

5433

180

No. 1, August, 1975

57

Studies in Hawaiian *Drosophila*,
Miscellaneous New Species, no. 1¹

D. ELMO HARDY AND K. Y. KANESHIRO

UNIVERSITY OF HAWAII

HONOLULU, HAWAII

We are describing six new species of *Drosophila* for which names are needed for cytogenetic and other studies being done on the evolution of the Hawaiian *Drosophilidae*. Five of these belong in the picture-winged species group and one to the *mimica* subgroup of the modified mouth-parts species.

✓ *Drosophila differens* Hardy and Kaneshiro, n.sp. (fig. 1a)

Very similar to *planitibia* (Hardy), from Maui and differentiated only by having the face entirely or predominantly yellow rather than all black except for the lower margin; also in the type male the pleura are predominantly yellow with a dark brown to blackish streak along upper edge of each mesopleuron, a spot in middle of upper pteropleuron and with upper sternopleuron brown. In *planitibia* males the pleura are predominantly subshining black with the propleuron, lower hind corner and hind margin of sternopleuron, also lower portion of pteropleuron and upper portion of metapleuron yellow. Two paratype males of *differens* are very similar to this so the coloration of the pleura is obviously variable. There is also a slight but apparently consistent difference in the length of the marking in cell R₁. In *planitibia* males, it extends distally to just beyond the level of the m crossvein (fig. 1b) while in the Molokai males, it extends nearly to the marking at apex of the wing (fig. 1a).

Hybridization experiments have demonstrated that the populations from Maui and from Molokai represent distinct species as they are incapable of inter-breeding. Crosses have been done in both directions and have resulted in fertile females but sterile males. We find no morphological characters which will separate these species and consider them siblings.

Length: body, 7.0 mm., wings, 8.3 mm.

Holotype male: S. Hanalilolilo, Molokai, February 12, 1972, reared ex *Clermontia* stem (S. L. Montgomery and H. L. Carson). Allotype female: Kaunuohua, Molokai, July 8-10, 1969 (M. Muraoka). Six male and one female paratypes, same locality as type (H. L. Carson, February 6-12, 1972; K. Y. Kaneshiro, January 20, 1973). Two male paratypes, one same locality and date as allotype (H. L. Carson), and one from Puu Kolekole, Molokai, July 9, 1968 (K. Y. Kaneshiro).

¹ Published with the approval of the Director of the Hawaii Agricultural Experiment Station as Journal series no. 1737.

Type and allotype at B. P. Bishop Museum. Paratypes in University of Hawaii collection.

✓ *Drosophila gymnophallus* Hardy and Kaneshiro, n.sp. (fig. 2)

This species fits very close to *liophallus* Hardy and Kaneshiro and we find no morphological characters for separating these. The wing markings do show some rather slight differences. The dark brown to blackish spot on vein $M_{1,2}$ beyond the r-m crossvein is situated much closer to the m crossvein (fig. 2) than in *liophallus*. In the latter the dark spot is located halfway between r-m and m (refer to figure 10b, Hardy and Kaneshiro, 1968:200). Also, the dark brown to black spot on upper anterior margin of each mesopleuron is less extensively developed than in *liophallus*, not extending much beyond level with anterior notopleural bristle. In the latter species, the spot is larger, more conspicuous, extending nearly to posterior notopleural bristle. The disc of scutellum of *gymnophallus* is tinged with brown in the middle whereas in *liophallus* the scutellum is entirely yellow. The number and arrangement of the long rays on the arista also appear to show some differences; in *gymnophallus* 5-6 long, dorsal hairs are present and one or two rather long, preapical hairs are situated on posterior surface. It appears as though the apical portion of the arista may be slightly turned and it is possible that this is an aberration. In *liophallus* the arista is like that of most picture-winged *Drosophila* and about 8 dorsal hairs are present with no hairs on posterior surface.

The polytene chromosomes of these two are homosequential but hybridization tests have indicated that they are reproductively isolated. Hybrid males have very poor testes development and no viable sperms were produced. The hybrid polytene chromosomes showed extremely poor synapsis.

Length: body and wings, 6.0 mm.

Holotype male and allotype female: Waialua, Oahu, May 3 and 24, 1970 (S. L. Montgomery). 7 paratypes, 4 males, 3 females from the following localities on Oahu: same as type; Puuulu Valley, near Puu Pane, February 20, 1970 reared in lab medium. Eggs ex-*Dracaena* stem (S. L. Montgomery); Kaunala Gulch, Pupukea, July 30-31, 1969 (F. Clayton); and Makaleha Valley, 1800 ft, July 11, 1968 (S. K. Ochikubo).

