
THE NET-WINGED MIDGE FAUNA (DIPTERA: BLEPHARICERIDAE) OF ANTIOQUIA DEPARTMENT, COLOMBIA

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ABSTRACT. The "net-winged midge" fauna of Antioquia Department, Colombia, was studied and found to consist of 14 species in the genera *Paltostoma* and *Limonicola* (Blepharicerinae, Apistomyiini). Of these, ten are described as new: *P. roldani* Hogue and Bedoya, *P. aspergonympha* Hogue, *P. charadrae* Hogue, *P. eldorado* Hogue, *P. inca* Hogue, *P. andeana* Hogue and Bedoya, *L. lichanos* Hogue and Bedoya, *L. astylis* Hogue, *L. medius* Hogue, and *L. kolomeros* Hogue. *Paltostoma saltana* Edwards, 1929, and *L. davila* Hogue, 1982, plus two unidentified *Limonicola*, known only from larvae, comprise the remainder. Keys to species and general ecological notes are also provided.

RESUMEN. Se estudió la fauna de "mosquitas de alas reticuladas" del Departamento de Antioquia, Colombia. Esta consta de 14 especies de los géneros *Paltostoma* y *Limonicola* (Blepharicerinae, Apistomyiini). De estas, diez son descritas como nuevas especies: *P. roldani* Hogue & Bedoya, *P. aspergonympha* Hogue, *P. charadrae* Hogue, *P. eldorado* Hogue, *P. inca* Hogue, *P. andeana* Hogue & Bedoya, *L. lichanos* Hogue & Bedoya, *L. astylis* Hogue, *L. medius* Hogue, y *L. kolomeros* Hogue. Las restantes son *P. saltana* Edwards, 1929 y *L. davila* Hogue, 1982, mas dos larvas de *Limonicola* no identificadas. Se incluyen claves de las especies y notas ecológicas generales.

INTRODUCTION

The net-winged midges, or Blephariceridae, are an ancient and highly specialized family of nematoceros flies adapted to torrential waters, about whose neotropical components exists only a meager body of literature (Hogue, 1977, 1981a, 1982a). Indications from unpublished regional investigations by Hogue are that many undescribed species exist in the region and that possibly the richest fauna of any country is to be found in Colombia. We have discovered many new species in the Department of Antioquia during our joint field studies there. Also, detailed ecological data have been obtained regarding these species, primarily by Bedoya for her matriculation in biology at the Universidad de Antioquia (Bedoya, 1984). The purpose of this paper is to describe the fauna and summarize the other information now available from the area.

The Department of Antioquia is situated in the northwestern portion of Colombia and is one of the larger political divisions of the country, with a land area of 63,612 square kilometers. Its topography and climate are diverse, the former including extensive mountainous terrain (corresponding to the northern extremes of the Andean Cordilleras Central and Occidental), where swift, rocky streams abound. A long rainy season of approximately seven months occurs in the period April to November,

providing the constant ground water that supplies numerous permanent flows. Details of the aquatic habitats of Antioquia and locations of some of the collecting sites are presented by Roldán (1988:1-5) and Bedoya and Roldán (1984). Bedoya and Roldán also give physicochemical data on many of the streams from which blepharicerids were taken (see summary under Notes on Ecology).

The authors made numerous collecting trips to several portions of the Department from 1982 to 1986, when the material for this study was gathered.

METHODS

PREPARATION OF MATERIAL

Routinely it has been found useful to dissect apart the elements of the male terminalia (keeping one or two specimens intact) and mount them on a microscope slide as follows: first, the outer gonostylus is severed at its base and positioned with the medial surface up. Then, the cerci with accompanying inner arms are freed by breaking the epandrial membrane at the base of the former; this complex is removed and placed on the slide dorsal side up. Finally, the mesosomal complex (gonites, tines, aedeagus, and associated structures) is dislocated from the genital capsule by severing the articulations of the dorsal gonite arm and condyle on the margin of the genital capsule, and lifting it out. It is also oriented on the slide with its dorsal side up.

MORPHOLOGICAL TERMINOLOGY

The terminology for the descriptions that follow is mostly that established in Hogue's earlier treatments of blepharicerid anatomy (1978, 1979, 1981b, 1987). For the con-

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venience of users of this paper, key structures are labeled in figures here for the male terminalia (Figs. 5–8), female terminalia (Fig. 13), pupa (Fig. 20), larva (Fig. 56), adult heads (Figs. 58, 59), and tarsi (Fig. 61). A glossary is provided for the various forms taken by the modified (generally short, peglike) dorsal sensilla of the larvae (Fig. 126). Both primary and secondary sensilla often modify and multiply with succeeding instars (“neotrichy”), their numbers obscuring the identification of the primary setae in many cases. The peglike setae are often well developed and, on intermediate abdominal segments, form two linear series—one beginning in the antero-mediodorsal position, extending laterad along the anterolateral margin of the segment and curving sharply ventrad to the base of the pseudopod, and a second complementary series following a similar path on the posterior portion of the segment. We call the combined set the “circumlateral series” (Fig. 56) (“marginal armature” of Dumbleton, 1963), comprised of an “anterior portion” and “posterior portion.” The series is characteristic of many larvae of the Apistomyiini, particularly *Paltostoma*, in Antioquia. The setae arise from and follow corresponding elevated ridges—the “circumlateral ridges.”

We use the established term “*pollex*” (Lat. thumb) for the ventrobasal area of tarsomere 5, which is set with a group of heavy oversized setae. Whereas they do not arise from a distinct convexity, the function of these setae is the same as the thumblike projection of many grasping insect tarsi, especially among ectoparasites, namely to provide a catch or opposing member for the claw(s) closing upon it. Blepharicerids use the apparatus for clinging tenaciously together during mating and to perches. Hogue erroneously referred to this organ as the “calcipala” in an earlier work (1982).

In keeping with common usage by students of the family, the conspicuous lobes of the 10th tergite in the male terminalia are called “cerci,” even though their homology with these elements in other Diptera is not demonstrated.

In the Apistomyiini, the ventromedial area of the VIIIth abdominal segment of the female is modified into a distinct, bilobed structure, which becomes a part of the terminalia and to which we refer here simply as “sternite VIII.”

In general form, apistomyiine larvae may be “lobiform” or “onisciform.” In the former (e.g., Fig. 101), the anterior and posterior margins of the abdominal segments are smoothly rounded, with a wide space between the lateral lobes whether or not the larva is contracted. In the latter condition (e.g., Fig. 56), the anterior and posterior margins of the abdominal segments are angular and in contact when the larva is contracted.

We express numbers of setae in groups in general terms (“few” = 3–5, “several” = 6–12, “numerous” = 13–30, “very numerous” = 31–70), followed by actual counts if determinable and appropriate.

All measurements are given in millimeters. The formula for comparative sizes of male vs. female pupae is (L)/(W) male/(L)/(W) female. Leg segment proportions are “progressive,” i.e., beginning basally, the relative length of each segment compared to its next more basal neighbor. Larval body length is taken from fully mature specimens (usually prepupal larvae, i.e., those showing only a trace of the pupal branchiae).

STAGE ASSOCIATIONS

Stage associations were made by careful application of the variously reliable methods, some of which were used by Hogue elsewhere (Hogue, 1973). These are as follows:

1. Ontogenetic method (called “continuity method” in Hogue, 1973): This matches larva–pupa, pupa–adult, by inspection of the pharate phase of the later stage within the earlier. The later stage may be seen through the integument of the earlier in the intact specimen, dissected out of the earlier, or collected with the exuviae at the time of ecdysis. This is a very reliable method. Errors sometimes occur when structures on the new insect are not clearly discernible through the body wall of the old.

2. Statistical method: When more than one species is present at a specific site, the different stages are equated on the basis of their similar frequency of occurrence. This is often unreliable and sometimes misleading, because at certain times in the development of a population one stage predominates in numbers and earlier stages decrease as later stages increase.

3. Syntopic method: This associates stages merely upon their common occurrence at a single collection site, when no other species are present. This is a moderately reliable procedure, but there always is the possibility that additional species are present.

4. Proximity method: This is for immatures only and assumes conspecificity of these stages found in immediate proximity (tightly grouped) in a microhabitat or portion thereof. Fairly reliable, this method requires care during collecting to isolate material taken in contiguity.

5. Phyletic inference method: The early stages are associated on the basis of structural similarity to known stages of related species. It is frequently unreliable because of convergence and character inconsistency.

6. Individual rearing: Individual specimens are reared in isolation. It is an absolutely reliable method but difficult to manage for larva–pupa without special laboratory equipment to maintain specimens alive in oxygenated water. Adults sometimes will emerge from pupae carefully collected and placed on a damp substrate. No individual rearings were made for this study.

NOMENCLATURE

We chose to base new species primarily on adult males because they are the most consistently distinctive stage. Also, when names descriptive of anatomy are applied to this stage the possibility is avoided of producing inappropriate names if stage associations have to be changed.

Authorship of some of the new species is attributed only to Hogue (see Classification). These were discovered by him from material collected outside of and subsequent to Bedoya’s project (Bedoya, 1984).

MATERIAL

A total of 3,666 specimens were available for this work. They were collected, along with environmental data, from the Department of Antioquia in northwestern Colombia. All the material is retained in the collection of the Entomology Section of the Los Angeles County Museum of Natural History (indicated by “LACM” where the material is listed under Specimens Examined); a few were borrowed from the American Museum of Natural History in New York (“AMNH”).

The study has suffered somewhat from a lack of adequate material for several of the rarer species. We urge stream biologists working in Colombia to collect blepharicerids at every opportunity, making sure to take large series of the stages available and look thoroughly for free-flying adults.

BLEPHARICERIDAE OF ANTIOQUIA DEPARTMENT

CLASSIFICATION

The blepharicerid fauna of Antioquia Department, Colombia, consists of the following taxa:

Paltostoma Schiner

1. *Paltostoma roldani* Hogue and Bedoya, n. sp.
2. *Paltostoma aspergonympha* Hogue, n. sp.
3. *Paltostoma charadrae* Hogue, n. sp.
4. *Paltostoma eldorado* Hogue, n. sp.
5. ? *Paltostoma saltana* Edwards, 1929
6. *Paltostoma inca* Hogue, n. sp.

Paltostoma schineri group

7. *Paltostoma andeana* Hogue and Bedoya, n. sp.

Limonicola Lutz

8. *Limonicola lichanos* Hogue and Bedoya, n. sp.
9. *Limonicola astylis* Hogue, n. sp.
10. *Limonicola davila* Hogue, 1982
11. *Limonicola medius* Hogue, n. sp.
12. *Limonicola kolomeros* Hogue, n. sp.
13. *Limonicola* unidentified larva 1
14. *Limonicola* unidentified larva 2

KEYS TO THE BLEPHARICERIDAE OF ANTIOQUIA DEPARTMENT

Adults

General features of the adults are sometimes difficult to determine on dried specimens. They may be more clearly seen in alcoholic material in which deformations have not occurred. Definitive species identification is best done with the terminalia; in the male, the shape of the outer gonostylus is the most useful character and is often visible even in dried or alcoholic specimens. Slide mounts are necessary to reveal internal characters of the terminalia, setal patterns of the thorax, and mouthparts, as well as external details of the tarsi, etc.

Adult males (*Paltostoma saltana* inadequately known)

1. *General*.—Mouthparts well developed, proboscis usually longer than head width (Fig. 1). Apex of hind tibia and basitarsus never inflated (Fig. 4). Anal lobe of wing usually small or completely undeveloped. *Terminalia*.—Sperm sac small (width never greater than 0.75 length of aedeagal rods), walls of aedeagal rods thin, internal canal not evident (Fig. 6). Lateral tine present or absent, if latter often replaced by a ventral plate. Inner gonostylus entirely distinct from aedeagal guide (Fig. 5). Inner arm of cercus long and well sclerotized, apex approximate to contiguous with opposite member (Fig. 8). *Paltostoma* . . . 2

General.—Mouthparts poorly developed, proboscis much shorter than head width (Fig. 84). Apex of hind tibia and tarsal segments 1–3 often inflated (Fig. 109). Anal lobe of wing often produced. *Terminalia*.—Sperm sac large (approximately as wide or wider than length of aedeagal rods), walls of aedeagal rods thick, internal canal evident (Fig. 89). Lateral tine completely absent. Inner gonostylus fused to aedeagal guide (Fig. 88). Inner arm of cercus short and poorly sclerotized, apex distant from opposite member (Fig. 91). *Limonicola* . . . 7

2. *General*.—Palpus 1-segmented. *Terminalia*.—Lateral tine present. 3
General.—Palpus 2-segmented. *Terminalia*.—Lateral tine absent. 6
3. *General*.—Fore tarsus unlike mid and hind tarsi (Fig. 30): longer and stouter; fore tarsomere 5 straight and expanded distad, without pollex; mid and hind tarsomeres 5 similar, curved, with pollex of heavy setae; fore claws simple, mid and hind claws sickle-shaped, with sub-basal tooth. *Terminalia*.—Sperm sac and bases of aedeagal rods with spiculae on inner walls (Fig. 10). *P. aspergonympha*
General.—Tarsi similar on all legs (Fig. 3): tarsomeres 5 curved, with basiventral pollex of heavy setae; claws all sickle-shaped, with sub-basal tooth. *Terminalia*.—Sperm sac and aedeagal rods without internal armature. . . . 4
4. *General*.—Ultimate antennal segment longer than penultimate (Fig. 1). *Terminalia*.—Lateral tine spined at base. 5
General.—Ultimate antennal segment shorter than penultimate (Fig. 33). *Terminalia*.—Lateral tine unarmed. *P. charadrae*
5. *General*.—No characters. *Terminalia*.—Outer gonostylus simple, ovoid in outline. Outer aedeagal rods arising directly from posterolateral corners of sperm sac (Fig. 42). . . *P. eldorado*
General.—No characters. *Terminalia*.—Apex of outer gonostylus angled sharply ventrad (Fig. 7). Outer aedeagal rods arising more or less laterally from sperm sac, bases gently arching (Fig. 6). *P. roldani*
6. *General*.—Proboscis long (2.4–2.6 width of head). Length of basal palpal segment 2.0 distal. *Terminalia*.—Outer gonostylus with conspicuous ventral tooth on ventral margin (Fig. 68). Inner gonostylus very short and with acute apex (Fig. 66). *P. andeana*
General.—Proboscis very long (3.0 head width). Length of basal palpal segment 1.5 distal. *Terminalia*.—Outer gonostylus entire (Fig. 64). Inner gonostylus long and with rounded apex (Fig. 62). *P. inca*
7. *General*.—Ultimate segment of antenna elongate, flask-shaped (Fig. 102). *Terminalia*.—Inner gonostylus very small, mostly fused with aedeagal guide (Fig. 92). *L. astylis*
General.—Ultimate segment of antenna cylindrical, subequal to penultimate (usually slightly

- smaller). *Terminalia*.—Inner gonostylus with well-developed apex, free of aedeagal guide. 8
8. *General*.—First (and sometimes second) flagellar segment of antenna reduced, smaller and more condensed than others (Fig. 112). *Terminalia*.—Inner gonostylus bifurcate, sublobes broadly rounded apically (Fig. 118). *L. kolomeros*
General.—Flagellomeres of antenna equal in size and shape throughout (except terminal which may be longer than rest). *Terminalia*.—Inner gonostylus simple. 9
9. *General*.—Hind tarsomeres of same diameter as tibia (not inflated) (Fig. 86). *Terminalia*.—Outer gonostylus very much elongated, strap-like, its ventral margin at base not lobulate (Fig. 90). *L. lichanos*
General.—Hind tarsomeres inflated (Fig. 109). *Terminalia*.—Outer gonostylus elongate but not greatly so, its ventrobasal margin lobulate (Fig. 116). 10
10. *General*.—No characters. *Terminalia*.—Ventrobasal lobe of outer gonostylus short, less than half the length of gonostylus (making entire organ L-shaped) (Fig. 116). Apex of inner gonostylus only slightly narrowed, more or less straight, base only a little broader than apex (Fig. 114). *L. medius*
General.—No characters. *Terminalia*.—Ventrobasal lobe of outer gonostylus long, about same length as gonostylus (making entire organ V-shaped). Apex of inner gonostylus constricted and angled outward, base broad. *L. davila*
- Adult females (Paltostoma saltana and Limonicola kolomeros unknown)*
1. *General*.—Mouthparts well developed or not, but labellar lobes always much shorter (or only slightly longer) than remainder of labium; mandibles present or not. *Terminalia*.—Spermathecae oblong (Fig. 15) or spherical (Fig. 71). Medial depression of sternite VIII simple, without a "collarlike" subdivision (Fig. 70). *Paltostoma* . . . 2
General.—Mouthparts always poorly developed, labellar lobes much longer than remainder of labium; mandibles never present. *Terminalia*.—Spermathecae pear-shaped (Fig. 73). Medial depression of sternite VIII with "collarlike" subdivision (Fig. 73). *Limonicola* . . . 7
2. *General*.—Mandibles well developed, laciniae long and whiplike; palpus composed of two elongate segments (Fig. 59). *Terminalia*.—Apex of thumblike inner sublobe of hypogynial lobe spiculate. 3
General.—Mandibles absent, laciniae very short and stubby; palpus a single diminutive segment (Fig. 2). *Terminalia*.—Apex of thumblike inner sublobe of hypogynial lobe denticulate. . . 4
3. *General*.—Lateral margin of mandible with numerous fine spiculae (Fig. 59). *Terminalia*.—Spermathecae elongate, ducts very short. *P. inca*
General.—Lateral margin of mandible with a few denticulae only (Fig. 80). *Terminalia*.—Spermathecae spherical, ducts very long, curving around and adnate to corpus. *P. andeana*
4. *General*.—Claws on all legs short, curved, with sub-basal tooth (Fig. 31). *Terminalia*.—Medial depression of sternite VIII acutely V-shaped (Fig. 14). Lateral margin of VIIIth sternite lobe curved strongly, apex closely appressed to base of hypogynial plate; lobe usually with only 5–6 setae (up to 10 rarely), restricted to its central surface (Fig. 14). *P. aspergonympha*
General.—Claws on all legs long, slender, sigmoidally curved (Fig. 4). *Terminalia*.—Medial depression of sternite VIII U-shaped (Fig. 13) to broadly V-shaped (Fig. 15). Lateral margin of VIIIth sternite lobe straight to curved, if latter then apex not closely appressed to base of hypogynial plate; lobe with 11–30 setae, usually 12–20 and often extending onto membrane at base of lobe (Fig. 15). 5
5. *General*.—Ultimate antennal segment longer (1.3) than penultimate. *Terminalia*.—Ventrolateral surface of inner thumblike lobe of hypogynial lobe with acutiform scalelike teeth. Internal sclerotization at base of medial depression of sternite VIII a narrow, elongate bar. *P. roldani*
General.—Length of ultimate antennal segment equal to penultimate. *Terminalia*.—Ventrolateral surface of inner thumblike lobe of hypogynial lobe with microtrichia. Internal sclerotization at base of medial depression of sternite VIII lanceolate or broad. 6
6. *General*.—No characters. *Terminalia*.—Internal sclerotization at base of medial depression of sternite VIII wide, lanceolate (Fig. 15). *P. charadrae*
General.—No characters. *Terminalia*.—Internal sclerotization at base of medial depression of sternite VIII wide, subquadrate (Fig. 16). *P. eldorado*
7. *General*.—Ultimate segment of antenna elongate, irregularly shaped (Fig. 103). *Terminalia*.—No characters. *L. astylis*
General.—Ultimate segment of antenna subequal to penultimate (usually slightly smaller) (Fig. 107). *Terminalia*.—No characters. . . 8
8. *General*.—5th tarsomere of hind leg with weak pollex (Fig. 109). *Terminalia*.—Apex of VIIIth sternite lobe produced, broad (Fig. 110). Dorsal division of lobe of hypogynial plate long and slender (Fig. 110). *L. medius*
General.—5th tarsomere of hind leg without pollex (Fig. 87). *Terminalia*.—Apex of VIIIth sternite lobe not produced, acute (Fig. 72). Dorsal division of lobe of hypopygial plate short and broad (Fig. 72). 9

9. *General*.—No characters. *Terminalia*.—Apex of lobe of sternite VIII slightly incurved. *L. davila*
General.—No characters. *Terminalia*.—Apex of lobe of sternite VIII straight. . . *L. lichanos*

Immatures

Because the larval and pupal stages of the two genera do not segregate by any reliable characters in parallel with the adult male dichotomy, the following keys run directly to species.

Pupae (*Paltostoma saltana*,
Limonicola astylis, and *L. kolomeros unknown*)

It is important in some cases to distinguish carefully between males and females when attempting to identify pupae with the key, because characteristics of one or the other sex of one species may resemble the opposite sex of another species. When the terminalia of pharate adults are not available within the pupal case, or eggs present, the sexes may be distinguished as follows: female pupae are generally larger (some exceptions) than male pupae and less angular. The apices of the fore and mid leg cases extend less than that of the hind leg (not reaching the posterior rim) in females; the leg cases are all long and approximately coterminate in males.

1. Integument hirsute, densely covered with bristlelike spines (Fig. 51). *P. andeana*
Integument papillose (Fig. 18). 2
2. Posteriormost branchial lamellae strongly convergent, often contiguous. Outer plates triangular (Fig. 48). (most *Paltostoma*) . . . 3
Posteriormost branchial lamellae parallel to divergent. Outer plates elongate (Fig. 97).
. (most *Limonicola*) . . . 5
3. Papillae minutely spinulate (Fig. 21, inset).
. *P. aspergonympha*
Papillae smoothly rounded 4

Note: The following two species are very similar and difficult to distinguish. Only relative characteristics are available. The males are more distinctive than the females, having the following features the more acutely developed:

4. Anterior branchial plates parallel, apices slightly twisted to bring outer margins dorsad, acuminate; posterior plates usually contiguous apically (Fig. 45). Smaller (length usually less than 4 mm). *P. charadrae*
Anterior branchial plates divergent, apices not twisted, acute; posterior plates convergent only (Fig. 47). Larger (length usually greater than 4 mm). *P. eldorado*
5. Lateral margins of abdominal segments IV–VI with small cusps (Fig. 18). Posterior prolongation of posterior branchial plate swollen and joining similar convexity of branchial sclerite to form compound bulla (Fig. 17). . . *P. roldani*
Lateral margins of abdominal segments entire,

- without cusps. Posterior prolongation of posterior branchial plate bullate but not joined to similar convexity of branchial sclerite. 6
6. Abdominal tergites raised middorsally. 7
Abdominal tergites planate middorsally.
. *L. davila*
 7. Scutum sparsely papillose, papillae restricted to posterior region only. Medial dorsal ridge of abdomen continuous, itself with a medial depression (Fig. 49). Outer branchial plates with broad membranous border on inner side (Fig. 50). *P. inca*
Scutum densely papillose over entire area. Raised middorsal portion of abdomen broken into a discontinuous series of low bosses. Outer branchial plates entirely sclerotized. 8

Note: The following two species have very similar pupae. The differences noted here are tentative because of inadequate material of *L. medius*.

8. Outer margin of anterior lamellar plate excavated at base; bulla at base of lamellae large and hemispherical (Fig. 100). *L. medius*
Outer margin of anterior lamellar plate entire; bulla at base of lamellae moderately large, and slightly flattened (Fig. 99). *L. lichanos*

Fourth-instar larvae (*Limonicola astylis*, *L. medius*, and *L. kolomeros unknown*)

1. Dorsal pseudopod VII very small and inserted almost completely into posterior margin. Anterior and posterior margins of abdominal segments often angular, in contact when larva contracted (“onisciform shape”). Area medial to base of pseudopod ventrally with scattered small setae. Anterior and posterior lines of heavy modified setae on conoid convexities, curving laterally into base of dorsal pseudopod (=circumlateral series) (Fig. 56).
. (mostly *Paltostoma*) . . . 2
- Dorsal pseudopod VII well developed and projecting free of posterior margin. Anterior and posterior margins of abdominal segments smoothly rounded, a wide space between segments when larva contracted (“lobular shape”). Area medial to base of pseudopod ventrally with patch of dense denticles. Modified dorsal setae mostly small and setiform (circumlateral series absent) (Fig. 101).
. (mostly *Limonicola*) . . . 7
2. Dorsa of abdominal segments I–VI each with pair of large, dorsolateral, sclerotized, smooth, erect, spinelike projections, with sharply acute apices (Fig. 74). *P. inca*
Dorsa of abdominal segments I–VI not produced. 3
3. Basal antennal segment elongate, 0.7–1.0 length of distal (Fig. 88). *P. andeana*
Basal antennal segment very short, never more than 0.2 length of distal (Fig. 56). 4

4. Several dorsal modified sensilla conspicuously larger than others and coniform (Figs. 25, 32).
..... *P. aspergonympha*
Dorsal modified sensilla all more or less equal in size and shape. 5
5. Terminal lobe tapering and narrow posteriad, border not deeply pigmented. Circumlateral series ill-defined, mostly lateral (Figs. 26, 53).
..... *P. charadrae*
Terminal lobe broad throughout, border deeply pigmented (black). Circumlateral series of modified setae well developed, extensive mediad. (Figs. 56, 57). 6
6. Lateral margin of abdominal segment VII slightly concave anterior to dorsal pseudopod (Fig. 56). Pseudopod I elongate.
..... *P. eldorado*
Lateral margin of abdominal segment VII strongly excised anterior to dorsal pseudopod (Fig. 57). Pseudopod I barely longer than broad.
..... *P. saltana*
7. Terminal lobe tapering and narrow posteriad, border not pigmented. 8
Terminal lobe broad throughout, border deeply pigmented (black). 9
8. Dorsolateral portions of abdominal segments II–VI drawn out into prominent, upward arching prolongations (Fig. 23). Dorsa of prothoracic region and lateral portions of abdominal segments with linear series of clavate (modified) setae (Fig. 24). *P. roldani*
Dorsa of abdominal segments II–VI planate, without protuberances of any kind (Fig. 122). Dorsa of prothoracic region and lateral portions of abdominal segments densely set with ascinaform (modified) setae (Fig. 124).
..... *L. unidentified larva 1*
9. Dorsa of abdominal segments I–VI each with a central boss. Terminal lobe very broad, strongly arcuate, terminal incision very narrowly V-shaped (Fig. 101). *L. lichanos*
Dorsa of abdominal segments I–VI planate, without a central boss. Terminal lobe moderately broad, slightly curved, terminal incision broadly U-shaped. 10
10. A conspicuous seta on lateral margin of terminal lobe (Fig. 123). . *L. unidentified larva 2*
Lateral margin of terminal lobe non-setose (not figured). *L. davila*

SYSTEMATICS

The Blephariceridae of Antioquia Department are placed in *Paltostoma* and *Limonicola*, the former provisionally. These apistomyiine genera along with the Brazilian *Kelloggina* Williston, 1907, are currently under study by Hogue, who has found them in need of revision and reclassification. *Paltostoma*, in particular, consists of a varied assemblage and may possibly require division. Many of the species exhibit medial structures in the male terminalia considerably different from those of the type species. The distinction even from *Limonicola*, the best

defined genus, is obscured by sharing of larval types with *Paltostoma*. For example, this stage of *Limonicola lichanos* is of the type normal to *Paltostoma*, whereas the pupa and adults clearly resemble those of *Limonicola*.

The two genera and all neotropical blepharicerids are referred to the tribe Apistomyiini for the present. The tribe is considered in its broad sense to include the Paltostomatini, whose monophyly and distinctiveness has not yet been adequately demonstrated.

APISTOMYIINI

PALTOSTOMA Schiner

Paltostoma Schiner, 1866:931. Type species: *Paltostoma superbiens* Schiner, 1866.

Paltostoma is currently an ill-defined genus used for most neotropical apistomyiine species that do not fall readily into the other genera. Most larvae have a very small dorsal pseudopod VII and conspicuous circumlateral series of secondary sensilla, pupa with more or less triangular outer branchial plates, the posterior pair convergent, adult mouthparts usually well developed, male terminalia with thin-walled aedeagal rods lacking inner canals, lateral tines usually present, and female terminalia with medial depression of sternite VIII with a "collar-like" subdivision. (See Keys for more characteristics.)

The name refers to the much elongated, slender proboscis of the males of most species (Greek *paltōn* = spear + *stoma* = mouth); its gender is neuter.

1. *Paltostoma roldani* Hogue and Bedoya, new species

Figures 1–8, 13, 17–19, 23, 24

Limonicola sp. 3 of Bedoya, 1984. Bedoya and Roldán, 1984:118, fig. 4a. Roldán, 1988: fig. 143. [Determinations based on larvae.]

DIAGNOSIS. *Adult*.—By external features, adults of *P. roldani* are indistinguishable from those of *P. eldorado* (both with a single palpal segment and ultimate antennal segment longer than penultimate). Features of the terminalia are distinctive, however, the outer aedeagal rods arise laterally from the sperm sac and curve gently rather than arising directly from the posterolateral corners; also, the shape of the male's outer gonostylus is distinctive (apex bent down at a right angle). In the female the thumblike lobe of the hypogynial plate bears acutiform scalelike teeth not found in *P. eldorado*. *Pupa*.—This stage is unique among Blephariceridae in the possession of cusps on the outer margins of the abdominal tergites. *Larva*.—The larva is immediately recognizable by the large, blunt, porrect projections from the dorsolateral portions of abdominal segments II–VI.

DESCRIPTION. *Male* (Figs. 1, 3, 5–8). Robust, well sclerotized, with especially stout hind legs.

Coloration. Ground color rich, velvety chocolate-brown, darker and tending toward black on anterior portion of scutum. Head capsule and thorax with silvery pollinosity, forming irregularly appearing and disappearing patches as specimen is rotated in light from certain angles; supraalar sclerites dull in contrast to other sclerites. Legs and abdomen, including terminalia, dull, without evident pollinosity; abdominal tergites tending to light orange-brown anteriorly. Wing membrane infusate. *Size.* A medium-sized blepharicerid. Measurements (N = 3-4): wing length 6.0 (6.0-6.0). Leg segment lengths:

		fore leg	
femur		2.7	(2.6-2.8)
tibia		2.9	(2.8-3.0)
tarsus	1	1.9	(1.9-2.0)
	2	0.82	(0.80-0.84)
	3	0.47	(0.42-0.50)
	4	0.24	(0.20-0.26)
	5	0.30	(0.28-0.32)
		mid leg	
femur		3.5	(3.5-3.6)
tibia		3.0	(2.8-3.1)
tarsus	1	1.9	(1.8-1.9)
	2	0.78	(0.74-0.82)
	3	0.46	(0.44-0.48)
	4	0.24	(0.20-0.26)
	5	0.31	(0.30-0.32)
		hind leg	
femur		4.9	(4.8-5.0)
tibia		4.5	(4.4-4.7)
tarsus	1	2.2	(2.2-2.3)
	2	0.69	(0.66-0.70)
	3	0.42	(0.40-0.45)
	4	0.25	(0.24-0.26)
	5	0.27	(0.26-0.28)

Head (Fig. 1). Normal type, subholoptic. Eyes approximate dorsally, interocular distance equal to combined diameters of five ommatidia; anterior margin of eye smoothly curved. Mouthparts well developed, proboscis very long, labium about 1.6 head width; palpus very short, a single elongate segment clearly evident (=segment 3), sensory pit present; a basal segment partly developed, 0.5 length of segment 3. Antenna 15-segmented, flagellar segments elongate barrel-shaped; ultimate segment elongate, longer (1.6-1.8) than penultimate, proportions of apical three segments 1.0-1.0-1.6 to 1.8.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals few and scattered; occipitals numerous (13-16); labrals numerous, scattered, on basal half only; labials and labellars numerous, scattered throughout.

Thorax and appendages (Fig. 3). Anal angle of wing produced, lobular. Legs somewhat heavier than in most Apistomyiini, hind legs considerably stouter than other legs. Tibial spurs 0-0-1. Progressive leg segment proportions: fore leg 1.1-0.7-0.4-0.6-0.5-1.3, mid leg 0.9-0.6-0.4-0.6-0.5-1.3, hind leg 0.9-

0.5-0.3-0.6-0.6-1.1; tarsomere 4 short in relation to 3 in all legs (0.5-0.6). Tarsomeres 5 similar on all legs, curved, with pollex of heavy setae; claw sickle-shaped, trichiate basally, with sub-basal tooth.

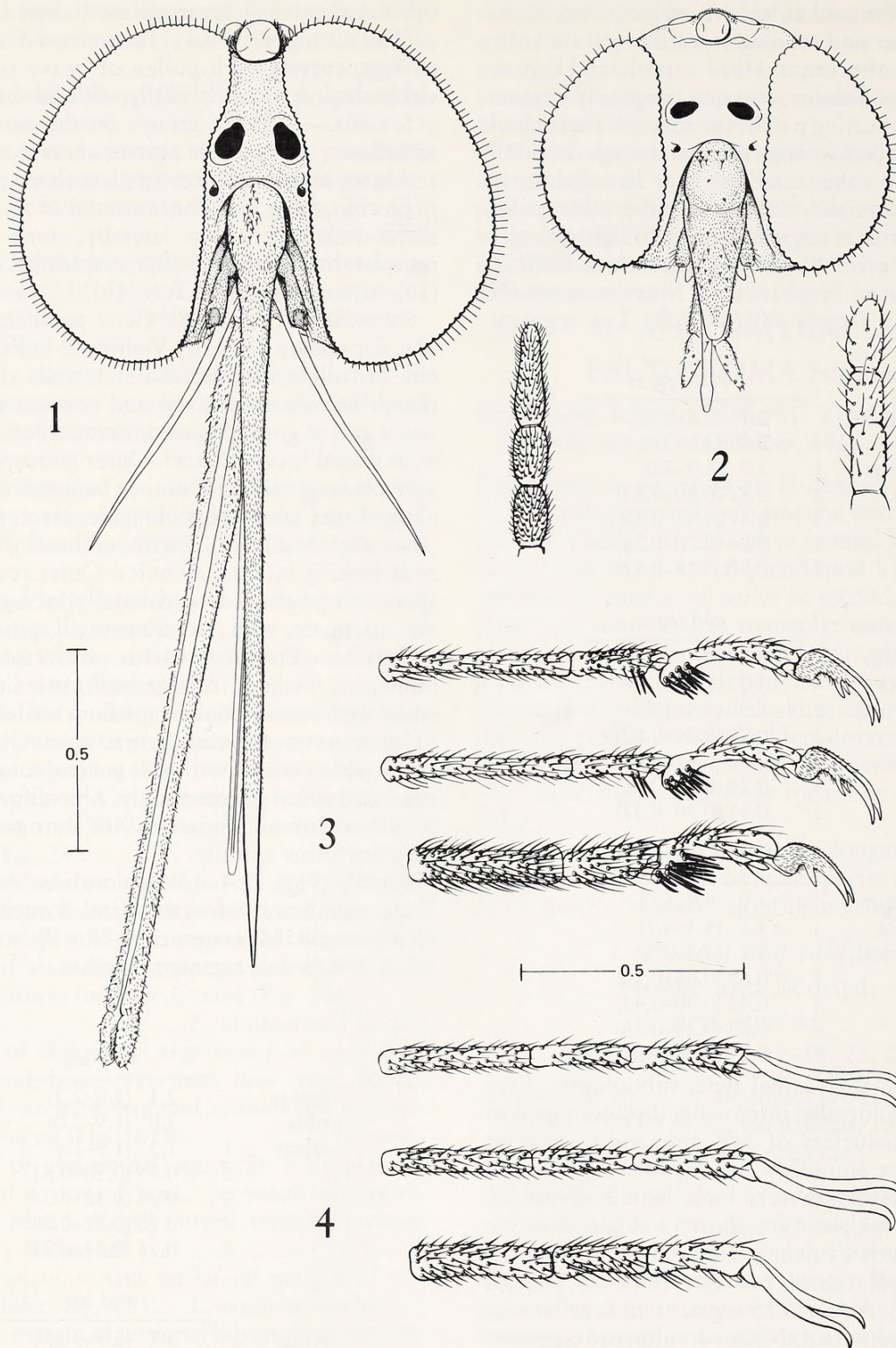
Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals absent; short dorsocentral series; supraalars and prescutellars absent; scutellars numerous, long and concentrated in an elongate, dense brushlike group laterally, none medially; preepisternals several (5-8); metapleurals numerous (18); suprametapleurals few (4-5).

