

Pictorial key to the common Indian species of *Aedes* (*Stegomyia*) mosquitoes

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ABSTRACT

The paper provides a simple pictorial key to differentiate common *stegomyia* species found in urban areas. This key will help medical officers and paramedical staff in demarcating the areas of influence of *Aedes aegypti* within a Dengue surveillance area.

INTRODUCTION

Increasing attention is now being given to Dengue/DHF surveillance, in the NCT, Delhi and other parts of India, following the massive outbreak of Dengue/DHF, in 1996. In Delhi, Dengue has been declared a notifiable disease, and legislative measures are in force for prevention of *Aedes aegypti* breeding. *Aedes* surveillance forms the most important component of Dengue prevention. For the medical officers, at the peripheral levels as well as other non-entomological staff, it is essential to know identification of common *Aedes* species to demarcate the areas of influence of Dengue vector *Aedes aegypti*. Three common *Stegomyia* species, viz. *Aedes aegypti*, *Ae. albopictus* and *Ae. vittatus* are found in urban areas of India. *Ae. aegypti* shows a centripetal distribution while *Ae. albopictus* and *Ae. vittatus* are confined to peripheral areas. However, in the fast expanding cities it is difficult to pinpoint the centre of the city and hence the area of influence of *Ae. aegypti*. Therefore recognition of the three common species is essential for practical purposes. A simple key providing identification characters of *Aedes*, both larval and adult stages, of the common *Stegomyia* species found in the urban areas of India, could be of considerable value in *Aedes* surveillance. The present key has been prepared with this objective in view.

In addition we give the behavioural characteristics, which can help, visually differentiate, *Aedes* species from the ubiquitous *Culex* and the *Anopheles* species.

Bionomics

There are about three hundred mosquito species throughout the country. These are broadly divided into Anophelines and Culicines. Amongst Anophelines a few species transmit malaria in India. Culicine mosquitoes include three medically important genera, viz. *Aedes*, *Culex* and *Mansonia*. Several of them are closely associated with man and his domestic animals through the blood feeding habit of the female mosquitoes, transmitting dengue/DHF, Japanese encephalitis and filariasis. *Aedes aegypti* and *Ae. albopictus* are very common and are known to be carriers of Dengue/DHF in the country.

Aedes mosquitoes lay their eggs singly (Fig. 1A), like the *Anopheles* but their eggs do not have lateral floats or frills (Fig. 1B). They float on the water by means of minute air bubbles which form in the irregularities (nodules) on the surface of the egg. In contrast *Culex* mosquitoes lay

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their eggs in boat shaped masses, or rafts, a large number of eggs being cemented together (Fig. 1C).

Culicine larvae differ from those of Anophelines in the possession of a siphon or breathing tube. When undisturbed, the larvae of Anophelines, lie flat along the surface of water (Fig. 1E). In contrast, in a similar situation, culicine larvae hang 'head down' from the surface of water keeping the tip of the breathing tube in contact with the surface of water (Fig. 1F).

The larva of *Aedes* mosquitoes can be easily recognized by the naked eye following characteristic movement and shape of siphon tube (Table 1).

Table 1 Recognition of *Aedes* and *Culex* larvae (Visual)

Character	<i>Aedes</i>	<i>Culex</i>
Movement	Characteristics "S" shaped, snake like or "figure 8" movement, involving all parts of the body.	Whip-like or "figure C" movement which propels them rapidly to the bottom of the container.
Siphon tube	Dark in colour, about twice as long as wide	Long and tapered, at least three times as long as wide.
Light	React quickly to changes in light intensity, are disturbed by the beam of flashlight/shadow/removal of the cover from the container provoking them to dive to the bottom and get overlooked.	Are not sensitive to changes in light intensity, a rather strong disturbance is required to cause them to go to the bottom of the container and return fairly soon to the surface.
Habit	Gregarious in habit	Not gregarious in habit

Aedes aegypti : It is the true "house hunting mosquito", both male and female remain close to the house of origin. The adult female is a small mosquito and the male is smaller than the female distinguished by its plumose antennae and longer and more developed palps. It is dark coloured and ornamented with white markings. The adults of this species can be easily recognized by the characteristic lyre-shaped white marking on the thorax¹.

Ae. aegypti is a vicious biter, biting with great frequency inside houses both by day and night. It can bite through socks and shirts. In India it prefers human blood to that of cattle. Females of *Ae. aegypti* are most active under conditions of high humidity. Therefore, warm humid weather increases the incidence of mosquito-biting in the community.

It is domestic mosquito in India, ordinarily breeding in close proximity to human dwellings. In general, it prefers clean water and never breeds in swamps, rivers, lakes, pits, drains or other places where malaria mosquitoes usually breed. The eggs of *Ae. aegypti* mosquitoes are never laid in a dry container. The female will die rather than lay eggs in a dry place. She deposits her eggs on the sides of a water-holding container, she can find, at or just above the water-line, cementing them there with a secretion from her body.

