

ADDITION TO THE FAUNA OF THE FAMILY
DROSOPHILIDAE OF JAPAN AND ADJACENT
COUNTRIES (Diptera)

I. Genera *Stegana*, *Amiota*, *Leucophenga*, and
Microdrosophila, with discussion on the
homology of phallic organs

By Toyohi Okada

*Department of Biology, Faculty of Science,
Tokyo Metropolitan University*

This is to report some species of the family Drosophilidae new or little known from Japan, Okinawa, and Taiwan, the first section concerning genera *Stegana*, *Amiota*, *Leucophenga*, and *Microdrosophila*, and the second section *Paramycodrosophila*, *Mycodrosophila*, *Liodrosophila*, and *Drosophila*. Beside collected by the author himself, the material involves those bestowed by many investigators mentioned below from various localities shown in parentheses: Dr. H. L. Carson, Washington University, Missouri (Hokkaido), Mr. F. Hihara and Mr. M. Sugita, Tokyo Metropolitan University (Hokkaido, Honshu, Okinawa), Dr. R. Kano, Tokyo Medical and Dental University (Okinawa), Dr. Y. Matsudaira, St. Paul's University, Tokyo (Honshu), Dr. Y. Nagata, Miyazaki University (Kyushu), Mr. K. Nakamura, Shizuoka High School (Honshu), Dr. T. Okadome, Meijō University, Aichi Pref. (Kyushu), Mr. T. Saigusa, Kyushu University (Kyushu), Dr. L. H. Throckmorton, Chicago University (Kyushu), Dr. M. R. Wheeler, Texas University (Kyushu), and Mr. T. Yamasaki, Tokyo University of Education (Taiwan), to whom the author's hearty thanks are due.

Acknowledgement is made also to the partial financial supports through the Japan Society for the Promotion of Science as part of the Japan-U. S. Cooperative Science Program and through Ministry of Education for Individual Science Research.

The type series are deposited at the Department of Biology, Faculty of Science, Tokyo Metropolitan University.

Abbreviations used in the textfigures: a. anterior paramere; c. clasper; d. decasternum; e. aedeagus; g. genital arch; o. apodeme of aedeagus; p. posterior paramere; r. vertical rod; t. anal plate; u. ventral recurved process; v. ventral fragma.

Scales in the textfigures: broken line, 1.0 mm; solid line, 0.1 mm; dotted line, 0.01 mm.

Stegana ornatipes Wheeler and Takada

Stegana ornatipes Wheeler and Takada, 1964. Ins. Micronesia, 14: 233 (Caroline Is.)

♂, ♀. Eyes dark purplish red, bare. Ocellar triangle black. Periorbits black, somewhat pruinose. Humerals one, strong. Prescutellars as long as anterior dorsocentrals. Acrostichal hairs in about eight rows. Anterior dorsocentrals half as long as posteriors; distance between anterior and posterior pairs one-fifth distance between anterior pair. Anterior scutellars divergent, longer than posteriors, which are nearer to each other than to anteriors. Sterno-index about 0.8. Preapicals on all tibiae, apicals on fore and mid. R_{2+3} strongly curved to costa at tip, R_{4+5} and M strongly convergent, third costal section with about nine warts. Abdominal tergites glossy black, abdominal sternites black, broader than long.

Periphallic organs. Genital arch black, large, somewhat narrowing above, broadly truncate below, hairy and pubescent. Anal plate small, crescent, yellow, with long hairs, separated from genital arch. Clasper large, globular, projected below genital arch, apically with a black stout tooth, distal margin gently concave and with a row of about thirteen long hairs; lower half black and with short hairs, upper half pale and basally with a tuft of thick hairs. Phallic organs: Aedeagus pale and bifid, connected with ventral fragma by mean of short black vertical rod. Anterior paramere large, roughly quadrate. Posterior parameres paired, black. Ventral fragma black, triangular, with long curved lateral arms and broad notch. Ejaculatory apodeme dark brown, with plate small, oval, distally connected with long thick stalk. Egg-guide oval, broader than long, outer margin black, with a long hair, caudal margin hairy. Other features as in original description.

Specimens examined. 5 ♂, 3 ♀, Komi, Iriomote, Okinawa, 9 VII 1966 (Okada and Hihara).

Remarks. As compared with the original form from Caroline Islands, body darker, mesopleural black band broader, halteres darker, C 3-fringe better developed, and apical tooth of clasper thicker.

Distribution. Okinawa (new record), Caroline Is.

Stegana (Stegana) nigripennis (Hendel)

Orthostegana nigripennis Hendel, 1914. Suppl. Ent. 3: 115 (Taiwan).

Stegana kanoi Okada, 1956. Syst. Study: 14 (Okinawa), new synonymy.

Specimens examined. 1 ♂, Kirishima-onsen, 19 VIII 1965 (Wheeler); 1 ♂, Komi, Iriomote, Okinawa, 10 VII 1966 (Okada and Hihara).

Distribution. Japan (new record), Okinawa, Taiwan.

Amiota (Amiota) sinuata sp. n.

(Fig. 1 A-E)

♂. Body about 2.5 mm in length, dark brown. Eyes bare. Antenna with second joint orange yellow, third greyish brown. Arista with four dorsal and two ventral branches beside a moderate fork. Palpus dark brown, elongate, with many long setae below. Ocellar triangle black. Periorbits brown. Front brown, mat, anteriorly narrowing and silverly pollinose, narrower than length down middle, posteriorly two-fifths as broad as head width. Face grey. Carina high, narrow, and short. Cheek narrow, brown, the greatest width one-eighth the longest diameter of eye. Occiput black. Orbitals equally long, anterior reclinate twice as apart from posterior reclinate as from proclinate. Vibrissa strong, other orals short.

Mesonotum dark brown, nearly unicolorous. Scutellum paler, mat, twice as broad as long, distally rounded. Thoracic pleura dark brown, sternepisternum paler, with white spots on humerus and below wing. Only one strong humeral. Acrostichal hairs in about ten irregular rows. Anterior dorsocentrals two-thirds as long as posteriors, distance between anterior and posterior dorsocentrals two-sevenths distance between anterior pair. Anterior scutellars longer than posteriors, divergent; posteriors crossed, nearer to each other than to anteriors. Stern-index about 0.7. Legs yellow. Metatarsus as long as rest of tarsal joints in fore leg, longer than rest of tarsal joints in mid, longer than three tarsal joints in hind. Preapicals on second tibiae, apicals on all. Wings (1A) hyaline, R_{2+3} slightly curved to costa apically, R_{4+5} basally strongly sinuated, distally convergent with M. C-index 1.2; 4V-index 2.7; 4C-index 2.2, 5x-index 2.0; Ac-index 5.0. Cl-bristles two, subequal; C3-fringe on basal three-fourths. Halteres milky white. Abdominal tergites yellow, with broadly brownish black caudal bands, 2T laterally black, abdominal sternites pale.

Periphallic organs (1B): Genital arch dark brown, dilated below, gently convexed on ventral margin, hairy and pubescent. Clasper oval, pale, projected below genital arch, with a row of about eight long apically blunt teeth on upper half, lower distal margin rounded, with short sensilla-like hairs. Anal plate large, pale, fusiform, hairy and pubescent, separated from genital arch. Phallic organs (1D, E): Aedeagus yellowish grey, basally swollen, distally narrowing and bifid. Anterior paramere seemingly fused to aedeagus, with about ten sensilla laterally. Apodeme robust, laterally flattened, reddish brown. Ventral fragma deeply notched, arnes brown and broad. Posterior parameres absent. Ejaculatory apodeme (1C) dark brown, stalk and plate narrow.

