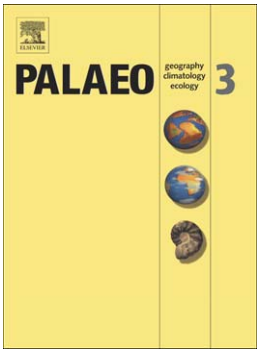

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Anachronistic facies in the Early Triassic successions of the Persian Gulf and its palaeoenvironmental reconstruction

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Abstract

The Permian–Triassic boundary corresponds with the largest mass extinction in the Earth's history, during which most living taxa were diminished. The delayed recovery time after this boundary was also one of the longest among all mass extinction events, and resulted from enduring unfavorable environmental conditions for living organisms. Such long-lasting harsh conditions during the Early Triassic resulted not only in the delayed recovery of organisms but also considerable changes in depositional processes, which formed 'anachronistic facies' all around the world. In this study, anachronistic facies and features are reported, for the first time, from the Early Triassic intervals of the Persian Gulf. Also, it aims to interpret the factors governing formation of these facies using sedimentological evidence. Accordingly, three types of microbial facies (including stromatolitic boundstones, oncoidal facies and thrombolytic facies), highly cemented facies/layers, large-ooid facies and coarse intraclastic facies are introduced as the anachronistic facies of the Early Triassic sequences in four giant and supergiant gas fields in the Persian Gulf region. Seemingly, the oscillations in $CaCO_3$ saturation can be considered as the main cause for the formation of anachronistic facies in these intervals. The evidence shows that an increase in dissolved CO_2 caused acidification of the sea water, $CaCO_3$ dissolution and extinction. Carbonate dissolution causes reduction in dissolved CO_2 and increase in Ca^{2+} and HCO_3^- (super-saturation situation). Therefore, sea-water under-saturation and subsequent super-