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New species of tarantulas from Brazil and notes on the Hapalopini tribe (Araneae, Theraphosidae, Theraphosinae)

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Abstract. The monophyly of Theraphosinae is supported by both morphological and molecular phylogenies. However, intergeneric relationships often show polytomies and branches with low support. A previous phylogenetic study proposed an intergeneric relationship for the subfamily based on molecular data and divided it into three tribes: Grammostolini, Hapalopini and Theraphosini. However, not all genera of Theraphosinae were sampled, and some relationships were inferred based on morphological similarities. Regarding the Hapalopini from Brazil, the relationships of some genera are still uncertain, such as *Kochiana*, *Catanduba*, and *Munduruku*. In this paper, we describe four new species of Hapalopini from Brazil: *Cyriocosmus paresi* sp. nov., *Hapalopus akroa* sp. nov., *H. guidonae* sp. nov., and *K. fukushimae* sp. nov. In addition, we propose an updated diagnosis for these three genera and for the species *K. brunnipes* and *M. bicoloratum*.

Keywords. Mygalomorphae, Taxonomy, New World Spiders.

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Introduction

Theraphosidae Thorell, 1869 is divided into 12 subfamilies mainly found in tropical and subtropical regions (Luddecke *et al.* 2018; Foley *et al.* 2019). Five of these subfamilies have representatives in South America: Aviculariinae, Simon 1892; Ischnocolinae Simon, 1892; Psalmopoeinae Samm & Schmidt, 2010; Schismatothelinae Guadanucci, 2014; and Theraphosinae Thorell, 1869 (Guadanucci

& Weinmann 2014; Lüddecke *et al.* 2018). Theraphosinae is the most diverse of the subfamilies, distributed throughout temperate and tropical zones of the New World (Pérez-Miles & Perafán 2020). They are defined by the following set of characters: presence of urticating setae types I, III, IV, VI or VII in dorsal abdomen; which may appear in combined or modified form across species; presence of keels on male palpal bulb; large and extended subtegulum (Pérez-Miles *et al.* 1996; Bertani 2000; Kaderka *et al.* 2019). The relationships between Theraphosinae genera and its monophyly have been tested in some phylogenetic analysis based on morphological characters, such as Pérez-Miles *et al.* (1996); Bertani (2001); Bertani *et al.* (2011); Perafán *et al.* (2016); Perafán & Valencia-Cuellar (2018); Galleti-Lima & Guadanucci (2019); Fabiano Da-Silva *et al.* (2019). Although these phylogenies did not sample all genera and were generally based on similar morphological matrices (i.e., Bertani *et al.* 2011; Perafán *et al.* 2016; Perafán & Valencia-Cuellar 2018; Galleti-Lima & Guadanucci 2019), the results confirmed the monophyly of Theraphosinae. However, intergeneric relationships have often shown polytomies and other branches with low support, usually supported by changes of unique and/or conflicting characters by homoplasy (Turner *et al.* 2018).

Turner *et al.* (2018) proposed an intergeneric relationship hypothesis for the subfamily Theraphosinae, based on genetic variations of the 16S mitochondrial marker, (frequently used as taxonomic barcoding in spiders) and propose a genera classification into tribes. According to the authors, Theraphosinae is subdivided into two supergroups, the first composed by the tribes Grammostolini and Hapalopini, and the second composed by the tribe Theraphosini. The groups recovered in Turner *et al.* (2018) share morphological patterns that have been recovered in morphological phylogenies, such as the distinct types of urticating setae.

The primary taxonomic traits that distinguish the Hapalopini are: Often show abdominal patterns, but this feature may be reduced or absent in some species; lack of type I abdominal urticating setae and most species with only type III urticating setae (type IV setae may co-occur in certain specie); lack of trochantal and coxal stridulating setae; and femur IV without retrolateral scopula. In Brazil, this tribe is represented by the genera *Cyriocosmus* Simon, 1903; *Hapalopus* Ausserer, 1875; *Plesiopelma* Pocock, 1901; *Catanduba* Yamamoto *et al.*, 2012; *Kochiana* Fukushima *et al.*, 2008 and *Munduruku* Miglio *et al.*, 2013.

When comparing the taxonomic history of these genera, *Cyriocosmus* is the only with a recent revision and updated taxonomic status (Pérez-Miles 1998; Fukushima *et al.* 2005; Kaderka 2016, 2019; Gabriel 2017). The genera *Hapalopus* and *Plesiopelma* present a confusing taxonomic scenario, with some recent descriptions of new species and synonyms, but without any recent comprehensive taxonomic revision (i.e., Pérez-Miles *et al.* 1996; Fukushima *et al.* 2005; Yamamoto *et al.* 2007; Perdomo *et al.* 2009; Gabriel 2011, 2016; Ferretti & Barneche 2013; Fonseca-Ferreira *et al.* 2017; Mori & Bertani 2020; Gabriel & Sherwood 2022). Furthermore, the genera *Catanduba*, *Kochiana* and *Munduruku* maintain an uncertain relationship with other genera of Hapalopini (Yamammoto *et al.* 2012; Fabiano-da-Silva *et al.* 2019). Among these taxa, the monotypic genus *Munduruku* was proposed, based on morphological characters, without any proposal of relationship (Miglio *et al.* 2013). The genus *Kochiana* is also monotypic, and was proposed by Fukushima *et al.* (2008) to accommodate *Mygale brunipes* Koch, 1841. This genus was also proposed based on morphological characters and its relationship proposal, and appears in a polytomy branch together with *Plesiopelma*; *Homoeomma* Ausserer, 1871; *Grammostola* Simon, 1892; *Tmesiphantes* Simon, 1892 and others. After that, Yamamoto *et al.* (2012) proposed the genus *Catanduba,* in part composed of species previously described in *Plesiopelma*. The authors suggested that this genus is a sister group to *Plesiopelma*. However, this relationship hypothesis did not consider *Kochiana* in the analyses.

Despite this taxonomic scenario, the Brazilian genera of Hapalopini have clear synapomorphies that allow the inclusion of new species. Therefore, in this work we describe four new species of Hapalopini from Brazil: *Cyriocosmus paresi* sp. nov., *Hapalopus akroa* sp. nov. *Hapalopus guidonae* sp. nov. and *Kochiana fukushimae* sp. nov. In addition, we propose an updated diagnosis for the genera *Hapalopus* and *Kochiana*, raise new morphological characters for the species *K. brunnipes* (Koch 1841) and *Munduruku bicoloratum* Miglio *et al.* 2013, and discuss some taxonomic issues with notes involving the Brazilian genera of Hapalopini.

Material and methods

Institutions acronyms

Material examined are deposited in the following collections. Abbreviation, institution, city, country and curator are as follows:

CAD = Coleção Aracnológica Diamantina, Rio Claro, São Paulo, Brazil (J.P.L Guadanucci)
CHNUFPI = Coleção de História Natural da Universidade Federal do Piauí, Floriano, Piauí, Brazil (L.S. Carvalho)
IBSP = Instituto Butantan, São Paulo, São Paulo, Brazil (A.D. Brescovit)
MPEG = Museu Paraense Emilio Goeldi, Belém, Pará, Brazil (A.B. Bonaldo)
MZSP = Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil (R. Pinto-da-Rocha)

General structures abreviations

Eyes

ALE = Anterior lateral eyes
AME = Anterior median eyes
PLE = Posterior lateral eyes
PME = Posterior median eyes

Male palpal bulb

A = Apical keel
AC = Accessory keels
E = Embolus
MC = Median crest
PA = Paraembolic apophysis
PI = Prolateral inferior keel
PS = Prolateral superior keel
PT = Prolateral tegular apophysis
PTK = Prolateral tegular keel
SA = Subapical keel
TK = Tegular keel
VP = Ventral tegular projection
V = Vertical area

Leg and palp segments

PP = Prolateral protuberance
TP = Tubercular process

Spermathecae

GC = Granular cavities
MD = Middle depression

Spines and other setae

ap = Apical
d = Dorsal
p = Prolateral
r = Retrolateral
v = Ventral

Analysis and procedures for preparation of material

Photographs and measurements (given in millimeters) were taken using a Leica MC170 digital camera mounted on a Leica M205C stereomicroscope with LAS Core software v. 4.12.0 All photographs were taken with dry material, which improves the quality of details shown in the images. Live specimens photographs were taken using a DSLR camera Nikon D3300 with a 60 mm f2.8D macro lens.

The length and width of eye tubercle, eyes and interdistances are the maximum values obtained. The methods to measure carapace, labium, sternum, palp and legs segments follows Hamilton *et al.* (2016). The number and the disposition of legs and palp spines were enumerated from the anterior third to the posterior third, modified from Petrunkevitch (1925). The terminology for palpal bulb keels follows Bertani (2000) with modifications.The terminology of morphological characters follows Raven (1985).

The spermathecae was dissected and cleaned using a solution of Ultrazyme®, (one tablet per 1 ml of distilled water). The structure was immersed in this solution for 24 hours at ca 25°C room temperature, resulting in the digestion of soft tissue.

Geographical coordinates are in DMS (degrees, minutes, and seconds). For the distribution data, maps were made using SimpleMappr (Shorthouse 2010).

Results

Class Arachnida Cuvier, 1812
Order Araneae Clerck, 1757
Family Theraphosidae Thorell, 1869
Subfamily Theraphosinae Thorell, 1869

Tribe **Hapalopini** Turner *et al.*, 2018

Diagnosis

See Turner *et al.* (2018: 102) and Pérez-Miles & Perafán (2020: 135).

Genera included

Aenigmarachne Schmidt, 2005
Antikuna Kaderka, Ferretti & Hüsser, 2021
Bonnetina Vol, 2000; *Cardiopelma* Vol, 1999
Catanduba Yamamoto *et al.*, 2012
Chromatopelma Schmidt, 1995
Cyriocosmus Simon, 1903
Davus Pickard-Cambridge, 1892
Hapalopus Ausserer, 1875
Hapalotremus Simon, 1903

Isiboroa Gabriel *et al*., 2023
Kochiana Fukushima, Nagahama & Bertani, 2008
Magnacarina Mendoza *et al*., 2016
Munduruku Miglio *et al*., 2013
Plesiopelma Pocock, 1901
Schizopelma Pickard-Cambridge 1897
Thrixopelma Schmidt, 1994
Urupelma Kaderka, Lüddecke, Řezáč, Řezáčová & Hüsser, 2022

Genus ***Cyriocosmus*** Simon, 1903

Type species

Hapalopus sellatus Simon, 1889, by original designation.

Diagnosis

See Kaderka (2019).

Species included

Cyriocosmus aueri Kaderka, 2016
C. bertae Pérez-Miles, 1998
C. bicolor (Schiapelli & Gerschman, 1945)
C. blenginii Pérez-Miles, 1998
C. elegans (Simon, 1889)
C. fasciatus (Mello-Leitão, 1930)
C. fernandoi Fukushima, Bertani & Silva, 2005
C. foliatus Kaderka, 2019
C. giganteus Kaderka, 2016
C. hoeferi Kaderka, 2016
C. itayensis Kaderka, 2016
C. leetzi Vol, 1999
C. nicholausgordoni Kaderka, 2016
C. nogueiranetoi Fukushima, Bertani & Silva, 2005
C. paresi sp. nov.
C. paredesi Kaderka, 2019
C. perezmilesi Kaderka, 2007
C. peruvianus Kaderka, 2016
C. pribiki Pérez-Miles & Weinmann, 2009
C. ritae Pérez-Miles, 1998
C. sellatus (Simon, 1889)
C. venezuelensis Kaderka, 2010
C. versicolor (Simon, 1897)
C. williamlamari Kaderka, 2016

Distribution

The genus *Cyriocosmus* is distributed in South America from northern Argentina and extend to Bolivia, Brazil, Colombia, Paraguay, Peru, Trinidad and Tobago, Venezuela.

Cyriocosmus paresi sp. nov.

