

Douglass R. Miller  
and Howard L. McKenzie

# Sixth Taxonomic Study of North American Mealybugs, with Additional Species from South America (Homoptera: Coccoidea: Pseudococcidae)<sup>1, 2</sup>

## ABSTRACT

One new pseudococcid genus, *Prorhizoecus*, and 15 new species are described and illustrated in this paper. Only three of the new species were collected in California: *Dysmicoccus polymeris*, *Pseudococcus beardslayi*, and *Spilococcus nototrichus*. Other new North American species were collected as follows: *Trionymus strongylus*, Arizona; *T. idahoensis*, Idaho; *Cataenococcus mexicanus*, *Hypogeococcus othnius*, *Prorhizoecus atopoporus*, *Rhizoecus neostangei*, *Spilococcus villanuevat*, *Trionymus coronus*, Mexico; and *Chorizococcus coniculus*, New Mexico. Four Central and South American species are described: *Dysmicoccus brachydactylus* and *D. dactylus*, Chile; *Hypogeococcus othnius*, Costa Rica, Guatemala, Nicaragua, and Venezuela; *Mammicoccus balachowskyi*, Peru.

Revised keys to North American species are given for the genera *Cataenococcus*, *Chorizococcus*, *Dysmicoccus*, *Hypogeococcus*, *Pseudococcus*, *Rhizoecus*, *Spilococcus*, and *Trionymus*. In addition, a key to the two species of *Mammicoccus* is presented.

## INTRODUCTION

THROUGH THE EFFORTS of G. F. Ferris and H. L. McKenzie the mealybug species of California have become relatively well known. Although three new California species are treated in this paper, discovery of undescribed species is becoming increasingly difficult. Our studies have therefore taken a new direction. With a larger number of available specimens, we are now better able to understand the amount of intraspecific variation that occurs. We are beginning to formulate more comprehensive chronological and geographical distribution

patterns and host ranges. With this new information our species concepts have become somewhat broader.

In addition to studying California mealybugs, we have recently turned our attention to those of the western United States and, to a limited extent, Mexico.

This paper includes descriptions of one new genus, and 15 new species as follows: three different species from California; one each from Arizona, Idaho, and New Mexico; five different species from Mexico; two from Chile; one from Peru; and one with specimens from

<sup>1</sup> Submitted for publication December 10, 1969.

<sup>2</sup> National Science Foundation Grant No. GB-5847 to the junior author provided the funds necessary for the completion of this paper.

Costa Rica, Guatemala, Mexico, Nicaragua, and Venezuela. Revised keys are also presented, which include one new genus and 10 new North American species. No keys are given for the South American species.

Type specimens and other slides are in the following depositories, hereafter abbreviated as shown: British Museum (Natural History), London (BM); California State Department of Agricul-

ture, Sacramento (CDA); Instituto Nacional de Investigaciones Agricolas, Chapingo, Mexico (INIA); Collection of Coccoidea, University of California at Davis (UCD); University of Chile, Santiago (UCS); University of Hawaii (UH); National Collection of Coccoidea, United States National Museum, Washington, D.C. (USNM); Virginia Polytechnic Institute, Blacksburg (VPI); Zoological Institute, Academy of Sciences of USSR, Leningrad (ZAS).

### CHANGES IN TECHNIQUE

We have made three changes in the technique used in the five previous studies in this series. (1) In the description of a new species, only the holotype is discussed under "Recognition characters." The illustration is based solely on the type. Any differences in the rest of the type series are discussed under "Variation." (2) The enlargements of selected leg parts presented

along the margin of each illustration are of the dorsal leg surface only. The ventral surface is shown on the main drawing. (3) Discoidal and minute circular pores are no longer distinguished as separate entities since they often intergrade into each other. Therefore, we have called them all discoidal pores, and have indicated small or large where necessary.

### KEYS AND DESCRIPTIONS

#### Genus *Cataenococcus* Ferris

This genus, with the single species herein described as new, and the species recently described by Williams (1969), contains six species for North America. To accommodate the new species, the

key presented by Ferris (1953) under *Farinococcus* (which he later (1955) discovered was distinct from the genus *Cataenococcus*) should be revised as follows:

- 3. Cerarii arranged in 17 or 18 distinct pairs ..... 4  
 "Cerarii arranged in an almost continuous band about the margins of the body, this band broken into an indeterminable number of small groups of conical setae ..... *olivaceus* (Cockerell)"
- 4. Dorsal multilocular disk pores present ..... *mexicanus* Miller and McKenzie  
 Dorsal multilocular disk pores absent ..... 5
- 5. Multilocular disk pores present on thorax ..... *cualatensis* (Cockerell)  
 Multilocular disk pores absent on thorax ..... *larai* Williams

#### *Cataenococcus mexicanus* Miller and McKenzie, new species

(Figure 1)

**Suggested common name.** Dense-pored mealybug.

**Collection data.** Adult females on

unidentified Compositae, collected at Apizaco, Tlaxcala, Mexico, July 16, 1967, by D. R. Miller and J. Villanueva B.

**Type material.** Holotype adult female (single specimen on slide), deposited at UCD. Two adult female para-

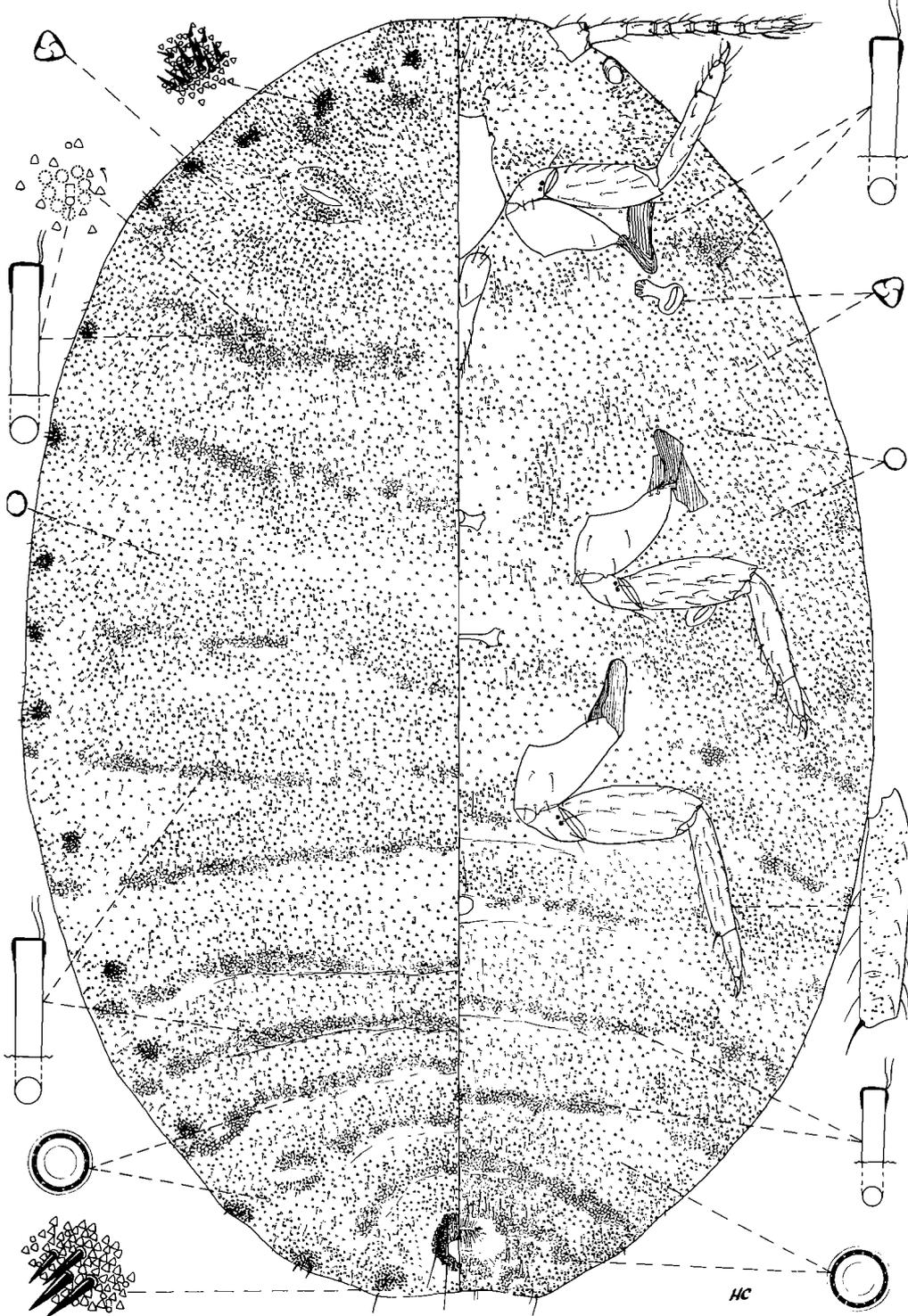


Fig. 1. *Cataenococcus mexicanus* Miller and McKenzie, new species, collected at Apizaco, Tlaxcala, Mexico, July 16, 1967, on unidentified Compositae.

types and three immature paratypes on three slides (UCD, USNM).

