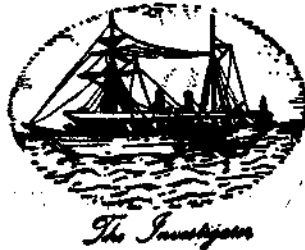


# PROCEEDINGS OF THE SYMPOSIUM ON COASTAL AQUACULTURE

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## **PART 2 : MOLLUSCAN CULTURE**

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**STUDY ON THE STOMACH CONTENTS OF PEARL OYSTER  
*PINCTADA FUCATA* (GOULD) WITH REFERENCE TO THE INCLUSION  
OF BIVALVE EGGS AND LARVAE**

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**ABSTRACT**

The pearl oyster which is a filter-feeder as any other bivalve mollusc, has been considered to feed on phytoplankton including detritus. A detailed study made on the feeding of pearl oyster *Pinctada fucata* collected from the pearl culture farm as well as natural beds showed the presence of bivalve eggs and larvae along with copepods and crustacean larvae, spicules of sponges, etc. Several samples of oysters collected at different periods of 1977 and 1978 gave the same results indicating that this is a regular feature.

Experiments were conducted to elucidate the role of bivalve larvae in the feeding of pearl oysters. Trochophore larvae of *P. fucata* obtained in rearing experiments were fed to starved oysters. These were readily ingested by the pearl oysters. The larvae were passed out in the faecal matter alive and these, when reared, developed into straight-hinge stage.

**INTRODUCTION**

OUR knowledge of the food and feeding habits of the pearl oysters in the Indian waters is very meagre apart from the passing reference made by Herdman (1903). Ota (1959) has studied the feeding habits of the Japanese pearl oyster and the production of faeces in relation to seasonal changes, nuclear insertion and culture conditions. He had observed that the pearl oysters feed on the swimming bivalve larvae. Upon frequently noticing the presence of bivalve eggs and larvae in the stomach of the Indian pearl oyster, a detailed study was carried out on the significance of their presence in the feeding regime of the species and the results are reported.

The author wishes to express his gratitude to Dr. E.G. Silas, Director and Dr. K. Alagar-

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**MATERIAL AND METHODS**

During the course of a study on the biology of pearl oyster *Pinctada fucata* in the Veppalodai pearl culture farm and the Gulf of Mannar pearl banks, the stomach contents of pearl oyster were examined based on regular samples. A total of 426 and 154 oysters for the years 1977 and 1978 respectively from the farm and 150 and 70 oysters during the same period from the pearl banks were examined for qualitative assessment of the stomach contents.

Starved oysters were fed with the laboratory reared pearl oyster larvae. The stomach and intestinal contents of these oysters were examined

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periodically to find out the fate of the larvae ingested. The pseudo-faeces which were discharged by the oysters were examined and the larvae thrown out were separated and reared. The faecal matter was also examined and the larvae present were separated and reared.

#### OBSERVATIONS

##### *Stomach contents of oysters from the farm*

The stomach and intestinal analysis of oysters from the farm showed that 59.5 and 66.3 per cent of the stomachs contained eggs and shelled larvae of bivalves respectively, almost throughout the year. The size range of the straight-hinge larvae was from 27.5 to 115  $\mu$  in the dorsoventral axis and 37.5 to 125  $\mu$  in the anteroposterior axis. They were of different shapes suggesting that they belong to more than one species. Larvae with umbone ranged in size from 162.5 to 232.5  $\mu$  in dorsoventral axis and 200 to 275  $\mu$  in the anteroposterior axis. Other larvae found in the stomach were gastropods in March, April, August and September, heteropods in April, June, August and October, and nauplii in July, August, October and November. Copepods and their appendages, spicules of sponges and some unidentified spores were the other constituents. *Euglena* and *Cerattum* along with some other flagellates were also present. The diatoms were represented by *Navicula*, *Nitzschia*, *Oscillatoria*, *Coscinodiscus*, *Gyrosigma*, *Pleurosigma*, *Asterionella*, *Thalassiothrix*, *Diploneis*, *Amphora*, *Rhizosolenia* and *Chaetoceros*. The organisms were found in a matrix of mucus and organic detritus. Some were in semidigested condition and occasionally frustules of copepods too were observed. A few minute sand particles also were present in the stomach content of oysters.

##### *Stomach contents of oysters from the pearl banks*

Oysters from Vaipar Peria paar, Devi paar and Tholayiram paar collected from January to April and November to December were analysed for the study. The depth at which the oysters were collected ranged from 12-21 m.

Of the stomachs examined, 71.4 per cent contained eggs of pearl oysters throughout the course of observation and in 4.3 per cent cases shelled bivalve larvae were present during April and November of both the years. The larvae were at different stages of development in straight-hinge and umbonal stages. Copepods and their appendages, nauplii, spicules of sponges, *Euglena* and flagellates were the other inclusions in the stomach. The diatoms enumerated earlier were also present. These organisms were found mixed in a good amount of organic detritus along with few sand particles.

