

A REVISION OF THE SUBGENUS *HIRTODROSOPHILA*
OF THE OLD WORLD, WITH DESCRIPTIONS OF
SOME NEW SPECIES AND SUBSPECIES
(Diptera, Drosophilidae, *Drosophila*)

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Up to present about sixty species have been recognized to belong to the subgenus *Hirtodrosophila* of the genus *Drosophila*, of which so far as the author is aware thirty-three are of the Old World species: nineteen Palaearctic, seven Oriental, seven Australian, and four Ethiopian, including three species common to the Oriental and Australian Regions (*longecrinita* Duda, *astioidea* Duda, *seminigra* Duda) and one common to Palaearctic and Oriental Regions (*trivittata* Strobl). The present study describes nine new species, three from Okinawa and seven from Japan, including one species common to Okinawa and Japan, and two new subspecies, one from Okinawa (original form from Samoa) and one from Japan (original form from Oriental Region). As a result the total number of the Old World *Hirtodrosophila* species attains forty-two: twenty-seven Palaearctic, eleven Oriental, seven Australian, and four Ethiopian, including three species common to Palaearctic and Oriental Regions and four to Oriental and Australian.

Beside description, some notes are given for several species on the hitherto poorly known features especially of the internal reproductive organs.

This subgenus includes a number of atypical species lacking one or more archetypic characters which appear in some members of a taxon (Stenzel, 1963), and showing exceptional features such as more than one ventral branches of arista beside terminal fork, not remarkably long hairs on the anterior side of the third antennal joint, rather distinct preapical bristle of fore tibia, and unusually pictured wings. Furthermore, some species show extensive colour variations which deserve the names of variety or form. This subgenus has intimate relations to the genera *Zygothrica* Wiedemann, 1830, *Paraliodrosophila* Duda, 1923, and *Paramycodrosophila* Duda, 1924. Comparison between *Hirtodrosophila* and *Zygothrica* was made in detail by Burla (1956), in which he stressed especially that the stipes basis of mouth parts is thick and apically rounded in *Zygothrica*, but slender in *Hirtodrosophila* (cf. text-fig. 9), and that the posterior reclinate orbital is nearly equally distant from procli-

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nate orbital and inner vertical in the former, while it is always nearer to proclinate than to inner vertical (cf. text-figs. 2, 8) in the latter. The differences between *Hirtodrosophila* and *Paraliodrosophila* are not pronounced according to Wheeler (1954), but he noticed that the unusual shiny front and general shiny appearance of mesonotum and abdomen found in *Paraliodrosophila* as well as *Zygothrica* are not characteristic of *Hirtodrosophila*. *Paramycodrosophila* is related closer to *Hirtodrosophila* than to *Mycodrosophila* Oldenberg, 1914 according to Wheeler (1954) and is different from ordinary *Hirtodrosophila* in having anterior reclinate orbital situated close to or slightly anterior to proclinate and distal costal break exceptionally deep with costa before the break thickened and blackened. In this aspect *Drosophila unicolorata* Wheeler is close to *Paramycodrosophila*.

Type designation had been confused before Frota-Pessoa (1945) selected as type *Drosophila latifrontata* Frota-Pessoa, 1945 (= *D. carinata* Duda, 1923, nec Grimshaw, 1901). He rejected previous designations by Sturtevant (1927) and Malloch (1934) of *D. longecrinita* Duda, 1924 and *D. hirticornis* de Meijere, 1914, respectively, for the reason that the former species was nomen nudum and the latter was not involved in Duda's paper (1923) which established *Hirtodrosophila*.

The keys to the Palaearctic and Oriental species of *Hirtodrosophila* were given by Duda (1924, 1926), that to Japanese by Okada (1956), and that to Korean by Kang and Lee (1964). For the Nearctic and Neotropical species there are keys by Sturtevant (1942), Frota-Pessoa (1945), Patterson (1943), and others. In the present work an attempt is made to present a key to the Old World species.

The p.f. and PI used in the description are after Okada (1956, 1966).

Throckmorton (1966) noticed close similarity in the internal structures especially of ventral receptacles between Japanese *Hirtodrosophila* species (e.g. *histrioides*=*confusa*) and many Hawaiian Scaptoid and Drosophiloid species, suggesting Japanese origin of Hawaiian Drosophilidae.

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Subdivision of the subgenus *Hirtodrosophila*

The subgenus *Hirtodrosophila* has thus far been subdivided into six species-groups: *longara* group, Hsu, 1949, *duncani* group, Hsu, 1949, *cinerea* group Hsu, 1949, *magnarcus* group Frota-Pessoa, 1951, *glabrifrons* group Burla, 1956, and *hirticornis* group Burla, 1956. These groups refer to the New World species except the *hirticornis* group which includes the Old World species beside the New World ones.

In the present study the Old World species are to be divided into three species-

groups and five species-subgroups: *denticeps* group, *quadrivittata* group including *quadrivittata*, *trivittata*, and *confusa* subgroups, and *hirticornis* group including *hirticornis* and *latifrontata* subgroups, with an additional species, *spinipes* Lamb, which is ungrouped, and a few others which are tentatively grouped.

**Key to the species-groups and -subgroups of the
Old World *Hirtodrosophila***

1. Anterior parameres slender, as long as aedeagus, separated from hypandria. Egg-guide triangular apically, discally with numerous teeth.....*denticeps* group
— Anterior parameres shorter than aedeagus, entirely or partially confluent with hypandria. Egg-guide without numerous discal teeth. 2.
2. Third antennal joint anteriorly with short hairs. Clasper usually broader than long. Aedeagus branched or bilobed apically. Egg-guide more or less rounded apically. *quadrivittata* group 3.
— Third antennal joint anteriorly with long hairs. Clasper usually longer than broad. Aedeagus simple, neither branched nor distinctly bilobed.
..... *hirticornis* group 5.
3. Aedeagus with distinct lateral branches. *quadrivittata* subgroup
— Aedeagus without distinct lateral branches, at most merely bilobed distally. ...
..... 4.
4. Anal plate ventrally with a tuft of stout bristles. *trivittata* subgroup
— Anal plate without tuft of stout bristles. *confusa* subgroup
5. Ventral fragma triangular, proximally narrowing. Genital arch with heel much elongated below. Clasper narrower than long. *latifrontata* subgroup
— Ventral fragma quadrate proximally. Genital arch truncate below, with heel triangularly projected below or proximally. Clasper usually as broad as long. ...
..... *hirticornis* subgroup

The *denticeps* species-group, n.

Third antennal joint anteriorly with short hairs. Genital arch triangularly lobose below. Anal plate ventrally with a tuft of stout bristles. Clasper broader than long. Aedeagus simple. Anterior parameres much elongated, basally contiguous with aedeagus, apically free from hypandria. Ventral fragma quadrate anteriorly. Egg-guide distally triangular, discally with numerous teeth. Including *denticeps* Okada and Sasakawa, 1956: 26 (Japan) and *tripartita* Okada, 1966: 78 (Nepal).

The *quadrivittata* species-group, n.

Third antennal joint anteriorly with short or slightly long hairs. Genital arch usually lobose below. Anal plate ventrally often with a tuft of stout bristles. Clasper broader than or as broad as long. Aedeagus simple or branched. Anterior parameres usually small, fused at least partially to hypandria. Ventral fragma quadrate anteriorly. Egg-guide rounded apically, without numerous discal teeth.

Including *quadrivittata*, *trivittata*, and *confusa* species-subgroups.

The *quadrivittata* species-subgroup, n.

Clasper as broad as long. Aedeagus laterally with branches. Wings often pictured.

Including *quadrivittata* Okada, 1956: 83 (Japan, Korea), *omogoensis* Okada, 1956: 82 (Japan), *yakushimana* sp. n. (Japan), *hiharai* sp. n. (Japan), *fascipennis* sp. n. (Japan), *macromaculata* Kang and Lee, 1961: 30 (Korea), and *kirishimana* sp. n. (Japan).

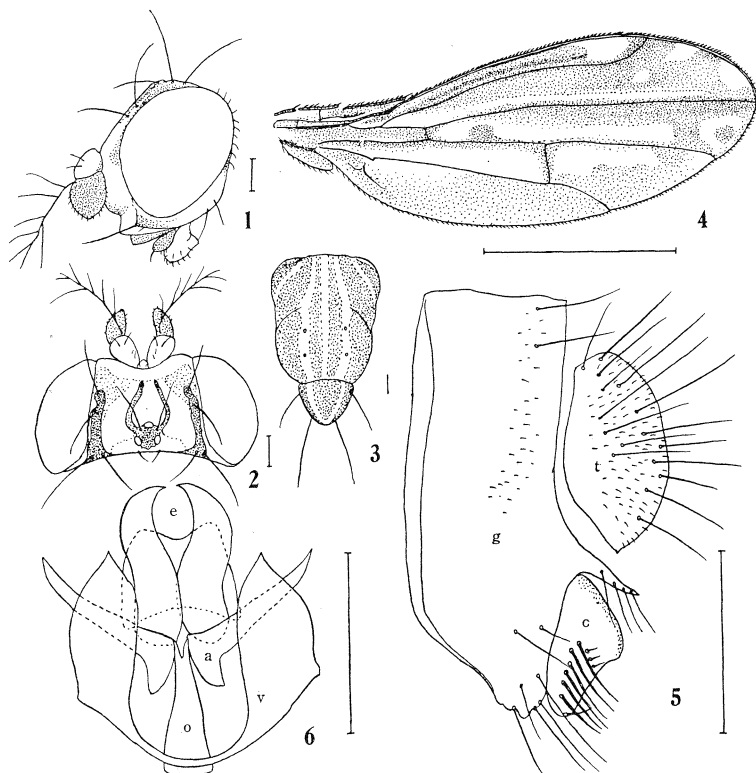
***Drosophila* (*Hirtodrosophila*) *kirishimana* sp. n.**

ヒメハマダラシヨウジヨウバエ (新称)

(Text-figs. 1-6)

♂. Body about 2.3 mm, slender. Head considerably oblique to the body axis. Eye dark red, somewhat purplish, with sparse piles. Antenna with second joint yellowish brown, third black, oval, large, with rather long hairs anteriorly. Arista with four dorsal and one long ventral branches beside a small terminal fork. Palpus black, oval, with a prominent apical seta. Ocellar triangle black. Periorbits black, anteriorly curved inward, two-thirds as long as front. Front greyish white, silvery shining, flat, slightly concaved anteromedially, with a pair of narrow black inwardly curved stripes submedially, anteriorly slightly broader than length down middle, posteriorly not distinctly broadened, half as broad as head width. Face yellowish grey. Carina high, broad, anteriorly black, not reaching buccal margin. Cheek white, black anteriorly and above postgena, about one-eighth as broad as the greatest diameter of eye. Occiput black. Anterior reclinate orbital absent. Proclinate long, nearly as long as posterior reclinate, slightly inside latter. Vibrissa stout and long, other orals fine.

Mesonotum brownish black, laterally darker, with five yellowish white longitudinal stripes, one narrow at meson, a pair medially somewhat constricted at dorsocentral lines, a pair short above humeri. Anterior end and ventral half of humerus also yellowish white. Scutellum brownish black, laterally darker, with a pair of distally confluent yellowish white longitudinal stripes. Mesopleura distinctly bicolorous, upper half black and lower half white. Humerals three, lowest the longest. Acrostichal hairs in four rows. Anterior dorsocentrals only slightly shorter than the posteriors, distance between anterior and posterior dorsocentrals about four-sevenths distance between anterior pair. Anterior scutellars divergent, slightly shorter than posteriors. Sterno-index about 0.4. Legs yellow, distally fuscous. Fore metatarsus as long as two succeeding tarsal joints, hind metatarsus as long as three succeeding tarsal joints. Preapicals on mid and hind tibiae, weak on mid tibia, apicals distinct on mid tibia. Wings slender, black with white markings at tips of cells R_{2+3} , R_{4+5} , and M, between veins R_{2+3} and Cu, intercalated by black spots above vein M beyond anterior crossvein and at apex. R_{2+3} convexed medially and strongly curved to costa at apex. R_{4+5} and M distally divergent. C-index 1.8, 4V-index 1.5, 4C-index 1.2, 5x-index 1.7, Ac-index 2.0. Cl-bristle single, short. C3-fringe on basal three-fifths. Halteres black. Abdominal tergites largely black, with white median stripe and lateral white spots. Abdominal sternites pale brown, membrane white.



