

THE MANGALAVANAM BIRD SANCTUARY / MANGROVE AREA, ERNAKULAM, KERALA

A brief report

Submitted to

The Kerala Forest Department

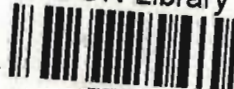
PA AZEED, S BHUPATHY



Sálim Ali Centre for Ornithology and Natural History
Coimbatore, Tamil Nadu

June 2006

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1. BACKGROUND

Mangalavanam, a bird sanctuary situated amidst the fast growing city, the Ernakulam is a valuable haven for a large number of birds, especially those depending on wetlands. It also offers important roosting sites for a variety of terrestrial species. For the last two years there is a general opinion that the number of birds visiting the Mangalavanam mangroves or nesting there is showing a drastic trend of decline. The Kerala Forest Department requested the Salim Ali Centre for Ornithology and Natural History, Coimbatore to visit, conduct a preliminary investigation of the issue and provide them with input regarding the decline of birds. Hence, a field visit was made to Mangalavanam during 22-23 May 2006.

2. BIRD POPULATION

The present report is based on bird counts conducted in the area during evening (1800-1900 hrs) and early morning (0500-0700 hrs) in the mangrove area and its immediate surroundings. Rapid surveys in areas outside Mangalavanam were also conducted to identify possible threats to birds arriving in the mangrove area. Data generated during the present study is compared with that of the previous study (Azeez et al. 2004).

A total of 194 birds belonging to 32 species were observed during this rapid assessment. It may be noted that May is the peak breeding season of colonial nesting birds (cormorants, herons, egrets) in Kerala. However, no nests could be found during this visit.

The number of birds observed during this survey is much low compared to the results obtained by Azeez et al (2004, Annexure 1), which is 398 birds belonging to 62 species (Table 1). 283 aquatic birds of 20 species contributed majority of the bird population during 2002, but only 83 birds belonging to 13 species formed the aquatic bird fauna during the present survey (Appendix 1). These figures indicate sharp decline in the bird populations in Mangalavanam. The variations in the number of birds observed during the 2002 and 2006 could be partly due to the time of survey (2002- end of migratory season, 2006- Summer or pre monsoon). Nevertheless, the reduction in the number of species and populations in Mangalavanam should be viewed seriously, investigated scientifically and required mitigatory measures need to be implemented. A quick survey of birds was also conducted in the adjacent backwaters, BPCL area, railway yard, reclaimed wetlands, and small and isolated wetlands. However, no notable congregation of the birds could be seen. Since we were reported about development of some new colonies of nesting water birds, we visited one site nearby Thoppupady. This new colony has developed and became active with in the last one or two years. A colony with about 50 Little Cormorants and 10 Night Herons were found on a tamarind tree of approximately 30 m height. Almost all nests had recently hatched chicks. At least one or two locations of new nesting sites are also reported recently. It is likely that few small nesting colonies may be found in and around Cochin/ Ernakulam City if a survey is conducted.

Table 1. Wetland birds recorded from Mangalavanam

No	Scientific name	Common name	Feb-03	May-06
1	<i>Phalacrocorax carbo</i>	Large Cormorant	12	0
2	<i>Phalacrocorax niger</i>	Little Cormorant	60	15
3	<i>Anhinga rufa (melanogaster)</i>	Indian Darter	16	20
4	<i>Ardea cinerea</i>	Grey Heron	6	0
5	<i>Ardea purpurea</i>	Purple Heron	2	0
6	<i>Ardeola grayii</i>	Indian Pond Heron	24	8
7	<i>Bubulcus ibis</i>	Cattle Egret	18	1

8	<i>Ardea alba</i>	Large Egret	0	1
9	<i>Egretta intermedia</i>	Smaller (Median) Egret	29	0
10	<i>Egretta garzetta</i>	Little Egret	19	4
11	<i>Nycticorax nycticorax</i>	Night Heron	45	10
12	<i>Haliastur Indus</i>	Brahminy Kite	4	0
13	<i>Amaurornis phoenicurus</i>	Whitebreasted Waterhen	4	2
14	<i>Vanellus indicus</i>	Redwattled Lapwing	2	2
15	<i>Tringa stagnatilis</i>	Marsh Sandpiper	2	0
16	<i>Tringa glareola</i>	Wood Sandpiper	6	0
17	<i>Ceryle rudis</i>	Lesser Pied Kingfisher	2	0
18	<i>Alcedo atthis</i>	Small Blue Kingfisher	2	1
19	<i>Pelargopsis capensis</i>	Storkbilled Kingfisher	1	2
20	<i>Halcyon smyrnensis</i>	Whitebreasted Kingfisher	5	2
21	<i>Dendrocygna javanica</i>	Lesser Whistling Teal	4	15
Total			263	83

3. POSSIBLE THREATS

Decline of birds in Mangalavanam appears largely due to disturbance currently prevailing in the area. Major disturbances in the area include;

- i) The immediate surroundings of Mangalavanam have become a bustling centre of real estate development. A few large high rise buildings are built in the area and several more are under construction. It is reported that many more are in various stages of execution, conceptual stage or under official perusal for approval. It is also heard that a large residential township is also proposed almost bordering the sanctuary, in the name of eco-city. The high rise buildings pose pressure on birds in many ways as briefed below.
 - a. *It curtails their movements.* The high rise buildings close to the sanctuary interrupt proper orientation, take off and landings. Some of the buildings that have come up in the area are 7-8 floors and close to the bird sanctuary. Earlier building, located on the seaward side was of only 3-4

floors. All other sides were free of buildings and offered the birds good sight of the areas ahead. The absence of high buildings on these sides allowed the birds to slowly rise, soar and proceed to other locations for their daily and seasonal routine movements for foraging and other activities.

