



***Psalmopoeus victori*, the first arboreal theraphosid spider described for Mexico (Araneae: Theraphosidae: Aviculariinae)**

***Psalmopoeus victori*, primera araña terafósida arborícola descrita para México (Araneae: Theraphosidae: Aviculariinae)**

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Abstract. A new species of tarantula, *Psalmopoeus victori* sp. nov. (Araneae, Theraphosidae, Aviculariinae) is described from Veracruz, Mexico. It is the first arboreal species described in Mexico and represents the most northerly known distribution for the genus *Psalmopoeus*. A detailed description of the lyra is presented.

Key words: Mygalomorphae, arboreal tarantula, taxonomy, stridulating organ.

Resumen. Se describe una especie nueva de tarántula, *Psalmopoeus victori* sp. nov. (Araneae, Theraphosidae, Aviculariinae) de Veracruz, México. Es la primera especie arborícola descrita en México y la distribución más al norte conocida hasta ahora para el género *Psalmopoeus*. Se presenta una descripción detallada de la lira.

Palabras clave: Mygalomorphae, tarántula arborícola, taxonomía, órgano estridulante.

Introduction

Theraphosid spiders are mainly terrestrial, living in burrows or natural cavities, some of them under rocks or fallen logs. Arboreal species live in cavities of trees or build their nest in epiphytes. Most arboreal species are found in tropical regions of America, Africa, and Asia. In America, arboreal tarantulas are represented by the Aviculariinae genera *Avicularia* Lamarck 1818, *Iridopelma* Pocock 1901, *Pachistopelma* Pocock 1901, *Tapinauchenius* Ausserer 1871, and *Psalmopoeus* Pocock 1895. The distribution of the genus *Psalmopoeus* is from Venezuela and Colombia extending north to Belize and presumably to Mexico (Reichling, 2003). Mexico has the second highest count of known tarantula species worldwide, with ca. 74 species (Platnick, 2014). The only records of a Mexican arboreal theraphosid were an adult male of *Psalmopoeus* seen in Quintana Roo (according to Locht pers. com., this species does not belong to the one described here) and *Avicularia panamensis* (Simon, 1891) mentioned as present in Mexico by Locht (2008). *Avicularia panamensis* was originally described as *Eurypelma panamense*, but Raven (1985) synonymized *Eurypelma* Koch 1850 with *Avicularia* Lamarck 1818. The problem with this generic

synonymy is that it resulted in some terrestrial species being placed into the genus *Avicularia*. Gabriel (2009) examined the holotype of *A. panamensis* and determined that this species does not belong to *Avicularia*, and transferred the species to the terrestrial genus *Sericopelma* Ausserer 1875. This created the new combination *Sericopelma panamense* (Simon, 1891).

In 2008-2009, Jiménez and Santa Cruz collected a single female arboreal tarantula from Veracruz, which fits with the diagnosis of *Psalmopoeus* but differs from all known species. This finding confirms the presence of this arboreal genus in Mexico and North America and suggests that it is a new species. Locht (2008) mentions the existence of an undescribed species of *Psalmopoeus* from Quintana Roo, but since it has yet to be described, the species reported here is the first truly arboreal tarantula to be formally described for México. *Psalmopoeus victori* sp. nov. from Mexico is here described and illustrated.

Materials and methods

The general descriptive format follows West et al. (2008) and Raven (2005) with some modifications, e. g., spination and trichobothrial conformation on legs were not studied in the same detail as in Raven's work. All measurements are in millimeters and were taken using an ocular micrometer on a stereomicroscope Nikon SMZ645

and with a digital caliper with an error of 0.1 mm. Leg and palp measurements were taken along the dorsal central axis of the left side. Abbreviations: AME= anterior median eyes; ALE= anterior lateral eyes; PME= posterior median eyes; PLE= posterior lateral eyes; d= dorsal; p= prolateral; r= retrolateral; v= ventral; Pap= prolateral tibial apophysis; Rap= retrolateral tibial apophysis. CNAN= Colección Nacional de Arácnidos, México D.F.; UNAM= Universidad Nacional Autónoma de México. Spination description follows Pérez-Miles and Locht (2003); that of tarsal scopulae, from Pérez-Miles (1994). Geographical coordinates were obtained with a Garmin GPS 12XL. The pictures for figures 1, 2 were taken with a digital camera attached to a stereomicroscope. Photographs of figure 3 were taken with a reflex digital camera. Types are deposited in CNAN and OUMNH.

