

bothriotrichia. Antennae/Head as 3/2; antennal segments ratio as 4 : 7 : 6 : 16. Ventral tube with 1 + 1 setae. Dens and mucro related as 58 : 33.

Material examined : Leaf litter, B.B.W.L. Sanct, Parmadan, North 24 Pgs. Dist. 10.ix.2009, coll. G.P. Mandal, 12exs.

Distribution : INDIA : West Bengal, Kerala, Maharashtra (Bombay); COSMOPOLITAN.

Genus XIV. *Sphyrotheca* Börner, 1906

16. *Sphyrotheca gangetica* Yosii

1966. *Sphyrotheca gangetica* Yosii, *Res. Kyoto Univ. Sci. Exped. Karakoram and Hindukush*, 1955, **8** : 333-405.

Diagnosis : Body length upto 1.5 mm. Ground colour white, deep purple pigments present, antennae pigmented distally, head with two transverse stripes. Ant/head ratio as 1 : 8. And ratio as 11 : 14 : 21 : 55. Eye 8 + 8, black. Unguis robust with 2 very distinct inner teeth. Unguiculus broad, apically pointed. Furcula in ratio as 4 : 9 : 3. Manubrium is dorsally with many setose and ventrally nude. Mucro is smooth on outer and minutely serrated on inner margin.

Material examined : Leaf litter, B.B.W.L. Sanct, Parmadan, North 24 Pgs. Dist. 09.ii.2010, coll. G.P. Mandal, 12exs.

Distribution : INDIA : West Bengal and Uttar Pradesh.

SUMMARY

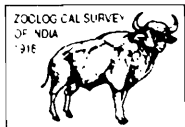
The present paper deals with 16 species of Collembola under 14 genera distributed over 7 families recorded from Bhivuti Bhushan Wild Life Sanctuary, Parmadan, North 24 Pgs. West Bengal. This is the first consolidated report of Collembola fauna from this Sanctuary. The population of the species namely *Lepidocyrtus exploratorius*, *Onychiurus indicus*, *Ballistrura bengalensis* and *Salina bengalensis*, were very rich and collected very good examples from this sanctuary.

ACKNOWLEDGEMENTS

I am grateful to the Director, Dr. K. Venkataraman, Zoological Survey of India, Kolkata for giving permission to carry out the project, laboratory facilities and kind encouragement. I am thankful to Dr. A.K. Sanyal, Scientist-F for helping various ways and Dr. G. Thirumalai, Scientist- F & Divisional in Charge, Entomology Division for encouragement. Author is indebted to Dr. A.K. Hazra, ex Additional Director, who initiated the project and helping various ways to carry out the project. Author is grateful to staff members of the Apterygota section namely Shri K.K. Suman, Shri K.L. Nath and Shri N.C. Moitra for helping in collection of collembola. I am also thankful to the P.C.C.F, Govt. of West Bengal & Shri Rana Dutta, D.F.O. of B.B.W.L.S, Parmadan for providing necessary permission to carry out the project and logistic support.

REFERENCES

- Christansen, K.A and Bellinger, P. 1998. The Collembola of North America North of the Rio Grande, A Taxonomic Analysis. *Grinnel College, Iowa* : 1-1520.
- Janssens, F. 2011. Checklist of Collembola of the world. www.collembola.org.
- Mandal, G.P. 2010. Checklist of Collembola from India. www.zsi.gov.in
- Mitra, S.K. 1966. On some Indian Collembola with the description of a new species of *Xenylla* (Collembola : Hypogastruridae). *Sci. & Cult, Calcutta*, **32** : 210-211.



Rec. zool. Surv. India : 111(Part-2) : 67-74, 2011

ON A COLLECTION OF INSECTA : DIPTERA : MUSCIDAE FROM UTTARAKHAND

BULGANIN MITRA

*Zoological Survey of India, M-Block, New Alipore
Kolkata-700053*

INTRODUCTION

As constituted by Mc Alpine *et. al* (1981-1989), the family Muscidae (True flies) is coming under the subdivision Calyprate of the series Schizophora under the superfamily Muscoidea of the infraorder Muscomorpha belonging to the suborder Brachycera.