b. *Hurdles in the transportation of nest materials and food for fledglings:*

The high rise buildings cause serious hurdles in the regular movements of the nesting birds in transporting nesting materials and subsequently it is likely to hinder the movement of birds while bringing food materials to the chicks and fledglings.

c. *Striking colours of the buildings:* Some of the recently built high rise buildings are painted with striking colours. It is very likely that the newly rising buildings also will go for striking colours and also to considerable quantity of surfacing with reflective materials such as glass. This is likely to show strange to the birds and scare them.

d. *High and powerful Lights:* The bright lights that are likely to be fitted on to large scale building complexes are also plausible to cause fear to the birds.

ii) Noise and other disturbance: It is found that the foundations of the high rise buildings are built deep in converted (filled up) coastal wetlands or backwater. This requires deep piling and the piling is mostly done by physical hammering that produces loud recurring banging sound.

iii) The clattering sound due to mechanical activities, dredging in the backwaters and filling of the wetlands give no scope for birds to feed in the nearby shallow waters of Mangalavanam.

iv) During the day, the road (Dr. Salim Ali Road) leading to the Mangalavanam is being used as parking space for four wheelers. On a busy day about 150 cars could be seen parked along the road, which is a recent development. The vehicle movements and the activities of people is a notable disturbance to the birds visiting the sanctuary for

nesting and feeding.

- v) Apart from the above, domestic waste (largely liquid based) is drained directly into Mangalavanam. Also, there appears to be increase in garbage dumping, which remains unattended for longer period, in the area. This leads to increase in the number of crows (10 during 2002 and 60 during 2006). The large number of crows poses serious threats to eggs and chicks. Frequent raids by crows are liable to cause the nesting birds to desert the nests.
- vi) The tide/ water inlet point to the Mangalavanam (on the Salim Ali road) is open, and currently without any mesh to stop the entry of solid wastes such as plastic bags. A large numbers of such non-biodegradable wastes is seen stuck to pneumatophores of the mangroves and partially buried in the silt.
- vii) It is reported that the Indian Ocean Tsunami of 2004 has caused significant ingress of silt to the mangroves in Mangalavanam, and changed the water depth profiles making it shallow. In case this has happened that would have changed the bottom profile of the wetland and decreased the availability of fishes on which the birds depended to a great extent.

4. MEASURES SUGGESTED FOR IMPROVEMENT

About two years back we had conducted a brief study and proposed development plan for Mangalavanam (Azeez et al 2004). Consolidating the observations made in the previous study with that of the present one, a few suggestions are made below that may help in maintaining and developing the area to a better haven for birds in the city of Kochi/Ernakulam. It was felt that a longer investigation on the bird abundance and the environmental quality in and around the area may help us to manage the issue of declining bird species / numbers in the sanctuary. The study has to cover a larger area, probably extending to other nearby backwaters and areas that provide resources for the sustenance of birds nesting and roosting in Mangalavanam.

- Some of the adjacent areas that are currently under the control of Indian railway, BPCL, Revenue Department and Corporation of Cochin can be annexed to the Mangalavanam protected area to form a buffer zone.
- Some parts of the BPCL areas, which were earlier marshy, may be excavated to form depressions that can be flooded during tidal influx. Such a modification also would facilitate the tidal flux in the system, along with providing a refuge to animals such as fish. Along the sides of the depressions common local mangrove species may be planted.
- The vegetation of the areas proposed for acquisition may be improved using local plant species. Plants that can provide sufficient roosting and nesting sites with prolific branching may be given priority.
- It is felt that due to past activities in the environs of the wetland, considerable load of silt would have accumulated in the water body. Desilting select areas during appropriate seasons may be helpful in improving the system. Some of the earlier studies also suggested desiltation of the pond (Jayson and Easa 1999, and Karunakaran et al 1999). However, utmost care has to be taken in doing this, because such an activity, if taken up in an intense scale, may disturb the birds. Prior to undertaking such an exercise it is advisable to explore the possible impacts of such an action on the system as a whole. It is also advisable that a proper schedule for the job is made with areas marked properly on a map, bearing in mind the seasonal dynamics of the system, under the guidance of experts including ecologists.
 1. Prior to desilting, a study using core samples may be conducted to understand the recent sediment deposition and also on the depth and extent upto which the desilting has to be done.
 2. A study of the fish fauna and benthos, and their abundance may be undertaken to ensure food availability for birds.
 3. A survey of wetlands in vicinity of Ernakulum / Kochi, on which the birds may depend for foraging and other activities, may be undertaken and the

possible threats assessed. A documentation of the heronries and colonies of nesting birds in and around the city may also be done.

