

**STUDIES ON SOME ASPECTS OF
BIOLOGY AND TRANSPLANTATION OF THE CLAM
MERETRIX CASTA (CHEMNITZ) IN THE BHEEMUNIPATNAM BACKWATERS**

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ABSTRACT

Studies on the growth of *Meretrix casta* (Chemnitz) showed that the clams in the natural bed grew at the rate of 3.6-3.9 mm per month while the specimens kept in the cages showed growth rates of 0.9 mm and 0.77 mm per month respectively for on bottom and off bottom culture. The equation for length weight relation was found to be $W = 0.0002221 L^{3.2251}$. The spawning period of *M. casta* was found to be between April-May. Dispersal of clam seed in virgin areas did not yield fruitful results as there was heavy mortality due to floods.

INTRODUCTION

A BED of *Meretrix casta* was located in the backwaters of Bheemunipatnam near Naga-mayyapalam, situated about 32 kilometers north of Vishakhapatnam during a survey of the area for finding out suitable sites for marine fish farming. Some aspects of the biology of the clam have been studied. During 1977 and 1978 attempts were made to transplant the seed of clams and the results of the experiments are given in this paper.

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MATERIAL AND METHODS

The clam bed of above 3 ha is situated about 3 km north of Bheemunipatnam in the shallow areas of backwaters at a depth of 0.5 to 1.5 m. The bed is subjected to tidal influence. Random samples of the clams were collected for biological study once in a fort-

night along with the data on temperature and salinity during the period January 1977 to December 1978. Data on the length frequency 3 (mm size intervals) of the samples collected in the same month were pooled. Growth of clams was also studied by keeping them in nylon meshed iron frame cages both on bottom and off bottom during August 1978 to October 1979.

ENVIRONMENT

Temperature : During 1977, the temperature ranged from 25.2°C in January to 30.0°C in May gradually declining to 27.0°C in August. Higher values of temperature were noticed in September (29.5°C) and October (30.0°C). In November and December the temperature values were low being 26.0°C and 25.2°C (Fig. 1). In 1978, the temperature fluctuated from 22.0°C in October to 33.0°C in May.

Salinity : The salinity values in 1977 and 1978 showed more or less similar trends. During January - July the values were higher and from August to December they were low. During 1977, the salinity increased from 25.17‰ in January to 32.81‰ in July, while in 1978

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it increased from 28.93‰ in January to 34.42‰ in April. It remained steady during May to June. The Lower values of salinity in

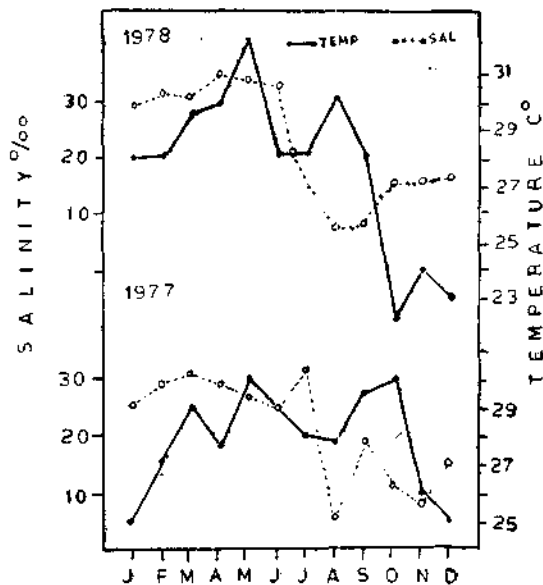


Fig. 1. Seasonal fluctuations of temperature and salinity of Bheemunipatnam Backwaters during 1977-'78.

1977 ranged from 5.6‰ in August to 19.9‰ in September, while they ranged from 7.41‰ in September to 20.9‰ in July during 1978.

GROWTH

Clams from the natural bed (Fig. 2): During January to April, 1977 only adult clams of length range 20–45 mm could be examined. The mode at 37–39 mm in April would represent about a year growth. In May 1977 a fresh brood entered the fishery and the growth of this could be traced to the mode at 34–36 mm in January 1978. A growth of 30–35 mm of the brood was recorded in about 9–10 months.

The growth of the clam during 1978 showed that the new brood that appeared in April

with the modal length of 7–9 progressed to 34–36 mm in December *i.e.* a growth of 34–36 mm in 8 months. Thus the data on the growth of 1976, 1977 and 1978 year classes showed comparable values. A growth of about 37–39 mm in 10–11 months of 1976 year class, 34–36 mm in 9–10 months of 1977 year class and 34–36 mm in 9 months of 1978 year class was observed. It was also found that the clams showed a growth rate of 5–6 mm/month during the first 3 months of life and a growth rate of 2–4 mm per month during the next 4 months.

