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## Belemnite “Doppellinien”: myths and realities

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The term “Doppellinien” was first introduced by Stolley in 1911 for the designation of small lateral grooves on belemnite rostra, having the appearance of fine and straight double grooves. He paid special attention to peculiar appearance of lateral lines in *Oxyteuthis*, and this was the justification for the consequent elevation of the separate family Oxyteuthidae.

Now, more than a century later, Doppellinien remain poorly studied, and their biological nature is uncertain. Small lateral grooves, both double (=“Doppellinien”) and single, can be observed relatively rare, only in case of good preservation, and tracing them often requires a large set of specimens. As a result, almost no attention is paid to them in the classification of belemnites, unlike “normal” well-developed apical and alveolar grooves. The only attempts to summarize data about lateral lines in belemnites were made by V.A. Gustomesov (1962, 1973, 1978). He concluded that the appearance of lateral lines is characteristic for suborders, allowing to recognize the attribution in some problematic cases. Particularly, Doppellinien were considered to be characteristic of the suborder Belemnopseina only. However, lateral grooves did not strike roots in the common practice of taxonomic work, neither on species-level nor on genus-level. But in the case of the family Oxyteuthidae, the appearance of lateral lines (doppellinien in the posterior part, branching into two single grooves in the anterior part) still remains the main character defining the family. Moreover, this character makes a point for debates about phylogenetic affinities, as the morphology of lateral lines and the general morphology indicate mutually exclusive affinities.

New data were obtained from rostra of several families (Rhabdobelidae, Acrocoelitidae, Cylandroteuthidae, Mesohibolitidae, Oxyteuthidae); in all of them, typical Doppellinien were found. Thus, we can state a wide distribution of Doppellinien in belemnites even outside the suborder Belemnopseina. In all these cases within the suborder Belemnitina, the position of the Doppellinien is different from that known from Belemnopseina: they occupy the lower half of the lateral side of the rostrum, while the upper half is occupied by a single groove.

A key to the understanding of interrelations of different positions of the Doppellinien in both suborders is provided by the poorly known species “*Cylindroteuthis*” *kowalevi*, unusual among related Cylandroteuthidae in its hastate form. This species shows a combination of belemnitin- and belemnopsein-type Doppellinien, providing the idea that the formation of belemnopsein-type Doppellinien is mainly connected with the hastate rostrum form. This is well-supported by the configuration of lateral lines in non-hastate forms of Belemnopseina, which, vice versa, demonstrate lateral lines typical for Belemnitina. Thus, lateral lines in both suborders are derivatives of the same prototype, and their common modifications seem to be correlated with certain rostrum shapes.

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