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58. OBSERVATIONS ON THE BIO-FOULING IN PEARL OYSTER FARM AT KRUSADAI ISLAND, GULF OF MANNAR

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ABSTRACT

Emphasis was laid mainly to identify the dominant groups of biofoulers on pearl oysters and cages in commercial farming during the year 1985-86. The rate of biofouling observed in Krusadai farm was less compared to the observations made at Tuticorin. Comparatively more of fouling was observed during the south west monsoon and north east monsoon periods. During the south west monsoon, barnacles contributed more and during the north east monsoon silt deposition was found to increase the quantum of fouling. Barnacles, bryozoans, molluscan spat, tunicates, decapods, crustaceans and sea weeds were found on pearl oysters and cages througout the year in varying quantities. Boring by sponges and spionids were practically nil.

INTRODUCTION

First attempt to culture pearl oysters in India dated back to 1864 by Phipps, as is evident from Markham's (1865) letter to the British Government in India. A pearl oyster nursery at Tuticorin near Hare Island was established for the first time in 1864. Successful pearl oyster farming and a break through in cultured pearl production were achieved by Central Marine Fisheries Research Institute in 1972 (Alagaraswami 1974). Earlier, attempts made to rear pearl oyster in captivity to produce cultured pearl at Krusadai Island were reported by Devanesan and Chidambaram (1956) and Nalluchinnappan et al (1982). A commercial cultured pearl producing farm is successfully established at Krusadai Island in the Gulf of Mannar in 1983 for the first time in India.

Biofouling on pearl oysters and cages is one of the major problems faced in pearl oyster farming which requires periodical cleaning of oysters and cages. Kuriyan (1950) and Ananthanarayanan (1967) had also observed such settlement of fouling organisms on pearl oysters and cages at Krusadai Island. Detailed studies on the fouling and boring organisms on pearl oysters in the farm at Tuticorin were made by Alagarswami and Chellam (1976), Dharmaraj and Chellam (1983) and Velayudhan (1983). Here an attempt is made to identify the different fouling organisms, month of occurrence and the intensity of settlement of dominant foulers on oysters and cages.

MATERIALS AND METHODS

The live pearl oyster *Pinctada fucata* and the box cages (40 x 40 x 10 cm) used to rear them, themselves provide the substrate for the various fouling communities. The cages were suspended at a depth of 3-4 m from unit wooden rafts (5 x 5m) floated 50 m away from the shore. The bottom of the farm site is hard with a mixture of mud and sand. Ten cages containing 150 *P. fucata* each were taken for the study. The oysters ranged 40 mm and 45 mm in dorso ventral measurement (DVM). The pearl oysters and cages were cleaned by scrapping off the encrusting fouling organisms. Such encrusting forms and other free living organisms found inside the cages were then sorted out and identified to the extent possible and the data is furnished in Table 1. The volume of important fouling groups found on pearl oysters collected from one cage (150 oysters) was estimated every month by volume displacement method. The fouling load per oyster was determined by weighing the scrap from 100 oysters of the above size group every month which is given in Table 2. The observation covered a period of twelve months.from July 1985 to June 1986.

TABLE 1. *Fouling organisms observed on oysters and cages and the month of occurrence at Krusadai farm from July 1985 to June 1986.*

Sl. No.	Name of organisms	observed in cage (c)/oysters (o)	month observed
1.	*SPONGES*		
	Cliona sp	0	Nov - Jan
2	*COELENTERATES*		
	Companularia sp	0	Nov - Feb
	Obelia sp	C & 0	Nov – Feb
	Sertularia sp	C & O	Sept, Dec - Jan
	Lytocarpus sp	C & O	March
	Clavularia sp	C	Dec, Jan
	Sarcophytum sp	C & O	September
	Bunodactis sp	O	September
3.	*BRYOZOANS*		
	Membranipora sp	C & O	Oct – Dec
	Thalamoporella sp	C & O	Nov - Dec
	Bugula sp	C	Mar - June
4.	*ANNELIDS*		
	Dasychone sp	C & O	Oct - Jan
	Polydora sp	O	Dec, Jan
	Perineris sp	O	Throughout the year
	Eunice sp	C	Aug, Sept, Mar - May
5.	*ARTHROPODS*		
	Balanus sp	C & O	Throughout the year
	Lystamata sp	C & O	Aug, Sept, March - May
	Gonodactylus sp	C	April, May
6	*ISOPODS*		
	Sphaeroma sp	C & O	Throughout the year
	Cilicaea sp	O	Throughout the year
7.	*DECAPODS*		
	Pinnotheres sp	C & O	Throughout the year
	Matuta sp	C	June
	Charybdis sp	C	Throughout the year
	Thalamita sp	C	Throughout the year
	Panulirus sp	C	April - June
8.	*PYCNOGONIDS*		
	Nymphon sp	C	August, September
9.	*MOLLUSCS*		
	Pinctada sp	C & O	January, May, June
	Cyprea sp	C	August, September
	Drupa sp	C	May, June
	Pyrene sp	C	May, June
	Cymatium sp	C	August, September
	Doris sp	C	April
	Modiolus sp	C & O	June, July
	Murex sp	C & O	September

