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DROSOPHILIDAE FROM BANANA TRAPS OVER AN ALTITUDINAL TRANSECT IN PAPUA NEW GUINEA

I. Descriptions of new species with notes on newly recorded species

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Abstract. Fourteen new species of the genus *Drosophila* are described. Seven belong to subgenus *Scaptodrosophila*, 6 to subgenus *Sophophora* and 1 to subgenus *Drosophila*. A new species of *Styloptera* is described. Notes on 3 previously described species, *D. (So.) ironensis*, *D. (So.) rhopaloa* and *D. (D.) persicae*, have been added. All specimens were caught at lures made from fermented bananas and placed in densely forested areas in Morobe Province, Papua New Guinea during 1977.

The drosophilid fauna of New Guinea is apparently large and diverse, according to several recent but preliminary accounts (Okada 1981; Carson & Okada 1982a). Until a few years ago, little or no specific attention has been given to the systematic and evolutionary biology of these flies from this large and ecologically diverse tropical island. During about 5 months in the latter part of 1977, we undertook a survey of the Drosophilidae of the Morobe Province in the eastern part of the island, now included within the independent nation of Papua New Guinea. Using a variety of collecting methods, we encountered many new species. A significant number of these were found to be associated with flowers as breeding and feeding substrates. Four of our publications have dealt with this unusual and interesting fauna (Okada & Carson 1980, 1982; Carson & Okada 1980, 1982b).

In this paper (Part 1) and the next (Part 2), we record additional data obtained in 1977 from a number of the same localities in the Morobe Province. In this first part, we present descriptions of 15 new species collected from lures baited with fermented banana. We also include notes on several previously described species newly recorded from this area. In part 2 we will record the frequency of species attracted to banana over an 8-station altitudinal transect, extending from about sea level to 2200 m altitude.

Banana trap collections are important, since the use of such traps is a standard method of collection that is used worldwide to sample *Drosophila* populations, especially to obtain samples for studies of population genetics. A review of the literature on collecting *Drosophila* (Carson 1971) has shown that by no means are all species of Drosophilidae of an area, whether tropical or temperate, attracted to such traps. The New Guinea drosophilids are no exception. As will be documented in our second paper, not only did the composition of species attracted to banana change drastically

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over the transect studied, but most of the flower-breeding species, previously described from the same areas, were not attracted to fermenting banana.

This work was carried out in 1977 at the Wau Ecology Institute in Papua New Guinea. It would have been impossible without the continual counsel and help of the director, Dr J. Linsley Gressitt, and Margaret, his wife, who lost their lives in an airplane accident in 1982. This and the following paper are dedicated to their memory.

All holotypes and allotypes are deposited in Bishop Museum, Honolulu, Hawaii (BPBM); paratypes are there and in the National Science Museum, Tokyo, Japan (NSMT).

DESCRIPTIONS OF NEW SPECIES AND NOTES ON NEWLY RECORDED SPECIES

1. *Drosophila (Scaptodrosophila) spinomelana* Okada & Carson, new species

Fig. 1A-C

♂,♀. Body about 2 mm in length. Eye dark red, with thick pile. Antenna mat black, 2nd joint distally brown. Arista with 3 upper and 2 lower branches and a large fork. Palpus black, with a few stout setae below. Ocellar triangle pruinose black. Periorbit black, laterally pruinose. Frons subshining black, anteriorly as broad as median length, $\frac{1}{3}$ as broad as head width, posteriorly broadened. Face pruinose black, paler above. Carina narrow, long. Clypeus black. Cheek grayish brown, $\frac{1}{2}$ as broad as greatest diameter of eye. Anterior reclinate orbital $\frac{2}{3}$ proclinate, nearer to proclinate than to posterior reclinate, which is as long as proclinate. Second oral $\frac{1}{2}$ vibrissa. Thorax entirely subshining deep black. Humerals 2. Acrostichal hairs in 6 rows. Anterior dorsocentrals $\frac{1}{2}$ posteriors, length distance of dorsocentrals $\frac{1}{2}$ cross distance. Lateral scutellars divergent, longer than apicals, which are equally apart from each other and from laterals. Sterno-index 0.7. Legs black, thick, tibiae and tarsi dark yellow; metatarsi as long as rest of tarsal joints. Wing hyaline, R_{2+3} nearly straight, R_{4+5} and M parallel. C-index 2.0; 4V-index 3.0; 4C-index 1.6; 5x-index 3.5; Ac-index 3.0. C1-bristles 2, subequal; C3-fringe $\frac{1}{2}$. Haltere yellowish orange. Abdominal tergites subshining deep black in ♂, pale with broad black medially contiguous black bands in ♀. Periphallallic organs (Fig. 1A) black, cercus with 3 short black bristles below, thus the specific name. Phallic organs (Fig. 1B) yellowish brown, parameres small. Ovipositor (Fig. 1C) yellowish brown.

Type data. PNG: NEW GUINEA (NE): Morobe Prov. Holotype ♂ (BPBM 12,714), allotype ♀, 7♂,5♀ paratypes, Mt Kaindi, 2200 m, 11.IX.1977; 1♂ paratype, same data as above except 27.X.1977; 1♂,1♀ paratypes, same data as above except 2120 m, 27.X.1977. All ex banana baits (Carson). Paratypes: 8♂,5♀ in BPBM; 1♂,1♀ in NSMT.

Relationships. This species somewhat resembles *D. (Sc.) sydneyensis* Malloch in the coloration of body and legs, but it differs from the latter by having black stout bristles on the cerci and small parameres.

2. *Drosophila (Scaptodrosophila) latifasciola* Okada & Carson, new species

Fig. 1D-F

♂,♀. Body about 2 mm in length. Eye castaneous red, with fine pile. Antenna with 2nd joint yellowish brown, 3rd mat black. Arista with 4 upper and 2 lower branches and a large fork.

