

# XIII

## WORK DETAILS FOR ROPE CULTURE OF MUSSELS

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Work details showing the salient features of various aspects of materials needed and methods followed in mussel culture are detailed in this paper.

### GENERAL

Species of mussels that are culturable are *Perna viridis* (green mussel) and *P. indica* (brown mussel) (Fig. 1 & 2). The former is known to grow upto a size of 230 mm and the latter to a size of 125 mm. But the size commonly observed in the natural beds

is 180 mm in the case of green mussel and 80 mm in brown mussel.

### *Distribution :*

Green mussel is found in the rocky areas of the coasts of Orissa, Andhra, North Tamil Nadu (Pondicherry to Pulicat), Kerala and Maharashtra. Brown mussel is

characteristic of the rocky areas of extreme south-west and south-east coast of India.

*Local Names :*

Green mussel is known as 'Kakkai', 'Vakunda' or 'Shintale' (Goa-Jaithpur area), 'Kulachi' (Malwan area), 'Neelkallu' (North and South Kanara), 'Kallumeikai', 'Kadukka' (Kerala) and 'Alichip-palu' (Andhra). Brown mussel is called 'Chippi', 'Muthuva', 'Muthuvachippi' (Kerala), 'Kallikai', 'Chippi', 'Kalluthodu' (Tamil Nadu).

*Season of Fishery :*

A. Green mussel :	
Ratnagiri region	: November to April
Malwan region	: September to May
Karwar region	: December to May
Cannanore—Calicut region	: November to May
Cochin region	: December to May
Madras region	: January to September
Kakinada region	: May
B. Brown mussel :	
Vizhinjam area	: October to May
Colachal—Muttom area	: November to April
Cape Comorin area	: November to April

*Price in the market :*

A. Green mussel : per 100 numbers :	
at landing centre	.. Rs. 2-3
at the market	.. Rs. 3-5
meat alone packed in polythene bags	.. Re. 5-6 (per kg)
B. Brown mussel : per 100 numbers :	
(80-110 mm)	.. Rs. 7-10
(55-80 mm)	.. Rs. 3-5

**BIOCHEMICAL COMPOSITION OF MEAT**

The Indian mussels are said to contain 8-10% protein, 1-3% fat and 3-5% glycogen. In addition to this calcium, phosphorous, manganese, iodine and iron are also present. This compares favourably with blue mussels of Europe, where the protein value is said to go upto 14%. The calorific value has been worked out for green mussel meat as 6.28 Cal/gm (dry weight). The percentage of meat weight (edible portion) to the total weight ranges from 40 to 50 for green mussel and 35 to 45 for brown mussel in the marketable size.

**COLLECTION OF SEED AND SEEDING**

(i) *Seed availability :*

Green mussel seed can be obtained during September to December all along the west coast, in areas where rocky substrata exist. The potential of seed availability has not been thoroughly worked out, but several lakhs of seed which may otherwise perish because of exposure can be profitably utilised. Coasts of Kasargode, Cannanore, Tellicherry, Mahe, Thikkodi, Elatur and Calicut are the potential areas of green mussel seed. The size of the seed available during the season is between 15-25 mm.

In the east coast Cuddalore—Pondicherry region, Madras—Ennore region, Kakinada Bay area and the estuarine regions of Orissa can meet the requirement of seed for mussel culture. May to July appears to be ideal season for seed collection in the east coast.

Brown mussel seed occur along the submerged and partially exposed intertidal rocky areas from Vizhinjam to Cape Comorin from July to November, with a peak season in September. Several lakhs of seed ranging from 25-30 mm can be collected during this period.

(ii) *Methods employed for seed collection :*

(a) From natural bed :

(1) Hand picking from the intertidal area just below the low tide level. The seed is scraped with a sharp instrument so that the byssal threads are not completely destroyed; in otherwords, plucking should be avoided as far as possible.

(2) From deeper areas, similar removal by diving operation.

(b) Spat collection :

Mussel spat can be collected from natural bed and farm area during spawning season by employing several methods like suspending coir and nylon ropes over the mussel bed or by suspending spat settlers like frilled polyester ropes or iron hapas covered with nylon netting.

(iii) *Method of transport :*

Mussel being sturdy can stand transportation without much mortality upto a maximum of 24 hr provided one of the following conditions are given :

(a) Seed are kept in containers with sea water being periodically changed to avoid rise in temperature.

(b) The mussel seed are always kept wet with sea water either by water drip or placing them under soaked wood shavings, gunny bags or seaweeds.