Material from the following institutions was examined: OUMNH= Oxford University Museum of Natural History, United Kingdom and INBio= Instituto Nacional de Biodiversidad, Costa Rica. Material examined for comparisons: *Psalmopoeus reduncus* (Karsch, 1880), **Costa Rica**: male, INB0003535315, prov. Punta, San Luis Monteverde, AC Arenal, L N 449250_250850, Jun 1993; female, INB0003535240, prov. Heredia, Estación el Ceibo, L N 256500_527700, 5 Apr 1990; *P. cambridgei* (Pocock 1895), **Trinidad**: male, CNAN-Ar003615; *P. irminia* Saager, 1994, **Venezuela**: 3 males, CNAN-Ar003508.

Description

Subfamily Aviculariinae Simon, 1892

Genus *Psalmopoeus* Pocock, 1895

Type species: *Psalmopoeus cambridgei* Pocock, 1895

Psalmopoeus victori sp. nov.

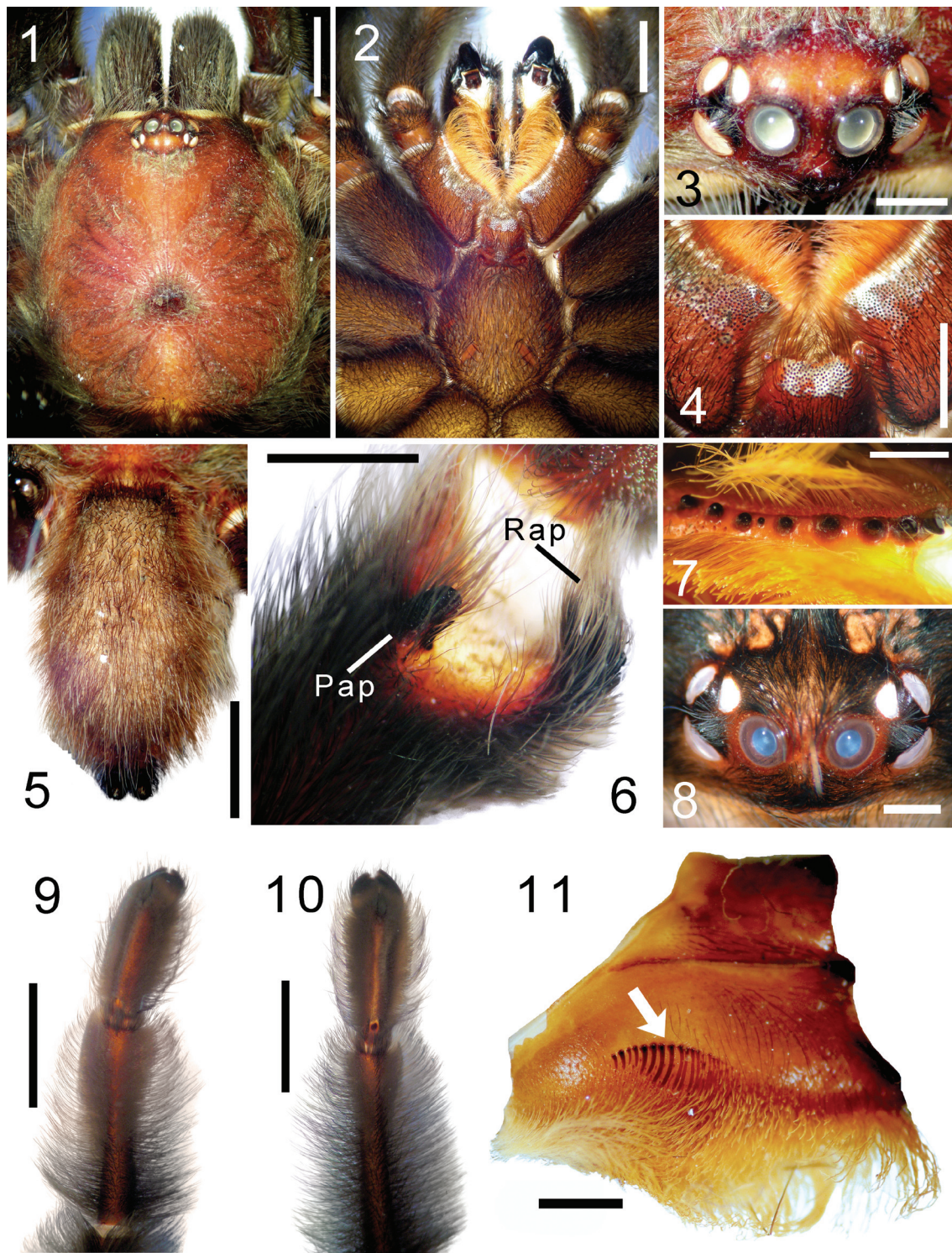
(Figs. 1-31)