Figs. 1-6. *Drosophila (Hirtodrosophila) kirishimana* sp. n. 1, 2. Head; 3. Mesonotum with scutellum; 4. Wing; 5. Periphallallic organs; 6. Phallic organs (ventral aspect).

a. anterior paramere; b. bridge connecting claspers (decastrer-num); c. clasper; d. discal teeth; e. aedeagus; g. genital arch; h. subterminal hairs; i. basal isthmus; m. marginal teeth; n. novasternum; o. apodeme of aedeagus; r. vertical rod; s. submedian spine; t. anal plate; v. ventral fragma. Scales: solid lines, 0.1 mm; broken line, 1.0 mm.

Periphallallic organs pale yellow. Genital arch broad, narrowing below, acutely prolonged posteriorly above insertion of clasper, with sparse macro- and microtrichia. Clasper ventrally narrowing, with a row of strong setae, without teeth. Anal plate fusiform, separated from genital arch, pubescent and hairy. Phallic organs pale yellow. Aedeagus thick, bilobed and apically curved inward. Anterior parameres large, blade-like, without sensilla. Posterior parameres absent. Ventral fragma rounded proximally, deeply and broadly notched. $PI=1.0$. p.f.=aBCDEf₀gHiklMN.

Holotype. ♂, Kirishima-jingu, Kagoshima Pref., Kyushu, Japan, 30 X 1963, by

sweeping (Okada).

Relationships. Similar with *D. narinosa* Frota-Pessoa in having only four rows of acrostichal hairs and striped mesonotum, but easily distinguished from it in having pictured wings.

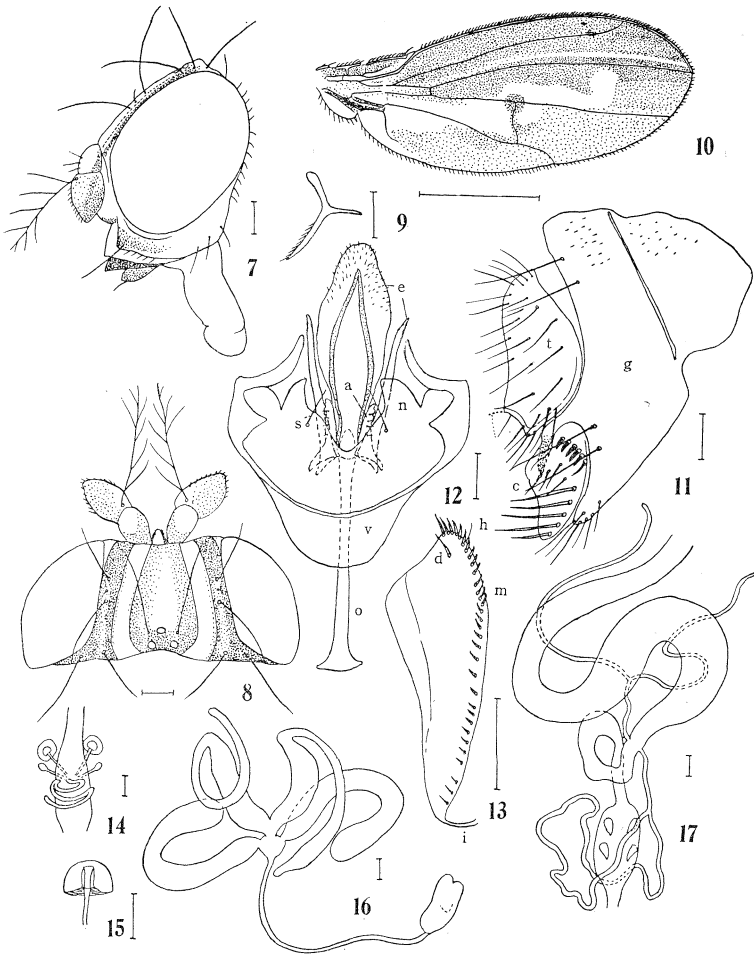
***Drosophila* (*Hirtodrosophila*) *hiharai* sp. n.**

ハマダラシヨウジヨウバエ (新種)

(Text-figs. 7-17)

♂, ♀. Body about 4.0 mm, bicolorous with dark dorsum and pale venter. Head rather oblique to the body axis. Eye dark purplish red, with fine piles. Antenna with second joint anteriorly white, posteriorly black, third joint large, oval, anteriorly pale yellow, posteriorly darker, with short hairs. Arista with four dorsal and one or two ventral branches beside a small or moderate terminal fork. Ocellar triangle black. Periorbits grey pollinose, narrow and short. Front dark brown, medioanteriorly paler and silvery pollinose, laterally with broad white anteriorly convergent longitudinal stripes, anteriorly slightly narrower than length down middle, posteriorly broadened and about half as broad as head width. Clypeus black, anteriorly acutely projected. Face yellowish brown, somewhat silvery shining, with black cross band below carina. Carina high, ridged, half as long as face, medially whitish. Cheek yellowish white, anteriorly black, about one-fifth as broad as the greatest diameter of eye. Mouth parts orange brown, thick, much elongated. Occiput black. Anterior reclinate orbital minute, equally distant from proclinate and posterior reclinate, which are long and subequal. Three orbitals equally apart from eye margin. Vibrissa strong, other orals fine.

Mesonotum mat black, anteriorly yellowish, with five narrow white longitudinal stripes, one at meson not reaching scutellum, a pair on dorsocentral lines reaching scutellum, a short pair above humeri before suture. Humerus also whitish below. Scutellum mat brownish black, laterally with white longitudinal posteriorly convergent stripes, not confluent distally. Mesopleura sharply bicolorous, black above, white below. Humeralis two or three, unequal, ventral one longest. Acrostichal hairs in four rows. Anterior dorsocentrals slightly shorter than posteriors, distance between anterior and posterior pairs about five-sevenths distance between anterior pair. Anterior scutellars divergent, as long as posteriors, which are convergent distally and nearer to each other than to anteriors. Sterno-index about 0.6. Legs yellow, femora whitish. Fore metatarsus as long as two succeeding tarsal joints, mid and hind metatarsi as long as three succeeding tarsal joints. Preapicals on mid and hind tibiae, apicals on mid tibia. Wings rather narrow, largely black, with a sinuate pale longitudinal stripe at middle running from wing base to the level of the tip of R_{2+3} , also with a narrow pale longitudinal stripe above R_{4+5} . R_{2+3} strongly curved to costa at tip. R_{4+5} and M strongly divergent distally. C-index 2.5, 4V-index 1.8, 4C-index 2.0, 5x-index 1.0, Ac-index 2.0. C1-bristles two, unequal. C3-fringe on basal about half. Halteres black, knob elongate, stalk short. Abdominal tergites black, slightly glossy, medially with a broad longitudinal whitish yellow stripe ranging whole abdominal length, laterally with distally narrowing white spots. Abdominal sternites pale.



Figs. 7-17. *Drosophila (Hirtodrosophila) hiharai* sp. n. 7, 8. Head; 9. Stipes; 10. Wing; 11. Periphallalic organs; 12. Phallic organs (ventral aspect); 13. Egg-guide; 14. ♀ reproductive organs (ventral aspect); 15. Spermatheca; 16. ♂ reproductive organs; 17. Digestive system (ventral aspect). Signs and scales as in Figs. 1-6.

Periphallalic organs pale yellow. Genital arch pointed below, narrowly projected caudoventrally above insertion of clasper, with sparse microtrichia dorsally and a few setae on upper and lower caudal margins. Anal plate irregular fusiform, separated from genital arch, hairy and sparsely pubescent. Clasper triangular, ventrally prolonged below tip of clasper, with a row of about eight black teeth above, a row

of several long bristles below, and a few short hairs at meson. Phallic organs pale yellow. Aedeagus robust, apically rounded and pubescent, basally with a pair of elongate orange brown blade-like processes. Anterior parameres orange brown, rod-shaped, short, basally dilated, contiguous to aedeagus, laterally somewhat serrated and with a row of a few sensilla. Ventral fragma rounded proximally, distally with a shallow triangular notch and distinct submedian spines. Hypandrial plates oval. Apodeme of aedeagus elongate, rod-shaped. $PI=1.2$. p. f.=aBcDEFG₀HIkLMN. Egg-guide yellow, apically gently rounded, basally tapering, with about thirty-two black pointed teeth along entire ventral margin and a single subapical tooth. Basal isthmus short, about one-eleventh as long as lobe.

Internal structures: Mid-intestine once or twice coiled. Rectal papillae oval, slightly longer than broad. Malpighian tubules with rather long common stalks, posterior branches distally fused with each other. Testes bright yellow, distally once coiled, proximally thick banana-shaped, basally fused to each other and contiguous to swollen tip of ejaculatory duct by a short common stalk. Paragonia thick, once folded. Ejaculatory bulb elongate oval, without caeca. Spermatheca yellowish brown, hemispherical, apically weakly concaved, stalk distally slightly dilated, deeply invaginated into theca, ending before its inner tip. Parovaria with oval tip, shorter than spermatheca. Ventral receptacle thrice folded.

Holotype. ♂, Kumotoriyama, Tokyo, Japan, 30 IX 1966, on fungi (Hihara).

Allotype. ♀, collected together with the holotype.

Paratypes. 1♂, 1♀ collected together with the holotype.

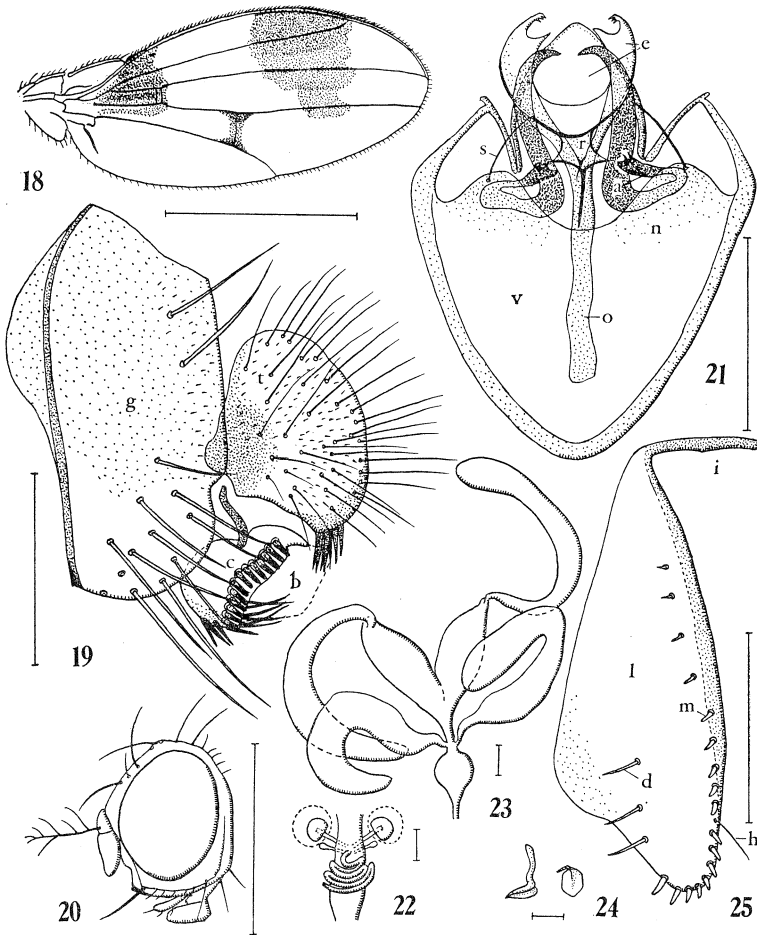
Relationships. Closely allied to the preceding species, *kirishimana*, in having pictured wings, strongly curved R_{2+3} , strongly divergent R_{4+5} and M, oblique eye, whitish stripes on mesonotum, scutellum, and abdominal tergites, sharply bicolorous thoracic pleura, and only four rows of acrostichal hairs. It is distinguished from *kirishimana* in having anteriorly white second antennal joint (yellowish brown in *k.*), minute but distinct anterior reclinate orbital (absent in *k.*), caudally not confluent scutellar pale stripes (confluent in *k.*), and in the details of wing markings and male genitalia.

