

Three New Species of *Chavesia* Balachowsky From Tropical America (Homoptera: Coccoidae)¹

JOHN W. BEARDSLEY
UNIVERSITY OF HAWAII, HONOLULU

Balachowsky (1957) established the genus *Chavesia* to accommodate an unusual myrmecophilous coccid, *C. caldasiae* Balachowsky, found infesting roots of coffee and banana at Chinchina, in central Columbia.

During 1969 I received from Dr. Carlos Evers, entomologist for the United Fruit Company, specimens of an apparently related undescribed species which had been collected in association with ants on roots of bananas at Changuenola, Panama. Subsequently, a study was made of slide mounted specimens in the collection of the U. S. Department of Agriculture, collected under similar circumstances from several localities in tropical America. This material contained two additional undescribed species, as well as additional specimens of *C. caldasiae* and the Panama form.

These coccids appear to be obligate myrmecophiles (Flanders, 1957) and may be of considerable economic importance, either alone or in combination with other root feeding species such as *Rhizococcus coffeae* Laing (Rober 1936, Valenzuela, 1961). These insects apparently infest the roots of many species of grasses, shrubs and trees, but the principal crops affected are coffee, cacao and bananas.

Virtually all known collections of *Chavesia* species have been taken in association with ant colonies, most often of the genus *Acropyga* Rodger². U. S. Department of Agriculture specimens had all been determined tentatively as "*Eumyrmococcus* sp." by the late Harold Morrison, and some published references to them appear under this generic designation. Balachowsky (1957) has pointed out important differences between *Chavesia* and the Palearctic *Eumyrmococcus* Silvestri, as well as other similar genera.

Although four species of *Chavesia* are now known, it seems likely that the group may be much larger. At present the genus is known only from southern Central America, Northern South America and Trinidad, but eventually it may be found to be more widely distributed in the American tropics than existing collections indicate.

Holotype specimens of the new species described here are deposited in the U. S. National Museum coccid collection, Washington, D. C.

¹Published with the approval of the Director of the Hawaii Agricultural Experiment Station as Journal Series No. 1183.

²See Weber (1944) for a review of the systematics and biology of the neotropical species of this hypogaecic group of ants.

THE GENUS CHAVESIA

Balachowsky considered *Eumyrmococcus* to be most similar to his monobasic *Chavesia*. The principal morphological characters which he used to differentiate between these genera were, in *Chavesia* 1) the greater number of antennal segments; 2) the presence of a conical circulus on the venter of the abdomen; 3) the presence of strongly developed anal lobes; 4) the absence of a poriferous, setabearing anal ring; and 5) the presence of small trilocular pores. The discovery of the 3 additional species of *Chavesia* which are described here requires some modification of Balachowsky's concept of the genus. For this reason the genus is redefined below.

Genus **Chavesia** Balachowsky, 1957.

Type species, **Chavesia caldasiae** Balachowsky (monobasic).

Body form similar to *Eumyrmococcus* Silvestri and other subterranean myrmecophilous pseudococcid genera such as *Hippaeococcus* Reyne, *Allomyrmococcus* Takahashi, etc. Cephalothorax strongly dilated, with abdomen either abruptly narrowed at the level of the third or fourth segment, or tapering relatively evenly toward the caudal end, giving the body a capitate or clavate shape in slide-mounted specimens. Antennae and legs well developed; antennae 4 or 5-segmented; tarsal claws moderately to strongly elongated, slender, without a denticle on inner face; claw digitules very fine, short, acute, or apparently absent. One or two small, conical, sclerotized circulus-like projections on venter of anterior abdominal segments. Anal lobes strongly developed, protuberant, with venter sclerotized, dorsum membranous or partly sclerotized and bearing numerous very long setae which together with the lobes apparently form a basket-like structure for retention of honeydew droplets. Anal opening a simple cylinder, narrowly sclerotized dorsally, without a surrounding poriferous anal ring or internal wax pores. Eyes and dorsal ostioles absent. Discernible cuticular gland orifices limited to small trilocular pores or absent; without tubular ducts or multilocular disc pores. Body setae abundant, slender, of variable length on different parts of the body; without enlarged conical setae in all stages.

