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Description of the larva of *Tetragonoderus (Crossonychus) variegatus* Dejean, 1829 (Coleoptera: Carabidae: Cyclosomini) with notes on biology

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Abstract

A late instar of the *Tetragonoderus (Crossonychus) variegatus* Dejean, 1829 larva is described for the first time, and is compared with its first instar, with the larva of another *Tetragonoderus* species, and with the larva of one *Cyclicus* species. Habitus and important structures of the larva are illustrated, as well the adult's membranous wings. Some aspects of the natural history of the larva and adult are also noted.

Key words: immature, Neotropical, beach, natural history, chaetotaxy, taxonomy

Introduction

Tetragonoderus is a speciose genus of small-bodied beetles, represented by about 80 species. The genus occurs throughout the Afrotropical, Oriental, Neotropical, and Nearctic Regions, and on the southern fringe of the Palearctic Region (Bousquet 2012). The beetles are normally found adjacent to water, for example, in riparian habitats or in sandy banks along the ocean shore. They are usually collected in large numbers at a single locality (Reichardt 1977).

Ball (2000) organized the species into two subgenera: *Peronoscelis* Chaudoir, 1876, which is comprised of the Western Hemisphere species (including *Crossonychus* Chaudoir, 1848), and *Tetragonoderus sensu stricto*, composed of the Eastern species (including *Cyclicus* Jeannel, 1949). The *Tetragonoderus* type species, *Carabus quadrum* Fabricius, 1792, is Afrotropical. Ball (2000) also divided the subgenus *Peronoscelis* in two species groups: *figuratus* and *intersectus* groups. The former is equivalent to *Peronoscelis (sensu Chaudoir 1876)*, and the latter to the Western Hemisphere species of *Tetragonoderus (sensu Chaudoir 1876)*. Chaudoir (1876) considered *Tetragonoderus* and *Peronoscelis* to be distinct genera but did not separate them according to the geographic distribution, having considered some Western Hemisphere species to be part of *Tetragonoderus*; *Peronoscelis* is exclusively American. Bousquet (2012) treated *Peronoscelis* as junior synonym of *Crossonychus*, as the latter is older, and treated *Cyclicus* as a distinct Eastern Hemisphere genus. In 2013, Park *et al.* described the new species *Tetragonoderus sinanensis* from Korea and attributed it erroneously to the subgenus *Peronoscelis* (Park *et al.* 2013); the species actually belongs to *Cyclicus* (Anichtchenko 2013). According to Ball's classification, *T. variegatus* Dejean, 1829 belongs to the *figuratus* group.

Larval forms of *Tetragonoderus* are poorly known, with only one described species: *T. (Peronoscelis) mexicanus* (Chaudoir, 1876) by Bousquet (2010), who also compared it to *Cyclicus elegans* (Andrewes, 1931). Despite the recent taxonomic interest in *Tetragonoderus*, larval forms of the genus are poorly known. Bousquet (2010) published the only description of any *Tetragonoderus* larva; he described *T. (Peronoscelis) mexicanus* (Chaudoir, 1876) and compared it to *Cyclicus elegans* (Andrewes, 1931). The present study expands our understanding of *Tetragonoderus* larvae by providing descriptions of multiple instars of an additional *Tetragonoderus* species, *T. (Crossonychus) variegatus*. This species is compared to *T. (Peronoscelis) mexicanus* in order to establish a baseline understanding of larval diversity within the genus. In addition, following Bousquet (2010), the new *Tetragonoderus* larvae are also compared to the larvae of *Cyclicus elegans* (Andrewes, 1931).