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# Two new species of *Phareicranaus* Roewer, 1913 (Opiliones: Laniatores: Cranaidae), with notes on gregarious behavior and maternal care in *Phareicranaus manauara*

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# Abstract

In this paper we describe two new species of *Phareicranaus* Roewer, 1913: *Phareicranaus rohei* **sp. nov.** from the state of Amazonas, Brazil and *Phareicranaus tizana* **sp. nov.**, from the state of Zulia, Venezuela. The number of known species of this genus increases to 47. We discuss and suggest the possible relationships of these species with their relatives and assign them into the clades proposed by Pinto-da-Rocha & Bonaldo (2011). Additionally, we conducted field observations at the type locality of *Phareicranaus manauara* (Pinto-da-Rocha, 1994), provide the first descriptions of maternal care and gregarious behavior, and discuss the occurrence of this behavior in the genus.

Key words: Andes, Amazon, harvestmen, Neotropics, systematics, social behavior, taxonomy.

# Introduction

Cranaids belonging to the genus *Phareicranaus* Roewer, 1913, are exquisitely colorful, large, hard-bodied and armored harvestmen endemic of tropical forests of Northern South America, ranging from the state of Acre, in Brazil, to Panamá (Townsend & Milne 2010; Pinto-da-Rocha & Bonaldo 2011). This group previously included 11 species, however *Santinezia* Roewer, 1923 was established as a junior synonym of *Phareicranaus* and now it comprises 45 taxa (Pinto-da-Rocha & Bonaldo 2011). Two other important papers have been published in the last decade on the genus (sub *Santinezia*): a taxonomic review of the Venezuelan species (González-Sponga 2003), and the first phylogenetic analysis (Pinto-da-Rocha & Kury 2003).

*Phareicranaus* was divided then into three groups of species based on 35 somatic and genital characters, as armature of the dorsal scutum and leg IV, number and distribution of setae and the shape of the ventral plate of the penis (Pinto-da-Rocha & Kury 2003). In a more recent revision, Pinto-da-Rocha & Bonaldo (2011) divided the genus into two clades based on 53 somatic and genital characters, and listed the following combination of characters supporting *Phareicranaus*: pedipalpal femur with a dorsoapical spine, strong ventral tubercles on pedipalpal femur, area II invading area I and base of penis glans ringed. The "first clade" is supported by the lateral strong tubercles in the pedipalp, absence of submedial mesal and curved apophysis on male femur IV, and stout spine on scutal area III. The "second clade" is supported by the pedipalpal femur incrassate, the penis with one spatulate distal setae on the ventral plate, free tergite III unarmed, and a ventral spur on the male coxa IV once or twice as long as it is wide (Pinto-da-Rocha & Bonaldo 2011).

Unlike other arachnids, many species of harvestmen form aggregations that can range from 3 to 70.000 individuals (Machado & Macías-Ordoñez 2007a). Aggregations seem to be induced predominantly by environmental conditions, the physiological hypothesis, and confer defensive advantages by speeding the defensive signal communication through scent-gland secretions, increasing the chances of avoiding predation, the defensive hypothesis (Holmberg *et al.* 1984; Machado *et al.* 2000). Gregariousness for species of *Phareicranaus* was only suggested to generally occur in nests of birds and lizards, *Ameiva* Meyer and *Cnemidophorus* Wagler

(Gonzalez-Sponga 1989). At least one species, *Phareicranaus curvipes* (Roewer, 1916), has been observed aggregating inside a lamppost hole in San Antonio de los Altos, Miranda, Central Venezuela (Colmenares, pers. obs.). Aggregations are more commonly found during the day inside caves, rocks, trunks, under logs, and in crevices and hollows of logs and trunks. There are only two records of aggregations on vegetation for North American leiobunnines species, *Leiobunum alvarezi* Goodnight & Goodnight and *Leiobunum ischionotatum* (Dugés) (Machado & Macías-Ordóñez 2007), however, other Sclerosomatidae, *Jussara luteovariata* (Mello-Leitão, 1932), were also observed and collected aggregations of 8-10 individuals on the leaves of herb bushes in the State Park of Pedra Branca, Rio de Janeiro, Brazil (Tourinho, pers. obs.); some of these aggregations on leaves are collected and deposited at the Museu Nacional of the Federal University of Rio de Janeiro (MNRJ 5843, MNRJ 5841), curator: A. Kury.

