

Dichotomous key for identification of Indian sandfly species (Diptera:Phlebotomidae)

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Abstract: Sandflies are the tiny haematophagous dipter insects of suborder Nematocera belonging to family Phlebotomidae, subfamily Phlebotominae. Fauna of Indian sub-zone is represented by 46 species, of these, 11 belong to *Phlebotomus* species and 35 to *Sergentomyia* species. Various classification systems for phlebotomine sandflies have been proposed since Newstead 1911, inclusive of the classifications given by Abonnenc, Davidson, Fairchild, Leng, Lewis, Quate, and Theodor. However, despite this immense literary work, there is no universal concurrence regarding the ranking of taxa above the species level. Therefore, A key is being formulated for Indian elements and the key has been run many time to confirm its validity.

Key words: Dichotomous key, Indian, Phlebotomidae

Introduction: The following dichotomous key was formulated after the taxonomic identification of each reported species. This key when coupled with the taxonomic descriptions and the mitochondrial COI sequences (discussed later in the thesis) forms the best tool for the identification of any new or pre existing sand fly species.

Key for Indian Genera of family Phlebotomidae

1. Posterior part of abdominal tergites II to tergite VI furnished with erect hairs; Cibarial teeth absent or if present in form of minute spicules scattered irregularly; Wing broad with unequal anterior and posterior margins..... Genus *Phlebotomus*
- Posterior part of abdominal tergites II-VI with recumbent hairs; Cibarial teeth present, arranged in definite row; Wing lanceolate in shape with similar anterior and posterior margins..... Genus *Sergentomyia*

Key for Males:

Key for Subgenera of genus *Phlebotomus*

2. Elongated terminalia; Gonostyle with 5 small spines; Gonocoxite having stout, elongated setae distally and tiny basal protuberance; Paramere with 2 long protuberance dorsally; Surstylus with small spines..... Subgenus *Phlebotomus*...4
- Short or medium-sized terminalia; Gonostyle with 4 or 5 long spines; Gonocoxite without setae distally and with or without large basal protuberance; Paramere with or without small ventral protuberance; Surstyle without spines..... 3
3. Gonostyle bearing 4 spines, Gonocoxite with basal protuberance and Paramere without ventral protuberance Subgenus *Paraphlebotomus* (one sp. *P. alexandri* Sinton)
- Gonostyle bearing 5 or 6 spines, Gonocoxite without basal protuberance, Aedeagus small, with an elongated lateral spine; Paramere with 1 or ventral processes of a protuberance Subgenus *Euphlebotomus* (one sp. *P. argentipes* Annandale & Brunette)

Key for various Species of subgenus *Phlebotomus*

4. Number of spines on surstyle two, two basal spines of gonostyle much closer to each other than to the terminal spines..... *P. papatasi* Scopoli
- Number of spines on surstyle more than three, Surstyle with 5 small apical spines; Position of 5 spines on gonostyle: 2 terminal, 1 sub-terminal, 1 at distal 1/6th and last 1 at distal 1/3rd *P. duboscqi* Neveu- Lemaire

Key for Subgenera of Males of genus *Sergentomyia*

5. Aedeagus stout and finger-like in appearance; Paramere with somewhat hooked or blunt ends..... Subgenus *Sergentomyia* ...9
- Aedeagus narrowing to the apex; Paramere with hooked ends 6
6. A₃ without ascoid; Genital filament with dilated apices..... Subgenus *Grassomyia* (one sp. *S. indica*)
- A₃ with one ascoid; Genital filament with narrow apices..... 7
7. Aedeagus with blunt apex..... 8
- Aedeagus with pointed apex..... Subgenus *Sintonius*... 11
8. Paramere with a ventral tubercle covered with hairs; genital filaments with prominent transverse striations..... Subgenus *Rondomyia* (one sp. *S. hodgsoni* Sinton)
- Paramere without any tubercle; Genital filament with or without transverse striations..... Subgenus *Parrotomyia* ... 12

Key for various Species of subgenus *Sergentomyia*

9. Cibarium with approximately 18 cibarial teeth uniform in size 10
- Cibarium with approximately 15-18 cibarial teeth non-uniform in size, lateral teeth larger than the central ones *S. theodori* Parrot
10. Chitinous arch present but ill developed; finger-shaped aedeagus slightly curving downwards *S. dentata* Perfiliev

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- Chitinous arch absent; finger-shaped aedeagus not curving downwards *S. punjabensis* Sinton

