Diversity of Avifauna in Palayakayal Mangroves Forest Ecosystem

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Abstract - Birds are one of the most diversified avian species among all creatures living on the earth. Coastal birds are an important biological component of coastal wetland ecosystem that plays greater esthetic, sporting and economic values. The present study was carried out in Palayakayal mangrove forest ecosystem which covers a distance of 5 Kilometers. The vast stretch of mangroves and seashore lands is being a boon to bird diversity. Moreover, the entire stretch supports diversity of bird species in the mangrove. The predominant tree species were *Avicennia sps, Borassus flabelifer, Cocus nucifera,* and *Tamarindus indica*. These trees are used by the birds for nesting, resting and roosting. Most of the birds were recorded in the study area are coming under 7 ecological groups. During the study period a total number of 34 bird species were recorded. Palayakayal mangrove being a virgin forest has not been explored significantly and it lacks basic knowledge for making conservation strategies. Information on the birds associated with the mangrove forests under natural conditions will be useful in predicting the potential of survival of various mangrove species, and in future plantation trials. In order to facilitate its significance and conservation, information is needed on the biodiversity of animals associated with this mangrove forest.

Keywords: Palayakayal, mangroove, bird diversity, conservation.

I. INTRODUCTION

The conservation of biological diversity has become a global concern. Biodiversity is the variation of life forms within a given system, biome or for the entire earth. It is also a measure of the relative diversity among organisms present in different ecosystems (Emerson and Brent 2005).Biodiversity is not distributed evenly on earth. It is consistently richer in the tropics. India, being a tropical country possesses a distinct identity, not only because of its geography, history and culture, but also because of the great diversity of its natural ecosystems (Gentry 1988). The existing biodiversity of the earth today are the biological species, the product of nearly 3.5 billion years of evolution (Alroy *et al.,*2001).

Birds are one of the most diversified avian species among all creatures living on the earth. India hold approximately 1,288 avian variety classified under 89 families and 17 orders. Among them, 900 are resident species and the rest are migratory (Diamond et al. 1987, Jayson and Mathew 2000, Singh 2008).Each bird species has its own preference and requirements in terms of food, roosting, and nesting (Ali 1977, Ricklefs 2003). The more diverse the vegetation, greater is the variety of bird life. There is a direct relationship between vegetation diversity and bird diversity (Ericson et al. 2003, Singh 2008)

Coastal birds are an important biological component of coastal wetland ecosystem that plays greater esthetic, sporting and economic values. Coastal wetlands often showed seasonal difference among bird species, they are divided into four groups 1. Summer residents (breeding), 2. Winter residents (occurring throughout winter); 3. Transients (Passing through during either fall or spring migration or both) and 4. Permanent residents. During the annual migrations, these birds exploit all variety of habitats such as grasslands, rivers, estuaries, lakes, marshes, sandy beaches, inter-tidal mud flats, coral reefs and mangroves. However, most of them prefer wetlands than forested areas. The status and distribution of coastal birds often indicate the stability, quality and heterogeneity of coastal wetlands. Birds are vulnerable to even slightest changes in structural and functional aspects of an ecosystem. Food, shelter and human-disturbance are the prime factors often determine the avian population density and diversity. Thus, the knowledge on avian diversity and density

of a habitat may be useful to predict the status of a habitat.

Mangroves harbor a greater variety of bird life than areas such as saltmarshes, mudflats and beaches(Mac Arthur and Mac Arthur,1961). Mangroves enable extensive breeding activity by a number of tree-nesting birds. Little information is available on the birds associated with mangroves in India. Except a few studies like 53 species from Bay Islands (Samanth, 1985), 24 migratory species from Sunderbans (Naskarand Guhabakshi,1987) and 166 species from Bhitarkanika mangroves (Mohanty, 1992).

