



## AVIFAUNAL DIVERSITY IN WHEAT CROP: A CASE STUDY OF BATHINDA DISTRICT OF PUNJAB

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### ABSTRACT

Ornithological studies confirmed that 83 species belonging to 16 orders were present in and around the wheat fields from preparatory tillage to ripening stage at village Ruldu Singh Wala, Katar Singh Wala and Bir Talab. The diversity analyses revealed a richness index of 77, 58 and 55, respectively. Rose-ringed parakeet was the most abundant at all the locations (10.53, 25.51 and 21.30%, respectively) followed by blue rock pigeon (7.57, 14.19 and 10.80). Passeriformes (46.99%) was the most dominant order followed by Ciconiiformes (12.05%) and Charadriiformes (8.43%). Insectivorous guild (39 species, 46.99%) was the dominating guild followed by omnivorous (19 species, 22.89%) and carnivorous guild (12 species, 14.46%). Species number increased from early (preparatory tillage and sowing) to late (seedling and ripening) stages. Thus, it is observed that wheat crop acts a major habitat for birds.

**Key words:** Agriculture, wheat, avifauna, diversity, abundance, dominance, guild, insects, seedling, ripening, rose ringed parakeet, pigeon, Passeriformes

Agroecosystems are managed by humans in terms of species composition. In Punjab, agricultural habitat determines the presence of various faunal groups namely insect, reptile, bird and mammal. Agroecosystems provide food to the birds and birds bring about seed dispersal, cross pollination and pest control (Dhindsa and Saini, 1994). Wheat is an important and prominent crop in Punjab. Insect and rodent pests damage the crop at various stages and farmers use various pesticides to control the pests. These chemicals have adverse effects on human health and have resulted in weakened immune system, endocrine disruption and even death of birds. This calls for an alternate measure for pest control. Various species of birds are natural enemies of these pests and acts as biocontrol agents. Hence, they need to be maintained to optimal limits in agroecosystem. The presence of birds as plant pollinators and seed dispersers indicates a healthy ecosystem (Ramchandra, 2013). But change in agricultural practices, deforestation, habitat destruction and fragmentation reduce their number (Mazumder, 2014). To counteract the decline in avian diversity, it is crucial to recognize habitats that are hotspots. Hence, the present study with an objective to study wheat crop as a habitat for birds by exploring their diversity and abundance. The activities of birds at various stages of the crop were recorded to study the role of birds.

### MATERIALS AND METHODS

The present study was conducted in Bathinda District of Punjab at three locations namely village Ruldu Singh Wala (I), Village Katar Singh Wala (II) and Village Bir Talab (III) for one year from May 2019 to April 2020. Weekly visits were conducted in selected locations between 6:00 am to 8:00 am to record avian species visiting the wheat crop. Birds visiting in and around the wheat fields were observed with binoculars and photographs were taken by digital camera. Any other relevant information was noted, and identification was done by visual observation and by comparing the photographs with universal accepted handbooks and field guides such as- Guide to the Birds of the Indian Subcontinent (Grimmet et al., 2011); and The book of Indian birds (Ali, 2002). Species richness, abundance as well as feeding habits was observed and recorded at different crop stages namely preparatory tillage, sowing, seedling and ripening stage.

### RESULTS AND DISCUSSION

The presence of various bird communities recorded in wheat agroecosystem along with their feeding guilds at different locations in Bathinda district of Punjab is given in Table 1. The species diversity/ abundance analyses confirmed that 83 species belonging to 16 orders, with species richness being maximum at

Table 1. Bird diversity and abundance at different stages of wheat crop (Bathinda district, Punjab)

