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Conservation status and suggestions for the maintenance of Island Biodiversity

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Abstract

The Gulf of Mannar is a large shallow bay forming part of the laccadive sea in the Indian Ocean. It lies between the southeastern tip of India and the west coast of Sri Lanka. There are 20 islands running almost parallel to the coastline of Gulf of Mannar. Among them Mandapam group of islands (Hare, Manali, Manoliputti, Poomarichan, Pullivasal, Krusadai and Shingle) are one of the richest coastal regions for biodiversity in Asia. An ecological study for the conservation of the biodiversity in these islands is ongoing from the year 2009. Each island has its unique characteristics, of biodiversity surrounded by coral reefs. The littoral, mangrove, tidal swamp, dry deciduous and scrubs insular forests of the islands hold a diversified faunal assemblage. The predominant existing plant species of the island are the mangroves (*Rhizophora mucornata poir*, *Avicenniamarina (Forssk.)Vierh, Ceriopstagal (perr.)Rabins)* and deciduous and scrub species (*Pandanus fascicularis, Thespesia populnea, Tamarindus indica, Cordia subcordata, Pithecolobium dulce, Ficus benghalensis, Pleurostylia opposite, Acacia planifrons, Salvadora persica, and Zizyphus nummularia) Pemphis acidula (Lythraceae* family of flowering herb) is the note worthy endemic plant species. These flora for their propagation totally depend on the Hymenopteran and Lepidopteran diversity of insects and the sun bird for pollination and Mammals and Aves for seed dispersal. This study on the animal - plant interaction helps a lot in the formulation of action plan for biodiversity conservation in Mandapam group of islands.

Keywords: Island, Pollinators, Seed dispersers, Biodiversity conservation.

1 INTRODUCTION

Gulf of Mannar biosphere reserve extends from Rameswaram Island to Tuticorin in between 78° 5' E - 79° 30' E longitudes and 8° 45' N - 9° 25' N latitudes, and extends to a distance of 140 km. There are 20 islands running almost parallel to the coastline of Gulf of Mannar. Among them Mandapam group of islands (Hare, Manali, Manoliputti, Poomarichan, Pullivasal, Krusadai and Shingle) are one of the richest coastal regions for biodiversity in Asia. These islands are situated at an average distance of about 8 km from the coastline of Gulf of Mannar [1]. Each island has its unique characteristics, of biodiversity surrounded by coral reefs. The littoral, mangrove, tidal swamp, dry deciduous and scrubs insular forests of the islands hold a diversified faunal assemblage.

The distribution of animals on the islands presents complicated and interesting patterns, because the islands which are even closely placed have their own distinctive animal fauna and flora. Their fauna is found to be different from main continents. These continental islands are situated close to their continent and resemble each other geologically. The degree of diversities in the fauna depends upon the length of time of separation of the island. The main reason for the habitat destruction in the islands is human interferences. Increased vegetation invasion from main land through human interferences like introduction of *Prospsis sps.*, creepers like *Dolichos lablak, Coccinia grandis, Cucumis pubescens,*

Momordica dioica, and some epiphytes (yet to be identified) pose threat to the natural floral diversity and also to the dependent faunal diversity. Second main reason for the habitat disturbance is due to the erosion in the mutualistic relationships between the pollinators and seed dispersers. 'Pollination and Seed dispersal' are important events in the life of plants. The 'pollinators' aid in cross-pollination, and the 'seed dispersers' assist in the dissemination of Diasporas to far away locations and suitable micro sites required for seed germination.

