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Habitus of the holotype (CNAN-T01342) of *Brujita chapulapa* n. gen., n. sp.

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Two new genera and two new species of troglobitic harvestmen of Stygnopsidae (Opiliones, Laniatores, Gonyleptoidea) from Oaxaca, Mexico, with notes on selected morphological characters

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ABSTRACT
Two monotypic and troglobitic genera of harvestmen are described from caves in Oaxaca, Mexico: The Karosinae Cruz-López & Francke, 2017 *Brujita chapulapa* n. gen., n. sp. and the Stygnopsinae Sørensen, 1932 *Toojah cimutaa* n. gen., n. sp., both based on males only. Also, based on the examination of the male holotype of *Hoplobunus planus* Goodnight & Goodnight, 1973, the new combination is proposed: *Mictlana plana* (Goodnight & Goodnight, 1973) n. comb., proposing an emended diagnosis for *Mictlana* Cruz-López & Francke, 2015, including an analysis of the dilemma of the position of the ocularium and observations on selected homoplastic characters. Finally, on the regard of troglobitic stygnopsids, a review of the exclusive morphological traits exhibit by some representatives of the family is addressed, discussing on the putative synapomorphies of each subfamily.

KEY WORDS
Ocularium,
frontal bulge,
caves,
eyeless,
putative
synapomorphies,
new combination,
new species,
new genus.

RÉSUMÉ
Deux nouveaux genres et deux nouvelles espèces d'opilions troglobies Stygnopsidae (Opiliones, Laniatores, Gonyleptoidea) d'Oaxaca, Mexique, avec des notes sur certains caractères morphologiques.
Deux genres monotypiques et troglobies d'opilions sont décrits de grottes de l'État d'Oaxaca, Mexique : *Brujita chapulapa* n. gen., n. sp. appartenant aux Karosinae Cruz-López & Francke, 2017 et *Toojah cimutaa* n. gen., n. sp. appartenant aux Stygnopsinae Sørensen, 1932, tous deux décrits uniquement sur des mâles. Sur la base de l'examen de l'holotype de *Hoplobunus planus* Goodnight & Goodnight, 1973, nous proposons également la combinaison nouvelle : *Mictlana plana* (Goodnight & Goodnight, 1973) n. comb., avec une diagnose émendée pour *Mictlana* Cruz-López & Francke, 2015, une discussion sur la position de l'occularium et des observations sur quelques caractères homoplasiques. Finalement, concernant les stygnopsides troglobies, une revue des caractères morphologiques exclusifs présents chez certains représentants de la famille est réalisée, avec une discussion sur les synapomorphies putatives de chaque sous-famille.

MOTS CLÉS
Ocularium,
lobe frontal,
grottes,
aveugle,
synapomorphies putatives,
combinaison nouvelle,
espèce nouvelle,
genre nouveau.

INTRODUCTION

Mexico has one of the most diverse troglobitic faunas due to its extensive and complex cave systems throughout the entire territory (Reddell 1981). In a review of cave fauna from Mexico, Guatemala and Belize, Reddell (1981) reported at least 279 troglobitic metazoan especies in these countries, the great majority in Mexico. Regarding Opiliones Sundevall, 1833, Kury & Cokendolpher (2000) supposed that almost 20% of the Mexican fauna are troglobites or troglophiles, and then 46% of total undescribed species in the genera *Hoplobunus* Banks, 1900 and *Karos* Goodnight & Goodnight, 1944, [both *sensu* Goodnight & Goodnight (1953)] are predominant troglophilic or troglobitic.

The current knowledge on the systematics of Stygnopsidae Sørensen, 1932 has been studied using a phylogenetic framework (Cruz-López & Francke 2015, 2017). These studies clarified the phylogenetic position of many troglobitic and troglophilic taxa previously recognized as part of *Hoplobunus* and *Karos* (Cruz-López & Francke 2015, 2017). Troglobitic stygnopsids exhibit different degrees of troglomorphisms, *i.e.* depigmentation of cuticle, elongation of appendages, elevated tarsal count and reduction or total lack of eyes (Table 1). However, only six species are completely blind: *Chinquipellobunus madlae* (Goodnight & Goodnight, 1967), *Hoplobunus planus* Goodnight & Goodnight, 1973, *Mexotroglinus sbordonii* Šilhavý, 1977, *Mictlana inops* (Goodnight & Goodnight, 1971), *Serrobunus paulbryanti* Aguiñaga & Cruz-López, 2019 and *Troglostygnopsis anophthalma* Šilhavý, 1974, calling attention that all of them belong to different genera and both *Mexotroglinus* Šilhavý, 1977 and *Troglostygnopsis* Šilhavý, 1974 are monotypic.

In the present contribution, two new and monotypic genera of eyeless stygnopsids are described: *Brujita chapulapa* n. gen., n. sp. and *Toojah cimutaa* n. gen., n. sp. from different caves in Oaxaca state, Mexico. These new genera can be recognized from other troglobitic stygnopsids mainly by combination of character of external morphology and male genitalia. Based on the revision of the holotype of *H. planus*, the new combination *Mictlana plana* (Goodnight & Goodnight, 1973) n. comb. is proposed, with an emended diagnosis of the genus *Mictlana* Cruz-López & Francke, 2015. Finally, a discussion on the putative synapomorphies for both subfamilies and a discussion of some conflictive characters as the correct ocularium position in *Mictlana* and *Brujita* n. gen. are addressed.

MATERIAL AND METHODS

Type material examined in this work are deposited in two collections (see Abbreviations). Male genitalia were prepared for scanning electronic photographs (SEM) following the procedure described in Acosta *et al.* (2007). SEM photographs were taken in a Hitachi S-2460N microscope in the Laboratorio Nacional de Biodiversidad (LaNaBio), in the Instituto de Biología, UNAM (IB-UNAM). Images were assembled into plates using Photoshop CS5. Nomenclature of scutum follows Kury & Medrano (2016), pedipalpal armature follows Acosta *et al.* (2007) with additional annotations on the armature taken from Aguiñaga & Cruz-López (2019), for macrosetae and microsetae on penis according respectively to Kury & Villarreal (2015) and Kury (2016). Additionally, I will adopt the term flimsy lamina referring to the undeveloped ventral plate of penis, which is a synapomorphy of Stygnopsidae according to Cruz-López & Francke (2017).