Type material. Holotype male (CNAN-T0086), **Mexico**: Veracruz, Mpio. San Andrés Tuxtla, 26-VIII-2008, V. H. Jiménez, collector (coll.) (matured in captivity). Paratypes: 3 males (CNAN-T0086), from the type locality, grown in captivity by J. I. Mendoza, Mexico City, 14-XII-2012; 1 female (CNAN-T0087), from the type locality 19-I-2009, V. Jiménez and J. Mendoza coll.; 1 female (CNAN-T0088), Veracruz, 19-I-2009, V. H. Jiménez and S. Santacruz coll.; 1 male and 1 female (OUMNH-2011-087), from the type locality, grown in captivity by J. I. Mendoza, Mexico City, 26-V-2010, deposited by E. Hijmensen. Additional material examined: 1 juvenile CNAN-Ar003569, Veracruz, 19-I-2009, J. I. Mendoza coll.

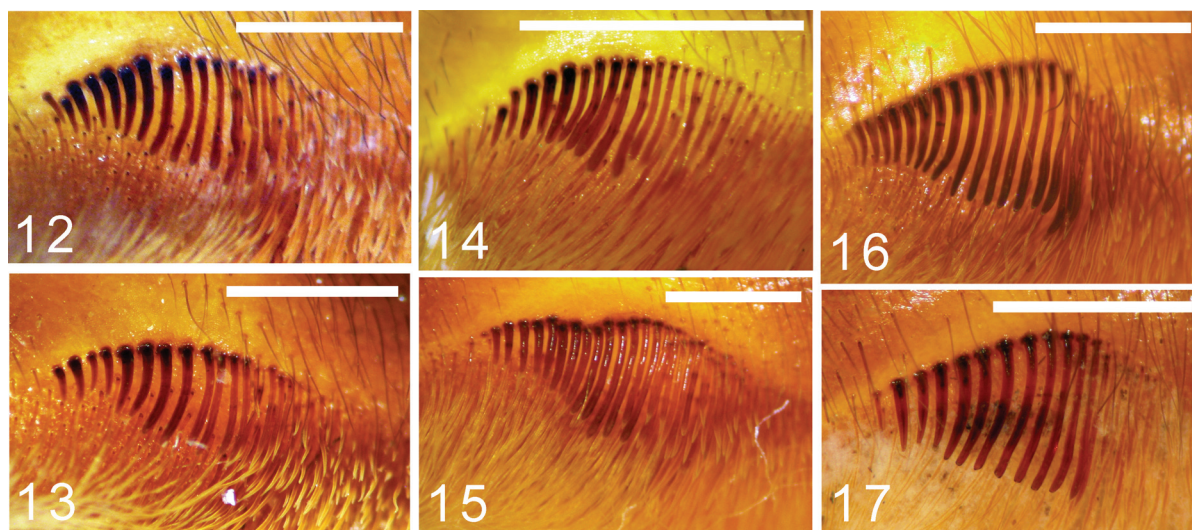
Diagnosis: male palpal bulb with a slender embolus 2½ half times longer than tegulum, curved to retrolateral side on apical fourth (Fig. 20). Maxillary lyra with ca.

13 spines that gradually increase in size from 0.2 to 0.6 (proximal to distal) in the same straight line as the edge of the oral fringe (Figs. 11-13). Female with 2 independent spermathecae almost as wide as long (Fig. 27). Male with slightly red setae on abdomen (Fig. 29). Female abdomen dorsally black with long red setae, ventrally black. Legs and palpi: femora, patellae, tibiae, and metatarsi with dark green sheen, most notable on femur of palpi and legs I-II. Legs III and IV with dense, long red setae (Fig. 30). *Psalmopoeus victori* sp. nov. is similar to *P. reduncus* but differs from all congeners by the coloration in females, with red setae on the entire abdomen and legs III and IV (Fig. 30), and shape of genitalia of both sexes. The male also differs by the shape of the palpal bulb with a big globose tegulum and long embolus bent retrolaterally in the apical fourth, and in the shape of the maxillary lyra. Male palpal bulb of *P. victori* is similar to those of *P. reduncus* but differs from this by a better-defined separation of the embolus from the tegulum, also in the narrow base of the embolus (best seen in retrolateral face) (Fig. 19). The lyra of *P. victori* has a smaller number of spines, which are wider and more curved than those of *P. reduncus* (Figs. 12, 13). Spermathecae of *P. victori* females differ from those of *P. reduncus* in having more sclerotized lobes, widest at the base (Fig. 27).

