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## ***Proshapalopus marimbai*, a new tarantula species (Mygalomorphae, Theraphosidae) and first genus record from Colombia**

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A new species of *Proshapalopus* Mello-Leitão, 1923, distributed in the Southwest Colombia in the Chocó Region, is described. A morphological cladistic analysis based on the previous matrix of a Theraphosinae group confirmed the inclusion of this species within *Proshapalopus*. The new species, *Proshapalopus marimbai* n. sp., can be distinguished from other species of the genus mainly by the reduced number of labial cuspules, around 40; in contrast the other species having over 100. Males can be distinguished by the thickened femur III, presence of intermediate urticating setae type I-III only, palpal bulb with a considerably long prolateral inferior keel (from ventral median depression to embolus apex) and the accessory keel pronounced distally. Females can be distinguished for lacking urticating setae type III and the non-incrassated tibia IV. This discovery constitutes the fourth species described for *Proshapalopus* and the first record for Colombia, expanding the geographical distribution of the genus, until now known for Brazil only. Other aspects of distribution and the phylogenetic relationship of the new species are also discussed here.

<http://zoobank.org/urn:lsid:zoobank.org:pub:852AF8E4-67C3-4DD9-B386-29F5C6E9A073>

**Keywords:** Chocó; cladistics; marimba; tarantula; Theraphosinae; Tumaco

### **Introduction**

Colombia is one of the most biological diverse countries in the world, due to its privileged geographical location in the Northwestern corner of the American continent, within the inter-tropical zone of the globe, gathering some of the greatest systems of the continent (Andean, Amazonian, Orinoquia, Caribbean Basin and Pacific Basin) (Rangel-Ch 2005). Despite the above characteristics, there are several biological groups as well as some geographic regions that have not yet been explored or with little data collected. The family Theraphosidae Thorell, 1869, which includes the spiders called tarantulas in the American Continent, is one of those groups which taxonomy in Colombia is still unclear, due the lack of studies and taxonomic reviews.

Theraphosidae comprises the largest spiders and is the most specious group of Mygalomorphae, with more than 130 genera and 970 species (World Spider Catalog 2017), mainly distributed in the tropical and subtropical regions. The knowledge about

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their taxonomy and diversity in Colombia has significantly increased in the last eight years; five genera, three of them endemic, and 11 species have been described for the country based on morphological characters (Pérez-Miles et al. 2008; Pérez-Miles and Weinmann 2010; Guadanucci and Weinmann 2014, 2015; Perafán et al. 2015, 2016; Cifuentes et al. 2016).

There was a recent discovery of a tarantula species in Tumaco, a town located in the Chocó Region of Western Colombia (Tumbes-Chocó-Magdalena Biodiversity Hotspot). The morphological characteristics of this species resemble the diagnostic characters of the genus *Proshapalopus* Mello-Leitão, 1923, but these do not match with any of the species described for the genus, neither its geographical distribution, as they are distributed in the Amazon Forest and the Atlantic Forest of Brazil.

*Proshapalopus* was initially described by Mello-Leitão (1923) based on a single male of its type species, *Proshapalopus anomalus* Mello-Leitão, 1923 from Pinheiral, Rio de Janeiro, Brazil, and recently reviewed by Bertani (2001). According to Bertani (2001), males of *Proshapalopus* can be distinguished by the presence of an accessory keel under the prolateral inferior keel on the male palpal bulb, and females can be distinguished by having a thickened tibia IV together with the absence of type III urticating setae (*Proshapalopus amazonicus* Bertani, 2001); or type I urticating setae with the region “a” shorter than the region “b” (*P. anomalus* Mello-Leitão, 1923 and *Proshapalopus multicuspidatus* (Mello-Leitão, 1929)). Currently, *Proshapalopus* comprises three species, *P. amazonicus*, *P. anomalus* and *P. multicuspidatus*.

A cladistic analysis based on a modified matrix of Bertani et al. (2011) confirmed the inclusion of the specimens from Tumaco in a new species of *Proshapalopus* described here. This constitutes the first record of the genus for Colombia. Distribution and morphological aspects are discussed, and a phylogenetic relationship hypothesis is proposed.

## Material and methods

Male palpal organ keel terminology follows Bertani (2000, 2001) and urticating setae terminology follows Cooke et al. (1972) and Bertani and Guadanucci (2013). Number and disposition of spines enumerated from the anterior third to the posterior third, modified according to Petrunkevitch (1925). All measurements are given in millimeters (mm); body and legs measures were taken with a vernier caliper, others measurements were taken using an ocular micrometer. Legs and palp measurements were taken in dorsal view along the central axis of the left-side limbs. The geographic coordinates and altitude data were referenced by GPS, Datum WGS84. The distribution map was produced using SimpleMappr (Shorthouse 2010). Type material is stored in 70% ethanol and deposited in the Arachnological Collection of the Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá, Colombia.

## Abbreviations

A = apical keel; ALE = anterior lateral eyes; AME = anterior median eyes; d = dorsal; D = ventral median depression; OQ = ocular quadrangle (including lateral eyes); p = prolateral; AC = prolateral accessory keel; PB = prolateral branch; PI = prolateral inferior keel; PME = posterior median eyes; PMS = posterior median spinnerets; PLE = posterior lateral eyes; PLS = posterior lateral spinnerets; PS = prolateral superior keel; r = retrolateral; R = retrolateral keel; RB = retrolateral branch; SA = sub-apical keel; and v = ventral.