**Gross external features.** This mealybug is yellowish-orange. It is lightly dusted with a smooth, white secretion. Unusually broad filaments were present around entire body margin. A filamentous ovisac is produced, which encloses the adult female.

This species occurs on the roots of its host.

**Recognition characters.** Adult female holotype, mounted, 2.80 mm long, 1.79 mm wide (paratypes, 1.86 to 2.30 mm long, 1.30 to 1.69 mm wide); body rotund.

Dorsum with 18 pairs of cerarii. Anal-lobe cerarii each with 4 and 5 conical setae, zero and 1 oral-collar tubular ducts, 4 or 5 large discoidal pores, large cluster of trilocular pores, no basal sclerotization. Remaining cerarii each with 4 to 9 conical setae, large cluster of trilocular pores. Anterior cerarii tend to have more conical setae than do those on abdomen. Trilocular pores abundant over surface. Multilocular disk pores present in transverse bands on posterior margins of abdominal segments 8 through 2, also present on posterior margins of each thoracic segment, absent on head except in clusters near cerarii. Within clusters and rows of multilocular disk pores there are frequently elongate, oral-collar tubular ducts. Oral-collar tubular ducts with traces of rims similar to *Phenacoccus gossypii* Townsend and Cockerell. Large-sized discoidal pores scattered over surface, slightly smaller than trilocular pores. Body setae short and conical, noticeably smaller than cerarian setae.

Anal ring dorsal, removed approximately one-half diameter of ring from abdomen apex, unusually broad, with 3 rows of pores; each of its 6 setae slightly longer than greatest diameter of ring.

Venter with multilocular disk pores on posterior margin of each abdominal segment and in lateral areas on thorax,

absent on head. Trilocular pores numerous. Large-sized discoidal pores scattered over surface. Oral-collar tubular ducts of two sizes: larger size present in clusters and rows of multilocular disk pores as on dorsum; smaller size present in transverse-medial rows on each abdominal segment. Body setae unusually short.

Circulus small, oval, not divided by intersegmental line. Legs large; hind femora dorsally with 3 and 28 small translucent pores (not illustrated) (paratypes, 9 to 26); hind tibiae dorsally with 86 translucent pores (paratypes, 39 to 50); tarsal digitules setose, not extending to tip of claw; claw digitules weakly capitate, extending to tip of claw; claw with denticle absent. Antennae 8-segmented.

**Variation.** The paratypes differ as follows: one specimen with 17 pairs of cerarii; some cerarii may possess 12 conical setae; anal ring on one specimen with five pairs of setae; apical antennal segment sometimes partially divided into ninth segment.

**Notes.** The generic placement of this species is a problem since it may, at times, possess only 4 cerarian setae in each anal-lobe cerarius. Possession of this character in McKenzie's (1967) key to genera would bring this species out at *Dysmicoccus* rather than *Cataenococcus*. This reduced number of cerarian setae also occurs in *C. cualatensis* (Cockerell), another Mexican species. Since both species possess numerous setae in all other cerarii and since both have the characteristic rotund body shape, they are retained in *Cataenococcus*.

This species is most closely related to *Cataenococcus cualatensis*, but differs from it in possessing dorsal multilocular disk pores; clusters of multilocular disk pores which frequently surround an oral-collar tubular duct; and two sizes of ventral oral-collar tubular ducts—none of which are found in *C. cualatensis*.

**Genus *Chorizococcus* McKenzie**

This genus, with the single species herein described as new, contains 26 species for North America. To accommodate the new species, the key presented by McKenzie (1967) should be revised as follows:

- 12(11). Cerarii on anal lobes only ..... A
- Cerarii on at least last 2 or 3 abdominal segments ..... 13
- A(12). Oral-collar tubular ducts present on dorsomedial areas of abdomen; occurring on grasses ..... *coniculus* Miller and McKenzie
- Oral-collar tubular ducts absent on dorsomedial areas of abdomen; occurring on *Abronia* ..... *abroniae* McKenzie

***Chorizococcus coniculus* Miller and McKenzie, new species**

(Figure 2)

**Suggested common name.** Conical-seta mealybug.

**Collection data.** Adult females on unidentified grass (Gramineae), collected in canyon above Alamogordo, Otero Co., New Mexico, August 4, 1966, by D. R. Miller.

**Type material.** Holotype adult female (single specimen on slide), deposited at UCD. Five adult female paratypes on five slides (BM, CDA, UCD, USNM, VPI).

**Gross external features.** This mealybug is pink, with translucent legs. The derm is lightly dusted with a smooth, white bloom. No marginal filaments were observed. A loose, filamentous ovicase, produced within the grass sheath, encloses the entire female in addition to many yellow eggs. It is approximately twice the length of a fully mature, adult female.

This species infests the leaf sheaths of its host.

**Recognition characters.** Adult female holotype, mounted, 3.90 mm long, 2.53 mm wide (paratypes, 2.81 to 4.23 mm long, 1.79 to 2.43 mm wide); body elongate.

Dorsum with single pair of cerarii (anal lobe), each with 2 conical setae, 3 or 4 auxiliary setae, small cluster of trilocular pores, 3 or 4 discoidal pores, and no basal sclerotization. Triloculars

extremely numerous over entire surface. Multilocular disk pores in small numbers from abdominal segment 9 through 4. Discoidal pores approximately same size as trilocular pores, scattered over entire surface. Oral-rim tubular ducts small, with small rim, present in reduced numbers over surface. Oral-collar tubular ducts of two sizes: large size most abundant, present over entire surface, most numerous on anterior abdominal segments, least numerous on head; small size uncommon, associated with transverse rows of body setae. Body setae slender, only slightly shorter than ventral body setae.

Anal ring dorsal, touching apical margin of abdomen, with 2 rows of conspicuous pores; each of its 6 setae nearly equal in length to greatest diameter of ring.

Venter with multilocular disk pores on posterior and anterior margins of abdominal segments 9 through 5; rows restricted to posterior margins on segments 4 and 3, with a few such pores scattered on thorax and head. Trilocular pores numerous. Discoidal pores same as on dorsum, scattered over surface. Oral-rim tubular ducts same as on dorsum, present in small numbers along lateral margin of thorax. Oral-collar tubular ducts same two sizes as on dorsum, present on posterior and lateral margins of abdominal segments, restricted to lateral and sublateral areas of thorax and head. Body setae abnormally short.

