



A remarkable new species of *Multumbo* showing sexual dimorphism, with the transfer of *Multumbo* and *Piassagera* to the Hernandariinae (Opiliones, Gonyleptidae)

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Abstract

A new species of *Multumbo* Roewer, 1927 (Gonyleptidae: Hernandariinae), *M. dimorphicus* sp. nov., is described from Rio de Janeiro state, southeastern Brazil. It presents sexual dimorphism in leg IV, contrasting remarkably with the type species of the hitherto monotypic genus *Multumbo* and the closest genera (*Piassagera* Roewer, 1928 and *Pseudotrogulus* Roewer, 1932), which were all thought to have lost this dimorphism. The presence of sexual dimorphism in *M. dimorphicus* implies a complex scenario of loss or reversal of this character. New records are given of type species of genus, *Multumbo terrenus* Roewer, 1913, for which a lectotype is designated. New diagnoses are provided for Hernandariinae and *Multumbo*. *Multumbo* and *Piassagera* are transferred from the Gonyleptinae to the Hernandariinae.

Resumo

Uma nova espécie de *Multumbo* Roewer, 1927, *M. dimorphicus* sp. nov., é descrita do estado do Rio de Janeiro. Ela apresenta dimorfismo sexual na perna IV, condição em notável contraste com a espécie-tipo do até então gênero monotípico *Multumbo* e com os gêneros mais relacionados, *Piassagera* Roewer, 1928 e *Pseudotrogulus* Roewer, 1932, nos quais esse dimorfismo era considerado como perdido. A presença de dimorfismo sexual em *M. dimorphicus* sugere um complexo cenário de perda ou reversão desse dimorfismo. Também foram incluídos novos registros da espécie-tipo do gênero, *Multumbo terrenus* Roewer, 1913, e um lectótipo é designado. Novas diagnoses para *Hernandariinae* and *Multumbo* são apresentadas. *Multumbo* e *Piassagera* são aqui transferidos de Gonyleptinae para Hernandariinae.

Key words: *Multumbo dimorphicus*, armature of leg IV, Laniatores, Gonyleptinae, Atlantic Rain Forest, areas of endemism, Serra dos Órgãos

Introduction

Cranidae Roewer, 1913 is a family of Laniatores typically distributed in the Andean and Amazonian parts of the Neotropics. The four subfamilies that now compose the Cranidae were previously included in the large family Gonyleptidae (e.g. Roewer, 1923), until Kury (1994b) isolated them as a separate family. The “false Craninae” that were reallocated to the Gonyleptidae (Gonyleptinae) by Kury (1992) included the genera *Multumbo* Roewer, 1927, *Piassagera* Roewer, 1928 and *Pseudotrogulus* Roewer, 1932—all from the region of the Brazilian Atlantic Forest.

The key character used by Roewer to distinguish the Craninae from the other Gonyleptidae was the condition of the coxae IV, hidden under dorsal scutum in dorsal view, which is symplesiomorphic at this level

(Kury, 1992). Typical Gonyleptidae also present a hyperthelic coxa IV with a strong external apophysis as a secondary sexual character in males, often accompanied by a strong femoral armature. This condition, however, was lost in some taxa of Gonyleptidae, resulting in the absence of evident sexual dimorphism in leg IV. Within Gonyleptidae, these changes occur in a clade composed of *Multumbo*, *Piassagera*, and *Pseudotrogulus* (DaSilva, 2007; DaSilva & Pinto-da-Rocha, in prep.), besides independent losses in species belonging to the subfamilies Progonyleptoidellinae and Caelopyginae (Kury & Pinto-da-Rocha, 1997; Pinto-da-Rocha, 2002; Machado & Macías-Ordóñez, 2007).

