GASTROPODS AND BIVALVES ASSOCIATED WITH REEF BUILDING CORALS, PALK BAY, SOUTHEASTERN INDIA

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ABSTRACT

Reef building corals of the families Pocilloporidae, Acroporidae, Poritidae, and Faviidae were collected at low tide. A total of 73 species of molluscs were associated with corals in Palk Bay, *viz.*, 46 species of gastropods belonging to 17 families, and 27 species of bivalves belonging to 13 families. Molluscs were rarely associated with young corals. The present study shows that the structure and size (weight) of corals influence the molluscan diversity. The number of molluscan individuals increased with increasing coral weight. With a single exception, no molluscs were associated with the massive coral *Favia pallida*. Very few boring bivalves were recorded from branching corals.

INTRODUCTION

Molluscs are associated with corals, either because they use coral as a habitat, or they feed on the coral tissue/mucus (Robertson 1970). Hadfield (1976) divided the coral-mollusc association into four categories: (1) predators and parasites (2) borers of living corals (3) epizoic species and (4) molluscs which serve as species substrate for corals. Austin *et al.* (1980) described 101 species associated with the coral *Pocillopora damicornis* from the Great Barrier Reef, none was a bivalve. Some of the lithophagine borers attack living corals as well as dead skeletons. It is not fully understood how they manage to settle among living coral polyps.

Epilithic and endolithic molluscs produce a great deal of sediment on reefs. As a substrate, coral colonies are very complex and their dead undersides and branches offer shelter and food for large number of molluscs. There are obvious general difference in the type of substrate provided by various categories of growth forms of corals. For instance, branching corals are better habitats for byssate forms and massive corals are more suitable for cemented or boring bivalves (Morton 1982). The present study was undertaken to estimate how the structure and morphology of corals influence the molluscan diversity in an Indian coral reef ecosystem.

MATERIALS AND METHODS

Colonies of *Acropora corymbosa*, *Pocillopora damicornis*, *Porites lutea* and *Favia pallida* of various sizes were sampled in Palk Bay, southeastern coast of India (9°17'N; 79°8'E). The observations were carried out between April and September 1994, during low tide when the reef was exposed.

The weight of each colony was measured. The epilithic and predating molluscs were separated and preserved in 10 % formalin. The collected colonies were then broken with a hammer and chisel to extract endolithic molluscs. The total fauna of gastropods and bivalves were identified and counted.

RESULTS

A total of 73 species of molluscs were associated with corals in Palk Bay (Table 1). Gastropods represented the numerically dominant group with 46 species belonging to 17

families. Among these species of gastropods, 7 species were hiding in the live and dead coral, *viz.*, *Cantharidus interruptus*, *Nerita albicilla*, *Vermetus* sp., *Spiroglyphus spirulaeformis*, *Vermicularia inopertus*, *Cypraea errones*, *Drupa heptagonalis*. A total of 21 species were present in the dead corals, and 31 species were found in sand among the corals. Bivalves were represented by 27 species belonging to 13 families. Out of these bivalves, 12 species were embedded in live coral, and 13 species were dwelling in the dead coral parts (crevices and clefts). Some of them were byssally attached to the coral skeleton. Only 6 species of bivalves were observed in the coral sand.

Acropora corymbosa and *Pocillopora damicornis* give protection from wave action to several fragile bivalves, but otherwise, more gastropods than bivalves are associated with these corals. Very few boring bivalves were recorded from branching corals.

Molluscs were rarely associated with young corals. There were no molluscs associated with *Pocillopora damicornis* weighing less than 100 g. But, the number of molluscan individuals increased with increasing coral weight. For example, no molluscs were found associated with the staghorn coral, *Acropora corymbosa* weighing less than 180 g.

A 500 g *A. corymbosa* harboured 5 species of gastropods and 4 species of bivalves, while a 1025 g specimen yielded 6 species of gastropods and 4 species of bivalves. Many bivalves were embedded in the massive coral *Porites lutea*. With a single exception, no molluscans were associated with the massive coral *Favia pallida* (Table 2).

DISCUSSION

The lithophagines associated with corals possess glands in the siphons which may inhibit the nematocyst discharge of the coral. Morton & Scott (1980) have made some progress in showing how the protection is achieved. Lithophagines are generally dominant among the bivalves of coral reef areas, otherwise dominated by the gastropods. The reason for this may be that bivalves need organically rich environments, especially water rich in suspended organic matter (Taylor 1971). The biomass of suspension feeders may increase with the amount of suspended material.

The inter-branch volume of branching corals is a measure of habitat size and protection from wave action. Hence the branching corals *Acropora corymbosa* and *Pocillopora damicornis* have a large number of molluscan associates. Small branching coral colonies have small inter-branch volumes, *i.e.*, less space, and the branches are fragile and thin compared with larger colonies. Hence, the small corals have no associated molluscs.

Except in one sample, there were no molluscs associated with *Favia pallida*. We suggest that this finding is related to the structure of the skeleton and the rough, uniform surface of this species of coral. The corallites of *F. pallida* are circular, projecting up to 5 cm (Gopinadha Pillai 1969).

Table 1. Molluscs associated with corals in Palk Bay. S = Coral sand, D = Dead coral, L = Live coral, (•) = present, (o) = absent.

