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A new species of Lohmannia (Acari: Oribatei: Lohmanniidae) from mangroves at Quintana Roo (Mexico)

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ABSTRACT — A new species of Lohmannia, L. maya n. sp., from mangrove soils in Mexico is described and illustrated. It is morphologically similar to L. similis Balogh, 1962, L. jornoti Mahunka, 1985 and L. lanceolata Grandjean, 1950 but differs from these species in having lateral and posterior setae wide in their proximal half and thin in their distal half, ending in a sharp tip, and a continuous notogastral band S8. It also has a smaller body size (727 µm) compared with the three aforementioned species (790, 810 and 840 µm respectively). The 11 species of the genus Lohmannia recorded from the Americas were compared, a key for them is included, and some ecological notes for the new species are also provided.

KEYWORDS — mites; taxonomy; mangrove fauna; key; Mexico

ZOOBANK — 2A1BAC59-9B03-438A-8C9C-02E66EEDDD00

INTRODUCTION

Data on taxonomy and ecology of oribatid mites from Mexico have been increasing in the last two decades (Palacios-Vargas & Iglesias, 2004) and ecological contributions have been published recently (García et al. 2014). Six genera of the family Lohmanniidae are known from Mexico, among which the genus Lohmannia is represented by three recorded species: L. banksi Norton et al., 1978 from Veracruz, Campeche and Hidalgo states; L. juliae Mahunka, 1984 from Veracruz and L. lanceolata Grandjean, 1950 from Quintana Roo (Vázquez, 2001).

Much later after the review of the Lohmanniidae by Granjean (1950), that of Sengbusch (1984) included the description of a new species from Micronesia and a comparison with most of the known taxa belonging to the genus Lohmannia. Recently, Norton and Ermilov (2014) did a historical review of immature oribatids where they include members of Lohmannia.

Lohmannia is a Cosmopolitan genus with 27 species, including two subgenera, Lohmannia (Lohmannia) and Lohmannia (Carolohmannia), as well as two subspecies, Lohmannia (L.) javana javana Balogh, 1961 and Lohmannia (L.) javana interrupta Choi, 1985 (Subías, 2004, online version 2016) but few have been recorded from the Americas until now.

From the United States of America, L. texanus Banks, 1910; L. (Carolohmannia) carolensis Norton et al., 1978; and L. banksi Norton et al., 1978 were described, the latter species occurs also in Mexico. From the Antilles (Marie-Galante, Guade-
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Loupe), L. jurnoti Mahunka, 1985 was described, there are records of L. lanceolata Grandjean, 1950 from Panama and Peru. From South America, L. bifoliata Willmann, 1936 from Curaçao and part of the Antilles; L. juliae Mahunka, 1984 from Paraguay and L. (lanceolata) turcmenica Bulanova Zachvatkina, 1960 from Argentina are known. Lohmannia vulcania Schatz, 1993 was described from the Galapagos Islands and L. similis Balogh, 1962 was recorded from Peru and the Galapagos Islands.

In this contribution we describe a new species of Lohmannia from Mexico and a key for those known from the Americas is provided and some new ecological data for the new taxon is given.

MATERIALS AND METHODS

Mites were collected from mangrove soil and litter samples from Chetumal Island and fixed in 75% ethanol. Only 34 specimens of Lohmannia were found, and some were mounted under smooth slides in Hoyer’s solution and other were kept in 75% ethanol. Four specimens were dissected and mounted. Observations and measurements were undertaken under a phase-contrast Carl Zeiss microscope Axiostar plus and drawings were done with the aid of a “camera lucida”. In the description, all body measurements are in micrometers (µm) and indicated between parentheses after each morphological character. Setal nomenclature follows those of Grandjean (1950) and Norton (1977).

