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Identification and quantitative detection of hydrocarbon-degrading genes in North Sea water for use with a real-time monitoring device

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With growing activity from the oil and gas industries, fast detection and monitoring of hydrocarbons in the marine environment is becoming increasingly important, and becoming mandatory to mitigate impact on the ecosystem. New methods and monitoring devices are being developed for on-line in situ monitoring, and DNA-based technology can allow for rapid on-site detection of target species used as biosensors of environmental changes. In the Genomape project, we propose to use real-time quantitative polymerase chain reaction (qPCR) technique to quantify specific DNA sequences from hydrocarbon degrading bacteria. The gene-based assays are developed with the aim to implement them on a robotized genosensor, the Environmental Sampling Processor (ESP), used for real-time monitoring of oil contamination in Norwegian offshore.

In this work we present the preliminary results on the identification of the target genes and primer design. Both phylogenetic and functional genes are used, focusing genes actively involved in degradation of hydrocarbons. A combination of metatranscriptomics and RNA stable isotope probing (RNA-SIP) is being carried out. The mRNA isolated from seawater microbial communities exposed to oil or single hydrocarbons (e.g. naphthalene) is being sequenced and assembled. This work will also present the general vision and workflow of the project to use the ESP for monitoring of oil and gas activities.