



## New species of predatory mites (Acari: Prostigmata: Cunaxidae) for southern Brazil

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### Abstract

Two new species of Cunaxidae, *Cunaxoides lajeadensis* Wurlitzer & Monjarás-Barrera **sp. nov.** and *Lupaeus waldumirus* Wurlitzer & Monjarás-Barrera **sp. nov.**, are described from *Ipomoea alba* L. (Convolvulaceae) on the edge of an urban forest fragment.

**Key words:** *Cunaxoides*, forest fragment, *Ipomoea alba*, *Lupaeus*

### Introduction

Cunaxidae are predators that occupy numerous habitats, among them soil, litter, stored products, agricultural crops, and synanthropic habitats (Bashir 2009; Skvarla *et al.* 2014). Eight species have been described from Brazil's South Region: *Rubroscirus nidorum* Ferla & Rocha, 2012; *Scutopalus tomentosus* Rocha, Skvarla, & Ferla, 2013; *Neocunaxoides promatae* Rocha, Rodrigues & Ferla 2015; *Bonzia flechtmani* Rocha, Rodrigues & Ferla 2015; *Dactyloscirus multiscutus* Rocha, Rodrigues & Ferla 2015; *Denheyernaxoides americanus* Rocha, Da-Costa & Ferla, 2016; *Armascirus raulzito* Rocha & Argolo 2017 and *Scutopalus acaraje* Rocha & Argolo 2017 (Ferla & Rocha 2012; Rocha *et al.* 2013, 2015, 2016, 2017).

The genera *Cunaxoides* Baker & Hoffmann, 1948 and *Lupaeus* Castro & Den Heyer, 2009 belong to Cunaxoidea, which is defined by having their pedipalps divided into three segments (Skvarla *et al.* 2014). The genus *Cunaxoides* includes 26 species (Den Heyer *et al.* 2013; Skvarla *et al.* 2014; Ripka *et al.* 2015; Bagheri *et al.* 2016; Skvarla & Dowling 2019) while *Lupaeus* is represented by 28 species (Skvarla *et al.* 2014; Paktinat-Saeij *et al.* 2016a; Corpuz-Raros *et al.* 2019; Skvarla & Dowling 2019). In Brazil, no species of the genus *Cunaxoides* have hitherto been found, while *L. martini* (Den Heyer, 1979); *L. clarae* (Den Heyer, 1979) and *L. lobidorsalis* Castro & Den Heyer, 2009 (Skvarla *et al.* 2014) have been reported for *Lupaeus*.

In this article, we describe the first species belonging to the genus *Cunaxoides* for Brazil and one species of the genus *Lupaeus*, both collected in Rio Grande do Sul, Brazil.

### Material and methods

The mites were collected from the leaves of tropical white morning-glory, *Ipomoea alba* L. (Convolvulaceae), from the edge of an urban forest fragment in the city of Lajeado, Rio Grande do Sul, Brazil (29°26'13''S, 51°57'43''W). The leaves were collected and deposited in plastic bags and kept in a Styrofoam box with Gelox® to maintain a low temperature. The mites were observed using a stereomicroscope (Zeiss Stemi 305) and mounted on microscope

slides in Hoyer's medium (Zhang 2003). The slides were kept in an oven at an average temperature of 50–60 °C for approximately eight days, for drying, fixation and clarification of the specimens.

The images were recorded using a fluorescence stereo zoom microscope (Zeiss Axio Zoom.V16). Morphological details were observed under a phase contrast optical microscope (Zeiss Imager Z2). The drawings were illustrated with the help of Clear camera (Leica—DMLS) and Corel Draw X8® software.

Nomenclature and abbreviations of leg: attenuate solenidion (*asl*); blunt rod-like solenidion (*bsl*); setae between () indicate duplex; terminal solenidion (*tsl*); dorsoterminal solenidion (*dtsl*); simple tactile seta (*sts*); trichobothrium (*T*); small blunt rod-like solenidion (*sbsl*) (Mejía-Recamier & Palacios-Vargas 2007; Den Heyer *et al.* 2013; Skvarla *et al.* 2014). Prodorsal setae: posterior trichobothria (*pt*), anterior trichobothria (*at*), median proterosomal setae (*mps*), lateral proterosomal setae (*lps*), famulus (*fam*) (Fisher *et al.* 2011, Bagheri *et al.* 2016). Hysterosomal setae: internal humerals ( $c_1$ ), external humerals ( $c_2$ ), internal dorsals ( $d_1$ ), internal lumbals ( $e_1$ ), internal sacrals ( $f_1$ ), external sacrals ( $f_2$ ), internal clunals ( $h_1$ ), external clunals ( $h_2$ ). Anal region: postanals (*ps*); genital region: genital setae (*g*) aggenital setae (*ag*). Hypognathal setae (*hg*) (Den Heyer & Castro 2008a). Measurements are given in micrometers ( $\mu\text{m}$ ), with averages in bold and minimum-maximum in parentheses.

All activities were carried out at the Laboratory of Acarology of the Universidade do Vale do Taquari—Univates, Lajeado, Rio Grande do Sul state, Brazil.

## Systematics

### Cunaxidae Thor, 1902

#### Cunaxoidinae Den Heyer, 1978

#### *Cunaxoides* Baker & Hoffmann, 1948

#### *Cunaxoides lajeadensis* Wurlitzer & Monjarás-Barrera sp. nov.

(Figures 1–8A)

**Description.** *Female* (n = 6). Idiosoma length **299** (250–355); idiosoma width **182** (163–210)

*Dorsum* (Fig. 1A–2A). Length and width of dorsal proterosomal shield: **71** (66–75); **73** (67–80), propodosomal region with dotted striations forming a subrectangular “shield” bearing setae *lps*, *mps* and sensilla (*pt* and *at*). Hysterosomal region with a “shield-like” area defined by surrounding striations, showing setae  $c_1$ ,  $c_2$ ,  $d_1$  and  $e_1$ . Holotype with proterosomal and hysterosomal regions forming a “fosse” between setae (*pt-mps*) and ( $c_1-c_2$ ). Lyrifissures *im* located between setae  $e_1$  and  $f_1$ . Setal lengths as follows: *at* **64** (57–70), *pt* **69** (65–75), *lps* **17** (10–22), *mps* **22** (20–24),  $c_1$  **18** (15–25),  $c_2$  **11** (10–13),  $d_1$  **19** (17–23),  $e_1$  **21** (18–25),  $f_1$  **23** (20–25),  $h_1$  **22** (18–25). Distance between setae: *at-at* **17** (15–20), *at-lps* **33** (29–35), *lps-lps* **57** (53–63), *pt-pt* **66** (62–72), *pt-mps* **10** (8–10), *mps-mps* **48** (45–55), *mps-c<sub>1</sub>* **28** (17–35),  $c_1-c_1$  **44** (39–50),  $d_1-d_1$  **43** (39–46),  $e_1-e_1$  **43** (42–45),  $f_1-f_1$  **48** (40–60),  $h_1-h_1$  **33** (31–35).

*Venter* (Fig. 1B). Ventral shield absent and genital shield recognizable. Integument with a pair of propodogastral setae, three pairs of hystergastral setae and one pair of paragenital setae, near hystergastral setae. Genital papillae and setae ( $g_1-g_4$ ) arranged longitudinally. Length of genital setae:  $g_1$  **10** (9–13),  $g_2$  **9** (8–10),  $g_3$  **13** (10–16),  $g_4$  **19** (15–25).

*Gnathosoma* (Figs. 3A–B). Subcapitulum: Length **88** (85–90), width **65** (60–72), with the presence of four pairs of setae,  $hg_1$  **11** (10–12),  $hg_2$  **17** (15–20),  $hg_3$  **21** (20–25),  $hg_4$  **13** (10–15). Distance between setae:  $hg_1-hg_1$  **6** (5–7),  $hg_2-hg_2$  **8** (6–10),  $hg_3-hg_3$  **36** (37–47),  $hg_4-hg_4$  **23** (20–25),  $hg_1-hg_3$  **24** (22–25),  $hg_2-hg_4$  **37** (34–42),  $hg_1-hg_2$  **18** (16–22). Posterior ventral region of subcapitulum with longitudinal striation (Fig. 2A). Palp **54** (48–59), divided into three segments; trochanter without setae; femorogenu with five *sts*; tibiotarsus with five *sts*, a terminal solenidion and a terminal claw. Length of chelicerae **82** (73–82) (Fig. 3B).

