

## Three New Species of Picture-Winged *Drosophila* from the Hawaiian Islands

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### ABSTRACT

We describe three new species of Hawaiian *Drosophila* for which names are required for cytogenetic and other studies being conducted on the evolution of the group. Two of these belong in the *adiastola* species subgroup, the third to the *orphnopeza* species subgroup.

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Nearly 500 species of endemic Drosophilidae have been described for the Hawaiian Archipelago, but many more new species still remain to be named and described. Researchers studying the evolutionary biology of this group often require taxonomic treatment of miscellaneous species so that previously undescribed species can be discussed in published works. Herein, we describe three species for which names are required so that cytogenetic and other studies can be published. Two of these species belong to the *adiastola* species subgroup and the third to the *orphnopeza* species subgroup. The latter is the first species of Hawaiian *Drosophila* to be associated with an endemic palm.

#### *Drosophila mulli* n. sp. (figs. 1a and b).

This species fits loosely in the *orphnopeza* species subgroup because of similarities found in the base color patterns, foreleg ciliation and genitalia of the males. Its wing pattern more closely resembles *D. micromyia* Hardy and Kaneshiro (1975:60-62) because of similar markings at the apices of  $R_{2+3}$ ,  $R_{4+5}$ ,  $M_{1+2}$ , along the r-m and m crossveins and the absence of the spot in cell  $R_1$  which is normally found in species of the *orphnopeza* complex. *D. mulli* is not, however, closely related to *micromyia* and differs in the characters pointed out above. The absence of brown vittae and other markings on the mesonotum and scutellum and the lack of a spot in cell  $R_1$  readily differentiates this species from others in the *orphnopeza* complex. Cytogenetically this species possesses a unique inversion on the fourth chromosome and has six fixed inversions different from *micromyia*. (Carson 1990).

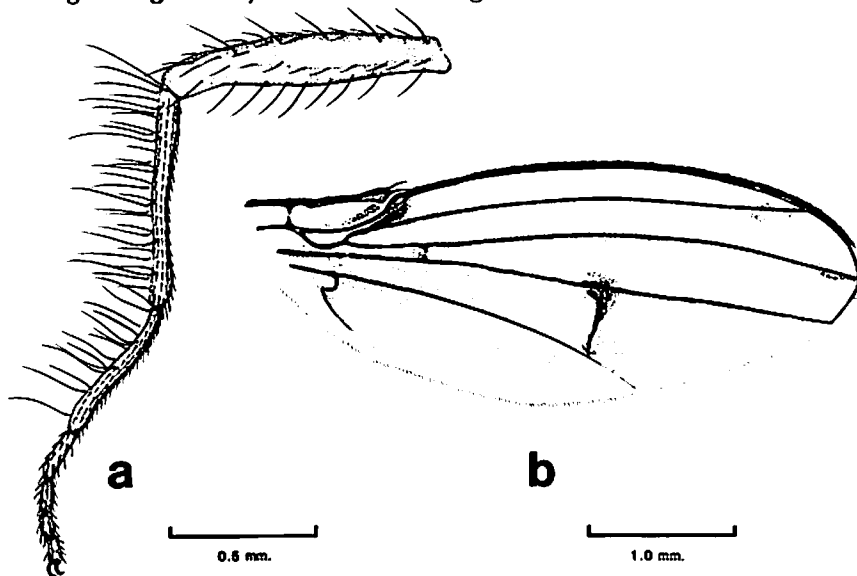
**Male. Head:** Front yellow, covered with a light silvery grey pollen; face white with median portion raised slightly to form a small carina. Ocular sclerite and gena white. Ocellar triangle medium to dark brown, ocelli light yellowish brown on brilliant ruby red. Arista with five to six dorsal and two ventral rays in addition to the apical fork, and six or seven short setae along the inner margin of the apical two-thirds of the rachis. Occipital area dark

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brown to black. **Thorax:** Dorsum brownish yellow and lacking conspicuous markings or vittae. Pleura yellow, occasionally tinged with brown. **Legs:** Predominantly yellow. Forelegs with tibia and basitarsus each bearing three distinct rows of long curled cilia along the length of the dorsal surfaces; the posterodorsal row of cilia on the tibia with six to eight hairs, the dorsal row with nine to thirteen, and the anterodorsal row with six to nine; the posterodorsal and dorsal rows of cilia on the basitarsus with two to four hairs and the anterodorsal row with five to eight (fig. 1a). **Wings:** Two and one-half times longer than wide. The third costal section is about four and one-third times longer than the fourth and the costal fringe extending about one-half the distance between the apices of veins  $R_{2+3}$  and  $R_{4+5}$ . Distinct brown spots present at the base of cell  $R_1$ , at the apex of vein  $R_{2+3}$ , and at m crossvein; small, less-distinct markings present at apices of  $R_{4+5}$  and  $M_{1+2}$ . **Abdomen:** Dark brown to black. **Length:** body 4.3 - 5.0 mm; wings 4.3 - 4.8 mm.

