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Four new species of the spider genus *Physocyclus* Simon, 1893 (Araneae: Pholcidae) from Mexico, with updated taxonomic identification keys

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Abstract. Four new species of the spider genus *Physocyclus* Simon, 1893 are described from Mexico. Two species are described based on male and female adult specimens: *Physocyclus mariachi* sp. nov. and *P. sikuapu* sp. nov. Two species are described only with female adult specimens: *P. lyncis* sp. nov. and *P. pocamadre* sp. nov. The biogeographical province with the highest diversity of species is the Balsas Depression, located in the Mexican Neotropic, with 12 species. *Physocyclus lyncis* sp. nov. belongs to the *dugesi* species group, whereas the other three new species belong to the *globosus* species group. The total number of species of *Physocyclus* is increased to 37, distributed in North America (mainly Mexico) and Central America, with one cosmopolitan species: *P. globosus*. Updated taxonomic identification keys for males and females are provided.

Keywords. Taxonomy, species groups, Arteminae, Jalisco, Michoacan, Baja California Sur.

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Introduction

The spider family Pholcidae C.L. Koch, 1850 is the ninth largest family in the order Araneae, currently composed by 96 genera and 1854 species, including the species herein described (WSC 2022). The family is subdivided into five subfamilies: Arteminae Simon, 1893 Modisiminae Simon, 1893, Ninetinae Simon, 1890, Pholcinae C.L. Koch, 1850, and Smeringopinae Simon, 1893 (Huber 2011; Dimitrov *et al.* 2013; Eberle *et al.* 2018). The spider genus *Physocyclus* Simon, 1893, is classified in the subfamily Arteminae, which is the most diverse of the subfamily, with 34 species not considering the species described herein. In the last phylogenetic proposal by Eberle *et al.* (2018), the phylogenetic relationships of *Physocyclus* are not clear yet the genus might be related to the genus *Nita*, but also closely related to: ("*Wugigarra*" Indonesia (*Trichocyclus* (*Wugigarra* Australia + *Holocneminus* exc. *huangdi*))).

The genus *Physocyclus* is a common pholcid spider in Mexico (Valdez-Mondragón 2010, 2013, 2014; Jiménez & Palacios-Cardiel 2013), currently with 32 species distributed throughout the Mexican territory. *Physocyclus* is distributed mainly in North and Central America, from the south of the United States to Costa Rica (Valdez-Mondragón 2010, 2013; Jiménez & Palacios-Cardiel 2013). The habitat of these spiders is mainly dry and semiarid ecosystems, xeric shrub zones, deserts, and tropical deciduous forest (Valdez-Mondragón 2010, 2013, 2014; Nolasco & Valdez-Mondragón 2020). Some species are found in caves and holes in walls, other species among big boulders or tree bark on the ground. All the species of the genus are considered troglophilic, and so far no troglobitic species have been found. Also, is it common to find sympatric species of *Physocyclus* in the same locality, such as some regions of western Mexico where *P. brevicornus* Valdez-Mondragón, 2010*, P. lautus* Gertsch, 1971, and *P. globosus* (Taczanowski, 1874) have been collected in the same locality (Valdez-Mondragón 2010). There are two synanthropic and common species, *P dugesi* Simon, 1893 and *P. globosus*, the latter with a cosmopolitan distribution influenced by human activities (Beatty *et al.* 2008; Valdez-Mondragón 2010; Huber & Kwapong 2013) (Figs 1–7). Species associated with human habitation are found in places like roof corners in bedrooms, basements and bathrooms, under sinks, tables and benches, under electrical facilities, under stored objects and furniture, and under street drains, in dark warm places with few drafts and little disturbance.

The morphology of the genus comprises a small body ranging from 3 to 5 mm, and long legs with dark rings on the distal part of the femora and tibiae. Male chelicerae are wide and complex, with lateral apophyses variable in size, shape, position, and number. The coloration of the body varies between beige and pale brown, with irregular dorsal grey or brown patterns on the carapace. However, the general shape and coloration is similar among species, differing mainly in the shape of the reproductive structures (male palps and female genitalia) (Valdez-Mondragón 2010, 2014).

According to Valdez-Mondragón (2013, 2014), *Physocyclus* is a monophyletic genus based in morphological phylogenetic analyses, constituted by two species groups, *globosus* and *dugesi*, with 15 and 22 species respectively, including the new species described herein. The distribution pattern of these species groups is the Mesoamerican and Mexican Mountain biotic components for the *globosus* group, and the Mesoamerican and Continental Nearctic biotic components for the *dugesi* group (Valdez-Mondragón 2013, 2014).

In this work, we describe four new species from the states of Jalisco, Michoacan and Baja California Sur, Mexico. With this contribution, the number of described species of the genus increases to 37, described species, with Mexico being the country that holds the highest diversity of this genus. Additionally, updated taxonomic identification keys for males and females are provided.

Material and methods

Specimens were collected manually, preserved and observed in 80% ethanol. The type material is deposited at the Colección Nacional de Arácnidos (CNAN), Instituto de Biología, Universidad Nacional

Autónoma de Mexico, Mexico City. The additional examined material is deposited at the Laboratory of Arachnology (LATLAX), Laboratorio Regional de Biodiversidad y Cultivo de Tejidos Vegetales (LBCTV), IBUNAM, Tlaxcala City, Mexico; and the American Museum of Natural History (AMNH), New York City, United States. The specimens were measured and examined with a Zeiss Discovery Stereoscope V.8, and the photographs were done using a Zeiss Axio Zoom V.16 microscope and Axio Zoom Zen and Zen Pro digital software. The map was made with QGIS ver. 3.10. The photographs and map were edited in Photoshop CS6 ver. 130x32. The measurements of all specimens are in millimeters (mm). The male palps and female epigyna were dissected and observed in ethanol (80%). Photography was conducted with specimens and structures submerged in commercial-use gel alcohol (to hold them in the appropriate position), and the preparation completely covered with 80% ethanol. A dissecting microscope (Zeiss Discovery Stereoscope V.8) fitted with a camera lucida was used to make the drawings. The female genitalia were cleaned in potassium hydroxide (KOH 10%) for 10 minutes, to clean the soft tissues around the pore plates. Morphological terminology and descriptions follow Valdez-Mondragón & Francke (2015) and Nolasco & Valdez-Mondragón (2020).

Abbreviations

ALE	=	anterior lateral eyes
AME	=	anterior median eyes
BU	=	bulb of palp
DAP	=	dorsal apophyses of procursus
E	=	embolus
ES	=	embolic sclerites
LAC	=	lateral apophyses of chelicerae
L/d	=	length/diameter
PLE	=	posterior lateral eyes
PME	=	posterior median eyes
PP	=	pore plates
PR	=	procursus
SF	=	stridulatory files of chelicerae
SO	=	spermatic operculum
VAE	=	ventral apophyses of epigynum

Results

Class Arachnida Cuvier, 1812
Order Araneae Clerck, 1757
Family Pholcidae Koch, 1850
Subfamily Arteminae Simon, 1893
Genus *Physocyclus* Simon, 1893

Type species

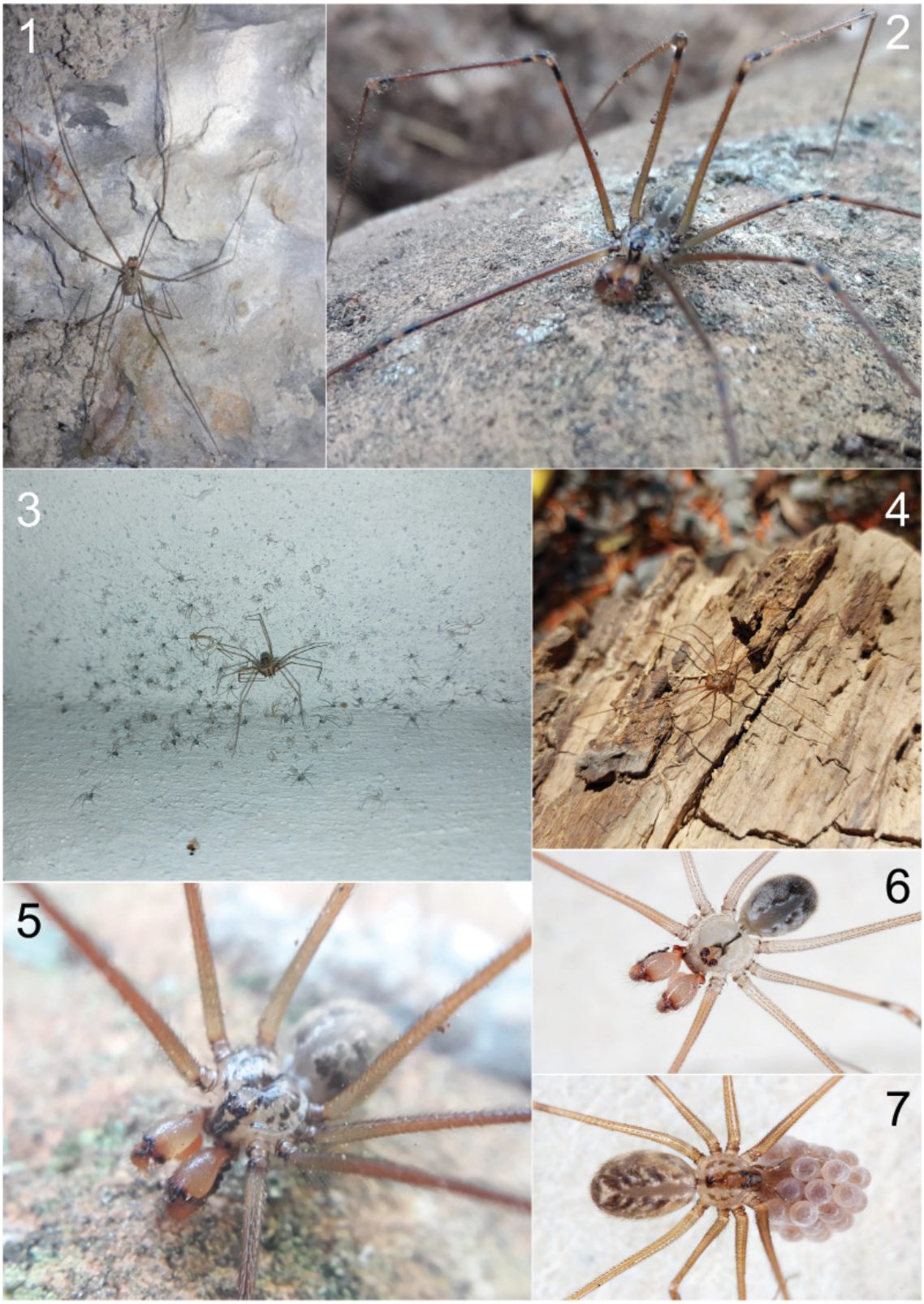
Pholcus globosus Taczanowski, 1874.

Diagnosis

See Valdez-Mondragón (2010, 2013, 2014).

Distribution

The genus *Physocyclus* is native and endemic in North and Central America (Valdez-Mondragón 2010), with the exception of *P. globosus*, which has a cosmopolitan distribution due to human activities (Valdez-Mondragón 2010, 2013, 2014). Huber & Villarreal (2020) mentioned that Caporiacco's (1955) records



Figs 1–7. Live specimens of the spider genus *Physocyclus*. **1**. Male of *Physocyclus darwini* Valdez-Mondragón, 2010. **2**, **5**. Males of *P. michoacanus* Valdez-Mondragón, 2010. **3**. Female and juveniles of *P. dugesi* Simon, 1893. **4**. Male of *P. dugesi*. **6**. Male of *P. reddelli* Gertsch, 1971. **7**. Female of *P. globosus* (Taczanowski, 1874), holding the ovisac. Photos 6 and 7 by Bernhard A. Huber (2019).

of *P. dugesi* Simon, 1893 from Miranda (1 ♀) and Caracas (1 juv.) are dubious and presumably based on specimens of *P. globosus* or a species of *Priscula* Simon, 1893. The natural distribution of *Physocylus* is mainly in arid and dry ecosystems (Figs 9–10, 13, 76, 77), such as xerophilous scrubs or deserts, although some species occur in zones with temperate and subtropical climates, such as deciduous forest (Figs 8, 12, 70, 72). The specific habitat of these spiders is between big boulders, in tree bark, or inside any hollow that provides protection (Figs 11, 71). In karstic zones, due to their trogophilic habits, they are commonly found inside caves, on the walls or between fissures (Figs 11, 73, 75) (Valdez-Mondragón 2010).

Composition

The genus *Physocyclus* is composed of two species groups: *globosus* and *dugesi*. The *globosus* group includes 15 species: *P. bicornis* Gertsch, 1971, *P. gertschi* Valdez-Mondragón, 2010, *P. globosus*, *P. guanacaste* Huber, 1998, *P. huacana* Valdez-Mondragón, 2010, *P. lautus* Gertsch, 1971, *P. mariachi* sp. nov., *P. modestus* Gertsch, 1971, *P. montanoi* Valdez-Mondragón, 2010, *P. paredesi* Valdez-Mondragón, 2010, *P. pocamadre* sp. nov., *P. sarae* Valdez-Mondragón, 2010, *P. sikuapu* sp. nov., *P. validus* Gertsch, 1971, and *P. xerophilus* Nolasco & Valdez-Mondragón, 2020.

The *dugesi* group includes 22 species: *P. brevicornus* Valdez-Mondragón, 2010, *P. californicus* Chamberlin & Gertsch, 1929, *P. cornutus* Banks, 1898, *P. darwini*, *P. dugesi*, *P. enaulus* Crosby, 1926, *P. franckei* Valdez-Mondragón, 2010, *P. hoogstraali* Gertsch & Davis, 1942, *P. lyncis* sp. nov., *P. marialuisae* Valdez-Mondragón, 2010, *P. merus* Gertsch, 1971, *P. mexicanus* Banks, 1898, *P. michoacanus*, *P. mysticus* Chamberlin, 1924, *P. palmarus* Jiménez & Palacios-Cardel, 2013, *P. pedregosus* Gertsch, 1971, *P. peribanensis* Valdez-Mondragón, 2014, *P. platnicki* Valdez-Mondragón, 2010, *P. reddelli*, *P. rothi* Valdez-Mondragón, 2010, *P. sprousei* Valdez-Mondragón, 2010, and *P. tanneri* Chamberlin, 1921.

The identification key of species of *Physocyclus* Simon, 1893 is updated from Valdez-Mondragón 2010 (hereafter VM 2010), using the same abbreviations.

