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Mastigoproctus spinifemoratus, a New Species of Giant Vinegaroon (Thelyphonida: Thelyphonidae) from Mexico †

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Abstract: *Mastigoproctus* Pocock, 1894, is the most speciose genus in the thelyphonid subfamily Mastigoproctinae Speijer, 1933, with eighteen described species distributed from the Southern United States to Colombia and Venezuela. Ten of these species occur in Mexico. In the present contribution, *Mastigoproctus spinifemoratus*, sp. nov., is described based on an adult male and two juveniles from Eastern Nuevo León and Southwestern Tamaulipas, Mexico. It differs from five other species of *Mastigoproctus*, in which spiniform tubercles are present on the retrolateral surface of the pedipalp femur, in the ventrally directed epistome of the carapace, and the absence of an accessory spine on the prodorsal margin of the pedipalp trochanter. The new species raises the number of *Mastigoproctus* species to nineteen and the number in Mexico to eleven.

Keywords: Mexico; morphology; North America; taxonomy; Uropygi; whip-scorpion

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1. Introduction

The thelyphonid genus *Mastigoproctus* Pocock, 1894, comprises large vinegaroons or whip-scorpions distributed from the Southern United States to Colombia and Venezuela [1,2] and recognized by the following combination of characters: (i) carapace with conspicuous anterolateral carina; (ii) median ocular tubercle with superciliary carina; (iii) tergites I–III with median longitudinal suture; (iv) pair of pygidial ommatoids; (v) sternites II and III of male unmodified except for lateral swellings; (vi) stridulatory organ comprising randomly distributed setae on retrolateral surface of chelicera and prolateral surface of pedipalp coxa; (vii) pedipalp patellar apophysis longer in males than females, but not ornamented; and (viii) legs II–IV with tibial spur ventrodistally [3–5].

After being ignored for half a century, interest in the systematics of *Mastigoproctus* has renewed, with several new species described in the past 25 years [5–11]. *Mastigoproctus* is the currently most speciose genus of Mastigoproctinae Speijer, 1933, with eighteen described species [12], ten of which occur in Mexico (Table 1) [5,11]. The Brazilian species previously assigned to *Mastigoproctus* were recently transferred to *Amauromastigon* Mello-Leitão, 1931 and *Heptatarsus* Castro-Pereira & Pinto-da-Rocha, 2025 [13]. In the present contribution, *Mastigoproctus spinifemoratus*, sp. nov., is described based on an adult male and two juveniles from Eastern Nuevo León and Southwestern Tamaulipas, Mexico. The new species raises the number of *Mastigoproctus* species to nineteen and the number in Mexico to eleven.

Table 1. Mexican species of *Mastigoproctus* Pocock, 1894, and states in which it was recorded.

Species	Distribution
M. cinteotl Barrales-Alcalá et al., 2018	Queretaro, San Luis Potosí, Tamaulipas
M. franckei Barrales-Alcalá, 2023	San Luis Potosí
M. giganteus (Lucas, 1835)	Morelos
M. lacandonensis Ballesteros and Francke, 2006	Chiapas
M. mexicanus (Butler, 1872)	Aguascalientes, Jalisco
M. scabrosus (Pocock, 1902)	Oaxaca, Veracruz
M. spinifemoratus, sp. nov.	Nuevo León, Tamaulipas
M. tohono Barrales-Alcalá et al., 2018	Arizona (USA), Sonora
M. vandevenderi Barrales-Alcalá et al., 2018	Sonora
M. xetame Barrales-Alcalá and Francke, 2023	Jalisco
M. yalchanchak Barrales-Alcalá and Francke, 2023	Chiapas

