



AVIAN DIVERSITY IN THE WETLANDS OF BANGALORE

Antoney P.U.,* Swetha K.S.** & Sreepad S.**

Introduction

The health of an ecosystem can perhaps be best assessed by the species of birds present in it. Whether we live in the most congested of Indian cities, or the densest of its forests, or along its coasts and high up on its mountains, birds are our companions. Quite apart from a sentimental value, birds render incalculable service to man. Through their sheer diversity, numbers, mobility and functional roles as predators, prey and dispensers of pollen and plant seed, are necessary for the survival of natural ecosystems. Birds are the principal agency that controls the bewildering multiplication of insect life; which if unchecked, would overwhelm all life forms on this planet. Due to their remarkable utility as biological 'thermometers' or indicators the study of changes in communities of birds has given us great insights in the related fields of conservation biology. Due to their remarkable utility as biological 'thermometers' or indicators the study of changes in communities of birds has given us great insights in the related fields of conservation biology. One major advantage of bird community study and estimating abundance of avian species in a habitat is that similar studies when repeated after several years could help in assessing the status of bird species themselves. The study could also help in understanding changes taking place in the habitat and how that changes influence the composition of bird fauna. In fact, such time span studies are rare in India.

* Professor & Head, Dept. of Zoology, Christ College, Bangalore.

** 5th semester B.Sc.CBZ students, Christ College, Bangalore

Wetlands are one of the most productive ecosystems, comparable to tropical evergreen forests in the biosphere. They play a significant role in the ecological sustainability of a region. But the amount of fresh water covers only 2.53% of the earth's water. On the earth's surface, fresh water is the habitat of a large number of species. These aquatic organisms and the ecosystem in which they live represent a substantial sector of the earth's biological diversity. Wetlands of Bangalore occupy about 4.8% of the geographical area (640 sq km) covering both urban and non-urban areas. There were 262 lakes (in 1960) within the Green belt area of the city, which has fallen to 34 healthy lakes at present. In the recent past, the wetland values are often overlooked resulting from the growing population pressures and unplanned development threatening their very existence.

Study Areas

Bangalore district is situated in the heart of the South-Deccan plateau in peninsular India to the South-Eastern corner of Karnataka State between the latitudinal parallels of 12° 39' N & 13° 18' N and longitudinal meridians of 77° 22' E & 77° 52' E at an average elevation of about 900 meters covering an area of about 2,191 sq. kms. Seven lakes (Agara, Madiwala, Lalbagh, Yediur, Hebbal, Puttenahally and Hesserghetta) in Bangalore were selected for the present study based on their location, area, level of pollution etc.

Methodology

Abundance and diversity of avifauna in the six sites were analyzed in detail by visiting each site once a month from October 2005 to March 2007. Bird population studies were carried out by line transect, variable distance line transect, point count methods. Standardized timed bird censuses were conducted in the morning from 9 am to 12 noon and in the evening from 3 pm to 6 pm. The first six months of the study was dedicated mostly for secondary data collection. All the birds seen or heard in the transects were recorded. An 8x40 zenith-prismatic binocular and a portable tape recorder were used for identifying the birds and recording their sounds. The data obtained were compiled and correlated. Various biodiversity indices were calculated from the data obtained.

Results and Discussion

A total number of 112 species of birds were identified from the various wetlands of Bangalore selected for this study. There is a clear difference in the bird fauna

among the seven study sites. In terms of species numbers Hebbal Lake was the richest, followed by Hesserghetta Lake. Yediur and Agara lakes recorded the least number among the entire study sites. The abundance and diversity of bird species in the Hebbal, Hesserghetta, Madiwala and Puttnehally lakes are to be attributed to the richness of various types of vegetation in and around these lakes. The high value of similarity index between sites H & G (0.614) may be attributed to the fact that both of them are surrounded by thick vegetations.