RESULTS

Description of species

Lohmannia maya n. sp.
(Figures 1-3)

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Diagnosis — Body length (n = 10) 727 (690–751), width 342 (320–358). Color light to medium brown. Lohmannia maya n. sp. differs from its congeners by the combination of smallest size; body surface homogeneously finely punctated; evenly covered with fine spots; posterior exopseudostigmatic setae (exp) dilated but elongated, about twice as long as its width; transverse bands S3 – S7 and S8 medially interrupted; all prodorsal and all 16 pairs of gastronomic setae phylliform, with serrated margins; setae p1 and p2 of different length and width, setae p1 directed dorsal; 2 pairs of subcapitular setae phylliform; epimeral setae strongly dilated; all medial genital setae setiform and smooth, lateral setae dilated and ciliate; all anal setal phylliform and slightly ciliate; legs with 2 kind of setae, setiform and ciliate, and broadly phylliform with serrated margins.

Type-specimen — Holotype (length: 740; width: 347) female mounted on slide and deposited in the acarological collection of Laboratorio de Ecología y Sistemática de Microartrópodos, Facultad de Ciencias, UNAM, Mexico. Original label 04/sep/2011, ex mangrove litter on littoral marine, A. García col.

Paratypes — All specimens are females, 15 on slide and 18 stored in 75% ethanol. Original labels. 04/sep/2011, ex mangrove litter of littoral marine sand, A. García col. All the material will be deposited in the acarological collection of Laboratorio de Ecología y Sistemática de Microartrópodos, Facultad de Ciencias, UNAM.

Prodorsum — (Figure 1A) slightly elongated, anterior part wide, almost membranous. Lateral margin weakly bisinuate anterior to setae exa. Transverse band Sb between interlamellar setae distinct, straight, clearly situated anterior to gastronomic tectum.

Setae ro slightly phylliform, with serrated margins, length 105 (86–111), with sharp tip, reaching anteriad of the rostrum. Setae le 94 (81–101), similar to ro but shorter; setae exa phylliform, with serrated margins, 48 (39–64); setae exp dilated and elongated, about twice long its width, 47 (42–53), with serrated margins and finely spinose surface (Figures 1A, D). Sensillus (ss) with 11 branches, distally increasing in length 91 (81–99), with four to six small spines opposite to branches (Figure 1A, D). Setae in 95 (83–104), phylliform with serrated margins.

Notogaster — (Figure 1A) Lateral margins parallel in anterior half, posteriorly rounded. Transverse bands weekly developed, bands S3 – S7 and S8 incomplete and interrupted medially; S6 incomplete
**Figure 1:** *Lohmannia maya* n. sp.♀: A – dorsal chaetotaxy; B – ventral chaetotaxy; C – subcapitulum setae; D – prodorsal setae: *ss* = sensillus, *exp* = posterior exopseudostigmatic, *exa* = anterior exopseudostigmatic, *ro* = rostral, *le* = lamelar.
on each side. Band S₈ complete. Lyrifissures hardly discernible: ia located laterally, at the level epimeral setae 3c; im located dorsally, next setae e₂; ip laterally, in the middle part of notogaster; ips ventrally, next to preanal plate and ih between setae h₃ and p₃ (Figures 1A-B).

Sixteen pairs of gastronomic setae present, all phylliform, with serrated margins. Setae of inner rows c₁, c₂, d₁, d₂, e₁, shorter and thinner than those of margins. Setae p₁ strongly dilated, constantly erected dorsally; making it much shorter than p₂ in dorsal aspect (Figure 1A-B). Measurements of setae (n=10): c₁ 60 (47-72), c₂ 74 (62-91), c₃ 105 (94-120), d₁ 62 (47-74), d₂ 66 (49-76), d₃ 103 (89-114), e₁ 67 (49-81), e₂ 73 (64-81), f₁ 89 (72-101), f₂ 95 (76-104), h₁ 103 (79-111), h₂ 90 (76-106), h₃ 105 (91-114), p₁ 70 (59-77), p₂ 107 (94-116), p₃ 105 (94-111).

