

# Insights into the *Eucyclops graeteri* species complex (Copepoda, Cyclopidae) – the case of sulphidic groundwaters of Mangalia (Southern Dobrogea, Romania)

Maria Mirabela Pop<sup>‡</sup>, Andrei Ștefan<sup>§‡</sup>, Filip Paul Boancă<sup>‡</sup>, Fabio Stoch<sup>‡</sup>, Sanda Iepure<sup>‡¶</sup>

<sup>‡</sup> Emil Racovița Institute of Speleology, Cluj-Napoca, Romania

<sup>§</sup> National Museum of Natural History "Grigore Antipa", Bucharest, Romania

<sup>‡</sup> Université libre de Bruxelles, Bruxelles, Belgium

<sup>¶</sup> Romanian Institute of Science and Technology, Cluj-Napoca, Romania

Corresponding author: Maria Mirabela Pop ([mariamirabelapop0@gmail.com](mailto:mariamirabelapop0@gmail.com))

## Abstract

Members of the *Eucyclops graeteri* species complex are widely distributed in European groundwaters and share some morphocharacters such as:

1. a long aesthetasc on the ninth segment of female antennula,
2. short or very reduced spinule row ("serra") on furcal rami,
3. lateral hairiness of 5th thoracic somite strongly reduced, and
4. few or no hairs on the distal margin of the intercoxal sclerite of 4th legs pair.

All these characters are subject to strong selective pressure in the underground environment; therefore, the study of molecular markers is needed to better define the taxonomy and phylogeny of this species group. The Southern Dobrogea region in Romania conceals dark, isolated, and sulfide-rich aquifers, accessible through artificial wells, springs, and the Movile Cave. The chemoautotrophically-based Movile Cave hosts a member of the *E. graeteri* complex, described several years ago as a subspecies (*E. graeteri scythicus* Plesa, 1989). The morphological and molecular analyses performed on specimens of this species complex collected from Southern Dobrogea revealed new records for *E. graeteri scythicus* both in sulfidic and non-sulfidic artificial wells dug near the cave as well as a species putatively new to science collected in three sulfidic wells from Mangalia. Mitochondrial markers allocated the Movile Cave population in a distinct clade within the genus *Eucyclops*, *Eucyclops serrulatus* s.l. being the closest taxon. The putative new species belongs to a different clade within the subfamily Eucyclopinae, raising doubts on the monophyly of this species complex. Furthermore, our investigations revealed the occurrence of ectosymbiont sulfur-oxidizing *Thiothrix* bacteria associated with *E. graeteri scythicus* suggesting that this putative symbiosis could allow

this taxon to better cope with sulphidic-rich environments. These unique sulfidic groundwater environments therefore provide an interesting model system in which to study the taxonomy of copepods and their adaptation to very harsh environmental conditions.

## **Keywords**

sulfide-rich continental aquifers, copepods, symbiosis, taxonomy

## **Presenting author**

Maria Mirabela Pop

## **Presented at**

25th International Conference on Subterranean Biology (Cluj-Napoca, 18-22 July 2022)

## **Funding program**

This work was supported by grants of the Romanian Ministry of Education and Research, CNCS - UEFISCDI project number PN - III - P4 - PCE - 2020 - 2843 (EVO-DEVO-CAVE) within PNCDI III.

## **Conflicts of interest**

None.