

Avifauna of Rakchham- Chhitkul Wildlife Sanctuary District Kinnaur, Himachal Pradesh, India

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Abstract: The exploration of Rakchham- Chhitkul Wildlife Sanctuary present in the Baspa valley (Sangla valley) situated in remote tribal district of Kinnaur in Himachal Pradesh, India revealed the presence of a diverse population of birds consisting of 73 species, belonging to 52 genera, spread over 24 families and 9 orders. The 8.2% species of birds in the area were resident while a large percentage i.e. 91.8% being local or long range migrants. 23.2% birds were local migrants and 49.3% summer visitors. The population of around 19.1% species augmented during summers because of influx of more individuals during summer. Analysis of data revealed that of the 73 species recorded, 23 (31.5%) were very common, 34 (46.6%) common, 14 (19.1%) uncommon and 2 (2.8%) rare to the sanctuary.

Keywords: Avifauna, residential status, relative abundance, Rakchham Chhitkul Wildlife Sanctuary, District Kinnaur.

I. Introduction

Himachal Pradesh is very rich in terms of bio-diversity, primarily due to varied climatic conditions ranging from tropical in the foothills to arctic environment in the trans-Himalayan region. Historical influx of fauna from adjacent biogeographical regions and subsequent speciation in relation to local environment has greatly enriched the animal resources of the State. Above timber line (3000 m), Palaearctic and endemic animals are predominant, and at lower and middle altitudes, largely Oriental, some Palaearctic and some Ethiopian elements available. In recent years, the state has come under a strong threshold of development thereby natural ecosystems over-exploited and even destroyed by the rapidly increasing human population. Therefore, a number of endemic, restricted range and endangered species found in the region are facing threat to their existence.

Present investigations have been conducted in Rakchham- Chhitkul Wildlife Sanctuary located in the Baspa valley (Sangla valley) with geo-coordinates of latitude 31^o14'22" N - 31^o28'37"N and longitudes 78^o17'31"E - 78^o 31'30"E covering an area of about 304 Km², in the northeast corner of the Kinnaur district of Himachal Pradesh, India (Fig. 1). The Baspa river which originates near the Indo-Tibet border flows through Kinnaur forming this valley from Chhitkul to its junction with Sutlej River at Karchham. The Baspa valley is characterized by lofty snow peaks lying on the left and right banks of river Baspa. These rugged, precipitous peaks represent two of the world's greatest mountain ranges. The mountain ranges on the right bank of Baspa river form the part of Great Himalayan range while those on the left bank the Dhauladhar ranges separating Baspa valley from Uttarakhand state of India and parts of Shimla district of the Himachal Pradesh. Upper most part of the mountain peaks are usually covered by perpetual snow cover. The rocks in the valley are varied in age from pre-cambrian to permocarboniferous. Schists, gneisses, granites, quartzites, phyllites, and limestones, quartzites slates and dolomite are major rock types. Soil type is sandy to sandy loam and highly fragile. The altitude of Baspa valley ranges from 3,200masl to 5,486masl. The temperature varying from -15°C to 18°C, mean rainfall is 463 mm and annual snowfall 1130 mm.



