

# The Genus *Sphaerogastrella* DUDA (Diptera, Drosophilidae) of Papua New Guinea

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**Synopsis** Five new species of the genus *Sphaerogastrella* DUDA (Diptera, Drosophilidae) are described from Papua New Guinea: *flabellata*, *papuana*, *scutellaris*, *albimana* and *hypsela*, with a revision of the genus by means of taximetric analysis.

The previous revision of the genus *Sphaerogastrella* DUDA, 1922 (Diptera, Drosophilidae) involved only 2 species, *javana* (DE MEIJERE, 1911) and *rostralis* OKADA, 1974, while *novoguineensis* DUDA, 1926 has been overlooked (OKADA, 1974). The present article describes 5 new species from Papua New Guinea with a further revision of 8 species of this genus by means of taximetric analysis. The species from New Guinea attains 7 in number, which is much larger than estimated by us before, only 2 (CARSON & OKADA, 1982).

## *Sphaerogastrella javana* (DE MEIJERE)

*Camilla javana* DE MEIJERE, 1911. Tijdschr. Ent., 54: 422 (Java)

*Sphaerogastrella flavipes* DUDA, 1922. Arch. Naturgesch., 88: 158 (Sumatra)

*Camilla atidis* FREY, 1917. Finska vetensk. Vorhand., 59: 30 (Sri Lanka) n. syn.

Further specimens examined. NEW GUINEA: PNG (NE): Wau, 3 ♂, 3 ♀, 19. VIII-16. IX. 1977 (OKADA); Bulolo, 1 ♂, 15. IX. 1977 (OKADA); Snake River, 600 m, 1 ♂, 1 ♀, 30. VIII. 1977 (CARSON), from a large cultivated plant of Cucurbitae. CELEBES: Marino, 1 ♂, 10. XII. 1973 (SHINONAGA). SABAH: Kota Kinabalu, 1 ♂, 2 ♀, 4. XI. 1979 (HIHARA); Sandakan, 2 ♂, 1. XI. 1979 (HIHARA). PHILLIPPINES: Puerto Princesa, Palawan, 2 ♂, 1. XI. 1979 (HIHARA); Los Baños, Luzon, 2 ♂, 20. X. 1979 (HIHARA). BURMA: Rangoon, 11 ♂, 1 ♀, 13-14. XII. 1981 (KITAGAWA, TODA). THAILAND: Namtok, 2 ♂, 1 ♀, 18. IX. 1975 (KURAHASHI). MALAYA: Kuala Lumpur, 2 ♂, 20. XI. 1979 (HIHARA).

Distribution. Java, Sumatra, Sri Lanka, Burma (n. loc.), Thailand, Viet Nam, Malaya, Singapore, Philippines, Sabah (n. loc.), Celebes, Mollucas, New Guinea.

Australian specimens recorded by BOCK (1979, 1982) seem to belong to *S. novoguineensis*, since they have black knobs on halteres. According to MATHIS (personal communication) *Camilla atidis* FREY from Sri Lanka is possibly a *Sphaerogastrella* species. Our observation of the holotype ♀ of this species borrowed from the University of Helsinki proved its conspecificity with *S. javana*. The leg and face are variable in coloration even in *javana* from Java, and DUDA synonymized the paler form, *flavipes*, from Sumatra with *javana*. Moreover, although FREY distinguished *atidis* from *javana* by the absence of an apical tooth of fore coxa, we found a tooth even in the holotype of *atidis*.

*Sphaerogastrella novoguineensis* DUDA

(Fig. 1I-L)

*Sphaerogastrella novoguineensis* DUDA, 1926. Supplta ent., 14: 53.

Duda gave this name to 2 ex certainly from New Guinea having body metallic blue and femora, tibiae and halteres black. Further description is given below.