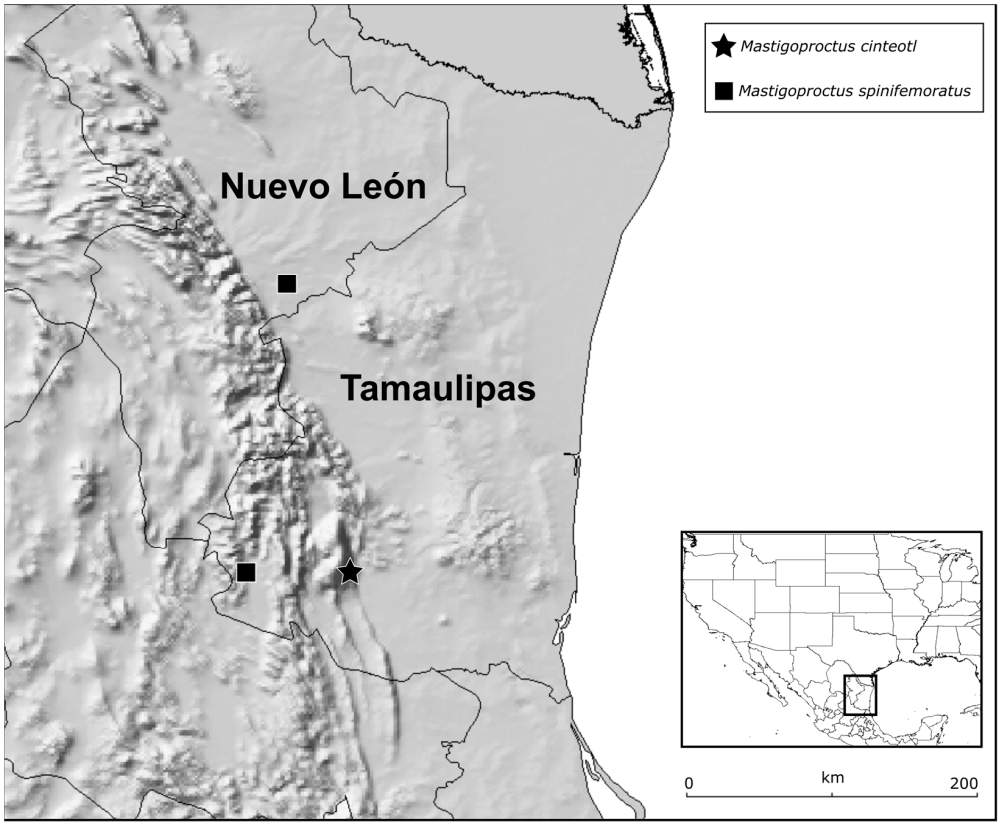


Figure 1. Map of Mexico plotting distributions of *Mastigoproctus cinteotl* Barrales-Alcalá et al., 2018, and *Mastigoproctus spinifemoratus*, sp. nov. Type locality of *M. cinteotl* from Barrales-Alcalá et al. (2018).

2. Materials and Methods

The material examined is deposited at the California Academy of Sciences (CAS), San Francisco, CA, USA. Morphology was studied, and measurements were recorded using a Nikon SMZ 1500 stereoscope fitted with an ocular micrometer at the American Museum of Natural History (AMNH), New York, NY, USA. Male genitalia were dissected following the protocol of Castro-Pereira and Pinto-da-Rocha (2025) [13].

Digital images were obtained using a Nikon D3300 camera with a 60 mm macro lens and StackShot equipment for the acquisition of stacked images at the AMNH.

Measurements follow Huff et al. (2008), Barrales-Alcalá et al. (2018), and Castro-Pereira and Pinto-da-Rocha (2025) [5,12,13]. Color in ethanol was described according to the NBS-IBCC color system (https://archive.vn/ufMMn, accessed on 14 November 2024). Morphological terminology follows Millot (1949), except for carapace morphology, which

follows Castro-Pereira and Pinto-da-Rocha (2025) [13]; segmentation of the pedipalps, which follows Snodgrass (1948) [14,15]; spination of the pedipalp trochanter, which follows Barrales-Alcalá et al. (2018) [5]; and gonopod structures, which follow Barrales-Alcalá et al. (2018) and Seraphim et al. (2019) [5,16].

A map (Figure 1) was prepared with DIVA-GIS (https://diva-gis.org, accessed on 14 November 2024) using a digital elevation model from Natural Earth (https://www.naturalearthdata.com, accessed on 14 November 2024). The approximate coordinates of the type material were obtained from Tageo (https://www.tageo.com, accessed on 14 November 2024).

3. Taxonomy

Family Thelyphonidae Lucas, 1835;
Subfamily Mastigoproctinae Speijer, 1933;
Genus *Mastigoproctus* Pocock, 1894.

Type species. *Thelyphonus giganteus* Lucas, 1835, by original designation.

