

### Short Communication

## Ecology of ascidians in the macrofouling community of New Mangalore port

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Ascidians constitute a major component of macrofouling community at the New Mangalore port during the premonsoon season (February-May). The presence of ascidians in these waters is being reported for the first time. A scidian recruitment was not observed during monsoon season (June-September). At this locality salinity does not drop substantially during monsoon months and hence the absence of ascidians during monsoon cannot be attributed to salinity stress. The only striking change in the environmental parameters during monsoon months was the increased suspended load (turbidity) and this may be one of the controlling factors in the recruitment of ascidians in this area.

Ascidians form an important group of fouling organisms but studies related to this group of fouling organisms from Indian waters are very limited<sup>1-5</sup>. As a part of the ongoing programme to evaluate macrofouling, different localities along the coast of India have been monitored<sup>6,7</sup>. This paper deals with the monthly distribution of ascidians in relation to some environmental parameters at New Mangalore port waters.

Study was carried out at New Mangalore port (12°56'N; 74°48'E), from March 1992-March 1993. Two stations namely oil jetty (st. 1) and ore jetty (st. 2) were selected for panel exposure. The water depths at st. 1 and st. 2 were about 4 m and 8 m (during high tide) respectively. Possible effect of oil and ore spillage at the respective sites was the basic criteria for selecting these stations for the study. Hydrographic parameters (water temperature, salinity, dissolved oxygen, pH and suspended load) were estimated at monthly intervals at both the stations using standard methods<sup>8</sup>.

Fiberglass panels (10 × 15 × 0.3 cm) were fixed to fiberglass bars with the help of PVC nuts and bolts. Minimum panel exposure was for 1 month duration. The panels were suspended vertically in duplicate facing each other. After retrieval, the panels were fixed in 5% formalin. The exposed side (side 'A') and the inner side (side 'B') of the panels were evaluated for the area covered by each ascidian species. The area covered was measured with the help of vernier callipers.

The results of the environmental parameters collected from sub-surface and near-bottom from each station have been pooled together and the means are presented in Table 1.

Seven species of ascidians were observed in the macrofouling community viz. *Symplegma viride*, *Diplosoma macdonaldi*, *Diplosoma listerianum*, *Botryllus schlosseri*, *Perphora listeri indica*, *Polyclinum indicum* and *Styela bicolor*. Their recruitment occurred only during the premonsoon (March-May) and postmonsoon (Dec.-Jan.). There was no settlement during the monsoon and postmonsoon (Oct.-Nov.) months. Settlement was quite high during the premonsoon months as compared to postmonsoon (Dec.-Jan.) months at both these stations (Table 2). Monthly settlement of ascidians at st. 2 was quite intense with covered area varying between 38 to 79% (April 1992). *S. viride* preferred to settle on the inner side of the panel and could colonize the entire panel. However, it was not found to inhabit the exposed side to a great extent. Application of one way ANOVA to the colonization of ascidians (% cover) revealed that the pattern varied significantly even in these very closely located stations ( $F_{(1,102)} = 6.509$ ,  $P = 0.012$ ).

A perusal of literature<sup>9</sup> indicates that 45 species of ascidians have been reported so far from Indian waters. The ascidians encountered during the present study are being recorded for the first time from Mangalore waters and, thus form a new locality record.

