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Drosophilidae Associated with Flowers in Papua New Guinea

IV. Araceae, Compositae, Convolvulaceae, Rubiaceae, Leguminosae, Malvaceae

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Synopsis Eight new species of *Drosophila*, (*Scaptodrosophila*) *diana*, (*Sc.*) *parapsychotriae*, (*Sc.*) *amydriae*, (*Sophophora*) *gorokaensis*, (*Drosophila*) *wauana*, (*D.*) *mucunae*, (*D.*) *spinula*, and (*D.*) *quadriserrata*, are described from Morobe Province, Papua New Guinea. Five of them, *amydriae*, *wauana*, *mucunae*, *spinula*, and *quadriserrata*, appear to be associated with freshly decayed flowers; in the other three this relationship is less clear. Among the four species belonging to the subgenus *Drosophila*, *spinula* frequents many kinds of flowers but was bred only from *Mucuna* and two species of *Ipomoea*. This latter host is shared by the *melanogaster* group species, *D. elegans*. *D. (Sc.) hibisci* was reared from *Hibiscus esculentus*. In the four papers of this series we have described 37 new species, 23 of which belong to the subgenus *Scaptodrosophila*. Of the latter, nine were reared from decayed inflorescences. Three more species of this subgenus, *plaua*, *meta-tarsalis* and *scaptomyzoidea*, were bred in such sites. We conclude that flowers, particularly of monocotyledons, are important natural breeding substrate for flies of the subgenus *Scaptodrosophila*.

This is the fourth paper demonstrating that many species of Drosophilidae in Papua New Guinea are associated with flowers (CARSON & OKADA, 1980; OKADA & CARSON, 1980, 1982). The first three papers have dealt exclusively with host plants which are monocotyledonous, specifically plants belonging to four families, Araceae, Marantaceae, Musaceae and Zingiberaceae. The present paper presents descriptions of eight new species of *Drosophila* from various flower and fruit sources, including a number of dicotyledonous hosts. Included are three species of *Drosophila* belonging to the subgenus *Scaptodrosophila*. As has been emphasized in earlier papers, flies of this subgenus are not only exuberantly speciated in New Guinea but also display a strong tendency to be flower-associated. With the three species described in this paper, the number of new species of flower *Scaptodrosophila* described in this series of papers rises to 23, as shown in the key in which 3 more known species, *hibisci*, *parapunctipennis* and *scaptomyzoidea*, are included.

Material and Methods

The collections and observations reported here were made in 1977 along an altitudinal transect in Morobe Province, Papua New Guinea. This extended from the summit of Mt. Kaindi (2220 m) to near sea level at Lae. The methods used in the ecological studies are described in OKADA and CARSON (1982).

Descriptions of New Species

↷ *Drosophila* (*Scaptodrosophila*) *diana* n. sp.

(Fig. 1A-C)

♂, ♀. Body about 1.2 mm in length. Eye dark castaneous red, with pile. Antenna black. Arista with 4 upper and 2-3 lower branches and a large fork. Palpus black, with a few strong setae below. Periorbit velvety black. Frons subshining black, with a pair of anteriorly convergent broad black stripes, anteriorly broader than median length, half as broad as head width, posteriorly wider. Face grayish black. Carina high. Cheek very narrow, gray. Anterior reclinate orbital 1/5 posteriors, just outside proclinate, which is as long as posterior reclinate. Second oral fine. Mesoscutum, scutellum and thoracic pleura subshining black, somewhat pruinose; humeral callus brownish. Humerals 3, long. Acrostichal hairs in 6 rows. Lateral scutellars slightly divergent, as long as apicals, which are subequally apart from each other and from laterals. Legs black, tarsi gray. Metatarsi as long as the rest of tarsal joints. Wing hyaline, outer margin rounded; R_{2+3} gently curved to costa distally; R_{4+5} and M parallel. C-index 1.3; 4V-index 1.3; 4C-index 1.4; 5x-index 3.0; Ac-index 3.0. Cl-bristles 2, long, subequal; C3-fringe 4/5. Halter black, stalk paler. Abdominal tergites deep subshining black. Periphallalic organs (Fig. 1A), phallic organs (Fig. 1B) and ovipositor (Fig. 1C) brownish black.

Holotype ♂ (C211.58), allotype ♀, 3♂ paratypes, Wau, 1300 m, 11. X. 1977, ex *Chrysanthemum* flowers (M. S. CARSON). Types in Bishop Museum.

This species closely resembles *D. minima* OKADA in general, but differs from the latter in having epandrium narrowing below and male cercus without stout bristles below.

↷ *Drosophila* (*Scaptodrosophila*) *parapsychotriac* n. sp.