Holotype. ♂, Anbo, Yakushima, 30 VII 1963 (Okada), collected around human eye.

Paratypes. 6♂, collected together with holotype.

Distribution. Japan.

Relationships. Somewhat resembles *A. leucostoma* Loew from Europe in having

long anterior reclinate orbitals, brown mesonotum, and long dorsal and ventral branches of arista, but differs from it in having genital arch broadly truncate below, with heel low (narrow with heel high in *leucostoma*), and clasper with distal margin much inflated below teeth row (not so in *l.*)

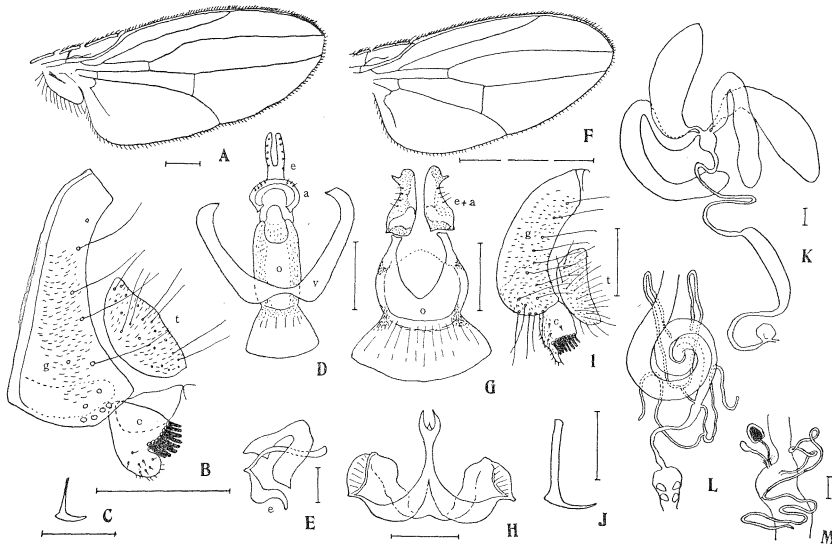


Fig. 1. A-E. *Amiota (Amiota) sinuata* sp. n. A. Wing (σ); B. Periphallic organs; C. Ejaculatory apodeme, lateral aspect; D. Phallic organs, ventral aspect; E. *ibid.*, lateral aspect. F-L. *Amiota (Amiota) acuta* sp. n. F. Wing (σ); G. Phallic organs; H. Posterior paramere; I. Periphallic organs; J. Ejaculatory apodeme, lateral aspect; K. σ internal reproductive organs; L. Digestive system. M. *Amiota (Amiota) alboguttata* (Wahlberg), forma *furcata* Okada, φ internal reproductive organs.

***Amiota (Amiota) acuta* sp. n.**

(Fig. 1 F-L)

σ . Body about 1.5 mm in length, glossy black. Eye dark reddish brown, bare. Antenna with second joint dark brown; third black, short but broad. Palpus yellowish brown, with a few short setae. Ocellar triangle deep black, convexed. Periorbits black, somewhat pollinose, and narrow. Front deep black, slightly glossy, anteriorly as broad as length down middle, posteriorly half as broad as head width. Clypeus deep black. Face mat black, with broad white cross band on buccal margin. Carina very short, greyish brown. Check greyish brown, narrow, about one-ninth as broad as the greatest diameter of eye. Occiput black. Anterior reclinate orbital slightly shorter than others, twice as apart from posterior reclinate as from proclinate. Vibrissa rather weak, other orals fine.

Mesonotum deep black, somewhat glossy, humeral callus milky white. Scutellum short, hemispherical, deep black. Thoracic pleura black, white at wing base. Humeral one. Prescutellars well developed, longer than anterior dorsocentrals. Acrostichal hairs in about ten irregular rows. Anterior dorsocentrals minute, close to posteriors, two-sevenths as long as posteriors. Distance between anterior and posterior dorsocentrals one-fourth distance between anterior pair. Anterior scutellars divergent, slightly longer than posteriors, which are equally distant from each other and from anteriors. Sterno-index about 0.8. Legs pale yellow. Preapicals on all tibiae, apicals on middle. Wings (IF) hyaline; R_{2+3} only weakly curved to costa at tip; R_{4+5} and M distally convergent; M faint distally; posterior crossvein slightly sinuated; third costal section with about twenty minute warts. C-index 1.7; 4V-index 3.2; 4C-index 2.2; 5x-index 1.2; Ac-index 4.5; Cx-index 0.7. Cl-bristles two, unequal; C3-fringe on basal five-eighths. Halteres white. Abdominal tergite entirely black.

Periphallalic organs (II): Genital arch black, narrow, dorsally abruptly narrowing, heel rounded, toe rectangular, pubescent and hairy. Clasper brownish black, quadrate, slightly pubescent, projected below genital arch, distally with a straight row of about seven black long teeth, below the teeth row with a finger-like projection. Anal plate elliptical, brownish black, hairy and pubescent, separated from genital arch. Phallic organs (1G, H): Posterior parameres, spear-shaped, distally tripartite, basally flattened. Aedeagus apparently fused to anterior parameres, black, rod-shaped, subapically with triangular process, laterally with about four sensilla, basally with large flat apodeme. Ventral fragma obscure.

Mid-intestine (1L) with two or three coils. Rectal papillae oval, slightly longer than broad. Malpighian tubules with common stalk short, branches distally whitish, posterior branches ending free. Testis (1K) deep orange, large, elliptical. Seminal vesicle narrow and short. Paragonia slender, once folded. Ejaculatory duct very long, distal half thicker. Ejaculatory bulb globular, without caeca. Ejaculatory apodeme (1J) with stalk longer than plate, which is oval.

Holotype. ♂, Asakawa, Tokyo, 3 VI 1967, collected around human eye (Okada).

Distribution. Japan.

Relationships. Somewhat allied to *A. promissa* Okada, similar in having obscure aedeagus, but differs in having anterior parameres thicker, posterior paramere tripartite, fore femur not black, and front not reddish brown.

Amiota (*Amiota*) *orchidea* sp. n.

(Fig. 2 A-E)

♂. Body about 3 mm in length, nearly uniformly black, somewhat pollinose in grey. Eyes dark red, bare. Antenna dark brownish black, second joint slightly paler, third about two-thirds as broad as long, apically rounded. Arista basally pale yellow, with about five dorsal and two ventral branches beside terminal single tip. Palpus black, crescent, with a few long stout ventral setae. Ocel-

lar triangle and periorbits well demarcated, pollinose in grey, periorbits anteriorly pollinose in silver. Front mat black, slightly narrowing below, posteriorly slightly less than half as broad as head width. Clypeus black. Carina low, much broadened below. Lower half of face broadly yellowish white. Cheek black, narrow, about one-tenth as broad as the greatest diameter of eye. Anterior reclinate orbital slightly shorter than proclinate, twice nearer to proclinate than to posterior reclinate. Vibrissa prominent, other orals fine. Mouthparts greyish yellow.

