AVIFAUNA OF AGRO-ECOSYSTEMS OF MAIDAN AREA OF KARNATAKA

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ABSTRACT

*Diversified wetland agro-ecosystems of Maidan areas of Karnataka have provided congenial habitats for the survival of 27 species of water birds belonging to 13 families. The relative composition of aquatic bird species and their density varied significantly. Further, the Ardeidae members dominated and were common in all habitats. Interestingly, the area was found congenial for certain resident migrants viz., Painted Stork (*Mycteria lencepahala*), Black Ibis (*Pseudibis papillosa*) and Oriental White Ibis (*Threskiornis melanocephalus*), which were recorded every winter. The study showed that, the varied composition of water birds associated with the wetland agro-ecosystem is for sharing common habitat for different purposes. It is hoped that this study would provide a preliminary database for the avifauna of this area, for further research.*

KEYWORDS
Agro-ecosystems, aquatic avifauna, Karnataka, Maidan area, relative composition

Birds have fascinated human beings in various ways by their valuable services. They play a vital role in various agro-ecosystems; their diversity is an indication of congenial habitat for survival (Jayson & Mathew, 2002). The diversified vegetation of the wetlands of central Karnataka attracts large number of aquatic avifauna. However, in the recent past, the natural wetland patches and bushy scrub areas are depleting (Uttangi, 2001) at a rapid rate due to the expansion of rice fields (Basavarajappa, 2005 a,b). Daniel *et al*. (1990), Jayson and Mathew (2002) and others have reported on various species of birds in different vegetation types. However, reports on aquatic birds occurring in plains of central Karnataka is not available.

STUDY AREA

Physiographically, the study area occupies a central position in the state of Karnataka, and lies between $13^0 27'$-$14^0 39'$N & $74^0 38'$-$76^0 40'$E at an altitude of 671m (Kamath, 1991). The landscape consists of vast stretches of plains with scattered horticultural gardens, bushy vegetation and irrigated paddy fields. For the present study, the Channagiri taluk of Davangere district was selected. The natural vegetation is typically that of scattered bushy scrub represented by *Acacia arabica*, *A. farmesiana*, *Mariscus paniceus*, *Eupatorium indica*, *Parthenum hysterophorus*, *Saccharum spontaneum*, *Ipomoea reptans*, *Lantana camara* and stray trees like *Eucalyptus citriodora*, *E. tereticorms*, *Pheonx vulgaris*, *Pongamia pinnata*, *Mangifera indica*, *Tamarindus indica* and *Cocos nucifera* and other flora (Basavarajappa, 1998, 2002, 2005a; Kamath, 1991). Three different sites were selected at random covering an area of 1900ha. They were: (i) Kenghalu - dominated with rice fields; (ii) Doddathota - with wet grassland, flooded inland with grass and uncultivable grazing pasture located at the margins of sparsely distributed rice fields on the banks of Sulekere, a small seasonal canal; and (iii) Neeravari - an area thickly distributed with grassy marshes. The study sites were differently located at 5km each. In each site, observations were made fortnightly during 2002-03.

METHODOLOGY

The Variable Width Line Transect Method described by Burnham *et al*. (1980) was adopted. The transect covered 2km in all the three sites for the enumeration of water birds. Altogether, 72 line transects were laid and birds were observed using a binocular (10x30) and identified with the help of field guides (Ali, 1996; Ali & Ripley, 1983, 1987; Sonobe & Usui, 1993; Woodcock, 1980). The flora of natural vegetation was identified as per Gambel (1967). The following formula was used for calculating Relative Dominance.

Relative Dominance = ni X 100/N; where, ni = number of individuals of the species; N = the total number of individuals of all the species seen during the study period. To find out the diversity of birds the commonness index method of Jayson and Mathew (2002) was used. The Commonness Index is the average frequency of sighting of a species in one sampling at a site. Further, Percent Occurrence and Relative Abundance was calculated as follows.

$$\text{Percent Occurrence} = \frac{\text{No. of species of each family}}{\text{Total no. of different species seen}} \times 100$$

$$\text{Relative Abundance} = \frac{\text{No. of individuals of the species}}{\text{No. of individuals of all species}} \times 100$$

To determine the significant differences of water birds and relative composition of different families, the Kruskal Wallis One Way Analysis of Variance and the Friedman Two-Way Analysis of Variance tests were used as per Saha (1992).