(Fig. 1D-F)

♂, ♀. Body 1.2-2.2 mm in length. Eye dark red, with pile. Antenna with 2nd joint orange yellow, 3rd gray, yellow below. Arista with 3-4 upper and 2 lower branches and a large fork. Palpus yellowish orange, with an apical seta. Ocellar triangle small, black. Periorbit golden yellowish gray. Frons golden brown; anteriorly orange, 5/7 as broad as head width, as broad as median length,

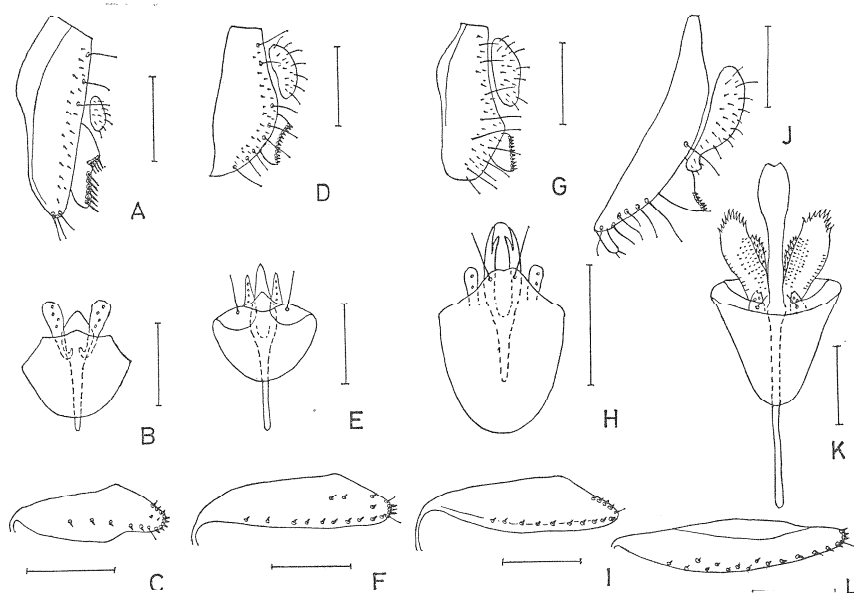


Fig. 1. A-C, *Drosophila (Scaptodrosophila) diana*; D-F, *D. (Sc.) parapsychotriae*; G-I, *D. (Sc.) anydriae*; J-L, *D. (Sophophora) smithersi*. A, D, G, J, Peripheral hallic organs; B, E, H, K, phallic organs; C, F, I, L, ovipositor. Scales 0.1 mm.

posteriorly broader. Face and clypeus yellowish gray. Carina narrow. Cheek yellowish gray, $1/7$ as broad as the greatest diameter of eye. Anterior reclinate orbital $1/5$ proclinate, at middle between proclinate and posterior reclinate, which is slightly longer than proclinate. Second oral fine. Mesoscutum pale brown, with faint brownish stripes outside and inside dorsocentral lines. Scutellum mat subshining brown. Thoracic pleura slightly paler. Humerals 2 or 3, long. Acrostichal hairs in 6 rows. Prescutellars weak. Anterior dorsocentrals half posteriors; length distance of dorsocentrals $2/5$ cross distance. Lateral scutellars convergent, longer than apicals, which are equally apart from each other and from laterals. Sterno-index 0.5. Legs yellow, tarsi slightly fuscous; metatarsi as long as the rest of tarsal joints. Wing hyaline, crossveins clear. R_{2+3} nearly straight; R_{4+5} and M parallel. C-index 2.0; 4V-index 2.0; 4C-index 1.2; 5x-index 2.4; Ac-index 2.5. C1-bristles 2; C3-fringe $1/4$. Halter brown. Abdominal tergites mat yellowish brown, with broad black medially broadened caudal bands.

Periphallallic organs (Fig. 1D), phallic organs (Fig. 1E) and ovipositor (Fig. 1F) pale yellowish brown.

Holotype ♂ (C221.25), allotype ♀, 6♂, 1♀ paratypes, Mt. Kaindi, 1900 m, 30. IX. 1977, near *Psychotria* flowers (CARSON). Types in Bishop Museum; 2♂ paratypes in National Science Museum, Tokyo.

This species resembles *D. fuscopalpis* WHEELER et TAKADA in general colorations

and male genitalia, but differs from the latter in having palpus not dark brown.

✓ *Drosophila (Scaptodrosophila) amydriae* n. sp.

(Fig. 1G-I)

♂, ♀. Body about 2 mm in length. Eye dark red, with pile. Antenna with 2nd joint orange, 3rd gray. Arista with 3 upper and 2 lower branches and a small fork. Palpus brownish gray or orange gray, with a few setae below. Ocellar triangle brownish gray. Frons golden brown, anteriorly orange and 1/3 as broad as head width, slightly narrower than median length, posteriorly wider. Face gray; carina narrow, long. Clypeus yellowish gray. Cheek orange, 1/6 as broad as the greatest diameter of eye. Anterior reclinate orbital 2/3 proclinate, just outside proclinate; posterior reclinate longer than proclinate. Vibrissa long, other orals fine. Mesoscutum and scutellum subshining grayish orange. Thoracic pleura paler below. Humerals 2. Acrostichal hairs in 8 rows. Anterior dorsocentrals half posteriors; length distance of dorsocentrals half cross distance. Lateral scutellars divergent, longer than apicals, which are equally apart from each other and from laterals. Sterno-index 0.5; median sternopleural fine. Legs yellow; metatarsi as long as the rest of tarsal joints. Wing hyaline. R_{2+3} straight; R_{4+5} and M parallel. C-index 2.8; 4V-index 2.0; 4C-index 1.0; 5x-index 2.0; Ac-index 2.0. C1-bristles 2, subequal; C3-fringe 1/2-3/4. Halter orange brown. Abdominal tergites mat pruinose black, anterolaterally orange yellow; caudal tergites nearly entirely black, narrowly yellow on caudal margins.

Periphallalic organs (Fig. 1G), phallic organs (Fig. 1H) and ovipositor (Fig. 1I) pale yellow.

