

Field Study on Corals and Coral Living Organisms in Van Tivu, in the Gulf of Mannar

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The results of the study on corals in the Van Tivu island in the Gulf of Mannar, are presented. Eighteen species of stony corals were recorded in our study area. *Favia*, *Porites*, *Acropora*, *Tubipora*, and *Montipora* spp., were found to contribute about 80% of the total coral population in Van tivu. The northeast and southwest transects were found to have higher percentage of corals. The molluscs alone contributed about 30% of the total reef fauna. The northeast transect had a good numerical data of molluscs. The vulnerable molluscan species from this area was found to be *Sepia* spp. Different types of coral reef fishes were present in the Van tivu. The notable ones are Butterfly fishes (*Chaetodontidae*), Parrot fishes (*Scaridae*), Clown and Damsel fishes (*Pomacentridae*) and Lion and Scorpion fishes (*Scorpaenidae*). Coral reef destruction was found to be caused by bio-eroding organisms. The common bio-eroders observed during our field study were lion fish, butterflies, wrasses, *Echinometra mathei* (Echinoderm) and *Lambis* spp. (Gastropods) and *Tridacna* spp. (Bivalves).

Key words : Van Tivu, planktons, corals, sponges, molluscs, bio-eroding organisms, line transect.

The Gulf of Mannar is bordered on the west by the south-east coast of India and on the east by the north west coast of Sri Lanka and is enclosed between 8° 35'N – 9° 29'N Latitude and 78° 8'E - 79° 30'E Longitude. This covers, on the Indian side an approximate area of 10,500 sq. kilometers. The Gulf of Mannar includes 21 islands and it stretches about 140 kilometers from Tuticorin to Rameswaram.

Over 3600 species of fauna and flora exist in this area having a combination of different eco-systems (BNHS, 2000). The faunal diversity is based on zonation, growth rate, inter specific competition, physiographic and hydrobiological characters of the micro-habitat. Different types of corals and coral reefs densely surround all Gulf islands. The sea will be rough during April and August but calmer during September.

Van Tivu in Gulf of Mannar was the study area for this investigation. Van Tivu has an elaborate surface area of 16.00ha. It is situated 6 km away from Tuticorin and comprises of sandy soil with sparse vegetation of low bushes, mostly seaweeds, sea grasses and xerophytic plants. The seabed of the Van Tivu is consisting of sand and silty clay. The climate of this region is highly varied and it depends upon the SW and NE monsoon. The wave height of this region is between 4 to 8 meters and the wave periods vary between 5-8 seconds. The present study was aimed to make a preliminary status survey on the present status of corals and coral living organisms in Van Tivu with particular reference to bio-eroding agents.

Materials and methods

The present study followed transects line sampling method of Loya and Slobodkin, (1971). Triplicates of four transects were

made in the study area of Van Tivu. They are North East Transect (NET), North West Transect (NWT), South East Transect (SET) and South West Transect (SWT).

Result and Discussion

The numerical observations of animal groups like zooplanktons, sponges, corals, polychaetes, molluscs, echinoderms and coral reef fishes are shown in Tables 1 and 2 and the average values in the different zones are given in Fig. 1 to 7.

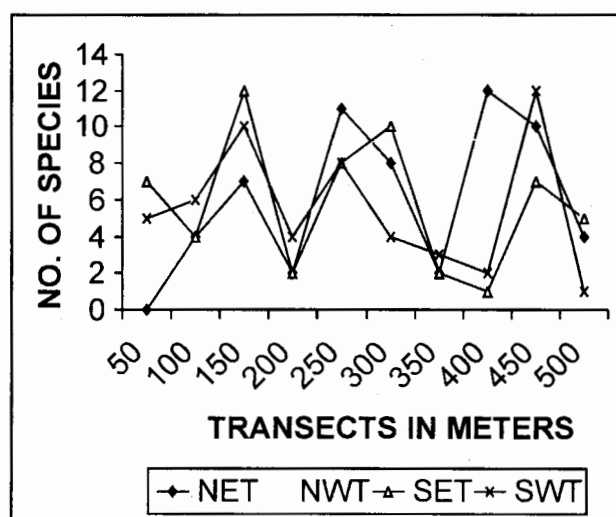


Fig. 1. Average values of zooplankton in Van Tivu

Different species of Zooplanktons are abundantly present in Van Tivu (Table 1). In our survey, the Zooplankton numbers were found to decrease because of periodic fluctuations of physico chemical parameters like temperature, salinity and BOD caused by large-scale water pollution. The mean density of zooplankton in Van Tivu is 75 ind/lit. The species of zooplankton, which are most vulnerable in this area, are *Creseis acicula*, *Janthina* spp., *Eucalanus attanuatatus* etc (Srinivasan, 1999).

