

CMFRI

W. K. S.

WORKSHOP ON

MUSSEL FARMING

25 - 27 SEPTEMBER, 1980

MADRAS



CENTRE OF ADVANCED STUDIES IN MARICULTURE

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

P. B. No. 1912, COCHIN-682 018, INDIA

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

COCHIN - 682 018

CENTRE OF ADVANCED STUDIES IN MARICULTURE

WORKSHOP ON MUSSEL FARMING

MADRAS 25-27 SEPTEMBER 1980

TECHNICAL SESSION III	MUSSEL CULTURE TECHNOLOGY	CMFRI-CAS/ME 80/BP- 11
-----------------------	------------------------------	---------------------------

FARM TECHNOLOGY

P.S. KURIAKOSE AND K.K. APPUKUTTAN

Central Marine Fisheries Research Institute, Cochin-6

INTRODUCTION

Mussels are sedentary animals growing attached to hard substrates along the coastal region by means of secreted threads called byssus. They can be transplanted from their natural habitats to any artificial hard object in the sea where they will re-attach secreting fresh threads. This unique character of mussels is taken advantage of culturing these animals. Mussel culture has been practiced in France since the beginning of this century. From there it spread to countries such as Spain, Holland, Belgium, Italy, Philippines, U.S.A, Australia and New Zealand, where different techniques were adopted depending on the hydrographic, social and economic conditions. In India mussel culture has been introduced only very recently. In 1971 the Central Marine Fisheries Research Institute, initiated culturing of brown mussel at Vizhinjam Bay and later successful experiments were conducted at Calicut and Madras in 1975, to study the possibilities of culturing mussels in the open sea.

TECHNIQUES OF MUSSEL FARMING

Different methods are adopted for the culture of mussels such as the sea bottom culture, pole culture, long line culture and raft culture.

SEA BOTTOM CULTURE

This technique is widely practised in Netherlands and in a number of other European countries including Denmark and West Germany. The principle of bottom culture is the transfer of seed or juvenile mussels from areas of great abundance where growth is very poor due to overcrowding to areas of fast growth and fattening potential. Seed mussels dredged from the natural beds are spread in a thick layer in the shallow grounds. When they have reached a length of about 25-30 mm they are thinned out and transferring the excess portion to deeper areas for fast growth and fattening. When ready for marketing the mussels are dredged and dumped in a thick layer in an area of little tidal movement free from drifting sand, where they are left for 48 hours to rid themselves off silt. When mussels are 2 to 2½ years old they attain a size of about 60 to 70 mm and are ready for harvest. The chief advantage of bottom cultivation is that the mussels are for most part of the time in water and therefore feed longer. The main drawbacks are exposure to bottom predators like star fishes and crabs, and need to clean the mussels of silt.

POLE CULTURE

Pole culture is the oldest and principal method of mussel farming in France. In this method mussels are grown on rows of poles erected in the intertidal area. Mussel seed or spat is collected on spat collector poles

erected near the natural bed. When the seed mussels reach a length of about 20 mm they are taken out at intervals and transferred to rearing poles closer to the land. The poles are 75 cm apart and are set in rows at right angle to the shore. The seeds are attached to the rearing poles in bags of fine netting which rot and fall apart after the mussels attach themselves to the poles, by byssus threads. As the mussels grow they are thinned out in order to reduce competition for food and the thinnings are transferred to another rearing posts. Another seed collection technique recently practiced in France involves suspending loosely woven ropes 13 mm in diameter and 3 meter long in the intertidal region near natural beds. Within 3 weeks seed mussels of about 5 to 10 mm size will be concentrated in the crevices between the strands of the ropes. The ropes are then wrapped around poles driven in the intertidal flats. The mussels quickly become established on the poles. The procedure is similar to the traditional method. The mussels are thinned out periodically as they grow and wrapped round other poles. By the end of second year the mussels are harvested, and marketed having reached a size of about 50 mm.

The main advantage of pole culture is that the mussels are less exposed to the bottom living predatory crabs and star fishes. Predation is further reduced by the adoption of plastic sheaths around the base of the pole. The main drawback however is that, the mussels are exposed at low tide especially on spring tide and so less time is available for feeding, growth and fattening. Also the poles are vulnerable to storms.

LONG LINE CULTURE

The long line method of mussel farming was introduced very recently in Europe. This method is very successful in open sea mussel farming. Long lines are 50 to 75 metre long and consists of a pair of ropes strung between two parallel pair of metal, wooden or stylofoam floats. Each end of the line and sometimes the middle is anchored. Floats are spaced 3 to 7 metres apart. Mussel seeds are collected from natural beds and transplanted over the ropes and suspended from the long lines about 0.5 metre apart. The mussel growing ropes should not be allowed to touch the bottom at any time. The growth in this system is very rapid.

RAFT CULTURE OR SUSPENDED CULTURE

The raft culture technique has undergone the greatest development in recent years offering the best prospects for farming of mussels in the sheltered and open coastal waters. This method is generally used in waters more than three metres depth. The nature of the sea bottom is not important because the suspended ropes are not touching the bottom. The raft is rather a simple device. In the beginning the rafts were made from the hulls of old fishing vessels to provide floatation and the top is equipped with a wooden frame work from which the ropes are suspended. Very recently specialised rafts have been developed and the modern rafts commonly have four or more large wooden floats covered with cement or fiberglass to protect the wood from marine boring organisms. On the top of the floats frame work of wooden beams are provided, about 50 to 60 cm apart, from which the ropes are hung. The size of the raft vary but an average raft is 20 x 20 metre size

and will accommodate 500 ropes. Recently large operators have constructed stronger rafts of about 700 square metre size for use in more deeper waters. Such rafts can hold 1000 ropes.