Holotype ♂ (C220.24), allotype ♀, 5♂, 2♀ paratypes, McAdam Park, 1200 m, 22. IX. 1977, reared ex fruits of *Amydrium* (CARSON). Types in Bishop Museum; 1♂, 1♀ paratypes, National Science Museum, Tokyo.

This species resembles *D. bryani* MALLOCH in male genitalia, but differs in having C-index larger and thoracic pleura without dark patches.

✓ *Drosophila (Sophophora) gorokaensis* n. sp.

(Fig. 2A-C)

Drosophila sp. of *fusciphila* subgroup from Goroka: BOCK & WHEELER, Univ. Texas Publ., (7213): 34.

♂, ♀. Body about 2.5 mm in length. Eye dark red, with pile. Antenna with 2nd joint orange, 3rd gray, orange above. Arista with 4 upper and 4 lower branches and a moderate fork. Palpus yellow, with a long apical black seta. Ocellar triangle gray. Periorbit mat yellowish gray. Frons mat orange yellow, anteriorly orange, as broad as median length, 3/10 as broad as head width. Face yellowish gray. Carina high, narrow. Clypeus yellow. Cheek yellowish orange,

1/8 as broad as the greatest diameter of eye. Anterior reclinate orbital 1/4 proclinate, slightly nearer to proclinate than to posterior reclinate, which is slightly longer than proclinate. Second oral 2/3 vibrissa. Mesoscutum and thoracic pleura subshining orange brown. Scutellum slightly darker. Humerals 2, long. Acrostichal hairs in 8 rows. Anterior dorsocentrals 2/3 posteriors; length distance of dorsocentrals 3/7 cross distance. Lateral scutellars convergent, as long as apicals, which are nearer to each other than to laterals. Sterno-index 0.7. Legs yellow; fore metatarsus as long as succeeding 2 tarsal joints; mid and hind as long as succeeding 3. Wing hyaline, slightly fuscous along costal margin; R_{2+3} straight; R_{4+5} and M parallel. Male sex-combs with about 20 and 15 teeth on metatarsus and 2nd tarsal joint, respectively, and with several intermittent black long bristles. C-index 2.3; 4V-index 2.0; 4C-index 1.1; 5x-index 2.0; Ac-index 2.4. C1-bristles 2; C3-fringe 1/2. Halter orange brown. Abdominal tergites orange brown, with broad black medially not interrupted caudal bands; in ♂ caudally shiny black.

Sex-combs
20/15

Periphallie organs (Fig. 2A) dark brown, as figured by BOCK and WHEELER (1972); surstylus very small, epandrium elongate below. Phallic organs (Fig. 2B) dark brown. Ovipositor (Fig. 2C) yellowish brown.

Holotype ♂ (100127), allotype ♀, 5♂, 4♀ paratypes, Mt. Kaindi, 5, 20. IX 1977 (CARSON). Types in Bishop Museum.

reared ex Amygdrium
Kaindi
(cf. P. 522)

✓ *Drosophila (Drosophila) wauana* n. sp.

(Fig. 2D-F)

♂, ♀. Body 2-2.5 mm in length. Eye dark red, with pile. Antenna orange brown, 3rd joint dark brown except at base. Arista with about 7 upper and 2 lower branches and a moderate fork. Palpus grayish yellow, with about 2 short black setae below. Ocellar triangle dark brownish black, large. Periorbit yellowish gray. Frons mat grayish yellow, anteriorly pale, silvery pruinose in ♂, anteriorly 3/8 as broad as head width, as broad as median length, posteriorly wider. Face yellowish gray. Carina high, long. Cheek yellowish gray, 1/8 as broad as the greatest diameter of eye. Anterior reclinate orbital 1/3 proclinate, slightly nearer to proclinate than to posterior reclinate, which is longer than proclinate. Second oral as long as vibrissa. Mesoscutum and scutellum subshining yellowish brown, scutellum golden pruinose. Thoracic pleura yellowish brown, with 3 diffuse dark brown patches. Humerals 2. Acrostichal hairs in 8 rows. Anterior dorsocentrals half posteriors; length distance of dorsocentrals half cross distance. Lateral scutellars divergent, as long as apicals, which are equally apart from each other and from laterals. Sterno-index 0.5, middle sternopleural as long as anteriors. Legs yellow; basal 3 joints of ♂ fore tarsi with tufts of dense short brown hairs. Fore metatarsus as long as succeeding 2 tarsal joints; mid and hind as long as succeeding 3. Wing hyaline, crossveins somewhat clouded; R_{2+3} slightly curved to costa apically; R_{4+5} and M parallel. C-index 4.0; 4V-index 1.5; 4C-index 0.6; 5x-index

1.5; Ac-index 1.8. C1-bristles 2, equal; C3-fringe $1/2$ or slightly more. Halter yellowish brown. Abdominal tergites mat yellowish orange, with mat black broad medially obscurely interrupted caudal bands.

Periphallic organs (Fig. 2D) dark brown. Phallic organs (Fig. 2E) brown; aedeagus dark brown. Ovipositor (Fig. 2F) yellowish brown.

Holotype ♂ (82118), Wau, 1300 m, 27. VIII. 1977, by sweeping (OKADA); allotype ♀, same locality as above, 1. X. 1977 (OKADA). Paratypes: 1♂, Wau, 8. VIII. 1977, reared ex flowers of *Mucuna* (CARSON); 5♂, 5♀, same place as above, IX-X. 1977 (OKADA); 1♂, Bulolo, 15. IX. 1977 (OKADA); 1♂, Lae, 10m, 23-25. VIII. 1981 (TOBARI & TAKANASHI). Types in Bishop Museum.

