RESEARCH ARTICLE.........

Study of age and growth in the blood clam, *Tegillarca rhombea* (Born, 1778)

A.M. MESHRAM AND S. A. MOHITE

ABSTRACT...... The blood clam, *Tegillarca rhombea* (Born, 1778), also known as blood cockle, is one of the commonly found clam along the south west coast of Maharashtra, India. Present work analyses the age and growth of this clam. *T. (A.) rhombea* was observed to attain extreme length of 67.5 mm during the sampling period from February 2014 to January 2015 (except June - July) and the analysis of observed and extreme length by FiSAT showed that the clam could attain extreme length of 70.58 mm. The length of 64 mm was attained at the end of the first year and 77 mm at second year. L∞ value was 90.28 mm and growth constant (k) was 1.15 monthly. The recruitment was observed in December (Projected values). The cumulative frequency analysis showed that the males reach first maturity at 22 mm and females at 24 mm.

KEY WORDS...... Blood clam, *Tegillarca rhombea,* Age, Growth

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INTRODUCTION...

Many species of clams occur abundantly along Indian coast, particularly in the estuaries and backwaters, forming sustenance fisheries. The clams are rich in protein, glycogen and minerals which are easily digestible. Being lower in food chain they are admirably suited for 'on-bottom' farming. Due to the realization about the high nutritive value of clams and their importance in the economy of the coastal fishing villages coupled with the development of an export market for the frozen clam meat, stimulated research which resulted in a wealth of information on this important group during the last decade (Jones, 1970; Alagarswami and Narasimham, 1973; Nayar and Mahadevan, 1974; Silas *et al.,* 1982 and

Alagarswani and Meivappan, 1989). Blood clam belonging to family: Arcidae (Lamarck, 1809) is one of the important constituent of the clam catch along the south west coast of Maharashtra, India. Due to the presence of haemoglobin in its blood (Kanchanapangka *et al.,* 2002 and Gabriel *et al*., 2011), this cockle can be considered as a new candidate species for culture. Current work was hence, undertaken to study the age and growth of *T. rhombea* along this coast.

RESEARCH METHODS.....................................

The growth study of was conducted by the length-frequency method. The data was collected from February 2014 to January 2015, *i.e.* for one year and

interpreted by using modal progression analysis method given by Bhattacharya (1967). For this, 1200 specimens were collected, at weekly intervals. Shell length of each specimen was measured with accuracy of 0.1 mm using vernier calipers. The clams were grouped into class intervals of 5 mm. The length frequencies were converted in to percentages for further analysis. Modes recognized in the length frequency data for the period of 12 months (February 2014 to March 2015, excluding June - July) were represented in the form of scatter diagram, following the method used by Devraj (1983). From the size frequency analysis, dominant modes of size distribution of *T. (A.) rhombea* were noted and the value of the growth line at every third month was taken as growth for a quarter (Appukuttan, 1996). The shifting of the mode values in the graphs for different months was used as the base for interpretation of growth. The length frequencies are used for separating the polymodal length frequency distribution into modal lengths of different year classes.

The estimation of growth parameters was also supplemented by analyzing the data by using FiSAT (FAO-ICLARM Stock Assessment Tools) computer software package developed by Gayanilo *et al.* (1996), which included i) Direct fit of length frequency data by ELEFAN-II (Electronic length frequency analysis) method introduced be Pauly and David (1981) and developed into a computer software package by Gayanilo *et al.* (1988), ii) Modal progression analysis by

Bhattacharya (1967) method.

Length at first maturity was studied by examining the gonad sections of 240 clams measuring 20 - 65 mm, collected during the study period (Narasimham, 1988) and by plotting the cumulative frequencies against the total shell length. The median of the cumulative frequency distribution of sexually active specimens was considered to represent the height at which 50 per cent of animals are sexually mature.

RESEARCH FINDINGS AND ANALYSIS...........

Monthly random samples of clams from the clam beds were collected from February 2014 to March 2015 ranged in total length 21 to 68 mm, mainly clustering between size groups 20 - 25, 25-30, 30-35 mm and 50-55, 55-60 and 60-65 mm. It was observed that modal groups of 50-55, 55-60 and 60-65 mm size clam was caught during all the months along the Ratnagiri coast.

