



Avian Community Structure in Cattle Sheds of Punjab and Haryana

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Abstract: The present study was conducted to find out whether cattle sheds could support the bird diversity. To perform the research, cattle sheds were selected from three villages each from district Ludhiana (Punjab) and Jind (Haryana), point count method was used for the collection of the data. A total of 56 avian species were recorded from the selected cattle sheds, classified into 13 orders and 32 families. Order Passeriformes was most dominant constitute 39.29% of total identified species followed by Pelecaniformes, Columbiformes, Coraciiformes, Accipitriformes, Charadriiformes, Piciformes, Bucerotiformes, Cuculiformes, Gruiformes, Psittaciformes and Galliformes, Strigiformes. From the recorded avian fauna 44 species were observed from cattle sheds of Punjab and 50 bird species were observed from the cattle sheds of Haryana with similarity index 0.679. The majority of the birds visiting cattle sheds were insectivorous (32.14%), followed by omnivorous, carnivorous, granivorous, frugivorous and nectarivorous which shows the presence of abundance of insects. However, presence of birds of different feeding guilds shows that cattle sheds provide a diverse range of food and suitable habitat to birds.

Keywords: Avian diversity, Cattle sheds, Haryana, Punjab, Species richness

Avian species are an integral part of biodiversity on this planet, their distribution depends on food availability and feeding behavior (Kler and Kumar 2015). On the Indian subcontinent, over 13% of the total world's bird diversity, or approximate 1,358 bird species are found, belonging to 26 orders and 114 families, from which 423 bird species reside in Punjab and around 520 bird species have been recorded from Haryana state (Maheswaran and Alam 2024). From the agricultural ecosystem of Punjab 213 species of birds has been recorded (Kler et al., 2022). For the assessment of the local ecosystem or regional landscapes, it is essential to have knowledge about the avian diversity and composition (Kiros et al., 2018). From the perspective of environmental monitoring, documentation of bird species assemblages in various landscapes is being prioritized (Hossain and Aditya 2016). Birds are present throughout many habitats and perform essential part in the health and balance of ecosystems (Tesfahunegny et al., 2016). Agro ecosystems, which make up 38% of the earth's land, represent one of the most productive ecosystems (Foley et al., 2011). Punjab and Haryana are widely recognized as most important agricultural states of India (Singh and Singh 2017). Availability of food and eating patterns within a given ecosystem impacts bird community structure and distribution (Sohil and Sharma 2020). In addition to food, agricultural ecosystem provides shelter and breeding sites to avian species (Kaur et al., 2017). Cattle sheds serve a dual function by providing farmers an additional source of income while serving a crucial conservation site sustaining a rich array of

bird species and enriching habitat diversity (Grewal et al., 2023). Various studies have been conducted on various aspects of bird diversity in different ecosystems of Punjab (Sidhu and Kler 2017, Kaur et al., 2018) and Haryana (Chopra and Jakhar 2016, Kumar and Sahu 2019, Kumar and Sahu 2020, Singh et al., 2020), but not much work has been done regarding the diversity of birds in cattle sheds. The main objective of this study is to find the potential of cattle sheds if they can sustain the birdlife.

MATERIAL AND METHODS

Study area: Present study was conducted in villages of districts Ludhiana (Punjab) and Jind (Haryana) from April 2022 to March 2024. Cattle sheds from villages Halwara (latitude 30° 73'01.2"N, longitude 75° 64' 64.7"E), Hissowal (latitude 30° 80'70.5"N, longitude 75° 66'11.5"E), and Sudhar (latitude 30° 76'82.3"N, longitude 75° 64'89.5"E) were selected from district Ludhiana (Punjab) and named as Location I, II, and III respectively. Villages Barsola (latitude 29° 39'19.1"N, longitude 76° 23'40.8"E), Nirjan (latitude 29° 33'80.1"N, longitude 76° 37'23.1"E), and Pandu Pindara (latitude 29° 31'37.6"N, longitude 76° 36' 25.5"E) were selected from Jind (Haryana) and named as location IV, V, and VI respectively. The selected cattle sheds surrounded by agricultural fields, and a water body is present near the cattle sheds of location III and VI. Cattle sheds characterized with spacious areas, storage rooms, plastered/ unplastered walls, enough ventilation, and slip-resistant flooring bricks. Tree species recorded from the selected sheds were Kikar (*Acacia*

nilotica), Neem (*Azadirachta indica*), Peepal (*Ficus religiosa*), and Banyan (*Ficus benghalensis*) which varies in different cattle sheds. Cattle sheds of all locations were half-shed (mostly with iron sheets) and half-open however, the cattle shed of location II is fully shed with no tree diversity. Watering and feeding areas of cattle located in shaded sections however the open section allow cattle to freely roam.