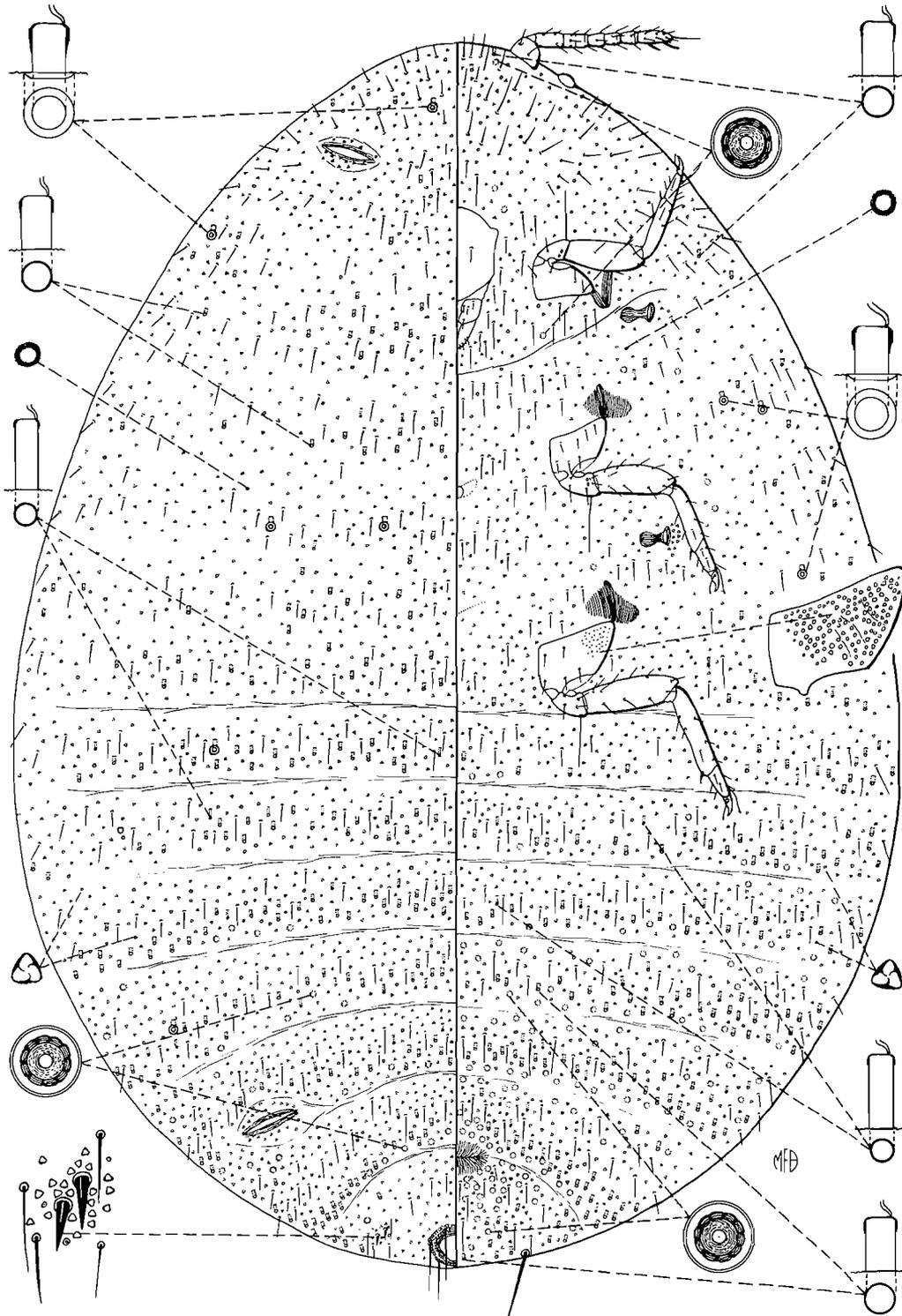


Fig. 2. *Chorizococcus coniculus* Miller and McKenzie, new species, collected at canyon above Alamogordo, Otero County, New Mexico, August 4, 1966, on unidentified grass (Gramineae).

Circulus absent. Legs moderate in size; hind coxae abnormally expanded, dorsally with 49 and 50 translucent pores, ventrally with 115 to 127 (paratypes, dorsally with 124 to 154, ventrally with 23 to 71); tarsal digitules capitate, extending beyond tip of claw; claw digitules capitate, extending beyond tip of claw; claws with no denticle. Antennae 8-segmented.

**Variation.** Paratypes remarkably similar to holotype. Occasionally, 1 or 2 dorsal multilocular disk pores present on medial portion of thorax.

**Notes.** The generic placement of this species is a definite problem. Although it keys to *Chorizococcus*, the body form and grass-infesting habit make it atypical for the genus.

It is most closely related to *Chorizococcus rostellum* (Hoke), but differs in possessing dorsal multilocular disk pores; discoidal pores; dorsal oral-collar tubular ducts of two sizes—all of which are absent in *C. rostellum*. It has no circulus, whereas *C. rostellum* has a small, distinctive circulus.

**Genus *Dysmicoccus* Ferris**

This genus, with the one species herein described as new, contains 31 species for North America. In addition,

three new species are described from South America. McKenzie's (1967) key should be revised as follows:

- A(11). Ventral multilocular disk pores either absent or fewer than 10 in number ..... *polymeris* Miller and McKenzie
- Ventral multilocular disk pores more than 20 in number ..... 13
- 13(A). "Ventral multilocular disk pores distributed from posterior apical segment of abdomen forward to thorax and head .. *racemus* McKenzie"
- "Ventral multilocular disk pores distributed from posterior segment of abdomen forward to segment 6 or 7, absent on thorax and head .. 14"

***Dysmicoccus brachydactylus* Miller and McKenzie, new species**

(Figure 3)

**Suggested common name.** Short-digitule mealybug.

**Collection data.** Adult females on *Taraxacum officinalis* (Compositae), collected at Caupolican, Valdivia, Chile, January 11, 1964, by L. Duran.

**Type material.** Holotype adult female (single specimen on slide), deposited at UCD. Two adult female paratypes on two slides (UCS, USNM).

**Gross external features.** No information.

**Recognition characters.** Adult female holotype, mounted, 1.88 mm long, 1.45 mm wide (paratypes, 2.29 to 2.31 mm long, 1.85 to 1.91 mm wide); body rotund.

Dorsum with 17 pairs of cerarii. Anal-lobe cerarii each with 2 conical

setae, 3 auxiliary setae, cluster trilocular pores, and no basal sclerotization. Remaining cerarii each with 1 to 6, usually 3, conical setae, zero to 4 auxiliary setae, cluster trilocular pores, and usually 1 or 2 discoidal pores. Multilocular disk pores absent. Dorsum with light scattering of trilocular and discoidal pores. Oral-collar tubular ducts absent. Dorsal body setae short, except on medial areas of abdominal segments 9, 8, and 7 where conspicuously longer than on rest of surface.

Anal ring dorsal, situated near abdominal apex, with 2 rows of pores, outer row weakly sclerotized; each of its 6 setae slightly longer than greatest diameter of ring.

Venter with multilocular disk pores present in small numbers from abdominal segment 9 through 5, with one such pore anterior to hind pair of legs. Trilocular and discoidal pores lightly scat-

