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Avifaunal Studies on Magadi Lake, Shirahatti (T), Gadag (Dt), Karnataka, India

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Abstract The present study was conducted on the avifaunal diversity of Magadi lake, Shirahatti (T), Gadag (Dt), Karnataka. The study revealed that the study area inhabiting several local and migratory bird species. The Magadi wetland attracts every year more than 100 species of wetland birds which includes both local and migratory. Highest population of Bar-headed geese, Demoiselle cranes, Ruddy shelduck, Herons, Coots, Grebes, Painted stork (NT), Cormorants, Waders, Black winged stilt, Black tailed godwit, Sand pipers, Ibis were registered during the study. The hitherto study also revealed that the family Anatidae contributed highest percent (74.04%) and dominated the entire lake by Bar headed geese. The remaining families occupied further ranks with 2.73% to 0.5%. The wetland is facing shortage of rainfall, anthropogenic pressures, siltation, reduction in storage of water.

Keywords Bar headed geese, Demoiselle crane, Wetland birds, Migratory birds, Threatened species.

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Introduction

Migration is either regular or seasonal movement which takes place in response to changes in food availability, habitat and weather conditions. Migration is marked by the annual seasonality (Peter et al. 2001). Non-migratory birds are said to be resident or sedentary. Approximately 1800 species of the worlds 10,000 bird species are long distance migrants (Sekercioglu 2007, Rolland et al. 2014).

Wetlands are defined as areas of marsh, fen and peat land or water, whether natural or artificial, permanent or temporary with water that is static or slightly flowing fresh, brackish or salt, including areas of marine water, the depth of which does not exceed 6 meter (Hosetti 2002). Wetlands constitute a treasure of living community, birds inhabiting wetlands for feeding, breeding, nesting or roosting are called as wetland birds (Paramesh and Gupta 2013) which comprises birds groups like water fowl and waders. Kattan and Franco (2004) opined that monitoring of wetland birds provides valuable information on the ecological health and status of wetlands and can be a vial tool for developing wetlands. The importance of local landscapes for conservation of avifauna can only be understood by knowing the structure of the bird community of that region.

The abundancy of wetlands in South Asia is declining due to anthropogenic pressures which can greatly influence the structure of the bird and decline in several water bird populations (Bird Life International 2004). Hence it is an important factor to understand and control the underlying causes in order to prevent the loss of key components of the

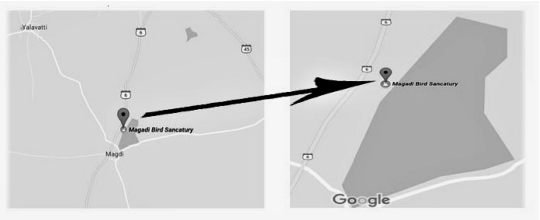

Fig. 1. Study area.

biodiversity of wetland habitats (Dutta 2011). The present study has conducted to study about avifauna diversity of Magadi lake.

Materials and Methods

Magadi lake is a manmade lake that is built on the outskirts of Magadi village in Shirahatti taluk (8 kms from Shirahatti) Gadag district (26 kms from Gadag), Karnataka, India between $15^0.22'$N and $75^0.51$ E (Fig. 1). The lake spans about 134 acres of land area with a catchment of 900 hectares. The main water source is rain and surrounded by agricultural crop lands which are the food source for birds. This lake attracts many migratory birds and resident birds from Eurasian countries and within the country also. Hence it is chosen for the study of diversity and abundance of avifauna in this region.

Methodology

Density and diversity are useful attributes and valuable indicators of habitat quality (Javed 1996). Hence birds counting data from field visits were used to project the current population levels and estimated the density.

Observation and photography of the wetland birds at the lake was done by using olympus binoculars (OLYMPUS 10 × 15 DPSI, field 6.50) and (Cannon Eos 6001) DSLR camera. They were classified into orders and families by referring to Birds of the Indian Subcontinent by Grimmet and Inskipp (2011) and survey of birds conducted by point count method. The nomenclature used in the hitherto study was provided in standardized and common and scientific names to the birds of the Indian subcontinent (Manakadan and Pittie 2001). The status on the movement and reasonability of occurrence, the parameter are listed as LM-Local Migratory, WM-Winter Migratory and R- Resident depending on its movement and seasonality (Table 1).