***Drosophila (Hirtodrosophila) fascipennis* n. sp.**

モンクロシヨウジョウバエ (新種)

(Text-figs. 18-25)

♂, ♀. Body about 1.6 (♂) to 2.5 mm (♀). Glossy brown. Wing with large black patches. Eye oval, dark red, with rough reddish piles. Antenna dark brown, third joint oval, less than twice as long as broad, with short thick pubescence. Arista with about three dorsal and one ventral branches beside a rather small terminal fork. Palpus pale grey, slender, with a prominent apical and two shorter ventral setae. Mouth-parts grey. Ocellar triangle black, convex, marginally paler. Periorbits grey, short, half as long as front length. Front flat, about half as broad as head breadth, with silvery pruinosity, anteriorly slightly narrowing and pale grey, posteriorly glossy black. Clypeus glossy black. Carina high, narrow, but short. Cheek pale brown, silvery pollinose, anterior tip and posterior part black, about one-fifth as broad as the greatest diameter of eye. Occiput glossy black. Anterior



Figs. 18-25. *Drosophila (Hirtodrosophila) fascipennis* sp. n. 18. Wing; 19. Peripheral palps; 20. Head; 21. Phallic organs (ventral aspect); 22. ♀ reproductive organs (ventral aspect); 23. ♂ reproductive organs; 24. Ejaculatory apodeme; 25. Egg-guide. Signs and scales as in Figs. 1-6.

reclinate orbital small, about three-tenths others, slightly nearer posterior reclinate than proclinate, proclinate slightly inside others. Only one long oral. Postverticals well developed.

Mesonotum dark yellowish brown, somewhat pollinose especially in female, with obscurely demarkated black stripes on both sides of dorsocentral lines, inner pair longer than outer and broadened posteriorly. Scutellum dark brown, marginally darker. Humerus, notopleural region, and wing base pale yellowish grey. Meso-

pleura mostly dark brown to black, with broad black longitudinal stripe at middle, sternites pale. Humeral two, subequal, with an additional short bristle above. Acrostichal hairs in six rows. Posterior dorsocentrals about twice as long as anterior, distance between anterior and posterior pairs about two-thirds or half the distance between anterior pair. Anterior scutellars parallel or slightly convergent, as long as posteriors. Sterno-index about 0.55. Legs pale yellow, metatarsi slightly longer than succeeding two tarsal joints. Preapicals prominent on hind tibia, apicals on mid. Wings hyaline, rather broad, with two large black irregularly demarcated patches, one near the wing base between R_1 and Cu distally reaching anterior crossvein, another larger near middle between C and M ranging from posterior crossvein to the tip of R_{2+3} narrowing posteriorly. Posterior crossvein and its margin also distinctly black. C-index about 2.3, 4V-index about 2.4, 4C-index about 1.3, 5x-index about 1.5, Ac-index about 3.2. C1-bristles two, subequal, C3-fringe on basal two-fifths. Halteres white. Abdominal tergites slightly convex, entirely glossy black. Abdominal sternites black, second sternite pale, third and fourth longer than broad, fifth broader than long.

Periphallallic organs: Genital arch broad, black, heel low and rectangular, toe broadly rounded, posterior margin with about two upper and ten lower bristles. Anal plate oval, fuscous, thickly hairy, ventrally with several short stout ventrally pointed setae. Clasper fuscous, hemispherical, with a conical projection above and a row of about twelve black teeth in a concaved row, ventrally with a few stout pointed setae. Decasternum nearly quadrate. Phallic organs: Aedeagus pale, membranous, broad and apically slightly pointed, laterally with large projection, which is curved inward and minutely serrated apically and with a pointed process subapically. Apodeme black, long. Vertical rod basally broad, apically pointed. Anterior paramere short, black, apically broadly truncate and with about three apical sensilla, basally curved inward to continue to an elongate black lateral process. Posterior parameres seemingly absent. Ventral fragma broadly triangular, pale, marginally black, with elongate lateral arms. Hypandrium with stout submedian spine. p.f.=a'b'Cdef₆HIklmN. PI=0.7. Egg-guide fusiform, pale yellowish grey, medially swollen above, apically rounded, with about seventeen marginal and three longer but thinner discal yellowish teeth. Basal isthmus straight, dark brown.

Mid-intestine with three coils. Malpighian tubules with common stalks short, posterior branches apically fused. Testis pale yellowish white, crescent, basally narrowing to become a fusiform seminal vesicle. Both seminal vesicles basally fused. Paragonia pale milky yellow, thick and once folded. Ejaculatory duct basally swollen. Ejaculatory apodeme pale brown, plate oval, stalk longer than plate. Spermatheca yellowish brown, broader than long. Parovaria short, club-shaped. Ventral receptacle folded thrice titely.

Holotype: ♂, Kôfu, Yamanashi Pref., Japan, 11 XI 1960, collected by sweeping (Okada, Seta).

Allotype: ♀, Hikosan, Fukuoka Pref., Japan, 24 XI 1961 (Okada).

Paratypes: 1 ♀, Hachônoike, Shizuoka Pref., Japan, 23 IX 1966 (Nakamura); 1 ♂, collected together with the allotype; 1 ♂, Kosugidani, Yakushima, Kyushu, Japan, 23 VII 1950 (Shirôzu).

Relationships. Allied to *D. macromaculata* Kang and Lee from S. Korea in having

spotted wing, but easily distinguished from it in having two large wing patches (three in *macromaculata*) and entirely black abdominal tergites (with pale spots in *m.*).

***Drosophila (Hirtodrosophila) yakushimana* sp. n.**

ヤクシマフサンヨウジヨウバエ (新称)

(Text-figs. 44-47)

♂, ♀. Body about 3 mm, dark brown. Eye dark red, with fine piles. Antenna with second joint orange brown, third greyish brown, twice as long as broad, with short hairs anteriorly. Arista with four dorsal and two ventral branches beside a fine terminal fork. Palpus orange, with a few setae. Ocellar triangle black, frontal triangle pollinose. Periorbits grey, pollinose. Front dark brown, mat, anteriorly as broad as length down middle, posteriorly slightly broader than half head width. Clypeus dark brown. Face grey, dark below. Carina high, rather broad, long, medially whitish. Cheek narrow, about one-seventh as broad as the greatest diameter of eye, yellowish grey, dark anteriorly and above postgena. Anterior reclinate orbital one-third posterior reclinate, half proclinate, proclinate inside others, anterior reclinate slightly nearer to proclinate than to posterior reclinate. Vibrissa stout, second oral one-third vibrissa, third as long as second. Occiput dark brown.

Mesonotum dark brown, with diffuse pale narrow longitudinal stripes along dorso-central lines, contiguous to the similar stripes on periorbits and scutellum. Scutellum dark brown, laterally with pale stripes. Mesopleura paler than mesonotum, medially dark. Two unequal humerals, lower longer. Acrostichal hairs in eight rows. Anterior dorsocentrals four-ninths as long as posteriors, distance between anterior and posterior pairs half distance between anterior pair. Anterior scutellars divergent, slightly shorter than posteriors, posteriors equally apart from each other and from anteriors. Sterno-index about 0.45. Legs yellowish brown. Fore metatarsus as long as two succeeding tarsal joints, mid metatarsus as long as three, hind metatarsus as long as four. Preapicals on mid and hind tibiae, apicals on mid tibia. Wings clear, distally slightly fuscous, veins at that area also dark. R_{2+3} merely slightly curved to costa at tip, R_{4+5} and M slightly convergent distally. C-index about 2.3, 4V-index about 1.9, 4C-index about 1.0, 5x-index about 1.7, Ac-index about 3.0. C1-bristles two, subequal, C3-fringe on basal half. Halteres greyish white. Abdominal tergites largely brownish black, cerci yellow. Abdominal sternites paler.

Periphallalic organs yellow. Genital arch broad, hairy and pubescent, ventrally truncate, toe rounded, caudal margin narrowly projected above clasper. Anal plate oval, truncate below, hairy and pubescent, separated from genital arch. Clasper broad but short, tapering above, with a straight row of about six black teeth at middle of distal margin, a few stout pale setae at ventrocaudal corner. Phallic organs pale yellow. Aedeagus rod-shaped, medioventrally with a large pubescent dilatation, laterally with paired serrated horn-like branches. Anterior paramere dark, V-shaped, apically apparently contiguous to hypandrium and with a few sensilla. Hypandrium oblong, pubescent at distal margin, with stout but short submedian spine. Ventral fragma quadrate, slightly concaved proximally, caudally

with a deep broad median notch, lateral arms pubescent, distally bilobed. Apodeme of aedeagus stout and thick. p.f.=abcdefg₀HIklm'N. PI=1.2. Egg-guide pale yellow, apically rounded, with about three upper marginal long pointed pale yellow teeth and about seventeen lower marginal pointed yellow teeth.

Holotype. ♂, Kosugidani, Yakushima, Kyushu, Japan, 30 VII 1963 (Okada).

Allotype. ♀, collected together with the holotype.

Paratypes. 5♂, 3♀, collected together with the holotype.

Relationships. Allied to *D. (H.) omogoensis* Okada, from Japan, in having dark brown body with obscure pale longitudinal stripes along dorsocentral lines, broad and high carina, laterally branched aedeagus, deep broad median notch of ventral fragma, and apically rounded egg-guide. It, however, is distinguished from *omogoensis* in having third costal fringe on basal half (one-third in *o.*), lower sterno-index, fewer clasper teeth, and apically truncate slender aedeagus (apically pointed and robust in *o.*)

***Drosophila (Hirtodrosophila) quadrivittata* Okada**

(Text-figs. 48-50)

Male internal reproductive organs were not known before, except the ejaculatory bulb and its apodeme. Testes bright yellow, banana-shaped, basally confluent with each other to make a globular seminal receptacle. Paragonia once folded.

Specimens examined. Hikosan, Kyushu, Japan, 24 X 1961 (Okada); Kumotoriyama, Tokyo, Japan, 30 IX 1966 (Hihara); Nopporo, Hokkaido, Japan, 8 VIII 1966 (Hihara).

The *trivittata* species-subgroup, n.

Clasper as broad as long. Aedeagus simple. Wings non-pictured. Including *trivittata* Strobl, 1893 : 281 (Europe, Siberia, Java, Formosa, Okinawa, Japan, Korea) (including vars. *ussurica* Duda, 1935 : 93, Siberia, and *trifasciata* de Meijere, 1916 : 206, Java), *trilineata* Chung, 1960 : 41 (Korea), *sexvittata* Okada, 1956 : 73 (Japan, Korea) (including f. *triangularata* n. Japan), and *alboralis* Momma and Takada, 1954 : 97 (Japan, Korea).

***Drosophila (Hirtodrosophila) trivittata* Strobl**

(Text-figs. 51-53)

Male internal reproductive organs were not described before. Testis bright yellow, with six outer and four inner thin coils, basally not confluent with each other. Paragonia folded once or one and half times. Ejaculatory bulb with four short caeca, two anterior and two posterior. Ejaculatory apodeme with stalk much dilated, plate nearly quadrate.

Specimens examined. Kamikawa, Mie Pref., Japan, 20 X 1960 (Okada); 1♂, 2♀, Barubido, Okinawa, 6 VI 1962 (Kano).

Remarks. *D. (H.) trilineata* Chung, 1960 described from Korea without comparison to *trivittata* is hardly distinguishable from the latter so far as the original description with figure is concerned. The present author has, however, seen some male

specimens from Korea with aedeagus finely serrated at tips differing from that of *trivittata* which is non-serrated. It is not certain whether they are *trilineata* or not.

***Drosophila* (*Hirtodrosophila*) *sexvittata* Okada**

In general the legs are unicolorously yellow and the caudal process of genital arch above insertion of clasper is pale and obtuse apically, while in some cases the femora are medially dark brown and the caudal process of genital arch is dark brown and acutely pointed apically, for which the name form *triangulata* n. is proposed here.

Specimens of *triangulata* examined. Sapporo, Japan, VIII 1953; Kumotoriyama, Tokyo, Japan, VII 1953.

The *confusa* species-subgroup, n.

Clasper broader than long. Anal plate ventrally without tuft of stout bristles. Aedeagus simple, without lateral branches. Arista often with more than one ventral branches beside fork. Carina various in development.

Including *confusa* Staeger, 1844 : 16 (Europe, Japan, Korea), *asozana* Okada, 1956 : 87 (Japan), and probably *limbicostata* Okada, 1966 : 79 (Nepal).

***Drosophila* (*Hirtodrosophila*) *confusa* Staeger**

Drosophila confusa Staeger, 1844 : 16.

Drosophila vibrissina Duda, 1924c : 246 (Syn. by Frydenberg, 1956).

Drosophila grischuna Burla, 1950 : 620 (Syn. by Frydenberg, 1956).

Drosophila histrioides Okada and Kurokawa, 1957 : 4 (Syn. n.)

