

CHAPTER - III

BIODIVERSITY :
TAXONOMY

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Taxonomy was treated unrewardly and stepmotherly by the financial agencies and secondly the students find field like molecular biology. Hence, it has never been an attractive profession but, now the picture is very fastly changing in favour of taxonomy since taxonomists need in research institutes, museums, central and government agencies, industries, zoos, universities etc. Taxonomy plays a crucial role in the field of applied biology including public health, national defense, pest management, environmental problems, wild life management, nutritional science, forensic science and several other fields in identifying the species. In fact, now a days, taxonomists are largely involved in designing and implementing control programmes of pest and diseases effectively. Taxonomy and other branches of biological sciences are inter-linked. Taxonomy also helps in evolutionary history of the species and guide the explorations for native and exotic species for fruitful use.

The mosquitoes are of great hygienic importance and economic losses due to mosquitoes no doubt, amply justify the great sums. Hence, in the present topic attempts have been made on taxonomy of the mosquitoes. In past, Strickland and Choudhury (1927), Knowles and Senior white (1927), Christophers (1933), Barraud (1934), Afridi & Puri (1940), Puri (1948, 1960), Wattal and Karla (1961), Roy and Brown (1970), Russell *et al.* (1943), Stone *et al.* (1959), etc. have contributed on the taxonomy of the mosquitoes. Christophers (1933), Barraud (1934), Evans (1938), Stone *et al.* (1959), Ross & Robert (1943), Wattal and Karla (1961) Harrison and Scanlon (1973), Knight & Stone (1977), Rao, (1984) etc. contributed on Indian mosquitoes.

The mosquitoes belong to the family Culicidae of Order Diptera. The family Culicidae is characterized by following features :

1. Vein subcosta (SC) reaching the costa, R_{2+3} forked, R_{4+5} simple, no cross-vein connection of R_1 and R_2 , media (M) two branched and anal vein (A) long and reaching wing margin.
2. Scales present on wing, head and body.
3. Absence of a definite suture between the prescutum and scutum, pronotum completely divided.
4. Mouth parts elongated, formed for piercing and for blood sucking in the female, males not blood suckers.
5. Antennae long and filamentous, with 14 and 15 segments, in male brushy and plumose while, in female hairy and pilose.
6. Larvae aquatic. with complete head capsule, one pair of functional spiracles situated dorsally on eighth abdominal segment.

The family Culicidae contain three sub families viz.,

1. Toxorhynchitinae
2. Anophelinae
3. Culicinae

The sub family Toxorhynchitinae is represented by following characters.

1. Proboscis long, broad at base and flexible distally.
2. Adult being flower feeding.
3. Larvae predaceous.

As the members of subfamily Toxorhynchitinae do not possess blood sucking proboscis, they can not feed on animals. Therefore, medically this subfamily has no importance.

The subfamily *Anophelinae* is recognized by following characters :

1. Palpi of male and female as long as proboscis (except *Bironella*).
2. Scutellum rounded.
3. Leg^s very long and slender.
4. Tibial bristles and pulvilli absent.
5. Abdomen without scales.
6. Wing usually with light and dark markings.

According to Edwards (1932) the subfamily *Anophelinae* is divided into three genera, namely *Chagasia* Cruz, *Bironella* Theobald and *Anopheles* Meigen. The genus *Chagasia* Cruz is recognized by scutellum slightly trilobed; *Bironella* Theobald with scutellum rounded, wing with stem of median (M) forked and wavy and *Anopheles* Meigen with scutellum evenly rounded and wing with stem of median (M) fork straight.

The subfamily *Culicinae* is medically very important it shows following characters :

1. Scutellum trilobed, each lobe bearing bristles and area between the lobe without bristles.
2. Abdomen completely clothed with broad scales which always lie flat.
3. Scales present on veins as well as along hind margin of wing.
4. Mouth parts long and in female adapted for piercing.
5. In male, palpi long and with uniform thickness throughout the entire length, terminal part generally with little bend.
6. In female, palpi conspicuously shorter than the proboscis.

The subfamily Culicinae includes about 1500 species distributed to more than 20 genera. Two third of the described species belongs to the genera *Culex* and *Aedes*.

GENUS ANOPHELES MEIGEN 1818

Meigen. Syst. Besshr. I.p. 10, 1818 (*Anopheles* Hgg.)

The genus *Anopheles* is erected by Meigen in 1818. This genus shows following features :

1. Body not hump backed when at rest.
2. In female, palpi as long as proboscis and slender.
3. In male, palpi club shaped.
4. Palpi five segmented.
5. Proboscis in straight line with body.
6. Pronotum lack setae.
7. Scutellum half moon shaped or rounded with a uniform row of hairs along the margin.
8. Wing spotted with white and dark scales.
9. Abdomen densely hairy.
10. Mandibles and maxillae of female well developed and toothed.
11. Anal cerci very small.

420 species have been reported under the genus *Anopheles* from the World out of which 50 are well known vectors of malaria. Christophers (1933) divided the genus *Anopheles* into four subgenera,

1. *Anopheles*,
2. *Myzomyia*
3. *Nyssorhynchus* and
4. *Stegomyia*.

However, recently, Nagpal & Sharma (1995) visualized six subgenera namely,

1. *Anopheles* Meigen,
2. *Cellia* Theobald,
3. *Kerteszia* Theobald,
4. *Lophopodomyia* Antunnes,
5. *Nyssorhynchus* Blanchard and
6. *Stethomyia* Theobald of this genus.

They visualized twelve zones of epidemiology of the World. According to them the subgenus *Anopheles* found in all the 12 zones with a maximum distribution in Malaysian (56 species) and minimum from Afrotropical zones (11 speices). The subgenus *Cellia* is found in 10 zones and a maximum number of species are recorded from Afrotropical zone (115 spp.) and a minimum from South American zone (1 sp. only). The subgenus *Kerteszia* is reported from only three American zones, with a maximum number from South America (11 spp.) followed by Central America (5 spp.) and North America (1 sp. only). The subgenus *Lophopodomyia* is reported from two zones, South America (6 spp.) and Central American (1 sp. only). The subgenus *Nyssorhynchus* is reported only from four epidemiological zones with a maximum distribution in South America (30 spp.) followed by Central American (9 spp.), North America (4 spp.) and Chinese zone (1 sp.). The subgenus *Stethomyia* is reported from two regions only, South America (5 spp.) and Central America (2 spp.). From the subgenus *Cellia*, 197 species have been reported from the world and 34 species from India (Nagpal & Sharma, 1995).

From India, 58 species of the genus *Anopheles* have been reported (Rao, 1975; Nagpal & Sharma, 1995). From Kolhapur district, Maharashtra four species of *Anopheles* have been reported (Sathe and Girhe, 2001) and have been redescribed in the text.

ANOPHELES (CELLIA) CULICIFACIES GILES**FEMALE** (Fig. 25) :

5.2 mm long, 1.2 mm broad; antenna 1.45 mm long, pilose; fore wing 3.55 mm long, hind leg 9.85 mm long, head dark brown, thorax dark brown, abdomen reddish brown.

HEAD :

0.5 mm long, 0.6 mm broad, globular; vertex smooth, dark brown; eyes large, rounded and black; interocular space 0.16 mm, clypeus broad, convex, brownish; proboscis 2.1 mm long, cylindrical, straight and black; palpi pale brown, slender as long as proboscis, apical pale band of palpi nearly equal to pre apical dark band, no pale scales on palpi; mandibles and maxillae yellow, well developed, toothed; antenna 15 segmented 1.45 mm long, hairy, pilose and dark brown; scape 0.20 mm long, 0.17 mm broad; pedicel 0.09 mm long, 0.14 mm broad, brown; flagellum 13 segmented, dark brown, 1.16 mm long.

Flagellar formula :

1 L/W = 0.15, 13 L/W = 0.25, L 1/13 = 0.060, W 1/13 = 0.10.

THORAX :

1.3 mm long, 1.15 mm broad, laterally compressed, dark brown; scutum shield like; anterior pronotal lobe brown, sparsely hairy; mesothoracic spiracles rounded with bristles, postnotum yellow and rounded, prealar knob and sternopleuron pale yellow, scutellum rounded with a uniform row of hairs along the margin; sternopleuron and mesepimeron flat, nearly rectangular, pale yellow.

Fore wing :

3.55 mm long, 0.91 mm broad, spotted with white and dark scales; scales 0.02 mm long, elongated, present on veins as well as fringe on hind margin of wing; squama and alula semicircular, transparent with scales on the hind margin; R_{2+3} forked, R_{4+5} straight, subcosta straight, 2.90 mm long, media straight & bifurcated, 2.60 mm long, radius straight & slightly curved at apex, 3.40 mm long; no cross-vein connection of R_1 and R_2 , cross-veins r-m and m-cu both present; cubitus bifurcated cu_1 1.68 mm long; anal (A) vein 1.51 mm long and reaching margin; wing with four dark spots on costa involving vein 1, vein 3 (R_{4+5}) mainly dark, inner costa interrupted.

Angle between m-cu & cu_1 90° , m_{3+4} & r-m 85° and R_{2+3} \neq r-m 35° .

Halter : 0.25 mm long, 0.21 mm broad, dark brown, rounded at tip.

Hind Leg :

9.85 mm long, slender without narrow white bands; coxa 1.20 mm long, broad, yellowish brown with bristles; trochanter 0.35 mm long, hard and dark brown; femur 2.00 mm long, cylindrical, yellow; tibia 2.3 mm long, slender and curved; tarsus 4.00 mm long, 5 segmented and without bands; femur and tibia not speckled, tip of hind leg not white.

Other legs : Special marks : Similar.

ABDOMEN :

3.4 mm long, 1.2 mm broad, reddish brown, cylindrical, unbanded, covered with densely fine hairs; scales absent, abdomen

tip pointed; anal cerci 0.15 mm long, 0.11 mm broad, slender very small.

COLOUR :

Black : Eye, proboscis.
 Brown : Palpi, antenna, scape and pedicel.
 Yellow : Pronotum, maxillae, mandibles.

MALE :

4.8 mm long, slender, smaller than female, phytophagus.

Host : Human, zoophilic.

Host plant : Grass and other vegetation.

Holotype : Female, India, Maharashtra, Kolhapur, coll. Girhe B.E., 28-IX-2000; head, antenna, wings, legs and abdomen mounted on slide and labelled as above.