#### EXPERIMENTAL FEEDING OF OYSTERS

As the presence of bivalve larvae was a regular feature in the stomachs of pearl oysters especially from the pearl culture farm, some experiments were conducted in the laboratory to find out whether the larvae are ingested as food and if so whether they are digested.

Twenty healthy oysters from the farm were brought to the laboratory and five were examined immediately for their stomach and intestinal contents. All the oysters were in spent condition. Eggs of different shapes, bivalve larvae of straight-hinge and umbo and diatoms were present in them. Detritus was in fairly good quantity with few sand particles. The remaining oysters were kept in clean, filtered sea water. Next day, the examination of the faecal matter showed the presence of bivalve larvae, pteropods, appendages of copepods, detritus and sand particles. Examination of the contents of stomachs and intestines of three oysters on opening showed that they were empty except for the presence of few sand particles. Ten such oysters were fed with straight-hinge larvae in filtered sea water medium. Within 45 minutes all the larvae in the water had been filtered and ingested. The pseudo-faeces ejected as puffs of loose mucus was found to contain large number of larvae of pearl oysters entangled in mucus.

The faecal matter as ribbon-like extrusions began to appear within 2 hours of feeding. A large number of pearl oyster larvae wrapped in mucus like material were present in it. The faecal matter extruded next day was found to contain only mucus-like matter and sand particles. The stomach and intestinal contents of three oysters cut open showed that they were empty except for mucus and a few sand grains.

In another set of experiment, ten oysters in healthy condition, kept starving over night, were fed with laboratory reared trochophore larvae, 5 hours old. The purpose of the experiment was to find out whether the larvae passed out in the faecal matter were alive and if so were capable of further development. The pseudofaeces was collected and the larvae embedded in the loose mucus were separated and reared. The larvae developed further into straight-hinge stage. The larvae which were separated immediately from the faecal matter also developed to straight-hinge stage. It was observed further that the larvae were able to pass through the alimentary system within 2 hours of feeding. Most of the larvae retained in the stomach for longer time were dead. A few larvae passing out alive after a prolonged period were feeble and inactive.

#### DISCUSSION

Herdman (1903) noted that the unicellular organisms such as spores of algae, diatoms, infusorians and foraminifers formed largely the food of pearl oysters and that, radiolarians, minute embryos and larvae of various animals, algal filaments, spicules of Alcyonarians, sponges and small numbers of minute sand grains were also found in the stomach occasionally in large quantities. Ota (1959) has observed the swimming bivalve larvae also in the stomach contents of the Japanese pearl oyster during summer. Kuwatani (1965), feeding the oysters with charcoal particles, noticed particles upto  $30 \times$

$17.5 \mu$  size in the oesophagus and only  $17.5 \times 10 \mu$  size and less had passed through the digestive diverticula from the stomach. Cerruti (1941), quoted by Korringa (1952), has recorded as stomach contents of *Ostrea edulis* large quantities of organic detritus, diatoms, flagellates, larvae of molluscs, eggs and gastrula of a variety of marine invertebrates, plant fibres and pollen grains and he found that only very small diatoms were reduced to empty frustules in the intestinal tract.

According to Korringa (1952) the feeding method of lamellibranchs certainly is very wasteful. Only part of the material ingested can be digested. No evidence of selection of food is found and the actively feeding oyster appears to ingest anything that it can ingest. Some microorganisms found in the stomach are not digested and they emerge from the oyster unchanged, often alive. Lamellibranch larvae are often ingested in great numbers. They always leave the oyster alive. These larvae very rarely succeed in freeing themselves from the mucus and organic detritus they are wrapped in, and therefore are doomed to perish. The experimental feeding of pearl oysters with the laboratory, reared pearl oyster larvae shows that most of the larvae ingested pass through the alimentary tract often alive. If they pass out within two hours, they could develop further if separated from the faeces immediately.

The present observations on the feeding of pearl oyster *P. fucata* are in agreement with the previous works on oyster feeding. The presence of diatoms, dinoflagellates, larvae of various animals, plants and other animal remains, detritus and sand particles in the stomach of pearl oyster shows that the pearl oyster, like any other bivalve mollusc, ingests all the materials that it can. The plankton investigations in the Veppalodai pearl culture farm area during the years 1975 to 1977 (to be reported elsewhere) showed that the lamelli-

branch larvae were present throughout the year with a major peak during July to November and a secondary one from March to May. The measurements of the planktonic lamelli-branch larvae of straight-hinge and umbonal stages were close to those of the larvae found in the stomach of pearl oysters from the farm at Veppalodai.

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