**Female.** Similar to male except lacking in the ornate ciliation of the forelegs. **Length:** body 4.6 - 5.3 mm; wings 4.0 - 5.2 mm.



**FIGURE 1.** *Drosophila mullii*. a. Front leg showing long ciliation on tibia and tarsus, b. Wing of male.

**Holotype male:** Olaa Forest Reserve, 985 m (3200 ft.), June 25, 1985. **Allotype female:** same locality as the type, July 30, 1985. Sixteen paratypes (6 males and 10 females): same locality as the type, June-August 1985. Two laboratory reared  $F_1$  individuals (a male and a female) from a wild collected female were also examined but are not included in the type series. The entire series was collected by W. P. Mull at Volcanoes, Hawaii. All of the wild collected adults were taken from the undersides of leaves of the endemic fan palm *Pritchardia beccariana* Rock; this represents the first association of

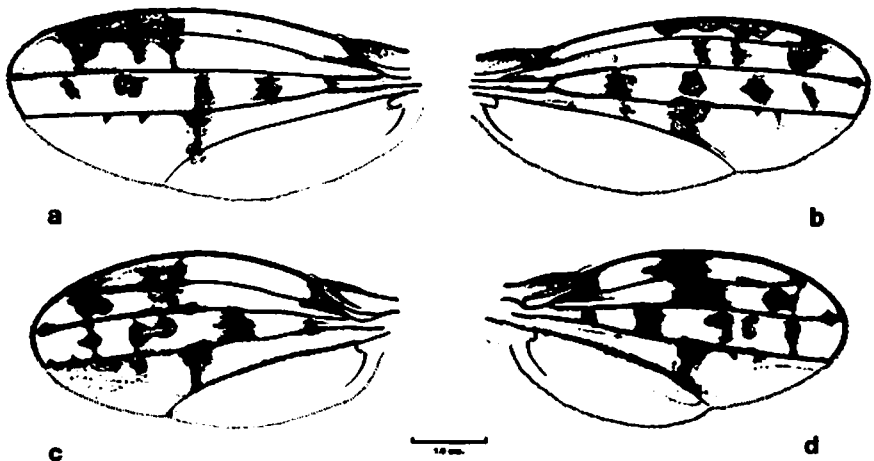
any of our endemic picture-winged species with a species of palm. Host plant of the larvae is unknown.

**Etymology:** It is with pleasure that we name this new species in honor of Mr. William P. Mull, naturalist, conservationist, and collector of this fly.

Type, allotype, and some of the paratypes in the B.P. Bishop Museum; the remainder of the paratypes in the collection of the University of Hawaii.

*Drosophila neoclavisetae* n. sp. (figs. 2a and b).

Belonging in the *adiastola* species subgroup. The presence of an extra crossvein in cell  $R_5$ , the spotted markings of the wings, and the shape of the male genitalia place this species with *neogrimshawi* (Bryan) (Bryan 1934:435; Hardy 1965:543-545) and *clavisetae* Hardy (1966:219-222) in the *clavisetae* species complex of the *adiastola* species subgroup. This species fits closest to *clavisetae* of East Maui; both share similar wing (figs. 2a-d) and thoracic markings and possess numerous long hairs on the posterior abdominal segments of the male, a character which is not as well developed in the males of *neogrimshawi*. In *neoclavisetae* the setae are more rounded and not as flattened as those of *clavisetae*. The banding pattern of the polytene chromosomes of this species is homosequential to *clavisetae* (Carson 1990).



**FIGURE 2.** *Drosophila neoclavisetae*. a. Wing of female, b. Wing of male. *Drosophila clavisetae*. c. Wing of female, d. Wing of male.