Paratype : 24 Male, 83 Female Sex ratio (σ : δ) 1 : 3.45, coll. Girhe, B.E., September 2000 to September 2001, Kolhapur;
 4 σ , 12 δ Kolhapur, 24-IX-2000, 3 σ , 9 δ
 Malkapur, 2-X-2000, 2 σ , 6 δ Kolhapur, 15-XI-2000, 1 σ , 5 δ Kagal, 17-XII-2000,
 2 σ , 6 δ Panhala, 6-I-2001, 1 σ , 7 δ , Jaysingpur,
 2-II-2001, 3 σ , 10 δ , Gadhinglaj, 4-III-2001,
 1 σ , 6 δ , Ajra, 5-IV-2001, 1 σ , 3 δ ,
 Hatkanangale, 4-V-2001, 1 σ , 5 δ , Kolhapur, 2-VII-2001, 2 σ , 8 δ , Malkapur, 18-VIII-2001,
 3 σ , 6 δ , Hatkanangale, 3-IX-2001, same data as above.

ANOPHELES (CELLIA) STEPHENSI* LISTON*FEMALE** (Fig. 26) :

4.55 mm long, 1.10 mm broad; antenna 1.35 mm long, hind leg 6.9 mm long, wing 3.2 mm long, head blackish brown, thorax blackish brown, abdomen reddish brown.

HEAD :

0.70 mm long, 0.50 mm broad, dark blackish brown; eyes large, rounded, black; interocular space 0.11 mm; clypeus rounded, brown; proboscis 1.65 mm long, cylindrical, blackish brown; palpi 1.65 mm long, slender with speckling, as long as proboscis; apical and subapical pale band of palpi equal and separated by a dark band; nape triangular, brown; antenna 1.35 mm long, 15 segmented, hairy brown, pilose, scape 0.22 mm long and 0.15 mm broad; pedicel 0.08 mm long and 0.10 mm broad, brown, rounded; flagellum 1.05 mm long, 13 segmented.

Flagellar formula :

1 L/W = 0.12, 13 L/W = 0.02, L 1/13 = 0.085, W 1/13 = 0.19.

THORAX :

1.20 mm long, 1.10 mm broad, blackish brown, broad scaled, laterally compressed; anterior pronotal lobe blackish brown, sparsely hairy; scutum black, shield like, covers greater part of thorax dorsally; prealar knob and sternopleuron yellowish brown; prescutellar space yellow, sparsely hairy; scutellum rounded, black, half moon shaped with uniform row of hairs along the margin; anterior pronotal lobe and posterior pronotal lobe brown, pronotum rounded, lack setae; spiracles rounded yellow.

Fore wing :

3.2 mm long, 6.5 mm broad, spotted with white dark scales, scales 0.02 mm long, present on veins as well as fringe on hind margin; subcosta (SC) straight, 2.65 mm long, extending the costa, R_{2+3} forked; media (M) straight 2.37 mm long, Radius straight, slightly curved at apex, 2.90 mm long; cubitus (cu) bifurcated, cu_1 1.43 mm long; anal (A) 1.39 mm long and reaching wing margin, wing with four dark spots on costa involving vein 1.

Angle between m-cu & cu_1 93° , m_{3+4} & r-m 47° and R_{2+3} & r-m 36° .

Halter : 0.13 mm long, 0.10 mm broad and rounded at tip.

Hind leg :

6.9 mm long, slender, speckled, longer than body; coxa 0.5 mm long, broad, brown; trochanter 0.20 mm long, hard, black; femur 1.0 mm long, cylindrical; tibia 1.50 mm long, slender with brownish scales arranged densely; tarsus 3.7 mm long and 5 segmented, tarsal segments without bands; claws simple and curved.

Other legs : Special marks : Similar, unbanded.

ABDOMEN :

2.65 mm long, blackish brown, slightly tapered at distal end; tergites blackish brown, while sternite yellowish; abdomen unbanded, densely hairy, scales absent; anal cerci 0.15 mm long, small, yellowish brown, club shaped.

COLOUR :

Black : Head, scales on wing.

Blackish brown : Thorax and abdomen, tergites.

Brown	:	Nape.
Yellowish brown	:	Anal cerci, pulvilli.
Yellow	:	Mandible, maxillae.
White	:	Scales on wing.

MALE :

5.00 mm long, slender, smaller than female, antenna plumose; phytophagous.

Host : Human, cattle.

Host plant : Grass, other vegetation.

Holotype : Female, India, Maharashtra, Kolhapur, coll. Girhe, B.E., 28-IX-2000; head, antenna, wings, legs and abdomen mounted on slide, labeled as above.

Paratype : 17 Male, 59 Female, Sex ratio (σ : φ) 1 : 3.47, coll. Girhe, B.E., September 2000 to September 2001; 8 σ , 26 φ , Kolhapur, 11-X-2000; 6 σ , 21 φ , Malkapur, 18-VIII-2001; 3 σ , 12 φ , Ajra, 3-IX-2001, same data as above.

*ANOPHELES (CELLIA) THEOBALDI GILES***FEMALE** (Fig. 27) :

4.3 mm long, 0.58 mm broad, antenna 1.25 mm long, fore wing 2.65 mm long, hind leg 7.97 mm long, head blackish brown, thorax blackish brown, abdomen yellowish brown.

HEAD :

0.65 mm long, 0.45 mm broad in dorsal view nearly rounded or globular; eyes large, rounded, black, interocular space 0.16 mm; vertex smooth, dark brown; nape rounded, reddish brown; proboscis 1.10 mm long, cylindrical, black, densely scally; palpi slender, as long as proboscis, black banded; apical and subapical pale bands equal and separated by a dark band; mandibles maxillae yellow, well developed, toothed; antenna 1.25 mm long, 15 segmented, hairy, pilose, scape 0.15 mm long, 0.13 mm broad; pedicel 0.25 mm long, 0.09 mm broad, blackish brown; flagellum 0.85 mm long, 13 segmented.

Flagellar formula :

1 L/W = 0.13, 13 L/W = 0.21, L 1/13 = 0.12, W 1/13 = 0.07.

THORAX :

1.10 mm long and 0.75 mm broad, blackish brown, laterally compressed, lyre shaped, anterodorsocentral, posterodorsocentral bristles present; sternopleuron broad, yellowish brown; postnotum smooth, yellowish brown, rounded; prescutellar space brownish, sparsely hairy; scutellum half moon shaped with a uniform row of hairs along the margin; pronotum lack setae.

Fore wing :

2.65 mm long and 0.7 mm broad, spotted with white and dark scales, scales 0.02 mm long, present on veins as well as fringe on hind margin, subcosta (SC) straight, 2.00 mm long, reaching the costa, R_{2-3} forked, R_{4+5} simple, no cross vein connection of R_1 and R_2 , media (M) straight, 1.67 mm long, then bifurcated; radius straight, slightly curved at apex, 2.45 mm long; cubitus bifurcated, cu_1 1.8 mm long; anal vein 1.6 mm long, wing with four dark spots on costa including vein 1, fringe spot on all the veins.

Angle between m-cu & cu_1 87° , m_{3+4} & r-m 75° and R_{2+3} & r-m 31° .

Halter : 0.20 mm long, brown and 0.18 mm broad and rounded at tip (pin shaped).

Hind leg :

7.95 mm long, slender, longer than body; coxa 1.10 mm long, broad, brownish yellow; trochanter 0.3 mm long, hard, yellowish brown; femur 1.85 mm long, speckled, cylindrical; tibia 2.10 mm long, speckled; tarsus 2.60 mm long, 5 segmented, slender, tarsal segments banded, apical white band of 3rd, 4th and 5th segment white; claws simple, curved.

Other legs : Special marks : tarsal segments on fore leg with broad bands, midleg similar.

ABDOMEN :

2.55 mm long, 0.55 mm broad; bands absent, densely hairy, dorsally yellowish brown, ventrolaterally blackish brown; scales absent; anal cerci very small, hairy, 0.14 mm long, 0.11 mm broad.

COLOUR :

Black	:	Eye, proboscis.
Blackish brown	:	Scape, pedicel.
Brown	:	Vertex, tarsal segments.
Yellow	:	Mandibles, maxillae.
Yellowish brown	:	Sternopleuron, postnotum.
White	:	Bands on tarsal segments.

MALE :

5.00 mm long, slender, smaller than female, antenna plumose, phytophagous.

Host : Human, domestic animals.

Host plant : Grass and other vegetation.

Holotype : Female, India, Maharashtra, Kolhapur, coll. Girhe, B.E. 19-VII-2001; head, antenna, leg, wing and abdomen mounted on the slide labeled as above.

Paratype : 8 Male, 18 Female, coll. Girhe, Sex ratio (σ : ♀) 1 : 2.25, B.E., September 2000 to September 2001, Kolhapur; 2 σ , 5 ♀ ; Gadhinglaj 17-VI-2001; 4 σ , 8 ♀ , Malkapur, 11-VII-2001; 2 σ , 5 ♀ , Hatkanangale, 3-IX-2001, same data as above.

ANOPHELES (CELLIA) SUBPICTUS GRASSI**FEMALE** (Fig. 28) :

5.20 mm long, 1.25 mm broad, fore wing 3.00 mm long, antenna 1.30 mm long, hind leg 6.8 mm long, head brown, thorax and abdomen blackish brown.

HEAD :

0.40 mm long, 0.37 mm broad, brown, hairy, in dorsal view nearly rounded or globular; clypeus blackish brown, rounded; vertex yellowish brown with vertical bristles; tempus semicircular, black with temporal bristles; eyes black, rounded, large, interocular space 0.018 mm; proboscis 1.62 mm long, blackish brown; labellum yellow, small; palpi 1.62 mm long, as long as proboscis; apical white pale band nearly equal to the pre-apical dark band; mandibles and maxillae slender; as long as proboscis, toothed; nape rounded, black with flat scales; antenna 1.30 mm long, brown, pilose, 15 segmented, scape 0.12 mm long, 0.18 mm broad; pedicel 0.09 mm long, 0.15 mm broad, rounded and blackish brown; flagellum 1.09 mm long, 13 segmented.

Flagellar formula :

1 L/W = 0.25, 13 L/W = 0.61, L 1/13 = 0.7, W 1/13 = 0.17.

THORAX :

1.55 mm long, 0.85 mm broad, scutum blackish brown, covers greater part of thorax dorsally, scutellum half moon shaped with uniform row of hairs along the margin; mesothoracic spiracle rounded and with bristles; postnotum smooth and blackish brown; pre-scutellar space brownish and sparsely hairy; anterodorsocentral bristles and posterodorsocentral bristles

present; anterior and posterior pronotal lobes rounded, black; pronotum lack setae.