Terminalia (Figs. 5-8). Cerci parallel; interlobular depression shallow, V-shaped; individual cercus broadly triangular. Lateral walls of subanal pouch heavily sclerotized and connected to posterior arm of gonite by a stout arm. Apex of tegmen with dorsal recurved keel. Outer gonostylus large, a simple rectangular lobe, apex bent ventrad at right angle. Inner gonostylus elongate, erect, digitiform (apex slightly dilated). Expanded bases of aedeagal rods lacking internal spinules. Outer rods leaving sperm sac at the side and basally arcuate. Lateral tine attenuate, with numerous small spines at base.

Sensilla.—Epandrium with transverse series of numerous medium to large setiforms. Cercus generally with mixed small to medium setiforms; setae of inner arm nearly complete to apex. Outer gonostylus with medium setiforms general ectally; sparse basal and apical groups entally. Alveoliform sensilla of Xth tergite not apparent. Xth sternite with two long setiforms apically.

Female (Figs. 2, 4, 13). *Coloration.* As in male. Wing membrane infusate. *Size.* A medium-sized blepharicerid. Measurements (N = 2): wing length 6.5 (6.2-6.8). Leg segment lengths:

		fore leg	
femur		2.1	(2.0-2.2)
tibia		2.0	(1.9-2.0)
tarsus	1	1.3	(1.2-1.4)
	2	0.55	(0.50-0.61)
	3	0.34	(0.32-0.37)
	4	0.23	(0.22-0.24)
	5	0.26	(0.24-0.28)
		mid leg	
femur		3.1	(2.9-3.3)
tibia		2.1	(2.1-2.2)
tarsus	1	1.4	(1.3-1.5)
	2	0.55	(0.48-0.61)
	3	0.34	(0.32-0.37)
	4	0.23	(0.22-0.24)
	5	0.27	(0.27-0.28)
		hind leg	
femur		4.3	(4.2-4.4)
tibia		3.9	(3.9-3.9)
tarsus	1	2.0	(1.9-2.2)
	2	0.70	(0.64-0.75)
	3	0.39	(0.38-0.40)
	4	0.24	(0.22-0.25)
	5	0.26	(0.26-0.26)

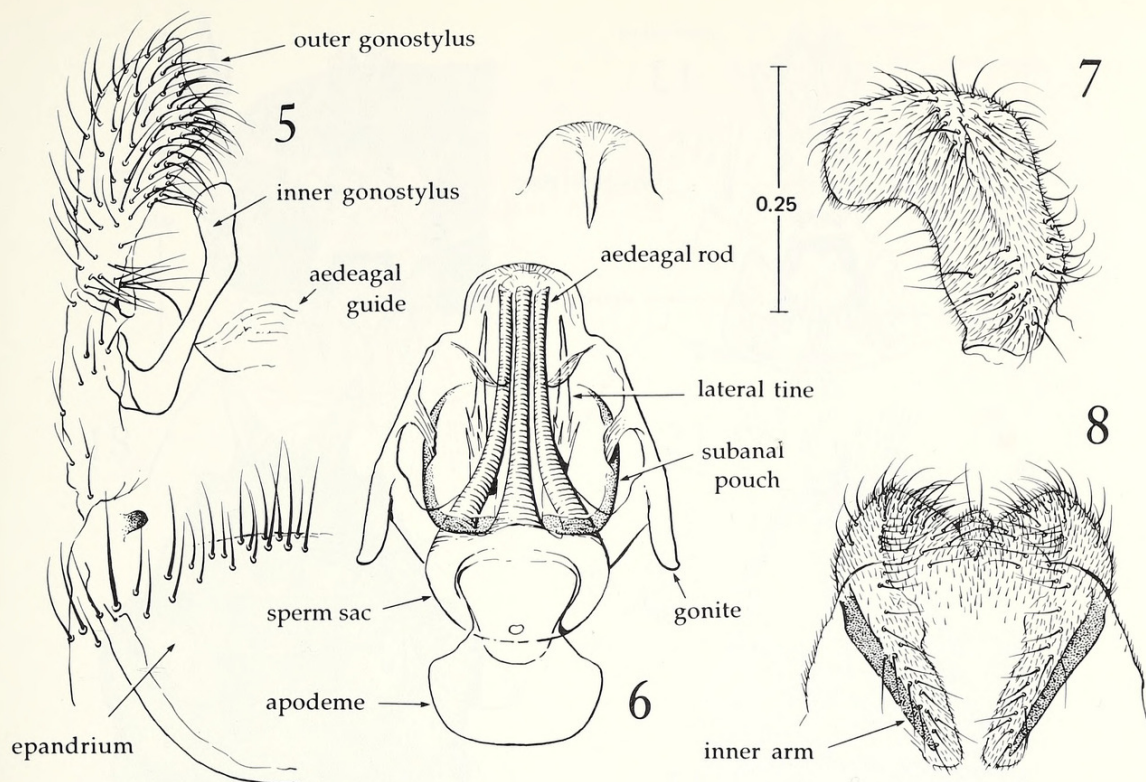


Figures 1-4. *Paltostoma roldani*. 1. Male head (frontal view) and terminal antennal segments (inset). 2. Female head and terminal antennal segments (arrangement as for male). 3. Terminal tarsal segments of male (fore leg, upper; mid leg, center; hind leg, lower; lateral view). 4. Terminal tarsal segments of female (arrangement as for male).

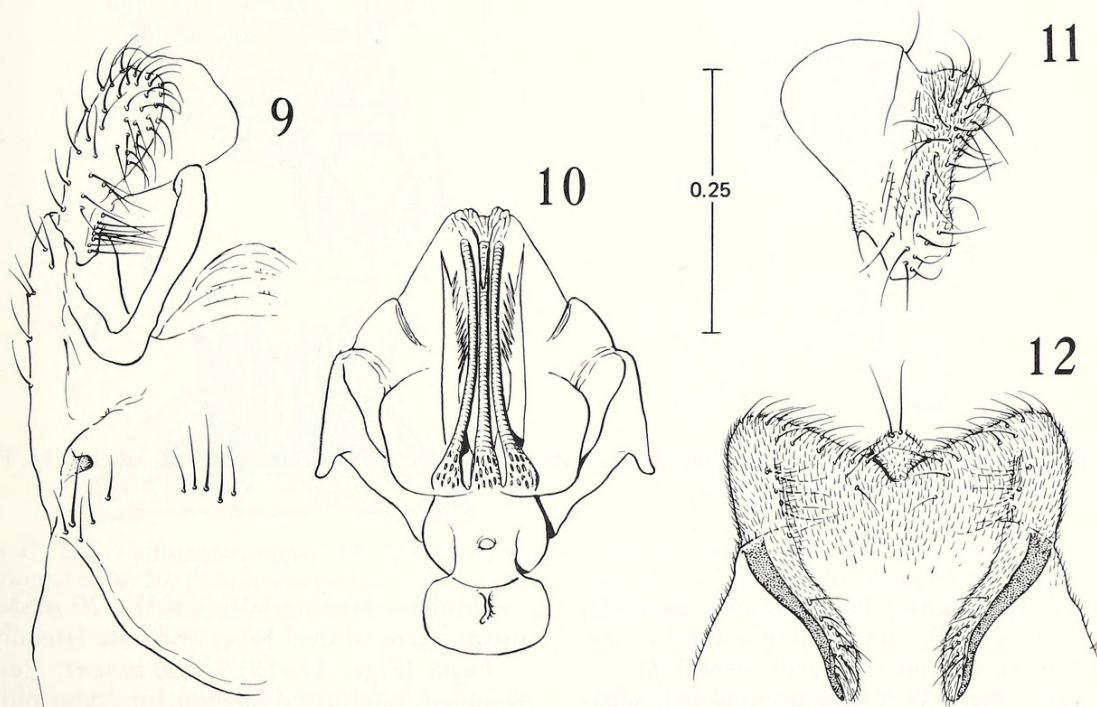
Head (Fig. 2). Colocephalous type, dichoptic. Eyes distant dorsally, interocular distance equal to 0.3 width of head capsule. Mouthparts well developed; mandibles absent, lacinia very short; proboscis very short, labium about 0.3 width of head capsule; margin of hypopharynx entire, apex of labrum rounded to truncate; palpus very short, a single diminutive segment; sensory pit present. Antenna 15-segmented, flagellar segments elongate

cylindrical, ultimate segment slightly longer (1.3) than penultimate, proportions of apical three segments 1.0-1.0-1.3.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals few, scattered, small; occipitals several (5-8), extending dorsad to near vertex; postgenals few (2-5); labrals several to numerous, scattered midlength; labials and labellars several, scattered.



Figures 5-8. *Paltostoma roldani*, male terminalia (dorsal views), anatomical details labeled. 5. Genital capsule and gonostyli. 6. Mesosomal structures and gonites. 7. Left outer gonostylus (inner view). 8. Cercal complex.

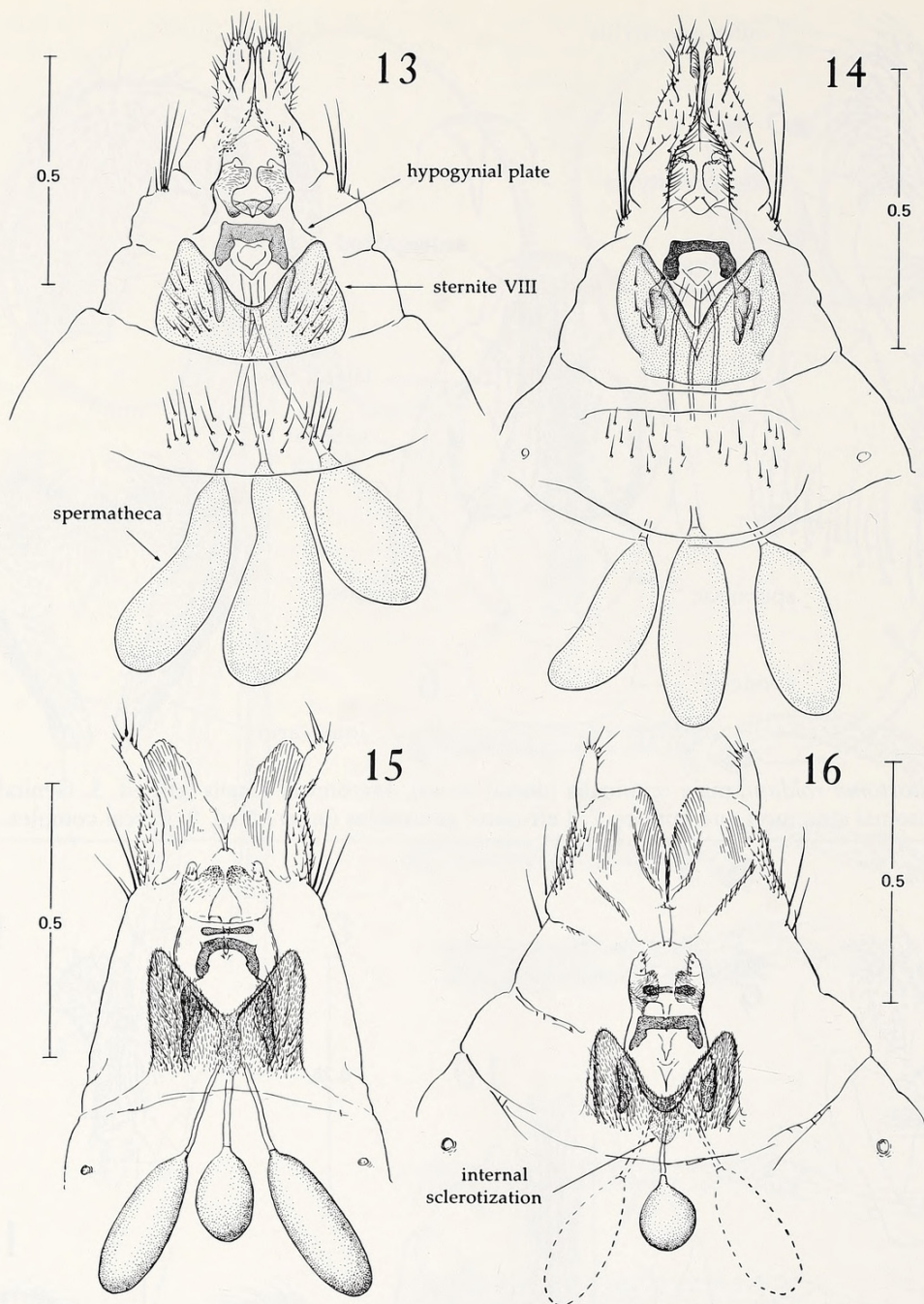


Figures 9-12. *Paltostoma aspergonympa*, male terminalia (dorsal view). 9. Genital capsule and gonostyli. 10. Mesosomal structures and gonites. 11. Left outer gonostylus (inner view). 12. Cercal complex.

Thorax and appendages (Fig. 4). Anal angle of wing produced, lobular. Legs long and slender, hind legs especially stout. Tibial spurs 0-0-1. Progressive leg segment proportions: fore leg 0.9-0.7-0.4-0.6-0.7-1.1, mid leg 0.9-0.6-0.4-0.6-0.5-1.3, hind leg 0.9-0.5-0.3-0.6-0.6-1.1; tarsomere 4 short in relation to 3 on all legs (0.5-0.7). Tarsomeres 5

similar on all legs, curved, with weak pollex of heavy setae; claws simple, long, slender and gently sigmoidally curved, non-trichiate.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals absent; dorsocentral series complete; supraalars and prescutellars absent; scutellars very numerous, long and concentrated in an



Figures 13–16. *Paltostoma*, female terminalia (ventral view). 13. *P. roldani*, anatomical details labeled. 14. *P. aspergonympa*. 15. *P. charadrae*. 16. *P. eldorado*.

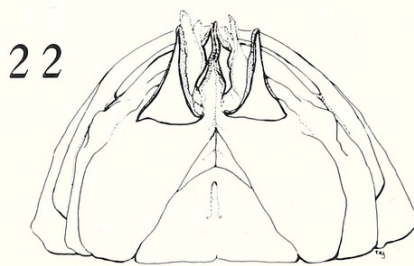
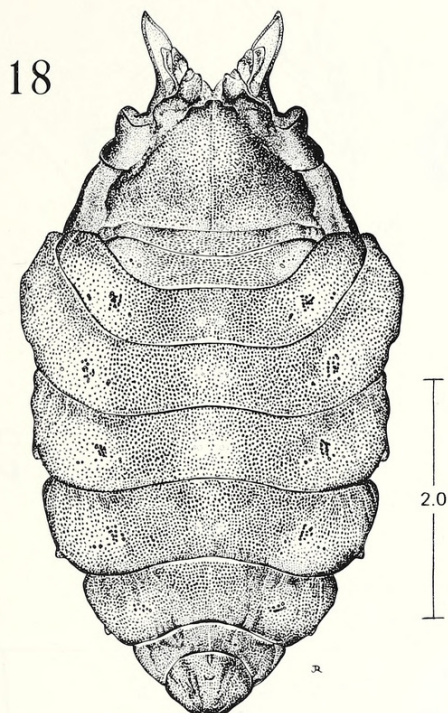
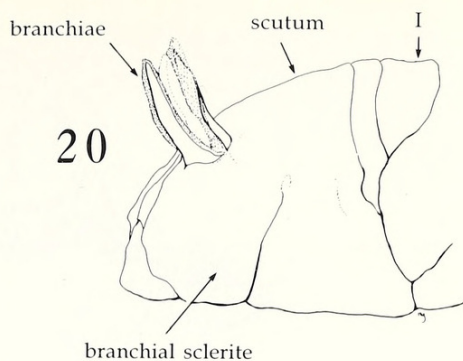
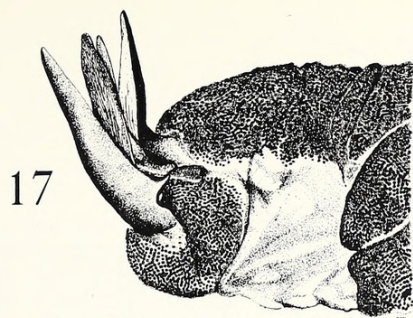
elongate, brushlike group laterally, none medially; preepisternals few (4); metapleurals several to numerous (11–14); suprametapleurals several (6).

Terminalia (Fig. 13). VIIIth sternite well sclerotized throughout, base broad, lateral margin curved; medial depression deep, U-shaped, internal sclerotization flat, narrow, fusiform; lobe straight, apex not appressed to hypogynial plate. Hypogynial plate complex, base much broader than lobes; lobe with narrowed neck, dorsal division short, lobulate, nude, ventral division with strong longitudinal striae becoming acute spinuliforms distad. Spermathecae three, all large, weakly sclerotized, two similar, elongate oviform, third about two-thirds size of others, oviform; necks very short and straight.

Sensilla.—Sternite VIII with 15–20 medium setiforms general over lobes and base laterally.

Pupa (Figs. 17–19). **Integument**. Periphery rounded, sclerotized integument underfolded and forming broad ventral border. Papillose dorsally. Papillae even and very dense (individual papillae nearly touching each other). Individual papillae small, smooth, rounded, oval convexities; larger on scutum and branchial sclerite. Papillar distribution as follows: scutum—dense over entire disc; branchial sclerite—dense over entire posterodorsal convexity (except anteriorly) and on ventral fold only; metathoracic and abdominal tergites—even and dense over entire dorsum.

Size. Medium for family. Measurements, male



Figures 17–22. *Paltostoma*, pupae. 17. *P. roldani*, anterior portion, lateral view. 18. Same, entire, dorsal view. 19. Same, frontal view. 20. *P. aspergonympha*, anterior portion, lateral view, anatomical details labeled. 21. Same, entire, dorsal view; detail of cuticular papillae (insets). 22. Same, frontal view.

(N = 10): length 5.3 (4.6–5.8), width 3.3 (2.8–3.6); female (N = 10): length 5.9 (5.2–6.5), width 3.8 (3.4–4.3). Male about 0.8 size of female.

General. Outline shape oval, margins irregular; abruptly widened laterally at abdominal segment III in both sexes. L/W male = 1.6, female 1.6. Shape in cross section moderately convex, sides declivous all around. Dorsal sclerites: branchial sclerite longer than tall, complex, with a dorsal convexity that joins basiposterior bulla of first branchial lamella; acutely folded along ventral margin. Anterior margin of scutum sharply precipitous, with weakly tri-

lobed anterior margin. Suture separating metathoracic sclerite from abdominal tergite I angulate medially. Lateral margins of abdominal tergites projecting equally, margins of III–VI each usually with a small but conspicuous cusp or tooth just posterior to midpoint (cusp rarely absent).

Branchiae. Large, porrect, slightly divergent. Outer plates elongo-triangular, with semi-acute apices; inner two plates similar to outer but slightly smaller; anterior plate largest; anterior and posterior plates with strongly expanded bases; posterior expansion of the anterior plate bullate, joining dor-

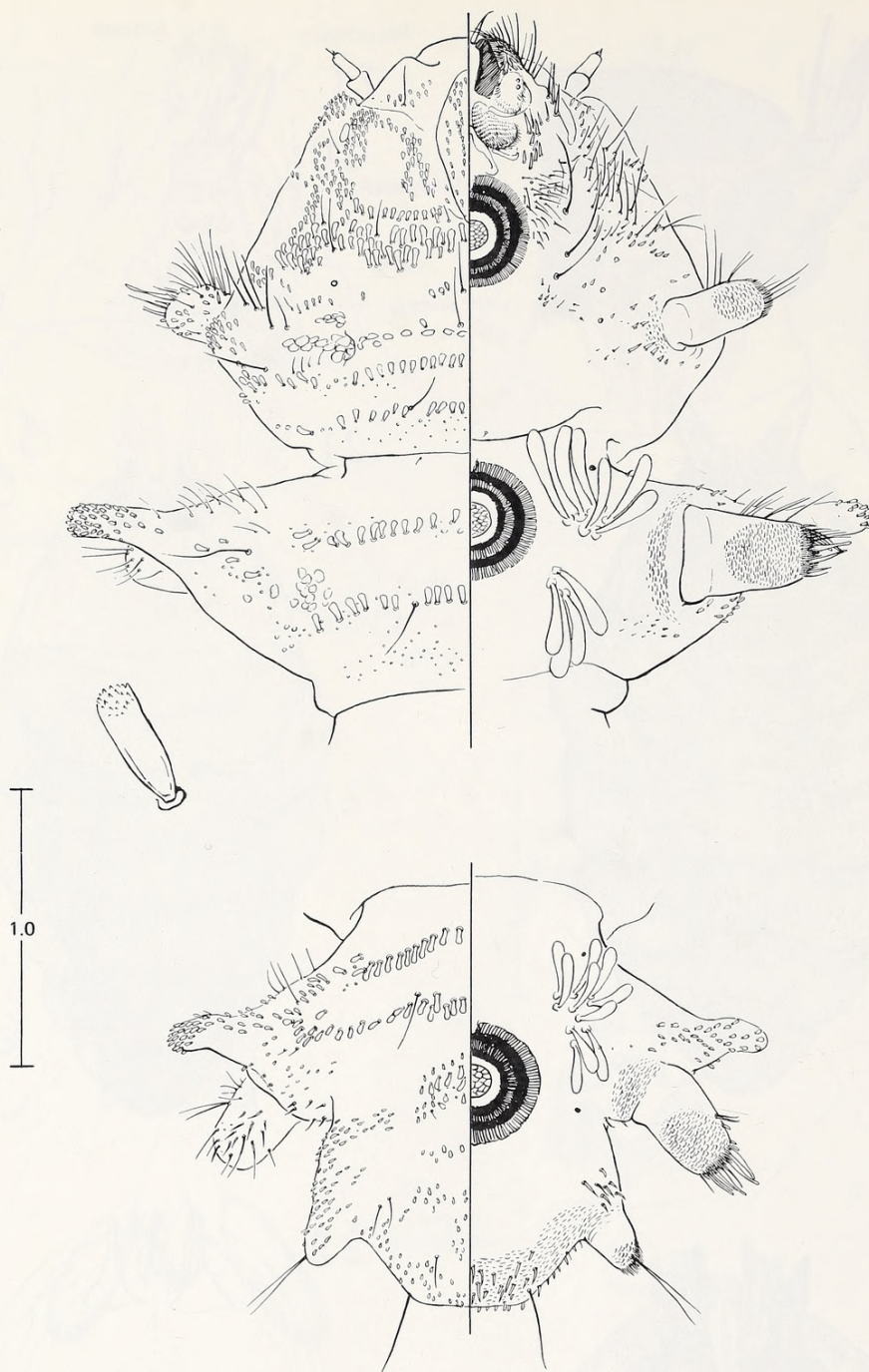


Figure 23. *Paltostoma roldani*, larva (dorsal view, left; ventral view, right; typical modified sensillum, inset).

sal convexity of branchial sclerite; bases of anterior lamellae approximate, apices divergent.

Larva (Figs. 23–24). *General*. Body form complex lobiform. Outline shape of anterior division angular, subhexagonal.

Integument. Dorsum moderately well sclerotized. Corrugations distinct, fine, linear and arranged in circular pattern around transverse rows of modified sensilla, becoming zig-zagging between these sensilla; corrugations ringing dorsolateral prominences. Venter with imbricate patches curving concentrically around bases of pseudopods.

Coloration. Trunk pigmentation even, light brown; sclerotized portions pale brown.

Size. Medium for the family. Measurements ($N = 10$): body length 7.8 (7.3–8.7), head capsule width

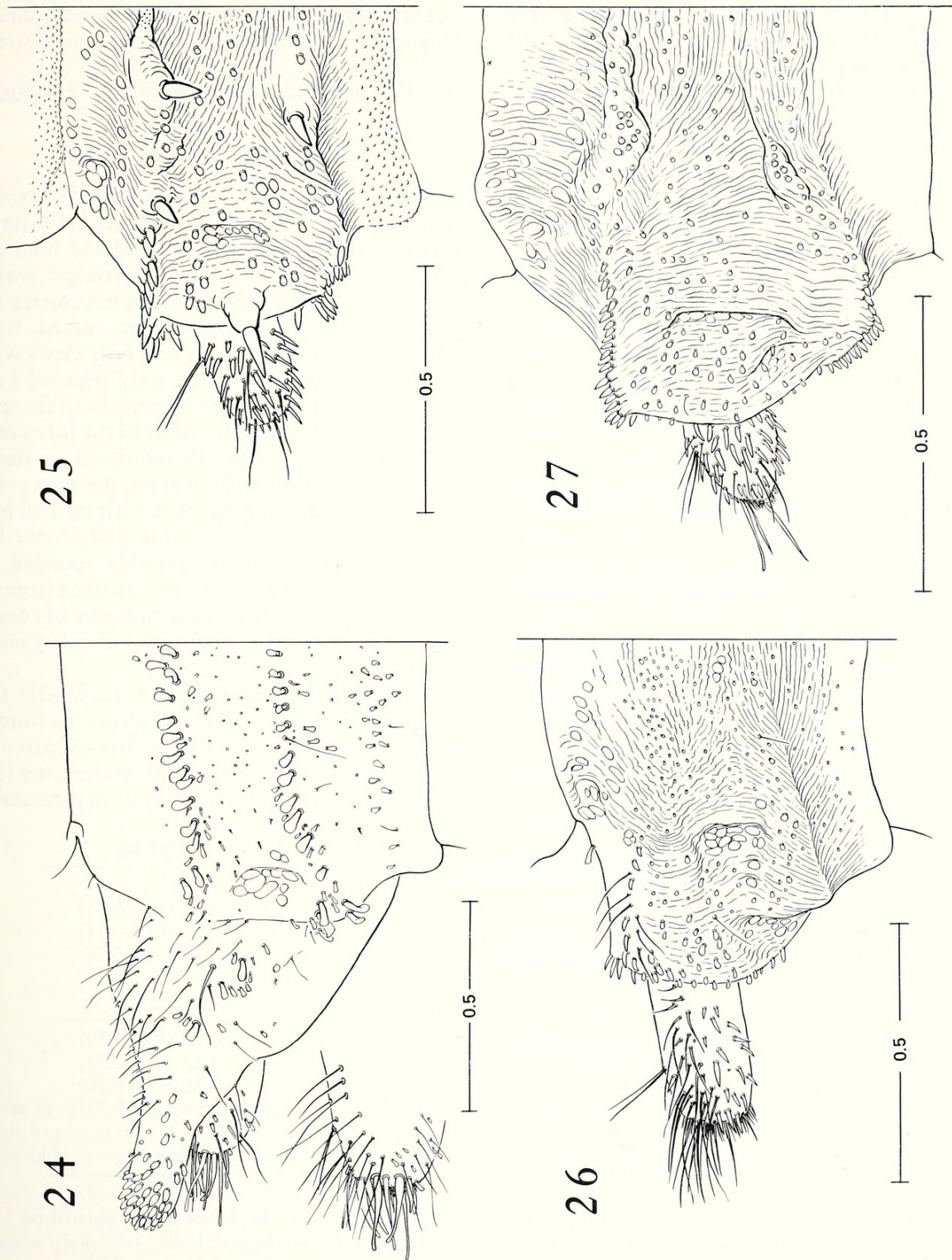
1.7 (1.6–1.9), antennal segment lengths, basal 0.08 (0.07–0.09), apical 0.14 (0.13–0.15).

Head. Antennal segment proportions 1.0–1.9.

Trunk. Medirolateral portions of abdominal dorsum drawn outward and upward into long, up-curving, conical projections (similar to dorsal pseudopods but arising in dorsolateral area of segment, far removed from morphological position of those structures). No other dorsal sclerotizations present.

Anal division. Dorsal pseudopod a large, conical lobe directed posterolaterad. Terminal incision V-shaped, open and spacious. Terminal lobe narrowed apically, posterior margin straight.

Primary sensilla (medium setiforms unless otherwise described). tM–T in line, well spaced. stM–T lateral to t, small, pyriform. Inner tpP anterior



Figures 24-27. *Paltostoma* larvae, abdominal segment III (left half, dorsal view). 24. *P. roldani*. 25. *P. aspergonympa*. 26. *P. charadrae*. 27. *P. eldorado*.

to spiracle. Outer tpI–VI indiscernible. Terminal setae 1–1, long, widely separated.

Dorsal modified sensilla. Small, obovate types in rows on head sclerites. Numerous large modified sensilla of special form (elongate, with spatulate, denticulate apex) distributed in transverse, anterior and posterior, monolinear rows on segments I–VI, these losing regularity laterally, becoming scattered and mixed with small setiforms. These large sensilla also present on prothorax, but not arranged linearly. Dense clusters of small, elongate glandiforms and elongate oviforms on apices of dorsolateral projections. Dorsal sensilla of pseudopods setiform posteriorly, small oviforms anteriorly; several curved, blunt-tipped chaetiforms/taeniaforms apically. Integument set with general background field of very small, fine setiforms.

SPECIMENS EXAMINED. Types: HOLOTYPE male (terminalia mounted on slide no. CLH 86-603); ALLOTYPE female (terminalia mounted on slide no. CLH 87-178); 3 male and 3 female PARATYPES: COLOMBIA, *Quindio*, Quebrada Salado, 4 km E Calarcá, 20 Jun 1984, C.L. Hogue, CLH 338 (LACM) (1 female with terminalia mounted on slide no. CLH 85-185, 2 females, still in pupal cases, with heads mounted on slides nos. 87-13 and 87-14).

Additional Specimens. COLOMBIA, *Antioquia*, no specific locality, Aug 1983 I. Bedoya 4 (2 larvae). Quebrada Iguaña, 13 Jun 1984, C.L. Hogue, CLH 323 (18 larvae, 3 pupae). Quebrada La Cascada, 13 Jun 1984, C.L. Hogue, CLH 324 (2 pupae). Quebrada La Cascada, 13 Jun 1984, C.L. Hogue, CLH 324.1 (46 larvae). Quebrada Piedra Blanca, 12 km W Guarne, 8 Jan 1986, C.L. Hogue, CLH 347.1.2 (7 larvae, 55 pupae). Quebrada La Espadera, 7.7 km E Medellín, 23 Jun 1983, C.L. Hogue, CLH 308 (10 pupae). Quebrada La Cascada, 9.1 km E Medellín, 23 Jun 1983, C.L. Hogue, CLH 309.1, 309.2 (2 larvae, 22 pupae). Quebrada La Cascada, 9.1 km E Medellín, 23 Jun 1983, C.L. Hogue, CLH 309.3 (2 larvae). Quebrada El Treinta, 2 km N Palmitas, 22 Jun 1983, C.L. Hogue, CLH 303 (19 pupae). Quebrada El Treinta, 2 km N Palmitas, 12 Jun 1984, C.L. Hogue, CLH 320 (7 larvae); 1 km SE Paso de Boquerón, 22 Jun 1983, C.L. Hogue, CLH 300 (7 larvae, 12 pupae). Quebrada La Hundida, 16.8 km E Santuario, 8 Jan 1986, C.L. Hogue, CLH 348.2 (1 larva). Quebrada Cadavid, 17.9 km E Santuario, 8 Jan 1986, C.L. Hogue, CLH 349.1.2 (13 larvae).

Quindio, same data as types (188 larvae, 46 pupae).

Valle, Quebrada Honda, Peñas Blancas, 1800 m, 3 Jun 1974, C.L. Hogue (1 larva, 1 pupa).

ETYMOLOGY. The species is named for Dr. Gabriel Roldán, in recognition of the multitude of his unmatched contributions to the study of the aquatic insects of Antioquia Department.

REMARKS. Association of the stages of *P. roldani* is certain: larva–pupa–adults by the ontogenetic method.

As seen from the collection records this is a fairly widespread and common species. It is also conspicuous because of its relatively large size. Our collections contain another species with similar larvae except for the slightly less developed dorsolateral projections and chaetotactic differences; it is unnamed and not found in Antioquia Department.

The holotype and two paratypes were found by Hogue trapped in a spider web over a small stream.

