

CMFRI bulletin 42

Part One

AUGUST 1988



NATIONAL SEMINAR ON SHELLFISH RESOURCES AND FARMING

TUTICORIN

19-21 January, 1987

Session - I

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(Indian Council of Agricultural Research)
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8. EXPLOITATION OF MOLLUSCAN SHELL DEPOSITS IN VIGAI ESTUARY AT ATHANKARAI

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ABSTRACT

Molluscan shell deposits are present in the bed of Vaghai estuary at Athankaral, on the southeast coast of India, which are being exploited intensively since 1978. The topographical and environmental features of the estuary, distribution and species composition of shell deposits, extent of resources, methods of exploitation, magnitude of production and utilization have been studied.

The shell deposits are distributed in the bed of estuary over a distance of 4.63 km in the upper portion of the estuary. They are subfossil deposits 0.15 m-0.46 m in thickness and comprise predominantly of *Meretrix casta* which are favoured as raw material in the manufacture of calcium carbide and in tannery industry. Shells of other species in the deposits like *Cerithidea fluviatilis*, *Hemifusus cochlidium*, *Paphia* etc. are converted into lime. The annual production of lime shells from the estuary is about 5.500 t. The presence of large numbers of live adults and seed clams of *Meretrix casta* present in the upper layer of sediment along with the subfossil shells is pointed out and the need for preventing the destruction of live shellfish is stressed.

INTRODUCTION

Molluscan shell deposits are distributed at

several places along the east and west coasts such as Chikka Lake, Vembanad Lake, Sonapur, Kakinada Bay, Pulicat Lake etc. and are exploited for use in the production of lime, cement etc. (Rao, 1969, Alagarswami and Narasimham, 1973, Rasalam & Sebastan 1976), The mollu-

scan shell deposits are mainly subfossil deposits and are important as a resource as they yield shell lime and offer livelihood to rural people in the coastal areas where they occur. Since a very long time molluscan shell deposits are known to be found in the bed of Vaghai estuary at Athankaral on the southeast coast of India and shells have been collected from therein by people of the villages around, converted into

lime and sold for whitewashing or for use in construction of buildings. But the exploitation was on a very small scale and was only a subsistence fishery until quite as recently as 1978. Early in 1978 it was observed that the shell lime deposits in the bed of the estuary were intensively quarried and large quantities of shells were being collected annually thereafter.

In view of the economic importance of the lime shell deposits of the estuary it was felt necessary that topography of the estuary, the environmental conditions, the associated fauna and flora, distribution of the shell deposits, their exploitation, magnitude of shell production and utilisation are to be studied and the scope for future utilization of the resources discussed,

MATERIAL AND METHODS

Observations were made on the topography of the Vaigai estuary, the ecological conditions, the fauna and flora of the estuary and distribution and exploitation of shell deposits. Data on the magnitude of shell production were collected on observation days at the estuary and the total quantity removed, from the records of the Taluk office of the Revenue Department at Rarvanathapuram. Information was also collected on the utilization of the lime shells,

TOPOGRAPHY OF VAIGAI ESTUARY

The Vaigai estuary is formed by the river Vaigai which originates in the Western Ghats and opens on the southeast coast into the Palk Bay (Dunna and Alagarswami, 1964) on the eastern side of the village Athankarai which is about 25 km. northwest of Mandapam Camp. The estuary runs almost parallel to the National Highway 49 and turns northwards 1.8 km. before the mouth to join the sea. The length of the estuary is 8.2 km and its width is 130 m upstream, 200-240 m in the lower reaches and a maximum of 356 m near the mouth (Rao et al 1987). The depth ranges from less than 1 m in the upper portion of the estuary to 2 m or more in the lower part.