Although, very little information on the biology of most of the species in this genus have been provided (Townsend & Milne 2010; Machado & Warfel 2006), cases of maternal care through the guarding of eggs and nymphs have been described for at least two species of cranaids: *Phareicranaus calcariferus* (Simon, 1879) (Machado & Warfel 2006; Hunter *et al.* 2007; Townsend *et al.* 2009) and *Phareicranaus* sp. (Machado & Warfel 2006); the last one from Colombia and probably not yet described. Two females of *P. calcariferus* were found caring for offspring in Trinidad, one in a small forest fragment in Mount St. Benedict and the other along an isolated road near the village of Brasso Seco in Paria Springs; a second species was in the collection of the Museum of Comparative Zoology (MCZ), Harvard University, MA, USA, found in a vial containing the female and 21 eggs (Machado & Warfel 2006).

In this paper we report and describe for the first time a case of gregarious behavior and late maternal care in *Phareicranaus manauara* (Pinto-da-Rocha, 1994), and we also describe two new species of *Phareicranaus*: one from a remote site in the Amazon rainforest, state of Amazonas in Brazil, and the other from the state of Zulia in Venezuela.

### Material and methods

**Taxonomy.** We are considering all the records of *Phareicranaus serratotibialis* (Roewer, 1932) were in fact referred to as specimens of *Phareicranaus calcariferus* (Simon, 1879) because the two species were synonymized (Pinto-da Rocha & Bonaldo 2011). Measurements are given in mm. Terminology, drawings and observations on the genitalia followed Acosta *et al* (2007) and Gnaspini (2007). Acronyms of repositories are INPA, Instituto Nacional de Pesquisas da Amazônia, Manaus, Amazonas, Brazil; MIZA, Museo del Instituto de Zoología Agrícola Francisco Fernández Yépez, Maracay, Venezuela; MBLUZ, Museo de Biología de la Universidad del Zulia, Maracaibo, Venezuela.

**Behavior.** Aggregation definitions and types are used in this paper following Machado and Macías-Ordoñez (2007b). All the data were collected at Reserva Ducke, Manaus, Amazonas in Brazil from May 17–19 and June 8–9 of 2012, and the harvestmen were observed during the night (8–11 p.m.) and day (10–11 a.m.), for four days, totalizing six periods of observation, aggregation were observed for about one hour each time. We observed the specimens of *Phareicranaus manauara* on tree trunks and bushes, in two different sites. We refer to the sites here as site one and site two (2°55′48.1074″S, 59°58′27.6168″W), the distance between the two sites was about 3 meters. The two sites were placed along the large trail in the central station of the reserve. Additional observations of aggregations were also made in the Experimental Farm of the Federal University of Amazonas, located near the BR 174 highway, 38 km North of Manaus (02° 39' 41.4″S, 60° 07' 57.5″ W) by Larissa de Souza Lança during the field sampling for her master's dissertation (Lança, 2011).

#### Results

#### Cranaidae Roewer, 1913

# Phareicranaus Roewer, 1913

A complete synonymic list is found in Pinto-da-Rocha & Bonaldo 2011.

# Phareicranaus rohei sp. nov.

(Figs. 1 A-D; 3 A-C; 6)

**Type material.** Male holotype: (INPA-OP-2073), Brazil, Amazonas state, RDS Ucari, right border of "Médio Rio Juruá", Bauana Community, near Rio Bauana, Fabio Röhe *leg.* Paratypes: 1 male and 1 female (INPA-OP-2074), same data as holotype.

