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Ancyronyx reticulatus and *A. pulcherrimus*, two new riffle beetle species from Borneo, and discussion about elmid plastron structures (Coleoptera: Elmidae)

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Abstract

Two new species of *Ancyronyx* Erichson, 1847 (Coleoptera: Elmidae) are described from Borneo: *A. pulcherrimus* (Brunei) and *A. reticulatus* (Sabah). Habitus views, illustrations of important characters as well as plastron structures of *Ancyronyx reticulatus* are presented and discussed.

Key words: Coleoptera, Elmidae, *Ancyronyx*, new species, morphology, Borneo

Introduction

The first taxonomic review of *Ancyronyx* Erichson, 1847 was published almost 150 years after the description of the genus (Jäch 1994), followed by descriptions of several additional new species and descriptions of larvae (Jäch 2003, 2004; Freitag & Jäch 2007, Freitag & Balke 2011, Bian *et al.* 2012 and Freitag 2012). Based on several newly described species, especially from the Philippines, the morphological characteristics of the genus were modified and some important character states had to be added (see Freitag 2012).

However, the generic classification of Elmidae has not yet been studied satisfactorily, and it can be expected that other genera (e.g. *Podelmis* Hinton, 1941 and some New World genera) will be found to be synonymous with *Ancyronyx*, thereby increasing the number of species considerably. A total of 19 species and one subspecies of *Ancyronyx* have been described worldwide before 2013 (see Freitag 2012).

Two species groups were distinguished within the genus by Freitag & Jäch (2007), the *A. variegatus* and *A. patrolus* species groups. The two new species from Borneo described herein belong to the *A. variegatus* species group, which includes also *A. acaroides* Grouvelle, 1896; *A. helgeschneideri* Freitag & Jäch, 2007; *A. hjarnei* Jäch, 2003; *A. jaechi* Freitag, 2012; *A. johanni* Jäch, 1994; *A. malickyi* Jäch, 1994; *A. procerus* Jäch, 1994; *A. raffaelacatharina* Jäch, 2004; *A. sarawacensis* Jäch, 1994; *A. schillhammeri* Jäch, 1994; *A. variegatus* (Germar, 1824) and *A. yunju* Bian, Guo & Ji, 2012. This species group is characterized by comparatively large body size, moderately to extremely long legs, and stout coxites of the ovipositor (Freitag 2012). Most species inhabit submerged wood in permanent running waters. Some species are characterized by striking aposematic colouration.

Material, methods and abbreviations

The material used for this study is deposited in the following institutions (abbreviations used refer to collections in the text): **BM**: Brunei Museum, Brunei; **CKB:** Collection of Ján Kodada, Bratislava, Slovakia; **NMW:** Naturhistorisches Museum Wien, Austria; **UB**: Department of Biology, Universiti Brunei, Darussalam, Brunei.
Specimens used for study of internal morphology were soaked in warm water with several drops of concentrated

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Spangler, 1981; *Stegoelmis*; *Stenhelmoides*; see e.g. Spangler 1981a) or radialspiculate setae (*Anommatelmis* Spangler, 1981; see Spangler 1981b). Plastron setae vary in width and length, as well as in the development of lateral projections, but they are always densely arranged and more or less overlapping, and they are distributed in various patterns over the ventral and dorsal surface of the body including legs (see Čiampor 2001; Čiampor & Kodada 1998; Hinton 1971, 1976; Jäch & Boukal 1996; Jäch & Kodada 1997; Kodada & Jäch 2005; Spangler 1981b, 1990). The plastron setae are often intermixed with flattened, somewhat elongate or pointed granules; however these granules may also be present on areas without plastron. Type and extent of cuticular plastron structures are regarded important tools for the classification of species and genera.

Examination of several species of the *Ancyronyx variegatus* species group under a light microscope interestingly did not reveal any sharply delimited areas covered by distinct plastron setae, which are usually present in other elmid genera. Furthermore, species of this group lack specialized cleaning or smoothing setae on femora and tibiae, which are most likely involved in "plastron grooming" (e.g. *Stenhelmoides*; see Spangler & Perkins 1989). Only in *A. acaroides* we found rows of several short spines along the distal portions of meso- and metatibiae, which might be involved in plastron grooming.

Elmid plastron structures usually cover genae, hypomera, sides of prosternum, mes- and metepisterna, lateral portions of meso- and metaventrite, epipleura, lateral portions of ventrites, exposed portions of pro- and mesotrochantins, surface of coxae, femora and in some species also tibiae. Remarkably, in *Ancyronyx reticulatus* and some other closely related species examined, most of these body parts are covered irregularly with a variously thick layer of encrustations/secretions (Figs 8, 10, 17–18, 21–24). Examination of *A. reticulatus* under the scanning electron microscope revealed that, at least on the pronotum there are microstructures (resembling plastron structures) underneath these encrustations/secretions (Fig. 24). We did not remove these encrustations to examine the body surface below. On the ventrites, especially near their anterior margins there are various other cuticular microstructures (Figs 26–28), which might serve to keep a gaseous layer (plastron). Obviously, more research has to be carried out to be able to properly describe distribution and function of the plastron in the genus *Ancyronyx*.

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