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A new Amazonian species of *Cryptocellus* (Arachnida, Ricinulei), with descriptions of its integumental structures and all free-living life stages

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Abstract

A new species of *Cryptocellus* Westwood, 1874 is described, based on males, females and all free-living immature stages. *Cryptocellus muraquitana* sp. nov. from Juruti, Pará, Brazil, is a member of the *foedus* group of species and probably closely related to *Cryptocellus icamiabas* Tourinho & Azevedo, 2007, *C. abaporu* Bonaldo & Pinto-da-Rocha, 2003 and *C. simonis* Hansen & Sørensen, 1904. The new species is illustrated using stereomicroscopy and scanning electron microscopy. The large diversity of integumental structures of the new species is described and compared to that of previously studied species of *Cryptocellus* and *Pseudocellus* Platnick, 1980.

Key words: Amazon forest, cryptozoic species, rare species, SEM, nature conservation, taxonomy, systematics

Introduction

Ricinuleids are medium-sized arachnids that inhabit litter and soil in tropical rainforest and cave ecosystems. They can be easily identified by the presence of a cucullus (a sclerite covering the chelicerae) and the modified metatarsus and tarsus of the third leg of the male, forming a copulatory apparatus that transfers sperm to the female (Harvey 2003). Although the order was once considered rare, several new species have been recognized recently and descriptions of ricinuleids have become more frequent, with some even including all free-living stages (Tourinho & Saturnino 2010; Valdez-Mondragón & Francke 2011; Salvatierra *et al.* 2013). The rich integumental characters of species of both *Pseudocellus* (Talarico *et al.* 2005; 2006) and *Cryptocellus* (Salvatierra *et al.* 2013) have been shown to have potential value for systematics, although a phylogenetic analysis, using genetic data, has only been conducted for the genus *Ricinoides* Ewing (Muriene *et al.* 2013).

However, discovering a new species of Ricinulei is still considered a taxonomic event (Tourinho *et al.* 2010). Several species are endemic to caves in North, Central and South America, which can be difficult to access (e.g. *Pseudocellus* and *Cryptocellus*) while most *Cryptocellus* and *Ricinoides* Ewing, 1929 species are distributed in remote sites in the Amazon basin and Africa, which require a significant effort to collect (Barreiros *et al.* 2005). The order thus remains an obscure group, underestimated throughout its range in the New and Old Worlds. Several species of Ricinulei are known from only a few individuals and from single localities, e.g. in *Cryptocellus* three species are only known from males; seven only from females and two only from nymphs.

In this paper, we describe the male, female, larva and all nymphal stages of a new ricinuleid species from Amazon. This species is placed in the *foedus* group, based on the characters of the male accessory piece of leg III. The integumental structures previously described for other species are identified and new ones are described for the new species. We also discuss and compare these characters with those found in *C. iaci* and *Pseudocellus*.

The study of the integumental structures in this order is taxonomically promising for identifying and separating closely related species within Ricinulei. *C. muiraquitana* possesses long, curved setae with conspicuous lateral bands of small thumb-like papillae on basifemur IV and only one barbed seta on DTI-IV. The only other species of the group for which detailed information on integumental structures is available is *C. iaci*, which differs from *C. muiraquitana* in lacking the first type of seta and in having two barbed setae on DTT-IV, a microbarbed micropore, sculptured surface microtubercles and smooth surface microtubercles. The pore organ, setae of types 2B, 4, 6 and 9B are still only known in *Pseudocellus* species.

There are seven papers dealing with the description of the diverse integumentary ultrastructures among Ricinulei species (Pittard & Mitchell 1972; Legg 1976; van der Hammen 1979; Talarico *et al.* 2005; 2006; 2008; Salvatierra *et al.* 2013), but, unfortunately, the terminology used in most of them is not standardized. To avoid double work, describing and creating a proliferation of names to the same structure previously described and to use those integumental structures as informative characters, a catalog of compiled terminology of ricinuleid tegumentary structures is needed.

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