Relationships. This species belongs to the *histrion* group of the *quinaria* section, and is closely similar to *D. trisetosa* OKADA especially in male and female genitalia and in having 3 long sternopleurals, but differs in having shaggy male fore tarsi and darker abdominal tergites. It is one of the commonest species of *Drosophilidae* in Wau.

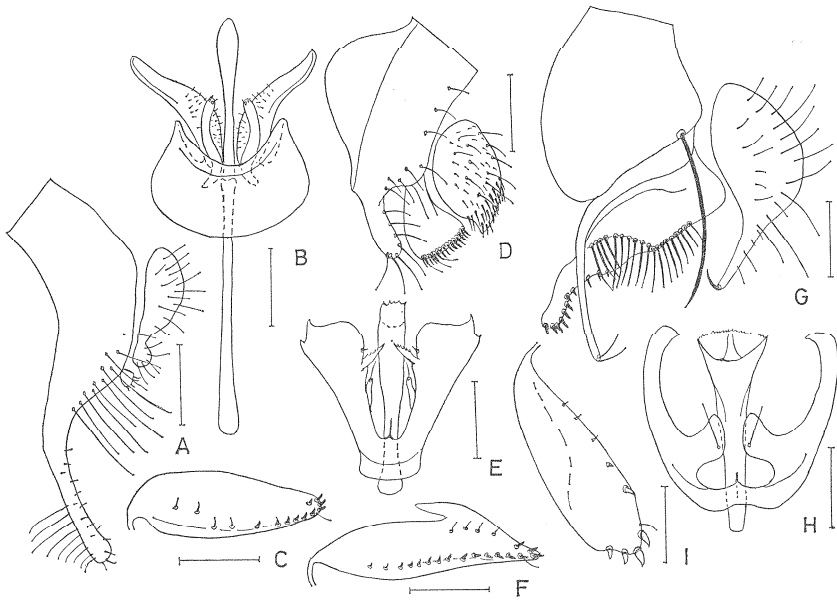


Fig. 2. A-C, *Drosophila (Sophophora) gorokaensis*; D-F, *D. (D.) wauana*; G-I, *D. (D.) mucunae*. A, D, G, Periphallic organs; B, E, H, phallic organs; C, F, I, ovipositor. Scales 0.1 mm.

✓ *Drosophila (Drosophila) mucunae* n. sp.

(Fig. 2G-I)

♂, ♀. Body about 2 mm in length. Eye light reddish brown, with pile. An-

tenna with 2nd joint orange, 3rd orange gray. Palpus yellowish orange, with a long apical seta. Ocellar triangle yellowish gray. Periorbit mat grayish brown. Frons mat grayish brown, anteriorly orange brown, 1/3 as broad as head width, much broader than long. Face mat orange brown. Carina gray, high, long. Cheek yellowish gray, narrow, 1/9 as broad as the greatest diameter of eye. Anterior reclinate orbital 1/3 proclinate, at middle between proclinate and posterior reclinate, which is much longer than proclinate. Mesothorax entirely mat grayish or yellowish brown. Humerals 2, long. Acrostichal hairs in 8 rows. Anterior dorsocentrals 2/3 posteriors; length distance of dorsocentrals 1/3 cross distance. Lateral scutellars divergent, as long as apicals, which are equally apart from each other and from laterals. Sterno-index 0.7; median sternopleural long. Legs yellow; femur, tibia and metatarsus of ♂ fore leg with long setae below; metatarsus and 2nd tarsal joint of ♂ fore leg with tufts of dense golden short hairs. Metatarsi as long as succeeding 3 tarsal joints. Wing hyaline, crossveins clear. R_{2+3} straight; R_{4+5} and M parallel. C-index 1.7; 4V-index 2.0; 4C-index 0.8; 5x-index 1.7; Ac-index 1.9. C1-bristles 2, subequal; C3-fringe 2/3–3/5. Halter grayish brown. Abdominal tergites mat yellowish brown, with dark obscure medially interrupted caudal bands; caudal tergites entirely black.

Periphallallic organs (Fig. 2G) black, much complicated. Phallic organs (Fig. 2H) pale brown; aedeagus tripartite distally. Ovipositor (Fig. 2I) pale yellow with orange teeth.

Holotype ♂ (C211.24), allotype ♀, 4♂ paratypes, Wau, 1200 m, 3. VIII. 1977, reared ex flowers of *Mucuna* (CARSON); paratypes: 1♂, 2♀, same place as above, 3. VIII. 1977, reared ex green flowers (CARSON); 1♂, same place as above, 7. X. 1977, at light trap (OKADA). Types in Bishop Museum; 1♂, 1♀ paratypes in National Science Museum, Tokyo.

Relationships. This species resembles the foregoing species, *D. wauana*, in having 3 long sternopleurals and shaggy fore leg, but differs entirely in the structures of periphallallic organs. This belongs to the *quinaria* section, but species-group is uncertain.

♣ *Drosophila (Drosophila) spinula* n. sp.