Data collection: Field observations were taken twice a month at all locations in morning (7:00-9:00 a.m.) and evening hours (5:00-7:00 p.m.). Point count method was used for the observation of birds visiting cattle sheds by naked eyes or with the help of binoculars. Photographs of observed species were taken by using Canon EOS 1200D to identify bird species. Identification of the birds were done on the basis of their characters as described by Grimmett et al. (2013). List of the recorded bird's species was prepared using the checklist prepared by Praveen et al. (2016). IUCN status of the birds recorded by using IUCN Red List of Species (IUCN 2023). Feeding guilds of birds were classified by using available literature and direct observation during field study (Kumar et al., 2019).

Data analysis: From the collected data species richness (total bird species observed from a location), relative abundance, species diversity by Shannon-Wiener Index (H') (Sekhon et al., 2024), and Jaccard's similarity index (Cj) (Kumar and Sahu 2019) were calculated by using appropriate formulas in MS excel 2013. Kruskal Wallis and Mann-Whitney U test were used to analyze the data statistically using SPSS version 16 computer software.

RESULTS AND DISCUSSION

During the present study period a total of 56 birds were recorded from cattle sheds of the selected villages of Punjab and Haryana which belongs to 13 orders and 32 families (Table 1). Order Passeriformes was most dominant constitute 39.29% of total identified species followed by Pelecaniformes, Columbiformes, Coraciiformes, Accipitriformes, Charadriiformes, Piciformes (Bucerotiformes, Cuculiformes, Gruiformes, Psittaciformes and Galliformes, Strigiformes (1.79%) (Fig. 1).

From the villages of Punjab 44 bird species were recorded, belonging to 11 orders and 29 families with species richness of 36, 26, and 29 at locations I, II, and III respectively. Shannon-Wiener Index was highest at Location I (2.15), followed by Location II (1.86) and Location III (1.71). Fifty bird's species were recorded from the villages of Haryana belonging to 13 orders and 29 families with species richness of 33, 29, and 38 at Location IV, V, and VI respectively. Shannon-Wiener Index was highest at Location V (1.93), followed by Location VI and Location IV (Table 2). Jaccard's similarity index (Cj) shows similarity of 0.679 in Punjab and Haryana. Singh and Laura (2012) stated that avian diversity is correlated directly with plant diversity because plants provide birds a place for nesting, and reproduction and also food to eat. Present study showed variation in bird species richness in different location being highest in location VI (38), followed by I, IV, III, V and location II. The highest species richness was due to the good structure and vegetation of cattle sheds at Location VI and I,