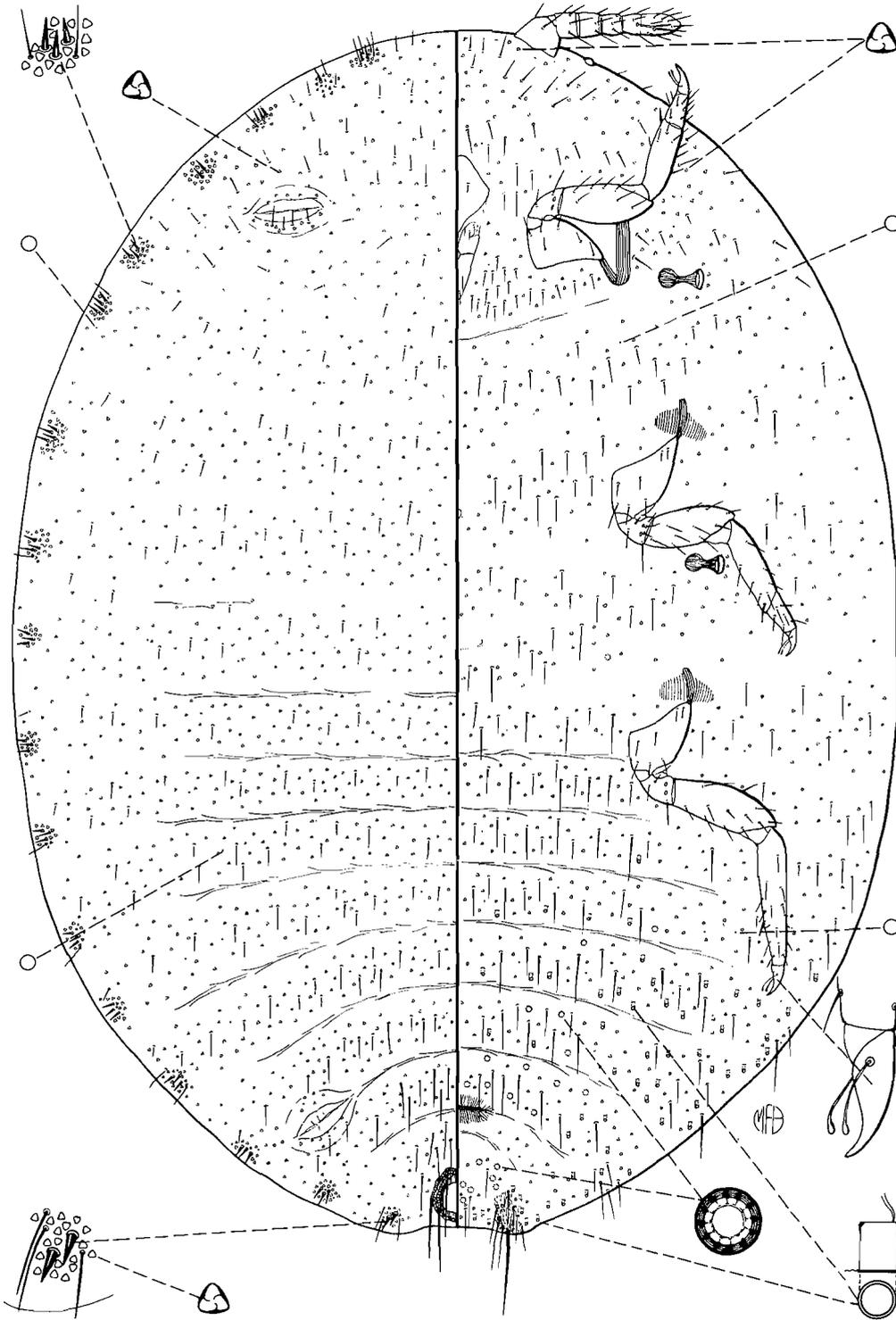


Fig. 3. *Dysmicoccus brachydactylus* Miller and McKenzie, new species, collected at Caupolican, Valdivia, Chile, January 11, 1964, on *Taraxacum officinalis* (Compositae).

tered over surface. Oral-collar tubular ducts noticeably short, with large dermal orifice, present on abdominal segments 9 through 4, most numerous on sublateral areas of segments 8, 7, and 6. Body setae conspicuously longer than those on dorsum. Anal lobe with large, heavily sclerotized area bearing 6 or 8 long body setae.

Circulus absent. Legs small with no translucent pores; tarsal digitules with acute apices not reaching tip of claw; claws with digitules short, not extending to claw apex; claws without denticle. Antennae 6-segmented. Eye small, nearly absent, with no discoidal pores in association.

**Variation.** Normally with 17 pairs of cerarii, rarely with 16. Multilocular disk pores on venter sometimes absent on abdominal segment 5, rarely present on thorax. Oral-collar tubular ducts usually absent on abdominal segment 4.

**Notes.** This species is closely related to *Dysmicoccus obesus* (Lobdell) in that it has multiple-seta cerarii and dorsal, posterior abdominal segments with a patch of elongate body setae. It differs, however, in possessing 6-segmented antennae; 16 or 17 pairs of cerarii; and large oral-collar tubular ducts, in contrast to *D. obesus*, which has 8-segmented antennae; 12 or 13 pairs of cerarii; and small tubular ducts.

This species is also closely related to *Dysmicoccus lasii* (Cockerell), but has bispinose cerarii only, in contrast to the multiple-seta cerarii of *D. brachydactylus*.

### *Dysmicoccus dactylus* Miller and McKenzie, new species

(Figure 4)

**Suggested common name.** Digitule mealybug.

**Collection data.** Adult females on unidentified plant, collected at "Quebrada Lo Rojas" (Quebrada Las Rosas?), La Cruz, Chile, March 15 and April 21, 1961, by L. M. Smith.

**Type material.** Holotype adult female (single specimen on slide), deposited at UCD. One adult female paratype (UCS).

**Gross external features.** No information.

**Recognition characters.** Adult female holotype, mounted, 1.68 mm long, 0.82 mm wide (paratype, 1.36 mm long, 0.61 mm wide); body elongate.

Dorsum with 6 or 7 pairs of definite cerarii on abdomen, those on thorax with setae widely separated. Anal-lobe cerarii each with 2 conical setae, 3 or 4 auxiliary setae, diffuse cluster of trilocular pores, 2 or 3 small discoidal pores, and large, conspicuous area of basal sclerotization. Remaining cerarii with their setae anteriorly becoming progressively more slender and farther separated; these cerarii with weak cluster of trilocular pores, and no area of basal sclerotization. Multilocular disk pores scattered in small numbers over entire surface, most abundant on abdomen and posterior thorax. Dorsum evenly beset with trilocular pores. Small discoidal pores present in moderate numbers over surface. Oral-collar tubular ducts of one size, scattered over surface, loosely associated with dorsal multiloculars. Body setae slightly more robust than normal, shorter than those on venter; without elongate body setae on posterior abdominal segments.

Anal ring dorsal, situated near abdomen apex, with 3 rows of pores, outer row more weakly sclerotized than other two; each of its 6 setae approximately twice as long as greatest diameter of ring.

Venter with multilocular disk pores on posterior and anterior margins of abdominal segments 9 through 6, these rows restricted to posterior margins on segments 5 and 4, with a few such pores on remaining abdominal segments and lateral margins of posterior thorax. Trilocular pores scattered over surface. Small discoidal pores uncommon, lightly distributed over surface. Oral-

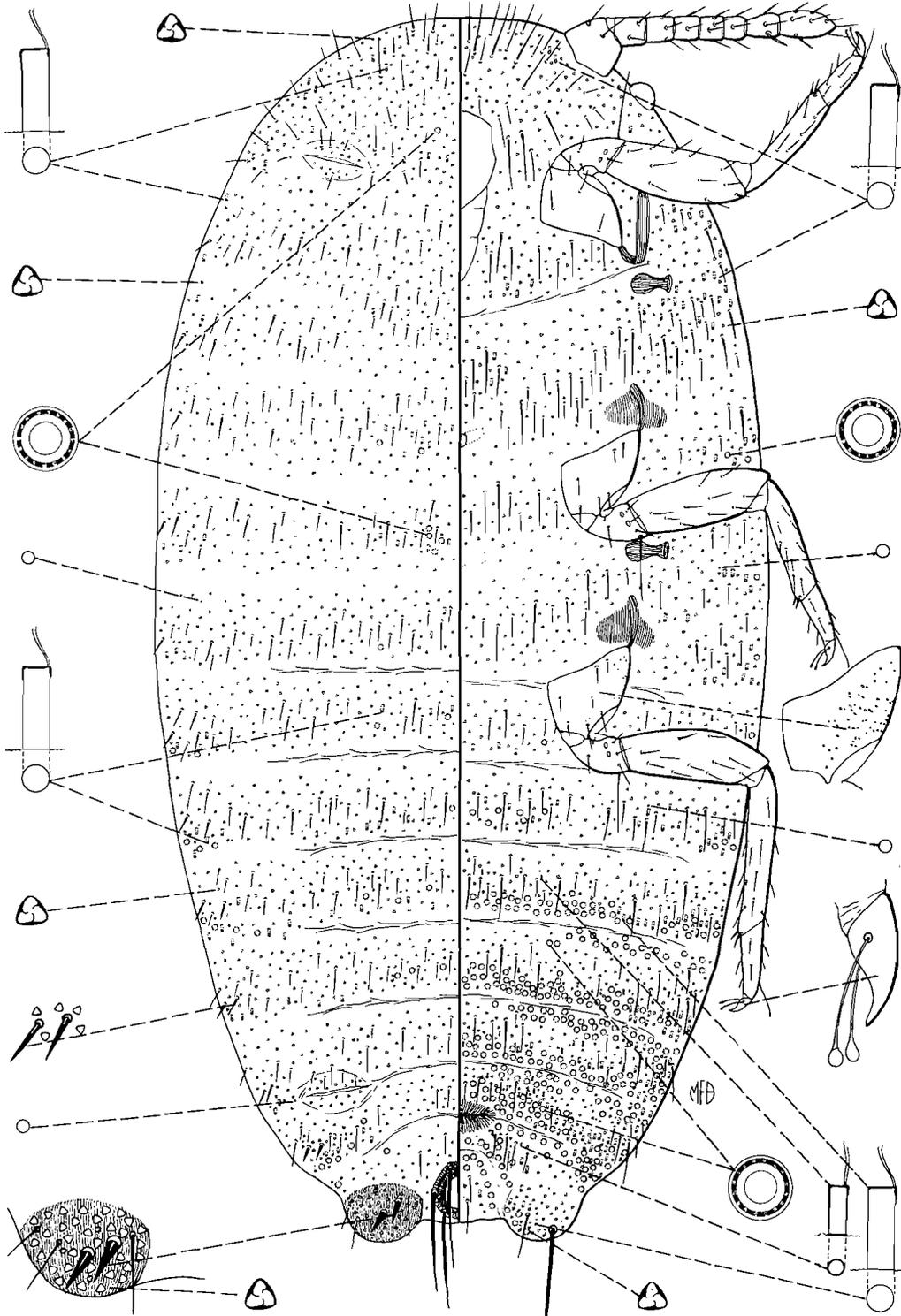


Fig. 4. *Dysmicoccus dactylus* Miller and McKenzie, new species, collected at "Quebrada Lo Rojas" (Quebrada Las Rosas?), La Cruz, Chile, March 15, 1961, on unidentified plant.

collar tubular ducts of two sizes: larger size same as on dorsum, most abundant, present primarily on posterior margins of abdominal segments, also along margin of thorax and head and near mouth-parts; smaller size closely associated with transverse rows of body setae on most abdominal segments. Body setae normal for genus.