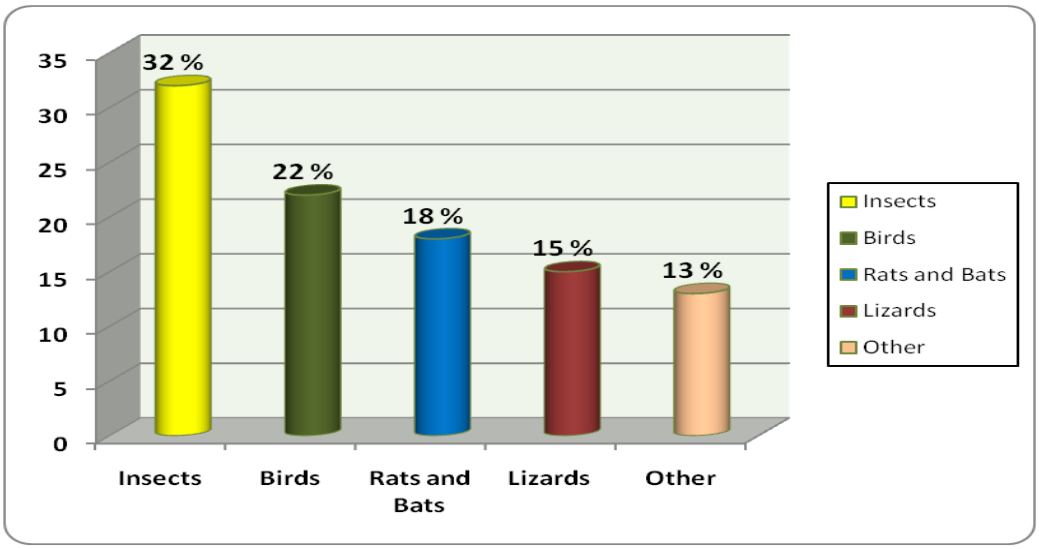

Fig.1: Represents the overall percentage of animal – plant interaction in the mandapam group of Islands.

The threats for island diversity

The major threats to the island diversity are the human interference in the interiors of Single, Pulivasal, Kurusadi, Poomarichan and Hare islands. The existing human trails, newly created goddess in the island by the local fishermen folk. Night halting places in the islands by the fishermen and the day and night settlements of poachers in the island with family are the existing documents. Fishing near the mangroves and coral beds to catch the deep sea fishes cause damage to the island mangroves. The second major threats to the floral diversity are the invasive plants which has transformed as pest as well as epiphytes on the native plants. Collection and removal of dead plants for fire wood purpose by the daily wage workers employed by the department should be prevented just to save the native insular diversity.

2. METHODOLOGY

This paper suggest few steps for biodiversity conservation in the five major types of forests namely, littoral, mangrove, dry deciduous and scrubs forests of the mandapam group of islands. Identification of native plant species was done using quadrate method in each forest type. Two quadrates were made for each forest type in the mandapam group of islands. From the sample plot only the flowering and fruiting plant species which attract more animal visitors were selected and identified as "focal plant" species. Species identification was confirmed by taking digital photographs and a small sample of plant twig. After identification proper herbarium is maintained in the laboratory for further reference. Identification of the plant species was confirmed by Dr.Celladurai, Botanist, Government Sidha Medical College, Palayamkottai. The visits of the animal to the focal plants were carried out through extended watches during day and night hours. Bird visitor's activities were recorded between 6.30 to 8.30hours in the morning. Mist netting below and above the canopy near the fruiting trees confirmed the bird and bat visitors. The animal visitors also visited fruiting and flowering plants for other purpose like nesting, roosting, perching and predation. The study provided a record about the available animal visitors, focal plants, their distribution, role and percentage of interaction in the insular forests of the mandapam group of islands.

3. RESULTS

The table 1 listed out the highly interactive plant species (both scrub and trees) with the fauna of the island. The scrub and tree species from the forest type namely littoral, mangrove, and dry deciduous and scrub forest of the mandapam group of islands. The orthropodon groups of the island mainly the lepidopteran species interact with the floral diversity for food (for insect predation and nectar feeding)

and shelter (resting and nesting). Fig 1 represents the overall percentage of animal – plant interaction in the mandapam group of islands. The insects, reptiles, birds, and small mammals are the 'keystone mutualists" of the island faunal population. The interactions of insect and bird varieties of the island are the maximum when compared to the other animals. The insects outnumbered all the faunal members by way of pollination interaction. Reptiles and small mammals are the major predators in the island who keep the insect population under check. Fig 2a-c represents the percentage of mutualistic plant and animal interaction in the island forests.

