Clam Fishery Resources of the Vellar Estuary

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Observations made during January 1977 to June 1978 indicated the existence of rich clam beds in the Vellar Estuary. Clams were distributed from river mouth to 10 km. towards the upper reaches of the estuary. Total stock of clams varied in different months from 354 t to 7050 t of which 88.0% to 99.8% was formed by *Meretrix casta* and the rest by *Katelysia opima*. Density of clams per square metre was observed to be always higher in the upper reaches (210 g to 5920 g) than in mid (9.4 g to 2290 g) and lower (1 g to 864 g) reaches of the estuary. *M. casta* was dominant in all the zones; however *K. opima* was more in latter. Length composition of these clams in different months indicated that spat fall occurred during March–September with peak in April–July. Fishing was done by agricultural labourers in their off season. The method of collection was by hand picking and scooping with bamboo baskets during low tide. 1045 m tons of clams was landed during the period of observation. 70% of this landings was directly utilised for lime industry and the rest for shucking meat. Problems of the clam fishery at Vellar and the scope of expansion of the fishery are discussed.

Widley distributed along both the coasts of India, clams form an important fishery in backwaters, estuaries and lagoons. Their potentiality as a sustainable resource was stressed by the National Commission on Agriculture (1976).

There is very little information available about the resource potential of clams in India (Alagarswami & Narasimham, 1968; Nayar & Mahadevan, 1974; Rasalam & Sebastian, 1976). Though the Vellar Estuary (11°29′N Lat; 79° 46′E Long.) was observed to be rich in clam beds (CMFRI, 1978), so far no information is available on the stock density, biological characteristics of the resources and on fishery and utilization. Observations made on these aspects during 1977–'78 are presented in this account.

Material and Methods

The Vellar estuary is a bar built estuary and open to sea throughout the year. However, the position of the mouth changes due to sand bar formation and amount of flow of freshwater during monsoon months. Details on the ecological and hydrographical features are given elsewhere (Ramamoorthi, 1954; Balasubrahmanyam, 1959). In the present observation, the tidal influence was observed up to B. Muthlur, 10 km from the mouth. This stretch of 10 km was divided into 3 zones indicating the upper (zone I), mid (zone II) and lower (zone III) reaches of the estuary for the convenience of sampling and comparison.

Each zone was sampled monthly at 10 stations, with samples of one m^2. Simultaneously temperature, salinity, depth and nature of substrata were also noted. Fishery data was collected on the days of sampling and estimated for the month. Mode of utilization was recorded by oral enquiry. Though the data on environmental condition and fishery could be collected for all the 18 months, sampling of clams could not be done during October 1977 to February 1978 because of heavy floods in the esturay.

Observations

In the Vellar Estuary, clam populations comprised mainly of *Meretrix casta* (Chemnitz) and to a lesser quantity by *Katelysia opima* (Gmelin). *Meretrix meretrix* (Linnaeus) is yet another species of some importance, but not considered separately for the present study.

Ecology of clam beds

Salinity and temperature observed during 1977–78 in the three zones are given in Table 1. These two parameters showed a decline during October to January when the estuary was flooded with freshwater and from January, they tend to rise and showed a peak in May-July. Other features of environment observed zone wise are presented below:

Zone I: Area between B. Mutlur and railway bridge was demarcated under this zone. Two irrigation channels, *Anantham pattu vaykal* and old Vellar discharge freshwater into the estuary in this zone. Because of such influx and also due to seepage of freshwater from the adjoining paddy fields, throughout the period of cultivation (July to March), salinity was always observed to be much lower than at the other two zones. Depth varied from 1 m to 3 m at different points. The bottom was sandy and muddy in most of the places sampled.

