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Morphology and evolution in karyorelictids (Protozoa, Ciliophora)

Morphologie und Evolution der karyorelictiden Ciliaten

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Unlike all other ciliates, karyorelictids have a non-dividing paradipliod macronucleus. Thus, they are widely considered to represent an ancestral situation of the dimorphic ciliate nuclear apparatus (Corliss JO 1979: *The Ciliated Protozoa*. Pergamon Press, Oxford). Most karyorelictids live in the marine interstitial and are difficult to preserve. Using a new fixative (Foissner W & Dragesco J 1996: *J Euk Microbiol* 43, 12), many new details of the somatic and oral ciliary pattern could be revealed. We found convincing morphological evidences for a sistergroup relationship of loxodids and trachelocercids (Fig. 1). They have a "strong" synapomorphy, viz. a non-ciliated (glabrous) stripe bordered by a highly specialized ciliary row (bristle kinety) on the left side. This character is also found in *Kentrophoros*, a unique ciliate feeding on the epibiontic bacteria growing on its glabrous stripe; its oral structures are reduced to inconspicuous vestiges (Foissner W 1995: *Arch Protistenk* 146, 165). Furthermore, *Kentrophoros* and loxodids have a peculiar dorsolateral ciliary row lacking in trachelocercids. Thus, the order Protostomatida Small & Lynn 1985, uniting the Kentrophoridae and Trachelocercidae but excluding the Loxodidae, is very likely artificial. Some of the intraordinal relationships are still paraphyletic because no synapomorphies could be found. Likewise, the positions of the Geleidiidae and of *Protocrucia* remain obscure (Fig. 1). Possibly, ontogenetic data will provide deeper insights.

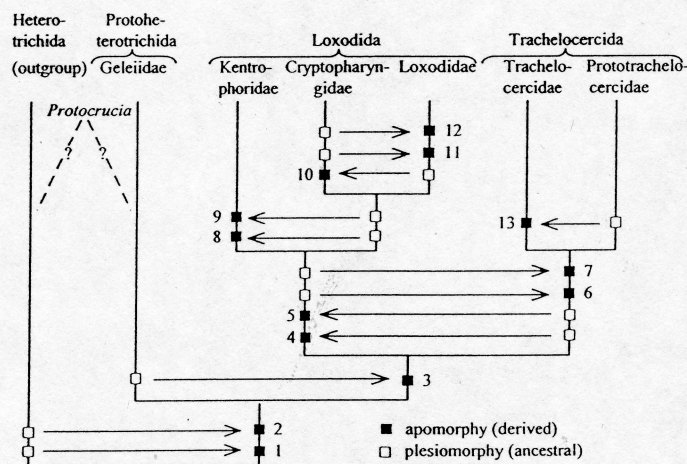


Fig. 1. A phylogenetic (cladistic) system of karyorelictid ciliates. The analysis was restricted to classical morphological traits because ontogenetic data are lacking for most taxa. The heterotrichs were chosen as outgroup because molecular trees argue for a sistergroup relationship with the karyorelictids (for review see Eisler & Fleury 1995. In: Brugerolle G, Mignot J-P (eds) *Protistological Actualities*, Clermont-Ferrand, 102). Character states (apomorph/plesiomorph): 1, adoral membranelles highly modified or reduced/of typical structure; 2, macronucleus non-dividing/dividing; 3, highly specialized bristle kinety framing glabrous stripe/without, i.e. completely and uniformly ciliated; 4, epipellicular scales or mucilage/without; 5, dorsolateral kinety/without; 6, brosse/without; 7, oral apparatus apical/ ventrolateral; 8, epibiontic/symbiotic bacteria on glabrous stripe/without; 9, oral apparatus almost completely reduced/complete; 10, dorsolateral kinety elongated to ventral side/restricted to dorsal and posterior margin of cell; 11, Müller organelles/ without; 12, buccal kineties interrupted at anterior buccal vertex/uninterrupted; 13, circumoral kinety simple/compound.