

#### ✓ IV. Descriptions of New Hawaiian *Drosophila*<sup>1,2</sup>

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The following ten new species belong in a variety of species groups and are being described at this time to provide names needed for some of the genetic studies being reported on in this bulletin.

The drawings have been prepared by Miss Geraldine Oda, University of Hawaii.

##### ✓ *Drosophila assita* n. sp. (figs. 1a-c)

Because of the all rufous thorax in combination with the presence of a large brown spot in the middle of cell R<sub>1</sub> and the tiny, seta-like preapical dorsal bristles of the front tibiae, this would run to couplet eight of our key to picture-winged species (Hardy and Kaneshiro, 1968: 174), and the species is closely related to *vesciseta* Hardy and Kaneshiro. It differs by having the labella and palpi all yellow, rather than black; by having a clump of long curled dorsal cilia on the front tibia of male and complete rows of anterodorsal and posterodorsal cilia extending almost the full length of the segment (fig. 1a), rather than lacking the long basal cilia and having only about four long cilia on the posterodorsal surface of front tibia; by having a row of six long anterodorsal cilia on front basitarsus, and with four or five short posterodorsal cilia on basal two-thirds, rather than having over a dozen long black cilia arranged over the dorsal surface as in *vesciseta*. The wing markings are very similar in the two, the brown spot at middle of cell R<sub>1</sub> is larger, however, in *assita*, being distinctly longer than the spot at apex of cell R<sub>1</sub>; in *vesciseta* the middle spot is shorter, less than the length of the apical wing spot. Compare figure 1b with figure 26b (Hardy and Kaneshiro, 1968: 232). The genitalia differ as shown in figure 1c, compared with figure 26c (*loc. cit.*).

**MALE. Head:** Proclinate bristles equal in size to anterior reclinates, the latter situated one-third to two-fifths the distance between the proclimates and upper reclinates. The upper bristle on the sides of the oral margin is strong, approximately equal in size to the upper reclinate bristles, the second bristle in each row is about half the length of the first. Head and appendages entirely yellow, except for a tinge of brown over the upper median portion of the occiput, extending over the ocellar triangle. The front is opaque, golden yellow over median portion, yellow along orbits. The arista has about ten dorsal and three to four ventral rays in addition to the small apical fork and the inner surface is setose almost to its base. Palpus with a single apical bristle, subequal to second bristle of vibrissal row. Labellum fleshy. **Thorax:** Yellow to rufous in ground color, tinged faintly

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with brown on each mesopleuron, upper pteropleuron, metapleuron and over the pleurotergon; also, the mesonotum with a faint tinge of brown down median portion. Two strong humeral bristles present, anterior dorsocentrals situated just slightly in front of a line drawn between second anterior supraalars. Scutellum pale yellow. *Legs*: Yellow except for a faint preapical tinge of brown on hind tibiae, similar in many respects to *punalua* with front femur slender, flattened ventrally. Tibiae and tarsi bearing long cilia as noted above and as in figure 1a. *Wings*: Subhyaline with the subbasal brown marginal spot not continuous to r-m crossvein; with the spot in middle of cell  $R_1$  continuous across cell  $R_3$  almost to vein  $R_{4+5}$  and distinctly longer than the spot at apex of cell  $R_1$ . Spot at apex of  $R_1$  continuing through upper two-thirds of cell  $R_3$ . Spot at apex of vein  $R_{4+5}$  rather

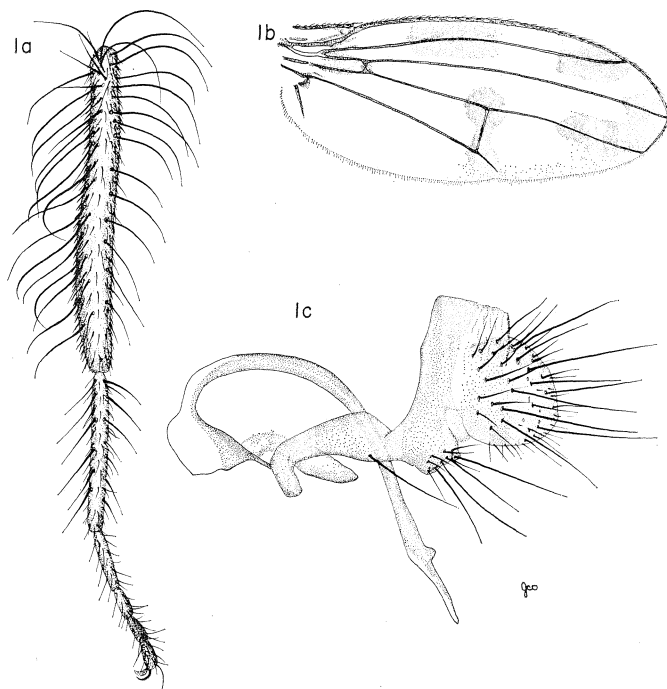


FIG. 1. *D. assita* n. sp. a, front tibia and tarsus of male; b, wing; c, male genitalia.

small not contiguous with other apical spots; also with a prominent spot at the apex of vein  $M_{1+2}$  and a large rather dumbbell spot over the m crossvein as in figure 1b. The r-m crossvein situated near basal one-fourth of cell 1st  $M_2$ . *Abdomen*: Largely subshining black in ground color covered with grey-brown pollen. First tergum largely yellow, with just a faint streak of brown through median portion and with posterolateral margins of terga 2-4 yellow, covered with yellow-brown pollen. Venter entirely yellow; genitalia are as in figure 1c.

Length: body and wings, 4.25-4.50 mm.

*FEMALE* unknown.

Holotype male and two male paratypes, Mt. House, above Naalehu, Hawaii, southern slopes of Mauna Loa, 2750', December 18-19, 1967, "L19" (H. L. Carson and K. Y. Kaneshiro).

Type in the B. P. Bishop Museum, paratypes in the collections of the U. S. National Museum and the University of Hawaii.

