



Original Research Article

Observation on the Biodiversity Conservation of Birds in Paddy Agro Ecosystem in Different Crop Stages

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A B S T R A C T

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In the present observation, birds were identified and recorded for community structure and diversity in the paddy agro-ecosystem in the different crop stages in Arjuni/Mor taluka of Gondia district. The variation in species richness and relative abundance of avifauna is associated with crop stages. Ploughing, Puddling operation, Nursery transplantation, Vegetative stage, Milky and grain maturation, Harvesting and Post harvesting stages were observed for birds. The significance of birds either beneficial or harmful to the crops, their role in biological control of insect pest and related biodiversity conservation is discussed.

Introduction

Agriculture provides a concentrated and highly predictable source of food to birds. Paddy crop is one of the most important and widely grown cereal crops in India and also in many parts of the world (Subramanya and Veeresh, 1998). Paddy (*Oryza sativa*) is an important and prominent crop in this area. Maharashtra had 14.99 lakh hectares of paddy cultivation are along with 32.37 lakh tons of rice production. Maharashtra is very rich in bird diversity with good numbers of species and subspecies due to good agro-climatic condition. In India, 63 species of depredatory birds in agricultural crops, of which more than 22 species causing damage to the paddy crop is recorded. There are about 48 species of beneficial birds in agricultural importance (AINPAO:

Technical Bulletin-II). Among insect pests to the paddy crop Yellow stem borer, Gall midge, Leaf folder, Hispa, Caseworm, Climbing cutworm, Brown plant hopper, Green leaf hopper, Gundhy bug, Whorl maggot are some important causing serious loss to the paddy crop in various stages. The insect pests and diseases continue to be a major production constraint in all rice ecosystems (Gour et al., 1999). In India the farmers are using enormous quantities of insecticides, chemicals and unable to overcome the pest menace (Rao et al., 1998). Large number of birds, fish and other animals are reported to be killed by pesticides in agriculture environment (Biswas, 1994). To avoid this phase, integrated bird pest management specialists

have started looking for alternatives to insecticides and chemicals. Cultural, bio-control, non-lethal chemicals, neem based and genetic measures have gained lot of importance as alternatives (Rao et al., 1998). Rare information is available on the role of birds in different stages of paddy crop except for few studies and in India (Dhindsa and Toor, 1980; Subramanya and Veeresh, 1998). The observations were made on the role of birds in different stages of paddy agro ecosystem at Arjuni/Morgaon taluka, district Gondia, Maharashtra.

Materials and Methods

Study Area: Total area in Arjuni/Mor taluka under paddy cultivation is 25,218 hectares. One hectare of paddy fields was selected for the study. Birds were observed from middle of June 2012 to late October 2012 for community structure and diversity.

Methodology: Birds were counted regularly in various stages of the paddy crop beginning from ploughing stage to till harvest of the crop and after harvest of crop also (Subramanya and Veeresh, 1998). Bird identified and counted in selected area in paddy field in different crop stages. The field condition was categorized according to paddy cultivation practices. The field conditions are Ploughed plot (Inundated), Puddled (Inundated), Nursery (Inundated), Transplanted (Inundated), Tillering stage (Inundated), Milky stage (Inundated), Seed Maturation stage (Inundated), Harvesting stage (Dry), after harvested (Dry).

Results and Discussion

A systematic list of 22 species of different birds visiting in different stages of paddy crop belonging to 18 families along with their species richness and its relative abundance has been presented in Table 1. The list reveals that out of the total birds

species recorded, 17 species were beneficial to the paddy ecosystem and most of the birds also showed local movements, of these 4 species were omnivorous of which Glossy Ibis is in endangered list. Five species were predatory birds of these 3 species were omnivorous. Red wattled lapwings, pond herons, Cattle Egrets, Black Drongos, Common Mynas and Common Babblers were found in fairly good numbers throughout the study period. Among 18 families eight belonged to order Passeriformes, 4 families to order Falconiformes, 3 families of order Coraciiformes and 1 family each of order: Columbiformes, Ciconiiformes and Charadriiformes.

