

3 mutabilis group
n. sp. *mutabilis*
L. strachanensis Malaya, Indonesia
Singapore
L. wauensis PNG

A Revision of the *Leucophenga mutabilis* Species-group (Diptera, Drosophilidae) of the Oriental and Adjacent Regions

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Abstract Eighteen species including two new species of the *Leucophenga mutabilis* species-group of the Oriental and adjacent Regions are revised with taximetric analyses.

The *mutabilis* species-group of the genus *Leucophenga* MIK, 1886, was established by BÄCHLI (1971) based on *L. mutabilis* (ADAMS, 1905) for the species with sexually dimorphic palpus; large, broad, and nearly bare in female, small, slender, and setigerous in male. He enumerated in this group twenty African and three Oriental species, including ten new and three unnamed ones. It corresponds to the "Group 3" of BOCK (1979), in which he included six Australian species, with one new and one unrecorded. OKADA (1970) called this group the *nigriventris* complex, and later (1971) the *guttiventris* complex, enumerating six Oriental and two Micronesian species. Both names are, however, unable to use because *Leucophenga nigriventris* (MACQUART, 1942) was synonymized with *Drosophila melanogaster* MEIGEN, 1830, by TSACAS (1967) and *L. guttiventris* (DE MEIJERE, 1908) was with *D. bellula* BERGROTH, 1894, by BOCK (1979). LIN and WHEELER (1972) called this group *angusta* group because so-called *L. nigriventris* auctt. corresponds to *L. angusta* OKADA, 1956.

The present study treats seventeen species of this group of the Oriental, Micronesian and Australian Regions, including the descriptions of two new species, with taximetric analyses. The number of species of this group totals thirty-seven. The type specimens of the new species are deposited in Bishop Museum, Honolulu, (BM), and National Science Museum (Nat. Hist.), Tokyo (NSMT).

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Leucophenga mutabilis Species-group

Leucophenga mutabilis group: BÄCHLI, 1971, 77.

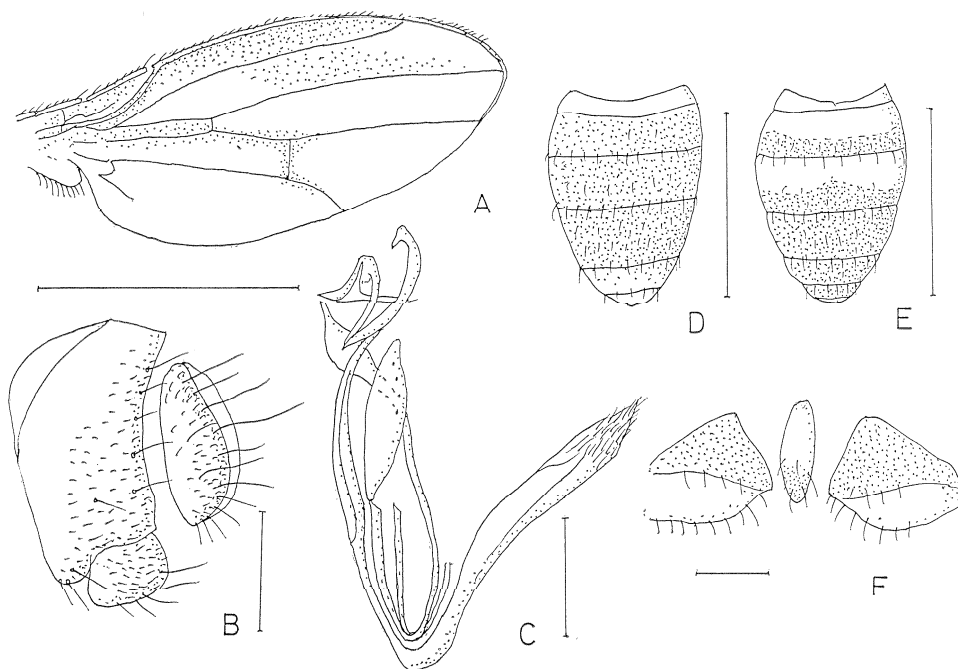


Fig. 1. A-F. *Leucophenga striatipennis*; A, wing; B, peripheral phallic organs; C, phallic organs; D, male abdomen; E, female abdomen; F, female 7th abdominal tergites and ovipositor. Scale 1 mm for A, D, E, 0.1 mm for other figs.

