

The Genus *Lissocephala* MALLOCH and an Allied New Genus of Southeast Asia and New Guinea (Diptera, Drosophilidae)

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Abstract A new genus allied to the genus *Lissocephala* MALLOCH is established, with descriptions of 6 new species, 3 of the new genus and 3 of *Lissocephala*, from Southeast Asia and New Guinea. Taximetric analyses are made to estimate the relationships between the 2 genera and between the species.

TSACAS, LACHAISE and DAVID (1981) suggest that the African and the Oriental species currently classified as "*Lissocephala*" should be separated into two genera and *Lissocephala* would be retained for the African species. The present study treats the Oriental and New Guinean species, in which the opinion of these authors is partly supported and a new genus is erected for *L. asiatica* OKADA and its allies.

The material of the present study has been obtained from various sources. Six new species, 3 of *Lissocephala* and 3 of the new genus, are described. The types of new species are deposited in the National Science Museum, Tokyo (NSMT) and the Bishop Museum, Honolulu (BM).

Genus *Lissocephala* MALLOCH

Lissocephala MALLOCH, 1929. Ann. Mag. nat. Hist., (10) 4: 250. Type: *L. unipunctata* MALLOCH (S. Rhodesia).

Entire frons smooth and glossy; postverticals minute; 2nd oral fine; carina developed; mesoscutum shiny; scutellum dull; acrostichal hairs in 6 or more rows; humerals 1 or 2; sterno-index 0.8-1.0. Wing usually with black stripe along costa or basally; C-index low; C3-fringe 8/10-9/10 or nearly entire; abdominal tergites smooth, glossy, metallic blue, green or purple black (revised from WHEELER & TAKADA, 1964).

Eggs without filaments (African species) or with 11-14 short filaments (*L. powelli* CARSON et WHEELER). Larval mouth-hook without ventral teeth; anterior spiracle simple. Puparial body spicules undeveloped (CARSON & WHEELER, 1973; TSACAS & LACHAISE, 1979).

The larvae are known to breed on figs (African species: MALLOCH, 1929; TSACAS *et al.*, 1977, 1979, 1981) or parasitic on land crabs (*L. powelli*: CARSON & WHEELER, 1973). THROCKMÖRTON (1975) places this genus in neither Drosophilinae nor Steganinae, because of its "pantropic distribution which provides sound evidence

for the tropical origin of the Drosophilidae." TSACAS and LACHAISE (1979) thinks it better to create a new subfamily for this genus if THROCKMÖRTON's opinion is accepted. The present study retains it in Drosophilinae as generally classified.

This genus involves besides 17 African species, *bicolor* (de MEIJERE, 1911) (Java, Formosa), *binotata* (de MEIJERE, 1914) (Java), *fijiensis* HARRISON, 1954 (Fiji), *metallescens* (de MEIJERE, 1914) (Southeast Asia, Microsnesia, Australia), *powelli* CARSON et WHEELER, 1973 (Christmas I., Indian Ocean), *sabroskyi* WHEELER et TAKADA, 1964 (Micronesia, Melanesia, India), *versicolor* MALLOCH, 1934 (Samoa) and 3 new species.

Lissocephala bicoloroides n. sp.

(Figs. 1A-C)

♂, ♀. Body about 2.2 mm in length. Eye dark red, bare. Antenna orange. Arista 5-6/3-4. Palpus yellowish orange. Frons glossy brown, anteriorly orange. Carina low but long. Face gray, orange above. Clypeus gray. Cheek narrow, gray. Thorax entirely glossy red yellow. Scutellum without transverse wrinkles.