Caged clams kept on bottom: The growth rate of specimens in cages kept on bottom was traced from September 1978 to October 1979. The modal value of the clam in September at 20 mm progressed to 33 mm in October 1979 showing a growth of 12 mm in 13 months *i.e.* a growth rate of 0.9/month. It was found that the rate of growth during December 1978–May 1979 was higher than the rest of the period.

Caged clams kept off bottom: The rate of growth of these clams was studied simultaneously with these kept on bottom in order to compare the growth rates. The modal values at 18 mm in September 1978 shifted to 28 mm in October 1979 showing a growth of 10 mm in 13 months thereby showing a growth of 0.77 mm per month.

Thus the growth rate of clams in the first 10–13 months in different substrata showed that the clam in the natural bed grow at the rate of 3.6–3.8 mm per month, while those kept in cages showed growth rates of 0.9 mm and 0.77 mm per month respectively for on bottom and off bottom culture.

LENGTH WEIGHT RELATIONSHIP

For the length weight relationship general formula $W = aL^b$ was fitted. Least square estimates for a and b were obtained and the logarithmic formula $\log W = 3.6535 + 3.2261$

log L was obtained. The general equation of this relationship is $W = 0.0002221 L^{3.2261}$ when L shows for length and W for weight was obtained (Fig. 3).

phase (3) ripe phase (4) running phase and (5) spent phase.

In the resting phase dominant during August. November, the gonads were indistinguishable-

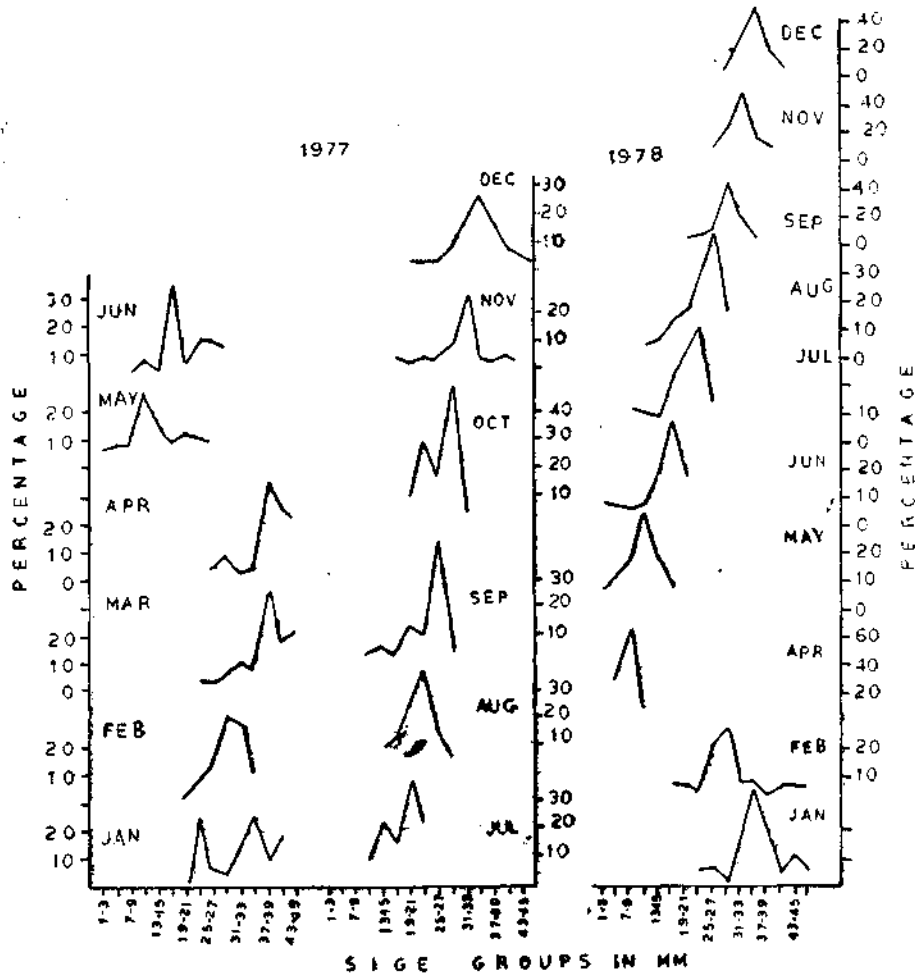


Fig. 2. Length frequency distribution in percentage of *meretrix casta* during 1977-78.

REPRODUCTION

During 1977-78 fortnightly samples of minimum of 50 individuals were examined. Five stages were distinguished in the reproduction cycle (1) Inactive or resting phase (2) active

The active phase with distinct gonads and developing gametes, dominated during December - February. In the ripe phase dominant during March, the gonads were plumpy occupying a major portion of the body with ripe gametes. The ova were large and

spermatozoa were motile. Spawning phase April-May with spawning gametes and spawned or spent phase during June-July, the gonads turned flat and translucent.

