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# A new, apparently arboricolous species of the millipede genus *Mestosoma* SILVESTRI, 1897 from near Iquitos, Peruvian Amazonia (Diplopoda: Polydesmida: Paradoxosomatidae)*

by

S.I. Golovatch, R.L. Hoffman, A. Mármol & J. Adis

Prof. Dr. Sergei I. Golovatch, Institute for Problems of Ecology and Evolution, Russian Academy of Sciences, Leninsky pr. 33, Moscow 117071 (V-71), Russia; e-mail: sgol@orc.ru
Prof. Dr. Richard L. Hoffman, Virginia Museum of Natural History, 1001 Douglas Avenue, Martinsville, Virginia 24112, U.S.A.; e-mail: rhoffman@vmnh.org
Prof. Dr. Andrés Mármol, Departamento de Zoología, Universidad Nacional de la Amazonia Peruana (UNAP), Apartado Postal 373, Iquitos/Loreto, Peru; e-mail: marmolandres@hotmail.com
Prof. Dr. Joachim Adis, Tropical Ecology Working Group, Max-Planck-Institute for Limnology, Postfach 165, 24302 Plön, Germany; e-mail: adis@mpil-ploen.mpg.de
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## Abstract

*Mestosoma junki* n.sp., described from the vicinity of Iquitos, Peru, is distinguished from known relatives by the colour pattern (dorsally black with a bright red median band) and details in body, leg, and gonopod structure. It differs from other species of *Mestosoma* except *M. hylaeicum* JEEKEL, 1963, by inhabiting whitewater (várzea) inundation forest in which it appears to be possibly an obligate arboricole at least in the adult stage.
Keywords: **Diplopoda, Paradoxosomatidae, *Mestosoma*, new species, taxonomy.**

## Resumo

*Mestosoma junki* n.sp., descrito nos arredores de Iquitos, Peru, diferencia-se de seus parentes conhecidos, pelo padrão de coloração (dorsalmente preto com uma faixa vermelha mediana) e detalhes estruturais de corpo, perna e gonópode. Difere de outras espécies de *Mestosoma*, exceto de *M. hylaeicum* JEEKEL, 1963, habitando florestas de água branca (várzea), onde possivelmente apresenta-se como arborícolo obrigatório, pelo menos no estágio adulto.

## Introduction

The genus *Mestosoma* SILVESTRI, 1897 is among the most speciose and widespread taxa of Neotropical millipedes, with about 75 nominal species mostly in South America and Central America as far north as Costa Rica; one species is possibly naturalized on

*Dedicated to Prof. Dr. Wolfgang J. Junk on the occasion of his 60th anniversary.

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the island of Dominica in the Lesser Antilles (HOFFMAN 1999). As in numerous other instances of such distribution, the epicentre of diversity seems focussed in the Andean region (JEEKEL 1963).

That the northwestern Andes and/or the Surinam plateau are among the main source areas for the Amazonian fauna, is well-known (e.g. GOLOVATCH et al. 1998; VOHLAND 1998). Moreover, the only pan-Amazonian endemic paradoxosomatid is *Mestosoma hylaeicum* JEEKEL, 1963, a species ranging from Iquitos, Peru downstream to Pará and Amapá states, Brazil. Its survival strategy and bionomics show this remarkable species to be strictly associated with and confined to whitewater inundation forest (= "várzea"), with a certain macrophyte providing about half of the diet for immatures but not for adults at least in the environs of Manaus, Central Amazonia (ADIS 1992; ADIS & VICTORIA 2001).

The present paper puts on record another species of *Mestosoma* apparently restricted to the "várzea" around Iquitos, Peru. Field observations strongly indicate that this species is, at least in the adult stage, either a facultative or obligatory arboricole, as suggested also by its large size, long legs, and brilliant (?aposematic) coloration.

All type material is in the collection of Museo de Historia Natural in Lima, Peru.

## *Mestosoma junki* GOLOVATCH & HOFFMAN, n.sp. (Figs. 1-7)

Holotype ♂, Peru, Rio Amazonas, left bank, 80 km NE (ca. 50 mi downstream) of Iquitos, Yanamono, whitewater inundation forest (várzea), near Explorama Lodge, on Melastomataceae leaves at 1.70 m above forest floor, 20.12.1998, leg. A. MÁRMOL.