4. A study on the bird movement pattern in and around the sanctuary will help us to identify and restrict high rise constructions.
 5. Noise pollution due to the ongoing constructions in and around Mangalavanam should be controlled. Pre-cast foundation structures may reduce this problem very much. Ambient noise levels of the area need to be assessed, at the earliest.
- Measures may be taken to prevent solid wastes, especially plastic ones from dumping in close vicinity of the wetland. It is seen that solid waste materials enter the area from the sides of the main road. Later these materials float in the water and during low tide get stuck on the grills separating the wetland from the backwaters and also the roots and pneumatophores of mangroves. Garbage dumping sites may be managed scientifically to avoid overcrowding of scavengers such as crows, which in turn affect other species.
 - Liquid waste discharges that may flow down to the mangrove area also may be diverted or treated at the source.
 - The road leading to the sanctuary is currently used as a parking space. About 150 vehicles are parked here during the day time. Movement of these vehicles is an additional disturbance to the birds. Attempts may be made to develop a parking space elsewhere and the road may be kept quiet and clean. The nearby buildings may be directed to have own parking space in their own premises.
 - Mangalavanam is becoming a small island surrounded by tall buildings (Kerala High Court, National Institute of Oceanography (NIO) and Central Marine Fisheries Research Institute (CMFRI). Currently more constructions are planned. As birds cannot land in an area like helicopters or advance fighter aircrafts, it is suggested that the height of the new (proposed) buildings should be restricted to 3-4 floors. Striking colours and focus lights on the high-rise buildings may be avoided.

- It is high time that all authorities concerned with the development of Cochin (Cochin Development Corporation, Cochin Municipality), environment protection (Forest Department, NGO), and responsible citizens to chalk out plans and implement the same for conserving Mangalavanam. If immediate steps are not undertaken, Mangalavanam with large congregation of birds may remain only in records.
- Adequate funding may earmarked to conduct studies, develop management strategy and execution for long-term sustenance of the Mangalavanam Sanctuary.
- The Mangalavanam and the area around may be declared as an eco-sensitive area and further disturbances such as constructions and real-estate developments may have follow strict directives required for an eco-sensitive area.

5. ACKNOWLEDGEMENTS

Mr. CS Yalakki, IFS, CF, Kerala Forest Department

Mr. Nirmal John, IFS, DFO, Kerala Forest Department

Dr. BS Corrie, IFS, CCF, Kerala Forest Department

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Dr. L. Vijayan, Director I/c, SACON, Coimbatore

Ms. Sheeba, SACON, Coimbatore

Appendix 1. Birds recorded from Mangalavanam

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1	<i>Phalacrocorax carbo</i> #	Large Cormorant	12	0
2	<i>Phalacrocorax niger</i> #	Little Cormorant	60	15
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4	<i>Ardea cinerea</i> #	Grey Heron	6	0
5	<i>Ardea purpurea</i> #	Purple Heron	2	0
6	<i>Ardeola grayii</i> #	Pond Heron	24	8
7	<i>Bubulcus ibis</i> #	Cattle Egret	18	1
8	<i>Ardea alba</i>	Large Egret ^{+JE}	0	1
9	<i>Egretta intermedia</i> #	Smaller (Median) Egret	29	0
10	<i>Egretta garzetta</i> #	Little Egret	19	4
11	<i>Nycticorax nycticorax</i> #	Night Heron	45	10
12	<i>Dendrocygna javanica</i> #	Lesser Whistling Teal	4	15
13	<i>Elanus caeruleus</i>	Blackwinged Kite	1	0
14	<i>Milvus migrans</i>	Pariah Kite	8	0
15	<i>Haliastur Indus</i> #	Brahminy Kite	4	0
16	<i>Accipiter badius</i>	Indian Shikra	2	1
17	<i>Spilornis cheela</i>	Crested Serpent Eagle	2	0
18	<i>Amaurornis phoenicurus</i> #	Whitebreasted Waterhen	4	2
19	<i>Vanellus indicus</i> #	Redwattled Lapwing	2	2
20	<i>Tringa stagnatilis</i> #	Marsh Sandpiper	2	0
21	<i>Tringa glareola</i> #	Wood Sandpiper	6	0
22	<i>Columba livia</i>	Blue Rock Pigeon	18	6
23	<i>Streptopelia decaocto</i>	Indian Ring Dove	4	2
24	<i>Streptopelia chinensis</i>	Spotted Dove	2	2
25	<i>Psittacula krameri</i>	Rose-ringed Parakeet	4	2
26	<i>Psittacula cyanocephala</i>	Southern Blossomheaded parakeet	0	0
27	<i>Clamator jacobinus</i>	Pied Crested Cuckoo	1	0
28	<i>Cuculus varius</i>	Brainfever Bird	4	0
29	<i>Eudynamis scolopacea</i>	Indian Koel	2	2
30	<i>Centropus sinensis</i>	Common Crow-Pheasant	4	2
31	<i>Athene brama</i>	Spotted Owlet	1	2
32	<i>Apus affinis</i>	House Swift	2	0
33	<i>Cypsiurus parvus</i>	Palm Swift	6	0
34	<i>Ceryle rudis</i> #	Lesser Pied Kingfisher	2	0
35	<i>Alcedo atthis</i> #	Small Blue Kingfisher	2	1
36	<i>Pelargopsis capensis</i> #	Storkbilled Kingfisher	1	2
37	<i>Halcyon smyrnensis</i> #	Whitebreasted Kingfisher	5	2
38	<i>Halcyon chloris</i>	Whitecollard kingfisher ^{+JE}	0	0
39	<i>Merops orientalis</i>	Small Green Bee-eater	4	2
40	<i>Coracias benghalensis</i>	Indian Roller	2	2

