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PROBLEMS AND PROSPECTS OF PEARL CULTURE IN INDIA

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INTRODUCTION

When Kokichi Mikimoto took the small step forward in 1893 by producing a few blister pearls in the Japanese pearl oyster *Pinctada martensii* (= *P. fucata*) at the coastal village of Jinmiyonmura on Ago Bay, a new industry of pearl culture was born. As he was building up a small-scale industry, a few marine scientists and technicians got themselves interested in it and, in 1907, Tokichi Nishikawa produced the first spherical cultured pearl in the oyster. Subsequently, the credibility of cultured pearl as jewel was established in the 1920s and was followed by a boom of pearl culture industry with a master touch of Mikimoto and several other industrialists who joined the bandwagon. After World War II, pearl culture industry was established in Australia, Philippines, Burma, Thailand, Malaysia and Indonesia, all with Japanese collaboration.

In India, since late James Hornell sowed the idea of pearl culture in 1916, there has been interest and some experimental work done in Tamil Nadu since 1938 and in Gujarat since 1958. However, success in developing the technology was achieved only in 1973 when the first batch of free, spherical cultured pearls was produced at the Central Marine Fisheries Research Institute (Alagarswami, 1974). While research on pearl culture continued since then, it took a decade for the establishment of an industry for the production of cultured pearls in 1983. This paper briefly identifies the problems of pearl culture in India and indicates the prospects for future.

RESOURCE OF PEARL OYSTERS

The pearl fisheries of India in the Gulf of Mannar and Gulf of Kutch have been well known for the production of the finest of natural pearls. Both are based on the species *Pinctada fucata*. The major problem with these resources has been that production in natural beds has fluctuated very wildly and the years when they have yielded to fishery have been a few and far between (Mahadevan and Nayar, 1973). Resource of such character cannot be depended upon in pearl culture for which the supply of oysters has to be on time and in required numbers. A second species of pearl oyster *P. margaritifera* has recently been suggested as a potential candidate species for pearl culture in India based on the indicative survey on mariculture potential of Andaman and Nicobar Islands carried out by the CMFRI (Alagarswami, 1983). The species does not occur along the mainland coast in any appreciable numbers. A species which is believed to occur in the Andaman and Nicobars, based on the analogy of its occurrence and culture in the Mergui Archipelago of Burma, is *P. maxima*. Several other species such as *P. sugillata* and *P. anomioides* occur in the Indian waters but these have not been found useful in production of cultured pearls. It is obvious that *P. fucata* will form the mainstay in any pearl culture effort in India with *P. margaritifera* as supporting species when technology is worked out. The problem has been in the area of assured steady supplies of pearl oyster.

The efforts on enhancing the resource through spat collection have not been very successful as can be seen from the data presented in some of the chapters of this Bulletin. Spat collection on the natural beds of Gulf of Mannar is logistically difficult in terms of distance, depth, accessibility and security and no meaningful effort could be made so far. Spat settlement in inshore areas has been moderate but it is composed of multi-species *Pinctada* populations with a progressively declining *fucata* component as seen at Vizhinjam (Achari, 1982) and at Tuticorin (Alagarswami, 1977). The general conclusion that arises from the experimental work conducted so far is that inshore spat collection would not be of much use in pearl culture.

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In this despairing situation, the silver lining was the development of hatchery technology for production of pearl oyster at the CMFRI (Alagarswami *et al.*, 1983). It has been shown that over a million spat of *P. fucata* can be produced in one larval rearing in the hatchery. The technology is adoptable for any species of marine bivalve. Experimental success has recently already been obtained with *P. margaritifera.* It is a question of rearing the spat upto the stage they can be used in pearl production programme which is one of farm management problems.

Maintaining a ' breeding reserve ' of pearl oysters in the Gulf of Mannar has been a popular suggestion put forward by earlier workers (Devanesen and Chidambaram, 1956). The present author has been interested in sea-ranching of pearl oyster from hatchery to the natural beds to see the possibility of reviving the pearl oyster population. The programme, commenced by end of 1985, is under monitoring.

Technology of Pearl Culture

For over half a century the technology of pear culture has not undergone much change from the basics of cultured pearl production (Cahn, 1949 ; Alagarswami, 1970 ; Wada, 1973 ; Mizumoto, 1979 ; Kafuku and Ikenoue, 1983 ; Ward, 1985). Till late 1960s when the pearl crash occurred after 1966, even the need for change was not recognised at the farmer's level. Subsequently there has been overwhelming interest in experimental work in two directions, namely genetic improvement of stocks and tissue culture of mantle. Practical application of mantle tissue culture in production of cultured pearl has already commenced (*Technocrat*, 18 (4), 1985).

The techniques of farming and pearl production developed in 1973, continue to remain in the region of basics. The rate of pearl production and composition of grades remain around the average. There is need for change and improvement in technology along modern lines if pearl culture in India is to be competitive.

Infrastructure and Manpower

Pearl oyster farming is the major component of the activities of pearl culture. This is a continuous operation with rafts, longlines or bottom platforms in position in the sea round the year, with the pearl oysters coming in and going out of the farm. The marine conditions are dynamic with seasonal changes and annual variations. Areas subject to monsoon, typhoon and cyclone have to pay a very high premium in maintaining structures in the open-sea. Certain countries have ideal locations along their coast in their bays and lagoons to carry out pearl oyster farming without any major problem such as Japan, Australia and Philippines. The Indian pearl culture at present has a special problem in this respect with almost straight coastlines of the mainland. The only area which has some protection and affords tolerable sea conditions is the Gulf of Mannar where pearl culture is being carried out. By no means these are ideal conditions as compared to the Japanese bays. The Andaman-Nicobar and Laksbadweep islands offer better scope and conditions for pearl culture but lack other necessary infrastructure facilities. The future for pearl culture would appear to lie in these islands. Pearl culture on the mainland coast would need greater logistic support and investment in farming than in the islands,

A programme of manpower development for pear culture was initiated at the CMFRI as early as 1976 with the establishment of training courses (CMFRI, 1977). Transfer of technology has been done at various levels and in different manner through training, technical expertise and consultancy. There is no problem in this respect and certain foreign institutions have been interested in the Indian expertise in pearl culture.

