



AVIAN DIVERSITY OF CHANDIGARH (UT)

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ABSTRACT

Studies on avian diversity of Chandigarh revealed the presence of 239 species of birds belonging to 156 genera, 54 families and 17 orders. Analyses of data on residential status revealed that of the total 239 species of birds, 140 species were either residents or local migrants (including birds with winter and summer influx) and rest 99 were long range migrants to Chandigarh. Out of 140 resident and local migrant birds, 73 (31%) species were local migrants, 34 (14%) were residents, 18 (8%) showed winter influx and 15 (6%) showed summer influx in their populations. Of the long range migrants, 77 (32%) species were winter visitors and 22 (9%) were summer visitors to Chandigarh. Chandigarh supported 95 (40%) common species, 79 (33%) very common, 50 (21%) uncommon and 15 (6%) rare species of birds. A total of 68 species of water birds belonging to 46 genera, 15 families and 6 orders were recorded from Sukhna wetland of Chandigarh. It was further reported that Chandigarh supported 12 threatened species of birds.

KEY WORDS: Avifauna, Residential Status, Relative Abundance, Water Birds, Sukhna Wetland, Chandigarh.

INTRODUCTION

Biodiversity at present is better understood for birds in many respects than any other major group of organisms because they probably inspire more extreme interest in humans, are often spectacular, relatively easily observed and not too cryptic to identify (Bruford 2002). In order to understand the importance of a site for birds, it is necessary to examine its significance in terms of the presence and abundance of species that occur there in different seasons. The status and nature of these species also need to be taken into account. Threat status, breeding status, vulnerability through congregations and the proportion of the total population of each species that occur at the site, are all important factors in determining a site's importance (Heath and Evans 2000).

The Union Territory of Chandigarh is located in the foothills of the Shivalik hill ranges, which form a part of the fragile Himalayan ecosystem. It encompasses an area of 114 sq kms, is situated at 30° 44' N and 76° 47' E and at an altitude of around 365 meters asl. Summer temperature reaches up to 44°C and winter temperature goes down to 1°C. Annual rainfall is around 111.4 cm and most of the rain is recorded during July-September. Chandigarh is a representative of modern architecture and town planning, the city is a creation of the French Architect, Le Corbusier. Chandigarh and the area surrounding it were constituted as a Union Territory on 1 November 1966. It serves as the joint capital of both Punjab and Haryana States. It is bound on North and West by Punjab and on the East and South by Haryana. It is occupied by Kandi (Bhabhar) in the north east and Sirowal (Tarai) and alluvial plains in the remaining part. The subsurface formation comprises of beds of boulders, pebbles, gravel, sand, silt, clays and some kankar. The area is drained by two seasonal rivulets viz. Sukhna Choe in the east and Patiala-Ki-Rao Choe in the west (Chandigarh Administration 2011).

The present study area of Chandigarh is located in the sub-tropical climatic zone. Core of the city is well planned and maintained with good vegetation cover. Leisure Valley, Rajendra park, Bougainvillea Park, Zakir Rose Garden, Shanti Kunj, Hibiscus Garden, Garden of Fragrance, Botanical Garden, Smriti Upavan, Topiary garden and Terraced Garden are some of the famous parks of Chandigarh. In addition, there are some scrub forest patches, wastelands and some seasonal streams in the city proper. There are some agriculture fields on the outskirts of the city. Moreover, Sukhna Lake forms one of the important attraction points for nature lovers. Besides, open waters of the lake, some marshy areas especially on the regulator end and a thick forest of *Acacia* spp. on the western border of it forms an important habitat for a number of water birds visiting the lake. There is a single wildlife sanctuary named Sukhna WLS under the jurisdictions of the Chandigarh administration. Sukhna WLS is situated on a hilly tract supporting scrub forest of *Acacia catechu*, *Acacia nilotica*, *Lantana camara*, *Butea monosperma*, *Lanaea coromandelica*, *Morus alba*, *Delbergia sissoo* etc. Plantations of *Eucalyptus* especially around the streams and low lying areas have replaced the scrub forest. At places a number of check dams constructed to check soil erosion have given rise to marshes.

Despite some extensive studies on birds of different parts of western Himalayas (Theobald, 1862; Whistler, 1925, 1926 a, b & c; Jones 1947 a & b, 1948; Wynter-Blyth, 1951, 1952, 1953; Pandey, 1989; Gaston *et al.*, 1993; Mehta *et al.*, 2002; Mahabal 2005; Kumar *et al.*, 2006; Mattu and Thakur, 2006; Thakur *et al.*, 2006, 2010, 2011), Chandigarh, situated at the base of the western Himalayas has not attracted the attention of field biologists. Therefore, present study was conducted as a part of a

project on faunal wealth of Chandigarh, funded by Chandigarh Administration.

METHODOLOGY

Specific sampling strategies were adopted for studying the avifauna of Chandigarh as the present study area was large enough and the target species were high in numbers (Fig. 1). These strategies were mainly based upon the principle of exploration of a portion of the individuals in the whole population. Thus, stratified random sampling technique

(Snedecore and Cochran 1993) was followed for studying the birds of the area, which involved the division of the present study area of Chandigarh into different strata, based upon habitat type. This technique not only allowed collection of the right type of scientific information but also saved time and yielded the avian data which was very much amenable for analysis for the better presentation of results.