Zone II: This zone was located between railway bridge to Biological Station. It was observed to be more

Table 1. *Environmental parameters in different zones during* 1977–1978

	Zone I				Zone II				Zone III			
	Salinity, ‰		Temperature, °C		Salinity, ‰		Temperature, °C		Salinity, ‰		Temperature, °C	
	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
1977												
January	5.84-23.04	18.43	26.5–27.9	27.4	23.01–26.72	25.61	26.8-28.4	27.3	27.21–33.11	30.11	26.4–28.5	26.9
February	10.46–25.72	21.85	27.3-29.6	28.4	24.50-27.07	25.64	27.3–28.5	28.2	29.24–34.08	31.32	27.3–29.2	28.0
March	16.08–27.82	22.08	27.0–29.2	28.9	28.04–31.16	29.16	28.8–29.2	29.0	31.34–35.14	33.03	28.9–31.0	29.8
April	21.45–31.72	30.00	28.9–30.1	29.8	29.65–32.78	32.10	29.0–29.6	29.4	32.83–35.48	34.72	29.0–31.2	30.1
May	22.84-32.01	30.46	28.8-31.0	30.4	29.72–34.05	33.58	29.8–31.4	30.0	34.00–35.84	35.06	29.2–30.8	29.5
June	24.76–31.48	30.37	29.2–31.3	29.8	31.08–34.72	33.80	29.8–31.6	31.0	33.85–35.12	34.83	29.8–31.4	31.0
July	14.52–32.47	29.26	28.9–32.0	31.0	33.25-35.00	34.65	28.9–30.7	30.2	32.58–35.76	35.33	27.4–30.2	28.9
August	16.87–32.08	30.21	27.4-30.2	29.5	31.08–33.46	32.43	28.0–28.9	28.4	31.76–34.25	32.38	26.9–28.4	27.8
September	15.38–28.87	24.28	27.4–29.8	29.3	29.78–32.47	31.42	28.9–29.4	29.0	32.85–35.75	34.56	27.5–28.8	28.0
October	1.08– 7.83	4.08	26.5–29.2	28.3	4.00–11.76	8.09	27.0–28.7	28.5	17.85–32.84	29.30	27.2–28.2	27.8
November	0.00– 0.89	0.15	24.1–27.3	25.4	0.02– 2.17	0.85	25.0–26.6	26.3	3.17–23.76	15.08	25.4–27.8	26.8
December	0.15– 4.08	2.24	25.2–28.0	26.8	3.76–14.18	12.87	26.8–27.5	27.0	15.73–29.85	17.82	26.4–27.8	27.2
1978												
January	3.82– 8.76	5.08	25.4–28.9	26.4	11.58–21.67	18.76	26.5–27.3	26.9	20.78–32.85	24.72	26.9–28.8	27.4
February	10.75–18.76	14.89	27.1–19.4	27.4	18.47–26.08	24.07	26.8–27.4	27.2	25.87–34.18	30.80	27.5–31.0	29.4
March	15.48–27.52	17.93	26.4–29.1	27.9	28.60–30.00	29.11	27.3–27.8	27.5	28.53–35.16	30.48	27.0–30.0	28.8
April	13.72–22.08	21.06	28.0–30.2	29.1	27.60–32.06	30.56	28.9–30.0	29.2	31.06–33.20	32.31	28.1–30.2	29.4
May	15.30–28.96	24.31	28.0–29.8	29.0	30.47–33.80	32.11	29.6–31.3	30.4	33.82–35.20	34.52	29.0–30.3	29.5
June	18.48-32.14	30.22	29.4–31.2	31.0	31.27–35.20	34.50	32.1–33.5	33.2	33.25–35.74	35.08	28.4–31.5	30.4

or less similar in hydrographic condition to that of zone III. Depth varied from 2 to 5 m. Most of the area was covered with hard clyaish substratum in 1977 and sandy and muddy in 1978, which might have been the result of heavy flood in November 1977.

