

FIG. 2. Variation of chromic oxide content with (007) spacing. The upper curve represents octahedral chromium and the lower curve tetrahedral chromium (after Lapham, 1958).

suggested the use of names peninite and clinocllore by prefixing the term 'chromium'.

The plot of  $\text{Cr}_2\text{O}_3$  against  $d_{007}$  and  $\text{Cr}_2\text{O}_3$  against intensity of 002 reflections for Byrapur chlorites on the diagrams of Lapham (Figs. 2 and 3) indicate that chromium in both the flaky and lamellar chlorites is in the octahedral position. The presence of more than 2% chromium and its occupancy in the octahedral sites warrants the classification of both the flaky and lamellar chlorites of Byrapur as kaemmererites.

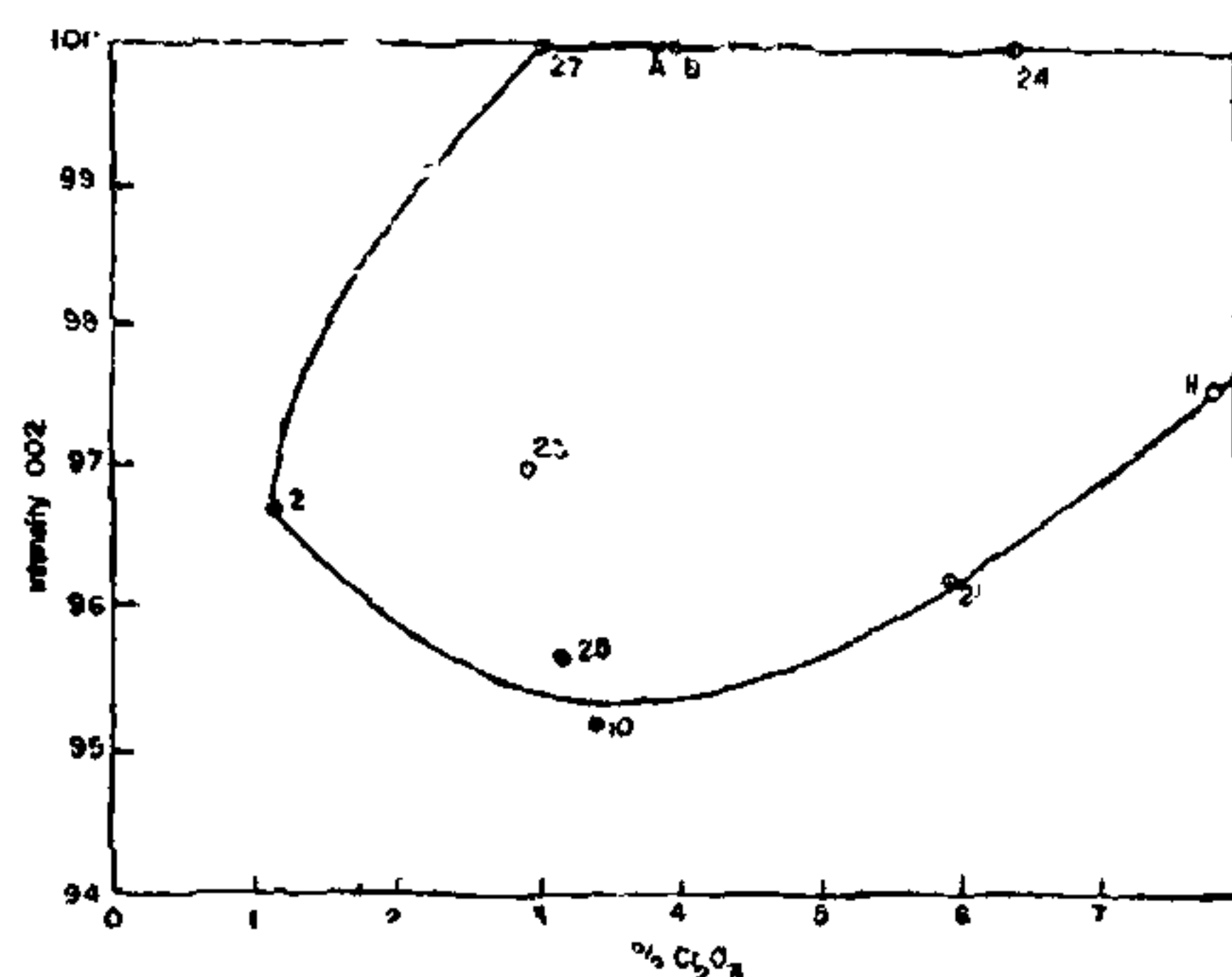


FIG. 3. Variation in chromic oxide content with (002) intensity. The upper curve represents octahedral chromium and the lower curve tetrahedral chromium (after Lapham, 1958).

