

## PHYLOGENY AND SYSTEMATICS OF THE WOCKLUMERIINA (AMMONOIDEA, CLYMENIIDA, MIDDLE TO LATE FAMENNIAN)

Becker, Ralph Thomas

Museum für Naturkunde, D-10115 Berlin, thomas.becker@rz.hu-berlin.de

In one of his classic monographs, Schindewolf (1937) described the ammonoid biostratigraphy of the latest Famennian (Wocklum-Stufe, Upper Devonian VI) which is based to a large extent on the rapid evolution of clymeniids with strange triangular coiling, also known, for example, in some Carboniferous goniatites. Trigonal whorls were thought to have evolved in three parallel lineages, two of which terminated abruptly during the sudden mass extinction associated with the global Hangenberg Event.

Since Schindewolf's work, new rich faunas with triangular clymeniids have been described from SW England, Algeria, South China, Russia, Kazakhstan, Thuringia, and Poland. These records, a revision of German collections (> 1.500 specimens), and new collections from Morocco, the Rhenish Massif, and Oklahoma allow a re-evaluation of systematics and phylogeny. Neo- and lectotypes had to be selected for all German taxa and there are new species of *Synwocklumeria* and *Kielcensia*. Intermediate Russian and Polish taxa show that Wocklumeriidae with ventral lobe were derived from open umbilicate Parawocklumeriidae (Korn 1992). Both groups form a natural systematic unit (Wocklumeriaceae) characterized by three apomorphies: 1. triangular coiling of at least early stages, 2. weak to strong constriction of straight whorl parts, and 3. the dorsal lobe is divided or reduced. Heterochronic processes played a major role in phylogeny. *Parawo. paradoxa*, *Epiwo. applanata*, *Wo. sphaeroides*, and *Kielcensia bohdanoviczi* represent iterative hypermorphic end-members, partly with re-activated ancestral conch features such as evolute and rotund coiling. Intraspecific dimorphism in the latter two species is documented by micromorphic specimens with shortened triangular ontogenetic stages. Heterochronic speciation (miniaturisation) may have been in progress just before the sudden extinction caused by the Hangenberg anoxic event. Large intraspecific variability of shell parameters in some species, slowly expanding longidomic whorls, deep protective constrictions, and the reduction of the ocular sinus indicate a suprabenthonic (demersal) lifestyle of Wocklumeriaceae. Triangular coiling can be interpreted as an attempt to shift the centre of mass and aperture downwards in order to optimize seafloor feeding during long phases of growths.

Shells features and sutural patterns support Schindewolf's idea of an origin of Wocklumeriaceae in Hexaclymeniidae although both groups are separated by a record gap. Glatziellidae, Pachyclymeniidae and Biloclymeniidae are regarded as further hexaclymeniid side-branches. All clymeniids with primarily wide and later subdivided ventral lobe are assigned to the suborder Wocklumeriina. Goniclymeniids with narrow ventral lobes were derived from Platyclymeniidae. This confirms the dissolution of the traditional Goniclymeniina (Korn 1992) and requires a re-definition of the Clymeniina.

Korn, D. (1992): Relationship between shell form, septal construction and suture line in clymenid cephalopods (Ammonoidea; Upper Devonian). - N. Jb. Geol. Paläont., Abh. 185, 115-130.

Schindewolf, O.H. (1937): Zur Stratigraphie und Paläontologie der Wocklumer Schichten (Oberdevon). - Abh. preuß. geol. L.-Anst., n.F. 178, 141 pp.

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Autor(en)/Author(s): Becker Ralph Thomas

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