Identification keys

Males

1. Sclerotized cones on frontal lamina of chelicerae present (VM 2010: figs 15, 22) 2
– Sclerotized cones on frontal lamina of chelicerae absent (VM 2010: figs 63, 77) 22

2. Few sclerotized cones (<10) on each frontal lamina (VM 2010: figs 42, 49) 3
– Numerous sclerotized cones (>10) on each frontal lamina (VM 2010: figs 105, 119) 5

3. Procursus pointing to front of palp, with basal half dark brown and distal half dark, with thin and long spine distally; sclerites on bulb, with oval shape in prolateral view (Nolasco & Valdez-Mondragón 2020: figs 6–8) ..... ***P. xerophilus*** Nolasco & Valdez-Mondragón, 2020
– Procursus pointing to base of palp (VM 2010: figs 44, 51) 4

4. Embolic sclerites half-moon shaped in retrolateral view; without projection directed to base of embolus; procursus with long ventral notch and ventral protuberance on median part (VM 2010: figs 44–45)…… ..... ***P. globosus*** (Taczanowski, 1874)
– Embolic sclerites oval-shaped in retrolateral view; with conical projection directed to base of embolus; procursus with short ventral notch and without ventral protuberance on median part (VM 2010: figs 51–52)…….. ..... ***P. guanacaste*** Huber, 1998

5. Palp femur with a ventral conical apophysis in the middle (VM 2010: figs 86, 121) 6
– Palp femur without ventral conical apophysis in the middle (VM 2010: figs 128, 135) 8

6. Palp femur thin, with long conical apophyses; embolus short, curved and thin; lateral apophyses of chelicerae absent; chelicerae with big cones on basal and prolateral parts of frontal lamina, except on anterior half of region with upside-down U-shape (VM 2010: figs 84–86) .... ***P. mysticus*** Chamberlin, 1924
– Palp femur wide, with small conical apophyses; embolus large and wide; lateral apophyses of chelicerae present; chelicerae with small cones scattered (VM 2010: figs 98–100) 7

7. Chelicerae with large and curved lateral apophyses, without oval protuberance on basal part of frontal lamina; sclerotized cones on prolateral part of frontal lamina and toward prolateral part of lateral apophyses of chelicerae; procursus with short and thin apical spine; embolic sclerites small, oval apically; embolus rounded in dorsal part (VM 2010: figs 98–100) .....***P. reddelli*** Gertsch, 1971
– Chelicerae with small and trapezoidal lateral apophyses, with oval protuberance on basal part of frontal lamina; sclerotized cones along frontal lamina and on frontal protuberance of chelicerae; procursus with large and wide apical spine; embolic sclerites large, triangular apically; embolus straight and triangular (VM 2010: figs 119–121) .....***P. franckei*** Valdez-Mondragón, 2010

8. Embolus pointing in perpendicular position to longitudinal axis of palp femur (VM 2010: figs 10, 135) 9
– Embolus pointing to base of palp femur (VM 2010: figs 31, 107) 14

9. In retrolateral view, palp with inconspicuous notch between embolic sclerites and embolus; embolus partially covering embolic sclerites; dorsal protuberance present on bulb; chelicerae with lateral apophyses slightly curved; sclerotized cones of chelicerae on half basal, on prolateral part of frontal lamina, and prolateral part of lateral apophyses (VM 2010: figs 133–136) .... ***P. brevicornus*** Valdez-Mondragón, 2010
– In retrolateral view, palp with conspicuous notch between embolic sclerites and embolus; embolus not covering embolic sclerites; dorsal protuberance absent on bulb; chelicerae with lateral apophyses straight; sclerotized cones of chelicerae in other position (VM 2010: figs 8, 10, 22, 24) 10

10. Embolic sclerites thin; circular notch between embolic sclerites and embolus; embolus with circular dorsal part; sclerotized cones of chelicerae on prolateral part of frontal lamina and prolateral part of lateral apophyses (VM 2010: figs 8–11) ..... ***P. californicus*** Chamberlin & Gertsch, 1929
– Embolic sclerites wide; oval notch between embolic sclerites and embolus; embolus with curved dorsal part; sclerotized cones of chelicerae scattered (VM 2010: figs 24–25, 178–179) 11

11. Chelicerae with sclerotized cones on basal half of frontal lamina and few scattered cones on distal part; lateral apophyses of chelicerae long; procursus pale in basal half and dark in distal half, with a short apical spine; embolus wide, oval basally (Jiménez & Palacios-Cardiel 2013: figs 5–8) .... ***P. palmarus*** Jiménez & Palacios-Cardiel, 2013
– Chelicerae with sclerotized cones on ¾ of total length of frontal lamina and prolateral part of lateral apophyses; lateral apophyses of chelicerae short; procursus totally dark, with a long apical spine; embolus with other shape (VM 2010: figs 22, 24, 176, 178) 12

12. Chelicerae without sclerotized cones on small central region of frontal lamina; in retrolateral view, procursus with long ventral notch, starting at level of dorsal apophyses of procursus (VM 2010: figs 176–178) .....***P. darwini*** Valdez-Mondragón, 2010
– Chelicerae with sclerotized cones totally covering ¾ of length of frontal lamina; in retrolateral view, procursus with small ventral notch at middle (VM 2010: figs 22) 13

13. Chelicerae with long cones on frontal lamina; procursus shorter than in *P. peribanenis*; distal spine slightly wider than in *P. peribanensis*; in retrolateral view, procursus with conspicuous

notch between embolic sclerites and embolus; embolus wide and straight (VM 2010: figs 22–24) ..... ***P. dugesi*** Simon, 1893

– Chelicerae with small cones on frontal lamina; procursus longer than in *P. dugesi*; with distal spine thinner than in *P. dugesi*; procursus with inconspicuous notch between embolic sclerites and embolus; embolus wide and sinuous (Valdez-Mondragón 2014: figs 6, 8) ....***P. peribanensis*** Valdez-Mondragón, 2014

14. Embolus with distal concavity, ending in a sharp tip (VM 2010: figs 31–32) 15
– Embolus without distal concavity, ending in a rounded or curved tip (VM 2010: figs 17–18) 19

15. Embolus with dorsal part slightly curved, almost straight, and with small distal ventral concavity (VM 2010: figs 72–73) 16
– Embolus with dorsal part strongly curved, distal ventral concavity large (VM 2010: figs 163–164) 17

16. In retrolateral view, lateral apophyses of chelicerae short and conical, in frontal view without protruding laterally of chelicerae; embolus straight and long (VM 2010: figs 29–31) .... ***P. enaulus*** Crosby, 1926
– In retrolateral view, lateral apophyses of chelicerae wide and rounded apically, in frontal view without protruding laterally of chelicerae; embolus straight and shorter than in *P. enaulus* and *P. sprousei* (VM 2010: figs 70–72) ..... ***P. merus*** Gertsch, 1971
– In retrolateral view, lateral apophyses of chelicerae strongly wider than in *P. enaulus* and *P. merus*, in frontal view protruding laterally of chelicerae; embolus long and sinuous (VM 2010: figs 168, 170) ..... ***P. sprousei*** Valdez-Mondragón, 2010

17. Sclerotized cones of chelicerae scattered along frontal lamina; embolic sclerites partially covered by embolus; in dorsal view, embolic sclerites sigmoid; lateral apophyses of chelicerae absent; chelicerae with basal-frontal protuberance; palp femur with ventral-distal conical apophysis, rounded apically (VM 2010: figs 161–163) ..... ***P. marialuisae*** Valdez-Mondragón, 2010
– Sclerotized cones of chelicerae not scattered along frontal lamina; embolic sclerites not covered by embolus; in dorsal view, embolic sclerites straight; lateral apophyses of chelicerae present; chelicerae without basal-frontal protuberance; palp femur without ventral-distal conical apophysis (VM 2010: fig. 105) 18

18. Embolic sclerites short; embolus with claw-shape apically, with deep distal-ventral concavity; lateral apophyses of chelicerae short and straight, ending in rounded tip; sclerotized cones of chelicerae on prolateral part and basal half of frontal lamina (VM 2010: figs 105–108) .... ***P. tanneri*** Chamberlin, 1921
– Embolic sclerites long, spine-shaped; embolus wide, with shallow distal ventral concavity; lateral apophyses of chelicerae long and straight, ending in a sharp tip; sclerotized cones of chelicerae on prolateral part of frontal lamina, first basal ⅓ of chelicerae, and on prolateral part of lateral apophyses (VM 2010: figs 126–129) ..... ***P. michoacanus*** Valdez-Mondragón, 2010

19. In retrolateral view, embolus apically ending in a rounded or curved shape; procursus thin and short, with inconspicuous distal spine; sclerotized cones of chelicerae scattered along frontal lamina (VM 2010: figs 15, 17, 183, 185) 20
– In retrolateral view, embolus apically ending in a rounded shape in ventral part, and dorsal part ending in a sharp tip; procursus wide and long, with conspicuous distal spine; sclerotized cones of chelicerae on prolateral-basal part of frontal lamina and prolateral part of lateral apophyses (VM 2010: figs 56, 58, 91, 93) 21

20. Embolus apically ending in a rounded shape; embolic sclerites long and wider than in *P. rothi*, without distal notch dorsally; dorsal apophysis of procursus shorter than in *P. rothi*; sclerotized cones of chelicerae along of frontal lamina and on prolateral part of lateral apophyses; lateral apophyses of chelicerae wide and long, in lateral view conical and curved (VM 2010: figs 15–17) ..... ***P. cornutus*** Banks, 1898
– Embolus apically ending in a curved shape; embolic sclerites long and thinner than in *P. cornutus*, with small distal notch dorsally; dorsal apophysis of procursus larger than in *P. cornutus*; sclerotized cones distributed until ⅔ part of length of frontal lamina and on lateral apophyses; lateral apophyses of chelicerae wide and short, in lateral view conical, ending in two tips with different sizes (VM 2010: figs 183–185) ..... ***P. rothi*** Valdez-Mondragón, 2010

21. Embolic sclerites long and wide, rounded apically; embolus without apical notch; procursus with apical spine thinner than in *P. hoogstraali*; sclerotized cones on basal half, prolateral part of frontal lamina and prolateral part of lateral apophyses; lateral apophyses of chelicerae shorter than in *P. hoogstraali*, projected at almost same length of chelicerae (VM 2010: figs 91–94) ..... ***P. pedregosus*** Gertsch, 1971
– Embolic sclerites long and thin, spine-shaped apically; embolus with apical notch; procursus with apical spine wider than in *P. pedregosus*; sclerotized cones on basal and prolateral part of frontal lamina of chelicerae but missing on lateral apophyses; lateral apophyses of chelicerae longer than in *P. pedregosus*, projected at same length of chelicerae (VM 2010: figs 56–59) ..... ***P. hoogstraali*** Gertsch & Davis, 1942

22. Two lateral apophyses in each chelicera (Figs 17–19) 23
– One single apophyses in each chelicera (VM 2010: figs 77–78) 27

23. Chelicerae with both lateral apophyses close to each other, in parallel position, pointing downwards; lateral apophyses of chelicerae with 3-4 sclerotized cones (Figs 17–19) 24
– Chelicerae with lateral apophyses pointing in perpendicular position, forming different angles; lateral apophyses of chelicerae without sclerotized cones (VM 2010: figs 1–2) 25

24. In frontal view, longest lateral apophyses of chelicerae wide and dark, with stridulatory ridges on it, without sclerotized cones; frontal-distal apophyses of chelicerae conical, with 3-4 sclerotized cones; procursus straight, with ventral notch at median part, with a long spine distally; in retrolateral view, embolic sclerites short; in dorsal view, embolus thin basally and becoming wider distally and in retrolateral view ending in a rounded tip (Figs 17–19, 21–22, 24–27) ..... ***P. mariachi*** sp. nov.
– In frontal view, longest lateral apophyses of chelicerae short and pale, with 3-4 apical sclerotized cones; frontal-distal apophyses of chelicerae conical, without sclerotized cones; procursus curved, with ventral notch at basal part, without distal spine; in retrolateral view, embolic sclerites long and wider than in *P. mariachi* sp. nov.; in dorsal view, embolus straight and in retrolateral view slightly curved, ending in "J" shape (VM 2010: figs 197, 200) ..... ***P. platnicki*** Valdez-Mondragón, 2010

25. Chelicerae with basal-lateral apophyses short, ending in small rounded tip; chelicerae with distal-frontal conical apophyses, sclerotized, protruding from the distal margin of chelicerae; procursus with long and thin distal spine; embolic sclerites rounded dorsally; embolus square in retrolateral view, with a small spine sub-distally on dorsal view (VM 2010: figs 63–66) ..... ***P. lautus*** Gertschi, 1971
– Chelicerae with paired lateral apophyses, conical, ending in sclerotized and sharp tips; chelicerae with small distal-frontal conical apophyses or lateral-distal apophyses; procursus with short distal spine or long and wide; embolic sclerites curved or square-shaped dorsally (VM 2010: figs 1–3; Valdez-Mondragón 2014: figs 23–25) 26

26. In retrolateral view, chelicerae with one lateral wide apophysis and the other small and triangular, forming a 90° angle between them; procursus conical, with rounded ventral notch in retrolateral view; embolic sclerites wide and square; embolus without distal spine (VM 2010: figs 1–4) ..... ***P. bicornis*** Gertschi, 1971
– In retrolateral view, chelicerae with one lateral apophysis wide and ax-shaped and the other thin and conical, forming a <90° angle between them; procursus straight, with oval ventral notch in retrolateral view; embolic sclerites short, slightly oval; embolus with a wide distal spine (Valdez-Mondragón 2014: figs 21, 23–26) ..... ***P. paredesi*** Valdez-Mondragón, 2010

27. Stridulatory ridges occupying full length of lateral apophyses of chelicerae (VM 2010: figs 112–113) 28
– Stridulatory ridges occupying part of total length of lateral apophyses of chelicerae (VM 2010: figs 140–141) 32

28. Procursus wide and straight, ending in a short spine (Fig. 44; VM 2010: fig. 79) 29
– Procursus thin and conical, ending in a long spine (VM 2010: figs 156, 192) 30

29. Procursus wider in distal half than basal half, with curved projection ventrally; embolic sclerites with square notch in median part; embolus ending in a rounded small ventral projection, without ventral projections and without small spine dorsal-apically but with a conspicuous triangular projection in dorsal view (VM 2010: figs 79–80) ..... ***P. modestus*** Gertsch, 1971
– Procursus wider in basal half than distal half, without curved projection ventrally; embolic sclerites square-shaped and without square notch in median part; embolus ending in square shape, with a small ventral projection pointing to base of femur and with small spine dorsal-apically (Figs 44–47, 50–51) ..... ***P. sikuapu*** sp. nov.