(Fig. 3A–C)

♂, ♀. Body 2.0 mm in length. Eye dark red, with fine pile. Arista with 4 upper and 3 lower long branches and a large fork. Palpus yellow, with a long apical black seta. Ocellar triangle and periorbit gray. Frons mat orange brown, anteriorly half as broad as head width, broader than median length. Face mat gray. Cheek yellowish gray, 1/9 as broad as the greatest diameter of eye. Carina narrow, long. Clypeus yellow. Anterior reclinate orbital minute, outside proclinate; a few similar minute setae in front of it; posterior reclinate slightly longer than proclinate. Second oral as long as vibrissa, 3rd shorter. Mesoscutum and

scutellum orange yellow, unicolorous. Thoracic pleura a little paler. Humerals 2, equal. Acrostichal hairs in 8 rows. Anterior dorsocentrals 2/3 posteriors; length distance of dorsocentrals half cross distance. Sterno-index 0.8; median sternopleural short. Lateral scutellars convergent; apicals slightly longer than laterals, equally apart from each other and from laterals. Legs yellow; fore femur with a row of about 12 stout spinules inside, thus the specific name; fore tibia with about 6 similar spinules. Metatarsi as long as succeeding 2 tarsal joints. Wing hyaline, crossveins clear; R_{2+3} gently curved to C; R_{4+5} and M somewhat convergent distally. C-index 1.5; 4V-index 3.0; 4C-index 2.0; 5x-index 1.5; Ac-index 4.0. C1-bristles 2, long, equal; C3-fringe 2/3. Halter yellow. Abdominal tergites yellow, with narrow medially interrupted dark caudal bands; caudal tergites in ♂ entirely black.

Periphallalic organs (Fig. 3A) pale yellowish brown; epandrium caudally with 2 black pointed projections; surstylus black, finger-like. Phallic organs (Fig. 3B) brown; aedeagus 4-lobed distally. Ovipositor (Fig. 3C) small, merely hairy; lobes separated widely by a large globular plate. Egg with 2 very short but thick filaments.

Holotype ♂ (90403), Wau, 1300 m, 4. IX. 1977; allotype ♀, same place as above, 5. X. 1977; 3♂, 1♀ paratypes, same place as above, VIII-IX. 1977, all ex *Datura* flowers (OKADA); other paratypes: 3♂, 1♀, ex *Hibiscus* flowers, 23. VIII. 1977; 2♂, 3♀, ex *Thunbergia* flowers, 8. IX. 1977, all in Wau (OKADA); 1♀, Bulolo, 18. IX. 1977, ex *Ipomoea* flowers (OKADA); 2♂, 3♀, Wau, 8. VIII. 1977, reared ex flowers of *Mucuna* (CARSON). Types in Bishop Museum; 2♂, 1♀ paratypes in National Science Museum, Tokyo.

Relationships. This species is unique among the members of the genus in the structure of ovipositor. Superficially it resembles *immigrans* group species in having spinules on fore femur.

✓ *Drosophila (Drosophila) quadriserrata* n. sp.

(Fig. 3D-G)

♂, ♀. Body about 3 mm in length. Eye dark purplish red, with pile. Antenna with 2nd joint orange brown, 3rd grayish brown. Arista with about 6 upper and 2 lower branches and a large fork. Palpus orange, with a few strong black setae below. Ocellar triangle black. Periorbit grayish brown. Frons mat orange gray, anteriorly orange, as broad as median length, 1/3 as broad as head width. Face yellowish gray. Carina large, broader below. Clypeus yellowish gray. Cheek yellowish brown, 1/7 as broad as the greatest diameter of eye. Anterior reclinate orbital 2/3 proclinate, nearer to proclinate than to posterior reclinate, which is as long as proclinate. Vibrissa stout, 2nd oral as long as vibrissa. Mesoscutum mat grayish brown. Scutellum mat yellowish brown, pruinose. Thoracic pleura somewhat paler than mesoscutum. Humerals 2, long. Acrostichal hairs in 8 rows. Anterior dorsocentrals 2/3 posteriors; length distance of dorso-

centrals 1/3 cross distance. Lateral scutellars parallel, as long as apicals, which are nearer to each other than to laterals. Sterno-index uncertain. Legs yellow; fore femur with a row of spinules inside below; ultimate tarsal joints fuscous. For and hind metatarsi as long as succeeding 3 tarsal joints; mid metatarsus longer than succeeding 3. Wing hyaline, crossveins somewhat clouded. R_{2+3} straight; R_{4+5} and M parallel. C-index 3.6; 4V-index 1.2; 4C-index 0.6; 5x-index 1.0; Ac-index 1.4. C1-bristles 2, subequal; C3-fringe 2/5. Halter yellowish brown. Abdominal tergites yellowish brown, with medially interrupted obscure caudal dark bands.

Periphallalic organs (Fig. 3D) pale brown. Phallic organs (Fig. 3E-F) pale brown; aedeagus with 2 pairs of slender projections laterally, thus the specific name. Ovipositor (Fig. 3G) orange yellow, pointed.

Holotype ♂ (C220.25), allotype ♀, McAdam Park near Wau, 1200 m, 22. IX. 1977, reared ex fruits of *Amydrium* (CARSON). Types in Bishop Museum.

Relationships. This species belongs to the *immigrans* group, unique in having 2 pairs of slender flaps on aedeagus.

