anemones per tank to ensure maximum survivability.

**Water quality maintenance**

Maintaining good water quality and ensuring slight water circulation is also found very essential for better survival of larvae. In the larval rearing tank 25% water was exchanged daily with sand filtered sea water. Aeration was provided at four corners of the tank through the PVC columns covered with 200 micron bolting silk cloth and aeration was adjusted to create a mild water circulation. In order to reduce "head-butting syndrome", four sides of the glass tanks were covered with black cloth to avoid reflection of light inside the tank. A low intensity light (40 w) was provided to the larvae during day and night to locate the feed and it also helped to keep the larvae swimming towards the surface at night rather than sinking to the bottom. Through different experimental trials, various hurdles associated with larval rearing have now been overcome and hatchery production of *P. biaculeatus* was achieved with 75 to 85% survival at each spawning.


**Remote setting**

Remote setting is the method of setting larvae of bivalves in distant areas, away from the hatchery after transporting eyed larvae (pediveliger) in cool and moist condition without water. The advantages are that hatcheries need not be established near the
farms, transportation charges for cultch with spat can be completely eliminated and loss due to transportation stress can be minimized. However farmers must develop simple infrastructure to set the transported larvae near the farm.

In India, the first success in remote setting of edible oyster larvae has been done at CMFRI in 2000 when larvae from east coast were set at Cochin. This study indicated the scope for developing this technique for edible oyster *Crassostrea madrasensis*. In the present study remote setting was done and simultaneously the cultch preference and the growth of the spat in different salinities were studied.

**Remote setting experiment**

Pediveliger larvae of 280 µm were transported from Tuticorin Shellfish Hatchery of CMFRI in low temperatures (22 to 28ºC) and made to set at the Calicut Research Centre of CMFRI after a transit period of 28 hrs. The larvae were acclimatized in 32 ppt salinity in 10 liters of seawater for 30 minutes. After acclimatization, when the activity of the larvae became stable, they were released in one tonne tanks at a stocking density of 5000 larvae per litre and provided with two different type of cultch material. Empty oyster shells cleaned, dried and aged and shells of the clam *Villorita cyprinoides* were used as cultch. The settlement pattern on the inner and outer surface of oyster shell was also noted. Mild aeration was provided and mixed feed of *Isochrysis galbana* and *Chaetoceros* spp. was provided to the larvae in 1:2 ratio. While continuing the aeration, 50% water was renewed everyday and the occurrence of swimming larvae monitored.

When the settled larvae became visible after 19 days, their linear measurements were taken and growth and survival monitored. An experiment to evaluate the effect of salinity

![Fig. 1. Remote-set oyster spat on oyster](image1)

![Fig. 2. Remote-set oyster spat on clam shell](image2)
on the growth and survival of the settled spat was done by stocking 50 spat settled on shell clutches in salinities of 5, 10, 15, 20 and 25 ppt. The length and width of the spat was measured using a digital vernier calipers every 15 days.

The mean and standard error were calculated from the observed individual measurements of the replicates. These means were used to calculate the instantaneous growth rate (IGR), which does not have time restriction. The IGR was computed from the formula

\[
IGR = \frac{L_n - L_i}{t}
\]

where, \(L_n\) is the natural log of the length at time \(t\) and \(L_i\) is the natural log of the initial length.

**Results**

The activity of the larvae during acclimatization period ranged between 63.5 to 83.3% and the average survival was 78.7%. Highest settlement of 60% was observed on oyster shell clutches (Fig. 1). Settlement on tank surfaces was 35.5% followed by settlement on clam shell (Fig. 2) (Table 1). The % settlement on the outer surface oyster shell

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<tbody>
<tr>
<td>1</td>
<td>No. of larvae released (initial)</td>
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<td>2</td>
<td>Percentage survival after transit</td>
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<tr>
<td>3</td>
<td>Total no. of spat in oyster shells</td>
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<tr>
<td>4</td>
<td>Total no. of spat settled inside the tank</td>
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<tr>
<td>5</td>
<td>No. of spat in clam shell</td>
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<tr>
<td></td>
<td>Total spat</td>
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<tr>
<td>6</td>
<td>% of settlement</td>
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was higher (76%) than on the inner surface. The larvae measured 6.01 mm in 19 days and reached 12.36 and 14.93 mm in 38 and 75 days respectively. The IGR in different salinities varied with the highest (0.0182) and lowest (0.0115) in 5 ppt (Fig 3). The mean length of the oyster spat in different salinities were noted (Fig. 4) and the highest mean length was in 15 ppt. Survival was 100% in all the salinities during the 34 day experimental period.

The study indicated the scope for remote setting of oyster larvae. This can be taken up as a collaborative venture with the State Fisheries Department wherein the setting facilities can be developed as a common facility where major oyster farms are located. The survival and good growth of the spat in 5 to 25 ppt salinity indicates the scope for starting oyster culture during September-October itself along the west coast. This can result in two crops instead of a single crop.


Remote setting of the yellow clam *Paphia malabarica* and the pearl oyster *Pinctada fucata* in India

*Paphia malabarica* and *Pinctada fucata* are two commercially important bivalves of India, the former as an edible resource and the latter for the production of akoya and mabe pearls. The seed production techniques for these two bivalves has been developed at the Tuticorin Research Centre of CMFRI. Along the west coast of India, *Paphia malabarica* supports a very good fishery. Semi-culture or relaying of these clams by clam fishers is popular and the potential for clam mariculture is also high since the domestic and export demand for this clam is high during the past two decades.

Remote setting is the technique of setting the pediveliger larvae produced in hatcheries at sites near the farm site away from the production site. The method of transporting the larvae is unique - they are sieved and packed in moist cloth and placed in containers under moist, cool condition without water.

The pearl oyster *Pinctada fucata*, though found in the paars of Gulf of Mannar and Palk Bay, has been found to have good survival and growth along the west coast. The experiments done on akoya pearl and mabe production indicated a good potential for