SOME OBSERVATIONS ON THE CLAM BEDS OF KALI ESTUARY, KARWAR

S. N. HARKANTRA

National Institute of Oceanography, Dona Paula, Goa-403 004

ABSTRACT

Observations on ecology, growth, spawning periodicity and other biological features of hard clam *Meretrix casta* (Chemnitz) in the Kali estuary have been reported. Dense clam beds have been found in sandy deposits. The average growth was 2.9 mm per month. Seasonal variations in the growth has been observed and are correlated to the changes in temperature and salinity. Spawning period is prolonged with a break in winter. Increase in shell weight is much faster than any other liner dimensions. Possibilities of migration of adult clams to deeper waters have been postulated.

Meretrix casta (Chemnitz) is abundantly found in estuaries and backwaters along the Indian coast. Large quantities of clams are collected for food and for their use as bait. Their shell is utilised for making lime. Hand picking and scoop net fishing are commonly used for their collection in the Kali estuary when sea fishing is suspended during the monsoon. Ramamurthy (1954) studied some hydrological aspects of the Kali estuary but he gave no attention to the study of commercially important benthic animals of this estuary. An attempt has been made in the present study to determine the growth, breeding and seasonal abundance of *M. casta* in relation to changes in the environmental features of this estuary. Such a study useful for starting clam culture in this estuary and give some assessment of natural benthic resources.

The clam bed is situated 2 km from the mouth of the river Kali, where substratum is sandy. Inspite of tidal and fresh water influences, the major part of the clam bed remains submerged almost permanently and water column varies from 0.5 to 2.5 m. Samples of clams were collected at random from the clam bed of the estuary (Fig. 1) at monthly intervals from January to December, 1974. In addition, the samples obtained from the local clam pickers were also examined. To assess the clam abundance, van Veen grab was operated which gave coverage of 0.04 m^2 at the bottom.

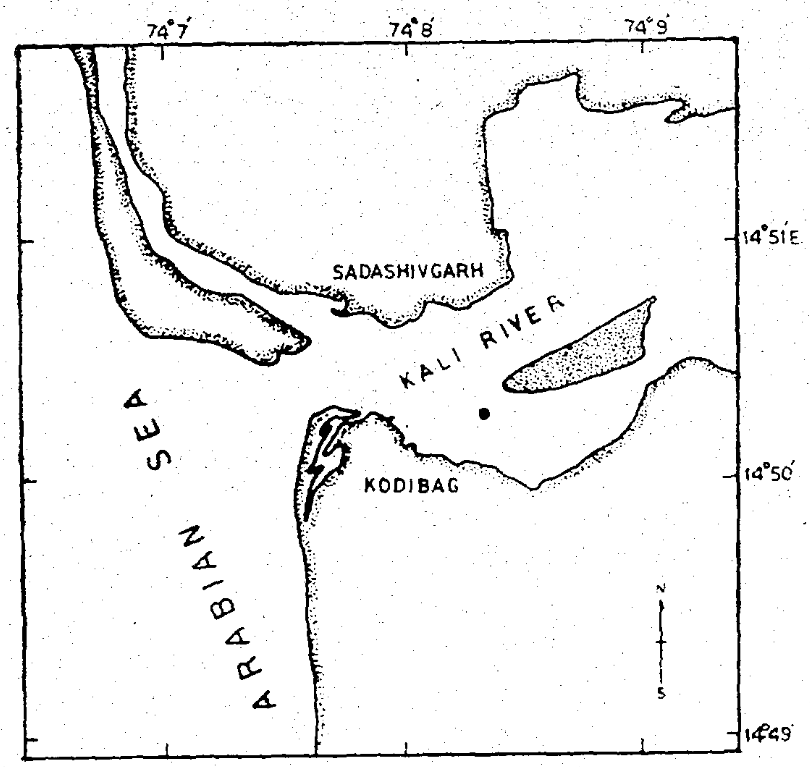

Fig. 1. Map of Kali estuary, solid circle indicate position of the station.

Some environmental parameters such as temperature, salinity, dissolved oxygen and suspended matter in the bottom water were also determined when the clam samples were collected. The size of each clam was measured with a sliding callipers with an accuracy of 0.5 mm and these were separated into 5 mm size groups. Gonadial smear were examined for determining the stage of maturation. The wet weight of the clam was determined excluding the weight of the shell and those of the pea crabs found inside. The water content was calculated after drying the specimen at 60°C in hot air oven till they attained constant weight.

