

STUDY OF ANOPHELINE DIVERSITY IN MOSQUITO BORNE DISEASED PREVALENT AMRAVATI DISTRICT OF MAHARASHTRA

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Abstract:

In India, the fight against malaria was started in 1953 with the National Malaria Control Programme & before the vectors could develop resistance, the shift to the National Malaria Eradication was undertaken in 1958. Out of the 390 units, 250 units were declared free from this disease by 1966. The reappearance of malaria in many areas leads towards National Vector Borne Disease Control Programme.

The base of the vector Borne Disease Control Programme is to identify various species of mosquito which acts to transmit the diseases like Malaria, Filaria, Dengue, Chikungunya, Japanese Encephalitis etc.

Vidarbha region is basically a malaria prone zone. The geographical status of this district is mainly a causative phenomenon of this disease. In Amravati district is the hotspot of variety of mosquito borne diseases. In Amravati district alone during 2003-04, there were 1455 reported patients of malaria out of which 5 died as per the Maharashtra Government record while 8 patients were found suffering from Japanese Encephalitis, 6 dengue patients and 14 of Chikungunya and fatality rate observed in case of Japanese encephalitis was 38 %. The prevalence of elephantiasis is also fairly large in this area. The number of patients is very high as most of the peoples prefer the private medical practitioners whose record is usually not recorded in the government record.

Amravati is a tropical area with high humidity as temperature of the zone raises beyond 44⁰ C during summer season. All the environmental conditions are favorable for breeding of mosquitoes. In the present paper all the species are caught by net trap method and identified. Diversity of mainly anopheline mosquitoes carried out to highlight their role as a vector. The keys used for identification of the anopheline species are Christophers, Barraud and Nagpal, Shrivastava. The species identified are *Anopheles theobaldi*, *A. culicifacies*, *A. pallidus*, *A. vagus*, *A. minimus*, *A. subpictus*, *A. sundaicus*, *A. philipinensis* mainly in the Amravati district.

All the diversified characters used in identification are wing venation, forelegs and hind legs, maxillary palpi, antennae, proboscis etc.

Keywords: *Anopheles species*, Amravati.

Introduction:

Mosquitoes of the tribe Anophelini commonly called malarial mosquitoes. They resemble with other mosquitoes, but are generally have spotted wings and their position of sitting with some angle during rest. The vector Borne Disease Control Programme is to identify various species of mosquito which acts to transmit the diseases like Malaria, Filaria, Dengue, Chikungunya, Japanese Encephalitis etc. Vidarbha region is basically a malaria prone zone. Amravati district is the hotspot of variety of mosquito borne diseases.

Methodology:

Collection of mosquito specimens from different 5 geographical regions of the district Amravati viz Amravati (20.93°N 77.75°E), Achalpur (21°16'8"N 77°30'47"E). Chandur railway(20.8107059 N 77.972104E), Daryapur(21.25404 N 78.01127E) and Morshi (21.3269681N 78.0070275E) carried out during the work of present paper. Several specimens collected from different regions that were resting indoor or outdoor were collected by net trap method during morning or evening period. The collections were made from cattle sheds or human dwellings for diversity study. Keys used for identification of the anopheline species were Christophers, Barraud and Nagpal, Shrivastava. Morphological identification of the specimens carried out by using characters like, mouth parts - proboscis, maxillary palps, antennae wing venation, scales on wings and legs.

