

Records of Drosophilidae with Description of Two New Species from Bhutan (Insecta: Diptera)

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Abstract: Altogether twenty species representing seven genera of the family Drosophilidae have been recorded for the first time from Bhutan. Details of these species including the taxonomic description of two new species, *Lordiphosa paraffabella* and *Nesiodrosophila neocirricauda* are provided.

Keywords: Drosophilidae, Taxonomy, *Lordiphosa*, *Nesiodrosophila*

INTRODUCTION

The family Drosophilidae is a large group of flies of world-wide distribution. On world basis the family comprised over 2800 species (Wheeler, 1981, '86). The number of species however, has increased considerably since then due to the description of many more new species from different countries. By and large, the compositions of drosophilid fauna of most of the countries are now fairly established. However, Bhutan, a small country on the eastern Himalayas with China on the north and India on the South, has not attracted the attention of many *Drosophila* workers until recently (De and Gupta, 1995) and whose entire land still awaits exploration.

The present paper represents the results of the first surveying study carried out recently in the vicinity of Phuntsholing, a boarder town of Bhutan.

The flies for the present study were largely collected by net-sweeping over wild vegetation. Occasionally flies were also collected directly with the help of aspirator while they were at rest. For systematic study the procedure of Gupta (1969) was adopted. The type specimens were deposited in the "*Drosophila* collection" of the Department of Zoology, Banaras Hindu University, Varanasi.

DESCRIPTION

Genus *Drosophila* Fallen.

Drosophila Fallen, 1823, Geomyzides Sueciae, 2: 4. Type species: *Musca funebris* Fabricius; Sweden.

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Subgenus Sophophora Sturtevant.

Sophophora Sturtevant, 1939, Proc. Nat. Acad. Sci., 25: 139. Type species: *D. melanogaster* Meigen; Europe.

Drosophila melanogaster Meigen.

D. melanogaster Meigen, 1830, Syst. Beschreib., 6: 85. Specimens examined: 68 ♂, 82 ♀, October, 1993, Phuntsholing, Bhutan.

Distribution: Cosmopolitan, Bhutan (New record).

Drosophila ananassae Doleschall

D. ananassae Doleschall, 1858, Nat. Tijd. Ned. Ind., 17: 128.

Specimens examined: 87 ♂, 113 ♀, October, 1993, Phuntsholing, Bhutan.

Distribution: Cosmopolitan, Bhutan (New record).

Drosophila bipectinata Duda.

D. bipectinata Duda, 1923, Ann. Mus. Nat. Hung., 20: 52.

Specimens examined: 3 ♂, 2 ♀, October, 1993, Phuntsholing, Bhutan.

Distribution: Australia, New Guinea, Cambodia, Celebes, Malaysia, Indonesia, Fiji, Taiwan, Philippines, Thailand, Micronesia, Samoa, Ryukyu Is., Singapore, Japan, Nepal, Pakistan, Sri Lanka, India and Bhutan (New record).

Drosophila malerkotliana Parshad and Paika

D. malerkotliana Parshad and Paika, 1964, Res. Bull., Punjab University, 15: 235.

Specimens examined: 43 ♂, 21 ♀, October, 1993, Phuntsholing, Bhutan.

Distribution: India, Indonesia, Malaysia, Singapore, Thailand, Ivory Coast, Sri Lanka, Celebes and Bhutan (New record).

Drosophila kikkawai Burla

D. kikkawai Burla, 1954, Rev. Brasil. Biol., 14: 47.

Specimens examined: 2 ♂, 8 ♀, October, 1993, phuntsholing, Bhutan.

Distribution: Indonesia, Malaysia, Philippines, Taiwan, Thailand, China, Ryukyu Is., Vietnam, Micronesia, New Guinea, Australia, Samoa, South America, India and Bhutan (New record).

Subgenus Drosophila Fallen S. Str.

Drosophila Fallen, 1823, Geomyzides Sueciae, 2: 4. Type species: *Musca funebris* Fabricius; Sweden.

Drosophila nasuta Lamb

D. nasuta Lamb, 1914, Trans. Linn. Soc., 16: 346.

Specimens examined: 24 ♂, 66 ♀, October, 1993, Phuntsholing, Bhutan.

