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Palaeogeographic distribution of Ordovician hyoliths

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Abstract. The palaeographic distribution of hyoliths during the Ordovician is obviously not uniform. The main regions of hyolith appearance are European peri-Gondwana and African Gondwana. The diversity of hyoliths was increasing during the Ordovician with a peak in the Darriwilian (Llanvirnian; Oretanian) and highest peak during the Sandbian-Katian (Caradocian) interval. Hyoliths are highly endemic in all regions and all studied areas contain some possibly unique genera. This aspect is even more pronounced on the species level, because Gondwana, peri-Gondwana, Baltica and Laurentia share no species.
Keywords. hyoliths, Ordovician, Gondwana, Baltica, Laurentia, Perunica, palaeogeography

INTRODUCTION

Hyoliths are known from all parts of the world, but pattern of their palaeographic distribution is obviously not uniform. The main regions of their Ordovician occurrence are African Gondwana and European peri-Gondwana. The distribution of hyoliths in the so called Mediterranean Province was already analyzed by Marek (1976).

Ordovician hyoliths were reported from the following regions: Laurentia – USA (Malinky 1990) and Scotland (Malinky 2003b), Baltica – Sweden (Malinky 2002) and Estonia (Malinky 2003a), Gondwana – Morocco (Marek 1983b), peri-Gondwanan Armorican Terrane Assemblage – Armorica (Marek 1983a), Iberia (Dolores 1979, Gutiérrez-Marco & Bernárdez 2003) and Perunica (Valent 2006) and Poland – Malopolska Massif (Holy Cross Mountains) (Dzik 1994) (fig. 1). Data on hyoliths from other regions are insufficient and in need of revision.

RESULTS

There are several genera showing a restricted distribution in all above mentioned areas. The genera *Girvanolithes* Malinky, 2003 and *Solenotheca* Malinky, 1990 are unique for Laurentia, where they occurred in the Middle to Upper Ordovician. The genera *Crispatella* Malinky, 2002, *Sulcavitus* Sysoev, 1957 and *Trapezotheca* Sysoev, 1957 are unique for the Baltica, where they occurred during the Lower to Middle Ordovician. The genus *Hyolithes* Eichwald, 1840 (type genus of the order Hyolithida) occurred during the

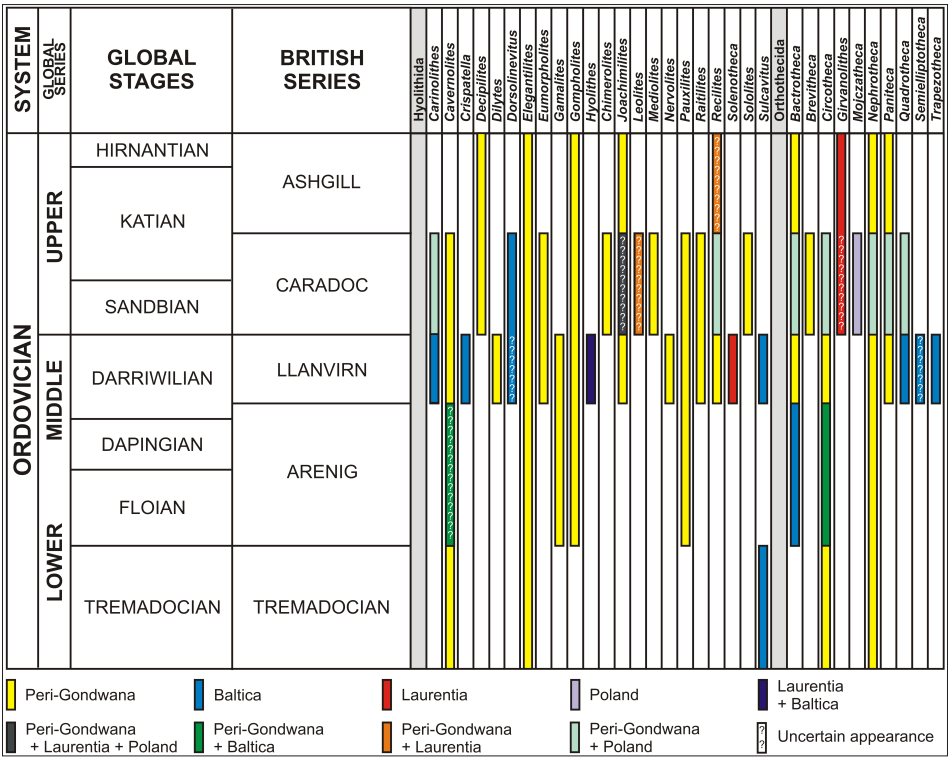

Fig. 1 Distribution of hyoliths during the Ordovician (according to International Subcomission on Ordovician Stratigraphy, 2007).

Ordovician only in Laurentia and Baltica. Genera *Joachimilites* Marek, 1967 and *Leolites* Marek, 1967 were common in the Upper Ordovician to Laurentia, African Gondwana and European peri-Gondwana (genus *Joachimilites* was doubtfully recorded from Poland). The genus *Recilites* Marek, 1967 occurred during the Upper Ordovician both in Laurentia and the European peri-Gondwana.