The Gonyleptinae were hypothesized by Kury (1992) to comprise a clade with the subfamilies Hernandariinae, Sodreaninae, Progonyleptoidellinae, and Caelopyginae, although not every one of these subfamilies forms a subclade of its own: Hernandariinae, Sodreaninae and Caelopyginae are probably monophyletic, but the other two are probably just evolutionary grades (Kury & Pinto-da-Rocha, 1997; Firmo & Pinto-da-Rocha, 2002; Pinto-da-Rocha, 2002; Kury & Pinto-da-Rocha, 2007). Due to recent generic rearrangements among these subfamilies, *Pseudotrogulus* was transferred from the Gonyleptinae to the Hernandariinae by Firmo & Pinto-da-Rocha (2002). Additionally, a phylogenetic analysis of the Hernandariinae by DaSilva (2007) and DaSilva & Pinto-da-Rocha (in prep.) indicates that two other genera currently in the Gonyleptinae, *Multumbo* and *Piassagera*, should be transferred to Hernandariinae.

In this paper we describe a new species of Gonyleptidae that strongly resembles *Multumbo terrenus* Roewer, 1927 (the sole species of the genus until now), except that it shows unexpected plesiomorphies, most of which are related to the presence of sexual dimorphism of leg IV. The systematic position of the related genera is discussed and a new subfamilial assignment is proposed.

Abbreviations of depository institutions are: HEMS (Private collection Hélia Eller Monteiro Soares, Brazil); MHNCI (Museu de História Natural Capão da Imbuia, Curitiba, Brazil); MNRJ (Museu Nacional/UFRJ, Rio de Janeiro, Brazil); MZSP (Museu de Zoologia/USP, São Paulo, Brazil); SMF (Naturmuseum Senckenberg, Sektion Arachnologie, Frankfurt, Germany). Geographical coordinates are in decimal degrees. Negative values refer to South and West. All measurements are given in millimeters (mm).

Systematics

Hernandariinae Sørensen, 1884

Hernandaroidae Sørensen, 1884; Kury, 2007: 162. See Kury (2003) for other citations.

Hernandariinae Roewer, 1913; Pinto-da-Rocha & Giribet, 2007: 91 (tab. 4.1); Kury, 2007: 164, 167; Kury & Pinto-da-Rocha, 2007: 196, 197 (fig. 4.29.h), 198, 199, 203, 202; Curtis & Machado, 2007: 283; Gnaspiri & Hara, 2007: 393.

See Kury (2003) for other citations.

Hernandariidae Sørensen, 1932; Kury, 2007: 165.

Apembolephaeninae Mello-Leitão, 1930; see Kury (2003) for citations.

Diagnosis. Gonyleptidae with dense granulation on whole body, camouflage of dirt, strong apophyses on anterior margin of dorsal scute, and single opening of scent glands. Sexual dimorphism of leg IV present or absent. Sexual dimorphism of basitarsus I present or absent. Mesotergum with 3 or 4 areas separated by transverse grooves. Penis, tarsi, pedipalps, chelicerae, and armed leg IV of males follow the pattern of the clade Gonyleptinae + Hernandariinae + Sodreaninae + Progonyleptoidellinae + Caelopyginae.

Hernandariinae is now composed of the following genera:

Acrogonyleptes Roewer, 1917

Ariaeus Sørensen, 1932

Hernandaria Sørensen, 1884

Multumbo Roewer, 1913 (new assignment)
Piassagera Roewer, 1928 (new assignment)
Pseudotrogulus Roewer, 1932

***Multumbo* Roewer, 1927**

Multumbo (type species *Multumbo terrenus* Roewer, 1927, by monotypy); see Kury (2003) for synonymy.
Remarks. Originally placed in Cranainae (Gonyleptidae); transferred to Gonyleptinae (Gonyleptidae) by Kury (1992).
Hereby transferred to Hernandariinae.

Diagnosis. *Multumbo* can be distinguished from the other genera of Hernandariinae by having the central pair of apophyses of anterior margin separated, smaller than the pair of apophyses of corners, tarsus I 6-segmented, and granules of mesotergum concentrated close to grooves between areas and to a longitudinal axis marked by lack of epidermic pigment, resembling a central longitudinal groove. All tubercles and granules of body are rounded, basitarsus I of male is swollen, the ocularium and its pair of tubercles are robust, and anterior portion of prosoma lacks camouflage of dirt (characters shared with some species of *Pseudotrogulus*), while the opening of the scent glands is large and directed upward (as in *Acrogonyleptes* and *Hernandaria*). Mesotergum divided into three areas. This is the only genus of the subfamily that may have or not sexual dimorphism in leg IV.

