

ORIGINAL ARTICLE

# Review of the genus *Leucophenga* Mik (Diptera: Drosophilidae) in India, with descriptions of five new species from northern India

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## Abstract

A review of all Indian *Leucophenga* species is given, including descriptions of five new species: *L. champawatensis*, *L. chaubattiaensis*, *L. kumaonensis*, *L. nainae* and *L. neointerrupta*. New collection records of some species from India and adjacent countries; namely, Myanmar and China, and distribution range of each species within India are also given. Keys to species groups and species occurring in India are provided.

**Key words:** key, Kumaon region, new record, species group, Uttarakhand.

## INTRODUCTION

The family Drosophilidae is relatively large, consisting of 76 genera with more than 3800 described species from the world (Wheeler 1981, 1986; Bächli *et al.* 2004). The family is divided into two subfamilies, Steganinae and Drosophilinae, which include approximately 16 and 84% of the total species, respectively. The genus *Leucophenga* Mik is the largest genus in the Steganinae, with approximately 190 described species, followed by the genera *Stegana* Meigen (approximately 120 species), *Amiota* Loew (approximately 110 species) and *Phortica* Schiner (approximately 70 species). Within the genus *Leucophenga*, the following nine species groups have been recognized (Bächli 1971; Okada 1990a): *argentata*, *cuthbertsoni*, *flaviseta*, *flavopuncta*, *maculata*, *mutabilis*, *ornata*, *proxima* and *subpollinosa*.

To date, a total of 21 species of *Leucophenga* has been recorded from India (Gupta 1970, 1974; Bächli 1973;

Singh & Gupta 1974; Vaidya & Godbole 1976; Dwivedi & Gupta 1979; Panigrahy & Gupta 1982; Gupta & Panigrahy 1987; Singh & Bhatt 1988; Singh & Negi 1989; Singh & Dash 1993, 1998; Singh *et al.* 2000; Singh & Fartyal 2002), but some of them have never been assigned to a species group. This paper reviews all Indian *Leucophenga* species, including five new species from the Kumaon region of the state Uttarakhand, northern India, classifying them into species groups and presenting keys to species groups and species, and distribution range of each species within India.

## MATERIALS AND METHODS

The surveyed area, Kumaon region, is located at approximately 1900 m above sea level. The area is characterized by dense, evergreen coniferous forests on medium to very steep slopes. Conditions are extremely moist due to heavy rainfall. Figure 1 shows collection localities. Fly collections were made by R.S.F. by net sweeping over natural habitats.

We followed McAlpine (1981) for morphological terminology, and Zhang and Toda (1992) for the definitions of measurements and indices (Table 1). There has been some uncertainty and confusion in the homology

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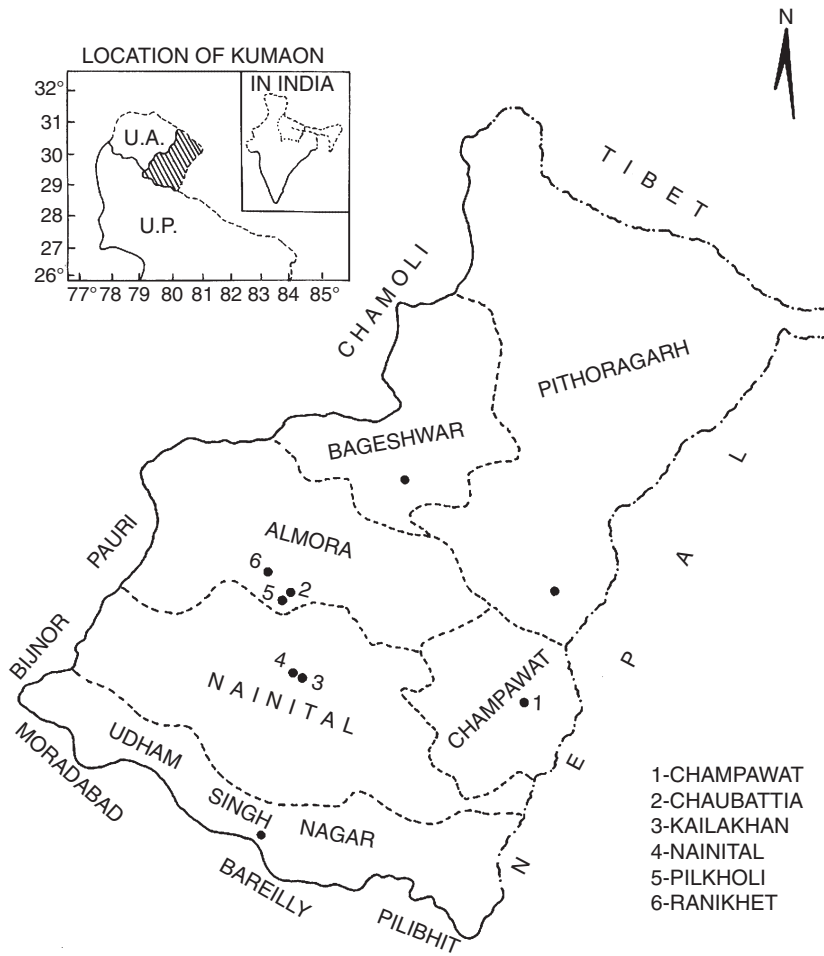


Figure 1 Map of the Kumaon region, showing the collection sites. U.A., Uttaranchal; U.P., Uttar Pradesh.

Table 1 Explanation of indices

Index	Explanation
Sterno	Anterior katepisternal seta/posterior katepisternal seta in length
C	Second costal section between subcostal break and $R_{2+3}$ /third costal section between $R_{2+3}$ and $R_{4+5}$
4C	Third costal section between $R_{2+3}$ and $R_{4+5}$ / $M_1$ between r-m and dm-cu
4V	$M_1$ between dm-cu and wing margin/ $M_1$ between r-m and dm-cu
5X	$CuA_1$ between dm-cu and wing margin/dm-cu between $M_1$ and $CuA_1$
C3F	Length of heavy setation in third costal section/(length of heavy setation in third costal section + length of light setation in third costal section)

and the terminology for some parts of male terminalia, in particular for the so-called phallic organs, between the genus *Leucophenga* and other drosophilid genera. Chen and Toda (1994) gave a reasonable interpretation for the homology of the gonopods and its appendage organs, comparing the detailed structure of male terminalia between *Leucophenga* and some steganine taxa.

We adopted their terminology in the description of male terminalia.

All of the holotypes, some of the paratypes and other specimens from India are deposited in the Department of Zoology, Kumaon University, Nainital, Uttaranchal, India (DZKU), and the remaining paratypes and the specimens from Myanmar and China are deposited in

the collection of Systematic Entomology, Hokkaido University Museum, Sapporo, Japan (SEHU).

## SYSTEMATICS

### Genus *Leucophenga* Mik

*Leucophenga* Mik (1886): 317; Wheeler (1981): 24; Chen and Toda (1994): 540.