*Legs* (Figs. 4A–D). Length of legs I–IV: **182** (175–193); **165** (150–182); **174** (165–188); **199** (188–213). Length of tarsi I–IV: **58** (55–68); **51** (45–57); **51** (48–55); **53** (49–58). Chaetotaxy: coxae (Fig. 1B) I–IV, 3-1-3-3 *sts*; trochanters I–IV, 1 *sts*, 1 *sbsl*-1-2-1 *sts*; basifemora I–IV, 4-4-3-2 *sts*; telofemora I–IV, 4-4-3-2 *sts*; genua I–IV, 4 *asl*, 5 *sts*-2 *asl*, 5 *sts*, -1 *asl*, 5 *sts*-1 *asl*, 6 *sts*; tibiae I–IV, 6-6-5 *sts*, 1 *bsl*-4 *sts*, 1 *T*; tarsi I–IV: 2 *asl*, 1 *fam*, 16 *sts*, 2 *tsl*, 1 *dtsl*-2 *asl*, 1 *tsl*, 1 *dtsl* 14 *sts*-1 *asl*, 1 *tsl*, 1 *dtsl*, 10 *sts*-1 *asl*, 2 *tsl*, 8 *sts*.

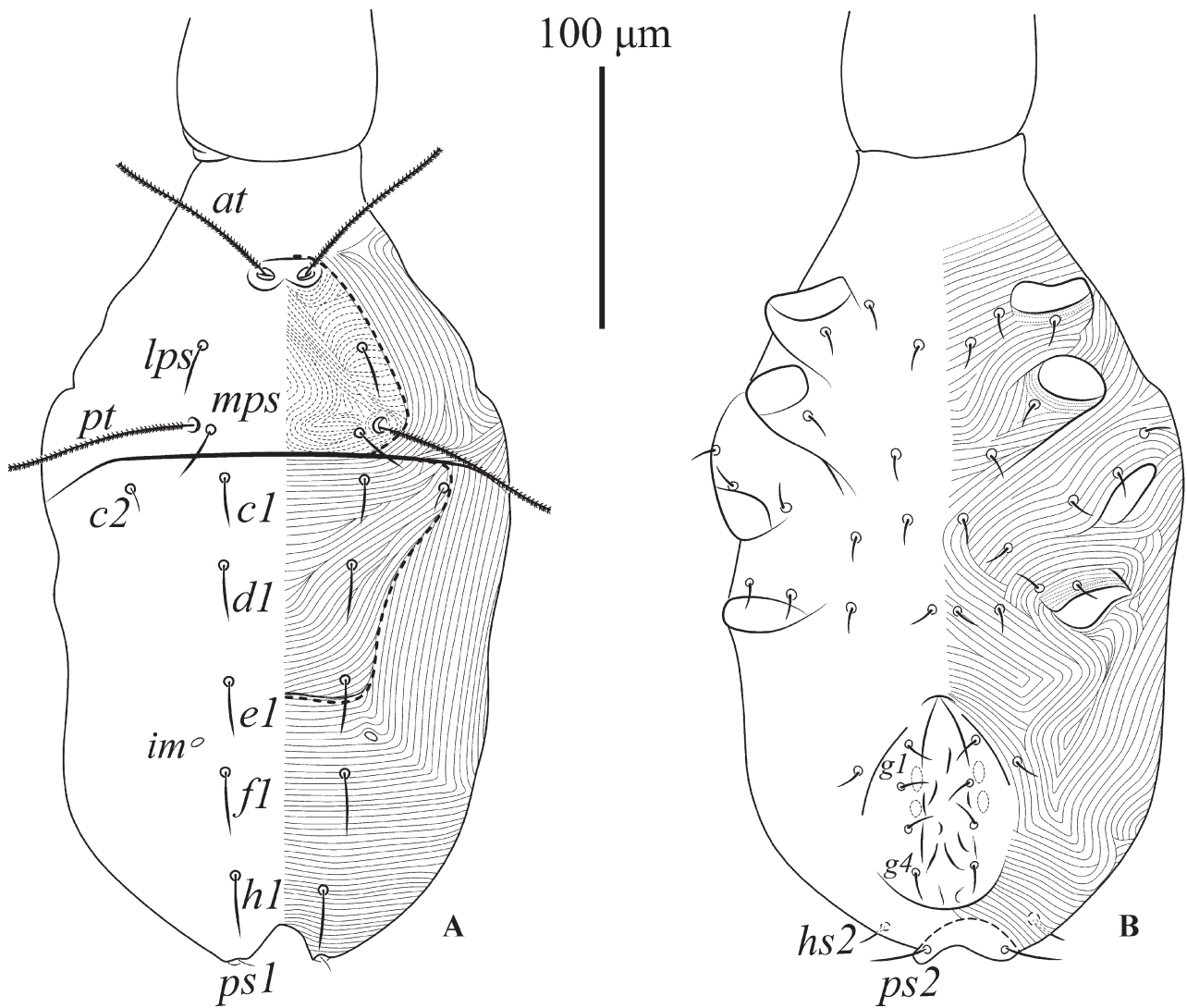


FIGURE 1. *Cunaxoides lajeadensis* sp. nov., female. (A) Dorsal and (B) ventral view of the idiosoma.

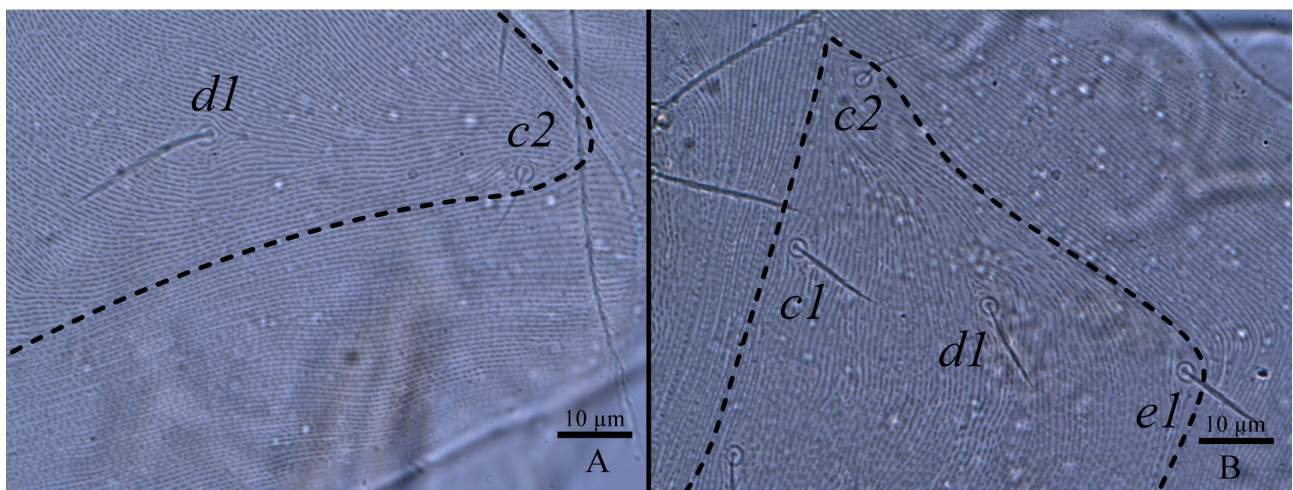


FIGURE 2. *Cunaxoides lajeadensis* sp. nov. (A) Female and (B) male dorsal view idiosoma.

*Male* (n = 3). Idiosoma length **222** (215–230); idiosoma width **136** (130–140).