The members of the family are usually non-metallic, black, but rarely possess metallic colouration similar to that of Calliphoridae. They are small to medium in size; robustly-built, prominent head with holoptic eyes in males and dichoptic in females. Antennae 3 segmented, aristate and plumose. The proboscis is of licking type, however it is greatly modified and adapted for piercing and sucking blood in the subfamily Stomoxyinae. Thorax with dorsal suture continuous across the middle; with well defined posterior calli. Hypopleural bristles absent. Wings exhibiting a sharp bend in vein m (Muscinae), or without a sharp bend in vein m (e.g., Coenosiniinae, Mydaeinae). Wings with a well developed lower calypter. Tibiae with or without a dorsal pre-apical bristle.

Adult Muscids occur in many habitats, but they are less common in dry, open and exposed habitats, or where sandy or acidic soils prevail (Pont, 1986). The adults are closely associated with decaying organic matters; especially dung, but many groups have acquired special habits, which may be widely different. Larvae aquatic (more or less, in some species), or terrestrial; phytophagous, or saprophagous, or coprophagous, or consuming stored produce, or mycophagous, or predatory. Pupa enclosed within a puparium.

Muscidae are well represented in all zoogeographical regions and are extremely numerous in the Oriental Region; though as yet only a small percentage of the species has been described. Out of 3800 species (Skidmore, 1985) of Muscidae India only represents by 258 species (6.7 %).

However, the present paper is based on the recent surveys in Uttarakhand by author himself (2003-2005) and as well as from the previous published data. This is the first consolidated report of the Family Muscidae from the state of Uttarakhand after its separation from the state of Uttar Pradesh (9th November 2002). The present report accounts for 22 species of muscids belonging to 10 genera and 3 tribes under 4 subfamilies of which 6 species under 2 genera are been recorded for the first time from the state of Uttarakhand.

The taxonomic system of this paper was followed by Vockeroth (1972). General morphology, materials & methods have been dealt in the "Fauna of Tripura" and other state fauna series of the author (2000, 2003, 2004, 2006).

LIST OF SPECIES

A. Subfamily MUSCINAE

Tribe MUSCINI

1. *Morellia nigrisquama* Malloch
2. *Morellia pectinipes* Emden
- *3. *Musca (Byomya) conducens* Walker
4. *Musca (Musca) domestica* Linnaeus
- *5. *Musca (Viviparomusca) bezzi* Patton & Cragg
- *6. *Orthellia coerulifrons* (Macquart)
7. *Orthellia gavis* (Walker)
- *8. *Orthellia indica* (Robineau-Desvoidy)
- *9. *Orthellia lauta* (Wiedemann)
- *10. *Orthellia timorensis* (Robineau-Desvoidy)
11. *Orthellia viridis* (Wiedemann)

Tribe HYDROTAEINI

12. *Hydrotaea cilifemorata* Emden
13. *Hydrotaea dentipes* Fabricius

B. Subfamily PHAONIINAE

Tribe PHAONIINI

14. *Helina nemorum* (Stein)

15. *Helina punctata* (Robineau-Desvoidy)
 16. *Phaonia debilis* Stein.
 17. *Phaonia kambaitiana* Emden
 C. Subfamily MYDAEINAE
 18. *Graphomya maculata* (Scopoli)
 19. *Hebecnema umbratica* (Meigen)
 20. *Myospila bina brunneiofemorata* Emden
 D. Subfamily STOMOXYINAE
 21. *Stomoxys calcitrans* (Linnaeus)
 22. *Stomoxys pullus* Austen

SYSTEMATIC ACCOUNT

Key to the subfamily

1. Proboscis elongate, strongly sclerotized; adapted for piercing, tapering from a broad base to a slender apex and with atrophied labella; pteropleuron haired; vein m gradually curved forward apically from about middle of last section STOMOXYINAE
 — Proboscis moderately weakly sclerotized, not distinctly tapering to apex and with well developed and often fleshy labella; propleuron haired or bare; vein m variable, often straight or shortly curved forward near middle of last section 2
 2. Vein m_{1+2} with apical portion curved strongly forward at about middle length, body colour grey to black and often metallic MUSCINAE
 — Vein m_{1+2} straight or curved only slightly forward, body non-metallic 3
 3. Pteropleuron with hairs confined to upper margin below wing base, prosternum bare, hind spiracle without strong black setulae in marginal fringe... MYDAEINAE
 — Pteropleuron with hairs on lower as well as on upper half (bare in the genera *Atherigona*, *Gymnodia*), prosternum haired, hind spiracle with few to many strong black setae in marginal fringe PHAONINAE

