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51. DEVELOPMENT OF OYSTER CULTURE IN PULICAT LAKE AREA – PROSPECTS AND PROBLEMS*

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ABSTRACT

Pulicat lake is bestowed with rich natural oyster beds. There has not been any concerted effort at culturing oysters on scientific lines, probably because of lack of sustained demand and lucrative regular remuneration.

After a preliminary study of the oyster beds, a suitable location was selected for conducting experiments on oyster culture. Asbestos sheets were found to be by far the best cultch among the materials tried. Tray culture method proved to be appropriate for the area. The rate of production of oyster meat during the course of the study was 224.4 g/5 months/0.75 m^2 area. Incidental to the production of oysters, the trays were found to harbour a variety of fishes of prime quality adding to the production by 1.8 kg/5 months 0.75 m^2.

This study points to the possibility of developing a system of oyster-cum-fish culture' as a profitab'e proposition in the area. The suitability of the area for the venture is also discussed.

INTRODUCTION

In India no organised culture is being done worth its name (Durve 1974) except for the attempts made by Hornell (1910 b) to culture oysters in Pulicat Lake and the experimental work at Karapad creek oyster farm of Tuticorin centre of Central Marine Fisheries Research Institute, Tuticorin (Anon 1977) and in Mahim creek near Bombay. Also the efforts made by the Department of Fisheries, Government of Tamil Nadu at culturing oysters in Pulicat lake were sporadic and preliminary in nature. Devanesan and Chacko (1955) outlined the importance and possibility of culturing them in the area. Chidambaram and Dinamani (1951) made observations on spat fall and setting of *C. madrasensis.*

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RESULTS

Selection of site Ramakrishna and Ganapathy (1979) conducted a survey of natural oyster beds of the Pulicat Lake with a view to selecting a suitable site for conducting oyster culture experiments taking into account the nature of substratum, hydrographical conditions, water currents, spat setting and retentivity. Accordingly a site in the vicinity of Ice-plant at Pulicat village was selected for the purpose where the present experiments were carried out.

Selection of cultch material In this study, wooden planks, asbestos sheets and glass panels were used simultaneously with replicates of 8, 7 and 6 respectively during the spawning season The details of replicates, area of the cultch, number of spat on either side and the average number are shown in Table 1.

It is noticed that the spat have settled down on all asbestos sheets (100.0%) whereas only 4 out of 6 glass panels (66.7%) and 3 out of 8 wooden planks (37.5%) had spat settlement. Of the three cultch materials tried, the density of spat settlement on asbestos was 2.53/100cm² followed by wooden planks, 1.38/100cm² and glass panels, 1.02/100 cm² indicating the preference of spat to the asbestos sheets for attachment.

Positional influence of cultch on spat fall Only two positions namely one vertical and the other horizontal have been tried. The cultch used was asbestos sheets.

Asbestos sheets were placed vertically in the improvised slots in a dealwood box keeping the box along the tidal flow. The side facing the lake mouth was designated as 1st side and

TABLE 1. *Comparative statement of spat fall on different cultch materials between 28-12-1979 and 18 1-1980.*

Sheet No.	Asbestos sheets (Size: 45 x 30 cm)					Glass panels (Size: 50 x 26 cm)					Wooden planks (Side: 47 x 27 cm)				
	1st side		2nd side		Average	1st side		2nd side		Average	1st side		2nd side		Average
	T. No.	No. per 100cm²	T. No.	No. per 100cm²	No. per 100cm²	T. No	No. per 100cm²	T. No.	No. per 100cm²	No. per 100cm²	T No.	No. per 100cm²	T. No.	No per 100cm²	No. per 100cm²
I	43	3.2	25	1.9	2.6	24	1.85	—	—	0.93	—	—	—	—	—
II	18	1.3	12	0.9	1.1	—	—	—	—	—	—	—	—	—	—
III	59	4.4	18	1.3	2.9	16	1.23	8	0.62	0.93	35	2.76	11	0.87	1.81
IV	43	3.2	25	1.9	2.6	—	—	—	—	—	—	—	—	—	—
V	56	4.1	40	3.0	3.5	18	1.38	10	0.77	1.08	—	—	—	—	—
VI	39	2.9	20	1.5	2.2	18	1.38	12	0.92	1.15	21	1.84	6	0.52	1.18
VII	48	3.6	30	2.2	2.8						—	—	—	—	—
VIII											22	1.57	10	0.71	1.14
Av. No./ 100 cm² per side		3.24		1.81	2.53		1.46		0.58	1.02		2.06		0.70	1.38
Average number/100 cm² of cultch :					2.53					1.02					1.38

Note: 1st side is the side facing the lake mouth and the 2nd side is the opposite side of the 1st side.

