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Study on the Mangrove Ecosystem in Maldives

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Abstract: This study was carried out in HA. Baarah, Maldives during 2004. Present study was done to increase the understanding of ecological rich ecosystems like mangrove. Mangrove vegetation in HA.Baarah is mainly dominated by *Rhizophora mucronata Lam*, *Hibiscus tiliaceus L* and *Pemphis acidula* species. Site 1 studied is rich in soil fertility as result diversity is higher in this area compared to site 2. Site 1 is rich in organic matter, the soil is very dark, waterlogged, many organisms especially worms leeches and other borrowing organisms are present. Site 2 is more of having stiff clay or sandy like soil. *Hibiscus tiliaceus L* and *Pemphis acidula* species are common in this area. *Ceritidea cingulata* is common to both the areas

Key words: Mangrove ecosystem · Mangroves · Soil fertility · Species diversity · Dominance

INTRODUCTION

Mangrove ecosystems are found all over the world in tropical and subtropical regions. In Maldives, Mangrove ecosystems occur towards both end of the country and no Mangroves are found in the central islands of the country. 14 Mangrove species are found in Maldives however all 14 species are not to be found together in one single region or island. As the islands of the Maldives are geographically isolated by large bodies of water as a result the environmental conditions of these islands also differ. This is the reason why different Mangrove species adapted to different environmental conditions are restricted to particular islands. In K. Hura only one Mangrove species is found, in Addu atoll 3 species are found and in HA. Baarah four Mangrove species are found (*Bruguiera cylindrical* Blume, *Excoecaria agallocha, Rhizophora mucronata* Lam, *Ceriops tagal* C.B.Rob) [1].

This study was carried out in 2004 to explore the mangrove ecosystem in H A. Baarah, Maldives. The island Baarah is located in the Haa Alif Atoll, Latitude N 06° 49', 867'; E 073° 12', 793' with an area of 18324700 feet^2 and a population of 1652 having 800 males and 839 females. The mangrove ecosystem stretches over a large area of the island specifically on the two ends. 16% of the island area is covered by mangroves. These mangrove ecosystems are one of the most important coastal communities found in the islands of Maldives. However there has been little scientific work done to study these habitats. As a result their ecological, social and economic benefits have largely been unrecognized. Consequently, these ecosystems are under great pressure from the population and developmental activities threatening their existence. In this study, vegetation of the areas, other associated organisms, the soil analysis and other physical parameters of two different sites were analyzed.

MATERIAL AND METHODS

The study was carried out to compare different Mangrove areas and to estimate the species diversity and density of different Mangrove species, using standard sampling techniques. It also involved the analysis of soil from the sites in the mangrove ecosystems for clear interpretation of the environmental conditions in which they are adapted. Two Mangrove sites were studied. Quadrate sampling and line transect methods were used to obtain data in order to estimate the species density and diversity of these species in both sites of the Mangrove. The species were identified using standard identification keys. Soil sample were collected and subjected to physical (soil moisture), chemical (pH, organic matter, organic carbon and nitrogen content).

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RESULTS AND DISCUSSION

These forests are characterized by trees, shrubs and other vegetations that thrive in saline or brackish water. Mangroves support an ecosystem that is comprised of plants, animals and other microorganisms that have adapted to life in dynamic environment of the tropical intertidal zones. Mangrove ecosystems are important environmentally and economically [2].

Site 1 is dominated by *Rhizophora mucronata* Lam. Both quadrat and line transect reflect the highest importance value to the above species. In quadrat sampling, the importance value of *Rhizophora mucronata* Lam is found to be 108.38 and in line transect the value is 180.267. In contrast to site 1, site 2 is dominated by *Hibiscus tiliaceus* L (Table 1 and 2).

