AGE AND GROWTH OF THE SNAIL *CERITHIDEA* (*CERITHIDEA*) *OBTUSA* (LAMARK) (MESOGASTROPODA : POTAMIDIDAE)

P. V. Sreenivasan* and R. Natarajan

Centre of Advanced Study in Marine Biology, Parangipettai - 608 502, India

Abstract

Growth of the snail *Cerithidea* (*Cerithidea*) *obtusa* (Lamark), was studied by population sampling and also by marking and recovery experiments. The snail grows in width of the body whorl, to 13.4, 20.0, 23.4 and 25.6 mm by the end of first, second, third and fourth years of life. No apparent seasonal variations were noticed in the growth rate. Asymptotic length (L_{oc}) for this species was estimated to be 27.8 mm and the Von Bertalanffy's growth equation is $L_t = 27.8 \ [(1 - e^{-0.3025 \ (t + 0.1425)}]$. The population consisted mainly of the snail in the second year of life. Normal life span of this species was observed to be 5 years.

Introduction

A Potamidid Snail *Cerithidea* (*Cerithidea*) *obtusa* (Lamark) is one of the major faunal constituents of the mangrove ecosystem of Killai Backwaters (southeast coast of India,

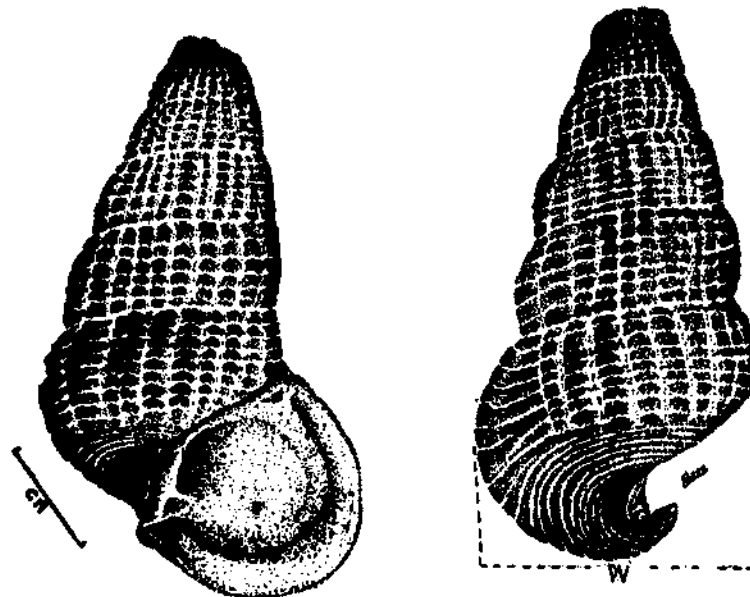11° 28' N; 79°49' E). This species is endemic to the mangrove environment and is often found attached by a thin film of mucus to the branches of *Rhizophora mucranata*. The snail exhibits tidal rhythm by descending from the trees with receding tide and ascending to the trees during ebb. *C.* (*C.*) *obtusa* appears to be adapted to longer period of exposure and shorter periods of submersion,

Fig. 1. Method of measuring width of the body whorl of *C.* (*C.*) *obtusa*. (Decollation of apical whorl is evident).

* Present address: Madras Research Centre of Central Marine Fisheries Research Institute, 29 Commander-in-chief Road, Madras - 600 105.

Informations on this species are limited only to its ecological distribution (Berry, 1963; Vermeij, 1973), and nothing is known about its biology. Therefore, the growth of *C.* (*C.*) *obtusa*, was studied to reveal the age structure of the population, along with data on the