A. Subfamily MUSCINAE

Key to the tribes

1. Pteropleuron with tuft of hairs on upper part below base of wings **Muscini**
 — Pteropleuron bare **Hydrotaeini**

Tribe MUSCINI

Key to the genera

1. Thorax and abdomen black or yellow with dark vittae or tessellated patterns 2

- Thorax and abdomen metallic green, blue or purple, without dense grayish pollen **Orthellia** Robineau-Desvoidy
 2. Bend of m subangular (but rather broadly rounded in *Musca lucens*), outline of arisal plumosity forming a convex curve up to tip, ovate; prostigmal present, stem vein with 1 to about 7 setulae on posterior side of dorsal surface **Musca** Linnaeus
 — Bend of m broadly rounded, outline of arisal plumosity forming a very sharp angle at tip, lancet shaped, prostigmal absent, stem vein bare **Morellia** Robineau-Desvoidy
 Genus **Morellia** Robineau-Desvoidy

1830. **Morellia** Robineau-Desvoidy, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, 2 : 405. Type-species : **Morellia agilis** Robineau-Desvoidy (= **Morellia hortorum** Fallén).

Key to the species

1. Fuscous black with slight purplish reflections and some silver and grayish dust, palpi and antennae black, thorax shining purplish black; prosternum hairy; lower calyptra dark brown; **nigrisquama** Malloch
 — Black with silver-white pollinosity, palpi and antennae fuscous brown, thorax with dense silver-white dust; prosternal plate with setulose, slightly rounded sides, lower calyptra greysih white, with whitish border and fringe **pectinipes** Emden

Morellia nigrisquama Malloch

1928. **Morellia nigrisquama** Malloch, *Ent. Mitt.* 17 : 329. Type-locality : Sumatra.

Distribution : India : Uttarankhand (Mussorie), Assam, West Bengal.

Elsewhere : Malay, Nepal, Sumatra, Thailand.

Morellia pectinipes Emden

1965. **Morellia pectinipes** Emden, *Fauna. Brit. India*, Muscidae, 1 : 112.

Distribution : India : Uttarankhand (Mussorie), Bihar.

Elsewhere : ? Sri Lanka.

Genus **Musca** Linnaeus

1758. **Musca** Linnaeus, *Syst. Nat. Ed.* 10 : 589. Type-species : **Musca domestica** Linnaeus.

KEY TO THE SUBGENERA

1. Propleural depression hairy **Musca** Linnaeus
 — Propleural depression bare 2

2. Suprasquamal ridge bare
 **Byomya** Robineau-Desvoidy
 Suprasquamal ridge setulose
 **Viviparomusca** Townsend
 Subgenus **Byomya** Robineau-Desvoidy

1830. *Byomya* Robineau-Desvoidy, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, 2 : 392. Type-species : *Byomya violacea* Robineau-Desvoidy.

***Musca (Byomya) conducens** Walker

1859. *Musca conducens* Walker, *J. Proc. Linn. Soc. Lond., Zool.* 4 : 138.

Material examined : 10 ♀♀, 7 ♂♂, Kharakot, Bageshwar district, 25.ix.2003, coll. B.Mitra. Alt. 1400 mts.

Diagnosis : Thorax fuscous black, two undusted vittae on either side rather close together towards and behind suture, first abdominal segment largely dark on dorsum, second and third orange in male except for a black median vittae.

Distribution : India : Uttarakhand (Bageshwar) Andaman Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Madhya Pradesh, Nagaland, Orissa, Punjab, Uttar Pradesh, West Bengal.

Elsewhere : China, Flores Island, Jawa, Lombok, Malaya, Myanmar, Nepal, Philippines, Ryukyu Island, Sabah, Sarawak, Sri Lanka, Sumatera, Sumbawa, Thailand; Ethiopian; New Guinea; Palaearctic.

Subgenus **Musca** Linnaeus

1915. *Promusca* Townsend, *J. Wash. Acad. Sci.*, 5 : 434. Type-species : *domestica* Linnaeus.

Musca (Musca) domestica Linnaeus

1758. *Musca domestica* Linnaeus, *Syst. Nat. Ed.* 10, 1 : 596.

Diagnosis : Four black vittae on thorax, inner pair terminating towards posterior end; propleural depression with fine setulose hairs; suprasquamal ridge without black setulae, all post *dc* strong; mid tibia without *av* and *ad* setae.

Distribution : India : Uttarakhand (Almora), Andaman Islands, Andhra Pradesh, Assam, Bihar, Chandigarh, Goa, Himachal Pradesh, Karnataka, Kashmir, Maharashtra, Manipur, Nagaland, Punjab, Sikkim, Tripura, West Bengal.

