

ON THE LARGE-SCALE COLONISATION OF THE SPAT OF MUSSEL, *MYTILUS VIRIDIS**, IN COCHIN REGION

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ABSTRACT

Large-scale colonisation of the spat of the green mussel, *Mytilus viridis*, a species heretofore considered as not existing in sizable quantities in the Cochin region, was noticed on the anti-erosion granitstone embankments of Andakaran Azhi beach between Shertalai and Cochin. The spat, which appear to settle during the postmonsoon period, grow in profusion in the midlittoral and infralittoral regions. The density of the population varies from surface to surface even on a single boulder. A marked concentration is noticed in the sheltered, dark niches beneath the stones, while the flat upper surfaces that are constantly exposed to severe wave actions appear to be least suitable for mussel growth. It was estimated that on an average, 220-248 spat/100 Cm² were in areas submerged most of the time, while 112-170, in less favourable surroundings. The population which is densest at Andakaran Azhi diminishes gradually northwards. But on the whole, the potentiality of this resource is large enough to provide ample seed for extensive culture operations along this region.

INTRODUCTION

At present more than fifteen species of edible bivalve molluscs are exploited along the east and west coasts of India. But the quantity of the shell fish caught is very small compared with the total marine fish landings. The present supplies to the markets are from the shellfish stock harvested from the natural beds, since industrialised culture is not yet carried out in our country. The bulk and value of the edible bivalve fisheries are contributed by 7 species of which the mussel, *Mytilus spp.* occupy a place next only to the edible clams. Two species of mussels, *M. viridis* (green mussel) and another, *Mytilus sp.* (brown mussel) occur fairly extensively along both the coasts. The latter is confined to the southern region, from Quilon to Cape Comorin. The green mussel occurs sporadically in Cuddalore, Madras, Ennore, Pulicat, Kakinada, Visakhapatnam and Sonapur in the east coast, while in the west coast, Quilon, Vizhinjam, Cochin, Kozhikode, Tellicherry, Cannanore, Mangalore, Kaup, Gangoli, Karwar, Goa, Malwan and Ratnagiri are the regions where this is found in fishable quantities. Within this coastal stretch of approximately 960 km

* The species is recently removed from the genus *Mytilus* and is assigned to the genus *Perna*.

mussel populations thrive well in natural beds, suggesting thereby, that the littoral zone of these areas in the west coast is more conducive to the growth of mussels than in the east coast.

All over the world the traditional harvesting from the sea is found not to be sufficient to meet the existing demand for sea foods and a partial solution to this complex problem has been found in the advance of scientific economic methods of farming fishes and shellfish in coastal waters. The development in the last decade of surface floating units for both rafts and cages in the sea has been one of the major aspects in the expansion of sea farming. Realising the high nutritive value of the mussel flesh many countries have developed modern techniques in mussel culture to raise tended stock by scientific farming (Milne 1972, Bardach 1972, Pillai 1972, Iversen 1968).

Before undertaking mussel farming in our country many factors like the physico-chemical quality of sea water, topography of the coastline of the proposed farm sites, environmental influences and easy accessibility to the farm throughout the year for operations in connection with farm maintenance and management are to be taken into consideration. Vicinity of natural beds to the farm site will not only facilitate large-scale seed collection during the breeding season but also eliminate difficulties involved otherwise in transporting them to the farm areas.

As part of the programme to solve the various problems connected with mussel farming, a survey of the mussel-seed resources along the west coast was initiated by the Central Marine Fisheries Research Institute. During one of the field trips along the Shertalai-Cochin coastal area the occurrence of a vast green-mussel-spat population was noticed in October 1974 on the anti sea-erosion granitestone embankments at Andakaran Azhi beach, north of Shertalai.

It was hitherto considered that the green mussel did not exist in appreciable quantities in the Cochin region. In this context the above observation is very significant. Before the assessment of the dependability and potentiality of the newly found resource, investigations on the physical environmental factors, season of setting of mussel spat, rate of growth of the spat, population density in different months and the rate of mortality in this area seemed desirable. Therefore, collection of data in regard to the above aspects was started in November, 1974 from the entire stretch from Cochin to Shertalai. The present paper describes the habitat where the mussel spat were noticed and also an estimate of the newly settled population.

Description of the habitat

As an anti sea-erosion measure, the Public Works Department of Kerala Government had stacked huge granite boulders along the coast from Alleppey up to Cochin to form a stone wall of considerable height. Extending into the sea from this wall, there are perpendicular granitestone groynes (Fig. 1).

