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WORKSHOP ON

# MUSSEL FARMING

25 - 27 SEPTEMBER, 1980

MADRAS



CENTRE OF ADVANCED STUDIES IN MARICULTURE

**CENTRAL MARINE FISHERIES RESEARCH INSTITUTE**

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TECHNICAL SESSION III MUSSEL CULTURE ; CMFRI-CAS/MF/80/BP -3  
TECHNOLOGY ;

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## CRITERIA FOR SITE SELECTION FOR MUSSEL FARMS

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### INTRODUCTION

In recent years considerable progress has been made in cultivating mussels in India. Mussel culture forms an important programme in the mariculture activities of countries like France, Spain, Italy, Netherlands and North America. Many countries in Asia like Singapore, Philippines, Thailand, Indonesia, etc., have also taken up mussel culture in recent years in view of its high production potential.

In India the mussel culture has been taken up in a number of places. The Central Marine Fisheries Research Institute has been carrying out culture of brown mussel, Perna indica at Vizhinjam and the green mussel, P. viridis at Calicut and Madras. Experimental work on mussel culture has been carried out in Goa by National Institute of Oceanography, Ratnagiri and Kakinada. A pilot project on mussel culture has been taken up by the Government of Kerala in Vizhinjam. This shows the wide interest that has been

awakened for mussel culture in our country.

India has a coastline of about 6100 km and offers immense scope for mussel culture. Before a site is selected for mussel culture a detailed study about the topography of the place, environmental conditions like salinity, oxygen, temperature, rainfall, pollution, etc, should be carried out.

Let us first consider the different methods of mussel culture that are in vogue and the criteria applied for the site selection for farming by each method.

#### DIFFERENT METHODS OF CULTURE AND CRITERIA FOR SITE SELECTION

A perusal of the available literature shows that the following methods are generally adapted for mussel culture.

- 1) Mussel farming on sea beds.
- 2) Mussel farming on rows of poles.
- 3) Mussel farming on rafts.
- 4) Mussel farming on long lines.
- 5) Mussel farming on racks.

The success in farming by any one of the above methods depends upon many environmental factors and great care should be taken in choosing the site for farming. Let us take up the methods one by one and see what are the criteria that should be applied in selecting the site.

#### On bed culture:

This type of mussel culture is widely practiced in Netherlands, England and West Germany. The farms are located from the low water level down to a depth of 5 or 6 meters.

The bed should be of firm texture consisting of sand and little mud. Areas with shifting sands and strong tidal currents are not suited for this type of culture. Tidal mud flats where mussels would be exposed for many hours between tides should be avoided since growth will be poor in these areas.

The salinity fluctuations over the farm area should not be large. Sudden lowering of salinity below 20-25‰ causes heavy mortality. Areas subject to influx of fresh-water are not suited for locating the farm.

The water over the farm area should be fairly clear and rich in phytoplankton. Large amount of silt in the water will choke the gills of growing mussels and interfere with their growth. Since wind exerts an influence on the amount of silt suspended in water, areas protected from strong winds should be chosen.

The area selected should be free from the discharge of industrial wastes and sewage to prevent pollution. It should also be free of predators like star fish and crab which cause damage to mussel beds.

Sea bed culture has not been tried in our country. Many shallow bays are available along our coast where this method of culture could be practiced. Suitable sheltered areas are available inside most of the estuaries along the east coast. They are in communication with the sea for 6 to 8 months and mussel parks could be set up after preparing the beds. Since this is an easy method of mussel culture without much capital investment, suitable areas could be selected for popularising mussel culture in our country. Shallow

areas in Palk Bay and Gulf of Mannar could be utilised for this type of culture.

Pole Culture (Bouchot method of France)

This method is prevalent in France where mussels are grown on rows of long poles driven into soft mud of the tidal region. The ground should be gently sloping and tidal amplitude fairly high so that greater portion of the poles are exposed during low tide. The farm area should be selected with great care after testing the bottom for underlying obstructions. The lower 2 or 3 meter length of the pole should be driven into the substratum so that the poles could withstand the waves and current. Areas in the sea where there is a thin layer of sand over rocky substratum, as in Kovalam bay, are not suitable. Poles erected in such areas topple over when the sandy layer is eroded by current and waves.

Areas exhibiting wide fluctuations of temperature and salinity should be avoided. Sheltered areas should be preferred as heavy swells and waves uproot the poles if they are not firmly fixed. Areas in the sea prone to infestation of Teredo sp., Pholas sp. etc, should not be selected. In course of time the submerged portions of the poles are heavily riddled with Teredo and the poles break at the water level when waves and swells sweep across the farm area.

Suitable areas for pole culture are available in Kutch, Sunderbans and Andaman Islands where tidal fluctuations are high.

Raft Culture:

Raft culture is carried out in Spain extensively and very high production has been obtained by this method. Large rafts are anchored in deep bays and the mussels are grown on ropes suspended from the raft. The substratum should be of soft mud so that the rafts could be securely anchored. Areas with rocky outcrops should be avoided since the anchors are likely to get fouled up. Moreover swells when they pass over submerged rocky outcrops increase in height and disturb the rafts.

