

Taxonomy and systematics

## A new Mexican species of *Paraxenylla* (Collembola: Hypogastruridae) from marine littoral sand of Quintana Roo, Mexico

### *Una especie nueva mexicana de Paraxenylla (Collembola: Hypogastruridae) de arena del litoral marino de Quintana Roo, México*

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#### Abstract

The new species *Paraxenylla mahahualana* sp. nov. from Quintana Roo is described, it is similar to *P. cubana*, and shares the presence of ventral tube with 1 + 1 seta but differs in having tibiotarsi with 5 tenent hairs and 5 cylindrical sensilla on antennal segment IV and 3 + 3 tenacular teeth. A key for the 10 species known in the genus is also given.

*Keywords:* Arenicolous; Springtail; Taxonomy, Mexican Caribbean

#### Resumen

Se describe la nueva especie *Paraxenylla mahahualana* sp. nov. de Quintana Roo, que es similar a *P. cubana*, con la que comparte la presencia de un tubo ventral con 1 + 1 sedas, pero difiere en que los tibiotarsos tienen 5 sedas capitadas y las 5 sensilas del artejo antenal IV son cilíndricas y 3 + 3 dientes tenaculares. Se proporciona una clave para las 10 especies conocidas en el género.

*Palabras clave:* Arenícola; Cola de resorte; Taxonomía, Caribe mexicano

#### Introduction

Collembola are mainly hygrophilous arthropods and may be found on land or directly associated to water

habitats. Following Deharveng et al. (2008), 525 water-dependent species of springtails have been reported worldwide, of which 465 are found in freshwater habitats and close to 60 from marine littoral environments. The

same authors believe that for the Neotropical region approximately 45 water-dependent species have been recorded. In Mexico, 39 taxa have been recorded associated to aquatic environments, 16 from freshwater surfaces and the benthic zone of deep lakes (Palacios-Vargas, 2000; Palacios-Vargas et al., 2018), and 23 living in marine littoral biotopes associated to sand, rocky surfaces and crevices at marine coastal areas (Palacios-Vargas, 2000). If those living in humid caves are taken into account the total might be close to one hundred species (including the unpublished records of the Project LE002 CONABIO, Facultad de Ciencias, UNAM).

The genus *Paraxenylla* is related to marine littoral environments and only 10 species have been described so far, and even these species occur in different continents. On the most recent revision of the genus, Palacios-Vargas and Janssens (2006) described 2 species and gave new combinations for 3 of them. Queiroz and Deharveng (2008) described a new species from Brazil found in litter of the Atlantic Forest of southeast Brazil, 40 km away from the coast line. Until now, from Mexico, only *P. lapazana* Palacios-Vargas and Vázquez (1989) was known, and it was described from rocks on the beach of La Paz, Baja California Sur, in the Mexican Pacific Coast. Here, we describe a new species from Quintana Roo, in the Caribbean Sea of Mexico, from sand and rocks on the beach.

The genus seems to have a cosmopolitan distribution, mainly on the shores, littoral rocks, sand and several biotopes in the mangroves, and they have been found on green algae (Gama & Deharveng, 1984). Its members feed on algae and on diatoms; they may play an important role in recycling nutrients, and making them available to other consumers in the intertidal and supratidal food web.

## Materials and methods

Specimens were collected on littoral beaches north of Mahahual, Quintana Roo State (Fig. 1), washing sand and rocks in buckets in several points (Fig. 2). Floating debris was examined, and specimens were captured with a fine brush and put in small jars filled with 95% ethanol. Some of them also were captured using epineustic traps (Palacios-Vargas, 1990). Collembola were sorted, cleared up and mounted under slides in Hoyer's solution. More abundant specimens in the samples belong to *Friesea josei* Palacios-Vargas (Collembola: Neanuridae) described from Tamarindo Beach, Guanica, Puerto Rico (Palacios-Vargas, 1986) using the same methodology. Drawings were done using a Carl Zeiss Axiostar Plus phase contrast microscope with an adapted drawing tube. Measurements were done with an ocular micrometer. All measurements are given in micrometers.

Abbreviations used in this contribution are: Ant. = antennal segment; Abd. = abdominal segment; PAO = postantennal organ; sgd = dorsal guard sensillum; sgv = ventral guard sensillum; Th. = thoracic segment.