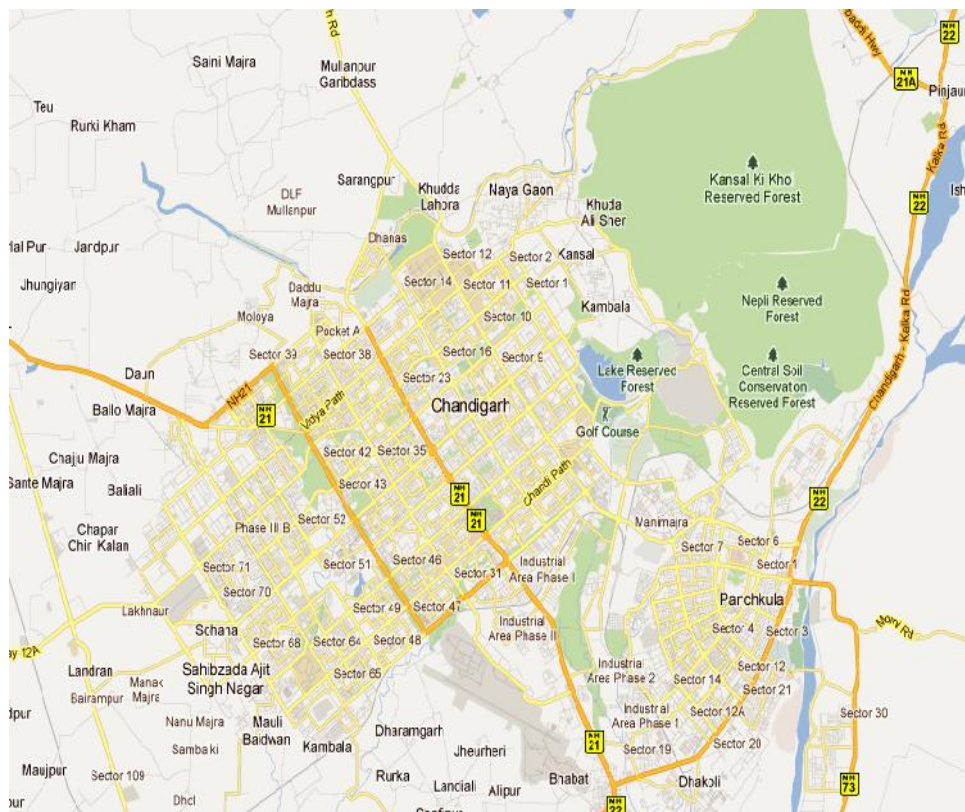


FIGURE 1: Map of Chandigarh showing different areas explored for Avifauna (Source: <http://maps.google.co.in/maps?hl=en&q=Chandigarh&gbv>)

Various habitat types like forests, grasslands, streams, human settlements etc., spread over different parts of Chandigarh were selected for the present studies. These investigations were conducted during different seasons of the years 2000-2003. The other most important aspect kept in consideration was the activity of birds. Since the peak activity in most birds lasts for 1 or 2 hours after sunrise or before sunset, so recording of birds was done either in early morning or late evening hours as also used by Thakur *et al.* (2002).

Birds were observed with aid of 10 x 50 super Zenith field binoculars and 1000 mm tele lens of Questar make especially for water birds. Field identifications were carried out with the help of various field guides (Ali and Ripley 1983; Grimmett *et al.*, 1999; Kazmierczak 2000). The nomenclature followed here is after Manakadan and Pittie (2001).

The data recorded in each survey from different habitat types of Chandigarh was kept separate and analysed for relative abundance on the basis of frequency of sightings

(McKinnon and Philips 1993). Based upon these, different categories assigned were: Very Common (recorded > 50 % times), Common (between 25-49 % times), Uncommon (24 % times) and Rare (recorded once or twice). The relative frequency scale was fixed in such a way so as to include the migrant species sighted seasonally in good numbers (which visited the area for a brief period of time) to their respective category. Residential status of the birds has been worked out and different categories like resident, winter visitor, summer visitor etc., have been assigned strictly with reference to the study area on the basis of presence or absence method (Thakur *et al.* 2002, 2010). The birds that showed irregular trend of sighting and population fluctuations (non-seasonal) in Chandigarh have been placed under resident with local movements (R/LM) category.

RESULTS AND DISCUSSION

Diversity and Status

Studies on diversity of avifauna of Chandigarh revealed the presence of 239 species of birds belonging to 156 genera, 54 families and 17 orders. Familywise analyses of the data showed that family Muscicapidae-the largest family of birds in India, dominated the diversity with 47 species, followed by Anatidae (20), Accipitridae (19), Scolopacidae (9), Ardidae, Columbidae and Motacillidae (8 each), Charadriidae (7), and Phasianidae, Cuculidae and

Sturnidae (6 species each). However, families like Anhingidae, Threskiornithidae, Pandionidae, Jacanidae, Glareolidae, Caprimulgidae, Apodidae, Coraciidae, Upupidae, Bucerotidae, Pittidae, Irenidae, Paridae, Sittidae, Certhiidae, Zosteropidae, Fringillidae and Oriolidae were least represented with a single species each in the study area (Table).

TABLE 1: Systematic list of birds of Chandigarh (UT)

S. No	Taxon	Res. St.	Rel. Abd.
I. Order: Podicipediformes			
1. Family: Podicipedidae			
1.	Little Grebe <i>Tachybaptus ruficollis</i> (Pallas, 1764)	R/WV	C
2.	Great Crested Grebe <i>Podiceps cristatus</i> (Linnaeus, 1758)	WV	C
II. Order: Pelecaniformes			
2. Family: Phalacrocoracidae			
3.	Little Cormorant <i>Phalacrocorax niger</i> (Vieillot, 1817)	R/WV	C
4.	Great Cormorant <i>Phalacrocorax carbo</i> (Linnaeus, 1758)	R/WV	C
3. Family: Anhingidae			
5.	Darter <i>Anhinga melanogaster</i> Pennant, 1769	(NT) R/LM	Ra
III. Order: Ciconiiformes			
4. Family: Ardidae			
6.	Little Egret <i>Egretta garzetta</i> (Linnaeus, 1766)	R	VC
7.	Grey Heron <i>Ardea cinerea</i> Linnaeus, 1758	WV	UC
8.	Purple Heron <i>Ardea purpurea</i> Linnaeus, 1766	R/LM	UC
9.	Large Egret <i>Casmerodius albus</i> (Linnaeus, 1758)	R/WV	C
10.	Median Egret <i>Mesophoyx intermedia</i> (Wagler, 1829)	R/LM	C
11.	Cattle Egret <i>Bubulcus ibis</i> (Linnaeus, 1758)	R/LM	VC
12.	Indian Pond-Heron <i>Ardeola grayii</i> (Sykes, 1832)	R/LM	VC
13.	Black-crowned Night-Heron <i>Nycticorax nycticorax</i> (Linnaeus, 1758)	R/LM	C
5. Family: Ciconiidae			
14.	Painted Stork <i>Mycteria leucocephala</i> (Pennant, 1769)	(NT) R/LM	Ra
15.	Asian Openbill-Stork <i>Anastomus oscitans</i> (Boddaert, 1783)	R/SV	UC
16.	European White Stork <i>Ciconia ciconia</i> (Linnaeus, 1758)	R/LM	Ra
6. Family: Threskiornithidae			
17.	Eurasian Spoonbill <i>Platalea leucorodia</i> Linnaeus, 1758	R/LM	Ra
IV. Order: Anseriformes			
7. Family: Anatidae			
18.	Lesser Whistling-Duck <i>Dendrocygna javanica</i> (Horsfield, 1821)	SV	C
19.	Greylag Goose <i>Anser anser</i> (Linnaeus, 1758)	WV	UC
20.	Bar-headed Goose <i>Anser indicus</i> (Latham, 1790)	WV	C
21.	Brahminy Shelduck <i>Tadorna ferruginea</i> (Pallas, 1764)	WV	C
22.	Common Shelduck <i>Tadorna tadorna</i> (Linnaeus, 1758)	WV	Ra
23.	Comb Duck <i>Sarkidiornis melanotos</i> (Pennant, 1769)	SV	C
24.	Cotton Teal <i>Nettapus coromandelianus</i> (Gmelin, 1789)	WV	Ra
25.	Gadwall <i>Anas strepera</i> Linnaeus, 1758	WV	C
26.	Eurasian Wigeon <i>Anas penelope</i> Linnaeus, 1758	WV	VC
27.	Mallard <i>Anas platyrhynchos</i> Linnaeus, 1758	WV	VC
28.	Spot-billed Duck <i>Anas poecilorhyncha</i> J.R. Forester, 1781	R/LM	VC
29.	Northern Shoveller <i>Anas clypeata</i> Linnaeus, 1758	WV	C
30.	Northern Pintail <i>Anas acuta</i> Linnaeus, 1758	WV	VC
31.	Garganey <i>Anas querquedula</i> Linnaeus, 1758	WV	C
32.	Common Teal <i>Anas crecca</i> Linnaeus, 1758	WV	VC
33.	Red-crested Pochard <i>Rhodonessa rufina</i> (Pallas, 1773)	WV	C
34.	Common Pochard <i>Aythya ferina</i> (Linnaeus, 1758)	WV	VC
35.	Ferruginous Pochard <i>Aythya nyroca</i> (Guldenstadt, 1770)	(NT) WV	UC

