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Redescription of *Anovia circumclusa* (Gorham) (Coleoptera: Coccinellidae: Noviini), with first description of the egg, larva, and pupa, and notes on adult intraspecific elytral pattern variation

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Abstract

Anovia circumclusa (Gorham), a neotropical lady beetle, recently was recorded in North America for the first time. Previously, only the adult form of this beneficial predator had been described. This paper provides a redescription of the adult and the first descriptions of the egg, larva, and pupa. Diagnostic characters for the genus and species are given, and intraspecific color variation in *Anovia* adults is discussed.

Key words: ladybird, lady beetle, coccinellid, larva, morphology, taxonomy, scale predator, color variation

Introduction

Members of the charismatic beetle family Coccinellidae are well known for their appealing coloration. In agricultural circles, though, they are equally famous for their efficacy as biological control agents. One of the earliest examples of successful biological control involved a lady beetle from the tribe Noviini: *Rodolia cardinalis* (Mulsant) (Koebele 1892; Olliff 1895). This beetle was imported into the U.S. from Australia in the late 19th century and was instrumental in the protection of California's citrus crops from the cottony cushion scale, *Icerya purchasi* Maskell (Caltagirone and Doutt 1989). Interest in noviines as biocontrol agents has been renewed by the recent discovery of an introduced pest scale in Florida, *Crypticerya genistae* (Hempel) (Hodges 2006). Subsequently, a newly introduced noviine, *Anovia circumclusa* (Gorham) was found feeding on this adventive scale insect (Forrester and Vandenberg 2008). Both predator and prey have been collected from Honduras, Mexico, and Panama, and are apparently native to the Neotropics (Gordon 1972; Gordon 1985; Hodges 2006).

Noviini consists of ~80 described species and three genera: *Anovia* Casey, *Novius* Mulsant, and *Rodolia* Mulsant. Despite the large number of species, little taxonomic work has focused on immature stages. Of those 80 nominal species, only seven have had immature stages described: *Anovia virginalis* (Wickham), *Novius cruentatus* Mulsant, *Rodolia koebelei* Olliff, *R. cardinalis* (Mulsant), *Rodolia concolor* Lewis, *Rodolia fausti* (Weise) and *Rodolia limbata* Motschulsky. A review of literature pertaining to larval Noviini is provided in Table 1. Noviine species are effective biocontrol agents as both larvae and adults, so larval descriptions for the tribe are desirable (Rees *et al.* 1994).

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