Included species. The genus *Mastigoproctus* currently includes nineteen species: *Mastigoproctus abeli* Villarreal-Manzanilla and Giupponi, 2009; *Mastigoproctus ayalai* Víquez and Armas, 2007; *Mastigoproctus baracoensis* Franganillo, 1931; *Mastigoproctus cinteotl* Barrales-Alcalá et al., 2018; *Mastigoproctus colombianus* Mello-Leitão, 1940; *Mastigoproctus floridanus* Lönnberg, 1897; *Mastigoproctus formidabilis* Hirst, 1912; *Mastigoproctus franckei* Barrales-Alcalá, 2023; *Mastigoproctus giganteus* (Lucas, 1835); *Mastigoproctus lacandonensis* Ballesteros and Francke, 2006; *Mastigoproctus mexicanus* Butler, 1872; *Mastigoproctus proscorpio* (Latreille, 1806); *Mastigoproctus santiago* Teruel, 2010; *Mastigoproctus scabrosus* Pocock, 1902; *Mastigoproctus tohono* Barrales-Alcalá et al., 2018; *Mastigoproctus xetame* Barrales-Alcalá and Francke, 2023; *Mastigoproctus vandevenderi* Barrales-Alcalá et al., 2018; *Mastigoproctus yalchanchak* Barrales-Alcalá and Francke, 2023; *Mastigoproctus spinifemoratus*, sp. nov.

Distribution. The genus *Mastigoproctus* has been recorded in six countries and territories: Colombia, Cuba, Martinique (France), Mexico, the USA, and Venezuela.

Mastigoproctus spinifemoratus, sp. nov.
Figures 1–6, Table 2.

Etymology. The specific epithet is a combination of the Classic Latin words spini = spines and femorātus = femur, reflecting the presence of spiniform tubercles on the retrolateral margin of the pedipalp femur. It is masculine in gender.

Type material. Holotype ♂, 2J paratypes (CAS), MEXICO: **Tamaulipas:** *Miquihuana Municipality*: El Puerto, along logging road E of Miquihuana, on ridge SE of Cerro Peña Nevada [23°32′ N 99°49′ W], 8400 ft, 31.VIII.1986, D.E. Breedlove. **Nuevo León:** *Linares Municipality*: 20 mi. W of Linares [24°51′ N 99°34′ W], 8.XI.1946, E.S. Ross.

Diagnosis. *Mastigoproctus spinifemoratus*, sp. nov., resembles five species of the genus in which spiniform tubercles are present on the retrolateral surface of the pedipalp femur, i.e., *Mastigoproctus mexicanus*, *Mastigoproctus scabrosus*, *Mastigoproctus vandevenderi*, *Mastigoproctus xetame*, and *Mastigoproctus yalchanchak*. However, the new species differs as follows. The epistome of the carapace is ventrally directed, and an accessory spine is absent from the prodorsal margin of the pedipalp trochanter in the new species, whereas the epistome is anteriorly directed, and an accessory spine is present in the other five species.

Description. Based on the holotype male. The female is unknown.

Coloration (in ethanol): Carapace and pedipalp vivid reddish orange (centroid 34). Median ocelli and minor lateral ocelli are of moderate olive color (centroid 107). Major lateral ocelli and flagellar organs are brilliant yellow in color (centroid 83). Tergites I–IX and

pygidium are brownish–orange (centroid 54). Prosternum, mesosternum, metasternum, sternites II–IX, flagellum, chelicera, and legs I–IV are vivid orange in color (centroid 48). Ommatoids are brilliant orange–yellow (centroid 67).