30. Palp femur straight ventrally; lateral apophysis of chelicerae wide, shield-shaped; embolic sclerites slightly curved in retrolateral view; embolus wide, with apical wide and curved concavity (VM 2010: figs 190–192) ..... ***P. sarae*** Valdez-Mondragon, 2010
– Palp femur curved ventrally (VM 2010: fig. 114) 31

31. Palp femur thinner than in *P. montanoi*; lateral apophysis of chelicerae wide and triangular-shaped in frontal view, with half length of chelicerae; embolic sclerites short, not protruding embolus; embolus long and inverted S-shaped (VM 2010: figs 112–114) ..... ***P. validus*** Gertsch, 1971
– Palp femur wider than in *P. validus*; lateral apophysis of chelicerae wide and shield-shaped in frontal view, almost with same length as chelicerae; embolic sclerites long, with an S-shape, protruding embolus; embolus small and square (VM 2010: figs 154–156) ..... ***P. montanoi*** Valdez-Mondragón, 2010

32. In lateral view, chelicerae with lateral-basal apophysis projected toward frontal part, and thin lateral-distal apophysis, ending in serrated tip; procursus curved, with curved ventral notch and a rounded distal-dorsal projection; embolic sclerites wide and conspicuous, with small rounded distal notch; in retrolateral view, embolus wider than in *P. huacana*, without notch between bulb and embolus (VM 2010: figs 140–143) ..... ***P. gertschi*** Valdez-Mondragón, 2010
– In lateral view, chelicerae with only one lateral apophysis wide and square-shaped; procursus conical, with ventral notch "V"-shaped; embolic sclerites conical and slightly curved, without small rounded distal notch; in retrolateral view, embolus thinner than in *P. gertschi*, with rounded notch between bulb and embolus (VM 2010: figs 147–150) ..... ***P. huacana*** Valdez-Mondragón, 2010

Females

1. Epigynum in ventral view, bell-shaped, with lateral constrictions strongly marked in median part, with anterior half smaller than posterior half (VM 2010: figs 19, 26) 2
– Epigynum in ventral view, with other shape, without constrictions in median part, or if present, barely visible (VM 2010: figs 60, 67) 19

2. Ventral apophyses of epigynum long and conical or long and flat (VM 2010: figs 19, 21, 130, 132) . 3
– Ventral apophyses of epigynum small, with other shape (VM 2010: figs 95, 97, 137, 139) 15

3. Pore plates long and thin (VM 2010: figs 39–41, 75) 4
– Pore plates with other shape (VM 2010: figs 20, 27) 9

4. Epigynum with light ventral region, rounded, close to epigastric furrow (VM 2010: figs 35, 74) 5
– Epigynum with light ventral region, triangular, close to epigastric furrow (VM 2010: figs 109, 130) 8

5. Epigynum with ventral apophyses long or flat (Fig. 61; VM 2010: fig. 74) 6
– Epigynum with ventral apophyses short, conical and rounded distally (VM 2010: figs 33–38) 7

6. Epigynum with ventral apophyses long and flat, rounded distally; epigynum rounded in lateral view; wide light region in median part triangular; pore plates wide and oval (Figs 61–63) ..... ***P. lyncis*** sp. nov.
– Epigynum with ventral apophyses thin and sharp apically, slightly curved in lateral view; epigynum slightly curved in lateral view; wide light region in median part circular; pore plates thin and long (VM 2010: figs 74–76) ..... ***P. merus*** Gertsch, 1971

7. Epigynum with ventral apophyses rounded apically, with upside-down chair shape (type I), or with ventral apophyses long and conical, ending in a rounded tip (type II); in frontal view, anterior rounded protuberances on ventral apophysis absent; pore plates shorter than in *P. sprousei* (VM 2010: figs 33–41) ..... ***P. enaulus*** Crosby, 1926
– Epigynum with ventral apophyses wide and rounded basally, ending in a conical tip; in frontal view, anterior rounded protuberances on each ventral apophysis; pore plates longer than in *P. enaulus* (VM 2010: figs 172–175) ..... ***P. sprousei*** Valdez-Mondragón, 2010

8. Epigynum with ventral apophyses straight in ventral view, short and conical in lateral view; epigynum with light ventral region close to epigastric furrow shorter than in *P. michoacanus*; pore plates short and thin, straight, slightly wider in posterior part (VM 2010: figs 109–111) ..... ***P. tanneri*** Chamberlin, 1921
– Epigynum with ventral apophyses wide and curved in ventral view, wide and curved in lateral view; epigynum with light ventral region close to epigastric furrow longer than in *P. tanneri*; pore plates long, slightly curved, wider in anterior part (VM 2010: figs 130–132) ..... ***P. michoacanus*** Valdez-Mondragón, 2010

9. Epigynum with ventral apophyses wide in basal part, with small tips (VM 2010: figs 26, 180) 10
– Epigynum with ventral apophyses long and conical, with wide tips (VM 2010: figs 19, 165) 11

10. Epigynum with tips of ventral apophyses separated from each other, tips longer than in *P. darwini*; pore plates thin, curved, "V"-shaped; light region close to epigastric furrow smaller than in *P. darwini* (VM 2010: figs 26–28) ..... ***P. dugesi*** Simon, 1893
– Epigynum with tips of ventral apophyses very close to each other, tips smaller than in *P. dugesi*; pore plates wide and straight; light region close to epigastric furrow longer than in *P. dugesi* (VM 2010: figs 180–182) ..... ***P. darwini*** Valdez-Mondragón, 2010

11. Epigynum with ventral and conical paired projections on posterior margin, ventral apophyses conical and slightly curved, separated by a notch on anterior margin; pore plates wide and curved (VM 2010: figs 165–167) ..... ***P. marialuisae*** Valdez-Mondragón, 2010
– Epigynum without ventral and conical paired projections on posterior margin (VM 2010: fig. 19) 12

12. Epigynum with ventral apophyses thin and long, with a sharp tip; epigynum with wide and light region on median part; epigastric furrow triangular-shaped; pore plates with half-circle shape (Jiménez & Palacios-Cardiel 2013: figs 10–13) ..... ***P. palmarus*** Jiménez & Palacios-Cardel, 2013
– Epigynum with ventral apophyses wide and long, with a rounded tip (VM 2010: figs 19–21) 13

13. Epigynum with ventral apophyses close to each other; epigynum with thin and triangular light region in median part; pore plates wide and oval, slightly curved, close to each other (VM 2010: figs 19–20) ..... ***P. cornutus*** Banks, 1898
– Epigynum with ventral apophyses widely separated from each other; epigynum with wide light region in median part (VM 2010: figs 187, 189) 14

14. Epigynum with ventral apophyses pointing downward; light region in median part with rhomboid shape; pore plates thinner than in *P. rothi*, forming a 90° angle (Valdez-Mondragón, 2014: figs 15–17) ..... ***P. peribaniensis*** Valdez-Mondragón, 2014
– Epigynum with ventral apophyses pointing toward front; light region in median part oval; pore plates wider than in *P. peribanensis*, forming a >90° angle (VM 2010: figs 187–189) ..... ***P. rothi*** Valdez-Mondragón, 2010

15. Chelicerae with stridulatory ridges; epigynum with ventral apophyses wide and flat; pore plates wide, oval-shaped (VM 2010: figs 12–14, 137–139) 16
– Chelicerae without stridulatory ridges; epigynum with ventral apophyses small and conical; pore plates with other shape (VM 2010: figs 95–97, 123–125) 17

16. Epigynum with ventral apophyses flat and rhomboid-shaped, with porosities; epigastric furrow forming a >90° angle; pore plates wide and oval, without a sclerotized region in anterior margin (VM 2010: figs 12–14) ..... ***P. californicus*** Chamberlin & Gertsch, 1929
– Epigynum with ventral apophyses rounded, without porosities; epigastric furrow curved; pore plates wide and oval, with a sclerotized region in anterior margin (VM 2010: figs 137–139) ..... ***P. brevicornus*** Valdez-Mondragón, 2010

17. Anterior part of epigynum circular; ventral apophyses of epigynum inconspicuous; epigynum with dark central region forming upside-down "T" shape; pore plates small and triangular (VM 2010: figs 123–125) ..... ***P. franckei*** Valdez-Mondragón, 2010
– Anterior part of epigynum square; ventral apophyses of epigynum conspicuous; epigynum without dark central region with upside-down "T" shape; pore plates elongated (VM 2010 figs 95–97) 18

18. Ventral apophyses of epigynum close to each other, smaller than in *P. reddelli*; epigynum with conspicuous triangular dark region in median part; pore plates large and oval, with a small constriction in middle, without sclerotized region in anterior margin (VM 2010: figs 95–97) ..... ***P. pedregosus*** Gertschi, 1971
– Ventral apophyses of epigynum separated from each other, longer than in *P. pedregosus*; epigynum without triangular dark region in median part; pore plates markedly curved at posterior part, with sclerotized region in anterior margin (VM 2010: figs 102–104) ..... ***P. reddelli*** Gertschi, 1971

19. Epigynum longer than wide (VM 2010: figs 60, 88) 20
– Epigynum wider than long (VM 2010: figs 46, 53) 22

20. Epigynum with two ventral apophyses on anterior margin, small and cylindrical; a third large and conical apophysis located on basal ⅓ part, ending in a rounded tip; pore plates markedly thin and long, almost in parallel position to each other (VM 2010: figs 88–90) ..... ***P. mysticus*** Chamberlin, 1924
– Epigynum without two ventral apophyses on anterior margin; epigynum without sharp and conical apophyses, and without a third large and conical apophysis ventrally (VM 2010: fig. 60; Figs 67–68) 21

21. Epigynum with two anterior, circular, wide apophyses, short and circular in ventral view; two ventral protuberances, flat and curved on middle part; epigynum without long and light bell-shaped region in median part; pore plates thin and long, wider in posterior half (VM 2010: figs 60–62) ..... ***P. hoogstraali*** Gertsch & Davis, 1942
– Epigynum with two small anterior apophyses, oval in ventral view; without two ventral protuberances on middle part; epigynum with long and light bell-shaped region in median part; pore plates markedly thinner and longer than in *P. hoogstaali* (Figs 67–69) ..... ***P. pocamadre*** sp. nov.

22. Epigynum with ventral paired concavities on median part (VM 2010: figs 67, 151) 23
– Epigynum without ventral concavities on median part (VM 2010: figs 46, 81) 29

23. Epigynum with oval and large concavities on median part (VM 2010: figs 5, 151) 24
– Epigynum with small concavities on median part, "U"-shaped, close to epigastric furrow (VM 2010: figs 67, 144) 26

24. Chelicerae with stridulatory ridges; ventral apophyses of epigynum wide, forming a "T" shape with median region between central concavities; pore plates wide, slightly curved, pointing to each other (VM 2010: figs 151–153) ..... ***P. huacana*** Valdez-Mondragón, 2010
– Chelicerae without stridulatory ridges; ventral apophyses of epigynum thin, not forming a "T" shape with median region between central concavities (VM 2010: figs 5–7, 194–196) 25

25. Ventral apophyses of epigynum wider than in *P. sarae*, located on anterior part; in ventral view, apophyses pointing to each other; pore plates wide and oval, without oval translucid structures below them (VM 2010: figs 5–7) ..... ***P. bicornis*** Gertsch, 1971
– Ventral apophyses of epigynum thinner than in *P. bicornis*, located on central part; in ventral view, apophyses pointing downwards; pore plates small, slightly curved in posterior part, located above two oval translucid structures (VM 2010: figs 194–196) ..... ***P. sarae*** Valdez-Mondragón, 2010

26. Ventral concavities of epigynum close to each other (VM 2010: fig. 67) 27
– Ventral concavities of epigynum separated from each other (VM 2010: fig. 144) 28

27. Epigynum with ventral apophyses small and triangular in ventral view; ventral concavities on posterior part, with "W" shape; pore plates oval, smaller than in *P. paredesi*, above translucid structures (VM 2010: figs 67–69) ..... ***P. lautus*** Gertsch, 1971
– Epigynum with apophyses small and conical in ventral view; ventral concavities large and oval, on central part; pore plates semicircular, longer than in *P. lautus*, without oval translucid structures below (Valdez-Mondragón 2014: figs 31–33) ..... ***P. paredesi*** Valdez-Mondragón, 2010

28. Epigynum with ventral apophyses wide in ventral view, close to each other, ending in a rounded tip, located on median part; in ventral view, two deep and elongated anterior concavities absent; pore plates small and oval, above oval translucid structures (VM 2010: figs 144–146) ..... ***P. gertschi*** Valdez-Mondragón, 2010
– Epigynum with ventral tiny apophyses, widely separated from each other, ending in a small sharp tip, located on anterior margin of epigynum; in ventral view, two deep and elongated anterior concavities

present; pore plates wide and oval, with a small contraction in middle, without oval translucid structures below (VM 2010: figs 201–203) ..... ***P. platnicki*** Valdez-Mondragón, 2010

29. Epigynum with ventral apophyses small, conical, on median part (VM 2010: figs: 81, 83) 30
– Epigynum with ventral apophyses with different size, shape and position, or even absent (VM 2010: figs 116, 118) 33

30. Chelicerae without stridulatory ridges; epigynum corrugated (Figs 55–56) 31
– Chelicerae with stridulatory ridges; epigynum not corrugated (VM 2010: fig. 81) 32

31. Pore plates circular, small, widely separated from each other, without translucid structures below them; in lateral view, epigynum without curved concavity (VM 2010: figs 158–160) .... ***P. montanoi*** Valdez-Mondragón, 2010
– Pore plates oval, longer than in *P. montanoi*, close to each other, with translucid oval structures below; in lateral view, epigynum with curved concavity (Figs 55–57) ..... ***P. sikuapu*** sp. nov.

32. Epigynum with ventral apophyses small and conical in ventral view, thin and conical in lateral view; pore plates elongated, above oval translucid structures (VM 2010: figs 81–83) .... ***P. modestus*** Gertsch, 1971
– Epigynum with ventral apophyses small and slightly elongated in ventral view, wide and conical in lateral view; pore plates oval, above oval translucid structures (Nolasco & Valdez-Mondragón 2020: figs 14–16) ..... ***P. xerophilus*** Nolasco & Valdez-Mondragón, 2020

33. Epigynum with rounded shape, without ventral apophyses; with dark central spot; pore plates short and triangular, above oval translucid structures (VM 2010: figs 116–119) .... ***P. validus*** Gertsch, 1971
– Epigynum with bell shape, with ventral apophyses; without dark central spot; pore plates oval or elongated, without oval translucid structures below (Figs 31–33) 34

34. Pore plates elongated, wider distally; conical apophyses located on two dark regions; epigynum with paired concavities close to epigastric furrow (Figs 31–33) ..... ***P. mariachi*** sp. nov.
– Pore plates oval; conical apophyses not located on two dark regions; epigynum without paired concavities close to epigastric furrow (VM 2010: figs 46–47, 53–54) 35

35. Epigynum with one long and curved apophysis, slightly bifurcated at tip; pore plates with half oval shape, close to each other (VM 2010: figs 46–48) ..... ***P. globosus*** (Taczanowski, 1874)
– Epigynum with three ventral apophyses, one on anterior part and two in median, not bifurcated distally; pore plates oval, separated by their own width (VM 2010: figs 53–55) .... ***P. guanacaste*** Huber, 1998

Physocyclus mariachi sp. nov. Nolasco & Valdez-Mondragón
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Figs 14–33

Differential diagnosis

Males of *Physocyclus mariachi* sp. nov. resemble *P. paredesi* in the shape of LAC, and by absence of sclerotized cones in frontal part of chelicerae (Figs 17–18, 24; VM 2010: figs: 204, 205). In *P. mariachi* sp. nov. (1) two longer and more sclerotized LAC on each male chelicera (Figs 17–19, 24–25; VM 2010: figs 204–205; Valdez-Mondragón 2014: figs 21, 23–24); (2) LAC wider, more curved (Figs 17–18, 24); (3) distal-frontal apophyses of chelicerae longer, with some sclerotized ones (Figs 17–18, 24); (4) in retrolateral view, PR of male palp darker, straight (Figs 21, 26); (5) distal

spine of PR harpoon-shaped; (6) in dorsal view, ES wide, sigmoid-shaped (Figs 22–23, 27); (7) in retrolateral view, E thinner but longer, with distal concavity between two small sclerotized spines (Figs 21–23, 26–27). Females of *P. mariachi* sp. nov. with (1) triangular epigynum (Fig. 31); (2) with small and conical apophyses on anterior part, located on two dark regions (Figs 31–32); (3) in dorsal view, PP long, thin, in convergent position to each other (Fig. 33); PP oval, almost circular in *P. paredesi* (Valdez-Mondragón 2014: fig. 33).