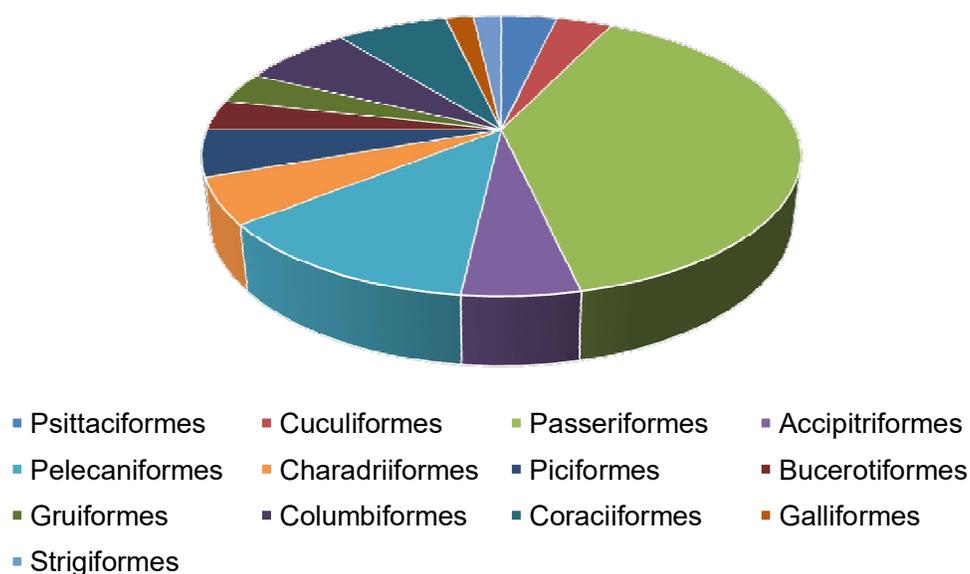


Fig. 1. Percent composition of different bird orders in cattle sheds of Punjab and Haryana

