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A new species of *Macroxenus* Brölemann, 1917 from Peru (Diplopoda: Polyxenida: Polyxenidae)

Новый вид *Macroxenus* Brölemann, 1917 из Перу (Diplopoda: Polyxenida: Polyxenidae)

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КЛЮЧЕВЫЕ СЛОВА: кистехвост, таксономия, Южная Америка.

ABSTRACT. A new millipede species in the genus *Macroxenus* is described from the Sandoval Lake Reserve, Amazon Basin, Peru. *Macroxenus peruensis* sp.n. is the first species of polyxenid to be described from Peru, and only the second species in the genus to be reported from South America.

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РЕЗЮМЕ. Описан новый вид диплопод рода *Macroxenus* из заповедника озеро Сандовал в бассейне Амазонки (Перу). *Macroxenus peruensis* sp.n. — первый вид семейства Polyxenidae, описанный из Перу, а также лишь второй в этом роде, отмеченный в Южной Америке.

Introduction

In 1917, Brölemann created a new genus, *Macroxenus*, in the order Polyxenida, family Polyxenidae, for a species from Algeria first described as *Polyxenus rubromarginatus* by Lucas [1846] and more thoroughly described in Lucas [1849]. Brölemann [1917] redescribed the species based on new specimens also collected in Algeria and noted that this species was not only distinct from species in the genus *Polyxenus* Latreille, 1802 in having a different arrangement of hooks on the caudal trichomes, but that it was the first polyxenid species observed to have biarticulated sensilla on the gnathochilaria. In 1944, Schubart described a new species, *Monographis caingangensis* Schubart, 1944 from Brazil, later to be redescribed and renamed *Macroxenus caingangensis* in a more detailed description by Condé & Massoud [1974]. Subsequently, a third species was described in the genus: *Macroxenus enghoffi* Nguyen Duy-Jacquemin, 1996 from the Canary Islands.

In 1948, Silvestri moved two species formerly in the genus *Polyxenus* into two new genera *Chilexenus* Silvestri, 1948 and *Macroxenodes* Silvestri, 1948, based on the presence of pseudoarticulated gnathochilarial sensilla: *Chilexenus rosendinus* (Silvestri, 1903) and *Macroxenodes meinerti* (Silvestri, 1898). In 2003, Nguyen Duy-Jacquemin created a fourth genus, *Afraustraloxenodes*, for 4 species from Africa with the distinctive gnathochilarial sensilla.

Condé & Nguyen Duy-Jacquemin [2008] grouped the four genera together in the subfamily Macroxeninae with other distinctive characters being: the presence of 8 ommatidia, lamellate teeth along the anterior edge of the labrum and a type II telson [Condé, 1970]. Nguyen Duy-Jacquemin [2009] revised the subfamily, redescribing a number of species using new material and provided diagnostic characters and associated identification keys to the four genera.

In this paper a new species in the genus *Macroxenus* is described from Peru.

Material and methods

The polyxenid millipede examined for this study was collected by M. Kozlov into 75% ethanol. The specimen was then cleared, mounted in Hoyer's medium, and examined with an Olympus Vanox compound microscope.

Results

The specimen was determined to be a new species in the genus *Macroxenus* and is described below.

Order **Polyxenida** Lucas, 1840
Family **Polyxenidae** Lucas, 1840
Subfamily **Macroxeninae** Condé
et Nguyen Duy-Jacquemin, 2008
Genus ***Macroxenus*** Brölemann, 1917

Type species: *Polyxenus rubromarginatus* Lucas, 1846.
Other taxa included: *Macroxenus caingangensis* (Schubart, 1944), *M. enghoffi* Nguyen Duy-Jacquemin, 1996.