**Etymology.** The name is a patronymic in honor of Fabio Röhe, a Brazilian mammalogist who has contributed largely to the studies of Amazonian harvestmen by collecting specimens of this species and several other important samples of both species and genera of harvestmen from many localities in the Amazon basin.

**Diagnosis.** Is related to the other species possessing white circles on the dorsal scutum [*Phareicranaus angelicus* (Roewer, 1963), *Phareicranaus divisor* Pinto-da-Rocha & Bonaldo, 2011, *Phareicranaus gracilis* (Pinto-da-Rocha & Kury, 2003), *Phareicranaus hermosa* (Pinto-da-Rocha & Kury, 2003), *Phareicranaus ortizi* (Roewer, 1952) and *Phareicranaus singularis* (Soares, 1970)]. It can be distinguished from *P. angelicus* and *P. ortizi* by the absence of black areas on the scutal scutum; from *P. gracilis*, by the absence of white circles in lateral areas; from *P. divisor*, *P. hermosa* and *P. singularis* by number of white circles: prosoma with 14, area I with 13, area II with 9, area III with 14 and posterior margin with 18.

Distribution. Known only from the type locality (Fig. 6).

**Description.** Male Holotype. Measurements: Dorsal scutum length 7.58; width 7.5; prosomal length 3.5; width 5.41; pedipalpal femur 4.16; femur IV 16; leg I 23.08; II 50.66; III 35.75; IV 48.83.

Dorsal scutum (Fig. 1 A, B). Anterior border with a median projection between the chelicerae, two paramedian and a lateral row of 2–3 small tubercles on each side. Eye mound with two spiniform tubercles, five tubercles behind them and two lateral. Area I with an anterior row of 2–3 small tubercles and a posterior row of four tubercles, II with a posterior row of 4–5 small tubercles, III with two sharp, divergent and high spiniform paramedian tubercles, two small tubercles behind them and two lateral rows (anterior and posterior) of three small tubercles. Posterior border with 18 tubercles. Free tergite I with a pair of paramedian tubercles and a smaller tubercle on each side, II–III with a pair of larger paramedian spiniform tubercles and a smaller tubercle each side. Anal operculum with three rows of 4–5 of small tubercles.

Venter. Coxa I with median row of 4–5 tubercles, three anterior, five posterior and three apical (the anterior one larger); II with a median row of 8–9 small tubercles, three anterior, three posterior and five apical; III with a median row of 7–8 median tubercles, 3–4 anterior, 8–9 posterior and five apical; IV with a median row of 7–8 small tubercles, 6–7 anterior, 8–9 posterior and a pair large apophyses close to the spiracles. Free sternites II–III with two well defined tubercles each side; IV–V with one well defined tubercle each side.

Chelicerae. Basichelicerite with six tubercles on lateral of bulla; hand with several small frontal tubercles; fixed finger with four teeth; movable finger with four teeth.

Pedipalps (Fig. 1 C). Coxa with 2–3 small tubercles. Trochanter with two dorsal and three ventral tubercles. Femur with a row of 6–7 ventral strong tubercles (three basal and 3–4 median-apical), a retrolateral row of 7–9 tubercles, a dorsal row of 6–7 tubercles (apical larger and sharp). Patella granular, with 12–14 dorsal tubercles unequally distributed and one prolateral apical tubercle. Tibia ventrally with four ectal and four mesal spines (IiIi). Tarsus dorsally granular, ventrally with four ectal (IiIi) and 3–4 mesal spines (IiIi on the left pedipalp and IiI on the right pedipalp).

