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The fishery and biology of *Meretrix casta* (Chemnitz) in the Moorad estuary, Kerala

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ABSTRACT

Meretrix casta forms an important fishery in the Moorad estuary. The average annual landing for the period 2000-2004 was 426t, the average catch per effort was 573 kg and total effort was 3182. Clams ranging from 28 to 32 mm size contributed to the fishery. *M. casta* is a continuous breeder with two peaks in March-April and August-September. The percentage edibility ranged between 8 and 16. The standing stock biomass in the Moorad estuary was estimated at 2073 t with an average density of 1096 numbers per sq. m. The present status and management options for this important fishery are discussed.

Meretrix casta (Chemnitz) is an important venerid clam occurring in estuaries and backwaters of both east and west coast of India. It occurs in Goa, Aghnashini, Uppunda, Coondapur, Udyavara and Mulki estuaries in Karnataka and Ashtamudi, Chettuva, Bepore, Korapuzha, Moorad and Chaliyar estuaries in Kerala, contributing to sustenance fishery in these estuaries. In the east coast, it forms a fishery in Vellar, Pulicat and Bhimunipatnam backwaters (Seshappa, 1971; Alagaraswami and Meiyappan, 1989b; Narasimham, 1991). Biology of the white clam has been studied by Abraham (1953), Durve (1964), Seshappa (1971), Sreenivasan (1983), Thangavelu and Sanjeevraj (1985) and Thangavelu and Poovannan (1994).

Observations on the clam fishery were made regularly during the period 2000-2004. The data on catch and effort were collected and the trend in

production was analyzed. Monthly samples (40-50 numbers/month) of *Meretrix casta* were collected from the natural beds in Moorad estuary during 2004. The total length, total weight and wet meat weight were recorded. Gonad smears were examined under the microscope to determine the maturity stages. The classification of maturity stages were as given by Ropes (1968). The percentage edibility was studied as percentage of wet flesh weight to the total weight of the clam (Durve, 1964). The environmental parameters viz; salinity, pH, clarity, and dissolved oxygen were also monitored regularly.

Fishing area: Moorad estuary is a small water body with a water-spread area of about 1.4 sq. km, located in Kozhikode district, North Kerala between 11°32'N to 11°35'N and 75°35'S to 75°40'S supporting a good fishery for fin fishes and bivalves. It remains connected to the Arabian Sea throughout

the year. The bottom substrate is sand and mud. The salinity ranges from 7 in July to 35 ppt in December, pH 6.57 to 8.23, and clarity 35 to 75 cm and dissolved oxygen 3.9 to 5.1 ml/L. The clam beds are distributed in 152 ha. *M. casta* forms a major portion of the clam fishery of this estuary.

Fishing method: *M. casta* is collected by hand picking from shallow areas during low tides by women and children, particularly during peak season and is used for domestic consumption. The other method of fishing is by using a scoop or bag net attached to a pole. Two to three men operate from a canoe. The net is pushed into the mud to rake up the clams and lifted up. The bag net is vigorously shaken in the water to clear the mud in the bag net and the clams are transferred to the canoe. The depth of the fishing area is about 1.5-2 m at high tide.

Fishery: The fishery begins after the monsoon. Peak fishing occurs from December to May with maximum fishing effort during February to May. With increase in effort, there is increased production. Clam fishing is carried out for about 16-20 days a month. The average catch per canoe is 150 kg.

During the period 2000-2004, the average total production of the clam was estimated at 426 t. The average total

effort was 3182 and average catch per effort was 573 kg. In 2000, the total production was 315t and the monthly average production was 26t. In 2001, the total production was 1690t and monthly average production was 141 t. The total production during 2002 was 988 t and monthly average production was 82t. The total production during 2003 was 1954 t and the monthly average production was 163 t. 168t of clams were exploited in 2004 with monthly catch of 14 t. Maximum catch of 3182 t was observed in 2001, whereas the catch declined in 2002 by 42% although effort increased by 64%. The catch almost doubled in 2003 by 94% while the effort decreased by 8%. In 2004 the catch declined drastically by 91% and the effort was lower by 86%. The fluctuations in the fishery may be due to poor spat fall (Table 1).

During the entire period of observation, maximum landings of *M. casta* were recorded in April (329 t). During 2000 and 2004, fishing was restricted to four months. In 2001, there was no fishing from June to September. The total effort ranged from 120 in August to 1303 in May. The catch per effort ranged from 13 kg in September to 279 kg in February.