TAXONOMIC AFFINITIES OF CHAVESIA

Balachowsky (1957) provisionally assigned *Chavesia* to the "Kerminae-Eriococcini". The subfamily and tribal designations were based on his (1948) classification of the Coccoidea in which he treated both the eriococcids and the pseudococcids as tribes within his subfamily "Kerminae." Most workers now regard the Eriococcidae as a distinct family level taxon which may include the genus *Kermes* but which does not include the Pseu-

dococcidae (Ferris, 1957, Hoy, 1963).

There seems to be little morphological evidence to support placing *Chavesia* with the Eriococcidae, and Hoy (1963) has specifically excluded the genus from that family. The features of *Chavesia* which Balachowsky mentions as being eriococcid in nature (i.e.: absence of poriferous anal ring and lateral tubular ducts; the form of the antennae and tarsi) are by no means universal within that family, nor are they lacking in all pseudococcids. There are none of the short, broad, acorn shaped or conical setae typical of eriococcids, even in first instar *Chavesia* nymphs. The absence of tubular ducts in this genus eliminates from consideration one of the most reliable structures for separating eriococcids and pseudococcids, but the trilocular pores of *C. caldasiae* are suggestive of pseudococcid rather than eriococcid affinities. Moreover, the male genitalia of *Chavesia* are definitely not of the eriococcid type. In *Chavesia* both penial sheath and aedeagus (Fig. 2) are rather similar to those of *Puto*, a group of primitive mealybugs (Beardsley, 1962) and certain Margarodidae (i.e.: *Steingelia* and *Matsucoccus*). Figures of the adult males of *Pseudorhizoecus proximus* Green and *P. migrans* Green (Green, 1933), although small and lacking sufficient detail, appear quite similar, both in body form and genitalia structure, to males of *Chavesia eversi* from Panama. Green placed *Pseudorhizoecus* in the Pseudococcidae, although that genus, like *Chavesia*, lacks such typical pseudococcid features as a seta-bearing poriferous anal ring, dorsal ostioles, multilocular disc pores, tubular ducts, and cerarii.

The species of *Pseudorhizoecus* were found in association with *Acropyga* ants on coffee roots in Surinam (Bunzli, 1935). Although these coccids do not possess the greatly developed anal lobe "honeydew basket" characteristic of *Chavesia*, it seems possible that these genera may be closely related. Furthermore, the presence of conical ventral circuli in *Chavesia* similar to those characteristic of the *Rhizoecus* group of subterranean mealybugs, may indicate relationship between these two groups. It seems likely, therefore, that both *Chavesia* and *Pseudorhizoecus* are highly specialized pseudococcids, possibly allied to the *Rhizoecus* group.

KEY TO THE KNOWN SPECIES OF CHAVESIA (adult females)

1. Anal lobes fused at base with eighth abdominal segment, not separated by an intersegmental constriction; postero-lateral setae of anal lobe "honeydew basket" much longer than length of lobes; antennae shorter than forelegs.....2
- Anal lobes distinctly separated from eighth abdominal segment by intersegmental constriction, apparently articulating with eighth segment at their bases; postero-lateral setae of lobes shorter than, or about as long as, anal lobes; antennae longer than forelegs.....3
2. Head and thorax with scattered small trilocular pores; tarsal claws about

- 2/3 as long as tarsi; anal lobes relatively short and broad (Fig. 5).....
*cladasiae* Balachowsky
- Body without discernible pores or ducts; tarsal claws relatively small, 1/4 to 1/3 as long as tarsi; anal lobes relatively long and slender (Fig. 3).....*weberi*, n. sp.
3. Antennae borne on a distinctly sclerotized semicircular prominence; 4-segmented, the second segment distinctly broader near middle than at ends; body form clavate, the sides of abdomen tapering evenly to base of anal lobes (Fig. 1).....*eversi*, n. sp.
- Antennae not borne on a sclerotized prominence; usually 5-segmented, the second segment slightly narrower at middle than at ends; body form capitate, abdomen abruptly constricted at third segment (Fig. 4).....*trinidadensis*, n. sp.