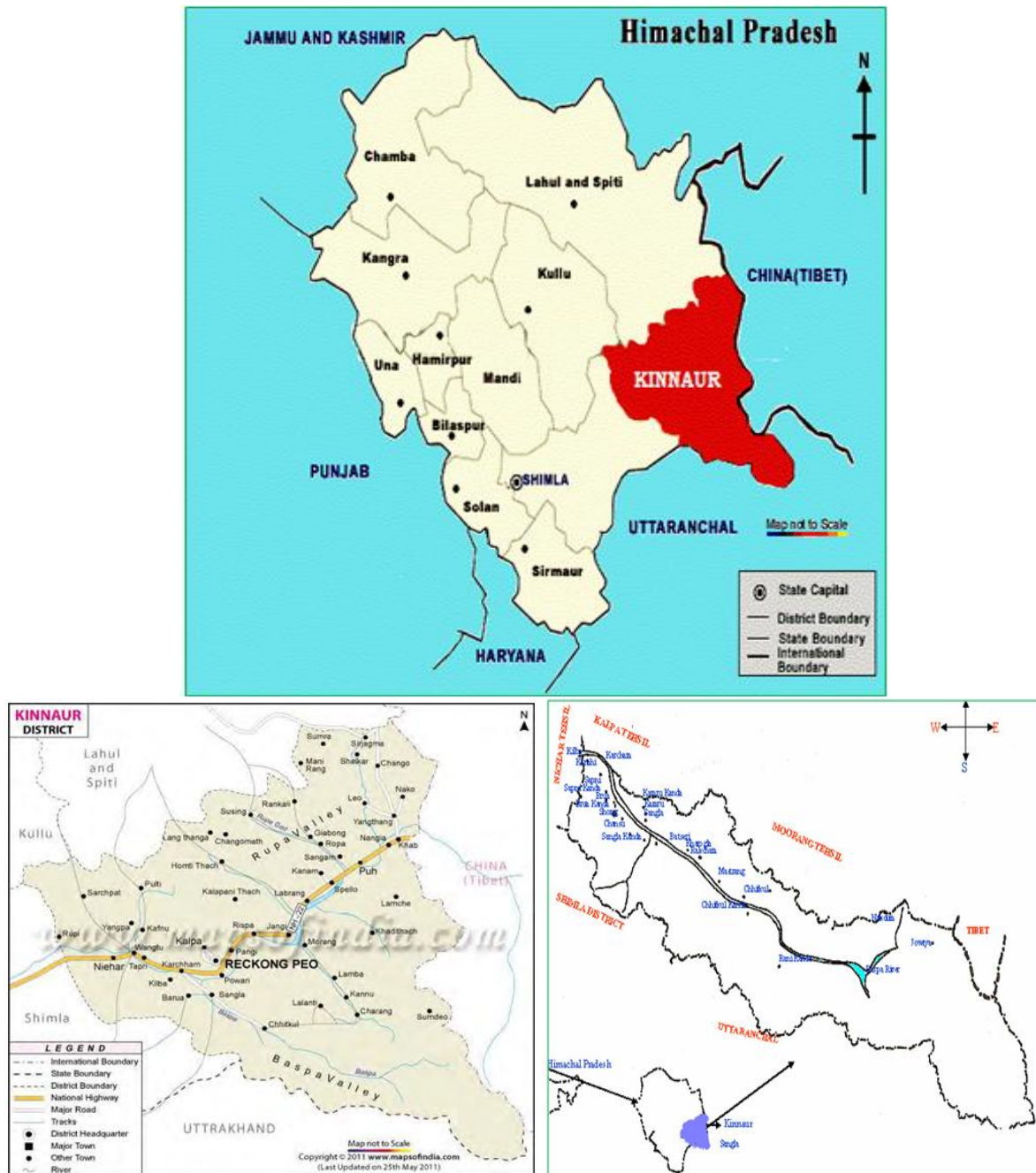


Fig.1: Map of Baspa valley, the study area in District Kinnaur, Himachal Pradesh, India (Source: mapsfindia.com and diagrammatic map of Baspa Valley).

The parts of the sanctuary up to altitude 3450 m gets the good precipitation in the form of rain or snow but beyond that rainfall recedes progressively and it is mainly in the form of snow. The forest type of this sanctuary includes Lower Western Himalayan Temperate Forest, Upper Western Himalayan Temperate Forest, Sub-Alpine Birch-Fir Forest. The sanctuary area is fed with numerous snow-fed perennial and seasonal streams. Govind Pashu Vihar Sanctuary of Uttarakhand is adjacent to this sanctuary and on its eastern boundary lies the Tibetan plateau of China.