Holotype male CNAN T0086 (Figs. 1-7, 9-10, 12, 18-20, 29): body length 32.4 (not including chelicerae and spinnerets), carapace 16.2 long, 15.2 wide. Caput not markedly elevated; fovea recurved, 1.8 wide. Eyes: anterior eye row procurved, posterior eye row recurved. Eye sizes and interocular distances: AME 0.8; ALE 0.85; PME 0.6; PLE 0.7; AME-AME 0.4; AME-ALE 0.2; PME-PME 1.95; PME-PLE 0.2; ALE-PLE 0.05. Eye tubercle, 3.6 wide; 2.5 long; clypeus absent (Fig. 1, 3). Labium 1.65 long; 2.5 wide; with ca. 195 cuspules. Maxilla inner corner (left, right) with approximately 221-214 cuspules (Fig. 4). Cheliceral promargin with 9 teeth (first large, second-third medium, fourth small, fifth medium, and sixth-ninth larger, proximal to distal) (Fig. 7). Sternum length 8.0. Sigillae elongated oval, third and fourth pair hardly visible; fourth pair half its length from the margin (Fig. 2). Maxillary lyra (Fig. 12): elongated oval with ca. 13 spines that gradually increase in size from 0.2 to 0.6 (proximal to distal); ventral edge isolated from the oral division in the first 2/3, distally joining this and differing little; spines of the first proximal half shorter and wider, slightly curved; dorsal edge line slightly convex in the same straight line as the edge of the oral fringe and scarcely separated from it; gaps evenly spaced on the first 2/3. Legs: formula: I, IV, II, III. Length of legs and palpal segments (femur, patella, tibia, metatarsus, tarsus, total): I: 18.3, 9.6, 14.7, 13.8, 8.3, 64.7. II: 17.3, 8.1, 13.6, 13.4, 7.4, 59.8. III: 13,



Figures 1-11. *Psalmopoeus victori* sp. nov. Holotype male CNAN T-0086 (1-7, 9-10). 1, carapace, dorsal view; 2, prosoma, ventral view; 3, ocular tubercle, dorsal view; 4, labial and maxillary cuspules; 5, abdomen, dorsal view; 6, tibial apophyses, ventral view; 7, cheliceral teeth, showing well developed teeth on promargin; 9, metatarsus and tarsus III, ventral view; 10, metatarsus and tarsus IV, ventral view. Paratype female CNAN T-0087 (8, 11); 8, ocular tubercle, dorsal view; 11, maxilla, prolateral view, arrow showing the lyra. Scale= 4mm (1-2, 5, 9-10), 2mm (4, 6), 1mm (3, 7-8, 11).