**Cladistic analysis**

Cladistic analysis was based on the previous matrix of Bertani et al. (2011), with the replacement of *Pterinopelma sazimai* Bertani, Nagahama & Fukushima, 2011 by *Pterinopelma felipeleitei* Bertani and Leal (2016), according to Bertani & Leal, (2016), and the inclusion of *Proshapalopus marimbai* n. sp. A data matrix composed of 35 morphological characters and 33 genera has been constructed (Table 1). The cladistic analysis was carried out in TNT version 1.1 (Goloboff et al. 2008), under maximum parsimony and the settings used in Bertani et al. (2011). A heuristic search was used with 20 addition sequences and tree-bisection reconnection processes, with and without implied weighting (Goloboff 1993) under different concavity values ( $k=3-12$ ). Character optimization was performed in Winclada 1.00.08 (Nixon 1999–2002) and characters mapped are those that are unambiguously optimized. Characters used in the cladistics analysis are listed in Table 1.

**Taxonomy**

Family **Theraphosidae** Thorell, 1869  
Genus ***Proshapalopus*** Mello-Leitão, 1923

***Proshapalopus marimbai* n. sp.**  
(Figures 1–3)

*Material examined*

Holotype male (ICN-Ar 8042), Colombia, Nariño, Barbacoas, km. 25 road Tumaco-Pasto, Reserva Natural Biotopo Selva Húmeda (1°25'N; 78°15'W), 600 masl, 14-ix-2015, col. D. Martínez and N. Herreño. Allotype female (ICN-Ar 8043), with same data. Paratypes, 1 female and 1 male (ICN-Ar 8044), with same data.

*Diagnosis*

*Proshapalopus marimbai* n. sp. (Figure 1) differs from other species of the genus by the reduced number of labial cuspules (Figure 2G), around 40 (more than 100 on the other species). Males can be distinguished by having thickened femur III and also by having palpal bulb embolus with an accentuated ventral median depression (D), prolateral superior keel (PS) poorly developed forming the embolus edge, prolateral inferior keel (PI) very long (from D to embolus apex), sub-apical keel (SA) long without small denticles, and accessory keel (AC) under PI pronounced distally (Figure 2A-F).

The male of *P. marimbai* n. sp. resembles those of *P. amazonicus* and *P. multicuspidatus* by the presence of an accentuated D. Moreover, it also resembles that of *P. multicuspidatus* by having tibial apophysis with branches converging originating from a common base, with prolateral branch thickened and metatarsus I folding laterally on the retrolateral branch. *Proshapalopus marimbai* n. sp. differs from all the above mentioned species in having reduced number of labial cuspules, PI very long, AC pronounced, smooth sub-apical keel (SA) (bordered by small denticles on *P. multicuspidatus* and *P. amazonicus*), only type intermediate I-III urticating setae present (I and III present on *P. multicuspidatus* and *P. amazonicus*), and normal tibia IV (thickened on *P. amazonicus*).

The female of *P. marimbai* n. sp. resembles that of *P. amazonicus* in the absence of urticating setae type III and urticating setae type I with the region “a” longer than the

Table 1. Character matrix used in cladistic analysis, taken from Bertani et al. (2011) (? = unknown, - = non applicable).

Species	Characters																									
	0	1	2	3	4	5	6	7	8	9	2	1	2	3	4	5	6	7	8	9	3	1	2	3	4	
<i>Aphonopelma scenarum</i> (F. O. Pickard-Cambridge, 1897)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Sphaerobothria hoffmani</i> Karsch, 1879	0	0	0	0	0	1	0	0	0	0	?	0	1	0	0	0	0	0	0	0	0	0	0	0	0	?
<i>Phormictopus cancerides</i> (Latreille, 1806)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1
<i>Cyrtopholis portoricae</i> Chamberlin, 1917	0	-	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	1	0	0	0
<i>Acanthoscurria geniculata</i> (C. L. Koch, 1841)	1	0	0	0	0	0	0	0	0	0	-	0	1	0	1	0	0	1	0	1	0	1	0	0	0	1
<i>Acanthoscurria sternalis</i> Pocock, 1903	0	0	0	0	0	0	0	0	1	0	-	0	1	0	1	0	0	1	0	1	0	0	0	0	1	0
<i>Panphobeteus</i> sp.	0	2	0	2	0	0	2	0	0	0	2	0	2	0	0	0	1	0	0	0	0	1	0	0	0	1
<i>Brachypelma emilia</i> (White, 1856)	0	2	0	0	0	0	2	0	0	0	2	0	1	0	3	-	0	0	1	0	0	0	0	0	0	1
<i>Xenesthis inmanis</i> (Ausserer, 1875)	0	2	0	2	0	0	2	0	0	0	2	0	2	0	0	0	0	1	0	0	0	0	0	0	0	1
<i>Theraphosa blondi</i> (Latreille, 1804)	-	2	0	0	0	0	2	1	0	0	1	-	2	-	3	-	-	0	1	1	-	1	0	0	0	0
<i>Theraphosa apophysis</i> (Tinter, 1991)	-	2	0	0	0	0	2	1	0	0	1	2	0	0	0	3	-	-	0	1	1	-	1	0	0	0
<i>Eupalaestrus campestratus</i> (Simon, 1891)	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
<i>Eupalaestrus weijenberghi</i> (Thorell, 1894)	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
<i>Proshapalopus amazonicus</i> Bertani, 2001	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
<i>Proshapalopus anomalus</i> Mello-Leitão, 1923	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
<i>Proshapalopus multicauspidatus</i> (Mello-Leitão, 1929)	1	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
<i>Lasiadora</i> sp.	0	0	2	1	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	1
<i>Nhandu carapensis</i> Lucas, 1983	1	1	2	1	0	0	1	0	0	0	-	2	-	1	0	0	1	0	0	0	0	0	0	1	0	0
<i>Nhandu tripepii</i> (Dresco, 1984)	1	1	2	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1
<i>Nhandu coloratovillosus</i> (Schmidt, 1998)	1	1	2	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	1
<i>Nhandu cerradensis</i> Bertani, 2001	1	1	2	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1
<i>Vitalius sorocabae</i> (Mello-Leitão, 1923)	1	1	0	2	1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1
<i>Vitalius wackeri</i> (Mello-Leitão, 1923)	0	1	0	2	1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1
<i>Vitalius dubius</i> (Mello-Leitão, 1923)	1	1	1	2	1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
<i>Vitalius roseus</i> (Mello-Leitão, 1923)	1	1	0	2	1	0	0	1	0	0	0	-	1	-	0	1	0	0	0	0	0	0	0	0	0	1
<i>Vitalius vellutinus</i> (Mello-Leitão, 1923)	1	1	0	2	1	0	0	1	0	0	0	-	1	-	0	1	0	0	0	0	0	0	0	0	0	0