Birds play major role as seed dispersers, pollinators and insect predators (Heine and Speir 1989, Balasubramanian 1996, Balasubramanian *et al.,* 1998, Kavitha 2012, Margaret 2012). Birds, by virtue of their greater mobility, are more effective seed disseminators (Ridley 1930). Role of birds in the restoration of tropical forests is vital because they carry seeds both externally and internally to far – away places (Green 1993, Whittaker and jones 1994, Vanitharani *et al.,* 2009, Kavitha 2012, Margaret 2012). Their species specific interaction with plant species varies among the forest types as well as among different habitats even within the same region (Glyphis *et al.,* 1981, Buchanan 1989, Dean and Milton 2000, Renne *et al.* 2002). Thus the interaction between the forest birds and forest trees are one of very close interdependences. The birds benefit the plants in cross – pollination and seed dispersal and get the reward of food. This mutualistic interaction permits forest restoration and conservation

II. STUDY AREA

In the Palayakayal mangroves above the water the trees are home to many species of birds. A large number of shorebirds and migratory bird species, including Kingfishers herons and egrots find mangroves as prime nesting and resting sites. Palayakayal mangrove being a virgin forest has not been explored significantly and it lacks basic knowledge for making conservation strategies (Lakshmanan, 2007). Information on the birds associated with the mangrove forests under natural conditions will be useful in predicting the potential survival of various mangrove species, and in future plantation trials. It is also essential to preserve species dynamic areas as insurance for future biodiversity. In order to facilitate its significance and conservation, information is needed on the biodiversity of avian fauna associated with this mangrove forest. This study is aimed at avian faunal diversity in palayakayal mangrove forest ecosystem which has not been explored so far.

III. METHODOLOGY

The study has been carried out in palayakayal mangrove forest. Data will be collected at every week of four months. The activities of the bird species will be studied in the palayakayal mangrove forest ecosystem. Vegetation sampling will be done by using quadrate method. In one hectare sample plot the bird attractive plant species with flowers, fruits and both with flowers and fruits were selected as targeted plant species for the observation of the activities of birds. The bird species which frequently and abundantly visited the focal plant species are considered as the common bird species. The bird visits and the purpose of their visits will be observed during 0630 and 0830 h when the bird feeding activities were higher. Observation will be carried out either by using binoucular (7×50) or by naked eyes depending upon the distance. Birds count will be made by walking on the margin of the coastal area. The observations will be made 5 times in quadrate focal plant species covering the period of three months. The data will be provided on the details of the role of bird species in palayakayal mangrove forest ecosystem. For identifying birds, field guides (Grimmett *et al.,* 1999; Ali 2002 and 2005; Vanitharani *et al.,* 2009; Kavitha, 2012).Weekly visit to the sites was made for three month and an average of 4 weeks was accounted for a month. Birds are identified by referring the key books (Salim Ali, 2002). The present study was focused on the ecological status of avifaunal diversity and density in the study area the birds are classified on the basis of "The book of Indian birds" (Salim Ali, 2002).

IV. RESULTS

The present study was carried out in Palayakayal mangrove forest ecosystem which covers a distance of 5 Kilometers. The vast stretch of mangroves and seashore lands is being a boon to bird diversity. Moreover the entire stretch supports diversity of bird species in the mangrove. The predominant tree species were *Avicennia sps, Borassus flabelifer, Cocus nucifera, and Tamarindus indica*; these trees are used by the birds for nesting, resting and roosting. Most of the birds were recorded in the study area are coming under 7 ecological groups (Nectarivores, Granivores, Frugivores, Insectivores, Carnivores, Omnivores and water birds).

During the study period a total number of 34 bird species were recorded. They were coming under 12 orders and 19 families (Table 1). Plate 1 and 2 shows the digital documentation of avian fauna in palayakayal mangrove forest ecosystem. During the study period, higher number of birds were recorded in September (419), followed by August (399), June (376) and July (372) Table 2.