The length of *M. casta* ranged from 8-42 mm. In January '04 size range of 16-36 mm occurred in the fishery with

TABLE 1: Meretrix casta production during 2000-2004

Year	Total Catch (T)	Effort (Nos.)	C/E (Kg)
2000	315	2572	122
2001	1690	5351	316
2002	989	14808	67
2003	1954	13559	144
2004	168	1894	89
Total	5116	38184	738
Average	1023	7637	148

20 mm size group dominating. In February, 24-50 mm occurred with dominant size groups of 24-28 mm. In March, the mode shifted to 30-32 mm, followed by 32 mm and 34mm in April. In May, 32 and 34 mm size groups dominated with 40 mm size clams also contributing to the fishery. In July-August and October also the same size groups occurred. In November, the smaller size clams of 8-16 mm occurred. This indicated that spawning has occurred in September - October. In subsequent months the mode shifted to 20, 22 and 24mm. The dominant size groups occurring in the fishery were 20-22 mm and 22-24mm. However, larger size groups, 32-34 mm, 34-36 mm and 36-38 mm occur in greater quantities during December to March and May to August. During the peak fishing season the undersized clams (8-14 mm) are also fished.

Growth of clams was rapid during January to April. The growth rate was 4.7 mm and 1.63 g in January, decreased slightly in February (1.70 mm, and 0.49g) and increased again by 2.83 mm and 5.54 g in March. From May onwards growth was retarded due to drop in salinity during the monsoon months and also due to spawning activity. Seed clams of average length 11.27 mm and average weight 0.37 g occurred during November (Fig.1). The percentage edibility of *M. casta* ranged between 8.1 in November and 16 in December; percentage edibility was also high during January, March, April & October (12-12.9%).

Males were dominant throughout the year except in January and December. Females with mature gonads occurred during January to April and December. Partially spent females occurred during January to April and fully spent females occurred in May and

December. Females in maturing condition occurred in June and October. In males also similar gonadal condition prevailed. Mature males occurred during January to August and in December. Partially spent males were present during January to April and June-August. Fully spent males occurred from May to October and December. Males with maturing gonads occurred during January, March, June, October and December. Spawning occurs throughout the year with peak spawning in March-April and August-September.

Standing stock: The estimated total biomass of *Meretrix casta* in the Moorad estuary in 2004 was 2073 t in a clam bed area of 152 ha. The average biomass was 2484 g per sq. m and the average density was 1096 numbers per sq. m.

Utilization: Consumption of meat of the white clam is confined to the local people. The white clam fished from the Moorad estuary is primarily for the shell. The fishers sell the clams at the rate of Rs. 125/100kg. The shell grit is sold at the rate of Rs. 18/tin (1 tin=20kg). The shell is utilized as fertilizer and for the production of snowcem.

Factors affecting the fishery: Indiscriminate fishing for small sized clams during peak season affects the sustainability of the fishery. Large quantities of small sized clams are fished and allowed to putrefy. This is later sold for use in the lime industry. Occurrence of red tide due to toxic algal bloom (*Hornellia marina*) during the post monsoon months affects the fishery. The fishing is temporarily suspended till the effect of the algal bloom subsides. This has a drastic economic impact on the clam fishers.

Meretrix casta forms a significant resource in the Moorad estuary,

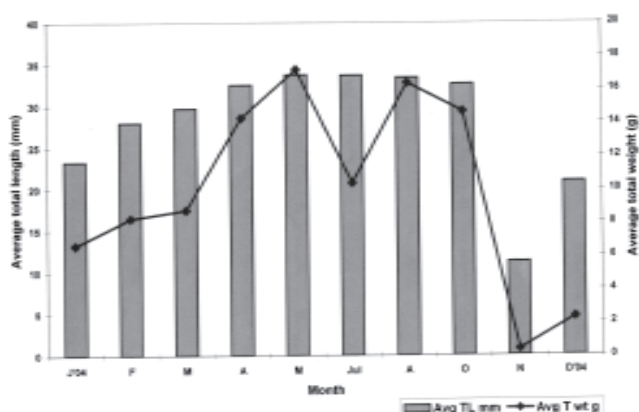


Fig.1. Growth pattern of *Meretrix casta* in Moorad estuary

exploited for meat and shell. The size group of 28-32 mm forms the exploited stock. The white clam is a continuous breeder with peak spawning in March-April and August-September. Abraham (1953) reported that *M. casta* of Adyar estuary breeds in July-August and October-November and a third spawning occurs in the summer. Durve (1964) and Parulekar *et.al.* (1973) recorded that *M. casta* is a continuous breeder. In the Vellar estuary, *M. casta* spawns during April-September (Sreenivasan 1983). Thangavelu and Poovannan (1994) reported that *M. casta* breeds throughout the year with peaks in March-April and August-September in the Muttukadu backwaters as is the case in Moorad estuary. They also reported mortality of *M. casta* at high salinity of 62 ppt. Thangavelu and Sanjeevraj (1985) observed three spawning peaks in *M. casta* in the Pulicat Lake. Seshappa (1971) has also reported two spawning peaks in *M. casta* in Beypore and Korapuzha estuaries in North Kerala. Salinity influences the growth as well as spawning. The growth of *M. casta* was rapid during January-April and retarded during the monsoon months. The average total weight also drops significantly in July as a result of

