

Experimental culture of green mussel, *Perna viridis* (Linnaeus) in the Andamans

R. SOUNDARARAJAN, K. DORAIRAJ and I. JAGADIS

Central Agricultural Research Institute, Port Blair

ABSTRACT

Experiments were conducted for the first time in the Andamans to culture green mussels, *Perna viridis* in velon netting bags and coir ropes in back water creek and inshore waters. While growing of mussels in velon netting bags did not succeed, the rope method gave encouraging results. Mussels of 47-81 mm sizes were collected for this purpose from natural habitat and seeded to the coir ropes.

At Sippighat, poles were erected and the seeded ropes were suspended from cross poles tied to the erected poles. As the creek area was shallow, seeding was done only to 1 m length of the ropes. The mussels showed growth increments ranging from 5.7 to 14.8 mm per month, which are comparable to results in culture experiments conducted in the mainland. The total net increase in weight ranged from 13 to 23 kg/metre length of rope in 4-5 months. The predation was negligible. The cultured mussels in the size range of 50 to 100 mm contained 36.3 per cent meat by body weight while the mussels in the natural habitat averaged about 33.7 percent.

The culture experiments at Pongibalu inshore waters, where seeded ropes were suspended from columns of the jetty, had the advantage of longer water column measuring more than 3 metres but it had a setback of heavy predation of growing mussels by the predator fishes.

The green mussel, *Perna viridis* has a restricted distribution in Andamans. This species was first recorded from a tidal creek at Sppighat in South Andaman by Appukuttan (1977). The surveys conducted by the authors showed the presence of mussel population in tidal creeks at Bimbleton and Kadakachan Depot and on columns of jetties and small rocks in the inter-tidal region at Junglighat and Meetakhari in South Andaman.

The mussels are removed from their beds by the local population and mussel meat is gaining popularity of late. Mahadevan (1983) has suggested that mussel culture can be

attempted as a first step in Sippighat creek either by keeping them on trays or in nylon twine meshed bags or by pole culture method. Initially attempts were made to culture the mussels in velon netting bags kept in brackish-water ponds but within few days heavy mortalities occurred probably due to different environmental conditions. Therefore experiments were conducted to culture mussels on ropes by seeding and suspending them in a brackishwater creek.

MATERIALS AND METHODS

The mussels were collected from their natural habitat in Bimbleton Creek. Since the

mussel spats were not available in appreciable quantity larger ones (47-81 mm) were used for the culture. The mussels were cleaned and seeded in six coir ropes of 15 to 20 mm thickness upto 1 m length. First the coir rope was inserted into a cylindrically stitched bag of cotton mosquito cloth, open at both ends. The mussels were filled around the rope tightly and both the ends of the bags were stitched to the rope. The seeded ropes were suspended in the water column from a mangrove pole frame in such a way that the bottom stone did not touch the creek floor.

A second set of 19 ropes was seeded during January to March 1986 and suspended in the same way, at the same culture site. Periodical observations were made to study linear growth and weight increase in cultured mussels, nature of fouling on growing mussels and spat settlement on ropes. Data on temperature, salinity, and dissolved oxygen content of water at the

culture site were also collected. For spat settlement loosely woven 4-6 thin coir ropes and corrugated asbestos sheets (30 cm × 30 cm) were suspended along with seeded ropes and examined periodically.

In another experiment in January '86 green mussels were cultured by suspending seeded ropes from a column of Pongibalu jetty where water depth was more than 3 m during low tide. However, the experiment had a set back due to heavy predation on the mussels by large sized coral fishes especially parrot fishes.

Environmental Conditions of the Culture Site: The bed of the creek at Sippighat was slushy with about 1.5 m water depth at the lowest tide. The tidal amplitude at the site ranges from 0 to 2.4 m. The data on temperature, salinity and dissolved oxygen content of brackish water at the culture site are given in Table 1. The water temperature ranged from

Table 1 Environmental conditions of the culture site in Sippighat tidal creek in South Andaman

