



On the sun-spiders of the *ibirapemussu* species-group of the genus *Gaucha* Mello-Leitão, 1924 (Solifugae, Mummuciidae), with description of a new species

LEONARDO S. CARVALHO^{1*} & RICARDO BOTERO-TRUJILLO^{2,3}

¹Universidade Federal do Piauí, Campus Amílcar Ferreira Sobral, BR 343, KM 3.5, Bairro Meladão, s/no. CEP 64808-605, Floriano, PI, Brazil

²Current address: Theodore Roosevelt Postdoctoral Research Fellow. Division of Invertebrate Zoology and Richard Gilder Graduate School, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024-5192, USA

³División Aracnología, Museo Argentino de Ciencias Naturales “Bernardino Rivadavia” – CONICET, Av. Ángel Gallardo 470, CP: 1405DJR, C.A.B.A., Buenos Aires, Argentina

*Corresponding author. E-mail: carvalho@ufpi.edu.br

Abstract

A new solifuge species in the genus *Gaucha* Mello-Leitão, 1924 and the *ibirapemussu* species-group is herein described based on males and females collected at Itacuruba, State of Pernambuco, and Jaicós, State of Piauí, both in Northeastern Brazil. Males of the new species can be readily recognized by having the movable finger MM and MSM teeth reduced and of similar size. The present finding raises to twelve the number of described species in the genus, five of which belong to the *ibirapemussu* species-group. Besides, a new locality record for the species *Gaucha ibirapemussu* (Carvalho *et al.*, 2010) is here presented, along with an updated identification key for all *Gaucha* species.

Key words: New species, solifuges, taxonomy, Piauí, Pernambuco

Introduction

The Linnean shortfall regarding South American solifuges has decreased considerably in the past two decades, among others, with the description, redescription, and revision of several taxa (Xavier & Rocha 2001; Rocha & Canello 2002; Martins *et al.* 2004; Rocha & Carvalho 2006; Carvalho *et al.* 2010; González-Reyes & Corronca 2013; Iuri *et al.* 2014; Botero-Trujillo 2014, 2016; Botero-Trujillo *et al.* 2017, 2019; Blanco *et al.* 2017), along with some ecological studies (Xavier & Rocha 2001; Martins *et al.* 2004; Rocha & Carvalho 2006; Catenazzi *et al.* 2009). In South America, there are representatives of three Solifugae families, namely Ammotrechidae Roewer, 1934, Daesiidae Kraepelin, 1899 and Mummuciidae Roewer, 1934. While Daesiidae is represented in this continent by only three poorly known species narrowly distributed in Argentina and Chile, Ammotrechidae and Mummuciidae are more widely distributed in the continent (Maury 1984; Harvey 2003; Botero-Trujillo *et al.* 2017).

Regarding mummuciids, a recent morphological cladistic analysis integrating traditional characters and morphometric data for 15 out of 25 nominal species that were recognized at that time, allowed the recognition of two new generic synonyms and the proposition of a diagnosis and delimitation of the genus *Gaucha* Mello-Leitão, 1924 (Botero-Trujillo *et al.* 2017). With eleven described species, *Gaucha* is the most species-rich genus in the family. Although most of its species are allocated to one of two species-groups, there remains one, *Gaucha ramirezi* Botero-Trujillo *et al.*, 2019 that is of uncertain systematic position (Botero-Trujillo *et al.* 2019). The remaining fourteen mummuciids are distributed in *Mummucia* Simon, 1879 (5 spp.), *Mummucina* Roewer, 1934 (5 spp.), and the monotypic genera *Cordobulgida* Mello-Leitão, 1938, *Mummucipes* Roewer, 1934, *Uspallata* Mello-Leitão, 1938, and *Vempironiella* Botero-Trujillo, 2016 (Harvey 2003; Botero-Trujillo 2014, 2016; Botero-Trujillo *et al.* 2017).

Gaucha species are known from dry and/or savanna environments (e.g., Pampa, Caatinga and Cerrado biomes) throughout central South America, with most of its described species known from Brazil (Botero-Trujillo *et al.* 2017). This country harbors one of the most diversified biotas of the world (Lewinsohn & Prado 2005), which is poorly

and heterogeneously known (Oliveira *et al.* 2016) and only partially protected by conservation areas (Oliveira *et al.* 2017b). As a consequence, large areas remain without a single record of many taxa and several hitherto undescribed species are expected to be found, as more specimens become available, as it happens for several arachnid groups (Brescovit *et al.* 2011; Carvalho *et al.* 2014; DeSouza *et al.* 2014, 2017; Porto *et al.* 2014; Oliveira *et al.* 2017a; Santos *et al.* 2017).

Recent expeditions to Northeastern Brazil resulted in the collection of the specimens of *Gaucha* from the States of Piauí and Pernambuco that are here newly studied. Thorough examination revealed that these specimens correspond to an undescribed *Gaucha* species belonging to the *ibirapemussu* species-group (Botero-Trujillo *et al.* 2017), described herein. In addition, the distribution range of *Gaucha ibirapemussu* (Carvalho *et al.*, 2010), previously known only from its type locality at the Parque Nacional da Serra das Confusões, is extended northwards in the State of Piauí, Northeastern Brazil.

Material and methods

The material examined belongs to the following Brazilian collections (acronyms and curators in parentheses): Coleção de História Natural da Universidade Federal do Piauí, Floriano, Piauí (CHNUFPI, E.F.B. Lima); Coleções Taxonômicas da Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais (UFMG, A.J. Santos).

The specimens were examined submersed in 80% ethanol. Nomenclature used for teeth and other cheliceral structures, and color and style of chelicerae schematic drawings follows Bird *et al.* (2015). Leg segmentation terminology follows Shultz (1989), except for distal two segments which are herein called basi- and telotarsus, respectively, following recent publications (Bird & Wharton 2015; Botero-Trujillo 2016; Botero-Trujillo *et al.* 2017, 2019). Description style followed the most recent and comprehensive taxonomic paper regarding Mummuciidae representatives (Botero-Trujillo *et al.* 2017).