*Paraleucophenga* Oldenberg (1914a): 18 (preoccupied by *Paraleucophenga* Hendel 1914 [Diptera: Muscidae]). Type species: *Leucophenga quinquemaculata* Strobl, 1893, by monotypy.

*Neoleucophenga* Oldenberg (1914b): 93 (replacement name for *Paraleucophenga* Oldenberg).

*Diagnosis* (after Grimaldi 1990). Proclinate and anterior reclinate orbital setae very close together, separated by distance less than half of that between anterior and posterior reclinate orbitals; gonopods fused to each other, forming somewhat triangular plate, anteroventrally with apically curved median rod; surstylus squared, flat, broad.

### Key to species groups and ungrouped species of Indian *Leucophenga*

According to the following keys, it is sometimes difficult to identify species groups and/or species when only female specimens are available, due to the lack of distinct, diagnostic characters in females of some *Leucophenga* taxa.

- 1 Abdominal tergite III sexually dimorphic: very short, discolored, usually non-setigerous in male but neither shortened nor discolored and setigerous in female ..... *proxima* group
- Abdominal tergite III not sexually dimorphic..... 2
- 2 Palpus sexually dimorphic: large, broad, nearly bare in female but small, slender, setigerous in male ..... *mutabilis* group
- Palpus not sexually dimorphic..... 3
- 3 M<sub>1</sub> distally abbreviated, not reaching wing margin ..... *abbreviata* (de Meijere)
- M<sub>1</sub> complete, reaching wing margin ..... 4
- 4 Male scutum not silvery pollinose in cephalic view; wing with distinct dark patches..... *ornata* group
- Male scutum silvery pollinose in cephalic view; wing hyaline, only slightly fuscous on costa and crossveins or with small black patch below R<sub>1</sub> ..... 5
- 5 Body relatively small, slender; wing usually dark fuscous along costa and with black patch below R<sub>1</sub>; thoracic pleura with dark patches or stripes ..... *subpollinosa* group

- Body relatively large; wing hyaline, without black patch below R<sub>1</sub> ..... *maculata* group

### *Leucophenga maculata* species group

*Leucophenga maculata* species group, Okada (1990a): 555.

*Diagnosis* (after Okada 1990a). Body yellowish brown; palpus usually yellow, small in both sexes; halter yellow; wing hyaline, rarely smoky; male scutum silvery pollinose in cephalic view; abdominal tergites with black patches or bands.

*Indian species included.* *L. albiceps* (de Meijere, 1914); *L. angulata* Singh *et al.*, 2000; *L. chaubattiaensis* Fartyal and Toda sp. nov.; *L. clubiata* Singh *et al.*, 2000; *L. kumaonensis* Fartyal and Singh sp. nov.; *L. nainae* Fartyal and Singh sp. nov.; *L. neolacteusa* Singh and Bhatt, 1988; *L. okhalkandensis* Singh *et al.*, 2000; *L. rimbickana* Singh and Gupta, 1981 (India [West Bengal]); *L. shillongensis* Dwivedi and Gupta, 1979 (India [Meghalaya]).

### Key to Indian species of the *maculata* group

- 1 CuA<sub>1</sub> distally abbreviated, not reaching wing margin; M<sub>1</sub> distally very thin ..... *chaubattiaensis* Fartyal and Toda sp. nov.
- CuA<sub>1</sub> distally not abbreviated, reaching wing margin; M<sub>1</sub> distally not very thin.....2
- 2 Wing smoky ..... *rimbickana* Singh and Gupta
- Wing hyaline.....3
- 3 Scutum brownish yellow, with two dark and two light brown, longitudinal stripes..... *nainae* Fartyal and Singh sp. nov.
- Scutum not brownish yellow, without two dark and two light brown, longitudinal stripes.....4
- 4 Abdominal tergites IV and V completely white ..... *clubiata* Singh *et al.*
- Abdominal tergites IV and V not completely white .....5
- 5 Abdominal tergites IV and V completely black .....6
- Abdominal tergites IV and V not completely black .....7
- 6 Abdominal tergite III completely black ..... *neolacteusa* Singh and Bhatt
- Abdominal tergite III not completely black ..... *okhalkandensis* Singh *et al.*
- 7 Abdominal tergites IV to VI each with transverse caudal black band..... *shillongensis* Dwivedi and Gupta
- Abdominal tergites IV to VI each with black patches .....8

- 8 Abdominal tergite III medially with three small black patches.....  
 ..... *kumaonensis* Fartyal and Singh sp. nov.  
 – Abdominal tergite III medially with one large, somewhat triangular, black patch.....9  
 9 Medial patch on abdominal tergite III confluent with lateral ones, forming caudal band .....  
 ..... *albiceps* de Meijere  
 – Medial patch on abdominal tergite III separated from lateral ones .....*angulata* Singh *et al.*

***Leucophenga albiceps* (de Meijere)**

*Drosophila* (*Leucophenga*) *albiceps* de Meijere (1914): 258.  
*Leucophenga albiceps*: Okada (1990a): 557; Singh and Fartyal (2002): 13.

*Specimens examined. India:* 16♂14♀, Lariyakanda, Cantt., Zoo Area, Nainital District, Kumaon, Uttaranchal, 16.v.1997 to 20.ix.1998; 4♂7♀, Patuwadangar, Nainital District, Kumaon, Uttaranchal, 10.ix.1998;

10♂8♀, Chaubattia Garden, Almora District, Kumaon, Uttaranchal, 21.viii.1998, R. S. Fartyal.  
*Distribution.* Japan, Taiwan, Indonesia (Java), Nepal, India (Uttaranchal).

***Leucophenga angulata* Singh *et al.***

*Leucophenga angulata* Singh *et al.* (2000): 149.