Growth: The clam populatioa exhibits a striking difference (Fig. 2) in the size range 10 to 55 mm. Most of the size groups lie between 15 to 40 mm. The maximum size of *M. casta* recorded was 53.5 mm in the estuary. Abraham (1953) has reported the size of this clam as 56.3 mm in the Adayar river whereas Seshappa (1966) observed only 31 mm as the maximum size in the Beypore and Koraphuza estuaries.

Table 1 shows the average values of environmental parameters at the clam bed. A pooled size frequency percentage for one year shows a dominance of the 30-35 mm size group

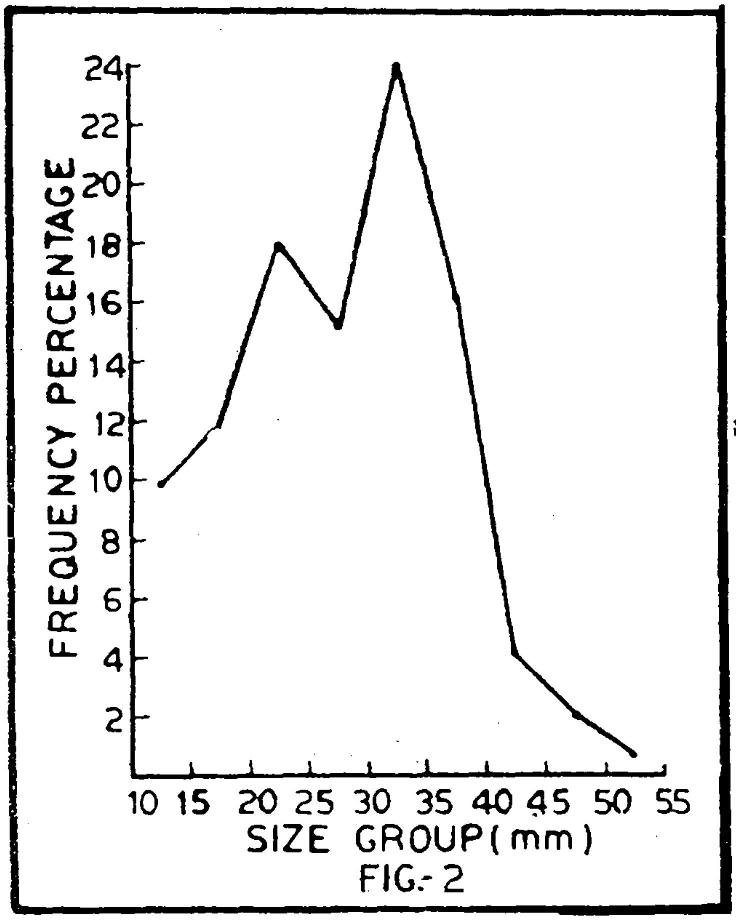

Fig. 2. Pooled size frequency of *M. casta*.

(Fig. 2), representing a year class and indicates an average growth rate of 2.9 mm per month. Parulekar *et al* (1973) observed the growth rate of *M. casta* as 2.7 mm in Goa estuaries whereas Durve (1970) has reported its growth rate as 0.79 mm in an experimental fish farm near Mandapam camp. This indicates that growth rate is faster in natural beds than in the fish farm. The size groups above 40 mm represent the second year class. Poor representation or the absence of bigger clam (Figs. 2 and 4) in the collection indicates the possibility of migration by the bigger specimens into deeper waters as reported by Desai (1967) and Parulekar *et al* (1973).

TABLE I. Environmental features (average values) in the clam bed.

Parameters		Values
Salinity ‰	...	24.51
Temperature °C	...	28.6
Dissolved oxygen ml/l	...	3.97
Suspended load g/l	...	0.08