Elsewhere : Cosmopolitan.

Subgenus **Viviparomusca** Townsend

1915. *Viviparomusca* Townsend, *J. Wash. Acad. Sci.*, 5 : 435, Type-species : *Musca bezzii* Patton & Cragg.

***Musca (Viviparomusca) bezzii** Patton & Cragg

1913. *Musca bezzii* Patton & Cragg, *Indian J. med. Res.* 1 : 19.

Material examined : 5 ♀♀, 3 ♂♂, Khatima, U.S. Nagar district, 29.ix.2004, coll. B.Mitra.

Diagnosis : Eyes distinctly hairy, thorax densely dusted whitish to cinereous-grey with four (especially in male) black vittae, median vitta of second tergite strongly dilated along fore margin, otherwise almost parallel sided, and at hind margin never dilated, but as a rule slightly narrowed, moderately broad, stem vein with 4-7 setulae on hind side of dorsal surface.

Distribution : India : Uttarakhand (Mussorie, Nainital), Arunachal Pradesh, Assam, Chandigarh, Himachal Pradesh, Jammu & Kashmir, Meghalaya, Nagaland, Tamilnadu, Punjab, Sikkim, Uttar Pradesh.

Elsewhere : Malaya, Myanmar, Nepal; East Palaearctic.

Genus **Orthellia** Robineau-Desvoidy

1863. *Orthellia* Robineau-Desvoidy, *Hist. nat. Dipt. env. Paris*, 2 : 837. Type-species : *Lucilia rectinervis* Robineau-Desvoidy.

Key to the species

1. Thorax without prst dc, anterior mesopleural absent; prst acr absent; parafrontalia polished; Thorax without prst dc, anterior mesopleural absent; prst acr absent; parafrontalia polished; interfrontalia narrower than parafrontalia in female 2
- Thorax with two pairs of conspicuous prst dc, anterior mesopleural distinct; one pair of strong prst acr present or interfrontalia wider than one parafrontalia in female 3
2. Palpi and antennae brownish orange, bend of m vein subangular; discal cell without hairs m-m closer to bend than r-m, base of wings yellowish, frons wider than an eye **lauta** (Wiedemann)
- Palpi and antenna fuscous, bend of m vein very broadly and evenly rounded, discal cell more or less extensively haired, at least apical third largely hairy, frons much narrower than an eye **gavisia** (Walker)
3. Thorax with a pair of strong prst acr and 3 pairs of post dc; m with deep behind bend, wing covered with hairs throughout; antennae black to fuscous; parafacialia shining blue green; interfrontalia narrower than parafrontalia; frons wide **viridis** (Wiedemann)
- Thorax without prst acr, interfrontalia wider than a parafrontale, the latter more or less dusted 4
4. Discal cell wholly hairy; m usually without a dip behind, mesonotum either conspicuously dusted

in front, or with only three post dc, the anterior two of which are sub equal; mid tibia without an ad seta

..... *timorensis* (Robineau-Desvoidy)

- Discal cell with a bare strip; m with a distinct bend, mesonotum not markedly dusted in front and with more than 3 post dc, the anterior 2- 4 of which are inconspicuous, palpi slender

5. Mid tibia with an ad seta between apical fifth and fourth, second segment of antenna ferruginous, third and palpi infuscate ferruginous, nearly basal half of discal cell bare, the bare area extended towards apex along 4th, facets on inner part of eyes strongly enlarged

..... *indica* (Robineau-Desvoidy)

- Mid tibia without an ad seta, second antennal segment strongly infuscate, third narrowly reddish at base, otherwise like palpi fuscous, discal cell hairy except on a longitudinal strip close to 5th vein; facets on inner part of eyes only slightly enlarged

..... *coerulifrons* (Macquart)

1851. *Lucillia coerulifrons* Macquart *Mem. Soc. Sci. Agric. Lille.*, 248.

Material examined : 3 ♀♀, 3 ♂♂, Sarada river side, Tanakpur, Champawat district, 13.ix.2004, coll. B. Mitra.

Distribution : India : Uttarankhand (Champawat) Arunachal Pradesh, Assam, Bihar, Kerala, Uttar Pradesh.

Elsewhere : Borneo; Myanmar; Sri Lanka; Flores Island; Formosa; Jawa; Laos; Lombok; Malaya; Nepal; Philippines; Ryukyu Islands; Sumatera; Thailand; Japan.

