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Meiofauna communities associated with cold seeps: understanding their function, adaptation and origin

S. Van Gaever, L. Moodley, F. Pasotti, A. Willems en A. Vanreusel
Sectie Mariene Biologie, Gent University, Gent, Belgium

Reduced deep-sea environments such as seeps do not only provide information about the boundaries of multicellular life, but they can also give insight into fundamental aspects of ecology and evolution. Megafaunal communities are relatively well described from a wide number of seep locations from different margins. In contrast, studies on seep meiofauna are scarce and have been restricted to bulk measurement of abundance or biomass of major taxa.

Through investigations on the meiofauna associated with the methane-seeping Håkon Mosby Mud Volcano (HMMV, SW Barents Sea slope, 1280 m), the pockmarks on the Storegga Slide (offshore mid-Norway, 740 m) and the REGAB seep site of the Angola Basin (South Atlantic Ocean, 3150 m) a better insight in the function, adaptations and origin of the dominant taxa is obtained. At HMMV, highly significant differences in diversity and density among the meiofaunal assemblages associated with different habitats were found. The highest densities were caused by one single nematode species (*Halomonhystera disjuncta*), thriving with extremely high numbers in the bacterial mats. Enhanced densities and dominance of selected species at HMMV were influenced by both direct (abiotic) and indirect (bacterial source specificity) consequence of sediment geochemistry. Biomarker analyses of the HMMV meiofauna revealed that the *Halomonhystera* nematode was thriving on chemosynthetically derived food sources, but FISH and TEM did not reveal the presence of any endosymbionts. The strongly depleted carbon isotope signatures of the copepods indicated a trophic link with methane-derived carbon. The ovoviviparous reproduction of *Halomonhystera disjuncta* at HMMV has been identified as an important adaptation of parents securing the survival and development of their brood in this anoxic environment. This

nematode species was not found at the adjacent Storegga Slide. Here the reduced sediments harboured a very impoverished nematode assemblage both in terms of diversity and standing stock. The scattered and limited extend of the reduced sediments seem not to have led to an established and thriving seep fauna. At the Angola Basin, the reduced sediments from the REGAB site are dominated by two large nematode species (*Sabatieria mortenseni* and *Desmodora* sp), both relatively low in numbers but by their large body size representing an elevated nematode biomass compared to adjacent control sites. Both the *Halomonhystera* sp. from the HMMV and this *Sabatieria* sp. show morphological similarities with cosmopolitan, opportunistic shallow water nematode species. Apparantly no particular meiobenthic taxon can be found in all the various reduced seeps across the oceans, but similar distribution processes must explain the dominance of these taxa.