In India the suspended culture or raft culture method was found to be more suitable and a series of experiments are being conducted on this method in bay and open sea since 1971. Square rafts of 6 x 6 metres are found more suitable in the bay whereas rafts of the size 8 x 8 metres are found to be ideal for the open sea conditions. The main frame work of the raft is made of teak wood poles having 6 to 8 metres length and 20 to 35 cm girth. In the open sea rafts are made of 10 numbers of teak poles whereas the rafts in the bay are made of only 8 numbers of teak poles. The poles are tied together using coir and nylon ropes of 5-7 mm thickness in the shape of a square raft. The raft is provided with a trellis work of 12 numbers of solid (Kallan) bamboo poles of 12 cm diameter, which were tied to the main frame work of teak wood poles. Nylon ropes are found more durable and strong when compared to the coir ropes. Five to six empty sealed metallic drums of 200 litres capacity are used as floats. These drums are tied to the main frame work of teak wood poles, at four corners and at the centre. The number of floats have to be increased as the weight of the raft increases due to the growth of mussels, so as to keep the raft floated well above the water level in order to avoid the damage caused by marine borers and foulers. A few wooden planks are fixed over the raft to provide working space.

The rafts are towed to the farm site with the help of a mechanised boat. Two to three grapnel type or danfarth

types anchors each weighing 100 to 125 kg are used for anchoring the raft in position. Tested iron chains of 11 to 13 mm line diameter size having a length of about 3 to 4 times the depth of the farm site are used as anchor chains. Proper anchoring is of great importance especially in the open sea. After anchoring it has to be checked if possible with the help of divers. Flags and warning wink lights are to be provided to keep the fishing or sailing vessels away from the farm area. In the bays iron anchors and anchor chains are not necessary because of the calm nature of the water. Granite blocks of 100 kg weight are used as anchors. These granite blocks are drilled at the centre and anchor clamps are provided to tie the 16 mm nylon ropes to use as anchor ropes. Four such anchors are used one at each corner of the raft. When a series of rafts are used in the bay the number of anchors can be reduced. but in the open sea each raft has to be anchored separately.

CULTURE TECHNIQUE

Mussel seeds are to be collected from the natural mussel beds. Seed mussels of length varying from 20 to 35 mm are found to be ideal for seeding. Seeds collected from the submerged rocks are far better than those from the intertidal exposed rocks, as the small mussels available over the intertidal rocks may be of stunted growth. Before transplantation seeds are to be cleaned properly in sea water to remove the adhering mud particles and epifauna. Mussel seeds can live out of water for about 24 hours provided they are not exposed to sun. Transportation of seeds from the collection centres to the farm area and the whole seeding process has to be completed within this period. The seed is generally transported in gunny bags in moist condition. Seeds can be stored in large cement tanks

provided with sea water circulating system. In such tanks the seeds can be kept for 2 to 3 days.

Nylon ropes of 14 mm diameter or coir ropes ranging from 20 to 25 mm diameter are used for seeding. The coir ropes are more ideal for the initial attachment of the seed mussels due to its rough fibrous nature, but they are not durable. They can be used only for one season. Nylon ropes can be used for a minimum of 4 seasons. The length of the rope used for seeding is decided according to the depth at which the rafts are anchored. Experiments have shown that 6 to 10 metre length of the rope is ideal for seeding. Increasing the length of the rope is not advisable since there is every chance of the rope getting entangled or twisted each other due to water currents. About 750 to 1500 gm of juvenile mussels can be seeded to one metre length of the rope. The seeds are kept around the rope and securely attached by enclosing and stitching in knitted cotton or bandage cloth of 25 cm width. The knitted banian cloth having 5 mm mesh size are more suitable because they disintegrate quickly and have more elasticity. Before seeding small wooden pegs or spacers are inserted to the ropes at intervals of 40 to 50 cm to avoid slippage of mussel seeds from the rope after seeding. In the upper portion of the rope about one metre is left free for tying the rope to the raft. The seeded ropes are to be suspended from the trellis work of bamboo poles of the raft at about 0.5 to 1 metre apart with the lower free end about 2 metre above the bottom, for eliminating the bottom predators. The seed mussels get attached over the ropes within 2 to 3 days and the cloth cover disintegrates in sea water within 10 days.

MAINTENANCE OF RAFTS

Periodic visit to the farm is essential for the inspection of the rafts and suspended ropes. Oil barrels used as floats may develop holes, they have to be replaced immediately. The damages caused to the frame work of the raft should be attended to immediately. Due to the increase in weight of mussels raft show a tendency to sink, more floats have to be provided. Occassional thinning of the over-crowded mussels from the ropes may be necessary and these thinnings can be transplanted on to other ropes. If the water in the farm area gets polluted due to red-tide or blooms of other toxic marine organisms etc, the rafts have to be towed to safer areas. Measures against unusual predation as noted at Vizhinjam bay in 1979 (Appukuttan, MS) are also to be taken.

Spawning of mussels will take place in the farm much earlier than in the natural beds. In the Calicut area green mussels in the farm will spawn throughout the season. Artificial spat collectors like roof tiles, cement blocks asbestose sheets, strings of coconut shells, split bamboo poles, coir ropes, frilled nylon ropes and iron happas covered with nylon netting can be used for the collection of spat from farm in the bay as well as in the open sea. Roof tiles, iron happas and frilled nylon and coir ropes are ideal material for spat collection.

The harvesting of the mussels has to be done when they are in the prime condition. The brown mussels reach this condition 5 to 6 months after seeding, when they reach a size of 50 to 60 mm. The green mussels will attain this condition 5 to 6 months after seeding when they reach a size of about 70 to 90 mm. But in the open sea mussel culture, very often, the onset of monsoon forces a premature harvest, whereas in the case of bays harvesting can be made as and when the mussels grow to marketable size.