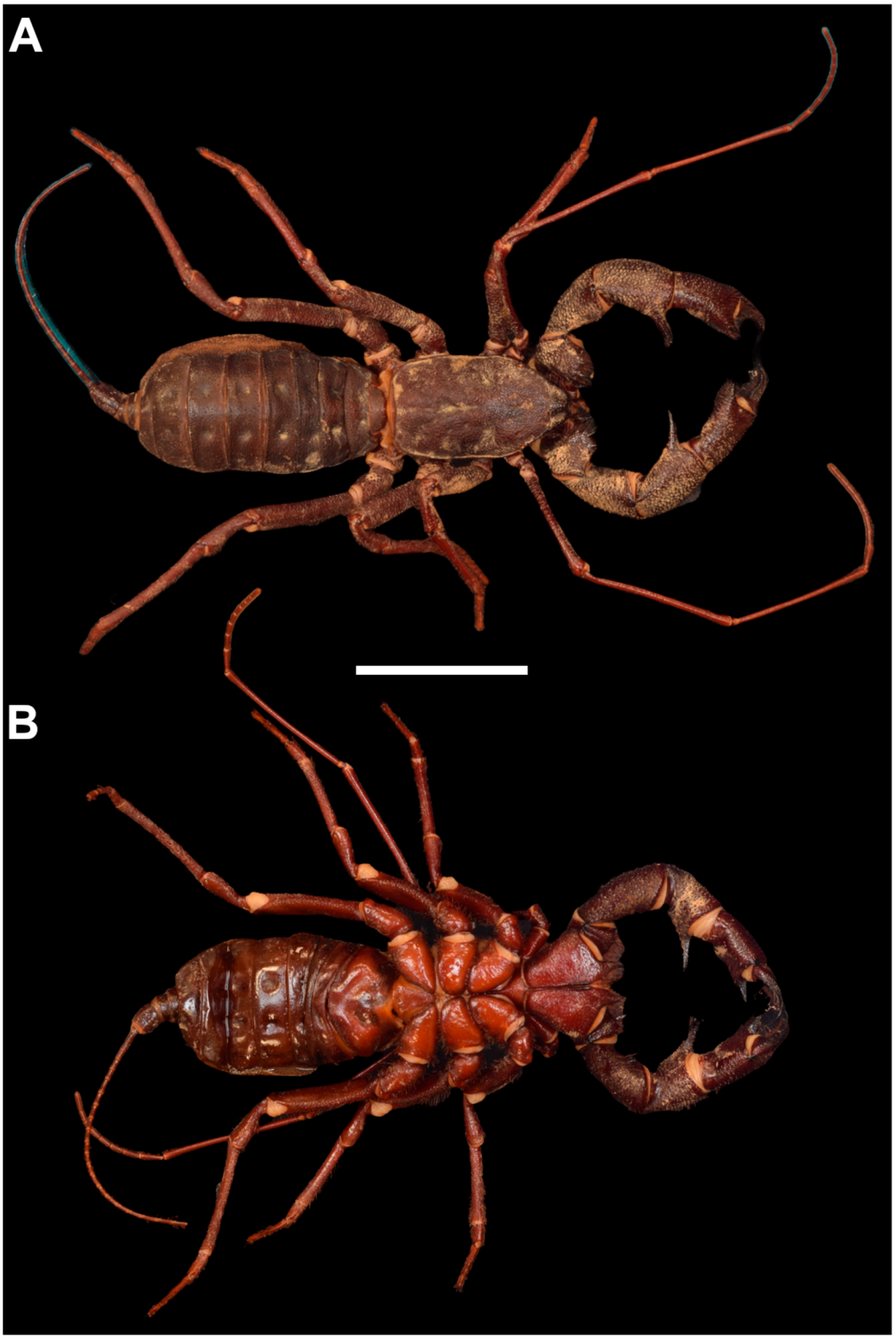


Figure 2. *Mastigoproctus spinifemoratus*, sp. nov., holotype ♂(CAS), habitus. (**A**) Dorsal aspect. (**B**) Ventral aspect. Scale bar: 10 mm.

Chelicerae: Manus anterior margin is densely setose pro- and retrolaterally, with conspicuous, long setae (Figure 5A); retrodorsal surface with proximal tubercle is large and blunt; retrolateral surface with the stridulatory area (plectrum) comprises conspicuous,

stout setae, shorter than other setae on the surface; ventral surface is densely setose, with conspicuous, long setae. The fixed finger has a conspicuous, falciform subapical tooth. The movable finger is obliquely paired with the fixed finger.