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

✓ *Drosophila lasiopoda* Hardy and Kaneshiro, n.sp. (fig. 3)

This is a sibling of *villitibia* Hardy and *formella* Hardy and Kaneshiro; the three are indistinguishable morphologically. The dark margin in middle of cell R_1 does appear to be consistently longer in *lasiopoda* and in some specimens is continuous with the brown mark directly below

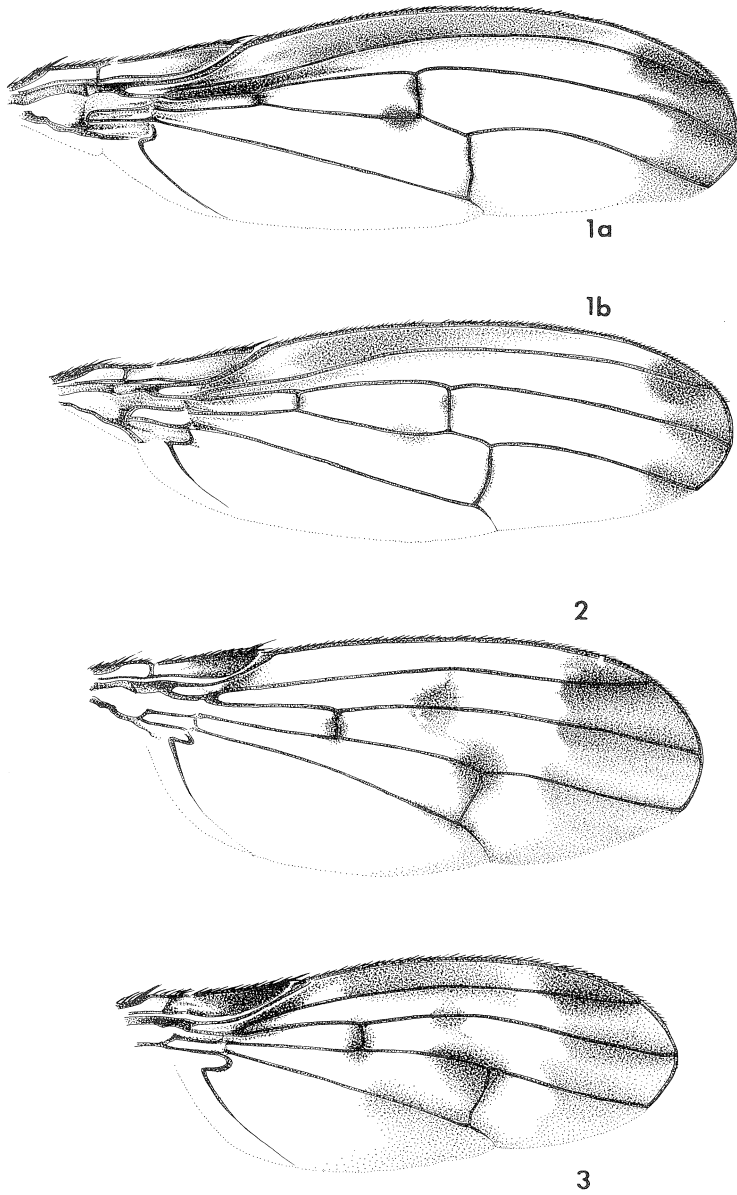


FIG. 1. *Drosophila differens* n.sp., a. wing; *D. planitibia* (Hardy), b. wing.
FIG. 2. *D. gymnophallus* n.sp., wing.
FIG. 3. *D. lasiopoda* n.sp. wing.

end of vein R_1 (fig. 3). In *villitibia* the brown marking is widely spaced from the brown mark below end of R_1 as well as from the brown mark in apex of cell R_1 , the spaces often equal to the length of the m cross-vein; this is obviously a variable character. Also, the front tibiae seem to consistently have a few more long, ventral cilia in *lasiopoda* than in *villitibia*, with an average of 13 posteroventral and 13-15 anteroventrals in *lasiopoda* and 11 posteroventral and 12 anteroventral in *villitibia*. This again would probably show some variation and would be a trivial character. The metaphase chromosomes are distinctly different in the two. *Villitibia* has 5 rods and one dot whereas *lasiopoda* has 6 rods. Crosses between the two populations show them to be biological species. The F_1 males are sterile. Most of the hybrids died in the pupal stage, few F_1 adults were obtained and of these the males were all sterile. It should be noted that this is the species referred to as "*villitibia*", from Maui, in the discussion of *formella* Hardy and Kaneshiro (1972:155).