Thorax mat black. Humeral one, stout. Prescutellars well developed, nearly as long as anterior dorsocentrals. Acrostichal hairs in about fourteen irregular rows. Anterior dorsocentrals about half as long as posteriors, distance between anterior and posterior pairs about one-third distance between anterior pair. Scutellars long, anterior scutellars widely divergent, slightly longer than posteriors, which are crossed. Sterno-index about 0.8. Sternepisternum with numerous hairs below. Legs brownish black, paler at trochanters, knee-joints, tip of tibiae, and tarsi. Fore tibia often paler. Preapicals on all tibiae, apicals prominent on mid tibia. Wings (2A) hyaline, R_{2+3} only slightly curved to costa at tip; M very weak, M-Cu also weak at tip. R_{4+5} and M slightly convergent distally. C-index 2.0; 4V-index 2.5; 4C-index 1.5; 5x-index 0.7; Ac-index 3.5; Cx-index 0.9. Cl-bridles two, rather weak; C3-fringe on basal four-fifths. Third costal section with about twenty-five minute warts. Halteres white. Abdominal tergites somewhat glossy black.

Periphallic organs (2B): Genital arch black, oblong, narrowing above, entirely separated from each other at middorsal line, lower tip obtusely triangular, hairy and pubescent. Clasper pale brown, oblong, longer than broad, distally with a row of about eight long black teeth, occupying entire distal margin. Anal plate dark grey, crescent, hairy and pubescent, separated from genital arch. Decasternum dark brown, triangular. Phallic organs (2C-E) mostly dark brown, much complicated. Aedeagus rod-shaped, distally divided, apparently fused to anterior parameres. Apodeme of aedeagus broad. Posterior parameres V-shaped, fused to each other, black, apically with a median apically furcated process and lateral slender curved tuberculated processes.

Holotype. ♂, Miyazaki, 1959, collected around human eyes (Nagata).

Paratypes. 3♂, collected together with holotype, 2♂, Saitoshi, Miyazaki Pref. 29 VI 1960 (Nagata).

Distribution. Japan.

Relationships. Closely allied with *A. albilabris* (Zetterstedt, 1860) from Europe, but different in having black fore tibia.

Amiota (Amiota) trifurcata sp. n.

(Fig. 2 F-I)

♂. Body about 3.0 mm in length. Eyes dark red, bare. Antenna yellowish

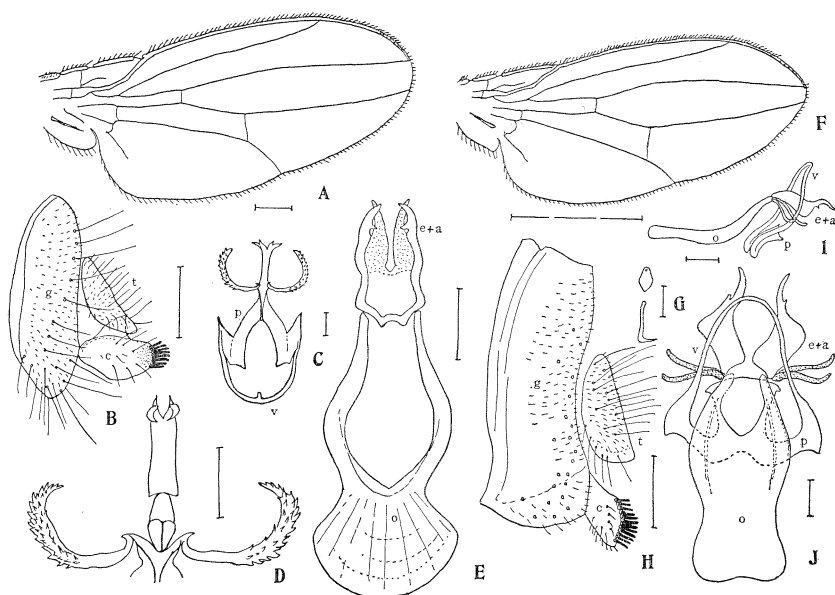


Fig. 2. A-E. *Amiota (Amiota) orchidea* sp. n. A. Wing (♂); B. Peripheral organs, ventral aspect, aedeagus omitted; C. Phallic organs, aedeagus omitted; D. Tip of posterior paramere; E. Aedeagus, dorsal aspect. F-J. *Amiota (Amiota) trifurcata* sp. n. F. Wing (♂); G. Ejaculatory apodeme, dorsal (upper fig.) and lateral (lower fig.) aspects; H. Peripheral organs; I. Phallic organs, lateral aspect; J. ibid., ventral aspect.

grey, third joint darker, broad oval, thrice as broad as cheek width. Arista with about four dorsal and three ventral short branches beside fork. Palpus dark yellow, semicircular, setigerous below. Proboscis white. Ocellar triangle brownish black. Periorbits brownish black, somewhat glossy, half as long as front. Front narrowing below, dark brownish black, lower half paler, posteriorly two-thirds as broad as head width. Clypeus brown. Face with broad white cross band below, which is divided by a narrow longitudinal black stripe. Carina low. Cheek pale yellowish white, very narrow, about one-fifteenth as broad as the greatest diameter of eye. Occiput black. Anterior reclinate orbital slightly shorter than others, somewhat nearer to proclinate than to posterior reclinate. Vibrissa thrice as long as succeeding orals.

Mesonotum and scutellum uniformly reddish brown, thoracic pleura reddish brown, paler below, humerus and wing base white. One long humeral. Prescutellars half as long as posterior dorsocentrals. Acrostichal hairs in about eight irregular rows. Distance between anterior and posterior dorsocentrals about one-third distance between anterior pair. Posterior scutellars convergent. Sternindex about 0.9. Legs yellowish grey, coxa paler. Preapicals on all tibiae. Wings (2F) hyaline, R_{2+3} only weakly curved to costa at tip. R_{4+5} and M strongly

convergent distally. Third costal section with about twelve minute warts. C-index about 1.9; 4V-index 2.8; 4C-index 0.6; 5x-index 1.2; Ac-index 6.0; Cx-index 0.4. Cl-bristles two; C 3-fringe on basal half. Halteres white. Abdominal tergites yellowish brown.

Periphallallic organs (2H) pale yellow. Genital arch dorsally not narrowing, ventrally broadly truncate, hairy and pubescent. Clasper quadrate, not extending below genital arch, distally with a somewhat convexed row of about twelve blunt black teeth. Anal plate oblong, hairy and pubescent, separated from genital arch. Phallic organs (2I-J): Aedeagus apparently fused to anterior parameres to become a pair of trifurcated black lobes, basally with broad large apodeme. Ventral fragma looped. Ejaculatory apodeme (2G) pale brown, with rhombic plate and long straight stalk.

Holotype. ♂, Masutomi, Yamanashi Pref., 12 VIII 1961 (Saigusa).

Distribution. Japan.

Relationships. Resembles *A. alboguttata* (Wahlberg) from Europe in having aedeagus tripartite and genital arch dorsally not distinctly narrowing and ventrally truncate, but easily distinguishable in body coloration.

***Amiota (Amiota) alboguttata*, forma *nagatai* Okada**

Amiota (Amiota) alboguttata, forma *nagatai* Okada, 1960. Mushi, 34: 96 (Japan).

