

## II

### FISHERY AND BIOLOGY OF THE BROWN MUSSEL, *PERNA INDICA* KURIAKOSE & NAIR

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On the culture ropes in the Vizhinjam bay brown mussel show an average growth rate of 35 mm per year. In the open sea, mussels on ropes grow to 25 mm in 5 months. The weight increase is 9.29 g/annum in the bay and 9.72 g for 5 months in open sea. The condition index is maximum in August (i.e. before spawning). The spawning lasts from May to September, with a peak in August.

#### INTRODUCTION

In Europe, mussels have been traditionally gathered from natural beds and cultured extensively in Spain, France and the Netherlands to meet market demands. The popularity of the brown mussels along the south-

west coast of India led Jones (1950, *J. Bombay Nat. Hist. Soc.* 49: 519-528<sup>1</sup>; 1968, *Sea-food Exporter*, 3: 21-28<sup>2</sup>) and Jones and Algarswami (1973, *Proc. Symp. Living Resources of the Seas around India: 641-647<sup>3</sup>*), to investigate the distribution and fishery. Kuriakose (1973, Ph.D. thesis, Univ. of Kerala, 347 pp.<sup>4</sup>) has

studied the growth rate, breeding habits and early development of this mussel. Additional details on the biology and fishery of the brown mussel in the Vizhinjam area are presented here to increase our understanding of the subject.

### FISHERY

From September to April regular exploitation of brown mussel commences every year from Cape Comorin to Vizhinjam. The details of commercial landings of mussels at Vizhinjam from 1976 to 1979 are given in Fig. 1. Fishing methods are comparatively simple. Jones (1950') has described in detail the fishing method of brown mussel from this area. The mussel fishing is done as an off time occupation by the fishermen, but during peak season most of them are engaged full-time in mussel fishing. The fishing is done mainly during 9 a.m. to 4 p.m. Lowtide, clean water and clear sunny days are good for fishing. They collect mussels from intertidal rocks (Plate I, a) using iron implements

like chisels with or without wooden handle or a knife, during lowtide. Mussels thus collected are kept in coir or nylon bags tied around their waist. After fishing, they swim back and reach the shore and empty the catch. The mussels are cleaned to remove fouling organisms, (Plate I, b) graded according to size and then disposed off to consumers and merchants in fresh condition. Cycle loads of mussels are taken to interior markets around Trivandrum city during peak fishing season (Plate I, c). In 1976-77, the fishery lasted till March with peak landings in October-December period. In 1977-78 fishery started by September and lasted till January. In 1978, fishery commenced by October and lasted till January 1979. During 1977, 1978 and 1979 the mussel fishery at Vizhinjam was poor, since the settlement of mussels around Vizhinjam and nearby places was a failure compared to previous years. In recent years the fishermen exploit mussels from the natural bed even before the mussels reach the harvestable size.

