Pinctada margaritifera (Linnaeus, 1758)

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IDENTIFICATION

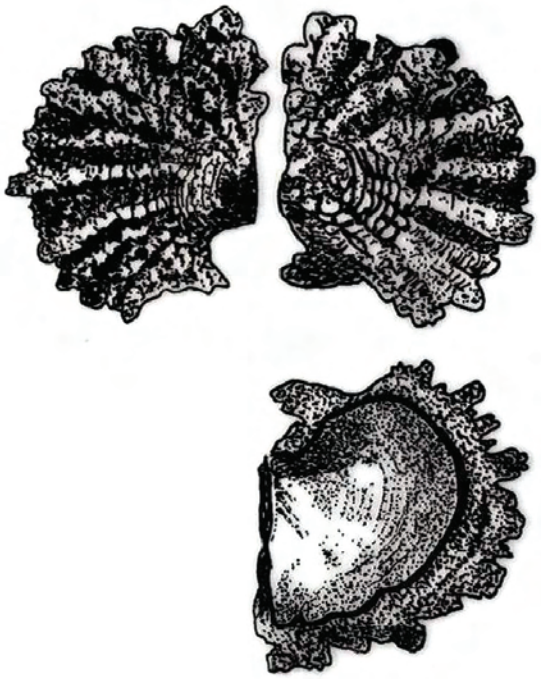
Order	:	**Ostreida**
Family	:	**Pteriidae**
Common/FAO Name (English)	:	**Black lip pearl oyster**

Local names: Muthu Chippi (**Tamil and Malayalam**)

MORPHOLOGICAL DESCRIPTION

The anterior margin of the shell extends in front of the anterior lobe. The anterior ear is well developed whereas the posterior ear and sinus are absent. The byssal notch is broad. The hinge is shorter than the width of the shell and is devoid of teeth. Left valves are moderately convex. The posterior end of the shell meets the hinge almost at a right angle. Outer shell is dark grayish-brown with greenish tinge and radially distributed white spots. The nacreous layer is iridescent with a silvery sheen and the non-nacreous margin is black. Due to the dark marginal colouration of the shell, it is also known as the 'Black-lip pearl oyster'.

Source of image : RC of CMFRI, Visakhapatnam



PROFILE

GEOGRAPHICAL DISTRIBUTION

Pinctada margaritifera is widely distributed in the Persian Gulf, Red Sea, Sudan, Papua New Guinea, Australia, French Polynesia, Indonesia, Andaman and Nicobar Islands, south-western part of Indian Ocean, Japan and Pacific Ocean. Along the Indian coast, the occurrence of black lip pearl oyster is sporadic. It is reported from Vizhinjam (Kerala), Lakshadweep Island, Gulf of Mannar (Tamil Nadu), and Visakhapatnam (Andhra Pradesh). It is endemic to the Andaman and Nicobar Islands.

HABITAT AND BIOLOGY

It is sedentary occupying the intertidal reef flats and is observed up to a depth of about 10 m. It is found attached with strong byssal threads to live or dead corals, block corals and large boulders. It is found attached to the coralline and sub-tidal regions in Andaman and Nicobar Islands.

Both protogyny and protandry have been reported for the species from different parts of the world. The spawning peak varies with locality. Major spawning in July and minor in November is observed in Taiwan and Japan, but it is different in Red Sea, where spawning occurs in June. Year round spawning is noted in French Polynesia. Onset of reproduction is regulated by sea surface temperature. Females outnumber males during the spawning season.

BREEDING IN CAPTIVE CONDITIONS

The broodstock development, breeding and larval rearing of *Pinctada margaritifera* was successfully carried out at Tuticorin R. C. of CMFRI. Black lip pearl oysters (shell height of 77-92 mm and weight of 70-97 g) collected from the pearl oyster beds of the Gulf of Mannar were placed in a meshwork basket and suspended at 5 m depth from rafts. After several months of maintenance, broodstock were brought to the hatchery, where it spawned spontaneously and profusely. Spawning was either natural and was also induced by thermal and chemical stimulation.

LARVAL REARING

The first polar body formed 24 min after fertilization and the fertilized eggs had a mean diameter of 59.9±1.4 µm. Fertilized eggs were stocked at a density of 30/ml in aerated fiberglass tanks (500 l) filled with filtered seawater at 28 °C. After 24 h, when the D-stage larvae (shell becomes D-shaped) had a mean shell length of 79.7±2.3 µm, they were collected with a 25 µm mesh sieve and stocked at a density of 2/ml in 500 l aerated fiberglass tanks. After 8 days of culture, early umbo stage (shell length of 110 µm) was reached and exhibited an average daily growth rate of 3.7 µm. Mean daily growth rate increased to 7.2 µm over the next 22 day period required for the larvae to reach the eye spot stage (shell length of 230 µm). Eye spots occurred in larvae that were 230 µm or greater in shell length and shortly after, it progressed to the pediveliger stage. Larvae were fed daily a mixed diet (1:1) of *Isochrysis galbana* and *Pavlova salina* at a concentration of 1-18 $\times$ 10^3 cells/ml.

