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DISTRIBUTION AND ABUNDANCE OF MOLLUSCAN CRYPTOFAUNA FROM KARAICHALLI ISLAND (GULF OF MANNAR), SOUTHEASTERN COAST OF INDIA

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ABSTRACT

Replicate samples of live coral, dead massive coral, dead branching coral, and live & dead coral were studied. The surface area, volume, percentage cover, biomass and percentage available living space were determined for molluscan cryptofauna in each habitat. The gastropods *Pyrene versicolor*, *Drupa* sp. and *Cerithium* sp. were common in branching corals. The bivalves *Saccostrea cuccullata*, *Arca* sp., *Isognomon* sp., *Pinctada* sp. and *Lithophaga* sp. were common in dead parts of ramose corals. Mytilids were rare in living parts of ramose corals. *Pyrene* sp., *Drupa* sp., *Cerithium* sp. and *Lambis* sp. were found crawling on the surface of the massive corals.

INTRODUCTION

Cryptofauna refers to the fauna living in coral substrates and certain fauna living on the surface of the substrates (Peyrot-Clausade 1974). However, the term epifauna is also used for animals living on surfaces. Cryptofauna can be divided into two components: the 'true borers' and the 'opportunistic' species. The 'opportunistic species' cannot bore. They utilize cracks, crevices, or live at the bases of long coral branches where they are completely hidden. Most of the bivalves belong to the boring cryptofauna and the gastropods belong to opportunistic cryptofauna (Richard 1973). There is no clear distinction between opportunistic cryptofauna and epifauna. But we use the term cryptofauna in accordance with Richard (1973).

Habitat structure is an ecological topic in its own right, and should not be treated simply as a routine component of all systems (McCoy *et al.* 1991). Qualitative and quantitative work has shown that coral reef cryptofauna is diverse and abundant (Ebbs 1966; Reish 1968; McCloskey 1970; Grassle 1973; Kohn & Lloyd 1973; Hutchings *et al.*, 1992). Several studies have been made on the molluscs associated with corals in other reefs (Tailor 1971; Patton 1975; Hadfield 1976; Morton 1984). The aim of this study is to document the distribution and abundance of molluscan cryptofauna from Karaichalli Island of Gulf of Mannar, southeastern coast of India.

MATERIALS AND METHODS

The study area is shown in Fig. 1. Replicate coral samples were collected during December 1994 at the southern tip of Karaichalli Island (8°57'N; 78°14'E) in the Gulf of Mannar, 18 km northeast of Tuticorin, southeastern coast of India. Extensive coral reefs occur only at depths from 1-6 m at the northern and southern tips of this island. The coral reef is composed of large boulders with intermittent sandy spaces. Every year during the southwest monsoon (April to October) several corals die due to the sedimentation. During that season, the branching corals are subjected to considerable damage by the mechanical force of high waves.

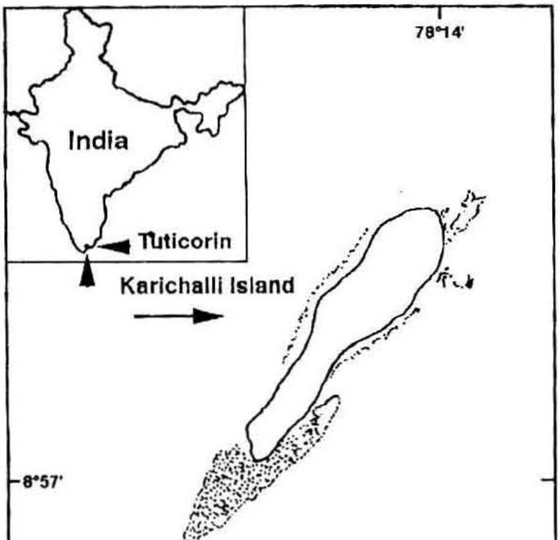

Figure 1. Study area. The dotted pattern indicates reef areas.

The habitats were classified into the four categories: live coral, dead massive coral, dead branching coral, and corals with live and dead parts.