Ventral region (Figure 1B-C)

Gnathosoma — Chelicerae and palps are very similar in appearance to those of L. lanceolata Grandjean, 1950. Subcapitulum with setae h (29) phylliform, strongly dilated with serrated margins, m₃ (37) longer and thinner than h and both setae have spiculate surface, setae m₁ (42) setiform and slightly ciliate, setae a (50) setiform and smooth. Three pairs of adoral setae, o₁ (26) more or less triangular; o₂ (40) long, setiform, thick and smooth; o₃ (33) setiform, smooth and pointed, shorter than o₁ (Figure 2A). Palptarsus with solenidion longer than segment (Figure 2B). Cheliceral setae chb (43), long, setiform, slightly serrated; seta cha (5) very short and thin (Figure 2C).

Epimeral region — Apodeme 1 complete, with two sternal extensions medially; apodeme II incomplete medially; apodeme III complete with short central extension directed posteriorly; apodeme IV complete, uniform. Epimeral formula: 3-1-3-4, all setae strongly dilated with spiculate surface; setae of median row (1a to 4a) shorter and smaller than those of the lateral rows.

Anogenital region — Genital region with 6 pairs of medial setiform and smooth setae, 4 pairs of lateral setae phylliform and ciliate. The anterior lateral setae inserted close to median row. Measurements of setae: Medial g₁ = 27, g₂ = 27, g₃ = 27, g₄ = 32, g₅ = 32, g₆ = 30; lateral g₁ = 32, g₂ = 32, g₃ = 35, g₄ = 37.

Preanal plate wide, width equal to that of genital plate. Adanal setae phylliform with serrated margins tapering distally. The 4th pair of adanal setae slightly thinner. Measurements of setae: ad₁ = 79, ad₂ = 81, ad₃ = 81, ad₄ = 79. Anal setae setiform and smooth; the second pair of anal setae reaching the insertion first pair. Measurements of anal setae: a₁ = 49, a₂ = 59. One additional adanal seta was observed in one specimen.

Legs — (Figure 3A-D). All legs monodactylous, short and stout. Femora I and II with ventral ridge. Claws without any ventral tooth. Legs of adults with two different kinds of setae: wide phylliform with serrate margins and spiculate surface, setiform and ciliate. Setal formulae of adult legs from trochanter to tarsus (solenidia between parenthesis) as follows: leg I 1-5-3(2)-5(1)-15(2+); leg II 0-6-3(1)-4(1)-13(1); leg III 2-3-2(1)-3(1)-12, leg IV 2-3-2(1)-2-12 (Figure 3A-D, Table 1).


Etymology — The species is named after the Maya region, the area where it was found.

Distribution — Known only from the type locality, at Cozumel, Quintana Roo, México.

Ecology — It seems that species of this genus are quite well adapted to salinity, as several specimens of L. similis Balogh, 1962 were collected from mangrove in Bermuda Islands (Schatz & Schuster, 2012) and Galápagos (Schatz, 1993), L. jornoti Mahunka, 1985 described from Marie-Galante (Antilles), was collected from the beach pebbles and L. maya n. sp. comes from Laguna Chuc Chacaab, Cozumel, Quintana Roo, in mangrove litter close to marine littoral where A. germinans tree was dominant. It may be a quite rare species as it was only found in three of the four months sampled: March, September and November but not in April. Relative humidity was 59 and 91 % during dry and rainy season, respectively. Temperature was 29.69 – 24.67 °C at noon; soil salinity was 36.8 – 32.3 %, while pH very alkaline (7.5-8.7). A total of 200 samples were col-
Figure 2: Lohmannia maya n. sp. ♀: A – subcapitulum; B – Palp; C – chelicera.
Figure 3: *Lohmannia maya* n. sp. ♀: A – chaetotaxy of first leg; B – chaetotaxy of second leg; C – chaetotaxy of third leg; D – chaetotaxy of fourth leg.
llected and processed using by Berlese funnels. Only 34 specimens of Lohmannia were found, which represent a very low percentage among the Oribatid mites (García et al. 2014).