(iv) *Seeding technique :*

Nylon rope, polypropylene rope (12 mm thick) or coir rope (14 & 20 mm) can be used for seeding. Coir rope will last only for one season whereas synthetic ropes can be used for atleast 4 seasons. Though the initial investment is more, synthetic ropes are more durable and can hold the complete weight of full grown mussels.

Since the idea of collection of seed is to transplant them on to a substratum to which they can attach themselves it is necessary that the seed are kept very close to that object for sufficient duration (ranging from 3 to 4 days). During this period byssal attachment takes place enabling the mussel to hold on to the rope fast. This principle is made use of in the rope culture by the following technique described below :—

The cleaned mussels kept in sea water are spread uniformly over mosquito netting of 25 cm width. The seed is securely wrapped around the coir or nylon ropes. The edge of both end of nettings is stitched using cotton thread. The seeded ropes are once again wound with thin plain coir rope at an interval of  $\frac{1}{4}$  metre to avoid slipping of mussels when the netting gets disintegrated within 2 to 4 days. Single rope of 6 m length can be seeded within 20 minutes and two persons can normally seed 30 to 35 ropes a day. Seeding can be done on lengthy tables or on cemented floor near the farm area.

(v) *Points to be observed while seeding :*

- (1) Seeding is to be done during the cool hours of the day under shade.
- (2) Overcrowding of seed is to be avoided by distributing the seed uniformly to cover the required length of rope. Wooden spacers or pegs can be used to promote firm grip for the mussel on the ropes. From experience, the following quantity of seed appears to be reasonable limit for seeding a given length of rope.

brown mussel	..	1.5 kg/metre
green mussel	..	500-700 g/metre

Care should be taken to avoid seeding the entire length of ropes giving sufficient free space to remain free above water level depending on the tidal amplitude. While suspending the ropes in rafts, the seeded ropes should not touch the bottom of the sea. It is ideal to give clearance of atleast 2 to 3 m from the bottom. Ropes can be suspended 50 to 70 cm apart in the raft. The

bottom end of the rope is weighted in the initial stages by using sinker stones so as to keep it vertical. This should ensure utilizing maximum advantage by entire column of water in the area.

**RAFT CONSTRUCTION**

The standard sizes of rafts used are 6 × 6 m and 8 × 8 m dimension. The materials required are given below :

<i>Materials for raft :</i>	6 × 6 m raft	8 × 8 m raft
1. Teak wood pole for outer frame work 7.5 cm diameter	8 nos (6 m long)	10 nos (8 m long)
2. Bamboo poles (Kallan) for trellis work	12 nos.	12 nos
3. Country wood ( $\frac{1}{2}$ × 3 m) planks for providing space for on-raft work.	2 nos	2 nos
4. Coir or nylon rope to lash the poles together (3-4 mm thick)	5 kg	6-7 kg
5. Floats—oil barrels 200 litre capacity, leak proof, thickly coated with anticorrosive paint or high density plastic barrels with antifouling paint.	4 nos	5 nos.

(Diagrammatic sketch of raft with culture ropes is given in Fig. 1)

*Materials for mooring the raft :*

- (1) Anchor—Grapnel or admiralty type of iron anchors. 50-100 kg—3 to 4 nos. depending on the place of mooring and size of rafts.
- (2) Anchor chain—Tested forged link chains coated with anti-corrosive paint ; at the rate of 5 lengths for every metre of water depth—12 or 9 mm diameter chains can be used.

*Precautions :*

Normally the rafts are moored at a depth ranging from 10-15 m. It would be useful to mark the position of the raft by installing winking lights or providing self-ignition lamps for the night and a flag with white and red colour to show the position during day time. Number of ropes to be suspended may vary from 50-100

depending on the size of the raft and the total weight of the harvest expected from each raft. The length of seeded portion of rope should be so adjusted as to avoid entangling amongst the ropes due to wind and current.

