

**SEVEN NEW SPECIES OF ONYCHIURIDAE  
(COLLEMBOLA)  
FROM THE NEOTROPICAL REGION<sup>1</sup>**

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**RESUMEN.** Se describen e ilustran siete especies nuevas de colémbolos de la familia Onychiuridae (*Onychiurus*, *Protaphorura*, *Tullbergia*) de México.

**PALABRAS CLAVE:** Onychiuridae, Taxonomía, Región Neotropical.

**ABSTRACT.** Descriptions and illustrations of seven new species of springtails of the family Onychiuridae (*Onychiurus*, *Protaphorura*, *Tullbergia*) from Mexico are given.

**KEY WORDS:** Onychiuridae, Taxonomy, Neotropical Region.

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Members of the Onychiuridae generally lack pigment and are very wide distributed. The species of this family occur in caves, under stones, loose bark of tree, and in needle-litter, dead leaves, humus, but they are mainly found in mineral soils. Maximum length is usually 1-2.5 mm.

Dunger (1986) suggested that *Mesaphorura krausbaueri*, is an indicator of warm soils without excess of humidity, a possible indicator of soil fertility, and also a pioneer in primary succession on cultivated soil. Other species such as *Onychiurus armatus*, have been used in studies of ecological processes as the effects of pollution and human activities (Fjellberg, 1985).

Presently 44 species have been recorded from the Neotropical Region (Mari Mutz and Bellinger, 1990; Rusek, 1992; Thibaud, 1994). In a recent revision of the Onychiuridae of this Region, Palacios-Vargas and Díaz (1995) have given many new records and cited the new species in here described as under press.

In this paper we add seven new species to this number, three belonging to *Onychiurus*, one to *Protaphorura* and three to *Tullbergia*, type material on slides, is kept in the senior author's institution.

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<sup>1</sup> Project "Catalogue of Mexican Collembola" from the CONABIO, México, and International Exchange UNAM-Universidad de La Habana.

GENUS *ONYCHIURUS* GERVAIS, 1841

*Onychiurus lagunensis* sp. nov.

(Figs. 1-5)

Body length (n= 2) 670  $\mu\text{m}$ , clothed with moderately long setae (Figs. 1-2). These are relatively uniformly distributed over the head, in dorsal and lateral surfaces of the thorax and abdomen. Skin-granules large. The largest ones appear dorsally on the head and dorsum of Th. II and III; in other areas the granules are smaller.

Ratio head: antenna = 1:0.8. The relative lengths of Ant. segments I:II:III-IV are as 1:1.2:2.6. Antennal bases covered with fine granules and distinctly delimited from neighbourhood. All antennal segments coarsely granulated on dorsal side. Sense organ of Ant. III consists of five equally high, conical, finely granulated papillae, guarded by 5 stout setae, two relatively long, but thin sensory rods and two large, smooth sensory clubs. On outer side near the sense organ there is a minute, fine rod, placed in a small pit. A second similar rod is on Ant. IV in line with the sense organ of Ant. III. A distinct relatively deep subapical pit houses a minute papilla near the tip of Ant. IV. Blunt enlarged setae absent (Fig. 3).

Postantennal organ in a deep and narrow furrow, consisting of 18-20 simple vesicles, lying with their longer axis at right angles to the long axis of the organ (Fig. 2). Claws untoothed (Fig. 5). Ratio of unguis: empodial appendage = 1:0.5. Ungues basally with a lamella-like broadening.

Dorsal pseudocelli on the body arranged as follows: 33/000/03322. Ventral tube with 3+3 setae. No trace of furcula. Ab. V with a pair of sensillae.

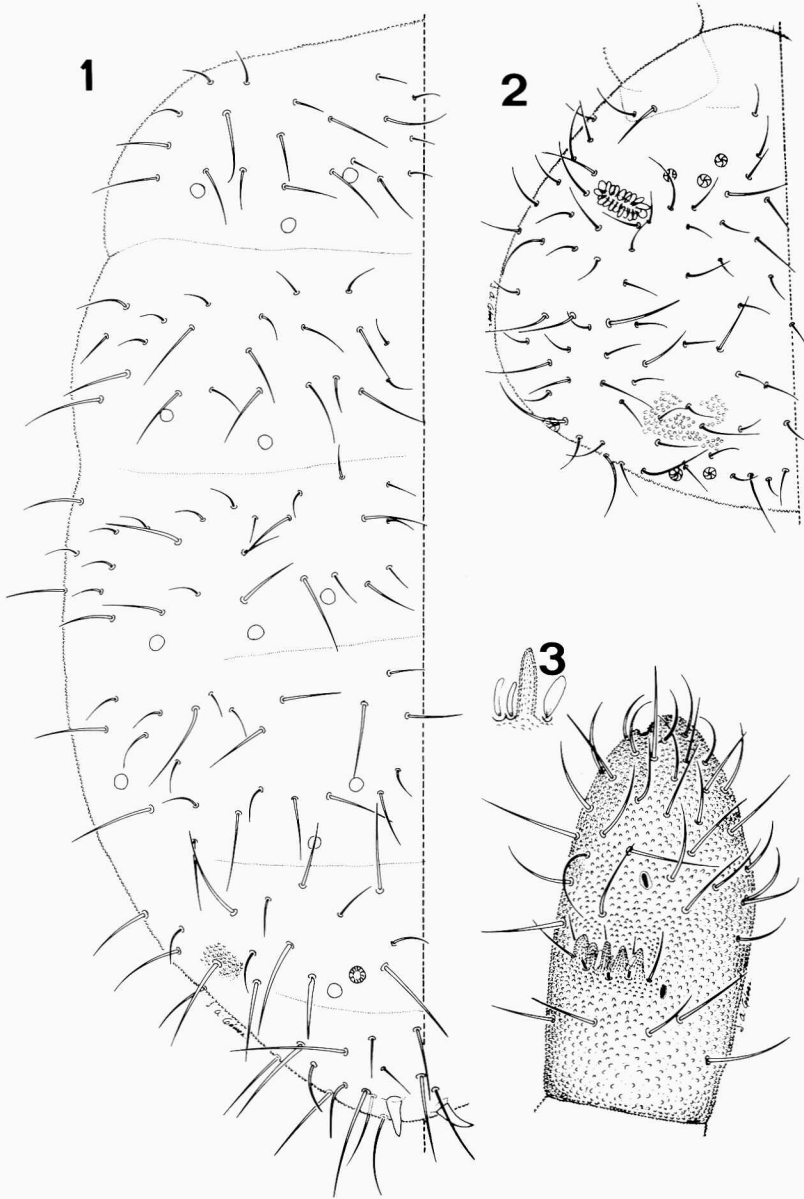
Anal spines small, strong, slightly curved, (Fig. 1). Ratio anal spine: unguis = 1:1.7.