Lakes		A	M	Y	L	H	P	G
Area (ha)		48.4	14.16	6.45	12.9	76.4	14.9	?
No. of Species		26	49	15	31	74	39	57
Habitat-	o*	6	8	3	6	8	7	1
	s*	4	10	1	2	14	3	11
	m*	9	13	2	7	14	15	16
	r*	11	19	10	17	41	13	29
	a*	1	9	0	2	13	3	7
	w*	4	6	2	4	4	6	4
	g*	8	9	4	-	7	-	10

o = Open water. s = Scrub, m = Marsh. r = Riparian- Trees and shrubs on edges of Lake, a = Aerial. w = Weedy margins, g = Grassland, Bush.

But the high value for similarity index between site-M & L (0.581) must be due to the same kind of landscape features created in and around these water bodies. A habitat wise analysis showed that the maximum number of birds in all the habitats selected were riparian indicating that vegetation is an important parameter deciding the avian diversity of any area. Based on food habits insectivorous birds were the most abundant forms in these wetlands followed by those feeding on fishes. Observations showed that there is not much correlation between the pollution of the water body and the richness of birds.

Recommendations

1. Since diversity in vegetation is one of the primary factors deciding Avian diversity in the wetlands, the concerned authorities like Forest department, BBMP, BDA and the LDA should take measures to plant more trees and shrubs like bamboos, tall grasses, Palm trees etc. in the periphery of these wetlands.
2. Any attempts to disturb the Puttnehally lake in the name of tourism or Eco development is to be discouraged since the lake harbour several breeding

birds and developmental activities will disturb their breeding grounds and it may result in their permanent disappearance from the area.

3. All kinds of developmental activities coming up in the vicinity of the wetlands are to be strictly monitored to prevent pollution and undue disturbance to the Avifauna of these lakes.
4. Create a Regional Conservation Forum represented by a network of educational institutions, researchers, NGO's, and the local people, to help restore the already degraded lakes and conserve those at the brink of extinction

Check List of the Birds identified during the study:

Species	Area	Ha	Sta	Ab	NS	Food
Lesser Whistling-Duck (<i>Dendrocygna javanica</i> (Horsfield, 1821))	LM	o	R	r	TB	FW
Spot-billed Duck (<i>Anas poecilorhyncha</i> (J.R.Forester, 1781))	PMA	o	R	c	G	IO
Northern Shoveller (<i>Anas clypeata</i> (Linnaeus, 1758))	H	o	W	f	B	F
Northern Pintail (<i>Anas acuta</i> (Linnaeus, 1758))	A	so	W	f	E	IWF
Garganey (<i>Anas querquedula</i> (Linnaeus, 1758))	AMP	mo	M	c	G	FIW
White-cheeked Barbet (<i>Megalaima viridis</i> (Boddaert, 1783))	AYHG	r	R	c	T	Frl
Coppersmith Barbet (<i>Megalaima haemacephala</i> (P.L.S.Müller, 1776))	G	r	R	f	T	Frl
Common Hoopoe (<i>Upupa epops</i> (Linnaeus, 1758))	M	r	RS	f	G	I
Indian Roller (<i>Coracias benghalensis</i> (Linnaeus, 1758))	G	r	R	f	C	IP
x Small Blue Kingfisher (<i>Alcedo atthis</i> (Linnaeus, 1758))	LG	r	RM	r	G	FI
White-breasted Kingfisher (<i>Halcyon smymensis</i> (Linnaeus, 1758))	LHAPGY	r	R	c	G	IFP
Lesser Pied Kingfisher (<i>Ceryle rudis</i> (Linnaeus, 1758))	G	r	R	r	G	FI

