

MISCELLANEOUS NOTE

13. BIOMETRICAL COMPARISON BETWEEN *BALANUS TINTINNABULUM* L. AND *BALANUS AMARYLLIS* D.

(With three text-figures)

INTRODUCTION

It has been customary in ecological work on barnacles to express their growth in terms of various parameters determined from repeated measurements of the shell (Barnes & Barnes 1959). Such studies of different species, most of them from temperate waters, have been made by various workers. However, there seems to be diversity of opinion regarding the adoption of a standard parameter for comparison. Some have used volume of the shell calculated from height and basal diameters (Moore 1934); some employed area of bases (Costlow & Bookhout 1953, 1956); Mawatari *et al.* (1954a, 1954b); orifice area (Marshall 1955); and others have adopted basal diameter measured through the rostro-carinal axis (Hatton 1938; Barnes & Powell 1953; Barnes 1956, 1958).

In the present studies, an altogether different parameter viz. the rostro-carinal diameter of the apical orifice, has been employed. This parameter has been found to be the most convenient one, to measure during field work. Its utility is further enhanced by the fact that by using this parameter alone, repeated measurements of the same population can be taken over a long period without destroying the individuals.

In order to prove the suitability of this parameter, comparative biometrical studies of two species of barnacles viz. *Balanus tintinnabulum* L. and *Balanus amaryllis* D. have been made. These two species were selected for this purpose because their shells are not so much deformed due to crowding, as was found to be the case in other, small-sized barnacles. In addition, the specimens of both these species are found in the same zone—the lowermost—of the intertidal region, although there are other ecological factors which determine their distribution (Wagh & Bal — in press). The shells of both the species attain fairly large size and were available in sufficient numbers at Bombay.

MATERIAL AND METHODS

The specimens were collected from the field at random. The collection was brought to the laboratory and the shells were cleaned of

the various organisms attached to them. The required lengths were measured to the nearest 0.1 mm. by using Vernier's callipers. The measurements were taken of about 600 individuals of *B. amaryllis* and 1000 those of *B. tintinnabulum*. Each specimen was measured for, rostro-carinal diameter along basis (Fig. 1 RC — BASAL) so also along

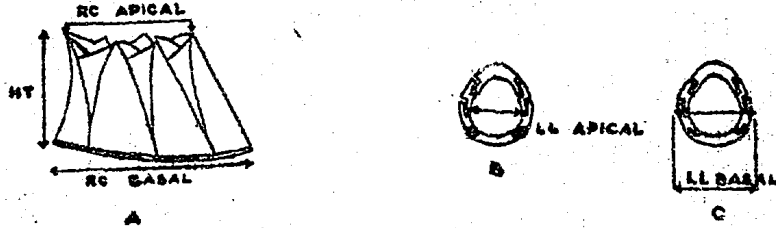


FIG. 1

Fig. 1 Diagrams showing apical and lateral views of barnacle shell explaining the parameters used.

apical orifice (Fig. 1 RC — APICAL), latero-lateral diameter along basis (Fig. 1 LL — BASAL) and apical orifice (Fig. 1 LL — APICAL) and height (Fig. 1 HT). The observations made, were grouped on the basis of rostro-carinal diameter of apical orifice into suitable size groups, the group interval being 1.5 mm.

The relationship between rostro-carinal diameter of the apical orifice and any other parameter is expressed by the equation $Y = a + bX$ where X denotes diameter of the apical orifice measured along the rostro-carinal axis and Y the variable. The values of constants 'a' and 'b' were calculated by the formulae:

$$b = \frac{XY - N\bar{X}\bar{Y}}{X^2 - N\bar{X}^2} \quad \& \quad a = \bar{Y} - b\bar{X}$$

where N = number of size groups.

The regression lines as shown in Figs. 2 and 3 were drawn.

OBSERVATIONS

The regression equation $Y = a + bX$ has the following values in *B. tintinnabulum* and *B. amaryllis*.

Different Parameter	<i>B. tintinnabulum</i>	<i>B. amaryllis</i>
Height	$Y = 9.7 + 1.0964 X$	$Y = 5.2 + 1.3031 X$
Rostro-carinal Basal diameter.	$Y = 14.2 + 1.6822 X$	$Y = 15.1 + 1.5301 X$
Latero-lateral Basal diameter.	$Y = 18.0 + 1.2610 X$	$Y = 12.8 + 1.6020 X$
Latero-lateral Apical diameter.	$Y = 3.5 + 0.7032 X$	$Y = 1.5 + 0.7009 X$

It may be seen that the regression coefficients for parameters rostracarinal basal and latero-lateral basal are more in *B. tintinnabulum* than those in *B. amaryllis*.

