SEASONAL ABUNDANCE AND DISTRIBUTION OF SEEDS OF MUD CRAB *SCYLLA SERRATA* IN PICHAVARAM MANGROVE, SOUTHEAST INDIA

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ABSTRACT

Seasonal abundance and distribution of juveniles of *Scylla serrata* were studied in Pichavaram mangrove from April 1981 to March 1982. Peak abundance during post-monsoon (January to February) and total absence during monsoon (October to November) were the notable features of juvenile seasonality. The population of juveniles was higher in the seagrass and algal bed areas of the mangrove. Crabs of 20–30 mm carapace width dominated the population in the shallow intertidal zone of the mangrove.

Commercial-scale production of the mud crab *Scylla serrata* (Forskal) by fattening and grow-out culture is being carried out in South and Southeast Asia (BOBP, 1992). However, large-scale hatchery production of crab seeds by hatching the eggs and rearing the larvae has not yet been successful due to larval mortality and cannibalism at megalopa stage (Ong, 1964, 1966; Mounsey, 1989). The collection of wild juvenile crabs from the tidal flats and marshy coastal lands chiefly caters to seed requirement. Mangrove waters are known for their role as suitable nursery grounds for the commercially important fishes and crustaceans, including the mud crab. Hence, the present study was made to assess the seasonal abundance and distribution of seed crabs in a tropical mangrove area of India and to find out the probable influence of environmental factors that control their abundance and distribution.

MATERIALS AND METHODS

Pichavaram mangrove, located on the southeast coast of India (11°27′N, 79°47′E), occupies an area of 1100 ha. It lies between the Vellar and Coleroon

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estuaries and receives three types of waters: marine water during high tides through an inlet from the sea, estuarine water from the estuaries, and fresh water from an inland channel and a few irrigation canals. Four sites at different regions of the mangrove were sampled once in a fortnight from April 1981 to March 1982: (1) an interior mangrove with semi-locked waterways and less circulation of water, having a black muddy substrate, (2) a region with a sandy mud bottom in the vicinity of the inlet from sea, influenced by the neritic waters, (3) a coarse sandy area near the freshwater channel, and (4) an algal bed area with a moderate water salinity and muddy substrate (Fig. 1).

