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Edible Oyster Spat-fall at Parangipettai Backwaters, South-east India

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Abstract

The spat settlement of the edible oyster *Crassostrea madrasensis* (Preston) was monitored for a period of one year (April 1982- March 1983) in the backwaters of Parangipettai. Settlement was perennial with peaks of abundance during August (late pre-monsoon) and October (monsoon). Of the six materials lime coated half tiles were the best-spat collector. The decrease in salinity during late pre-monsoon and monsoon periods, probably triggered active breeding resulting in subsequent peak spat-falls. A positive correlation between spat-fall and dissolved oxygen content of the water was also observed. Concave surface attracted more spat than convex surface.

Introduction

The edible oyster *Crassostrea madrasensis* (Preston) is the most important species of oyster found along the south coast of India. Proper spat-fall prediction constitutes one of the essential pre-requisites for planned oyster farming. There have been earlier studies on the spat-fall of *C. madrasensis* in Pulicat Lake, Madras coastal waters (Devanesan and Chacko, 1955), Cochin backwaters (Purushan *et al.*, 1981), Vaigai estuary (Rao *et al.*, 1983). Bhimunipatnam backwater (Reuban *et al.*, 1982), Mulki estuary (Mohan Joseph and Shantha Joseph, 1983), Tuticorin Bay (Thangavelu and Sundaram, 1983; Muthiah, 1987) and at Muttukadu backwaters (Sarvesan *et al.*, 1990). The present study was carried out at Parangipettai backwaters (Tamil Nadu) in order to find out the magnitude and seasonality of spat-fall in this region and to identify the best cultch for oyster seed.

Description of the Study Area

The Parangipettai backwaters (11°27'N Lat., 79°47' Long.) is located about 200 km. to the South of Madras. This is an extensive water body connecting two estuaries, the Vellar estuary in the north and the Coleroon estuary in the south, forming an estuaring complex (Fig. 1). The northern part of the backwater is mainly a broad and deep canal connected to Vellar estuary, whereas, the southern part is a complex network of small channels and islands supporting typical mangrove flora and connected to Coleroon estuary. The whole of the backwater system is flushed predominantly by seawater that enters through the estuarine mouths during high tide and by brackishwater or freshwater flowing from the estuaries, small freshwater canals and irrigation channels.

Materials and Methods

The oyster spat-fall was monitored at two different sites: one in the vicinity of the mangrove (Station I) and the other at the northern canal region (Station II), located about 5 km away from Station I, for a period of one year (April, 1982-March,

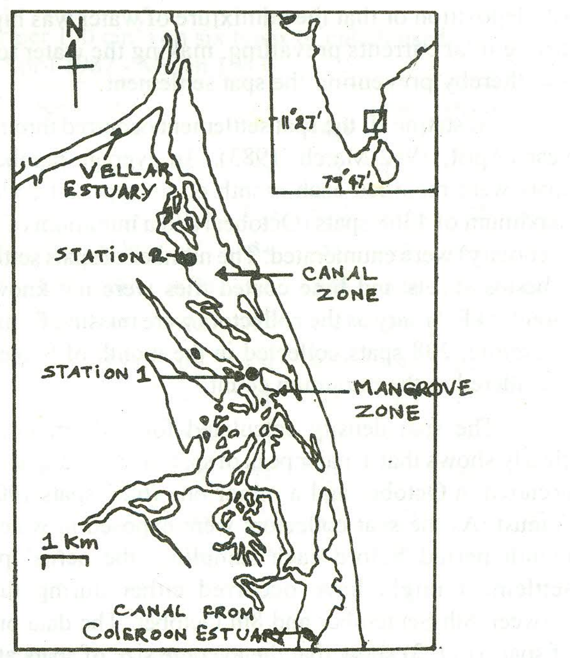

Fig. 1. Location of the study area.

1983). Monthly panels were replaced once in 30 days starting from 8 April 1982. Six cultch materials (corrugated asbestos sheets 10 × 20 cm, oyster shells 7-9 cm in length, coconut shells, used automobile type pieces 10 × 20 cm, semicylindrical roofing country tiles and lime coated semicylindrical roofing tiles) were used as experimental cultch. The above spat-collectors were installed on a wooden rack (1 × 1 m) made of wooden cross-bars in order to facilitate free flow of water through the spat-collectors kept on them. The racks were driven into the bottom ground in such a way that the platforms holding the cultch remained in the predetermined mid tidal level. The spat-collectors were removed at periodic intervals from the racks and transferred to large containers (15 l capacity) filled with 10% formalin solution and brought to laboratory for futher analysis. The number of spats on either side of each unit of collectors were recorded and expressed as numbers per 100 cm^2. The spat size was measured using dividers.

Hydrological parameters such as surface water temperature, salinity and dissolved oxygen content were recorded at the time of each collection. The rainfall data were obtained from the meterological unit of the institute.