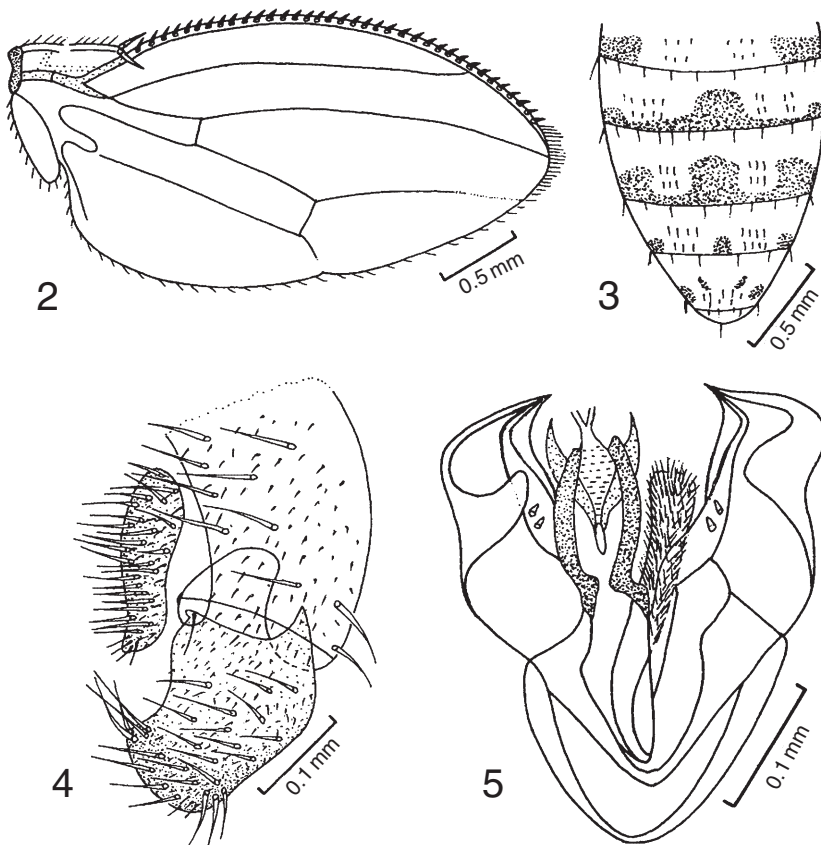
*Specimens examined. India:* 2♂7♀, Kailakhan, Nainital District, Kumaon, Uttaranchal, 20.vii.1997; 1♂3♀, Pines, Nainital District, Kumaon, Uttaranchal, 11.viii.1998, R. S. Fartyal.  
*Distribution.* India (Uttaranchal).

***Leucophenga chaubattiaensis* Fartyal and Toda sp. nov.**

(Figs 2–5)

*Diagnosis.* CuA<sub>1</sub> distally abbreviated, not reaching wing margin (Fig. 2); M<sub>1</sub> distally very thin (Fig. 2); aedeagus very hirsute and blunt at tip (Fig. 5); paramere with approximately two setulae (Fig. 5).

*Male.* Body length 3.80 mm (*n* = 1).



Figures 2–5 *Leucophenga chaubattiaensis* Fartyal and Toda sp. nov., male. 2 Wing; 3 abdomen; 4 epandrium, surstylus and cercus (lateral view); and 5 hypandrium, aedeagus, parameres and gonopods (ventral view).

Head: Arista with approximately seven upper and three lower branches in addition to terminal bifurcation. Antennal pedicel and first flagellomere light brown. Palpus yellow, with one prominent subapical seta and two small setae on ventral side. Clypeus brown. Frons including ocellar triangle brownish black. Orbitals in ratio of 6 : 5 : 7. Facial carina light brown. Vibrissa prominent and subvibrissal setae minute. Gena light brown, with greatest width 0.09 of eye diameter. Eye bright red.

Thorax: Acrostichal setulae in 10–12 irregular rows. Scutum brown; scutellum medially light brown, laterally black. Basal scutellar setae divergent, longer than convergent apicals. Sterno index 0.71. Legs light brown; knees pale. Preapical dorsal seta present on tibiae of midlegs and hindlegs; apical seta on tibiae of all legs.

Wing (Fig. 2) hyaline. R-m and dm-cu crossveins clear; R<sub>4+5</sub> slightly convex. Two C<sub>1</sub> setae subequal; C3F 0.71. Average wing vein indices: C, 2.94; 4V, 1.68; 4C, 0.89; 5X, 1.43. Halter pale yellow.

Abdomen (Fig. 3): Tergites yellowish brown; II with two lateral black patches; III to V each with two lateral and one median patch; VI with four small patches.

Male terminalia (Figs 4,5): Epandrium brown, pubescent, with approximately 10 large setae per side. Surstylus quadrate, pubescent, with approximately 26 large and four small setae. Cercus narrow and elongated, separated from epandrium, with approximately 27 long setae and four minute ventral setae. Parameres small, leaf-like. Gonopods as long as anteroventral median rod. Hypandrium anteriorly narrowly arched, lateromedially broadened.

*Female*. Body length 4.00 mm ( $n = 2$ ). Head, thorax and wing as in male.

*Holotype*. (Ac. no. 75). ♂ (DZKU), “India: Chaubattia Garden, Almora District, Kumaon, Uttaranchal, 23.viii.1998, R. S. Fartyal leg.”

*Paratypes*. (Ac. no. 76). 1♂2♀ (DZKU and SEHU), same data as holotype.

*Distribution*. India (Uttaranchal).

*Relationship*. This species resembles *L. albiceps*, but can be easily distinguished from it by the diagnostic characters of wing veins.

*Etymology*. Pertaining to the type locality.

### *Leucophenga clubiata* Singh *et al.*

*Leucophenga clubiata* Singh *et al.* (2000): 151.

*Specimens examined*. **India**: 2♂5♀, Cantt. Area, Nainital, Nainital District, Kumaon, Uttaranchal, 20.viii.1997; 1♂3♀, Mukteshwar, Nainital District,

Kumaon, Uttaranchal, 12.ix.1998; 3♂2♀, Cheena Peak, Nainital District, Kumaon, Uttaranchal, 10.v.1999, R. S. Fartyal.

*Distribution*. India (Uttaranchal).

### *Leucophenga kumaonensis* Fartyal and Singh sp. nov.

(Figs 6–8)

*Diagnosis*. Abdominal tergites III to V each with two lateral, one median and two small submedian black patches (Fig. 6); parameres without pubescence apically (Fig. 8); aedeagus slightly pointed at tip (Fig. 8); aedeagal apodeme slightly developed.

*Male*. Body length 4.20 mm ( $n = 2$ ).

Head: Arista with approximately six upper and six lower branches in addition to terminal bifurcation. Antennal pedicel and first flagellomere light brown. Frons including ocellar triangle light brown. Orbitals in ratio of 7 : 6 : 8. Facial carina brown. Palpus yellowish brown, with one subapical and four ventral setae. Vibrissa prominent. Gena pale yellow, with greatest width 0.14 of eye diameter. Eye dark red.

Thorax: Acrostichal setulae in 10 irregular rows. Scutum dark brown. Scutellum blackish brown, apically pale; subscutellum entirely darker. Basal scutellar setae divergent; apical scutellars convergent, cruciate. Sterno index 1.0. Legs light brown, with slightly darker knees on midlegs and hindlegs. Preapical dorsal and apical ventral setae present on tibiae of all legs.

Wings hyaline. R-m and dm-cu crossveins clear. C<sub>1</sub> setae two, unequal. C3F 0.81. Average wing vein indices: C, 2.44; 4V, 2.00; 4C, 1.20; 5X, 1.00. Halter pale yellow.

