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Preliminary Account on the Intensity of Fouling in Karwar Waters

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Biology of fouling in Karwar waters is presented. The composition of fouling communities, their fluctuations in relation to hydrographical factors such as temperature, dissolved oxygen, salinity and the influence of the nature and texture of the substratum on fouling communities are discussed.

In recent years, considerable attention is being paid towards the study of fouling organisms which attach on to all kinds of structures in saline waters causing serious problems to the submerged timber structures, piles, pillars, buoys and the hulls of watercrafts. While information is available on the fouling organisms of the other Indian regions, (Palekar & Bal,1957; Ganapathy *et al.*, 1958; Antony Raja, 1959; Nair, 1965, 1967; Nair, 1967 b; Menon & Nair, 1971; Menon *et. al.*, 1970). Virtually nothing is known on this important group from the Karwar waters.

It is in this context, an attempt has been made to study the composition of the fouling organisms of Karwar, their distribution and differential seasonal abundance.

Karwar bay (14° 48′–51′N and 74° 06′E) (Fig. 1) is an outpush of Arabian sea with Kali river emptying into it on the northern side. During the south – west monsoon period which begins in early June, the bay waters get diluted with rain water and estuarine discharge, decreasing the salinity and temperature but increasing the turbidity. Based on the influence of the monsoon, the year can be distinguished into three well-defined periods, the pre-monsoon (Feb–May), monsoon (June–Sept.) and the post-monsoon period (Oct.–Jan).

The two stations selected (Kodibag and Baithkol) were 5 km from each other and represent two different ecological habitats. Kodibag is situated at the Kali river mouth and Baithkol, is located to the south of the bay taking an incurve from the inshore waters (Fig. 1). Owing to the intense operation of fishing vessels, this locality is subjected to pollution with lube oil and organic matter. The depth vary from 5–8 m and 6–8 m for stations 1 and 2 respectively in between the tidal shifts.

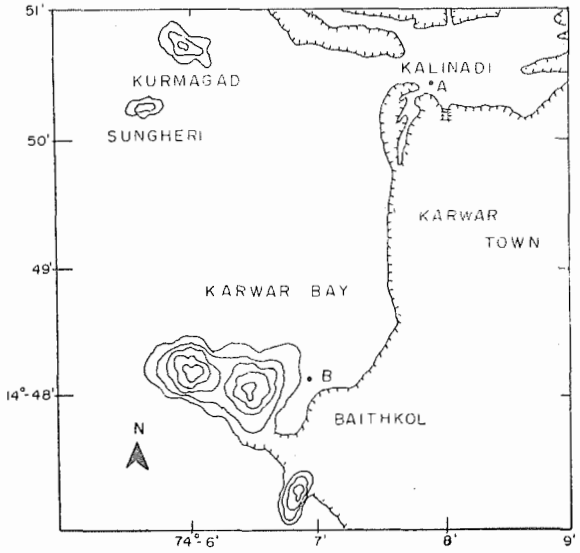

Fig. 1. Karwar bay showing test sites Kodibag (A) and Baithkol (B)

Material and Methods

Racks (60 x 30 cm) with fixed glass panels (15 x 10 cm) were suspended in the water at a depth of 4 m at both the stations. Fortnightly data were collected for seven months from March to September 1979, from smooth and rough glass panels immersed vertically. The observations and analyses of the physico-chemical parameters were performed by standard methods (Salinity–Mohr Knudsen method, Oxygen-Winkler method, Temperature–Thermometry and vertical extinction co-efficient by S. D. reading/0.95).

Table 1. *Settlement of fouling organisms in Kodibag (Station 1)*

		Balanus				Oysters				Polychaetes				Bryozoans			
		A		B		A		B		A		B		A		B	
		a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
March	1.	61	51.69	61	51.69	2	1.69	2	1.69	45	38.14	45	38.14	10	8.47	10	8.47
	2.	63	62.94	65	51.57	1	0.99	4	3.18	30	29.97	46	36.51	9	8.99	11	8.71
April	1.	63	46.67	63	46.67	3	2.22	3	2.22	62	45.82	62	45.82	7	5.19	7	5.19
	2.	58	44.62	67	45.27	3	2.31	6	4.05	61	46.92	65	43.91	8	6.16	10	6.76
May	1.	45	48.91	45	48.91	1	0.00	0	0.00	40	43.48	40	43.48	7	7.61	7	7.61
	2.	41	44.57	46	46.47	1	1.09	3	3.03	41	44.57	41	41.42	9	9.78	9	9.97
June	1.	40	72.56	40	72.56	0	0.00	0	0.00	9	16.36	9	16.36	6	10.91	6	10.9
	2.	38	76.00	48	74.99	2	4.00	0	0.00	7	14.00	7	10.93	3	6.00	9	14.06
July	1.	41	93.17	41	93.17	0	0.00	0	0.00	3	6.83	3	6.83	0	0.00	0	0.00
	2.	36	100.00	28	87.50	0	0.00	0	0.00	0	0.00	4	12.50	0	0.00	0	0.00
August	1.	1280	99.77	1280	99.97	1	0.11	1	0.11	2	0.22	2	0.22		0.00	0	0.00
	2.	1664	99.84	1320	99.63	0	0.00	1	0.05	1	0.08	2	0.16	1	0.08	2	0.16
September	1.	1250	99.97	1250	99.97	1	0.11	1	0.11	0	0.00	0	0.00	2	0.22	2	0.22
	2.	1300	99.93	1340	99.63	0	0.00	1	0.07	0	0.00	0	0.00	1	0.07	4	0.30