Table 1. List of avifauna with diversity and IUCN status in Magadi lake. *Source :www.IUCNredlist.org/details and www.birdlife.org.

Order	Family	Common name	Scientific name	Frequency	Status	IUCN*	WPA
Accipitrifomes	Accipitridae	Black winged kite	*Elanus caerulens*	Com	R	LC	Sch I
		Brahminy kite	*Haliastur indus*	Com	R	LC	Sch I
		Shikra	*Accipiter badius*	Com	R	LC	Sch I
		Montagu's harrier	*Circus pygargus*	Com	WV/Wm	LC	Sch I
		Black-shouldered kite	*Elanus axillaris*	Com	R	LC	Sch I
		Marsh harrier	*Circus aeruginosus*	Com	WV/Wm	LC	Sch I
Anseriformes	Anatidae	Indian spot billed duck	*Anas poecilorhynca*	Com	R Seasonal	LC	Sch IV
		Northern shoveler	*Anas clypeata*	Com	M/WV	LC	Sch IV
		Ruddy shelduck	*Tadorna ferruginea*	Com	WM	LC	Sch IV
		Eurassian teal	*Nettapus coramandalians*	Com	M	LC	Sch IV
		Garganey	*Anas querquedula*	Com	M	LC	Sch IV
		Lesser whistling duck	*Dendocygna javanica*	Com	RM/WV	LC	Sch IV
		Barheaded geese	*Anser indicus*	Com	WM	LC	Sch IV
Apodiformes	Apodidae	Asian palm suift	*Cypsiurus balasiensis*	Com	R	LC	Sch IV
		House swift	*Apus nipalensis*	Com	R	LC	Sch IV
Bucerotiformes	Upupidae	Hoopoe	*Upupa epops*	Com	R	LC	Sch IV
	Bucerotidae	Indian grey horn bill	*Ocyceros birostris*	Com	R	LC	Sch I
Charadriformes	Charadridae	Little ringed plover	*Charadrius dubius*	Com	R	LC	Sch IV
		Yellow wattled lapwing	*Vanellus malbaricus*	Com	R	LC	Sch IV
		Red watteled lapwing	*Vanellus indicus*	Com	R	LC	Sch IV
		Pacific golden flover	*Pluvialis fulva*	Com	R	LC	Sch IV

Table 1. Continued.

