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Two new species of *Pamphobeteus* Pocock 1901 (Araneae: Mygalomorphae: Theraphosidae) from Brazil, with a new type of stridulatory organ

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Abstract

Two new species of *Pamphobeteus* Pocock 1901 are described from Brazil: *Pamphobeteus crassifemur* sp. nov. and *Pamphobeteus grandis* sp. nov.; *Pamphobeteus nigricolor*, formerly described from Colombia, Ecuador and Bolivia, is recorded from Brazil and its distribution in Ecuador and Bolivia is questioned. A new type of stridulatory organ is described from legs III and IV of *P. crassifemur* sp. nov. The structure consists of spiniform setae. Stridulation occurs when the spider moves the legs III and IV, sometimes while shedding urticating hairs.

Key words: Tarantula, Taxonomy, Morphology, Amazon, Stridulatory organ

Introduction

The spider genus *Pamphobeteus* Pocock 1901 comprises some of the largest spiders in the world and was first distinguished from *Lasiodora* C.L. Koch 1850 by the absence of both a scopula on the inferior side of the first leg femur and stridulatory organ on the anterior side of the first leg coxa and on the opposing posterior side of the palpal coxa (Pocock 1901). The type species is *Lasiodora nigricolor* Ausserer 1875 from Bogota, Colombia. It is found in northwestern South America and comprises ten species described from Colombia, Ecuador, Bolivia and Peru.

Pocock (1903) added three new species to *Pamphobeteus: Pamphobeteus antinous* Pocock 1903, from Bolivia, *Pamphobeteus insignis* Pocock 1903 and *P. ornatus* Pocock 1903 both from Colombia. In the same work he transferred the Colombian *Pamphobeteus fortis* (Ausserer 1875) and *Pamphobeteus ferox* (Ausserer 1875), the Ecuadoran *Pamphobeteus augusti* (Simon 1889) and *Pamphobeteus verpertinus* (Simon 1889) from *Lasiodora* .

Many more species were described in *Pamphobeteus* by Mello-Leitão (1923), viz., *Pamphobeteus platyomma* Mello-Leitão 1923, *Pamphobeteus melanocephalus* Mello-Leitão 1923, *Pamphobeteus cesteri* Mello-Leitão,1923, *Pamphobeteus rondoniensis* Mello-Leitão 1923, *Pamphobeteus roseus* Mello-Leitão 1923, *Pamphobeteus sorocabae* Mello-Leitão 1923, *Pamphobeteus cucculatus* Mello-Leitão, 1923, *Pamphobeteus tetracanthus* Mello-Leitão 1923, *Pamphobeteus exsul* Mello-Leitão 1923, *Pamphobeteus holophaeus* Mello-Leitão 1923, *Pamphobeteus insularis* Mello-Leitão 1923 and *Pamphobeteus anomalus* Mello-Leitão 1923. He also transferred *Crypsidromus isabellinus* Ausserer 1875 and *Lasiodora benedeni* Bertkau 1880, to *Pamphobeteus.*

Piza described more new species over a number of years including *Pamphobeteus piracicabensis* Piza 1933, *Pamphobeteus masculus* Piza 1939, *Pamphobeteus communis* Piza 1939, *Pamphobeteus cephalo-*

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phaeus Piza 1944, *Pamphobeteus mus* Piza 1944 and *Pamphobeteus litoralis* Piza 1976. Soares (1941) described two species: *Pamphobeteus urbanicolus* Soares 1941 and *Pamphobeteus ypiranguensis* Soares 1941.

All *Pamphobeteus* species described by Mello-Leitão, Piza and Soares are from Brazil. Lucas, Silva Jr & Bertani (1993) considered that the Brazilian species described by these authors were clearly distinct from those distributed in northwestern South America and transferred most of them to the new genus *Vitalius* Lucas, Silva Jr & Bertani 1993. *Pamphobeteus anomalus* Mello-Leitão 1923 was transferred to *Eupalaestrus* Pocock 1901 by these same authors and later transferred by Bertani (2001) to *Proshapalopus* Mello-Leitão 1923. As this name was preoccupied, then the species was called *Proshapalopus amazonicus* (Bertani 2001) by Bertani (2001).

Schmidt (1995) described *Pamphobeteus ultramarinus* Schmidt 1995 from Ecuador, and Schmidt & Antonelli (1996) described *Pamphobeteus striatus* Schmidt & Antonelli, 1996 from Peru. Schmidt & Bischoff (1997) transferred *P. striatus* to a new genus, *Lasiodorides* Schmidt & Bischoff 1997. Pérez-Miles *et al.* 1996 transferred *Pamphobeteus isabellinus* to *Lasiodora*. Bertani (2001) transferred a Brazilian species *Pamphobeteus benedeni* (Bertkau 1880) back to *Lasiodora* and transferred *Pamphobeteus holophaeus* Mello-Leitão 1923 to *Eupalaestrus* Pocock 1901, which was then synonymized with *Eupalaestrus spinosissimus* Mello-Leitão 1923. Schmidt (2002) described another species from Ecuador and Peru, *Pamphobeteus petersi* Schmidt 2002.

Currently, there are ten species in *Pamphobeteus—P. antinous, P. augusti, P. ferox, P. fortis, P. insignis, P. nigricolor, P. ornatus, P. petersi, P. ultramarinus* and *P. vespertinus*—distributed in northwestern South America. The genus is more speciose in the Andean mountain range of Colombia and Ecuador. Few species recorded east of the Andes: *P. antinous, P. petersi* and *P. ultramarinus*. Until now, no *Pamphobeteus* species had been recorded from Brazil.

Although many species were recently described, *Pamphobeteus* has never been revised. After examining most of the types of species included in *Pamphobeteus*, we recognised that two Brazilian species were new. Herein, we describe these new species and extend our knowledge of the distribution of *P. nigricolor* to include Brazil.

Material & methods

Specimens from the following institutions were examined: IBSP – Instituto Butantan, São Paulo; MNRJ – Museu Nacional, Rio de Janeiro; BMNH – The Natural History Museum, London; MNHN – Muséum National d'Histoire Naturelle, Paris; SMF – Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt-am-Main.