Key for various Species of subgenus *Sintonius*

11. Cibarial cavity with 4-7 comparatively large cibarial teeth *S. christophersi* Sinton
- Cibarial cavity with 18-24 small, irregularly arranged cibarial teeth *S. clydei* Sinton

Key for various Species of subgenus *Parrotomyia*

12. Cibarial cavity with about 17 tiny cibarial teeth arranged uniformly on single row; pigment patch absent *S. babu* Annandale
- Cibarial cavity with about 20 hardly visible cibarial teeth vaguely arranged on two rows; Pigment patch small, round, light in color *S. baghdadis* Adler and Theodor

Key for Females:

Key for Subgenera of genus *Phlebotomus*

13. Spermatheca with uniform segmentation; Spermathecal capsule approximately round, Spermathecae without neck 14
- Spermatheca with non-uniform segmentation; Spermathecal capsule spindle-like..... Subgenus *Adlerius*...17
14. Spermathecae with enlarged apical segment and distinguished from other segments by deep furrow.....15

- Apical segment of spermathecae not distinguished from other segments..... 16
- 15. Spermathecae with 2-9 segments..... Subgenus *Paraphlebotomus* ...18
 - Spermathecae with more than 15 segments.....Subgenus
Euphlebotomus (one sp. *P. argentipes* Annandale & Brunette)
- 16. Spermathecal head enlarged..... Subgenus *Phlebotomus* ...19
 - Spermathecal head narrow.....Subgenus *Synphlebotomus* (one sp. *P. eleanorae* Sinton)

5.2.1.1 Key for various Species of Subgenus *Adlerius*

- 17. Spermathecae with 15-16 irregular segments and characteristically long neck..... *P. longiductus* Parrot
- Spermathecae elongated yet ovoid, incompletely segmented with small apical knob and thick individual duct *P. chinensis* Newstead

Key for various Species of Subgenus *Paraphlebotomus*

- 18. Spermathecae 7-9 segmented; Spermathecal duct without serrations; Flagellomere I<Flagellomere II+Flagellomere III..... *P. alexandri* Sinton
- Spermathecae 5-6 segmented; Spermathecal duct with fine striations; Flagellomere I>Flagellomere II+Flagellomere III..... *P. sergenti* Parrot

Key for various Species of Subgenus *Phlebotomus*

19. Pharyngeal armature in form of blunt teeth directing downwards at an angle *P. bergeroti*
Parrot
- Pharyngeal armature in form of irregular squamae 20
20. Spermathecae with more than 8 segments *P. papatasi* Scopoli
- Spermathecae with 7-8 segments 21
21. Spermathecae narrowing towards its base *P. salehi* Mesghali
- Spermathecae cylindrical, not narrowing towards base *P. duboscqi* Neveu- Lemaire

Key for Subgenera of genus *Sergentomyia*

22. Spermathecae with uniform segmentation..... Subgenus *Sintonius*... 25
- Spermathecae without uniform segmentation 23
23. Spermathecae with some faint segmentation at the apex Subgenus
Neophlebotomus (one sp. *S. puri* Sinton)
- Spermathecae without any segmentation 24
24. Spermathecal capsule with thick envelop, Antennal formula 1/ 3-15; Spermathecal envelop without any striations over it Subgenus *Parrotomyia*... 26

- Spermathecal capsule tubular, without envelop, Spermathecae with smooth surface Subgenus *Sergentomyia*(one sp. *S. punjabensis* Sinton)

Key for various Species of subgenus *Sintonius*

- 25. Cibarial cavity with 15-16 large, distinctly pointed cibarial teeth *S. clydei* Sinton
- Cibarial cavity with 5 long, pointed, prominent cibarial teeth *S. christophersi* Sinton

Key for various Species of subgenus *Parrotomyia*

- 26. Ventral plate with distinct angular notch; cibarial cavity with much prominent sharp cibarial teeth 27
- Ventral plate without angular notch; cibarial cavity with comparatively less prominent cibarial teeth 28
- 27. Cibarial teeth 26-32 in number, equal in size *S. babu* Annandale
- Cibarial teeth 16-20 in number, un-equal in size, 4-5 centrally located cibarial teeth smaller in size *S. baghdadis* Adler and Theodor
- 28. Pharyngeal armature very peculiar in form of three bunches of long scales with pointed apices *S. kauli* Lewis
- Pharyngeal armature not as above *S. montana*Sinton

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