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Description of *Tingis americana* nymphs (Hemiptera: Tingidae), with emphasis on integumentary structures

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Abstract

The five instars of *Tingis* (*Tingis*) *americana* Drake are described and illustrated, with emphasis on the ontogenetic changes of integumentary structures. The study was performed using scanning electron microscopy.

Key words: Integument, morphology, scanning electron microscopy, SEM

Introduction

Tingis Fabricius is the largest tingine genus, comprising 113 extant and two fossil species distributed worldwide, most of them palearctic (Guilbert 2013). Its monophyly was never formally tested in a phylogenetic approach, although some of its species have been included in analyses addressed for other purposes (Guilbert 2001, 2004). From these analyses, there are some evidences that *Tingis* is polyphyletic. The genus may be characterized by the head moderately short, with four or five tubercles; bucculae contiguous apically; rostrum not reaching onto abdomen; pronotum moderately convex, coarsely punctate, tricarinate; carinae low, median percurrent on collar and sometimes fading on posterior projection; paranota evenly rounded; costal area of hemelytra with one to four rows of cells, explanate; subcostal area oblique, narrower or wider than costal (Hurd 1946). There are 11 neotropical species of *Tingis* (Guilbert 2013), whose life cycle is largely unknown, except for *Tingis* (*Tingis*) *americana* Drake (Moreira *et al*. 2013). Host plants for Neotropical species are provided mostly in their original descriptions, listed in Drake and Ruhoff's catalogue, and include several botanical families, such as Bignoniaceae, Verbenaceae, Boraginaceae, Euphorbiaceae, Dilleniaceae, and Malpighiaceae (Drake & Ruhoff 1965). *Tingis americana*, recorded from Brazil, Paraguay, and Argentina, has *Tecoma* sp. (Drake & Ruhoff 1965), *Handroanthus heptaphyllus*, and *H. chrysotrichus* (Bignoniaceae) (Moreira *et al.* 2013) as host plants.

Lace bugs nymphs have remarkable features on their tegument, whose morphological variation may be useful in species identification and phylogenetic analysis (Lee 1969; Guilbert 2004; Guilbert *et al*. 2008). However, detailed studies on their structure, ontogeny and physiology are still scarce. There are some descriptions of lace bug immatures focusing on the integumentary ultrastructure with scanning electron microscopy (SEM) (e.g. May 1977; Rekha & Sreekumar 2004; Guilbert 2005; Guilbert & Montemayor 2010), usually limited to the fifth instar nymphs. As far as we know, there is a single study with SEM including all instars (Guidoti & Barcellos 2013). Moreover, immatures of Neotropical species have been rarely described (e.g. Montemayor 2010; Montemayor *et al*. 2011; Guidoti & Barcellos 2013).

Descriptions of fifth instar nymphs are available to 24 Western palearctic Palearctic species of *Tingis* (Péricart 1981). Up to now, no Neotropical species of this genus had its immatures described. We aimed to describe all nymphal instars of *T. americana*, with emphasis on the morphology and ontogenetic development of their

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challenge might be to compile and correctly interprete the information on the genus scattered in the literature. Also, as nymphal morphology has been applied in phylogenetic analyses, it is imperative to standardize this terminology in order to correctly hypothesize homologies on *Tingis* immatures.

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