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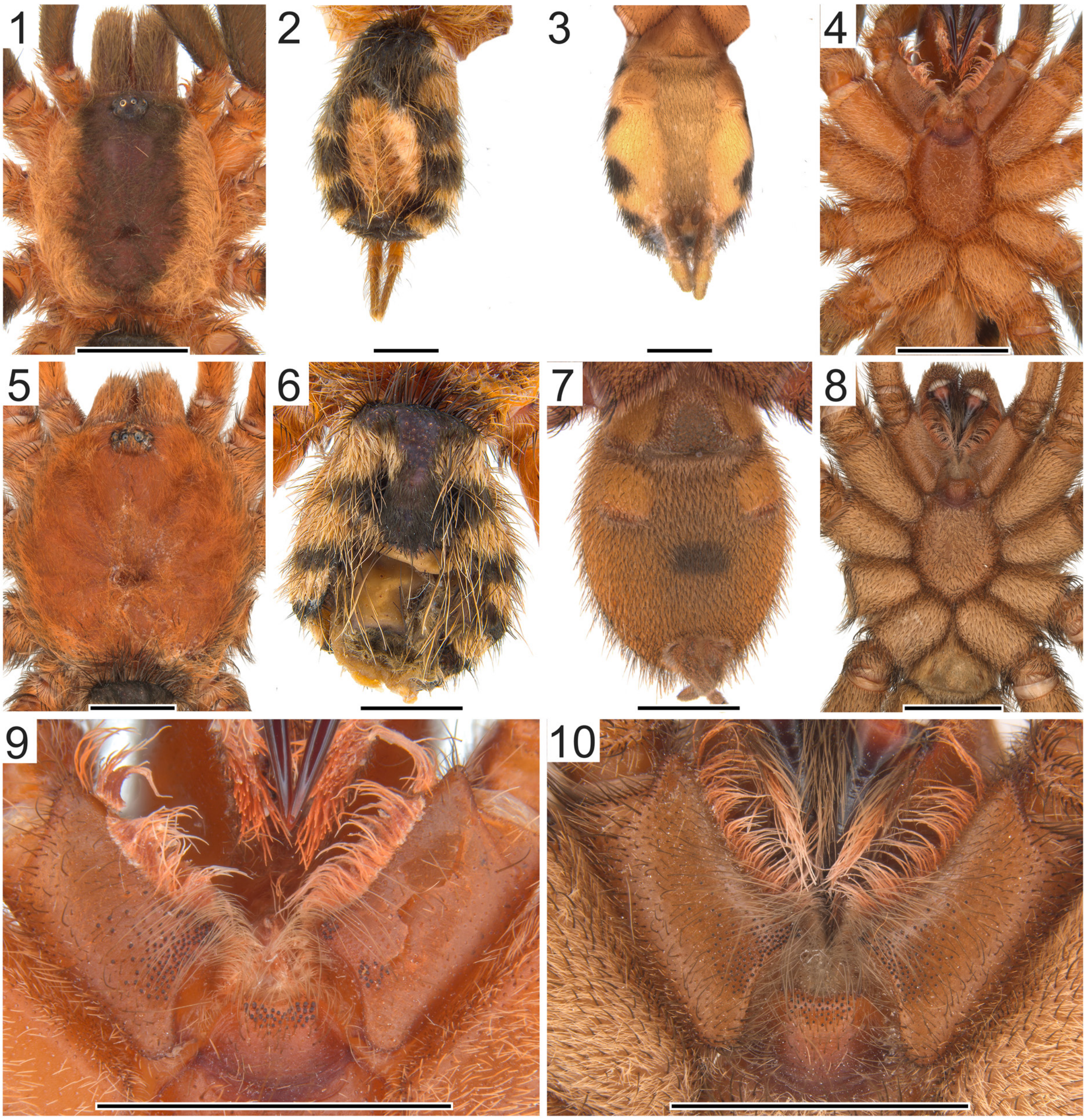
Figs 1–4, 9, 43–52, 115, 119, Table 1

Diagnosis

Males of *Cyriocosmus paresi* sp. nov. differ from congeners by a combination of carapace with dark oval band (Figs 1, 115), dorsal abdomen with four prominent stripes (Figs 2, 115) and ventral abdomen with longitudinal band of dark setae (Fig. 3). Male palpal bulb is similar to *C. aueri*, *C. bertae*, *C. elegans*,



Figs 1–10. Species of Hapalopini. **1–4, 9**. *Cyriocosmus paresi* sp. nov., holotype ♂, CAD 1441. **5–8, 10**. *Hapalopus guidonae* sp. nov., holotype ♂, CAD 1443. **1, 5**. Prosome, dorsal view. **2, 6**. Opisthosoma, dorsal view. **3, 7**. Opisthosoma, ventral view. **4, 8**. Prosome, ventral view. **9–10**. Labium and endites. Scale bars = 5 mm.

Table 1. Length of legs and palpal segments of the male holotype of *Cyriocosmus paresi* sp. nov. (CAD 1441).

Legs	I	II	III	IV	Palp
Femur	4.72	4.16	3.7	4.96	3.07
Patella	2.73	2.32	1.9	2.33	1.87
Tibia	3.45	2.86	2.55	3.94	2.46
Metatarsus	3.14	2.75	2.91	4.72	-
Tarsus	2.27	2.13	2.22	2.42	0.67
Total	**16.31**	**14.22**	**13.28**	**18.37**	**8.07**

C. foliates, *C. itayensis*, *C. leetzi*, *C. nicholausgordoni*, *C. paredesi*, *C. peruvianus* and *C. versicolor* by the short paraembolic apophysis (PA), less than half of embolus length (Figs 43–45). The new species can be distinguished from all species, except from *C. fasciatus* (Fukushima *et al.* 2005: 6, fig. 10), by the pronounced anterior prolateral tegular apophysis (PT) (Figs 45–46) and from *C. fasciatus* by the extended vertical distance in the region between embolus and paraembolic apophysis (V) (Figs 43, 45). Females are unknown.

Etymology

The name is in honor of the Paresí indigenous people, originating from the north region of Mato Grosso State, Brazil, known for their historical resistance against colonization.

Type material

Holotype

BRAZIL • ♂; Mato Grosso, Campo Novo dos Parecis, 23 Oct. 2017; N. Porfírio col.; CAD 1441.

Paratypes

BRAZIL • 3 ♂♂; same data as for holotype; CAD 1442.

Description

Male (holotype CAD 1441)

Color (in alcohol): carapace, lateral margins reddish-brown, dark oval central band covering caput and thoracic fovea. Chelicerae dark brown, legs dark grey except by the patellae reddish-brown. Dorsal abdomen black with 4 light brown stripes. Mirror patch light brown color. Sternum, coxae and maxillae reddish brown, labium dark brown. Ventral abdomen reddish brown with longitudinal spot of dark bristles (Figs 1–4). Live specimens show golden pubescence in reddish-brown areas of carapace (Fig. 115). Type III urticating setae only, with short barbs, on the central dorsum of the abdomen.. Total length: 11.42. Chelicerae basal segment: length 1.42. Carapace elongated: length 5.07, width 4.03. Abdomen: length 6.28. Clypeus absent. Eye tubercle slightly elevated, sub-rectangular: length 0.49, width 0.95. Anterior eye row slightly procurved, posterior slightly recurved. Eyes sizes and interdistances: AME 0.19, ALE 0.24, PME 0.12, PLE 0.18, AME–AME 0.10, AME–ALE 0.06, ALE–ALE 0.62, PME–PME 0.44, PME–PLE 0.03, PLE–PLE 0.64, AME–PME 0.03, ALE–PLE 0.10. Thoracic fovea straight, narrow, deep: width 0.74. Chelicerae basal segment with 7 well-developed teeth on furrow promargin, with a group of ca 10 small teeth on proximal area of furrow. Intercheliceral tumescence absent. Maxillae with ca 100 cuspules, located on anterior inner corner.

Labium subrectangular: length 0.63, width 1.05, with ca 38 cuspules. Sternum slightly round: length 2.58, width 2.36; with three pairs of oval sigilla separated by its diameter from the edge.

Palp: palpal bulb with rectangular tegulum, pronounced PT (Figs 43–46); short PS, discreetly pronounced (Figs 43, 45); short PA, detached from PS (Figs 43, 45), slightly curved to prolateral view (Fig. 44), raised from embolus by a extended vertical region (V) with height of half the length of the embolus (Figs 43, 45); embolus thin and long, below PA (Figs 43, 45). Cymbium with two asymmetric lobes. Palpal tibia unmodified (Figs 47–49).

Tibial apophysis: prolatero-ventral spur with two branches of different sizes (Fig. 51); retrolateral branch larger, slightly procurved, with a small apical spine (Figs 50–52); prolateral branch with half the length of the retrolateral branch, with contiguous apical spine slightly longer (Figs 51–52). Metatarsus I folds retrolaterally to tibial apophysis.

Superior tarsal claws without teeth. Tarsal scopulae: I-II entire with longitudinal band of conical setae; III-IV divided by longitudinal band of conical setae. Metatarsal scopulae dense, extension: I and II on distal 3/4; III and IV on less than half. Clavate tarsal trichobothria in two rows, each with ca 7 trichae, interspersed with ca 9 filiform trichobothria of different sizes. Leg formula 4123 (Table 1).

Spination (proximal to distal): cymbium and tarsi without spines. Palp: femur 0; patella 0; tibia (r) 0. Leg I: femur 0; patella 0; tibia (v) 1-2-ap2; metatarsus (v) 1-0-ap1, (p) 1. Leg II: femur (p) 1; patella 0; tibia (v) 1-2-ap2, (p) 1; metatarsus (v) 1-1-ap1, (p) 1. Leg III: femur (r) 1; patella 0; tibia (v) 1-1-ap2, (p) 1-1-0, (r) 0-2-ap1; metatarsus (v) 1-1-2, (p) 0-1-1, (r) 1-1-1. Leg IV: femur (p) 1, (r) 1; patela 0; tibia (v) 1-1-ap2, (p) 1-1-0, (r) 1-2-0; metatarsus (d) 1, (v) 1-1-ap2, (p) 1-1-ap2, (r) 1-2-ap3.

Genus ***Hapalopus*** Ausserer 1875

Type species

Hapalopus formosus Ausserer, 1875, by monotypy.

Diagnosis

Adapted from Pérez-Miles & Perafán (2020) and considering the drawings of *Hapalopus formosus* by Gerschman & Schiapelli (1973: 71, figs 79–84). The species of *Hapalopus* have a dotted or striped abdominal pattern. The males can be distinguished from males from other genera of Theraphosinae by this character combination: palpal bulb with globose tegulum; prolateral inferior keel (PI) projected with ring shape (except in *H. lesleyae*); ventral tegular projection (VP) with a keel (TK) (only in *H. formosus*, *H. serrapelada*, *H. akroa* sp. nov., and *H. guidonae* sp. nov.); retrolateral face of palpal tibia with a tubercular process (TP) or a field of spines; tibial apophysis with two convergent branches, fused at base with prolateral branch shorter and thicker than retrolateral. Females can be distinguished from other Tharaphosinae genera by spermathecae with single receptacle, well sclerotized or with two sclerotized receptacles fused at the base.

Species included

Hapalopus akroa sp. nov.
H. aymara Perdomo, Panzera & Pérez-Miles, 2009
H. coloratus (Valerio, 1982)
H. formosus Ausserer, 1875
H. gasci (Maréchal, 1996)
H. gasci (Maréchal, 1996)
H. guidonae sp. nov.
H. serrapelada Fonseca-Ferreira, Zampaulo & Guadanucci, 2017
H. triseriatus Caporiacco, 1955
H. variegatus (Caporiacco, 1955)

Distribution

The genus *Hapalopus* is distributed in South America in northern and northeastern Brazil, Bolivia, Colombia, Guyana, Panamá, and Venezuela.

Hapalopus akroa sp. nov.

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Figs 11–18, 53–66, 119, Table 2

Diagnosis

Males of *Hapalopus akroa* sp. nov. can be characterized by the abdomen with a dorsal longitudinal middle dark band (Figs12, 15), the palpal bulb VP with a TK (Figs 53, 55), the PI ring-shaped with a denticulate margin (Fig. 54) and apical keel (SA) discrete serrated (Fig. 56). Males differ from *H. lesleyae* by the absence of PA (Fukushima *et al.* 2005: 20, fig. 51; Gabriel 2011: 78, fig. 6). They differ from *H. aymara* by the presence of PS, pronunciated VP and the abdominal pattern (Fig. 12; Perdomo *et al.* 2009: 54, figs 1–6), from *H. serrapelada* and *H. formosus* by the absence of a retrolateral keel (Gerschman & Schiapelli 1973: 71, fig. 79; Fonseca-Ferreira *et al.* 2017: 186, fig. 18), and from *H. guidonae* sp. nov. by the longer embolus (distance between the distal portion of TK and the proximal portion of SA longer than the length of VP), by the SA less serrated, the PI with a pronounced denticulate margin, and by the abdominal dorsal pattern, without stripes (Figs 12, 53–56). Females can be diagnosed by their abdomen with a dorsal longitudinal middle dark band and by their spermathecae with a single rounded receptacle (Figs 15, 65). They differs from *H. aymara*, *H. gasci*, and *H. serrapelada* by the spermathecae shape with a single rounded receptacle (Fig. 65; Perdomo *et al.* 2009: 54, fig. 7; Fukushima *et al.* 2005: 20, fig. 54; Mori & Bertani 2020: 48, fig. 58; Fonseca-Ferreira *et al.* 2017: 187, figs 24–25). They differs from *H. coloratus, H. formosus*. *H. nigriventris* and *H. variegatus* by the abdominal pattern with a dorsal longitudinal middle dark band (Fig. 15; Gabriel & Sherwood 2022: 8; Ausserer 1875: 175; Gabriel 2016: 78; Caporiacco 1955: 281).

Etymology

The name is in honor of the indigenous Akroá people, originating from the southeastern region of Piauí State, Brazil, and known for their historical resistance against colonization.

Type material

Holotype

BRAZIL • ♂; Piauí, Parque Nacional Serra das Confusões, 2010–2011; L.S. Carvalho *et al.* col.; IBSP 272763.

Paratype

BRAZIL • 1 ♀; same data as for holotype; IBSP 272771 • 1 ♂; same data as for holotype; IBSP 343841.

Description

Male (holotype IBSP 272763)

Color (in alcohol): carapace, light orange. Chelicerae orange. Legs light orange except by the tarsus and metatarsus dark orange. Dorsal abdomen beige with a longitudinal dark band. Mirror patch bright yellow color. Sternum, coxae, labium and maxillae light orange. Ventral abdomen beige (Figs 11–13). Only type III urticating setae, on the central dorsum of the abdomen. Total length: 20.77. Chelicerae basal segment: length 2.15. Carapace elongated: length 9.22, width 7.69. Abdomen: length 9.40. Clypeus absent. Eye tubercle slightly elevated, oval: length 1.61, width 1.00. Anterior eye row slightly procurved, posterior slightly recurved. Eyes and interdistances: AME 0.29, ALE 0.24, PME 0.21, PLE 0.33, AME–AME 0.22, AME–ALE 0.15, ALE–ALE 0.30, PME–PME 0.73, PME–PLE 0.10, PLE–PLE 0.99, AME–PME0.11,

Table 2. Length of legs and palpal segments of *Hapalopus akroa* sp. nov. holotype male and paratype female (IBSP 272763, IBSP 272771).

