



New Venezuelan genus of Hubardiidae (Arachnida: Schizomida)

OSVALDO VILLARREAL MANZANILLA¹, ALESSANDRO PONCE DE LEÃO GIUPPONI^{2,3} & ANA LÚCIA TOURINHO^{2,4}

¹Laboratorio de Sistemática Molecular, Museo del Instituto de Zoología Agrícola, Facultad de Agronomía, Universidad Central de Venezuela, Apartado 2101-A, ZP 4579, Maracay, Edo. Aragua, Venezuela. E-mail: osvaldovillarreal@gmail.com

²Laboratorio de Aracnología, Museu Nacional, Universidade Federal do Rio de Janeiro. Quinta da Boa Vista s/n, São Cristóvão 20.940-040, Rio de Janeiro - RJ - Brasil

³Núcleo de Morfologia e Ultraestrutura de Artrópodes, Departamento de Entomologia, IOC / Fiocruz, Rio de Janeiro, RJ, Brasil. E-mail: agiupponi@gmail.com

⁴INPA - Instituto Nacional de Pesquisas da Amazônia, Programa de Coleções Zoológicas – Coleção de Invertebrados, Avenida André Araújo, 2936 – Aleixo – CEP 69011-970, Cx. Postal: 478, Manaus – AM – Brasil. E-mail: amtourinho@gmail.com

Abstract

A new Amazonian genus and species of Schizomida is described from Tobogán de la Selva, Amazonas state in Venezuela. *Piaroa virichaj* n. gen. and n. sp. is the seventh species of the order described for Venezuela. *Piaroa virichaj* gen. and n. sp. is distinguished by having the metapeltidium entire; abdominal segment IX – XII elongated in the male; male without posterodorsal abdominal process on segment XII; male flagellum flattened dorsoventrally, very elongated, with two small dorsomedian depressions; pedipalps not sexually dimorphic; spermathecae with lateral lobes slender and curved, with the base swollen, ending in slightly trifid bulbs; medial lobes absent; gonopod absent. The locality where the species was collected is shown in a map, a discussion on the taxonomic characters of the new genus and species, the relationships of the new genus and the interrelationship of some species in Hubardiidae are provided.

Key words: Neotropics, Venezuela, Amazonia, Schizomida, taxonomy, new genus

Resumen

Se describe un nuevo género y especie del Orden Schizomida, proveniente del Tobogán de la Selva, en el Estado Amazonas en Venezuela. *Piaroa virichaj* n. gen. y n. sp. es la séptima especie del orden descrita para Venezuela. El nuevo género y especie es caracterizado por poseer el metapeltidio entero, segmentos abdominales IX – XII alongados en los machos, sin proceso posterodorsal abdominal en el segmento XII; flagelo del macho deprimido dorsoventralmente, muy alargado, con dos pequeñas depresiones dorsomedianas; pedipalpos sin dimorfismo sexual; espermatecas sin lóbulos mediales, con lóbulos laterales delgados y curvos, con la base ensanchada, terminando en pequeños bulbos trífidos, gonópodo ausente. La localidad donde fue recolectada la especie es mostrada en un mapa, una discusión sobre los caracteres taxonómicos del nuevo género y especie, las relaciones del nuevo género y las interrelaciones de algunas especies en Hubardiidae son presentadas.

Introduction

The order Schizomida comprises about 260 current species, placed in the families Protoschizomidae and Hubardiidae (Harvey 2007). The members of this order are distributed in the tropical and subtropical regions of the world, however the South American fauna is poorly known, with only 31 known species and eight genera (Armas & Colmenares 2006; Bonaldo & Pinto-da-Rocha, 2007; Cokendolpher & Reddell 2000; González-

Sponga 1997; Pinto-da-Rocha 1996; Reddell and Cokendolpher 1995; Tourinho & Kury 1999; Villarreal & Teruel 2006).

Only six species of Schizomida have been recorded from Venezuela, although the taxonomic status of some species is uncertain. They are arranged in three genera, *Hansenochrus* Reddell & Cokendolpher, 1995, *Stenoschizomus* González-Sponga, 1997 and *Wayuuzomus* Armas & Colmenares, 2006 (Armas & Colmenares 2006; González-Sponga 1997; Villarreal & Teruel 2006). In the last 20 years descriptions of numerous species and some new genera from the West Indies and South America have reported the high level of endemism in the species of this group (Armas 2001, 2002; Armas & Colmenares 2006; Cokendolpher & Reddell 2000; González-Sponga 1997, Pinto-da-Rocha 1996; Teruel 2003; 2004; 2007; Teruel & Armas 2002; Villarreal & Teruel 2006), other examples are the records of Harvey (2001), who described four endemic genera from the Seychelle Islands.

