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Two new species of *Simulium* (*Gomphostilbia*) (Diptera: Simuliidae) from Cameron's Highlands, Peninsular Malaysia, with keys to 21 species of the *Simulium asakoae* species-group

H. TAKAOKA^{1,2}, M. SOFIAN-AZIRUN¹, Z. YA'COB¹ & R. HASHIM¹

¹Institute of Biological Sciences, Faculty of Science, University of Malaya, Kuala Lumpur, 50603, Malaysia

²Corresponding author. E-mail: takaoka@oita-u.ac.jp

Abstract

Two new black fly species, *Simulium* (*Gomphostilbia*) *brinchangense* and *S. (G.) tanahrataense*, are described on the basis of reared adult females, males, pupae and larvae from Cameron's Highlands, Peninsular Malaysia. These new species are assigned to the *asakoae* species-group within *Simulium* (*Gomphostilbia*) and taxonomic notes are given to distinguish each new species from six known species in Malaysia. Revised keys to identify all 21 species including 13 species from other countries are provided for females, males, pupae and mature larvae. The species diversity of the *asakoae* species-group in Cameron's Highlands is briefly noted.

Key words: black fly, *Gomphostilbia*, Simuliidae, Malaysia, diversity

Introduction

The fauna of black flies in Peninsular Malaysia is rich in diversity, being represented by 47 named and 3 unnamed species, which are all classified in the genus *Simulium* Latreille and are further placed in four subgenera: 1 species in *Daviesellum* Takaoka & Adler, 26 species (25 named and 1 unnamed) in *Gomphostilbia* Enderlein, 4 species in *Nevermannia* Enderlein and 19 species (17 named and 2 unnamed) in *Simulium* Latreille s. str. (Adler & Crosskey 2013; Crosskey 1973; Edwards 1928; Takaoka 2000, 2008, 2012; Takaoka & Adler 1997; Takaoka & Davies 1995, 1997; Takaoka *et al.* 2010, 2011a,b, 2012a,b,c, 2013a,b).

In recent surveys on pupae and larvae of black flies in Cameron's Highlands, Peninsular Malaysia, we collected four new species of the subgenus *Gomphostilbia*, of which two were already described as *S. (G.) sofiani* Takaoka & Hashim, 2011 and *S. (G.) izuae* Takaoka, Sofian-Azirun & Hashim, 2013 (Takaoka *et al.* 2011a, 2013b). The remaining two new species are described here on the basis of female and male adults reared from pupae, pupal exuviae with their cocoons and mature larvae in 80% ethanol. These new species are assignable to the *asakoae* species-group defined by Takaoka (2012) in having a combination of yellow fore coxae, enlarged male hind basitarsi and the ventral plate with lateral margins somewhat emarginated sub-basally or medially when viewed ventrally.

Taxonomic notes to distinguish these two new species from six other Malaysian species of the *asakoae* species-group are given, and revised keys to identify all 21 species of the same species-group, including 13 species from other countries are provided for females, males, pupae and mature larvae.

The species diversity of the *asakoae* species-group in Cameron's Highlands is briefly noted.

The methods of collection, description and illustration, as well as terms for morphological features used here, follow those of Takaoka (2003). The holotypes and paratypes will be deposited in the Institute of Biological Sciences, Faculty of Science, University of Malaya, Kuala Lumpur, Malaysia.

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