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## DEVELOPMENT OF CULTURED PEARLS IN INDIA

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THE technology of production of spherical cultured pearls was first developed in Japan in 1907<sup>1</sup>. In Australia, the first experimental production of cultured pearls was reported in 1957<sup>2</sup>. In India, experiments to produce cultured pearls commenced in 1933 but, despite prolonged efforts, were not successful<sup>3</sup>. The present author, in an earlier communication, described the pearl culture technology of Japan and indicated the prospects of producing cultured pearls in the Indian pearl oyster *Pinctada fucata*<sup>4</sup>. Experiments on pearl culture were initiated at the Pearl Culture Laboratory of the Central Marine Fisheries Research Institute at Veppalodai (near Tuticorin) in December 1972. The successful development of the

technology, for the first time in India, is described here.

### EXPERIMENTAL PROCEDURE

A pearl oyster farm was established in the Gulf of Mannar, about 1.5 km off Veppalodai. Modern method of raft culture was employed for rearing the oysters which were collected from the pearl banks off Tuticorin. The pearl oysters, after they have grown in the farm for a few months, were brought to the laboratory for surgical operation. A total of 150 oysters was operated in the first series of experiments during May-August 1973. The oysters ranged 53.7–69.0 mm along their dorso-ventral axis and 25.5–51.5 g in weight.

The oysters were kept in a fibreglass tank holding about 1000 litres of sea water for the initial conditioning. On the day of operation they were removed in batches, cleaned and placed in glass troughs containing sea water. Menthol crystals were spread over the surface for further conditioning. When the oysters were found adequately narcotised, they were taken out one by one and clamped on a special stand for the operation. The shell-opening was regulated to an optimum gap with a pair of tongs. A healthy unconditioned oyster was opened and portions of mantles were cut. Small bits of about 2 mm square were prepared from the mantle and kept moist under aseptic conditions to be used as graft tissues. Spherical shell beads used as nuclei were obtained from Japan and these were of 3-4 mm diameter. Larger nuclei of 6 mm diameter made indigenously from the conch shell were also used in a few cases to study their suitability.

pletion of the operation the oysters were returned to sea water in basins.

Within minutes of their immersion in sea water, the oysters began to show signs of recovery. They were kept for a week in the laboratory in wooden vats arranged in a series in which a constant flow of sea water was maintained. There were a few instances of ejection of nuclei in the early stages of the experiments. Subsequently, the oysters were returned to the raft in the farm. During the post-operative phase of culture, the oysters were periodically taken out and cleaned of the fouling organisms.

### RESULTS

The operated oysters were examined in batches for the development of cultured pearls. The results obtained in 77 oysters so far examined are presented in Table I.

TABLE I

*Results of experiments on production of cultured pearls*

Batch No.	Date of operation	Date of examination for pearls	Duration of post-operative culture (days)	No. of oysters examined	No. of oysters		
					Nucleus ejected	Nucleus present, but no pearl	Pearls produced
I	12-6-1973 25-6-1973	25-7-1973	30-43	11	5	4	2
II	25-6-1973 2-7-1973 10-8-1973	18-10-1973	69-108	16	3	7	6
III	10-8-1973 14-8-1973	16-11-1973	94-98	12	2	3	7
IV	14-8-1973 16-8-1973	22-1-1974	159-161	18	3	4	11*
V	16-8-1973	24-1-1974	161	11	3	-	8
VI	16-8-1973	23-2-1974	191	9	-	-	9
Total				77	16	18	43

\* Of the 11 pearls, two were produced with conch shell nuclei made indigenously.

During the operation, an incision was made at the base of the foot and a graft piece was carefully inserted within the tissues of the oyster. This was followed by the implantation of a nucleus with the aid of special instruments. The graft piece and the nucleus were brought in contact with each other as far as the two could be manipulated. Gonads and the alimentary canal of the oyster were the two sites used for implanting the nuclei. On the com-

The above cultured pearls, though removed from the oysters sooner than the intended period of culture with a view to assessing the success of the experiments, form the first series of free, spherical cultured pearls produced in India. Deposition of nacre over the nucleus was observed 30 days after the operation and the pearl had a distinct lustre after 43 days. Those produced between 69 and 191 days were of bright lustre. The results



of the experiments show a progressive improvement in the techniques employed in the operation. The



FIG. 1. The Indian pearl oyster *Pinctada fucata* with a cultured pearl *in situ* (indicated by arrow).

ratio of 8 pearls out of 11 oysters obtained in batch V is considered to be extremely good. Cent per cent success was achieved in batch VI. Pearls

were produced both in the regions of gonads and alimentary canal. Pearls of different colours, namely, silver white, ivory white, light pink, golden yellow and steel grey, have been obtained among those so far produced. The growth of pearl has been found to be faster in the warmer waters of the Gulf of Mannar than in the well-known colder areas of Japan. These experiments prove that an industry of cultured pearls can be developed in India entirely from indigenous efforts.

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