

ARTÍCULO:

A new remarkable troglomorphic gonyleptid from Brazil (Arachnida, Opiliones, Laniatores)

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A NEW REMARKABLE TROGLOMORPHIC GONYLEPTID FROM BRAZIL (ARACHNIDA, OPILIONES, LANIATORES)

Abel Pérez G. & Adriano B. Kury

Abstract

The new genus *Giupponia* is described for the new species *Giupponia chagasi* from two limestone caves in Serra do Ramalho, Carinhanha, Bahia State, Brazil. This species shows remarkable troglomorphisms, such as complete depigmentation, very elongate appendages, very high tarsal segmentation and complete loss of the ocular structures. This is the first anophthalmic cave dwelling harvestman from Brazil. The affinities of *Giupponia* are discussed on the grounds of external and genital morphology. Placement in the family Gonyleptidae, subfamily Pachylinae is supported by external morphology and genital features. The new genus is compared to the other two described troglomorphic gonyleptid species, *Pachylospeleus strinatii* Šilhavý, 1974 and *Iandumoema uai* Pinto-da-Rocha, 1996.

Key words: anophthalmy, Bahia state, biospeleology, Gonyleptidae, harvestmen, *Iandumoema*, Neotropics, Pachylinae, *Pachylospeleus*, troglobites.

Taxonomy:

Giupponia gen. nov.
Giupponia chagasi sp. nov.

Un nuevo y singular Goniléptido troglomorfo de Brasil (Arachnida, Opiliones, Laniatores)

Resumen

Se describe un nuevo género y especie, *Giupponia chagasi*, proveniente de una cueva calcárea localizada en la Serra do Ramalho, Carinhanha, Estado de Bahía, Brasil. La especie presenta notables troglomorfismos tales como una fuerte despigmentación, apéndices muy alargados, alta segmentación tarsal y pérdida completa de las estructuras oculares. Este es el primer troglobio anoftalmo de Brasil. Se discuten las afinidades de *Giupponia* sobre la base de su morfología externa y genital. Los resultados obtenidos ubican a la nueva especie en la familia Gonyleptidae, subfamilia Pachylinae. *Giupponia chagasi* es comparada con las otras dos especies conocidas de goniléptidos troglobios: *Pachylospeleus strinatii* Šilhavý, 1974 e *Iandumoema uai* Pinto-da-Rocha, 1996.

Palabras clave: anoftalmia, Biospeleología, Gonyleptidae, Opiliones, *Iandumoema*, Neotrópico, Pachylinae, *Pachylospeleus*, Troglobios, Brasil.

Taxonomía:

Giupponia gen. nov.
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Introduction

In the family Gonyleptidae there are only a few cave-dwelling species which developed troglomorphisms. The monotypic subfamily Pachylospeleinae was created for the genus *Pachylospeleus* Šilhavý, 1974 with the single species *Pachylospeleus strinatii* Šilhavý 1974 from caves in São Paulo state (Šilhavý, 1974). The genus *Iandumoema* Pinto-da-Rocha, 1996 was created for the species *Iandumoema uai* Pinto-da-Rocha, 1996 from the karst of Minas Gerais (Pinto-da-Rocha, 1996). Both species are somewhat depigmented and possess elongate appendages, but still retain some of the pigmented layer and the lens of the eye. An expedition of the Arachnology Laboratory of the Museu Nacional in the Bahia State (eastern Brazil) yielded some specimens of an undescribed depigmented species with extremely elongate appendages and which lacks eyes altogether. This is the first anophthalm harvestman from Brazilian caves, although not the first anophthalm from Brazil — there is a eyeless small species belonging to an unknown family (traditionally included in the meaningless family Phalangodidae), which has been described from termite nests in the state of Rio de Janeiro — *Caecobunus termitarum* Roewer, 1927. The new blind cave dwelling gonyleptid is herein described as a new species in a new genus, and its subfamilial inclusion is discussed.

Acronyms of repositories are AMNH (American Museum of Natural History, New York), CBK (Colección Biopaleológica de la Sociedad Espeleológica de Cuba, Havana), CAS (California Academy of Sciences, San Francisco), IBUT (Instituto Butantan, São Paulo), MNRJ (Museu Nacional, UFRJ, Rio de Janeiro), MZSP (Museu de Zoologia, USP, São Paulo) and SMF (Senckenberg Museum, Frankfurt). All measurements are in mm.