✓ *Drosophila attigua* n. sp. (fig. 2)

This is obviously a very primitive species and is externally indistinguishable from *D. primaeva* Hardy and Kaneshiro (1968: 258). It can be separated from *primaeva* by lacking setae on the aedeagus and by having setae on the parameres. It has been demonstrated that these are chromosomally distinct and this species is being discussed in a paper in this journal by Dr. H. L. Carson. For description and figures of *primaeva* refer to the above cited reference. The *primaeva* complex of species is recognized by the lack of ciliation or ornamentation on the male legs, by having a black sclerotized rim on each labellum in combination with the predominantly rufous body, the evenly yellow-brown tinged wings, slightly darker over the m crossvein and the large size, compared to most rufous species which lack ornamentation on the legs.

fig. 2

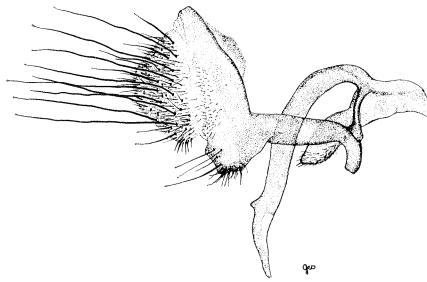


FIG. 2. *D. attigua* n. sp., male genitalia.

*FEMALE.* Not distinguishable from *primaeva*.

Holotype male, allotype female and 32 paratypes, 19 males, 13 females, Mt. Kahili, Kauai, 2500', March 19–20, 1968, "L41C21" (J. P. Murphy).

Type and allotype in the B. P. Bishop Museum, paratypes in the collections of the U. S. National Museum, British Museum (Natural History), and the University of Hawaii.

✓ *Drosophila claytonae* n. sp. (figs. 3a–c)

This species is almost identical with *D. limitata* Hardy and Kaneshiro in most respects but is differentiated by having the brown markings on the mesonotum semi-shining, not having a dense covering of yellow-grey over the mesonotum almost obscuring the brown color; also by having the sternopleura largely yellow, with the bristles situated on a yellow background, rather than sternopleura being mostly brown to black with the bristles situated on a brown background. The subbasal wing spot is pale brown in *limitata*, also the wings in *claytonae* are more slender and elongate, nearly three times longer than wide, rather than approximately two and one-half times longer than wide. The wing markings are very similar in the two (fig. 3a, c.f. with fig. 8b, Hardy and Kaneshiro, 1968: 195). The ornamentation of the front legs appears to be the same in both species, both are

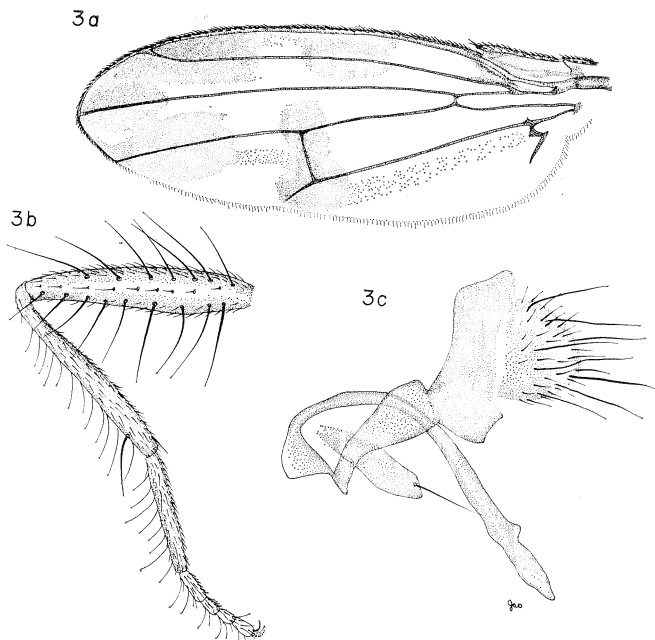


FIG. 3. *D. claytonae* n. sp. a, wing; b, front leg of male; c, male genitalia.

characterized by having an abundance of rather short cilia over the dorsal and anterodorsal portion of the front tibia and basitarsus; also the preapical dorsal bristle of the tibia is strong, extending almost twice its length beyond apex of tibia (fig. 3b). The genitalia are as in figure 3c. Otherwise fitting the description of *limitata* refer to Hardy and Kaneshiro (*op. cit.*: 194).

Holotype male, allotype female and nine paratypes, five males, four females, Upper Olaa Forest, Hawaii, 4,000', July 8-9, 1968, F<sub>1</sub> generation, "L89L1" (F. E. Clayton).

Type and allotype in B. P. Bishop Museum. Paratypes in the collections of the U. S. National Museum, British Museum (Natural History) and the University of Hawaii.

It should be noted that some specimens of *claytonae* show indications of spurs developed along vein  $M_{1+2}$ , the obvious beginning of the extra crossvein characteristic of the "idiomyia" group of species. These short spur veins are also found frequently in specimens of *limitata*.

It is a pleasure to name this species after Dr. Frances E. Clayton, University of Arkansas, whose contributions in cytogenetics and laboratory rearing techniques have been most valuable to our study of the Evolution and Genetics of Hawaiian drosophilids.

#### *Drosophila hystricosa* n. sp. (figs. 4a-d)

Because of the dark brown to black body, head and appendages, the presence of ciliation on the front basitarsi and lack of markings in the wings, this species resembles *D. caccabata* Hardy. The two are not related, however, and the resemblance is superficial. It differs from *caccabata* by having the mouthparts

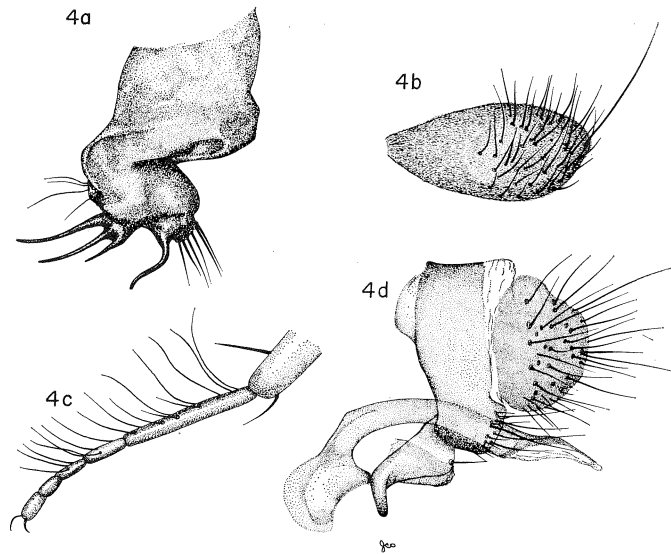


FIG. 4. *D. hystricosa* n. sp. a, mouthparts of male; b, palpus; c, apex of front tibia and front tarsus of male; d, male genitalia.