Leucophenga group 3: BOCK, 1979, 25.

Leucophenga nigriventris complex: OKADA, 1970, 18.

Leucophenga guttiventris complex: OKADA, 1971, 68.

Leucophenga angusta complex: LIN & WHEELER, 1972, 241.

***Leucophenga striatipennis* n. sp.**

(Fig. 1)

♂, ♀. Body about 3.0 mm in length. Antenna with 2nd joint yellowish brown. Arista 5/2. Palpus black. Frons gray, anteriorly yellowish orange, longer than broad, broader in ♂ than in ♀. Face and clypeus gray. 2nd oral fine. Mesoscutum dark brown, scutellum dark brownish black. Thoracic pleura pale yellowish gray, with faint dark patches. Humerals 2, lower longer. Acrostichal hairs in 10 (♀)–14 (♂) rows. Anterior dorsocentrals half posteriors, length distance of dorsocentrals 1/4 cross distance, lateral scutellars divergent, apicals slightly nearer to laterals than to each other. Sterno-index about 0.7. Legs yellow. Wing (Fig. 1 A) with black patches as in *L. limbipennis*. C-index 3.2; 4V-index 2.4; 4C-index 1.3; 5x-index 1.8; Ac-index 3.0; C1-bristles 2; C3-fringe 7/10. Halter yellowish white. Ab-

dominal tergites (Fig. 1 D-E) deep velvety black, 1T and anterior end of 2-3T yellowish white. ♀ 7T caudoventrally rectangular and weakly setigerous (Fig. 1 F). Periphallalic organs (Fig. 1 B) black, caudal margin of cercus hyaline. Phallic organs (Fig. 1 C) yellowish brown, aedeagus distally hairy.

Holotype. ♂, Semongok, Sarawak, 21. X. 1975 (SHIMA); allotype, ♀, Pekanbaru, Sumatra, 2-4. VIII. 1971 (OKADA); 6 ♂, 1 ♀ paratypes, Univ. Singapore, 6. VIII. 1971 (OKADA). Types in NSMT.

Distribution. Sarawak, Sumatra, Singapore.

Relationships. This species resembles *L. limbipennis* in wing patterns, but differs in having abdominal tergites deep velvety black.

Leucophenga wauensis n. sp.

(Fig. 2 A-D)

♂, ♀. Body about 2.5-3.0 mm in length. Antenna with 2nd joint orange yellow, 3rd gray. Arista 4-10/2-3. Palpus black. Ocellar triangle black inside ocelli. Periorbit narrow, orange brown. Postverticals small. Frons grayish yellow or orange brown, longer than broad. Face gray. Clypeus yellowish gray (♀) or brownish black (♂). Cheek very narrow, yellow. 3 long orbitals. 2nd oral small. Mesoscutum mat dark brown (♀) or mat black (♂). Scutellum dark brown or black, anterior margin narrowly yellow. Thoracic pleura pale, metapleura with black patch. Humeral 1, long. Acrostichal hairs in 10-12 rows. Anterior dorsocentrals small, 1/4 posteriors, close to the latter. Lateral scutellars divergent, slightly longer than apicals, which are equally apart from each other and from laterals. Sterno-index 0.5. Legs yellow, ♂ fore metatarsus with 2 long hairs apically, ♂ 2nd tarsal joint of fore leg with 2 curly hairs. Wing (Fig. 2 A) with dark patches along costa, below R_{2+3} , and over posterior crossvein. C-index 2.2-2.5; 4V-index 2.0-3.1; 4C-index 1.2; 5x-index 1.1-1.4; Ac-index 1.8-2.0, C3-fringe 2/3. Halter yellowish orange. Abdominal tergites (Fig. 2 B) mostly black, in ♀ anterior half of 3-4T pale. Aedeagus (Fig. 2 D) apically shaggy. Periphallalic organs (Fig. 2 C) with surstylus large and quadrate. ♀ 7T caudoventrally not projected.