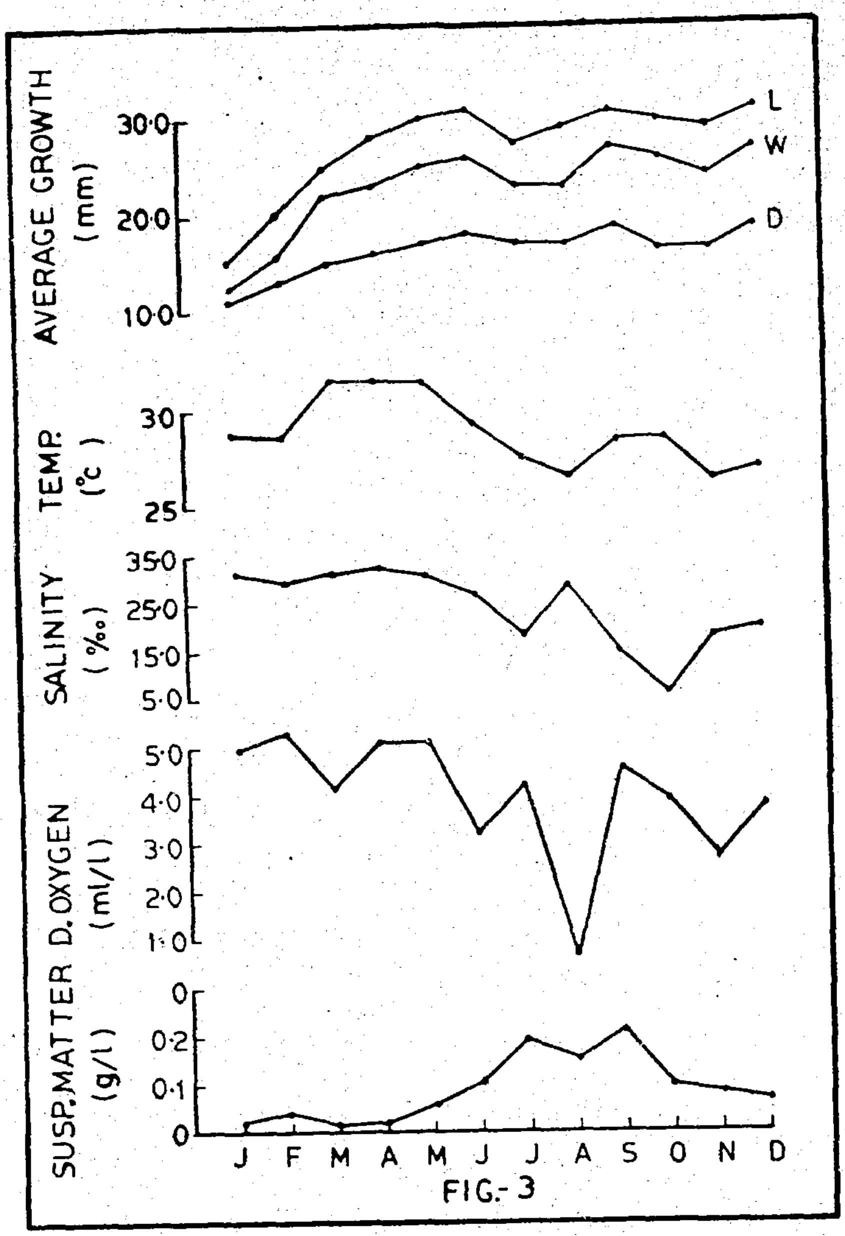

Fig. 3. Monthly fluctuation in the environmental parameters in the clam bed and an average growth on *M. casta* in length (L), width (W) and depth (D).

Figures 3 and 4 show the monthly growth progression in relation to changes in the environmental parameters. As can be seen from Fig. 4, the mode at 15 mm in January progressively moves to 40 mm by June, indicating an average growth increase of 5 mm per month. From July to

September, the mode at 34-40 mm was found to be static and is not traceable thereafter. In October, a mode appears at 15-20 mm and this is traceable upto November to December and reaches a size of 25-30 mm, thus attaining an average monthly increase of again 5 mm.

When the growth rate is considered in relation to changes in the environmental parameters, it is seen that higher salinity and temperature accelerate the growth whereas the reduction in salinity and temperature during June to September there is practically no growth (Fig. 3). This feature is also reflected from the rings found on the shells.

Regular annual rings were observed in most of the clams examined. However, finding of these rings can be attributed to the changes in the environment during the monsoon. These changes are likely to be associated with physiological changes in the clam. Rao (1961) has also observed similar rings in another clam *Ketalysia opima* from the Madras waters. In the Kali estuary, the phases of accelerated and retarded growth seem to be changes in the salinity and temperature (Figs. 3 and 4). Hence these parameters seem to have the maximum influence on the growth of *M. casta* as reported by Durve (1970) and Parulekar *et al* (1973). Figures 3 and 4 show that the growth rate was greater in the younger animals than in the adults as reported by Seshappa (1967).

