

## Microbial diversity and metal fluxes in contaminated North Sea sediments (MICROMET)

Duration of the project: Phase 1: 15/12/2006 – 31/01/2009  
Phase 2: 01/01/2009 – 31/01/2011

Budget Phase 1: 480.866 €

Keywords: Heavy-metals, marine sediments, microorganisms, biodiversity, RNA sequencing, biogeochemistry

### Context

As many heavy metals are complexed by organic matter in contaminated marine sediments, metals might be released in the water column when organic matter is degraded by microorganisms. This might affect microbial biodiversity and lead to metal bioaccumulation in higher trophic levels. To date, microbial communities in marine sediments of the Belgian Continental Plate (BCP) remain poorly studied, particularly in heavy metal contaminated zones. The MICROMET project fits within two priority research domains of the Science for a Sustainable Development programme (Biodiversity and Marine Ecosystems) and is directly connected with the aims of the Water Framework Directive (2000/60/EC).

### Project description

#### Objectives

The aim of the MICROMET project is to understand the link between microbial activity and heavy metal fluxes in marine sediments. To this end, the whole microbial communities will be studied in the BCP area using an interdisciplinary approach in which geochemical and microbiological methods will be closely integrated. The research is subdivided in three Work Packages (WP 1-3). The aim of WP 1 is to determine the impact of metallic contaminants on the microbial diversity in sediments. The aim of WP 2 is to assess the importance of microorganisms in the leaching of metal contaminants from the sediments into the water column. The aim of WP 3 will be to run numerical models with the data collected during the project. This will allow predictions and lead to a better understanding of the benthic ecosystems.

#### Methodology

WP 1. About 10 sampling stations on the BCP will be examined during the first year. Sediments will be sampled before and after the major phytoplankton blooms. Microbial diversity will be determined using the DGGE approach. Pure cultures of microorganisms will be characterized, microbial biomass and geochemical properties of the sediment will be determined. Pore-water heavy metal concentrations will be determined using the Diffusive Equilibrium Technique (DET) and the Diffusive Gradient Technique (DGT). In the second year, sediments of 4 selected stations will be sampled monthly to take different organic matter sedimentation patterns into account. In addition to DGGE, the complete SSU rRNA will be sequenced in order to have a better understanding of the microbial diversity and physiologies.

WP 2. Vertical profiles of sediment cores from the 4 selected stations will be examined in more detail using the FISH and real-time PCR approaches, microbial productivity measurements, and

detailed geochemical analyses. The central part of WP 2 will consist of laboratory simulations in which sediment cores will be incubated under various environmental conditions.

WP 3. Numerical models will be run and validated with the data generated in this study. This will allow to predict the occurrence of benthic metal fluxes taking various factors into account.

#### Interaction between the different partners

Two microbiologist teams (ULB & UGent) and two geochemist teams (VUB & USTL) will work on the same sediment cores during the whole project. As a consequence, the different partners will closely interact and the microbiological data will be easily correlated with the geochemical data.

#### Expected results

The MICROMET project aims at gathering new data on environmental variables and microbiological processes not previously investigated in the BCP area.

Sediment microbiological variables will include indices of biodiversity, SSU rRNA sequences and biomasses. Enzymatic activities and sulfate reduction rates will also be determined. These data are totally missing on the BCP.

Sediment geochemical variables will include oxygen, pH, S(-II), and heavy metal profiles (micro-electrodes). High-resolution heavy metal profiles will be obtained by the DET and DGT approaches. Other variables (organic C & N, etc.) will also be determined.

MICROMET website : <http://ulb.ac.be/sciences/micromet>

#### Partners

##### Activities

1) Marine Biology Laboratory, ULB. The activities of the unit deal with the biology, ecology and ecotoxicology of marine invertebrates and marine microbial communities.  
<http://www.ulb.ac.be/sciences/biomar>

2) Protistology and Aquatic Ecology, UGent. The activities of the unit deal with the biology and biodiversity of prokaryotes protists in freshwater and marine ecosystems.  
<http://www.pae.ugent.be>

3) ANCH Laboratory, VUB. The research unit focuses on the development of reference materials, the study of the role of oceans in the greenhouse effect, and on the analysis of pollutants in the environment.  
<http://www.vub.ac.be/ANCH/>

4) PBDS Laboratory, USTL. The research unit develops and optimizes electrochemical methods for measuring metals in sedimentary environments.  
[http://www.univ-lille1.fr/geosciences/umr\\_pbds/umr\\_pbds.html](http://www.univ-lille1.fr/geosciences/umr_pbds/umr_pbds.html)

Contact information

Coordinators

David C. Gillan & Philippe Dubois  
Université Libre de Bruxelles (ULB)  
Marine Biology Laboratory  
CP160/15  
50 av. F. Roosevelt  
B-1050 Bruxelles  
Tel: + 32 (0) 2 650 43 85 (28 39)  
Fax: + 32 (0) 2 650 27 96  
dgillan@ulb.ac.be  
phdubois@ulb.ac.be

Promoters

Koen Sabbe  
Ghent University  
Protistology & Aquatic Ecology  
Dept. Biology  
Krijgslaan 281-S8  
B-9000 Ghent  
Tel: + 32 (0)9 264 85 11  
Fax: + 32 (0)9 264 85 99  
Koen.Sabbe@UGent.be

Willy Baeyens & Martine Leermakers  
Vrije Universiteit Brussels (VUB)  
Department of Analytical and Environmental Chemistry (ANCH)  
Pleinlaan 2  
1050-Brussels  
Tel: + 32 (0)2 629 36 02 (32 66)  
Fax: + 32 (0)2 629 32 74  
wbaeyens@vub.ac.be  
mleermak@vub.ac.be

Jean-Claude Fischer  
Université des Sciences et Technologies de Lille  
UMR CNRS 8110, PBDS  
Equipe de Chimie Analytique et Marine  
Bât. C8  
59 655 Villeneuve d'Ascq Cedex (France)  
Tel: + 33 3 20 43 49 28  
Fax + 33 3 20 43 48 22  
jean-claude.fischer@univ-lille1.fr

## Follow-up Committee

|         |             |  |
|---------|-------------|--|
| Estelle | Balian      | - Institut Royal des Sciences Naturelles de Belgique (IRSNB)             |
| Kris    | Cooreman    | - Instituut voor Landbouw en Visserijonderzoek (ILVO)                    |
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