Holotype male: Waikamoi, Maui, 4200 ft., October 14, 1967 (H. L. Carson). Allotype female: same locality as type, February 22, 1967 (J. P. Murphy). Nine paratypes, (7 males and 2 females) same locality as type, September 1965-October 1967 (H. L. Carson, K. Y. Kaneshiro, J. P. Murphy).

Type, allotype, and some paratypes in 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.

✓ ***Drosophila micromyia* Hardy and Kaneshiro, n.sp.** (figs. 4a-c)

This is one of the smallest of the picture-winged species; body length ranging from 2.9 mm-3.1 mm and wings about 3.5 mm. Based on male genitalic structures (fig. 4c), it would appear to be very close to the *vesciseta* subgroup, but is readily differentiated by the absence of any marking in the middle of cell R_1 of the wing (fig. 4a) and also by the well-developed preapical dorsal bristle of the front tibia. All species so far described in the *vesciseta* subgroup (Hardy and Kaneshiro, 1971:165) are characterized by the wing having a conspicuous spot in middle of cell R_1 , and also by a rudimentary preapical dorsal bristle on front tibia. This species is also differentiated from all other *vesciseta* subgroup species by the lack of long cilia on the front basitarsus (fig. 4b). An analysis of the banding patterns of the polytene chromosomes is necessary to determine the relationship of this species to the *vesciseta* subgroup.

MALE. *Head*: Front reddish brown, face white and slightly raised down median portion. Antennae yellow, tinged with brown at apex of the third segment. Arista with eight dorsal and three ventral rays in addition to apical fork, also with short, prominent setae along apical half of inner margin. *Thorax*: Rufous, tinged with brown, lacking conspicuous vittae on dorsum. Pleura yellow. *Legs*: Yellow with a row of moderately long, curled cilia extending about two-thirds the length on