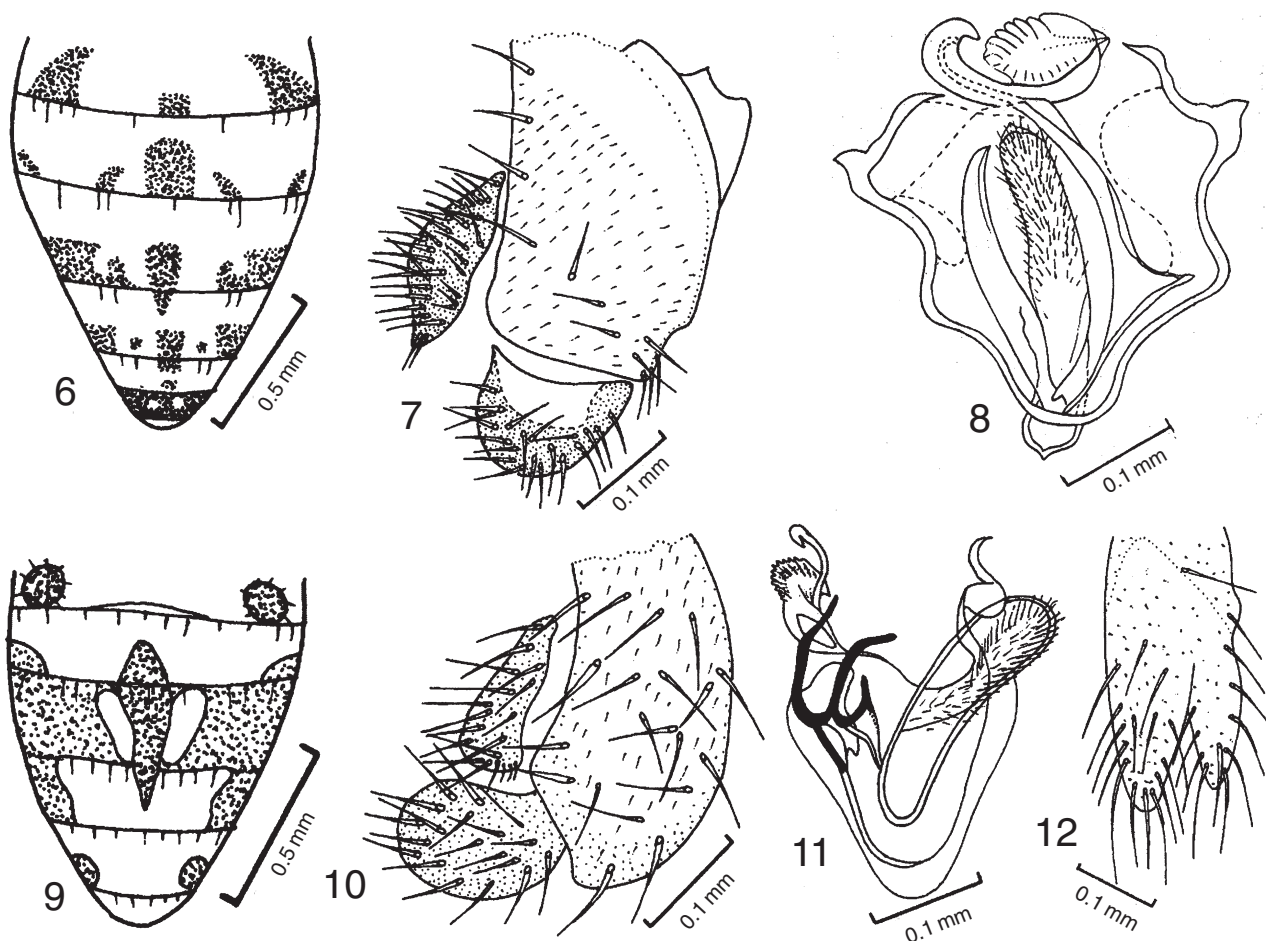
Abdomen (Fig. 6): Tergite II with two lateral and one median black patch; VI with one small median patch.

Male terminalia (Figs 7,8): Epandrium broad, entirely pubescent, with approximately seven large setae scattered on posterodorsal margin to ventral portion and four small setae on anteroventral corner per side. Surstylus broader than long, ovoid, pubescent apically and laterally, with 19–20 setae. Cercus large, fusiform, entirely pubescent, with approximately 32 setae. Parameres large and leaf-like. Hypandrium anteriorly narrowly arched, lateromedially broadened.

*Female*. Unknown.

*Holotype*. (Ac. no. 77). ♂ (DZKU), “India: Nainital, Govt. House, Nainital District, Kumaon, Uttaranchal, 18.vii.1999, R. S. Fartyal and B. K. Singh leg.”

*Paratype*. (Ac. no. 78). 1♂ (DZKU), same data as holotype.



Figures 6–12 6–8 *Leucophenga kumaonensis* Fartyal and Singh sp. nov., male; 9–12 *Leucophenga nainae* Fartyal and Singh sp. nov., male and female. 6,9 Abdomen; 7,10 eandrium, surstylus and cercus (lateral view); 8,11 hypandrium, aedeagus, parameres and gonopods (ventrolateral view); and 12 female cerci.

*Distribution.* India (Uttaranchal).

*Relationship.* This species resembles *Leucophenga maculata* (Dufour, 1939) in the structure of male terminalia but distinctly differs from it in having the apically bare parameres.

*Etymology.* Pertaining to the type locality.

***Leucophenga nainae* Fartyal and Singh sp. nov.**

(Figs 9–12)

*Diagnosis.* Scutum brownish yellow, with two dark and two light brown longitudinal stripes; scutellum dorso-medially light brown, sublaterally brownish black; abdominal tergite III pale white, with two lateral and one median black patch; IV nearly entirely black, with

two light yellow patches submedially; V yellowish medially, black on lateral sides (Fig. 9).

*Male.* Body length 3.72 mm ( $n = 2$ ).

Head: Arista with approximately six upper and two lower branches in addition to terminal bifurcation. Antennal pedicel and first flagellomere light brown. Frons including ocellar triangle dark brown. Orbitals in ratio of 5 : 4 : 6. Facial carina light brown. Palpus pale yellow, with one prominent subapical seta. Vibrissa prominent; subvibrissal setae minute. Gena light brown, with greatest width 0.22 of eye diameter. Eyes brownish red.

Thorax: Acrostichal setulae in 14 regular rows. Basal scutellar setae slightly divergent; apicals cruciate. Sterno index 0.7. Legs pale yellow. Preapical dorsal seta present

on tibiae of all legs; apical ventral seta only on tibia of midleg.

Wings hyaline. R-m and dm-cu crossveins clear; R<sub>4+5</sub> and M<sub>1</sub> nearly parallel. C<sub>1</sub> setae two, equal. C3F 0.64. Average wing vein indices: C, 2.85; 4V, 2.00; 4C, 2.13; 5X, 2.20. Halter light brown.

Abdomen (Fig. 9): Tergites II and VI each with two lateral black patches.