Figs 8–13. Typical habitats of the spider genus *Physocyclus* Simon, 1893 from Mexico. **8**. Deciduous forests (Nayarit). **9–10**. Oasis in desert (Baja California Sur). **11**. Cave entrance located in a deciduous forest (Guerrero). **12**. Thorny scrub with columnar cacti (Guanajuato). **13**. Xerophilous scrub (Baja California Sur).

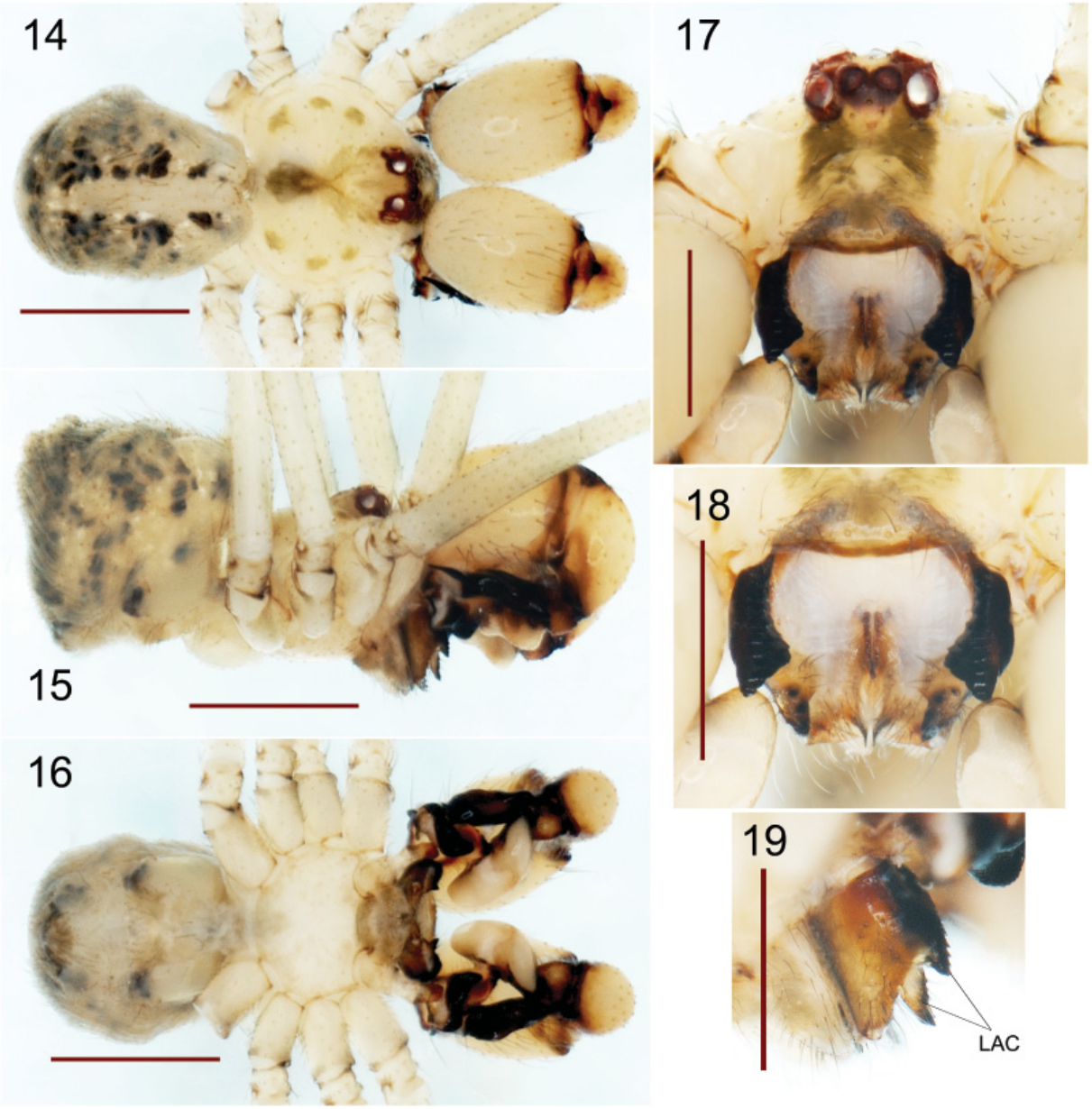
Etymology

The species name is a noun in apposition, and it refers to a genre of regional and popular Mexican music commonly known as "Mariachi", from the state of Jalisco where the type locality of the species is located.

Material examined

Holotype

MEXICO • ♂; Jalisco, Municipality of Hostotipaquillo, 2 km SW of Hostotipaquillo; 21.0879° N, 104.0685° W; 1355 m a.s.l.; 9 Nov. 2020; A. Valdez, I. Navarro, A. Juárez and S. Nolasco leg.; daytime collection; CNAN-T01471.



Figs 14–19. *Physocyclus mariachi* sp. nov. Male (holotype). **14–16**. Habitus in dorsal, lateral and ventral views, respectively. **17**. Carapace, frontal view. **18**, **19**. Chelicerae in frontal and lateral views, respectively. Scale bars: 14–16 = 1 mm; 17–19 = 0.5 mm.

Paratypes
MEXICO • 1 ♀; same collection data as for holotype; CNAN-T01472 • 1 ♀; Municipality of Plan de Barrancas, 2.5 km SE of Plan de Barrancas; 21.0239° N, 104.1907° W; 915 m a.s.l.; 9 Nov. 2020; A. Valdez, I. Navarro, A. Juárez and S. Nolasco leg.; daytime collection; CNAN-T01473.

Other material
MEXICO • 1 ♂, 1 ♀; Nayarit, Municipality of El Nayar, Arroyo Santiago; AMNH • 1 immature; same collection data as for holotype; LATLAX • 1 immature; same collection data as for second paratype; LATLAX.

Description

Male (holotype, CNAN-T01471)
Measurements. Total length 2.5. Carapace 1.11 long, 1.3 wide. Clypeus 0.5 long. Diameter AME 0.08, ALE 0.12, PME 0.10, PLE 0.12. Distance ALE-PME 0.06, PME-PME 0.13. Leg lengths: I (total 23.5): femur 6.4/patella 0.5/tibia 6.7/metatarsus 8.5/tarsus 1.3; tibia II: 4.5; tibia III: 3.1; tibia IV: 5; tibia I L/d 40.5.

Prosoma. Carapace light beige with Y-shaped light gray pattern around fovea and posterior part of carapace. Fovea longitudinal. Carapace with three irregular spots on each side (Figs 14–15). Clypeus wide, with dark brown irregular mark lengthwise (Fig. 17). Chelicerae pale, with two lateral apophyses on each side, with triangular tip and pointing down (Figs 17–19, 24–25). Anterior apophyses of chelicerae wide, dark, sclerotized, with small cones, in lateral view looks like a sawn surface. Posterior apophyses of chelicera small and thinner than anterior apophyses, with 4–5 sclerotized cones on each side (Figs 17–19, 24–25). Chelicerae with stridulatory files. Sternum light beige, with small and inconspicuous light brown spots. Labium brown, wider than long. Endites brown prolaterally, beige retrolaterally, longer than wide (Fig. 16).

Legs. All segments with beige coloration. Tibiae and femora with brown rings distally. Trochanters light brown (Figs 14–16).

Opisthosoma. Globular, longer than wide, high, with numerous white, gray and dark spots (Figs 14–15). Spinnerets dark brown, with short seta around (Fig. 16).

Palp. DAP wide and dark (Fig. 21). PR entirely dark, with notch in middle part, ending in long thin spine (Figs 21–23, 26). ES small and short, with oval shape in prolateral and retrolateral views (Figs 20–21, 26), wide, long and sinuous in dorsal view (Figs 22–23, 27). E small and short in retrolateral view, ending in a small tip. SO positioned in distal part of E (Fig. 26).

Female (paratype, CNAN-T01472)
Similar to the male, differences:

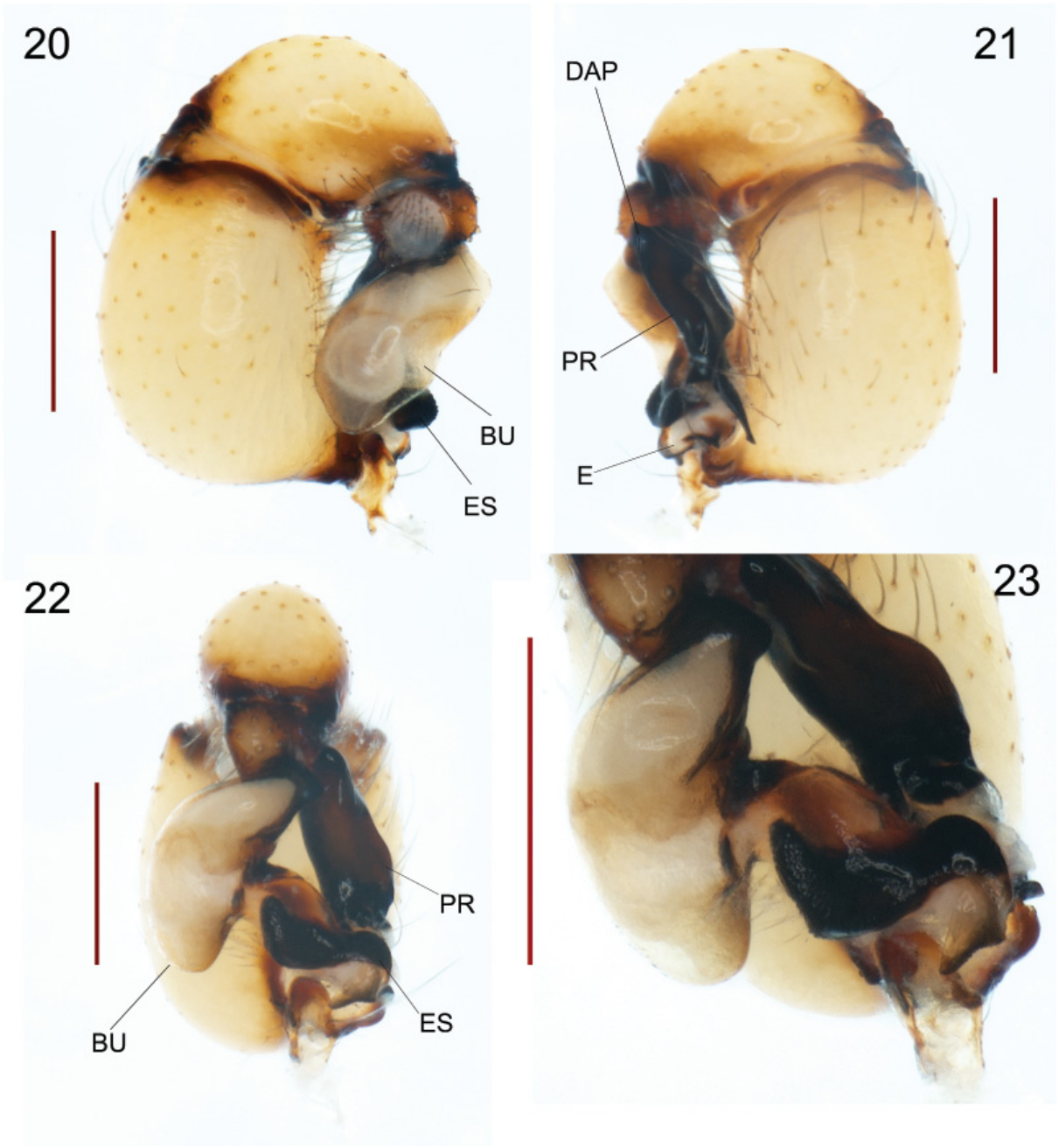
Prosoma. Carapace clearer, almost white, with darker dorsal pattern (Fig. 28). Carapace with small protuberance on posterior part (Fig. 29, red arrow). Sternum brown, with beige region in middle part (Fig. 30). Clypeus darker than in male, beige region in central part. Chelicerae with brown coloration, without LAC or sclerotized cones (Fig. 29).

Opisthosoma. With dorsal patch in anterior part (Fig. 28, red arrow). This structure might be a functional complex (with the protuberance of prosoma).

Legs. Femora and tibiae with darker rings distally (Figs 28–30).

Epigynum. Wider than long, bell-shaped, with VAE small, conical, pointing forward, surrounded by dark spot, with clear stripe across epigynum longitudinally (Figs 31–32). PP small and elongated, oval-shaped, located in perpendicular position (Fig. 33).

Measurements. Total length 3.7. Carapace 1.2 long, 1.2 wide. Clypeus 0.4 long. Diameter AME 0.08, ALE 0.12, PME 0.11, PLE 0.11. Distance ALE-PME 0.06, PME-PME 0.12. Leg lengths: I (total 16.8): femur 4.4/patella 0.5/tibia 4.6/metatarsus 6.1/tarsus 1.1; tibia II: 3.3; tibia III: 2.4; tibia IV: 3.6; tibia I L/d: 24.6.



Figs 20–23. *Physocyclus mariachi* sp. nov. Male (holotype). **20–22**. Left palp, prolateral, retrolateral and dorsal views, respectively. **23**. Bulb of male palp, dorsal view. Scale bars: 0.5 mm.