Fore wing :

3.00 mm long, 0.85 mm broad with white and dark scales, scales 0.02 mm long, present on veins as well as fringe on hind margin; wing with four dark spots on costa, vein 1; fringe spot on all the veins, Sc vein straight, 2.60 mm long, reaching the costa, R_{2+3} forked; media straight, bifurcated apically, 2.30 mm long, radius straight, slightly curved at apex, 2.90 mm long, cross-vein r-m and m-cu both present; cubitus (cu) bifurcated cu_1 1.68 mm long; anal vein 1.42 mm long, touching wing margin.

Angle between m-cu & cu_1 95° , m_{3+4} & r-m 83° and R_{2+3} & r-m 33° .

Halter : 0.13 mm long, 0.08 mm broad, blackish brown, rounded at tip.

Hind leg :

7.8 mm long, yellowish brown, elongated than body; coxa 0.7 mm long, yellowish, broad, brown; trochanter 0.2 mm long, dark brown; femur 2.00 mm long, without spur, black, non speckled; tibia 2.30 mm long, yellow, elongated than femur, non speckled; tarsus 2.6 mm long, five segmented with narrow five white bands on each segment; claws simple and curved.

Other legs : Special marks : Similar.

ABDOMEN :

3.25 mm long, 0.6 mm broad, blackish brown, not distinctly banded, densely hairy, scales absent, anal cerci 0.25 mm long, 0.22 mm broad, brown.

COLOUR :

Black	:	Eye, scales on wing.
Blackish brown	:	Scutum, postnotum.
Brown	:	Proboscis, antenna.
Yellowish brown	:	Hind leg.
Yellow	:	Mandible, maxillae, labellum.
White	:	Bands on tarsus of each leg.

MALE :

4.90 mm long, slender, smaller than female, antenna plumose, phytophagous.

Host : Human and domestic animals.

Host plant : Vegetation.

Holotype : Female, India, Maharashtra, Kolhapur coll. Girhe, B.E., 16-XI-2000, head, antenna, leg, wing and abdomen mounted on the slide labeled as above.

Paratype : 6 Male, 19 Female, Sex ratio (σ : φ) 1 : 3.16, coll. Girhe, B.E., September 2000 to September 2001, Kolhapur; 1 σ , 3 φ , Kolhapur, 29-IX-2000; 1 σ , 4 φ Kolhapur, 15-XI-2000; 4 σ , 12 φ Malkapur 11-VIII-2001, same data as above.

GENUS CULEX LINNAEUS 1758

The genus *Culex* is erected by Linnaeus in 1758. More than 400 species of this genus have been reported from various parts of the world (Stone, 1959). It is characterized by

1. Presence of well developed pulvilli,
2. Buccopharyngeal armature present in female,
3. No spiracular or post spiracle bristles,
4. Mesonotal bristles well developed,
5. Mesonotal and scutellar scales usually all narrow,
6. In female, palpi shorter than proboscis,
7. Wings generally unspotted with only dark scales,
8. Tarsi without pale ring,
9. Scutellum is trilobed with three tuft of hairs on the lobe,
10. Palpi four segmented, may be entirely dark, tipped or ringed with white and some times covered with white spot,
11. Pronotum lack setae,
12. Abdomen slightly tapering, blunt and covered with broad scales,
13. Claws simple and curved,
14. Abdomen covered with scales and
15. Anal cerci very small.

The genus *Culex* is divided into seven subgenera by Barraud (1934) namely :

1. *Lutzia* Theobald, 1903,
2. *Barraudius* Edwards, 1921,
3. *Neoculex* Dyar, 1905,
4. *Mochthogenes* Edwards, 1930,

5. *Lophoceratomyia* Theobald, 1905,
6. *Culiciomyia* Theobald, 1907 and
7. *Culex* Linnaeus, 1758.

From India, 50 species have been reported under above sub genera. *Lutzia* contain 4 species, *Barraudius* 1, *Neoculex* 2, *Mochthogenes* 5, *Lophoceratomyia* 10 and *Culiciomyia* 7 species while sub genus *Culex* contain 21 species.

SUB-GENUS CULEX

Syst. Nat.ed. X, p. 602. Genotype, *C. pipiens* Linn.

Leucomyia Theobald, 1907, M.C. iv, p. 372.

Genotype, *C. gelidus* Theo.

Oculeomyia Theobald, 1907, M.C. iv, p. 515.

Genotype *C. bitaeniorhynchus* Giles (as *O. sarawati* Theo.)

Theobaldiomyia Brunetti, 1912 Ree. Ind. Mus, iv p. 462 (nom. nov for *Leucomyia* Theo.) (Edwards, 1932, p. 200).

The subgenus *Culex* is characterized by

1. Moderate body size,
2. Head with upright and narrow scales on vertex, flat scales at sides but no border of flat scales round eye margin in front,
3. Scutellar scales narrow,
4. Palpi of male always longer than proboscis, last two segments upcurved and hairy,
5. Antenna of male without scale tufts,
6. Hypopygium^(male) without scales and without an apicoventral lobe but with a subapical lobe divided,
7. Style without spiny crest,

8. Phalosome divided into lateral portions usually with various teeth or lobes,
9. Paraprocts with rather dense tuft of spines or hairs at crown and
10. Buccopharyngeal armature of female with one row of teeth, teeth may be sharp or blunt.

From Kolhapur district two species have been reported.

CULEX (CULEX) EPIDESMUS THEOBALD**FEMALE** (Fig. 29) :

8.65 mm long, 2.00 mm broad, antenna 2.9 mm long, fore wing 5.25 mm long, hind leg 14.4 mm long, head yellowish brown, thorax reddish brown, abdomen yellowish brown.

HEAD :

1.2 mm long, 0.65 mm broad, globular with upright and narrow scales on vertex, yellowish brown, flat scale at sites but no border, flat scale around eye margin in front; clypeus broad, rounded, convex dorsally; eyes black, interocular space 0.12 mm; tempus semi-circular, dark brown; proboscis 3.00 mm long, brown with pale ring in the middle, cylindrical and straight; labium cylindrical, densely scally and dark brown; labellum short and pale brown; maxillary palp four segmented, dark brown, 0.6 mm long, stub like, hairy, shorter than proboscis; mandibles and maxillae long, blade like; stylet curved; palpifer and palpus brown; nape dark brown and rectangular; antenna 2.9 mm long, 15 segmented, blackish brown and pilose; scape 0.05 mm long, 0.18 mm broad, dark brown, pedicel 0.10 mm long, 0.15 mm broad; flagellum 2.75mm long, 13 segmented.

Flagellar formula :

1 L/W = 1.5, 13 L/W = 0.62, L 1/13 = 0.03, W 1/13 = 0.12.

THORAX :

1.75 mm long, 1.6 mm broad, reddish brown, undifferentiated, laterally compressed; scutum blackish brown, shield like, covers greater part of the dorsal surface; sternopleuron rectangular, reddish brown and larger than mesepimeron; anterior pronotal lobe rounded, brown; mesepimeral bristles two; paraprocts with dense tuft of spines; prescutellar space brown with

prescutellar bristles; scutellum brown, trilobed with three tufts of hair on the lobe; scutellar scales narrow; anterodorsocentral bristles and posterodorsocentral bristles blackish brown.

Fore wing :

5.25 mm long, 1.40 mm broad, yellowish area at tip, covered with dark scales; scales 0.02 mm long, present on veins as well as fringe on hind margin, costa dark, except at tip; subcosta straight 4.63 mm long, R_{4+5} simple, no cross-vein connection of R_1 and R_2 . media (M) straight, branched apically, 3.3 mm long, radius 5.15 mm long, straight, slightly curved at apex; cross-vein r-m and m-cu both present; cubitus (CU) forked, anal (A) 1.55 mm long and reaching wing margin.

Angle between m-cu & cu_1 89° , m_{3+4} & r-m 81° and R_{2+3} & r-m 35° .

Halter : 0.65 mm long, 0.42 mm broad, rounded, expanded at tip.

Hind leg :

14.4 mm long, elongated, brown, slender longer than body; coxa 1.3 mm long, brown, yellowish brown with coxal bristles; trochanter 0.6 mm long, hard, brown; femur 3.5 mm long, cylindrical, densely covered with scales and spurs; tibia 4.2 mm long, slender, straight with yellowish brown tibial spurs; tibia longer than femur; tarsus 4.8 mm long, with pale ring, five segmented; first pretarsus longer than other; claws simple, curved, brownish, untoothed; pulvillus and empodium densely hairy.

Other legs : Special marks : Similar.

ABDOMEN :

5.70 mm long, 1.2 mm broad with dark yellow scales; dorsal abdominal pale stripes parallel, unconstricted dark scales rare on

underside and restricted to centre line; last abdominal segment narrow and shorter than other; anal cerci 0.4 mm long. 0.3 mm broad, brown.

COLOUR	:	
Black	:	Eyes.
Blackish brown	:	Scutum, vertex, scape, antenna
Brown	:	Proboscis, legs, maxillary palp, Scutellum.
Yellow	:	Wing, femur, coxa.
Brown	:	Scutum, sternopleuron.

MALE :

8.50 mm long, smaller, slender than female, antenna elongated, plumose and brushy; phytophagous.

Host	:	Human
Host plant	:	Unknown.
Holotype	:	Female, India, Maharashtra, Kolhapur. coll. Girhe, B.E., 19-X-2000; Head, antenna, leg, abdomen, mounted on slide, labelled as above.
Paratype	:	4 male, 29 female; Sex ratio (M:F) 1 : 7.25; coll. Girhe, B.E., from September 2000 to September 2001, Kolhapur; 1♂, 9♀. Kolhapur, 21-XII-2000; 2♂, 15♀, Hatkanangale, 6-I-2001; 1♂, 5♀, Gadhinglaj, 4-III-2001; same data as above.

CULEX (CULEX) PIPIENS LINNAEUS**FEMALE** (Fig. 30) :

7.0 mm long, 1.2 mm broad, antenna 2.75 mm long, brownish, hairy; fore wing 4.5 mm long, hind leg 10.4 mm long; head, thorax and abdomen brown.

HEAD :

1.20 mm long, 1.0 mm broad, globular and nearly rounded; vertex rough, brownish laterally hairy; eyes large, rounded, black; interocular space 0.45 mm; clypeus rounded, brown, nape rectangular, brown; vertical bristles and temporal bristles elongated and yellowish brown; proboscis 2.2 mm long, with pale ring in the middle, brown, straight, club shaped; palpi 0.6 mm long, dark brown, four segmented, densely hairy, stub like; mandibles and maxillae long, straight, yellow with blade like stylets; antenna 2.75 mm long, 15 segmented, dark brown, hairy, pilose; scape 0.08 mm long, 0.22 mm broad; pedicel 0.12 mm long, 0.19 mm broad, dark brown; flagellum 2.55 mm long, 13 segmented.

