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Comparison of benthic foraminifera inside and outside a sulphur-oxidizing bacterial mat from the present oxygen-minimum zone off Pakistan (NE Arabian Sea)

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Assemblages of live (Rose Bengal stained) and dead benthic foraminifera and stable oxygen and carbon isotopic composition of live benthic foraminifera were studied in and outside a bacterial mat composed of the large sulphur-oxidizing bacteria Thioploca and Beggiatoa from the oxygen minimum zone off Pakistan (NE Arabian Sea). Two cores from the same Multicorer, retrieved a bacterial mat and ambient sediment. The dominant species (Globobulimina affinis, G. turgida, Bolivina pacifica, B. pseudopunctata, Uvigerina peregrina and Buliminella tenuata) in both cores are characteristic for dysoxic oxygen minimum zone conditions. The most significant difference between the two cores is the reduced number of stained benthic foraminifera in the top 0.5 cm of the bacterial mat. Faunal densities of stained species are more than four times higher in the sediment surface sample (0-0.5 cm) outside the bacterial mat, at a distance of only 1.5 m. All stained species however, observed outside the Beggiatoa/Thioploca mat were also observed in the core with the mat. Two species, Virgulinella fragilis and Bolivina dilatata exclusively occur in the core with the bacterial mat. The diversity within the bacterial mat core is thus slightly higher than outside. Furthermore, the abundances of the species Buliminella morgani, B. tenuata and Alliatina primitiva are significantly higher in the bacterial mat than outside. Globobuliminids, on the other hand, seem to prefer the conditions outside the bacterial mat and are five times more frequent in the core outside the bacterial mat. Benthic foraminifers inhabit a broader microhabitat range outside the bacterial mat (˜5 cm) than within (3.5 cm). A marked decrease in stained benthic foraminiferal abundances was observed at the level of a black sulphur-rich layer which is interpreted to mark the shallow

redox front below the bacterial mat. Stable carbon isotope analyses on live benthic foraminifera do not support a relation of the investigated Beggiatoa/Thioploca mat to a constant or seasonal seepage of methane at the continental slope off Pakistan. Surprisingly, however, stable oxygen isotope values of many species and especially of Uvigerina peregrina decrease with depth, which questions the suitability of U. peregrina as a solid recorder of bottom-water d18O.