Orthellia gavis (Walker)

1859. *Musca (Neomyia) gavis* Walker, *J. Proc. Linn. Soc. Lond. Zool.* 4 : 138.

Distribution : India : Uttarankhand (Almora), Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Punjab, Sikkim, West Bengal.

Elsewhere : Jawa, Nepal, Pakistan, Simeule Island, Sumatera, Tamaon Island.

**Orthellia indica* (Robineau-Desvoidy)

1830. *Lucilia indica* Robineau-Desvoidy, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, 2 : 453.

Material examined : 1 ♀♀, 7 ♂♂, Cantonment Road, Almora district, 18.ix.2003, coll. B.Mitra, alt. 1650 mts.

Distribution : India : Uttarankhand (Almora) Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chandigarh, Goa, Kerala, Maharashtra, Manipur, Mizoram, Nagaland, Orissa, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal.

Elsewhere : Bali, Bangladesh, Malaya, Myanmar, China, Formosa, Jawa, Nepal, Pakistan, Philippines, Simeule Islands, Sumatera, Sumbawa, Thailand, Vietnam; cosmopolitan.

**Orthellia lauta* (Wiedemann)

1830. *Musca lauta* Wiedemann, *Aussereurop. Zweifl. Insekt.* 2 : 410.

Material examined : 6 ♀♀ 2 ♂♂, Khirakot, Bageshwar dist., 25.ix.2003, coll. B. Mitra, alt. 1400 mts.

Distribution : India : Uttarankhand (Bageshwar) Andaman Islands, Andhra Pradesh, Assam, Bihar, Chandigarh Karnataka, Manipur, Madhya Pradesh, Nagaland, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal.

Elsewhere : China, East Malaysia, Flores Island, Jawa, Kalimantan, Laos, Lombok, Malay, Myanmar, Nepal, Pakistan, Philippines, Ryukyu Islands, Sumatera, Sumbawa, Sri Lanka, Taiwan, Thailand; Australia.

**Orthellia timorensis* (Robineau-Desvoidy)

1830. *Lucilia timorensis* Robineau-Desvoidy, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, 2 : 460.

Material examined : 10 ♀♀, 15 ♂♂, Saiha, Dehradun district., 21.v.2006, coll. B. Mitra.

Distribution : India : Uttarankhand (Dehradun), Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Kerala, Orissa, Sikkim, Tamil Nadu, Uttar Pradesh, West Bengal.

Elsewhere : Bangladesh, China, Dammar Islands, Flores Island, Jawa, Malaya Myanmar, Nepal, Philippines, Ryukyu Islands, Simeulae Island, Sulawesi, Sumatera, Taiwan, Thailand, Viet Nam; Japan; Papuan subregions.

Orthellia viridis (Wiedemann)

1824. *Idia viridis* (Wiedemann), *Analecta Ent.*, : 50. Type-locality : North america.

1826. *Musca caesarion* Meigen, *Syst. Besch. europ. zweifl. Insekt.*, 5, 57. Type-locality : Portugal.

Distribution : India : Jammu and Kashmir, Manipur, Punjab, Himachal Pradesh, Sikkim, Tripura, Uttarankhand (Mussorie, Dehradun, Nainital, Almora), West Bengal.

Elsewhere : Nepal, Pakistan, Tibet, Hawaii; Holarctic.

Tribe HYDROTAEINI

Genus *Hydrotaea* Robineau-Desvoidy

1830. *Hydrotaea* Robineau-Desvoidy, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, 2 : 509. Type-species : *Musca meteorica* Linnaeus.

Diagnosis : Eyes bare or hairy; frontal triangle not reaching lunula (in Oriental species), more or less dusted; arista bare to short-haired; thorax with more or less conspicuous dust, never glossy bluish black, with 4 post dc, pra small or absent; prosternum, propleural depression, pteropleura and hypopleura without setulae; abdomen ovate (σ) or triangularly subcordate (φ), with moderately strong setae only laterally and at apex; wings hyaline in Oriental species, fore femur of male with distinctive pre-apical v teeth, mid tibia (in Oriental species) without an av seta.

Key to the species

1. pd seta of hind tibia indistinct or hardly longer than greatest tibial diameter, only the prsc acr somewhat stronger; eyes virtually bare
..... *cilifemorata* Emden
- pd seta of hind tibia more than twice length of greatest tibial diameter; jowls with some conspicuous upcurved setae on anterior part
..... *dentipes* Fabricius

Hydrotaea cilifemorata Emden

1965. *Hydrotaea cilifemorata* Emden, *Fauna. Brit. India, Muscidae*, 1 : 317. Type-locality : Dehradun.

