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Response of Early Jurassic (Pliensbachian Toarcian) benthic marine faunas from south western Europe to temperature related stresses (EvoBiv)

Global warming and temperature-related stresses (TRS), in particular deoxygenation and acidification of seawater, have raised concerns over the degradation and transformation of modern marine ecosystems. The geological and fossil record conserves ancient episodes of TRS and their effects on the taxonomic composition, ecological characteristics, and evolutionary dynamics of the marine biota, thus providing the opportunity to develop better predictive frameworks for long-term biotic response to climate change. We propose to study the early Toarcian (early Jurassic, ca. 183 million years before present) warming/extinction event in selected geological sections of south-western Europe. By integrating expertise across diverse disciplines in earth and life sciences we will establish links between multiple environmental variables (notably geochemical proxy data, sedimentary facies) and the quantitative occurrences of multiple macrobenthic taxa (mainly bivalves and brachiopods, jointly representing a broad ecological variety of life habits, feeding modes, body size, and mobility levels). Applying physiological principles as the bridging concept we expect to identify and understand the relative role of particular environmental factors (extreme temperatures, reduced oxygenation, acidification) as drivers of biotic change. We will also investigate whether decreases in body size were an early indicator of imminent change at the community level, and whether large-sized species were preferentially affected by TRS. Finally, by tracking the environmental and faunal change leading up to, across, and following the early Toarcian crisis, we will test whether the pattern of ecological recovery from TRS follows a trajectory independent from that of TRS-induced ecological degradation – a pattern found in various modern systems experiencing ecological regime shifts.