Legs (Fig. 1 D). Coxa: I and II with an anterior dorsal tubercle; III smooth; IV with 4–5 latero-dorsal tubercles and an apical spiniform tubercle. Trochanter: I with one dorsal and three ventral tubercles; II with one dorsal median tubercle, two retrolateral and three ventro-apical tubercles; III dorsally with one apical tubercle, three prolateral, four retrolateral and three ventral tubercles; IV with one apical anterior dorsal tubercle, five prolateral, three retrolateral and 4–5 small ventral tubercles. Femora: I–IV straight, with rows of small tubercules; III with one basal retrolateral tubercle and with two dorso-apical sharp tubercles; IV with two ventral rows of more larger tubercles in the first half, one curved retrolateral spiniform tubercle in the second half and two dorso-apical tubercles. Patella I–IV granular. Tibia: I–III granular; IV with two ventral basal tubercles (the basal larger than the other). Tarsal formula: 8(3)/13–14(3)/8/9.

Penis (Fig. 3 D–F). Ventral plate not very cleft in the distal border, distal corners with flange forming two subequal apical lobes. With 7 setae not easily distinguishable in groups along the lateral borders; the distal pair on the corners of the ventral plate. Gland without dorsal process, with a membranous sac. Stylus smooth, slightly curved and arising straight from glans. Apex bent at an obtuse angle, not swollen.



**FIGURE 1.** Male holotype of *Phareicranaus rohei* **sp. nov.**, male holotype. A, habitus, lateral view. B, habitus, dorsal view. C, pedipalp, ventral view. D, femur IV, dorsal view. Scale bar: 1 mm.

Color (in alcohol). Body and legs dark brown, except in trochanter, which are more clear. Eye mound, anterior border, quelicerae and pedipalps with a darker reticule. Chelicerae fingers reddish. Tubercles of the dorsal scutum and free tergite I with white tip, and circled by a greenish area that finishes in white rings. Spiniform tubercles of the eye mound and free tergites II–III yellowish. Tarsus clear brown.

Female paratype. Anterior margin with two paramedian and two tubercles on each side. Eye mound with only 4–5 tubercles behind the spiniform tubercles. Pedipalp with tubercles slightly smaller than the male; Tarsus with four mesal spines in both sides (IIII). Body generally darker than in the male. Tarsal formula: 8(3)/12-13(3)/8/9.

### Phareicranaus tizana sp. nov.

(Figs. 2 A–D; 3 D–F; 4 A; 6)

**Type material.** Male Holotype: (MIZA-0016292) Ayajpaina, Municipio Machiques de Perijá, Sierra de Perijá, Zulia, Venezuela (10°03'00"N, 72°45"58"W), 1200 msnm. 07/X/2007. P. Colmenares col. Paratypes: 1 female (MIZA-0016293) and 2 inmature (MIZA-0016294), with same data as holotype; 1 male and 1 female (INPA-OP-2075), 3 females and 1 immature (MIZA-0016295), Ayajpaina, Municipio machiques de Perijá, Sierra de Perijá, Zulia, Venezuela (10°03'00"N, 72°45"58"W), 1150 msnm. 07/i/2008. P. Colmenares col.

**Etymology.** Tizana is a traditional and popular Venezuelan drink made of orange juice and granadina, mixed with several pieces of different fruits. It is more characteristic in the Zulia state, where it is part of the local folklore. Noun in apposition.

**Diagnosis.** Femur IV slightly curved (Fig. 2 D), with a large ventro-distal tubercle. Tibia IV with two strong ventral tubercles in the middle, curved towards each other (Fig. 2 E). Penis with five latero-basal lanceolate setae in two rows (2+3), one sinous latero-distal larger setae, and two small ventral setae on each side (Fig. 3 D–F).

Distribution. Known only from the type locality (Fig. 6).

**Description.** Male holotype. Measurements: Dorsal scutum length 12; width 12.25; prosomal length 5.75; width 7.41; pedipalpal femur 5.75; femur IV 28.33; leg I 30.91; II 64.83; III 47.83; IV 70.41.