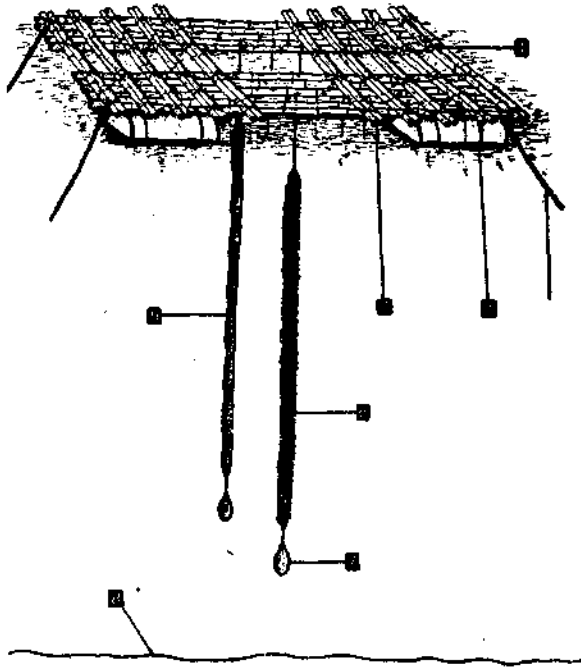


Fig. 1. Diagram of a typical mussel raft

1. Frame work of raft.
2. Bamboo pole.
3. Metal float.
4. Anchor rope.
5. One seeded rope.
6. Seeded mussel rope after a week.
7. Sinker.
8. Sea bottom.

#### FARM MAINTENANCE

After launching the rafts in the farm area with seeded mussels a close watch over the rafts is necessary. Periodical visit to the farm by atleast two persons to observe the following are necessary:-

1. Thinning of ropes with crowded seed settlement to avoid slipping and also to transplant the seed to fresh ropes.
2. Examination of ropes for fouling organisms, cleaning operations and elimination of predators.
3. Periodical mending of raft structure wherever necessary.
4. Supervising the raft once in a week to check the position of the raft and the condition of seeded ropes.
5. A close vigilance over the farm site will avoid poaching and pilferage of raft materials and farm grown mussels.

It is necessary to have a canoe to reach the farm site and a good diver can help checking the position of the anchors.

#### PROGRESSION OF GROWTH OF MUSSELS IN THE FARM

##### (i) Green mussel :

Growth in the Farm :

Month	Total Length (in mm)	Total wt. (in grams)	Meat wt. (in grams)
Nov.	20.6	1.1	0.40
Dec.	36.0	4.5	1.74
Jan.	50.6	9.60	3.81
Feb.	63.7	12.60	5.59
Mar.	74.9	28.60	11.40
Apr.	88.2	37.50	15.18

##### Average growth rate :

First month	..	15.4 mm
Second month	..	13.6 mm
Third month	..	13.1 mm
Fourth month	..	11.2 mm
Fifth month	..	13.3 mm

Total growth in a period of five months	..	67.6 mm
Total weight increase in five months	..	36.4 g
Total meat increase in five months	..	14.7 g

##### (ii) Brown mussel :

Month	Bay			Open Sea		
	Total length (in mm)	Total wt. (in gm)	Meat wt. (in gm)	Total length (in mm)	Total wt. (in gm)	Meat wt. (in gm)
October	28	1.5	0.5	..	..	..
November	30	2.0	0.9	..	..	..
December	33	2.5	1.0	..	..	..
January	37	2.8	1.0	41.3	4.3	1.5
February	41	4.0	1.4	44.2	5.0	1.5
March	46	4.7	1.8	51.0	6.5	2.5
April	54	4.8	1.8	58.8	10.0	4.3
May	55	7.6	3.3	69.3	15.3	6.6
June	57	10.2	4.5	..	..	..

Growth rate in the open sea brown mussel is faster and the meat weight percentage is also higher than those in the bay. The ideal period for suspending the ropes for culturing the brown mussel along Vizhinjam—Cape Comorin zone is September-November period. Similarly for green mussels in the west coast November-December is ideal period. In the east coast June-July appears to be ideal for releasing seeded ropes.

**PRODUCTION EXPECTED BY CULTURING**

(i) *Green mussel* :

Seed weight used for a metre length of rope 500-700 g  
 Full grown mussels (per metre length)  
 after 5 months .. 6.9 kg

The total production for a single rope of  
 6 metre length (6 m × 6.9 kg) .. 41.4 kg  
 Maximum number of ropes of 6 metre  
 length in one raft .. 100  
 Production that can be anticipated from  
 each raft (100 × 41.4) .. 4,140 kg

(ii) *Brown mussel* :

Seed weight used for a metre length of rope is 1.5 kg and they grow to 10 kg within 8 months (giving allowance for accidental slipping during growth and 5% mortality in the initial stages).

Total production for a single  
 rope .. 6 m × 10 kg = 60 kg  
 Approximate production for a  
 raft .. 50 × 60 kg = 3000 kg