NURSERY REARING

Nursery rearing can be carried out either in indoor system in hatchery or outdoor system in farm. In hatchery, it was fed a mixture of *Isochrysis galbana*, *Skeletonema* sp. and *Nitzschia* sp. at concentration of 2.5 x 10^3 cells/ml until a size of 1 mm, and was doubled thereafter. Feeding was given once a day. Water was exchanged daily. In the farm, spats were placed in pyramidal lantern nets covered with velon fabric of appropriate mesh and were suspended from rafts at depths of 5 m. Average density was 600 spat/net.

In the hatchery, growth of juveniles was very slow at 0.09 mm/day. On transplantation to the culture raft in the farm, growth rate increased to 0.4 mm/day. However, mortality of spat was more in the farm. Survival rate ranged from 15.16 % to 17.40 %.

GROW-OUT

Till the oysters reached 50-60 mm shell length, they were grown in intermediate grow-out systems with regular cleaning of shells. Once they reached 50-60 mm shell length, they were removed and transferred to the main grow-out system. When the oysters reach 90-120 mm, they were 'seeded' with the shell nucleus and a graft of mantle tissue for creating a cultured pearl. After the operation, the shells were kept ventral edge down and handled carefully with each oyster being placed in a catch bag. The oysters were then either ear-hung on ropes or placed in panel nets and carefully transferred to grow-out lines. After 4-6 weeks, the oysters were checked to see if it had rejected the nucleus. Any oysters that had rejected the nucleus, or were dead after the operation, were removed from the grow-out system. The 4-6 weekly cleaning cycles was resumed (if necessary) for the next 18-24 months, after which there was a second operation to remove the pearl. At this time, suitable oysters, i.e. those that have produced good pearls, were re-seeded with another nucleus to produce another pearl. For the second operation, there was no need for a graft of mantle tissue as the pearl sac has already formed and would continue to produce mother-of-pearl to coat the new nucleus.

FOOD AND FEEDING

The black lip pearl oyster is a filter feeder which feeds by filtering water across its gills to trap plankton and other digestible materials. Stomach contents of individuals collected from wild showed the presence of bivalve eggs (few), appendages of copepods and phytoplankters such as *Tetraselmis* sp. (abundant), *Navicula* sp., *Nitzschia* sp., *Oscillatoria* sp., *Fragilaria* sp., *Chaetoceros* sp., *Euglena* sp., *Amphora* sp. and *Diplonei* sp. Five microalgae species viz., *Pavlova salina*, *Isochrysis galbana*, *Chaetoceros calcitrans*, *Nannochloropsis oculata* and *Chlorella marina* are used as feed in hatchery and nursery rearing.

GROWTH RATE

Growth rate of 5 µm/day was reported during the first 7 days of larval rearing. Growth rate of spat was 0.09 mm/day in hatchery, whereas in farm, it was 0.4 mm/day during the 3 month rearing period. The 11 months old spat measured 38.8 mm in shell height, 33.2 mm in hinge length and 6 g in weight.

DISEASES AND CONTROL MEASURES

Mass mortality caused by necrosis of the adductor muscle by virus in pearl farms has been reported. *Perkinsus* sp. was isolated in Australia from the cultured oyster. In Europe, the parasitic copepod, *Anthessius pinctadae* was reported from pearl oyster. High mortality of oyster due to protistan parasites has been described from the Red Sea. Two polypous mesenchymal tumours in oysters were described from Australia. Occurrence of boring sponge (*Lithophaga* sp.) has been reported on the shell of the oyster. Shell boring polychaete (*Polydora* sp.) infestation is reported from Visakhapatnam, India.

PRODUCTION, MARKET AND TRADE

PRODUCTION

Information not available

MARKET AND TRADE

The black-lip pearl oyster is one of the valuable species for the pearl industry. It produces the black pearls and supports a multimillion dollar industry in the Pacific. It has traditionally been used as food, for ornaments, jewellery, tools and fish hooks in the Indo-Pacific region. French Polynesia and Cook Islands are the major producers of black south sea pearls. French Polynesia is also the major global supplier of Tahitian black pearl. Culture techniques for black pearls were first developed in French Polynesia and the industry grew quickly to create major export earnings estimated at US $ 200 million in 2000. The industry in French Polynesia alone is worth approximately US $ 140 million per year. Cook Islands later developed an industry that is now worth US $ 5 million. Black-lip pearl oyster in Andaman and Nicobar waters are presently utilized more for the shell craft industry than for the pearls.

CHALLENGES TO MARICULTURE

Nursery rearing of spat in sea and in closed conditions is plagued with the problems of fouling, environmental stress and predation by fish and invertebrates and this leads to high mortality. Production of mother oysters for nucleation and pearl production on a continuous and commercial scale are big challenges for Indian mariculture

FUTURE PROSPECTS

Black pearls are highly sought after in the international pearl industry. Large scale commercial production of blacklip pearl oyster will be a boon for oyster farmers for better economic returns while earning forex for the country.

SUGGESTED READING

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