ABSTRACT

Tropical Marine Biofouling Dynamics and the Effectiveness of Antifouling Paints

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Marine biofouling is a major problem experienced when surfaces are immersed in water. These organisms increase the surface roughness and the weight of the ships hull resulting in an increase in the frictional drag and fuel consumption. This biological problem can be controlled using antifouling paints that contain biocides such as copper oxide or more commonly tributlytin (TBT), which is more effective. However due to the adverse effects of TBT on the marine environment, regulations are being placed to restrict its use. Non-toxic foul release systems are now being tested as alternatives to TBT. This study determined the sequence and rate of colonization of marine biofoulers in a tropical estuarine environment in Trinidad and compared the effectiveness of a silicone foul release system to a copper based and TBT based antifouling paint.

Recruitment and development of fouling communities on glass panels, untreated fibre-glass panels, and fibre-glass panels coated with a silicone foul release system, a copper based paint and a TBT based paints were observed. 10cm x 10cm panels were hung vertically on rafts at about 1m below the surface of the water for fourteen months. Growth and development of these panels were monitored using under-water photography. Multivariate statistical techniques were used to model the sequence of fouling in relation to measured environmental factors to determine if they influenced colonization on the panels.

A total of 31 species of marine biofoulers were found. These included diatoms, marine algae, ascidians, barnacles, polychaetes, bryzoans, hydroids and sponges. The rate of fouling occurred fastest on the glass panels, however the silicone-coated panels were the most diverse. Seasonal rainfall, salinity and phosphate concentration appear to be the only measured environmental parameters to affect colonization.

The TBT coated panels had the least number of species (6) settling and therefore was the most effective antifoulant. However, due to the low surface energy and adhesion strength of the marine foulers, the silicone foul release system proved to be an effective alternative. Once the weight approached 2.1g organisms fell off and the percentage cover of the bare panel increased. A legally binding instrument is to be developed by the Marine Environment Protection Committee to ensure global prohibition of the application of organotin compounds on ships by January 2003, and a complete prohibition of the presence of organotin compounds which act as biocides in antifouling systems on ships by January 2008. This could be supported since there are proven efficient alternatives such as the silicone foul release systems.

Key words: fouling, silicone foul release, copper, tributyltin