A Nikon SMZ1500 dissecting microscope was used for illustrations (with a camera Lucida attachment). Abbreviations: ALE = anterior lateral eyes, AME = anterior median eyes, ap = apical, d = dorsal, p = prolateral, PLE = posterior lateral eyes, PLS = posterior lateral spinnerets, PME = posterior median eyes, PMS = posterior median spinnerets, r = retrolateral, STC = superior tarsal claws, v = ventral. Male palpal bulb keel terminology follows Bertani (2000); urticating hair terminology follows Cooke *et al. (*1972). All measurements are in millimeters (mm).

Type material examined of other species

Pamphobeteus antinous Pocock 1903 holotype male from Bolivia, Madre de Dios, BMNH 1895–11–9–2; *Pamphobeteus augusti* Simon 1889 four syntypes males and one immature male from Ecuador, MNHN Ar–4780; *Pamphobeteus ferox* Ausserer 1875 three syntypes females and two immature males from Colombia, Bogota, BMNH 1890.7.1.376; *Pamphobeteus fortis* Ausserer 1875 holotype female from Colombia, Bogota,

BMNH 1890.7.1.368; *Pamphobeteus insignis* Pocock 1903 two syntypes males from Colombia, Cauca, BMNH 46–20; *Pamphobeteus ornatus* Pocock, 1903 holotype male from Colombia, Rio Dagua, BMNH 1896.3.15–5; *Pamphobeteus nigricolor* Ausserer 1875 syntypes male and female from Colombia, Bogota, BMNH 1890–7–1–373; *Pamphobeteus ultramarinus* Schmidt 1995, holotype male from Ecuador, near Tena, SMF 38594, and *Pamphobeteus verspertinus* Simon 1889, holotype male from Ecuador, Los Fuentes, near Quito, MNHN Ar–4775.

Stridulation in *Pamphobeteus crassifemur* sp. nov. was recorded by a Handycam Sony TRV15 8mm in 2000 after an unsuccessful mating trial.

Taxonomy

Pamphobeteus Pocock 1901

Lasiodora (ad part): Ausserer 1875: 192–194; Simon 1888: 403–404.
Pamphobeteus Pocock 1901: 545; Pocock 1903: 91–93; Roewer 1942: 251–252; Bonnet 1958: 251; Schiapelli & Gerschman de Pikelin 1979: 295–296, Figs 25–31; Pérez-Miles *et al*. 1996: 54; Brignoli 1983 : 133, 139; Platnick 2008.

Type species: – *Lasiodora nigricolor* Ausserer 1875; by original designation.

Diagnosis: – *Pamphobeteus* is most similar to *Xenesthis* Simon in males having an embolus with concave/convex aspect in conjunction with the presence of a well developed apical keel that extends largely by the embolous edge, a well developed retrolateral keel (Figs 1–3), and metatarsus I folding between the tibial spur processes (Fig. 4); females have spermathecae largely fused, but still presenting vestiges of the two spermathecae in the distal region (Fig. 6). Males and females can further be distinguished from *Xenesthis* by having the scopulae on metatarsi IV restricted to apical portion.

Distribution: – The species occurs in northwestern South American (Colombia, Ecuador, Peru, Bolivia and Brazil) (Fig. 19).

Pamphobeteus nigricolor (Ausserer 1875)

Lasiodora nigricolor Ausserer 1875: 192, plate 7, fig. 36.
Pamphobeteus nigricolor: Pocock 1901: 545; Schiapelli & Gerschman 1979: 295, figs 25–31; Schmidt 1993: 92, figs 256–258; Pérez-Miles *et al*. 1996: 54, fig. 32; Schmidt 1997 and 1998: 20, figs 220–222; Bertani 2000: 30, figs 39–40.
Pamphobeteus negricolor: Smith 1986: 160, fig. 72h; Smith 1987: 160, fig. 72h.

Diagnosis: – Males resemble those of *P. augusti*, *P. insignis* and *P. ornatus* by the slender embolus; they can be distinguished from these three species by the embolus being roughly the same width for its length, i.e., without any constriction on apex. Females resemble those of *P. ferox* and *P. fortis* by the spermathecae having narrow bases, less than two times receptaculum length. They can be distinguished from *P. ferox* by the lateral sides of the spermathecae basis not extending laterally and from *P. fortis* by the unconstricted receptacula stalks.

Material examined: – BRAZIL: Amazonas: Seringalzinho, Jaú National Park, 01º 50'S 61º 35'W, IBSP 9698, male, S. Couceiro *et al.* col., 7 Aug 2000.

Distribution: – Colombia and here newly recorded from the state of Amazonas, Brazil.

Remarks: – Pocock (1901), after diagnosing *Pamphobeteus*, and designating the type species as being *P. nigricolor*, cited their zoogeographical range as Colombia, Ecuador and Bolivia. However, it is unclear whether he was referring only to the type species or to the genus. Pocock (1903) described three new *Pampho-*

beteus species and transferred two other species to *Pamphobeteus*, having as the geographical distribution the same three countries. Hence, we believe that Pocock (1901) was referring to the genus distribution (he was probably then aware that *Pamphobeteus* species occurred in those countries). *P. nigricolor* seems to be found only in the region of the Colombian–Brazilian border. It is improbable that this species reaches Ecuador and Bolivia. Furthermore, *P. nigricolor* was described from specimens from "Neu-Granada" (Colombia); the syntype labels have the inscription "Bogota". However, the city of Bogota, situated at a high altitude (2640 meters above sea level), has no recent records of theraphosids (Juan Jacobo Jimenez, pers. com.). On the other hand, it was, in the past, an important center in South America. Hence, we suggest that the type specimens came from lower elevation forests east of the Andean cordillera and were dispatched to Europe through Bogota, thus causing this confusion. The collection of a specimen in the Brazilian Amazon forest support this suggestion.

Note: – Females of *P. ornatus*, *P. insignis* and *P. augisti* are undescribed. Males of *P. ferox* and *P. fortis* were described by Schmidt (1990) and Strand (1907), respectively. However, it is not possible to be sure that they are conspecific with their males based only on these poor descriptions.

***Pamphobeteus crassifemur* sp. nov.**
(Figs 1–12, 19. Tables 1, 2)

Xenesthis sp. Lucas 1982: 351 (misidentification).