highly modified, the labella spinose around the margins, rather than mouthparts not ornate; by the dorsal cilia on front tarsi more elongate and much different in arrangement as in figure 4c, compared with figure 55a (Hardy, 1965: 197); by having the palpi densely setose dorsally; three ventral rays on the arista rather than two, and the anterior reclinate bristles smaller than proclimates. *D. hystricosa* is more closely related to *biseriata* Hardy, from Oahu, but that species differs by having the lower half of the front, the face, genae, palpi, and two basal segments of antennae yellow, rather than black; each labellum with a series of four to five black spines on upper apical portion (ref. fig. 45a, Hardy, 1965: 180) rather than with a complete border of spines (fig. 4a); by having the legs yellow, rather than front femora brown; by the cilia on front tarsi being less numerous, compare fig. 45b (Hardy, 1965: 180) with figure 4c.

**MALE.** Predominantly dark brown to black species, grey-brown pollinose, subshining. **Head:** Higher than long, completely dark colored, mostly black with lower portion of front, median portion of face, and lower portion of occiput tinged with rufous in the ground floor. Face raised down the median portion with antennal furrows rather well developed. Sides of face converging below, narrowest in area occupied by oral vibrissae. The vibrissae small, hair-like and uniform in size. Clypeus and mouthparts dark brown to black. Palpi densely setose dorsally (fig. 4b). Labella with strong spines around margins as in figure 4a. Anterior reclinate bristles of front slightly shorter than proclimates and situated almost opposite the latter. Arista with six dorsal and three ventral rays in addition to apical fork. **Thorax:** Entirely dark colored, mesonotum rather densely grey-brown pollinose but with the ground color slightly shining through. Pleura faintly tinged with rufous in the ground color. Two pairs of well-developed humeral bristles. Anterior dorsocentral bristles about three-fifths as long as posterior pair and situated approximately opposite the second pair of supraalars. Halteres yel-

low. *Legs*: Coxae and front femora brown, middle and hind femora yellow, tinged lightly with brown. Tibiae and tarsi yellow. Front tibia lacking long cilia but with numerous erect hairs over the posterodorsal and posterior surfaces, these hairs are equal to just slightly longer than the width of the tibia. Front tarsi with long, slightly curled cilia, arranged down the dorsal surface in three irregular rows from the base of tarsus to apex of the third tarsomere (fig. 4c); fifteen or more long hairs on the basitarsus. Basitarsus just slightly over half as long as tibia and over two times longer than second tarsomere, preapical dorsal bristle small, extending approximately to apex of segment. *Wings*: Subhyaline, lacking dark markings. Costal fringe extending one-third to two-fifths the distance between apices of veins  $R_{2+3}$  and  $R_{4+5}$ . Fourth costal section about one-sixth as long as third. Last section of vein  $M_{1+2}$  one-half longer than penultimate section. *Abdomen*: Entirely dark brown to black, subshining. Genitalia as in figure 4d.

Length: body and wings, 3.6 mm.

*FEMALE* unknown.

Type male and four paratypes, Keanae Valley, Maui, 1500', July 21, 1965, associated with *Clermontia kakeana*, "C134.2" (H. L. Carson).

Type in the B. P. Bishop Museum. Paratypes in the collections of the U. S. National Museum and the University of Hawaii.

✓ *Drosophila kambysellisi* n. sp. (figs. 5a-d)

This species is very close to *mimica* Hardy, occupies the same habitat, and has probably been confused with *mimica* in the field in some situations. The two are similar in most respects, but *kambysellisi* is slightly smaller, and the mesonotum, scutellum and front are dark brown to black, rather than reddish brown. *D. kambysellisi* is readily differentiated by having the anterior reclinate bristles

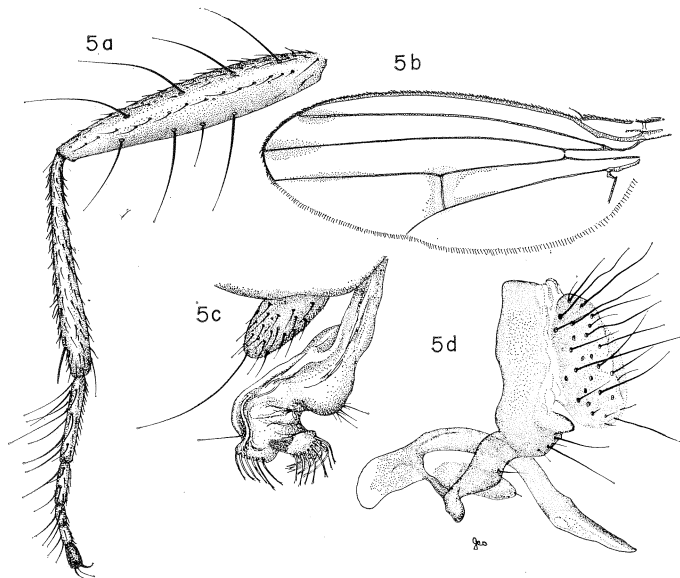


FIG. 5. *D. kambysellisi* n. sp. a, front leg of male; b, wing; c, mouthparts of male; d, male genitalia.

situated opposite the proclimates rather than distinctly in front of the latter; by having the palpi broad, not long and slender; by having long curved spines along the apex of the labellum and with the apex drawn out into a slender process (fig. 5c), compare with figure 139a (Hardy, 1965: 366); also by having the anterior dorsocentrals moderately developed, not rudimentary.