Zone III: This zone was demarcated between Biological Station to river mouth. Tidal mixing is more in the zone and therefore hydrographic features were more stable and similar to the adjoining sea. Vast area of intertidal zone near river mouth was found to be exposed during low tide offering easy access to hand picking of clams. Estuary becomes wider in this zone and depth varied from 1 m to 4 m. The bottom was covered with fine sand near the mouth while it was sandy and muddy to hard clayish in other areas.

Clam population

Population density of clams varied from 371 t (March 1978) to 7153 t (February 1977). 88.0 to 99.8% of the population was contributed by *M. casta* and the rest by *K. opima* (Fig.1). The fluctuation in the stock

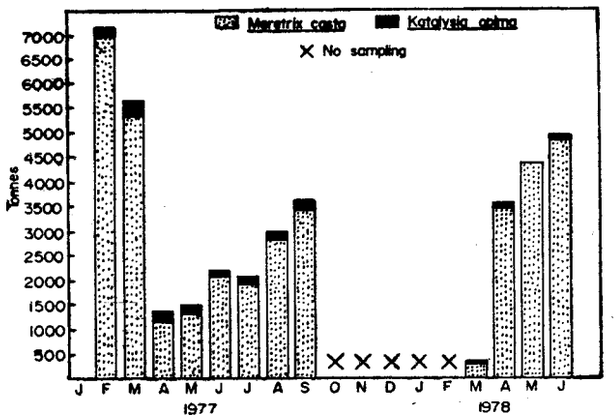

Fig. 1. Clam resources in the Vellar Estuary

from month to month may be due to natural causes such as mortality, migration, erosion, seed settling and also due to fishing pressure.

The distribution of the clams in the estuary was not uniform, but differed between the zones (Table 2). During 1977, clams were present more abundantly in zone I, than in zones II and III. But in 1978, zone II was found to be more productive *M. casta* dominated in all the zones; and K. *opima* was of some significance only in zone III.

Length composition of *M. casta* population in different months in the three zones is given in Fig. 2 and that of *K. opima* in Fig. 3. In zones I and II both smaller and larger individuals of *M. casta* were present while only lager ones were present in zone III. Spat fall of *M. casta* was recorded during May to September in 1977 and from March onwards in 1978

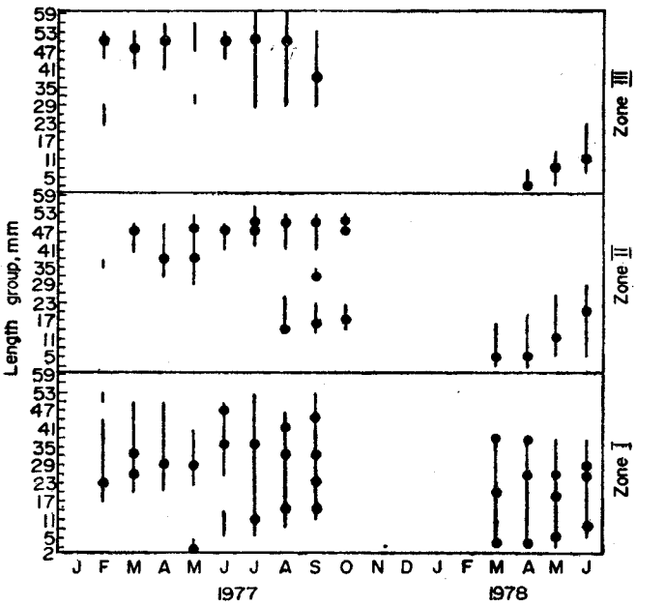

Fig. 2. Length composition of M. *Casta* (range and modes are indicated)