**Derivatio nominis:** This species is named after Sierra La Laguna, Baja California, the type locality.

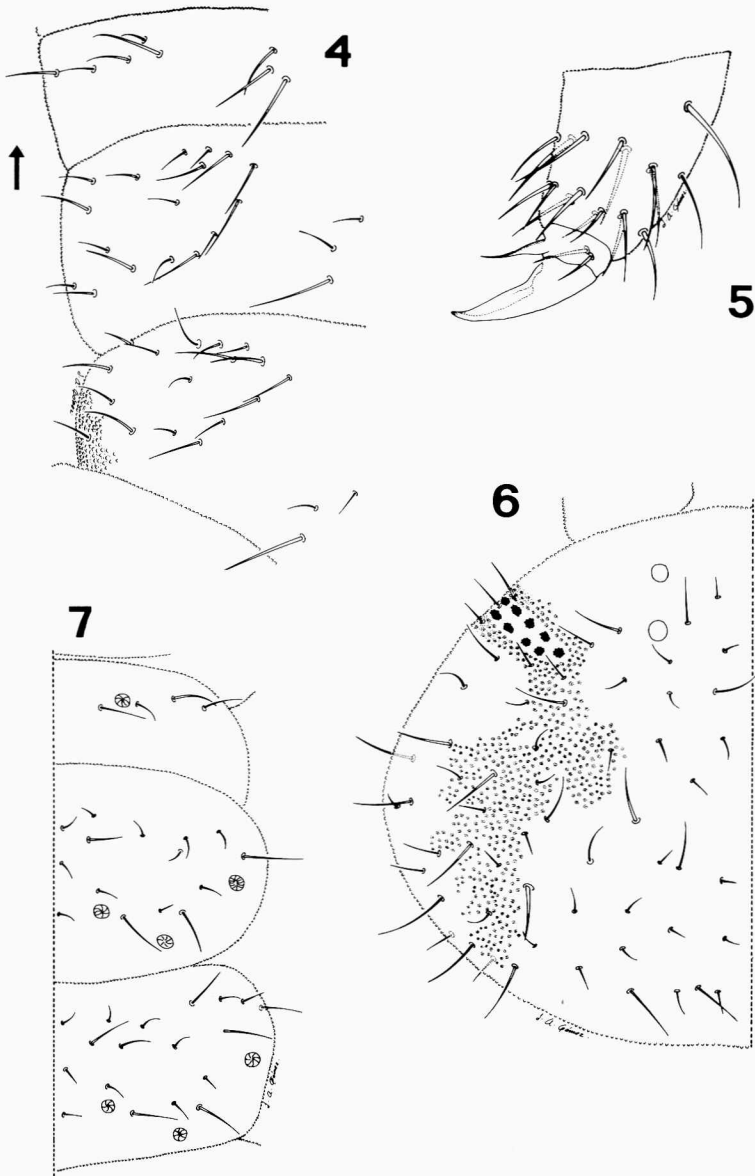
**Type material:** Holotype female, one paratype preadult.

**Type locality:** Mexico, Baja California Sur, 840 m altitude, in *Populus brandegeei* litter and 1,220 m altitude, in mixed forest of *Quercus* sp. and *Pinus* sp.; 14-XI-82; M. Vázquez col.

**Discussion.** This species is similar to *O. pseudarmatus* Folsom, 1917, but it lacks pseudocelli in Th. II and also has fewer number of vesicles in the postantennal



Figs. 1-3 *Onychiurus lagunensis* n. sp. 1 - abdominal segments I to VI, 2 - head, 3 - antennal segments III and IV, and magnification of sensillae of Ant. III.



Figs. 4-5 *Onychiurus lagunensis* n. sp. 4 - thorax I to III, lateral view, tibiotarsus III. Figs. 6-7. *Onychiurus lotius* n. sp. 6 - head, 7 - thorax I to III.

organ. The pseudocellar formula resembles that of *O. voegtlini* Christiansen & Bellinger, 1980 but in *O. voegtlini* anal spines are absent and the postantennal organ is different.

Note: This species was cited as *O. ca. encarpatus* by Vázquez & Palacios-Vargas (1990).

***Onychiurus lotius* sp. nov.**

(Figs. 6-10)

Body length (n= 8) 650  $\mu\text{m}$ , clothed with moderately long setae (Figs. 6-7). There are in addition some long (15-25  $\mu\text{m}$ ) outstanding bristles and two pairs of sublateral sensillae on the head (Fig. 6). On Th. I the long setae are in a central transverse row. In Th. II to Ab. V they are in three rows. There are also small setae (6-7  $\mu\text{m}$ ) over the whole body. Skin-granules remarkably large. The granules are equally distributed over the body.

Ratio head: antenna = 1:0.8. The relative lengths of Ant. segments I:II:III-IV are as 1:1.7:6.4. Antennal bases covered with fine granules, distinctly delimited from neighbourhood. Papillae of sense organ of Ant. III are very difficult to see. They are four short, conical, very finely granulated papillae, guarded by 5 stout setae; two relatively long, but thin sensory rods; and two large, smooth bent sensory clubs. A minute, microsensilla placed in a small pit occurs on the outer side of the sense organ. There is a second similar microsensilla on Ant. IV in line with the sense organ of Ant. III. A distinct relatively deep subapical pit housing a minute papilla occurs near the tip of Ant. IV. Swollen blunt setae absent (Fig. 9).

Postantennal organ lies in a deep and wide furrow. It consists of 10 complex vesicles (Fig. 6).

