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Ultrastructure of the fossula spongiosa and pretarsus in *Haematoloecha nigrorufa* (Stål) (Hemiptera: Heteroptera: Reduviidae: Ectrichodinae)

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Abstract

The ultrastructure of the fossula spongiosa and pretarsus of adult *Haematoloecha nigrorufa* (Stål) (Heteroptera: Reduviidae: Ectrichodinae) was examined for the first time using scanning electron microscope. The fossula spongiosa of *H. nigrorufa* is located on the ventral surface of the distal part of the tibia of both the fore- and midlegs. The area of the fossula spongiosa on the female foreleg is approximately 251338.88 μm^2, while the area of the fossula spongiosa on the male foreleg is markedly smaller, only about 196548.98 μm^2. For both genders the area of the fossula spongiosa on the foreleg is approximately 1.50 times as large as that on the midleg. Externally, the ventral surface of the fossula spongiosa is covered by a large number of tenent hairs that are evenly interspersed with a few mechanosensory setae. Each tenent hair consists of two parts: a hair shaft and an apical plate. A tenent hair is 22.58±1.60 μm in length, 1.90±0.09 μm in shaft diameter, and 10.90±0.63 μm^2 in apical plate area. Morphologically, the tenent hairs are similar and constitute a nearly uniform hair array on the ventral side of the fossula spongiosa. The density of tenent hairs is about 4.46±0.35 hairs per 100 μm^2 and the total number of tenent hairs is more than ten thousand on the fossula spongiosa of the female foreleg. These tenent hairs are presumed to function as adherence during locomotion or prey capture of the assassin bugs. In addition, scanning micrographs and descriptions for the pretarsus are also given.

Key words: Reduviidae, *Haematoloecha nigrorufa*, fossula spongiosa, tenent hair, ultrastructure

Introduction

Phenomena and mechanisms of insects walking on smooth vertical surfaces or even inverted surfaces have attracted the interest of scientists for a very long history (Gorb, 2001; Peisker and Gorb, 2012). The extraordinary ability for climbing is mainly due to some highly specialized structures, which are widespread among insects. Previous studies have revealed that, in their evolution, insects have developed two distinctly different types of adhesive structures adapted to substrate attachment during locomotion: hairy adhesive surfaces and smooth flexible pads (Gorb and Beutel, 2001; Beutel and Gorb, 2001).

For almost two centuries, certain groups of Reduviidae (Insecta: Heteroptera) and some other groups of cimicomorphan Heteroptera have been known to possess an attachment structure on the legs referred to as "fossula spongiosa" (Miller, 1942; Weirauch, 2007). The fossula spongiosa is a hairy attachment structure that belongs to the first type of adhesive structures. The fine structure of the fossula spongiosa has been only studied as a taxonomic character in detail in few species of Reduviidae, such as *Haematorrhophus nigroviolaceus* (Reuter) (Ectrichodiinae), *Peirates affinis* Serville (Peiratinae), *Rhodnius prolixus* Stål (Triatominae), *Platymeris biguttata* (L.) (Reduviinae), *Sphaeridops amoenus* (LePeletier & Serville) (Sphaeridopinae), and *Mirambulus morio* Breddin (Vesciinae) (Haridass and Ananthakrishnan, 1980; Weirauch, 2007).

As the second largest and one of the most diverse groups of Heteroptera, Reduviidae currently includes more than 6, 600 known species worldwide (Weirauch, 2008). Most reduviid species are predators of other insects such as carabid beetles, field gryllids, or millipedes (Haridass and Ananthakrishnan, 1980). Consequently some

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