

# Resource Potential and Status of Pearl Oyster Fishery in India

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## Introduction

Many cultivable species of pearl oysters are known to occur in the Indo-Australian Archipelago which is an important region in the world distribution of pearl oysters (Alagarwami, 1983). Culture of pearl oysters in India was attempted at Tuticorin as early as in 1864 (stated by Jeyabaskaran *et al.*, 1983), however, the actual pearl culture project was started in 1913 by the pioneering molluscan researcher Dr. James Hornell with the establishment of a pearl oyster farm at Krusadai Island, Gulf of Mannar (Hornell, 1916, 1922).

Small scale experiments on the rearing of pearl oyster in captivity were continued and basic data on environmental conditions were collected in early 50's (Devanesan and Chidambaram, 1956; Devanesan and Chacko, 1958). Simultaneously, experiments on pearl culture were also conducted at Sikka, Gulf of Kuchch in 1956 (Pandya, 1974). Mahadevan and Nayar (1968, 1973) provided the basic ecological informations on Indian pearl banks and Easwaran *et al.* (1969) described the potential of pearl oyster in Gulf of Kuchch.

We present here an account of the development of Indian Pearl fisheries that took place over several decades and the progress made in artificial pearl culture in India.

**Species Distribution and Ecology :** The pearl oysters belonging to genus *Pinctada* comes under the family Pteriidae. They enjoy a world wide distribution through the tropical belts. They generally occur in shal-

low subtidal areas attached to the substratum firmly with the bundle of byssus threads, each thread having a discoid structure at the distal end for fixation. In the Gulf of Mannar which is the major source of pearl fishery in India, the pearl oysters occur on the rocky or dead coral outcrops forming the pearl banks. The banks are distributed over a wide area at various depths ranging from 15 to 25 m. Although six species of pearl oyster are known to occur in the Gulf of Mannar, the major pearl fishery is constituted by *Pinctada fucata*. In the Gulf of Kuchch, pearl oysters are found as stray individuals on the reefs at shallow depths upto 6 m. Some times they can also be collected from the loose sandy or muddy substratum attached to the submerged objects in littoral waters and from the rock crevices or also from the pillars of piers and jetties (Alagarwami, 1977).

The pearl oyster fishery of India is represented by two genera and seven species. *Pinctada fucata* (Gould), *P. margaritifera* (Linnaeus), *P. chemnitzii* (Philippi), *P. sugillata* (Reeve), *P. anomioides* (Reeve) and *P. atropurpurea* (Dunker) belonging to the genus *Pinctada* and a single species *Pteria penguin* (Roding) representing genus *Pteria* (Fig. 1). Details of the species distribution in Indian waters is presented in Table 1. *Pinctada fucata* (Gould) which occurs in extensive beds in the Gulf of Mannar and to a much less extent in the Gulf of Kuchch, supports a fishery by itself. Being the source of the oriental pearls, *P. fucata* has its own commercial importance.

The Black-lip *Pinctada margaritifera* is another commercially important pearl oyster species in India, with distribution restricted only to the Andaman and Nicobar Islands and rarely collected from the mainland (Alagarwami, 1983). It generally occupies the intertidal reef flat and is recorded from the maximum depth of 10 m. The reef flats of Andaman and Nicobar Island are coralline and are interspersed with hard sandy bottom, covered with algal growth. The other five species of pearl oyster are not of much economic importance since their pearl yield is low or the pearls produced by them are not of good quality in terms of lustre (Alagarwami, 1983).

The widely distributed *P. chemnitzii* is found on the coarse sandy bottom in the Palk Bay, Gulf of Mannar, whereas on the Central West Coast of India, it is recorded from the subtidal rocky area (8-10 m depth) (Majumdar, 1977; Parulekar, 1981).

