

Biofoulers on aluminium and stainless steel panels at Vijaydurg harbour, central west coast of India

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Occurrence of cirripede larvae in the water column and their settlement on the panels throughout the year showed that barnacles were the prolonged breeders. Fluctuations in the salinity values appear to have affected the settlement on the panels. Depth dependent changes were not significant in the settlement of fouling organisms. Algal settlement was confined to subsurface waters only.

Fouling organisms exhibited wide temporal and regional variations which are governed mainly by hydrographical conditions and geographical locations¹⁻³. Oyster settlement is less at Mangalore waters due to the long quiescent periods after the oogenic activity⁴. On the other hand faster maturity and reproduction enhance the settlement of bryozoans⁵. The present study has been carried out at Vijaydurg harbour which is one of the prospective site along the central west coast of India for power station (16°33'N; 73°20'E). In this paper observations on seasonal variations in the settlement of fouling organisms on 2 types of substrates along with observations on their planktonic larvae in the water column at Vijaydurg harbour are presented and discussed in relation to salinity variations.

Fouling data were collected by immersing commercial grade aluminium and stainless steel panels (10 × 15 cm) at subsurface (1 m) and at nearbottom (5 m) depths using mild steel frames. Panels were cleaned with dilute HCl followed by tap water and distilled water before deployment. Of the 2 sets of panels, 1 set was removed at monthly interval, whereas cumulative panels were retrieved at 2, 3, 4, 5 and 6 months intervals. After retrieval, panels were kept in polythene bags with 5% formalin for qualitative and quantitative analyses of the fouling assemblage.

Zooplankton was collected every month, using Heron Tranter plankton net (mesh size 100 µm) fitted with a TSK flow meter, to observe the abundance of fouling larvae in the water column. Salinity was monitored by following standard procedure⁶.

Fig. 1(A) shows the variations in the values of salinity at the site. Salinity values ranged between 16.28 to 37 × 10⁻³ at subsurface and 23.5 to 38 × 10⁻³ at nearbottom depth. In general the salinity

was low during monsoon suggesting the dilution effect due to river discharge.

Incidence in terms of percentage composition of fouling zooplankton larvae showed that the cirripede larvae were present throughout the study period (Fig. 1B). Composition of cirripede larvae varied from 2.39-29.58%, whereas it varied from 1.26 to 12.31% and 0.08 to 1.17% respectively for lamellibranch and bryozoan larvae. The numerical abundance of cirripede, lamellibranch and bryozoan larvae was in decreasing order.

Monthly monitoring of both aluminium and stainless steel coupons showed that barnacle settlement occurred throughout the year. The 2 dominantly prevailing species were *Balanus amphitrite* and *Megabalanus tintinnabulum*. The other species observed at this harbour were *Balanus variagatus* and *Cthamalus malayensis*. The growth rate of barnacles for the 30 days exposure period varied from 1.5 to 15 mm. Hydroid settlement was observed throughout the year. Bryozoans were absent during monsoon, whereas they were abundant from October to December 1989. The colonies of *Hippoporina indica* and *Membranipora* species were prevalent along this coast. The other species observed at this station were *Bugula neritina*, *Scrupocellaria* and *Electra*. Bryozoan growth varied from 3.1-28.9 mm diameter. Bivalve and polychaete settlement were less as compared to the other fouling organisms. Oyster size varied between 1.55 and 8.99 mm. Bivalves encountered on the panels at this station were *Crassostrea gryphoides*, *Perna viridis*, *Modiolus* sp. and *Littorina* sp. Algae were recorded throughout the year on the monthly panels deployed at subsurface waters (Fig. 2D). The species encountered were *Enteromorpha intestinalis*, *E. tubulosa*, *E. linza*, *Cladophora glomerata*, *C. fasciculata*,

Lyngbya majescula, *Ectocarpus siliculosus*, *Ulva rigida*, *U. fasciata* and *Giffordia sandrina*. Algal settlement was confined to subsurface only.

Not much variation was observed at the 2 depths studied ($P > 0.005$) except in May during which the biomass was comparatively higher at the near bottom on aluminium and stainless steel panels, than at the subsurface (Fig. 2A, B).

Abundance of cirripede larvae in the water column and the settlement of barnacles on the panels throughout the year show that as a group it is a continuously breeding organisms which can tolerate a wide range of fluctuations in the hydrographical parameters. Increase in the abundance of cirripede larvae and its heavy settlement on the panels along with an increase in salinity indicated that this parameter influences the release of cirripede larvae and its adhesion to the substrate at this station. The settlement of barnacles was found throughout the year at Visakhapatnam, Madras, Cochin, Mangalore, Karwar and Bombay waters^{4,7-9}. This indicates that

barnacles can tolerate wide range of fluctuations in salinity. Peak settlement of barnacles at all the above stations was reported during high salinity periods. This indicates that salinity was one of the major factors which controls the settlement of barnacles. Bryozoan settlement and growth were mainly confined to the period from Nov. '89 to Jan. '90. However, *Hippoporina* sp. was observed during most of the period of study. This indicates that *Hippoporina* sp. could tolerate fluctuations in salinity values and can be considered as a euryhaline species.