Male terminalia (Figs 10,11): Epandrium broad, pubescent, with 20–23 setae per side. Surstylus pubescent, with approximately 18 setae. Cercus somewhat triangular, pubescent, with approximately 20 long setae. Aedeagus distally highly hirsute. Gonopod triangular, dorsally somewhat wrinkled. Hypandrium anteriorly narrowly arched, laterocaudally somewhat broadened. *Female*. Body length 4.00 mm ( $n = 1$ ). Head, thorax, wing and abdomen as in male. Cercus (Fig. 12) brownish, with 12–15 long setae.

*Holotype*. (Ac. no. 69). ♂ (DZKU), “India: Chaubattia Garden, Almora District, Kumaon, Uttaranchal, 21.viii.1998, R. S. Fartyal and B. K. Singh leg.”.

*Paratypes*. (Ac. no. 70). 2♂1♀ (DZKU and SEHU), same data as holotype.

*Distribution*. India (Uttaranchal).

*Relationship*. This species resembles *Leucophenga rectinervis* Okada, 1966 in the structure of male terminalia, but clearly differs from it in the abdominal color pattern (in *rectinervis*: III largely black; IV with three large black patches; V with five black patches).

*Etymology*. Patronym dedicated to the Naina Devi, a famous Goddess of the Kumaon hills.

### *Leucophenga neolacteusa* Singh and Bhatt

*Leucophenga neolacteusa* Singh and Bhatt (1988): 153.

*Specimens examined*. **India**: 1♂11♀, Dhobighat, Nainital, Nainital District, Kumaon, Uttaranchal, 7.viii.1996; 5♂9♀, Cheena Peak, Nainital District, Kumaon, Uttaranchal, 10.ix.1997; 4♂9♀, Chaubattia Garden, Almora District, Kumaon, Uttaranchal, 23.viii.1998, R. S. Fartyal.

*Distribution*. India (Uttaranchal).

### *Leucophenga okhalkandensis* Singh et al.

*Leucophenga okhalkandensis* Singh et al. (2000): 153.

*Specimens examined*. **India**: 1♂3♀, Nainital, Nainital District, Kumaon, Uttaranchal, 12.vi.1997; 1♂4♀, Ranikhet, Pilkholi, Almora District, Kumaon, Uttaranchal, 19.viii.1998; 4♂2♀, Chaubattia Garden, Almora

District, Kumaon, Uttaranchal, 23.viii.1998, R. S. Fartyal.

*Distribution*. India (Uttaranchal).

### *Leucophenga mutabilis* species group

*Leucophenga mutabilis* species group, Bächli (1971): 77; Okada (1989): 803.

*Diagnosis*. Palpus sexually dimorphic: large, broad and nearly bare in female, but small, slender and setigerous in male; abdominal tergites mostly black or spotted; wing fuscous or hyaline.

*Indian species included*. *L. angusta* Okada, 1956; *L. bellula* (Bergroth, 1894); *L. neoangusta* Godbole and Vaidya, 1976 (India [Poona]).

#### Key to Indian species of the mutabilis group

- 1 Abdominal tergites III to V largely black; halter brown .....2
- Abdominal tergites III to V yellow, with black patch(es) .....3
- 2 Scutum with dark brown quadrate area behind dorsocentral setae..... *neoangusta* Godbole and Vaidya
- Scutum without dark brown quadrate area behind dorsocentral setae ..... *angusta* Okada ♂
- 3 Halter brown; palpus black..... *angusta* Okada ♀
- Halter yellow; palpus brown ..... *bellula* (Bergroth)

### *Leucophenga angusta* Okada

*Leucophenga (Leucophenga) angusta* Okada (1956): 28; Gupta and Panigrahy (1987): 62; Okada (1989): 807.

*Specimens examined*. **India**: 4♂3♀, Pithoragarh, Pithoragarh District, Kumaon, Uttaranchal, 23.ix.1998; 6♂7♀, Nainital, Nainital District, Kumaon, Uttaranchal, 9.vi.1997, R. S. Fartyal.

*Distribution*. Japan, Korea, Taiwan, the Philippines, China, Vietnam, Malaysia, Singapore, Indonesia (Sumatra, Java), Myanmar, Nepal, Sri Lanka, Micronesia, Fiji, Australia, India (Uttaranchal new record, Orissa).

### *Leucophenga bellula* (Bergroth)

*Drosophila bellula* Bergroth (1894): 75.

*Leucophenga (Leucophenga) bellula*: Wheeler (1981): 25.

*Leucophenga bellula*: Okada (1989): 808.

*Specimens examined*. **India**: 4♂9♀, Ratighat, Nainital District, Kumaon, Uttaranchal, 28.v.1999; 2♂5♀,

Champawat, Champawat District, Kumaon, Uttaranchal, 27.x.1997; 1♂6♀, Kailakhan, Nainital District, Kumaon, Uttaranchal, 19.xi.1997, R. S. Fartyal.  
*Distribution.* Japan, Taiwan, China, Malaysia, Indonesia (Java), Nepal, Sri Lanka, Micronesia, New Guinea, Australia, Africa, India (Uttaranchal, West Bengal).

### *Leucophenga ornata* species group

*Leucophenga ornata* species group, Bächli (1971): 28; Okada (1990b): 679.

*Diagnosis* (after Okada 1990b). Wing with distinct brown or black patches; palpus slender, as wide as antennal first flagellomere in both sexes; male scutum not silvery pollinose; male abdominal tergite III not shortened.

*Indian species included.* *L. neointerrupta* Fartyal and Toda sp. nov.; *L. ornata* Wheeler, 1959; *L. pectinata* Okada, 1968 (Taiwan, Hong Kong, Thailand, Sri Lanka, India [Orissa]); *L. pentapunctata* Panigrahy and Gupta, 1982 (India [Orissa]); *L. quadripunctata* (de Meijere, 1908); *L. regina* Malloch, 1935.

### Key to Indian species of the ornata group

- 1 R-m and dm-cu crossveins clear; dark area along costa interrupted at distal portion of subcostal break ..... *neointerrupta* Fartyal and Toda sp. nov.
- R-m and dm-cu crossveins clouded ..... 2
- 2 R<sub>4+5</sub> with black patch ..... 3
- R<sub>4+5</sub> without black patch ..... 5
- 3 Wing with dark patterned area larger than hyaline area; R<sub>2+3</sub> strongly curved to costa distally; abdominal tergites with brown to black spot around socket of each seta ..... *regina* Malloch
- Wing with dark patterned area smaller than hyaline area; R<sub>2+3</sub> not so strongly curved to costa distally; abdominal tergites without brown or black spot around socket of each seta ..... 4
- 4 Dark patch on R<sub>2+3</sub> and R<sub>4+5</sub> confluent with dm-cu patch; R<sub>4+5</sub> apically without dark patch ..... *ornata* Wheeler
- Black patch on R<sub>2+3</sub> separated from dm-cu patch; R<sub>4+5</sub> apically with distinct dark patch ..... *pentapunctata* Panigrahy and Gupta
- 5 R<sub>2+3</sub> without black patch ..... *pectinata* Okada
- R<sub>2+3</sub> with small black patch ..... *quadripunctata* de Meijere

### *Leucophenga neointerrupta* Fartyal and Toda sp. nov.

(Figs 13–17)

*Leucophenga interrupta* Duda, 1924: Singh and Gupta (1974): 24 (misidentification).