***Multumbo terrenus* Roewer, 1927**

Multumbo terrenus Roewer, 1927: 351, fig 17; see Kury (2003) for synonymy.

Type locality. Brazil, Rio de Janeiro, Teresópolis: Serra dos Órgãos.

Type material examined. Rio de Janeiro, syntypes 1 ♂ and 1 ♀ (SMF 259); here designated as lectotype ♂ and paralectotype ♀.

Other material examined. Brazil. Rio de Janeiro: Teresópolis, 1 ♀ (SMF 1425); Teresópolis (Subaio, early Hotel Sayonara), R.L.C. Baptista & M.I. Landim, IV/1995, 2 ♂ and 1 ♀ (MNRJ 5375); Teresópolis (Fazenda Vale da Revolta), R. Sachsse, II/1989, 1 ♂ (MNRJ 6424); same locality, A.B. Kury & Entomological Expedition UFRJ, VI/1990, 4 ♂ and 4 ♀ (MNRJ 6578); Teresópolis (Parque Nacional da Serra dos Órgãos), A.B. Kury, A. Giupponi, D. Pedroso & V. Orrico, VIII/2005, 2 ♂ (MNRJ 16196); same locality, A.B. Kury, XII/1989, 1 ♀ (MNRJ 6565); same locality, H. Peracchi & E. Izecksohn, VI/1965, 1 ♂ (HEMS 296); same locality, H. Peracchi & E. Izecksohn, VI/1965, 2 ♂ (HEMS 297); same locality, M.S. Baptista, 1995, 1 ♀ (MNRJ 5428); Teresópolis (Parque Nacional da Serra dos Órgãos, Rancho Frio and Pedra do Sino trails), Arachné Expedition, X/2006, 4 ♂ and 5 ♀ (MNRJ 18712); Silva Jardim (Aldeia Velha, Fazenda Bom Retiro), A.B. Kury, M. Khalil & A. Duran, I/1994, 1 ♂ and 1 ♀ (MNRJ 6843); Cachoeiras de Macacu (Boca do Mato), R. Pinto-da-Rocha & A.B. Kury, X/1988, 1 ♂ (MHNCI 6389); same locality, A.B. Kury & R. Pinto-da-Rocha, X/1988, 1 ♀ (MNRJ 6316); Cachoeiras de Macacu (Reserva Ecológica de Guapiassú), R. Baptista *et al.*, III/2001, 1ma and 2 ♀ (MNRJ 14301); Guapimirim (Estação Ecológica Estadual Paraíso), R. Pinto-da-Rocha & R.S. Bérnils, VII/1996, 2 ♂ and 1 ♀ (MZSP 15493); Guapimirim (Parque Nacional da Serra dos Órgãos, near Garrafão), A.F. Barbosa, X/2001, 1 ♂ (MNRJ 4686); Guapimirim (Parque Nacional da Serra dos Órgãos, base of Pico Dedo de Deus), D. Pedroso, A.P.L. Giupponi & E. Wienskowski, VIII/2004, 3 ♂ and 5 ♀ (MNRJ 17627); Guapimirim, A.P.L. Giupponi, II/2000, 2 ♂ and 2 ♀ (MNRJ 4611).

***Multumbo dimorphicus* sp. nov.**

(figs. 1–9)

Type material. Santa Maria Madalena (Parque Estadual do Desengano, Serra da Rifa, 650–800 m, -21.9534 - 41.9530), A.B. Kury, A.P.L. Giupponi & M. Baptista, III/1998, 1 ♂ holotype and 2 ♀ paratypes (MNRJ 17383); Macaé (Área de Proteção Ambiental do Sana, -22.4000 -42.1833), D. Pedroso & A. Pérez, VII/2002 1 ♂ and 2 ♀ paratypes, (MNRJ 11353).

Distribution (Fig. 10). Brazil. Rio de Janeiro State. Macaé (Sana) and Santa Maria Madalena. WWF Ecoregion NT0160 (Serra do Mar coastal forests); vegetation type is Tropical & Subtropical Moist Broadleaf Forests.

Etymology. From the Greek, referring to the sexual dimorphism in leg IV, which is unusual in this genus.