Many investigators have conducted studies on diversity of birds in different parts of the Himachal Pradesh (Singh and Banyal, 2013; Thakur, 2013; Singh *et al.*, 2014) but only a few studies have been conducted on diversity and ecology of birds of Greater Himalayan area of Himachal Pradesh in general and this sanctuary area in particular (Wynter-Blyth, 1948; Narang, 1989). However, the present study area of Rakchham-Chhitkul wildlife sanctuary has not received sufficient attention of the field biologists due to severe cold climate, inaccessible habitat and lack of local expertise. Further, as the area remains cut-off from rest of the world during winters due to heavy snow fall, therefore, study of bird life of this high altitude area becomes more important as

no study has been conducted on the birds during winters. The present study provides a preliminary list of avifauna observed at the sanctuary for the first time and would act as baseline literature for further studies in this area.

II. Methodology

Present study area of Chhitkul-Rakchham wildlife sanctuary has been explored during 2012-2014 in various habitat types. Keeping in view the harsh cold climate of the study area and heavy snow fall during winters, most of areas studied were covered by trekking. Explorations have been conducted in Nagasti, Chhitkul, Mastrang, Rakchham, Dang-dang, Shee, Boningsaring and Batseri areas. Stratified random sampling technique (Snedecore and Cochran, 1993) has been followed for the study of birds which involved the division of sites into different strata, based on vegetation type and habitat. Piecewise linear line transects have been laid in different habitat types for counting the number of individuals of birds. The other important factor considered was the activity of birds. Since peak activity in most birds lasts for 1 or 2 hours after sunrise or before sunset, the birds were recorded during the most active period of the day i.e., morning (0600 to 1000 hours) and evening (1600 to 1900 hours). Nikon (10x40) field binoculars were used for observations. Field identifications of birds were carried out with the help of various field guides (Ali and Ripley, 1983; Grimmett *et al.*, 1999). For confirmation of identifications, photographs of birds were taken with the help of Nikon DSLR D90 with 70-300 mm tele- lens.

The data recorded in each survey from different transects has been kept separate and analyzed for relative abundance on the basis of relative frequency scale of occurrence depending upon the number of sightings, as followed by McKinnon and Philips (1993). Based upon these different categories assigned were: very Common (recorded in more than 45 % of data sheets), Common (between 25% and 44 % of data sheets), Uncommon (between 10% and 24 % of datasheets) 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. Similarly, residential status was worked into various categories like resident, summer visitors, and resident with local movements etc. on the basis of presence and absence method (Singh *et al.*, 2014). The birds that showed irregular trend of sighting and population fluctuations (non-seasonal) have been placed under resident with local movements (R/LM) category (Singh and Banyal, 2013).

III. Results

The exploration of Rakchham- Chhitkul Wildlife Sanctuary area revealed the presence of a diverse population of birds consisting of 73 species, belonging to 52 genera, spread over 24 families and 9 orders. The diversity dominated by the Passerines constituting the majority with 54 species while non-passerines were represented by only 19 species (Table 1).

Table 1: Systematic list of birds recorded in Rakchham-Chhitkul wildlife sanctuary

S.No.	Taxon	Res. St.	Rel. Abd.
Order: Falconiformes			
Family: Accipitridae			
1.	Black Kite <i>Milvus migrans</i> (Boddaert, 1783)	R/SV	C
2.	Bearded Vulture <i>Gypaetus barbatus</i> (Linnaeus, 1758)	R/LM	C
3.	Himalayan Griffon <i>Gyps himalayensis</i> Hume, 1869	R/LM	C
4.	Long-legged Buzzard <i>Buteo rufinus</i> (Cretzschmar, 1827)	R/LM	Ra
5.	Golden Eagle <i>Aquila chrysaetos</i> (Linnaeus, 1758)	R	C
Family: Falconidae			
6.	Common Kestrel <i>Falco tinnunculus</i> Linnaeus, 1758	R/SV	VC
Order: Galliformes			
Family: Phasianidae			
7.	Himalayan Snowcock <i>Tetraogallus himalayensis</i> G.R. Gray, 1843	R	C
8.	Chukor <i>Alectoris chukar</i> (J.E. Gray, 1830)	R	VC
9.	Impeyan Monal <i>Lophophorus impejanus</i> (Latham, 1790)	R/LM	C
Order: Gruiformes			
Family: Rallidae			
10.	Common Moorhen <i>Gallinula chloropus</i> (Linnaeus, 1758)	SV	UC

