

## SOME OBSERVATIONS ON THE BIOLOGY OF *BALANUS AMPHITRITE* D. FOULING THE CULTURED GREEN MUSSEL IN GOA WATERS

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### ABSTRACT

Observations on the biology of the barnacle *B. amphitrite* D. in relation to environmental parameters in Goa waters revealed that salinity, temperature and phytoplankton count were the main factors influencing its settlement, growth and breeding. The animal is a prolonged breeder with a peak in May. Recruitment was almost continuous throughout the year associated with a high rate of mortality. Fecundity varied from 3380 to 18700. An average growth rate of 1 mm per month was observed.

During the rope culture of green mussel *Mytilus viridis* L. in Goa, fouling was observed in varying intensities (Qasim, Parulekar, Harkantra, Ansari and Nair, 1977). One of the important fouling organisms was the barnacle, *Balanus amphitrite* D. which readily settle on mussels. Although it is not a serious problem but can lead to stunting growth of mussels if the settlement becomes heavy. Hence it was felt desirable to study the biology of this barnacle settled on the mussels with a view to obviate the fouling problem.

The barnacle specimens were scrapped from the shells of the mussels at fortnightly intervals from February-December 1976. Sampling for relevant environmental parameters was also done simultaneously. Length (base to apical region) and the basal diameter (latero-lateral distance along the base) measurements were recorded by means of vernier callipers, accurate upto 0.01 mm. Measurements were pooled in 1 mm size groups. Gonadal stages and fecundity were studied by standard method (Bagenal, 1975).

Pooled size frequency distribution (Fig. 1) shows the maximum size as 12.5 mm. Poor presence of bigger forms, was probably due to heavy natural mortality or severe competition for space to settle on the shells. As seen, in Fig 1, there were three distinct modes at 3-4 mm, 5-6 mm and at 11-12 mm size.

Fig. 2 shows the average monthly size frequency distribution for the period February-December 1976. It is clear that the mode at 2 mm in March progressively moved to 6 mm in June. Thereafter the mode is not traceable during July-August. The cessation of growth

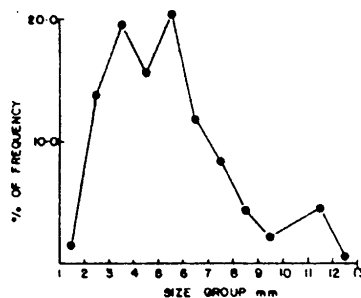


Fig. 1. Percentage of pooled size group frequency of *B. amphitrite*.

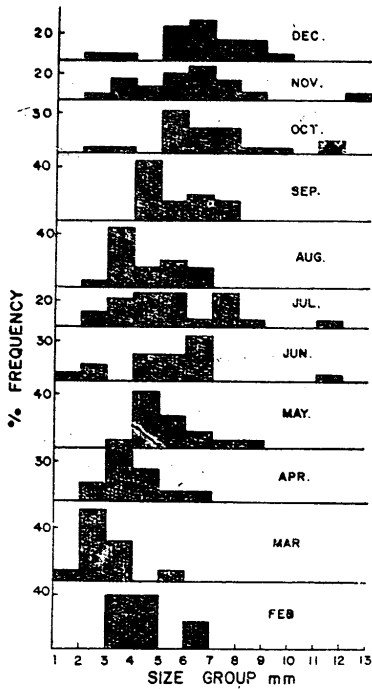


Fig. 2. Monthly percentage of length group frequency distribution of *B. amphitrite*.

during these months of heavy south-west monsoon is due to sudden fall in salinity (Table I), as earlier reported

Table I. Environmental parameters.