Table 1: LIST OF BIRD SPECIES RECORDED IN THE STUDY AREA DURING THE STUDY PERIOD

S.No	Common name	Species name	Family	Order
1	Shikra	*Accipiter badius*	Accipitridae	Accipitriformes
2	Lesser sand plover	*Charadrius mongolus*	Accipitridae	Charadriiformes
3	Lesser black backed gull	*Larus euscus*	Accipitridae	Charadriiformes
4	Common green shank	*Tringa nebularia*	Accipitridae	Charadriiformes
5	Cattle egret	*Bubulcus ibis*	Ardeidae	Ciconiiformes
6	Little egret	*Egretta garzetta*	Ardeidae	Ciconiiformes
7	Red noped ibis	*Pseudibis papillosa*	Ardeidae	Ciconiiformes
8	Spoted dove	*Streptopelia chinensis*	Ardeidae	Columbiforms
9	Eurasian collar dove	*Streptopelia decaocto*	Ardeidae	Columbiforms
10	Indian rollar	*Coracias benghalensis*	Ardeidae	Coraciformes
11	Chestnut headed bee eater	*Merops leschenaulti*	Charadriidae	Coraciformes
12	Small bee eater	*Merops orientalis*	Columbidae	Coraciformes
13	Asian koel	*Eudynamys scolopacea*	Columbidae	Cuculiformes
14	Greater coucal	*Centropus sinensis*	Coraciidae	Cuculiformes
15	Brahminy kite	*Haliastur indus*	Corvidae	Falconiforms
16	Black kite	*Milvus migrans*	Corvidae	Falconiforms
17	Eurasian sparrow hawk	*Accipiter nisus*	Corvidae	Falconiforms
18	Indian peafowl	*Pava cristatus*	Corvidae	Galliformes
19	House crow	*Corvus splendens*	Cuculidae	Passeriformes
20	Jungle crow	*Corvus macrohynchos*	Cuculidae	Passeriformes
21	Black drongo	*Dicrurus macrocercus*	Laridae	Passeriformes
22	Jungle babbler	*Turdoides striatus*	Leiothrichidae	Passeriformes
23	Sun bird	*Nectarinia asiatica*	Meropidae	Passeriformes
24	Red vented bulbul	*Pycnonotus cafer*	Meropidae	Passeriformes
25	Common myna	*Acridotheres tristis*	Nectarinidae	Passeriformes
26	Greenish warbler	*Phylloscopus trochilades*	Psititacidae	Passeriformes
33	Indian tree pie	*Dendeocitta vagabunda*	Scolopacidae	Psssiformes
27	Great egret	*Casmerodius albus*	Pycnonotidae	Pelecaniformes
28	Grey heron	*Ardea cinerea*	Sturnidae	Pelecaniformes
29	Indian pond heron	*Ardeola cinerea*	Threskiornithidae	Pelecaniformes
30	Little heron	*Butorides striatus*	Phalacrocoracidae	Pelecaniformes
31	Black ibis	*Pseudibis papillosa*	Phasianidae	Pelecaniformes
32	Roseringed parakeet	*Psittacula karmeri*	Phylloscopidae	Psittaciformes
34	Great cormorant	*Phalacro conax carbo*	Threskiornithidae	Suliformes

Figure 1: Percentage of Avian faunal visitor's order-wise composition in Palayakayal Mangrove forest ecosystem.

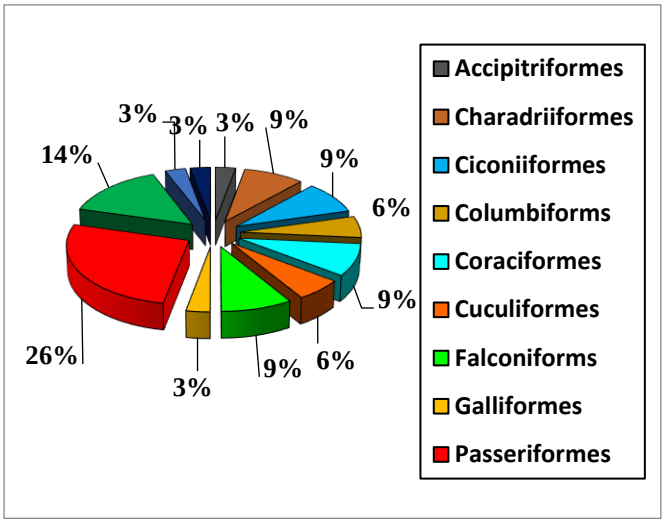


Figure 2: Percentage of Avian faunal visitor's Family-wise composition in Palayakayal Mangrove forest ecosystem.

