



The Gulf of Cadiz – an extensive seepage area in the European margin with a vast potential for experimental approaches

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The sampling effort on the benthic assemblages associated to mud volcanoes in the Gulf of Cadiz (GoC) started in 2000. Early investigations, focused mainly in the shallower Moroccan field, showed a high variability in the faunal composition of different structures, low degree of endemism, and typical seep species represented by inconspicuous species such as the small-sized siboglinids and buried bivalves. Most recent discoveries showed that at greater depths the degree of endemism is clearly higher and mud volcanoes are colonized by large-sized Siboglinidae sometimes forming conspicuous clumps and fields, Thyasiridae bivalves may reach high densities and Bathymodioline bivalves may occur around carbonate slabs. Stable isotope techniques have been an essential tool for the research on the energetic basis of GoC chemosynthetic communities. Depleted values of $\delta^{13}\text{C}$ (-28 to -52%) together with light $\delta^{15}\text{N}$ signatures measured in the tissues of siboglinid polychaetes and thyasirid, lucinid, solemyid and bathymodiolid bivalves are indicative of the presence of methanotrophic and/or thiotrophic symbionts. $\delta^{13}\text{C}$ and $\delta^{34}\text{S}$ values for the bathymodiolids are compatible with the predominance of methanotrophy but other thiotrophic bivalves may use mixed carbon sources and do not necessarily reflect the isotopic value of the methane source. For these, $\delta^{34}\text{S}$ ratios also suggest the utilization of local biogenic reduced sulfur sources. PCR-DGGE analyses confirmed the occurrence of bacteria and phylogenetic analyses based on the 16S ribosomal RNA gene sequences from the gill tissues of the suspected thiotrophic species indicated that these bacteria were related to other sulfur-oxidizing endosymbionts from deep-sea chemosynthetic environments.

The GoC is the most extensive known seepage area in European margins. Environmental heterogeneity acting at different depths and spatial scales leads to a high variability of the faunal composition and trophic pathways. The GoC is thus a natural laboratory with a vast potential for ecological observations and experimentation. Under the umbrella of the CHEMECO project in situ experiments are being set for the multidisciplinary study of colonisation processes including the establishment of microbial communities, recruitment of metazoan larvae and development of symbioses. Another aspect of this project is to assess the impact of symbiotic metazoan colonisation on chemical exchanges and biogeochemical processes and to evaluate the ability of symbiotic organisms to recolonize after disturbance.