*Dorsum* (Fig. 5A-2B) Length and width of dorsal proterosomal shield: **64** (60–67); **62** (60–65), length and width of hysterosomal shield. **60** (58–65); **68** (65–70). Length of legs I–IV: **156** (150–163); **139** (135–140); **155** (150–163); **174** (168–180). Propodosomal region with dotted striations forming a subrectangular “shield” showing

setae *lps*, *mps* and sensilla (*pt* and *at*). Hysterosomal region with a “shield-like” area defined by surrounding striation, shield bearing setae *c*<sub>1</sub>, *c*<sub>2</sub>, *d*<sub>1</sub> and *e*<sub>1</sub>. Lyrifissures *im* located between *e*<sub>1</sub> and *f*<sub>1</sub> setae. Length of dorsal setae: *at* 56 (55–58), *pt* 58 (55–65), *lps* 17 (15–19) *mps* 20 (17–23), *c*<sub>1</sub> 15 (14–15), *c*<sub>2</sub> 9 (8–10), *d*<sub>1</sub> 13 (12–13), *e*<sub>1</sub> 13 (12–14), *f*<sub>1</sub> 15 (10–17), *h*<sub>1</sub> 11 (10–13). Distance between setae *at-at* 15 (15–16), *at-lps* 30 (29–32), *lps-lps* 49 (48–52), *pt-pt* 57 (55–60), *pt-mps* 8 (8–9), *mps-mps* 39 (39–40), *mps-c*<sub>1</sub> 22 (20–25), *c*<sub>1-c</sub><sub>1</sub> 32 (30–35), *d*<sub>1-d</sub><sub>1</sub> 33 (31–35), *e*<sub>1-e</sub><sub>1</sub> 30 (28–31), *f*<sub>1-f</sub><sub>1</sub> 27 (26–28), *h*<sub>1-h</sub><sub>1</sub> 34 (32–35).

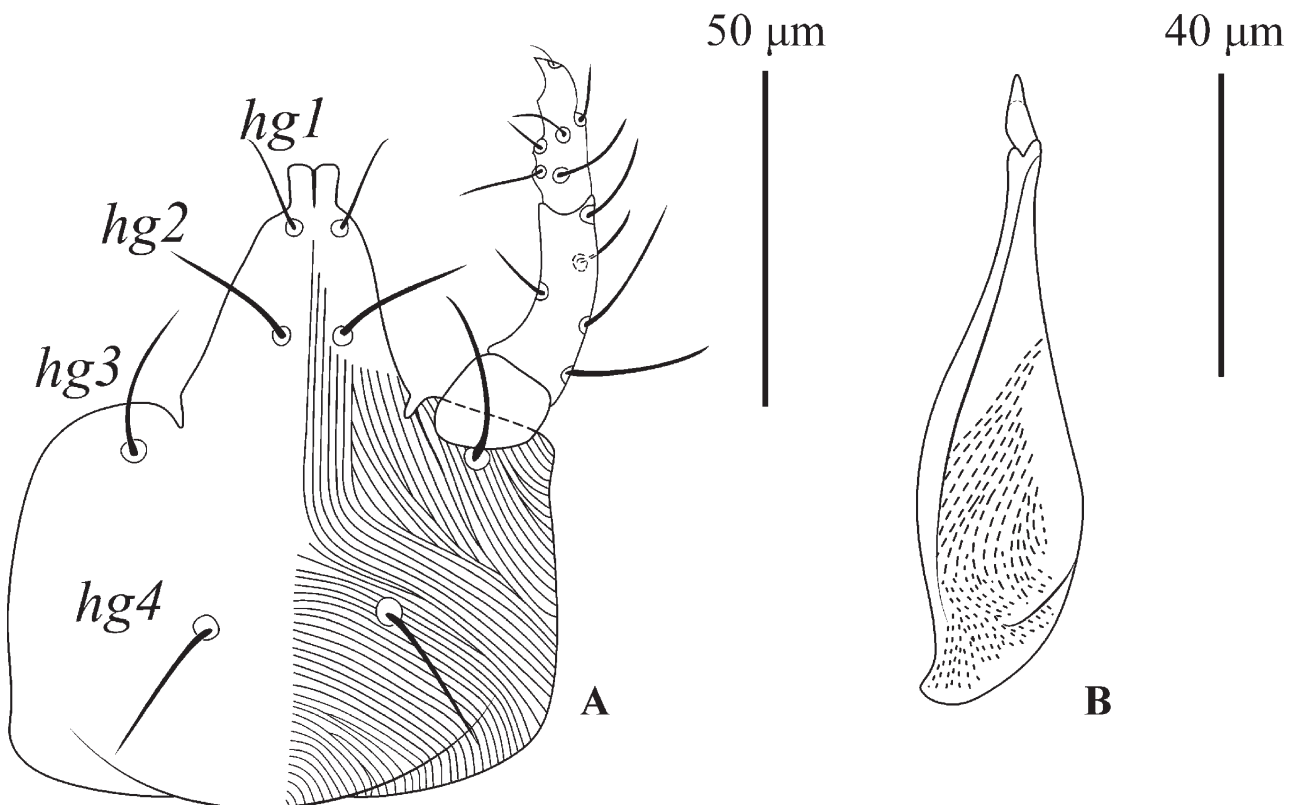
*Venter* (Fig. 4B). Ventral shield absent and genital shield recognizable. Integument with a pair of propodogastral setae, three pairs of hystergastral setae and one pair of paragenital setae, near hystergastral setae. Genital papillae and setae (*g*<sub>1</sub>-*g*<sub>4</sub>) with longitudinal directions. Length of genital setae: *g*<sub>1</sub> 5 (5-5), *g*<sub>2</sub> 5 (5-5), *g*<sub>3</sub> 4 (5-5), *g*<sub>4</sub> 5 (5-5).

*Gnathosoma*. Subcapitulum: Length 71 (70–74), width 44 (40–48), with four pairs of setae, *hg*<sub>1</sub> 9 (8–10), *hg*<sub>2</sub> 13 (10–15), *hg*<sub>3</sub> 18 (16–20), *hg*<sub>4</sub> 13 (11–15). Distance between setae: *hg*<sub>1</sub>-*hg*<sub>1</sub> 5 (4–5), *hg*<sub>2</sub>-*hg*<sub>2</sub> 6 (5–7), *hg*<sub>3</sub>-*hg*<sub>3</sub> 26 (38–39), *hg*<sub>4</sub>-*hg*<sub>4</sub> 20 (19–21), *hg*<sub>4</sub>-*hg*<sub>3</sub> 20 (19–20), *hg*<sub>2</sub>-*hg*<sub>4</sub> 30 (28–32), *hg*<sub>1</sub>-*hg*<sub>2</sub> 12 (9–15). Posterior ventral region of subcapitulum with longitudinal striation. Palp 43 (42–45), divided into three segments; trochanter without setae; femorogenu with five *sts*; and tibiotarsus with five *sts*, a terminal solenidion and a terminal claw. Length of chelicerae 68 (65–72).

*Legs* (Figs. 6A–D). Chaetotaxy: coxae (Fig 2) I–IV, 3-1-3-2 *sts*; trochanter I–IV, 1-1-2-1 *sts*; basifemora I–IV, 3-3-2-1 *sts*; telofemora I–IV, 4-4-3-2 *sts*; genua I–IV, 3 *asl*, 5 *sts*-2 *asl*, 5 *sts*-2 *asl*, 5 *sts*-2 *asl*, 5 *sts*; tibiae I–IV, 6 *sts*, 1 *asl*-6 *sts*-5 *sts*, 1 *bsl*-1 *T*, 4 *sts*; tarsi I–IV: 2 *asl*, 1 *fam*, 16 *sts*, 2 *tsl*, 1 *dtsl*-1 *asl*, 11 *sts*, 2 *tsl*-1 *asl*, 8 *sts*, 2 *tsl*-1 *asl*, 7 *sts*, 1 *tsl*, 1 *dtsl*.

*Tritonymph* (male) (n = 1). Idiosoma length 200; idiosoma width 125.