Additional material examined: *Iandumoema uai* Pinto-da-Rocha, 1996, 1♂ 1♀ (MNRJ), *Pachylospeleus strinatii* Šilhavý, 1974, 2♂♂ 1♀ (MNRJ 6790).

Systematic accounts

Giupponia new genus

ETYMOLOGY. Genus name honors the arachnologist Alessandro Ponce de Leão Giupponi, who not only collected the holotype of *Giupponia chagasi*, but also has been seriously involved in building up the Arachnological Section of the Museu Nacional through his devotion and friendship.

TYPE SPECIES. *Giupponia chagasi* new species, by present designation.

DIAGNOSIS. Gonyleptidae without eyes, eye mound projected in high erect spine. Coxa IV in male armed with dorso-apical trifold small apophysis. Frontal hump with paired spines. Area I undivided. All scutal areas, free tergites and sternites unarmed. Tarsus III-IV without tarsal process. Femur IV without apophysis and spines. Ventral plate with parabolic cleft and four basal flattened truncated setae and three distal cylindrical pointed setae. Glans without dorsal and ventral processes, partially fused to ventral plate. Relative length of legs: II-IV-III-I. Tarsal segmentation male 8-9(3)/34-37(4)/7/8, female 8-9(3)/29-36(4-5)/7/8. Calcaneus I more than twice longer than astragalus, calcanei II-III a little shorter, calcaneus IV much shorter than astragalus.

Giupponia chagasi new species

Figs. 1-12.

ETYMOLOGY. Species name honours the other collector of the holotype of *Giupponia chagasi*, the myriapodologist Amazonas Chagas Junior who is another enthusiastic member of our team.

TYPE MATERIAL. ♂ holotype (MNRJ 4640), Carinhanha, Serra do Ramalho, Lapa do Boqueirão, 29.vi.2001, leg. A. Giupponi & A. Chagas; 1♂ 8♀♀ paratypes (MNRJ 4699), Carinhanha, Serra do Ramalho, Gruta do Zé Bastos, 28.vi.2001, leg. A. Giupponi, A. Chagas & R. Baptista; 1♀ paratype each, same data (AMNH, CAS, IBUT, MZSP, CBK, SMF).

DISTRIBUTION. Species known from two caves in the Serra do Ramalho, municipality of Carinhanha, Bahia State, Brazil (see Fig 12).

DESCRIPTION. Male holotype measurements. Carapace 1.51 long 1.81 wide, abdominal scutum 2.22 long 2.44 wide. Pedipalp: Fe 3.62, Pa 1.69, Ti 2.04, Ta 1.42, claw 1.12.