Month	Temperature (°C)	Salinity (ppt)	Oxygen (ml/l)
January '86	26.4—31.9 (29.7)	19.27—31.08 (25.74)	1.97—2.97 (2.60)
February '86	26.2—31.8 (29.4)	28.94—34.78 (30.79)	2.52—4.65 (3.24)
March '86	30.6—32.1 (31.5)	29.80—33.47 (31.37)	1.90—3.80 (2.85)
April '86	31.4—31.8 (31.6)	28.28—33.17 (31.29)	1.80—3.24 (2.30)
May '86	27.4—30.8 (30.04)	0.94—31.04 (22.34)	1.63—7.14 (2.98)
June '86	25.8—30.3 (29.2)	0.38—30.68 (11.45)	2.05—3.89 (3.01)
July '86	25.9—31.6 (27.2)	0.25—27.74 (10.76)	2.28—5.87 (4.45)

Table 2. Average size, monthly growth rate and production of green mussel, *Perna viridis* in Sippighat tidal creek

Rope No.	Culture period days	Initial average size		Final average size		Average growth per month		Total weight		Net wt. increase	Calculated net production kg/m/5 months
		Length mm	Weight g	Length mm	Weight g	mm	g	At stocking	Final		
								kg	kg		
A	132	47.3	—	103.5	—	12.8	—	—	—	—	—
B	132	47.3	—	112.0	—	14.7	—	—	—	—	—
1	200	56.2	18.2	117.1	117.7	9.1	14.9	11.25	32.0	20.75	15.6
2	200	56.2	18.1	107.8	105.0	7.7	13.0	11.00	24.5	13.5	10.2
3	160	58.4	16.7	110.2	96.4	9.7	14.9	10.0	32.0	22.0	20.6
4	160	58.4	16.7	106.3	97.3	9.0	15.1	10.0	26.0	16.0	15.0
5	160	63.4	19.6	110.0	95.4	8.7	14.2	10.0	30.0	20.0	18.8
6	153	60.1	19.6	108.7	107.5	9.5	17.2	15.0	34.5	19.5	19.1
7	140	66.5	27.8	101.0	95.6	7.4	14.5	10.0	23.0	13.0	13.9
8	134	54.8	16.7	92.5	75.0	8.4	13.1	12.0	35.0	23.0	25.7
9	134	77.1	41.7	113.7	116.7	8.2	16.8	10.0	24.5	14.5	16.2
10	132	59.5	20.4	101.8	98.8	9.6	17.8	12.0	27.0	15.0	17.1
11	132	59.5	19.2	96.0	77.5	8.3	13.3	12.0	32.5	20.5	23.3
12	132	80.7	37.0	105.8	97.3	5.7	13.7	11.0	26.0	15.0	17.1
13	131	69.9	32.3	101.2	97.9	7.2	15.0	10.0	24.5	14.5	16.6
14	131	69.9	31.3	106.0	98.1	8.3	15.3	9.0	24.0	15.0	17.2
15	131	69.9	28.6	105.1	97.3	8.1	15.7	10.0	26.0	16.0	18.3
16	131	68.9	29.4	102.8	95.0	7.5	15.0	12.0	32.5	20.5	23.5

25.8°C to 32.1°C during the study period. The temperatures were maximum during March—April 1986. The salinity showed wide fluctuations (0.25—34.78 ppt) but it was generally stable during February—April. With the onset of monsoons in the latter part of May, the inter-mittent heavy rains and subsequent floods caused wide fluctuations in salinity while near freshwater conditions often prevailed during May—July (Table 1). The dissolved oxygen content ranged between 1.63 and 7.14 ml/l during different months. Maximum dissolved oxygen content was noticed in May 1986.

RESULTS AND DISCUSSION

Growth

In the first experiment at Sippighat, out of the six culture ropes seeded during October—November, 1985, growth was monitored in two ropes. The average size of mussels in the beginning of November was 47.3 mm and it increased to 103.5 mm and 112.0 mm in the respective ropes in 132 days. The growth per month worked out to 12.8 mm and 14.7 mm, respectively.

In the second experiment out of the 19 culture ropes growth of mussels was followed in 16 ropes as the remaining three ropes had slipped off from the pole to the ground. The average length of seeded mussels varied from 54.8 mm to 80.7 mm with an average weight of 16.7 g to 37.0 g (Table 2). The culture period ranged from 131 to 200 days. At harvest the average length varied from 92.5 to 117.1 mm and the monthly growth rate was 5.7 to 9.7 mm. The weight increase ranged from 75.0 to 117.7 g.

The average growth rate of mussels in the 41-60 mm size group seeded on 10 ropes was

observed to be about 11.5 mm while those of size group 61-80 mm seeded on 8 ropes showed an average growth of 8 mm in the initial 5 months.

