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Short Communication

DISTRIBUTION AND ABUNDANCE OF BENTHIC POLYCHAETES AROUND ARTIFICIAL REEFS

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ABSTRACT

A study was conducted in coastal waters off the east coast of Peninsular Malaysia to determine the distribution and abundance of polychaetes around an artificial reef complex. The distribution and abundance of polychaetes around the artificial reef complex were determined before and after the reef installation. Forty two families of polychaetes were found in the area. The dominant families before the reef installation showed continued domination after the reef installation. This study shows that the abundance and distribution of polychaetes are highly influenced by the artificial reef installation.

KEYWORDS: artificial reefs, distribution, abundance, polychaetes.

INTRODUCTION

Fishermen have been constructing artificial reefs in various aquatic environment for centuries to attract marine organisms, particularly those of commercial value (Turner *et al.*, 1969; Stone, 1982; Grove & Sonu, 1983). In most cases artificial reefs were actually attempts to imitate or to amplify the effect of natural reefs as a habitat for marine life. Artificial reefs placed in the marine environment can enhance fisheries productivity by providing substrate for attaching organisms, increase habitat complexity by providing vertically defined spaces and change the wave and current pattern (Turner *et al.*, 1969).

Many researches have been done on the attraction of fish and other invertebrates to artificial reefs (Alcala *et al.*, 1981; Gomez *et al.*, 1982; Ibrahim, 1991 & 1996). Research conducted in Florida Keys showed that an unproductive area of water managed to attract fish and other organisms after the installation of artificial reef (Stone *et al.*, 1979). This is due to the ability of artificial reefs to provide substrate for attaching organisms, change current and wave patterns in the area and develop a complex and stable artificial habitat in terms of feeding hierarchy (Molles, 1978).

Many past researches on artificial reef have only been concentrated on the attraction of fish and other invertebrates. Little studies have been done on the occurrence of benthic organisms around artificial reef complex. As a component in the complex feeding hierarchy in artificial reef areas, benthic organisms too play important role in enhancing the productivity of artificial reefs. This study is thus to examine the distribution and abundance of benthic organisms particularly polychaetes, around an artificial reef complex.

MATERIALS AND METHODS

This study was conducted outside monsoon season which occurs between November and March every year. Pieces of cube-shaped concrete structures (Figure 1) were constructed and installed in pyramidal form. There were 10 pieces of the structure in a module and 15 modules were arranged to make a reef complex having an approximate base dimension of 4m x 4m and a height of 2m.

An area with latitude 05° 27.40'N and longitude 103° 06.19'E was selected as the experimental reef installation site. It was located approximately 2.1 km from the east coast of Peninsular Malaysia, having sandy mud bottom and depth at low tide of 12m (Figure 2). Recorded current speed for the area was 0.057m/sec to 1.400m/sec. Locations of the artificial reef and sampling stations were determined prior to the start of the study using a GPS. Sampling stations were located 0, 5 and 10m from the artificial reefs location in the directions of north, south, east and west (Figure 2). Prior to the installation of the reef modules, samples of bottom sediments were taken at the pre-

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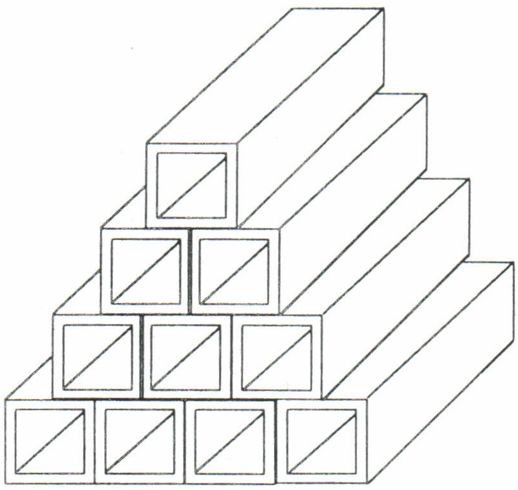

Figure 1. Configuration of the reef module

determined locations using a Smith McIntyre grab. The whole sediment samples were sieved using 500μm sieves. Benthic organisms were preserved in 10% buffered formalin for later identification under microscopes (Stereoscopes 40x) in the laboratory. Taxonomic keys and diagrams were used for identification purposes (Day, 1967; Gosner, 1971).