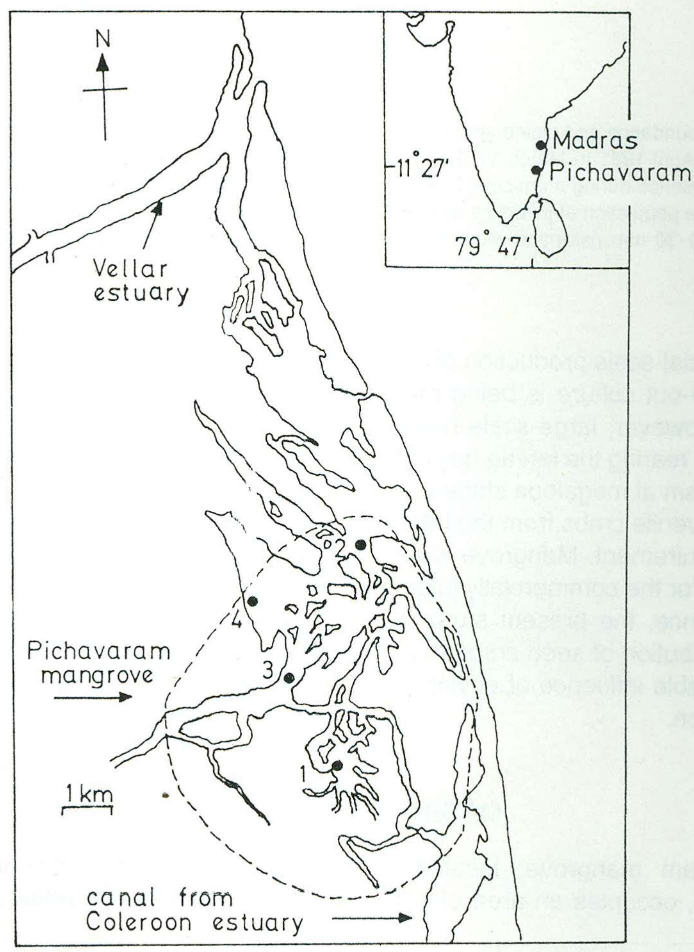

Fig. 1. Sampling sites in the mangrove

Cast net and velon screen drag net were used to collect the seed crabs. While gears such as crab trap or crab pot are generally used to catch the large adult *Scylla serrata*, the above two types of nets were found to be the most efficient gears to catch the feebly swimming juvenile crabs in the shallow mangrove water. The cast net, measuring about 4.5 m in diameter with stretch mesh size of 5 mm, was operated in the intertidal flats (maximum tidal amplitude up to 0.5 m) and shallow water fronts of the sampling sites. The gear was operated about five times randomly at each site. The cast net was thrown each time in an undisturbed spot within a site. The velon screen drag net of 4×1 m dimensions and 2 mm mesh size was also hauled for a distance of about 10 m along the shore in the intertidal zone. At each site two or three such hauls were made. The bottom line of the drag net was dragged in line with the ground in order to collect the small crabs buried in the soft muddy substrate. The area of coverage was determined and held relatively constant with the greatest possible standardized deployment of the gears, which allowed realistic calculation of the crab densities. The maximum width of the carapace was measured for each crab.

Rainfall, water temperature, and salinity were recorded simultaneously. The nature of substrate was noted and the sediment samples were analysed to find out the textural composition following the hydrometer method outlined by Jhingran *et al.* (1969).

RESULTS

A total of 234 juveniles of *S. serrata* was collected from the four sampling sites. The population density of the crabs showed narrow fluctuations in their abundance during summer and pre-monsoon (April to September), followed by a peak in post-monsoon (January to February) (Fig. 2). A total absence of crabs was observed at all four sites during the monsoon (October to November). Mean crab densities of 7.09/50 m^2 during post-monsoon and 2.17/50 m^2 during the rest of the period were recorded.

The size frequency analysis performed for the crabs showed that the size range was between 8 and 60 mm and individuals of 20–30 mm size were more abundant (48%) throughout the sampling period. Although the crab seeds were available at all the four sites, their distribution was not uniform (Table 1). The maximum number of crabs were collected from site 4, mostly from December to February, whereas the minimum catch was from site 3. However, the salinity variations between the sampling sites were not significant ($F = 0.44$, $p < 0.05$) and did not correlate ($r = 0.11$) with the crab seed distribution among the sites. At sites 1 and 4, the substrate was muddier than in the other two sites. Nevertheless, site 4 was rich in macrophytes, while in other sites only pneumatophores were present (Table 1).

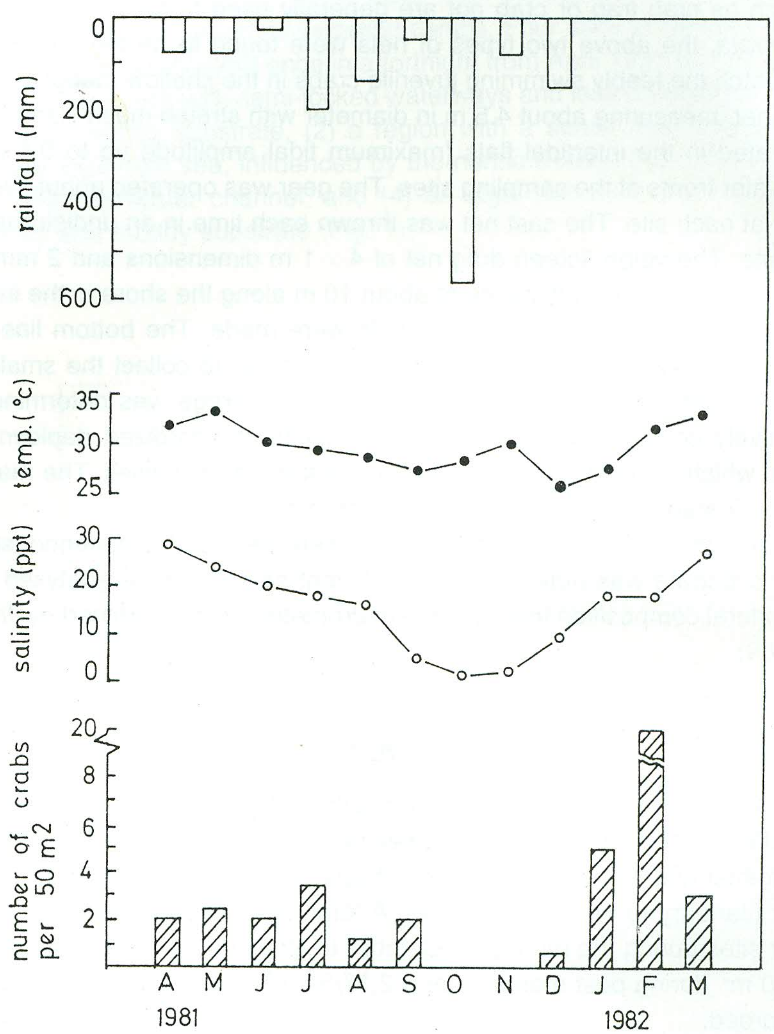

Fig. 2. Population density of the crabs in relation to salinity, temperature and rainfall