Results and Discussion

The observations made throughout the one year study period on the spat settlement at station I (mangrove) were not encouraging. Only 2-9 spats/month could be collected from the whole set of collectors in the months of July, September and December. During the rest of the study period, the spat settlement was toally absent. This indicates that either the platform erected to keep the collectors was in too shallow a level resulting in heavy silt deposition or that the admixture of water was high due to strong tidal currents prevailing, making the water too turbid, and thereby preventing the spat settlement.

At station II, the spat settlement occurred throughout the year (April, 1982-March, 1983). An average number of 816 spats were recorded each month on all types of collectors. A maximum of 4368 spats (October) and a minimum of 192 spats (February) were enumerated. The number of spats settled on the asbestos sheets and lime coated tiles were not known in the month of February as the collectors were missing from the rack. Therefore, 208 spats collected in the month of September are considered as the minimum count.

The spat density calculated for each month (Fig. 2) clearly shows that a major peak of spat-fall (17.15 spats/100 cm^2) occurred in October and a minor one (6.86 spats/100 cm^2) in August. As the spat collectors were exposed in water for one month period before each sampling, the actual peak spat settlement might have occurred either during the period between 8th September and 8th October. The data on the size of spats (Fig. 3) show that the average size of spats at the time of sampling in October was around 4 mm. More number of tiny spats (1-2 mm) were also observed during this period. This indicates that a fresh spat-fall occurred at the end of September or during the first few days of October. Likewise, the minor peak in August, with an average spat size of 5 mm indicates an abundant spat settlement during late July to early August. Therefore, the whole period of late July to early October can be considered as the oyster spat-fall season at Parangipettai backwaters.

Perennial breeding of *C. madrasensis* with one or two peaks of larval and spat abundance have been observed earlier in Indian coastal waters, particularly in the southeast coast.

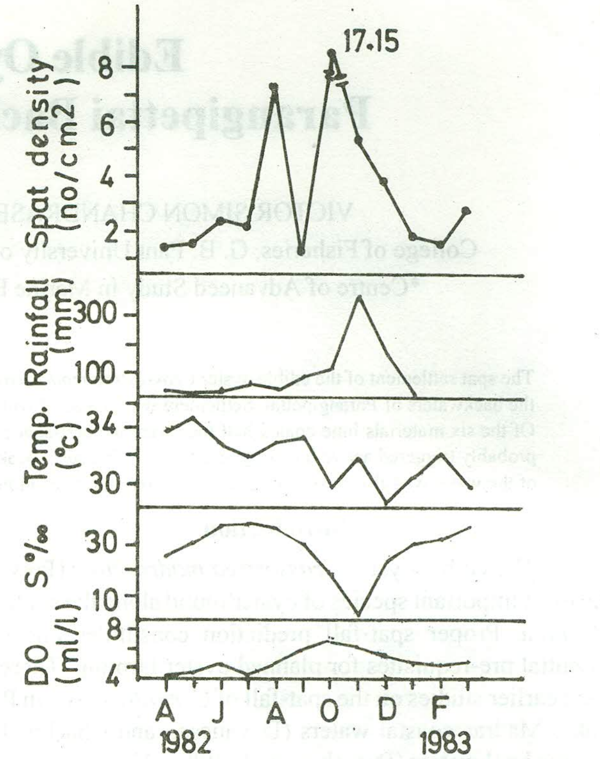

Fig. 2. Seasonal changes in environmental parameters and spat fall.

Reuban *et al.* (1983) monitored spat-fall throughout the year with peaks in March - October in Bhimunipatnam backwaters. Muthiah (1987) recorded peak spawning and spat-fall during April-May and August- September at Tuticorin Bay. Biannual peaks of spat-fall were noticed during March-April and September-October at Muttukadu backwaters (Sarvesan *et al.*, 1990).

Rainfall has been found to be a major factor in the breeding and subsequent larval settlement of oysters, by reducing the salinity and temperature (Kong and Lun, 1975; Quayle, 1980). The increased spat-fall during July-October observed in the present study may be due to an active breeding of oysters caused by the premonsoon (July-August) and northeast monsoon (October) rains. Although there was no remarkable increase in rain-fall during July-August at Parangipettai, the freshwater influx from the upper reaches of the estuaries (due to the heavy precipitation in the catchment areas of the rivers) lowering the salinity to nearly a degree of 20 ppt might have stimulated the breeding of oysters. A positive correlation between oyster spat-fall and dissolved oxygen content of the water ($r = 0.60$; $P > 0.05$), observed in the present work also indicates the probable influence of high dissolved oxygen content of the water on their settlement behaviour.

The size of spats ranged from 1.0 to 28 mm indicating the growth of spats upto 28 mm/month (Fig. 3). A growth rate of 20-30 mm/month has been recorded for *C. madrasensis* in the Mulki estuary of the west coast of India (Mohan Joseph and

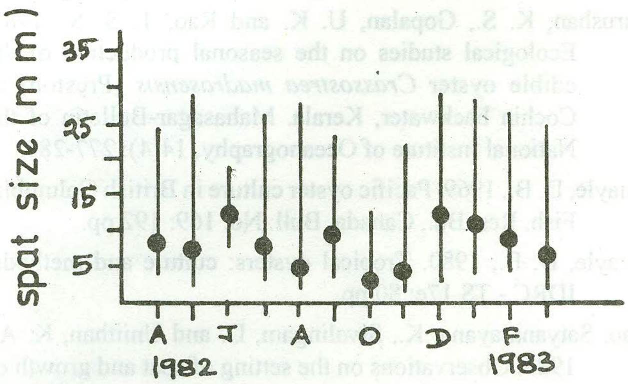

Fig. 3. Mean lengths and ranges in spat size during the study period.