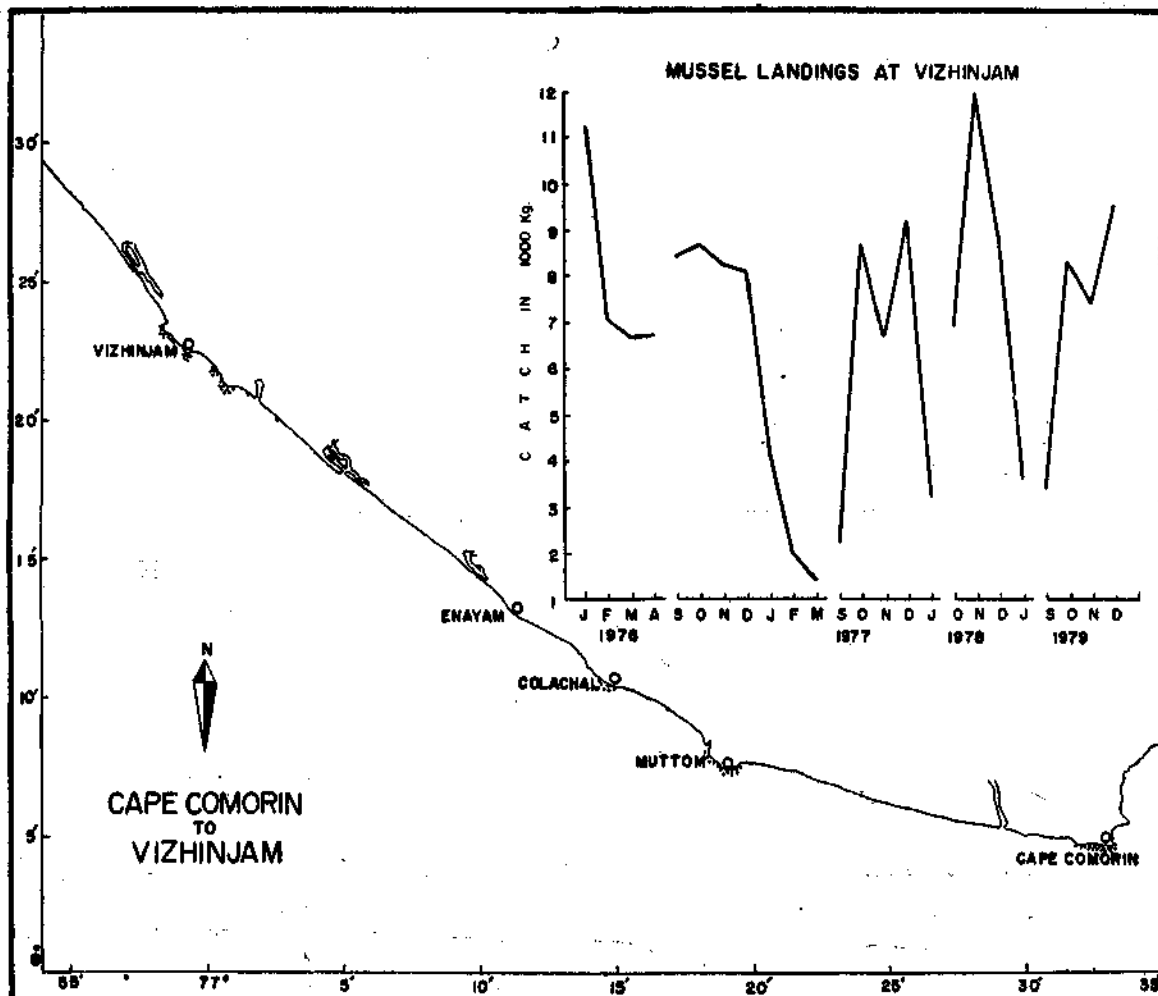


Fig. 1. Cape Comorin to Vizhinjam showing important mussel fishery centres and mussel landings at Vizhinjam from 1976-79.



**PLATE I.** a. Exploitation of mussel from natural bed around Vizhinjam.  
b. Cleaning and grading of mussels collected from natural bed.  
c. Disposal of mussels to interior markets.

## BIOLOGY

The data presented here were obtained from the cultured mussels in the farm at Vizhinjam bay and open sea during 1976-79 and 1978-79 respectively.

### Growth rate :

The growth rate inside the bay from 1976 to 1979 is given in Fig. 2. Analysis of data collected for each year has shown that the growth rate in all the three years follows an identical pattern. In 1976-77 the growth

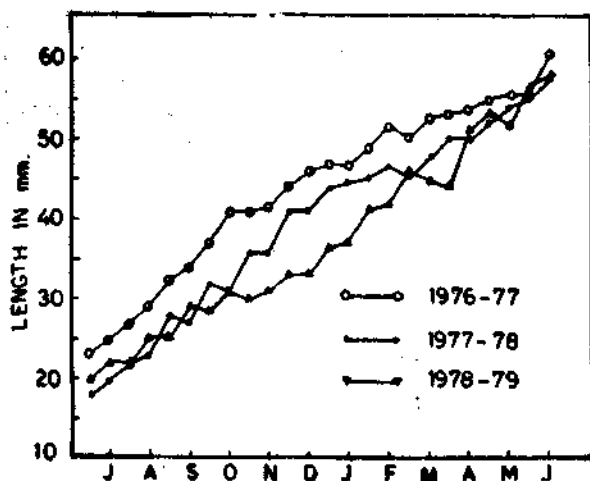


Fig. 2. Growth rate of cultured mussel in the bay for 1976-77, 1977-78 and 1978-79.