Order: Charadriiformes		
Family: Scolopacidae		
11. Common Sandpiper <i>Actitis hypoleucos</i> Linnaeus, 1758	SV	UC
Order: Columbiformes		
Family: Columbidae		
12. Blue Rock Pigeon <i>Columba livia</i> Gmelin, 1789	R/SV	C
13. Hill Pigeon <i>Columba rupestris</i> Pallas, 1811	R/LM	VC
14. Snow Pigeon <i>Columba leuconota</i> Vigors, 1831	R/LM	VC
15. Oriental Turtle-Dove <i>Streptopelia orientalis</i> (Latham, 1790)	SV	C
Order: Cuculiformes		
Family : Cuculidae		
16. Common Cuckoo <i>Cuculus canorus</i> Linnaeus, 1758	SV	UC
Order: Apodiformes		
Family: Apodidae		
17. Himalayan Swiftlet <i>Collocalia brevirostris</i> (Horsfield, 1840)	R/SV	C
18. Common Swift <i>Apus apus</i> (Linnaeus, 1758)	SV	C
Order: Coraciiformes		
Family: Upupidae		
19. Common Hoopoe <i>Upupa epops</i> Linnaeus, 1758	SV	VC
Order: Passeriformes		
Family: Alaudidae		
20. Eastern Skylark <i>Alauda gulgula</i> Franklin, 1831	SV	VC
21. Horned Lark <i>Eremophila alpestris</i> (Linnaeus, 1758)	R/LM	VC
Family: Hirundinidae		
22. Plain Martin <i>Riparia paludicola</i> (Vieillot, 1817)	R/SV	VC
23. Eurasian Crag-Martin <i>Hirundo rupestris</i> Scopoli, 1769	SV	VC
24. Red-rumped Swallow <i>Hirundo daurica</i> Linnaeus, 1771	SV	UC
Family: Motacillidae		
25. White Wagtail <i>Motacilla alba</i> Linnaeus, 1758	R/SV	VC
26. Citrine Wagtail <i>Motacilla citreola</i> Pallas, 1776	SV	C
27. Grey Wagtail <i>Motacilla cinerea</i> Tunstall, 1771	SV	C
28. Eurasian Tree Pipit <i>Anthus trivialis</i> (Linnaeus, 1758)	SV	C
29. Oriental Tree Pipit <i>Anthus hodgsoni</i> Richmond, 1907	SV	VC
Family: Campephagidae		
30. Scarlet Minivet <i>Pericrocotus flammeus</i> (Forster, 1781)	R/LM	C
Family: Laniidae		
31. Rufous-backed Shrike <i>Lanius schach</i> Linnaeus, 1758	SV	C
32. Grey-backed Shrike <i>Lanius tephronotus</i> (Vigors, 1831)	SV	UC
Family: Cinclidae		
33. Brown Dipper <i>Cinclus pallasii</i> Temminck, 1820	R	C
Family: Troglodytidae		
34. Winter Wren <i>Troglodytes troglodytes</i> (Linnaeus, 1758)	R	C
Family: Prundellidae		
35. Rufous-breasted Accentor <i>Prunella strophhiata</i> (Blyth, 1843)	R/LM	VC