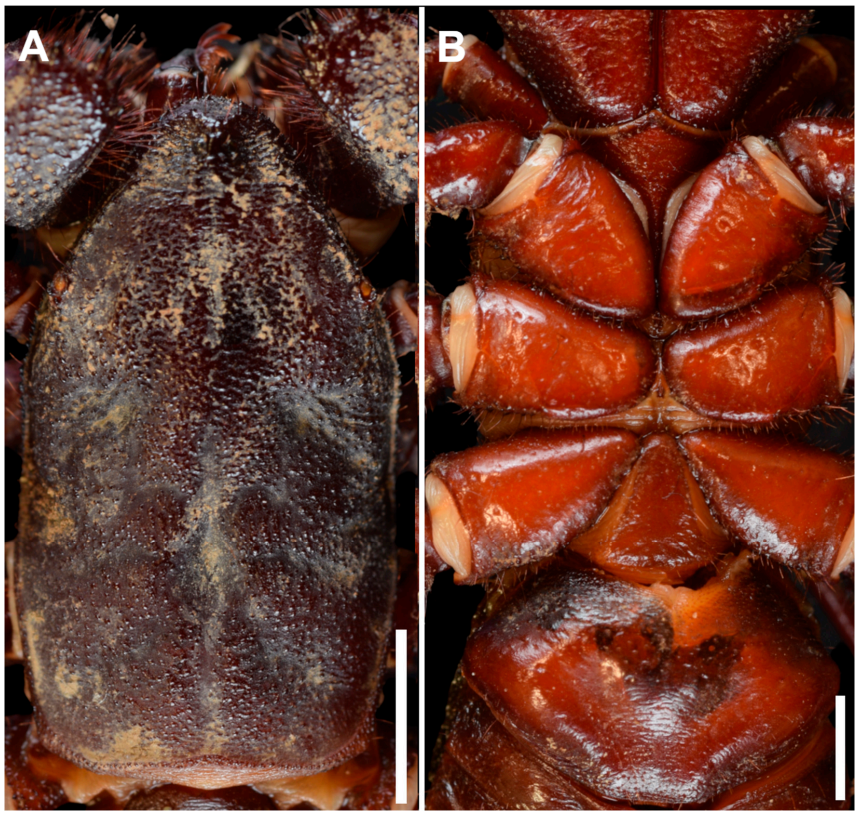


Figure 3. *Mastigoproctus spinifemoratus*, sp. nov., holotype ♂(CAS), prosoma. (**A**) Dorsal aspect. (**B**) Ventral aspect. Scale bars: 5 mm.

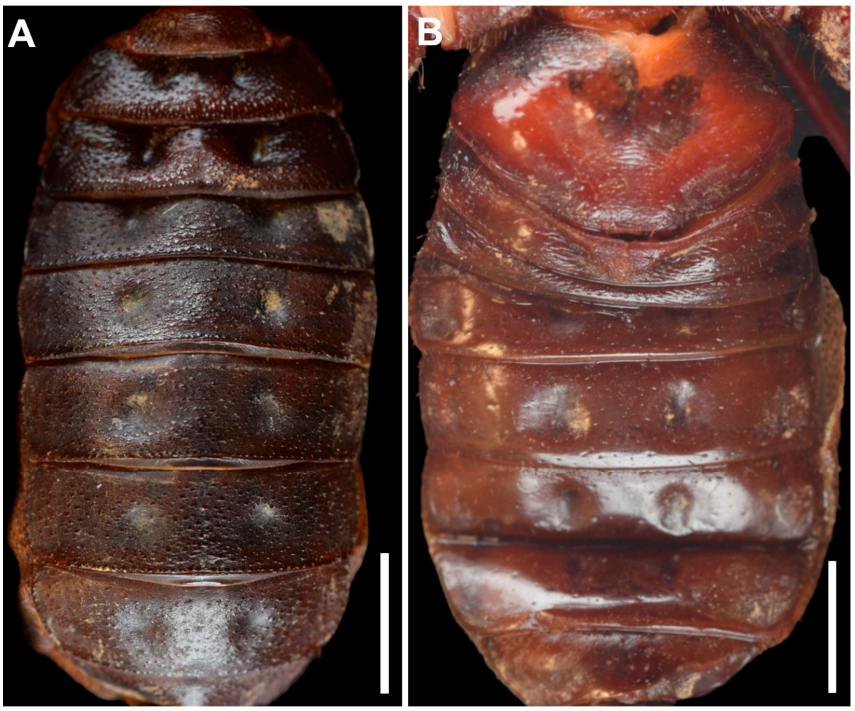


Figure 4. *Mastigoproctus spinifemoratus*, sp. nov., holotype ♂(CAS), opisthosoma. (**A**) Dorsal aspect. (**B**) Ventral aspect. Scale bars: 5 mm.

Pedipalps: The coxal process is falciform, situated proventrally (Figure 6). Trochanter dorsal surface is tuberculate; prodorsal margin has five sharp, conical spines (S1–S5) distally (S2 on dextral pedipalp with bifid apex); spine length ratio is S3 > S2 = S4 > S1 > S5, without accessory spine; the prolateral surface has a subtransverse row of blunt, conical tubercles proximally; the ventral surface has two sharp apical spines, with longer distal spine than the proximal spine, and without a basal tuberculate bulge. The femur is long; the dorsal surface is densely tuberculate, with a conspicuous subterminal spine; the retrolateral surface has spiniform tubercles; the ventral surface is densely tuberculate; the proventral surface has a conspicuous spine. The patella dorsal surface is punctate; the prodorsal surface is without spines, with long patellar apophysis; the retrolateral surface has spiniform tubercles; the ventral surface is punctate, with a subterminally small spine; the patellar apophysis has prolateral smooth margin; retrolateral margin is with a row of denticles. The tibia prodorsal margin has a row of small, conical spines and a long tibial apophysis; the ventral surface has two conical subterminal spines; the tibial apophysis (fixed finger) is subconical and setose, with a retroventral margin with row of denticles. The tarsus (fixed finger) is falciform and setose, with a conspicuous dorsobasal lobe and bifid apex; the prodorsal margin has a row of denticles.

