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NOTE

Encrusting form of coral as a biofouler in the marine environment of southeast coast of India

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Abstract

Encrusting form of coral *Montipora* sp. belonging to the family Acroporidae, was found to settle on vertically submerged biofouling test panels installed at Pudhumadam coastal waters in the Gulf of Mannar. No other types of corals were found to settle on these test panels. The recruitment and growth of the coral occurred during March and November. Only 2% of the total number of test panels showed coral attachment. A range of 7 - 15% of the surface area of the panels was covered by the coral growth. Out of four different types of test panels employed, the one which was made of concrete, showed no coral settlement.

Knowledge of biofouling organisms has become important in view of the damages they cause to various fishing crafts, under water structures, objects and instruments that are employed or installed by man in the marine environment. The surfaces of these objects are used for settlement by a wide variety of organisms in the marine environment. The most commonly occurring foulers are barnacles, polychaetes, bivalves, sponges and algae. However, reports on corals as biofoulers are few (Callow, 1999). This is mostly due to the limitation in the distribution of corals to certain areas of the marine realm. In coral reef areas, larvae of corals may disperse and settle on any suitable substratum including man-made structures.

Gulf of Mannar in the southeast coast of India has a chain of 21 islands with fringing and patch reefs around them. The length of the coastline of the mainland in the vicinity of these islands is about 140 km between Rameswaram and Tuticorin with a number of fishing villages. There are hundreds of fishing canoes and motorised medium size boats which encounter biofouling problem requiring periodic cleaning and maintenance. Since the Gulf of Mannar has a coral reef rich environment, there is every possibility of corals contributing to the biofouling problem. Therefore, a study on biofouling by corals was conducted.

This study was carried out with funds provided by the Department of Ocean Development of the Government of India through its Ocean Science and Technology Cell based at Annamalai University in Tamil Nadu. Ms. Jackie Wolstenholme

of the museum of Tropical Queensland, Australia, identified the coral genus in this study.

Material and methods

Pudhumadam coast near Mandapam was chosen as the test site in the Gulf of Mannar (Fig. 1). This study was carried out for a period of one year from November 16, 2002 to November 15, 2003. Four types of test panels were used viz., 1) plain Aini wood (*Artocarpus hirsutus*), 2) fibre coated Aini wood, 3) tar coated Aini wood and 4) concrete. The dimensions of the wood-based panels were 20 x 20 x 2.5 cm in length, breadth and width (LxBxW) and the concrete panels measured 20 x 20 x 1.25 cm.

An underwater biofouling panel suspension system was established (Marimuthu *et al.*, 2004) at the study site in the coastal waters at Pudhumadam for observing the attachment and accumulation of macrofoulers (Fig.1). The panels were vertically submerged under water at 2 meters depth where the total depth was 4 meters and the distance from the shore

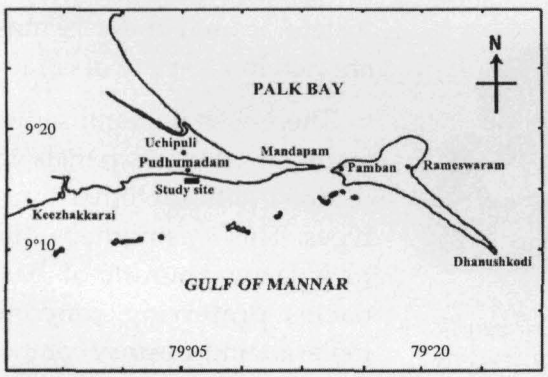

Fig. 1. *Biofouling study site at Pudhumadam coast*

was 60 meters. They were suspended vertically in such a way that one side of the panel was facing seaward and the other to the shore. Observations on the macrofoulers settled on both sides of the panels were made. The location of the biofouling test site was recorded using a Garmin model 12XL GPS (Lat. 09° 16.246′ N., Long. 78° 59.847′ E.).