**Remarks** — Schatz (1993) made a comparison of several neotropical species from the “lanceolate” group and studied the variation of specimens of L. lanceolata from two localities: Peru and Galapagos Islands. Lohmannia maya n. sp. is very close to L. lanceolata Grandjean, L. jornoti Mahunka, and L. similis Balogh, as they share the following characteristics: they have similar shape and length of rostral setae, lateral margins of notogaster in the anterior portion are parallel; both, rostral setae and marginal setae on notogaster are phylliform; however, these last setae are very thin on the second half of notogaster of the new species. Differences to other species are that the length of setae exp in L. maya n. sp. is twice its width, lateral setae of notogaster are wider and bent at the proximal half and are very thin in distal half; first half of setae p₁ is wide and thin at the end, the band S₃ is continuous; from subcapitulum, seta m₂ is setiform and thinner than seta h, besides that the new species is the smallest in length among all Lohmannia known from Americas (table 2). Also, other members that occur in Americas are compared in table 2 and a key to the Lohmannia species from Americas is presented herein.

**Key to the American species of Lohmannia**

1. Setae exp dilated, almost circular or elongated; gastronomic setae phylliform or dilated; two pairs of anal setae ........................................ 2
   — Setae exp phylliform with serrate margin; all gastronomic setae elongated, flattened and serrate; a single pair of anal setae. Maximum length: 1025 μm; maximum width: 631μm ........................................ 6

2. Setae exp dilated but elongated ........................ 3
   — Setae exp, almost circular .................................. 5

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**Table 1: Leg formula of Lohmannia maya n. sp. (Phylliform setae are noted in bold).**

<table>
<thead>
<tr>
<th>Trochanter</th>
<th>Femur</th>
<th>Genua</th>
<th>Tibia</th>
<th>Tarsus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leg I</td>
<td>-</td>
<td>d, b, l, l', l'', v''</td>
<td>d, l', l''</td>
<td>p''</td>
</tr>
<tr>
<td>Leg II</td>
<td>-</td>
<td>d l', l'', p''</td>
<td>d, l', l''</td>
<td>o''</td>
</tr>
<tr>
<td>Leg III</td>
<td>v', l'</td>
<td>d, ev', l'</td>
<td>d, l', v'</td>
<td>o'</td>
</tr>
<tr>
<td>Leg IV</td>
<td>v', l'</td>
<td>d, ev', l'</td>
<td>d, l', v'</td>
<td>o'</td>
</tr>
</tbody>
</table>

**Table 2: Comparison of species of Lohmannia occurring in America.**

<table>
<thead>
<tr>
<th>Prodorsal setae</th>
<th>Gastronomic setae</th>
<th>Subcapitulum setae</th>
<th>Genital setae</th>
<th>Anal and Adanal setae</th>
<th>Dimensions (μm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ro</td>
<td>le</td>
<td>exu</td>
<td>exp</td>
<td>ss</td>
<td>in</td>
</tr>
<tr>
<td>L. banksi Norton et al., 1978</td>
<td>II</td>
<td>II</td>
<td>V</td>
<td>VIII</td>
<td>II</td>
</tr>
<tr>
<td>L. juliae Mahunka, 1984</td>
<td>II</td>
<td>II</td>
<td>V</td>
<td>VIII</td>
<td>II</td>
</tr>
<tr>
<td>L. lanceolata Grandjean, 1950</td>
<td>II</td>
<td>II</td>
<td>V</td>
<td>VIII</td>
<td>II</td>
</tr>
<tr>
<td>L. similis Balogh, 1962</td>
<td>II</td>
<td>II</td>
<td>VII</td>
<td>VIII</td>
<td>II</td>
</tr>
<tr>
<td>L. jornoti Mahunka, 1985</td>
<td>II</td>
<td>II</td>
<td>V</td>
<td>VIII</td>
<td>II</td>
</tr>
<tr>
<td>L. vulcania Schatz, 1993</td>
<td>II</td>
<td>II</td>
<td>V</td>
<td>VIII</td>
<td>II</td>
</tr>
<tr>
<td>L. (Carolohmannia) carolensis Norton et al., 1978</td>
<td>IV</td>
<td>IV</td>
<td>II</td>
<td>VI</td>
<td>VIII</td>
</tr>
<tr>
<td>L. maya n. sp.</td>
<td>II</td>
<td>II</td>
<td>VII</td>
<td>VIII</td>
<td>I</td>
</tr>
<tr>
<td>L. bifoliata Willmann, 1936</td>
<td>II</td>
<td>II</td>
<td>VII</td>
<td>VIII</td>
<td>II</td>
</tr>
<tr>
<td>L. (lanceolata) tararauna Paula Benevides, 1960</td>
<td>II</td>
<td>II</td>
<td>V</td>
<td>VIII</td>
<td>II</td>
</tr>
<tr>
<td>L. iraminia Banks, 1910</td>
<td>IX</td>
<td>IX</td>
<td>V</td>
<td>III</td>
<td>IX</td>
</tr>
</tbody>
</table>