(Continued)

Table 1. (Continued).

Species	Characters																											
	0	1	2	3	4	5	6	7	8	9	2	1	2	3	4	5	6	7	8	9	3	1	2	3	4			
<i>Vitalius longisterndis</i> Bertani, 2001	0	1	0	2	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
<i>Vitalius lucasae</i> Bertani, 2001	1	1	0	2	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
<i>Vitalius buecherli</i> Bertani, 2001	1	1	1	2	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitalius paranaensis</i> Bertani, 2001	1	1	0	2	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Pterinopelma felpelaitai</i> (Bertani & Leal, 2016)	0	0	0	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
<i>Pterinopelma vittosum</i> (Keyserling, 1891)	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
<b><i>Proshapalopus marimbai</i> n. sp.</b>	1	0	0	1	1	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

List of the characters and states as follow: (0)—Embolus length: 0, long, embolus 2.5 times longer than its width. 1, short, embolus length less than 2.5 times its width. (1)—Apical keel (A): 0, small, restricted to the embolus apex. 1, intermediate, extending slightly backwards, reaching or not the sub-apical keel. 2, very long, extending backwards by almost all ventral embolus edge. (2)—Embolus apex diameter: 0, slender. 1, thick. (3)—Retrolateral keel: 0, absent. 1, present, not pronounced, slightly rounded. 2, present, pronounced, sharp. (4)—Sub-apical keel (SA): 0, absent. 1, present. (5)—Prolateral accessory keel, under prolateral inferior keel: 0, absent. 1, present. (6)—Denticulate row in the prolateral inferior keel: 0, absent. 1, present. (7)—Distal embolus shape: 0, embolus apex conical, retrolateral region slightly convex. 1, embolus apex slightly laterally flattened, retrolateral region slightly concave under and above retrolateral keel. 2, embolus apex very flattened laterally, giving it a concave/convex general appearance; retrolateral side very concave under and above retrolateral keel, or only one concave region when retrolateral keel absent. (8)—Prolateral inferior keel: 0, present. 1, absent. (9)—Male palpal bulb ventral median area: 0, normal, or with slight depression at ventral median area. 1, male palpal bulb with pronounced depression at ventral median area. (10)—Male palpal bulb with long sub-apical row of denticles (SA), reaching more than half of embolus length: 0, absent. 1, present. (11)—Male palpal bulb with prolateral superior keel and apical keel apically fused: 0, prolateral superior keel and apical keel not completely fused. 1, prolateral superior keel and apical keel completely fused. (12)—Male tibial apophysis shape: 0, two straight branches originated from common base, retrolateral branch slightly narrow in its median region. 1, two convergent branches originated from common base, tapering distally, prolateral branch is thickened. 2, two straight branches originated from common base, retrolateral lacks median narrowing. 3, two convergent branches which do not originate from common base, retrolateral with median narrowing. (13)—Male tibial apophysis: 0, present, normal size. 1, present, very reduced. 2, absent. (14)—Flexion of metatarsus I of males: 0, touching side of retrolateral branch. 1, touching apex of retrolateral branch. 2, closing between two branches, thus contacting inner face of both branches. (15)—Number of male tibial apophysis branches: 0, two branches. 1, one branch. (16)—Fusion of spermathecae: 0, spermathecae separated. 1, spermathecae fused in small area. 2, spermathecae widely fused, but still presenting vestiges of two spermathecae in the distal region. 3, spermathecae completely fused, that is, no vestige of two spermathecae. (17)—Spermathecae shape: 0, not subspheric. 1, subspheric. (18)—Spermathecae length: 0, short. 1, long, at least twice as long as heavily sclerotized area. (19)—Spermathecae stalk: 0, stalk narrower than spermathecae bulb. 1, stalk as wide as spermathecae bulb. (20)—Trochanteral striulatory hairs: 0, absent. 1, present. (21)—Coxal striulatory hairs: 0, absent. 1, present. (22)—Type III urticating hair in females: 0, present. 1, absent. (23)—Type I urticating hair morphology: 0, “A” region longer or as long as the “B” region. 1, “A” region shorter than “B” region. (24)—Type I urticating hair: 0, normal. 1, thickened. (26)—Color pattern: 0, variable, commonly a homogeneous black or dark brown. 1, carapace dark brown with thoracic region gradually lighter, femora black, patellae, tibiae, and metatarsi I and II laterally pinkish. (27)—Male leg length and diameter: 0, normal legs. 1, long and narrow legs. (28)—Female carapace marginal hairs: 0, covered with short marginal stiff hairs, pointing out. 1, covered by long marginal soft hairs, many pointing to inner carapace region. (29)—Female carapace hair cover: 0, short hairs, mainly on cephalic region. 1, very long, curly, scattered hairs, mainly on cephalic region. (30)—Male palpal tibia retrolateral process: 0, absent. 1, present. (31)—Spine row on male dorsal palpal tibia apex: 0, male dorsal palpal tibia apex without row of spines. 1, male dorsal palpal tibia apex with a row of 5 or more spines. (32)—Spines on male palpal tibia apex: 0, 1 to 3 scattered apical prolateral spines. 1, 5 or more apical prolateral closely positioned spines. (33)—Male metatarsus I: 0, straight. 1, curved. (34)—Scopulae on retrolateral femora IV face: 0, absent. 1, present.