In this paper a new genus of Schizomida is described. The species was collected in December 2002, in the Amazonas state, during the Arachnological expedition of Museu Nacional do Rio de Janeiro - Brazil (MNRJ), Museo de Historia Natural La Salle - Venezuela (MHNLS) and Zoologisches Forschungsmuseum Alexander Koenig, Bonn - Germany (ZFMK) to Venezuela. Genitalic features of female and masculine flagellum are illustrated and described, methods and terminology follow Harvey (1992) modified by Reddell & Cokendolpher (1992). Depositories are Arachnological Collections of the Museo de Historia Natural La Salle (MHNLS) and Museu Nacional/UFRJ (MNRJ).

Taxonomy

Hubbardiidae Cook

Hubbardiinae Cook

Piaroa gen. n.

Figs 1–12

Etymology. The name honors the native tribe *Piaroa*, living in the Northwest Amazonas state in Venezuela, where the new species and genus were collected. A noun in apposition.

Diagnosis. Dorsal. Propeltidium with two anterior setae (one behind the other) and three pairs of setae; corneate eyes absent; metapeltidium entire; body without clavate setae. Abdominal segment IX – XII elongated in the male; male without posterodorsal abdominal process on segment XII. Male flagellum flattened dorsoventrally, very elongated - length about 6.5X width, with two small dorsomedian depressions. Pedipalps not sexually dimorphic. Dorsal anterior margin of femur IV curved at about a 90° angle. Female genitalia: spermathecae with lateral bulbs or lobes slender and curved, with the base swollen, ending in slightly trifid bulbs, there with some ducts or pores of secretory glands visible, medial spermathecae absent; gonopod absent. Chitinized arch heart-shaped, anterior border very constricted medially, posterior border convex, lateral borders sharp.

Type species. *Piaroa virichaj* sp. n.

Piaroa virichaj sp. n.

Figs 1–12.

Etymology. According to the *Piaroa* culture *Virichaj* is the demon that casts spells of fever on natives.

Type material. Male holotype (MHNLS I-0077). VENEZUELA, AMAZONAS, Tobogán de la Selva,

5°23'10" N 67°36'53" W. 160 m. 23-25.xii.2002. Giupponi A., Pérez-González A. & Villarreal M.O. leg. Paratypes. 1 female and 1 subadult (MHNLS I-0077). 2 subadults (MNRJ 04291), the same.

Diagnosis. Total length between 4.92 – 5.56 millimetres. Propeltidium with three pairs of dorsal and anterior setae. With faint, oval eyespots. Movable cheliceral finger with long keel or lamella with three teeth, guard tooth very reduced and curved, unmovable finger with five teeth. Male flagellum flattened dorsoventrally, very elongated, with two dorsal small depressions. Femur IV three times wider than long. Female lateral lobes of spermathecae swelling at base, curving distally, so the bulbs are facing. Apical trifold blunt bulbs with little nodules present.