**Female. Head:** Predominately amber brown; vertex yellow, tinged with brown and covered with light silvery-grey pollen; the anterior reclinate bristle subequal to the proclinate and arising immediately posterolaterally to the latter; ocellar triangle dark brown. Face yellow-brown with medium portion raised to form a prominent ridge. Mouthparts yellow; mentum well developed and covered with thin setae; a pair of setae on distal portion

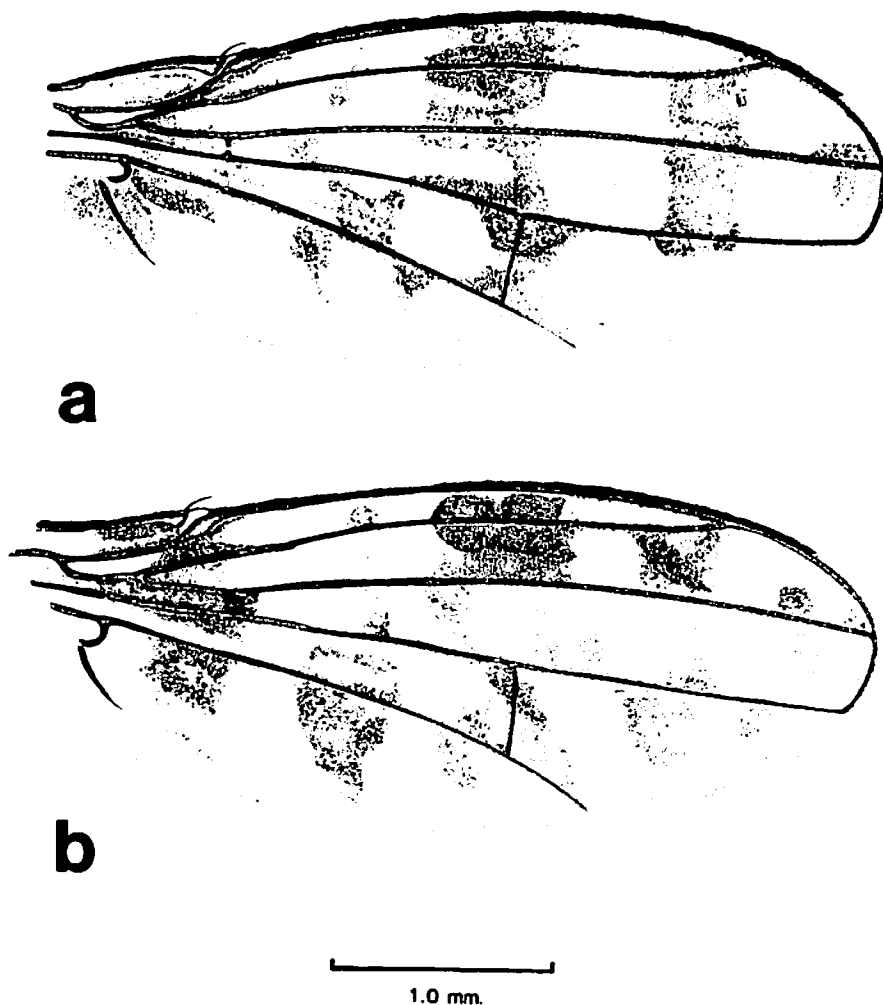
twice as long as the others. Oral vibrissae with one strong and two moderately developed bristles. Arista with six dorsal and three ventral rays in addition to the apical fork; scape and pedicel yellow. **Thorax:** Dorsum predominately reddish brown; mesonotum with a distinct brown median vitta nearly five times broader posteriorly than anteriorly, and bordered on each side by two brown vittae one-half as wide; area behind the humerus brown; and giving rise to a short brown line just below the intrascutellar suture, which bisects area between the dorsocentrals and the supra- and postalars; with eight to ten rows of acrostical setae. Disc of the scutellum brown, with the edges and sides yellow. Pleura mostly yellow; some brown markings occurring on the anepimeron. **Legs:** Predominantly yellow, with varying amounts of brown on femora and tibiae; a distinct brown band present on the distal apices of all three tibiae; in some specimens a second brown band sometimes present at the base of the hind tibia; tarsi brown. **Wings:** Somewhat broad and rounded, more than twice as long as wide, with anterior portions covered with brown markings and large hyaline spots tinged light yellow-brown (fig. 2a). Third costal section approximately 4 times larger than the fourth, the costal fringe extending about one-third the distance between veins  $R_{2,3}$  and  $R_{4,5}$ . An extra crossvein situated in the basal fifth of cell  $R_5$  about halfway between the r-m and m crossveins. Dark brown markings covering basal and apical thirds of cell  $R_1$ , and extending into the apical half of cell  $R_3$  to form three confluent spots. Cell  $R_5$  with five evenly spaced spots; the first or basal-most bisected by the r-m crossvein, the second bisected by the extra crossvein, the third or middle spot continuing through the 1st and 2nd  $M_2$  cells as a band bisected by the m crossvein and terminating in cell  $M_4$  just below the  $M_{3,4}$  vein. Halteres yellow. **Abdomen:** Mostly dark brown and black. **Length:** body, 6.0 - 6.4 mm; wings, 6.5 - 7.0 mm.