Shantha Joseph, 1983, 1985). The monthly mean values of spat size ranged from 5 to 10 mm in the present observation, which would be an ideal size for transplantation of spat from the cultch to the spat rearing or oyster farming structures.

Out of the six types of spat collectors used, the intensity of spat settlement was high in lime coated tiles followed by asbestos sheets, oyster shells, tyre piece, tiles (without lime coating) and coconut shells (Table 1). In the peak season (October) 1809 spats were enumerated on the lime coated tiles, whereas it was less than half of this number on other collectors. Lime coated tiles are the traditional cultch in commercial use in Europe (Quayle, 1980).

A comparison between the number of spats settled on the concave and convex surfaces of the cultch revealed that the spats were invariably more on the concave side (Table 2). Silas *et al.* (1982), Muthiah (1987) and Sarvesan *et al.* (1990) have also recorded a relatively high degree of spat settlement on the concave surface of the collectors.

The present investigation is a preliminary study on the spat-fall at parangipettai backwaters. A continuous monitoring of spat-fall for a longer period at several sites may explain the

Table 1. Total number of spats settled and their density (number per 100 cm^2) on six types of cultch used at station-II in parangipettai backwaters during April 1982 - March 1983.

		April 1982	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan. 1983	Feb.	March	$\bar{X}$
Asbestos sheets	No. of spats	56	24	61	23	NA 80	851	416	215	33	NA	138		
	Density (No/100 cm^2)	1.4	0.60	1.53	0.58	-	2.0	21.2	10.4	5.38	0.83	-	3.45	4.74
Oyster shells	No. of spats	26	45	65	33	125	26	156	47	84	53	22	44	
	Density (No./100 cm^2)	1.73	3.00	4.33	2.20	8.33	1.73	10.4	3.313	5.6	3.50	1.46	2.93	4.03
Coconut shells	No. of spats	14	24	38	52	111	21	447	20	73	14	23	58	
	Density (No/100 cm^2)	0.28	0.48	0.76	1.04	2.22	0.42	8.94	0.4	1.46	0.28	0.46	1.16	1.49
Tyre pieces	No. of spats	20	18	34	65	175	4	815	102	43	17	8	119	
	Density (No/100 cm^2)	0.5	0.45	0.85	1.63	4.38	0.1	20.38	2.6	1.1	0.43	0.2	2.97	2.97
Tiles	No. of spats	46	72	64	86	190	12	290	197	77	65	139	85	
	Density (No/100 cm^2)	0.92	1.44	1.28	1.72	3.8	0.24	5.8	3.94	1.54	1.3	2.78	1.7	2.21
Lime coated tiles	No. of spats	102	74	151	168	253	65	1809	468	275	85	NA	86	
	Density (No/100 cm^2)	2.04	1.48	3.02	3.36	5.06	1.3	36.18	9.36	5.5	85	NA	1.72	6.43

NA: data not available.

Table 2. The mean number of spats settled, in each month, on the convex and concave sides of four types of cultch at Station II during April 1982 - March 1983.

Cultch	Convex/Concave side	Apr. 1982	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan. 1983	Feb.	Mar.	$\bar{X}$	Chi^2	Remarks
1. Tiles	Convex	4.0	6.4	2.8	4.4	19.4	0.6	6.4	11.0	4.8	0.8	10.4	4.0	6.25	3.583	Significant at 0.01 level
	Concave	5.2	8.0	4.0	8.6	18.6	1.8	51.6	28.4	10.6	12.2	17.4	13.2	14.97		
2. Lime coated tiles	Convex	7.2	5.6	9.2	8.8	18.8	5.6	58.2	45.2	18.8	2.2	NA	8.0	17.05	14.256	Significant at 0.01 level
	Concave	14.0	9.6	21.0	24.8	31.8	7.4	303.6	48.6	36.2	14.8	NA	9.0	47.35		
3. Coconut shells	Convex	0.4	0.6	1.0	1.2	4.1	0.1	1.8	0	2.4	1.2	0.6	4.4	1.48	6.28	Significant at 0.05 level
	Concave	1.0	1.8	2.8	4.0	7.0	2.0	70.8	5.0	12.2	1.6	4.0	7.2	9.95		
4. Oyster shells	Convex	0.6	1.5	2.0	1.2	0.2	1.4	1.6	1.2	8.8	3.4	2.0	3.2	2.26	2.56	Not significant
	Concave	2.0	3.0	4.5	2.1	12.3	1.2	29.6	8.2	8.0	7.2	2.4	5.6	7.18		

spat settlement pattern and the factors influencing it more precisely.

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