S.No.	Common name	Scientific name	Feeding habits	Location I						Location II						Location III					
				Ruldu Singh Wala			Katar Singh Wala			Bir Talab			Katar Singh Wala			Bir Talab					
				PT	SW	SD	RP	PT	SW	SD	RP	PT	SW	SD	RP	PT	SW	SD	RP		
1.	Alexandrine parakeet	<i>Psittacula eupatria</i> (L., 1766)	F	-	0.58	-	-	-	-	-	-	-	0.07	3.88	1.45	-	0.05				
2.	Ashy prinia	<i>Prinia socialis</i> (Sykes, 1832)	I	0.93	1.08	1.81	0.72	-	0.09	-	-	-	-	-	0.36	-	0.65				
3.	Asian koel	<i>Eudynamys scolopacea</i> (L., 1758)	O	-	-	0.20	0.38	-	-	-	-	-	0.33	-	0.12	-	0.15				
4.	Bank myna	<i>Acridotheres ginginianus</i> (Latham, 1790)	I	-	0.17	-	0.21	-	-	-	-	-	0.13	1.94	0.24	-	1.10				
5.	Bay backed shrike	<i>Acridotheres ginginianus</i> (Valenciennes, 1826)	I	-	-	-	0.13	-	-	-	-	-	-	-	-	-	-				
6.	Black crowned night Heron	<i>Lanius schach</i> (L., 1758)	I	-	-	0.40	0.26	-	-	-	-	-	-	-	-	-	-				
7.	Black drongo	<i>Dicrurus adsimilis</i> (Vieillot, 1817)	I	-	0.33	1.01	1.19	1.10	1.11	1.10	1.67	0.97	1.09	2.65	1.35	-	-				
8.	Black francolin	<i>Francolinus Francolinus</i> (L., 1766)	O	-	0.50	0.81	0.51	-	0.09	0.84	0.80	-	0.36	-	0.55	-	-				
9.	Black ibis	<i>Pseudibis papillosa</i> (Temminck, 1824)	O	2.78	0.25	1.01	1.45	1.10	0.43	2.10	2.40	2.91	1.21	2.65	2.10	-	-				
10.	Black kite	<i>Milvus migrans</i> (Boddaert, 1783)	C	-	0.08	-	0.09	-	-	-	0.20	-	0.12	-	0.05	-	-				
11.	Black winged stilt	<i>Himantopus himantopus</i> (L., 1758)	MG	0.93	8.24	13.31	4.13	-	0.26	-	0.33	1.94	2.53	15.93	5.90	-	-				
12.	Blue rock pigeon	<i>Columba livia</i> (J.F. Gmelin, 1789)	G	12.04	8.74	5.04	4.47	13.19	15.09	16.81	11.69	10.68	13.27	13.72	5.55	-	-				
13.	Blue throat	<i>Erethacus svecicus</i> (L., 1758)	I	1.85	0.25	1.01	1.32	1.10	0.69	-	1.54	-	0.60	-	0.65	-	-				
14.	Blyth's reed warbler	<i>Acrocephalus dumetorum</i> (Blyth, 1849)	I	-	0.17	1.21	0.13	-	-	-	-	-	-	-	-	-	-				
15.	Brown headed barbet	<i>Megalaima Zeylanica</i> (J F Gmelin, 1788)	F	-	-	-	0.13	-	-	-	-	-	-	-	0.20	-	-				
16.	Brahminy starling	<i>Sturnus pagodarum</i> (J F Gmelin, 1789)	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
17.	Cattle egret	<i>Bubulcus ibis</i> (L., 1758)	I	4.63	12.90	2.22	9.50	7.69	6.69	6.72	3.47	14.56	13.39	7.96	3.95	-	-				
18.	Common babbler	<i>Turdoides caudatus</i> (Dumont, 1823)	O	-	-	-	0.34	-	-	-	-	-	-	-	0.05	-	-				
19.	Common crow	<i>Corvus splendens</i> (Vieillot, 1817)	O	-	0.33	0.60	2.00	4.40	0.94	2.52	10.49	1.94	0.60	5.31	10.31	-	-				
20.	Common green shank	<i>Tringa nebularia</i> (Gunnerus, 1767)	C	-	-	-	-	-	-	-	0.13	-	-	-	-	-	-				
21.	Common hoopoe	<i>Upupa epops</i> (L., 1758)	O	1.85	0.42	0.81	0.34	-	-	-	-	-	0.36	0.44	0.05	-	-				
22.	Common moorhen	<i>Gallinula chloropus</i> (L., 1766)	O	8.33	5.16	3.23	2.00	-	-	-	-	-	-	-	-	-	-				
23.	Common myna	<i>Acridotheres tristis</i> (L., 1766)	O	4.63	6.32	4.84	6.94	9.89	5.32	11.76	9.75	4.85	6.63	9.73	10.11	-	-				
24.	Common redshank	<i>Tringa nebularia</i> (L., 1758)	I	-	0.67	-	0.13	-	-	-	-	-	-	-	-	-	-				
25.	Common rose-Finch	<i>Carpodacus erythrinus</i> (Pallas, 1770)	MG	-	-	-	0.17	-	-	-	-	-	-	-	-	-	-				
26.	Common sandpiper	<i>Actitis hypoleucos</i> (L., 1758)	I	-	0.67	-	0.13	-	-	-	-	-	0.12	-	-	-	-				
27.	Common starling	<i>Sturnus vulgaris</i> (L., 1758)	MG	-	0.08	-	1.49	-	-	-	-	-	-	-	-	-	-				