♂, ♀. Body about 2 mm in length. Eye dark red, bare. Antenna with 2nd joint dark orange, 3rd grayish black. Arista with 5 upper and 2 lower branches and a large fork. Palpus black. Periorbit brownish black, shining blue or purple. Frons glossy brownish black, shining blue or purple, anteriorly dark orange and half as broad as median length. Ocellars absent. Face dark brown. Carina

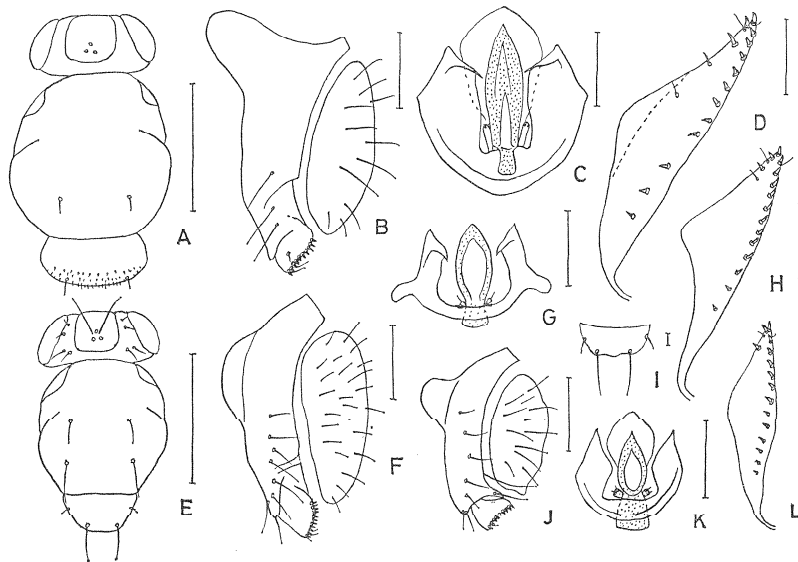


Fig. 1. A-D, *Sphaerogastrella flabellata*; E-H, *S. papuana*; I-L, *S. novoguineensis*. — A, E, head and thorax; B, F, J, periphallallic organs; C, G, K, phallic organs; D, H, L, ovipositor; I, scutellum. Scales 1 mm in A and E, 0.1 mm in other Figs.

large, broad. Cheek dark brown, 1/4 as broad as the greatest diameter of eye. Clypeus brownish black. Anterior reclinate orbital absent, proclinate half posterior reclinate. Orals absent. Mesoscutum and thoracic pleura glossy black, shining blue or purple. Scutellum (Fig. 1I) uniformly velvety black, trapezoid, caudal margin somewhat projected at middle. Humerals and acrostichal hairs absent. Anterior dorsocentrals half posteriors, length distance of dorsocentrals 2/3 cross distance. Lateral scutellars small, divergent, 1/4 apicals, which are parallel and slightly nearer to laterals than to each other. Legs brown, femora black. Fore metatarsus as long as 3 succeeding tarsal joints; mid and hind metatarsi as long as the rest of tarsal joints. Wing hyaline.  $R_{2+3}$  nearly straight;  $R_{4+5}$  and M parallel. C-index 2.0; 4V-index 1.5–2.0; 4C-index 1.3; 5x-index 1.2; Ac-index 3.0. C1-bristles 2; C3-fringe 1/2. Halter with knob black, stalk orange. Abdominal tergites glossy black. Periphallalic and phallic organs (Fig. 1J–K) black. Ovipositor (Fig. 1L) yellowish brown.

Specimens examined. NEW GUINEA: PNG (NE): Wau, 105 ex, VIII–IX. 1977 (CARSON, OKADA), numerous on a heap of compost maintained at the Wau Ecology Institute; Bulolo, 63 ex, 1–15. IX. 1977 (OKADA); Headshump near Bulolo, 910 m, 1 ♂, 1 ♀, 18. IX. 1977 (M. S. CARSON), individually from a leaf; Lae, 8 ex, 27–30. IX. 1977 (CARSON, OKADA), by general sweeping; Snake River, 600 m, 1 ♀, 30. VIII. 1977 (CARSON).

Distribution. New Guinea, Australia.

A single specimen from Lae was reported by us in table 3 of "Banana trap paper" II (CARSON & OKADA, 1983). This species can be distinguished from *S. javana* by black knob of halter and caudomedially projected scutellum. According to PAPP (personal communication) the types of this species are not present in Budapest.

*Dächli* (1983 manuscript) reported 1 syntype (♂) Sumbang, Huon Gulf, S. var. nov. *guineensis*. Det. O. Kuda in Hong. Nat. Hist. Mus.