DISCUSSION

The distribution patterns of decapod crustaceans have been studied in relation to a number of field and experimentally measured parameters, among which salinity was reported to be a principal limiting factor for a number of species (Miller and Maurer, 1973; Mair, 1980). In the present study, the minimum population density or total absence of juveniles of *S. serrata* occurred at the time of maximum rainfall in October, when the salinity was very low (1.52 ppt). Le Reste (1976) reported

Table 1. Characterization of sampling sites and percentage catch of *Scylla serrata* seeds

Site	Sediment type	Sediment composition (%) Sand	Silt	Clay	Seagrass community	Pneumatophores	Salinity (mean and range)	Catch of crab seeds (%)
I	Muddy	58.8	10.0	31.2	–	+	14.52 (1.52–28.51)	11.29
II	Sandy mud	70.2	6.0	23.8	–	+	17.53 (2.03–31.01)	24.19
III	Sandy	80.8	2.0	17.2	–	+	13.77 (1.53–25.51)	8.07
IV	Muddy	66.4	8.0	25.6	+*	–	16.79 (3.02–26.51)	56.45

* *Gracilaria verrucosa, Enteromorpha intestinalis, Cladophora* sp., *Halophila ovalis, Syringodium isoetifolium.*

an inverse relationship between rainfall and annual catch of adult *S. serrata*. Macnae (1968) and Hill (1975) reported the mortality of *S. serrata* due to freshwater flooding. Furthermore, Hill (1979) found that a minimum concentration of 2 ppt of salinity was necessary for the survival of juveniles of *S. serrata*. Pichavaram mangrove has a network of waterways that are regularly flushed by both marine and fresh waters. During peak monsoon periods, the freshwater influx is relatively high and the whole system becomes a freshwater body. This condition remains unchanged at least for about one month during the peak monsoon season. The decrease in salinity leading to freshwater condition might have driven the total *S. serrata* population, including the juveniles, to the higher saline nearshore waters. The reappearance of juveniles during post-monsoon (December onwards) can be considered a re-establishment of the population in the mangrove with gradual increase in salinity.

Scylla serrata preys on the slow-moving benthic invertebrates (Hill, 1976) and elimination of these prey organisms during freshwater flooding may be another reason for the elimination of *S. serrata* population, as observed by Hill (1979) at St. Lucia lagoon of South Africa. The observations of the present study corroborate those of Hill on this phenomenon. However, a thorough study on the breeding biology and larval recruitment of the crab is warranted to find out the recruitment pattern of juveniles from the adjacent sea into the mangrove, and to ascertain the effects of salinity on their abundance.

The spatial distribution of *S. serrata* seeds among the sampling sites was not found to be affected by salinity, since there was no marked difference in salinity among the sites. The seasonal fluctuations in the crab population density at each site were almost uniform, showing lowest values invariably during the monsoon.

Low temperature has been found to be unfavourable to the feeding, growth, and survival of *S. serrata* in temperate regions (Hill, 1979, 1980). Hill (1982) reported low catches in winter from Deception Bay, Australia. However, the seasonal variations in water temperature did not seem to influence the distribution of juveniles of *S. serrata* in the present study. As Pichavaram is a tropical coastal system, the low temperatures recorded there are not as low as those of temperate regions.

The distributional patterns of crabs have been dealt with in relation to substrate composition as an ecological factor influencing habitat choice (Whitting and Moshiri, 1974). Experimental studies conducted by Seiple (1979) revealed that marsh crab, *Sesarma reticulatum*, preferred muddy substrate exclusively. More than 50% of the total number of juvenile *S. serrata* collected in the present study were from site 4, which has rich seagrass and algal community in a muddy substrate (Table 1). The adults of *S. serrata* move about in deeper waters while the post-larvae and juveniles prefer conditions of shallow water, muddy substrate, and shelter provided by mangrove roots, macrophytes, and reeds (Hill, 1979, 1982). In the present observation the juvenile crabs seem to prefer algal bed at site 4 to the other areas having pneumatophores, but not the algal macrophytes. The reason may be that *S. serrata*, being a predator of slow-moving and sessile benthic invertebrates, prefers the areas of algal flora that harbour such fauna. The seed crabs from such areas could be collected in good numbers during the post-monsoon season (January to February) and used for stocking in brackishwater culture ponds.

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