The distance between successive groynes, the extent to which the groynes jut into the sea, and the breadth of each groyne vary from place to place. In most of the places the groynes are about 5 metres broad extending to a distance of 150 metres into the subtidal flats at intervals of 150 metres. In places like Narakkal beach they have been laid at closer intervals and they extend over only a short distance into the sea.

The stones of the groynes in the midlittoral zone and the infralittoral fringe form ideal substrata for the attachment of mussel spat although those in the deeper infralittoral zone might also have sizable population. Mussel spat found near the upper extreme point of tidal limits were covered by sea water only for a short duration whereas majority of those settled seawards were exposed to air only for a short duration. Depending on the positions of attachment a certain pattern in the distribution of the population was noticeable making it obvious that the density of the population in the area depended on the role played by tides.



FIG. 1. The granite stone embankments with the groynes jutting out into the sea, at Narakkal.

The topographical changes which take place during the postmonsoon months in the environment also appeared to control the density of the population. Seawater front reaches the granite stone wall during the monsoon period lashing the walls constantly, thereby completely submerging the groynes and the sandy flat. With the abatement of monsoon, the water front recedes and a narrow strip of foreshore is formed with silt deposition. The muddy sand left behind by the receding monsoon sea fills up the interspaces of the groyne stones as well killing

most of the biota and a new animal community typical of sandy habitat develops. In the upper limit sand enveloped stones lie exposed in most of the places even during high tide. In the midlittoral region this damage is partial and is confined to the midrib of the groyne. It is at this time that *Mytilus* spats appear to settle down and grow in profusion in the midlittoral region and infralittoral fringe (Figs 2 & 3). Those which settle down on stone surfaces which are constantly washed by the silt-laden water in the lower midlittoral region and infralittoral fringe survive while those in the upper limit perish due to exposure. Even during the highest tidal periods water level does not reach most of such zones. The water spray or splashing also is not adequate enough to keep the substratum wet and prevent mortality of mussel spat. The 'Druse' on the flat upper surface on many of the stones that are constantly washed here are disadvantageously placed since silt in the water is imprisoned among the byssal threads and settles down to form agglutinated sand platform which envelops the young mussels and destroys them. The spat appear to make an effort to overcome this adverse condition by developing longer byssal threads so that they can rise up from the substratum a little. Those spat which had settled down on the spherical sides and vertical faces of the boulders escape this ordeal. A marked concentration in the settlement of mussel spat in the sheltered, darker niches beneath the stones was noticed. Therefore, the density of the population varies even on a single stone.



FIG. 2. Colony of *Mytilus* spats encrusting the surface of a granite boulder.

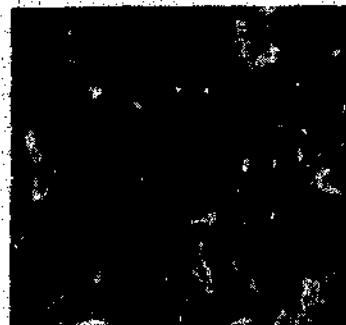


FIG. 3. A close-up of the spat colony showing the uniform size of the spats.

Spat which had attached on the substratum of the infralittoral fringe thrived well since even during the lowest tide the water level was sufficient to cover the individuals. It was not possible to find out the condition of the population in the deeper waters in the area since approach was difficult. Therefore estimation was not made from this zone.

Design for the estimation of population

It was not possible to cover all the groynes for estimating the population density. Therefore only a few groynes were taken at random in each area A, B, and C. Three transects were established in each groyne representing (a) rocks

always covered with water (TS 1) (b) rocks partly in and partly out during low tides (TS 2) and (C) majority of rocks which remain exposed for most part of the day except the sides (TS 3). Collection of mussels was made in an area of 100 sq. cm. and the total in that area were counted, individuals measured and weighed. It was noticed that settling of mussel spat does not occur in the entire available area of the rocks. This necessitated calculation of total effective surface in which mussels had settled, based on the actual measurements of all the effective surface of rocks where mussel spat were noticed. Such measurements were restricted to only one groyne from each area A, B and C as the conditions of groynes were identical in the same area. Total number of rocks with mussels were also counted. The average number of mussels occurring in 100 sq. cm. is known. From this the existing population was calculated. The population in a single groyne having been estimated in each area it would thus be possible not only to calculate the total existing mussel population for the entire stretch from Shertalai to Narakkal but also assess the comparative richness of the area A, B and C.