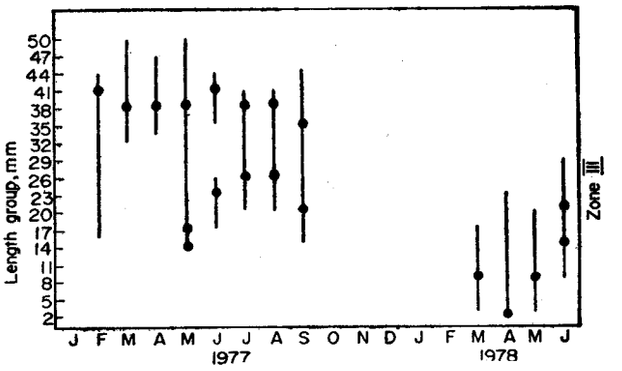

Fig. 3. Length composition of *K. opima* (range and modes are indicated)

indicating the period of spawning of this species in the Vellar Estuary. In the case of *K. opima*, settlement of seeds was observed in May 1977 and from March to May in 1978. Both *M. casta* and *K. opima* mature at a very small size of 10–15 mm in the Vellar Estuary. Thousands of eggs were observed in the ovary in both the cases. Both the species spawn over a prolonged period of March to September with intensive spawning between April to July as indicated from the heavy spat fall in these months.

Pattern of growth of *M. casta* in the Vellar Estuary, both from natural bed and on transplantation was given by Sreenivasan (1980), which was 18 mm in 12 months and 34 mm in 13 months respectively. Growth was influenced by the salinity and temperature of the environment (Abraham, 1953; Durve, 1970 and 1973).

Table 2. *Density of the population of clams/m² in the Vellar Estuary*

	1977												1978				
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
Zone I																		
Weight, g	—	5,920	4,298	765	914	1,488	1,474	1,804	2,755	—	—	—	—	—	210	910	625	1,548
% of *M. casta*	—	100.0	100.0	100.0	100.0	100.0	99.0	99.3	98.7	—	—	—	—	—	100	99.8	99.8	99.8
% of *K. opima*	—	—	—	—	—	—	1.0	0.7	1.3	—	—	—	—	—	—	0.2	0.2	0.2
Number of animals		1,116	486	75	110	4,620	625	910	1,097	—	—	—	—	—	64	12,133	2,601	5,622
% of *M. casta*	—	100	100	100	100	100	99	99.7	99.5	—	—	—	—	—	100	99.9	9.9	99.9
% of *K. opima*	—	—	—	—	—	—	1.0	0.3	0.5	—	—	—	—	—	—	0.1	0.1	0.1
Zone II																		
Weight, g	—	9.4	43	113	277	38	109	561	182	103	—	—	—	—	107	1,969	2,290	1,868
% of *M. casta*	—	65.0	100.0	100	96	100	99	100	94.5	88.3	—	—	—	—	86.9	99.6	99.9	99.4
% of *K. opima*	—	35.0	—	—	4	—	1	—	5.5	11.7	—	—	—	—	13.1	0.4	0.1	0.6
Number of animals	—	2	1	4	6	1	2	389	58	9	—	—	—	—	851	24,483	5,327	1,985
% of *M. casta*	—	50	100	100	83	100	100	100	93.1	88.9	—	—	—	—	96	99.8	99.9	99.7
% of *K. opima*	—	50	—	—	17	—	—	—	6.9	11.1	—	—	—	—	4	0.2	0.1	0.3
Zone III																		
Weight, g	—	233	493	290	220	295	123	209	211	—	—	—	—	—	1	30	864	810
% of *M. casta*	—	64	48't'	52't'	48't'	71	96.7	54.5	38.9	—	—	—	—	—	—	80	99.5	94.7
% of *K. opima*	—	36	52't'	48't'	52't'	29	3.3	45.5	61.1	—	—	—	—	—	100	20	0.5	5.3
Number of animals	—	7	14	9	7	8	7	8	11	—	—	—	—	—	4	1,645	5,860	1,673
% of *M. casta*	—	43	36	33	28	50	42.9	25	18.2	—	—	—	—	—	—	97.4	99.6	98.4
% of *K. opima*	—	57	64	67	72	50	57.1	75	81.8	—	—	—	—	—	100	2.6	0.4	1.6