Avian diversity of Chandigarh

36.	Tufted Pochard <i>Aythya fuligula</i> (Linnaeus, 1758)	WV	UC
37.	Common Merganser <i>Mergus merganser</i> Linnaeus, 1758	WV	UC
V. Order: Falconiformes			
8. Family: Accipitridae			
38.	Oriental Honey-Buzzard <i>Pernis ptilorhynchus</i> (Temminck, 1821)	R/LM	UC
39.	Black-shouldered Kite <i>Elanus caeruleus</i> (Desfontaines, 1789)	R/LM	VC
40.	Black Kite <i>Milvus migrans</i> (Boddaert, 1783)	R	VC
41.	Pallas's Fish-Eagle <i>Haliaeetus leucoryphus</i> (Pallas, 1771)	(VU) R/LM	Ra
42.	Egyptian Vulture <i>Neophron percnopterus</i> (Linnaeus, 1758)	(EN) R/LM	VC
43.	Indian White-backed Vulture <i>Gyps bengalensis</i> (Gmelin, 1788)	(CR) R/LM	Ra
44.	Slender-billed Vulture <i>Gyps tenuirostris</i> (G.R. Gray, 1844)	(CR) R/LM	Ra
45.	Eurasian Griffon <i>Gyps fulvus</i> (Hablizl, 1783)	WV	UC
46.	Cinereous Vulture <i>Aegypius monachus</i> (Linnaeus, 1766)	(NT) WV	UC
47.	Red-headed Vulture <i>Sarcogyps calvus</i> (Scopoli, 1786)	(CR) R	UC
48.	Short-toed Snake-Eagle <i>Circaetus gallicus</i> (Gmelin, 1788)	R/LM	UC
49.	Crested Serpent-Eagle <i>Spilornis cheela</i> (Latham, 1790)	R	C
50.	Western Marsh-Harrier <i>Circus aeruginosus</i> (Linnaeus, 1758)	WV	UC
51.	Shikra <i>Accipiter badius</i> (Gmelin, 1788)	R	C
52.	Eurasian Sparrowhawk <i>Accipiter nisus</i> (Linnaeus, 1758)	R/LM	UC
53.	Tawny Eagle <i>Aquila rapax</i> (Temminck, 1828)	R/LM	C
54.	Steppe Eagle <i>Aquila nipalensis</i> Hodgson, 1833	WV	UC
55.	Bonelli's Eagle <i>Hieraaetus fasciatus</i> (Vieillot, 1822)	R/LM	UC
56.	Booted Eagle <i>Hieraaetus pennatus</i> (Gmelin, 1788)	WV	UC
9. Family: Pandionidae			
57.	Osprey <i>Pandion haliaetus</i> (Linnaeus, 1758)	WV	C
10. Family: Falconidae			
58.	Common Kestrel <i>Falco tinnunculus</i> Linnaeus, 1758	WV	C
59.	Laggar <i>Falco jugger</i> J.E. Gray, 1834	(NT) R/LM	UC
VI. Order: Galliformes			
11. Family: Phasianidae			
60.	Black Francolin <i>Francolinus francolinus</i> (Linnaeus, 1766)	R	C
61.	Grey Francolin <i>Francolinus pondicerianus</i> (Gmelin, 1789)	R	VC
62.	Common Quail <i>Coturnix coturnix</i> (Linnaeus, 1758)	WV	C
63.	Jungle Bush-Quail <i>Perdica asiatica</i> (Latham, 1790)	R	C
64.	Red Junglefowl <i>Gallus gallus</i> (Linnaeus, 1758)	R	VC
65.	Indian Peafowl <i>Pavo cristatus</i> Linnaeus, 1758	R/LM	VC
VII. Order: Gruiformes			
12. Family: Rallidae			
66.	White-breasted Waterhen <i>Amaurornis phoenicurus</i> (Pennant, 1769)	R/WV	VC
67.	Purple Moorhen <i>Porphyrio porphyrio</i> (Linnaeus, 1758)	R/LM	C
68.	Common Moorhen <i>Gallinula chloropus</i> (Linnaeus, 1758)	R/WV	VC
69.	Common Coot <i>Fulica atra</i> Linnaeus, 1758	WV	VC
VIII. Order: Charadriiformes			
13. Family : Jacanidae			
70.	Pheasant-tailed Jacana <i>Hydrophasianus chirurgus</i> (Scopoli, 1786)	SV	C
14. Family : Charadriidae			
71.	Little Ringed Plover <i>Charadrius dubius</i> Scopoli, 1786	R/WV	C
72.	Kentish Plover <i>Charadrius alexandrinus</i> Linnaeus, 1758	WV	UC
73.	Northern Lapwing <i>Vanellus vanellus</i> (Linnaeus, 1758)	WV	C
74.	Yellow-wattled Lapwing <i>Vanellus malabaricus</i> (Boddaert, 1783)	SV	UC
75.	River Lapwing <i>Vanellus duvaucelii</i> (Lesson, 1826)	R/WV	C
76.	Red-wattled Lapwing <i>Vanellus indicus</i> (Boddaert, 1783)	R/LM	VC
77.	White-tailed Lapwing <i>Vanellus leucurus</i> (Lichtenstein, 1823)	WV	Ra
15. Family: Scolopacidae			
78.	Common Snipe <i>Gallinago gallinago</i> (Linnaeus, 1758)	WV	Ra
79.	Black-tailed Godwit <i>Limosa limosa</i> (Linnaeus, 1758)	(NT) WV	Ra