A set of panels with duplicates of each type was immersed in the beginning (November 16, 2002) of the study period and new sets were added at fortnightly intervals. Thus, a total of 192 panels were immersed during the course of one-year period. At the end of the study period (November, 2003), all the panels were collected simultaneously and analyzed in the laboratory. Setting up and retrieval of the panels were done by SCUBA diving. The first set of panels immersed in the beginning would have been in the water for one whole year and the last set only for one fortnight. Immediately after retrieving the test panels, those, which contained coral recruits, were labeled and washed in fresh water. The panels were then sun dried and all surfaces were searched for coral recruits. Surface area covered by corals was calculated following English *et al.* (1997).

Results and discussion

The study revealed that only one type of encrusting coral belonging to the family Acroporidae (*Montipora* sp.) was observed in the panels. Occasionally, encrust of this coral was also found on an oyster shell, *Crassostrea* sp, attached to the foul-

ing panel. Attachment was noticed only on the seaward side of the panels. (Fig.2). The different types of test panels containing the coral, the surface area covered and the percentage covered on the substratum are presented in Figure-3. The coral settlement was observed in the wood, tar coated and fibre coated panels suspended during March. Maximum surface area covered (61.6cm^2) was on the fibre coated wood panel and minimum (7.3cm^2) on the oyster shell attached to the tar coated wood panel. These corals occupied only 2% of the test panels. All the test panels were retrieved in November 2003. The settlement and subsequent growth of these corals should have occurred between March and November 2003. This indicated that the spawning season of this coral is around the same period. Harrison (1993) has also reported that coral spawns during the full moon period between October and December.

Although the depth, orientation of the substratum and competition with other organisms are factors which affect the recruitment rate of hard corals (Banks and Harriott, 1996) the availability of coral spawn in a nearby location should also be considered. In the present case, the attachment of these corals on the seaward side of the test panels, indicated that the currents, the monsoon wind and wave action would have transported the larvae from the nearby Hare and Mulli islands, situated only 5 km away from the site. The waters around these islands are rich in a variety of corals.

There was no coral settlement on concrete panels in contrast with the other three types. This was perhaps due to a large amount of barnacles preferring concrete material and posing competition for the attachment of