Flagellar formula :

1 L/W = 0.13, 13 L/W = 0.32, L₁/13 = 0.063, W₁/13 = 0.15.

THORAX :

1.5 mm long, 2.1 mm broad, laterally compressed, undifferentiated, brown; scutum shield like, dark brown, covers dorsal surface; anterior prenotal lobe nearly rounded, brown; spiracular area pale yellow; mesepimeron rectangular, yellow two bristles present; scutellum yellowish brown, trilobed with three bunches of hair on lobe; metapleuron triangular; prealar knob rounded, yellow; paratergite elongated and pale yellow.

Fore wing :

4.5 mm long, 1.10 mm broad, unspotted with only dark scales, scales 0.02 mm long, present on veins as well as fringe on hind margin; subcosta 3.70 mm long, straight, reaching the costa, base of subcosta without tuft of hairs on the under side of the wing, media (M) straight, 3.84 mm long, radius straight slightly curved at apex, 4.3 mm long; r-m and m-cu present; cubitus (cu) bifurcated, cu₁ 1.52 mm long; anal (A) vein 1.14 mm long, extend up to wing margin.

Angle between m-cu & cu₁ 91°, m₃₊₄ & r-m 76° and R₂₊₃ & r-m 36°.

Halter : 0.45 mm long, 0.26 mm broad, yellowish brown, club shaped at tip.

Hind leg :

10.4 mm long, slender, longer than body; coxa 1.0 mm long, yellowish brown, broad, with few brownish bristles; trochanter 0.3 mm long, hard, dark brown; femur 2.5 mm long, cylindrical; preapical end pale yellow while apical end yellowish brown, with distinct white spot; tibia 3.0 mm long, slender with brownish tibial spines; tarsus 3.6 mm long, five segmented, without pale ring; claws simple, curved, untoothed.

Other legs : Special marks : Unbanded, dark brown, pale ring absent.

ABDOMEN :

4.3 mm long, 1.4 mm broad, elongated, slender, covers with thickly overlapping scales; tergites dark brown while sternites pale yellow; dorsal abdominal pale stripes constricted laterally and centrally, patches of dark scales on under side of pale abdomen on

median line; abdomen covers with few hairs, last two segments densely hairy; anal cerci 0.2 mm long, 0.18 mm broad, dark brown, densely hairy, broad.

COLOUR	:	
Black	:	Eyes.
Brownish black	:	Head.
Brown	:	Clypeus, tergites, legs, claws, palpi.
Yellow	:	Mandibles and maxillae, sternum.
Yellowish brown	:	Scutellum, femur.

MALE :

6.9 mm long, smaller and slender than female, antenna plumose and brushy; phytophagous.

Host	:	Human and birds
Host plant	:	Grass and other vegetation.
Holotype	:	Female, India, Maharashtra, Kolhapur. coll. Girhe B.E., 11-I-2001, Head, antenna, leg, abdomen mounted on slide, labelled as above.
Paratype	:	15 male, 43 female; Sex ratio (M:F) 1 : 2.86 coll. Girhe, B.E., from September 2000 to September 2001, Kolhapur; 1♂, 4♀, Kolhapur, 29-IX-2000; 2♂, 6♀, Malkapur, 17-X-2000; 1♂, 5♀, Kolhapur, 30-XI-2000; 2♂, 3♀, Kagal, 3-XII-2000; 1♂, 2♀, Panhala, 6-I-2001; 1♂, 3♀, Jaysingpur, 17-II-2001; 1♂, 2♀, Gadhinglaj, 4-III-2001; 1♂, 3♀, Ajra, 5-IV-2001; 1♂, 4♀, Hatkanangale, 4-V-2001; 1♂, 5♀, Kolhapur, 28-VII-2001; 1♂, 3♀, Malkapur, 31-VIII-2001; 2♂, 3♀, Hatkanangale, 2-IX-2001; same data as above.

SUBGENUS BARRAUDUS EDWARDS

Bull. Ent. Res., xii, p.322. Genotype, *C. pusillus* Maeq.

The subgenus *Barraudus* erected by Edwards in 1921 is distinguished by following characters.

1. Small mosquitoes without conspicuous ornamentation.
2. Segment one of hind tarsi distinctly shorter than tibia.
3. Pulvilli well developed.
4. Scales on vertex of head, apn and scutellum all narrow.
5. Paraproct with hairs or spines at crown, no lateral arms.

The subgenus *Barraudus* is represented by a single species from India (Barraud, 1934).

CULEX (BARRUDUS) MODESTUS FICALBI**FEMALE** (Fig. 31) :

7.30 mm long, 1.12 mm broad, fore wing 4.5 mm long, antenna 2.3 mm long, hind leg 13.0 mm long, head dark brown, thorax yellowish brown, abdomen yellow.

HEAD :

0.80 mm long, 0.72 mm broad, covered with brown narrow scales, globular dark brown; clypeus broad, rounded, dark brown; tempus yellow, vertex pale yellow; vertical and temporal bristles elongated, dark brown; tori yellowish brown; eyes black, rounded, interocular space 0.025 mm; maxillary palp four segmented; palpi 0.72 mm long, dark brown, stub like, hairy, $\frac{1}{4}$ of proboscis; proboscis 2.4 mm long, labium yellow; nape rounded with fairly numerous upright scales; antenna 2.3 mm long, 15 segmented, brownish, pilose and hairy; scape 0.18 mm long, 0.25 mm broad,

rounded, yellow; pedicel 0.20 mm long and 0.21 mm broad; flagellum 1.92 mm long, 13 segmented.

Flagellar formula :

1 L/W = 0.25, 13 L/W = 0.63, L 1/13 = 0.08, W 1/13 = 0.20.

THORAX :

2.00 mm long, 1.10 mm broad, laterally compressed with hump shaped appearance; scutum shield like, yellowish brown; scutellar scales lighter, anteriopronotal lobe semicircular, dark brown, posterior pronotal lobe flat and yellow; scutellum pale yellow, trilobed with three bunches of hair on the lobe; sternopleuron and mesepimeron large, flat and yellowish brown; prespiracular area pale yellow; anteriordorsocentral bristles and posteriordorsocentral bristles elongated, yellowish brown.

Fore wing :

4.50 mm long, 0.90 mm broad, unspotted with only dark scales, scales 0.019 mm long, present on veins as well as fringe on hind margin; subcosta (SC) vein 3.72 mm long, straight, reaching the costa; R_{2+3} forked, R_{4+5} simple, media (M) 3.96 mm long, straight, bifurcated apically; cross-vein r-m and m-cu both present; cubitus (cu) bifurcated, cu_1 3.38 mm long; radius straight and slightly curved at apex, 4.30 mm long; anal (A) vein 2.65 mm long, reaching margin.

Angles between m-cu & cu_1 92° , m_{3+4} & r-m 73° and R_{2+3} & r-m 39° .

Halter : 0.30 mm long, 0.19 mm broad, pale yellow with broad tip.

Hind leg :

13.00 mm long, yellowish brown, longer than body; coxa 0.60 mm long, broad, hairy and yellowish brown; trochanter 0.20 mm long, black and hard; femur 2.0 mm long, cylindrical; tibia 3.5 mm long, densely scally; tarsus 6.7 mm long, 5 segmented, unbanded; segment 1 of hind tarsi shorter than tibia; claws simple and curved; pulvillus and empodium narrow.

Other legs : Special marks : All legs dark brown, fore and hind femora lighter posteriorly, pale except dorsally.

ABDOMEN :

4.5 mm long, 1.10 mm broad; dorsum dark brown, lateral rectangular pale ochreous patches on tergites forming a continuous pale border on either side of abdomen, sternites uniformly pale ochreous; abdomen cylindrical, sparsely hairy, dark yellow dorsally and pale yellow ventrally. Abdomen not distinctly banded, brownish scales restricted on the tergum. Anal cerci 0.15 mm long and 0.12 mm broad.

COLOUR :

Black	:	Eye, trochanter.
Dark Brown	:	Proboscis, flagellum of antenna, clypeus, Palpi.
Yellow	:	Sternum, mandibles.
Yellowish brown	:	Abdomen.

MALE :

7.00 mm long, slender, smaller than female, antenna plumose and brushy, phytophagous.

- Host** : Human, cattle.
- Holotype** : Female, India, Maharashtra, Kolhapur. coll. Girhe, B.E., 7-VI-2001; head, antenna, legs, abdomen, mounted on slide, labelled as above.
- Paratype** : 6 male, 21 female; Sex ratio (M:F), 1:3.5; coll. Girhe, B.E., September 2000 to September 2001; 1♂, 5♀ Kolhapur 29-IX-2000; 3♂, 11♀ coll. Sathe, T.V., Kolhapur 27-VI-2001; 2♂, 5♀, coll. Girhe, B.E., Hatkanangale 3 IX-2001; same data as above.

SUBGENUS : MOCHTHOGENES EDWARDS

Bull. Ent. Res. XXI, p.305. Genotype, *C. Malayi* (Leic).

The subgenus *Mochthogenes* is characterized by

- 1) Small size and dark colour without ornamentation,
- 2) Dorsal surface of head mainly covered with flat scales,
- 3) First hind tarsal segment about as long as tibia or longer and
- 4) Palpi quite short in both sexes.

From India five species have been reported (Barraud 1934).

CULEX (MOCHTHOGENES) MALAYI EDWARDS**FEMALE** (Fig. 32) :

8.00 mm long, 1.10 mm broad, antenna 2.95 mm long, fore wing 4.6 mm long, hind leg 9.3 mm long; head blackish brown, thorax blackish brown, abdomen pale yellow.

HEAD :

1.00 mm long, 0.8 mm broad, covered with small light coloured flat scales; in dorsal view nearly rounded or globular, blackish brown; eyes black, large; interocular space 0.15 mm, clypeus rounded, brown; vertex yellowish brown, with vertical bristles; tempus semicircular brown with temporal bristles; upright scales on vertex and nape; proboscis 1.40 mm long, straight, cylindrical, brownish black; labellum small, yellow; palpi 0.4 mm long, hairy, four segmented, 1/6th length of proboscis, entirely brownish black; mandibles and maxillae, slender, straight, yellow with blade like stylet, as long as proboscis; buccopharyngeal armature present; head with flat scales at side and with a small flat scales along the eye margin; antenna 2.95 mm long, hairy, 15

segmented, pilose, brownish black, longer than proboscis; scape 0.08 mm long, 0.18 mm broad; pedicel 0.11 mm long, 0.14 mm broad, rounded and brown; flagellum 2.76 mm long, 13 segmented.