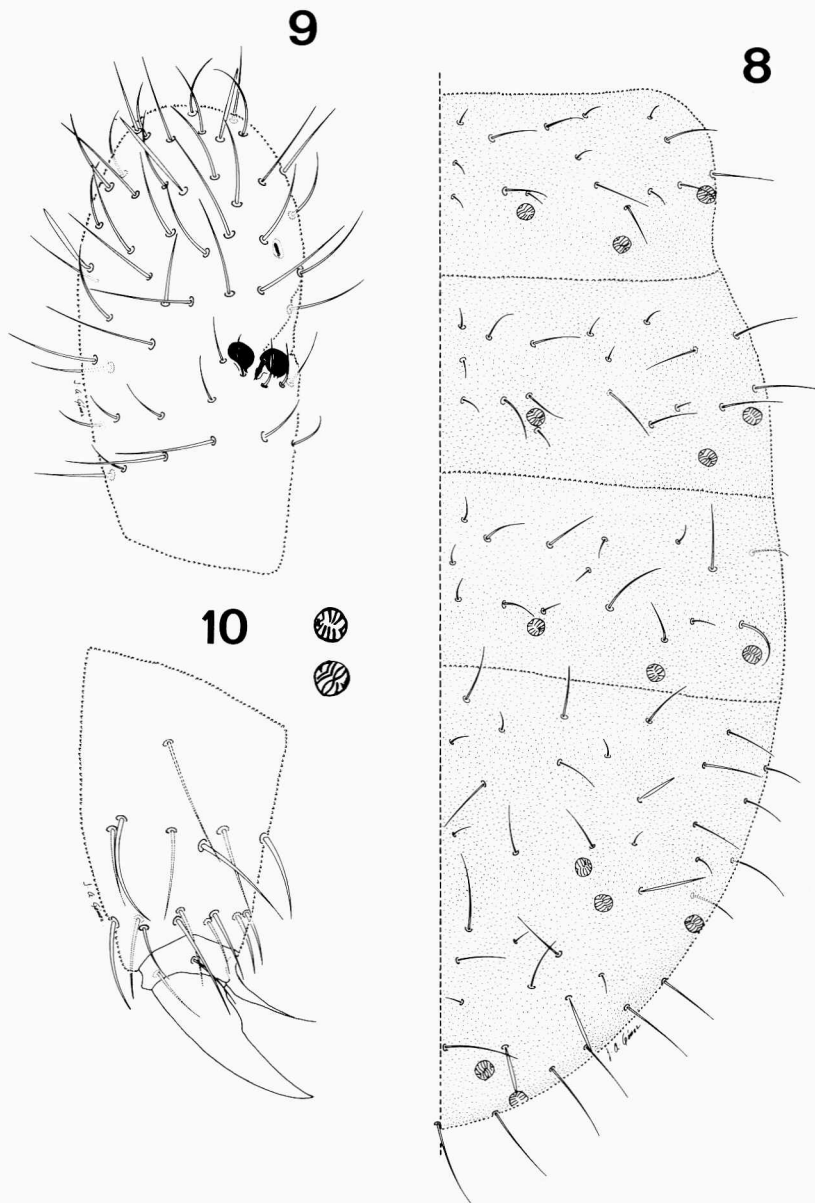
Claw untoothed (Fig. 10). Ratio of unguis: empodial appendage = 1:0.5. Ungues tapering gradually from the bases towards the end.

Dorsal pseudocelli arranged as follows: 22/233/33332. Ventral tube with 7+7 setae. Male ventral organ absent. Abd. IV to VI fused, with two pairs of dorso-lateral sensillae (Fig. 8). No trace of furcula.

Without anal spines. Male with three pairs of pregenital setae, eighteen circumgenital setae and four pairs of eugenital setae.

**Variation:** Some specimens have 4+4 or 6+6 setae on ventral tube.

**Derivatio nominis:** This species is named after Dr. Antonio Lot Helgueras, Principal of the Institute of Biology, UNAM, México.



Figs. 8-10 *Onychiurus lotius* n. sp. 8 - abdomen I to VI, 9 - antennal segments III and IV, 10 - tibiotsarsus III.

**Type material:** Holotype male, four paratypes males and three paratype juveniles.

**Type locality:** Mexico, Jalisco, Chamela Biol. Station, Cuenca 1, 40 m; soil and litter; 24-VIII and 16-XI-91; A. Rodríguez and J.A. Gómez cols.

**Discussion.** *O. lotius* sp. nov. belongs to the group which have on antennal bases two pseudocelli. It differs from *O. opus* Christiansen & Bellinger, 1980 in the pseudocellar formula, a smaller number of vesicles in postantennal organ and unguiculus shorter than in *O. opus*.

Note: This species was cited as *O. ca. opus* by Palacios-Vargas & Gómez (1993) from the type locality.

***Onychiurus trilobatus* sp. nov.**

(Figs. 11-16)

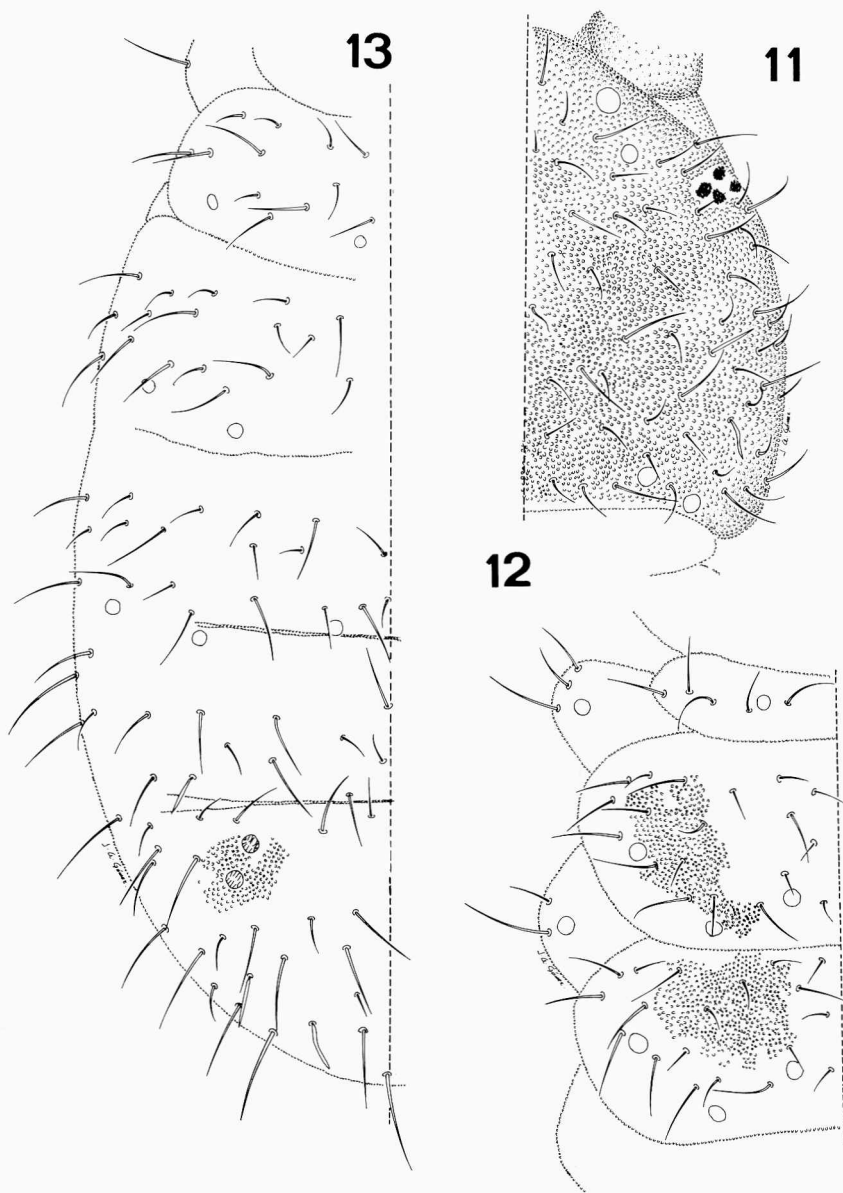
Body length (n = 8) 720  $\mu\text{m}$ , relatively uniformly clothed with moderately long setae (20-28  $\mu\text{m}$ ) (Figs. 11-14). Moreover there are some long outstanding setae laterally on the head, on each tergite near its anterior, posterior and lateral margin, one on the precoxa of each leg. Skin-granules large; the granules, however, are not equally distributed over the body, the largest ones appear on the dorsum of the head; on the other segments the large granules are among the fine ones, surrounding the pseudocelli. Hind part of the head and toracic and abdominal tergites are covered with fine granules.