Specimens examined. 5♂, Komi, Iriomote, Okinawa, 9 VII 1966 (Okada and Hihara).

Distribution. Okinawa (new record), Japan.

***Amiota (Amiota) alboguttata*, forma *furcata* Okada**

(Fig. 1 M)

Amiota (Amiota) alboguttata, forma *furcata* Okada, 1960. Mushi, 34: 96 (Japan).

♀. Mid-intestine coiled twice. Malpighian tubules with common ducts short, posterior branches looped. Rectal papillae oval. Spermatheca black, oval, truncate basally, with rather long slender stalk. Parovaria nearly as long as spermatheca, white, distally gradually swollen, ending in rounded tip. Ventral receptacle slender, with about four large folds.

Specimens examined. 6♂, 1♀, Asakawa, Tokyo, 9 VIII 1962 (Okada), ♀ collected by sweeping bushes, ♂ coming around human eye.

Distribution. Japan.

***Leucophenga pectinata* sp. n.**

(Fig. 3 A-D)

♂. Body about 4 mm in length. Eyes dark red, bare. Antenna with second

joint orange brown, third deep grey. Arista with about ten dorsal and four ventral branches beside small fork. Palpus slender, black, with an apical and two ventral stout setae. Ocellar triangle orange grey, black at the margin of ocelli. Periorbits greyish brown, pollinose, broad and straight. Front mat brown, anteriorly narrower than length down middle, posteriorly three-eighths as broad as head width. Face mat grey. Carina flat. Cheek orange, narrow, about one-eighteenth the greatest diameter of eye. Occiput black below. Anterior reclinate orbital as long as proclinate, situated twice nearer to proclinate than to posterior reclinate. Vibrissa stout, other orals fine.

Mesonotum dark orange brown, unicolorous. Scutellum mat dark orange brown, apically white. Thoracic pleura paler than mesonotum, with black longitudinal stripe above, upper margin of which obscurely demarcated. Three humerals, uppermost longest. Prescutellars strong. Acrostichal hairs in about fourteen rows. Anterior dorsocentrals small, about two-fifths as long as posteriors, distance between anterior and posterior pairs about one-fourth distance between anterior pair. Anterior scutellars slightly divergent, somewhat longer than posteriors, which are slightly nearer to each other than to anteriors. Sterno-index about 0.9. Legs yellow, metatarsus of all legs longer than four succeeding tarsal joints. Preapicals on all tibiae, apicals on fore and mid tibiae. Wings (3A) fuscous, with three distinct black patches, one below R_{2+3} extending below M, each one on anterior and posterior crossveins. R_{2+3} gently curved to costa at tip, R_{4+5} and M parallel. Third costal section distally with about four warts. C-index 1.1; 4V-index 1.8; 4C-index 1.5; 5x-index 0.8; Ac-index 3.3. Cl-bristles two, subequal; C3-fringe on basal half. Halteres white, with knob black. Abdominal tergites (3D) black, anterior margin yellow, black caudal bands anteriorly concaved and waving. Abdominal sternites mostly pale.

Periphallalic organs (3B) black. Genital arch narrowing above, broadly truncate below, hairy and pubescent. Clasper oval, projected below genital arch, caudodistally with about five strong setae in a row, dorsal surface pubescent and with a few long hairs, ventral surface much setigerous. Anal plate elongate oval, hairy, separated from genital arch. Decasternum low triangular. Phallic organs (3C): Aedeagus pubescent, pale, basally dark, robust rod-shaped, apically gently pointed. Anterior paramere black, large triangular, distally with about nine scattered sensilla. Posterior parameres mostly black, with triangular flap gross. Ventral fragma in narrow arch.

Holotype. ♂, Kenting (Kuraru), Taiwan, 3 VII 1965 (Yamasaki).

Distribution. Taiwan.

Relationships. Allied with *L. quinquemaculipennis* Okada from Japan in abdominal patterns, and general features of phallic organs, but differs in having no black spots at the ends of R_{2+3} and R_{4+5} .

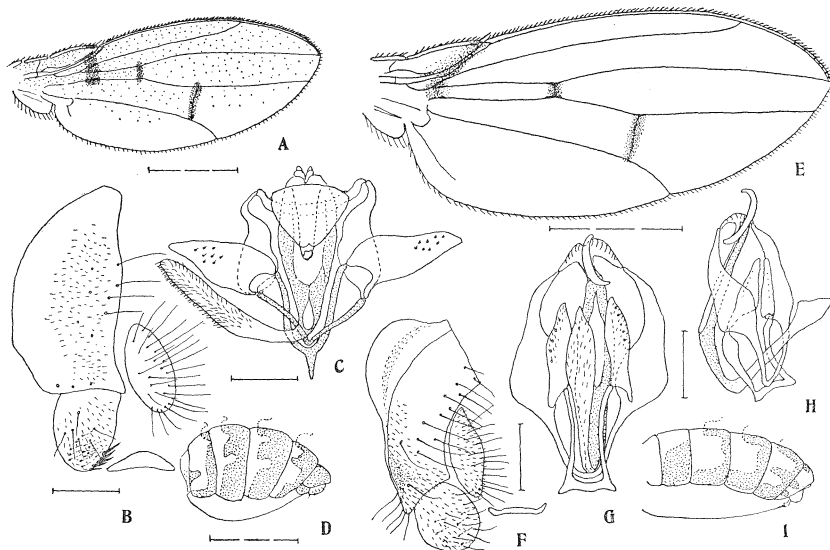


Fig. 3. A-D. *Leucophenga pectinata* sp. n. (♂). A. Wing; B. Peripheral organs; C. Phallic organs, ventral aspect; D. Abdomen. E-I. *Leucophenga saigusai* sp. n. E. Wing (♂); F. Peripheral organs; G. Phallic organs, ventral aspect; H. *ibid.*, lateral aspect; I. Abdomen (♂).

Leucophenga saigusai sp. n.

(Fig. 3 E-I)

♂, ♀. Body about 3.0 mm in length, dark orange brown. Eyes dark red, bare. Antenna with second joint orange brown, third brownish black. Arista with about five dorsal and two ventrodistal long branches beside small fork. Palpus velvety black, dilated, with short apical and a few fine ventral setae. Ocellar triangle black. Periorbits yellowish grey, anteriorly rounded, posteriorly broadened, medially dark brown. Front dark reddish brown to brownish black, nearly parallel-sided, anteriorly nearly as broad as length down middle, posteriorly one-third as broad as head width. Face yellowish grey, flat, carina undeveloped. Cheek whitish, narrow, one-fourteenth as broad as the greatest diameter of eye. Clypeus black. Occiput black. Anterior reclinate orbital as long as proclinate, half posterior reclinate, twice as apart from posterior reclinate as from proclinate. Vibrissa rather fine, other orals very fine.