Chavesia eversi, new species (Fig. 1).

Adult female: Length of slide mounted specimens about 1.3 mm.; body form clavate, widest across mesothorax; sides of abdomen tapering evenly to base of anal lobes. Antennae relatively large (about 0.38 mm long), apparently 4-segmented, basal segment articulating with a distinctly sclerotized semicircular prominence (possibly a greatly reduced scape); segment 2 broadest near middle, about 62 μ maximum width; segments 3 and 4 narrower; approximate lengths of segments (base to apex) 54 μ : 150 μ : 50 μ : 130 μ . Antennal setae relatively short (mostly 15–25 μ long), a few on segment 4 up to about 35 μ . Legs relatively short and stout; hind legs with femora about 110 μ long, tibiae about 65 μ , tarsi 35 to 50 μ ; apices of tarsi not strongly narrowed; tarsal claws long (about 50 μ), slender, bases distinctly expanded; bearing a pair of short (about 7 μ) very fine digitules. Labium incompletely 2-segmented, about 100 μ long by 75 μ wide at base. Eyes absent. Spiracles large, 25–27 μ across opening, sclerotized rim of peritreme not forming a complete ring. A small, midventral “circulus” on abdominal segment 2, appearing as a short, broad sclerotized cone with a central tubular aperture about 6 μ diameter. Eighth abdominal segment conspicuously modified, consisting of a narrow basal cylindrical portion with integument of posterior two-thirds strongly sclerotized, separated from posterior portion (anal lobes) by a distinct intersegmental crease. Anal lobes sclerotized ventrally and laterally, apparently membranous dorsally; lobes, except posterior 1/5 of length, broadly connected by an unsclerotized membrane; dorsal surface of united lobes forming a concave depression. Anal opening located between bases of anal lobes; anal tube inconspicuous, narrowly sclerotized dorsally.

Body without discernible integumental pores or ducts. Setae varying noticeably in length and density on different parts of body. Dorsum of head, thorax and first abdominal segment with numerous, close-set, short, fine, setae, mostly 6–10 μ long; venter of head and thorax with longer, sparser setae, 12 to 22 μ long. Setae on dorsum of abdominal segment 2