Abbreviations

Institutions

AMNH	American Museum of Natural History, New York;
CNAN	Colección Nacional de Arácnidos, UNAM, Mexico.

Features

MS A-E	Macrosetae groups A to E on penis;
SST 1-3	Spiniform Setiferous Tubercles on pedipalpal tibia, from basal 1 to distal 3.

SYSTEMATICS

Family Stygnopsidae Sørensen, 1932
Subfamily Karosinae Cruz-López & Francke, 2017

Genus *Mictlana* Cruz-López & Francke, 2015

Mictlana Cruz-López & Francke, 2015: 878. — Cruz-López 2018a: 534; 2018b: 80. — Aguiñaga & Cruz-López 2019: 9. — Cruz-López *et al.* 2019: 286.

Type species. — *Hoplobunus inops* Goodnight & Goodnight, 1971.

Emended Diagnosis. — Troglobitic karosins, eyeless, with two dorsal lobes on the prosoma, the small one located in the middle and the anterior one larger and rounded. Scutum rectangular, type iota (i) with the lateral clear areas well marked. Chelicera with heterogeneous dentition, movable finger with a basal triangular tooth. Penis with the pars distalis spear-shaped, with two short pairs of MS C and two pairs of MS A, both contiguous and forming a lateral row.

Remarks

Cruz-López & Francke (2015) recovered *Karos* Goodnight & Goodnight, 1944 genera-group clade (currently Karosinae) with nine synapomorphies: mesotergal areas not completely covered with tubercles, ocularium in the middle of prosoma, ocularium small, cheliceral dentition homogeneous, no sexual dimorphism on chelicera size, males with chelicera small, follis of penis not on apical depression, pedipalpal femur with a mesodistal setiferous tubercle and pedipalpal patella with mesal armature. At that moment, Cruz-López & Francke (2015) considered that the anterior rounded lobe on prosoma of *Mictlana inops* was the ocularium due to the size of the structure, being in this way a reversion from the synapomorphy "ocularium in the middle" to the anterior position on prosoma in this species. Later, Cruz-López & Francke (2017) postulated the possibility that the small lobe on the middle of the prosoma could be the ocularium by comparison of this structure with the true ocularium of other karosins, and

TABLE 1. — Troglobitic and troglophilic species of Stygnopsidae Sørensen, 1932, presenting their current subfamilial assignment, troglomorphisms and distribution.

Subfamily/Species	Habitat	Troglomorphisms	State and country
Karosinae Cruz-López & Francke, 2017			
Huasteca gratiosa (Goodnight & Goodnight, 1971)	Troglophilic	Cuticle slightly pigmented	San Luís Potosí, Mexico
Huasteca rugosa (Goodnight & Goodnight, 1971)	Troglophilic	Cuticle slightly pigmented	Veracruz, Mexico
Huasteca silhavyi Cruz-López & Francke, 2015	Troglophilic	Cuticle slightly pigmented	Veracruz, Mexico
Huasteca kardia Cruz-López & Francke, 2019	Troglophilic	Cuticle slightly pigmented	Oaxaca, Mexico
Karos parvus Goodnight & Goodnight, 1971	Troglophilic	Cuticle slightly pigmented	Tamaulipas, Mexico
Karos projectus Goodnight & Goodnight, 1971	Troglophilic	Cuticle slightly pigmented, legs slightly elongated	San Luís Potosí, Mexico
Karos tersum Cruz-López & Francke, 2015	Troglobitic	Cuticle depigmented, legs slightly elongated, eyes reduced	San Luís Potosí, Mexico
Mictlana inops (Goodnight & Goodnight, 1971)	Troglobitic	Cuticle depigmented, legs elongated, high tarsal count, eyes absent	Tamaulipas, Mexico
Mictlana plana (Goodnight & Goodnight, 1973) n. comb.	Troglobitic	Cuticle depigmented, legs elongated, high tarsal count, eyes absent	San Luís Potosí, Mexico
Potosa reddelli Cruz-López & Francke, 2015	Troglobitic	Cuticle slightly pigmented	Hidalgo, Mexico
'Karos' depressus Goodnight & Goodnight, 1971	Troglobitic	Cuticle slightly pigmented, eyes reduced	Querétaro, Mexico
Stygnopsinae Sørensen, 1932			
Chinquipellobunus coahuilaensis Cokendolpher, 2004	Troglophilic	Cuticle slightly pigmented	Coahuila, Mexico
Chinquipellobunus madlae (Goodnight & Goodnight, 1967)	Troglobitic	Cuticle depigmented, eyes absent	Texas, U.S.A.
Chinquipellobunus mexicanus (Goodnight & Goodnight, 1971)		Data not available	Nuevo León, Mexico
Chinquipellobunus osorioi Goodnight & Goodnight, 1944		Data not available	Nuevo León, Mexico
Chinquipellobunus russelli (Goodnight & Goodnight, 1967)		Data not available	Texas, U.S.A.
Iztlina venefica Cruz-López & Francke, 2017	Troglobitic	Cuticle slightly pigmented, legs elongated, high tarsal count	Chiapas, Mexico
Mexotroglinus sbordonii Šilhavý, 1977	Troglobitic	Cuticle depigmented, eyes absent	Chiapas, México
Minisge kanoni Cruz-López, Monjaraz-Ruedas & Francke, 2019	Troglobitic	Cuticle depigmented, legs elongated, high tarsal count, eyes reduced	Oaxaca, Mexico
Minisge sagai Cruz-López, Monjaraz-Ruedas & Francke, 2019	Troglobitic	Cuticle depigmented, legs elongated, high tarsal count, eyes reduced	Oaxaca, Mexico
Philora izel Cruz-López & Francke, 2016	Troglophilic?	Cuticle depigmented, eyes reduced	Oaxaca, Mexico
Philora nympha Cruz-López & Francke, 2016	Troglobitic	Cuticle depigmented, legs elongated	Puebla, Mexico
Sbordonia armigera Šilhavý, 1977	Troglophilic?		Chiapas, Mexico
Serrobunus boneti Goodnight & Goodnight, 1942	Troglobitic	Cuticle slightly pigmented, legs elongated	San Luís Potosí, Mexico
Serrobunus queretarius Šilhavý, 1974	Troglobitic	Cuticle slightly pigmented, legs elongated	Querétaro, Mexico
Serrobunus linares Aguiñaga & Cruz-López, 2019	Troglophilic	Cuticle slightly pigmented	Nuevo León, Mexico
Serrobunus paulbryanti Aguiñaga & Cruz-López, 2019	Troglobitic	Cuticle depigmented, legs elongated, eyes absent	Tamaulipas, Mexico
Stygnopsis apoalensis (Goodnight & Goodnight, 1973)	Troglophilic	Legs elongated	Oaxaca, Mexico
Stygnopsis oaxacensis (Goodnight & Goodnight, 1973)	Troglophilic	Legs elongated	Oaxaca, Mexico
Stygnopsis robusta (Goodnight & Goodnight, 1971)	Troglobitic	Cuticle slightly pigmented, legs elongated	Veracruz, Mexico
Tonalteca spinooculorum (Goodnight & Goodnight, 1973)	Troglobitic	Cuticle slightly pigmented, legs elongated	Oaxaca, Mexico
Troglostygnopsis anophthalma Šilhavý, 1974	Troglobitic	Cuticle depigmented, legs elongated, high tarsal count, eyes absent	Chiapas, Mexico
'Hoplobunus' zullinii Šilhavý, 1977	Troglobitic	Cuticle slightly pigmented, legs elongated	Chiapas, Mexico