D. histrioides is found to be synonymous with *confusa* through comparison of Japanese specimens of the former species with British specimens of the latter given by Dr. E. B. Basden, as well as with the redescriptions of the latter by Burla (1950) and Frydenberg (1956). The karyotypes of *histrioides* and *confusa* described by Kurokawa (in Okada and Kurokawa, 1957) and Burla (1950), respectively, are also strictly coincident. (n=1 large R, 3 small R, and 1 dot). Kang, Kim, and Bahung (1964) described karyotypes of *histrioides* of Korea in which they seem to have misidentified the large R to be a V., according to Kurokawa's private information.

The *hirticornis* species-group Burla

Aedeagus simple, without lateral branches. Anterior parameres elongate, basally contiguous to the base of aedeagus, apically confluent with hypandria. Genital arch with heel more or less pointed. Egg-guide pointed apically, ending in two stout teeth. Third antennal joint anteriorly with long hairs.

Including *hirticornis* and *latifrontata* species-subgroups.

The *hirticornis* species-subgroup Burla s. str.

Ventral fragma quadrate. Clasper usually as broad as long, distally not deeply concaved. Genital arch truncate below, with heel somewhat pointed below or ante-

rriorly. Carina usually low and short.

Including *hirticornis* de Meijere, 1914: 261 (Java), *dentata* Duda, 1924: 205 (Formosa, Sumatra) (including vars. *scutellata* Duda, 1926: 65 and *minuta* Duda, 1926: 66, Sumatra), *longecrinata* Duda, 1924: 204 (Formosa, Okinawa, Philippines, New Guinea) (including var. *curvinervis* Duda, 1926: 66, Formosa, New Guinea), *lundstroemi* Duda, 1935: 72 (Europe), *oldenbergi* Duda, 1924: 204 (Europe), *nokogiri* Okada, 1956: 84 (Japan, Korea), *pseudonokogiri* Kang, Lee, and Bahung, 1965: 53 (Japan, Korea), *kangi* Okada and Lee, 1964: 20 (Korea), *akabo* Burla 1954: 109 (Africa), *sanyi* Burla, 1954: 113 (Africa), *trapezina* Duda, 1923: 41 (Formosa), *nigripennis* Kang, Lee, and Bahung, 1965 (Korea), *manonoensis* Harrison, 1954: 101 (Samoa), *novicia* Wheeler and Takada, 1964: 194 (Bonins, Carolines), *mediohispidia* sp. n. (Japan), *okadomei* sp. n. (Japan), *hirtinokogiri* sp. n. (Okinawa), and probably *vina* Burla, 1954: 112 (Africa). Some Neotropical species are also included here by Burla, 1956. Judging from the figures of male and female genitalia drawn by Basden (1961) and Hackman (1957, 1965), *oldenbergi* and *lundstroemi* can definitely be associated to this subgroup.

***Drosophila (Hirtodrosophila) mediohispidia* sp. n.**

ヒゲノコギリショウジョウバエ (新称)

(Text-figs. 26-28)

♂, ♀. Body about 2.0 mm, dark greyish brown. Eye sparsely pilose. Antenna grey, third joint elongate, with long hairs anteriorly. Arista with about three dorsal and a long ventral branches beside a large terminal fork. Palpus yellowish brown, with a long apical seta. Ocellar triangle black. Periorbits grey, pollinose. Front dark orange brown, anteriorly paler and as broad as length down middle, posteriorly half as broad as head width. Clypeus dark brown. Carina low. Cheek grey, one-sixth as broad as the greatest diameter of eye. Occiput greyish brown. Anterior reclinate orbitals one-third others, equally distant from others, proclinate inside others. Vibrissa strong, other orals fine, base of orals narrowly black.

Mesonotum and scutellum dark greyish brown, nearly unicolorous. Mesopleura paler, with dark brown patches below notopleurals, at pteropleura, and at the upper region of sternopleura. Three humerals, uppermost the shortest. Acrostichal hairs in eight rows. Anterior dorsocentrals half as long as posteriors, distance between anterior and posterior pairs half distance between anterior pair. Anterior scutellars divergent, slightly shorter than posteriors, which are equally apart from each other and from anteriors. Legs greyish yellow. Fore metatarsus as long as two succeeding tarsal joints, mid metatarsus as long as three, hind as long as four succeeding tarsal joints. Wings slightly fuscous, R_{2+3} nearly straight, R_{4+5} and M slightly convergent. C-index about 2.0, 4V-index 1.7, 4C-index 1.0, 5x-index 2.0, Ac-index 3.5. Cl-bristles two (?). C3-fringe on basal two-thirds. Halteres milky white. Abdominal tergites greyish brown, with caudal medially continuous black bands laterally projected to reach anterior margins, more caudal bands broader. Abdominal sternites paler.

Periphallalic organs pale yellow. Genital arch pubescent and hairy, broadly truncate below, toe and heel pointed, without invagination at the insertion of clasper.

Anal plate oval, separated from genital arch, hairy and pubescent. Clasper narrow, triangular, distally somewhat concaved and with about sixteen pointed black bristles in irregular rows. Phallic organs pale yellow. Aedeagus apically narrowly pointed, subapically dilated laterally, submedially with a tuft of shaggy short hairs on dorsal surface, thus the species name. Apodeme of aedeagus elongate and robust. Anterior paramere rod-shaped, basally contiguous to aedeagus, distally with a few sensilla and fused to hypandrium. Hypandrium large, triangular, apically with a long submedian spine. Ventral fragma quadrate, distally with a broad rounded hairy median process. p.f.=aBcdEfg₀HIKLMN. PI=1.2. Egg-guide orange yellow, fusiform, apically abruptly narrowing, ending in two black stout teeth, subapically somewhat constricted, with an oblique row of about four black teeth dorsally, more distal teeth being larger, ventral margin with a row of minute pale spicules nearly on entire length and with a small subterminal hair. Basal isthmus darker, about one-third as long as lobe.

Holotype. ♂, Kosugidani, Yakushima, Kyushu, Japan, 28 VII 1963 on fungi (Okada).

Allotype. ♀, collected together with the holotype.

Paratypes. 4♂, 1♀, collected together with the holotype.

Relationships. Closely allied to *D. (H.) longecrinita* Duda from Okinawa, Formosa, and New Guinea, especially in having eight rows of acrostichal hairs, straight R₂₊₃, slightly convergent R₄₊₅ and M, elongate third antennal joint with long hairs anteriorly, medially non-interrupted narrow black caudal bands of abdominal tergites, ventrally truncate genital arch, and apically pointed subapically dilated egg-guide. It differs, however, from *longecrinita* in having aedeagus apically narrowly pointed and medially with shaggy hairs (apically truncate and medially dentated in *longecrinita*), mesopleura with dark patches (without dark patches in *l.*), ventral fragma of phallic organs with large rounded median process (without such process in *l.*), ocellar triangle black (pale in *l.*), and male fore tarsi without long recurved hairs.

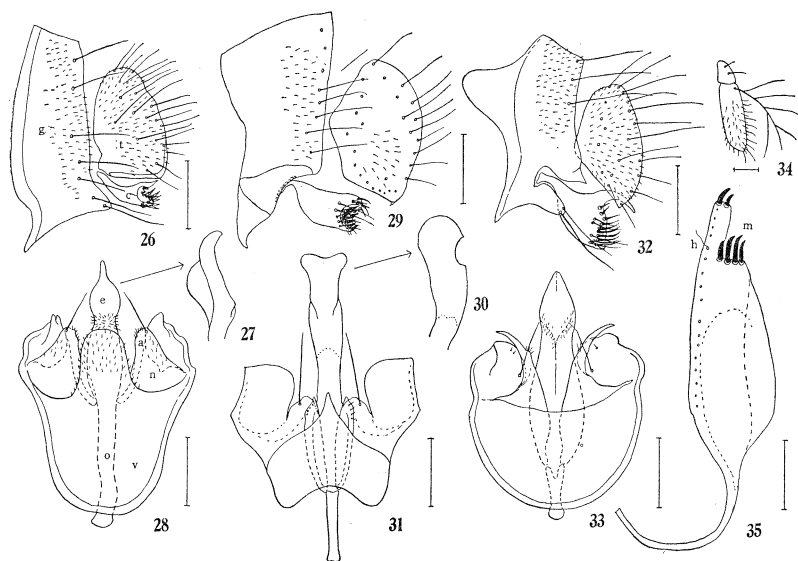
***Drosophila (Hirtodrosophila) okadomei* sp. n.**

オカドメフサシヨウジョウバエ (新称)

(Text-figs. 29-31)

♂. Body about 2.4 mm in length. Eye dark red, with sparse piles. Antenna with second joint yellowish brown, anteriorly dark, third joint greyish brown, elongate, with rather long hairs anteriorly. Arista with three dorsal and one ventral long branches beside a large terminal fork. Palpus yellowish grey, spherical, with a long apical seta. Ocellar triangle black. Periorbits pale greyish brown, somewhat pollinose. Front greyish brown, anteriorly orange and as broad as length down middle, posteriorly half as broad as head width. Clypeus pale yellowish brown. Cheek greyish brown, about one-sixth as broad as the greatest diameter of eye. Anterior reclinate orbital slightly nearer to proclinate than to posterior reclinate, one-third as long as posterior reclinate. Proclinate slightly inside others, slightly shorter than posterior reclinate. Vibrissa strong, other orals fine.

Mesonotum mat yellowish brown, scutellum greyish brown, mesopleura paler. Three humerals, uppermost the shortest. Acrostichal hairs in eight rows. Anterior



Figs. 26-28. *Drosophila (Hirtodrosophila) mediohispidia* sp. n. 26. Periphallallic organs; 27. Tip of aedeagus (lateral aspect); 28. Phallic organs (ventral aspect). —Figs. 29-31. *Drosophila (Hirtodrosophila) okadomei* sp. n. 29. Periphallallic organs; 30. Tip of aedeagus (lateral aspect); 31. Phallic organs (ventral aspect). —Figs. 32-35. *Drosophila (Hirtodrosophila) nudinokogiri* sp. n. 32. Periphallallic organs; 33. Phallic organs (ventral aspect); 34. Antenna; 35. Egg-guide. Signs and scales as in Figs. 1-6.

dorsocentrals half as long as posteriors, distance between anterior and posterior dorsocentrals about three-eighths distance between anterior pair. Anterior scutellars divergent, slightly shorter than posteriors. Sterno-index about 0.5. Legs yellow. Fore metatarsus as long as two succeeding tarsal joints, mid and hind metatarsi as long as three succeeding. Preapicals on mid and hind tibiae, apicals prominent on mid tibia. Wings slightly fuscous. R_{2+3} straight, R_{4+5} and M nearly parallel. C reaching M. C-index about 1.6; 4V-index 1.7; 4C-index 1.2; 5x-index 1.6; Ac-index 3.6. C1-bristles two, C3-fringe on basal five-sevenths. Halteres brown. Abdominal tergites mostly black, anterior two-thirds of 1T and anterior one-third of 2T yellow.

Periphallallic organs black. Genital arch broad, pubescent, anteroventral corner pale and pointed below, caudal margin with several long hairs. Anal plate oval, pubescent and hairy, separated from genital arch. Clasper oblong, basally narrowing, apically with a concaved row of about seven large black teeth and several long and short setae. Phallic organs mostly black. Aedeagus rod-shaped, gently curved ventrally, apically inflated laterally, medially paler. Apodeme of aedeagus short and thick. Anterior parameres elongate, basally contiguous to aedeagus, distally fused to conical hypandria, which have long submedian spines. Ventral fragma basally black, with acutely pointed median process, caudolaterally broad and pale.

p.f.=aBCDEf₀g₀HIKlMn. PI=3.0.

Holotype. ♂, Yakushima, Kyushu, Japan, 7 VIII 1965 (Okadome).

Paratype. 1♂, collected together with the holotype.