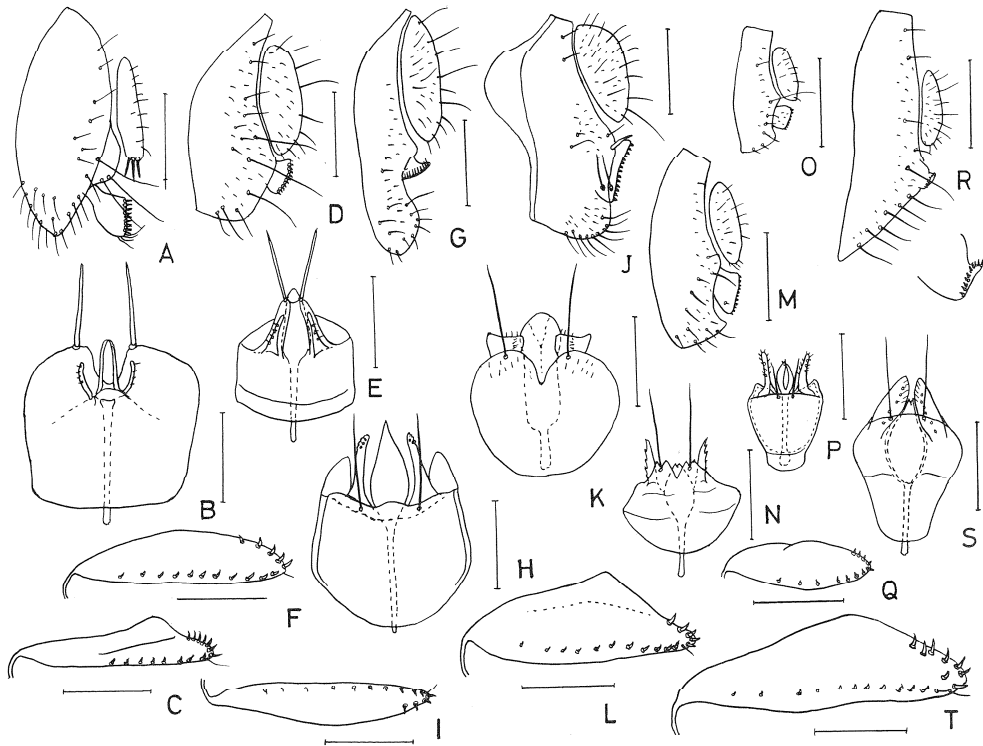


FIG. 1. A-C, *Drosophila (Scaptodrosophila) spinomelana*. D-F, *D. (Sc.) latifasciola*. G-I, *D. (Sc.) ambiguifasciola*. J-L, *D. (Sc.) subeluta*. M-N, *D. (Sc.) elutoides*. O-Q, *D. (Sc.) nannosoma*. R-T, *D. (Sc.) specenosoides*. A, D, G, J, M, O, R = peripheral organs; B, E, H, K, N, P, S = phallic organs; C, F, I, L, Q, T = ovipositor. Scale 0.1 mm.

Palpus yellowish white, with a few stout black setae below. Ocular triangle black. Periorbit golden gray. Frons golden brown, anteriorly yellow, brown above antennal bases, anteriorly as broad as median length, $\frac{1}{3}$ as broad as head width, posteriorly slightly wider. Face yellowish orange. Carina narrow, long. Clypeus yellowish white. Cheek mat yellow, $\frac{1}{10}$ as broad as greatest diameter of eye. Anterior reclinate orbital $\frac{2}{3}$ proclinate, nearer to proclinate than to posterior reclinate, which is longer than proclinate. Second oral $\frac{1}{2}$ vibrissa. Mesoscutum and scutellum subshining yellowish orange, thoracic pleura paler. Humerals 2. Acrostichal hairs in 6 rows. Anterior dorsocentrals $\frac{2}{3}$ posteriors, length distance of dorsocentrals $\frac{1}{2}$ cross distance. Lateral scutellars divergent, as long as apicals, which are equally apart from each other and from laterals. Sterno-index 0.5. Legs yellow, metatarsi as long as rest of tarsal joints. Wing slightly fuscous anteriorly, posterior crossvein clouded, R_{2+3} gently curved to costa apically, R_{4+5} and M parallel. C-index 2.0; 4V-index 1.5, 4C-index 1.0, 5x-index 2.0, Ac-index 2.8. C1-bristles 2; C3-fringe $\frac{1}{5}$. Haltere yellow. Abdominal tergites subshining yellowish orange, with broad black medially convex caudal bands, thus the specific name. Periphallallic organs (Fig. 1D), phallic organs (Fig. 1E), and ovipositor (Fig. 1F) pale yellow.

Type data. PNG: NEW GUINEA (NE): Morobe Prov. Holotype δ (BPBM 12,715), allotype δ , 1 δ paratype, Wau, 1200 m, 22.IX.1977, ex banana baits (Carson). Types in BPBM.

Relationships. This species somewhat resembles *D. (Sc.) adelphe* Bock in body coloration and male genitalia, but it differs from the latter by having the C-index smaller and thoracic pleura paler.

3. *Drosophila (Saptodrosophila) ambiguifascia* Okada & Carson, new species

Fig. 1G-I

♂,♀. Body 2.5 mm in length. Eye dark red, with pile. Antenna with 2nd joint orange-brown, 3rd gray. Arista with 4 upper and 3 lower branches and a large fork. Palpus yellowish brown, with a few stout black setae below. Ocellar triangle black, marginally pruinose gray. Periorbit pruinose gray. Frons gray, anteriorly orange-yellow, with a pair of anteriorly convergent dark brown stripes, anteriorly as broad as median length, about $\frac{1}{2}$ as broad as head width, posteriorly broadened. Face gray. Carina high. Clypeus yellowish gray. Cheek yellowish brown, $\frac{1}{10}$ as broad as greatest diameter of eye. Anterior reclinate orbital $\frac{1}{3}$ proclinate, nearer to proclinate than to posterior reclinate, which is as long as proclinate. Second oral thin, $\frac{1}{4}$ vibrissa. Mesoscutum and scutellum pruinose gray yellow. Thoracic pleura mat dark brown, sutures pale. Humeral 2, subequal. Acrostichal hairs in 8 rows. Anterior dorsocentrals $\frac{1}{2}$ posteriors, length distance of dorsocentrals $\frac{1}{2}$ cross distance. Lateral scutellars divergent, as long as apicals, which are equally apart from each other and from laterals. Sterno-index about 1.0. Legs yellow, metatarsi as long as rest of tarsal joints. Wing hyaline, R_{2+3} straight, R_{4+5} and M parallel. C-index 2.0; 4V-index 2.0; 4C-index 1.2; 5x-index 1.8; Ac-index 3.0. C1-bristles 2, unequal; C3-fringe $\frac{3}{5}$. Haltere yellow. Abdominal tergites mat black, caudal margins yellow, 1st tergite yellow, 2nd medially yellow. Periphallal organs (Fig. 1G) and phallic organs (Fig. 1H) pale yellow. Ovipositor (Fig. 1I) yellowish brown.

Type data. PNG: NEW GUINEA (NE): Morobe Prov. Holotype ♂ (BPBM 12,716), allotype ♀, 5♂, 1♀ paratypes, Headshump forest, N of Bulolo, 910 m, 17-18.IX.1977, ex banana baits (Carson). Paratypes: 4♂, 1♀ in BPBM, 1♂ in NSMT.

Relationships. This species resembles *D. (Sc.) bryani* Malloch in body coloration and phallic organs, but it differs from the latter in the shape of the periphallal organs and by having a larger C-index and indistinct abdominal bands.