then, the anterior lobe would be a developed frontal bulge, structure widely found in other karosins but poorly studied; without evidence of eyes position, this supposition is uncertain. Clear figures of the frontal bulge are available in the description of *Karos morronei* Cruz-López, 2018 (Cruz-López 2018a: figs 5-7). Similar problem determining the position of the true ocularium was detected by Cruz-López *et al.* (2016) on the troglobitic Belizean *Jarmilana pecki* (Goodnight & Goodnight, 1977), a pyramidopid harvestman without eyes or retina evidence, and with two dorsal lobes on prosoma.

The character "Chelicera with homogenous dentition", another synapomorphy of Karosinae, was recovered as a reversion to the plesiomorphic state, heterogeneous dentition, in *M. inops* in Cruz-López & Francke (2015). In a broader phylogeny of Stygnopsidae, cheliceral dentition is a homoplastic character through the family, causing conflict to a

Fig. 1. — Habitus of the holotype (CNAN-T01342) of *Brujita chapulapa* n. gen., n. sp. **A**, dorsal; **B**, lateral. Scale bars: 1 mm.

subfamilial allocation of *Mictlana* and *Mexotroglinus* based only on this character. According to Cruz-López & Francke (2017), the character describing the shape of the mesotergal sulci has two states evenly distributed between Stygnopsinae and Karosinae. For that, in the present work, the character "mesotergal sulci sinuous" is considered a putative synapomorphy of Karosinae, character clearly illustrated by SEM photographs in Cruz-López & Francke (2017, 2019a) and observed on the holotype of *H. planus*. Additionally, Cruz-López & Francke (2019a) detected the presence of cheliceral comb in several Karosinae representatives, structure observed on the holotype of *M. plana* n. comb., but unfortunately that could not be checked in any specimen of *M. inops*.

Additionally, in the phylogeny of Stygnopsidae proposed by Cruz-López & Francke (2017), *Mictlana* was recovered as monophyletic with high support (posterior probability 0.91), including a putative female and uncertain immatures of *H. planus*. Now with the inclusion of *H. planus* in *Mictlana*, the presence of a large rounded anterior lobe on prosoma could be considered a putative synapomorphy of this genus, regardless whether or not it is the ocularium or the anterior bulge.

Mictlana plana
(Goodnight & Goodnight, 1973) n. comb.

Hoplobunus planus Goodnight & Goodnight, 1973: 88. — Reddell 1981: 165. — Rambla & Juberthie 1994: 218. — Kury & Cokendolpher 2000: 155. — Kury 2003: 238. — Cruz-López & Francke 2017: 322. — Aguiñaga & Cruz-López 2019: 2.

