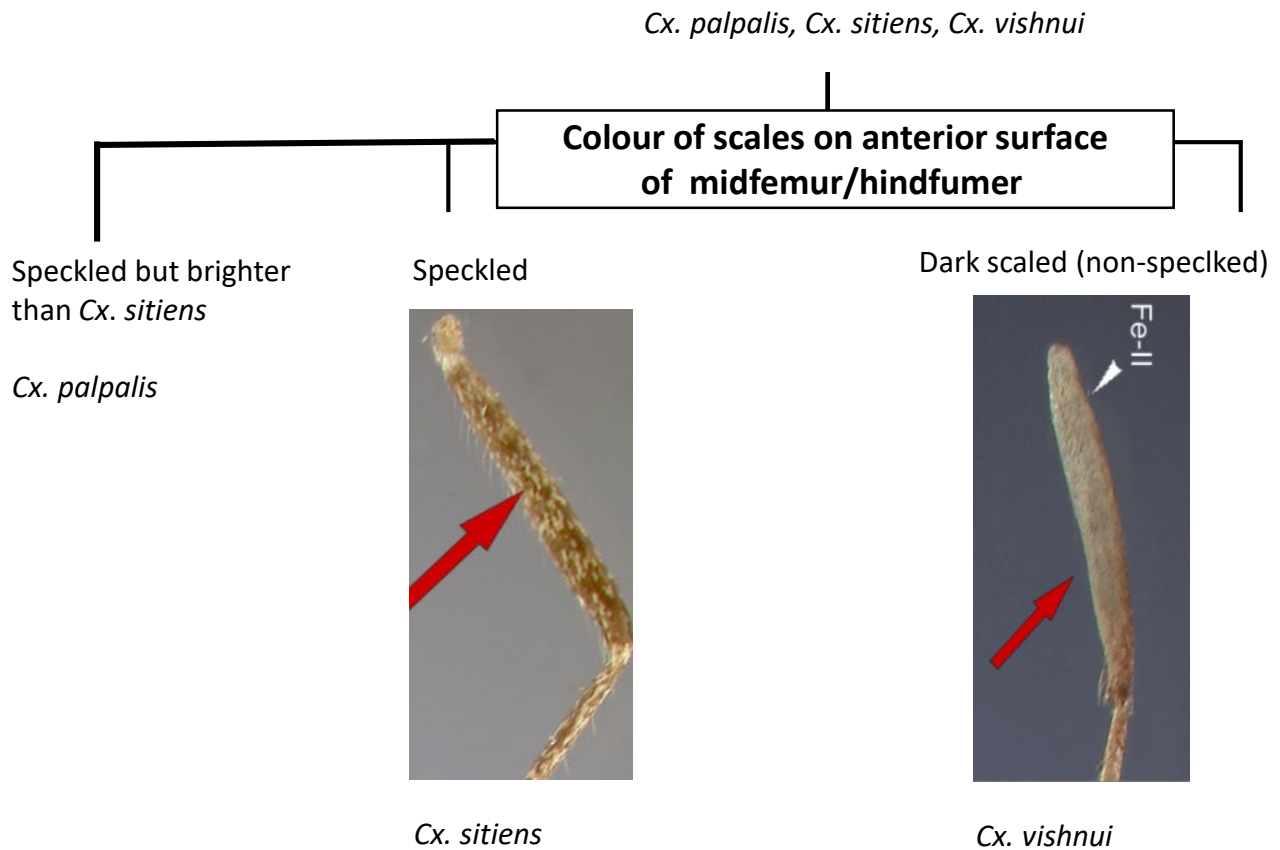
Go to 31/34

Foretibia usually with a line of pale spots on anterior surface

Foretibia without any pale spots on anterior surface



Identifying *Cx. annulirostris*, *Cx. palpalis*, *Cx. sitiens*, *Cx. tritaeniorhynchus*, *Cx. vishnui*

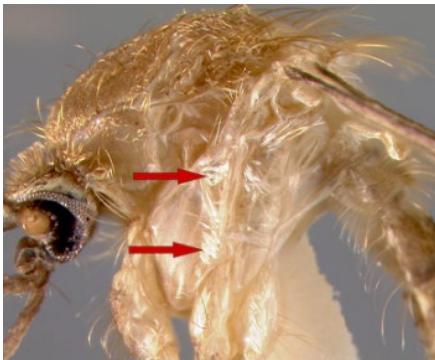
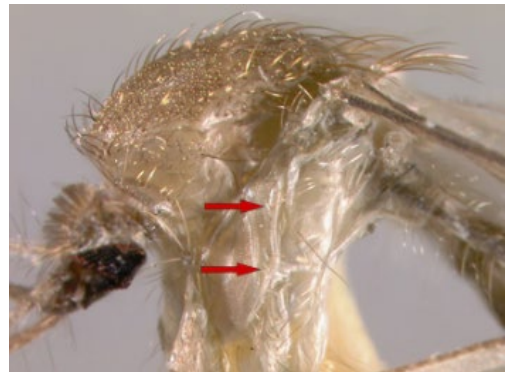