41	<i>Upupa epops</i>	Hoopoe	1	0
42	<i>Tockus birostris</i>	Grey Hornbill	1	0
43	<i>Megalaima zeylanica</i>	Large Green Barbet	1	1
44	<i>Megalaima viridis</i>	Small Green Barbet ^{+JE}	0	0
45	<i>Megalaima haemacephala</i>	Crimsonbreasted Barbet	1	0
46	<i>Dinopium benghalense</i>	Lesser Goldenbacked Woodpecker	1	2
47	<i>Eremopterix grisea</i>	Ashycrowned Finch Lark	4	0
48	<i>Alauda sp.</i>	Sky Lark	2	0
49	<i>Hirundo smithii</i>	Wire-tailed Swallow	2	0
50	<i>Oriolus oriolus</i>	Golden Oriole	1	0
51	<i>Dicrurus adsimilis</i>	Black Drongo	2	2
52	<i>Artamus fuscus</i>	Ashy Swallow-shrike	2	0
53	<i>Acridotheres tristis</i>	Common Myna	6	4
54	<i>Acridotherus fuscus</i>	Jungle myna ^{+JE}	0	0
55	<i>Dendrocitta vagabunda</i>	Indian Tree Pie	1	1
56	<i>Corvus splendens</i>	House Crow	6	35
57	<i>Corvus macrorhynchos</i>	Jungle Crow	4	25
58	<i>Chloropsis cochinchinensis</i>	Gold mantled Chloropsis ^{+JE}	0	0
59	<i>Pycnonotus jacosus</i>	Redwhiskered bulbul ^{+JE}	0	0
60	<i>Pycnonotus leucogenys</i>	Whitecheeked Bulbul	1	0
61	<i>Pycnonotus cafer</i>	Redvented Bulbul	4	2
62	<i>Turdoides affinis</i>	Whiteheaded Babbler	8	6
63	<i>Prinia socialis</i>	Ashy Wren-warbler	3	0
64	<i>Orthotomus sutorius</i>	Tailor Bird	4	0
65	<i>Copsychus saularis</i>	Magpie Robin	2	2
66	<i>Saxicola caprata</i>	Pied Bush Chat	4	0
67	<i>Saxicoloides fulicata</i>	Indian Robin	1	2
68	<i>Motacilla alba</i>	White Wagtail ^{+JE}	0	0
69	<i>Motacilla maderaspatensis</i>	Large Pied Wagtail ^{+JE}	0	0
70	<i>Nectarinia minima</i>	Small sunbird ^{+JE}	0	0
71	<i>Nectarinia asiatica</i>	Purple Sunbird	2	2
72	<i>Passer domesticus</i>	House Sparrow	4	4

- Aquatic species; J&E – Recorded by Jayson and Easa (1999)

Annexure 1

**ECODEVELOPMENT PLAN FOR THE MANGALAVANAM
MANGROVE AREA, ERNAKULAM, KERALA**

Submitted to the Kerala Forest Department



**Sálim Ali Centre for Ornithology and Natural History
Coimbatore, Tamil Nadu**

June 2004

STUDY TEAM

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1.1. Introduction

The Mangalavanam at Cochin, Ernakulum district, Kerala (Figure 1) is a patch of natural greenery comprising mainly of Mangrove species. Mangroves with a unique combination of specialized plants and animals are known for its fragile nature. They play an important role in stabilizing the land along coast and margins of backwaters. These specialized ecosystems accommodate a variety of marine and freshwater organisms as their nursery and feeding grounds. Mangroves, once common along the coastal plains of Kerala, have currently become a rare feature in the state. Except for a few patches and a few rudimentary representations of certain species here and there, mangroves have practically disappeared from the state. Presently the state has only 17 km² under mangroves (Basha 1992). This is one of the direct consequences of high population density and intense activities in the coastal belt, despite the coastal regulation zone notification (1991). The Mangalavanam mangrove area is a symbolic relict of the original ecological set up of Cochin.

1.2. Location

The Mangalavanam reserve is a small tidal wetland (9°59'13.4" N and 76°16'26.1" E) located in the backyard of Central Marine Fisheries Institute (CMFRI) and National Institute of Oceanography (NIO) close to the new building complex of the High court of Kerala. The area is flanked by the Bharat Petroleum campus in the northeast, the old ERG station on south and NIO and CMFRI campuses along the Sálim Ali Road on the west. The area is connected with the Cochin backwaters by a feeder canal. Currently the area under protection is only a small patch of greenery with a tidal wetland. For long term conservation and development of the area parts of the adjacent land also has to be incorporated (Figure 2). The details of the ownership and the area of land that can be considered for the development of the Mangalavanam are given Table 2. The total area falls under survey numbers 1137, 1145, 1174, 1146, 1148, 1147, 1140, 1141, 1143, 1151 and 1152 of Ernakulam village (Karunakaran et al 1990)

Table 1 Ownership of land in Mangalavanam (Source GCDA 1998)	
Southern Railway	3.74
Railway land leased to Bharat Petroleum	1.2
Kerala Forest Department	0.73
Corporation of Cochin	0.16
Police Department	0.12
Revenue land	0.26
Poramboke	2.10
Private land	0.13
Total	8.44



Figure 1 Location of Mangalavanam mangrove

1.1. Significance of the area

The very existence of such a unique ecological relict amidst a bustling city like Cochin itself is significant. Despite human pressures of various kinds from all around, the remarkably high utilization of this habitat by the wetland birds for breeding is another

fascinating aspect of Mangalavanam. Such an area in the midst of the bustling activities of the city is very vital as a haven for the avian and other flying creatures. For academic and ecological reasons it is imperative to conserve the area to prevent it succumbing to the multifarious pressures from the expansive city of Cochin.