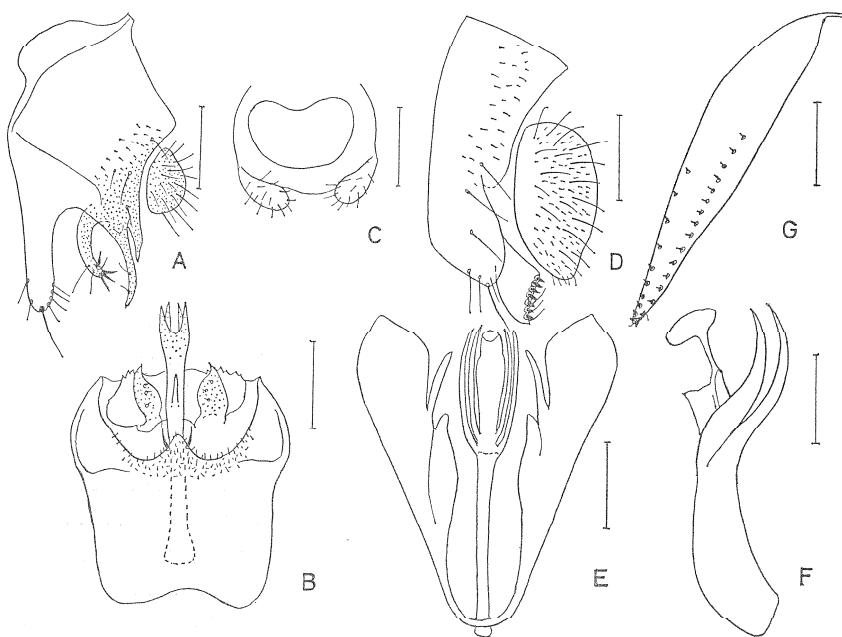


Fig. 3. A-C, *Drosophila (D.) spinula*; D-G, *D. (D.) quadriserrata*. A, D,Periphallalic organs; B, E, F, phallic organs; C, G, ovipositor. Scales 0.1 mm.

Key to Flower Associated *Scaptodrosophila* Species of Papua New Guinea

1. Body about 4 mm in length; tips of long veins black *parapunctipennis*

- 1
- Body less than 2.5 mm in length; tips of long veins not black2
 - 2. Small black species3
 - Yellow or yellowish brown species12
 - 3. Arista pubescent or with very short branches.....4
 - Arista plumose9
 - 4. Proclinate orbitals absent5
 - Proclinate orbitals present6
 - 5. Fore tarsi with a row of stout black bristles below; mesopleura bare.....
..... *aproclinata*
 - Fore tarsi without stout black bristles below; mesopleura with a bristle
..... *paragma*
 - 6. Arista merely pubescent, without fork *nuda*
 - Arista with short branches, with a fork7
 - 7. Acrostichal hairs in 8 rows *parviramosa*
 - Acrostichal hairs in 6 rows8
 - 8. Mesoscutum shiny black..... *plaua*
 - Mesoscutum mat black *hibisci*
 - 9. Frons with anterior margin incised *incisurifrons*
 - Frons with anterior margin not incised10
 - 10. Costal index about 1.3; abdominal tergites entirely subshining black *diana*
 - Costal index about 2.5; abdominal tergites not entirely black11
 - 11. Fifth abdominal tergite orange, with a large black spot *nigrops*
 - Fifth abdominal tergite orange yellow, without black spot *phryniae*
 - 12. Costal index about 5.013
 - Costal index less than 3.014
 - 13. Mesoscutum yellow *scaptomyzoidea*
 - Mesoscutum mat reddish brown *spathicola*
 - 14. Femora and tibiae with black annuli; hind metatarsus much longer than the
rest of tarsal joints *heliconiae*
 - Legs unicolorous15
 - 15. Metatarsi much longer than the rest of tarsal joints16
 - Metatarsi as long as or shorter than the rest of tarsal joints17
 - 16. Metatarsi much longer than the rest of tarsal joints; anterior reclinate orbital
1/3 posteriors *metatarsalis*
 - Fore metatarsus as long as the rest of tarsal joints; mid and hind metatarsi
longer than the rest of tarsal joints. Anterior reclinate orbital 3/5 posteriors..
..... *paraphryniae*
 - 17. C3-fringe less than 1/418
 - C3-fringe 2/5 or more20
 - 18. Third and 4th tarsal joints of fore leg in both sexes with each 2 stout black teeth
apically *lagomorpha*
 - Third and 4th tarsal joints of fore leg without such teeth19

19. Mesoscutum subshining grayish orange; abdominal tergites pale yellowish brown *psychotriae*
 — Mesoscutum mat pale orange brown; abdominal tergites yellowish brown, with broad black medially interrupted caudal bands *parapsychotriae*
20. Fifth abdominal tergite with median black spot *xanthops*
 — Fifth abdominal tergite without median black spot 21
21. Length distance of dorsocentrals as long as cross distance *paracentralis*
 — Length distance of dorsocentrals less than half cross distance 22
22. Length distance of dorsocentrals 1/5 cross distance *cominsiae*
 — Length distance of dorsocentrals 2/5 or more of cross distance 23
23. Anterior reclinate orbital 2/3 proclinate *amydriae*
 — Anterior reclinate orbital 1/3 or less of proclinate 24
24. Second to 4th abdominal tergites with well-demarcated caudal black bands ..
 *tringulata*
 — Abdominal tergites with obscure caudal bands 25
25. Mesoscutum mat orange yellow *anthia*
 — Mesoscutum subshining orange brown *paranthia*

Observations on Ecology and Life History

1. Araceae

The first two papers of this series dealt with the many drosophilid associates of the aroid genera *Colocasia* and *Alocasia*. *Amydrium magnificum* (ENGL.) NICOLSON, a large climbing aroid, was found to be abundant at McAdam Memorial Park near Wau (1200 m). Although no young inflorescences could be located, some spadices were laden with reddish berries; most of the spathes remained only as remnants. No imagoes were observed near these spadices. One spadix, resembling a maize "corn cob" in size and appearance, had a decaying core; it was taken to the laboratory and was placed on sterile sand. After 23–27 days, 21 specimens of *D. (Sc.) amydriae* emerged. As the berries had remained intact, it is clear that the immature stages had developed in the decaying tissues of the core of the inflorescence. This niche resembles that of *D. xanthops* OKADA et CARSON (1980) which emerged from very old decayed *Alocasia* inflorescences long after the other species had eclosed.