2. *Paltostoma aspergonympha* Hogue, new species

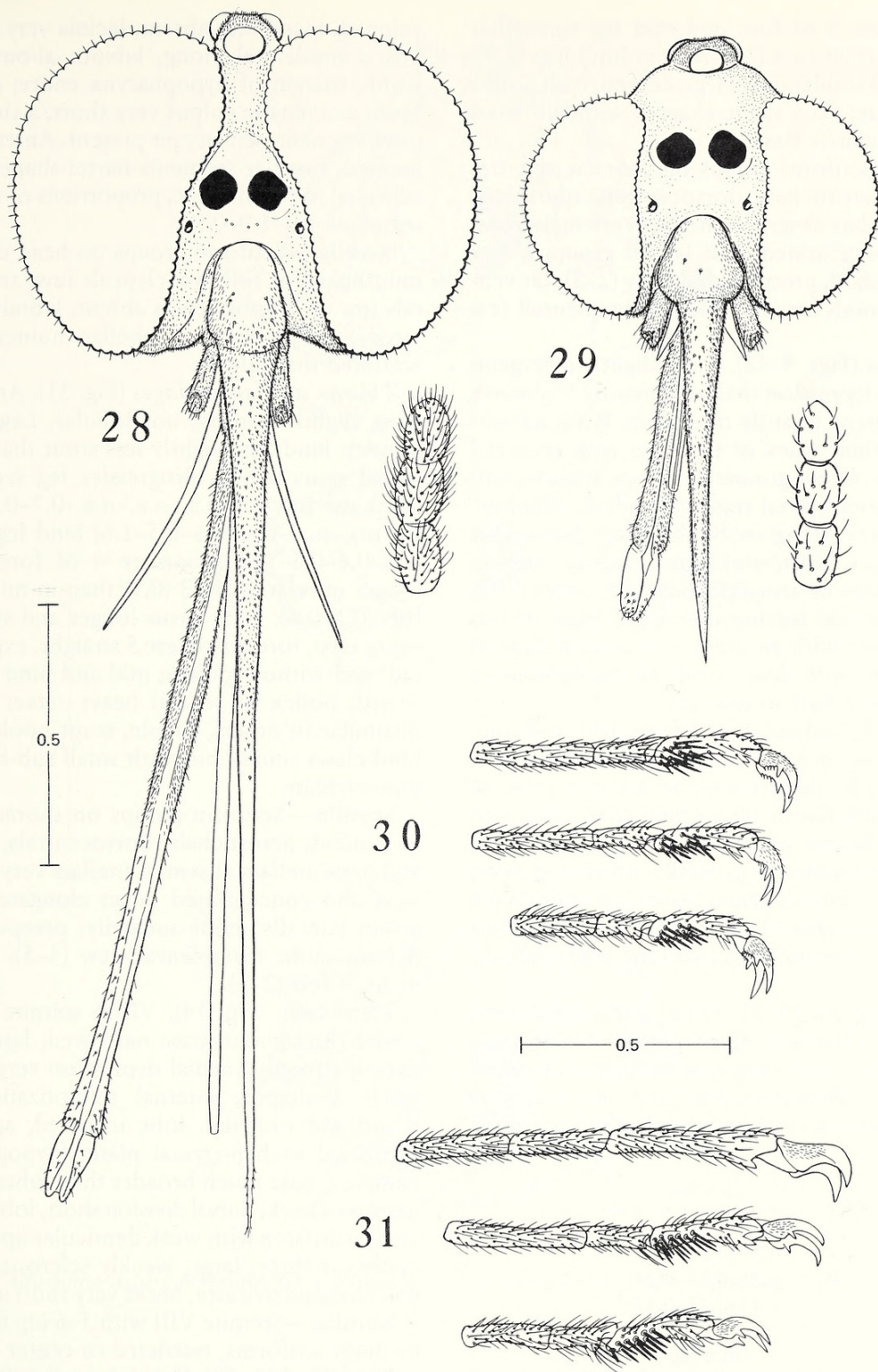
Figures 9–12, 14, 20–22, 28–32

DIAGNOSIS. *Adult.*—The female of this species is unique among regional *Paltostoma* in the dissimilarity of the fore tarsi to the mid and hind tarsi: fore tarsomere 5 is unusually long, straight, without a pollex, and bears simple claws; tarsomeres 5 on the other legs are relatively short, curved, with a basal pollex of heavy setae, and bear claws with a sub-basal tooth. This is the only regional *Paltostoma* with spinules on the inner walls of the sperm sac and bases of the aedeagal rods; the lobes of the VIIIth sternite of the female terminalia are distinctive, with a curved lateral margin, the apex closely appressed to the the base of the hypogynial plate. *Pupa.*—Only the pupa of this *Paltostoma* have denticulate, rather than smoothly rounded, papillae. *Larva.*—The larva is distinguished from other regional *Paltostoma* by the presence of conspicuously large and heavy, coniform, secondary sensilla on the dorsum.

DESCRIPTION. *Male* (Figs. 9–12, 28–31). Only pharate specimens are available (dissected from pupae). *Coloration.* Not available. *Size.* Apparently a medium-sized blepharicerid. Measurements (N = 2) (femur–tarsus 1 unextended and not measurable):

		fore leg	
tarsus	2	0.50	
	3	0.31 (0.30–0.31)	
	4	0.18 (0.18–0.18)	
	5	0.27 (0.26–0.28)	
		mid leg	
tarsus	2	0.50 (0.50–0.50)	
	3	0.32 (0.30–0.34)	
	4	0.18 (0.17–0.20)	
	5	0.26 (0.24–0.28)	
		hind leg	
tarsus	2	0.38 (0.38–0.38)	
	3	0.21 (0.21–0.21)	
	4	0.15 (0.15–0.15)	
	5	0.23 (0.23–0.24)	

Head (Fig. 28). Normal type, subholoptic. Eyes approximate dorsally, interocular distance equal to combined diameters of 3–5 ommatidia; anterior margin of eye smoothly rounded. Mouthparts well developed, proboscis very long, labium about 1.9



Figures 28–31. *Paltostoma aspergonympha*. 28. Male head (frontal view) and terminal antennal segments (inset). 29. Female head and terminal antennal segments (arrangement as for male). 30. Terminal tarsal segments of male (fore leg, upper; mid leg, center; hind leg, lower; lateral view). 31. Terminal tarsal segments of female (arrangement as for male).

head width; palpus very short, a single elongate segment clearly evident (=segment 3), sensory pit present, large; a basal segment partly developed, 0.2 length of segment 3. Antenna 15-segmented, flagellar segments subcylindrical; ultimate segment slightly shorter (0.9) than penultimate, proportions of apical three segments 1.0–1.0–0.9.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals numerous; occipi-

tals numerous; genals and postgenals absent; labrals numerous, scattered, on basal half only; labials and labellars numerous, scattered throughout.

Thorax and appendages (Fig. 30). Anal angle of wing slightly convex, not lobular. Legs long and slender, hind legs stouter than others. Tibial spurs 0–0–1. Progressive leg segment proportions: fore leg n.a.–n.a.–n.a.–n.a.–0.6–1.5; mid leg n.a.–n.a.–n.a.–0.6–0.6–1.4; hind leg n.a.–n.a.–n.a.–0.6–0.7–

1.5; tarsomere 3 of fore and mid leg somewhat longer in relation to 4 (1.7) than in hind legs (1.4). Tarsomeres 5 similar on all legs, curved, with pollex of heavy setae; claw sickle-shaped, with sub-basal tooth and trichiate basally.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals, dorsocentrals, supraalars, and prescutellars absent; scutellars very numerous, long and concentrated in a lateral group, a few scattered mediad; preepisternals few (2–3), far ventral; metapleurals few (5–6); suprametapleurals few (4–5).

Terminalia (Figs. 9–12). Cerci slightly divergent; interlobular depression shallow, broadly V-shaped; individual cercus broadly triangular. Walls of sub-anal pouch thin. Apex of tegumen with recurved keel dorsally. Outer gonostylus large, a subrectangular lobe, apicoventral angle expanded, a shallow, elongate groove along ental face. Inner gonostylus elongate, erect, digitiform (apex slightly angled). Expanded bases of aedeagal rods with internal spinules. Lateral rod leaving sperm sac more or less posteriorly and with an arcuate curvature. Lateral tine attenuate, with dense small spines along inner margin of distal half to near tip.

Sensilla.—Epandrium with a few setiforms in medial and lateral groups. Cercus with medium setiforms primarily along posterior margin; setae of inner arm grouped near apex. Outer gonostylus with medium setiforms generally distributed ectally; mixed medium setiforms generally distributed along ventral third of ental surface; expanded ventral lobe non-setate. Alveoliform sensilla of Xth tergite not apparent. Xth sternite with two long setiforms apically.

Female (Figs. 14, 29, 31). Only pharate specimens are available (dissected from pupae). **Coloration.** Not available. **Size.** Apparently a medium-sized blepharicerid. Measurements (some not available) (N = 2) (femur–tarsus 1 unextended and not measurable):

		fore leg	
tarsus	2	0.40	(0.39–0.42)
	3	0.27	(0.27–0.27)
	4	0.24	(0.23–0.24)
	5	0.43	(0.42–0.43)
		mid leg	
tarsus	2	0.58	(0.57–0.59)
	3	0.33	(0.32–0.34)
	4	0.17	(0.16–0.17)
	5	0.27	(0.27–0.27)
		hind leg	
tarsus	2	0.43	(0.43–0.43)
	3	0.25	(0.24–0.25)
	4	0.16	(0.16–0.16)
	5	0.25	(0.24–0.25)

Head (Fig. 29). Colocephalous type, dichoptic. Eyes distant dorsally, interocular distance equal to 0.3 width of head capsule. Mouthparts well de-

veloped, mandibles absent, lacinia very short; proboscis moderately long, labium about 1.0 head width; margin of hypopharynx entire; apex of labrum acuminate; palpus very short, a single diminutive segment; sensory pit present. Antenna 15-segmented, flagellar segments barrel-shaped, ultimate subequal to penultimate, proportions of apical three segments 1.0–1.0–0.9.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals few, small occipitals few (2–3); postgenals absent; labrals few, scattered, small; labials and labellars numerous, small, scattered throughout.

Thorax and appendages (Fig. 31). Anal angle of wing slightly convex, not lobular. Legs long and slender, hind legs slightly less stout than fore legs. Tibial spurs 0–0–1. Progressive leg segment proportions: fore leg n.a.–n.a.–n.a.–0.7–0.9–1.8; mid leg n.a.–n.a.–n.a.–0.6–0.5–1.6; hind leg n.a.–n.a.–n.a.–0.6–0.6–1.6; tarsomere 4 of fore leg much longer in relation to 3 (0.9) than in mid and hind legs (0.5–0.6). Fore tarsus longer and stouter than other tarsi, fore tarsomere 5 straight, expanded distad, and without pollex; mid and hind tarsomeres 5 with pollex of several heavy setae; fore claws dissimilar to others, simple, stout hooks, mid and hind claws similar but with small sub-basal tooth, non-trichiate.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals, dorsocentrals, supraalars, and prescutellars absent; scutellars very numerous, long and concentrated in an elongate, brushlike group laterally, none medially; preepisternals indeterminate; metapleurals few (4–5); suprametapleurals few (2–5).

Terminalia (Fig. 14). VIIIth sternite well sclerotized throughout, base narrowed; lateral margin curved strongly, medial depression very deep, narrowly V-shaped, internal sclerotization keeled, broad and irregular, lobe incurved, apex closely appressed to hypogynial plate. Hypogynial plate complex, base much broader than lobes; lobe with narrowed neck, dorsal division short, lobulate, nude, ventral division with weak denticulae apically. Spermathecae three, large, weakly sclerotized, all similar, elongate oviform, necks very short and straight.

Sensilla.—Sternite VIII with 5–6 (up to 10 rarely) medium setiforms, restricted to center of lobe.

Pupa (Figs. 20–22). **Integument.** Periphery abrupt, ventral sclerotized border developed on thorax only. Papillose dorsally. Papillae even and moderately dense generally. Individual papillae minutely multispinulate (abdomen) to spiniform (branchial sclerite); very small on scutum, larger on branchial sclerite, and largest on abdomen. Papillar distribution as follows: scutum—sparse and few on disc; branchial sclerite—general over entire surface (few centrally); metathoracic and abdominal tergite I—moderately dense, sparser mediad; abdominal tergites II–VIII—even and dense over entire dorsum.

Size. Small for family. Measurements, male (N = 10): length 4.0 (3.7–4.5), width 2.1 (1.9–2.5); fe-

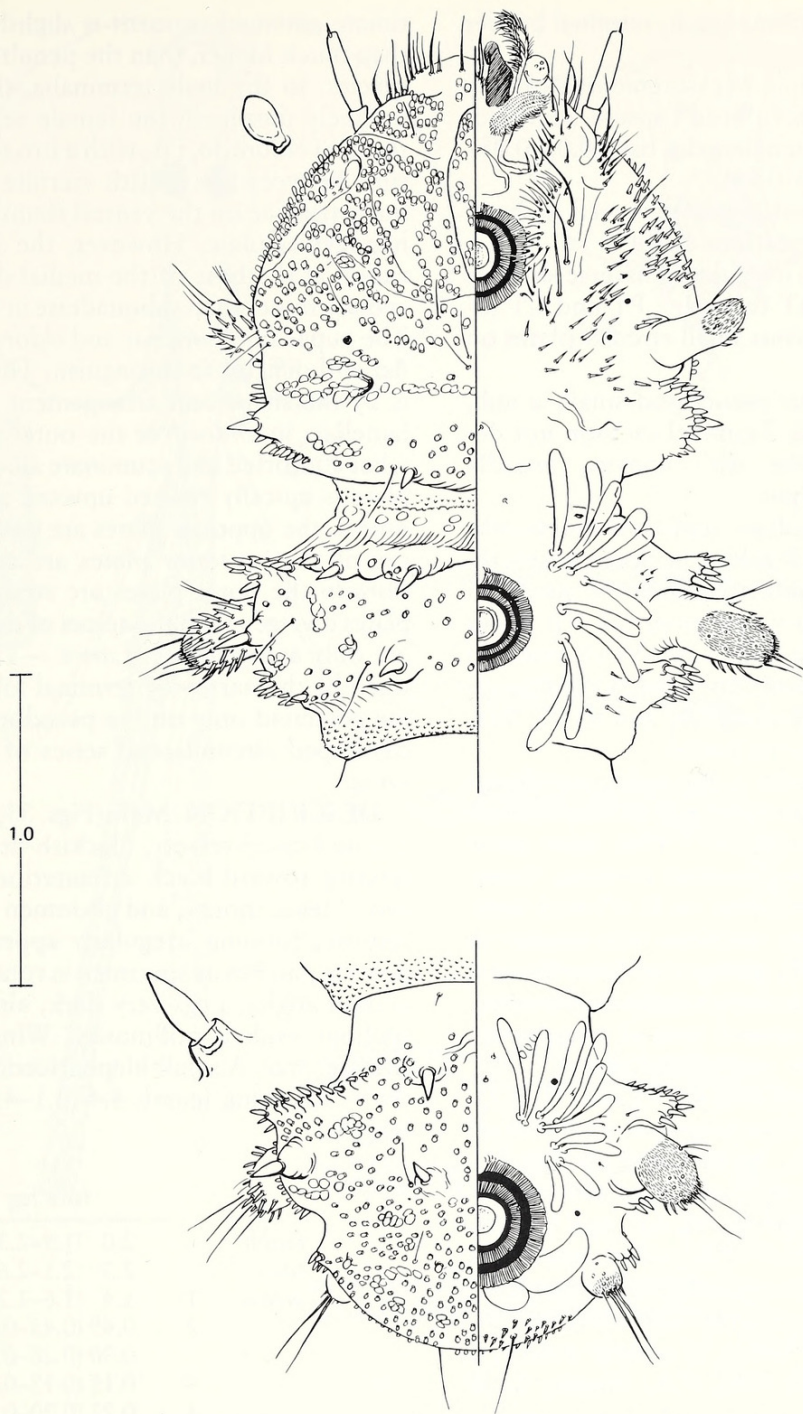


Figure 32. *Paltostoma aspergonympha*, larva (dorsal view, left; ventral view, right; typical modified sensilla, insets).

male (N = 10): length 4.3 (4.2–4.6), width 2.3 (2.1–2.5). Male 0.9 size of female.

General. Outline shape elliptical, entire (thorax not abruptly narrowed). L/W male = 2.0, female 1.9. Shape in cross section subtriangular (rounded angles; equilateral), sides steeply inclined. Dorsal sclerites: branchial sclerite taller than long, simple, smoothly rounded (no convexities). Anterior margin of scutum gradually inclined. Suture separating metathoracic sclerite from abdominal tergite I, smoothly curved medially. Abdominal tergites smoothly convex middorsally (no medial ridges or nodes); lateral margins entire.

Branchiae. Erect, parallel, except hind pair con-

tiguous apically. Outer plates triangular, with acute apices; inner two plates smaller, thinner and narrower than outers; anterior plate largest.

Larva (Figs. 25, 32). *General.* Body form subonisciform. Medial elevated zones of abdominal segments well developed. Outline shape of anterior division subovate.

Integument. Dorsum well sclerotized. Corrugations very strong, irregular, convergent over circumlateral ridges. Venter with area around bases of pseudopods very finely strigulate, a few scattered setae anterior and posterior to base of each pseudopod.

Coloration. Trunk pigmentation even, dark

brown; sclerotized portions black; terminal border unpigmented.

Size. Medium for genus. Measurements (N = 10): body length 5.9 (5.4–6.4), head capsule width 1.3 (1.1–1.5), antennal segment lengths, basal 0.05 (0.05–0.05), apical 0.22 (0.20–0.24).

Head. Distal antennal segment curved at base. Antennal segment proportions 1.0–4.4.

Trunk. Dorsum with irregular transverse anterior convexity (including AT tubercle); PT and LT tubercles present. Numerous small circular plates on anal division.

Anal division. Dorsal pseudopod small, a nub, directed posterolaterad. Terminal incision not developed. Terminal lobe with convex, broadly rounded posterior margin.

Primary sensilla (medium setiforms unless otherwise described). tM–T in line, in close cluster; tI–VI large, modified coniform (similar to modified sensilla on AT convexity and outer tpI–VI). Inner tpP anterior to spiracle. Outer tpI–VI represented by large, modified, coniform sensilla (similar to modified sensilla on AT convexity and tI–VI). Terminal setae 1–1, widely separated.

Dorsal modified sensilla. Large oviforms in linear series and patches on head sclerites and prothorax. Scattered ellipsoid sensilla on I–VIII; these more numerous and denser on terminal division. Transverse anterodorsal convexities on II–VI each bearing a conspicuous heavy coniform seta (similar to tI–VI and outer tpI–VI), giving way laterally to a linear series of similar but increasingly smaller setae, series curving ventrad around base of pseudopod. Background field of fine setiforms absent.

SPECIMENS EXAMINED. Types: HOLOTYPE male (dissected from pupa and mounted on slides nos. CLH 86-541, 86-615, and 88-73); ALLOTYPE female (dissected from pupa and mounted on slides nos. CLH 86-626, 86-627, and 87-209; 5 male and 4 female PARATYPES (all pharate adults in pupal cases, terminalia and heads dissected from pupae and mounted on slides): COLOMBIA, *Antioquia*, Quebrada El Treinta & nearby stream, 2 km N Palmitas, 22 Jun 1983, C.L. Hogue, CLH 302, 303 (LACM).

Additional Specimens. COLOMBIA, *Antioquia*, same data as types (46 larvae, 69 pupae). No specific locality, Aug 1983, I. Bedoya 2 (6 larvae); 1 km SE Paso de Boquerón, 22 Jun 1983, C.L. Hogue, CLH 300 (1 larva).

ETYMOLOGY. The name is a compound noun meaning “spray sprite” (Latin: *aspergo* = spray + *nympha* = water sprite).

REMARKS. Association of the stages is certain: larva–pupa–adults by the ontogenetic method.

3. *Paltostoma charadrae* Hogue,
new species

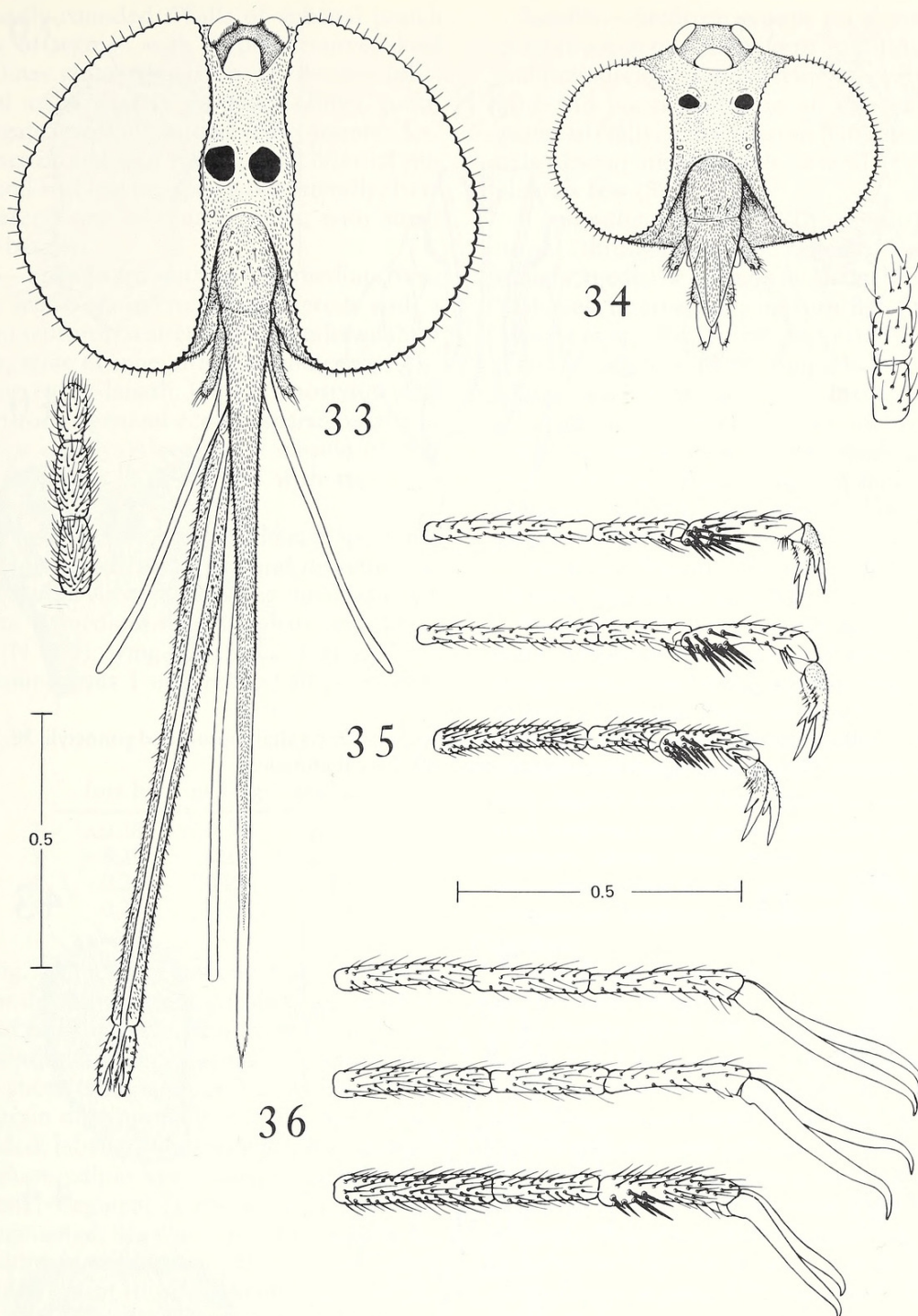
Figures 15, 26, 33–40, 45, 53

DIAGNOSIS. *Adult.*—Adults have a single palpal segment like *roldani* and *eldorado*, but the ul-

timate antennal segment is slightly shorter, rather than much longer, than the penultimate as in those species. In the male terminalia, the lateral tine is uniquely unspined; the female terminalia are like those of *eldorado*, i.e., with a broad median depression between the VIIIth sternite lobes and with microtrichiae on the ventral thumblike lobe of the hypogynial plate. However, the internal sclerotization at the base of the medial depression is lanceolate rather than subquadrate in outline. *Pupa.*—The pupae of *charadrae* and *eldorado* are very similar and difficult to distinguish. The best separation is by the shape and arrangement of the branchial lamellae: in *charadrae* the outer plates are somewhat contorted and acuminate apically; the anterior plate is apically twisted upward so that, in dorsal aspect, the opposite plates are parallel and the apices of the posterior plates are contiguous; in *eldorado* the outer plates are straight, the anterior plates divergent and the apices of the posterior plates are only approximate. *Larva.*—This stage is identified by the narrowed terminal lobe, spiniform setae posteriad only on the pseudopods, and poorly developed circumlateral series of dorsal modified setae.

DESCRIPTION. Male (Figs. 33, 35). *Coloration.* Ground color velvety, blackish-brown, darker and tending toward black on anterior portion of scutum. Head, thorax, and abdomen with silvery pollinosity, forming irregularly appearing and disappearing patches as specimen is rotated in light from certain angles. Legs very dark, almost black, dull, without evident pollinosity. Wing membrane infusate. *Size.* A small blepharicerid. Measurements (N = 10): wing length 4.4 (4.1–4.7). Leg segment lengths:

		fore leg	
femur		2.0	(1.9–2.3)
tibia		2.3	(2.1–2.6)
tarsus	1	1.4	(1.6–1.2)
	2	0.49	(0.45–0.55)
	3	0.30	(0.26–0.34)
	4	0.15	(0.13–0.18)
	5	0.22	(0.20–0.24)
		mid leg	
femur		2.8	(2.5–3.2)
tibia		2.4	(2.2–2.7)
tarsus	1	1.2	(1.1–1.4)
	2	0.47	(0.42–0.54)
	3	0.28	(0.18–0.32)
	4	0.15	(0.13–0.16)
	5	0.23	(0.21–0.25)
		hind leg	
femur		3.5	(3.2–3.9)
tibia		3.5	(3.2–4.0)
tarsus	1	1.3	(1.2–1.5)
	2	0.46	(0.40–0.53)
	3	0.27	(0.23–0.31)
	4	0.16	(0.15–0.18)
	5	0.21	(0.18–0.24)

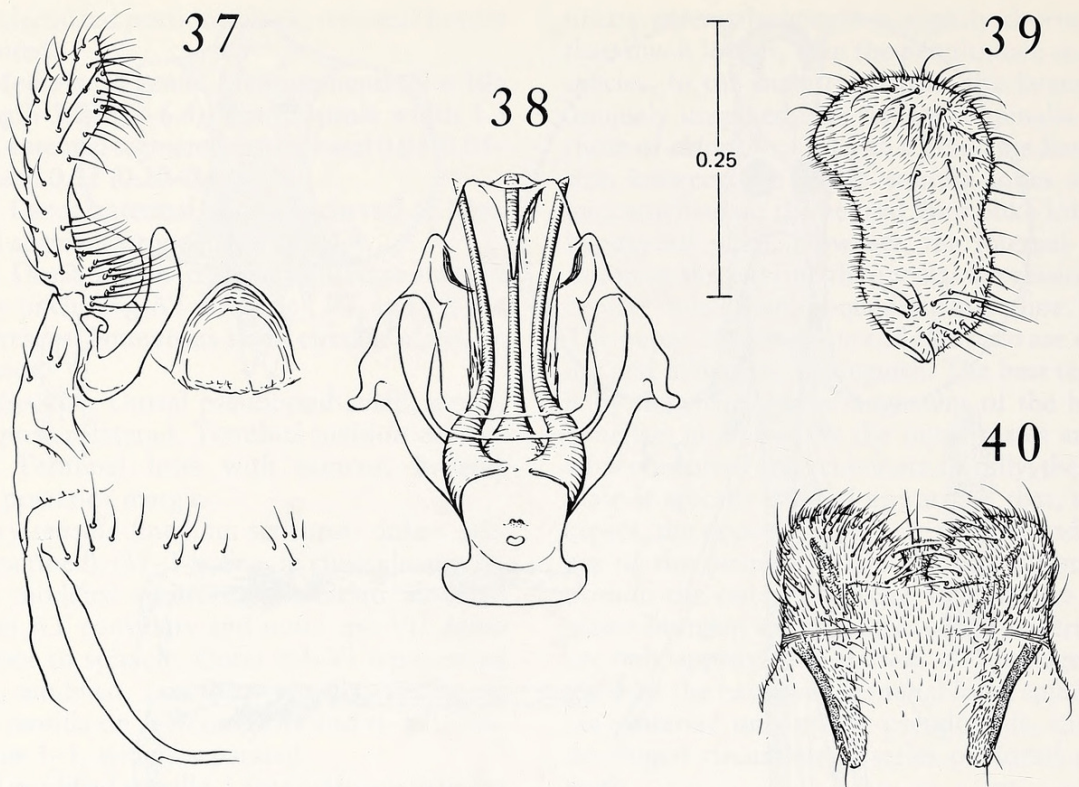


Figures 33–36. *Paltostoma charadrae*. 33. Male head (frontal view) and terminal antennal segments (inset). 34. Female head and terminal antennal segments (arrangement as for male). 35. Terminal tarsal segments of male (fore leg, upper; mid leg, center; hind leg, lower; lateral view). 36. Terminal tarsal segments of female (arrangement as for male).

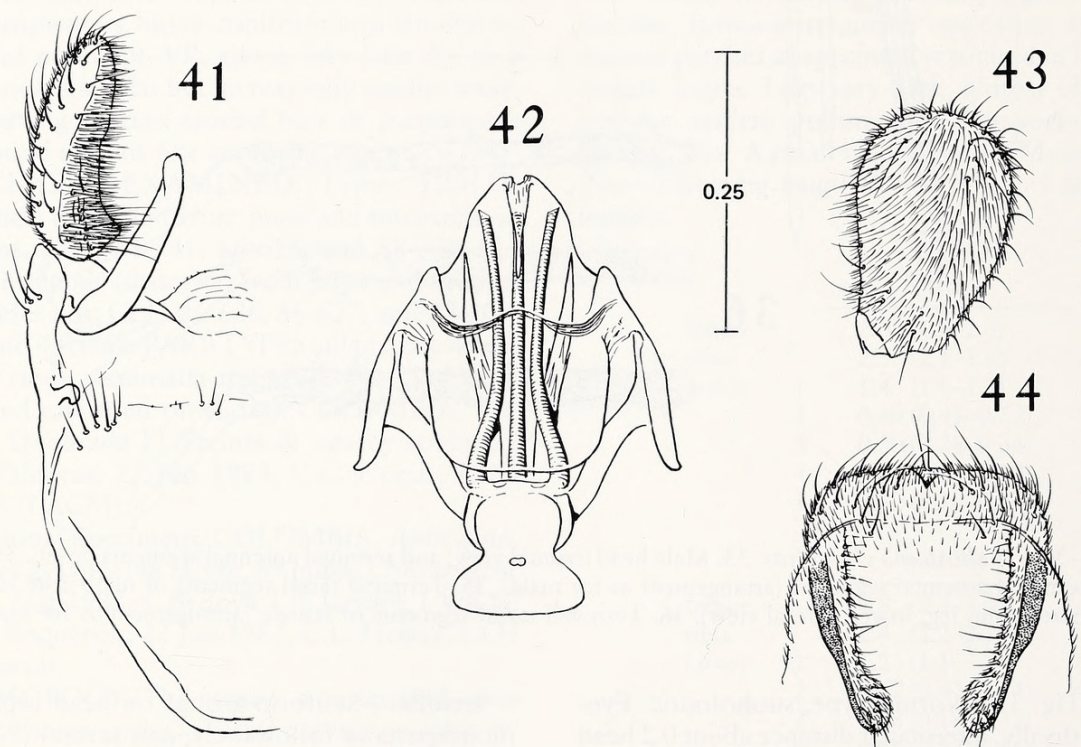
Head (Fig. 33). Normal type, subholoptic. Eyes disjunct dorsally, interocular distance about 0.2 head width; anterior eye margin sharply excised to accommodate antennal sockets. Mouthparts well developed, proboscis long, labium about 1.7 head width; palpus very short, a single elongate segment clearly evident (=segment 3), sensory pit vestigial; a basal segment partly developed, 0.25 length of segment 3. Antenna 15-segmented, flagellar segments elongate barrel-shaped; ultimate segment smaller than (0.8) penultimate, proportions of apical three segments 1.0–1.0–0.8.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals several (9–12); occipitals few (2–3); postgenals few (5); labrals absent; labials and labellars numerous, scattered throughout.

Thorax and appendages (Fig. 35). Anal angle of wing produced, lobular. Legs long and slender, hind leg stouter than others. Tibial spurs 0–0.1. Progressive leg segment proportions: fore leg 1.1–0.6–0.4–0.6–0.5–1.4; mid leg 0.9–0.5–0.4–0.6–0.5–1.6; hind leg 1.0–0.4–0.4–0.6–0.6–1.3; tarsomere 4 short in relation to 3 in all legs (0.5–0.6). Tarsomeres 5



Figures 37–40. *Paltostoma charadrae*, male terminalia (dorsal views). 37. Genital capsule and gonostyli. 38. Mesosomal structures and gonites. 39. Left outer gonostylus (inner view). 40. Cercal complex.



Figures 41–44. *Paltostoma eldorado*, male terminalia (dorsal views). 41. Genital capsule and gonostyli. 42. Mesosomal structures and gonites. 43. Left outer gonostylus (inner view). 44. Cercal complex.

similar on all legs, curved, with pollex of heavy setae; claw sickle-shaped, with sub-basal tooth and trichiate basally, several heavy trichiae ventrally between base and tooth.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals absent; dorsocentrals few

(2), posterior; supraalars and prescutellars absent; scutellars numerous, in lateral group, a few setae scattered medially; preepisternals absent; metapleurals numerous (13); suprametapleurals few (3).

Terminalia (Figs. 37–40). Cerci parallel; interlobular depression shallow, V-shaped; individual

cercus broadly rounded. Walls of subanal pouch thin. Apex of tegmen with medial recurved keel dorsally. Outer gonostylus large, an obovate lobe, apicodorsal angle slightly produced. Inner gonostylus elongate, erect, digitiform (apex simple). Expanded bases of aedeagal rods lacking internal spinules. Lateral rod leaving sperm sac laterally, base arcuate. Lateral tine attenuate, short, with small spines sub-basally.

Sensilla.—Epandrium with a few medium setiforms in a sparse transverse series. Cercus with a few medium setiforms scattered on apicodorsal third and basally; setae of inner arm few and evenly dispersed along entire length. Outer gonostylus with medium setiforms general ectally; sparse basal and apical groups entally. Alveoliform sensilla of Xth tergite not apparent. Xth sternite with two long setiforms apically.

Female (Figs. 34, 36). A single pharate specimen is available (dissected from pupa and mounted on slide). **Coloration.** As in male. **Wing membrane** infuscate. **Size.** A medium-sized blepharicerid. Measurements (N = 1): wing length 6.2. Leg segment lengths (femur-tarsus 1 unextended and not measurable):

		fore leg	mid leg	hind leg
tarsus	2	0.38	0.38	0.49
	3	0.29	0.27	0.28
	4	0.21	0.21	0.19
	5	0.27	0.27	0.24

Head (Fig. 34). Colocephalous type, dichoptic. Eyes distant dorsally, interocular distance equal to 0.3 width of head capsule. Mouthparts poorly developed, mandibles absent, lacinia very short; proboscis very short, labium about 0.28 width of head capsule; margin of hypopharynx entire; apex of labrum rounded; labellar lobes straight, shorter than base of labium; palpus very short, a single diminutive segment (=segment 3), sensory pit absent. Antenna 15-segmented, flagellar segments elongate cylindrical, ultimate segment equal to penultimate, proportions of apical three segments 1.0-1.0-1.0.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals few (5), scattered, small; occipitals few (5); postgenals absent; labrals absent; labials several, scattered generally, labellars few, small, restricted to apex.

Thorax and appendages (Fig. 36). Anal angle of wing produced, lobular. Legs moderately long and slender; hind legs stouter than others. Tibial spurs 0-0-1. Progressive leg segment proportions: fore leg n.a.-n.a.-n.a.-0.8-0.7-1.3; mid leg n.a.-n.a.-n.a.-0.7-1.0-1.3; hind leg n.a.-n.a.-n.a.-0.6-0.7-1.3; tarsomere 4 short in relation to 3 on all legs (0.7). Fore and mid tarsomeres 5 similar, straight, without pollex; hind tarsomere 5 curved, with weak pollex of enlarged setae; claw simple, long, slender, and gently sigmoidally curved, non-trichiate; hind claw somewhat stouter and shorter than others.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals, dorsocentrals, supraalars, and prescutellars absent; scutellars very numerous, long and concentrated in an elongate, brushlike group laterally, a few scattered mediad; preepisternals absent; metapleurals several (6); suprametapleurals few (3).