Holotype ♂, Wau, Papua New Guinea, 3. IX. 1977 (OKADA), at light trap; allotype ♀, *ibid.*, 26. IX. 1977 (OKADA). Types in BM.

Distribution. Papua New Guinea.

Relationships. This species resembles *L. limbipennis* in wing and abdominal patches, but differs in having vein between anterior and posterior crossveins clear and aedeagus distally shaggy (hairy in *limbipennis*).

Leucophenga limbipennis DE MEIJERE

Leucophenga limbipennis DE MEIJERE, 1908, Tijdschr. Ent., 51: 156.

Diagnosis. Wing patched; palpus black; scutellum tan; halter yellow; ♀ 7T caudoventrally not projected; 3-4T largely black.

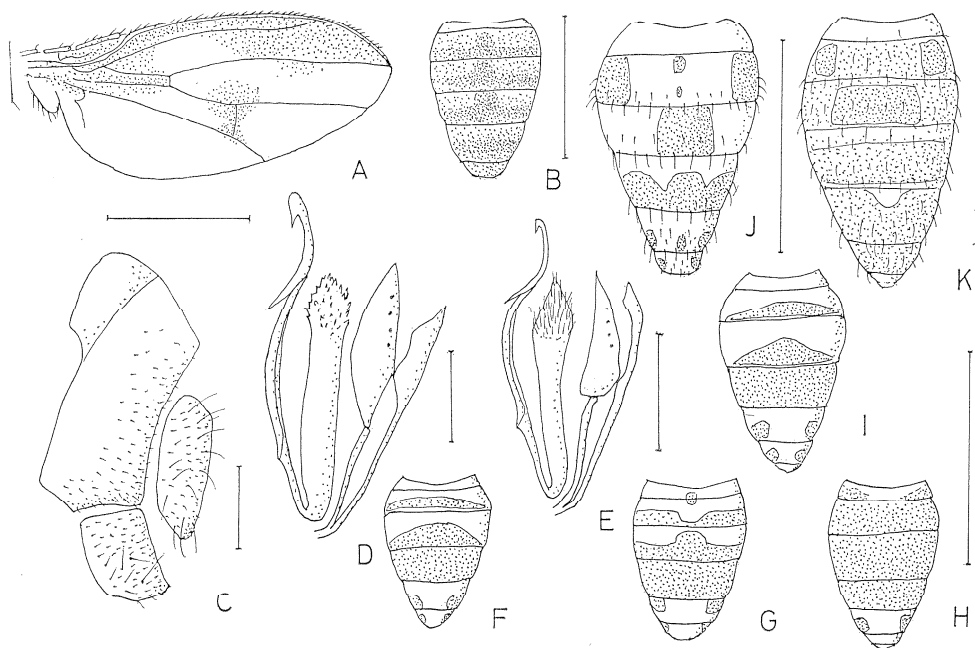


Fig. 2. A–D. *Leucophenga wauensis*; A, wing; B, abdomen; C, peripheral phallic organs; D, phallic organs. — E–I, *L. taiwanensis*; E, phallic organs; F–G, male abdomen; H–I, female abdomen. — J–K, *L. magnipalpis*; J, female abdomen; K, male abdomen. Scale 1 mm for A, 0.1 mm for other figs.

Specimens examined. 1 ♂, 1 ♀, Singapore, 24. VII – 6. VIII. 1971 (IKEDA, OKADA).

Distribution. Sri Lanka, Indonesia, Singapore, Micronesia.

***Leucophenga taiwanensis* LIN et WHEELER**

(Fig. 2 E–I)

Leucophenga taiwanensis LIN et WHEELER, 1972, Univ. Texas Publ., (7213): 253.

Diagnosis. Wing patched; palpus black; scutellum tan; halter yellow; abdominal patterns (Fig. 2 F–I) variable; ♀ 7T caudoventrally not projected; aedeagus (Fig. 2 E) hairy.

