New species of *Fissiphallius* Martens 1988 from Brazil and notes on the morphology of Fissiphalliidae (Arachnida, Opiliones)

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Abstract

The seventh species of Fissiphalliidae, *Fissiphallius orube* sp. nov., and the fourth from Brazil (type locality state of Acre, Cruzeiro do Sul, at the Moa river), is described. The new species differs from the remaining species of the family in lacking a pergula, having a knob at the base of the rutrum, and the ocularium spiniform projection with apical portion single or divided in two to three parts.

Key words: Amazonian Rainforest, harvestmen, taxonomy, Laniatores, genitalic morphology

Introduction

The family Fissiphalliidae was described by Martens (1988), who named it after its unusual genitalia, the main diagnostic feature of the family. At first, the family was thought to be related to Phalangodidae due to some similarities in the genitalia and body size (Martens 1988). However, at the time, the study of the genitalia of Laniatores was very limited to a small number of published drawings and descriptions, especially for tiny species. With better knowledge of the genitalia of small harvestmen, some authors suggested the subsequent placement of Fissiphalliidae as the sister group of Zalmoxidae or a monophyletic group within Zalmoxidae (Kury & Pérez, 2002, Pinto-da-Rocha, 2004; Tourinho & Pérez González, 2006), as closely related to Icaleptidae (Kury & Pérez, 2002), or as related to both Guasiniidae and Icaleptidae, based on the presence of the stragulum (Pinto-da-Rocha & Kury 2003). This relationship has been recovered in molecular phylogenetic analyses, wherein Fissiphalliidae is the sister group of Zalmoxidae, and both these families are more closely related to Icaleptidae than to other Zalmoxoidea (Giribet et al 2010, Sharma & Giribet 2011, 2012). The phylogenies based on molecules reject the hypothesis of Fissiphalliidae as nested within Zalmoxidae.

Tourinho and Pérez González (2006) conducted a comparative study of the species of Fissiphalliidae and a brief study of the geographical distribution of the new species they described. It is very likely that the diversity of the family, as well other harvestmen families, is even greater, especially in the Amazon, and that some members are presently included in other families of small harvestmen, or not assigned to any family at all (Kury, 2003).

Knowledge on the diversity of Amazonian species is still scarce, since most of the region—especially the sites most remote and distant from urban centers—is not accessed by researchers. However, some sites have been surveyed by the Instituto Nacional de Pesquisas da Amazônia, the Museu Paraense Emílio Goeldi, the Universidade Federal do Mato Grosso, and the Universidade Federal d Acre (A.L. Tourinho, pers. comm.). If it is difficult to estimate the diversity of large Amazonian species (e.g., Manaosbiidae, Cosmetidae), then small species are presumably much more neglected (Tourinho & Pérez González 2006).

The main objectives of this study are the description of a new species of Fissiphalliidae.
**Material and methods**

All measurements are in millimeters. The specimens examined are deposited in the collections of the Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP), Instituto Butantan, São Paulo (IBSP), Museu Nacional do Rio de Janeiro (MNRJ) and, all in Brazil.

The terminology for genital features is based mainly on Tourinho and Pérez González (2006) and Pinto-da-Rocha (2007), because Martens (1988) used terms not homologous to those applied for other families with similar genitalia, such as Icaleptidae and Zalmoxiidae (see Kury & Pérez 2002). Martens (1988) called the rutrum the "immovable ventral finger" and the stragulum the "movable dorsal finger".

**Taxonomy**

*Fissiphallius orube* sp. nov.  
(Figs. 1–11)

**Type material.** Male holotype (MZSP-15914), Brazil, Acre, Cruzeiro do Sul, near shore of river Moa, 7.6500°S, 72.6833°W, R. S. Vieira leg. Paratypes: 4 males and 7 females (MZSP 36.498, IBSP, MNRJ), same collecting data as holotype.

**Etymology.** *Orube* is a noun in apposition taken from the main Brazilian indigenous language (Tupi), meaning “happiness”.