## Description

*Paraxenylla* Murphy, 1965

Syn. *Haloxenylla* Gama and Deharveng, 1984:131

## Diagnosis

Habitus of *Xenylla*. Body length 360-1,500  $\mu\text{m}$ , with dark blue pigment, PAO absent, with 5 + 5 eyes. Mouthparts modified with tendency to a type for chewing. Labral setae 7/ 5, 5, 4. Antennae *Xenylla* type, but with sensorial organ of antennal segment III with 5 similar elements, ventral guard setae between the sensorial rods. Antennal segment IV with 4 thick sensilla, one microsensillum, one subapical organ and a simple apical bulb. Tenent hairs,

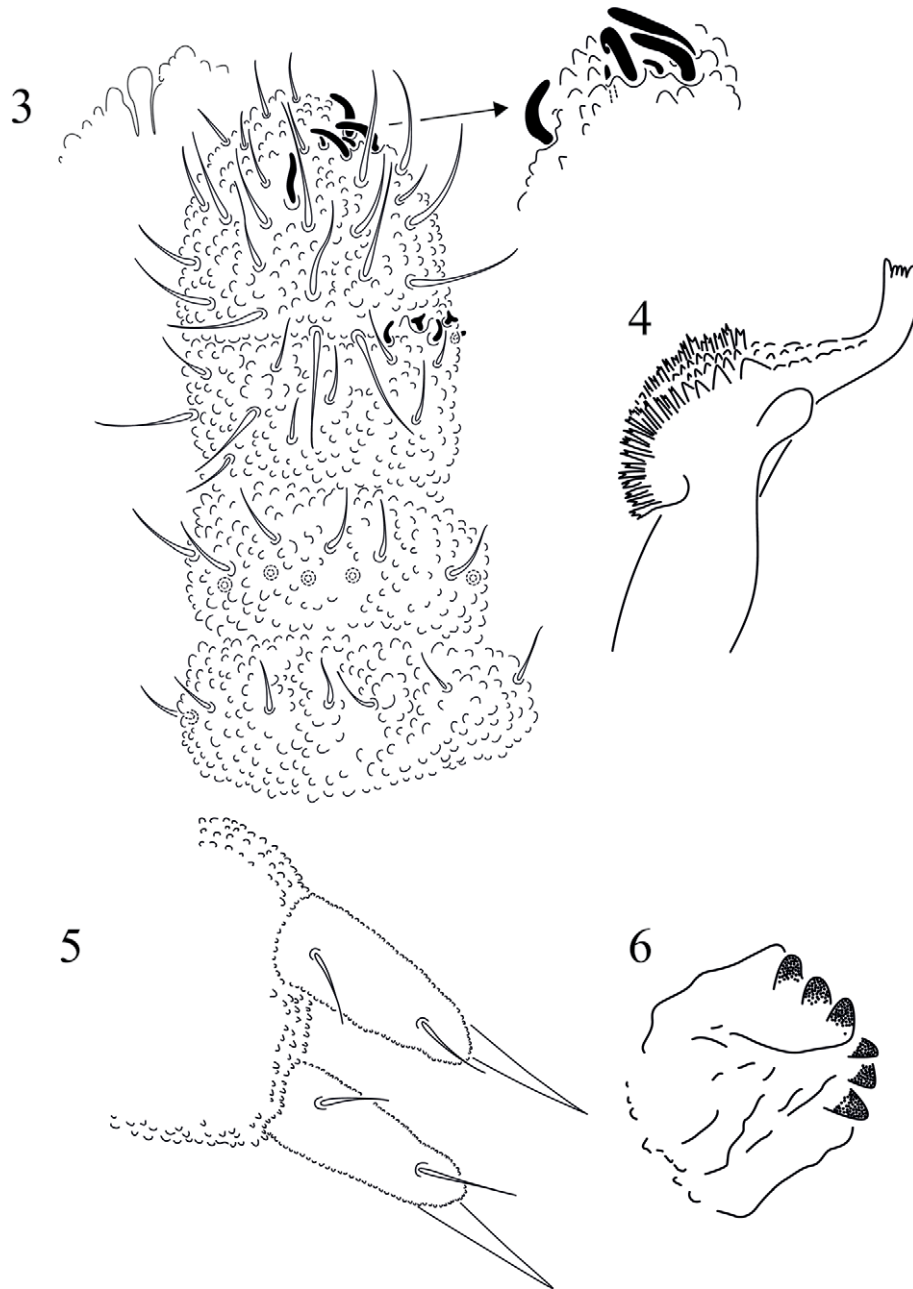


Figuras 1-2. *Paraxenylla mahahualana* sp. nov. 1, Type locality; 2, methodology, washing sand and rocks.