This species breeds in the rotting leaves of *Pisonia* and to date has been collected only at Bird Park, Hawaii National Park, Kilauea (Volcano), Hawaii, where it lives in close association with *mimica* but it has not been recorded to date from other areas where *mimica* occurs. According to Dr. M. P. Kambysellis and as discussed in his paper currently in preparation, this species has an average of only seven ovarioles per ovary in the female, whereas *mimica* has fourteen.

*MALE. Head:* Front largely brown to black in ground color, rather densely silvery pubescent, yellow on the anterior and anterolateral margins. Front broad, compared to its length, measured from median ocellus to anterior median margin the front is two times wider than long. Vertex and upper median portion of occiput dark brown to black, grey pollinose. Remainder of head yellow, except for a faint tinge of brown on lower portion of face. The sides of face are convergent basally, and the median portion is slightly raised, the antennal furrows are shallow. Oral margin with four or five distinct bristles in a row just above genal bristle and approximately equal in size to the genal bristle; the upper vibrissae are represented by short hairs. Frontal bristles are as noted in introduction above. Third antennal segment yellow-brown, second yellow, brown dorsally. Arista with seven dorsal and three ventral rays in addition to the apical fork and with setae on the apical two-thirds of the inner surface. Mouthparts yellow. Labella rather slender, with strong curved yellow spines at apices. Apical bristle of palpus long, yellow, equal to or slightly longer than the segment (fig. 5c). *Thorax:* Dark brown to black on dorsum, pale yellow on pleura. Postscutellum and metanotum yellow-brown, covered with grey pollen. Two humeral bristles present. Anterior dorsocentrals about equal in size to upper humeral bristle and situated opposite second pair of supraalar bristles. *Legs:* Entirely pale yellow. Front tibiae lacking ornamentation, the preapical dorsal bristle moderately developed, extending approximately to apex of segment. Front basitarsus and second tarsomere with numerous moderately long anterior cilia arranged irregularly in two rows (fig. 5a). *Wings:* Subhyaline, very similar to those of *mimica*, but lacking distinct infuscation over r-m crossvein. With a faint brown infuscation over m crossvein, and often with faint indications of brown infuscation at apices of veins  $R_{2+3}$  and  $R_{4+5}$  (fig. 5b). Costal fringe extending half the distance between  $R_{2+3}$  and  $R_{4+5}$ . *Abdomen:* First tergum and narrow base of second yellow, remainder of abdomen dark brown to black covered with brown pollen. Genitalia are as in figure 5d.

Length: body, 2.7 mm.; wings, 2.9 mm.

*FEMALE* unknown. The females have not been associated with the males and are probably being confused with *mimica*.

Holotype male and thirteen male paratypes from Bird Park, Kilauea (Volcano), Hawaii, type collected May 21, 1968 (M. P. Kambysellis), paratypes collected: same data as type, and June 2, 1968, same collector as type, also July 1963, "G36A", (W. B. Heed) and three specimens collected by L. Throckmorton, no date given.

Type and some paratypes in the B. P. Bishop Museum. The remainder of the paratypes in the collections of the U. S. National Museum, British Museum (Natural History), and the University of Hawaii.

This species is named after Dr. M. P. Kambyssellis, Harvard University, whose ovarian transplantation and ovarian development studies have made very important contributions to our knowledge of the Hawaiian *Drosophila*.

***Drosophila murphyi* n. sp. (figs. 6a-c)**

This species runs to couplet 16 of our key to the picture-winged species (1968: 175), and is very closely related to *orphnopeza* Hardy and Kaneshiro. It is differentiated by having the front basitarsus of the male very densely ciliated on the dorsal surface (fig. 6a), the cilia are arranged in numerous rows covering the entire dorsal surface of the basal two tarsomeres. Rather than, as in *orphnopeza*, with approximately a half dozen pairs of setae or cilia arranged on the dorsal surface of the tibia. *Wings*: As in figure 6b. The male genitalia are very similar in the two but can be differentiated by the shape of the parameres, c.f. figs. 6c and 13c (Hardy and Kaneshiro, 1968: 205). Otherwise fitting the description of *orphnopeza* for both sexes.

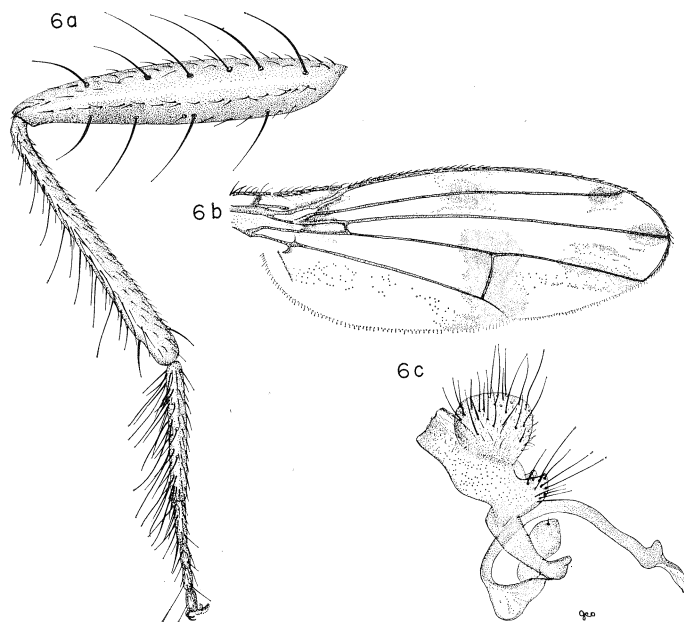


FIG. 6. *D. murphyi* n. sp. a, front leg of male; b, wing; c, male genitalia.

Type male and allotype female, Pololu Stream, North Kohala, Hawaii, 3300', June 12, 1968, "L79G1", (H. L. Carson). Twenty paratypes, 15 males, five females from the following localities on the Island of Hawaii: same as type; Honau-nau Forest Reserve, January 31, 1967 (K. Y. Kaneshiro); OIaa Forest Reserve, September 3, 1965, 3775' (J. K. Fujii and F. Kamiya); Awini Trail, 2200', August 2, 1966 (D. E. Hardy); Awini Camp, August 2, 1966 (J. K. Fujii); and East of



Puu Ohu, South Kohala Mountains, 3500', October 26, 1967 (J. P. Murphy). This species has been reared from rotting bark of *Cheirodendron* sp.