Small Bee-eater (<i>Merops orientalis</i> (Latham, 1801))	PGMA	r	R	f	G	I
Pied Crested Cuckoo (<i>Clamator jacobinus</i> (Boddaert, 1783))	PGH	r	R	f	C	IW
Common Hawk Cuckoo (<i>Hierococcyx varius</i> (Vahl, 1797))	HG	r	R	f	C	I
Indian Plaintive Cuckoo (<i>Cacomantis passerinus</i> (Vahl, 1797))	HG	r	R	f	C	I
Asian Koel (<i>Eudynamys scolopacea</i> (Linnaeus, 1758))	HY	r	R	c	C	IFrN
Greater Coucal (<i>Centropus sinensis</i> (Stephens, 1815))	HG	r	R	c	C	P
Rose-ringed Parakeet (<i>Psittacula krameri</i> (Scopoli, 1769))	HGL	r	R	c	C	FrG
House swift (<i>Apus affinis</i> (J E Grey, 1830))	GMH	a	R	c	G	I
Spotted Owlet (<i>Athene brama</i> (Temminck, 1821))	H	r	R	f	C	PI
Blue Rock Pigeon (<i>Columba livia</i> (Gmelin, 1789))	HMGLP	r	R	a	C	GY
Spotted Dove (<i>Streptopelia chinensis</i> (Scopoli, 1786))	YMHG	r	R	c	C	G
White-breasted Waterhen (<i>Amauromis phoenicurus</i> (Pennant, 1769))	LMP	wm	R	f	B	FIW
Purple Swamphen (<i>Porphyrio porphyrio</i> (Linnaeus, 1758))	LAMPY	wgm	R	c	B	DFWO
Common Moorhen (<i>Gallinula chloropus</i> (Byth, 1842))	LYP	o	RW	c	B	FDW
Common Coot (<i>Fulica atra</i> (Linnaeus, 1758))	AMHLPY	o	R	c	B	FI
Black-tailed Godwit (<i>Limosa limosa</i> (Linnaeus, 1758))	H	o	W	o	G	IW
Marsh Sandpiper (<i>Tringa stagnatilis</i> (Bechstein, 1803))	MGP	m	W	o	G	IF
Common Greenshank (<i>Tringa nebularia</i> (Gunner, 1767))	H	m	W	r	G	FI

Green Sandpiper (<i>Tringa ochropus</i> (Linnaeus, 1758))	GM	m	W	f	GC	FI
Wood Sandpiper (<i>Tringa glareola</i> (Linnaeus, 1758))	MP	a	W	r	GC	FI
Common Sandpiper (<i>Actitis hypoleucos</i> (Linnaeus, 1758))	GP	m	W	r	G	IF
Little Stint (<i>Calidris minuta</i> (Leisler, 1812))	H	m	W	r	E	IFW
Pheasant-tailed Jacana (<i>Hydrophasianus chirurgus</i> (Scopoli, 1786))	H	ow	R	r	B	FIW
Black-winged Stilt (<i>Himantopus himantopus</i> (Linnaeus, 1758))	H	mr	R	r	G	IFW
Little Ringed Plover (<i>Charadrius dubius</i> (Scopoli, 1786))	HG	mr	RW	f	GB	I
Grey-headed Lapwing (<i>Vanellus cinereus</i> (Linnaeus, 1758))	H	ma	RW	s	G	IF
Red-wattled Lapwing (<i>Vanellus indicus</i> (Boddaert, 1783))	LGP	m	R	c	G	IF
x Brown-headed Gull (<i>Larus brunnicephalus</i> (Jerdon, 1840))	H	oa	W	o	BG	FIW
River Tern (<i>Sterna aurantia</i> (J.E.Gray, 1831))	H	oa	R	o	G	FI
Whiskered Tern (<i>Chlidonias hybridus</i> (J.E.Gray, 1831))	H	oa	R	s	G	FI
Black-shouldered Kite (<i>Elanus caeruleus</i> (Desfontaines, 1789))	HM	ar	?	s	C	P
Black Kite (<i>Milvus migrans</i> (Boddaert, 1783))	LGAMP	ar	R	a	C	PI
Brahminy Kite (<i>Haliastur indus</i> (Boddaert, 1783))	MPGH	ar	R	c	C	P
Western Marsh Harrier (<i>Circus aeruginosus</i> (Linnaeus, 1758))	HAMP	mw	W	f	GB	P
Shikra (<i>Accipiter badius</i> (Gmelin, 1788))	MH	ra	R	r	C	P
Booted Eagle (<i>Hieraetus pennatus</i> (Gmelin, 1788))	GMH	ra	RW	r	C	P
Common Kestrel (<i>Falco tinnunculus</i> (Linnaeus, 1758))	H	ra	W	r	C	P