Specimens were examined with Leica M165C and Olympus SZ40 stereomicroscopes. Photographs of preserved specimens were taken with Leica DFC 290 and DFC 295 digital cameras mounted on the M165C stereomicroscope, and the extended focal range images composed with Helicon Focus 6.2.2 Pro software (<http://www.heliconsoft.com/heliconsoft-products/helicon-focus/>). Measurements are expressed in millimeters. The distribution map was produced using ArcGIS 10.3 (ESRI 2013). One chelicera of male was prepared for SEM as described by Botero-Trujillo (2016) and Botero-Trujillo *et al.* (2017). SEM micrographs were taken under high vacuum with a Philips FEI XL30 TMP at the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Buenos Aires, Argentina.

Taxonomy

Family Mummuciidae Roewer, 1934

Genus *Gaucha* Mello-Leitão, 1924

Gaucha Mello-Leitão, 1924: 140–141 (as *Gaùcha* [sic]). **Type species:** *Gaucha fasciata* Mello-Leitão, 1924 (by original designation).

Gauchella Mello-Leitão, 1937: 84 (synonymized by Botero-Trujillo *et al.* 2017: 13). **Type species:** *Gaucha stoeckeli* Roewer, 1934.

Metacleobis Roewer, 1934: 589 (synonymized by Botero-Trujillo *et al.* 2017: 13). **Type species:** *Metacleobis fulvipes* Roewer, 1934.

Mummuciella Roewer, 1934: 583, 587 (synonymized by Mello-Leitão, 1937: 84). **Type species:** *Mummuciella simoni* Roewer, 1934.

Species composition. Twelve South American species, namely: *Gaucha avexada* Botero-Trujillo, Ott & Carvalho, 2017; *Gaucha cabriola* sp. nov.; *Gaucha casuhati* Botero-Trujillo, Ott & Carvalho, 2017; *Gaucha curupi* Botero-Trujillo, Ott & Carvalho, 2017; *Gaucha eremolembra* Botero-Trujillo, Ott & Carvalho, 2017; *Gaucha fasciata* Mello-Leitão, 1924; *Gaucha fulvipes* (Roewer, 1934); *Gaucha ibirapemussu* (Carvalho, Candiani, Bonaldo, Suesdek & Silva, 2010); *Gaucha mauryi* (Rocha, 2001); *Gaucha ramirezi* Botero-Trujillo, Ott, Mattoni, Nime, Ojanguren-Affilastro, 2019; *Gaucha santana* Botero-Trujillo, Ott, Mattoni, Nime, Ojanguren-Affilastro, 2019; and *Gaucha stoeckeli* Roewer, 1934;

Distribution. Argentina (Buenos Aires, Córdoba and Santiago del Estero provinces), Bolivia (Cochabamba and La Paz departments), Brazil (States of Bahia, Distrito Federal, Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pernambuco [new record], Piauí, Rio Grande do Sul, Tocantins), Uruguay (Lavalleja, Río Negro, Rivera).

Diagnosis. See details in Botero-Trujillo *et al.* (2017: 13) and amendment regarding the pleural marks made by Botero-Trujillo *et al.* (2019).

Up to date key to the identification of *Gaucha* species

(Modified from Botero-Trujillo *et al.* 2017)

- 0 Opisthosomal pleural membranes with white marks surrounding the socket of some setae, visible on the blackish band (Botero-Trujillo *et al.* 2019, fig. 3D) *Gaucha ramirezi*
- 0' Opisthosomal pleural membranes with black marks surrounding the socket of some setae, visible on the whitish band (Botero-Trujillo *et al.* 2017, fig. 24D) **1**
- 1 Movable finger mucron of male short, with gnathal edge carina very prominent (Botero-Trujillo *et al.* 2017, fig. 11C); male and female cheliceral fixed finger with or without FSD tooth (Botero-Trujillo *et al.* 2017, figs. 13A, 15A), often the size of a minute denticle **2 (*fasciata* species-group)**
- 1' Movable finger mucron of male long, with gnathal edge carina moderately prominent (Botero-Trujillo *et al.* 2017, fig. 25C); male and female cheliceral fixed finger without FSD tooth (Botero-Trujillo *et al.* 2017, figs. 25A,C) **7 (*ibirapemussu* species-group)**
- 2 Fixed finger mucron of male with evident subterminal flange (Botero-Trujillo *et al.* 2017, fig. 17B) *Gaucha fulvipes*
- 2' Fixed finger mucron of male without subterminal flange (Botero-Trujillo *et al.* 2017, figs. 11C, 13C) **3**
- 3 Fixed finger of male with FP and FM teeth noticeably elongated, FD tooth being much smaller (Botero-Trujillo *et al.* 2017, fig. 13C, 2019, fig. 8C) **4**
- 3' Fixed finger of male with FP, FM and FD teeth of average size, none noticeably elongated (Botero-Trujillo *et al.* 2017, figs. 11C, 15C, 2019, fig. 8C) **5C**
- 4 Fixed finger of male with FD tooth small but evident (Botero-Trujillo *et al.* 2019, fig. 8C); male and female without FSD tooth *Gaucha santana*
- 4' Fixed finger of male with FD tooth greatly reduced (Botero-Trujillo *et al.* 2017, fig. 13C); FSD tooth present in female and, most often, also in male (though reduced) (Botero-Trujillo *et al.* 2017, figs. 13A,C) *Gaucha curupi*
- 5 Flagellum rounded and much inflated (Botero-Trujillo *et al.* 2017, figs. 11E,F) *Gaucha casuhati*
- 5' Flagellum moderately inflated (Botero-Trujillo *et al.* 2017, figs. 15E, 19F) **6**
- 6 Flagellum sub-triangular in appearance, with basal portion pronounced dorsally and noticeably elevated (Botero-Trujillo *et al.* 2017, figs. 15E,F) *Gaucha fasciata*
- 6' Flagellum drop-like, with basal portion moderately elevated and gently curved dorsally (Botero-Trujillo *et al.* 2017, fig. 19F) *Gaucha stoeckeli*
- 7 Fixed finger FM and FD teeth of male exceptionally long and narrow; movable finger MM tooth of male greatly reduced, smaller than MSM (Botero-Trujillo *et al.* 2017, fig. 27E) *Gaucha mauryi*
- 7' Fixed finger FM and FD teeth of male small or moderately long; movable finger MM tooth of male larger than MSM or both teeth similar in size (Figs. 8, 10; Botero-Trujillo *et al.* 2017: figs. 23C, 25C) **8**
- 8 Fixed finger mucron of male remarkably thin and straight; FM and FD teeth of male small (Botero-Trujillo *et al.* 2017, figs. 23C–E) *Gaucha eremolembra*
- 8' Fixed finger mucron of male moderately thin, with apex directed towards the apex of movable finger; FM and FD teeth of male moderately elongated (e.g., Figs. 8, 10; Botero-Trujillo *et al.* 2017: figs. 21C, 25C) **9**
- 9 Flagellum with apex very broad, densely coated with long spicules (Botero-Trujillo *et al.* 2017, figs. 21E,F); fixed finger prodorsal carina bent towards the retrolateral surface, such that the apex of the flagellum is placed subdorsally on the finger *Gaucha avexada*
- 9' Flagellum with apex narrow and tubular in appearance, predominantly spicule-less (Figs. 7, 12; Botero-Trujillo *et al.* 2017: fig. 25E; Carvalho *et al.* 2010: figs. 14–15); fixed finger prodorsal carina straight on dorsal view, not bent laterally **10**
- 10 Fixed finger mucron of male relatively short and robust, notably bent towards the venter (Botero-Trujillo *et al.* 2017, fig. 25C; Carvalho *et al.* 2010, figs. 9–10); male with MM tooth distinctly longer and larger than MSM tooth (Botero-Trujillo *et al.* 2017, fig. 25C; Carvalho *et al.* 2010, figs. 9–10) *Gaucha ibirapemussu*
- 10' Fixed finger mucron of male relatively long and thin, gently bent towards the venter (Fig. 5, 6, 8–11); male with MM and MSM teeth similar-sized (Fig. 5, 6, 8–11) *Gaucha cabriola* sp. nov.