decreased salinity. The meat content and the condition index also decreases during monsoon. Similar situation has been reported for *M. casta* in the Marine fish farm at mandapam (Durve, 1970, 1973), in the Beypore and Korapuzha estuaries (Seshappa, 1971), Vellar estuary (Sreenivas, 1983b), and Muttukadu backwaters (Thangavelu and Poovannan 1994). The percentage edibility in *M.*

casta in the Moorad estuary is higher than (8 to 16%) that reported by Durve (1964) for *M. casta* (4.2 to 6.46%) from Mandapam while Krishnakumari *et al* (1977) reported it to be higher at 11.26 to 12% for *M. casta* in Goa. Therefore, March - April and October to January are the best seasons for the exploitation of *M. casta* for high meat content.

M. casta are fished regularly for their meat and shell in most estuaries, backwaters and coastal lagoons. Although there is no export demand for *M. casta* meat presently, it is desirable to explore the possibility of exporting the meat of *M. casta* and attempt culture of this species (Thangavelu & Poovannan, 1988). The undersized clams that are fished during the peak season can be transplanted to suitable areas so as to harvest at a later period to augment production. (Rao and Rao, 1983). The meat of *M. casta* is highly nutritious, however it spoils rapidly. It is necessary to set up storage and depuration facilities along major production centers. The standing stock of *M. casta* is 2073 t, while the present level of exploitation is only around 1000 t annually and therefore exploitation can be increased at least two folds. However, re-laying /

semiculture practices must be adopted to protect the exploitation of under sized clams. Monitoring for clam beds from toxic algal blooms, and pesticides is essential to ensure that these areas are free from pollution. Alternative uses / value added products of clam meat also need to be developed.

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References

- Abraham, K.C. 1963. Observations on the biology of *Meretrix casta* (Chemnitz). *J. Zool. Soc. India*, **5**(2): 163-190.
- Alagarwami, K and M.M. Meiyappan 1989b. Prospects and problems of management and development of marine molluscan resources (other than cephalopods) in India. *Bull. Cent. Mar. Fish. Res. Inst.*, **44** (1): 250-261.
- Durve, V.S. 1964. Preliminary observations on the seasonal gonadal changes and spawning in the clam *Meretrix casta* (Chemnitz) from the marine fish farm. *J. Mar. Biol. Assoc. India*, **6** (2): 241-248: 125-135.
- Durve, V.S. 1970. On the growth of the clam *Meretrix casta* (Chemnitz) from the Marine Fish Farm. *J. Mar. Biol. Assoc. India.*, **12**: 125-135
- Durve, V.S. 1973. Experimental transplantation of the clam *Meretrix casta* (Chemnitz) in the Marine Fish Farm. *Indian J. Fish.*, **20**: 56-60
- Krishnakumari, L., M.D. Rajagopal and Sumitra Vijayaraghavan 1977. Some aspects of biology and biochemistry of the backwater clam *Meretrix casta* (Chemnitz). *Mahasagar Bull. Nat. Inst. Oceanogr.*, **10** (3/4): 157-163
- Narasimham, K.A. 1991. Present status of clam fisheries of India. *J. Mar. Biol. Assoc. India*, **33**: (1&2): 76-88.
- Parulekar, A.H., S.N. Dwivedi and V.K. Dhargalkar 1973. Ecology of clam beds in Mandovi, Cumbarjua Canal and Zuari estuarine system of Goa. *Indian J. Mar. Sci.*, **2**: 122-126.
- Rao, K.S. and G.S. Rao 1983. Experimental clam culture at Mulki, Dakshina Kannada. *J. Mar. Biol. Assoc. India*, **2**: 557-560.
- Ropes, J.W. 1968. Reproductive cycle of the surf clam *Spisula solidissima* in offshore, New Jersey. *Biol. Bull.*, **135**(2): 345-365
- Seshappa, G. 1971. Some observations on the backwater clam *Meretrix casta* (Chemnitz) in the Beypore and Korapuzha estuaries. *Indian In Fish.*, **14** (1&2): 298-305
- Sreevnivasan, P.V. 1983. Growth of the clam *Meretrix casta* (Chemnitz) transplanted in the Vellar estuary. *Proc. Symp. Coastal Aquaculture*, **2**: 564-568
- Thangavelu R and P Poovannan 1994. Some aspects of biology of the clam *Meretrix casta* (Chemnitz) in Muttukadu backwaters. *J. Mar. Biol. Assoc. India*, **36** (1&2): 77-80.
- Thangavelu R and P.J. Sanjeevraj. 1985. Fishery and biology of the clam *Meretrix casta* (Chemnitz) in Pulicat Lake. *J. Mar. Biol. Assoc. India*, **27**: (1&2): 75-83.

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