x Red-headed Falcon (<i>Falco chicquera</i> (Daudin, 1800))	HP	ra	R	s	C	P
Little Grebe (<i>Tachybaptus ruficollis</i> (Pallas, 1764))	LMAHP	o	R	c	BG	FI
Little Cormorant (<i>Phalacrocorax niger</i> (Vieillot, 1817))	YGAMP	ows	R	f	C	F
Great Cormorant (<i>Phalacrocorax carbo</i> (Linnaeus, 1758))	LM	ows	R	f	C	F
#Darter (<i>Anhinga melanogaster</i> (Pennant, 1769))	PH	w	R	s	C	F
Little Egret (<i>Egretta garzetta</i> (Linnaeus, 1766))	LGAMPH	msg	R	a	C	FI
Grey Heron (<i>Ardea cinerea</i> (Linnaeus, 1758))	PMA	gm	RMW	c	C	FI
Purple Heron (<i>Ardea purpurea</i> (Linnaeus, 1766))	LMGAP	mw	RM	f	CB	FI
^h Large Egret (<i>Casmerodius albus</i> (Linnaeus, 1758))	GH	mw	R	a	C	FI
Median Egret (<i>Mesophoyx intermedia</i> (Wagler, 1829))	G	mw	R	r	C	FI
Cattle Egret (<i>Bubulcus ibis</i> (Linnaeus, 1758))	AGHMPY	mg	R	a	C	FI
Indian Pond Heron (<i>Ardeola grayii</i> (Sykes, 1832))	AMLPGH	mg	R	c	C	FI
+ little green Heron (<i>Butorides striatus</i> (Bonaparte, 1857))	L	r	R	x	C	F
Night Heron (<i>Ncticorax ncticorax</i> (Linnaeus, 1758))	P	r	R	o	C	F
White Ibis (<i>Threskiornis melanocephalus</i> (Latham, 1790))	P	g	R	o	C	F
x Eurasian Spoonbill (<i>Platalea leucorodia</i> (Linnaeus, 1758))	HP	m	RW	s	B	FI
Spot Billed Pelican (<i>Pelecanus philippensis</i> (Gmelin, 1789))	LM	o	W	f	C	F
White Stork (<i>Ciconia ciconia</i> (Swinhoe, 1879))	G	gm	W	x	C	F
Painted Stork (<i>Mycteria leucocephala</i> (Pennant, 1769))	GHP	m	R	s	C	FI

x Asian Openbill Stork (<i>Anastomus oscitans</i> (Boddaert, 1783))	HP	ms	R	s	C	F
Brown Shrike (<i>Lanius cristatus</i> (Linnaeus, 1758))	HM	rs	W	f	C	IP
Rufous-backed Shrike (<i>Lanius schach</i> Linnaeus, 1758))	MH	r	R	f	C	IFP
x Indian Treepie (<i>Dendrocitta vagabunda</i> (Latham, 1790))	H	r	R	r	C	FrI
House Crow (<i>Corvus splendens</i> (Vieillot, 1817))	HALMPGY	r	R	a	C	IO
Jungle crow (<i>Corvus macrorhynchos</i> (Wagler, 1827))	HALMPGY	rg	R	a	C	IO
Ashy Woodswallow (<i>Artamus fuscus</i> (Vieillot, 1817))	HG	a	RM	f	C	I
Eurasian Golden Oriole (<i>Oriolus oriolus</i> (Linnaeus, 1758))	HL	r	S	r	C	IFr
Black Drongo (<i>Dicrurus macrocercus</i> (Vieillot, 1817))	MHGA	r	RM	c	C	PN
Ashy Drongo (<i>Dicrurus leucophaeus</i> (Vieillot, 1817))	H	r	?	f	C	IN
Indian Robin (<i>Saxicoloides fulicata</i> (Linnaeus, 1776))	MG	s	R	c	G	I
#Common Stonechat (<i>Saxicola torquata</i> (Linnaeus, 1766))	HG	s	W	s	GB	I
Pied Bushchat (<i>Saxicola caprata</i> (Linnaeus, 1766))	AM	s	M	c	G	I
Grey-headed Starling (<i>Sturnus malabaricus</i> (Gmelin, 1789))	HAMG	r	R	f	T	IN
Rosy Starling (<i>Sturnus roseus</i> (Linnaeus, 1758))	LHM	r	W	f	G	FrIN
Common Myna (<i>Acridotheres tristis</i> (Linnaeus, 1766))	AGHMLPY	r	R	a	T	GIP
Jungle Myna (<i>Acridotheres fuscus</i> (Wagler, 1827))	AGHMLPY	r	R	a	T	FrGIN
Great Tit (<i>Parus major</i> (Linnaeus, 1758))	H	sr	R	o	T	FrIW
Barn Swallow (<i>Hirundo rustica</i> (Linnaeus, 1758))	MG	a	W	f	G	I