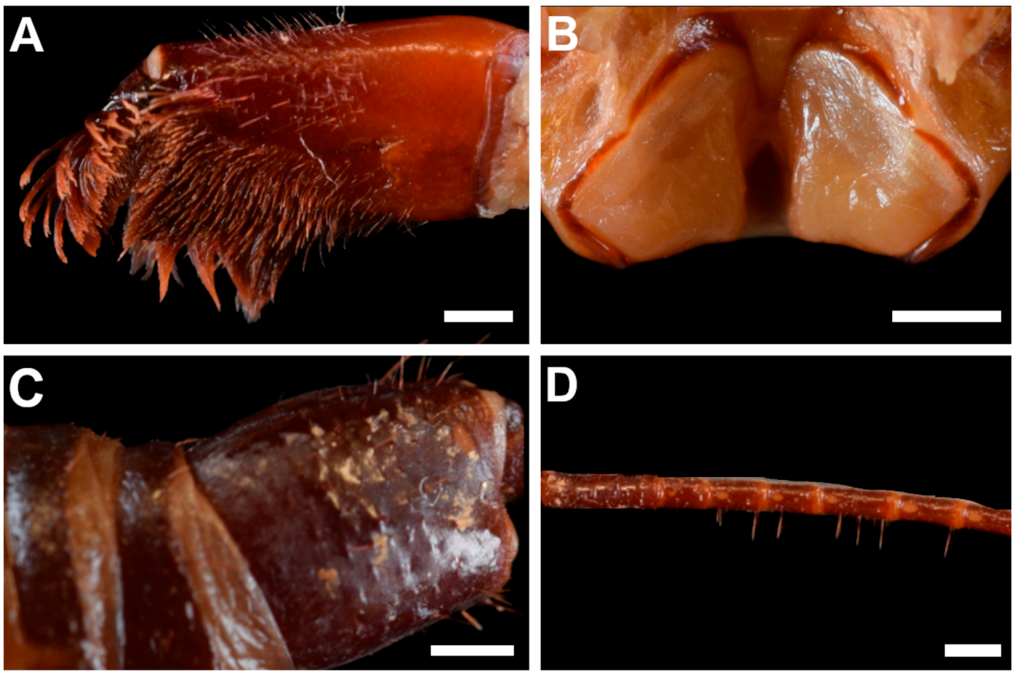


Figure 5. *Mastigoproctus spinifemoratus*, sp. nov., holotype ♂(CAS). (**A**) Dextral chelicera, prolateral aspect. (**B**) Male genitalia. (**C**) Pygidium, lateral aspect. (**D**) Section of flagellum, ventral aspect. Scale bars: 1 mm.

Legs: Coxa I has a prolateral, finely and sparsely tuberculate, retrolateral surface with a row of blunt tubercles equal in size; coxae II–IV each have prolateral margins with distal bulges; retrolateral surfaces are tuberculate; coxa IV has a dorsal surface with tubercles of variable size. Trochanters I–IV are longer than they are wide, progressively decreasing in length anteriorly (relative lengths: IV > III > II > I); trochanter I has a prolateral finely and sparsely tuberculate surface retrolateral surface has a small conical tubercle distally; trochanters II–IV have retrolateral surfaces each with conical tubercles; trochanters III and IV have dorsal surfaces each with small conical tubercles. Femora I–IV are long, progressively decreasing in height anteriorly (relative lengths: IV > III > II > I); femur I has finely and sparsely tuberculate surface; femora II–IV have dorsal, prolateral, and ventral tuberculate surfaces, tubercles of dorsal and ventral surfaces forming longitudinal

rows. Patellae I–IV have relative lengths I > IV = II > III; patella I has smooth surfaces; patellae II–IV have finely and sparsely tuberculate surfaces. Tibiae I–IV have relative lengths I > IV > II = III; tibia I has a smooth surface; dorsal surface has two trichobothria distally; tibiae II–IV have finely and sparsely tuberculate surfaces; dorsal surfaces each have distal trichobothrium, proventral margins are each with tibial spur distally. Tarsus I has eight tarsomeres with relative lengths I (basal) > VIII (terminal) > II ≥ III ≥ IV ≥ V > VII ≥ VI; basitarsi and distitarsi II–IV each have dorsal surfaces with terminal bulge; ventral surfaces have a pair of setal rows submedially; basitarsi II–IV have proventral margins each with a pair of tarsal spurs distally; distitarsi II–IV are trisegmented with relative lengths of segments I (basal) > III (terminal) > II, setose, each with falciform tarsal process and a pair of falciform ungues terminally.