Ae. aegypti larvae are consistently more abundant in poorer areas of the city than in better residential areas. This is due to greater number of water containers and the greater rate of infestation of the same². Desert coolers and tyres are favoured breeding sites because they

provide both shaded water and a resting place for the adults.

Aedes albopictus : It is black mosquito with silvery white markings. The adults of this species are recognised by a narrow silvery white median line running nearly the whole length of the mesonotum behind the head.

The adults bite vigorously in jungle or in the open, near their breeding places. It is not a house-hunting species, except in forest bungalows. Females feed during the day but not at night under normal condition. Primarily larvae of *Ae. albopictus* are found in water butts, garden tanks etc. if these contain dead leaves and are in shade of trees. However, this species has also now adapted to urban environment breeding in artificial containers in outdoor situations. Like *Ae. aegypti*, populations of *Ae. albopictus* also show susceptibility to infection with Dengue virus.³

Aedes vittatus : This is an atypical species for the subgenus *Stegomyia* in having pecten of siphon with 20-34 long pointed teeth, extending along the basal three fourth of the siphon, one or two simple distal teeth lie between hair tuft and the apex of the siphon (key).

Ae. vittatus breeds in rain water pools and other peridomestic collections near human dwellings, sometimes in rock pools and is fairly frequent in tree holes.

These three species of *Aedes* mosquitoes viz. *Ae. aegypti*, *Ae. albopictus* and *Ae. vittatus* are commonly encountered in urban areas of the country. They can easily be differentiated at both adult and larval stage following pictorial keys no. 1 and 2.

ACKNOWLEDGEMENTS

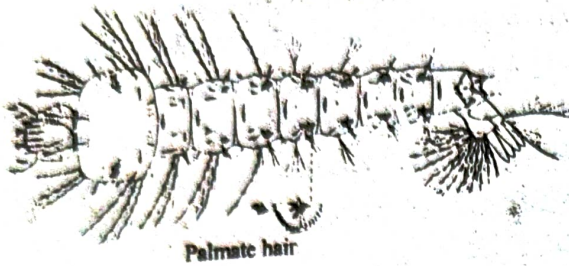
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PICTORIAL KEY TO LARVAE OF COMMONLY ENCOUNTERED SPECIES OF AEDES MOSQUITOES

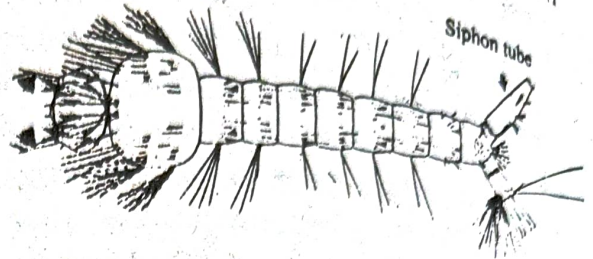
SIPHON TUBE ABSENT; PALMATE HAIR PRESENT