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28.	Common stone chat	<i>Saxicola torquata</i> (Pallas, 1773)	I	-	0.42	0.40	1.06	-	0.17	-	5.41	-	-	0.88	0.25
29.	Common tailorbird	<i>Orthotomus sutorius</i> (Pennant, 1769)	I	-	-	0.81	0.38	-	-	-	-	-	-	-	-
30.	Eurasian collared dove	<i>Streptopelia decaocto</i> (Frivaldsky, 1838)	G	1.85	2.16	3.63	2.51	4.40	11.23	7.14	2.34	-	2.17	0.44	1.65
31.	Great cormorant	<i>Phalacrocorax Carbo</i> (L., 1758)	C	-	0.25	0.81	0.04	-	-	-	-	-	-	-	-
32.	Greater coucal	<i>Centropus sinensis</i> (Stephens, 1815)	O	-	0.33	-	0.43	-	0.09	-	0.33	-	-	0.44	0.30
33.	Grey heron	<i>Ardea cinerea</i> (L., 1758)	C	-	0.33	-	0.26	-	-	-	-	-	-	-	-
34.	Grey francolin	<i>Francolinus pondicerianus</i> (J.F. Gmelin, 1789)	O	-	-	-	0.09	-	-	-	0.53	-	-	2.21	0.30
35.	Grey goshawk	<i>Accipiter novaehollandiae</i> (Gmelin, 1788)	C	-	-	-	-	-	-	-	-	-	-	-	0.05
36.	Grey wagtail	<i>Motacilla cinerea</i> (Tunstall, 1771)	I	-	0.25	-	-	-	-	-	-	-	-	-	-
37.	House sparrow	<i>Passer domesticus</i> (L., 1758)	O	1.85	2.91	2.62	4.64	-	0.34	2.52	0.80	-	0.24	0.88	0.50
38.	Indian treepie	<i>Dendrocitta Vagabunda</i> (L., 1790)	O	-	0.33	0.40	0.72	1.10	0.17	1.26	0.33	-	0.12	0.88	0.55
39.	Indian chat	<i>Cercomela fusca</i> (Blyth, 1851)	I	-	0.42	-	1.28	3.30	0.60	3.36	0.94	-	1.45	2.21	1.30
40.	Indian cuckoo	<i>Cuculus micropterus</i> (Gould, 1838)	I	-	-	-	0.09	-	-	-	0.20	-	-	-	0.25
41.	Indian grey Hornbill	<i>Ocyrceros birostris</i> (Scopoli, 1786)	O	-	0.17	0.20	0.77	-	-	0.42	1.00	-	0.24	1.33	0.95
42.	Indian robin	<i>Saxicoloides fulicata</i> (L., 1766)	I	-	-	-	0.26	-	-	-	0.13	-	-	-	-
43.	Indian roller	<i>Coracias benghalensis</i> (L., 1758)	I	0.93	0.08	0.60	0.51	2.20	2.06	4.62	1.87	0.97	0.60	2.21	0.90
