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47. BROWN MUSSEL (*PERNA INDICA*) RESOURCES ON THE SOUTHWEST COAST OF INDIA AND THE RESULTS OF FARMING EXPERIMENTS AT VIZHINJAM

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ABSTRACT

The distribution, abundance and fishery of the brown mussel (*Perna indica*) along the southwest coast of India are dealt with in this account. The annual production of brown mussel was estimated around 500 t and the total stock about 1500 t. This shows that there is scope for increased production from the natural beds. The results of mussel farming experiments done in the Vizhinjam Bay by raft culture method are given. The prospects of mussel farming and the problems encountered are discussed.

INTRODUCTION

The brown mussel, *Perna indica* and green mussel, *Perna viridis* contribute to the mussel fishery along Indian coasts. The brown mussel occur in the southernmost part of east and west coasts. Jones (1950), Jones and Alagarwami (1973), Alagarwami et al (1980), Appukuttan and Nair (1980) and Silas et al (1982) have given details of distribution, abundance, fishery, utilization and marketing of this species. Experiments on brown mussel culture were taken up at Vizhinjam in 1971 (Achari 1975, Anon 1978, Appukuttan and Nair 1983) and basic technology for farming this species was evolved. In this paper the distribution of the brown mussel *Perna indica*, its fishery, exploitation and total stock based on the survey during 1982-84 period and results of farming experiments in 1980, 1981 and 1983 are given.

MATERIAL AND METHODS

The results indicated in the present study are based on the survey during 1982-84 period from Quilon to Muttom. The estimation of total stock and exploited stock are made for major areas of mussel beds by regular visits to the centres twice a month and collection of daily landings and also random sampling of settlement in the beds. The effort is represented here as the total man power employed every month. The meat weight percentage, condition index, details of spawning and growth

rate were taken for farm grown mussels for 1980, 1981 and 1983. By tracing the peak modes, growth was estimated and growth was also observed directly by keeping mussels in cages from floating rafts.

Distribution

Jones and Alagarwami (1973) have indicated the distribution of *Perna indica* from Varkala to Kovalam (Kanyakumari) along the southwest coast of India. The natural beds of brown mussel are located mainly in the intertidal rocky area and also in the nearshore submarine rocks (Fig 1 A). At Muttom and Enayam there are a few mussel beds on the submarine rocks, 2-3 km away from shore at 5-6 m depth. The mussels occur even upto 15m depth. The important mussel fishing centres on the southwest coast are Kovalam, Avaduthura, Vizhinjam, Mulloor, Pulinkudi, Chowarah, Enayam, Colachal, Kadiyapatnam and Muttom (Fig. 2). Besides these occasional fishing is practiced at Kappil, Chilakkoor, Papanasam, Vettoor (near Varkala), Kodimuna, Vaniyakudi, Kurumpainai, Enayam Puthenthura, Ramanthurai and Kovalam (Kanyakumari). There is also brown mussel settlement in the harbour breakwaters at Sakthikulangara (Quilon) and harbour pilings in Valiathura (Trivandrum) which is exploited seasonally.

Fishery and Abundance

Brown mussel fishery along the southwest coast is of sustenance nature. The fishing