Legs	I	II	III	IV	Palp
Femur	6.90/5.87	6.50/5.11	7.76/6.67	9.61/7.26	4.83/4.91
Patella	4.20/3.84	3.80/3.70	3.61/3.64	3.83/ 3.86	2.80/3.17
Tibia	6.43/4.94	5.46/4.22	4.90/5.70	7.14/ 5.74	3.73/3.15
Metatarsus	5.70/4.13	5.67/3.90	7.90/7.93	10.9/8.06	-
Tarsus	4.02/3.00	3.95/2.28	4.17/3.96	4.9/3.55	2.10/3.60
Total	**27.25/21.79**	**25.38/19.21**	**28.34/27.90**	**36.38/28.47**	**13.46/14.83**

ALE–PLE 0.20. Thoracic fovea slightly procurved, deep: width 2.10. Chelicerae basal segment with 9 well-developed teeth on furrow promargin, with a group of ca 22 small teeth on proximal area of furrow. Intercheliceral tumescence absent. Maxillae with 100–150 cuspules, located on anterior inner corner. Labium subrectangular: length 1.27, width 2.21, with ca 40 cuspules. Sternum slightly round: length 4.57, width 3.77; with three pairs of oval sigilla separated by its diameter from the edge.

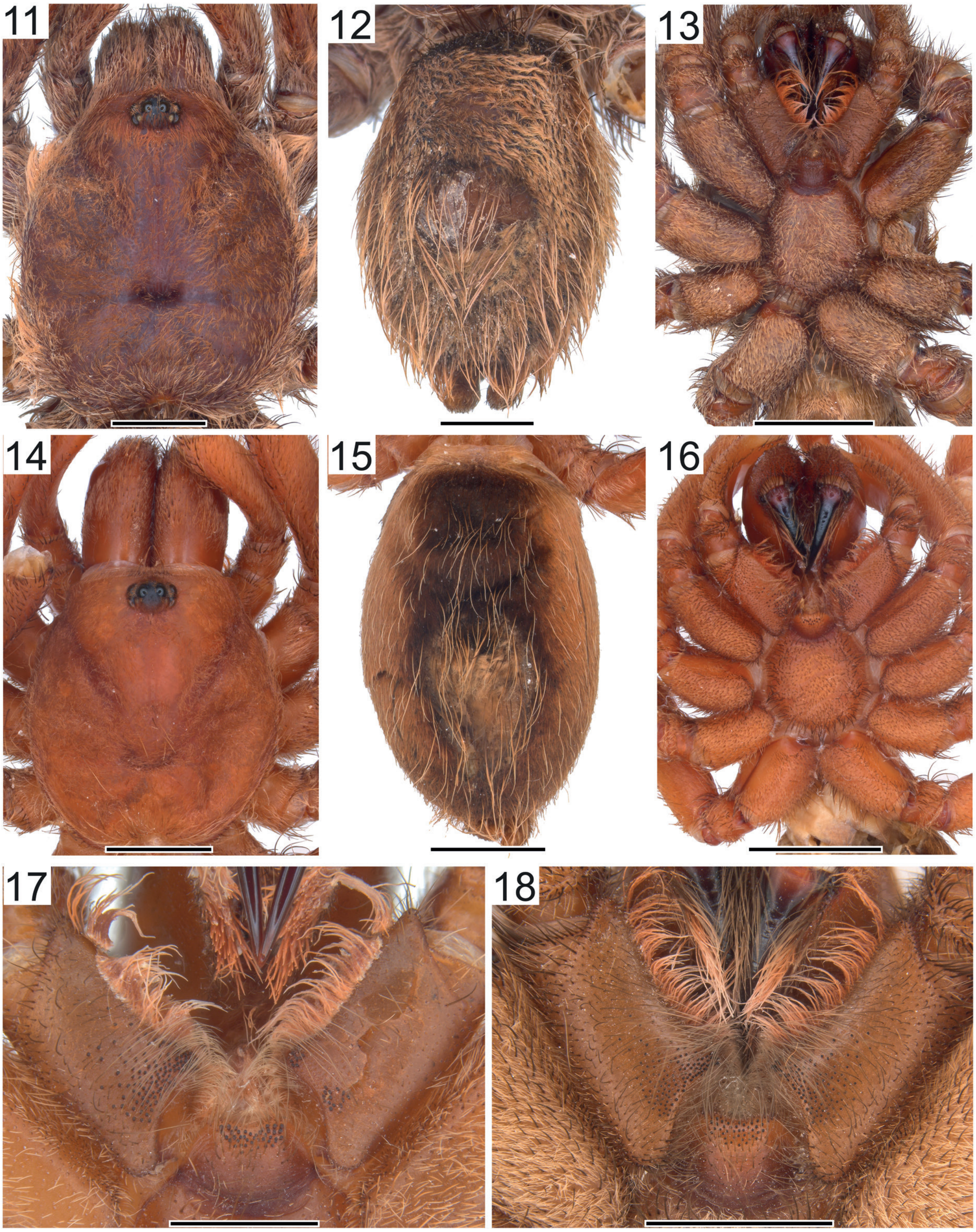
Palp: globose tegulum with embolus elongated (Figs 53, 55); pronounced PI ring shaped with a denticulate margin, more pronounced than PS (Figs 54–55); retrolateral keel absent; SA slightly serrated (Fig. 56); pronounced VP with a large TK (Figs 53, 55, 57). Cymbium with two asymmetric lobes. Palpal tibia slightly thickened at base, with a TP covered with setae in retrolateral face (Figs 58–61).

Tibial apophysis: composed of two converging branches fused at base (Fig. 63); retrolateral branch longer, slightly curved (Fig. 62); prolateral branch short and thick, slightly recurved with a small apical spine (Fig. 64). Metatarsus I fold between the two branches of the tibial apophysis.

Superior tarsal claws with three small teeth on the midline. Tarsal scopulae: I-II entire with longitudinal band of conical setae; III-IV divided by longitudinal band of conical setae. Metatarsal scopulae: I-IV on distal 1/3. Clavate tarsal trichobothria in two rows, each with ca 19 trichae, interspersed with ca 10 filiform trichobothria of different sizes. Leg formula 4312 (Table 2).

Spination (proximal to distal): cymbium and tarsi without spines. Palp: femur 0; patella (v) ap1, (p) 1; tibia (p) 0-2-1. Leg I: femur (d) 1; patella 0; tibia (p) 1, (r) 0-1-1; metatarsus (v) 2-0-ap1, (r) 0-1-0. Leg II: femur (p) 1; patella 0; tibia (v) 2-2-ap1, (r) 0-1-0; metatarsus (v) 0-2-ap1, (p) 1, (r) 1. Leg III: femur (d) 0-0-2; patella (p) 1; tibia (v) 0-1-ap2, (p) 0-2-ap1, (r) 0-1-1; metatarsus (v) 1-2-ap2, (p) 1-3-1, (r) 1-2-1. Leg IV: femur (d) 1; patela (p) 1; tibia (v) 1-1-ap2, (p) 0-1-1, (r) 1-1-0; metatarsus (d) 1-2-1, (v) 2-4-2, (p)1-2-1, (r) 1-4-2.

Female (Paratype IBSP 272771)
Color (in alcohol): as in male, except for carapace black without long hairs (Fig. 14). Only type III urticating setae, on the central dorsum of the abdomen. Total length: 24.34. Chelicerae basal segment: length 3.40. Carapace elongated: length 8.84, width 8.22. Abdomen: length 12.10. Clypeus absent. Eye tubercle slightly elevated, oval: length 1.30, width 1.80. Anterior eye row slightly procurved, posterior slightly recurved. Eyes and interdistances: AME 0.30, ALE 0.43, PME 0.24, PLE 0.32, AME–AME 0.37, AME–ALE 0.12, ALE–ALE 1.10, PME–PME 0.90, PME–PLE 0.15, PLE–PLE 1.21, AME–PME 0.12, ALE–PLE 0.18. Thoracic fovea straight, short, deep: width 1.31. Chelicerae basal segment with 9 well-developed teeth on furrow promargin, and a group of ca 22 small teeth on proximal area of furrow. Intercheliceral tumescence absent. Maxillae with 100–150 cuspules, located on anterior inner corner.



Figs 11–18. *Hapalopus akroa* sp. nov. **11–13, 17**. Holotype ♂, IBSP 272763. **14–16, 18**. Paratype ♀, IBSP 272771. **11, 14**. Prosome, dorsal view. **12, 15**. Opisthosoma, dorsal view. **13, 16**. Prosome, ventral view. **17, 18**. Labium and endites. Scale bars = 5 mm.

Labium trapezoidal: length 1.16, width 2.02, with ca 13 cuspules. Sternum slightly round: length 4.19, width 4.12; with three pairs of oval sigilla separated by its diameter from the edge.

Spermathecae: composed by a single receptacle, well sclerotized with granular cavities throughout the receptacle (Figs 65–66).

Superior tarsal claws with four small teeth on the midline. Tarsal scopulae: I-II entire; III entire with longitudinal band of conical setae; IV divided by longitudinal band of conical setae. Metatarsal scopulae dense, extension: I more than a distal half; II on distal half; III and IV on distal 1/3, divided by longitudinal band of conical setae. Clavate tarsal trichobothria in two rows, each with ca 10 trichae, interspersed with ca 13 filiform trichobothria of different sizes. Leg formula 4312 (Table 2).

Spination (proximal to distal): femura, patellae and tarsi without spines. Palp: tibia (v) 0-2-ap3. Leg I: tibia 0; metatarsus (v) 1-1-ap1. Leg II: tibia (v) 0-1-ap0, (d) 0-1-ap0; metatarsus (v) 1-1-ap2. (p) 1-1-ap0. Leg III: tibia (v) 0-1-ap2, (p) 1-1-ap0, (r) 0-1-ap1; metatarsus (v) 1-1-ap2, (p) 1-3-1, (r), 2-1-1. Leg IV: tibia (v) 1-2-ap2, (r) 1-1-ap1; metatarsus (v) 1-1-ap2, (p) 1-2-2, (r), 1-2-1.

Hapalopus guidonae sp. nov.

urn:lsid:zoobank.org:act:8727A003-C54F-46C0-9A10-74C2EF371E43

Figs 5–8, 10, 67–78, 116, 119, Table 3

Diagnosis

Males of *Hapalopus guidonae* sp. nov. can be characterized by the bright orange color on carapace and legs, the abdomen with dark stripes united by a black middle stripe (Figs 5–6, 116), by the palpal bulb VP with a TK (Figs 67, 69), the PI ring-shaped and apical keel (SA) serrated (Fig. 70). The males differ from *H. lesleyae* by the absence of PA (Fukushima *et al.* 2005: 20, fig. 51; Gabriel 2011: 78, fig. 6). They Differs from *H. aymara* by the presence of PS, a pronounced VP and by the abdominal striped pattern (Figs 6, 116; Perdomo *et al.*, 2009: 54; figs 1–6). They Differs from *H. serrapelada* and *H. formosus* by the absence of retrolateral keel (Gerschman & Schiapelli 1973: 71, fig. 79; Fonseca-Ferreira *et al.*, 2017: 186, fig. 18) and the abdominal stripe pattern (Figs 6, 116). They Differs from *H. akroa* sp. nov. by the shorter embolus which has the distance between the distal portion of TK and the proximal portion of SA shorter than the length of VP, SA serrated, PI with a discrete denticulate margin, and the abdominal dorsal pattern, with stripes (Figs 6, 67–69). Females are unknown.

Etymology

The specific epithet is given in honor of the French-Brazilian archaeologist Dr Niède Guidon, and for her fundamental contribution to the creation and preservation of the Serra da Capivara National Park.

Type material

Holotype

BRAZIL • ♂; Piauí, Parque Nacional Serra da Capivara, 23 Oct. 2017; R. Fonseca-Ferreira col.; CAD 1443.

Paratypes

BRAZIL • 2 ♂♂; Maranhão, Manga, Mata de Babagaçu, 23 Jul. 2023; A. Galleti-Lima, R.P. Indicatti, L. Carvalho and J.P.L. Guadanucci col.; CAD 1446–1447. • 2 ♂♂; Maranhão, São Raimundo das Mangabeiras, Campo Mamão, 24 Jul. 2023; A. Galleti-Lima, R.P. Indicatti, B. Gambaré and J.P.L. Guadanucci col.; CAD 1448–1449.

Table 3. Length of legs and palpal segments of holotype male of *Hapalopus guidonae* sp. nov. (CAD 1443).

Legs	**I**	**II**	**III**	**IV**	**Palp**
Femur	7.4	6.47	5.64	7.23	4.15
Patella	4.21	3.43	3.34	3.33	2.92
Tibia	6.88	5.73	4.41	6.42	4.09
Metatarsus	6	5.61	6.95	8.13	-
Tarsus	3.76	3.02	3.83	4.21	2.19
Total	**28.25**	**24.26**	**24.17**	**29.32**	**13.35**

Description

Male (holotype CAD 1443)

Color (in alcohol): Carapace, light orange. Chelicerae orange. Legs light orange except by the tarsus and metatarsus dark orange. Dorsal abdomen black with five beige stripes. Mirror patch bright yellow color. Sternum, coxae, labium and maxillae light orange. Ventral abdomen beige with a spot composed by dark bristles (Figs 5–8). Live specimens show brighter brown colors (Fig. 116). Type III urticating setae only, on the central dorsum of the abdomen. Total length: 15.26. Chelicerae basal segment: length 1.66. Carapace elongated: length 9.24, width 7.63. Abdomen: length 6.03. Clypeus absent. Eye tubercle slightly elevated, oval: length 1.2, width 1.52. Anterior eye row slightly procurved, posterior slightly recurved. Eyes and interdistances: AME 0.36, ALE 0.4, PME 0.27, PLE 0.30, AME–AME 0.15, AME–ALE 0.02, ALE–ALE 0.94, PME–PME 0.72, PME–PLE 0.03, PLE–PLE 1.19, AME–PME 0.09, ALE–PLE 0.15. Thoracic fovea slightly procurved, deep: width 1.09. Chelicerae basal segment with 10 well-developed teeth on furrow promargin, with a group of ca 30 small teeth on proximal area of furrow. Intercheliceral tumescence absent. Maxillae with ca 100 cuspules, located on anterior inner corner. Labium subrectangular: length 1.13, width 1.70, with ca 40 cuspules. Sternum slightly round: length 3.88, width 3.57; with three pairs of oval sigilla separated by its diameter from the edge of the sternum.