44.	Indian shikra	<i>Accipiter badius</i> (J.F. Gmelin, 1788)	C	-	0.08	0.81	0.17	1.10	0.26	0.84	0.20	-	0.36	0.88	0.10
45.	Issabelline shrike	<i>Lanius isabellinus</i> (Hemprich & Ehrenberg, 1833)	I	-	0.08	-	-	-	-	-	-	-	-	-	-
46.	Indian swallow	<i>Hirundo rustica</i> (L., 1758)	I	-	0.17	-	-	-	0.43	-	-	12.62	9.17	-	1.80
47.	Jungle babbler	<i>Turdoides striatus</i> (Dumont, 1823)	I	4.63	5.24	5.44	5.75	-	1.63	5.88	3.74	-	2.65	4.42	4.40
48.	Large grey babbler	<i>Turdoides malcolmi</i> (Sykes, 1832)	O	-	-	-	0.34	9.89	1.46	-	0.94	-	-	-	-
49.	Large pied wagtail	<i>Motacilla maderaspatensis</i> (J.F. Gmelin, 1789)	I	0.93	0.83	1.01	0.04	-	0.09	0.84	-	-	0.48	0.44	0.15
50.	Laughing dove	<i>Streptopelia senegalensis</i> (L., 1766)	G	1.85	1.08	0.60	1.32	-	0.26	-	0.07	-	-	0.88	0.40
51.	Lesser golden backed woodpecker	<i>Dinopium benghalense</i> (L., 1758)	I	-	-	0.20	0.04	-	-	-	-	-	-	0.44	0.05
52.	Little cormorant	<i>Phalacrocorax niger</i> (Vieillot, 1817)	I	-	0.17	0.20	0.21	-	-	-	-	-	-	-	-
53.	Little egret	<i>Egretta garzetta</i> (L., 1766)	O	-	-	-	0.17	-	-	-	-	-	-	-	-
54.	Long tailed shrike	<i>Lanius schach</i> (L., 1758)	I	0.93	0.25	0.20	0.17	-	0.09	0.84	0.33	-	-	-	-
55.	Median figret	<i>Mesophoyx intermedia</i> (Wagler, 1829)	I	-	-	-	0.17	-	-	-	-	-	-	-	-
56.	Oriental honey buzzard	<i>Pernis ptilorhynchus</i> (Temminck, 1821)	I	-	0.08	-	-	-	-	-	-	-	0.12	-	-
57.	Oriental Magpie Robin	<i>Copsychus saularis</i> (L., 1758)	I	-	0.08	-	0.09	-	-	-	-	-	-	-	-
58.	Oriental Tree Pipit	<i>Anthus hodgsoni</i> (Richmond, 1907)	I	3.70	1.75	-	-	1.10	0.60	-	0.33	1.94	0.97	-	0.35
59.	Oriental White Ibis	<i>Threskiornis melanocephalus</i> (Latham, 1790)	C	-	0.08	-	0.30	-	-	-	-	-	-	-	-