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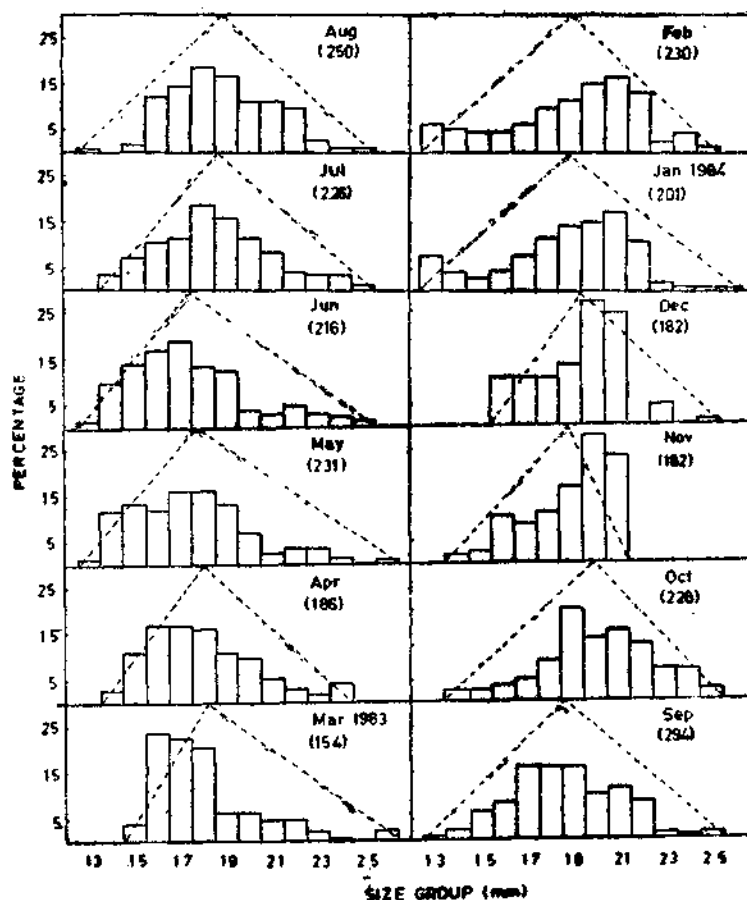

Fig. 2. Size composition (in percentage) of *C.* (*C.*) *obtusa* (Numbers denote the sample size).

conditions for optimum growth and influence of environmental factors.

MATERIAL AND METHODS

Growth of *C.* (*C.*) *obtusa*, was estimated by Peterson's method and by marking and recovery. Observations were made from March 1983 to February 1984.

For former method, an area of 50 m², loca-
ted along the fringe of a mangrove island,
was marked for sampling. Collection of sam-

This standardisation was followed on all the
sampling days. Width of the body whorl
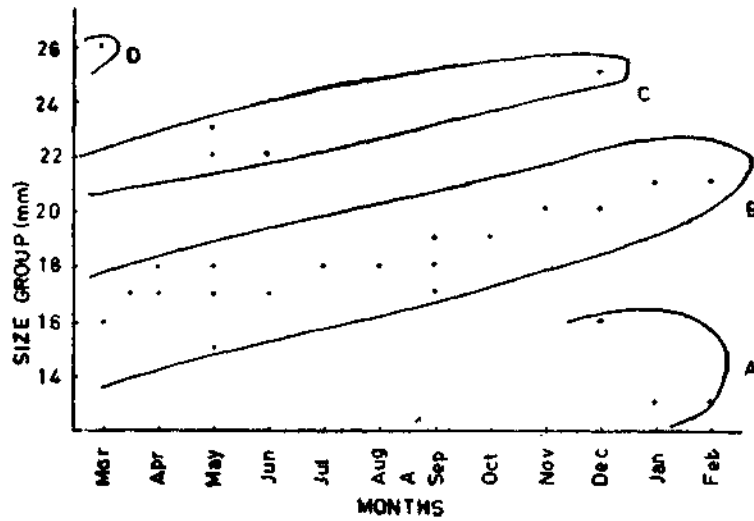(Fig. 1), was recorded of individual snails,

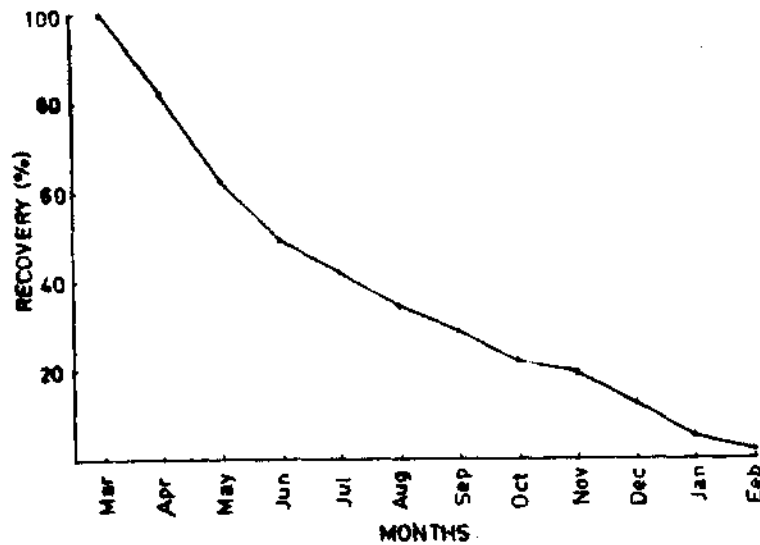Fig. 3. Modal groups of different broods in the population of C. (C.) obtusa.

