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# FISHERY AND BIOLOGY OF PEARL OYSTERS

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## PEARL FISHERIES

The important pearl fisheries for the marine pearl oysters have been concentrated in Asia. On the other hand, the fresh water pearl fisheries were more popular in Europe and America. The major pearl fisheries in Asia have been in the Persian Gulf, Red Sea, India and Sri Lanka. To a small extent Japan had its natural pearl fishery. In Philippines and Australia, the pearl oysters were fished more for the shells than for the pearls.

In the Persian Gulf, the important pearling areas have been Bahrain, Kuwait, Dubai, Muscat and Bushire. There are more than 120 pearl banks in the Persian Gulf of which 60-70 rich banks are around Bahrain. The Red Sea pearl fishery was of great importance before the opening of the Suez Canal. Some beds are found even now in the Farasan Islands, South of Sabia and Jidda, West of Mecca. These beds are located on the Arabian Coast. In the Dongonab Bay along the coast of Sudan, the pearl shells are fished. In America, Gulf of California, Mexico, Panama and Venezuela have been important centres of pearl production.

In India, the two important areas for pearl fisheries are the Gulf of Mannar and Gulf of Kutch. There are over 60 well-known pearl oyster beds in the Gulf of Mannar at a depth of 10-20 m and at a distance of 11-16 km from the coast of Tamil Nadu. In the recent years, the fishery has been conducted with Tuticorin as the base of operations. However the pearl fisheries are intermittent and there are long gaps of unproductive periods between short spells of productive fisheries. In the recent years there have been annual pearl fisheries from 1955 to 1961 and thereafter the beds have again gone into the recessive cycle. Fishery prior to 1955 dates back to 1928. Over 80 million oysters were fished during the 1955-61 series. The Gulf of Kutch fishery is of a lower magnitude. Although the fishery

used to be conducted once every 3 or 4 years, after 1966 there has been no pearl fishery in that area.

Nearly parallel to the Indian beds, pearl banks exist along the Gulf of Mannar coast of Sri Lanka. The production of these beds has been as fluctuating as that of the Indian beds. After a lapse of 33 years, a pearl fishery was conducted in 1958 which yielded 4.5 million oysters. Subsequently there were two minor fisheries in 1960 and 1961. Fishing for oysters is conducted in the Gulf of Mannar beds of India and Sri Lanka by skin-diving and collection of oysters. As an experimental measure, Sri Lanka introduced dredging operation in 1958. In the Gulf of Kutch, the fishery is conducted by handpicking as the beds are located in the intertidal zone. Fishing for natural pearls to-day is not even a fraction of what existed in older days. The Persian Gulf fishery has gone into oblivion as there has been no real interest. In India and Sri Lanka there have been no fishery for the last two decades as seen earlier. In Japan, Australia and Philippines cultured pearl industry has obliterated the natural pearling and every oyster found is used for production of cultured pearl. Even in the case of freshwater pearls, the beds of Europe have nearly vanished and those of the Mississippi-Tennessee Rivers of U.S.A. are not as productive for pearls as they were before. Thus we find that the natural pearl fisheries have very nearly been replaced by cultured pearl industry. Today one does not talk of the Orient or the Occident pearls but of the cultured pearls.

## BIOLOGY

### Species

In India at least six species of pearl oysters have been recorded. Of these, P. fucata is the only species which contributes to pearl production. In terms of abundance, P. sugillata and P. chemnitzii are next in importance on the mainland. In the Andaman and Nicobar Islands P. margaritifera is the most dominant species.

### Habitat

P. fucata inhabits depths from 10-20 metres in the pearl banks of the Gulf of Mannar. The same species occupies the intertidal habitat in the Gulf of Kutch. Thus the species can adapt itself to different depth conditions within the above range.

P. margaritifera has been collected from the intertidal flats of the Andaman and Nicobar Islands. The pearl oysters live attached to hard substratum such as corals, rocks etc., with the secretion of byssus.

P. fucata also tolerates a wide temperature range in its natural distribution. It occurs in pure tropical conditions in the Gulf of Mannar but lives under temperate conditions in Japan where the winter temperature goes down to about 10°C. The species, though stenohaline, can tolerate short term salinity fluctuations.

