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PROSPECTS OF MUSSEL CULTURE IN AN ESTUARINE ENVIRONMENT

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ABSTRACT

Successful spatfall in the Korttalaiyar estuary at Ennore has been obtained and the mussel attained a length of about 80 mm during a period of 8 months. The shallowness of the estuary precludes the possibility of using the raft technique of culture. The 'bouchot' system, using stakes in the inter-tidal zone or the method of spreading the mussels on suitably prepared substratum for growth can be employed in the estuary. It is suggested that certain behaviour pattern of the spats observed in the laboratory could be utilised to secure attachment of the spats to the ropes used for culture, which will make mussel culture simpler and easier.

Mussel culture is the most important form of saltwater aquaculture and is unique among aquacultural practices as it produces a staple food rather than a luxury item (Bardach *et. al.*, 1972). Spain is the leading nation in mussel culture producing about 300,000 kg/ha of drained meat in a year. In India, Qasim and Achari (1972) have carried out preliminary experiments on mussel culture at Vizhinjam and obtained a yield of about 200 tons per hectare per year. Jones and Alagarswami (1973) have given a general picture of the mussel fishery resources of India. The potential resources for mussels are very high and with suitable methods of culture the production could be increased considerably (Qasim 1975).

There are about 2 million hectares of cultivable brackish water area in our country, (Jhingran *et. al.*, 1970) and they can be utilised to produce additional food resources. Most of the Indian estuaries are, fortunately, free from serious pollution and their sheltered water afford an ideal place for the culture of crustaceans, fishes and molluscs.

However, the main draw back is that most of the rivers are seasonal and estuaries remain cut off from the sea for most part of the year by the formation

of a sand bar at the mouth by the action of tides and waves. This temporary isolation of the estuary from the sea brings about drastic changes in the circulation and mixing pattern and affects the life of the estuarine animals. The Korttalaiyar estuary at Ennore, about 18 km north of Madras, was no exception to this general pattern as the river used to be cut off completely from the sea every year by the formation of the bar. But from December 1972 the bar at the mouth of the river was kept open throughout the year by the dredgers of the State Electricity Board of Tamil Nadu so that the Ennore Thermal Station, which is situated on the southern bank of the river can draw its requirements of sea water to cool its turbines. This open estuary with sheltered water and fast tidal current presented an ideal place for culture practice. This note records the results of the observations carried out during early 1973 on the culture of the green mussel, *Mytilus viridis*, in such estuarine environment.

An initial survey of the estuary revealed that the deeper areas are found near the mouth and the estuary becomes shallow upstream. A station in the marine zone, about 1 km from the mouth, with a depth of about 4 meters was selected for study. The raft technique of culture was adopted since the method is simple and easy to maintain with minimal capital construction costs. In this technique the animals are cultured on ropes suspended from fixed or freely floating structures and the main advantage is the maximum utilisation of three dimensional space in which the animals are suspended ensuring greater exploitation of available food.

Four thick casuarina posts, about 7 meters long, were driven into the bed of the estuary to a depth of about 2 meters and the top of the posts lashed together with bamboo poles in two layers at right angles to one another with the poles $\frac{1}{2}$ meter apart. The superstructure above the water level, measuring about 10 sq. meters, was so positioned that it remained well about the water level even during the high water mark of spring tides (Fig. 1). The tidal amplitude in the estuary was about 1 meter. The temperature of the surface water in the estuary varied from 25.6° C to 20.5° C and the salinity from 32.32 ‰ to 34.2 ‰ providing a stable environment.

Adult green mussels, measuring 100-130 mm in length, collected from Kasimode Bay at Royapuram, formed the parent stock for these experiments. Coir ropes of 2.5 mm diameter were used to suspend the mussels. A sleeve or tube of 8 cm diameter made out of mosquito cloth was used to secure attachment of the mussels to the ropes. One end of the coir rope is introduced into the sleeve and tied with thin cotton thread. The mussels are introduced into the space in between the rope and the sleeve and again tied with a thin cotton thread enclosing the mussels in the pocket formed. By repeating this process a number of mussels can be attached to the rope within a short time and the

prepared rope presented the appearance of bulged-out pockets at regular intervals along the rope (Fig. 1.2 & 1.3). In a week's time the mosquito net rot and fall away and the mussels attach themselves to the ropes with their byssus threads. (Fig. 1.4). Number of coir ropes without any animal were suspended from the frame to collect the spats on their surface. All the ropes were weighted with stones so that they may not swing violently in the tidal current and get fouled up. Apart from the ropes, Calicut tiles, granite stones, edible oyster shells and green mussel shells were also used as spat collectors.