Fifteen days after isolation, this same inflorescence yielded two ♂♂ and two ♀♀ of *Drosophila (D.) quadrt serrata*, a new species belonging to the *immigrans* group. The details suggest, however, that this species was breeding on the decayed core of the inflorescence and was not flower-associated. The species rather closely resembles *D. (D.) immigrans* STURTEVANT, the nominate species for a species group which is well developed in Papua New Guinea. The island appears to have about ten species of this group in addition to *D. immigrans*, some of which are undescribed. In both temperate and tropical regions of the world *D. immigrans* is an abundant species.

Despite its worldwide commonness and the good development of its species group in Morobe Province, *D. immigrans* itself is very infrequent. Thus, CARSON and OKADA (1981) report the collection of 3779 specimens of Drosophilidae taken at banana traps set at eight sites from sea level to 2200 m. Banana is a favorite feeding substrate for this well-known, virtually cosmopolitan species. At these traps, 1♂ and 1♀ of *D. immigrans* were taken among 605 drosophilids in a *Nothofagus* grove at 2120 m. The species was cultured from these two flies and a vigorous stock (K30) was taken to Australia where an examination of genitalia, kindly made by Dr. I. R. Bock, confirmed the identification. Cytological examination of the salivary gland chromosomes by TRIBE (1981) revealed that the stock was without the widespread inversions characteristic of this species. Two females were caught at Kunai Creek in 1119 specimens but none at Wau or Bulolo (1117 specimens). At Wau, a single female specimen was swept from *Morus* fruits but among the thousands of specimens examined at Wau Ecology Institute in 1977, no further *immigrans* were found. In over five months of intensive collecting, these five specimens were the only ones of this species obtained. These appear to be the first records of *D. immigrans* in New Guinea. The relationship of the Morobe Province *D. immigrans* to populations of Australia and the rest of the world would make an interesting study.

Thirteen days after isolation of the *Amydrium* spadix described above, 1♂ and 3♀♀ of *D. (So.) gorokaensis* emerged. These flies were placed on laboratory food and yielded a vigorous stock. Although this species was not obtained either from banana traps or otherwise at Wau or at lower elevations, it was reasonably frequent at Kunai Creek and near the summit of Mt. Kaindi. Isofemale lines are easy to establish. The specimens found in Morobe Province appear to be conspecific with the specimen mentioned by BOCK and WHEELER (1972, p. 34) as "2. Undescribed species from Goroka, New Guinea." It belongs to the *fusciphila* subgroup. We plan to write more on its distribution in an forthcoming publication. Although we describe it here, this species, like *D. quadriserrata*, is probably not a flower-breeding species in the strict sense.

2. Compositae, Convolvulaceae, Leguminosae, Malvaceae, Rubiaceae

In Table 1, we present collection records for four species of *Drosophila* which are associated with flowers of various families. *Drosophila spinula* adults have been taken at many species of flowers but have been reared only from *Mucuna* and two species of *Ipomoea*. *D. (Sc.) scaptomyzotidea* DUDA is found occasionally at flowers but specimens were reared only from *Strongylodon*, a leguminous vine found in the deep forest at Mt. Missim, 1570 m. The species is widespread; a small number of specimens have been recorded from Micronesia, southeast Asia, New Guinea and Australia. OKADA (1975) records that this species was bred out of flowers of *Malvaviscus* (Malvaceae) on the campus of the University of Singapore.

Mucuna albertisii T. MUELL. is a large leguminous vine growing along the roadside near the Wau Ecology Institute. We describe here two new species, *D.*

Table 1. Occurrence of *Drosophila (D.) spinula* n. sp., *D. (Sc.) scaptomyzoidea* DUDA, *D. (Sc.) hibisci* BOCK and *D. (So.) smithersi* BOCK in flowers in Papua New Guinea.

Locality and host flower	Date	Number collected or reared*:			
		<i>spinula</i>	<i>scapto- myzoidea</i>	<i>hibisci</i>	<i>smithersi</i>
Brown River, Central Province					
<i>Crinum</i> sp.	16. X. 61	42	—	—	—
Wau, Morobe Province					
<i>Solandra</i> sp.	25. VIII. 77	6	—	—	—
<i>Datura arborea</i> L.	14. VIII. 77	5	—	—	—
	19. VIII. 77	—	1	—	—
	24, 28. VIII. 77	—	—	—	2
	12. IX. 77	—	—	—	1
	22. IX. 77	10†	—	—	—
<i>Thunbergia laurifolia</i> LINDL.	8. IX. 77	8	—	—	—
<i>Gladiolus</i> sp.	10. XI. 77	3	—	—	—
<i>Hibiscus</i> sp.	23, 24. VIII. 77	10	—	—	1
<i>Hibiscus esculentus</i> L.	XI. 77	—	—	34; 26*	—
<i>Chrysanthemum</i> sp.	11. X. 77	1	—	—	—
<i>Mucuna albertisii</i> T. MUELL.	8. VIII. 77	5*	—	—	—
<i>Rosa</i> sp.	11. X. 77	4	1	—	—
<i>Amaryllis</i> sp.	10. XI. 77	36	—	—	—
<i>Coffea</i> sp.	18. X. 77	—	2	—	—
Bulolo, Morobe Province					
<i>Ipomoea carnea</i> JACK	18. IX. 77	6*	1	—	—
	29. IX. 77 ⁺	1; 5*	—	—	—
Kaisenik, Morobe Province					
<i>Ipomoea alba</i> L.	13. XI. 77	2*	—	—	—
Mt. Missim, Morobe Province					
<i>Strongylodon archboldianum</i> MERR. and PERRY	2. X. 77	—	7*	—	—

