ISSN 0254-380 X

भाकृअनुप
ICAR

समुद्री मात्स्यिकी सूचना सेवा
MARINE FISHERIES INFORMATION SERVICE

No. 114

OCTOBER, NOVEMBER, DECEMBER 1991

तकनीकी एवं विस्तार अंकावली
TECHNICAL AND EXTENSION SERIES

केन्द्रीय समुद्री मात्स्यिकी अनुसंधान संस्थान
कोचिन, भारत

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
COCHIN, INDIA

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INDIAN COUNCIL OF AGRICULTURAL RESEARCH

INVASION OF CLAMS IN PRAWN CULTURE FIELDS : EFFECTS ON THE GROWTH OF PRAWNS*

The black clam, *Villorita cyprinoides* var. *cochinensis* is distributed in the backwaters along the west coast of India, from Goa to Kerala. It is a euryhaline species thriving in salinities ranging from 30 ppt to near freshwater conditions. It is also known to survive in a wide variety of ecosystems. The Vembanad Lake supports a rich fishery of clams especially the black clam, with an annual production of about 25,000 tonnes.

Traditional prawn farming in the Vypeen Island of Kerala is carried out in two types of ecosystems namely, seasonal fields and perennial fields. Presently around 1,200 ha of brackish-water area is being used for prawn culture practices. The prawn production by this extensive culture method is dependent solely on natural productivity of the culture system.

The invasion of black clam in large numbers in the prawn culture systems has been noticed of late in Vypeen Island and has in certain cases created panic among the prawn farmers. This is turn has resulted in a drastic decline of the lease value of the infested culture systems during 1986-'87. A survey conducted in Vypeen Island has revealed that the clams were absent in most of the perennial systems and coconut groves in the central region of the island from Narakkal to Kuzhippilly.

Bivalves being filter-feeders, harvest large amount of phytoplankton from the overlying water diminishing the overall productivity of the ecosystem. Clams are also known to have profound influence upon sedimentation and on the fluxes of dissolved nutrients and gases across the sediment-water interface. Naturally clam populations in the prawn culture systems influence the processes and properties of aquatic ecosystems.

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Traditional prawn farming is an important occupation among the coastal farmers of Vypeen Island. Any factor resulting in the decrease of production from the culture systems will adversely affect the fisherfolk of the area. With this in view, it was decided to conduct a study to assess the impact of the invasion of clams into the prawn culture systems. This report is based on the results of a short-term experiment conducted from July to October, 1987 in a perennial prawn culture field having an area of 4 ha. Invasion of black clams was observed in this pond.

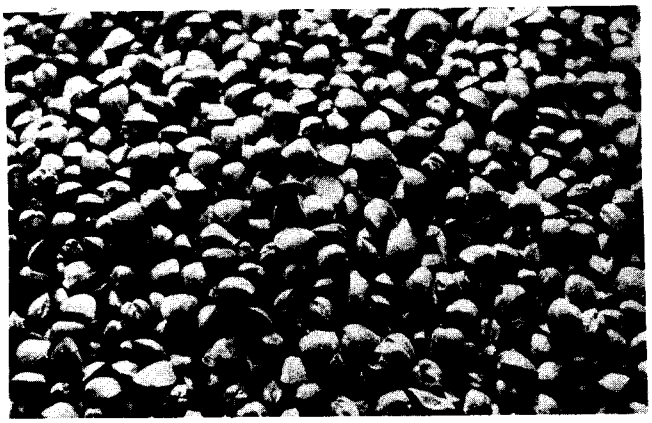

Fig. 1. The black clam, *Villorita cyprinoides* var. *cochinensis*

The experiment was done using two identical pens with five compartments. One pen was placed over a clam bed and the other in an area devoid of clams. The pens were stocked with seeds of the white prawn, *Penaeus indicus* (5 Nos/m^2) and the growth rate was monitored for a period of 90 days. Supplimentary feeding was not done during the study period. The water quality and primary production in the pens were monitored during the study. Observations were made on the food and feeding habits of prawns in the culture system.

The culture experiment showed that the growth of prawns was adversely affected by the presence of clams. The prawns with an average initial size of 34.7 mm attained 102.0 mm (6.78 g) in the pen devoid of clams whereas it attained only 93.6 mm (5.07 g) in the pen with clams in a period of 90 days. Among the hydrographic parameters studied there was an increase in the levels of dissolved inorganic nitrogen, whereas there was a decrease in the levels of dissolved oxygen, pH, calcium and primary production in the pen placed over the clam bed. These differences were more marked in the water just above the substratum compared to the surface water of the pens. However, phosphorus levels remained the same.

The distribution of clams in the pond was patchy forming distinct beds in sandy areas of the pen. Clams were absent in the loose muddy substratum. The maximum density of clams observed in the pond was 224 clams/m^2 and 150 clams/m^2 in the pen placed over the clam bed. The clams had a size range of 30-40 mm during July, 1987. An inverse relation was observed between the density of clams and that of other benthic organisms like polychaetes and amphipods. The density of other macrobenthos was lower in clam beds than in areas devoid of clams. Studies on the food and feeding habits of the prawns showed that the prawns did not consume clams to any considerable extent (Index of preponderence 0.39) inspite of their abundant occurrence in the pond.

The presnt study confirmed that the growth of prawns was adversely affected by the presence of clams. However, the difference in water quality parameters in relation to the presence of clams might not have had any major influence on the growth of prawns in the present study, as the actual differences between the two pens were not considerable. This less marked difference in surface water quality parameters may be attributed to the low density of clams and also to the mixing up of water between the pens. It has been observed that the density of benthic organisms was less in places where clam density was high. The reduction in the density of organisms, the prime food of prawns and the low primary

Fig. 2. Shells of the black clam harvested from a perennial culture field. The pond sluice and canal in background.

production caused by the clams may have resulted in reduced growth of prawns. The effect is more pronounced here as no supplimentary feed was provided and the prawns had to depend only on natural food in the pond.

Though clams may have an indirect adverse effect on the prawns in traditional culture systems as in the present study, they can be beneficially reared together with prawns by providing supplimentary food and careful manipulation of the density of clams. Clams do not compete with prawns for food because clams are filter-feeders depending on suspended organic particles, phytoplankton and bacteria. They form a group of the most efficient primary consumers low in the food chain. Eutrophic condition is characterised by the dense phytoplankton populations and associated depletion of dissolved oxygen levels during early morning hours. In such situations, clams can improve the oxygen regime, avoiding dangerous fluctuations in the dissolved oxygen levels by controlling phytoplankton and bacterial density efficiently owing to their high clearance rate. Clams may also improve the fertility status of the system by returning nutrients from soil through bioturbation and remineralization. Thus, it points to the polyculture of prawns with clams adopting careful management practices.