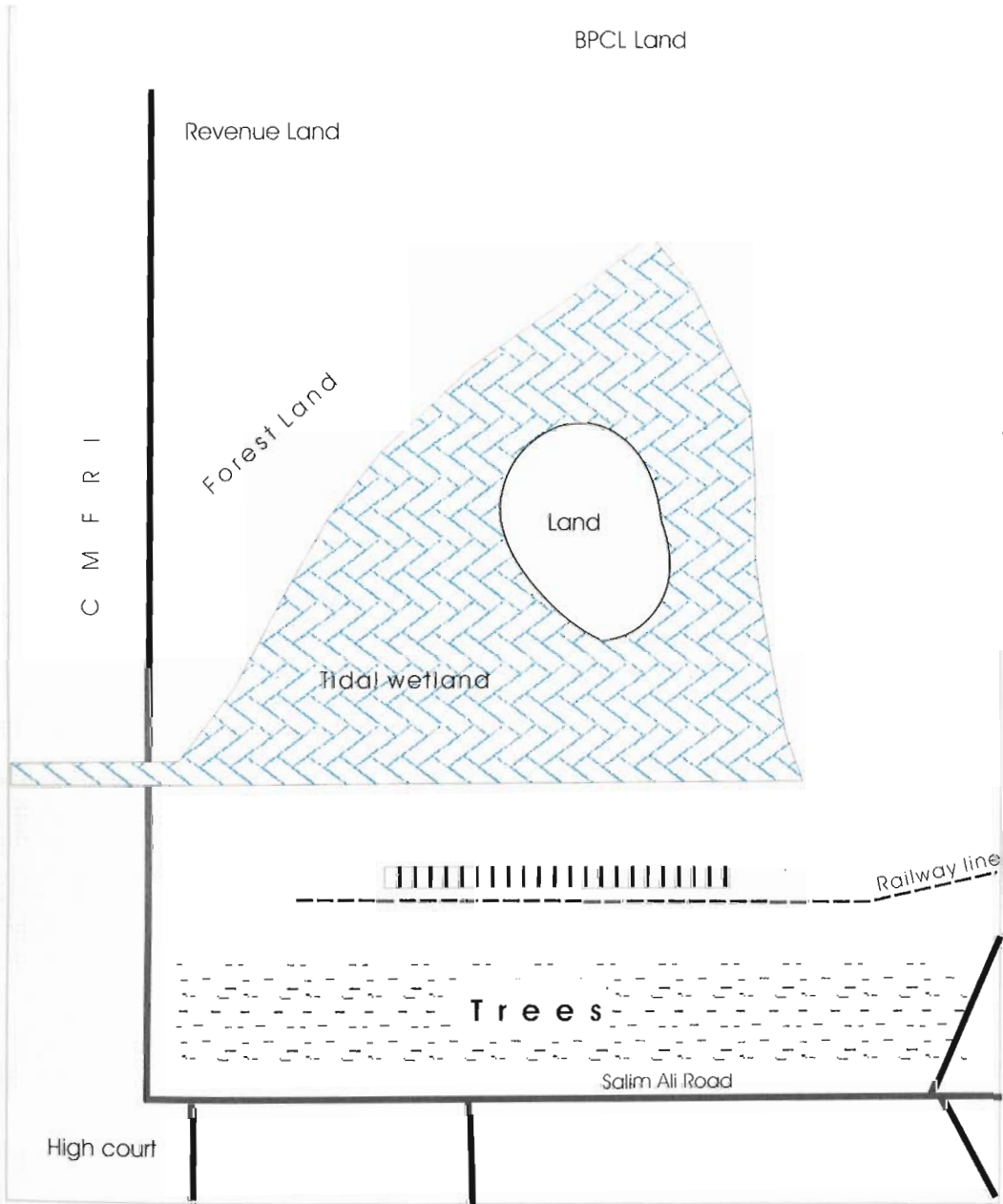


Figure 2 Schematic map of the Mangalavanam area

1.4. Flora

Mangroves in Kerala may be the single most damaged system. The Mangrove area of the state has reduced drastically from an estimated 700 km² (Ramachandran et al 1985) to about 17 km² (Basha 1991 & 1992). Currently in Kerala, major mangrove patches are seen in Keeryad Island, northern part of Kochi Port and Research Farm at Puthuvypu, Mahe to Dharmadam coastal belt, Mallikkad, Ashram, Pathiramanal and Mangalavanam. In Cochin, mangroves are now mainly found in Mangalavanam, Panangad, Thripunithura, Kumbalam, Nettur, Panambukad, Puthuvype, Vypin, Mulavukad, Kumbalangi, Kannamaly and Chellanam.

The Mangalavanam is rich in floral diversity. Most of the floral species are either mangrove species or those that can tolerate frequent saltwater / brackish water inundation. During our brief preliminary survey conducted in February 2003 twenty-five species of plants could be recorded (Table 3). The floral list is expected to be considerably higher if a seasonal survey is conducted in the area.