Order	Family	Common name	Scientific name	Frequency	Status	IUCN*	WPA
	Laridae	Brown headed gull	*Chroico cephalus, Brunnicefalus*	Com	WV/Wm	LC	Sch IV
		River tern	*Sterna aurantia*	Com	R	NT	Sch IV
	Recurvirostridae	Black winged stilt	*Himatopus himatopus*	Com	R	LC	Sch IV
	Scolopacidae	Common snipe	*Gallingo gallingo*	Com	M	LC	Sch IV
		Common sand piper	*Actitis hypoleucos*	Com	WM/WV	LC	Sch IV
		Little stint	*Calidris minuta*	Com	WM/WV	LC	Sch IV
		Green sand piper	*Tringa ochropus*	Com	M	LC	Sch IV
		Marsh sand piper	*Tringa stagnatilis*	Com	M	LC	Sch IV
		Wood sand piper	*Tringa glareola*	Com	M	LC	Sch IV
		Black tailed godwit	*Limosa limosa*	Com	M	NT	Sch IV
		Common green shank	*Tringa nebularia*	Com	WM	LC	Sch IV
Ciconiformes	Ciconidae	Painted stork	*Mycteria leucocephala*	Com	Seasonal	NT	Sch IV
		Asian open bill	*Anastomus oscitanus*	Com	Seasonal	LC	Sch IV
		Wooly necked stork	*Ciconia episcopus*	Com	R	VU	Sch IV
		White stork	*Ciconia ciconia*	Com	WV/Wm	LC	Sch IV
	Threskiornithidae	Black headed ibis	*Threskiornithis melanocephalus*	Com	R	NT	Sch IV
		Black ibis (Red naped ibis)	*Pseudibis papillosa*	Com	R	LC	Sch IV
		Glossy ibis	*Plegadis falcinellus*	Com	R	LC	Sch IV
		Eurassian spoon bill	*Platalea leucocordia*	Com	Seasonal	LC	Sch I
Coraciformes	Alcedinidae	Common kingfisher	*Alcedo athis*	Com	R	LC	Sch IV
	Cerylidae	Pied king fisher	*Ceryl rudis*	Com	R	LC	Sch IV
	Halcyonidae	White throated kingfisher	*Halcyon smyrnensis*	Com	R	LC	Sch IV
	Meropidae	Green bee eater	*Merops orientalis*	Com	R	LC	Sch IV
Cuculiformes	Cuculidae	Asian koel	*Endynamis scolopacea*	Com	R	LC	Sch IV
Columbiformes	Columbidae	Eurassian collared dove	*Streptopelia decaocto*	Com	R	LC	Sch IV
		Red collared Dove (Red Turtle Dove)	*Streptopelia tranquevaricia*	Com	R	LC	Sch IV
		Laughing Dove	*Spilopaelia senegalensis*	Com	R	LC	Sch IV
Falconiformes	Falconidae	Common kestrel	*Falcotin nunculus*	Com	WM	LC	Sch IV
		Red-necked falcon	*Falco chicquera*	Com	R	NT	Sch I
Galliformes	Phasianidae	Grey Francolin	*Francolinus pondiceriamus*	Com	R	LC	Sch IV
		Indian pea fowl	*Pavo cristatus*	Com	R	LC	Sch I
Gruiformes	Rallidae	White breasted water hen	*Amanurnis phornicurus*	Com	R	LC	Sch IV
		Eurasian coot	*Fulica atra*	Com	WV/Wm	LC	Sch IV
		Common moor hen	*Gallinula chloropus*	Com	R	LC	Sch IV
	Gruidae	Demoiselle crane	*Grus virgo*	Com	WM	LC	Sch IV
Passeriformes	Acrocephalidae	Blyth's Reed warbler	*Acrocephalus dumentorum*	Com	WM	LC	Sch IV
	Alaudidae	Oriental Sky lark	*Alauda gulgula*	Com	R	LC	Sch IV
		Rufous tailed finch lark	*Ammomanes phoenicura*	Com	R	LC	Sch IV
		Ashy crowned sparrow	*Eremopterix griseus*	Com	R	LC	Sch IV
	Cisticolidae	Jungle prinia	*Prinia sylvatica*	Com	R	LC	Sch IV
		Ashy prinia	*Prinia socialis*	Com	R	LC	Sch IV
		Plain prinia	*Prinia inornata*	Com	R	LC	Sch IV
		Common Tailor bird	*Orthotomus sutorius*	Com	R	LC	Sch IV
	Corvidae	Indian jungle crow	*Corvus culminatus*	Com	R	LC	Sch IV
		House crow	*Corvus splendens*	Com	R	LC	Sch IV
	Dicruridae	Black Drongo	*Dicrurus macrocercus*	Com	R	LC	Sch IV
		Ashy Drango	*Dicrurus leucophaeus*	Com	WM	LC	Sch IV
	Hirundinidae	Streak throated swallow	*Hirundo fluvicola*	Com	R	LC	Sch IV
	Laniidae	Long-tailed shrike	*Lanius schach*	Com	R	LC	Sch IV
	Leiothrichidae	Common babbler	*Turdoides caudata*	Com	R	LC	Sch IV

Table 1. Continued.

