

## A DEVICE FOR BIOFOULING STUDIES IN ESTUARIES IN RELATION TO THE TIDAL CYCLE

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### ABSTRACT

A device developed for studying the bio-ecological processes in an estuary in relation to the tidal flow is described here. The deployment of this device could provide continuous and reliable data which will, not only minimize the field trips and economise the cost of the project, but would also help in modelling of the estuarine environment. The results of a trial made in the Mandoyi estuary are also given.

**Key-words :** Biofouling, tidal cycle, device, estuaries.

The estuaries have been the topic of scientific investigations due to various reasons such as cyclic rhythm of the tidal flow, their role as breeding ground for commercially important organisms, proximity to the human activity, etc. However, most of the attempt have been concentrated so far on the complete cycle of tidal flow without differentiating between the incoming and outgoing tidal flows. It was thought appropriate to devise some means so as to differentiate between the impact of tidal flow on the various bio-ecological processes. Hence, a device has been developed to assess the bio-deterioration of material and described.

The device consists of a rectangular frame of PVC rods (Fig. 1). The basal end of the frame has the circular plastic disc at the centre of which an arrangement for fixing up the experimental panel is provided. On either side-arms of the frame is a pair of sliding clamps which hold in between them a pair of perforated plastic beakers. These beakers are fixed one above the other and the lower one is covered with the plankton cloth of suitable mesh size so as to prevent the entry of the fouling organisms. The base of this assembled beakers is attached to a PVC rod of sufficient length so that the other end of it extends well beyond the horizontal arm of the frame. To this end are attached a pair of cup-like structures which in turn are fixed base to base.

The operation consists of suspending the device horizontally at a suitable depth. The end of the frame having a basal disc is so oriented that the experimental panel is exposed either to incoming or outgoing tide. Thus, if the end of the frame having an experimental plate is towards the seaward tide, the plate will remain exposed during the flooding tide. But it will remain covered by the paired perforated beakers with plankton cloth during the receding tide. However, the plate will be surrounded by water throughout the

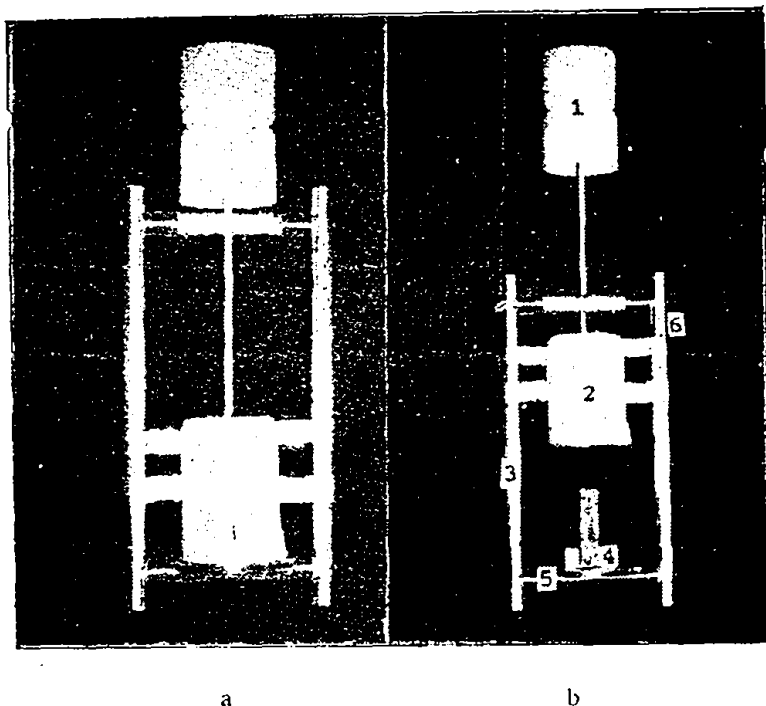


Fig. 1. Device (a) in closed condition and (b) in open condition: 1. Plastic beakers fixed base to base 2. Perforated plastic beaker with plankton cloth 3. Rectangular frame 4. Point for fixing experimental panel 5. Basal disc 6. Slots for adjusting the movement of the perforated plankton beaker.

period of suspension though it may be devoid of planktonic larvae. The alternate exposure is achieved by the impact of water-movements, incoming as well as outgoing, on the beakers that are fixed base to base. Alternately, if the device is turned through  $180^\circ$  i.e. the basal plate having experimental panel is placed towards the leeward side, the panel will then be exposed during the receding tide and covered during the flooding tide.

Thus the device could be helpful in finding out the settlement that takes place either during the high or low tide. The device used in pair show the settlement of fouling organisms during the complete tidal cycle.

In order to test the device in the field, it was exposed for operation in the Mandovi Estuary, Goa (about 4 km from the mouth). The device was fixed up with wooden panels (*Mangifera indica*) and the set was maintained at 1.5 meters below the mean low tide level. In addition, a control panel was also exposed at the same depth.

Earlier it was ascertained in the laboratory that the optimum current speed to make the device operational was 8-10 cm/sec. The current flow at the experimental site is reported to be (at the rate) 60 cm/sec during low tide and 13-22 cm/sec during high tide (NIO technical publication, 1979).

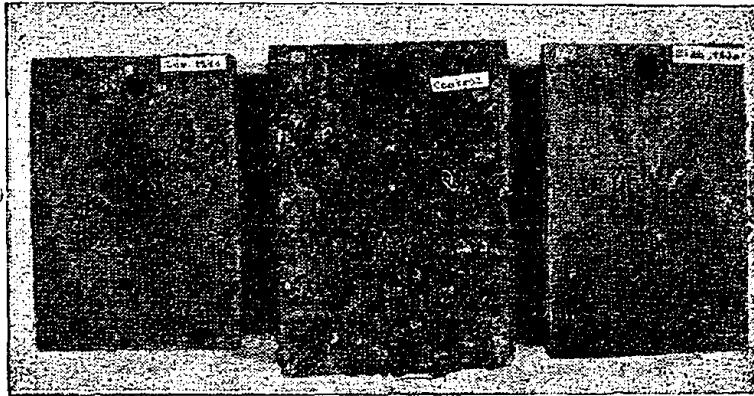


Fig. 2. Settlement on experimental panels.

Table I. Data on biofouling obtained by the use of device and the control panel.

	High Tide	Low Tide	Control
Biomass (g)	0.240	2.800	11.370
Area covered (%)	7.2	13.27	66.33
Barnacle (sq. cm)	14.198	30.73	86.16
Encrusting (sq. cm) bryozoa	0.49	—	44.42
Oyster (sq. cm)	0.70	—	—
Serpulid (sq. cm)	—	—	0.31

The panels were exposed for a period of 30 days (21st December 1983 to 21st January 1984). It was found that the settlement on the panels exposed only during the low tide was more than that on the panels exposed during the high tide. The control panels showed a higher rate of settlement than experimental panels (Fig. 2). The details about the weight of organisms settled on these panels are given in Table I. The dominant fouling organisms found on all the three panels were the sessile barnacles and encrusting bryozoans. One specimen of oyster was also found on the panel exposed during the high tide. The serpulids were found on the control panels only.

The biomass values of fouling assemblages indicate that the period of the low tide was more conducive for settlement. The bryozoans and oysters were found only on the panels exposed during the high tide. The settlement of barnacles was more on the panel exposed during the low tide. These observations indicate that, this device is useful for studying the quantitative and qualitative differences in biofouling of material exposed in the marine environment.

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**REFERENCES**

N.I.O., 1979 Master plan for pollution control of the rivers Zuari and Mandovi. Tech. Report 02/79.