

Ber. Inst. Erdwiss. K.-F.-Univ. Graz	ISSN 1608-8166	Band 16	Graz 2011
IGCP 596 Opening Meeting		Graz, 19-24 <sup>th</sup> September 2011	

## Devonian to Carboniferous microconchid tubeworms: invasion of fresh-water habitats

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Small, spirally-coiled calcareous worm tubes are common in the Paleozoic and Triassic (WEEDON 1990, TAYLOR & VINN 2006, ZATOŃ & VINN 2011), but rare in the Jurassic (VINN & TAYLOR 2007, ZATOŃ & TAYLOR 2009). Such tubeworms are traditionally assigned to the polychaete genus *Spirorbis*. However, the pre-Cretaceous examples have been reinterpreted as microconchids (Class Tentaculita BOUČEK 1964) on the basis of the early ontogeny and microstructure of their tubes. Within the substrate-cemented tentaculitoids, it is possible that spirorbiform microconchids (Katian) have been derived from the geologically older, non-spiral cornulitids (first known from the Darriwilian) (VINN & MUTVEI 2009, VINN 2010).

Microconchid tube worms originated in normal marine environment during the Late Ordovician and not before the Early Devonian they spread to marginal marine brackish and fresh-water habitats. The fresh-water colonization by microconchids presumably took place via the brackish water habitats, similarly to several other groups of marine invertebrates. It seems that the occupation of the brackish and fresh water environments proceeded nearly in the same time in different regions of the Earth. Most probably, early fresh-water microconchids gained a vast food resources in the form of suspended organic matter that could be delivered from the land by rivers and streams, and originated straight in the place of microconchid living. The unlimited food resources connected with microconchid biology enabled them to reproduce fast and in large numbers. In addition, opportunistic microconchids benefited from the weaker competition by the other suspension feeding encrusters in the Devonian to Carboniferous fresh water habitats. Microconchids occupied brackish and fresh water environments especially often during the Carboniferous. During the expansion of land-masses with prolific flora and terrestrial aquatic basins in the Carboniferous, microconchids also commonly used terrestrial plants and bivalves as a hard substrate in fresh- and brackish-water environments. In Carboniferous brackish water environments, microconchids usually lived in great densities and formed buildups such as patch-reefs, bioherms or biostromes. In contrast, fresh water microconchids have never seen to form similar organic buildups.

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Jahr/Year: 2011

Band/Volume: [16](#)

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