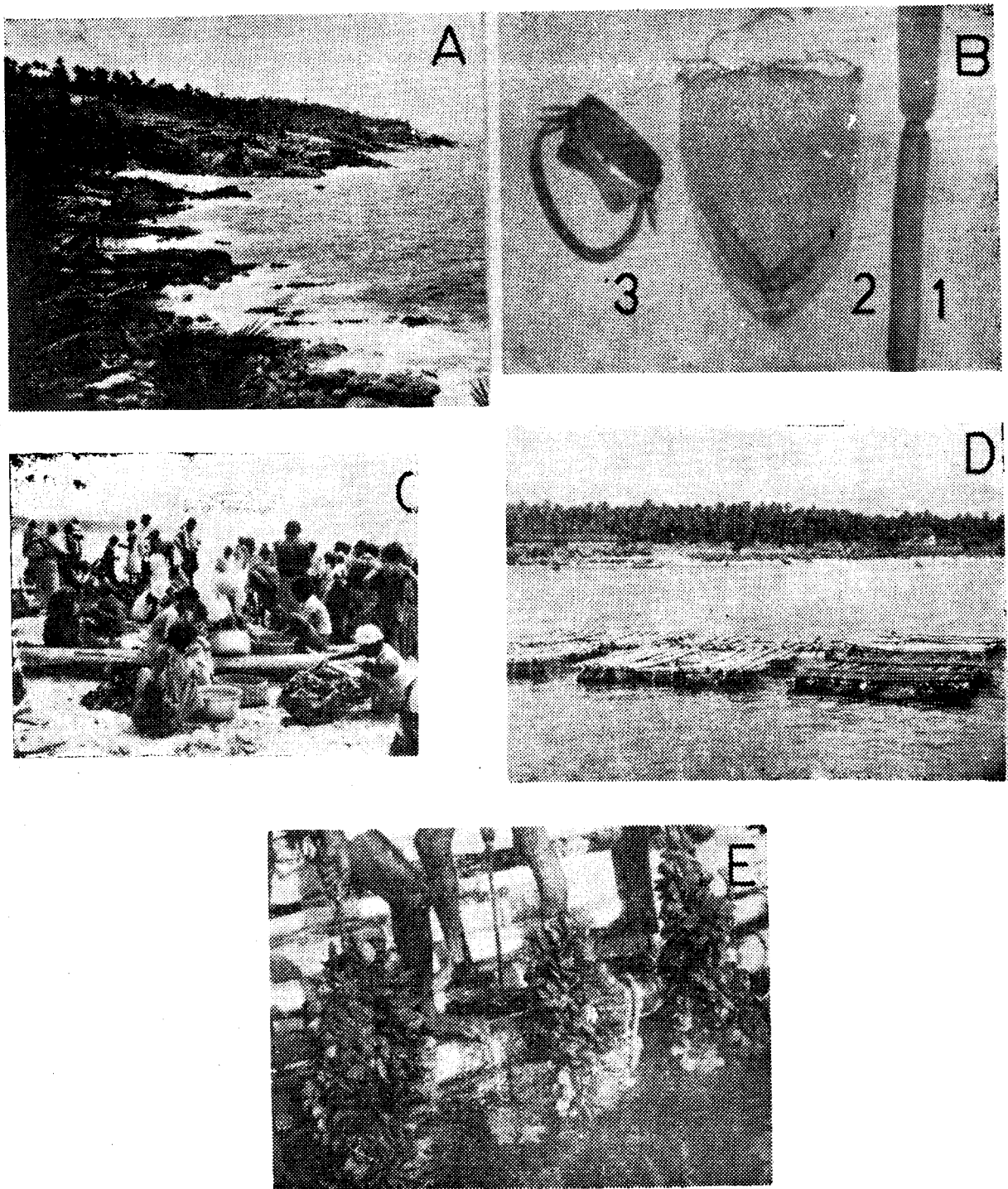


Fig 1 A Mussel beds in the intertidal area at Vizhinjam; B 1. Chissel used for mussel exploitation - 'Chippikathi'; B 2. Nylon bagnet used for mussel collection; B 3. Locally made mask used by divers engaged in mussel picking. C Grading the mussels brought from natural bed for marketing; D Mussel culture rafts inside Vizhinjam Bay; E Harvestable sized mussels on ropes.

methods have been described by Jones (1950) and Jones and Alagarwami (1973). Appukuttan and Nair (1980) have given the seasons and the magnitude of the fishing at Vizhinjam from 1976

to 1979. The fishermen reach the mussel bed by swimming or in catamarans and collect the mussel using iron chissel with wooden handle locally known as *Chippikathi* (Fig 1. B 1) and keep