The *ibirapemussu* species-group

Species composition. Five species from Northeastern Brazil, namely: *Gaucha avexada*; *Gaucha cabriola* sp. nov.; *Gaucha eremolembra*; *Gaucha ibirapemussu*; *Gaucha mauryi*.

***Gaucha cabriola*, new species**

Figs. 1–17; Tab. 1

urn:lsid:zoobank.org:act:7AC8663E-C340-4DF3-8582-E8B86E2C6DF3

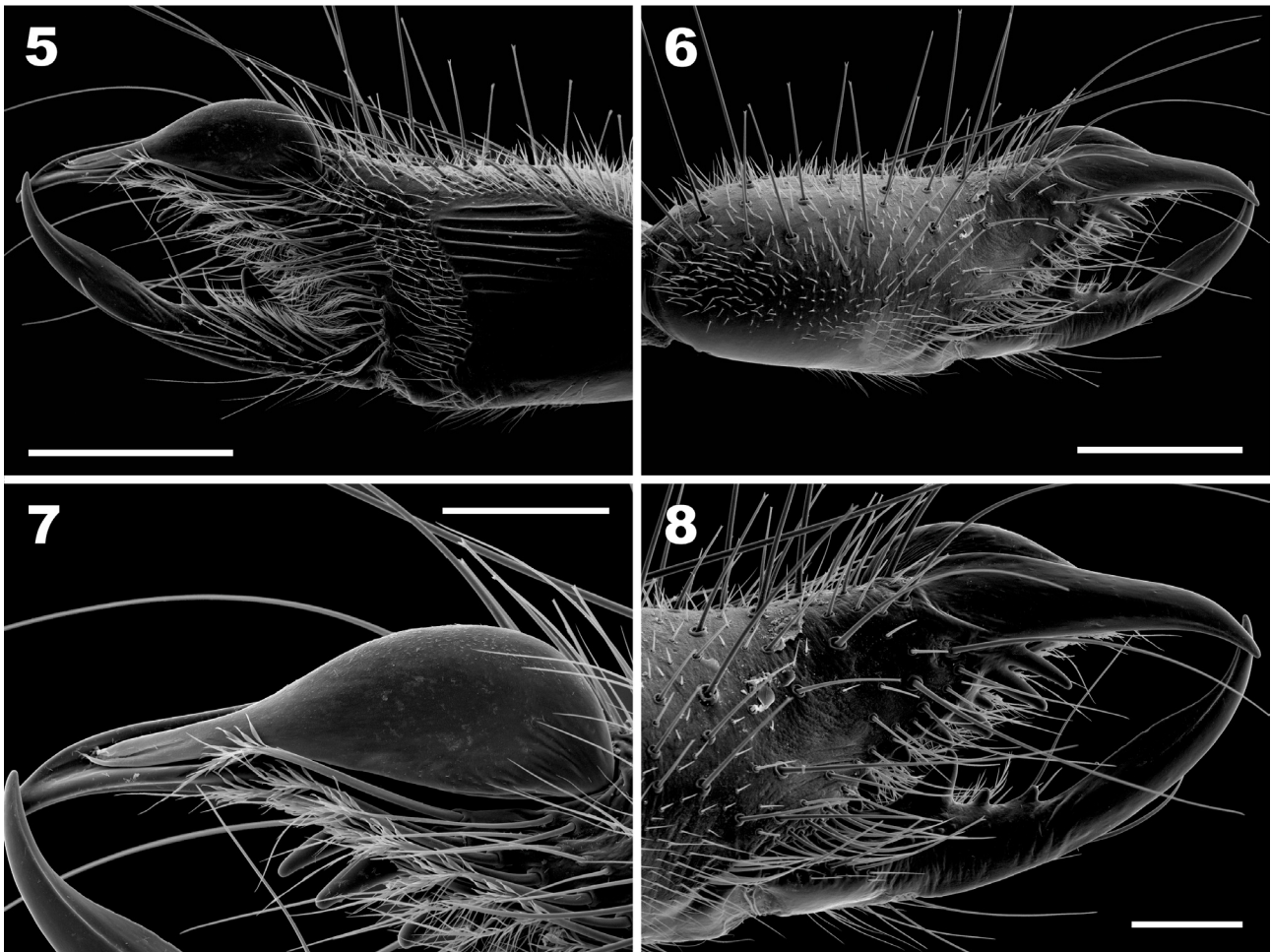
Type material. Holotype: male from BRAZIL: Pernambuco: *Itacuruba* (near Riacho Itacuruba, 8°47'14.8"S 38°41'53.7"W), 2014, S.C. Sousa leg. (CHNUFPI 2519). **Paratypes:** same data of holotype, 1 ♂ (CHNUFPI 2503), 1 ♂, 1 ♀ (CHNUFPI 2510), 1 ♂ (CHNUFPI 2604), 1 ♂ (UFMG 23063).