Other Observations

Heavy fouling by barnacles was observed on cultured mussels in the Sippighat creek. This necessitated periodical cleaning of mussels. Further the culture ropes were observed to harbour alghids, gastropods, young ones of spiny lobster, *Panulirus ornatus* (35-40 mm in total length), shrimps, small crabs etc. Accumulation of silt below the culture ropes made the bed at the culture site shallower than the surrounding areas. Amidst the cultured mussels, mussel spat had been noticed to settle during June—July. About 2 to 92 mussel spats measuring 5-15 mm were recorded from different ropes. Settlement of spats was however least in frills of thin coir ropes suspended along with culture ropes for spat collection.

The meat weight percentage averaged 36.3 by total weight of cultured mussels. Mussels in natural habitat gave an average of 33.7 percent.

Production

In the sixteen culture ropes of the second experiment the total weight of seed in different ropes varied from 9.0 kg to 15.0 kg (Table 2). Increases in the total weight were periodically recorded for all the ropes till the end of July 1986.

During the culture period of 131-200 days the gross weight increase in mussels from different ropes ranged from 23.0 kg to 35.0 kg with the net weight increase ranging from 13.0 kg to 23.0 kg. These results gave a net production

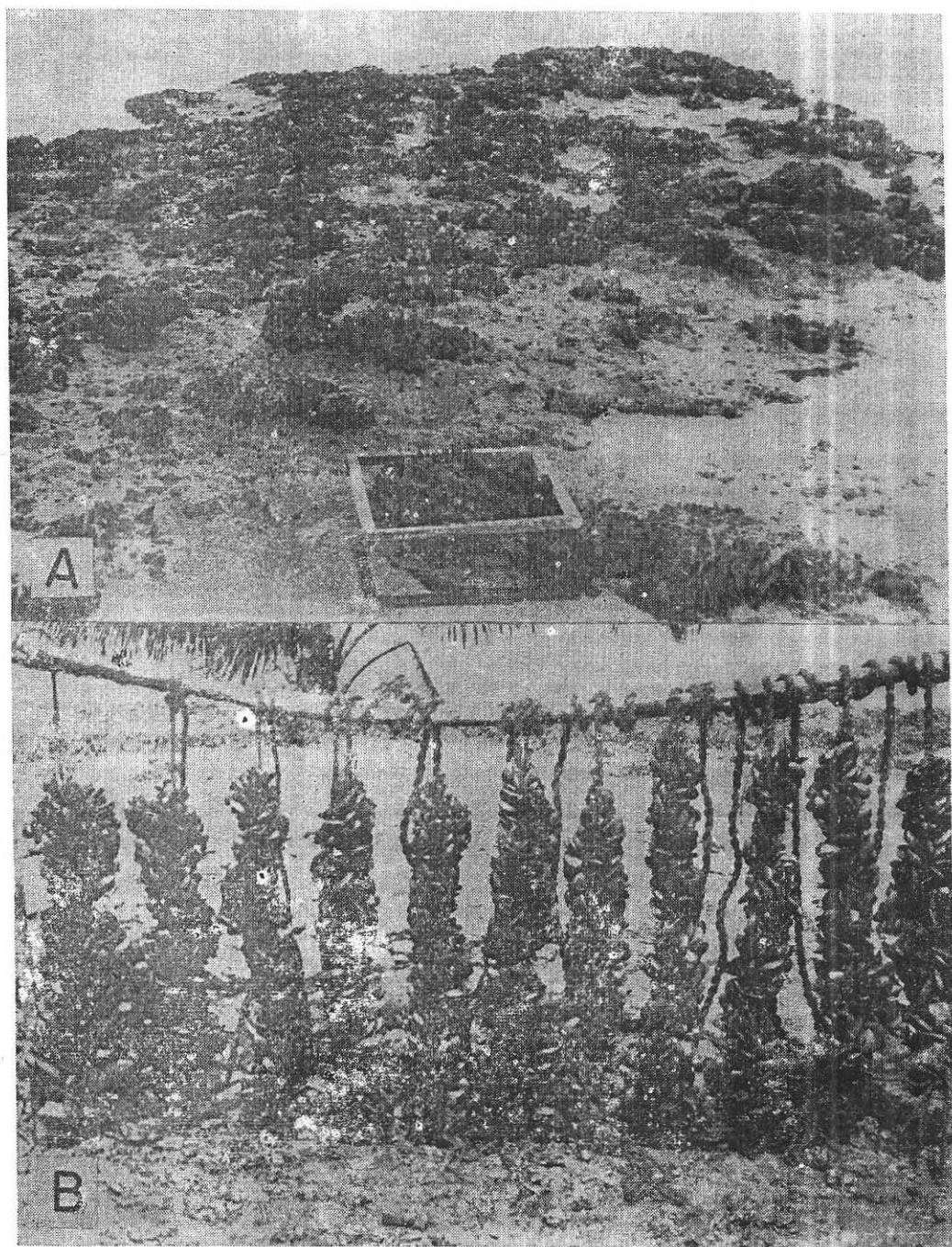


Plate 1. A. A view of green mussel bed exposed during the low tide in Bimbleton creek, South Andaman.
B. Green mussels grown on ropes at Sipighat creek, South Andaman.

of mussels per metre rope length for a culture period of five months varied from 10.2 kg to 25.7 kg. An overall analysis indicated that the ropes seeded in the latter part of March gave better net production.

The green mussel (*Perna viridis*) and brown mussel (*P. indica*) occur along the Indian coast. In Andamans only the green mussel occurs in limited population (Appukuttan, 1977; Mahadevan, 1983 and Soundararajan and Dorairaj, 1986). In India, the mussel culture is of recent origin and has yet to be taken up on commercial scale. A number of mussel culture experiments conducted on both the coasts of India involving both green and brown mussels have demonstrated the viability of mussel farming. In almost all the experiments, main emphasis centred on culture of mussels on ropes suspended from rafts in bays or open seas. The culture experiments have shown that green mussel grows much faster than the brown mussel (Appukuttan *et al* 1980, 1983 and Kuriakose, 1980).

