EXECUTIVE SUMMARY OF THE PROJECT

The 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 south west 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 break water 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.

The sub-tidal rocky out crops are distributed around the Islands off Goa. Hence, three important islands namely, St. George Island, Grand Island and Pequeno Island and St. George Reef were selected for the present study. In Grand Island is located few kilometres west from Mormugao Peninsula in South Goa and about 6 km from Baina Beach. This Island is the lengthiest among the islands off Goa. It is about 6 to 7 Km in length and 1 to 2 km in breadth. The Island is covered by rich rocky reefs and number of exposed rock tips is there around the shallower regions of the Island. This Island has familiar SCUBA diving sites such as Davy Jones Lockers, Sail Rock, Turbo Tunnel, Surge City and Bounty Bay and ship wreck called Suzy's Wreck. St. George Island is located at the western side of Grand Island and separated from Grand Island by a narrow shallow channel. A light house tops the island and there is a boat jetty at the northern side of the Island. In the St. George Island there is a submerged rocky reef located in the channel in between Pequeno Island and Grand Island. The heavy water current and low visibility around this reef, made it not suitable for a diving that day. During low tide, the tip of the reef can be exposed. Pequeno Island is a small Island situated at a distance of around a kilometre from the Baina Beach of Vasco Da Gama. It is
also called as Bat Island. It is almost a round shaped Island fully covered with vegetations and mostly rocky inter-tidal and sub-tidal regions.

The Karwar group of Islands are rocky with sandy shore and proximal to intertidal, estuarine region forming an ideal location for diverse marine organisms characteristic of rocky, sandy inter-tidal and estuarine regions. As very few groups of Islands in India are having this unique combination, Karwar islands are ecologically very significant. Presence of halophytes and mangroves in a few Islands, occurrence of endangered organisms, such as Olive Ridley turtles, *Lepidochelys olivacea*, dolphins, a wide variety of benthic flora and fauna make the region ecologically significant and diverse. The near shore waters are productive as run off from the Islands and main land brings in rich nutrients.

Karwar Islands are tropical with steep rock hills of about 20-60 m height jutting out of the sea. The coast of the Islands is rocky and there are pockets of beaches in Kangigudda Islands due to accretion process. There are no sand-dunes. Migmatitic gneiss and Granitoid with basaltic dykes are the rock types that constitute the hills of karwar Islands with intermediate lateritic soils.

Netrani is an uninhabited Island located nearly 18 km off Murdeshwar (Karnataka State) in the southwest coast of India (14° 02' N lat; 74° 33' E long) and hence it was selected for the survey. The Indian Navy based at Karwar uses the Netrani Island as target for shooting/shelling practice and evidence of the same was observed during the survey. The wealth of biodiversity around this reef emphasizes the need to conserve and preserve it.

The Vizhinjam Bay in Thiruvananthapuram district of Kerala is protected by the breakwater system constructed for the harbour, which consists of granite stones and concreted tripods. Kovalam is located one kilometre north of Vizhinjam and is well known for its pristine beaches and natural rocky shores. However little is known about the underwater habitats offshore of this famous beach. The offshore habitats can be divided in to two main types: sandy and rocky. Sandy habitats are generally not very interesting. On the other hand, there are several places along the beach where rocky promontories plunge in to the ocean and provide shelter for many interesting sea creatures. Observations were made at Vizhinjam wave breaker, Mulloor, and Chewvara to represent the Kerala state. (8° 05' N lat.; 76° 59' E long) This site is on the inner side of the Vizhinjam fishing harbour's wave breaker. Number of coral juvenile attachment was noticed at this Station along with a good reef fish assemblage. This is also mussel bed. Lot of fish assemblages are found at this station. Except
some 4 species of sponges, brown mussels, giant barnacles also found. Depth is around 6-7m. This site was same as Mulloor site. But more number of fish assemblages found. Patchy growths of hard corals are found to occur off Vizhinjam along the southwest coast of India.

At Enayam (08° 12’92” N lat; 77° 10’ 906” E long) there is a patchy reef found around a rock about 500 m from the shore. 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. Leeward sides of the offshore Enayam rock has a good coral cover. Maximum depth at the leeward is 7m and at the seaward side is around 10m. Lot of commercial and reef fish assemblages observed at this Stations.

Rocky reef offshore of Muttom, Tamilnadu was surveyed for benthic percentage cover. This marine habitat consists of two rocky structures Keelkal and Melkal, located approximately 1 km offshore. The area above the water line was approximately circular with a diameter of 15-20 m and a height of 3-5 m above the water surface reaching to a depth of 15m. Most benthic taxons were rare, occupying less than 1% of the space surveyed by transect lines. The dominant categories were barnacles, fine turfing algae, sponges and rubble. Much of the sponge cover at this site was encrusting. Large parrot fish, surgeon fish and snapper were observed at these sites. The Muttom area is well known for its abundance of star fish which are predators on mussels (Gaymer and Himmelman, 2002). This study clearly indicates the need for monitoring this area in future also.

The following threats to the marine biodiversity of the study area were observed:

- Rubber tyres, plastics and glass bottles, tins, entangled nets and plastic broken bits were found on most of the reefs showing the anthropological threats.
- Dead coral pieces were recorded especially at the leeward side of the islands.
- More anthropological influences were found on the leeward side of the Islands than in the seaward side.
- Broken cup corals were observed at the leeward side.
- Anchor damages were evident around the Islands and the reefs surrounding the main land.
The following recommendations are suggested for the protection of the environment.

- Implement strict rules for accessing the Islands.
- Fishing activities using destructive gears and methods around the reefs should be banned.
- Permanent anchor lines and buoys should be constructed at selected points to help divers making eco-tourism.
- Necessary steps should be taken to prevent littering the Island.
- Proper awareness programmes showed be conducted among the user groups to protect the rocky and coral reefs so as to protect the environment for a sustainable future use.
- Training programmes for the protection of reef environment and its biodiversity should be given to local NGOs and Community Leaders so as to make them capable of conveying the message to the user groups at the appropriate time.

The following research papers were published/under preparation from the data collected through the project.

1. *Coral Reef ecosystems along the West Coast of India with special reference to Southwest Coast*. (in press).
2. *Occurrence of azooxanthellate Seleretinian Coral off Goa, Southwest Coast of India*. (Accepted for publication In Marine Biodiversity Records.)
3. Coral biodiversity of the Southwest Coast of India. (Submitted for publication)
4. Sponge biodiversity of the Southwest Coast of India. (Submitted for publication)
5. Reef fish biodiversity of the Southwest Coast of India (Submitted for publication)
6. Biodiversity of Echinoderms in the Southwest Coast of India (Submitted for publication)
7. Qualitative and Quantitative assessment of seaweeds of the Southwest Coast of India. (Under preparation)

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