Order	Family	Common name	Scientific name	Frequency	Status	IUCN*	WPA
		Large grey babbler	*Turdoides (argya) malcollmi*	Com	R	LC	Sch IV
		Jungle babbler	*Turdoides striata*	Com	R	LC	Sch IV
	Monorchidae	Asian paradise fly catcher	*Terpsiphone paradisi*	Com	R	LC	Sch IV
	Motacillidae	White wagtail	*Motacilla alba*	Com	WM	LC	Sch IV
		Grey wagtail	*Motacilla cineria*	Com	WM	LC	Sch IV
		Paddy field pipit	*Anthus ruflus*	Com	R	LC	Sch IV
		Pied wagtail	*Motacilla maderaspatensis*	Com	WM	LC	Sch IV
	`	Yellow wagtail	*Motacilla flava*	Com	WM	LC	Sch IV
	Muscicapidae	Common stone chats	*Saxicola torquata*	Com	WM	LC	Sch IV
		Pied bush chat	*Saxicola caprata*	Com	R	LC	Sch IV
	Nectarinidae	Purple sun bird	*Cinnyris asiaticus*	Com	R	LC	Sch IV
	Ploceidae	Indian silver bill (white throated munia)	*Euodice Malbarica*	Com	R	LC	Sch IV
		Baya weaver bird	*Ploceus phillippinus*	Com	R	LC	Sch IV
	Paridae	Great Tit (Indian Great Tit)	*Parus major parus (cinereus)*	Com	R	LC	Sch IV
	Pycnonotidae	Red-vented bulbul	*Pycnonotus cafer*	Com	R	LC	Sch IV
	Passeridae	House sparrow	*Passer domesticus*	Com	R	LC	Sch IV
	Sturnidae	Common Myna	*Acredotheras tristis*	Com	R	LC	Sch IV
Pelecaniformes	Phalacrocoracidae	Greater cormorant	*Phalacricorax carbo*	Com	R	LC	Sch IV
	Ardeidae	Grey Heron	*Ardea cinerea*	Com	R	LC	Sch IV
		Purple Heron	*Ardea Purpurea*	Com	R	LC	Sch IV
		Indian pond Heron	*Ardeola grayii*	Com	R	LC	Sch IV
		Cattle Egret	*Bubulcus ibis*	Com	R	LC	Sch IV
		Little Egret	*Egretta gargetta*	Com	R	LC	Sch IV
		Intermidiate Egret	*Mesophoxy intermedia*	Com	R	LC	Sch IV
Phoenicopteri-formes	Phoneicopteridae	Greater Flamingo	*Phonicopterus roseus*	Com	Pass. M	LC	Sch IV
Piciformes	Megalaimidae	Coppersmith Barbet	*Megalaima (Psilopogon) cephalus*	Com	R	LC	Sch IV
Psittaciformes	Psittaculidae	Rose- ringed parakeet	*Psittacula krameri*	Com	R	LC	Sch IV
Podicipedi-formes	Podicipedidae	Little grebe	*Tachybaptus ruficolus*	Com	R	LC	Sch IV
Strigiformes	Strigidae	Spotted owlet	*Athene brahma*	Com	R	LC	Sch IV

Results and Discussion

Magadi lake is one of the most important lakes in North Karnataka which has been attracted migratory birds like Bar headed geese since 1995. This lake is also threatened by many domestic and agricultural activities from neighboring villagers. The Magadi lake fulfils only Two Ramsar criteria viz., II Criteria (Wetland supports threatened ecological communities), VI Critera (Wetland regularly supports 1% of the individuals, in a population of one species or sub species). IBA Criteria: Al (Threatened species), Ramsar Wetland type-6 (Water storage impoundment).

During the present investigation a total of 100 species of wetland birds belonging to 19 orders and 45 families were recorded. Among them, order Passeriformes was dominating (17 families with 32 species) followed by Charadriformes (4 families and 15 species), Coraciformes (4 families with 4 species), Ciconiformes (2 families with 8 species), Bucerotiformes (2 families with 2 species) and Accipitriformes comprises one family with six species respectively. The remaining orders constituted with one or two families with one or two species each (Table 1). The present study also revealed that the family Anatidae contributed 74.04%, was dominating especially by Bar Headed Geese and further rank occupied by Leiothrichidae (2.73%), Gruidae (2.29%), Cisticolidae

Table 2. Percentage composition of order and family of Magadi lake.