Palp: Globose tegulum with short embolus (Figs 67, 69); pronounced PI ring shaped, more pronounced than PS (Fig. 68); retrolateral keel absent; SA serrated (Figs 67, 69–70); pronounced VP with a large TK (Figs 67, 69, 71). Cymbium with two asymmetric lobes. Palpal tibia slightly thickened at base, with a TP covered with setae in retrolateral face (Figs 72–75).

Tibial apophysis: composed of two converging branches fused at base (Fig. 77); retrolateral branch longer, slightly curved (Fig. 76); prolateral branch short and thick, slightly recurved with a small apical spine (Fig. 78). Metatarsus I folds between the two branches of the tibial apophysis.

Superior tarsal claws with three small teeth on the midline. Tarsal scopulae: I-II entire with longitudinal band of conical setae; III-IV divided by longitudinal band of conical setae. Metatarsal scopulae not dense, extension: I and II on distal 1/3; III and IV on less than distal 1/3. Clavate tarsal trichobothria in two rows, each with ca 8 trichae, interspersed with ca 10 filiform trichobothria of different sizes. Leg formula 4123 (Table 3).

Spination (proximal to distal): cymbium and tarsi without spines. Palp: femur (p) 1; patella (p) 1; tibia (p) 0-2-3. Leg I: femur (p) 1; patella (p) 1; tibia (p); metatarsus (p) 0-1-1, (r), 1. Leg II: femur (p)1; patella 0; tibia (v) 1-2-ap2, (p) 1; metatarsus (v) 1-1-ap1, (p) 1. Leg III: femur (r) 1; patella 0; tibia (v) 1-1-ap2, (p) 1-1-0, (r) 0-2-ap1; metatarsus (v) 1-1-2, (p) 0-1-1, (r) 1-1-1. Leg IV: femur (p)0-0-1, (r)0-0-1; patela 0; tibia (v) 1-1-ap2, (p) 1-1-0, (r) 1-2-0; metatarsus (d) 1, (v) 1-1-ap2, (p)1-1-ap2, (r) 1-2-ap3.

Genus ***Kochiana*** Fukushima *et al.*, 2008

Type species

Mygale brunnipes Koch, 1841 by monotypy.

Diagnosis

Adapted from Fukushima *et al.*, 2008 and Pérez-Miles & Perafán (2020): Males of *Kochiana* ressemble *Catanduba*, *Homoeomma*, *Plesiopelma*, and *Tmesiphantes* Simon, 1892 by the palpal bulb with long and narrow embolus pointing downward (prolateral view). Males differ from other genera by the combination of following characters: presence of prolateral tegular keel (PTK), PS short and discrete; absence of digital apophysis in tegulum, embolus with an apical median crest (MC), absence of metatarsus tubercle on the male leg I, metatarsus I fold between the two branches of the tibial apophysis and femur III straight. Females differ from those of other genera by the sclerotized spermathecae, with two receptacles and granular cavities (GC) on receptacles, ducts and base.

Distribution

The genus *Kochiana* is distributed in northeastern Brazil states of Paraíba, Alagoas and Sergipe, mainly found in fragments of Atlantic rainforest.

Species included

Kochiana brunnipes (Koch, 1841)
K. fukushimae sp. nov.

Kochiana fukushimae sp. nov.

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Figs 19–26, 79–90, 117–118, 119; Table 4

Diagnosis

Males and females differ from *Kochiana brunnipes* by the color pattern, black with red setae in dorsal abdomen, maxilla, and chelicerae basal segment dark grey bordered by red setae (Figs 19–24, 117–118). Males of *K fukushimae* sp. nov differ from those of *K. brunnipes* by the shorter embolus, less curved in ventral direction (Figs 79–81), the subtle accessory keels (AC) (Fig. 80) and the retrolateral branch of tibial apophysis less flattened (Fig. 87). Females differ from *K. brunnipes* by the spermathecae not projected in ventral direction and by absence of middle depression (MD) at base (Fig. 89).

Etymology

The name is given in honor of Dr Caroline Sayuri Fukushima, for her valuable contribution to Theraphosidae taxonomy and conservation.

Type material

Holotype

BRAZIL • ♂; Sergipe, Areia Branca, Parque Nacional Serra de Itabaiana, 30 Apr. 2022; M.D.F. Magalhães, P.H. Martins and Gonzalez-Filho H.M.O col.; CAD 1444.

Paratype

BRAZIL • 1 ♀; same data as for holotype; CAD 1445.

Figs 19–26. *Kochiana fukushimae* sp. nov. **19–21, 25**. Holotype ♂, CAD 1444. **22–24, 26**. Paratype ♀, CAD 1445. **19, 22**. Prosome, dorsal view. **20, 23**. Opisthosoma, dorsal view. **21, 24**. Prosome, ventral view. **25–26**. Labium and endites. Scale bars = 5 mm.

Table 4. Length of legs and palpal segments of *Kochiana fukushimae* sp. nov. holotype male and paratype female (CAD 1444–1445).

LEGS	I	II	III	IV	Palp
Femur	13.14/12.14	12.17/11.63	10.93/10.14	12.93/12.98	7.82/8.97
Patella	6.95/8.11	6.11/7.42	5.42/6.52	6.29/6.78	4.71/6.07
Tibia	10.31/9.3	9.82/8.18	8.43/6.56	10.32/9.52	8.11/6
Metatarsus	9.06/8.11	8.74/8.02	9.51/9.42	14.03/11.55	-
Tarsus	7.32/5.86	6.52/5.62	6.09/5.48	6.8/6.46	2.79/6.02
Total	**46.8/43.52**	**43.36/40.87**	**40.38/38.12**	**50.37/47.29**	**23.43/27.06**

Description

Male (holotype CAD 1444)

Color (in alcohol): carapace dark grey with long hairs. Chelicerae dark grey. Legs dark grey except the femur black. Dorsal abdomen black covered with red bristles, mirror patch slightly yellow color. Sternum and coxae black. Maxillae and labium dark grey with strong red setae on the edge (Figs 19–21). Live specimens show more intense colors, especially the red abdominal bristles (Figs 17). Only type III urticating setae, on the central dorsum of the abdomen. Total length: 30.3. Chelicerae basal segment: length 4.14. Carapace elongated: length 14.73, width 13.27. Abdomen: length 12.95. Clypeus absent. Eye tubercle slightly elevated, oval: length 1.51, width 2.24. Anterior eye row slightly procurved, posterior slightly recurved. Eyes and interdistances: AME 0.43, ALE 0.4, PME 0.37, PLE 0.4, AME–AME 0.24, AME–ALE 0.17, ALE–ALE 1.27, PME–PME 0.94, PME–PLE 0.04, PLE–PLE 1.36, AME–PME 0.11, ALE–PLE 0.26. Thoracic fovea straight, short, deep: width 1.70. Chelicerae basal segment with 11 well-developed teeth on furrow promargin, with a group of ca 34 small teeth on proximal area of furrow. Intercheliceral tumescence absent. Maxillae with ca 150 cuspules, located on anterior inner corner. Labium trapezoidal: length 1.87, width 2.28, with ca 60 cuspules. Sternum oval: length 6.30, width 5.46; with three pairs of oval sigilla separated by its diameter from the edge.

Palp: elongated tegulum with PS and PI (Fig. 79–81); short and discrete PS; Presence of PTK above PS, in tegulum (Figs 80–81); presence of (AC) between PI and PTK (Fig. 80); retrolateral and apical keels absent (Figs 80–81); long embolus, fully curved to the retrolateral direction with the apex slightly curved to ventral direction (Figs 79, 80); presence of medial crest (MC) in the embolus apex (Fig. 82). Cymbium with two asymmetric lobes. Straight palpal tibia, with a small prolateral protuberance (PP) and small grooves in the contact region with the palpal bulb (Figs 83–85).

Tibial apophysis: with two straight branches of different sizes (Fig. 87); retrolateral branch longer, slightly curved and flattened in apex, with a small apical spine (Fig. 86); prolateral branch digitiform, with two thirds of the retrolateral branch, with a small basal spine (Fig. 88). Metatarsus I folds between the two branches of the tibial apophysis.

Superior tarsal claws with four small teeth on the midline. Tarsal scopulae: I-II entire; III entire with longitudinal band of conical setae; IV divided by longitudinal band of conical setae. Metatarsal scopulae dense, extension: I and II more than distal half; III on distal half; IV on distal 1/3, divided by longitudinal band of conical setae. Clavate tarsal trichobothria in two rows, each with ca 10 trichae, interspersed with ca 13 filiform trichobothria of different sizes. Leg formula 4123 (Table 4).

Spination (proximal to distal): Cymbium and tarsi without spines. Palp: femur (p) 1; patella 0; tibia (p) 2. Leg I: femur (p) 1; patella 0; tibia (v) 2-1-1, (p) 1-1-0; metatarsus (v) ap1; Leg II: femur (p) 1; patella 0; tibia (v) 3-3-ap3; metatarsus (v) 2-ap1. Leg III: femur 0; patella 0; tibia (v) 2-1-ap2, (p) 1, (r), 1-0-1;

metatarsus (v) 1-2-ap3, (p) 1, (r), 2-1-1; Leg IV: femur 0; patela 0; tibia (v) 1-ap3, (p) 1-1-2, (r), 1-1-2; metatarsus (v) 2-2-2+ap3, (p) 2-3-2, (r), 1-2-2.

Female (Paratype CAD 1445)
Color (in alcohol): as in male, except by carapace black without long hairs (Figs 22–24, 118). Only type III urticating setae, on the central dorsum of the abdomen. Total length: 37.08. Chelicerae basal segment: length 5.58. Carapace elongated: length 17.08, width 14.97. Abdomen: length 19.9. Clypeus absent. Eye tubercle slightly elevated, oval: length 1.76, width 2.31. Anterior eye row slightly procurved, posterior slightly recurved. Eyes and interdistances: AME 0.46, ALE 0.50, PME 0.34, PLE 0.40, AME–AME 0.29, AME–ALE 0.22, ALE–ALE 1.66, PME–PME 1.25, PME–PLE 0.06, PLE–PLE 1.74, AME–PME 0.24, ALE–PLE 0.38. Thoracic fovea straight, short, deep: width 2.48. Chelicerae basal segment with 11 well-developed teeth on furrow promargin, and a group of ca 34 small teeth on proximal area of furrow. Intercheliceral tumescence absent. Maxillae with ca 150 cuspules, located on anterior inner corner. Labium trapezoidal: length 2.34, width 3.11, with ca 60 cuspules. Sternum slightly round: length 7.16, width 6.88; with three pairs of oval sigilla separated by its diameter from the edge.

Spermathecae: not projected in ventral direction, with two sclerotized rounded receptacles over a sclerotized base without middle depression (Fig. 96). Presence of granular cavities over the receptacles, ducts and base (Figs 89–90).

Superior tarsal claws with four small teeth on the midline. Tarsal scopulae: I-II entire; III entire with longitudinal band of conical setae; IV divided by longitudinal band of conical setae. Metatarsal scopulae dense, extension: I entire; II more than a distal half; III on distal half; IV on distal 1/3, divided by longitudinal band of conical setae. Clavate tarsal trichobothria in two rows, each with ca 10 trichae, interspersed with ca 13 filiform trichobothria of different sizes. Leg formula 4123 (Table 3).

Spination (proximal to distal): cymbium and tarsi without spines. Palp: femur (p) 1; patella 0; tibia (v) ap3, (p) 1. Leg I: femur (p) 1; patella 0; tibia (v) 1-1-1, (p) 1; metatarsus (v) ap1. Leg II: femur (p) 1, patella 0; tibia (v) 2-1-ap3; metatarsus (v) 2-ap1. Leg III: femur 0; patella 0; tibia (v) 1-1-ap2, (p) 1, (r), 0-1-1; metatarsus (v) 0-2-ap2, (p) 1, (r), 2-0-1. Leg IV: femur 0; patela 0; tibia (v) 1-ap2, (p) 1-0-2, (r), 0-1-2; metatarsus (d) 0, (v) 2-2-ap2, (p) 1-3-2, (r), 1-3-2.

Kochiana brunnipes (Koch, 1841)

Figs 27–34, 91–102, 119

Mygale brunnipes Koch, 1841: 35.

Eurypelma brunnipes – Koch 1850: 74, transferred from *Mygale* (did not designate the type of *Eurypelma*).
Avicularia brunnipes – Raven 1985: 153, considered *Eurypelma* a junior synonym of *Avicularia* Lamarck, 1818.

Kochiana brunnipes — Fukushima *et al.* 2008: 405, transferred from Avicularia.