Terminalia (Fig. 15). VIIIth sternite well sclerotized throughout, base broad; lateral margin straight, medial depression moderately deep, broadly V-shaped, internal sclerotization flat, fusiform; lobe straight, apex not closely appressed to hypogynial plate. Hypogynial plate complex, base as broad as lobes, lobe with broad necks, dorsal division short, lobulate, nude, ventral division microtrichiate laterally, becoming denticulate mediad. Spermathecae three, all large, weakly sclerotized, two similar, elongate oviform, third about two-thirds size of others, oviform; necks very short and straight.

Sensilla.—Sternite VIII with 18-23 medium setiforms, distributed generally over lobe.

Pupa (Fig. 45). Very similar to pupa of *P. eldorado*. **Integument.** Periphery rounded, sclerotized integument underfolded and forming broad ventral border all around. Papillose dorsally. Papillae even and very dense generally (individual papillae nearly contiguous). Individual papillae small, those of scutum slightly larger than others; smooth, rounded, oval convexities. Papillar distribution as follows: scutum—dense over entire disc; branchial sclerite—dense over entire surface; metathoracic and abdominal tergites—even and dense over entire dorsum.

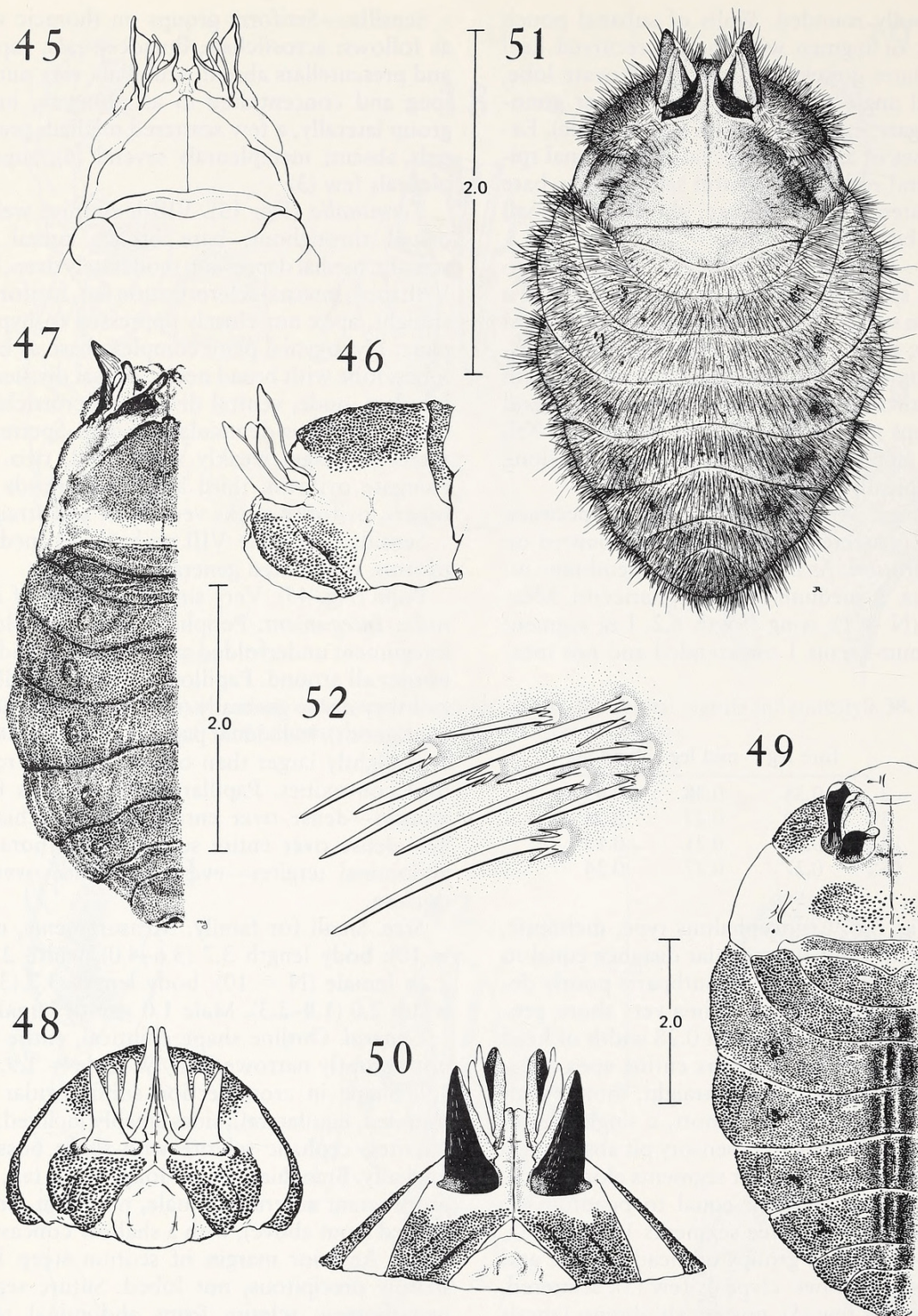
Size. Small for family. Measurements, male (N = 10): body length 3.7 (3.6-4.0), width 2.0 (1.8-2.2); female (N = 10): body length 3.7 (3.0-4.2), width 2.0 (1.8-2.3). Male 1.0 size of female.

General. Outline shape elliptical, entire (thorax not abruptly narrowed). L/W male = 1.9, female 1.9. Shape in cross section subtriangular (angles rounded, equilateral), sides steeply inclined. Dorsal sclerites: cephalic sclerite with slight bosses sub-medially. Branchial sclerite longer than tall, slightly protuberant anteriad in male, not so in female (as viewed from above); with a shallow concavity centrally. Anterior margin of scutum steep but not sharply precipitous, not lobed. Suture separating metathoracic sclerite from abdominal tergite I smooth medially. Abdominal tergites smoothly convex middorsally (no medial ridges or nodes); lateral margins entire.

Branchiae. Porrect, anterior plates divergent, middle parallel, hind approximate apically.

Larva (Figs. 26, 53). Similar to *P. eldorado*. **General.** Body form subonisciform. Medial elevated zones of abdominal segments well developed. Integument of anterior and posterior depressed zones faintly coriaceous. Outline shape of anterior division subovate.

Integument. Dorsum moderately well sclerotized. Corrugations distinct, irregular to linear; linear corrugations convergent over anterior and pos-



Figures 45-52. *Paltostoma*, pupae. 45. *P. charadrae*, anterior portion, dorsal view. 46. *P. eldorado*, anterior portion, lateral view. 47. Same, left half, dorsal view. 48. Same, frontal view. 49. *P. inca*, left half, dorsal view. 50. Same, frontal view. 51. *P. andeana*, entire, dorsal view. 52. Same, details of cuticular bristles.

terior transverse ridges. Venter with area at bases of pseudopods with blunt denticulae.

Coloration. Trunk pigmentation even, light brown; sclerotized portions pale brown, terminal border unpigmented.

Size. Medium for the family. Measurements ($N = 3$): body length 5.8 (5.7-6.1), head capsule width 1.1 (1.0-1.2), antennal segment lengths, basal 0.05 (0.05-0.05), apical 0.13 (0.13-0.14).

Head. Antennal segment proportions 1.0-2.7.

Trunk. Dorsum of abdominal segments I-VI more or less evenly rounded, without convexities or projections; numerous small plates on anal division.

Anal division. Dorsal pseudopod small, a nub, directed posterolaterad. Terminal incision not developed. Terminal lobe narrowed posteriad, with convex posterior margin.

Primary sensilla (medium setiforms unless oth-

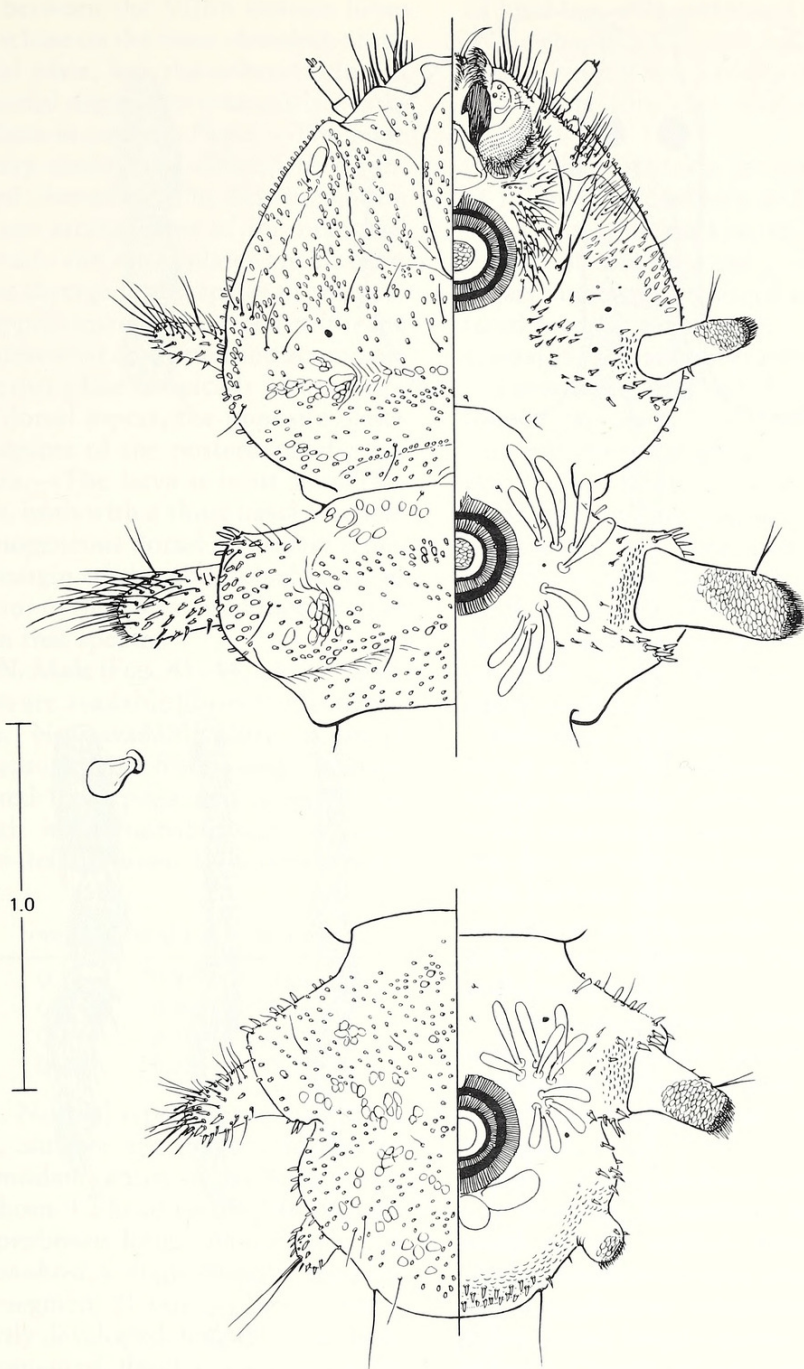


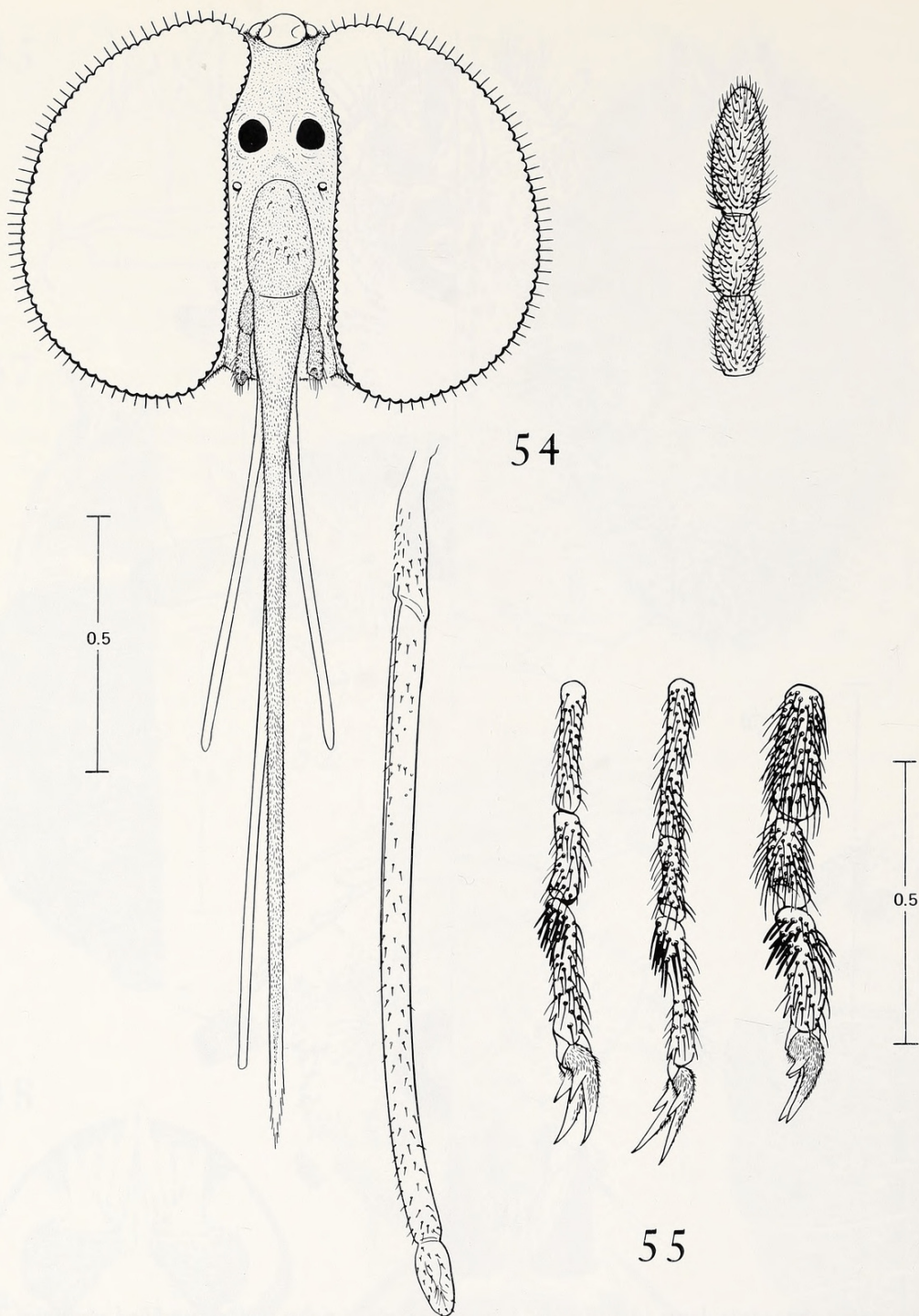
Figure 53. *Paltostoma charadrae*, larva (dorsal view, left; ventral view, right; typical modified sensillum, inset).

erwise described). tM-T oblique, tM slightly more medial. stM-T indiscernible; stI-VI distant from tI-VI, tI-VI small, ovoid, sessile (no PT tubercle). stVII and inner tp proximate. Inner tpP anterolateral to spiracle; inner tpI-VI set well anteriad. Outer tpI-VI indiscernible. Terminal setae 1-1, widely separated.

Dorsal modified sensilla. Small pyriforms/oviforms in linear series and patches on head sclerites, small pyriforms general on body integument, somewhat clustered in AT and PT areas. Circumlateral series complete. Sensilla of pseudopods setiform anteriorly; posteriorly acute to lanciform. Background field of fine setiforms absent.

SPECIMENS EXAMINED. Types: HOLOTYPE male (terminalia on slide no. CLH 87-114); ALLOTYPE female (dissected from pupa and mounted on slides nos. CLH 88-3B, 88-3W, 88-3H, and 86-577); 23 male PARATYPES (one dissected from pupa): COLOMBIA, *Antioquia*, 1 km SE Paso de Boquerón, 22 Jun 1983, C.L. Hogue, CLH 300 (LACM).

Additional Specimens. COLOMBIA, *Antioquia*, same data as types (12 larvae, 17 pupae). No specific data, Aug 1983, I. Bedoya 5 (6 larvae). 12 km W Piedra Blanca, Guarne, 8 Jan 1986, C.L. Hogue, CLH 347.1.2 (1 larva, 3 pupae). Quebrada La Cascada, 9.1 km E Medellín, 23 Jun 1983, C.L. Hogue,



Figures 54, 55. *Paltostoma eldorado*. 54. Male head (frontal view) and terminal antennae segments (inset). 55. Terminal tarsal segments of male (fore leg, left; mid leg, center; hind leg, right; lateral view).

CLH 309.1 (5 larvae, 6 pupae). Quebrada El Treinta, 2 km N Palmitas, 22 Jun 1983, C.L. Hogue, CLH 303 (1 pupa).

Quindio, Quebrada Salado, 4 km E Calarcá, 20 Jun 1984, C.L. Hogue, CLH 338 (2 females, 2 larvae, 28 pupae).

ETYMOLOGY. The name is a noun in the genitive case transliterated from Greek (*charadra* = rocky gorge), referring to the "bed of a mountain torrent." In like terrain the species is found.

REMARKS. Association of pupa-adults is by the ontogenetic method, of larva-pupa by syntopy. The species appears to be very closely related to *P. eldorado*.

4. *Paltostoma eldorado* Hogue, new species

Figures 27, 41-44, 46-48, 54-56

DIAGNOSIS. Adult.—By external characters, the adults of this species are indistinguishable from those of *P. roldani* (both with a single palpal segment and ultimate antennal segment longer than penultimate). In the male terminalia the outer aedeagal rods arise abruptly from the posterolateral corners of the sperm sac and are more or less straight; also the outline shape of the outer gonostylus is simple, without lobes of any kind. In the female terminalia the species is like *charadrae*, i.e., with a broad me-

dian depression between the VIIIth sternite lobes and with microtrichiae on the inner thumblike lobe of the hypogynial plate, but the sclerotization at the base of the medial depression is lanceolate rather than subquadrate in outline. *Pupa*.—The pupa of *eldorado* is very similar and difficult to distinguish from that of *charadrae*. The best separation is by the shape and arrangement of the branchial lamellae: in *eldorado* the outer plates are straight, the anterior plates divergent; the apices of the posterior plates are approximate only; in *charadrae* the outer plates are somewhat contorted and acuminate apically; the anterior plate is apically twisted upward so that, in dorsal aspect, the opposite plates are parallel; the apices of the posterior plates are contiguous. *Larva*.—The larva is most similar to that of *P. saltana*, both with a short basal antennal segment and homogeneous dorsal secondary setae, but the pleural margin of the abdominal segment VII is entire anterior to the dorsal pseudopod rather than excised as in that species.

DESCRIPTION. Male (Figs. 41–44, 54, 55). Only pharate specimens are available (dissected from pupae). *Coloration*. Not available. *Size*. A small blepharicerid. Measurements from a single pharate specimen, dissected from pupa and mounted on slide: wing length indeterminable. Leg segment lengths as follows (femur–tarsus 1 unextended and not measurable):

		fore leg	mid leg	hind leg
tarsus	2	0.54	0.49	0.41
	3	0.29	0.30	0.24
	4	0.19	0.16	0.16
	5	0.25	0.29	0.23

Head (Fig. 54). Normal type, subholoptic. Eyes disjunct dorsally, anterior eye margin sharply incised to accommodate antennal sockets, interocular distance about 0.2 head width. Mouthparts well developed, proboscis long, labium about 1.5 head width; palpus short, a single elongate segment clearly evident (=segment 3), sensory pit present; a basal segment partly developed, length 0.6 segment 3. Antenna 15-segmented, flagellar segments elongate barrel-shaped, ultimate segment longer (1.5) than penultimate, proportions of apical three segments 1.0–1.0–1.5.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals numerous (12–16), scattered; occipitals few (3–4); postgenals few (5–6), short; labrals absent; labials and labellars numerous, scattered throughout.

Thorax and appendages (Fig. 55). Anal angle of wing produced, lobular. Legs long and slender; hind legs somewhat stouter than other legs. Tibial spurs 0–0–1. Progressive leg segment proportions: fore leg n.a.–n.a.–n.a.–0.5–0.7–1.3; mid leg n.a.–n.a.–n.a.–0.6–0.5–1.8; hind leg n.a.–n.a.–n.a.–0.6–0.7–1.4; tarsomere 4 short in relation to 3 in all legs (0.5–0.6). Tarsomeres 5 similar on all legs, curved, with pollex of enlarged setae; pollex of fore and mid legs weak, setae only slightly enlarged, pollex

of hind legs well developed with heavy setae; claw sickle-shaped, with sub-basal tooth and trichiate basally, several heavy trichiae ventrally between base and tooth, fore claw slightly heavier than other claws.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals and dorsocentrals absent; supraalars, prescutals (seven setae on anteromedial margin of scutum), and prescutellars absent; scutellars numerous, in lateral group, a few setae scattered medially; preepisternals few (2); metapleurals several (9–10); suprametapleurals few (4).

Terminalia (Figs. 41–44). Cerci parallel; interlobular depression very shallow and small; individual cercus broad, slightly truncate. Walls of subanal pouch thin. Apex of tegmen with recurved keel dorsally. Outer gonostylus moderately large, a simple obovate lobe. Inner gonostylus elongate, erect, digitiform (apex slightly angled). Expanded bases of aedeagal rods lacking internal spinules. Lateral rod leaving sperm sac posteriorly with only a slight curvature. Lateral tine attenuate, with a few small spines midlength.

Sensilla.—Epandrium with a few medium setiforms in a group sublaterally and a few small setiforms medially. Cercus with a few medium setiforms scattered on apicodorsal third; setae of inner arm few and grouped near apex. Outer gonostylus with medium setiforms general ectally; sparse basal and apical groups entally. Alveoliform sensilla of Xth tergite not apparent. Xth sternite with two long setiforms apically.

Female (not figured). Only a single, subpharate specimen is available (partly dissected from pupa). *Coloration*. Indeterminable. *Size*. Apparently a medium-sized blepharicerid. Measurements indeterminable.

Head. Colocephalous type, dichoptic. Eyes distant dorsally, interocular distance equal to 0.27 width of head capsule. Mouthparts poorly developed; mandibles absent, character states of lacinia and hypopharynx indeterminable; proboscis very short, labial length indeterminable, labrum only about 0.2 width of head capsule; apex of labrum rounded; size of labellar lobes indeterminable, undeveloped on specimen; palpus very short, a single diminutive segment (=segment 3), sensory pit present but vestigial. Antenna 15-segmented, flagellar segments barrel-shaped, ultimate segment equal to penultimate, proportions of apical three segments 1.0–1.0–1.0.

Sensilla.—Setiform groups on head capsule and mouthparts as follows (specimen poor, setal states mostly indeterminable): clypeals absent, scattered, small; occipitals apparently few (4); postgenals few (2); labrals absent; labials and labellars indeterminable.

Thorax and appendages; terminalia. Structures undeveloped on specimen; all character states indeterminable.

Pupa (Figs. 46–48). Very similar to pupa of *P. charadrae*. *Integument*. Periphery rounded, scler-

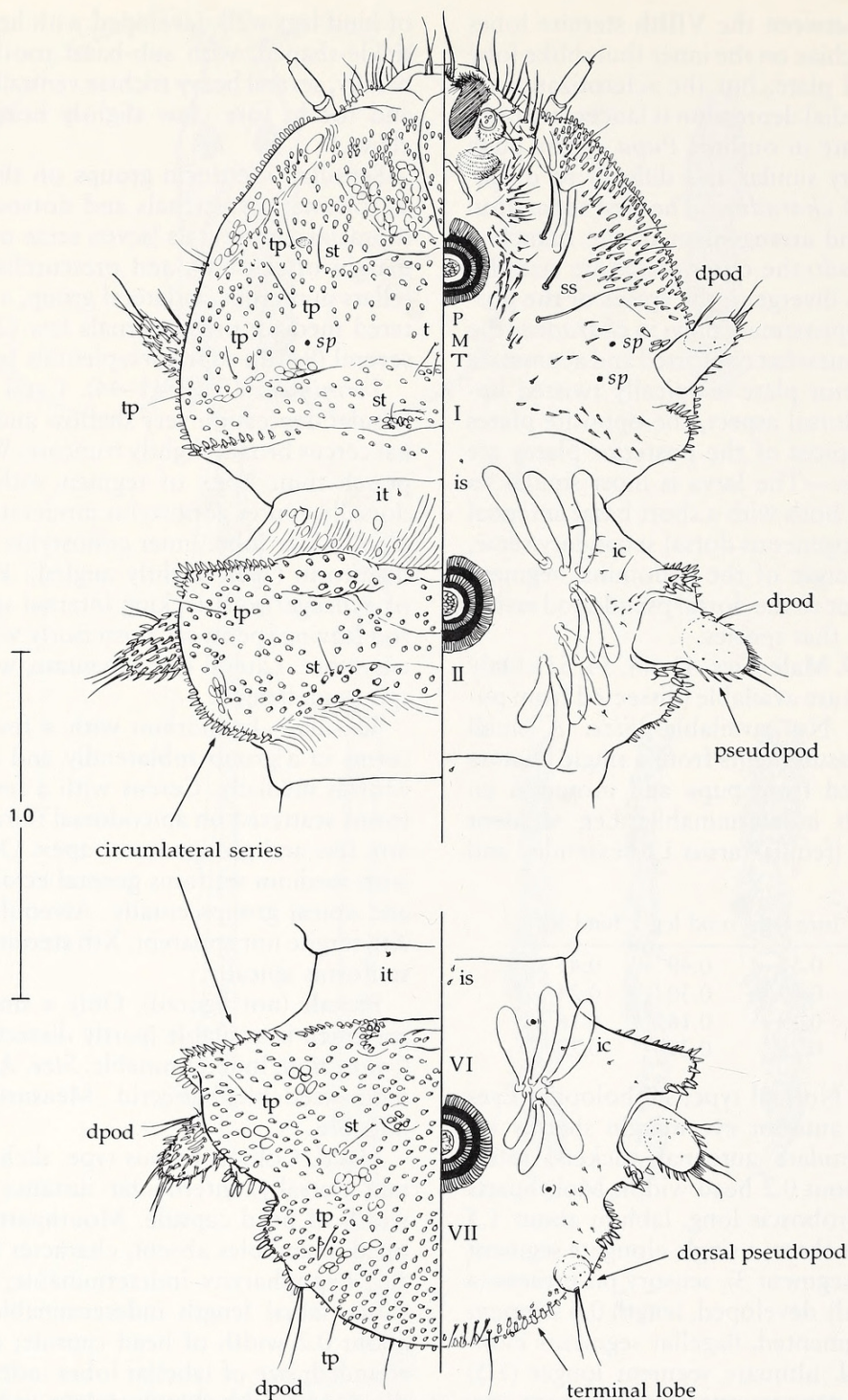


Figure 56. *Paltostoma eldorado*, larva (dorsal view, left; ventral view, right); anatomical details labeled: primary sensilla, t—tergal, st—subtergal, tp—tergopleural, dpod—dorsal pseudopodal, it—intertergal, is—intersternal, ic—intercalary, ss—substernal, sp—spiracle.

otized integument underfolded and forming broad ventral border all around. Papillose dorsally. Papillae even and very dense generally (individual papillae nearly contiguous). Individual papillae small, those of scutum conspicuously larger than others; smooth, rounded, oval convexities. Papillar distribution as follows: scutum—dense over entire disc; branchial sclerite—dense over entire surface; meta-thoracic and abdominal tergites—even and dense over entire dorsum.

Size. Small for family. Measurements, male (N

= 10): body length 4.2 (3.9–4.6), width 2.1 (2.1–2.3); female (N = 8): body length 4.6 (4.4–4.8), width 2.5 (2.3–2.7). Male 0.8 size of female.

General. Outline shape elliptical, entire (thorax not abruptly narrowed). L/W male = 2.0, female 1.9. Shape in cross section subtriangular (angles rounded, equilateral), sides steeply inclined. Dorsal sclerites: cephalic sclerite with broad, irregular, inverted U-shaped ridge against upper margin. Branchial sclerite longer than tall, strongly protuberant anteriad in male, barely so in female (as viewed

from above), complex in both sexes, with a strong furrow curving obliquely from base of branchiae to posteroventral corner of sclerite. Anterior margin of scutum sharply precipitous, trilobed. Suture separating metathoracic sclerite from abdominal tergite I smoothly rounded medially. Abdominal tergites smoothly convex middorsally (no medial ridges or nodes); lateral margins entire.

Branchiae. Porrect, anterior plates divergent, middle parallel, hind contiguous apically.

Larva (Figs. 27, 56). *General.* Body form onisciform. Medial elevated zones of abdominal segments well developed. Outline shape of anterior division subovate.

Integument. Dorsum moderately well sclerotized. Corrugations distinct, linear to irregular, forming areolate pattern, linear corrugations convergent over anterior and posterior transverse ridges. Integument of anterior and posterior depressed zones faintly coriaceous. Venter with area medial to bases of pseudopods minutely strigulate; minute setae anterior and posterior to base of pseudopod.

Coloration. Trunk pigmentation even, light brown; sclerotized portions pale brown, terminal border unpigmented.

Size. Medium for the family. Measurements ($N = 10$): body length 5.8 (5.4–6.2), head capsule width 1.3 (1.2–1.4), antennal segment lengths, basal 0.05 (0.05–0.05), apical 0.17 (0.16–0.19).

Head. Antennal segment proportions 1.0–3.5.

Trunk. Dorsum of abdominal segments I–VI with anterior and posterior, transverse pillowlike convexities (strongest in AT and PT positions). Numerous small circular plates on anal division.

Anal division. Dorsal pseudopod small, a nub, directed posterolaterad. Terminal incision not developed. Terminal lobe with convex, broadly rounded posterior margin.

Primary sensilla (medium setiforms unless otherwise described). tM–T small, in line and closely clustered. stM–T close to and lateral to t, small; stI–VI associated with PT convexity. Inner tpP anterolateral to spiracle; inner tpI–VI set well anteriorad, outer tpI–VI indiscernible. Terminal setae 1–1, widely separated.

Dorsal modified sensilla. Small pyriforms/oviforms in linear series and patches on head sclerites, scattered on trunk segments except for dense groupings on AT and PT convexities. Circumlateral series extensive and complete. Sensilla of pseudopods setiform apically; dorsally acute to lanciform. Background field of fine setiforms absent.

SPECIMENS EXAMINED. Types: HOLOTYPE male (ex pupa in alcohol, dissected and mounted on slides nos. CLH 87-215H, 87-215B, 87-215W, and 87-215T); ALLOTYPE female (ex pupa in alcohol, partially on slides nos. CLH 86-519 and 86-520); 3 male PARATYPES (all dissected from pupae, terminalia mounted on slides): COLOMBIA, *Antioquia*, Quebrada Piedra Blanca, 12 km W Guarne, 8 Jan 1986, C.L. Hogue, CLH 347.1.1, 347.1.2 (LACM).

Additional Specimens. COLOMBIA, *Antioquia*, same data as types (23 pupae). Salto Tequendamita, 23 Jun 1983, C.L. Hogue, CLH 310 (1 pupa).

Caldas, 6 km N Manizales, 17 Jun 1984, C.L. Hogue, CLH 336 (28 larvae).

ETYMOLOGY. The species is named in honor of the famed “Golden Man” of Colombian antiquity and his fabled cache of gold, long sought by the Conquistadors but never found. The name is used in the nominative case and in apposition to the generic appellation.

REMARKS. Association of the pupa–adult was by the ontogenetic method. No larvae have been collected with known pupae of this species so the larva–pupa association is by the phyletic inference method (larvae and pupae are both very similar to those of *charadrae*).

5. ? *Paltostoma saltana* Edwards, 1929

Figures 57, 75

Paltostoma saltana Edwards, 1929:71–73, figs. 37, 42, 48, 62–65.

REDESCRIPTION. **Larva** (Figs. 57, 75). *General.* Body form subonisciform. Abdominal segments with medial elevated ridges. Outline shape of anterior division subovate.

Integument. Dorsum well sclerotized. Corrugations distinct, mostly linear, convergent across transverse anterior and posterior ridges. Integument of anterior and posterior depressed zones corrugopapillose. Venter with area at bases of pseudopods very finely strigulate, a few scattered setae in area.

Coloration. Trunk dark brown, evenly pigmented; sclerotized portions pale brown, terminal border unpigmented.

Size. Medium for the family. Measurements ($N = 4$): body length 8.8 (8.2–9.2), head capsule width 2.1 (1.9–2.3), antennal segment lengths, basal 0.05 (0.05–0.05), apical 0.10 (0.10–0.11).

Head. Antennal segment proportions 1.0–2.1.

Trunk. Dorsum irregular, especially laterad: circumlateral ridges very prominent, especially anterior; both irregular; strong lateral lobes anterior and posterior to bases of pseudopods of trunk segments and on abdominal segment VII.

Anal division. Dorsal pseudopod small, a nub, directed posterolaterad. Terminal incision not developed. Terminal lobe with convex, broadly rounded posterior margin.

Primary sensilla (medium setiforms unless otherwise described). tM–T in line, well spaced. stI–VI very small. stVII and inner tp proximate. Inner tpP slightly medial to spiracle. Outer tpI–VI indiscernible. Terminal setae 1–1, widely separated.

Dorsal modified sensilla. Of special form: wide, pyriform with flattened apex that is occasionally collapsed, rim minutely denticulate. Slight modifications of these special sensilla in linear series and patches on head sclerites. Circumlateral ridges strong, irregular. Sensilla in circumlateral series uniform in size and shape, glandiform. A similar series

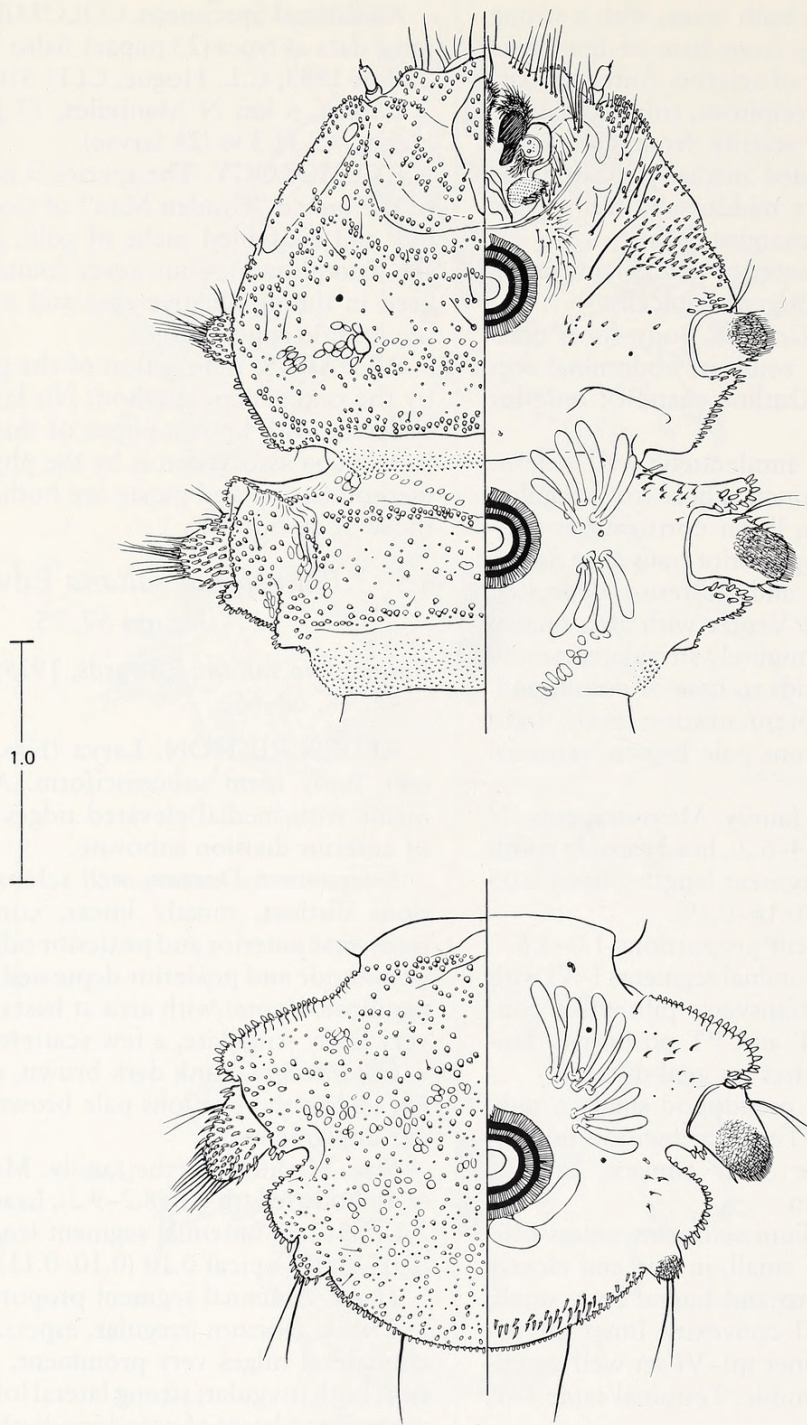


Figure 57. *Paltostoma saltana*, larva (dorsal view, left; ventral view, right).

on lateral convexity of abdominal segment VII. Sensilla of pseudopods setiform apically; dorsally modified, fustiform. Background field of small setiforms absent.