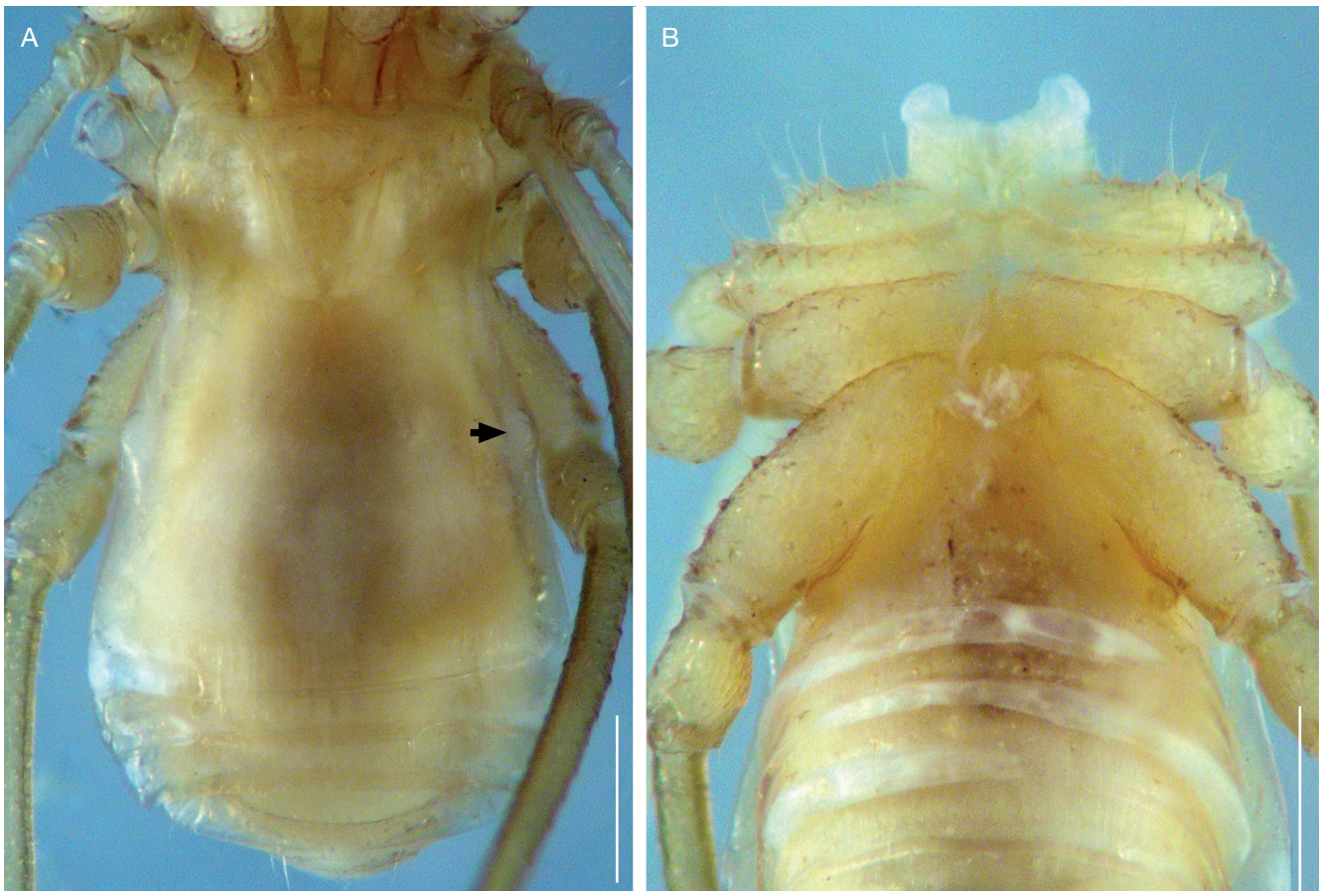

Fig. 2. — Scutum and venter of the holotype (CNAN-T01342) of *Brujita chapulapa* n. gen., n. sp. **A**, scutum; **B**, venter. Arrow indicate lateral clear area. Scale bars 0.5 mm.

Material examined. — **Holotype. Mexico**. ♂; San Luís Potosí: Aquismón, Cueva de San Nicolas, 10 Km SW Aquismón; 16.VII.1968; J. Fish leg; AMNH.

Diagnosis. — *Mictlana plana* n. comb. can be differentiated from *M. inops* by the shape of lateral clear areas of scutum: these are small and rounded in *M. plana* n. comb., while they are large and digitiform in *M. Inops*.

Remarks

During the revision of stygnopsid types deposited at the AMNH, penises of some of them were found lost. Even though the penis of *Hoplobunus planus* is quite damaged, penial morphology was clear, with two pairs of short MS C and A on lateral margins, remarkably similar to those on *M. inops*. Also, both lobes on prosoma are present, but in *M. plana* n. comb the middle one is barely noticeable.

Genus *Brujita* n. gen.

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Type species. — *Brujita chapulapa* n. sp.

Diagnosis. — *Brujita* n. gen. can be recognized from other Karosinae harvestmen by the following combination of characters: wide dorsal lobe at the frontal margin of prosoma, slightly elevated and rounded, no eyes; movable finger of chelicera with a basal blunt tooth; penis with MS A, B, C and D very long and with only a pair of small MS E in the middle flimsy lamina. *Mictlana* is the most similar genus to *Brujita* n. gen., but the new genus can be differentiated from it by the absence of two dorsal lobes on prosoma, *Brujita* n. gen. having only the anterior one; and by the penis morphology, which in *Mictlana* is spear-shaped, with two pairs of short MS C and A respectively, and four pairs of small MS E (Cruz-López & Francke 2015: fig. 55A-C), whereas the penis of *Brujita* n. gen. is spoon-shaped, with two and four pairs of long MS C and A + B respectively and with only a pair of small MS E.

Etymology. — Brujita means 'little witch' in Spanish, feminine name taken from the song Brujita, written by the Spanish compositor and singer Nacho Vegas, gender feminine.

Brujita chapulapa n. gen., n. sp.
(Figs 1-5)

urn:lsid:zoobank.org:act:8303BC47-4F38-4414-86D1-6B50FBA1D792

Type material. — **Holotype. Mexico** • ♂; Oaxaca: San Francisco Chapulapa, J2 cave; 17°54'12.8"N, 96°45'54.2"W; 01.V.2009; M. Pugliese leg.; CNAN-T01342.
Paratype. Mexico • ♂; same locality as for holotype; 10.IV.2006; V. Siegel leg.; CNAN-T01343.

Diagnosis. — As for the genus.

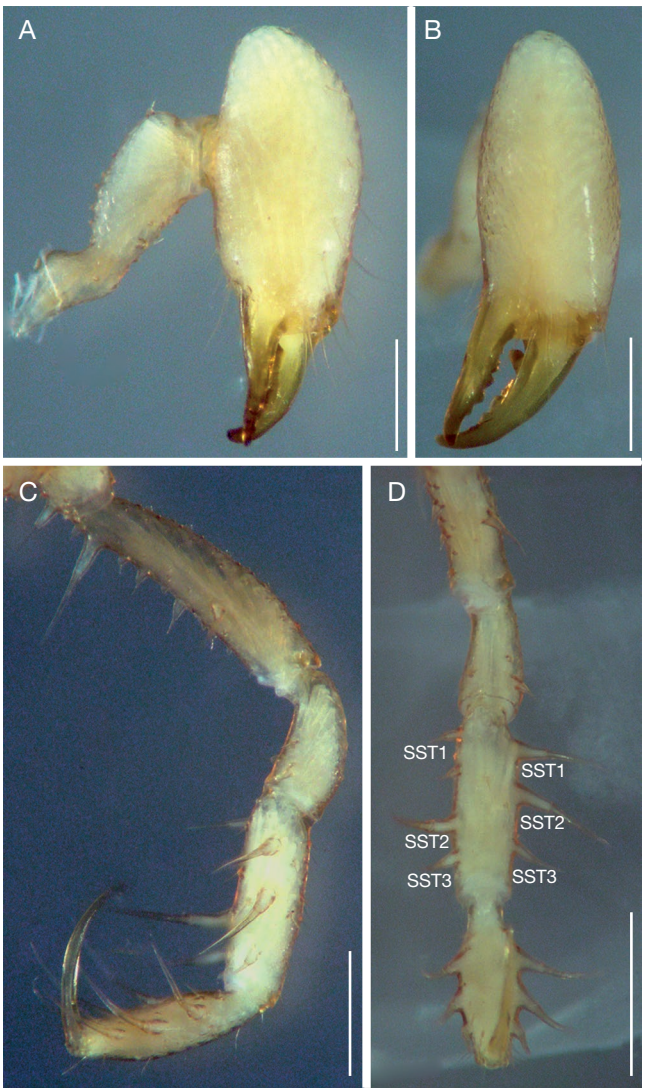

Fig. 3. — Chelicera and pedipalp of the holotype (CNAN-T01342) of *Brujita chapulapa* n. gen., n. sp. **A**, chelicera mesal; **B**, chelicera frontal; **C**, pedipalp mesal; **D**, pedipalp ventral. SST 1-3 indicated on **D**. Abbreviations: see Material and methods. Scale bars: 0.5 mm.