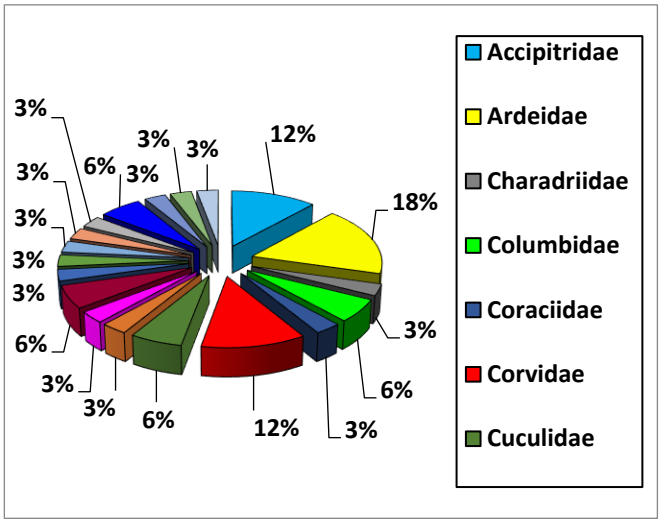


Table 2. MONTH-WISE VARIATION OF AVIFAUNA DURING THE STUDY PERIOD.

SI.NO	NAME OF THE BIRDS	JUNE	JULY	AUGUST	SEPTEMBER
1	*Streptopelia chinensis*	4	5	5	4
2	*Streptopelia decaocto*	5	12	13	14
3	*Haliastur indus*	20	15	16	16
4	*Milvus migrans*	25	9	17	15
5	*Eudynamys scolopacea*	6	5	7	5
6	*Merops leschenaulti*	10	10	12	12
7	*Merops orientalis*	12	14	14	11
8	*Coracias benghalensis*	4	7	8	8
9	*Dicrurus macrocercus*	15	11	15	15
10	*Acridotheres tristis*	9	10	10	10
11	*Corvus splendens*	19	22	19	19
12	*Corvus macrohynchos*	9	12	11	10
13	*Pycnonotus cafer*	13	12	10	11
14	*Psittacula karmeri*	10	5	8	9
15	*Dendeocitta vagabunda*	8	7	8	9
16	*Nectarinia asiatica*	11	13	10	12
17	*Pseudibis papillosa*	4	5	5	6
18	*Phylloscopus trochilades*	3	2	5	5
19	*Pava cristatus*	10	17	16	17

Great egret was the most abundant bird (126) followed by Jungle Crow (79) Brahminy Kite (67), Black kite (66), Indian peafowl (60), Black drongo(56), Lesser black-backed gull(56), Cattle egret (56), Great cormorant (55), Commongreen shank (46), Little heron (53), small bee eater (51), Eurasian sparrow hawk (50), Grey heron (50), little egret (47), sun bird (46), Red vented bulbul (46), Eurasian collar dove (44), Chestnut headed bee eater (44), Greater coucal (40), Common myna (39), Lesser sand plover (38), shikra (37), Indian pond heron (34), Rose ringed parakeet (32), Indian tree pie

(32), Indian roller (27), Asian koel (23), Black ibis (21), Red noped ibis (20), spotted dove (18) and greenish warbler (15) were recorded during the four month study period.

Among the 12 orders of birds recorded in the study area, the % of occurrence of Passeriformes was at highest (26%) followed by Pelecaniiformes (14%), Falconiformes (9%), Charadiiformes (9%), Ciconiiformes (9%), Coraciformes (9%), Cucliformes and Columbiformes (6%), and remaining forms Accipitriformes, Galliformes, Psittaciformes and Suliformes (3%) (Figure 1). Among the Passeriforme birds namely the sun birds and bulbuls are the common and frequent visitors to the mangroves of palayakayal. The babblers, crow and drongo are the median visitors.

