



Mud volcanoes in the Mediterranean Sea are hot spots of exclusive meiobenthic species

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Mud volcanoes are cold seeps, in which the escape of gas and fluids associated with mud creates 3-D bottom structures that enhance the spatial heterogeneity and potentially alter the functioning of the benthic ecosystems. We investigated a complex system of mud volcanoes of the Mediterranean Sea characterised by the presence of different structures (i.e. isolated domes, domes surrounded by moats, clustered domes, and ridges) associated with different levels of seepage. We hypothesize that the combined effects of seafloor heterogeneity (i.e. different forms of seafloor topography), fluid emissions and trophic characteristics of these systems can influence the biodiversity of meiofauna (with special focus on the nematodes) and their feeding habits. We found that sediments affected by intensive seepage displayed the lowest faunal abundances and number of higher taxa. However, mud volcanoes without emissions, but characterized by a high structural complexity (such as the ridges), were associated with the highest meiofaunal abundances and number of higher taxa. Mud volcanoes hosted also a remarkable abundance of taxa specifically associated with these structures (e.g. Acarina, Cumacea, Tanaidacea, Cladocera and Hydrozoa) and absent in slope sediments used as a control. Each mud volcano area displayed a different nematode species composition. Overall 76 nematode species (from a total of 235) were exclusively associated with mud volcano structures, whilst 29 were exclusively encountered in slope sediments. We conclude that the presence of mud volcanoes on the sea floor, for their contribution to increase spatial heterogeneity and for the extreme conditions associated with gas emissions, promotes higher levels of beta diversity, thus enhancing the regional (gamma) benthic diversity. These findings provide new insights on the factors controlling benthic biodiversity in mud volcanoes and clues for future action of conservation of the biodiversity specifically associated with these habitats.