The biotic response of the Late Pliensbachian–Toarcian foraminiferal assemblages to the environmental perturbations in the pelagic and neritic environments of the Neotethys ocean

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During the late Pliensbachian–Toarcian interval, several global events were recognized as cooling and sea-level fall, warming, and sea-level rise which were driven by the changes in the concentration of the atmospheric CO\(_2\). The latter one caused a second-order mass extinction during the Jenkyns Event in the early Toarcian, which was sedimentologically represented by black shales on the epicontinental carbonate-siliciclastic ramps of the Neotethyan Boreal-Atlantic Foraminiferal Biome (BAFB). While in the distal, hemipelagic-pelagic parts of the Western Neotethys, in the Mediterranean Foraminiferal Biome (Zsiborás & Görög, 2020, Görög & Zsiborás, 2020) with condensed Ammonitico Rosso carbonates, the black shales are usually missing.

The Bakonycsénye (Hungary) sections gave firstly the opportunity for the investigation of foraminifers from the upper Pliensbachian–Toarcian Ammonitico Rosso successions belong to the MFB. Thus, our goals were to show out the effect of the Jenkyns Event on the foraminiferal assemblages in this biome and based on the literature, to compare them with the ones of the MFB and BAFB.

Foraminiferal fauna was extracted by glacial acetic acid from 22 samples of three sections. Microfacies studies, taxonomic and palaeoecological analyses (abundance, diversity, morphogroups, and ecozones) were used for the evaluation of the palaeoenvironmental changes. For the comparison, a review of the literature was carried out to collect similar quantitative data about the assemblages of other regions.

The upper Pliensbachian was affected by a cooling event and a global sea-level fall (JPlie8) which was characterized by a diverse ammodiscinid-lenticulinitid-ichthyolariid-nodosariid mixed epi- and infaunal assemblage in Bakonycsénye. During the rapid global warming and sea-level rise event (JToa1) in the lower Toarcian, ammodiscinids and ornamented ichthyolariids disappeared thus the assemblage changed into a less diverse lenticulinitid-nodosariid-polymorphinid infauna-dominated assemblage. In the middle-upper Toarcian, epifaunal grazer spirillinids reigned the assemblages followed by lenticulinitids and nodosariids.
The microfossils indicated low to moderate oxygen levels in the upper Pliensbachian–lower Toarcian, high from the middle Toarcian. From then, the opportunist epifaunal spirillinids appeared in mass. They could graze on a microbial and/or fungal biofilm or could be fed on marine snow. Thus, the existence of the main foraminiferal groups depended on the microbial activity which increased during the warmer intervals.

Based on the ratio of the foraminiferal morphogroups, the foraminiferal fauna of Bakonycserye was similar to others from the Mediterranean Biome and it was remarkably different from Boreal Atlantic ones. The calculated provinciality indices showed no provinciality between the foraminiferal fauna of Bakonycserye and other Western and Southern European localities in the upper Pliensbachian–upper Toarcian interval. These results also proved the global warming event linked to the increased atmospheric CO$_2$ level caused by the Karoo-Ferrar LIP.