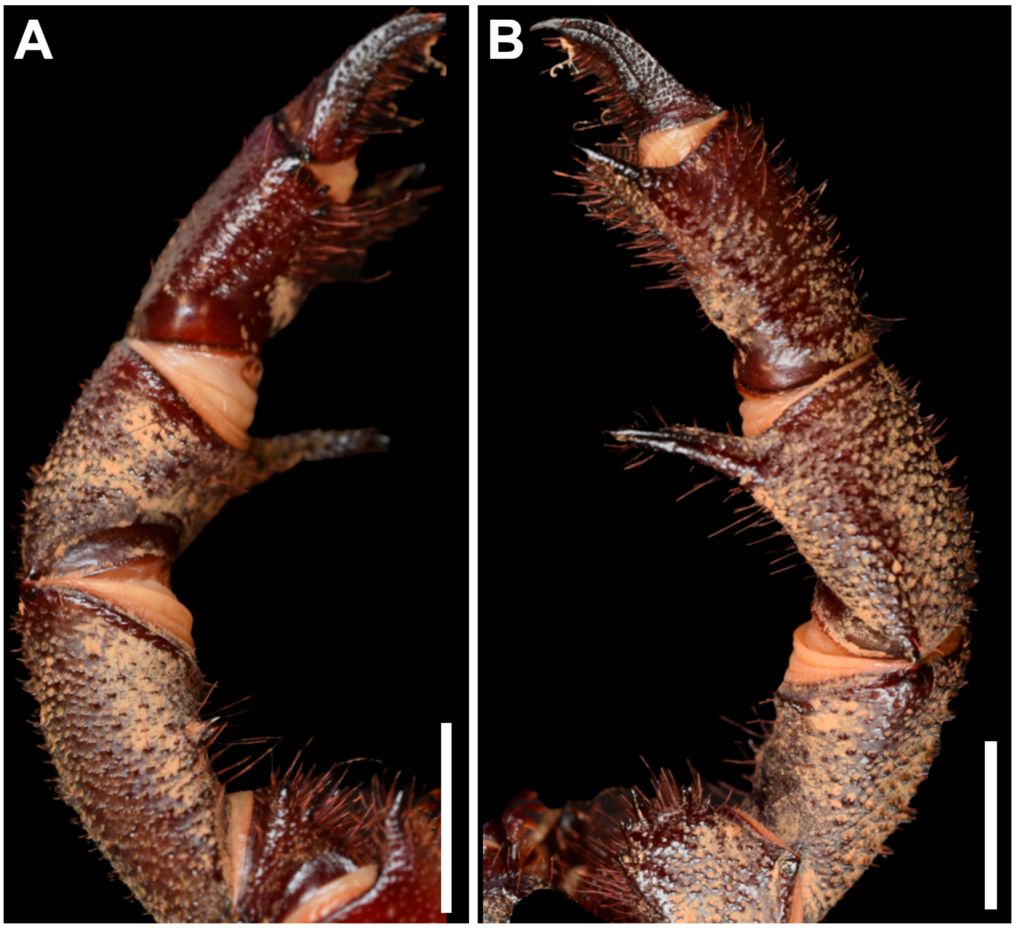


Figure 6. *Mastigoproctus spinifemoratus*, sp. nov., holotype ♂(CAS), dextral pedipalp. (**A**) Ventral aspect. (**B**) Dorsal aspect. Scale bars: 5 mm.

Opisthosoma: Tergites I–IX are granular, each without longitudinal median suture (Figures 2 and 4A); tergite I has a pair of posterolateral eminences; tergites II–VIII are each with two submedian sulci; tergites II–IX are each with lateral and posterior margins granular; tergite IX is without submedian sulci. Sternites II–IX are each with lateral margins granular; sternite II is irregularly hexagonal in shape, with two bulges posterolaterally and posterior margin sublinear medially; surface punctuates anteriorly; it is smooth laterally, without median longitudinal suture; sternites III–IV are wider than they are long; sternite III has a shape of an inverted triangle in shape, with concave anterior margin, posterior margin convex, densely setose medial surface, complete median longitudinal suture, and delimited by two depressions; sternite IV is with anterior margin concave, posterior margin shallow convex, and without median longitudinal suture; sternites V–VIII are each with two

submedian sulci; sternite IX is without submedian sulci; sternites V–IX are subrectangular and conspicuous, and sternite VIII is larger (Figure 4B). Pleuron is granular.

Male gonopods: *Lobus lateralis primus* has an irregular quadrilateral shape, with a width greater than length and less than half the width of sternite II (Figure 5B, Table 2).

Pygidium: Segment X with lateral longitudinal suture is complete; posterior margin with granular row is restricted to dorsal semicircle (Figure 5C). Segment XI posterior margin is without a granular row on the dorsal semicircle. Segment XII has a pair of ommatoids situated posteriorly; one pair is situated prodorsally, the other—retrodorsally; ommatoids are oval, with a height less than half the height of the segment (Table 2).