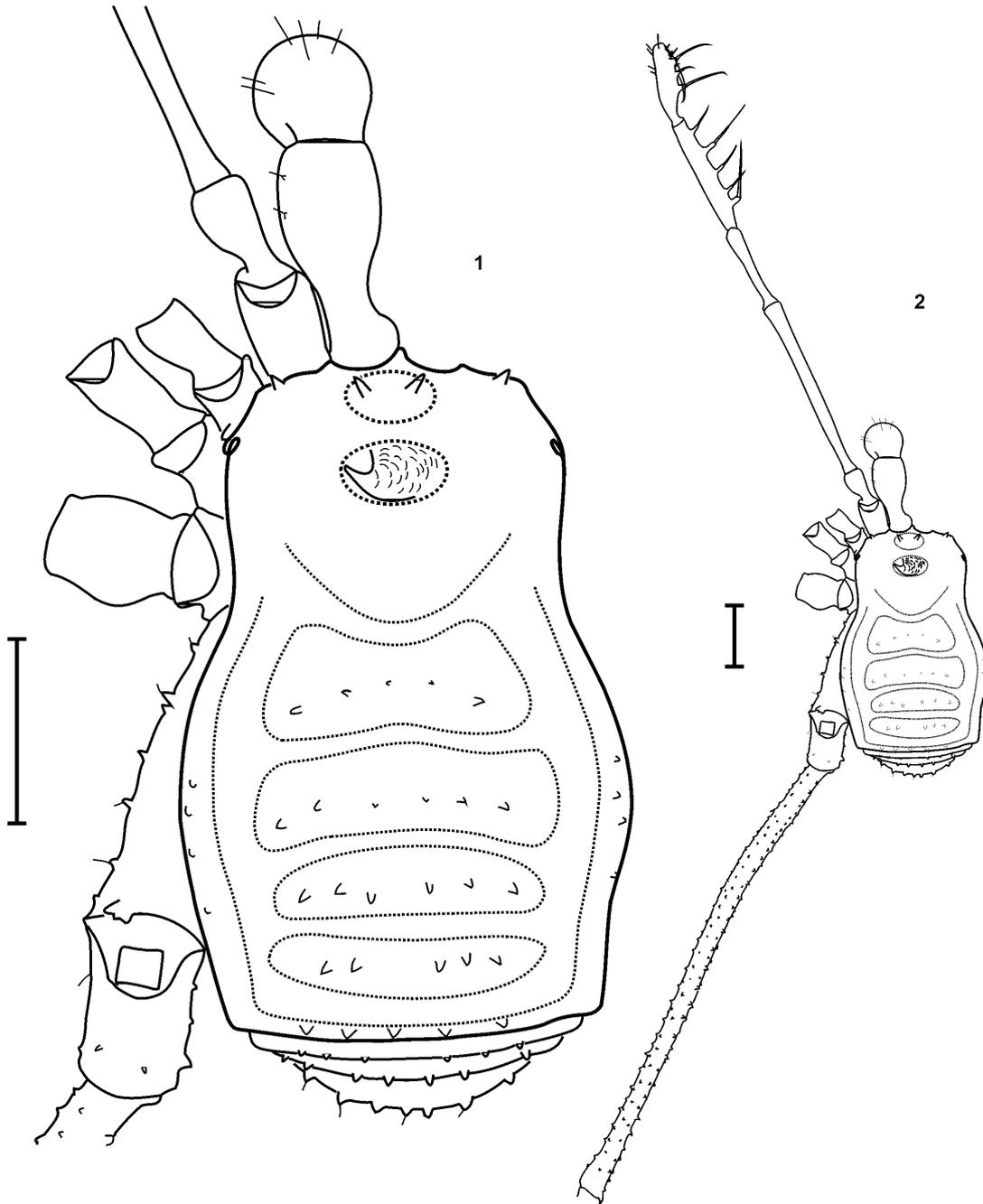
Dorsum. — Scutum outline attenuate pyriform, elongate, widest at area II. Cheliceral sockets shallow, frontal margin of carapace with one projections in each of the lateral thirds. Frontal hump of carapace armed with a pair of pointed spines. Eye mound narrow, situated far from frontal margin of carapace, projected in a very high erect process. Without any trace of eyes. Mesotergum divided in four areas by four transverse deep wide grooves. Area I undivided. Each area with a transverse row of low pointed tubercles. Posterior margin and free tergites I-III also with a tubercle transverse row each. Lateral margins with a few small tubercles. Two ozopores of similar size present, only the anterior visible in dorsal view.

Venter. — Coxae I-IV and stigmatic area densely covered with tubercles. Stigmatic area partially fused with coxa IV. Genital opercle rounded, subquadrangular. Coxa IV without ventral apophyses, connected to posterior margin of stigmatic area by a lateral process. Stigmata visible. Stigmatic area with posterior groove and thickened posterior border. All free sternites with a transverse tubercle row each.

Chelicera. — Basichelicerite (trochanter) as long as carapace, unarmed, without swollen bulla. Hand slender and unarmed. Fixed and movable finger with 4 low and broad teeth.

Pedipalp. — Measurements of segments: Tr 0.5, Fe 3.4, Pa 1.3, Ti 2.2, Ta 1.4, claw 1.0. Twice longer than body, all segments much elongate and slender, with spination concentrated in tibia-tarsus. Coxa long, reaching half of basichelicerite in situ. Trochanter with ventral setiferous tubercle. Femur smooth and unarmed, except for ventro-basal setiferous tubercle. Patella unarmed, much elongate and slender, only slightly thickened distally. Tibia cylindrical, with five ectal (IiiIi) and five mesal (IiiIi) setiferous tubercles. Tarsus slightly convex ventrally, armed with three ectal (iII) and three mesal (IiI) setiferous tubercles and many ventral bristles.