Relationships. Resembles *D. (H.) nokogiri* Okada from Japan and Korea especially in having acute median process of ventral fragma, but distinguished from it in paler body, lower C-index (2.5 in *nokogiri*), ventrally pointed genital arch (truncate in *n.*), and non-serrated aedeagus (serrated in *n.*)

***Drosophila (Hirtodrosophila) nudinokogiri* sp. n.**

ハダカノコギリシヨウジョウバエ (新称)

(Text-figs. 32-35)

♂, ♀. Body about 2.8 mm, orange brown in general colour. Eye red, with very sparse piles. Antenna with second joint orange, third yellowish grey, elongate, with long hairs anteriorly. Arista with three dorsal and one ventral long branches beside a large terminal fork. Palpus yellowish brown, with a rather short terminal seta. Ocellar triangle orange, black inside ocelli. Periorbits orange. Front orange, with numerous frontal hairs, anteriorly as broad as length down middle, posteriorly slightly broadened and slightly narrower than half head width. Clypeus yellow. Face orange yellow, flat, swollen at eye margins. Carina very short, narrow, pale. Cheek yellowish brown, about one-sixth as broad as the greatest diameter of eye. Occiput orange, medially fuscous. Anterior reclinate orbital half as long as others, at middle between others, proclinate slightly inside others. Vibrissa long, other orals fine.

Mesonotum yellowish brown, mat, sometimes with scattered fuscous patches. Scutellum yellowish grey, mat, unicolorous. Postscutellum darker, postnotum orange. Mesopleura yellowish grey, with obscure dark stripes below humeri, propleura dark. Two humerals, subequal. Acrostichal hairs in about ten irregular rows. Anterior dorsocentrals half as long as posteriors, distance between anterior and posterior dorsocentrals one-third distance between anterior pair. Anterior scutellars slightly shorter than posteriors, divergent (?), posteriors nearer to each other than to anteriors. Sterno-index about 0.5. Legs yellow, femora slightly paler. Fore metatarsus as long as three succeeding tarsal joints, mid and hind metatarsi nearly as long as four succeeding. Preapicals prominent on hind tibia, apicals on mid tibia. Wings slightly fuscous, veins dark. R₂₊₃ slightly curved to C at tip. R₄₊₅ and M distinctly convergent distally. C-index 1.6; 4V-index 1.8; 4C-index 1.5; 5x-index 1.7; Ac-index 4.1. C1-bristle one, stout. C3-fringe on basal two-thirds. Halteres yellow. Abdominal tergites orange brown, with narrow straight medially not interrupted caudal black bands.

Periphallic organs pale yellow. Genital arch truncate below, pubescent above, posterior margin deeply concaved at the insertion of clasper, caudal margin with a few long hairs on upper half and lower tip. Anal plate pubescent and hairy, oval, separated from genital arch. Clasper broad, basally tapering, distal margin nearly straight, with a row of about ten long pointed bristles and several shorter setae. Phallic organs pale yellow. Aedeagus straight, rod-shaped, apically gently pointed, subapically somewhat constricted and hairy, basally elliptical. Apodeme of aedeagus

narrow and short. Anterior paramere elongate, sharply pointed and curved outward distally, apparently fused to aedeagus at base and separated from hypandrium apically, with a few sensilla at meson. Hypandrium oval, with a long submedian spine and a few sensilla-like microtrichia. Ventral fragma hemispherical, proximal margin straight, without median process. p.f.=aBcDEFg₀HIKIMn. PI=4.0. Egg-guide orange, apically abruptly narrowing, ending in two large black teeth, subapically with a transverse row of about four large black teeth, ventral margin with a row of about eighteen minute sensilla-like teeth on apical three-fourths. Basal isthmus long, dark orange, half as long as lobe.

Holotype. ♂, Komi, Iriomote, Okinawa, 8-12 VII 1966 (Okada and Hihara).

Allotype. ♀, collected together with the holotype.

Paratypes. 1♂, 5♀, collected together with the holotype; 2♀, Kosugidani, Yakushima, Kyushu, Japan, 28-30 VII 1963 (Okada).

Relationships. Closely allied to *D. (H.) novicia* Wheeler and Takada, 1964 from the Bonin and Caroline Islands in having short carina, long third antennal joint with long hairs, non-serrated aedeagus, apically free elongate anterior parameres, and triangular clasper, but distinguished from it in having more than ten rows of acrostichal hairs (eight in *novicia*), dorsally not narrowing genital arch, and narrower anterior parameres.

***Drosophila (Hirtodrosophila) hirtinokogiri* sp. n.**

セグロノコギリシヨウジヨウバエ (新称)

(Text-figs. 36-39)

♂, ♀. Body about 2.8 mm, yellowish brown with paler venter. Eye dark red, with sparse piles. Antenna with second joint yellowish brown, third elongate and with long hairs anteriorly. Arista with three dorsal and one ventral long branches beside a large terminal fork. Palpus greyish yellow or black, with a prominent apical seta. Ocellar triangle black. Periorbits yellowish grey, two-thirds as long as front, anteriorly slightly curved inward. Front yellowish grey, anteriorly paler and as broad as length down middle, posteriorly slightly more than half as broad as head width. Face pale greyish white, wide. Carina short, narrow, whitish. Cheek yellowish grey, narrow, about one-ninth as broad as the greatest diameter of eye. Occiput pale. Clypeus pale grey. Anterior reclinate orbital nearer to proclinate than to posterior reclinate, two-thirds as long as and thinner than other orbitals, proclinate inside others. Vibrissa stout and long, other orals minute. Mouth parts greyish yellow or black.

Mesonotum mat, dark yellowish brown, laterally paler. Scutellum mat yellowish brown, unicolorous. Mesopleura pale yellowish white. Two humerals, subequal. Acrostichal hairs in about ten somewhat irregular rows. Anterior dorsocentrals slightly more than half as long as posteriors, distance between anterior and posterior dorsocentrals three-eighths distance between anterior pair. Scutellars long, subequal, anteriors divergent, posteriors nearer to each other than to anterior. Stern-index about 0.5. Legs pale yellow, coxa white, fore metatarsus as long as two succeeding tarsal joints, mid and hind metatarsi as long as four succeeding. Pre-apicals prominent on hind tibia, apicals on mid tibia. Wings fuscous veins darker.

C reaching M. R_{2+3} nearly straight, R_{4+5} and M slightly convergent distally. C-index about 1.7; 4V-index 1.6, 4C-index 1.2; 5x-index 1.7; Ac-index 3.9. C1-bristles two, C3-fringe on basal four-fifths. Halteres brown, pale at base. Abdominal tergites yellowish brown, with medially not interrupted anteriorly diffuse caudal black bands, more caudal bands broader especially in male. Abdominal sternites pale.

Periphallallic organs. Genital arch black, without microtrichia, white and acutely pointed below, with small triangular projection above insertion of clasper, posterior margin with a few hairs above. Anal plate oval, black, separated from genital arch, hairy but without microtrichia, ventral tip rounded and with several short hairs. Clasper black, narrow, somewhat crescent, distally slightly concaved, with a row of about five large black teeth on upper half, and tufts of long and short setae below. Phallic organs pale. Aedeagus robust, subapically much inflated laterally and with fine serration, apically shallowly concaved. Anterior parameres yellowish brown, much elongate, basally contiguous to aedeagus, apically fused to hypandria and with a few obscure sensilla. Ventral fragma quadrate, medio-caudally with large rounded projection. Hypandrium crescent, distally with a long submedian spine. Apodeme of aedeagus short and narrow, yellowish brown. p.f.= abCDEfg₀HIKIMn. PI=5.0. Egg-guide elongate fusiform, yellow, apically gradually elongate, yellowish orange, ending in two black stout teeth, subapically with an oblique row of about four stout black teeth along dorsal margin, ventral margin with about thirteen minute sensilla-like teeth on apical three-fourths. Basal isthmus yellowish orange, about three-fourths as long as lobe.

Holotype. ♂, Komi, Iriomote, Okinawa, 8-12 VII 1966, collected on fungi (*Auricularia*) on rotten tree (Okada and Hihara).

Allotype. ♀, collected together with the holotype.

Paratypes. 15♂, 4♀, collected together with the holotype.

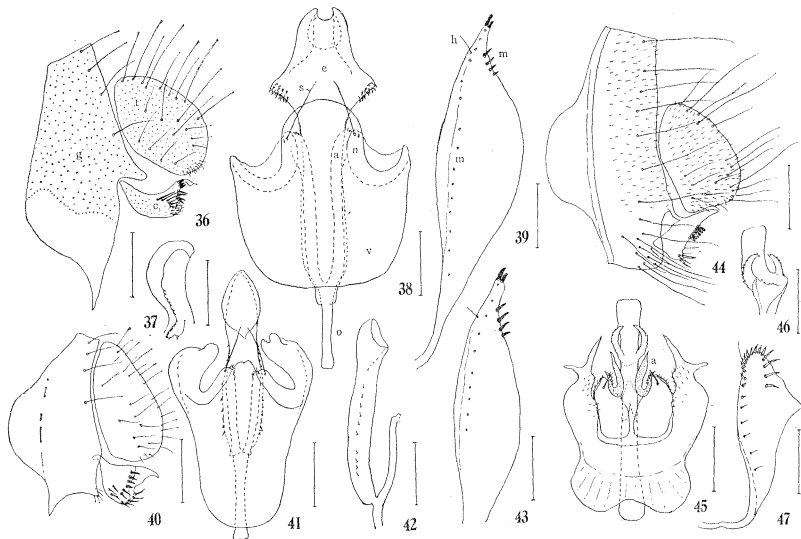
Relationships. Resembles *D. (H.) nudinokogiri* Okada in this paper, in having long third antennal joint with long hairs anteriorly, about ten somewhat irregular rows of acrostichal hairs, low C-index, and nearly straight R_{2+3} , but differs from it in having paler front, diffuse black abdominal bands (well demarcated in *nudinokogiri*), black periphallallic organs (yellow in *n.*), narrower clasper, ventrally much more elongated genital arch, subapically inflated hairy aedeagus (not so in *n.*), large rounded median process of ventral fragma (without process in *n.*), and distally gradually narrowing egg-guide (abruptly narrowing in *n.*)

***Drosophila (Hirtodrosophila) seminokogiri* sp. n.**

ウスイロノコギリシヨウジョウバエ (新称)

(Text-figs. 40-43)

♂, ♀. Body about 2.7 mm, yellowish brown with paler venter. Eye dark red, nearly bare. Antenna with second joint orange brown, third yellowish grey, elongate, with long hairs anteriorly. Arista with three dorsal and one ventral long branches beside a large terminal fork. Palpus yellowish grey, mat, anteriorly orange brown and slightly broader than length down middle, posteriorly slightly broader, half as broad as head width. Face greyish white, mat. Carina narrow, short, whitish. Cheek narrow, orange yellow, about one-eighth as broad as the greatest



Figs. 36-39. *Drosophila (Hirtodrosophila) hirtinokogiri* sp. n. 36. Peripheral phallic organs; 37. Tip of aedeagus (lateral aspect); 38. Phallic organs (ventral aspect); 39. Egg-guide. — Figs. 40-43. *Drosophila (Hirtodrosophila) seminokogiri* sp. n. 40. Peripheral phallic organs; 41. Phallic organs (ventral aspect); 42. Aedeagus and anterior paramere (lateral aspect); 43. Egg-guide. — Figs. 44-47. *Drosophila (Hirtodrosophila) yakushimana* sp. n. 44. Peripheral phallic organs; 45. Phallic organs (ventral aspect); 46. Tip of aedeagus (lateroventral aspect); 47. Egg-guide. Signs and scales as in Figs. 1-6.

diameter of eye. Occiput black, upper margin paler. Anterior reclinate orbital half as long as others, slightly nearer to proclinate than to posterior reclinate, proclinate inside others. Vibrissa strong, other orals fine.

Mesonotum mat orange brown, nearly unicolorous, humerus pale. Scutellum mat yellowish brown, flat, unicolorous. Mesopleura pale. Two humerals, subequal. Acrostichal hairs in about twelve irregular rows. Anterior dorsocentrals slightly longer than posteriors, distance between anterior and posterior dorsocentrals about three-sevenths distance between anterior pair. Anterior scutellars divergent, as long as posteriors, posteriors as near from each other as from anteriors. Sterno-index about 0.5. Legs yellow, fore metatarsus subequal in length to two succeeding tarsal joints, mid metatarsus as long as three, hind as long as four succeeding tarsal joints. Preapicals on hind tibia, apicals on mid tibia. Wings slightly fuscous, R_{2+3} only weakly curved to C at tip, R_{4+5} and M weakly convergent distally. C-index 1.5; 4V-index 1.8; 4C-index 1.5; 5x-index 2.0, Ac-index 4.8. C1-bristles two, subequal, C3-fringe on basal three-fourths. Halteres brownish black, stalk yellow. Abdominal tergites orange brown, with rather broad straight caudal black bands, medially projected anteriorly to reach the anterior margin. Abdominal sternites

pale.