Fig. 4. Recovery of marked specimens of C. (C.) obtusa.

ples was done once in a month. All snails
found within 15 minutes by 2 persons were
removed both from the ground and the trees.

since shell length of this species is varied be-
cause of decollation of apex. Measurements
were taken by vernier caliper nearest to 0.1

mm accuracy. Data on width were pooled to 1.0 mm size groups and monthly percentage composition of different groups were found to study the progression of modal group.

In the marking and recovery experiments 205 snails of different size were measured individually and numbered with enamel paints, after washing off mud and debris. A thin

RESULTS

Population sampling

Percentage composition of size groups and the mean size of the population of the snails are given in Fig. 2. The size groups ranged from 13 to 26 mm and the mean size of the population from 17.5 to 20.1 mm. The modal values were plotted in Fig. 3, from which it is
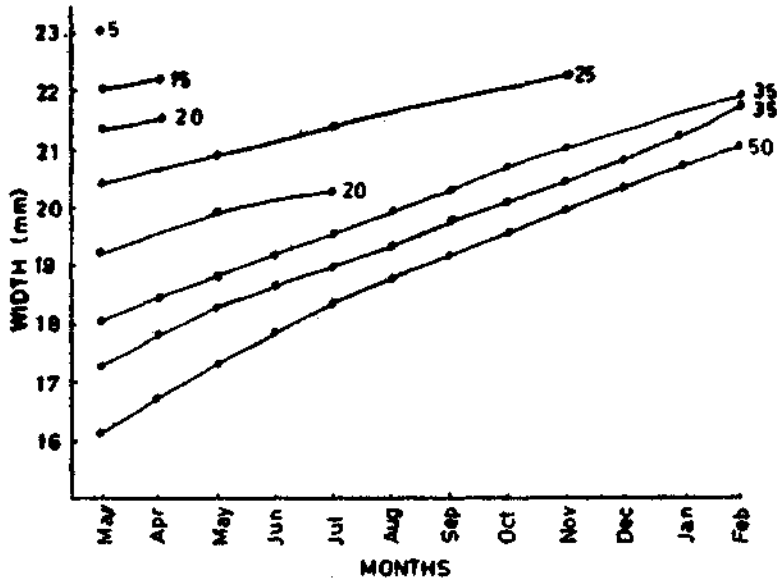

Fig. 5. Progression in the mean size of the marked snails (Number indicates the initial strength).

coast of Canada Balsam was applied over the painted numbers to avoid erosion of numbers by water. The numbered snails were released in the same sampling site and after every thirty days' interval searches were made to recover tagged snails. The snails were numbered after measurement, in case of eroded numbers. Growth was traced by progression of mean length from month to month, in each 1 mm group.

evident that they assort into 4 groups, namely, A, B, C and D, representing different broods. Brood B, which was represented in the population throughout the year, showed a modal progression from 16 mm in March 1983 to 21 mm in February '84. Brood C, from a modal size of 22 - 23 mm in May '83, increased to 25 mm in December. When brood D was present only in March '83, brood A, was recorded in December - February period. Thus

brood B showed a growth of 5 mm in 11 months, while C showed 2 to 3 mm in 7 months. The other two broods, showed no clear growth.