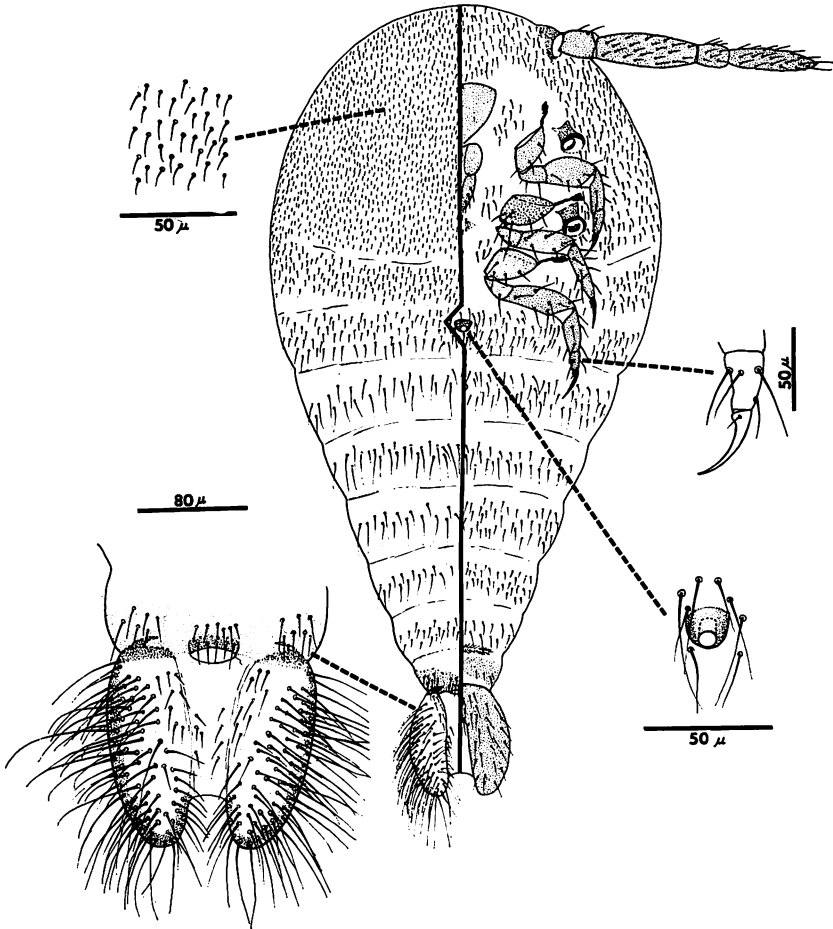


FIG. 1. *Chavesia eversi* n. sp.; mature female.

up to 40 μ long; those of segments 3 to 6 mostly 55–65 μ ; shorter on segment 7 (about 30 μ on anterior part, about 40 μ on posterior margin); setae of dorsum of anterior part of segment 8 very fine, 12–15 μ long. Setae of venter of abdominal segments mostly 15 to 40 μ long, the longest setae on posterior margins of segments. Setae of dorsum of anal lobes elongate, most 70 to 100 μ except along inner anterior part of each lobe (25–30 μ).

Described from 17 slide mounted specimens. Holotype and 9 paratypes: Changuinola, Panama, 21 August 1969, C. Evers collector, on roots of banana tended by *Acropyga kathrynae* Weber. Four paratypes: same locality, collector and plant host, 15 Sept. 1969, associated with *Pheidole subarmata*. Three paratypes: Columbia, S. A., 10 Oct. 1956, S. E. Flanders collector, on coffee.

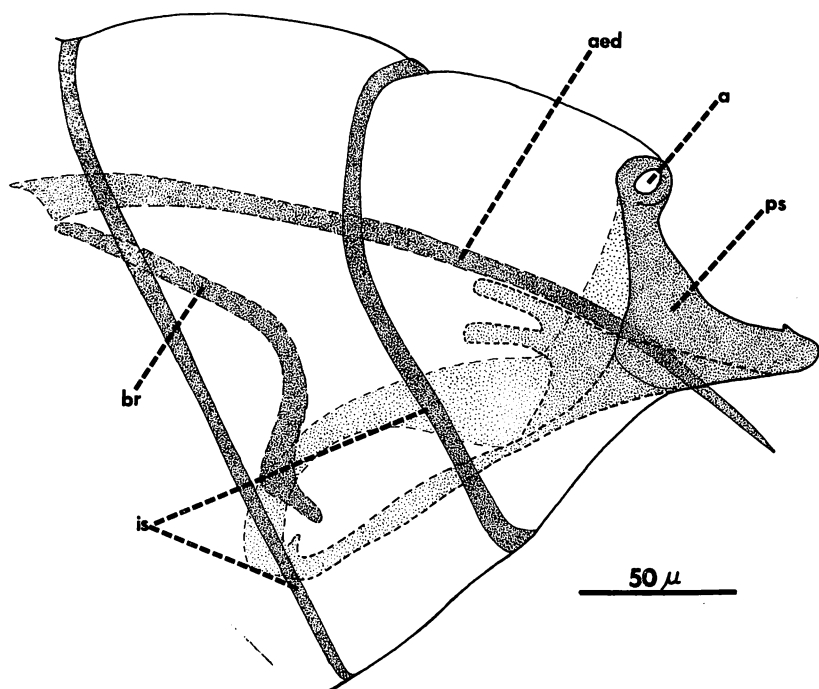


FIG. 2. *Chavesia eversi* n. sp.; adult male, lateral aspect of posterior abdominal segments. (a—anus, aed—aedeagus, br—basal rod, is—intersegmental sclerites, ps—penial sheath).

Three adult male specimens from the Panama collections are also at hand. These are morphologically degenerate without vestiges of wings, eyes, mouthparts or thoracic sclerites. They are about 0.9 mm in length with clavate body form. The antennae are 2-segmented and about 75 μ long. The apical segment bears several long, fleshy setae (up to 45 μ); otherwise the body is completely devoid of vestiture. The posterior margin of each abdominal segment forms a narrow, strongly sclerotized ring. The genitalia are as shown in Figure 2.

