

SEEP ecology

– a multiproxy approach to establish a seabed ecological baseline in the North Sea prior to human activities in the subsurface

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The SEEP and SEEP ecology projects were established to generate a preproduction and syn-production baseline which can distinguish between absence of hydrocarbons (HC), natural seepage, and environmental impacts related to HC exploration and production by a multiproxy approach. However, the results from these two studies focusing on seepage, can also be used to establish a seabed ecological baseline in the North Sea prior to human activities in the subsurface. This ecological baseline for the benthic fauna and microbial communities is therefore also very relevant for discussing the impact of offshore wind and marine infrastructure to determine the environmental health of the seabed pre/post human activities.

To develop a methodology for an ecological baseline we use three key communities of microbes, bivalves and benthic foraminifera that have widely differing roles in the marine ecosystem.

The microbial community reveal the presence of HC degrading microbes, and analyses can distinguish between omnipresent guilds, guilds that are associated with natural seepage of hydrocarbons, and guilds that are associated with polluted sites. The bacterial community responds fast and reveals current conditions.

The bivalves are long lived filter feeders that deposit pollutants from the benthic and planktonic environment in their shells. They are important in the marine food web and useful in reconstructing the palaeoecology of the environment, since the bivalves are present in the oldest part of the marine beds in the sediment cores from the study dating back at least 8000 years. Trace elements analysed of the bivalve shells will provide us with information on past pollutants and gas seepage in the environment.

Benthic foraminifera are small, well preserved, diverse and widely distributed in marine sediments and are therefore excellent candidates for the study of both past and recent ecological conditions. The different benthic foraminiferal species have adapted to distinct environments with changing oxygen and food conditions. Further, studies have shown that some species thrive during methane release events. Hence, establishing an endemic benthic foraminiferal fauna for seep environments in the North Sea will aid our identification of past and present seepage to the seafloor.

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