80.	Spotted Redshank <i>Tringa erythropus</i> (Pallas, 1764)	WV	Ra
81.	Common Redshank <i>Tringa totanus</i> (Linnaeus, 1758)	WV	UC
82.	Marsh Sandpiper <i>Tringa stagnatilis</i> (Bechstein, 1803)	WV	UC
83.	Common Greenshank <i>Tringa nebularia</i> (Gunner, 1767)	WV	UC
84.	Wood Sandpiper <i>Tringa glareola</i> Linnaeus, 1758	WV	UC
85.	Common Sandpiper <i>Actitis hypoleucos</i> Linnaeus, 1758	WV	C
86.	Temminck's Stint <i>Calidris temminckii</i> (Leisler, 1812)	WV	C
16. Family: Recurvirostridae			
87.	Black-winged Stilt <i>Himantopus himantopus</i> (Linnaeus, 1758)	R/SV	VC
88.	Pied Avocet <i>Recurvirostra avosetta</i> Linnaeus, 1758	WV	Ra
17. Family: Burhinidae			
89.	Stone-Curlew <i>Burhinus oedicnemus</i> (Linnaeus, 1758)	R/LM	UC
90.	Great Stone-Plover <i>Esacus recurvirostris</i> (Cuvier, 1829)	R/SV	C
18. Family: Glareolidae			
91.	Small Pratincole <i>Glareola lactea</i> Temminck, 1820	SV	C
19. Family: Laridae			
92.	Brown-headed Gull <i>Larus brunnicephalus</i> Jerdon, 1840	WV	C
93.	Gull-billed Tern <i>Gelochelidon nilotica</i> (Gmelin, 1789)	WV	UC
94.	River Tern <i>Sterna aurantia</i> J.E. Gray, 1831	R/WV	C
95.	Black-bellied Tern <i>Sterna acuticauda</i> J.E. Gray, 1831	(NT) R/WV	C
96.	Whiskered Tern <i>Chlidonias hybridus</i> (Pallas, 1811)	WV	UC
IX. Order: Columbiformes			
20. Family: Columbidae			
97.	Blue Rock Pigeon <i>Columba livia</i> Gmelin, 1789	R/LM	VC
98.	Oriental Turtle-Dove <i>Streptopelia orientalis</i> (Latham, 1790)	R/WV	C
99.	Little Brown Dove <i>Streptopelia senegalensis</i> (Linnaeus, 1766)	R/LM	VC
100.	Spotted Dove <i>Streptopelia chinensis</i> (Scopoli, 1786)	R/LM	VC
101.	Red Collared-Dove <i>Streptopelia tranquebarica</i> (Hermann, 1804)	SV	C
102.	Eurasian Collared-Dove <i>Streptopelia decaocto</i> (Frivaldszky, 1838)	R/LM	VC
103.	Emerald Dove <i>Chalcophaps indica</i> (Linnaeus, 1758)	R/LM	UC
104.	Yellow-legged Green-Pigeon <i>Treron phoenicoptera</i> (Latham, 1790)	R/LM	C
X. Order: Psittaciformes			
21. Family: Psittacidae			
105.	Alexandrine Parakeet <i>Psittacula eupatria</i> (Linnaeus, 1766)	R/LM	VC
106.	Rose-ringed Parakeet <i>Psittacula krameri</i> (Scopoli, 1769)	R/LM	VC
107.	Slaty-headed Parakeet <i>Psittacula himalayana</i> (Lesson, 1832)	R/LM	C
108.	Plum-headed Parakeet <i>Psittacula cyanocephala</i> (Linnaeus, 1766)	R/LM	VC
XI. Order: Cuculiformes			
22. Family: Cuculidae			
109.	Pied Crested Cuckoo <i>Clamator jacobinus</i> (Boddaert, 1783)	SV	C
110.	Brainfever Bird <i>Hierococcyx varius</i> (Vahl, 1797)	R/SV	VC
111.	Indian Cuckoo <i>Cuculus micropterus</i> Gould, 1838	R/SV	VC
112.	Common Cuckoo <i>Cuculus canorus</i> Linnaeus, 1758	SV	VC
113.	Asian Koel <i>Eudynamys scolopacea</i> (Linnaeus, 1758)	R/LM	VC
114.	Greater Coucal <i>Centropus sinensis</i> (Stephens, 1815)	R	C
XII. Order: Strigiformes			
23. Family: Strigidae			
115.	Jungle Owlet <i>Glaucidium radiatum</i> (Tickell, 1833)	R	C
116.	Spotted Owlet <i>Athene brama</i> (Temminck, 1821)	R	C
XIII. Order: Caprimulgiformes			
24. Family: Caprimulgidae			
117.	Common Indian Nightjar <i>Caprimulgus asiaticus</i> Latham, 1790	R/SV	C
XIV. Order: Apodiformes			
25. Family: Apodidae			
118.	House Swift <i>Apus affinis</i> (J.E. Gray, 1830)	R/LM	C
XV. Order: Coraciiformes			

