

PEARL CULTURE IN INDIA

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ABSTRACT

Two regions in India namely the Gulf of Manner in the Bay of Bengal and the Gulf of Kutch in the Arabian Sea have pearl oyster resources of considerable magnitude. The species of oyster which is known to produce natural pearls at both these places is Pinctada fucata. In 1972, a site (Veppalodei) near Tuticorin in the Gulf of Manner was selected for conducting experiments on pearl culture. The techniques used for raising the oysters and for producing cultured pearls were similar to those used in Japan. At first a fairly large population of pearl oysters was raised on floating rafts. The growth of oysters on the rafts was rapid, although fouling by different organisms became a serious problem. When sufficient numbers of healthy oysters became available, a minor surgical operation was performed on each oyster. A graft tissue and a nucleus were introduced in the tissues of the oyster. The nuclei were readily accepted by the oysters and for the first time in India free spherical cultured pearls were produced. The growth of pearls in the pearl-sec developed by the oysters was rapid and the lustre over the nuclei became well marked in 43 days, and within 3 months, cultured pearls began to be obtained. At first the nuclei used in the experiments were imported from Japan, but subsequently a process for the production of spherical beads from the shells of the Indian conch, Xancus pyrum was developed. Pearls obtained using conch beads were of similar quality as those from the Japanese beads. From these investigations it is now

possible to develop a pearl culture industry in India purely from indigenous efforts.

INTRODUCTION

In India the pearl oyster resources are found in the Gulf of Kutch (Arabian sea) along the northern coast of Gujarat and in the Gulf of Mannar (Bay of Bengal) adjoining the Tamil Nadu coast (south-east India). From 1913 to 1939, the fishery for natural pearls took place in Gujarat every alternate years in the oyster beds known as "Khaddas". These beds are found within the tidal zone and get fully exposed during the ebb tides. They are located in the coral reef areas. (Kaswaran et al., 1969). From 1939 onwards the pearl fishery continued every 3-4 years till 1967. After that, because of serious depletion in the oyster population, there has been no fishery at all. In each season, the average number of oysters fished from 1950 to 1967 was about 17,000.

In the Gulf of Mannar, the pearl oyster banks, locally known as "paars", are always found underwater on the submerged areas of coral reefs or in between bottom rocks. The oysters are collected by skin diving. During the fishing seasons for pearls, which were in all 13 from the years 1900 to 1961, more than 60 pearl banks or "paars" were exploited and due to indiscriminate destruction of oysters, the resources were seriously depleted. In the 7 fishing seasons, which took place from 1955 to 1961, more than 86 million oysters were collected (Alagarswami and Qasim, 1973).

The pearl oyster which contributes to the fishery at both the places in India is Pinctada fucata. It breeds several times during the year and the spats keep settling to the bottom periodically. The average life span of the pearl oyster is 6-7 years during which period it attains a size of about 75 mm. It grows fairly fast during the first few years of its life and thereafter it shows little growth (Devanesan and Chidambaram, 1956).

PEARL OYSTER FARMING ON RAFTS

Hornell (1916 and 1922) indicated that farming of pearl oysters and inducing them to produce pearls would be the only satisfactory way of making the Indian pearl fishery remunerative. From 1933 onwards a series of efforts were made by the Government of Madras (Tamil Nadu) to produce cultured pearls, but no success was achieved (see Chacko, 1970). As mentioned earlier, since 1967 in Gujarat and since 1961 in Tuticorin, there has been no fishery for natural pearls at all.

In 1972, a site about 25 km north of Tuticorin was selected for farming the pearl oysters. This site was in a coastal village called Veppalodai. It offered several advantages over the other nearby sites, for it was away from the fishing route, close to the pearl oyster beds, relatively unpolluted, and had a hard substratum with pieces of corals and shells. Oysters were collected from the pearl banks by SCUBA diving and skin diving. These were brought to the shore laboratory and each oyster was measured and weighed. The oysters were then placed in sandwich type frame nets made of two frames of steel rods of 6 mm diameter. The frames were woven with synthetic twine to get uniform meshes of 2 cm square. Each frame measured 60 cm x 40 cm and was divided into 5 equal mesh sections. Two of these frames jointly formed a sandwich-type frame net. The frames were thickly painted with anti-corrosive paint. In each section of the frame, 6-10 oysters were arranged in a row, with their hinged portion pointing downwards and the anterior portion of each oyster resting over the posterior portion of another oyster in an overlapping fashion. The frames were secured firmly with the help of twine running along the sides.