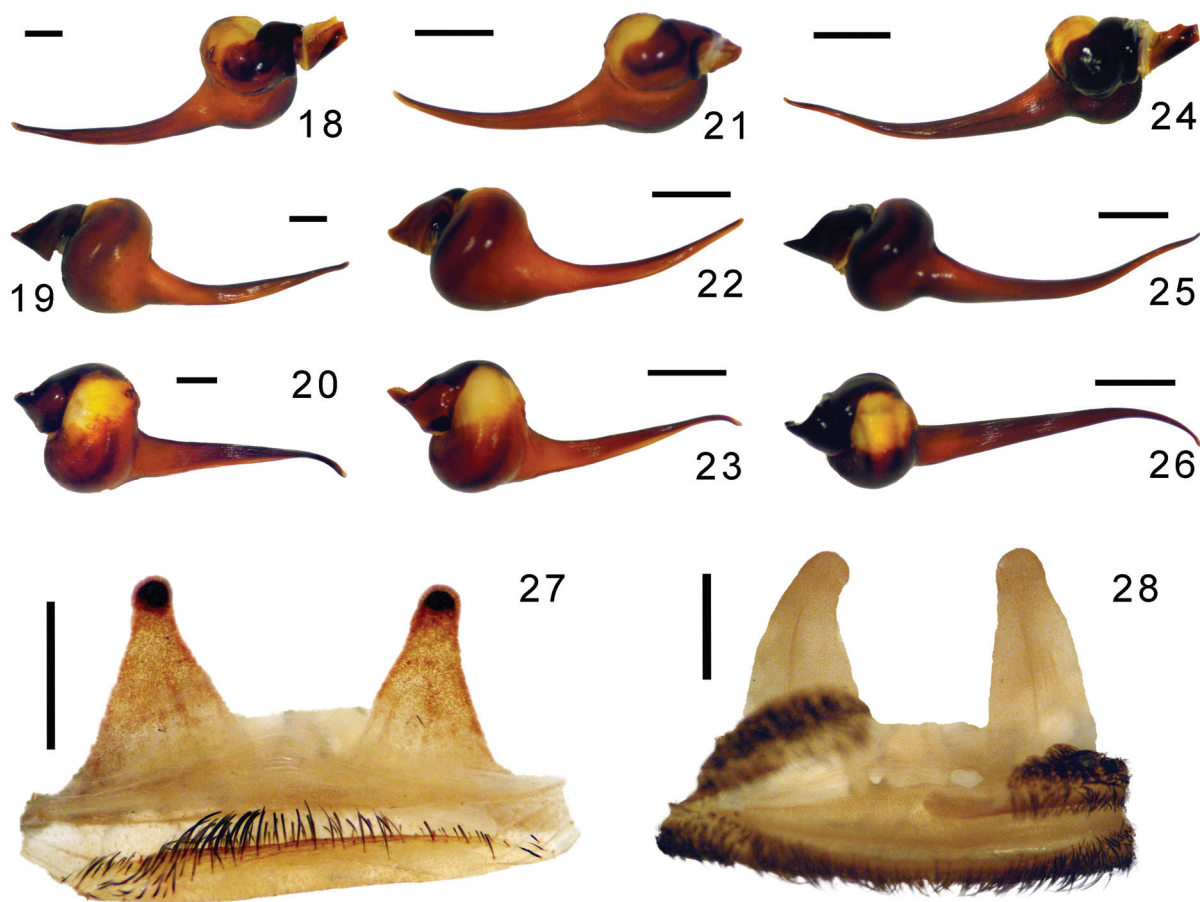


Figures 12-17. *Psalmopoeus*, maxillary lyra, prolateral view: (12-13) *P. victori* sp. nov. 12, holotype male CNAN T-0086; 13, paratype female CNAN T-0087. (14-15) *P. reduncus*; 14, male INB0003535315; 15, female INB0003535240; 16, *P. cambridgei*, male CNAN-Ar003615; 17, *P. irminia*, male CNAN-Ar003508. Scale= 1mm (12-17).

6.6, 11.1, 12.6, 6.6, 49.9. IV: 16.4, 7.4, 14.6, 16.4, 7.4, 62. Palp: 10.7, 6.1, 9.5, -, 3.4, 29.7. Chaetotaxy (left side): only 3 ventral spines present on metatarsus IV distally. Scopulae: tarsi I-IV densely scopulate and entire, I-III undivided (Fig. 9), IV divided by narrow band of setae (Fig. 10). Metatarsi I-II densely scopulate; III scopulate on distal 2/3 and IV scopulate on distal quarter. Tibia I with 2 apophyses that do not originate from a common base, Pap short and strong, with 1 short spine on inner face; the Rap is well developed, broad at its base with 1 short and strong spine on the inner face (Fig. 6). Metatarsus I slightly curved proximally. Palp: embolus spindly, $2\frac{1}{2}$ times longer than tegulum, curved to retrolateral side on apical fourth. Embolus base with clear separation from tegulum, width of the embolus base $\frac{2}{5}$ of tegulum height (Fig. 18-20). Color pattern: in live specimens, carapace slightly olive green; ventral coxae, labium, maxillae, and sternum black; abdomen dorsally grey with reddish setae, ventrally dark gray. Legs and palpi: femora, patellae, tibiae, and metatarsi with dark green iridescence, noticeably on femur. All legs with long lateral grey hairs (Fig. 29).