Though, in general the extent of settlement of oysters on the panels was less, their occurrence was comparatively higher than barnacles. This shows

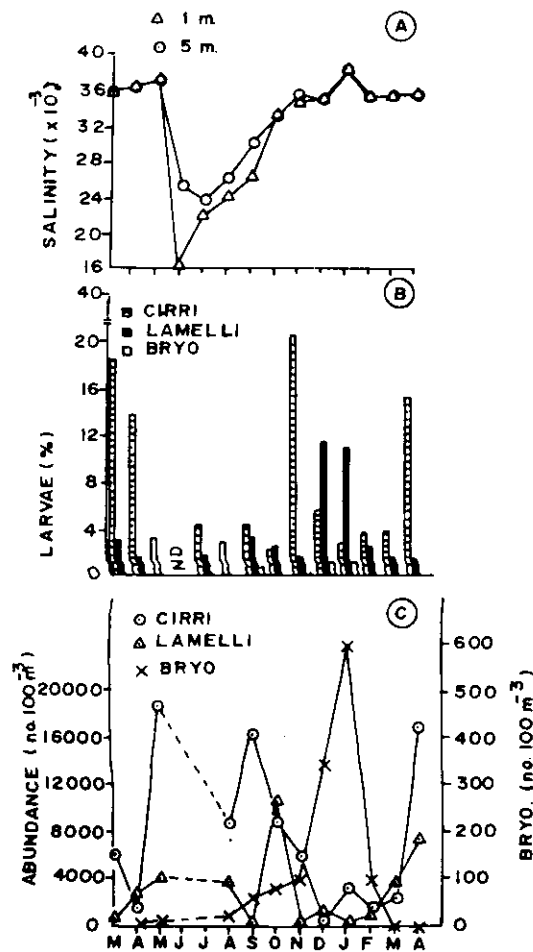


Fig. 1—Monthly variations of salinity (A), percentage composition of fouling zooplankton larvae (B) and abundance of fouling zooplankton larvae (C)

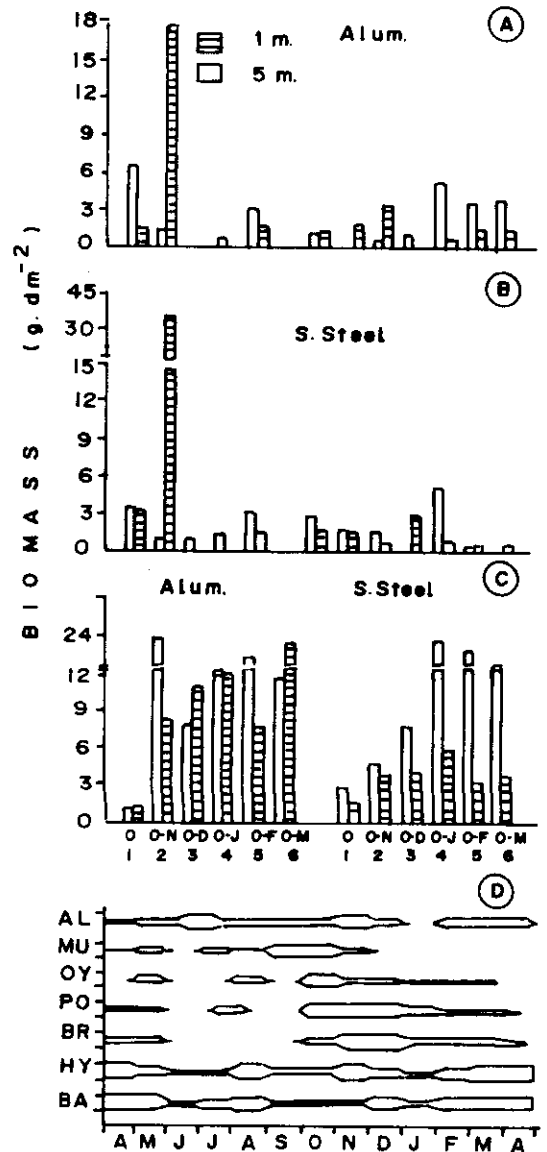


Fig. 2—Variations of total fouling biomass on monthly (A-B) and cumulative panels (C) and abundance of fouling organisms (D) [AL = algae, MU = mussels, OY = oysters, PO = polychaetes, BR = bryozoans, HY = hydroids, BA = barnacles]

that competition for space controls the growth and settlement of oysters as reported earlier⁴.

There were no depth dependent variations in the biomass values. But in case of algae depth dependent changes were observed. The algal settlement as expected was confined to subsurface waters only. Substrate selectivity was observed in case of bryozoans and barnacles. Bryozoans preferred to settle on stainless steel panels, whereas barnacles settled on aluminium panels. This shows that type of material plays an important role in the settlement of fouling organisms⁹.

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