4. *Drosophila (Saptodrosophila) subeluta* Okada & Carson, new species

Fig. 1J-L

♂,♀. Body about 2 mm in length. Eye dark red, nearly bare. Antenna with 2nd joint orange-yellow, 3rd grayish brown. Arista with 4 upper and 2 lower branches and a moderate fork. Palpus yellowish brown, with a few stout black setae below. Ocellar triangle black. Periorbit yellowish gray. Frons mat orange-yellow, with 2 broad black anteriorly narrowing longitudinal stripes, anteriorly as broad as median length, $\frac{1}{3}$ as broad as head width. Face white. Carina high, narrow, $\frac{1}{2}$ as long as face. Clypeus yellowish white. Cheek yellowish orange, black at the insertion of vibrissa, $\frac{1}{10}$ as broad as the greatest diameter of eye. Anterior reclinate orbital $\frac{1}{3}$ proclinate, just outside it, posterior reclinate longer than proclinate. Vibrissa strong, 2nd oral fine. Mesoscutum mat yellowish orange, with 3 pairs of black longitudinal stripes, inner pair inside dorsocentral line, reaching apex of scutellum, median pair along dorsocentral line, not extending behind anterior dorsocentrals, outer pair short, behind suture. Scutellum mat yellowish brown, with a pair of black stripes. Thoracic pleura paler than mesoscutum. Humeral 3, uppermost one small. Acrostichal hairs in 6 rows. Anterior dorsocentrals $\frac{1}{2}$ posteriors,

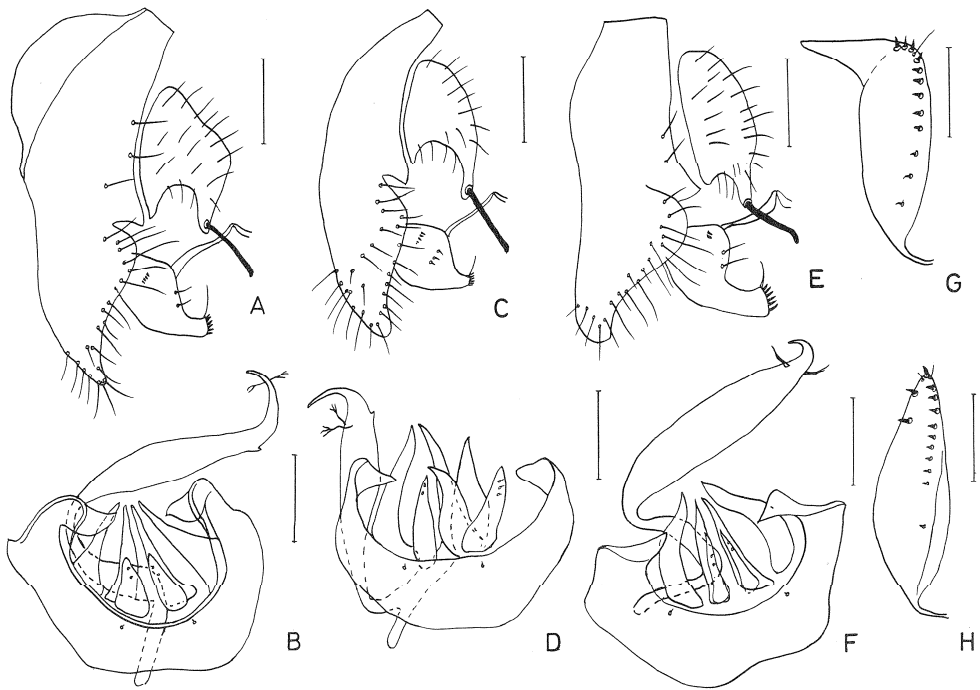


FIG. 2. A-G, *Drosophila (Sophophora) rhopaloa*: A,B,G from New Guinea; C,D from India; E,F from Java. H, *D. (Drosophila) persicae*. A,C,E = peripheral organs; B,D,F = phallic organs; G,H = ovipositor. Scale 0.1 mm.

length distance of dorsocentrals $\frac{1}{2}$ cross distance. Lateral scutellars divergent, as long as apicals, which are nearer to each other than to laterals. Sterno-index 0.7, median sternopleural as long as anterior. Legs yellow, fore metatarsus as long as 3 succeeding tarsal joints, mid and hind longer than rest of tarsal joints. Wing hyaline, R_{2+3} nearly straight, R_{4+5} and M parallel. C-index 2.0; 4V-index 1.7; 4C-index 1.2; 5x-index 1.7; Ac-index 4.0. C1-bristles 2, long, subequal; C3-fringe $\frac{1}{2}$. Haltere yellowish gray. Abdominal tergites in δ yellowish brown with broad mat black medially interrupted caudal bands, caudal tergites entirely black, in f nearly entirely black, 1st and 2nd tergites medially pale. Peripheral phallic organs (Fig. 1J) and phallic organs (Fig. 1K) yellow. Ovipositor (Fig. 1L) yellowish brown.

Type data. PNG: NEW GUINEA (NE): Morobe Prov. Holotype δ (BPBM 12,717), allotype f , 3 δ , 1 f paratypes, Wau, 1200 m, 11-18.VIII.1977, ex banana baits (Carson); 8 δ , 16 f paratypes, same data as above except 7.VIII-19.X.1977, ex fruit traps, by sweeping ex garbage and from light traps (Okada); 2 δ , 1 f paratypes, Bulolo, 10-18.IX.1977 (Okada); 2 δ , 1 f paratypes, Mt Kaindi, Kunai Crk, 11.IX.1977 (Okada); 1 δ , 1 f paratypes, Lae, 27-29.IX.1977 (Okada). Paratypes: 14 δ , 18 f in BPBM; 2 δ , 2 f in NSMT.

Relationships. This species resembles *D. (Sc.) eluta* Wheeler & Takada in having a striped mesoscutum and white carina, but it differs from the latter by having a median

pair of mesoscutal stripes just along the dorsocentral lines (outside the lines in *eluta*), a narrower frons, darker abdominal tergites, and shorter parameres.

5. *Drosophila (Scaptodrosophila) elutoides* Okada & Carson, new species

Fig. 1M-N

♂. Body 1.5 mm in length. Eye red, with pile. Antenna with 2nd joint yellow, dark above, 3rd gray. Arista with 4 upper and 2 lower branches and a large fork. Palpus black, with a few long stout black setae below. Ocellar triangle black. Periorbit yellowish gray, short. Frons yellowish gray, laterally fuscous, anteriorly narrower than median length, less than $\frac{1}{3}$ as broad as head width. Face whitish gray. Carina well developed, flat above. Clypeus yellow. Cheek yellow, less than $\frac{1}{10}$ as broad as greatest diameter of eye. Anterior reclinate orbital close to proclinate, which is very long. Second oral $\frac{1}{2}$ vibrissa. Mesoscutum dirty yellow, with 3 pairs of distinct black longitudinal stripes, inner pair inside dorsocentral line, extending to scutellar end, median pair outside dorsocentral line, nearly reaching scutellum, outer pair short, before suture. Thoracic pleura paler than mesoscutum. Humerals 2. Acrostichal hairs in 6 rows. Length distance of dorsocentrals $\frac{1}{2}$ cross distance. Apical scutellars equally apart from each other and from laterals. Sterno-index 0.5. Legs yellow, metatarsi as long as 3 succeeding tarsal joints. Wing hyaline, slightly fuscous, R_{2+3} nearly straight, R_{4+5} and M parallel, veins dark. C-index 1.6; 4V-index 1.6; 4C-index 1.2; 5x-index 1.5; Ac-index 3.0. C1-bristles 2, subequal; C3-fringe $\frac{1}{2}$. Haltere yellow. Abdominal tergites dirty yellow, with medially interrupted caudal black bands on 2nd to 4th tergites, 5th tergite with band broad and not interrupted. Periphallalic organs (Fig. 1M) and phallic organs (Fig. 1N) pale yellow.

Type data. PNG: NEW GUINEA (NF): Morobe Prov. Holotype ♂ (BPBM 12.718). 1♂ paratype. Lae, 10 m, 29.IX.1977, ex banana baits (Carson). Types in BPBM.