Mesonotum dark orange brown, with three diffuse dark longitudinal stripes, median one broadened distally. Scutellum yellowish brown or brownish black, apically yellow. Thoracic pleura slightly paler than mesonotum, with broad black longitudinal stripe. Humerus pale yellow, with two humerals, upper longer. Pre-scutellars well developed. Acrostichal hairs in about ten irregular rows. Anterior dorsocentrals half as long as posterior one, distance between anterior and

posterior dorsocentrals about one-fourth distance between anterior pair. Anterior scutellars slightly divergent, three-fourths as long as posteriors, which are slightly nearer to each other than to anteriors. Sterno-index about 0.8. Legs yellow, ultimate tarsal joints darker, ♂ femora slightly darker. Metatarsi of all legs as long as the rest of tarsal joints. Preapicals on all tibiae, apicals on mid tibia. Wing (3E) slightly fuscous, with three small black patches, one below R_1 extending to M, each one on anterior and posterior crossveins. R_{2+3} gently curved to costa at tip, R_{4+5} and M slightly convergent distally. C-index 2.5; 4V-index 1.9; 4C-index 1.3; 5x-index 1.2; Ac-index 3.7. Cl-bristles two, subequal, C3-fringe on basal three-fourths. Halteres yellowish orange. Abdominal tergites (3I) mostly black, 1T yellow, 2T medially yellow, 3-5T with lateral yellow spots, 6T (♂) yellow with lateral black spots.

Periphallic organs (3F) yellowish brown. Genital arch parallel-sided, ventrally broadly truncate, hairy and pubescent. Clasper oval, large, pubescent and setigerous, projected below genital arch. Anal plate fusiform, pubescent and hairy, separated from genital arch. Decasternum narrow, cross-bar shaped. Phallic organs (3G, H): Aedeagus orange brown, bare, rod-shaped, distally much dilated dorsoventrally. Anterior paramere oblong, pale yellowish brown, distally pubescent and with about ten sensilla mostly in a row. Posterior paramere as usual. Hypandria rather broad, pale brown. Ventral fragma proximally truncate.

Holotype. ♂, Masutomi, Yamanashi Pref., 12 VIII 1961 (Saigusa).

Allotype. ♀, collected together with holotype.

Distribution. Japan.

Relationships. Resembles foregoing species, *L. pectinata*, in wing and abdominal markings, but differs in more diffuse black wing patches, non-pubescent and distally dilated aedeagus, and in larger C-index.

***Leucophenga atrinervis* sp. n.**

(Fig. 4 A-I)

Leucophenga nigrinervis Duda ?, Okada 1968. Syst. Study Early Stages Drosophilidae: 10.

♂, ♀. Body about 3.5 mm in length, yellowish brown. Antenna (4A) with second joint orange brown, third grey brown, rounded below. Arista with about five dorsal and two ventral long branches beside a large fork. Palpus yellowish brown, apically darker, slender, with a few long setae below. Ocellar triangle black. Periorbits grey, somewhat glossy. Occiput brown. Front yellowish grey, posteriorly about half as broad as head width. Clypeus greyish white. Face concaved. Cheek pale yellow, one-sixth as broad as the greatest diameter of eye. Carina broad, low, whitish yellow. Anterior reclinate orbital as long as proclinate, slightly shorter than posterior reclinate, nearer to proclinate than to posterior reclinate. Vibrissa prominent, other orals fine.

Mesonotum greyish yellow, paler along dorsocentral lines, with dark median patch posteriorly. Thoracic pleura yellowish grey, paler ventrally, with a narrow well demarcated black longitudinal stripe above. Two humerals, upper longer. Acrostichal hairs in about ten irregular rows. Anterior dorsocentrals about two-fifths as long as posteriors, distance between anterior and posterior pairs about one-third distance between anterior pair. Anterior scutellars divergent, longer than posteriors. Sterno-index about 0.8. Legs yellow, preapicals prominent on hind tibia, apicals on mid and hind tibiae. Wing (4B) hyaline, with black stripes along veins R_1 , R_{2+3} , R_{4+5} and Cu at their distal parts; crossveins also clouded. R_{2+3} nearly straight, R_{4+5} and M slightly convergent distally. Cl-ristles two, subequal. C3-fringe on basal seven-ninths. C-index 2.3; 4V-index 2.4; 4C-index 1.2; 5x-index 0.8; Ac-index 3.0. Halteres white. Abdominal tergites yellow, 2T caudally with broad lateral black bands laterally reaching anterior margin, 3-6T with caudal black bands medially, laterally, and dorsolaterally projected anteriorly. 7T black. Abdominal sternites yellow, narrow.

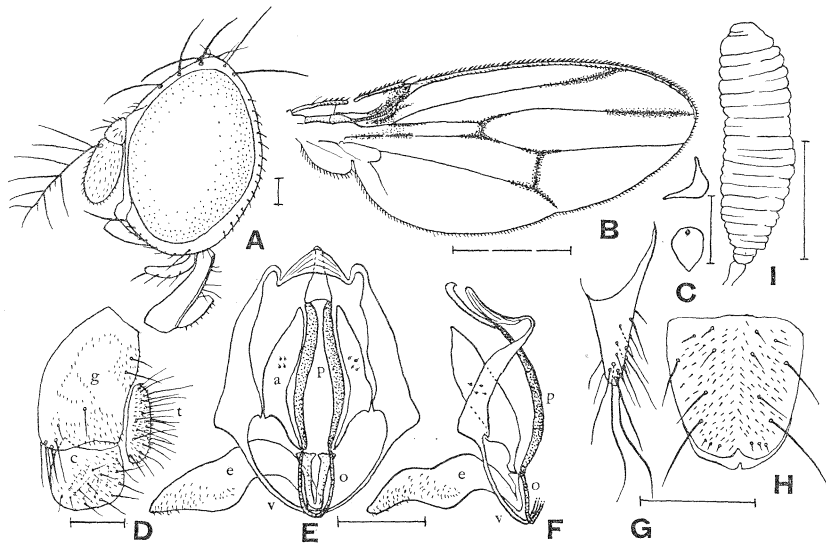


Fig. 4. A-I. *Leucophenga atrinervis* sp. n. A. Head (♂); B. Wing (♀); C. Ejaculatory apodeme, lateral (upper fig.) and dorsal (lower fig.) aspects; D.Periphallalic organs; E. Phallic organs, ventral aspect; F. ibid., lateral aspect; G. Cercus (♀); H. Egg-guides; I. Spermatheca.

Periphallalic organs (4D) pale brown. Genital arch oval, pubescent and hairy, projected below genital arch. Anal plate oblong, pubescent and hairy, separated from genital arch. Phallic organs (4E, F): Aedeagus pale yellow, fusiform at lateral aspect, distally pubescent. Anterior paramere pale grey, lobose, with a few sensilla medially. Posterior parameres as usual. Ventral fragma arched. Egg-guides (4H) fused, pale grey, quadrate, and hairy. Ventral cerci (4G) elon-

gate and hairy. Ejaculatory apodeme (4C) with plate oval, apically pointed, stalk very short. Spermatheca (4I) black, elongate, with transverse shrinks.

Holotype. ♂, Nuruyu, Miyagi Pref., 9 VII 1958 (Okada), emerged from larvae found in fungi on a rock.

Allotype. ♀, obtained together with holotype.

Paratypes. 6♂, obtained together with holotype.

Distribution. Japan.

Relationships. Closely resembles *L. nigrinervis* Duda from Taiwan in wing patterns, but differs in having black stripe also on R_{4+5} .