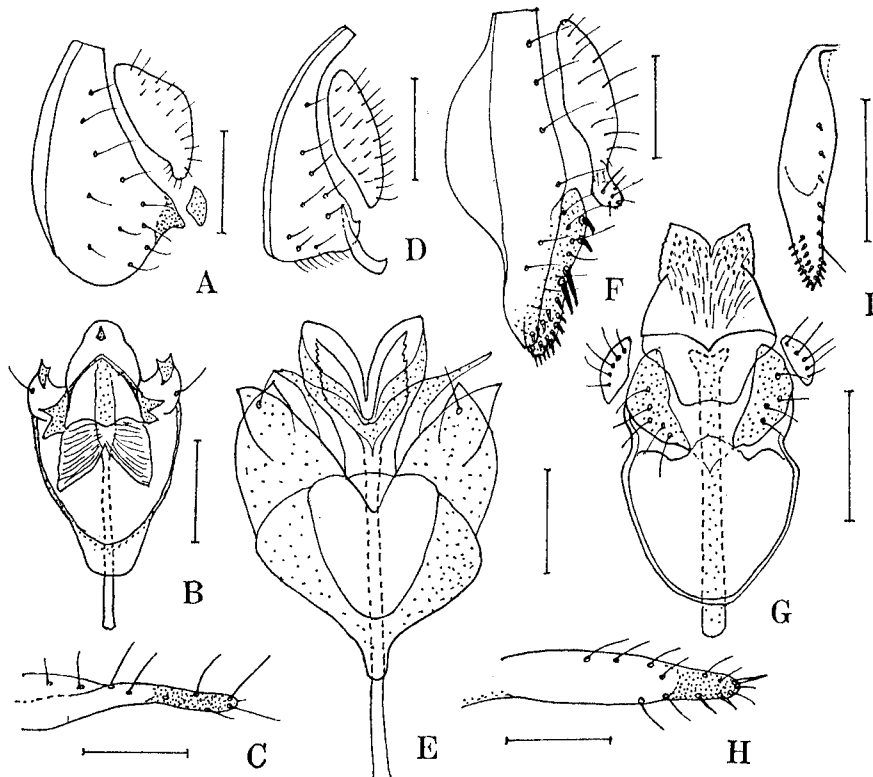


Fig. 1. *Lissocephala* spp. A-C, *L. bicoloroides*; D-E, *L. parabolicolor*; F-H, *L. subbicolor*; I, *L. metallescens*. A, D, F, Periphallic organs; B, E, G, phallic organs; C, H, I, ovi-positor. Scales 0.1 mm.

Humeral 2. Acrostichal hairs in 6–8 row, Sterno-index 1.0. Wing hyaline, with faint dark shade below 3rd costal section. C-index 0.9; 4V-index 2.2; 4C-index 1.7; 5x-index 1.6; Ac-index 3.8; C3-frings 3/5. Halter orange brown.

Periphallalic organs (Fig. 1A) gray. Epandrium with a short finger-like process caudally below. Cercus large. Surstylus vestigial. Phallic organs (Fig. 1B) black. Aedeagus gross, with 2 lateral short projections. Ovipositor (Fig. 1C) rod-like, yellow, apically black, with several long marginal hairs.

Holotype ♂ (25206), Sandakan, Sabah, 1. XI. 1979 (HIHARA). Paratypes: 1 ♂, same data as above; 3 ♂, Singapore, Univ. Campus, 6. VIII. 1971 (OKADA); 1 ♀, Penang, Malaya, 23. XI. 1979 (HIHARA). Types in MSMT.

Distribution. Sabah, Singapore, Malaya.

Relationships. This species resembles *L. bicolor* (de MEJERE) in body coloration, but differs from it by larger 4V-index and weaker wing shade.Periphallalic organs coincide with those of African species of *sanu* species-group.

Lissocephala parabicolor n. sp.

(Figs. 1D–E)

♂. Body about 2.5 mm in length. Antenna pale yellowish orange. Arista 5–6/2–4. Palpus yellowish orange. Frons glossy orange gray, anteriorly paler. Face mat yellowish white. Carina long, flat above. Clypeus yellowish white. Cheek narrow, yellowish white. Mesoscutum somewhat glossy orange gray, caudally and laterally darker. Scutellum nearly quadrate, dark brown, finely pubescent. Thoracic pleura slightly paler than mesoscutum. Humeral 2. Acrostichal hairs 8 rows. Anterior dorsocentrals half posteriors. Lateral scutellars divergent, slightly longer than apicals. Sterno-index 1.0. Legs yellowish gray. Wings hyaline, costal fringe thick, with faint dark spot near apex of R_1 . C-index 1.1; 4V index 1.8; 4C-index 1.4; 5x-index 1.0; Ac-index 3.9; C3-fringe 9/10. Halter black, stalk yellowish.