Shifting of the modes to next modal class was evident from the ELEFAN- II analysis. The analysis showed a curve indicating the broods or spawning periods. The recruitment was observed in December (Projected values). The length of 64 mm was attained at the end of the first year and 77 mm at second year (Fig. 1). *T. (A.) rhombea* was observed to attain 67.5 mm length and the analysis of observed and extreme length by FiSAT II predicted that the clam could attain 70.58 mm length (Fig.2). ELEFAN II analysis showed L∞ value of 90.28 mm and growth constant (k) as 1.15
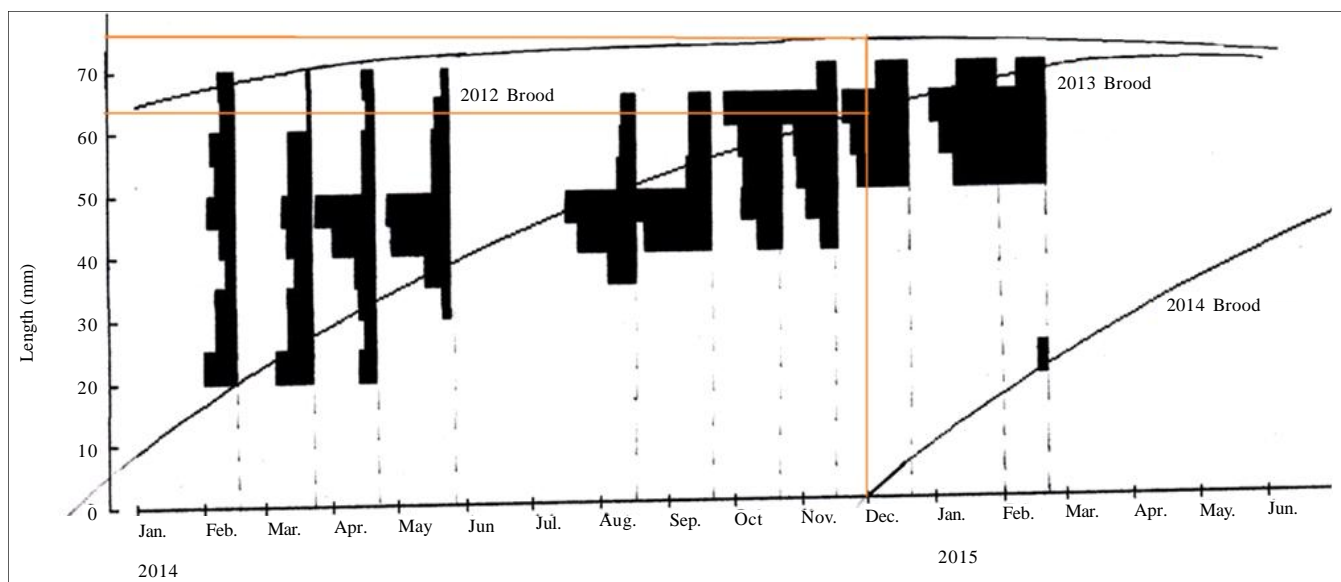

Fig. 1 : Modal progression of the length frequency observed, drawn by using ELEFAN – II method

monthly. The cumulative frequency analysis showed that the males reach first maturity at 22 mm and females at 24 mm (Fig. 3).

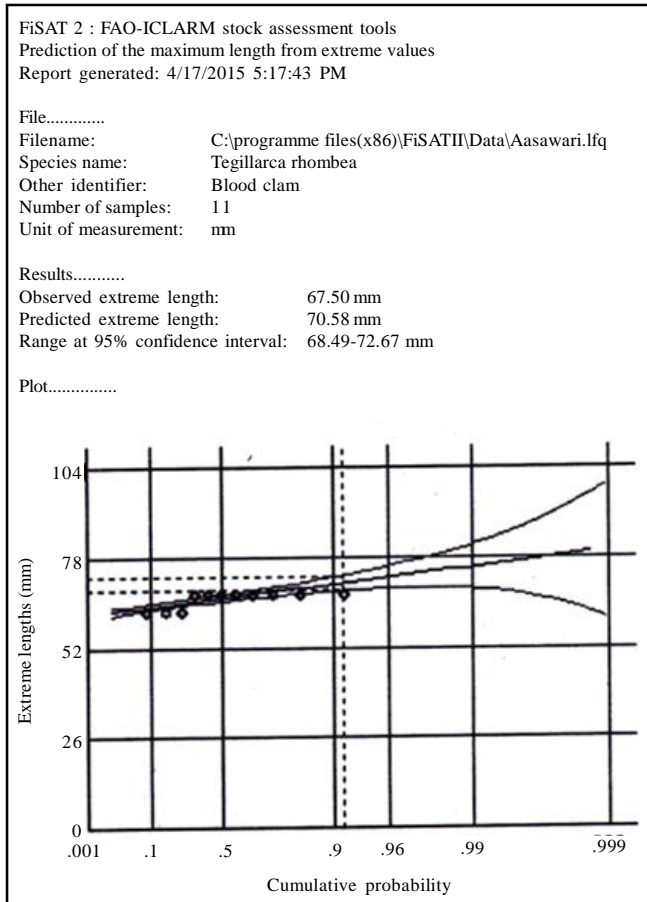Growth is expressed as length, weight and volume

