Crassostrea madrasensis (Preston, 1916)*

Biji Xavier

IDENTIFICATION

Order	:	**Ostreida**
Family	:	**Ostreidae**
Common/FAO Name (English)	:	**Indian backwater oyster**

Local names: Kadal muringa, Muringa, Muru (**Malayalam**); Ali, Kalungu, Patti (**Tamil**); Muri (**Kannada**)

MORPHOLOGICAL DESCRIPTION

The Indian backwater oyster is an irregularly shaped oyster with straight shells. The shell has a deep left valve and concave right valve. The hinge which joins the shells is narrow and long. The animal has a right and left mantle lobe which encloses the mantle cavity which in turn encloses the rest of the organs.

**Crassostrea bilineata* (Roding, 1798) as per Huber,M. (2010)

Source of image : CMFRI, Kochi

PROFILE

GEOGRAPHICAL DISTRIBUTION

Crassostrea madrasensis is widely distributed along both the east and west coasts of India. Along east coast, it is available in Bahuda estuary, Visakhapatnam; Sarada estuary, Kakinada; deltas of Godavari and Krishna rivers; Pulikat Lake; Ennore; Guggalore and Mandapam. Along west coast, it is distributed in Anchengo back water; Ashtamudi and Vembanad lakes; Kochin harbour and backwaters; Azhikode; Beypore; Thellicherry; Elathur; Chauyar estuary; Pavanji; Sambhavi; Sitanadhi; Coondapur; Venkatapur; Sharavathi and Kalinadhi estuaries and Pirotan Islands, Gujarat. It also occurs along Pakistan coast.

HABITAT AND BIOLOGY

It is a euryhaline brackish water oyster, inhabiting backwaters, estuaries, ports and harbours. It also occurs occasionally in open sea as thick bed. It is found in intertidal zones at depths of around 4 m. It grows to a maximum size of 212 mm and larger ones are available in estuaries.

Oysters have separate sexes generally but hermaphrodites are also present. In one spawning, a female of length 80-90 mm size releases 10-15 million eggs. The eggs and sperm are discharged directly into the water, where fertilization and development takes place. Larvae drift for few weeks and attach to substrate, when they are one-third millimeter long.

PRODUCTION SYSTEMS

BREEDING IN CAPTIVE CONDITIONS

The induced breeding, larval rearing and spat production of *C. madrasensis* has been successfully achieved at Tuticorin R. C. of CMFRI. Oysters (1 yr old) with uniform gonadal state were used for broodstock development. The stocking density used for broodstock development was 25 individuals/ 100 l of water. They were fed a mixture of *Chaetoceros affinis, Skeletonema costatum, Thalassiosira subtilis, Nitzschia closterium, Isochrysis galbana, Pavlova* sp. and *Chlorella salina.* Food was provided twice daily and a cell concentration of 0.8-1.0 x 10^6 cells/ml was maintained. Water was exchanged every day morning prior to feeding. The matured individual was induced to spawn with a temperature increase of 2-4 °C above the ambient. Males spawned first, which induced the females to spawn. The fertilized eggs settled at the bottom and reached morula stage within 4 h.

LARVAL REARING

The 'straight hinge' or 'D' shell larval stage was observed after 20 h of fertilization and the larvae measured 66 µm in length on first day. It was reared in rectangular FRP tank and fed with phytoflagellates. Early umbo stage (100 µm) was obtained on 3rd day and late umbo stage (260-270 µm) between 12-15 days. Eyed and pediveliger stages were observed on 13-17 and 14-18 days, respectively. At pediveliger stage, the larvae developed functional foot, sank to the bottom and started crawling (swimming creeping stage). The pediveliger larvae settled down, losing the velum totally. The shell edges grew hexagonally and the larvae developed the characteristic adult features and metamorphosed into spat of 450 µm in length. The mixture of *Isochrysis* spp. and *Pavlova* spp. were used as feed during different larval stages. However the concentration of algae was increased based on the larvae's nutritional requirements, viz., 'D' shape: 3,000-4,000 cells/ml/ larvae; early umbo: 4,000-5,000 cells/ml/larvae; umbo: 5,000-8,000 cells/ml/larvae; late umbo: 8,000-10,000 cells/ml/larvae and eyed, pediveliger and spat: 10,000-12,000 cells/ml/larvae.