Paratype female CNAN T-0087 (Figs. 8, 11, 13, 27, 30): body length 47.74 (not including chelicerae and spinnerets), carapace 19.96 long, 18.83 wide. Caput not markedly elevated; fovea recurved, deep, 1.0 wide. Eyes: anterior eye row procurved, posterior eye row recurved. Eyes sizes and interocular distances: AME 0.8; ALE 1.0; PME 0.7; PLE 0.9; AME-AME 0.67; AME-ALE 0.43; PME-PME 2.4; PME-PLP 0.17; ALE-PLP 0.17. Eye tubercle, wide 4.5; long 3.0; clypeus absent (Fig. 8). Labium 3.4 long;

3.9 wide; with ca. 133 cuspules. Maxilla inner corner (left, right) with approximately 201, 210 cuspules. Cheliceral promargin with 9 teeth (first-fifth medium, sixth-ninth large, proximal to distal). Sternum length 10.4. Sigillae elongated oval, second, third, and fourth pairs hardly visible; fourth pair once its length from margin. Maxillary lyra (Figs. 11, 13): elongated oval with ca. 13 spines that gradually increase in size from 0.2 to 0.5 (proximal to distal); ventral edge isolated from the oral division in the first 2/3, distally joins this and differs little; spines of the first proximal half shorter and wider, slightly curved; dorsal edge line slightly convex in the same straight line as the edge of the oral fringe and scarcely separated from it; gaps evenly spaced on the first 2/3. Large distal spines shorter than in males. Legs formula: I, IV, II, III. Length of legs and palpal segments (femur, patella, tibia, metatarsus, tarsus, total): I: 15.9, 9.26, 13.47, 12.8, 8.52, 59.95. II: 14.09, 9.26, 11.73, 12.28, 7.79, 55.15. III: 12.2, 7.75, 10.77, 11.1, 7.76, 49.58. IV: 14.83, 8.3, 13.42, 13.91, 7.43, 57.89. Palp: 11.02, 6.56, 8.31, -, 8.44, 34.33. Chaetotaxy (left side): only 3 ventral spines present distally on metatarsus IV. Scopulae: tarsi I-IV densely scopulate, all undivided. Metatarsi I-II densely scopulate; III scopulate on distal half and IV scopulate on distal third, divided by narrow band of setae. Genitalia: 2 spermathecae separated at their base, approximately as wide as long. Each with a single sclerotized receptacle, neck defined by interior and exterior margin. Total length at base 2.8 (Fig. 27). Color pattern: in live specimens, carapace and dorsal chelicerae green sheen; ventral labium reddish, maxillae black with inner corner reddish, coxae



Figures 18-28. Left palpal bulb: *P. victori* sp. nov., holotype male. 18, prolateral view; 19, retrolateral view; 20, dorsal view. *P. reduncus*, male INB0003535315; 21, prolateral view; 22, retrolateral view; 23, dorsal view. *P. cambridgei*, male CNAN-Ar003615; 24, prolateral view; 25, retrolateral view; 26 dorsal view. Genitalia: 27, *P. victori* sp. nov. paratype female spermathecae; 28, *P. reduncus* female INB0003535240 spermathecae. Scale= 1mm (18-28).