Additional material examined. BRAZIL: Piauí: *Jaicós* (7°16'22.35"S 41°15'34.8"W), XII.2013–II.2014, T. Jiménez-Pinheiro *et al.* leg., 1 juvenile (CHNUFPI 2471), 2 ♀ (CHNUFPI 2472), 1 ♂ (CHNUFPI 2473), 1 ♀ (CHNUFPI 2474), 1 ♂ (CHNUFPI 2475), 1 ♂ (CHNUFPI 2476), 3 juveniles (CHNUFPI 2477), and 1 ♀ (CHNUFPI 2478).

Etymology. The specific epithet is a noun in apposition, inspired in a folkloric legend from Portugal, brought by the XIX century to the States of Pernambuco and Piauí, where the new species is known from. Hearsay tell that, according to the legend the 'Cabriola' goat throws fire and smoke through her eyes, nose and mouth at anyone wandering deserted streets on Friday nights. Also, it enters the houses through the roof or door, looking for spoiled and mischievous boys to become its meal. So luckily, there is no material evidence of its existence, and it only lives in the local folklore and in this solifuge species name.



FIGURES 1–4. *Gaucha cabriola* sp. nov. 1. Male paratype, habitus, dorsal aspect (CHNUFPI 2604). 2. Male paratype, pro-peltidium and chelicerae, dorsal aspect (CHNUFPI 2604). 3. Male paratype, opisthosoma, lateral aspect (UFMG 23063). 4. Male paratype, opisthosoma, 3rd and 4th post-genital sternites (CHNUFPI 2604). Scale bars: 2 mm (1); 1 mm (3); 0.5 mm (2), 0.2 mm (4).



FIGURES 5–8. *Gaucha cabriola* sp. nov., right chelicera of male paratype under SEM (CHNUFPI 2604). 5. Prolateral aspect. 6. Retrolateral aspect. 7. Detail of flagellum, prolatral aspect. 8. Detail of movable and fixed fingers, retrolateral aspect. Scale bars: 0.5 mm (5–6); 0.2 mm (7–8).

Diagnosis. *Gaucha cabriola* sp. nov. belongs to the *ibirapemussu* species-group as this was defined by Botero-Trujillo *et al.* (2017: 29). Males of the new species can be distinguished from all other described *Gaucha* species by having the MM and MSM teeth very small and similar in size to each other (Figs. 6, 10, 15–16). Additionally, within the *ibirapemussu* species-group, males of *G. cabriola* sp. nov. also differ from males of *G. avexada* by the practically smooth flagellum with diminute spicules (Figs. 7, 12); from males of *G. eremolembra* by the shape of the fixed finger mucron, more robust and with the apex curved ventrally in the new species (Figs. 8, 10, 15–16); from males of *G. mauryi* by having the FM and FD teeth not so exceptionally elongated, and the larger MM tooth; and from males of *G. ibirapemussu* by having the fixed and movable finger mucra comparatively longer, straighter and thinner (Figs. 8, 10, 15–16), as well as by the shape of the flagellum which is less globose in the new species (Figs. 7, 12).

Description. Male holotype (CHNUFPI 2519): Measurements in Table 1. **Color:** On 80% ethanol-preserved specimens. Propeltidium base color yellow, with whitish patches posteriorly without well-defined borders; ocular tubercle yellow, dark around the eyes (Figs. 1–2). Chelicerae with manus yellow with some whitish areas; distal region of the fingers reddish (Figs. 2, 9). Meso-, metapeltidium, and dorsal surface of opisthosoma with a three-dark-band design typical of the family: tergites with median, longitudinal brown band, and paired, thinner lateral whitish bands (Fig. 1); lateral pleural membranes with sub-dorsal black and sub-ventral white bands becoming diffuse towards posterior segments (Fig. 3); white band of opisthosomal pleural membrane with black marks surrounding the insertion socket of most setae, and inter-segmental transversal vertices yellow (Fig. 3); sternites base color whitish yellow, with lateral margins conspicuously darkened, but three-four posteriormost sternites and preanal sternite with faded color (Fig. 3); anal plate with faded dark color ventrally, and dorsally with whitish regions. Ventral aspect of prosoma uniformly yellow; sternum lighter than coxae. Pedipalps yellowish, with telotarsus tip darker than the

rest of pedipalp. Legs dark yellow, darker at tibia, basitarsus and telotarsus (Fig. 1). Malleoli predominantly whitish. **Chelicera:** Fixed finger all three primary teeth (FP, FM and FD) and one secondary FSM tooth (Figs. 8, 10, 15–16); FM and FD columnar (Figs. 8, 15); FM and FD longer than other teeth in the finger, FM similar in size to FD or only slightly larger, such that $FM \approx FD > FP$ (Figs. 10, 16). Fixed finger FSD secondary tooth absent (Figs. 10, 15–16). Fixed finger prodorsal carina straight along most of its length; mucron long and predominantly straight, not markedly thin, and with the apex (FT tooth) slightly curved towards the venter. Movable finger MP tooth pronounced, markedly higher than MSM and MM (Figs. 8–11, 15–16); MSM tooth higher and broader (Figs. 8, 9–11, 15–16); MM tooth approximately as broad as high, triangular, similar in size as MSM (Figs. 10, 15–16). Chelicera, prolateral surface with carpet-like field of barbled and bristle-like promedial (*pm*) setae covering the distalmost third of manus (Figs. 5, 11). Flagellum drop-like, moderately inflated posteriorly and medially; ventral margin slightly sinuous (Figs. 7, 12). Flagellum with minute spicules along prodorsal margin only (Fig. 7); apex of the flagellum reaching two thirds of the mucron length from the base (Figs. 7, 12); apex very narrow without distinct spicules (Fig. 7).

TABLE 1. Metric data for *Gaucha cabriola* sp. nov., provided for one male and one female for both localities where the species is recorded. ¹Measured along medial axis, from the propeltidium anterior margin to the opisthosoma posterior margin. ²Measured in dorsal view at widest point. ³Measured in retrolateral view parallel to longitudinal axis of chelicera, from the fixed finger apex to anterolateral propeltidial lobe anterior margin. ⁴Measured in retrolateral view, along vertical axis at highest part of manus. ⁵Sum of individual segment lengths. ⁶Maximum height. ⁷Measurement excludes claws.