***Leucophenga stenomaculipennis* sp. n.**

(Figs. 5D, 7C)

♂. Body about 4.5 mm in length, pale brown. Eye large, dark red, bare. Antenna with second joint orange, third grey. Palpus yellowish orange, slender, with a few setae below. Ocellar triangle mat black. Periorbits grey, narrow. Front mat yellowish grey, orange anteriorly, anteriorly narrower than length down middle, posteriorly slightly broader than half head width. Clypeus yellowish grey. Face greyish white. Carina undeveloped. Cheek narrow, whitish grey, about one-fourteenth as broad as the greatest diameter of eye. Anterior reclinate orbitals much nearer to proclinate than to postclinate, slightly shorter than others. Vibrissa strong, other orals fine.

Mesonotum mat yellowish grey, nearly unicolorous. Scutellum mat yellowish grey, apically paler, laterally slightly dark. Thoracic pleura paler than mesonotum, with a faint dark longitudinal stripe at middle. One humeral. Prescutellars well developed. Acrostichal hairs in about twelve rows. Anterior dorsocentrals three-fifths as long as posteriors, distance between anterior and posterior pairs one-third distance between anterior pair. Anterior scutellars divergent, posteriors as long as anteriors and equally distant from each other and from anteriors. Legs yellow. Wings slightly fuscous. R_{2+3} straight, R_{4+5} and M slightly convergent distally. Small black spots below R_1 , at tips of R_{2+3} and R_{4+5} , and around crossveins. C-index 3.0; 4V-index 1.6; 4C-index 1.0; 5x-index 1.0; Ac-index 3.0. Cl-bristles two, unequal; C3-fringe on basal four-sevenths. Halteres yellow. Abdominal tergites pale yellow, with caudal black bands which are laterally reaching anterior margins, and median black longitudinal stripe beginning 3T caudally.

Periphallic organs orange yellow. Genital arch broad, truncate below. Clasper hemispherical, without teeth. Anal plate oblong. Phallic organs (7C) pale brown. Aedeagus oblong, pubescent. Anterior paramere blade-like, with a longitudinal row of about five sensilla. Ventral fragma narrowly pointed anteriorly, laterally broadened. Testis (5D) pale yellow, coiled one and half times. Ejaculatory duct distally titely folded several times.

Holotype. ♂, Masutomi, Yamanashi Pref., 11 VIII 1961 (Saigusa).

Paratypes. 1♂, Tōbetsu, Hokkaido, 17 VIII 1951; 2♂, Yunoyama, Mie Pref., 21 X 1966 (Okada).

Distribution. Japan.

Relationships. Closely allied with *L. quinquemaculipennis* Okada, but body paler, mesopleural dark stripe obscure, wing spots especially at the end of R_{2+3} much smaller, and basal fragma of genital arch not conspicuous.



Fig. 5. A-C. *Leucophenga quinquemaculipennis* Okada. A. ♂ internal reproductive organs; B. Digestive system (♀); C. ♀ internal reproductive organs. D. *Leucophenga stenomaculipennis* sp. n. ♂ internal reproductive organs. E. *Leucophenga concilia* Okada. ♀ internal reproductive organs. F. *Microdrosophila pseudopleurolineata* Wheeler and Takada. ♂ internal reproductive organs.

***Leucophenga quinquemaculipennis* Okada**
(Fig. 5 A-C)

Leucophenga quinquemaculipennis Okada, 1956. Syst. Study: 33. (Japan).

♂, ♀. Mid intestine (5B) coiled twice. Malpighian tubules with common stalks short, posterior branches ending free. Testis (5A) bright yellow, with two outer and one inner coils. Paragonia once folded. Ejaculatory duct proximally much swollen. Ejaculatory bulb small, without caeca. Spermatheca (5C) black, oblong, cross-shrunked, Parovaria with large oval tips. Ventral fragma twice folded. A pair of tiny pregenital plates in uterus.

Specimens examined. 1♂, 1♀, Nishitappu, Hokkaido, 8 VII 1966 (Hihara).

Distribution. Japan.

Leucophenga concilia Okada

(Fig. 5 E)

Leucophenga concilia Okada, 1956. Syst. Study: 30 (Japan).

♀. Parovaria large elliptical, twice as thick as spermathecal sheath, different from the original description.

Specimens examined. 10♂, 4♀, Kaimon-dake, Kagoshima Pref., 21 VIII 1965 (Okada).

Distribution. Japan, S. Korea.

Leucophenga argentata de Meijere

Leucophenga argentata de Meijere, 1914, Tijd. Ent. 57 : 238 (Java).

Specimen examined. 1♂, Komi, Iriomote, Okinawa, 10 VII 1966 (Okada and Hihara).

Distribution. Okinawa (new record), Taiwan, Java, Philippines, Micronesia.

Leucophenga lacteusa Takada and Wakahama

Leucophenga lacteusa Takada and Wakahama, 1967. Annot. zool. Jap., 40 : 56 (Okinawa).

Specimen examined. 1♂, Kirishima-onsen, Kagoshima Pref., 19 VIII 1965 (Okada).

Distribution. Japan (new record), Okinawa.

Leucophenga ornata Wheeler

Leucophenga ornata Wheeler, 1959. Univ. Texas Publ. 5914 : 184 (Java).

Specimen examined. 1♀, Komi, Iriomote, Okinawa, 10 VII 1966 (Okada and Hihara).

Distribution. Okinawa (new record), Japan, Java, Nepal.

***Microdrosophila pleurolineata* Wheeler and Takada**

Microdrosophila pleurolineata Wheeler and Takada, 1964. Ins. Micronesia, 14 : 217 (Micronesia).

Specimens examined. 2♂, 5♀. Mt. Banna, Ishigaki, Okinawa, 5 VII 1966 (Okada and Hihara).

Distribution. Okinawa (new record), Micronesia.

***Microdrosophila acristata* sp. n.**

(Fig. 6 A-C)

♂, ♀. Body about 2.0 mm in length. Eye dark red, with thick piles. Antenna with second joint orange brown, third black. Arista with about five dorsal and one ventral branches beside a terminal fork. Palpus black, with a few stout setae below. Ocellar triangle black. Periorbits brownish black, mat. Front brown, anteriorly narrowly orange and slightly broader than length down middle, posteriorly about half as broad as head width. Clypeus black. Face greyish brown. Carina high, brownish black, long but narrow. Cheek pale, about one-fifth as broad as the greatest diameter of eye. Occiput black below. Proclinate orbital half as long as posterior reclinate, outside posterior reclinate, anterior reclinate minute, just behind proclinate. Vibrissa strong, other orals fine.

Mesonotum mat brownish black. Scutellum and thoracic pleura also mat brownish black. One strong humeral. Acrostichal hairs in eight rows. Anterior dorsocentrals three-fifths as long as posteriors, distance between anterior and posterior pairs about seven-eighths distance between anterior pair. Anterior scutellars divergent, three-fifths as long as posteriors, which are equally apart from each other and from anteriors. Sterno-index about 0.4. Legs dark yellow, femora darker. Metatarsi as long as succeeding three tarsal joints in fore, longer than three succeeding in mid, and shorter than three succeeding in hind legs. Preapicals on all tibiae, apicals on mid tibia. Wings (6A) narrow, anterior half slightly fuscous, R_{2+3} not distinctly curved to costa distally, R_{4+5} and M parallel. C-index 1.8; 4V-index 5.0; 4C-index 2.7; 5x-index 5.0; Ac-index 5.0. Cl-bristles two, C3-fringe on basal two-thirds. Halteres white. Abdominal tergites mostly black.

