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67. INDUCED BREEDING AND EARLY DEVELOPMENT OF *VILLORITA CYPRINOIDES* VAR *COCHINENSIS* WITH COMMENTS ON HATCHERY SYSTEM

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ABSTRACT

Villorita cyprinoides is an important resource which can be developed in low saline conditions of the estuarine systems. *Villorita cyprinoides* var *cochinensis* is induced to spawn in the laboratory by adjusting the hydrogen ion concentration. The eggs measuring 55 μ develop into trochophore stage by 19 h after fertilisation and become 'D' shaped larvae (95 μ) by 29h. By about 11 days the larvae (140 μ) show signs of settlement but continue planktonic life up to 26 days when they (450 to 500 μ) settle at bottom.

The laboratory temperature ranged from 27.5°C to 34°C and the salinity ranged from 17.2‰ to 18.35‰. Eventhough the larvae could survive in almost fresh water condition during late stage of development salinity above 19‰ is found to be detrimental to the larvae. The advantages of using hapa system for hatchery purpose is also presented in the paper.

INTRODUCTION

Villorita forms a major resource of clam in low saline conditions and even in fresh water bodies. In Vembanad lake 25,000 t of this clam are landed annually (Achary 1986). Nothing is known about its early development and breeding habits. Considerable work has been done on the hatchery production of other bivalve species in India and elsewhere and the detailed works by Loosanoff et al (1963 and 1966) have presented the problems involved in such studies. The works of Rao et al (1976) on *Mytilus viridis* Alagarsami et al (1983) on *Pinctada fucata*, Nayar et al (1984) on *Crassostrea madrasensis* and of Appukuttan et al (1984) on *Perna indica* are the recent studies on the rearing of commercial bivalves from India which are worth mentioning.

MATERIAL AND METHODS

Adult *Villorita cyprinoides* var. *Cochinensis* are brought to the laboratory and conditioned in fibre glass tanks by keeping them in water collected from the same locality of their beds during April 1982. They are given regular feed developed from the same water along with the plankton blooms stimulated by adding nutrients. Mickel solution A & B are used as nutrients to develop the bloom. After two to three weeks the

clams are kept in glass containers and induced for breeding by increasing the pH from 6.5, to 7.5 by adding very dilute solution of KOH in a very slow process. Saturated solution of 0.5ml KOH is mixed with 100 ml of water taken from the parent animals tank and this solution is added drop by drop and the desired pH is developed in the medium.

Males started releasing sperms by sudden closing of the valves in the initial period and subsequently by ejection by the same process. This gives stimulation to the female clams and slowly they release fully mature translucent eggs within one hour. Eventhough few eggs remain at the bottom of the container, by slight disturbance of water the eggs remain in suspension.

The eggs and sperms are transferred to other containers, mixed well and further observations made.

FERTILIZATION AND FORMATION OF TROCHOPHORE

Immediately after mixing the eggs with the sperm the eggs are fertilized. Spawned eggs measure 55 microms in diameter, are spherical and the yolk is uniformly distributed giving a translucent appearance (Fig 1 A). The first division starts within half an hour (Fig 1 B),

