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Three new species of *Simulium* (*Nevermannia*) (Diptera: Simuliidae) from Vietnam

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Abstract

Three new species of black flies, *Simulium* (*Nevermannia*) *langbiangense*, *S. (N.) phami*, and *S. (N.) bachmaense*, are described on the basis of females, males, pupae and larvae collected in Vietnam. All three species are assigned to the *Simulium feuerborni* species-group of *Simulium* (*Nevermannia*). *Simulium (N.) langbiangense* **sp. nov.** is characterized by the female sensory vesicle with a large opening, and a short common basal stalk of the six pupal gill filaments, *S. (N.) phami* **sp. nov.** is most striking in having the pupal gill with five filaments, a character not reported in species of the *S. feuerborni* species-group, and *S. (N.) bachmaense* **sp. nov.** is characterized by the female genital fork with a triangular lobe-like projection pointed posteromedially on each arm, and the small larval postgenal cleft. This represents the first record of the *S. feuerborni* species-group from Vietnam.

Key words: *Simulium*, black fly, new species, Vietnam

Introduction

The *Simulium feuerborni* species-group in the subgenus *Simulium* (*Nevermannia*) Enderlein, first defined by Datta (1973) and redefined by Takaoka (2003), is a small homogeneous group consisting of 27 named and two unnamed species, and the majority of species of this group are distributed in the Oriental Region and only four are known in eastern parts (China, Korea and Japan) of the Palaearctic Region (Adler & Crosskey 2014). Females of the *S. feuerborni* species-group, as those of the three other groups in the subgenus *Nevermannia*, are considered ornithophilic, as judged by the tarsal claws with a large basal tooth (Adler *et al.* 2004). However, biting habits and other biological aspects remain unknown.

In Vietnam, a total of 28 species of black flies of the genus *Simulium* have been recorded, of which eight species are in the subgenus *Gomphostilbia* Enderlein, 19 in the subgenus *Simulium* Latreille, and one in the subgenus *Nevermannia* (Takaoka *et al.* 2014a, b). In surveys in Bach Ma National Park, near Hue City, Central Vietnam, and Lam Dong Province, southern Vietnam, we collected three species of the *S. feuerborni* species-group, which are distinguished from all the known species by the enlarged opening of the female sensory vesicle, the pupal gill with five filaments, and the genital fork with a triangular lobe-like projection pointed posteromedially on each side, respectively. Three species are described here as new species based on females, males, pupae and mature larvae. This finding represents the first record of the *S. feuerborni* species-group from Vietnam.

The methods of collection, description and illustration, and terms for morphological features used here, follow those of Takaoka (2003).

Holotypes and paratypes of the new species are deposited in Institute of Biological Sciences, Faculty of Science, University of Malaya, Kuala Lumpur, Malaysia.

Type specimens. HOLOTYPE: Female (with associated pupal exuviae and cocoon) (preserved in 80% ethanol), reared from pupa, collected from a small stream (width 0.2–0.3 m, depth 2–3 cm, water temperature 17.0°C, shaded, altitude 1,414 m, 16°11'41.099" N/107°51'47.675" E), slowly flowing from a natural forest, near the top of Bach Ma National Park, Phu Loc, Thua Thien-Hue Province, Vietnam, 23-II-2014, by H. Takaoka, M. Sofian-Azirun and Z. Ya'cob. PARATYPES: One male (with associated pupal exuviae and cocoon) (preserved in 80% ethanol), reared from pupa, and one mature larva (preserved in acetic alcohol), same data as those of holotype.

Biological notes. The pupae and larva of this new species were collected from dead tree leaves in the water. Associated species were *S. (G.)* sp. (*S. gombakense* species-group).

Etymology. The species name *bachmaense* refers to the name of the national park, Bach Ma, where this new species was collected.

Remarks. *Simulium (N.) bachmaense* sp. nov. is assigned to the *S. feuerborni* species-group based on the combination of the following characteristics: male genitalia with a simple lamellate ventral plate (Fig. 6D), a short inwardly-twisted style, a simple narrow median sclerite and several parameral hooks; the pupal gill with six long thread-like filaments per side (Fig. 7G); and the larval head with a small short postgenal cleft (Fig. 7H).

The female of *S. (N.) bachmaense* sp. nov. is distinctive among the members of the *S. feuerborni* species-group in having the genital fork with a triangular lobe-like projection pointed medioposteriorly in each arm (Fig. 6B). The lobe-like projections of the genital fork in most known species of the *S. feuerborni* species-group are rounded medioposteriorly, as shown in Fig. 1F and Fig. 5C.

This new species is similar to *S. (N.) fruticosum* Takaoka & Choochote from Thailand (Takaoka & Choochote 2005) and *S. (N.) chitoense* Takaoka from Taiwan (Takaoka 1979) in many characters including the number of enlarged upper-eye male facets, male genitalia, arrangement of the pupal gill filaments, and simple wall-pocket-shaped cocoon. However, this new species is distinguished from both known species by the female genital fork having a triangular lobe-like projection with pointed apex (Fig. 6B), ellipsoidal spermatheca (Fig. 6C), almost yellowish male antennae and small postgenal cleft which is 0.46 times the length of the postgenal bridge (Fig. 7I). This new species is also distinguished from *S. (N.) fruticosum* by having the greater number (25) of minute processes on the middle of the cibarium (cf., 11 in *S. (N.) fruticosum*), pupal head integument moderately covered with tubercles (cf., densely covered in *S. (N.) fruticosum*) and anterolateral trichomes, of which the shorter one is about half the length of the longer one (Fig. 7D) (cf., the shorter one about one-third the length of the longer one in *S. (N.) fruticosum*), and from *S. (N.) chitoense* by the yellowish-brown female scutum (cf., brownish-black scutum in *S. (N.) chitoense*), and larval posterior circlet consisting of 88 rows of up to 17 hooks per row (cf., 70 rows of up to 12 hooks in *S. (N.) chitoense*).

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