Table 1—Monthly variations in the environmental parameters

Parameters	1992											1993	
	March	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	March
	Oil jetty												
Temp. (°C)	27.25	28.00	29.00	30.00	24.00	21.50	21.60	25.75	27.00	25.00	24.00	26.25	26.00
Sal. ( $\times 10^{-3}$ )	34.85	34.99	34.86	34.57	36.05	32.74	35.02	34.10	34.31	35.58	34.60	36.09	36.64
Diss. O <sub>2</sub> (ml. l <sup>-1</sup> )	3.92	3.75	3.89	4.12	4.11	3.08	2.78	3.02	2.61	3.94	4.24	4.23	4.09
pH	7.50	7.80	7.90	7.75	7.90	8.05	7.95	8.15	8.15	8.40	8.05	8.10	8.30
Susp. load (mg. l)	0.39	0.05	0.14	0.13	0.04	0.04	0.03	0.04	0.03	0.03	0.04	0.03	0.04
	Ore jetty												
Temp. (°C)	28.00	28.00	29.00	30.50	23.75	21.15	21.25	26.00	26.40	25.00	23.75	25.75	25.25
Sal. ( $\times 10^{-3}$ )	34.07	35.00	35.38	33.46	34.32	32.62	35.15	36.10	34.91	36.49	34.43	35.34	34.44
Diss. O <sub>2</sub> (ml. l <sup>-1</sup> )	3.59	3.88	3.55	3.15	2.46	3.03	2.87	2.96	1.43	3.30	3.88	4.38	3.69
pH	7.60	7.95	7.90	7.90	8.00	8.05	7.75	8.15	8.05	8.45	8.10	8.15	8.25
Susp. load (mg. l)	0.39	0.04	0.05	0.12	0.05	0.03	0.04	0.04	0.04	0.03	0.04	0.04	0.24

Table 2—Monthly variations in percentage cover of ascidians on aluminium panels

Months	Oil jetty				Ore jetty			
	A	B	A	B	A	B	A	B
March '92	1	44	16	98	33	27	45	17
April	60	91	87	100	79	58	51	38
May	100	100	53	64	PL	PL	—	—
June	—*	—*	—	—	—	4	8	—
July	—	—	PL	PL	—	—	—	—
Aug.	—	—	—	—	—	—	—	—
Sept.	—	—	—	—	—	—	—	—
Oct.	—	—	—	—	—	—	—	—
Nov.	—	—	—	—	—	—	—	—
Dec.	—	1	—	—	—	—	—	—
Jan. '93	—	38	2	15	—	—	—	—
Feb.	9	57	10	4	—	—	2	—
March	—	87	44	100	27	27	19	10

A = Exposed side; B = inner side; — = no settlement; PL = both panels lost; \* = one panel lost

Earlier work by Menon *et al.*<sup>10</sup> on annual cycle of fouling organisms at New Mangalore Port reported oysters, barnacles, bryozoans and hydroids as the dominant fouling organisms, but ascidians were not observed in this region. Menon *et al.*<sup>10</sup> made the study during Nov. 1973–Oct. 1974 when the commissioning of the port (Jan. 1974) had just begun. This process might have led to the change in environmental characteristics of the locality. The then 25 m wide connection with the open sea had been widened to 500 m with a sill depth of 15 m. This process could have possibly changed the environment to one which is more conducive for ascidian recruitment.

One of the most likely source for the introduction of the ascidians could be the emigrants brought in by the shipping activity<sup>11</sup>. Though fouling organisms can be dispersed by larval dispersion, such a

possibility in case of ascidians is remote as the lecithotrophic larval development of ascidians lasts only for a few hours. From these observations it is evident that the biodiversity at New Mangalore Port has changed considerably since its commissioning.

The recruitment of ascidians was not observed during monsoon season. Similar observations have been made earlier at Goa<sup>6</sup> and Bombay<sup>12</sup>. Barnes<sup>13</sup> stated that fouling in tropical waters is an year-round phenomenon except for localities which were influenced by fresh water run off. Ascidians are exclusively marine and generally unable to survive in low salinities<sup>9</sup>. In this context it is to be noted that at New Mangalore Port salinity does not drop substantially during the monsoon months (Table 1), as it does not experience increased fresh water discharge. Hence, the disappearance of ascidians during monsoon months cannot be attributed to variations in salinity. The only striking environmental change during monsoon months was the increased turbidity (Table 1). Swami and Karande<sup>12</sup> also attributed increased turbidity as the probable factor for the lack of ascidian settlement during monsoon months.

The ascidian settlement occurs only during the late postmonsoon and premonsoon months. Such clear seasonality in settlement can only be possible if there is fresh introduction of larvae every year. Ascidians under unfavourable conditions break down, lose their shape and form a heap of cells, a process which is referred as dedifferentiation<sup>14</sup>. These cells differentiate into adults on the return of favourable condition. This capacity of ascidians to overcome unfavourable conditions might be aiding such clearly demarcated seasonality in their recruitment to fouling community.

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