Each colony was wrapped in a thin plastic sheet to determine the total colony displacement volume. Associated macrobenthic animals were removed from the coral colony after breaking with a hammer and chisel. The volume of coral pieces was measured (colony volume). Total colony displacement volume minus colony volume is an index of colony internal space (Tsuchiya & Yonaha 1992). The corals were finally broken into small pieces to remove the associated molluscs. They were preserved in 10 % formalin for identification and biomass measurements. Other cryptofaunal communities such as sponges, polychaetes, crustaceans, sipunculans and ascidians were not enumerated.

The surface area of the sample was determined by coating all surfaces of block, except the cut surface, with several layers of liquid latex until a coat of latex was built up. When dry, the latex was peeled off and the surface area measured with a planimeter (Hutchings & Weate 1977).

RESULTS AND DISCUSSION

The density of cryptofauna molluscs in different habitats in relation to surface area, volume, weight and internal space are shown in Table 1. The list of molluscs collected from different habitats with their relative abundance are shown in Table 2.

The percentage of molluscs in dead branched coral was higher than in the live branched coral. Dead massive coral harboured more molluscs than the live massive coral. The coral with live and dead parts had a higher percentage of molluscs than live coral.

Table 1. Density of cryptofauna molluscs in different habitats.

Habitat	Total wet weight (g)	Total volume (cc)	Internal space (cc)	Surface area (cm^2)	Weight of molluscs (%)
Live Coral					
a. *Montipora digitata*	720	318	76	268	2.58
b. *Porites solida*	610	212	21	174	0.91
Dead branched coral					
Acropora surculata	648	237	82	182	3.40
Dead Massive Coral					
Favites virens	564	196	48	169	1.62
Live & Dead Coral					
a. *Pocillopora damicornis*	570	260	62	154	2.72
b. *Favia pallida*	640	223	41	172	1.08

Table 2. Molluscs collected from different habitats together with their relative abundance. C.L.D.P.= Coral with live and dead parts; B= Branched; M=Massive.

Name of the species	Live coral		Dead coral		C.L.D.P.	
	B	M	B	M	B	M
GASTROPODS						
Scutus unguis				*		
Trochus radiatus		*				*
T. stellatus	*	*	*		*	
T. tentorium				*	*	
Turbo intercostalis	*		*	*		
Nerita albicilla				*	*	*
N. polita			*			
Nodilittorina pyramidalis		*		*		
Planaxis sulcatus		*			*	
Cerithium obeliscus	*	*		*		
C. citrinum		*			*	*
C. scabridum		*		*	*	*
Lambis lambis		*			*	
Cypraea caputserpentis				*		
Murex virgineus	*		*		*	
Drupa tuberculata	*		*		*	
D. margariticola	*	*	*			
Pyrene versicolor	*	*	*	*	*	*
P. zebra	*			*	*	
Planispira fallaciosa		*				
BIVALVES						
Barbatia fusca		*	*			*
Arca symmetrica			*	*		*
Lithophaga gracilis	*		*	*	*	
L. levigata			*	*		*
L. nigra	*		*	*		*
L. stramineus			*	*	*	
Isognomon isognomum		*	*	*		*
Pinctada anomoides		*		*		*
P. margaritifera		*		*		
Saccostrea cuccullata		*		*		
Venerupis macrophylla			*		*	*
Petricola divergens		*	*			
P. lithophaga			*	*		
Gastrochaena gigantea			*		*	
G. impressa			*			*
Pholadidea cheveyi			*			*
Parapholas quadritozonata		*	*			*

The nature of the bottom, wave action, exposure, temperature, availability of suitable food and behavioural aspects of larvae and adults are involved in determining the distribution and abundance of cryptofauna (Hutchings & Weate 1977). Roughgarden (1975) proposed three conditions necessary for a symbiotic relationship to evolve:

i) the host should be easy to find.
ii) the host should survive well with the symbiont.
iii) the host should provide substantial benefit to the guest.