*Sphaerogastrella flabellata* n. sp.

(Fig. 1A–D)

♂, ♀. Body (Fig. 1A) about 3.5 mm in length. Eye dark red, bare. Antenna with 2nd joint orange brown, 3rd mat black. Arista with 5–6 upper and 2–3 lower branches and a terminal fork. Palpus grayish brown, with fine setae below. Peri-orbit glossy black, shining blue. Frons glossy dark brown, shining blue, anteriorly twice as broad as head width; frontal shield quadrate. Ocellars absent. Face glossy dark brown, black above. Carina flat above. Cheek glossy orange brown, about 2/7 as broad as the greatest diameter of eye. Clypeus glossy orange brown. Orbitals and orals absent. Mesoscutum and thoracic pleura glossy black, shining blue. Scutellum mat black, finely setigerous, very large and fan-shaped, thus the specific name. Humerals and acrostichal hairs absent. Anterior dorsocentrals absent, posteriors short. Lateral scutellars absent, apicals very short. Legs yellowish brown, femora black except apices. Wing basally black,  $R_{2+3}$  gently curved

apically toward costa,  $R_{4+5}$  and M parallel. C-index 2.2; 4V-index 1.5; 4C-index 1.0; 5x-index 1.0; Ac-index 3.0. C1-bristle 1; C3-fringe 1/2. Abdominal tergites glossy black, shining blue. Periphallie and phallic organs (Fig. 1B-C) black. Ovipositor (Fig. 1D) yellowish brown. Egg with 4 long filaments, which are half as long as egg itself.

Holotype ♂ (92612), Wau, PNG, 26 IX. 1977; 7 ♂, 8 ♀ paratypes, same locality, 21. VIII-5. X. 1977 (OKADA), by sweeping; 1 ♂ paratype, Headshump near Bulolo, 910 m, 15. X. 1977 (CARSON), collected from a fallen fruit on the ground. Types in Bishop Museum, 2 ♂, 2 ♀ paratypes in National Science Museum, Tokyo.

Distribution. New Guinea.

This species differs from other known species of *Sphaerogastrella* in having large fan-shaped scutellum.

*Sphaerogastrella papuana* n. sp.

(Fig. 1E-H)

♂, ♀. Body 2.5-3.0 mm in length. Eye deep red, bare. Antenna with 2nd joint orange brown, 3rd grayish brown. Arista with 5 upper and 2 lower branches and a large fork. Palpus mat gray, with a short apical seta. Periorbit broad, glossy brownish black, shining blue. Frons (Fig. 1E) glossy orange brown, shining blue, anteriorly half as broad as head width, posteriorly wider. Ocellars long. Face glossy orange brown, laterally black. Carina flat above. Clypeus glossy dark brown. Cheek glossy brown, 1/3 as broad as the greatest diameter of eye. Proclinate orbital half posterior reclinate; anterior reclinate absent. Orals absent. Mesoscutum and thoracic pleura glossy black, shining blue or purple. Scutellum velvety black, trapezoid, caudal margin straight. Humeral and acrostichal hairs absent. Anterior dorsocentrals half posteriors; length distance of dorsocentrals 3/5 cross distance. Lateral scutellars minute; apicals long, parallel, equally apart from each other and from laterals. Legs yellowish brown, femora and mid tibia except apex black. Fore metatarsus longer than succeeding 3 tarsal joints, mid metatarsus longer than and hind metatarsus as long as the rest of tarsal joints. Wing basally black.  $R_{2+3}$  nearly straight;  $R_{4+5}$  and M parallel. C-index 2.4; 4V-index 2.0; 4C-index 1.0; 5x-index 1.3; Ac-index 2.5. C1-bristles 2; C3-fringe 2/5. Halter black. Abdominal tergites glossy black, shining blue. Phallic and periphallie organs (Fig. 1F-G) deep black. Ovipositor (Fig. 1H) yellowish brown.

Holotype ♂ (92619), Wau, PNG, 26. IX. 1977; 4 ♀ paratypes, same locality, 22. VIII-10. IX. 1977 (OKADA), by sweeping. Types in Bishop Museum, 1 ♀ paratype, in National Science Museum, Tokyo.

Distribution. New Guinea.

