



## A new species of the giant pill-millipede genus *Sphaerobelum* Verhoeff, 1924 from northern Thailand, with an extensive description and molecular characters (Diplopoda: Sphaerotheriida: Zephroniidae)

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### Abstract

As a first step towards an inventory of the giant pill-millipedes in Thailand, a new species of the genus *Sphaerobelum* Verhoeff, 1924, *S. truncatum* n. sp. is described from Nan Province, northern Thailand. A determination key is presented for all five known *Sphaerobelum* species. Clear morphological differences between *S. truncatum* n. sp. and the other four *Sphaerobelum* species were found on the anterior telopods. For the first time in *Sphaerobelum*, the partial mitochondrial COI gene was sequenced for *S. truncatum* n. sp. and compared with distance, maximum parsimony and maximum likelihood methods to those of species from other giant pill-millipede genera. *Sphaerobelum truncatum* n. sp. was found to differ from all other analyzed giant pill-millipedes, including species of *Zephronia* Gray, 1832, by 22–30%, including numerous amino acid changes, supporting the separate status of *Sphaerobelum* among other giant pill-millipede genera. Maximum likelihood and parsimony analyses support the placement of *Sphaerobelum* in the Zephroniidae. Figures of all relevant structures of *Sphaerobelum truncatum* n. sp. are provided to allow the use of these characters in future descriptions of species of the family Zephroniidae.

**Key words:** giant pill-millipede, new species, arthropod, taxonomy, Thailand

### Introduction

Millipede diversity in the world has been estimated to be 80,000 species (Hoffman 1979). However, up to now, approximately 8,000–12,000 species have been described (Sierwald & Bond 2007; Shear 2011). Among these, the order Sphaerotheriida contains currently 325 species (Wesener *et al.* 2010) and occupies a discontinuous geographical area which includes South Africa, Madagascar, the entire Oriental region, as well as New Zealand and Australia (Jeekel 1974; Hoffman 1982; Shelley 1999; Wesener & VandenSpiegel 2009). The order contains four families: Sphaerotheriidae in South Africa, Procyliosomatidae in Australia and New Zealand, Arthrosphaeridae restricted to southern India and Madagascar, and Zephroniidae (synonym Sphaeropoeidae) in Southeast Asia and the Sunda Islands, as well as an isolated genus on the Seychelles (Wesener & VandenSpiegel 2009). The family Zephroniidae is by far the most species-rich family of the order, with 140 species in 14 genera (Wesener *et al.* 2010).

However, the Zephroniidae are also in urgent need of revision; only four of its species could be included in a recent phylogenetic analysis (Wesener & VandenSpiegel 2009). Because of the unclear identity of the type species of the genus *Zephronia*, *Z. ovalis* Gray, 1832, a distinction between the three most species-rich genera, *Zephronia* Gray, 1832, *Castanotherium* Pocock, 1895 and *Sphaeropoeus* Brandt, 1833 is still problematic. On the other hand, some smaller genera are relatively well defined and were recently revised (e.g. Jeekel 2000; Mauriès 2001).