Periphallalic organs (6B) pale yellow. Genital arch pubescent, dorsally and anteroventrally narrowing. Clasper large, triangular, hairy and pubescent, partly fused to anal plate, projected below genital arch. Anal plate huge, fusiform, pubescent and hairy, separated from genital arch. Phallic organs (6C): Aedeagus black, widely divided into paired curved lobes, each lobe distally trifid, apodeme black, distally bifid. Anterior parameres fused to be a large pale brown triangular plate, with scattered short setae and apical stout short sensillar bristles. Posterior parameres pale, irregularly trilobed. Egg-guide elongate.

Holotype. ♂, Sung-Kuang, Taiwan, 29 VI 1965 (Yamasaki).

Allotype. ♀, collected together with holotype.
Paratypes. 3♀, collected together with holotype.

Distribution. Taiwan.

Relationships. Resembles *M. cristata* Okada from Japan in having anterior parameres fused to be a triangular plate, and aedeagus apically tripartite, but differs in having no crest-like combs on 6S and in wings anteriorly fuscous.

***Microdrosophila nigripalpis* Okada**

(Fig. 6 D-I)

Microdrosophila nigripalpis Okada, 1966. Bull. Brit. Mus. (NH) Suppl. 6: 41 (Nepal).

♂, ♀. Periphallalic organs (6E) pale yellow. Genital arch not narrowing above, with broad hooked process below, pubescent and hairy. Clasper and anal plate apparently fused to genital arch. Phallic organs (6F): Aedeagus fusiform in lateral aspect, pale brown, basally narrowing to continue to a dark elongate apically hooked ventral recurved process. Apodeme of aedeagus long, apically narrowing. Anterior parameres separated from each other, somewhat trapezoid, with about three long hairs inside. Ventral fragma distally looped to articulate with aedeagus. Egg-guide (6G) triangular, with three stout bristles. Mid-intestine (6H) coiled twice. Malpighian tubules with very long common ducts and very short branches, posterior branches making a complete loop. Spermatheca with stalk distally swollen. Ventral receptacle with two large folds. Ovarian egg (6I) with single filament which is longer than egg itself. Wings as in Fig. 6 D.

Specimens examined. 3♂, 4♀, Kirishima-onsen, Kagoshima Pref., 21 VIII 1965 (Okada).

Distribution. Japan (new record), Nepal.

***Microdrosophila pseudopleurolineata* sp. n.**

(Figs. 5 F, 6 J-N)

♂. Body about 2.0 mm in length. Eye deep purplish black, with thick piles. Antenna with second joint greyish brown, third brownish black, short. Arista with about thirteen dorsal and four ventral branches beside fine fork. Palpus black, ventrally with about two stout and several shorter setae. Ocellar triangle black. Periorbits whitish yellow, posteriorly broadened. Front yellowish white, frontal triangle marginally orange. Face white. Clypeus white. Carina low, broadened below. Cheek white, about two-sixths as broad as the greatest diameter of eye, narrowing below. Occiput yellow, brown below. Anterior reclinate orbital fine, proclinate slightly shorter than and outside reclinate. Vibrissa long, other orals short.

Mesonotum yellowish grey, with a broad brownish black longitudinal stripes

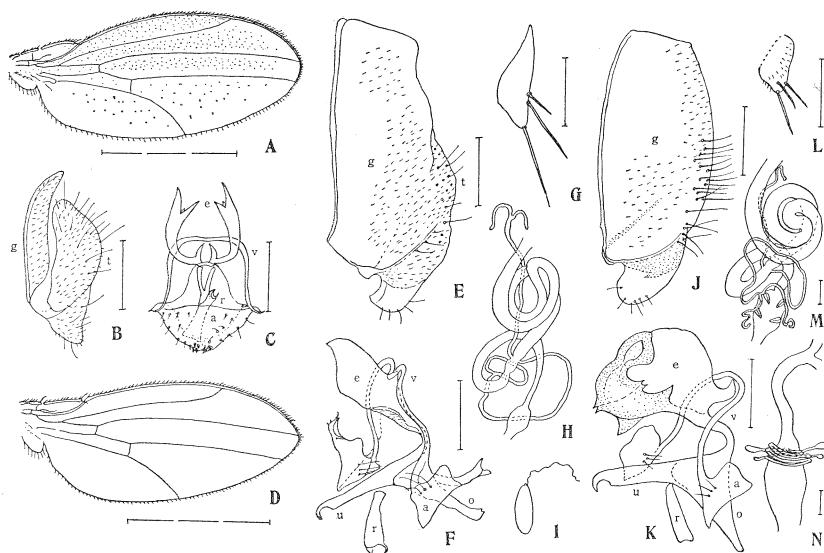


Fig. 6. A-C. *Microdrosophila acristata* sp. n. (♂). A. Wing; B. Periphthallic organs; C. Phallic organs, ventral aspect. D-I. *Microdrosophila nigripalpis* Okada. D. Wing (♂); E. Periphthallic organs; F. Phallic organs, ventrolateral aspect; G. Egg-guide; H. Digestive system (♀); I. Ovarian egg. J-N. *Microdrosophila pseudopleurolineata* sp. n. J. Periphthallic organs; K. Phallic organs, ventrolateral aspect; L. Egg-guide; M. Digestive system (♀); N. ♀ internal reproductive organs.

caudally. Scutellum brownish black, marginally paler. Thoracic pleura yellowish white, with a broad black longitudinal stripe above. Two humerals, upper one small. Acrostichal hairs in eight rows. Anterior scutellars five-sevenths as long as posteriors, distance between anterior and posterior pairs seven-eighths distance between anterior pair. Anterior scutellars parallel, posteriors very long, parallel, nearly thrice as long as anteriors, slightly more apart from each other than from anteriors. Sterno-index about 0.4. Legs yellow, femora pale. Preapicals on all legs, apicals on fore and mid tibiae. Wings hyaline, elongate, R_{2+3} nearly straight, R_{4+5} and M parallel. C-index 1.3; 4V-index 4.5; 4C-index 2.8; 5x-index 4.0; Ac-index 2.7. Cl-bristles one. C3-fringe on basal nine-tenths. Halteres fuscous. Abdominal tergites yellowish grey, with broad black waving cross bands. 6T anteriorly yellow. Abdominal sternites yellow.

Periphthallic organs (6J) pale yellowish brown, finely pubescent and caudally setigerous, ventrally narrowing and curved ventroanteriorly, ending in a rounded tip, with brown crescent flap inside, which seems to represent clasper. Anal plate seemingly absent. Phallic organs (6K): Aedeagus massive, pale brown, apically brown, laterally with bilobed triangular processes, basally much narrowing, curved ventrally in U-shape, ending in a apically clawed rod-shaped ventral recurved

process. Apodeme of aedeagus vertically flattened, apically narrowing. Anterior parameres small, irregularly quadrate, attached to looped posterior parameres. Ventral fragma rod-shaped, attached to ventral recurved process. Egg-guide (6L) short triangular, pale yellow, finely pubescent, distally with three stout bristles.