Result and Discussion:

The species identified were *Anopheles culicifacies*, *A. theobaldi*, *A. subpictus*, *A. vagus*, *A. sondaicus*, *A. pallidus*, *A. minimus* and *A.philipinensis*

***1. Anopheles culicifacies* Giles 1901**

- Small, dark mosquito
- Palpi: three small almost equal yellow areas

- Head with yellowish white and brown upright scales, frontal tuft of white hairs
- Thorax with brown and yellow hairs and hair-like scales, Distinct median dark longitudinal line
- Abdomen dark brown color covered with long yellow hairs, scales absent.
- Wing is covered with narrow spindle shaped scales
- The costa five yellowish-white scaled portions as on the first longitudinal vein
- The 2nd & 4th LV has three lighted portions
- The 3rd LV is dark scaled throughout except its origin
- The 5th and 6th LV has only one light scaled area
- Legs dark brown, but at the distal extremity of the tibia shows a small spot of yellowish scales

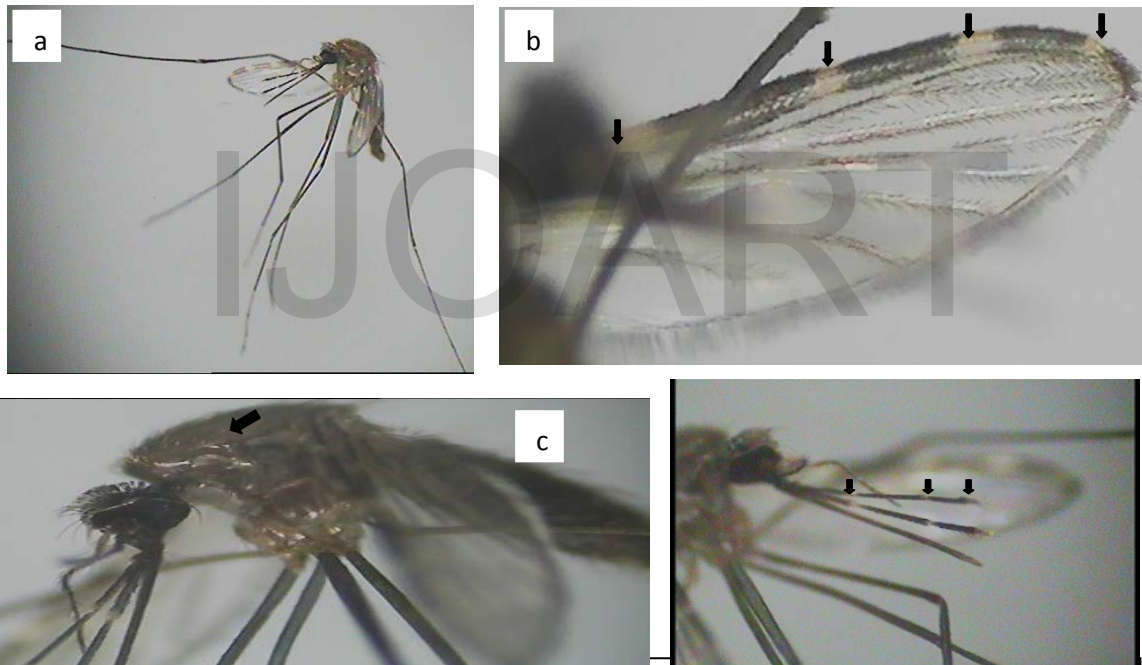


Fig. 1: *Anopheles culicifacies* Giles 1901: a) A whole mount b)The costa five yellowish-white scaled portions c)Thorax with brown and yellow hairs and hair-like scales d) Palpi with three small almost equal yellow areas

2. *Anopheles theobaldi* Giles 1901

- Palpi : Black with three white bands .
- Proboscis is black with a white tip.
- Head: with black and white scales.
- Thorax: show a median and two lateral darker lines.

- Abdomen: Abdomen is intensely black with long white hairs.
- Wings: Wings are covered with spindle shaped scales.
- Costa has six black scaled areas.
- First LV has four dark markings.
- The second LV is for the most part white, but shows two black scaled areas on the main trunk and two dark spot on each of its branches.
- The third LV is white except for three dark spots.
- The forth LV has two long black spots on the main trunk and two small black spots on each of its branches.
- The fifth LV has only one dark spot on main trunk, three on its anterior branch, and one on its posterior branch.
- The sixth LV has three dark spots.
- legs: legs are much with white scales and differ in detail in anterior, mid and hind leg.