Relationships. This species resembles the foregoing species, *subeluta*, by having a striped mesoscutum, but it differs from the latter in having a median pair of mesoscutal stripes outside the dorsocentral lines, the outer pair before suture. The abdominal bands are distinct and the epandrium is not very elongate ventrally.

6. *Drosophila (Scaptodrosophila) nanosoma* Okada & Carson, new species

Fig. 1 O-Q

♂,♀. Body very small, about 1 mm in length, thus the specific name. Eye castaneous red, with thick pile. Antenna with 2nd joint yellowish orange, 3rd gray. Arista with 3 upper and 2 lower branches and a moderate fork. Palpus yellow, with a few black setae below. Ocellar triangle glossy black. Periorbit golden yellowish gray, anteriorly broadened. Frons golden yellowish gray, anteriorly orange, anteriorly $2\times$ as broad as long, $\frac{5}{8}$ as broad as head width. Face gray. Carina broad, flat above. Clypeus yellowish gray. Cheek yellowish gray, $\frac{1}{2}$ as broad as greatest diameter of eye. Anterior reclinate orbital $\frac{1}{3}$ proclinate, outside it, posterior reclinate as long as proclinate. Second oral $\frac{1}{3}$ vibrissa. Thorax uniformly orange-yellow. Scutellum with a faint pale median longitudinal line. Humerals 2. Anterior dorsocentrals close to suture, $\frac{5}{8}$ posteriors, length distance of dorsocentrals equal to cross distance. Lateral scutellars divergent, as long as apicals, which are equally apart from each other and from laterals. Sterno-index 0.6, median sternopleural fine. Legs yellow, metatarsi as long as 3 succeeding tarsal joints. Wing hyaline, rounded, R_{2+3} gently curved to costa, R_{4+5} and M parallel. C-index 1.2;

4V-index 2.7; 4C-index 2.0; 5x-index 3.0; Ac-index 3.0. C1-bristles 2, unequal; C3-fringe $\frac{2}{5}$. Haltere orange-yellow. Abdominal tergites mat yellowish gray, with faint medially interrupted dark caudal bands, caudal tergites of δ black, lateral borders of each tergite brownish black in δ . Periphallallic organs (Fig. 1O), phallic organs (Fig. 1P), and ovipositor (Fig. 1Q) pale yellow.

Type data. PNG: NEW GUINEA (NE): Morobe Prov. Holotype δ (BPBM 12,719), allotype δ , 14 δ , 3 δ paratypes, Lae, 10 m, 29.IX.1977; 2 δ , 1 δ paratypes, Perenin Riv, 227 m, 7.XI.1977; 11 δ , 3 δ paratypes, Gurakor Crk, 607 m, 7.XI.1977. All ex banana baits (Carson). Paratypes: 25 δ , 5 δ in BPBM; 2 δ , 2 δ in NSMT.

Relationships. This species resembles *D. (Sc.) parapsychotriae* Carson & Okada in male genitalia and body size, but it differs from the latter by having a paler body, a smaller C-index, and a larger 4V-index. The periorbit is broadened caudally and the anterior dorsocentrals are situated well before the posteriors. The last 2 characteristics are similar to those in *Microdrosophila* species.

7. *Drosophila (Scaptodrosophila) specensoides* Okada & Carson, new species

Fig. 1R-T

δ , δ . Body about 2.5 mm in length. Eye dark red, nearly bare. Antenna with 2nd joint brown, 3rd grayish black. Arista with 3 upper and 2 lower branches and a large fork. Palpus yellowish gray, with a few setae below. Ocellar triangle and periorbit mat brownish black. Frons mat brownish black, anterior margin dark orange, anteriorly as broad as median length, $\frac{1}{2}$ as broad as head width. Face gray, flat below. Carina narrow, short. Cheek yellow, $\frac{1}{5}$ as broad as greatest diameter of eye. Anterior reclinate orbital $\frac{3}{5}$ proclinate, slightly nearer to proclinate than to posterior reclinate, which is longer than proclinate. Vibrissa long, 2nd oral fine. Mesoscutum and scutellum mat brownish black, humeral callus grayish orange below. Thoracic pleura dark brown or mat brownish black, sternepisternum yellowish gray. Humerals 2. Acrostichal hairs in 8 rows. Anterior dorsocentrals $\frac{2}{5}$ posteriors, length distance of dorsocentrals $\frac{1}{2}$ cross distance. Lateral scutellars divergent, as long as apicals, which are equally apart from each other and from laterals. Sterno-index 0.6. Legs yellowish gray, metatarsi as long as rest of tarsal joints. Wing hyaline, R_{2+3} straight, R_{4+5} and M parallel. C-index 2.5; 4V-index 2.0; 4C-index 1.0; 5x-index 1.5; Ac-index 2.8. C1-bristles 2, unequal; C3-fringe $\frac{2}{5}$. Haltere orange-brown, medially dark. Abdominal tergites nearly uniformly mat brownish black, lateral corners orange-brown. Periphallallic organs (Fig. 1R) and phallic organs (Fig. 1S) pale brown. Ovipositor (Fig. 1T) yellow, with yellowish-brown teeth.

Type data. PNG: NEW GUINEA (NE): Morobe Prov. Holotype δ (BPBM 12,720), Wau, 1200 m, 23.IX.1977; allotype δ , 1 δ , 1 δ paratypes, Mt Kaindi, 2300 m, 28.VIII.1977; 5 δ , 2 δ paratypes, same locality as above, 2200 m, 11.IX.1977; 14 δ , 6 δ paratypes, Mt Kaindi, Kunai Crk, 1515 m, 11.IX.1977; 2 δ paratypes, Gurakor Crk, 607 m, 7.XI.1977; 1 δ , 1 δ paratypes, Perenin Riv, 227 m, 7.XI.1977; 1 δ paratype, Bulldog Road, 2000 m, 22.VIII.1977. All but the last ex banana bait (Carson). 1 δ paratype, Wau, 1200 m, 8 X 1977 (Okada). Paratypes: 10 δ , 9 δ in BPBM; 2 δ , 2 δ in NSMT.

Relationships. This species resembles *D. (Sc.) specensis* Bock, thus the specific name, in body coloration and male genitalia. It differs from the latter by having a paler sternepisternum, darker abdominal tergites and a narrower aedeagus.

