

## Diversity and distribution of midge-fauna (Insecta : Diptera) of Jammu, Kashmir and Ladakh Himalaya (India)

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### ABSTRACT

In this paper midge-fauna, including 58 species, belonging to 35 genera, under Nematoceran families, viz. Blephariceridae, Cecidomyiidae, Ceratopogonidae, Chaoboridae, Chironomidae, Deuterophlebiidae, Dixidae and Scatopsidae, have been studied. These midges are occurring in different kinds of habitats (aquatic, semi-aquatic and terrestrial), in diverse areas and localities of Jammu, Kashmir and Ladakh Himalayan regions. The chironomid midges are dominant in these regions, incorporating 38 species under 18 genera, followed by cecidomyiids and blepharicerids, having 8 spp. and 5 spp. respectively. Ceratopogonids and Chaoborids, are represented by 2 spp. each, whereas deuterophlebiid, dixid and scatopsid, with 1 sp. each. Apart from these, about 29 genera, covering 42 new species (undescribed by earlier authors) of chironomid midges, prevalent in Tso Moriri lake of Ladakh region, have also been listed. The larvae of aquatic midges are inhabitants of diverse water bodies of Jammu, Kashmir and Ladakh Himalaya, serving as food for fishes and as valuable bio-indicator of water quality. The database pertaining to different kinds of midges, has been updated in the light of recent systematic and nomenclatural changes. The local distribution and diversity of midge-fauna have been discussed. Besides, an up-to-date annotated check list of valid midge species, has been presented. © 2014 Trade Science Inc. - INDIA

### KEYWORDS

Midge-fauna;  
Check list;  
Distribution;  
Diversity;  
Jammu;  
Kashmir;  
Ladakh;  
Himalaya.

### INTRODUCTION

The adult midges are small to medium-sized insects, with slender body, longer and segmented antennae, and long-legged. The larvae of midges are mostly aquatic, with well developed head capsule. These insects belong to sub-order Nematocera of order Diptera. The midge-fauna of Jammu, Kashmir and Ladakh Himalayan regions of paramount zoo-geographical importance include main families, viz. Blephariceridae (net-winged

midges), Cecidomyiidae (gall / terrestrial midges), Ceratopogonidae (biting midges), Chaoboridae (phantom midges), Chironomidae (non-biting midges), Deuterophlebiidae (mountain midges), Dixidae (dixid midges or meniscus) and Scatopsidae (dung midges). The midges are not only diverse group of insects but have adapted to different ecological habitats (aquatic, semi-aquatic and terrestrial), occurring in vast areas and localities of Jammu, Kashmir and Ladakh region.

The larvae of gall midges and dung midges are ter-

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restrial. The cecidomyiid larvae are known for producing galls in plants and damaging valuable crops. The larvae of non-biting midges, dixid midges, phantom midges, biting midges, mountain midges and net-winged midges are inhabitant of aquatic and semi-aquatic environments. The larvae of some species of chaoborid and cecidomyiid are predaceous, feeding on other small insects. The larvae of blepharicerid and chironomid (blood worm), serve as food for fishes, besides as valuable bio-indicators of water quality. The aquatic midges, have been found to be prevalent in diverse water bodies of Jammu, Kashmir, and Ladakh, like rivers, wetlands, lakes, streams, springs, 'nallas', ponds, marshes and rice fields, etc.

A total of 58 valid species of midges, belonging to 35 genera, 8 families of Infra-orders, viz. Bibionomorpha (8 spp.), Blephariceromorpha (6 spp.), Culicomorpha (43 spp.) and Psychodomorpha (1 sp.), is known to occur in Jammu, Kashmir and Ladakh Himalayan regions of Indian sub-continent. In addition to these species, about 42 new under 29 genera of midges have also been reported from Tso Moriri Lake of Ladakh, however, the details regarding descriptions and confirmation of these new taxa are not available. In this communication, an updated annotated checklist of midge-fauna is provided and faunal diversity, with local distribution, have briefly been discussed. Besides, various genera, covering number of new species (undescribed), pertaining to each genus prevalent in Tso Moriri Lake, have also been listed.

