



## The identity and genetic characterization of *Simulium reptans* (Diptera: Simuliidae) from central and northern Europe

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### Abstract

Although *Simulium reptans* Linnaeus is one of the first two blackfly species ever described its identity and taxonomy are still not precisely defined. *S. reptans* and closely related species from central and northern Europe were characterized based on genetic variability, haplotype number and haplotype distribution. *S. galeratum* can be considered a synonym of *S. reptans*, but despite this, two distinct species are present in Great Britain and central Europe. The available name *S. reptantoides* Carlsson can be used for the second species; earlier reported as *S. reptans* from Great Britain and central Europe. A total of 80 mitochondrial cytochrome c oxidase I gene sequences were analyzed: 44 *S. reptans*, 36 *S. reptantoides*; 38 from Great Britain, 19 from Slovakia, 8 from Lithuania, 3 from Latvia and 12 from Sweden. In 73 individuals a 606 bp section (long sequences), and in all 80 individuals a fully overlapping 453 bp section (short sequences) were analyzed. Results confirmed that *S. reptans* and *S. reptantoides* are two genetically isolated species. The variation between these species is 80.01% of total variation; approximately six times higher than the variation among the populations within species. The genetic divergence between species is 7.02% in long sequences and 7.46% in short ones. The genetic divergence within species is 1.18% in *S. reptans* and 0.83% in *S. reptantoides* in long sequences, and 1.38% and 1.05% in short sequences. Maximum likelihood trees, maximum parsimony trees and the haplotype network constructed using TCS showed that each species consists of two units, labelled as A and B forms. The distribution of the *S. reptans* forms is not identical—in Slovakia and the Baltic area only *S. reptans* B was found, meanwhile both A and B forms were present in Great Britain and Sweden; with the A form clearly dominant. In contrast, both forms of *S. reptantoides* were present in Great Britain and Slovakia, and absent in Scandinavia and the Baltic area. Additional studies comprising more individuals from larger areas of Europe are required to verify the taxonomic position of these species' forms.

**Key words:** *Simulium galeratum*, *Simulium reptantoides*, taxonomy, genetic differences, cytochrome c oxidase I

### Introduction

The *reptans* species group of the genus *Simulium* Latreille consists of 16–18 named species (Adler & Crosskey 2012), and this includes *Simulium colombaschense* (Scopoli), the type species of the genus *Simulium*. The group is exclusively Palaearctic and most species can be found in Europe and the Caucasus area. One species, reported under the name *Simulium reptans* Linnaeus appears to have a very wide distribution; being recognized throughout most of Europe and in large areas of Asia. Although *S. reptans* is one of the first two blackfly species ever described, its identity and taxonomy are still problematic. The taxonomical problems of *S. reptans* are often connected with the closely related species *Simulium galeratum* Edwards; originally described as a morphological form of *S. reptans* from Great Britain. The presence of *S. galeratum* has also been reported from large parts of Europe, occasionally also as *Simulium reptantoides* Carlsson (Jedlička & Knoz 2006). However, the entire *reptans* species-group needs a general revision (Jedlička & Seitz 2008).

The complicated taxonomy of *S. reptans* is illustrated by the 20 available synonymic names (including two

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