*Dorsum* (Fig. 7) Length and width of dorsal proterosomal shield: 55; 55, length and width of hysterosomal shield. 65; 45. Length of legs I–IV: 130; 112; 137; 142. Propodosomal region with dotted striations forming a subrectangular “shield” showing setae *lps*, *mps* and sensilla (*pt* and *at*). Hysterosomal region with a “shield-like” area defined by surrounding striation, shield bearing setae *c*<sub>1</sub>, *c*<sub>2</sub>, *d*<sub>1</sub> and *e*<sub>1</sub>. Lyrifissures *im* located between *e*<sub>1</sub> and *f*<sub>1</sub> setae. Length of dorsal setae: *at* 54, *pt* 55, *lps* 13, *mps* 15, *c*<sub>1</sub> 13, *c*<sub>2</sub> 9, *d*<sub>1</sub> 13, *e*<sub>1</sub> 11, *f*<sub>1</sub> 14, *h*<sub>1</sub> 10. Distance between setae *at-at* 15, *at-lps* 27, *lps-lps* 46, *pt-pt* 55, *pt-mps* 7, *mps-mps* 42, *mps-cl* 20, *cl-cl* 33, *d*<sub>1-d</sub><sub>1</sub> 33, *e*<sub>1-e</sub><sub>1</sub> 31, *f*<sub>1-f</sub><sub>1</sub> 30, *h*<sub>1-h</sub><sub>1</sub> 21.



**FIGURE 3.** *Cunaxoides lajeadensis* sp. nov. female. Gnathosoma-A. Subcapitulum and palp ventral view; B. Dorsal view of the chelicera.

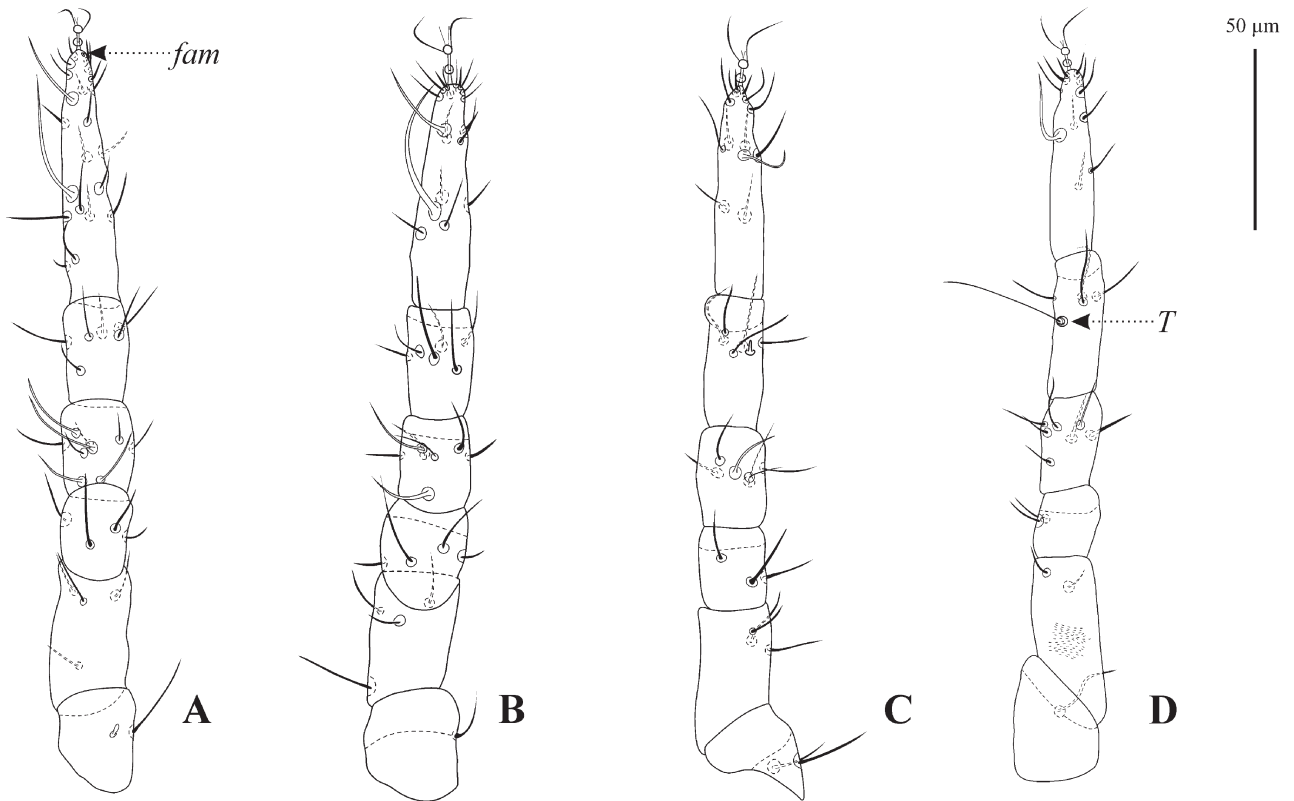


FIGURE 4. *Cunaxoides lajeadensis* sp. nov., female. A. Leg I; B. Leg II; C. Leg III; D. Leg IV.

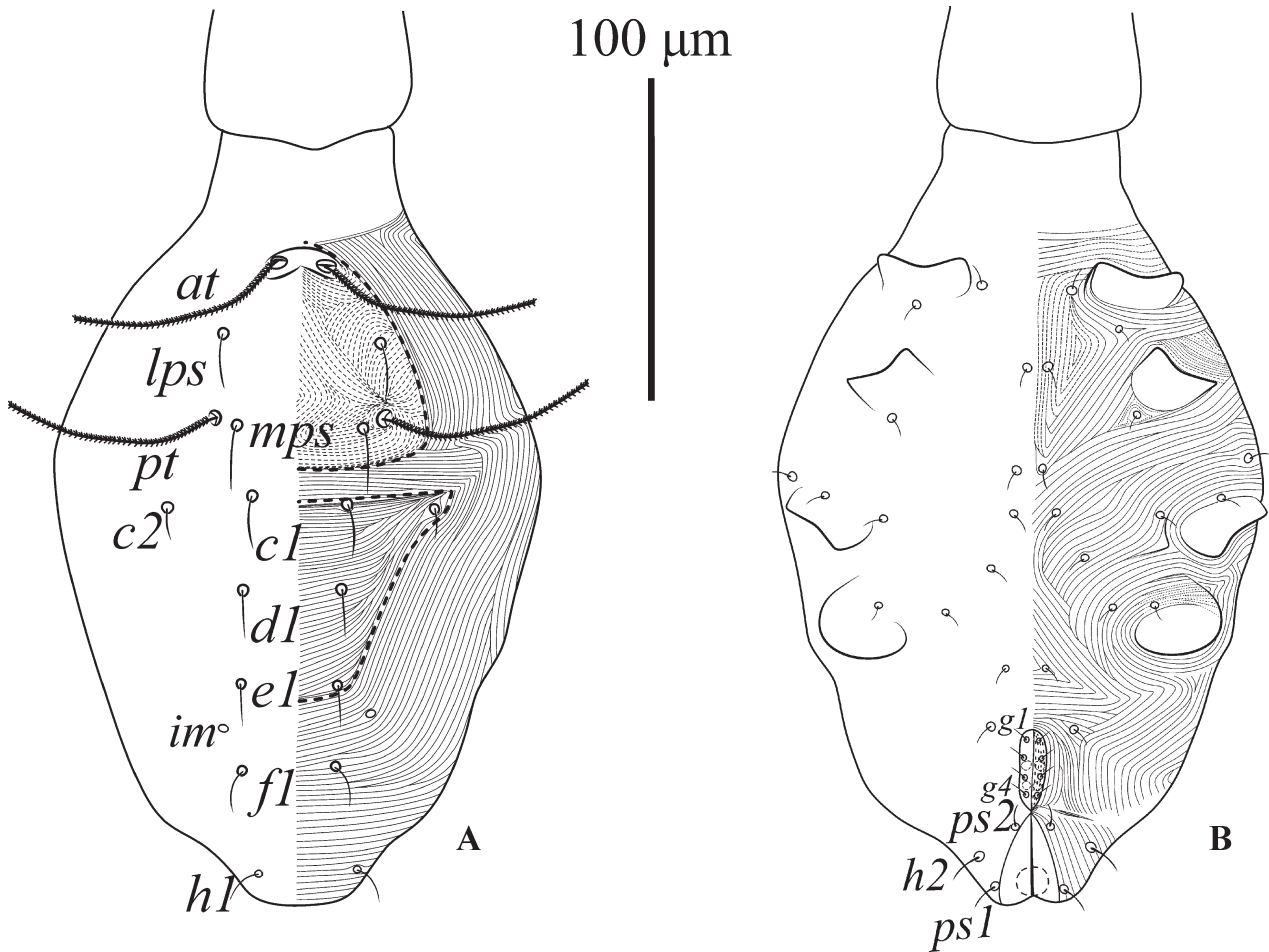


FIGURE 5. *Cunaxoides lajeadensis* sp. nov., male. (A) Dorsal and (B) ventral view of the idiosoma.

