



The immature stages of the biting midge *Culicoides debilipalpis* Lutz (Diptera: Ceratopogonidae)

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Abstract

The fourth instar larva and pupa of *Culicoides debilipalpis* Lutz, 1913 are described, illustrated, and photomicrographed from material collected in tree-holes of *Salix* sp. in Entre Rios Province, Argentina by using binocular, phase-contrast, and scanning electron microscopy. Measurements of instars I–IV are also presented. The larva shows features typical to carnivorous-predatory larvae, as well as characters typical of larvae occurring in tree holes and clean water. Details on larval biology, habitat, and feeding behavior are given.

Key words: *Culicoides debilipalpis*, larva, pupa, bionomics

Introduction

Larvae of the worldwide genus *Culicoides* Latreille are important components in the bioenergetic cycle within aquatic and semiaquatic systems (Alencar *et al.*, 2001). The adult females are potential vectors of etiological agents that can cause diseases in humans and animals or bite in such large numbers that they thereby cause economic damages (Ronderos *et al.*, 2003b; Ronderos *et al.*, 2004).

The immature stages of Ceratopogonidae are poorly known in comparison with those of other economically important families of aquatic Diptera. Of the 267 Neotropical species of *Culicoides*, the larvae of only 23 and the pupae of 34 species are known (Borkent & Spinelli, 2007; Ronderos *et al.*, 2008b). Moreover, the knowledge of the habitats of the Neotropical species is highly limited.

The purpose of this paper is to provide not only the first detailed description of larva and pupa of *Culicoides debilipalpis* Lutz with scanning electron microscopy (SEM), binocular microscope (BCM) and phase-contrast microscopy (PCM) from specimens recently collected in Argentina, but also to give details of larval biology, habitat, and feeding behavior.

Material and methods

First to fourth instar larvae and pupae of *C. debilipalpis* were collected in large numbers by using pipettes to remove water from tree-holes of *Salix* sp. (Salicaceae) in Entre Rios Province, Argentina. The material containing the larvae and pupae was carried to the laboratory. The larvae were placed individually in Petri dishes and pupae were conditioned in vials, individually, with a drop of water. Observations were made daily until adult emergence.

In order to observe the ultrastructural characters, larvae and pupae were examined by using a scanning electron microscope (JSM6360LV) following the technique of Ronderos *et al.* (2000b, 2008a) except that we used 30% glycolid acid to clean the specimens and the exposure time of cleaning was increased to 10 minutes. For observation with BCM, specimens were slide-mounted in Canada balsam following the technique described by Borkent & Spinelli (2007). Mounted larval exuviae were placed with their ventral sides upwards to facilitate examination of the epipharyngeal combs within the head capsule and the alimentary channel; the latter is only visible when specimens are well cleared and observed with PCM. Pupal exuviae were mounted dorsally, ventrally