

# FUNCTIONAL DIVERSITY OF BACTERIOPLANKTON COMMUNITIES IN CONTRASTING ENVIRONMENTS OF THE NW MEDITERRANEAN COAST

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## Abstract

We studied the metabolic diversity of bacterioplankton in four contrasting environments of the Catalan coast (NW Mediterranean) by comparing the profiles of sole carbon sources using Biolog-Eco microplates. Bacterioplankton communities were metabolically different in enclosed and open environments. Patterns of carbon utilization during harmful algal blooms were not different from those obtained from other enclosed environments.

*Keywords: bacterioplankton metabolism, Biolog, HABs, coastal zone*

## Introduction

A lot of information is now available on the phylogenetic bacterial diversity in marine environments. However, to understand the biogeochemical role of different microbial communities it is essential to have knowledge also on their functional diversity. Previous studies in the coastal zone of the Catalan coast have shown that the bacterial community was phylogenetically different in enclosed from open areas (1). To our knowledge, no information on functional diversity in the Mediterranean Sea has been reported. In other environments, functional diversity has been assessed using Biolog plates (2). Since each species of bacteria differ in the specific organic substrates that they can use as carbon and energy sources, each community would have a characteristic profile of carbon source utilization in the Biolog plate. The aim of our study was to evaluate if bacterial functional diversity was different in zones with different trophic conditions. Among the enclosed zones, we have included two blooms of the toxic dinoflagellate *Alexandrium*.

## Material and methods

Metabolic diversity of bacterioplankton was studied in the surface of four different regions of the Catalan Coast (NW Mediterranean). Station AH (Arenys de Mar Harbour) was sampled in January 2002 during a bloom of the dinoflagellate *Alexandrium minutum*. Station TH (Tarragona Harbour) was sampled in June 2001 during a bloom of the dinoflagellate *Alexandrium catenella*. Station BH (Barcelona Harbour) was sampled regularly from June 2001 until October 2002 a period with no HABs (harmful algal bloom) detectable. Apart from the three harbours, we collected samples from two coastal open environments in Blanes (St. BL) and Masnou (St. MA) in different periods between 2001 and 2003.

Metabolic diversity was assessed by means of Biolog-Eco microplates that provide profiles of sole carbon source utilization (see ref. 3 for a review). Biolog-Eco plates contain 31 different carbon sources in triplicates. After inoculation of the wells (150 µl sample), the plates are incubated for 6 days and absorbance is afterwards measured at 590 nm. The pattern of color development of each plate gives a fingerprint for every community. The patterns of color development were compared after normalizing the data according to ref. 4. Hierarchical cluster analysis (HCA) was used to determine differences between patterns of substrate utilization. The Wards Method and City-block distance clustering was used in this analysis. Data from HCA were used to construct a dendrogram (Fig. 1) and the shorter the leaf the greater the similarity.

## Results and discussion

The dendrogram, and the principal component analysis, showed two groups of samples. The first group contained all the samples from the oligotrophic areas (BL and MA) and some BH samples with low chlorophyll concentrations. The second group contained only samples from the enclosed environments, i.e. the harbours. Included in this group we found the samples from HABs (AH and TH) and most of the BH samples. Seasonal grouping could not be easily observed among the enclosed samples from BH. Patterns of metabolic activity of bacterioplankton during HABs did not differ from those obtained in BH along the year, when no dinoflagellates bloom was detected.

Our results suggest that, similarly to phylogenetic diversity (1), functional diversity of bacterioplankton populations is different in harbours than in open coastal stations, with metabolic capabilities of bacterioplankton during HABs not different from those of other enclosed areas.

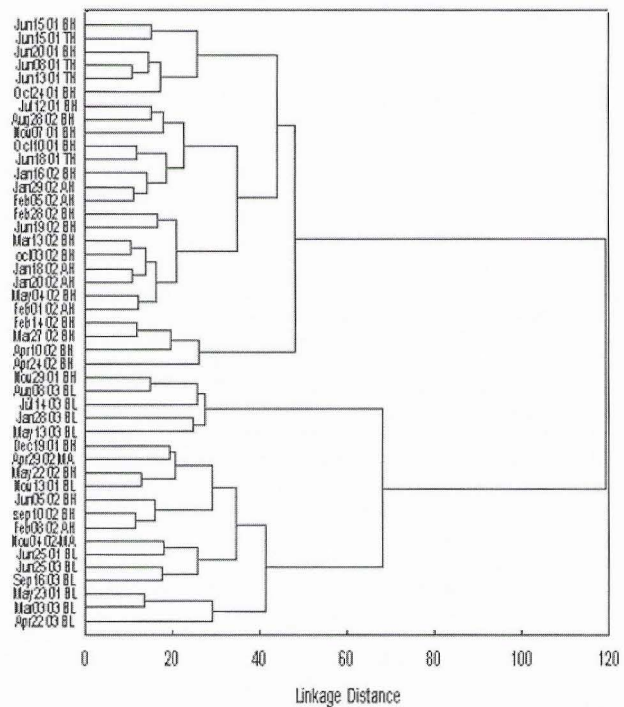


Fig.1. HCA results for Biolog data obtained from the Catalan coast. Branches are labeled by date and station: BH: Barcelona harbour, TH: Tarragona harbour, AH: Arenys harbour, BL: Blanes and MA: Masnou.

## Acknowledgements

The study was supported by the EU projects: BIOHAB (EVK3-CT1999-00015) and BASICS (EVK3-CT2002-00078).

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