*Diagnosis.* Aedeagus apically narrowing and hooked, basally serrated; parameres large, leaf-like (Figs 16,17).  
*Male.* Body length 4.20 mm ( $n = 3$ ).

Head: Arista with six to seven dorsal and two to three ventral branches in addition to terminal bifurcation. Antennal pedicel and first flagellomere yellowish brown. Palpus light brown, with one subapical and approximately four setae on ventral margin. Clypeus light brown. Frons including ocellar triangle brown. Orbitals in ratio of 6 : 5 : 7. Facial carina light brown. Vibrissa prominent; subvibrissal setae minute. Gena brown, with greatest width 0.14 of eye diameter. Eyes dark red.

Thorax: Acrostichal setulae in 16 regular rows. Scutum brown; scutellum pale yellow. Basal scutellar setae longer than apicals, slightly convergent; apicals cruciate. Distance between ipsilateral dorsocentral setae approximately one-third distance between anterior dorsocentrals. Thoracic pleura light brown. Sterno index approximately 0.67. Legs pale yellow; preapical dorsal seta present on tibiae of all legs; apical ventral seta on tibiae of forelegs and midlegs.

Wings (Fig. 13): Anterior margin dark brownish black along costa, but interrupted at distal portion of subcostal break. R-m and dm-cu crossveins clear. C<sub>1</sub> setae two, subequal; C3F 0.85. Average wing vein indices: C, 2.94; 4V, 1.75; 4C, 0.85; 5X, 1.22. Halter dull brown.

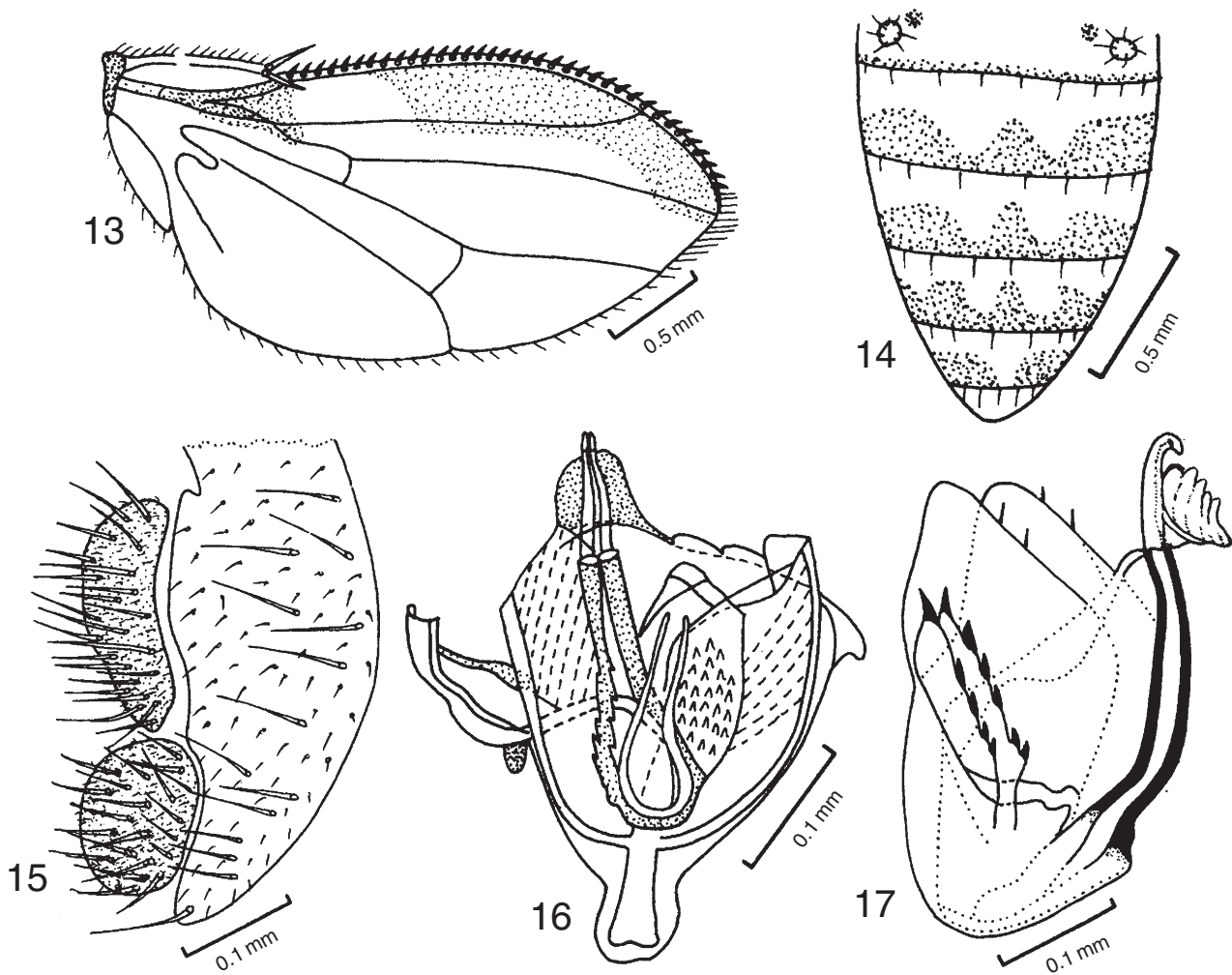
Abdomen (Fig. 14): Tergites yellow; II with one pair of round black patches on lateral sides; III to V each with narrow apical black band protruded medially and sublaterally; VI with one pair of lateral black patches.

Male terminalia (Figs 15–17): Epandrium broad above and narrow below, pubescent, with 13–14 setae per side. Surstylus ovoid, broader than long, pubescent, with 20–23 small setae. Cercus large, separated from epandrium, entirely pubescent, with 23–24 setae. Aedeagus long; apodeme well developed and bilobed. Parameres each with a few fine setulae on subapical margin. Gonopods slightly curved and gently serrated on dorsal surface. Hypandrium narrowly arched.

*Female.* Unknown.

*Holotype.* (Ac. no. 71). ♂ (DZKU), “India: Pilkholi-Ranikhet, Almora District, Kumaon, Uttaranchal, 19.xi.1996, R. S. Fartyal leg.”





Figures 13–17 *Leucophenga neointerrupta* Fartyal and Toda sp. nov., male. 13 Wing; 14 abdomen; 15 epandrium, surstylus and cercus (lateral view); and 16,17 hypandrium, aedeagus, parameres and gonopods (16 in ventral view and 17 in lateral view).

