



A report on two new and two unrecorded species of *Drosophila* from Mukteshwar, Kumaon, India (Diptera: Drosophilidae)

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ABSTRACT: Taxonomic description of two new species viz., *Drosophila mukteshwarensis* and *Drosophila sargakhetensis* and new distribution records of *Drosophila hubeiensis* Sperlich and Watabe, 1997 and *Amiota pseudotau* Toda and Peng, 1990 is given. A list of Drosophilidae collected from Mukteshwar is also provided.

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KEYWORDS: *Drosophila*, Drosophilidae, new species, new records, Kumaon, India

The first use of the family name Drosophilidae was probably by the German dipterist, Hermann Lowe, in several papers published in 1862. The family contains nearly 3600 species around the world (Wheeler, 1981, 1987 and unpublished, Bächli, 1998). The members of the family Drosophilidae particularly the genus *Drosophila* occupy very important position among the organisms that are used as material for genetics studies. The Indian Drosophilid fauna has been studied extensively in recent years and most areas have been covered in collections (Gupta (1969, 1970, 1971, 1972); Gupta and Ray-Chaudhuri (1970a,c); Gupta and Singh (1977, 1979); Singh and Gupta (1977a,b, 1981); De and Gupta (1996a,b); Reddy and Krishnamurthy (1968, 1970)).

Mukteshwar (29° 28'N lat. and 79° 39' E long.) in Kumaon region, a hilly area is located at an elevation of about 2250 meter (7,500 feet) amsl. The area is characterized by having dense evergreen Oak forest (*Quercus floribunda*) with medium to steep slopes. The forest vegetation consists of broad leaved and coniferous species and extremely moist condition due to heavy rainfall. Although some of the areas have been surveyed and have yielded very interesting results (Singh and Bhatt, 1988; Singh and Negi, 1989, 1992, 1995, Singh *et al.*, 2000, 2004; Fartyal and Singh, 2004), still a vast area of Kumaon region is unknown for its Drosophilid fauna. Looking into the

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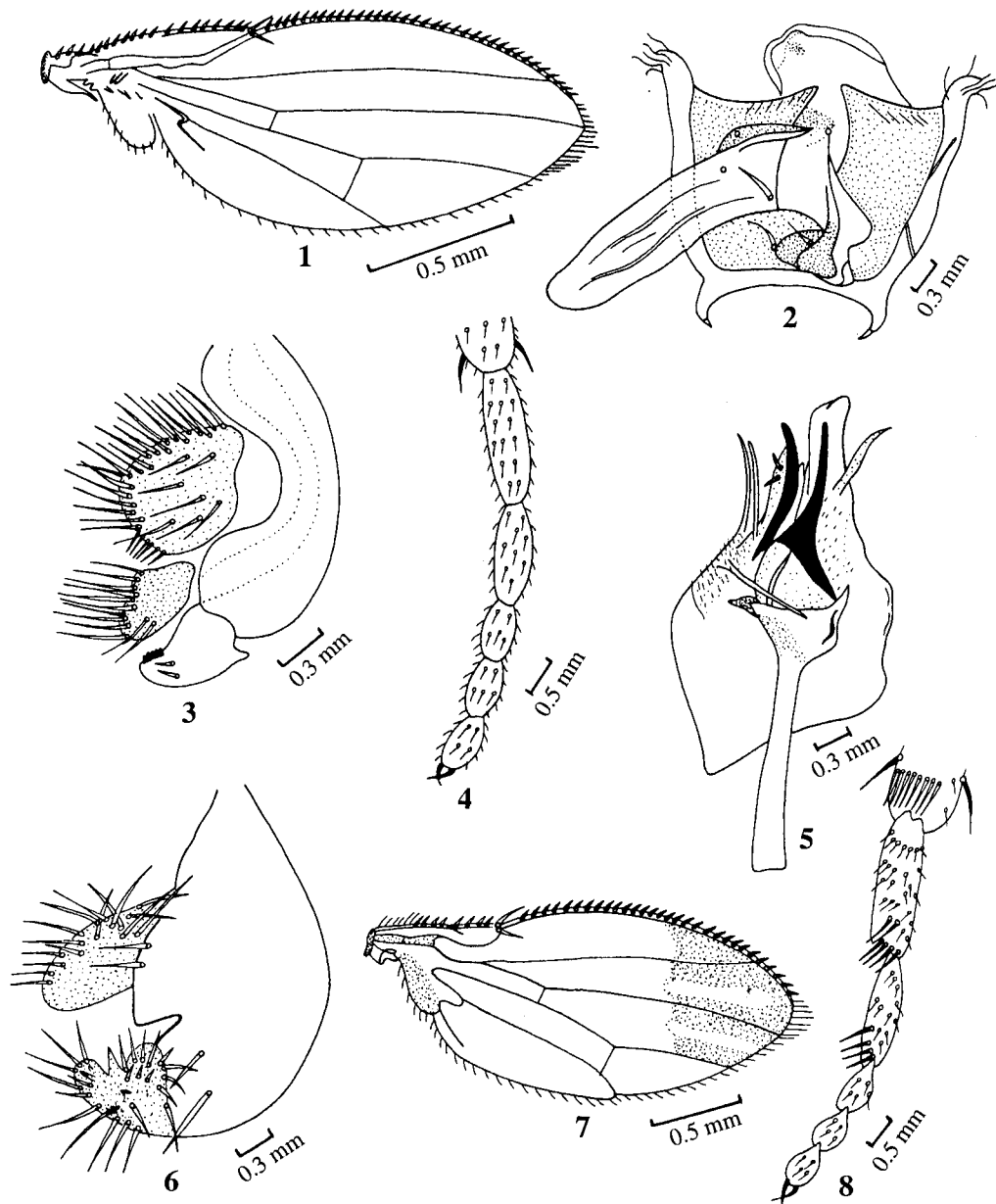