Distribution: Sri Lanka, Africa, Madagascar, Mauritius, Seychelles, Micronesia, Indonesia, Taiwan, New Guinea, Fiji, Samoa, Hawaii, Nepal, India and Bhutan (New record).

Subgenus Dudaica Strand

Dudaica Strand, 1943, Folia Zool. et. Hydrobiol., 12: 212. Type species: *Drosophila senilis* Duda; Philippines.

Drosophila senilis Duda

D. senilis Duda, 1926, Suppl. Entomol., 14: 91. Syn. *Zygothrica malayana* Takada, 1976, Kontyu, 44: 68.

Specimens examined: 3 ♂, 4 ♀, October, 1993. Phuntsholing, Bhutan.

Distribution: Philippines, Indonesia, India and Bhutan (New record).

Genus Lordiphosa Grimaldi

Lordiphosa Basden, 1961, Beitr. Ent., 11: 186 (as subgenus of the genus *Drosophila*). Type species: *Drosophila fenestrarum* Fallen.

Lordiphosa Grimaldi, 1990, (as a genus) Bull. Amer. Mus. Nat. His., 197: 1-139.

***Lordiphosa paraflabella* sp. nov.**

Average length of body: 2.0-2.1 mm. (♂), 2.1-2.25 mm. (♀).

Head ♂♂: Arista with about 3 dorsal and 2 ventral branches in addition to small terminal bifurcation. Antenna with both pedicel and first flagellomere brown. Frons and fronto-orbital plate glossy black. Facial carina black and prominent. Clypeus black. Vibrissa single, large and stout. Palpus brown, with one strong and two fine apical setae. Gena black and broad, greatest width of gena nearly 2/7 the greatest diameter of eye. Eyes dark red. Anterior reclinate orbital very small; proclinate orbital 2/3 the length of posterior reclinate.

Thorax ♂♂: Scutum and scutellum unicolourous, dark brown. Acrostichal setulae in 6 regular rows. The distance between anterior and posterior dorsocentrals 2/5 the distance between two anterior dorsocentrals. Basal scutellars nearly parallel; apical scutellars convergent. Thoracic pleura dark brown.

Legs ♂♂: Yellowish brown. Apicals on first and second tibiae, preapicals on all three tibiae.

Wings ♂♂: Smoky brown, with two faint large patches. Approximate wing vein indices: C-index 1.45; 4V-index 2.3; 4C-index 1.6; 5X-index 1.8; C₃ fringe 0.6. Halter pale.

Abdomen ♂♂: Tergites uniformly dark brown to black.

Male terminalia (Fig. 1): Epandrium dark brown, large and broadly rounded below, setigerous, upper portion with 2-3 setae and lower with 11-12 setae. Cercus elongate, separate from epandrium, setigerous, with two very large thick setae in middle and 14-15 moderate setae around. Surstylus brown, triangular, with 9 small black prensisetae and about 14 small yellow setae on its inner surface and outer margin. A tubular process emerging from epandrium between cercus and surstylus, with about 8 large distal setae.

Aedeagus straight, long, apically narrowing. Apodeme much longer than aedeagus. Parameres small, with three fine sensilla. Gonopods fused together forming a lobe with flap-like structure laterally. Hypandrium without submedian spines. Hypandrial apodeme much longer than broad, round distally (Fig. 2).

Holotype ♀, *Bhutan* Phuntsholing, October, 1993 (De and Gupta).

Paratypes: 2 ♂♂, 2 ♀♀, same locality and collectors as holotype. Deposited in the "Drosophila Collection", Department of Zoology, Banaras Hindu University, Varanasi, India.