*Venter*. Ventral shield absent and genital shield recognizable. Integument with a pair of propodogastral setae, three pairs of hysteroastral setae and one pair of paragenital setae, near hysteroastral setae. Genital papillae and setae ( $g_1$ - $g_4$ ) with longitudinal directions. Length of genital setae:  $g_1$  5,  $g_2$  5,  $g_3$  5,  $g_4$  5.

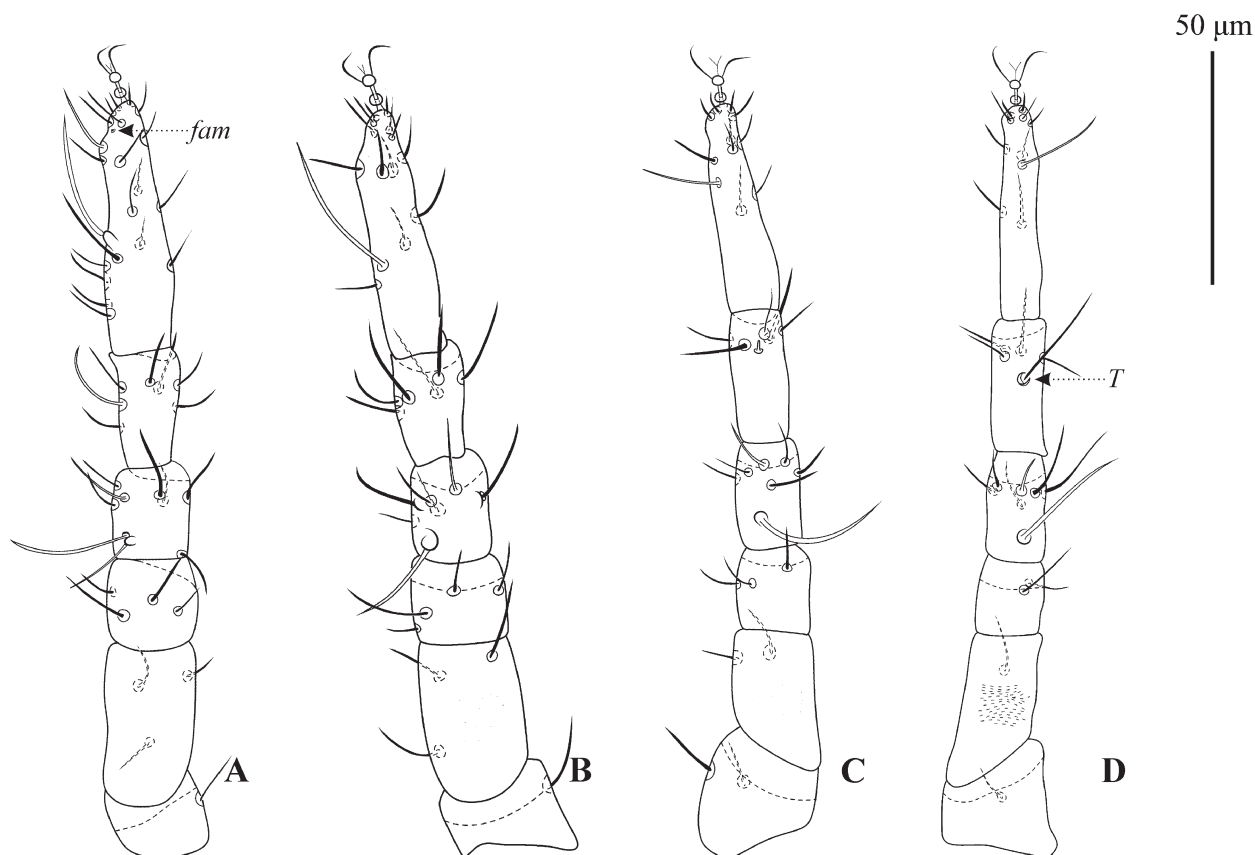
*Gnathosoma*. Subcapitulum: Length 65, width 48, with four pairs of setae,  $hg_1$  5,  $hg_2$  8,  $hg_3$  15,  $hg_4$  10. Distance between setae:  $hg_1$ - $hg_1$  5,  $hg_2$ - $hg_2$  7,  $hg_3$ - $hg_3$  34,  $hg_4$ - $hg_4$  18,  $hg_1$ - $hg_3$  25,  $hg_2$ - $hg_4$  30,  $hg_1$ - $hg_2$  12. Posterior ventral region of subcapitulum with longitudinal striation. Palp 32 (42-45), divided into three segments; trochanter without setae; femorogenu with five *sts*; and tibiotarsus with five *sts*, a terminal solenidion and a terminal claw. Length of chelicerae 63.

**Remarks.** The female and male were distinguished by the morphometry of the idiosoma and by the chaetotaxy of the legs, which have fewer setae on coxae IV, trochanter I, basifemora I-IV; genua I, III and IV; tibiae I; and tarsi II-IV. The tritonymph resembles the adult male by the chaetotaxy of the legs and the size of some structures. However, it differs by presenting a clear ecdysial line dorsally on the propodosoma (Fig. 7) (Den Heyer 2006; Castro & Den Heyer 2008b; Den Heyer & Castro 2009 and Paktinat-Saeij *et al.* 2016b). *Cunaxoides lajeadensis* Wurlitzer & Monjarás-Barrera **sp. nov.** has a faint orange color (Fig. 8A).

**Diagnosis.** *Cunaxoides lajeadensis* Wurlitzer & Monjarás-Barrera **sp. nov.** (female) resembles *Cunaxoides lootsi* Den Heyer, 2013, by presenting “shields” (propodosomal and hysterosomal) formed by striations of the idiosoma and the same chaetotaxy of coxae II, III and IV, trochanters II, III and IV, basifemora I-IV, telofemora I-IV, genua I-III, tibiae III and IV. Differences are presented in Table 1.

