MAHASAGAR
Vol.25, No.1. (June), 1992, pp. 55-60

LARVAL SETTLEMENT PATTERN OF *CRASSOSTREA MADRASENSIS* (PRESTON)*

M. KALYANASUNDARAM**
Centre of Advanced Study in Marine Biology, Annamalai University,
Parangipettai - 608 502.

ABSTRACT

Spatfall on asbestos sheet was found intense when compared with ground glass and plain glass. Further, settlement on 0° angle (lower surface of horizontal plate) was intense than on 45°, 90°, 130° and 180° angles which are influenced by light.

Key - words : *Crassostrea madrasensis*, larvae, settlement

The provision of a suitable settling surface is an important aspect in the large scale production of oyster spat in the hatcheries and also to harvest more seed in the estuary. Studies on settlement of *Crassostrea madrasensis* on the east and west coasts of India, mostly dealt with settlement periods, preference of substratum and settlement at different localities (Nair and Nair, 1985). No information is available on the effect of surface angle on attachment, vertical distribution and effect of light on settlement of larvae. The present study was carried out to understand the settlement pattern of the edible oyster *C. madrasensis*.

A site at Vellar estuary opposite to the Marine Biological Station was chosen for the study. The experimental frames in the intertidal area were fixed such that these were completely exposed during peak low tide, and immersed during high tide. Settlement pattern was observed from June 1985 to March 1986.

The settlement panels (28.5 x 15.0 cm) were rectangular sheets of ground glass, plain glass and asbestos plates. Panels were held singly in mild steel frames. Two types of frames were used as per the model of Cranfield (1968) and it was originally designed by Korringa (cited by Cranfield, 1968). Two frames were placed at right angle to the tidal current and tied to wooden poles fixed on all the sides. The frames were held about 10 cm above the substratum.

One type of frame supported 12 plates: four horizontal, four oblique (45° lower surface) and four vertical (Fig.1). The settlement plates in each series were set 10 cm apart. The bottom horizontal plates and the lower edges of the oblique as well as vertical plates were 10 cm above the substratum.

The second type of frame was fixed with five horizontal plates one above the other at 10 cm distance with the bottom plate resting 15 cm above the substratum. This frame was used to test the effect of light on oyster larval settlement. The frame was covered with black

* Part of the thesis submitted for the degree of Doctor of Philosophy in Marine Biology of Annamalai University.

** Present address : Raja Serfoji College, Thanjavur - 613 005

cloth (bottom side was not covered) to exclude light and to reduce the speed of water current.

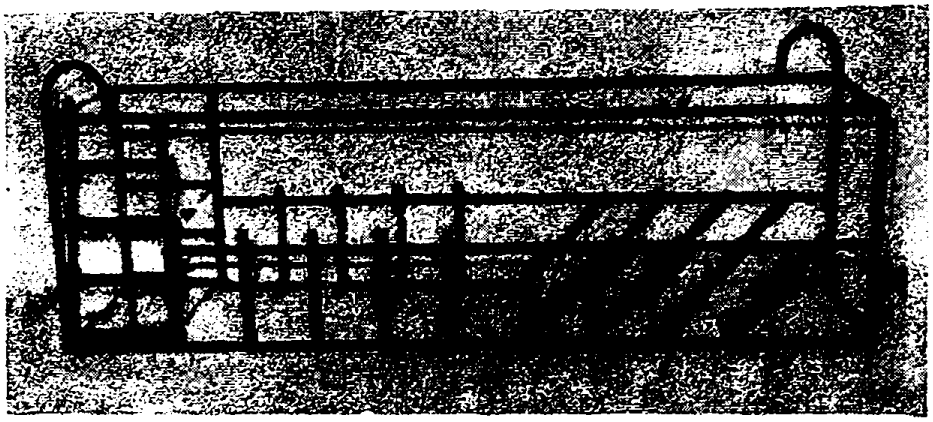

Fig. 1. Frame with 12 plates to sample oyster settlement at different angles.

The experimental plates were removed from both the types of frames at the end of the sampling period of 30 days and examined in the laboratory. Oyster spats were identified and counted. The intact lower valves of the spats, cemented to the surface of the plates were also counted.