Among the 19 families of birds identified in the study area the Ardedae (18%), Accipitridae and Corvidae were at a highest (12%) percentage of composition followed by Cuculidae, Threskiornithidae, Meropidae and Columbidae (6%) and the remaining forms Charadriidae, Coracidae, Laridae, Leiothrichidae, Nectarinidae, Psititacidae, Scolopacidae, Pycnonotidae, Sturnidae, Phalacrocoracidae, Phasianidae, and Phylloscopidae were found to be (3 %) in occurrence (Figure 2). According to the month wise variation study observed in the avifaunal diversity (Table 2) in Palayakayal mangrove forest ecosystem, the birds recorded in the study area were categorized into 7 ecological groups based on their food and feeding habits; such as Nectarivores, Frugivores, Granivores, Insectivores, Carnivores, Omnivores and Water birds (Table 3). Among them Water birds were highest (29%) percentage of composition followed by Frugivores (20%), Insectivores and Carnivores (15%), Omnivores and Granivores (9%) and Nectrivores (3%) (Figure 3).

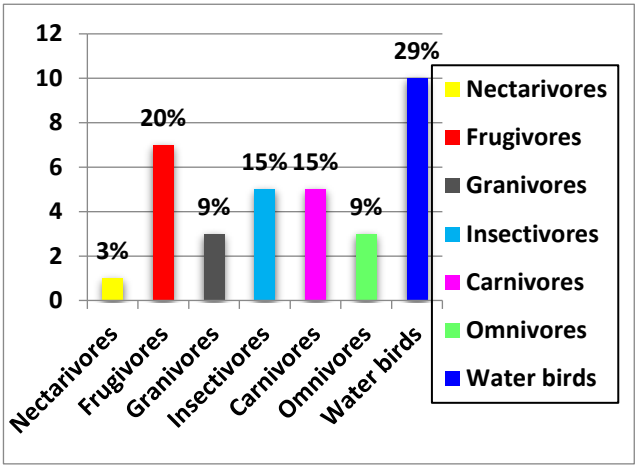
TABLE 3: Calculated value of frequency, density and relative abundance of the avifaunal diversity.

SI.NO	NAME OF THE BIRDS	T1	T2	T3	FRE	DEN	ABU
1	*Streptopelia chinensis*	18	7	16	43.75	1.12	2.58
2	*Streptopelia decaocto*	44	10	16	62.5	2.75	4.4
3	*Haliastur indus*	67	12	16	75	4.19	5.58
4	*Milvus migrans*	66	12	16	75	4.12	5.5
5	*Eudynamys scolopacea*	23	6	16	37.5	1.37	3.83
6	*Merops leschenaulti*	44	5	16	31.25	2.75	8.8
7	*Merops orientalis*	51	13	16	81.25	3.19	4.63
8	*Coracias benghalensis*	27	7	16	43.75	1.69	3.85
9	*Dicrurus macrocercus*	56	14	16	87.5	3.5	4
10	*Acridotheres tristis*	39	12	16	75	2.44	3.25
11	*Corvus splendens*	79	15	16	93.75	4.93	5.26
12	*Corvus macrohynchos*	42	14	16	87.5	2.63	3
13	*Pycnonotus cafer*	46	12	16	75	2.88	3.83
14	*Psittacula karmeri*	32	10	16	62.5	2	3.2
15	*Dendeocitta vagabunda*	32	8	16	50	2	4
16	*Nectarinia asiatica*	51	15	16	93.75	3.18	3.4
17	*Pseudibis papillosa*	20	4	16	25	1.25	5
18	*Phylloscopus trochilades*	15	5	16	31.25	0.93	3
19	*Pava cristatus*	64	16	16	100	4	4
20	*Centropus sinensis*	40	8	16	50	2.5	5
21	*Casmerodius albus*	134	16	16	100	8.38	8.38
22	*Bubulcus ibis*	56	7	16	43.75	3.5	8
23	*Egretta garzetta*	47	6	16	37.5	2.94	7.83
24	*Larus euscus*	56	12	16	75	3.5	4.66
25	*Accipiter nisus*	50	9	16	56.25	3.12	5.5
26	*Phalacro conax carbo*	60	10	16	62.5	3.75	6
27	*Tringa nebularia*	54	12	16	75	3.37	4.5
28	*Charadrius mongolus*	38	7	16	43.75	2.38	5.42
29	*Accipiter badius*	37	8	16	50	2.31	4.62
30	*Ardea cinerea*	52	13	16	81.25	3.25	4