Ratio head: antenna = 1:0.9. Relative lengths of Ant. segments I:II:III:IV are as 1:1.7:1.8:2.7. All antennal segments coarsely granulated on dorsal side. Sense organ of Ant. III consists of four equally high, conical, finely granulated papillae guarded by 5 stout setae; two thin sensory rods; and two large, trilobate sensory clubs (Fig. 14). A distinct depression houses a minute papillae on the tip of Ant. IV. On the outer side in line with the third antennal segment sense organ there is a minute, microsensilla placed in a shallow depression; there is a second similar microsensilla on the bases of Ant. IV. Blunt swollen setae absent.

Postantennal organ consists of 10 complex vesicles, lying with its longer axis at right angles to head (Fig. 15). Ventral tube with 7+7 setae. Pseudocelli on dorsum arranged as follows: 32/233/33332.

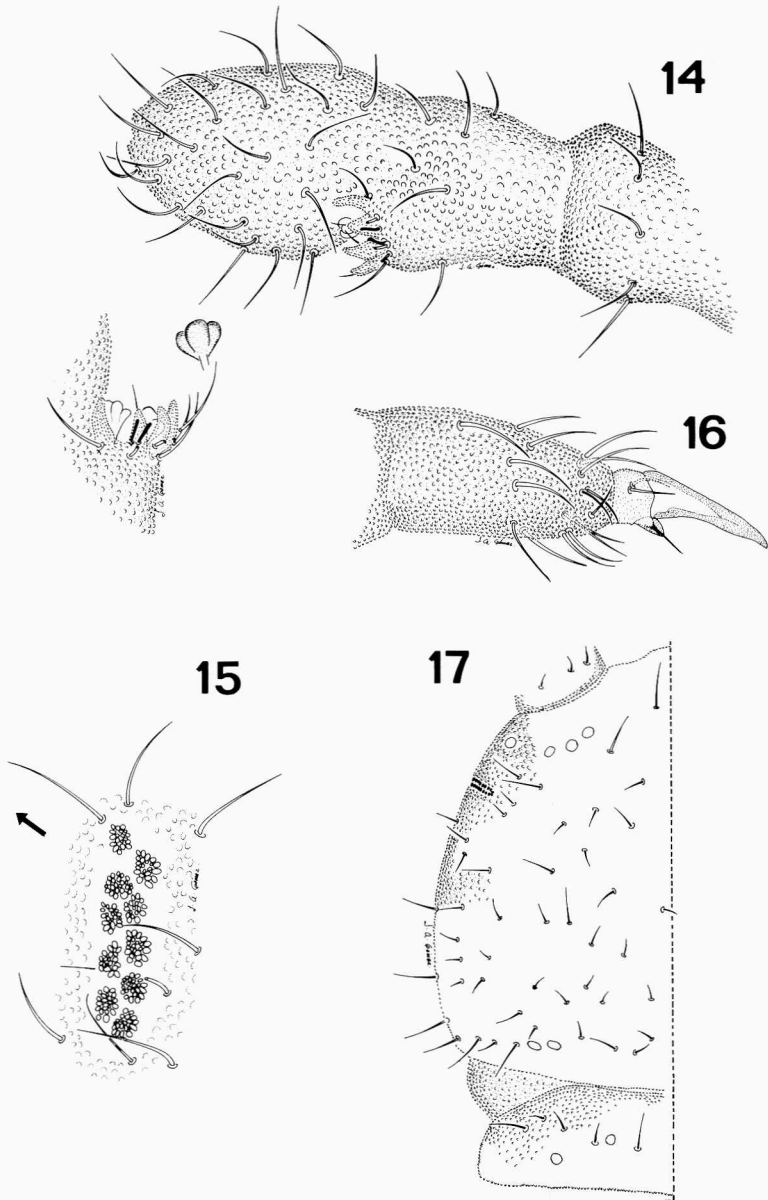
Claw untoothed (Fig. 16). Ratio of unguis: empodial appendage = 1:0.5. Empodial appendage with a lamella-like broadening at the bases. Female with three pairs of pregenital setae, ten genital setae and one pair of eugenital setae.

No trace of furcula. Without anal spines.



Figs. 11-13 *Onychiurus trilobatus* n. sp. 11 - head, 12 - thorax I to III, 13 - abdomen I to VI.





Figs. 14-16 *Onychiurus trilobatus* n. sp. 14 - antennal segments II to IV, and magnification of structures of sense organ, 15 - postantennal organ, 16 - tibiotarsus III. Fig. 17 *Protaphorura hoguei* n. sp. 17 - head and thorax I.

**Variation:** Some specimens (two) have 5+5 or (one) 6+6 setae on ventral tube.

**Derivatio nominis:** The name of this new species refers to the shape of the sensory clubs of the sense organ of Ant. III.

**Type material:** Holotype female, three paratypes female, two paratypes males and three paratypes juveniles.

**Type locality:** México, Jalisco, Chamela Biol. Station (Cuenca I) 40 m altitude; litter; 16-XI-91; A. Rodríguez and J.A. Gómez, cols.

**Discussion.** This species is near *O. paro* Christiansen & Bellinger, 1980, but it is distinguished by the characteristic sense organ of Ant. III, the different pseudocellar formula and the absence of modified setae (ventral organ) in the male of *O. trilobatus* sp. nov.