Red-rumped Swallow (<i>Hirundo daurica</i> (Linnaeus, 1771))	MHG	a	W	f	G	I
Red-whiskered Bulbul (<i>Pycnonotus jocosus</i> (Linnaeus, 1758))	HG	r	R	c	B	IFrM
Streaked Fantail Warbler (<i>Cisticola juncidis</i> (Rafinesque, 1810))	HG	s	R	r	B	I
Ashy Prinia (<i>Prinia socialis</i> (Sykes, 1832))	MG	s	R	f	B	IN
Plain Prinia (<i>Prinia inornata</i> (Sykes, 1832))	HM	s	R	f	B	IN
Blyth's Reed-Warbler (<i>Acrocephalus dumetorum</i> (Blyth, 1849))	MG	s	W	f	B	I
Eurasian Great Reed-Warbler (<i>Acrocephalus arundinaceus</i> (Linnaeus, 1758))	H	s	M	o	E	I
Booted Warbler (<i>Hippolais caligata</i> (Lichtenstein, 1823))	H	s	W	o	B	I
Common Tailorbird (<i>Orthotomus sutorius</i> (Pennant, 1769))	HGM	s	R	f	B	IN
Greenish Leaf-Warbler (<i>Phylloscopus trochiloides</i> (Sundevall, 1837))	LH	r	S	f	G	I
White-headed Babbler (<i>Turdoides affinis</i> (Jerdon, 1847))	HG	r	R	c	C	I
Singing Bushlark (<i>Mirafra cantillans</i> (Blyth, 1845))	HG	rs	R	r	G	WI
Ashy-crowned Sparrow-Lark (<i>Eremopterix grisea</i> (Scopoli, 1786))	HG	gs	R	f	G	WI
Eastern Skylark (<i>Alauda gulgula</i> (Franklin, 1831))	G	s	R	r	G	WI
Tickell's Flowerpecker (<i>Dicaeum erythrorhynchos</i> (Latham, 1790))	HL	r	R	f	C	GM
Purple-rumped Sunbird (<i>Nectarinia zeylonica</i> (Linnaeus, 1766))	LGH	r	R	c	TB	N
Purple Sunbird (<i>Nectarinia asiatica</i> (Latham, 1790))	LHP	r	R	c	C	N
Loten's Sunbird (<i>Nectarinia lotenia</i> (Linnaeus, 1766))	LHP	r	R	c	CB	N

House Sparrow (<i>Passer domesticus</i> (Linnaeus, 1758))	AGHLPY	gr	R	c	T	IG
Large Pied Wagtail (<i>Motacilla maderaspatensis</i> (Gmelin, 1789))	LMG	gm	R	c	E	I
Yellow Wagtail (<i>Motacilla flava</i> (Linnaeus, 1758))	M	gm	W	r	G	I
Grey Wagtail (<i>Motacilla cinerea</i> (Tunstall, 1771))	G	gm	S	f	G	I
Paddyfield Pipit (<i>Anthus rufulus</i> (Vieillot, 1818))	HGA	gm	R	f	G	IM
Red Munia(<i>Amandava amandava</i> (Linnaeus, 1758))	H	s	R	f	B	MG
xSpotted Munia (<i>Lonchura punctulata</i> (Linnaeus, 1758))	H	s	R	r	B	MG

Species total 112

Status (St)