SPECIMENS EXAMINED. COLOMBIA, *Antioquia*, 1 km SE Paso de Boquerón, 22 Jun 1983, C.L. Hogue, CLH 300 (3 larvae).

Cundinamarca, Río Frio, road from Zipaquira to Pacho, 2,900 m, 22 Jul 1967, P. & B. Wygodzinsky (12 larvae: AMNH).

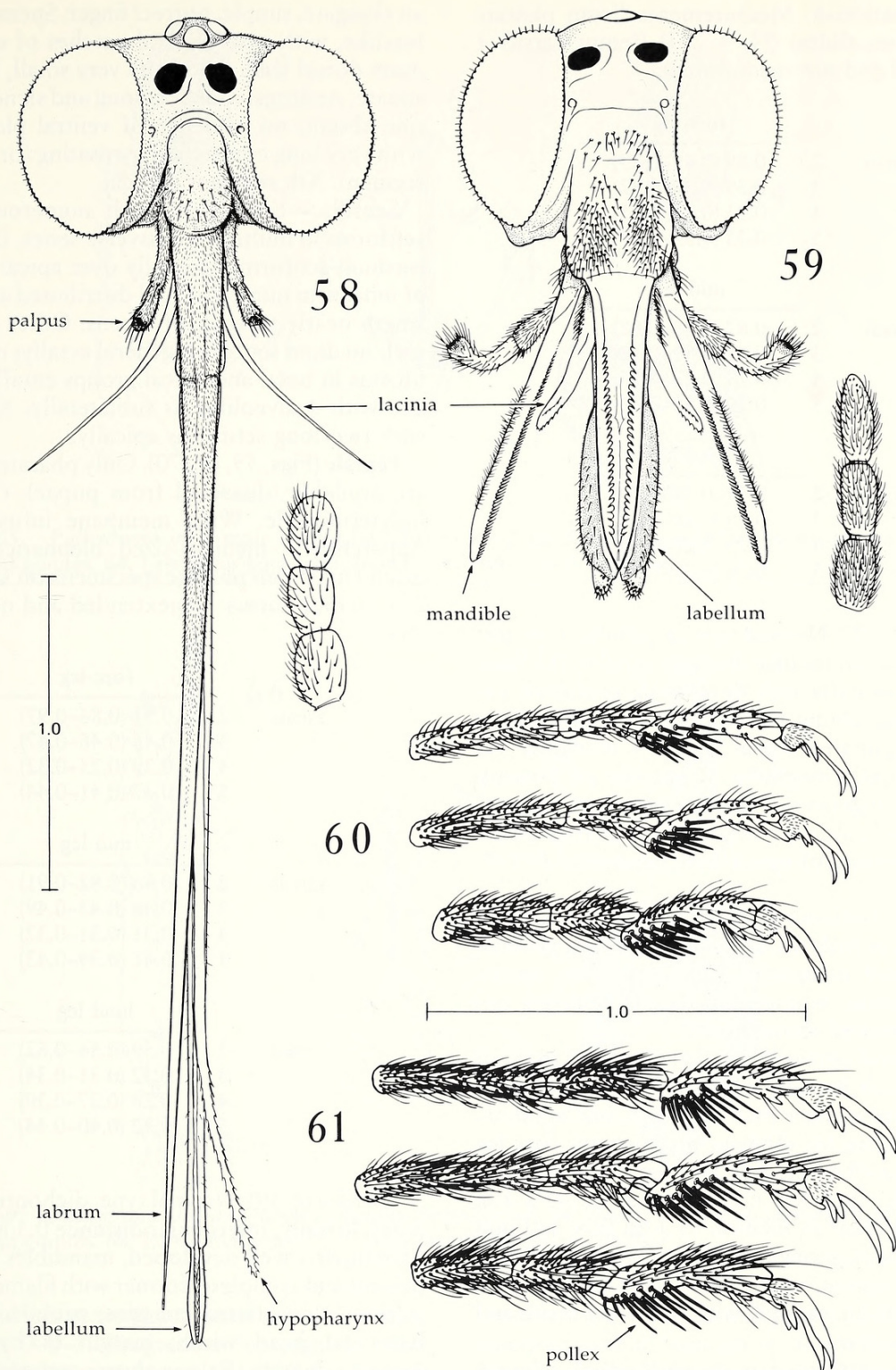
REMARKS. Edwards' (1929) association of the male with the larva (which we assume to have been based only on sympatry), plus his inadequate description of the former, makes the identity of this

species uncertain at this time. The larva that he figured in his original description (fig. 65) is unquestionably conspecific with ours from Antioquia and Cundinamarca but Edwards' figure of the female cotype is not diagnostic; likewise, his figure of an outer respiratory plate is insufficient to place the pupa.

6. *Paltostoma inca* Hogue, new species

Figures 49, 50, 58–65, 70, 74, 76

DIAGNOSIS. *Adult*.—Externally the adults of both sexes are somewhat similar to those of *P.*



Figures 58–61. *Paltostoma inca*, anatomical details labeled. 58. Male head (frontal view) and terminal antennal segments (inset). 59. Female head and terminal antennal segments (arrangements as for male). 60. Terminal tarsal segments of male (fore leg, upper; mid leg, center; hind leg, lower; lateral view). 61. Terminal tarsal segments of female (arrangement as for male).

andeana, but the male has a longer proboscis and the basal segment of the palpus is shorter in proportion to the distal (1.5) than in that species (2.0). Both male and female terminalia are very distinct (see Keys). *Pupa*.—The pupa keys out with those of *Limonicola medius* and *L. lichanos*, all with the abdominal tergites raised medially, but is distinguished most obviously from those species by the

sparse papillae on the thorax (in these other two species the thorax is densely papillose). *Larva*.—The larva is very distinctive, being the only regional species with very large, spinelike, dorsolateral projections on the dorsa of abdominal segments I–VI.

DESCRIPTION. Male (Figs. 58, 60, 62–65). Only pharate specimens are available (dissected from pupae). *Coloration*. Indeterminable. *Size*. A medium-

sized blepharicerid. Measurements (from pharate specimens on slides) (N = 2-3) (femur-tarsus 1 unextended and not measurable):

		fore leg	
tarsus	2	0.89	(0.89-0.89)
	3	0.39	(0.37-0.42)
	4	0.23	(0.22-0.25)
	5	0.35	(0.32-0.37)
		mid leg	
tarsus	2	0.87	(0.86-0.88)
	3	0.41	(0.41-0.42)
	4	0.23	(0.23-0.25)
	5	0.36	(0.35-0.36)
		hind leg	
tarsus	2	0.57	(0.56-0.59)
	3	0.28	(0.28-0.29)
	4	0.23	(0.22-0.24)
	5	0.36	(0.35-0.37)

Head (Fig. 58). Normal type, dichoptic. Eyes distant dorsally, interocular distance equal to 0.3 head width. Mouthparts well developed, proboscis extremely long, labium about 3.0 head width; palpus short, 2-segmented, basal segment elongate, 1.5 length of distal (=segment 3); sensory pit present. Antenna 15-segmented, flagellar segments elongate barrel-shaped, ultimate segment equal to penultimate, proportions of apical three segments 1.0-1.0-1.0.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals numerous, general; occipitals and postgenals indeterminable, apparently numerous, minute; labials and labellars numerous, scattered throughout.

Thorax and appendages (Fig. 60). Anal angle of wing produced, broadly lobular. Legs long and slender, hind legs stouter than others. Tibial spurs 0-0-1. Progressive leg segment proportions: fore leg n.a.-n.a.-n.a.-0.4-0.6-1.5; mid leg n.a.-n.a.-n.a.-0.5-0.6-1.6; hind leg n.a.-n.a.-n.a.-0.5-0.8-1.6; tarsomere 4 short in relation to 3 on fore and mid legs (0.6), hind leg longer (0.8). Tarsomeres 5 similar on all legs, curved, with extensive pollex of heavy setae; claw sickle-shaped, with sub-basal tooth and trichiate basally.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals and dorsocentrals apparently absent (specimens imperfect); prescutals indeterminable; supraalars several (6-7); prescutellars indeterminable; scutellars numerous, long and concentrated in a dense lateral group; preepisternals-episternals very numerous (33); metapleurals numerous (27-30); suprametapleurals few (4-5).

Terminalia (Figs. 62-65). Cerci parallel; interlobular depression deep, narrow, linear; individual cercus lobular, apex truncate. Tegmen very broad, apex furrowed, posterolateral margin with strong, arcuate fold extending mediad. Outer gonostylus moderately large, simple, obovate. Inner gonostylus

an elongate, simple, porrect finger. Sperm sac small, boxlike, with anterolateral patches of spinulae on inner dorsal wall. Apodeme very small, horizontal, square. Aedeagal rods very long and slender. Lateral tine absent, no evidence of ventral plate. Gonite with very long corpus (compensating for extra wide tegmen). Xth segment conical.

Sensilla.—Epandrium with numerous medium setiforms in multiple, transverse series. Cercus with medium setiforms generally over apical half; setae of inner arm numerous and distributed along entire length nearly to apex of cercus. Outer gonostylus with medium setiforms general ectally; medium setiforms in basal and apical groups entally. Xth tergite with 4 alveoliforms sublaterally. Xth sternite with two long setiforms apically.

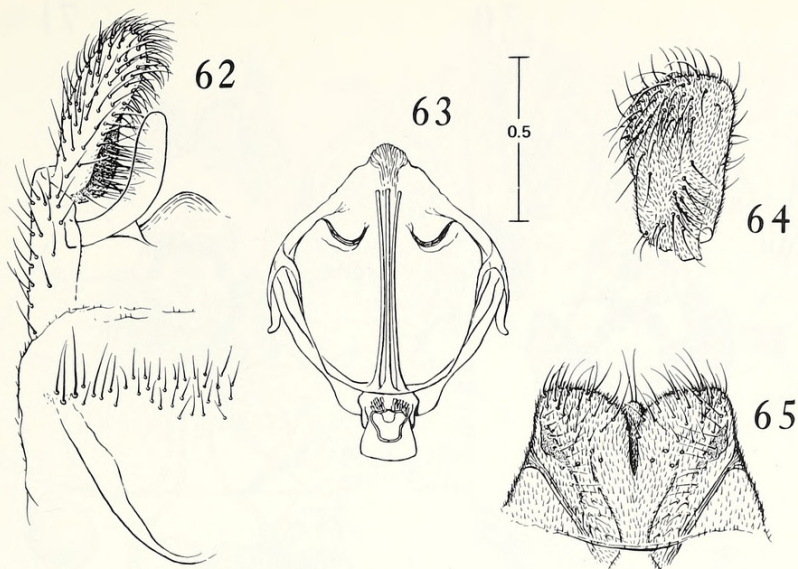
Female (Figs. 59, 61, 70). Only pharate specimens are available (dissected from pupae). **Coloration.** Indeterminable. Wing membrane infusate. **Size.** Apparently a medium-sized blepharicerid. Measurements (from pharate specimens on slides) (N = 2-3) (femur-tarsus 1 unextended and not measurable):

		fore leg	
tarsus	2	0.91	(0.86-0.97)
	3	0.46	(0.46-0.47)
	4	0.29	(0.25-0.32)
	5	0.42	(0.41-0.44)
		mid leg	
tarsus	2	0.86	(0.82-0.91)
	3	0.46	(0.43-0.49)
	4	0.31	(0.31-0.32)
	5	0.41	(0.39-0.43)
		hind leg	
tarsus	2	0.59	(0.54-0.62)
	3	0.32	(0.31-0.34)
	4	0.28	(0.27-0.30)
	5	0.42	(0.40-0.44)

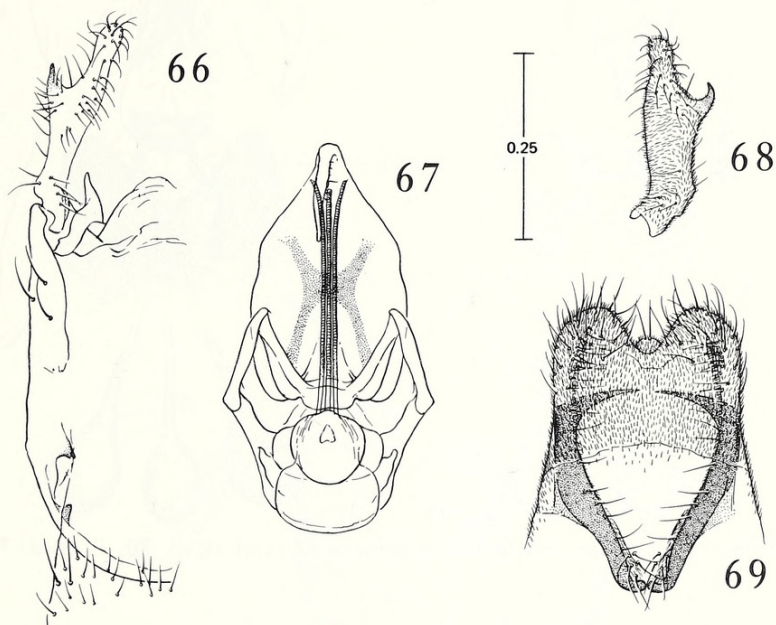
Head (Fig. 59). Normal type, dichoptic. Eyes disjunct dorsally, interocular distance 0.3 head width. Mouthparts well developed, mandibles and lacinia present and complete, former with filamentous projections along lateral margins; proboscis long, labium 1.1 head width; margin of hypopharynx strongly dentate. Palpus short, composed of very short basal segment and two elongate distal segments (=segments 2 and 3; proportions 1.0-1.2), sensory pit very well developed and terminal. Antenna 15-segmented, flagellar segments elongate cylindrical, ultimate slightly longer than penultimate, proportions of apical three segments 1.0-1.0-1.2.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals very numerous, general; posterior groups confluent, rear of head generally setate, including postgenal area; labials and labellars very numerous, general.

Thorax and appendages (Fig. 61). Anal angle of wing slightly convex, not lobular. Legs long and



Figures 62–65. *Paltostoma inca*, male terminalia (dorsal views). 62. Genital capsule and gonostyli. 63. Mesosomal structures and gonites. 64. Left outer gonostylus (inner view). 65. Cercal complex.



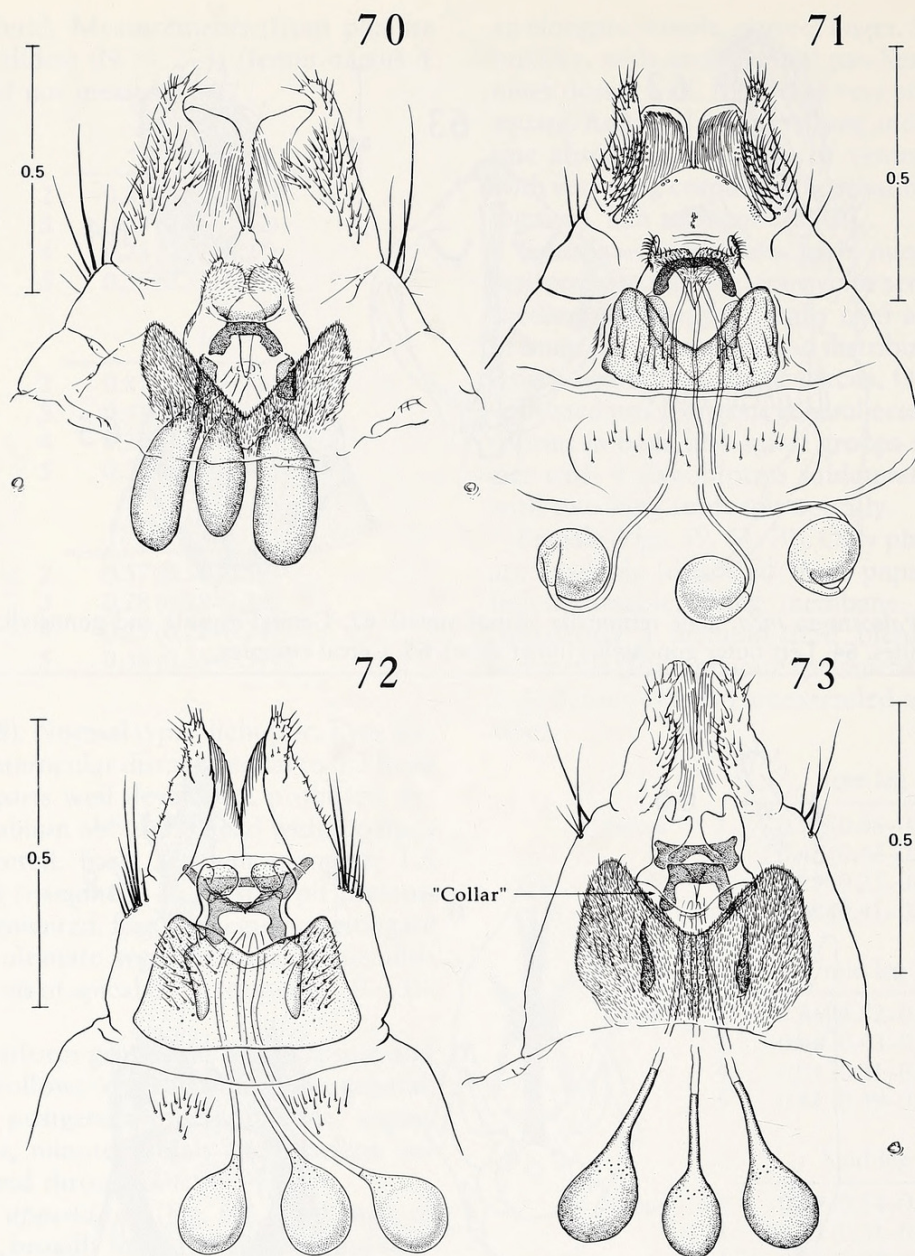
Figures 66–69. *Paltostoma andeana*, male terminalia (dorsal views). 66. Genital capsule and gonostyli. 67. Mesosomal structures and gonites. 68. Left outer gonostylus (inner view). 69. Cercal complex.

slender; hind legs somewhat stouter than other legs. Tibial spurs 0–0–1. Progressive leg segment proportions: fore leg n.a.–n.a.–n.a.–0.5–0.6–1.4; mid leg n.a.–n.a.–n.a.–0.5–0.7–1.3; hind leg n.a.–n.a.–n.a.–0.6–0.9–1.5; tarsomere 4 short in relation to 3 in fore and mid leg (0.6–0.7), long in hind leg (0.9). Tarsomeres 5 similar on all legs, with pollex of heavy setae, ventral group of slightly oversized setae present also subterminally; claw sickle-shaped, with sub-basal tooth and trichiate basally.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals scant; dorsocentral series undeveloped; prescutals numerous (11–16), a small subgroup of four to seven located ventrally just anterior to prescutal suture; supraalars few (1–3); prescutellars absent; scutellars numerous, and con-

centrated in a dense lateral group, numerous setae scattered medially from group across posterior margin of sclerite; preepisternals and episternals numerous, former longer; metapleurals very numerous, a small ventral subgroup separated from main upper field; suprametapleurals few (3–4).

Terminalia (Fig. 70). Medial plate of the VIIIth sternite broad; lateral margin straight, medial depression deep, broadly V-shaped, medial internal sclerotization undeveloped; lobe somewhat narrow, straight, apex distant from hypogynial plate. Hypogynial plate complex, base slightly broader than lobes, lobe sessile (not on neck), dorsal division elongate, with few small setae, ventral division broad, generally with long microtrichiae. Spermathecae three, moderate-sized, medial smaller than



Figures 70-73. *Paltostoma* and *Limonicola*, female terminalia (ventral view). 70. *P. inca*. 71. *P. andeana*. 72. *L. lichanos*. 73. *L. astylis*.

laterals, all well sclerotized and similar in shape, elongate-oval, with short necks and short, straight ducts.

Sensilla.—Sternite VIII with seven to ten medium setiforms, distributed generally over lobe.

Pupa (Figs. 49, 50). **Integument.** Periphery abrupt, sclerotized integument underfolded and forming broad ventral border. Papillose dorsally. Papillae irregular in density and distribution. Individual papillae small, smooth, rounded, oval convexities. Papillar distribution as follows: scutum—sparse transverse group on disc; branchial sclerite—dense over most of surface to base of branchiae; meta-thoracic sclerite—dense throughout; abdominal tergites—generally dense, but slightly closer and smaller mediad than laterad.

Size. Medium for family. Measurements, male (N = 10): length 5.7 (5.5-5.9), width 3.7 (3.5-3.9);

female (N = 10): length 6.3 (6.0-6.7), width 4.1 (3.9-4.7). Male 0.8 size of female.

General. Outline shape ovoid. Cross section depressed triangular. Dorsal sclerites: cephalic sclerite smooth. Branchial sclerite square, flat. Anterior margin of scutum smoothly and gently inclined. Abdominal tergites convex medially, forming a medially grooved, middorsal ridge; lateral margins entire.

Branchiae. Moderately large, erect; anterior and middle plates subparallel, all slightly divergent, posterior plates parallel, erect. Anterior and posterior plates rigid, heavily sclerotized, triangular, and about equal in size, with broad, membranous inner margins; inner two plates narrower, thinner and narrower than outers, entirely semimembranous.

Larva (Figs. 74-76). **General.** Body form lobi-form. Medial elevated zones of abdominal seg-



Figure 74. *Paltostoma inca*, larva (dorsal view, left; ventral view, right; typical modified sensillum, inset).

ments not developed. Outline shape of anterior division subovate.

Integument. Dorsum moderately well sclerotized. Corrugations distinct, fine, zig-zagging mid-dorsally, becoming concentric and linear around bases of large, dorsal, spinelike projections. Venter with area at bases of pseudopods minutely strigulate.

Coloration. Trunk pigmentation even, sclerotized portions pale brown to black; terminal border unpigmented.

Size. medium for the genus. Measurements ($N = 10$): body length 9.2 (8.6–9.6), head capsule width

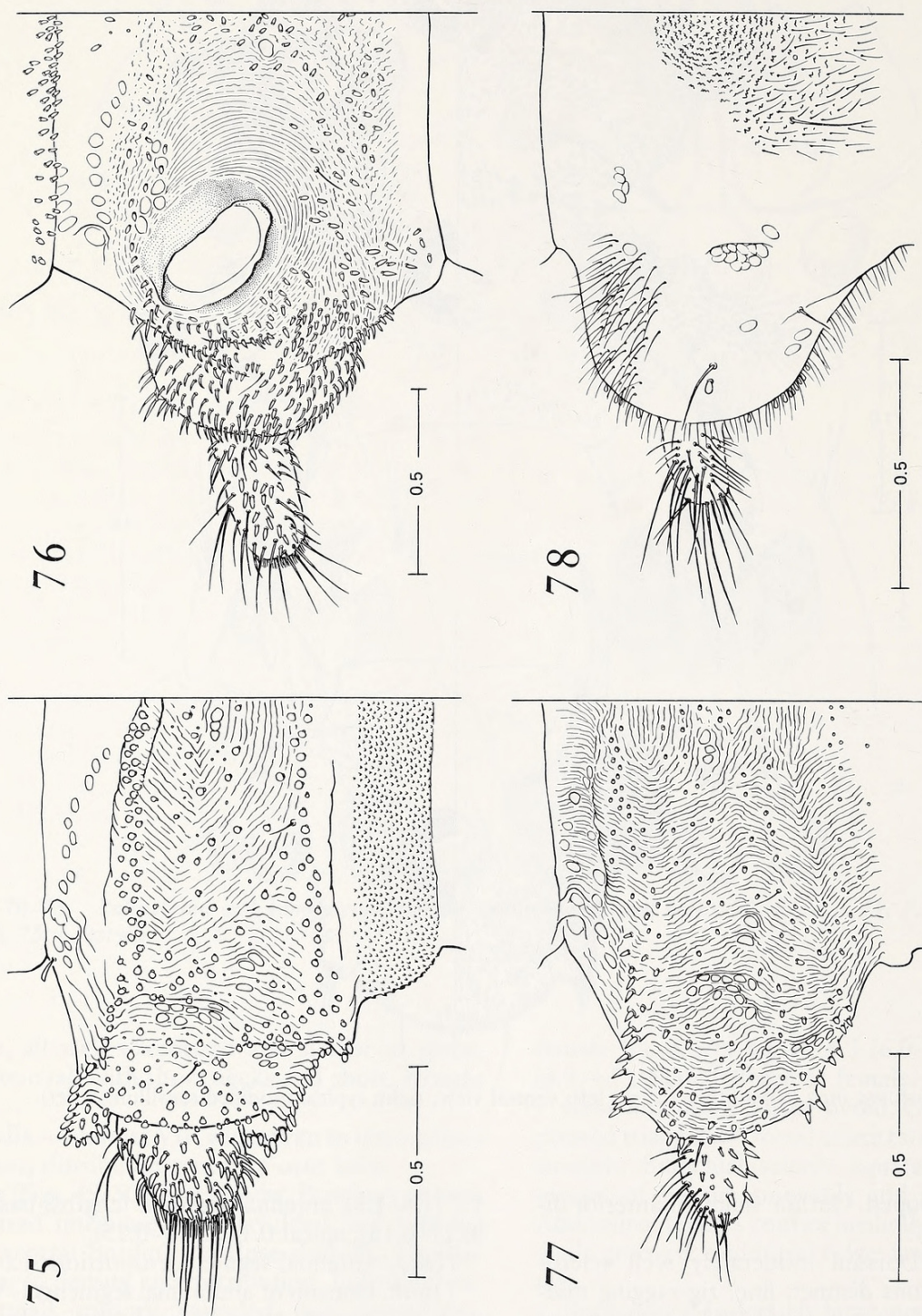
1.7 (1.4–1.8), antennal segment lengths, basal 0.11 (0.11–0.13), apical 0.14 (0.13–0.15).

Head. Antennal segment proportions 1.0–1.2.

Trunk. Dorsum of abdominal segments I–VI each with a pair of large, dorsolateral, sclerotized, smooth, erect, spinelike projections, with sharply acute apices; projection of abdominal segment I about one-half size of others.

Anal division. Dorsal pseudopod small, a nub, directed posterolaterad. Terminal incision not developed. Terminal lobe narrowed posteriad, with convex posterior margin.

Primary sensilla (medium setiforms unless oth-



Figures 75-78. *Paltostoma* and *Limonicola* larvae, abdominal segment III (left half, dorsal view). 75. *P. saltana*. 76. *P. inca*. 77. *P. andeana*. 78. *L. lichenos*.

erwise described). tM-T oblique, tM more medial. stM-T indiscernible; stI-VI posterior to base of spine; stVII and inner tpVII proximate. Inner tpP anteromedial to spiracle. Outer tpI-VI indiscernible. Terminal setae 1-1, widely separated.

Dorsal modified sensilla. Circumlateral series and ridges not developed. Small elongate oviform to pyriform types general on head sclerites and trunk segments, these more dense laterad than mediad; areas around bases of dorsal spinelike projections and projections themselves bare. Dorsal sensilla of pseudopods setiform apically and anteriorly, elongate ovoid to pyriform dorsally. Background field of fine setiforms absent.

SPECIMENS EXAMINED. Types: HOLOTYPE male (entirely dissected from pupa and mounted on slides nos. CLH 88-76H, 88-76B, 88-76W, and 88-76); ALLOTYPE female (entirely dissected from pupa and mounted on slides nos. CLH 88-79H, 88-79B, 88-79W, and 88-79); 2 male and 2 female PARATYPES (entirely dissected from pupae and mounted on slides): BOLIVIA, *La Paz*, small tributary to south of Río Unduari, 21.2 km W Puente Villa, 18 Jul 1988, C.L. Hogue, CLH 456 (LACM).

Additional Specimens. BOLIVIA, *La Paz*, same data as types (138 pupae, 56 larvae). Río Elena, 6.6 km E Yolosa, 17 Jul 1988, C.L. Hogue, CLH 453.1.1 (6 pupae, 7 larvae); 0.1 km E Puente Villa, 18 Jul 1988, C.L. Hogue, CLH 455 (28 pupae, 102 larvae); 15 km S Coripata, 18 Jul 1988, C.L. Hogue, CLH 454.1.1 (13 pupae, 53 larvae).

COLOMBIA, *Antioquia*, Quebrada La Espadera, 7.7 km E Medellín, 23 Jun 1983, C.L. Hogue, CLH 308 (2 larvae); 3 km N Palmitas, 22 Jun 1983, C.L. Hogue, CLH 301 (1 pupa).

Valle, Quebrada Honda, Peñas Blancas, 1,800 m, 3 Jun 1974, C.L. Hogue (36 larvae).

ECUADOR, *Pastaza*, 21 km W Puyo, 9 May 1977, P.J. Spangler, DRG-23 (2 pupae, 2 larvae).

Pinchicha, 58.2 km WNW Aloag, junction of highways 30 and 35 on road to Santo Domingo, 3,300 feet, 9 Jul 1973, J. Emmel (1 larva).

Zamora-Chinchipe, 14.4 km S Zumbi, 950 m, 4 Nov 1979, J. Anderson (1 larva).

PERU, *Junin*, San Ramón, Estancia Naranjal, 20-27 Jul 1965, P. & B. Wygodzinsky (8 pupae, 17 larvae: AMNH).

ETYMOLOGY. The species is named in honor of the historic Incan Empire, with whose geographic extent the insect's distribution generally coincides. The name is used in the nominative singular and in apposition to the generic appellation.

REMARKS. A series of larvae and a single pupa are all that have been taken in Antioquia Department. Until Hogue collected new material of all stages in 1988 in Bolivia, the association of larva and pupa could not be made. The specimens from Bolivia are the first of the family Blephariceridae that have been recorded in the literature from that country.

The larva is very different from any other from

Antioquia Department in the possession of six pairs of very long, erect, dorsal spines. There are other species of *Paltostoma* and *Kelloggina* with similar-appearing processes; however, these are not strictly homologous organs, having slightly different places of origin from the dorsal body wall.

Association of the stages is certain (ontogenetic method).

7. *Paltostoma andeana*
Hogue and Bedoya,
new species

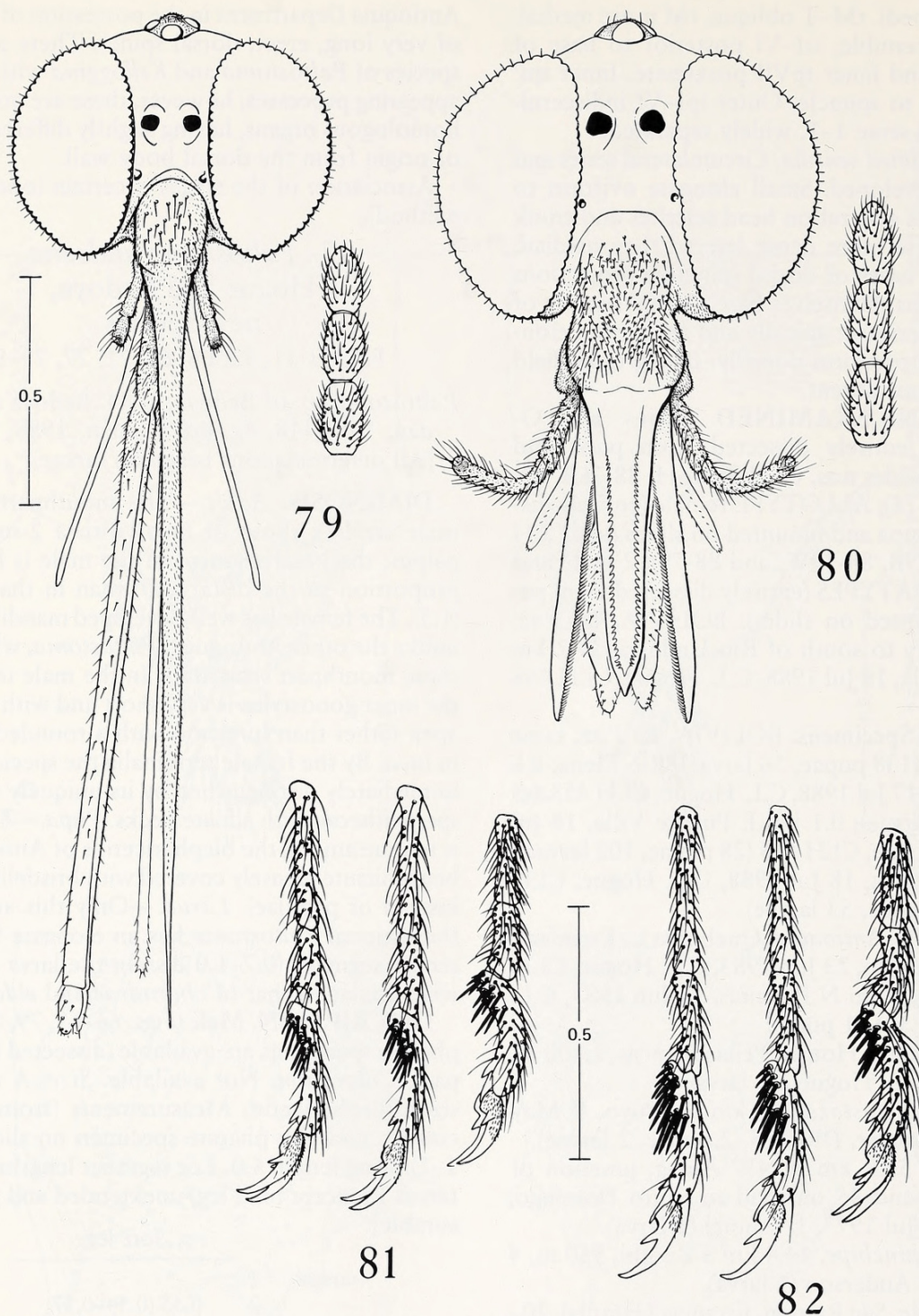
Figures 51, 52, 66-69, 71, 77, 79-83

Paltostoma sp. of Bedoya, 1984. Bedoya and Roldán, 1984:118, fig. 4d. Roldán, 1988: fig. 144. [All determinations based on larvae.]

