

## Avian Diversity of Lower Shivalik Foothills, India

Girish Chopra, Sanjeev Kamal Sharma

Department of Zoology,  
Kurukshetra University, Kurukshetra, India  
sharmaksanjeev\_37@rediffmail.com

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**Abstract:** Lower Shivalik Foothills in India is a region which is afforested with a good number of endemic and exotic plant species that supports healthy faunal diversity. The present study deals with the avian diversity of this region extending from Panchkula (30°41'N and 76°50'E) in Haryana to Paonta Sahib (30°27' N and 77°37'E) in Himachal Pradesh, from December 2009 to November 2011. This two year study revealed the presence of 156 bird species that belonged to 18 orders and 39 families. The order Passeriformes dominated with maximum number of bird species i.e. 70 (44.87%). The observed bird species were designated as Abundant (60, 38.46%), Common (48, 30.77%), Uncommon (41, 26.28%) and Rare (7, 4.49%). Out of 156 bird species observed in the study area, 99 (63.46%) were resident birds, 16 (10.26%) were winter migrants and 41 (26.28%) were local migrants. All the winter migrants such as Mallard, Common Coot, Northern Pintail, Lesser Whistling Duck, Common Pochard, Common Teal, Spot Billed Duck, Garganey, Gadwal etc. were observed in large numbers in the Renuka lake (30°36' N, 77°27' E with an area of 0.82 Km<sup>2</sup>), the largest natural lake of Himachal Pradesh only during the second year of study. No migratory birds were recorded in the Renuka lake because the excavation work was in progress in first year of study.

**Keywords:** Diversity, Endemic, Exotic, Resident, Migratory.

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### 1. INTRODUCTION

India lies at the junction of Africa, temperate Eurasia and Oriental biogeographical provinces and as a result it has biological heritage that qualifies it as one of the twelve mega diversity nations of the world [1].

Indian biodiversity includes large number of species of invertebrates, 2546 species of fishes, 204 species of amphibians, 446 species of reptiles, 1228 species of birds and 372 species of mammals [2]. Although, avian diversity has been studied by vast number of researchers in different regions in India [3, 4, 5]. 'Lower Shivalik Foothills' in the North are still to be explored fully. Scanty information about avian fauna is reported from this region so far [6, 7]. The region has thick cover of vegetation in many of its parts and also has three major wetlands that invite large number of migratory birds especially in winters. Recently, numerous anthropogenic activities are affecting both flora and fauna of the region, specially the avifauna. Therefore, present study was conducted in different habitats of the study area, viz., roadside plantation, agricultural fields, orchards and wetlands to record avian diversity from December, 2009 to November 2011.

### 2. MATERIALS AND METHODS

The present study was carried out in the 'Lower Shivalik Foothills' extending from Panchkula (30°41'N and 76°50'E) in the state of Haryana to Paonta Sahib (30°27' N and 77°37'E) in the state of Himachal Pradesh from December, 2009 to November, 2011. The altitude of the study site ranged from minimum 316m (Toka region) to a maximum of 1201m (Jamta region) and the average temperature varied from 42<sup>0</sup>C in summers to 7<sup>0</sup>C in the peak winters.

Periodic fortnightly visits were conducted to different selected sites and avifauna was recorded using point count method [8]. Birds were observed using the binoculars and were photographed using Sony Cyber shot DSC-H9 digital camera. 'A Pocket Guide to the Birds of the Indian sub continent' was used to identify the photographs [9]. Classification of the recorded bird species was also done [10]. The observed birds during these visits were categorized as 'Resident' or 'R', 'Local migrants' or 'LM', and 'winter migrants' or 'WM' [11]. On the basis of frequency of

sighting, various bird species were categorized as 'Abundant' or 'A' (encounter rate 95% to 100%), 'Common' or 'C' (encounter rate 60% to 95%), 'Uncommon' or 'UC' (encounter rate 20% to 60%) and 'Rare' or 'R' (encounter rate less than 20%) [12]. Recorded data was statistically analyzed.

