

NAUTILOID SYSTEMATICS BASED ON SIPHUNCULAR STRUCTURE AND POSITION OF MUSCLE SCARS

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Analysis of shell shape and position and size of retractor muscle scars indicates that only a fraction of fossil nautiloids and ammonoids were adapted for active swimming. On the other hand, siphuncular structure indicates that several taxa of nautiloids were probably well adapted for vertical migration.

A hitherto undescribed siphuncular structure was recently discovered in actinoceratids and orthoceratids (Mutvei 1997, 1999, and unpublished). The connecting ring is here composed of two layers: an outer, thin spherulitic-prismatic layer, which is a continuation of that layer from the septal neck; and an inner, thick layer that is calcified and forms a direct continuation of the nacreous layer of the septal neck. The latter layer is traversed by numerous pores through which the exchange of cameral liquid took place. This type of connecting rings also occurs in *Lituitidae* and *Baltoceratidae*, both orthocerids. All these taxa have dorsal retractor muscle scars.

The tarphyceratid connecting ring differs from that of orthoceratids-actinoceratids in consisting of a single, thick, spherulitic-prismatic layer. This layer is a continuation of that layer in the septal neck and shows two or more sublayers of different orientation of acicular crystallites (Mutvei, unpublished). There was certainly also an inner glycoprotein (conchiolin) layer that continued from the nacreous layer of the septal neck but was uncalcified and therefore not preserved. Tarphyceratids have ventral and/or lateral retractor muscle scars.

As pointed out by Furnish and Glenister (1964), most ellesmeroceratids are poorly preserved and therefore lack information on muscle scars and siphuncular structures, except that the connecting ring is often said to be thickened. In addition to *Baltoceratidae*, which are orthoceratids, the families *Bathmoceratidae*, *Cyrtoceratidae* and *Cyclostomiceratidae* also seemingly have no close relationship to the rest of ellesmeroceratids, which still lack a definition and may contain unrelated groups.

Cameral deposits seem to have developed only in orthoceratids and actinoceratids that possessed calcified connecting rings with pores. The formation of these deposits is still poorly understood.

Furnish, W.M. and Glenister, B.F. 1964: Nautiloidea-Ellesmerocerida. In R.C.Moore (Ed.): *Treatise on Invertebrate Paleontology, Part K, Mollusca 3*, K129-K159, Univ. Kansas Press, Lawrence.

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