Circulus absent. Legs moderate in size; dorsal surface hind coxae with 54 and 57 minute, translucent pores, ventral surface with 27 and 24 (paratype, 34 and 22 dorsally, 23 and 23 ventrally); hind tibiae with these structures absent; tarsal digitules capitate, extending to tip of claw; claw digitules with unusually bulbous apex, extending beyond tip of claw; claws with denticle absent. Antennae 8-segmented. Eyes large, with discoidal pores in association.

**Variation.** Paratype differs in having fewer dorsal multilocular disk pores, these present on abdomen and posterior thorax only; 2 rows of pores on anal ring; no ventral multilocular disk pores anterior to abdominal segment 4; antennae either 7- or 8-segmented.

**Notes.** The generic placement of this species is a problem. With the presence of more than 5 pairs of cerarii, it falls well within the present limits of *Dysmicoccus*; the body form and anal-lobe cerarii, however, suggest a possible affinity with *Trionymus*.

If included in *Dysmicoccus*, it seems closest to *D. timberlakei* (Cockerell), another possible *Trionymus* candidate. This species differs from *D. timberlakei* in possessing, at most, 10 pairs of cerarii, and in having no circulus; *D. timberlakei*, on the other hand, has a full complement of 17 pairs of cerarii and a well-developed circulus.

***Dysmicoccus polymeris* Miller and McKenzie, new species**

(Figure 5)

**Suggested common name.** Multilocular mealybug.

**Collection data.** Adult females on *Lithocarpus densiflora echinoides* (Fagaceae), collected 15 mi. N. E. of Nevada City, Nevada Co., California, July 14, 1966, by D. R. Miller.

**Type material.** Holotype adult female (on left side of slide; single female paratype on right), deposited at UCD. Eight adult female paratypes (excluding paratype on slide with holotype) on seven slides (excluding holotype slide) (BM, CDA, UCD, USNM, VPI, ZAS).

**Gross external features.** This mealybug is pink with translucent legs. The derm is heavily dusted with a fluffy white secretion. From 6 to 8 thin, moderately long filaments are produced on the caudal and lateral areas of the abdomen. A loose filamentous ovisac is produced beneath and behind the body of the female. The ostiole secretion is light gray.

This species inhabits the roots of its host.

**Recognition characters.** Adult female holotype, mounted, 3.05 mm long, 2.10 mm wide (paratypes, 1.59 to 3.39 mm long, 0.99 to 2.54 mm wide); body broadly oval.

Dorsum with 12 and 13 cerarii, 8 cerarii on abdomen and 4 or 5 on anterior thorax and head. Anal-lobe cerarii each with 4 or 5 conical setae, 6 slender auxiliary setae, large cluster of approximately 25 trilocular pores, and unusual, partially sclerotized basal area; next 3 cerarii each with 3 or 4 conical setae, small cluster of trilocular pores. Trilocular and discoidal pores scattered over surface. Multilocular disk pores absent. Oral-collar tubular ducts present only near anterior margin of abdominal segment 9. Body setae slender, noticeably shorter than those on venter, not noticeably elongate on posterior abdominal segments.

Anal ring dorsal, situated near apical margin of abdomen; with 2 rows of pores, outer row inconspicuous and lightly sclerotized; each of its 6 setae

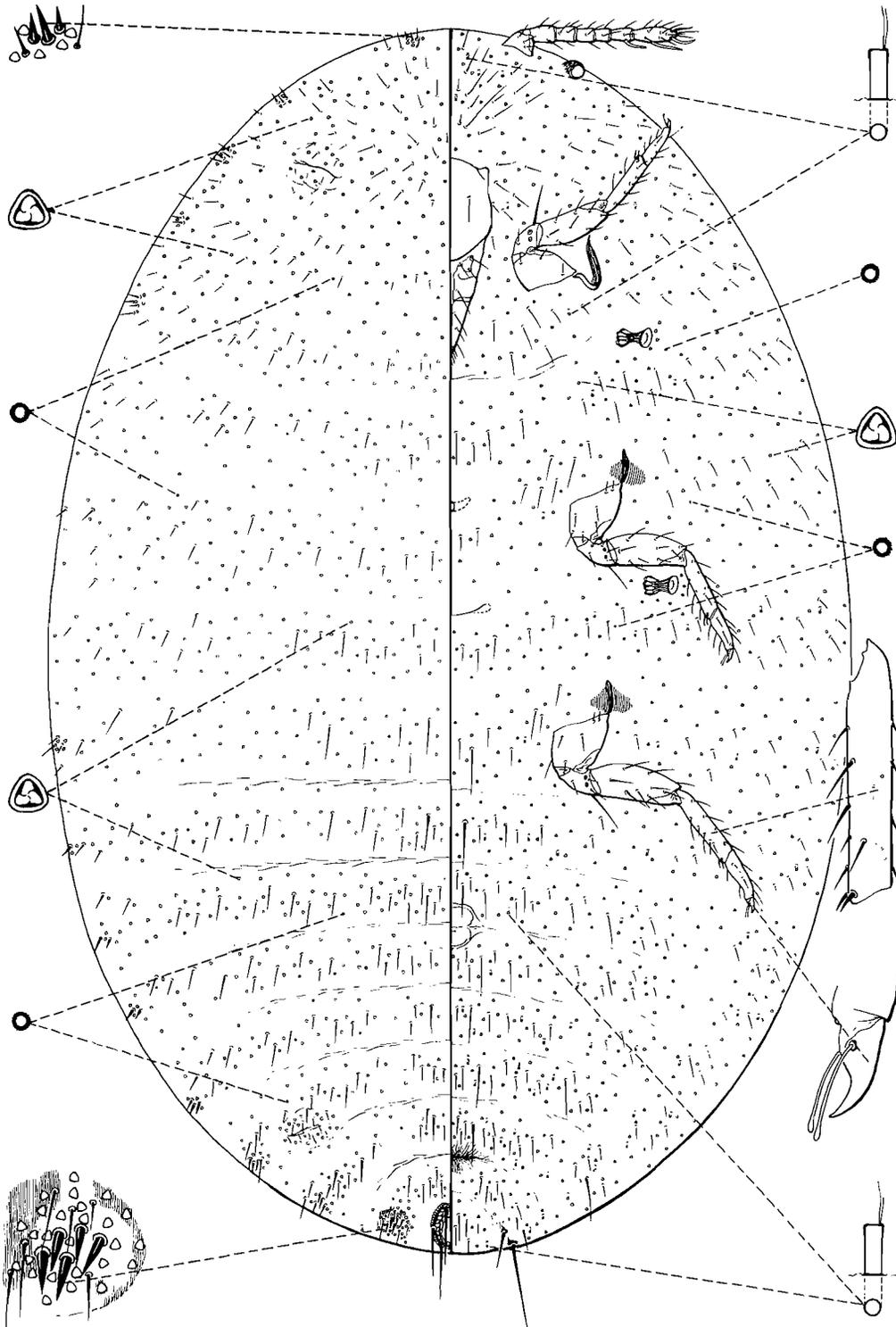


Fig. 5. *Dysmicoccus polymeris* Miller and McKenzie, new species, collected 15 miles northeast of Nevada City, Nevada County, California, July 14, 1966, on *Lithocarpus densiflora echinoides* (Fagaceae).

approximately one and one-half times as long as greatest diameter of ring.