#### GENUS *PROTAPHORURA* ABSOLON, 1901

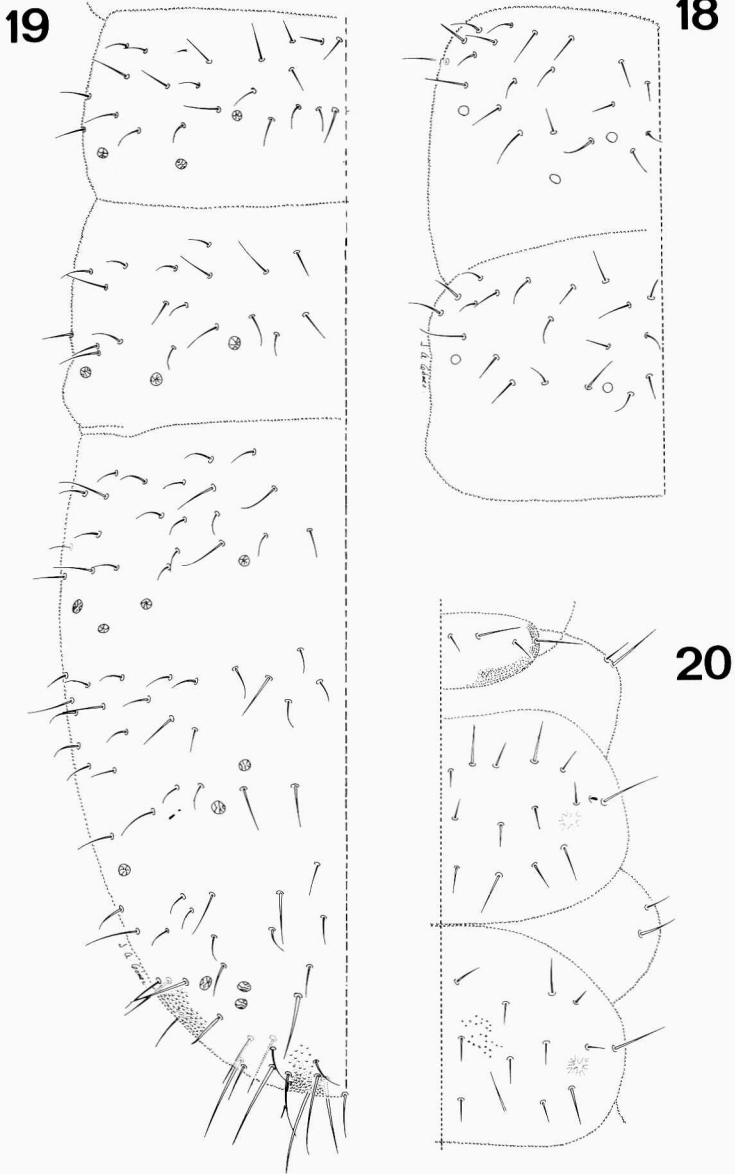
##### *Protaphorura hoguei* sp. nov.

(Figs. 17-19, 21, 22)

Body length (n=4) 790  $\mu\text{m}$ , clothed with few moderately long setae (11-30  $\mu\text{m}$ ) (Fig. 17-19). Moreover there are some long outstanding setae laterally on the head, on each tergite near its posterior margin, one on the precoxa of each leg. There are also small setae (about 6  $\mu\text{m}$ ) over the whole body. Skin moderately granulated. The granules are almost equally disposed on the body.

Ratio head: antenna = 1:0.8. The relative lengths of Ant. segments I:II:III:IV are as 1:1.7:1.1:2.5. Antennal bases covered with fine granules is distinctly delimited from neighbourhood. Ant. I finely granulated, Ant. II and Ant. III coarsely granulated on dorsal side, Ant. IV moderate granulated. Sense organ of Ant. III consists of five equally high, conical, finely granulated papillae guarded by 5 stout setae; two relatively long, but thin sensory rods; and two large sensory clubs, one mulberry-like, short, straight and another smooth, bent, and bigger. A minute microsensilla occurs on the outer side near this sense organ. There is a second similar microsensilla on the bases of Ant. IV in line with the sense organ of Ant. III. An indistinct subapical pit occurs near the tip of Ant. IV. Blunt swollen setae absent (Fig. 22).

Postantennal organ in a deep and narrow furrow, the margins of which are covered



Figs. 18-19 *Protaphorura hoguei* n. sp. 18 - thorax II and III, 19 - abdomen I-VI. Fig. 20. *Tullbergia bassolsae* n. sp. 20 - thorax I to III.

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with coarse granules. It consists of about 25 simple vesicles, lying with their long axis at right angles to the long axis of the organ (Fig. 17).

Claw untoothed (Fig. 21). Ratio of unguis: empodial appendage = 1:0.7. Empodial appendage tapering with more or less distinct inner lamella.

Pseudocelli on the dorsum arranged as follows: 42/333/33332. Ventral tube with 4+4 setae. Male ventral organ absent. Male with four pairs of eugenital setae, ten circumgenital setae and three pairs of pregenital setae. Female with three pairs of pregenital setae, eight genital setae and one pair of eugenital setae.

No trace of furcula. Without anal spines. Ab. V and Ab. VI fused.

**Derivatio nominis:** This species is named after Dr. Charles Hogue (in memoriam), Entomologist from the Natural History Museum of Los Angeles County, California.

**Type material:** Holotype male, one paratype female and other paratype with no determined sex.

**Type locality:** México, Baja California Sur, Cabo San Lucas; sand wash, in beach; 4-XII-87; J. Palacios and M. Vázquez cols.

**Discussion.** This species is near *O. voegtlini* Christiansen & Bellinger, but differs in the pseudocellar formula, in large number of postantennal vesicles and lacking the four pseudocelli in the base of each coxa.

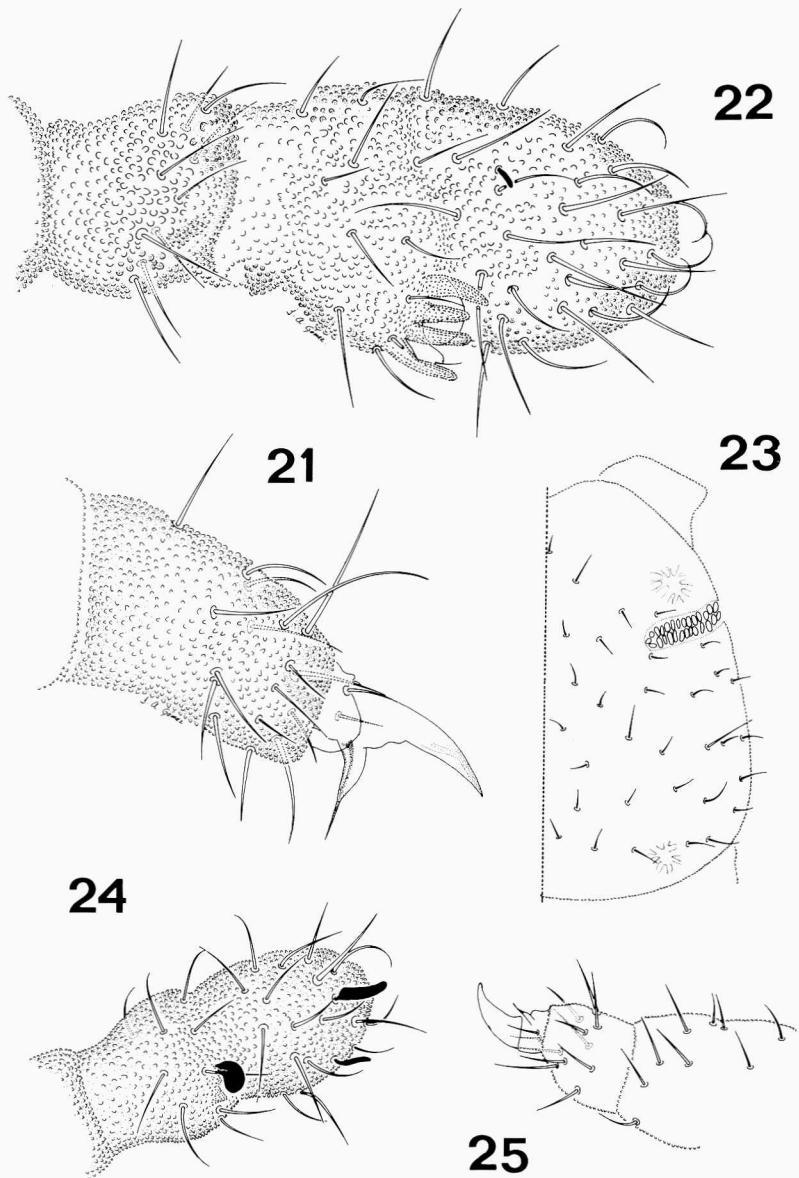
GENUS *TULLBERGIA* LUBBOCK, 1876

*Tullbergia bassolsae* sp. nov.