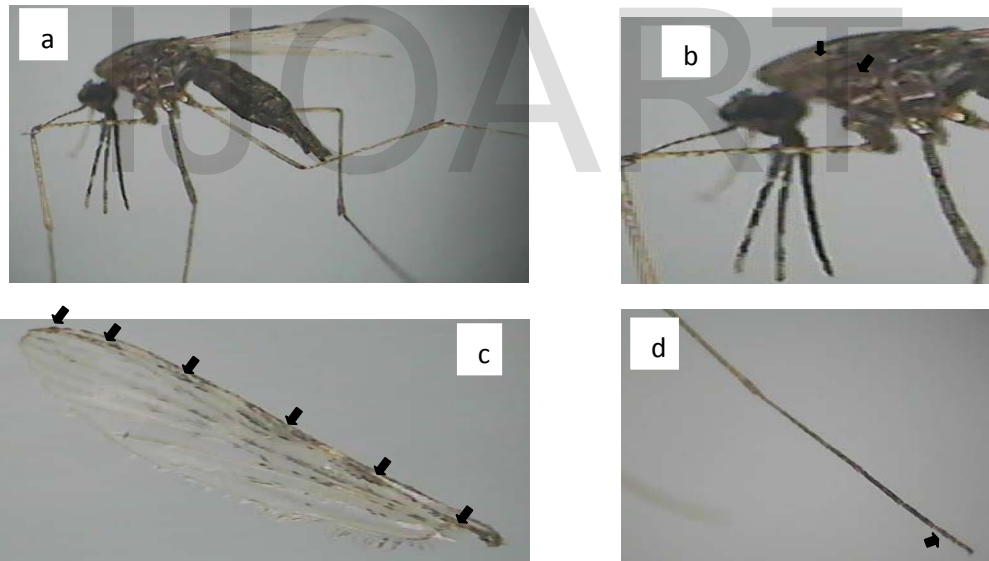


Fig.2: *Anopheles theobaldi* Giles 1901: a) A whole mount b) Thorax with a median and two lateral darker lines. c) Costa with six black scaled areas. d) Hind leg with white scales

***Anopheles subpictus* Grassi 1899**

- Head: well marked frontal tuft

- Palpi: Apical segment about half the pre apical in length, with a broad apical band and two narrow pale bands
- Thorax: Lateral areas somewhat darker than the median area covered with short golden curved hairs with white scales and erect black scales.
- Wings: base of costa with three small dark accessory spots middle dark spot usually about twice as long as the others. Dark area on vein 1 shorter than the dark costal area, fringe commonly with an additional pale area between termination of vein 6 and base and often one between 5 and 6, scales of wings are moderately broad.
- Legs: with femora distinctly swollen. Tibiae mark with a thin pale line on anterior surface Coxae pale.
- Abdomen: with golden hairs and some narrowish yellow.



Fig. 3 *Anopheles subpictus* Grassi 1899:a) A whole mount b) Apical segment about half the pre apical in length, with a broad apical band c) Wing's middle dark spot usually about twice as long as the others d) Tibiae mark with a thin pale line

4. *Anopheles vagus* Doenitz 1902

- Very closely resemblance to *Anopheles subpictus*.

- Sub apical dark band on female palpi much narrower, only about $\frac{1}{4}$ to $\frac{1}{5}$ length of pale apical area; pre humeral dark accessory spot at base of costa
- Dark scales connecting the two portion along inner border of costa; The sub apical dark spot on the costa is usually short