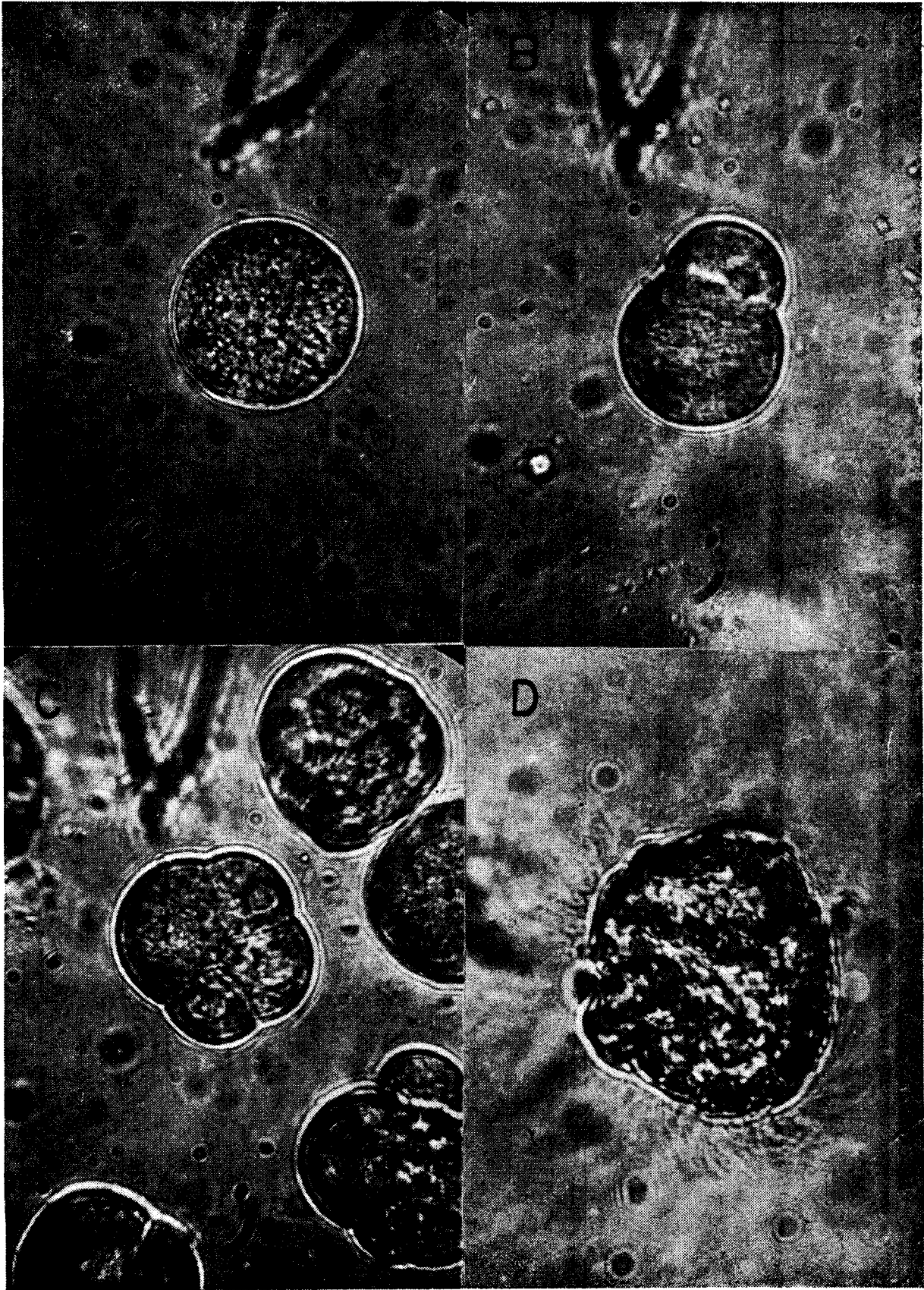


Fig. 1. Early development of *Villorita cyprinoides* var *Cochinchensis*, A Egg, B Stage of first division, C. Stage of second division, D Trochophore larva