Emended diagnosis

Males and females differ from *Kochiana fukushimae* sp. nov. by the collor pattern, black with patellae, metatarsi and tarsi orange brown and absence of red setae on abdomen (Figs 27–34). Males differ from *K. fukushimae* sp. nov. by the longer embolus, more curved in ventral direction from half its length

Figs 27–34. *Kochiana brunnipes* (Koch, 1841). **27–29, 33**. ♂, MZSP 28774. **30–32, 34**. ♀, MZSP 28776. **27, 30**. Prosome, dorsal view. **28, 31**. Opisthosoma, dorsal view. **29, 32**. Prosome, ventral view. **33–34**. Labium and endites. Scale bars = 5 mm.

(Fig. 92), prominent accessory keels (AC) (Figs 92–93) and retrolateral branch of tibial apophysis entirely flattened (Fig. 99). Females differ from *K. fukushimae* sp. nov. by the spermathecae projected in ventral direction ("horn shaped" according to Fukushima *et al.*, 2008) and presence of unsclerotized middle depression (MD) at base (Fig. 101).

Type material (not examined)

Holotype

BRAZIL • ♀; unknown type locality; unknown collection date; G.W. Freireis col.; C.L. Koch det.; ZMB-2071.

Other material examined

BRAZIL • 1 ♂; Alagoas, Murici, Murici Ecological Station, 09°14′ S, 35°48′ W; 12 Aug. 2006; R. Bertani, D.R.M. Ortega and R.H. Nagahama col.; MZSP 28776 (used by Fukushima *et al.* 2008 for the species redescription) • 1 ♀; same data as for preceding; MZSP 28774 • 1 ♀; Pernambuco, Brejo da Madre de Deus, Reserva Particular do Patrimônio Natural Mata do Bituri, 8°11′30.2″ S, 36°23′52.0″ W; 16 Oct. 2019; R. Fonseca-Ferreira, M. Morales, N.E.V. Saraiva and A.C.S. Silvino leg.; CAD 1104 • 1 ♂; Paraíba, Areia, Parque Estadual da Mata do Pau Ferro, 6°57′55.4″ S, 35°45′0″ W; 31 May 2015; L.S. Carvalho col.; CHNUFPI 2130.

Emended description

See Fukushima *et al.* 2008 for colors description, measurements and spination data.

Male (MZSP 28774, same used by Fukushima *et al.* 2008)

Palpal bulb: elongated tegulum with PS and PI (Figs 91–93); short and discrete PS; Presence of PTK above PS, in tegulum (Figs 92–93); presence of (AC) between PI and PTK (Figs 92–93); retrolateral and apical keels absent (Figs 91, 93); long embolus, fully curved to the retrolateral direction and curved to ventral direction from half its length (Figs 91–92); presence of medial crest (MC) in the embolus apex. (Fig. 94). Cymbium with two asymmetric lobes. Straight palpal tibia, with a small prolateral protuberance (PP) and small grooves in the contact region with the palpal bulb (Figs 95–97). Retrolateral branch of tibial apophysis entirely flattened (Fig. 99).

Female (MZSP 28776, same used by Fukushima *et al.* 2008)

Spermathecae: projected in ventral direction, with two sclerotized rounded receptacles over a sclerotized base with a non-sclerotized middle depression. Presence of GC along the receptacles, ducts, and base (Figs 101–102).

Genus ***Munduruku*** Miglio, Bonaldo & Pérez-Miles, 2013

Type species

Munduruku bicoloratum Miglio, Bonaldo & Pérez-Miles, 2013, by monotypy.

Emended diagnosis

Adapted from Miglio *et al.* 2013 and Pérez-Miles & Perafán (2020). *Munduruku* ressembles other genera of Hapalopini by the abdominal pattern in adults of both sexes, here forming concave and convex openings along a thicker longitudinal stripe; type III urticating setae present and predominant (females also possesses type IV restricted to the edges of the mirror patch); male tibial apophysis with two branches fused at base. Males share with *Hapalopus* the shape of tibial apophysis, with the prolateral branch short, thick and slightly recurved and presence of TP in palpal tibia. Males differ from other Hapalopini genera by combination of following characters: piriform palpal bulb, with weak PS; embolus slightly twisted in apex; presence of pronounced SA, detacheded from embolus, without apical keel. Females differ from those of *Kochiana* by the presence of GC in spermathecae restricted to the receptacles apex. Differs from other genera of Hapalopini by the shape of spermathecae, not fused at base, with two caliciform receptacles, heavily sclerotized along with the ducts.

Distribution

See Miglio *et al.* (2013).

Species included

Monotypical.

Munduruku bicoloratum Miglio, Bonaldo & Pérez-Miles, 2013

Figs 35–42, 103–114, 119

*Munduruku bicoloratum***,** Miglio *et al.* 2013: 185.

Emended diagnosis

Same as for genus.

Type material (not examined)

Holotype

BRAZIL • ♂; Pará, Juruti, Acampamento Mutum; 01°36′44.7″ S, 56°11′39.2″ W; 6 Jun. 2007; H.F. da Silva Filho col.; MPEG 19026.

Paratypes

BRAZIL • 1 ♀; Same data as for holotype; 4 Jun. 2007; D.F. Candiani col.; MPEG 19028 • 1 ♀; Pará, Juruti, Barroso, Sítio 3 Irmãos, 02°27′45.5″ S, 56°00′51.0″ W; 12 Aug. 2008; N.C. Bastos col.; MPEG 19029 • 1 ♂; Pará, Juruti, Capiranga, 02°30′25.4″ S, 56°11′04.8″ W; 6 Jun. 2007; H.F. da Silva Filho col.; MPEG 19027 • 1 ♀; Pará, Juruti, platô Juruti; Feb. 2007; T.C.S. Ávila-Pires *et al.* col.; MPEG 19025 • 1 ♂; Pará, ferrovia, Km 26 da Ferrovia; 9 May 2007; A. Lima, P. Suarez and A.J. Baia Goes col.; MPEG 19030 • 2 ♂♂, 1 ♀; Pará, Santarém, RESEX Tapajós-Arapiuns, junto ao Rio Inambú, Comunidade Nova Canaã, 03°10′16.6″ S, 55°48′57.8″ W; 12–26 Jun. 2011; M.S. Hoogmoed and T.C.S. Ávila-Pires col.; MPEG 19031–19032.

Other material examined

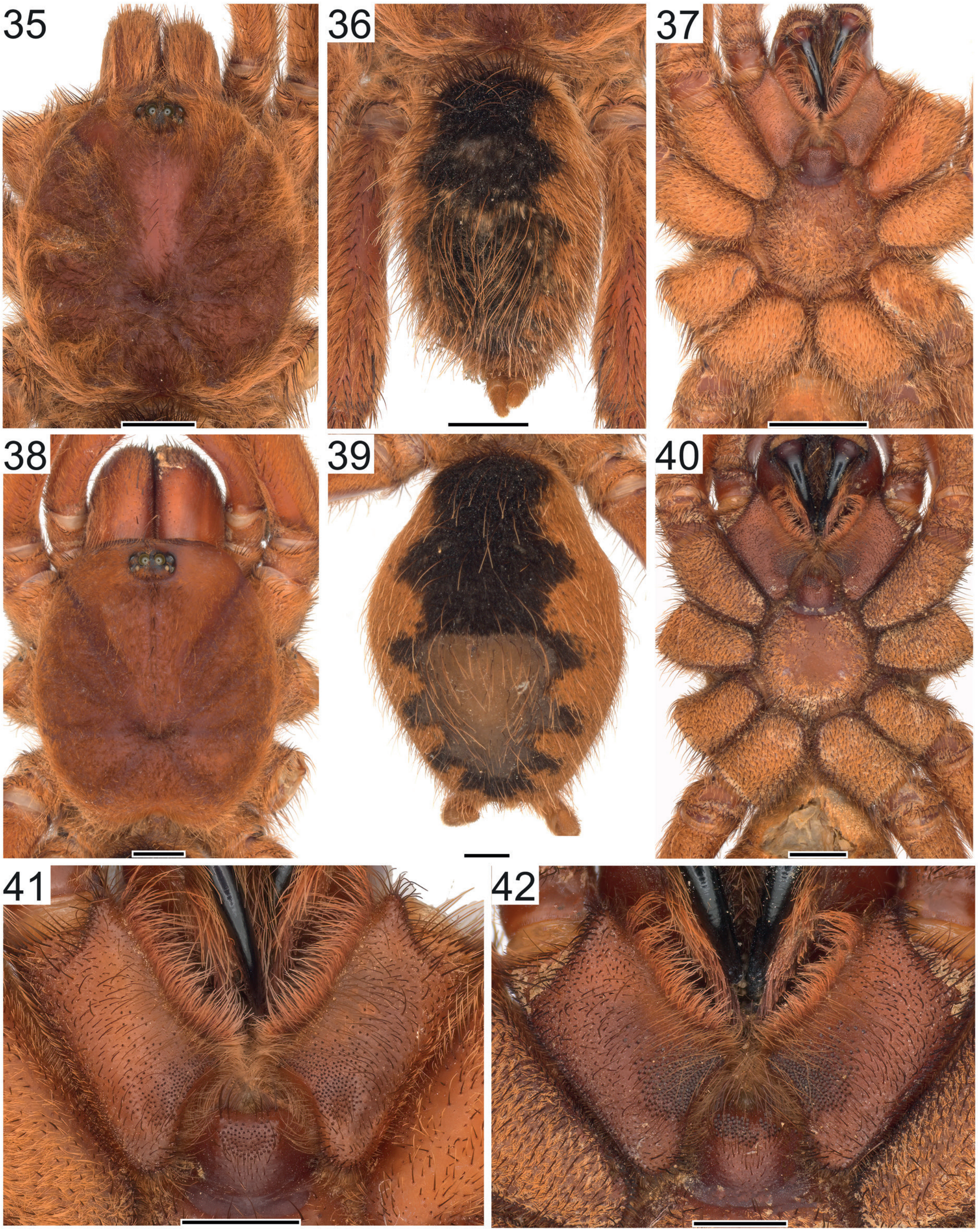
BRAZIL • 1 ♂, topotype; 10 Jun. 2007; N.F. Lo-Man-Hung and D.F. Candiani col.; MPEG 30871 • 1 ♀; Pará, Juruti, platô Capiranga, 02°28′22.1″ S, 56°12′29.4″ W; 9 Feb. 2007; N.F. Lo-Man-Hung col.; MPEG 30870 • 1 ♀; Pará, Juruti, platô Capiranga, 02°28′22.1″ S, 56°12′29.4″ W; 5 Jun. 2007; H.F. da Silva Filho col.; MPEG 30869.

Emended description

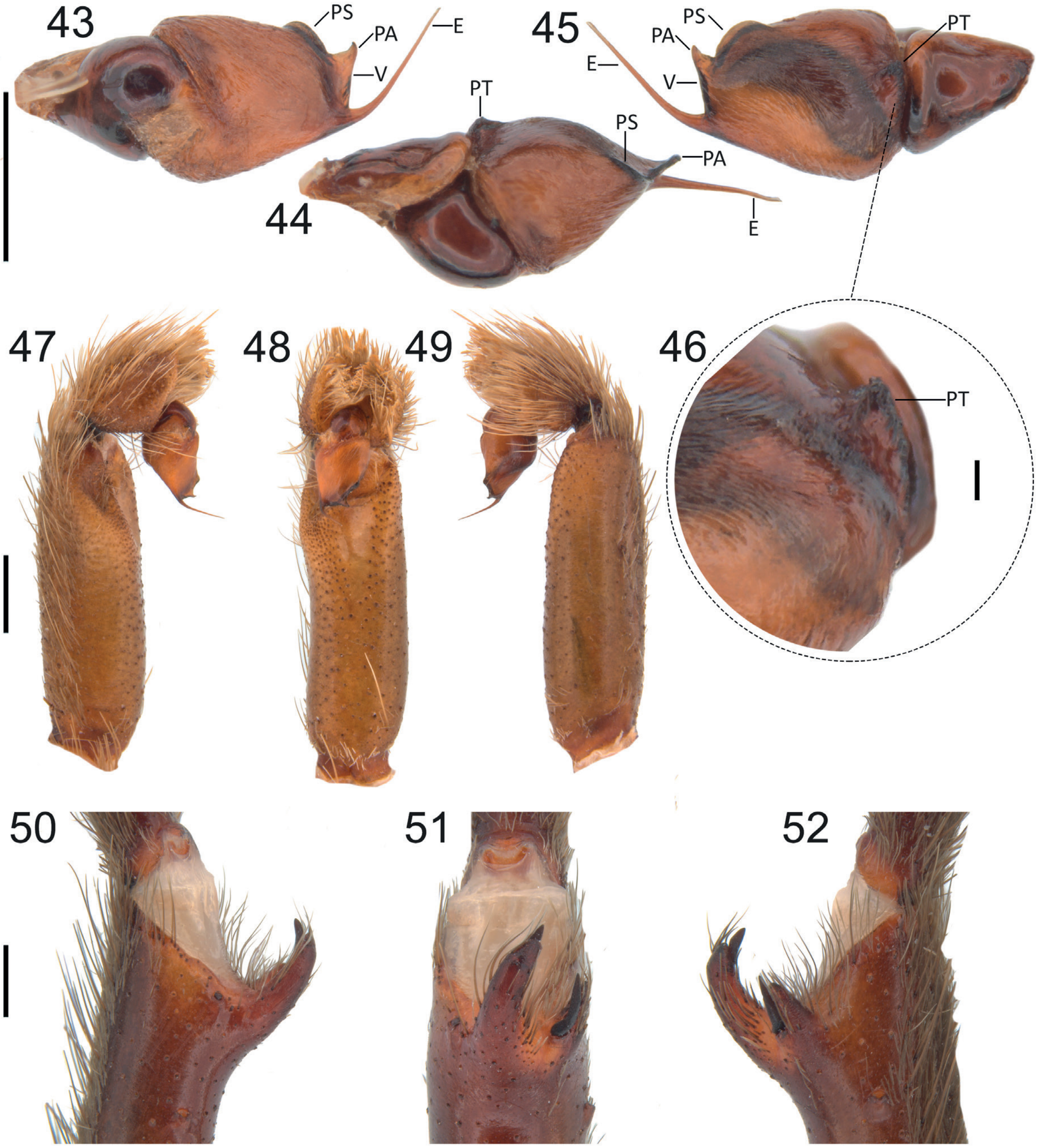
See Miglio *et al.* (2013) for color description, measurements and spination data.