RESULTS AND DISCUSSION

Details such as family, relative dominance and status of aquatic avifauna in the study area is as given in Table 1. Twenty-seven species of water birds belonging to 13 families were recorded. Of all, family Ardeidae (9 species) was relatively dominant (68.7%). It represented 33.4% of the total number of water bird species surviving under wetland conditions of central part of Karnataka. The most common and abundant species of Ardeidae family were the Cattle Egret (*Bubulcus ibis*) and Little Egret (*Egretta garzetta*) followed by Indian Pond Heron or

Paddy bird (*Ardeola grayii*), Little Grebe (*Tachybaptus ruficollis*), Purple Moorehen (*Porphyrio porphyrio*) (Table 1). Interestingly, the density of water birds varied significantly ($X^2 = 15.60$, $P > 0.05$) in different wetland agro-ecosystems of central Karnataka.

Six species of birds namely, Grey Heron (*Ardea cinerea*), Indian Shag (*Phalacrocorax fuscicollis*), Crab Plower (*Dromas ardeola*), Black-winged Stilt (*Himantopus himantopus*), Pied Avocet (*Recurvirostra avosetta*) and Common Ringed Plover (*Charadrius hiaticula*) were uncommon (Table 1), while the Indian Darter (*Anhinga melanogaster*), Great Cormorant (*Phalacrocorax carbo*), Sociable Lapwing (*Vanellus gregarius*), Stone Curlew (*Burhinus oedicnemus*) and River Tern (*Sterna aurantia*) were rarely seen in this area. Thus, the relative composition of aquatic birds belonging to different families varied significantly ($X^2 = 22.11$, $P > 0.05$). Habitats with varied vegetation influence the diversity of bird species (Jayson & Mathew, 2002). It is presumed that the native flora (i.e., scattered horticultural gardens, bushy scrub and stray trees in the paddy fields) might have extended comfortable shelter and foraging grounds for water birds. As these bird species are heterogeneous in their feeding habit (Ali & Ripley, 1983, 1987), the available fauna, *viz*., crabs, snails, calms, worms, insect larvae and pupae in the paddy fields and in water bodies may constitute their feed. Wetlands are potential sources for plankton life. They play an important role in the cycle of changes (i.e., elements of organic matter eaten by bacteria and protozoa and in turn consumed by the insect larvae, rotifers and crustaceans), which form the basis of food for water birds (Uttangi, 2001). By feeding on insect pests, their larvae and pupae, water birds control large amount of pest population in paddy fields. Further, they provide manure. Hence, the ecological role played by water birds in agro-ecosystems of Maidan area is unique of its kind.

The resident migrant (i.e., birds that breed in one part of the area in one season and move to other parts within the state or country in a different season) birds such as Painted Stork (*Mycteria leucocephala*), Black Ibis (*Pseudibis papillosa*) and Oriental White Ibis (*Threskiornis melanocephalus*) were winter migrants in this region. The breeding activities of Black Ibis and Oriental White Ibis were observed at different localities in the wetlands. The area is enriched by small water canals, streams, water bodies (Basavarajappa, 2005b) and sparsely distributed tall stray trees *viz*., *Cocos nucifera*, *Mangifera indica*, *Pheonx vulgaris*, *Tamarindus indica*, *Eucalyptus citriodora* and *E. tereticorms*. The bushy scrub constituted by *Lantana camara*, *Saccharum spontaneum*, *Ipomoea reptans* and others in the vicinity of paddy fields might have attracted the Oriental White Ibis and Black Ibis. Moreover, they get good food i.e., insects, crabs, insect larvae, pupae and small fishes from this ecosystem. Perhaps, all these conditions might have influenced these resident migrants to breed. To support this, few nests of the Black Ibis and Oriental White Ibis were seen on a few stray coconut trees near paddy fields. Thus, the wetland agro-ecosystems have provided suitable habitats for the survival of these birds. However, in the recent

years, the uncultivable grazing fields, bushy scrub areas and wetland patches have been cleared (Uttangi, 2001) and the stray trees removed for paddy cultivation (Basavarajappa, 1998, 2004). Weedicides and insecticides are ruthlessly used in paddy fields to control weeds and insect pests. Many birds associated with wetlands are forced to leave the habitat as villagers cut the emergent vegetation and the number of nests have declined in this area (Basavarajappa, 2002 and 2005a,b). The reason for decline of nests of other birds in general and water birds in particular is not known. This requires thorough scientific monitoring and documentation. Therefore, the preservation of wetland patches is essential to restore water birds.