The nets were suspended from a raft made of teak wood planks and casuarina poles mounted on 4-5 wooden barrels or empty metal drums of about 200 litre capacity each. The dimension of the raft was

6.1 m x 4.6 m. Each raft could easily hold about 30 pearl nets which in all contained 900-1500 oysters. In the first phase of oyster farming, 4 such rafts containing 3,600 to 6,000 oysters were maintained and all the rafts were kept 1.5 km away from the shore. The survival of the oysters on the rafts during this phase, which lasted from December 1972 to October 1973, was about 78%. The main cause of mortality was the settlement of fouling organisms over the oysters. Of the various fouling organisms, the settled larvae of the bivalve, Avicula vexillum in May and June and the barnacles, Balanus amphitrite from July to September were very dominant. Very often 40-60 barnacles were found settled on a single oyster. The settlement of barnacles generally cemented the valves of the oysters resulting in their death.

From May to about October, there was a regular settlement of pearl oyster spats on the frame nets. These spats came as a result of breeding of oysters in the farm. Thus it is possible to collect a fairly large number of young pearl oysters from the farm itself by suspending suitable spat collectors. Once the technique for the collection of young oysters is standardized and used as a routine, there will be no need for diving operations to collect the oysters from the submerged pearl banks.

TECHNOLOGY OF CULTURED PEARLS

In a series of recent communications, the details of farming procedure and the technique of producing cultured pearls have been described (Alagarwami, 1970 and 1974, Alagarwami and Qasim, 1973 and 1974). The techniques used were similar to those developed and perfected in Japan. These can be summarized as follows:

Pearl oysters grown on the raft were brought to the laboratory where they were conditioned in standing sea water. Healthy oysters were then narcotized in a menthol-sea water solution in batches. From one narcotized oyster, mantles were removed and cut into small bits to be used as grafts. These grafts were placed on a smooth

wooden block. The oysters were then fixed one by one on a special stand and the openings of their valves were regulated with a special pair of tongs. An incision was made at the base of the foot of each oyster and a piece of mantle was first introduced either in the region of the gonads or in the alimentary canal. This was immediately followed by the insertion of a nucleus into the cut along with the remaining portion of the graft tissue covering the nucleus. The surgical instruments were then withdrawn and the operated oysters were returned to running sea water in basins for recovery. The oysters generally accepted the nuclei, and if they rejected them, they did so within a few hours. A few, however, rejected the nuclei even after 2-3 days. The oysters were, therefore, kept under observation for about a week and all those which had accepted the nuclei were returned to the raft.

The oysters were examined periodically and the nacre deposition on the nuclei was found to commence 30 days after the operation. The lustre on the pearls improved with time, and 3 months after the operation, free spherical cultured pearls were produced. The size of the pearls increased with time. The pearls were generally white, ivory, golden yellow and steel grey in colour.

From these findings it is clear that the pearl oyster from the Gulf of Mannar can yield high quality cultured pearls. Another point of interest is that since the water in the south-east coast of India is uniformly warm, the deposition of nacreous layer over the nuclei is much faster than in Japanese water where the temperature is low.

In the first few sets of experiments, the nuclei (shell beads) imported from Japan were used, but subsequently efforts were made to produce shell beads indigenously from the conch shell (sacred chank) Xancum pyrum. The reason for choosing the sacred chank was that in India this shell is being used for making bangles and rings. From each shell, two pairs of bangles are obtained when it is cut along a particular angle. The rest of the shell goes

as waste. Thus, a supply of the unused portions of the conch shell is readily available. The following technique was used for making the shell beads:

Two pairs of circular corborandum wheels of different smoothness were taken. In each pair, the top wheel was about half the size of the bottom one. These were fixed inside a suitable metallic housing and fitted to an ordinary bench drill. The top wheel was inserted to the spindle of the drill and the bottom one was fixed on to the platform of the drill which moved to and fro from the axis of the pillar with a sliding action. The details of the equipment and the method of making beads have been described by Velu, Alagarwami and Qasim (1973).

The conch shell was first cut into small pieces with a chisel and their sharp edges were smoothed by an ordinary grinder. These ground pieces were roughly sorted out into different size groups. Pieces of almost similar sizes were placed on the bottom wheel and the top wheel was lowered until it began to touch the shell pieces. The coarser wheels were used first. When the motor of the drill was switched on, the top wheel rotated at 1500-2000 r.p.m., while the bottom wheel oscillated with a frequency of 50-60 oscillations per second. Due to simultaneous rotatory and oscillatory movements of the upper and the lower wheels, the cut pieces of the conch shell were turned into spherical beads. The use of the finer pair of grinding wheels and a weak solution of hydrochloric acid made the beads perfectly spherical with a bright polished surface.

In the next series of experiments, the indigenously made beads were used as nuclei and the quality of cultured pearls obtained using these beads was very similar to that of the Japanese beads.

From the technology noted above, it has now become possible in India to develop a pearl culture industry entirely from indigenous efforts. Further refinements in the methodology are in progress and it is hoped that the pearl culture in India will soon be taken

up both in the public and private sectors on a commercial scale.

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