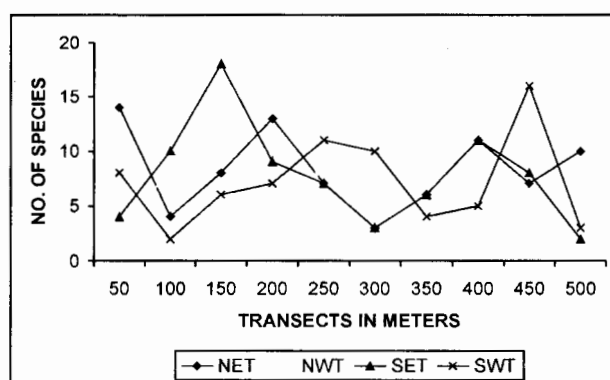


Fig. 2. Average values of Sponges in Van Tivu

Most of the sponges are found on the reef flats. They play a vital role in the coral reef eco system. They are very useful to increase the primary production. More than

Table 1. Distribution of Zooplanktons, Sponges and Corals in Van Tivu

Distance in meters	Zooplankton				Sponges				Corals			
	Z I 3XM4	Z II 3XM3	Z III 3XM2	Z IV 3XM1	Z I 3XM4	Z II 3XM3	Z III 3XM2	Z IV 3XM1	Z I 3XM4	Z II 3XM3	Z III 3XM2	Z IV 3XM1
50	0±1	3±1	7±2	5±1	14±4	6±2	4±1	8±3	3±1	6±1	5±1	2±1
100	4±1	6±2	4±2	6±1	4±1	7±2	10±3	2±1	2±1	4±1	4±1	4±1
150	7±2	9±3	12±3	10±3	8±3	12±3	18±5	6±1	5±1	2±1	6±1	1±1
200	2±1	7±2	2±1	4±1	13±4	19±5	9±3	7±2	4±1	1±1	3±1	3±1
250	11±3	3±1	8±2	8±2	7±2	6±2	7±2	11±3	6±1	5±1	4±1	6±1
300	8±2	13±3	10±3	4±1	3±1	7±2	3±1	10±3	2±1	3±1	4±1	5±1
350	2±1	10±2	2±1	3±1	6±2	11±3	6±2	4±1	1±1	4±1	3±1	4±1
400	12±4	9±3	1±1	2±1	11±3	4±1	11±3	5±1	3±1	5±1	2±1	5±1
450	10±2	7±2	7±2	12±3	7±2	2±1	8±2	16±5	4±1	2±1	1±1	3±1
500	4±1	5±1	5±1	1±1	10±3	5±1	2±1	3±1	3±1	3±1	4±1	2±1

Data are given as mean ± SD n=5

Zone I – North east point view transect, Zone II – North west point view transect, Zone III– South east point view transect, Zone IV – South west point view transect, M1, M2, M3, M4 = Number of transects with triplicates

270 species of sponges were found to be present in the Gulf of Mannar. Among these about ten species of sponges were recorded in our study area. The important genera present in Van tivu are *Callyspongia* sp., *Oceanapia* sp., *Haliclona* sp., *Axinella* sp., *Sigmadocic* sp., etc (Dhandapani, 1996). In the present survey, the northwest transect had more number of species when compared to other area of observation which were found to be influenced by the coastal pollution through tidal current, wind etc.

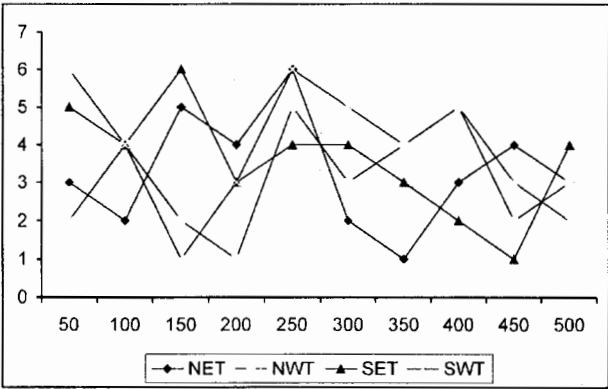


Fig. 3. Average values of Corals in Van Tivu

Reefs are centers of high biological productivity, sites of CO₂ sink, eco system of very high bio diversity, shoreline protec-