Type, allotype and some paratypes in the B. P. Bishop Museum, remainder of paratypes in the collections of the U. S. National Museum, British Museum (Natural History), and the University of Hawaii.

This species is named after Mr. John P. Murphy who has been in charge of the laboratory and the field coordinator for the evolution and genetics project since 1965. He has been very active in field work and has made very important contributions to this project.

***Drosophila ocellata* n. sp. (figs. 7a-e)**

Because of the ornamentation of the front tibiae of the male (presence of a clump of long black cilia at base of segment and numerous cilia extending most of the length) this would appear most closely related to *punalua* Bryan and related species. It is readily differentiated from other known species in this complex by the strange development of the male palpi and by the presence of a large, round, dark brown spot on vein  $M_{1+2}$  beyond the m crossvein (fig. 7d), also the ciliation on the front tibiae and tarsi differs as do the thoracic markings and the male genitalia.

**MALE. Head:** Front opaque yellow-brown, more distinctly tinged with yellow in the ground color along the orbits. Remainder of head yellow, except that the upper median portion of the occiput and the vertex are tinged with brown. Face slightly raised down median portion and gently produced on lower margin. Procli-

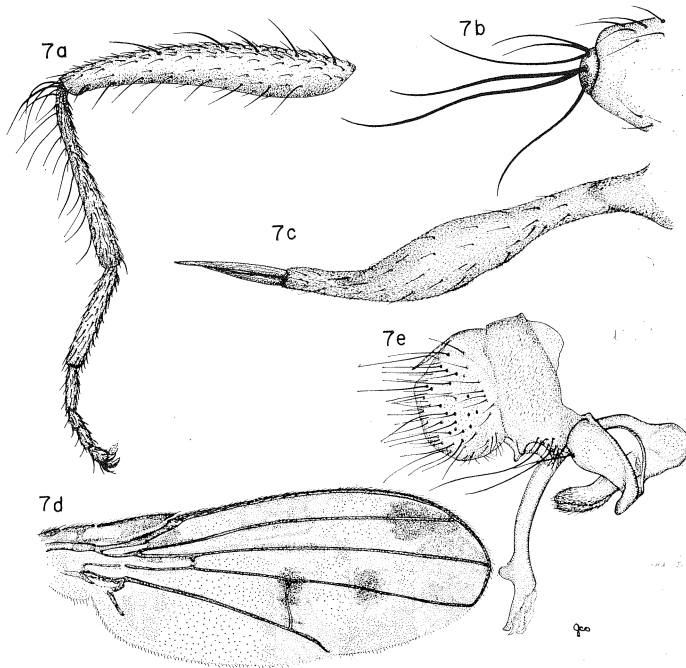


FIG. 7. *D. ocellata* n. sp. a, front leg of male; b, base of front tibia, dorsal; c, palpus; d, wing; e, male genitalia.

nate bristles small, scarcely larger than the post-ocular setae on the occiput, and situated very near middle of front, measured from lower ocellus to anteromedian margin. Anterior reclinate bristles tiny, about two-thirds as long as proclimates and situated approximately two-fifths the distance from the proclinate to upper reclimates. Ocellar bristles about equal in size to upper reclimates. One strong bristle developed at upper edge of each vibrissal row, this is equal in size to the post-ocular bristles. Genal bristles small, approximately equal in size to the proclinate bristles of the front. Mouthparts yellow. Palpi elongate, terminating in a sharp point which is formed by two or three closely appressed bristles at the apex (fig. 7c). The palpus is very sparsely short setose. Mentum with six or eight moderately long hairs just before apex. *Thorax*: Yellow in ground color, marked with brown on the pleura and on the dorsum. Mesopleura dark brown on upper two-thirds; sternopleura each with a brown marking on upper median portion and metapleura largely brown. Each humerus with a prominent brown spot in upper median portion and mesonotum with three indistinct broad brown vittae extending most of the length. The mesonotum is rather densely yellow-brown pollinose, partially obscuring the ground color. Scutellum dark brown, except for a yellow spot on each basolateral margin. Anterior dorsocentral bristles situated well behind anterior supraalar. Two strong humeral bristles present. *Legs*: Yellow with a tinge of brown before apices of tibiae. Front femora distinctly contorted, swollen dorsally, flat on the ventral surface. Tibia with a clump of long black, dorsal setae at base and a row of about fourteen anterior cilia extending from base to about apical fourth of segment (fig. 7a) and about four long curved basal bristles on tibia (fig. 7b); no preapical dorsal bristles present. Tarsi not ornate, lacking long cilia. *Wings*: Lightly fumose with a subbasal brown spot at apex of second costal cell extending to base of vein  $R_{4+5}$ ; a less distinct brown marking near middle of cell  $R_1$  extending through cell  $R_3$  into the upper portion of cell  $R_5$ ; with the apical portions of veins  $R_{2+3}$ ,  $R_{4+5}$  and  $M_{1+2}$  covered by dark brown spots, these are at least partially convergent in the apical portion of cell  $R_3$ . The m crossvein covered by a large brown spot and a large round spot is situated on vein  $M_{1+2}$  beyond m crossvein as in figure 7d. The r-m crossvein is situated at about basal one-third of cell 1st  $M_2$ . *Abdomen*: Dark brown to black covered with brown pollen. Genitalia are as in figure 7e. The shape of the aedeagus, hypandrium and the presence of setae on the parameres and inner surface of the hypandrium are characteristic of the *paucipuncta* subgroup (Kaneshiro, same bulletin).

Length: body, 4.5–4.7 mm.; wings, 4.7–5.0 mm.

*FEMALE*. Fitting the description of the male in most respects. The proclinate bristles, however, are well developed, equal in size to the post-ocular bristles. The palpi are normal in development, each has a small black apical bristle. The front legs are normal in development.

Holotype male, allotype female and 45 paratypes, 26 males, 19 females, Mt. Kualapa, Kauai, 1400', March 27–28, 1968, "L45" (K. Y. Kaneshiro and H. L. Carson).

Three male paratypes, same data as type. This species has been reared from rotting *Pisonia* sp. ? bark.