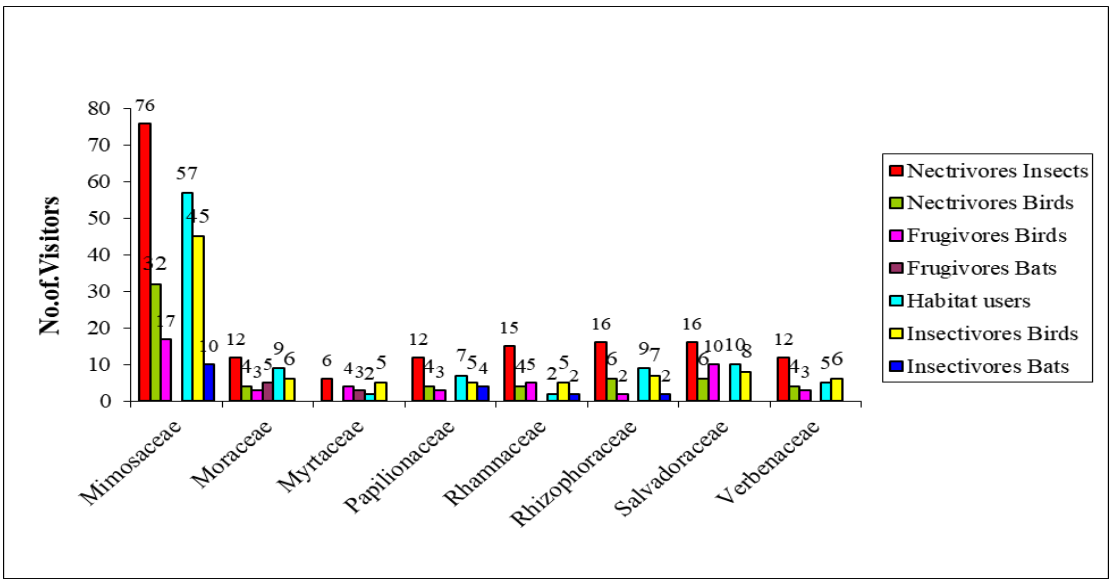

Fig.2a: Mutualistic Plant and Animal interaction in Dry Deciduous Forest in the islands.

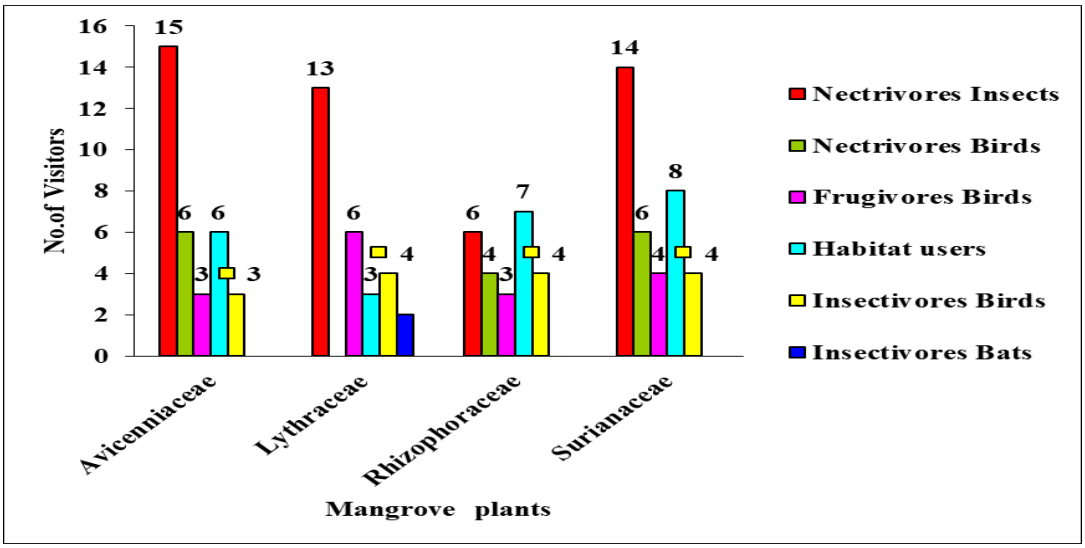

Fig.2b: Mutualistic Plant and Animal interaction in Mangroove Forest in the islands.