Specimens examined. [Formosa]: 27 ♂, 14 ♀, Puli, Nan-Tou, 19. VIII. 1969 (OKADA); 1 ♀, Alishan, Chiayi, 14–15. VIII. 1967 (OKADA).

Distribution. Formosa.

Remarks. This species seems to be conspecific with *L. limbipennis* DE MEIJERE, because of similar diagnostic characters, especially variable abdominal patterns.

***Leucophenga spilossoma* LIN et WHEELER**

Leucophenga spilossoma LIN et WHEELER, 1972, Univ. Texas Publ., (7213): 251.

Diagnosis. Wing hyaline; palpus black; scutellum black, caudally pale; halter yellow; abdominal tergites maculated; ♀ 7T caudoventrally not projected.

Specimens examined. [Formosa]: 5 ♂, Alishan, Chiayi, 14–15. VIII. 1967 (THROCKMORTON); 2 ♂, 1 ♀, ibid., 25. V. 1971 (KANMIYA); 2 ♂, 2 ♀, Fenchihu, Chiayi, 12. IV. 1961 (SAIGUSA); 1 ♀, Wulai, Taipei, 15. VII. 1977 (IKEDA).

Distribution. Formosa.

***Leucophenga magnipalpis* DUDA**

(Fig. 2 J–K)

Leucophenga magnipalpis DUDA, 1924, Arch. Naturg., 90 A (3): 187.

Diagnosis. Wing hyaline; palpus black in ♀, dark brown in ♂; scutellum black, caudally yellow; halter yellow; abdominal tergites maculated in ♀ (Fig. 2 J), largely black in ♂ (Fig. 2 K).

Specimens examined. 2 ♂, 2 ♀, Lishan, Tai-Chung, Formosa, 31. V. 1971 (KANMIYA).

Distribution. Formosa, Malaysia.

***Leucophenga flavohalterata* MALLOCH**

Leucophenga flavohalterata MALLOCH, 1925, Proc. Linn. Soc. N. S. W., 50: 334.

Diagnosis. Wing hyaline; palpus black; scutellum black, caudally yellow; halter yellow; abdominal tergites largely black; ♀ 7T caudoventrally not projected.

Specimen examined. 1 ♂, Effate Is., New Hebrides, 10–13. II. 1978 (SHIMA).

Distribution. Australia, New Hebrides (n. loc.).

***Leucophenga angusta* OKADA**

Leucophenga angusta OKADA, 1956, Syst. Study Jap. Dros., 28.

Diagnosis. Wing hyaline; palpus brown; scutellum tan; halter brown, apically darker; abdominal tergites maculated in ♀, mostly black in ♂; ♀ 7T caudoventrally projected.

Distribution. Japan, Korea, Formosa, Hong Kong, Viet Nam; India, Sri Lanka, Malaysia, Indonesia, Micronesia, Fiji, Australia.

***Leucophenga neoangusta* VAIDYA et GODBOLE**

Leucophenga neoangusta VAIDYA et GODBOLE, 1976, J. Univ. Poona, Sci. Tech., 48: 87.

Diagnosis. Not distinguishable from *L. angusta* (♂).

Distribution. India.

***Leucophenga orientalis* LIN et WHEELER**

Leucophenga orientalis LIN et WHEELER, 1972, Univ. Texas Publ., (7213): 249.

Leucophenga magnipalpis auctt. (not DUDA, 1924).

Diagnosis. Wing hyaline; palpus black; scutellum dark brown, laterally black, apically pale; halter yellow; abdominal tergites maculated; ♀ 7T caudoventrally not projected.

Specimens examined. 1 ♀, Victoria Peak, Hong Kong, 19. IX. 1972 (KUROKAWA); [Formosa]: 1 ♂, 2 ♀, Fenchihu, Chiayi, 12. IV. 1965 (SAIGUSA); 2 ♀, Chiaoliping, Chiayi, 13. IV. 1965 (SAIGUSA); 1 ♂, 1 ♀, Kuantzulin, Tai Nan, 28-9. V. 1971 (KANMIYA); 1 ♀, Hassenzan, Tai-Chung, 29. V. 1971 (KANMIYA); 1 ♂, 3 ♀, Lishan, Tai-Chung, 1. VI. 1971 (KANMIYA).