### 3. RESULTS AND DISCUSSION

Of the nearly 10,000 avian species reported worldwide [13], India, with its rich biological heritage, harbors 1300 of these and that too in different habitats. Avian diversity has also been the subject of study of many researchers, particularly in the state of Haryana [14, 15, 16, 17, 18, and 6]. In the present study, a total of 156 avian species were identified during the periodic fortnightly visits to the "Lower Shivalik Foothills" from December, 2009 to November, 2011 (Table 1).

**Table 1.** A classified chart of various bird species in the study area.

Sr. No.	Common Name	Zoological Name	Residential Status	Abundance Status
<b>Order: PASSERIFORMES</b>				
<b>Family: PITTIDAE: Pittas</b>				
1.	Indian Pitta	<i>Pitta brachyuran</i>	LM	UC
<b>Family: HIRUNDINIDAE: Swallows.</b>				
2.	Wire-tailed Swallow	<i>Hirundo smithii</i>	R	A
3.	House Swallow	<i>Hirundo tahitica</i>	R	A
4.	Striated Swallow	<i>Hirundo striolata</i>	R	A
5.	Streak-throated Swallow	<i>Hirundo fluvicola</i>	R	A
6.	Red Rumped Swallow	<i>Hirundo daurica</i>	R	C
<b>Family: LANIIDAE: Shrikes.</b>				
7.	Brown Shrike	<i>Lanius cristatus</i>	R	A
<b>Family: ORIOLIDAE: Orioles.</b>				
8.	Eurasian Golden Oriole	<i>Oriolus oriolus</i>	LM	UC
<b>Family: MOTACILLIDAE: Pipits, Wagtails</b>				
9.	White Wagtail	<i>Motacilla alba</i>	R	C
10.	Forest Wagtail	<i>Dendronanthus indicus</i>	R	A
11.	Yellow Wagtail	<i>Motacilla flava</i>	R	A
12.	White Browed Wagtail	<i>Motacilla maderaspatensis</i>	R	C
13.	Grey Wagtail	<i>Motacilla cinerea</i>	LM	A
<b>Family: NECTARINIIDAE: Sunbirds.</b>				
14.	Purple Sunbird	<i>Nectarinia asiatica</i>	R	A
15.	Crimson Sunbird	<i>Aethopyga siparaja</i>	LM	UC
<b>Family: ALAUDIDAE: Larks.</b>				
16.	Indian Bush Lark	<i>Mirafra erythroptera</i>	R	A
17.	Sand Lark	<i>Calandrella raytal</i>	R	A
18.	Common Crested Lark	<i>Galerida cristata</i>	LM	UC
19.	Rufous Tailed Lark	<i>Ammomanes phoenicurus</i>	LM	UC

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20.	Singing Bush Lark		LM	A
<b>Family: STURNIDAE: Starlings, Mynas.</b>				
21.	Asian Pied Starling	<i>Sturnus contra</i>	R	UC
22.	Brahminy Starling	<i>Sturnus pagodarum</i>	R	C
23.	Common Myna	<i>Acridotheres tristis</i>	R	A
24.	Bank Myna	<i>Acridotheres ginginianus</i>	R	A
25.	Asian Glossy Starling	<i>Aplonis panayensis</i>	LM	A
<b>Family: PASSERIDAE: House Sparrows, Weaver Birds.</b>				
26.	Red Vented Bulbul	<i>Pycnonotus cafer</i>	R	A
27.	White-eared Bulbul	<i>Pycnonotus leucotis</i>	R	C
28.	Scaly-breasted Munia	<i>Lonchura punctulata</i>	R	C
29.	House sparrow	<i>Passer domesticus</i>	R	UC
30.	Baya Weaver	<i>Ploceus philippinus</i>	R	C
31.	Black Headed Munia	<i>Lonchura Malacca</i>	LM	UC
32.	Red Munia	<i>Amandava amandava</i>	LM	UC
33.	Himalayan Bulbul	<i>Pycnonotus leucogenys</i>	R	A
34.	Indian Silverbill	<i>Lonchura malabarica</i>	LM	A
<b>Family: CORVIDAE: Crows, Tree Pies.</b>				
35.	House Crow	<i>Corvus splendus</i>	R	A
36.	Jungle Crow	<i>Corvus macrorhynchos</i>	R	A
37.	Black Drongo	<i>Dicrurus macrocercus</i>	R	A
38.	Rufous Treepie	<i>Dendrocitta wagabunda</i>	LM	C
39.	Large Billed Crow	<i>Corvus macrorhynchos</i>	R	UC
40.	Common Raven	<i>Corvus corax</i>	LM	UC
41.	Yellow-billed Blue Magpie	<i>Urocissa flavirostris</i>	LM	A
42.	Indian Treepie	<i>Dendrocitta wagabunda</i>	R	A
43.	Asian Paradise Flycatcher	<i>Terpsiphone paradise</i>	LM	UC
<b>Family: MUSCICAPIDAE: Babblers, Flycatchers, Warblers, Thrushes, Chats.</b>				
44.	Brown Rock Chat	<i>Cercornela fusca</i>	R	A