TABLE 2. *Positional influence of cultch : Density of spat on vertically positioned asbestos sheets (Average number per 100 cm² area of cultch)*

Expt. No.	Date	Asbestos sheet		Average number of spat		Average number of spat/100 cm²
		No.	Size (cm)	1st side	2nd side	
1	15-12-'75	8	55.0 x 25.0	7.70	2.40	5.10
2	15-10-'77	3	60.0 x 30.0	3.03	0.37	1.70
3	11- 1-'78	3	60.0 x 30.0	3.90	1.40	2.70
4	14-12-'78	5	45.5 x 40.5	5.64	3.70	4.70
5	18- 1-'80	7	45.0 x 30.0	3.24	1.81	2.53
Average number per 100 cm² of cultch				4.70	1.94	3.35

* The side facing the lake mouth.

the other as 2nd side. The lake mouth remained open throughout the period of this study. A total of five experiments were conducted, details of which are shown in Table 2.

From the Table it is seen that the spat fall was heavy and varied from 5.1 to 3.03 no/100 cm² with an average of 4.70 no/100 cm² on the lake side. On the other side it varied from 0.37 to 3 7 no/100 cm² with an average of 1.94/100 cm². On the whole, inclusive of both sides the average number was 3.35 per 100 cm² It is clear that the area facing the lake mouth attracted more spat in all the experiments.

Asbestos sheets, two in numbers for each set, were horizontally tied to casuarina poles with nylon ropes in a tier fashion one above the other in such a way as to leave sufficient space for the flow of water in between. These sets were positioned inside dealwood boxes. Twelve such sets were prepared (Table-3).

From the table it is seen that out of 24 sheets 8 sheets (33.3%) were found with spat on lower surface while 3 sheets (8.5%) were found with spat on upper surface. The range of the number of spat per 100 cm² attached on lower surface was between 0.61 and 5.39 with an average of 1.38; while it was 0.06 to 0.39 on the upper surface with an average of 0.26. This indicated that the spat preferred lower surface for attachment.

TABLE 3. *Positional influence of cultch : Density of spat on horizontally positioned asbestos sheets (Average number per (100/cm² area of cultch)*

Set No.	Sheet No.	Number of Spat			
		Upper surface		Lower surface	
		Total	No./100cm²	Total	No/100cm²
I	1	—	—	—	—
	2	—	—	—	—
II	1	—	—	14	0 78
	2	6	0.33	24	1.33
III	1	—	—	11	0.61
	2	—	—	12	0.67
IV	1	—	—	—	—
	2	—	—	11	0.61
V	1	—	—	—	—
	2	7	0.39	17	0.94
VI	1	—	—	—	—
	2	—	—	12	0.67
VII	1	—	—	—	—
	2	1	0.06	97	5.39
VIII	1	—	—	—	—
	2	—	—	—	—
IX	1	—	—	—	—
	2	—	—	—	—
X	1	—	—	—	—
	2	—	—	—	—
XI	1	—	—	—	—
	2	—	—	—	—
XII	1	—	—	—	—
	2	—	—	—	—
Average number per 100cm²/side		0.26		1.38	

TABLE 4: *Spat settlement consequent to the Secondary in March-April 79*

Date	Cultch size (cm)	No. of spat both sides	No/ 100 cm^2	Height (mm)		Length (mm)	
				Range	Average	Range	Average
March'79	46x40	5.0	0.27	3-11	6.9	3-12	7.1
Apr. '79	,,	5 5	0.30	5-10	7.3	5-10	7.9
Average			0.29	3-11	7.1	3-12	7.5

Spawning and setting The spawning periods and setting of the spat were observed by studying the spat settlement on the cultch provided. It was found that the peak periods of spawning were between October and December when spat settlement was 4.7/100 cm^2 (Table 2). Secondary spawning was noticed during March-April and the spat settlement during this period was 0.29 no/100 cm^2 as shown in Table 4.

During the peak spawning season in October December (monsoon), the spat settlement noticed during the first half of the monsoon (.i.e) before the middle of November (1-9 no/ 100 cm^2) did not survive whereas the spat settlement seen subsequently during December survived and attained marketable size in due course of time.