Conclusion

The present study emphasizes the need to conduct a detailed study on the status of wetland ecosystems, and biology of water birds to have accurate information on the ecological role of birds associated with wetlands. The agro-ecosystems of Karnataka are diversified with various aquatic birds and 27 species of wetland-associated birds survive in this area. However, in the recent past, the wetland agro-ecosystems in this area are degraded or destroyed due to encroachment for the expansion of rice fields. This would eventually alter the natural vegetation on the banks of water canals, streams and in the uncultivable wetland patches making it unsuitable for birds to roost and nest. Unaltered natural patchy vegetation is essential in agro-ecosystems, which makes it very important to take steps to preserve wetlands flora and avifauna for the health of biodiversity of Maidan areas.

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Table 1. Aquatic avifauna found in the agro-ecosystems of Maidan area of Karnataka

	Family	Common Name	Scientific Name	Relative abundance	Status
1.	Ardeidae	Indian Pond Heron	*Ardeola grayii*	1.10	C
2.	Ardeidae	Giant Heron	*Ardea goliath*	0.84	C
3.	Ardeidae	Black-crowned Night Heron	*Nycticorax nycticorax*	0.90	C
4.	Ardeidae	Little Egret	*Egretta garzetta*	8.29	VC
5.	Ardeidae	Cattle Egret	*Bubulcus ibis*	8.42	VC
6.	Ardeidae	Large Egret	*Ardea alba*	0.45	C
7.	Ardeidae	Little Green Heron	*Egretta picata*	0.97	C
8.	Ardeidae	Grey Heron	*Ardea cinerea*	0.77	UC
9.	Ardeidae	Purple Heron	*Ardea purpurea*	0.90	C
10.	Anhingidae	Indian Darter	*Anhinga melanogaster*	0.25	R
11.	Phalacrocoracidae	Great Cormorant	*Phalacrocorax carbo*	0.51	R
12.	Phalacrocoracidae	Indian Shag	*Phalacrocorax fuscicollis*	0.64	UC
13.	Podicipedidae	Little Grebe	*Tachybaptus ruficollis*	1.29	C
14.	Ciconiidae	Painted Stork	*Mycteria leucocephala*	0.12	RM
15.	Threskionithidae	Black Ibis	*Pseudibis papillosa*	1.68	RM
16.	Threskionithidae	Oriental White Ibis	*Threskiornis melanocephalus*	1.29	RM
17.	Rallidae	Purple Moorehen	*Porphyrio porphyrio*	1.16	C
18.	Rallidae	Common Moorehen	*Gallinula chloropus*	0.90	C
19.	Dromadidae	Crab Plover	*Dromas ardeola*	0.58	UC
20.	Recurvirostridae	Black-winged Stilt	*Himantopus himantopus*	0.32	UC
21.	Recurvirostridae	Pied Avocet	*Recurvirostra avosetta*	0.12	UC
22.	Charadriidae	Sociable Lapwing	*Vanellus gregarius*	0.19	R
23.	Charadriidae	Red-Wattled Lapwing	*Vanellus indicus*	0.45	C
24.	Charadriidae	Common Ringed Plover	*Charadrius indicus*	0.25	UC
25.	Scolopacidae	Stone Curlew	*Burhinus oedicnemus*	0.12	R
26.	Laridae	River Tern	*Sterna aurantia*	0.12	R
27.	Jacanidae	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	0.32	C

C - Common; VC - Very Common; UC - Uncommon; R - Rare; RM - Resident Migrant

Table 2. Aquatic avifauna representation in families

S. No	Family	Percent Occurrence	Relative Abundance	Status
1.	Ardeidae	33.4	68.69	VC
2.	Anhingidae	3.7	0.77	R
3.	Cioconiidae	3.7	3.88	VR
4.	Charadriidae	11.1	2.72	R
5.	Dromadidae	3.7	1.74	UC
6.	Jacanidae	3.7	0.97	C
7.	Lariidae	3.7	0.38	R
8.	Phalacrocoracidae	7.4	3.49	UC
9.	Podicipediae	3.7	3.88	C
10.	Rallidae	7.4	8.94	UC
11.	Recurvirostridae	7.4	1.36	C
12.	Scolopacidae	3.7	0.38	R
13.	Threskiornithidae	7.4	0.38	RM

Each value is a mean of 72 observations.
VC - Very Common; R - Rare; VR - Very Rare; UC - Uncommon;
C - Common; RM - Resident Migrant.

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