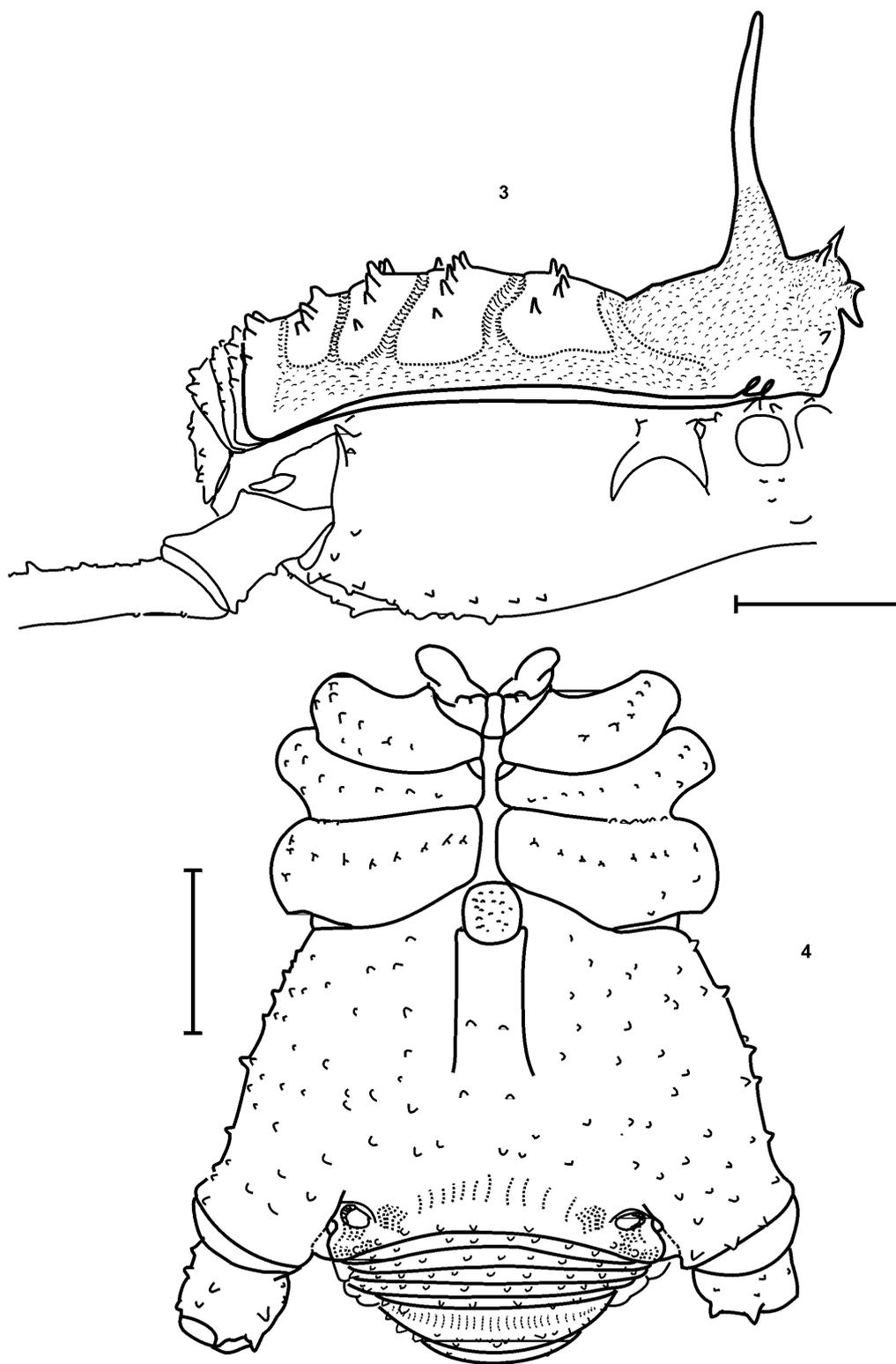
Legs. — Dorso-basal apophyses of coxae I-II short, simple. Coxa IV surpassing scutum in dorsal view, its posterior border reaching groove IV and covered with dorsal setiferous tubercles and dorso-apical trifold blunt apophysis. Trochanter IV short with low tubercles. Femur IV very long, only slightly sinuous, densely covered with small sharp tubercles. Tarsus III-IV without tarsal process ("pseudonychium"). Tarsal counts 9(3)/34-37(4)/7/8. Ratio calcaneus/astragalus of legs I-IV: 2.6/0.9/0.8/0.3. Leg measurements in Table I. Genitalia. — Ventral plate subrectangular, a little narrower in the middle, lateral margins much thinner and rugose, distal margin with parabolic cleft. Setae arranged in two groups. Basal group with four flattened large truncate setae. Distal group with three cylindrical pointed smaller setae. Glans without dorsal or ventral