region “b” (*sensu* Bertani 2001, Figure 4), but differs in the reduced number of labial cuspules and the tibia IV not thickened.

*Description*

Male (holotype ICN-Ar 8042) (Figure 1). Total length, not including chelicerae or spinnerets 34.15; including chelicerae 38.61. Carapace longer than wide, length 17.03, width 15.64. Abdomen length 17.12. PLS with three segments, distal digitiform, basal length 2.1, medial 1.9, distal 2.6. PMS well developed mono-segmented, length 1.0. Anterior eye row procurved, posterior recurved. Eyes sizes and inter-distances: AME 0.45, ALE



Figure 1. *Proshapalopus marimbai* n. sp. male, habitus. Scale bar = 1 cm.

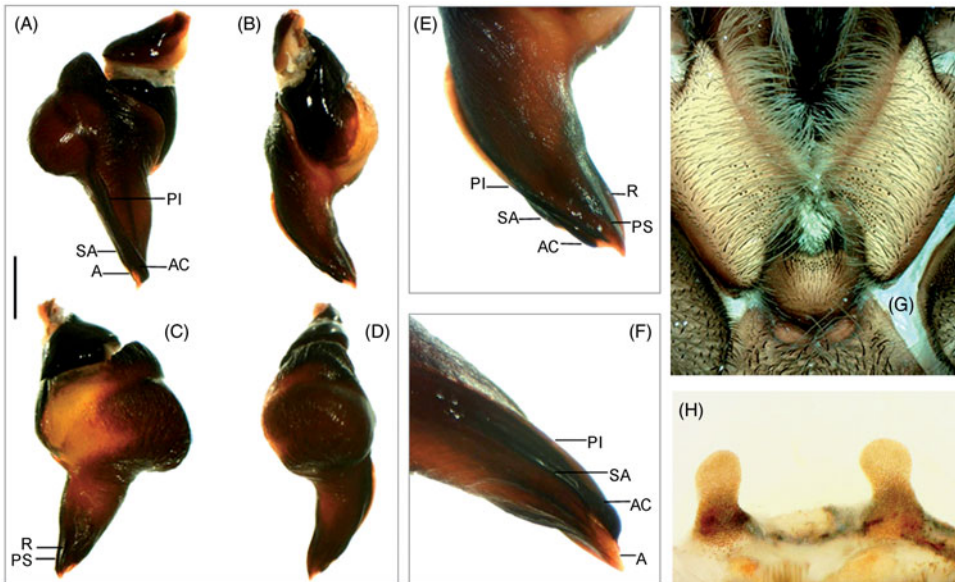


Figure 2. *Proshapalopus marimbai* n. sp. A–G, male: A–D, left palpal bulb. A, prolateral view; B, dorsal view; C, retrolateral view; D, ventral view; E, F, detail of apex of palpal bulb; E, dorsal view; F, prolateral ventral view; G, labium and maxillae; H, female, spermathecae. Scale bar = 1 mm.