Periphallic organs pale yellow. Genital arch medially broadened, truncate below, projected at heel, without microtrichia, caudal margin nearly straight, with a few hairs above. Anal plate oval, separated from genital arch, broadly rounded below, without microtrichia but hairy. Clasper broad, triangular, distally with a row of about four stout black teeth above and scattered strong black pointed bristles below. Phallic organs pale yellow. Aedeagus rod-shaped, subapically only slightly inflated laterally, lateral margin with prominent serrations. Apodeme of aedeagus pale brown, straight. Anterior paramere pale brown, elongate, proximally contiguous to aedeagus, distally fused to conical hypandrium, with a few sensilla distally. Hypandrium crescent, with a strong submedian spine. Ventral fragma triangular, longer than broad, with median triangular process. p.f.=abCDEfg₀HIKIMn. PI=2.3. Egg-guide yellow, narrow, fusiform, gradually narrowing apically, ending in two stout black teeth, upper margin subapically with an oblique row of about ten minute sensilla-like teeth on distal two-thirds.

Holotype. ♂, Komi, Iriomote, Okinawa, collected on fungi (*Auricularia*) on rotten tree, 8-12 VII 1966 (Okada and Hihara).

Allotype. ♀, collected together with the holotype.

Paratypes. 3♂, 2♀, collected together with the holotype.

Relationships. Closely allied to *D. (H.) hirtinokogiri* Okada in this paper, similar in having mesopleura much paler than mesonotum, R₂₊₃ nearly straight, and egg-guide gradually narrowing distally, but distinguished from it in having abdominal black bands medially projected anteriorly (not projected in *hirtinokogiri*), aedeagus subapically not remarkably dilated and hairy (exceedingly dilated and hairy in *h.*), paler periphallic organs with broad clasper and ventrally truncate genital arch (darker with narrow crescent clasper and ventrally acutely pointed genital arch in *h.*), and ventral fragma mediocaudally triangular (rounded in *h.*)

***Drosophila (Hirtodrosophila) nokogiri* Okada**

(Text-fig. 54)

Male internal reproductive organs were not known before, except the ejaculatory bulb and its apodeme. Testis with five to seven outer pale yellowish coils and three or four inner dark yellow slender coils. Paragonia coiled once or one and half times.

Specimens examined. Kumotoriyama, Tokyo, Japan, 30 IX 1966 (Hihara).

***Drosophila (Hirtodrosophila) pseudonokogiri* Kang, Lee, and Bahng**

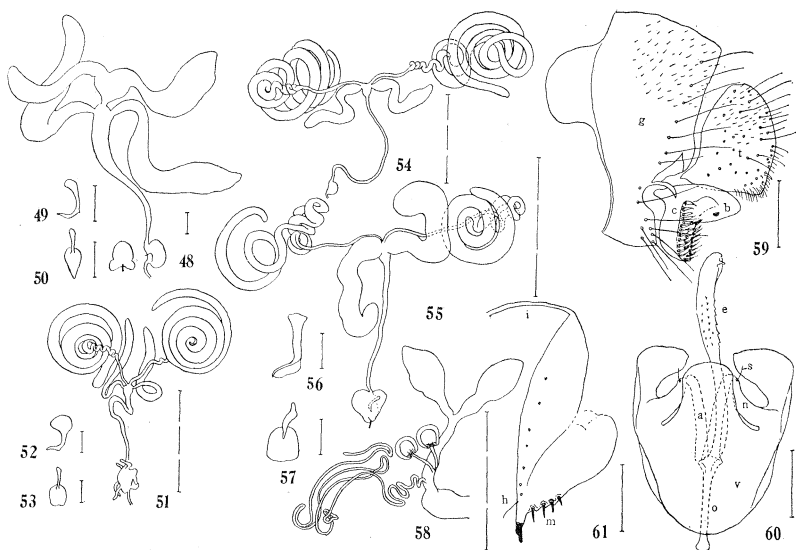
ニセノコギリシヨウジヨウバエ (新称)

(Text-figs. 55-61)

Drosophila (Hirtodrosophila) pseudonokogiri Kang, Lee, and Bahng, 1963: 53.

Recorded from Japan for the first time. Females and the internal structures of both sexes were not known before.

♀. Egg-guide dark brown, broad, apically pointed ending in two black teeth, dorsal margin with an oblique row of about four black pointed teeth, ventral margin



Figs. 48-50. *Drosophila (Hirtodrosophila) quadrivittata* Okada. 48. ♂ reproductive organs; 49, 50. Ejaculatory apodeme. — Figs. 51-53. *Drosophila (Hirtodrosophila) trivittata* Strobl. 51. ♂ reproductive organs; 52, 53. Ejaculatory apodeme. — Figs. 54. *Drosophila (Hirtodrosophila) nokogiri* Okada ♂ reproductive organs. — Figs. 55-61. *Drosophila (Hirtodrosophila) pseudonokogiri* Kang, Lee, and Bahng. 55. ♂ reproductive organs; 56, 57. Ejaculatory apodeme; 58. ♀ reproductive organs; 59. Periphallic organs; 60. Phallic organs (ventral aspect); 61. Egg-guide. Signs and scales as in Figs. 1-6.

with a row of about seven minute sensilla-like teeth before subterminal hair. Basal isthmus one-third as long as lobe. Spermatheca orange brown, globular, basally pale and cross-striated, covered by hyaline sheath. Parovaria not observed. Ventral receptacle with about three basal small and three distal large folds.

♂. Anal plate with a tuft of short hairs at caudoventral corner. Genital arch very broad, pubescent above. Aedeagus subapically with a short process and laterally serrated. Hypandrium with a short submedian spine. Ventral fragma caudo-medially with a large rounded median process. p.f.=abCDEfg₀HIKLMn. PI=2.3. Testes orange yellow, with about two inner and five outer coils, basally not confluent with each other. Paragonia thick, folded once or one and half times. Ejaculatory bulb comparatively large, globular, distally gently bilobed. Ejaculatory apodeme robust, with stalk thick, one and half times as long as plate, which is as long as broad, distally truncate. Mid-intestine with three coils. Malpighian tubules with moderate common stalks, posterior branches fused at tips.

Specimens examined. Akan, Hokkaido, Japan, VII 1965 (Wheeler); Kumotoriyama, Tokyo, Japan, 30 IX 1966 (Hihara), 8 X 1966 (Okada and Hihara).

The *latifrontata* species-subgroup, n.

Ventral fragma triangular. Clasper narrower than long, distally deeply concaved. Genital arch with heel exceedingly pointed below. Carina large, long, and high.

Including *latifrontata* Frota-Pessoa, 1945: 480 (Sumatra, Formosa, Okinawa, Japan), (including *yakuensis* subsp. n., Japan and vars. *jacobsoni* Duda, 1926: 66, *nigra* Duda, 1926: 68, *poecilogastra* Duda 1926: 69, and *sublineata* Duda, 1926: 69, from Sumatra) *astioidea* Duda, 1923: 42 (Sumatra, New Guinea), *seminigra* Duda, 1926: 68 (Sumatra, Okinawa, Samoa), *unicolorata* Wheeler, 1959: 183 (Samoa, Japan) (including *exilis* subsp. n., Japan), and *innocua* Malloch, 1934: 294 (Samoa).

Drosophila (Hirtodrosophila) latifrontata Frota-Pessoa

ヒロヅフサシヨウジヨウバエ (新称)

(Text-figs. 66-68)

♂, ♀, Body about 1.2 to 2.0 mm, yellowish brown, with venter paler. Eye with piles. Arista with three dorsal and one ventral branches beside a large fork. Ocellar triangle black. Carina high, broad, and long. Cheek dark below eye and at anterior tip. Mesonotum pale brown, with obscure pale longitudinal stripes. Thoracic pleura much paler than mesonotum. Acrostichal hairs in six rows. Anterior scutellars much shorter than posteriors. Sterno-index about 0.6. Legs pale yellow, tibiae and tarsi with upright hairs. Wings hyaline, R_{2+3} straight. C-index 1.0-1.4, 4V-index 2.0-2.6; 4C-index 1.8-2.0, 5x-index 2.3-2.6, Ac-index 3.0. C3-fringe on basal half or slightly more. Halteres pale yellow. Abdominal tergites with obscurely demarcated broad laterally narrowing caudal black bands.

Periphallallic organs pale yellow. Genital arch narrowing and pubescent above, truncate below, with heel exceedingly elongated ventrally, toe finger-like, caudal margin with a row of hairs. Anal plate separated from genital arch, oval, slightly pointed below, pubescent and hairy. Clasper crescent, apically concaved, much longer than broad, distally with about seven stout black teeth in a concaved row. Phallic organs pale. Aedeagus rod-shaped, bare, apically dilated dorsoventrally. Anterior paramere dark, elongate, basally contiguous to aedeagus, distally fused with hypandrium and with a few sensilla. Hypandrium quadrate, with moderate subapical spine. Ventral fragma triangular, anteriorly narrowing. p.f.=aBCDEfg₀HIKLMn. PI=1.8. Egg-guide fusiform, pale yellow, apically narrowly pointed ending in two isolated black stout teeth, dorsally with about four pointed teeth in an oblique row, ventrally with a row of about eleven minute teeth. Basal isthmus long, half as long as lobe.

Mid-intestine with three coils. Malpighian tubules with rather long common stalks, posterior branches apically nearly completely contiguous to each other. Testes with two thick whitish inner coils and three thinner orange yellow outer coils, basally contact with anterior margin of paragonia and separately inserted on the tip of ejaculatory duct. Paragonia thick, transparent, irregularly folded one and half times. Ejaculatory bulb with a pair of short posterior caeca. Spermatheca pale yellowish grey, spherical. Parovaria with short stems and large oval knobs. Ventral receptacle with about twenty-five basal coils and two or three distal large

folds.

Specimens examined. Iriomote, Okinawa: numerous ♂, ♀, Komi and Goza, 8-12 VII 1966 (Okada, Hihara); Ishigaki Is., Okinawa: 21 ♂, 11 ♀, Hoshino, 24 VII 1955 (Kano); 21 ♂, 12 ♀, Barubido, 6 VI 1962 (Kano); 13 ♂, 2 ♀, Minato, 16 VI 1962 (Asahina).

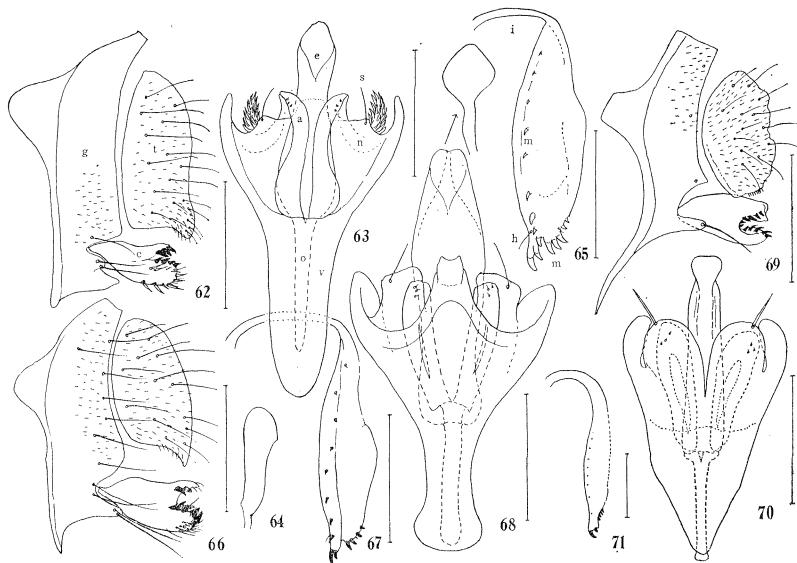
Remarks. *D. (H.) innocua* Malloch is certainly conspecific with the present species. The male genitalia of *innocua* figured by Wheeler and Kambysellis (1966) is same as that of present species.

***Drosophila (Hirtodrosophila) latifrontata yakuensis* subsp. n.**

(Text-figs. 62-65)

♂, ♀. Body about 1.5 mm, orange yellow in general coloration. Differs from the original form in having mesopleura not remarkably paler than mesonotum, abdominal black bands narrower and sharply demarcated, aedeagus more gently dilated distally, egg-guide with apical two teeth not isolated from the dorsal teeth row, and basal isthmus of egg-guide shorter.

Holotype. ♂, Kosugidani, Yakushima, Kyushu, Japan, collected on fungi (Okada).