FiSAT 2 : FAO-ICLARM stock assessment tools
Prediction of the maximum length from extreme values
Report generated: 4/17/2015 5:17:43 PM

File.............
Filename: C:\programme files(x86)\FiSATII\Data\Aasawari.lfq
Species name: Tegillarca rhombea
Other identifier: Blood clam
Number of samples: 11
Unit of measurement: mm

Results...........
Observed extreme length: 67.50 mm
Predicted extreme length: 70.58 mm
Range at 95% confidence interval: 68.49-72.67 mm

Plot...............

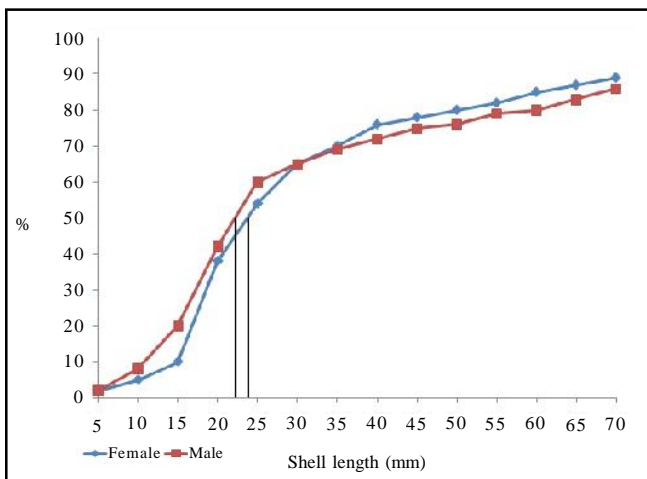**Fig. 2: Analysis of observed and extreme length by FiSAT II**

Fig. 3:   Length at first maturity on the basis of cumulative frequency analysis

in molluscs as well as other living organisms. Growth is mainly related to the quality and quantity of food which is assimilated from the environment and the energy provided by the nutrients (Sahin *et al.,* 1999).

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Length at first maturity (L_m), the mean length at first reproduction or mean length at sexual maturity (L_m) may be defined as the length at which 50 per cent of all individuals are sexually mature *i.e.*, the length at which 50 per cent of the female clams are in mature condition. The cumulative frequency analysis showed that the males reach first maturity at 22 mm and females at 24 mm. During the study period, clams of maximum size of 62 mm were harvested, indicating the possibility of the maximum length that the *T. (A.) rhombea* could attain as predicted by FiSAT II.

Stevenson and Dickie (1954), observed that sigmoid growth curves were common among the bivalves. It is generally known that many marine organisms have a sigmoidal curve for weight and length growth and there are many bivalvia species exhibiting a similar growth tendency. It has been suggested that this type of curve may be used to explain the growth of most lamellibranchiata such as *A. cornea* (Bagenal, 1980).

Ansell and Parulekar (1978); Broom (1982); Rao (1952); Rao *et al.* (1964) and Mane (1976) reported that retardation of the growth rate in bivalves due to low salinities was known in Indian waters. Crisp (1984) reported that the growth curves for weight and length of many organisms are sigmoid.

Mzighani (2005) reported isometric growth in *A.*

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antiquate by studying the population structure of Cockles, *A. antiquata* from a Sandy/Muddy Beach near Dar es Salaam, Tanzania. Length-weight relationship for overall data (1,951 specimens) obtained from January to December 2001 was calculated. Correlation co-efficient r obtained was 0.9850 (P < 0.0001). The slope b and condition factor were 2.7134 and 0.0006, respectively.

Amanda and Matthias (2006) studied the population dynamics and fisheries potential of *A. tuberculosa* along the pacific coast of costa rica. They reported that the Von Bertalanffy growth parameters, K and L∞, (0.14 and 63.15, respectively) revealed a growth performance (ɸ'= 2.75) which is in the range of reported values for this family of bivalves.

Ark clams or blood clams live in shallow water where they burrow in sandy silt, mud and seagrass beds. In some areas, smaller individuals are more abundant near the shore and larger animals are found in deeper water. *T. rhombea* was found to inhabit the estuarine area along this coast and present work could be used as to continue the investigations into its culture potential here.

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