Status totals R= 82 S = 3 W = 22 M = 3 ? = 2

Status percents R= 73 S = 3 W = 20 M = 3 ? = 2

Abundance totals a = 9 c = 27 f = 36 r = 20 o = 9 s = 9 x = 2

Abundance percents a = 8 c = 24 f = 32 r = 19 o = 8 s = 8 x = 2

Season totals W = 200 V = 208 S = 161 F = 218

Season percents W = 78. V = 81 S = 63 F = 85

Area totals A = 26 M = 49 Y = 15 L = 31 H = 74 P = 39 G = 57

Area percents A = 23 M = 44 Y = 13 L = 28 H = 66 P = 35 G = 51

Habitat totals a = 16 g = 14 m = 28 o = 16 r = 50 s = 22 w = 10

Habitat percents a = 14 g = 13 m = 25 o = 14 r = 45 s = 20 w = 9

Nesting substratum- total T = 9 B = 25 G = 36 E = 4 C = 49

Nesting Substratum percents T = 8 B = 22 G = 32 E = 4 C = 44

Food Total F = 44 W = 16, l = 81 O = 4 Fr = 10 P = 16 G = 9 M = 5 N = 11

Food Percents F = 39 W = 14, l = 72 O = 4 Fr = 9 P = 14 G = 8 M = 4 N = 10

Areas

A=Agara Lake, M=Madiwala Lake Y=Yediur lake. L=Lalbagh Tank.
H=Hebbal Lake. P=Puttenehally Lake. G= Hesserghetta Lake

Habitat

a = Aerial. g = Grassland. m = Marsh. o = Open water. r = Riparian- Trees
and shrubs on edges of Lake, s = scrub, Brush. w = Weedy margins

Status (St)

R = Resident. S = summer visitor. W = winter visitor M = Migrant. ? = Unknown
status; Too few records to determine status.

Abundances

(based on a full day in the best habitat)

a = Abundant. Certain to be seen in large numbers. c = Common. Almost
certain to be seen in moderate numbers. f = Fairly common. Usually seen in
small numbers, or somewhat local. r = Rare. Usually miss, or in very small
numbers and very local. o = Occasional. Irregular, not seen every year. s =
Casual. Not seen most years. x = Accidental.

Nesting Substratum

T= Tree holes/Buildings. G= Ground/Tunnel/Walls of buildings. C= Tree
canopy/Trunk B= Bush/Shrub/ Reed bed/Grass land. E= Extralimital

Food

F= Fish. W= Weeds. I= Insects. O= Omnivorous. Fr= Fruits. P= Predaceous. G=
Grains. M= Flower buds, leaves, weeds. N= Nectar.

= A single record of two or more birds.

+ = A single record of one bird.

x = Reported by others.

h = Hypothetical or unverified.

Acknowledgment

Our sincere gratitude to the Research and Development Cell of Christ College for the financial assistance extended for this study. We are also thankful to the Lake Development Authority of Karnataka and the Karnataka Forest Department for their varied co-operations

References:

- 1 Ali, S. (1996), *The book of Indian Birds*, Bombay Natural History Society, Oxford University Press.
2. Ali, S. and Ripley, S. D. (1983), *Hand book of the Birds of India and Pakistan* (Compact ed.) Oxford University Press, Bombay, Twelfth edition (2002)
- 3 Antony, P.U., *Bird Communities in the Forest Habitats of Wayanad, S. India Ph. D. Thesis*, 2006
- 4 Grimmet R, Inskipp, C and Inskipp, T (1998) *Birds of the Indian Sub-continent*, Christopher Helm, London
- 5 Kiran, R and Ramachandra, T.V (1999) *Status of wetlands in Bangalore and its conservation aspects* ENVIS journal of Human Settlements, March 1999: 16-24
- 6 Prater S.H (1948), *The Book of Indian Animals*, Oxford University Press
- 7 Ramachandra, T.V., Rajasekara Murthy, C. and Ahalya, N., 2001. *Restoration of Lakes and Wetlands* Proceedings of Lake 2000, CES Technical Report 87, CES, Bangalore.