IDENTIFY

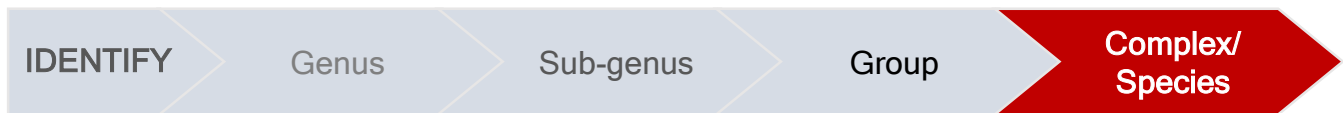
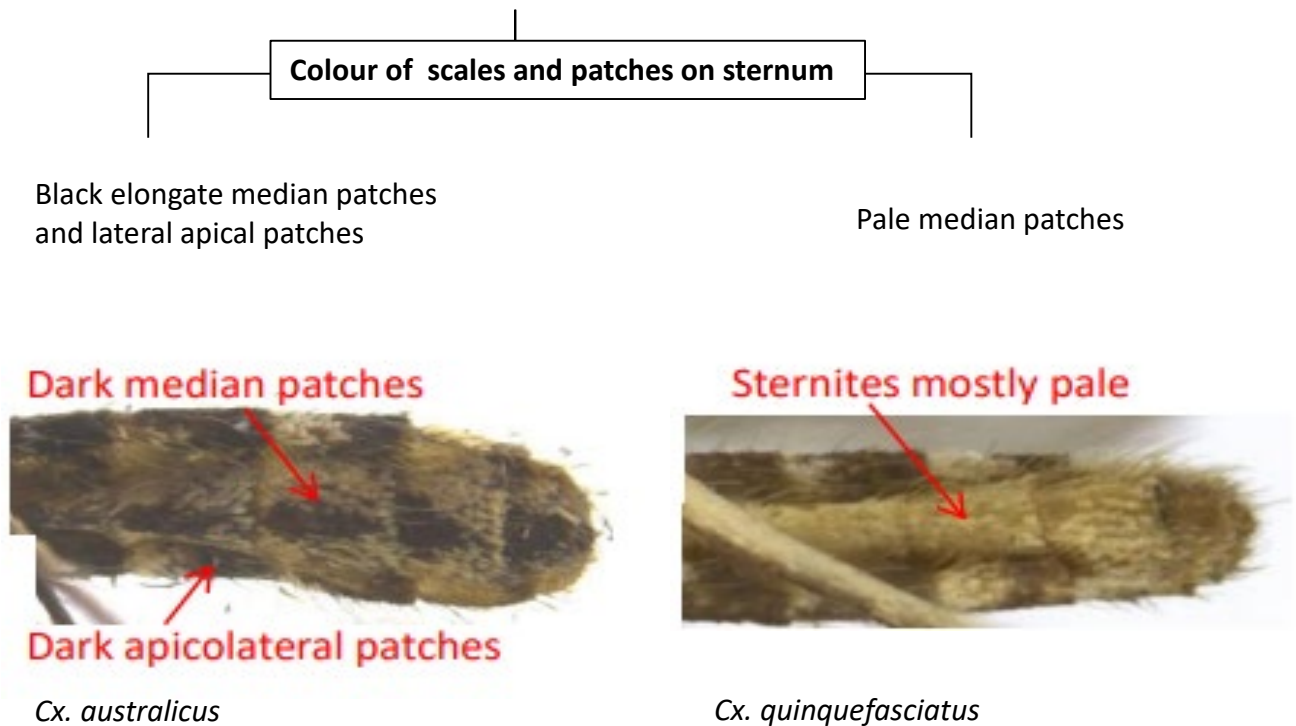
Genus

Sub-genus

Group

Complex/
SpeciesIdentifying *Cx. quinquefasciatus*, *Cx. australicus*, *Cx. pervigilans*, *Cx. pacificus***Presence of scales and their numbers
on mesepimeron**Numerous scales at the base of
upper bristles*Cx. quinquefasciatus*, *Cx. australicus*,
*Cx. pervigilans*Without or less than 6 scales
at the base of upper bristles*Cx. pacificus***Colour and contrast of thoracic
integument and mesonotal scales**Thoracic integument dark
Mesonotal scaling light (highly contrast)*Cx. pervigilans*Thoracic integument light
Mesonotal scaling dark (less contrast)*Cx. quinquefasciatus*, *Cx. australicus*

Go to 33/34

Identifying *Cx. quinquefasciatus*, *Cx. australicus*

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