**Diagnosis.** *Fissiphallius orube* sp. nov. can be distinguished from other species of the family by the absence of a pergula (except *F. sturmi* Martens, 1988), the presence of four setae near encounter of stragulum with rutrum (Fig. 9), by the ocularium bearing a spiniform tubercle with apex single or divided in two (Figs. 1, 5) or three branches, by the stragulum with bifid apex (arrow-like, see Fig. 8). It is similar to the Colombian *F. sturmi* Martens, 1988, in the genitalia, especially the rutrum, which is a narrow plate with rounded apex, and by the lack of a pergula (see Martens 1988).

**Description (male holotype).** Measurements. Total length: 2.65; prosoma length: 0.75; opisthosoma maximum width: 2.2, width of prosoma across ocularium 1.00; femur IV length: 1.75.

**Dorsum.** (Figs. 1, 5) Anterior margin of prosoma with three paracheliceral projections (Fig. 1). Ocularium with large central spiniform projection, with apex divided in three branches (other specimens have only one or two branches). Areas I–IV V-shaped, undivided and without tubercles. Lateral margin with 11 rounded similar sized tubercles from groove II to posterior margin. Posterior margin with one tubercle on each corner (Fig. 5). Free tergites covered by setae; free tergite I with one tubercle on each side; free tergite II with 12 tubercles; free tergite III with five tubercles, median larger than tergite length. Anal operculum with one large tubercle and several smaller tubercles scattered.

**Venter.** (Fig. 2) Coxae I–IV irregularly tuberculate. Genital operculum not enlarged, stigmatic area long. Posterior margin with one row of larger tubercles. Free sternites with a row of minute tubercles. Free sternites IV and V with two median, divergent, large tubercles (larger on sternite V).

**Chelicera.** Covered by setae. Bulla short, well marked, with one prolateral and one retrolateral tubercles. Movable finger (III) with four teeth, fixed finger smooth.

**Pedipalp.** (Fig. 6–7) Trochanter smooth. Femur dorsally smooth, ventrally with two basal, two median and two subapical (one ectal, one mesal) setiferous tubercles (Fig. 7). Patella with mesal setiferous tubercle. Tibia with three mesal (III) and three ectal (III) setae. Tarsus with two ectal (II), two mesal setae (II).

**Legs.** (Figs. 3–4) Legs I–IV covered by tubercles. Coxa II with apical retrolateral spiniform tubercle (Fig. 1–2). Coxa IV with dorsal apical large tubercle. Trochanter IV with sub-basal retrolateral spiniform tubercle. Femora II–IV with two ventral rows of large tubercles, larger on IV. Tibia IV with small tubercle on base, increasing in size distally, with subapical, ventral, large, bifid tubercle (Fig. 4). Metatarsus IV tuberculated. Tarsal formula: 3 (2), 5 (3), 5, 5.

**Penis.** (Figs. 8–11) Stragulum with central portion long and with an apical projection bifid (Fig. 8), apex arrow-like (Fig. 8–9). At 2/3 length of rutrum, base is half the width of distal part, distal margin with two pairs of large setae, apex of distal margin rounded; base of rutrum (just below articulation of rutrum and truncus) with four large setae. Pergula (median ventral lobe) absent (Fig. 10–11).
**Coloration.** (in 70% ethanol) Body from pale yellow to orange, with small darker spots on lateral margin of dorsal scutum and median diamond shaped patch (lighter than body). Legs pale yellow.

**Description of female paratype:** Measurements. Total length 2.15; prosoma length 0.65; opisthosoma maximum width 1.75, width of prosoma at ocularium level 0.85; femur IV length 1.5. Very similar to male, differing in the following features: body slightly smaller, legs markedly shorter (in relation to body), ocularium less developed, with bifid apex, spiniform retrolateral projection of trochanter IV less developed, femur-tibia IV without evident tubercles. Tarsal formula: 3(2), 5(3), 5, 5.

**Distribution:** Recorded only from type locality.

**FIGURES 1–7.** Male holotype of *Fissiphallius orube* sp. nov. Habitus, 1: dorsal view; 2: ventral view; 5: lateral view. 3: Male apex of coxa, trochanter, femur and patella of leg IV, ventral view; 4: Patella, tibia, tarsus and metatarsus of male leg IV, lateral view. Pedipalp, 6: lateral view; 7: ventral view. Scale bars: 1–3, 6–7 = 1 mm; 4–5.
FIGURES 8–11. Penis of male holotype of *Fissiphallius orube* sp. nov. Apical region: 8, dorsal view; 9, ventral view; 10, lateral view. 11, entire penis in lateral view. Abbreviations: R = rutrum, S = stylus, ST = stragulum. Scale bars: 8–10 = 0.1 mm; 11 = 0.2 mm.

