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Pinnocaris and the origin of scaphopods

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The description of a tiny coiled protoconch in the Ordovician *Pinnocaris lapworthi* Etheridge, 1878 indicates that this ribeirioid rostroconch mollusc cannot be the ancestor of scaphopods, resolving recent debate concerning the role of *Pinnocaris* in scaphopod evolution. The sense of coiling of the scaphopod protoconch is opposite to that of *Pinnocaris*. Scaphopod protoconchs resemble helcionelloid molluscs (Cambrian-Early Ordovician) in terms of their direction of coiling, although the scaphopod shell is strongly modified by the extreme anterior component of growth. Convergence is identified between scaphopods and two helcionelloid lineages (*Eotebenna* and *Yochelcionella*) from the Early-Middle Cambrian. The large stratigraphical gap between helcionelloids and the first undoubted scaphopods (Devonian or Carboniferous) supports the notion that the scaphopods were derived from conocardioid rostroconchs rather than directly from helcionelloids. However, the protoconch of conocardioid rostroconchs closely resembles the helcionelloid shell, suggesting that conocardioids in turn were probably derived from helcionelloids.

Key words: Mollusca, Rostroconchia, Scaphopoda, Helcionelloida, Pinnocaris, Ordovician.

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