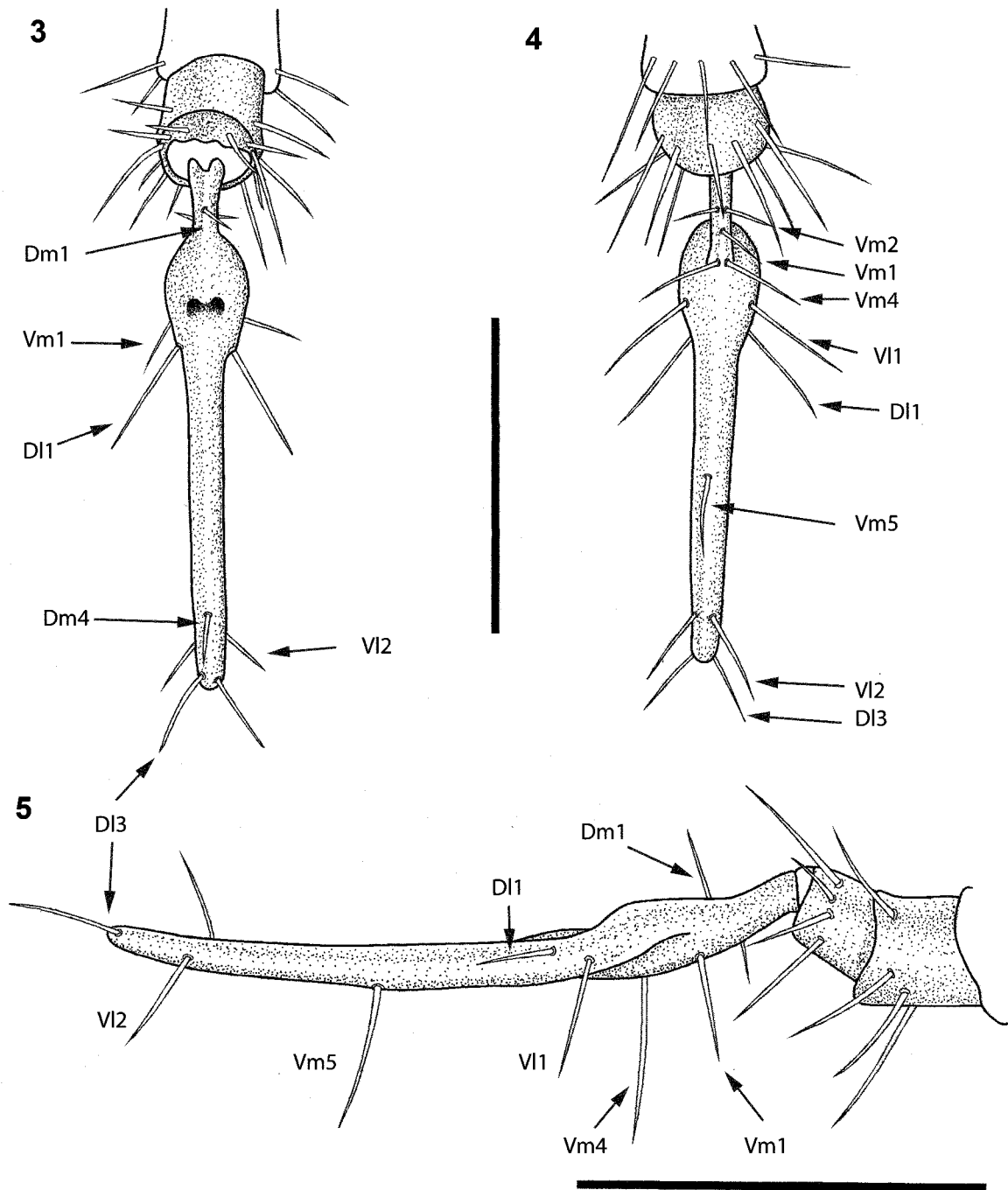
FIGURES 1–2. *Piaroa virichaj* gen. n. & sp. n., (male holotype). 1. Habitus: Dorsal view. 2. Same: lateral view. Scale bars 1 millimeter.

Description of the male (holotype). Coloration. Propeltidium, chelicerae, legs I, pedipalpus and basal portion of flagellum yellowish-brown. Mesopeltidium, metapeltidium, abdominal segments and legs lighter. Propeltidium. (Figs 1–2, 6). With two anterior setae (one behind the other), and one pair of medial dorsal setae and other posterior pair. Metapeltidium entire.

Abdomen (Figs 1–2). Setae: Tergite II with three pairs of microsetae. Tergites I–VIII with a pair of large dorsal; VIII with one pair and one pair of distolateral IX with one pair of large distal and one pair of short and distolateral ones. Segments IX–XII elongated. Segment XII without posterodorsal process. Ventral region. Respiratory spiracles large and oval, slightly sclerotized, darker than sternites.

Flagellum (Figs. 3–5). Pedicel very long, about 65% of the length of the bulb. Bulb 1.3 time longer than wide. Distal portion 2.6 times the length of the bulb. Bulb flattened dorsoventrally, very elongated, with two dorsal small depressions. **Vm**₂ anterior **Dm**₁; **Vm**₁ at level **Dm**₁; **Vm**₄ at level of proximal border of dorsal depression; **Dm**₄ posteriorly, near of **VI**₂; **DI**₃ extremely posterior.