Periphallalic organs (Fig. 1D) black; surstylus vestigial. Phallic organs (Fig. 1E) black; aedeagus large, with a lateral pointed process.

Holotype ♂ (90322), Wau, Papua New Guinea, 3. IX. 1977 (OKADA), at light. I have seen a ♂ of this species in Texas University collection, Danu, Kalli Bay, New Island, 2–9. IX. 1962 (Noona Dan Expedition, 1951–62). Type in BM.

Distribution. Papua New Guinea, New Island.

Relationships. This species resembles the foregoing species in body coloration, but it differs from the latter in having no dark shade below 3rd costal section, and having black knob of halter.

Lissocephala subbicolor n. sp.

Lissocephala bicolor: OKADA, 1968. Kontyû, Tokyo, 36: 340 (not de MEJERE, misidentified).

♂, ♀. Body 2.5–3.0 mm in length. Antenna with 2nd joint yellowish orange, 3rd grayish orange. Arista 4–5/2–3. Palpus orange. Frons glossy gray brown, anterior half orange. Face gray. Carina long and high. Cheek yellowish orange, narrow. Mesoscutum glossy orange. Scutellum mat yellowish brown, with fine transverse wrinkles. Thoracic pleura pale below. Humerals 2. Scutellars long, laterals slightly divergent. Sterno-index 0.8–1.0. Wing hyaline, without dark shade below costa. C-index 1.0–1.2; 4V-index 1.6; 4C-index 1.5; 5x-index 1.1; Ac-index 4.0–4.5. C3-fringe 9/10. Halter orange brown.

Periphallic organs (Fig. 1F) black. Epandrium narrowing below. Surstylus large, with strong bristles. Phallic organs (Fig. 1G) black. Aedeagus gross. Paramere large. Ovipositor (Fig. 1H) rod-like, pale, apically black, with marginal hairs.

Holotype ♂ (12226), Kang-tzu-lin, Tainan, 23. V. 1971 (KANMIYA). Paratypes: 3 ♂, Puli, Nantow, 19. VIII. 1967 (OKADA); 1 ♀, Chitau, Nantow, 16–17. VIII. 1967 (OKADA); 1 ♀, Mt Banna, Ishigaki Is., 5. VII. 1966 (OKADA). Types in NSMT.

Distribution. Formosa, Ryukyus.

Relationships. This species resembles *L. bicoloroides* in body coloration including halter, phallic organs and ovipositor. It differs from the latter in having no dark shade on wing, having fine transverse wrinkles on scutellum and well-developed surstylus.

Lissocephala metallescens (DE MEIJERE)

(Fig. 1I)

Drosophila metallescens de MEIJERE, 1914. Tijds. Ent., 54: 265.

Ovipositor (Fig. 1I) pale, triangularly pointed, with a row of discal teeth besides usual marginal teeth.

Further specimens examined. 1 ♂, Yangoon, Burma, 10–14. I. 1983 (TODA); 18 ♂, 14 ♀, Efate I., 10 km nw of Vila, New Hebrides, 10–13. II. 1976 (SHIMA); Tonga: 1 ♂, 1 ♀, Tongatapu, 9–10. VIII. 1981; 9 ♂, Vava'u 13. VIII. 1981 (TOBARI, FUYAMA, TAKANASHI); 1 ♂, 1 ♀, Lae, Papua New Guinea, 27–29. IX. 1977 (OKADA).

Distribution. India, Sri Lanka, Burma (n. loc.), Thailand, Malaysia, Indonesia, Micronesia, New Guinea, New Hebrides (n. loc.), Solomon Is., Santa Cruz Is., Tonga (n. loc.)

Genus *Thyrecephala* n.

Type: *Lissocephala asiatica* OKADA, 1964.

