

**MORPHOLOGY, FEEDING HABITS AND PHYLOGENETIC IMPLICATIONS OF THE CRETACEOUS COLEOID *DORATEUTHIS SYRIACA* WOODWARD.**

Alexander LUKENEDER, Mathias HARZHAUSER

The main problem in interpreting fossil coleoids and their relation to extant taxa is the extremely rare preservation of soft tissues. With few exceptions, the dataset on soft part morphology – e.g. the digestive systems – of the manifold fossil coleoid groups is still too poor to integrate such information in a consistent phylogenetic tree. One of the most promising localities to solve questions concerning the soft tissue morphology of fossil coleoids is located in Lebanon. There, the Upper Cretaceous “fish-shale” (“Fischschiefer”) yields a large number of coleoid cephalopods along with crustaceans and fishes, being known to science since the late 1870s (LARTRET 1877, LEWIS 1878, FRAAS 1878, WOODWARD 1883, 1896, ROGER 1946).

An exceptionally preserved coleoid from the Upper Cretaceous (Upper Santonian) of Lebanon is described. The specimen represents the rare species *Dorateuthis syriaca* WOODWARD 1883 of the family Plesiotheuthidae and is characterized by indications of soft tissue such as the buccal mass, mandibles, oesophagus, arms and the gladius. These details allow a refined description of the species, which WOODWARD (1883) based on a poorly preserved holotype and presented as a strongly idealized drawing. Furthermore, the specimen displays the stomach content, comprising exclusively fish remnants. The amount of ingested food reveals *Dorateuthis syriaca* as a voracious

feeder whose diet suggests similar predatory habits as documented from modern squids.

The specimen of the coleoid *Dorateuthis syriaca* WOODWARD 1883 is housed in the collection of the Natural History Museum Vienna (Inv. NHMW1998z0105/0000). It was bought by the Museum in 1998 and derives from the Sahil Alma section in Lebanon. Only one slab is available, containing the dorsal part of the squid in ventral view. The counterpart of the slab is missing. This individual is conspecific with other specimens of *Dorateuthis syriaca* WOODWARD 1883 collected at the same locality. A comparison with photographs of the holotype housed in the Natural History Museum London, kindly provided by Dirk Fuchs (Berlin), confirmed the identification but showed that the original definition by WOODWARD (1883) was highly idealized and lacked important information. The specimen is exceptionally preserved and includes soft tissue, which is indicated as a brownish cover on the pale calcareous marl slab. Although the specimen is slightly distorted and compressed, it is sufficiently complete to allow biometric measurements of shape and size.

The first dating of the Sahil Alma section as “Senonian” by FRAAS (1878) was refined by EJEL & DUBERTRET (1966) as Upper Santonian based on planktonic foraminifera.

*Dorateuthis syriaca* was an active predator feeding at least partly on fish. Remnants of its

digestive system suggest the presence of a chyme-filled caecum or caecal sac next to stomach. Based on the mass and preservation of the ingested food, the specimen is interpreted to have preyed on fish only a few hours before its death. This species was an octobranchian, coleoid with 3 types of arms. Like several other Plesiotheuthididae, it shows a tendency to a stalked preservation of the circumoral appendages. Both features could be argued to indicate a close relation with the Octobranchiomorpha. In contrast, the gladius of *Dorateuthis syriaca* is reminiscent of that of a decabranchian oegopsid. It cannot be excluded, however, that the similarities with oegopsids (overall body-outline and gladius-shape) represent analogous developments due to adaptation to similar habits. Information on whether the Plesiotheuthididae had a crop could support a decision on a potential affiliation with the vampyromorphs. This calls for putting more emphasis on soft part morphologies of exceptionally preserved specimens in future studies. More detailed analysis of the so-called stomach contents might reveal differentiations of crop, stomach and caecum areas, which could then be applied to phylogenetic schemes if consistent patterns turn up. The octobranchian nature of the specimen supports the still controversial systematic position of the Plesiotheuthididae within the Octobranchiomorpha. The oegopsid affinities of the gladius therefore point to parallel evolution.

## References

**Alexander LUKENEDER**  
Natural History Museum  
Geological-Palaeontological Department  
Burgring 7  
A-1010 Vienna  
Austria  
e-mail: alexander.lukeneder@nhm-wien.ac.at

**Mathias HARZHAUSER**  
Natural History Museum  
Geological-Palaeontological Department  
Burgring 7  
A-1010 Vienna  
Austria  
e-mail: mathias.harzhauser@nhm-wien.ac.at

- EJEL, F., DUBERTRET, L. 1966. Sur l'age précis du gisement de poissons et de Crustacés crétacés de Sahel Alma (Liban). – Société géologique de France, Comptes Rendues somm. Séanc., 1966: 353-354.
- FRAAS, O. 1878. Geologisches aus dem Libanon. – Jahrbuch des Vereins für Vaterländische Naturkunde in Württemberg, 34: 257-391.
- LARTRET, L. 1877. Exploration géologique de la Mer Morte de la Palestine et de l'Idumée. – 320 p., Paris (Bertrand).
- LEWIS, E.R. 1878. The fossil fish localities of the Lebanon. – Geological Magazine Decade 2, 5, 214-220.
- ROGER, J. 1946. Les invertébrés des couches du Crétace Supérieur du Liban. – Mémoires Société Géologique France, N. S., 51: 1-92.
- WOODWARD, H. 1883. On a New Genus of Fossil "Calamary" from the Cretaceous Formation of Sahel Alma, near Beirut, Lebanon, Syria. – Geological Magazine, N. S., 10: 1-5.
- WOODWARD, H. 1896. On a Fossil *Octopus* (*Calais Newboldi*, J. De C. Sby. MS.) from the Cretaceous of the Lebanon. – Quaternary Journal of the Geological Society, 52: 229-234.