Growth and survival of oysters To find out the rate of growth of the spat, those settled on asbestos sheets during the later half of the monsoon were studied till an average height of about 60.0 mm was reached within a period ranging from 4 to 7 months. In another experimen,t the spat from the asbestos sheets were removed and transferred to wooden trays after they attained an average size of about 40.0 mm in height and were cultured till they attained an average size of about 80.0 mm in about 3 to 5 months.

Three experiments were conducted on asbestos sheets commencing after the monsoon (Table 5). From the Table it is observed that the average height increase per month in these three experiments ranged from 6.8 to 7.7 mm and in length the range was from 5.1 to 6.6 mm with maximum increase in the first two months. In subsequent months the rate of growth slows down. The percentage of survival was poor in summer months (June : 73.5, May : 61.7, March : 56.5 and March : 60.0). The cumulative percentages of survival were 34.5, 23.8, 22.0 and 15.7 at the end of 7, 7, 4 and 6 months respectively. It has also been noticed that the oysters grown on asbestos sheets generally reached a height of about 30 to 35 mm in about three months and 40 to 50 mm in about 5 months. It is also clear that the growth in height and length are almost comparable till a height of 40 to 45 mm was reached from whence increase in height surpassed that of length resulting in oblong shape.

The results of the four experiments in wooden trays are shown in Table 6. The experience has been that the experiments initiated before monsoon have been vitiated due to severe monsoon resulting in heavy mortality.

The average increases in height and length ranged from 1.7 to 5.0 mm and 1.4 to 5.1 mm respectively. The growth have been generally slow and steady in almost all the months. The fall in the average size noticed during the course of the experiments No. II and IV might be due to the death of bigger specimens during summer period. Similarly during the third experiment, the fall in average height might be due to the death of larger specimes during monsoon. From the Table it is seen that the percentage of survival was poor in monsoon months when heavy mortality occurred. Summer

TABLE 5. *Growth of oysters grown on asbestos sheets.*

Date	Total number on both sides	Height (mm) Range	Height (mm) Average	Length (mm) Range	Length (mm) Average
Experiment I					
15.12.75	139	7-10	8 0	7-9	7.5
23. 3.76	88	28-67	47.3	23-83	47.5
19. 5.76	68	37-85	57.4	35-72	48.4
25. 6.76	50	40-82	59.7	35-68	51.1
16. 7.76	48	45-85	61.6	35-68	53.8
Experiment II					
17.1.77	80	2-12	6.8	3-10	6.3
16.2.77	68	10-30	17.6	10-25	13.6
29.3.77	56	18-65	36.2	20-62	35 6
19 4.77	47	18-70	39 7	20 66	39.3
16.5.77	29	25-60	48 1	25-60	42.8
16.6.77	24	30-70	48.7	25-60	41 1
18.7.77	21	35-80	52.5	30-60	44.5
7.8.77	19	40-75	58.3	40-65	48.7
Experiment III					
14.12.78	172	2-5	2.5	2-4	2.2
17. 2.79	100	15-47	30.9	15-48	33 1
14. 3.79	60	15-60	31.9	15-56	33.2
18.4.79	52	30-58	37.9	25 55	39 6
16.5.79	45	30-60	43.4	30-62	43.5
14.6.79	27	30-60	4ε.3	30-51	40.5

TABLE 6 *Growth of oysters grown in wooden trays*

Date	Total number per tray	Height (mm) Range	Height (mm) Average	length (mm) Range	length (mm) Average
Experiment I					
28.4 76	50	27-80	45.9	25-60	38.6
19.5.76	40	32-89	50.2	30-75	43.8
25.6.76	28	40-92	60.1	35-86	49.7
16.7.76	22	45-95	65.1	32-70	50.7
14.9.76	19	60-105	67.3	48-92	64.3
Experiment II					
17.1.77	50	35-80	58.7	30-90	57.2
16.2 77	32	35-98	61.5	30-65	48.4
29.3.77	24	50-98	80.2	35-80	65.8
19.4.77	16	60-105	78.0	38-89	56.4
16.5 77	13	60-110	78.5	48-90	62.9
Experiment III					
15.10.77	150	40-85	61.7	40-80	51.9
16.11.77	120	50-100	67.2	32-75	51.8
14.12.77	80	45-100	66.0	35-75	50.0
11.1.78	46	48-100	66.9	37-75	51.8
Experiment IV					
15.2.78	68	30-105	62.0	30-95	52.0
15.3.78	50	35-105	65.0	35-82	57.5
18.4.78	40	52-88	70.0	33-68	49.0
11.5.78	29	45-99	59.3	35-74	44.4
14.6.78	24	45-89	62.5	39-75	51.9
18.7.78	19	60-105	80.2	45-80	63.7

months also experienced poor survival (66.7% and 70.0% experiments II and I respectively). The cumulative percentage of survival at the end of 5, 4, 3 and 5 months in experiments I to IV are 38.0, 26.0, 30.7 and 27 9 respectively.