Testis (5F) bright yellow, thick, once loosely coiled, basally contiguous with large elliptical seminal vesicle. Paragonia hyaline, once folded. Ejaculatory bulb rounded, without caeca. Ejaculatory apodeme with long stalk and short plate. Spermatheca (6N) hyaline, club-shaped; parovaria shorter than spermatheca, hyaline, with rounded tip. Ventral receptacle with about three tite folds. Mid-intestine (6M) coiled three times. Rectal papillae slender, apically pointed. Malpighian tubules with very long common ducts, anterior branch absent, posterior branches short, ending free.

Holotype. ♂, Kyoto, 17 X 1967, swept among bush (Okada).

Allotype. ♀, Hatchônoike, Shizuoka Pref., 23 IX 1966, upon fallen bamboo leaves (Okada and Nakamura).

Distribution. Japan.

Paratypes. 1♂, 1♀, collected together with allotype; 1♂, Kannami, Shizuoka Pref., 22 IX 1966 (Okada); 2♂, Kirishimajingu, 19 VIII 1965 (Okada).

Relationships. Allied with *M. pleurolineata* Wheeler and Takada, but differs in having black caudal bands of abdominal tergites medially not projected forward, aedeagus apicoventrally not narrowly projected, and genital arch without caudal process.

***Microdrosophila urashimae* Okada, 1960**

Microdrosophila urashimae Okada, 1960, Kontyû, 28 : 219 (Japan).

Specimens examined. 2♂, Sang-Kuang, Taiwan, 29 VI 1963 (Yamasaki).

Distribution. Taiwan (new record), Japan, S. Korea.

Homology in the components of phallic organs

The phallic organs of the genera *Leucophenga* and *Microdrosophila* show close resemblance in having U-shaped components with dorsal and ventral arms (compare Fig. 8 E and I). This structural similarity has made the author to misinterpret the homology of the organs concerned: 'dorsal arm' as aedeagus and 'ventral arm' as ventral recurved process in both genera (Okada, 1966. Bul. Brit. Mus. (NH), Suppl. 6 : 121). The misinterpretation was found to be caused by the clearing of material, a method usual in examining external genitalia of insects. Using, however, unclared fresh material, the innervation of ejaculatory duct into aedeagus was tracable and, consequently, the homology of U-shaped components could definitely be established between two genera as below.

	dorsal arm	ventral arm
<i>Leucophenga</i>	dorsal processes	aedeagus
<i>Microdrosophila</i>	aedeagus plus dorsal processes	ventral recurved process

The dorsal processes (shaded black in Fig. 7 E-J) are paired rod-shaped organ and well developed in general *Leucophenga* species (Fig. 7 E, F), but show gradual reduction in number and size in *Microdrosophila* (Fig. 7 G-J). The posterior parameres are well developed in general *Leucophenga* species and in *Microdrosophila maculata* (Fig. 7 E-G), forming bridges between dorsal processes and ventral fragma, while in the general *Microdrosophila* species, posterior parameres are absent and dorsal processes are directly contiguous with ventral fragma. Finally, dorsal processes are entirely absent and the connection between aedeagus and ventral fragma becomes obliterated in *Microdrosophila urashimae* Okada, *M. fuscata* Okada, and *M. matsudairai* Okada.

The ventral recurved process is absent or vestigial in *Microdrosophila macula-*

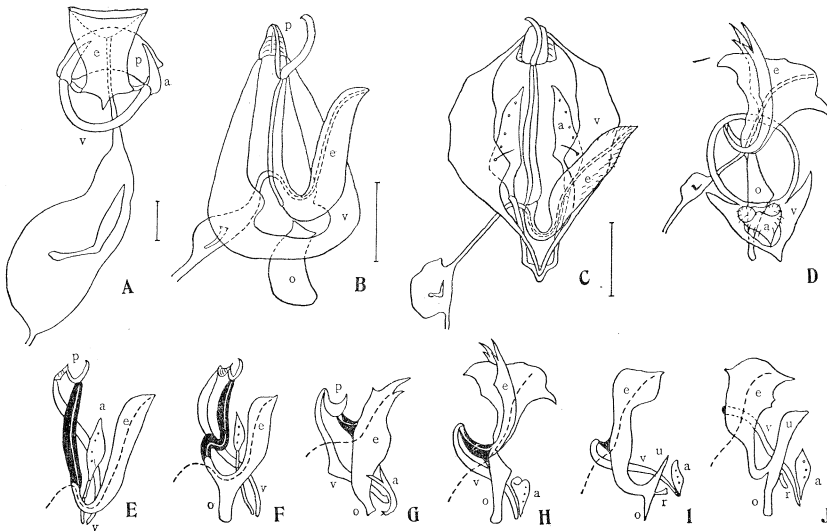


Fig. 7. A-D. Innervation of ejaculatory duct into aedeagus. A. *Leucophenga (Trichiasiphenga) argentosa* Okada (Eda, Kanagawa, Pref., VII 1967, Sugita); B. *L. ornata* Wheeler (Ôyama, Kanagawa Pref., 20 V 1967, Okada); C. *L. stenomaculipennis* sp. n. (Yunoyama, Mie Pref., 21 X 1966, Okada); D. *Microdrosophila cristata* Okada (Dorhûsan, Kanagawa Pref., 28 XI 1966, Okada). E-J. Serial changes in proportion of phallic organ components. E. *Leucophenga quinquemaculipennis* Okada; F. *L. nigroscutellata* Duda (Nepalese specimen); G. *Microdrosophila maculata* Okada; H. *M. cristata* Okada; I. *M. purpurata* Okada; J. *M. pleurolineata* Wheeler and Takada. Innervation of ejaculatory duct shown by broken line; dorsal process shaded in black.

ta, *M. cristata*, and *M. acristata*, present but small in *M. purpurata*, while it is well developed in *M. pleurolineata* (Fig. 7 J) and related species (*M. marginata* Okada, *M. nigrohalterata* Okada, both from Nepal, *M. pseudopleurolineata*, Fig. 6 K), showing its gradual development compensatory with the reduction of dorsal process as well as posterior parameres.

The apodeme of aedeagus is usually absent in *Leucophenga* (7C), except in *L. nigroscutellata* Duda (7F) and *L. ornata* Wheeler (7B). *L. ornata* has, however, the apodeme separated from aedeagus, suggesting a process of the secondary development of the apodeme in the genus *Leucophenga*.

Leucophenga (*Trichiaspiphenga*) *argentosa* Okada (7A) has an extraordinarily huge cup-like aedeagus, which even possesses a pair of small dorsal processes contiguous with posterior parameres.

The sequences in proportion of the phallic organ components compared among species of *Leucophenga* and *Microdrosophila* are as summarized below.

	dorsal processes	posterior parameres	apodeme of aedeagus	ventral process
<i>Leucophenga argentosa</i>	small, paired	present	absent	absent
<i>L. quinquemaculipennis</i> & related species	large, paired	present	absent	absent
<i>L. ornata</i>	large, paired	present	present but separated	absent
<i>L. nigroscutellata</i>	large, paired	present	present	absent
<i>Microdrosophila maculata</i>	small, paired	present	present	absent
<i>M. acristata</i>	small, paired	absent	present	absent
<i>M. cristata</i>	small, paired	absent	present	vestigial
<i>M. purpurata</i>	minute, unpaired	absent	present	small
<i>M. pleurolineata</i> & related species	vestigial	absent	present	large
<i>M. urashimae</i> , <i>M. fuscata</i>	absent	absent	present	absent
<i>M. matsudairai</i>	absent	present	present	absent