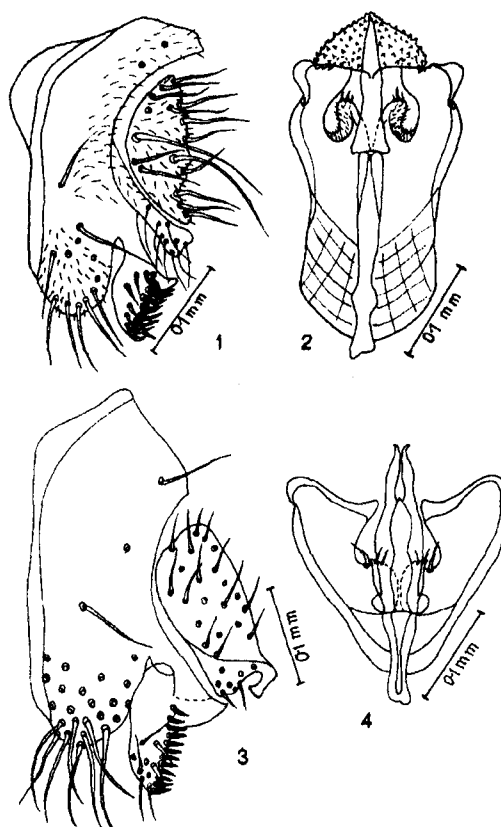
Relationships: This species closely resembles *L. serriflabella* Okada (1966) in having fused posterior parameres of male terminalia, but differs clearly from it in having much darker body colouration (yellowish brown in *serriflabella*); C-index 1.45 (2.4 in *serriflabella*); two halves of epandrium jointed below cercus (epandrium not jointed below cercus in *serriflabella*) and aedeagus straight, long, apically narrowing (aedeagus setulose in *serriflabella*).

Key to species of the genus *Lordiphosa* found in India and Bhutan:

- 1 Posterior margin of epandrium extended like a tubular process between cercus and surstylus *paraflabella* sp. nov.
- Posterior margin of epandrium not extended like a tubular process between cercus and surstylus 2
- 2 Scutum with two broad, dark brown lateral stripes *himalayana* Gupta and Gupta
- Scutum without dark lateral stripes 3
- 3 Epandrium forming tubular process ventrally 4
- Epandrium not forming tubular process ventrally 5
- 4 Paramere branched apically *peniglobosa* Kumar and Gupta
- Paramere truncate apically *aurantifrons* Okada
- 5 Thoracic pleura with 3 black stripes *acutissima* Okada
- Thoracic pleura without stripes 6
- 6 Surstylus with 2 sets of prensisetae *neokurokawai* Singh and Gupta
- Surstylus with 1 set of prensisetae 7
- 7 Paramere distally narrowing and setulose *coei* Okada
- Paramere distally not narrowing and setulose *parantillaria* Kumar and Gupta

Note: *L. paraflabella* is the only species of the genus *Lordiphosa* recorded from Bhutan so far.

Genus *Nesiodrosophila* Wheeler and Takada *Nesiodrosophila* Wheeler and Takada, 1964, *Insects of Micronesia*, 14 (6): 163-242. Type species: *Nesiodrosophila lindae* Wheeler and Takada; Caroline Is.



Figs. 1-4. *Lordiphosa paraflabella* sp. nov.: 1. Epandrium, cercus and surstylus; 2. Aedeagus, hypandrium and paramere; *Nesiodrosophila neocirricauda* sp. nov.: 3. Epandrium, cercus and surstylus; 4. Aedeagus, hypandrium and paramere.