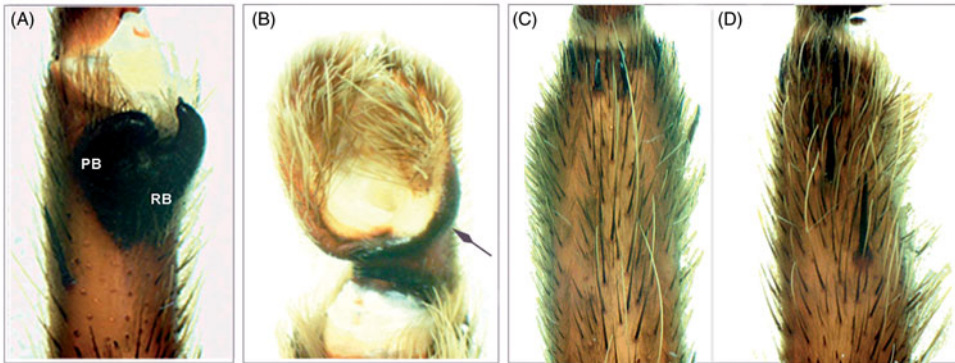


Figure 3. *Proshapalopus marimbai* n. sp. male. A, left tibial apophysis; B, left cymbium; C, D, left tibial palp: C, dorsal view; D, prolateral view. The arrow indicates the anterior retrolateral angle of the cymbium strongly sclerotized.

0.35, PME 0.2, PLE 0.3, AME-AME 0.25, AME-ALE 0.2, ALE-ALE 1.45, PME-PME 1.15, PME-PLE 0.05, PLE-PLE 1.5, AME-PME 0.2, ALE-PLE 0.2. OQ markedly elevated sub-rectangular, length 1.7, width 2.3, clypeus 0.2. Fovea transverse deep, slightly recurved, width 3.25. Cephalic region slightly raised, thoracic striations slightly conspicuous. Chelicerae without rastellum, basal segments with 14 well-developed teeth on furrow promargin and numerous small teeth on the proximal area of furrow. Intercheliceral tumescence absent. Labium sub-quadrangle, length 1.8, width 2.8, with 23 cuspules on the anterior half. Maxillae sub-rectangular, with 80/85 (left/right) cuspules restricted on the proximal prolateral angle, anterior lobe distinctly produced into conical process (Figure 2G). Labio-sternal junction narrow in the middle with two lateral nodules (Figure 2G). Sternum longer than wide, length 7.5, width 6.1, with three pairs of oval sigilla clearly distinguishable; smaller pair anterior more rounded, distanced less than its diameter from margin; larger pair posterior, distanced its diameter from margin. Slender legs. Superior tarsal claws with a median row of small teeth on proximal half: I 6 teeth; II-IV 7-8 teeth. Tarsal scopulae: I-IV scopulated with distal rhomboidal group of adhesive setae, that increases in size from anterior to posterior legs; tarsal scopulae I and III entire, IV divided by a medial stripe of longer conical setae. Metatarsal scopulae extent: I and II scopulated along all its length; III on distal half; IV apically, sparse scopulated. Femur III thickened. Femur IV with retrolateral scopula. Stridulatory setae absent. Urticating setae: only type III (intermediated type I-III) urticating setae present (urticating setae curved proximally, with a very small basal area of reversed barbs), located on dorsal patch in the posterior half of the abdomen. Tibial apophysis composed of two convergent branches originated from a common black base (Figure 3A): prolateral branch thickened and smaller, with a basal inner spine; retrolateral branch with small apical spine; one spine retrolateral on spur. Metatarsus I straight, when flexed touches the retrolateral branch of the male spur laterally. Palpal tibia with numerous spines on dorsal and prolateral faces (Figure 3C, D). Cymbium bilobed, the internal lobe largest, the anterior retrolateral angle strongly sclerotized (Figure 3B).

Palpal bulb sub-conical, straight, with accentuated ventral median depression (D) and embolus long, slightly flattened distally (Figure 2A-D). Prolateral keels present, the PS poorly developed forming the embolus edge distally; PI very long; AC present under the PI, accentuated distally; A small, translucent; SA long without small denticles; R present, not pronounced. Other flat accessory keels under SA (Figure 2A-F).



Color (alive): Cephalothorax and legs brown with black setae, abdomen brown with reddish large setae and a darker distal patch of urticating setae. Carapace covered by short black slender setae and bordered by numerous short reddish hairs pointing out. Legs covered by abundant slender hairs with long scattered hairs and short reddish hairs, numerous on coxae, trochanters and femora. Legs with numerous spiniform setae. Iridescent scopulae and claw tuft.

Spination (proximal to distal). Femur: palp: 0d, 0v, 0-0-1p, 0r; I: 0d, 0v, 0-0-1p, 0r; II: 0d, 0v, 0-0-1p, 0r; III: 0d, 0v, 0-0-1p, 0-0-0-1r; IV: 0d, 0v, 0p, 0-0-0-1r. Patella: palp and I-II: 0; III: 0d, 0v, 0p, 0-1-0r; IV: 0d, 0v, 0p, 0-1-0r. Tibia: palp: 0-0-4d, 0-0-1v, 2-2-6p, 0-0-3r (9 spines on distal dorsal and lateral border); I: 0d, 1-1-1v, 0-0-1p, 0r; II: 0d, 2-2-2v, 1-1-1p, 0r; III: 0d, 0-1-2v, 2-2-2p, 1-1-1r; IV: 0d, 1-2-3v, 2-2-1p, 1-2-2 r. Metatarsus: I: 0d, 0-0-2v, 0-1-0 p, 0r; II: 0d, 4-0-3v, 0-1-0p, 0r; III: 0-1-2d, 2-2-4v, 1-2-1p, 0-1-1r; IV: 2-2-2 d, 4-5-6v, 2-2-1p, 0-2-0r. Tarsus: palp and legs: 0.