45.	Rufous Vented Prinia	<i>Prinia burnessi</i>	R	A
46.	Ashy Prinia	<i>Prinia socialis</i>	R	A
47.	Jungle Prinia	<i>Prinia sylvatica</i>	R	A
48.	Common Tailorbird	<i>Orthotomous sutoris</i>	R	A
49.	Black Redstart	<i>Phoenicurus ochruros</i>	R	UC
50.	Plumbeous Water Redstart (♂, ♀)	<i>Rhyacornis fuliginosa</i>	R	C
51.	Hodgsons Redstart	<i>Phoenicurus hodgsoni</i>	R	C
52.	White-capped water Redstart	<i>Chaimarrornis leucocephalus</i>	R	C
53.	Eurasian Blackbird	<i>Turdus merula</i>	R	UC
54.	Oriental Magpie Robin	<i>Copsychus saularis</i>	LM	A
55.	Verditer Flycatcher	<i>Eumyias thalassina</i>	LM	UC
56.	Pied Bushchat	<i>Saxicola caprata</i>	R	A
57.	Blue Whistling Thrush	<i>Myiophonus caeruleus</i>	LM	UC
58.	Bluethroat	<i>Luscinia svecica</i>	LM	UC
59.	Asian Brown Flycatcher	<i>Muscicapa dauurica</i>	R	A
60.	Striated Babbler	<i>Turdoides earlie</i>	R	A
61.	Spotted Forktail	<i>Enicurus maculates</i>	LM	UC
62.	Common Redstart	<i>Phoenicurus ochruros</i>	R	C
63.	Indian Chat	<i>Cercomela fusca</i>	R	A
64.	Zitting Cisticola	<i>Cisticola juncidis</i>	LM	UC
65.	Rufous Fronted Prinia	<i>Prinia buchanani</i>	LM	UC

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66.	Streaked Laughing Thrush	<i>Dendronanthus indicus</i>	R	C
<b>Family: EMBERZIDAE</b>				
67.	Crested Bunting	<i>Melophus lathami</i>	R	A
<b>Family: SILVIDAE:</b>				
68.	Common Babbler	<i>Tirdiides caudatus</i>	R	A
69.	Jungle Babbler	<i>Turdoides striatus</i>	R	A
<b>Family: ZOSTEROPIDAE: White Eyes.</b>				
70.	Oriental White Eye	<i>Zosterops palpebrosus</i>	R	UC
<b>Order: CICONIFORMES</b>				
<b>Family: ARDEIDAE: Herons, Egrets, Bitterns.</b>				
71.	Cattle Egret	<i>Bubulcus ibis</i>	R	A
72.	Great Egret	<i>Casmerodius albus</i>	R	C
73.	Intermediate egret	<i>Mesophoyx intermedia</i>	R	C
74.	Little Egret	<i>Egretta garzetta</i>	R	C
75.	Indian Pond Heron	<i>Ardeola grayi</i>	R	C
76.	Purple Heron	<i>Ardea purpurea</i>	WM R	R
77.	Black crowned Night Heron	<i>Nycticorax nycticorax</i>	LM	UC
<b>Family: CICONIIDAE: Storks</b>				
78.	Black Strok	<i>Copsychus saularis</i>	WM	R
79.	White Strok	<i>Orthotomous sutoris</i>	WM	R
<b>Order: FALCONIFORMES</b>				
<b>Family: ACCIPITRIDAE: Hawks, Vultures</b>				
80.	Black- Shouldered Kite	<i>Elanus caeruleus</i>	R	UC
81.	Shikra	<i>Accipiter badius</i>	R	C
82.	Himalayan Griffon	<i>Gyps himalayensis</i>	R	C
83.	Crested Serpent Eagle	<i>Spilornis cheela</i>	R	C
84.	Short Toed-Snake Eagle	<i>Circaetus gallicus</i>	LM	UC
85.	Egyptian Vulture	<i>Ardeola grayii</i>	LM	UC