Sl. No.	Name of organisms	Observed in cage (c) oysters (o)	month observed
	Avicula sp	C & O	May, June
	Pinna sp	C	October, November
	Cymatium sp	C & O	February - June
	Crassostrea sp	C & O	April – June
	Oliva sp	C & O	May
	Martesia sp	C & O	April, Aug & Sept
10.	*ECHINODERMS*		
	Antedon sp	C & O	November - January
	Salmacis sp	C	June - September
11.	*TUNICATES*		
	Ascidia sp	C & O	May, June, Aug., Sept.
	Rhabdocynthia sp	C & O	March - July
	Dicarpa sp	C & O	Throughout the year
	Botrylloides sp	C & O	April, June
	Diplosoma sp	C & O	Throughout the year
	Leptoclinum sp	C & O	March - April
12.	*PISCES*		
	Acanthurus sp	C	April - June, August
	Blennius sp	C	Throughout the year
	Pterocrites sp	C	May
	Gobius sp	C	Throughout the year
II. 1.	*SEA WEEDS*		
	Gracilaria sp	C	Throughout the year
	Cladophora sp		October - December
	Enteromorpha sp	C & O	September - December
	Dictyota sp		November, December
	Ceramium sp		September - January
	Gelidium sp		December, January
	Sargassum sp	C	Throughout the year.

TABLE 2. *Seasonal variation of fouling intensity (%) of predominant group of fouling organisms and the fouling load on oyster in the pearl oyster farm at Krusadai Island.*

Period	Barnacles (%)	Annelids (%)	Bryozoans (%)	Molluscs (spat) (%)	Tunicates (%)	Sew weeds (%)	Fouling load (Min-Max) per oyster (g)
1985 July-Sept	70.8	5.6	3.1	13.2	6.3	1.0	3.6 - 6.8
Oct - Dec	58.0	12.1	9.7	8.2	4.9	7.1	2.8 - 6.6
1986 Jan - March	62.5	10.0	9.8	5.6	6.1	6.0	1.3 - 4.9
April - June	74.8	3.0	5.4	10.6	4.5	1.7	3.8 - 6.4

OBSERVATIONS

Emphasis was laid mainly to identify different fouling organisms, dominant groups and their seasonal occurrence on pearl oysters and cages in the pearl oyster farm at Krusadai Island. The different biofoulers in pearl oyster cages and on pearl oysters identified during the period of observation is shown in Table 1. Fouling intensity of important groups is given in Table 2.

Barnacles were found to be the most important constituent of the fouling organisms. The volume of barnacle load was very high (74.8%) during April-June 1986. Though dominant, barnacle load was comparatively less (58.0%) during October-December 1985. The other conspicuous group that increased the volume mainly was molluscan spat. They were abundantly seen during the periods July-September 1985 (13.2%) and April-June 1986 (10-6%). Between October 1985 and March 1986 annelids were represented in fairly good numbers. The volume was 12.1% (October-December) and 10.0% (January-March). Bryozoans were well represented from October to December 1985 (9.7% and from January to March 1986 (9.8%). The tunicates were found in large numbers during July-September 1985 (6.3%) and January-March 1986 (6.1%). Sea weeds were found abundantly during the periods October-December 1985 (7.1%) and January-March 1986 (6.0%) (Table 2).

Among others, decapod crabs and some species of fishes were also observed throughout the year. Very rarely, instance of boring by the sponge *Cliona* sp, polyclad worm *Polydora* sp and pholad *Martesia* sp were observed (Table 1).

The maximum fouling load was observed during July-September 1985 and the minimum was recorded in January-March 1986. During October-December 1986 silt deposition was found on oysters and cages.