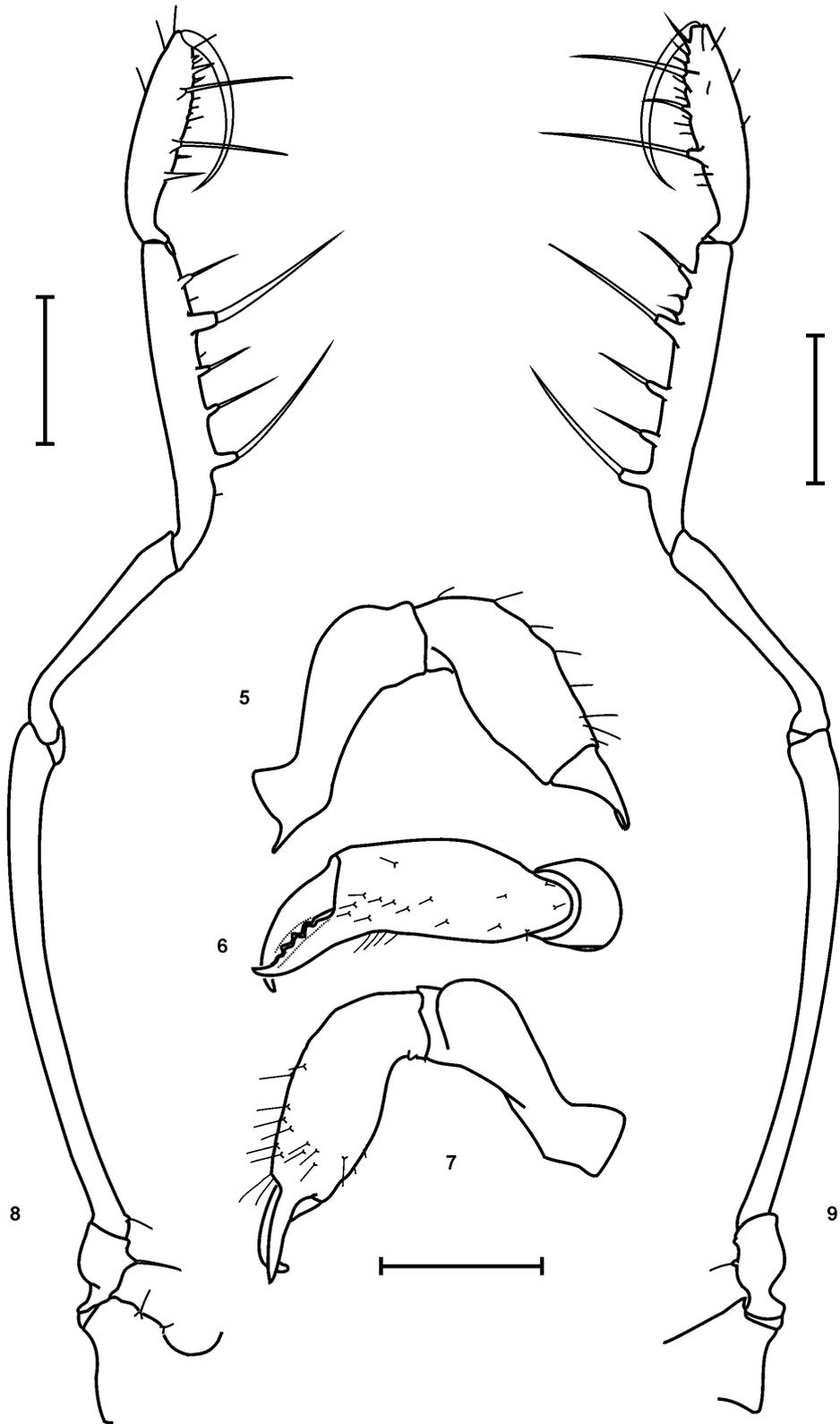
Figs. 1-2. *Giupponia chagasi* species nova, male holotype (MNRJ 4640). 1. Habitus, dorsal with detail of scutum and tergites; 2. Same, more general view. Scale bars: 1 mm.