Later experiments conducted in the Vellar Estuary indicated that period of exposure and submergence also influence the growth of the clam. Seed clam transplanted in two pens, namely, one below low tide (Pen I) and one above mean tide level (Pen II) and in the wooden racks submerged fully under water showed differences in the growth, (Fig. 4). The observed growth was 27 mm

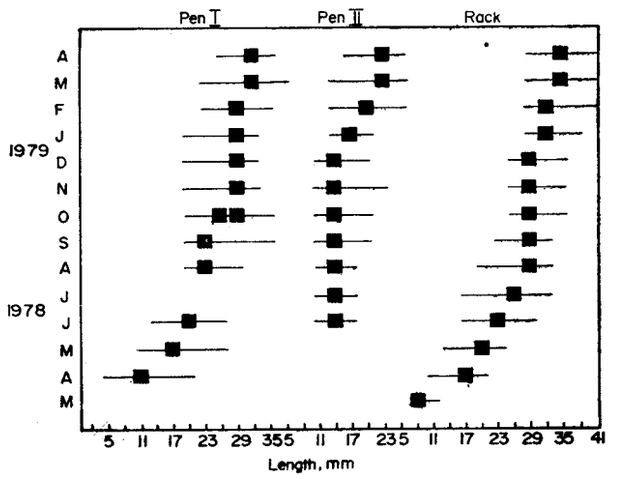

Fig. 4. Growth of *M. casta* on transplantation (range and modes are indicated)

in 13 months in the submerged racks, 21 mm in 12 months in Pen I and 9 mm only in 10 months in Pen II.

Growth of *K. opima* determined by transplantation experiment was 27.6 mm in 8 months from 5.6 mm to

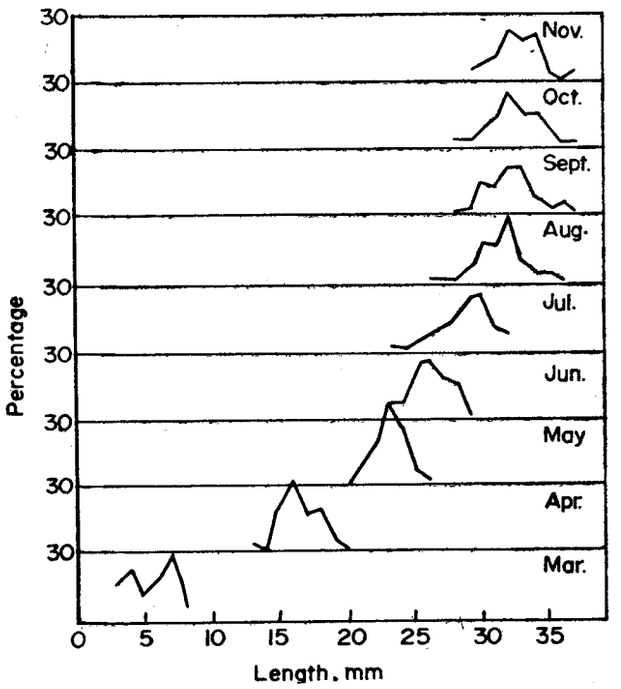

Fig. 5. Growth of *K. Opima* on transplantation

33.3 mm during March-November period of 1978 (Fig. 5). From this observation it is evident that K. *opima* is fast growing than *M. casta* in the Vellar Estuary.

Fishery

Clam fishery was mainly carried out by both the Harijan men and women who are mainly landless agricultural labourers. In dry months of February-July they enter into clam fishing as means of living. Therefore fishery was irregular and seasonal. There is no auctioning of clam beds since 1972 and no licensing for fishing. This often leads to indiscriminate fishing of undersized clam in the beds of closer vicinity.