This species resembles *S. flabellata* in having basally black wing, but differs in the shape of scutellum.

*Sphaerogastrella albimana* n. sp.

(Fig. 2A-B)

♀. Body (Fig. 2A) 2.2 mm in length. Eye dark brownish red, bare. Antenna with 2nd joint dark orange, 3rd grayish black. Arista with 5 upper and 4 lower long branches and a large fork. Palpus black, with a long apical seta. Frons much broader than long; frontal shield quadrate, glossy black, slightly granulose. Face glossy black. Cheek glossy black, 1/10 as broad as the greatest diameter of eye. Clypeus black. Face glossy black, carina truncate below. Anterior reclinate orbital absent, proclinate half as long as posterior reclinate. Second oral half vibrissa. Mesoscutum glossy black, slightly bluish and granulose. Scutellum uniformly velvety black, trapezoid, broader than long. Thoracic pleura glossy black. Humeral 1, minute. Acrostichal hairs absent. Length distance of dorso-centrals 2/3 cross distance. Lateral scutellars divergent, 1/7 as long as apicals, which are equally apart from each other and from laterals. Sternopleural 1. Legs grayish yellow; coxa yellowish white; fore tarsi milky white, thus the specific name, ultimate joint brown; fore femora and tibiae black; mid and hind legs black around knee joints. Wing hyaline.  $R_{2+3}$  nearly straight;  $R_{4+5}$  and M parallel. C-index 3.0; 4V-index 1.5; 4C-index 0.7; 5x-index 1.9; Ac-index 2.0. C1-bristle 1, C3-fringe 1/2. Halter brownish black, whitish below. Abdominal tergites glossy black, not much swollen. Ovipositor (Fig. 2B) pale brown.

Holotype ♀ (C210.17), Mt. Kaindi, 2200 m, PNG, 10. IX. 1977 (CARSON), on

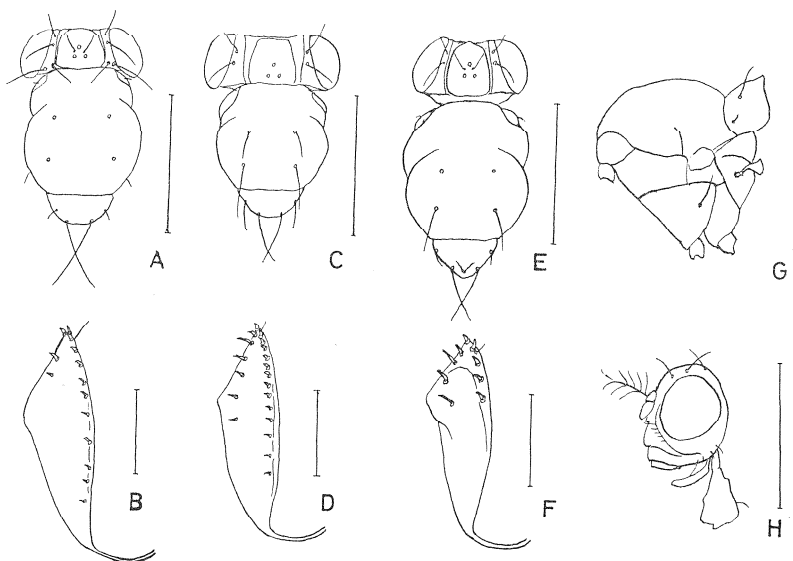


Fig. 2. A-B, *Sphaerogastrella albimana*; C-D, *S. scutellaris*; E-H, *S. hypsela*. — A, C, E, head and thorax; B, D, F, ovipositor; G, thorax; H, head. Scales 0.1 mm in B, D and F, 1 mm in other Figs.

banana bait. This is not reported in our "banana trap" paper. Type in Bishop Museum.

Distribution. New Guinea.

This species is unique among the genus in having white fore tarsi.

*Sphaerogastrella scutellaris* n. sp.