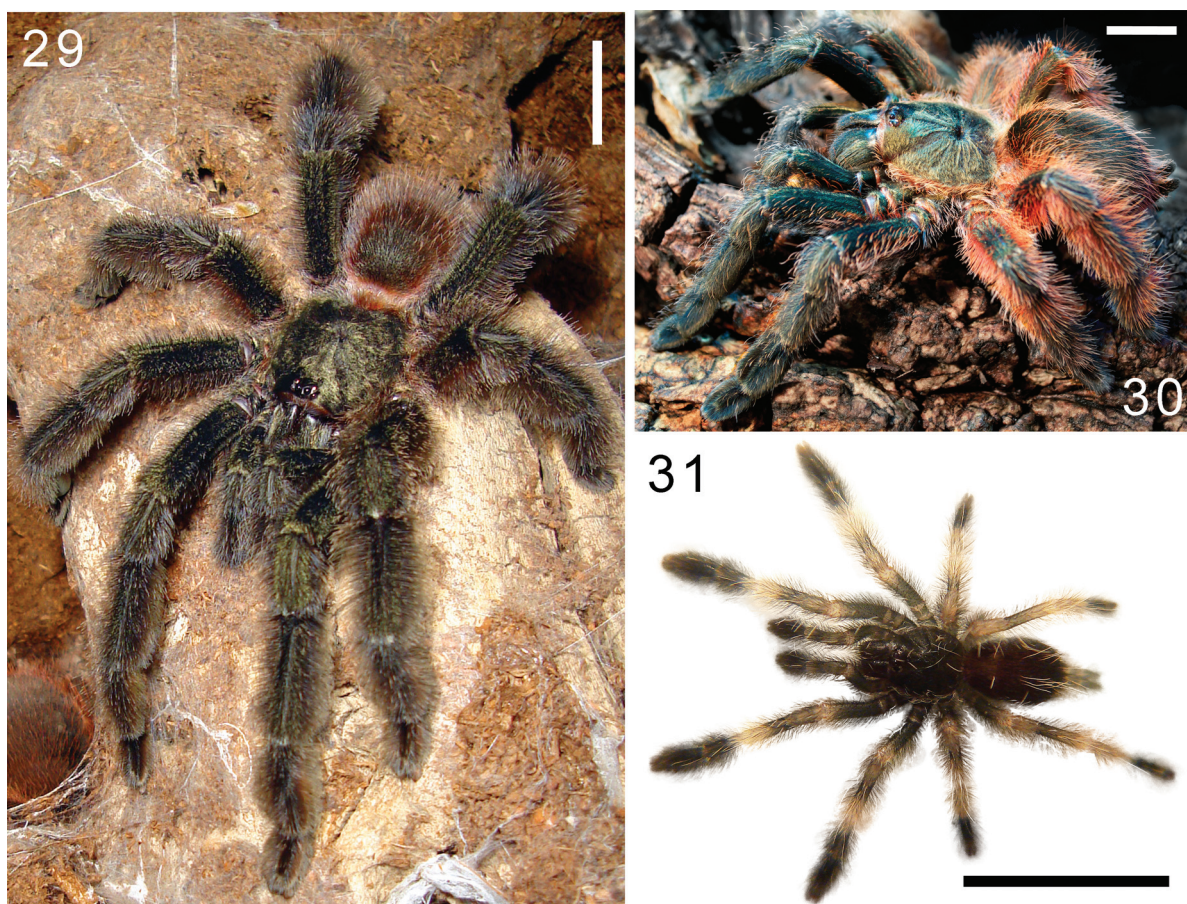
and sternum black, sigillae orange; abdomen dorsally black with long red setae, ventrally black. Legs and palpi: femora, patellae, tibiae, and metatarsi with dark green sheen, most notable on femur of palpi and legs I-II. Legs III and IV with dense, long red setae (Fig. 30).

Color pattern ontogeny: as with other aviculariinae, the color pattern of these spiders changes during their development. Spiderlings of *P. victori* sp. nov. have a black carapace; the abdomen dorsum is dark blue with red tones and the spinnerets have a whitish ring at the base of each segment. The segments of the legs are whitish as follows: femora distal quarter, tibiae distal half, and metatarsus proximal half (Fig. 31). In larger stadia, the carapace is dark brown with green tones; the abdomen dorsum is metallic green; spinnerets and legs have a dark brown color with a green tone on the femora. As individuals grow, the carapace becomes more green; the

abdomen dorsum develops red setae; palpi, legs I-II show dark green color on femora, patellae, and tibiae while the legs III-IV show red setae overall femora, patellae, tibiae, and metatarsus. The legs have a white ring at the terminal end of tibiae and metatarsus. Adult females have the carapace green sheen; legs I-II becomes darker whereas metallic green sheen is most notable on femora; legs III-IV and abdomen dorsum increases the red color of setae (Fig. 30). Adult males change completely in color; the carapace and all femora become olive green; abdomen dorsum preserved reddish setae but not as dense as in females; the legs develop long lateral grey hairs that give them a feathery appearance (Fig. 29). Both sexes show a black ventral region.

Taxonomic summary

Etymology: the specific name is a patronym in honor of Víctor H. Jiménez Arcos, a Mexican herpetologist who



Figures 29-31. *Psalmopoeus victori* sp. nov. habitus. 29, male; 30, female; 31, spiderling. Scale= 10mm (29-31).

saw and collected the first specimen of the species.

Distribution: known only from rainforest in Veracruz, México.

Natural history: all spiders were found at night in a primary forested area. They make retreats in tree cavities at medium height elevation. Spiders are difficult to find even at night. One of the females was found in a recently fallen tree branch. However, since there were no systematic collecting efforts to estimate the size of the population, it is not possible to know if they are large or small. The area is under pressure from human activities and it is possible that this is the only existing population at this location.

Conservation: more studies are needed to learn about *Psalmopoeus victori* sp. nov. biology and habits, and to establish the rarity of the species. Because the distribution area is small and the species looks attractive for pet trade collectors, the exact distribution is not provided here. However, Mexican government approved in 2011 a program of captive breeding for reintroduction and legal pet trade.