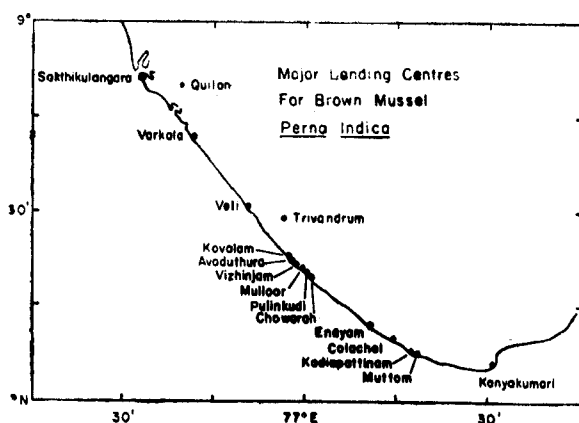


Fig. 2. Important brown mussel beds along southwest coast of India

them in nylon net bag (Fig I. B2) tied around their waists. For collecting mussel from deeper waters, most of the fishermen use local made

masks (Fig I. B3), which helps in locating the mussel settlement in the submarine rocks. Fishing is generally done during sunny days between 9 am to 4 pm in all the major centres. The major areas of mussel beds along southwest coast are Vizhinjam area (Kovalam to Vizhinjam), Mulloor-Chowarah and Colachel-Muttom. The annual landings at important centres from Vizhinjam to Muttom for 1982-83 and 1983-84 and the catch per effort of exploited mussel for corresponding period are given in Table-1. Fishing commences in all the centres by September and lasts till March with peak landings during November-January period. The present exploitation of mussels from all the centres together amount to 500 t annually. The catch per effort varied from 3 to 17.28 kg, the highest during November and lowest in March. The catch per effort shown in Table-1 indicates that

TABLE 1. Showing total exploited quantity of brown mussel from important centres for 1982-83 and 1983-84 with the catch per effort for each month.

Months	Catch (kg)	1982-83		1983-84		
		Effort	C/E	Catch (kg)	Effort	C/E
VIZHINJAM						
Sep	13,000	1100	11.80	—	—	—
Oct	16,469	1126	14.60	26,350	1736	15.18
Nov	21,128	1050	20.12	42,000	2430	17.28
Dec	15,655	775	20.20	19,995	1829	10.93
Jan	8,060	806	10.00	5,704	713	8.00
Feb	2,380	476	5.00	2,893	406	7.12
Total exploited quantity	76,692			96,142		
ENAYAM						
Nov	800	120	6.70	26,000	2080	12.50
Dec	26,000	2000	13.00	22,000	2000	11.00
Jan	15,000	1500	10.00	20,800	2080	10.00
Feb	12,500	1850	6.90	5,625	750	7.50
Mar	4,800	800	6.00	2,600	520	5.00
Total exploited quantity	59,100			77,025		
COLACHAL						
Nov	4,875	450	10.83	23,400	3120	7.50
Dec	13,000	1250	10.40	36,400	3640	10.00
Jan	7,000	700	10.00	19,500	2600	7.50
Feb	9,000	1200	7.50	10,500	1750	6.00
Mar	5,400	720	7.50	2,184	728	3.00
Total exploited quantity	39,275			91,984		

TABLE 1 Contd.

Months	Catch (Kg)	1982-83		1983-84		C/E
		Effort	C/E	Catch (Kg)	Effort	
KADIYAPATNAN-MUTTOM						
Nov	3,375	400	8.44	11,400	1040	10.96
Dec	10,000	600	16.67	9,750	780	12.50
Jan	5,400	624	8.65	4,600	624	7.37
Feb	3,600	480	7.50	3,500	600	5.83
Mar	1,440	240	6.00	1,400	312	4.49
Total exploited quantity	23,815			30,650		
MULLOR-CHOWARAH						
Oct				52,000	3120	16.66
Nov				52,475	2850	18.41
Dec	No data available			9,250	1050	8.80
Jan				5,000	600	8.33
Feb				—	—	—
Total exploited quantity				15,6065		