C. eversi is most closely related to *C. trinidadensis*, n. sp., from which it may be separated by the characters given in the key to species. See discussion following description of the latter.

***Chavesia trinidadensis*, new species** (Fig. 3).

Adult female: Length of slide-mounted specimen about 1.1 mm; body form capitate, broadest across mesothorax; abdominal segments 1 to 4 progressively narrower; segments 5 to 7 and basal part of 8 of nearly uniform width. Antennae relatively long (about 0.4 mm), 5-segmented (two apical segments sometimes incompletely separated), basal segment not borne on a sclerotized prominence; second segment slightly narrower at middle

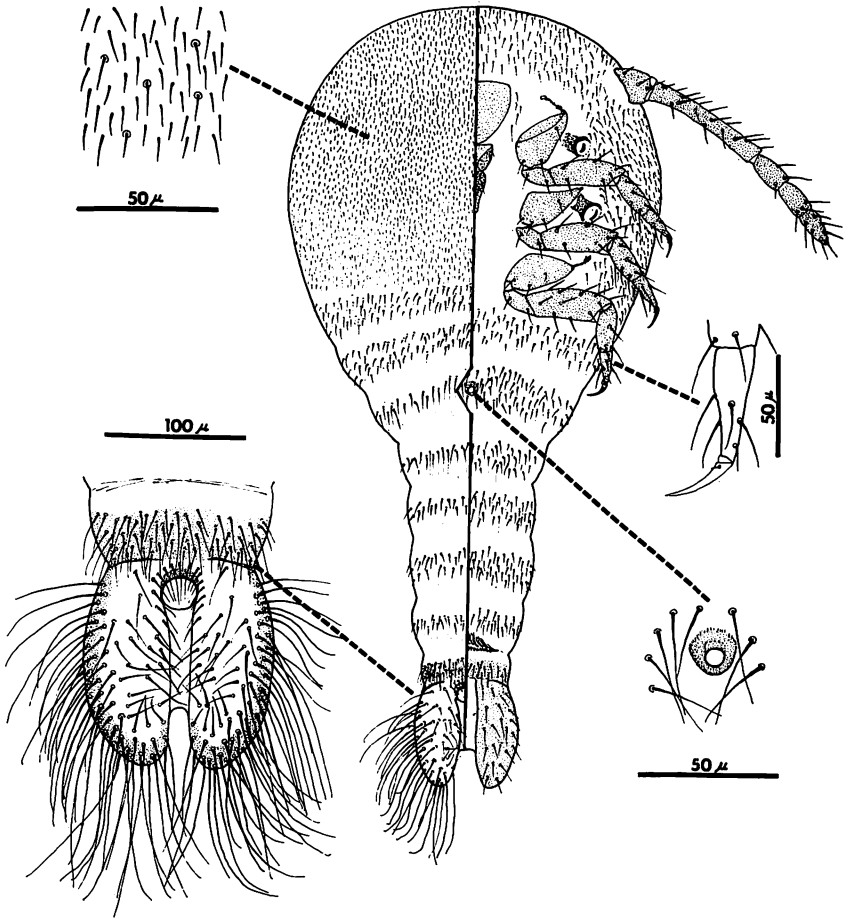


FIG. 3. *Chavesia trinidadensis* n. sp., mature female.

than at ends, not noticeably broader than segments 3 and 4. Approximate lengths of segments (base to apex) 50 μ ; 185 μ ; 65 μ ; 50 μ ; 50 μ . Antennal setae mostly 15–18 μ long with longer setae to 55 μ on segments 3–5 and apical part of 2. Legs moderately short and stout; hind femora about 112 μ long; hind tibiae about 75 μ ; hind tarsi about 55 μ , apically narrowed; tarsal claws elongate (about 40 μ), slender, base weakly expanded, claw digitules extremely fine, minute (about 4 μ long). Labium 2-segmented about 100 μ long, 60 μ wide at base. Eyes absent; spiracles large, sclerotized rim of peritreme not forming a complete ring. Abdominal segment 3 with a small midventral circulus, in form of a short sclerotized cone with central internal tube about 8 μ diameter. Eighth abdominal segment modified as in *C. eversi*, with anterior sclerotized portion separated by a distinct inter-

