

## Growth of the Black Clam, *Villorita cyprinoides*(Grey) from Colvale River (Goa)

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Average monthly growth in shell length was 1.66 mm in *V. cyprinoides*. Relationships of shell length, shell width and shell length, shell breadth showed linear pattern while those of shell length/shell weight and shell length, shell volume showed parabolic pattern. von Bertalanffy growth equation was adequate to represent growth of this clam in terms of shell length.

*Villorita cyprinoides* (Grey) which is an inhabitant of backwaters of India, is a potential species for aquaculture<sup>1</sup>. Except for a report<sup>2</sup> on the meat weight and biochemical composition, very little information on the biology of this bivalve of Goa is available. The present study pertains to monthly growth increment in shell length and its relationship with other growth indices like shell width, shell breadth, total weight and total volume.

Specimens (485) of *V. cyprinoides*, measuring 16.3-33.7 mm in shell length, were collected during Sept. 1981 to Aug. 1982, from the natural bed at Colvale River (lat.15°50' N; long. 73°50' E). In the laboratory, the clams were kept in running seawater for 48 h for defaecation. They were measured to the nearest 1 mm with a Vernier calipers and weighed on a single pan Sartorius balance. Volumetric dimensions of the shell were estimated by displacement method. Relationships between different parameters were arrived at by the method of least square. In all cases, the shell length was considered as basic index to establish the relationship.

Weight of each individual at each length interval was calculated and length-weight curve plotted using allometric equation,  $Y = a X^n$  where,  $Y$  and  $X$  are weight and length of individual respectively while,  $a$  and  $n$  are 2 constants to be determined, empirically.

Mean length and specific growth rate ( $G$ ) in each month was calculated by the method of Bal and Jones<sup>3</sup> while von Bertalanffy growth equation, as described by Chatterji *et al.*<sup>4</sup>, was fitted to the total shell length.

A summary of the regression analyses for various relationships alongwith their test of significance are given in Table 1. Relationships of shell width and shell breadth with shell length were isometric whereas shell weight and shell volume relationships with shell length were curvilinear.

Relationship between shell length and shell width was linear [ $Y = 0.4970 + 0.9148 X$  ( $r = 0.9964$ );  $Y$  and  $X$  being shell length and shell width, respectively]. Linear relationship was also recorded between shell length and shell breadth [ $Y = 0.3085 + 1.6318 X$  ( $r = 0.9964$ );  $Y$  and  $X$  being shell length and shell breadth, respectively]. Parabolic relationship was obtained between shell length and shell weight, and shell length and shell volume [ $Y = 0.4144 \times 10^{-5} X^{2.4814}$  ( $Y =$  shell length) and  $Y = 0.3893 \times 10^{-5} X^{1.8315}$  ( $Y =$  shell volume) respectively].

*Seasonal growth increment*- Average calculated growth increment and relative growth as percentage of increment in shell length are presented in Table 2. A decrease in specific growth rate with increasing shell length was observed.

Asymptotic length ( $L_{\infty}$ ) attained by the clam was

Table 1—Analysis of the Regression of Different Shell Measurements on Total Shell Length of *V. cyprinoides*

Character	Mean total shell length (mm) ( $\bar{Y}$ )	Mean different shell measurements (mm) ( $\bar{X}$ )	Regression coefficient ( $n$ )	S.S. due to regression	Residual S.S.	D.F.	Correlation coefficient ( $r$ )
Shell width	19.02 ± 9.89	17.89 ± 9.08	0.9148	6834.6851	10.8348	485	0.9964
Shell breadth	19.02 ± 9.89	12.32 ± 6.27	1.6318	7799.5916	12.4483	485	0.9964
Shell weight	19.02 ± 9.89	4.77 ± 5.07	1.4814	6662.7654	11.4927	485	0.9389
Shell volume	19.02 ± 9.89	2.81 ± 2.87	1.8312	6790.7852	10.2125	485	0.9457

S.S. = Sum of squares; D.F. = Degrees of freedom

Table 2—Mean Observed Length, Calculated Length, Relative Growth and Specific Growth Rate of *V. cyprinoides* in Each Month

Month	Mean observed length (mm)	Length calculated by growth equation (mm)	Growth increment (mm)	Relative growth (%)	Specific growth (%)
Sept. '81	20.4	15.05	—	7.27	69.49
Oct.	22.0	22.07	1.6	6.77	69.48
Nov.	23.6	27.08	1.6	5.97	65.15
Dec.	25.1	30.56	1.5	5.28	60.80
Jan. '82	26.5	33.18	1.4	5.03	56.40
Feb.	27.8	35.00	1.3	4.67	52.40
March	29.0	36.24	1.2	4.13	43.43
April	30.0	37.21	1.0	3.33	39.08
May	30.0	37.87	0.9	2.91	34.75
June	31.7	38.34	0.8	2.52	34.74
July	32.5	38.67	0.8	2.46	30.40
Aug.	33.2	38.90	0.7	2.10	—

calculated graphically by plotting  $L_t$  against  $L_{t+1}$  where  $L_t$  is the shell length at time  $t$ <sup>4</sup>. The von Bertalanffy growth equation<sup>4</sup> describes the growth of *V. cyprinoides* adequately as all the specimens were collected from the same environment throughout the study period. The calculated values were as follows;

$$L_t = 39.5 [1 - e^{-0.3388(t+0.4160)}]$$

The average shell lengths were calculated in each month (Table 2).

Allometric growth has been used extensively in determining the growth of bivalves<sup>5,6</sup> and for this, shell length is considered to be the most appropriate parameter<sup>7</sup>. Shell length/shell width and shell length/shell breadth relationship showed a linear growth pattern and the calculated  $n$  values were 0.9148 and 1.6318 respectively in the present investigation. This shows that the ratio between these two parameters with increasing shell length in different

months, is having constant relative growth. In *Meretrix casta*,  $n$  values were calculated to be 0.8975 (shell length/shell width) and 1.0586 (shell length/shell depth) and showed a similar linear pattern<sup>8</sup>.

Relationship of shell length/shell weight and shell length/shell volume showed parabolic pattern, and do not follow the cube law strictly. Values of  $n$  for shell weight and shell volume were calculated to be 2.4814 and 1.8315, respectively. The shell weight seems to increase more rapidly than any other parameter. Similar, parabolic relationship has been reported between shell length/shell weight in *Meretrix casta* where  $n$  value was calculated to be 2.9895 (ref. 8).

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