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Integrative redescription of a forgotten Italian pill millipede endemic to the Apuan Alps—*Glomeris apuana* Verhoeff, 1911 (Diplopoda, Glomerida, Glomeridae)

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Abstract

The Italian pill millipede species *Glomeris apuana* Verhoeff, 1911, is redescribed from fresh material and its COI barcoding fragment is sequenced. The new specimens were compared to the original type series, of which a lectotype was selected. *G. apuana* was apparently still viewed as a subspecies of *G. ligurica*, as its name cannot be found in 'Fauna Europaea', or any faunal lists or catalogues in the last 85 years. We show that the species is both genetically and morphologically unique. *G. apuana* is easy to identify based on its entirely black coloration in combination with the absence of any main striae on the thoracic shield. Genetically, *G. apuana* shows large p-distances of >10% to four different populations of *G. ligurica* Latzel, 1884. *G. apuana* also differs from other sequenced *Glomeris* species, *G. marginata* Latreille, 1803, *G. connexa* Koch, 1847, and *G. klugii* Brandt, 1833 by p-distances of >10%. Specimens of *G. klugii* from a population occurring in sympatry with *G. apuana* were newly sequenced. All records of *G. apuana*, a large, easy to identify and conspicuous species, are from a narrow coastal zone of the Apuan Alps, an area in which the species might be microendemic.

Key words: soil arthropod, endemism, Italy, Apuan Alps, Barcoding, COI

Introduction

Pill millipedes of the order Glomerida, a basal order of the Diplopoda (Blanke & Wesener 2014) with approximately 280 described species, show a holarctic distribution (Shelley & Golovatch 2011): the majority of genera occur in Europe (Mauriès 2005, Wesener 2010). In Europe, the genus *Glomeris* Latreille, 1803 is by far the most species-rich (Kime & Enghoff 2011) with more than 70 species described from Europe and North Africa (Golovatch *et al.* 2009).

The taxonomy of *Glomeris* is chaotic and outdated. Genetic studies have confirmed long suspected synonymies and clarified the taxonomic status of numerous species (Hoess & Scholl 1999, 2001, Wesener 2015). In Europe, *Glomeris* has its center of diversity in central Europe just south of the Alps (Kime 2000). While many pill millipede species are relatively widespread, Italy, with its 21 endemics, is especially rich in local endemic *Glomeris* species (Strasser & Minelli 1984, Foddai *et al.* 1995, Kime & Enghoff 2011), as it harbors more country endemics than all other European countries combined. However, in some cases it remains unclear whether these names represent real species, or just colour variants of otherwise widespread species.

Even less known than these local species, which are in need of a taxonomic revision, are species that have apparently been forgotten. These 'forgotten' species are no longer mentioned in the recent literature, keys, catalogues, or atlases about central European or Italian Glomerida (Strasser & Minelli 1984, Foddai *et al.* 1995, Hoess 2000, Kime & Enghoff 2011, Fauna Europaea). One of these forgotten species is *Glomeris apuana* Verhoeff, 1911, which was first described as a subspecies of *G. ligurica* Latzel, 1886 from the Apuan Alps and later upgraded to species status (Attems 1927). For unknown reasons, since the Second World War *G. apuana* has again been considered a subspecies of G. *ligurica*. *G. apuana* is morphologically easy to identify, as it is completely black in colour and has no main striae on the thoracic shield. The discovery of an unknown black Italian *Glomeris* species, which was morphologically and genetically unique, led to the rediscovery of the old name *G. apuana* and prompted

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