Chelicerae (Fig. 7). Movable jaw sharp and curving in terminal third, sub-apical guard tooth present, with 3 accessory teeth, fixed jaw with 5, the proximal larger, three next the same size, distal teeth slightly larger.



FIGURES 3–5. *Piaroa virichaj* gen. n. & sp. n., (male holotype). 3. Flagellum: dorsal view. 4. Same ventral view. 5. Same: lateral view. Scale bars 1 millimeter.

Pedipalps (Fig. 8). Trochanter with a small prolateral spine, with large sharp frontal process, triangle-like shaped, with a row of ventral setae. Femur short and robust, dorsally curved, in shape of clef, thinner at base and wider at apex, dorsal surface three times longer than ventral, dorsal surface with some setae, ventral face armed with apical short and blunt tubercle. Patella surface generally smooth, tubular, three times longer than wide, with short mesoventral spines and a few dorsal and ventral setae. Tibia similar in form with patella, slightly thinner and lesser setae, dorsally curved. Tarsus conic, half of the tibia's length, with numerous setae, visible sharp spur, and apical inner spine; tarsal claw sharp and curved, slightly larger than half tibial length.

Legs (Fig. 9). Hubbardiinae pattern, anterodorsal margin of femur IV curved at about a 90° angle.

Measurements. Table 1.

TABLE 1. *Piaroa virichaj* gen. n. & sp. n. Measurements in millimeters.

Characters	MALE (MHNLS I-0077)	FEMALE (MHNLS I-0077)
Propeltidium: L/W	1.61/0.87	1.53/0.82
Abdomen: L	3.95	3.39
Flagellum: L/W/H	1.68/0.26/0.21	broken 0.37/0.10/ 0.8
Pedipalp: L		
trochanter	0.57	0.59
femur	0.79	0.63
patela	0.87	0.68
tibia	0.87	0.58
tarsus/claw	0.39/0.16	0.29/0.16
Leg: I L		
trochanter	0.57	0.37
femur	1.79	1.58
patela	2.29	1.87
tibia	1.71	1.45
basitarsus	0.71	0.42
telotarsus	0.42	0.59
Leg: IV L		
trochanter	0.58	0.39
femur	1.76	1.24
patela	0.74	1.34
tibia	0.74	0.79
basitarsus	0.81	0.26
telotarsus	0.66	0.32

Description of female (paratype). (Figs 10–11). Medial lobes and gonopod absent, when cleared with peroxide at 3% and examined in glycerin. Chitinized arch with posterior border U-shaped, 2.6 times wider than long; chitinized arch and base lobes joint heart-shaped, deep anterior border constriction, reaching 1/3 of structure length.