**Male.** Description based upon a single damaged specimen which agrees with the female in most respects. Features and coloration similar to those of female. Mouthparts yellow; large flap-like processes similar to those found in the males of *clavisetae* arising dorsolaterally from labellum to fuse proximally near the base of labrum. Three broad vittae, one medial and two submedial, extending the length of the mesonotum; pleural markings and color slightly darker than female. Right middle leg (the only leg present on the specimen before us) agreeing with leg of the female. Wings as in figure 2b. Abdomen strikingly colored; with the exception of the yellow posterior margin of the fifth tergite, the terga of the first five segments black; the pleurum, sternum, and remaining abdominal segments predominantly yellow; numerous long slightly flattened black setae up to 9 or 10 mm in length on the posterolateral margins of the fifth and sixth segments, these occurring in two rows on each segment; the posterior rows arranged in distinctly straight lines extending along the posterolateral margins; the anterior rows arranged irregularly just anterior to the posterior row and occupying staggered positions relative to the row of marginal setae. Tenth tergum well rounded, with the apical margins covered with black setae. **Length:** body, 7.0 mm; wings, 5.7 mm.

**Holotype female and four paratype females:** Puu Kukui, West Maui, 4500 ft., July 16, 1969, M56 (H.L. Carson). **Female paratype and male paratype:** Trail to Puu Kukui, 3600 ft., September 17 - 18, 1975, T80 (K.Y. Kaneshiro).

**Etymology:** We are naming this species *neoclavisetae* because of its obvious affinities with *clavisetae* from East Maui.

Type and some paratypes in the B.P. Bishop Museum. Other paratypes in the University of Hawaii collection.



**FIGURE 3.** *Drosophila toxocharta*. a. Wing of male. *Drosophila peniculipedis*. b. Wing of male.

*Drosophila toxochaeta* n. sp. (fig. 3a).

Belonging to the *adiastola* species subgroup and fitting in the *adiastola* complex of species by having the wings predominately brown, covered with numerous hyaline spots, and by having the front basitarsus of the male flattened laterally (see Hardy and Kaneshiro 1968:236 and 1972:159-160 for a key and discussion of species in this complex). This species is most closely related to *peniculipedis* Hardy (1965:408-410) of Maui, with which it is morphologically identical in all characters except wing pattern. Carson (1990) showed that the chromosome sequence of this species is identical to that of *peniculipedis*.

Striking differences in the arrangement of the brown markings and hyaline spots of the wings, shown in figures 3a and b, distinguish the males of the two species. In *D. toxochaeta*, the basal portion of the wing is partially hyaline, and a large brown band transverses the wing from the basal half of the second costal section to just beyond the r-m crossvein. Cell R<sub>1</sub> has two hyaline spots, cells R<sub>3</sub> and R<sub>5</sub> each contain six hyaline spots, and cells 1st M<sub>2</sub>, 2nd M<sub>2</sub> and M<sub>4</sub> have three spots each. Male genitalia very similar to those of *peniculipedis*. Length: body, 5.0 - 5.2 mm; wings, 4.7 mm.

Female. Unknown.

**Holotype male:** East Ohia Gulch, Molokai, January 24, 1973 (S.L. Montgomery). Two male paratypes: Mapulehu Gulch, Molokai, 800 ft., February 13, 1972, Q86QA, reared ex. *Touchardia* stems (S.L. Montgomery).

**Etymology:** From the Greek *toxon* (a bow) + *chaeta* (bristle), pertaining to the strong, curled bristle near the apex of the front femur. This is characteristic of the *adiastola* species subgroup.

Type and one paratype in the B.P. Bishop Museum; one paratype in the collection of the University of Hawaii.

## ACKNOWLEDGMENTS

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