



Redescriptions of three *Milnesium* Doyère, 1840 taxa (Tardigrada: Eutardigrada: Milnesiidae), including the nominal species for the genus

ŁUKASZ MICHALCZYK¹, WERONIKA WEŁNICZ^{2,3}, MARCUS FROHME² & ŁUKASZ KACZMAREK³

¹*School of Biological Sciences, University of East Anglia, Norwich Research Park, Norwich NR4 7TJ, UK.*

E-mail: LM@tardigrada.net

²*Department of Molecular Biology and Functional Genome Analysis, University of Applied Sciences Wildau, Bahnhofstraße 1, 15745 Wildau, Germany. E-mail: wwelnicz@th-wildau.de, mfrohme@th-wildau.de*

³*Department of Animal Taxonomy and Ecology, A. Mickiewicz University, Umultowska 89, 61-614 Poznań, Poland.*

E-mail: kaczmar@amu.edu.pl

Abstract

In this paper we redescribe two species (*Milnesium eurystomum* Maucci, 1991 and *Milnesium tardigradum* Doyère, 1840) and one subspecies (*Milnesium tardigradum granulatum* Ramazzotti, 1962), which we elevate to the species level. We establish a new type series for *M. tardigradum* sensu stricto along with the sequences of the cytochrome c oxidase subunit I (COI) and the internal transcribed spacer 2 region (ITS2). Moreover, we define two species groups within the genus based on the appearance of the dorso-lateral cuticle (the *tardigradum* and the *granulatum* group, with smooth and reticulated cuticle, respectively) and propose a system for denotation of the number of points on secondary branches of claws in the genus. We also provide a diagnostic key to all described *Milnesium* species and discuss the world distribution of the genus.

Key words: claws, COI, cuticle, diagnostic key, ITS2, *M. eurystomum*, *M. granulatum*, *M. tardigradum* sensu stricto, taxonomy

Introduction

Until the descriptions of *Limmenius* by Horning, Schuster & Grigarick in 1978 and *Milnesioides* by Claxton in 1999, two other genera constituting with *Milnesium* the carnivorous family Milnesiidae Ramazzotti, 1962, *Milnesium tardigradum* Doyère, 1840 had been very distinct from all other known eutardigrade taxa. As a result of the unique morphology of the genus, taxonomists did not pay much attention to its variation (a situation known also in other tardigrade taxa, e.g. the genus *Paramacrobotus* or the *Macrobotus hufelandi* group). In consequence, for over 150 years the genus *Milnesium* was comprised of a single species, *M. tardigradum*. Although Rahm (1931) and Ramazzotti (1962) found specimens distinctly different from *M. tardigradum*, they did not regard the variations as sufficient to be separated into new species but described them as subspecies: *M. tardigradum trispinosa* and *M. tardigradum granulatum*, respectively.

Specimens regarded as *M. tardigradum* have been found on all continents, hence the species used to be considered cosmopolitan (e.g. Ramazzotti & Maucci 1983, McInnes 1994, Pilato & Binda 2001). This has started to change at the end of the last century, when two new *Milnesium* species were described, *Milnesium tetralamellatum* Binda & Pilato, 1990 and *Milnesium eurystomum* Maucci, 1991. Currently, sixteen recent species and two subspecies from sites around the world are known in the genus. Moreover, a single fossil species, *Milnesium swolenskyi* Bertolani & Grimaldi, 2000, was also identified from Cretaceous amber.

Definitely one of the most burning issues in the taxonomy of the genus *Milnesium* is the lack of a detailed description of *M. tardigradum* sensu stricto. The original account (Doyère 1840) contains several drawings, but is devoid of important morphometric data and a comprehensive account. Without the detailed knowledge of the traits of the typical nominal species of the genus and the full set of measurements required by modern taxonomy, it is