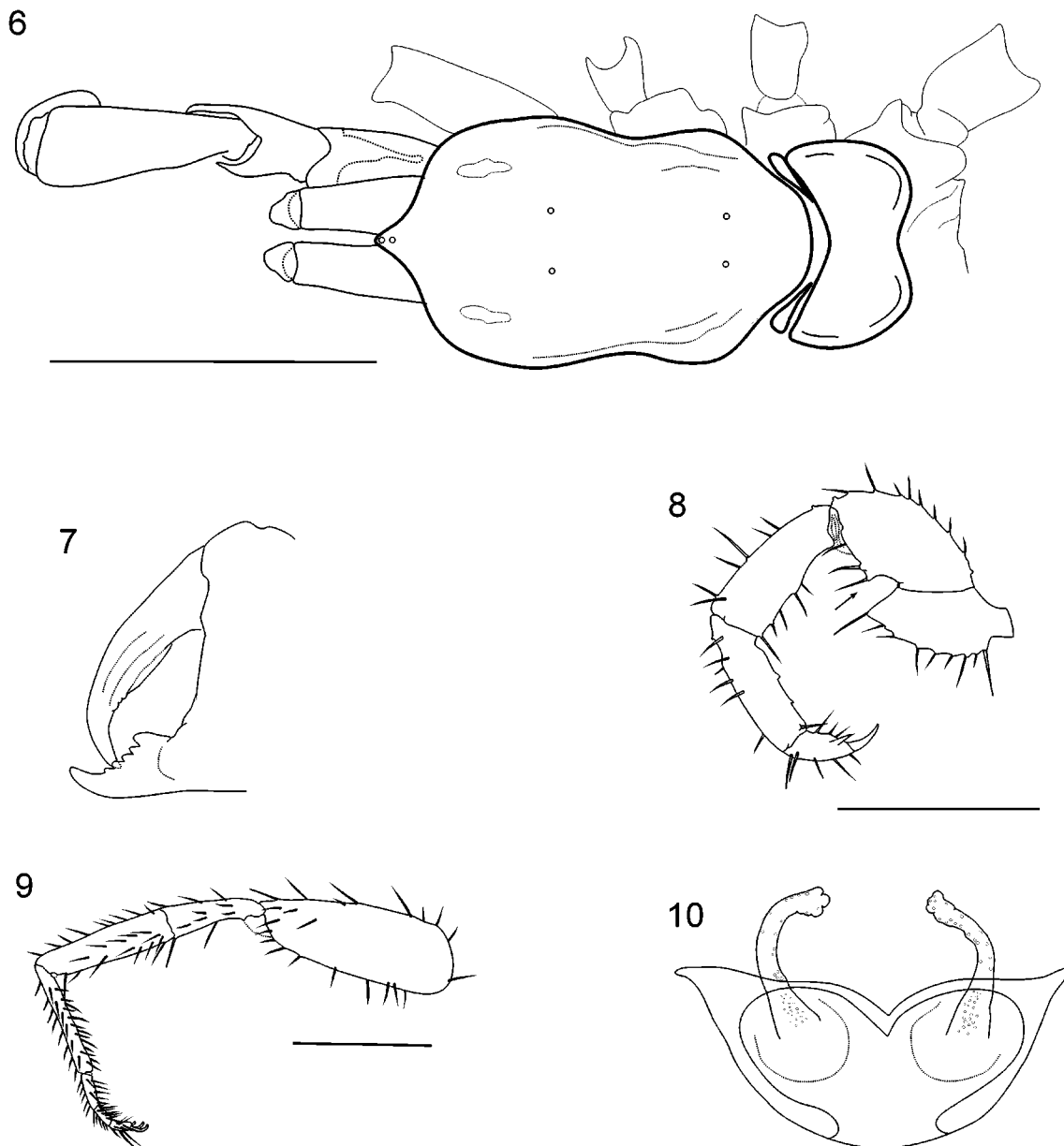
Natural history. All specimens were collected in a very restricted and small micro-habitat, they were found under flat stones, they were up-side-down walking on the stone's undersurface. The locality (Fig. 12) was a secondary growth forest with a sunless understory. It was very humid and resembled a dry stream bed; with dense litter layer, rotten logs and stones. Presently, this locality has been being used for tourism activities.

Discussion

The phylogenetic relationships among South American genera of Hubbardiinae are unknown at present. The main characters used in taxonomy and systematics of this group are the male flagellum shape, chaetotaxy setae, spermathecae shape, angle of the anterodorsal border in the femur IV, abdominal enlargement and presence of distodorsal process on abdominal segment XII of males.

The male of *Piaroa virichaj* sp. n. resembles that of some species of *Stenochrus goodnightorum* group (e.g. *S. goodnightorum* (Rowland 1973), *S. lanceolatus* (Rowland, 1975), *S. orthoplax* (Rowland, 1973) and *S. silvino*, (Rowland & Reddell, 1977)), by the abdominal elongation, and the shape of the male flagellum, which is elongated, with broad-based and two dorsal depressions. However, the new genus possesses a movable cheliceral jaw with many accessory teeth and the carapace length is higher than the *goodnightorum* group

(1.53 – 1.61 vs. 0.89 – 1.42). Except *S. lanceolatus*, the remaining species of this group share the seta Dm4 placed in proximal third of the flagellum. In *S. lanceolatus* and *P. virichaj* sp. n. this seta is distal.



FIGURES 6–9. *Piaroa virichaj* gen. n. & sp. n., (male holotype). Propeltidium, mesopeltidium and metapeltidium: dorsal view. 7. Cheliceral movable and fixed jaw. 8. Pedipalp: lateral view. 9. Leg IV: prolateral view. Scale bars 1 millimeter. 10. Spermathecae: dorsal view.