In this case, corals provide food and shelter for the molluscs. Due to higher nutrient availability and plankton productivity, molluscs appeared more prominent on the bases and undersides of corals. Branching corals are better for byssus secreting forms, and massive corals are more suitable for cemented or boring bivalves. Large dead molluscs could act as a substrate for coral settlement. However, the role of mollusc cryptofauna in different habitats of coral reefs is not fully understood.

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REFERENCES

Ebbs, N. K. 1966. The coral-inhabiting polychaetes of the Northern Florida reef tract. Part I. Aphroditidae, Polynoidae, Amphinomidae, Eunicidae and Lysaretidae. - Bulletin of Marine Science **16**(3): 485-555.

Grassle, J. F. 1973. Variety in coral reef communities. Pages 247-270 *in* O. A. Jones & R. Endean (eds.). The Biology and Geology of Coral Reefs, Volume II, Biology I. - Academic Press, New York and London.

Hadfield, M. G. 1976. Molluscs associated with living corals. - Micronesia **12**: 133-148.

Hutchings, P. A. & P. B. Weate. 1977. Distribution and abundance of cryptofauna from Lizard Island, Great Barrier Reef. - Marine Research in Indonesia **17**: 99-112.

Hutchings, P. A., W. E. Kiene, R. B. Cunningham & C. Donelly. 1992. Spatial and temporal patterns of non-colonial boring organisms (Polychaete, sipunculans and bivalve molluscs) in *Porites* at Lizard Island, Great Barrier Reef. - Coral Reefs **11**: 23-31.

Kohn, A. J. & M. C. Lloyd. 1973. Polychaetes of truncated reef limestone substrates on Eastern Indian Coral Reefs: diversity, abundance and taxonomy. - Internationale Revue der Gesamten Hydrobiologie **58**(3): 369-399.

McCloskey, L. R. 1970. The dynamics of the community associated with a marine scleractinian coral. - Internationale Revue der Gesamten Hydrobiologie **55**(1): 13-81.

McCoy, E. D., S. S. Bell & H. R. Mushinsky. 1991. Habitat structure: Synthesis and perspectives. Pages 427-430 *in* S. S. Bell, E. D. McCoy & H. R. Mushinsky (eds.). Habitat Structure: The Physical Arrangement of Objects in Space. - Chapman & Hall, London.

Morton, B. S. 1984. Coral associated bivalves of the Indo-Pacific. Pages 140-224 *in* W. D. Russell-Hunter (ed.). The Mollusca, Vol. 5, Ecology. - Academic Press, New York. 695 pp.

Patton, W. K. 1975. Animal associates of living coral reefs. Pages 1-36 *in* O. Jones & R. Endean (eds.). Biology and Geology of Coral Reefs, vol. 3, Biol. 2. - Academic Press, New York.

Peyrot-Clausade, M. 1974. Ecological study of coral reef cryptobiotic communities. An analysis of the polychaete cryptofauna. Pages 269-283 *in* A. M. Cameron, B. M. Campbell, A. B. Cribb, R. Endean, J. S. Jell, O. A. Jones, P. Mather & F. H. Talbot (eds.). Proceedings of the second International symposium on Coral Reefs. Brisbane: Great Barrier Reef Committee, vol. 1. 793 pp.

Reish, D. J. 1968. The polychaetous annelids of the Marshall Islands. - Pacific Science **22**(2): 208-231.

Richard, G. 1973. Abondances et dominances des Mollusques dans un ecosysteme corallien (Moorea, Polynesie francaise). - Bulletin du Museum National d'Histoire Naturelle 3rd series **163**: 309-313.

Roughgarden, J. 1975. Evolution of marine symbiosis - a simple cost benefit model. - Ecology **56**: 1201-1208.

Tailor, J. D. 1971. Reef associated molluscan assemblages in the western Indian Ocean. - Symposium on Zoological Society of London **23**: 501-534.

Tsuchiya, M. & C. Yonaha. 1992. Community Organization of associates of the scleractinian coral *Pocillopora damicornis*: Effects of colony size interactions among the obligate symbionts. - Galaxea **II**(1): 169-173.