Table I.
Measurements of long podomeres of legs of the holotype of *Giupponia chagasi* n. sp.

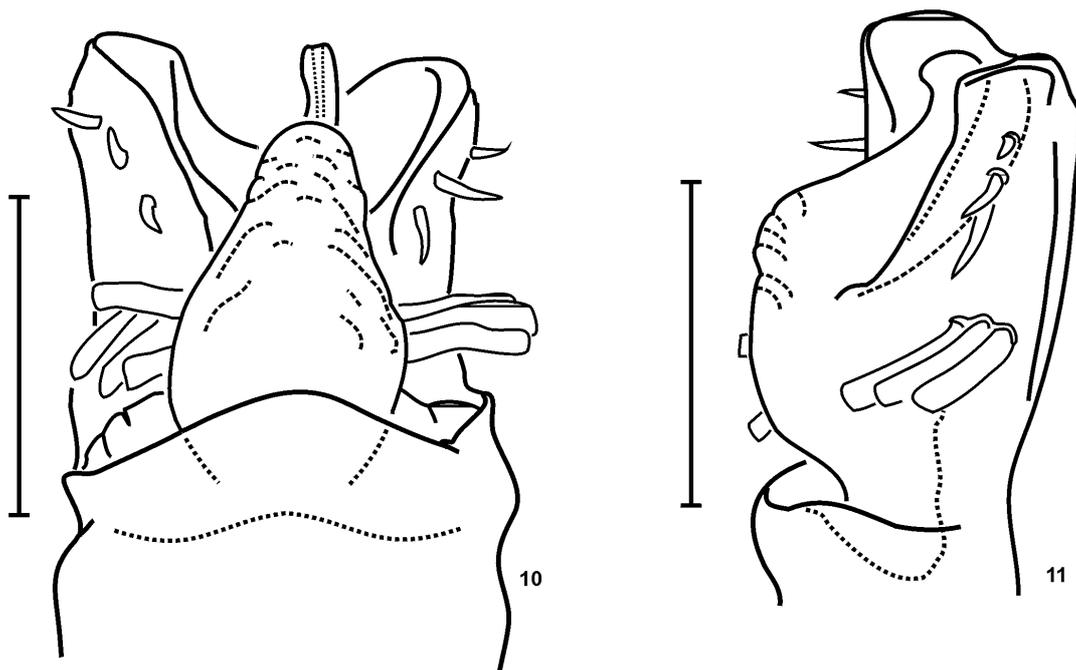
	I	II	III	IV
Total length of leg	19.3	37.9	20.9	27.7
Femur	4.9	9.3	6.0	7.8
Tibia	3.6	8.1	3.4	5.1
Metatarsus	6.5	8.8	6.1	8.3



Figs. 3-4. *Giupponia chagasi* species nova, male holotype (MNRJ 4640). 3. Body, lateral view; 4. Coxae, stigmatic area and sternites, ventral view. Scale bars: 1 mm.



Figs 5-9. *Giupponia chagasi* species nova, male holotype (MNRJ 4640). **5.** Right chelicera, ectal view, **6.** Same, frontal view; **7.** Same, mesal view; **8.** Right pedipalp, ectal view; **9.** Same, mesal view. Scale bars: 1 mm.



Figs. 10-11. *Giupponia chagasi* species nova, male holotype (MNRJ 4640). **10.** Distal part of Penis, dorsal view; **11.** Same, lateral view. Scale bar: 0.1 mm.

processes, fused with ventral plate until mid-length. Stylus thick and with apex swollen.

Female. — Much similar to male, excepted dorso-apical apophysis of coxa IV, reduced to a little spiniform tubercle. Tarsal counts (n=14) 8-9(3)/29-36(4-5)/7/8. Ratio calcaneus/astragalus of legs I-IV: 2.0/0.8/0.8/0.2.