Figs. 62-65. *Drosophila (Hirtodrosophila) latifrontata yakuensis* subsp. n. 62. Peripheralia; 63. Phallic organs (ventral aspect); 64. Tip of aedeagus (lateral aspect); 65. Egg-guide. — Figs. 66-68. *Drosophila (Hirtodrosophila) latifrontata* Frota-Pessoa. 66. Peripheralia; 67. Egg-guide; 68. Phallic organs (ventral aspect), upper fig. tip of aedeagus in lateral aspect. — Figs. 69-71. *Drosophila (Hirtodrosophila) unicolorata exilis* subsp. n. 69. Peripheralia; 70. Phallic organs (ventral aspect); 71. Egg-guide. Signs and scales as in Figs. 1-6.

Allotype. ♀, collected together with the holotype.

Paratypes. 2♂, 7♀, collected together with the holotype.

***Drosophila (Hirtodrosophila) seminigra* Duda**

ムナグロフサシヨウジヨウバエ (新称)

Drosophila (Dasydrosophila) frontata var. *seminigra* Duda, 1926: 65.

Hirtodrosophila seminigra, Malloch, 1934: 292.

Drosophila (Hirtodrosophila) seminigra, Wheeler and Kambysellis, 1966: 534.

♂, ♀. Black mesonotum and entirely yellow abdomen are the characteristics of this species. Periphallalic organs: Genital arch not narrowing above, heel prominently pointed below. Phallic organs: Aedeagus seemingly bifurcated in V-shape, ventral fragma deeply concaved distally, anterior paramere small, oval, basally not contiguous to aedeagus.

Specimens examined. 2♂, 1♀, Goza, Iriomote, Okinawa, 10-12 VII 1966, collected on fungi (Okada, Hihara).

***Drosophila (Hirtodrosophila) unicolorata exilis* subsp. n.**

クロテンフサシヨウジヨウバエ (新称)

(Text-figs. 69-71)

♂, ♀. Body about 1.5 mm, with black spots at the end of first costal section, at the base of insertion of orals, on and above humerus, as in the original form. Remarkable difference from the latter is only thinner aedeagus thus the subspecific name.

Eye deep purplish red, with piles. Antenna with third joint black below, long hairs anteriorly. Arista yellow, with three dorsal and one ventral branches beside a small terminal fork. Palpi grey, with two apical stout setae. Ocellar triangle pale brown, periorbits paler. Front pale yellowish grey, flat, anteriorly broader than length down middle, posteriorly broader than half head width. Clypeus pale. Cheek pale, about one-fourth as broad as the greatest diameter of eye, with large black spot interrupted by a narrow longitudinal yellowish line at the base of orals. Anterior reclinate orbital half proclinate, one-third posterior reclinate, situated just outside proclinate. Vibrissa long, other orals fine. Occiput pale. Carina short but high. Face and mouth parts sometimes glossy black.

Mesonotum yellowish orange, shiny, paler along dorso-central lines, with black short longitudinal stripes above humerus and below middle of humerus. Scutellum yellowish orange, distally somewhat fuscous. Mesopleura pale yellowish white, with small black spots at the caudal upper margin of sternepisternum and below halteres. Humeral two, long, subequal. Acrostichal hairs in six rows. Anterior dorso-centrals two-thirds as long as posteriors, distance between anterior and posterior pairs three-fifths distance between anterior pair. Anterior scutellars parallel, two-thirds as long as posterior pair, posteriors slightly nearer to each other than to anteriors. Sterno-index about 0.8. Legs pale yellow, fore metatarsus shorter than two succeeding tarsal joints, mid and hind metatarsi as long as two succeeding tarsal joints. Preapicals on mid and hind tibiae, apicals prominent on mid tibia.

Wings hyaline, rather broad, apically slightly pointed. First costal section apically black and thick, second costal break deep and the vein below the break black. R_{2+3} distally gently curved to costa, R_{4+5} and M parallel. C-index 1.0, 4V-index 2.0, 4C-index 1.9, 5x-index 2.0, Ac-index 3.9. C1-bristles two, subequal, C3-fringe on basal three-fifths. Halteres pale yellow. Abdominal tergites yellow, with narrow straight medially interrupted caudal black bands, abdominal sternites pale.

Periphallic organs pale yellow. Genital arch not narrowing and pubescent above, exceedingly narrowly elongated below at heel, toe finger-shaped with a stout bristle, caudal margin with a few bristles, and deeply excavated at the insertion of clasper. Clasper oblong, distal end concaved, with about ten black pointed teeth along the concaved distal margin. Anal plate elliptical, separated from genital arch, pubescent and hairy. Phallic organs pale yellow. Aedeagus slender (thus the subspecific name), distally tapering, straight, apically slightly dilated laterally and truncate. Anterior paramere elongate, basally contiguous to aedeagus, distally broadened and with a few sensilla. Hypandrium large, oval, distally with a stout brownish submedian spine. Ventral fragma narrow triangular. p.f.=aBCDEfg₀HIkIMn. PI =2.0. Egg-guide pale yellow, slender, apically narrowing, ending in two stout black curved teeth, upper margin subapically with an oblique row of about four black pointed teeth, dorsal margin with a row of about ten minute pale sensilla-like teeth, basal isthmus thick, yellow, about one-third as long as lobe.

Holotype. ♂, Komi, Iriomote Is., Okinawa, 11-12 VII 1966, collected on fungi (Okada, Hihara).

Allotype. ♀, collected together with the holotype.

Paratypes. 3♂, 2♀, collected together with the holotype.

Relationships. Distinguished from the original form from Samoa in having slender aedeagus (much dilated in the original form), and hypandrium larger and nearly reaching the apex of the lateral arm of ventral fragma (small and ending far before the end of lateral arm in the original form).

It resembles the genus *Paramycodrosophila* in having deep second costal incision with veins above it black and swollen and anterior reclinate orbital situated close to proclinate.

Ungrouped species

D. spinipes Lamb, 1914: 336 (Seychelles), described by female specimens: fore tarsi with stout spines below, anterior reclinate orbital as long as other orbitals and equally apart from others.

Key to the Old World species of the subgenus

Hirtodrosophila

1. Wings with conspicuous large black markings..... 2.
- Wings without conspicuous large black markings. 5.
2. Acrostichal hairs in six or eight rows. Mesopleura dark brown, not sharply bicolorous. 3.
- Acrostichal hairs in four rows. Mesopleura sharply bicolorous, black above

- and white below. Mesonotum black, with five narrow yellowish white longitudinal stripes. Wings narrow, R_{2+3} remarkably curved to costa apically. 4.
3. Acrostichal hairs in eight rows. Wing markings roughly in three cross bands. *macromaculata*
 — Acrostichal hairs in six rows. Wing markings in two cross bands. *fascipennis*
4. Scutellum with pale stripes distally confluent. Second antennal joint yellowish brown. Periorbits black with inner margin silvery shining without constituting distinct stripes. *kirishimana*
 — Scutellum with pale stripes distally not confluent. Second antennal joint milky white, caudally black. Periorbits grey, with inner margin silvery striped. *hiharai*
5. Wings with second costal break deep, costal vein above the break black and thick. 6.
 — Wings not as above. 7.
6. Aedeagus distally dilated laterally. Hypandrium small. *unicolorata*
 — Aedeagus not dilated, thin. Hypandrium large, reaching apex of lateral arm of ventral fragma. *unicolorata exilis*
7. Mesonotum entirely black. 8.
 — Mesonotum not entirely black. 9.
8. Abdominal tergites entirely yellow. *seminigra*
 — Abdominal tergites entirely black. *latifrontata* var. *nigra*
9. Mesonotum with distinct black longitudinal stripes. 10.
 — Mesonotum without or with only diffuse dark stripes. 16.
10. Mesonotum with three broad black stripes. 11.
 — Mesonotum with only one broad black stripe. 12.
 — Mesonotum with four, six, or two black stripes. 13.
11. Scutellum black, 2-4 T not entirely black. *trivittata*, *trilineata*
 — Scutellum yellowish brown. *trivittata* var. *ussurica*
 — 2-4T entirely black, 5T anteriorly and posteriorly narrowly black, 6T with four black spots. *trivittata* var. *trifasciata*
12. Abdominal tergites with medially interrupted caudal black bands. *latifrontata* var. *jacobsoni*
 — Abdominal tergites entirely yellow. *astioidea*
13. Crossveins clouded. Buccal margin milky white. Mesopleura with a broad black longitudinal stripe above. *alboralis*
 — Crossveins clear. Buccal margin not white. Mesopleura without distinct black stripe. 14.
14. Mesonotum with four broad black longitudinal stripes, median pair somewhat broadened caudally. Scutellum entirely black. *quadrivittata*
 — Mesonotum with two, four or six narrow black longitudinal stripes. Scutellum paler than mesonotum at least apically. 15.
15. Caudal margin of male genital arch laterally with blunt triangular pale process. *sexvittata*
 — Caudal margin of male genital arch laterally with sharply pointed triangular black process. *sexvittata* f. *triangulata*

16. Front anteriorly much broader than length down middle. C-index about 1.0. Anterior scutellars much shorter than posteriors. 17.
 — Front anteriorly nearly as broad as length down middle. C-index usually more than 1.0. Anterior scutellars usually as long as posteriors..... 21.
17. Carina high, broad, and long. 18.
 — Carina not or only weakly developed. 20.
18. Mesopleura much paler than mesonotum. 19.
 — Mesopleura not distinctly paler than mesonotum. Abdominal tergites with caudal black bands narrow and sharply demarcated. *latifrontata yakuensis*
19. Abdominal tergites with caudal black bands broad and obscurely demarcated. *latifrontata*
 — Abdominal tergites dark brown, laterally paler. *innocsa*
20. Scutellum brown. *latifrontata* var. *sublineata*
 — Scutellum black. *latifrontata* var. *poecilogastra*
21. Mesonotum with more or less distinct diffuse dark longitudinal stripes. 22.
 — Mesonotum nearly unicolorous. 24.
22. Arista with four to six dorsal and one ventral branches beside a terminal fork. Third costal fringe on basal less than half. Abdominal tergites without trapezoid black markings. Male abdominal tergum apically yellow. *lundstroemi*
 — Arista with three dorsal and one ventral branches beside a terminal fork. Third costal fringe on basal about three-fifths. Abdominal tergum apically black. 23.
23. R_{4+5} and M distally convergent. 4V-index about 1.5. *oldenbergi*
 — R_{4+5} and M distally parallel. 4V-index about 2.1. *kangi*
24. Small species, about 1.5 mm in length. 25.
 — Larger species, more than 2.0 mm in length. 27.
25. Eyes bare. Third antennal joint very short. *spinipes*
 — Eyes with piles, sometimes bare. Third antennal joint longer than broad. 26.
26. Cheek broad, about one-fourth as broad as the greatest diameter of eye. *dentata*
 — Cheek narrow, about one-eighth as broad as the greatest diameter of eye. *dentata* var. *minuta*
27. Heavy costal fringe absent on the third costal section. *limbicostata*
 — Third costal section with heavy fringe. 28.
28. Dark brown to brownish black species. Mesopleura usually darker than mesonotum or with dark patches. 29.
 — Yellowish to pale brown species. Mesopleura usually paler than mesonotum. 36.
29. Acrostichal hairs in six rows. 30.
 — Acrostichal hairs in eight rows. 33.
30. Wings clear. Third costal fringe on basal two-thirds. 31.
 — Wings fuscous. Third costal fringe on basal half or more. 32.
31. C-index about 3.8. *tripartita*
 — C-index about 1.5. *nigripennis*
32. C-index about 2.5. Dorsal branches of arista about four beside fork.