when present, capitate or acuminate. Unguis without empodium, with or without a median tooth. Furcula well developed, mucro completely or partially separate from dens. Tenaculum with 2, 3 or 4 teeth on each ramus. Anus terminal and abdominal segment VI as a truncate cone. Anal spines absent. Chaetotaxy of type I, with mesosetae and macrosetae. Dorsally on thoracic segments II and III

with m2 (absent in *Xenylla*) as a macroseta. On abdominal segments I-IV, p2 is a macroseta; on abdominal V a1 is a macroseta and ss at p4. Ventral chaetotaxy of the head and abdominal segments I-III reduced. Ventral tube with 1, 2, 3 or 4 setae per side.

*Type species: Xenylla (Paraxenylla) mangle* Murphy, 1965



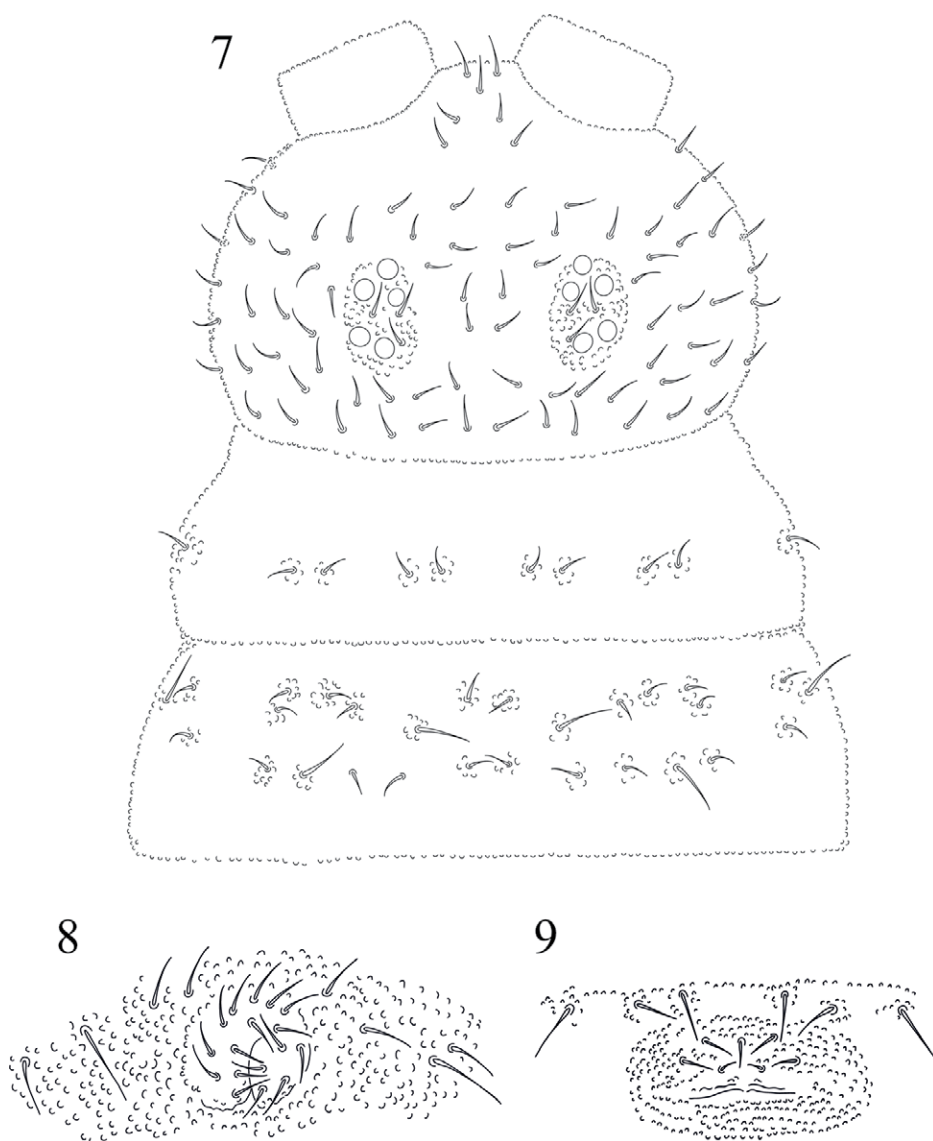
Figuras 3-6. *Paraxenylla mahahualana* sp. nov. 3, Antennal segments I-IV with magnification of apical bulb and sensilla; 4, mandible; 5, furcula; 6 tenaculum.

