



†Hard coral diversity along southwest coast of India

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Abstract

Patchy growths of hard corals are found to occur off Vizhinjam and Enayam along the southwest coast of India. This study gives the result of survey conducted off Vizhinjam and Enayam for assessment of the coral cover and biodiversity following Line Intercept Transect method. A total of 13 species belonging to six genera of Scleractinians was represented in this study. The most common genus *Pocillopora* was represented by five species. Relative abundance values were derived for each species and they were assigned the status dominant, abundant, common, uncommon and rare. *Pocillopora verucosa* and *P. meandrina* were assigned the status 'dominant' in Vizhinjam and *Montipora aequituberculata* in Enayam. *Pocillopora damicornis* belonged to the category 'abundant' and all the other species were either of 'common' or 'uncommon' status only. Biodiversity indices such as Pielou's Evenness Index; Shannon Diversity Index and Simpson Diversity Index were also determined for each site. The coral fauna in structure and composition was more related to Gulf of Mannar than any other reef.

Keywords: Coral reef, Enayam, Vizhinjam, biodiversity, relative abundance

Introduction

Coral reefs are tropical marine ecosystems which are characterized by remarkably high biomass production and a rich faunal and floral diversity unequalled by any other habitat. The major reef formations in India are restricted to the Gulf of Mannar, Palk Bay, Gulf of Kutch, Andaman and Nicobar and the Lakshadweep Islands. There are patches of reefs in the intertidal areas of central west coast of India. Coral patches have been recorded in the intertidal regions of Ratnagiri, Malvan and Redi, south of Bombay (Qasim and Wafer, 1979) and at the Gaveshani Bank (Netrani) 100 km off Mangalore (Nair and Qasim, 1978; Zacharia *et al.*, 2006). Hermatypic corals along the shore are reported from Quilon in the Kerala coast to Enayam in Tamil Nadu (Pillai and Jasmine, 1995).

Occurrence of coral reefs along the southwest coast was once considered meager to non-existent,

but recent observations have shown that there are many reefs and coral communities in the area. The stony corals of the southwest coast have not been studied well. Coral patches occur in intertidal locations and submerged banks on the continental shelf along the west coast. Their diversity at these sites is generally restricted to a few genera. If a firm and immobile substratum is available, the likelihood of establishment of coral colony would considerably increase. It proved true off Vizhinjam where almost all the colonies collected were seen attached to breakwater boulders with the exception of the genus *Montipora* which was attached to the sea bottom. An earlier study made by Pillai and Jasmine (1995) revealed a patchy reef with good growth of pocilloporid corals from Enayam and also a few colonies from the Vizhinjam Bay attached to the boulders. We made a thorough underwater survey of these two areas to study the present status of coral growth. The study was aimed

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to describe species diversity, species richness, live and dead stony coral cover and their health condition and distribution.

Material and Methods

Vizhinjam Bay is an enclosed embayment (08° 22' 529" N lat.; 76° 59' 466" E long.) with the seaward side having huge granite and concrete boulders as wave breakers. At Enayam (08° 12' 92" N lat.; 77° 10' 906" E long.) there is a patchy reef formed around a rock about 500 m from the shore. Life-form Line Intercept Transect method was adopted for the survey in both these sites. In Enayam, areas around the reefs were chosen in random and 20 m long transects were sampled along the depth contours and the area covered by live and dead corals and other substrates were recorded. At Vizhinjam corals were found mostly on the granite and concrete blocks and here 20 m long transects were placed along the shore line at different depths. Transects were sampled in two sites, Vizhinjam Bay side and Harbour side. Six and nine transects were sampled at Enayam and Vizhinjam patchy reefs respectively. All hard corals intercepted by the transects were recorded and their maximal projected length were measured. The colonies were sampled and identified following Scheer and Pillai (1983), Pillai (1986), Veron (2000) and Rani and Sandhya (2007). The relative abundance of each species was calculated according to the contribution to living cover and the methodology adopted was as described in Sandhya et al. (2008).

The diversity of corals was calculated following Shannon-Weiner Index (H') and Pielou's Evenness Index (J'). To compare the biodiversity of two places, dominance plots were drawn by ranking the species in decreasing order of abundance. Relative abundance expressed as percentage of abundance in the sample was plotted across the species, against the increasing rank in x-axis on a log scale. On the y-axis the cumulative percentage was plotted. This cumulative curve is referred to as the dominance plot.