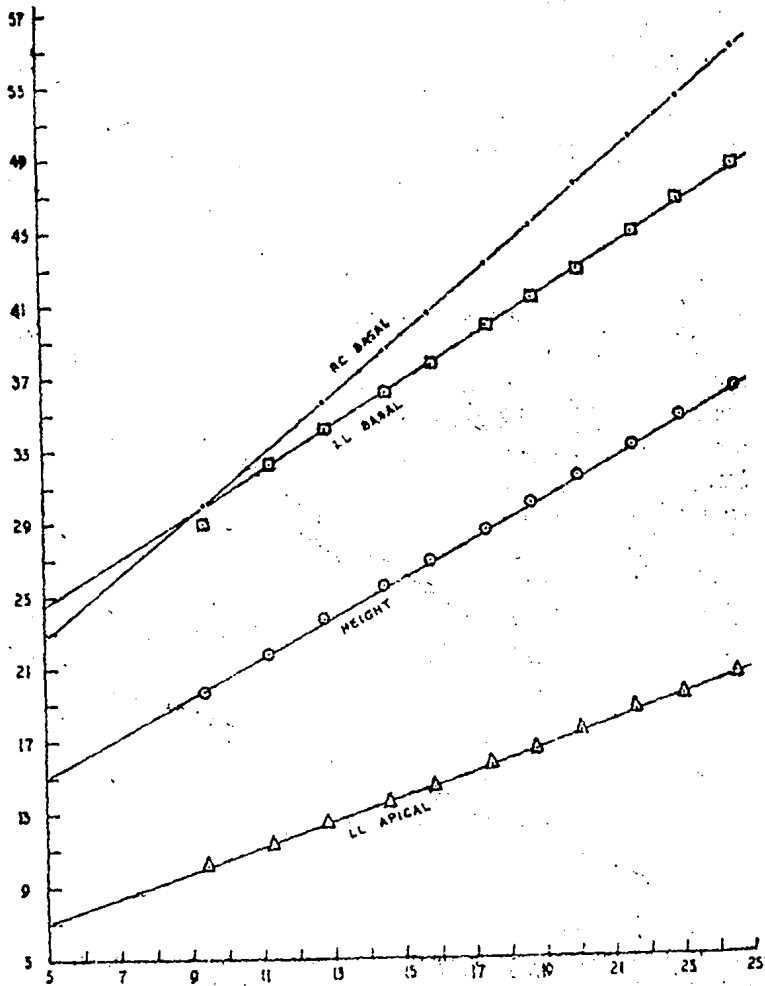


Fig. 2 A graphical presentation of relationship between RC-APICAL diameter and various other shell parameters in *Balanus tintinnabulum* L.

From the Figs. 2 and 3 it is evident that the parameter RC basal has the fastest growth in *B. tintinnabulum* whereas in *B. amaryllis* the rate of growth seems to be more or less uniform.

An inspection of the slope of the regression line reveals that LL basal and height grow more rapidly than other parameters in *B. amaryllis*.

The parameter LL apical has slow growth in both the species.