This genus is related to *Lissocephala*, having in common the features: frons glossy, postverticals minute, 2nd oral fine, mesoscutum shiny, scutellum dull, C-index low and abdominal tergites smooth and glossy. It differs from *Lissocephala*

in having frontal shield usually well demarcated, antennal bases closely apposed, acrostichal hairs 2-4 rows, sterno-index 0-0.5, and C3-fringe 2/5-3/5. It somewhat resembles *Hypselothyrea* de MEIJERE especially in well demarcated frontal shield, thus the generic name. Egg with 4 long filaments, so far as known.

This genus includes 5 species transferred from *Lissocephala*, which are, besides the type species, *parasiatica* (TAKADA et MOMMA, 1975: 24) n. comb., *neoasisatica* (TAKADA et MOMMA, 1975: 26) n. comb., *indersinghi* (TAKADA et MOMMA, 1975: 24) n. comb., and *corpusculata* (TAKADA et MOMMA, 1975: 26), n. comb. (all Malaya), and 3 new species.

Thyrecephala asiatica (OKADA) n. comb.

Lissocephala asiatica OKADA, 1964. Kontyû, Tokyo, 32: 106.

Further specimen examined. 1 ♀, Rangoon, Burma, 10-14. I. 1982 (TODA).

Remarks. A record from Malaya by TAKADA and MOMMA (1975: 24) would refer to a different species, having surstylus teeth divided into 2 groups.

Distribution. Amami, Ryukyus, Formosa, Burma (n. loc.), Malaya, Java.

Thyrecephala bimaculata n. sp.

(Figs. 2A-C, I)

♂, ♀. Body about 1.5 mm in length. Eye dark red, with pile. Antenna yellow, 3rd joint basally black. Arista 7-9/2-3. Palpus dark. Clypeus yellowish. Frons glossy black, broader than long, medioanteriorly bright yellow. Face gray, carina undeveloped. Cheek yellowish, very narrow. Mesoscutum (Fig. 2I) mat yellowish orange, laterally with large black spot. Scutellum mat orange, with lateral black spots. Thoracic pleura yellowish orange, dark below. Humeral 1, long. Acrostichal hairs 2 rows. Anterior dorsocentrals longer than posteriors. Lateral scutellars divergent, as long as apicals. Legs yellow, femora fuscous subapically. Wing hyline. C-index 1.5-2.0; 4V-index 2.5-3.0; 4C-index 1.8-2.0; 5x-index 2.5-3.5; Ac-index 3.0-4.0; C3-fringe 1/2-3/5. Halter pale, knob dark. Abdominal tergites brownish black. Periphallic organs (Fig. 2A) black; epandrium pointed below, surstylus with a row of about 15 black teeth. Phallic organs (Fig. 2B) pale; aedeagus globular. Ovipositor (Fig. 2C) pale, triangular, without discal teeth.

Holotype ♂ (92306), Wau, Papua New Guinea, 23. IX. 1977 (OKADA). Paratypes: 2 ♂, 5 ♀, same locality as above, 27. VIII-10. X. 1977 (OKADA); 1 ♂, 6 miles nw Lae, 9. VII. 1957 (HARDY); 2 ♀, Sentani, 18. VI. 1959 (GRESSITT, MAA), malaise trap; 1 ♀, Manokwari, Vogelkop, 75 m, 24. VII. 1957 (HARDY); 1 ♀, Cyclops Mts, 150-250 m, 17. VII. 1959 (MAA). Types in BM, some paratypes in NSMT.

Distribution. Papua New Guinea, NW New Guinea.