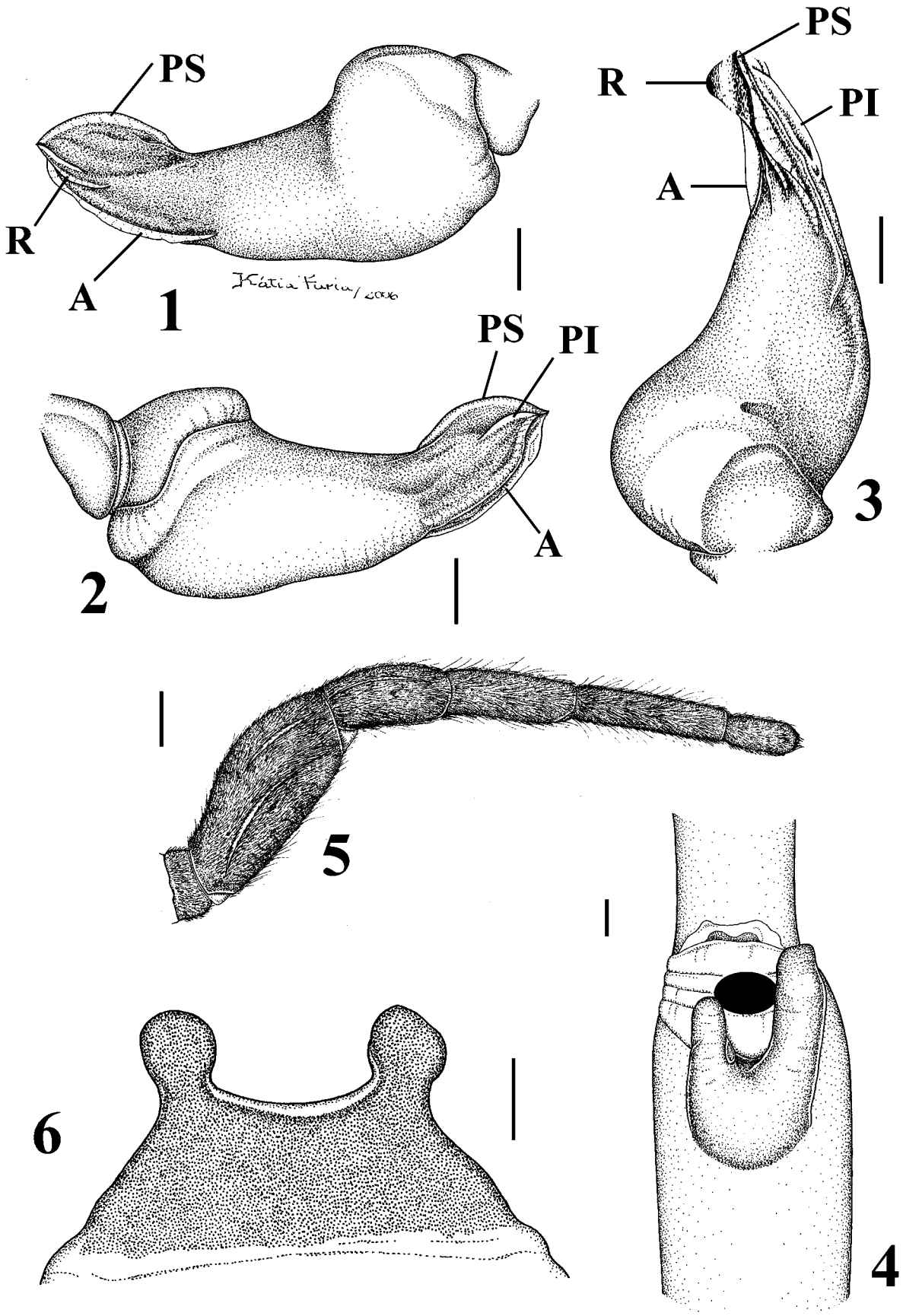
Diagnosis: – Males resemble those of *P. antinous*, *P. grandis* sp. nov., *P. petersi*, *P. ultramarinus* and *P. vespertinus* by the broad embolus. They can be distinguished by the thickened femora, especially the 3rd pair (Fig. 5). This characteristic feature is also diagnostic for females (Fig. 8).

Material examined: – Holotype male IBSP 8330, Brazil: Rondônia: Samuel Hydroelectric Power Station Dam, IBSP Faunal Rescue Team of Collectors, 9 Feb 1989. Paratype female IBSP 4945, as for holotype but, M. Costa, 10 Feb 1989.

Additional material examined: – BRAZIL: Rondônia: Porto Velho, dam of Samuel Hydroelectric Power Station, IBSP 12395, 1 female, 9 Feb 1989 and 1 immature, 30 Jan 1989; IBSP 12394, 1 female, 20 Dec 1998 and 1 immature, 30 Jan 1989; IBSP 12396, 1 female, 9 Feb 1988 and 1 immature, 20 Dec 1988; IBSP 12392, 1 female, 10 Feb 1989 and 1 immature, 30 Jan 1989; IBSP 12397, 1 female, 9 Jan 1989; IBSP 12393, 1 female, 10 Feb1989 and 1 immature, 9 Jan 1989; IBSP 12391, 1 female and 1 immature, 10 Feb 1989; IBSP 4945, 1 female, M. Costa col., 10 Feb 1989; IBSP 4946, 1 female, 2 immatures; IBSP 11132, 1 male; IBSP 10324, 1 male, 10 Feb 1989; IBSP 11142, 1 female; IBSP 7025, 1 female, M. Costa col.; IBSP 8332, 1 male, 12 Dec 1988; IBSP 8330, 1 male, 9 Feb 1989; IBSP 10320, 1 female, 10 Feb 1989; Montenegro, IBSP 10378, 1 male, R. Bertani col., 22 Jul–2 Aug 2002; Pimenta Bueno, Tchegau Farm, IBSP 4548, 1 female, R. S. G. Almeida col., Jun 1989; Casseterite mineration area, between Alto Candaias and Massangana, IBSP 4096, 1 female, C. Froelich ded. May 1971; Mato Grosso: Barracão Queimado, 120 km from Vilhena, BR-29 road, IBSP 3633, 1 female, Dr. H. Araújo ded., 28 Sep 1962.