For raft culture to be successful fairly calm waters are absolutely essential. If rough sea conditions prevail in the area selected for raft culture, the raft will be tossed up and down violently. The mussel ropes as a result, swing violently and there is a likelihood of mussels falling down from the rope due to ropes getting entangled with each other. At the time when seeded ropes are suspended from the raft, calm conditions are essential at least for a few days so that the mussels could attach themselves securely on the ropes. Waves seem to influence the time taken to form the byssal threads. If the substratum i.e. the rope is in continuous motion, the mussels do not secrete the byssal threads and fall to the bottom of the sea when the cotton netting enclosing them disintegrates.

Areas opposite to or slightly south of the bar of an estuary are not ideal to locate the rafts. During the rainy season these areas are subject to heavy influx of fresh water and sudden lowering of salinity. Freshwater moves over the more saline water as a fast current and due to the prevailing

winds at that time is carried south wards. Heavy mortality of mussels in the top 0.5 - 1.0 meter of rope takes place due to sudden lowering of salinity.

Areas near submerged rocks abound with fishes belonging to the genus Caranx speciosus, Platax tiera, Scatophagus argus, etc, and they cause damage to the seeded ropes. Before the mussels have time to secrete the byssal threads for attachment, these fishes puncture the netting cloth used for seeding by constant nibbling and the seeds fall out. The fishes damage the cloth while feeding on the detritus which settle upon the cloth due to the filtering action of the mussels.

Another criteria which should be borne in mind is that the area selected for farming should be as near as possible to natural mussel beds. Since the whole culture operation at present mainly depend upon the mussel seeds that settle profusely on rocks, location of the site near natural beds will cut down the cost of transportation of the seeds.

Since fouling organisms like ascidians, sponges, etc., compete for space and food with mussels on the culture ropes, areas which abound with the above organisms should be avoided.

The area selected for farming mussels by raft should be free from pollution by sewage, pesticides, industrial wastes, discharge from nuclear power plants, oil spills and chemicals. While selecting the site it should be borne in mind that these pollutants are likely to be carried by ocean current over long distance.

To ensure high bacteriological purity the mussels should be cleaned and left in large tanks containing filtered

pure sea water for about 24 - 48 hours. In order to cut down the cost of production the farm area should be located very near or in a place where these infrastructure facilities are available.

Generally the fishermen resent the presence of these rafts in their fishing area. Rafts in the inshore area are likely to hamper the shore-seine and drift net operations of the fishermen. It will be a problem to select a site which will not clash with the interests of the fishermen.

Suitable areas for raft culture could be found in the west coast of India and in Andaman Islands where there are numerous sheltered deep bays with calm conditions.

#### Long Line method:

In this method the mussel ropes are suspended from long ropes stretched between buoys anchored firmly on the sea bed. Floats are used at regular intervals along the rope to prevent it from sagging too much and touch the bottom. The long line method can be used in fairly deep waters. The area should be free from pollution and have rich phytoplankton/ to ensure rapid growth of mussels. /production

The long line method could be used in areas where the sea conditions are rough and rafts are difficult to maintain. The usefulness of this method is being evaluated at Kovalam now.

#### Rack cultivation:

In this method practiced in Yugoslavia, mussels are grown on racks which are kept submerged but well above sea bed. It is an ideal method for shallow creeks where low tidal current is present. This method has been successfully



used in Tuticorin for growing edible oysters. The growing mussels in the racks are likely to be covered by dense silt. The rack requires periodic cleaning in order to remove not only the settled silt but also the predators that might have reached the rack. The wooden poles and racks are subject to attacks of Teredo and are likely to be destroyed quickly. Sheltered conditions are essential and polluted areas/avoided; Creeks with influx of freshwater/to be are not suitable.

#### GENERAL CONSIDERATIONS

Whatever method is adopted for mussel farming the success in farming depends to a large extent on the site selected. It may be stated that the site selected should be located in a sheltered area which is not subjected to extreme variations in temperature, salinity and oxygen. Areas subject to influx of freshwater should not be chosen for mussel culture since mussel cannot tolerate low salinity for long time.

Mussel culture in estuaries and backwater areas cannot be carried out throughout the year since for part of the year the bar/of most of the rivers remain closed. Moreover / month estuarine areas are subject to human interference and are polluted by industrial wastes and sewage. Heavy mortality is likely to occur to the mussels when the bar is closed and the water gets more polluted. In Mussels grown in estuaries there is a possibility of bacterial load going up and the product may not be good for human consumption.

Areas in open sea are generally free from pollution and are suitable for mussel farming. If the site is free

from storm and cyclones and located in sheltered areas, it is ideal for mussel farming by raft method. The sea conditions play a vital role on the success of mussel farming. Calm conditions are essential not only for the safety of the raft but also for successful spat fall and attachment of seed on the ropes. Past experience at Kovalam shows that calm conditions are absolutely essential when seeded ropes are put on the raft. In fact the total production depends upon local weather conditions. In rough weather the mussels fail to produce byssal threads, fall down from the ropes and are lost for ever.

Another point which should be taken into consideration is that although suitable vast areas are available for mussel culture it may not be possible to carry<sup>out</sup> the culture operation in many of the areas. Suitable areas in the open sea overlap the area of fishing operations by local fishermen. Rafts cannot be located in fishing areas since its presence will interfere with the shore-seine and drift net operations. Steeped as they are in age old practice of capture fishery the fishermen, especially of Tamil Nadu, are very slow to appreciate new ideas. The idea of culturing marine animals is strange to them and lot of persuasion is required even to tolerate the presence of rafts in their fishing areas, leave along their active co-operation. The situation is bound to change in the course of time when they realise that mariculture is another rewarding method for improving their socio-economic conditions.

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