### MATERIALS AND METHODS

The database presented in this communication pertains to species and genera of different kinds of midges-aquatic, semi-aquatic and terrestrial / plant, occurring in diverse localities and areas of Jammu, Kashmir State of Indian sub-continent. The midge-fauna, actually cover three geographically and climatically different regions of this State : i) Jammu (sub-tropical); ii) Kashmir (temperate), including main Himalayan range of Kashmir Valley, Pir Panjal Himalayan range, and iii) Ladakh (cold desert), bounded on the North by eastern range of Karakorum mountain and Tibetan Plateau. The database of these regions, has been updated in the light of latest nomenclatural and taxonomical changes, after consult-

ing various earlier survey reports and other relevant published work, besides online data on the midges of the world.

The synonymies of the taxa are listed under valid species, given in the parentheses in the systematic check list. The references to the authors reporting and describing taxa, are in the form of numbers, given in the square brackets in front of the listed species of different kinds of midges, belonging to various Nematoceran families. The details of references, in accordance with numbers, are cited in the reference section of the text. In addition to these, abbreviations in connections with local distribution of midge-fauna, have been used, cited under the valid species and also in parentheses. The keys to the abbreviations are given at the end of the systematic check list. In future, a more comprehensive study on the monitoring of chironomid midges, based on the fresh field collections, especially of those belonging to Kashmir region, is required to confirm the local distribution as well as for the identification of taxa up to the species level, of the listed species in the present check list.

### RESULTS AND DISCUSSION

#### Systematic check list

##### ORDER : NEMATOCERA

##### INRA-ORDER 1 : BIBIONOMORPHA

##### Family 1 : Cecidomyiidae (Gall midges)

##### Subfamily 1 : Cecidomyiidae

##### Tribe 1 : Cecidomyiini

1. *Dicrodiplosiscylindriciformis* Kashyap<sup>[20,21,25]</sup>  
Distribution : K (Sri)

2. *Holobremiacylindrica* Kashyap<sup>[20,21,24]</sup>  
Distribution : JK

3. *Orseoliaoryzae* (Wood-Mason)<sup>[5]</sup>  
Host : Rice (*Oryzasativa*)  
Distribution : JK

##### Tribe 2 : Aphidoletini

4. *Aphidoletesaphidomyza* (Rondani)<sup>[3,6]</sup>  
Hosts : Aphid species on various host plants: *Aphis* (A.) *craccivora* Koch on *Robinia pseudoacacia*, A. (A.) *fabaesolanella* Theobald on *Rumex nepalensis*, A. (A.) *gossypii* Glover on Buckwheat, *Fagopyrum* spp. (*F. esculentum*, *F. kashmiranum*, *F. sagittatum*);

*A. pomi* De Geer on *Prunus domestica*, *A. (A.) spiraecola* Patch on *Rubus antennifer*, *Chaetosiphon* sp. on *Rosa macrophylla*; *Capitophorus hippophaes* on *Carduus edelbergii*, *Macrosiphum (M.) rosae* Linnaeus on cultivated rose, *Rhopalosiphum* sp. on *Prunus* sp.

Distribution : K

**Tribe 3: Mycodiplosini**

5. *Coquillettomyia longicurvatus* Kashyap<sup>[20,21,23]</sup>  
Distribution :

**Tribe 4 : Lasiopteridi**

6. *Cystiphora taraxacii* Kieffer<sup>[53]</sup>  
Host : *Taraxacum officinale* Weber  
Distribution : K

**Subfamily 2 : Porricondyliinae**

**Tribe : Porricandylini**

7. *Parepidosis rectangularis* Kashyap<sup>[20,21,26]</sup>  
Distribution : K (Sri)
8. *Porricondylas rinagarensis* Kashyap<sup>[20,21,26]</sup>  
Distribution : K (Sri)