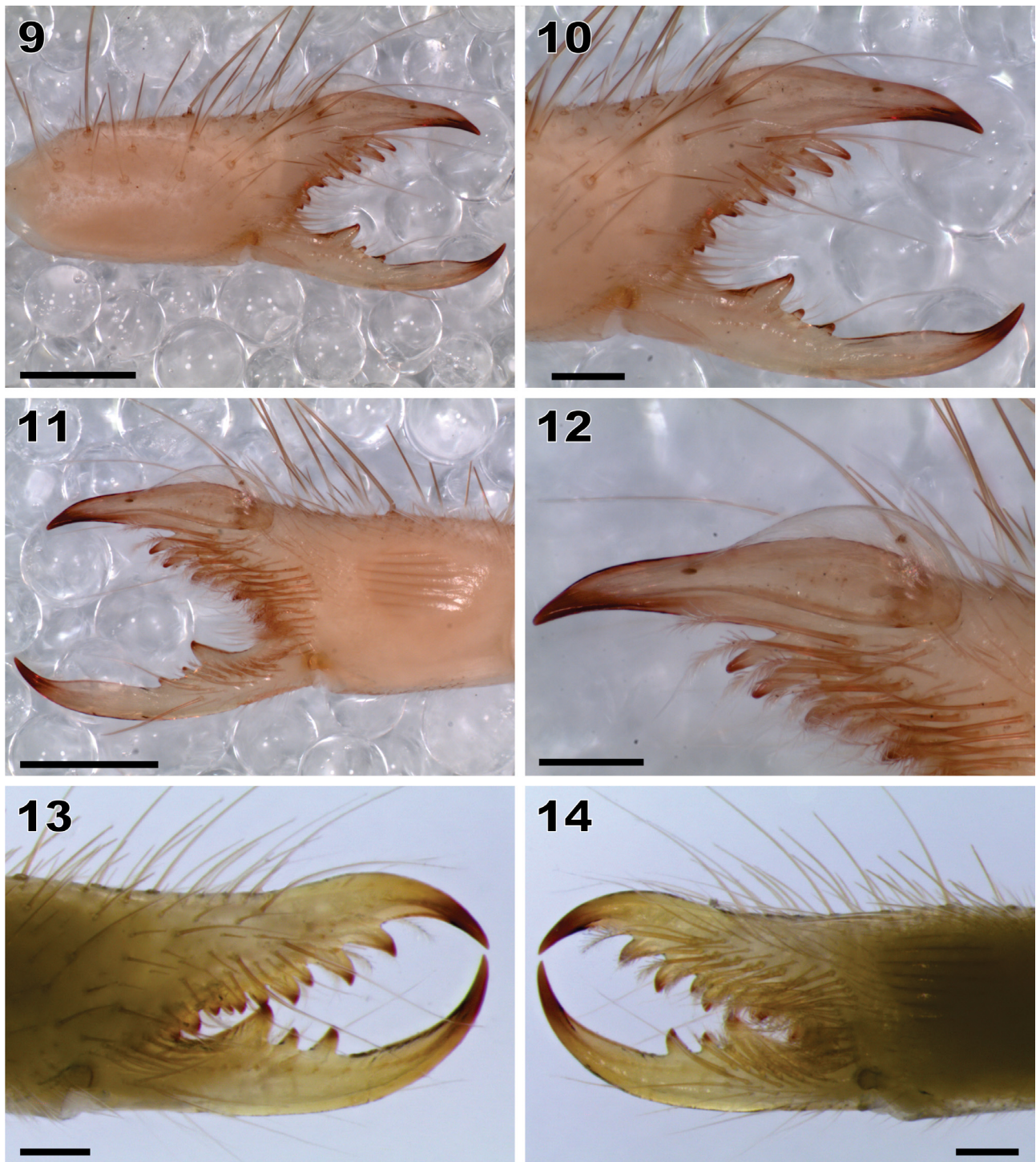
Locality	Itacuruba (type locality)	Jaicós
Voucher	♂ holotype CHNUFPI 2519 [♀ paratype CHNUFPI 2510]	♂ CHNUFPI 2475 [♀ CHNUFPI 2474]
Total body L (w/o chelicerae) ¹	8.88 [10.63]	10.88 [11.00]
Propeltidium length	1.83 [1.78]	1.93 [1.83]
Propeltidium width ²	2.03 [2.29]	2.14 [2.31]
Chelicera length ³	2.58 [2.92]	2.72 [2.75]
Chelicera width ²	0.86 [0.97]	0.99 [0.99]
Chelicera height ⁴	0.81 [0.92]	0.94 [1.02]
Pedipalp total length ⁵	6.81 [5.93]	7.47 [6.33]
Pedipalp femur length	2.34 [1.91]	2.67 [2.08]
Pedipalp tibia length	2.08 [1.78]	2.26 [1.91]
Pedipalp tibia width ²	0.48 [0.51]	0.56 [0.53]
Basitarsus + telotarsus length	2.39 [2.24]	2.54 [2.34]
Leg I total length ⁵	5.47 [4.91]	6.10 [5.12]
Patella I length	1.81 [1.53]	2.03 [1.63]
Tibia I length	1.70 [1.50]	1.88 [1.68]
Basitarsus I length	1.07 [1.04]	1.27 [0.97]
Telotarsus I length	0.89 [0.84]	0.92 [0.84]
Leg IV total length (w/o claws) ⁵	7.86 [7.35]	9.55 [7.10]
Patella IV length	2.01 [2.34]	3.08 [2.01]
Patella IV height ⁶	0.51 [0.56]	0.61 [0.61]
Tibia IV length	2.64 [2.31]	2.95 [2.42]
Basitarsus IV length	1.91 [1.68]	2.10 [1.58]
Telotarsus IV length ⁷	1.30 [1.02]	1.42 [1.09]

Female paratype (CHNUFPI 2510). The coloration of the specimen has faded. Similar to males for most morphological aspects but larger in size; morphometric values in Table 1. Chelicera on lateral aspect, fixed finger highest elevation at level of FD tooth. Fixed finger robust, markedly curved towards the venter. Movable finger MP tooth moderately higher than MM tooth; MM higher than MSM (Figs. 13–14); movable finger retrolateral carina similarly developed to that of male.