**Etymology.** The epithet is in homage to the city of Lajeado, Rio Grande do Sul, Brazil, where the species was found.

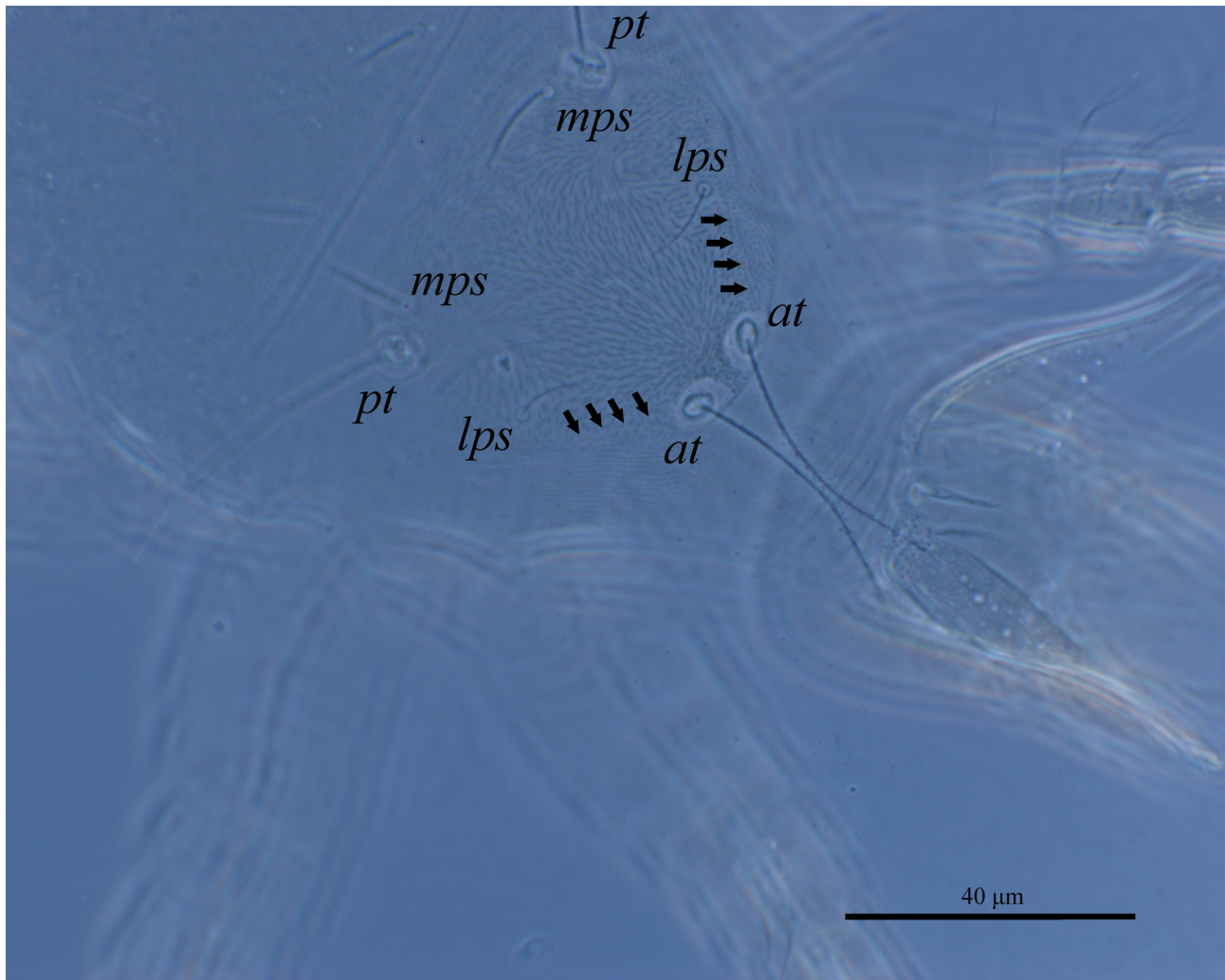
**Type material. Holotype:** Female collected from tropical white morning-glory, *Ipomoea alba* L. (Convolvulaceae) in Lajeado, Rio Grande do Sul, Brazil, 29°26'13 "S, 51°57'43"W, 34 m above sea level, collector: Wesley Borges Wurlitzer and date: 14/I/2019. The seven paratypes (five females, two males and one tritonymph) will be deposited at the Museu de Ciências Naturais (MCN) of the Universidade do Vale do Taquari-Univates, Lajeado, Rio Grande do Sul, Brasil. The holotypes (one female one male) will be deposited at Acarology and Entomology Department, Escola Superior de Agricultura “Luiz de Queiroz”, Universidade de São Paulo (ESALQ / USP), Piracicaba (SP), Brazil.



**FIGURE 6.** *Cunaxoides lajeadensis* **sp. nov.**, male. A. Leg I; B. Leg II; C. Leg III; D. Leg IV.

**TABLE 1.** Differences between *Cunaxoides lootsi* Den Heyer, 2013 and *C. lajeadensis* sp. nov.

<i>Cunaxoides lootsi</i>	<i>Cunaxoides lajeadensis</i> sp. nov.
Hysterosomal “shield”: setae <i>c2</i> and <i>e1</i> absent	Hysterosomal “shield”: setae <i>c2</i> and <i>e1</i> present
Coxae I: 3 <i>sts</i> , 1 <i>peg</i>	Coxae I: 3 <i>sts</i>
Trochanter I: 1 <i>sts</i>	Trochanter I: 1 <i>sts</i> , 1 <i>sbsl</i>
Genua IV: 1 <i>asl</i> , 5 <i>sts</i>	Genua IV: 1 <i>asl</i> , 6 <i>sts</i>
Tibiae I and II: 1 <i>asl</i> , 1 alveolus, 5 <i>sts</i> -1 <i>bsl</i> , 5 <i>sts</i>	Tibiae I and II: 6-6 <i>sts</i>
Tarsi I–IV: 3 <i>asl</i> , 1 <i>bsl</i> , 1 <i>dtsl</i> , 1 famulus pit, 2 <i>tsl</i> , 18 <i>sts</i> -1 <i>bsl</i> , 1 <i>dtsl</i> , 1 <i>tsl</i> , 16 <i>sts</i> -1 <i>ks</i> , 1 <i>tsl</i> , 14 <i>sts</i> -1 <i>ks</i> , 13 <i>sts</i> .	Tarsi I–IV: 2 <i>asl</i> , 1 <i>fam</i> , 16 <i>sts</i> , 2 <i>tsl</i> , 1 <i>dtsl</i> -2 <i>asl</i> , 1 <i>tsl</i> , 1 <i>dtsl</i> 14 <i>sts</i> -1 <i>asl</i> , 1 <i>tsl</i> , 1 <i>dtsl</i> , 10 <i>sts</i> -1 <i>asl</i> , 2 <i>tsl</i> , 8 <i>sts</i> .



**FIGURE 7.** *Cunaxoides lajeadensis* sp. nov., male phase tritonymph. Dorsal view of the ecdysial line, with phase contrast.

### *Lupaeus* Castro & Den Heyer, 2009

#### *Lupaeus waldumirus* Wurlitzer & Monjarás-Barrera sp. nov.

(Figures 8B–11)

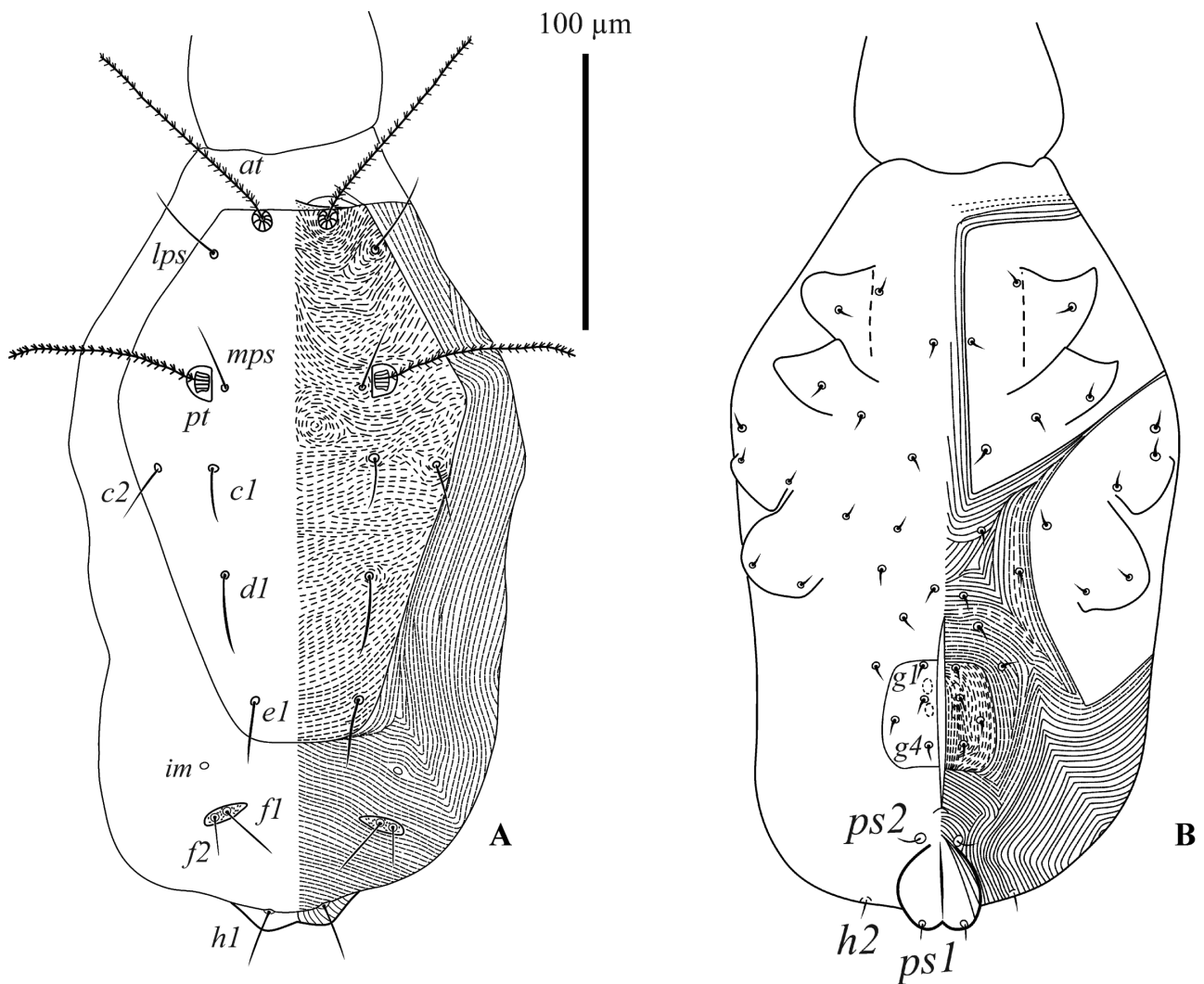
**Description.** *Female* (n = 8) idiosoma length **265** (237–297); idiosoma width **165** (136–209).

