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Note

Bivalve resources of the Chettuva estuary, Kerala

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ABSTRACT

Clams form a major exploited resource of Chettuva estuary. A rapid survey was carried out to assess the bivalve resource and potential stock. The estuary harbors an estimated standing stock of 378 t of bivalves; *Meretrix casta* is the dominant species (340 t) followed by *Villorita cyprinoides* (33.6 t). Aspects of conservation and management of bivalve fishery are detailed. The prospects for enhancing bivalve production from the estuary through relaying/ semi culture of clams and promoting mussel farming in the lower reaches of the estuary are discussed.

Several species of clams, found in the estuaries and backwaters of India, are exploited for their meat and shells. Information on the ditribution and exploitation of clams from India was provided by Rao (1963), Jones (1968), Alagarswami and Narasimham (1973) and Rasalam and Sebastian (1973). Studies on the resource characteristics, exploitation and biology of clams from Karnataka, Kerala and Andhra Pradesh were made by Harkantara (1975), Rao (1984) and Nayar *et al.* (1984), Rao and Rao (1985), Achary (1988), Narasimham *et al* (1984), Laxmilatha & Appukuttan (2002). Distribution of deposits of estuaries of Karnataka was documented by Gopal *et. al.* (1976) and Venkatkumaran and Bhat (1978). Biological aspects of important clam species were dealt with by Durve (1970), Seshappa (1967). Silas *et. al.* (1982) felt that the existing potential for bivalve culture was immense and stressed the need for organizing culture programme to augment production.

Considering the demand for meat and shells by the various industries, the Chetuva estuary (10º12'-10º16' N 76º 07'-76º10' E) was surveyed during Feb. 2000 to assess the existing bivalve resources and the potential for exploitation and culture.

Sampling sites were fixed within six main zones of the Chettuva estuary (Fig.1). Each zone was further sub divided into 5 to 6 sub stations to facilitate adequate sampling and were studied in detail. The survey of the entire estuary was carried out in the early hours (0600-0800hrs.) and could be carried out within ten days. The bivalve distribution in a unit area (25 x 25 cm) was taken by demarking the area of clam bed with a quadrant. About 2" sample (bivalve & sediment) within the quadrant area was collected for analysis. Observations on

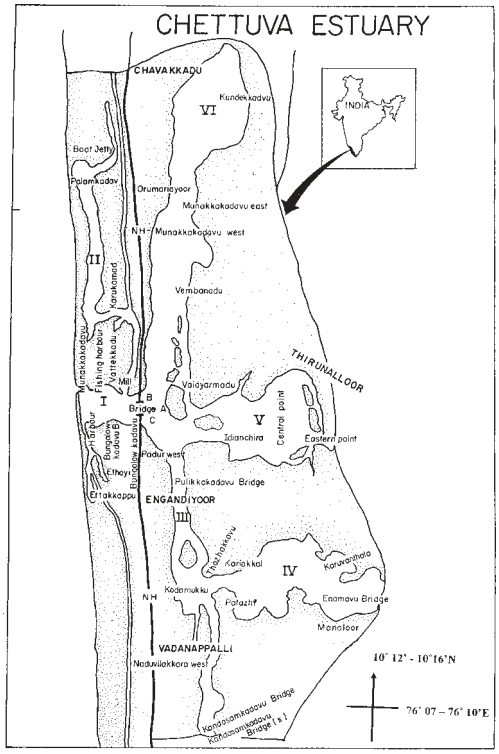

Fig. 1 Map showing zones I to VI in Chettuva Estuary

the area of the clam bed, hydrographic parameters like salinity, temperature, dissolved oxygen content and productivity were recorded. Sediment samples were collected to analyze the grain size and composition of the clam beds. Faunal samples were studied in detail by noting species composition, the length range of each samples, its shell-on and meat weight.

Ecology of the bed: The hydrographic parameters showed wide variations within the six zones (Table 1).