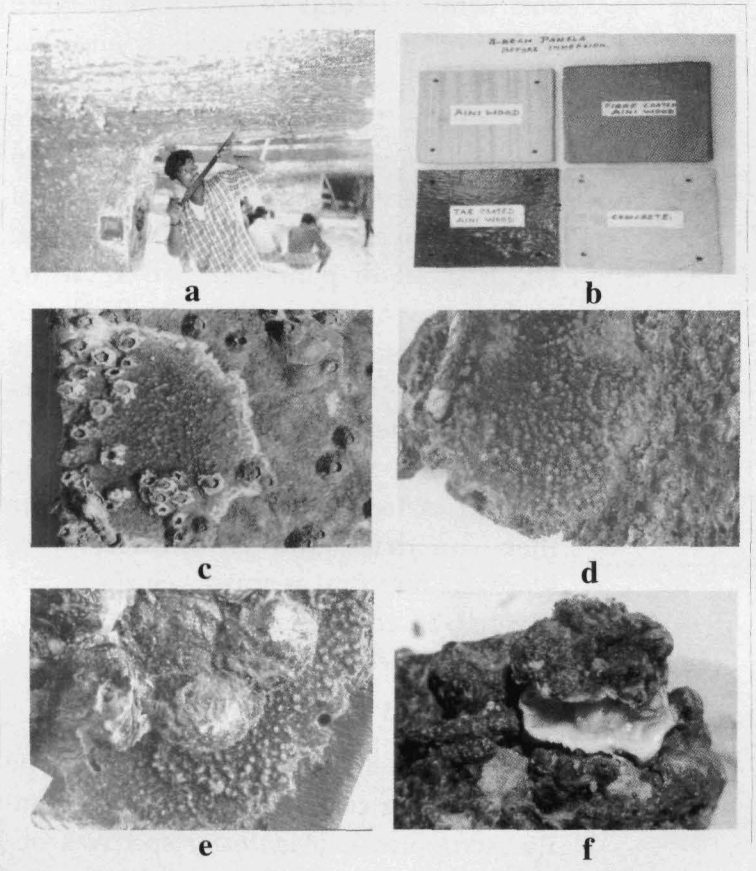

Fig. 2. (a) *Clearing Biofoulers from a boat, (b) Fresh panels, (c, d & e) Encrusting form of* Montipora sp. *(f). Encrusting* Monitipora *sp. on oyster shell*

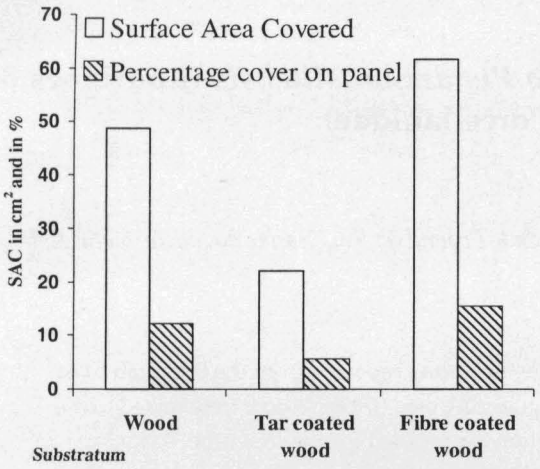

Fig. 3. *Surface Area Covered (SAC) by encrusting form of coral on biofouling panels*

other organisms including the corals. Mundy (2000) has also indicated that successful recruitment of corals depends on competitive interactions with other sessile organisms such as sponges, ascidians, bryozoans, etc. In general, corals are known to seek locations where there will be good light penetration, availability of clean, clear and warm water. Babcock and Smith (2000) have indicated that suspended sediments and silt in the water column may affect the coral population and symbiotic organisms by reducing light availability for photosynthesis. However, Pudhumadam coastal waters with rocky shoreline are relatively less disturbed and the location of biofouling test panel system about 60 meters away from the shoreline might have given the conducive conditions for the settlement of coral larvae of the encrusting form. However, the fact that only 2% of the test panels could be occupied by the coral and that too an encrusting form which indicated that they face stiff competition from other biofoulers such as barnacles, polychaetes and bivalves.

References

Babcock, R. and L. Smith. 2000. Effects of sedimentation on coral settlement and surviourship. *Proc. Ninenth Int. Coral Reef Symp.* Bali, Indonesia. 23-27 October 2000. **1**:245-248.

Banks, S.A. and V.J. Harriott. 1996. *Coral Reefs* **15** (4): 225-230.

Callow, M.E. 1999. The Status and Future of Biocides in Marine Biofouling Prevention. *In:* Fingerman, M., Nagabhushanam R. and Thompson M.F. (Eds.). Vol.3: 109-126. *Recent Advances in Marine Biotechnology; Biofilms, Bioadhesion, Corrosion and Biofouling* (vol.3). Oxford & IBH Publishing Co. Pvt. Ltd. 312pp.

English, S., C. Wilkinson and V. Baker. 1997. Survey manual for Tropical Marine Resources. Second edition. Australian Institute of Marine Science. 390pp.

Harrison, P.L. 1993. *Search,* **24**: 45-48.

Marimuthu, N., J.J. Wilson, B. Muthuraman, S. Magesh and A.K. Kumaraguru. 2004. *Seaweed Res.Utiln.,* **26** (1&2): 41-46.

Mundy, C. N. 2000. *Coral Reefs,* **19**: 124-131.

Prabhakar, Ch.V. and L.M. Rao. 2000. *Poll. Res.,* **19**(2): 271-277.