

SEM MICROPHOTOGRAPHS OF BIOFOULING ORGANISMS ON FLOATING AND BENTHIC PLASTIC DEBRIS

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Abstract

Results from the first electron microscopic observations of both floating and benthic marine plastic debris are presented. Plastics were collected near the marine protected area of the Cap de Creus (Catalan Coast). Floating plastic microphotographs showed fungi and bacteria as the first settlers and a high diversity community of microalgae mainly diatoms and some dinoflagellates. Benthic plastics are less colonized by microorganisms and they are recovered by characteristic muddy sediment from the trawled fishing grounds. The results are discussed taking into account the paramount importance to improve knowledge of the marine plastic debris dynamics and consequently their impact in the marine environment.

Keywords: *Algae, Biodiversity, Fouling*

Introduction

Marine debris is defined as any manufactured or processed solid material that enters the marine environment. Plastics account for the largest fraction of marine debris, which average proportion varies between 60 to 80% of total marine debris. In many regions, plastic materials constitute as much as 90 to 95% of the total amount of marine debris [1]. Apart from the widely evidenced negative effect of plastics on marine mammals, turtles and seabirds, plastics can also indirectly alter marine biodiversity by other less known actions, such as help in the introduction of alien species by floating plastics [2, 3]. Marine debris doubles the rafting opportunities for biota, assisting the dispersal of alien species [4]. This work aims to improve the knowledge of plastic debris effect both surface and bottom presenting images of the settler plastic microorganisms using the scanning electronic microscope (SEM) from areas subject to different levels of fishing impact.

Methods

Plastics were collected in the framework of the COMSOM project (CTM2008-4617). Samples were fixed in 2% glutaraldehyde. After dehydration in ethanol series, were critical point dried in liquid CO₂, sputtered with gold-palladium and examined with a Hitachi S-3500N operated at 5 kV.

Results and Discussion

SEM microphotograph of floating plastic debris shows the substrate covered by fungi and bacteria and a very diverse community of microalgae mainly benthic diatoms of the genus *Thalassionema sp.*, *Closterium sp.*, *Tabularia sp.*, *Navicula sp.*, *Achnanthes sp.*, *Thalassiosira sp.*, *Cylindrotheca*. Dinoflagellates and resting cysts have been observed in some occasions. SEM microphotograph of benthic plastics shows, in general, a very distinct aspect. They are recovered by characteristic muddy sediment from the trawled fishing grounds and presented a less colonized substrate by microorganisms. Diatoms are present but in rare occasions. It has been observed quite often spawns of unidentified organisms. This study of the microorganisms attached to plastic debris shows the high potentiality of SEM analysis to study plastic debris biofouling. SEM micrographs have been applied to study biofouling organisms in different interfaces, but this is the first study of SEM microphotograph applied to marine plastic debris. Plastic accumulation in the marine environment represents an extra impact source for marine biodiversity that is already threatened by other factors like climate change, overfishing and many other anthropogenic activities. But evidences are still anecdotal, which implies an urgent need of increasing our knowledge on this subject.

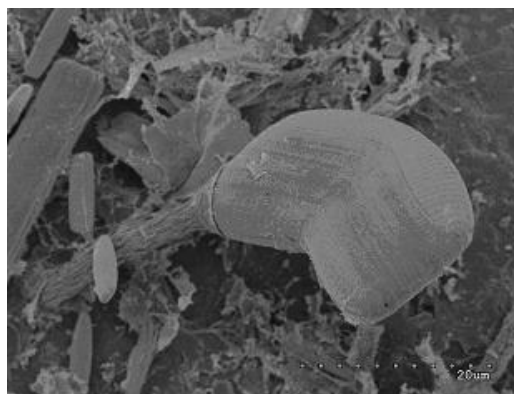


Fig. 1. Two cells of *Achnanthes* joined to the substrate for a peduncle.

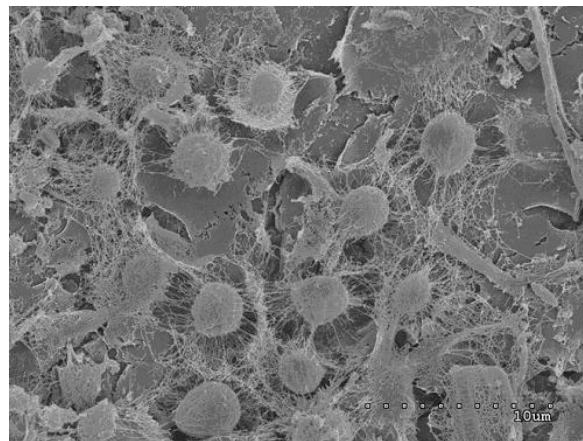


Fig. 2. Spawn of an unidentified species on a marine plastic debris.

References

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