**Pearl Fisheries in India :** The origin of pearl fisheries in India is not fully understood (Alagarwami and Qasim, 1973), however, pearl oyster resources in the Gulf of Mannar have been harvested from ancient time. In Gulf of Mannar the pearl banks are located between Kanyakumari and Rameswaram at varying water depths. They can be grouped under three broad divisions such as the northern or Kilakarai division which extends from Adam's Bridge to Vaipar, the Central or Tuticorin division extending from Vaipar to Manapad and the Southern or Kanyakumari division from Manapad to Kanyakumari. Of this the Central or Tuticorin division is the most productive one (Hornell, 1922).

In the Gulf of Kuchch the pearl banks are locally known as "KHADDAS" and are located along the intertidal region of Southern Coast of Jamnagar District (Gokhale *et al.*, 1954; Easwaran *et al.*, 1969). The oysters are found scattered on the discontinuous reefs interspersed with sandy patches,

which are exposed during the ebb tides (Alagarwami and Qasim, 1973). There are about 42 important reefs along the Jamnagar coast, in Gulf of Kuchch (Gokhale, *et al.*, 1954; Easwaran *et al.*, 1969; Pandya 1974).

**Potential of Pearl Oyster Culture in India:** Ever since the invention of pearl culture techniques by Mikimoto of Japan, the world pearl culture industry is growing, amazingly. In the Japanese method a small piece of pearl oyster is introduced or grafted carefully along with a spherical shell bead as the nucleus into a pearl oyster in between the lobes of the gonad. The operation is completed within a few minutes but it requires expertise. The beads forming the nuclei are prepared from the hard shell of bivalves molluscs. The operated oysters are reared in farms in calm shallow bays. The oysters are kept in cages or sandwich nets hanging from floating rafts at a depth of about 1 m down from the water surface. The secretion of nacre i.e., pearl substance commences at the end of one or two weeks and a small sized culture pearl is formed in a period of six months. However, the formation of large pearls takes two to three years. While under culture conditions, the pearl oyster shells are cleaned regularly, to remove the growth of unwanted materials such as sponges, barnacles, and ascidians which settle on them.

As in case of shrimps or mussel farming, the success of pearl oyster culture depends largely on the availability of adequate quantity of pearl oyster spat. Other important factors for commercial pearl culture are successful implantation of the nucleus, favourable environmental conditions, availability of food and absence of parasites and predators.

In India, attempts to rear the pearl oysters in captivity were made in early 50's (Devanesan and Chidambaram, 1956). The oysters were successfully reared in cages

near Krusadai Island in the Gulf of Mannar and secretion of nacre around the introduced shell beads was observed but spherical culture pearls where not formed (Devanesan and Chacko, 1958). The successful invention of indigenous techniques for production of cultured pearls was actually achieved in 1973 (Alagarwami and Qasim, 1973, Alagarwami, 1974) which gave much needed boost to pearl culture industry in India. The natural populations of pearl oysters of genus *Pinctada* have been showing great decline, resulting in the suspension of traditional fisheries in the Gulf of Mannar and Gulf of Kutch. This prompted the farming of pearl oysters by off bottom technique at Veppalodai in Tamil Nadu. These efforts, initiated in the early 70's, culminated in great success and a technique for the production within 3 months of perfectly spherical and free pearls by transplant of biogenic or synthetic particles has been perfected by the scientists of Central Marine Fisheries Research Institute (ICAR), Cochin.

#### References

- Alagarwami, K., 1974. Development of cultured pearls in India *Curr. Sci.* 43 (7) : 205-207
- Alagarwami, K., 1977. The larval transport and settlement of pearl oysters (genus *Pinctada*) in the Gulf of Mannar. *Proc. Symp Warm Water Zool.* spl. pub. UNESCO/NIO, 678-686 pp.
- Alagarwami, K., 1983. A critical review of progress and problems of pearl culture in India. *Proc. Symp. Coast. Aquaculture*, part 2 : 574-583.
- Alagarwami, K., 1983. The Black-lip pearl oyster resource and pearl culture potential. *CMFRI Bull.* 34 : 72-78.
- Alagarwami, K. and S. Z. Qasim., 1973. Pearl culture - its potential and implications in India. *Indian J. Fish.* 20 (2) : 533-550.
- Devanesan, D.W. and P. I. Chacko., 1958. Report of culture-pearl experiments at the Marine Fisheries Biological Station, Krusadai, Gulf of Mannar. No. 5 : 26 pp.
- The techniques developed are being transferred to actual users by conducting the training courses, which includes all aspects of pearl culture. The pioneering efforts in devising indigenous techniques have led to the development of commercial pearl culture ventures, along the South-east coast of India. However, since we have a vast natural pearl resource and the potentials for commercial pearl culture are tremendous, the Government sector should give a lead to encourage entrepreneurs to enter this lucrative industry. In this regard the Andaman and Nicobar Islands as also the Lakshadweep group of Islands which are considered to have promising potentials for pearl culture fishery, because of the environmental suitability, need to be given priority and immediate attention.

