ASSESSMENT OF MARINE PAINTS BASED ON TUBEWORMS AND SEPIA SHELL

Aida Tadros [1]*, Manal El naggar [1] and Fatma Zaghloul [1]
[1] National Institute of Oceanography and Fisheries (NIOF) - BT_AIDA@yahoo.com

Abstract
Two Marine paints were prepared with the same formulation except one based on tubeworms (AF_t) and the second contains *Sepia* shell (AF_S). The two paints together with their blank (B) were applied on unprimed steel panel and immersed in seawater. The biological investigation of the coated surfaces showed (AF_S) inhibits heterotrophic bacteria, actinomycetes and the sulfate reducing bacteria after 21 days of immersion with 43%, 25% and 64%, respectively, compared to (B). After 70 days of immersion (AF_S) was free from diatoms, primary stages of macroalgae and the polychaet larvae while primary stages of macroalgae were formed on (B).
Keywords: Diatoms, Fouling, Bio-Accumulation, Chemical Analysis

Introduction
The immersed surfaces in marine environment are usually rapidly colonized by microorganisms, includes attachment of bacteria, diatoms, fungi, and protozoans. These are often followed by the settlement of algal spores and larvae of macro invertebrates. The colonization process is termed biofouling [1]. This study aims to evaluate the antifouling property of tubeworms and Sepia shell as natural pigments for marine fouling control.
Each of tubeworms and Sepia shell was incorporated individually in similar marine paint formulation. The paints were applied on unprimed steel panels, immersed in Eastern harbor (EH) and their coated surfaces were biologically assessed.

Material and Methods
Tubeworms have been collected from (EH) and *Sepia* shell is available and easily obtain. Both washed with tap water, distilled water, dried at 70 ºC and grind till fine particle size <71µm using sieves.
Chemical analysis; the total C% of tubeworms and *Sepia* shell was measured in Micro-analytical Center, Fac. of Sci. Cairo Univ.
Spectrophotometer measurement; 0.1g of each of tube worms and sepia shell in 50 ml D.W. was stirred and the spectrum of each solution was measured after 2, 4,7,8,9, and 10 days.
Marine paint formulation was prepared with a composition of oil binder 25, iron oxide 10, zinc oxide 24, and complementary pigments 13. Tubeworms and/or *Sepia* shell were added with 25 % in the paint. The two paint formulations together with the blank were applied on unprimed steel panels 10X10X0.5cm, hanged in a frame and immersed in EH. The condition of the surfaces was followed photographically and biologically inspected [Figs 1&2]. The microbiological examination for heterotrophic bacteria, actinomycetes, sulfate reducing bacteria and marine fungi and the biological investigations for diatom and zooplankton population were carried out for the biofilms formed on (B), (AF_t) and (AF_S) coated steel panels according to the APHA, 1995 [2].

Results and Discussion
The four different microbial communities were monitored after 7, 14, 21 and 21 and 28 days. The diatom and zooplankton formed on the coated surfaces were examined and identified after 70, 85 and 95 days.
The C% was found to be 12.22 % and 13.82% for tubeworms and sepia shell respectively. The spectra of the tubeworms after 8 days showed two absorption bands at 385 nm and 370 nm respectively, while the aqueous medium of the *Sepia shell* showed one absorption band at 270 nm.
The coated steel surfaces were inspected in triplicates for heterotrophic bacteria, actinomycetes and marine fungi after 7, 14, 21 and 28 days of immersion. The data indicated that the maximum inhibition for heterotrophic bacteria, actinomycetes and the sulfate reducing bacteria was observed after the 21 days of immersion on (AF_S). They were significantly inhibited by 43%, 25% and 64%, respectively, compared to (B). After 14 days of immersion the marine fungi showed to be inhibited by 14% on (AF_t) compared to (B).
The results of the biological investigation after 70 days of immersion showed primary stages of macroalgae were formed on (B). Rare numbers of diatoms (*Navicula*, *Cosinodiscus* and *Thalassionema nitzschioides)* and rare numbers of zooplankton species (copepoda, protozoa, and free living nematode and spionoid larvae of polychaet) were recorded on (B) and (AF_t). These species were attached to the coated surfaces from the surrounding seawater, while (AF_S) surface was free from diatoms, primary stages of macroalgae and the polychaet larvae. After 85 and 95 days of immersion, frequent forms of primary stages of macroalgae and rare diatom species (*Skeletonema*, *Nitzschia closterium* & *Navicula*) were formed on all examined steel coated panels (B, AF_t and AF_S) and a detection of only one polycheat larva was observed after 95 day on each examined coated panel. (AF_S) steel coated surface showed better fouling control than (AF_t) over a period of 100 days of immersion.

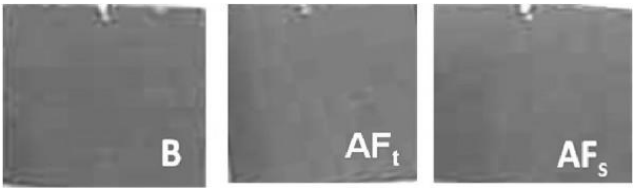

Fig. 1. Coated surfaces before immersion

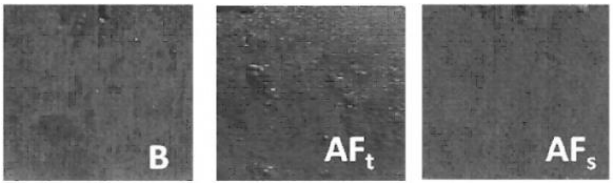

Fig. 2. Coated surfaces after 70 days of immersion

References
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