Months	Salinity ‰	Temperature °C	Phyto- plankton count n (×10 <sup>6</sup> )/l
Feb.	33.81	28.25	4.10
Mar.	33.86	29.50	3.10
Apr.	32.53	30.35	1.80
May	34.53	29.16	1.90
June	30.95	29.40	0.40
Jul.	13.12	28.50	0.70
Aug.	13.83	26.75	0.79
Sep.	22.09	27.90	7.70
Oct.	30.03	28.35	0.25
Nov.	33.34	29.75	1.80
Dec.	34.19	21.10	5.00

by Iyengar, Krishnan and Kelkar (1957) in Bombay waters. The mode at 4 mm in September gradually moved to 6 mm in November. Except the stunted growth during July-August the growth rate is at an average of 1 mm per month. Besides the low salinity, the rate of growth appears to be affected by the fluctuations in the numerical abundance of phytoplankton (Table I), which is the main source of food for the filter feeders like barnacles.

To study the trends of correlation between different morphometric measurements like length, basal diameter and body weight relevant data were analysed using linear regression and the following equations were derived which shows length and basal diameter relationship to be highly significant ( $r = 0.9291$ ).

$$\log L = 1.5202 + 1.3580 \log W; r = 0.6350$$

$$\log B = 1.8493 + 0.7076 \log W; r = 0.5158$$

$$\log L = 0.8768 + 1.6095 \log B; r = 0.9291$$

Observations were also carried out on the maturation cycle and spawning periodicities of the barnacle by procedure of Patel and Crisp (1960). Minimum size at maturity was observed to be 3 mm at an age of about three months. Females bearing egg pouches were observed in the size range of 3.6 to 10.5 mm. The presence of matured females (Fig. 3) throughout the year indicates prolonged breeding habit of this species. However, intensive spawning was observed during the pre-monsoon period and again during post-monsoon period (Fig. 3), which coincided with high salinity (Table I). Similar observations have earlier been reported by Karande (1965).

Fecundity of *B. amphitrite* D. varied from 3380 to 18700 in a size range of 3.8 to

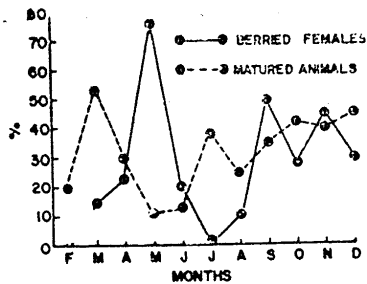


Fig. 3. Monthly percentage of occurrence of berried females and mature animals of *B. amphitrite*.

9.5 mm respectively. To find out the relation between different body measurements and fecundity, the following equations were derived which showed better correlation between length and fecundity.

$$\log F = 3.6435 + 7.0748 \log L; r = 0.5657$$

$$\log F = 1.1535 + 3.1719 \log B; r = 0.4764$$

$$\log F = 1.7429 + 0.7995 \log W; r = 0.1430$$

As seen from Fig. 2 and from the breeding behaviour (Fig. 3), recruitment to the standing stock continues almost throughout the year with a peak in pre-monsoon (Nair, 1965). Goswami (personal communication) has also observed a maximum concentration of cirripede larvae during the pre-monsoon season in the plankton taken from the Goa waters.

Though the recruitment was prolonged, the population size, was moderate and hence it was considered worthwhile to find out the rate of

mortality. Mortality rate was calculated by comparing the abundance of known age groups in successive months (Qasim, 1973). The rate was found to be 0.5518. The main reason for mortality may be fall in salinity during monsoon as also observed by Hutchin (1952); the other reason can be attributed to predation and natural death.

The foregoing account on the biology of *B. amphitrite* shows that the maximum size attained and the rate of growth in these animals are less than that observed elsewhere (Paul, 1942). These differences may partly be due to severe competition for food with the mussels which are also active filter feeders. In spite of prolonged breeding and continuous recruitment, the small sized thriving population indicates high rate of mortality which is due to fall in salinity or predation or limited space available on mussel shells to settle or natural death. This greatly reduces the danger of intensive fouling on cultured mussels.

#### ACKNOWLEDGEMENT

We are grateful to Dr. S. Z. Qasim, Director, N. I. O., Goa, for the encouragement and suggestions on the manuscript. Thanks are also due to Dr. A. B. Wagh, Scientist for assistance in identification and to Shri S. S. Shastri, Scientist for help in the statistical analysis.

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