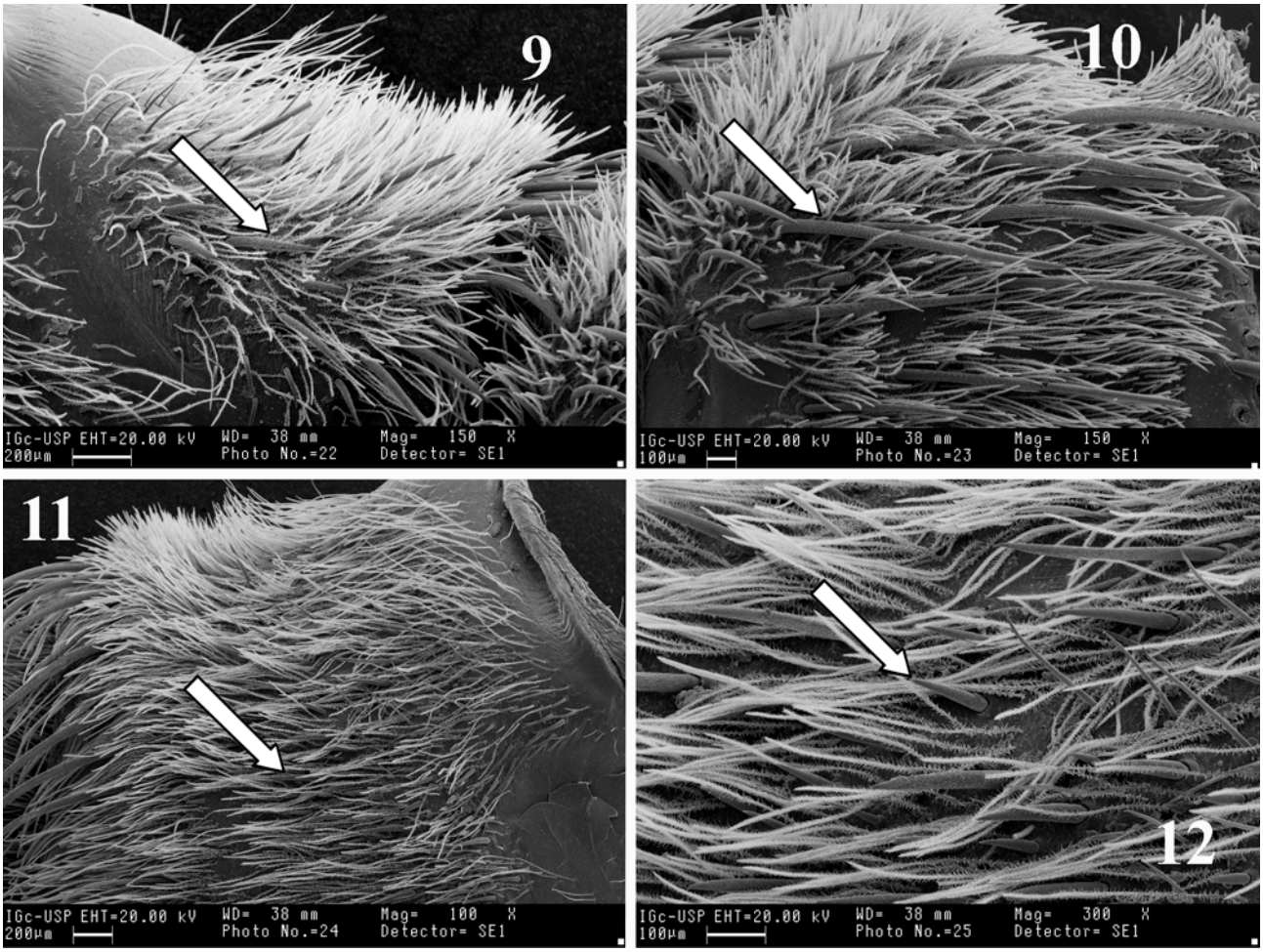
Etymology: – The specific name is taken from the Latin, *crassus* meaning "thick" and femur, a feature of the legs of males and females of this species.

Description: Holotype male. Total length, not including chelicerae or spinnerets 57. Cephalothorax 28.81 long, 27.31 wide. Anterior eye row procurved, posterior row recurved. Eyes sizes and inter-distances: AME 0.75, ALE 0.60, PME 0.74, PLE 1.02, AME–AME 0.56, AME–ALE 0.46, AME–PME 0.42, ALE–ALE 2.26, ALE–PME 0.48, PME–PME 1.75, PME–PLE 0.21, PLE–PLE 3.05, ALE–PLE 0.66. Eye tubercle: length 3.05, width 3.71; clypeus 1.5. Fovea: deep, straight, 4.72 long. Cephalic area moderately raised. Thoracic striae conspicuous. Labium: length 3.62, width 3.73, with 72 cuspules. Maxillae: between 100–200 cuspules



FIGURES 1–6. *Pamphobeteus crassifemur* sp. nov.. 1–5 Male holotype. 1–3. Palpal bulb. 1, retrolateral, 2, prolateral, 3, dorsal. 4, Tibial apophysis, ventral. 5, Leg. III, dorsal. (6) Female paratype, spermathecae.

FIGURES 7–8. *Pamphobeteus crassifemur* sp. nov.. 7, Male. 8, Female. Photos : R. Bertani.



FIGURES 9–12. *Pamphobeteus crassifemur* sp. nov.. Stridulatory setae. 9, Coxa IV, prolateral. 10, Trochanter IV, prolateral. 11, Coxa III, retrolateral, 12, Same, detail. Arrows show spiniform setae.

spread across inner edge. Sternum: length 13.55, width 9.02. Sigilla: small anterior pairs, less than one diameter from margin and larger posterior pair, more than two diameters from margin. Chelicerae: 11 teeth decreasing in size from distal area and row of small teeth on promargin. Tarsi I–IV densely scopulate. Metatarsi I – II

fully scopulate; III 1/2 densely scopulate; IV 1/3 densely scopulate. All femora thickened, mainly 3rd pair (Fig. 5). Spination: femora and patellae I–IV and palp 0; tibiae palp v0–0–1, p0–1–0; I 0, II v0–1–2(ap), p1–0–0; III v0–1–2(ap), IV v0–1–0; metatarsi I 0, II v1–0–0, III v0–2–3 (2 ap), r0–0–1, IV v11(2ap), p2–0–1. Spiniform setae on prolateral coxae I, retro- and prolateral coxae II–III, retrolateral coxae IV; prolateral/dorsal trochantera I, prolateral/dorsal and retrolateral/dorsal trochantera II–III, retrolateral trochantera IV (Figs 9–12). STC with small teeth. PLS articles length: apical 6.28, medial 4.04 and basal 4.72. PMS rounded, small. Urticating hair types I and III present. Cephalothorax and abdomen dark brown with red-brown hairs. Femora, patellae and tibiae with conspicuous stripes. Slight purple sheen on femora. Tibial apophysis with retrolateral process longer than prolateral (Fig. 4). Metatarsus I folds between the two processes. Male palpal bulb strongly flattened laterally, spoon-like shaped (Figs. 1–3). Prolateral superior keel well-developed, prolateral inferior weakly developed. Apical keel extended ventrally to middle of embolus. Retrolateral keel short, reaching less than 0.25 of embolus length, strongly developed forming crest distally.