During the time of ploughing stage the relative abundance (in percentage) of Cattle egrets was 30.4, House crow 22.4, Mynas 12.0, Herons 11.1, Drongos 6.8 and Storks 1.6. These birds were to pick up insects, larvae, ants and earthworms. During the puddling stage the relative abundance of Cattle egret were 47.6, Mynas 15.4, Herons 12.6 and Drongos 11.2 and these birds fed on insects and other matter. In the Nursery stage Cattle egret's relative abundance was 29.4, Lapwing's 15.4, Pigeon's 12.6, Mayna's 11.8, Crow's 8.4, Green bee eater's 7.0 and Dove's 5.6 and these birds eat on insects and grains. During the time of transplantation stage Cattle egrets abundance was 21.6, Lapwings and Mynas 11.2 each, Heron's 9.6, Green bee-eaters 7.2, Little egrets 6.0, Drongos 5.6 and Indian Rollers 1.6, these were eating on insects, and tramping of the crop was also observed.

In the tillering stage Cattle egrets abundance (per cent) was 38.1, Mynas 13.2, Herons 13.0, Lapwings 8.4, Drongos 8.1, Little egrets 5.7, Indian rollars 5.4 and Green bee-eaters 1.6; these birds eat on insects and other matter in paddy field. In the milky

stage bayas abundance was 24.9, Munias 22.1, Sparrows 13.6 per cent, Lapwings 7.5, Cattle egrets 10.2, Herons 5.7 and Mynas 5.3; these birds were sucking the milk of seeds, eat on insects and other matter. In the Seed maturation stage Munias abundance was 19.8, Bayas 19.4, Sparrows 14.3, Cattle egrets 13.5, Lapwing 10.8, Herons 6.5 per cent, Mynas 7.3 and these birds eat on seeds by removing husk and also fed on insect matter.

In the harvesting stage Cattle egrets abundance was 32.9, Herons 21.7, Mynas 13.0, Rollers 5.7, Lapwings 4.5, Kingfishers 6.3, Green bee-eaters and bayas 4.2 each, Sparrows 3.5, Crows 2.5, ibis and Drongos 1.4 each, these birds eat on insects and seeds in the paddy fields. After harvest of the crop the relative abundance of Cattle egrets was 36.9, Mynas 21.7, Doves 8.6, Drongo's 3.6, Green bee eaters 2.4, Indian Rollers 2.1, Crows 4.8, Sparrows 3.9, Storks 2.7 and Kingfishers 2.1; these were eating on spilled over seeds and insects in paddy harvested fields. The winter migrants like open billed storks and glossy ibis also were noticed during observation may be due to shortage of water. The abundance of mollusks, insects, its larvae and other matters attract large number of migratory birds. Most of migratory birds inhabit wide range of habitats. The birds like common babbler, common myna, small bee eater, black drongo and Indian roller have an important role in predation on insects. Among these, common babbler and small green bee-eater feed directly on insects infesting the paddy crop. The birds with small population have less significance as insect predators but are important in view of their low numbers thus need special consideration for conservation. It is presumed that the native flora (scattered horticultural fields, bushy scrub and stray trees in the paddy fields) might have extended comfortable shelter & foraging grounds for water birds. As these birds are

heterogeneous in their feeding habit (Ali & Ripley, 1996, 1987), the available fauna viz., crabs snails, worms, insect larvae & pupae in the paddy fields & in water bodies may constitute their food. Wetlands are potential sources for plankton life. They play an important role in the cycle of changes, which form the basis of food for water birds (Uttangi, 2001). By feeding on insect pests, their larvae & pupae, water birds control large amount of pest population in paddy fields.

The resident migrant birds such as Black Ibis & Oriental white Ibis & Painted Stork were winter migrants in this region. The breeding activities of Black Ibis & White Ibis were observed at different locations near wetlands. The area is enriched by small water canals, water bodies & sparsely distributed tall trees viz., *Mangifera indica*, *Tamarinds indica*. The bushy scrub constituted by *Lantana camara*, *Ipomoea spp*, etc in the vicinity of paddy fields might have attracted the Oriental white Ibis & black Ibis. Moreover they get good food i.e. insects crabs, insect larvae, pupae & small fishes from this ecosystem. Perhaps all these conditions might have influenced these resident migrants to breed. Thus the semi-aquatic agro-ecosystem have provided suitable habitat for the survival of these birds. However in the recent years, the uncultivable grazing fields, bushy scrub areas & wetland patches have been cleared (Uttangi, 2001) and the stray trees removed for paddy cultivation (Basavarajappa, 1998, 2004). Insecticides and weedicides are ruthlessly used in paddy fields to control insect pest and weeds. Many birds associated with agro-ecosystem are forced to leave the habitat as villagers cut the vegetation & the numbers of nests have declined. Therefore the preservation of wetland patches is essential to restore and conserve birds.