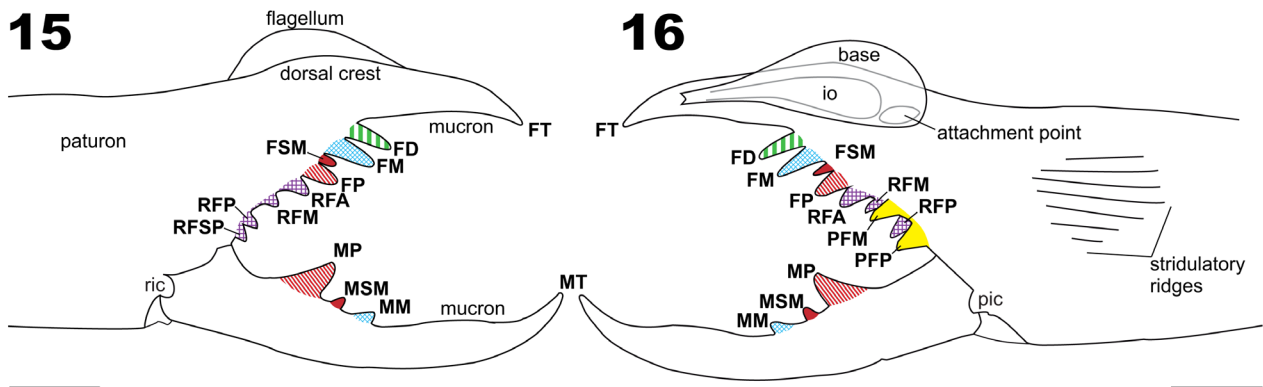
Notes. All the chelicerae of examined males (n = 14 chelicerae), females (n = 10) and juveniles (n = 8) were

confirmed to lack the fixed finger FSD tooth. The FD tooth is broken in both chelicerae of two males (CHNUFPI 2475 and 2503).

Distribution. *Gaucha cabriola* **sp. nov.** is known from Itacuruba, State of Pernambuco, and Jaicós, State of Piauí, both in Northeastern Brazil (Fig. 17). Both localities are inserted within the Brazilian Caatinga, a semiarid biome.



FIGURES 9–14. *Gaucha cabriola* **sp. nov.**, right chelicerae of male (CHNUFPI 2604) and female (CHNUFPI 2510) paratypes. 9–10. Retrolateral aspect of male chelicera. 11. Prolateral aspect of male chelicera. 12. Detail of flagellum, prolateral aspect. 13. Retrolateral aspect of female chelicera. 14. Prolateral aspect of female chelicera. Scale bars: 0.5 mm (9, 11); 0.2 mm (10, 12–14).



FIGURES 15–16. *Gaucha cabriola* sp. nov., schematic representation of the male cheliceral morphology in retrolateral (15) and prolateral (16) views. Abbreviations: FD, fixed finger, distal tooth; FM, fixed finger, medial tooth; FP, fixed finger, proximal tooth; FT, fixed finger, terminal tooth; io, ipsilateral opening; MM, movable finger, medial tooth; MP, movable finger, proximal tooth; MSM, movable finger, submedial tooth; MT, movable finger, terminal tooth; PFM, profundal medial tooth; PFP, profundal proximal tooth; pic, prolateral interdigital condyle; ric, retrolateral interdigital condyle; RFA, retrofodal apical tooth; RFM, retrofodal medial tooth; RFP, retrofodal proximal tooth; RFSP, retrofodal subproximal tooth. Scale bars: 0.25 mm.

