



Microbial-Foraminiferal Episodes in the Lower Aptian of Oman – the Signature of Oceanic Anoxic Event 1a in shallow-marine Carbonate Ramp Deposits?

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Oceanic anoxic events (OAEs) are well documented in hemipelagic and pelagic settings where they are usually recorded in form of black-shale intervals. Only a few studies, however, have focused on the OAE1a (Selli level) time-equivalent facies of shallow epicontinental seas, forming the link between the continents and the oceans.

From the northern Oman shallow carbonate ramp system, Immenhauser et al. (2005) documented two conspicuous stratigraphic intervals of Lower Aptian age that are characterized by the short-lived (approx. 150 ka) occurrence of an out-of-balance facies (“*Lithocodium/Bacinella* consortium”) including what are interpreted to be microbial communities consisting of macroalgae, and larger sessile foraminifera in m-scale buildups and massive bindstone facies. Judging from high-resolution chemostratigraphy and biostratigraphic evidence, these algal-foraminiferal-microbial episodes represent the shoalwater equivalents of the oceanic OAE1a black shales.

New material from cored exploration wells in Oman, located in mid-ramp settings, shows that these two *Lithocodium/Bacinella* stratigraphic intervals can possibly be traced downramp into deeper water (intrashelf) environments. Yet, compared to the coastal sections of Immenhauser et al. (2005), the bindstone-dominated intervals are less well defined and their stratal architecture is more complex. It also seems that in deeper water, the geometries of *Lithocodium/Bacinella* lithosomes differ from the coastal m-scale buildups as known from outcrops. In subcrop, however, the geometry of these carbonate bodies is difficult to pinpoint due to the limitations of a 1-D approach (core analysis). In both, up- and mid-ramp domains, *Lithocodium/Bacinella* facies alternates with stratigraphic intervals dominated by rudist bivalves. This biotic pattern is also recognized in other coeval Tethyan sections and is perhaps a character-

istic shoalwater expression of the OAE1a.

The short-lived regional occurrence of microbial-foraminiferal out-of-balance facies cannot be explained by local environmental factors (e.g., salinity and oxygen level) alone. Based on field observations, logged cores, and comparative studies between the fossil biota in these sections and modern life forms, working hypotheses for the possible causal relationship between the OAE1a event and algal-foraminiferal-microbial episodes, as well as for the different response of mid- and up-ramp environments, are discussed. The results shown here represent another step towards the improved understanding of the Early Aptian period of biotic, oceanic and climatic change.

References

Immenhauser, A., Hillgärtner, H. and van Bentum, E. (2005) Microbial-foraminiferal episodes in the Early Aptian of the southern Tethyan margin: ecological significance and possible relation to oceanic anoxic event 1a. *Sedimentology*, 52: 77-99.