Etymology. — Noun in apposition referring to the type locality.

Description

Measurement

Scutum length = 2.6 mm; scutum width at mid-bulge level = 1.9 mm; scutum width at posterior margin = 2.2 mm; cheliceral hand length = 2.2 mm.

Body (Figs 1; 2)

Scutum type zeta (ζ) with constriction 1 shallow, constriction 2 not marked, posterior margin wider than mid-bulge area. Ocularium at the frontal margin of scutum, base cylindrical, apically rounded, with no eyes. With lateral clear areas teardrop-shaped, at level of mesotergal area II. Dorsum smooth, with few and very small tubercles in the middle of each mesotergal areas. Sulcus I well marked, sulci II-IV shallow. Free tergites without ornamentation. Coxae I-IV similar in size ventrally, ornated with long spiniform setiferous tubercles, larger on coxae I and II. Stigmatic area triangular, spiracles hidden between coxae IV and stigmatic area. Free sternites without ornamentation.

Chelicera (Fig. 3A, B)

Basichelicerite elongated, with bulla well marked and ornated with spiniform tubercles dorsally and ventrally. Cheliceral hand swollen, covered with many setae. Fixed cheliceral finger with five teeth, the second bifid. Movable finger with four teeth, the basalmost blunt and larger than the others.

Pedipalp (Fig. 3C, D)

Trochanter with a long basal setiferous spiniform tubercle; femur with a ventral row of six spiniform setiferous tubercles, the second the largest, and with long setiferous tubercle on mesal side; patella with a subapical spiniform setiferous tubercle on mesal side; tibia with IIi (1 = 2 > 3) and iiII (3 = 4 > 1 = 2) on mesal and ectal margins, respectively, SST 1-3 indicated on the figure. Tarsus with III SST (1 > 2 > 3) on both margins; tarsal claw as large as tarsus.

Legs (Table 2)

All legs slender and long, without armature, only with few setae, trochanter III rounded. Tarsal count: 6(3):27(3):6:7, first tarsomere of all legs very large, about one third of the length of the tarsus.

Penis (Fig. 4)

Flimsy lamina of penis spoon-shaped, with a dorsal depression with the follis inserted on it; follis six times longer than wide, with stylus smooth and apical small bristles; with a dorsal lobe on the base of stylus; MS A + B, C and D very long, MS C and D apically pointed, MS A + B apically spatulate, both groups set together and impossible to separate; two pairs of both MS C and D at the same level, laterally to follis; four pairs of MS A + B forming a row at the base of pars distalis, a pair of small MS E in the middle of ventral face of flimsy lamina, at the same level of MS C.

Female

Unknown.

Subfamily Stygnopsinae Sørensen, 1932

Genus *Toojah* n. gen.

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Type species. — *Toojah cimutaa* n. sp.

Diagnosis. — *Toojah* n. gen. can be recognized from the other Stygnopsinae taxa with lateral clear areas in the middle of scutum (*i.e. Panzosus* Roewer, 1949, *Paramitraceras* Pickard-Cambridge, 1905, *Philora* Goodnight & Goodnight, 1954, *Troglostygnopsis* and *Sbordonia* Šilhavý, 1977), by the following combination of characters: scutum type zeta (ζ) with the mid-bulge not marked, lateral margins straight, posterior margin of scutum wider than mid-bulge