FIGURE 1. (1)–(4): *Drosophila mukteshwariensis* sp. nov. (1) wing; (2) phallic organs; (3) periphallic organs; (4) foreleg (σ). (5)–(8): *Drosophila sargakhetensis* sp. nov. (5) phallic organs; (6) periphallic organs; (7) wing; (8) foreleg (σ).

above situation Drosophilidae of Mukteshwar was surveyed which has yielded two new species and two new records from this region.

The Drosophilid flies were collected at several collecting stations in Mukteshwar. Following two methods were employed to collect Drosophilid flies. (1) Trap-bait and (2) Net-sweeping methods.

The collected flies were etherized, categorized and the species were identified under Wild-Leitz- Stereozoom Microscope. The males were studied as such but the individual females, which could not be identified, were isolated and allowed to breed in separate vials containing standard laboratory food medium. The progeny obtained from such single gravid females were used for species identification. Camera Lucida drawings of taxonomic characters of the species were made.

In general, descriptions of different species were based on adult specimens. The terminology used in the descriptions of *Drosophila* species, periphallid and phallic organs is as proposed by Sturtevant (1942), Hsu (1949) and McAlpine (1981) respectively.

Genus *Drosophila* Fallén

Drosophila Fallén, 1823. p. 4. Type species *Musca funebris* Fabricius, 1787, by subsequent designation (Zetterstedt), type locality, Europe.

Diagnosis

Arista usually plumose (exceptionally with reduced rays, never micropubescent), anterior reclinate orbital setae small, postvertical setae well developed, scutellum typically with 6 or more rows of acrostichal setulae and two pairs of dorsoventral setae, prescutellar setae enlarged or not, sternopleuron with up to 3 microchaetae.

Subgenus Drosophila Fallén S. Str.

Subgenus *Drosophila* Fallén S. Str. *Drosophila* Fallén, Diptera, Sveciae Geomyz. 2:4
Type species: *Musca funebris* Fabricius.

Diagnosis

Gena often broad: subvibrissal setae large, prescutellar setae not or barely, enlarged; propleural bristles absent, apical bands on anterior abdominal tergites when present, usually interrupted in the middle. Usually rather large species.

Drosophila (Drosophila) mukteshwarensis sp. nov

Average length of body: 3.60 mm (σ).

Diagnosis

Aedeagus long and broad, aedeagal dorsal process small, ca.7, prenisetae arranged in nearly straight or slightly concave row on surstylus.

Head, ♂

Arista with about 3 upper and 2 lower branches in addition to terminal bifurcation. Antenna with pedicel and flagellomere grayish brown. Frons including the ocellar triangle blackish brown. Orbitals in the ratio 11 : 8 : 16. Facial carina brownish yellow. Palpus light brown, vibrissa prominent and subvibrissal setae equal. Gena yellow, greatest width of gena 0.16 the greatest diameter of eye. Eyes bright red.

Thorax ♂

Brown in colour with light yellow linings. Acrostichal setulae regular in 8 rows. Anterior scutellars convergent and crossing each other, posterior parallel. Scutum light brown and scutellum gray with 4 yellow patches. Ventral part of scutellum dark brown. Sterno-index 0.81. Thoracic pleura light brown. Legs dark brown. Preapicals on all three tibiae, apicals on first and second tibiae [Fig. 1(4)].

