

# DIEL AND SEASONAL VARIATIONS IN ABUNDANCE, ACTIVITY AND COMMUNITY STRUCTURE OF PARTICLE-ATTACHED AND FREE-LIVING BACTERIA IN THE NW MEDITERRANEAN SEA (0-100M)

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## Abstract

A multidisciplinary approach was used to investigate the response of the attached versus free-living bacteria during diel or seasonal changes within the water column at the NW Mediterranean JGOFS-DYFAMED station. Community structure and activity of both compartments answered very rapidly to night/day changes during spring phytoplanktonic bloom and were clearly influenced by depth stratification in summer. These results, coupled with other biotic and abiotic parameters, suggested that bacterial successions could affect or reflect the bacterial response to changes in the quality or quantity of organic material in the water column.

**Keywords :** *Bacteria, Biodiversity, Fecal Pellets, Food Webs.*

A major topic in aquatic microbial ecology concerns the fate of particulate organic matter (POM) and the pathways by which is produced, transferred within the food web, transported downward as sinking POM through the water column, and decomposed and mineralized by microbes. It is well established that pelagic bacteria play an active role in the transformation of particulate (POC) to dissolved organic carbon (DOC) via a wide variety of enzymatic pathways [1]. Even if the relative contribution of particle-attached versus free-living bacteria in the total bacterial abundance and activity is relatively well known, the influence of bacterial diversity on the functions of both communities remains poorly documented.

The most important finding of this study was that the activity of attached bacteria showed pronounced diel variations in the upper mixed water column with higher activities at night. Under mesotrophic conditions, the contribution of attached bacteria to total bacterial activity increased from less than 10% at day time to 83% at night time (Figure 1).

cycling of particulate organic carbon in the NW Mediterranean Sea and the importance of diel variability in these processes.

## References

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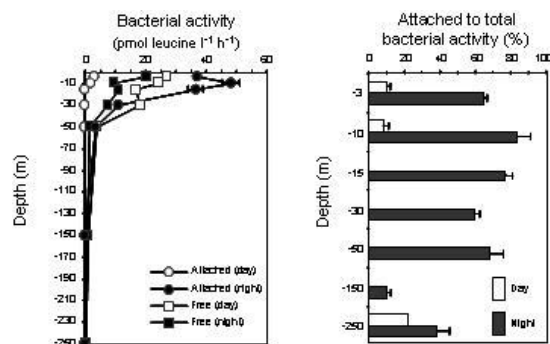


Fig. 1. Diel variations of particle-attached versus free-living bacterial activity, and contribution of the attached bacteria to the total bacterial activity under mesotrophic conditions (spring) at the JGOFS-DYFAMED station (NW Mediterranean).

At high chlorophyll *a* concentration, the highest cell-specific activities and contribution to total bacterial activity were due to free-living bacteria at day and to attached bacteria at night. Under summer oligotrophic conditions, free-living bacteria dominated and contributed to the most important part of the bacterial activity at both day and night whereas attached bacteria were much less abundant but presented the highest cell-specific activities. These diel and seasonal variations in activities were concomitant to changes in bacterial community structure, mainly in the upper layer. The number of attached CE-SSCP [2] ribotypes was fairly constant suggesting that particles are colonized by a relatively limited number of ubiquitous ribotypes. Most of these ribotypes were also free-living ribotypes suggesting that attached bacteria probably originate from colonization of newly formed particles by free-living bacteria in the upper layer.

These results reinforce the biogeochemical role of attached bacteria in the