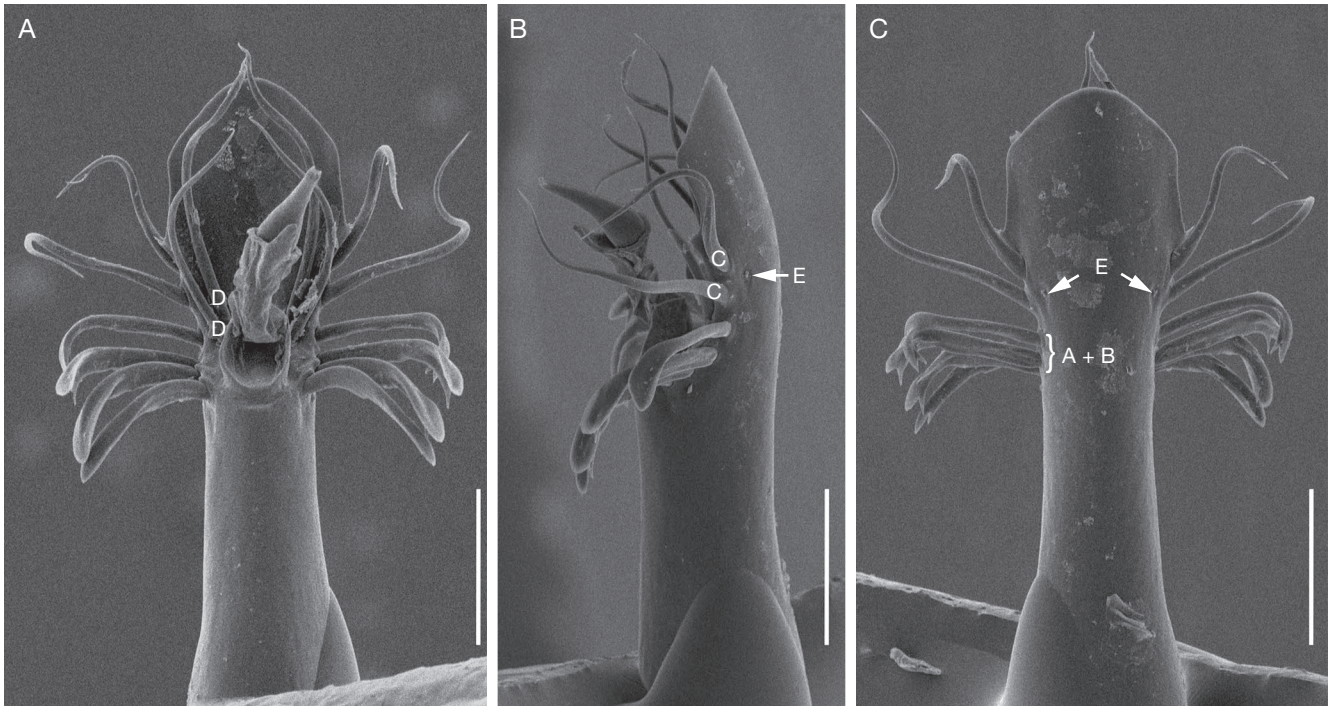

FIG. 4. — Penis of the holotype (CNAN-T01342) of *Brujita chapulapa* n. gen., n. sp. **A**, dorsal; **B**, lateral; **C**, ventral. MS A+B, C, D and E are marked on each figure. Abbreviations: see Material and methods. Scale bars: 100 µm.

section giving the appearance of trapeze, lateral clear areas teardrop-shaped; ocularium at frontal margin, elevated and rounded apically, no eyes; pars distalis of penis swollen, with the flimsy lamina thick in lateral view, apical margin ventrally curved and presence of six pairs of microsetae T2 on the middle of flimsy lamina. *Troglostygnopsis* is the most similar genus to *Toojah* n. gen., both are eyeless and have lateral clear areas, but they can be differentiated by the following characters: ocularium narrow in *Troglostygnopsis* (Šilhavý 1974: fig. 14), whereas the ocularium is apically rounded and wide in *Toojah* n. gen.; lateral clear areas in *Troglostygnopsis* are large and triangular (Šilhavý 1974: fig. 20), whereas in *Toojah* n. gen. they are small and teardrop-shaped; pedipalpal femur of *Troglostygnopsis* is dorsally armed by a row of spiniform tubercles (Šilhavý 1974: fig. 14), whereas in *Toojah* n. gen. it is unarmed; penis in *Troglostygnopsis* has a *Paramitraceras*-pattern with multiple spatulate MS A+B, a small pair of MS E1 and two pairs of MS D (Cruz-López & Francke 2017: fig. 42D-F), whereas in *Toojah* n. gen. MS A+B groups are recognizable from each other, both with two pairs of large MS E, MS D absent and microsetae T2 on flimsy lamina present.

ETYMOLOGY. — Name taken from the Chinantecan word: 'too jah' that means cave, gender feminine.

Toojah cimutaa n. gen., n. sp.
(Figs 5-8)

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TYPE MATERIAL. — **Holotype**. **Mexico** • ♂; Oaxaca, Valle Nacional, Te Cimutaa cave; 17°54'10.5"N, 96°22'37.5"W; 25.IV. 2008; Paul Bryant leg.; CNAN-T01344.

DIAGNOSIS. — As for the genus.

ETYMOLOGY. — Noun in apposition referring to the name of the cave where it was found.

TABLE 2. — Pedipalpal and leg measurements in mm of the holotypes of *Brujita chapulapa* n. gen., n. sp. and *Toojah cimutaa* n. gen., n. sp. Abbreviations: **Tr**, trochanter; **F**, femur; **P**, patella; **T**, tibia; **M**, metatarsus; **T**, tarsus; **LI-IV**, legs I to IV.

Species	Appendage	Tr	F	P	T	M	T
Brujita chapulapa n. gen., n. sp.	Pedipalp	0.5	1.8	0.9	1.3	–	1.2
	LI	0.5	3.9	0.8	2.8	4.8	3.4
	LII	0.5	6.3	1.1	6.5	7.6	14.7
	LIII	0.5	3.3	1.0	3.1	5.7	3.7
	LIV	0.5	6.5	1.1	4.7	7.0	5.0
Toojah cimutaa n. gen., n. sp.	Pedipalp	0.7	2.1	0.5	1.6	–	1.4
	LI	0.4	4.7	1.1	4.4	6.4	3.1
	LII	0.7	7.8	1.3	7.8	8.0	14.7
	LIII	0.6	5.8	1.4	4.8	6.8	4.2
	LIV	0.8	7.6	1.3	5.6	8.3	4.6

DESCRIPTION

Measurement

Scutum length = 3.4 mm; scutum width at mid-bulge level = 1.7 mm, scutum width at posterior margin = 2.8 mm; cheliceral hand length = 3.0 mm.

Body (Figs 5; 6)

Scutum type zeta (ζ) with the mid-bulge not marked, lateral margins straight, posterior margin of scutum wider than mid-bulge section giving the appearance of trapeze; ocularium at the frontal margin, wide and rounded, no eyes. Lateral clear areas teardrop-shaped, at level of mesotergal area II. Sulcus I very deep, sulci II-IV shallow. Coxae I and II with similar size, coxae III and IV similar in size and slightly larger than coxae I and II. Coxae I and II ventrally ornated with a row

Fig. 5. — Habitus of the holotype (CNAN-T01344) of *Toojah cimutaa* n. gen., n. sp. **A**, dorsal; **B**, lateral. Scale bars: 1.5 mm.

