

A Study Of Environmental Impacts On The Coral Resources In The Vicinity Of The Saint Martin Island, Bangladesh

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Abstract: A study of the environmental impacts on the coral resources in the vicinity of the Saint Martin Island, Bangladesh was conducted with a view to making an assessment of the current status of coral resources in the island and identifying major natural and anthropogenic environmental threats to the future sustainability of these resources. It is evident that the coral resources have been reduced significantly, and currently, only 41 coral species are available. The existing environmental condition (assessed by pH, salinity, turbidity and temperature) in the island is not found responsible for the survival of the corals. The study also reveals that the major anthropogenic interventions are responsible for the gradual depletion of the coral resources. The major anthropogenic threats to the coral resources are coral collection and overfishing. In addition, coral extraction is identified as a potential threat to the future integrity of coral communities in the island. Environmental threats from anthropogenic activities related to sedimentation, land erosion and pollution are also the concerns for the coral communities in the island. For the conservation of the coral population, no coral monitoring cell has been established in this island.

Index Terms: Conservation, Coral resources, Environmental impact, Saint Martin Island

1. Introduction

The Saint Martin Island is one of the most beautiful islands in Bangladesh. This island is locally known as Narikel Jinjira (Coconut Island). It is located in the Bay of Bengal, approximately 9 km south of the Cox's Bazar-Teknaf peninsula. This island is very much resourceful with enormous biological diversity i.e. mollusk-300 species, fish -150 species, amphibian-5 species, coral-66 species, turtle-5 species, snail-5 species, bird-200 species, mammals-20 species [1]. The surface area of the island is about 8 km², however, it may vary depending on the tidal level. This is the most attractive tourist spot in Bangladesh. At present, unplanned tourism makes this island fragile. Around 3000 tourists arrive every day in tourism season (November - March) [2]. Following the recommendation of the National Conservation Society, the small Saint Martin Island was declared as an Ecologically Critical Area under the Bangladesh Environment Conservation Act [2]. Mahmood *et al.* gave a preliminary study of corals of the Saint Martin Island [3]. Tomas Tomascik made several studies on the coral reefs describing the different types of coral species, their abundance and the condition of the corals [4]. Chowdhury *et al.* have surveyed the coastal geomorphology of the Island [5]. Ahmed *et al.* made an overview on the coral reef ecosystem of Bangladesh and made a detailed analysis of the coral resources in the Island [1]. Khan *et al.* noticed that Saint Martin's coral resources were started to vanish at that time [6]. However, since no work has been done after 1997, a systematic study was needed and that is why the present study was carried out.

2. METHODS AND MATERIAL

An environmental and socio-economic study was carried out in the Saint Martin Island to obtain the latest primary information for the environmental impacts on the coral resources, to identify the present and past status of coral resources. The study was carried out by field survey, observation, focus group discussion and in-depth interview. Each site was evaluated by the observations on environmental parameters, the relative abundance of corals and evidence of natural and anthropogenic impacts. With the assistance of local GOs, NGOs and people, a socio-economic survey was carried out to

obtain primary data on some key socio-economic indicators from the households. 3 sites were selected for the present study and SCUBA diving survey was done with 100 to 400 m from the beach towards the sea and up to 12 m depth. The quantitative measurements of corals were conducted by using the line intercept transect and quadrat methods [7] with the help of a marine diver named S.M. Atiqur Rahaman. Water quality parameters were assessed by measuring pH, salinity, turbidity and temperature. Among these pH, salinity, temperature were measured in situ with the help of a portable multi-meter (senslon 156, HACH, USA) and turbidity was measured with the help of Secchi disc.

3. RESULTS AND DISCUSSION

At the beginning of the study, the relevant maps, models and reports were studied to get an initial idea about the island, its biodiversity especially the coral resources and socio-economic conditions. The flow chart diagram of the study is shown in Fig. 1.

