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Latest Ordovician ostracod assemblages and biogeography

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Geological records indicative of the Hirnantian glaciation are known from many areas, in both high and low palaeolatitudes. Gradual cooling culminated in the double glacial maximum of the early Hirnantian (BRENCHLEY 2004) and caused dramatic changes in the composition of brachiopod faunas as well as in other invertebrate fossil groups (SHEEHAN 2001 and references therein). Changes in the biodiversity of ostracod faunas through this critical interval of climate change have so far received limited attention, probably because the ostracod records from this interval are scarce, especially when compared to older parts of the Ordovician. The aim of this work is to assemble published and original data on the Hirnantian ostracod assemblages in an attempt to establish their overall biogeographical patterns and biodiversity.

The most diverse latest Ordovician ostracod fauna is that of Baltoscandia. Two distinct ostracod assemblages are documented here, the high-diversity beyrichicope-dominated assemblage, termed the *Medianella aequa* association (MEIDLA 1996a), and the binodicope-dominated, low-diversity *Harpabollia* fauna (MEIDLA 1996b) or *Harpabollia harparum* association (MEIDLA 2007). The distribution areas of the assemblages are distinct, mainly following the general palaeodepth zonation of the Baltoscandian Palaeobasin, with beyrichicope-dominated assemblages within the onshore reef belt and binodicope-dominated faunas offshore (southern Estonia, Latvia, Lithuania, northeastern Poland, southern Sweden). Published and collated data from Norway can tentatively be interpreted as a mixture of these two assemblages.

The binodicope-dominated *Harpabollia* assemblage existed in Baltoscandia until the early Late Hirnantian (early *persculptus* graptolite biozone). This assemblage contains a number of taxa that are also recorded in the Hirnantian of the Cellon section of the Carnic Alps (*Harpabollia harparum*, *Scanipisthia rectangularis* - SCHALLREUTER 1990), whereas its generic relationships to the pre-Hirnantian ostracod assemblages of Baltoscandia are rather weak (MEIDLA 1996b). In the eastern Baltic and in Norway the occurrence of *Harpabollia* and related taxa are coincident with those stratigraphic intervals where positive $\delta^{13}\text{C}$ isotopic values are recorded, coincident with high latitude glaciation (AINSAAR *et al.* accepted, BERGSTRÖM *et al.* 2006).

The low palaeolatitude record of ostracods from rocks of presumed Hirnantian age outside eastern Baltoscandia comes from North America Anticosti Island and the Yukon Territory. Here, species of the *Harpabollia* assemblage are not recorded. In the section of western Anticosti, elevated values of the stable carbon isotopic ration seemingly occur only in the topmost part of the Lafromboise Member, Ellis Bay Formation (see BRENCHLEY *et al.* 2003 for a summary). Elevated carbon isotopic values are not recorded in the Yukon sections, probably representing the latest Hirnantian (GOODFELLOW *et al.* 1992).

Other areas with presumably Hirnantian ostracod records are the Soom Shale in South Africa, where a single myodocope species is recorded (GABBOTT *et al.* 2003). According to the chitinozoan evidence (VANDENBROUCKE *et al.* 2009) the ostracod-bearing strata are represent the latest Hirnantian, i.e. are post-glacial. The Hirnantian interval probably crops out also in the Farka Muth section in the northwestern Himalayas (Himachal Pradesh, northern India). Ostracod genera recorded in this succession near the Ordovician-Silurian boundary (*Steusloffina*, *Vendona* - SCHALLREUTER *et al.* 2008) are common in the Katian and Hirnantian of Baltoscandia but do not represent the *Harpabollia* assemblage. The uppermost Ordovician ostracod-bearing strata above the possible interval of the Boda event

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(latest pre-Hirnantian) show only low stable carbon isotopic values and no evidence of cooling (SUTTNER *et al.* 2007).

A high level of provincialism is considered to be characteristic of Ordovician ostracod assemblages, as a function of their benthic neritic habit and limited dispersal capability (WILLIAMS *et al.* 2003). The increasing affinities between the Baltoscandian and Peri-Gondwanan areas mark decrease of this provincialism in the latest Ordovician. Although the appearance of peri-Gondwanan species in Baltoscandia apparently represents a climatically induced migration, there is no evidence of similar migrational changes from other areas up to now. Most promising in this respect could be the Anticosti section but the migration wave may not have reached Laurentia because of restrictive ocean circulation (MAC NIOCAILL *in* BARNES 2004).

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