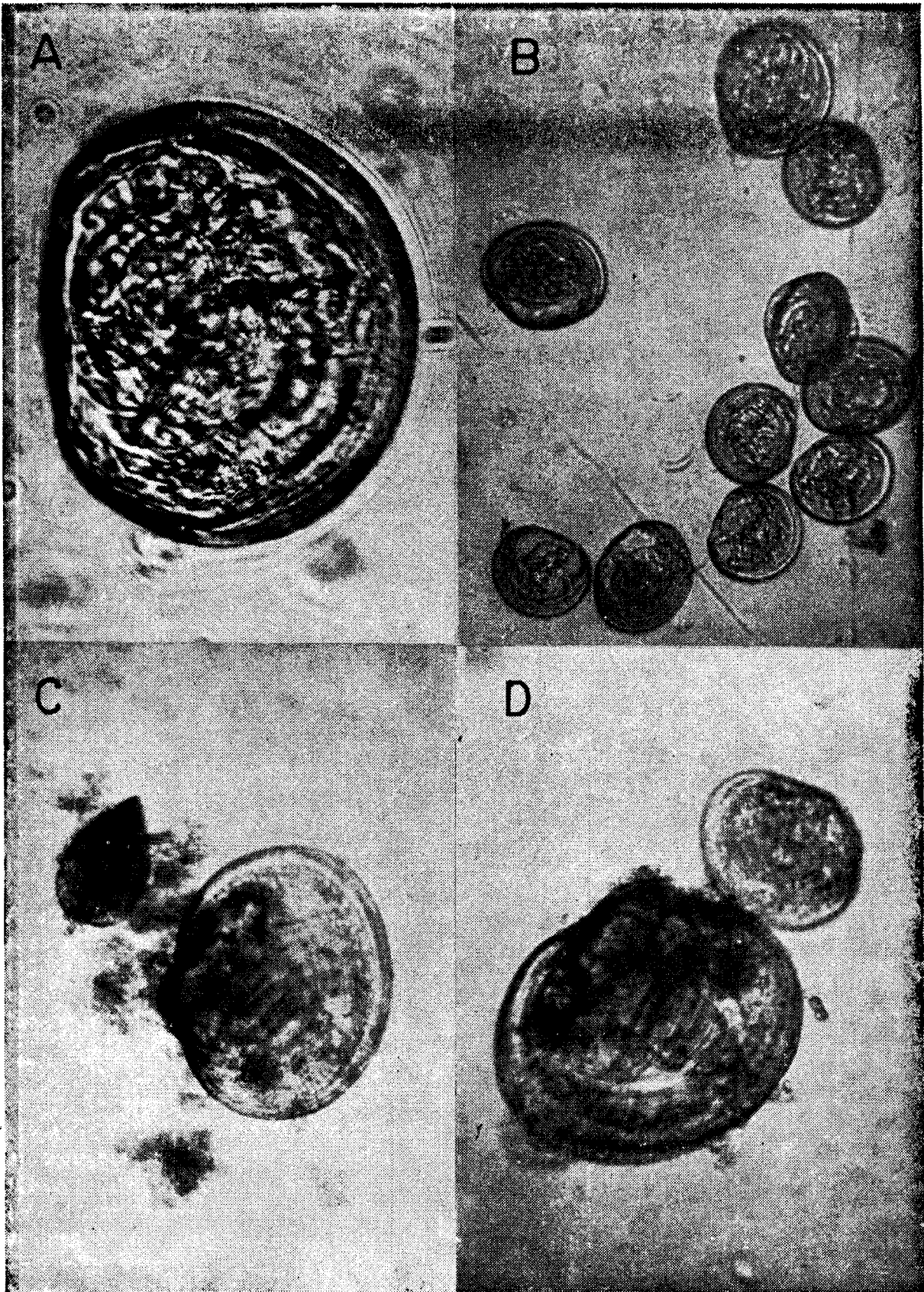


Fig. 2. Early development of *Villorita cyprinoides* var *Cochinnensis* (A 'D' shaped larva; B Larva 11 days old; C & D Larva 26 days old-settlement stage)

and the second division in another 30 minutes (Fig 1). Further cell division is at a very fast rate (Fig 1). Eggs show rotatory movement during the time of first division and blastula is formed in another five hours. By this time cilia also are noticed around the periphery and active rotatory movement was observed. The eggs reach trochophore stage by 19 h after fertilisation (Fig 1 D). The trochophore is more or less antero-posteriorly elongated and the apical tuft of cilia are typical as found in other bivalve larvae. The larvae move in a clock-wise direction and are fast moving. Heavy ciliation is noticed at the anterior and posterior ends and circum oral cilia are comparatively large. Shell started forming during the eight hour period of growth of the trochophore larvae. Velum also starts developing and subsequently they reach 'D' shaped stage (95 μ) by 29 h (Fig 2 A).