ENVIRONMENTAL CONDITIONS

The estuary is connected with the sea except in the months April to June when a sand

bar Fs formed near the mouth. In some years the mouth of the estuary gets closed much earlier in January due to accumulation of sand under the influence of strong winds and tides. The sediment is grey in colour and consists of clayey mud with an admixture of fine and medium grain sand in the upper and lower parts of the estuary. Near the mouth the sediment is largely sandy with a small percentage of fine mud. The water temperature of the estuary varies from 27.5°C to 37.5°C with the highest values in the summer months, April to June. Salinity of the estuary fluctuates over a wide range of 17.83‰ to 71.2‰. The salinity values are high in the summer months especially in the upper reaches when the estuary is cut off from the sea and there is progressive evaporation. A drastic drop in salinity to as low as 3-5‰ takes place in some weeks during October-December as a result of discharge of freshwater from the Vaigai reservoir and irrigation canals following heavy rains.

FAUNA AND FLORA OF THE ESTUARY

The fauna of the estuary consists of mostly molluscs, fishes, prawns and crabs. Beds of the clam *Meritrix casta* are distributed from the upper reaches of the estuary upto a distance of 1.6 km from the mouth. Seed clams of *Meritrix casta* occur in enormous numbers in the upper part of the estuary opposite Perungulam and south of it. Three beds of the oyster *Crassostrea madrasensis* each consisting of several patches and larger formations exist in the lower and middle portions of the estuary (Rao et al 1987). The small gastropod *Cerith/dea fluviatilis* is found in large numbers in the shallow parts of the estuary. Three species of prawns *Penaeus ind/cus*, *P. samisulcatus* and *Metapenaeus burkenroadi* and several species of fishes like *Himantura* sp., *Thri-socles* sp., *Tachysurus* spp., *Mugi/ cephalus*, *Tilapia mossambica* etc. occur in the estuary and are caught in drag nets called C/?/pp/va/a/ forming a subsistence fishery. The flora consists of the sea-grasses *Cymodocea* spp and *Halophila ova/is* and the algae *Eneromorpha* spp, and *Polysiphonia* sp, the latter as encrusting flora on oyster beds.

DISTRIBUTION OF SHELL DEPOSITS

The shell deposits are distributed as a layer from a distance of 3.70 km from the mouth of the estuary up to the point midway between Perungulam and causeway over a distance of 4.63 km. These are subsoil deposits, 0.15 m-0.45 m in thickness and are located below a grey muddy sand sediment 0.6-0.9 m thick

Analysis of the composition of the shell deposits show that they consist exclusively of molluscan shells. Shells of the clam *Meretrix casta* form the predominant portion amounting to 75-90%. Next in importance to the clam shells are the shells of *Cerithidea fluviatilis* a common gastropod in the estuary. *C. fluviatilis* accounts for 3-24%. The rest consists of the shells of species like *Area complanata*, *Paphia* sp, *Gafranum* sp, *Sanguinolaria diphos*, *Umbonium vestiarium*, *Bullia* sp, and *Hemifusus cocftlidium*.

The shell deposits in the estuary being 0.15-0.45 m in thickness, if it is assumed that they are on an average 0.30 m in thickness and since the length and width of the estuary over which the deposits are distributed are 4.63 km and 135 m, the standing stock of the subfossil molluscan deposits appear to be about 1,60,000 t. To determine the actual magnitude of the shell deposits a geological survey of the estuary is needed.

The source of the shell deposits are the shells of *Meretrix casta* and *Cerithidea fluviatilis* which are inhabitants of the estuary and after death were covered by sediment. The shells like *Area*, *Sanguinolaria*, *Hemifusus* forming a small component would have drifted into the area from the inshore waters.

EXPLOITATION

The exploitation of the shell deposits in the estuary was permitted by the Government of Tamil Nadu till a few years back through issue of licences by the Revenue Department on payment of seniorage. The Tamil Nadu Government propose to exploit the subfossil shell deposits present in the estuary directly. Shell merchants took licences from the Taulk Office, Ramanathapuram and have the shells collected by persons including fisherfolk and agricultural labourers of the villages adjoining the Vaigai estuary at Athankarai

The lime shells are collected from the bed of the estuary using simple devices consisting of a crowbar and a bag like synthetic net tied securely to a semicircular or circular frame fabricated out of a tree branch. The diameter of the frame varies from 30 cm to 50 cm and the length of the net is 90 cm to 180 cm. The presence of lime shells is detected by thrusting the crowbar into the bed of the estuary. If shells

TABLE 1. Percentage composition of the different molluscan shells found in samples of subfossil deposits of Vaigai Estuar/at Athankarai (the fifth sample is one from discarded shells).