Paratypes: 1 ♀, same locality, on *Heliconia* leaves (Musaceae) and inflorescence ca. 300 m away from river bank, 10.10.1998, leg. A. MÁRMOL. – 1 ♀ juv., same locality, on *Heliconia* leaves (Musaceae), 9.10.1998, leg. A. MÁRMOL.

Name: Honours Prof. Dr. Wolfgang J. Junk, a prominent limnologist of Amazonia and Head of the Tropical Ecology Working Group at the Max-Planck-Institute for Limnology, Plön/Germany.

Diagnosis: Differs from congeners by the special colour pattern and a number of somatic, leg, and gonopod characters (see below).

Description: Length of holotype ca. 30 mm, width of midbody pro- and metazona 2.2 and 2.7 mm, respectively. Paratype ♀ ca. 30 mm, width of midbody pro- and metazona 2.6 and 3.1 mm, respectively. Colour in alcohol brown to castaneous or red-brown with a broad pale (faded!) to pinkish (metaterga) axial stripe extending from collum down to covering entire epiproct; the stripe being slightly narrowed on each side towards stricture between pro- and metaterga, each body ring with a somewhat horologiform spot dorsally, likely more or less strongly faded due to preservation. Head, legs and antennae sometimes darker than background, only tip of antenna entirely pallid. Live coloration nearly black, with the median dorsal band actually scarlet or crimson (R. MORGAN in litt.).

Antennae very long and slender, in situ reaching beyond body ring 4 (♂) or 3 (♀) dorsally. In width, head = 2< collum = 3 = 4<5 = 16, onward body very gently and gradually tapering. Paraterga very poorly developed (Fig. 1), low, mostly set at 1/2 midbody height, in lateral view considerably thicker on pore-bearing body rings compared to poreless ones; in dorsal view, calluses always narrow, complete and margined strongly dorsally (Fig. 1) but only over caudal 1/2, evidently oblique and somewhat more slightly so ventrally; caudolateral corner of paraterga always rounded, never projecting caudally beyond rear tergal contour; ozopores lateral, evident, only traceable from above due to very delicate sinuosity at margin not far away anteriorly of caudal corner. Stricture between pro- and metazona relatively superficial, modestly striolate (Fig. 1).

Surface smooth and shining throughout, 2+2 long setae or their insertion points anteriorly in one row on each postcollar metatergum (Fig. 1). Transverse sulcus very delicate, traceable on body rings 5-17 to 18 (Fig. 1). Pleurotergal carinae present, in rings 3-6 each with a distinct caudal tooth evidently surpassing

rear contour of ring, with a reduced lobule instead on ring 7, almost absent from ring 8, onward carinae increasingly reduced to virtually fully disappear from last few rings. Epiproct long, conical, slightly and gradually tapering toward apex, its ventral extent slightly longer than hypoproct, its tip subtrucate with rounded corners, subapical papillae inconspicuous. Hypoproct (Fig. 2) subtriangular, nearly pointed caudad; setae long, supporting knobs absent.

Sterna largely with deep cross-impressions, rather abundantly setose; between ♂ coxae 3 undivided; between ♂ coxae 4 with an inconspicuous, oppressed, spatuliform, caudal lobe (Fig. 3), between ♂ coxae 5 and 6 rather deeply separated axially, entirely flat between ♂ coxae 7 and 9, onward like in coxae 5 or 6, i.e. normal. Most ♂ sterna with very faint traces of a knob near each coxa. Legs very long (♂, ca. 1.7 times longer than midbody height) to long (♀, ca. 1.3 times as long as midbody height), ♂ coxa 2 with a conspicuous, setose, ventral cone carrying the gonopore. ♂ femora 4-7 each with a distinct setigerous knob (= adenostyle) at proximal 1/3 ventrally (Fig. 4), these legs somewhat less heavily setose than others. ♂ tibiae without ventro-apical inflation. ♂ tarsi especially densely setose ventrally but forming no brushes.

Gonopods as in Figs. 5-7. Coxa oblong subcylindrical, modest, heavily setose distally, with a ventral subtransverse ridge at midway and a medially enlarged cannula (= coxal horn). Prefemur evidently shorter than femur, latter slightly enlarged distad and rather sharply curved near end. Postfemoral portion shorter, demarcated clearly both basally and distally. Solenophore directed medially, very large and long, nearly circular, distinctly set off from femur by an almost complete cingulum, from postfemur by a sulcus on ventral side; lamina lateralis hypertrophied, with a few succeeding lamellar structures sheathing much of solenomere on ventral and medial sides; lamina medialis smaller and slenderer, sheathing distal 2/3 solenomere, with a prominent subapical tooth marking the distalmost course of solenomete (traced ventrally as a groove), and an apical uncus with a denticle at base.