Using similar procedures, sampling for bottom sediments were again conducted at similar pre-determined stations two months after the reef installation. Sediment samples were then analyzed for benthic organisms. As a control, sediments were also sampled before and after the installation of the artificial reef complex at sites approximately 100 meters from the reef complex and analyzed for benthic organisms.

RESULTS AND DISCUSSION

Although benthic organisms comprise many phyla, this study emphasizes only on Class Polychaeta of the Phylum Annelida. The distribution and abundance of polychaetes in the predetermined sampling locations before and after the installation of the reef modules are shown in Table 1. Analysis of sediment samples taken at each sampling location before and after the installation of the reef modules revealed the presence of 24 families of polychaetes. In terms of numbers (above the mean), the dominant families of polychaetes before the reef installation were Glyceridae, Lumbrineridae, Nephtydae, Onuphidae, Pilargidae, Sabellidae, Scalibregmidae and Syllidae. Families of Eunicidae, Glyceridae, Nephtydae, Onuphidae, Ophellidae, Pilargidae, Sabellidae, Scalibregmidae and Syllidae were found to be dominant after the reef installations. The polychaetes recorded a mean percentage increase of 229.89 after the reef installation. The domination by a few species of organisms in an area is due to factors such as availability of resources, quality of water and stability of water with respect to current in the area. Warwick (1986) noted that the domination is caused by a varied degree of availability of resources and water quality in the area. In this study, families of Glyceridae, Nephtydae, Onuphidae, Pilargidae, Sabellidae, Scalibregmidae and Syllidae (except Lumbrineridae) showed a continued domination before and after the reef installation. It could thus be postulated from the present study that the installation of the reef complex has provided conducive environment for the domination of the families of polychaetes, beside the factors of resource availability and water quality.

There was a significant increase in the number of polychaetes for all the sampling stations after the reef installation ($P<0.05$). Before the reef installation, the number of polychaetes presence at each sampling stations were small (37.92 ±16.60), but it showed a marked increase after the installation of the reef complex (106.08±41.69). The percentage increase in the number of organisms by sampling stations was found to be 197.72. This increase is probably due to effect of reef installation on the current pattern in the area. The installation of the reef complex stabilizes the water current to some extent and this provides conducive environment for the settlement of polychaetes in the surrounding areas. Analysis on the control samples did not show marked increase in number of organisms before and after the reef installation.

CONCLUSION

The study shows that the abundance and distribution of polychaetes are highly influenced by the installation of artificial reefs. Polychaetes were found to be more abundant after the installation of artificial reefs. As polychaetes is one of the important organisms that determines the productivity of an area, this findings is of importance for future consideration of artificial reef installation programs.

Table 1. Distribution and abundance of polychaetes according to sampling stations before and after (in brackets) the installation of artificial reef modules.