Flagellar formula :

1 L/W = 0.15, 13 L/W = 0.68, L 1/13 = 0.03, W 1/13 = 0.13.

THORAX :

2.25 mm long, 1.15 mm broad, laterally compressed, blackish brown, shield like, scutum covers dorsal surface; anterior pronotal lobe and posterior pronotal lobe rounded; mesonotum with brown narrow scales; scutellar scales narrow, acrostichal bristles elongated; fossal area yellow; scutellum trilobed with three tuft of hairs on the lobe; metapleuron formed by metapisternum, metepimeron and metameron; mesothoracic spiracle rounded while metathoracic spiracle slit shaped; anterior dorsocentral bristles and posterior dorsocentral bristles blackish brown.

Fore wing :

4.80 mm long, 1.3 mm broad, unspotted, covered with only dark scales; scales 0.023 mm long, present on veins as well as fringe on margin; subcosta (SC) vein straight, 3.25 mm long, reaching the costa; radius straight, 4.59 mm long; R_{2+3} forked, R_{4+5} simple, no cross-vein connection of R_1 and R_2 , cross vein r-m and m-cu prominent; media (M) straight, 3.47 mm long, bilobed apically, cubitus (cu) bifurcated, cu_1 2.89 mm long; anal 1.50 mm long, reaching wing margin.

Angle between m-cu & cu_1 90° , m_{3+4} & r-m 75° and R_{2+3} & r-m 42° .

Halter : 0.40 mm long, 0.22 mm broad, tip club shaped.

Hind leg :

9.3 mm long, slender, longer than body; coxa 1.0 mm long, narrow, broad, deep brown; trochanter 0.3 mm long, hard, dark; femur 2.0 mm long, pale narrowly, brown dorsally from near base to knee; cylindrical, preapical region white, dark at apical end; tibia 2.8 mm long, slender; tarsus 3.2 mm long, 5 segmented, with dark scales, without bands; first pretarsal longer than others, claws simple, curved.

Other legs : Special marks : Fore and mid femora lighter posteriorly.

ABDOMEN :

4.75 mm long, 1.2 mm broad, cylindrical, brownish black dorsally; pleuron with several broad scales, each group usually consists of scales and marked with pale bands; abdomen with uniform transverse pale yellow bands and dark scale band alternately; tergites sparsely covered with hairs, sternal plates dirty white with few scales with pale broad yellow band; anal cerci 0.13 mm long, 0.08 mm broad, small, few hairs lies on last two segment.

COLOUR :

Black	:	Eye, abdominal dark band, head.
Reddish brown	:	Scutum, prenotal lobe, post notal lobe.
Brownish black	:	Antenna, proboscis.
Yellow	:	Mandibles and maxillae.
White	:	Sternal plates.

MALE (Fig. 33) :

7.95 mm long, slender and smaller than female, antenna plumose and brushy, phytophagous.

- Host** : Human.
- Host plant** : Vegetation.
- Holotype** : Female, India, Maharashtra, Kolhapur coll. Girhe, B.E., 12-II-2001; Head, antenna, legs and abdomen, mounted on slide, labelled as above.
- Paratype** : 5 Male, 14 Female, Sex ratio (M : F) 1 : 2.8, coll. Girhe, B.E. September 2000 to September 2001, Kolhapur; coll. Sathe, T.V., 2♂, 6♀, Kolhapur, 2-II-2001, coll. Girhe, B.E. 2♂, 4♀ Kagal 5-III-2001, . 1♂, 4♀, Ajra, 5-IV-2001; same data as above.

GENUS *Aedes* MEIGEN, 1818

The genus *Aedes* is erected by Meigen in 1818. This genus includes 600 species represented from all over the world (Cheng, 1964) of which more than 112 species have been reported from India (Barraud, 1934). This genus shows following features :

1. Claws toothed in most female species.
2. Post spiracular bristles present.
3. Pulvilli absent or hair like.
4. Female abdomen tends to be more pointed.
5. Cerci longer than in other groups.
6. Fringe of hair on squama of wing.
7. Proboscis normal and not enlarged or approximated behind the head.
8. Antenna of male nearly always distinctly plumose with the last two segments elongate and in female with moderate long hairs.
9. Bristles of mesonotum usually well developed.
10. Pronotum lack setae.
11. Scutellum trilobed.

Barraud (1934) divided the genus *Aedes* into following 11 sub-genera :

1. *Medicus* Theobald, 1901,
2. *Ochlerotatus* Lynch Arribalzaga, 1891,
3. *Finlaya* Theobald, 1903,
4. *Christophersiomyia* Barraud, 1923,
5. *Stegomyia* Theobald, 1901,
6. *Rhinokusea* Edwards, 1929,

7. *Indusius* Barrauds, 1934,
8. *Bankinella* Theobald, 1907,
9. *Aedes* Meigen, 1818,
10. *Cancredes* Edwards, 1929 and
11. *Diceromyia* Theobald, 1911.

From India, Barraud (1934) described 116 species belonging to above eleven subgenera.

SUBGENUS *STEGOMYIA* THEOBALD

M.C. I, p. 233. Genotype, *Culex fasciatus* Fab.

Scutomyia Theobald, 1904, Entom. XXXVii, p. 77.

Genotype *S. albolineata* Theo.

Quasistegomyia Theobald, 1906, 2nd Rept. Wellac. Lab. P. 69.

Genotype *Q. unilineata* Theo.

Catatassomyia Dyar and Shannon, 1925, Insec. Ins. Mens. Xiii, p.71,

Genotype, *C. neronephada* D. and S.

The subgenus *Stegomyia* is represented by the following features :

1. Body size small or medium.
2. Body colour black or dark, highly ornamented with patches, spots or lines of snow white scales.
3. Two or more basal white bands or tarsi of at least one pair of leg of which one or more tarsal segments completely white. Tarsi in no case all completely dark nor with apical and basal bands.
4. Proboscis entirely dark except in few cases.
5. Scales on vertex and scutellum are broad and flat.

6. Palpi of male slender, terminal segments unruptured and with few hairs.
7. Antennae of male with plumose hairs mainly projecting on two side and not in regular whorles.
8. Harpago absent.

Under this subgenus, Barraud described 16 species from India. From Kolhapur district seven species have been reported under the subgenus *Stegomyia* of which two are redescribed and four species have been newly reported and described for the first time from India.

AEDES (STEGOMYIA) AEGYPTI LINNAEUS

FEMALE (Fig. 34) :

5.30 mm long, 0.8 mm broad; antenna 1.95 mm long, fore wing 3.5 mm long, hind leg 8.5 mm long; head blackish brown, thorax black, abdomen dark.

HEAD :

0.6 mm long, 0.5 mm broad, in dorsal view nearly rounded or globular; with silver white flat scales in middle of vertex continued downward between eyes; silvery flat scales on tori, eyes large, rounded, black; interocular space 0.09 mm; vertex hairy, dark black with vertical bristles; tempus semicircular, blackish brown with temporal bristles; clypeus rounded with two small silvery white dots; scales on vertex flat, broad; proboscis 2.2 mm long, straight, cylindrical, black; palpi 0.6 mm long, shorter than proboscis, palpifer black, palpus white; silver scales on clypeus and palpi; nape rectangular; mandibles, maxillae as long as proboscis, yellow

straight, with blade like stylet; antenna 1.95 mm long, blackish brown, 15 segmented, pilose, hairy; scape 0.08 mm long, 0.14 mm broad; pedicel 0.20 mm long, 0.11 mm broad; rounded, blackish brown; flagellum 1.67 mm long, 13 segmented.

Flageller formula :

1 L/W = 0.091, 13 L/W = 0.66, L 1/13 = 0.013, W1/13 = 0.10.

THORAX :

1.0 mm long, 0.8 mm flat, broad silver white scales on all lobes of scutellum; laterally compressed, scutum black with scutal suture; white mid dorsal strip present in mid dorsal region of scutum; sternopleuron and mesepimeron broad, flat with patches of white scales; post spiracle rounded with bristles; scales on scutum broad and flat, prescutellar space hairy, black with prescutellar bristles; pronotum lack setae; bristles of mesonotum usually well developed; with lyre shaped marking of silvery scales; anterodorsocentral and posterodorsocentral bristles present.

Fore wing :

3.8 mm long, 0.95 mm broad, unspotted only with dark scales; squama and alula convex, transparent, fringe on hind margin; scales present along the veins as well as fringe of them along hind margin; subcosta (SC) straight 3.2 mm long, reaching the costa, R₂₊₃ forked, Media (M) straight, but bifurcated apically, 3.4 mm long, radius 3.7 mm long, straight and slightly curved at end; no cross vein connection of R₁ and R₂, corss-vein r-m and m-cu distinct, cubitus (cu) bifurcated, cu₁ 1.62 mm long; anal vein 1.36 mm long, reaching margin.

Angle between m-cu & cu₁ 91°, m₃₊₄ & r-m 71° and R₂₊₃ & r-m 35°.

Halter : 0.18 mm long, 0.14 mm broad, yellow, rounded at tip.

Hind leg :

8.5 mm long, slender, longer than body; coxa 1.10 mm long, broad, dark-brown, with few bristles; trochanter 0.4 mm long, hard, dark brown; femur 1.4 mm long, cylindrical with a white longitudinal line running from the base for nearly whole length; preapical end white, apical end black with white knee spot; tibia 2.20 mm long, dark, black; tarsus 3.4 mm long, five segmented with prominent five dark and white bands, on 4th usually widest band, 5th segment entirely white; claws curved, toothed; pulvillus short, hairy.

Other legs : special marks : A narrow basal white band on 1st, 2nd & 3rd tarsal segment of fore and mid leg.

ABDOMEN :

3.7 mm long, 0.7 mm broad, tergites brownish black, slender, pointed; black with dorsal white transverse bands; white patches of scales on latero-tergites; sternal plates dirty white, tergal plates dark blackish brown; all abdominal segments clothed with dark and white scales; anal cerci 0.3 mm long, black, flat, sparsely hairy.

COLOUR :

Black	:	Eyes, proboscis, prescutellum.
Blackish brown	:	Abdomen, antenna, tergites.
White	:	Patches on head, thorax and abdomen.
Yellow	:	Mandible, maxillae.
Yellowish brown	:	Wings.