Table 3 Plants recorded in Mangalavanam during February 2003

No.	Species	Habit
1	<i>Acanthus ilicifolius</i> *	Shrub
2	<i>Acrostichum aureum</i> *	Shrub
3	<i>Alternanthera</i> sp	Herb
4	<i>Avicennia officinalis</i> *	Tree
5	<i>Azadirachta indica</i>	Tree
6	<i>Caryota urens</i>	Tree
7	<i>Ceiba pentandra</i>	Tree
8	<i>Coccinia grandis</i>	Climber
9	<i>Cuscuta reflexa</i>	Twiner
10	<i>Derris trifoliata</i>	Straggler
11	<i>Enterolobium saman</i>	Tree
12	<i>Eucalyptus</i> sp	Tree
13	<i>Ficus gibbosa</i>	Tree
14	<i>Hibiscus tiliaceus</i>	Tree

15	<i>Hydnocarpus alpine</i>	Tree
16	<i>Hygrophila sp</i>	Shrub
17	<i>Ipomoea sp</i>	Climber
18	<i>Morinda tinctoria</i>	Tree
19	<i>Polyalthia longifolia</i>	Tree
20	<i>Pongamia pinnata</i>	Tree
21	<i>Rhizophora mucronata</i> *	Tree
22	<i>Tectona grandis</i>	Tree
23	<i>Terminalia catappa</i>	Tree
24	<i>Tinospora cordifolia</i>	Straggler
25	<i>Woodina odiyari</i>	Tree
* Mangrove species		

The vegetation of the Mangalavanam is dominated by *Avicennia officinalis*, *Rhizophora mucronata* and *Acanthus ilicifolius*. True mangrove and mangrove associate species such as *Avicennia officinalis*, *Rhizophora mucronata*, *Acanthus ilicifolius*, *Derris trifoliata* and *Acrostichus aureum* are also present here. Other plant species included *Alternanthera sp*, *Azadirachta indica*, *Caryota urens*, *Ceiba pentandra*, *Coccinia grandis*, *Cuscuta reflexa*, *Enterolobium saman*, *Eucalyptus sp*, *Ficus gibbosa*, *Hibiscus tiliaceus*, *Hydnocarpus alpina*, *Hygrophila sp*, *Ipomoea sp*, *Morinda tinctoria*, *Polyalthia longifolia*, *Pongamia pinnata*, *Tectona grandis*, *Terminalia catappa*, *Tinospora cordifolia* and *Woodina odiyari*.

1.5. Fauna

Considering the small size of the area, a large number of birds and other faunal elements are reported from the Mangalavanam in the past (Jayson and Easa 1999).

1.6. Butterflies

After the birds it is the butterflies that can attract the attention on visiting the area. During the short visit made to Mangalavanam, seventeen species of butterflies were observed (excluding Hesperidae, Lycaenidae). More species of butterflies are likely in appropriate seasons. By planting suitable larval food plants and flowering plants in the adjacent areas proposed to be acquired the number of butterflies in the area can go up considerably. If planned scientifically, a good butterfly park can be developed, without much additional

monitory burden. The butterfly park would serve as an added advantage and attraction and enhance the tourism potential of the area.

Table 4 Butterflies recorded in Mangalavanam		
Family: NYMPHALIDAE		
1	<i>Acraea violae</i> Horsfield	Tawny Coster
2	<i>Ariadne ariadne palliolior</i> Fruhstorfer	Angled Castor
3	<i>Danaus genutia</i> Cramer	Striped Tiger
4	<i>Danaus chrysippus</i> Lin.	Plain Tiger
5	<i>Elymnias hypermnestra</i> Linnaeus	Common Palmfly
6	<i>Euploea core core</i> Cramer	Common Crow
7	<i>Melanitis leda ismene</i> Cramer	Common Eveningbrown
8	<i>Mycalesis perseus blasius</i> Fabricius	Common Bushbrown
9	<i>Precis iphita</i> Cramer	Chocolate Pansy
10	<i>Precis lemonias lemonias</i> Lin.	Lemon Pansy
Family: PAPILIONIDAE		
11	<i>Pachliopta hector</i> Lin.	Crimson Rose
12	<i>Pachliopta aristolochiae aristolochiae</i> Fabricius	Common Rose
13	<i>Princeps polytes romulus</i> Cramer	Common Mormon
14	<i>Princeps demoleus</i> Lin.	Lime Butterfly
Family: PIERIDAE		
15	<i>Delias eucharis</i> Drury	Common Jezebel
16	<i>Eurema hecabe contubernalis</i> Moore	Common Grass Yellow
17	<i>Leptosia nina nina</i> Fabricius	Psyche

1.7. Vertebrates

During the field survey conducted for two days during February 2002, a total of 71 species of vertebrates were recorded. It included two species of amphibians (*Limnonectes limnocharis* and *Bufo melanostictus*), five of reptiles (*Calotes versicolor*, *Hemidactylus frenatus*, *Mabuya carinata* and *Sphenomorphous* sp., *Xenochropis piscator*), 62 of birds and two of mammals (*Pteropus giganteus* and *Funambulus sublineatus*). The dominant vertebrate fauna observed was birds. A total of 398 birds belonging to 62 species were observed during the survey. Aquatic forms numbering 20 species contributed majority of the bird population. Including other earlier records (Jayson and Easa 1999), the total number of bird species visiting the area is 72. A survey during migratory seasons may add on more species to the list of birds in the area.