*Paraxenylla mahahualana* sp. nov. (Figs. 3-11)

Body length (n = 6) 780  $\mu$ m (range 700-1,150  $\mu$ m). Males are the smallest and females the longest, even more than 1,100  $\mu$ m. Body with short acuminate setae (5  $\mu$ m). Macrosetae and sensorial setae (8-10  $\mu$ m) about twice the length of ordinary setae. Color very dark blue in alcohol, black when alive, eye patches black. Ratio head: antenna = 1:0.6. Ant. I with 7 dorsal setae. Ant. II with 11 setae. Ant. III sensory organ consists of 2 very small sensory rods, 2 longer guard setae and one external microsensillum (Fig. 3). Ant. IV with 4 cylindrical sensorial sensilla, subequal in size, one microsensillum, one subapical organ and a simple apical bulb. There are also 18 long dorsal acuminate

setae and 7 small thicker curving setae with apex truncate similar to sensilla (Fig. 3). Labrum with /5, 5, 4 setae. 5 + 5 eyes well pigmented.

Mandible with 5 small apical teeth (Fig. 4). Maxillae with 6 hypertrophied fringed lamellae as illustrated for *P. affinis* by Gama and Deharveng (1986). Labium with a small internal process. Only one poslabial seta. Prothorax with 4 + 4 dorsal setae (plus 1 lateral on each side). Dorsal chaetotaxy of head and thorax in Fig. 7. Trochanters with 5 setae each, femora I, II, III with 11, 11, 10 setae respectively. Tibiotarsi I, II, III with 18, 18, 17 setae respectively, each with 5 tenent hairs well developed, dorsal one more clearly capitate, 2 ventro-distal and 2



Figuras 7-9. *Paraxenylla mahahualana* sp. nov. 7, Dorsal chaetotaxy of head and thoracic segments I and II; 8, male genital plate; 9, female genital plate.

ventro-proximal less capitate (Fig. 11). On each femur, 1 long ventral acuminate tenent hair. Unguis about 10  $\mu\text{m}$  long, without teeth, no empodial appendix.

Dorsal chaetotaxy of abdomen in Fig. 10. Ventral tube with 1 + 1 setae. Abd. II with 2 + 2 ventral setae, Abd. III with 4 + 4 setae. Tenaculum with 3 teeth on each ramus (Fig. 6). Mucrodens (20  $\mu\text{m}$ ) with only one seta, elongated with a sharp ending (Fig. 5). Female with 3 + 3 pregenital setae, 5-6 circumgenital and 2 eugenital (Fig. 9). Male with 3 + 3 pregenital setae, 10 circumgenital and 4 + 4 eugenital (Fig. 8). Each anal valve with 11 setae. Anus terminal, no anal spines.

#### Taxonomic summary

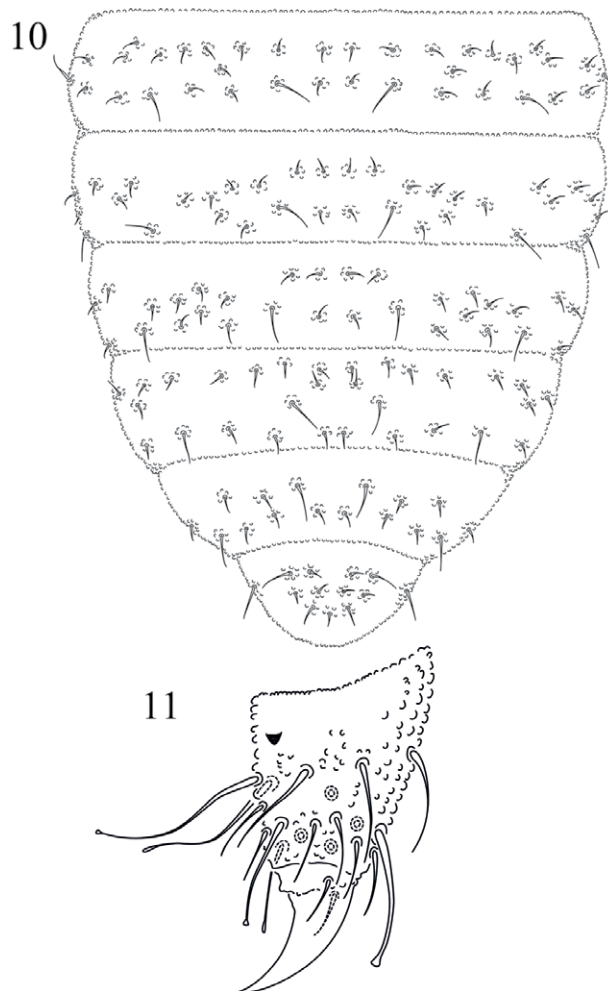
*Derivatio nominis*: from the type locality: Mahahual, Quintana Roo (Figs. 1, 2).