## Discussion

Based on the structure of the distal end of the gonopod femorite, within *Mestosoma* the new species appears to fall rather clearly into Group IV as distinguished by JEEKEL (1963). Furthermore, *M. junki* n.sp. seems to join the rather small Subgroup 1, which is characterized by the presence of a lamellar expansion at the base of the solenophore. However, the shape and conformation of the solenophore in the new taxon are highly complicated and distinct.

Using the key to *Mestosoma* as compiled by JEEKEL (1963) brings one rather smoothly to couplet 21 whence real difficulties begin in an attempt to place the new species. Indeed, it keys out as *M. consocius* (CHAMBERLIN, 1955) but in fact the latter form differs strongly enough to fall into Subgroup 2 of Group IV (cf. CHAMBERLIN 1955). Indeed, *M. junki* n.sp. is distinguished through the unique combination of characters like colour pattern contrastingly vivid, paraterga margined not only dorsally but ventrally, lobuliform sternal process between ♂ coxae 4 quite small while other sterna almost or completely unmodified, ♂ coxae 2 each with a prominent ventral cone, ♂ femora 4-7 each with a glandular ventral cone in basal 1/3, gonopod solenophore very particular in shape and structure.

The strangely inflated cannula seems to be characteristic of some other species of *Mestosoma*, such as *M. alticola* (ATTEMS, 1931), *M. schindleri* (KRAUS, 1956) (both from Bolivia), *M. andresense* KRAUS, 1957, *M. ethophor* (CHAMBERLIN, 1955) and *M. contumum* (CHAMBERLIN, 1955) (all three from Peru). These species do not, however, share any great similarity in other gonopod details, so perhaps the modified cannula is a homoplasic rather than synapomorphic development.

This is especially clear when comparing *M. junki* n.sp. with *M. huallagae* (CHAMBERLIN, 1955) and *M. frater* (CHAMBERLIN, 1955), both latter species also from Peru, whose gonopod structure at least superficially seems particularly close. In *M.*

*huallagae*, which might well prove to be the same as *M. ethophor* sensu KRAUS (1956), the coloration is slightly different (e.g. individual pale deltoid spots on the terga, the paraterga are sometimes also pale), the sterna are unmodified, the cannula seems enlarged, and the tip of the solenophore is emarginate, not unciform. In *M. frater*, however, there seems to be no axial row of light spots, let alone a line, on the terga, the sternum between ♂ coxae 4 is with two cones, the cannula seems normal, unmodified, and the solenophore tip is likewise emarginate, not unciform (CHAMBERLIN 1955).

Although it is difficult to deduce possible lines of affinities solely from published descriptions (the smallest variance in the position from which gonopods are illustrated results in quite a different appearance!), and since a large number of additional species of this genus remain to be accounted, we cannot suggest a closer relationship for *junki* n.sp. with any further confidence. Some similarities can also be traced in the gonopod drawings for *M. sphinx* (VERHOEFF, 1941) and *M. contumum* in the sense of KRAUS (cf. VERHOEFF 1941: Fig. 23; KRAUS 1956: Fig. 12), allowing for differences in style of rendition, but these species have little in common with *junki* n.sp. otherwise in terms of body structure and geographic provenance.

The selva near Iquitos is remarkable for its exceptionally high biological diversity. At Yanamono in particular, up to 302 arboreal species per ha have been recorded (KALLIOLA et al. 1993). Although the life-form of arboricoles is certainly quite subordinate among diplopods, a group strongly dominated by forest floor-dwellers (= stratobionts) (cf. KIME & GOLOVATCH 2000), some of the tree-living millipedes, especially larger Polydesmida, show bright colour patterns, usually reddish, combined with unusually long legs. While the latter adaptation is clearly associated with an enhanced climbing capacity, the bright patterns might well prove to represent warning coloration - see GOLOVATCH & ENGHOFF (1994) for examples among Paradoxosomatidae. These inferences have been confirmed by the field observations of Randy C. MORGAN, who collected this species at Iquitos. He found (pers. commun.) that it occurred only above ground, on leaves and tree trunks as high as several meters, and was conspicuously active during the day. At one site it was abundant numerically, at others nearby only a few individuals were seen. Mr. MORGAN did not detect any trace of a volatile secretion during capture and handling of specimens, which may attest to the efficacy of the vivid red dorsal colours as a defensive device. This remarkable species was even kept in culture for over a year at the Cincinnati Zoological Park, Ohio, U.S.A.