Venter with multilocular disk pores absent. Trilocular pores present over entire surface. Discoidal pores same as on dorsum, scattered over surface. Oral-collar tubular ducts sparsely scattered over entire venter, most abundant on abdomen where distributed segmentally in transverse rows near body setae. Body setae noticeably elongate. Anal lobes with thin, sclerotized anal bar.

Circulus large and rectangular, divided and folded along intersegmental line. Legs moderate in size; hind tibiae dorsally with 8 and 10 inconspicuous translucent pores (paratypes, 0 to 13); tarsal and claw digitules capitate, extending beyond claw apex; claws with denticle absent. Antennae 7-segmented. Eyes normal for genus; no discoidal pores in association.

**Variation.** Paratypes differ from holotype as follows: cerarii varying in number from 11 to 13 with 6 to 8 on abdomen and 4 to 6 on anterior thorax and head; cerarian setae short and conical to slender and elongate; anal-lobe cerarii each with 2 to 5 conical setae; five out of nine paratypes possess several distorted "multilocular disk pores" near vulva; translucent pores on tibiae so inconspicuous that at times not noticeable; antennae on one paratype 6-segmented, normally 7-segmented with segment 4 showing indication of division.

**Notes.** The generic placement of this species is a problem. The presence of a sclerotized anal-lobe bar would place it in the tribe Planococcini, and the presence of cerarii with more than 2 conical setae would place it in the genus *Ferrisicoccus* Ezzat and McConnell. At present, it is difficult to know how much weight should be placed on the character of the anal-lobe bar. Many species of both *Dysmicoccus* and *Pseudococcus* show a broad area of ventral anal-lobe sclerotization, with a heavy bar passing through it. In some instances, the pe-

ripheral sclerotization could possibly disappear and leave only an anal bar.

The most closely related species is *Dysmicoccus difficilis* (Lobdell). Both species have multiple-seta, anal-lobe cerarii (*D. difficilis* has 2 larger conical setae and 1 or 2 smaller ones); a reduced number of cerarii, many containing more than 2 conical setae; dorsum of posterior abdominal segments without elongate body setae; no dorsal oral-collar tubular ducts or dorsal multilocular disk pores; and a large circulus.

They differ as follows: *Dysmicoccus polymeris* either completely lacks multilocular disk pores, or has a few aberrant multiloculars near the vulva; it normally possesses from 3 to 5, nearly equal conical setae on each anal-lobe cerarius; the anal-lobe cerarii are only partially sclerotized; the ventral anal lobe has a slender, sclerotized bar; and the antennae are 6- or 7-segmented; *D. difficilis*, on the other hand, has several ventral multilocular disk pores; 2 large conical setae and 1 or 2 smaller setae on each anal-lobe cerarius; completely sclerotized anal-lobe cerarii; ventral anal lobe with broad sclerotized area; and 8-segmented antennae.

*Dysmicoccus polymeris* is also similar to *D. obesus* (Lobdell), but differs in possessing no multilocular disk pores; normally from 3 to 5 conical setae in each anal-lobe cerarius; partially sclerotized anal-lobe cerarii; no elongate body setae on dorsum of posterior abdominal segments; ventral anal-lobe bar; and 6- or 7-segmented antennae; *D. obesus*, however, has many multilocular disk pores; 2 anal-lobe cerarian setae; completely sclerotized anal-lobe cerarii; a patch of elongate body setae on dorsum of segments 9 and 8; no ventral anal-lobe sclerotization; and 8-segmented antennae.

Inclusion of this species in the "genus" *Dysmicoccus* adds more weight to Beardsley's (1966) belief that this group is polyphyletic and should be re-examined and defined in a stricter sense.



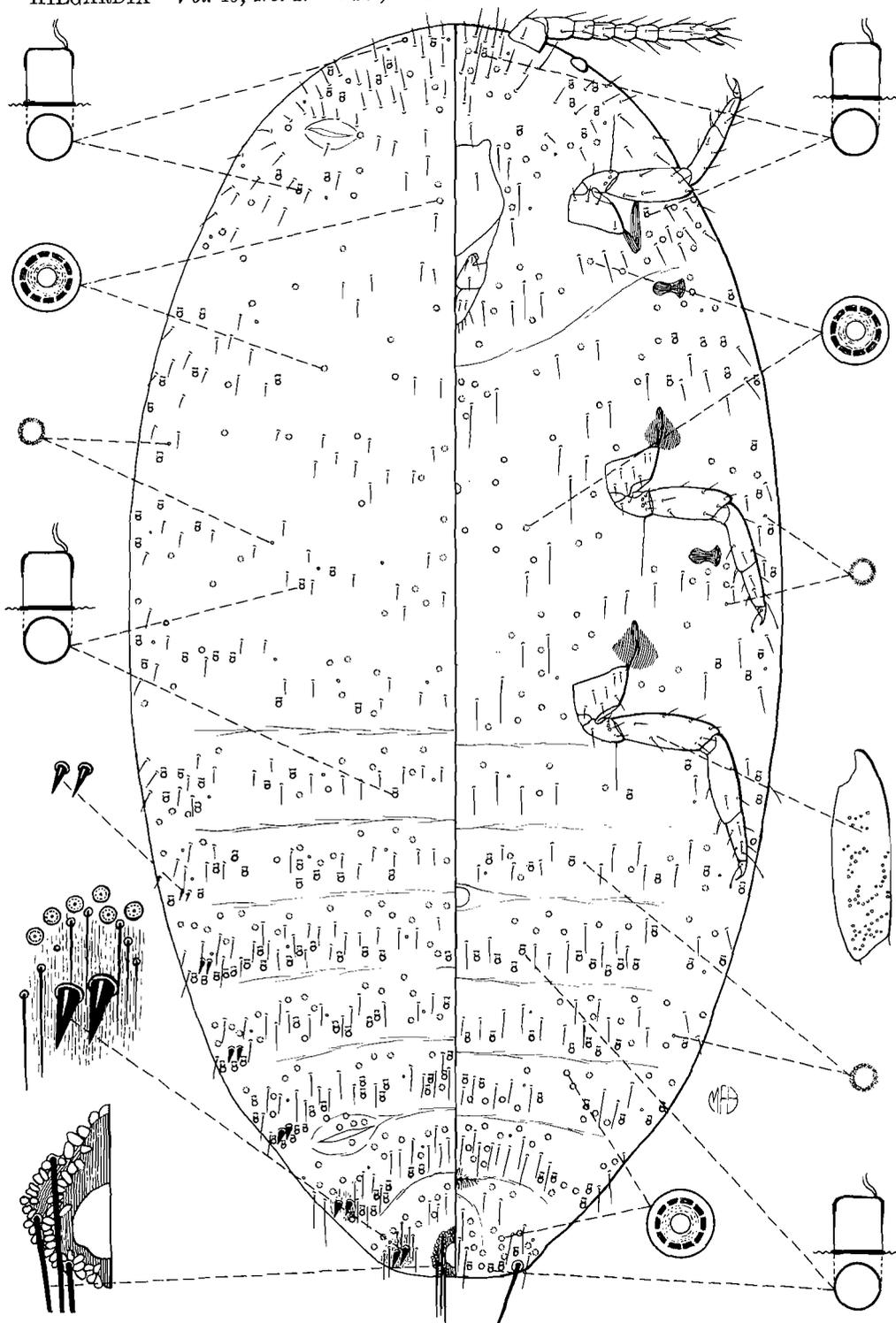


Fig. 6. *Hypogeococcus othnius* Miller and McKenzie, new species, collected in quarantine at Washington, D. C., from Venezuela, August 3, 1938, on *Cattleya* sp. (Orchidaceae).

*Epidendrum* sp., collected at Laredo, Texas, from Arriago, Chiapas, Mexico, July 13, 1950, by Cary. Adult female, one immature, on "orchid," collected at San Pedro, California, from Oaxaca, Mexico, December 6, 1965, by L. R. Gillogly. Adult females on "orchid," collected at San Francisco, California, from Nicaragua, July 5, 1938, by R. D. Clemens.

**Type material.** Holotype adult female (on slide with three paratypes; second specimen from left is holotype), deposited at USNM. Twenty-one adult female paratypes and four immature paratypes (excluding three paratypes on slide with holotype) on 15 slides (excluding holotype slide) (BM, CDA, INIA, UCD, UCS, USNM, VPI).