31	*Ardeola cinerea*	34	5	16	31.25	2.13	6.8
32	*Butorides striatus*	53	12	16	75	3.32	4.41
33	*Pseudibis papillosa*	21	6	16	37.5	1.32	3.5
34	*Turdoides striatus*	42	10	16	62.5	2.63	4.2

T1-total no of individuals of the species; T2-total no of weeks in which species occurred;
T3-total no of weeks studied; F- Frequency; D- Density; A-Abundance

Figure 3: Percentage of Ecological Groups Observed in the Palayakayal Forest Ecosystem



Table, 4 shows frequency, density and relative abundance of the avifaunal diversity. Among the 34 species the highest percentage of relative abundance and frequency rate were calculated in Pavacristatus and Casmerodiusalbus (16 weeks out of 16 weeks) followed by Corvussplendens and Nectariniaasiatica (15weeks out of 16 weeks), Corvusmacrohynchos and Dicrurusmacrocercus (14 weeks out of 16 weeks) and so on.

Table 4: Ecological Classification of the Recorded Birds in the Palayakayal Mangrove Forest Ecosystem Based on their Food and Feeding Habits.

SI.NO	COMMON NAME	SPECIES NAME	ECOLOGICAL GROUP
1	Purple Sun bird	*Nectarinia asiatica*	Nectarivores
2	Asian koel	*Eudynamys scolopacea*	Frugivores
3	Jungle babbler	*Turdoides striatus*	Frugivores
4	Black drongo	*Dicrurus macrocercus*	Frugivores
5	Common myna	*Acridotheres tristis*	Frugivores
6	Red vented bulbul	*Pycnonotus cafer*	Frugivores
7	Rose ringed parakeet	*Psittacula karmeri*	Frugivores
8	Indian tree pie	*Dendeocitta vagabunda*	Frugivores
9	Spotted dove	*Streptopelia chinensis*	Granivores
10	Eurasian collar dove	*Streptopelia decaocto*	Granivores
11	Indian peafowl	*Pava cristatus*	Granivores
12	Chestnut headed bee eater	*Merops leschenaulti*	Insectivores
13	Small bee eater	*Merops orientalis*	Insectivores
14	Indian roller	*Coracias benghalensis*	Insectivores
15	Red naped ibis	*Pseudibis papillosa*	Insectivores

16	Greenish warbler	*Phylloscopus trochiloides*	Insectivores
17	Brahminy kite	*Haliastur indus*	Carnivores
18	Black kite or pariah kite	*Milvus migrans*	Carnivores
19	Shikra	*Accipiter badius*	Carnivores
20	Greater coucal	*Centropus sinensis*	Carnivores
21	Eurasian sparrow hawk	*Accipiter nisus*	Carnivores
22	House crow	*Corvus splendens*	Omnivores
23	Jungle crow	*Corvus macrohynchos*	Omnivores
24	Lesser black backed gull	*Larus fuscus*	Omnivores
25	Great egret	*Casmerodius albus*	Water birds
26	Cattle egret	*Bubulcus ibis*	Water birds
27	Little egret	*Bubulcus ibis*	Water birds
28	Great cormorant	*Phalacro conax carbo*	Water birds
29	Common green shank	*Tringa nebularia*	Water birds
30	Lesser sand plover	*Charadrius mongolus*	Water birds
31	Grey heron	*Ardea cinerea*	Water birds
32	Indian pond heron	*Ardeola cinerea*	Water birds
33	Little heron	*Butorides striatus*	Water birds
34	Black ibis	*Pseudibis papillosa*	Water birds