Dorsal scutum (Fig. 2 A, B). Anterior border with a median projection between the chelicerae and a lateral row of 3–4 small tubercles on each side. Eye mound with two spiniform tubercles, each one with a small basal tubercle behind. Carapace smooth. Area I with two small paramedian spiniform tubercles and a posterior row of three small tubercles; II with a posterior row of 5–6 small tubercles; III with two spiniform tubercles, two lateral and two posterior small tubercles. Free tergite I with a pair of larger paramedian spiniform tubercles and 2–3 smaller tubercles on each side, II with a pair of larger paramedian spiniform tubercles and a smaller tubercle on each side, III with only a paramedian pair of spiniform tubercles. Anal operculum with some small tubercles without arrangement.

Venter. Coxa I with a median row of five tubercles, three anterior, five posterior and three apical (anterior larger than the others); II with a median row of 11 small tubercles, four anterior, four posterior and four apical; III with a median row of 9–10 median tubercles, four anterior, four-five posterior and four apical; IV with a median row of 10–12 tubercles, several tubercles without arrangement over the surface and a pair of very low and tuberculated processes close to the spiracles.

Chelicerae. Basichelicerite with seven tubercles on bulla; hand with several small frontal tubercles; fixed finger with three teeth; movable finger with four teeth.

Pedipalps (Fig. 2 C). Coxa with two ventral tubercles. Trochanter with two tubercles over a dorsal hump and 4–5 ventral tubercles (mesal larger than the others). Femur with three ventro-basal tubercles (larger mesal bifid and two ectal), a median row of six subequal ventral strong tubercles, a retrolateral row of 7–9 very low tubercles and a dorsal row of 7–8 tubercles (the apical larger). Patella granular, with 11–14 dorsal tubercles unequally distributed and one prolateral apical tubercle. Tibia dorsally granular, ventrally with four ectal (III) and four mesal spines (III). Tarsus dorsally granular, ventrally with five ectal (IIII) and five mesal spines (IIII).

Legs (Fig. 2 D, E). Coxa: I with an anterior and a posterior dorsal tubercle; II with an anterior dorsal tubercle; III smooth; IV with 4–5 latero-anterior tubercles and three apical tubercles (the posterior larger and sharp). Trochanter: I dorsally granulated and with three ventral tubercles; II dorsally granulated, with two retrolateral tubercles and four ventro-apical tubercles; III dorsally granulated, with three prolateral tubercles, four retrolateral, one median and four ventro-apical tubercles; IV with one dorsal tubercle, six prolateral (the apical larger), five retrolateral (the apical larger), and 8–10 small ventral tubercles. Femora: I–IV with row of small tubercles; III with





**FIGURE 2.** Male holotype of *Phareicranaus tizana* **sp. nov.,** male holotype. A, habitus, lateral view. B, habitus, dorsal view. C, pedipalp, ventral view. D, femur IV, dorsal view. E, patella and tibia IV, dorsal and ventral view. Scale bar: 1 mm.



**FIGURE 3.** Male genitalia. A–C, *Phareicranaus rohei* **sp. nov.**: A, dorsal view. B, lateral view. C, ventral view. *Phareicranaus tizana* **sp. nov.**: D, dorsal view. E, lateral view. F, ventral view. Scale bar: 0.1 mm.

one basal retrolateral tubercle and two dorso-apical tubercles; IV slightly curved, with one prolateral and two retrolateral basal tubercles followed by a row of tubercles decreasing in size until the first half, one larger and curved ventral spiniform sub-apical tubercle and two dorso-apical tubercles. Patella I–IV tuberculated. Tibia: I–III granulated; IV slightly s-curved, ventrally with a row of four tubercles in the first half, two tubercles in the middle (the proximal larger and procurved, followed by another slightly smaller and retrocurved) and a row of 4-5 tubercles decreasing in size in the second half (Fig. 2 E). Tarsal formula: 9(3)/20(3-4)/9-10/12.

Penis (Fig. 3 D–F). Ventral plate with slightly concave distal border, concave lateral borders and ventrally with two small setae on each side. Distal corners smooth. Two groups of setae: five laterobasal lanceolate setae in two rows (2+3) and one larger, sinuous latero-distal setae. Glans with small dorsal process. Stylus arising from glans. Apex not bent nor swollen.