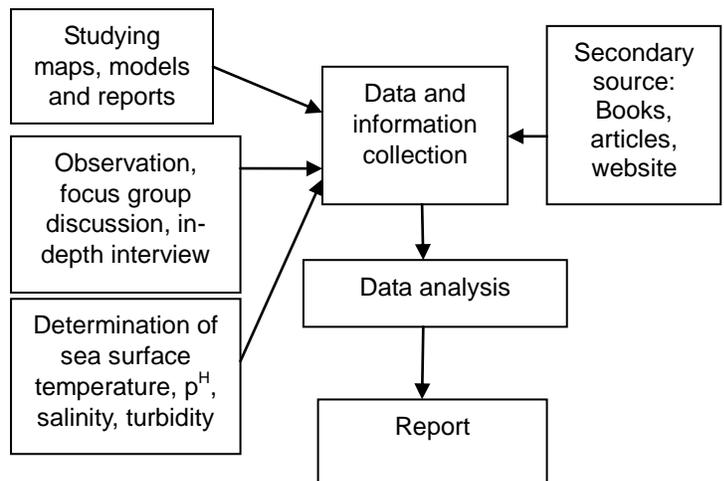


Fig. 1. Flow chart of the study

3.1 Population statistics

The present population of the Saint Martin Island is 8170 and the numbers of households are 896. A large majority of

married men (981) on the island have one wife, 58 married men have two wives and six married men have three wives. Thus, there are 1518 married adults on the island. The total number of children in the 896 households is 2518. Children below 12 years of age account for 43.2% of the population while those above 12 years of age represent 26.1% of the island's population. The sex ratio in the child population is roughly 1:1. Married adults represent 30.7% of the total population [4].

3.2 Health and sanitation

All families own a house, however, only 48 households (5% of all households) have sanitary toilets. The lack of sanitary facilities on the island is alarming. Most of the young children suffer from skin disorders and internal parasites (i.e., worms), largely due to poor hygiene. According to the local health service providers, this is possibly due to a large number of dog population on the island. The lack of sanitation facilities on the island causes severe problems during the rainy season when the groundwater often becomes contaminated. It is found that the groundwater is the source of drinking water in the island and pumped by tube wells. Only 395 households have this facility. As green coconut is available in the island, tourists often prefer green coconut water as an alternative to tube well water during the dry season.

3.3 Fishing

The majority of the household heads in the Saint Martin Island are fishermen, and therefore, fishing is the dominant earning source in the island. However, many fishermen have alternative options related to farming (mainly paddy and vegetable cultivation) and other businesses. Table 1 provides information on the primary occupation of household heads in the Saint Martin Island.

TABLE 1: *The primary occupation of household heads in Saint Martin Island*

Primary Occupation	Number of Household Heads	Percentage
Fishermen	485	57.0%
Businessmen	252	30.5%
Farmers	67	5.0%
Service	54	4.5%
Technician	18	1.5%
Day Labour	8	0.6%
Barber	3	0.2%
Community Support	9	0.7%
Total	896	100%

There are 237 shops on the island owned by 183 household heads who consider themselves as businessmen. Some of the businessmen also own farm land and 21 businessmen own fishing boats, with a total of 28 boats. Only 67 household heads consider themselves to be farmers. There are also 3 farmers each of whom owns one fishing boat. Fifty four household heads do services in GOs and NGOs. In addition, there are 29 household heads of other professions. Among

them, there are 18 technicians, 8 day labourers and 3 barbers. Nine families are obtained with women as household heads and they have been living on community support services.

3.4 Livestock and crop ownership

Livestock in the island seems to be insufficient to meet the local demand. There are 360 cows on the island owned by 143 households (26.7% of all households) whereas 329 goats owned by 87 households (16.3% of households). There are 5216 chickens owned by 53 households (9.9% of households). Coconut is an important cash crop in the island. There are 9127 coconut trees in the island, however, only 116 families (21.7% of households) own coconut trees. In addition, 85 families cultivate fruit trees such as papaya and banana. There are 467 fruit trees in the island [4]. The people of the Saint Martin Island live in relative isolations with few amenities that are widely available in other communities. Lack of basic amenities such as education, sanitation, basic health care, electricity has resulted in community hardship and poverty. An important issue that needs to be addressed is whether the socio-economic impoverishment of the local community will affect conservation measures or not, considering the fact that the local economy is resource-based.