26. Family: Alcedinidae			
119.	Small Blue Kingfisher <i>Alcedo atthis</i> (Linnaeus, 1758)	R/LM	C
120.	White-breasted Kingfisher <i>Halcyon smyrnensis</i> (Linnaeus, 1758)	R/LM	VC
121.	Lesser Pied Kingfisher <i>Ceryle rudis</i> (Linnaeus, 1758)	R	C
27. Family: Meropidae			
122.	Blue-bearded Bee-eater <i>Nyctyornis athertoni</i> (Jardine & Selby, 1828)	R	Ra
123.	Small Bee-eater <i>Merops orientalis</i> Latham, 1801	SV	VC
124.	Blue-tailed Bee-eater <i>Merops philippinus</i> Linnaeus, 1766	SV	C
28. Family: Coraciidae			
125.	Indian Roller <i>Coracias benghalensis</i> (Linnaeus, 1758)	R/SV	VC
29. Family: Upupidae			
126.	Common Hoopoe <i>Upupa epops</i> Linnaeus, 1758	R/WV	VC
30. Family: Bucerotidae			
127.	Indian Grey Hornbill <i>Ocyrceros birostris</i> (Scopoli, 1786)	R/LM	VC
XVI. Order: Piciformes			
31. Family: Capitonidae			
128.	Great Barbet <i>Megalaima virens</i> (Boddaert, 1783)	WV	UC
129.	Brown-headed Barbet <i>Megalaima zeylanica</i> (Gmelin, 1788)	R/LM	VC
130.	Coppersmith Barbet <i>Megalaima haemacephala</i> (P.L.S. Müller, 1776)	R/SV	VC
32. Family: Picidae			
131.	Eurasian Wryneck <i>Jynx torquilla</i> Linnaeus, 1758	WV	C
132.	Grey-capped Pygmy Woodpecker <i>Dendrocopos canicapillus</i> (Blyth, 1845)	R	C
133.	Fulvous-breasted Pied Woodpecker <i>Dendrocopos macei</i> (Vieillot, 1818)	R	C
134.	Yellow-fronted Pied Woodpecker <i>Dendrocopos mahrattensis</i> (Latham, 1801)	R	C
135.	Lesser Golden-backed Woodpecker <i>Dinopium benghalense</i> (Linnaeus, 1758)	R	VC
XVII. Order: Passeriformes			
33. Family: Pittidae			
136.	Indian Pitta <i>Pitta brachyura</i> (Linnaeus, 1766)	SV	UC
34. Family: Alaudidae			
137.	Singing Bush-Lark <i>Mirafra cantillans</i> Blyth, 1845	R/LM	UC
138.	Ashy-crowned Sparrow-Lark <i>Eremopterix grisea</i> (Scopoli, 1786)	R/LM	UC
139.	Indian Short-toed Lark <i>Calandrella raytal</i> (Blyth, 1845)	R/LM	C
140.	Common Crested Lark <i>Galerida cristata</i> (Linnaeus, 1758)	R/SV	VC
141.	Eurasian Skylark <i>Alauda arvensis</i> Linnaeus, 1758	WV	C
35. Family: Hirundinidae			
142.	Pale Martin <i>Riparia diluta</i> (Sharpe & Wyatt, 1893)	WV	UC
143.	Common Swallow <i>Hirundo rustica</i> Linnaeus, 1758	WV	VC
144.	Wire-tailed Swallow <i>Hirundo smithii</i> Leach, 1818	SV	VC
145.	Red-rumped Swallow <i>Hirundo daurica</i> Linnaeus, 1771	R/WV	C
146.	Streak-throated Swallow <i>Hirundo fluvicola</i> Blyth, 1855	R/LM	UC
36. Family: Motacillidae			
147.	White Wagtail <i>Motacilla alba</i> Linnaeus, 1758	WV	C
148.	Large Pied Wagtail <i>Motacilla maderaspatensis</i> Gmelin, 1789	R/LM	VC
149.	Citrine Wagtail <i>Motacilla citreola</i> Pallas, 1776	WV	C
150.	Yellow Wagtail <i>Motacilla flava</i> Linnaeus, 1758	WV	C
151.	Grey Wagtail <i>Motacilla cinerea</i> Tunstall, 1771	R/WV	VC
152.	Paddyfield Pipit <i>Anthus rufulus</i> Vieillot, 1818	R/WV	C
153.	Eurasian Tree Pipit <i>Anthus trivialis</i> (Linnaeus, 1758)	WV	C
154.	Oriental Tree Pipit <i>Anthus hodgsoni</i> Richmond, 1907	WV	C
37. Family: Campephagidae			
155.	Small Minivet <i>Pericrocotus cinnamomeus</i> (Linnaeus, 1766)	R/LM	VC
156.	Long-tailed Minivet <i>Pericrocotus ethologus</i> Bangs & Phillips, 1914	WV	UC
157.	Common Woodshrike <i>Tephrodornis pondicerianus</i> (Gmelin, 1789)	R	UC
38. Family: Pycnonotidae			