† McAdam Memorial Park

⁺ Garagos River, near Lae

* reared

(*D. mucunae* and *D. (D.) wauana*. Along with *D. spinula*, these species were reared from freshly fallen flowers of this vine. *D. wauana* is very common in collections made by general sweeping around the Wau Institute. A small new *Scaptodrosophila* species *D. (Sc.) diana* (10 specimens) was collected from cultivated *Chrysanthemum* and *Rosa* flowers in a garden at the Wau Institute on October 11, 1977. *D. spinula* and *D. scaptomyzoidea* were collected from the same flowers at the same time (see Table 1).

The large species *Datura arborea* L., in addition to the specimens listed in Table 1 also yielded two specimens of *D. (So.) ananassae* and one of *D. (So.) birchii* (col-

Table 2. Rearing of *D. elegans* BOCK et WHEELER from flowers of the genus *Ipomoea* in Papua New Guinea.

Host species	Locality	Date	No. of flowers examined	No. of eggs (or larvae)	No. of specimens reared
<i>Ipomoea carnea</i> JACK	Bulolo	6. IX. 77	12	—	3
		18. IX. 77	10	12	16*
	Garagos River near Lae	29. IX. 77	27	—	2
<i>Ipomoea alba</i> L.	Kaisenik near Wau	13. XI. 77	6	—	6*

* *D. spinula* also reared; see Table 1.

lected 4. IX. 77 at Wau). *D. (So.) smithersi* BOCK* (a member of the *fusciphila* subgroup of the *melanogaster* group) was frequently found in light traps in Wau (34 specimens) and one specimen was also taken on wet cloths hanging near a house, where *D. (Sc.) pictipennis* was also found.

D. (Sc.) hibisci has been described recently from northern Australia where it breeds in the tubular flowers of two species of native *Hibiscus* (Malvaceae) (COOK, PARSONS & BOCK, 1977). At the Wau Ecology Institute, this species was discovered by Dr. Wayne C. GAGNÉ in the flowers of the common garden "okra" or "gumbo" (*Hibiscus esculentus* L.) where it was subsequently shown to be breeding.

Small numbers of imagoes of *Drosophila (Sophophora) elegans* BOCK et WHEELER were discovered in the flowers of the large shrub-like species *Ipomoea carnea* JACK (Convolvulaceae) (Table 2). *Ipomoea* flowers ("morning glories") open in the morning then wilt in the afternoon of the same day. Ten flowers were brought to the laboratory and examined (Table 2). Three showed no eggs or larvae; four contained a single egg placed at the base of one of the five stamens. Two flowers showed two eggs apiece and one flower showed four eggs and, in addition, two very small larvae. These flowers were pooled and placed on damp sand. After 12 days, 16 *D. elegans* had emerged. It is possible that some small larvae were missed, as one was found concealed within a mass of shed pollen at the base of the corolla tube. The manner in which *D. elegans* and *D. spinula* share the *Ipomoea* flower niche needs further study.

Only a very small number of imagoes of *D. elegans* are present in a single flower although our visits to the flowering plants were made either during the middle of the morning or later in the day. As the data in Table 2 indicate, the number of immature stages per flower is very small.

Unlike many other highly specialized flower-dwelling flies, *D. elegans* oviposits and develops well on laboratory medium. The number of eggs laid in a single day

* This species is newly recorded from New Guinea. Male and female genitalia are shown in Fig. 1J-L.

- *elegans* group
D. (So.) smithersi
 Prakash Reddy
 1979 India
 ex *Ipomoea*

by one female, however, appears to be very small and the yield per vial of laboratory food is low.

Drosophila elegans belongs to the *Drosophila melanogaster* species group, which is now known to contain 115 described species (BOCK, 1980). Except for the cosmopolitan forms such as *D. melanogaster* and *D. simulans*, little is known of the breeding sites of most of these species. With the exception of *D. erecta* (LACHAISE et TSACAS, 1974), however, most appear to have generalist tendencies. The specialization of *D. elegans* is therefore of particular interest. Imagoes of this species were also found by BOCK and PARSONS in the flowers of *Ipomoea fistulosa* (= *Ipomoea carnea* JACK) in New Guinea, although no locality or date is given (BOCK, 1980).

OKADA and CARSON (1980) have described *D. (Sc.) psychotriae* from the flowers of *Psychotria* (Rubiaceae) on Mt. Kaindi. Although this species was not reared from the flowers, fifteen specimens were taken at the flowers of two species of large *Psychotria* trees which are in flower in the area at the time. This species, which has been previously seen only near the inflorescences of *Alocasia macrorrhiza* (Araceae) also appears to be flower-adapted. Accompanying it, on the same inflorescences of *Psychotria* was a second species, *D. parapsychotriae*.

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