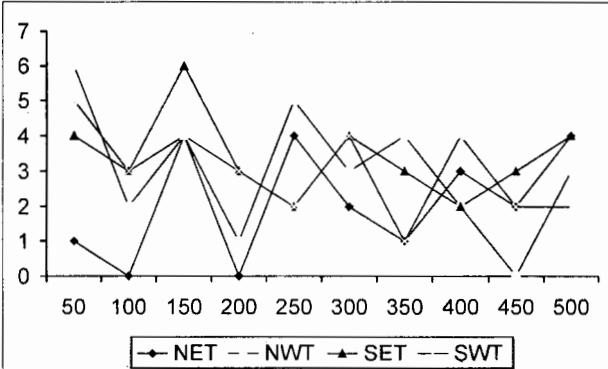


Fig. 4. Average values of Echinoderms in Van Tivu

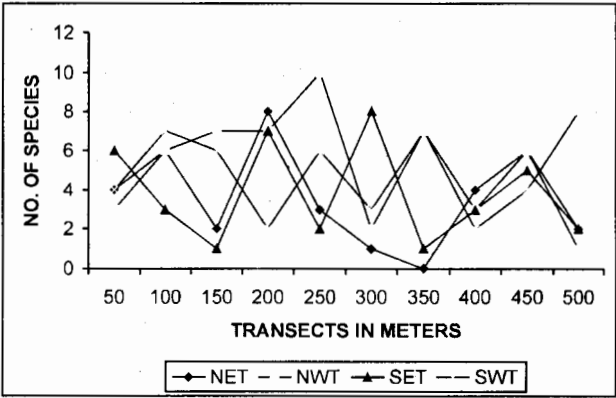


Fig. 5. Average values of Polychaetes in Van Tivu

tors, source of huge deposit of CaCO₃ and centers of scientific research. Additionally, they provide us with many natural raw materials for pharmaceutical products or

Table 2. Distribution of Polycheates, Molluscs, Echinoderms and Coral reef fishes in Van Tivu.

Distance in meters	Polychaetes				Molluscs				Echinoderms				Coral reef fishes			
	Z1 3XM4	ZII 3XM3	ZIII 3XM2	ZIV 3XM1	Z1 3XM4	ZII 3XM3	ZIII 3XM2	ZIV 3XM1	Z1 3XM4	ZII 3XM3	ZIII 3XM2	ZIV 3XM1	Z1 3XM4	ZII 3XM3	ZIII 3XM2	ZIV 3XM1
50	1±1	6±2	4±1	5±1	4±1	3±1	6±1	4±1	2±1	1±1	4±2	0±1	2±1	4±2	6±2	5±2
100	0±1	2±1	3±1	3±1	6±1	6±1	3±1	7±1	1±1	3±1	0±1	3±1	4±1	3±1	4±1	6±2
150	4±1	4±1	6±2	4±1	2±1	7±1	1±1	6±1	3±1	2±1	2±1	0±1	6±2	2±1	1±1	4±1
200	0±1	1±1	3±1	3±1	8±1	7±1	7±1	2±1	4±1	1±1	3±1	1±1	3±1	6±2	4±1	1±1
250	4±1	5±2	2±1	2±1	3±1	10±1	2±1	6±1	1±1	4±1	1±1	4±2	1±1	4±1	6±2	4±1
300	2±1	3±1	4±1	4±1	1±1	2±1	8±1	3±1	2±1	1±3	4±2	0±1	4±1	6±2	2±1	5±1
350	1±1	4±1	3±1	1±1	0±1	7±1	1±1	7±1	3±1	3±1	1±1	2±1	2±1	2±1	4±1	6±3
400	3±1	2±1	2±1	4±1	4±1	3±1	3±1	2±1	1±1	2±1	0±1	1±1	6±2	4±1	3±1	3±1
450	2±1	0±1	3±1	2±1	6±1	6±1	5±1	4±1	2±1	1±1	2±1	3±1	3±1	3±1	4±1	4±1
500	4±1	3±1	4±1	2±1	2±1	1±1	2±1	8±1	4±1	0±2	1±1	1±1	2±1	4±1	1±1	4±1

Data are given as mean ± SD n=5
Zone I – North east point view transect, Zone II – North west point view transect, Zone III– South east point view transect Zone IV – South west point view transect, M1, M2, M3, M4 = Number of transects with triplicates

life-saving drugs. 18 species of stony corals were recorded from Van Tivu. *Favia valenciennesis*, *Porites compressa*, *P. somaliensis*, *Acropora formosa*, *Montipora* spp., *Tubipora* spp., and *Symphyllia* spp., alone contribute 82% (Santhanam and Venkataramanujam, 1996) of stony corals in Gulf of Mannar. Marine organisms have been used successfully as biological indicators of coastal pollution and in the assessment of the influence of waste disposal operations on the marine environment (Herut *et al.*, 1996). In our investigation also, coastal pollution was found to affect the reduction of coral species. The dumping of the fly ash has affected the recolonization of *Acropora formosa*. The release of sewage has affected the massive corals by spreading through the massive sediments (Santhanam and Venkataramanujam, 1996).