*Dorsum* (Fig. 9A). Length and width of dorsal shield **187** (178–198); **127** (117–152). Length of legs I–IV: **169** (143–190); **151** (132–164); **155** (140–173); **195** (184–204). Length of tarsi I–IV: **60** (55–66); **49** (41–55); **48** (44–53); **54** (50–56). Proterosomal and hysterosomal dorsal shields fused and well sclerotized. Setae  $f_1$  and  $f_2$  on small platelets. Dorsal shield with presence transverse of lobes between setae *mps* and *c<sub>r</sub>*. Lyrifissures *im* transverse,

located between setae  $e_1$  and  $f_1$ . Length of dorsal setae:  $at$  64 (82–90),  $pt$  80 (71–90),  $lps$  27 (22–36),  $mps$  19 (20–24),  $c_1$  21 (15–31),  $c_2$  13 (10–21),  $d_1$  16 (20–23),  $e_1$  16 (15–25),  $f_1$  26 (19–29),  $f_2$  13 (14–16),  $h_1$  25 (21–29). Distance between the setae:  $at-at$  23 (22–24),  $at-lps$  23 (21–25),  $lps-lps$  63 (60–66),  $pt-pt$  70 (67–86),  $pt-mps$  10 (6–12),  $mps-mps$  50 (46–55),  $mps-c_1$  27 (26–29),  $c_1-c_1$  58 (49–64),  $d_1-d_1$  53 (50–57),  $e_1-e_1$  35 (31–39),  $f_1-f_1$  48 (42–55),  $f_2-f_2$  60 (53–67),  $h_1-h_1$  21 (20–22).



**FIGURE 8.** Photographs of the two new species of Cunaxidae. A—*Cunaxoides lajeadensis* sp. nov. female; B—*Lupaeus waldumirus* sp. nov., female.

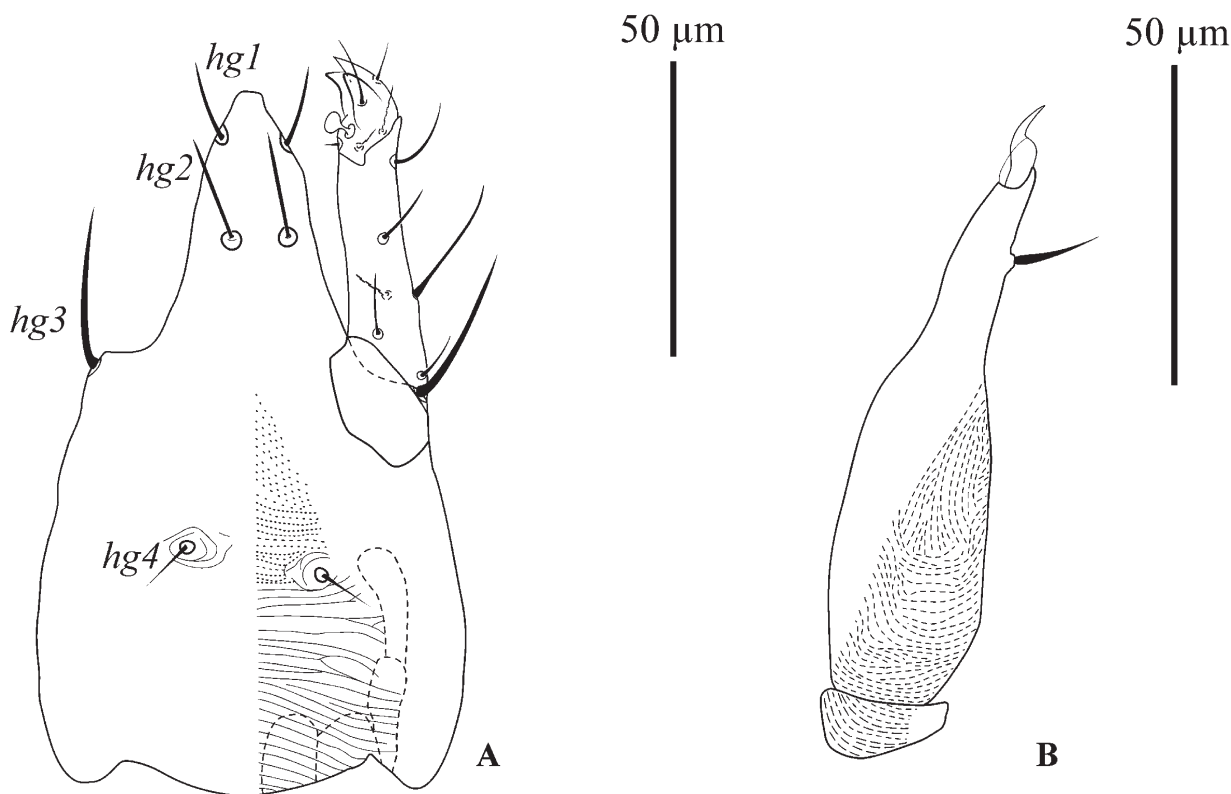


**FIGURE 9.** *Lupaeus waldumirus* sp. nov., female. (A) Dorsal and (B) ventral view of the idiosoma.



*Venter* (Fig. 9B). Coxal shields I and II separated medially. Coxal shields I and II divided. Propodogastral setae occur on posteromedian edge of coxae II. Hysterogastral setae three pairs on integument. Paracoxal setae near median edge of coxae IV. Striate genital valves showing four pairs of *g* setae; two pairs of genital papillae. A pair of paragenital setae occur laterad anterior parts of genital valves. Integument provided with finely lobed, almost continuous striae. Length of genital setae: *g*<sub>1</sub> 8 (5–10), *g*<sub>2</sub> 8 (7–5), *g*<sub>3</sub> 7 (5–9), *g*<sub>4</sub> 8 (5–11).

*Gnathosoma* (Figs. 10A–B). Subcapitulum: length 97 (116–104), width 53 (58–82), with four pairs of setae, *hg*<sub>1</sub> 7 (7–9), *hg*<sub>2</sub> 9 (8–9), *hg*<sub>3</sub> 40 (50–62), *hg*<sub>4</sub> 19 (11–15). Distance between setae: *hg*<sub>1</sub>-*hg*<sub>1</sub> 7 (7–9), *hg*<sub>2</sub>-*hg*<sub>2</sub> 9 (8–9), *hg*<sub>3</sub>-*hg*<sub>3</sub> 40 (50–62), *hg*<sub>4</sub>-*hg*<sub>4</sub> 19 (20–23), *hg*<sub>1</sub>-*hg*<sub>3</sub> 29 (31–38), *hg*<sub>2</sub>-*hg*<sub>4</sub> 51 (45–55), *hg*<sub>1</sub>-*hg*<sub>2</sub> 17 (14–17). Posterior ventral region of subcapitulum with horizontal striation ending in dots. Palp 51 (55–60), divided into three segments; trochanter without setae; femorogenua with 6 *sts*; tibiotarsus with 5 *sts* a bladder-shaped apophysis and two pointed process (Fig. 9A). Length of chelicera 106 (98–114) and length of cheliceral setae 13 (11–15) (Fig. 10B).



**FIGURE 10.** *Lupaeus waldumirus* sp. nov., female. Gnathosoma—A. Subcapitulum and palp ventral view; B. Chelicera dorsal view.