158.	Himalayan Bulbul <i>Pycnonotus leucogenys</i> (Gray, 1835)	R/LM	VC
159.	Red-vented Bulbul <i>Pycnonotus cafer</i> (Linnaeus, 1766)	R/LM	VC
	39. Family: Irenidae		
160.	Common Iora <i>Aegithina tiphia</i> (Linnaeus, 1758)	R/SV	VC
	40. Family: Laniidae		
161.	Bay-backed Shrike <i>Lanius vittatus</i> Valenciennes, 1826	SV	C
162.	Rufous-backed Shrike <i>Lanius schach</i> Linnaeus, 1758	R/LM	VC
	41. Family: Muscipidae		
	Sub-Family: Turdinae		
163.	Blue Rock-Thrush <i>Monticola solitarius</i> (Linnaeus, 1758)	WV	C
164.	Blue Whistling-Thrush <i>Myiophonus caeruleus</i> (Scopoli, 1786)	WV	C
165.	Orange-headed Thrush <i>Zoothera citrina</i> (Latham, 1790)	SV	UC
166.	Tickell's Thrush <i>Turdus unicolor</i> Tickell, 1833	SV	UC
167.	Grey-winged Blackbird <i>Turdus boulboul</i> (Latham, 1790)	WV	UC
168.	Dark-throated Thrush <i>Turdus ruficollis</i> Pallas, 1776	WV	VC
169.	Himalayan Rubythroat <i>Luscinia pectoralis</i> (Gould, 1837)	WV	UC
170.	Bluethroat <i>Luscinia svecica</i> (Linnaeus, 1758)	WV	C
171.	Oriental Magpie-Robin <i>Copsychus saularis</i> (Linnaeus, 1758)	R/SV	VC
172.	Indian Robin <i>Saxicoloides fulicata</i> (Linnaeus, 1776)	R/LM	VC
173.	Black Redstart <i>Phoenicurus ochruros</i> (Gmelin, 1774)	WV	VC
174.	White-capped Redstart <i>Chaimarrornis leucocephalus</i> (Vigors, 1831)	WV	C
175.	Common Stonechat <i>Saxicola torquata</i> (Linnaeus, 1766)	R/LM	VC
176.	White-tailed Stonechat <i>Saxicola leucura</i> (Blyth, 1847)	R	UC
177.	Pied Bushchat <i>Saxicola caprata</i> (Linnaeus, 1766)	R/SV	VC
178.	Grey Bushchat <i>Saxicola ferrea</i> Gray, 1846	WV	VC
179.	Variable Wheatear <i>Oenanthe picata</i> (Blyth, 1847)	WV	UC
180.	Indian Chat <i>Cercomela fusca</i> (Blyth, 1851)	R	C
	Sub-Family: Timaliinae		
181.	Spotted Babbler <i>Pellorneum ruficeps</i> Swainson, 1832	R	C
182.	Black-chinned Babbler <i>Stachyris pyrrhops</i> Blyth, 1844	R/LM	C
183.	Yellow-eyed Babbler <i>Chrysomma sinense</i> (Gmelin, 1789)	R	C
184.	Common Babbler <i>Turdoides caudatus</i> (Dumont, 1823)	R/LM	C
185.	Striated Babbler <i>Turdoides earlei</i> (Blyth, 1844)	R	UC
186.	Large Grey Babbler <i>Turdoides malcolmi</i> (Sykes, 1832)	R	C
187.	Jungle Babbler <i>Turdoides striatus</i> (Dumont, 1823)	R	VC
	Sub-Family: Sylviinae		
188.	Franklin's Prinia <i>Prinia hodgsonii</i> Blyth, 1844	R	C
189.	Jungle Prinia <i>Prinia sylvatica</i> Jerdon, 1840	R	VC
190.	Ashy Prinia <i>Prinia socialis</i> Sykes, 1832	R	VC
191.	Plain Prinia <i>Prinia inornata</i> Sykes, 1832	R	VC
192.	Pale Grasshopper-Warbler <i>Locustella naevia</i> (Boddaert, 1783)	WV	UC
193.	Common Tailorbird <i>Orthotomus sutorius</i> (Pennant, 1769)	R/SV	VC
194.	Common Chiffchaff <i>Phylloscopus collybita</i> (Vieillot, 1817)	WV	VC
195.	Tickell's Warbler <i>Phylloscopus affinis</i> (Tickell, 1833)	WV	C
196.	Gold-spectacled Flycatcher-Warbler <i>Seicercus burkii</i> (Burton, 1836)	WV	UC
197.	Grey-headed Flycatcher-Warbler <i>Seicercus xanthoschistos</i> (G.R. Gray & J.E. Gray, 1846)	R/WV	VC
198.	Striated Marsh-Warbler <i>Megalurus palustris</i> Horsfield, 1821	R/LM	C
199.	Common Lesser Whitethroat <i>Sylvia curruca</i> (Linnaeus, 1758)	WV	VC
	Sub-Family: Muscipinae		
200.	Orange-gorgeted Flycatcher <i>Ficedula strophiatea</i> (Hodgson, 1837)	R/WV	C
201.	Red-throated Flycatcher <i>Ficedula parva</i> (Bechstein, 1792)	WV	C
202.	Slaty-blue Flycatcher <i>Ficedula tricolor</i> (Hodgson, 1845)	SV	C
203.	Verditer Flycatcher <i>Eumyias thalassina</i> (Swainson, 1838)	WV	UC
204.	Rufous-bellied Niltava <i>Niltava sundara</i> (Hodgson, 1837)	SV	C
205.	Grey-headed Flycatcher <i>Culicicapa ceylonensis</i> (Swainson, 1820)	SV	C

	Sub-Family: Monarchinae		
206.	Asian Paradise-Flycatcher <i>Terpsiphone paradisi</i> (Linnaeus, 1758)	SV	C
	Sub-Family: Rhipidurinae		
207.	Yellow-bellied Fantail-Flycatcher <i>Rhipidura hypoxantha</i> Blyth, 1843	WV	C
208.	White-throated Fantail-Flycatcher <i>Rhipidura albicollis</i> (Vieillot, 1818)	R/LM	VC
209.	White-browed Fantail-Flycatcher <i>Rhipidura aureola</i> Lesson, 1830	R/LM	C
	42. Family: Paridae		
210.	Great Tit <i>Parus major</i> Linnaeus, 1758	R/LM	VC
	43. Family: Sittidae		
211.	Wallcreeper <i>Tichodroma muraria</i> (Linnaeus, 1766)	WV	C
	44. Family: Certhiidae		
212.	Eurasian Tree-Creeper <i>Certhia familiaris</i> Linnaeus, 1758	WV	UC
	45. Family: Nectariniidae		
213.	Purple Sunbird <i>Nectarinia asiatica</i> (Latham, 1790)	SV	VC
214.	Crimson Sunbird <i>Aethopyga siparaja</i> (Raffles, 1822)	R/LM	C
	46. Family: Zosteropidae		
215.	Oriental White-eye <i>Zosterops palpebrosus</i> (Temminck, 1824)	R/LM	VC
	47. Family: Emberizidae		
	Sub-Family: Emberizinae		
216.	Crested Bunting <i>Melophus lathamii</i> (Gray, 1831)	R/SV	VC
217.	Rock Bunting <i>Emberiza cia</i> Linnaeus, 1766	WV	VC
	48. Family: Fringillidae		
218.	Common Rosefinch <i>Carpodacus erythrinus</i> (Pallas, 1770)	R/WV	VC
	49. Family: Estrildidae		
219.	Red Munia <i>Amandava amandava</i> (Linnaeus, 1758)	R/LM	C
220.	White-throated Munia <i>Lonchura malabarica</i> (Linnaeus, 1758)	R/LM	UC
221.	Spotted Munia <i>Lonchura punctulata</i> (Linnaeus, 1758)	R/LM	C
	50. Family: Passeridae		
	Sub-Family: Passerinae		
222.	House Sparrow <i>Passer domesticus</i> (Linnaeus, 1758)	R/LM	C
223.	Eurasian Tree Sparrow <i>Passer montanus</i> (Linnaeus, 1758)	R/LM	C
224.	Yellow-throated Sparrow <i>Petronia xanthocollis</i> (Burton, 1838)	SV	C
	Sub-Family: Ploceinae		
225.	Black-breasted Weaver <i>Ploceus benghalensis</i> (Linnaeus, 1758)	R/LM	UC
226.	Baya Weaver <i>Ploceus philippinus</i> (Linnaeus, 1766)	R/LM	C
	51. Family: Sturnidae		
227.	Brahminy Starling <i>Sturnus pagodarum</i> (Gmelin, 1789)	R/SV	C
228.	Common Starling <i>Sturnus vulgaris</i> Linnaeus, 1758	WV	C
229.	Asian Pied Starling <i>Sturnus contra</i> Linnaeus, 1758	R/LM	C
230.	Common Myna <i>Acridotheres tristis</i> (Linnaeus, 1766)	R	VC
231.	Bank Myna <i>Acridotheres ginginianus</i> (Latham, 1790)	R/LM	VC
232.	Jungle Myna <i>Acridotheres fuscus</i> (Wagler, 1827)	R/LM	VC
	52. Family: Oriolidae		
233.	Eurasian Golden Oriole <i>Oriolus oriolus</i> (Linnaeus, 1758)	SV	VC
	53. Family: Dicruridae		
234.	Black Drongo <i>Dicrurus macrocercus</i> Vieillot, 1817	R	VC
235.	Ashy Drongo <i>Dicrurus leucophaeus</i> Vieillot, 1817	R/LM	UC
236.	Spangled Drongo <i>Dicrurus hottentottus</i> (Linnaeus, 1766)	R/LM	C
	54. Family: Corvidae		
237.	Indian Treepie <i>Dendrocitta vagabunda</i> (Latham, 1790)	R	VC
238.	House Crow <i>Corvus splendens</i> Vieillot, 1817	R	VC
239.	Jungle Crow <i>Corvus macrorhynchos</i> Wagler, 1827	R/LM	VC

