

## WESTERMANN MORPHOSPACE ANALYSIS OF THE CRETACEOUS AMMONOID SUPERFAMILY DESMOCERATOIDEA

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### Abstract

Ammonoids of the Cretaceous superfamily Desmoceratoidea are geographically and stratigraphically widespread. However, the group is understudied, with just one prominent Japanese worker, T. Matsumoto, who worked on desmoceratoids extensively in the 1970s-1990s. Since then, few researchers have studied desmoceratoid taxonomy, phylogeny, or ecology. Based on their geographic distributions and typical geologic contexts, desmoceratoids are traditionally interpreted to have been open ocean dwellers. However, details of their paleoecology and mode of life are lacking, limiting our ability to interpret desmoceratoid diversity dynamics through the Cretaceous. The Westermann morphospace method is a way to predict the life mode of coiled (non-heteromorph) ammonoids based on morphological measurements of shell shape. The morphospace has three end-member morphotypes, spherocone, oxycone, and serpenticonic, with predicted modes of life for different morphospace regions. Shell shape measurements were made on 112 desmoceratoid specimens from collections at the U.S. National Museum of Natural History and the Natural History Museum in London (UK); these specimens are from every continent except Australia and Antarctica. Westermann parameters were computed and specimens were plotted in Westermann morphospace so that patterns of morphospace occupation could be assessed. Desmoceratoids generally fall towards the oxycone corner of the morphospace, with genera falling into two groups, one more platyconic with predicted good swimming efficiency and one more discoconic with more limited swimming efficiency. *Lewesiceras* and *Desmoceras* have specimens in both groups, while *Puzosia* uniquely occupies a more central position in the morphospace. Temporally and regionally, there were no significant variations in morphology. While often interpreted as uniformly effective open ocean swimmers, these results indicate that desmoceratoid ammonoids had varying modes of life.

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