Color (in alcohol). Body and legs dark brown. Dorsal scutum dark brown. Anterior part of the prosoma and eye mound, with small reticle that extends until the posterior border, wich possess a larger and transversal light reticle. Pedipalps reticulated. Groove I with a very thin and short white stripe. Groove II with two white stripes almost joined in the middle. Groove III with two well separated white stripes. A longitudinal, soft brown, discontinuous thin stripe that goes from groove I to the posterior margin, where it fuses with another similar, but tranversal, soft brown stripe. A thin white stripe between the two paramedian tubercles of free tergite III. Cheliceral fingers light brown to dark brown. Tarsus light brown. A view of a live specimen in figure 4 A.

Female paratype. Pedipalp with tubercles slightly smaller than the male. Spiniform tubercles of area III and free tergites proportionally larger than the male. Without the ventral process near the stigmata. Body generally darker than the male.

**Natural history and conservation.** This species occurs in highly humid evergreen montane forest, between 1100 and 1950 MASL in the northern part of the Andes in Venezuela. They are found near small streams, generally over the vegetation and over tree trunks close to the water. This species shares habitat with other large harvestmen, such as cosmetids *Cosmetus* sp. and *Cynorta* sp.

*Phareicranaus tizana* **sp.nov.** and the other harvestmen species found in the Sierra de Perijá are under risk of local extinction because of the extensive cultivation of "Malanga" (*Xanthsoma sagittifolium* Araceae) using fire; this type of cultivation is used by the indigenous *Yukpa* people and some minor farmers in the mountains and foothills, the negative impact of the fire to the fauna and flora has been also well documented by the local media. Other threat is the mineral national program which is extracting carbon from the northern foothills of the Sierra de Perijá mountains in the last twenty years.

*Phareicranaus manauara* (Pinto-da-Rocha, 1994) (Figs. 4B, 5 A–B)

Santinezia manauara Pinto-da-Rocha, 1994: 29 [Type Locality: Brazil, Amazonas, Manaus, Reserva Ducke.]; Pinto-da-Rocha & Kury 2003: 190; Kury 2003: 98.

Phareicranaus manauara: Pinto-da-Rocha & Bonaldo, 2011: 20.

**Social behavior.** We checked site one during the day and nights, but specimens of *P. manauara* were only active and seen on vegetation and three trunks during night observations (8–11 p.m.), during the day they were aggregating within a sheltered area in loose aggregation. During the first day we only made night observations at site one, we counted 10 individuals, three alpha males and four females on vegetation, and one group of three individuals in loose aggregation, two females and a male. A couple on the three trunk were disturbed by our presence and dispersed after ten minutes of observation; they moved closer to the bush where the group was aggregating. In day two, during the day, they were in loose aggregation inside a tubular-like cave shelters formed by rotten logs partially covered by large fallen palm leaves. At night we observed 15 adults forming small groups on top of the leaves of one single median sized herb bush (about 140 cm tall) standing on the left side of the shelter. Nearly each stem of the plant had at least a couple of *P. manauara*; just one single stem had one aggregation of four individuals, two stems with aggregations of three individuals (Fig. 5 A), and two stems with one couple each (Fig. 5 B).



**FIGURE 4.** A, live male of *Phareicranaus tizana* **sp. nov.**, photo by P. A. Colmenares. B, nymphs of *Phareicranaus manauara* aggregating in the tree trunk of site two at Reserva Ducke in Manaus, Amazonas state in Brazil, photo by G. Giribet.



**FIGURE 5.** Aggregation in *Phareicranaus manauara* in site one at Reserva Ducke, in Manaus, Amazonas state in Brazil: A, three individuals aggregating. B, a couple, with the male in an extended resting position, photos by G. Giribet.



FIGURE 6. Distribution of Phareicranaus rohei sp. nov. (triangle) and Phareicranaus tizana sp. nov. (circle).