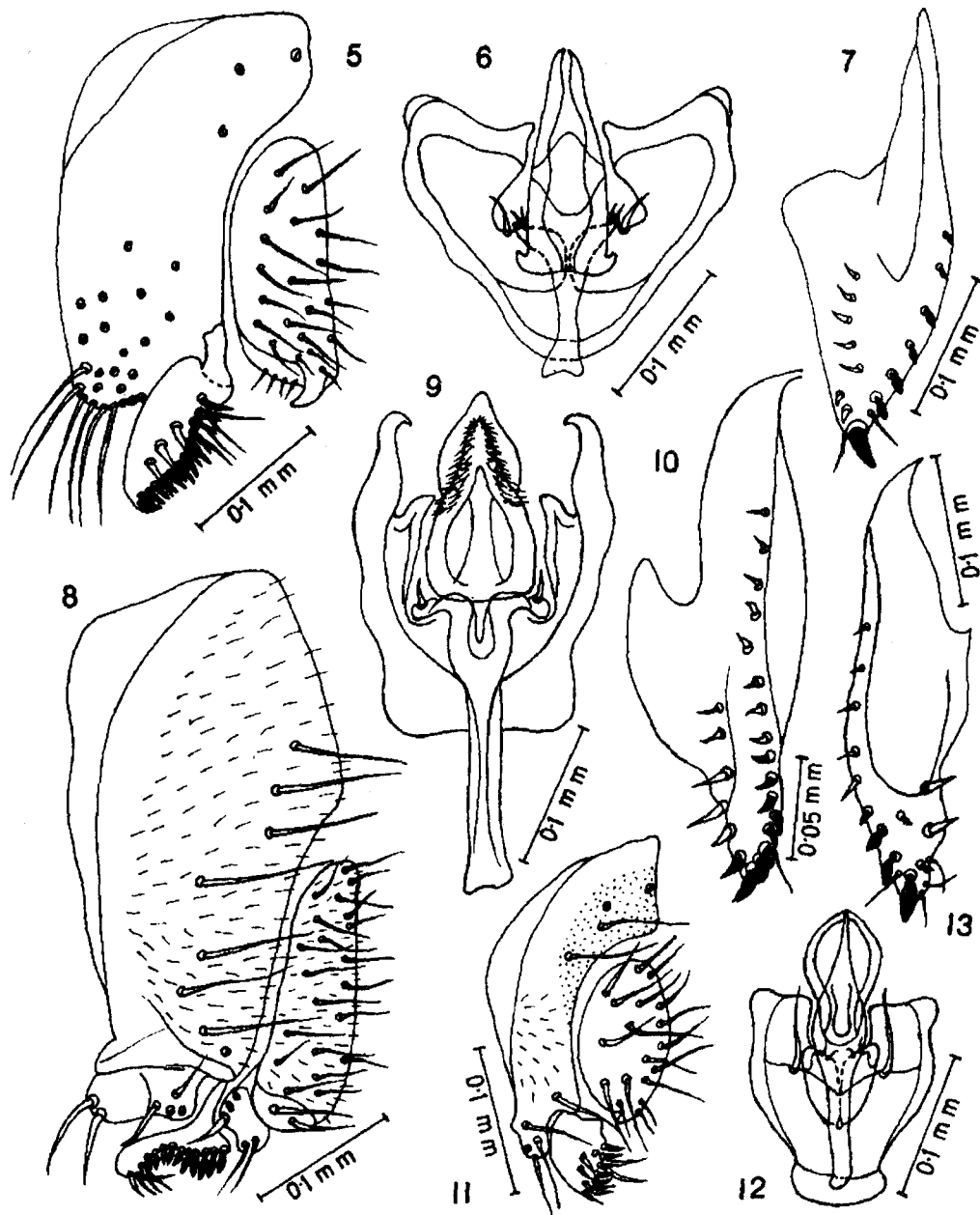
***Nesiodrosophila neocirricauda* sp. nov.**

Average length of body: 1.8-1.9 mm (♂); 1.95 (♀).

Head ♂♂: Arista with 5-6 dorsal and 2 ventral branches in addition to terminal bifurcation. Antenna with pedicel light brown, first flagellomere darker. Frons and fronto-orbital plate brown. Facial carina short and low. Clypeus brown. Vibrissa large and strong, second oral fine. Face flat. Palpus brown, with one large apical seta. Gena brown, greatest width of gena 1/7 the greatest diameter of eye. Eyes dark red. Anterior reclinate orbital smaller than other orbitals. Proclinate orbital 5/7 the length of posterior reclinate.

Thorax ♂♂: Scutum pale brown, basally much darker; scutellum dark brown. Acrostichal setulae in 6 regular rows. The distance between anterior and posterior dorsocentrals 5/9 the distance between two anterior dorsocentrals. Basal scutellars nearly parallel; apical scutellars convergent. Thoracic pleura dark brown.

Legs ♂♂: Pale brown. Apical seta on first and second tibiae, preapicals on all three tibiae.



Figs. 5-13. *Nestodrosophila cirricauda*: 5. Epandrium, cercus and surstylus; 6. Aedeagus, hypandrium and paramere; 7. Oviscapt. *Liodrosophila trichaetopennis*: 8. Epandrium, cercus and surstylus; 9. Aedeagus, hypandrium and paramere; 10. Oviscapt. *Liodrosophila fasciata*: 11. Epandrium, cercus and surstylus; 12. Aedeagus, hypandrium and paramere; 13. Oviscapt.