8. *Drosophila (Sophophora) hypomelana* Okada & Carson, new species

Fig. 3A-C

♂. Body 2.5-3.0 mm in length. Eye castaneous red, with sparse pile. Antenna with 2nd joint orange, 3rd grayish brown. Arista with 4 upper and 2-3 lower branches and a moderate fork. Palpus gray, with a long apical seta. Ocellar triangle and periorbit grayish brown. Frons brown, anteriorly orange, anteriorly as broad as median length, $\frac{3}{8}$ as broad as head width. Face grayish brown, brownish black laterally below. Carina long. Clypeus dark brown. Cheek very narrow. Anterior reclinate orbital $\frac{1}{3}$ proclinate, nearer to proclinate than to posterior reclinate, which is longer than proclinate. Vibrissa long, 2nd oral slightly shorter than vibrissa, other orals fine. Mesoscutum and scutellum dark yellowish brown, subshining. Thoracic pleura brownish black, thus the specific name. Humerals 2. Acrostichal hairs in 8 rows. Anterior dorsocentrals $\frac{1}{2}$ as long as posteriors, length distance of dorsocentrals $\frac{2}{3}$ cross distance. Lateral scutellars divergent, as long as apicals, which are equally apart from each other and from laterals. Sterno-index 0.6. Legs yellowish gray, coxae and femora brownish black except apices, ♂ metatarsus (Fig. 3C) with sexcomb of about 20 teeth in a straight row, fore metatarsus longer than 2 succeeding tarsal joints, mid and hind shorter than them. Wing somewhat fuscous, especially anteriorly. C-index 2.5; 4V-index 2.2; 4C-index 1.0; 5x-index 1.5; AC-index 3.0. C1-bristle 1, long; C3-fringe $\frac{2}{9}$. Haltere yellowish gray, stalks orange. Abdominal tergites subshining black or dark brown with broad black caudal bands. Periphallalic organs (Fig. 3A) and phallic organs (Fig. 3B) brown.

Type data. PNG: NEW GUINEA (NE): Morobe Prov. Holotype ♂ (BPBM 12,721), Mt Kaindi, 2100 m, 3.IX.1977; 10♂ paratypes, same locality, 28.VIII.1977; 18♂ paratypes, same data as above except 2200 m, 10.IX.1977. All ex banana baits (Carson). Paratypes: 24♂ in BPBM; 4♂ in NSMT.

Relationships. This species belongs to the *suzukii* subgroup of the *melanogaster* group and is related to *D. (So.) unipectinata* Duda in having a single long comb on the male fore metatarsus.

9. *Drosophila (Sophophora) apodemata* Okada & Carson, new species

Fig. 3D-F

♂. Body 2 mm in length. Eye dark red, with thick pile. Antenna with 2nd joint yellow, 3rd yellowish gray. Arista with 3 upper and 2 lower branches and a large fork. Palpus yellow, with a stout apical seta. Ocellar triangle and periorbit pale yellowish gray. Frons yellowish orange, somewhat fuscous inside periorbits, anteriorly as broad as median length, $\frac{1}{3}$ as broad as head width. Face and clypeus yellow. Carina narrow, high and long. Cheek yellow, $\frac{1}{8}$ as broad as greatest diameter of eye. Anterior reclinate orbital $\frac{1}{3}$ proclinate, nearer to proclinate than to posterior reclinate, which is as long as proclinate. Second oral slightly shorter than vibrissa, 3rd shorter. Mesoscutum and scutellum subshining orange-yellow, the former having faint dark stripes along dorsocentral lines on anterior $\frac{1}{2}$. Thoracic pleura paler than mesoscutum. Humerals 2. Acrostichal hairs in 8 rows. Anterior dorsocentrals $\frac{1}{2}$ posteriors, length distance of dorsocentrals $\frac{1}{2}$ cross distance. Lateral scutellars slightly divergent, slightly shorter than apicals, which are nearer to each other than to laterals. Sterno-index 0.6. Legs yellow, fore and mid metatarsi as long as 2 succeeding tarsal joints, mid metatarsus as long as 3 succeeding. Fore metatarsus of ♂ with 3 small lateral sexcombs distally with 2, 3 and 4 teeth respectively, 2nd tarsal joint with 2 sexcombs with 1 tooth each distally (Fig. 3D). Wing hyaline, R_{2+3} straight, R_{4+5} and M slightly divergent distally. C-index 2.2; 4V-index 2.2; 4C-index 1.3; 5x-index 1.0;

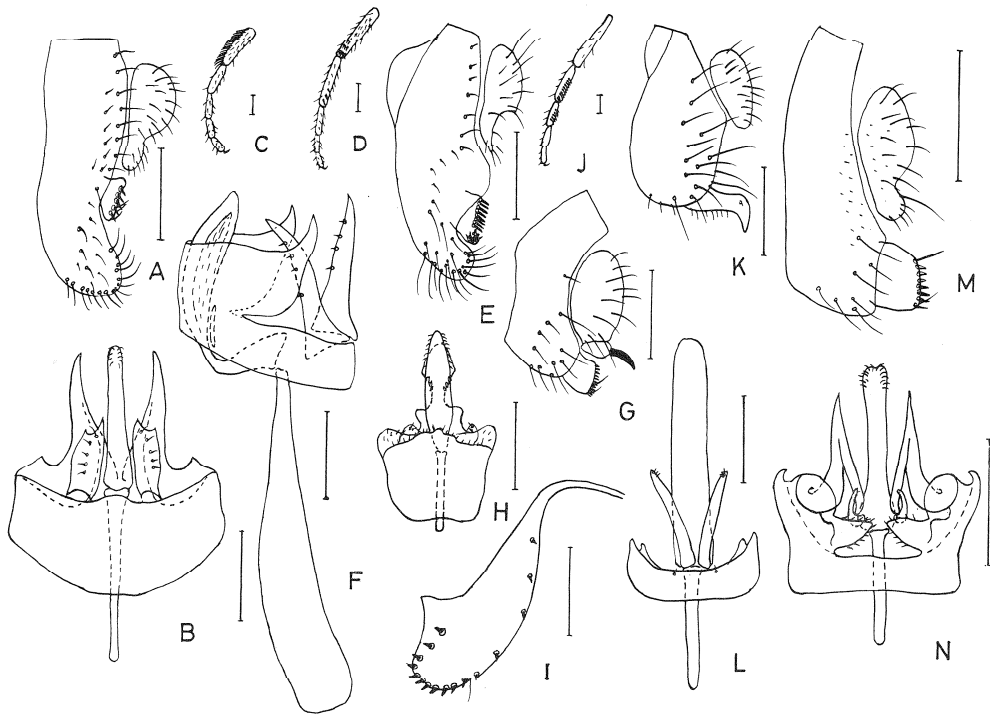


FIG. 3. A-C, *Drosophila (Sophophora) hypomelana*. D-F, *D. (So.) apodemata*. G-I, *D. (So.) rhombura*. J-L, *D. (So.) longissima*. M-N, *D. (So.) constricta*. A, E, G, K, M = periphallallic organs; C, D, J = δ fore tarsi; B, F, H, L, N = phallic organs; I = ovipositor. Scale 0.1 mm.

Ac-index 3.0. C1-bristles 2, subequal; C3-fringe $\frac{1}{3}$. Haltere yellow. Abdominal tergites sub-shining brownish black, 1st tergite pale. Periphallallic organs (Fig. 3E) and phallic organs (Fig. 3F) yellow, apodeme of aedeagus very long, thus the specific name.

Type data. PNG: NEW GUINEA (NE): Morobe Prov. Holotype δ (BPBM 12,722), Mt Kaindi, Kunai Crk, 1500 m, 11.IX.1977, ex banana baits (Carson). Type in BPBM.

Relationships. This species belongs to the *suzukii* subgroup of the *melanogaster* group and resembles *D. (So.) pulchrella* Tan, Hsu & Sheng in details of the sexcombs, in the long apodeme of the aedeagus and the long parameres. It differs from the latter by lacking a black spot on the male wing and having the epandrium not tapered ventrally. The last-mentioned feature and the medially constricted male cercus are similar to the foregoing species, *hypomelana*.