Table 1. Bird species from cattle sheds of Punjab and Haryana

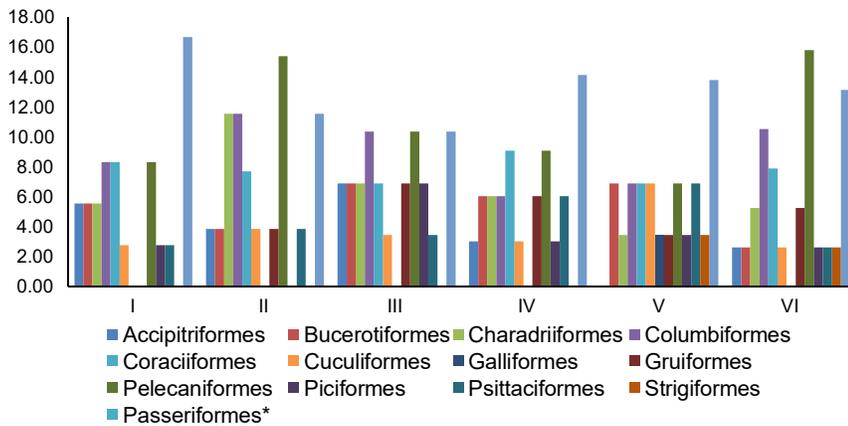
Species	Scientific name	Order	Family	IUCN status	Feeding guild
Alexandrine Parakeet	<i>Psittacula eupatria</i>	Psittaciformes	Psittaculidae	NT	F
Asian Koel	<i>Eudynamys scolopaceus</i>	Cuculiformes	Cuculidae	LC	O
Asian Pied Starling	<i>Gracupica contra</i>	Passeriformes	Sturnidae	LC	O
Bank Myna	<i>Acridotheres ginginianus</i>	Passeriformes	Sturnidae	LC	I
Baya Weaver	<i>Ploceus philippinus</i>	Passeriformes	Ploceidae	LC	G
Black Drongo	<i>Dicurus macrocercus</i>	Passeriformes	Dicuridae	LC	I
Black Kite	<i>Milvus migrans</i>	Accipitriformes	Accipitridae	LC	O
Black-headed Ibis	<i>Threskiornis melanocephalus</i>	Pelecaniformes	Threskiornithidae	NT	C
Black-winged Kite	<i>Elanus caeruleus</i>	Accipitriformes	Accipitridae	LC	C
Black-winged Stilt	<i>Himantopus</i>	Charadriiformes	Recurvirostridae	LC	O
Brahminy Starling	<i>Sturnia pagodarum</i>	Passeriformes	Sturnidae	LC	I
Brown Rock Chat	<i>Oenanthe fusca</i>	Passeriformes	Muscicapidae	LC	I
Brown-headed Barbet	<i>Psilopogon zeylanicus</i>	Piciformes	Ramphastidae	LC	F
Cattle Egret	<i>Bubulcus ibis</i>	Pelecaniformes	Ardeidae	LC	C
Common Hoopoe	<i>Upupa epops</i>	Bucerotiformes	Upupidae	LC	I
Common Moorhen	<i>Gallinula chloropus</i>	Gruidiformes	Rallidae	LC	O
Common Myna	<i>Acridotheres tristis</i>	Passeriformes	Sturnidae	LC	O
Common Sandpiper	<i>Actitis hypoleucos</i>	Charadriiformes	Scolopacidae	LC	C
Common Tailorbird	<i>Orthotomus sutorius</i>	Passeriformes	Cisticolidae	LC	I
Coppersmith Barbet	<i>Psilopogon haemacephalus</i>	Piciformes	Ramphastidae	LC	F
Eurasian Collared Dove	<i>Streptopelia decaocto</i>	Columbiformes	Columbidae	LC	G
Great Egret	<i>Ardea alba</i>	Pelecaniformes	Ardeidae	LC	C
Greater Coucal	<i>Centropus sinensis</i>	Cuculiformes	Cuculidae	LC	O
Green Bee-eater	<i>Merops orientalis</i>	Coraciiformes	Meropidae	LC	I
House Crow	<i>Corvus splendens</i>	Passeriformes	Corvidae	LC	O
House Sparrow	<i>Passer domesticus</i>	Passeriformes	Passeridae	LC	G
Indian Black Ibis	<i>Pseudibis papillosa</i>	Pelecaniformes	Threskiornithidae	LC	C
Indian Grey Hornbill	<i>Ocyrceros birostris</i>	Bucerotiformes	Bucerotidae	LC	O
Indian Peafowl	<i>Pavo cristatus</i>	Galliformes	Phasianidae	LC	O
Indian Pond Heron	<i>Ardeola grayii</i>	Pelecaniformes	Ardeidae	LC	C
Indian Robin	<i>Saxicoloides fulicatus</i>	Passeriformes	Muscicapidae	LC	I
Indian Roller	<i>Coracias benghalensis</i>	Coraciiformes	Coraciidae	LC	I
Indian Silverbill	<i>Euodice malabarica</i>	Passeriformes	Estrildidae	LC	G
Jungle Babbler	<i>Turdoides striata</i>	Passeriformes	Leiothrichidae	LC	O
Laughing Dove	<i>Streptopelia senegalensis</i>	Columbiformes	Columbidae	LC	G
Lesser Golden-backed Wood pecker	<i>Dinopium benghalense</i>	Piciformes	Picidae	LC	I
Little Cormorant	<i>Microcarbo niger</i>	Pelecaniformes	Ardeidae	LC	C
Little Egret	<i>Egretta garzetta</i>	Pelecaniformes	Ardeidae	LC	C
Oriental Magpie Robin	<i>Copsychus saularis</i>	Passeriformes	Muscicapidae	LC	I
Pied Kingfisher	<i>Ceryle rudis</i>	Coraciiformes	Alcedinidae	LC	C
Plain Prinia	<i>Prinia inornata</i>	Passeriformes	Cisticolidae	LC	I
Purple Sunbird	<i>Cinnyris asiaticus</i>	Passeriformes	Nectariniidae	LC	N
Red-vented Bulbul	<i>Pycnonotus cafer</i>	Passeriformes	Pycnonotidae	LC	G
Red-wattled Lapwing	<i>Vanellus indicus</i>	Charadriiformes	Charadriidae	LC	O
Rock Pigeon	<i>Columba livia</i>	Columbiformes	Columbidae	LC	G
Rose-ringed Parakeet	<i>Psittacula krameri</i>	Psittaciformes	Psittaculidae	LC	F
Rufous Treepie	<i>Dendrocitta vagabunda</i>	Passeriformes	Corvidae	LC	I
Shikra	<i>Accipiter badius</i>	Accipitriformes	Accipitridae	LC	C
Spotted Owlet	<i>Athene brama</i>	Strigiformes	Strigidae	LC	C
Western Yellow Wagtail	<i>Motacilla flava</i>	Passeriformes	Motacillidae	LC	I
White Wagtail	<i>Motacilla alba</i>	Passeriformes	Motacillidae	LC	I
White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	Gruidiformes	Rallidae	LC	O
White-browed Wagtail	<i>Motacilla maderaspatensis</i>	Passeriformes	Motacillidae	LC	I
White-throated Kingfisher	<i>Halcyon smyrnensis</i>	Coraciiformes	Alcedinidae	LC	I
Wire-tailed Swallow	<i>Hirundo smithii</i>	Passeriformes	Hirundinidae	LC	I
Yellow-legged Green Pigeon	<i>Treron phoenicopterus</i>	Columbiformes	Columbidae	LC	G