Oyster culture Of the several methods like stick culture. bottom culture, longline culture, raft culture and tray culture the last mentioned two culture methods have been tried in the present work

The raft culture technique was found unsuitable since the growing oysters dropped to the bottom as the galvanised wires were broken due to rusting and the nylon ropes damaged by crabs.

The tray culture was found suitable in the area. Wooden trays of 60x40x10 cm size with 7 to 8 reapers of 5 cm width fixed at the bottom of the trays were arranged in a suitable box one above the other The oysters have been reared in these trays/boxes in the Pulicat Lake.

The selected cultch (asbestos sheets) were kept in vertical position in the boxes during September, about a month before spawning and setting of spat took place. At the end of December, spat measured about 5 to 10 mm in size. They reached an average height of 30 to 35 mm by the end of March/April and are designated as 'Oysterlings'. When these oysterlings reached a height of 40-50 mm on an average in about 5 to 6 months i. e. by May/June, these were removed carefully with the help of a chisel and were transferred to the wooden trays of the size mentioned earlier. The removal of oysterlings from the cultch may inflict some damage to them to the tune of about 15 to 20%.

The number per tray was maintained at around 50. Five such trays with oysterlings were stacked in each dealwood box and these were arranged one above the other in line with the tidal flow of water. These boxes were periodically cleaned of the silt and macrophytes which were brought down by the floods and tides. While cleaning the trays and boxes the associated fish, crabs and prawns were collected and recorded.

Oysterlings in trays reached an average height of 80.0 mm after a period of 2 to 2½ years with an average meat weight of 6.8 g/oyster. The production of marketable size oysters worked out to 224.4 g/5 months/0.75 m^2 at 33.0% survival level (Table 6). Since these boxes were kept in the open lake, fishes, crabs and prawns entered into these boxes. The harvested figures for these associates worked out to be about 4.3kg/0.75 m^2. Fishes included perches, catfishes eels and gobids and accounted for 3.36 kg followed by crabs, 0.89 kg and prawns. Among the fishes, perches accounted for 2.67 kg.

Experiments conducted to find out the positional influence of the cultch on the intensity of spat-fall reveal that the under surfaces of the horizontally positioned cultch attract more spat. This is in agreement with the results obtained by Hopkins (1935) Similar observations were made by Schaefer (1937) who attributed the setting behaviour of *C. gigas* to the upward position of the foot of the swimming larvae and also possibly due to negative geotaxis. The same may be true in the case of this species also.

The delineated spawning seasons of this oyster in Pulicat lake especially of the heavy spawning during October-December period coincide with those of the same species at Ennore and Adyar (Hornell 1010a; Devanesan and Chacko 1955 and Rao and Nayar 1956)

Of the methods tried in this study, tray method of culturing oysters at mid-water level has been found to be suitable for Pulicat Lake.

Observations on the oysters cultured on asbestos sheets and in wooden trays revealed that the latter is better. Although the growth in the former was slightly slow, in the percentage of survival was better in the latter. In general heavy mortalities of oysters observed during monsoon might be due to sudden lowering of salinity, water temperature and heavy load of silt which were the result of influx of rain water from the catchment area during north east monsoon.

Harvesting of oysters during pre-monsoon has been found to be ideal since they reach marketable size and are in best condition.

The average meat weight of 6 8g/oyster at harvestable size obtained in this study is less than the 10 g obtained at Karapad (Anon 1977). The results obtained in this study indicate the possibility of taking up oyster culture in the Pulicat lake. The advantages for taking up oyster culture in the pulicat lake are the existence of natural oyster beds in the lake, the perennial communication of the lake with the sea, the natural spawning and settlement of spat inside the lake, availability of several hactares of land suitable for oyster culture in lake, the easy accessability by road and the proximity Madras to City which facilitate marketing.

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