

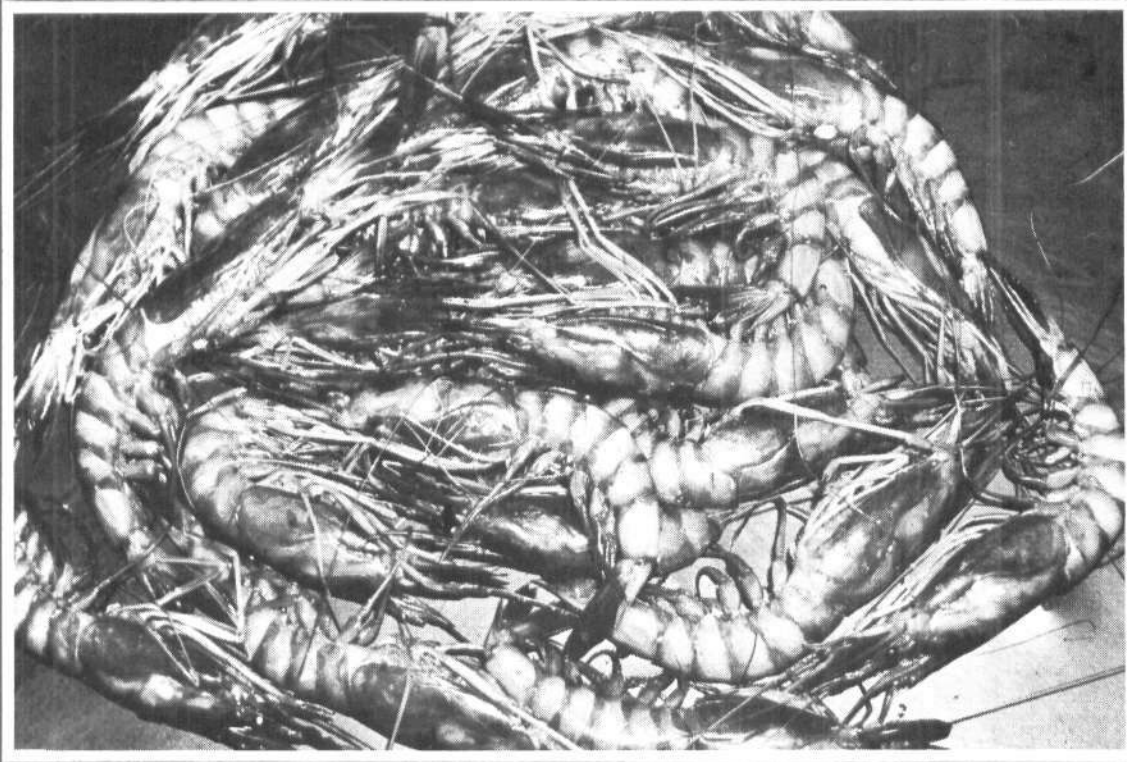
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MUSSEL CULTURE EXPERIMENTS IN ENNORE ESTUARY, CHENNAI

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Introduction

In the last decade, very good natural beds of mussels occurred at Ennore Courtalayar estuary, in Chennai especially underneath the railway bridge, northern lock area, along the vast oyster beds and the pillars of the boat jetty. In recent years, mussels in the natural grounds of Ennore estuary face serious problems of siltation due to developmental activities, continuous dredging operations for edible oyster collection and discharge of domestic sewage and industrial effluents into the estuarine region which result in destruction of natural stocks. Apart from the above, pressure is exerted on the natural beds due to mussel fishing at Cuddalore, Pondicherry and Chennai by the aquaculturists who use mussel meat for feeding the shrimp or for domestic consumption. As a result the natural habitat is exploited indiscriminately without allowing further settlement of mussels.

The present paper gives a detailed account on experiments of mussel culture carried out by the Institute in 1996 in association with fishermen of Ennore in an estuarine environment by adopting the long-line and rack culture methods.

Culture experiments

Mussel culture was initiated in January 1996 by launching two long-lines and erecting four racks near the barmouth of the Ennore estuary, located in the northern boundary of Chennai city. Each long-line consisted of 20 mm PP rope of 24 metre length which formed the head rope. Eight HDPE barrels each 50 litre capacity were tied with 4 mm thick PP rope to the long head rope at a gap of 3 m (Fig. 1). One end of the anchor ropes (4 m long) was tied to the head rope and the other end to an anchor stone weighing about 80 kg. The long-line with floats took a straight line shape during high tide but curved slightly during the low tide. A second long-line was put parallel to the first one.