Type, allotype and some paratypes in the B. P. Bishop Museum. Remainder

of the paratypes in the collections of the U. S. National Museum, British Museum (Natural History) and the University of Hawaii.

*Drosophila ornata* n. sp. (figs. 8a-e)

This species belongs in the *adiastola* complex because of the broad, flattened, densely setose front basitarsus of the male, the strong, curved, preapical posterior bristle of front femur, and by the pattern of the wing markings. It differs from other species in this complex by having the wings hyaline with numerous brown to black marks extending across cells  $R_1$ ,  $R_3$ ,  $R_5$  and 1st  $M_2$  (figs. 8c-d), rather than having the wings brown with rather large hyaline spots as in other species of this complex; by the densely setose front tibia (fig. 8a); by having dense yellow hair on the apical margin of each labellum of the male (figs. 8b), as well as by genital characters (fig. 8e).

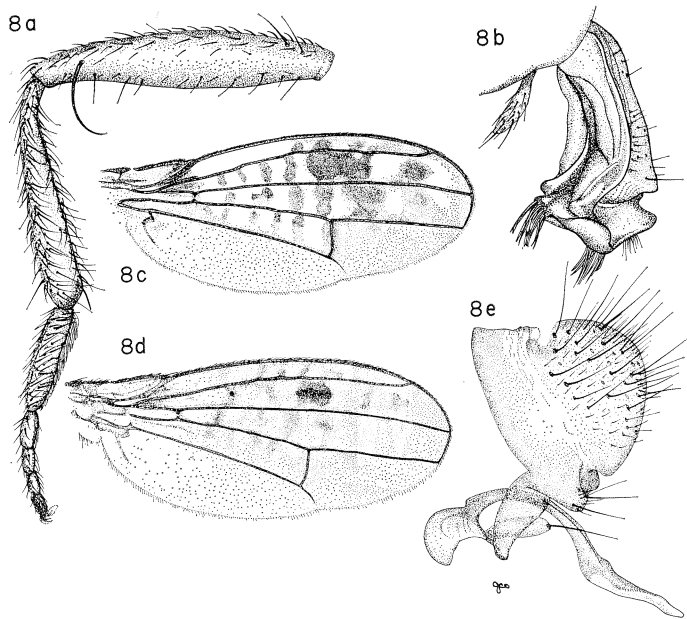


FIG. 8. *D. ornata* n. sp. a, front leg of male; b, mouthparts of male; c, wing of male; d, wing of female; e, male genitalia.

**MALE. Head:** Front opaque golden, tinged with brown, opaque yellow along the orbits. The remainder of head is yellow except for reddish brown eyes with a faint tinge of brown on the vertex and upper median portion of occiput. Face yellow-white, very slightly raised down median portion and with shallow antennal furrows. Oral margin lacking distinct bristles, with fine black hairs on upper portion, these are arranged in two irregular rows. Anterior reclinate bristle thin, rather hair-like, scarcely over four-fifths as long as proclinate bristle and situated about two-fifths the distance from proclinate to upper reclinate. Antennae entirely yellow, second segment with one moderately strong dorsal bristle; this is almost equal in size to the genal bristle, also with two to three shorter dorsal bristles. The arista has eight dorsal and three ventral rays in addition to the apical

fork. Occiput rather densely black setose on sides, having two to four irregular rows in addition to the ocular row. Mouthparts entirely yellow. Palpi approximately four times longer than wide, and with numerous black setae on the apical portion and with a dense clump of yellow setae on the median portion of the inner edge of each palpus. One moderately small apical bristle present, this is approximately half the length of the proclinate bristle of the front. Mentum with pale thin hairs scattered over the apical half. Mouthparts large and conspicuous. Mentum and labella equal or slightly longer than the height of the head. Mentum with sparse scattered setae almost the entire length (fig. 8b). Labella with densely placed brownish yellow hairs at the apical margins. *Thorax*: Yellow in ground color, tinged with brown over dorsum and over upper half of each pleuron. With a pair of rather indistinct yellowish vittae extending down mesonotum from anterior margin in line with dorsocentral bristles and extending almost to the posterior dorsocentrals. Scutellum opaque brownish yellow on the disc, yellow on the sides and venter. Postscutellum and metanotum yellow. Anterior dorsocentral bristles situated distinctly behind a line drawn between anterior supraalar. *Legs*: Yellow except for the dark brown to black apical tarsomeres. Front legs as noted above and as in figure 8a. The preapical posterior bristle of the femur is approximately equal in length to the basitarsus. The tibiae are flattened laterally and densely covered with erect hairs over the entire posterior surface. Also, the posterior surface of the basitarsus is densely haired. The preapical dorsal bristle of front tibia is approximately equal in length to the hairs on the posterior surface. *Wings*: Predominantly subhyaline with numerous dark brown to black marks across the cells as noted above (fig. 8c), also with a brown to dark brown streak extending from apical portion of second costal cell over the r-m crossvein into the upper portion of base of cell 1st  $M_2$  and with extreme basal portion of the wing tinged yellow-brown. Also the cells in the posterior portion of wing are light fumose. The r-m crossvein is situated at the basal one-fifth of cell 1st  $M_2$ . *Abdomen*: Opaque brown, tinged with yellow on the first tergum and on basal portion of second. Genitalia are as in figure 8e. The shape of the aedeagus would definitely place this species in the *adiastola* subgroup. The parameres are cylindrical with elongate apical sensilla.

Length: body and wings, 6.25–6.5 mm.

*FEMALE*. Similar to the male except for differences in wing markings as in figures 8c and 8d, and for secondary sexual characters. Also one prominent oral bristle is developed, equal in size to the proclinate bristle of the front. Ovipositor rather short, the blades slender.

Holotype male, Kanaele Swamp, Kauai, 2500', March 19–20, 1968, "L41" (H. L. Carson). Allotype female, Pouli Stream, Hanalei Distr., Kauai, March 13, 1968, "L37G17" (H. L. Carson). Fifteen paratypes: same as type and allotype.

Type and some paratypes in the B. P. Bishop Museum. The remainder of the paratypes in the collections of the U. S. National Museum, British Museum (Natural History), and the University of Hawaii.