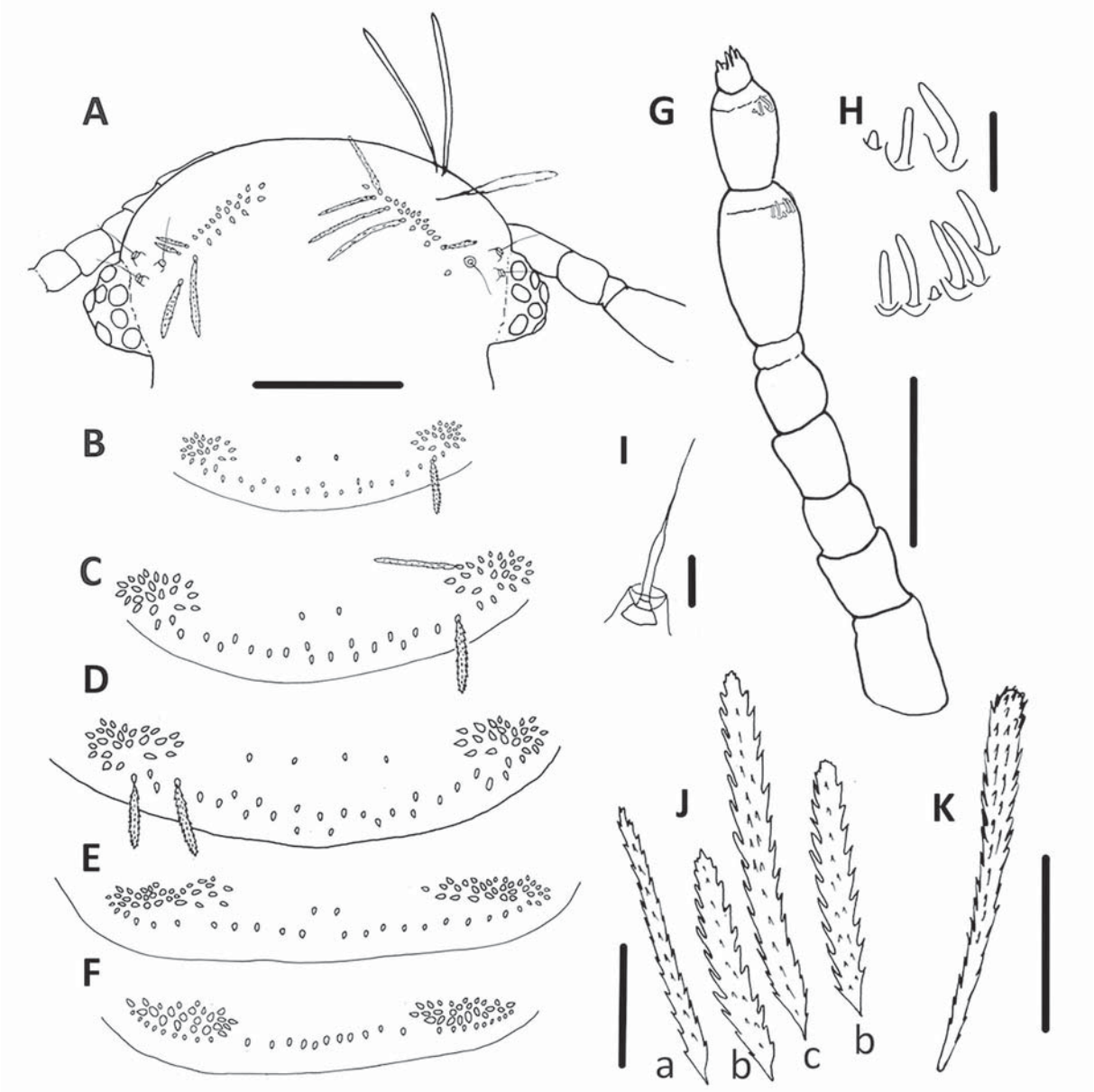

Fig. 1. *Macroxenus peruensis* sp.n., holotype. A — head; B — collum; C–F — tergites showing pattern of trichome insertions: C — tergite 2; D — tergite 5; E — tergite 9; F — tergite 10; G — left antenna showing proportions of articles; H — sensilla on articles VII and VI, left antenna; I — trichobothrium; J — tergal trichomes: smaller lateral (a), posterior row of two sizes (b) and (c); K — anterior vertex trichome. Scale bars: A–F (shared), G — 200 μm; H, I — 20 μm; J — 50 μm, K — 100 μm.

Рис. 1. *Macroxenus peruensis* sp.n., голотип. A — голова; B — коллум; C–F — тергиты с характером распределения точек прикрепления трихома: C — тергит 2; D — тергит 5; E — тергит 9; F — тергит 10; G — левая антенна с пропорциями члеников; H — сенсиллы на члениках VII и VI, левая антенна; I — трихоботрия; J — тергальные трихомы: более мелкие боковые (a), задний ряд разных размеров (b) и (c); K — передний теменной трихом. Масштаб: A–F (общий), G — 200 мкм; H, I — 20 мкм; J — 50 мкм, K — 100 мкм.