Wings, ♂ [Fig. 1(1)]

Wing clear, posterior cross (dM-Cu) vein slightly fouscous. C₁ setulae two, equal, C₃ fringe 0.50. Average wing vein indices C-index 3.60; 4V-index 1.61; 4C-index 0.71; 5X-index 1.67. Haltere stem brown and knob pale yellow.

Abdomen, ♂

Abdominal tergites yellowish brown. 1st, 2nd and 3rd abdominal tergites with light brown bands and 4th, 5th and 6th abdominal tergites with dark brown bands in male interrupted in the middle, 6th not interrupted.

Male terminalia, (Periphallic organs, Fig. 1(3))

Epandrium brown not pubescent; cardoventrally broad and inner surface of epandrium concave. Epandrium with one ventral lobe with about 11–12 hair or spines. Surstylus with about 6–7 prensisetae arranged in nearly straight or slightly concave row. Cercus oval pubescent with 7 small and stout hair and about 28 long setae.

Phallic Organs, [Fig. 1(2)]

Aedeagus long and slender, basal apodeme half the length of aedeagus. Parameres leaf like with two apical sensilla. Gonopod fused. Hypandrium somewhat quadrate and ventrally slightly tapering, upper caudo dorsal margin with several fine hair.

Holotype, ♂

India: Uttaranchal, Kumaon, Nainital district, Mukteshwar, 26 August 2000 coll. Joshi (DZKU).

Paratype, 08♂

Same data as the holotype. Deposited in the department of Zoology, Kumaon University, Nainital.

Distribution

India (Uttaranchal, Kumaon, Nainital district, Mukteshwar).

Relationship

This species closely resembles *D. curviceps* Okada and Kurokawa in the structure of its aedeagus but distinctly differs from it in many other details.

Etymology

In reference to the type locality of this species.

Subgenus *Sophophora* Sturtevant

Sophophora Sturtevant, 1939, *Proc. Nat. Acad. Sci.*, **25**: 139. Type species *Drosophila melanogaster* Meigen, 1830; type locality: Austria and Germany.

Diagnosis

Apical bands on anterior abdominal tergites, when present, not interrupted in the middle; subvibrissal setae relatively large; gena usually relatively narrow; prescutellar setae absent; propleural setae absent.

***Drosophila sargakhetensis* sp. nov.**

Average length of the body: 2.6 mm (♂).

Diagnosis

Antenna, upper half of frons, clypeus and palpus blackish; thoracic pleura, fore coxa, femur and abdominal tergites dark brown; lower half of frons milky white; aedeagal basal process not serrated at least on distal half margin.

Description

Head, ♂

Arista with 4 dorsal and 3 ventral branches in addition to terminal bifurcation. Antenna with pedicel and flagellomere blackish. Frons including the ocellar triangle light yellowish brown. Orbitals in the ratio 9 : 6 : 13. Facial carina yellow. Palpus blackish brown. Clypeus blackish brown in colour. Vibrissa long and subvibrissal setae equal. Gena dark brown, greatest width of gena 0.15 the greatest diameter of eye. Eyes dark red.

Thorax, ♂

Scutum and scutellum light brown. Acrostichal setulae regular in 8 rows. Anterior scutellars convergent and crossing each other, posterior slightly divergent. Sterno-index 0.71. Legs brown. 1st and 2nd tarsomere of foreleg with sex spines, 1st tarsomere with 4 + 2 spines and 2nd tarsomere with 3 + 1 sex spines [Fig. 1(8)].

Wings, ♂ (Figure 1(7))

Presence of black patches at the tip of R_{2+3} and R_{4+5} wing veins; R_{2+3} slightly curved to costa at tip; R_{4+5} and M distally slightly convergent C_1 setulae two unequal; C_3 fringe 0.60. Average wing vein indices: C-index 2.41; 4V-index 2.00; 4C-index 1.09; 5X-index 2.00. Haltere stem and knob light brown in colour.

Abdomen, ♂

In male 1st to 4th tergites light brown; 5th and 6th tergites dark black.

Male terminalia (Periphallic organs, Figure 1(6))

Epandrium broad, bare with about 4–5 long bristle. Surstylus somewhat triangular, pubescent with about 6 small setae and 20–22 long setae. Cercus oval and pubescent with about 17–18 long setae.

Phallic organs [Fig. 1(3)]

Aedeagus slender and bifid. Basal apodeme of aedeagus double length of aedeagus. Anterior parameres large, black and apically pointed. Posterior parameres small and leaf like with two apical sensilla. Hypandrium bilobed. Ventral fragma longer than broad.

Holotype, ♂

India, Uttaranchal, Kumaon, Nainital districts, Sargakhet, 2 July 1999, coll. Joshi (DZKU).