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- Devanesan, D. W. and K. Chidambaram., 1956. Results obtained at the pearl oyster farm, Krusadai Island, Gulf of Mannar, and their application to problems relating to pearl fisheries in the Gulf of Mannar - I. Contribution from the Marine Fisheries Biological Station Krusadai Island, Gulf of Mannar. No. 4 : 89 pp.
- Easwaran, C. R., K. K. Narayanan and M. S. Michael., 1969. Pearl Fisheries of the Gulf of Kutch. *J. Bombay nat. Hist. Soc.*, 66 (2) : 338-344.
- Gekhale, S. V., C. R. Easwaran and R. Narasimhan., 1954. Growth rate of the pearl oyster, *Pinctada fucata* in the Gulf of Kutch with a note on the pearl fishery of 1953. *J. Bombay nat Hist. Soc.*, 52 (1) : 124-136.
- Hornell, J., 1916. An explanation of the cyclic character of the pearl fisheries of the Gulf of Mannar *Madras Fish. Bull.* 8 : 11-22.
- Israel, J., 1922. The Indian pearl fisheries of the Gulf of Mannar and Palk Bay. *Madras. Fish. Bull.* 16 : 1-188.

Jayabaskaran, Y., D. Sudhandra Dev, I. Nair, Achinnappan and N. Radhakrishnan., 1983. On the growth of the pearl oyster *Pinctada fucata* (Gould) under farm conditions at Tuticorin, Gulf of Mannar. *Proc. Symp. coast. Aquaculture*, No. 2 : 587-589.

Mahadevan, S. and K.N. Nayar., 1968. Underwater ecological observations in the Gulf of Mannar off Tuticorin VII. General topography and ecology of the rock bottom. *J. mar. biol. Ass. India*. 9 (1) : 147-167.

Mahadevan, S. and K. N. Nayar., 1973. Pearl oyster

resources of India. In : *Proc. Symp. Living Resources of the Sea around India*. CMFRI spl. pub. 659-671 pp.

Pandya, J. A., 1974. Pearl oyster resource and culture experiments in Gujarat. In: R. V. Nair (ed.) *Proc. Group Disc. Pearl Culture*, CMFRI pub. 25-27 pp.

Parulekar, A. H., 1981. Marine fauna of Malvan, - Central West Coast of India. *Mahasagar Bull. nat. Inst. Oceanogr.* 14 : 13-44.

Ranade, M. R., 1977. Occurrence of Pearl oysters in Ratnagiri district. *J. Bombay nat. hist. soc.*, 74 (3): 553-554.