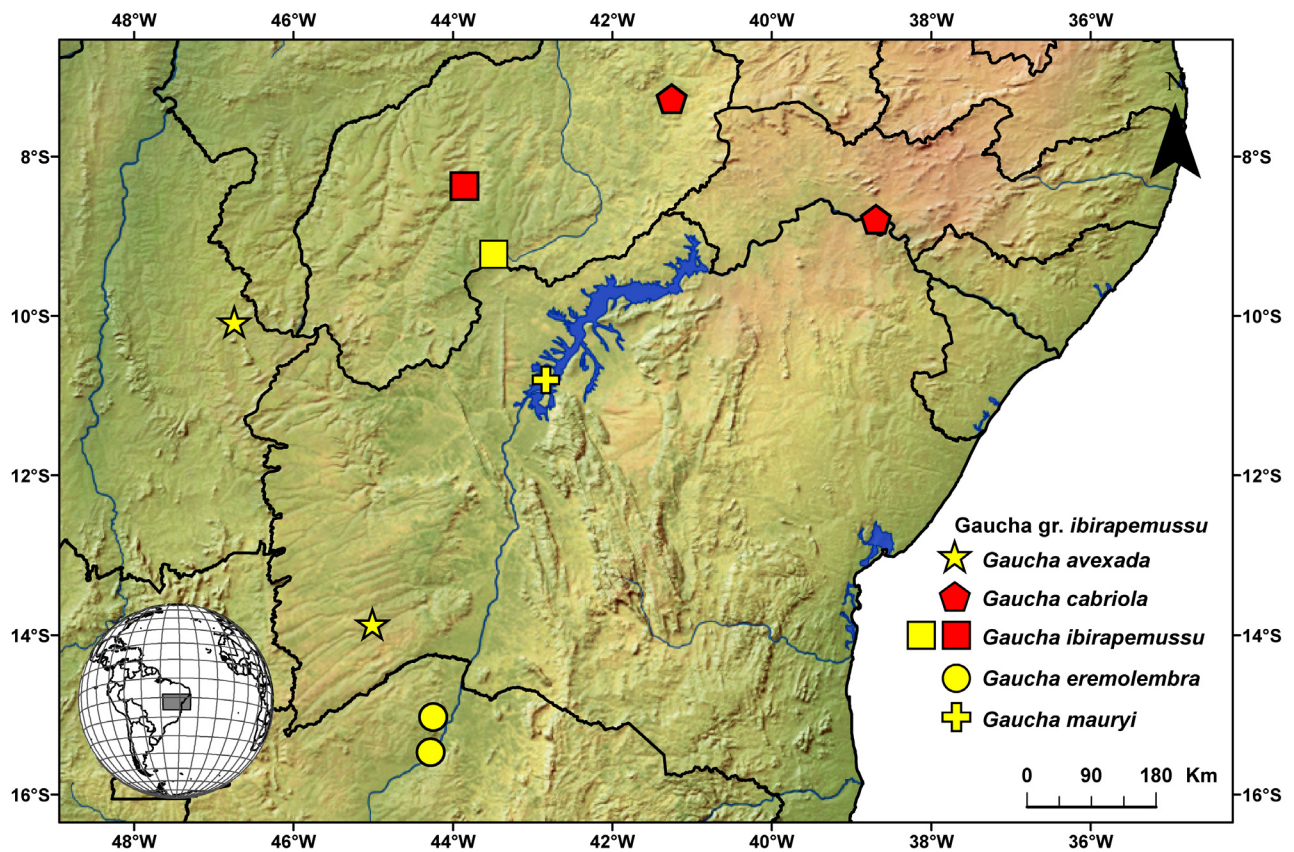


FIGURE 17. Known geographical distribution of *Gaucha* gr. *ibirapemussu* species, including *Gaucha cabriola* sp. nov. (red pentagon) and the new record of *Gaucha ibirapemussu* (red square). Records shown in yellow are previously published confirmed records (Botero-Trujillo *et al.*, 2017).

New records

Gaucha ibirapemussu (Carvalho *et al.*, 2010)

Mummucia ibirapemussu Carvalho, Candiani, Bonaldo, Suesdek & Silva, 2010: 21–30, figs. 2–27.

Material examined. BRAZIL: **Piauí:** *Alvorada do Gurguéia* (Fazenda Escola da Universidade Federal do Piauí, 8°22'11.5"S 43°51'30.2"W), 30.VI.2018, D.B.S. Barbosa *et al.* leg., 1 ♂ (CHNUFPI 2468), 2 ♂ (CHNUFPI 2469), 1 ♂ (CHNUFPI 2470), 1 ♂ (CHNUFPI 2479).

Distribution. Known from the municipalities of Alvorada do Gurguéia, Caracol and Guaribas, in the State of Piauí, Northeastern Brazil (Fig. 15). Both localities are inserted within the Brazilian Caatinga, a semiarid biome.

Acknowledgements

The authors are especially thankful to Diogo Bruno Barbosa e Silva (UFPI/CAFS, Floriano, Piauí), Raul Azevedo (UFCA, Crato, Ceará), and Tamaris Giménez Pinheiro (UFPI/CSHNB, Picos, Piauí) for donating the specimens analyzed in the present paper. Thanks are also to Adalberto José dos Santos (UFMG), Martín J. Ramírez and Andrés A. Ojanguren Affilastro (MACN) for their permission to use laboratory equipments at the Universidade Federal de Minas Gerais and the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”. We thank two anonymous referees and Lorenzo Prendini for providing valuable comments on an earlier version of the manuscript. This publication is registered in compliance to Brazilian regulations at the Sistema Nacional de Gestão do Patrimônio Genético e do Conhecimento Tradicional Associado (SISGen; #A86A886).

References

- Bird, T.L. & Wharton, R.A. (2015) Description of a new solifuge *Melanoblossia ansie* sp. n. (Solifugae, Melanoblossiidae) with notes on the setiform flagellar complex of Melanoblossiinae Roewer, 1933. *African Invertebrates*, 56, 515–525.
<https://doi.org/10.5733/afin.056.0218>
- Bird, T.L., Wharton, R.A. & Prendini, L. (2015) Cheliceral Morphology in Solifugae (Arachnida): Primary Homology, Terminology, and Character Survey. *Bulletin of the American Museum of Natural History*, 394, 1–356.
<https://doi.org/10.1206/916.1>
- Blanco, E.V., de Armas, L.F. & Martínez, L. (2017) Una nueva especie del género *Eutreacha* Maury, 1982 del Caribe colombiano (Solifugae: Ammotrechidae). *Revista Ibérica de Aracnología*, 30, 139–143.
- Botero-Trujillo, R. (2014) Redescription of the sun-spider *Mummucina titschacki* Roewer, 1934 (Solifugae, Mummuciidae) with notes on the taxonomy of the genus. *Zootaxa*, 3884 (4), 319–332.
<https://doi.org/10.11646/zootaxa.3884.4.2>
- Botero-Trujillo, R. (2016) The smallest known solifuge: *Vempironiella aguilari*, new genus and species of sun-spider (Solifugae: Mummuciidae) from the coastal desert of Peru. *Journal of Arachnology*, 44, 218–226.
<https://doi.org/10.1636/JoA-S-16-012>
- Botero-Trujillo, R., Ott, R. & Carvalho, L.S. (2017) Systematic revision and phylogeny of the South American sun-spider genus *Gaucha* Mello-Leitão (Solifugae: Mummuciidae), with description of four new species and two new generic synonymies. *Arthropod Systematics and Phylogeny*, 75, 3–44.
- Botero-Trujillo, R., Ott, R., Mattoni, C.I., Nime, M.F. & Ojanguren-affilastro, A.A. (2019) Two new species of the sun-spider genus *Gaucha* from Argentina and Brazil (Solifugae, Mummuciidae). *Zootaxa*, 4551 (2), 180–194.
<https://doi.org/10.11646/zootaxa.4551.2.3>
- Brescovit, A.D., Oliveira, U. de, Santos, A.J.dos. & Horizonte, B. (2011) Aranhas (Araneae, Arachnida) do Estado de São Paulo, Brasil: diversidade, esforço amostral e estado do conhecimento. *Biota Neotropica*, 11, 717–747.
<https://doi.org/10.1590/S1676-06032011000500035>
- Carvalho, L.S., Brescovit, A.D., Santos, A.J. Dos, Oliveira, U. & Guadanucci, J.P.L. (2014) Aranhas da Caatinga. In: Bravo, F. & Calor, A.R. (Eds.), *Artrópodes do Semiárido: biodiversidade e conservação*. Printmídia, Feira de Santana, pp. 15–32.
- Carvalho, L.S., Candiani, D.F. & Bonaldo, A.B. (2010) A new species of the sun-spider genus *Mummucia* (Arachnida: Solifugae: Mummuciidae) from Piauí northeastern Brazil. *Zootaxa*, 31 (1), 19–31.
<https://doi.org/10.11646/zootaxa.2690.1.2>
- Catenazzi, A., Brookhart, J.O. & Cushing, P.E. (2009) Natural history of coastal Peruvian solifuges with a redescription of *Chinchippus peruvianus* and an additional new species (Arachnida, Solifugae, Ammotrechidae). *Journal of Arachnology*, 37, 151–159.
<https://doi.org/10.1636/H08-31.1>
- DeSouza, A.M., DaSilva, M.B., Carvalho, L.S., Medeiros, A. de S., da Silva, M.B. & Carvalho, L.S. (2017) Opiliões Laniatores do semiárido: grandes achados taxonômicos com o pouco que se conhece. In: Bravo, F. (Ed.), *Artrópodes do Semiárido II: Biodiversidade e conservação*. MétiS, São Paulo, pp. 7–27.
- DeSouza, A.M., DaSilva, M.B., Carvalho, L.S. & Oliveira, U. (2014) Opiliões Laniatores do Semiárido. In: Bravo, F. & Calor, A.R. (Eds.), *Artrópodes do Semiárido: biodiversidade e conservação*. Printmídia, Feira de Santana, pp. 47–56.