GENERIC DIAGNOSIS. Presence of pseudoarticulated sensilla on the palpi of the gnathochilaria. Type II [Condé 1970] telson with two latero-dorsal bundles of hooked trichomes side by side; dorsal face of telson with clusters of barbate trichomes *c* each side protruding into the bundles of hooked trichomes, spine on tarsus 2, oval lateral tufts of tergal trichomes widely separated, five or more basiconic sensilla on antennal article VI.

DISTRIBUTION. Algeria, Portugal, Malta, Canary Islands, Brazil, Venezuela, Peru.

***Macroxenus peruensis* sp.n.**

Figs 1, 2.

HOLOTYPE. Adult female, Peru, Sandoval Lake, S12°36′48″, W69°01′57″, 28 Feb 2019, M. Kozlov leg. Specimen mounted on slide. [Peru 131, 2019]. Slide deposited in the Zoological Museum of the State University of Moscow, Russia.

ETYMOLOGY. Adjective, named after the country in which it was found.

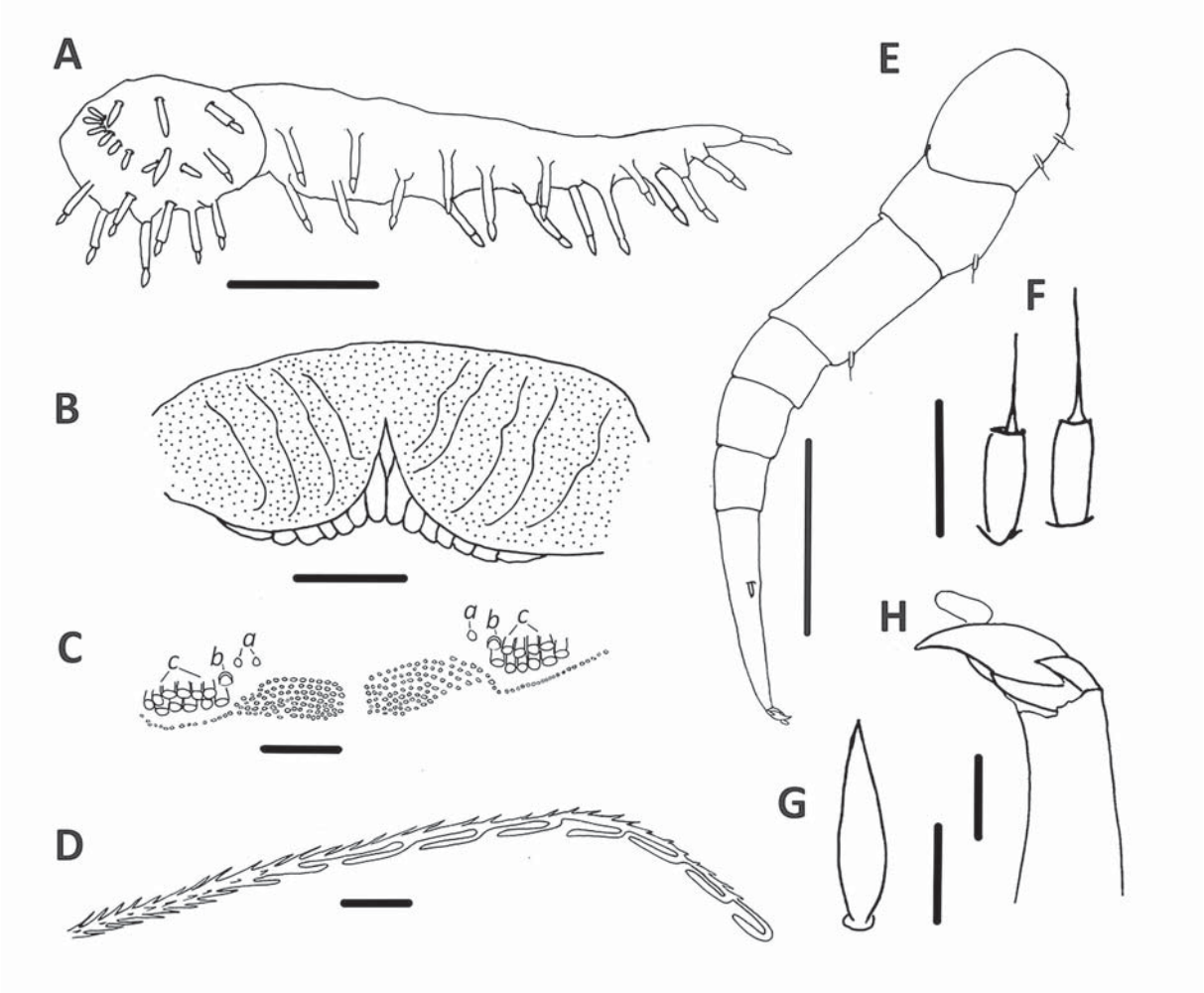

Fig. 2. *Macroxenus peruensis* sp.n., holotype. A — right gnathochilarium; B — labrum; C — pattern of insertions of dorso-medial (ornamental) trichomes on telson (refer text for details of *a*, *b* and *c*); D — hooked caudal trichome; E — left 13th leg; F — typical setae of coxa, femur, prefemur; G — spine on tarsus 2. Scale bars: A, C, D — 50 µm; B — 20 µm; E — 200 µm; F, G, H — 10 µm.

Рис. 2. *Macroxenus peruensis* sp.n., голотип. A — правый гнатохилярий; B — верхняя губа; C — характер распределения точек прикрепления дорсо-медиального (орнаментального) трихома на тельсоне; D — крючковидный хвостовой трихом; E — левая 13-я нога; F — типичные щетинки на тазике, бедре и предбедре; G — шип на лапке 2. Масштаб: A, C, D — 50 мкм; B — 20 мкм; E — 200 мкм; F, G, H — 10 мкм.

DIAGNOSIS. Very similar in morphology to *M. caingangensis* but differing in a number of characters: presence of just 2–4 trichomes in a medial row anterior to the continuous posterior row of trichomes; sensilla on antennal article VII with the posterior sensillum 1/3 smaller and thinner than the anterior sensillum. The dorsal face of telson is typical of the subfamily, but with only 1–2 trichomes *a* each side, one trichome *b* and tight clusters of approximately 10 trichomes *c* each side extending into the caudal bundles.

DESCRIPTION. Measurements: Body length after mounting on slide 3.45 mm, caudal bundle 1.0 mm, tarsus length 13th leg, 197 µm.