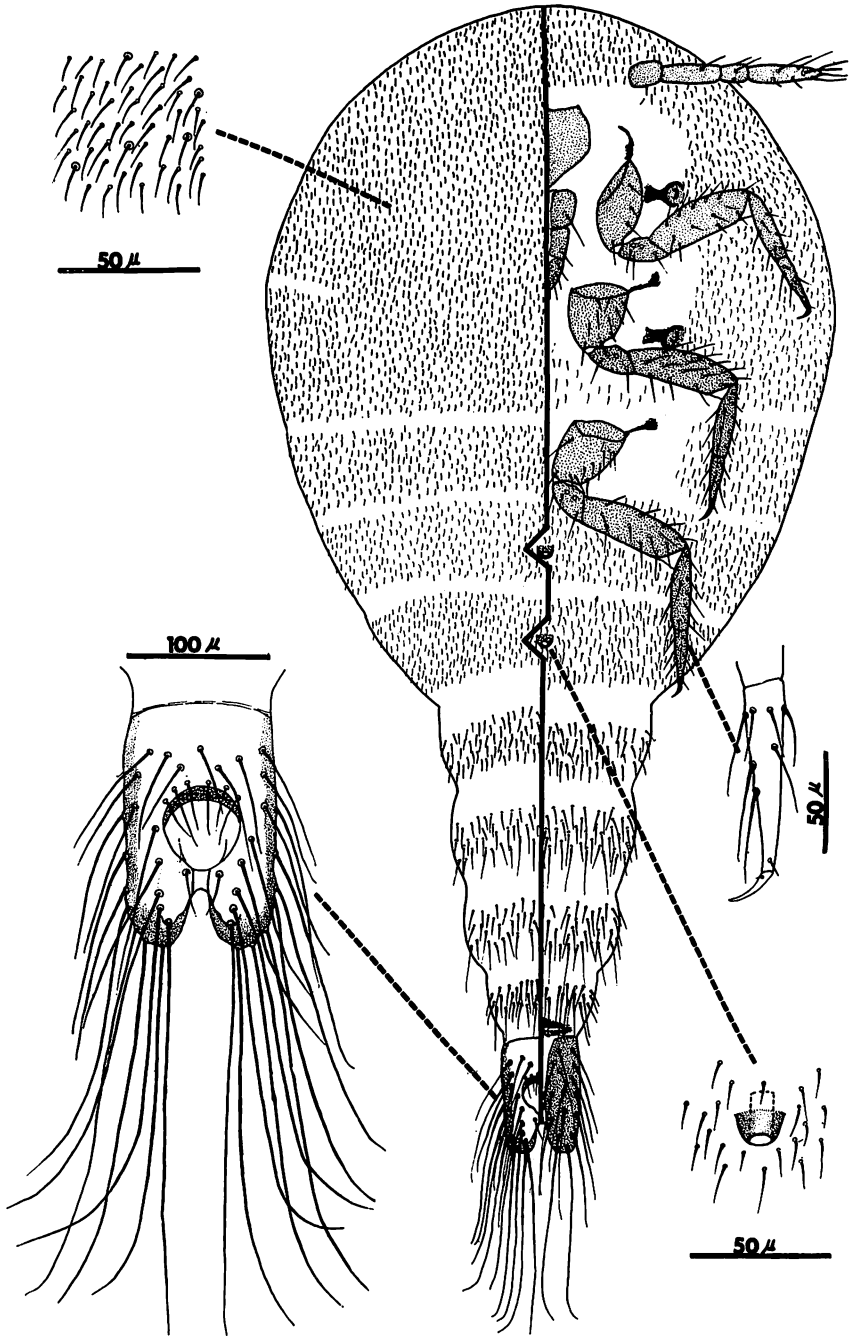


FIG. 4. *Chavesia weberi* n. sp., mature female.

segmental constriction from anal lobes. Anal lobes similar to *C. eversi*; about 150 μ long; sclerotized ventrally, membranous dorsally, joined by a ventral membrane for about two-thirds of their length. Anal tube short, opening between bases of anal lobes, narrowly sclerotized dorsally.