MALE :

5.20 mm long, slender, smaller than female, antenna plumose, brushy, last two segments elongate; phytophagous.

- Host** : Human, cattle.
- Host plant** : Grass and other vegetation.
- Holotype** : Female, India, Maharashtra, Kolhapur coll. Girhe, B.E., 20-IV-2001, mouth parts antenna, wing, leg, abdomen on slide, labelled as above.
- Paratype** : 6 Male, 30 Female; Sex ratio (σ : φ) = 1 : 5, coll. Girhe, B.E., from September 2000 to September 2001, Kolhapur;
 1 σ , 3 φ , Kolhapur, 29-IX-2000, 2 σ , 4 φ , Malkapur, 2-X-2000; 3 σ , 5 φ , Kolhapur, 15-XI-2000;
 1 σ , 2 φ , Kagal 17-XII-2000, 1 σ , 5 φ , Jaysingpur 2-II-2001, 1 σ , 3 φ , Gadhinglaj, 4-III-2001;
 2 σ , 4 φ , Ajra, 5-IV-2001; 2 σ , 5 φ , Hatkanangale, 4-V-2001, 1 σ , 4 φ , Malkapur, 18-VIII-2001;
 2 σ , 5 φ , Hatkanangale, 3-IX-2001;
 same data as above.

AEDES (STEGOMYIA) KOLHAPURENSIS SP.NOV.**FEMALE** (Fig. 35) :

3.7 mm long, 0.65 mm broad, antenna 1.25 mm long, fore wing 2.10 mm long, hind leg 4.60 mm long; head dark brown, thorax blackish brown, abdomen slender and black.

HEAD :

0.4 mm long, 0.35 mm broad, in dorsal view nearly rounded; vertex hairy, dark brown, vertical temporal bristles present; scales on vertex broad and flat; eyes rounded, black; interocular space 0.06 mm; proboscis 1.9 mm long, entirely dark, straight, cylindrical, maxillary palp 0.4 mm long; palpifer, palpus white; silver coloured scales or patches on clypeus and palpi; mandibles and maxillae straight, elongate and yellow with blade like stylet; nape blackish brown, rounded; antenna 1.25 mm long, blackish brown, 15 segmented, hairy and pilose; scape 0.12 mm long, 0.11 mm broad, black; pedicel 0.15 mm long, 0.10 mm broad; brown while, rounded; flagellum 0.98 mm long, 13 segmented.

Flagellar formula :

1 L/W = 0.15, 13 L/W = 0.59, L 1/13 = 0.02, W 1/13 = 0.08.

THORAX :

0.8 mm long, 0.65 mm broad, hump shaped scutum covers dorsal surface of thorax, undifferentiated laterally compressed and ornamented with few white scales; scutellum blackish brown, trilobed with three bunches of hairs on the lobes; scales on scutellum broad and flat; pronotum lack setae, bristles on mesonotum usually well developed; post spiracular bristles present; lyre shaped marking of white scales absent on thorax; prescutellar space blackish brown with prescutellar bristles.

Fore wing :

2.10 mm long and 0.8 mm broad, wing unspotted only with dark scales, scales 0.02 mm long on veins on hind margin; squama semicircular, transparent with fringe of scales on margin; subcosta (SC) straight, 1.70 mm long reaching costa, R_{2+3} forked, R_{4+5} simple, no cross-vein connection of R_1 and R_2 , Media (M) straight, bifurcated, 1.85 mm long, cross-vein r-m and m-cu both present, radius 2.0 mm long, straight, slightly curved at apex; cubitus (cu) bifurcated, cu_1 1.32 mm long, anal (A) vein 1.11 mm long, reaching margin.

Angle between m-cu & cu_1 94° , m_{3+4} & r-m 68° and R_{2+3} & r-m 33° .

Halter : 0.18 mm long, 0.13 mm broad, rounded at tip.

Hind Leg :

4.60 mm long, slender, banded and longer than body; coxa 0.6 mm long, broad and dark brown; trochanter 0.2 mm long, hard, black; femur 1.10 mm long, cylindrical, speckled, tibia 1.3 mm long, dark and blackish brown; tarsus 1.40 mm long, five segmented, four basal white bands on tarsal segment; claws small curved and toothed; pulvilli and empodium short.

Other legs : Special marks : Similar.

ABDOMEN :

2.50 mm long, 0.60 mm broad, slender black with dorsal transverse white and black bands, black and white patches irregularly distributed on turgal plates; abdomen densely hairy, anal cerci 0.27 mm long, 0.18 mm broad and hairy.

COLOUR :

Black : Eye, scape.

Blackish brown : Legs, scutellum.

Brown	:	Vertex, pedicel.
White	:	Bands on legs, knee spot.
Yellow	:	Mandibles and maxillae.

MALE :

3.6 mm long, smaller than female, antenna plumose, brushy, phytophagous.

Host : Human.

Host plant : Unknown.

Holotype : Female, India, Maharashtra, Kolhapur, coll. Girhe, B.E., September 2000 to February 2001. Mouth parts, head, wing, legs and abdomen, mounted on slide labeled as above.

Paratype : 6 male, 14 female; 1♂, 6♀, coll. Girhe, B.E., Ajra, 02-XI-2000; 3♂, 5♀ Hatkanangale, 19-XI-2000, Sex ratio (♂ : ♀) 1 : 2.3. Same data as above.

DISCUSSION :

Aedes kolhapurensis sp.nov. resembles with *Aedes aegypti* in Barraud's key in its characters.

1. Presence of fringe of hair on squama of wing.
2. Scales on vertex flat and broad.
3. Leg banded.
4. Claws curved and toothed.
5. Anal vein ends near VIth vein.

However, it differ from the above species by following characters.

1. Clypeus triangular
2. Vertex raddish brown with bristles.
3. Flagellar formula :
 $1 L/W = 0.15, 13 L/W = 0.59, L 1/13 = 0.02, W 1/13 = 0.08.$
4. Anal cerci 0.27 mm long, rounded and blackish brown at tip.
5. Lyre shaped marking of white scales absent on thorax.

SUBGENUS *Aedes* MEIGEN 1818

Syst. Besch. i.p. 13 Genotype, *A. cinereus* Mg.

Verrallina Theobald, 1903 M.C. iii p. 295.

Genotype, *Aedes butleri* Theo.

Neomacleaya Theobald, 1907, M.C. iv p. 238.

Genotype, *N. indica* Theo.

Aioretomyia Leicester, 1908, *Cul. malaya* p. 185.

Genotype, *A. varietas* Leic.

The subgenus *Aedes* erected by Meigen in 1818 is distinguished from other subgenera by having following characters :

1. Size small to medium.
2. Dark brown or reddish brown.
3. Mostly with lateral pale markings on abdomen.
4. Head entirely or mainly with flat scales.
5. Palpi very short in both sexes.
6. Scuteral scales always narrow.
7. Claw of fore and mid tarsi toothed in females and
8. Proboscis about length of fore femur or slightly longer.

Under this subgenus 18 species have been described from India (Barraud, 1934).

Aedes (Aedes) uniformis* Edwards*FEMALE** (Fig. 36) :

6.9 mm long, 1.40 mm broad, medium sized, antenna 1.80 mm long, black; fore wing 3.60 mm long, hind leg 9.55 mm long, head blackish brown, thorax brown, abdomen black.

HEAD :

0.8 mm long, 0.55 mm broad, black brown; in dorsal view nearly rounded or globular, hairy, highly ornamented with spots and lines of snow white scales; eyes large, rounded and black; interocular space 0.10 mm; clypeus convex and ornamented with white scales; nape blackish brown, rounded; without any upright scales, tempus white; proboscis 2.3 mm long, about the length of fore femur, blackish brown, entirely dark; palpi 0.5 mm long, dark blackish brown, apical end of IVth palpus white, $\frac{1}{4}$ length of proboscis; mandibles and maxillae straight, elongate, yellow, as long as proboscis and with apical blade like stylet; antenna 2.80 mm long, 15 segmented blackish brown, pilose; hairy, scape 0.05 mm long, 0.13 mm broad; pedicel 0.15 mm long, 0.12 mm broad; circular and black; flagellum 2.60 mm long, 13 segmented.

Flagellar formula :

$$1 L/W = 0.1, 13 L/W = 0.38, L 1/13 = 0.03, W = 0.015.$$

THORAX :

1.85 mm long, 1.20 mm broad, large, laterally compressed, undifferentiated, hump back appearance, ornamented with patches or spots of white scales; scutum covers dorsal region, black, with irregular white patches or spots; pronotum lack setae, bristles of mesonotum well developed, deep brown; 4 to 5 ppn bristles; mesothoracic spiracle rounded with spiracular bristles;

sternopleuron and mesepimeron rectangular, flat and ornamented with irregular patches of white scales; post spiracular bristles present; antero and posterodorsocentral bristles present; scutellum trilobed with three bunch of hairs on the lobe, scales on scutellum white and flat.

Fore wing :

3.60 mm long, 0.95 mm broad, unspotted with dark scales; scales 0.02 mm long, fringe of hairs on squama; small, dark scales on veins as well as fringe on hind margin; subcosta (SC) 3.12 mm long, straight, reaching the costa, R_{2+3} forked, R_{4+5} simple, no cross-vein connection of R_1 and R_2 , Media (M) straight and bifurcated marginally, 3.42 mm long, radius 3.56 mm long, slightly curved at tip, cross-vein r-m and m-cu very prominent, cubitus (cu) bifurcated, cu_1 1.76 mm long, anal (A) vein 1.46 mm long.

Angle between m-cu & cu_1 91° , m_{3+4} & r-m 83° and R_{2+3} & r-m 30° .

Halter : 0.3 mm long, 0.2 mm broad, black and clubbed.

Hind leg :

9.55 mm long, slender, banded and longer than body; coxa 1.0 mm long, blackish brown; trochanter 0.3 mm long, black and hard; femur 2.2 mm long, cylindrical with preapical white and apical end black; tibia 2.55 mm long, slender, clothed with dark scales; tarsus 3.5 mm long, five segmented, banded, first segment longer than others; claws curved and toothed; pulvillus short and hairy.

Other legs : Special mark : Tarsal claws of all legs toothed.

Abdomen :

4.25 mm long, black, without pale marking except for small lateral patches of pale scales on tergite one; abdomen tapering, pointed and distinctly banded; anterior abdominal bands broad while last few narrowed in the middle, their hind margin 'A' shaped; a faint median longitudinal pale stripes absent; laterotergites blackish brown with few white scales, sternum yellow and with broad bands; anal cerci 0.4 mm long, 0.3 mm broad and hairy.