Distribution. Japan, Ryukyus, Formosa, Hong Kong (n. loc.).

***Leucophenga nigripalpis* DUDA**

Leucophenga nigripalpis DUDA, 1924, Arch. Naturg., 90 A (3): 188.

Diagnosis. Wing hyaline, palpus black; scutellum tan; halter yellow; abdominal tergites spotted; ♀ 7T caudoventrally projected.

Specimens examined. 17 ♀, Bulolo, Papua New Guinea, VIII-X. 1977 (OKADA); 3 ♀, Tugu, Java, 27-30. VII. 1971 (IKEDA, OKADA).

Distribution. Formosa, Malaysia, Indonesia (n. loc), Papua New Guinea (n. loc.).

Remarks. Record from Nepal (OKADA, 1966) is that of *L. angusta*.

***Leucophenga bellula* (BERGROTH)**

Leucophenga bellula (Bergroth, 1894), Stettin. Ent. Ztg., 55:75 (*Drosophila*).
Leucophenga guttiventris (DE MEJERE, 1911), Tijdschr. Ent., 54: 414 (*Drosophila*).

Diagnosis. Wing hyaline; palpus brown; scutellum tan; halter yellow; abdominal tergites maculated; ♀ 7T caudoventrally not projected.

Distribution. Japan (Amami), Hong Kong, Formosa, China, India, Nepal, Malaysia, Indonesia, New Guinea, Australia.

***Leucophenga boninensis* WHEELER et TAKADA**

Leucophenga boninensis WHEELER et TAKADA, 1964, Ins. Micronesia, (14): 231.

Diagnosis. Wing hyaline; palpus dark brown; scutellum tan; halter tan; abdominal tergites spotted; ♀ 7T caudoventrally projected.

Distribution. Bonin Is., Guam.

***Leucophenga fuscipennis* DUDA**

Leucophenga fuscipennis DUDA, 1923, Anns. hist. nat. Mus. natn. hung., 20: 28.

Diagnosis. Wing hyaline; palpus brown; scutellum tan; halter yellow; abdominal tergites maculated, 2T black on caudal half; ♀ 7T caudoventrally projected.

Specimens examined. 3 ♂, 1 ♀, Puli, Nan-Tou, Formosa, 19. VIII. 1967 (OKADA).

Distribution. Formosa.

***Leucophenga tritaeniata* DUDA**

Leucophenga tritaeniata DUDA, 1923, Arch. Naturg., 90 A (3): 185.

Diagnosis. Wing patched; palpus black; scutellum dark, laterally black, caudally pale; halter yellow; abdominal tergites mostly black; aedeagus weakly hairy distally.

Specimen examined. 1 ♂, Wau, Papua New Guinea, 14. IX. 1977 (OKADA), by sweeping.

Distribution. New Guinea, Australia.

***Leucophenga atriventris* LIN et WHEELER**

Leucophenga atriventris LIN et WHEELER, 1972, Univ. Texas Publ., (7213): 243.

Diagnosis. Wing hyaline; palpus black; scutellum tan; halter yellow; abdominal tergites mostly black; ♀ 7T caudoventrally projected.

Specimens examined. 20 ♂, 1 ♀, Wau, Papua New Guinea, VIII-X. 1977 (OKADA), mostly at light traps; 1 ♂, Kang-tsu-lin, Tai-Nan, Formosa, 28-29. VI. 1971 (KANMIYA); 1 ♂, Saiyok, Kanchana, Thailand, 29. XII. 1975 (SHIMA); 1 ♂, 1 ♀, Kundasan, Mt. Kinabar, Sabah, 3. VII. 1982 (YAMASAKI).

Distribution. Formosa, Thailand (n. loc.), Sabah (n. loc.), New Guinea, New Ireland.

***Leucophenga ponapensis* WHEELER et TAKADA**

Leucophenga ponapensis WHEELER et TAKADA, 1964, Ins. Micronesia, 14: 232.

