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# Macrobenthic community response to long-term climate change in the Adriatic Sea (Italy)

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The ecological consequences of climate change on marine ecosystems remains poorly understood, particularly for ecological communities that reside in enclosed basins, which limit marine species in their ability to migrate. Here we use assemblages of late Quaternary fossils mollusks preserved in nearshore sediments to explore how nearshore marine benthic communities responded to past climate changes in the northern Adriatic. We focus on three time periods: (1) the last interglacial (<125ka BP), when regional temperatures were higher than today, representing a possible analogue for the near-future global warming; (2) the last late glacial 14.5-18.0 ka BP; and (3) the mid-Holocene 6.0-1.0 ka BP, when conditions were similar to today but with a minimal human impact. Temporal dynamics of benthic communities was assessed by applying multivariate and resampling approaches to abundance data for core-derived samples of fossil mollusks. Results demonstrate that the penultimate interglacial benthic assemblages shifted to a new community state during the subsequent glacial period. The shift represented a decline in abundance of exclusively Mediterranean nearshore species and a concurrent increase in abundance of nearshore species of cosmopolitan and boreal affinity. This shift was, most likely, driven by global climate cooling. Following this major community restructuring, the local nearshore communities had reversed back to their previous state during the mid-Holocene, when interglacial climate conditions were fully reestablished again. We conclude that the nearshore community responded to long-term climate changes by displaying a resilient (rather than persistent or stochastic) behavior, with Holocene biota reversing back to the pre-existing interglacial state. However, regional pollution, trawling and the threat of spreading invasive species are already taking their toll and the present-day communities are shifting to a novel, historical unprecedented community state. Nonetheless, our findings indicate that if local and regional threats can be mitigated, the coastal marine communities of the northern Adriatic would be resilient against limited climate warming in the near future.