Res. St.= residential status, R= Resident, R/LM= Resident with local movements, R/WV= Resident with winter influx, R/SV= Resident with summer influx, WV= Winter visitor, SV= Summer visitor

Rel. Abd.= Relative abundance, VC= Very common, C= Common, UC= Uncommon, Ra= Rare

Threat Categories=CR: Critical, EN: Endangered, VU: Vulnerable, NT: Near Threatened

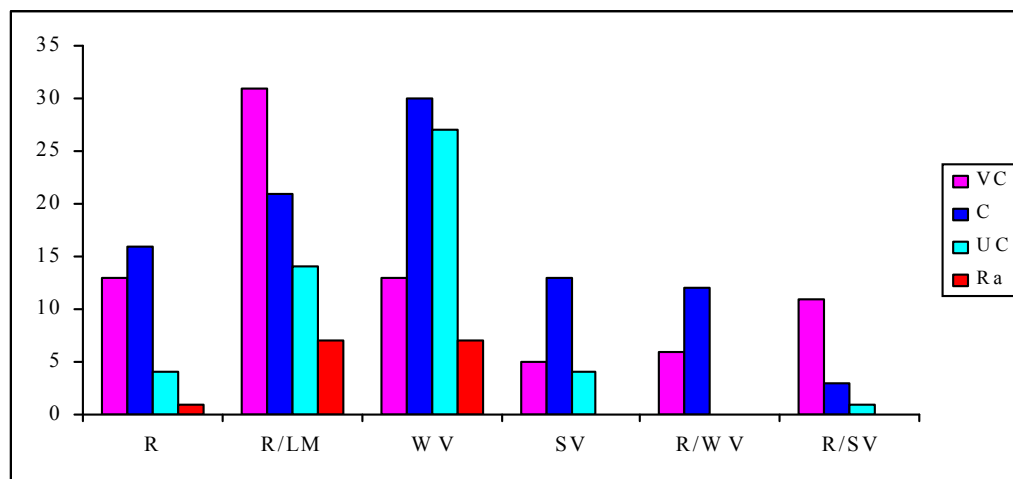
TABLE 2: Number of species (%) in different abundance and status categories

Rel. Abd.	VC	C	UC	Ra	Total
Res. St.					
R	13	16	4	1	34 (14)
R/LM	31	21	14	7	73 (31)
WV	13	30	27	7	77 (32)
SV	5	13	4	-	22 (9)
R/WV	6	12	-	-	18 (8)
R/SV	11	3	1	-	15 (6)
Total	79 (33)	95 (40)	50 (21)	15 (6)	239

This high diversity (239 species) of birds in an area of around 114 sq km can be correlated with earlier works of Hunter (1989) and Gaston (1995) who reported that Shiwalik hill ranges due to its location in the foothills, in addition to the long range migrants from north and central Asia, attracts a large number of winter migrants from the Himalayas and summer (breeding) visitors from adjacent plains. Similarly, avifaunal studies carried out in adjacent areas of Shiwalik hills also revealed the presence of high diversity of birds like Mehta *et al.* (2002) reported the presence of 206 species of birds from Ropar wetland of Punjab; Thakur *et al.* (2011) revealed the presence of 167 species of birds spread over 121 genera, 51 families and 17 orders in Nalagarh valley of Himachal Pradesh. In addition, Manakadan and Pittie (2001) have reported

Muscicapidae as the largest bird family of India with 370 species. Similarly, Muscicapidae was also reported as the largest bird family of Shiwalik ecosystem of Punjab by Kumar *et al.* (2006).

Analyses of data on residential status revealed that of the total 239 species of birds, 140 species were either residents or local migrants (including birds with winter and summer influx) and rest 99 were long range migrants to Chandigarh. Out of 140 resident and local migrant birds, 73 (31%) species were local migrants, 34 (14%) were residents, 18 (8%) showed winter influx and 15 (6%) showed summer influx in their populations. Of the long range migrants, 77 (32%) species were winter visitors and 22 (9%) were summer visitors to Chandigarh.