- ESRI (2013) *ArcGIS Desktop: Release 10.2*. Environmental Systems Research Institute, Redlands, California. [program]
- González-Reyes, A.X. & Corronca, J.A. (2013) A new solifugae species of *Mummucina* Roewer, 1934 (Solifugae, Mummuciidae) from the Northwest of Argentina. *Zootaxa*, 3737 (5), 538–544.
<https://doi.org/10.11646/zootaxa.3737.5.2>
- Harvey, M.S. (2003) *Catalogue of the Smaller Arachnid Orders of the World*. CSIRO Publishing, Victoria, 398 pp.
<https://doi.org/10.1071/9780643090071>
- Iuri, H.A., Iglesias, M.S. & Ojanguren-Affilastro, A.A. (2014) A new species of *Chileotrecha* Maury, 1987 (Solifugae: Ammotrechidae) from Argentina with notes on the genus. *Zootaxa*, 3827 (1), 20–30.
<https://doi.org/10.11646/zootaxa.3827.1.2>
- Lewinsohn, T.M. & Prado, P.I. (2005) How Many Species Are There in Brazil? *Conservation Biology*, 19, 619–624.
<https://doi.org/10.1111/j.1523-1739.2005.00680.x>
- Martins, E.G., Bonato, V., Machado, G., Pinto-da-rocha, R., Rocha, L.S., Bonato, C., Machado, G., Pinto-da-rocha, R., Martins, E.G., Bonato, V., Machado, G., Pinto-da-rocha, R. & Rocha, L.S. (2004) Description and ecology of a new species of sun spider (Arachnida: Solifugae) from the Brazilian Cerrado. *Journal of Natural History*, 38, 2361–2375.
<https://doi.org/10.1080/00222930310001647343>
- Maury, E.A. (1984) Las familias de solifugos Americanos y su distribución geográfica (Arachnida, Solifugae). *Physis, Buenos Aires*, Secc. C, 42, 73–80.
- Oliveira, U., Brescovit, A.D. & Santos, A.J. (2017a) Sampling effort and species richness assessment: a case study on Brazilian spiders. *Biodiversity and Conservation*, 26, 1481–1493.
<https://doi.org/10.1007/s10531-017-1312-1>
- Oliveira, U., Paglia, A.P., Brescovit, A.D., de Carvalho, C.J.B., Silva, D.P., Rezende, D.T., Leite, F.S.F., Batista, J.A.N., Barbosa, J.P.P.P., Stehmann, J.R., Ascher, J.S., de Vasconcelos, M.F., De Marco, P., Löwenberg-Neto, P., Dias, P.G., Ferro, V.G. & Santos, A.J. (2016) The strong influence of collection bias on biodiversity knowledge shortfalls of Brazilian terrestrial biodiversity. *Diversity and Distributions*, 22, 1232–1244.
<https://doi.org/10.1111/ddi.12489>
- Oliveira, U., Soares-Filho, B.S., Paglia, A.P., Brescovit, A.D., De Carvalho, C.J.B.B., Silva, D.P.D.P., Rezende, D.T., Leite, F.S.F., Batista, J.A.N., Barbosa, J.P.P.P., Stehmann, J.R., Ascher, J.S., De Vasconcelos, M.F., De Marco, P., Löwenberg-Neto, P., Ferro, V.G. & Santos, A.J. (2017b) Biodiversity conservation gaps in the Brazilian protected areas. *Scientific Reports*, 7, 9141.
<https://doi.org/10.1038/s41598-018-22953-y>
- Porto, T.J., Carvalho, L.S., de Souza, C.A.R., Oliveira, U. & Brescovit, A.D. (2014) Escorpiões da Caatinga: conhecimento atual e desafios. In: Bravo, F. & Calor, A.R. (Eds.), *Artrópodes do Semiárido: biodiversidade e conservação*. Printmídia, Feira de Santana, pp. 33–46.
- Rocha, L.S. & Canello, E.M. (2002) Redescription of *Metacleobis fulvipes* Roewer From Brazil (Solifugae, Mummuciidae). *Journal of Arachnology*, 30, 104.
[https://doi.org/10.1636/0161-8202\(2002\)030\[0104:ROMFRF\]2.0.CO;2](https://doi.org/10.1636/0161-8202(2002)030[0104:ROMFRF]2.0.CO;2)
- Rocha, L.S. & Carvalho, M.C. (2006) Description and ecology of a new solifuge from Brazilian Amazonia (Arachnida, Solifugae, Mummuciidae). *Journal of Arachnology*, 34, 163–169.
<https://doi.org/10.1636/H04-24.1>
- Santos, A.J., Brescovit, A.D., de Oliveira-Tomasi, M., Russo, P. & Oliveira, U. (2017) Curves, maps and hotspots: the diversity and distribution of araneomorph spiders in the Neotropics. In: Vieira, C. & Gonzaga, M.O. (Eds.), *Behaviour and Ecology of Spiders*. Springer, Cham, pp. 1–28.
https://doi.org/10.1007/978-3-319-65717-2_1
- Shultz, J.W. (1989) Morphology of locomotor appendages in Arachnida: evolutionary trends and phylogenetic implications. *Zoological Journal of the Linnean Society*, 97, 1–55.
<https://doi.org/10.1111/j.1096-3642.1989.tb00552.x>
- Xavier, E. & Rocha, L.S. (2001) Autoecology and description of *Mummucia mauryi* (Solifugae; Mummuciidae). *Journal of Arachnology*, 29, 127–134.