Wings ♂♂: Hyaline. Approximate wing vein indices: C-index 1.4; 4V-index 2.7; 4C-index 1.9; 5x-index 2.5; C₃ fringe 0.85. Halter white.

Abdomen ♂♂: Tergites uniformly dark brown.

Male terminalia: Epandrium yellowish brown, large, broadly projected below, with 3 upper and about 25 large setae ventrally. Surstylus elongate with 12 black prenisetae and 7-8 large setae on inner surface. Cercus rectangular with a blunt, small projection at outer lower margin and with about 30 setae (Fig. 3).

Aedeagus robust, conical. Apodeme about half the length of aedeagus. Parameres small, with two apical sensilla. Hypandrium with a pair of submedian spines. Hypandrial apodeme triangular (Fig. 4).

Holotype ♀, Bhutan, Phuntsholing, October, 1993 (De and Gupta). Paratypes: 13 ♂♂, 6 ♀♀, same locality and collectors as holotype. Deposited in the "Drosophila Collection", Department of Zoology, Banaras Hindu University, Varanasi, India.

Relationships: This species closely resembles *Nesiodrosophila cirricauda* Okada (1988) in general morphology and the structure of male terminalia, but differs clearly from it in having overall paler body colouration (body mostly blackish brown to black in colour in *cirricauda*); Arista branches 6-7/2 (5/1 in *cirricauda*); and cercus with a blunt process ventrally (pointed triangular ventral process in *cirricauda*).

Nesiodrosophila cirricauda Okada

N. cirricauda Okada, 1988, Ent. Scand. Suppl., 30: 109-149.

Specimens examined: 8 ♂♂, 17 ♀♀, October, 1993, Phuntsholing, Bhutan.

Distribution: Sri Lanka, Bhutan (New record).

Remarks: This species has not been recorded so far from India. Details of its male and female terminalia are shown in figures 5-7.

Key to species of the genus *Nesiodrosophila* found in India and Bhutan:

- 1 Thoracic pleura with 2 dark longitudinal stripes
lindae Wheeler and Takada
- Thoracic pleura without longitudinal stripes 2
- 2 Arista branches 5-6/2'; cercus with a ventral blunt process
neocirricauda sp. nov.
- Arista branches 5/1; cercus with a ventral pointed process
cirricauda Okada

Note: *N. lindae* is only recorded from India and the other two species from Bhutan only.

Genus Liodrosophila Duda

Liodrosophila Duda, 1922, Arch. Naturgesch A, 88(4): 153. Type species: *Camilla coeruleifrons* de Meijere; Indonesia.

Liodrosophila trichaetopennis Takada and Momma

L. trichaetopennis Takada and Momma, 1975, J. Fac. Sci., Hokkaido University, 20(1): 9-48.

Specimens examined: 200 ♂♂, 187 ♀♀, October, 1993, Phuntsholing, Bhutan.

Distribution: Malaysia, Bhutan (New record).

Remarks: This species has not been recorded so far from India. Details of its male and female terminalia are shown in figures 8-10.

Liodrosophila fasciata Duda *L. fasciata* Duda, 1926, Suppl. Ent., 14: 54.

Specimens examined: 43 ♂♂, 42 ♀♀, October, 1993, Phuntsholing, Bhutan.

Distribution: Indonesia, Malaysia and Bhutan (New record).

Remarks: This species has not been recorded so far from India. Details of its male and female terminalia are shown in Figures 11-13.

Liodrosophila ceylonica Okada *L. ceylonica* Okada, 1974, Mushi, 48(5): 29-63.

Specimens examined: 11 ♂♂, 8 ♀♀, October, 1993, Phuntsholing, Bhutan.

Distribution: Sri Lanka, Taiwan, India and Bhutan (New record).