One of us (AM) holds similar observations, i.e. some animals were taken on *Heliconia* leaves and inflorescences well above ground in a várzea environment (see Material section) while the red band on the dorsum rather quicky gets bleached to pinkish or even yellowish in alcohol. A pity that, from such an abundant material as referred to above, only very few specimens have been fixed in alcohol and ultimately rendered for study.

If one may draw the analogy derived from the várzea-dweller *M. hylaeicum* (cf. ADIS 1992), the juveniles of *M. junki* n.sp., unlike adults, can rather be expected to develop in the soil. It has to be tested thus whether the juveniles also feed on macrophyte roots, and the adults mount onto above-ground vegetation prior to flooding.

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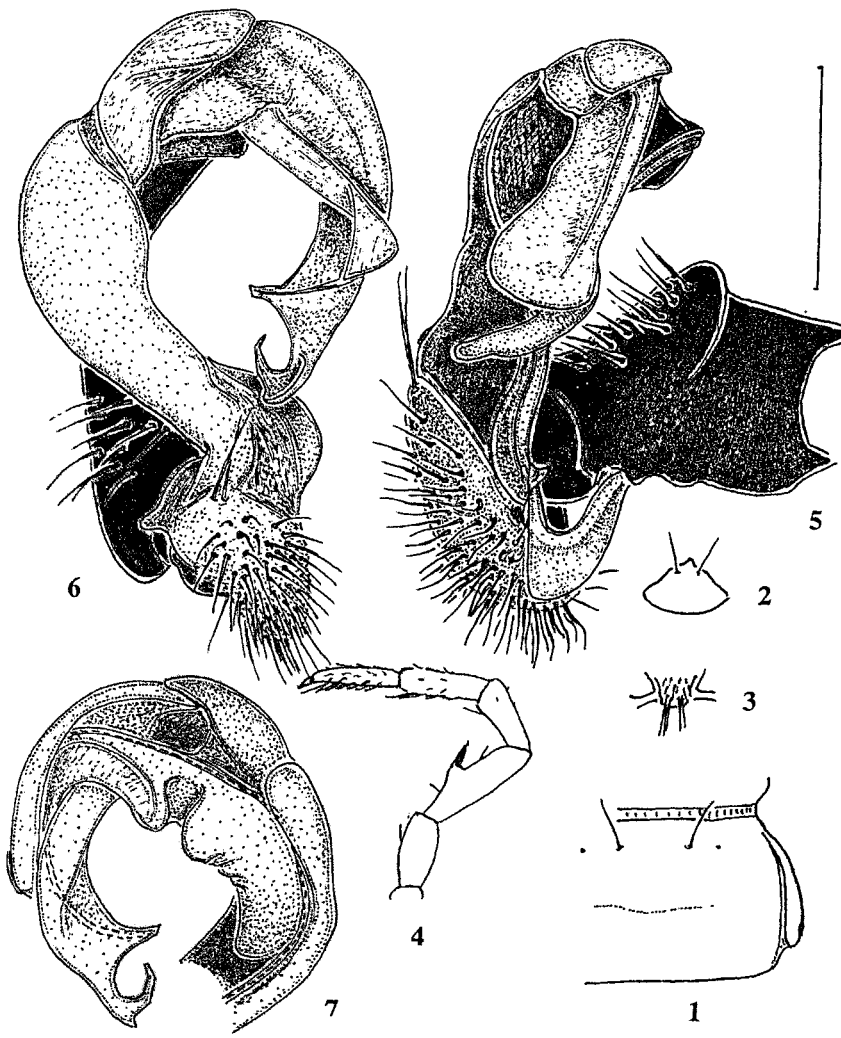


Figs. 1-7:
*Mestosoma junki* sp.n., holotype ♂, **1:** right half of body ring 10, dorsal view; **2:** hypoproct, ventral view; **3:** sternal tubercle between coxae 4, ventral view; **4:** leg 6; **5-7:** right gonopod, medial, ventral, and subdorsal views, respectively. Scale bar 2.0 (**1-4**) or 0.5 mm (**5-7**).