Males were with their bodies in opposed direction, however, it seemed that the distribution of individuals was spatially organized. Adults of both genders resting in the leaves of lower vegetation were only detected alone; they were distancing about 10–20 cm and never sharing the same stem or leaf. Most of the individuals were resting in the leaves of the higher bushes of the herb, some were resting on top of the leaves, and others were upside down, resting on the inferior face of the leaves; some males were even upside down hanging only with three posterior legs (Legs IV and the right or the left leg III) (Fig. 5 B), holding onto the plant stem. In the loose aggregations the males touched the female with legs II and sometimes also touched other males in the bush. Males frequently were positioned standing on top of the resting females covering them with their bodies, legs I and III directed anteriorly and legs IV posteriorly. We did not observed them mating. The fourth day of observation occurred about 20 days later. The individuals were still together in the same bushes in site one, but more spread out in the vegetation, occupying an area of no more than 9 m<sup>2</sup>. Other observations gregarious behavior in *P. manauara* were reported for the Experimental Farm of the Federal University of Amazonas/UFAM close to the city of Manaus, AM, Brazil (Lança 2011); 57 individuals were sampled and were always seen in small or median bushes and small palm leaves forming groups of several immovable individuals.

**Maternal care.** We observed one adult female guarding 29 nymphs in different stages of development at site two (Fig. 4 B); both female and nymphs were resting on a tree trunk at the main access trail of Reserva Ducke in Manaus, AM, Brazil. The female was resting close to the nymphs keeping the typical posture observed in the other cases of maternal care (Villarreal & Machado 2011; Machado & Macías-Ordóñez 2007a). We made the observations for two days; we only observed them briefly because after ~5 minutes of observation the nymphs dispersed and quickly found shelter in a tunnel formed by fallen palm leaves covering the tabular roots of a large

tree. The early staged nymphs dispersed first; the adult female first followed the nymphs as they were dispersing, then guarded the entrance of the shelter while the nymphs aggregated within. In the first day of observation the female stayed immovable for at least four minutes, then she moved to the left side of the nymph group and touched one of them with the right second leg, and afterwards entered the shelter.

As in the case of *Phareicranaus calcariferus* (Townsend *et al.* 2009), the younger instars were found in large numbers and they were standing slightly apart from the older instars; the last ones were resting under and on top of an Araceae leaf attached to the tree trunk where both instars and adult female were. During the first night we observed two individuals, older instars, resting on the inferior face of the leaf and other two resting on the plant stem, while all the younger instars were forming an aggregation on the right side of the plant. On the second day, two older instar were resting under the Araceae leaf and two were on top of the inferior face of the same leaf. One male nymph was observed close to the younger instar aggregation, but it maintained the distance of about 3–4 cm. During the second day of observation, when disturbed, the nymphs dispersed and the female moved to the top of the shelter, above the aggregation, but kept guarding the remaining nymphs. On the fourth day we found only one female at night in the trunk of site two, but no nymphs, which had apparently dispersed during the period between visits; the shelters were inspected and no harvestmen were found. In site one a female was observed in the bush, but between site one and two we found two alpha males, one beta male and eight more females foraging on the palm bushes and stems; they were distancing about 1 m, likely dispersing.

#### Discussion

Recent phylogenetic analysis divided *Phareicranaus* into two clades (Pinto-da-Rocha & Bonaldo 2011), the first one comprises the species previously known as part of both the *Santinezia gigantea* and *Santinezia festae* species groups (Pinto-da-Rocha & Kury 2003). It includes all the species with white circles, some of them forming a monophyletic subclade (Pinto-da-Rocha & Bonaldo 2011). These species are distributed only in the Amazon region, and this pattern have a biogeographical significance: *Phareicranaus gracilis* from Ecuador, *P. hermosa* and *P. ortizi* from Peru and *P. angelicus* from Colombia, and *P. singularis* and *P. divisor* from Brazil (Pinto-da-Rocha & Bonaldo 2011) erroneously assigned *P. divisor* in the diagnosis to the *P. curvipes* species group, which represent the second clade they proposed in the same paper).