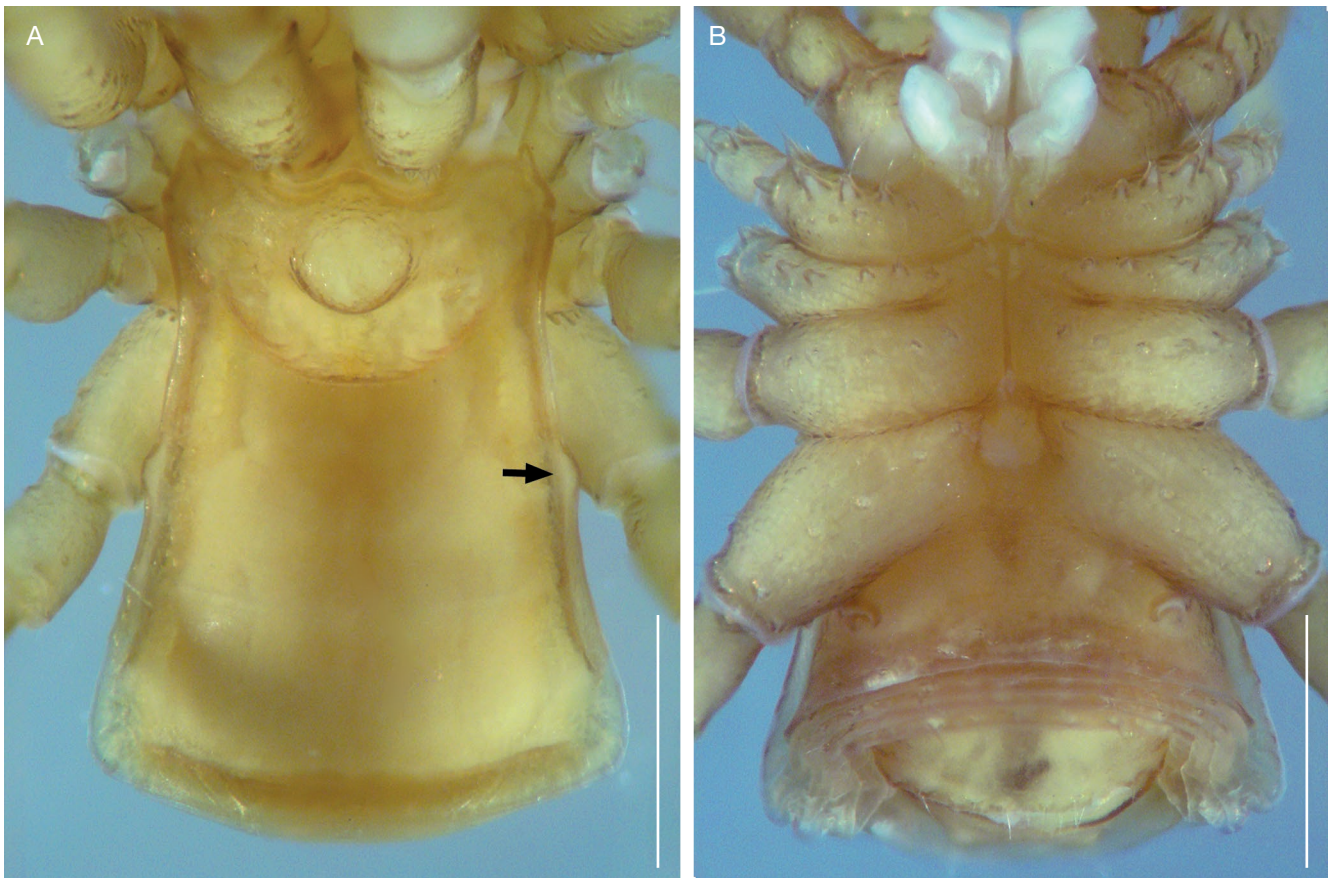

FIG. 6. — Scutum and venter of the holotype (CNAN-T01344) of *Toojah cimutaa* n. gen., n. sp. **A**, scutum; **B**, venter. **Arrow** indicates lateral clear area. Scale bars 1.0 mm.

of long spiniform setiferous tubercles; coxae III and IV with a row of widely spaced tubercles. Stigmatic area reverse "T" shaped, spiracles not hidden.

Chelicera (Fig. 7A, B)
Basichelicerite with long bulla, covering almost all segment. Cheliceral hand swollen, fixed finger with seven teeth, the first and the sixth larger, movable finger five teeth, the basalmost larger and blunt.

Pedipalp (Fig. 7C, D)
Trochanter with two large spiniform setiferous tubercles on ventral side, the distalmost larger; femur slightly compressed laterally, with a ventral row of seven spiniform setiferous tubercles, the first three larger and decreasing in size slightly; patella unarmed; tibia with IIi (1 = 2 > 3) and iiIi (3 > 1 = 2 = 4), major SST on mesal and ectal sides indicated on the figure, tarsus with II (1 > 2) on both sides, first setiferous tubercle on mesal margin very large, almost the same length than tarsus. Tarsal claw of the same size that tarsus.

Legs (Table 2)
Trochanter III rounded, longer than other trochanters. All segments without armature, except apical portion of femur IV with two ventral rows of reduced tubercles. Tarsal count: 8(3):51(8):6:7.

Penis (Fig. 8)
Base of pars distalis swollen, with the flimsy lamina thick in lateral view and the apical margin ventrally curved. Follis inflated and almost three times larger than wide, with a bilobular dorsal projection, spines only on the ventro-apical portion of follis, stylus inserted in it and with small bristles on the tip. Macrosetal arrangement *Stygnopsis*-type *sensu* Cruz-López & Francke (2017), all MS with similar size, spatulate at the tip and with the bases well marked and deep. MS arranged as follow: two pairs of MS E on the middle of flimsy lamina, two pairs of MS C lateral to the base of follis, a pair of MS A dorsally, below the base of follis and a pair of MS B ventrally, near the base of pars distalis.

Female
Unknown.

DISCUSSION

Cruz-López & Francke (2017) recognized two monophyletic groups and considered them as subfamilies of Stygnopsidae: Stygnopsinae and Karosinae. Also, they discussed on the conflictive genus *Mexotroglinus*, which exhibits morphological characters of both subfamilies, but was phylogenetically

Fig. 7. — Chelicera and pedipalp of the holotype (CNAN-T01344) of *Toojah cimutaa* n. gen., n. sp. **A**, chelicera mesal; **B**, chelicera frontal; **C**, pedipalp mesal; **D**, pedipalp ventral. SST 1-3 indicated on D. Abbreviations: see Material and methods. Scale bars: 0.75 mm.

allocated into Stygnopsinae. Because of this, diagnostic characters of both subfamilies are mainly homoplastic, such as the heterogeneous cheliceral dentition mentioned below, and the uncertain position of the ocularium exhibit by *Mictlana*.