(Fig. 2C-D)

♀. Body (Fig. 2C) about 2.2 mm in length. Eye orange red, rather small, bare. Antenna black, 2nd joint dorsally orange brown. Arista with 5 upper and 3 lower branches and a large fork. Palpus black. Periorbit glossy black, broad. Frons (Fig. 2C) nearly twice as broad as long; frontal shield quadrate, glossy black; parafrontalia mat grayish black. Face glossy black. Carina broad, short, glossy black. Cheek black, half as broad as the greatest diameter of eye. Anterior reclinate orbital absent; proclinate shorter than posterior reclinate. Second oral 1/4 vibrissa. Mesoscutum and thoracic pleura glossy black. Scutellum uniformly velvety black, distally evenly rounded. Humerals absent. Anterior dorsocentrals slightly shorter than posteriors, length distance of dorsocentrals 3/5 cross distance. Lateral scutellars convergent, unusually long, half as long as apicals, thus the specific name; apicals equally apart from each other and from laterals. Sternopleural 1. Legs black, coxae, tarsi and basal halves of femora yellow. Wing hyaline.  $R_{2+3}$  nearly straight,  $R_{4+5}$  and M parallel. C-index 2.0; 4V-index 1.7; 4C-index 1.1; 5x-index 1.3; Ac-index 3.0. C1-bristle 1; C3-fringe 1/2. Halter brown. Abdominal tergites glossy black. Ovipositor (Fig. 2D) brownish black.

Holotype ♀ (C221.16), Mt. Kaindi, 1900 m, PNG, 27. X. 1977 (CARSON), near (not "ex") *Alocasia macrorrhiza*. Type in Bishop Museum.

Distribution. New Guinea.

This species is unique among the genus in having very broad frons and long lateral scutellars.

*Sphaerogastrella hypsela* n. sp.

(Fig. 2E-H)

♀. Body (Fig. 2E, H) about 2.5 mm in length. Head slightly broader than thorax. Eye reddish brown, rather small, bare. Antenna with 2nd joint orange brown, black above, 3rd grayish black. Arista with 4 upper and 2 lower branches and a large fork. Palpus slender, black. Periorbit broad, glossy black. Frons anteriorly as broad as median length; frontal shield glossy black, slightly longer than broad, anteriorly rounded; parafrontalia pruinose gray. Face broad, convex, glossy black. Carina small, short. Cheek black, as broad as 1/3 greatest diameter of eye. Anterior reclinate orbital absent; posterior reclinate longer than proclinate. Vibrissa fine. Mesoscutum and thoracic pleura glossy black. Scutellum triangular, pointed and upcurved, thus the specific name (Fig. 2G). Humeral 1,

fine. Length distance of dorsocentrals slightly shorter than cross distance. Lateral scutellars very short. Sternopleural 1. Legs glossy black including coxae and mid and hind trochanters; fore tarsi white, mid and hind tarsi and basal half of hind femur yellowish brown. Wing hyaline.  $R_{2+3}$  straight;  $R_{4+5}$  and M slightly convergent. C-index 2.0; 4V-index 2.0; 4C-index 1.2; 5x-index 1.0; Ac-index 3.6. C1-bristle 1; C3-fringe 1/2. Halter yellow. Abdominal tergites glossy black, 1T dark orange brown. Ovipositor (Fig. 2F) yellowish brown.

Holotype ♀ (91830), Bulolo, PNG, 18. IX. 1977 (OKADA), by sweeping. Type in Bishop Museum.

Distribution. New Guinea.

This species resembles *S. albimana* in having white fore tarsi, but is easily distinguished from the latter and any other member of the genus by upright scutellum as in *Hypselothyrea* (*H.*) species. This species differs, however, from *Hypselothyrea* in having abdomen basally not narrowing.

#### Taximetric Analysis

By means of  $S_{ok}$  proximity analysis and UPGA cluster analysis of the eight species of *Sphaerogastrella* ( $t=8$ ) over thirteen diagnostic characters ( $n=13$ ), a dendrogram of relationships of the species was established (Fig. 3). Each character is divided into two states: presumed plesiomorph coded 0 (large letter) and presumed apomorph coded 1 (small letter).

