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Article

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Association of larvae and adults of Mexican species of *Macrelmis* (Coleoptera: Elmidae): a preliminary analysis using DNA sequences

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Abstract

Insect life stages are known imperfectly in many cases, and classifications are usually based on adult morphology. This is unfortunate as information on other life stages may be useful for biomonitoring. The major impediment to using elmid (Coleoptera) larvae for freshwater biomonitoring is the lack of larval descriptions and illustrations. Reliable molecular protocols may be used to associate larvae and adults. After adults of seven species of Mexican *Macrelmis* were identified morphologically, seven larval specimens were associated to them based on two gene fragments: Cox1 and Cob. The phylogenetic analysis allowed identifying the larval specimens as *Macrelmis leonilae*, *M. scutellaris*, *M.* species 7, *M.* species 10, and *M.* species 11. Two species based on adults associated uncertainly with one larva, and one larva did not match with any adult. Adult/larval association in elmids using DNA sequence data seems to be promising in terms of speed and reliability.

Key words: Elmidae, systematics, identification, Mexico, beetles, fresh water

Introduction

Freshwater biomonitoring consists of identifying the species inhabiting an area to assess water quality. Several insect taxa are used in freshwater biomonitoring because of their abundance and range of pollution tolerance among species, especially Ephemeroptera, Plecoptera, Trichoptera (Zhou *et al*., 2007) and Elmidae (Brown, 1987). Elmidae (Coleoptera) are the fourth most species-rich family of aquatic beetles (Jäch & Balke, 2008); however, larval stages of elmids are poorly known (Manzo & Archangelsky, 2008). Recently, molecular methods have been employed to describe larval stages (Čiampor and Ribera, 2006; Čiamporova-Zaťovičová et al., 2007).

Elmidae comprise two subfamilies: Larainae and Elminae. To date, 64 species of Elmidae have been described from Mexico, three of them belong to Larainae and the remaining to Elminae (Santiago-Fragoso and Spangler, 1995). Of these, 10 have been assigned to the genus *Macrelmis* Motschulsky 1859 (Brown [1984] synonymized *Elsianus* Sharp 1882 with *Macrelmis*), and several more species of this genus await description (Silvia Santiago, pers. comm.). Hinton (1940) described the first immature stages of *Macrelmis*, and associated the larva and adult of *Elsianus graniger* Sharp 1882 based on the cast skin of a last instar larva found with a pupa that, upon eclosion, proved to be *E. graniger*. Hinton (1940) also associated the larva and adult of *Elsianus striatus* Sharp 1882, according to its geographic distribution. Until now, only two more larvae of *Macrelmis* have been associated with adults: *M. isis* (Hinton 1946) (Manzo and Archangelsky, 2001) and *M. saltensis* Manzo 2008 (Manzo and Archangelsky, 2008).

Within *Macrelmis*, three species groups have been recognized based on larval and adult characters. The *M. granigera* species group includes adults with a gibbose pronotum (Hinton, 1940), and larvae with the anterior corner of the pronotum blunt and the emargination of abdominal segment IX shallow (Bertrand, 1972). Larvae known for this group are *M. granigera* and *M. saltensis*. The *M. striata* species group includes adults lacking the gibbose pronotum, and larvae with the anterior corner of the pronotum acute and the emargination of IX abdominal segment sharp (Bertrand, 1972). The larvae known for this group are *M. striata* and *M. isis*. The *M. milleri* species group includes adults with an accessory structure in the aedeagus (Spangler, 1987), but their larvae are unknown.

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