3.5 Status of coral resources

The present study revealed that there are only 41 coral species in the Saint Martin Island whereas 141 coral species were found in 1980's [7]. In the year 1990 and 2000, there were 127 and 66 coral species respectively in the Island [4], [7], [8]. Fig. 2 shows the reduction of coral species over the period of time in the island. It is very clear that the coral species have been reducing gradually, and if this pattern continues, it is estimated that the coral species might be reduced to 24 by the year 2030. It can be apprehended that by 2045, there might not be any coral species in the Saint Martin Island if steps are not taken to conserve them. It is found that corals and sea turtles are the important biodiversities of this island and these are threatened due to unplanned tourism, overfishing, and other anthropogenic activities. The ship services and engine boats are used for carrying the tourists to the island. As a result, a huge amount of waste oil, plastic, and other non-biodegradable waste are discharged in the marine water adjacent to the island. It has been recognized that the population pressures and economic development have already caused a high degree of environmental degradation in the absence of integrated planning. It became evident from the field visits that sometimes tourists are caught by law enforcing agency during illegal activities with respect to the island's biodiversity. Some local people hunt turtles and break off corals to sell to the visitors which make the island's biodiversity on a stake.

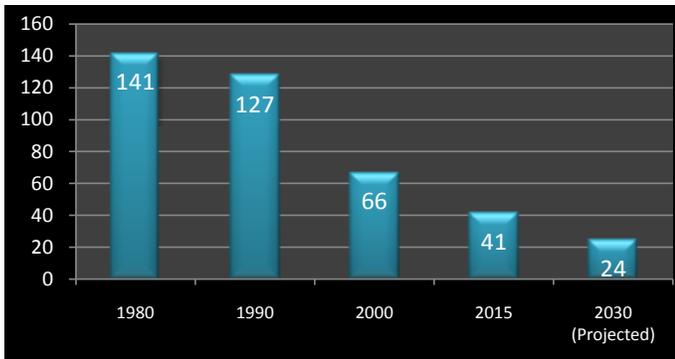


Fig. 2. Coral population in the island.

Coral reefs are susceptible to human activities because the majority of coral reefs grow in shallow waters which are near to shore where human activities are extensive. Human impacts, such as coral extraction, increased sediment load, population stress, overfishing, oil pollution, waste from hotels and restaurants, use of diesel, uncontrolled tourism, habitat destruction and development along shorelines have dramatic adverse impacts on the coral population [9].

3.6 Environmental condition in the island

The environmental condition was evaluated by measuring sea surface temperature, salinity, turbidity and p^H . Table 2 represents the obtained environmental condition and optimal condition for the survival of coral [4].

TABLE 2: The existing environmental condition in the Saint Martin Island and optimal condition for coral development

Parameter	Values	Optimal conditions
Sea surface temperature ($^{\circ}C$)	22-29	20-30
Salinity (ppt)	27-35	25-42
Turbidity (Secchi disc in meters)	2.9-4.6	>7.0
p^H	7.4 - 7.9	7.0 – 8.5

Coral is very susceptible to environmental conditions. The existing environmental condition evaluated by surface temperature, salinity, turbidity and pH is found quite suitable for the survival of the coral resources.

4. CONCLUSION

The enormous biodiversity of the Saint Martin Island has been reducing day by day. Increasing rate of unplanned tourism has been resulting in increased disturbances hampering the natural processes in the island making it vulnerable. The coral population has been decreasing remarkably over the years, and currently, it has reached an alarming level. The coral collection, overfishing, lack of enforcement of laws, movement of tourist ships and improper waste management are identified as the reasons of coral depletion. Environmental condition is still found suitable to support the growth and existence of the coral community. Government intervention is immediately needed to save the biodiversity of this island.

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