

# Taxonomic revision of the genus *Carinolithus* (Early–Middle Jurassic) based on morphometric analyses and diagenesis observations: Implications for biostratigraphy and evolutionary trends

**Stefano Visentin, Giulia Faucher, Elisabetta Erba**

University of Milan, Department of Earth Science, 20133 Milan, Italy; stefano.visentin@unimi.it, giulia.faucher@unimi.it, elisabetta.erba@unimi.it

A total of 100 specimens of the genus *Carinolithus* were selected from published papers and new sampling of sections in the Tethys Ocean (Sogno Core and Breggia sections, Lombardy Basin). The species *C. poulabronei* and *C. cantaluppii* have diagnostic characters that cannot be confused with other those of species and, consequently, were not considered for morphometric analysis. Size measurements were performed for the following parameters: total height, height without proximal and distal shields, stem width (SW), proximal shield width, distal shield width (DS) and thickness of the distal shield (TDS). Only three (DS, TDS and SW) were diagnostic for taxon discrimination. Based on the DS, two groups were distinguished –  $>7.8 \mu\text{m}$  and  $<6.8 \mu\text{m}$ . Two groups were distinguished based on the TDS –  $>1.8 \mu\text{m}$  and  $<1.5 \mu\text{m}$ . Analogously, based on the SW, two groups of specimens were identified –  $>1.3 \mu\text{m}$  and  $<1.0 \mu\text{m}$ .

Our results provide a revised subdivision of *C. superbus* and *C. magharensis* based on a simple, but effective, morphometry that can be seen with a polarising-light microscope. An additional 50 specimens of *C. cantaluppii* were qualitatively investigated to assess the potential role of diagenesis on its morphology. Four pictures were taken for each specimen – with and without a quartz-plate, and at  $0^\circ$  and  $45^\circ$  to the polarisers. All investigated specimens revealed that *C. cantaluppii* is a diagenetic artifact that is produced through different degrees of overgrowth on specimens of *C. poulabronei*, *C. superbus* and *C. magharensis*. Using a quartz-plate at  $45^\circ$  to the polarisers allows: 1) recognition of the species that have undergone the diagenetic modification; and 2) the degree of diagenetic change. This impacts the taxonomy and correct identification of this species, and suggests a method for the evaluation of nanofossil/sediment preservation. The morphometry-based revised taxonomy of the genus *Carinolithus* has the potential for improving the biostratigraphic resolution of the Toarcian–Aalenian interval, and has implications for the reconstruction of evolutionary trends.