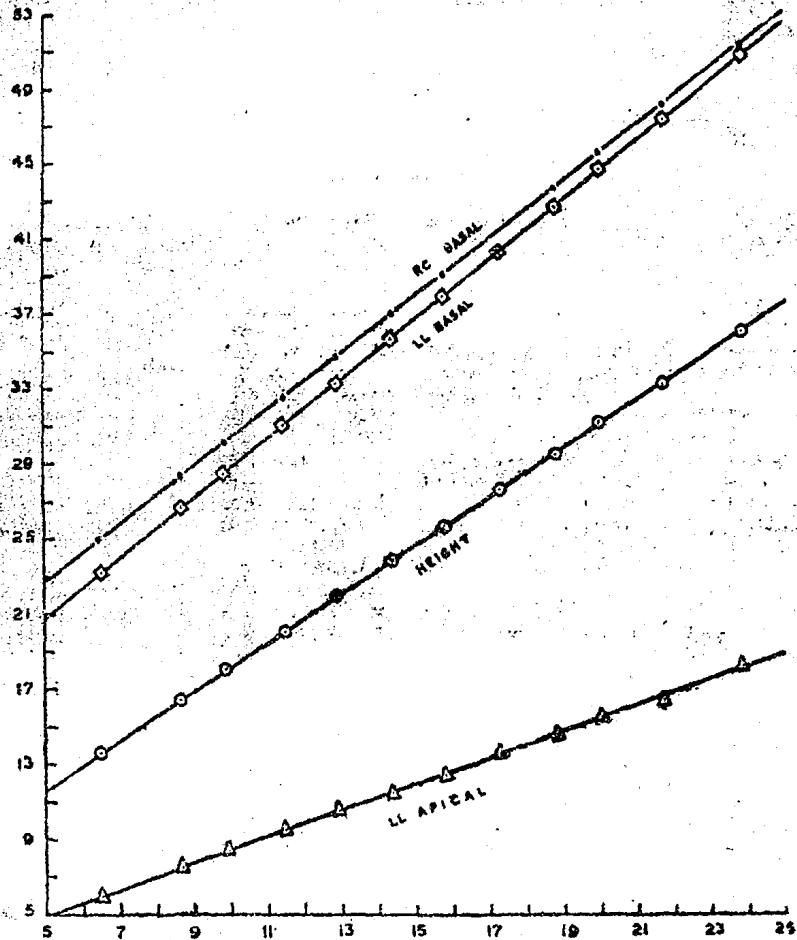


Fig. 3 A graphical representation of relationship between RC-APICAL diameter and various other shell parameters in *Botanus amaryllis* D.

ACKNOWLEDGEMENTS

We are grateful to Dr. N. K. Panikkar, Director, Indian Programme of the International Indian Ocean Expedition (at present the Director, National Institute of Oceanography, Panaji-Goa) for his keen interest and constant encouragement in the investigations and its outcome. We

are also thankful to Dr. A. H. Parulekar for his most valuable and willing help. One of us (A.B.'7) gratefully acknowledges the award of fellowship by the Indian National Committee on Oceanic Research, C.S.I.R., New Delhi.

NATIONAL INSTITUTE OF OCEANOGRAPHY,
PANAJI, GOA
KIRTI COLLEGE,
BOMBAY-28,
February 13, 1970.

ARUN B. WAGH

D. V. BAL

REFERENCES

- BARNES, H. (1956): The growth rate of *Chthamalus stellatus* (Poli). *J. Mar. biol. Ass. U. K.* 35 (2): 355-361.
- (1958): The growth rate of *Verruca stroemia* (O. Müller). *ibid.* 37: 427-433.
- & BARNES, MARGARET, (1959): Some parameters of growth in the common intertidal barnacle *B. balanoides* (L.). *ibid.* 38: 581-587.
- & POWELL, H. T. (1953): The growth rate of *B. balanoides* (L.) and *B. crenatus* under varying conditions of submersion. *ibid.* 32: 107-128.
- COSTLOW, J. D. (JR.) & BOOKHOOT, C. G. (1953): Molting and growth in *B. improvisus*. *Biol. Bull. Woods Hole* 105: 420-433.
- & ————— (1956): Molting and shell growth in *B. amphitrite niveus*. *ibid.* 110: 107-116.
- *HATTON, H. (1938): Essais de bionomie explicative sur quelques espèces intercotidales d'algues et d'animaux. *Ann. Inst. Oceanogr. Monaco* 17: 241-248.
- MARSHALL, N. (1955): Measurements of plankton feeders in relation to gross production. *Ecology* 36 (2): 360.
- MAWATARI, S. Y., HIROSAKI & KOBAYASHI, S. (1954a): Settlement and growth of acorn barnacle, *B. amphitrite communis* Darwin. *Misc. Rep. Res. Inst. Nat. Resour.*; Tokyo 33: 46-55.
- & ————— (1954b): Settlement and growth of acorn barnacle, *B. amphitrite communis* Darwin. II. *ibid.* 34: 48-57.
- MOORE, H. B. (1934): The biology of *Balanus balanoides*. I. Growth rate and its relation to size, season and tidal level. *J. Mar. biol. Ass. U.K.* 19: 851-868.

*Not referred in original.