

# Study Of Anopheline Diversity In Mosquito Borne Diseased Prevalent Nashik District Of Maharashtra, India

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**Abstract:** In India, the malaria control programme had started in 1953. 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. Nashik district a malaria appeared zone. The geographical status of this district is mainly a causative phenomenon of this disease. 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. Nashik is a tropical area with high humidity as temperature of the zone raises beyond during summer season. All the environmental conditions are favourable for breeding of mosquitoes. In the present paper all the species are caught by net trap method and identified. Diversity of mainly anopheles mosquitoes carried out to highlight their role as a vector. The keys used for identification of the anopheline species are Nagpal, Shrivastava , Barraud and, Christophers. 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:** Mosquito, wing, proboscis, blood, Malaria

## I. INTRODUCTION

Mosquitoes may be ancient species than human being [1]. India has mega biological diversity [2]. Mosquitoes belong to the order Diptera. They have a single pair of wings, they specially long, thin legs and a head featuring a prominent proboscis. Mosquito bodies and wings most often are covered in tiny scales. Adult sizes may range from 3 to 9 mm, its connectivity related aquatic habitat they exploit lentic aquatic habitat for breeding [3], [4].

Male adult mosquitoes do not take blood meals, while the females do. However, a few species of female adult mosquitoes do not absorb blood at all and feed only on plant nectar and other sugars, just like the males [5]. The mosquito's proboscis that extends out from the mouth area is relatively smooth with the females and somewhat bushy with males. The hairs on the mosquitoes antenna assist with the ability to hear. Antennae's hairs of male are very "feathery" and large, while the female's antennae's hair are smoother and less feathery appearance. Specially male mosquitoes are smaller than females of the same species and live shorter lives than the females.

Almost every person has had the displeasing involvement of being bitten by a mosquito. Mosquito bites can cause skin irritation through an allergic counteraction due to the mosquito's saliva. After biting causes the red bump and itching. But a more serious effects are found from some mosquito bites may be transposal of serious diseases and viruses such as malaria, virus, Zika and West Nile virus, which can lead to disabling and probably pernicious effected such as encephalitis, meningitis and microcephaly. Mosquitoes cause more deaths than any other animal in the world. They are carriers of diseases, including malaria, dengue fever, yellow fever, Zika and West Nile virus which can be transmitted to humans and animals when the mosquito feeds on blood [6]. Only the female mosquito feeds on blood, when a female feeds on blood their abdomen become enlarge and can spread up to 3 times its own body weight in blood. Mosquitoes like O-type blood, people with high body heat, pregnant women and strong breathers. Many of these reasons are because mosquitoes can sense carbon dioxide ( $\text{CO}_2$ ) from up to 100 feet distance. Which is a reason why they circulate around our heads where we exhale  $\text{CO}_2$  by respiration. Female's mosquito live for two weeks to a month while males mosquito usually live for just a week. Mosquitoes go through four lifecycles stages i. e. egg, larva, pupa, and adult. Female mosquitoes tend to lay their eggs in stagnant water even very shallow storage like small puddles are suitable [7].

Mosquitoes of the tribe Anophelini commonly termed malarial mosquitoes. They resembles 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 of Government is to identify various species of mosquito which acts to transmit the diseases like Malaria, Filaria, Dengue, Chikungunya, Japanese Encephalitis etc [8]. Western Maharashtra region is basically a malaria prone zone. Nashik district is the hotspot of variety of mosquito borne diseases.

## II. MATERIAL AND METHOD

Collection of mosquito specimens from different 5 geographical regions of the district Nashik viz Igatpuri( $19.6973^\circ \text{N}$ ,  $73.5609^\circ \text{E}$ ) Dindori ( $20.2042^\circ \text{N}$ ,  $73.8272^\circ \text{E}$ ), Surgana ( $20.5605^\circ \text{N}$ ,  $73.6374^\circ \text{E}$ ), Satana ( $20.5982^\circ \text{N}$ ,  $74.2033^\circ \text{E}$ ), Kalwan ( $20.4731^\circ \text{N}$ ,

73.9815°E), and Peint (20.2647°N, 73.5081°E) 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, Covell, Nagpal, and 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.

### III. RESULT AND DISCUSSION

The species identified were *Anopheles culicifacies*, *A. theobaldi*, *A. subpictus*, *A. vagus*,

*A. sundaicus*, *A. pallidus*, *A. minimus* and *A. philippensis*.

#### 1. *Anopheles minimus* Theobald 1901

The subapical one usually as a broad, or nearly as broad as the apical, The female palpi have two broad white bands apically, 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.

