

AGE, GROWTH AND LENGTH-WEIGHT RELATIONSHIP STUDIES IN
THE SANDY BEACH WHELK, *BULLIA VITTATA* (L) (MOLLUSCA :
NASSARIIDAE)

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ABSTRACT

Age, growth and length-weight relationship of the sandy beach whelk *Bullia vittata* from Porto Novo coastal region was studied. The gastropod attained a length of 17, 34.5, 42.5 and 50.2 mm during its first, second, third and fourth year respectively.

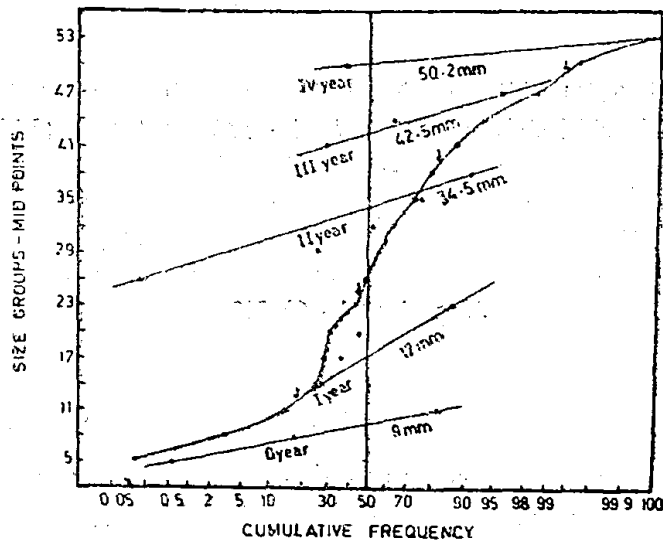
Key-words: Age, growth, *Bullia vittata*, mollusca,

Age and growth studies help to understand the nature of the stock, growth, survival rates and recruitment of the populations. Growth studies on various prosobranch molluscs were carried out by Sadasivam (1948); Scheltama (1964); Ramamoorthi and Alagaraja (1975); McLachlan and Vander Horst (1979); Roberts and Hughes (1980); Thivakaran (1984) and Maruthamuthu (1984). Though the sandy beach whelk *Bullia vittata* occurs all along the east and west coasts of India, no work has been carried out on the growth of this gastropod. In the present study, probability plot von Bertalanffy's equation and Ford-Walford graph, methods have been employed to assess its growth rate.

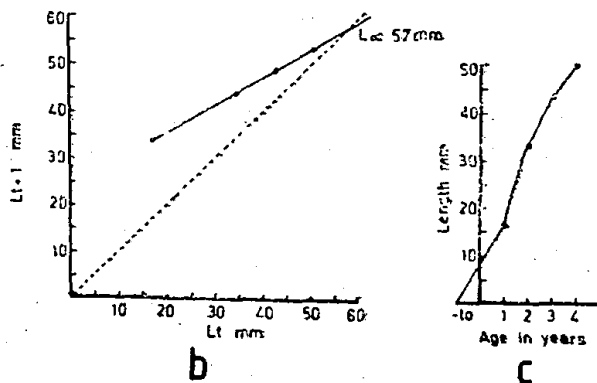
Monthly samples of *B. vittata* were collected for a period of one year (November 1984 to October 1985) from the sandy beach of Porto Novo (11°30'N; 79°46'E). Care was taken to see that the entire study area was covered and all the size groups were collected. The greatest anteroposterior measurement was taken as a length and the maximum diameter of the body whorl considered as the width. The data were arranged in different size groups of five mm intervals. The specimens collected for the growth study were also used for the length-weight relationship analysis.

Length frequency distribution

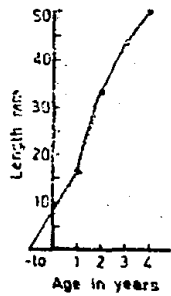
In the present study by using this method the average size of a few earlier classes can be traced. Determination of age and growth based on a single method has its own limitations. This method was not found to be of much use owing to the poor representation of earlier size groups in the present sample



a



b



c

Fig. 1a. Probability plot curve showing length attained in different year groups. (b) Ford-Walford graph showing maximum attainable length of *B. vittata*. (c) Theoretical growth curve fitted using von Bertalanffy's equation.

Probability plot method

The cumulative percentage of occurrence of different size groups for one year were plotted separately on arithmetic probability paper in order to note the points of inflection (Fig 1a). Based on the data for the year 1984-1985 the probability plot showed a growth of 17.0, 34.5, 42.5 and 50.2 mm in length for first, second, third and fourth years respectively.

von Bertalanffy's equation

The mathematical equation derived by von Bertalanffy (1938) was used to calculate the length of animals at any given time. From the sources of the probability plot, length calculated for different years using this equation was plot-

ted along with the observed length of the same period. Based on the data of the year 1984-1985 the theoretical growth curve for this species is presented in the Fig. 1c. From the growth curve, it can be observed that *B. vittata* attains a length of 16.72, 33.78, 43.81 and 49.77 mm during its first, second, third and fourth years respectively.

Ford-Walford graph

Ford Walford graph was constructed for *B. vittata* by plotting L_t verses L_{t+1} , when intersected by a 45° diagonal from the origin. L_∞ (length at infinity) attained was 57 mm (Fig. 1b).

Length-weight relationship

To find out the difference if any between males, females and immature specimens of *B. vittata* the equation was fitted separately as shown below.

The regression equations for immature individuals, male and females of *B. vittata* are:

$$\text{Immature : Log 'W' = 0.2946 + 2.6448 Log 'L'}$$

$$\text{Male : Log 'W' = 2.4384 + 0.7342 Log 'L'}$$

$$\text{Female : Log 'W' = 1.7384 + 1.2095 Log 'L'}$$

The growth rate of *B. vittata* was estimated by employing different methods viz., probability plot, theoretical growth curve and von Bertalanffy's equation. The growth rate decreased with an increase in age. Generally first year group recorded highest growth rate and then the growth decreased in successive year groups. Wilbur and Owen (1964) reported that the relative growth with an increase in age is known in molluscs. Scheltema (1964) studied the growth of *Nassarius obsoletus* at Beaufort, North Carolina and found that the first year class attains a length of 11.5 mm. He also recorded the absence of growth during winter months due to the cessation of feeding and may also be due to the unsuitability of local environment. McLachlan and Vonder Horst (1979) reported the growth of *B. rhodestoma* from South African waters and suggested that the growth rate declines from lower to higher year class. Sadasivam (1984) reported that 1.17 mm growth per month and the maximum size observed by him was 22 mm in *Cerithidea fluviatilis*. The same species attained the maximum size of 26 mm in the Vellar estuary (Ramamoorthy and Alagaraja, 1975). *Nassa stolata* attains a length of 8.2, 11.7, 13.75, 15.4 and 16.4 mm during 0, I, II, III and IV year respectively (Thivakaran, 1984). In the present study, *B. vittata* attains a length of 17, 34.5, 42.5 and 50.2 mm during its first, second, third and fourth years respectively. The life span of this intertidal gastropod appears to be four to five years normally.

Analysis of variance revealed no significant differences between males and females. Significant differences were found between immature, males and females

of *B. vittata*. Changes in the constant allometry of length-weight relationships are associated with the increase in size and sexual maturity as observed in some other molluscan species from Porto Novo waters (John, 1980; Rajagopal, 1982; Jayabal, 1984 and Thivakaran, 1984).

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