Palmate hair

ANOPHELES SPECIES

SIPHON TUBE ABSENT; PALMATE HAIR PRESENT



Siphon tube

SIPHON SHORT ABOUT TWICE AS LONG AS WIDE, WITH ONE VENTRAL TUFT ON EACH SIDE



SIPHON TUBE AT LEAST 3X AS LONG AS WIDE, WITH SEVERAL VENTRAL HAIR TUFT ON EACH SIDE



CULEX SPECIES

SIPHON WITH PECTEN TOOTH ALL IN ONE RANK, NONE WIDELY SEPARATE

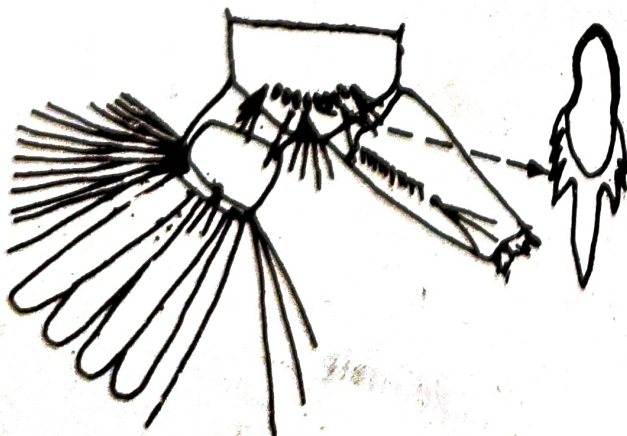


THE MOST DISTAL PECTEN TOOTH WIDELY SPACED FROM MAIN RANK AND ATTACHED BETWEEN HAIR TUFT AND APEX OF SIPHON



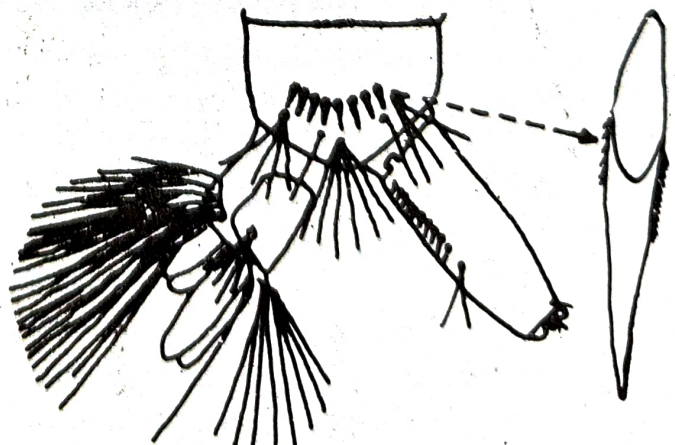
AEDES VITTATUS

INDIVIDUAL COMB SCALE THORN-SHAPED WITH A STRONG MEDIAN SPINE AND STOUT LATERAL SPINES



AEDES AEGYPTI

INDIVIDUAL COMB SCALE SLIPPER SHAPED, EVENLY TAPERED WITH A FRINGE BUT NO LATERAL SPINES



AEDES ALBOPICTUS

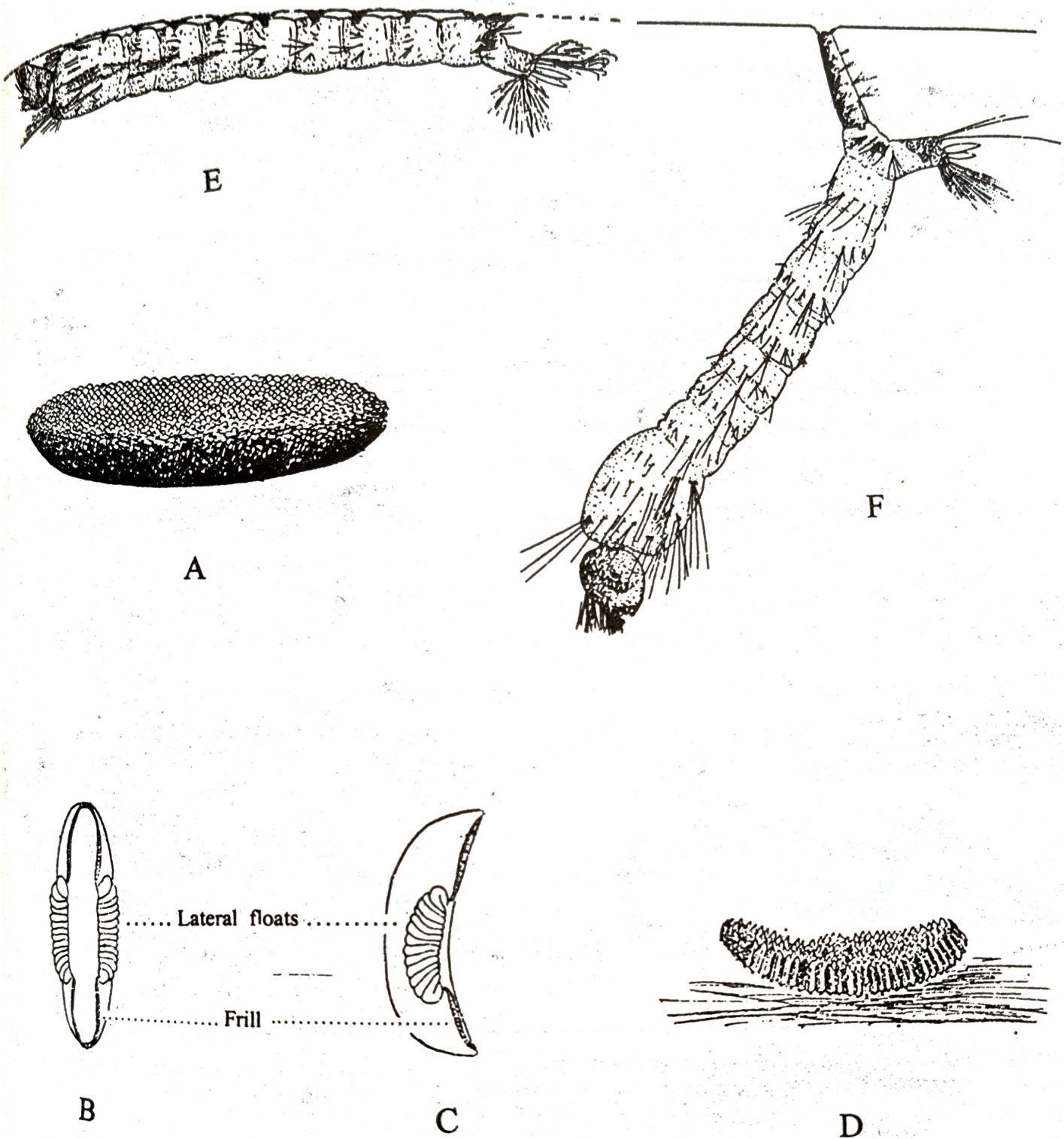


Fig. A, Lateral view of an egg of *Aedes aegypti* showing the nodules on dorsal surface. B & C, *Anopheles* egg dorsal and lateral view. D, A cluster of *Culicine* eggs fused together in the form of a raft. E, Lateral view of *Anopheles* larva (undisturbed), lying flat on the surface film of water. F, Lateral view of *Culicine* larva (undisturbed) showing how it hangs down from the surface film of water.