#### 2. *Anopheles annularis*

Head , thorax and abdomen are smaller than others, legs are long, abdomen is small and golden colour with hairy covering. Probosis are strong, scales are thick with banded.

#### 3. *Anopheles sundaicus* Rodenwaldt

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

#### 4. *Anopheles subpictus* Grassi 1899.

Head: well marked frontal tuft, Palpus: 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 5and 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 yellow.

#### 5. *Anopheles philippensis* 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, Palpus: 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 is 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.

#### 6. *Anopheles vagus* Doenitz 1902

Very closely resemblance to *Anopheles subpictus*, Sub apical dark band on female palpi much narrower, only about 1/4 to 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.

#### 7. *Anopheles culicifacies* Giles 1901

Dark and small size mosquito, Palpus: three small almost equal yellow areas, Head with white yellowish and brown perpendicular scales, frontal cluster of white hairs, Thorax possess brown and yellow hairs and hair-like scales, Specific median dark longitudinal line, Abdomen dark brown colour enveloped with long yellow hairs, scales absent, Wing is covered with narrow spindle shaped scales, the costa five white -yellowish 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.

#### 8. *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.

#### 9. *Anopheles theobaldi* Giles 1901

Palpus : Three bands are white other black, 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 strongly 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 [9].  
Table No.1.1 Mosquitoes are trapped in Monsoon - 2016

Species / Location	Anopheles minimus	Anopheles annularis	Anopheles sundaicus	Anopheles subpictus	Anopheles philippensis	Anopheles vagus	Anopheles culicifacies	Anopheles vagus	Anopheles culicifacies	Anopheles pallidus	Anopheles theobaldi
Nashik	26	22	12	16	13	18	26	21	15	18	
Sinnar	20	24	10	14	10	16	27	16	28	14	
Yevla	36	28	12	26	12	14	26	20	15	16	
Niphad	32	36	14	13	9	15	15	20	16		

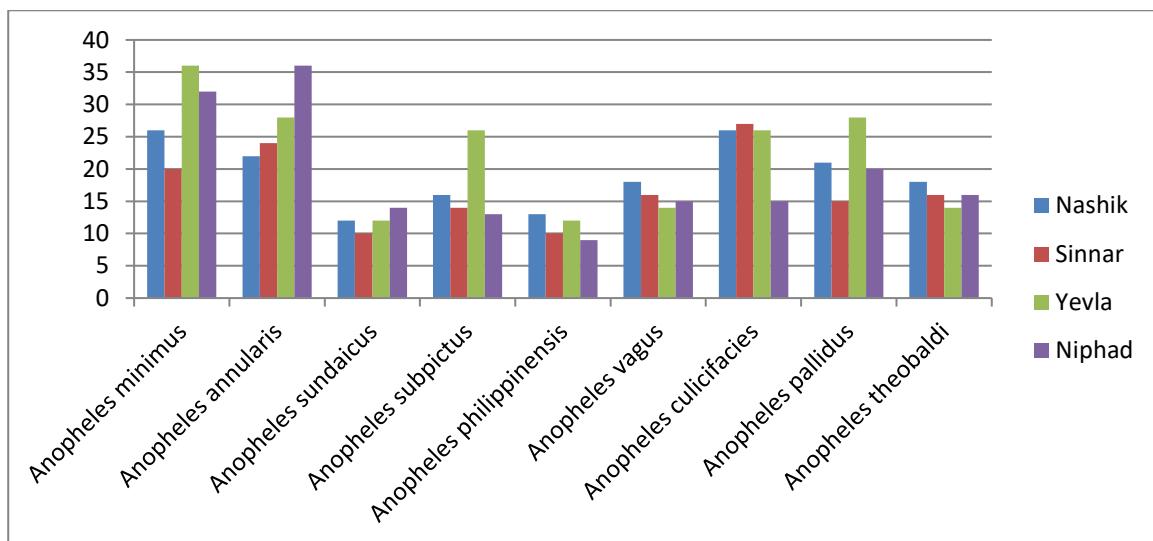


Fig.No. 1.1 Showing the trapped mosquito in Monsoon

Table No. 1.2 Mosquitoes are trapped in Winter - 2016

Species / Location	Anopheles minimus	Anopheles annularis	Anopheles sundaicus	Anopheles subpictus	Anopheles philippensis	Anopheles vagus	Anopheles culicifacies	Anopheles pallidus	Anopheles theobaldi
Nashik	16	12	8	12	8	12	16	18	15
Sinnar	10	14	4	10	4	14	17	18	10
Yevla	26	18	6	6	8	12	19	19	12
Niphad	22	28	10	8	6	13	14	16	13