Soil composition : All the sampled zones were composed of fine and coarse sand, ranging from 38.3 % fine sand in zone VI to 16.2% fine sand in Zone IV. The organic carbon content in the soil ranged from 0.3 mg C/m^3 in Zone II to a high of 1.68 mg C/m^3 in Zone IV. The

TABLE 1. *Hydrological and sediment characteristics in the various zones of Chettuva estuary (February 2000)*

	Salinity (ppt)		Dissolved oxygen (ml/L)		Productivity (MgC/m3)		Depth (m)	Clarity (m)	Temp °C	Organic Carbon mg C/m3
	Surface	Bottom	Surface	Bottom	Gross Surface	Net Surface				
Zone I	33.38	33.17	2.71	2.49	0.47	0.32	2.19	0.66	29.58	1.02
Zone II	20.67	20.67	3.16	2.75	0.83	1.04	1.60	0.30	31.50	0.3
Zone III	24.86	25.14	2.95	2.78	0.11	0.00	2.29	0.94	30.29	1.5
Zone IV	24.00	25.00	2.92	2.43	1.46	0.83	1.40	0.51	31.00	1.68
Zone V	29.00	30.00	3.53	3.53	1.67	0.21	0.86	0.40	32.00	0.95
Zone VI	28.83	28.80	4.49	3.98	1.33	0.38	1.17	0.52	31.17	0.63
Average	26.79	27.13	3.29	2.99	0.98	0.46	1.58	0.56	30.92	1.01

physical nature of the substratum is predominantly sandy with mixed type of substrate of clay and sand in the upper reaches.

Bivalve resource

The Chettuva estuary is dominant in *Meretix casta* and to some extent *Villorita cyprinoides*. Zones II and I were rich in *M. casta*; Zones III and VI also had a meager population of *M. casta*. *V.cyprinoides* was found to be distributed in Zone III and meager in Zones IV and VI. A very sparse population of *Crassostrea madrasensis* and to a negligible extent *Saccostrea cucullata* was found in the Zone I and totally absent in all other zones.

Salinity and the substrate influence the distribution of clams in the Chettuva estuary. *M. casta* prefers high salinities and sandy bottom. Zones I, II and III have salinities ranging from 20 to 33 ppt due to its proximity to the sea. *V. cyprinoides* being less euryhaline, was found in Zones II and III where the average salinity was below 25 ppt. Although Zone V recorded salinity of 30 ppt, no clams were found in this zone. Zone VI also had high salinity levels; however the occurrence of clams in this zone was sparse.

The average density of *M. casta* was 50.8 numbers per sq. m in Zone I and 55 numbers per sq. m in Zone II and 12 numbers per sq. m in Zone VI. *V. cyprinoides* was very sparsely populated in Zone III and IV at 2.28 and 7.2 numbers per sq. m respectively. In Zone VII it was insignificant at 0.8 numbers per sq. m. *C. madrasensis*, found only in Zone I was 8 numbers per sq. m.

The average biomass, denoted by the total weight in grams per sq. m was highest in Zone I at 674.75 g/sq. m. *M. casta* contributed 34.8% and *C. madrasensis* 65.25 % to the total average biomass in Zone I. The total average biomass of Zone II was 318-g/sq. m, wholly contributed by *M.casta*. The total average biomass of Zone III was 50.16-g/sq .m and comprised 2.83% of *M. casta* and 97.17% *V. cyprinoides*. In Zone VI, the total average biomass was 77.2 g/sq. m comprising 92.75% of *M. casta* and 7.25% *V. cyprinoides*. The total average biomass of the estuary was 1215.5-g/sq.m.

The estimated biomass (standing stock) of bivalves in the Chettuva estuary is estimated at 378.09 tonnes in an estimated bed area of 208.75 ha and total water spread area of 15 sq. km. The estimated biomass of *M. casta* is 340.13 t/ha contributing 89.96% to the total biomass and *V. cyprinoides* 33.56 t/ha forming 8.76 % of the total biomass. The estimated biomass *C. madrasensis* is 4.4 t/ha in the Chettuva estuary forming 1.16% of the total estimated biomass (Table 2).

Villorita cyprinoides and *Meretrix casta* are the exploited clams in the estuary. About 22 clam fishers in 10-15 canoes per day are engaged in the exploitation of *M. casta*. Fishing is done by handpicking or with a scoop /bag net. Fishing is carried out for about 19 days in a month. The total annual production of *M. casta* was 192.46 t in 1999 with an average production of 16.04 t /month.