Diagnosis. This species is only distinguished from *Multumbo terrenus* by the armed leg IV in males; females seem to be identical. Both species present similar morphological variation, as described below. Therefore, most morphological variation in the genus that is not related to secondary sexual dimorphism represents non-fixed polymorphism spread throughout the populations of both species.

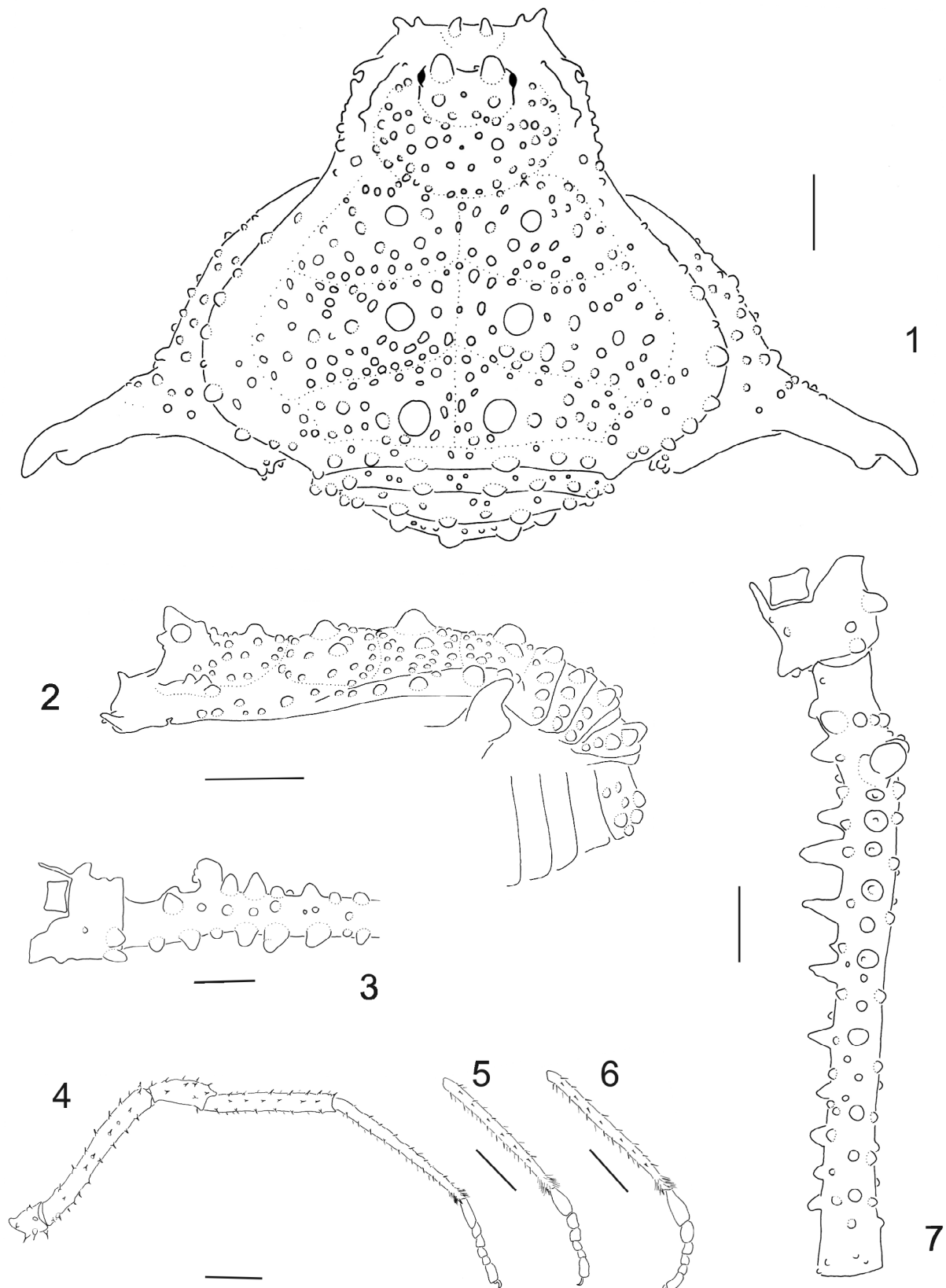
Description of male holotype. Body and legs densely granular and covered by camouflage of dirt, except anterior portion of prosoma, pedipalps, chelicerae and stigmatic and genital areas. All granules and tubercles rounded, spines only present on femur IV of male (Figs. 1, 2 and 7). All setae short and strong (Fig. 4), except on pedipalps and chelicerae.