(Figs. 20, 23-25, 30)

Body length (n=4) 424  $\mu\text{m}$ , clothed with moderate setae (7  $\mu\text{m}$ ) and short (4  $\mu\text{m}$ ) ones (Figs. 20, 30). Tergite of Th. I with a central transverse row. Row m of Th. II and III is of short setae (4  $\mu\text{m}$ ) (Fig. 20). In Ab. I to Ab. III and Ab. V many small setae occur in two irregular rows. In Ab. IV there are 3 rows. The posterior row 2-4 has short and 4 longer setae. The longer setae on anterior tergites are about 1/6 as long as the tergites, and on Ab. V 1/4 as long as this tergite; the setae are longest on last abdominal segment (Fig. 30). Integumentary granules fine, equally disposed on the head and tergites, slightly coarser granules, cover Ab. VI dorsally. Antennal bases are well delimited.

Ratio head: antenna = 1: 0.7. The relative lengths of Ant. segments I:II:III:IV



Figs. 21-22 *Protaphorura hoguei* n. sp. 21 - tibiotarsus III, 22 - antennal segments II to IV. Figs. 23-25 *Tullbergia bassolsae* n. sp. 23 - head, 24 - antennal segments III and IV, 25 - tibiotarsus III.

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are as 1:1.7:1.7:2.1. Sense organ of Ant. III with two small sensory rods concealed behind a moderately high integumentary fold not divided into separate papillae; in addition there is one sensory club, which is thick, cylindrical, rounded at the tip, strongly bent and not concealed by the fold. At the base of the fold are three guard setae. Ventro-laterally on Ant. III there is a very short ovoid sensory seta protected by three setae. Ant. IV furnished with 2 moderately thick "olfactory" setae (one thicker than the other), and provided at the tip with a microsensilla and indistinct subapical pit (Fig. 24).

Postantennal organ shorter than the width of Ant. I (2/3 width of Ant. I), lies in a moderately deep furrow. It consists of about 30 simple vesicles lying in two parallel rows slightly oblique to the long axis of the organ (Fig. 23). Claw untoothed. Empodial appendage rudimentary in shape of a minute claw-like process. Clavate tibiotarsal setae absent (Fig. 25).

Dorsal pseudocelli as follows: 11/011/11111. The pseudocelli moderately star shaped with seven arms.

Ventral tube with 6+6 setae; one of those is twice as long as the others. The pseudocelli of Ab. V are each guarded by a moderately long "sensory" seta, similar to "olfactory" setae of Ant. IV (Fig. 30).

Anal spines relatively short and weak, but usually rather strongly curved and placed on moderately high papillae (Fig. 30). Ratio anal spine: unguis 1:1.3.

Genital area of the male with three pairs of pregenital setae, seven circumgenital setae and three pairs of eugenital setae.

**Derivatio nominis:** This species is named after Dra. Isabel Bassols Batalla (*in memoriam*), Biological Sciences National School, Polytechnic National Institute, México, D. F.

**Type material:** Holotype male, one paratype male and one paratype juvenile.

**Type locality:** México: Veracruz, Montepío Beach, Los Tuxtlas; from sand, J. Palacios and I. Vázquez, cols.

**Discussion.** This species is close to *Tullbergia hades* Christiansen & Bellinger, 1980, with a similar pseudocellar formula, but differs by having only one sensory club in sense organ of Ant. III and two olfactory hairs in Ant. IV. Also differs in the type of pseudocelli; in *T. hades* they are without interior markings, while *T. bassolsae* they are stellate.

Note: This species was cited as *Mesaphorura* sp. by Palacios-Vargas (1989) from the type locality, Veracruz.

***Tullbergia aliciae* sp. nov.**

(Figs. 26, 29, 31)

Body length (n=9) 483  $\mu\text{m}$ , clothed with moderately long setae (Fig. 26). Moreover, there are some long setae (21  $\mu\text{m}$ ) in dorsum and lateral margin. Setae distribution and size are shown in figures 26 and 28. Tegumentary granules fine, equally distributed on the head and toracic and abdominal tergites, with relatively uniformly distributed fine integumentary granules, interspersed with somewhat coarser granules on Ab. VI. Antennal bases are not very well delimited.

Ratio head: antenna = 1: 0.5. The relative lengths of Ant. segments I:II:III:IV are as 1:1.2:1.8:1.8. Sense organ of Ant. III with two small sensory rods concealed behind a small integumentary fold not divided into separate papillae; in addition there are two thick, cylindrical sensory clubs, which are rounded at the tip, strongly bent towards each other and not concealed by the fold. At the bases of the fold three guard setae are inserted. There is a short ovoid sensilla protected by three setae ventro-laterally on Ant. III. Ant. IV furnished with 2 short, thick olfactory setae and a microsensilla at the tip with a microsensilla as well as an indistinct subapical pit, and one spherical apical bulb (Fig. 31).

Postantennal organ ovoid, about half as long as the width of Ant. I. It consists of about 40 (38-42) simple vesicles lying in four irregular rows (Fig. 27).

Claw untoothed. Empodial appendage rudimentary, in shape of a minute claw-like process. Clavate tibiotarsal setae absent (Fig. 29). Dorsal pseudocelli on the body arranged as follows: 11/111/11111. The pseudocelli are star shaped.