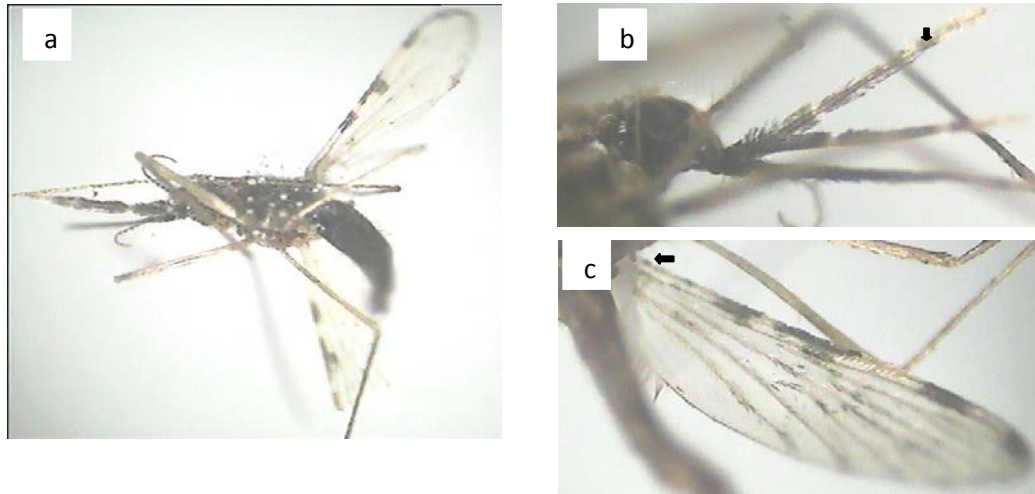


Fig. 4: *Anopheles vagus* Doenitz 1902: a) A whole mount b) Sub apical dark band $\frac{1}{4}$ to $\frac{1}{5}$ length of pale apical area c)Thorax with brown and yellow hairs and hair-like scales d) The sub apical dark spot on the costa is usually short

5. *Anopheles sundaicus* Rodenwaldt

- The characters and ornamentation closely approaches *Anopheles subpictus* except legs are speckled. Color darker than *A. subpictus* and *A. vagus* and the lateral areas of the thorax more contrastingly dark
- Proboscis entirely dark. prehumeral dark accessory spot continuous from extreme base of costa to humeral cross vein without pale scales interiorly as in *A. Vagus*.
- An extra fringe spot between 5.2 and 6
- There may be rather prominent black scales on VII segment ventrally.
- Legs are speckled

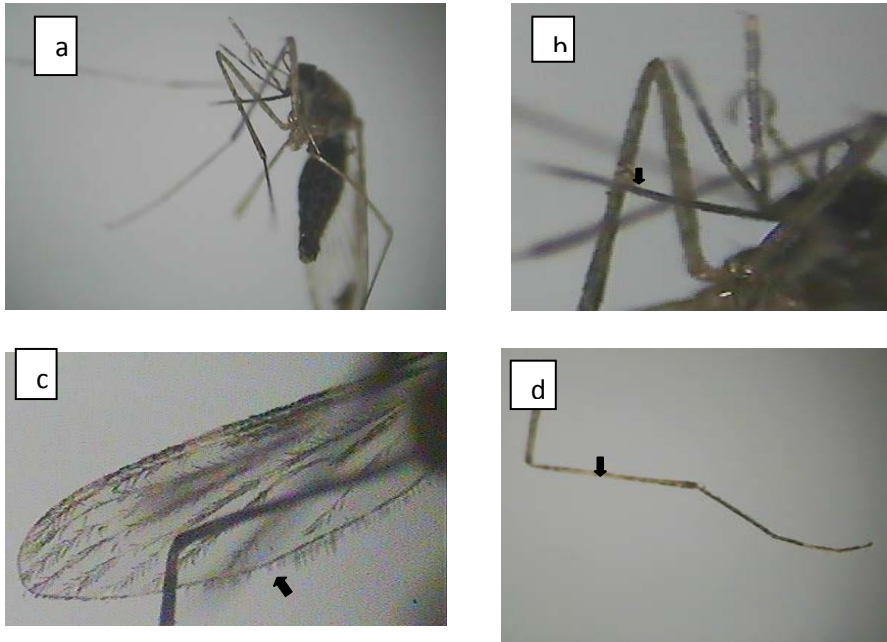
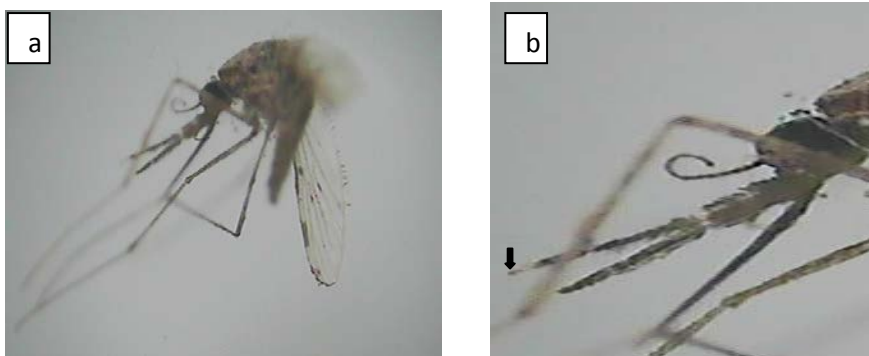