Distribution : India : Uttarakhand (Dehradun), West Bengal.

Elsewhere : None.

Hydrotaea dentipes Fabricius

1805. *Musca dentipes* Fabricius, *Syst. Antliat.* : 303. Type-locality : Denmark.

Distribution : India : Uttarakhand (Nainital), Himachal Pradesh, Jammu and Kashmir.

Elsewhere : Nepal, Tibet. Holarctic.

B. Subfamily PHAONIINAE

Tribe PHAONIINI

Genus *Helina* Robineau-Desvoidy

1830. *Helina* Robineau-Desvoidy, *Mem. pres. div. Sav. Acad. Sci. Inst. Fr.*, 2 : 493. Type-species : *Helina euphemioidea* Robineau-Desvoidy.

Diagnosis : Eyes of male holoptic to sub holoptic, female dichoptic; arista short to long plumose; pre-alar bristle very strong; stpl 1 + 2, or 2 + 2; prosternum and hypopleura bare; r_1 bare, dorsal surface at node of r_{4+5} bare, sometimes bare on both surface; m_{1+2} never upcurved at apex, lower squamae tongue-shaped

Key to the species

1. Fuscous black with rather dense whitish dust, eyes rather densely haired, arista densely plumose, ad

surface of hind tibia with 3 or more setae
..... *nemorum* (Stein)

- Fuscous rather densely dusted pale grey, eyes almost bare, arista not very densely plumose, ad surface of hind tibia with only 2 setae
..... *punctata* (Robineau-Desvoidy)

Helina nemorum (Stein)

1915. *Mydaea nemorum* Stein, *Supplta ent.*, 4 : 19. Type-locality : Formosa.

Distribution : India : Uttarakhand (Mussorie), Himachal Pradesh, Uttar Pradesh, West Bengal.

Elsewhere : Myamnar, Formosa.

Helina punctata (Robineau-Desvoidy)

1830. *Rhorella punctata* Robineau-Desvoidy, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, 2 : 492. Type-locality : France.

Distribution : India : Uttarakhand (Kumaon), Himachal Pradesh, Assam, Madhya Pradesh, Tamil Nadu, Uttar Pradesh, West Bengal.

Elsewhere : Nepal, Holarctic.

Genus *Phaonia* Robineau-Desvoidy

1830. *Phaonia* Robineau-Desvoidy, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, 2 : 482. Type-species : *Phaonia viarum* Robineau-Desvoidy.

Diagnosis : Eyes bare or hairy, holoptic to more or less narrowly separated in male, dichoptic in female; female without proclinate fronto-orbital bristles; arista long plumose or short haired; prst ac present or absent; post dc 3-4; prosternum and pteropleura bare; hypopleura bare or hairy; m_{1+2} straight; lower squama tongue-shaped; fore tibia with or without p-seta.

Key to the species

1. 3 strong post dc, 1 + 1 strong and long acr
..... *kambaitiana* Emden
- 4 strong post dc, 0 + 1 strong acr ... *debilis* Stein

Phaonia debilis Stein

1918. *Phaonia debilis* Stein, *Annls. hist-nat. Mus. natn. hung.*, 16 : 167. Type-locality : Mussoorie.

Distribution : India : Uttarakhand (Mussorie), West Bengal.

Elsewhere : Myanmar, Malaysia.

Phaonia kambaitiana Emden

1965. *Phaonia kambaitiana* Emden, *Fauna. Brit. India, Muscidae*, 1 : 236. Type-locality : Myanmar.

Distribution : India : Uttarakhand (Dehradun), Himachal Pradesh.

Elsewhere : Myanmar.

C. Subfamily MYDAEINAE

Key to the genera

1. Three or four stpl bristles present, arranged in a triangle or quadrilateral; hind tibia with distinct anterodorsal apical bristle at least as long as tibial diameter; lower squama usually narrow, rounded posteriorly, and with its antero-median corner distinctly lateral of margin of scutellum, only rarely broadened and truncated posteriorly..... 2

One or three stpl bristles never in a triangle, either the anterior lacking or the lower lacking and the posterior preceded by a row of bristle-like hairs of decreasing size; hind tibia without anterodorsal apical bristle; lower squama broad, truncate posteriorly, and with its antero-median corner extending under anterolateral corner of scutellum **Graphomya** Robineau-Desvoidy

2. Presutural acrostichal hairs in 4 more or less regular rows, those in outer rows longer and stronger than in inner rows **Hebecnema** Schnabl

- Presutural acrostichal hairs uniform in length or strongly, in 6 or more very irregular rows.....
..... **Myospila** Rondani

Genus **Graphomya** Robineau-Desvoidy

1830. *Graphomya* Robineau-Desvoidy, *Mem. pres. div. Sav. Acad. Sci. Inst. Fr.*, 2 : 403. Type-species : *Musca maculata* Scopoli.