10. *Drosophila (Sophophora) ironensis* Bock & Parsons

Drosophila (Sophophora) ironensis Bock & Parsons, 1978, Aust. J. Zool. 26: 102.

Specimens examined. PNG: NEW GUINEA (NE): 1 δ , Morobe Prov, Mt Kaindi, Kunai Crk, 1500 m,

12.IX.1977; 1♂, Perenin Riv, 227 m, 7.XI.1977; 1♂, Lae, 10 m, 29.IX.1977. All ex banana baits (Carson). First 2 in BPBM.

in the narrow sense

Distribution. Queensland, Australia; New Guinea (new record).

11. *Drosophila (Sophophora) rhombura* Okada & Carson, new species

Fig. 3G-I

♂,♀. Body 2 mm in length. Eye dark red, with pile. Antenna with 2nd joint orange-brown, 3rd grayish black. Arista with 4 upper and 3 lower long branches and a moderate fork. Palpus yellowish gray, with a long black apical seta. Ocellar triangle black. Periorbit gray. Frons orange-brown, anteriorly orange-yellow, anteriorly slightly broader than median length, $\frac{2}{5}$ as broad as head width. Face and clypeus brown. Carina short, narrow. Cheek yellowish orange, $\frac{1}{5}$ as broad as greatest diameter of eye. Anterior reclinate orbital $\frac{2}{5}$ proclinate, at middle between proclinate and posterior reclinate, which is as long as proclinate. Second oral $\frac{1}{3}$ vibrissa. Mesoscutum subshining orange-brown, caudally darker. Scutellum dark orange-brown. Thoracic pleura paler below. Humerals 2. Acrostichal hairs in 6 rows. Anterior dorsocentrals $\frac{1}{2}$ posteriors, length distance of dorsocentrals $\frac{1}{2}$ cross distance. Lateral scutellars parallel, as long as apicals, which are equally apart from each other and from laterals. Sterno-index 0.5. Legs yellowish orange, metatarsus and 2nd tarsal joint of ♂ fore leg with 2 longitudinal sexcombs of about 25 and 16 teeth, respectively. Fore metatarsus as long as 3 succeeding tarsal joints, mid and hind as long as rest of tarsal joints. Wing hyaline, R_{2+3} slightly curved to costa apically, R_{4+5} and M parallel. C-index 3.5; 4V-index 2.5; 4C-index 1.0; 5x-index 3.0; Ac-index 2.0. C1-bristles 2; C3-fringe $\frac{1}{3}$. Haltere orange-brown. Abdominal tergites subshining yellowish brown, with clearcut black caudal medially contiguous bands. Periphallic organs (Fig. 3G) yellow, phallic organs (Fig. 3H) yellowish brown, penis envelope rhombic, thus the specific name. Ovipositor (Fig. 3I) orange-brown, broad.

Type data. PNG: NEW GUINEA (NE): Morobe Prov. Holotype ♂ (BPBM 12,723), 4♂ paratypes, Mt Kaindi, 2200 m, 11.IX.1977; allotype ♀, 1♂,6♀ paratypes, same data as above except 2120 m, 28.VIII.1977; 12♂ paratypes, Mt Kaindi, Kunai Crk, 1515 m, 11.IX.1977. All ex banana baits (Carson). 1♂ paratype, Mt Missim, 2.X.1977, ex fungi (Okada); 3♂ paratypes, Wau, 8.I.1974 (Shinonaga). Paratypes: 16♂,4♀ in BPBM; 5♂,2♀ in NSMT.

Relationships. This species belongs to the *montium* subgroup of the *melanogaster* group and resembles *D. (So.) pseudomayri* Baimai in having a large tooth on the surstylus and a broad aedeagus, but it is distinguished from the latter by the rhombic penis envelope and small parameres.

12. *Drosophila (Sophophora) longissima* Okada & Carson, new species

Fig. 3J-L

♂. Body about 2.5 mm in length. Eye castaneous red, with pile. Antenna with 2nd joint orange-yellow, 3rd gray. Arista with 3 upper and 2 lower branches and a large fork. Palpus yellow, with a prominent apical seta. Ocellar triangle grayish brown. Periorbit gray. Frons orange-brown, anteriorly orange-yellow, anteriorly narrower than median length, $\frac{1}{5}$ as broad as head width, caudally wider. Face gray. Carina broad. Clypeus yellowish gray. Cheek narrow, $\frac{1}{10}$ as broad as greatest diameter of eye. Mesoscutum and scutellum orange-brown, thoracic pleura paler. Humerals 2, long, 2 smaller above. Acrostichal hairs in 8 rows. Anterior dorsocentrals $\frac{1}{2}$ posteriors, length distance of dorsocentrals $\frac{3}{8}$ cross distance. Lateral scutellars

convergent, as long as apicals, which are equally apart from each other and from laterals. Sterno-index 1.0. Legs yellowish gray, fore metatarsus as long as 2 succeeding tarsal joints, mid and hind as long as 3 succeeding. Metatarsus and 2nd tarsal joint of δ fore leg with longitudinal sexcombs of about 10 and 5 teeth, respectively (Fig. 3J). Wing hyaline, veins yellow, R_{2+3} gently curved to costa, R_{4+5} and M slightly convergent distally. C-index 2.0; 4V-index 2.2; 4C-index 1.3; 5x-index 2.0; Ac-index 3.0. C1-bristles 2, subequal; C3-fringe $\frac{2}{3}$. Haltere orange-brown. Abdominal tergites subshining yellowish gray, with caudal narrow medially contiguous brown bands. Periphallallic organs (Fig. 3K) pale yellow; surstylus apically clawed, without teeth. Phallic organs (Fig. 3L) pale yellow, with long aedeagus, thus the specific name.

Type data. PNG: NEW GUINEA (NE): Morobe Prov. Holotype δ (BPBM 12,724), allotype δ , Wau, 1200 m, 23.IX.1977; 1 δ paratype, Lae, 10 m, 21.IX.1977. All ex banana baits (Carson). Types in BPBM.

Relationships. This species seems to belong to the *montium* subgroup of the *melanogaster* group and resembles *D. (So.) rhopaloa* Bock & Wheeler in having an elongate acedeagus, but it differs from the latter and from any other species of the *melanogaster* group by the shape of surstylus.

13. *Drosophila (Sophophora) rhopaloa* Bock & Wheeler

Fig. 2A–G

Drosophila (Sophophora) rhopaloa Bock & Wheeler, 1972, Univ. Texas Publ. **7213**: 69.

Drosophila (Sophophora) coonorensis Reddy & Krishnamurthy, 1973, Orient. Insects **7**: 262. **New synonymy.**

Specimens examined. PNG: NEW GUINEA (NE): Morobe Prov. 4 δ , 3 δ , Mt Kaindi, Kunai Crk, 1500 m, 3.XI.1977, ex banana baits (Carson). Six specimens in BPBM.

Remarks. The New Guinean form of this species (Fig. 2A–B) differs exceedingly from the form from Java (Fig. 2E–F) (which is identical to the original form from Thailand); it has the body much darker, the aedeagus more deeply curved apically, and the epandrium more elongate below. Both forms are, however, linked by the Indian form (Fig. 2C–D: *coonorensis*), which is intermediate in the features of aedeagus and epandrium. Ovipositor (Fig. 2G) is pale yellow.