Table.1 A Systematic List of Birds with their Species Richness and its Relative Abundance.

Order	Family	Species	I	II	III	IV	V	VI	VII	VIII	IX
Coraciiformes	Coraciidae	Indian Rollar	6 (2.4)	--	3 (4.2)	2 (1.6)	20 (5.4)	--	--	8 (5.7)	7 (2.1)
	Alcedinidae	Pied Kingfisher	--	4 (5.6)	--	--	--	--	--	--	4 (1.2)
		White brested Kingfisher	9 (3.6)	6 (8.4)	--	6 (4.8)	17 (4.6)	--	--	9 (6.3)	7 (2.1)
	Meropidae	Small Green Bee-eater	12 (4.8)	--	5 (7.0)	9 (7.2)	6 (1.6)	--	--	6 (4.2)	8 (2.4)
Columbiformes	Columbidae	Blue Rock Pегion	--	--	9 (12.6)	--	--	--	8 (2.9)	--	--
		Spotted Dove	4 (1.6)	--	4 (4.6)	7 (5.6)	--	--	5 (1.8)	2 (1.5)	22 (8.6)
Ciconiformes	Scolopacidae	Common Sand Piper	--	--	--	--	--	5 (1.5)	--	--	--
Charadriiformes	Charadriidae	Red wattled lapwing	--	--	11 (15.4)	14 (11.2)	31 (8.4)	25 (7.5)	30 (10.8)	5 (4.5)	19 (5.7)
Falconiformes	Accipitridae	Parih kite	10 (4.0)	--	--	--	--	--	--	--	--
	Ardeidae	Indian pond heron	28 (11.1)	9 (12.6)	--	12 (9.6)	48 (13.0)	19 (5.7)	18 (6.5)	31 (21.7)	10 (3.0)
		Cattle Egret	76 (30.4)	34 (47.6)	21 (29.4)	27 (21.6)	141 (38.1)	34 (10.2)	38 (13.6)	47 (32.9)	123 (36.9)
		Little Egret	--	--	--	5 (6.0)	21 (5.7)	--	--	2 (1.4)	--
	Threskiomithidae	Glossy Ibis	--	--	--	--	--	--	--	2 (1.4)	4 (1.2)
	Ciconidae	Openbilled stork	--	--	--	--	--	--	--	--	9 (2.7)
Passeriformes	Corvidae	House crow	56 (22.4)	--	6 (8.4)	13 (10.4)	9 (2.4)	--	--	4 (2.5)	16 (4.8)
	Dicruridae	Black drongo	17 (6.8)	8 (11.2)	4 (5.6)	7 (5.6)	30 (8.1)	12 (3.6)	10 (3.6)	2 (1.4)	12 (3.6)
	Muscicapidae	Indian Robin	--	--	--	--	--	4 (1.2)	--	--	--
	Stumidae	Common myna	30 (12.0)	11 (15.4)	8 (11.8)	14 (11.2)	49 (13.2)	21 (5.3)	17 (7.3)	19 (13.0)	69 (21.7)
	Silvidae	Common babbler	--	--	--	4 (5.2)	--	18 (4.4)	--	--	4 (1.2)
	Passeridae	House sparrow	--	--	--	--	--	46 (13.6)	37 (14.3)	5 (3.5)	13 (3.9)
	Ploceinae	Baya weaver	--	--	--	--	--	83 (24.9)	54 (19.4)	6 (4.2)	--
	Estridae	White throated Munia	--	--	--	--	--	77 (22.1)	55 (19.8)	--	--

Stages of Paddy crop: I: Ploughing; II: Puddling; III: Nursery; IV: Transplantation Stage; V: Tillering Stage; VI: Milky Stage; VII: Seed Maturation Stage; VIII: Harvesting Stage; IX: After Harvested. (Relative abundance mentioned in parenthesis)

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