Sl. No.	Order	%	Sl. No.	Family	%
1	Accipitrifomes	0.32	1	Accipitridae	0.32
2	Anseriformes	74.04	2	Anatidae	74.04
3	Apodiformes	1.1	3	Apodidae	1.1
4	Bucerotiformes	0.25	4	Upupidae	0.2
			5	Bucerotidae	0.05
5	Charadriformes	1.68	6	Charadridae	1.02
			7	Laridae	0.12
			8	Recurvirostridae	0.14
			9	Scolopacidae	0.4
6	Ciconiformes	0.85	10	Ciconidae	0.34
			11	Threskiornithidae	0.51
7	Coraciformes	1.12	12	Alcedinidae	0.22
			13	Cerylidae	0.05
			14	Halcyonidae	0.18
			15	Meropidae	0.66
8	Cuculiformes	0.11	16	Cuculidae	0.11
9	Columbiformes	0.77	17	Columbidae	0.77
10	Falconiformes	0.09	18	Falconidae	0.09
11	Galliformes	0.3	19	Phasianidae	0.3
12	Gruiformes	3.93	20	Rallidae	1.64
			21	Gruidae	2.29
13	Passeriformes	12.14	22	Acrocephalidae	0.5
			23	Alaudidae	1.13
			24	Cisticolidae	2.17
			25	Corvidae	0.71
			26	Hirundinidae	0.18
			27	Laniidae	0.15
			28	Leiothrichidae	2.73
			29	Monorchidae	0.2
			30	Motacillidae	0.35
			31	Muscicapidae	0.18
			32	Nectarinidae	0.18
			33	Ploceidae	0.63
			34	Paridae	0.06
			35	Pycnonotidae	0.24
			36	Passeridae	1.53
			37	Sturnidae	0.69
			38	Dicruridae	0.38
14	Pelecaniformes	2.15	39	Phalacrocoracidae	0.37
			40	Ardeidae	1.79
15	Phoenicopteriformes	0.16	41	Phoneicopteridae	0.16
16	Piciformes	0.08	42	Megalaimidae	0.08
17	Psittaciformes	0.36	43	Psittaculidae	0.36
18	Podicipediformes	0.5	44	Podicipedidae	
19	Strigiformes	0.05	45	Strigidae	0.05

(2.17%) and Ardeidae (1.79%), Passeridae (1.53%), Alaudidae (1.13%) and Charadridae (1.02%) consecutively. The remaining families constituted only 0.05% to 1% each of total family wise frequency of occurrence (Table 2, Figs. 2 and 3).

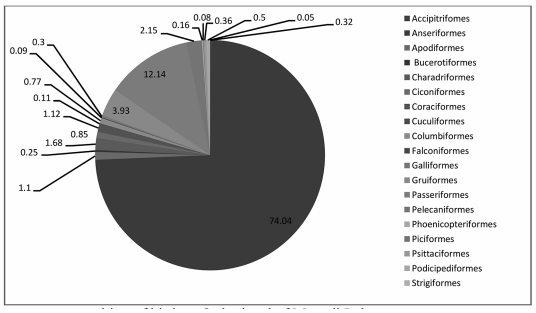

Fig. 2. Percentage composition of birds at order level of Magadi lake.

According to IUCN status – Least concerned (LC) occupies highest percent 94% (n=94) and Nearly. Threatened (NT) 5% (n=5). Those includes painted stork *(Mycteria leucocephala),* Black headed ibis *(Threskiornithis melanocephalus)*, red necked Falcon, Black tailed godwit *(Limosalimosa)* and River Tern *(Sterna aurantia)* and vulnerable 0.1% (n=1) Wooly necked stork *(Ciconia episcopus)* respectively (Table 3), (Fig. 4).

According to Wild Life Protection Act 1972 India and its recent amendments, 90% (n=90) birds mentioned under schedule- IV and 10% (n=10) are under schedule- I (Table 1, Fig. 4). Further, similar studies were made and those include Kaulgud et al. (2016); On Anekere wetland of Karkala, Udupi District (Iswara et al. 2009), Kundawada lake (Harish 2016) and Nippani Reservoir of Belgaum District (Donar et al. 2012) in Karnataka State. These studies also recorded the seasonal variations in diversity

Table 3. Status of threatened birds of Madgadi lake.