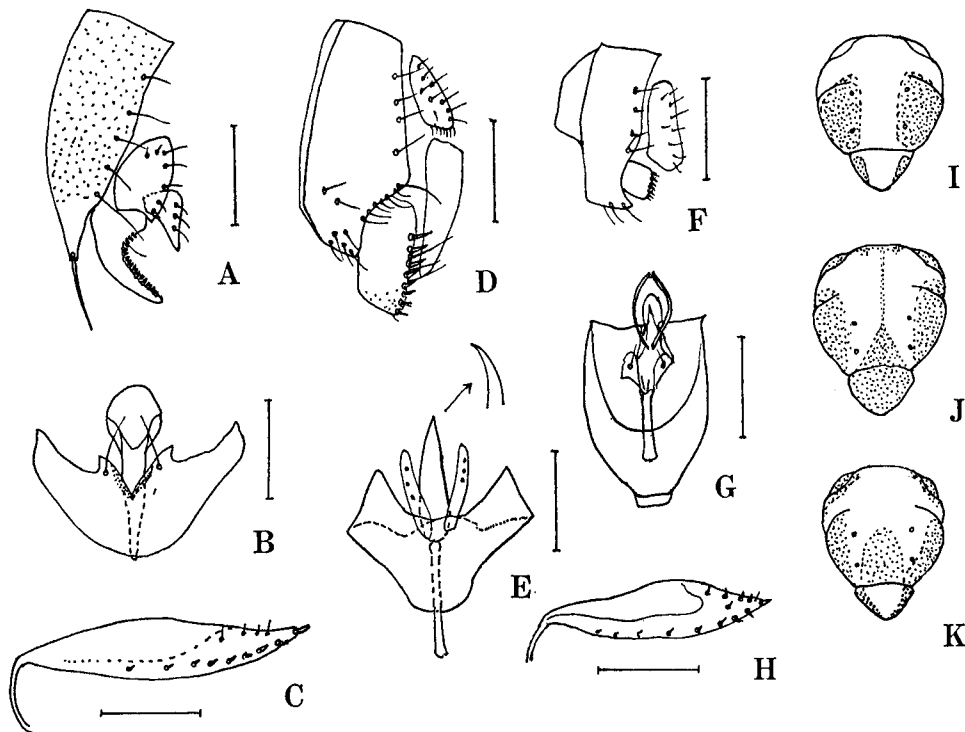


Fig. 2. *Thyreocephala* spp. A-C, I, *T. bimaculata*; D, E, J, *T. trimaculata*; F-H, K, *T. viridifrons*. A, D, F, Periphallic organs; B, E, G, phallic organs; C, H, ovipositor; I-K, mesonotum. Scales 0.1 mm.

Relationships. This species resembles *T. asiatica* in having black lateral spots on mesoscutum and thoracic plura dark blue, but it differs from the latter in having distinct black spots on scutellum, clear wing, and frons anteriorly bright yellow.

Thyreocephala trimaculata n. sp.

(Figs. 2D-E, J)

♂. Body about 1.2-1.5 mm in length. Eye dark red, sparsely piled. Antenna orange, 3rd joint black. Arista 6/5. Palpus yellow or black. Frons glossy black, shining metallic purple. Face whitish. Carina undeveloped. Cheek yellowish, narrow. Mesoscutum (Fig. 2J) orange, with large black patches laterally and caudomedially. Scutellum velvety black. Thoracic pleura yellowish orange, with a black longitudinal stripe medially. Humerals 2. Acrostichal hairs 4-6 rows. Lateral scutellars divergent, as long as apicals. Sterno-index ca 0.5. Legs yellow. Wing hyaline. C-index 1.3-1.5; 4V-index 2.0; 4C-index 1.4; 5x-index 2.5; Ac-index 2.5-2.8; C3-fringe 1/2. Halter yellowish orange or brown. Abdominal tergites brown, laterally darker.

Periphallic organs (Fig. 2D) pale: epandrium triangular below; surstylus with a straight row of about 10 black teeth. Phallic organs (Fig. 2E) pale; aedeagus

slender; paramere slender and as long as aedeagus. Egg with 4 long filaments.

Holotype ♂ (B255), Wampit V., Gurakor Village, 950 m, nr Wau, 7. VII. 1957 (HARDY). Paratypes: 2 ♀, collected together with holotype; 1 ♂, 1 ♀, Lae, 10 m, 6. VII. 1957 (HARDY); 2 ♀, Vogelkop, Sururai Vill, Anggi, Ciji 1850–2040 m, 25–29. VII. 1957 (HARDY); 1 ♀, Cyclops Mts, Ifar 300 m, 20. VI. 1959 (HARDY). Types in BM.