TABLE 1. *Pamphobeteus crassifemur* sp. nov.. Male holotype. Length of left legs and palpal segments.

	Palp	I	II	III	IV
Tarsus	7.02	14.25	13.63	13.30	14.27
Metatarsus	——	22.07	21.27	23.44	30.39
Tibia	14.52	17.94	18.51	17.48	20.95
Patella	9.82	13.14	12.62	13.25	13.48
Femur	16.20	25.39	23.62	22.46	26.01

TABLE 2. *Pamphobeteus crassifemur* sp. nov. Female paratype. Length of left legs and palpal segments.

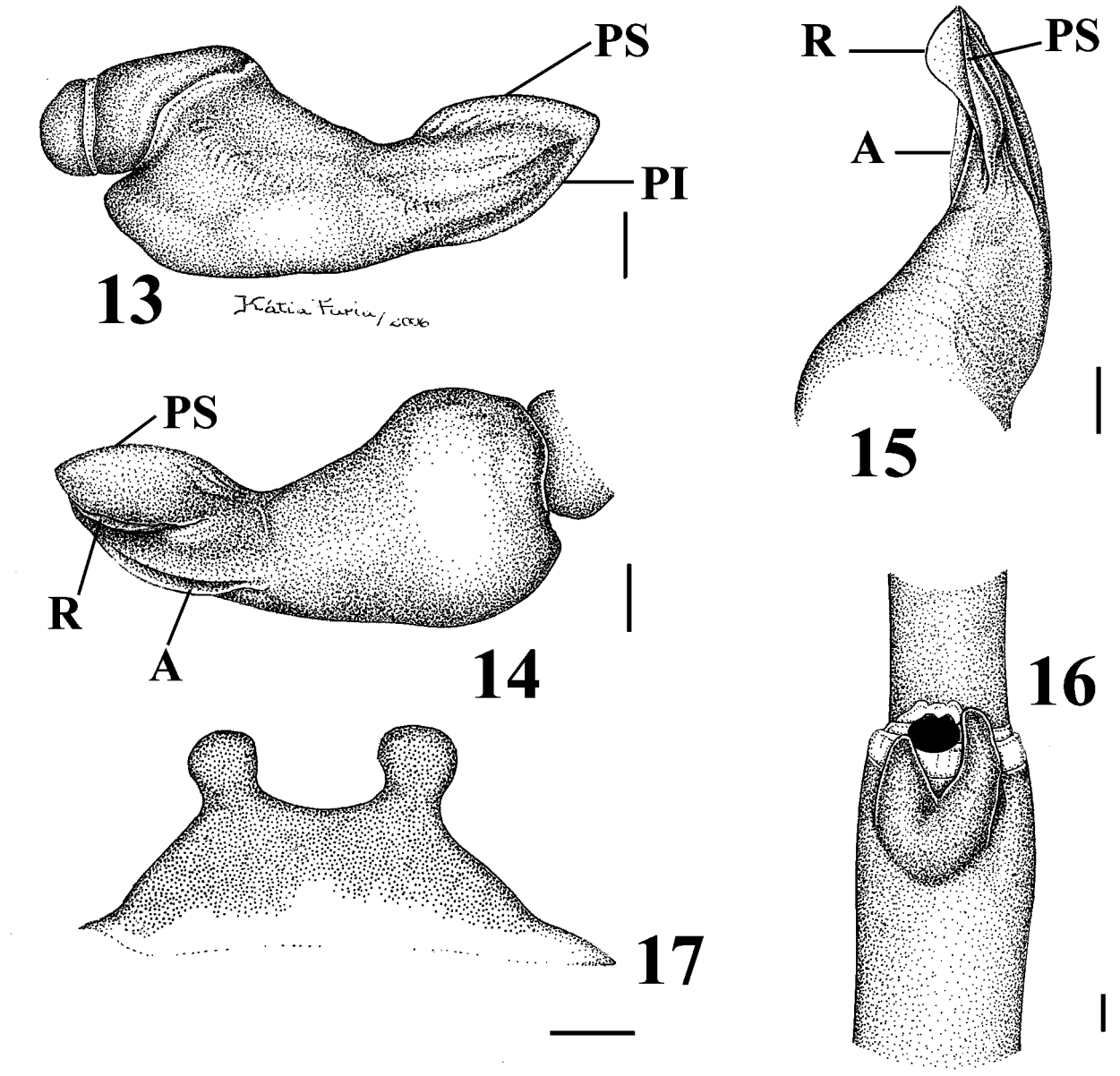
	Palp	I	II	III	IV
Tarsus	12.86	12.16	11.17	11.02	12.07
Metatarsus	——	17.18	17.35	19.79	26.80
Tibia	10.92	16.71	15.51	15.75	19.39
Patella	8.42	12.46	12.46	12.17	12.29
Femur	14.04	22.72	20.63	19.05	24.30