**INFRA-ORDER 2: BLEPHARICEROMORPHA**

**Family 1: Blephariceridae (Net-winged midges)**

**Subfamily: Blepharicerinae**

**Tribe : Blepharicerini**

9. *Bibliocephala* sp.<sup>[22]</sup>  
Distribution : K (Kmc)
10. *Blepharicera asiatica* (Brodsaky)<sup>[54]</sup>  
(=*Blepharocera kuenlunensis* Lackschewitz)<sup>[32]</sup>  
Distribution : L
11. *Blepharicera indica* (Brunnetti)<sup>[9,32,54]</sup>  
Distribution : L (Sat)
12. *Blepharicera* sp.<sup>[12,17]</sup>  
Distribution : K (Lid, Sin); J (Ban- Bishleri Stream)
13. *Philorus bionis* Agharkar<sup>[2]</sup>  
Distribution : K

**Family 2: Deuterophlebiidae (Mountain Midges)**

14. *Deuterophlebia mirabilis* Edwards<sup>[14]</sup>  
Distribution : K (Gan)

**INFRA- ORDER 3. CULICOMORPHA**

**Family 1 Ceratopogonidae (Biting midges)**

15. *Culicoides* sp.<sup>[35,44,45]</sup>  
Distribution : K (Jeh-Zer, Chh; Dal, Man, Anc, Nar)
16. *Bezzia* sp.<sup>[1,8]</sup>

Distribution : K (Jeh, streams Son)

**Family 2: Chaoboridae (Phantom midges)**

**Subfamily : Choaborinae**

17. *Chaoborus flavicans* Meigen<sup>[38]</sup>  
Distribution : J (Sur)
18. *Chaoborus* sp.<sup>[31,44,45]</sup>  
Distribution : K (Anc, Dal, Man, Nar, Nil, Jeh-Chh, Zer)

**Family 3 : Chironomidae (Non-biting midges)**

**Subfamily 1 : Chironominae**

19. \**Chironomus circumdatus* Kieffer<sup>[36,50]</sup>  
Distribution : J (Uni, Suc)
20. \**Chironomus* nr. *flavipilum* Tokunaga<sup>[36]</sup>  
Distribution : J (Bis)
21. \**Chironomus incertipennis* Chaudhuri and Das<sup>[36,41]</sup>  
(=*Chironomus plumosus* Chernovsky)<sup>[27,30,42,47,51]</sup>  
Distribution : J
22. \**Chironomus (Astrachironomus) javanus* Kieffer<sup>[36]</sup>  
(=*Chironomus javanus* Kieffer)<sup>[36]</sup>  
Distribution : J
23. \**Chironomus kiienensis* Tokunaga<sup>[36]</sup>  
Distribution ; J
24. \**Chironomus samoensis* Edwards<sup>[29,36]</sup>  
Distribution : J (Bis, Deo, Gad, San)
25. \*\**Chironomus pseudothummi* Str.<sup>[49]</sup>  
Distribution ; J
26. \**Chironomus striatipennis* Kieffer<sup>[28]</sup>  
Distribution : J
27. *Chironomus* spp.<sup>[4,7,8,16,17,31,35,36,44,45]</sup>  
Distribution : J (Deo, Kab, Man ; stream in Bani; stream in Gad); K (Anc, Dal ; Jeh and its tributaries – Chh, Gant, Kha, Poh, Ram, Uri, Zer, ; Man, Nar, Nil; Rice fields in districts – Ana, Bud, Ban, Pul, Kup, Sri; springs in Kul- Khu, Nag, Thu ; streams in Son).
28. *Cryptochironomus* sp.<sup>[40]</sup>  
Distribution : J
29. *Glyptotendipes* sp.<sup>[22]</sup>  
Distribution : K (Yus- Doo, Kmc)
30. *Himatendipes glacies* (Tokunaga)<sup>[37,46]</sup>  
Distribution : K
31. *Micropspectra chandrarolensis* Mahehwari & Maheshwari<sup>[33,34]</sup>  
Distribution : L (Tso)
32. *Micropspectra chanderi* Maheshwari &