Eight genera are known only from the European peri-Gondwanan terranes: *Brevitheca* Marek, 1967, *Decipilites* Marek, 1975, *Dilytes* Marek, 1974, *Eumorpholites* Marek, 1967, *Chimerolites* Marek, 1967, *Mediolites* Marek, 1989, *Nervolites* Marek, 1974 and *Raitilites* Marek, 1989). Hyolith faunas of the European peri-Gondwana and African Gondwana are very similar at the generic level (all genera known from Morocco were found also in the peri-Gondwanan area: *Elegantilites* Marek, 1966, *Gamalites* Marek, 1974, *Gompholites* Marek, 1966, *Nephrotheca* Marek, 1966, *Panitheca* Marek, 1967, *Pauxilites* Marek, 1966 and *Sololites* Marek, 1967). The genus *Cavernolites* Mare, 1974 occured during the Middle Ordovician in the African Gondwana, European peri-Gondwana and Baltica. The genus *Circotheca* Sysoev, 1958 has been reported from the peri-Gondwana and Baltica.

The genus *Mojczatheca* Dzik, 1994 is unique for Poland (Malopolska Massif – Holy Cross Mountains) and genera *Bactrotheca* Novák, 1891, *Carinolithes*, *Circotheca*,

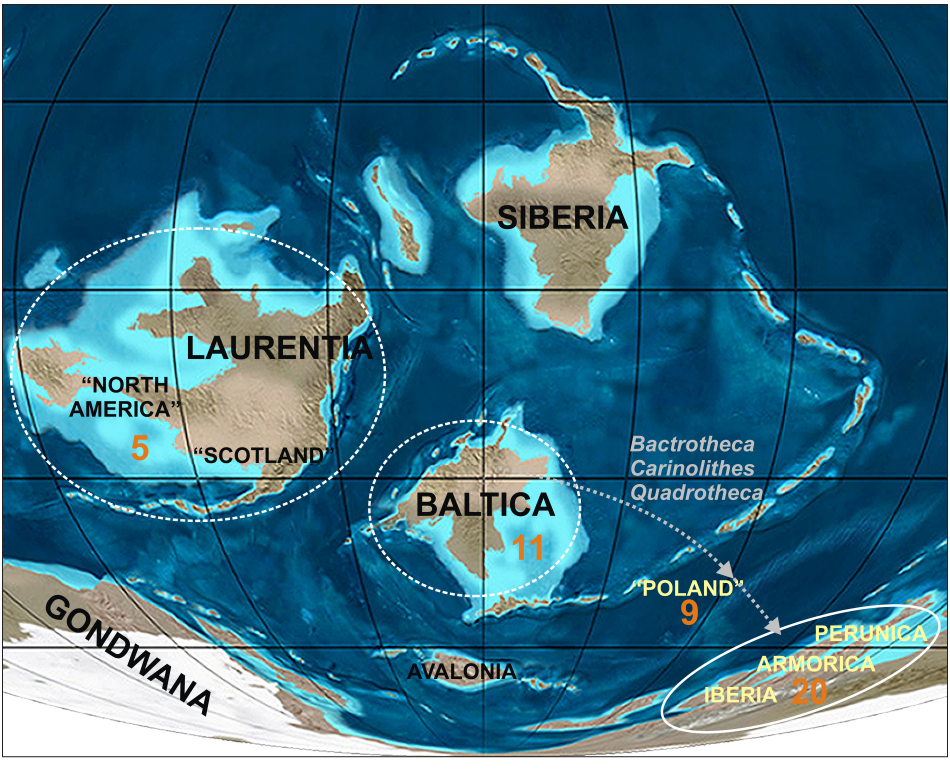

Fig. 2 Position of terranes during the Middle Ordovician (~470 Ma) with numbers of unique genera for each region and with pointed migration of genera *Bactrotheca*, *Carinolithes* and *Quadrotheca* from the Baltica to the peri-Gondwana during the Middle to Upper Ordovician (modified from Blakey, 2008).

Nephrotheca, *Panitheca*, *Quadrotheca* Sysoev, 1958 and *Recilites* occurred during the Sandbian-Katian (Caradoc) both in Poland and peri-Gondwana.

CONCLUSIONS

The diversity of hyoliths was increasing during the Ordovician with a peak during the Darriwilian (Llanvirnian; Oretanian) and highest peak in the Sandbian-Katian (Caradocian) interval. This pattern is best documented in the peri-Gondwana. However, Laurentia and the Baltica region show maximum of hyolith diversity during the Darriwilian (Llanvirnian; Oretanian), though both are distinctly poorer in terms of the Ordovician hyolith diversity. Globally the highest hyolith diversity was reported from Perunica.

The genera *Bactrotheca*, *Carinolithes* and *Quadrotheca* first appeared in the Baltica (Floian-Darriwilian stages) and later in the European peri-Gondwana (in the Darriwilian-Sandbian stages) (fig. 2). This indicates a general migration direction from Baltica to the peri-Gondwana, because the peak of diversity in Baltica precedes that in the peri-Gondwanan terranes.

Hyoliths show a high endemicity in all regions and all areas contain some possibly unique genera. This aspect is even more pronounced on the species level, becuase Gondwana, peri-Gondwana, Baltica and Laurentia share no species. In total, 32 hyolith genera were recorded from the Ordovician, including 23 genera from the European peri-Gondwanan terranes.

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