Graphomya maculata (Scopoli)

1763. *Musca maculata* Scopoli, *Ent. Carniolica* : 326. Type-locality : North Yugoslavia.

Diagnosis : Fuscous-black with dense whitish-grey or yellowish-grey dust and a broad black pattern, male with largely testaceous abdomen; head with, densely long-haired, in female moderately long-haired; thorax with the median vitta dusted brownish anteriorly and the paramedian dark vittae in male usually fused behind (rarely also in front of) suture with each other, the black median vitta broader near scutellum and more distinctly extended forward; median spot of scutellum never occupying much less than half its basal width, in male almost or quite fused at base with the lateral spots, its apes exceeding level of discal setae. Abdomen much as in rufitibia but the median spots usually reaching further towards hind margins, the fourth segment with conspicuous oblong-ovate fuscous paramedian spots, the dark spots at middle of each lateral half of the intermediate segments in male restricted to posterior half and on second segment sometimes obsolete; lower calyptera markedly greyish-brown in male and slightly

browned in female; legs fuscous with the tibiae brown to reddish-brown.

Distribution : Uttaranchal (Mussorie), Jammu and Kashmir.

Elsewhere : China, Formosa, Myanmar, Philippines, Ryukyu Is., Sri Lanka.

Genus **Hebecnema** Schnabl

1889. *Hebecnema* Schnabl, *Trudy russk. ent. Obschch.*, 23 : 331. Type-species : *Anthomyia umbratica* Meigen.

Hebecnema umbratica (Meigen)

1826. *Anthomyia umbratica* Meig., *Syst. Besch. Europ. Zweifl. Insekt.* 5 : 88. Type-locality : ? Germany.

Diagnosis : Piceous-black with thin brown dust, thorax with traces of somewhat irregularly defined incomplete vittae, abdomen in male rather densely dusted greyish-brown with a very narrow dark median vitta, which is often vestigial on third and especially fourth segment, in female more glossy, the median vitta broader but less well defined and not reaching posterior segments; head dusted brownish-grey, parafacialia not distinctly dusted whitish in Oriental specimens; eyes in male subcontiguous, arista not very densely short-plumose; anterior mesopleural well developed, auxiliary prostigmal variable, hypopleura bare; wings markedly smoky in male, hardly so in female; calyptera pale brownish-grey with concolorous border and pale golden fringe; halteres dull reddish-yellow; Mid femur with a small a pre-apical, some erect av setulae at base (less numerous in female), and 3-4 pv setae on basal two-fifths, mid tibia with 2(-3) strong p setae; hind femur without pv setae, with 4-6(♂) or 3-4(♀) strong av setae on less than apical half, hind tibia with 1 ad and 1-2 av setae.

Distribution : India : Uttaranchal (Mussorie, Dehradun), Himachal Pradesh, South India, West Bengal.

Elsewhere : Formosa, Hong Kong, Myanmar.

Genus **Myospila** Rondani

1856. *Myospila* Rondani, *Dipterol. Ital. Prodr.*, 1 : 91. Type-species : *Musca mediatubunda* Fabricius.

Myospila bina brunneiofemorata Emden

1965. *Xenosia bina brunneiofemorata* Emden, *Fauna. Brit. India, Muscidae*, 1 : 433. Type-locality : Mussorie.

Diagnosis : Black with rather dense grey; in places somewhat greenish or bluish grey dust; third antennal segment brown at base; thorax with four conspicuous incomplete vittae, which are usually fuscous; abdomen with a pair of conspicuous small brown spots near hind margin of second and third segments; apical part of m...

more strongly upcurved; fore tibia without a p seta, fore femur of male largely infuscated; mid and usually hind femora infuscated on basal half.

Distribution : India : Uttarakhand (Mussorie), Madhya Pradesh.

Elsewhere : None.