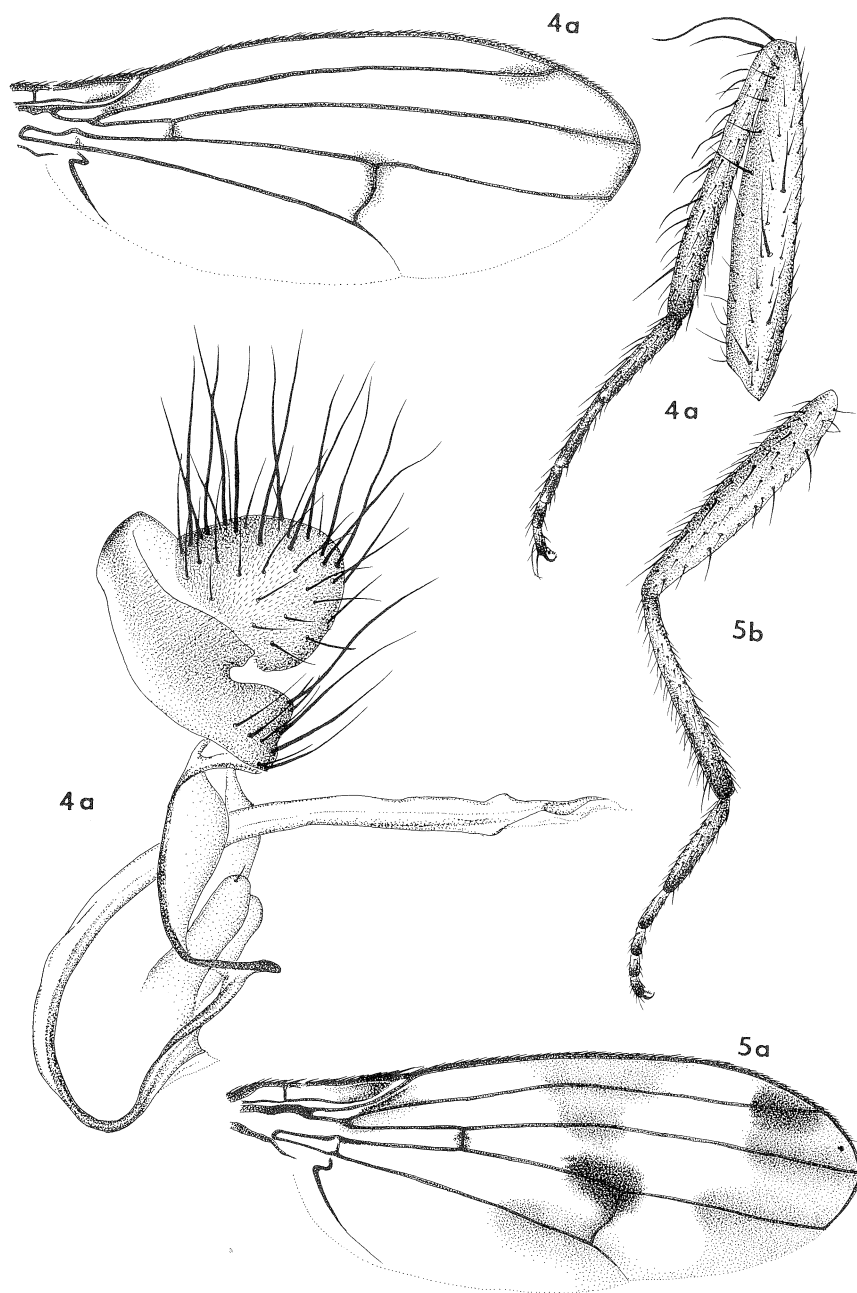


FIG. 4. *D. micromyia* n.sp. a. wing; b. front leg of male; c. male genitalia, lateral.
FIG. 5. *D. psilotarsalis* n.sp., a. wing; b. front leg of male.

the anterodorsal surface of the tibia; single curled hair at base of tibia nearly twice as long as others; preapical dorsal bristle approximately one-half longer than the ventral apical bristle. Tarsi lacking long cilia (fig. 4b). *Wings*: With a small inconspicuous subbasal spot, and small, isolated markings at apices of veins R_1 , R_{2+3} , and R_{4+5} and at m crossvein (fig. 4a). *Abdomen*: Predominantly dark brown to black. Male genitalia as in figure 4c, fitting in the *vesciseta* subgroup as described by Kaneshiro (1969).

Length: body, 2.9-3.1 mm; wings, 3.5 mm.

FEMALE. Similar to male except for sexual characters. Ovipositor slender and elongate, at least two times longer than cerci.

Holotype male, allotype female and 28 paratypes (21 males and 7 females): Mahanaloa Valley, Kokee, Kauai (1950 ft), March 23, 1973 (K. Y. Kaneshiro). Also one paratype male: Plum Tree Trail, Kokee, Kauai (M9), August 10, 1968 (H. T. Spieth).

Type, allotype and some paratypes in B.P. Bishop Museum. Others in U.S. National Museum and University of Hawaii Collection.

✓ ***Drosophila psilotarsalis* Hardy and Kaneshiro, n.sp.** (fig. 5a-b)

In the key to picture-winged species (Hardy and Kaneshiro, 1968:177) this would run imperfectly to *hirtipalpus* Hardy and Kaneshiro. It would fit here because of the densely setose palpi, the general wing markings and the body coloration. It is readily differentiated by the ornamentation of the front legs of the male. The front tibia has abundant, erect cilia scattered over the anterodorsal and anterior surfaces (fig. 5b); not having the long hairs arranged in distinct rows, about 10 each down anterodorsal and posterodorsal surfaces, and one row of shorter cilia down dorsal surface as in *hirtipalpus*. Front basitarsus lacking long cilia but with about six tiny, pale, erect setae extending down posterior surface. In *hirtipalpus* the front basitarsus has one moderately long, straight, black preapical cilia, which is slightly longer than second tarsomere. Palpi dark brown to blackish; in *hirtipalpus* they are yellow, tinged with brown. The wing markings are slightly different from those of *hirtipalpus*, the brown mark in middle of cell R_1 is not so extensive, filling usually less than one-third the length of that cell from end of vein R_1 to end of vein R_{2+3} (fig. 5a), with broad hyaline marks on either side of this spot. The sides of the brown median mark is somewhat variable but in the specimens studied it is distinctly smaller than in specimens of *hirtipalpus* which have been examined. In the latter the brown mark in middle of R_1 is about equal in length to the penultimate section of vein M_{1+2} , and the hyaline areas below and beyond the mark are usually subequal to the length of the m crossvein (refer to figure 7c, Hardy and Kaneshiro, 1968:193). The specimens are also slightly smaller than *hirtipalpus*.