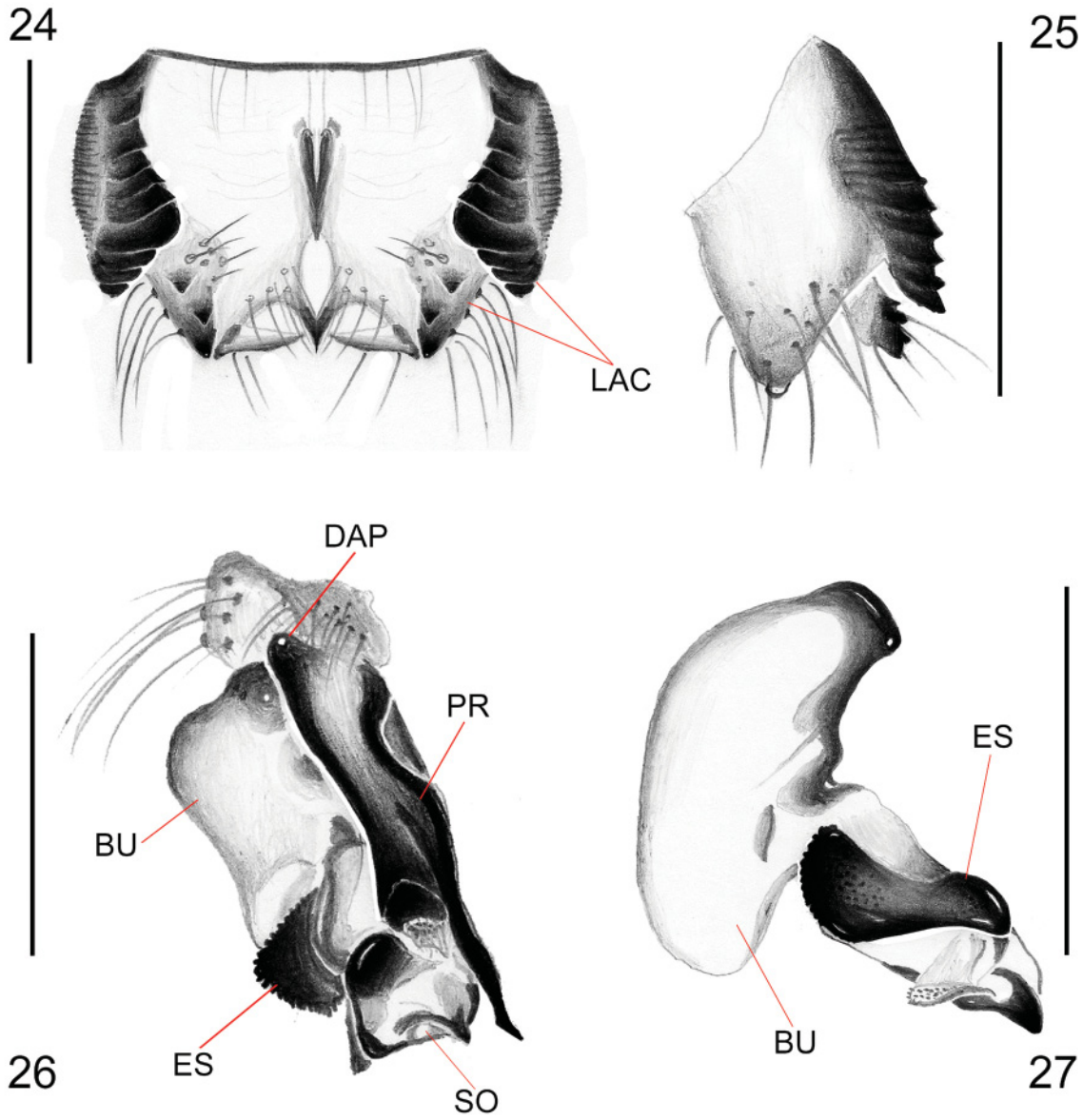
Variation

Females

Female collected in Plan de Barrancas is bigger than female collected at type locality. With an ocher coloration. The coloration of the dorsal pattern of the carapace and chelicerae is darker in this female. (*N*=1): Tibia I: 5.7; tibia II: 3.9; tibia III: 2.9; tibia IV: 4.4; tibia I L/d: 26.2.

Distribution

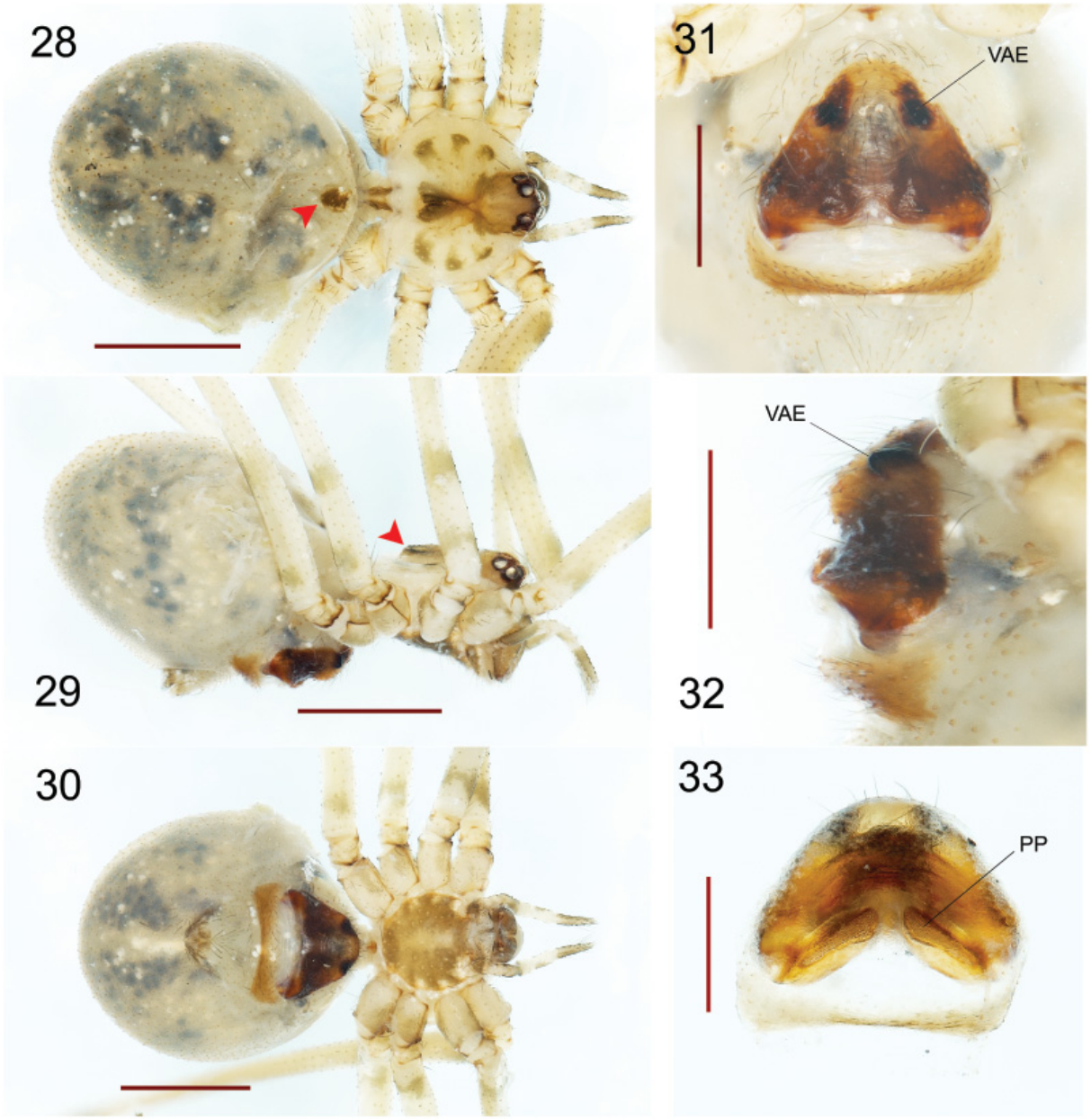
Mexico: Jalisco (Fig. 78).



Figs 24–27. *Physocyclus mariachi* sp. nov. Male (holotype). **24–25**. Detail of chelicerae, frontal and lateral views, respectively. **26**. Details of procursus, embolus and embolic sclerites of left palp, retrolateral view. **27**. Detail of bulb, dorsal view. Scale bars: 0.5 mm.

Remarks

This new species was previously recorded by W. J. Gertsch from Arroyo Santiago, Nayarit, Mexico, who tentatively named the species as *Physocyclus* "*nayaritus*". The species was never described, however, Gertsch drew some sketches consulted by A. Valdez-Mondragón at the American Museum of Natural History (AMNH) (year 2008). Those sketches are shown herein (Figs 34–37).



Figs 28–33. *Physocyclus mariachi* sp. nov. Female (paratype). **28–30**. Habitus in dorsal, lateral and ventral views, respectively; red arrows indicate a dorsal patch in the opisthosoma (28) and the dorsal protuberance in carapace (29). **31–33**. Epigynum, ventral, lateral and dorsal views, respectively. Scale bars: 28–30 = 1 mm; 31–33 = 0.5 mm.

Natural history

The specimens were collected among boulders on the ground. The male type and one female were collected close together during copulation. The vegetation of the type locality was disturbed deciduous forest (Figs 70–71).

Physocyclus sikuapu sp. nov. Valdez-Mondragón & Nolasco
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Figs 38–57

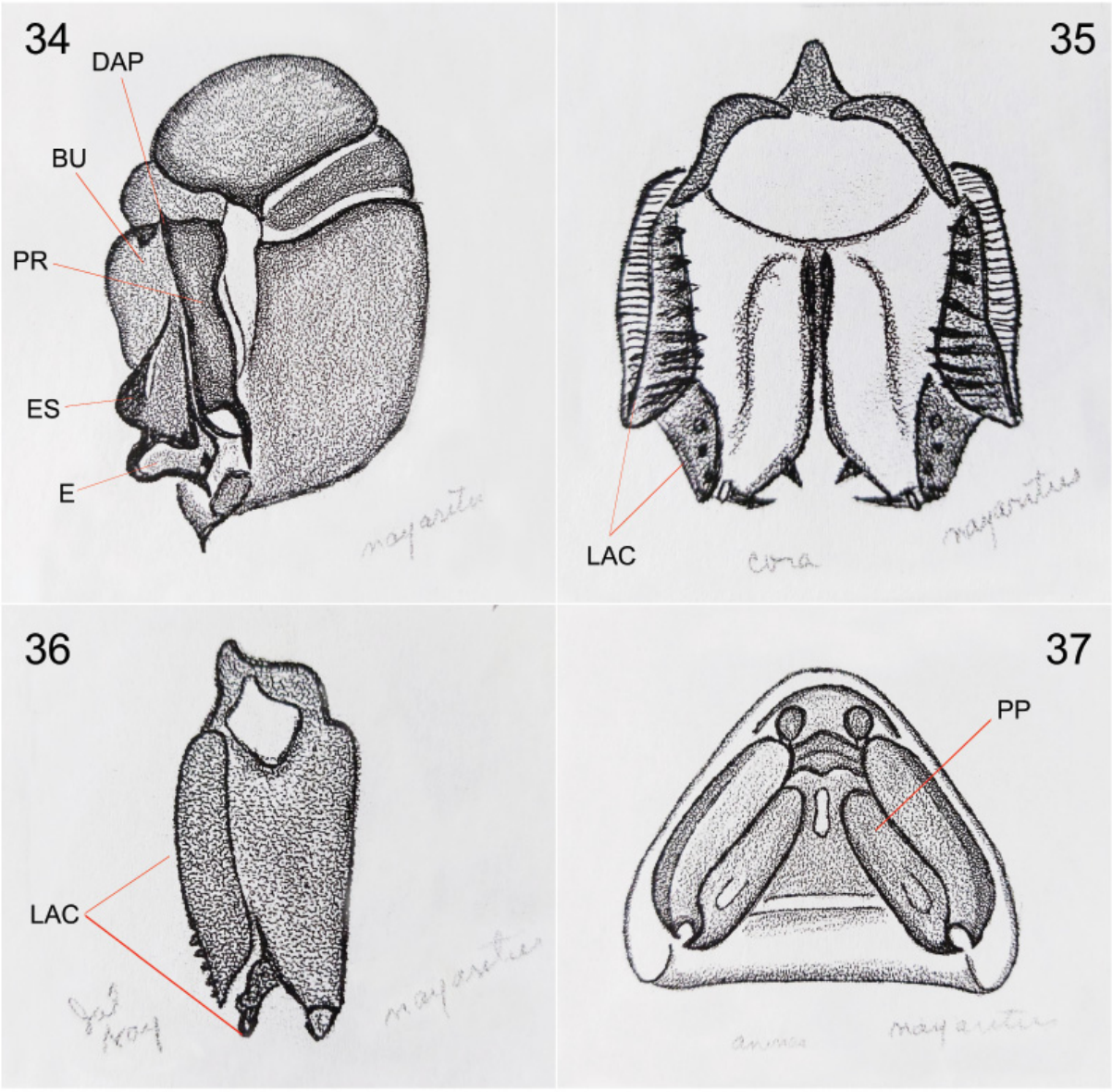
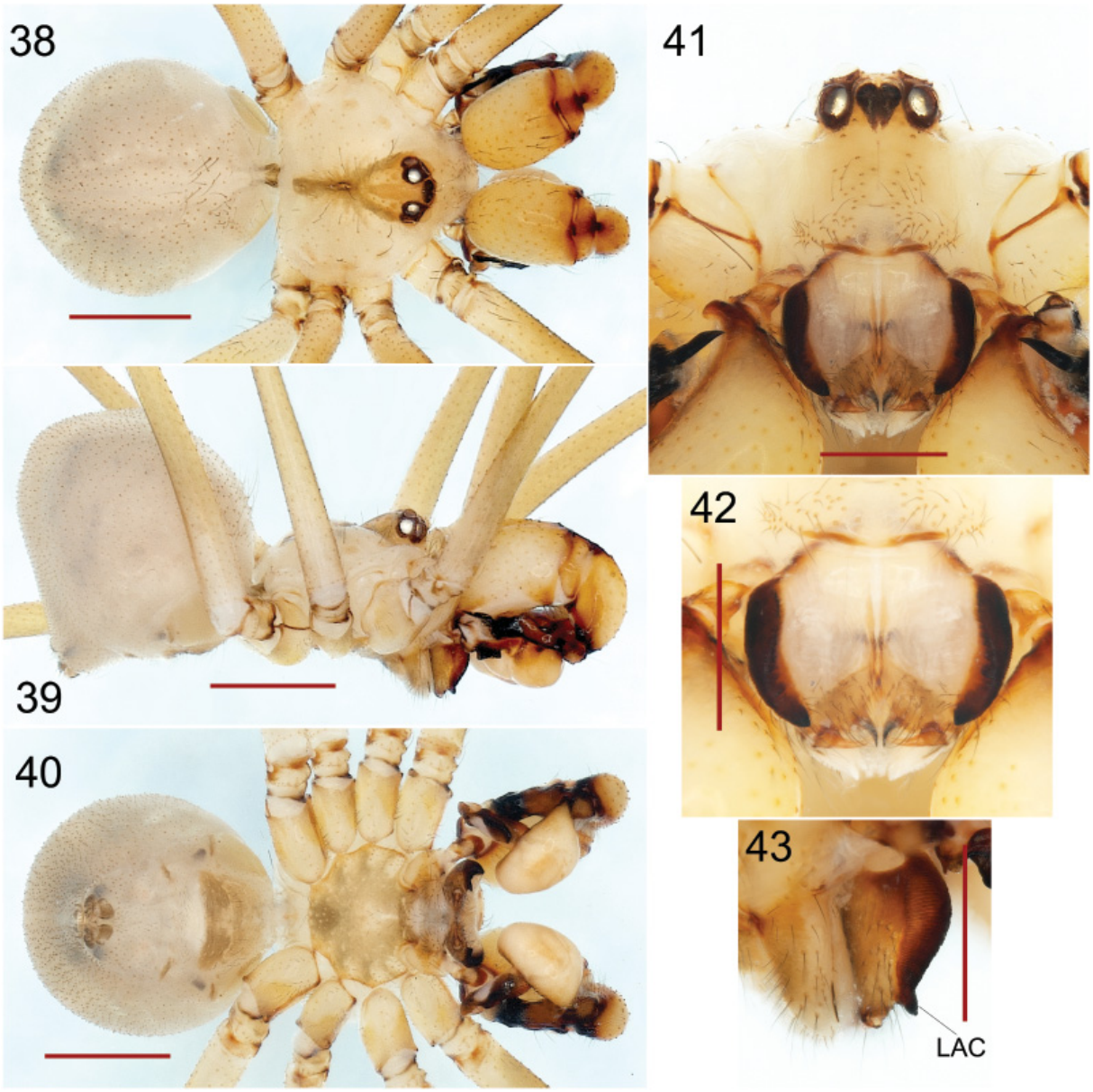