Distribution. Papua New Guinea, NW New Guinea.

Relationships. This species resembles *T. bimaculata* in having lateral black spots on mesoscutum, but differs from the latter in having mesoscutum caudomedially black, scutellum velvety black, frons anteriorly not bright yellow and surstylus with straight row of teeth.

Thyrecephala viridifrons n. sp.

(Figs. 2F–H, K)

♂, ♀. Body about 1.5 mm in length. Eye with fine pile. Antenna orange, 3rd joint gray, antennal bases slightly separated from each other. Arista 6/2. Plapus gray. Frons shiny metallic blue black, granulose. Face black, yellowish above. Carina yellow, short. Clypeus black. Cheek black, narrow. Second oral unusually long, slightly shorter than vibrissa. Mesoscutum (Fig. 2K) orange yellow, laterally and caudomedially dark. Scutellum orange, laterally black. Thoracic pleura pale yellow, with black patches above. Acrostichal hairs 4 rows. Lateral scutellars divergent, as long as apicals. Sterno-index 0.3. Legs yellow. Wing somewhat fuscous, veins dark. C-index 1.1; 4V-index 3.2; 4C-index 2.7; 5x-index 4.3; Ac-index 4.0; C3-fringe 2/5. Halter brown. Abdominal tergites mat brownish black, caudal segments largely yellow. Periphallic organs (Fig. 2F) black; epandrium pale and truncate blow; surstylus quadrate, with a straight row of about 10 teeth. Phallic organs (Fig. 2G) brown; aedeagus ellipsoidal; paramere absent. Ovipositor (Fig. 2H) orange yellow, triangularly pointed, with orange marginal teeth. Egg with 4 long filaments.

Holotype ♂ (12110), 1 ♀ paratype, Penang, 20. VII. 1971 (OKADA). Types in NSMT.

Distribution. Malaya.

Relationships. This species somewhat resembles *T. trimaculata* and *T. bimaculata* in having dark mesoscutal patches and laterally black scutellum, respectively, but differs from the latter in having shiny blue black granulose frons.

Taximetric Analyses and Construction of Key to Species

For estimating the relationships of the 2 genera and of the species, MCD proximity analysis and UPGMA cluster analysis are made, using 15 external morphological characters ("A"–"O"), each coded in 2 states, 0 and 1.

- “G” Scutellum black (G=0), yellowish (g=1), or with black spots (G'=0.5).
 “H” Thoracic pleura fuscous below (H=0), pale (h=1) or with dark stripe above (H'=0.5).
 “I” Acrostichal hairs 6–8 rows (I=0), 2–4 rows (i=1), or 4–6 rows (I'=0.5).
 “J” Wing hyaline (J=0), or basally with black diagonal streak (j=1).
 “K” C-index more than 1.3 (K=0), or less than 1.1 (k=1).
 “L” 4V-index less than 1.7 (L=0), or more than 2.0 (l=1).
 “M” C3-fringe 2/5–3/5 (M=0), or 8/10–9/10 (m=1).
 “N” Halter black (N=0), plae (n=1), or brown (N'=0.5).
 “O” Abdominal tergites glossy black (O=0), or pale (o=1).

When necessary, an intermediate state coded 0.5 is applied. The characters show no comparison (NC) in some cases: *L. binotata* (“I”, “J”, “M”), *L. sabroskyi* (“N”), *L. versicolor* (“M”), *T. parasiatica* (“B”), and *T. corpusculata* (“B”, “C”, “D”, “E”). The species showing more than 4 NC, *T. indersinghi* and *T. neoasiatica*, are excluded from the analyses.

The result of analyses is as shown in Fig. 3. The genera *Lissocephala* and *Thyrecephala* are divided in 2 major clusters. *T. corpusculata* is remotely clustered from other *Thyrecephala* species, reflecting its somewhat unusual features.

From this dendrogram a key to genera and species is provided. The numerical signs on the branching points of dendrogram correspond to the orders of key couplets. The alphabetical signs put on the stem of dendrogram are the key character states selected from the original $n \times t$ matrix, those in parentheses are used in simultaneous keys.