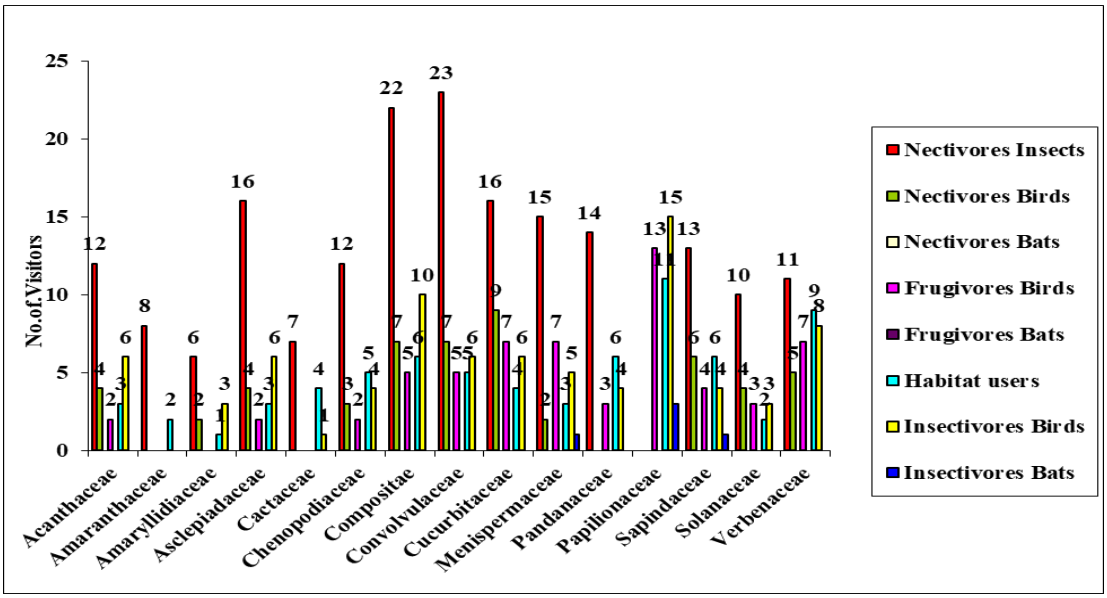

Fig:2c Mutualistic Plant and Animal interaction in Scrub Forest in the islands.

Table-1: The highly interactive plant species of the island.

S. No	Botanical Name	Island in which the Focal plant occur					
Mangroove and Scrub Forest							
1.	*Suriana martitima L.*	Shingle	Poomarichan	Pullivasal	-	-	-
2.	*Pemphis acidula forst*	Shingle	Poomarichan	Pullivasal	Kurusadai	Manoli	Hare
Mangroove Forest							
3.	*Avicennia marina*	Shingle	Poomarichan	Pullivasal	-	-	Hare
4.	*Ceriops tagal (per.) rabins*	Shingle	Poomarichan	Pullivasal	Kurusadai	Manoli	Hare
Scrub Forest							
5.	*Achyranthes aspera Linn. Var.*	-	-	-	-	Manoli	Hare
6.	*Aloe vera*	-	-	-	-	-	Hare
7.	*Asystasia gangetica (L.) T.*	Shingle	Poomarichan	Pullivasal	Kurusadai	Manoli	Hare
8.	*Atriplex repens roth*	-	Poomarichan	-	-	-	Hare
9.	*Calotropis gigantea*	-	-	-	Kurusadai	-	Hare
10.	*Cissus quadrangularis*	-	Poomarichan	Pullivasal	Kurusadai	-	-
11.	*Coccinia grandis*	-	Poomarichan	Pullivasal	Kurusadai	Manoli	Hare
12.	*Crinum latifolium L.*	-	Poomarichan	Pullivasal	-	Manoli	Hare
13.	*Crotalaria tecta heyne ex roth*	-	Poomarichan	Pullivasal	-	Manoli	-
14.	*Cucumis pubescens*	Shingle	-	Pullivasal	-	-	-

15.	*Cymbopogon caesius Nees ex Hook*	Shingle	-	-	-	-	-
16.	*Dodonaea viscose (L.) jacg*	Shingle	Poomarichan	Pullivasal	Manoli	Manoli	Hare
17.	*Dolichos lablak linn*	Shingle	Poomarichan	Pullivasal	Manoli	Manoli	Hare
18.	*Hedyofis puberula (G. Don) Arn*	Shingle	-	-	-	-	-
19.	*Indigofera oblongifolia forsk*	-	-	-	Kurusadai	-	Hare
20.	*Ipomoea crolaceae*	Shingle	Poomarichan	Pullivasal	Kurusadai	Manoli	Hare
21.	*Ipomoea pescaprae (I) R. Br*	Shingle	-	-	-	-	-
22.	*Launaea sarmentosa (Wild.) Sch.Bip.ex Kuntze*	Shingle	Poomarichan	-	-	-	-
23.	*Premna serratifolia L.*	-	-	-	-	-	Hare
24.	*Momordica dioica roxb ex Willd*	-	Poomarichan	Pullivasal	Kurusadai	Manoli	Hare
25.	*Opuntia dillenii*	-	-	-	-	-	Hare
26.	*Pandanus fascicularis Lam*	Shingle	Poomarichan	-	Kurusadai	-	-
27.	*Phyllanthus fascicularis Lam*	-	-	-	Kurusadai	-	-
28.	*Phyllanthus amarus Schum & Thonn.*	-	-	-	Kurusadai	-	-
29.	*Solanum trilobatum Linn*	-	-	-	Kurusadai	-	-
30.	*Tinospora cordifolia miers*	-	Poomarichan	-	-	-	-
31.	*Vernonia cinerea (L.)*	-	-	-	-	-	Hare
Tidal Swamp Forest							
32.	*Cymodocea serrulata (R.Br) Asch. & maqnus*	Shingle	Poomarichan	Pullivasal	Kurusadai	Manoli	Hare
33.	*Sesuviam portulacastrum L.*	Shingle	Poomarichan	Pullivasal	Kurusadai	Manoli	Hare