- *pseudonokogiri*
 — C-index about 2.0. Dorsal branches of arista about five to seven beside fork.
 *sanyi*
33. Carina low and short. Third costal fringe on basal more than half. 34.
 — Carina broad and high. 35.
34. Abdominal tergites nearly entirely black or with black caudal bands medially
 projected to reach anterior margins. C-index about 2.5. Third antennal joint
 black with rather short hairs. *nokogiri*
 — Abdominal tergites with caudal black bands medially not projected forward.
 C-index less than 2.0. Third antennal joint pale brown, with long hairs.
 *mediohispidia*
35. Third costal fringe on basal less than half. Sterno-index about 0.8.
 *omogoensis*
 — Third costal fringe on basal half. Sterno-index about 0.5. *yakushimana*
36. Carina long and high or broad. 37.
 — Carina short and low. 41.
37. C-index about 1.5 to 2.0. 38.
 — C-index about 3.5. 39.
38. Third costal fringe on basal nine-tenths. Wings clear. *manonoensis*
 — Third costal fringe on basal five-sevenths. Wings slightly fuscous.
 *okadomei*
39. Third costal fringe on basal three-fifths. *asozana*
 — Third costal fringe on basal half or less than half. 40.
40. Wings extensively fuscous. Abdominal tergites with medially contiguous cau-
 dal black bands. Anterior reclinate orbital minute, about one-fifth as long as
 proclinate. *denticeps*
 — Wings only slightly fuscous. Abdominal tergites with medially interrupted
 caudal black bands. Anterior reclinate orbital about one-third as long as proclinate.
 *confusa*
41. Third antennal joint with short hairs. 42.
 — Third antennal joint with long hairs. 44.
42. Front anteriorly narrower than length down middle. Abdominal tergites with
 narrow dark caudal bands. *vina*
 — Front anteriorly as broad as length down middle. 43.
43. Abdominal tergites with trapezoid dark spots. *trapezina*
 — Abdominal tergites with medially interrupted caudal black bands.
 *hirtinokogiri*
44. Acrostichal hairs in eight rows. 45.
 — Acrostichal hairs in ten or twelve rows. 47.
45. Third costal fringe on basal nearly half. Male fore tarsi with long recurved
 hairs along inside. Aedeagus serrated laterally. 46.
 — Third costal fringe on basal four-fifths. Male fore tarsi without long recurved
 hairs. Aedeagus non-serrated. *novicia*
46. R_{2+3} nearly straight, not curved to costa at tip. *longecrinita*
 — R_{2+3} curved to costa at tip. *longecrinita* var. *curvinervis*
47. Thoracic pleura not paler than mesonotum. C1-bristles single. Third costal

- fringe on basal about two-thirds. Abdominal tergites with narrow medially not interrupted caudal black bands. *nudinokogiri*
 — Thoracic pleura much paler than mesonotum. 48.
 48. C1-bristle single. Abdominal tergites pale brown. *akabo*
 — C1-bristles two. Abdominal tergites with broad black medially not interrupted caudal bands. 49.
 49. Male abdominal tergum apically black. Genital arch caudoventrally pointed. Aedeagus mediolaterally inflated and hairy. *hirtinokogiri*
 — Male abdominal tergum apically yellow. Genital arch cephaloventrally pointed. Aedeagus laterally serrated. *seminokogiri*

Phylogenetic considerations

Throckmorton (1962) considered that the subgenus *Hirtodrosophila* is almost surely a polyphyletic group and is badly need of revision. The present phylogenetic considerations given below are still far from satisfaction because of poor informations especially of the male and female internal organs in many species in question. It was attempted, however, to give certain scope for the pseudophylogenetic relationships between species groups or subgroups, summarizing knowledges thus far accumulated.

The *quadrivittata* subgroup of the *quadrivittata* group is probably located near the root of *Hirtodrosophila* stock, having "primitive" features of simple banana-shaped testes, only a few small tite folds of ventral receptacles, and usually long anterior parameres which are separated from hypandria. The long lateral processes of aedeagus characteristic of this subgroup seem, on the contrary, to be of a "derived" pattern.

The *denticeps* group resembles *quadrivittata* subgroup in the long anterior parameres separated from hypandria and also in a tuft of heavy bristles at the posteroventral corner of male anal plates, differing, however, from the latter in having numerous irregular loose folds of ventral receptacles and numerous discal teeth on the egg-guide lobes, both representing patterns unique among the subgenus. The latter feature is frequently found in the genus *Scaptomyza* and seems to be primitive, related to the single hairy sternite-like egg-guide of *Leucophenga* and related genera. The leaf-mining habit of the larvae of *Drosophila denticeps*, mining leaves of *Chloranthus japonicus* Siebold (Okada and Sasakawa, 1956) also suggests close relations between *denticeps* group and *Scaptomyza*. The heavy bristles of male anal plates occur rather polyphyletically in several lines of genera *Drosophila* and *Scaptomyza*.

The *trivittata* subgroup of the *quadrivittata* group resembles *quadrivittata* subgroup as well as *denticeps* group in having heavy bristles of male anal plates on one hand and the *confusa* subgroup of *quadrivittata* group in small anterior parameres which are fused to hypandria, coiled testes, and in the occurrence of coiled element in the ventral receptacles on another hand.

The *hirticornis* group is certainly an offshoot of the *confusa* subgroup, similar to the latter in male anal plates without heavy bristles, testes coiled, and especially the ventral receptacles with characteristic proximal coils and distal folds examined

Table 1. Geographical distribution of the Old World *Hirtodrosophila* species.

	Africa	Europe	Siberia	Nepal	Japan	Korea	Okinawa
<i>denticeps</i>					X		
<i>tripartita</i>				X			
<i>quadrivittata</i>					X	X	
<i>omogoensis</i>					X		
<i>yakushimana</i>					X		
<i>hiharai</i>					X		
<i>fascipennis</i>					X		
<i>macromaculata</i>						X	
<i>kirishimana</i>					X		
<i>trivittata</i>		X	X		X	X	
<i>trilineata</i>						X	
<i>sexvittata</i>					X	X	
<i>alboralis</i>					X	X	
<i>confusa</i>		X			X	X	
<i>asozana</i>					X		
<i>limbicostata</i>				X			
<i>hirticornis</i>							
<i>dentata</i>							
<i>longecrinita</i>							X
<i>lundstroemi</i>		X					
<i>oldenbergi</i>		X					
<i>nokogiri</i>					X	X	
<i>pseudonokogiri</i>					X	X	
<i>kangi</i>						X	
<i>akabo</i>	X						
<i>sanyi</i>	X						
<i>nigripennis</i>						X	
<i>okadomei</i>					X		
<i>mediohispida</i>					X		
<i>nudinokogiri</i>					X		X
<i>seminokogiri</i>							X
<i>hirtinokogiri</i>							X
<i>manonoensis</i>							
<i>novicia</i>							
<i>vina</i>	X						
<i>trapezina</i>							
<i>latifrontata</i>					X		X
<i>astioidea</i>							
<i>seminigra</i>							X
<i>unicolorata</i>					X		
<i>innocua</i>							
<i>spinipes</i>	X						

Table 1. (contin.)

	Formosa	Java	Sumatra	Philip- pines	New Guinea	Samoa	Palau	Bonins
<i>denticeps</i>								
<i>tripartita</i>								
<i>quadrivittata</i>								
<i>omogoensis</i>								
<i>yakushimana</i>								
<i>hiharai</i>								
<i>fascipennis</i>								
<i>macromaculata</i>								
<i>kirishimana</i>								
<i>trivittata</i>	X	X						
<i>trilineata</i>								
<i>sexvittata</i>								
<i>alboralis</i>								
<i>confusa</i>								
<i>asozana</i>								
<i>limbicostata</i>								
<i>hirticornis</i>		X						
<i>dentata</i>	X		X					
<i>longecrinita</i>	X			X	X			
<i>lundstroemi</i>								
<i>oldenbergi</i>								
<i>nokogiri</i>								
<i>pseudonokogiri</i>								
<i>kangi</i>								
<i>akabo</i>								
<i>sanyi</i>								
<i>nigripennis</i>								
<i>okadomei</i>								
<i>mediohispida</i>								
<i>nudinokogiri</i>								
<i>seminokogiri</i>								
<i>hirtinokogiri</i>								
<i>manonoensis</i>						X		
<i>novicia</i>							X	X
<i>vina</i>								
<i>trapezina</i>	X							
<i>latifrontata</i>	X							
<i>astioidea</i>			X		X			
<i>seminigra</i>			X					
<i>unicolorata</i>						X		
<i>innocua</i>						X		
<i>spiniipes</i>						X		

so far (the proximal folds and distal coils in *D. nokogiri*, figured by the present author, 1956, is very probably a mistake and may be reversal). This pattern of ventral receptacles has been found frequently among the Hawaiian endemic species of Drosophilidae by Throckmorton (1966), and mainly from this reason he supposed the Eastern Asiatic, probably Japanese, origin of the Hawaiian endemic forms. The *hirticornis* group are prevalent in South-east Asia as well as in Japan, and it is plausible that the Hawaiian endemic species, having close connections to *hirticornis* and *denticeps* groups and also to *confusa* subgroup, had originated from or near their common stock which would have inhabited South-east Asia.

The *hirticornis* group is, furthermore, unique among the subgenus in the genital arches more or less sharply pointed below at heels, claspers longer than broad, egg-guides distally much pointed ending in two heavy isolated teeth and with a row of minute alveoli along ventral margin, and the third antennal joints provided with especially long hairs anteriorly from which the subgeneric name was derived.

The main character differentiations explained above can be summarized below, assuming each set of character states to have been differentiated from a state expressed by a large letter to that of small letter (not corresponding to the letters in p.f.)

- A. Aedeagus simple, without lateral branches → a. with long lateral branches.
- B. Testes simple, banana-shaped → b. with coils.
- C. Anterior parameres long, nearly as long as aedeagus and separated from hypandria → c. small and fused to hypandria.
- D. Ventral receptacles with only a few small tite folds → D'. loosely and irregularly folded → d'. with proximal coils and distal folds → d. with coils alone.
- E. Anal plates without a tuft of heavy bristles → e. with a tuft of heavy bristles caudoventrally.
- F. Genital arch not sharply pointed below → f. sharply pointed below.
- G. Claspers broader than long → g. longer than broad.
- H. Egg-guides apically not pointed → h. pointed sharply ending in two heavy isolated bristles.
- I. Egg-guides with numerous discal teeth → i. without numerous discal teeth.
- J. Third antennal joints without long hairs anteriorly → j. with long hairs anteriorly.

Arranging these alphabetical signs a formula expressing character differentiations can be obtained for each group or subgroup. The formula of hypothetical ancestor is ABCDEFGHIJ, and that of the Hawaiian Drosophilidae and the genus *Scaptomyza*, roughly summarized from Throckmorton (1962, 1966), Wheeler and Takada (1966), Takada (1965, 1966), and others, is in general AbCd'eFGHiJ or AbCd'eFGHIJ. Among New World species a complete set of the character differentiations concerned has been determined only in *D. duncani* Sturtevant, which shows a formula ABCd-EFGHiJ and thus seems to have its origin near the base of *Hirtodrosophila* stock.

<i>denticeps</i> group	AbCD'eFGHIJ
<i>quadrivittata</i> group	
<i>quadrivittata</i> subgroup	aBCDeFGHiJ
<i>trivittata</i> subgroup	AbcdeFGHiJ
<i>confusa</i> subgroup	Abcd'EFGHIJ

hirticornis group
hirticornis subgroup Abcd'Efghij
latifrontata subgroup Abcd'Efghij

In view of these character differentiations expressed by the formulae a supposed phylogenetic sequence of the Old World *Hirtodrosophila* with additional relation to *Scaptomyza* and Hawaiian endemic Drosophilidae in general can roughly be illustrated as in Fig. 72.

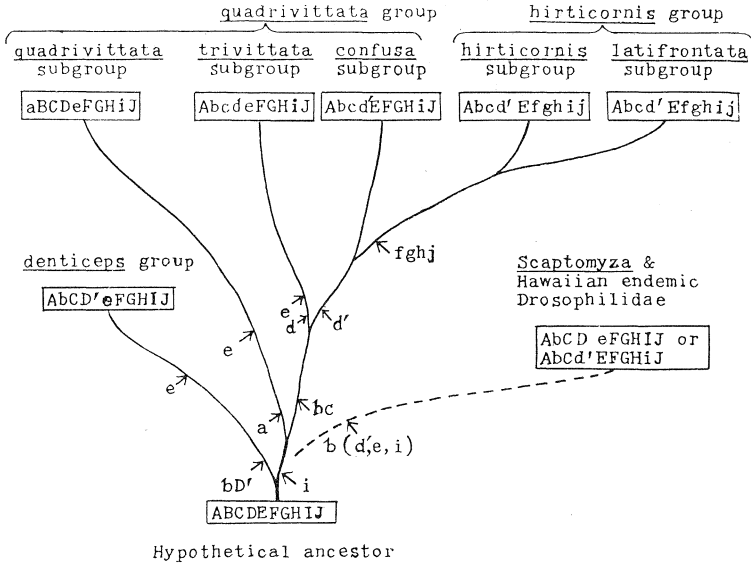


Fig. 72. A supposed phylogenetic differentiation of the subgenus *Hirtodrosophila* of the Old World in relation to the genus *Scaptomyza* and the Hawaiian endemic Drosophilidae (for explanation see text).

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