Families	Sampling stations												Total	% Change
	1	2	3	4	5	6	7	8	9	10	11	12		
Ampharetidae	0(0)	0(2)	1(2)	2(2)	1(7)	1(6)	0(1)	0(6)	1(0)	0(1)	1(7)	0(1)	7(34)	385.7
Aphroditidae	0(1)	0(0)	0(1)	0(1)	0(0)	0(2)	1(3)	1(1)	0(2)	0(0)	0(10)	0(0)	2(21)	950.0
Capitellidae	2(0)	0(3)	3(1)	1(3)	0(5)	2(2)	4(1)	4(5)	2(0)	1(9)	0(8)	9(2)	28(39)	39.3
Cirratulidae	0(3)	0(3)	2(6)	1(4)	0(3)	0(2)	2(1)	0(5)	1(0)	3(3)	2(7)	0(3)	11(40)	263.6
Dorvilleidae	0(2)	0(2)	0(2)	5(3)	0(4)	0(8)	2(2)	0(5)	0(1)	2(3)	0(3)	0(4)	9(39)	333.3
Eunicidae	1(7)	2(4)	3(7)	2(11)	0(3)	0(7)	0(5)	2(3)	2(2)	3(1)	3(4)	0(10)	18(64)	255.6
Glyceridae	3(6)	3(2)	1(4)	10(11)	1(14)	5(12)	3(11)	2(2)	0(3)	5(10)	1(15)	8(17)	42(107)	154.8
Lacydoniidae	0(4)	1(5)	1(1)	4(1)	0(0)	0(6)	1(3)	1(1)	0(3)	0(0)	0(2)	0(3)	8(29)	262.5
Lumbrineridae	0(4)	2(3)	0(6)	1(3)	0(2)	2(2)	3(4)	0(4)	0(2)	1(8)	4(0)	9(2)	22(40)	81.8
Magelonidae	2(1)	2(2)	0(2)	0(5)	0(2)	0(1)	1(1)	0(1)	0(0)	0(1)	0(0)	0(0)	5(16)	220.0
Maldanidae	3(2)	0(3)	1(1)	3(5)	1(6)	2(4)	0(7)	0(2)	0(1)	3(4)	1(1)	0(3)	14(39)	178.6
Nephtydae	2(6)	1(7)	5(7)	4(9)	4(4)	4(11)	2(5)	1(7)	2(2)	4(6)	7(14)	6(18)	42(96)	128.6
Nereidae	0(3)	1(1)	0(3)	1(1)	3(4)	1(5)	0(1)	0(0)	0(0)	3(5)	0(1)	6(5)	15(29)	93.3
Onuphidae	4(2)	0(2)	0(5)	2(17)	3(6)	4(13)	3(8)	1(3)	0(8)	5(15)	3(12)	3(13)	28(104)	271.4
Ophellidae	2(2)	2(4)	3(5)	1(8)	0(10)	1(4)	1(3)	1(2)	0(0)	0(6)	2(9)	2(4)	15(57)	280.0
Phyllodocidae	0(3)	2(2)	0(4)	0(7)	1(8)	0(2)	2(1)	0(3)	0(1)	1(3)	1(3)	0(1)	7(38)	442.9
Pilargidae	8(5)	0(3)	0(1)	1(13)	0(4)	3(3)	1(10)	0(4)	0(1)	3(8)	9(12)	4(15)	29(79)	172.4
Pisonidae	1(2)	1(1)	1(0)	2(5)	0(7)	5(6)	2(8)	0(1)	0(1)	0(9)	0(3)	3(2)	15(45)	200.0
Sabellidae	4(8)	2(2)	0(7)	7(16)	6(8)	3(20)	4(7)	0(5)	0(3)	4(7)	0(12)	8(11)	38(106)	178.9
Scalibregmidae	3(10)	2(0)	0(2)	4(4)	5(9)	16(12)	3(2)	1(2)	0(1)	1(19)	5(4)	0(7)	40(72)	80.0
Spionidae	0(3)	3(5)	1(2)	6(4)	0(15)	3(8)	0(2)	3(4)	1(3)	0(5)	0(6)	0(11)	17(25)	47.1
Sternaspidae	0(0)	2(5)	2(1)	0(1)	0(2)	0(0)	1(0)	1(1)	0(1)	0(1)	0(1)	0(0)	6(13)	116.7
Syllidae	3(2)	0(2)	0(2)	8(15)	0(12)	4(8)	1(4)	9(0)	0(1)	1(7)	5(16)	0(8)	31(77)	148.4
Trochochaetidae	0(1)	1(0)	0(0)	2(1)	1(4)	0(3)	1(4)	0(2)	0(0)	1(0)	0(4)	0(1)	6(20)	233.3
Total	38(77)	27(63)	24(72)	67(150)	26(139)	56(147)	38(94)	27(69)	9(36)	41(131)	44(154)	58(141)	455(1273)	179.8
% Change	102.6	133.3	200.0	123.9	434.6	162.6	147.4	155.6	300.0	219.5	250.0	143.1	179.8	