S. No	Botanical Name	Island in which the Focal plant occur					
Dry Deciduous Forest							
34.	*Acacia planifrons*	Shingle	Poomarichan	Pullivasal	-	-	-
35.	*Albizzia lebbeck*	Shingle	Poomarichan	-	-	-	Hare
36.	*Azardiracta indica*	Shingle	Poomarichan	-	Kurusadai	Manoli	Hare
37.	*Borassus flabellifer*	Shingle	Poomarichan	Pullivasal	Kurusadai	Manoli	Hare
38.	*Breynia vitis – ideae (bum.f) c. fischer*	-	-	-	Kurusadai	-	-
39.	*Capparis brevispina DC.*	-	Poomarichan	-	-	-	-
40.	*Clerodendrum ineme (L).*	-	-	Pullivasal	-	-	-

	Gaertn						
41.	*Cocos nucifera*	-	-	-	-	-	-
42.	*Cordia obliqua Willd*	-	-	-	-	-	Hare
43.	*Cordia subcordata lamt*	-	-	-	Kurusadai	-	-
44.	*Dichrostachys cinera*	Shingle	Poomarichan	-	Kurusadai	-	Hare
45.	*Excoecaria agallocha L.*	Shingle	Poomarichan	Pullivasal	Kurusadai	Manoli	Hare
46.	*Ficus benghalensis*	-	Poomarichan	-	Kurusadai	-	Hare
47.	*Phonix pusilla gaertn*	Shingle	Poomarichan	Pullivasal	-	Manoli	Hare
48.	*Pithecolobium dulce*	Shingle	-	-	Kurusadai	-	Hare
49.	*Pleurostylia opposite (Wall.)Alston*	-	Poomarichan	-	-	Manoli	Hare
50.	*Pongamia pinnata*	-	-	-	Kurusadai	-	-
51.	*Prosopis glandulosa*	-	Poomarichan	-	Kurusadai	-	Hare
52.	*Rhizophora mucornata poir*	-	Poomarichan	-	-	-	Hare
53.	*Salvadora persica*	Shingle	Poomarichan	Pullivasal	Kurusadai	Manoli	Hare
54.	*Syzygium cumini (L.) Skeels*	-	-	-	-	-	Hare
55.	*Tamarin indica*	Shingle	-	-	-	-	-
56.	*Thespesia populnea cav*	Shingle	Poomarichan	Pullivasal	Kurusadai	Manoli	Hare
57.	*Wattakaka volublis (L.F) Stapf*	-	-	-	-	-	Hare
58.	*Wrightia tinctoria*	Shingle	Poomarichan	-	-	-	-
59.	*Zizyphus nummularia (bumf).white & Arn*	Shingle	-	-	-	-	Hare

4. DISCUSSIONS

The present study documented the distribution of 59 focal plant species represented in the five major forest types of mandapam group of islands. Among the mangroves (*Rhizophora mucornata poir, Avicenniamarina (Forssk.) Vierh, Ceriopstagal (perr.) Rabins)* and deciduous and scrub species (*Pandanus fascicularis, Thespesia populnea, Tamarindus indica, Cordia subcordata, Pithecolobium dulce, Ficus benghalensis, Pleurostylia opposite, Acacia planifrons,*

Salvadora persica, and Zizyphus nummularia) Pemphis acidula (Lythraceae family of flowering herb) are the note worthy endemic plant species of the islands. Natural forests with their multi-tiered vegetation have always been the ideal home for a large variety of diversified faunal assemblage. The Gulf of Mannar's (GOM'S) richness of plant and animal species make it one of the richest coastal regions in India [2]. The insular floral diversity from the providing food for the animals, their spreading crown and dense foliage provide shelter for ideal nesting and also roosting places, for animals and birds. Providing the required habitat and the foraging ground for the insular faunal diversity is the sign for islands Biodiversity Conservation. The present study has confirmed that 59 focal plant species are high interaction with all feeding levels of animals in the island forests of mandapam group of islands. The island conservation of faunal diversity greatly depends on the preservation of the highly interactive insular floral diversity of the islands.

Conclusions

All the representatives of the island are important. Fauna and Flora are inter dependent in the insular forests of islands. Therefore the protection of the native biodiversity is essential for biodiversity conservation mandapam group islands. The prohibition of introduction of animals from increase the main land. The present studies suggests 59 plant species can used for afforestation programme while approving in the in waders like *prospsis* who have augmented at the island at the moment pose a great threat for the erosion of native biodiversity. Providing more opportunity for plant-animal interaction will enhance for biodiversity at the same moment the paper suggest.

5. ACKNOWLEDGEMENTS

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