*Phareicranaus rohei* **sp. nov.** is another species with white circles and could be considered a member of the first clade, and is more morphologically related with *P. divisor*, regarding the dorsal scutum with almost the same pattern of white circles. However, the two species may be separated regarding the armature of the tibia IV, one tubercle in *P. divisor* and two in *P. rohei* **sp. nov.**, and the number of setae in the male genitalia, six in *P. divisor* and seven in *P. rohei* **sp. nov.** Another possibly related species is *P. gracilis*, with major similarity in the penis, but with the distal border of the ventral plate more concave than in *P. rohei* **sp. nov.** Differences in the leg IV are remarkable, with two tubercles in the femur and one in the tibia in *P. gracilis*, while *P. rohei* **sp. nov.** has exactly the opposite configuration, with one tubercle in the femur and two in the tibia. Also, *P. gracilis* exhibits white circles in lateral areas, absent in *P. rohei* **sp. nov.** 

The second clade is composed of the remaining species and those that previously were considered part of the *Santinezia curvipes* species group (Pinto-da-Rocha & Kury 2003), with a large part of them living in the Andean and Caribbean region; *P. tizana* **sp. nov.** could be considered a member of the this clade.

*Phareicranaus tizana* **sp. nov.** is morphologically related to *P. furvus* and *Phareicranaus heliae* (Avram, 1983). These three species share a very similar external morphology and size, being large species (12 mm of dorsal scutum length in media). They also share the same pattern of white strips in the dorsal scutum, the groups and kind of setae and the shape of the ventral plate. Although, *P. furvus* can be distinguished from *P. tizana* **sp. nov.** by the armature of the tibia IV, with one row of tubercles in *P. furvus* and two (curved towards each other) in *P. tizana* **sp. nov.** by the armature of the plate. On the other hand, *P. tizana* **sp. nov.** possesses two pairs of long distal setae, and none in the ventral face of the plate. On the other hand, *P. tizana* **sp. nov.** possesses only one long distal setae, and two pairs of small setae in the ventral face of the plate. It can be differentiated from *P. heliae* by these ventral setae, as well as by the shape of the apex of the ventral plate, concave in *P. heliae* and almost straight in *P. tizana* **sp. nov.** 

The presence of two small setae in the ventral plate of the penis is a character that appears only three times in the genus, or at least was not properly illustrated for all species. In literature, considering both diagnoses and

illustrations of *Phareicranaus* species (simple schematic line drawings and SEM, Kury 2012), these setae can be found within two species: *P. gigantea* and *P. festae*, both from the first clade of Pinto-da-Rocha & Bonaldo (2011). Until now, this character has not been registered for species of the second clade (including the old *P. curvipes* group). The distance between species with these setae, in the most recent cladogram (Pinto-da-Rocha & Bonaldo 2011), suggests that this character has evolved independently, in different lineages inside the genus. However, the phylogenetic importance of this character remains poorly know, since it was not used in the two phylogenetic analysis of the genus (Pinto-da-Rocha & Kury 2003; Pinto-da-Rocha & Bonaldo 2011).

There are two known species from the state of Amazonas (Brazil): *P. manauara* (Pinto-da-Rocha 1994), and *P. singularis* (Kury 2003; Pinto-da-Rocha & Kury 2003; Pinto-da-Rocha & Bonaldo 2011); and two known species from the state of Zulia (Venezuela): *Phareicranaus calcarfemoralis* (Roewer, 1917) and *P. furvus* (Kury 2003; González-Sponga 2003; Pinto-da-Rocha & Kury 2003; Pinto-da-Rocha & Bonaldo 2011). Assessing the real distributional range of *P. rohei* **sp. nov.** and *P. tizana* **sp. nov.** is difficult because both species are from undersampled remote places. The addition of the two new taxa increases the know diversity of the genus to 47 species. There are several new species of this genera to be collected and described in the basin, we examined at least one more new species know only from females (one Amazonian "white spots" species in the INPA collection).

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