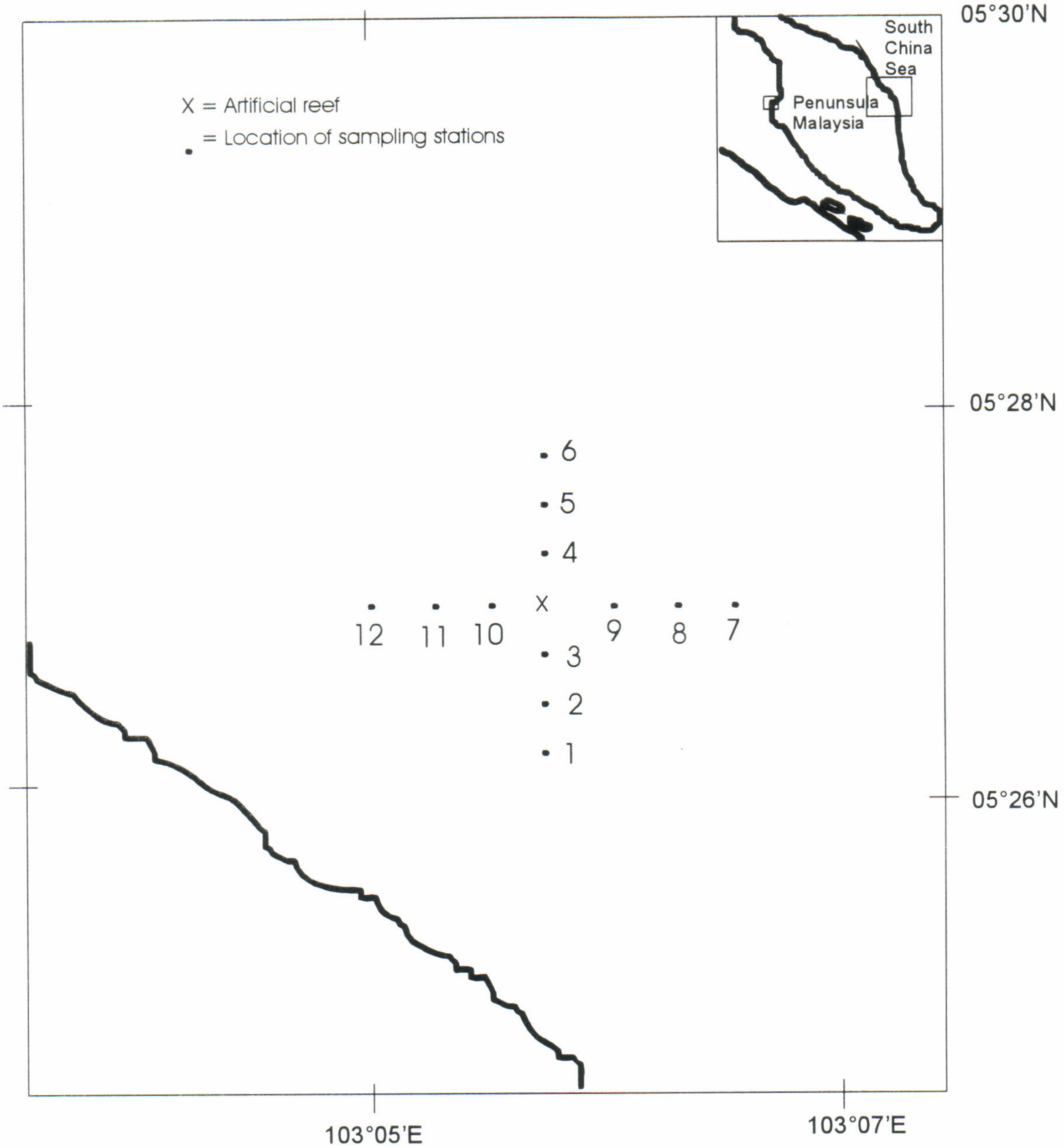

Figure 2. Location of experiment

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