C/E was highest at Mulloor-Chowarah during 1983-84 period. The estimated production during 1983-84 shows that 21% was from Vizhinjam area, 34.5% from Mulloor-Chowarah area and 44% from Colachal-Muttom area. The average number of fishermen engaged in mussel fishing is estimated as 790, of which 520 are active fishermen. The number of catamarans engaged in fishing annually in this region is around 295. Table 2 shows the estimated total stock of mussel, extent of mussel bed and the average weight of mussels per square metre

from important mussel beds. The total stock estimated was highest at Vizhinjam area, Mulloor-Chowarah ranking second and Colachal-Muttom ranking third in abundance. Observations on the natural settlement in Vizhinjam area during October-November 1982 by random sampling (Table 3) showed that the average number of spat/m² was 4794 and weight 7 kg/m². The size of the spat ranged from 15 mm to 35mm with monthly average of 1-15 mm in July, 10-20 mm in August, 15-25 mm in September and 15-35 mm in October.

TABLE 2. Showing total stock of mussel *P. indica* along southwest coast of India

Places	Extend of bed (in sq. mtr.)	Av. Wt. per sq mtr. (in kg)	Total estimated stock (in tonnes)
1) Vizhinjam area (Kovalam, Avaduthura, Vizhinjam and Kottappuram)	1,11,500	6	669.0
2) Mulloor-Chowara (Pulinkudi, Mullor, Karimpally)	71,000	6	426.0
3) Enayam	22,500	8	180.0
4) Colachal (Kurumpana, Veniakudi, Kodimuna and Colachal)	42,500	6	225.0
5) Kadiapatnam-Muttom	10,000	6	60.0
6) Varkala	2,000	5	10.0
7) Kappil	400	5	2.0
8) Sakthikulangara	1,800	8	14.4
Total	2,61,700		1586.4

TABLE 3. Showing the number and weight of spat settlement around Vizhinjam during October-November 1982.

Place	No- of observation	Total No of spat/sq. mtr.	Wt of spat/sq. mtr (in kg)
Vizhinjam (Oct.)	5	5132	7.3
Kovalam (Oct.)	4	4500	6.5
Avaduthura (Oct.)	5	5048	7.0
Vizhinjam (Nov.)	3	4680	7.0
Kovalam (Nov.)	3	4036	7.4
Avaduthura (Nov.)	4	4560	7.0
Average		4794	7.0

The mussel catches landed during peak season are disposed off at landing centres to the local consumers and merchants. The mussel brought to shore are cleaned to remove encrusted fouling organisms and seaweeds and they are graded and sold (Fig 1 A-E). From Vizhinjam area and Mulloor-Chowarah area mussels are taken on bicycle to Trivandrum and nearby markets. During November to January period truck loads of mussels with shell are taken from Muttom to interior markets. The price of mussel at Vizhinjam ranges from Rs 3 to 7/100 numbers during peak season and at Muttom it is Rs 3-5/100 numbers. During 1985 1120 kg of mussels collected from Sakthikulangara were sent to Kuwait in frozen condition on trial basis.

Farming Experiments

The results of the mussel farming experiments at Vizhinjam were given by Achari (1975) and Appukuttan and Nair (1983). Experiments during 1981-82 and 1982-83 have shown large scale slipping of seed when transplanted to ropes. Seeds of 20-30 mm size collected from submerged rocks showed minimum slipping during 1984 experiments. The environmental parameters of the mussel farm recorded during 1980-83 are shown in Fig. 3. As indicated by Appukuttan and Nair (1983) decline in salinity and temperature was recorded during May to October coinciding with the monsoon. The minimum salinity was recorded during May-July period and temperature was low during May to August. Dissolved oxygen varied from 4.02 to 5.51 ml/l during 1980-83 period. Meat weight percentage of farm grown mussels