The morphological condition of female genitalia of *Piaroa virichaj* sp. n. is particularly interesting, having only the lateral lobes. The shape of chitinized arc, the absence of gonopods and the morphology of lateral lobes are similar to *Stewartpeckius troglobius* (Rowland & Reddell, 1981), suggesting a relation between both genera. However, in this genus the medial lobes are present while they are absent in the new species. Another character shared by *Piaroa virichaj* sp. n. and *Stewartpeckius troglobius*, is the presence of a keel in the same region of the accessory teeth, in the movable finger of chelicera, which is also shared with *Pacal* Reddell & Cokendolpher, 1995. However the spermathecae of the last genus is easily distinguished by the shape of the lobes, terminating in large round sclerotized bulbs, with nodules. Nevertheless, the male flagellum is very distinctive in both genera.



FIGURES 11. *Piaroa virichaj* **gen. n. & sp. n.**, (female paratype). Habitus: lateral view. Scale bar 1 millimeter

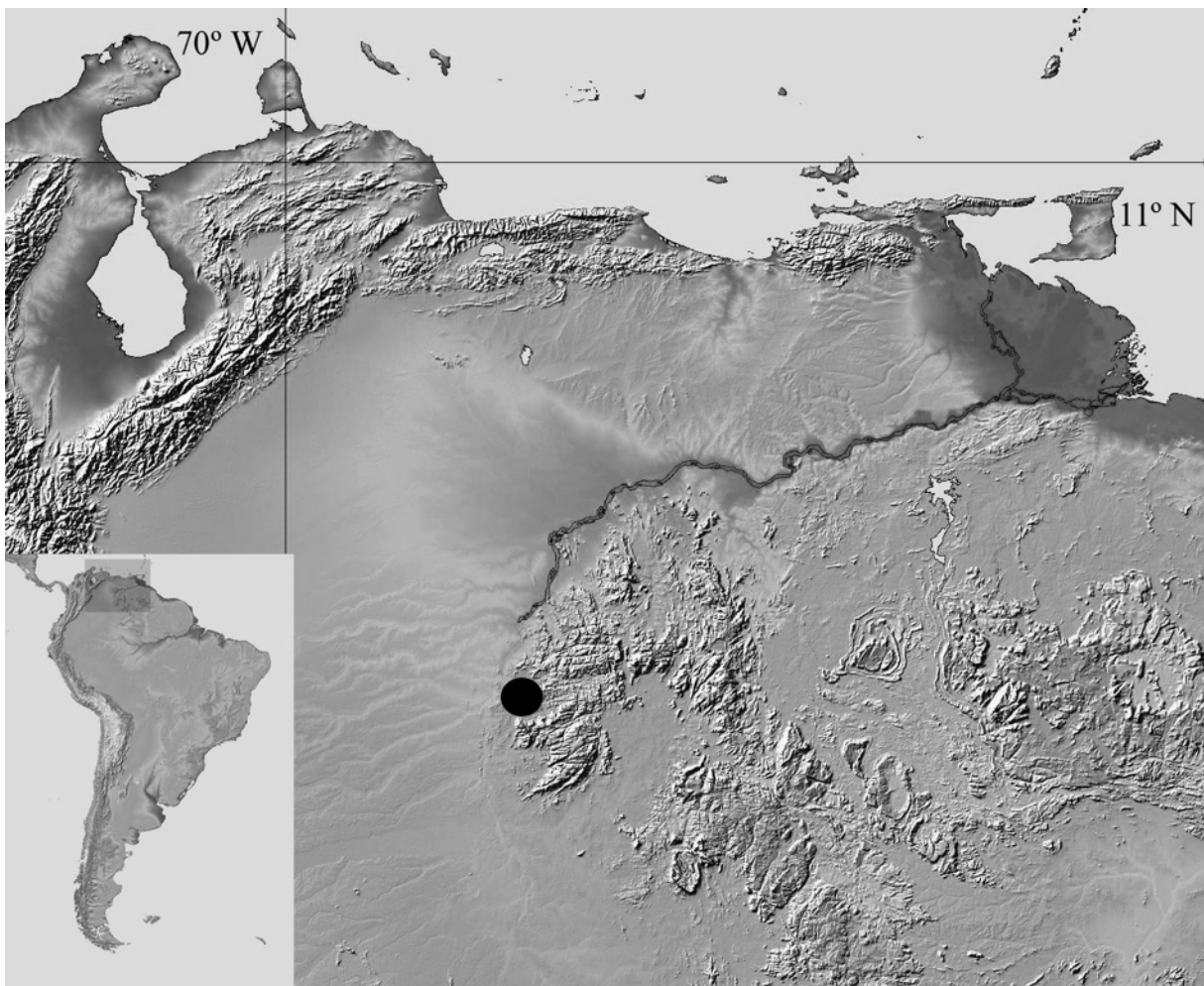


FIGURE 12. Map showing the type locality of *Piaroa virichaj* **gen. n. & sp. n.** in Amazonas State, Venezuela.