The meat is used for local consumption. The clam fetches Rs. 5-6/kg. The size of *M. casta* in the fishery ranged from 17.6 to 22.7 mm. The average length was 20.22 mm and the average weight 5g. The meat percentage was 12.57. The size of *V. cyprinoides* in the fishery was 18.3 to 33.1 mm and the

TABLE 2. *Estimated density and biomass of bivalves in the various zones of Chettuva estuary*

	Area of distribution (Ha)				Average density (Number/sq.m)				Estimated number Lakhs				Average biomass (g/sq.m)				Estimated biomass Tonnes			
	M c	*V c*	*C m*	*Total*	*M c*	*V c*	*C m*	*Total*	*M c*	*V c*	*C m*	*Total*	*M c*	*V c*	*C m*	*Total*	*M c*	*V c*	*C m*	*Total*
Zone I	75.0	Nil	1.0	76.0	50.8	Nil	8.0	58.8	381.2	Nil	0.8	382.0	234.8	Nil	440	674.8	176.06	Nil	4.4	180.46
Zine II	50.0	Nil	Nil	50.0	55.0	Nil	Nil	55.0	275.0	Nil	Nil	275.0	318.0	Nil	Nil	318.0	159.00	Nil	Nil	159.00
Zone III	10.5	60.0	Nil	70.5	1.71	2.28	Nil	4.0	1.8	13.7	Nil	15.5	1.4	48.74	Nil	50.2	1.49	29.2	Nil	30.71
Zone IV	Nil	2.3	Nil	2.3	Nil	7.20	Nil	7.2	Nil	1.6	Nil	1.6	Nil	95.42	Nil	95.4	Nil	1.54	Nil	1.54
Zone V	Nil	Nil	Nil	0.0	Nil	Nil	Nil	0.0	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.0	Nil	Nil	Nil	0.00
Zone VI	5.0	5.0	Nil	10.0	12.00	0.80	Nil	12.8	6.0	0.4	Nil	6.4	71.6	5.6	Nil	77.2	3.58	2.8	Nil	6.38
Total	140.5	67.3	1.0	208.8	119.5	10.3	8.0	137.8	664.0	15.7	0.8	680.5	625.8	149.76	440	1215.5	340.13	33.56	4.4	378.09

* *M.c: Meretrix casta; V.c: Villorita cyprinoides; C.m: Crassostrea madrasensis*

average length was 28.47 mm and the average weight 10.96g. The meat percentage was 10.88.

The total standing stock of the clams in the Chettuva estuary is 378 t of which the estimated standing stock of *M. casta* is 340 t. The present level of exploitation is moderate at 192 t only which is just over half the present estimated standing stock and therefore offers ample scope for further exploitation. However, there are signs of exploitation of seed clams, which in the long run could be detrimental to the fishery. There are no reliable estimates of exploitation of clams during different seasons, over a given period of time. Frequent surveys or continuous monitoring should be conducted to understand the change in stock sizes in relation to environmental and biological factors. Further, the continuous sand quarrying in the estuary could alter the bottom profile and the substratum and this would affect the seed settlement pattern and wipe out the whole population. The quarrying from the estuary comprises 3-5% of live juvenile clams, which is thus lost to the fishery.

Mariculture possibilities

The Chettuva estuary has pockets of marine zones (I, II, III) where mussel farming as well as clam transplantation / semi culture/ relaying and edible oyster transplantations can be carried out. A sizeable population of *Paphia malabarica* was present in the estuary 7-8 years ago, which has been wiped out probably due to the influx of fresh water from the upstream area. Preliminary ranching experiments by Central Marine Fisheries Research Institute, Cochin by transplanting *P. malabarica* from Dalawapuram, Quilon has shown significant survival and growth rates and therefore offers possibilities for re-populating this species through large

scale transplantation / relaying and reviving of the fishery.

The stock of *M. casta* can also be enhanced in the Chettuva estuary through relaying seed clams in areas of high productivity. The indiscriminate exploitation of juvenile clams along with sand quarrying needs to be controlled and regulated. Retting grounds in certain zones cause drastic changes in pH of both water and substratum, causing extensive changes in the clam beds and clam population.

The Chettuva estuary remains saline for most part of the year (September to May) and therefore offers immense scope for bivalve culture in the estuary. Mussel and edible oyster culture demonstration experiments carried out by Central Marine Fisheries Research Institute, Cochin during 1997-1998 in the estuary proved to be successful. Very high production of 700-900 kg mussel (shell-on) was obtained within a culture period for 5-6 months. Several farmers have been motivated to adopt mussel culture on a small scale, utilizing seed collected from Ethayii, Anchangadi and Thotappu lighthouse beach. A rapid survey of mussel seed resource availability was also carried out to assess the potential and scope of adoption of large-scale mussel culture in the estuary. From the present survey, it is evident that zones I, II and III are ideal areas for mussel farming in the Chettuva estuary from which @15,000t of mussel can be harvested annually.

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