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Intraspecific variation and new morphological characters revealed by multimodal imaging analysis on the Late Cretaceous coleoid *Dorateuthis syriaca*

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The Cretaceous outcrops of Haqel, Hjoula (Cenomanian) and Sahel Aalma (Santonian) in Lebanon are renowned for their exceptional preservation of coleoid soft tissue in coeval shallow carbonate mud deposits and provide an unmatched opportunity to study many specimens of a single species, *Dorateuthis syriaca*. Despite being the most abundant coleoid from these localities, the taxon lacks clear, unambiguous diagnostic characteristics of both the gladius, and soft tissue anatomy. The absence of a defined character complex for the species has led to inconsistencies in the literature and the need for a reappraisal. This investigation represents the largest sample of *D. syriaca* studied with high-resolution, multi-imaging techniques, and has obtained a comprehensive morphological dataset of measurements on this key taxon. This has allowed us to refine some of the character states used to understand the phylogeny of coleoids. Furthermore, we have identified morphological characters that were previously undescribed for the genus, including suckers, axial nerves, and possible retractor muscles, as well as provided confirmation of the circulatory and excretory systems, and an Octobrachia-type digestive system. We also discount the presence of tentacles, tentacular pockets, and hooks within the arm crown, and we show that the species definition of *D. syriaca* is more complex than expected as our sample suggests intraspecific variability is present in the gladius. We strongly support the hypothesis that it was an 8-armed coleoid that was likely an active visual predator.

Key words: Coleoidea, Lagerstätte, multimodal imaging, soft tissue preservation, Lebanon.

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