NATURAL HISTORY. The specimens of *Giupponia chagasi* n. sp. have been collected in the deeper part of both caves, in absolute darkness, high relative humidity and far from the entrances. This results in high stability of conditions of humidity and temperature of the environment. The holotype has been collected more than 800 m from the entrance of the Cave of Boqueirão and the paratypes from 200 m to the deepest explored zones of the Cave of Zé Bastos (700 m). The specimens were found alone, usually hidden in small crevices on the walls, a few were caught on the floor, under rocks or fallen secondary formations (stalactites and stalagmites). In the Cave of Zé Bastos some specimens inhabited semi-flooded galleries, and placed themselves on the mud-covered walls, near the waterline. The galleries inhabited by individuals of this species show low availability of food, namely, the absence of bat guano and of the associated fauna, and the great distance from the entrance (little influence from the external environment). Some specimens of *Giupponia chagasi* n. sp. have been collected together with a new troglomorphic species of *Charinus* (Arachnida, Amblypygi, Charinidae). Other associated fauna were roaches and spiders of the family Ctenidae (R. Baptista & A Giupponi, pers. comm.).

Discussion — relationships

The relationships of *Giupponia* are discussed next. The position of glans, free, based on an unfoldable sac, not encapsulated in a concavity in the truncus define its pertinence to the superfamily Gonyleptoidea (Kury, 1993; Unpublished).

Let us first review the absence of features typical of each Gonyleptoid family and then examine the positive evidence to include it the Gonyleptidae. Among the families of Gonyleptoidea, the Stygnopsidae and Agoristenidae are easily dismissed respectively because lack of a spiny sac and trifold spines of ventral plate plus keeled stylus. *Giupponia* also lacks the typical flattened pedipalps which are a remarkable synapomorphy of the Cosmetidae. The Assamiidae, besides the frontal processes of carapace and the specialized depressed pedipalps possess the introverted glans (Stacheltrichter). The Stygnidae do not possess a common eye mound and show specializations in ventral plate. The Manaosbiidae have a spindle-like swollen basitarsus plus typical armature of mesotergum. The Cranaiidae possess patella and tibia of pedipalpus covered with coarse granulations. The absence of sexual dimorphism of chelicerae is typical of Gonyleptidae and Manaosbiidae. The loss of a dorsal process of the glans penis appear to have occurred many times independently in the families of Gonyleptoidea, and its absence *per se* is not enough to place this genus in a given family. The short rectangular ventral plate with a parabolic cleft, in the same plan as the truncus, with two unequal groups of setae is typical of Gonyleptidae. This construction plan is present also

in early derivative Cranidae such as *Prostygnus*, who still possess although a dorsal process in the glans. This description could also apply to the Cosmetidae, which do not have this cleft. A typical feature of the Gonyleptidae, however, is absent — the flabelliform dorsal process of glans. This structure appeared only in the “advanced” Gonyleptidae (cf. Kury, 1994). Other positive evidence to include this genus in the Gonyleptidae is the presence of two ozopores, feature exclusive (although not universal) of this family and the bifid (or trifid) apical apophysis of coxa IV (single branched, when present, in the other families). Therefore, we have at least three positive evidences favoring the inclusion in Gonyleptidae, and lots of reasons not to include it in any other family of Gonyleptoidea.

Having established our hypothesis of *Giupponia* as a member of the Gonyleptidae, now comes the problem of its subfamilial inclusion. The outer features are so much cave-stereotyped that become of little use. The unfused free tergites discard at once the Heteropachylinae for our sampling universe. Mesotergal area II not invading area I could serve to discard the Goniosomatinae. The Gonyasamiinae are minute specialized Pachylinae with hooked eye mound and sturdy spiny stylus, features that do not match *Giupponia*.

The eye mound removed from the anterior border of carapace with a single huge spine is not typical of most subfamilies of Gonyleptidae. The eye mound in Gonyleptidae is very plastic, but such a position and armature occur in many genera of Pachylinae and Tricommatinae (who could be an offshoot of the former). The Tricommatinae typically show a fusion of left and right halves of mesotergal area I, swollen base of ventral plate and a *lamina parva*.

Male genitalia is the best basis for speculating subfamilial pertinence. The complete absence of spiny sacs and slender spines in ventral plate discards the pertinence to the Metasarcinae. The absence of helycoidal setae of distal group in ventral plate and the arrangement of the basal group in the same plan as ventral plate speak against the inclusion in the Gonyleptinae-like group (that is, Gonyleptinae, Hernandariinae, Progonyleptoidellinae, Sodreaninae, Caelopyginae). The Mitobatinae and Bourguyiinae among other things always possess a flabelliform ventral process of glans, absent in *Giupponia*. The Pachylospeleinae, a poorly defined subfamily in respect to Pachylinae, possess a ventral process of glans.

