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AGE AND GROWTH OF THREE ESTUARINE PORTUNID CRABS *SCYLLA SERRATA, S. SERRATA SERRATA* AND *THALAMITA CRENATA*

MERCY THOMAS[1], S. AJMALKHAN[2], K. SRIRAMAN[3] AND R. DAMODARAN[1]

[1] *School of Marine Sciences, University of Cochin, Cochin-682 016*
[2] *Centre of Advanced Study in Marine Biology, Annamalai University, Parangipettai*
[3] *Estuarine Fish Farm, Tamilnadu State Fisheries, Parangipettai*

ABSTRACT

In *Scylla serrata serrata* modes were traced for a period of two years and the growth was found to be 90 and 125 mm for I and II years respectively. In *Thalamita crenata* modes could be traced only for an year and the growth was found to be 36 mm. Growth determined by months mode curve indicated that *S. serrata* can grow upto 112, 151.5 and 187.5 mm, *S. serrata serrata* upto 88.5, 110.0 and 130.0 m m and *T. crenata* upto 34, 51 and 64 mm in the I, II and III year respectively. Growth assessed by probability plot for *S. serrata* was found to be upto 81.5, 117, 157 and 182 mm, for *S. serrata serrata* 71, 95.5, 112 and 126 mm and for *T. crenata* 24, 35.2, 52 and 62.2 mm in the 0, I, II and III year respectively. Employing von Bertalanffy's growth equation it was found that *S. serrata* can grow upto 118, 162 and 180 mm, *S. serrata serrata* to 96, 114 and 126 mm and *T. crenata* to 35.3, 52.2 and 62.6 mm respectively in the I, II and III year of life. The empirical length at different ages found by von Bertalanffy's growth equation showed general agreement with growth estimated by other methods. This shows that in the length ranges studied, the theoretical growth equation can be taken as adequate to indicate actual growth. The asymptotic length (L_{oc}) calculated by Ford-Walford method is 360, 160 and 78 mm respectively for *S. serrata, S. serrata serrata* and *T. crenata*.

INTRODUCTION

AGE AND GROWTH studies are aimed at understanding the nature of the stock and the role played by various year classes in the nature of the fishery. These also form the basis for calculations leading to our knowledge on growth, mortality, survival rate, recruitment and dynamics of the population. The results of such studies go a long way in proper management of fisheries constituted by commercially important organisms. Crabs support a sustenance fishery of appreciable importance (Rao *et al.*, 1973). No information is available on the age and growth of these organisms. Hence the present study on three estuarine crabs.

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MATERIALS AND METHODS

S. serrata and *S. serrata serrata* were collected from the commercial catches of Cochin backwaters and *T. crenata* from the Vellar estuary. As the carapace width is a more reliable character than the carapace length in the case of crabs it was used in the present study. The animals were conveniently divided into 15-20 size groups and the percentage frequency of each size group was calculated and used in analyses. Age evaluation was done by size frequency method (Petersen, 1891), months mode curve (Devaraj, 1977 ; Sriraman, 1978) and probability technique (Harding, 1949 ; Cassie, 1954 ; Ricker, 1968) and growth evaluation by von Bertalanffy's equation (von Bertalanffy, 1957) and Ford-Walford graph (Ford, 1933 ; Walford, 1946).

RESULTS

Age evaluation

Length frequency method

Modal tracing was not possible in *S. serrata*. In *S. serrata serrata* due to the continuous breeding habit, modes could be seen every month. Among them, the earlier mode at 72.5 mm in July 1980 was traced upto 117.5 mm in January showing a growth of 45 mm in 6 months, thus registering a growth of 90 mm in one year. For the second year, the brood was traced from 92.5 mm in January to 117.5 mm again in January showing a growth of 25 mm in an year. This added with I year growth comes to 115 mm in II year. Further modes could not be traced.

In *T. crenata* the earliest mode in the size group of 21-23 mm in November 1977 could be traced to a mode in the size group of 48-50 mm during August 1978 thus indicating a growth of 27 mm in 9 months thereby showing a growth rate of 36 mm in the first year. Further modes could not be traced.

Months mode curve

Growths of 112.5, 151.5 and 187.5 mm; 88.5, 110 and 130 mm and 34, 51 and 64 mm were derived respectively for *S. serrata*, *S. serrata serrata* and *T. crenata* for the I, II and III year of life. 3 broods were noticed in an year in all the above three crabs.