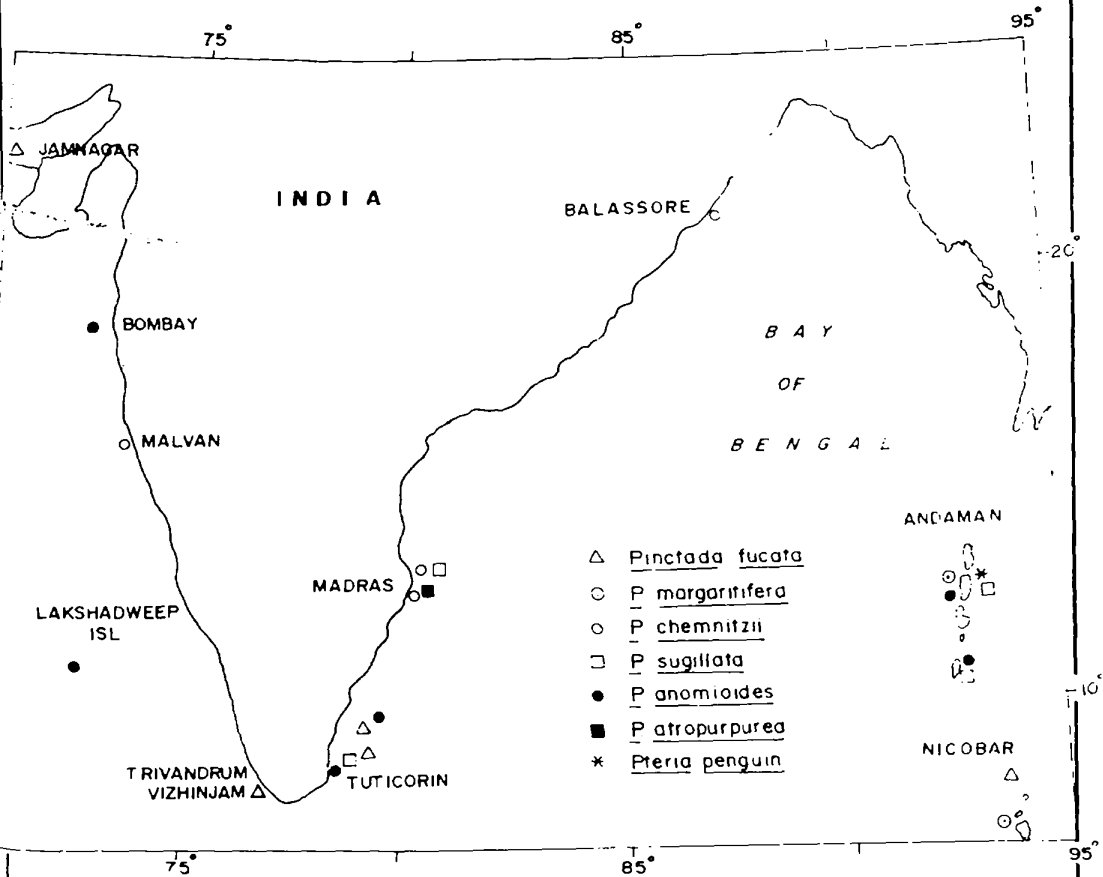


FIG 1 DISTRIBUTION OF PEARL OYSTERS IN INDIAN WATERS

Table 1: Distribution of pearl oysters in the maritime India with their known distributional range.

Species	Distributions in India	Known world distribution
<i>Pinctada fucata</i> (Gould)	Gulf of Mannar, Gulf of Kutch, Vizhinjam, Kerala, Lakshadweep, Andaman & Nicobar Islands	Indian Ocean, Red Sea, Persian Gulf, India & Western Pacific Ocean
<i>P. margaritifera</i> (Linnaeus)	Andaman & Nicobar Islands Lakshadweep	Indo-Pacific region
<i>P. chermutzii</i> (Philippi)	Tranquebar, Madras, Tuticorin Mandapam, Balassore, Palk Bay, Malvan (Central West Coast)	Indo-Pacific region
<i>P. sugillata</i> (Reeve)	Tuticorin, Madras Harbour	Australia, Indonesia, India and Ceybes
<i>P. anomitoides</i> (Reeve)	Bombay, Tuticorin, Mandapam Madras, Andaman and Lakshadweep Islands	Aden, Sri Lanka, Mergui Archipelago, India & Indonesian Islands
<i>P. atropurpurea</i>	Madras and Andaman Islands	Sri Lanka, Mergui Archipelago, India & the Philippine Islands
<i>Pteria penguin</i> (Roding)	Andaman Islands (Myabunder, Havelock & Camorta)	Fiji Islands, Thailand, Malaysia, Indonesia & India