#### *Drosophila paenehamifera* n. sp. (figs. 9a–h)

Fitting in the *varipennis* complex which is differentiated by the presence in the male of a large preapical dorsal hook on the front tibia, by the highly modified

mouthparts (figs. 9b-c), by the strongly arched costal margin (fig. 9f), the peculiar spatulate aedeagus (fig. 9h), as well as by other characteristics. Refer to description and figures of *hamifera* Hardy and Kaneshiro (1968: 254, figs. 35a-h). *D. paenehamifera* is differentiated by having only four or five anterodorsal cilia on the front tibia just beyond the base of the segment and one or two anterodorsal cilia near the hook (fig. 9a), rather than having a continuous row of anterodorsal cilia from base to the hook. The costal margin is not so highly arched in *paenehamifera* as in *hamifera* (fig. 9f compare with fig. 35e, *loc. cit.*). The wing markings are distinctly different in the two. In *paenehamifera* the wings are predominantly yellowish to brown. The r-m crossvein is situated beyond the middle of cell 1st  $M_2$  rather than slightly before the middle as in *hamifera*. The hyaline mark in the middle of the wing from the costa through cell  $M_2$  is much narrower, not so well developed in *paenehamifera* not extending to base of cell  $R_1$ , also the apical half of the wing lacks hyaline markings. In *hamifera* a prominent hyaline

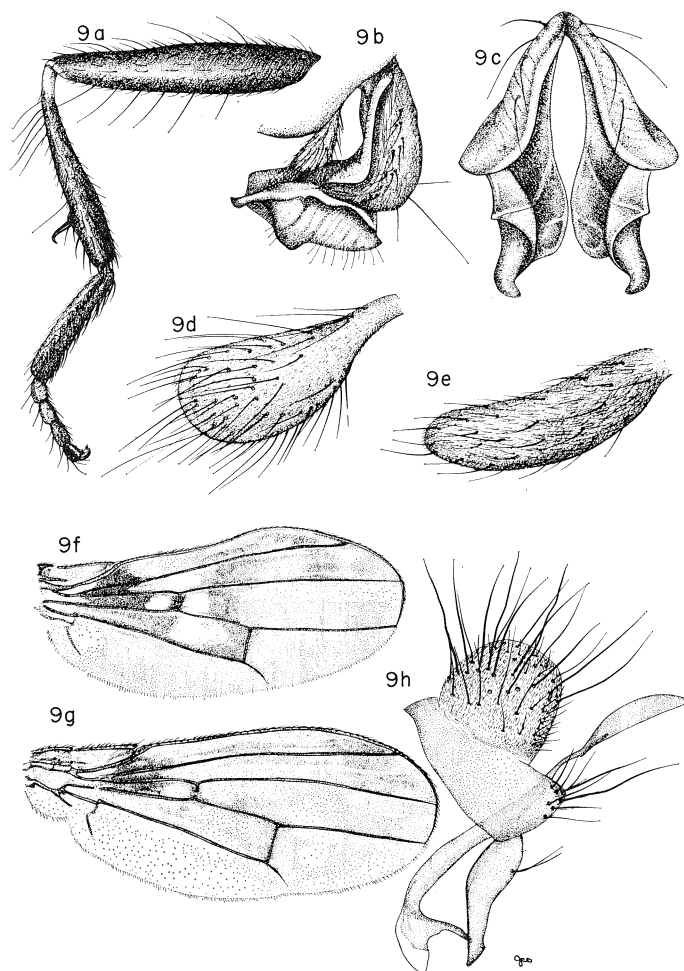


FIG. 9. *D. paenehamifera* n. sp. a, front leg of male; b, mouthparts of male, lateral; c, mouthparts, ventral; d, male palpus; e, female palpus; f, male wing; g, female wing; h, male genitalia.

band extends transversely from apex of cell  $R_1$  through most of cell 2nd  $M_2$  and the extreme apex of the wing, through cells  $R_3$  and  $R_5$ , is hyaline (refer to figure 35e, *loc. cit.*).

In other respects, fitting the description of *hamifera*, the mouthparts are as in figures 9b-d, the palpi are enlarged, clavate; the wings are as in figure 9f, and the genitalia are as in figure 9h.

*FEMALE*. Fitting the description of *hamifera* except that the r-m crossvein is situated at the middle of cell 1st  $M_2$  rather than slightly before the middle, the costa is not arched and the markings are slightly different (fig. 9g), also the palpus is more elongate and slender (fig. 9e).

Holotype male, Hanaula, West Maui, 4000', May 7-8, 1968, "L61" (H. L. Carson). Allotype female, same data, "L61B12" (K. Y. Kaneshiro). Seven paratypes, four males, three females, same data as type and allotype (collected by H. L. Carson, K. Y. Kaneshiro, and J. P. Murphy).

Type and allotype in the B. P. Bishop Museum. Paratypes in the collections of the U. S. National Museum, British Museum (Natural History), and the University of Hawaii.

✓ *Drosophila turbata* n. sp. (figs. 10a-c)

This species fits in the *hawaiiensis* complex by having a transverse band across the wing at level with the m crossvein (fig. 10c), it is closely related to *recticilia* Hardy and Kaneshiro from Maui and is the species keyed in couplet 44 (1968: 178) with *recticilia* as "n. sp. or pale specimens of above" from Oahu. After examining further specimens from Oahu, it is obvious that these are distinct species.