Regarding putative synapomorphies of both subfamilies, Cruz-López & Francke (2017, 2020) have remarked that despite the complex morphology of *Mexotroglinus*, "straight mesotergal sulci" is the only character common in all members of Stygnopsinae, while "sinuous mesotergal sulci" is present in all Karosinae. However, this character is somewhat difficult to see, especially on the small species and on those troglobitic species with shallow mesotergal sulci, because it is necessary to use tools such as the scanning electron microscopy to see details of microsculpture of mesotergum (Cruz-López & Francke 2019a, b). In the same way, the presence of cheliceral comb could be another putative synapomorphy of Karosinae (Cruz-López & Francke 2019a), however, SEM is necessary to observe this structure in small species.

As mentioned above, *Brujita* n. gen. has sinuous mesotergal sulci and cheliceral comb, but unfortunately, these characters could not be illustrated using SEM photos in this work because there are only two specimens of this species. On the other hand, the uncertain identity of the lobe on prosoma that could be interpreted as either the ocularium or the frontal bulge, and also, the heterogeneous dentition, make this new genus another aberrant taxon with a mix of morphological traits of both subfamilies, such as *Mexotroglinus* and *Mictlana*. Further morphological characters to reaffirm subfamilial assignment of *Brujita* n. gen. into Karosinae are: pedipalpal femur and patella with mesal armature, pars distalis of penis compressed, with the flimsy lamina thin, MS A, B and C together forming a lateral row, and follis many times longer than wide.

The subfamilial assignment of *Toojah* n. gen. is less complex. This genus is easily assigned to Stygnopsinae based on the combination of the following features: mesotergal sulci straight, a frontal lobe on prosoma (probably the ocularium), chelicera wide (probably sexually dimorphic) with heterogeneous dentition, absence of mesal armature on pedipalpal femur and patella, pars distalis not compressed, with the flimsy lamina wide and macrosetal groups A, B, C and E separated from each other. Additionally, MS D on Stygnopsinae generally are one pair of small setae, sometimes two pairs. With the addition of *Toojah* n. gen. to the subfamily, there are two genera without MS D, i.e. *Toojah* n. gen. and *Iztlina* Cruz-López & Francke, 2017.

Cruz-López & Francke (2019b) discussed on the broad assortment of epigean, troglophilic and troglobitic representatives of Stygnopsidae, as this family is one among related families of Gonyleptoidea which has conquered both epigean and hypoean habitats. Also, the previous perception of the troglobitic nature of the family considered by Mendes & Kury (2007) has changed with the discovery of many epigean representatives during the last years (Cruz-López & Francke 2019b). In this way, it is remarkable that nine genera of this family are monotypic; among these nine, six are troglobitic, and among these six, only four are completely blind: *Brujita* n. gen., *Mexotroglinus*, *Toojah* n. gen. and *Troglostygnopsis*. Also, these genera show morphological traits that complicate their subfamilial allocation, as mentioned above. Their peculiar morphological characters (autapomorphies) have been probably acquired during the caves colonization.

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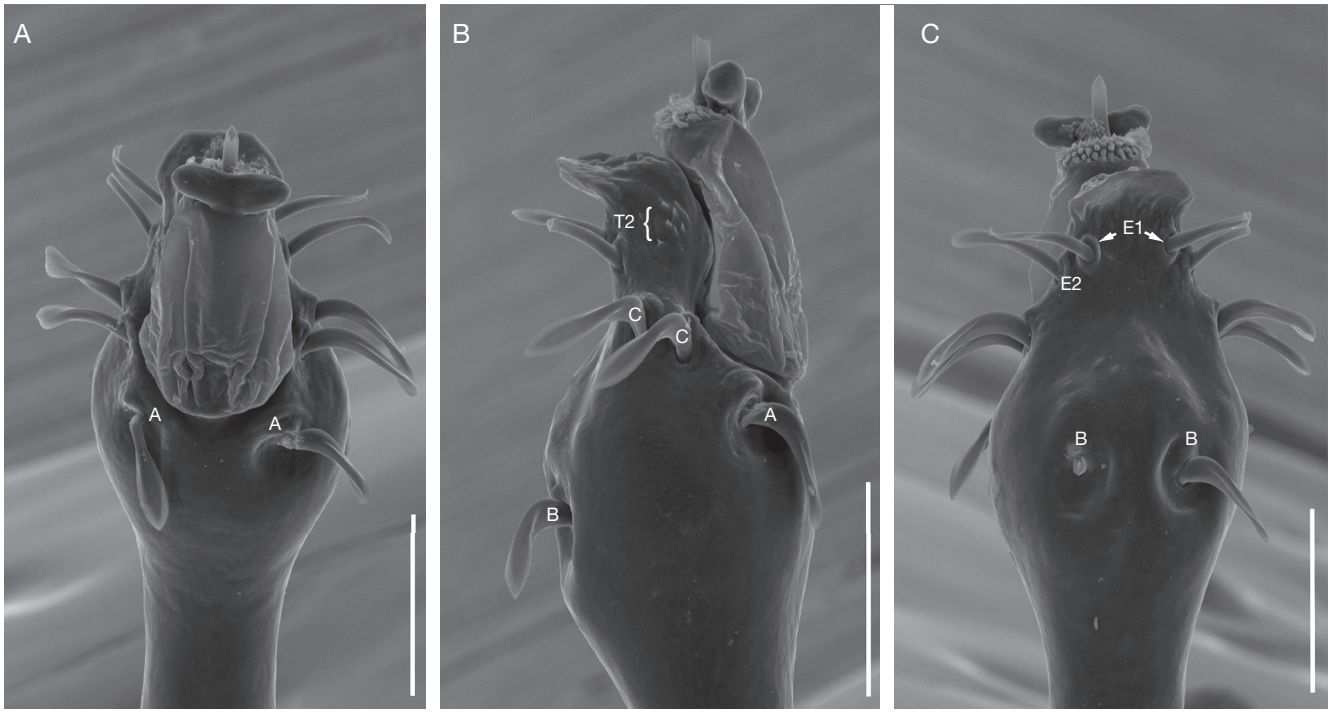

FIG. 8. — Penis of the holotype (CNAN-T01344) of *Toojah cimutaa* n. sp. **A**, dorsal; **B**, lateral; **C**, ventral. MS A, B, C, D and E, and microsetae T2 are marked on each figure. Abbreviations: see Material and methods. Scale bars: 50 µm.

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