*Type locality*: Mexico: Quintana Roo: Mahuahual: Punta Chacoy. 18°95'12" N, 87°61'81" W.

*Type material*: holotype female on slide number 22314, 3 paratypes females and 2 males on slides numbers 22315-22320. Holotype, 2 paratype females and 1 male deposited at Colección de Ácaros y Colémbolos, Facultad de Ciencias, others in the junior author's collection. April 30, 2017, F. Luna and J. G. Palacios-Vargas col.

#### Remarks

*Paraxenylla mahahualana* sp. nov. shares with *P. cubana* the presence of ventral tube with 1 + 1 seta, but they differ in the shape of Ant. IV sensilla, globular in *P. cubana* and cylindrical in the new species. They also differ in the number of tenacular teeth, 3 + 3 in *P. mahahualana* sp. nov. versus 2 + 2 in *P. cubana*. The tibiotarsus of the new species has 5 tenent hairs while *P. cubana* lacks of tenent hairs.



Figuras 10-11. *Paraxenylla mahahualana* sp. nov. 10, Abdominal dorsal chaetotaxy; 11, tibiotarsus III, chaetotaxy and unguis.

Key for identification of the species of *Paraxenylla* \* (modified and completed from Palacios-Vargas & Janssens, 2006).

- |   |   |
|---|---|
| 1. Ventral tube with 1 + 1 setae  | 4   |
| 1'. Ventral tube with more than 1 + 1 setae                                     | 2   |
| 2. Ventral tube with 2 + 2 setae  | <i>P. mangle</i> (Murphy, 1965) Gambia                            |
| 2'. Ventral tube with more than 2 + 2 setae                                     | 3   |
| 3. Ventral tube with 3 + 3 setae  | <i>P. arenosa</i> (Uchida & Tamura, 1937) Japan                   |
| 3'. Ventral tube with 4 + 4 setae   | 9   |
| 4. Tenaculum with 3 teeth on each ramus; tibiotarsi with tenent hairs           | 5   |
| 4'. Tenaculum with 2 teeth on each ramus; tibiotarsi without tenent hairs       | .....   |
|   | <i>P. cubana</i> Palacios-Vargas and Janssens, 2006 Cuba          |
| 5. With 1 + 1 ventral setae on abdominal segment II                             | 6   |
| 5'. With more than 1 + 1 ventral setae on abdominal segment II                  | 7   |
| 6. Very small species, less than 0.5 mm; 2 antennal sensilla bigger than others | .....   |
|   | <i>P. piloua</i> Thibaud and Wiener, 1997 New Caledonia           |
| 6'. About 1 mm long; one sensillum smaller than others                          | ..... <i>P. lapazana</i> Palacios-Vargas and Vázquez, 1989 Mexico |

7. With a total of 7 tenent hairs; unguis with one teeth; 1 + 1 ventral setae on abdominal segment II; about 0.9 mm long . . . . . *P. affiniiformis* (Stach,1930) Cosmopolita?  
7'. With less than 6 tenent hairs; unguis with no teeth . . . . . 8  
8. With 4 tenent hairs; 3 + 3 ventral setae on Abd. II; about 1.5 mm long . . . . .  
. . . . . *P. peruensis* Palacios-Vargas and Janssens, 2006 Peru  
8'. With 5 tenent hairs; 2 + 2 ventral setae on Abd. II; about 1.0 mm long . . . . .  
. . . . . *P. mahahualana* sp. nov. Mexico  
9. Tibiotarsi without tenent hairs, unguis with one tooth . . . . . *P. sooretamensis* Queiroz and Deharveng, 2008. Brazil  
9'. Tibiotarsi with 3 tenent hairs each, unguis without teeth . . . . . *P. oceanica* (Yosii, 1960) New Caledonia

\*We excluded *P. norvegica* Fjellberg, 2010 from the key because it does not fit completely in the genus, as it does not have elongated mucro and the position of the sensorial elements of Ant. III, do not correspond to the diagnosis.

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