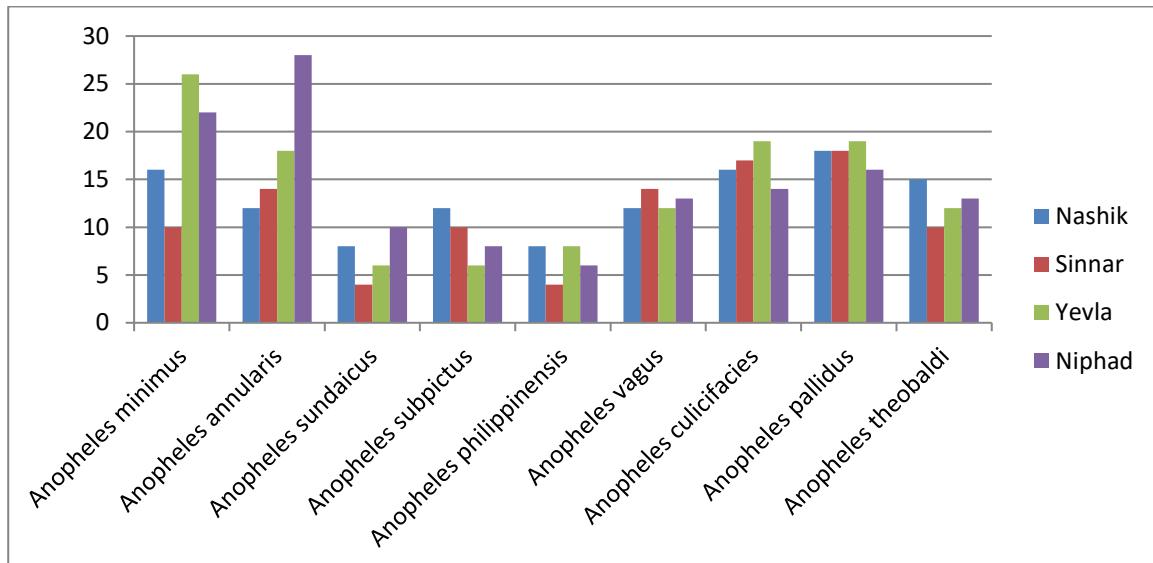


Fig.No. 1.1 Showing the trapped mosquito in winter

In Monsoon Anopheles mimimus trapped at Nashik 26, Sinnar 20, Yevla 36, and Niphad 32. Anopheles annularis trapped at Nashik 22, Sinnar 24, Yevla 28, and Niphad 36. Anopheles sundaicus trapped at Nashik 12 Sinnar 10, Yevla 12, and Niphad 14. Anopheles subpictus trapped at Nashik 16 Sinnar 14, Yevla 26, and Niphad 13. Anopheles philippensis trapped at Nashik 13 Sinnar 10, Yevla 12, and Niphad 9. Anopheles vagus trapped at Nashik 18 Sinnar 16, Yevla 14, and Niphad 15. Anopheles culicifacies trapped at Nashik 26 Sinnar 27, Yevla 26, and Niphad 15. Anopheles pallidus trapped at Nashik 21, Sinnar 15, Yevla 28, and Niphad 20. Anopheles theobaldi trapped at Nashik 18, Sinnar 16, Yevla 14, and Niphad 16.

In Winer Anopheles mimimus trapped at Nashik 16, Sinnar 10, Yevla 26, and Niphad 22. Anopheles annularis trapped at Nashik 12, Sinnar 14, Yevla 18, and Niphad 28. Anopheles sundaicus trapped at Nashik 8 Sinnar 4, Yevla 6, and Niphad 10. Anopheles subpictus trapped at Nashik 12, Sinnar 10, Yevla 6, and Niphad 8. Anopheles philippensis trapped at Nashik 8 Sinnar 4, Yevla 8, and Niphad 6. Anopheles vagus trapped at Nashik 12 Sinnar 14, Yevla 12, and Niphad 14. Anopheles culicifacies trapped at Nashik 16 Sinnar 17, Yevla 19, and Niphad 16. Anopheles pallidus trapped at Nashik 18, Sinnar 18, Yevla 19, and Niphad 16. Anopheles theobaldi trapped at Nashik 15, Sinnar 10, Yevla 12, and Niphad 13.

#### IV. CONCLUSION

Comparatively mosquitoes are trapped more in monsoon season then winter season due to the more reproductive locations and temperate climax in monsoon.

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