The mean sizes of the marked snail in each month is given in Fig. 5. The 16 mm group showed an increase of 5.1 mm from 16.1 mm to 21.2 mm in 11 months. Similarly, 17 mm
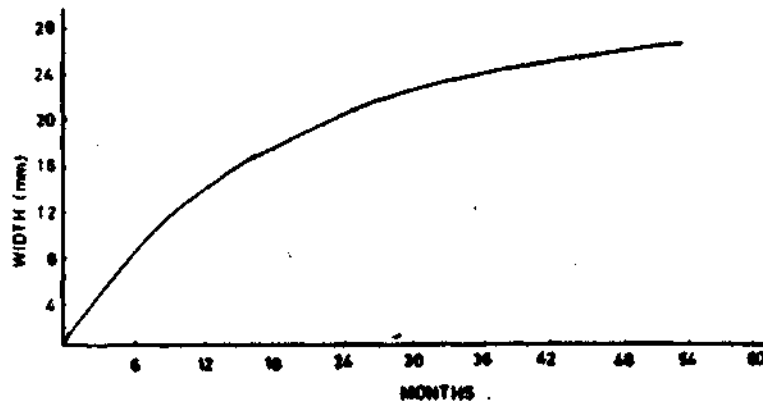

Fig. 6. Growth curve of C. (C.) obtusa.

Marking and recovery experiments

From an initial strength of 205, recovery dwindled to 3 snails, by the end of the study

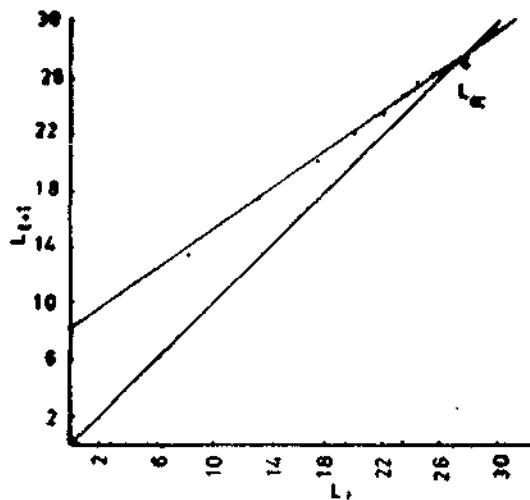Fig. 7.   Walford graph for C. (C.) obtusa.

(Fig. 4).   The dispersal was very quick in first three months, but slowed thereafter.

and 18 mm groups recorded a growth of 4.7 mm and 4 mm in the same period. While 19 mm and 20 mm groups attained 2.1 mm and 1.9 mm growth in 4 and 8 months respectively, 21 mm and 22 mm groups increased in size by 0.2 mm in one month.

Growth

Based on the data presented above, it can be inferred that the brood B at 16 mm in size in March '83 could be of about 16 months old, while C to be 30 months old. When brood D at 26 mm represented the older group of $4\frac{1}{2}$ years old, the brood A belonged to one year old new recruits to the population. Taking into consideration the growth of all the broods, a best fit was drawn to obtain the growth pattern of C. (C.) obtusa (Fig. 6). From this it was estimated that the snail attains 13.4 mm, 20.0 mm, 23.4 mm and 25.6 mm by the end of first, second, third and fourth years of life. The largest size group, viz. 26 mm was observed to be 54 months old.

Growth parameters

Growth parameters such as maximum size attainable ($L\infty$), the coefficient (k) and the orbitrary origin of growth (t_0) were estimated for *C. (C) obtusa*. By Walford graph (Fig. 7), as well as by Von Bertalanffy's growth equation (Fig. 8), $L\infty$ obtained was 27.8 mm; the Von Bertalanffy's growth equation being:

$$L_t = 27.8 \left[1 - e^{-0.3025 (t + 0.1425)} \right]$$

From the theorotical growth curve, it can be observed that the calculated and observed values are found closer to each other. The actual growth tends to decrease gradually from year to year.
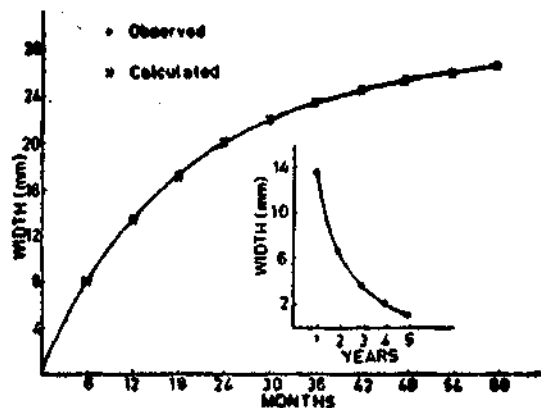

Fig. 8. Von Bertalanffy's growth curve for *C. (C.) obtusa* (Inset shows the net growth from year to year).

