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# Larval morphology of the hanging-fly *Bittacus trapezoideus* Huang & Hua (Insecta: Mecoptera: Bittacidae)

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## Abstract

The first-instar larva of the hanging-fly *Bittacus trapezoideus* Huang & Hua, 2005 is described using scanning electron microscopy for the first time. The eruciform larva bears three pairs of thoracic legs and eight pairs of abdominal prolegs. Like other species of the family Bittacidae, the larval head is remarkable for bearing a median ocellus frontally and a pair of compound eyes laterally. Each compound eye consists of seven ommatidia. The larval trunk is symmetrically furnished with furcated protuberances. The larva of *B. trapezoideus* is diagnostic for bearing short brush-shaped setae on dorsal protuberances. In addition, the labial palp possesses nine basiconic sensilla on the apex; the abdomen bears a pair of sensory protuberances beside the protrusible sucker. The function of the furcated protuberances is briefly discussed.

**Key words:** Ultramorphology, larva, mouthparts, seta, sensillum

## Introduction

Bittacidae are the second largest family of Mecoptera, and comprise more than 200 species in 18 genera throughout the world (Tan & Hua 2009a; Bicha 2011; Chen *et al.* 2013). The adults of Bittacidae are commonly called hanging-flies because they suspend themselves between flights on the edges of leaves or twigs of plants using the prehensile front tarsi (Dunford & Somma 2008; Byers 2009). Adult hanging-flies use their raptorial legs to capture small flying insects as food (Tan & Hua 2006; Ma *et al.* 2014b) or as nuptial gifts for mating (Thornhill 1980; Gao & Hua 2013). Although adult morphology is well-documented for Bittacidae, many aspects of the larval morphology remain unknown to date, especially at the ultra-morphological level.

Larval morphology plays an important role in insect taxonomy and phylogenetic analysis (van Emden 1957; Beutel *et al.* 2009; Meier & Lim 2009); however, only a few bittacid larvae have been studied previously, including the American species *Apterobittacus apterus* (MacLachlan) (Applegarth 1939), *Bittacus pilicornis* Westwood, *Bittacus punctiger* Westwood, *Bittacus occidentis* Walker (Setty 1940), *Hylobittacus apicalis* (Hagen) (Setty 1941) and *Bittacus strigosus* Hagen (Setty 1939), the Australian species *Harpobittacus tillyardi* Esben-Petersen (Currie 1932), and the Chinese species *Bittacus choui* Hua & Tan (Tan & Hua 2008) and *Bittacus planus* Cheng (Tan & Hua 2009b). Most of these larvae were illustrated using light micrographs or hand-drawings; thus, the ultra-morphology of bittacid larvae remains largely unstudied. In this paper, the first-instar larva of *Bittacus trapezoideus* Huang & Hua, 2005 is described using scanning electron microscopy.

## Material and methods

Adults of *B. trapezoideus* were captured using sweeping nets along the Jialing River source (34°13'N, 106°59'E, elev. 1500–1800 m) in the Qinling Mountains, Shaanxi Province of central China from the middle of July to late August in 2013. The adults were reared in nylon gauze cages (40 cm × 40 cm × 60 cm) under semi-natural conditions. Live potted plants were provided for suspending adults. Live fruit flies were supplied three times a day

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