Paratype, 2♂

Same data as holotype. Deposited in the Department of Zoology, Kumaon University, Nainital.

Distribution

India (Uttaranchal, Kumaon, Nainital district, Sargakhet).

Relationship

This species is a member of the subgenus *Sophophora* of the genus *Drosophila* where it resembles *D. nepalensis* Okada, 1955 in the structure of wings and other morphological details but distinctly differ from it in genital structures.

Etymology

Patronym referring to the type locality.

***Drosophila hubeiensis* Sperlich and Watabe**

Drosophila hubeiensis : Sperlich and Watabe, 1997, *Jpn. J. Ent.*, **65(3)**: 621–633.

Taxonomic characters: As described by Sperlich and Watabe, 1997.

Specimens examined

India: Uttaranchal, Kumaon, Nainital district, Bhatelia, 02, ♂ and 02♀ 23 July, 1999, coll. Joshi. July, 1999, coll. Joshi.

Distribution

Highlands of Hubei and Sichuan Provinces, Central China, North India (Kumaon, Mukteshwar, new locality).

Subgenus-*Phortica* Schiner

Phortica Schiner, 1862, wien. ent. Manatschr; 6:433; Okada, 1997, Kontyu, 39:96; MACA, 1977, Acta ent. bohemoslov., 74:116. Type species *Drosophila verigata* FALLEN, 1823.

***Amiota (Phortica) pseudotau* Toda and Peng**

Amiota pseudotau Toda and Peng, 1990. Entomotoxonomia Vol. XII(1): 41–55.

Taxonomic characters: As described by Toda and Peng, 1990.

Specimens examined

India: Uttaranchal, Kumaon, Nainital district, Mukteshwar 1♂, 13 August 2000, coll. Joshi.

Distribution

China, Gangdong; India (Kumaon, Mukteshwar, new locality).

List of *Drosophilidae* collected from Mukteshwar:

Genus/Subgenus	Species
Genus- <i>Amiota</i> Lowe	1. <i>bandes</i> Singh and Negi (1992)
	2. <i>biprotrusa</i> Chen and Toda, 1998
Subgenus- <i>Phortica</i> Schiner	3. <i>pseudotau</i> Toda and Peng, 1990 (new record, this paper)
Genus- <i>Dettopsomyia</i> Lamb	4. <i>nigrovittata</i> (Malloch, 1924)

Genus- *Drosophila* Fallen**Subgenus- *Drosophila* Sturtevant**

5. *analspina* Singh and Negi (1995)
6. *bishtii* Singh and Negi (1995)
7. *bizonata* Kikkawa and Peng, 1938
8. *immigrans* Sturtevant, 1921
9. *lacertosa* Okada (1956)
10. *mukteshwarensis* (new species, this paper)
11. *nainitalensis* Singh and Bhatt (1988)
12. *notostriata* Okada, 1966
13. *Painai* Singh and Negi, 1995
14. *parazonata* Dwivedi and Gupta, 1980
15. *repleta* Wollaston, 1858
16. *sulfurigaster* Duda, 1923
17. *trizonata* Okada, 1966

Subgenus- *Sophophora* Sturtevant

18. *bifasciata* Pomini, 1940
19. *hubiensis* Sperlich and Watabe, 1997
(new record, this paper)
20. *jumbulina* Parshad and Paika, 1964
21. *melanogaster* Meigen, 1930
22. *kikkawai* Burla, 1954
23. *nepalensis* Okada, 1955
24. *sarswati* Singh and Dash, 1995
25. *sargakhetensis* (new species, this paper)
26. *suzukii indicus* Parshad and Paika, 1964
27. *takahashii* Sturtevant, 1927

Genus- *Gitona* Meigen**Genus- *Hirtodrosophila* Duda**

28. *distigma* Meigen, 1830
29. *hexaspina* Fartyal and Singh, 2000

Genus- *Leucophenga* Mik

30. *quadrivittata* Okada, 1956
31. *albiceps* de Meijere, 1914
32. *angulata* Singh, Dash and Fartyal, 2000
33. *angusta* Okada, 1956
34. *bellula* (Bergroth, 1894)
35. *clubiata* Singh, Dash and Fartyal, 2000
36. *neolacteusa* Singh and Bhatt, 1988
37. *ornata* Wheeler, 1959
38. *subpollinosa* (de Meijere, 1914)

Genus- *Lissocephala* Malloch**Genus- *Paraleucophenga* Hendel**

39. *parasiatica* Takada and Momma, 1975
40. *neojavanaii* Singh and Negi, 1992

Genus- *Scaptomyza* Hardy

41. *elmoi* Takada, 1970
42. *quadruangulata* Singh and Dash, 1993

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