increment per year was 35 mm and in 1977-78, 35.6 mm and in 1978-79, 36.3 mm. Thus the average annual growth rate calculated was 35.33 mm. Open sea mussels on ropes showed a growth rate of 25 mm in five month period (Fig. 3). The growth rate per month

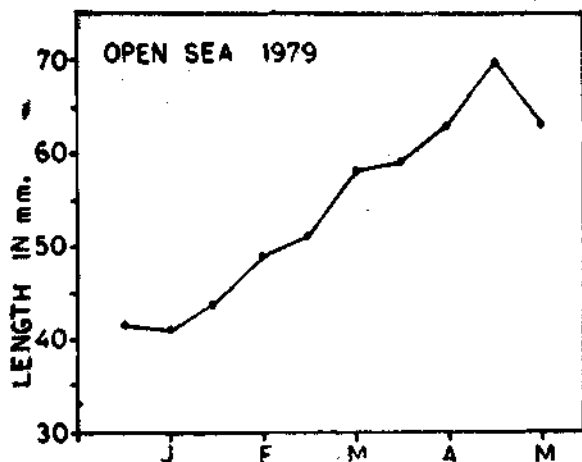


Fig. 3. Growth rate of cultured mussel in the open sea for 1979.

was calculated as 5 mm. It is quite evident that in open sea conditions mussels grow faster.

### Increase in total weight and flesh weight :

In 1976-77 the increase in total weight was 10.75 g for 12 months, in 1977-78, 9.24 g and in 1978-79, 8.9 g thus showing an average increase in weight of 9.29 g per year inside the bay. The average total weight increase calculated was 0.77 g/month. The increase in flesh weight for 1976-77 was 4.9 g, in 1977-78, 3.49 g and in 1978-79, 3.52 g with an average increase in flesh weight of 3.77 g/year inside the bay. The calculated flesh weight increase per month was 0.32 g. The details of increment in total weight and flesh weight are given in Figs. 4 and 5 respectively. An uniform pattern of increase in various months was observed in all the three seasons inside the bay.

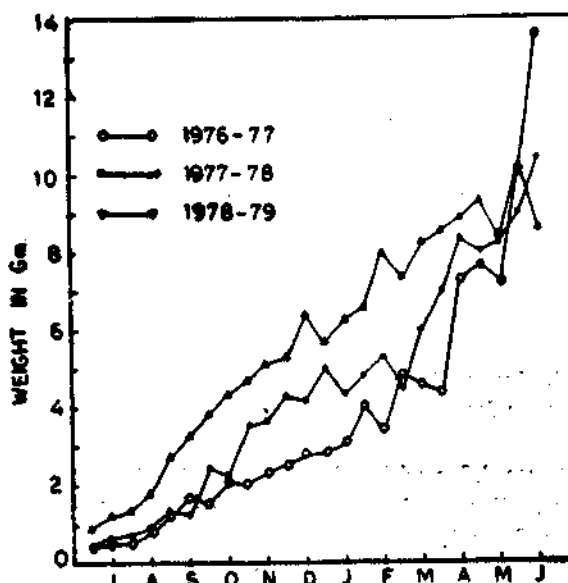


Fig. 4. The total weight increment of mussel inside the bay for 1976-77, 1977-78 and 1978-79.

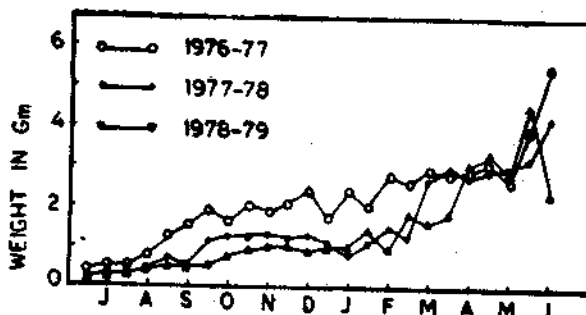


Fig. 5. The meat weight increment of mussels inside the bay for 1976-77, 1977-78 and 1978-79.