Fig. 5: *Anopheles sundaicus* Rodenwaldt: a) A whole mount b) Proboscis entirely dark c) An extra fringe spot between 5.2 and 6 d) Legs are speckled

6. *Anopheles pallidus* (Theobald)1901

- Brown with lighter wings.
- The markings of the wing show more extended pale areas;
- Vein 5 has no dark spot in its middle portion; Base of costa often more pale than dark.
- Segment 1 of hind tarsus is entirely devoid of any trace of apical banding. The abdomen usually shows some scales from segment 4



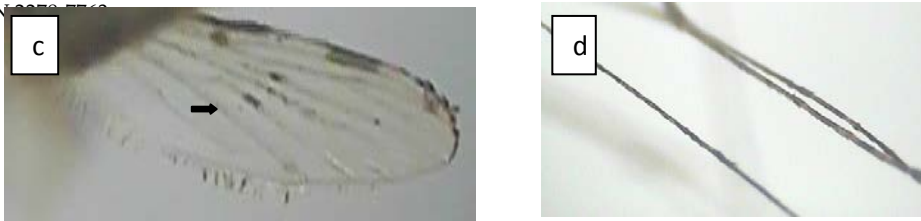


Fig.6. *Anopheles pallidus* (Theobald)1901: a)A whole mount b)The costa five yellowish-white scaled portions c) vein 5 has no dark spot in its middle portion d) Segment 1 of hind tarsus is entirely devoid of any trace of apical banding.

7. *Anopheles minimus* Theobald 1901

- The female palpi have two broad white bands apically, the subapical one usually as a broad, or nearly as broad as the apical
- The proboscis may be dark
- The wing rarely shows a fringe spot at vein 6 and the base of the costa is very constantly with a small pale interruption at the inner side of the inner costal spot.
- Pale spots are present in a course of 2.1 and 2.2 sometimes.
- The outer half of vein 6 is usually continuously dark; base of vein 3 usually has one or two dark spots.