NURSERY REARING

Nursery rearing of spat can be carried out either in tank or in wild in natural water. In tank, spat were fed with *Chaetoceros* spp., *Skeletonema costatum*, *Thalassiosira*, *Nitzschia* spp. and other phytoflagellates. In wild, the spat were stocked in netlon net cages in natural water, where no additional feed was supplemented. Spat cultured in natural waters exhibited rapid growth of 62.5 mm in 6 months with a growth rate of 10.2 mm/month.

GROW OUT

Bottom culture and off bottom culture are the two culture practices followed for the oyster culture. Off bottom culture methods include rack and string or ren culture, where oyster shell is used as ren for spat collection. This method is suitable for shallow estuaries, bays and back waters of 1-1.25 m depth. Rack is a fixed structure from which shell strings are suspended for the collection of spat. The estimated production is 80 t/ha/yr for a period of 7-10 months of culture. In rack and tray method, cultch free nursery reared spat of 25 mm size are transferred to trays (40 x 40 x 10 cm) @ 150 to 200 spat/tray. The tray is knitted with synthetic twine of suitable mesh size and suspended from rack. Once the shell grows to a size of 50 mm, it can be transferred to bigger rectangular trays and again suspended from racks. The estimated production is 120 t/ha/yr. In stake culture, stakes hold the shells with spat. In this system, nursery rearing is carried out for 2 months and grow out is continued for 10 months. The estimated production is 20 t/ha. Raft culture is an oyster farming method suitable for sheltered bays with depth more than 5 m. So far this method has not been tried in India. In long line culture, long ropes or cables are anchored at each end and are supported at intervals by floats. This farming method is practiced in deeper waters.

FOOD AND FEEDING

This oyster feeds on organic detritus and phytoplankton (mainly diatom and dinoflagellates) by filtering sea water with the ciliary action of its gills.

GROWTH RATE

Growth depends on food availability and environmental factors like temperature and salinity. Fast growth of spat occurs during the first three months. An average size of 87 mm is reached at the end of one year with a growth rate of 12.6 mm/month.

DISEASES AND CONTROL MEASURES

Multinucleated Sphere Unknown (MSX) disease caused by single-celled parasite, *Haplosporidium nelson*; Oyster trematode disease caused by *Gymnophallid metacercariae*; Metacercaria infection caused by sporocyst; Bucephalosis infection caused by cercariae of *Bucephalus* has been reported in *C. madrasensis*. In addition, *Vibrio alginolyticus*, *V. parahaemolyticus* and *V. harveyi* are the dominant bacterial flora infecting the backwater oyster. Reports are available on the presence of protozoan parasite *Perkinsus beihaiensis* in *Crassostrea madrasensis* from the Indian subcontinent, which caused mass mortalities in wild and farmed bivalve populations.

PRODUCTION, MARKET AND TRADE

PRODUCTION

Estimated world production of oyster is one million tonnes per annum. USA, Japan and Korea are largest producers of oyster through culture.

MARKET AND TRADE

Major oyster market in the world is represented by four countries namely, South Korea, Japan, USA and France. Global trade in oyster products are in the form of fresh, chilled, frozen, canned in brine, smoked, salted and dried oysters to the tune of 3,00,000 mt. Small scale farming of edible oyster is practiced to meet the domestic demand in India. However oyster shell powder is exported to the Arab countries. Edible oysters are usually marketed as live oysters with shell, shucked oyster meat, frozen oyster meat and canned oyster meat. Value added products suitable for the Indian domestic market viz., oyster pickle, dried oyster, smoked oyster in oil, canned oyster in brine, minced meat products, battered and breaded IQF meat, soups, oyster chowder, and oyster extracts etc. have also been developed.

CHALLENGES TO MARICULTURE

Though mass scale production has been achieved successfully in the hatchery, heavy mortality due to bacterial, fungal or viral diseases are common. Hence studies on larval diseases and their control measures need to be undertaken to ensure higher survival in production systems. In addition, consumer preference, market structure and marketing channel needs to be studied. Oyster culture is labour intensive. In order to ameliorate the non availability of skilled labour and increasing labour cost there is an urgent need for mechanization of the post harvesting process. Environmental monitoring of shellfish culture areas need to be strictly followed since these areas are mostly exposed to bacterial, industrial and domestic sewage pollution.

FUTURE PROSPECTS

India is blessed with good oyster resources which have small pockets of good demand. However the future of edible oyster mariculture depends on the successful development of its market throughout the country as well as exploring its export potential.

SUGGESTED READING

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