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- Maheshwari<sup>[33,34]</sup>  
Distribution : L (Tso)
33. *Micropspectraglacies* Maheshwari & Maheshwari<sup>[33,34]</sup>  
Distribution : L (Tso)
34. *Micropspectrahimachali* Maheshwari & Maheshwari<sup>[33, 34]</sup>  
Distribution : L (Tso)
35. *Micropspectralahulensis* Maheshwari & Maheshwari<sup>[33, 34]</sup>  
Distribution : L (Tso)
36. *Micropsepectraspatulata* Maheshwari & Maheshwari<sup>[33, 34]</sup>  
Distribution : L (Tso)
37. *Pseudochironomus* sp.<sup>[31]</sup>  
Distribution : K (Dal, Nil)
38. *Strictochironomus* sp.<sup>[48]</sup>  
Distribution : J (Gad)
39. *Tanytarsussinuatus* Goetghebuer<sup>[37]</sup>  
Distribution : L (Dra)  
**Subfamily 2 : Diamesinae**  
**Tribe : Diamesini**
40. *Diamesa (Diamesa) aberrata* Lundbeck<sup>[55]</sup>  
(=*Diamesaaberrata* Lundbeck)<sup>[39]</sup>  
Distribution : K (Har, Gan)
41. *Diamesakasulica* Pagast<sup>[39]</sup>  
Distribution ; K (Gan, Har)
42. *Diamesatenuipes* Goetghebuer<sup>[39]</sup>  
Distribution :
43. *Diamesasp.*<sup>[8,52]</sup>  
Distribution :
- Subfamily 3: Orthocladiinae**
44. *Cricotopus* sp.<sup>[8,37]</sup>  
Distribution : K (Gan, Son)
45. *Eukiefferiellahalvorseni* Casper<sup>[10,37]</sup>  
Distribution : K (Har)
46. *Krenosmittia?labellum* ( Maheshwari & Maheshwari)<sup>[33,34]</sup>  
Distribution : L (Tso)
47. *Krenosmittia?lamminansis*<sup>[33,34]</sup>  
Distribution : L (Tso)
48. *Krenosmittia?longulusi*<sup>[33,34]</sup>  
Distribution : L (Tso)
49. *Paracladiusalpicola* (Zetterstedt)<sup>[37]</sup>  
Distribution : L (Leh-Khal)
50. *Paracladius* n.sp.(undescribed)<sup>[37]</sup>  
Distribution : L (Leh- Khal)
51. *Paratrachocladusrufiventris* (Meigen)<sup>[37]</sup>  
Distribution : K (Gan)
52. *Smittia ?spicai*<sup>[33,34]</sup>  
Distribution : L (Tso)
53. *Smittia ?spiculumiensis*<sup>[33,34]</sup>  
Distribution : L (Tso)  
Subfamily 4 : Prodiamesinae
54. *Monodiamesasp.*<sup>[52]</sup>  
Distribution : K (Jeh. and its tributaries – Gant., Kha, Poh, Ram, Zer)  
**Tribe : Pentaneurini**
55. *Pentaneura* sp.<sup>[35,44,45]</sup>  
Distribution : J (Man); K (Anc, Jeh- Chh, Zer; Man, Nar)  
\*\*\*Chironomidae = Tendipedidae
56. *Tendipesatrella* Townes<sup>[12,31]</sup>  
Distribution : K (Dal, Lid, Nil and Sin)  
**Family 4. Dixidae (Dixid midge or Meniscus)**
57. *Dixaplatystyla* Edwards<sup>[15,43]</sup>  
Distribution : K  
**INFRA-ORDER 4: PSYCHODOMORPHA**  
**Family : Scatopsidae (Dung midge)**  
**Subfamily : Psectrosciariinae**
58. *Anaspauskashmirica* Freeman<sup>[19]</sup>  
Distribution : K (Gul)  
*Key to above given abbreviations* : Ana-Anantnag District of Kashmir, Anc- Anchar Lake, Band-Bandipore district of Kashmir, Bani- Banihal, Bis-Bishleri stream, Bish- Bishnah wetland, Bud-Budgam district of Kashmir, Bun – Buniyar 'Nalla', Chh- Chhatabal, Dal- Dal lake, Deo- Deolo village, Doo- Doodganga stream, Dra- Drass, Gad-Gadigarh, Gan- Gangbal, Gant- Gantmulla, Gul-Gulmarg, Har- Harmukh, J-Jammu Province, Jeh-Jehlum River, JK- Jammu and Kashmir State, K-Kashmir Province, Kar- Kargil, Kha- Khanabal, Kab- Kabir colony, Khal- Khalsi, Khu- Khudnag spring, Kmc- Khanshah Manshah canal, Kul – Kulgam, Kup- Kupwara district, L- Ladakh Province, Leh- Leh district, Lid- Lidder stream, Man-Manasbal Lake, Nag- Nagrad spring, Nar-Naranagh wetland, Poh- Pohru Nalla, Pul- Pulwama district, Ram- Rambiar 'Nalla', San- Sangrampur, Sat- Satpura Tso, Sin – Sind stream, Son- Sonmarg, Sri- Srinagar district, Suc- Suchetgarh, Sun-