NT (Near Threatened), LC (Least concern), I (Insectivorous), O (Omnivorous), C (Carnivorous), G (Granivorous), F (Frugivorous), N (Nectarivorous)

which provide suitable space to birds. Birds are also extremely sensitive to invasions from humans and the abundance of many bird species decreases in proximity of human settlements. The disturbances caused by human's activities for cattle management in cattle sheds can reduce the avian diversity, especially in fully shed system where space is more confined and disturb the bird species. The fully shed structure of cattle shed at Location II can be a reason for low species richness and diversity. Kruskal Wallis test shows a significant difference in species diversity at different locations of Punjab and Haryana. Mann-Whitney U test at location I differs significantly from locations II, III, V, and VI, and Location III differs significantly to locations IV and V (Table 3). The significant difference between the different locations is may be due to the different vegetation, structure and surrounding environments of these cattle sheds. Tree diversity and agricultural fields near the cattle sheds are the

main components influencing the avian diversity.

Avian species recorded from all the locations belong to orders Columbiformes, Bucerotiformes, Charadriiformes, Coraciiformes, Cuculiformes, Pelecaniformes, Passeriformes, and Psittaciformes. Order Accipitriformes observed at locations I, II, III, IV, and VI, Gruiformes observed at locations II, III, IV, V and VI, Piciformes observed at locations I, III, IV, V and VI, Strigiformes observed at location V and VI, Galliformes observed only at location V (Fig. 2). Order Passeriformes was dominant at all locations with the abundance (%) varying from 31.03 to 50.00 in selected locations. Strigiformes (Spotted Owlet with relative abundance of 0.57% and 0.12% at location V and VI respectively) and Galliformes (Indian Peafowl with relative abundance 6.33% at location V) were the least representing bird orders with one species each. Chopra et al. (2012) recorded Passeriformes as dominant bird order and



*Value for order Passeriformes is three times more than the value of other orders

Fig. 2. Representation of different bird orders observed in cattle sheds of Punjab and Haryana

Table 2. Community characteristics of bird species recorded from the cattle sheds of Punjab and Haryana during April 2022- March 2024

Community characteristics	Locations					
	I	II	III	IV	V	VI
Species richness	36	26	29	33	29	38
Species diversity	2.15	1.86	1.71	1.85	1.93	1.89
Species evenness	0.87	0.86	0.81	0.81	0.86	0.81

Table 3. Mann-Whitney U table for species diversity at selected locations

Locations	II	III	IV	V	VI
I	0.002	0.000	0.101	0.012	0.014
II	-	0.143	0.242	0.514	0.713
III	-	-	0.028	0.017	0.089
IV	-	-	-	0.514	0.551
V	-	-	-	-	0.799

Podicipediformes and Strigiformes as the least representing bird orders in Sultanpur National Park Gurgaon, Haryana. Passeriformes was most dominant order and this outcome aligns with the findings of majority of the studies that has been conducted on different aspects of avian diversity mainly in agricultural and pond ecosystems of Punjab and Haryana. Agricultural landscapes of district Panipat are also dominated by Passeriformes (Kumar and Sahu 2019). Sekhon et al. (2023) found order Passeriformes as most abundant during their study in village ponds of Punjab state with 32 families.

Grewal et al. (2023) recorded 26 bird species in the cattle sheds from the villages of Ludhiana. The structural plan of the cattle shed provides a safe cover to the bird species, because of this cattle sheds has the ability to conserve bird species. The current study demonstrates that the existence of birds belongs to six different feeding guilds, Insectivorous (32.14%), followed by Omnivorous, Carnivorous, Granivorous, Frugivorous, and Nectarivorous (1.79%), which shows that cattle sheds offer a variety of food resources to birds as well as a good place and space to feed.

CONCLUSION

The cattle sheds has the potential to support a diversity of bird species. This is because of its structural plan, tree diversity and presence of different types of food for birds. The bird diversity in rural ecosystem can be conserve by improving structural plan and habitat quality of cattle sheds.

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