- "A" Anterior reclinate orbital present (A=0) or absent (a=1).
- "B" Posterior reclinate orbital present (B=0) or absent (b=1).
- "C" Ocellars present (C=0) or absent (c=1).
- "D" Second oral present (D=0) or absent (d=1).
- "E" Vibrissa present (E=0) or absent (e=1).
- "F" Mesoscutum glossy black (F=0) or glossy bluish black (f=1).
- "G" Scutellum normal, trapezoid (G=0) or abnormal, large fan-shaped or upright (g=1).
- "H" Anterior dorsocentrals present (H=0) or absent (h=1).
- "I" Lateral scutellars present (I=0) or absent (i=1).
- "J" Apical scutellars long (J=0) or very short (j=1).
- "K" Femora yellowish brown (K=0) or black (k=1).
- "L" Wing basally not black (L=0) or black (l=1).
- "M" C3-fringe about 1/2 (M=0) or 1/3 (m=1).
- "N" Halter yellow (N=0) or black (n=1).
- "O" Aedeagus without ventral process (O=0) or with ventral process (o=1).
- "P" Tarsus of fore leg not white (P=0) or white (p=1).
- "Q" Lateral scutellars half apicals (Q=0) or less than 1/3 apicals (q=1).

The dendrogram shows that *S. rostralis* is most deviated from the remaining species and that *S. novoguineensis* and *S. papuana* are closest with each other. From

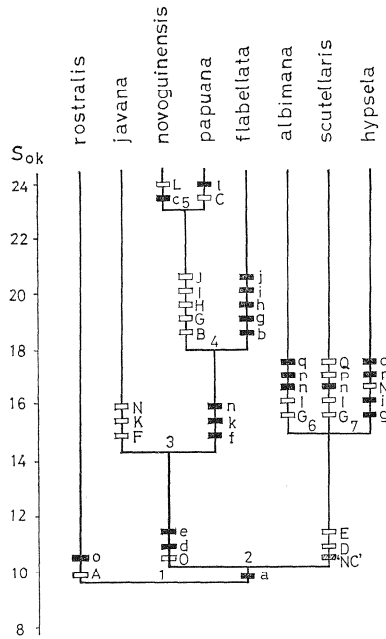


Fig. 3. A dendrogram of relationships of 8 species of *Sphaerogastrella*, based on  $S_{0k}$  proximity analysis and UPGA cluster analysis.  $r_{es} = +0.86$ . Numerical figures on the branching points of dendrogram correspond to key couplets. Alphabetical signs are diagnostic characters: large letters presumed plesiomorphs, small letters presumed apomorphs.

the dendrogram a sequential key to species was automatically constructed as below.

**Key to Species of the Genus *Sphaerogastrella***

1. Anterior reclinate orbital present (A); aedeagus with ventral process (o)..... *rostralis*  
 — Anterior reclinate orbital absent (a)..... 2
2. Vibrissa and second oral absent (ed); aedeagus without ventral process (O)... 3  
 — Vibrissa and second oral present (ED); aedeagus not seen..... 6
3. Mesoscutum glossy black (F); femora yellowish brown (K); halter yellow (N)  
 ..... *javana*  
 — Mesoscutum glossy bluish black (f); femora black (k); halter black (n)..... 4
4. Posterior reclinate orbital, anterior dorsocentrals and lateral scutellars absent (bhi); scutellum abnormal, very large and fan-shaped (g); apical scutellars very short (j)..... *flabellata*  
 — Posterior reclinate orbital, anterior dorsocentrals and lateral scutellars present (BHI); scutellum trapezoid, not very large (G); apical scutellars long (J)..... 5
5. Ocellars absent (c); wing basally not black (L)..... *novoguineensis*  
 — Ocellars present (C); wing basally black (l)..... *papuana*
6. Scutellum abnormal, upright and apically pointed (g); lateral scutellars absent (i); halter yellow (N); fore leg with tarsi white (p); lateral scutellars less than 1/3 apicals (q)..... *hypsela*



Univ Cambridge 李維 宮本友田 林 多田由倉 堀 孔大 Larson 75 Hardy  
朝岡 高木 久田 村 Baseda Boek Biichi Frydenberg Mace Chveta Gupta  
Tsacas Ebenhard Hackman Lakovian Lechari Krishnamitry Lesterka  
Steyskal 林, 李 Cambridge Univ 屋高翅 謝 劉 邱 邱 邱 (4)  
Mc Evey Arimaldi 孔大 和 田 金子 劉 邱 邱 謝 謝 若 史 漢 巴  
Lee 林 Ebenhard 張 Ding