Fig. **34–37**. Unpublished drawings of *P. mariachi* sp. nov. (= *P.* "*nayaritus*") made by W.J. Gertsch, archived at AMNH. **34**. Male palp in retrolateral view. **35–36**. Left male chelicerae in frontal and retrolateral views, respectively. **37**. Female epigynum, dorsal view.

Differential diagnosis

Males of *Physocyclus sikuapu* sp. nov. resemble *P. globosus* in having LAC short, by shape of distal spine of PR, pointing to the base of palp femora, and by the half-moon shape of the EE (Figs 42–44, 48–49; VM 2010: figs 42–44). In *P. sikuapu* sp. nov. (1) chelicerae completely flat, without sclerotized cones, with uniform beige coloration (Figs 42–43, 48–49); (2) LAC short, conical, pointing down, with SF occupying entire length of chelicerae (Figs 41–43, 48–49); (3) ES wider, shorter (Figs 44, 46–47, 50–51). Females of *P. sikuapu* sp. nov. with (1) bell-shaped epigynum in frontal view, with stretch marks transversally in posterior part (Figs 55–56); (2) VAE small, slightly curved in lateral view (Fig. 56); (3) in dorsal view, PP long, oval, with two bag-shaped structures below them (Fig. 57, red arrow).



Figs 38–43. *Physocyclus sikuapu* sp. nov. Male (holotype). **38**–**40**. Habitus in dorsal, lateral and ventral views, respectively. **41**. Carapace in frontal view. **42**–**43**. Chelicerae in frontal and lateral views, respectively. Scale bars: 38–40 = 1 mm; 41–43 = 0.5 mm.

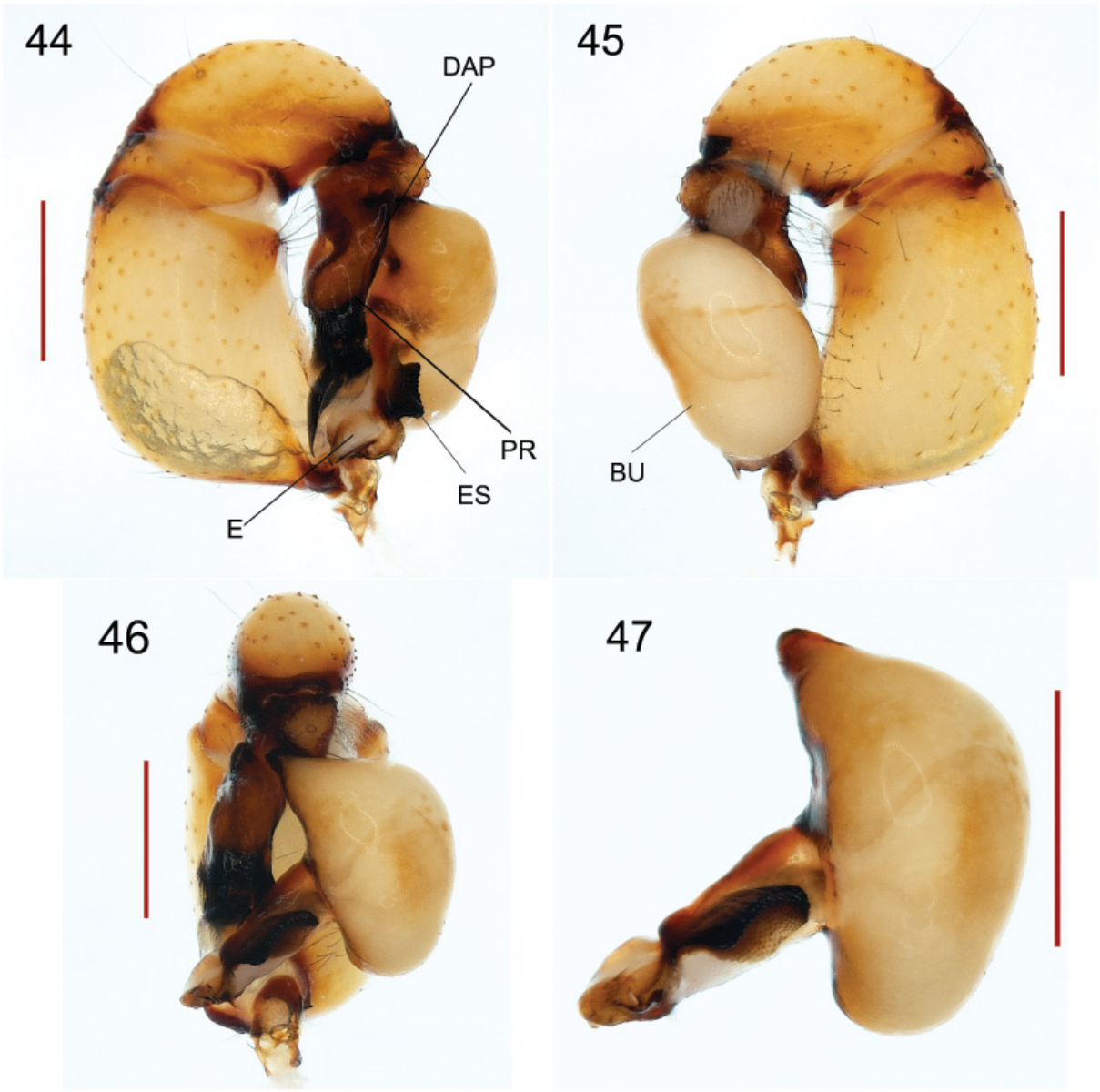
Etymology

The species name is a noun in apposition that means spider (sïkuapu = *spider*) in the Purépecha language from the pre-Columbian Purépecha state, which existed from the early 14th century until 1530, and today is known as the state of Michoacan, where the type locality is found.

Material examined

Holotype

MEXICO • ♂; Michoacan, Municipality of Aquila, cave at the viewpoint of Costa Aquila; 18.5634° N, 103.6471° W; 160 m.a.s.l.; 19 Nov 2020; A. Valdez, I. Navarro, A. Juárez and S. Nolasco leg; daytime collection; CNAN-T01474.



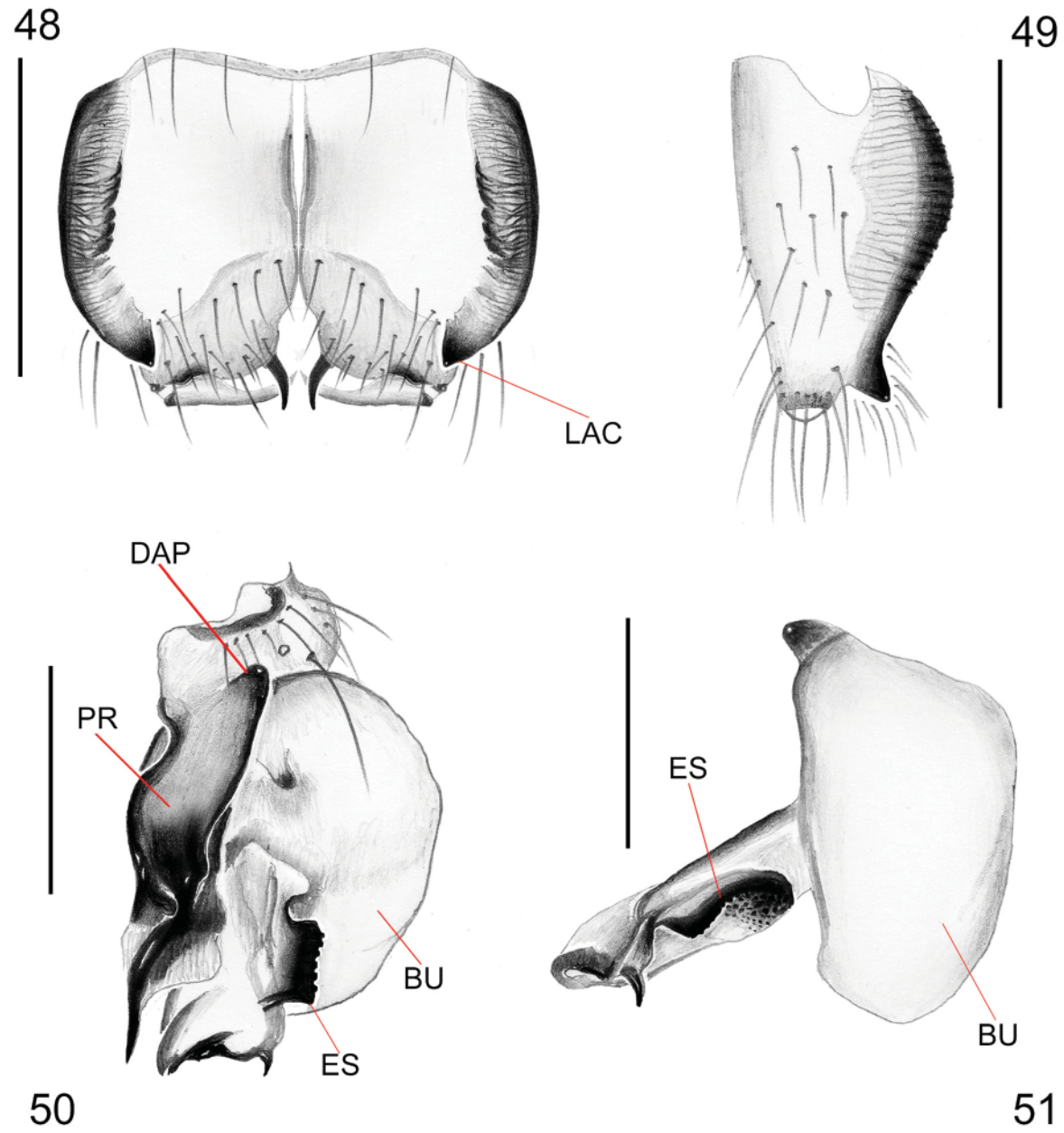
Figs 44–47. *Physocyclus sikuapu* sp. nov. Male (holotype). **44–46**. Right palp, prolateral, retrolateral and dorsal views, respectively. **47**. Bulb of male palp, dorsal view. Scale bars= 0.5 mm.

Paratypes

MEXICO • 1 ♂; same collection data as for holotype; CNAN-T01474 • 2 ♀♀; same collection data as for holotype; CNAN-T01475.

Other material

MEXICO • 8 immatures; same collection data as for holotype; LATLAX.

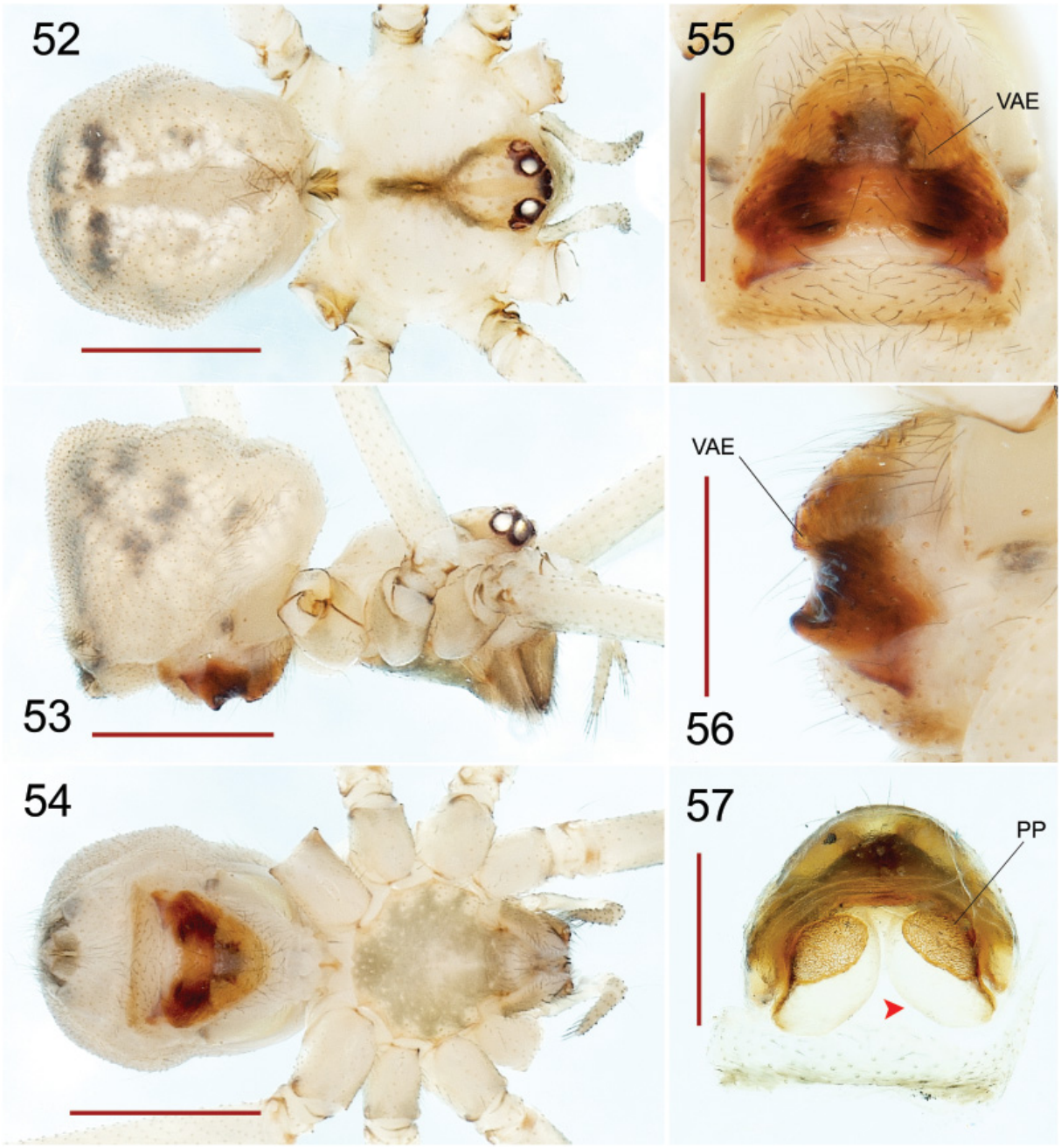


Figs 48–51. *Physocyclus sikuapu* sp. nov. Male (holotype). **48–49**. Detail of chelicerae, frontal and lateral views, respectively. **50**. Details of procursus, embolus and embolic sclerites of right palp, in retrolateral view. **51**. Detail of bulb, dorsal view. Scale bars= 0.5 mm.