14. *Drosophila (Sophophora) constricta* Okada & Carson, **new species**

Fig. 3M–N

δ . Body about 1.5 mm in length. Eye orange-red, with pile. Antenna with 2nd joint orange, 3rd gray. Arista with 4–5 upper and 2–3 lower branches and a fork. Palpus yellowish white. Ocellar triangle small, black, marginally gray. Periorbit grayish brown, short. Frons grayish orange, anteriorly nearly 2 \times as broad as median length, $\frac{3}{4}$ as broad as head width. Face yellowish gray. Carina gray, high, short, flat above. Clypeus yellowish gray. Cheek yellowish orange, $\frac{1}{2}$ as broad as the greatest diameter of eye. Anterior reclinate orbital $\frac{3}{4}$ proclinate, nearer to proclinate than to posterior reclinate, which is longer than proclinate. Second oral slightly shorter than vibrissa. Mesoscutum dark subshining orange, caudally darker. Scutellum dark orange, with median longitudinal orange line. Thoracic pleura orange-brown, with 2 obscure dark longitudinal stripes. Humeralis 2, subequal. Acrostichal hairs in 6 rows. Anterior dorso-centrals $\frac{2}{3}$ posteriors, length distance of dorsocentrals $\frac{2}{3}$ cross distance. Lateral scutellars divergent, as long as apicals, which are equally apart from each other and from laterals. Sterno-

index 0.3. Legs yellow, fore metatarsus longer than 2nd tarsal joint, mid and hind metatarsi as long as 2 succeeding tarsal joints. Sexcombs absent, δ fore tarsi with recurved hairs along anterior margin. Wing hyaline, R_{2+3} nearly straight, R_{4+5} and M parallel. C-index 1.0; 4V-index 3.0; 4C-index 3.0; 5x-index 2.8; Ac-index 3.2. C1-bristles 2, subequal; C3-fringe $\frac{3}{5}$. Haltere yellowish orange, medially dark. Abdominal tergites subshining orange, with broad black medially contiguous caudal bands. Periphallallic organs (Fig. 3M) yellowish gray. cercus constricted at middle, thus the specific name. Phallic organs (Fig. 3N) yellow.

Type data. PNG: NEW GUINEA (NE): Morobe Prov. Holotype δ (BPBM 12,725), 2 δ paratypes, Perenin Riv, 227 m, 7.XI.1977; 6 δ paratypes, Gurakor Crk, 607 m, 7.XI.1977. All ex banana baits (Carson). Paratypes: 7 δ in BPBM; 1 δ in NSMT.

Relationships. Although sexcombs are absent, this species seems to belong to the *melanogaster* species group because it has elongate posterior parameres.

15. *Drosophila (Sophophora) unguicula* Okada & Carson, new species

Fig. 4A-D

δ, φ . Body about 3 mm in length. Eye dark red, with pile. Antenna with 2nd joint orange-brown, 3rd darker. Arista with 4 upper and 3 lower branches and a large fork. Palpus yellowish brown, with a rather long apical seta. Ocellar triangle and periorbit dark brown. Frons mat orange-brown, anteriorly slightly narrower than median length, $\frac{3}{5}$ as broad as head width. Face grayish white. Carina high, long. Clypeus mat grayish yellow. Cheek grayish yellow, $\frac{1}{5}$ as broad as greatest diameter of eye. Anterior reclinate orbital $\frac{1}{4}$ proclinate, at middle between proclinate and posterior reclinate, which is slightly longer than proclinate. Second oral as long as vibrissa, 3rd and 4th $\frac{1}{2}$ vibrissa. Mesoscutum dark subshining orange-brown, with faint pale stripes along dorsocentral lines and middorsal line. Scutellum subshining orange-brown. Thoracic pleura darker than mesoscutum. Humerals 2, long. Acrostichal hairs in 8 rows. Anterior dorsocentrals $\frac{2}{3}$ posteriors, length distance of dorsocentrals $\frac{2}{3}$ cross distance. Lateral scutellars divergent, slightly shorter than apicals, which are slightly nearer to each other than to laterals. Sterno-index 0.9. Legs brown, δ metatarsus (Fig. 4D) with a stout claw apically, thus the specific name. Fore metatarsus as long as 2 succeeding tarsal joints, mid and hind as long as rest of tarsal joints. Wing long, apically brownish especially in δ , anteriorly fuscous, R_{2+3} nearly straight, R_{4+5} and M nearly parallel. C-index 2.5; 4V-index 2.0; 4C-index 1.0; 5x-index 1.5; Ac-index 2.5. C1-bristles 2; C3-fringe $\frac{3}{5}$. Haltere orange-brown, with stalk darker. Abdominal tergites glossy black, 2nd to 4th tergites laterally broadly yellowish orange. Periphallallic organs (Fig. 4A) dark brown, epandrium pale at ventral $\frac{1}{2}$, cercus with a strong black spur ventrally. Phallic organs (Fig. 4B) dark brown, aedeagus ventrosubapically with a long recurved process. Ovipositor (Fig. 4C) brown.

Type data. PNG: NEW GUINEA (NE): Morobe Prov. Holotype δ (BPBM 12,726), allotype φ , 2 δ paratypes, Mt Kaindi, 2129 m, 28.VIII.1977; 9 δ paratypes, same data as above except 2100-2211 m, 3-11.IX.1977; 1 δ paratype, Mt Kaindi, Kunai Crk, 1515 m, 14.XI.1977. All ex banana baits (Carson). Paratypes: 10 δ in BPBM; 2 δ in NSMT.

Relationships. This species seems to belong to the *dispar* species group. It differs, however, from *D. (So.) dispar* Mather by having no sexcomb on the 2nd tarsal joint of the male fore leg. The characteristic strong spur of the male periphallallic organs evaginates from the cercus in the present species, while it is from the epandrium