Flagellum: Flagellomeres are cylindrical, with setae arranged circularly (Figure 5D). Flagellar organs are elliptical or nearly so, situated ventrobasally from flagellomere II onwards.

Table 2. Measurements (mm) of the adult male holotype of *Mastigoproctus spinifemoratus*, sp. nov., deposited in the California Academy of Sciences, San Francisco, U.S.A. Abbreviations: H, height; L, length; W, width.

Total L		48.2
Carapace	L	18.4
	W (at median ocular tubercle)	4.4
	W (at posterior fovea)	10.1
	distance med. ocular tubercle to anterior margin	1.6
	median ocelli W	0.5
	distance between median ocelli	0.7
Pedipalp	coxa L	10.2
	coxa maximum W	5.6
	trochanter L	5.2
	trochanter W	4.7
	femur L	9
	femur W	4.3
	patella L	8.4
	patella W	4.1
	patellar apophysis L	4.4
	patellar apophysis W	0.9
	tibia L	7.8
	tibia W	3.7
	tibial apophysis L	3.4
	tibial apophysis W	1.2
	tarsus L	6.3
	tarsus W	1.3
Leg I	coxa L	2.5
	trochanter L	3.4
	femur L	12.9
	patella L	16.9
	tibia L	15.3
	tarsus L	13.1
Leg IV	coxa L	7.1
	trochanter L	5.7
	femur L	15.4
	patella L	6.7
	tibia L	14.2
	basitarsus L	2.7
	distitarsus L	7.3
Pygidium	ommatoid H	0.4
	ommatoid W	0.2
	ommatoid H: pygidium H	0.13
Male genitalia	*lobus lateralis primus* W: sternite II W	0.2

Variation. Based on juvenile paratypes.

Coloration (*in ethanol*): Carapace, tergites I–IX, and pygidium are brilliant orange (centroid 49). Major lateral ocellus and flagellar organs are light yellow (centroid 86). Prosternum, mesosternum, metasternum, sternites II–IX, flagellum, chelicerae, pedipalps, and legs I–IV are brilliant yellow (centroid 83).

Pedipalps: Trochanter prodorsal margin has five spines of variable length. The femur retrolateral surface is without spiniform tubercles. Patella prodorsal margin has one spine on sinistral pedipalp and three spines on dextral pedipalp.

Legs: Tarsus I has a variable length ratio of tarsomeres.

Distribution. It is known from only two localities, one in Eastern Nuevo León and the other in Southwestern Tamaulipas, Mexico (Figure 1).

4. Discussion

Mastigoproctus spinifemoratus, sp. nov., is the eleventh species of *Mastigoproctus* recorded from Mexico, where most of the species of the genus occur. It is the second species of the genus recorded from Tamaulipas, the other being *M. cinteotl*, recorded from the southwestern part of the state (Figure 1).

The new species exhibits two distinctive morphological characteristics. Firstly, an accessory spine is absent from the prodorsal margin of the pedipalp trochanter (i.e., the distalmost spine on the trochanter [5]) of the male. An accessory spine is also absent in the male of *M. xetame* and *Sheylayongium pelegrini* (Armas, 2000) of the monotypic genus *Sheylayongium* Teruel, 2018 but present in the females of both species [11,17]. Secondly, a stridulatory organ, created by setae on the prolateral surface of the pedipalp coxa (*pars stridens*) and the retrolateral surface of the chelicera (*plectrum*), is present. A stridulatory organ was first described in thelyphonids as a diagnostic character for the monotypic genus *Valeriophonus* Víquez and Armas, 2005 [18]. However, a stridulatory organ was subsequently discovered in eight Mexican species of *Mastigoproctus* [5,11]. Whether the stridulatory organ is synapomorphic for *Mastigoproctus* and *Valeriophonus* remains to be tested. The organ is absent in two Mexican species of *Mastigoproctus*, i.e., *M. scabrosus* and *M. yalchanchak* [5,11].

The male genitalia have not been described for most species of *Mastigoproctus*, preventing a comparison with the male genitalia of *Mastigoproctus spinifemoratus*, sp. nov., described herein. Descriptions of the male genitalia of thelyphonids may become more commonplace following the terminology proposed by Seraphim et al. (2019) [16,19]. Future fieldwork should aim to collect females of the new species to study and describe the female genitalia, which are routinely included in morphological descriptions of thelyphonids [5,8,11,13,16–19].

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Data Availability Statement: Data are contained within the article.

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