Key to species of the genus *Liodrosophila* found in India and Bhutan:

- 1 Wing with four large black patches *quadrimaculata* Okada
- Wing without black patches 2
- 2 Abdomen yellow with medianly interrupted caudal black bands
fasciata Duda
- Abdomen dark without medianly interrupted caudal black bands 3
- 3 Acrostichal setulae in two rows 4
- Acrostichal setulae in 4-6 rows 5
- 4 Aedeagus fusiform and hairy *ceylonica* Okada
- Aedeagus oblong and distally pubescent *globosa* Okada
- 5 Thoracic pleura orange brown *penispinosa* Dwivedi and Gupta
- Thoracic pleura dark brown to black 6
- 6 C-index less than 1.0 *nana* Wheeler and Takada
- C-index more than 1.0 7
- 7 Fore femur with a row of about 8-9 spinules *rufa* Okada
- Fore femur with a row of about 13-21 spinules 8
- 8 Spinules on fore femur with fine basal setulae
✓ *minidenta* Gupta and Gupta
- Spinules on fore femur without fine basal setulae 9
- 9 Body brown; aedeagus with flap-like structure basally
angulata Dwivedi *et al.*
- Body jet black; aedeagus without flap-like structure basally 10
- 10 Cercus with some lobular structures basally; aedeagus setulose
trichaetopennis Takada and Momma
- Cercus without lobular structures; aedeagus not setulose
Okadai Dwivedi and Gupta

Genus Hypselothyrea de Meijere

Hypselothyrea de Meijere, 1906, Anns. Mus. Nat. Hung., 4: 193. type Species: *Hypselothyrea dimidiata* de Meijere, New Guinea.

Hypselothyrea guttata Duda

H. guttata Duda, 1926, Suppl. Ent., 14: 56.

Specimens examined: 1♂, 1♀, October, 1993, Phuntsholing, Bhutan.

Distribution: Indonesia, Nepal, Taiwan, India and Bhutan (New record).

Genus *Microdrosophila* Malloch

Microdrosophila Malloch, 1921, Ent. News, 32: 12. Type species: *Drosophila quadrata* Sturtevant; USA.

Subgenus *Oxystyloptera* Duda

Oxystyloptera Duda, 1924, Arch. Naturgesch., 90 A₃: 192.

Microdrosophila paradistincta De and Gupta

M. paradistincta De and Gupta, 1994, Senckenbergiana biol., 74(1/2): 153-156.

Specimens examined: 8♂♂, 5♀♀, October, 1993, Phuntsholing, Bhutan.

Distribution: India and Bhutan (New record).

Genus *Mulgravea* Bock

Mulgravea Bock, 1982, Austr. J. Zool., Suppl. 89: 122. Type species: *Mulgravea minima* Bock; Queensland.

Thyrecephala Okada, 1985, Kontyu, 53: 338. Type species: *Lissocephala asiatica* Okada; Amami IS.

✓ *Mulgravea ranipoolensis* Kumar and Gupta

M. ranipoolensis Kumar and Gupta, 1991, Senckenbergiana Biol., 72(1/3): 45-51.

Specimens examined: 4♂♂, 4♀♀, October, 1993, Phuntsholing, Bhutan.

Distribution: India and Bhutan (New record).

⊙ *Mulgravea detriculata* De and Gupta

M. detriculata De and Gupta, 1995, Oriental Insects 29: 359-369.

Specimens examined: 9♂♂, 18♀♀, October, 1993, Phuntsholing, Bhutan.

Distribution: Bhutan.

⊗ *Mulgravea bhutanica* De and Gupta

M. bhutanica De and Gupta, 1995, Oriental Insects, 29: 359-369.

Specimens examined: 5♂♂, October, 1993, Phuntsholing, Bhutan.

Distribution: Bhutan.

♂ *Mulgravea peniglobosa* De and Gupta

M. peniglobosa De and Gupta, 1995, Oriental Insects, 29: 359-369.

Specimens examined: 14 ♂♂, 10 ♀♀, October, 1993, Phuntsholing, Bhutan.

Distribution: Bhutan.

♂ *Mulgravea spinisterna* De and Gupta

M. spinisterna De and Gupta, 1995, Oriental Insects, 29: 359-369.

Specimens examined: 2 ♂♂, October, 1993, Phuntsholing, Bhutan.

Distribution: Bhutan.

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