Men fish the clam with the bamboo baskets (Fig. 6) and women by hand picking. Fishing was done normally during low tide. Beds in deeper area were approached by canoes and fishing was done by diving. Each

Fig. 6. Clam fishing at the Vellar Estuary (Men use bamboo baskets, women in background are picking clams with hand

man can dive and collect clams weighing about 150 to 200 kg in 6 hours while a woman can pick up around 20 kg in the same period. The shells so collected were dried on open grounds (Fig. 7) for a fortnight prior to selling to the business men who transport them by lorries to Neyveli for lime-burning. A ton of clam

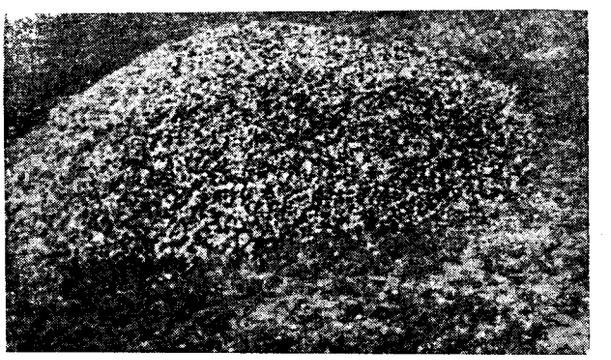

Fig. 7. Clams kept in the open for drying

shell costs Rs. 50 to 60 at the production centre. A total of 1045 t were landed during the period of observation valued over of Rs. 57,475.

Major quantity of the clam fished by women is shucked for clam meat. Only these people use them as food after boiling the meat. There is no market for clam meat in this area. Quantity of clams landed in different months, number of people engaged in fishing and percentage of clam used for shucking the meat and used directly for drying are given in Fig. 8.

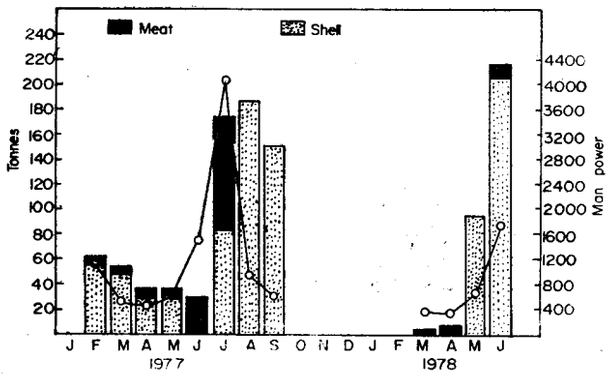

Fig. 8. Clam landings at Vellar Estuary

From the foregoing account it can be seen that Vellar Estuary is a potential area for clam fishery which at present is not properly exploited. The estimated stock of 371 to 7153 t of clams is by no means a small quantity. The present rate of exploitation is only 87.1 t per month which accounts for 2.62 % of the average density of the stock. The landings can be increased still more from the present rate of explcitation. Such an increase cannot pose serious problems to the population of clams since they are observed to have prolific breeding activity through six months in an year and fast growth which can help in replenishing the stock quickly.

Any attempt for improvement in the clam fishery of Vellar Estuary is greatly handicapped by the lack of market for clam meat which can assure a regulai income other than by selling the shells alone. This factor also drives people away from taking clam fishing as a full time job. Therefore there is an immediate need for popularising the clam meat in and around places through extension services.

At present there is no lime burning kilns located around Vellar Estuary. Establishing kilns through cooperative societies, will certainly give a good start to increase the clam production. Provisions for organized fishing and marketing of clams through such societies will bring a welcome change in the economic standards of the poor harijan labourers in this area. Further augmentation of the resources from the present level to higher magnitude can be done by practicing clam culture in the vast area of the estuary. Leasing out water areas for clam farming as is done at Portugal (Korringa, 1976) can be a right step in this direction.

Pollution, over fishing, exploitation of undersized clams and reclamation of rich clam beds are some of the problems facing the clam resources elsewhere in the country (Rasalam & Sebastian, 1974). Steps to prevent such problems even before they make an appearance at Vellar Estuary can also be advantageous.

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