The result showed that the organic matter content in site 1(0.34%) higher than site 2 (0.030%). Carbon content and nitrogen content is 0.196 % and 0.02% respectively in site 1. In site two carbon and nitrogen contents are 0.017% and 0.002 % respectively. The pH is found to be lower in site 1 (pH 6) compared to site 2 (pH of 6.5) (Table 3).

Table 1: Species diversity by Quadrate Sampling

Site	Species	Density (number per m^2)	Importance value
1	*Excoecaria agallocha L*	0.0004	9.66
	Rhizophora mucronata Lam	0.0354	108.38
2	*Ceriops tagal C.B.Rob*	0.0025	51.94
	Pemphis acidula	0.0004	14.43
	Hibiscus tiliaceus L	0.0046	62.32
	Sceevola taccada Roxb	0.0021	18.27
	Dodder laurel	0.0004	7.18

Table 2: Species diversity by Line Transect

Site	Species	Density (number per m^2)	Importance Value
1	*Pandanus tectotius Parkinson*	0.11	7.75
	Cordia subcordata	0.037	3.097
	Clerodendum inerme Gaertn	0.75	35.943
	Sceevola taccada Roxb	0.32	16.38
	Excoecaria agallocha L	0.026	3.687
	Bruguiera Cylindrica	0.536	52.877
	Rhizophora mucronata Lam	3.32	180.267
2	*Rhizophora mucronata Lam*	0.08	13.715
	Karamana Ceriops tagal C.B.Rob	0.13	31.133
	Hibiscus tiliaceus L.	0.45	87.047
	Cerbera manghas L.	0.016	23.089
	Pandanus tectotius Parkinson	0.04	15.481

Table 3: Soil fertility status

Parameters	Site 1	Site 2
Soil Moisture %	3.600	0.402
Soil pH	6.000	6.500
Organic Matter %	0.340	0.030
Carbon content %	0.196	0.017
Nitrogen %	0.020	0.002

This difference in vegetation and organisms present in the two sites depends on many factors. Soil condition is one of the contributing factors. *Rhizophora mucronata* Lam copes better with soft humus – rich mud which can be found through the site 1.On the other hand *Hibiscus tiliaceus* L favours stiff clay containing little organic matter as a result the other species dominates in the site 2. Site 1 shows greater index of dominance of 0.84 compared to 0.41 at site 2.

At site 1 the topsoil is darker in colour containing higher quantity of organic matter, this makes the soil in this area a little acidic than the site 2 where organic matter content is significantly low. Because of greater soil fertility, many organisms prefer to live at site 1. Organisms like earthworms, leeches, insects, fungi, woodlouse, microorganisms and many other types can be seen in the area, which was not very common in site 2. This indicates that soil fertility determines the species diversity [3]. At site 2 subsurface soils was typically waterlogged, have little aeration, which decreases with depth and contain high organic matter which decomposes at a very slow rate. This darker or black soil produces a strong odour when unearthed indicates the presence of hydrogen sulphide. This is the result of anaerobic bacteria and it could be *Desuifovibrio sp*. that thrives in anoxic condition [4].

Human activities have always been one of the biggest threats to any ecosystem and in the same way mangroves are under pressure from the population. Activities such as dumping of wastes, cutting down trees, logging and poor management practices stresses this ecosystem. Past studies indicate that it takes at least a century for mangroves to recover from severe damage, if they are able to recover at all. These pressures have already placed mangrove ecosystem around the world in danger of profound destabilization, the consequences which include loss of valuable mangrove resources and a reduction in mangrove ecosystem [5].

CONCLUSION

Mangrove ecosystems are one of the most important coastal ecosystems in the Maldives. It is a home for many plants, animals, fishes, crustaceans and many microorganisms. Not only that mangrove ecosystems render invaluable services to the ecology and hence to the environment. But unfortunately certain human activities put them under stress. So today we should take certain measures and conservation strategies in order to minimize human impact on this important

coastal ecosystem especially to countries like Maldives where erosion is a major problem for most of the villagers. Otherwise, mangroves will vanish from our ecosystem.

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