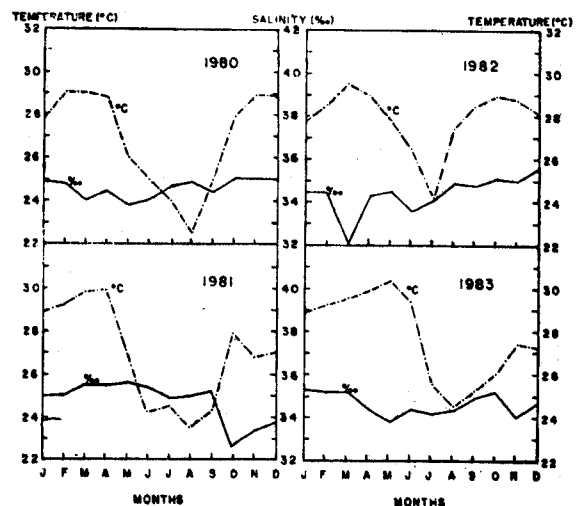


Fig. 3. Temperature and salinity for 1980-83 inside the Bay.

ranged from 21.35 to 39.83 in 1980, 35.66 to 41.50 in 1981 and 36.96 to 43.87 in 1983 (Fig.4)

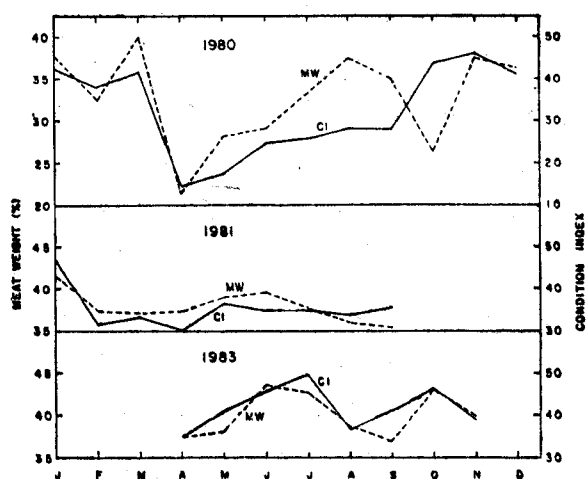


Fig 4. Meat weight percentage and condition index of mussel cultured in the Bay for 1980, 1981 and 1983.

and the condition index from 13.9 to 45.33 in 1980, 30.0 to 46.6 in 1981 and 35.27 to 45.79 in 1983. The high meat weight was noted during October-March period and the lowest in April. An identical trend was noticed for condition index. The meat weight and condition index show sharp decline after the spawning and usually spawning commences with the onset of southwest monsoon.

The growth observed from direct observation of mussels kept in rearing cages is shown in Fig 5. Samples collected from mussel ropes during 1980 showed that the peak mode in January was 40-44 mm and by September it has reached 60-64 mm, indicating a 20 mm growth in nine months at an average of 2.2 mm/month. In 1981 it was 2 mm/month and in 1983 2.5 mm/month. Direct observation also showed 2.5 mm growth per month. In the earlier experiments during 1976-79, Appukuttan and Nair (1983) found that the growth rate of mussels cultured on rope was 2.9 mm/month in the Bay and 5 mm/month in the open sea. Increase in meat weight during this period for farm grown mussel was 0.32 g/month in the Bay and 0.9 g/month in the open sea.

Spawning commences by the end of May and lasts till September with peak during June to August. Natural settlement of mussels was

noticed from July onwards with maximum settlement in September through November every year.

The price of mussel at Calicut was Rs 1.25/kg, at Goa Rs 3/kg, at Ratnagiri Rs 4/kg and at Vizhinjam Rs 1.50/kg. In recent years the demand for brown mussel has increased and as a result the price has gone upto Rs 3 to 4/kg at Vizhinjam and neighbouring areas.