86.	Lesser Spotted Eagle	<i>Aquila rapax</i>	R	C
87.	Brahminy Kite	<i>Haliastur Indus</i>	R	C
<b>Family: THRESKIORNITHIDAE: Ibis</b>				
88.	Black Headed Ibis	<i>Ardea purpurea</i>	WM	R
<b>Family: CAMPEPHAGIDAE: Minivets.</b>				
89.	Small Minivet	<i>Pericrocotus Cinnamomomeus</i>	LM	UC
<b>Family: FRINGILLIDAE: Finches.</b>				
90.	Common Rose Finch	<i>Clamator jacobinus</i>	R	A
<b>Order: PSITTACIFORMES Family: PSITTACIDAE: Parrots.</b>				
91.	Rose-ringed Parakeet	<i>Psittacula krameri</i>	R	A
92.	Plum-headed Parakeet	<i>Psittacula cyanocephala</i>	R	C
93.	Alexandrine Parakeet	<i>Psittacula eupatri</i>	R	C
<b>Order: CUCULIFORMES Family: CUCULIDAE: Cuckoos.</b>				
94.	Asian Koel (♂♀)	<i>Eudynamys scolopacea</i>	R	A
95.	Greater Coucal	<i>Centropus sinensis</i>	R	C
96.	Lesser Coucal		R	A
97.	Pied Cuckoo	<i>Clamator jacobinus</i>	R	C
98.	Indian Cuckoo	<i>Cuculus micropterus</i>	R	C
99.	Chestnut Winged Cuckoo	<i>Clamator coromandus</i>	R	UC
100.	Common Hawk Cuckoo	<i>Hierococcyx varius</i>	R	C
<b>Order: APODIFORMES Family: APODIDAE: Swifts.</b>				
101.	House Swift	<i>Apus affinis</i>	R	C
102.	Common Swift	<i>Apus apus</i>	R	A
<b>Order: UPUPIFORMES Family: UPUPIIDAE: Hoppoes.</b>				
103.	Hoopoe	<i>Upupa epos</i>	R	A