Collection Type

Table I shows the number and percentage of spatfall on ground glass, plain glass and asbestos sheet during the experimental period. The spat settlement on asbestos sheet was most intense whereas on ground glass (on both sides) it was less intense and least on plain glass.

Effect of surface angle on attachment

Table II shows the settlement pattern of *C. madrasensis* on the different angles of the plates. The lower surfaces of the horizontal plates showed high intensity of settlement followed by the lower surfaces of oblique plates and less intense on vertical plates.

The spatfall on 0° angle (lower surface) was intensive than that on 180° angle (upper surface) of the horizontal plates, the 0° angle having about 10 times as many as that on 180° angle.

Differences between the spatfall on 135° and 45° surfaces were significant and the spatfall on 45° was two times as intense as on 135° angle.

Vertical distribution of settlement

Fig. 2 shows the vertical distribution of oyster settlement on the horizontal plates of multiple unit frame type. The settlement was more intense on the plates closest to the bottom and least on plates farthest from the bottom.

The oyster settlement on oblique and vertical plates also varied with their height from the bottom. The spat, above and below the middle of the oblique and vertical plates, were

counted during the sampling period. The settlement on the lower half was higher than that on the upper half of both oblique and vertical plates.

Table I – Percentage of oyster spat from different spat collectors (June 1985 to March 1986)

	Percentage
Asbestos plate	42.1
Ground glass	38.1
Plain glass	19.1

Table II – Mean number and percentage of spat on different angles.

	0°	45°	90°	135°	180°
Numbers	23	22	8	5	4
Percentage	27.1	35.5	12.9	8.1	6.4

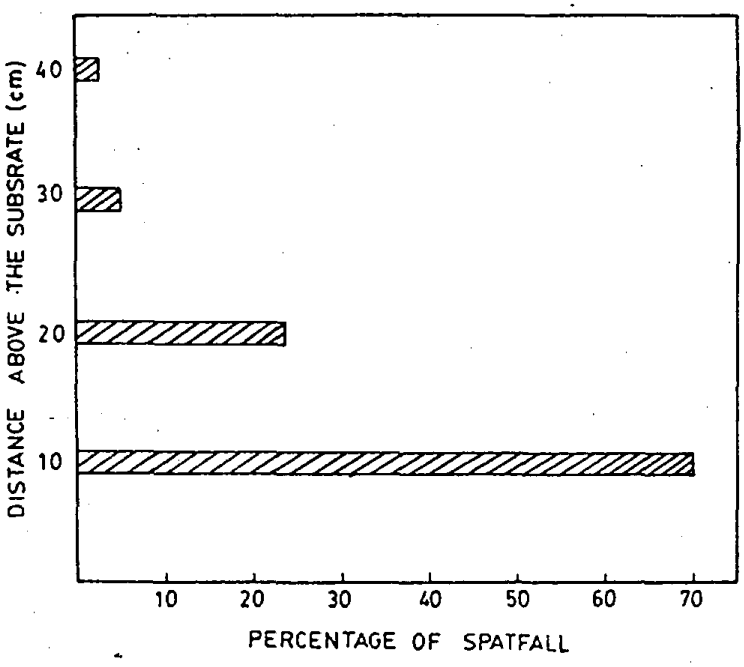

Fig. 2. Vertical distribution of oyster settlement on the horizontal plates of multiple unit frame type.

Effect of light intensity on settlement

Only horizontal plates (frame of the second type) were used for this experiment and significant differences in the settlement pattern were noticed. The spat ratio between the upper and lower surfaces showed no much difference. On the middle plates equal number of

spat settled on both upper and lower surfaces, but on the top plate and bottom plate less difference in the settlement of spat on upper and lower surfaces was observed (Fig.3) .