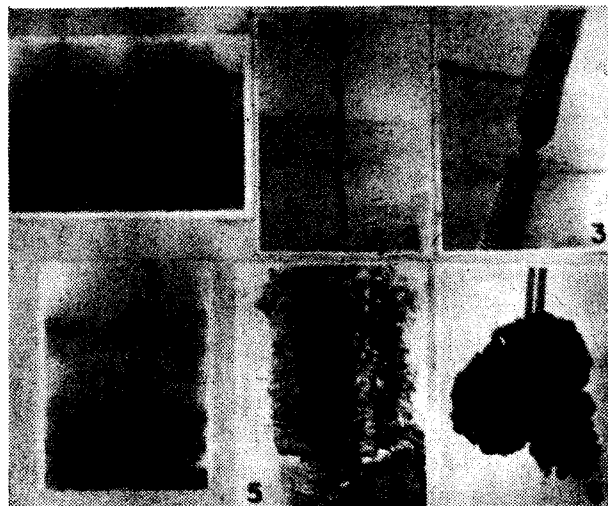


FIG. 1.1, A view of the fixed raft in the estuary; 1.2, Rope with mussel enclosed with sleeve of mosquito-netting for attachment; 1.3, A close up view of the rope; 1.4, Mussels attached to the rope with their byssus threads; 1.5, A Calicut tile showing heavy spatfall; 1.6, A view of a bunch of cultured mussel.

The ropes were suspended into the water by the end of January 1973 and within a fortnight all the ropes and the spat collectors were encrusted with *Balanus* sp. This encrustation provided a rough surface and was found favourable for spatfall. Spawning of the green mussel in the estuarine water was noticed by the middle of April 1973 and young spats measuring 2-5 mm were seen on the ropes, and other spat collectors by the middle of May. Among the various spat collectors used, the Calicut tile was found to attract the largest number of spats. The spats settle down in large numbers in the depression found in the Calicut tiles (Fig. 1.5). Next to the Calicut tiles, large number of spats were seen on the granite stones. The spats showed a tendency to settle along the groove found on the coir ropes. Good settlement was also observed on the casuarina posts below the water level. The spats thrived well and grew fast attaining a length of 15 mm by the end of June 1973. A growth rate of

about 10 mm per month was observed and the mussels attained a length of 80 mm by the end of the year. A bunch of mussels produced by culture at Ennore is shown in Fig. 1.6.

A production rate of about 9 kg of mussels per meter rope was obtained and this compares favourably with the rate of production in other countries. In Spain a production rate of 120 kg per a 10 m long rope has been obtained during the course of 18 months (Milne 1972). A 3 meter rope produced about 25 kg of mussels in 18 months from settlement in Scotland. The fast growth in such a short period at Ennore is evidently due to higher water temperature as compared to 10°C-20°C encountered in the waters around Scotland and Spain.

It was noticed that the top 1 meter of the ropes did not show any spat settlement. The settlement tended to be high near the bottom. Even the adult mussels showed a tendency to avoid the surface layers and migrated down the rope. They tend to clump together as a mass at the bottom of the rope.

Due to the operation of the dredger the estuarine water often was very turbid and carried a heavy load of silt. The silt sedimentation was found to be as high as nearly 0.465 cm per day. The heavy load of silt settled down at the site of the raft and often buried the growing mussels causing mortality. This problem could be overcome by shifting the raft further upstream. As the estuary is generally shallow further upstream, other methods of culture, i.e. the 'bouchot' system using stakes in the inter-tidal region or spreading the mussels as a layer on prepared estuarine bottom, could be profitably employed. The raft method of culture should be confined to the adjoining coastal waters where greater depths are available.

No predators were encountered in the estuary during this culture work. But occasionally, one or two crabs were found on the ropes, evidently attracted by the flesh of the dead mussels.

Experiments carried out in the laboratory on the behaviour of spats of mussel indicate that young spats, especially below 5 mm in length, possess a highly prehensile foot and show a strong tendency to climb along the walls of the aquarium. When the spats were kept in a small-mouthed container placed well below the surface of the water in an aquarium and one end of a piece of thin rope introduced into the container containing the spats, they climbed along the rope within a short time and attached themselves to the rope. A few field trials indicated that this 'rope trick' could be duplicated in the raft itself and the laborious process of enclosing the spats with a cloth to secure attachment to the ropes could be dispensed with. If this technique could be refined and perfected by further field trials it would make the culture of green mussel simpler and easier.

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HYDROGRAPHY OF THE INSHORE WATERS OF MADRAS COAST FOR THE PERIOD JANUARY 1973 TO MARCH 1975

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ABSTRACT

Study on the changes in salinity, pH, temperature dissolved oxygen and phosphate, nitrite, silicate and nitrate content of the inshore surface waters of the Madras coast from January 1973 to March 1975, shows that magnitude of changes of the different parameters varied widely between 1973 and 1974, and the pattern of their fluctuations generally confirms the earlier findings.

Water samples were collected from the inshore surface waters off Madras city, where the depth ranged from 20 to 30 metres, and the changes in salinity, pH, dissolved-oxygen content, phosphate, nitrite, silicate and nitrate were monitored from January 1973 to March 1975. Observations on the sea surface temperature were made from an area adjoining the Madras Harbour. The variations observed were subjected to smoothing analysis and are depicted in figures 1 and 2.

The fluctuations of salinity follow a similar trend reported earlier by the author (Muthusamy, MS). The post-monsoon recovery continues up to May