Studies in Hawaiian Drosophila, Modified Mouthparts Species No. 1: Mitchelli Subgroup[1]

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A large number of Hawaiian *Drosophila* species have the mouthparts of the male variously modified for grasping the female's genital area during courtship. These modifications consist of dense hairs, bristles, or processes on the lobes of the labella, or a sclerotization of the apical margin of the labellum into a heavy black rim (Carson, et al., 1970:453, fig. 4b; Spieth, 1966:281-288). Only preliminary studies of these flies have been done to date (Hardy, 1965). The species are known to breed in a wide assortment of media, such as rotting leaves, stems, flowers, fruits of native plants, and in fungi (Heed, 1968:389) and their nutritional and substrate requirements are at present poorly understood. The major emphasis in the studies of Hawaiian drosophilids to date has been on the picture-winged species of *Drosophila*. Since field and laboratory technics have been worked out for dealing with these species, most of them can be readily cultured under laboratory conditions and are therefore ideal for evolution and genetic studies. By comparison the modified mouthparts and other large groups of species have been almost totally neglected and it is now necessary that attention be given to these rather poorly known groups. A detailed investigation of the ecology and nutritional requirements of these species is obviously necessary as there has been little success in maintaining modified mouthpart species in laboratory cultures. It has been mainly through the efforts and perseverance of Miss Kathleen Resch, University of Texas, that a number of species are now being reared successfully in artificial media. J. S. Yoon, K. Resch, and M. R. Wheeler (1972a and 1972b) have published preliminary papers on the cytological and genetic relationships, including polytene chromosomes and metaphase karyotypes, among the *Drosophila* having modified mouthparts. The present paper is to clarify the taxonomy in the *mitchelli ("hystricosa")* subgroup.

The Mitchelli Subgroup

Members of this subgroup are characterized by having prominent black spines or reddish brown bristles (fig. 4) on the labellum of the male and the development and arrangement of these spines seem to be the best diagnostic features for separating species. Also the front basitarsus has numerous long anterodorsal cilia extending entire length, arranged in two or three irregular rows and the posterior surface of front tibia is

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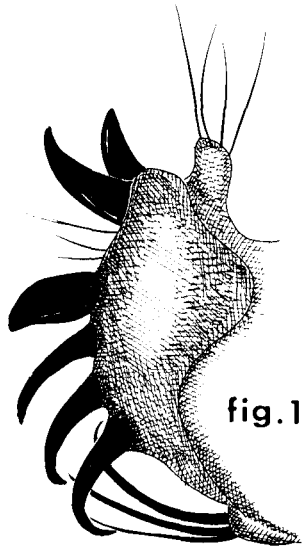
densely covered with short, erect cilia (*asketostoma* Hardy is an exception, see discussion below). The thorax and abdomen are entirely brown to black in ground color and usually the femora are brown to blackish. The palpi are thickly setose and the apical bristle is rather small, usually not over two times longer than other setae.

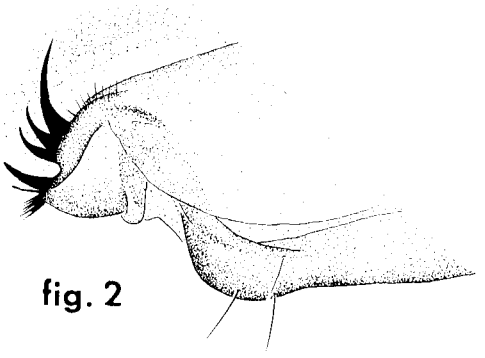
Because of the strong black spines on the labellum (fig. 1) and the long cilia on the basitarsus, *asketostoma* Hardy from Maui would fit here. The front tibiae are not ciliated, however, and the flies look quite different, are densely gray pollinose, usually with brown pollinose markings on mesonotum. The aristae are more sparsely haired, the oral vibrissae are much stronger and three rather prominent pairs of dorsocentral bristles are developed. It is questionable whether or not this species belongs in the *mitchelli* subgroup but these seem to show relationship. Further studies are needed to determine the true position of *asketostoma*.

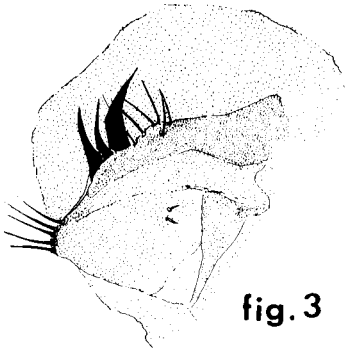
Yoon, et al. studied three species of this subgroup: *biseriata* Hardy, *hystricosa* Hardy and Kaneshiro and "*mitchelli*-like" (equals *nigrocirrus* Hardy). They discussed in detail the metaphase chromosome configurations and gave an analysis of polytene chromosomes of these three species. Interspecific hybridization studies demonstrated that all hybrid F-1 males were sterile.