REMARKS

Balanus spp was the dominant fouling organism on both oysters and cages throughout the year. though their presence varied during different periods. Peak settlement was recorded during July-September 1985 and April June 1986. Among the others annelids, molluscan spat, bryozoans and tunicates were the dominant groups (Table 2). This concurred with the observation of Alagarswami and Chellam (1976). Molluscan spat occur in large numbers on oysters during July-September and April-June. The spat were mainly of *Pinctada* spp, *Crassostrea* spp. *Modiolus* sp. and *Avicula* sp. The bryozoans *Membranipora* sp, *Thalamporella* sp, and *Bugula* sp were found to spread all over the cages and oysters. The tunicates, *Dicarpa* sp and *Diplosoma* sp were recorded throughout the year. Crabs of several genera are found althrough the year, mainly inside cages. Juveniles of *Panulirus* sp were also occasionally found (Table 1). Similar above observations were made by Alagarswami and Chellam (1976).

Sea weeds (Table I) were significantly seen from October to December 1985 and in January and February 1986. During the period October-December 1985 heavy silt deposition on oysters and cages was observed. This period coincides with the north east monsoon which results in change in direction of wind and water current in Kundugal channel. The silt brought by the current deposit on cages and oysters and the growth of sea weeds on oysters help the deposited silt retained which ultimately add to the fouling.

Boring by the annelid worm *Polydora* sp and sponge *Cliona* sp was very negligible when compared to the observations made by Velayudhan (1983) at Tuticorin and Veppalodai. From the Table 2, It can be seen that the fouling load per oyster at Krusadai farm ranged from 2.3 to 7.8 g during the one year period. But Jeyabaskaran et al (1983) reported that the weight of foulers per oyster varied between 3.5 and 32.0 g at Tuticorin farm.

REFERENCES

ALAGARSWAMI, K. 1970. Development of cultured pearls in India. *Curr. Sci.*, 43 (7): 205-207.

ALAGARSWAMI, K. AND A. CHELLAM. 1976. On fouling and boring organisms and mortality of pearl oysters in the farm at Veppalodai, Gulf of Mannar. *Indian J. Fish.*, 23 (1 & 2) : 10-22.

ANANTHANARAYANAN, R. 1967. The fouling organisms of the pearl oyster farm, Krusadai Island, Gulf of Mannar. *Madras Jour. Fisheries*, 31 : 145-146.

DEVANESAN, D. W. AND K. CHIDAMBARAM. 1956. Results obtained at the pearl oyster farm, Krusadai Island, Gulf of Mannar and their application to problems relating to pearl fisheries in the Gulf of Mannar, *Part I. Cent. Mar. Biol. St Krusadai Is., Gulf of Mannar*, 4 : 1-89.

DHARMARAJ, S. AND A. CHELLAM. 1983. Settlement and growth of barnacle and associated fouling organisms in pearl culture farm in the Gulf of Mannar. *Proc. Symp. Coastal Aqaculture*, Mar. biol. Ass. India, 2 : 608-613.

JEYABASKARAN, Y., D. S. DEV., I. NALLUCHINNAPPAN AND N. RADHAKRISHNAN. 1983. On the growth of the pearl oyster *Pinctada fucata* (Gould) under farm conditions at Tuticorin, Gulf of Mannar. *Proc. Symp. Coastal Aquaculture*, Mar. biol. Ass. India., 2 : 587-589.

KURIYAN, G. K. 1980. The fouling organisms of pearl oyster cages. *J. Bombay. Nat. Hist. Soc.*, 49 (1) : 90-92.

MARKHAM, C. R. 1865. Letter dt. 26-11-1865 to Government of Madras Rev. Dept. Lon. Proc. No. 5 of Rev. Dept. Ms. Government dt. 3-12-1866.

NALLUCHINNAPPAN, I , D. S. DEV, M. IRULANDI AND Y. JEYABASKARAN. 1982. Growth of pearl oyster *Pinctada fucata* (Gould) in cage culture at Kundugal channel, Gulf of Mannar. *Indian J. Mar. Sci.*, 111 : 193-194.

VELAYUDHAN, T. S. 1983. On the occurrence of shell boring polychaetes and sponges on pearl oyster *Pinctada fucta* and control of boring organisms. *Proc. Symp. Coastal Aquaculture*. Mar. biol. Ass. India, 2 : 614-618