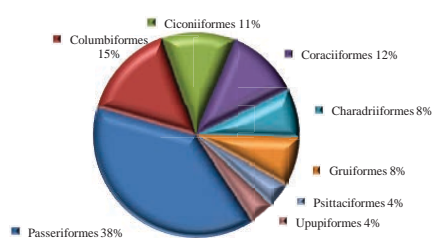
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(contd. Table 1)

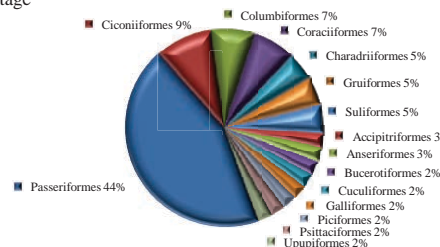
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PT- Preparatory tillage stage; SW- Sowing stage; SD- Seedling stage; RP- Ripening stage; I- Insectivorous; F- Frugivorous; C- Carnivorous; O- Omnivorous; MG- Multiple guild; G- Granivorous; N- Nectarivorous

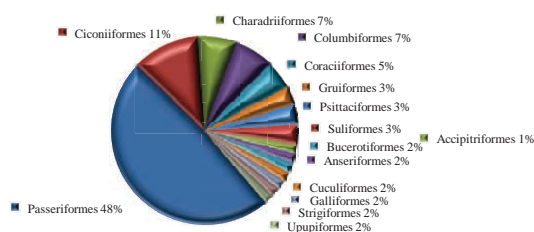
## Location I- Preparatory tillage stage



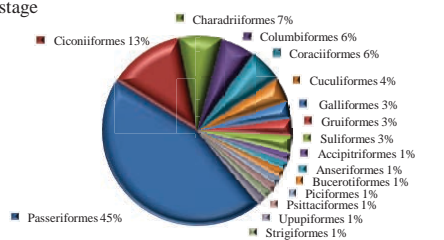
## Seedling stage



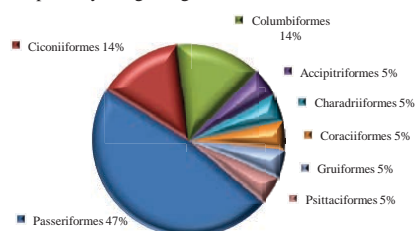
## Sowing stage



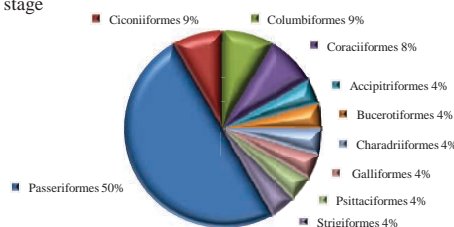
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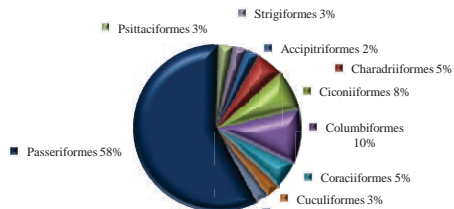
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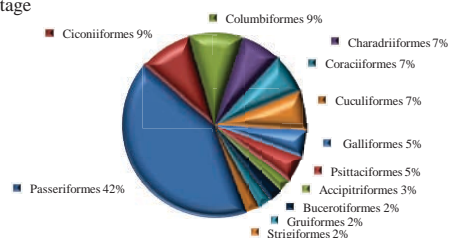
## Seedling stage



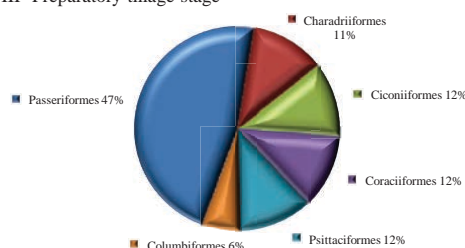
## Sowing stage



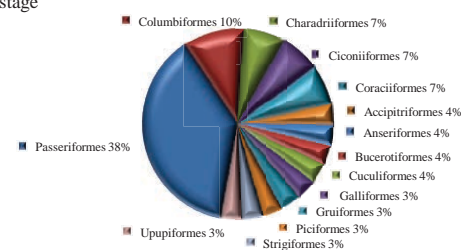
## Ripening stage



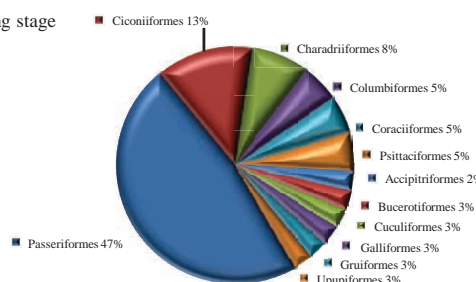
## Location III- Preparatory tillage stage