**Gross external features.** No information.

**Recognition characters.** Adult female holotype, mounted, 1.51 mm long, 0.94 mm wide (paratypes, from 1.24 to 2.39 mm long, 0.57 to 1.47 mm wide); body elongate to elongate oval.

Dorsum with 6 pairs of cerarii, sixth pair on one side reduced to 1 seta. Anal-lobe cerarii each with 2 large conical setae, 6 or 7 auxiliary setae, 1 or 2 multilocular disk pores, 1 small discoidal pore, weak basal sclerotization. Remaining cerarian setae becoming progressively smaller, setae of sixth pair approximately one-half length of setae of anal-lobe pair; each cerarius with 2 large, conical setae, several auxiliary setae, small discoidal pores, no basal sclerotization. Trilocular pores absent. Small discoidal pores scattered over surface. Multilocular disk pores present over entire surface, most abun-

dant on abdomen. Oral-collar tubular ducts noticeably short, with large orifices, present over entire abdomen and metathorax, restricted to marginal areas of anterior thoracic segments and head. Body setae slender, approximately same length as those on venter.

Anal ring dorsal, touching apex of abdomen; noticeably broad, although with only 2 rows of pores; each of its 6 setae over twice the length of greatest diameter of ring.

Venter with multilocular disk pores scattered over entire surface. Trilocular pores absent. Small discoidal pores present in small numbers. Oral-collar tubular ducts of same type as on dorsum, present over abdomen, restricted to body margin of thorax and head. Body setae moderate in length.

Single, undivided circulus resting on fourth-fifth intersegmental line. Legs robust; tibiae dorsally with 61 and 59 translucent pores (paratypes, 17 to 79); tarsal and claw digitules capitate, extending beyond tip of claw; claws with denticle absent. Antennae 7-segmented.

**Variation.** Although most of the paratypes agree with the above description, some variation has been noted. There may be 5 or 7 pairs of cerarii, and more oral-collar tubular ducts; the femur often has a few translucent pores; the circulus may be more longitudinally elongate and divided; and the antennae may be 6-segmented.

**Notes.** This species is distinct from the other members of this genus in that it has no enlarged dorsal body setae on the abdomen, and has very short, wide, oral-collar tubular ducts.

### Genus *Mammicoccus* Balachowsky

The pseudococcid genus *Mammicoccus* was described by Balachowsky in 1959. The type of the genus was designated as *Mammicoccus murilloi* Bala-

chowsky, a Colombian species. A second species, found in Peru, and herein described as new, is added to this remarkable mealybug genus.

KEY TO SPECIES OF *MAMMICOCCLUS*: ADULT FEMALES

- 1. With 1 circulus, located on abdominal segment 4; oral-collar tubular ducts absent on thorax and head ..... *murilloi* Balachowsky
- With 3 circuli, these located on abdominal segments 3, 4, and 5; oral-collar tubular ducts present on lateral areas, both dorsally and ventrally, of thorax and head ..... *balachowskyi* Miller and McKenzie

*Mammicoccus balachowskyi* Miller and McKenzie, new species

(Figure 7)

**Suggested common name.** Balachowsky mealybug.

**Collection data.** Adult female on flower of unidentified plant, collected 2 mi. S. Caraz Ancash, Peru (7,000 ft), February (?), 1964, by O. F. Clark.

**Type material.** Holotype adult female (single specimen on slide), deposited at UCD.

**Gross external features.** No information.

**Recognition characters.** Adult female holotype, mounted, 2.19 mm long, 1.06 mm wide; body elongate oval.

Dorsum with 16 and 17 cerarii; tendency for those along thoracic margin to disappear. Anal-lobe cerarii each with 2 conical setae, 1 auxiliary seta, several associated trilocular pores, no basal sclerotization. Remaining cerarii each with 2 conical setae, no auxiliary setae, slight concentration of trilocular pores; all cerarii on raised protuberances. Trilocular pores scattered over surface. Small discoidal pores in small numbers over surface. Two multilocular disk pores present on fifth abdominal segment, absent elsewhere. Oral-collar tubular ducts most abundant along body margin, with a few such pores present on medial and sublateral areas of abdomen and thorax. Body setae noticeably short, conspicuously shorter than those on venter.

Anal ring, although illustrated as dorsal, bent around abdominal apex, with 2 rows of pores; each of its 6 setae twice as long as greatest diameter of ring.

Venter with multilocular disk pores on medial region of abdomen, present on posterior and anterior margins of abdominal segments 9 through 7, restricted to posterior margins of segments 6 and 5. Quinquelocular pores present on midregion of abdominal segment 6 forward through prothorax, absent on posterior abdomen and head. Triloculars scattered as on dorsum. Small discoidal pores distributed in small numbers over surface. Oral-collar tubular ducts present along entire body margin, on medial areas of abdominal segments 7 through 2, and in small numbers near legs; variable in size but not distinctive enough to separate. Body setae moderate in length.

Three circuli; middle circulus on abdominal segment 4 quite distinctive, with 11 protuberances; circuli on segments 5 and 3 normal, each with single protuberance. Legs relatively large and slender; tibiae dorsally with 46 and 57 translucent pores, scattered along entire segment; tarsal digitules acute, not reaching tip of claw; claw digitules all broken, probably capitate; claws with noticeable denticle on plantar surface near tip. Antennae slender, 9-segmented.

**Notes.** This species is closely related to *Mammicoccus murilloi* Balachowsky, but differs in that it has 3 circuli; oral-collar tubular ducts on anterior abdominal segments, thorax, and head; ventral multilocular disk pores on abdominal segment 5; no quinquelocular pores on head; and many tibial translucent pores. *M. murilloi*, on the other hand, has 1 circulus; no oral-collar tubular ducts anterior to abdominal segment 5; quinquelocular pores on head; and no tibial translucent pores.