Description

Male (holotype, CNAN-T01474)

Measurements. Total length 3.8. Carapace 1.7 long, 1.6 wide. Clypeus 0.6 long. Diameter AME 0.08, ALE 0.12, PME 0.11, PLE 0.12. Distance ALE-PME 0.06, PME-PME 0.13. Leg lengths: I (total 38.7): femur 9.8/patella 0.6/tibia 10.6/metatarsus 15.9/tarsus 1.7; tibia II: 7.5; tibia III: 5.3; tibia IV: 7.4. tibia I L/d: 61.2.



Figs 52–57. *Physocyclus sikuapu* sp. nov. Female (paratype). **52–54**. Habitus in dorsal, lateral and ventral views, respectively. **55–57**. Epigynum, ventral, lateral and dorsal views, respectively (red arrow indicates translucid bag-shaped structure). Scale bars: 52–54 = 1 mm; 55–57 = 0.5 mm.

Prosoma. Carapace light brown, with a Y-shaped mark around fovea and posterior part of ocular region. Fovea longitudinal. Carapace with three conspicuous irregular spots, barely visible on each side (Fig. 38). Clypeus wide, with same color of carapace (Fig. 41). Chelicerae light beige, without sclerotized cones, with short and conical lateral apophyses, pointing down (Figs 42, 48). SF laterally occupying total length of chelicerae (Figs 42–43, 48–49). Sternum pale grey, with four pale marks on each side. Labium brown, wider than long. Endites brown, longer than wide (Fig. 40).

Legs. All segments with light beige coloration. Trochanters light brown, darker than in female. Femora and tibiae with barely visible ring-shaped marks distally.

Opisthosoma. Globular, longer than wide, with inconspicuous irregular marks. Spinnerets light beige (Figs 38–40).

Palp. DAP thin and conical. In retrolateral view, PR slightly sinuous, with basal half light brown and distal half dark, ending in a long, curved, distal spine (Figs 44, 50). PR with a notch in basal half. In retrolateral view, ES short, square-shaped (Figs 44, 50); in dorsal view curved, C-shaped (Figs 46–47, 51). E short, square-shaped distally in prolateral view (Figs 44, 20), long and semi-conical in dorsal view (Figs 46–47, 51).

Female (paratype, CNAN-T01475)
Similar to the male, differences:

Prosoma. Carapace with pale coloration (Fig. 52). With a Y-shaped mark darker than in male. Clypeus slightly darker than in male. Chelicerae brown, without sclerotized cones or lateral apophyses (Fig. 53).

Opisthosoma. With numerous and irregular grey, white and brown marks (Figs 52–54).

Epigynum. Wider than long, bell-shaped, VAE small and slightly curved in lateral view (Figs 55–56). Anterior part of epigynum has a central gray spot, between the VAE (Fig. 55). Posterior part of epigynum darker than anterior part and seems to have stretch marks transversally (Figs 55–56). PP oval, with a pair of bag-shaped structures below them, which have an oval shape (Fig. 57).

Measurements. Total length: 3. Carapace 1.3 long, 1.3 wide. Clypeus: 0.5. Diameter AME 0.06, ALE 0.11, PME 0.08, PLE 0.12. Distance ALE-PME 0.08, PME-PME 0.12. Leg lengths: I (total 27.7): femur 6.8/patella 0.6/tibia 7.8/metatarsus 11/tarsus 1.6; tibia II: 5.3; tibia III: 3.8; tibia IV:5.5; tibia I L/d: 52.3.

Variation

Males
Male paratype collected at the same locality as male holotype is smaller, with a light beige coloration. Sternum with same color as carapace, with irregular darker marks in the periphery. The marks in the opisthosoma are slightly darker. (*N*=1): tibia I: missing; tibia II: 7.6; tibia III: 5.4; tibia IV: 7.6.

Females
The other female paratype is a little bigger, with the VAE coloration clearer. (*N*=1): tibia I: 8.6; tibia II: 6; tibia III: 4.5; tibia IV: 6.3.

Natural history

The specimens were collected among big boulders in a disturbed tropical deciduous forest, and inside of a small karstic cave on walls and in the ground (Figs 72–73).

Distribution

Mexico: Michoacan (Fig. 78).

Physocyclus lyncis sp. nov. Nolasco & Valdez-Mondragón
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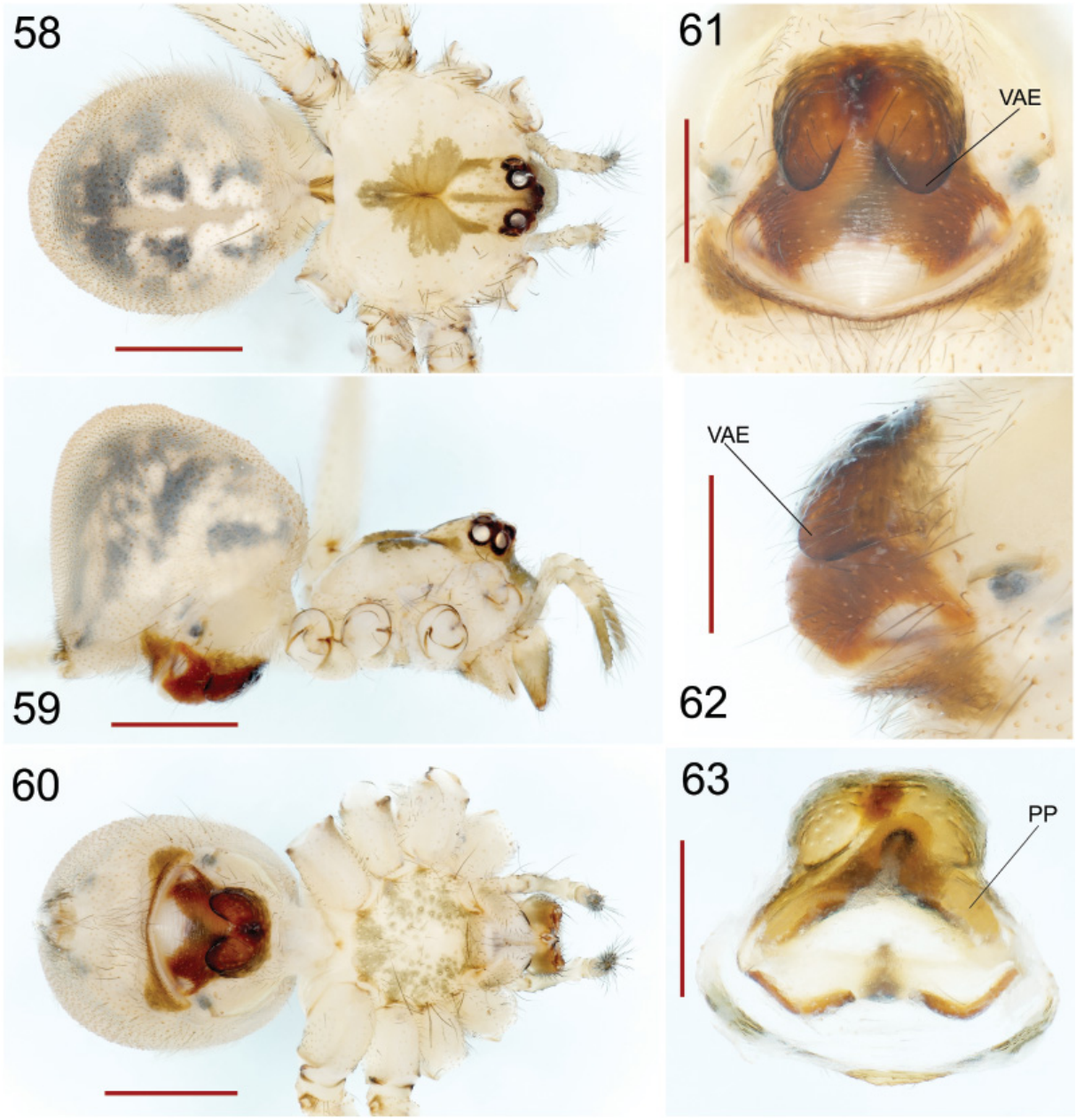
Figs 58–63



Figs 58–63. *Physocyclus lyncis* sp. nov. Female (holotype). **58**–**60**. Habitus in dorsal, lateral and ventral views, respectively. **61**–**63**. Epigynum in ventral, lateral and dorsal views, respectively. Scale bars: 58–60 = 1 mm; 61–63 = 0.5 mm.

Differential diagnosis

Females of *Physocyclus lyncis* sp. nov. resemble *P. californicus* by shape of epigynum, with semisquare shape in anterior part; VAE with a flat, wide shape in frontal and lateral views (Fig. 61; VM 2010: figs 12, 14). In *P. lyncis* sp. nov. (1) VAE long, wide, almost flat, ending in rounded tip, with dark region between them (Figs 61–62); (2) VAE closer to each other; (3) PP long, elongated, slightly curved (Fig. 63); (4) sclerotized arc of uterus pointing toward right side; (5) body coloration light beige, with a light brown inverted triangle pattern in carapace (Fig. 58); (6) irregular pale gray marks spread on sternum (Fig. 60).

Etymology

The species name is a noun in apposition and refers to the type locality where the species was collected: Cueva del Lince, Ejido La Primavera, Ecotourist Park, Jalisco, Mexico.

Material examined

Holotype

MEXICO • ♀; Jalisco, Municipality of Zapopan, Cueva del Lince, Ejido La Primavera, Ecotourist Park; 20.7120° N, 103.5700° W; 1605 m a.s.l.; 8 Nov. 2020; A. Valdez, I. Navarro, A. Juárez and S. Nolasco leg.; daytime collection; CNAN-T01476.

Paratypes

MEXICO • 1 ♀; same collection data as for holotype; CNAN-T01477 • 2 ♀♀; Municipality of Zapopan, Ejido La Primavera, Ecotourist Park; 20.6892° N, 103.5820° W; 1645 m a.s.l.; 30 Mar. 2012; L. Olguín, J. Mendoza, G. Contreras, C. Santibañez and D. Ortiz leg.; daytime collection; CNAN-T01478.

Other material

MEXICO • 2 immatures; same collection data as for holotype; LATLAX.

Description

Female (holotype, CNAN-T01476)

Measurements. Total length: 4.5. Carapace 1.6 long, 1.9 wide. Clypeus 0.5. Diameter AME 0.10, ALE 0.12, PME 0.12, PLE 0.15. Distance ALE-PME 0.11, PME-PME 0.18. Leg lengths: I missing; tibia II: missing; tibia III: 4.8; tibia IV: 6.4.

Prosoma. Carapace light beige with light brown irregular pattern, triangular-shaped around fovea and posterior part of ocular region (Fig. 58). Fovea longitudinal. Clypeus entirely light gray, without marks. Chelicerae light gray, without stridulatory files (Fig. 59). Sternum with light beige coloration, with spread and irregular pale gray spots. Endites and labium longer than wide, with light brown coloration (Fig. 60).

Legs. All segments with same coloration as carapace. Tibiae and femora with light gray rings distally. Trochanter light gray retrolaterally (Fig. 60).

Opisthosoma. Globose, longer than wide, with big dark marks, gray and white (Figs 58–59). Spinnerets light brown (Fig. 60).

Epigynum. Wider than long, with semisquare shape in anterior part; VAE long, wide, semicircular distally and almost flat, pointing downwards (Figs 61–62). Pale region close to epigastric furrow (Fig. 61). PP wide, sclerotized arc of uterus (Fig. 63).