Description: – Paratype. Female. IBSP 4945. Total length, not including chelicerae or spinnerets 66. Cephalothorax 30.87 long, 28.98 wide. Anterior eye row procurved, posterior row recurved. Eyes sizes and inter-distances: AME 0.73, ALE 0.72, PME 0.85, PLE 1.12, AME–AME 0.73, AME–ALE 0.65, AME–PME 0.21, ALE–ALE 2.49, ALE–PME 0.62, PME–PME 1.89, PME–PLE 0.24, PLE–PLE 3.18, ALE–PLE 0.67. Eye tubercle: length 3.23 width 4.07; clypeus 2.12. Fovea: deep, straight, 5.55 wide. Cephalic area moderately raised. Thoracic striae conspicuous. Labium: length 4.99, width 4.43, at least 145 cuspules. Maxillae: 100–200 cuspules spread across internal edge. Sternum: length 13.14, width 10.31. Sigilla: posterior, small, more than two diameters from margin. Chelicerae: eight well-developed teeth and row of small teeth on promargin. Tarsi I–IV fully scopulate. Metatarsi I–IV fully scopulate, metatarsi III–IV scopulate on apical half. Spination: femora I–IV and palp 0; patellae palp 0, I v0–0–2(ap), II v0–0–2(ap), III and IV 0; tibiae palp v0–4–3(2 ap), I v0–0–2(ap), II v0–0–2(ap), III v0–1–3(ap), IV v0–0–1(ap); metatarsi I v0–0–2(ap), II v1–0–2(ap), III v3–3–3(ap), r1–0–0, p1–0–0, IV 19(2 ap). Spiniform setae and STC as in male. PLS articles length: apical 6.02, medial 5.0 and basal 4.12. PMS rounded, small. Urticating hair types I and III present. Color pattern as in male, except for absence of purple sheen. Two spermathecae broadly fused (Fig. 6).

Distribution: Brazil: states of Rondônia and Western Mato Grosso (Fig. 19) .

***Pamphobeteus grandis* sp. nov.**
(Figs 13–19. Tables 3, 4)

Material examined: – Holotype male, MNRJ 34, Brazil: Acre: Embira River, B. de Oliveira. Paratypes: female, IBSP 8246, Brazil: Acre: Serra do Divisor National Park, R. Vieira *et al.* col., 9 Apr 1997; male, MNRJ 13594, Brazil: Amazonas, Rio Itecoahy Parko col., 1942; male, MNRJ 13710, Brazil: Amazonas: Rio Itecoahy Parko col. and 1 female , 2 males, MNRJ 14001, Brazil: Goiás: Lako col.



FIGURES 13–17. *Pamphobeteus grandis* sp. nov.. 13–16 Male holotype. 13–15. Palpal bulb. 13, prolateral, 14, retrolateral, 15, dorsal. 16, Tibial apophysis, ventral. 17 Female paratype, spermathecae.

Diagnosis: – Males resemble those of *P. antinous*, *P. crassifemur* sp. nov., *P. petersi*, *P. ultramarinus* and *P. vespertinus* by the broad embolus; they can be distinguished from *P. vespertinus*, *P. ultramarinus* and *P. petersi* by the shorter embolus; from *P. crassifemur* sp. nov. by lacking thickened leg femora, especially the 3rd pair, and from *P. antinous* by the more developed retrolateral keel on the bulb and the purple (instead of steel

blue) femora. Females resemble those of *P. petersi*, *P. crassifemur* sp. nov. and *P. ultramarinus* in the spermathecae having a wide base, more than twice as long as the receptaculum (Fig. 17). They can be distinguished from *P. crassifemur* sp. nov. by lacking thickened femora, from *P. petersi* by its uniform abdominal color pattern , which contrasts with the red hairs of the latter, and from *P. ultramarinus* by the uniform cephalothorax pattern, without two large colored areas from both sides of eye tubercle that extend backwards.

Etymology: – The specific name means "huge" in Latin. The specimen was found with a label written by Brazilian arachnologist, Cândido Mello-Leitão, stating "*Phormictopus grandis*, typus". However, the species has remained unpublished until now.

FIGURE 18. *Pamphobeteus grandis* sp. nov.. Male. Photo: Rick C. West.

Description (Holotype male): – Total length, not including chelicerae or spinnerets 56. Cephalothorax 28.66 long, 24.70 wide. Anterior eye row procurved, posterior row recurved. Eyes sizes and inter-distances: AME 0.68, ALE 1.05, PME 0.42, PLE 0.65, AME–AME 0.49, AME–ALE 0.59, AME–PME 0.28, ALE–ALE 2.07, ALE–PME 0.55, PME–PME 1.92, PME–PLE 0.13, PLE–PLE 2.85, ALE–PLE 0.45. Eye tubercle: length 2.99, width 3.63; clypeus 1.26. Fovea deep, straight, 4.84 wide. Cephalic area moderately raised. Thoracic striae conspicuous. Labium: length 3.72, width 4.37, with 60 cuspules. Maxillae: 100–200 cuspules spread across inner edge. Sternum: length 11.47, width 10.20. Sigilla: posterior pair more than two diameters from margin. Chelicerae: 12 teeth decreasing in size from distal area and row of small teeth on promargin. Tarsi I–IV densely scopulate. Metatarsi I fully scopulate; II 2/3 scopulate, III 1/2 densely scopulate; IV 1/3 densely scopulate. Spination: femora palp p0–0–1, I p0–0–1, II p0–0–1, III p0–0–1, r0–0–1, IV r0–0–1; patellae palp 0, I p2, II p2, III p3, r2, IV p2, r3; tibiae palp v0–1–0, p3–3–2, I p1–1–1, II v0–1–2(ap), p1–2–1, III v1–3–2(ap), p2–1–1, r1–1–1, IV v2–5–2(ap), p2–2–1, r2–2–1; metatarsi I v0–0–2(ap), II v1–1–0, p1–0–1, III v3–4–4(3 ap), p2–1–2, r0–1–1, IV v20(4 ap), p2–2–1, r0–1–1. Spiniform setae prolaterally on coxae I , retro-

and prolaterally on coxae II–III, retrolateral coxae IV; prolateral/dorsal on trochantera I, prolateral/dorsal and retrolateral/dorsal on trochantera II–III, retrolateral trochantera IV. STC with small teeth. PLS segment lengths: apical missing, medial 3.97 and basal 5.28. PMS rounded, small. Urticating hair types I and III present. Cephalothorax and abdomen dark brown. Conspicuous stripes on leg and palpal femora, patellae and tibiae. All femora, patellae, tibiae, metatarsi, carapace and chelicerae iridescent purple (Fig. 18). Carapace and eye tubercle hairy. Tibial apophysis with retrolateral branch slightly longer than prolateral (Fig. 16). Metatarsus I folds between the two branches. Male palpal bulb strongly flattened laterally, spoon–like shaped (Figs 13–15). Prolateral superior keel well-developed, prolateral inferior keel absent; apical keel extended ventrally to mid-length of embolus; retrolateral keel long, reaching more than half of apical keel length in retrolateral view, strongly developed, forming a crest in its distal portion.