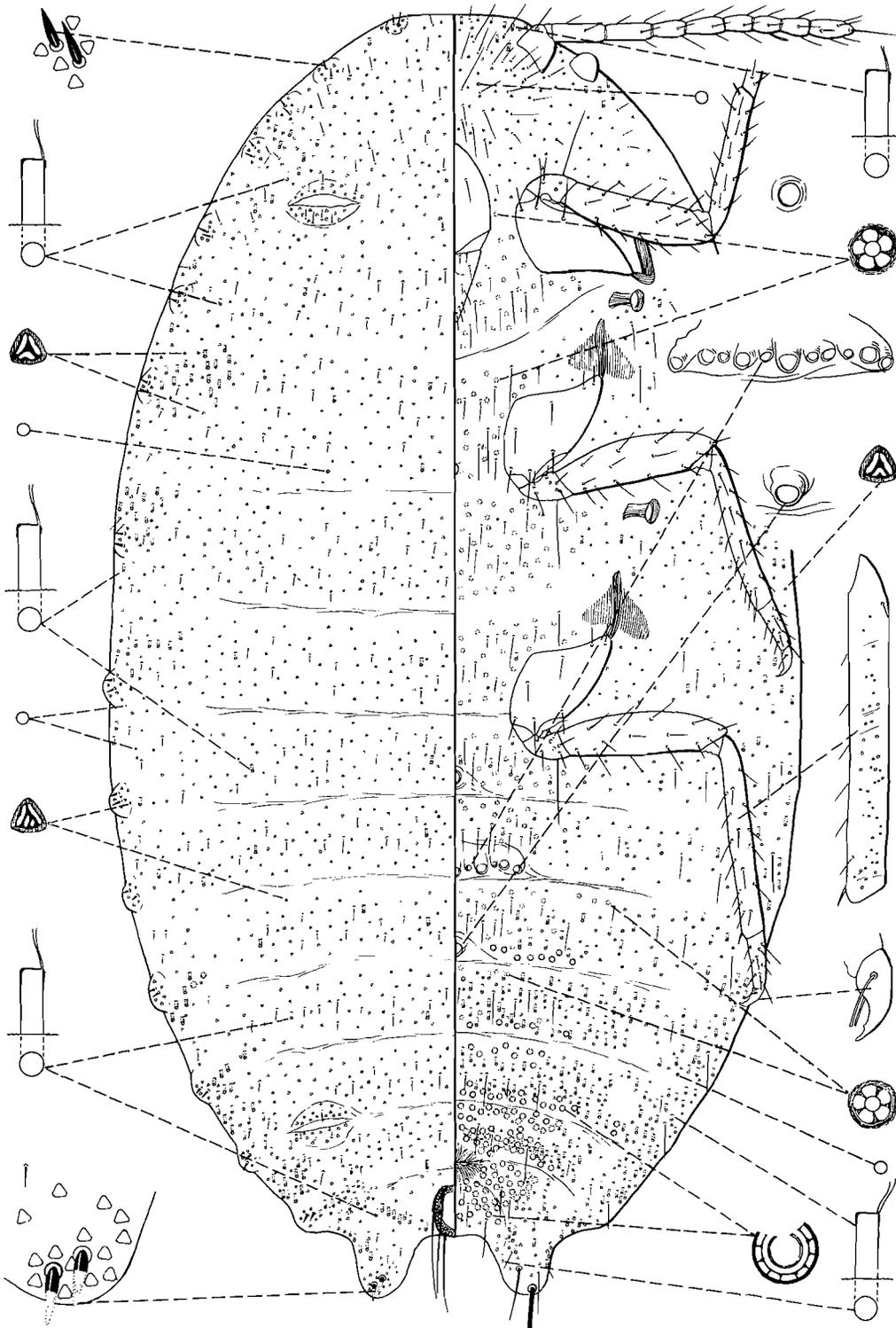


Fig. 7. *Mammicoccus balachowskyi* Miller and McKenzie, new species, collected 2 miles south of Caraz Ancash (7,000 feet), Peru, February, 1964, on flower of unidentified plant.

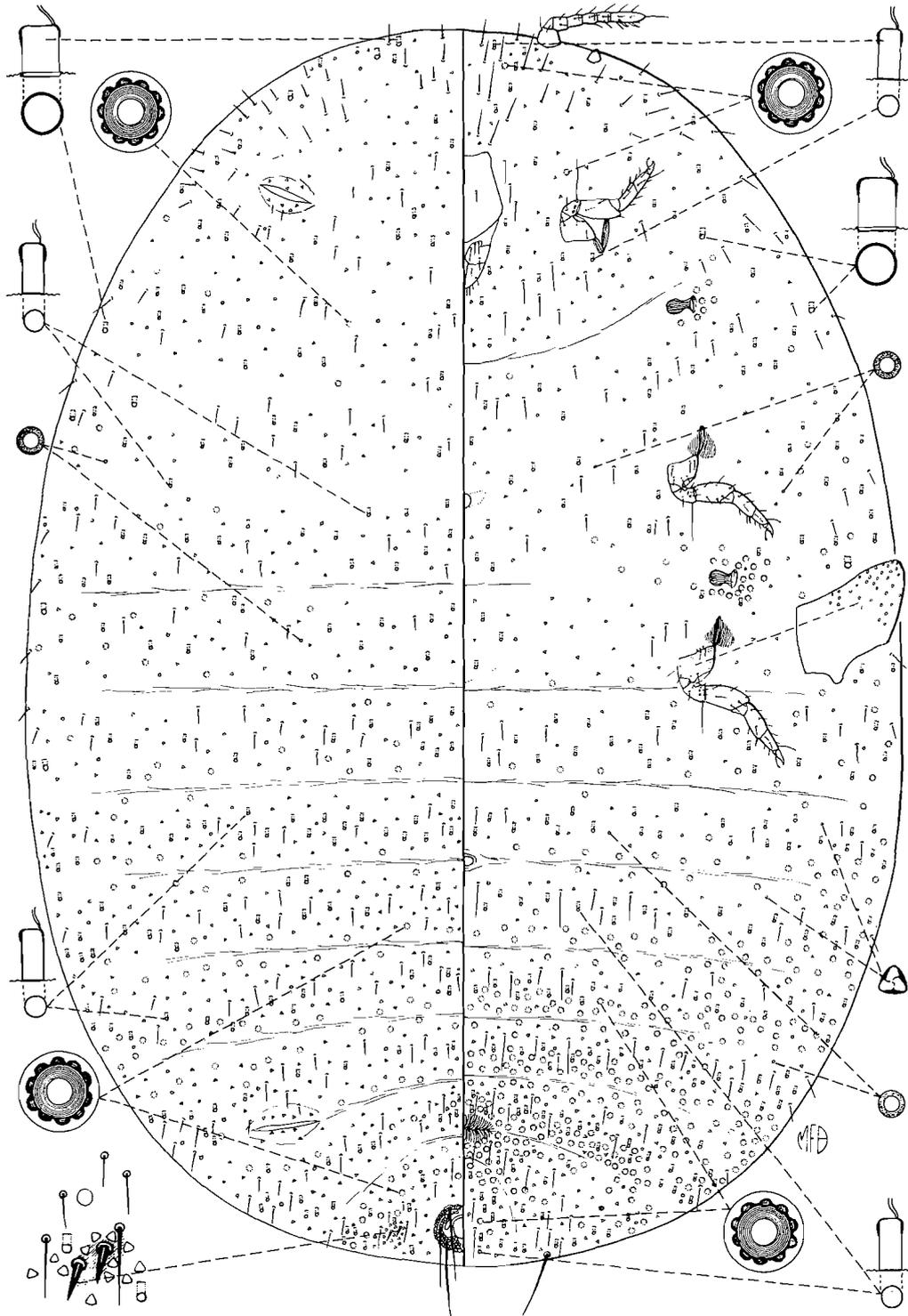


Fig. 15. *Trionymus strongylus* Miller and McKenzie, new species, collected at Madera Canyon, Santa Cruz County, Arizona, July 31, 1966, on *Trichachne* sp. (Gramineae).

related to *Trionymus magnus* (Cockerell and Cockerell), another questionable *Trionymus* species, we have decided to leave both species in this genus pending further study.

This species differs from *Trionymus magnus* in that it has lateral series of large-sized, oral-collar tubular ducts; broad, porous anal ring; and multilocular disk pores clustered around each spiracle. *T. magnus*, on the other hand, has no large-sized, oral-collar tubular

ducts; relatively thin anal ring with few pores; and no multilocular disk pores clustered around spiracles.

This species is also similar to *Chorizococcus coniculus*, herein described as new, but differs in that it has no oral-rim tubular ducts; clusters of multilocular disk pores around each spiracle; and 1 or 2 circuli. *C. coniculus* has oral-rim tubular ducts; no multilocular spiracular clusters; and no circuli.

### ACKNOWLEDGMENTS

We wish to give special thanks to Mr. Richard F. Wilkey of the Bureau of Entomology, California State Department of Agriculture, Sacramento, for his assistance in preparing slide mounts and in giving advice in certain critical areas.

Miss Louise M. Russell of the Systematic Entomology Laboratory, Agricultural Research Service, U. S. Department of Agriculture, was extremely helpful in making available certain critical type specimens necessary for comparison with the included new spe-

cies. Without her help this paper would not have been possible.

Mrs. Mary Foley Benson prepared the illustrations identified by her initials. We appreciate the help and concern she has expressed for this work. Mrs. Helen Court made the remaining drawings.

We wish to give special thanks to the staff and students of the Entomology Department, University of California, Davis, for their assistance and criticisms of this manuscript.

### LITERATURE CITED

- BALACHOWSKY, A.  
1959. Otras cochinillas nuevas Colombia. *Revista Acad. Colombia Ciencias Exactas Físicas Nat.* 10:362-66.
- BEARDSLEY, J. W.  
1965. Notes on the pineapple mealybug complex, with descriptions of two new species. *Proc. Hawaii. Ent. Soc.* 19:55-68.  
1966. Insects of Micronesia, Homoptera: Coccoidea. *Insects of Micronesia* 6:377-562.
- FERRIS, G. F.  
1953. Atlas of the scale insects of North America. Volume VI. The Pseudococcidae (Part II). Stanford, California: Stanford University Press. Pp. 279-506.  
1955. On some genera of the Pseudococcidae. *Microent.* 20:1-19.
- McKENZIE, H. L.  
1967. Mealybugs of California with taxonomy, biology and control of North American species. Berkeley: University of California Press. 525 pp.
- RAU, G. J.  
1938. Four more new species of mealybugs from New York State. *Canad. Ent.* 70:157-65.
- WILLIAMS, D. J.  
1969. A new species of *Cataenococcus* on banana in Costa Rica. *Bul. Ent. Res.* 59:101-04.