Explanation of symbols:
| l= | Setiform and ciliate; II= | phylliform with margin ciliate; III= | setiform and smooth; IV= | elongated, flattened; V= | dilated, almost circular; VI= | lanceolate and ciliate; VII= | dilated and elongated; VIII= | pectinate; IV= | Phylliform, broad. Information from original descriptions. |
3. Setae ro much longer than le; setae in reaching insertion of setae c1. 4
— Setae ro only slightly longer than le; setae in reaching insertion setae c1. Maximum length: 751 µm; maximum width: 351 µm. L. maya n. sp. Mexico

4. Setae p1 phylliform and straight; marginal setae of notogaster sparsely ciliate. Maximum length: 930 µm; maximum width: 390 µm. L. similis Balogh, 1962 Peru, Galápagos Islands
— Setae p1 phylliform and curved; marginal setae of notogaster unilaterally densely ciliate. Maximum length: 840 µm; maximum width: 405 µm. L. bifoliata Willmann, 1936. Curaçao

5. All gastronotic setae broadly dilate. 6
— All gastronotic setae phylliform. 7

6. With grooves running longitudinally on prodorsum; sensillus bristle-shape; setae le as long as ro. Maximum length: 400 µm. L. texanus Banks, 1910 U.S.A.
— Without grooves on prodorsum; sensillus pectinate; setae le shorter than ro. Maximum length: 886 µm; maximum width: 443 µm. L. banksi Norton et al., 1978 U.S.A., Mexico

7. Setae p1 phylliform and narrow. 8
— Setae p1 phylliform but dilate. 9

8. Setae le longer than ro; gastronotic median setae phylliform, long and narrow. Maximum length: 880 µm. L. lanceolata Grandjean, 1950 Panama, Peru
— Setae le shorter than ro; gastronotic median setae phylliform, short and dilated. Maximum length: 898 µm; maximum width: 422 µm. L. juliae Mahunka, 1984 Paraguay

9. Anal setae 2 no reaching insertion anal setae 1. 10
— Anal setae 2 reaching insertion anal setae 1. Maximum length: 826 µm; maximum width: 410 µm. L. jornati Mahunka, 1985 Antilles (Marie-Galante, Guadeloupe)

10. Solenidia of tibia I not so long, less long than the leg; setae le strongly phylliform, with serrated margins, curved, slightly funnel-shaped. Maximum length: 1125 µm; maximum width: 500 µm. L. vulcania Schatz, 1993 Galápagos Islands
— Solenidia of tibia I very long, longer than leg; setae le narrowly phylliform. Maximum length: 800 µm; maximum width: 440 µm. L. (lanceolata) turcmenica Bulanova-Zachvatkina, 1960 Argentina

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