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Pearl Culture Experiment along Kerala Coast

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Abstract

The spat of the Indian oyster, *Pinctada fucata* (Gould) and nucleated pearl oysters were transported to a farm set up in the sea off Andakaranazhi near Cochin, Kerala. They were cultured in a longline system from December 1994 to May 1995. The 3 month old pearl oyster spat of 15.9 mm average length attained 46.2 mm in 5 months. The nucleated pearl oysters also showed faster growth and survival. Pearl production in the nucleated oysters worked out to 33%.

Introduction

Pearl culture technology and hatchery production of pearl oyster spat was developed by the Central Marine Fisheries Research Institute, India in the late 70s (Alagarswami and Qasim, 1973, Alagarswami, *et al.*, 1983). Since then most of the research effort on pearl oyster and commercial production of pearls was carried out in the Gulf of Mannar and Palk Bay in close proximity to the natural pearl oyster beds. With the objective of expanding the pearl culture to other areas along the Indian coast, a location testing programme on pearl culture was conducted by CMFRI at Cochin and the results are presented here.

Andhakaranazhi situated about 37 km south of Cochin was selected as the site for the experimental work. The two bar mouths, one near the experimetnal site and the other at Chethi, about 15 Km south open to the Arabian Sea only during the monsoon (June to September); stable high saline conditions prevail during October to May.

Materials and Methods

Two sets of experiments were carried out simultaneously, to study the growth and survival of pearl oyster spat of 13.2 - 19.0 mm length and the survival of implanted adult oysters and assess the pearl culture production.

Pearl oyster spat and adult implanted oysters were transported by road from the shellfish hatchery of CMFRI at Tuticorin in December, 1994. After a tranist period of 11 hrs they were brought to the laboratory at Cochin where 90% of the adult oysters spawned. These oysters were taken to the experimental site and kept in fibreglass tanks of 80 l capacity. They were acclimatized to the ambient conditions for 48 hrs and provided with aeration. After acclimatization the pearl oysters were stocked in cages and suspended from a long-line moored in the sea.

Pearl oyster culture in India has been mostly by suspending cages from the racks or rafts. The strong wave action in the coastal region off Cochin was not considered favourable for pearl culture using raft or rack. Hence the pearl oysters were cultured by the long line method since they can withstand the rough sea conditions better than the raft or rack. A long line of 15 m length was fabricated using a 12 mm wire rope. Small floats (22.5 cm dia 2 nos. and 15 cm dia 11 Nos.) and empty 40 l jerry cans (2 nos) were used to give buoyancy to the longline. Two concrete blocks each of 50 kg were used as anchors. The longline was moored at 5 m depth, 200 m away from the shore.

Cages of 40 x 40 x 10 cm size made of 6 mm diameter iron frame covered with a synthetic fishing net of 1 - 1.5 cm mesh were used for rearing the pearl oysters. For rearing the pearl oyster spat, the cages were inserted into a velon screen bag of appropriate smaller mesh size. The pearl oyster spats numbering 659 were stocked at 325 and 324 numbers respectively in two cages and suspended at a depth of 2 m from the surface. After 30 days, part of the pearl oyster spat were transferred into an additional cage for thinning. The adult implanted oysters, numbering 69, were stocked in one cage. The growth increment and survival of the pearl oysters were noted at monthly intervals. The cages and the pearl oysters were cleaned at monthly intervals by removing the fouling organisms and the silt/mud.

Environmental Data: Data on Atmospheric temperature, surface water temperature, pH, salinity (titration method) and primary production (dark and light bottle method) were collected at monthly interval.

Results and Discussion

During the culture period, the hydrographic conditions of the farm did not show wide variation (Table 1). The surface water temperature ranged between a minimum of 25.4°C in December and a maximum of 27.2°C in May. The atmospheric temperature gradually increased from 28.6°C in December to reach a peak value of 31°C in May. The surface water salinity also showed a gradual increasing trend from 34 ppt in December to 36.3 ppt in May. The pH of water was highest 8.4 in December which decreased to 7.9 in March. The gross primary production of the water ranged between 250 mg C/m^3/day in January, 1995 and 3570 mg C/m^3/day in December 1994.