Male (MPEG 30871)

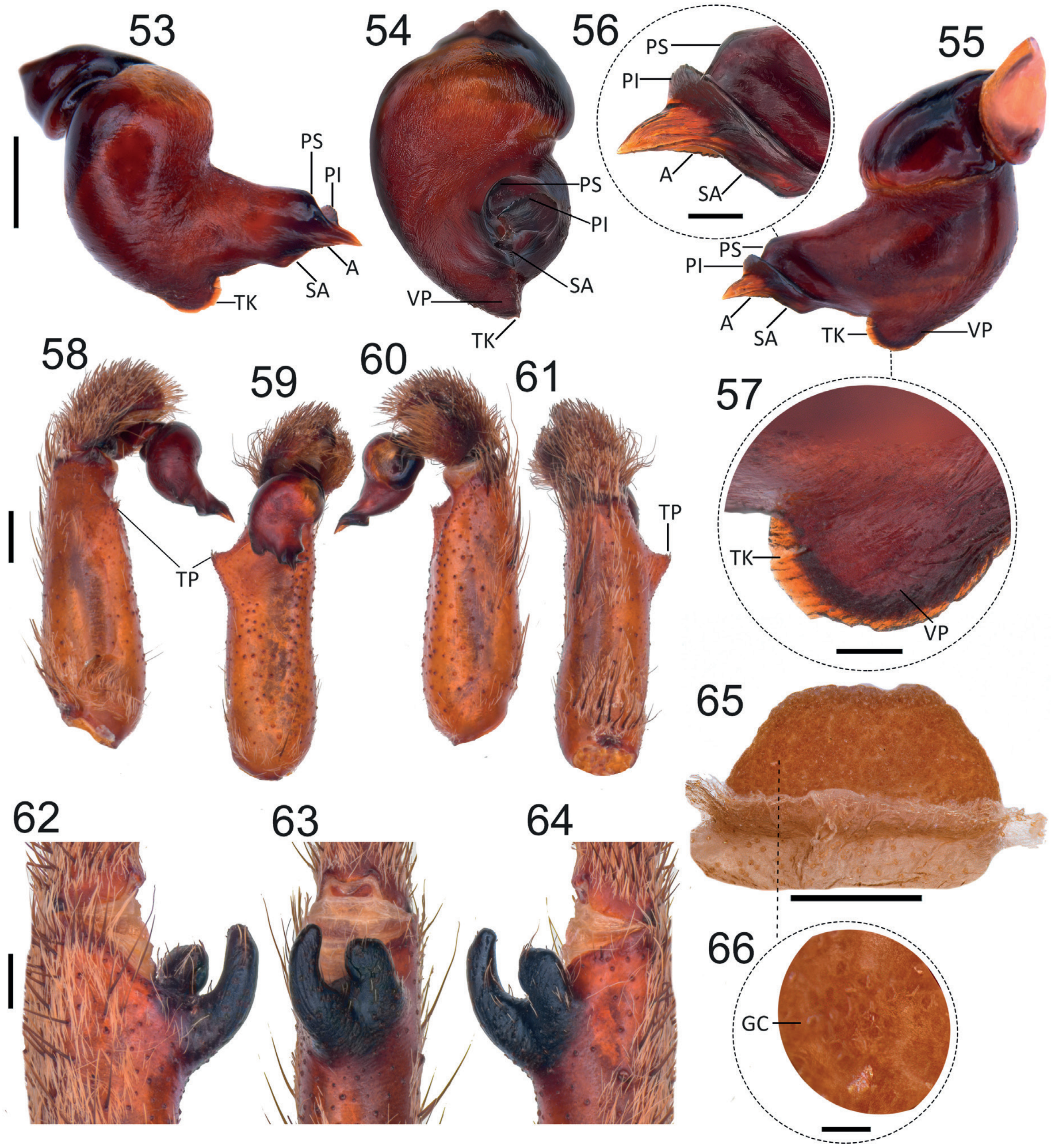
Palpal bulb: tegulum piriformis with PS and PI (Figs 103–105); subtle PS (Fig. 103–105); elongated embolus, twisted at apex with a pronounced and detached SA (Figs 105–106). Cymbium with two asymmetric lobes. Palpal tibia slightly thickened, with a PT and presence of small grooves in the contact region with the palpal bulb (Figs 107–109).



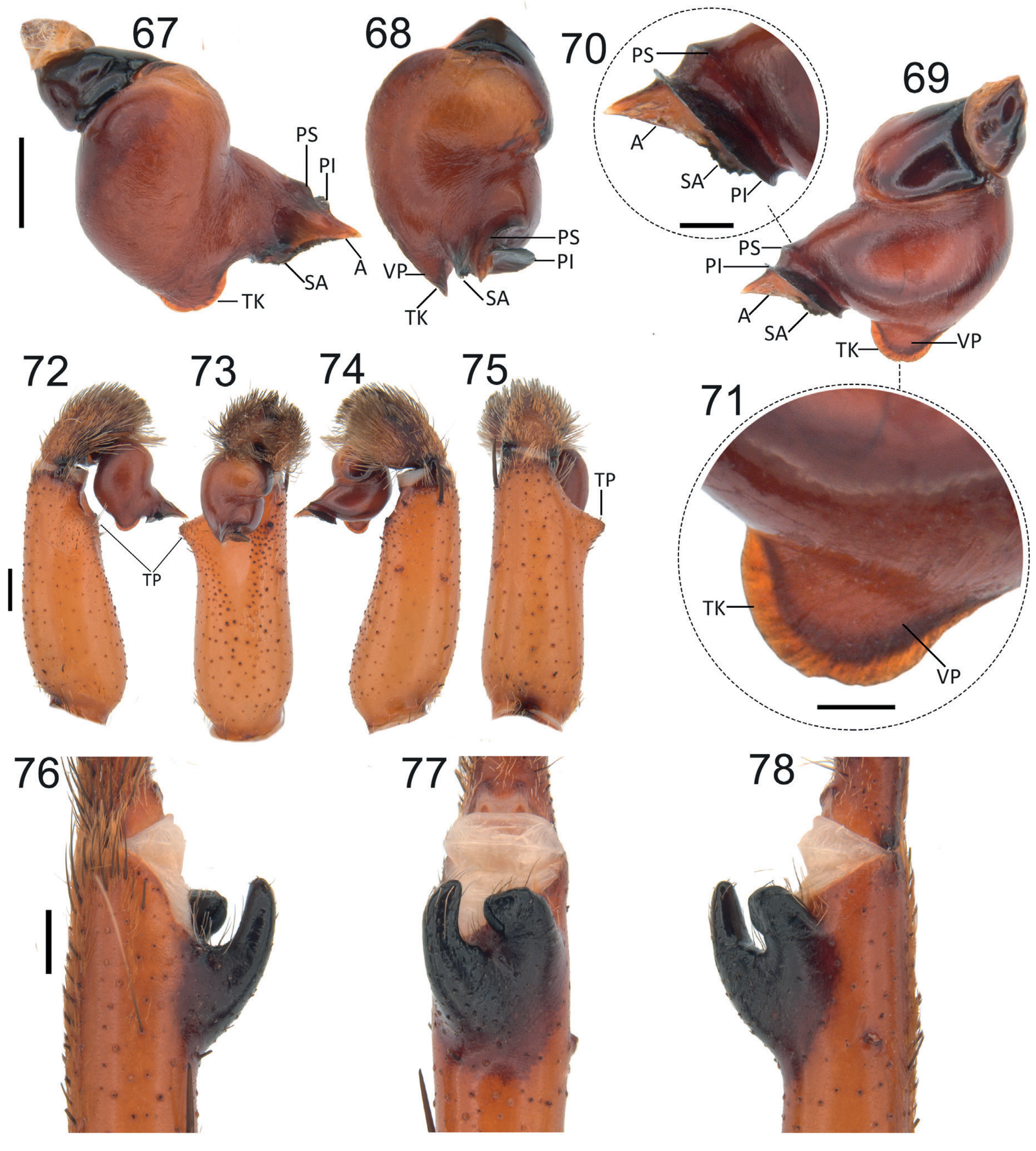
Figs 35–42. *Munduruku bicoloratum* Miglio, Bonaldo & Pérez-Miles, 2013. **35–37, 41**. ♂, MPEG 30871. **38–40, 42**. ♀, MPEG 30870. **35, 38**. Prosome, dorsal view. **36, 39**. Opisthosoma, dorsal view. **37, 40**. Prosome, ventral view. **41–42**. Labium and endites. Scale bars = 5 mm.



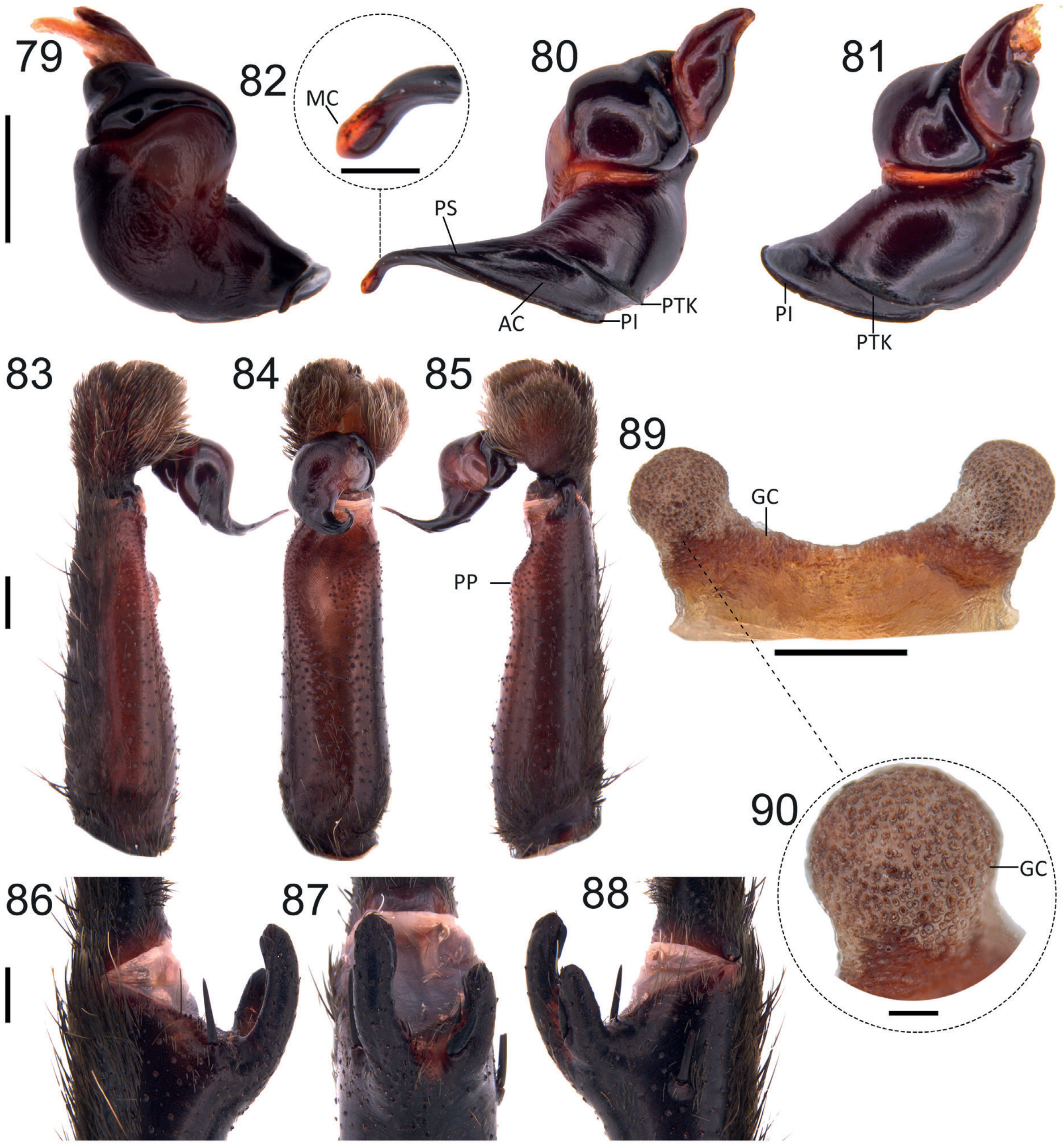
Figs 43–52. *Cyriocosmus paresi* sp. nov., holotype ♂, CAD 1441. **43–46**. Palpal bulb. **43**. Retrolateral view. **44**. Dorsal view. **45**. Prolateral view. **46**. Prolateral detached view. **47–49**. Palpal tibia. **47**. Retrolateral view. **48**.Ventral view. **49**. Prolateral view. **50–52**. Tibial apophysis. **50**. Retrolateral view. **51**. Ventral view. **52**. Prolateral view. Abbreviations: Palpal bulb: E = Embolus, PA = Paraembolic apophysis, PS = Prolateral superior keel, PT = Prolateral tegular apophysis, V = Vertical area. Dotted lines indicate detached areas. Scale bars: general area = 0.5 mm, detached area = 0.1 mm.