## Seedling stage



## Sowing stage



## Ripening stage

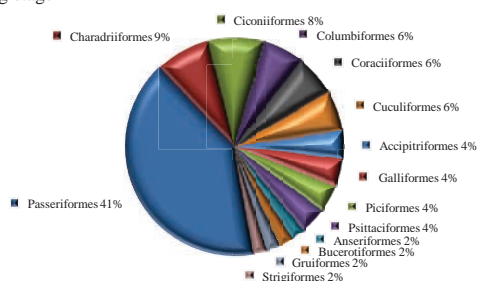


Fig. 1. Abundance of bird orders at various stages of wheat (location-I, II &amp; III)



location I (77); rose-ringed parakeet was found to be the most abundant species (10.53, 25.51 and 21.30%, respectively) followed by blue rock pigeon (7.57, 14.19 and 10.80%, respectively). The third most abundant species was cattle egret at location I (7.31%) and location III (9.97%) and common myna at location II (9.18%). Passeriformes (46.99%) formed the most dominant order. Similar observations were recorded on the avifauna of Sonanadi Wildlife sanctuary, Uttarakhand (Kumar, 2021). It was followed by Ciconiiformes (12.05%), Charadriiformes (8.43%), Coraciiformes (4.82%) and Columbiformes (4.82%), with similar being observed at all the studied locations. Relative abundance at four stages of wheat crop viz., preparatory, sowing, seedling and ripening stages revealed that during preparatory stage, wire tailed swallow was the most dominant (16.67%) at location I; rose-ringed parakeet at location II (25.27%) and location III (33.98%). During sowing stage at location I, cattle egret (12.90%) was the most abundant, and rose-ringed parakeet at location II (40.31%, and location III (28.35%). Seedling stage revealed the maximum abundance of black winged stilt at location I (13.31%) and location III (15.93%); at location II, blue rock pigeon was the most dominant (16.81%). During the ripening stage, rose-ringed parakeet was the most abundant at all the locations (Fig. 1).

The present study revealed various avian species during various crop stages in wheat. The orders found in abundance and feeding guilds were similar to earlier studies done at Ludhiana (Kler, 2009). Species number increased from early (preparatory tillage and sowing stage) to late (seedling and ripening) stages. This is because more complex vegetation provides more food resources, better cover and protection against predators. Agricultural crops are better habitats due to more food availability (Hafner et al., 1986). Insectivorous guild formed the most dominant guild (39 species, 46.99% abundance) followed by omnivorous (19 species, 22.89% abundance) and carnivorous guild (12 species, 14.46% abundance). Similar trend for feeding guild was observed at all the stages of wheat at the studied locations. Avian predators of rabi crops feeding on larvae exposed during field ploughing include cattle egret, common crow and common myna (Shah and Garg, 1988). Insects are the primary invertebrates present in agroecosystems; hence form the major part of diet of insectivorous species. Common crow was seen feeding on insects and sown wheat seeds. Pied crested cuckoo was found to feed on dragonflies and other insects. Indian chat, black drongo, white wagtail,

bay-backed shrike, black drongo and red-wattled lapwing were observed to feed exclusively on insects and soil invertebrates. Species richness of insectivorous bird community is dependent on food availability (both for adults and nestling). Role of insectivorous bird community in wheat agroecosystem should be considered to manage the arthropods and insect pests (Rey Benayas et al., 2017). Disparity in the diversity and abundance of the insectivorous bird communities at different locations is dependent on the availability and density of perching trees, availability of suitable nesting sites, and vegetation structure surrounding the study area (Rajashekara and Venkatesha, 2014).

Agricultural habitats have higher productivity (Dhindsa and Saini, 1994) and habitat breadth (Tschamtker et al., 2008). Wheat forms a major cropping system and acts a major habitat for bird species (Borad and Parasharya, 2018). Bird diversity and richness is dependent upon many variables. Habitat cover is directly influencing the survival of a species. Habitat heterogeneity also determines the occurrence and abundance (Pennington and Blair, 2011). Due to the presence of high diversity of plants and perennial multi-strata designs in the orchard systems, more habitats and resources are available for birds (Simon et al., 2010; Boller et al., 2004). Agriculture intensification have resulted in indirect negative impacts on the bird diversity i.e. reduction in nesting sites, bird mortality by farming operations and after harvesting, predation rate increases (Altaf et al., 2018).

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