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Selective potential of geotextiles on marine fouling settlement

Francesca Cima, Roberta Varello

University of Padova, Italy

Abstract

In recent years, the prevention of coastal erosion due to the action of waves, currents, tides and organisms has arisen as a top priority for reducing the damage to structures and loss of lands. Climatic change is making the erosion rates worse by increasing in storm frequency and intensity. The high coastline recession rates cause significant concern in heavily populated locations. New tools for application in hydraulic engineering are represented by nonwoven geotextiles. These materials are made of polypropylene (PP) and polyester (PET) fibres, have physical and hydraulic properties, which are useful in artificial structures for coastal protection as an alternative to natural hard substrates. On the other hand, they could interfere with the settlement of fouling species in respect of natural substrates. To better understand the potential effects of geotextiles on the colonization capability of fouling organisms, a 10-months study was carried out in the Lagoon of Venice (Italy), a particular environment of temperate transitional waters with high biodiversity. Three different needle punched staple fibre geotextiles were chosen from Naue GmbH & Co. (Germany): 1) Secutex R601 (white PP), 2) Secutex 251 GRK 4C (hot-calendered white PP and PET), and 3) Terrafix B 609 (multi-layered coloured PP and white PET). Fouling settlement was monitored and analysed on panels replaced monthly and compared with the colonization on wood panels as a reference substrate. All geotextiles revealed a negative effect on the settlement of green and red algae, bivalve molluscs and barnacles. Secutex R601 and Terrafix B 609 also inhibited the settlement of serpulids. Conversely, they showed a positive selective effect towards various ascidian species. The loss of pivot species in favour of the selection of dominant and/or invasive species could trigger negative consequences in both trophic chains of coastal ecosystems and in economical relevant activities of fishing industry and aquaculture.

Keywords

Artificial substrates, Coastal erosion, Macrofouling community, Nonwoven geotextile fabrics