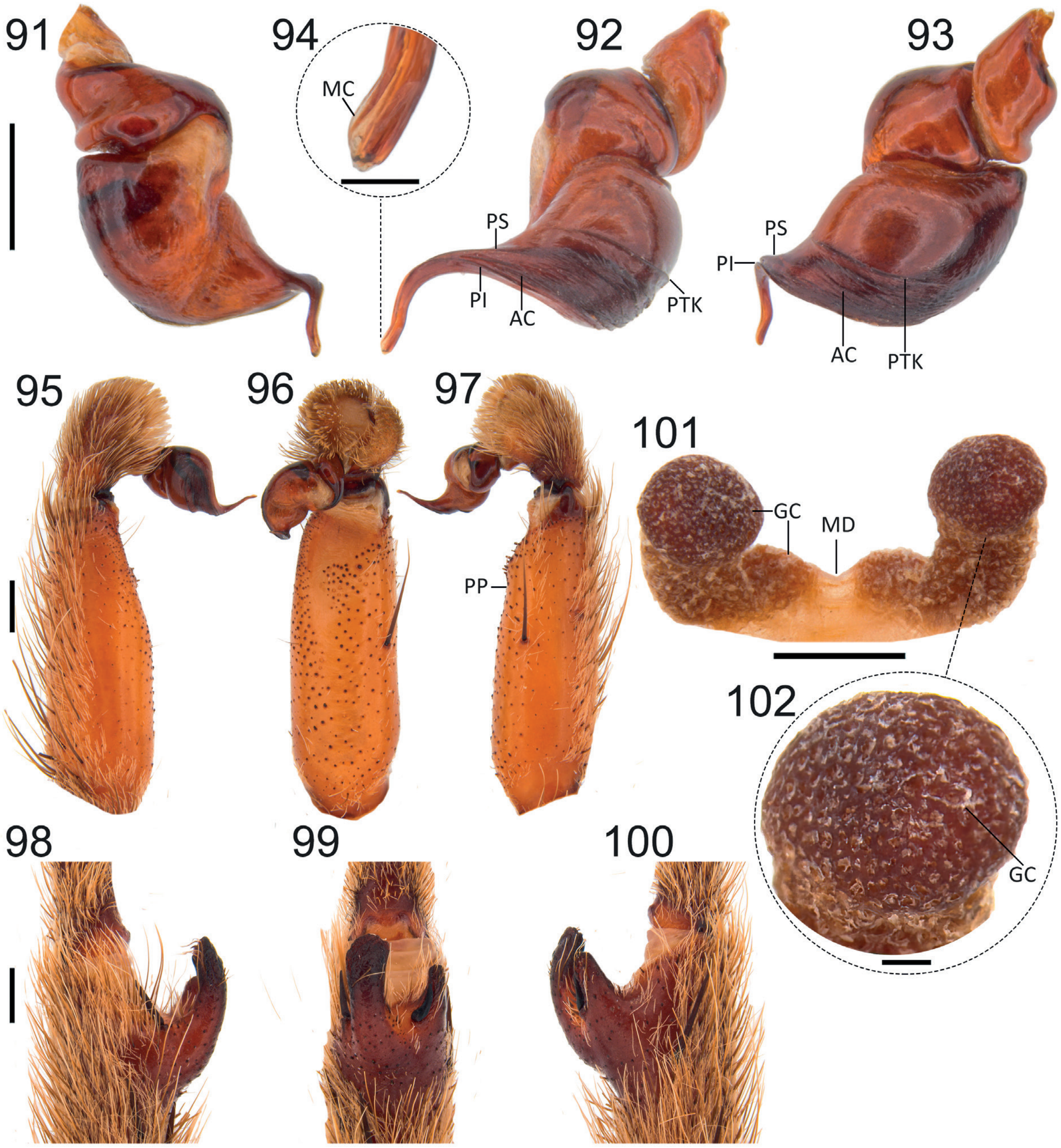
Figs 53–66. *Hapalopus akroa* **sp. nov. 53–64**. Holotype ♂, IBSP 272763. **65–66**. Paratype ♀, IBSP 272771. **53–57**. Palpal bulb. **53**. Retrolateral view. **54**. Frontal view. **55**. Prolateral view. **56**. Embolous prolateral view detached. **57**. Tegulum prolateral view detached. **58–61**. Palpal tibia. **58**. Retrolateral view. **59**. Ventral view. **60**. Prolateral view. **61**. Dorsal view. **62–64**. Tibial apophysis. **62**. Retrolateral view. **63**. Ventral view. **64**. Prolateral view. **65–66**. Spermathecae. **65**. Ventral view. **66**. Receptacle detached. Abbreviations: Palpal bulb: A = Apical keel, PI = Prolateral inferior keel, PS = Prolateral superior keel, SA = Subapical keel, TK = Tegular keel, VP = Ventral tegular projection. Palpal tibia: TP = Tubercular process. Spermathecae: GC = Granular cavities. Dotted lines indicate detached areas. Scale bars: general area = 0.5 mm, detached areas: 0.1 mm.



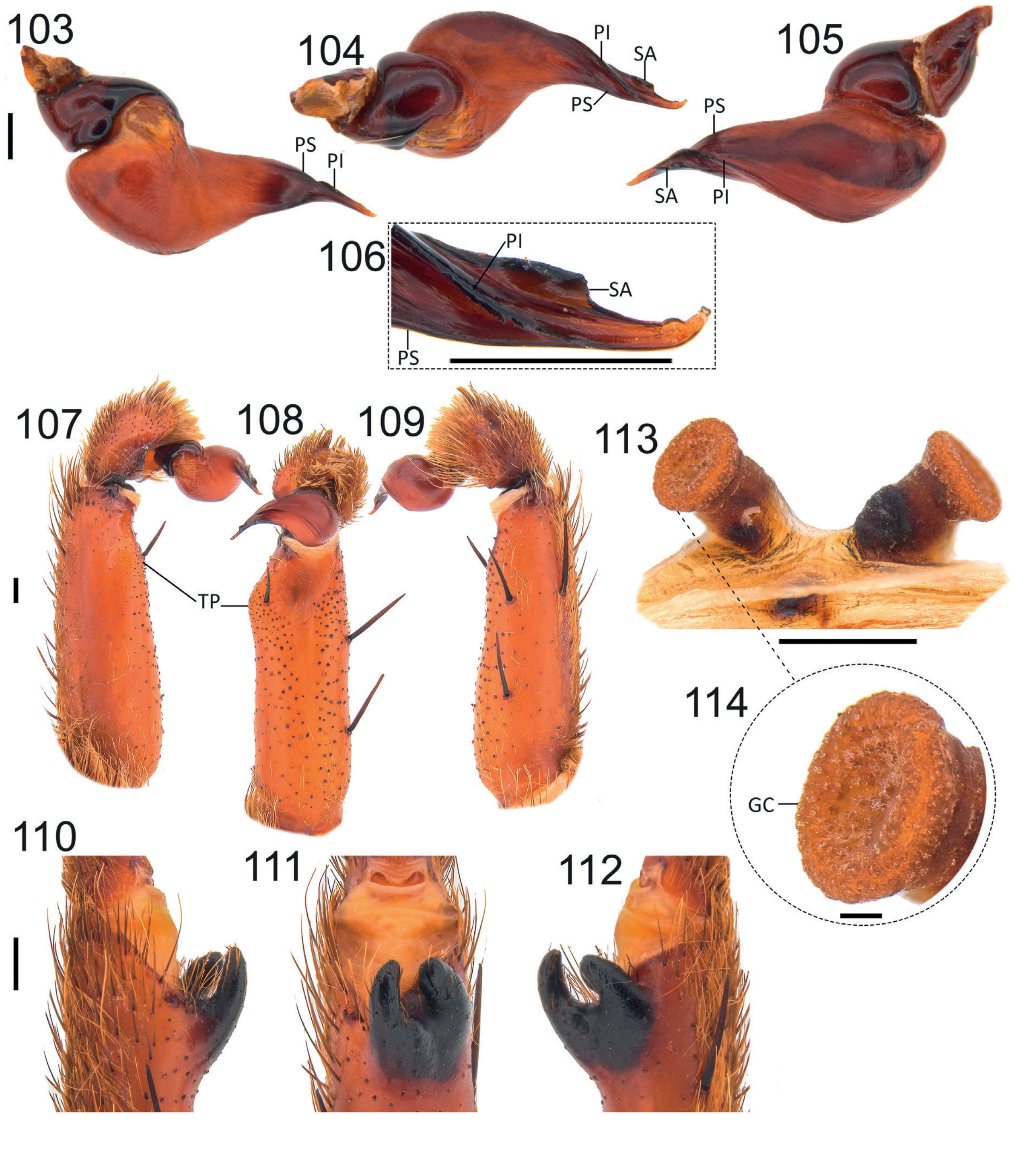
Figs 67–78. *Hapalopus guidonae* sp. nov., holotype ♂, CAD 1443. **67–71**. Palpal bulb, **67**. Retrolateral view. **68**. Frontal view. **69**. Prolateral view. **70**. Embolous, prolateral view detached. **71**. Tegulum, prolateral view detached. **72–75**. Palpal tibia. **72**. Retrolateral view. **73**. Ventral view. **74**. Prolateral view. **75**. Dorsal view. **76–78**. Tibial apophysis. **76**. Retrolateral view. **77**. Ventral view. **78**. Prolateral view. Abbreviations: Palpal bulb: A = Apical keel, PI = Prolateral inferior keel, PS = Prolateral superior keel, SA = Subapical keel, TK = Tegular keel, VP = Ventral tegular projection. Palpal tibia: TP = Tubercular process. Dotted lines indicate detached areas. Scale bars: general area = 0.5 mm, detached areas: 0.1 mm.



Figs 79–90. *Kochiana fukushimae* sp. nov. **79–88**. Holotype ♂, CAD 1444. **89–90**. Paratype ♀, CAD 1445. **79–82** Palpal bulb. **79**. Retrolateral view. **80**. Frontal view. **81**. Prolateral view. **82**. Embolous apex detached. **83–85**. Palpal tibia. **83**. Retrolateral view. **84**. Ventral view. **85**. Prolateral view. **86–88**. Tibial apophysis. **86**. Retrolateral view. **87**. Ventral view. **88**. Prolateral view. **89–90**. Spermathecae. **89**. Ventral view. **90**. Receptacle, detached view. Abbreviations: Palpal bulb: AC = Accessory keel, MC = Median crest, PI = Prolateral inferior keel, PS = Prolateral superior keel, PTK = Prolateral tegular keel. Palpal tibia: PP = Prolateral protuberance. Spermathecae: GC = Granular cavities. Dotted lines indicate detached areas. Scale bars: general area = 0.5 mm, detached areas: 0.1 mm.



Figs 91–102. *Kochiana brunnipes* (Koch, 1841). **91–100** ♂, MZSP 28774. **101–102**. ♀, MZSP 28776. **91–94**. Palpal bulb. **91**. Retrolateral view. **92**. Frontal view. **93**. Prolateral view. **94**. Embolous apex, detached view. **95–97**. Palpal tibia. **95**. Retrolateral view. **96**. Ventral view. **97**. Prolateral view. **98–100**. Tibial apophysis. **98**. Retrolateral view. **99**. Ventral view. **100**. Prolateral view. **101–102**. Spermathecae. **101**. Ventral view. **102**. Receptacle detached view. Abbreviations: Palpal bulb: AC = Accessory keel, MC = Median crest, PI = Prolateral inferior keel, PS = Prolateral superior keel, PTK = Prolateral tegular keel. Palpal tibia: PP = Prolateral protuberance. Spermathecae: GC = Granular cavities, MD = Middle depression. Dotted lines indicate detached areas. Scale bars: general area = 0.5 mm, detached areas: 0.1 mm.