EARLY AND LATE VELIGER STAGES

The straight hinged larvae or the 'D'-shaped larvae are found to be very active and the velum is better developed as the metamorphosis is advanced. After two days, the development of the intestine, other internal organs and musculature could be noticed. Within five days the late 'D' shaped larvae are found to show characteristic rotatory movement in the clockwise direction and by the sweeping action of cilia, algal particles are taken in. A slight disturbance in the microscope is giving stimuli to the larvae for contracting the velum and fall towards the left side. Again by expansion of the velum, movement is gained in the clock-wise direction.

The larvae reach 140 μ in 11 days (Fig 2B) and the umbo is well developed with progress in the development of soft parts. By this time the larvae actively feed on algae and the movement is slowed down. In another two days the velum gets reduced and shows sluggish movement when the larvae touch the bottom of the container. Intestine, adductor and other internal organs are demarcated and seen through the shell. Behind the remnant of the velum the foot is just forming and the planktonic life style is still continued.

SETTLEMENT OF LARVAE

In 26 days the larvae grow to 450 to 500 μ (Fig 2 C & D) The same algal diet was given. The foot is well developed, velum completely absorbed, gills are also well formed and the larvae crawl at the bottom of the container. The foot is extended to almost equal length of the antero-posterior margin and shows signs of selection at the bottom. When micro sand and silt particles are given as substrate the crawling movement is reduced. The larvae are very active in filtering and prefer lower salinities. The crawling movement continues upto 30 days.

OPTIMUM CONDITION FOR LARVAL DEVELOPMENT

The larvae are found to survive well in a salinity range of 17.2‰-18.35‰ and while the feed from fresh water culture is added to some of the batches of larvae the salinity is lowered and they are found to survive even in the level of fresh water condition as mentioned earlier. But when the salinity is raised above 19‰ it was found to be highly detrimental to the larvae. No mortality of the larvae were observed when the salinity remained below 19‰. In natural conditions also settlements occur and clam beds are formed in fresh water condition to the above range which is also substantiating the laboratory findings. The mixed feed developed using the water from the clam bed is found to be dominated by *Clamydomonas* sp and *Chlorococcum* sp and these algae are found to be good diet for the clam larvae as well as for the adult clams.

ADVANTAGE OF USING HAPA SYSTEM

A few batches of larvae are released in miniature hapa made of bolting silk (40 μ mesh) suspended in the tank and a flow of water is maintained from inside the hapa to the container tank. The hapa measured 25 cm x 25 cm x 25 cm and two hapas are suspended in each of the laboratory tanks. Water is flown by gravity from a higher level tank to the inside of the hapa and the additional water flowing to the hatchery tank is siphoned out to a lower tank.

No mortality of larvae are noticed by using this hapa system while in a control tank maintained under similar conditions and without using the hapa, the larvae did not metamorphose to the settlement stage because of heavy ciliate attacks. The density of feed (2,000 cells/ml) is maintained in proportion to the consumption rate of the larvae which can be detected from time to time by periodic sampling of the medium in which the larvae are kept. The hapa system is used throughout the experimental period. It is found that this system helps to wash out additional quantity of the planktonic algae and ciliates in the medium. The hapa are to be changed every three days to avoid clogging of the mesh and the larvae can be released to fresh hapa (which is washed and dried if it was used earlier) and fresh feed could be added subsequently. Even though this was conducted only on an experimental basis to evaluate the suitability of the system, the system is found to be very useful and this method can be adopted for large hatchery system. The contamination by ciliates and other organisms also can be minimised if a permanent flow of water is maintained in hapa.

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