Sl. No.	Order	Family	Name of the species	IUCN Status
1	Charadriformes (15)	Scolopacidae (08)	Black tailed Godwit	NT
		Laridae (02)	River tern	NT
2	Ciconiformes (08)	Ciconidae (04)	Painted stork	NT
			Wooly Necked Stork	VU
		Threskiornithidae (04)	Black headed Ibis	NT
3	Falconioformes (02)	Falconidae (02)	Red Necked Falcon	NT

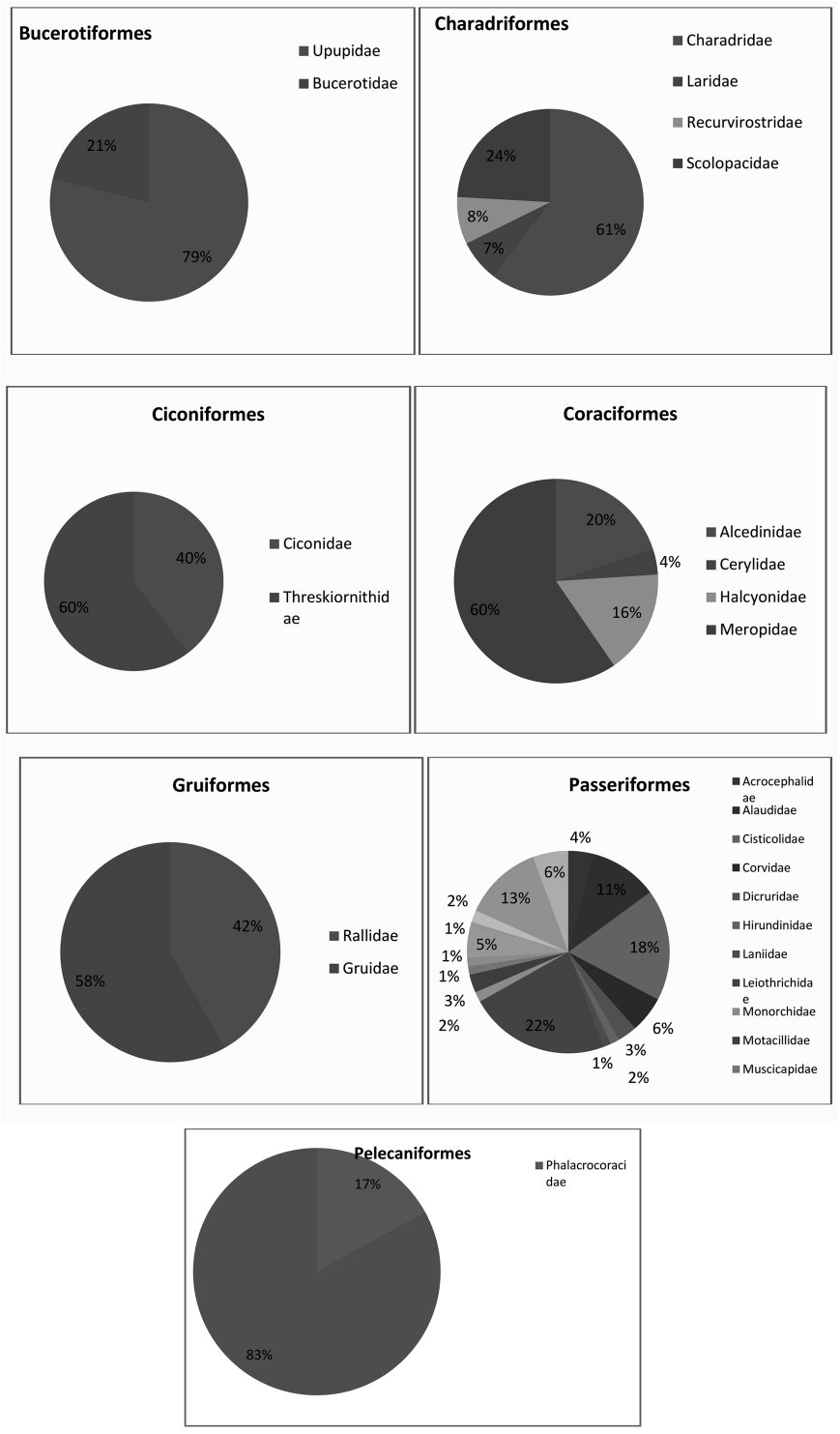

Fig. 3. Percentage composition of birds at Family level (1-7) of Magadi lake.