Table 1. Hydrographic data of the pearl oyster farm during the culture period

Month	pH	Salinity (ppt)	Water temperature (°C)	Atmospheric temperature (°C)	Dissolved Oxygen (ml/l)	Productivity Gross mgC/m³	Productivity Net mgC/m³
December	8.4	34.0	25.4	28.6	2.2	3.57	2.05
January	8.3	35.0	25.8	29.5	2.5	0.25	0.77
February	8.0	35.0	26.1	29.5	3.4	1.54	0.54
March	7.9	35.2	26.2	30.0	4.1	1.54	1.02
April	7.9	35.5	26.3	30.0	4.4	1.80	1.02
May	7.9	36.3	27.2	31.0	4.6	1.95	0.62

Table 2. Comparison of thickness of nacre in cultured pearls in different areas

Nucleus diameter (mm)		Thickness of nacre of cultured pearl (mm)	Duration of culture	Converted into/months (microns)
Japan (Cahn, 1947)				
3.05		0.318	2 years	13.25
4.10		0.363	2½ years	12.10
6.10		0.439	3 years	21.19
7.90		0.500	3½	11.91
India (Algarswami, 1975)				
3.00	Tuticorin	0.32	191 days	50.26
4.00	Tuticorin	0.31	161 days	57.76
5.81	Tuticorin	0.26	159 days	49.06
*3.00	Cochin	0.439+	164 days	80.31
*3.00	Tuticorin	0.061 calculated	36 days	50.83
*	Total	0.500	200 days	75.00

* Implanted and grown for 36 days at Tuticorin and the same animals were transplanted to Cochin and further rearing was continued for 164 days till harvest at Andhakaranazhi, near Cochin.

At the time of stocking, the pearl oyster spat had an average length of 15.9 mm (13.2 to 19.0 mm) and average weight 0.99 g and at the time of termination of the experiment the pearl oysters have grown to an average length of 46.2 mm and average wt. of 12.17 g. During the culture period fo 164 days the spat showed a growth rate 0.16 mm/day (4.8 mm/month) with an average weight increment of 0.07 g/day (2.1 g/month). This is faster than the growth rate of 47 mm in 8 months (age at 1 year) of the same age group of pearl oyster spat grown in the farm at Tuticorin on the east coast (Chellan, 1988). The DVM of one year old pearl oysters in the natural population at the Gulf of Kutch was found to be 45 mm (Narayanan and Michael, 1968) while in the Krusadai Island growth was reported to be 44 mm in one year, (Devanesan and Chidambaram, 1956). The high growth rate obsreved in the present culture experiment can be attributed to the almost stable marine environment conditions which prevailed at the farm during the culture period. Moreover the productivity at the farm site was higher than that observed in the Tuticorin farm (Victor and Velayudhan, 1987).

Pearl oyster spat brought from Tuticorin were healthy and did not show any sign of stress. There was no mortality and all the oysters were acclimatized before stocking. During the first two months there was no mortality of the cultured spat. However in March 88.5% of the stock perished as the local fishermen out of curiosity, removed the cages from the farm and left them on the sea bed. After this unforseen incident there was no mortality till the termination of the experiment.

Of the 400 pearl oysters implanted on 28.10.1994 with 3 mm diameter nuclei only 69 nos. survived. This low survival rate (17.25%) was due to the stress induced during tranist and the sudden spawning of pearl oysters at Cochin. 43.83% mortality was noted in the oysters after first 30 days of stocking. After this 24 nos. were lost due to the mishandling of the cages by the fishermen as mentioned above during March, 1995. There was no mortality in the remaining implanted pearl oysters till harvest.

The implanted pearl oysters of average DVM 41.23 mm (31.9 to 47 mm) had grown to 57.70 (52.1 to 65.8 mm) during the culture period of 164 days. The growth rate was 0.1 mm/day (3.01 mm/month).

Pearl Production: There was 33.3% pearl production in the implanted oysters when harvested on 25.7.1995. All the pearls produced were of good quality. The thickness of nacre was 0.439 mm on the 3 mm nucleus during the 164 days culture with an average coating of 80.31 mm/month. Eventhough the duration of pearl culture was restricted to 5 to 6 months, good quality pearls were produced. Thickness of nacre noted in the 3 mm nuclei in the present study was higher (Table 2) than that observed in the Japanese waters and in the Gulf of Mannar along the least coast.

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