	S	D	L
Class GASTROPODA			
Haliotidae			
Haliotis varia (Linné)	o	•	o
Fissurellidae			
Diodora lima (Sowerby)	o	•	o
Diodora funiculata (Reeve)	•	o	o
Diodora clathrata (Reeve)	•	o	o
Emarginula obovata (A. Adams)	•	o	o
Trochidae			
Euchelus asper (Gmelin)	•	o	o
Cantharidus interruptus (Wood)	o	•	•
Clanculus clanguloides (Wood)	o	•	o
Trochus radiatus (Gmelin)	•	o	o
Trochus stellatus (Gmelin)	•	•	o
Trochus tentorium (Gmelin)	•	•	o
Trochus pustulosus (Philippi)	•	o	o
Turbinidae			
Liotia cidaris (Reeve)	•	o	o
Turbo intercostalis (Menke)	•	o	o
Turbo petholatus (Linné)	•	o	o
Neritidae			
Nerita albicilla (Linné)	o	•	•
Nerita chameleon (Linné)	•	o	o
Nerita polita (Linné)	•	o	o
Nerita plicata (Linné)	•	•	o
Nerita maura (Recluz)	•	o	o
Nerita rumphii (Recluz)	•	o	o
Nerita squamulata (LeGuillou)	•	o	o
Littorinidae			
Littorina scabra (Linné)	•	o	o
Rissoidae			
Rissoina clathrata (A. Adam)	•	•	o
Turritellidae			
Turritella acutangula (Linné)	•	o	o
Turritella attenuata (Reeve)	•	o	o
Architectonica perspectiva (Linné)	•	o	o
Vermetidae			
Vermetid sp.	o	•	•
Spiroglyphus spirulaeformis (de Serres)	o	•	•
Vermicularia inopertur (Rüppell)	o	•	•
Cerithiidae			
Cerithium morus (Lamarck)	o	•	o
Cerithium obeliscus (Bruguiere)	•	•	o
Xenophoridae			
Xenophora corrugata (Reeve)	•	•	o
Strombidae			
Strombus gibberulus (Linné)	•	o	o
Strombus canarium (Linné)	•	o	o
Pterocera lambis (Linné)	•	o	o
Cypraeidae			
Cypraea moneta (Linné)	o	•	o
Cypraea errones (Linné)	o	•	•
Ovulum formosum (Adams & Reeve)	•	o	o
Cassididae			
Phalium canaliculatum (Bruguiere)	•	o	o
Phalium ponderosum (Gmelin)	•	o	o
Muricidae			
Drupa leptagonalis (Reeve)	•	o	o
Drupa margariticola (Broderip)	o	•	•
Pyrenidae			
Pyrene versicolor (Sowerby)	o	•	o
Pyrene zebra (Gray)	o	•	o
Buccinidae			
Engina zonata	o	•	o
Class BIVALVIA			
Arcidae			
Arca conplanta (Chemnitz)	o	•	o
Arca fusca	•	o	o
Mytilidae			
Modiolus metcalfei (Hanley)	o	•	o
Brachidontes variabilis (Krauss)	o	•	o
Septifer bilocularis (Linné)	o	•	o
Lithophaga teres (Philippi)	o	o	•
Lithophaga gracilis (Philippi)	o	o	•
Lithophaga nigra (d'Orbigny)	o	o	•
Lithophaga stramineus (Dunker)	o	o	•
Lithophaga cinnamomea (Lamarck)	o	o	•
Isognomonidae			
Isognomon nucleus (Linné)	o	•	•
Pterridae			
Pteria chinensis (Leach)	o	•	o
Ostreidae			
Ostrea forskalii	o	•	•
Erycinidae			
Galeomma paucistriata (Deshayes)	o	•	•
Scintilla hanleyi (Deshayes)	o	•	•
Chamidae			
Chama reflexa (Reeve)	o	•	o
Cardiidae			
Cardium setosum (Redfern)	•	o	o
Lunulicardia retusa (Linné)	•	o	o
Veneridae			
Venus reticulata	•	o	o
Venerupis macrophylla (Deshayes)	o	o	•
Irus exoticus (Lamarck)	o	•	o
Petricolidae			
Petricola lithophaga (Retzius)	o	o	•
Solenidae			
Solen lamarckii (Deshayes)	•	o	o
Solen aspersus (Dunker)	•	o	o
Gastrochaenidae			
Gastrochaena gigantea	o	•	o
Gastrochaena apertissima	o	•	•
Pholadidae			
Pholas orientalis (Gmelin)	o	•	o

Table 2. Number of gastropod (G) and bivalve (B) species associated with 4 species of coral. Increasing order of live coral weight (W) is shown for the 10 samples of each coral species.

Acropora corymbosa			*Pocillopora damicornis*			*Porites lutea*			*Favia pallida*		
W	G	B	W	G	B	W	G	B	W	G	B
90	0	0	55	0	0	375	0	1	180	0	0
155	0	0	100	0	0	420	0	0	195	0	0
180	0	0	200	1	1	435	0	0	240	0	0
310	4	0	215	1	1	650	1	1	260	0	0
465	6	2	270	3	1	740	5	3	275	0	0
500	5	4	280	2	3	850	3	0	305	0	0
625	6	1	300	3	0	925	1	2	325	0	0
720	6	0	350	2	0	1050	5	4	390	0	1
845	8	2	465	3	2	1210	4	2	400	0	0
1025	6	4	520	12	3	1365	2	3	590	0	0

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