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Biofouling is a natural process of colonization of submerged surfaces, involving a wide range of organisms, from bacteria to invertebrates. The biofilm formation starts with the recruitment of pioneer bacteria and rapidly evolves to a more complex structure, involving other microorganisms, including microalgae.

The aim of this study was to assess the influence of the nature of six artificial substrata with different surface energies, including antifouling paints on the biofilm microbial communities of the biofilms. Six substrata (polystyrene, Teflon®, two commercial antifouling paints and two paints produced in our laboratory) were submerged in triplicate, in May 2009, during two weeks, at two localities near Toulon on the French Mediterranean coast. At those localities, water qualities were dissimilar as one was in the Toulon military harbor while the other was on the south coast of Porquerolles Island, which is a natural protected area. The bacterial and microalgal diversities were investigated by PCR-DGGE and microscopic identifications respectively. In addition, the relative abundance of microalgae was studied for a period of 45 days.

We showed lower fouling density at Porquerolles compared to Toulon harbor. The bacterial community shows similar trends. It appears to be structured both by the sites and by the type of substrata. Pioneer microalgal communities were dominated at the two sites, and whatever the surfaces involved, by the same two Diatom species, *Licmophora gracilis* and *Cylindrotheca closterium*. Nevertheless, the fouling density showed the same tendency for the two sites with a significant antifouling effect of all the antifouling coatings compared to Teflon and even more to polystyrene. After the pioneer stage, both the efficacies (densities) and the dominance of the diatom community varied from a paint to another but always implicating other species than the pioneer ones (*Nitzschia* spp., *Navicula* spp.).

**Keywords:** Biofouling, biofilm, bacteria, diatoms, antifouling paint, microbial ecology.