Diagnosis. Wing hyaline; palpus black; scutellum tan; abdominal tergites mostly dark brown (♂) or black (♀), aedeagus densely hairy.

Distribution. Caroline Is.

Table 1. Original n (character) × t (taxon) matrix.

Species (t)	Character state (n)									
	A	B	C	D	E	F	G	H	I	J
<i>L. bellula</i>	1	0	0	1	1	1	1	0	1	1
<i>L. boninensis</i>	1	0	0	1	1	1	1	0	0	0
<i>L. orientalis</i>	0	0	1	1	1	1	1	0	1	0
<i>L. nigripalpis</i>	0	0	0	1	1	1	1	0	0	1
<i>L. angusta</i> ♂	0	0	0	0	0	0	0	0	NC	NC
<i>L. angusta</i> ♀	0	0	0	0	1	1	1	NC	0	1
<i>L. neoangusta</i>	0	0	0	0	0	0	0	0	NC	NC
<i>L. fuscipennis</i>	1	0	0	1	1	1	1	1	0	1
<i>L. cooparensis</i> ♂	0	0	0	1	0	0	1	NC	NC	NC
<i>L. cooparensis</i> ♀	0	0	0	1	1	0	1	NC	NC	NC
<i>L. ponapensis</i>	0	0	0	1	0	0	0	0	NC	NC
<i>L. atriventris</i>	0	0	0	1	0	0	0	1	0	1
<i>L. tritaeniata</i>	0	1	0	1	0	0	0	1	NC	NC
<i>L. flavohalterata</i>	0	1	1	1	0	0	0	NC	1	1
<i>L. magnipalpis</i>	0	0	1	1	0	0	0	0	1	1
<i>L. spilossoma</i>	0	0	1	1	0	0	1	0	1	1
<i>L. striatipennis</i>	0	1	1	1	0	0	0	0	1	1
<i>L. wauensis</i>	0	1	1	1	0	0	0	0	1	1
<i>L. limbipennis</i>	0	1	0	1	0	0	1	0	1	1
<i>L. taiwanensis</i>	0	1	0	1	0	0	1	0	1	1

Leucophenga cooparensis BOCK

Leucophenga cooparensis BOCK, 1979, Austr. J. Zool., Suppl. 71: 31.

Diagnosis. Wing hyaline; palpus black; scutellum tan; halter yellow; abdominal tergites mostly black in ♂, yellow and 4T mostly black in ♀.

Distribution. Australia.

Taximetric Analyses

Following ten diagnostic characters (A–J), each divided into two character states (0, 1), are applied for establishing a dendrogram of relationships between species (Table 1, Fig. 3) by means of MCD proximity analysis and UPGMA cluster analysis.

- A Palpus black (A=0) or brown (a=1).
- B Wing without (B=0) or with black patches (b=1).
- C Scutellum tan (C=0) or black at least basally (c=1).
- D Halter brown (D=0) or yellow (d=1).
- E 3T largely black (E=0) or black spotted (e=1).
- F 4T largely black (F=0) or black spotted (f=1).
- G 5T largely black (G=0) or black spotted (g=1).