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<b>Order: BUCEROTIFORMES</b> <b>Family: BUCEROTIDAE: Hornbills</b>				
104.	Indian Grey Hornbill	<i>Ocyrceros birostris</i>	R	A
<b>Order: CHARADRIIFORMES</b> <b>Family: RECURVIROSTRIDAE: Stilts, Avocets.</b>				
105.	Black-winged Stilt	<i>Himantopus himantopus</i>	LM	UC
<b>Family: CHARADRIDAE: Plovers, Curlew.</b>				
106.	Red-Wattled Lapwing	<i>Vanellus indicus</i>	R	A
107.	Common Sandpiper	<i>Actitis hypoleucos</i>	LM	UC
108.	Marsh Sandpiper	<i>Tringa stagnatilis</i>	R	UC
109.	Yellow-Wattled Lapwing	<i>Vanellus malabaricus</i>	LM	C
110.	Common Greenshank	<i>Tringa nebularia</i>	LM	UC
<b>Order: COLUMBIFORMES</b> <b>Family: COLUMBIDAE: Pigeons, Doves.</b>				
111.	Rock Pigeon	<i>Columba livia</i>	R	A
112.	Spotted Dove	<i>Streptopelia chinensis</i>	R	C
113.	Red Collared Dove	<i>Streptopelia tranquebarica</i>	R	C
114.	Oriental Turtle Dove	<i>Streptopelia orintalis</i>	LM	UC
115.	Hill Pigeon	<i>Columba rupestris</i>	R	A
116.	Eurasian Collared Dove	<i>Streptopelia decaocto</i>	LM	UC
<b>Order: CORACIIFORMES</b> <b>Family: ALCEDINIDAE: Kingfishers.</b>				
117.	White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	R	A
118.	Common Kingfisher	<i>Alcedo atthis</i>	LM	C
119.	Pied Kingfisher	<i>Ceryle rudis</i>	WM	R
120.	Strok Billed Kingfisher	<i>Halcyon capensis</i>	R	R
121.	Blue-eared Kingfisher	<i>Alcedo meninting</i>	WM	UC
<b>Family: MEROPIDAE: Bee-eaters.</b>				

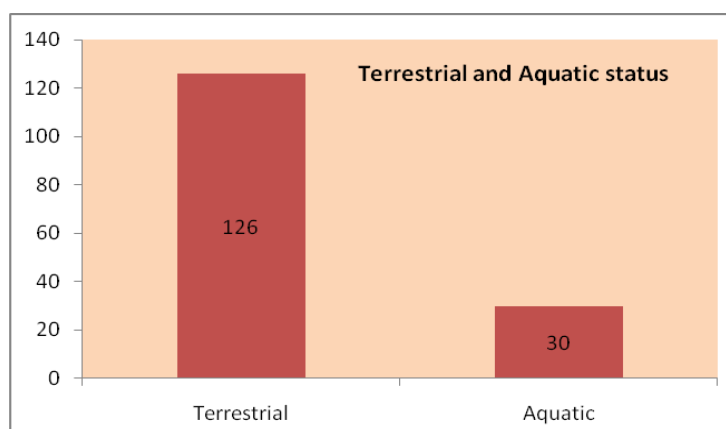
122.	Green Bee-eater	<i>Merops orientalis</i>	R	A
123.	Blue Cheeked Bee Eater	<i>Merops persicus</i>	LM	C
<b>Family: CORACIIDAE: Rollers.</b>				
124.	Indian Roller	<i>Coracias benghalensis</i>	R	C
<b>Order: PICIFORMES</b>				
<b>Family: CAPITONIDAE: Barbets.</b>				
125.	Brown-headed Barbet	<i>Megalaima zeylanica</i>	R	A
126.	Coppersmith Barbet	<i>Megalaima haemacephala</i>	R	A
127.	Blue Throated Barbet	<i>Megalaima asiatica</i>	LM	C
<b>Family: PICIDAE: Woodpeckers.</b>				
128.	Rufous Woodpecker	<i>Celeus brachyurus</i>	R	C
129.	Pale Headed Woodpecker	<i>Gecinulus Grantia</i>	LM	C
130.	Yellow Crowned Woodpecker	<i>Dendrocopos mahrattensis</i>	R	C
131.	Black Rumped Flameback	<i>Dinopium benghalense</i>	R	C
132.	Greater Yellow nape	<i>Picus flavinucha</i>	R	C
<b>Order: STRIGIFORMES</b>				
<b>Family: STRIGIDAE: Owlets.</b>				
133.	Spotted Owlet	<i>Athene brama</i>	R	A
<b>Order: GRUIFORMES</b>				
<b>Family: RALLIDAE: Rails, Coots.</b>				
134.	Common Moorhen	<i>Gallinula chloropus</i>	R	A
135.	White-breasted Water hen	<i>Amaurornis phoenicurus</i>	R	A
136.	Common Coot	<i>Fulica atra</i>	WM	UC
<b>Order: PELECONIFORMES</b>				
<b>Family: PHALACROCORACIDAE: Cormorants, Darter.</b>				
137.	Great cormorant	<i>Phalacrocorax carbo</i>	LM	A
138.	Little cormorant	<i>Phalacrocorax niger</i>	LM	UC
139.	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	LM	UC
140.	Darter	<i>Anhinga melanogaster</i>	LM	C
<b>Order: ANSERIFORMES</b>				
<b>Family: ANATIDAE: Ducks, Geese.</b>				
141.	Common Teal	<i>Anas crecca</i>	WM	UC
142.	Spot-billed Duck	<i>Anas poecilorhyncha</i>	WM	UC
143.	Mallard	<i>Anas platyrhynchos</i>	WM	UC