TABLE 3. *Pamphobeteus grandis* sp. nov.. Male holotype. Length of right legs and palpal segments.

	Pedipalp	I	II	III	IV
Tarsus	6.77	14.94	13.99	13.37	14.58
Metatarsus	——	21.10	20.17	21.72	31.00
Tibia	16.35	18.20	16.93	16.49	19.90
Patella	8.47	12.90	12.40	11.37	12.51
Femur	15.82	24.78	22.75	22.53	25.77

TABLE 4. *Pamphobeteus grandis* sp. nov.. Female paratype. Length of left legs and palpal segments.

	Pedipalp	I	II	III	IV
Tarsus	7.02	14.25	13.63	13.30	14.27
Metatarsus	——	22.07	21.27	23.44	30.39
Tibia	14.52	17.94	18.51	17.48	20.95
Patella	9.82	13.14	12.62	13.25	13.48
Femur	16.20	25.39	23.62	22.46	26.01

Description: Paratype female, IBSP 8246. Total length, not including chelicerae or spinnerets 61. Cephalothorax 25.40 long, 23.44 wide. Anterior eyes row procurved, posterior row recurved. Eyes sizes and inter–distances: AME 0.45, ALE 0.67, PME 0.68, PLE 0.77, AME–AME 0.48, AME–ALE 0.50, AME–PME 0.28, ALE–ALE 2.19, ALE–PME 0.64, PME–PME 1.48, PME–PLE 0.18, PLE–PLE 2.26, ALE–PLE 0.73. Eye tubercle: length 2.77, width 3.25; clypeus 1.43. Fovea deep, slightly procurved, 5.68 long. Cephalic area moderately raised. Thoracic striae conspicuous. Labium: length 3.32, width 4.04, with *ca*.100 cuspules. Maxillae: 100–200 cuspules spread across inner edge. Sternum: length 11.48, width 10.31. Sigilla: small 2nd pair 1 ½ diameter from margin; small 3rd pair 1 diameter from margin; small 4th pair, two diameters from margin. Chelicerae: 11 teeth decreasing in size from distal area and row of small teeth on promargin. Tarsi I–IV densely scopulate. Metatarsi I–II fully scopulate; III 1/2 densely scopulate; IV without scopula. Spination: femur palp p0–0–1, I p0–0–1, II 0, III r0–3–1, IV r0–0–2; patellae palp p1, I p1, II p1, III p2, r1, IV v1–3–2(ap), p1–2–1, r3; tibiae palp v0–1–4(ap), p1–4–1; I 0–1–3 (ap), p1–1–0, II v0–1–3(ap), p1–1–2; III v0–2–3(ap), p1–1–1, r1–1–1, IV v1–1–1; metatarsi I 0–0–3 (ap), II v1–0–3(ap), p0–1–1(ap), r1–0–1(ap) III v4–2–6 (5 ap), p2–1–1, r0–1–1, IV 2–1–4 (ap), p0–1–1, r0–0–1. Spiniform setae as in male. STC with small teeth. PLS segment lengths: apical 6.01, medial 4.37, basal 5.85. PMS rounded, small. Urticating hairs type I and III present. Cephalothorax and abdomen dark brown with light–brown hairs. Conspicuous stripes on legs and palpal femora and patellae. Labium, sternum, maxillae and coxae dark brown, other articles light brown. Cephalothorax and eye tubercle hairy. Chelicerae light brown. Two spermathecae broadly fused (Fig. 17).

Distribution: –Western part of the states of Acre and Amazonas, Brazil (Fig. 19). Records from the state of Goias, Brazil (MNRJ 14001) are dubious. Goias formerly included the region that is now the state of Tocantins. This state has, in its northern boundary, some influences from Amazonian vegetation, which is, however, very distinct when compared with the known distribution for the species, i.e., deep Amazonian Forest in the western Brazilian boundary.

Remarks: – Pocock (1903) presented a key separating *P. antinous* from other *Pamphobeteus* species based on the broad palpal organ of the male. At that time, *P. antinous* was the only species known outside the Andean region, suggesting a separation between Andean and east of the Andes groups of *Pamphobeteus* species. However, after mapping other recently described species, it can be seen that the division between broad and slender palpal embolus is related to northern/southern distribution (Fig. 19), not with the western/eastern side of the Andean mountain range.

Note: – Females of *P. augusti*, *P. insignis* and *P. ornatus* are unknown. Females of *P. antinous* and *P. vespertinus* were described by Schmidt (1993); however, based only on the poor descriptions it is not possible to be sure that they are conspecifics.