Table 5 Birds recorded from Mangalavanam

No	Scientific name	Common name	Number ^{\$}
1	<i>Accipiter badius</i>	Indian Shikra	2
2	<i>Acridotheres tristis</i>	Common Myna	6
3	<i>Acridotheres fuscus</i>	Jungle myna,	J&E
4	<i>Alauda sp.</i>	Sky Lark	2
5	<i>Alcedo atthis</i> #	Small Blue Kingfisher	2
6	<i>Amaurornis phoenicurus</i> #	Whitebreasted Waterhen	4
7	<i>Anhinga rufa (melanogaster)</i> #	Indian Darter or Snake bird	16
8	<i>Apus affinis</i>	House Swift	2
9	<i>Ardea alba</i>	Large Egret	J&E
10	<i>Ardea cinerea</i> #	Grey Heron	6
11	<i>Ardea purpurea</i> #	Purple Heron	2
12	<i>Ardeola grayii</i> #	Pond Heron or Paddy bird	24
13	<i>Artamus fuscus</i>	Ashy Swallow-shrike	2
14	<i>Athene brama</i>	Spotted Owlet	1*
15	<i>Bubulcus ibis</i> #	Cattle Egret	18
16	<i>Centropus sinensis</i>	Crow-Pheasant	4
17	<i>Ceryle rudis</i> #	Lesser Pied Kingfisher	2
18	<i>Chloropsis cochinchinensis</i>	Gold mantled Chloropsis	J&E
19	<i>Clamator coromandus</i>	Pied Crested Cuckoo	1
20	<i>Columba livia</i>	Blue Rock Pigeon	18
21	<i>Copsychus saularis</i>	Magpie Robin	2
22	<i>Coracias benghalensis</i>	Indian Roller	2
23	<i>Corvus macrorhynchos</i>	Jungle Crow	4
24	<i>Corvus splendens</i>	House Crow	6
25	<i>Cuculus varius</i>	Brainfever Bird	4
26	<i>Cypsiurus parvus</i>	Palm Swift	6
27	<i>Dendrocitta vagabunda</i>	Tree Pie	1
28	<i>Dendrocygna javanica</i> #	Whistling Teal	4
29	<i>Dicrurus adsimilis</i>	Black Drongo	2
30	<i>Dinopium benghalense</i>	Goldenbacked Woodpecker	1
31	<i>Egretta garzetta</i> #	Little Egret	19
32	<i>Egretta intermedia</i> #	Smaller (Median) Egret	29
33	<i>Elanus caeruleus</i>	Blackwinged Kite	1
34	<i>Eremopterix grisea</i>	Ashycrowned Finch Lark	4
35	<i>Eudynamis scolopacea</i>	Koel	2
36	<i>Halcyon chloris</i>	Whitecollard kingfisher	J&E
37	<i>Halcyon smyrnensis</i> #	Whitebreasted Kingfisher	5
38	<i>Haliastur indus</i> #	Brahminy Kite	4

39	<i>Hirundo smithii</i>	Wire-tailed Swallow	2
40	<i>Megalaima haemacephala</i>	Crimsonbreasted Barbet	1
41	<i>Megalaima viridis</i>	Small Green Barbet	J&E
42	<i>Megalaima zeylanica</i>	Large Green Barbet	1*
43	<i>Merops orientalis</i>	Small Green Bee-eater	4
44	<i>Milvus migrans</i>	Pariah Kite	8
45	<i>Motacilla alba</i>	Pied wagtail	J&E
46	<i>Motacilla maderaspatensis</i>	Large Pied Wagtail	J&E
47	<i>Nectarinia asiatica</i>	Purple Sunbird	2
48	<i>Nectarinia minima</i>	Small sunbird	J&E
49	<i>Nycticorax nycticorax</i> #	Night Heron	45
50	<i>Oriolus oriolus</i>	Golden Oriole	1
51	<i>Orthotomus sutorius</i>	Tailor Bird	4
52	<i>Passer domesticus</i>	House Sparrow	4
53	<i>Pelargopsis capensis</i> #	Storkbilled Kingfisher	1
54	<i>Phalacrocorax carbo</i> #	Large Cormorant	12
55	<i>Phalacrocorax niger</i> #	Little Cormorant	60
56	<i>Prinia socialis</i>	Ashy Wren-warbler	3
57	<i>Psittacula cyanocephala</i>	Blossomheaded parakeet	J&E
58	<i>Psittacula krameri</i>	Rose-ringed Parakeet	4
59	<i>Pycnonotus cafer</i>	Redvented Bulbul	4
60	<i>Pycnonotus jacosus</i>	Redwhiskered bulbul	J&E
61	<i>Pycnonotus leucogenys</i> .	Whitecheeked Bulbul	1
62	<i>Saxicola caprata</i>	Pied Bush Chat	4
63	<i>Saxicoloides fulicata</i>	Indian Robin	1
64	<i>Spilornis cheela</i>	Crested Serpent Eagle	2
65	<i>Streptopelia chinensis</i>	Spotted Dove	2
66	<i>Streptopelia decaocto</i>	Indian Ring Dove	4
67	<i>Tockus birostris</i>	Common Grey Hornbill	1
68	<i>Tringa glareola</i> #	Wood Sandpiper	6
69	<i>Tringa stagnatilis</i> #	Marsh Sandpiper	2
70	<i>Turdoides affinis</i>	Whiteheaded Babbler	8
71	<i>Upupa epops</i>	Hoopoe	1
72	<i>Vanellus indicus</i> #	Redwattled Lapwing	2
# - Aquatic species; * - Calls; J&E - Recorded by Jayson and Easa (1999)			
\$ Number of birds observed during the field visit – February 2003			

1.8. Conseryation importance

Mangalavanam area is important from the point of view of environmental conservation

for a number of reasons, some of which are briefly mentioned below.