Sundran'Nalla', Sur- Surinsar Lake, Tso- Tso Moriri Lake, Tum- Tumbernag spring, Uni- Uni- university campus, You- Yousmarg, Zer- Zero Bridge.

\*indicates pseudothummi- cytocomplexchironomid species, cytologically confirmed

\*\* indicate pseudothummi- cytocomplexchironomid species

\*\*\* indicate family Tendipedidae is being suppressed in favour of chironomidae

### Bibliomorphan midges (cecidomyiidae)

Eight species of gall midges are found to be prevalent in Jammu and Kashmir region, belonging to sub-family Cecidomyiinae (6 spp.) and Porricondyliinae (2 spp.). The cecidomyiids are not only inducing galls in plants but also damaging crops, and other economically important plants, besides as an important predator of aphids (plant lice). The Asian rice-gall midge, *Orseoliaoryzae* is a major pest of rice (*Oryzasativa*) in Jammu and Kashmir<sup>[51]</sup>. *Cystiphorataraxaiis* reported to be causing mines in the leaves of herb, *Cystiphorataraxaii* in Kashmir region<sup>[53]</sup>. *Aphidoletesaphidomyza* is an important predator of aphids in its larval stages and also as polyphagous, including number host plant species. In Kashmir valley, *A.aphidomyza* is found to be a predator of aphid pest, *Aphis gossypii*, damaging Buckwheat. In addition to this, it is also an important predator of number of other species of aphids, damaging fruit crops, medicinal plants and other host plant species. The details of host aphid- complex of *A. aphidomyza*, on various plant species are given in the systematic Check list. This gall midge possesses potential as a biological control agent of aphid pests of economic importance.

### Blephariceromorphan midges (blephariceridae and deuterophlebiidae)

Net-winged midges, belonging to the family Blephariceridae of Jammu, Kashmir and Ladakh region, are represented by 5 species. These midge species are: *Bibliocephala* sp., prevalent in the streams of Yousmarg (Kashmir); *Blephariceraasciatica* and *B. indica*, reported from high-altitude water bodies of Ladakh; *Blepharicerasp.* showing distribution in the Sind and

Lidder stream of Kashmir, and Bishleri stream in Banihal locality of Jammu region. In addition to these, *Philorusbionis*, has been found to be occurring in the streams in Kashmir region. Mountain midge, *Deuterophlebia mirabilis* (Deuterophlebiidae), has been observed to inhabit high-altitude lake, Gangbal in Kashmir.

### Culicomorphan midges (Ceratopogonidae, Chaoboridae, Chironomidae, Dixidae) and Psychodomorphan midge (Scatopsidae)

Phantom midges (Chaoboridae) and biting midge (Ceratopogonidae) of Jammu and Kashmir include two species each. Choaborids, *Chaoborusflavicans*, has been reported from Surinsar Lake of Jammu, whereas *Chaoborus* sp. showed wide occurrence in Dal, Manasbal, Nilnag and Anchar lakes, besides Naranag wetland and river Jehlum of Kashmir.