COLOUR :

Black	:	Eye, abdomen.
Blackish brown	:	Laterotergites, antenna.
Brown	:	Wing.
White	:	Femur.
Yellow	:	Mandibles, maxillae .
Yellowish brown	:	Thorax.

MALE

6.5 mm long, slender, shorter than female, antenna plumose and brushy, last two segments elongate, phytophagus.

Host : Human.

Host plant : Not known.

Holotype : Female, India, Maharashtra, Kolhapur, coll. Girhe, B.E., 12-XI-2000, Mouth parts, antenna, wing, legs, abdomen on slide, labelled as above.

Paratype : 3 Male, 11 Female; Sex ratio (M : F), 1 : 3.6; coll. 1♂, 5♀, Sathe, T.V., Kolhapur, 20-XI-2000; 2♂, 6♀, Girhe B.E., 17-1-2001, Malkapur; same data as above.

AEDES (AEDES) INDICUS THEOBALD**FEMALE** (Fig. 37) :

7.70 mm long, 1.30 mm broad, antenna 2.8 mm long, fore wing 4.6 mm long, hind leg 7.10 mm long; head blackish brown, thorax yellowish brown, abdomen brownish black.

Head :

0.90 mm long, 1.10 mm broad, no upright scales on head, in dorsal view nearly rounded or globular, dark blackish brown; eyes rounded, large and black; interocular space 0.11 mm; clypeus smooth, convex, blackish brown; nape reddish brown, rounded; vertex semicircular, dark brown, tempus circular and brown; vertical and temporal bristles well developed; proboscis 2.4 mm long, dark brown, clothed with brown scales, labium elongated cylindrical while labium short and yellowish brown; palpi 0.6 mm long, four segmented, blackish brown and shorter than proboscis; mandible and maxillae elongated, slender with blade like stylet, as long as proboscis; antenna 2.8 mm long blackish brown, 15 segmented, hairy, pilose; scape 0.22 mm long, 0.17 mm broad, black; pedicel 0.30 mm long, 0.13 mm broad, brown and rounded; flagellum 2.28 mm long, 13 segmented.

Flagellar formula :

1 L/W = 0.16, 13 L/W = 0.062, L 1/13 = 0.029, W 1/13 = 0.012.

THORAX :

2.10 mm long, 1.30 mm broad, undifferentiated, laterally compressed, yellowish brown; scutum yellowish brown, covers dorsal area, hump like appearance; mesothoracic and metathoracic spiracle rounded, with spiracular bristles; anterior and posterior pronotal lobes semi circular, dark brown; scutellum yellow, trilobed,

with three bunch of hairs on the lobe; bristles on mesonotum well developed, pronotum lack setae; sternopleuron flat, rectangular, larger than mesepimeron; metepisternum, metepimeron and metameron forms metapleuron; thorax with dark brown stripe on each side.

Fore wing :

3.6 mm long, 1.3 mm broad, unspotted with only dark scales, squama semicircular; transparent with fringe of hairs, dark scales present; scales 0.24 mm long, present on veins, fringe on hind margin; subcosta (SC) vein 3.80 mm long, straight; R_{2+3} forked, R_{4+5} simple, no cross-vein connection of R_1 and R_2 , Media (M) 3.95 mm long; radius 4.50 mm long, cross vein r-m and m-cu both present; cubitus (cu) bifurcated, cu_1 2.08 mm long, anal (A) vein 1.59 mm long.

Angle between m-cu and cu_1 93° , m_{3+4} and r-m 75° and r_{2+3} & r-m 35° .

Halter : 0.25 mm long, 0.22 mm broad, brown and flat at tip.

Hind leg :

7.10 mm long, slender and unbranched, blackish brown, coxa 0.9 mm long, broad, hairy, yellow; trochanter 0.20 mm long, broad, hard; femur 1.40 mm ^{long,} cylindrical with dark scales; tibia 2.60 mm long, slender, with tibial dirty yellow scales and yellow tibial spines, tarsus 3.00 mm long, five segmented, first tarsus longer than other and unbanded; claws curved, toothed; pulvilli and empodium short, hairy.

Other legs : Special marks : Similar.

ABDOMEN :

4.70 mm long, 1.3 mm broad, long tapering and pointed; brownish black, marked with complete transverse bands on tergites 2nd and 4th; abdominal dorsal transverse white bands broad and constricted mid dorsally; anal cerci 0.3 mm long and 0.2 mm broad, brown; in dorsal view, tergum of abdominal segment sparsely covered with flat scales.

COLOUR :

Black	:	Eye.
Blackish brown	:	Clypeus, scutum.
Brown	:	Vertex
Yellow	:	Tibial spines, mandibles, maxillae. Scutellum.
Yellowish brown	:	Coxa.

MALE :

7.40 mm long, slender, smaller than female, antenna plumose, brushy with last two segments elongate.

Host : Human.

Host plant : Grass and other vegetation.

Holotype : Female, India, Maharashtra, Kolhapur, coll. Girhe, B.E., Kolhapur, 29-IX-2000, mouth parts, head, wing, legs and abdomen on slide, labelled as above.

Paratype : 10 male, 36 female, Sex ratio (σ : ♀) 1 : 3.6. coll. Girhe, B.E., September 2000 to September 2001, Kolhapur; 4 σ , 15 ♀ , Kolhapur, 20-X-2001; 6 σ , 21 ♀ , Panhala, 21-V-2001; same data as above.

Aedes (Aedes) sangiti* sp. nov.*FEMALE** (Fig. 38) :

7.60 mm long and 1.05 mm broad, antenna 2.60 mm long, fore wing 4.65 mm long, hind leg 9.25 mm long, abdomen 4.69 mm long, head yellowish brown, thorax brown, abdomen brown.

HEAD :

0.31 mm long, 0.40 mm broad, in dorsal view globular, dorsal surface of head with many flat scales; clypeus rounded whitish; vertex smooth with white margin; interocular space 0.25 mm; proboscis 3.5 mm long, dark unspotted; labellum brown; maxillary palp 1.23 mm long and four segmented; palpus short and broad, apical palpus longer than others; mandible and maxillae long, blade like, stylet round and curved; antenna 2.60 mm long pilose, 15 segmented, scape 0.12 mm long, 0.15 mm broad; pedicel 0.07 mm long, 0.12 mm broad, yellowish brown; flagellum 2.41 mm long, 13 segmented.

Flagellar formula :

1 L/W = 0.03, 13 L/W = 0.50, W 1/13 = 0.14, L 1/13 = 0.04.

THORAX :

1.60 mm long, 1.10 mm broad undifferentiated, blackish brown, laterally compressed, narrow with hump backed appearance, with whitish pale hairs; thoracic greater part of the dorsal surface formed by shield like scutum of the second segment which bears the wing; scutellar scales broad and flat; anterior lateral pronotal lobe leaf like, whitish, posterior notal lobe rounded with few white scales, scutum with vertical scutal suture, scutellum trilobed with white and narrow scales and three bunch of hairs on

the lobes; prealar knob black, mesoepimeron & mesomeron blackish brown with sparsely white and black scales; metapleuron yellowish brown, metepisternum triangular and brownish, metepimeron verticle slit like; metameron triangular, lies at the base of metaepimeron.

Fore wing :

4.65 mm long, 2.10 mm broad, elongated, unspotted, bears tiny dark scales on veins on a fringe on hind margin; subcosta straight, 4.20 mm long, Media (M) bifurcated, 3.60 mm long; radius straight, slightly curved at apex, 4.35 mm long; cubitus bifurcated, cu_1 1.89 mm long, anal vein 1.63 mm long.

Angle between m-cu and cu_1 95° , m_{3+4} & r-m 85° and R_{2+3} & r-m 39° .

Halter : 0.30 mm long, 0.21 mm broad, brown and rounded at tip.

Hind leg :

9.25 mm long, unbanded, longer than body; coxa 0.60 mm long, broad, yellowish in colour; trochanter 0.12 mm long, triangular and hard; femur 2.21 mm long, elongated, cylindrical, blackish, brown dorsally and whitish ventrally with femoral spurs, white knee spot at apical end; tibia 3.10 mm long, elongated straight, slender unspeckled, black brown scales and brownish tibial spines silvery; tarsus 3.22 mm long, 5 segmented, unbanded, elongated; tarsal claws curved, toothed; pulvillus and empodium narrow.

Other legs : Special marks : Similar.

ABDOMEN :

4.69 mm long, 1.10 mm broad, tapering and pointed towards posterior, with white and brownish scales, dorsal surface not distinctly banded, pale brown band lies ventrally, blackish brown scales dorsally; first seven segments dark brown dorsally and yellowish brown ventrally; VIIIth abdominal segment narrow, non retractile, completely white with fine hairs; anal cerci 0.11 mm long, 0.08 mm broad, rounded and black at tip.

COLOUR :

Black	:	Dorsum of abdomen.
Brownish black	:	Thorax, leg, palpi, wing.
Brown	:	Labellum, head.
White	:	Tip of hind femur, VIII segment of abdomen.
Yellow	:	Maxillae, Mandible.
Yellowish brown	:	Ventral stripes of abdomen.

MALE :

7.4 mm long, smaller than female, phytophagous .

- Host** : Man, cow, buffalow, grass and other vegetation.
- Holotype** : Female, India, Maharashtra, Kolhapur coll. Girhe B.E., XV-X-2000, head, ^{antenna} legs, wing, abdomen mounted on slide, labelled as above.
- Paratype** : (46 female, 10 male), Sex ratio (σ : ♀), 1 : 4.6, from September, 2000 to September 2001, Kolhapur; 11 ♀ 2 σ , Coll. Girhe, B.E., Hatkanangale; 5 ♀ , 3 σ , coll. T.V. Sathe, Jaysingpur, 21-XI-2000, same date as above.

DISCUSSION :

Aedes sangiti sp. nov. resembles with *Aedes stegomyia* in Barraud's key in its characters.

- 1) Abdominal segment VIII not completely retractile,
- 2) Tarsal claws toothed in fore leg and mid leg,
- 3) Dorsal surface of head with many flat scales,
- 4) Scutellar scales broad & flat,
- 5) Proboscis dark.

However, it differs from the above species by following characters.