For bag culture method, synthetic twine was webbed to form a net having a mesh size of 20 mm. This net was made in the form of a bag of

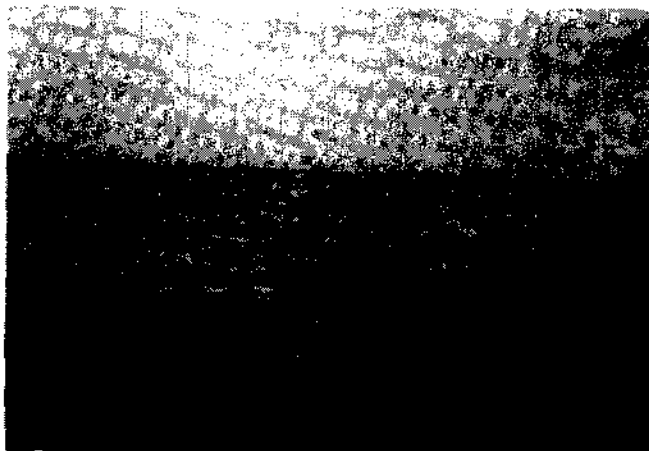


Fig. 1. Mussel culture by long line method at Ennore in Madras.

40 x 30 cm. The top side of the bag was provided with a rope of 5 mm thickness for tying to the long-line.

To construct the racks, casuarina poles of 2 different lengths (3.5 and 6.0 m) were selected. Six poles of 3.5 m were driven into the bottom at a distance of 2 m in a straight line. The poles of 6.0 m length were tied at the top of the driven poles just above the high water mark. Similarly four racks were erected running parallel to each other, occupying a total area of about 100 square metres.

For rope culture, 12 mm rope of 3 m was selected. Mussel seeds were transplanted to a length of about 1 m of the rope. To avoid slippage of seed mussels after transplantation a few small wooden pegs were inserted in between the strands at a distance of 50 cm. These ropes were suspended from the racks.

The site for the mussel culture was located about 600 m away from the barmouth of the Ennore estuary. The maximum depth in the culture site was 3 m during high tide. The bottom was muddy and bereft of any predatory organisms. The barmouth was kept open by dredging throughout the year for cooling the North Madras Thermal Power Plant and as a result there was a free flow of water from the sea into the estuary.

For the present culture operations seed was collected from the intertidal concrete pillars of Ennore dredger Jetty. Due to nonavailability of seed (20-30 mm), mussels with an average size of 45.9 mm were collected. For mussel seed collection, a novel device was fabricated with M.S. rod of 6 mm thick made into a rectangular frame and a synthetic netted bag attached to it. The rectangular frame was welded to a long G.I. pipe of 2.5 cm thick and this length can be increased with a coupling joint. Another G.I. pipe welded with a scrapper made of triangular metallic iron could be used for scrapping the seed. This device was used for collecting seed from the piers of the dredger jetty.

The collected seeds were placed in a plastic tub containing sea water and thoroughly washed to remove the silt and debris on the seed mussels. The foulers like barnacles, bryozoans, serpulids, modiolids, seaweeds etc were removed manually. In the natural habitat, adults, sub-adults and young ones may occur and collection was done without any discrimination. The seed mussels were used for seeding the ropes and the sub-adults and adults were used for bag culture.

Environmental details

In the farm site water was clear, upto 2 m depth. There was an ascending trend in salinity and temperature from January to May '96. The dissolved oxygen and pH did not show marked variations in the estuary (Fig. 2) during the period

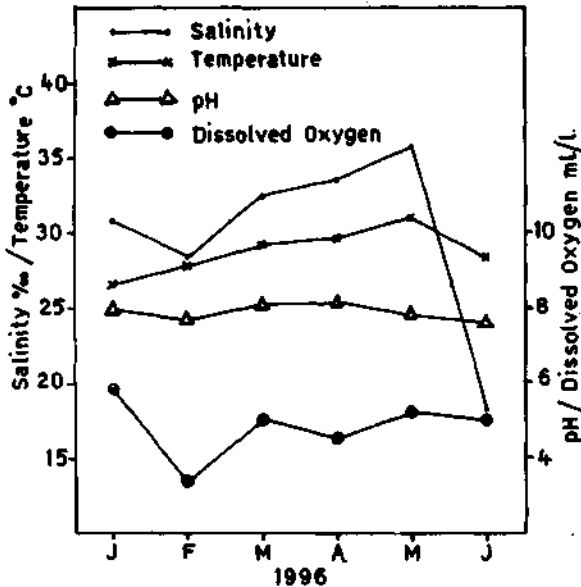


Fig. 2. Monthly average salinity, temperature, dissolved oxygen and pH in the mussel culture farm area.