DIAGNOSIS. *Adult.*—The mouthparts of the male are like those of *inca*, with a 2-segmented palpus; the basal segment in the male is longer in proportion to the distal (2.0) than in that species (1.5). The female has well-developed mandibles also, unlike the other Antioquian *Paltostoma*, which lack these mouthpart structures. In the male terminalia the inner gonostylus is very short and with an acute apex rather than long and with a rounded apex as in *inca*. By the female terminalia the species can be immediately distinguished by its uniquely spherical spermathecae with adnate necks. *Pupa.*—This stage is unique among the blepharicerids of Antioquia by being hirsute (densely covered with bristlelike spines instead of papillae). *Larva.*—Only this among all the regional *Paltostoma* has an elongate basal antennal segment (0.7-1.0 distal); the larva is otherwise similar to that of *charadrae* and *eldorado*.

DESCRIPTION. *Male* (Figs. 66-69, 79, 81). Only pharate specimens are available (dissected from pupae). *Coloration.* Not available. *Size.* A medium-sized blepharicerid. Measurements (from one alcoholic and one pharate specimen on slide) (N = 1-2): wing length 5.0. Leg segment lengths [femur-tarsus 1 (except hind leg) unextended and not measurable]:

		fore leg
tarsus	1	
	2	0.55 (0.54-0.57)
	3	0.29 (0.29-0.29)
	4	0.17 (0.16-0.18)
	5	0.26 (0.26-0.26)
		mid leg
tarsus	1	
	2	0.59 (0.54-0.65)
	3	0.30 (0.28-0.32)
	4	0.17 (0.16-0.18)
	5	0.24 (0.24-0.24)
		hind leg
tarsus	1	1.4
	2	0.34 (0.32-0.36)
	3	0.18 (0.17-0.19)
	4	0.16 (0.15-0.17)
	5	0.25 (0.24-0.25)



Figures 79-82. *Paltostoma andeana*. 79. Male head (frontal view) and terminal antennal segments (inset). 80. Female head and terminal antennal segments (arrangements as for male). 81. Terminal tarsal segments of male (fore leg, left; mid leg, center; hind leg, right; lateral view). 82. Terminal tarsal segments of female (arrangement as for male).

Head (Fig. 79). Normal type, subholoptic. Eyes disjunct dorsally, interocular distance equal to 0.2 head width; anterior eye margin entire. Mouthparts well developed, proboscis very long, labium 2.4-2.6 head width; palpus short, 2-segmented, basal segment elongate, 2.0 length of distal (=segment 3), sensory pit present. Antenna 15-segmented, flagellar segments barrel-shaped, ultimate segment slightly smaller (0.9) than penultimate, proportions of apical three segments 1.0-1.0-0.9.

Sensilla.—Setiforms on head capsule and mouth-

parts as follows: clypeals numerous, general; occipitals very numerous (30-35); postgenals few (4-5); labrals absent; labials and labellars numerous, scattered throughout.

Thorax and appendages (Fig. 81). Anal angle of wing produced, lobular. Legs long and slender, hind legs especially stout. Tibial spurs 0-0-1. Progressive leg segment proportions: fore leg n.a.-n.a.-n.a.-0.5-0.6-1.5; mid leg n.a.-n.a.-n.a.-0.5-0.6-1.4; hind leg n.a.-n.a.-0.3-0.5-0.9-1.5; tarsomere 4 short in relation to 3 on fore and mid leg (0.6), long

on hind leg (0.9). Tarsomeres 5 similar on all legs, curved, with pollex of enlarged setae; claw sickle-shaped, with sub-basal tooth and trichiate basally.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals absent; short dorsocentral series; prescutals several (8–11); supraalars few (3–4); prescutellars absent; scutellars numerous, long and concentrated in a dense lateral group, a few setae scattered mediad; preepisternals several (6–7); episternals numerous (15–16); metapleurals numerous (12–16), suprametapleurals few (3).

Terminalia (Figs. 66–69). Cerci parallel; interlobular depression shallowly U-shaped; individual cercus lobulate, with rounded apex. Subanal pouch with lateral walls modified into strongly sclerotized bars articulating with posterior lobe of gonite laterally and broadly fused with opposite member medially. Inner gonostylus short, triangular, apex acute. Inner walls of sperm sac with spinules. Ventral plate with a weak X-shaped sclerotization.

Sensilla.—Epandrium with numerous medium setiforms in transverse series. Cercus with medium setiforms mostly on apical third; setae of inner arm scattered along entire length, nearly to apex of cercus. Outer gonostylus with small setiforms general ectally; sparse basal and apical groups entally. Xth tergite with a pair of very short setiforms laterally. Xth sternite with two long setiforms apically.

Female (Figs. 71, 80, 82). Only pharate specimens are available (dissected from pupae). **Coloration.** Not available. **Size.** A medium-sized blepharicerid. Measurements (from pharate specimen on slide) (N = 1): wing length estimated at 5 mm. Leg segment lengths (femur–tarsus 1 unextended and not measurable):

		fore leg	
tarsus	2	0.62	
	3	0.34	
	4	0.21	
	5	0.30	
		mid leg	
tarsus	2	0.66	
	3	0.34	
	4	0.21	
	5	0.28	
		mid leg	
tarsus	2	0.38	
	3	0.20	
	4	0.17	
	5	0.28	

Head (Fig. 80). Normal type, dichoptic. Eyes disjunct dorsally, interocular distance 0.26 head width. Mouthparts well developed, mandibles and lacinia present and complete; proboscis long, labium 1.1 head width; margin of hypopharynx dentate; palpus short, composed of two elongate segments (=segments 2 and 3), proportions 1.0–1.4, sensory pit very well developed and terminal. Antenna 15-segmented, flagellar segments elongate barrel-shaped,

ultimate subequal to penultimate, proportions of apical three segments 1.0–1.0–1.0.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals very numerous, general; occipitals very numerous; postgenals several (7); labrals absent; labials and labellars very numerous, general.

Thorax and appendages (Fig. 82). Anal angle of wing slightly convex, not lobular. Legs long and slender; hind legs somewhat stouter than other legs. Tibial spurs 0–0–1. Progressive leg segment proportions: fore leg n.a.–n.a.–n.a.–0.5–0.6–1.4; mid leg n.a.–n.a.–n.a.–0.5–0.6–1.3; hind leg n.a.–n.a.–n.a.–0.5–0.9–1.6; tarsomere 4 short in relation to 3 in fore and mid leg (0.6), long in hind leg (0.9). Tarsomeres 5 similar on all legs, with pollex of heavy setae, ventral group of slightly oversized setae present also subterminally; claw sickle-shaped, with sub-basal tooth and trichiate basally.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals absent; dorsocentral series well developed; prescutals several to numerous (11–13); supraalars absent; prescutellars absent; scutellars numerous, long and concentrated in a dense lateral group, several setae scattered mediad from group; preepisternals several (8–9); episternals numerous (15–19); metapleurals several (12); suprametapleurals few (3).

Terminalia (Fig. 71). VIIIth sternite well sclerotized throughout, base broad; lateral margin straight, medial depression deep, broadly V-shaped, internal sclerotization keeled, irregularly quadrate; lobe straight, apex not closely appressed to hypogynial plate. Hypogynial plate complex, base as broad as lobes, lobes sessile, long microtrichiate, dorsal division elongate, ventral division broad. Spermathecae three, all similar, moderate-sized, well sclerotized, subspherical, necks short, strongly curved partially around corpus.

Sensilla.—Sternite VIII with 7–10 medium setiforms, distributed generally over lobe.

Pupa (Figs. 51, 52). **Integument.** Periphery abrupt, sclerotized integument underfolded and forming broad ventral border. Coarsely and densely set with long, slender, bristlelike spines in place of papillae. Individual spines very long and slender, with sharp apices and one or two very small basal spinelets (Fig. 52). Spine distribution as follows: scutum—moderately dense over entire disc, bristles shorter than elsewhere; branchial sclerite—dense over entire surface; metathoracic sclerite—along anterior half of sclerite only and shorter than elsewhere; abdominal tergites—dense over entire dorsum.

Size. Small for family. Measurements, male (N = 10): body length 3.1 (2.9–3.2), width 2.1 (2.0–2.2); female (N = 10): body length 4.1 (3.8–4.3), width 2.6 (2.4–2.8). Male 0.6 size of female.

General. Outline shape oval. Thorax somewhat narrowed in male but not abruptly. L/W male = 1.5, female 1.6. Dome-shaped in cross section; sides steeply inclined. Dorsal sclerites: cephalic sclerite smooth. Branchial sclerite taller than long, evenly

rounded. Anterior margin of scutum smoothly and gently rounded. Suture separating metathoracic sclerite from abdominal tergite I smoothly rounded medially. Abdominal tergites smoothly convex middorsally (no medial ridges or nodes); lateral margins entire.

Branchiae. Moderately large, erect, anterior and middle plates parallel, posterior plates contiguous to overlapping apically. Individual plates rigid, triangular, with acute apices; inner third of outer plates lightly sclerotized (almost membranous); inner two plates slightly shorter, thinner, and narrower than outers; anterior plate somewhat broader than posterior.

Larva (Fig. 77, 83). *General.* Body form subonisciform. Medial elevated zones of abdominal segments well developed. Outline shape of anterior division broadly ovate.

Integument. Dorsum well sclerotized. Corrugations distinct, mostly linear, convergent across transverse anterior and posterior ridges. Venter with area at base of pseudopods strigulose, non-setate.

Coloration. Trunk brown, evenly pigmented; sclerotized portions dark brown, terminal border unpigmented.

Size. Medium for the family. Measurements ($N = 10$): body length 5.8 (5.6–6.1), head capsule width 1.3 (1.3–1.4), antennal segment lengths, basal 0.14 (0.13–0.15), apical 0.19 (0.17–0.23).

Head. Basal antennal segment elongate. Antennal segment proportions 1.0–1.3.

Trunk. Dorsum irregular, especially laterad: anterior transverse rounded convex ridge; lateral lobes anterior and posterior to bases of pseudopods of trunk segments, these stronger posteriad.

Anal division. Dorsal pseudopod a small nub, directed posterolaterad and projecting slightly beyond posterior margin. Terminal incision only slightly developed. Terminal lobe with convex, broadly rounded posterior margin.

Primary sensilla (medium setiforms unless otherwise described). tM–T oblique, tM more medial. Inner tpP anteromedial to spiracle. Outer tpI–VI indiscernible. Terminal setae 1–1, widely separated.

Dorsal modified sensilla. Pyriform to ellipsoid sensilla general on head sclerites. Moderate-sized pyriforms/oviforms in anterior and posterior transverse linear groupings on trunk segments, series linear on thorax, irregular on abdomen. Circumlateral series incomplete: extending only a short distance anteromedially; gap small so that anterolaterals and posterolaterals grouped on small convexities. Scattered small sensilla in area between rows and in posterior intersegmental zone. Sensilla of pseudopods setiform anteriorly and apically; dorsally and posteriorly acute to lanciform. Background field of small setiforms absent.

SPECIMENS EXAMINED. Types: HOLOTYPE male (dissected from pupa and partially mounted on slides nos. CLH 85-50 = terminalia and 86-630 = head); ALLOTYPE female (terminalia dissected from pupa and mounted on slide no. CLH 85-50); 13 male and 4 female PARA-

TYPES (various terminalia and heads mounted on slides): COLOMBIA, *Antioquia*, Quebrada La Londoña, 9.3 km NW Palmitas, 12 Jun 1984, C.L. Hogue, CLH 321 (LACM).

Additional Specimens. COLOMBIA, *Antioquia*, same data as types (80 larvae, 128 pupae). Quebrada La Cristalina, 31 km W Doradal, 9 Jun 1986, C.L. Hogue, CLH 350.1 (1 larva, 2 pupae). Río Araña, 20 km S La Pintada, 17 Jun 1984, C.L. Hogue, CLH 333 (1 larva); 49.9 km E Marinilla, 14 Jun 1984, C.L. Hogue, CLH 326 (20 larvae, 3 pupae). Quebrada La Habana, 72.4 km E Marinilla, 14 Jun 1984, C.L. Hogue, CLH 328 (21 larvae); 78.1 km E Marinilla, 14 Jun 1984, C.L. Hogue, CLH 329.1 (59 larvae, 36 pupae); 13 km N Palmitas, 22 Jun 1983, C.L. Hogue, CLH 304 (109 larvae, 133 pupae); 7.4 km W Porce at km 54, 16 Jun 1985, C.L. Hogue, CLH 332 (1 larva, 1 pupa); 5.1 km E Río Calderas, Marinilla-Doradal, 14 Jun 1984, C.L. Hogue, CLH 327 (4 larvae). Quebrada La Hundida, 16.8 km E Santuario, 8 Jan 1986, C.L. Hogue, CLH 348.3.1 (3 larvae). Quebrada La Cascada, 65.9 km E Santuario, 10 Jan 1986, C.L. Hogue, CLH 351.1 (62 larvae, 30 pupae).

Caldas, Salto Lucio, 1 km SE Filadelfia, 17 Jun 1984, C.L. Hogue, CLH 335 (14 larvae); 6 km N Manizales, 17 Jun 1984, C.L. Hogue, CLH 336 (25 larvae, 36 pupae); 5 km N Supia, 17 Jun 1984, C.L. Hogue, CLH 334 (1 larva).

Cundinamarca, tributary to Río Sumapaz, km 86 Boquerón-Melgar Hwy, 8 Jun 1974, C.L. Hogue (19 larvae, 4 pupae).

Tolima, 3 km W Boquerón, 22 Jun 1984, C.L. Hogue, CLH 343 (1 larva, 1 pupa).

ETYMOLOGY. The name is an adjective, Latinized from the English “Andean” and arbitrarily assigned the neuter nominative ending “-a.” It is used in reference to this species’ occurrence in the Andes Mountains in contrast to the broader Caribbean or circum-Caribbean distribution of its relatives.

REMARKS. Association of the stages of *P. andeana* is certain, all by the ontogenetic method. This species is the most southern representative of a mainly Caribbean *Paltostoma schineri* group. All possess the “hirsute” type pupa and have several apomorphies well confirming the monophyly of the several species now known in the group: spermathecae of female terminalia with adnate necks, ventral margin of outer gonostylus of male terminalia with a conspicuous tooth midway. The larva, however, is unlike the typical Caribbean type, i.e., with segment VIII spatulate and with undeveloped dorsal pseudopods. It resembles the larvae of other species of *Paltostoma*, as for example, *P. eldorado*.

LIMONICOLA Lutz

Limonicola Lutz, 1928:67. Type species: *Limonicola plurivectis* Lutz, 1928.

This is a fairly well-defined genus. Adults are characterized by their vestigial mouthparts and the large sperm sacs and absence of lateral tines in the male

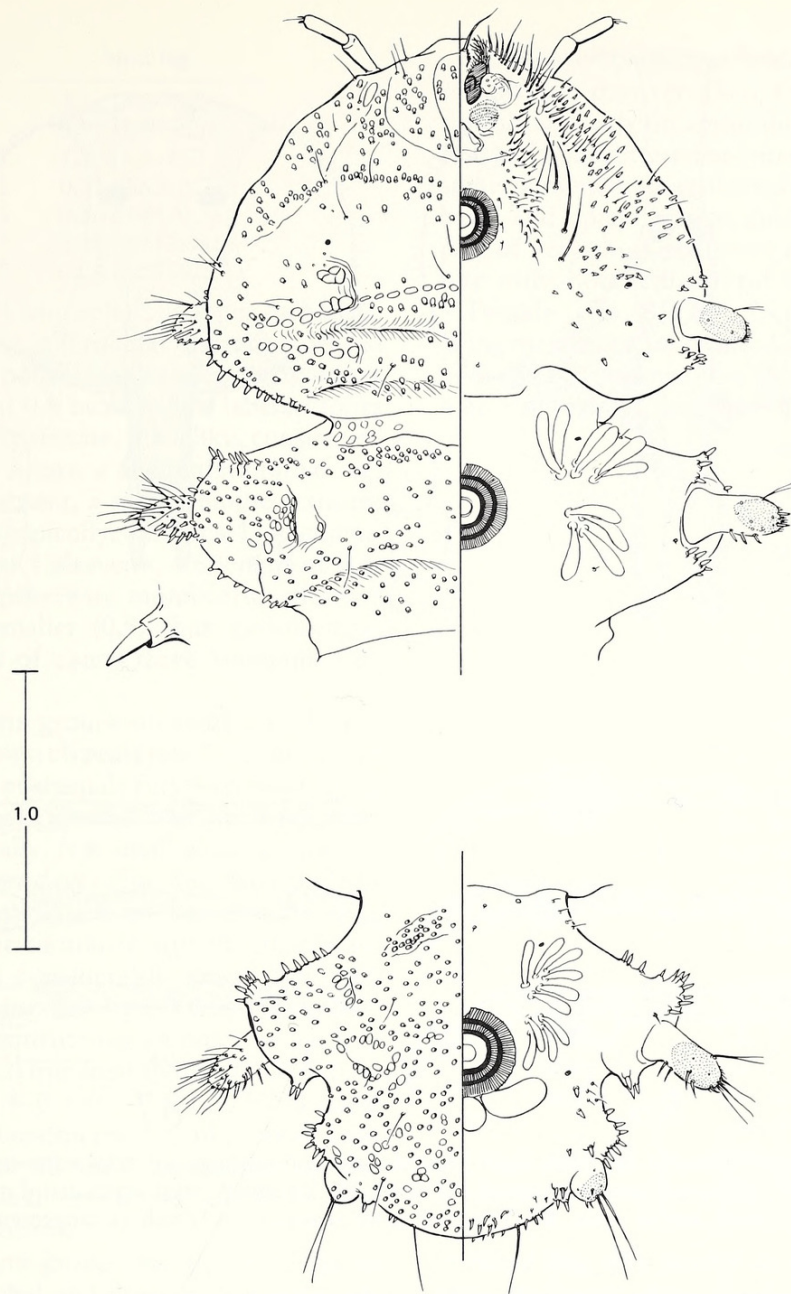


Figure 83. *Paltostoma andeana*, larva (dorsal view left, ventral view right; typical modified sensillum, inset).

terminalia. Also, the apex of the hind tibia and first two tarsal segments are inflated in the males of many species, a unique feature for blepharicerids. The branchial plates of the pupa are usually elongate, the posterior pair parallel to divergent; the larvae are lobiform, without clearly developed circumlateral series of modified sensilla. (See Keys for additional diagnostic features.)

Hogue's general collections contain many undescribed species of *Limonicola* from all parts of northwestern mainland South America; this may become the largest of all the neotropical genera. The genus apparently does not extend into Central America or southern South America.

The name of the genus means "dweller in the Río Limón" (Spanish *Limon* = Río Limón, near Maracay, Venezuela, where the first species was discovered + Latin *cola* = dweller). The second part of the word is a common Latin noun that can

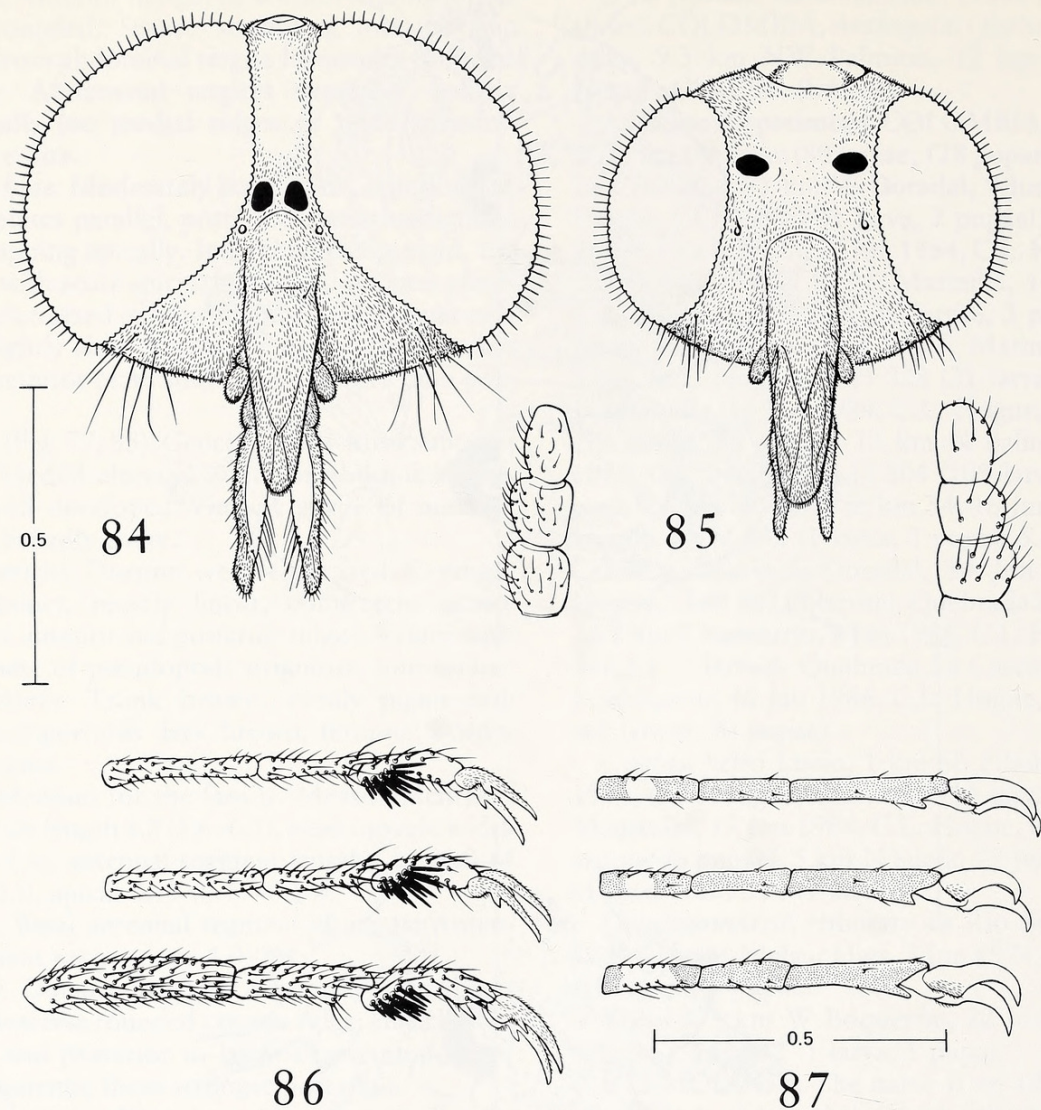
be either masculine or feminine. The International Code of Zoological Nomenclature (1985) calls for such nouns to be treated as masculine [Art. 30a(i)]. Also, because the type species name is masculine, I believe that the generic name was intended to be of that gender.

8. *Limonicola lichanos* Hogue and Bedoya, new species

Figures 78, 84–91, 96–99, 101

Limonicola sp. 1 of Bedoya, 1984. Bedoya and Roldán, 1984:118, fig. 4b. Roldán, 1988: fig. 141. [All determinations based on larvae.]

DIAGNOSIS. *Adult*.—Male *lichanos* are the only regional *Limonicola* with equal flagellar segments in the antenna (including the ultimate) and normal,



Figures 84-87. *Limonicola lichanos*. 84. Male head (frontal view) and terminal antennal segments (inset). 85. Female head and terminal antennal segments (arrangements as for male). 86. Terminal tarsal segments of male (fore leg, upper; mid leg, center; hind leg, lower; lateral view). 87. Terminal tarsal segments of female (arrangement as for male).

non-inflated hind tarsi. The females have unusually short legs (combined femur-tibia only about half the length in other species). The elongate, straplike shape of the outer gonostylus in the male terminalia is unique. In the female terminalia the apex of the the VIIIth sternite lobe is characteristically produced and straight; in all other species, except *davila* in which it is incurved, the apex is unproduced. *Pupa*.—The pupa is very similar to that of *medius*, both densely papillose and otherwise identical; only the outline shape at the base of the outer margin of the anterior lamellar plate differs, in being excavate rather than entire (the bulla at the base is also less developed than it is in *medius*). *Larva*.—The larva is identified immediately by the bosses in the centers of abdominal segments I-VI.

DESCRIPTION. Male (Figs. 84, 86, 88-91). *Coloration*. Ground color velvety dark brown to black. Head, thorax, and abdomen with silvery pollinosity, forming irregularly appearing and disappearing patches as specimen is rotated in light from certain angles; legs dull brownish-black, without evident

pollinosity. Wing membrane infusate. *Size*. A medium-sized blepharicerid. Measurements ($N = 7$): wing length 3.7 (3.4-4.0). Leg segment lengths:

		fore leg	
femur		1.2	(1.2-1.4)
tibia		1.5	(1.4-1.6)
tarsus	1	1.2	(1.1-1.3)
	2	0.49	(0.44-0.52)
	3	0.31	(0.27-0.33)
	4	0.18	(0.18-0.20)
	5	0.21	(0.20-0.23)
		mid leg	
femur		1.4	(1.3-1.6)
tibia		1.5	(1.4-1.6)
tarsus	1	1.1	(1.0-1.2)
	2	0.46	(0.42-0.50)
	3	0.29	(0.26-0.32)
	4	0.18	(0.17-0.20)
	5	0.21	(0.20-0.22)

		hind leg
femur		4.1 (3.6–4.3)
tibia		3.9 (3.4–4.2)
tarsus	1	1.5 (1.3–1.7)
	2	0.71 (0.65–0.76)
	3	0.50 (0.43–0.55)
	4	0.28 (0.21–0.31)
	5	0.24 (0.23–0.25)

Head (Fig. 84). Colocephalous type, dichoptic. Eyes distant dorsally, interocular distance 0.3 head width. Mouthparts poorly developed, proboscis very short, labium about 0.4 head width, labellar lobes parallel, lobe slightly sinuate, bladeliike, constricted distad, palpus very short, a single diminutive segment, sensory pit absent, a single minute setiform on inner margin subapically. Antenna 15-segmented; flagellar segment 1 elongate, 1.6 length of segment 2, segments otherwise moniliform; ultimate segment slightly smaller (0.9) than penultimate, ovoid, proportions of apical three segments 1.0–1.0–0.9.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals few (1–2); occipitals numerous (21–29); postgenals very numerous, long; labrals absent; labials absent; labellars numerous, scattered, long basally, few small setae apically.

Thorax and appendages (Fig. 86). Anal angle of wing produced, lobular. Legs moderately long, slender; fore femur sinuously curved, slightly incrassate; hind legs considerably longer but only slightly stouter than other legs. Tibial spurs 0–0–0. Progressive leg segment proportions: fore leg 1.2–0.8–0.4–0.6–0.6–1.2; mid leg 1.0–0.8–0.4–0.6–0.6–1.2; hind leg 1.0–0.4–0.5–0.7–0.6–0.9. Hind tarsal segments inflated; tarsomeres 5 similar on all legs, curved, with pollex of heavy setae; claw sickle-shaped, with sub-basal tooth and several trichiae between base and tooth.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichal and dorsocentral series absent; prescutals absent (a few–4 setae on antero-medial margin of scutum); supraalars few (2), far dorsal; prescutellars absent; scutellars numerous in lateral group; preepisternals several (7); metapleurals numerous (23); suprametapleurals few (5).

Abdomen. Pleural membranes of basal segments with long, sparse black hairs.

Terminalia (Figs. 88–91). Cerci divergent; interlobular depression very broadly V-shaped; individual cercus triangular, with rounded apex. Subanal pouch bowl-shaped, walls thin. Tegmen with truncate apex, latter slightly produced medially, with marginal sclerotization and with recurved medial dorsal keel; lateral margin strongly folded midway, fold extending mediad to midline. Outer gonostylus moderately large, an elongate, incurved, strap-shaped lobe. Inner gonostylus short, subtriangular, with produced, slightly angulate apex. Anterior lobes of gonites moderately expanded; apodeme small. Sperm sac large, with short longitudinal striae internally. Aedeagal rods moderately long and slender.

Sensilla.—Epandrium with numerous medium setiforms in transverse series. Cercus with medium setiforms mostly on apical third; setae of inner arm few and concentrated at anterior end. Outer gonostylus with medium setiforms general ectally; sparse basal and apical groups entally. Xth tergite with pair of very short setiforms sublaterally. Xth sternite with short setiform sublaterally.

Female (Figs. 85, 87). *Coloration.* As in male. *Wing membrane* infusate. *Size.* A small blepharic-erid. Measurements (N = 2): wing length 4.4 (4.4–4.4). Leg segment lengths (N = 3):

		fore leg
femur		0.9 (0.8–1.0)
tibia		0.9 (0.8–0.9)
tarsus	1	0.5 (0.5–0.5)
	2	0.18 (0.16–0.20)
	3	0.15 (0.15–0.16)
	4	0.16 (0.16–0.17)
	5	0.28 (0.25–0.30)

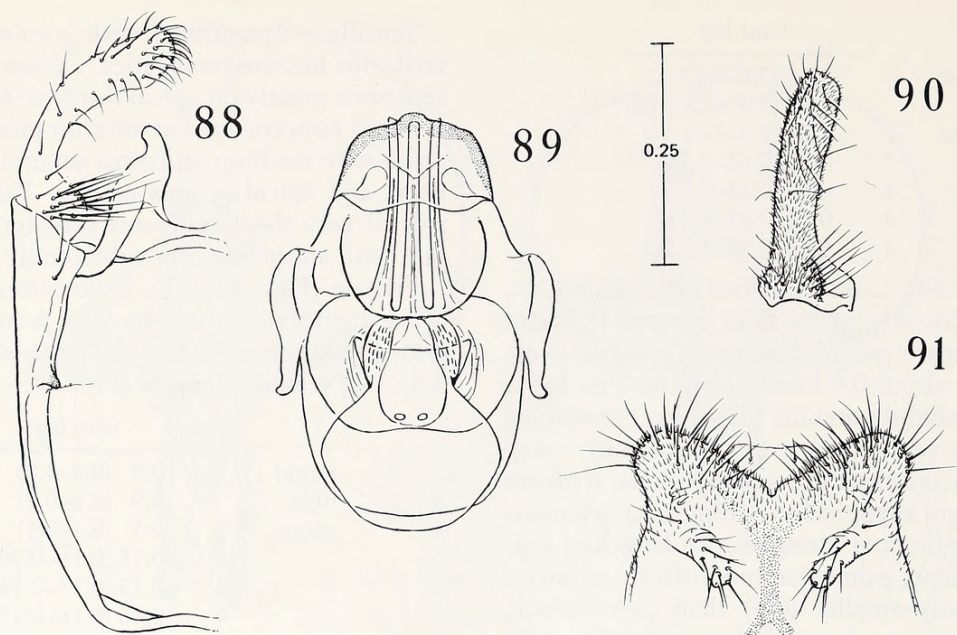
		mid leg
femur		0.9 (0.8–1.0)
tibia		0.8 (0.7–0.8)
tarsus	1	0.4 (0.4–0.4)
	2	0.15 (0.15–0.15)
	3	0.14 (0.12–0.16)
	4	0.16 (0.15–0.17)
	5	0.28 (0.24–0.30)

		hind leg
femur		1.8 (1.7–2.0)
tibia		1.6 (1.6–1.7)
tarsus	1	0.4 (0.4–0.4)
	2	0.16 (0.16–0.17)
	3	0.15 (0.15–0.15)
	4	0.15 (0.15–0.16)
	5	0.27 (0.24–0.30)

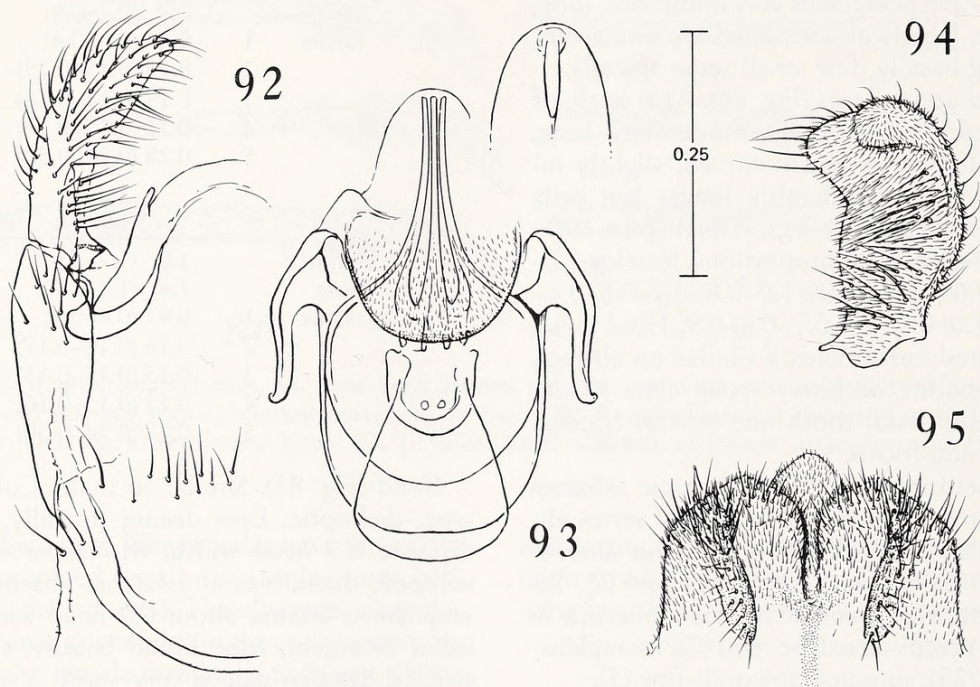
Head (Fig. 85). Similar to male. Colocephalous type, dichoptic. Eyes distant dorsally, interocular distance 0.3 head width. Mouthparts poorly developed; mandibles and lacinia absent; proboscis very short, labium about 0.4 head width, labellar lobes divergent, lobe broad basally, slightly constricted distally; palpus very short, a single diminutive segment (=segment 3), sensory pit absent. Antenna 15-segmented, flagellar segments moniliform, ultimate segment slightly smaller (0.9) than penultimate, proportions of apical three segments 1.0–1.0–0.9.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals few (2); occipitals numerous (15–18); postgenals very numerous and long; labrals and labials absent; labellars in two groups: numerous (11–13), longer basally, few (3–4), minute apically.