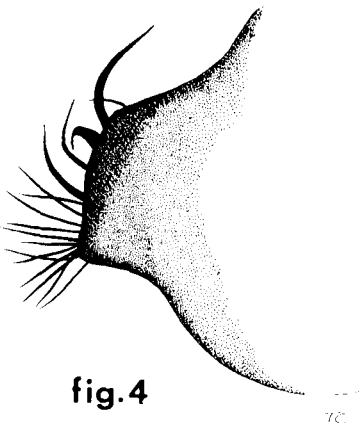
Key to Species

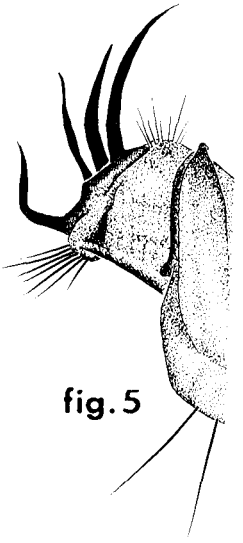
1. Dorsum of thorax and abdomen subshining, lightly pollinose, the pollen not obscuring the ground color. Crossvein not infuscated. Front tibia of male with dense, erect cilia over posterior surface..... 2
   Entire thorax and upper half of front densely gray pollinose, obscuring ground color. Mesonotum often marked with brown pollen. Crossvein r-m infuscated. Front tibia lacking erect cilia on posterior surface. Labellum as in figure 1. Maui.....*asketostoma* Hardy
2. Wings with upper apical portion brown..... 3
   Wings evenly infuscated, lacking distinct brown markings..... 4
3. Five thick black spines on labellum arranged in two sets (figure 2). Femora brown. Hawaii.....*mitchelli* Hardy
   Only three strong spines in one set (figure 3). Legs yellow. Hawaii .....*nigrocirrus* Hardy
4. Only two strong humeral bristles. With heavy black spines on labellum as in figures 5 and 6 and not with a row of erect cilia on posterior surface of front tarsus..... 5
   Three strong humerals; armature of labellum made up of reddish brown bristles, the uppermost pair rather spine-like (fig. 4); front tarsus with a row of erect posterior cilia, six on basitarsus. Maui..n. sp.
5. Spines of labellum arranged in one set of four, each spine bifid on inner surface (fig. 6)..... 6
   Spines arranged as in figure 5, with three upper spines close together

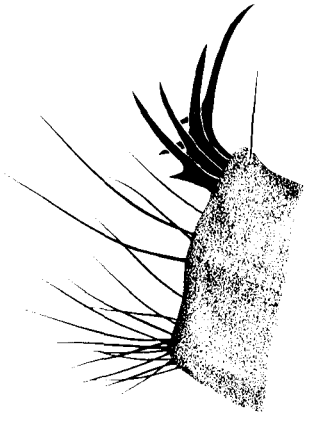


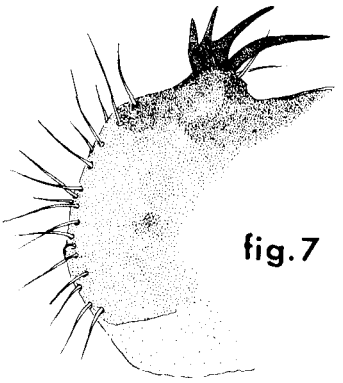












Labellae of mouthparts: FIG. 1. *Drosophila asketostoma* Hardy; FIG. 2, *mitchelli* Hardy; FIG. 3, *nigrocirrus* Hardy; FIG. 4, nsp. Maui; FIG. 5, *hystricosa* Hardy and Kaneshiro; FIG. 6, *biseriata* Hardy; FIG. 7, *furvifacies* Hardy.

and a large, well spaced, lower spine which curves at about right angle. Maui.....*hystricosa* Hardy and Kaneshiro

6. Legs entirely yellow. Labellum truncate below spines, shaped as in figure 6. Oahu.....*biseriata* Hardy
Femora dark colored, brown to blackish. Labellum rather strongly produced beyond spines as in figure 7. Kauai.....*furvifacies* Hardy

Drosophila nigrocirrus Hardy (fig. 3)

Drosophila nigrocirrus Hardy, 1965, Insects of Hawaii 12:392, figs. 153a-d.

This species was not correctly associated in the original description. It fits in the *mitchelli* complex and closely resembles that species. It is differentiated by the ciliation of front legs of male and the armature of the male labellum (figs. 2 and 3). Only one set of strong black spines is developed on the labellum. The longest cilia of the front basitarsus are subequal to the length of that tarsomere and 11-15 cilia are arranged in two irregular rows over its entire length. *D. mitchelli* has the basal cilia about equal in length to the basitarsus and has 18-20 long hairs arranged down anterodorsal surface arranged in three incomplete rows. The setae on the posterior surface of the front tibia are shorter, much less conspicuous than in *mitchelli,* not much longer than the recumbent setae over the remaining portions of the tibia, and less than half as long as preapical dorsal bristle. In *mitchelli* the posterior surface is densely covered with long conspicuous erect setae; these are more than two times longer than recumbant setae and two-thirds to three-fourths as long as preapical dorsal bristle. No host information is available to date.

The metaphase chromosome configuration, polytene chromosome analysis, and hybridization studies have been discussed by Yoon, et al. under the name "*mitchelli*-like." They made comparisons with two other species of this subgroup, *hystricosa* Hardy and Kaneshiro and *biseriata* Hardy, but did not have an opportunity to make comparisons with *mitchelli.* This species is widespread over the Island of Hawaii: collected at numerous localities on the slopes of Mauna Loa, Mauna Kea, Hualalai and the Kohala Mts.

Drosophila n. sp. (fig. 4)

One male specimen on hand from Waikamoi, Maui, July 8, 1964 (W. B. Heed) fits in the *mitchelli* complex because of the strong bristles on the labellum of male and by having abundant long cilia over the dorsal surface of the front tarsus. Further specimens will be needed before it can be described. It is differentiated from other members of this subgroup by the arrangement and development of the bristles on the labellum; only the uppermost pair are thickened spine-like (fig. 4), and the bristles are dark reddish brown rather than black. It also differs by having three strong humeral bristles and by having a row of moderately long erect cilia down posterior surface of front tarsus. The wings are evenly in-

fuscated, lacking brown markings, the thorax is entirely dark brown to blackish and the femora are entirely brown.

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