Ceratopogonids (biting midges), viz. *Culicoides* sp. and *Bezzia* sp., found to be widely prevalent in river Jehlum, Dal, Manasbal and Anchar lake, besides streams of Sonamarg and Naranag wetland. The *Culicoides* is a potential vector of Blue tongue (BT) disease of sheep, other domestic animals and wild ruminants. BT disease is reported from Jammu and Kashmir State, caused by Blue tongue virus (BTV). This economically important disease is not only endemic to this region but also has potential to spread rapidly and the particular species of *Culicoides* involved in the transmission of this disease has not been identified<sup>[56,57]</sup>. Dixid midge or Meniscus, *Dixaplatystyla* (Dixidae) is reported to occur in the aquatic environment of Kashmir.

Chironomid midges (non-biting midges) are the most tolerant aquatic insects to water and air temperature and also exhibit extreme elevational ranges, occurring in glacial melt streams in the Himalayan mountains<sup>[18]</sup>. Earlier, the check list of chironomid midges of Indian Sub-continent given by Chaudhuri et al. (2001), listed a total of 313 species of chironomids under 59 genera, belonging to four sub-families<sup>[11]</sup>.

A total of about 38 species, pertaining to 18 genera of non-biting midges, belonging to family Chironomidae, under three sub-families, viz. Chironominae (21 spp.), Orthocladiinae (10 spp.), Diamesinae (4 spp.), Prodiamesinae (1 sp.) and Tanypodinae (1 sp.), besides,

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*Tendipesatrella* (Tendipedidae = Chironomidae), unplaced in any sub-family, are known to occur in vast localities, in diverse water bodies of Jammu, Kashmir and Ladkakhimalayan regions (see systematic annotated checklist). The dominant sub-family, Chironominae, incorporated as many as 21 spp., belonging to 8 different genera, viz. *Chironomus* (9 spp.), *Microspectra* (6 spp.) and *Cryptochironomus*, *Glyptotendipes*, *Himatendipes*, *Strictochironomus*, *Pseudochironomus* and *Tanytarsus*, having 1 sp. each (see Check list).

The sub-family Chironominae is followed by sub-families Orthoclaadiinae and Diamesinae in dominance, with 10 spp. (6gen.) and 4 spp. (1 gen.) respectively. Rest of the sub-families contain 1 species, belonging to 1 genus each. The 9 species belonging to genus *Chironomus*, prevalent in different water bodies of Jammu region, as pseudothummi- cyto complex species stand cytologically confirmed<sup>[36]</sup>. These species are marked with astrisk, listed in the afore given systematic checklist. An in-depth investigations was carried out on Chironomidae of Tso Moriri lake, largest of high-altitude lakes in the Trans Himalayan region of India, situated in Changthang area in Ladakh by Maheshwari and Maheshwari (2003a,2003b)<sup>[33,34]</sup>. These authors have revealed several peculiar new chironomids of this lake, belonging to sub- families, viz. Chironominae, Orthoclaadiinae and Podonominae. Theses cover a total of 42 undescribed new species(26 spp. of Orthoclaadiinae,15spp. of Chironominae and 1 sp. of Podominae). The detailed descriptions of these new taxa are not available. The various genera, with total number of species (new), belonging to these families are listed as under:

I.Orthoclaadiinae :*Abiskomyia* (2n.spp.), *Chasmatonotus* (1 sp.), *Clinocladus* (1n.sp.), *Cricotopus* (1n. sp.), *Eukiefferiella* (1n.sp.), *Heterotrissocladus* (1n.sp.), *Nanocladus* (1n.sp.), *Oliveridia* (1n.sp.), *Oreadomyia* (1n.sp.), *Orthocladus*(1n.sp.), *Paracladius*(1n.sp.), *Paraphaenocladus*(1n.sp.), ?*Plecopterocladius* (1 sp.), *Psectrocladius* (1n. sp.),*Rheocericotopus* (1n.sp.), *Symbiocladus* (8n.spp.), *Thienemanniella*(1n.sp.) and *Zalutschia*(1n.sp.)

II.Chironominae :*Cryptochironomus* (1n. sp.), *Dicrotendipes* (1 n. sp.),*Kifferulus* (1 sp.), *Lenziella*(2

spp.), *Microspectra*(2 n.spp.), *Neostempellina* (1n. sp.), *Xenochironomus*(1 n.sp.)

III.Podonominae : *Paraboreochlus* (1 n.sp.).

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