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Review and phylogeny of the *geniculata* group, genus *Chinavia* (Heteroptera: Pentatomidae), with notes on biogeography and morphological evolution

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Abstract

Chinavia is one of the most diverse genera of Pentatomidae, comprising 80 species distributed in the Afrotropical, Neartic and Neotropical regions. Some groups of species have been proposed in the literature based on morphological similarities or phylogenetic analyses. The *geniculata* group was proposed to include *C. geniculata*, *C. gravis* and *C. nigritarsis*. However, eleven other species of *Chinavia* share somatic and genital characteristics with *C. geniculata*, *C. gravis* and *C. nigritarsis*, which allows hypothesizing the monophyly among these 14 species. In spite of the recent contributions to aspects of biology, immature stages and species catalogs in *Chinavia*, the definition of monophyletic groups within the genus and the establishment of boundaries among its species are essential to understand its diversity and to test hypotheses on biogeography and evolutionary biology. In this study we review the taxonomy of the *geniculata* group, test its monophyly and propose a phylogenetic hypothesis for the group. We discuss the phylogenetic relationships from a geographical perspective, and provide insights about morphological evolution.

Key words: genitalia, Heteroptera, Nezarini, systematics, taxonomy

Introduction

The genus *Chinavia* is one of the most diverse in Pentatomidae, comprising 80 species distributed in the Afrotropical, Neartic and Neotropical regions (Orian 1965, Linnavuori 1982, Rolston 1983). Schwertner (2005) confirmed the monophyletic status of the genus, with three synapomorphies of genitalia: processes of *capsula seminalis* tapering at the apex, superior processes of the pygophore absent, and parameres not geniculate (Schwertner 2005, Genevcius *et al.* 2012). Because the basal species are endemic to the Afrotropical region, the first diversification in *Chinavia* occurred probably before the separation of Gondwana, pointing to a minimum age of 65 Myr for this lineage of stink bugs (Schwertner 2005). The greatest diversity in the genus is found in the Neotropics (more than 60 species), where nearly all species have restricted distribution (e.g. *C. vanduzeei* Schwertner & Grazia, 2006, and *C. gravis* Walker, 1967, in the Amazonic region, *C. obstinata* Stål, 1860, and *C. difficilis* Stål, 1860, in the southern Atlantic Forest, *C. rideri* Frey-da-Silva & Grazia, 2001, in Cerrado, *C. musiva* Berg, 1878, in Chaco, etc). Only four species have widespread distribution in the Neotropics: *C. impicticornis* Stål, 1872, *C. runaspis* Dallas, 1851, and *C. ubica* Rolston, 1983, which occur from northern Brazil to Argentina, and *C. marginata* Palisot de Beauvois, 1805, from USA to Colombia. Recent studies in *Chinavia* have contributed aspects of biology (e.g. Schwertner *et al.* 2002, Matesco *et al.* 2009), morphology of immature stages (Matesco *et al.* 2008, Matesco *et al.* 2009) and faunistic records (e.g. Grazia & Campos 2010, Grazia & Schwertner 2011). However, taxonomic reviews are still required to propose a phylogeny-based classification of the genus, and subsequently to test hypotheses on historical biogeography and morphological evolution in an integrated approach as suggested for studies within Heteroptera (Weirauch & Schuh 2011).

Within *Chinavia*, several groups of species have been proposed (Schwertner & Grazia 2007, Genevcius *et al.* 2012). Schwertner & Grazia (2007) provided a synopsis of the Brazilian species, suggesting relationships among some of the species. Genevcius *et al.* (2012) established some of these groups as monophyletic, including the

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connexivum, similar to the species from the *obstinata* group. However, it is included in the *geniculata* group because of the recovered synapomorphies of general and genital morphologies.

Chinavia tuiucauna Schwertner & Grazia

(Fig. 4m; table 3)

Chinavia tuiucauna Schwertner & Grazia 2006, 246–247; Schwertner & Grazia 2007, 420, 433.

Diagnosis. Scutellum, pronotum and hemelytra without colored bands. Pronotum with truncate apices and juga with a narrow cream band on the external margins.

Adult size. 11–14mm.

Distribution. Brazil (Bahia).

Material examined. Holotype: Barro Preto (BA—Brazil), 2004, OM Marques col., DZRS (♀).

Comments. This species is very similar to *C. sebastiaoi*, distinguished by a shorter abdominal spine. It has been recorded in cacao trees (*Theobroma cacao*).

Chinavia vanduzeei Schwerter & Grazia

(Figs. 4n, 5j; table 3)

Chinavia vanduzeei Schwertner & Grazia 2006, 247–248; Schwertner & Grazia 2007, 422, 433–434.

Diagnosis. Wide cream bands present on the external margins of the pronotum, scutellum, hemelytra and apex of scutellum. Antennae, rostrum and tibia black. Margins of juga with a strong concavity in front of eyes.

Adult size. 11–14mm.

Distribution. Brazil (AM, PA, MA).

Material examined. Holotype: Rio Xingu (PA—Brazil), 1986, Spangler & Flint col.,NMNH (1♂). Paratypes: Madre de Dios, Rio Tambopata Reserve (Peru), 1982, Ross col., CAS (1♂); Rio Japurá (AM—Brazil), 1979, INPA (1♀); Ayrão, 1930, Klages col., NMNH (1♀); Rio Solimões, Belém (PA—Brazil), 1966, Malkin col., CAS (1♂); Fordlândia (PA—Brazil), 1970, DARC (1♂); Parque Nacional de Uruá (PA—Brazil), 1977, DARC (1♀); Itaituba (PA—Brazil), 1977, Ratcliff col., DZRS (♂); Buruticupu (MA—Brazil), 1978, DZRS (1♀).

Comments. Species with a unique color pattern within the genus, with large pale stripes along the whole body external margins. Is one of the smallest species of *Chinavia*.

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