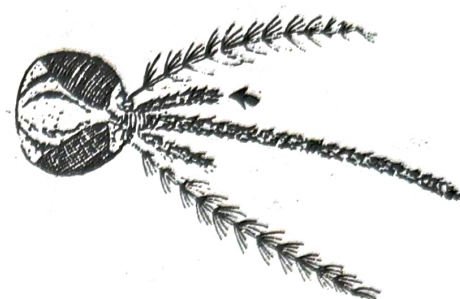
PICTORIAL KEY TO COMMONLY ENCOUNTERED SPECIES OF AEDES MOSQUITOES

PALPI ABOUT AS LONG AS PROBOSCIS

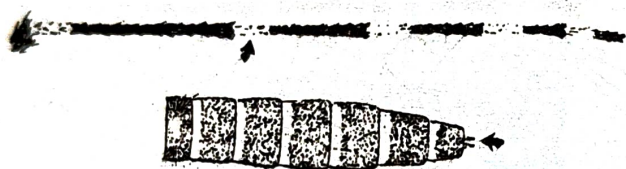


ANOPHELES SPECIES

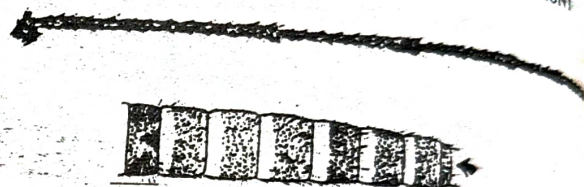
PALPI MUCH SHORTER THAN PROBOSCIS



LEGS WITH WHITE BANDS; ABDOMEN POINTED

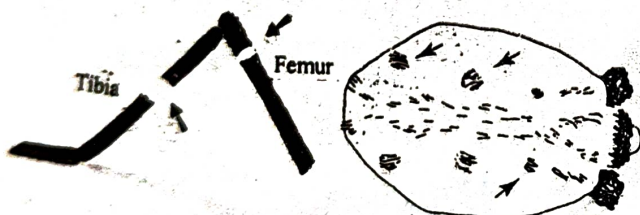


LEGS UNBANDIED, ENTIRELY DARK OR
TERMINAL SEGMENTS WHITE; ABDOMEN BLUNT



CULEX SPECIES

ALL FEMORA WITH PREAPICAL WHITE RING;
ALL TIBIAE WITH MEDIAN WHITE BAND;
THORAX WITH THREE PAIRS OF SMALL WHITE SPOTS

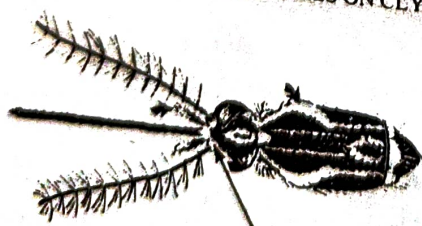


AEDES VITTATUS

FEMORA AND TIBIAE WITHOUT WHITE RINGS;
THORAX MARKED OTHERWISE

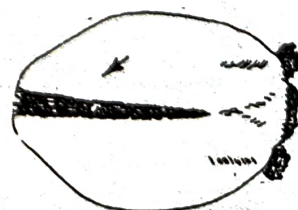


THORAX WITH LYRE-SHAPED MARKING FORMED BY SILVERY-WHITE SCALES
ON A BLACKISH BACKGROUND; SILVERY-WHITE SCALES ON CLYPEUS AND PALPI-



AEDES AEGYPTI

THORAX WITH A NARROW MEDIAN WHITE LINE,
CLYPEUS AND PALPI ENTIRELY DARK



AEDES ALBOPICTUS