Early Carboniferous marine ecosystem recovery after the Hangenberg Crise, insight from the Tournaisian brachiopod-coral fauna from South Belgium

Julien DENAYER[1,*], Bernard MOTTEQUIN[2], Edouard POTY[1]

[1] Université de Liège, Evolution and Diversity Dynamics Lab, Quartier Agora (Bat B18) – Allée du Six Août, 4000 Liège (Sart-Tilman), BELGIUM
[2] Royal Belgian Institute of Natural Sciences, Palaeontology Department, OD Earth and Life History, Rue Vautier 29, 1000 Bruxelles, BELGIUM

*Corresponding author: julien.denayer@ulg.ac.be, +32 (0) 4 3663248

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Abstract

The Hastarian Substage (Lower Tournaisian, Lower Carboniferous) was a period of recovery in the marine realm after the large-scale extinctions associated with the Hangenberg Event (Devonian-Carboniferous Boundary). The marine fauna remains relatively poor and dominated by cosmopolitan opportunistic organisms during almost the whole Hastarian times. The first diversification occurred at the end of this substage with the development of new faunas. In the Condroz sedimentation area, the Hun Member (base of the Yvoir Formation) corresponds to this diversification period. This 12 m-thick member is composed of sandy bioclastic limestone alternating with shale layers and cherts; it is interpreted as the lowstand system tract of a third order sequence. In the Chansin quarry (Bocq valley), this member has yielded an abundant association of silicified fauna showing an exquisite preservation. The association is dominated by rugose and tabulate corals along with brachiopods whereas bryozoans, gastropods and trilobites are only minor components. The rugose corals fauna is composed of solitary trochoid, ceratoid or cylindroid forms belonging to *Amplexus coralloides*, cf. *Amplexizaphrentis* sp., *Bradyphyllum* sp., *Caninia cornucopiae*, *C.* aff. *cornucopiae*, *Caninophyllum patulum*, *"Lophophyllum" konincki*, *Proheterelasma omaliusi*, *Rotiphyllum* sp., *Saleelasma delepinei*, *Siphonophyllia cylindrica*, *Sychnoelasma konincki*, *Zaphrentites delanouei*, and *Zaphrentites* sp. The good preservation of some specimens allows the observation of the calicular features that are rarely observed in time-equivalent fauna. Moreover, several corals show coiled or attached protocorallites. The tabulate corals are mainly small-sized (5 cm in diameter) micheliniid colonies, cladochonids and isolated corallites of *Beaumontia*. The massive colonies commonly show growth rings and talons. This coral association corresponds to a moderate diversified level-bottom community in which the external morphologies converge towards a single habitus. The brachiopod fauna, which is currently under study, is quite diverse but dominated by spire-bearers: athyridides (e.g. *Lamellosathyris lamellosa*, *Coveenia* sp.), spiriferides (*Unispirifer* sp., *Tylothyris laminos*a), and spiriferinides (e.g. *Syringothyris* sp.). It also includes some productides, strophomenides (*Leptagonia* gr. *analoga*), orthotetides (*Shellwienella* sp.), orthides (*Rhipidomella michelini*), rhynchonellides and terebratulides. The degree of disarticulation of the shells is particularly high, especially among spiriferides and spiriferinides, and it is clear that they have been disturbed and displaced from their living position, but the transport was probably over a short distance as indicated by the preservation of some delicate structures (e.g. mucronate cardinal extremities, flanges). Such accumulations might have been produced by storm events as suggest by the non-orientation of the corals preserved in chert layers.