**FIGURE 2:** Residential status and relative abundance of avifauna of Chandigarh

Analyses of data on residential status and relative abundance showed that of the 34 resident species of birds, 16 were common, 13 very common, 4 uncommon and 1 species was rare. Out of 73 local migrants, 31 species were very common, 21 common, 14 uncommon and 7 were rare. Of the 18 species of birds which showed winter influx, 12 were common and 6 were very common. Out of 15 species with summer influx, 11 were very common, 3 common and 1 species was uncommon. Of the 77 winter visitors, 30 species were common, 27 uncommon, 13 very common and 7 were rare. Of the summer visitors, 13 were common, 5 very common and 4 were uncommon. Therefore, Chandigarh supported 95 (40%) common species, 79 (33%) very common, 50 (21%) uncommon and 15 (6%) rare species of birds (Table 1 & 2, Fig. 2).

Moreover, the predominance of resident (34 species), local migrant (73 species) and winter visitors (77 species) in Chandigarh, situated in the Shiwalik range of Himalayas can be explained with the earlier work of Mahabal (2005) who elucidated that these categories of birds are predominantly observed in the lower zone of Himalayas and with increase in altitude there is a decrease in the number of resident and winter migrant birds.

Threatened Species

It was reported that Chandigarh supported 12 threatened species of birds which have been struggling for existence throughout their natural range of distribution (Table 1). Of these, Indian White-backed Vulture, Slender-billed Vulture and Red-headed Vulture have been categorized as Critically threatened; Egyptian Vulture has been placed

under Endangered category; Pallas's Fish-Eagle has been declared as Vulnerable; and Darter, Painted Stork, Ferruginous Pochard, Cinereous Vulture, Laggar, Black-tailed Godwit and Black-bellied Tern have been categorized as Near Threatened by Birdlife International (2011).

Water Birds

A total of 68 species of water birds belonging to 46 genera, 15 families and 6 orders were recorded from Sukhna wetland of Chandigarh. Analyses of data on residential status and relative abundance of these water birds revealed that only a single species was resident and rest 67 showed short or long range migrations. Of the migrants, 36 were winter visitors, 13 local migrants, 10 showed winter influx, 5 were summer visitors and 3 showed summer influx. A single resident water bird species recorded has been categorized as very common. Of the 36 winter visitors, 12 were uncommon, 11 common, 7 rare and 6 were very common. Out of 13 local migrant species, 4 each were very common and rare, 3 common and 2 were uncommon. Of the 10 species which showed winter influx, 8 were common and 2 were very common. Of the summer visitor water birds, 4 species were common and 1 was uncommon. Of the 3 species which showed summer influx, 1 each was placed under

very common, common and uncommon categories. Therefore, Sukhna wetland supported 27 common species, 16 uncommon, 14 very common and 11 rare species of birds (Table 1).

Recently, Kumar *et al.* (2005) have compiled the information on residential status of birds from different wetlands of India and enlisted 310 wetland bird species. Of these, 130 (around 42%) are migrants, 173 are resident, while the status is not known for 7 species. Of the 130 migrants, 107 species are winter visitors, 6 with some passage population, 13 species are summer migrants and remaining 4 species are purely passage migrants.

Based on their habits, habitats, characteristics and diagnostic appearance, these 68 water bird species can be categorized in to 13 categories (Menon 1992). Of these, Shore Birds dominated the water bird diversity with 19 species, followed by Dabbling Ducks (12 species), Lanky Wading Birds (8), Diving Ducks (6), Gulls and Terns (5), Rails and Coots (4), Storks and Water-Crows (3 each), Geese, Active Swimmers, and Stilts and Avocet (2 each) and Spoonbill and Jacana (1 species each) (Table 3). Similarly, Mehta *et al.* (2002) have recorded 69 species of water birds, categorized in to 13 groups from adjacent Ropar wetland of Punjab.

TABLE 3: Water bird species recorded in Sukhna wetland, Chandigarh

Category	Total Species	Sr. No.	Species (Common Name)
I. Dabbling Ducks	12	1.	Lesser Whistling-Duck
		2.	Brahminy Shelduck
		3.	Common Shelduck
		4.	Comb Duck
		5.	Gadwall
		6.	Eurasian Wigeon
		7.	Mallard
		8.	Spot-billed Duck
		9.	Northern Shoveller
		10.	Northern Pintail
		11.	Garganey
		12.	Common Teal
II. Diving Ducks	6	13.	Cotton Teal
		14.	Red-crested Pochard
		15.	Common Pochard
		16.	Ferruginous Pochard
		17.	Tufted Pochard
		18.	Common Merganser
III. Lanky wading birds	8	19.	Little Egret
		20.	Grey Heron
		21.	Purple Heron
		22.	Large Egret
		23.	Median Egret
		24.	Cattle Egret
		25.	Indian Pond-Heron
		26.	Black-crowned Night-Heron
IV. Storks	3	27.	Painted Stork
		28.	Asian Openbill-Stork
		29.	European White Stork
V. Spoonbill	1	30.	Eurasian Spoonbill
VI. Geese	2	31.	Greylag Goose
VII. Water-Crows	3	32.	Bar-headed Goose
		33.	Little Cormorant

VIII. Shore birds	19	34.	Great Cormorant
		35.	Darter
		36.	Little Ringed Plover
		37.	Kentish Plover
		38.	Northern Lapwing
		39.	Yellow-wattled Lapwing
		40.	River Lapwing
		41.	Red-wattled Lapwing
		42.	White-tailed Lapwing
		43.	Common Snipe
		44.	Black-tailed Godwit
		45.	Spotted Redshank
		46.	Common Redshank
		47.	Marsh Sandpiper
		48.	Common Greenshank
		49.	Wood Sandpiper
		50.	Common Sandpiper
		51.	Temminck's Stint
		52.	Stone-Curlew
		53.	Great Stone-Plover
		54.	Small Pratincole
IX. Active swimmers	2	55.	Little Grebe
		56.	Great Crested Grebe
X. Stilts and Avocet	2	57.	Black-winged Stilt
		58.	Pied Avocet
XI. Rails and Coots	4	59.	White-breasted Waterhen
		60.	Purple Moorhen
		61.	Common Moorhen
		62.	Common Coot
XII. Jacana	1	63.	Pheasant-tailed Jacana
XIII. Gulls and Terns	5	64.	Brown-headed Gull
		65.	Gull-billed Tern
		66.	River Tern
		67.	Black-bellied Tern
		68.	Whiskered Tern

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