Family: Muscicapidae

Subfamily: Turdinae

36. Blue Rock-Thrush <i>Monticola solitarius</i> Linnaeus, 1758	SV	UC
37. Blue Whistling-Thrush <i>Myiophonus caeruleus</i> (Scopoli, 1786)	R/SV	VC
38. Eurasian Blackbird <i>Turdus merula</i>	SV	UC
39. White-collared Blackbird <i>Turdus albocinctus</i> Royle, 1840	SV	UC
40. Himalayan Rubythroat <i>Luscinia pectoralis</i> (Gould, 1837)	R/SV	C
41. Bluethroat <i>Luscinia svecica</i> (Linnaeus, 1758)	R/SV	C
42. Orange-flanked Bush-Robin <i>Tarsiger cyanurus</i> (Pallas, 1773)	SV	UC
43. Blue-capped Redstart <i>Phoenicurus caeruleocephalus</i> (Vigors, 1831)	SV	C
44. Black Redstart <i>Phoenicurus ochruros</i> (Gmelin, 1774)	SV	VC
45. Blue-fronted Redstart <i>Phoenicurus frontalis</i> (Vigors, 1832)	SV	C
46. White-capped Redstart <i>Chaimarrornis leucocephalus</i> (Vigors, 1831)	R/SV	VC
47. Plumbeous Redstart <i>Rhyacornis fuliginosus</i> (Vigors, 1831)	R/SV	C
48. White-bellied Redstart <i>Hodgsonius phaenicuroides</i> (Gray, 1846)	R/SV	C
49. Common Stonechat <i>Saxicola torquata</i> (Linnaeus, 1766)	SV	C
50. Grey Bushchat <i>Saxicola ferrea</i> Gray, 1846	SV	C
51. Desert Wheatear <i>Oenanthe deserti</i> (Temminck, 1825)	SV	Ra

Subfamily: Timaliinae

52. Streaked Laughingthrush <i>Garrulax lineatus</i> (Vigors, 1831)	R/LM	C
53. Variegated Laughingthrush <i>Garrulax variegatus</i> (Vigors, 1831)	SV	UC

Subfamily: Sylviinae

54. Brown-flanked Bush-Warbler <i>Cettia fortipes</i> (Horsfield, 1845)	SV	C
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Family: Paridae

55. Simla Crested Tit <i>Parus rufonuchalis</i> Blyth, 1849	SV	C
56. Rufous-bellied Crested Tit <i>Parus rubidiventris</i> Blyth, 1847	SV	C
57. Great Tit <i>Parus major</i> Linnaeus, 1758	SV	UC

Family: Certhiidae

58. Eurasian Tree-Creeper <i>Certhia familiaris</i> Linnaeus, 1758	SV	C
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Family: Emberizidae

Subfamily: Emberizinae

59. Rock Bunting <i>Emberiza cia</i> Linnaeus, 1766	SV	VC
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Family: Fringillidae

60. Fire-fronted Serin <i>Serinus pusillus</i> (Pallas, 1811)	R/SV	VC
61. Yellow-breasted Greenfinch <i>Carduelis spinoides</i> Vigors, 1831	R/SV	VC
62. Eurasian Goldfinch <i>Carduelis carduelis</i> (Linnaeus, 1758)	SV	C
63. Common Rosefinch <i>Carpodacus erythrinus</i> (Pallas, 1770)	SV	C
64. Red-mantled Rosefinch <i>Carpodacus rhodochlamys</i> (Brandt, 1843)	SV	UC
65. Common Great Rosefinch <i>Carpodacus rubicilla</i> (Guldenstadt, 1775)	R/LM	UC
66. Red Crossbill <i>Loxia curvirostra</i> Linnaeus, 1758	R/LM	UC

Family: Passeridae

Subfamily: Passerinae

67. House Sparrow <i>Passer domesticus</i> (Linnaeus, 1758)	R/LM	VC
68. Cinnamon Tree Sparrow <i>Passer rutilans</i> Temminck, 1835	SV	VC
69. Tibetan Snowfinch <i>Montifringilla adamsi</i> Adams, 1858	R/LM	C

Family: Corvidae

70. Red-billed Chough <i>Pyrrhocorax pyrrhocorax</i> (Linnaeus, 1758)	R/LM	VC
71. Yellow-billed Chough <i>Pyrrhocorax graculus</i> (Linnaeus, 1766)	R/LM	VC
72. Jungle Crow <i>Corvus macrorhynchos</i> Wagler, 1827	R	VC
73. Common Raven <i>Corvus corax</i> Linnaeus, 1758	R/LM	C

Res. St. = Residential status: R= Resident, SV= Summer Visitor, R/LM= Resident with local movement, R/SV= Resident with Summer Influx.