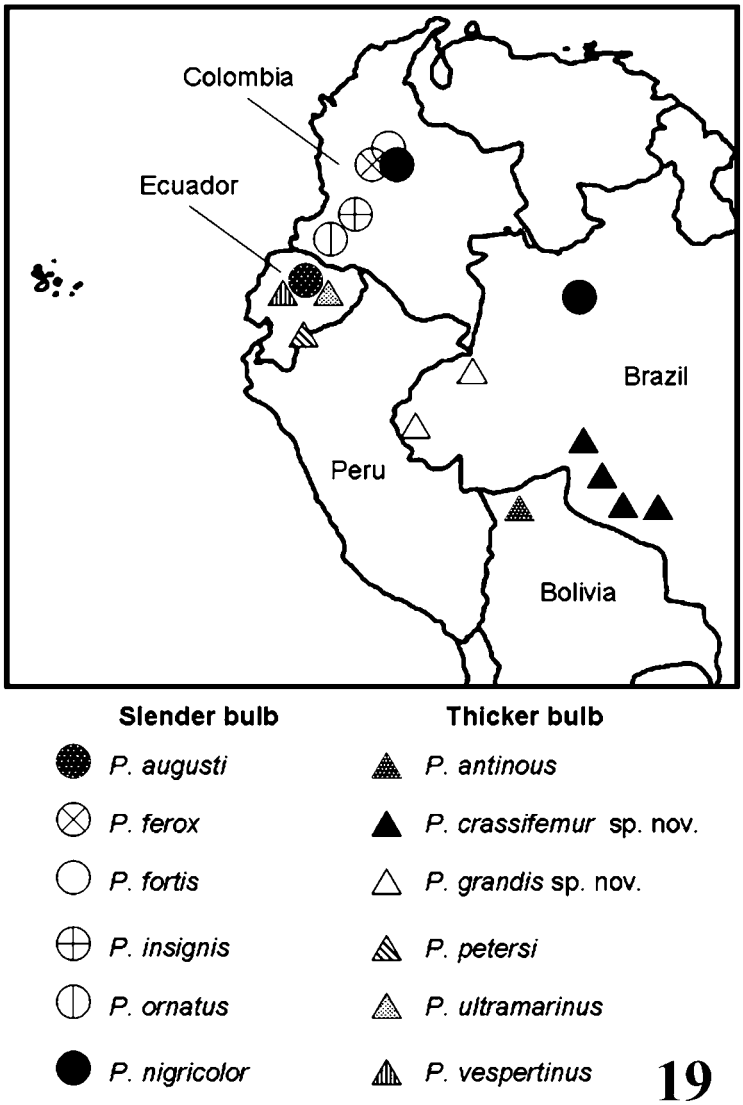


FIGURE 19. Records of *Pamphobeteus* species in South America, based on the type locality (included only species whose type is a male) and the examined material of *P. crassifemur* sp. nov. and *P. grandis* sp. nov. A geographic distribution with northern males having slender bulb and southern males having thicker embolus is visible.

Results

Stridulation: –After being touched by hand, a male of *P. crassifemur* sp. nov. quickly elevated its hind legs in the typical posture of shedding urticating hairs (Cooke *et al.* 1972). At the same time, a characteristic stridulating sound similar to a whistle was produced. No other parts of the body appeared to move. The spider was standing in the "resting" position, with all the other legs touching the substratum. We stimulated the spider on several other occasions and it repeated the same movements and stridulated, sometimes while shedding urticating hairs.

After examining the setae of legs III and IV and spination morphology, and analyzing the stridulation videotape record, we concluded that the sound could only be produced by contact between the many spiniform setae on retrolaterally on coxae and trochantera III and the prolateral spiniform setae of the same segments of leg IV (Figs. 9–12). The small spiniform setae on the coxae are spread over the entire retrolateral and prolateral faces of the segment, whereas the spiniform setae on the trochanter are more apically concentrated .

Discussion

Stridulation: –Stridulation can be defined as the process of sound production by friction of one rigid body part (the scraper) across a second part (the file) (Uetz & Stratton 1982). It plays a role in different contexts such as in intraspecific and interspecific communication, e.g., reproduction and defense, respectively (Marshall *et al.* 1995). There are many types —at least 8 types (Uetz & Stratton 1982) —of stridulatory organs and more than one type can be present in one spider species (Jocqué 2005). These organs are widely distributed in spider species, being present in at least 22 families (Uetz and Stratton 1982). Starck (1985), looking mainly at araneomorph spiders, stressed the homoplasy of these structures in different taxa and concluded that there has been parallel development of similar organs, even within the same family.

Theraphosidae are the biggest group to exhibit defensive stridulation among the spiders, with a great diversity of volume and sound produced (Marshal *et al.* 1995). Six of the eight theraphosid subfamilies have representatives presenting some type of stridulatory setae (Raven 1985). Many theraphosid taxa are characterized by the type and/or position of their stridulatory apparatus. They can be bacilliform setae (most Selenocosmiinae), plumose hairs (some Theraphosinae), paddle- or spike-shaped setae (most Eumenophorinae), curved paddle setae (all Ornithoctoninae), short modified setae (all Thrigmopoeinae) Raven (1985), plumose setae (most Harpactirinae) (Gallon 2002) acting against similar setae, thorns or spike setae on the contiguous appendages. Appendages with stridulatory apparatus are normally the outer chelicerae and prolateral maxillae or prolateral coxae I and retrolateral maxillae (Raven 1985). Some species have also stridulatory setae, less developed (grouped by facing segments), on prolateral coxae II and retrolateral coxae I, prolateral coxae III and retrolateral coxae II, and prolateral coxae IV and retrolateral coxae III, e.g., some *Lasiodora* species (RB pers. obs.)., Plumose setae on the retrolateral palpal trochantera are also present in some taxa (Raven 1985) and in *Theraphosa blondi* (Latreille) (Marshall *et al. 19*95*)*, on the femora of palp, first, and second pairs of legs.

The different morphology and positions of the stridulatory apparatus among the theraphosid subfamilies suggests that they are not homologous. Presumably, these organs developed independently several times in theraphosid evolution, which is in conformation with Starck's (1985), as discussed above.

In the Theraphosinae, stridulation is well–known in *Theraphosa* Thorell (e.g., Marshall *et al*. 1995). Other theraphosine genera reported to have stridulatory apparatus are *Grammostola* Simon, *Acanthoscurria* Ausserer, *Phormictopus* Pocock and *Cyrtopholis* Simon. In all of those genera, the stridulatory organs are positioned on the first appendages and consist of plumose hairs found between the coxae and/or trochantera of the palps and first legs, and hence differ from that reported here in *P. crassifemur* sp. nov.

The function of stridulation is not well understood at least for theraphosid spiders. For *Theraphosa blondi*, Marshall *et al*. (1995) suggested stridulation was an acoustic aposematism, since the spider produces sound and sheds urticating hairs during defensive behavior. This seems to be the same for *P. crassifemur* sp. nov., because the spider also sheds urticating hairs while stridulating. However, stridulation in *P. crassifemur* sp. nov. seems to be caused by spiniform setae on the third and fourth legs, not by plumose setae on the palp and first two pairs of legs, as suggested for *Theraphosa blondi* by Marshall *et al*. (1995).

The stridulation posture also differs between *Theraphosa blondi* and *Pamphobeteus crassifemur* sp. nov. In *T. blondi*, it is is like the typical mygalomorph threat posture but the anterior legs and palps do not stay extended. In fact, they are drawn back, putting the plumose hairs in contact with bearing surfaces. On the other hand, the stridulation posture of *P. crassifemur* sp. nov. is more similar to a theraphosid resting posture, but with the abdomen pointed up. This posture is very similar to that reported as a defensive behavior by *Eupalaestrus weijenberghi* (Thorell), an Uruguayan theraphosid (Pérez–Miles *et al* 2005). *Eupalaestrus* spp., as with *P. crassifemur* sp. nov., have spiniform setae on the posterior coxae (RB pers. obs.), possibly allowing these structures in *Eupalaestrus* spp. to produce stridulation.

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