REMARKS

The present study has shown that the exploitation of brown mussel is around 500 t annually and estimated total stock is roughly 1500 t. It is quite evident that the exploitation can be increased. The landings during 1983-84 period reveal that the maximum exploitation is at Colachal-Muttom area, which accounts for 50% of the estimated total stock of that area. At present mussel picking is done as a part-time occupation during fair season in most of these centres. When there is good fish landing at Vizhinjam, fishermen do not go for mussel picking. Recently most of the fishermen engaged in mussel fishing in the Colachal-Muttom area go to the east coast for chank fishing during November-January period and thus active mussel picking is not done during this season. At present there is no Government assistance to encourage mussel picking. This

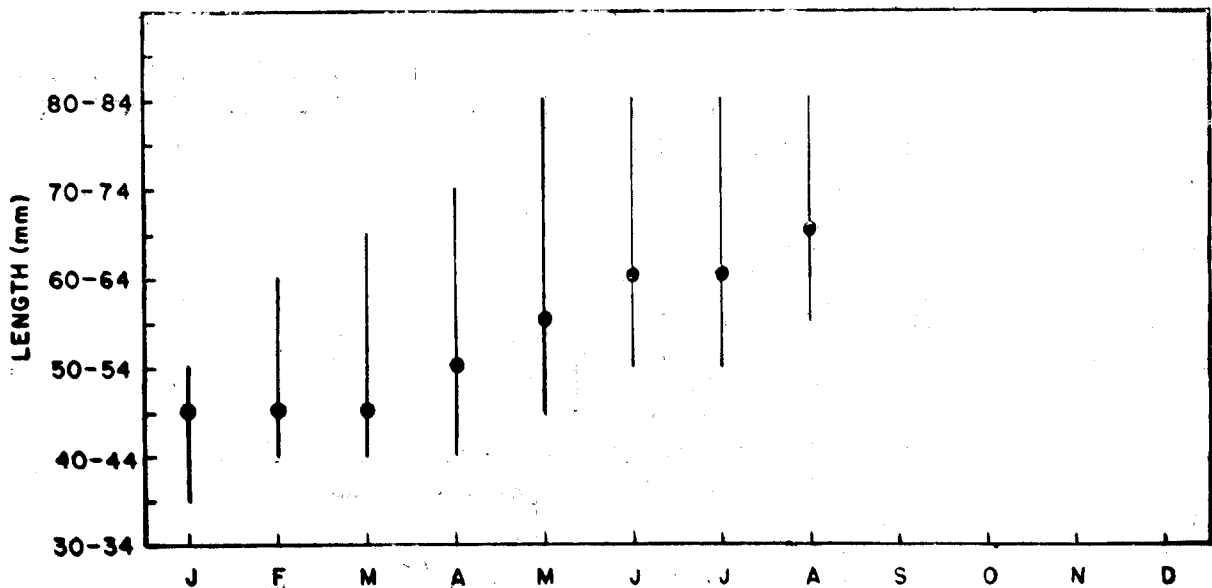


Fig. 5. Growth rate of mussels kept in rearing cages inside the Bay during 1980 for direct growth observation. The bar represents the size range and dot indicates the peak modes in different months

and the poor demand are two factors which keep the exploitation at low level. At present, mussel consumption is limited to the coastal belt and a few interior towns and villages near the landing centres.

The present study indicates slower growth rate for mussel inside the Bay compared to that observed in 1976-79 period. The reasons can be due to increase in the number of rafts in a limited area and also due to heavy silting inside the Bay caused by recent breakwater construction. Seed slipping noted during 1982-83 can also be due to the heavy silting inside the Bay. Though the mussel farming techniques have been developed and demonstrated through extension programmes and culture projects of various Government agencies, no mussel farming of commercial proposition has been taken up in India. Some of the aspects yet to be studied are the methods for increased seed collection from the wild and also production through hatchery techniques. Experiments revealed that farming in the open sea is more productive (Appukuttan and Nair 1983) and thus it is felt that improved techniques for mooring rafts in the open sea have to be developed. In European countries it takes 15-24 months for mussels to reach harvestable size, whereas in India it reaches this size within 6-3 months after seeding (Fig 1. E). Availability of mussel seed in the east and west coasts, high rate of production by farming in floating rafts and low cost technology for farming are factors conducive to large-scale mussel culture in India.

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