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The puzzling distribution of *Heteromurus (Verhoeffiella) absoloni* Kseneman, 1938 (Collembola: Entomobryidae: Heteromurinae) resolved: detailed redescription of the nominal species and description of a new species from Catalonia (Spain)

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Abstract

The species *Heteromurus (Verhoeffiella) absoloni* Kseneman, 1938 is redescribed in detail and characterized by its barcode, based on specimens from its type locality in Montenegro. A neotype is designated. Dorsal S-chaetotaxy is given for the first time in the subgenus *Verhoeffiella*. Chaeta morphology and distribution are thoroughly analyzed, in particular on antennae where 12 chaetal types are recognized. Several morphological features are newly described for the genus and for Heteromurinae. The widely disjunct distribution of the species is approached through morphological and molecular comparison of specimens from the type locality in Montenegro and from the Catalan population. We established that this last record is a new species described here as *Heteromurus (Verhoeffiella) gamae* **sp. nov.** New combination is proposed *Heteromurus (Verhoeffiella) constantinellus* (Čurčić & Lučić in Lučić, Čurčić & Mitić 2007) **comb. nov.** A table of all species of the subgenus is provided. The taxonomic status of *Verhoeffiella* and the problems of species discriminations in the subgenus are discussed.

Key words: taxonomy, chaetotaxy, troglomorphy, cave fauna, Dinarids, disjunct distribution, DNA barcodes

Introduction

Verhoeffiella Absolon, 1900 is a subgenus of *Heteromurus* Wankel, 1860 (considered as a full genus by Soto-Adames *et al.* 2008) which includes 9 troglomorphic species. They are present in several European karst areas: Balkans (Dinarids, Macedonia) (7 species), southeastern Italian Alps (one species), southern Catalonia (one species) and Cordillera Cantabrica (two species) in Spain, and Northeastern France (one species). In some areas (e.g. Dinarids) these species count among the dominant cave invertebrates in subterranean communities (Lukić & Deharveng, 2008) while in the Iberian Peninsula they are only known from a few caves (Jordana *et al.* 1990). No species has ever been recorded from intermediate regions (particularly Western Alps, southern Massif Central and the Pyrenees), a disjunct pattern extremely intriguing from a biogeographical and evolutionary point of view. Moreover, the species reported from Catalonia and Cordillera Cantabrica in Spain by Gama (1984) and from Northeastern France by Thibaud (1970) have been considered by these authors conspecific with three Dinaric species, *H. (V.) absoloni* Kseneman, 1938, *H. (V.) longicornis* (Absolon, 1900) and *H. (V.) cavicola* Absolon, 1900. Such a situation would probably represent the most extreme case of disjunct distribution among terrestrial troglomorphic species in Europe.

In spite of spectacular morphological modifications of several species in relation to cave life and the puzzling distribution pattern of the subgenus summarized above, *Verhoeffiella* has never been the subject of detailed morphological study, and the available descriptions remain basic. This may be due to the fact that chaetotaxic