Remarks

Sammand Schmidt (2010) created the subfamily Psalmopoeinae, which according to them is diagnosed by the following synapomorphies: urticating hairs absent, male palpal bulb with long embolus without keels, presence of 2 tibial apophyses distally on the leg I, lyriform stridulatory organ present (*Psalmopoeus*) or absent (*Tapinauchenius*), legs weakly spined or aspinose, and tarsi as broad as or broader than metatarsi. This subfamily comprises arboreal species of the genera *Psalmopoeus* and *Tapinauchenius*; however, not all these features are synapomorphic to Psalmopoeinae because they are present in most of the Aviculariinae genera as was observed in the cladistic analysis of West et al. (2008). They found that the monophyly of Aviculariinae is weakly supported by the presence of well-developed scopulae on tarsi and metatarsi, very extended laterally, mainly those of legs I and II. In this study, *Psalmopoeus* is included as part of Aviculariinae, considering that the absence of urticating hairs is not enough to create a subfamily, which far from

solving taxonomic problems, only creates more. The only way to resolve this problem is with taxonomic revisions and cladistic analysis of all the species in each genus, in order to test their relationships.

It was Pocock (1895) who first described the different types of stridulation organs including the one of *Psalmopoeus* with the description of *P. cambridgei*. The single autapomorphy for *Psalmopoeus* is the presence of stridulatory bristles forming a maxillary lyra (West et al. 2008). The stridulation organ is useful in taxonomy because it allows to distinguish between different species. According to Pocock (1903), 2 different groups can be identified based on the characteristics of the stridulating organ: *i*) the one that has stridulating spines on maxilla in the same straight line as the edge of the oral fringe and scarcely separated from it (Figs. 12-15), and *ii*) the one that has stridulating spines on maxilla forming a convex curvature, the middle of which is remote from the oral fringe and nearer the coxal groove (Figs. 16, 17). Based on the original descriptions of *P. reduncus* (Karsch 1880), *P. ecclesiasticus* Pocock 1903, *P. emeraldus* Pocock 1903, *P. affinis* Strand 1907, *P. pulcher* Petrunkevich 1925, *P. rufus* Petrunkevich, 1925, *P. intermedius* Chamberlin 1940, *P. langenbuchi* Schmidt, Bulmer and Thierer-Lutz 2006, and *P. victori* sp. nov. belong to the first group, while *P. irminia* Saager, 1994, *P. plantaris* Pocock, 1903, and *P. cambridgei* Pocock, 1895 belong to the second one. Other important features of the lyra are the number of spines, increasing from proximal to distal and their development. In all descriptions of *Psalmopoeus* most of the characteristics are mentioned, but no standard description has been made (Chamberlin, 1940, Petrunkevich, 1925, Pocock, 1903, Strand, 1907, Valerio, 1979). The description of maxillary lyra of *P. victori* sp. nov. includes all these features.

Some *Psalmopoeus* can be easily distinguished by color (e.g., *P. cambridgei*, *P. irminia*, and *P. pulcher*), but most of the Central American species are similar in color pattern, and like *P. reduncus*, are highly variable in coloration (Valerio, 1979). Witt (1996) described *P. maya* based on its color, which may be darker than other members of the genus. Due to the tendency of color to vary depending on how recently a tarantula has molted, the reliability of this distinction as a diagnostic character for *P. maya* was called into doubt (Reichling, 2003). Gabriel (2009) considered that *P. maya* should be treated as a junior synonym of *P. reduncus*, because its distinction is based on weak taxonomic features. Although *P. victori* sp. nov. is easily recognizable by coloration from all other *Psalmopoeus*, this could be considered a secondary taxonomic feature.

The general shape of male bulbs is similar in all *Psalmopoeus* species. Some such as *P. cambridgei* have

a small globose tegulum with a large slender embolus (Figs. 24-26). Others such as *P. reduncus* and *P. victori* sp. nov. have a bigger, globose tegulum with shorter slender embolus (Figs. 18-23). This may vary in size within the same species, but retains its constant specific proportions, as was demonstrated by Valerio (1979) during the redescription of *P. reduncus*. Although similar in shape to *P. reduncus*, the bulb of *P. victori* sp. nov. has an embolus base with clear separation from the tegulum; the base width is 2/5 of tegulum height and the embolus is 2½ times longer than the tegulum. Whereas in *P. reduncus* the embolus is wide in the base without clear separation from the tegulum; the width of the base is half of the tegulum height and the embolus is 2 times longer than the tegulum. The palpal bulb of *P. victori* sp. nov. has constant proportions regardless of whether it is larger or smaller in size. Despite the similarities, there are differences in the proportions between *P. reduncus* and *P. victori* sp. nov. bulbs.

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