REMARKS

Table 1 shows that the average number of mussel spat found in 100 cm² ranges from 220 to 248 in areas covered with sea water most of the time and 112 to 170 in less favourable surroundings. The estimated population of mussel spat in each groyne in Andakaran Azhi, Manacherry and Narakkal areas are presented in Table 2. The population of spat appears to be greater in Andakaran Azhi (3,69,279 groyne) diminishing gradually northwards (Manacherry 2,27,348 and Narakkal 1,08,860). Nevertheless the potentialities of the entire area A, B and C where more than 200 groynes exist, appear to be enormous.

The main spawning season for the westcoast green mussel is the south-west monsoon months and the young ones grow to fishable size by October-November. The size range of mussel noticed presently is 15-18 mm suggesting recent recruitment, about a month earlier i.e., during September-October. This would either mean that there is a secondary spawning during post-monsoon months or the main spawning period may vary from locality to locality.

Enquiries revealed that there is no established fishery for green mussels in this area and that the groynes are barren of mussels during the months of April, May and June. This indicates that the existing stock is seasonal and perishes soon. Perhaps the settled spat undergo the vicissitudes of the ill effects of the sand- and mud-wash of the tides upon the settlement in the later months and whatever mussels are able to survive grow to marketable size, which will be a negligible percentage of the original stock. The turn of the monsoon would make the conditions unfavourable for the survival and growth of the mussel on the groynes. Unless the existing population of young mussels is properly utilized the seasonal mussel-seed resources would go to waste. The very large mussel-seed population can very well support extensive culture operations if they are

TABLE 1. *The number of mussel spat in 100 cm² area at Andakaran Azhi, Manasserry and Narakkal groynes.*

A. Andakaran Azhi								
	TS 1	232	286	190	196	226	190	220
	TS 2	228	285	190	212	211	166	215
	TS 3	311	210	85	172	59	159	166
B. Manasserry								
	TS 1	211	281	144	256	—	—	223
	TS 2	182	272	134	188	—	—	194
	TS 3	47	122	141	139	—	—	112
C. Narakkal								
	TS 1	222	220	237	218	343	—	248
	TS 2	211	215	221	197	366	—	242
	TS 3	218	193	185	146	108	—	170

TABLE 2. *The estimated population of mussel spat in Andakaran Azhi, Manasserry and Narakkal beach.*

Area	TS 1					TS 2					TS 3					Grand Total
	Number of stones with mussels	Total area of attachment Cm ²	Total units of 100 Cm ²	Av. No./ Unit	Total population	No. of stones with mussels	Total area of attachment Cm ²	Total units of 100 Cm ²	Av. No./ Unit	Total population	No. of stones with mussels	Total area of attachment Cm ²	Total units of 100 Cm ²	Av. No./ Unit	Total population	
A	32	126000	1260	220	277200	16	37500	375	215	80625	4	6900	69	166	11454	369279
B	32	64000	640	223	142720	14	33000	330	194	64020	12	18400	184	112	20608	227348
C	40	18000	180	248	44640	16	16000	160	242	38720	6	15000	150	170	25500	108860

A: Andakaran Azhi; B: Manasserry; C: Narakkal.

collected during the months of November-December. Mussel culture could be carried out adopting the rope culture method. The seed mussel could also be transplanted on suitable substrata in large areas. If mussel culture is carried out making use of the plentiful spat available along Cochin coast it will be possible to obtain substantial quantities of nutritious cultured sea mussels regularly.

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REFERENCES

- BARDACH, J. E., I. H. RYTHER AND W. O. MCLARNEY. 1972. 'Aquaculture'. The Farming and Husbandry of Freshwater and Marine Organisms: 760-776.
- IVERSEN, E. S. 1968. *Farming the edge of the sea*: 126-140.
- MILNE, P. H. 1972. 'Fish and Shellfish farming in Coastal water': 17-24.
- NAIR, R. V. 1974. 'The commercial Molluscs of India' *Bull. Cent. mar. fish. Res. Inst.*, 25: 152-156.
- PILLAY, T. V. R. 1973. *Coastal Aquaculture in the Indo-Pacific Region*. Published by arrangement with the Food and Agriculture Organisation of the United Nations by Fishing News (Books) Ltd.