Legs and palpal segments lengths (femur/patella/tibia/metatarsus/tarsus): palp: 8.81/5.85/9.27/-/3.51, total 27.44; I: 17.25/8.47/14.29/12.32/8.36, total 60.69; II: 15.66/7.65/13.05/13.31/8.14, total 57.81; III: 14.03/6.54/11.5/16.23/8.21, total 56.51; IV: 18.0/7.52/15.63/23.13/7.67, total 71.95.

Female (allotype ICN-Ar 8043). Total length, not including chelicerae or spinnerets 42.22; including chelicerae 48.03. Carapace longer than wide, length 19.21, width 15.82. Abdomen length 23.01. PLS with three segments, distal digitiform, basal length 3.5, medial 2.4, apical 3.3. PMS well developed mono-segmented, length 2.4. Anterior eye row slightly procurved, posterior recurved. Eyes sizes and inter-distances: AME 0.45, ALE 0.30, PME 0.35, PLE 0.40, AME-AME 0.45, AME-ALE 0.2, ALE-ALE 2.0, PME-PME 1.4, PME-PLE 0.05, PLE-PLE 2.0, AME-PME 0.30, ALE-PLE 0.50. OQ markedly elevated sub-rectangular, length 2.1, width 3.0, clypeus 0.2. Fovea transverse deep, slightly procurved, width 3.6. Cephalic region slightly raised, thoracic striations slightly conspicuous. Chelicerae without rastellum, basal segments of chelicerae with 13 well-developed teeth on furrow promargin and numerous small teeth on the proximal area of furrow. Intercheliceral tumescense absent. Labium trapezoidal sub-rectangular, length 3.2, width 3.5, with 36 cuspules. Maxillae sub-rectangular, with 96/100 (left/right) cuspules restricted on the proximal prolateral angle, anterior lobe distinctly produced into conical process. Labio-sternal junction broad. Sternum as long as wide, length 7.3, width 7.3, with three pairs of oval sigilla clearly distinguishable; as male. Superior tarsal claws with a median row of small teeth on proximal half; palp 0, legs I-II 3 teeth, III-IV 5 teeth. Tarsal scopulae: palp and I-IV scopulated with distal rhomboidal group of adhesive setae, increasing in size from anterior to posterior legs; palp and leg III narrowly divided by a medial stripe of few longer conical setae, legs I-II entire, IV divided by a medial stripe of longer conical setae. Metatarsal scopulae extent: I scopulated along all its length; II on distal 2/3; III distal 1/3; IV absent, very few adhesive setae. Femur IV with retrolateral scopula; less dense than male. Stridulatory setae absent. Urticating setae: only type I urticating setae present, located on dorsal patch in the posterior half of the abdomen; urticating setae type I with the region "a" longer or equal to region "b" (*sensu* Bertani 2001, Figure 4). Spermathecae with two short granulated seminal receptacles, separated by a weakly area; seminal receptacles stalk narrower than bulb (Figure 2H). Colour (in alcohol): brown, similar to the male but lighter and less pilose.

Spination (proximal to distal). Femur: palp and legs I and II: 0d, 0v, 0-0-1p, 0r; III: 0d, 0v, 0-0-1p, 0-0-1r; IV: 0d, 0v, 0p, 0-0-1r. Patella: palp and leg I; II: 0d, 0v, 0-1-0p, 0r; III: 0d, 0v, 0-1-0p, 0-1-0r; IV: 0d, 0v, 0p, 0-0-1r. Tibia: palp: 0d, 1-0-2v, 0-2-1p, 0-



Figure 4. Geographic distribution and habitat of *Proshapalopus marimbai* n. sp. A, Map of northern of South America showing the distribution; B, habitat, Reserva Natural Biotopo Selva Húmeda, Nariño, Colombia. Red circle: locality.

1-2r; I: 0d, 0-1-3v, 0p, 0r; II: 0d, 0-2-2v, 0-2-0p, 0r; III: 0d, 0-2-2v, 2-2-2 p, 0r; IV: 0-2-0 d, 1-2-3v, 1-1-0 p, 1-2-1r. Metatarsus: I: 0d, 2-0-3v, 0p, 0r; II: 0d, 1-3-3v, 1-2-1p, 0-0-1r; III: 0-0-2d, 3-3-4v, 1-1-2 p, 2-2-1r; IV: 1-1-1 d, 4-4-4 v, 1-2-1 p, 1-0-1r. Tarsus: palp and legs: 0.

Legs and palpal segments lengths (femur/patella/tibia/metatarsus/tarsus): palp: 10.31/6.18/8.09/-/5.67, total 30.25; I: 13.66/7.75/10.44/9.66/5.68, total 47.19; II: 12.59/7.56/9.21/9.65/5.7, total 44.71; III: 11.35/6.95/7.84/11.85/5.85, total 43.84; IV: 14.44/7.66/12.25/16.34/6.25, total 56.94.

#### *Distribution*

Only known for its type locality, Reserva Natural Biotopo Selva Húmeda, in Southwestern Colombia, Barbacoas Municipality, Nariño Department, Colombia (Figure 4).

