

## Phylogeny, palaeoecology, and invasion of non-marine waters by the late Miocene hemicytherid ostracod *Tyrrhenocythere* from Lake Pannon

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*Acta Palaeontologica Polonica* 52 (2), 2007: 351-368

Species of the ostracod genus *Tyrrhenocythere* were found in sediments at the western margin of the Danube Basin, dated as Pannonian zone MN9/MN10 of the late Miocene, together with the euryhaline ostracods *Euxinocythere*, *Loxoconcha*, *Cyprideis*, *Hemicytheria*, *Amplocypris*, and Paratethyan Candoninae. Sandy and clayey deposits intercalated with lignite seams, as well as the ostracod assemblages, reflect oscillations of Lake Pannon water level and salinity, from freshwater to pliohaline. *Tyrrhenocythere* most probably evolved by phyletic transformation from *Hemicytheria*. The hinge and the central muscle scars of *Tyrrhenocythere* are plesiomorphic characters and the two genera differ in the arrangement of the marginal pore canals (MPC). The transformation of simple, straight and thin MPC in *Hemicytheria* to polyfurcate MPC in *Tyrrhenocythere* can be observed in sympatric and contemporaneous populations in Lake Pannon. On the basis of ornamentation, *T. pezinokensis* with heavily calcified valves bearing distinct ornamentation could be a descendent of ribbed and heavily calcified *Hemicytheria* and possibly represents an extinct lineage, while the lightly calcified *T. transitivum* sp. nov., *T. rastislavi* sp. nov., and *T. sp. 1*, and *T. sp. 2* are possibly related to reticulated and punctate *Hemicytheria*. This model assumes that more than one *Hemicytheria* lineage transformed their arrangement of MPC, and suggests that *Tyrrhenocythere* is a polyphyletic genus. After the retreat of Lake Pannon, *Tyrrhenocythere* species immigrated, together with other ostracod and molluscan fauna, into the Dacian Basin and Eastern Paratethys. Later, in the uppermost Messinian, they colonised the western Mediterranean. Late Miocene and Pliocene *Tyrrhenocythere* are found in brackish or mixed brackish/freshwater taphocoenoses, but the Pleistocene examples also adapted to freshwater/oligohaline lacustrine environment (Griffiths et al. 2002: 252). While salinity ranges of *Tyrrhenocythere* have shifted, toward freshwater since the late Miocene, temperature preference did not change. The mean annual air temperature of the Pannonian (15.6-21.7°C) is close to the temperature preference of living *Tyrrhenocythere*, with mean annual temperature 12 to 16°C. Two new species, *T. rastislavi*, and *T. transitivum* are described.

**Key words:** Ostracoda, Hemicytherinae, *Tyrrhenocythere*, marginal pore canals, Miocene, Lake Pannon, phylogeny.

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