*Paratype*. (Ac. no. 72). 1♂ (DZKU), same data as holotype.

*Distribution*. India (Uttaranchal, Uttar Pradesh, West Bengal).

*Relationship*. This species is very close to *Leucophenga interrupta* Duda, 1924 in having a similar coloration pattern on the wing but distinctly differs from it in the diagnostic characters of male terminalia.

*Remarks*. Singh and Gupta (1974) identified some (not specified) specimens collected from Uttar Pradesh, India as *L. interrupta*, but pointed out the clear differences in some characters of male terminalia between the Indian specimens and Okada's (1956) description based on

Japanese specimens. One of us (M.J.T.) examined the Indian specimens collected this time from Uttaranchal and compared them with those from Taiwan (the type locality of *L. interrupta*), Japan and China, and reached the conclusion that the Indian specimens are of a new species reconfirming the same diagnostic characters as pointed out by Singh and Gupta (1974). Previous records of *L. interrupta* from Vietnam, Thailand, Java of Indonesia, Nepal and Sri Lanka should be re-examined in the light of discovery of the present new species.

*Etymology*. Referring to the very close relationship to *L. interrupta*.

### *Leucophenga ornata* Wheeler

*Leucophenga ornata* Wheeler (1959): 184; Okada (1990b): 680.

*Drosophila (Leucophenga) ornatipennis* de Meijere (1914): 256.

*Leucophenga ornatipennis*: Duda (1924): 186.

*Leucophenga (Leucophenga) ornatipennis*: Okada (1956): 37.

*Specimens examined. India*: 1♂1♀, Chaubattia Garden, Almora District, Uttaranchal, 23.viii.1998, R. S. Fartyal.

*Distribution*. Japan, Korea, Taiwan, China, Vietnam, the Philippines, Indonesia (Java), Nepal, New Guinea, Australia, New Caledonia, India **new record** (Uttaranchal).

### *Leucophenga quadripunctata* (de Meijere)

*Drosophila quadripunctata* de Meijere (1908): 154.

*Leucophenga (Leucophenga) quadripunctata*: Okada (1956): 34.

*Leucophenga quadripunctata*: Okada (1990b): 683.

*Specimens examined. India*: 1♂1♀, Kailakhan, Nainital district, Kumaon, Uttaranchal, 27.viii.1997; 1♂1♀, Cheena Peak, Nainital district, Kumaon, Uttaranchal, 10.x.1997, R. S. Fartyal.

*Distribution*. Russia (Far East), Japan, Korea, Taiwan, China, Thailand, Malaysia, Indonesia (Sumatra, Java), Sri Lanka, Australia, New Guinea, India **new record** (Uttaranchal).

### *Leucophenga regina* Malloch

*Leucophenga regina* Malloch (1935): 90; Bock (1979): 34; Panigrahy and Gupta (1982): 489; Okada (1990b): 682; Chen and Aotsuka (2003): 148.

*Specimens examined. China*: 1♀, Jianfeng, Ledong County, Hainan Island, 21.ix.1993, M. J. Toda.

*Distribution*. Japan (Ryukyu Islands), China **new record** (Hainan Island), Australia, India (Orissa).

### *Leucophenga proxima* species group

*Leucophenga proxima* species group, Bächli (1971): 41; Okada (1987a): 90.

*Diagnosis*. Male abdominal tergite III much reduced in length, milky white to silvery in color, usually not setigerous; halter knob with black spot apically.

*Indian species included. L. albofasciata* (Macquart, 1851) (Indonesia [Java], Nepal, Sri Lanka, New Guinea, Australia, India [Uttar Pradesh, Madhya Pradesh]).

### *Leucophenga subpollinosa* species group

*Leucophenga subpollinosa* species group, Bächli (1971): 58; Okada (1987b): 676.

*Diagnosis* (after Okada 1987b). Body relatively small and slender; frons usually pale yellow; postvertical seta minute; scutum and scutellum silvery pollinose particularly in male; thoracic pleura with dark patches or stripes; abdomen black, with basal tergites silvery pollinose particularly in male; wing usually with dark band along costa and below R<sub>1</sub>.

*Indian species included. L. champawatensis* Fartyal and Singh sp. nov.; *L. flavicosta* Duda, 1926 (Taiwan, Indonesia [Sumatra, Java], Micronesia, New Guinea, India [Madhya Pradesh]); *L. subpollinosa* (de Meijere, 1914).

### Key to Indian species of the subpollinosa group

- 1 Wing with black band below R<sub>1</sub> .....  
..... *subpollinosa* (de Meijere)  
– Wing without black band below R<sub>1</sub> ..... 2
- 2 Scutum and scutellum light tan; halter with knob apically black ..... *flavicosta* Duda  
– Scutum and scutellum brownish black; halter with knob entirely pale yellow .....  
..... *champawatensis* Fartyal and Singh sp. nov.

