Sediments hosting gas hydrates – oases for metazoan meiofauna?

S. Sommer, E. Gutzmann, J. Schnell, O. Pfannkuche
Leibniz Institute of Marine Sciences, IFM –GEOMAR, Germany
ssommer@ifm-geomar.de / Fax: +49 431-6002911 / Phone: +49 431-6002119

The effect of methane seepage from sediments hosting shallow gas hydrates on standing stocks, distribution patterns and $^{13/12}$C/$^{15/14}$N isotopic composition of meio-benthic organisms, with particular respect to nematoda and rotifera, was studied at about 800 m water depth at Hydrate Ridge, Cascadia subduction zone, off Oregon. The presence of shallow gas hydrates, buried only a few tens of centimetres below the sediment surface was indicated by extensive bacterial mats of chemosynthetic Beggiatoa sp. and clam fields of the bivalve mollusk Calyptogena sp. Mean abundances of meio-benthic organisms integrated over the upper 10 cm of the sediment were highest (1294 ind10cm$^{-2}$) at clam fields, closely followed by control sediments least affected by gas hydrates (1199 ind10cm$^{-2}$) and lowest in sediments covered with bacterial mats (762 ind10cm$^{-2}$). Average meio-benthic biomass was highest at the clam field site (262.2 µgC 10cm$^{-2}$), 210.4 µgC 10cm$^{-2}$ at the control site and very low in sediments covered with bacterial mats (61.4 µgC 10cm$^{-2}$). The dominant taxa of meio-benthic organisms at the investigated sites were nematodes and, unexpectedly, rotifera that are almost unknown from the deep marine habitat. In terms of abundance, it is a rotifera dominated meio-benthic community in gas hydrate influenced sediments whereas a nematode dominated community prevails in control sediments. The spatial distribution of nematodes and rotifers is likely to be determined by competition and/or predation, and by the high adaptive capability of rotifers to highly sulphidic and anoxic conditions. The stable C isotope composition of nematodes clearly indicates the contribution of chemosynthetically produced organic carbon to their nutrition at the hydrate sites. However, estimates of the nematode population carbon turnover in relation to the bulk organic carbon supply indicate that in contrast to nematode communities in other cold seep environments the meio-benthos in the studied gas hydrate
containing sediments do not benefit from the excess availability of organic carbon via the chemoautotrophic food web. The tolerance to withstand severely deleterious environmental conditions caused by reduced oxygen availability and extremely high sulphide fluxes might be exhausted in nematodes and other meiobenthic organisms except rotifers.