of observation. However, during the second week of June '96, a cyclonic weather brought heavy rains which lowered the salinity and temperature.

Growth of mussels

As per the observations made in July, the average growth in length and increase in weight of transplanted mussels on ropes are shown in Fig. 3 & 4. The monthly average growth was registered

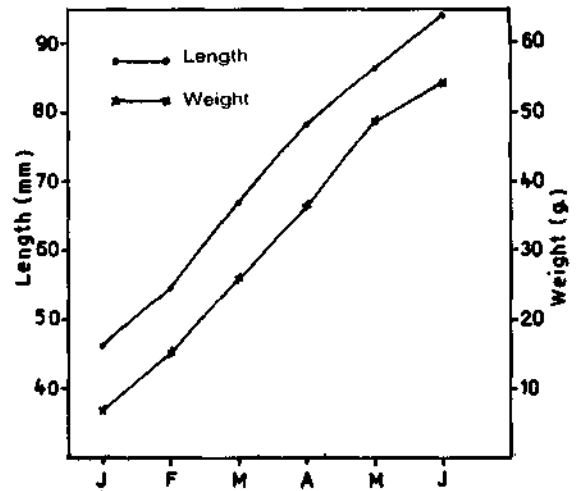


Fig. 3. Growth rate of mussels cultured on ropes.

at 9.7 mm and the average weight gain was 9.46 g. The growth seemed to be fast during March - April immediately after transplantation and in the subsequent months the growth decreased slightly.



Fig 4. Mussels grown on ropes.

The growth of mussels in bags is represented in Fig. 5. The average monthly increase in length was 6.8 mm and the weight increment was 7.28 g.

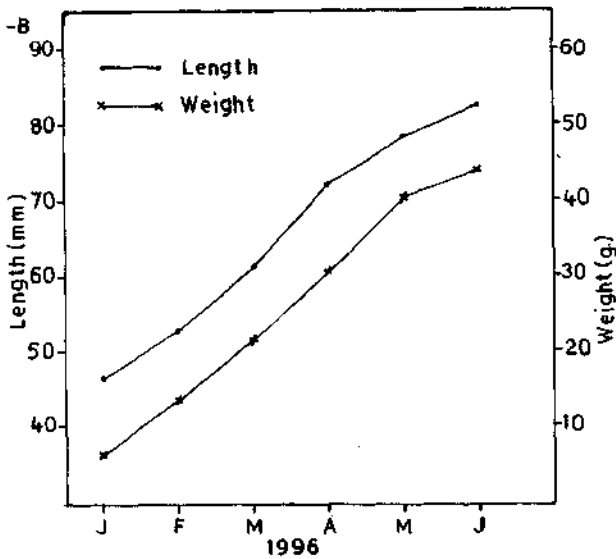


Fig. 5. Growth rate of mussels grown in bags.

The loss in growth might be due to overcrowding and failure in obtaining the diatom food to the mussels (Fig. 6).



Fig. 6. Mussels grown in bags.

Production

Mussels of an average size of 45.9 mm and a weight of 7.2 g in ropes attained 94.4 mm and 54.5 g respectively at the end of 5 months.

Mussels cultured in bags attained 80.6 mm in length and 43.6 g in weight for the same period.

The mussel seed of 2.15 kg per metre of rope and 2.2 kg per bag were used in the initial stage of transplantation. The production rate per metre of



Fig. 7. A part of the harvested mussels.

rope was calculated to 16.75 and 15.32 kg per bag at the end of 6 months. In 85 bags and 48 ropes, the harvest of mussel was estimated to be 2,910 kg (Fig. 7).

Associated fauna

Mussels in bags and ropes suspended from the longline and racks formed a good substratum for the settlement of fouling organisms such as barnacles, obelia, hydrozoans, serpulids, polychaetes, planarians, modiolids, mussels etc. The barnacle settlement was found to be high in February-March, as this period is the breeding season for barnacles in Ennore estuary.