The elongate male abdominal segments IX-XII in *Piaroa virichaj* sp. n. is much more evident than in *S. troglobius*. The last character appears to have been developed independently in numerous genera, there are records of intrageneric variation in *Hansenoehrus* (Villarreal & Teruel, 2006), however, it is considered a putative synapomorphy for the genus (Reddell & Cokendolpher, 1995). Although, this condition is also present in *P. virichaj* sp. n. we consider premature stating it as a convergence or a derived character for this genus.

The morphology of the male flagellum is used to support the internal groups of *Stenochrus*, thus, this condition shared between the new species herein described, and species of the *goodnightorum* assemblage of the genus *Stenochrus*, may suggest that the new species should be in fact a member of the genus *Stenochrus*. However, this action would not be consistent with the relationships of *Piaroa* and *goodnightorum* species, as the male flagellum frequently shows intra-generic variation. The species in *goodnightorum*, for example, show variations in the distal portion of the flagellum and the presence of different numbers of dorsal depressions, the same variations are also present in *Rowlandius* Reddell & Cokendolpher 1995 (e.g. *Rowlandius ramosi* Armas, 2002; *R. cupeyalensis* Armas, 2002 and *R. tomasi* Armas, 2007).

Additionally, the flagellum is sexually dimorphic and could be suffering an effect of strong selective pressure. Due to the highly variable nature of this character it should not be used alone to define genera (Reddell & Cokendolpher 1995). The species of *Piaroa* and *goodnightorum* group are clearly distinguished by the morphology of spermathecae. In *Piaroa* medial lobes are absent while they are present and large in the second group, additionally there are differences in the shape of chitinized arc and the size of lateral lobes in both unities. The characters of spermathecae and gonopod have been used for taxonomic purposes only recently (Brignoli 1973, Rowland 1975 in Reddell & Cokendolpher 1995), although they are stable morphologically, except for *Rowlandius* (e.g. *R. abeli* Armas, 2002; *R. monticola* Armas, 2002 and *R. toledo* Armas, 2002) and *Hansenochnus* (e.g. *H. centralis* (Gertsch, 1941) and *H. urbani* Villarreal & Teruel, 2006) that needs taxonomic review (Villarreal & Teruel, 2006).

A derived condition for *Piaroa virichaj* sp. n., within the Hubbardiidae, appears to be the single pair of lobes in the spermathecae, larger abdominal segments, and the presence of a small ventral tubercle in the femur of the pedipalp (Fig. 8) in both sexes. The presence of spines or tubercles in pedipalpal femur have been registered in other South American genera (e.g. *Adisomus* Cokendolpher & Reddell, 2000; *Surazomus* Reddell & Cokendolpher, 1995), however, these structures present in other species vary in size and form and are sexually dimorphic. Further systematic studies are needed to state properly if these characters are homologous and the former use in schizomids systematics. The presence of lamina in chelicerae, elongated abdomen in males and shape of spermathecae suggest a close relationship between *Stewartpeckius* Reddell & Cokendolpher, 1995 and *Piaroa* n. gen. It is worth mentioning that the male flagellum shape resembles *Hansenochnus* and *Stenochrus*, both also have two pairs of lobes in spermathecae, a plesiomorphic condition in Hubbardiidae. Presently, any conclusion about relationships and systematic position of *Piaroa virichaj* sp. n. without a complete cladistic analysis would be premature.

Acknowledgements

We thank Cristiana Serejo, Carlos DoNascimento and Francisco Provenzano for providing laboratory facilities. James Cokendolpher and Mark Harvey for the valuable comments on the manuscript. The results of this study are part of the project "Arachnological Expedition -Venezuela 2002". A. L. Tourinho acknowledges grant from CNPq (PDJ) # 151754/2007-1. We thank Abel Pérez G. (MNRJ) for having made possible this project. To Daniel Lew and Celsa Señaris (MHNSL) for their assistance during the development of this project. To Laura Hernandez (IVIC) and Andreina to the selfless support during the fieldwork.