TABLE 1. *Mean size (carapace width in mm) attained by* Scylla serrata *in different years of life as found out by various methods*

Year Class	Petersen's method	Months mode curve	Probability plot technique	Von Berta-lanffy's growth equation
0	—	—	81.5	—
1	—	112.5	117.0	118.0
2	—	151.5	157.0	162.0
3	—	187.5	182.0	180.0

TABLE 2. *Mean size (carapace width) in mm attained by* Scylla serrata serrata *in different years of life as found out by various methods*

Year Class	Petersen's method	Months mode curve	Probability plot technique	Von Berta-lanffy's growth equation
0	—	—	71	—
1	90	88.5	95.5	96
2	115	110.0	112.0	114
3	—	130.0	126	126

TABLE 3. *Mean size (carapace width in mm) attained by* Thalamita crenata *in different years of life as found out by various methods*

Year Class	Petersen's method	Months mode curve	Probability plot technique	Von Berta lanffy's growth equation
0	—	—	24	—
1	36	34	35.2	35.3
2	—	51	52	52.2
3	—	64	62.2	62.6

Probability plot

In *S. serrata* points of inflexion in the probability curve were seen at 10, 60 and 95. It could be seen that the first modal size value at 81.5 mm represented 0 year. Further modes at 117, 157 and 182 mm represented I, II and III year age groups respectively.

In *S. serrata serrata*, 22, 60 and 94 were the points of inflexion in the probability curve and modal size values at 71, 95.5, 112 and 126 mm represented 0, I, II and III year of age in life respectively.

In *T. crenata*, 0 year class attained 24 mm, I year class 35.2 mm, II year class 52 mm and III year class 62.2 mm.

Growth evaluation

von Bertalanffy's equation

The growth equations arrived at are given below :

S. serrata : $Lt = 318.63\ (1-e^{-0.1327\ (t+1.0793)})$

S. serrata serrata : $Lt = 162.94\ (1-e^{-0.3031\ (t+1.8796)})$

T. crenata : $Lt. = 78.21\ (1-e^{-0.4941\ (t+0.2110)})$

From the above equations, it was observed that *S. serrata* attained 118, 162 and 180 mm, *S. serrata serrata* 96, 114 and 126 mm and *T. crenata* 35.29, 52.17 and 62.57 mm at the age of I, II and III respectively.

Ford-Walford graph

Through this method Lœ was determined as 360, 160 and 78 mm respectively for *S. serrata, S. serrata serrata* and *T. crenata.*

Discussion

Determination of age and growth based on a single method has its own limitation especially when the determination of age and growth is through indirect methods or through statistical analysis as this. So, presently age and growth study in 2 species and one subspecies has been done through five statistical methods so that the outcome of one method will act as a check and control over the other. For easy comparison, the results of age and growth by different methods in all the two species and one subspecies of crabs are presented in Tables 1-3. Age and growth estimated by various methods, showed that the information derived agree in two or more methods. The empirical length at different ages, made by von Bertalanffy's growth equation show some agreement with the estimates by other methods, showing that, in the length ranges studied, the theoretical growth equation adequately describes actual growth. When comparing the growth rate of all the crabs, growth rate of *S. serrata* was more than any other species though the life span for all the species is 3 years. Warner (1977) compiled information regarding the size of (carapace width) full grown males with their age. In most of the species the age was found to vary from 1 to 5 years. But in two species the age was found to be as much as 17 or 15-20 years (*Paralithodes camtschatica* — 17 years and *Cancer pagurus* — 15-20 years). Both these species happen to be temperate forms (Hoopes and Karinen, 1972 ; Bennet, 1974) and it has been documented well that, temperate and polar forms live for more number of years than those of the tropics. In the present study from tropics, it could be seen that all the 3 crabs live for 3 years.

The consequences of the presence of an exoskeleton in crustaceans is that in these forms growth proceeds in steps by a series of moults or ecdyses. This makes the study of crab growth under natural condition quite difficult since it is not possible to mark individuals and successfully follow them through several moults. The number of moults a crab undergoes before becoming full grown depends on the increment at each moult and the frequency of moulting. The increment at each moult is generally expressed as a percentage of a pre-moult dimension such as carapace width. A common increment is 25% in crabs. But increments vary between 3 and 44% (Hartnoll, 1965) and within a species do not remain constant during growth. Usually the growth increments become smaller as crab becomes larger.

Presently age and growth has been studied in two species and one subspecies of crabs through indirect statistical methods. Direct information regarding number of moults a crab undergoes in its life, volume of increase in size due to moult will give a correct picture. Experimental studies in this line will add quite a lot of valuable clue to the phenomenon of age and growth in crabs.

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