- One of the important mangrove sites, in the port city of Cochin that is currently protected and can be developed for conservation and aesthetic purposes.
- Relict of the past natural coastal habitat still enduring the rapid pace of urbanisation and more lucrative land use
- A piece of serene wilderness at close proximity for the urban public
- A haven for large number of wetland birds in the middle of the sprawling city
- A site where migratory species may visit during seasons
- Nesting site of hundreds of avian colonial nesters
- Roosting site for hundreds of flying foxes
- An area with high potential for Nature education to inculcate the values of conservation
- A potential site for ecotourism in a small scale

1.9. Development plan

By virtue of being a fragile and sensitive area amidst a growing city, any development plan for the area should essentially be a conservation plan for the area. The development of tourism and associated activities and facilities has to be reckoned as an additional benefit from the conservation plan. However, the idea of such development of the area contributing funds to the exchequer by becoming an ecotourism spot cannot be discounted. Being a small fragile area, the carrying capacity of the region is very low even in physical terms, and the potential for tourism development in the area is limited in the conventional sense of allowing intensively tourists to directly enter and experience the system. Some steps that may be adopted in this direction are suggested below.

- Some of the adjacent areas that are currently under the control of Indian railway, BPCL, Revenue Department and Corporation of Cochin can be annexed to the Mangalavanam protected area to form a buffer zone.

- Some parts of the BPCL area, which was earlier marshy, may be excavated to form depressions that can be flooded during tidal influx. Such a modification also would facilitate the tidal flux in the system, along with providing a refuge to animals such as fish during low tide. Along the sides of the depressions common local mangrove species may be planted.
- The vegetation of the areas proposed for acquisition may be improved using local plant species in consultation with experts in the field. Plants that can provide sufficient roosting and nesting sites with prolific branching may be given priority.
- It is felt that due to past activities in the environs of the wetland, considerable load of silt has accumulated in the water body. Desilting select areas during appropriate seasons may be helpful in improving the system. Jayson and Easa (1999) and Karunakaran et al (1999) have also suggested desiltation of the pond. However utmost care has to be taken in doing this, because such an activity, if taken up in an intense scale, may disturb the birds. Prior to undertaking such an exercise it is advisable to explore the possible impacts of such an action on the system as a whole. It is also advisable that a proper schedule for the job is made with areas marked properly on a map, bearing in mind the seasonal dynamics of the system. under the guidance of experts including ecologists.
- The area covered by the tidal wetland and the thick mangrove vegetation has to be considered as the core of the protected area. Signboards and pillars may demarcate this area. The boundary of the larger area inclusive of the to-be-acquired lands may be clearly demarcated. Fencing may be done for the purpose.
- Measures may be taken to prevent solid wastes, especially the plastic one from dumping in the catchments of the wetland. Dumping solid wastes within a distance of 500 meters of the area may be curtailed. It is seen that many solid waste materials enter the area from the sides of the main road. Later these materials float in the water and during low tide get stuck on the grills separating the wetland from the backwaters. Such materials also get entangled with the mangrove roots.
- No liquid waste discharges that may flow down to the mangrove area also should be allowed.

- Visitors should not be allowed to go near nesting trees during breeding season. Presence of human beings disturbs birds. It is found that the birds in Mangalavanam are very wary of people. On seeing an intruder the birds fly away leaving the nest open for attack by nest-robbers such as crows. The crows here have learned quick attack on nests in such situations. Hundreds of eggs from the nest are lost in this manner.
- For observing birds, watch towers can be constructed slightly away from the mangrove area. One of the towers may be located in the railway yard about 30 meters from the mangroves. The second one may be located in the BPCL land towards the northwest of the wetland. The height of the towers may be around 10-12 m that may decide on site. The towers may be equipped with bird watchers telescopes.
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- It may be worthwhile to explore the possibility of establishing an appropriately located walkway or a bridge almost at mangroves' height towards its side. If it is made well camouflaged will be a good means for the visitors to observe birds in their natural activities. Such an arrangement will also generate tremendous interest from the tourists. If properly maintained such arrangement will facilitate in conducting studies on the bird ecology.
- A nature interpretation centre may be established in the existing building under the control of Forest department. The interpretation center may have the major theme as coastal wetland ecosystem especially mangroves. A number of suitable dioramas may be established to demonstrate the system. Interactive monitors that will provide photographic, audio and visual information may be also provided. A library with
- Books on the relevant topics suitable for non-technical persons may add on to the utility of the setup. A professionally done video recording of the Mangalavanam through seasons may be also made and exhibited.
- A crocodile pond is also proposed on the south of the natural pond connected with the main channel, so that tidal water influences it. According to Karunakaran et al (1990) the salt-water crocodile *Crocodilus porosus* was common in the backwaters



of Kerala. However, the pond may be isolated by proper netting so that the individuals do not escape out of the place leading to man-animal conflict.

- Aquarium is another welcome item in the area. The aquarium may exhibit tropical species. Attractive species such as sea anemones, crustaceans, sea snakes and other reptiles may be also exhibited in a recreated natural setup in the aquarium. Both enclosed aquaria and open ponds may be built. Salt water from the main channel may be treated and used for circulating.
- The area along with the suggested adjacent areas may be declared protected under relevant laws

1.10. Plates



Plate 1 a: Mangalavanam during high tide



Plate 1. b. A potential bird habitat to be annexed to the Mangalavanam wetlands



ate 2a. Night Heron – a common colonial nester in Mangalavanam



ate 2b: Flying fox colony in Mangalavanam



Plate 3a: Pneumatophores in Mangalavanam indicating healthy mangrove system



Plate 3.b: The wetland beds of Mangalavanam needs cleaning and desilting

1.11. References

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