A = Short term panel; B = Long term panel; a = Frequency of occurrence; b = Relative frequency of occurrence (%); 1 = Ist fortnight; 2 = IInd fortnight

viridis on the panels. However, it is generally known that the dissolved gases and nutrients have a great effect on fouling organisms. Only a marginal fluctuation in oxygen content was observed at station 2 exhibiting the relative stability of the water column.

Turbidity increases due to silt, detritus and particulate matter in the medium, reducing the penetration of light and preventing the attachment of fouling organisms to a greater extent (Nair, 1965). Corresponding values of the extinction co-efficient are enumerated in Table 3. Turbidity increased considerably in the monsoon season and more so in the estuarine region because of heavy influx. The settlement of fouling organisms depended on the primary profile of micro-foulers, whose growth intensity in turn affected by high turbidity, prevented the colonisation of successive foulers on the panels.

Based on the tests conducted and results obtained, it was seen that the colour and texture of the substratum had great effect on the attachment of fouling community. Although rough glass panels provided a better substratum for the attachment of foulers, their grey colour affected the attachment but a relatively greater number of fouling organisms was noticed over the smooth and transparent glass panels.

In the fortnightly and monthly records of fouler settlement (Table 1 and 2) at least two variants of the *Balanus amphitrite* could be recognised. The oyster community on the panels, comprised of two species namely *Crossostrea madrasensis* and *C. gryphoides*. *Sebellaria spinulosa* and *Pomatoceros triquetor* were amongst the common polychaetes that were found interspersed on the panels, while bryozoans were represented by five dominant species namely *Bugula cucullata, Alderina arabianensis, Schizoporella cochinensis, Nolella papuensis* and *Bowerbankia imbricata,* the hydroids were composed of as yet unidentified species.

Except for a decline in the population during the monsoon season, the barnacles were found to occur throughout the period of study. Their attachment slowed on immediately after the monsoon and showed peak settlement during January–April.

During the monsoon season there was no attachment of oysters whereas in the pre-monsoon there was fairly good attachment at both the stations. The fouling intensity was more conspicuous on long term panels than on short term ones.

The settlement of bryozoans was heavy in the estuarine region during the pre-monsoon and was absent during the monsoon while at station 2 they were sparse.

The two species of polychaetes encountered in the Karwar waters were totally absent during the monsoon period with peak settlement in station 1 during the pre-monsoon while at station 2 they appeared only after monsoon.

The colonial hydroids were the predominant pioneer fouling animals which formed a base for the settlement of other fouling communities over the panels. The general trend of the two species encountered was increase during the pre-monsoon and decrease in the monsoon respectively.

The present study has taken into consideration, the intensity of fouling organisms during March–September. The stations studied were unique in the sense that there was heavy fluctuation in salinity and temperature (station 1) and moderate pollution caused by oil and dredging (station 2). The intensity of fouling ranged in relation to the hydrographical conditions. The number of fouling species occurring in the Karwar waters is very much less compared to other places along the Indian coast especially, Madras and Vishakapatnam. This may be due to more stable hydrographic conditions prevailing in the latter places. This may also be due to the lesser rain fall along the east-coast inshore than over the areas of the present study where the coastal waters are very much diluted on account of the ingress of freshwater. Similar results have also been obtained in the case of Cochin harbour (Cheriyan, 1966). Of the various species of fouling organisms *Balanus sp.* constituted the most important component of the fouling community of Karwar as was found for other regions.

The settlement period of barnacles at the different harbours revealed the following trends. While peak settlement occurred during April and May in Vishakapatnam, it was in May, and October to December at Cochin harbour (Nair, 1965). In Mangalore waters, the foulers were found to be abundant during the pre and post-monsoons (Menon & Nair, 1971) and as far as the experiments reveal, heavy settlement occurred during August–September in Karwar waters. However, the settlement of barnacles occurred throughout the period of study in the Karwar region. Occurrence of oysters was during April and May in Madras coast (Paul, 1942) and during August and September in Karwar while in Mangalore waters they settled throughout the year. The settlement of bryozoans along Karwar was during March, April and May whereas it was in July, August in Cochin. However, the settlement of polychaetes resembled that of barnacles and was found to decrease during the monsoon.

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