Size measurement also showed some other definite growth patterns

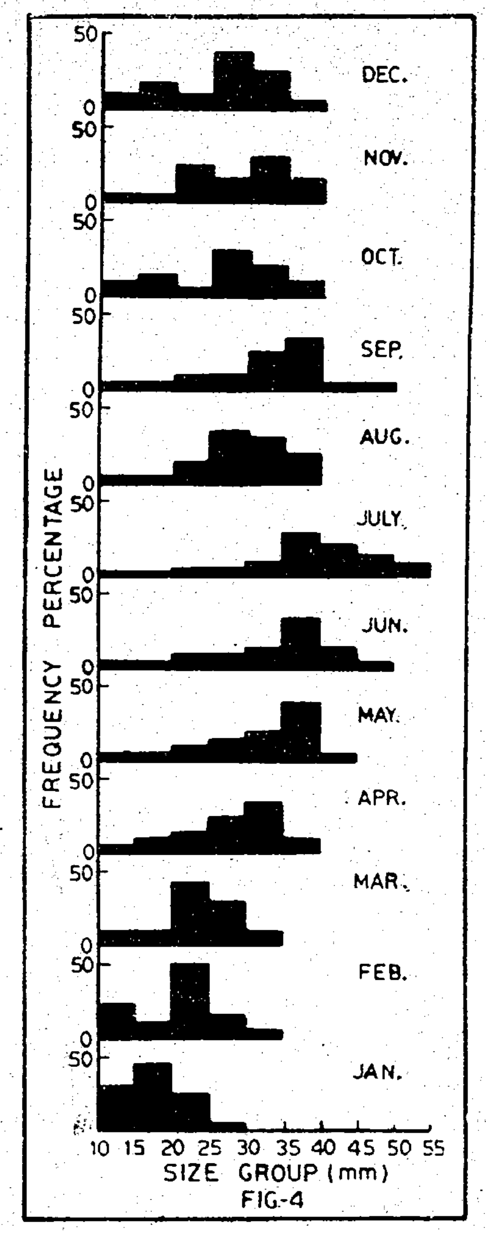

Fig. 4. Monthly length group frequency distribution of *M. casta*.

(Figs. 2 and 5). The increase in shell weight was more rapid than any other linear dimensions. It showed an average increase of 0.79 g monthly, while meat

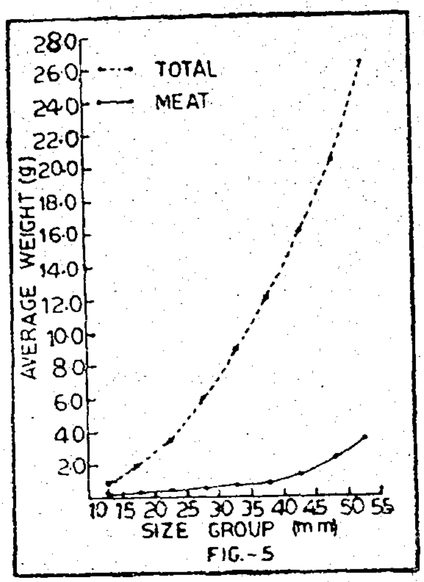

Fig. 5. Average total and meat weight growth of *M. casta*.

was only 0.1 g and contributed only 10-15 % of the total weight. Durve (1970) observed an incrcase of 1.1 g for the shell weight in the same species. Dry weight measurement in the present study revealed that the meat contains 60-70% water.

The growth pattern of *M. casta* coincided with the abundance of suspended matters suggesting that dense particulate matter has direct influence on the growth.

The growth and abundance of *M. casta* showed no correlation with the dissolved oxygen, probably due to the burrowing habit of the clam throughout its life span.

Breeding: Gonadial smear observation showed a dominance of females. Males and unsexed specimens together formed the rest. The clam attained maturity and probably spawned at a size of 10-25 mm. The presence of juveniles throughout the year (Fig. 4) in addition to mature animals indicates tha t this species is continuous breeder. It probably has a break during winter when temperature reaches is low. Therefore recruitment is almost continuous and is represented from the different size ranges in all the months of the year (Fig. 4). An abundance of spawning clams (Fig. 6) in the month of June and July coincide with the decline in salinity and temperature, probably the fall in these environmental factors triggers off the spawning of the clams as reported by the other workers (Abraham, 1953., Durve, 1964., Seshappa, 1967, Parulekar *et al* 1973).

Clam population and biomass: The clam populations are largely confined to sandy bottom. The abundance of clam in sandy area indicates that they are substratum specific. Seasonal changes in the clam population and biomass (wet and dry weight) are shown in Fig. 6. The population density increased from January to July (1600/m^2). A sudden decrease in August (80/m^2) may be due to their intense harvesting or possible migration (Fig. 6).

Parasites: Presence of one or two crabs. *Pinnothers* sp.) was noticed in the mantle cavity of almost all the clams examined. The association of these crabs with *M. casta* has earlier been reported by Alagarswami (1966) in Malpe waters.