	Samples				
	I	II	III	IV	V
<i>Meretrix casta</i>	88.29	79.54	74.93	89.67	52.78
<i>Cerithidea fluviatilis</i>	11.43	19.87	24.46	3.30	44.44
<i>Area complanata</i>	0.25	0.54	0.31	7.03	1.67
<i>Umbonium vestiarium</i>	—	0.01	0.15	—	0.69
<i>Bullia</i> sp	0.03	0.04	0.15	—	0.42

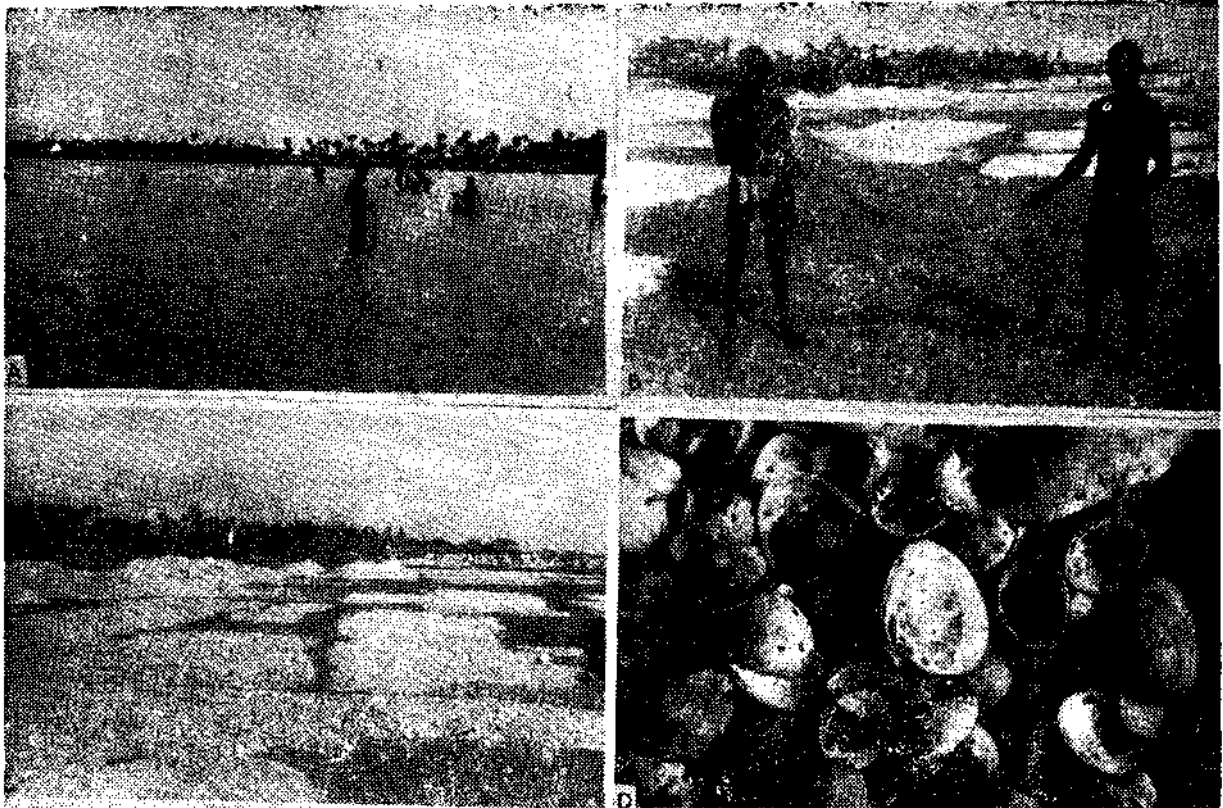


Fig. 1 A. Collection of shells from the Vaigai Estuary. B. Two workers holding the synthetic net used for keeping the shells taken. C. Shells gathered, spread and dried on the bank of the estuary before they are transported for utilization. D. A close up photograph of the shell of *Meretrix casta*, *Cerithidea fluviatilis*, *Sanguinolaria diphos*. etc. forming the deposits

are present, a metallic sound is produced on pushing down the crowbar. On locating the shells, the muddy sediment present over the shell layer is pushed sideways with hands and feet and shells collected with the bag net after rinsing them in the net by shaking the latter repeatedly. (Fig. 1 A-D)