Thorax and appendages (Fig. 87). Anal lobe of wing produced, lobular. Legs short. Fore femur sinuously curved, strongly incrassate. Tibial spurs 0–0–0. Progressive leg segment proportions: fore leg 1.0–0.6–0.4–0.9–1.1–1.7; mid leg 0.9–0.5–0.4–0.9–1.1–1.8; hind leg 0.9–0.2–0.4–0.9–1.1–1.8; tar-



Figures 88-91. *Limonicola lichanos*, male terminalia (dorsal views). 88. Genital capsule and gonostyli. 89. Mesosomal structures and gonites. 90. Left outer gonostylus (inner view). 91. Cercal complex.



Figures 92-95. *Limonicola astylis*, male terminalia (dorsal views). 92. Genital capsule and gonostyli. 93. Mesosomal structures and gonites. 94. Left outer gonostylus (inner view). 95. Cercal complex.

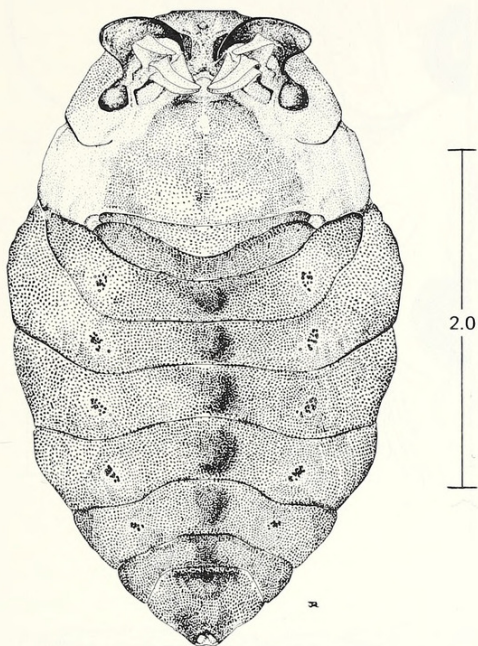
somere 4 of all legs slightly longer than 3 (1.2), tarsomeres 5 all similar, straight, slightly expanded apically; claws simple, hook-shaped.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals absent; dorsocentral series complete; prescutals absent; supraalars several (5), far dorsal; prescutellars several; scutellars very numerous, long and concentrated in group laterally, none scattered mediad; preepisternals several (8), long; episternals absent; metapleurals numerous (15-17); suprametapleurals few (4-5).

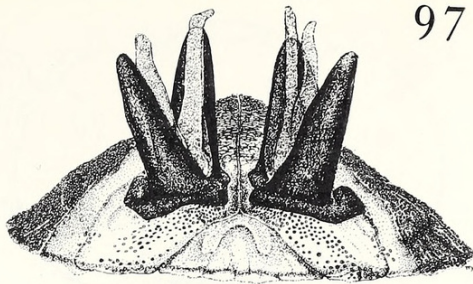
Terminalia (Fig. 72). VIIIth sternite well sclerotized throughout, base broad and well defined,

with small sclerotization at basal corners; lateral margin straight, medial depression shallow, very broadly V-shaped, internal sclerotization flat, fusiform; lobe straight, lobes originating from base of sclerite, apex not closely appressed to hypogynial plate. Hypogynial plate complex, base as broad as lobes, lobe with broad neck, dorsal division short, lobulate, ventral division broad, weakly denticulate laterally, denticulae becoming better defined mediad. Spermathecae three, moderate-sized, well sclerotized, and with minute clear pits on proximal third, all similar, pear-shaped, with smooth outline, necks short and straight.

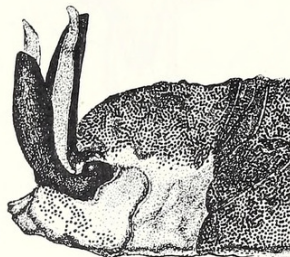
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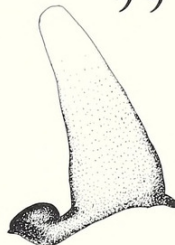
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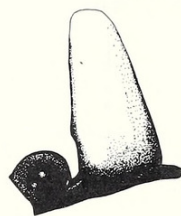
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100



Figures 96–100. *Limonicola*, pupae. 96. *L. lichanos*, entire, dorsal view. 97. Same, frontal view. 98. Same, anterior portion, lateral view. 99. Same, anterior branchial plate (anterior view). 100. *L. medius*, anterior branchial plate (anterior view).

Sensilla.—Sternite VIII with 30–35 medium setiforms, distributed generally over lobe.

Pupa (Figs. 96–99). **Integument.** Periphery abrupt, sclerotized ventral border present. Papillose dorsally. Papillae even and very dense (individual papillae nearly contiguous). Individual papillae subequal, small, smooth, rounded, oval convexities. Papillar distribution as follows: scutum—dense over entire disc; branchial sclerite—dense over entire surface; metathoracic sclerite—even and dense over entire surface; abdominal tergites—even and dense except for medial bosses where they are denser.

Size. Small for family. Measurements, male (N = 10): body length 3.8 (3.6–4.1), width 2.3 (2.0–2.5); female (N = 10): body length 3.9 (3.7–4.3), width 2.4 (2.1–2.7). Male 0.9 size of female.

General. Outline shape ovoid, thorax abruptly narrowed, more so in male than female. L/W male = 1.7, female 1.6. Cross section obtusely subtriangular; upper sides moderately inclined. Dorsal sclerites: cephalic sclerite irregular, with slight paramedial convexities. Branchial sclerite longer than tall, smoothly rounded and not projecting beyond cephalic sclerite. Anterior margin of scutum moderately inclined, not lobed. Suture separating metathoracic sclerite from abdominal tergite I V-shaped medially. Abdominal tergites with slight, antero-medial bosses; lateral margins entire.

Branchiae. Large, erect, anterior plates divergent, middle and posterior plates parallel. Outer plates subtriangular, elongate, broadly rounded apically; inner plates strap-shaped, much narrower than outer and slightly longer (exserted); outer margin of anterior plate entire; anterior plate expanded posterobasally to form a moderate-sized, slightly flattened bulla.

Larva (Figs. 78, 101). **General.** Body form generally lobiform. Outline shape of anterior division angular, subhexagonal.

Integument. Dorsum moderately well sclerotized. Corrugations distinct, fine, irregular throughout, except denser and arranged in a circular pattern around central node of abdominal segments I–VI. Venter with extensive (extending anterior and posterior to base of pseudopod), oval patches of strong denticulae medial to bases of pseudopods.

Coloration. Trunk light brown, evenly pigmented; sclerotized portions pale brown, except terminal border black.

Size. Medium for the genus. Measurements (N = 10): body length 5.1 (4.7–5.4), head capsule width 1.0 (1.0–1.0), antennal segment lengths, basal 0.04 (0.04–0.05), apical 0.15 (0.14–0.16).

Head. Antennal segment proportions 1.0–3.4.

Trunk. Dorsum of abdominal segments I–VI with a central boss or low, rounded convexity.



Figure 101. *Limonicola lichanos*, larva (dorsal view, left; ventral view, right; typical modified sensillum, inset).

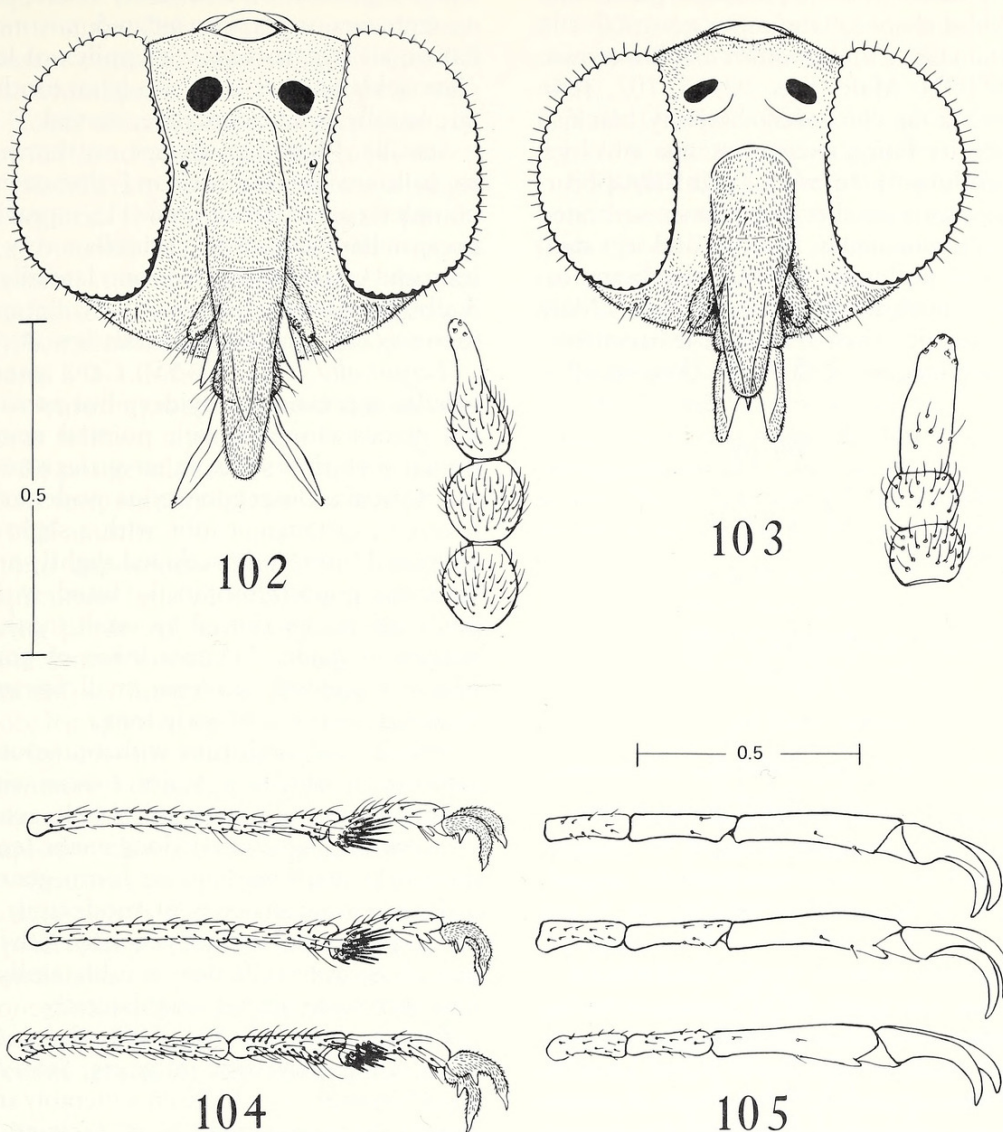
Anal division. Dorsal pseudopod small, lobular, directed posteriad. Terminal incision narrowly V-shaped. Terminal lobe broad, with arcuate posterior margin.

Primary sensilla (medium setiforms unless otherwise described). tM-T in line, long; tI-VI minute, pyriform. stM-T indiscernible; stVII and inner tp proximate. Inner tpP long, anteromedial to spiracle. Outer tpI-VI apparently lateral to inner tp, small, pyriform. Terminal setae 3-3, very short, chaetiform, submarginal, inserted ventrally.

Dorsal modified sensilla. Small obovate types in linear series and patches on head sclerites. Trunk segments with only a few, small pyriforms and setiforms laterally around base of pseudopod. Dorsal sensilla of pseudopods all setiform. Integument set with general background field of small, fine setiforms (except on central boss).

SPECIMENS EXAMINED. Types: HOLOTYPE male (terminalia mounted on slide no. CLH 87-168; 9 male PARATYPES (1 with terminalia mounted on slide no. 87-167): COLOMBIA, *Antioquia*, Quebrada La Hundida, 16.8 km E Santuario, 8 Jan 1986, C.L. Hogue, CLH 348.1 (LACM).

Additional Specimens. COLOMBIA, *Antioquia*, no specific locality, Aug 1983, I. Bedoya, 1 (5 larvae); Aug 1983, I. Bedoya, 3 (1 larva); Aug 1983, I. Bedoya, 7 (6 larvae). Quebrada Salado, 14 Jun 1984, C.L. Hogue, CLH 325 (2 females, 1 larva, 1 pupa). Quebrada Santo Domingo, 16 Jun 1984, C.L. Hogue, CLH 330 (8 males); 7.6 km S Porce, 16 Jun 1984, C.L. Hogue, CLH 332 (1 male, 2 larvae, 2 pupae); 7.6 km W Porce at km 57, 16 Jun 1984, C.L. Hogue, CLH 332 (3 males, 2 pupae, 3 larvae). Río Medellín, Primavera, 24 Jun 1983, C.L. Hogue, CLH 313 (580 larvae, 356 pupae).



Figures 102-105. *Limonicola astylis*. 102. Male head (frontal view) and terminal antennal segments (inset). 103. Female head and terminal antennal segments (arrangements as for male). 104. Terminal tarsal segments of male (fore leg, upper; mid leg, center; hind leg, lower; lateral view). 105. Terminal tarsal segments of female (arrangement as for male).

Caldas, 5 km N Supia, 17 Jun 1984, C.L. Hogue, CLH 334 (2 larvae).

Cundinamarca, Río Caqueza, 9 km NW Caqueza, 14 Apr 1981, C.L. Hogue, CLH 277 (2 males, 38 larvae, 15 pupae). Tributary to Río Caqueza, 1 km NE exit of Carrera 78 to Une, 15 Apr 1981, C.L. Hogue, CLH 279 (6 pupae).

Quindío, Río Quindío, 10 km N Armenia, Boquia, 18 Jun 1984, C.L. Hogue, CLH 337 (16 larvae, 123 pupae). Quebrada Salado, 4 km E Calarcá, 20 Jun 1984, C.L. Hogue, CLH 338 (1 male).

Valle, km 23 Cali-Dagua Highway (72A), 2 Jun 1974, C.L. Hogue (15 larvae, 1 pupa).

ETYMOLOGY. The name is a masculine noun in the nominative case transliterated from Greek and used in apposition to the generic name; it refers to the digitiform shape of the outer lobe of the dististyle (Greek *lichanos* = fore finger).

REMARKS. The imagoes of this and *L. astylis* are very similar, certainly indicating close relationship. The similarity extends to *L. davila* and *med-*

ius, the four species forming a complex with fairly similar immatures. The larvae of *astylis* and *medius* are not known but could be similar to larvae of either of the two other species (see Remarks under *L. medius* and *astylis*).

We have abundant material and are able to associate all the stages of this species with certainty using the ontogenetic criterion.

We have one male which differs slightly from the typical *L. lichanos*, the tip of the inner gonostylus being angled outward instead of straight. It may represent a closely related species, but we are considering it as a variant of *L. lichanos* for the present.

9. *Limonicola astylis* Hogue, new species

Figures 73, 92-95, 102-105

DIAGNOSIS. Adult.—The elongate, flask-shaped terminal antennal segment is distinctive for both sexes of *astylis*, as are the very small inner gono-

stylus (mostly fused with the aedeagal guide) and complex lobular shape of the outer gonostylus in the male terminalia. *Pupa and larva*.—Unknown.

DESCRIPTION. Male (Figs. 92–95, 102, 104). *Coloration*. Ground color deep, velvety blackish red-brown. Entire body, except antenna and legs, with silvery pollinosity, forming irregularly appearing and disappearing patches as specimen is rotated in light from certain angles; antenna and legs dull, without evident pollinosity. Wing membrane infusate. *Size*. A medium-sized blepharicerid. Male considerably smaller than female. Measurements (N = 10): wing length 4.2 (3.9–4.5). Leg segment lengths:

fore leg		
femur		1.7 (1.5–1.8)
tibia		1.9 (1.7–2.1)
tarsus	1	1.3 (1.1–1.4)
	2	0.70 (0.58–0.89)
	3	0.45 (0.42–0.49)
	4	0.23 (0.21–0.26)
	5	0.23 (0.21–0.25)
mid leg		
femur		2.1 (1.9–2.4)
tibia		2.1 (1.8–2.8)
tarsus	1	1.2 (1.0–2.0)
	2	0.64 (0.60–0.74)
	3	0.45 (0.41–0.50)
	4	0.23 (0.21–0.25)
	5	0.23 (0.21–0.26)
mid leg		
femur		3.6 (3.3–4.0)
tibia		3.5 (3.3–4.0)
tarsus	1	1.4 (1.3–1.5)
	2	0.71 (0.65–0.83)
	3	0.49 (0.45–0.53)
	4	0.23 (0.22–0.28)
	5	0.24 (0.22–0.27)

Head (Fig. 102). Colocephalous type, dichoptic. Eyes distant dorsally, interocular distance 0.3 head width. Mouthparts poorly developed, proboscis very short, labium about 0.4 head width, labellar lobes divergent, lobe blade-like, with sharply acute apices; palpus very short, a single diminutive segment, sensory pit absent. Antenna 15-segmented, flagellar segments moniliform, ultimate segment elongate, flask-shaped, longer (1.9) than penultimate, proportions of apical three segments 1.0–1.0–1.9.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals few (2–3); occipitals several (6–7); postgenals few (4–5); labrals and labials absent; labellars few, scattered, minute.

Thorax and appendages (Fig. 104). Anal angle of wing produced, lobular. Legs long and slender; fore femur sinuously curved, incrassate; hind legs stouter and considerably longer than other legs. Tibial spurs 0–0–0. Progressive leg segment proportions: fore leg 1.1–0.7–0.6–0.7–0.5–1.0; mid leg 1.0–0.6–0.5–0.7–0.5–1.0; hind leg 1.0–0.4–0.6–0.6–0.5–1.0; tarsomere 4 short in relation to 3 in all

legs (0.5). Hind tibia and tarsus slender throughout, no segments or portions inflated; tarsomeres 5 similar on all legs, curved, with pollex of heavy setae; claw sickle-shaped, with sub-basal tooth and trichiate basally, apex acuminate, curved.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals and dorsocentral series complete; prescutals several (11); supraalars absent; prescutellars several (11); scutellars very numerous, long and concentrated in group laterally, none medially; preepisternals several (5–6); metapleurals numerous (17); suprametapleurals few (4).

Terminalia (Figs. 92–95). Cerci parallel; interlobular depression fairly deep but narrow; individual cercus elongate with pointed apex. Subanal pouch with thin walls, inner surface covered with microtrichia. Outer gonostylus moderately large, an irregular, rectangular lobe with a slight inner, apicoventral boss, and produced slightly apicodorsally. Inner gonostylus mostly fused with aedeagal guide, apex represented by small tooth on lateral margin of guide. Anterior lobes of gonites moderately expanded; apodeme small. Sperm sac large. Aedeagal rods moderately long.

Sensilla.—Epandrium with numerous medium setiforms in transverse series. Cercus with medium setiforms generally over apical half; setae of inner arm few but distributed along entire length. Outer gonostylus with medium setiforms general ectally; a dense elongate patch of moderately large setiforms along ental surface ventrally. Xth tergite with pair of very short setiforms sublaterally. Xth sternite with short setiform sublaterally.

Female (Figs. 73, 103, 105). *Coloration*. As in male. Wing membrane infusate. *Size*. A medium-sized blepharicerid. Male considerably smaller than female. Measurements (N = 2): wing length 6.1 (5.3–6.9). Leg segment lengths:

fore leg		
femur		1.4 (1.3–1.6)
tibia		1.4 (1.2–1.7)
tarsus	1	0.8 (0.7–0.9)
	2	0.25 (0.19–0.30)
	3	0.17 (0.14–0.20)
	4	0.21 (0.20–0.23)
	5	0.35 (0.33–0.37)
mid leg		
femur		2.0 (1.8–2.2)
tibia		1.5 (1.4–1.7)
tarsus	1	0.7 (0.6–0.7)
	2	0.24 (0.20–0.28)
	3	0.16 (0.12–0.19)
	4	0.22 (0.20–0.23)
	5	0.34 (0.31–0.37)
mid leg		
femur		3.2 (2.9–3.6)
tibia		2.6 (2.3–2.8)
tarsus	1	0.6 (0.6–0.6)
	2	0.22 (0.18–0.26)
	3	0.15 (0.12–0.17)
	4	0.19 (0.17–0.20)
	5	0.32 (0.30–0.34)

Head (Fig. 103). Described from a single specimen. Similar to male. Colocephalous type, dichoptic. Eyes distant dorsally, interocular distance 0.3 head width. Mouthparts poorly developed; mandibles and lacinia absent; proboscis very short, labium about 0.4 head width, labellar lobes divergent, lobe blade-like; palpus very short, a single diminutive segment (=segment 3), sensory pit absent, replaced by several alveoliform sensilla in group on inner surface. Antenna 15-segmented, flagellar segments moniliform, ultimate segment elongate, longer (2.8) than penultimate, proportions of apical three segments 1.0–1.0–2.8.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals few (3); occipitals several (8–10); postgenals few (2–5) small; labrals absent; labials few, scattered; labellars few (2) basally, few (1–2) apically.

Thorax and appendages (Fig. 105). Described from two specimens (one with missing head). Anal angle of wing produced, lobular. Legs long and slender. Fore femur sinuously curved, incrassate. Tibial spurs 0–0–1. Progressive leg segment proportions: fore leg 1.0–0.6–0.3–0.7–1.3–1.6; mid leg 0.8–0.4–0.4–0.6–1.4–1.6; hind leg 0.8–0.3–0.4–0.7–1.3–1.7; tarsomere 4 of all legs slightly longer than 3 (1.2), tarsomeres 5 all similar, straight, slightly expanded apically; claw sickle-shaped, simple.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals absent; dorsocentral series complete; prescutals several (9–11); supraalars absent; prescutellars several; scutellars very numerous, long and concentrated in group laterally, a few scattered medially; preepisternals few (5); episternals few (2); metapleurals several (8); suprametapleurals several (6–8).

Terminalia (Fig. 73). VIIIth sternite well sclerotized throughout, base slightly narrowed, and ill defined at corners; lateral margin curved and indented slightly at midlength indicating distal origin of lobes; medial depression shallow, very broadly V-shaped, internal sclerotization flat, fusiform; lobe very slightly divergent, apex not closely appressed to hypogynial plate. Hypogynial plate complex, base as broad as lobes, lobe with broad neck, dorsal division short, lobulate, nude, ventral division broad, very weakly denticulate laterally, denticulae becoming better defined medially. Spermathecae three, moderate-sized, well sclerotized, and with minute clear pits on proximal third; all similar, pear-shaped, with smooth outline, necks short and straight.

Sensilla.—Sternite VIII with 30–40 medium setiforms, distributed generally over lobe.

Pupa and Larva. Unknown.

SPECIMENS EXAMINED. Types: HOLOTYPE male (terminalia mounted on slide no. CLH 86-602); ALLOTYPE female (terminalia mounted on slide no. CLH 87-145); 13 male and 1 female PARATYPES (partly in alcohol; some terminalia and heads mounted on slides): COLOMBIA, *Antioquia*, Quebrada Salado, 14 Jun 1984, C.L. Hogue, CLH 325 (LACM).

Additional Specimens. COLOMBIA, *Antioquia*,

Quebrada Alarcona, 22 Jun 1983, C.L. Hogue, CLH 307 (20 males). Quebrada El Salado, 24 km E Santuario, 10 Jan 1986, C.L. Hogue, CLH 353.1 (1 male).

Valle, Quebrada Honda, Peñas Blancas, 1,800 m, 3 Jun 1974, C.L. Hogue (1 male, 3 females).

ETYMOLOGY. The name is a feminine compound noun in the nominative case transliterated from Greek. It is used in apposition to the generic name and refers to the complete lack of the inner lobe of the dististyle in the male genitalia (Greek *a* = without + *stylis* = stylus).

REMARKS. The close relationship of this and *L. lichanos* has been noted above. Variation in the female terminalia make the two species difficult to distinguish on the basis of this set of structures alone. The immatures are not known but are expected to be similar to those of *L. lichanos*.

10. *Limonicola davila*

Hogue, 1982

Not figured

Limonicola davila Hogue, 1982.

SPECIMENS EXAMINED. COLOMBIA, *Antioquia*, 49.9 km E Marinilla, 14 Jun 1984, C.L. Hogue, CLH 326 (2 males); 7.6 km W Porce, at km 57, 16 Jun 1984, C.L. Hogue, CLH 332 (4 males, 3 pupae).

REMARKS. These records represent an unexpected extension of the range of a species formerly thought to be endemic to the isolated Sierra Nevada de Santa Marta in extreme northern Colombia. *Limonicola davila* may be distinguished from similar species of *Limonicola* by the keys provided above.

11. *Limonicola medius* Hogue, new species

Figures 100, 106–110, 114–117

DIAGNOSIS. *Adult.*—Externally, males of *L. medius* and *davila* are indistinguishable; the weak pollex on the hind tarsomere 5 is distinctive in the female. The L-shape of the outer gonostylus of the male terminalia is definitive, the much longer ventral lobe giving the structure a V-shape in *L. davila*. *Pupa.*—The pupa is extremely similar to that of *L. lichanos*; only the excised anterior margin at the base of the anterior lamellar plate and larger bulla at the base of the lamellae distinguish it from that species. *Larva.*—The larva is not known with certainty; it may be very similar and presently indistinguishable from that of *L. lichanos*.

DESCRIPTION. *Male* (Figs. 106, 108). Only one alcoholic specimen available. Very similar to *L. davila*. *Coloration.* Not available. Wing membrane infusate. *Size.* A medium-sized blepharicerid. Measurements (N = 1): wing length 3.5. Leg segment lengths:

		fore leg
		1.9
femur		1.4
tibia	1	1.2
tarsus	2	0.51
	3	0.30
	4	0.17
	5	0.22
		mid leg
		1.4
femur		1.3
tibia	1	1.1
tarsus	2	0.45
	3	0.26
	4	0.16
	5	0.21
		mid leg
		3.9
femur		3.7
tibia	1	1.4
tarsus	2	0.68
	3	0.43
	4	0.24
	5	0.22

Head (Fig. 106). Colocephalous type, subhol-optic. Eyes disjunct dorsally, interocular distance equal to combined width of eight ommatidia. Mouthparts poorly developed, proboscis very short, labium about 0.4 head width, labellar lobes divergent, lobe slightly incurved, bladellike, with acute apex; palpus very short, a single diminutive segment, sensory pit of segment 3 absent, replaced by a single alveoliform. Antenna 15-segmented, flagellar segments moniliform; ultimate segment slightly smaller (0.9) than penultimate, proportions of apical three segments 1.0–1.0–0.9.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: facials—a pair of stout setae high on vertex, one on either side; clypeals few (1); occipitals several (10–11), marginal to eye; postgenals numerous (16–18), long; labrals and labials absent; labellars numerous, long, scattered throughout.

Thorax and appendages (Fig. 108). Anal angle of wing produced, lobular. Legs long, slender; fore femur sinuously curved, incrassate; hind legs considerably longer than other legs. Tibial spurs 0–0–1, spur short. Progressive leg segment proportions: fore leg 1.7–0.9–0.4–0.6–0.6–1.3; mid leg 1.0–0.8–0.4–0.6–0.6–1.3; hind leg 1.0–0.4–0.5–0.6–0.6–0.9; tarsomere 4 short in relation to 3 in all legs (0.6). Hind tarsal segments inflated; tarsomeres 5 similar on all legs, curved, with pollex of heavy setae; claw sickle-shaped, with sub-basal tooth.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals few, on anterior part of scutum only; dorsocentral series absent; prescutals and supraalars absent; prescutellars few (1); scutellars numerous, in lateral group, none scattered medially; preepisternals few (2–3), long; metapleurals numerous (18); suprametapleurals several (7).

Terminalia (Figs. 114–117). Cerci slightly divergent; interlobular depression wide, V-shaped; individual cercus subtriangular. Subanal pouch without microtrichia on inner surface. Outer gonostylus moderately large, an elongate, curved strap with a short, ventrobasal lobe. Inner gonostylus a flat prong with angled, rounded apex and broadened base. Anterior lobes of gonites moderately expanded; apodeme small. Sperm sac large. Aedeagal rods moderately long.

Sensilla.—Epandrium with numerous medium setiforms in transverse series. Cercus with medium setiforms generally over apical half; setae of inner arm few but distributed along entire lengths. Outer gonostylus with medium setiforms general over distal half; several moderately long setiforms on inner face dorsobasally. Xth tergite with or without pair of very short setiforms sublaterally. Xth sternite non-setate.

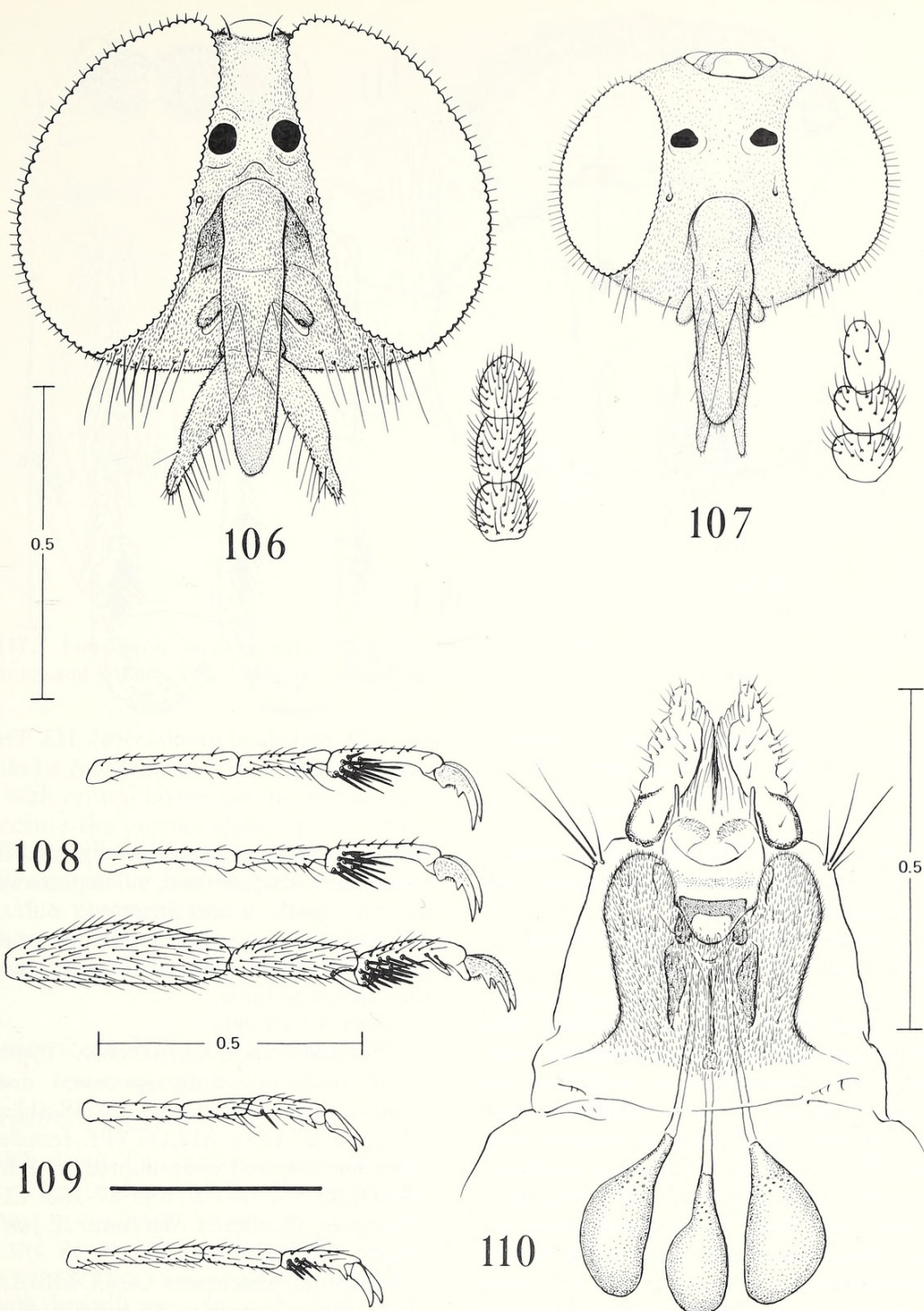
Female (Figs. 107, 109, 110). Only one imperfect alcoholic specimen available. Very similar to *L. davila*. **Coloration**. Not available. **Wing membrane** infusate. **Size**. A medium-sized blepharicerid. **Measurements** (N = 1): wing length 3.8. Leg segment lengths (mid leg unextended and not measurable):

		fore leg	hind leg
femur		1.0	2.3
tibia		1.0	2.0
tarsus	1	0.6	0.8
	2	0.31	0.41
	3	0.19	0.27
	4	0.14	0.16
	5	0.16	0.16

Head (Fig. 107). Structure.—Colocephalous type, dichoptic. Eyes distant dorsally, interocular distance 0.33 head width. Mouthparts poorly developed, mandibles and lacinia absent; proboscis very short, labium about 0.5 head width; apex of labrum and hypopharynx acute, margin of latter entire; labellar lobes divergent, lobe straight, bladellike, with acute apex; palpus very short, a single diminutive segment (=segment 3), sensory pit absent, replaced by group of several small alveoliforms. Antenna 15-segmented, flagellar segments moniliform, ultimate segment longer (1.5) than penultimate, proportions of apical three segments 1.0–1.0–1.5.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals few (2); occipitals numerous (13); postgenals and labrals absent; labials absent except for a few minute setiforms apically; labellars absent.

Thorax and appendages (Fig. 109). Anal angle of wing produced, lobular. Legs moderately long, very slender; fore femur sinuously curved, incrassate; hind legs considerably longer than other legs. Tibial spurs 0–0–1. Progressive leg segment proportions: fore leg 1.0–0.6–0.5–0.6–0.7–1.1; mid leg not available; hind leg 0.9–0.4–0.5–0.7–0.6–1.0; tarsomere 4 short in relation to 3 on all legs (0.6–



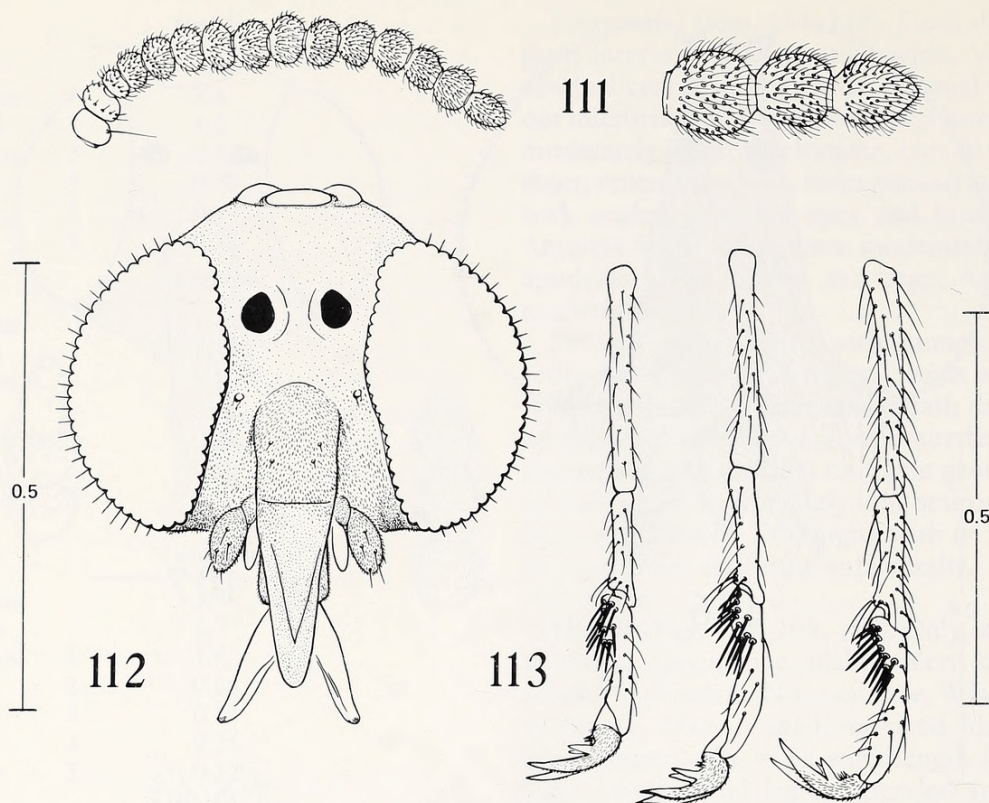
Figures 106–110. *Limonicola medius*. 106. Male head (frontal view) and terminal antennal segments (inset). 107. Female head and terminal antennal segments (arrangements as for male). 108. Terminal tarsal segments of male (fore leg, upper; mid leg, center; hind leg, lower; lateral view). 109. Terminal tarsal segments of female (arrangement as for male, center not available). 110. Female terminalia (ventral view).

