

MARINE FOULING

DEFINITION

- Any surface immersed in the sea becomes covered with sedentary organisms. When that surface is a ship's hull or some other manmade structures, whose performances will be affected by such growths, the settlement that results is termed as 'fouling'.
- This can also be defined as deterioration of manmade structures by sessile, sedentary and boring organisms in the marine environment.

EFFECT OF FOULING

- ▣ Fouling affects are seen in two major industries, such as shipping and fishing industries.
- ▣ In addition, marine fouling affects industrial plants, such as power stations or refinery using sea water for cooling purposes.
- ▣ Intake pipes must periodically be cleaned out to maintain a clear channel. Ships cooling pipes may also foul badly.
- ▣ Unless made of copper or cupro-nickel alloy which is more resistant to corrosion and toxic to settling larvae.

THE PASSAGE OF A SHIP THROUGH WATER IS HINDERED BY RESISTANCE DEPENDING ON:

(1) The displacement of water by hull.

(2) The frictional force between the water and the submerged surface.

Only the second of these is affected by fouling. This increased resistance to water by the affected hull requires more power to sail, thus increase the burden on fuel consumption.

- ▣ On the south-western coast of India, the brown mussel, *Perna indica* is cultured on suspended ropes, the fouling community on the ropes consists predominantly barnacles, *Saccostrea cucculata* and *Modiolus*.
- ▣ In another locality of the same coast, at Calicut where *Perna viridis* is cultured on open sea rafts, *Balanus* growth has had adverse effects on the culture of these green mussels.
- ▣ Bottom culture forms of mussels and oysters suffer more from frequent attacks by fouler than the off bottom culture forms. In large culture too, the bio fouling is found to affect by interfering with efficient flowing of water.

FOULING COMMUNITY

- The marine fouling complex along both the coasts of India appears to be typical representation of tropical flora and fauna.
- The establishment of a fouling community can be divided into different phases.
- Initially, a primary film develops comprised of bacteria, fungal spores, diatoms and colloidal organic matter.

- ▣ In the second phase, there is an establishment of macrofoulers, which, in Indian waters consists of hydroids, barnacles, tubicolous polychaetes, bryozoans, mussels, oysters and compound ascidians. These put together to form 'fouling community'.
- ▣ Various species of barnacle are most important members.
- ▣ Among the most important species of barnacle found in the community are *Balanus amphitrite*, *B. amaryllis*, *B. variegatus*, *Chthalamus* sp., *Malayensis* sp., *Lepas pectinata*, *Octolassamus angulata*.
- ▣ Among hydroids, *Obelia* sp., *Companularia* sp., *Sertularia* sp. are common.

- Among tubicolous polychaetes, *Serpula* sp., *Hydroides* sp., *Vomatoceros* sp. and *Mercierella* sp. are common in the community.
- Among bryozoans, *Bowrbankia* sp., *Electra* sp., *Aidhiriana* sp. and *Watersipora* sp. are the important members.
- Among molluscs, green and brown mussels, oysters *Crossostrea* sp. are most common in fouling community.
- In addition, common wood borers species belonging to *Teredo*, *Martesia*, *Nausitoria* genera.

MEASURES TO PREVENT FOULING

Control of bio fouling is being followed by adopting old and traditional methods and most advanced chemical methods to environmental friendly biological control methods.

DRY DOCKING : Dry docking and application of sardine oil to the hulls of fishing boat are the common controlling measures, followed along both the coasts of India.

ANTIFOULING PAINTS :Modern methods of fouling control by toxic antifouling paints have their genesis in the replacement of wooden ships by iron ships in the early part of the last century.

- The development of anticorrosive paints saved by ravage of iron hulls in the seawater.
- The essential philosophy behind antifouling paint is that it has leachable toxin bound in a matrix that can be applied on a surface.
- A number of toxins including mercury, arsenic, copper, DDT and organometals are used. Among them, copper has had the greatest success.

- The effectiveness of antifouling paints are dependent on the leaching from the surface. If leaching is prevented or reduced below a specific level, fouling invariably follows.
- The compound tributyl toluene (TBT) was used as a toxic ingredient in antifouling paints, which reduced fouling, but affected a specific population of molluscs.
- Recently, there has been a considerable effort directed toward the development of non-toxic, non-polluting antifouling controls.

- A useful approach to this problem is to recognize some biochemical compounds in various marine organisms, which effectively suppress or inhibit metamorphism in the larvae of sedimentary organisms.
- There have been many studies aimed at elucidating species metabolites with anti fouling activity from corals.
- Standing et al., (1984) observed that substances that inhibited barnacle settlement could be extracted from gorgonians of the genus *Lophogorgia* and Sea pancy, *Renillareniformis*