References

- Armas, L.F.de (2001) A new *Rowlandius* Reddell & Cokendolpher, 1995 (Schizomida: Hubbardiidae) from Navassa Island, Greater Antilles. *Revista Ibérica de Aracnología*, 4, 93–95.
- Armas, L.F.de (2002) Dos nuevos géneros de Hubbardiidae (Arachnida, Schizomida) de Cuba. *Revista Ibérica de Aracnología*, 5, 3–9.

- Armas, L.F.de & P.A. Colmenares G. (2006) Nuevo género de Hubbardiidae (Arachnida: Schizomida) del Zulia, Venezuela. *Boletín de la Sociedad Entomológica Aragonesa*, 39, 27–30.
- Bonaldo, A. & Pinto-da-Rocha R. (2007) A new species of *Surazomus* (Arachnida, Schizomida) from Brazilian Oriental Amazonian. *Revista Brasileira de Zoologia*, 24(2), 323–326.
- Brignoli P.M. (1973) Note sulla morfologia dei genitali degli Schizomidi e diagnosi preliminari di due nuove specie del Messico (Arachnida, Schizomida). *Fragmenta Entomologica*, 9, 1–9.
- Cokendolpher J.C. & Reddell J.R. (2000) New and rare Schizomida (Arachnida: Hubbardiidae) from South America. *Amazoniana*, 16 (1/2), 187–212.
- González-Sponga M.A. (1997) Arácnidos de Venezuela, Un nuevo género y dos nuevas especies de Schizomidae y redescrpción de *Schizomus simoni* Hansen y Sörensen, 1905 del Sistema Montañoso de la Costa (Schizomida). *Acta Biologica Venezuelica*, 17(2), 1–10.
- Harvey M. (1992) The Schizomida (Chelicerata) of Australia. *Invertebrate Taxonomy*, 6, 77–129.
- Harvey M. (2001) The Schizomida (Arachnida) of the Seychelle Islands. *Invertebrate Taxonomy*, 15, 681–693.
- Harvey, M.S. (2007) The smaller arachnid orders: diversity, descriptions and distributions from Linnaeus to the present (1758 to 2007). *Zootaxa* 1668, 363–380.
- Pinto-da-Rocha R. (1996) *Surazomus chavin* new species, first Schizomida (Hubbardiidae, Hubbardiinae) described from Peru. *Journal of Arachnology*, 24, 265–267.
- Reddell J.R. & Cokendolpher J.C. (1995) Catalogue, bibliography and generic revision of the Order Schizomida (Arachnida). *Texas Memorial Museum, Speleological monographs*, 4, 1–170.
- Rowland J.M. & Reddell J.R. (1979) The Order Schizomida (Arachnida) in the New World. II. *Simonis* and *brasiliensis* groups (Schizomidae, *Schizomus*). *Journal of Arachnology*, 7, 89–119
- Teruel R. (2003) Adiciones a la fauna cubana de schizómidos, con la descripción de un nuevo género y nueve especies nuevas de Hubbardiidae (Arachnida, Schizomida). *Revista Ibérica de Aracnología*, 7, 39–69.
- Teruel R. (2007) Esquizómidos troglomorfo de Cuba, con las descripciones de dos géneros y dos especies nuevos (Schizomida: Hubbardiidae: Hubbardiinae). *Boletín de la Sociedad Entomológica Aragonesa*, 40, 39–53.
- Teruel, R. & L.F. Armas de (2002) Un género nuevo de Hubbardiidae (Arachnida: Schizomida) del occidente de Cuba. *Revista Ibérica de Aracnología*, 6, 91–94.
- Tourinho A. & Kury A.B. (1999) The southernmost record of Schizomida in South America, first records of Schizomida for Rio de Janeiro and of *Stenochrus* Chamberlin, 1922 for Brazil (Arachnida, Schizomida, Hubbardiidae). *Boletim do Museu Nacional, Zool.*, 405, 1–6.
- Villarreal M.O. & Teruel R. (2006) Un nuevo *Hansenchrus* Reddell & Cokendolpher, 1995 (Schizomida: Hubbardiidae) de Venezuela Noroccidental. *Papeis Avulsos de Zoologia S. P.*, 46(20), 233–238.