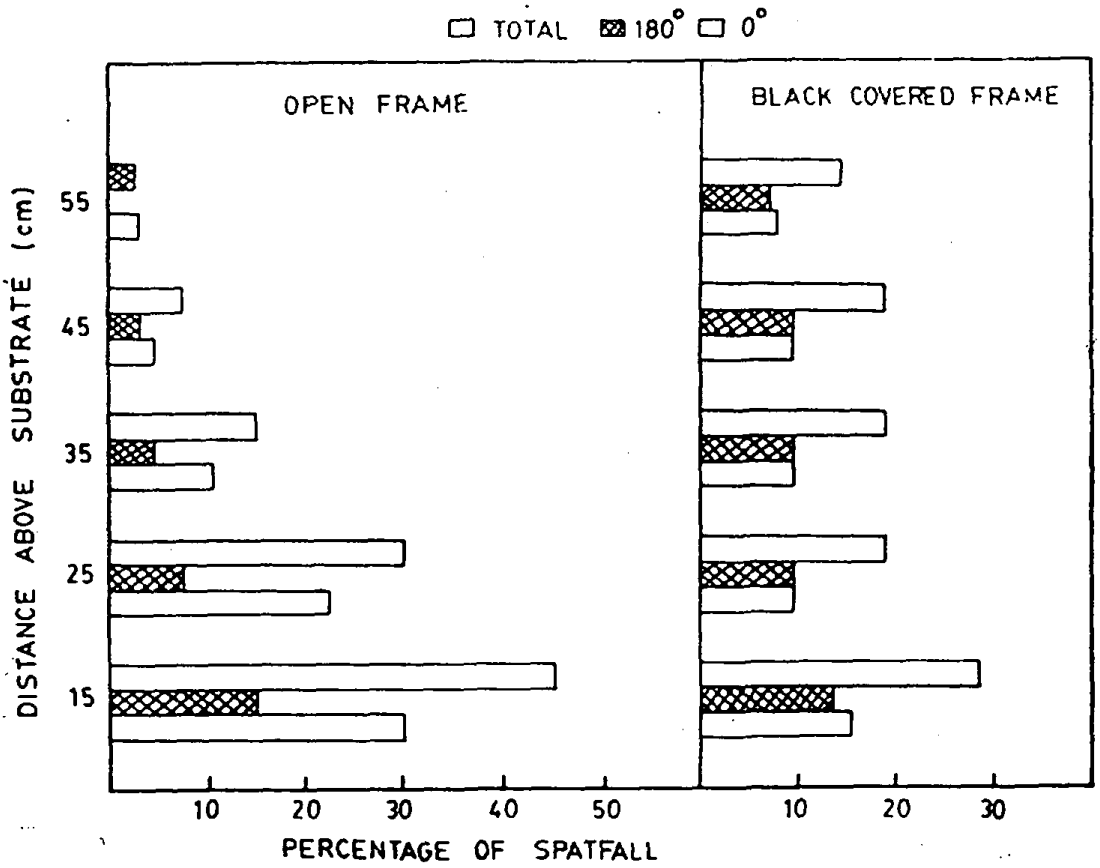

Fig. 3. Percentage spatfall on upper and lower surfaces of the five horizontal plates held in uncovered and covered frames.

The edible oyster *C. madrasensis* enjoys a wide distribution in the brackish water environment of South India. It is a common representative of the sedentary organisms of brackish water benthos. Usually they colonise on any hard substrate when they thrive well. The data collected from the series of panels provide a general picture of the pattern of settlement of *C. madrasensis*. The intentive settlement of oyster spat on asbestos sheets than on ground and plain glasses could probably be attributed to the surface roughness and opaque nature of the panel. Similar results were obtained by Cranfield (1970) in New Zealand waters.

Difference of opinion exists with regard to the side of settling. Cranfield (1968) and Kennedy (1980) found that the settlement predominantly occurred on the upper surface (180°) in *Ostrea lutaria* and *C. virginica*. On the other hand, Hopkins (1935), Schaefar (1937) and Pomerat and Reiner (1942) observed predominant settlement on the under surface (0°) in *O. lurida, C. gigas, C. virginica*. The result of the present study agrees with that of the later (Table III). All the above experiments showed negligible settlement on vertical

plates. The drastic difference in spatfall with angle of plates in favour of undersurfaces (0°) in the present observation may be due to negative reactions of mature larvae (pediveliger stage) to light. Table IV shows results of the intensity of settlement found on 0° and 180° surfaces in the present study, compared with variations in the intensity of spatfall reported by other workers.

