

GROWTH AND PHYLOGENETIC COMPOSITION OF THE BACTERIAL ASSEMBLAGE DURING A LAGRANGIAN STUDY IN THE RHONE RIVER PLUME

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Abstract

The Rhone River drains freshwater into the northwestern Mediterranean forming a plume that moves along the slope of the Catalan continental platform. This plume constitutes a water mass that can be followed in time in a Lagrangian way. We followed the water mass in cruise ARO2000 on board B/O *García del Cid* in early June 2000. Hydrography, concentrations of nutrients and the abundance and activities of microorganisms were determined simultaneously. Here we present the abundance, heterotrophic production and phylogenetic composition of the bacterioplankton in the plume.

Keywords: DGGE, Plume

The plume was tracked by three Argos buoys. Waters in the vicinity of the buoys were sampled at least once a day. Samples were taken with Niskin bottles in a rosette with a CTD profiler. Bacteria were counted by flow cytometry. Aliquots were incubated with ³H-leucine to determine bacterial heterotrophic production.

Samples for DNA were filtered through 0.22 µm pore diameter Sterivex filters. DNA was extracted according to Schauer et al. (1). A PCR amplification was carried out with bacterial specific primers and the products were separated in a DGGE. The most abundant bands were excised and sequenced (2).

Figure 1 shows bacterial numbers (filled circles), bacterial heterotrophic production (empty circles), chlorophyll a (empty circles) and the percent of high DNA bacteria (filled circles). There was a storm on June 6 (arrow in Fig 1) that changed conditions. The first five days can be safely assumed to represent the same water mass and the same microbial assemblage. Bacteria grew during this period as chlorophyll decreased. Bacteria almost doubled in four days and there was a parallel increase in bacterial heterotrophic production. The percent of high DNA bacteria was relatively high during the first three days and decreased thereafter.

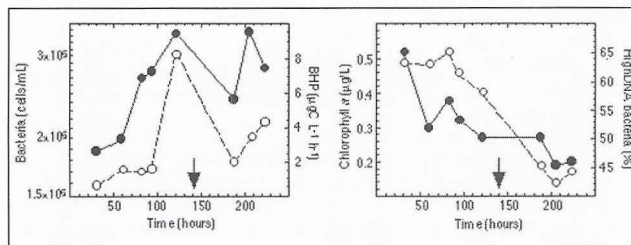
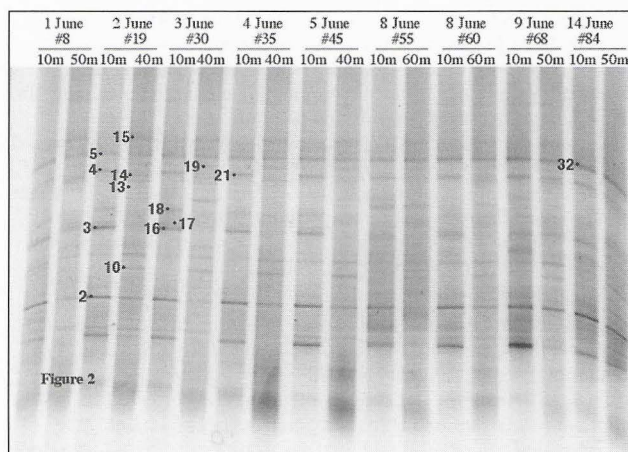


Figure 2 shows the DGGE gel for the whole period. For each sampling date, two samples are shown. The sample from 10 m depth corresponds to the plume and the second one to deeper water below the plume. The band patterns for the plume and the water outside were quite different. Thus, the plume had its own bacterial assemblage. On the contrary, the band patterns were very similar through the Lagrangian part of the study. Only after the storm some differences were observed. Most of the sequenced bands belonged either to the Cytophaga-Flavobacterium or to the alpha-Proteobacteria groups. All of the bands were closely related to uncultured clones. The only exception was band 5 that belonged to the recently isolated SAR11 group. A rather predominate band [2] was related to the *Roseobacter* clade.



The dynamics of bacterioplankton populations in the ocean are largely unknown. We have attempted to determine the scales in space and time at which bacterial assemblages change in the ocean. In previous studies we looked at spatial (1) and temporal (2) changes in the composition of the bacterioplankton in the coastal northwestern Mediterranean. The present study concentrated on short time changes in the bacterioplankton taking advantage of a hydrographical situation that allowed a Lagrangian study. Despite a doubling in bacterial numbers, the composition of the assemblage did not change significantly. Only after a storm occurred some changes were apparent in the DGGE band patterns. This constancy is consistent with the very smooth and slow changes in composition that we had observed in a seasonal study (2).

References

- Schauer, M., R. Massana and C. Pedrós-Alió. 2000. Spatial differences in bacterioplankton composition along the Catalan coast (NW Mediterranean) assessed by molecular fingerprinting. *FEMS Microbiol. Ecol.*, 33: 51-59.
- Schauer, M., V. Balagué, C. Pedrós-Alió and R. Massana. 2003. Temporal changes in bacterioplankton diversity in the oligotrophic Mediterranean Coast. *Aquatic Microbial Ecology*, 31:163-174.