Sequential and Simultaneous Key to Genera and Species

- The simultaneous key involves the character states in brackets.
1. Acrostichal hairs 6–8 rows (I, NC in *binotata*); [frontal shield not well demarcated (C); C-index less than 1.1 (k); C3-fringe 8/10–9/10 (m, NC in *binotata* and *versicolor*)]. Genus *Lissocephala*, 2.
 — Acrostichal hairs 2–4 rows (i) or 4–6 rows in *trimaculata* (I'), [wing hyaline (J), 4V-index more than 2.0 (l)]. Genus *Thyrecephala*, 10.
 2. Upper branches of arista more than 6 (a), [palpus yellow to tan (b), frons yellowish (d), face yellow to tan (e), mesoscutum yellowish (f), thoracic pleura pale (h), wing hyaline (J), abdominal tergites glossy black (0)]. 3.
 — Upper branches of arista less than 5 (A), [scutellum yellow to tan (g)]. 4.
 3. Scutellum yellowish (g), 4V-index more than 2.0 (l), halter brown (N').
 *bicoloroides*
 — Scutellum black (G), 4V-index less than 1.7 (L), halter black (N) . . . *parabicolor*
 4. Thoracic pleura pale (h), [frons yellowish (d), mesoscutum yellowish (f), 4V-index less than 1.7 (L), halter pale (n)]. 5.
 — Thoracic pleura with dark stripe above (H'), [palpus yellow or tan (b), face

- yellow to tan (e), wing basally with black diagonal streak (j), abdominal tergites glossy black (0)].....7.
5. Palpus yellow to tan (b), face yellow to tan (e), [wing hyaline (J, NC in *binotata*)] 6.
- Palpus gray to dark brown (B), face brown to black (F), [wing basally with black diagonal streak (j), abdominal tergites pale (o)]..... *fijiensis*
6. Abdominal tergites pale (o)..... *binotata*
- Abdominal tergites glossy black (O)..... *subbicolor*
7. Frons blackish (D), halter black (N), mesoscutum blackish (F), 4V-index more than 2.0 (1)..... *versicolor*
- Frons yellowish (d), halter pale (n, NC in *sabroskyi*).....8.
8. Mesoscutum blackish (F), 4V-index less than 1.7 (L)..... *powelli*
- Mesoscutum yellowish (f).....9.
9. 4V-index more than 2.0 (1)..... *metallescens*
- 4V-index less than 1.7 (L)..... *sabroskyi*
10. Upper branches of arista less than 5 (A), mesoscutum blackish (F), C3-fringe 8/10–9/10 (m), abdominal tergites pale (o), [scutellum black (G), thoracic pleura fuscous below (H), acrostichal hairs 2–4 rows (i), C-index less than 1.1 (k), halter brown (N')]...... *corpusculata*
- Upper branches of arista more than 6 (A), mesoscutum with black spots (F'), C3-fringe 2/5–3/5 (M), abdominal tergites glossy black (O), [frons blackish (D)]11.
11. Acrostichal hairs 4–6 rows (I'), frontal shield not well demarcated (C), [palpus yellow to tan (b), face yellow to tan (e), scutellum black (G), thoracic pleura with dark black stripe above (H'), C-index more than 1.3 (K), halter black (N)]. *trimaculata*
- Acrostichal hairs 2–4 rows (i), frontal shield well demarcated (c).....12.
12. Thoracic pleura with dark stripe above (H'), C-index less than 1.1 (k), halter brown (N'), [palpus gray to dark brown (B), face brown to black (E), scutellum with black spots (G')]...... *viridifrons*
- Thoracic pleura fuscous below (H), C-index more than 1.3 (K), halter pale (n, NC in *parasiatica*).....13.
13. Face yellow to tan (e), scutellum yellowish (g), [palpus yellow to tan (b)]....
..... *asiatica*
- Face brown to black (E).....14.
14. Scutellum yellowish (g)..... *parasiatica*
- Scutellum black (G), [palpus yellow or brown (B')]...... *bimaculata*

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