Head (Fig. 1A): Eight ommatidia. Vertex with 1 pair of posterior tufts each with an anterior row of 11 trichomes with 3–4 unevenly spaced trichomes anteriorly and 6 trichomes in a more widely spaced posterior row, the distance between each tuft is about their length, wide gap to anterior vertex trichomes. All trichomes long, slender and barbate (Fig. 1K). Three trichobothria of equal size arranged in an equilateral triangle with sensory hairs thicker basally (Fig. 1I). Gnathochilaria with lateral palps 2.5 times length of medial palp. Lateral palps with 17 long pseudoarticular sensilla typical of Macroxeninae, medial palp with 9 pseudoarticular sensilla and 12 smaller non-articulated sensilla (Fig. 2A). Labrum typical of the subfamily with dorsal surface ornamented with small papillae and anterior margin lined with lamellar teeth (Fig 2B). Presence of long setae along the posterior margin of the labrum not visible in this preparation.

Antennae: Long antennae with proportions of antennal articles as in Fig. 1G; Antennal article VI with 5 basiconic sensilla, and a conical sensillum (Fig. 1H, lower figure); antennal article VII with 1 large basiconic sensillum to anterior of 1 short basiconic sensillum and 1 posterior coeloconic sensillum (Fig. 1H). Setiform sensilla appear to be absent from both 6th and 7th articles.

Trunk: Collum with almost symmetrical arrangement of 64 trichomes, made up of lateral rosettes either side with 23+24 trichomes linked by a posterior row of 16 trichomes facing posteriorly, and two medial trichomes anteriorly (Fig.

1B). Lateral protuberances of collum with 4 barbate trichomes. Remaining tergites with lateral rosettes linked by a continuous posterior row of trichomes. Tergite 2 with 69 trichomes, made up of rosettes of 19+21, a posterior row of 27 and 2 medial anterior trichomes (Fig. 1C). Tergites 3–8 same pattern of trichome insertions, but with 4 medial anterior trichomes (Fig. 1D) Tergite 9 with just 2 medial anterior trichomes (Fig. 1E) and tergite 10 with none (Fig. 1F). Trichomes barbate, with those of posterior row broader and having wider serrations than those of the lateral tufts (Fig. 1J); both lateral tuft and posterior row of trichomes showing variations in size.