Both men and women gather lime shells from the estuary. But the number of men fishing the shells is much more than that of women. 300 to 1,200 adults take part in fishing shells per day and out of these women number about 103-150. Men collect per day 10 to 12 bags of shells, each bag weighing 20 kg while women gather 5 to 6 bags. Children above the age of 7 or 8 years also collect shells found in the shallow waters near the banks of estuary and they gather about one or two bags of shells in a day. A bag of shells fetches Rs. 1-50 for those who collect them. Sometimes

large numbers of live *Meretrix casta* including seed clams are gathered along with empty shells,

stretches on the southern bank of the estuary and allowed to dry for a day or two in

a coarse meshed sieve and later a fine meshed sieve to remove shell debris and sand. Oyster shells if present are removed as they are not favoured for use in the production of carbide,

MAGNITUDE OF PRODUCTION

production of shells from the Vaigai Estuary at Athankarai varies from 300 t to a maximum of about 600 t and the annual production from 3,100 t to about 6,500 t. The shells are gathered throughout the year except when there is rain. As rainfall is low and restricted to a short period especially during October-December, shell collection is actively carried out in the estuary on the remaining days

of the year. The magnitude of shell production is also influenced by the offtake of the shells by the using industries.

UTILIZATION

The lime shells collected from the estuary are rich in calcium carbonate which forms 70-80% and they are used by factories manufacturing calcium carbide and in lime, sugar, poultry and tannery industries in Tamil Nadu. The lime shells are loaded in lorries near Nagachi village situated on the southern side of the Vaigai Estuary and transported to several places like Madurai, Tuticorin, Srivaikuntam, Arumuganeri, Paramakudi, Manamadurai, Aruppukottai, Tiruchirapalli, Karur, Salem, Namakkal, Pudukkottai, Dindigul, Pattukottai, Vaniambadi, Alangulam, Sivaganga, Padalam and Ranipet. In each lorry 6-10 t of shells are transported. The residual fragment and small shells, mostly *Cerithidea* are burnt in small kilns located in the neighbourhood, converted into lime and sold for use in construction and whitewashing of buildings. A basket of 10 kg of shell lime costs Rs. 5-6/-.

DISCUSSION

The observation made in this study indicate that considerable lime shell deposits exist in the Vaigai estuary. The magnitude of the shell resources may be much more than the approximate quantity mentioned. A systematic geological survey of the estuary is required immediately to estimate the quantum of exploitable resources.

The removal of large numbers of live clams and seed clams of *Maretrix casta* along with the shell deposits in some parts of the estuary should be prohibited by the State Government as it will affect recruitment of clam populations. After removing lime shells the pits are left as they are. This is harmful for the survival of clam populations. After collecting lime shells the pits have to be covered with the mud removed from them. Controlled exploitation will be very helpful to the flourishing of clam populations. Transplantation of seed clams in other shallow parts of the estuary where they are not found now will also help in the conservation of clams.

The Tanhil-Nadu Government has recently stopped the system of issuing licences to individuals to exploit lime shell deposits in Vaigai estuary. The state Government intends to plan and exploit the shell deposits. If the exploitation is carried out on sound lines, after a survey of the shell deposits, there appear to be good prospects for further exploitation of the lime shells in the estuary. There is growing demand for lime shells. Apart from use in carbide industry, lime shells could be used in several industries such as cement, paper, polyfibres, caustic potash and mosaic tile industries and as poultry feed. It is not desirable to mechanize quarrying of shells in Vaigai estuary as it will not be possible then to provide employment to the large number of the poor rural folk who could be gainfully employed in shell collection especially when they do not have other means of livelihood.

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