#### *Natural history*

The “Reserva Natural Biotopo Selva Húmeda” is located in the coastal foothills of the Pacific Region, between 1°24'5" N-1°25'26" N and 78°17 '06" W-78°13'58" W, approx. 500 m a.s.l., which is equivalent to a Tropical wet forest according with the Holdridge (1971) life zones system. It has an average relative humidity of 88.6%, average temperature between 17 and 30 °C, rainfall between 6500 and 8000 mm per year, with its highest levels in May and September, and the lowest levels in August and December (Colmenares et al. 2005). This area is a unique rainforest, considered as one of the most rainy and humid rainforests in the world, with a great ecosystemic variety. It is estimated that the region sustains around 6000 species of plants and holds one of the highest rates of plant and continental bird’s endemism worldwide (Colmenares et al. 2005).

#### *Etymology*

The specific epithet is in honor of the music and tradition of the Southern Pacific of Colombia. The name is a noun in genitive and refers to one of the most emblematic percussion instruments of the region, the “marimba.”

### Cladistics

A search using equal weights and all characters codified as nonadditive with the previous matrix of Bertani et al. (2011), with the replacement of *Pterinopelma sazimai* Bertani, Nagahama & Fukushima, 2011 by *Pterinopelma felipeleitei* Bertani & Leal, 2016, and the inclusion of *P. marimbai* n. sp (Table 1), found 16 most parsimonious trees, each of 91 steps. The strict consensus of these did not provide a clear resolution although this consensus recovered *P. marimbai* n. sp. related phylogenetically with the other *Proshapalopus* species.

Searches with implied weighting varying the concavity indices ( $k$ ) between 3 and 5 and all nonadditive characters found between 3 and 4 shortest trees. The strict consensus of each concavity recovered the same topology (Figure 5B). Comparing this topology with the tree obtained by Bertani et al. (2011), *Vitalius* Lucas, Silva Junior & Bertani, 1993 is not recovered as monophyletic and constitutes a monophyletic group together with *Nhandu* Lucas, 1981. Searches with implied weighting and  $k=6-12$  recovered a single tree with the same topology (Figure 5A). This topology is similar to the tree topology preferred by Bertani et al. (2011), which was obtained with the same setting and  $k=6$ , although in the current hypothesis *Pterinopelma* is not recovered as monophyletic.

### Phylogenetic relationships

All results obtained, varying the parameters, recovered *P. marimbai* n. sp. within the node that supports the monophyly of the genus *Proshapalopus*, and their phylogenetic relationships within the group remain constant (*P. amazonicus* (*P. marimbai* n. sp. (*P. anomalus* + *P. multicuspidatus*))).

In the two hypotheses obtained, the monophyly of *Proshapalopus* is supported by the presence of a prolateral accessory keel under prolateral inferior keel, state (1) on character 5, and male palpal bulb with pronounced depression at ventral median area, state (1) on character 9, with reversion on *P. anomalus* (with slight depression). *Proshapalopus* recovers as sister group of (*Pterinopelma*, *Lasiodora*, *Vitalius* and *Nhandu*) in a node supported by one synapomorphy: sub-apical keel present, state (1) on character 4 (Figure 5).

*Proshapalopus marimbai* n. sp. was recovered as the sister group of (*P. anomalus* + *P. multicuspidatus*). The clade (*P. marimbai* n. sp. (*P. anomalus* + *P. multicuspidatus*)) is supported by one synapomorphy: male dorsal palpal tibia apex with a row of 5 or more spines, state (1) on character 31. Two homoplastic characters also support this node: palpal bulb with embolus short, state (1) on character 0, and male legs long and narrow, state (1) on character 27.

### Discussion

The analysis of the morphological characters, as well as the hypotheses obtained in the cladistic analysis, confirmed the inclusion of the tarantulas' specimens from "Biotopo," Tumaco, Colombia, into the genus *Proshapalopus* as a new species.

According to Bertani (2001), males of *Proshapalopus* can be distinguished by the presence of an accessory keel under the prolateral inferior keel on the palpal bulb. However, other Theraphosinae genera, not included in the matrix of Bertani (2001) and Bertani et al. (2011), showed this character (e.g. *Catanduba* Yamamoto, Lucas &