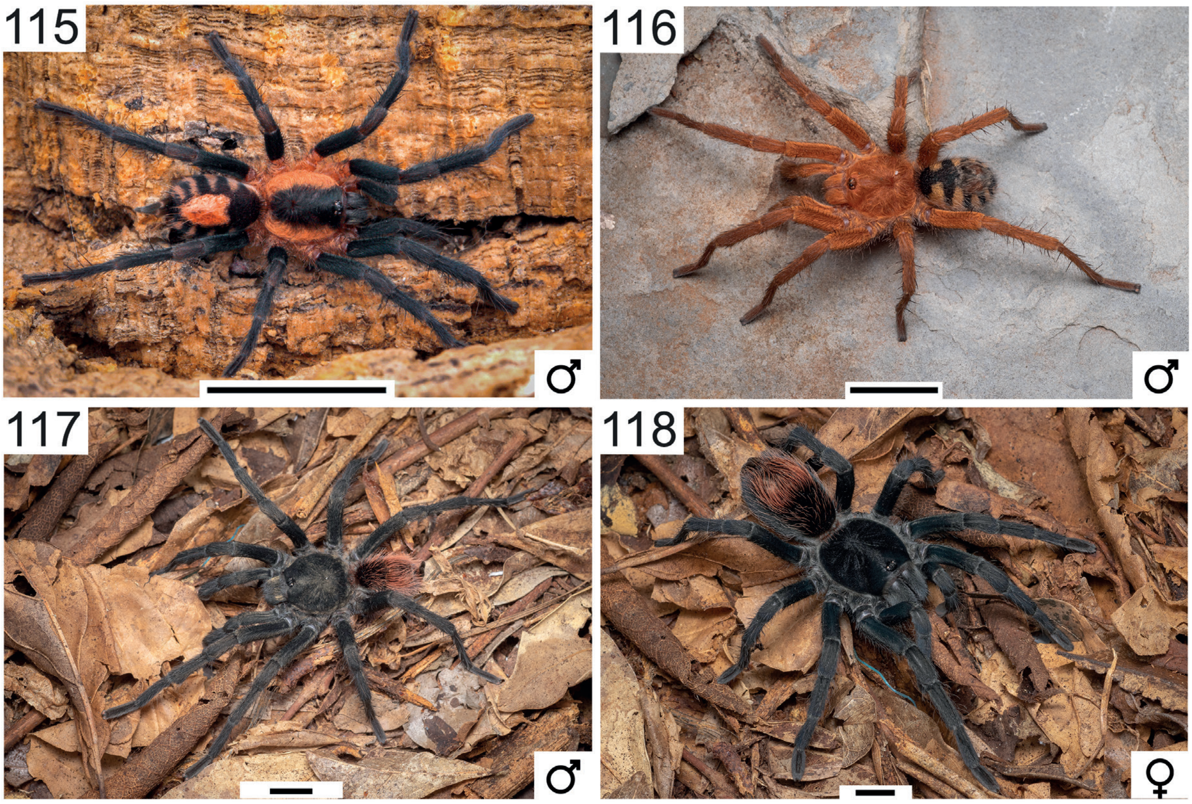
Figs 103–114. *Munduruku bicoloratum* Miglio, Bonaldo & Pérez-Miles, 2013. **103–112**. ♂, MPEG 30871. **113–114**. ♀, MPEG 30870. **103–106**. Palpal bulb. **103**. Retrolateral view. **104**. Dorsal view. **105**. Prolateral view. **106**. Embolous apex detached. **107–109**. Palpal tibia. **107**. Retrolateral view. **108**. Ventral view. **109**. Prolateral view. **110–112**. Tibial apophysis. **110**. Retrolateral view. **111**. Ventral view. **112**. Prolateral view. **113–114**. Spermathecae. **113**. Ventral view. **114**. Receptacle detached view. Abbreviations: Palpal bulb: PI = Prolateral inferior keel, PS = Prolateral superior keel, SA = Subapical keel. Palpal tibia: TP = Tubercular process. Spermathecae: GC = Granular cavities. Dotted lines indicate detached areas. Scale bars: general area = 0.5 mm, detached areas = 0.1 mm.

Female (MPEG 30870)
Spermathecae: composed by two caliciform receptacles not fused at base, heavily sclerotized along with the ducts with presence of GC only in the receptacles (Figs 113–114).

Discussion

According to Fukushima *et al.* (2005) it is possible to differentiate species of *Cyriocosmus* based on the cephalothorax and abdominal color pattern. Furthermore, the genus can also be recognized by the presence of a paraembolic apophysis on male palpal bulb, divergent branches on the tibial apophysis and a sinuous or spiral spermathecae with a convex base (Fukushima *et al.*, 2005). Among these characters, there is at least two pattern of variations of paraembolic apophysis length, a short one (as in *C. versicolor*, *C. bertae*, *C. leetzi*, *C. elegans*, *C. fasciatus*, *C. aurei*, *C. foliatus*, *C. giganteus*, *C. hoeferi*, *C. itayensis*, *C. nicholausgordoni*, *C. paredesi*, *C. perezmilesi*, *C. peruvianus*, *C. pribiki*, *C. venezuelensis* and *C. paresi* sp. nov.) and a long one (as in *C. nogueira-netoi*, *C. fernandoi*, *C. bicolor*, *C. blenginii*, *C. ritae* and *C. sellatus*) (Fukushima *et al.* 2005; Kaderka 2019). Furthermore, It was noted that *C. paresi* sp. nov. had the vertical region (V). This characteristic consists of the region that extends vertically between the embolus and PS, which in this species is particularly notable due to its size, measuring half the length of the embolus. We belive this variation is autapomorphic for *C. paresi* because it is specific to this species and is easily noticeable in males.

The genus *Hapalopus* comprises a problematic case within the Theraphosinae, due to the lack of taxonomic revision and the proposal of a coherent diagnosis for the genus. Pérez-Miles & Perafán (2020) proposed



Figs 115–118. Species of Hapalopini. **115**. *Cyriocosmus paresi* sp. nov., holotype ♂, CAD 1441. **116**. *Hapalopus guidonae* sp. nov., holotype ♂, CAD 1443. **117–118**. *Kochiana fukushimae* sp. nov. **117**. Holotype ♂, CAD 1444. **118**. Paratype ♀, CAD 1445. Scale bars = 10 mm. Photos: **115**. E.H. Yabiku. **116–118**. W. Moeller.

a unified diagnosis for the genus based on a set of characters established in previous works. The updated diagnosis herein proposed is based on character comparison of *H. guidonae* sp. nov. and *H. akroa* sp. nov. with other congeneric species. It is important to note that the only common character to all species of *Hapalopus* is the TP on male palpal tibia and the tibial apophysys shape with convergent branches. However, these structures are not exclusive to *Hapalopus* and are shared with other genera like *Munduruku* and *Neischnocolus* Petrunkevitch, 1925.

The presence of VP with a TK distinguishes *Hapalopus guidonae* sp. nov. and *H. akroa* sp. nov. from the other species, except for *H. formosus* and *H. serrapelada*, as they share structures with similar shape and position on palpal bulb. In the case of *H. formosus* (see Gershman & Schiapelli 1973: 71, figs 79–80, and 82) there is a similar keel on the ventral face of the tegulum, which was unamed until Bertani (2000) interpreted it as the PI divided into two separated parts, starting at the superior (dorsal) face of the embolus and extending along the tegulum, with a gap in the middle. Fonseca-Ferreira *et al.* (2017), following Bertani's proposal, also considered the PI split in two parts in the description of *H. serrapelada*. However, we believe that VP with a TK is not a split PI, because in *H. formosus*, *H. guidonae* sp. nov. and *H. akroa* sp. nov. it appears to arise from the ventral region of the tegulum and not as a continuation of the PI. We chose to assume that these structures are homologous between *H. formosus*, *H. serrapelada*, *H. guidonae* sp. nov. and *H. akroa* sp. nov. because males of other species of *Hapalopus* do not exhibit any similar characteristics.

Despite similar, the males palpal bulbs of *Hapalopus guidonae* sp. nov. and *H. akroa* sp. nov. can be distinguished based on the length of the embolus and the serrated intensity of the SA. Also, despite the geographic proximity, the two species are distributed in different mountain ranges. Since *H. akroa* sp. nov present in the "Serra das Confusões" mountain range and *H. guidonae* sp. nov. in the "Serra da Capivara" mountain range. Finally, the abdominal color pattern highlights their morphological differences, with *H. guidonae* sp. nov. having four black abdominal stripes, while *H. akroa* sp. nov. without any abdominal

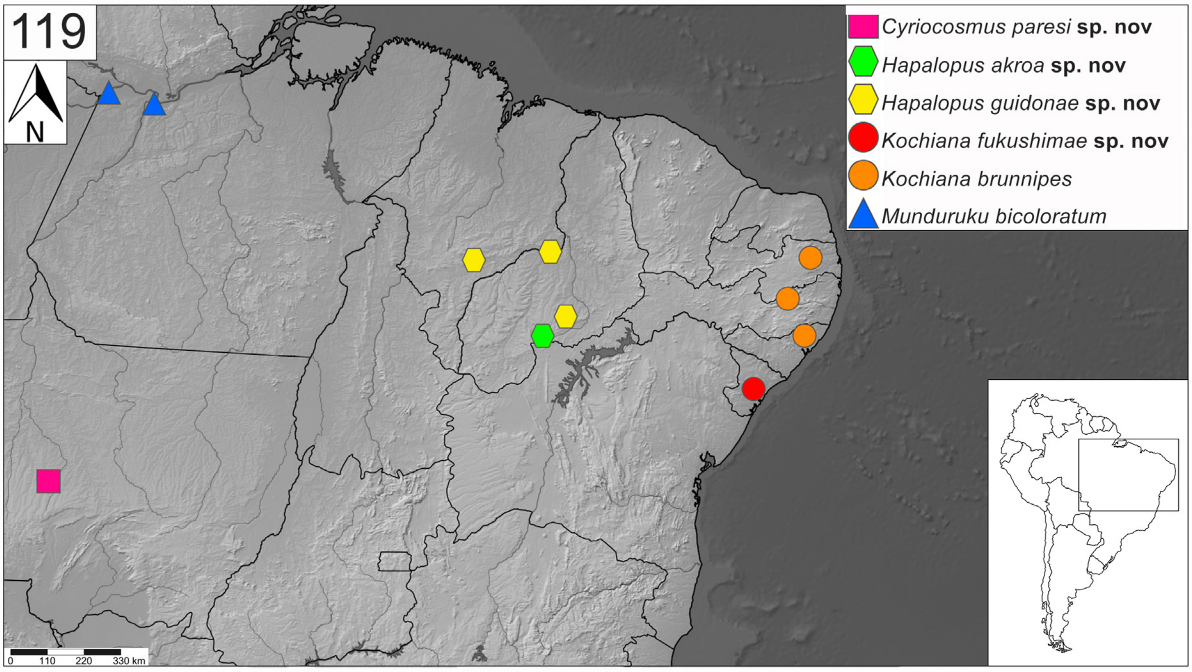


Fig. 119. Hapalopini species distribution. Pink squares = *Cyriocosmus paresi* sp. nov. Green hexagon = *Hapalopus akroa* sp. nov. Yellow hexagon = *H. guidonae* sp. nov. Red circles = *Kochiana fukushimae* sp. nov. Orange circles = *K. brunnipes* (Koch, 1841). Blue triangles = *Munduruku bicoloratum* Miglio, Bonaldo & Pérez-Miles, 2013.

stripe. Different types of abdominal marks are found of in other species of the genus, either as abdominal stripes (such as in *H. formosus*, *H. lesleyae*, *H. nigriventris* and *H. variegatus*), as three longitudinal dark bands on the dorsum of the abdomen, an intermediate band thicker than the marginal bands (*H. serrapelada*), as many light orange/yellow spots on the abdomen (*H. coloratus* and *H. triseriatus*) or by the absence of any abdominal marks (such as in *H. aymara* and *H. gasci*). Regarding the female characters, the species of *Hapalopus* seem to show two evident patterns: spermathecae with a single receptacle (*H. coloratus*, *H. formosus*, *H. nigriventris*, *H. triseriatus* and *H. akroa* sp. nov.) and with two receptacles with a fused base (*H. aymara*, *H. serrapelada* and *H. gasci*).

We also propose herein some nomenclatural changes for some structures of male palpal bulb and spermathecae from *Kochiana* and *Munduruku*. The presence of PTK and PP is observed in *K. fukushimae* sp. nov. and in *K. brunnipes*, however these characters were not described or coded in the morphological matrix proposed by Fukushima *et al.* (2008). In both species, the PP is not clearly distinguishable if the palpal tibia bristles are not removed (see Figs 72–74). This structure appears as a discreetly projected protuberance on the prolateral side of the palpal tibia of males. The examination of the same material used by Fukushima *et al.* (2008) to describe *K. brunnipes*, such segments were not depilated and this feature was not mentioned. In addition, PTK is evident and is illustrated in the paper (Fukushima *et al.*, 2008: 404, fig. 2), but not mentioned. Since these keels appears above the PS (notice that the PS is reduced in *Kochiana*) and is unconnected to the embolus, we interpret it as a new structure. The leg color pattern of *K. brunnipes* is very recognizable, differing remarkably from the pattern presented for *K. fukushimae* sp. nov., such as the male palpal bulb of both species, that show differences in embolus sizes and curvature. Also, *K. fukushimae* sp. nov. presents AC less evident when compared to *K. brunnipes*. Fukushima *et al.* (2008) describes the presence of granules in the spermathecae as being, together with its shape, a diagnostic character of the species. However, our images show that these granules show cavities (as mentioned in the emended diagnosis of the genus proposed here). These cavities have pronounced edges giving a granular appearance. They were probably previously described as granules because these cavities are discrete and difficult to identify at low magnification. Because of these characteristics, we name these structures as granular cavities. Similarly, females of *M. bicoloratum* and *H. akroa* sp. nov. also have spermatheca with such cavities in the receptacles, so this character should not be used as a diagnostic character for females of *Kochiana* as currently proposed.

The presence of TP in males of *Munduruku bicoloratum* was not mentioned in the original species description (Miglio *et al.* 2013). Same for the presence of GC in the females spermathecae, similar to those of *Kochiana*, but different in *M. bicoloratum* by being restricted to the receptacles. Another feature that drew our attention is the similarity of tibial apophysis of *M. bicoloratum* (Figs 87–90) with those of *Hapalopus. serrapelada, H. akroa* sp. nov. and *H. guidonae* sp. nov. (Figs 53–55; Fonseca-Ferreira *et al.* 2017: 186, fig. 15) and the spermathecae shape similar with *H. serrapelada* (Fonseca-Ferreira *et al.* 2017: 187, figs 24–25). We point that despite the presence of SA in *H. serrapelada*, *H. akroa* sp. nov. and *H. guidonae* sp. nov., this character is not clearly homologous to those of *M. bicoloratum*, since in species of *Hapalopus* the SA is serrated and not detached from embolus and in *Munduruku* it is not serrated and detached. In addition, the male palpal bulb of *M. bicoloratum* shows a piriform tegulum and does not have a PI ring shape as in species of *Hapalopus*. Finally, despite the presence of type IV urticant setae in *Munduruku* females, this character can occur in Hapalopini in a reduced form (e.g. *Plesiopelma* and *Trixopelma*) (Turner *et al.* 2018; Sherwood *et al.* 2021; Ferreti *et al.* 2024).

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