Table III – Percentage settlement on surfaces at different angles.

Species	0°	45°	90°	135°	180°	Source
C. viginica	8.0	10.0	4.0	41.0	37.0	Butler, 1955
O. lutaria	10.9	12.1	3.2	28.6	45.2	Cranfield,1968
C. gigas	65.7	22.6	6.6	4.0	1.1	Schaefar, 1937
O. lurida	85.9	13.0	0.8	0.2	0.01	Hopkins,1935
C. virginica	70.5	15.6	5.5	6.0	2.4	Pomeret and Reiner, 1942
C. madrasensis	37.1	35.5	12.9	8.1	1.4	Present study

Table IV– Percentage settlement on upper 180° and lower 0° surfaces of horizontal plates.

Species	0°	180°	Source
C. vinginica	36.4	64.4	Butler, 1955
O. lutaria	19.4	80.6	Cranfield, 1968
C. gigas	98.3	1.7	Schaefar, 1937
C. virginica	96.7	3.3	Pomerat and Reiner,1942
O . lurida	99.9	0.1	Hopkins, 1935
C. madrasensis	85.2	14.8	Present study

The vertical distribution of spatfall on horizontal plates was found to be more intense on bottom plate than on top plate. Similar observations were made by Cranfield (1968) on the larvae of *O. lutaria* in New Zealand waters.

The effect of light on settlement of other oyster species is well documented in literature (Walne, 1966, Cranfield 1968). The pattern of vertical distribution of spat changed when the frame was completely covered with the black cloth. The intensity of spat was found to be similar in both on top plate as well as bottom plate which may be due to light (since the panels were completely exposed to sunlight during the peak low tide) influencing the larval settlement as observed by Ritchie and Menzel (1969).

ACKNOWLEDGEMENTS

The author wishes to thank (Late) Prof. K. Ramamoorthi, C.A.S. in Marine Biology for his valuable guidance, Prof. V.K. Venugopalan for encouragements. CSIR for financial support and Annamalai University for the facilities provided.

REFERENCES

Butler, P.A., 1955. Selective setting of oyster larvae on artificial cultch. *Proceedings of National Shellfisheries Association* **45**: 95-105.

Cranfield, H.J., 1968. An unexploited population of oysters *Ostrea lutaria* Hutton, from Foveaux strait. Part II. Larval settlement patterns and spat mortality. *New Zealand Journal of Marine & Freshwater Research*, **2**: 183-203.

Cranfield, H.J., 1970. Some effects of experimental procedure on settlement of *Ostrea lutaria* Hutton. *New Zealand Journal of Marine & Freshwater Research*, **4**: 63-69.

Hopkins, A.E., 1935. Attachment of larvae of the Olympia oyster *Ostrea lurida* to plate surfaces. *Ecology*, **16**: 82-87.

Kennedy. V. S., 1980. Comparison of recent and past patterns of oyster settlement and seasonal fouling in broad creek and Tred avon river, Maryland. *Proceedings of National Shellfisheries Association*, **70**: 36-46.

Nair, N.V. and N.B. Nair, 1985. Settlement characteristics of *Crassostrea madrasensis* in the Cochin Backwaters. *Fishery Technology*, **22**: 5-13.

Pomerat, C.M. and E.R. Reiner, 1942. The influence of surface angle and of light on the attachment of barnacles and other sedentary organisms. *Biological Bulletin*, **82**: 14-25.

Ritchie, T.P. and R.W. Menzel, 1969. Influence of light on larval settlement of American oysters. *Proceedings of National Shellfisheries Association*, **59**: 116-120.

Schaefar, M.E., 1937. Attachment of the larvae of *Ostrea gigas*, the Japanese oyster, to plane surfaces. *Ecology*, **18**: 523-527.

Walne, P.R., 1966. Experiments in the large scale culture of the larvae of *Ostrea edulis* L. *Fisheries Investigation*, London, Series 2, **25**: 1-53.