Dorsum. Anterior margin of dorsal scute with a pair of paramedian, acuminate, apophyses, which are convergent but do not meet (Fig. 1); corners of anterior margin with 2 conical apophyses larger than the central ones, more external apophysis twice as large as internal one (Fig. 1); on one side there is a more external and smaller apophysis. Ocularium with a pair of very strong parallel tubercles of same height as ocularium, slightly pointed frontward (Figs. 1–2). Anterior portion of prosoma lacking camouflage and granulation limited by a long, oblique elevation between ocularium and lateral margin of prosoma, forming a sub-anterior margin; this margin with a strong posterior tubercle and 1 or 2 smaller anterior tubercles (Figs. 1–2). Single opening of scent glands on each side. Prosoma behind ocularium with a pair of main large tubercles, those of area I further apart, and those of area II–III larger than the others; areas I–III with an additional pair of paramedian tubercles similar in size to the main prosomal tubercles (Figs. 1–2). Denser granulation close to grooves and in 2 median longitudinal rows (giving the appearance of a longitudinal sulcus) in areas of mesotergum and on prosoma behind ocularium (Figs. 1–2). Lateral margin with less dense granulation, denser on prosoma than on mesotergum; 6 larger tubercles present on widest portion of dorsal scute, close to area III, one of them very large (Fig. 1). Posterior margin of dorsal scute and free tergites with a row of tubercles and some sparse granules; larger tubercles on median portion and on posterior segments; 8 tubercles on posterior margin, 9 on free tergite I, 7 on tergite II and 5 on tergite III (Fig. 1).

Venter. Granules similar in size to those of dorsal scute, arranged in a row on free sternites and spread homogeneously on coxae, except for more proximal portion, which is smooth; stigmatic and genital areas with sparser granulation; genital operculum granular. Coxae I–III with a row of longitudinal tubercles decreasing in size from I to III. Proximal portion of coxae, stigmatic and genital areas, and genital operculum without camouflage of dirt.

Pedipalps. Coxa and trochanter with 2 ventral distal tubercles. Femur smooth, apart from a ventral basal tubercle and some sparse granules, similar in diameter to other segments. Patella almost smooth, with only some sparse minute granules. Tibia II mesal and Ii ectal setae. Tarsus II mesal and Ii ectal and 2 paramedian rows of smaller setae on distal half.

Chelicerae. Segment I with one tubercle on base of bulla and one mesal apical; II with sparse, minute granules.