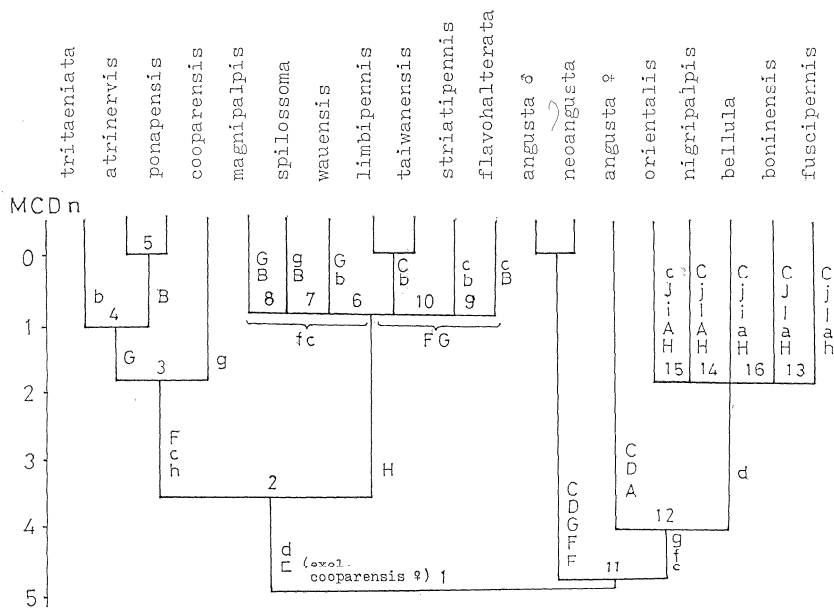


Fig. 3. A dendrogram of relationships of the species of *Leucophenga mutabilis* species-group of the Oriental and adjacent Regions. Alphabetical signs on the branches of dendrogram are the character states chosen from original $n \times t$ matrix (Table 1); numerical figures on the branching points of dendrogram are the orders of key couplets.

- H Aedeagus hairy at least distally (H=0) or nearly bare (h=1).
 - I Female 7T caudoventrally projected and thickly setigerous (I=0) or not projected and weakly hairy (i=1).
 - J Female 7S with pleural membrane finely spiculated (J=0) or smooth (j=1).
- A key to the species is automatically derived from the established dendrogram.

Sequential Key to the Species

- 1. 3T largely black (E, excl. *cooparensis* ♀); halter yellow (d). 2.
- Not simultaneously 3T largely black and halter yellow (not Ed). 11.
- 2. Aedeagus only apically hairy (h). 3.
- Aedeagus hairy on distal half (H). 6.
- 3. 5T black spotted (g). *L. cooparensis* ♂.
- 5T largely black (G). 4.
- 4. Wing black patched (b). *L. tritaeniata*.
- Wing hyaline (B). 5.
- 5. Thoracic pleura tan. *L. atriventris*.
- Thoracic pleura with black patches. *L. ponapensis*.
- 6. 4T black spotted (f). 7.

- 4T largely black (F). 9.
7. Wing black patched (b). *L. wauensis*.
- Wing hyaline (B). 8.
8. 5T largely black (G). *L. magnipalpis*.
- 5T black spotted (g). *L. spilossoma*.
9. Wing hyaline (B); scutellum black at least on basal half (c).
. *L. flavohalterata*.
- Wing black patched (b). 10.
10. Scutellum tan (C); abdominal tergites mostly subshining black.
. *L. limbipennis*, *L. taiwanensis*.
- Scutellum brownish black (c); abdominal tergites mostly velvety black.
. *L. striatipennis*.
11. 3–5T largely black (EFG); scutellum tan (c); halter brown (D).
. *L. angusta* ♂; *neoangusta*.
- 3–5T black spotted (efg). 12.
12. Halter brown (D); palpus black (A); scutellum tan (C). *L. angusta* ♀.
- Halter yellow (d). 13.
13. Aedeagus hairy only apically (h); palpus brown (a); female 7T caudoventrally projected and thickly setigerous (I); female 7S with surrounding membrane smooth (j). *L. fuscipennis*.
- Aedeagus hairy on distal half (H). 14.
14. Palpus black (A). 15.
- Palpus brown (a); scutellum tan (C). 16.
15. Scutellum black on basal half or at least on basal corners (c); female 7T caudoventrally not projected and weakly hairy (i); female 7S with surrounding membrane finely spiculated (J). *L. orientalis*.
- Scutellum tan (C); female 7T caudoventrally projected and thickly setigerous (I); female 7S with surrounding membrane smooth (j). *L. nigripalpis*.
16. 3T without lateral black spots; female 7T caudoventrally not projected and weakly hairy (i); female 7S with surrounding membrane smooth (j).
. *L. bellula*.
- 3T with lateral black spots; female 7T caudoventrally projected and thickly setigerous (I); female 7S with surrounding membrane finely spiculated (J). *L. boninensis*.

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