In addition to the above characteristics the antennae are entirely dark brown and tinged with black, as are the palpi. The epistoma is faintly tinged with brown and the mentum and labellum are entirely yellow.

The former has numerous long preapical setae. The palpi are densely covered with short black setae as in *hirtipalpus*. Mesonotum densely gray pollinose with four rather broad, brown vittae; the submedian vittae extending from about the posterior dorsocentrals to a level almost even with hind margins of the humeri, and the lateral pair extending from behind suture to just before level of posterior dorsocentrals. Also, with a brown mark behind each humerus extending to suture; this obscured by the dense gray pollen. Disc of scutellum dark brown, lateral margins and apex yellow. Legs entirely yellow except for a faint preapical and a pre-basal ring of brown on each hind tibia; also the apical tarsomeres are brown. Wings marked as in figure 4a. Abdomen largely dark brown to black in ground color, covered with gray-brown pollen, and with a pair of large yellow basal spots on sides of each tergum.

Length: body and wings, 4.5-5.0 mm.

FEMALE. Fitting the general characteristics of most of the species which fall in the broad *hawaiiensis* grouping.

Holotype male, allotype female, and two male paratypes: one-half mile northwest of Moahuiahea Radio tower, Hualalai, Hawaii, April 4, 1972 (K. Y. Kaneshiro).

Type and allotype in B. P. Bishop Museum. Paratypes in University of Hawaii collection.

✓ *Drosophila reschae* Hardy and Kaneshiro, n.sp. *mimica* sp. n.

Fitting in the modified mouthparts group of species very close to *mimica* Hardy and differentiated by having the dorsum of the thorax and abdomen dark brown to black; lacking a brown mark on r-m cross-vein and with the markings at apices of vein R_{2+3} , R_{4+5} , and M_{1+2} rather faint, not distinctly marked with brown as in *mimica*; and by having two pairs of well developed dorsocentrals bristles, with the anterior pair situated opposite the supraalars. Also most specimens have only one acrostichal seta situated near suture. In *mimica* the mesonotum, scutellum, front, and abdomen are rufous, tinged with brown and the sixth tergum is yellow. The apices of veins R_{2+3} , R_{4+5} , and M_{1+2} and also the r-m cross-vein are distinctly marked with brown. The anterior dorsocentral bristles in the male are rather weak, situated behind the supraalars.

Cytogenetic comparisons and hybridization studies were made of this species with *mimica* by Yoon, et al. (1972) and it was demonstrated that they are clearly biological species. In crosses between the two, the F_1 males were sterile. *D. reschae* differs cytologically from *mimica* by having shorter enlarged dot chromosomes, and the polytene chromosome III lacks the inversion N (*mimica* is polymorphic for N in chromosome III).

Holotype male, allotype female and 22 paratypes (5 males and 17 females): Puu Pane, Waialua, Oahu, Hawaii, March 1, 1970 (S. L. Montgomery). Also, 12 paratypes (3 males and 9 females) collected from the following localities: Palikea, Oahu (reared ex *Clermontia* leaves) May

11, 1966 (W. B. Heed); Waialua, Oahu, May 24, 1970 (S. L. Montgomery); Mokuleia Trail, Oahu, February 7, 1971 (S. L. Montgomery); W. Makaleha Valley, Oahu (reared ex *Pisonia* leaves), July 7, 1969 (S. L. Montgomery).

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

The species is named after Miss Kathleen Resch, University of Texas, Genetics Foundation, who is in charge of the Hawaiian *Drosophila* Stock Center, and who has been directly responsible for much of the success which has been achieved in rearing these flies under laboratory conditions.

REFERENCES CITED

- Hardy, D. E. and K. Y. Kaneshiro, 1968. New Picture-winged *Drosophila* from Hawaii. Univ. Texas Publ. 6818:171-262.
- 1971. New Picture-winged *Drosophila* from Hawaii, Part II. Univ. Texas Publ. 7103:151-170.
- 1972. New Picture-winged *Drosophila* from Hawaii, Part III. Univ. Texas Publ. 7213:155-161.
- Kaneshiro, K. Y., 1969. A study of relationships of Hawaiian *Drosophila* species based on external male genitalia. Univ. Texas Publ. 6918:55-70.
- Yoon, J. S., K. Resch and M. R. Wheeler, 1972. Cytogenetic relationships in Hawaiian *Drosophila* II. The *Drosophila mimica* subgroup of the "modified mouthparts" species group. Univ. Texas Publ. 7213:201-212.