The activity of sediment bacteria in a temporary river in relation to the hydrological status and to the persistence of organic pollutants

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Introduction: Microbes associated with river sediments play an important role in the C-flux being responsible for the transformation of organic carbon (autochthonous and allochtonous) into biomass. Changes in the assimilation or mineralization rates, determined by environmental factors, affect C-flux in the trophic chain and the fate of organic pollutants.
In the frame of the MIRAGE EU FP7 Project (**M**editerranean **I**ntermittent **R**iver Man**AGE**ment, www.mirage-project.eu), monitoring surveys have been conducted in the Candelaro river system (Apulia, Italy) in different periods to describe the structural and functional characteristics of native bacterial communities together with the presence of major organic pollutants.
Field campaigns were followed by experimental work to understand mechanisms affecting persistence and fate of hazardous substances. Results will be used to link hydrological and sediment transport models with pollution impact in order to provide guidelines for river restoration.

Methods: Bacterial abundance (BAB) has been determined by epifluorescence microscopy (DAPI stain) after a pre-treatment of the sediment slurry [1]. Total living biomass was estimated by ATP concentration [2]. The rate of bacterial carbon production (BCP) was determined by the ^{3}H-leucine uptake [3]. The potential for organic matter hydrolysis was determined by fluorimetric technique after Zoppini et al. [4]. Community respiration was estimated by ETS [5]. The presence of different phylogenetic groups by CARD-FISH [6].
For the experiment, natural sediment was collected in the Candelaro basin, immediately sieved (2mm mesh), transported refrigerated to the lab and characterized for polycyclic aromatic hydrocarbons (PAHs) content and for the composition and activity of the microbial community. Based on PAHs *in situ* concentrations, treatments were amended with a mixture of 7 compounds characterised by different structure and solubility. The behaviour of bacteria was followed in amended treatments and untreated control (triplicates) weekly for one month, and compared with a sterilized sediment.

Fig. 1: Location of sampling sites.

Results: Sampling carried out during the first year showed the presence of an active bacterial community and high concentration of PAHs in the river sediment. These substances belong to the list of EC priority dangerous substances; their strong absorption on particulate matter make suspended particles a possible vehicle for transport during flush. The above characteristics determined the choice of these compounds as target pollutants for the experiments to investigate the interactions between organic pollutants and microbial communities.
The benthic bacterial communities showed the capacity to immediately degrade specific aromatic compounds, without being negatively affected by the presence of the complex mixture of toxicants. The behaviour of different structural and functional parameters will allow to formulate hypothesis on the influence of PAHs on the native bacteria community.

References:
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