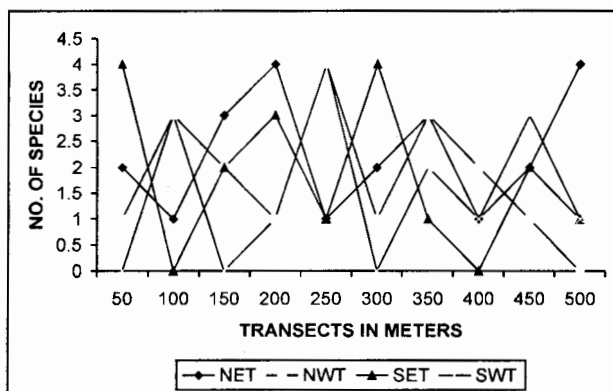


Fig. 6. Average values of Molluscs in Van Tivu

During the field survey it was found that, the southwest zone has been covered with predominantly *Acropora* spp. A numerical list of coral distribution in Van Tivu has also been reported. Northwest and southwest points transects showed higher percentage of corals observed (Table 2). The Van Tivu is thus densely covered by different species of corals.

The coral reef associated fishes like clown, damsel etc., are feeding voraciously

on polychaete worms as a live feed. In our survey, about five species of polychaete worms were recorded. Various species typically formed circular holes 0.5 – 2 mm in d/m penetrating upto 10 cm in the interior of coral skeletons. The notable polychaete families were *Cirratontidae*, *Eniidae*, *Sabellidae* and *Spionidae*.

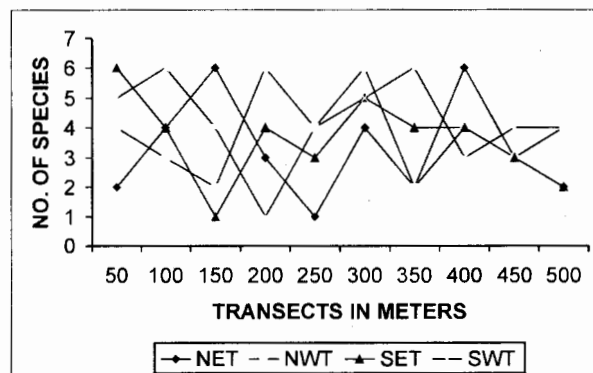


Fig. 7. Average values of Coral reef fishes in Van Tivu

The molluscan communities were represented in reefs mainly by bivalves, gastropods, scapopods and chiton. The predatory gastropod fauna was abundant in most of the reefs. They contributed about 20-30% of the total reef fauna. The families like Muricidae, Conidae, and Mitridae were the main representatives. They all formed huge colonies in the bottom niches of the reef.

The bivalves of coral reefs belonged to the families Mytilidae, Pteridae, Pectinidae etc., The giant clam *Tridacna gigas* is available in Van Tivu. We recorded more than three species of gastropods (*Dudicla* spp. and *Lambis* spp.) and bivalves (*Tridacna* spp. and *Hippopus* spp.) etc. and they were present in each transect of the distance between every 50 m.

Echinoderms present in coral reefs included sea stars, brittle stars, the feathered stars, sea urchin, and sea cucumber.

Indiscriminate fishing was found to affect reduction of the population. The use of metal scrapers and other implements on the sea grass beds to drag out the sea cucumbers, sea stars, sea urchin, feather star etc. were powerful enough to damage the niche (James, 1989). Northwest and south-east transects harboured a good amount of echinoderms.

The bottom fauna of coral reefs is extremely rich and varied. It finds good tropic conditions, plenty of hiding places to escape grazing and a great abundance of solid substratum for sessile benthic invertebrates to take shelter. The coral reef also provided nursery grounds for juveniles of coral reef fishes. Different types of corals and coral reefs densely surround the Van Tivu. Hence different types of reef associated fishes were abundantly present in this region. The important coral reef fishes were *Chaetodontidae* (butterfly fish), *Scaridae* (parrotfish), *Apogonidae* (cardinal fish), *Pomacentridae* (damselfish and clown fish) and *Scorpaenidae* (scorpion fish).

Our field observations in the Van Tivu indicated that, all the reef associated and reef dwelling organisms have been considerably destroyed mainly by coastal pollution leading to significant fluctuation of temperature in the ambient water. Van Tivu was found to be influenced by the discharge of considerable amount of heated effluents from chemical plants and fly ash from the thermal power plant. These pollutants carried by winds, waves and tidal current may largely affect the life conditions of reef-associated organisms in Gulf of Mannar. Many of the coral reef dwelling organisms cannot tolerate the wide range of temperature fluctuations (Ramadas *et al.*, 1999).

Hence, the significant fluctuation of temperature in the ambient water may cause sharp decline in many of the coral living organisms.

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