**Discussion**

The family is monogeneric and has low described diversity; only seven species have been described to date, including *F. orube* sp. nov. (Pinto-da-Rocha 2007), which shows remarkable morphological variation. The systematics of the group contrast with those of the remaining Laniatores due to the detailed descriptions and also because in some other Laniatores, a small number of species is divided extensively among more than one genus (e.g., Icaleptidae).

The geographical distribution of Fissiphalliidae encompasses the Brazilian Basin of the Amazonas River (*F. chicoi* Tourinho & Pérez González, 2006, *F. martensi* Pinto-da-Rocha, 2002, *F. orube* sp. nov., *F. tucupi* Tourinho & Pérez González, 2006) and the East Andean Cordillera in Colombia (*F. sturmi* Martens, 1988, *F. spinulatus* Martens, 1988 and *F. sympatricus* Martens, 1988). Brazilian records of Fissiphalliidae, as well as the known distribution of most Amazonian harvestmen species, are located near large rivers or tributaries of the Amazonas River in areas of varzea or upland (see Pinto-da-Rocha & Bonaldo 2006; Tourinho & Pérez González 2006). Poor sampling and poor taxonomic literature characterize the upland areas far from the major rivers. The Colombian species were collected in Paramos (Martens 1988), which have many bodies of water of much smaller dimensions than in the Amazonian lowlands, but nevertheless have a diverse fauna associated with them, even though rivers in high altitudes have a different influence on the fauna, when compared to large lowland rivers. Both the Amazon and the Paramos have high humidity levels, which indicates an affinity for moist (or humid areas) by the species of Fissiphalliidae, as is the case for most harvestmen (Machado et al. 2007). *F. orube* sp. nov. is the first record for the state of Acre, and reinforces that the geographical distribution of fissiphalliids is broader than currently known, as with the diversity of the family (Tourinho & Pérez González 2006).

Table 1 includes the morphological variation of external morphology and penis of Fissiphalliidae members. However, proposing a phylogenetic hypothesis using these characters is still a difficult task and beyond the scope of this contribution. This is due to the lack of detailed morphological studies of the species of Neotropical...
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<th><em>F. martensi</em></th>
<th><em>F. orube</em> sp. nov.</th>
<th><em>F. spinulatus</em></th>
<th><em>F. sturmi</em></th>
<th><em>F. sympaticus</em></th>
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<td>ocularium</td>
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<td>one large tubercle</td>
<td>spiniform tubercle divided in two-three branches</td>
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<td>Spiniform tubercles on free tergites</td>
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<td>sternite IV</td>
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<td>relation rutrum with penis length</td>
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Zalmoxidae, which represent the basal lineages of the family (Sharma & Giribet 2012). This precludes the polarization of several characters.

*F. orube* sp. nov. seems to be more closely related to Brazilian species based on the presence of spiniform tubercles on free tergites (absent in Colombian species). The absence of a median projection on the stragulum is also similar in Brazilian species (and shared by Colombian *F. sympathicus*), however, this absence is probably symplesiomorphic. *Fissiphallius orube* sp. nov. also shares with *F. chicoi* a ventral projection on the ventral plate near the stragulum’s insertion plane (also present in Colombian *F. sturni* and morphologically different from Brazilian *F. tucupi*). This projection is absent in Zalmoxidae and Icaleptidae. Some characteristics are difficult to polarize, such as V-shaped grooves, because they are present in some Zalmoxidae, including Neotropical species, but not others (see Kury & Pérez González 2007). The enlarged genital operculum present in some Fissiphalliidae is poorly described in most Zalmoxidae, and sometimes recorded in non-Neotropical species, even in species of same genus (e.g. Sharma 2012, Sharma *et al.* 2012), which renders the phylogenetic polarization of this character unambiguous. More detailed descriptions such as those that have been published for all fissiphalliids and zalmoxids recently described by P. Sharma and coworkers are needed to better understand species relationships within Fissiphalliidae.

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**References**