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144.	Common Pochard	<i>Aythya ferina</i>	WM	C
145.	Garganey	<i>Anas querquedula</i>	WM	C
146.	Lesser Whistling Duck	<i>Dendrocygna javanica</i>	WM	C
147.	Northern Pintail	<i>Anas acuta</i>	WM	C
148.	Gadwal	<i>Anas strepera</i>	WM	A
<b>Order: PODICIPEDIFORMES</b>				
<b>Family: PODICIPEDAE: Grebes.</b>				
149.	Little Grebe	<i>Tachybaptus ruficollis</i>	WM	C
<b>Order: GALLIFORMES</b>				
<b>Family: PHASIANIDAE: Pheasants, Quails.</b>				
150.	Grey Francolin	<i>Francolinus francolinus</i>	R	A
151.	Jungle Bush Quail	<i>Perdica asiatica</i>	R	A
152.	Red Jungle Fowl	<i>Gallus gallus</i>	R	C
153.	Indian Peafowl	<i>Pavo cristatus</i>	R	A
154.	Kalij Pheasant	<i>Lophura leucomelanos</i>	R	A
155.	Black Francolin	<i>Francolinus francolinus</i>	LM	R
156.	Rock Bush Quail	<i>Perdica argoondah</i>	R	UC

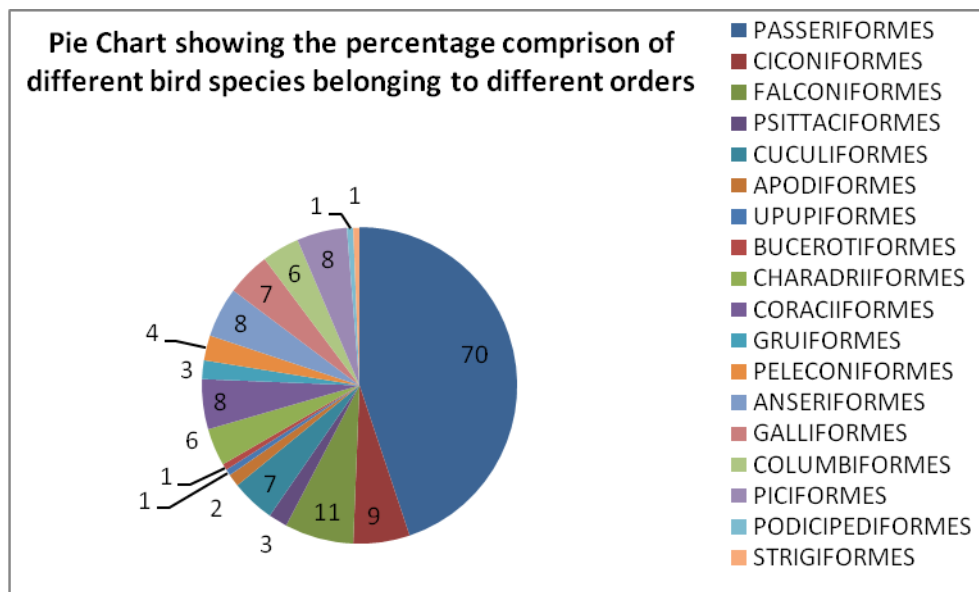
Of these, 126 (80.77%) were terrestrial bird species and 30 (19.23%) were aquatic bird species belonging to 18 orders and 34 families (Fig 1).