*D. turbata* specimens are smaller than *recticilia*; the mouthparts and legs are entirely yellow except for brown rim on labella and a tinge of brown on the sub-

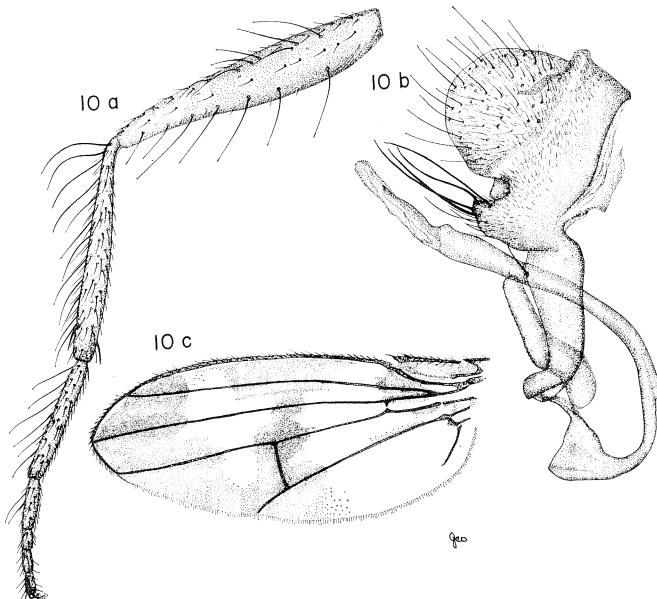


FIG. 10. *D. turbata* n. sp. a, front leg of male; b, male genitalia; c, wing.

apical and the subbasal portions of the hind tibia. In *recticilia*, the palpi and labella, also the front coxae and femora are brown. The ornamentation of the front legs are very similar in these species, the females have previously been confused with *gradata* Hardy and Kaneshiro. The two species are very similar in coloration and wing markings. The males are readily differentiated by having the front tibia ciliated over the entire length, and by the cilia on the front basitarsus being shorter, all approximately equal in length (fig. 10a); as well as by genital characters.

*MALE. Head:* Front opaque brown to black, tinged with rufous in the ground color of the lower half and with a narrow streak of yellow extending from median ocellus over middle part of the face ending opposite or just slightly beyond proclinate bristles. Eye orbits yellow to rufous in ground color, densely yellow-grey pollinose. Vertex and upper median occiput black in ground color, covered with grey pollen. Remainder of the head yellow-white, except for reddish brown compound eyes. Second and third antennal segments largely brown to black, with yellow on apex and ventral portion of second. Arista rather short, scarcely one-third longer than combined length of antenna, with six dorsal and three ventral rays in addition to apical fork and with inner surface setose almost to base. Palpi and mouthparts yellow except for a narrow rim of brown on each labellum. In *recticilia* the rim is broadly and conspicuously blackened. Palpus with two hair-like apical bristles, the longest is approximately equal to upper bristle of vibrissal row and the shorter of the two equal to secondary bristle of vibrissal row. Mentum yellow-brown, setose only on apical portion. Anterior reclinate bristle two-thirds to three-fourths as long as the proclinate and situated distinctly above the latter.

*Thorax:* Largely yellow in ground color, covered with yellow-grey pollen, with a pair of dark brown to black submedian vittae extending the entire length of segment, with a prominent black spot on each side just in front of suture and a brown to black vitta extending from behind suture to a level with the posterior dorso-central bristle. The two brown vittae are separated on each side by a very narrow, somewhat indistinct, yellow line extending down dorsocentral row. The lateral margins of mesonotum are broadly yellow. Each humerus is yellow except for a small brown mark on upper hind margin. Scutellum pale yellow. Sternopleura largely brown to black bordered with yellow and with a dark brown to black mark in upper portion, a small spot on pteropleuron and with a faint tinge of brown on lower portion of each metapleuron. The metanotum is polished dark brown to black, densely covered with grey pollen, also the postscutellum is yellow-brown. Two well developed humeral bristles present. Anterior dorsocentral bristles almost in line with second pair of anterior supraalars. Halteres, pale yellow.

*Legs:* Yellow except for preapical and prebasal tinges of brown on hind tibiae. Front tibia with two rows of moderately long anterodorsal cilia extending the whole length of segment (fig. 10a) and preapical dorsal bristle rather small, scarcely differentiated from surrounding setae. Front basitarsus with fourteen to sixteen long cilia arranged in pairs down anterodorsal surface, the entire length of the tarsomere. Second tarsomere with two anterodorsal cilia.

*Wings:* The subbasal spot through apex of second costal cell extends indistinctly to r-m crossvein, but does not enclose the crossvein. The transverse band across middle of wing at level with m crossvein is broad in the middle of cell  $R_1$ , becoming narrower in

cells  $R_3$  and  $R_5$  (fig. 10c). The brown mark in apex of wing is continuous through the cells, not interrupted. The r-m crossvein situated near basal one-fourth of cell 1st  $M_2$ . The costal fringe extends approximately two-thirds the distance between the apices of veins  $R_{2+3}$  and  $R_{4+5}$ . In the discussion of *recticilia* (*loc. cit.*) it was stated in the key that in this species the costal fringe extends one-half the distance between apices of vein  $R_{4+5}$  and  $M_{1+2}$ . This was an error, it should have read between  $R_{2+3}$  and  $R_{4+5}$ , and it is so stated under the description of that species. After examining further specimens we find this character to be variable and apparently of no value. *Abdomen*: Dark brown to black down median portion and on posterior and lateral margins of terga, leaving a large basal lateral yellow spot on each side of each terga. These areas are yellowish pollinose. The brown areas are brown pollinose. The genitalia are as in figure 10b. The narrow and elongate aedeagus with an insignificant preapical protuberance would definitely place this species in the *hawaiiensis* subgroup. The parameres are elongate with minute apical sensilla.

Length: body and wings, 3.5 mm.

*FEMALE*. Fitting the description of the male except for secondary sexual characters. The palpus has only one apical bristle, this is approximately equal in size to the second bristle of the oral margin.

Holotype male, Peacock Flat, Oahu, 1400', May 23, 1968, "L67" (H. L. Carson). Allotype female, Opaaula, Oahu, July 1964, "HN91" (W. B. Heed).

Nine paratypes, eight males, one female, from the following localities on Oahu: Trail to Kaau Crater, 1300', May 20, 1968, "L65" (M. P. Kambyzellis); Mt. Kaala, June 11, 1950 (No collector given—probably Gordon B. Mainland); Manoa Valley (no date given) (G. B. Mainland); and Haleanau Valley, Mt. Kaala, April 21, 1949, banana trap (G. B. Mainland).

Type and some paratypes in the B. P. Bishop Museum. The remainder of the paratypes in the collections of the U. S. National Museum, British Museum (Natural History) and the University of Hawaii.

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