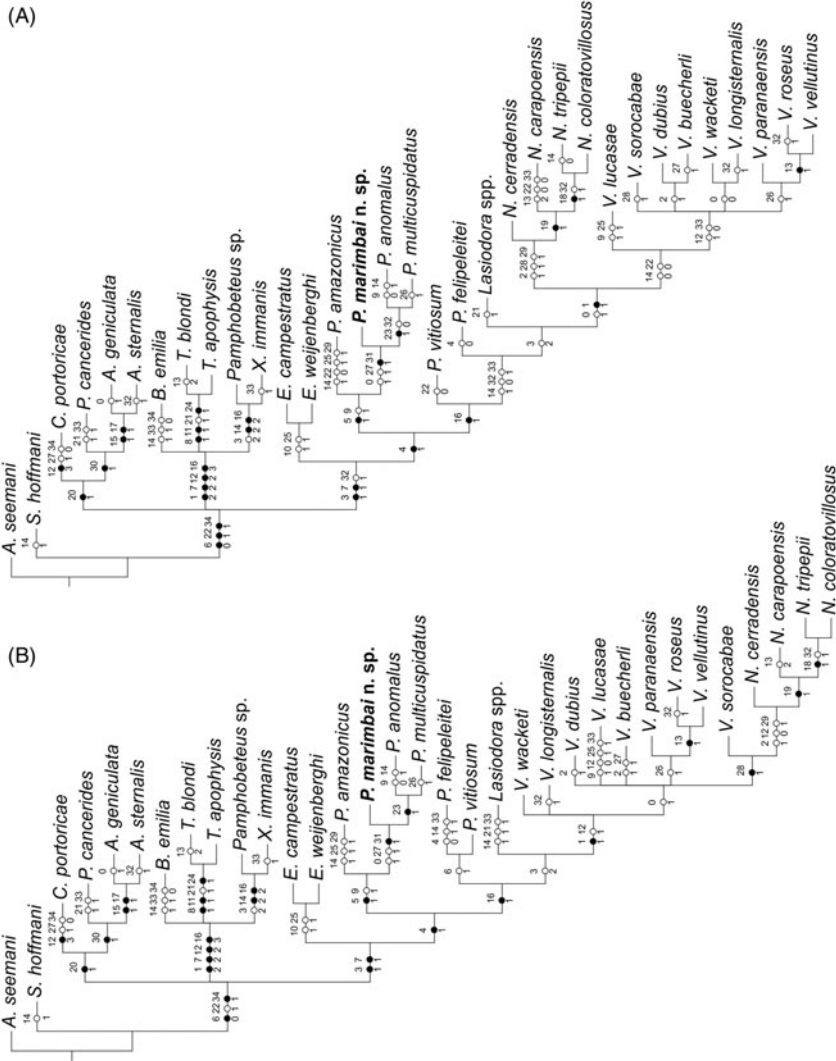


Figure 5. Phylogenetic hypotheses. A, single tree obtained with maximum parsimony, heuristic search, all characters nonadditive and concavities 6–12 ( $k=6$ , fit =29.81, length =91); B, single tree obtained with maximum parsimony, heuristic search, all characters nonadditive and concavities 3–5 ( $k=3$ , fit =27, length =96). Black and white circles represent homologous and homoplastic characters, respectively.

Brescovit, 2012, *Megaphobema* Pocock, 1901). Consequently, we suggest the diagnosis for *Proshapalopus* males as follows: males of *Proshapalopus* can be distinguished by having conical palpal bulb with ventral median depression (D) on embolus (with exception of *P. anomalus*, which is not pronounced) and an accessory keel (AC) under prolateral inferior keel (PI), and distal edge of the tibial palp with many spines.

*Proshapalopus marimbai* n. sp. can be easily distinguished from other species of the genus by the reduced number of labial cuspules, around 40 (more than 100 on the other species), males by the thickened femur III, palpal bulb with prolateral inferior keel very long (from D to embolus apex) and the accessory keel pronounced distally, and females by the absence of urticating setae type III and not thickened tibia IV.

The new species expands the geographical distribution of *Proshapalopus*, previously known with three species from Brazil. Bertani (2001) discussed that *Proshapalopus* presents a disjunct distribution in Brazil, where *P. amazonicus* is distributed in Amazon Forest, from the northern State of Mato Grosso to the south of the State of Pará, and *P. multicuspidatus* and *P. anomalus* are distributed in the Atlantic Forest; the first from the state of Paraíba to south of the state of Bahia and the second from extreme southeast of state of Minas Gerais to the states of Rio de Janeiro and Espírito Santo, south of Rio Doce River.

*Proshapalopus marimbai* n. sp. is distributed on “Reserva Natural Biotopo Selva Húmeda,” located in Chocó Region from Colombian Pacific. This Region shows similar characteristics to the ecosystems where the other species are found: dense vegetation, high temperature and humidity, with high levels of rainfall. *Proshapalopus* requires specific habitat conditions and thereby suggests historical relationships in the fragmented areas where it is currently distributed: Amazon Forest, Atlantic Forest and Chocó Region. This provides evidence of the connections between the eastern and western biota of northern of South America, belatedly separated by the northern region of the Andes mountain range (Antonelli et al. 2009).

Colombia is a megadiverse country, which diversity of Mygalomorphae spiders is still far from being discovered, although the research line in the country has been recently initiated. For this reason, the classification of some new taxa distributed in the country still offers some doubts. The disjunct distribution of *P. marimbai* n. sp., in relation to the other species of the genus, might lead to other different hypotheses. *P. marimbai* n. sp. could be part of a new taxonomic group, together with other species not yet discovered. Likewise, *P. marimbai* n. sp. could also belong to a different genus distributed in the region, which taxonomy might be still unclear. The general shape of the palpal bulb and the spermathecae resemble the reproductive organs of *Cyclosternum* Ausserer, 1871 and *Pseudhapalopus* Strand, 1907 distributed also in Colombia. However, these two genera present taxonomic problems and their monophyly is in doubt, so an urgent revision of these groups is necessary. Thereby, the inclusion of a new taxon within one of these genera could not be clearly justified. There is still a need to improve the information of these genera, as well as the development of new studies of the taxa distributed in Colombia. Until we are able to attain better information about these genera and new studies of the taxa distributed in Colombia the most prudent is to include this new species from Tumaco within the *Proshapalopus* genus.

Lastly, it is worth highlighting that our phylogenetic results call into question the monophyly of the genera *Pterinopelma* and *Vitalius*.

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