DENSITY OF CLAM POPULATION

During 1977, monthly collections were made in an area of one square metre by digging upto 12-20 cm and the clams were separated with the help of 2 mm mesh size sieve. It was observed that the density of population decreased from 6542 in May 1977 to 8 in September 1977. Similar decrease in the concentration during the period of May-November 1978 was also observed. This was due to intensive fishing for the clams in the area.

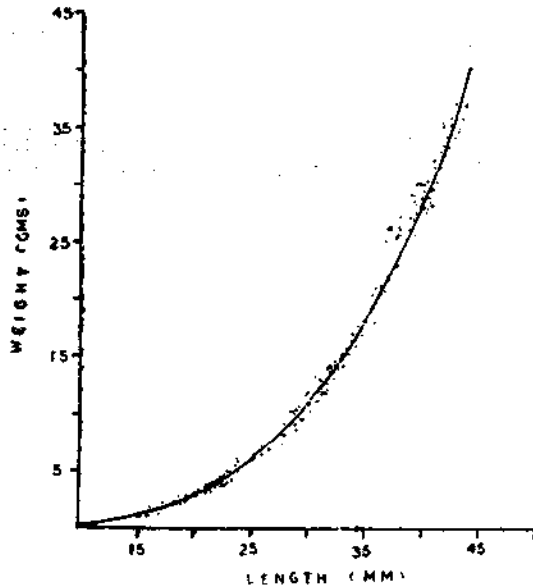


Fig. 3. Length - weight relationship of *meretrix casta*.

DISCUSSION

It is well known that in bivalves the rate of growth is rapid during early part of life and the growth decreases as the animals advance

in age. Abraham (1953) observed faster growth in the early part of the life of *M. casta* and the specimens attained 15 mm within two months and 29.5 mm within seven months. During the course of present study it was seen that the young clams grew to a size of 33 mm in 9 months showing a growth rate of 3.7 / month.

Salinity was found to influence the growth of marine bivalves. At Madras, Rao (1957) found that *Katylsia opima* continued to grow during the period of higher salinity (January-July) and there was cessation of growth during the period of low salinity (August-December). Similar observations of arrest of growth during the period of low salinity were by Nayar (1956) on *Donax cuneatus* at Palk Bay, by (1976) on *K. opima* Talikjedker et al. (1976) on *D. cuneatus*. During the present investigation it was observed in the natural bed that the salinity usually decreased very much during the period July-August both in 1977 and 1978 due to inundation of the backwater with the flood water. The larger clams measuring more than 28 mm burrowed 12-20 mm deep into the mud possibly to avoid less saline waters during the critical period. The clams showed lesser growth rate of 0.9 mm per month in the case of on bottom culture and 0.77 mm per month in the case of off bottom culture when compared with 3.6-3.8 mm per month of the clams in the natural bed. The lesser growth rate exhibited by these clams be due to following reasons.

As these clams are confined in the cages, they are devoid of opportunity to bury themselves in the mud during the critical period of low salinity unlike the clams in the natural bed and hence less saline waters might have checked their natural growth to a large extent. Besides, since cage culture experiments were conducted at a distance of about 3 Km from the natural bed the quality and quantity of food available there might have inhibited their growth of these clams to some extent.

Experiments on transplantation were undertaken during May and June in 1977 and 1978. Clams measuring 5-20 mm in 1977 and 10-18 mm in 1978 were collected and transplanted in areas which were more or less identical with those of natural bed. While dispersing the clam seed which amounted to 150,000 numbers weighing about 1.6 tonnes, care was taken to see that they were uniformly

distributed without over crowding. During August-September of 1977 and 1978 there was unprecedented flooding due to heavy rains and silting was heavy. As a result there was drastic change in salinity which was decreased to 5.6 ‰. This led to large scale mortality of all the clam seed sown in the area, since the young clams could not tolerate such low saline water.

REFERENCES

ABRAHAM, K. C. 1953. Observations on the biology of *Meretrix casta*. *J. Zool. Soc. India*, 5: 169-196.

MANE, U. N. 1973. Study on the biology of marine clam *Katylsia optima*. Ph. D. thesis, Maharashtra University, Aurangabad, Maharashtra, India.

NAYAR, K. NAGAPPAN 1936. Studies on the growth of wedge clam *Donax cuneatus*. *Indian J. Fish.*, 2: 325-348.

RAO, K. VIRABADRA 1951. Studies on the growth of *Katylsia opima*. *Proc. Indo-pacific Fisheries Council Sec.*, 11: 91-102.

——— 1951. Observations on the probable effects of salinity in spawning, development and settling of the Indian Backwater oyster *Ostrea madrasensis* Preston. *Proc. Indian Acad. Sci.*, 33: 231-256.

TALIKHEDKAR, P. M., U. H. MANE AND R. NAGABHUSHANAM 1976. Growth rate of the Wedge clam *Donax cuneatus* at Miriya Bay, Ratnagiri. *Indian J. Fish.*, 23 (1 & 2): 183-193.