



## Morphotaxonomy of the *Simulium* (*Simulium*) *tuberosum* species group (Diptera: Simuliidae) in Thailand

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### Abstract

Seventeen cytogenetically distinct taxa of the *Simulium* (*Simulium*) *tuberosum* species group in Thailand were examined morphologically, including *Simulium doipuiense* (cytoforms A and B), *S. manooni*, *S. rufibasis*, *S. setsukoa*, *S. tani* (cytoforms A-I), *S. weji*, *S. yuphae*, and one unknown species. Identification keys to larvae, pupae, males, and females are provided, along with diagnostic characters for each taxon and a morphology-based phylogeny.

**Key words:** *Simulium tuberosum* group, aquatic insects, black flies, morphology, Thailand

### Introduction

The *Simulium tuberosum* group is one of the largest and most morphologically homogeneous species groups of black flies, with 47 nominal species in the world (Adler & Crosskey 2008, Takaoka 2008). The group is richly represented in Thailand, which has seven described species: *S. doipuiense* Takaoka & Choochote, *S. manooni* Takaoka & Choochote, *S. rufibasis* Brunetti, *S. setsukoa* Takaoka & Choochote, *S. tani* Takaoka & Davies, *S. weji* Takaoka, and *S. yuphae* Takaoka & Choochote (Takaoka & Suzuki, 1984; Takaoka & Davies, 1995; Takaoka, 2001; Takaoka & Choochote, 2004a, 2005a, 2005b). Five of these nominal species are known only from Thailand. A cytogenetic study of the *Simulium tuberosum* group in Thailand revealed 10 additional taxa, referred to as cytoforms because not all are necessarily full species (Tangkawanit et al., 2009). A combined cytological-morphological approach to species recognition and identification has proved useful in the systematics of the Simuliidae (Adler *et al.* 2004). The objective of our study, therefore, was to provide morphological characters to aid identification of the cytologically known taxa in the *S. tuberosum* group in Thailand.

### Material and methods

Larvae were collected into Carnoy's fixative (3 parts 95% ethanol: 1 part glacial acetic acid) for cytotaxonomic identification. Pupae were fixed in Carnoy's solution or 80% ethanol or were reared individually on filter paper in plastic containers. Adults were fixed in 80% ethanol 12 hours after emergence. Representative specimens were deposited in the Clemson University Arthropod Collection in South Carolina and the Department of Biology at Mahidol University in Bangkok.