Results and Discussion

In the present investigation, the reefs of Enayam showed an average live coral cover of 83.1%. A total of 13 species of hard corals were found (Table 1). The average bleached and dead corals were less than 1% of the total coral cover. The resulting values were transformed into abundance categories (%). Based on the relative abundance values, *Montipora aequituberculata* was classified as 'Dominant' with the highest relative abundance percentage of 80.8. *Acropora efflorescens* (8.4%) and all the pocilloporids, except *Pocillopora edyoxi* belonged to the category 'Common'. Other species such as *Montipora turgescens*, *Porites lutea*, *Goniastrea pectinata*, *Turbinaria mesenterina*, *Montipora hispida*, and *Montipora verrilli* were categorized under 'Uncommon'. The reefs were evaluated according to a linear scale of coral cover (Gomez and Yap, 1988) and by this scale only those reefs with >75% coral cover are considered to be in excellent condition, 50-75% live coral cover in good condition; with 25-50% coral cover was considered as fair and those with < 25% live coral cover in poor condition. According to this scale, Enayam reef can be categorized as healthy.

The coral growth in Vizhinjam Bay is less, rather sparsely distributed when compared to Enayam waters. The total coral cover area is only 16.2% of the surveyed transect area and it can be considered as 'poor' condition. A total of nine species of hard corals were recorded from this area, the genus *Pocillopora* being dominant with five species. Considering relative abundance *Pocillopra verrucosa* and *P. meandrina* were categorized under 'Dominant' species; *P. damicornis* as 'Abundant', *P. woodjonesi*, *Montipora aequituberculata*, *M. millepora* and *M. verrilli* as 'Common' and *P. eydouxii* and *Porites lutea* as 'Uncommon' (Table 1). Bleaching of certain species was seen in colonies more exposed to strong sunlight, but its incidence was negligible.

The distribution of different species recorded here is compared with that of other coral areas of India (Table 2). The coral fauna of Vizhinjam and Enayam are more related to Gulf of Mannar with eleven species in common.

Table 1. Total percentage coral cover of each species, their life form categories and status according to relative abundance

Species	% cover	Life form categories	Relative abundance	Species status
Vizhinjam				
<i>Pocillopora damicornis</i>	1.75	Branching	10.79	Abundant
<i>Pocillopora verrucosa</i>	9.15	Branching	56.46	Dominant
<i>Pocillopora meandrina</i>	3.58	Branching	22.08	Dominant
<i>Pocillopora woodjonesi</i>	0.61	Branching	3.77	Common
<i>Pocillopora eydouxi</i>	0.12	Branching	0.73	Uncommon
<i>Montipora millepora</i>	0.44	Foliose	2.73	Common
<i>Montipora verilli</i>	0.17	Foliose	1.05	Common
<i>Montipora aequituberculata</i>	0.26	Foliose	1.61	Common
<i>Porites lutea</i>	0.12	Massive	0.76	Uncommon
Enayam				
<i>Pocillopora damicornis</i>	1.04	Branching	1.25	Common
<i>Pocillopora verrucosa</i>	2.75	Branching	3.31	Common
<i>Pocillopora meandrina</i>	0.68	Branching	0.82	Uncommon
<i>Pocillopora woodjonesi</i>	1.71	Branching	2.05	Common
<i>Pocillopora eydouxi</i>	0.56	Branching	0.67	Uncommon
<i>Montipora aequituberculata</i>	66.98	Foliose	80.76	Dominant
<i>Montipora verilli</i>	0.46	Foliose	0.56	Uncommon
<i>Montipora turgescens</i>	0.23	Encrusting	0.28	Uncommon
<i>Montipora hispida</i>	0.23	Encrusting	0.28	Uncommon
<i>Acropora efflorescens</i>	6.97	Branching	8.4	Common
<i>Porites lutea</i>	0.74	Massive	0.89	Uncommon
<i>Goniastrea pectinata</i>	0.56	Encrusting	0.67	Uncommon
<i>Turbinaria mesenterina</i>	0.16	Foliose	0.19	Uncommon