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

The family Muscicapidae, the largest bird family in India as well as in Himachal Pradesh holds its status as the largest family in this sanctuary too with 19 species. The second largest family in the sanctuary was Fringillidae with 7 species, closely followed by families Accipitridae and Motacillidae with 5 species each. The family Columbidae and Corvidae were represented by 4 species each, while family Phasianidae, Hirundinidae, Paridae and Passeridae represented by 3 species each. The family Apodidae, Alaudidae and Laniidae were represented by 2 species each. However, quite a large number of families 9 in total viz. family Falconidae, Rallidae, Scolopacidae, Cuculidae, Upupidae, Campephagidae, Cinclidae, Troglodytidae, Prundellidae, Certhiidae and Emberizidae were least represented in the area with single species each.

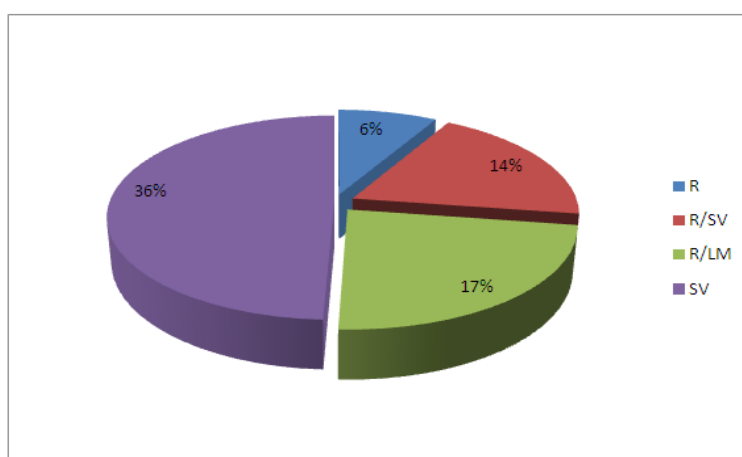


Fig. 2: Residential status of the birds of Rakchham-Chhitkul wildlife sanctuary (R: Resident, R/SV: Resident with Summer Influx, R/LM: Resident with local migration, SV: Summer Visitor)

Analyses of the data on residential status of the avifauna of the sanctuary revealed that 6 species (8.2%) are purely resident and the remaining 67 species (91.8%) showed seasonal local or long range migrations (Table 1; Fig. 2). The resident species recorded in the sanctuary are endemic to Himalaya and include species like Golden Eagle, Himalayan Snowcock, Chukor, Brown Dipper, Winter Wren and Jungle Crow. Of the 67 species showing migrations to various extent 17 species (23.2%) were local migrants, 36 species (49.3%) summer visitors and 14 (19.1%) showed summer influx. The species which show local migrations are Bearded Vulture, Himalayan Griffon, Long-legged Buzzard, Impeyan Monal, Hill Pigeon, Snow Pigeon, Horned Lark, Scarlet Minivet, Rufous-breasted Accentor, Streaked Laughing thrush, Common Great Rosefinch, Red Crossbill, House Sparrow, Tibetan Snowfinch, Red-billed Chough, Yellow-billed Chough, and Common Raven. A large number of species (49.3%) are summer visitors to the sanctuary and include birds like Common Moorhen, Common Sandpiper, Common Cuckoo, Common Swift, Common Hoopoe, Eastern Skylark, Eurasian Crag-Martin, Citrine Wagtail, Grey Wagtail, Eurasian Tree Pipit, Oriental Tree Pipit and Rufous-backed Shrike to name a few. It was further observed that populations of around 19.1% species augmented during summers because of influx of more individuals, hence categorized as summer influx category and includes birds like Common Kestrel, Blue Rock Pigeon, Himalayan Swiftlet, White Wagtail, Blue Whistling-Thrush, Himalayan Rubythroat, White-capped Redstart, Fire-fronted Serin, Yellow-breasted Greenfinch.