**Figure 1.** Bar diagram representing Terrestrial and Aquatic bird species.

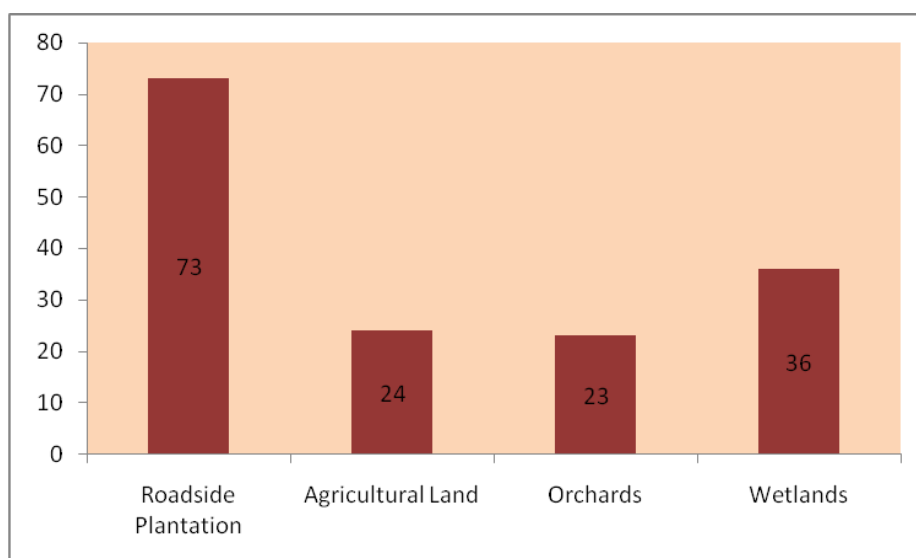
Out of 156 recorded avian species, maximum number of species, i.e., 70(44.87%) belonged to 14 families of order Passeriformes followed by 11 (7.05%) species of the order Falconiformes, 9 (5.77%) species of the order Ciconiformes, 8(5.13%) species each of the order Ansariformes,

Piciformes and Coraciiformes, 7 (4.49%) species each of the order Cuculiformes and Galliformes, 6 (3.85%) species each of order Columbiformes and Charadriiformes, 4 (2.56%) species of the order Peleconiformes, 3 (1.92%) species each of the order Psittaciformes and Gruiformes, 2 (1.28%) species of the order Apodiformes and only 1 (0.64%) species each of the order Upupiformes, Bucerotiformes, Strigiformes and Podicipediformes (Fig. 2).



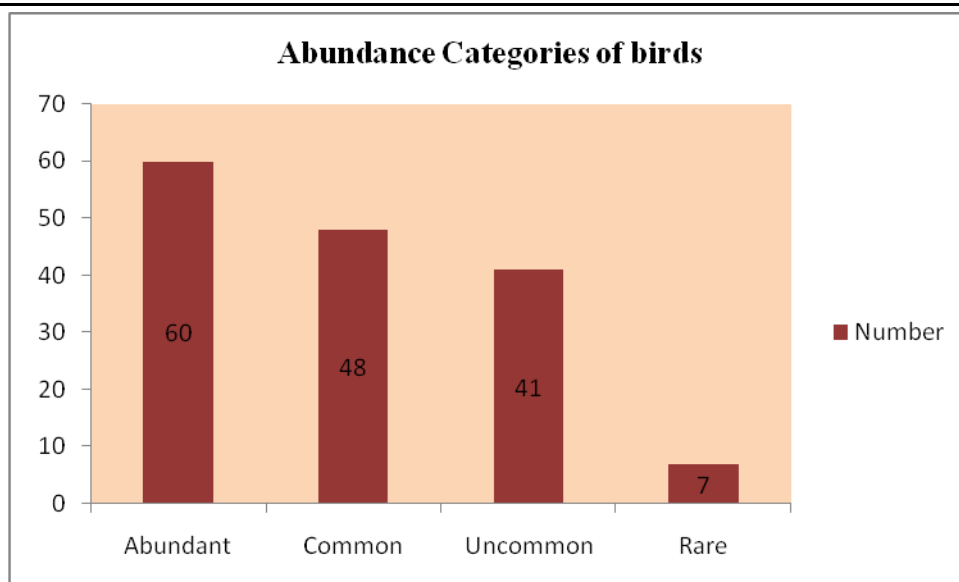
**Figure 2.** Comparison of number and percentage of bird species belonging to different avian orders.