Table 2. Distribution of corals of Vizhinjam and Enayam in other parts of India

Species	Lakshadweep Islands	Gulf of Mannar	Gulf of Kutch	Andaman and Nicobar Islands
<i>Pocillopora damicornis</i>	x	x		x
<i>Pocillopora verrucosa</i>	x	x		x
<i>Pocillopora meandrina</i>				x
<i>Pocillopora woodjonesi</i>				
<i>Pocillopora eydouxi</i>	x	x		x
<i>Montipora foliosa</i>	x	x	x	x
<i>Montipora verilli</i>		x		x
<i>Montipora aequituberculata</i>		x		x
<i>Montipora turgescens</i>		x	x	x
<i>Montipora hispida</i>		x	x	
<i>Acropora efflorescens</i>	x			x
<i>Porites lutea</i>	x	x	x	x
<i>Goniastrea pectinata</i>	x	x	x	x
<i>Turbinaria mesenterina</i>	x	x		

Biodiversity indices: The diversity indices are given in Table 3. With respect to the number of species and their abundance, Shannon diversity is more in Enayam. The evenness of species was also

more in Enayam. The dominance plot also proves the rich diversity of corals in the Enayam area compared to Vizhinjam (Fig. 1).

Table 3. Univariate community parameters in Vizhinjam and Enayam

Vizhinjam				
S	N	J'	H' (log _e)	1-Lambda'
4	30	0.76	1.06	0.62
3	51	0.87	0.96	0.58
3	20	0.93	1.03	0.65
3	18	0.76	0.83	0.52
3	5	0.71	0.78	0.54
6	19	0.61	1.10	0.53
3	6	0.89	0.98	0.71
2	6	0.66	0.46	0.34
1	4	0.53	0.23	0.42
Enayam				
6	60	0.79	1.43	0.72
5	19	0.87	1.40	0.75
1	98	0	0	0
1	69	0	0	0
5	85	0.38	0.61	0.28
6	18	0.97	1.74	0.86

S = total species; N = total individuals; J' = Pielou's evenness; H' = Shannon diversity; 1-Lambda' = Simpson diversity

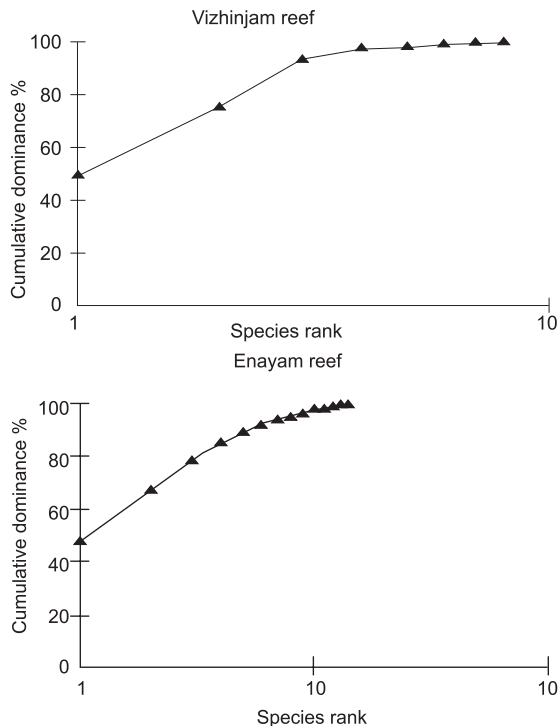


Fig. 1. Dominance plot for corals in Vizhinjam and Enayam

In both of the study sites, the genus *Pocillopora*, which enjoys a wide distribution all over the Indo-Pacific, was the most dominant with maximum number of species. Branching non-*Acropora* corals, which grow and recruit more slowly than acroporids, are the competitive dominants and they are defined as competition adapted. The health of the Enayam reef is generally excellent but harbours low species diversity when compared to other Indian reefs.

Pillai and Jasmine (1995) reported exploitation of coral colonies in the past in Enayam waters especially *Pocillopora eydouxi* colonies by local people which reduced their formation to a large extent. The present study showed only a very few colonies of this branching species which once dominated the entire reef. Further, removal of live coral colonies for ornamental reef fish trade by the local people at Vizhinjam is a major factor that restricts proliferation of corals in this area and thereby affects the health of the patchy reef.

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