LARVAL DEVELOPMENT OF THE OYSTER
*SACCOSTREA CUCULLATA* (BORN)

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**ABSTRACT**

The oyster *Saccostrea cucullata* was induced to spawn in the laboratory, by increasing the water temperature and by addition of sperm extract. Fertilized eggs developed into straight-hinge stage with a shell length of 65\(\mu\)m. The larval shell developed umbo at about 96\(\mu\)m length. Twenty-eight days are required for the complete development from the time of development of straight-hinge stage upto the period of metamorphosis. The description of the larval stages is presented in the paper.

*Saccostrea cucullata* is an Indo-Pacific species ranging in its distribution from East Africa to the Pacific Islands. In India, this species is distributed both in the east and west coasts. It is abundant around the harbour (mouth of the estuary) at Cuddalore; but rarely occur at the mouth of the Vellar estuary, where it is mostly associated with the edible oyster *Crassostrea madrasensis*. In other areas, like Chinnavaikkal, 7 km from mouth of the Vellar estuary, it is associated both with *Telescopium telescopium* and *C. madrasensis*. Awati and Rai (1931) studied the early development of this species. No work has been done on larval development of this oyster. The present study was carried out to describe the development of the larval stages of *S. cucullata* under laboratory conditions.

The oysters were collected from the natural populations of Porto Novo and Cuddalore waters. They were thoroughly cleaned before subjecting to spawning activity. The oysters were fed with unialgal cultures of *Thalassiosira* sp., *Skeletonema costatum* and *Amphiprora* sp. Gonadal smears were taken to ascertain the condition of the gonad before the bivalves were subjected to induced spawning. Batches of 8-10 oysters were taken at a time and spawning was induced by increasing the water temperature and by addition of sperm extract as suggested by Locsanoff and Davis (1963).

Filtered seawater, autoclaved at 15 lb/m² for 15 min. was used for larval rearing. Fingerbowls and pipettes used for the larval rearing were sterilized chemically (using chlorinated water) and then washed with distilled water.
After spawning was over, the bivalves were removed from the trough. The eggs were screened by bolting silk of fine mesh and placed in fingerbowls containing sterilized water. The sperm suspension was added to the container. The early development was observed under a binocular microscope. When the straight-hinge stage larvae developed 20 to 25 hours after fertilization, the larvae

Fig. 1. Early developmental stages of Saccostrea cucullata. (X 600)
A-Sperm, B-Unfertilized eggs, C-Fertilized eggs, D-1st Polar body; E-2 cell stage, F-4 cell stage, G-Multiple cell stage, H-Early trophophore.
were screened by bolting silk of fine mesh and placed in finger bowls for further development. After changing the water daily (S = 32-34%o; t = 28-29°C) axenic cultures of Isochrysis galbana were added to the container once in a day at a concentration of 50 to 100 cells/μl as food for the developing larvae. The terminology used in the present study was after Chanley and Andrews (1971).

**Egg**

The diameter of the unfertilized egg 40 μm. Matured eggs are spherical and the maturing eggs are oval or flask shaped (Fig. 1B). The nucleus was comparatively large and very clear and begins to disappear soon after fertilization.

**Early development (Fig. 1A-H)**

The chronological order of early development of this species is as follows:

<table>
<thead>
<tr>
<th>Course of development</th>
<th>Time after fertilization</th>
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</thead>
<tbody>
<tr>
<td>Formation of fertilization</td>
<td>5 minutes</td>
</tr>
<tr>
<td>membrane</td>
<td></td>
</tr>
<tr>
<td>Release of 1st polar body</td>
<td>40 minutes</td>
</tr>
<tr>
<td>Release of 2nd polar body</td>
<td>45 minutes</td>
</tr>
<tr>
<td>1st cleavage</td>
<td>1 hour 40 minutes</td>
</tr>
<tr>
<td>2nd cleavage</td>
<td>1 hour 50 minutes</td>
</tr>
<tr>
<td>Gastrula</td>
<td>5 hours</td>
</tr>
<tr>
<td>Trophophore</td>
<td>10 to 12 hours</td>
</tr>
<tr>
<td>Straight-hinge stage</td>
<td>20 to 25 hours</td>
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</tbody>
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The velum is the chief organ of locomotion at the straight-hinge stage. By means of their cilia, the larvae swim very actively in all directions and crowd near the surface of the water.

**Larval Development**

**Straight-hinge stage** (Fig. 2A)

The earliest straight-hinge larvae are about 65 μm in length. They retain their 'D' shape until they reach 80-85 μm in length. During this stage the height increases from 60 to 80 μm and it is 10 to 15 μm less than the length.

**Umbo stage** (Fig. 2B-E)

Umbo begins to form on the 7th day, when the length is 90 μm. The shape of the umbo is knobby and they become skewed when attains a length of 140 μm and a height of 130 μm on the 11th day. At a length of 220
μm, the height and length became equal. Afterwards the height increases over the length due to faster growth in this axis.

**Pediveliger stage (Fig. 2F).**

The foot develops on the 26th day, when the pediveliger reaches a length of 300 μm and a height of 340 μm. This larva crawls on the bottom of the

Fig. 2. Larval development of *Saccostrea cucullata*.
A-Straight-hinge state (X 120), B-E-Umbo stage (X 120), F-Pediveliger stage (X 70).
fingerbowls. The eye spot is present in the larva but it disappears during its metamorphosis into spat. The well-grown larva is reddish brown.

Spat

The pediveliger metamorphoses into plantigrade and gets attached to the bottom of side of the fingerbowls. The whole larval period from straight-hinge stage to metamorphosis takes nearly 28 days.

Loosanoff and Davis (1963) and Dupuy, Windsor and Sutton (1977) reared the larvae in running, filtered seawater free from particles up to 1μm and treated with antibiotics or ultraviolet light. Alagarswami, Dharmaraj, Velayudhan, Chellam, Victor and Gandhi, (1983) and Nayar, Rajapandian, Gandhi and Gopinathan (1984) have successfully reared the larvae of *Pinctada fucata* and *Crassostrea madrasensis* without adopting any elaborate system of filtration or sterilization. But in the present study, the rearing medium was prepared by first filtering the seawater through the cotton and then autoclaving the same as reported by Tan (1975).

As mentioned earlier, the larvae of *S. cucullata* reared by feeding with *Isochrysis galbana*, completed their life history in 28 days. Such rapid growth has also been reported earlier in the case of larvae of *O. edulis* and *C. virginica*, when fed with *I. galbano*. (Bruce, Knight and Parke, 1940; Davis, 1953; Walne 1956; Ukeles, 1969; Chanley and Dinamani, 1980).

As most other oyster larvae, *S. cucullata* also show inequivalve (left valve larger than the right one), skewed umbo, relatively greater height than length, presence of eye spot and reddish brown colour in advanced larval stage (Chanley and Andrews, 1971; Chanley and Dinamani, 1980).

The present study helps in identifying *S. cucullata* larvae (skewed umbo, relatively greater height than length, eye spot in pediveliger larvae) from plankton collections, predictions on the timing of spatfall through tracing larval abundance.

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REFERENCES