0.7). Tarsomeres 5 similar on fore and hind legs (mid leg not available), with weak pollex of heavy setae; fore pollex with a single seta, hind pollex with several setae; claw broadly sickle-shaped, simple.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals absent; a few setae in dorso-central series; prescutals, supraalars, and prescutellars absent; scutellars several to numerous in lateral group, few scattered mediad; preepisternals

absent; metapleurals few (5), placed along anterior margin; suprametapleurals few (3–4).

Terminalia (Fig. 110). VIIIth sternite well sclerotized throughout, base broad and well defined; lateral margin straight, medial depression shallow, U-shaped, internal sclerotization narrow; apex of lobe produced, broad, angled slightly mediad. Hypogynial plate complex, base as broad as lobes, lobe with broad neck, dorsal division long, fingerlike, ventral division denticulate apically. Spermathecae



Figures 111–113. *Limonicola kolomeros*. 111. Antenna of male. 112. Male head (frontal view). 113. Terminal tarsal segments of male (fore leg, left; mid leg, center; hind leg, right; lateral view).

three, moderate-sized, well sclerotized, all similar, pear-shaped, with smooth outline, one smaller than others, necks short and straight.

Sensilla.—Sternite VIII with 27–29 medium setiforms, distributed generally over lobe.

Pupa (Fig. 100). *Integument.* Periphery abrupt, sclerotized ventral border present. Papillose dorsally. Papillae even and very dense generally (individual papillae nearly contiguous). Individual papillae subequal, small; smooth, rounded, oval convexities. Papillar distribution as follows: scutum—dense over entire disc; branchial sclerite—dense over entire surface; metathoracic sclerite—even and dense over entire surface; abdominal tergites—even and dense except for medial bosses where they are denser.

Size. Small for family. Measurements, male ($N = 2$): body length 3.9 (3.8–4.0), width 2.6 (2.6–2.6); female pupa unknown.

Structure. Outline shape ovoid, thorax abruptly narrowed, more so in male than female. L/W male = 1.5, female unknown. Cross section obtuse subtriangular, upper sides moderately inclined. Dorsal sclerites: cephalic sclerite irregular, with slight paramedial convexities. Branchial sclerite longer than tall, smoothly rounded and not projecting beyond cephalic sclerite. Anterior margin of scutum moderately inclined, not lobed. Suture separating metathoracic sclerite from abdominal tergite I V-shaped medially. Abdominal tergites with slight, antero-medial bosses; lateral margins entire.

Branchiae. Large, erect, anterior plates divergent, middle and posterior plates parallel. Outer plates

subtriangular, elongate, broadly rounded apically; inner plates strap-shaped, much narrower than outer and slightly longer (exerted); outer margin of anterior plate excavate basally; anterior plate expanded posterobasally to form a large, conspicuous, spherical bulla.

Larva. Unknown.

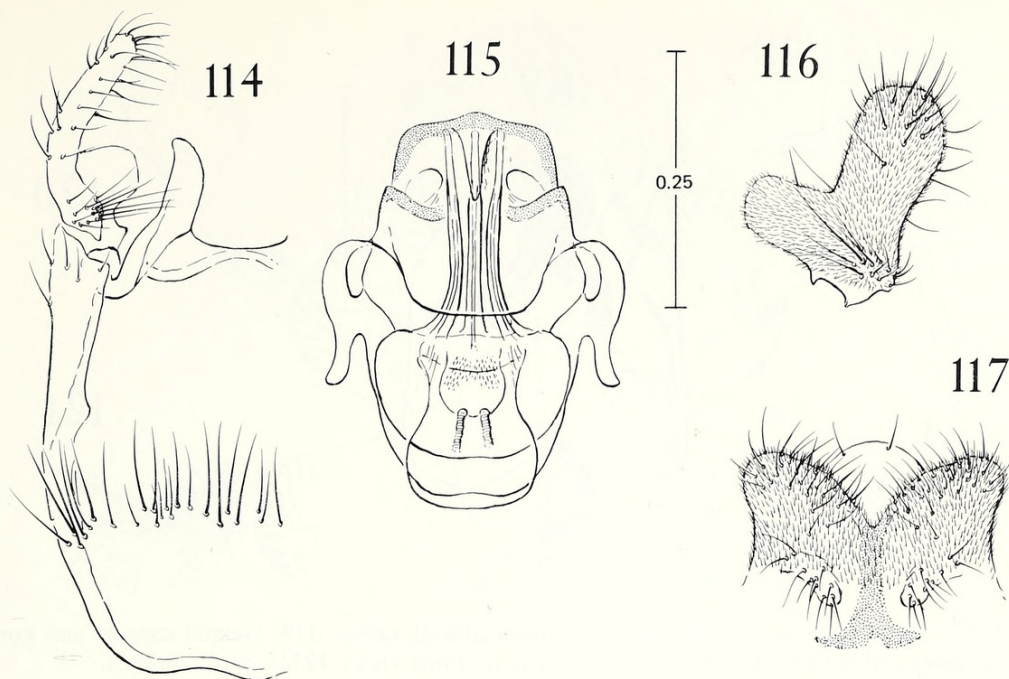
SPECIMENS EXAMINED. Types: HOLOTYPE male (alcoholic specimen dissected and mounted on slides nos. CLH 88-4H, 88-4B, 88-4W, and 87-159); ALLOTYPE female (alcoholic specimen dissected and mounted on slides nos. CLH 88-5H, 88-5B, 88-5W, and 87-160: COLOMBIA, *Antioquia*, Quebrada Alarcona, 22 Jun 1983, C.L. Hogue, CLH 307 (LACM).

Additional Specimens. COLOMBIA, *Antioquia*, Quebrada La Agudelo, 2.5 km S El Retiro, 10 Jun 1984, C.L. Hogue, CLH 319 (8 pupae).

ETYMOLOGY. The name is the masculine form of the Latin adjective *medius*, meaning central, intermediate, or neutral, in reference to the species' similarities to both *L. lichanos* and *L. davila*.

REMARKS. The partially developed ventrobasal lobe of the dististyle places this species in an intermediate position between *L. lichanos* and *L. davila*. The pupa is similar to that of *L. lichanos*, i.e., with a middorsal ridge. The convexities in the pupa of that species are associated with the central bosses of the abdominal segments, so the larva of *L. medius* could be of the *L. lichanos* type.

The pupa and adults are associated by the ontogenetic method. Some larvae (not recorded as Specimens Examined) were collected with the pu-



Figures 114-117. *Limonicola medius*, male terminalia (dorsal views). 114. Genital capsule and gonostyli. 115. Mesosomal structures and gonites. 116. Left outer gonostylus (inner view). 117. Cercal complex.

pae (Quebrada La Agudela) and these appear to be *L. lichanos*, with central bosses on the abdominal segments. Because the pupae exhibit central convexities on the dorsa of the abdominal tergites, the larvae may be conspecific and represent this stage of *L. medius*. It is preferable not to make this assumption (using the unreliable syntopic method) until additional material becomes available.

12. *Limonicola kolomeros* Hogue, new species

Figures 111-113, 118-121

DIAGNOSIS. *Adult.* This species is distinguished by the reduced first and second flagellar segments in the antenna, a condition known in no other member of the genus. The subtriangular outer gonostylus is unique also, as is the inner gonostylus (bifurcate, with broadly rounded sublobes). The female and immatures are unknown.

DESCRIPTION. *Male* (Figs. 111-113, 118-121). Only alcoholic and slide mounted specimens are available. *Coloration.* Not available. Wing membrane infuscate. *Size.* A medium-sized blepharicerid. Measurements (N = 4): wing length 3.4 (3.3-3.5). Leg segment lengths:

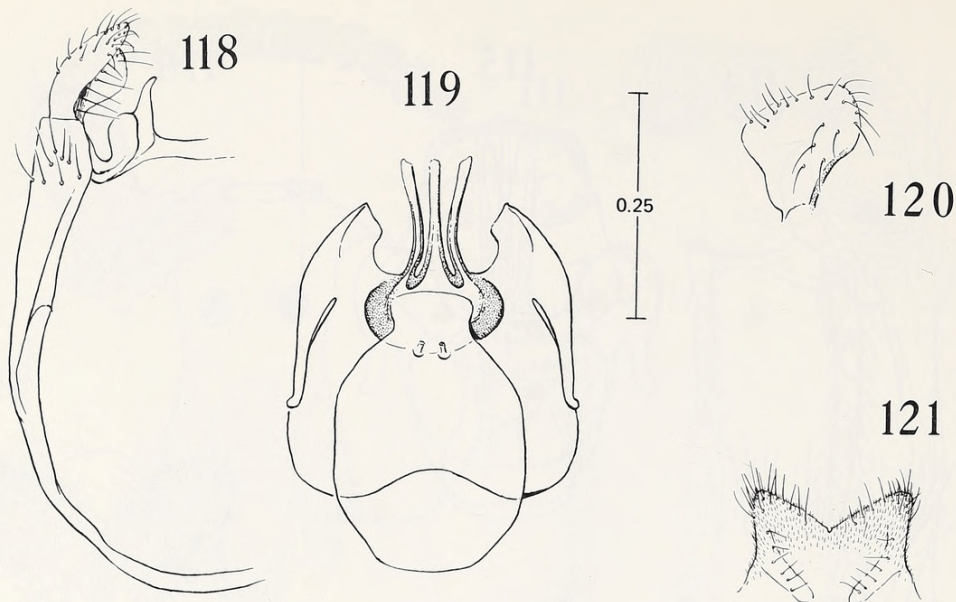
		fore leg
femur		1.2 (1.1-1.3)
tibia		1.4 (1.3-1.4)
tarsus	1	0.9 (0.8-1.0)
	2	0.46 (0.42-0.52)
	3	0.29 (0.27-0.32)
	4	0.16 (0.14-0.18)
	5	0.21 (0.19-0.22)

		mid leg
femur		1.6 (1.5-1.7)
tibia		1.4 (1.3-1.4)
tarsus	1	0.8 (0.8-0.9)
	2	0.47 (0.45-0.53)
	3	0.30 (0.28-0.33)
	4	0.17 (0.16-0.19)
	5	0.21 (0.21-0.21)

		hind leg
femur		3.0 (2.6-3.6)
tibia		2.9 (2.5-3.5)
tarsus	1	1.0 (0.9-1.1)
	2	0.55 (0.50-0.63)
	3	0.34 (0.30-0.38)
	4	0.19 (0.17-0.20)
	5	0.21 (0.21-0.22)

Head (Figs. 111, 112). Colocephalous type, dichoptic. Eyes distant dorsally, interocular distance 0.3 head width. Mouthparts poorly developed, proboscis very short, labium about 0.4 head width, labellar lobes long (1.6 length of labium), divergent, lobe straight, bladelike, with rounded apex; palpus very short, a single diminutive segment, sensory pit absent, replaced by group of several small alveoliforms. Antenna 15-segmented, flagellar segments moniliform, flagellar segments 1 and 2 compressed and slightly smaller than more distal segments; ultimate segment subequal to penultimate, pear-shaped, proportions of apical three segments 1.0-1.0-1.0.

Sensilla.—Setiform groups on head capsule and mouthparts as follows: clypeals few (0-4); occipitals numerous (14-22); postgenals absent; labrals and labials absent; labellars absent except for a few minute setiforms apically.



Figures 118–121. *Limonicola kolomeros*, male terminalia (dorsal views). 118. Genital capsule and gonostyli. 119. Mesosomal structures and gonites. 120. Left outer gonostylus (inner view). 121. Cercal complex.

Thorax and appendages (Fig. 113). Anal angle of wing produced, lobular. Legs moderately long, very slender; fore femur sinuously curved, slightly incrassate; hind legs considerably longer than other legs. Tibial spurs 0–0–0. Progressive leg segment proportions: fore leg 1.2–0.7–0.5–0.6–0.6–1.3; mid leg 0.9–0.6–0.6–0.6–0.6–1.3; hind leg 1.0–0.4–0.6–0.6–0.6–1.1; tarsomere 4 short in relation to 3 in all legs (0.6). Hind tibia and tarsus slender throughout, no segments or portions inflated; tarsomeres 5 similar on all legs, curved, with pollex of heavy setae; claw sickle-shaped, with sub-basal tooth and 3–4 small denticulae between base and tooth.

Sensilla.—Setiform groups on thoracic sclerites as follows: acrostichals absent; dorsocentral series complete; prescutals few (5); supraalars in two groups: far dorsal group few (3–6), ventral group few to several (4–6); prescutellars few, scattered; scutellars several in lateral group, few scattered mediad; preepisternals few (1–2); metapleurals few (4); suprametapleurals few (4).

Terminalia (Figs. 118–121). From two imperfect specimens. Cerci and interlobular depression indeterminate. Subanal pouch without microtrichia on inner walls. Outer gonostylus medium-sized, a rounded triangle formed from an expanded ventral margin midventrally. Inner gonostylus bifurcate, unequal sublobes broadly rounded apically. Anterior lobes of gonites (ventral bridge) greatly expanded; apodeme expansive. Sperm sac very small. Aedeagal rods very short.

Sensilla.—Epandrium with numerous medium setiforms in a transverse series. Setae of cercus indeterminate. Setae of inner arm few and distributed along entire length. Outer gonostylus with medium setiforms generally distributed on distal half; no basal group on inner surface. Setae of Xth tergite and sternite indeterminable.

Female, Pupa, and Larva. Unknown.

SPECIMENS EXAMINED. HOLOTYPE male (alcoholic specimen dissected and mounted on slides nos. CLH 87-214, 87-214W, 87-214B, and 87-214H; 3 PARATYPE males (two in alcohol, one dissected and mounted on slides nos. CLH 87-213, 87-213W, 87-213B, and 87-213H): COLOMBIA, *Antioquia*, Quebrada Alarcona, 22 Jun 1983, C.L. Hogue, CLH 307 (LACM).

ETYMOLOGY. The name is a masculine compound noun in the nominative case taken directly from Greek and used in apposition to the generic name; it refers to the reduced size and compression of the basal flagellar segments in the male antenna (Greek *kolos* = stunted + *meros* = segment).

REMARKS. This species is very poorly known, being represented by only four adult male specimens. It is a distinctive species, however, unlike other *Limonicola* in the compression of antennal flagellar segments and characteristics of the terminalia, especially the very small sperm sac and other features given above.

13. *Limonicola* unidentified larva 1

Figures 122, 124

Limonicola sp. 2 of Bedoya, 1984. Bedoya and Roldán, 1984:118, fig. 4c. Roldán, 1988: fig. 142.

DESCRIPTION. Larva (Figs. 122, 124). *General.* Body form lobiform. Outline shape of anterior division multiangular, roughly hexagonal.

Integument. Dorsum lightly sclerotized. Corrugations distinct, fine and irregular. Venter with a moderate-sized (not extending anterior to base of pseudopod), oval patch of denticulae at bases of pseudopods.

Coloration. Trunk pigmentation even, light

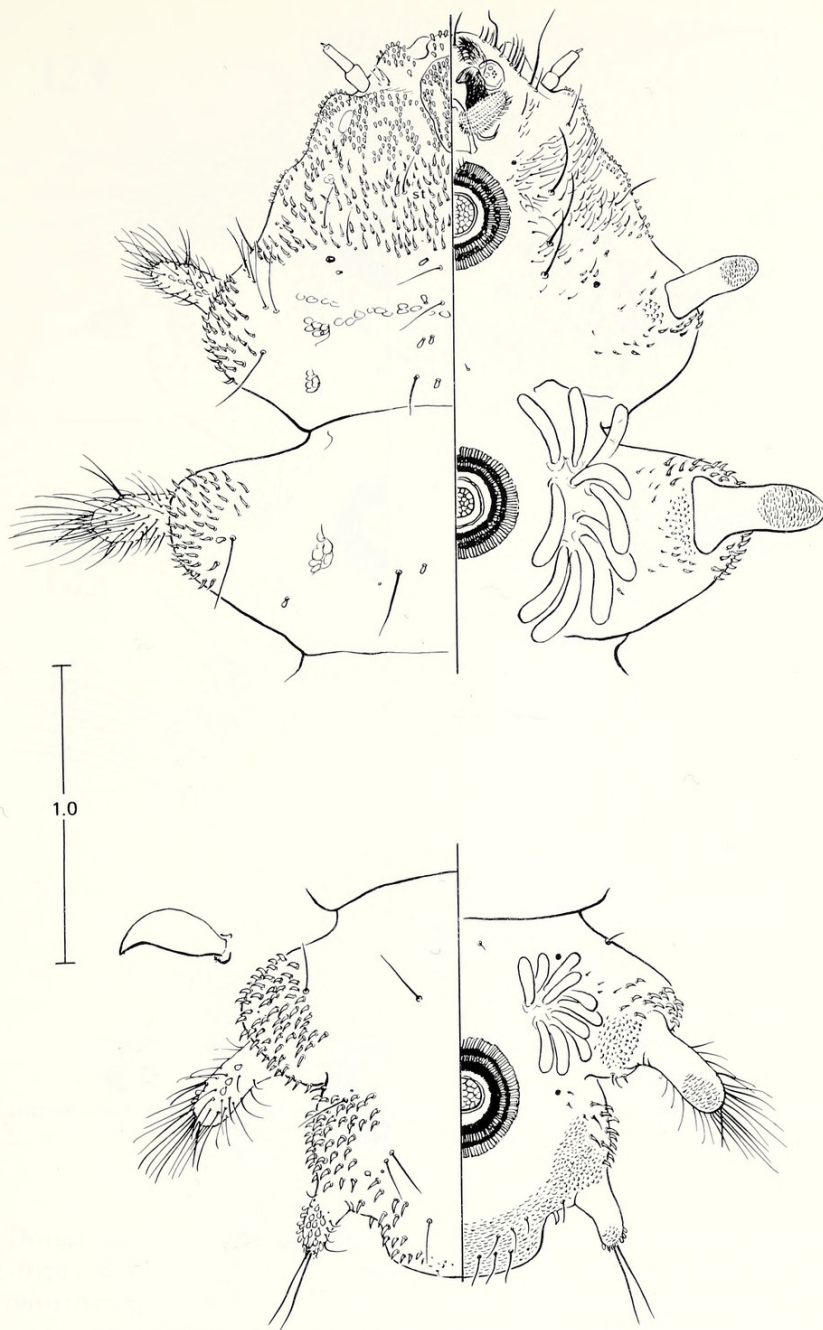


Figure 122. *Limonicola* unidentified larva 1 (dorsal view, left; ventral view, right; typical modified sensillum, inset).

brown; sclerotized portions pale brown; terminal border unpigmented.

Size. Medium for the family. Measurements (N = 10): body length 6.8 (5.2–8.7), head capsule width 1.5 (1.2–1.8), antennal segment lengths, basal 0.07 (0.06–0.08), apical 0.14 (0.11–0.18).

Head. Antennal segment proportions 1.0–2.0.

Trunk. Dorsum evenly rounded, without convexities, projections or special sclerotizations.

Anal division. Dorsal pseudopod a moderately large, elongate lobe, directed posterolaterad. Terminal incision U-shaped, spacious. Terminal lobe narrowed posteriad, with convex, posterior margin.

Primary sensilla (medium setiforms unless otherwise described). tM–T in line, well spaced; tI–VI often double; inner tpP anteromedial to spiracle.

Outer tpI–VI indiscernible. Terminal setae 3–3, small, sub-marginal, inserted ventrally.

Dorsal modified sensilla. Dense large ascinaciforms on medial head sclerites; smaller, curved, obovate types on lateralia. Ascinaciforms laterally only on abdominal segments I–VIII, curving ventrad around base of pseudopods. Dorsal sensilla of pseudopods mostly setiform, a few curved, oviform types intermingled, latter dominant on dorsal pseudopod of segment VII. Integument set with general background field of small, fine setiforms.

SPECIMENS EXAMINED. COLOMBIA, *Antioquia*, Quebrada Alarcona, 22 Jun 1983, C.L. Hogue, CLH 307 (3 larvae). Quebrada La Agudelo, 2.3 km S El Retiro, 10 Jun 1984, C.L. Hogue, CLH 319 (1 larva).

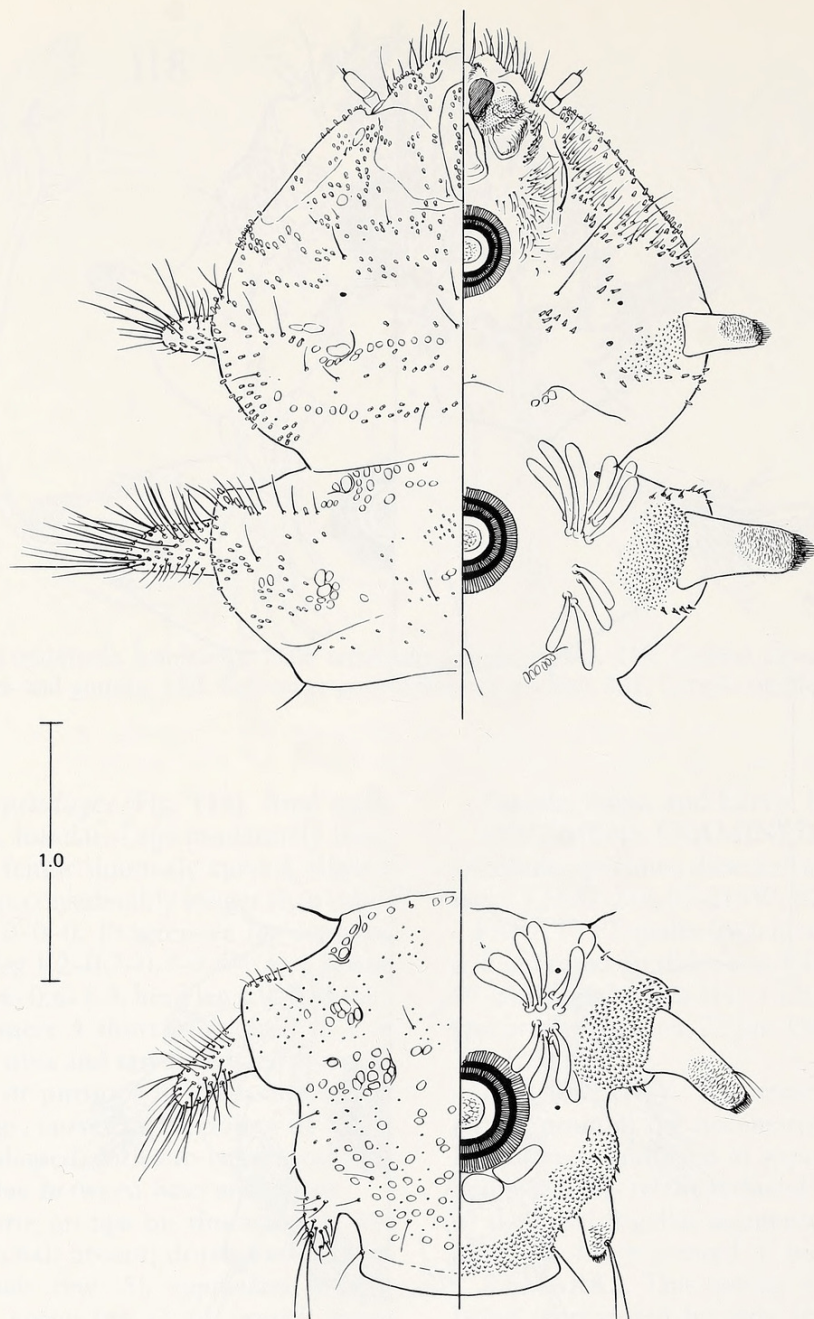


Figure 123. *Limonicola* unidentified larva 2 (dorsal view, left; ventral view, right).

Quindio, Rio Quindio, 10 km N Armenia, Bokuia, 18 Jun 1984, C.L. Hogue, CLH 337 (1 larva).

Valle, Quebrada Honda, Peñas Blancas, 1,800 m, 3 Jun 1974, C.L. Hogue (10 larvae).

REMARKS. The larva is very different from any other in Antioquia Department; the conspicuous ascinaform dorsal sensilla are unique. We have no clue as to its identity.

14. *Limonicola* unidentified larva 2

Figures 123, 125

DESCRIPTION. Larva (Figs. 123, 125). *General.*—Body lobiform. Outline shape of anterior division subovate.

Integument. Dorsum moderately well sclero-

tized. Corrugations of integument distinct, fine, linear to zig-zagging, linear ones convergent over anterior and posterior transverse ridges. Venter with an extensive (extending anterior to base of pseudopod), oval patch of strong denticulae at bases of pseudopods.

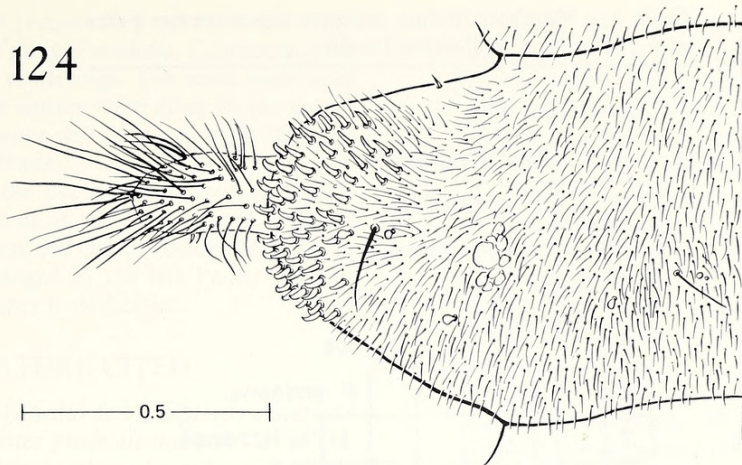
Coloration. Trunk pigmentation even; sclerotized portions pale brown, terminal border thick, sclerotized, black.

Size. Medium for the family. Measurements (N = 10): body length 6.4 (6.1–6.7), head capsule width 1.4 (1.3–1.5), antennal segment lengths, basal 0.05 (0.05–0.07), apical 0.12 (0.11–0.13).

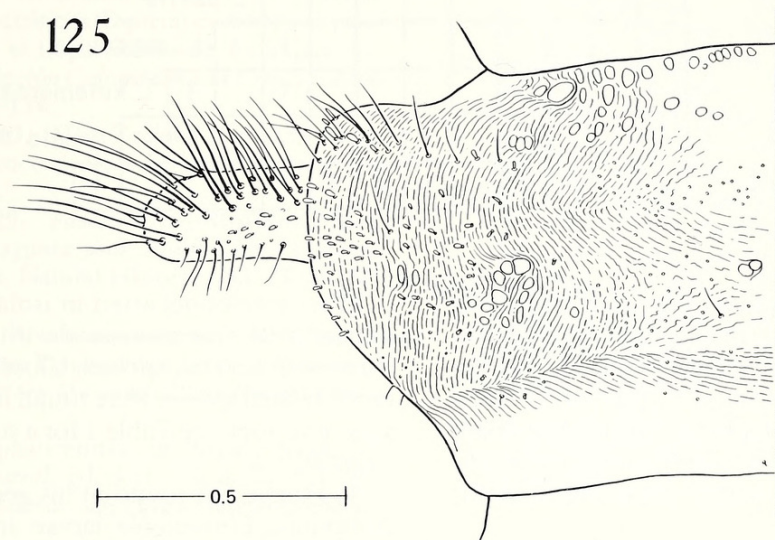
Head. Antennal segment proportions 1.0–2.3.

Trunk. Dorsum evenly rounded, without convexities or projections; numerous small, oval plates on anal division.

124



125



Figures 124, 125. *Limonicola* larvae, abdominal segment III (left half, dorsal view). 124. *L.* unidentified larva 1. 125. *L.* unidentified larva 2.

Anal division. Dorsal pseudopod moderately large, an elongate lobe, directed posteriad. Terminal incision asymmetrically U-shaped, narrow. Terminal lobe truncate, posterior margin slightly arcuate, lateral corners often slightly produced.

Primary sensilla (medium setiforms unless otherwise described). tM-T in line, well spaced. Inner tpP anterior to spiracle. Outer tpI-VI indiscernible. Normal terminal setae absent, a large, conspicuous, setiform present on the lateral edge of the terminal border.

Dorsal modified sensilla. Sparse, small pyriforms on head sclerites. Trunk integument generally with a few sparse, minute setiforms/pyriforms, these larger and linearly arranged anterolaterally, forming a series curving ventrad around base of pseudopod. Dorsal sensilla of pseudopods all long setiform. Background field of small setiforms absent.

SPECIMENS EXAMINED. COLOMBIA, *Antioquia*, Aug 1983, I. Bedoya, 6 (6 larvae). Salto Tequendamita, 23 Jun 1983, C.L. Hogue, CLH 310 (15 larvae). Quebrada Iguaá, 13 Jun 1984, C.L. Hogue, CLH 323 (4 larvae). Quebrada La Cascada, 13 Jun 1984, C.L. Hogue, CLH 324 (118 larvae).

Quebrada Piedra Blanca, 12 km W Guarne, 8 Jan 1986, C.L. Hogue, CLH 347.1.1, 347.3.1 (104 larvae). Quebrada La Cascada, 9.1 km E Medellín, 23 Jun 1983, C.L. Hogue, CLH 309.3 (33 larvae). 1 km SE Paso de Boquerón, 22 Jun 1983, C.L. Hogue, CLH 300 (13 larvae). Quebrada La Hundida, 16.8 km E Santuario, 8 Jan 1986, C.L. Hogue, CLH 348.2 (7 larvae). Quebrada Tebaida, 52.4 km E Santuario, 10 Jan 1986, C.L. Hogue, CLH 352.1 (6 larvae).

Valle, Quebrada Honda, Peñas Blancas, 1,800 m, 3 Jun 1974, C.L. Hogue (1 larva).

REMARKS. The isolated setae situated at the outer corners of the terminal lobe distinguish this larva from all others. Its similarity otherwise to the larva of *L. davila* suggests its possible identity to the similar *L. medius* or *L. astylis*, but no material is available to confirm this speculation.

NOTES ON ECOLOGY

As elsewhere in the Neotropics, the Blephariceridae of Antioquia show a fairly narrow range of adaptations to cool, clean, well-oxygenated, erosional

Table 1. Numbers in box indicate times species pairs occurred at same collection locality.

	P. roldani											
P. aspergonymphe	1	P. aspergonymphe										
P. charadrae	3	1	P. charadrae									
P. eldorado	1			P. eldorado								
P. saltana ?					P. saltana ?							
P. inca	2					P. inca						
P. andeana	2		1				P. andeana					
L. lichanos	2		1				1	L. lichanos				
L. astylis	2		1			1		1	L. astylis			
L. davila									L. davila			
L. subdavila								1		L. subdavila		
L. kolomeros								1		1	L. kolomeros	
L. unid. larva 1	1					1		1			1	L. unid. larva 1
L. unid. larva 2	5		1	2		1	2	1	1			1

streams. Immatures were found in water with temperatures ranging from 13 to 28 degrees centigrade; pH was near neutrality to slightly alkaline (pH 6.6–8.4); a high percent saturation of oxygen (90–112%); low concentrations of dissolved ions (conductivity $\mu\text{mhos}/\text{cm}^2$ 20–60). The elevations at which blepharicerids were collected ranged from 500 to 2,500 m above sea level.

Most species occurred in isolation at collection sites; several were associated with at least one other, some with several, species. Closely related and distantly related species were found inhabiting the same stream sectors. See Table 1 for a summary of species' associations.

As Hogue has found in his general collecting in Antioquia, *Limonicola* larvae and pupae tend to occupy smaller, free stones and be totally submerged; *Paltostoma* is more inclined to live at or just below the water surface, on larger rocks that are embedded in the substrate.

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To our friends and colleagues who helped in many aspects of progress we also express our thanks and appreciation; they include Uwe Matthias, Gil Challet, Margarita Correa, Marta Wolf, and Luis Fernando Roldán.

The artistic talents of Sharon Lee Belkin, Los Angeles, who prepared most of the detailed technical drawings of adults, female terminalia, and larvae, are acknowledged.

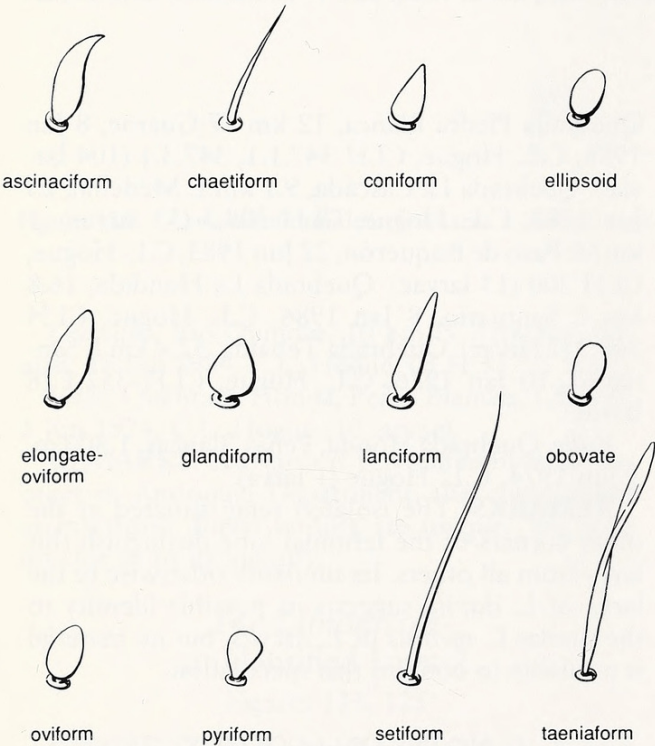


Figure 126. Explanation of terms used to describe the various forms taken by the specialized dorsal sensilla of blepharicerid larvae.

We are also indebted to Jacques Rifkind of Encino, California, and Teresa T. Young, Pasadena, California, who made larval and pupal renderings. The male terminalia and miscellaneous other figures were done by the senior author. Technical assistance was provided by William A. Powder and Thomas Meade.

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