Earlier also, Passeriformes has been a subject of interest for the scientists because of its being the clade of birds. Of the world’s approximately 9600 species of birds, nearly 60% belong to the passerine clade, Passeriformes [19]. Compared with other avian groups of comparative age [20], no other clade has evolved such great species richness and range of ecological diversification as the passerines [21, 22, 23, 24]. Maximum number of bird species, i.e., 73 (46.79%) were recorded from roadside plantation followed by 36 (23.08%) species from wetlands, 24 (15.38%) species from agricultural fields and 23 (14.74%) species from orchards (Fig. 3).



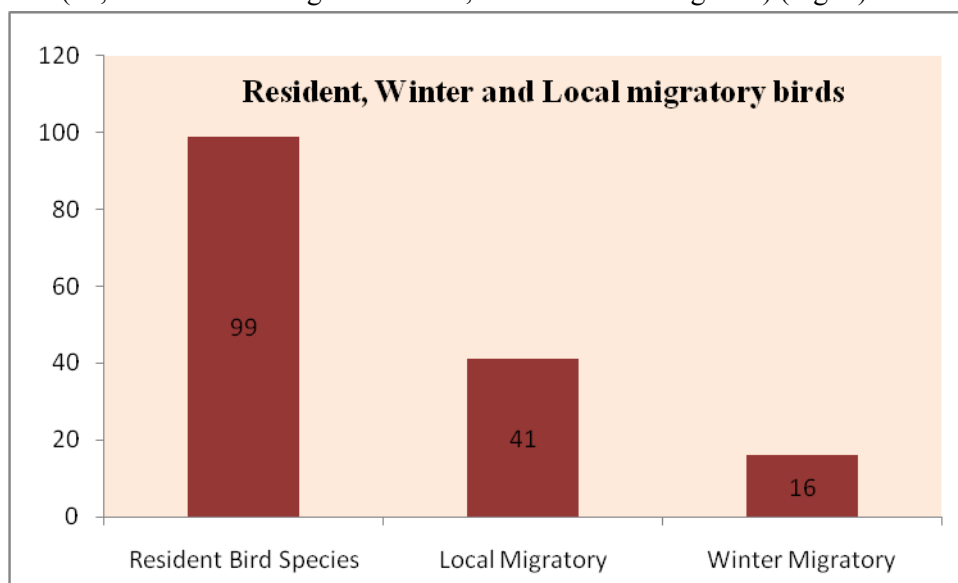
**Figure 3.** Bar diagram representing Habitat Distribution of bird species.

As many as 53 avian species were recorded from more than one type of habitat. Of these 16, bird species were observed in three broader habitats namely roadside plantation, agricultural fields and orchards, 17 species were sighted on roadside plantation and orchards and one species was noticed both in agricultural fields and orchards. Based on frequency of their sighting, 60 (38.46%) bird species were ‘abundant’, 48 (30.77%) species were designated as ‘common’, 41 (26.28%) species as ‘uncommon’ and 7 (4.49%) species as ‘rare’ (Fig.4).



**Figure 4.** Bar diagram representing abundance category of bird species.

Of the total recorded 156 bird species, 99 (63.46%) were ‘resident’ and 57 (36.54%) were ‘migrants’ (41, 71.93% local migrants and 16, 28.07% winter migrants) (Fig. 5).



**Figure 5.** Bar Chart showing the number of resident and migratory bird species in the study sites.

Keeping in mind the above data regarding the avian diversity of lower Shivalik hills, it can be said that the biodiversity of an area is greatly affected by the type of habitat and environmental conditions like altitude, temperature variation, humidity, rainfall etc. that provides favorable living conditions for the living organisms.

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