Legs (Fig. 2E): Naming of leg segments is after Manton [1956]. Legs 1 and 2 without trochantera, leg 1 also lacks tarsus 1. Trochanter, postfemur and tarsus 1 lack setae. Prefemora and femora each with 1 seta, coxa 1 with 1 seta, coxa 2–13, 1–2 setae (visibility partially obscured by gut contents), setae biarticulate (Fig. 2F); broad spine on tarsus 2 slightly shorter than claw (Fig. 2G), claw of telotarus with lamella and 2 processes (Fig. 2H).

Telson: Type II telson with a pattern of dorso-medial (ornamental) trichomes typical of Macroxeninae with 1–2 trichomes *a* internal and dorsal to the cluster of 10–11 trichomes *c* either side of the midline embedded in the caudal bundle, larger trichome *b* immediately adjacent internally to each cluster (Fig. 2C); caudal bundle of hooked trichomes beneath with a narrow medial gap, hooked trichomes with 3–7 hooks (Fig. 2 D).

REMARKS. This species is very similar to both *M. rubromarginatus* and *M. caingangensis* including size and pattern of antennal sensillae, but easily distinguished from both species in the pattern of tergal trichomes with just 2–4 widely spaced medial trichomes anterior to the continuous posterior row, in contrast to 9 in *M. rubromaginatus* and 14 in 3 uneven rows in *M. caingangensis*. *Macroxenus enghoffi* is quite distinct from the other 3 species in the genus with greater than 13 sensilla on antennal article VI and pattern of tergal trichomes with 5–14 trichomes in a single medial row, anterior to the continuous posterior row. Unfortunately, due to deficiencies in descriptions of both *M. rubromarginatus* and *M. caingangensis*, details of the pattern of trichomes dorsal to the telson (often referred to as "ornamental trichomes") are unknown except for a comment in Nguyen Duy-Jacquemin and Condé [1984] that *M. caingangensis* has 2–3 trichomes *a* each side. The only detailed description of this defining Macroxeninae character available for the genus *Macroxenus* to date has been for *M. enghoffii* which has a distinctly different pattern to *M. peruensis* sp.n. [Nguyen Duy-Jacquemin, 1996].

Apart from the differences in tergal trichome patterns, Nguyen Duy-Jacquemin [2009] separated *M. caingangensis* and *M. rubromarginatus* on the shapes of the antennal sensilla, noting that although the pattern and number of sensilla do not differ, the sensilla on *M. caingangensis* are longer and thinner than those in *M. rubromarginatus*. The sensilla of *M. peruensis* sp.n. are like those of *M. caingangensis* in both shape and number, with one difference being the two sensilla on antennal article VII differ in size, with the posterior sensillum 1/3 smaller and thinner than the anterior sensillum. Setiform sensilla were not visible in the sole specimen of *M. peruensis* sp.n. available. To determine if this absence is a diagnostic character, more specimens will need to be examined. It should be noted that the species names in the Fig. 10 legend in Nguyen Duy-Jacquemin [2009] are incorrect. The description in the text is correct however.

Discussion

M. peruensis sp.n. is the first polyxenid millipede to be identified from Peru. This would be due to a lack of collecting rather than unsuitable habitat. This species was collected east of the Andes Mountains in the upper reaches of the Amazon basin. A number of polyxenid species have been identified from a big collection of 1800 polyxenids 1500 km to the east in the Central Amazon region, in Brazil [Ishii *et al*., 1999]. Species identified included 2 species in the same subfamily as *M. peruensis* sp.n.: *Macroxenodes amazonicus* (Ishii, Nguyen Duy-Jacquemin et Condé, 1999) and *Macroxenodes* sp. Other polyxenid species found were *Lophoturus adisi* (Ishii, Nguyen Duy-Jacquemin et Condé, 1999) and *Ancistroxenus comans* (Loomis, 1934). It is to be expected that more species will be identified in the future from the Amazon region of Peru. Condé [1971] identified 133 out of total of 206 polyxenidans as being *Macroxenus* sp. in a study on Polyxenida in ant nests in Brazil. Unfortunately, no details were provided as to the location of the nests.

Although there are representatives of the subfamily Macroxeninae in South America, Africa and Southern Europe, *Macroxenus* is the only genus to be found in all three continents. This may change with collection and identification of more species. For example, until recently only one species in the genus *Chilexenus* had been identified, but now a new species has been described from Israel, far from the location of the type species in Chile [Short, 2020]. It is to be hoped that new collections of *Chilexenus* and *Macroxenus* from both South America and the Mediterranean will enable gene sequencing to confirm that characters used to separate the two genera are valid.

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