*Legs* (Fig. 11A–D). Chaetotaxy: coxae (Fig. 8B) I–IV, 3-2-3-3 *sts*; trochanter I–IV, 1-1-2-1 *sts*; basifemora I–IV, 4-6-3-1 *sts*; telofemora I–IV, 5-5-4-3 *sts*; genua I–IV, (1 *asl*, 1 *sts*), 2 *asl*, 5 *sts*-7 *sts*-5 *sts*, 1 *asl*-1 *asl*, 6 *sts*; tibiae I–IV, 7 *sts*-5 *sts*, 1 *bsl*-5 *sts*, 1 *bsl*-1 *T*, 4 *sts*; tarsi I–IV, 3 *asl*, 1 *fam*, 12 *sts*, 2 *tsl*-4 *asl*, 1 striated *bsl*, 12 *sts*, 1 *tsl*, 1 *dtsl*-3 *asl*, 8 *sts*, 1 *tsl*, 1 *dtsl*-1 *asl*, 2 *tsl*, 10 *sts*.

*Male and immature stages.* Unknown.

**Remarks.** *Lupaeus waldumirus* Wurlitzer & Monjarás-Barrera sp. nov. shows a dark orange color (Fig. 8B).

**Diagnosis.** The new species resembles *Lupaeus damavandiani* Paktinat-Saeij & Castro, 2016, for its dorsal morphometry, ventral striae, arrangement of genital setae, and chaetotaxy of coxae III–IV, trochanters I–IV, basifemora I–IV, telofemora I–IV, genua III, tibiae II, III and IV. The different morphological characters are shown in Table 2.

**Etymology.** The epithet is in honor of the grandfather of the first author, Mr. Waldomiro Moraes Borges, a conservationist who always cherished agroecology and nature.

**Type material. Holotype:** female collected from tropical white morning-glory, *Ipomoea alba* L. in Lajeado, Rio Grande do Sul, Brazil, 29°26'13 "S, 51°57'43"W, 34 m above sea level, collector: Wesley Borges Wurlitzer and date: 14/I/2019. The seven paratypes female will be deposited at the Museu de Ciências Naturais (MCN) of the Universidade do Vale do Taquari-Univates, Lajeado, Rio Grande do Sul, Brasil. Holotype will be deposited at

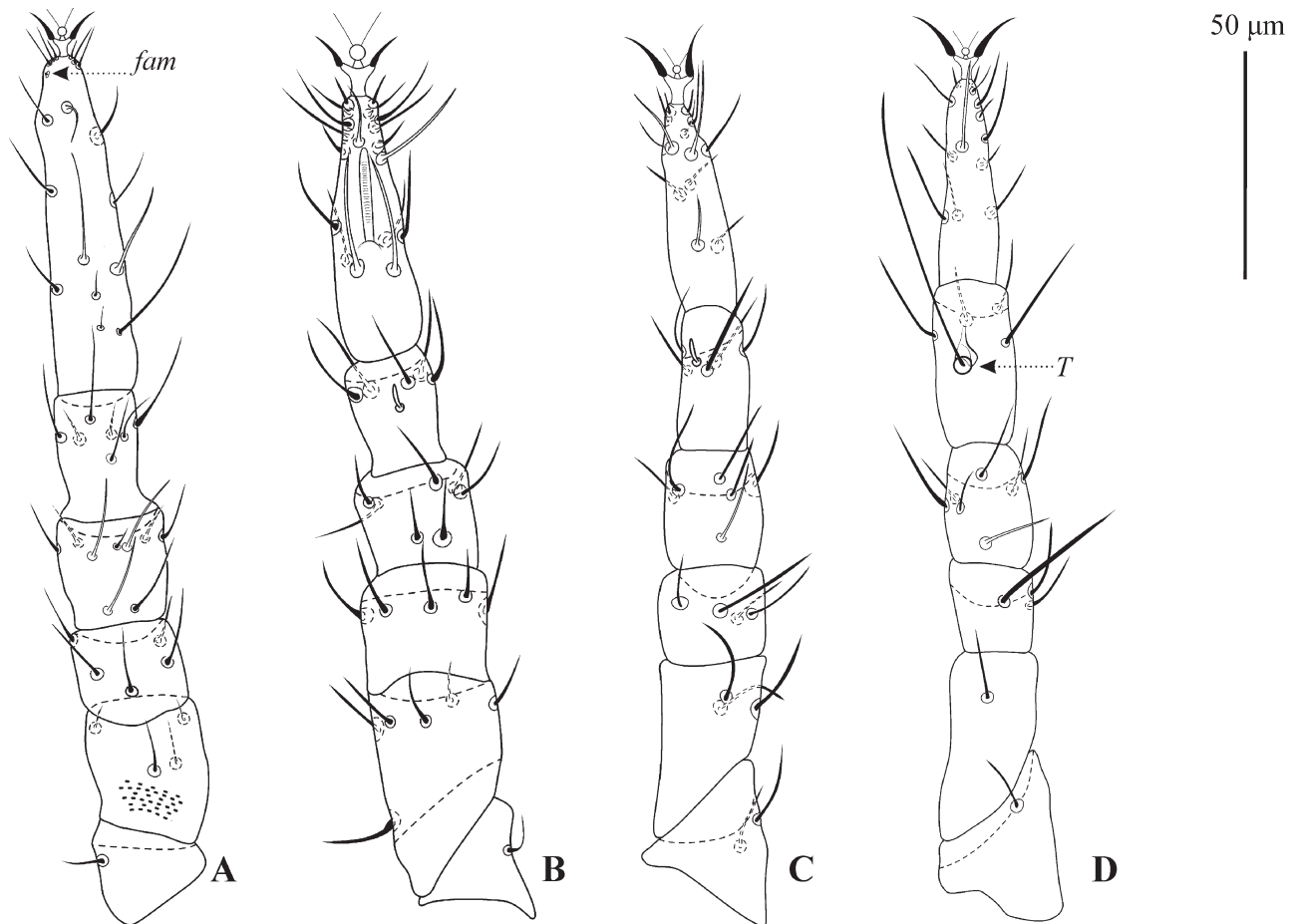


FIGURE 11. *Lupaeus waldumirus* sp. nov., female. A. Leg I; B. Leg II; C. Leg III; D. Leg IV.

TABLE 2. Differences between *Lupaeus damavandiani* Paktinat-Saeij & Castro, 2016 and *L. waldumirus* sp. nov.

<i>Lupaeus damavandiani</i>	<i>Lupaeus waldumirus</i> sp. nov.
Dorsal shield punctated	Dorsal shield with transverse lobes between the setae <i>mps</i> and <i>c</i> <sub>1</sub>
Coxa I and II: 1peg, 3-3	Coxa I and II: 3-2
Genu I, II and IV: (1 <i>asl</i> , 1 <i>sts</i> ), 3 <i>asl</i> , 4 <i>sts</i> -2 <i>asl</i> , 5 <i>sts</i> -1 <i>asl</i> , 5 <i>sts</i>	Genu I, II and IV: (1 <i>asl</i> , 1 <i>sts</i> ), 2 <i>asl</i> , 5 <i>sts</i> -7 <i>sts</i> -1 <i>asl</i> , 6 <i>sts</i>
Tibia I: 2 <i>asl</i> , 5 <i>sts</i>	Tibia I: 7 <i>sts</i>
Tarso I-IV: 3 <i>bsl</i> , 1 <i>fam</i> , 1 <i>dtsl</i> , 2 <i>tsl</i> , 19 <i>sts</i> -1 <i>bsl</i> , 1 <i>dtsl</i> , 1 <i>tsl</i> , 17 <i>sts</i> -1 <i>tsl</i> , 15 <i>sts</i> -15 <i>sts</i> .	Tarso I-IV: 3 <i>asl</i> , 1 <i>fam</i> , 13 <i>sts</i> , 2 <i>tsl</i> -4 <i>asl</i> , 1 striated <i>bsl</i> , 12 <i>sts</i> , 1 <i>tsl</i> , 1 <i>dtsl</i> -3 <i>asl</i> , 8 <i>sts</i> , 1 <i>tsl</i> , 1 <i>dtsl</i> -1 <i>asl</i> , 2 <i>tsl</i> , 10 <i>sts</i> .

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