### *Leucophenga champawatensis* Fartyal and Singh sp. nov.

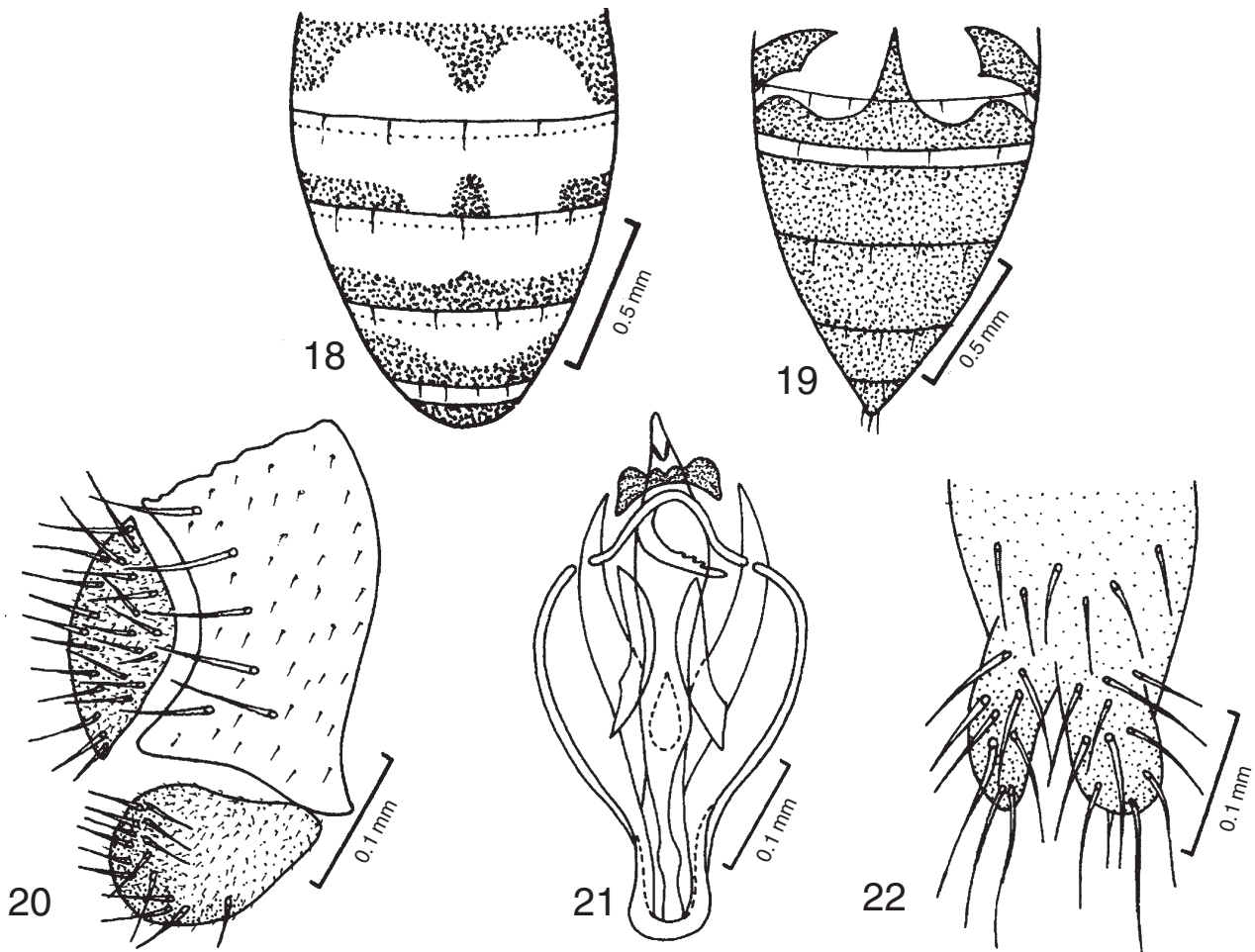
(Figs 18–22)

*Diagnosis*. Aedeagus slender, subapically broad, pointed at tip; parameres somewhat triangular, curved, pointed apically (Fig. 21).

*Male*. Body length 3.20 mm ( $n = 1$ ).

Head: Arista with approximately six dorsal and two ventral branches in addition to terminal bifurcation. Antennal pedicel and first flagellomere brownish black. Palpus light brown, with one subapical and one ventral setae. Clypeus brown. Orbitals in ratio of 10 : 8 : 15. Facial carina light brown. Vibrissa prominent; subvibrissal setae minute. Gena brown, with greatest width 0.14 of eye diameter. Eyes red.

Thorax: Acrostichal setulae in 14 irregular rows. Scutum light brown. Scutellum apically slightly pale; subscutellum dark brown; basal scutellar setae divergent; apicals convergent. Sterno index 1.00. Legs light



Figures 18–22 *Leucophenga champawatensis* Fartyal and Singh sp. nov., male and female. 18,19 Abdomen (18 male and 19 female); 20 epandrium, surstylus and cercus (lateral view); 21 hypandrium, aedeagus, parameres and gonopods (ventral view); and 22 female cerci.

brown; preapical dorsal seta present on tibiae of midlegs and hindlegs; apical ventral seta on tibiae of all legs.

Wing hyaline. R-m and dm-cu crossveins clear.  $C_1$  setae two, subequal; C3F 0.83. Average wing vein indices: C, 2.50; 4V, 2.62; 4C, 1.25; 5X, 1.69. Halter pale yellow.

Abdomen (Fig. 18): Tergite II light brown, with anterior dark band extending backward medially and laterally; III with three dark brown patches; IV and V each with dark caudal band; VI light brown.

Male terminalia (Figs 20,21): Epandrium broad, pubescent, with approximately six setae per side. Surstylus ovoid, separated from epandrium, pubescent, with approximately 14–15 setae. Cercus somewhat pointed ventrally, pubescent, with 21–22 setae. Gonopods dark

brown, somewhat triangular. Aedeagal apodeme not developed. Hypandrium narrow, arched.

*Female*. Body length 3.40 mm ( $n = 1$ ). Head, thorax and wing as in male.

Abdomen (Fig. 19): Tergite II with two lateral and one medial dark patch; III with dark brown caudal band protruded medially; IV to VI completely dark brown. Cercus (Fig. 22) narrow, apically rounded, each with approximately 12 setae.

*Holotype*. (Ac. no. 73). ♂ (DZKU), “India: Champawat, Champawat District, Kumaon, Uttaranchal, 23.vii.1999, R. S. Fartyal leg.”.

*Paratypes*. (Ac. no. 74). 1♂1♀ (DZKU and SEHU), same data as holotype.

*Distribution*. India (Uttaranchal).

*Relationship.* This species resembles *L. flavicosta* Duda, 1926 in lacking the black band below R<sub>1</sub> on the wing, but differs from it in having an entirely yellow halter.

*Etymology.* Pertaining to the type locality.

### *Leucophenga subpollinosa* (de Meijere)

*Drosophila (Leucophenga) subpollinosa* de Meijere (1914): 263.

*Leucophenga (Leucophenga) subpollinosa*: Okada (1956): 30; Wheeler (1981): 27.

*Leucophenga subpollinosa*: Bächli (1971): 58; Gupta (1974): 212; Okada (1987b): 678.

*Specimens examined.* **India:** 4♂, Chaubattia Garden, Almora District, Kumaon, Uttaranchal, 15.vi.1997; 3♂3♀, Bhowali, Nainital District, Kumaon, Uttaranchal, 9.vi.1999, R. S. Fartyal. **Myanmar:** 1♂, Mandalay, 31.xii.1981, M. J. Toda.

*Distribution.* Japan, Taiwan, China, the Philippines, Vietnam, Thailand, Malaysia, Indonesia (Sumatra, Kalimantan, Java), Myanmar **new record**, Nepal, Sri Lanka, Micronesia, Australia, Eritrea, Nigeria, Malawi, South Africa, India (Uttaranchal, Uttar Pradesh, Maharashtra).

### Ungrouped species

#### *Leucophenga abbreviata* (de Meijere)

*Drosophila abbreviata* de Meijere (1911): 400.

*Drosomyiella abbreviata*: Hendel (1914): 113.

*Leucophenga (Leucophenga) abbreviata*: Duda (1924): 185.

*Leucophenga abbreviata*: Okada (1966): 18.

*Specimens examined.* **China:** 2♂9♀, Jianfeng, Ledong County, Hainan Island, 22.ix.1993, M. J. Toda. **Myanmar:** 1♂1♀, Yangon, 10,13.i.1982, M. J. Toda.

*Distribution.* Taiwan, China (Hainan Island **new record**, Yunnan), Malaysia, Singapore, Indonesia (Sumatra, Java), Myanmar **new record**, Nepal, Sri Lanka, India (Orissa).

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