The Pachylinae is by far the largest subfamily of Gonyleptidae, including half of the valid species (400 out of 821). They surely do not form a monophyletic group, and actually assigning a given genus to the Pachylinae is almost the same as stating “Gonyleptidae incertae sedis”. In accordance to *Giupponia*, many genera of Pachylinae possess a naked stylus, without ventral or dorsal processes and a subrectangular ventral plate.



Fig. 12. South America, showing location of Serra do Ramalho (open circle), type locality of *Giupponia chagasi* species nova, on the left margin of São Francisco River.

Discussion — comparisons with the other troglomorphic Gonyleptidae

There are two other species of troglomorphic Gonyleptidae, namely *Pachylospeleus strinatii*, type of the monotypic subfamily Pachylospeleinae and *Iandumoema uai*, placed in Pachylinae. Both are roughly similar in habitus, to the point that Helia Soares labelled a specimen of *I. uai* as a new species of *Pachylospeleus*.

We had opportunity to examine males and females of both species. The most striking resemblance between both species is the scutum outline, pedipalps, general structure of ventral plate and the presence of a ventral process in glans. There are many significant differences, such as 1) the trochanter IV of male, which in *P. strinatii* is short, and in *I. uai* is long, hourglass-shaped; 2) *P. strinatii* possesses apical inner apophysis in coxa IV, absent in *I. uai*; 3) the apophysis of coxa IV of male in *P. strinatii* is slightly sinuous with a secondary small branch while in *I. uai* it is abruptly bent without secondary branch; 4) tarsal process absent in *I. uai*, present in *P. strinatii*. Minor differences are for example the eye mound, which in *P. strinatii* is unarmed and in *I. uai* is armed with an erect very high spine (see also Table II).

Giupponia is neither specially closely related to *Pachylospeleus* nor to *Iandumoema*. A synoptic scheme (Table II) will help separate those three species at a glance.

Table II.
Comparison among troglomorphic Gonyleptidae.

Character/taxa	<i>Giupponia</i>	<i>landumoema</i>	<i>Pachylospeleus</i>
Frontal hump	with pair of spines	2 small pointed tubercles	unarmed
Eye-mound	armed with huge erect spine.	armed with huge erect spine, with apex bent backwards.	2 paramedian small setiferous tubercles located on the posterior slope of eye mound.
Eyes	completely absent	cornea reduced to 50% size of epigean Pachylinae (<i>Eusarcus</i> sp.) of similar size. Pigment much reduced.	cornea reduced to 30% size of epigean Pachylinae. Pigment much reduced (literature data conflicting: Šilhavý, 1974: much reduced, but Pinto-da-Rocha, 1996: normal)
Pedipalps	extremely elongate	slender, but short	slender, but short
Dorso-apical apophysis of coxa IV	Blunt, very short and trifid.	Sharp, very long, abruptly bent and single-branched.	Sharp, very long, slightly sinuous and bifid.
Coxa IV ventral	with lateral-inner apophysis fused to stigmatic area.	without apophysis	with strong inner lateral pointed apophysis
Trochanter IV	short, unarmed	long, hourglass-shaped, with strong wide basal prolateral process	short, square, armed with strong dorso-apical pointed apophysis
Femur IV of ♂	straight	curved basally	straight, with dorso-basal apophysis
Tarsal process	absent	absent	present
Tarsal formula	8-9(3)/29-37(4-5)/7/8	7(3)/16-22(3-4)/6/6	6(3)/15-16(5)/6/6
Ventral process of glans penis	absent	present	present
Ventral plate	subrectangular, with parabolic cleft	trapezoid, entire	trapezoid, entire
Distribution	Two caves in Bahia State	Cave in Minas Gerais State	Cave in São Paulo State

Conclusion

The cave-dwelling species herein described — *Giupponia chagasi* — is the first entirely anophthalm member of Gonyleptidae — the largest family of Laniatores. Besides the eyelessness, *G. chagasi* shows the most advanced troglomorphisms ever recorder for this family, such as, high number of tarsal segments, extremely long pedipalps and legs, and high degree of depigmentation. Its inclusion in any of the 15 currently recognized subfamilies of Gonyleptidae is not positively supported by any evidence, although the typological combination of characters offers grounds for the inclusion in the meaningless subfamily Pachylinae. *G. chagasi* up to now is known from only from two caves, and this high local endemism of this species provides support for the conservation of the karstic area of Carinhanha in Bahia State.

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