The green mussels in 20-30 mm sizes showed a growth of 10.6 mm to 13.5 mm per month, when cultured in the West Coast open sea off Calicut (Kuriakose, 1980a). On the east coast, mussels of 10-25 mm size showed a monthly growth of 12.8 mm in the open sea off Kovalam (Madras), 8.0 mm in Ennore estuary (Madras) and 9.0 mm in the open sea of Kakinada (Rangarajan and Narasimham, 1980). In the present study, mussels of 47-81 mm length showed average monthly growth rates ranging from 5.7 mm to 14.7 mm (Table 2). A comparison of growth rate was made during the initial 4 to 5 months between the mussels with initial stocking sizes ranging from 47 mm and 60 mm (10 ropes) and those with initial stock-

ing sizes between 61 mm and 80 mm (8 ropes). A growth rate of about 11.6 mm/month was observed in the former group and about 8 mm in the latter group.

These studies showed that the optimum sizes of mussels when seeded to ropes were around 10-25 mm and the culture period of around 5 months was optimum in a favourable season. Kuriakose (1980b), produced 4.4 kg to 12.3 kg of green mussels per metre length of rope under open sea conditions when 500 g to 700 g of seed was used. Kuriakose and Appukuttan (1980) projected a production of 4140 kg/raft with about 100 ropes of 6 m length. Rangarajan and Narasimham (1980) stated that each raft accommodating 50 ropes of 6 m length produced about 2 ton of green mussels in a period of 4 months in the bay waters. Cheong and Chen (1983) found average yields of 46 kg to 52 kg/4 m length of ropes when cultured for 6 months, They used 150 m² rafts in sheltered estuarine areas. They recorded poor yields with pole and bouchot methods.

In this study a net production of 10-26 kg/metre rope in a period of five months has indicated a good possibility of culturing mussels in the Andamans using even the tidal creeks. Since the spat availability for large scale culture is a problem, there is a need to establish hatcheries using the brood stock available in the natural habitat. It may be possible to culture mussels throughout the year in bay waters as the green mussels have been observed to tolerate wide fluctuations in water conditions. Predation of mussels could be a problem in culturing mussels in the near-shore waters of the sea. Appukuttan (1980 b) reported large scale predation on mussels during 1979 by a fish, namely *Rhabdosargus sarba* (silver bream) in more than 1500 culture ropes in Vizhinjam

Bay. In the Andamans, big parrot fishes which abound in the coral reefs of inter-tidal region, seem to prey upon the cultured mussels. On the contrary no predation was observed in tidal creeks but fouling of mussels by barnacles was heavy.

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