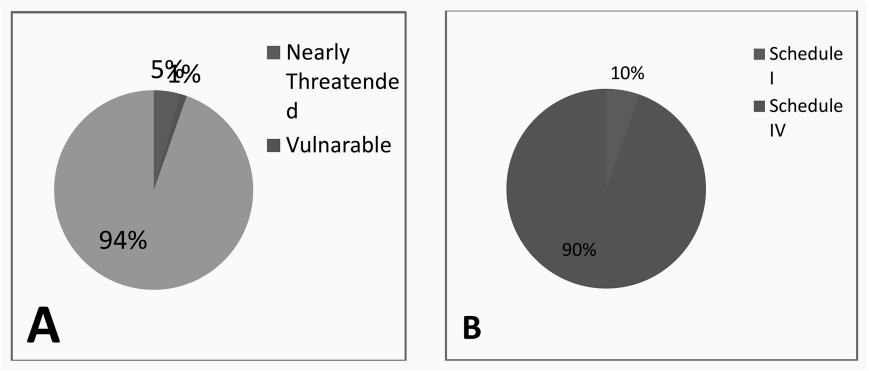

Fig. 4A. Relative abundance of IUCN status and **B.** Relative abundance of WPA of bird species recorded at Magadi lake.

and density of migratory avifauna of which some are globally threatened and near threatened species (Manohara and Hosetti 2017, Manohara et al. 2016).

The results of the present study indicated that IUCN status of birds in Magadi lake is as follows; the order Charadriformes registered 13.33% (n=2) of NT and 86.66% LC birds (n=13), followed by Ciconiformes 25% (n=2) of NT and 12.5% (n=1) Vulnerable and 62.5% (n=5) LC birds. The Falconiformes registered 50% (n=1) NT and 50% (n=1) LC birds. The remaining orders include least concerned species (Table 3, Fig. 4).

The family wise IUCN status indicated that the family Laridae recorded 50% (n=1) NT and 50% LC birds (n=1). Scolopacidae comprised 12.5% NT (n=1) and 87.5% (n=7) LC birds. Family Ciconidae recorded 25% (n=1) of NT, 25% vulnerable (n=1) and 50% LC birds (n=2). Theskiornithedae recorded 25% (n=1) NT and 75% (n=3) LC birds. Family Falconidae registered 50% NT and 50% LC birds. The remaining all families represented by least concerned species (Table 3).

Similar work was carried out by Bhivate and Patil (2016) at Shivaji University campus Kolhapur District observed that the wetlands were the safe areas for resident, migratory and threatened birds when they provide food and place for roosting. Patil (2017) studied Rankala tank of Kolhapura urban area and opined that the diversity of threatened birds was higher in urban lakes. The study area was covered in and around by green mat include aquatic plants, grasses, submerged hydrophytes and terrestrial plants like Acacia trees. Some of these plants provided nesting sites and also form a protection cover to the avifauna. The weed *Salvinia molesta* and *S. notans* formed a thick mat that provided a favorable nesting habitat for birds like Moorhens and Jacanas. Surprisingly in the history of avian studies of Magadi lake, for the first time passage migrant greater flamingo started visiting (21 numbers) and on the same day went back (on 26th December 2017, arrived at 1:30 pm and by 7:00 pm winged away), but the regular visitor Demoiselle crane has sighted too late in the lake (21 January 2018).

Conclusion

The abundant volume of water storage, favorable temperature, availability of plentiful food in and around the lake attracted the migratory birds in maximum number. Anyhow avian heritage of this landscape was under threat due to increased anthropogenic activities like washing of cloths and cattles, stone crushers in the upper catchments, siltation, continuous movement of vehicles adjacent to lake, decrease in rainfall and contamination of water due to agricultural runoff, all have been added to the threat to the birds. Additionally personal interviews with local people also comply with our results. Hence, hitherto wetland needs to be monitored to minimize disturbance because food chains of these wetlands are highly sensitive to habitat disturbances and therefore good indicators of the general condition of wetland

habitats (Kulshan 1992, Jayson and Mathew 2002, Kler 2002).

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