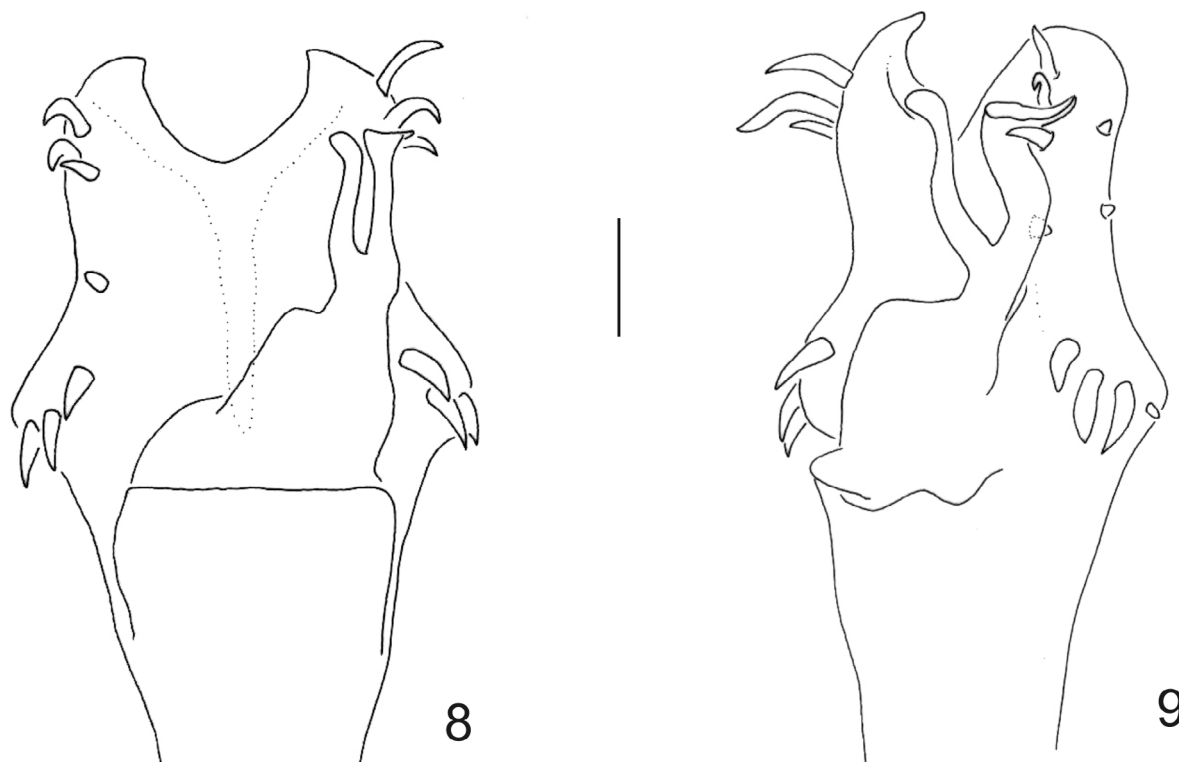
FIGURES 1–7. *Multumbo dimorphicus* sp. nov. 1, dorsal view of holotype male (MNRJ 17383); 2, lateral view of holotype; 3, trochanter and basal portion of femur of leg IV of holotype, retrolateral view; 4, trochanter-tarsus I of paratype female (MNRJ 11353), lateral view; 5, metatarsus-tarsus I of paratype male (MNRJ 11353, smaller male), lateral view; 6, metatarsus-tarsus I of holotype (larger male), lateral view; 7, trochanter-femur IV of holotype, dorsal view. Note swollen basitarsus I of males in figs. 5–6. Scale: 1 mm.

Legs. All with row of sparse tubercles decreasing in size distally. Trochanters with 3 to 4 larger ventral tubercles and some sparse smaller ones. Distitarsi of legs I–II 3-segmented (figs. 4–6). Tarsal process small. Leg I with tubercles a little stronger on venter of trochanter and femur. Basitarsus I swollen (figs. 5–6). Coxa IV with prolateral apical apophysis almost transversal and straight, with 2 distal branches, dorsal one larger, conical and curved, and ventral one rounded (fig. 1); trochanter IV with 1 prolateral sub-basal apophysis and 2 larger retrolateral apical apophyses, along with some scattered smaller tubercles (figs. 3 and 7); femur IV curved at basal third and armed with a retrolateral row of strong spines along its whole length, larger on sub-median portion, and with a dorsal row of spines becoming larger towards base (fig. 7); dorsal sub-basal apophysis rounded with a small anterior process (fig. 3); patella, tibia and metatarsus similar to those of other legs.

Color. Homogeneous dark-brown with some tubercles of lateral margin and areas of mesotergum with whitish apex; legs lighter brown; pedipalps, chelicerae, trochanter I, apex of metatarsus, and tarsus yellowish.

Description of penis of male paratype (Figs. 8–9). Ventral plate widened in the region of basal setae, with slightly concave sides; distal margin concave with angles slightly pointed inward and backward; sides with 5 distal, 1 median, and 4 ventral setae; ventral face covered by bristles. Three large distal setae close together (the proximalmost seta is slightly more dorsal); 2 much smaller distal setae situated in a more ventral position; median seta a little smaller than 2 distoventrals; more ventral basal seta much smaller than other basal setae; latter 4 inserted on a lateral lobe (dorsalmost of the four is a little more distal). Glans with ventral process with flabellum bearing few projections on apex and stylus S-shaped with oblique apex (projected more dorsally).

