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Ultrastructural analysis and polymorphisms in *Coarazuphium caatinga* (Coleoptera: Carabidae: Zuphiini), a new Brazilian troglobitic beetle

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Abstract

Coarazuphium caatinga **sp. n**. occurs in limestone caves located in Campo Formoso municipality, in the Brazilian Caatinga (Bahia, Brazil). The new species is close to *C. formoso* although they are morphologically distinct by the elytra sinuosity, which is more pronounced in *C. caatinga*; the aedeagus is more tapered at the tip in this last species. Important traits found in *C. caatinga* are the variable size presented by the eyes, and the remarkable variability of body pigmentation among specimens; both traits do not seem to be correlated. *Coarazuphium* Gnaspini, P., Vanin, S.A. & Godoy, N.M., 1998, species exhibit advanced troglomorphic characters in comparison to other Brazilian cave beetles, as are increased extra-optic sensory structures, presence of particular sensilla, and sensory and gustatory receptors. These characters are not detected under routine microscopy and thus require ultrastructural methods for their study.

Key words: eyes, coloration variability, ground beetle, caves, hypogeous, sensilla

Introduction

Obligatory cave-dwelling invertebrates usually possess singular morphological traits, such as the elongation of appendages (including sensorial structures), reduction of eyes, and wings. Those species are called troglobionts, by the Schinner-Racovitza classification system (modified by Holsinger & Culver 1988).

To date, all members of the genus *Coarazuphium* Gnaspini, P., Vanin, S.A. & Godoy, N.M., 1998, found in Brazilian caves are troglobitic species. According to Gnaspini & Trajano (1994), *Coarazuphium* species are considered those that have the most advanced troglomorphic traits among all Brazilian cave beetles. Some singular features of these species are not macroscopic and thus require of ultrastructural analyses for determining them. Recently, a new species *Coarazuphium whiteheadi* Ball and Shpeley 2013, was found in Mexico, probably a hypogaeic (troglophilic) specie (Ball & Shpeley, 2013), the only species of this genus not strictly troglobiont.

Coarazuphium species are closely related to two other Zuphiini genera: *Zuphium* Latreille, 1806 and *Parazuphium* Jeannel, 1942 (Godoy & Vanin 1990). Recently, Andújar *et al*. 2011 have described a new blind species of *Parazuphium* from Morocco. The authors stated that this new species has traits in common with *Ildobates* Español, 1966, and that this is probably a closely related genus (Ortuño *et al*. 2004; Ribera *et al*. 2006). Ball and Shpeley (2013) proposed that shared features of *Zuphioides* and *Coarazuphium* suggest that they are sister taxa, and noted that *Coarazuphium* posses the mostly derivate features, considering life habits. However, more detailed phylogenetic analysis would be needed to establish the position of those four genera within Zuphiini.

In this work, we describe the eighth species of the genus, *C. caatinga* found in limestone caves from Brazil. This description also focuses on the ultrastructural analysis of antennae, mouthparts, and legs.

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