Body without discernible pores or ducts. Setal pattern similar to that of *C. eversi*. Setae of dorsum of head and thorax dense, fine, short, (6–12 μ long); basal rings of most setae extremely narrow, a few with conspicuously wider basal rings scattered among these; venter of head and thorax with longer sparser setae, 15 to 25 μ long. Setae on dorsum of abdominal segment 2 up to 45 μ long; mostly 55 to 65 μ on segments 3 to 6; 40 to 50 μ on segment 7; 15 to 25 μ on basal part of segment 8. Ventral setae of abdominal segments mostly 25 to 40 μ long. Long setae of dorsum of anal lobes to 130 μ , shorter setae on inner anterior part of lobes about 35 μ long; ventral setae of anal lobes 25–35 μ long.

Described from 3 female specimens. Holotype: San Rafael, Trinidad, B. W. I., 31 May 1935, N. A. Weber collr., in clay under cacao tree. Paratypes: one, St. Augustine, Trinidad, B. W. I., 4 June 1935, N. A. Weber collr.; about roots of cacao; one, same locality and collector, 12 May 1935, on cacao roots.

Among the known species, *C. trinidadensis* is most similar to *C. eversi*. It differs from the latter in having 5 segmented antennae which are not borne on sclerotized processes. Also the second segment of the antenna is of distinctly different shape, being slightly constricted near the middle, rather than distinctly expanded as in *eversi*. In *trinidadensis* the tarsal claws are shorter and less noticeably expanded at their bases than in *eversi*, and the claw digitules of the former are much less strongly developed. *C. trinidadensis* has a well developed circulus on abdominal segment 3, whereas this structure is found on segment 2 in *eversi*. Also, the general shape of the body differs somewhat in these species, being clavate (abdominal segments evenly tapered) in *eversi*, and capitate (posterior abdominal segments of nearly uniform width) in *trinidadensis*.

Chavesia weberi, new species (Fig. 4).

Adult female: Length of slide-mounted specimen about 1.5 mm; body form capitate, broadest across mesothorax; anterior part of body from abdominal segment 4 forward forming a rounded expansion; narrow posterior abdominal segments of relatively uniform width, tapering slightly toward the rear; eighth segment distinctly narrower than seventh. Antennae 4-segmented moderately small, shorter than forelegs, about 0.28 mm total length, not borne on a sclerotized prominence; approximate lengths of segments 56 μ , 82 μ , 42 μ , 100 μ ; second segment nearly cylindrical. Antennal setae mostly 15 to 25 μ long, a few on apex up to 68 μ . Legs moderately long; hind femora 195 μ long, hind tibiae 120 μ , hind tarsi 100 μ ; tarsal claws relatively short (around 27 μ long), base not noticeably expanded, with barely discernible digitules. Labium 2-segmented, about 160 μ

long, $80\ \mu$ wide at base. Eyes absent; spiracles large (28 to $30\ \mu$ wide), sclerotized rim of peritreme not forming a closed ring. Abdominal segments 2 and 3 each with a small midventral circulus in the form of a sclerotized cone with a central internal tube about $8\ \mu$ diameter. Eighth abdominal segment without a distinct intersegmental constriction between basal portion and anal lobes, relatively elongate and narrow (about $175\ \mu$ long by about $105\ \mu$ wide at base), sides nearly parallel; ventral surface sclerotized except mesally at base, dorsum membranous; anal tube opening large (about $55\ \mu$ diameter), opening dorsally between bases of anal lobes, dorsum of tube narrowly sclerotized.