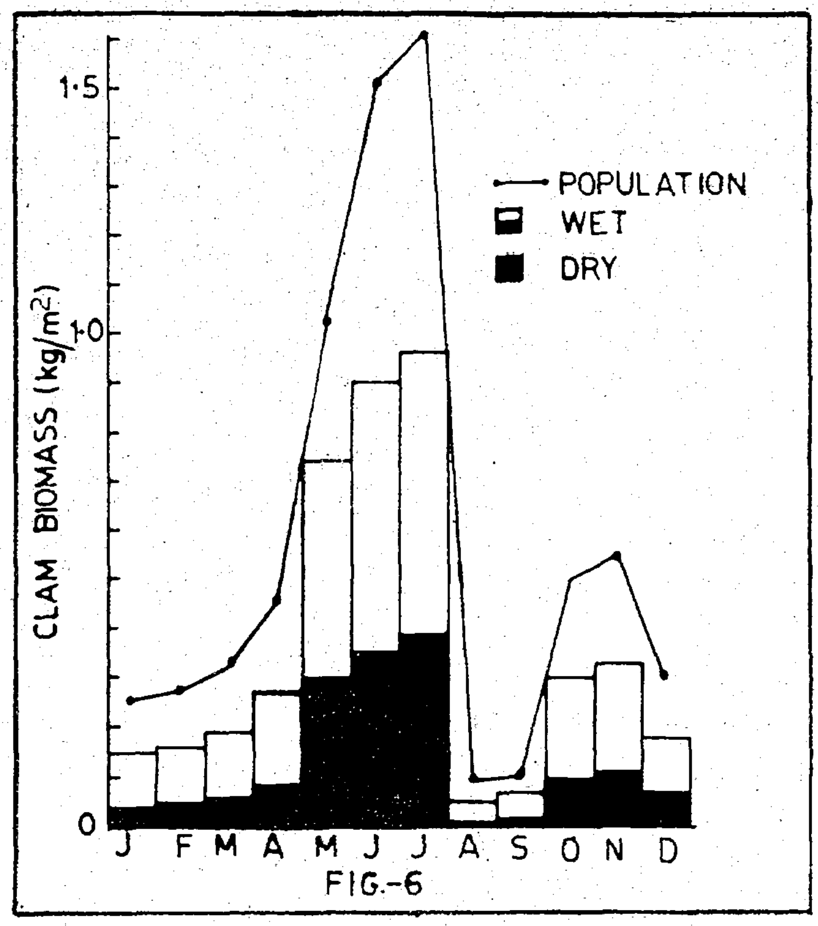

Fig. 6. Monthly variation in the clam population.

ACKNOWLEDGEMENTS

The author is grateful to Dr. S. Z. Qasim, Director, National Institute of Oceanography, Goa, for going through the manuscript and for valuable suggestions. Thanks are also due to Dr. S. N. Dwivedi and Dr. A. H. Parulekar for their help in this work.

REFERENCES

Alagarswami, K., 1966. Studies on some aspects of biology of the wedge-clam, *Dona fabu* Gmelin from Mandapam coast in the Gulf of Mannar. *J. mar. biol. Ass. India*, **8** (1): 56-75.

Durve, V. S., 1964. Preliminary observation on the seasonal gonadal changes in spawning in the clam *Meretrix casta* (Chemnitz) from the marine fish farm. *J. mar. biol. Ass. India*, **6**: 241-248.

Durve, V. S., 1970. On the growth of the clam *Meretrix casta* (Chemnitz) from the marine fish farm. *J. mar. biol Ass. India*, **12** : 125-135.

Durve, V. S. and K. V. George., 1975. Some observation on the index of condition of the clam *Meretrix casta* (Chemnitz) in relation to mud and sand qualities. *Indian J. Fish.*, **20** : 326-331.

Desai, B. N., 1971. Dominance of Mollusc in the benthic population off Cochin. *J. Bombay. nat. Hist. Soc.*, **68** : 355-362.

Parulekar, A. H., S. N. Dwivedi and V. K. Dhargalkar., 1973. Ecology of clam beds in Mandovi, Camberjua Canal and Zuari estuarine system of Goa., *Indian J. mar. Sci.* **2** : 122-126.

Ramamurthy, S., 1963. Studies on hydrological factors in North Kanara waters. *Indian. J. Fish.*, **10** (A). X : 75-93.

Rao, K. V., 1961. Studies on the growth of *Ketalysia opima* (Gmelin). *Proc. Indo. Pacific. Fish. Council.* Sec. **II**. 94-102.

Seshappa, G., 1967. On the backwater clam *Meretrix casta* (Chemnitz) in the Beypore and Karaphuza estuaries *Indian. J. Fish.*, **14** : 230-305.

Silas, E. G. and K. Algarswamy., 1965. An instance of parasitism by the pea crab. Symposium on Crustaceans. *mar. biol. Ass. India.*, Part-II.