Variation among specimens Sexual dimorphism. Males only distinguished from females by leg IV strongly armed and basitarsus I swollen. In females, coxa IV has a tubercle (instead of the apophysis of male), trochanter IV has no apophyses, femur IV has only tubercles and basitarsus I has the same diameter as the other tarsomeres.



FIGURES 8–9. *Multumbo dimorphicus* sp. nov., penis of paratype male (MNRJ 11353): 8, dorsal view; 9, dorso-lateral view.

Males. The type material includes two males, in different vials. The holotype (MNRJ 17383) is much larger and has the secondary sexual structures, mainly of leg IV, more strongly developed than in the paratype (MNRJ 11353). This type of male dimorphism, in which one morph has secondary sexual characters much more strongly developed than the other morph, is very common in the family Gonyleptidae (e.g., Mendes, 2005, who even refers to male polymorphism) and has also been reported from other Laniatores, such as Epedanidae, Triaenonychidae, Manaosbiidae, Cranidae, Stygnidae, and Cosmetidae (Forster, 1954; Suzuki, 1972; Hunt, 1985; Pérez & Vasconcelos, 2003; Gnaspini *et al.*, 2004). These differences may either represent two different adult instars (Gnaspini *et al.*, 2004) or two real morphs reflecting different sexual strategies (Tsurusaki & Fujikawa, 2004).

Males and females. Anterior margins of carapace may have two or three apophyses on corners. The number of tubercles varies on sub-anterior, lateral, and posterior margin of dorsal scute and free tergites, but maintains the general pattern described for holotype. The number of whitish tubercles on lateral and posterior margin and areas of mesotergum is highly variable.

Tarsal segmentation (number of segments of holotype in parentheses): 6, 10–12 (11), 7, 7–8 (8).

Measurements of males (those of holotype in parentheses): dorsal scute: length: 4.7–(5.9), width: 5–(6.9); legs: I: 10.5–(11.8), II: 26.9–(30.9), III: 17.9–(19.6), IV: 25.4–(28.9); femur IV: 7.1–(7.9); pedipalp: (4.8)–5.1.

Measures of females: dorsal scute: length: 5.5–5.7, width: 5.6–5.8; legs: I: 10.1–11.1, II: 25–27.4, III: 17.4–18.8, IV: 23.5–26.2; femur IV: 6.4–7.4; pedipalp: 4.7–5.4.

Discussion

According to the phylogenetic analysis of DaSilva (2007) and DaSilva & Pinto-da-Rocha (in prep.), the loss of sexual dimorphism in the armature of leg IV and in the armature of area III, absence of camouflage of dirt on the border of dorsal scutum and genital and stigmatic areas, and a short ventral plate of penis were among the synapomorphies uniting the clade *Multumbo* + *Piassagera* + *Pseudotrogulus*. This clade is the sister group of the “traditional” Hernandariinae (genera *Hernandaria* Sørensen, 1884 and *Acrogonyleptes* Roewer, 1917). The discovery of a species of *Multumbo* showing armed leg IV in males creates an incongruence in the mapping of the loss of sexual dimorphism on the phylogeny of the Hernandariinae. The number of derived character states uniting both species of *Multumbo* indicates that either the loss of dimorphism happened twice or that the absence of the armature of leg IV in males reversed autapomorphically in *Multumbo dimorphicus*. The ambiguous optimization of this character appears more complex by maintenance of plesiomorphic conditions of this armature in *Multumbo dimorphicus*. Thus, it has the same states as the Gonyleptinae + Hernandariinae + Sodreaninae + Progonyleptoidellinae + Caelopyginae clade: a bifid apophysis of coxa; presence and similarity in shape of external apophysis of trochanter and basal dorsal apophysis of femur; and presence and similarity in position of retrolateral spines of femur. This suggests two independent losses of dimorphism, one in *Multumbo terrenus* and one in *Pseudotrogulus*+*Piassagera*, which is remarkable because these losses would have occurred in a very conservative armature in closely related species.