Body without discernible pores or ducts. Setal pattern similar to *C. caldasiae*; setae of dorsum of head, thorax, and abdominal segments 1-4 short (8 - $14\ \mu$ long), fine, very dense; setae of venter of these regions slightly longer and sparser (12 - $16\ \mu$ long); setae of dorsum of abdominal segment 5 mostly 15 to $18\ \mu$ long, with a few much longer setae on posterior part (up to $70\ \mu$); on segments 6 and 7 mostly 15 to $25\ \mu$ long, with a few up to 85

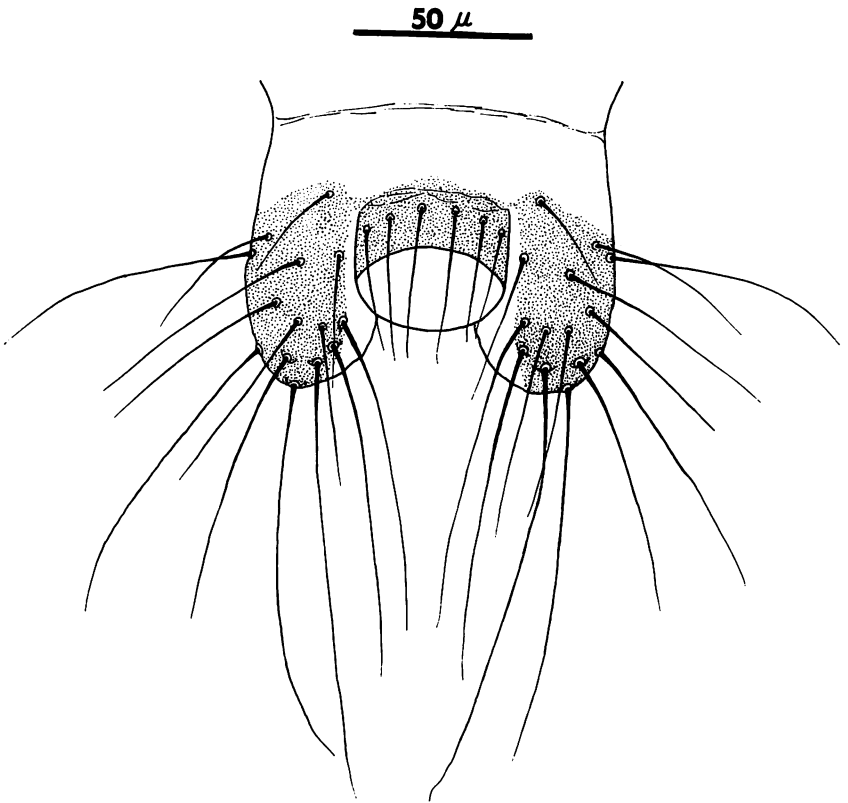


FIG. 5. *Chavesia caldasiae* Balachowsky, apex of abdomen, Trinidad specimen.

μ . Ventral setae of segments 5 to 7 and anterior part of 8 ranging up to about 85 μ long. Setae on anterior part of dorsum of segment 8 30 to 40 μ long, 60–135 μ laterally; posterior setae of anal lobes up to 375 μ ; ventral setae of anal lobes to about 100 μ .

Described from 3 adult female specimens. Holotype and 2 paratypes: near forest settlement, Mazaruni River, British Guiana, 21 Aug. 1935, N. A. Weber, collr.

This species is named for Dr. Neal A. Weber who collected most of the *Chavesia* material now in the U. S. National Museum collection in connection with his taxonomic and biological studies of tropical American *Acropyga* ants. From Weber's (1944) description and biological notes on *Acropyga* (*Rhizomyrma*) *paludis* it appears that the type specimens of *C. weberi* were taken in association with the type material of that ant.

This species, like *C. caldasiae*, has the anal lobes fused with the basal part of the eighth abdominal segment, and relatively short antennae. It is readily separated from the latter species by the absence of trilocular pores, the elongate, parallel-sided anal lobes, the presence of 2 ventral circuli, the relatively short tarsal claws, and the sclerotized rims of the spiracular peritremes not forming a complete ring.

Chavesia caldasiae Balachowsky (Fig. 5).

Material from the U. S. National Museum collection contains two specimens, labeled: San Raphael, Trinidad, B. W. I.; 27 November 1934, E. J. H. Berwick collr.; from W. M. Wheeler; on plant roots. These specimens agree essentially with Balachowsky's description of *C. caldasiae*, except that the anal lobes seem slightly less well developed than indicated in Balachowsky's figure. These specimens have been assigned, provisionally, to Balachowsky's species.

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