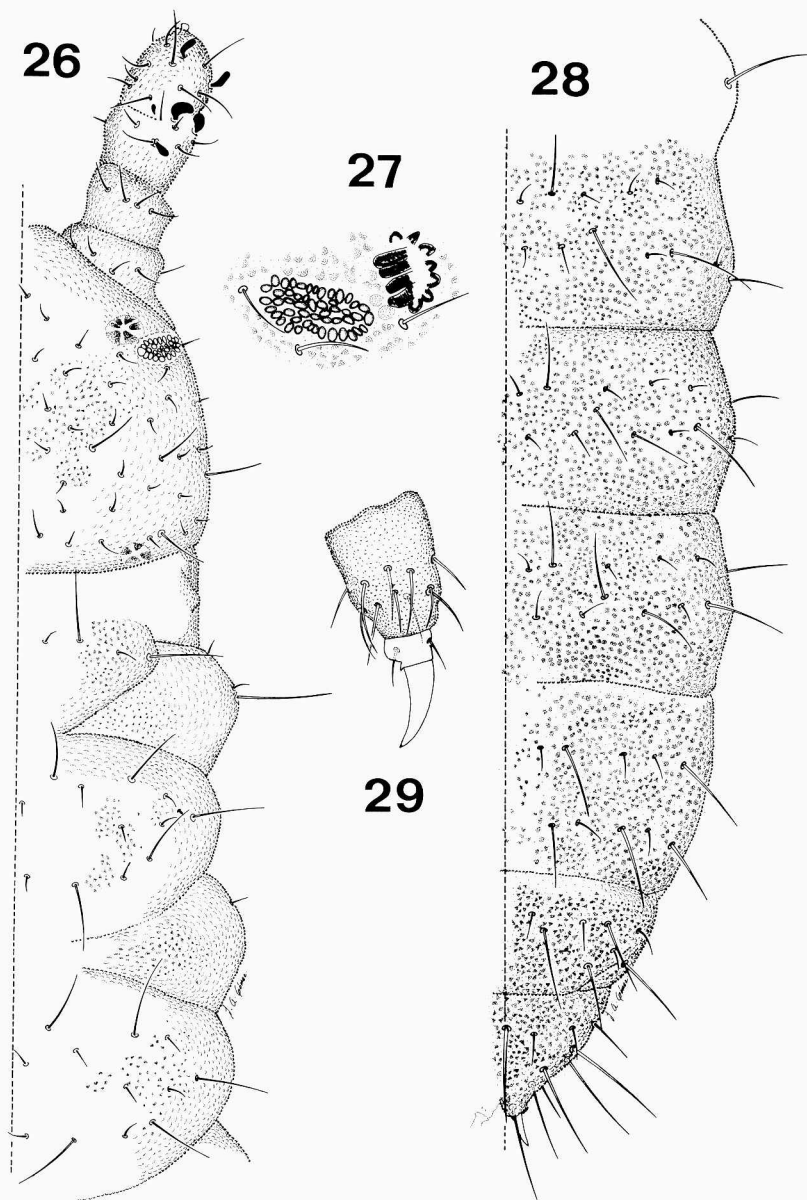
Ventral tube with 6+6 setae. The pseudocelli of Ab. V are guarded by the sensory setae similar to a normal setae. The Ab. VI tergite without a surrounding semicircular narrow ridge.

Anal spines relatively short and weak, but usually slightly curved and placed on high papillae which touch at their bases (Fig. 28). Ratio anal spine: unguis 1:1.6.

Genital area of the female similar to lips, furnished on the upper lip with a pair of minute setulae, with two pairs of pregenital setae, two genital setae and one pair of eugenital setae.

**Variation:** In some specimens the pseudocelli are very difficult to see; sometimes they are absent on many tergites. It is also possible to see some pseudocelli that look striated.

**Derivatio nominis:** This species is named after M. S. Alicia Rodríguez Palafox, Chamela Biol. Station (UNAM), Jalisco, México.



Figs. 26-29 *Tullbergia aliciae* n. sp. 26 - antenna, head and thorax I to III, 27 - postantennal organ and pseudocellus, left side, 28 - abdomen I to VI, 29 - tibiotsarsus III.



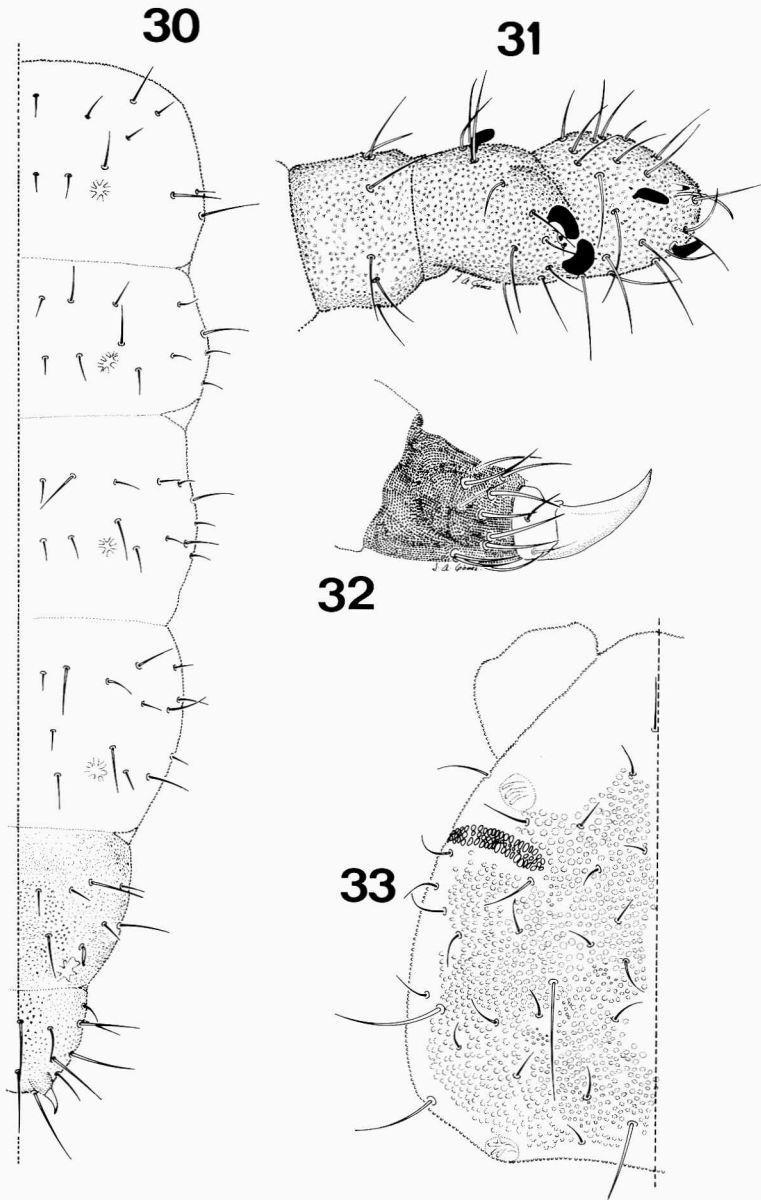


Fig. 30 *Tullbergia bassolsae* n. sp. 30 - abdomen I to VI. Fig. 31 *Tullbergia aliciae* n. sp. 31 - antennal segments II to IV. Figs. 32-33 *Tullbergia javieri* n. sp. 32 - tibiotalarsus III, 33 - head.

**Type material:** Holotype female, seven paratypes female, one paratype male and one paratype juvenile.

**Type locality:** México: Jalisco, Chamela Biol. Station (Cuenca I), 40 m; 24-VIII-91, 16-XI-91 and 12-I-92; A. Rodríguez and J.A. Gómez cols.