In the open sea samples the increment in total weight and flesh weight was greater than that observed in bay (Fig. 6). The increase in total weight for 5 months was 9.72 g with 1.94 g/month of flesh weight increment for the same period. In natural bed increase in total

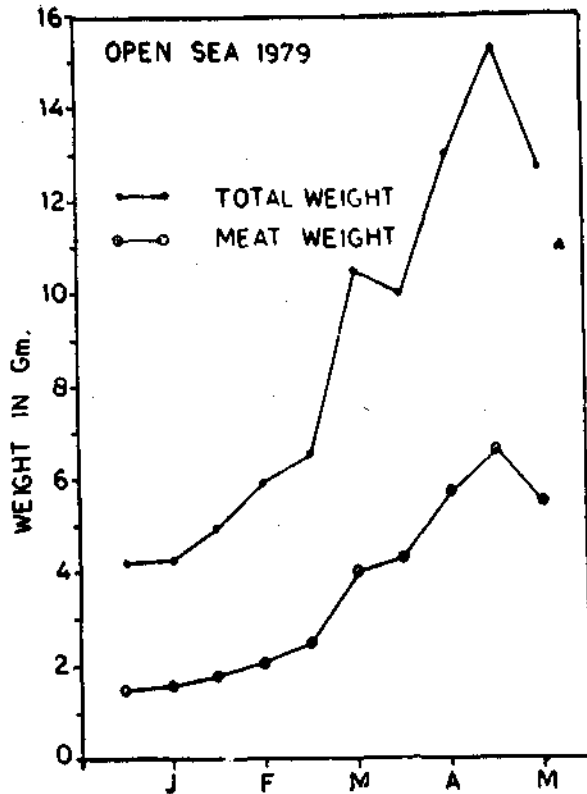


Fig. 6. Increase in total weight and meat weight of mussels in the open sea for 1979.

weight was 4.5 g with 0.9 g per month of flesh weight increase. The total weight-flesh weight-relationship is given in Table 1.

TABLE 1

The total weight-meat weight relationship for bay mussel for 1976-77, 1977-78 and 1978-79 and open sea mussel for 1978 and 1979.

Months	Bay			Open sea	
	1976-77	1977-78	1978-79	1978	1979
July	..	38.20	47.58	38.24	..
August	..	38.40	31.45	37.04	..
September	..	38.30	37.90	37.85	..
October	..	37.95	38.78	41.73	..
November	..	39.60	35.92	40.97	..
December	..	37.95	36.72	42.26	..
January	..	34.80	21.31	35.38	27.31
February	..	33.58	26.17	35.29	28.18
March	..	34.94	26.24	32.88	30.98
April	..	33.15	37.44	40.69	..
May	..	32.62	37.28	41.31	..
June	..	40.53	33.78	39.19	..

**Condition index :**

The condition index for each month was calculated after Baird (1966, *Fishery Invest* London, Ser. 2, 25 (2): 33 pp.<sup>5</sup>). The details of variations in the condition index is given in Fig. 7. The analysis shows that in 1976-77 from July to December the condition index showed increase, whereas in January and February it was decreasing. Again in March and June there was another increase. In 1977-78 the maximum condition index noticed was in June 1978. In 1978-79 period the maximum condition index was noticed in September. The minimum condition index was generally observed mainly during January to May. In all three years highest percentage was usually observed before the spawning. The changes in the decline of condition index appears to vary according to the time of the onset of monsoon during each year.

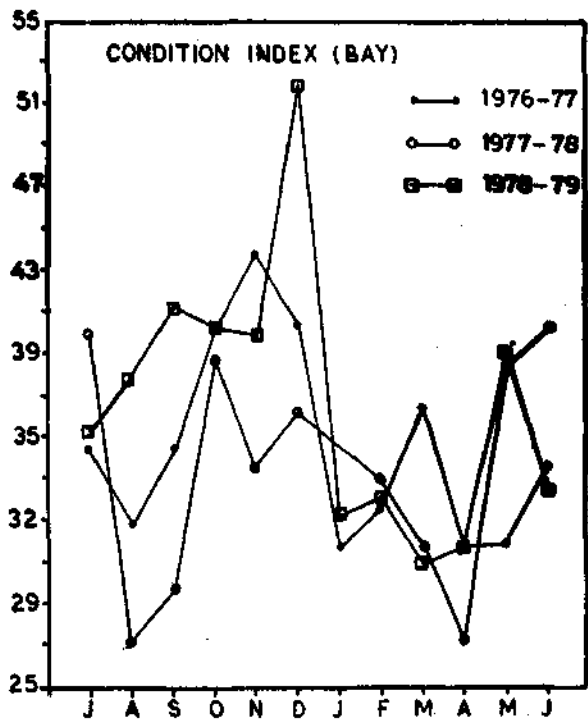
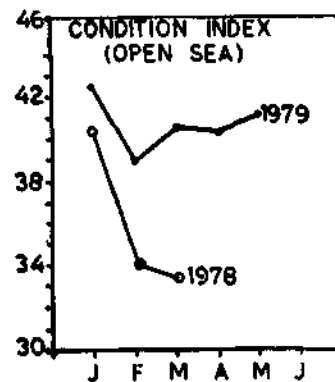


