Response of biota to methane emissions in the Black Sea

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The Black Sea bottom is characterized by enormous degassing of methane that at least doubles that of any other basin in the world. The presence of methane is evident from outbursts of submarine mud volcanoes and high-intensity cold seeps that release huge quantities of methane into the water column. Long-term release of free methane into the water column—often accompanied by self-inflaming—may drastically disturb the composition and biomass of such ecosystems. The influence of methane emissions on Black Sea biota is poorly investigated.

The main goal of our study is to shed light on the origin of methane in the area of active gas seepages, and to study the response of biota to them today and the geological past. The material was obtained in the course of the FR6 EU funded HERMES-BS-ONU 01-2008 cruise performed on 19–27 September, 2008, in the NW part of the basin using the Ukrainian R/V *Vladimir Parshin*. The cruise was designed to study the response of biota to methane fluxes in the area of active gas seepages and better understand the natural drivers that control the functioning cold seeps communities in the Black Sea.

Nematodes and foraminifers are the most significant organisms in density among the meiobenthic assemblage, their share of which is 43 and 46%, respectively. The density of meiobenthos varied from 200 to 16,400 ind/m^2. Hard-shelled foraminifera are represented by 39 benthic species. No soft-shelled foraminifera were discovered. Ostracoda are represented by eleven species. The abundance and simple diversity of foraminifera and ostracoda show a strong negative correlation with methane. On the contrary, abundance of diatoms shows a positive correlation with methane.

The influence of methane at different concentrations on benthic communities seems to be different and much more complicated than was previously thought. Among all the studied groups of meiobenthos, only the nematodes seem to accept elevated concentrations of methane. General characteristics of Nematoda from redox biotopes include a decrease in their diversity and an increase in the dominance of selected species. It appears that among 32 identified species of Nematoda, five species (*Terschellingia pontica*, *Linhomoeus* sp., *Sabatieria abyssalis*, D*esmodora pontica*, *Pomponema* aff. *Multipapillatum*) can be considered species-indicators of methane fluxes. Both Foraminifera and Ostracoda respond negatively to methane fluxes. No species-indicators among either group were discovered. It appears that cold seeps in the Black Sea are quite unfavorable to biotic communities, which appear to be very fragile and vulnerable. This study is still in progress. Its outcome will be reported elsewhere.

This study is a part of EU FR6 HERMES Project; contract GOCE-CT-2005-511234.