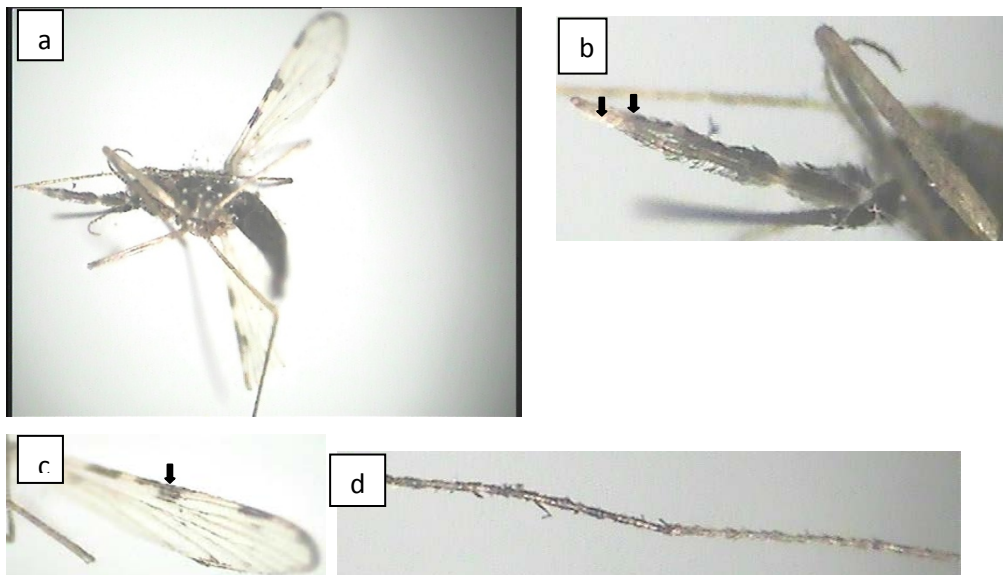


Fig. 7. *Anopheles minimus* Theobald 1901: a) A whole mount b) palpi have two broad white bands apically, the subapical one usually as broad, or nearly as broad as the apical c) the costa at the inner side of the inner costal spot. d) Legs speckled.

8. *Anopheles philippinensis* Ludlow, 1902.

Head: Scales, with a well marked white vertical area; vertical chaetae white

Antenna: white scales on first flagellar segment and commonly on 2-6 succeeding segments.

Palpi: broadish apical pale bands, sometimes with dark scales forming an extra dark band; narrow pale band at 2-3 and 3-4.

Thorax: Usually with one or two dark scales on a pronotum. Mesonotum almost black, unicolorous, covered throughout with broad, short, oval white scales & many dark scales laterally on anterior face.

Colour: In general it is very similar to *A. annularis*. color brown mosquito, but more usually it is darker.

Wings: It differs similarly to *A. pallidus*, in that the wing is lighter and the fifth vein extensively pale; there is usually no bridging of subcostal spot.

Legs: legs with front femora swollen in basal half. Front femora ornamental as shown; mid femora with a conspicuous pale spot on anterior surface towards apex. Tibia dark, usually with pale stripe and pale at apices. Front tarsus broadly apically and somewhat basally banded on segment 1-3; mid tarsus more narrowly apically banded on same segment; hind tarsus with 1 broadly banded with white apically, 2 with about 1/8 its length apically white. 3-5 in typical form continuously white, a dark band present, of varying extent, on base of 3 in many cases.

Abdomen : Scaling of the abdomen is not so profuse on the dorsum but the dark scales towards on the posterior external angles of the terminal abdominal segments and on the under surface. The amount of the white on segment 2 is often exceed 1/8, which is usually seen in *A. annularis*. There is usually some pale mark at the apex of segment 1.



8. *Anopheles philippinensis* Ludlow, 1902: a) A whole mount b) Palpi with dark scales forming an extra dark band; narrow pale band at 2-3 and 3-4. c) Wings with fifth vein extensively pale; there is usually no bridging of subcostal spot d) Tibia dark, usually with pale stripe and pale at apices.

White and Adhikari (1939) reported the occurrence of *Anopheles sunaicus* for the first time of total of 20 anopheline species based on larval collection from Chilka Lake. *A. sunaicus* is an important malaria vector although its zone of influence is restricted to coastal area of Orissa and parts of Ganjam and Vijayanagar district of Andhra Pradesh (Covell and Singh, 1942; Senior White and Adhikari, 1939) A.P. Dash et. al. 2001 studied Morphometrical variation in *Anopheles annularis* in eleven important characters from Keonjhar and Indore districts by applying the 't' test.

Acknowledgement: I acknowledge U.G.C. as the present paper work is a part of major project work funded by U.G.C. and also Department of Zoology, Sant Gadge Baba Amravati University Amravati, to carry out the work.

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