**Discussion.** This species is near *Tullbergia ampla* Christiansen & Bellinger and *T. duops* Christiansen & Bellinger, 1980, but differs in pseudocellar formula. In *T. duops* anal spines are about twice as long as inner edge of hind unguis. In *T. aliciae* n. sp. the postantennal organ only has 4 rows, while in *T. ampla* it has 5-10 rows.

Note: This species was cited as *T. ca. duops* in Palacios-Vargas and Gómez (1993) from the type locality.

***Tullbergia javieri* sp. nov.**

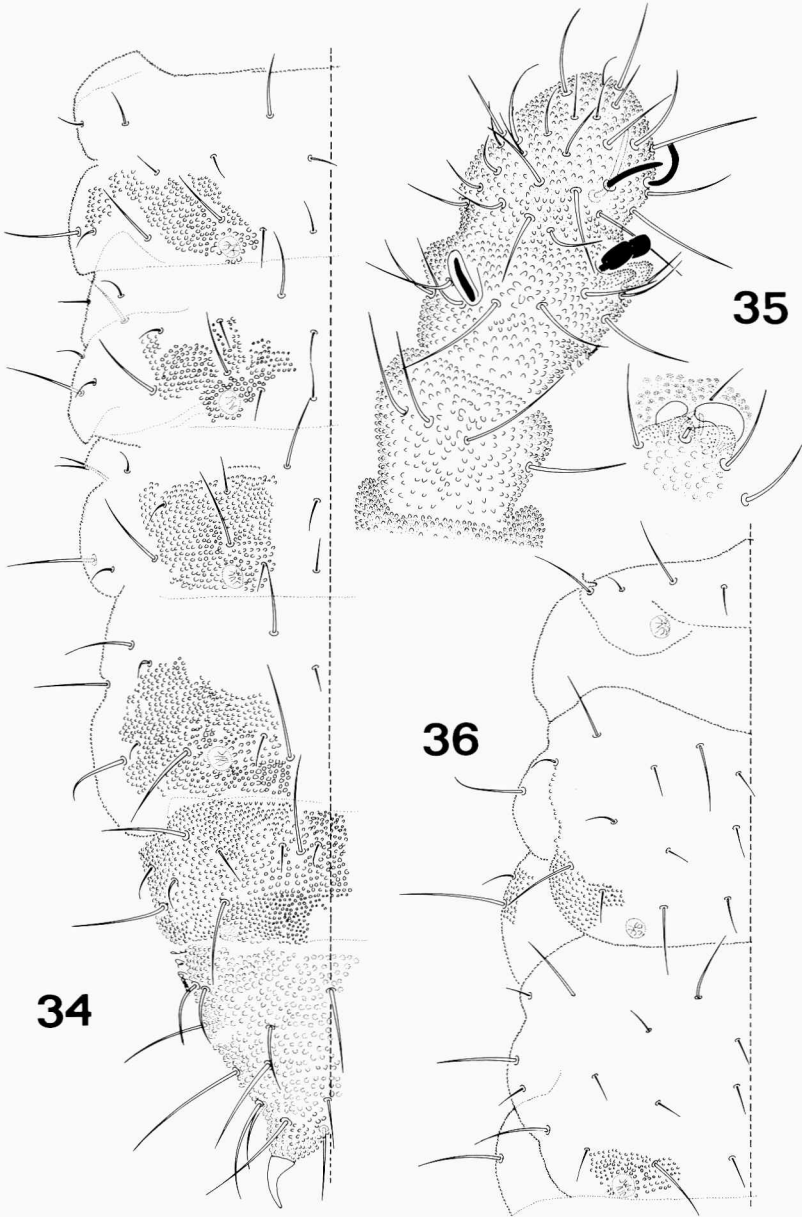
(Figs. 32-36)

Body length (n=8) 690  $\mu\text{m}$ , clothed with some long setae on dorsum and lateral margin (31  $\mu\text{m}$ ). Smallest setae 5  $\mu\text{m}$ . Tergite of Th. I with a median row of setae, Th. II and III to Ab. V with two transversal rows; on each side 1 longer one, in posterior row 4 short and 4 longer ones (Fig. 34 and 36). The longer setae on anterior tergites are about 1/3 as long as the tergite, and on Ab. V more than half the length this tergite. Skin-granules large on the head; coarser granules on the anterior and posterior margins of the tergites (Th. I to Ab. V) (Fig. 34). Antennal bases are delimited.

Ratio head: antenna = 1: 0.7. The relative lengths of Ant. segments I:II:III:IV are as 1:1.2:1.5:1.1. Sense organ of Ant. III with two small sensory rods concealed behind a moderately high integumentary fold not divided into separate papillae; with two thick curved clubs, one much larger than the other, strongly bent towards each other and not concealed by the fold. At the bases of the fold are inserted three guard setae. Ventro-laterally on Ant. III there is a short ovoid sensilla protected by three setae. Ant. IV furnished with 6 thick, blunt setae of varying lengths and bearing at the tip a microsensilla and a minute subapical pit (Fig. 35).

Postantennal organ longer than the width of Ant. I. It consists of about 80 simple vesicles lying in parallel rows, three on the inner 2/3 of the length and four for the outer 1/3. The outer tubercles slightly wider than the inner ones.

Claw untoothed. Empodial appendage rudimentary, shaped like a minute tubercle. Clavate tibiotarsal hairs absent (Fig. 32). Dorsal pseudocelli on the body arranged as follows: 11/122/11111. The pseudocelli are striate.



Figs. 34-36 *Tullbergia javieri* n. sp. 34 - abdomen I to VI, 35 - antennal segments II to IV and detail of antennal organ, 36 - thorax I to III.

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Ventral tube with 4+4 setae. The pseudocelli of fifth abdominal tergite lie directly on hind margin, and each is guarded by a long sensory seta, similar to normal setae (Fig. 34). On anterior margin of Ab. VI there is a small depression surrounded by a semicircular narrow ridge, covered with fine granules.

Anal spines long, strongly curved and placed on high papillae (Fig. 34). Ratio anal spine: unguis 1:1.3.

Genital area of the female with two pairs of pregenital setae, three genital setae and one pair of eugenital setae.

**Variation:** In some specimens the pseudocelli of Ab. V are lacking.

**Derivatio nominis:** This species is named after Dr. Javier Villalobos, Institute of Ecology, Jalapa, Veracruz, who kindly gave the specimens for study.

**Type material:** Holotype female, four paratypes females and three paratypes juvenils.

**Type locality:** México: Tamaulipas: Gómez Farías, Rancho del Cielo, forest, 1,250 m altitude, ex soil, IX and XI-1987, J. Villalobos col.

**Discussion.** This species is close to *M. nulla* Christiansen & Bellinger, 1980, and *M. mexicana* (Handschin, 1928) but differs from those species in the pseudocellar formula and by the dissimilar sense clubs of Ant. III.

Note: This species was cited by Villalobos (1990) as *Mesaphorura* aff. *mexicana* from Rancho del Cielo, Gómez Farías, Tamaulipas.

#### ACKNOWLEDGEMENTS

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