- 1) Vertex smooth, with white border.
- 2) Hind tibia with silvery spines.
- 3) Flagellar formula :
 $1 L/W = 0.03, 13 L/W = 0.50, W 1/13 = 0.04, L 1/13 = 0.14.$
- 4) Abdominal segments (I to VII) not distinctly banded and covered densely with blackish brown scales.
- 5) VIIIth abdominal segment completely white.
- 6) Anal cerci 0.11 mm long, 0.07 mm broad, rounded and black.

AEDES (AEDES) PUNCHGANGI SP. NOV.**FEMALE** (Fig. 39) :

7.35 mm long and 0.10 mm broad. Antenna 2.80 mm long, Fore wing 2.1 mm long, hind leg 10.5 mm long; head yellowish brown, thorax brown, abdomen pale yellowish white.

HEAD :

0.5 mm long, 0.45 mm broad; in dorsal view globular with few flat scales; eyes large, black; interocular space 0.21 mm, clypeus rounded, brownish with marginal bristles; vertex smooth and yellowish brown; nape yellowish brown and triangular; maxillary palpi very short proboscis 2.00 mm long, brown, straight, about length of fore femur; labium elongated and brownish; labellum yellowish brown, mandibles and maxillae long, blade like stylet; antenna 2.80 mm long, blackish brown, pilose, hairy, 15 segmented; scape 0.10 mm long, 0.11 mm broad; pedicel 0.06 mm long, 0.08 mm broad, rounded and brown; flagellum 2.64 mm long, 13 segmented.

Flagellar formula :

1 L/W = 0.12, 13 L/W = 0.60, L 1/13 = 0.02, W 1/13 = 0.12.

THORAX :

2.35 mm long, 1.80 mm broad, narrow, laterally compressed, brown with stripe on each side, scutum shield like, covers dorsal surface; scutellum yellowish and triangular; acrostichal bristles elongated and lies in the mid dorsal surface of scutum; prescutellar space pale yellow with prescutellar bristles; mesothoracic and metathoracic spiracles with spiracular bristles; postnotum pale yellow and cylindrical; propleuron and sternopleuron rounded and dark brown.

Fore wing :

4.15 mm long, 1.00 mm broad, unspotted bears tiny dark scales along the veins as well as fringe of them along the hind margin, fringe scales leaf like; subcosta (SC) 3.88 mm long, straight, reaching the costa; base of subcosta without tufts of hair on the underside of wing; media (M) bifurcated, 3.98 mm long, cu_1 2.87 mm long, radius 4.13 mm long; anal (A) 1.62 mm long, reaching margin.

Angle between m-cu and cu_1 96° , m_{3+4} & r-m 81° and R_{2+3} & r-m 35° .

Halter : 0.21 mm long, 0.17 mm broad, yellow and expanded at tip.

Hind leg :

10.50 mm long, unbanded, yellowish brown; coxa broad, 1.00 mm long; trochanter 0.3 mm long, hard and brown, femur 2.00 mm long, cylindrical, basal end whitish yellow while apical end yellowish brown; knee pale yellow; tibia 3.10 mm long, slender, brown with dark brownish scales; apical end of tibia with tibial spurs, no tarsal ring on tarsal segment; tarsus 4.10 mm long, unbanded, elongated, claw curved and toothed, empodium and pulvillus narrow.

Other legs : Similar.

ABDOMEN :

4.50 mm long, 2.11 mm broad, cylindrical tapering at hind end and sparsely covered with over lapping scales; scales lies on transverse margin of the segments; first VIth abdominal segments whitish while VIIth and VIIIth abdominal segments brownish and hairy; post genital plate brownish at tip, laterotergites yellowish with few scales; anal cerci 0.35 mm long, entirely brown, leaf like, hairy.

COLOUR :

Black	:	Eye
Blackish brown	:	Vertex, Antenna
Brown	:	Cerci, post genital plate and proboscis, Thorax
Yellowish brown	:	Labellum
Yellow	:	Laterotergites, coxa, prescutellar space, maxillae and mandibles.
White	:	First six segment of abdomen.

MALE :

7.10 mm long, smaller and slender than female, phytophagous.

Host : Man.

Host plant : Grass and other unknown vegetation.

Holotype : Female, India, Maharashtra, Kolhapur, Coll. Girhe, B.E., 30-XII-2000, head, antenna, wing, legs abdomen mounted on slide labeled as above.

Paratype : 5 male, 25 female : Sex ratio
(♂ : ♀) 1 : 5; 2♂, 10♀ Coll. Girhe, B.E.,
September 2000 to September 2001;
Kolhapur; 1♂, 6♀ Coll. Girhe, B.E., Panhala,
6-I-2001; 2♂, 9♀ Coll. Sathe T.V., Kolhapur.
21-XII-2000; same data as above.

DISCUSSION :

Aedes punchgangi sp.nov. resembles with *Aedes dorsalis* in Barrauds key in its characters.

1. Dorsal surface of head with flat scales.
2. Proboscis brown.
3. Thorax dark brown with stripe on each side.

4. No pale ring on tarsi.
5. Abdomen long tapering and pointed, claws toothed.

However, it differs from the above species by following characters.

1. Head, thorax brown while abdomen white.
2. Flagellar formula :
 $1 L/W = 0.12, 13 L/W = 0.60, L 1/13 = 0.02, W 1/13 = 0.12.$
3. First six (I to VI) abdominal segment white while VIIth and VIIIth segment brownish and hairy.
4. Anal cerci 0.35 mm long dark brown.

SUBGENUS MUCIDUS THEOBALD, 1901

M.C.i; p. 268. Genotype *Culex alternans* Westwd.

Pardomyia Theobald, 1907, M.C. iv, p. 280.

Genotype, *P. aurantia* Theo.

Elcrinomyia leicester, 1908, Cul. Malaya, p. 71.

Genotype, *E. aurcostriata* Leic.

The Subgenus *Mucidus* Theobald is distinguished from other subgenera by having following features :

- 1) Adults large sized with outstanding yellow, white and brown scales on body and legs, giving them mottled and mouldy appearance.
- 2) Wing mottled with yellow, brown and creamy scales.
- 3) Mesonotum remarkably long and twisted, resembling strands of cotton-wool.
- 4) ppn bristles numerous, usually about 20.

From India only two species have been described under this subgenus. From Kolhapur district a new species, *Aedes indica* sp.nov. have been reported and described for the first time.

Aedes (Mucidus) Indica* sp. nov.*FEMALE** (Fig. 40) :

Large mosquito, 10.30 mm long, fore wing 7.6 mm long, hind leg 19.5 mm long, antenna 5.2 mm long and yellowish dirty brown and longer than proboscis; head yellowish brown, thorax pale yellow, abdomen yellowish brown.

HEAD :

1.10 mm long, 1.00 mm broad, in dorsal view globular, compound eyes black, vertex dark brown, white scales on anterior margin of vertex; clypeus blackish brown and rounded; nape black, proboscis brownish gray, 4.6 mm long, white scales present on the middle region; labellum dark brown; maxillary palp 2.3 mm long, not more than $\frac{1}{2}$ length of proboscis, hairy, pale yellow; antenna 5.2 mm long, yellowish brown, pilose, scape black, 0.25 mm long, 0.30 mm broad; pedicel 0.30 mm long, 0.20 mm broad and brown; flagellum 4.65 mm long, 13 segmented.

Flagellar formula :

1 L/W = 0.35, 13 L/W = 0.88, L 1/13 = 0.08, W 1/13 = 0.02.

THORAX :

3.00 mm long, 2.00 mm broad, laterally compressed, hump shaped, brown, not with light matt, with brownish integument; scutellum trilobed with bunch of hairs on each lobe; mesonotum remarkably long and twisted, mesonotal scales whitish, long and twisted, mesonotal bristles light brown.

Fore wing :

7.5 mm long, 4.2 mm broad, yellowish with dark spots, wing mottled with yellow, brown and with creamy scales, ppn bristles numerous; no large yellow stick towards apex of wing extending on

vein 1. Subcosta straight, 6.5 mm long, reaching costa, costa yellow with dark scales on entire region except basal parts, radius 7.3 mm long, straight, slightly curved at apex; R_{2+3} , R_{4+5} simple, no cross-vein connection of R_1 and R_2 , Media (M) straight and bifurcated apically, cross-vein r-m and m-cu prominent; cubitus (Cu) forked, cu_1 3.9 mm; anal (A) vein 3.2 mm long, approaching margin; hind margin of wing with dark and yellow scales placed alternately.

Angle between m-cu & cu_1 91° , m_{3+4} & r-m 88° and R_{2+3} & r-m 43° .

Halter : 0.45 mm long, 0.38 mm broad, brownish, clubbed.

Hind Leg :

19.5 mm long, slender and longer than body; hind coxa 1.5 mm long, broad with white and yellow scales; hind trochanter 0.6 mm long, broad, black; hind femur 4.0 mm long with two yellow bands and brown bristles; tibia 5.00 mm long with three mid white rings and brownish tibial bristles; tarsus 8.4 mm long, four white bands present on tarsus.

Other legs : Special marks : all legs brown, banded with white stripes.

ABDOMEN :

6.20 mm long, 2.5 mm broad, brown with white scales, predominating at middle; last two segments slender and elongated than other; abdomen banded; anal cerci 0.35 mm long, rounded & black.

COLOUR :

Black : Eye.
Brown : Vertex, proboscis, labellum, thorax

White	:	Rings on legs. scales on abdomen and thorax
Yellow	:	Maxillary palp, scales on wing, hind tarsus.
Yellowish Brown	:	Antenna.
Blackish Brown	:	Clypeus.

MALE :

9.8 mm long, slender, antenna plumose and brownish.

Host : Human.

Host Plant : Unknown.

Holotype : Female, India, Maharashtra, Kolhapur.
coll. T. V. Sathe, 26-VII - 2001, Shivaji University, Kolhapur; head, antenna, wing hind leg and abdomen on slide, labeled as above.

Paratype : Sex ratio (σ : δ) 0 : 1; 1 ϕ Coll. B. E. Girhe, 14-VIII-2001; same data as above.

DISCUSSION :

Aedes Indica sp. nov. resembles with *A. M. seatophagoides* Theobald by having large size and leg markings, proboscis with white scales at middle (Barrand, 1934). However it differs from above species by having following characters.

- 1) Proboscis brownish gray.
- 2) Palpi not more than $\frac{1}{2}$ length of proboscis.
- 3) Abdomen with white scales predominating at middle than tip.
- 4) Four white bands on tarsus.
- 5) Dark scales on entire costa but lacking at basal region.
- 6) Wing length and breadth 7.5 mm & 4.2 mm respectively.
- 7) Larger body size than *A. M. seatophagoides*.