There was a change in the ecosystem of the farm as the culture ropes and bags formed a good habitat for fish, enhancing the biodiversity of organisms in the estuarine environment more than ever before. Some fishes like *Epinephelus*, *Chaetodon*, *Antennaris*, gobiids, eels, crabs such as *Metapograpsus* sp., *Pinnotherus* sp. and lobster juveniles were found to take shelter inside the mussel bags or in the small gaps in the clusters of mussel ropes suspended from the rack. The mussel ropes and bags in the farm became good attractants by providing food like polychaetes, algae etc to some visiting fishes like *Siganus* sp., *Etroplus* sp., *Caranx williamsii*, *Scatophagus* and *Tilapia* sp. The occurrence of other organisms like prawns *Penaeus indicus*, *Metapenaeus dobsoni*, *P. semisulcatus*, alphids, molluscs such as nudibranch, *Pecten* sp.,

Treptium sp. (a colourful swimming bivalve belonging to the family Aeolidae) and a devil fish was also noted in large numbers during May-June.

As a result of the establishment of the mussel farm, the site was transformed into a rich fishing ground. *Etroplus*, *Caranx*, *Tilapia*, and *Scatophagus* were caught in hooks and line at the rate of 5 to 8 numbers per hour in the farm. In the cast nets, along with the above fishes, prawns, crabs *Hemirhamphus*, *Siganus*, *Chaetodon*, *Ambassis* and silver bellies were also caught.

Spat collection experiments

Experiments were conducted by laying different spat collectors like (1) synthetic bags with mussels (45 x 30 mm), (2) synthetic fibre (2 m length), (3) velon screen (0.5 sq.m), (4) wooden planks (30 x 15 cm) and (5) tiles (25 x 15 cm) in the mussel farm during the breeding season at Ennore estuary. Among the five different types, synthetic bags

TABLE 1 Details regarding the number of longlines, racks, seeding and estimated values of mussels at Ennore estuary

Particulars	Longline	Rack
Number used	2	4
Length	24 m	12 m
Period of seeding	Jan-Feb. '96	Jan-Feb. '96
No. of bags used	85	-
No. of ropes used	-	48
Seeded length	-	1.5 - 2.0 m
Weight of seed used	2.2 kg	4.3 kg
Average size of mussels	45.9 mm	45.9 mm
Average weight of mussels	7.2 g	7.2 g
Average size of harvested mussels	94.4 mm	80.6 mm
Average weight of harvested mussels	54.5 g	43.6 g
Production rate	15.32 kg/bag	33.5 kg/rope
Duration of culture	5 months	5 months
Total quantity of mussels harvested	1,302 kg	1,608 kg

loaded with mussels formed a good spat collector. All the sides of the bag got settlement of mussels. The spat settlement was found more dense in the lower side than on the other sides. The number of spat per bag varied between 995 and 2,800. The average number of spat per bag was estimated at 1,625. The rate of seed settlement per square metre was calculated to 13,703. Another spat collector, the synthetic fibre, in small bunches inserted in between the strands of 12 mm rope at regular intervals of 30 cm distance got a moderate settlement of mussel seed. The average number of spat was observed to be 260 per bunch.

Remarks

To augment mussel production, attempts were made to motivate the fishermen of Ennore to initiate the mussel culture using technology developed by the C.M.F.R.I. The Madras Research Centre of Central Marine Fisheries Research Institute has proved now that mussel farming is possible at Ennore and about eight-fold growth of mussels could be obtained from a small area in 6 months. Encouraged by the results of our culture method, many fishermen of Ennore have come forward to venture into the mussel culture.

In Ennore estuary, the green mussel has registered an average growth of 9.7 and 6.9 mm in ropes and bags respectively. The growth increments are comparable to the results obtained by the earlier workers along the east and west coasts of India.

In the present experiments, the mussels on ropes showed a faster growth than in bags, but the growth seemed to be slightly lower than that reported by Kuriakose (*Bull. Cent. Mar. Fish Res. Inst. No.*, 29 : 33-39, 1980) and higher than that reported by Sreenivasan *et al.* (*Mar. fish. Infor. Serv. T & E Ser.*), No. 81:10-12, 1988).

Acknowledgements

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