Age structure of the population

Annual percentage composition of different size groups of *C. (C.) obtusa*, in the population is given in Fig. 9. Predominant size group recorded was 19 mm (constituting 14.2%), followed by 18 mm. Two and three year olds contributed to 73.5% and 21.5% of the

population respectively. Those in the first, fourth and fifth years were also present. The snail entered the population mainly in its second year of life. There was considerable reduction in the numerical strength of the snail from second year to third year, which
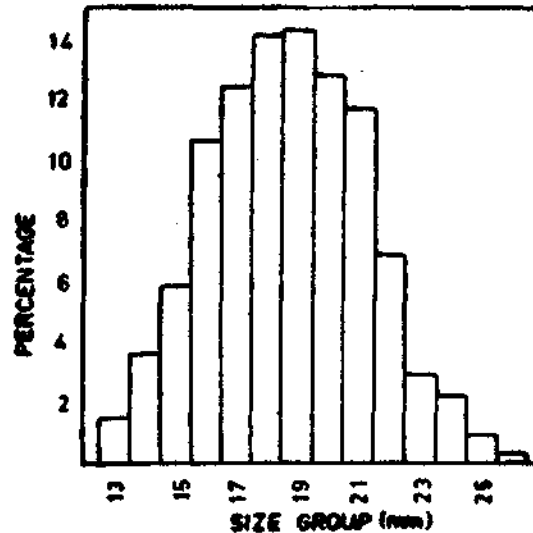

Fig. 9. Annual percentage composition of different size groups of *C. (C.) obtusa*, during the year 1983 - '84.

might be due to mortality. Since there is no fishing pressure on this species, the reason for mortality could be due to natural causes such as predation, diseases and senility, of which predation by crabs and birds appear to be the major one.

DISCUSSION

From the above observations, it is evident that *C. (C.) obtusa*, exhibits a slow but steady pace of growth. There was no difference in the growth between seasons, such as, summer (March-June), premonsoon (July - September), monsoon (October - December) and post-monsoon (January - February), prevailing

in Killai area. Such a growth, not influenced by seasons, was earlier observed in another gastropod *Cellana radiata*, by Balaparameswara Rao (1976).

Reduction in the growth rate between successive years was evident from the above study. Attainment of sexual maturity could result in slower growth because of diversion of energy towards the formation of gonadial products.

Decreased relative growth rate was observed to associate also with approach to asymptotic size in a related snail *Cerithidea decollata* by

Cockcrofts and Forbes (1981). They also stated that, after attaining certain body size, the growth of the snail consists of expanding and consolidating shell lip, rather than adding whorls and increasing body size.

Normal life span of *C. (C.) obtusa* in the population appears to be about 5 years. Gastropods, in general, have longer life span as deduced from the studies of Comfort (1957), Poore (1972) and Cockcrofts and Forbes (1981), which ranges from 1 to 13 years. Life span of *C. (C.) obtusa* falls well within the range of above observations.

REFERENCES

BALAPARAMESWARA RAO, M. 1976. Studies on the growth of the limpet *Cellana radiata* (Born) (Gastropoda : Prosobranchia). *J. moll. Stud.*, **42** : 136-144.

BERRY, A. J. 1963. Faunal zonation in mangrove swamps. *Bull. natn. Mus. St. Singapore*, **32** : 90 - 98.

COCKCROFT, V. G. AND A. T. FORBES 1981. Growth, mortality and longevity of *Cerithidea decollata* (Lnnaeus) Gastropoda: Prosobranchia) from Bayhead Mangroves, Durban Bay, South Africa. *The Veliger* **23** (4) : 300 - 308.

COMFORT, A. 1957. The duration of life in molluscs. *Proc. Malacol. Soc. Lond.*, **32** : 219-241.

POORE, G. L. B. 1972. Ecology of New Zealand abalones, *Haliotis* species (Mollusca : Gastropoda). 3. Growth. *NZ J. Mar. Freshw. Res.*, **6** (4) : 534 - 559.

VERMEIJ, G. J. 1973. Molluscs in mangrove swamps: Physiognomy, diversity and regional differences. *Syst. Zool.*, **22** (4): 609 - 624.