R & D Requirements on Pearl Culture

Some of the major thrust areas for further development of pearl culture are identified here. Directed efforts are needed to improve gross production and quality of cultured pearls in *Pinctada fucata.* Specific technology for *P. margaritifera* has to be developed for production of high value black pearls. Spat collection of the latter species in the Andaman-Nicobar Islands will have to be attempted adopting standard methods already available in other areas such as Sudan and French Polynesia (AQUACOP, 1982).

An important aspect of pearl culture which remains to be looked into is production of shell bead nuclei indigenously. The early experimental work by Velu *et al.* (1973) has not been followed up. This engineering problem will have to be solved with some urgency if the dependence on imports of nuclei from Japan has to be dispensed with.

Identification of sites and development of appropriate farming technology would need priority attention. Modern systems and materials should replace the structures used in farms. Prevention and

control of fouling and boring organisms appear to be a major area where simple and cost-effective measures have to be developed.

It will pay more dividends if the Central Agricultural Research Institute of ICAR at Port Blair could strengthen their pearl culture programme in the Andaman and Nicobar Islands with a proper resources and site survey and experimental work on *P. margaritifera*. The inference on possible occurrence of *P. maxima* has to be followed up. Likewise, the small effort in Bangaram island of Lakshadweep will have to be strengthened by the Administration with continued support from CMFRI.

The CMFRI which forms the nucleus for pearl culture research in the country may get involved in finer and critical aspects of pearl production adopting modern techniques of breeding and tissue culture. Oysters in the farm suffer high mortality due to unknown factors and investigations on pathology and disease control would be essential. Hatchery production has to be further examined for achieving higher survival rate and faster growth of larvae. Multidisciplinary research involving genetics, reproductive physiology, nutrition, pathology and water quality management will require greater purposeful orientation for achieving the intended results.

REFERENCES

ACHARI, G. P. K. 1982. New designs of spat collectors, breeding hapas, cages and improved technology for pearl farming *Symp. Coastal Aquaculture*, Abstract No. 182, 12-18 January, 1980, Cochin, Mar. Biol. Ass. India.

ALAGARSWAMI, K. 1970. Pearl culture in Japan and its lessons for India. *Proc. Symp. Mollusca*, Part III : 975-993. Mar. Biol. Ass. India.

ALAGARSWAMI, K. 1974. Development of cultured pearls in India. *Curr. Sci.*, 43 (7) : 205-207.

ALAGARSWAMI, K. 1977. Larval transport and settlement of pearl oysters (genus *Pinctada*) in the Gulf of Mannar. *Proc. Symp. Warm Water Zoopl. Spl. Publ.* UNESCO/NIO, pp. 678-686.

ALAGARSWAMI, K. 1983. The black-lip pearl oyster resources and pearl culture potential. In : Mariculture potential of Andaman and Nicobar Islands (K. ALAGARSWAMI, Ed.), *Bull. Centr. Mar. Fish. Res. Inst.*, 34 : 72-78.

ALAGARSWAMI, K., S. DHARMARAJ, T. S. VELAYUDHAN, A. CHELLAM, A. C. C. VICTOR AND A. D. GANDHI. 1983. Larval rearing and production of spat of pearl oyster *Pinctada fucata* (Gould). *Aquaculture*, 34 : 287-301.

AQUACOP. 1982. French Polynesia—Country Report. In : *Bivalve culture in Asia and the Pacific* (F. B. DAVY and M. GRAHAM, Eds.), Proceedings of a Workshop held in Singapore, 16-19 February 1982, Ottawa, Ont., IDRC, pp. 31-33.

CAHN, A. R. 1949. Pearl culture in Japan. *Fish. Leaflet, U.S. Fish and Wildl. Serv.*, 357, 91 pp.

CMFRI 1977. *Pearl culture training*. CMFRI Special Publication, 1 : 39 pp.

DEVANESAN, S. W. AND K. CHIDAMBARAM. 1956. Results obtained at the pearl oyster farm, Krusadai Islands, Gulf of Mannar and their application to problems relating to pearl fisheries in the Gulf of Mannar, Part I. *Contr. Mar. Biol. St. Krusadai Is., Gulf of Mannar*, 4 : 1-89.

KAFUKU, T. AND K. IKENOUE (Eds.). 1983. *Modern methods of Aquaculture in Japan*. Kodansha Ltd., Japan and Elsevier Scientific Publishing Co., Amsterdam, 216 pp.

MAHADEVAN, S. AND K. N. NAYAR. 1973. Pearl oyster resources of India, pp. 659-671. *Proc. Symp. Living Res. Seas India* CMFRI, 1973.

MIZUMOTO, S. 1979. Pearl farming in Japan. In : *Advances in aquaculture* (T. V. R. PILLAY and W. M. A. DILL, Eds), Fishing News Books Ltd., England, pp. 381-385.

VELU, M., K. ALAGARSWAMI, AND S. Z. QASIM. 1973. Techique of producing spherical shell beads as nuclei for cultured pearls. *Indian J. Fish.*, 20 (2) : 672-676.

WADA, K. 1973. Modern and traditional methods of pearl culture. *Underwater Journal*, 5 (1) : 28-33.

WARD, F. 1985. The pearl. *National Geographic*, 168 (2) : 193-222.