D. Subfamily STOMOXYINAE

Genus *Stomoxys* Geoffroy

1762. *Stomoxys* Geoffroy, *Hist. Ins.*, 3 : 538. Type-species : *Conops calcitrans*.

Diagnosis : Genus *Stomoxys* Geoffroy can be distinguished from all other Muscidae by the strongly sclerotized piercing proboscis combined with the short palpi. Eyes bare and vertically elongated, hind margin concave; ar plumose only on upper side; arrangement of ors in female irregular; prst ac indistinct, only 1 to 2 pairs of post ac, prst dc and post dc normally distinct; ia 0 + 1; prsb 1; hb 2-3; ph 1; np2;sa 1; pa 2; as 1; ds 2-3; ls2; prs and pp depression; posterior half of pt and upper part of hp hairy; wings hyaline; r 4 + 5 setulose on dorsal and ventral surfaces; tibiae without any submedian bristles; abdomen ovate-shaped, T5 with long erect hairs.

Key to the species

1. Abdomen spotted, median vittae short and broad *calcitrans* (Linnaeus)
Abdomen with dark transverse bands with or without median vittae *pullus* Austen

**Stomoxys calcitrans* (Linnaeus)

1758. *Conops calcitrans* Linnaeus, *Syst. Nat., Ed.*, 10, 1 : 604.

Material examined : 8 ♀♀, 12 ♂♂, Bhainkhali, Askot, Pithoragarh district, 23.ix.2004, coll. B. Mitra. Alt. 1650 mts.

Diagnosis : Fuscous black with whitish-grey or cinereous-grey pollinosity and some brown dust on the dark thoracic vittae and forming spots on abdomen; eyes in male separated by a quarter head-width or somewhat more, frons very slightly narrowed from vertex to middle, moderately dilated from there to lunula, interfrontalia parallel-sided; in female frons well over a third head-width at vertex; antennae fuscous-brown, apex of second and base of third segment dull reddish-orange; palpi yellowish-orange, only slightly longer than third antennal segment, not reaching fore margin of mouth; thorax with four fuscous vittae, which are somewhat brown-dusted; abdomen with a moderately broad less densely dusted and darker median vitta and

similar fore and hind margins; wings with the setulae on r₄₊₅ not nearly reaching r-m, m strongly up curved and distinctly sinuous near apex; legs fuscous with pale testaceous knees; base of hind femur with only one long hair, which seldom reaches length of femoral diameter, often with 2-3 shorter hairs following upon the long hair, hairs of the av row somewhat stronger and more erect.

Distribution : India : Uttarakhand (Pithoragarh), Manipur, Nagaland, Sikkim.

Elsewhere : Cosmopolitan.

Stomoxys pullus Austen

1909. *Stomoxys pulla* Austen, *Ann. Mag. nat. Hist.*, 8 (3) : 294. Type-locality : Mussoorie.

Diagnosis : Dark chocolate- brown with some brown dust, which is especially noticeable at neck, shoulders and sides. Head with silver-white and pale golden dust on face and pale golden and brown dust on parafrontalia; eyes in male separated by one-ninth head-width, frons somewhat narrowed from both extremities to middle, interfrontalia almost parallel-sided or slightly widened anteriorly, 4-5 times as wide at middle as a parafrontale, the latter linear at middle, very narrow in front and behind, with about 8 inclinate setae on anterior two-thirds and proclinate setulae continuing the row in single file on upper third; antennae wholly fuscous, greyish-orange, longer than antennae, somewhat exceeding fore margin of mouth; thorax with the four vittae distinct in front of suture, where they appear fuscous-brown on brown ground, but broadly suffused and indistinct behind suture; the dust of the abdomen much more uniformly brown, so that the greyish parts do hardly contrast, fourth segment more greyish-dusted with a pair of broad shifting darker vittae; wings conspicuously browned, the setulae on r₄₊₅ fine, exceeding r-m, apex of m conspicuously upcurved and sinuous, lying somewhat proximad of level of apex of r₄₊₅, R₅ at widest part two-and-a-half times as wide as at apex; lower calyptera brown, subopaque; halteres pale reddish-yellow; legs fuscous with pale testaceous knees; v surface of hind femur at base with one long erect setulose hair, which is longer than the femoral diameter, and beyond it with a few shorter half-erect hairs; basal two segments of fore tarsus in male on ad surface with a row of outstanding setulose hairs; each of these is bent in an a direction at its base, so that their main part lies at right angles with the tarsal segment.

Distribution : India : Uttarakhand (Mussoorie).

Elsewhere : None.