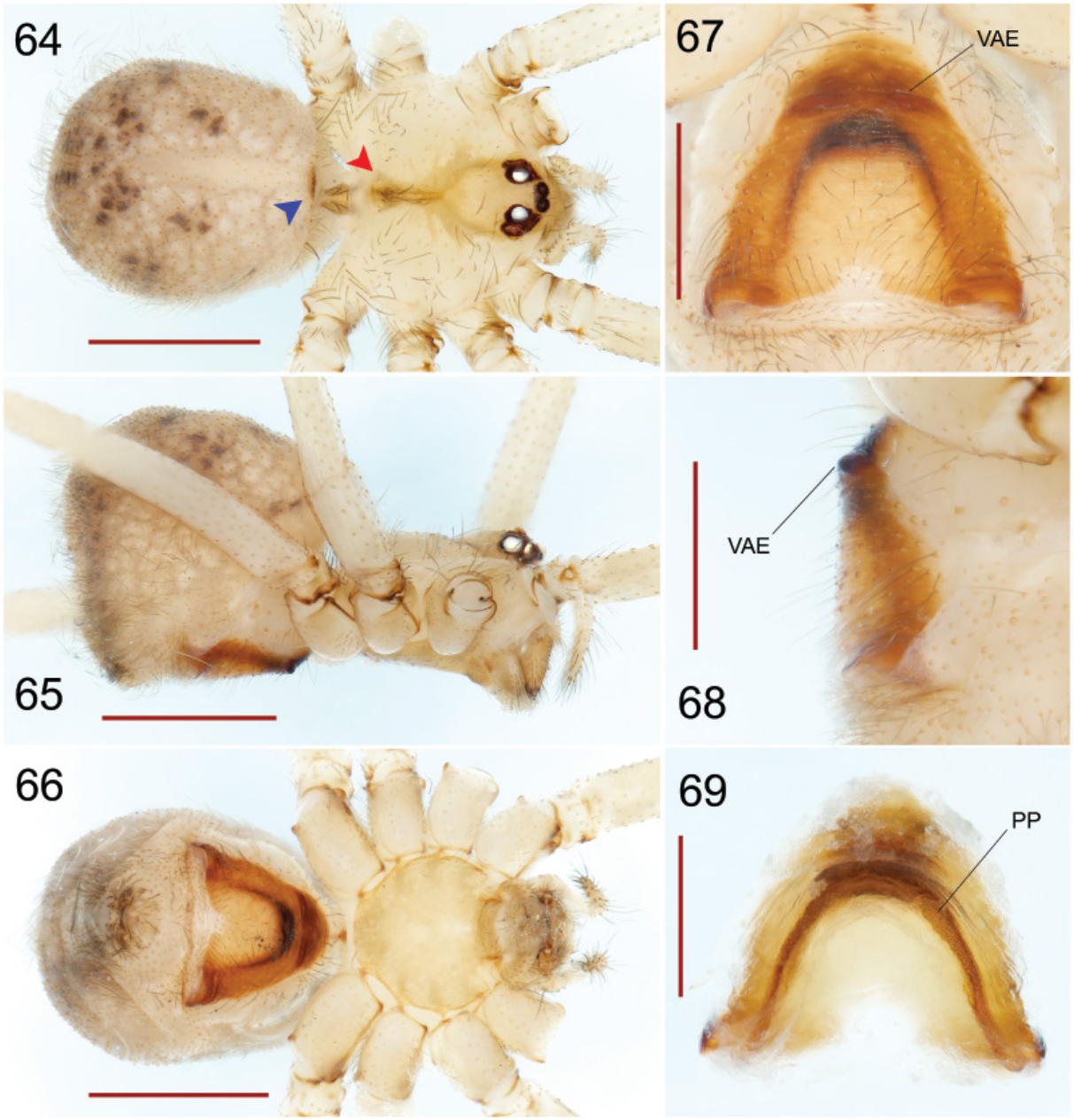
Male

Unknown.

Variation

Females

Female paratype collected from the type locality smaller than female holotype. The body coloration and its patterns are lighter. The marks on the ophistosoma are only dark. (*N*=1): tibia I: missing; tibia II: missing; tibia III: missing; tibia IV: 5.3. Females collected in 2012 are bigger than female holotype. Body coloration is ocher and the marks are dark brown. Dark region between the VAE is more marked



Figs 64–69. *Physocyclus pocamadre* sp. nov. Female (holotype). **64–66**. Habitus in dorsal, lateral and ventral views, respectively (red and blue arrows indicate the dorsal protuberance on carapace and dorsal patch on opisthosoma). **67–69**. Epigynum in ventral, lateral and dorsal views, respectively. Scale bars: 64–66 = 1 mm; 67–69 = 0.5 mm.

and darker. (*N*=2): female 1: tibia I: missing; tibia II: missing; tibia III: 5.6, tibia IV: 7.6. Female 2: tibia I: missing; tibia II: missing; tibia III: 4.9; tibia IV: 6.8.

Natural History

The specimens were collected on the walls of a small cave. The wall of the cave is of clay material that came off on contact (Fig. 75). This cave is located in perturbed oak forest, but the predominant vegetation of the Ejido La Primavera is oak-pine forest (Fig. 74). This type of vegetation is somewhat unusual for the genus *Physocyclus*, which commonly inhabits deciduous tropical forest and xerophytic scrub, but rarely temperate forest.

Distribution

Mexico: Jalisco (Fig. 78).

Physocyclus pocamadre sp. nov. Valdez-Mondragón & Nolasco
urn:lsid:zoobank.org:act:C1CAEA70-9477-4C27-BB99-41ED86B39D3B
Figs 64–69

Figs 70–73. Habitat and microhabitat of *Physocyclus mariachi* sp. nov. (70–71) and *Physocyclus sikuapu* sp. nov. (72–73). **70**. Disturbed deciduous forest near Municipality of Hostotipaquillo (type locality), Jalisco, Mexico. **71**. Big boulders on the ground where the specimens were collected (red arrows indicate the specific microhabitat). **72**. Deciduous tropical forest, Municipality of Aquila, Costa Aquila Michoacan, Mexico. **73**. Cave at the viewpoint of Costa Aquila (type locality).

Differential diagnosis

Females of *Physocyclus pocamadre* sp. nov. resemble those of *P. xerophilus* by shape and size of VAE. In *P. pocamadre* sp. nov. (1) VAE slightly elongated, in parallel position (Fig. 67–68); (2) epigynum longer than wide (Fig. 67); (3) lateral constrictions of epigynum absent; (4) PP elongated, thin, without bag-shaped structures below (Fig. 69).

Etymology

The species name is a noun in apposition, from the Mexican slang words "poca madre", which mean *something cool* or *something nice*.

Material examined

Holotype

MEXICO • ♀; Baja California Sur, Municipality of La Paz, cave close to the beach "El Tecolote", highway La Paz – El Tecolote; 24.3330° N, −110.3127° W; 4 m a.s.l.; 7 Aug. 2019; A. Valdez, P. Solís, A. Cabrera and D. Montiel leg.; daytime collection; CNAN-T01479.

Figs 74–77. Habitat and microhabitat of *Physocyclys lyncis* sp. nov. (74–75) and *Physocyclus pocamadre* sp. nov. (76–77). **74**. Pine-oak forest, predominant vegetation in the Ejido La Primavera, Ecotourist Park, Zapopan, Jalisco, Mexico. **75**. "Cueva del Lince" (type locality), inside of the Ejido la Primavera, Ecotourist Park, Zapopan, Jalisco, Mexico. **76**. Habitat close to the beach "El Tecolote", La Paz, Baja California Sur. **77**. Xerophytic scrub, close to the beach "Punta San Francisquito" (type locality), Baja California.

Paratypes

MEXICO • 2 ♀♀; same collection data as for holotype; CNAN-T01480. • 1 ♀; Baja California, Municipality of Ensenada, beach "Punta San Francisquito", San Francisquito Bay; 28.4089° N, 112.8581° W; 4 m a.s.l.; 23 Jul. 2019; A. Valdez, P. Solís, A. Cabrera and D. Montiel leg.; nighttime collection; CNAN-T01481.

Description

Female (holotype, CNAN-T01479)

Measurements. Total length 3.2. Carapace 1.4 long, 1.5 wide. Clypeus 0.3. Diameter AME 0.07, ALE 0.11, PME 0.11, PLE 0.12. Distance ALE-PME 0.05, PME-PME 0.13. Leg lengths: I (total 18.2): femur 5.4/patella 0.6/tibia 5.8/metatarsus 5.2/tarsus 1.2; tibia II: 4.3; tibia III: 3.3; tibia IV: 4.4; tibia I L/d: 41.1.

Prosoma. Carapace beige color, with a Y-shaped pale brown pattern around fovea and posterior part of ocular region (Figs 64–65). Carapace with a dorsal protuberance in posterior part (red arrow on Fig. 64). Fovea longitudinal. Clypeus without marks, entirely pale beige. Chelicerae with light brown coloration, without stridulatory files (Fig. 65). Sternum pale brown. Labium and endites dark brown, both wider than long (Fig. 66).

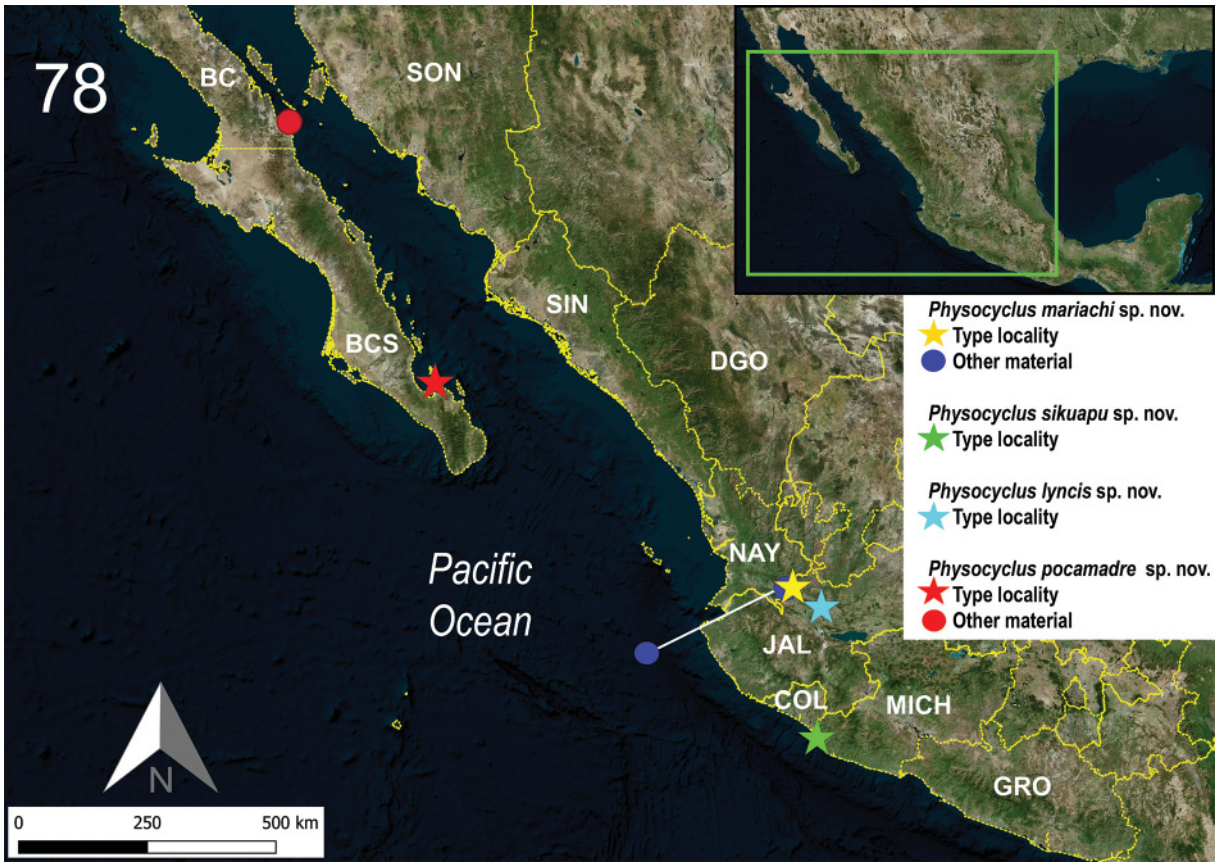


Fig. 78. Known records of *Physocyclus mariachi* sp. nov., *P. sikuapu* sp. nov., *P. lyncis* sp. nov., and *P. pocamadre* sp. nov. from Western Mexico. Abbreviations: BC = Baja California; BCS = Baja California Sur; COL = Colima; DGO = Durango; GRO = Guerrero; JAL = Jalisco; MICH = Michoacan; NAY = Nayarit; SIN = Sinaloa; SON = Sonora.

Legs. All segments with beige coloration. Tibiae and femora with light gray rings distally. Trochanters light beige, with a notch distally (Figs 64–66).

Opisthosoma. Longer than wide, with a dorsal patch located in anterior part (blue arrow on Fig. 64). This structure might be functional, together with dorsal protuberance of carapace (Fig. 64).

Epigynum. Longer than wide, with VAE small, semi-conical, pointing forward (Figs 67–68). VAE darker than rest of epigynum (Fig. 67). PP thin and markedly long (Fig. 69). Sclerotized arc of uterus thin (Fig. 69).

Male

Unknown.

Variation

Females

Females paratypes smaller than female holotype. One of them has a pale beige coloration and the pattern of the body has a light gray coloration, whereas the other female has a similar color as the female holotype. (*N*=2): female 1: tibia I: 5.3; tibia II: 3.9; tibia III: 2.9; tibia IV: 3.9. Female 2: tibia I: missing; tibia II: 3.6; tibia III: 2.7; tibia IV: 3.8. The ring coloration of tibiae and femora are light beige, barely visible. The pattern on carapace is slightly dark. (*N*=1): tibia I: 7.8; tibia II: 5.6; tibia III: 3.8; tibia IV: 5.4.

Natural history

The specimens were collected on their sheet webs among and under large boulders on the ground at both localities, close to the beaches "El Tecolote" and "Punta San Francisquito" (Figs 76–77). The vegetation type of both localities is dry xerophilous scrub, with cacti and scrubby vegetation (Figs 76–77). The specimens collected close to the beach "El Tecolote" were collected on their sheet webs among and under large boulders on the ground, and on walls of the cave, which is a concavity on a big wall.

Distribution

Mexico: Baja California and Baja California Sur (Fig. 78).

Discussion

The distribution pattern of the species groups is the Mesoamerican and Mexican Mountain biotic components for the *globosus* group, and the Mesoamerican and Continental Neartic biotic components for the *dugesi* group (Valdez-Mondragón 2013, 2014). Recent molecular phylogenetic studies under mitochondrial and nuclear markers support the monophyly of both species groups (in prep.).

Mexico is by far the richest country in terms of troglomorphic species of pholcid spiders, although the apparent dominance of species richness may be partly due to collectors' and taxonomists' biases (Huber 2018). Although the species of the genus *Physocyclus* are commonly found in caves and grottos in Mexico, no troglomorphic species has been collected so far, and all the species of the genus are considered troglophilic.

The total number of species of *Physocyclus* increases to 37, with 36 distributed along the Mexican territory. However, despite the growing knowledge of the genus *Physocyclus* since previous revisions by Valdez-Mondragón (2010) and the morphological phylogeny by Valdez-Mondragón (2013, 2014), the diversity of this genus in Mexico is still poorly known. The biogeography of Mexico is extremely complex; there were several dispersal and vicariance events because the Nearctic and Neotropical biotic

elements, known as the Mexican Transition Zone, overlap in Mexico (Morrone 2005). Provinces such as the Pacific Coast, Baja California, the Southern Altiplano, the Sonorense Province and long regions of tropical deciduous forest in the Pacific region (Valdez-Mondragón & Francke 2015: figs 22–23) are poorly sampled. The province of the Balsas Depression (BD), which has the highest diversity of species of *Physocyclus*, is the one that exhibits a greater influence of the Tropical Mesoamerican element. The vicariant events associated with the biotic evolution of the Transitional component would be related to the development of the Sierras Madre and the volcanism of the Trans-Mexican Volcanic Belt, which explain why the BD is one of the most biodiverse regions in the country (Morrone 2005).

Intensive sampling is needed to uncover the diversity of these spiders mainly in such semiarid ecosystems, xeric shrub zones, deserts, and tropical deciduous forest. Additionally, caves from tropical deciduous forest, a typical ambient for some genera of pholcids from Mexico, could be a significant source of new species (Valdez-Mondragón 2010).

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