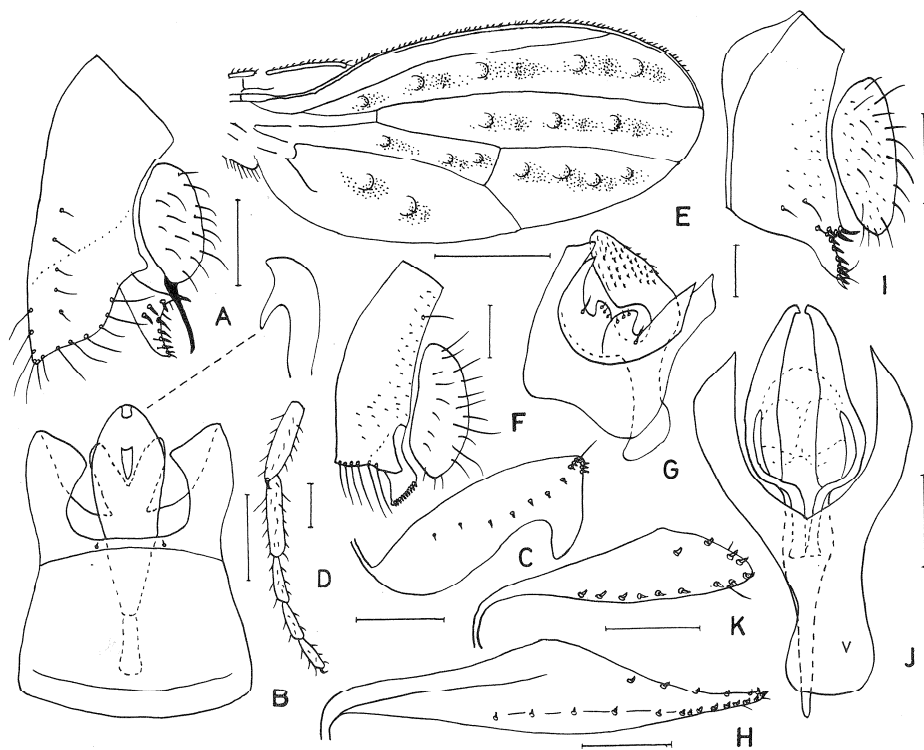


FIG. 4. A-D, *Drosophila (Sophophora) unguicula*. E-H, *D. (Drosophila) crispipennis*. I-K, *Styloptera punctata*. A, F, I = peripheral phallic organs; B, G, J = phallic organs; C, H, K = ovipositor; D = δ fore tarsi; E = wing. v = ventral fragma; scale 0.1 mm, for wing 1.0 mm.

(according to Mather) or surstylus (according to Bock who uses the term *clasper*) in *D. (So.) dispar*.

16. *Drosophila (Drosophila) crispipennis* Okada & Carson, new species

Fig. 4E-H

δ, \varnothing . Body about 4.5 mm in length. Eye dark red, with very sparse pile. Antenna with 2nd joint orange-yellow, 3rd grayish yellow. Arista with 6-7 upper and 3-4 lower branches and a fork. Palpus yellowish gray, with a few setae below. Ocellar triangle brown. Periorbit orange-yellow, not well demarcated from frons. Frons mat orange-yellow, anteriorly as broad as median length, $\frac{2}{3}$ as broad as head width. Clypeus grayish orange. Face gray, orange above. Carina large, long, flat above. Cheek mat yellowish white, glossy brown below, $\frac{1}{2}$ as broad as the greatest diameter of eye. Postgena black. Anterior reclinate orbital $\frac{1}{4}$ proclinate, just between proclinate and posterior reclinate, which is $\frac{2}{3}$ proclinate. Vibrissa long, 2nd oral $\frac{2}{3}$ vibrissa. Mesoscutum and scutellum mat orange-brown. Thoracic pleura mat black (δ) or brown (\varnothing and some δ). Humerals 2, long. Acrostichal hairs in 8 rows. Anterior dorsocentrals $\frac{2}{3}$ posteriors, length distance of dorsocentrals $\frac{1}{2}$ cross distance. Sterno-index 0.7, median sternopleural long. Lateral scutellars divergent, as long as apicals, which are slightly nearer to each other than to

laterals. Legs brown, femora and mid tibia except apical $\frac{1}{3}$ black. Fore femora with a row of about 20 spinules distally inside. Fore metatarsus as long as 3 succeeding tarsal joints; mid and hind longer than rest of tarsal joints. Wing (Fig. 4E) glossy brown, with several convex and concave spots alternatively arranged on major cells, thus the specific name. R_{2+3} straight, R_{4+5} and M somewhat divergent distally. C-index 2.5; 4V-index 1.4; 4C-index 1.0; 5x-index 1.5; Ac-index 2.0. C1-bristles 2; C3-fringe $\frac{3}{4}$. Halteres gray, stalks brown. Abdominal tergites dark brown, 5th tergite laterally, 6th medially orange in δ , nearly entirely brown in η . Periphallallic organs (Fig. 4F) and phallic organs (Fig. 4G) yellowish brown. Ovipositor (Fig. 4H) orange-brown.

Type data. PNG: NEW GUINEA (NE): Morobe Prov. Holotype δ (BPBM 12,727), allotype η , 11 δ , 5 η paratypes, Mt Kaindi, Kunai Crk, 1500 m, 8-12.IX.1977; 1 δ paratype, Mt Kaindi, 2120 m, 27.X.1977. All ex banana baits (Carson). 1 δ paratype, Wau, 1200 m, 14.IX.1977, ex banana baits (Okada). Paratypes: 10 δ , 4 η in BPBM; 3 δ , 1 η in NSMT.

Relationships. This species belongs to the *immigrans* group. The body coloration resembles that of *D. (D.) hypocausta* Osten-Sacken. The characteristic crepe wing membrane, which resembles *Jeannelopsis mirabilis* Séguy, is unique in the genus *Drosophila*.

of Dros. reticulata Wheeler 1957, ⁽⁶⁾ *unrecognized*.

17. *Drosophila (Drosophila) persicae* Bock & Parsons

Fig. 2H

Drosophila (Drosophila) persicae Bock & Parsons, 1978, Aust. J. Zool. **26**: 99.

Specimens examined. PNG: NEW GUINEA (NE): Morobe Prov. 11 δ , 1 η , Lae, 10 m, 29.IX.1977, ex banana bait (Carson). Nine specimens in BPBM.

Remarks. Ovipositor (Fig. 2H) brownish black.

Distribution. Queensland, Australia; New Guinea (new record).

18. *Styloptera punctata* Okada & Carson, new species

Fig. 4I-K

δ, η . Body about 2 mm in length. Eye dark red, with pile. Antenna with 2nd joint yellowish gray, brown above, 3rd gray. Arista with 4 upper and 2 lower branches and a large fork. Palpus orange-brown, with a few setae below. Ocellar triangle black; ocellars inserted outside triangle made by ocelli. Periorbit mat yellowish gray. Frons broader than median length, slightly broader than $\frac{1}{2}$ head width, medially yellowish gray, laterally with broad anteriorly convergent orange-brown stripes. Face mat yellowish gray. Carina broad, medially fuscous. Clypeus yellowish white. Cheek yellowish white, $\frac{1}{2}$ as broad as greatest diameter of eye, with a black spot below eye. Anterior reclinate orbital $\frac{3}{4}$ proclinate, nearer to proclinate than to posterior reclinate, which is longer than proclinate. Vibrissa strong, 2nd oral $\frac{1}{3}$ vibrissa. Mesoscutum mat orange-yellow, laterally brownish black, with brownish black spots at the insertion of acrostichal hairs and dorsocentral bristles, thus the specific name. Scutellum mat orange-yellow, with a pair of broad brownish black longitudinal stripes. Thoracic pleura yellowish gray, with 3 irregular brownish black stripes. Humeral 2. Acrostichal hairs in 4 rows, outer row with a few hairs. Dorsocentrals in 3 pairs, the more caudal pairs the longer. Lateral scutellars divergent, as long as apicals, which are equally apart from each other and from laterals. Sterno-index 0.4. Legs yellow, metatarsi as long as rest of tarsal joints. Wing hyaline, costal lappet and end of R_1 black, R_{2+3} nearly straight, R_{4+5} and M parallel. C-index 1.5; 4V-index 2.3; 4C-index 1.5; 5x-index 2.0; Ac-index 3.5. C1-bristles 2, long; C3-fringe $\frac{1}{2}$. Haltere yellowish