V. DISCUSSION

Birds are one of the best and in some case the only best to monitor the short- and long-term environmental changes. Birds are important biological indicators of environmental changes in inland wetlands from the time immemorial. Birds are a familiar feature of our environment and everyone notices them with great joy. The bird - watching is such a popular pastime world over. Due to their varied lifestyles, conspicuousness, diurnal habits and interesting plumage and calls, it attracts human tours them from the time immemorial. Birds are also regarded as good subjects for exploring a number of questions of ecological and conservation significance (Urfi, 2003). Fisherman from the 17th century has used flocks of seabirds as an indicator of fish abundance in coastal wetlands. Due to this in recent days more attention has been given in conservation, monitoring and ecological studies of birds in different areas (Newton, 1995). The dominant trend of bird-count exercised in India has been focused on endangered birds, wetland birds, heronries and birds found in protected habitat habitats such as national parks, sanctuaries and Important Bird Area (Urfi, 2005). Obviously complete details of common birds and even some coastal habitats such as mangroves of India are scanty till date (Sandilyan 2009, Sandiliyan *et al.*, 2010).Recent research is focused on the impact of climate change on birds and how the birds are responding for the ongoing climate change pandemonium (Yom-Tov *et al*., 2006; Van Buskirk *et al*., 2010; Gardner *et al*., 2011). Ornithologists and bird watchers in India agree that the contemporary knowledge about the status of common birds in the subcontinent is highly needed (Madson, 2003 Sandilyan, 2011).

Recent indisputable studies stated that there is a general decline in the number of common birds like a vulture, black kite, species of doves, drongo, roller and parakeets (Madson, 2003). On the other hand, mass decline of water and terrestrial birds from important habitats such as coastal were also reported (Sandilyan 2010; Sandilyan *et al*., 2010). But here in the current study we have recorded 1566 birds belonging to 34 species within 5 km that indicates the habitat quality. The total number of birds observed from the study area could not be compared with other true mangrove or any other mangrove forest ecosystem similar to that of the present study area,

the Palayakayal, because of lack of available literature.

There was a fluctuation in number of birds of different months during the study time. This may be due to the influence of the season as well as the human disturbance in palayakayal mangrove forest ecosystem. Apart from that several reports confirmed that seasonal variation, local migration pattern, reproductive behaviour, latitude and the regional and global microclimatic events and erratic climate might also influence the birds number in any habitat (Pittock, 2003, Romano *et al*., 2005). However, a detail long time study in this aspect is required to know the exact factors which influence the fluctuation in the study area.

The species composition of a specific area or a community is interlinked to the available resources of the area, which includes physical structure of the habitat, food availability and biotic interactions (Terdalkar *et al*., 2005). The results indicate that the current study area fulfills all the requirements for the recorded avifauna.

According to Salim Ali (1972 and 2003), birds are the friends of the farmer and not the foes, because they destroy the insects that affects the plant species. Birds constitute an important component of agro ecosystems and the role of birds in the agro ecosystem is gaining more and more attention. As depredators of insects, birds stand supreme among the vertebrate**.** The insectivore birds play an economically significant role in mangrove ecosystem by the way of controlling the insects that destroy the products in all the stages especially during pest outbreaks the birds are the only natural and eco-friendly saviour of the plants (Sandilyan, 2013).

A few granivorous and omnivorous bird species have been able to harvest energy and reproduce very efficiently in mangrove habitats, leading their large population buildups (Dhindsa and Saini, 1994). Among the recorded birds in the study area, the omnivore and granivores were 9%. The role of the two ecological groups should be investigated based on the above-mentioned aspect.

Apart from abiotic factors such as climatic conditions and soil nutrients a plant also needs to be free from disease and attack by predators (Majumdar and Bramachari, 1987). Insect pests attack can occur at every stage in the life cycle of a plant. These hazards can either severely impede its growth or results in its mortality (Cairns and John, 1988).

VI. CONCLUSION

Due to anthropogenic activities a range of forest types across the world are facing threats. The damages to the Sundarban forest is only the latest example of climate change driven destruction of forests and other ecosystems across the world – like the recent Amazon Forest fires and the Australian bush fires. Such events are only to increase the frequency in the future. Hence it is high time to conserve what remains and to restore what was lost.

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