### Feeding

Pearl oysters, like other bivalves, are filter-feeders and generally feed on phytoplanktonic organisms. Stomach contents also include bivalve eggs and shelled larvae which are in some seasons found abundantly. Copepods and crustacean appendages are also found. The pearl oyster is a wasteful feeder, and the filtering mechanism is not so efficient as to reject the unwanted materials at the time of food intake. Bivalve eggs, larvae etc. pass out not having been affected by the digestive process.

### Growth

The growth of P. fucata is fast during the first year and reaches about 50-55 mm size during the first year. During the subsequent years the growth is slow. The life span is estimated to be 5 or 6 years and the maximum size is about 10 cm. There are considerable differences in the growth rate from environment to environment. Temperature, availability of food, calcium content of water, depth, clarity, current, load of fouling organisms etc., play an important role in the growth of the pearl oyster.

### Spawning

P. fucata attains maturity at a very early stage when it is about 25-30 mm. The males and females are separate as a rule but hermaphroditic condition is observed in some individuals. In some species a change of sex from one spawning season to the next has been observed. Spawning has two peaks, about July-August and November-December, generally coinciding with the south-west and north-east monsoons respectively. Individual oyster spawns more than once in the same spawning season as the gonads are not emptied at one stretch.

### Development

The eggs and sperms are shed by the spawning pearl oysters into the sea water and fertilisation is external. The fertilised eggs pass through the morula, gastrula, trochophore and straight-hinge stages before the typical molluscan valiger stage is reached in about 24 hours from fertilisation. Subsequent development takes the larva through the umbo and full-grown stage. The larva sets as spat when it is about 0.3 mm. The Japanese oyster completes these developmental stages in about 3 weeks.

### Parasites and predators

Pinctada fucata has been reported to harbour quite a few parasites. The cestode Tetrahynchus unionifactor, trematodes Mutua margaritifera, Musalia herdmanni and Aspidogaster margaritifera, and nematodes Ascaris meleagrinae and Cheiracanthus uncinatus have found to be the common helminth parasites. Some of these parasites, may play a role in the formation of natural pearls constituting the nucleus. Occasionally the pea crab Pinnotheres sp., is found in the body cavity of the pearl oyster.

Externally, a number of organisms constitute the fouling complex on the pearl oyster, the important among them being the barnacles, ascidians, bryozoans, molluscan spat and algae. Boring organisms such



the sponge Cliona and polychaete Polydora can cause havoc to the shells.

The predators of pearl oysters are many. Octopus, file fishes and rays are the worst enemies which devour the oysters. Some of these can cause large-scale destruction of natural beds.

#### BIOLOGY OF PEARL

A pearl is merely an isolated concentration of the shell material made by the secretory mantle, which produces the main shell of the mollusc itself. When the pearl is formed in a nacreous shell, it is lustrous and qualified to be considered a gem. One produced in a porcellaneous, dull, white shell will also be dull and porcellaneous and will be only a concretion. The creation of a pearl may be considered an accident of nature. They are formed only when a foreign body becomes embedded in the mantle tissue or in any other tissue with a chance of a piece or a few cells of the mantle sticking on it as the foreign body makes its entry into the oyster. A pearl is also formed when the foreign body gets lodged between the shell and the mantle. Under the above conditions, unless the substance is rejected by the mollusc, it will be covered over by the mantle tissue in a few days forming a pearl-sac. The pearl-sac secretes the nacreous substance which gets deposited over the foreign substance which acts as the core material or nucleus of the pearl. Secretion and deposition of nacre continues with the life of the pearl oyster and a fine pearl is formed in course of time. Sometimes pearls are found without any trace of nucleus. In such cases at least a few broken cells of any tissue of the oyster or even the blood cells could have formed the nucleus. As these are not detectable they are called nucleusless pearls.

When the pearls are formed in the mantle or in any soft tissue of the oyster, they are free pearls. They are rarely round as they generally follow the shape of the nucleus. Also the pressure of

tissues can cause flattening on some facets. Such irregular free pearls are called "baroques". The size of the pearl would depend on the size of the nucleus and the duration of the process of secretion. When the pearls are formed between the shell and the mantle, they are always attached to the shell and are therefore called blisters. Pearls of the finest nacre are produced by Pinctada fucata and P. maxima. P. margaritifera produces fine black pearls but very rarely. These pearls produced by the pearl oyster without the interference of man are called the natural pearls.