Fig. 7. Variation in condition index in open sea and bay.

### Spawning :

The stages of gonad were classified as follows :—

Stage—I : Ova have not attained regular shape ; sperm non-motile.

Stage—II : Granulation in the ovary observed ; ovary without regular shape ; sperm non-motile.

Stage—III : Spherical ova ; ovary in brick-red colour, sperm motile.

Stage—IV : Spent.

For determining the stages of maturity in each month 50-300 numbers of specimens of size above 15 mm only were examined. In 1976-77, stage-I was observed from July to March, stage-II from December to April and stage-III in July and from April to June and stage-IV in July and August. In 1977-78 stage-I was observed from September to March, stage-II from November to March and stage-III in July, November, December and from March to June, stage-IV from August to November. In 1978-79 stage-I was present from October to March, Stage-II from November to December and in March, stage-III in July/August and April to May period, stage-IV in September and June. In the open sea samples observed in 1979, stage-I was dominant from January to March and from April to May stage-III alone was found in the sample. By examining the gonadic stages it could be seen that from April onwards farm-grown mussels reach sexual maturity and spawning commences by the end of May lasting till September with peak during July to August. Spent stages could be observed from June. Natural settlement of spat in mussel beds was noticed from July and peak period of settlement in good concentration was found from September till November.

### Fouling community of the farm area :

In the suspended mussel ropes various fouling organisms were encountered. Among them, *Balanus amphitrite* was the most important and next was *Crassostrea cucullata*. An interesting observation during 1977 in the farm area was the unusual heavy fouling by *Modiolus* sp. The settlement of this bivalve

starts by May, which almost coincides with the settlement of brown mussel in this area. One of the reasons for poor settlement of *P. indica* in the natural bed around Vizhinjam during 1977-79 period could be attributed to the heavy spat-fall of *Modiolus* sp., before the mussel spat settlement. It was also observed that during March-April *Avicula vexillum*, was found settling on mussel ropes and also in spat settlers in large quantities. *Aloidia sulculosa*, a bivalve and simple ascidians of *Ascidia* spp. were also commonly found on the mussel ropes throughout the year.

Several genera of crabs, *Thalamita* sp., and *Procellana* sp. were found on the ropes. *Pinnotheras* sp. was found inside the mussels as a commensal. Encrusting tubicolous polychaeta, nematodes, crinoids, flatworms and algae were also found over the cultured mussel ropes. *Halictina tenuiramosa*, *Callispongia diffusa*, *C. fibrosa* and *Mycale mytilorum* were seen encrusting on the mussel shells. None of them pose serious problems for mussel farming. *Modiolus* spat settlement alone seems to compete for space.

### REMARKS

There is a decline in mussel landing during the last three years. The probable reason for the decline in mussel catch is mainly due to the indiscriminate fishing by the local fishermen during this period and also due to the poor settlement of mussels in the natural bed. Local fishermen usually start exploiting the mussel stock when mussels are in young stage.

Growth rate in the open sea condition appears to be faster when compared to the growth rate in natural bed. Compared with the growth rate of green mussel cultured at Calicut (discussed elsewhere) and also at Goa, the growth of brown mussel is not fast. The total weight increment shows variation in open sea and bay condition. Weight increment is greater in the open sea. The total weight-flesh weight relationship showed an increment from May to December which is the ideal season for harvest. Spawning of *Perna indica* commences by May and lasts till September with peak period during July to August.