Multumbo occurs in the “Serra dos Órgãos” Area of Endemism, as delimited by Pinto-da-Rocha *et al.* (2005). These authors demonstrated the high degree of endemism of harvestmen in the Atlantic Rain Forest and showed that the group is a good model for historical biogeography studies. The “Serra dos Órgãos” Area of Endemism is composed of coastal forests, including the metropolitan area of Rio de Janeiro city and the mountains to the south of Paraíba do Sul river, such as the Serra dos Órgãos mountain range. *Multumbo terrenus* is restricted to the southern portion of the Serra dos Órgãos, while *M. dimorphicus* occurs parapatrically in the northern portion of this area of endemism (fig. 10). Due to their sister group relationship, this pattern may indicate a past event of faunal isolation between the two regions. Because the northern localities are under-

sampled and this pattern is exclusive to *M. dimorphicus*, no meaningful comparisons or conclusions are possible for the moment. However, this may allow the delimitation of a new area of endemism if additional species are discovered to be endemic to the region.

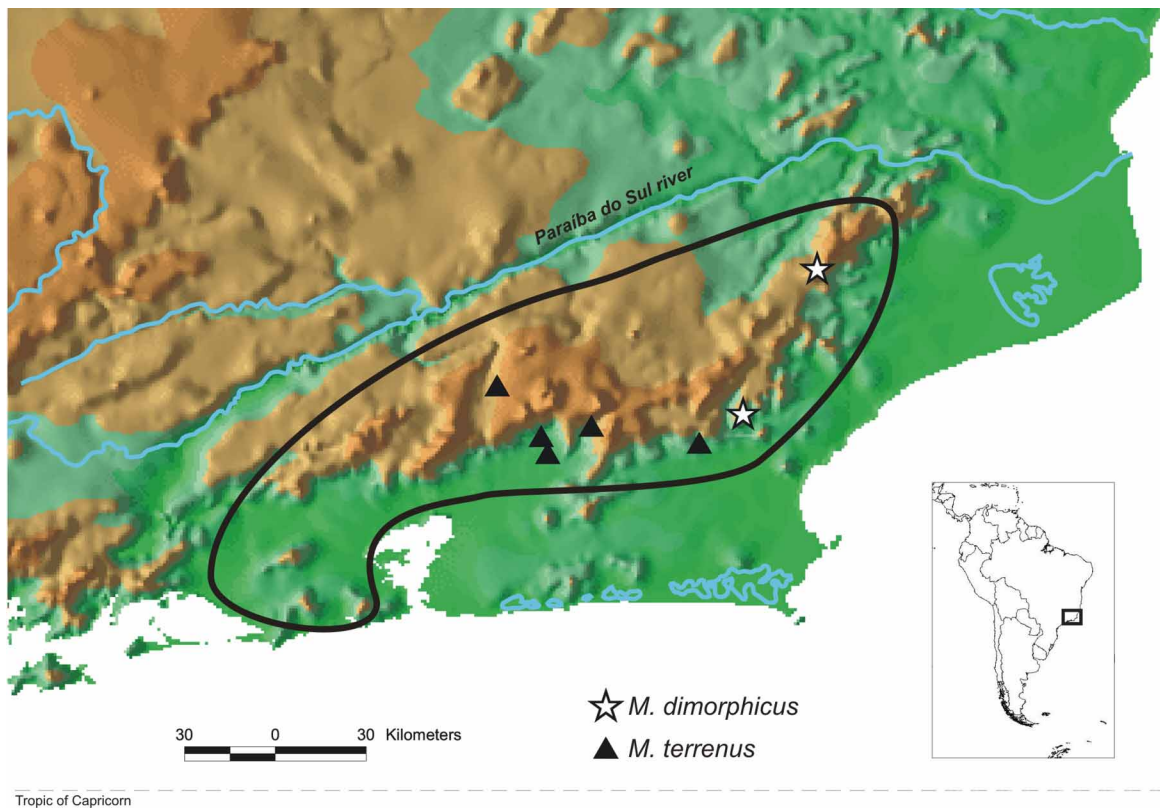


FIGURE 10. Distribution of *Multumbo* species. Black line: “Serra dos Órgãos” Area of Endemism (Pinto-da-Rocha *et al.*, 2005).

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