Analysis of data on relative abundance showed that of the 73 species recorded, 23 species (31.5%) were very common, 34 species (46.6%) common, 14 species (19.1%) uncommon and 2 species (2.8%) rare to the sanctuary (Table 1; Fig. 3). The birds like Common Kestrel, Chukor, Hill Pigeon, Snow Pigeon, Common Hoopoe, Eastern Skylark, Horned Lark, Plain Martin, Eurasian Crag-Martin, White Wagtail, Oriental Tree Pipit, Rufous-breasted Accentor, Blue Whistling-Thrush, White-capped Redstart, Fire-fronted Serin, House Sparrow, Red-billed Chough and Yellow-billed Chough were very common in the sanctuary. Species categorized as common included the birds like Black Kite, Bearded Vulture, Himalayan Griffon, Golden Eagle, Himalayan Snowcock, Impeyan Monal, Oriental Turtle-Dove, Himalayan Swiftlet, common Swift, Citrine Wagtail, Eurasian Tree Pipit, Grey Wagtail, Scarlet Minivet, Brown Dipper, Winter Wren, Himalayan Rubythroat, Bluethroat, Common Stonechat, Grey Bushchat, Streaked Laughingthrush, Brown-flanked Bush-Warbler, Simla Crested Tit, Rufous-bellied Crested Tit, Eurasian Tree-Creeper, Common Rosefinch, Tibetan Snowfinch and Common Raven. The uncommon birds in the sanctuary included species like Common Moorhen, Common Sandpiper, Common Cuckoo, Grey-backed Shrike, Blue Rock-Thrush, Eurasian Blackbird, White-collared

Blackbird, Orange-flanked Bush-Robin Variegated Laughing thrush, and Red-mantled Rosefinch. The two species rare in the sanctuary are Long-legged Buzzard and Desert Wheatear.

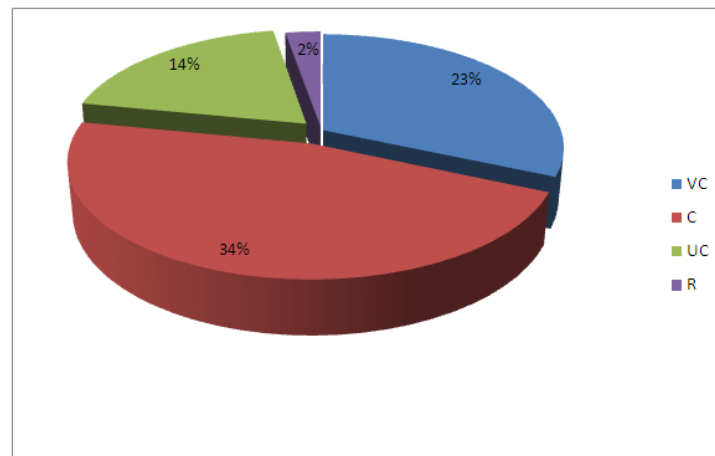


Fig. 3: Relative abundance of birds in Rakchham-Chhitkul wildlife sanctuary (VC: Very Common, C: Common, UC: Uncommon, R: Rare)

Further analysis of data on residential status and relative abundance revealed that of the 6 resident species, 4 species were common and 2 species very common. Of the 17 species of local migrants, 7 species were common, 2 species uncommon, 7 species very common while one species of was rare bird. Among the 36 species of summer visitors, 16 species were common, 12 species uncommon, 7 species very common and one species rare. Further, of the 14 summer influx species, 7 species were common and the other 7 species very common meaning thereby that none among them being uncommon and rare (Table 1; Fig. 4).

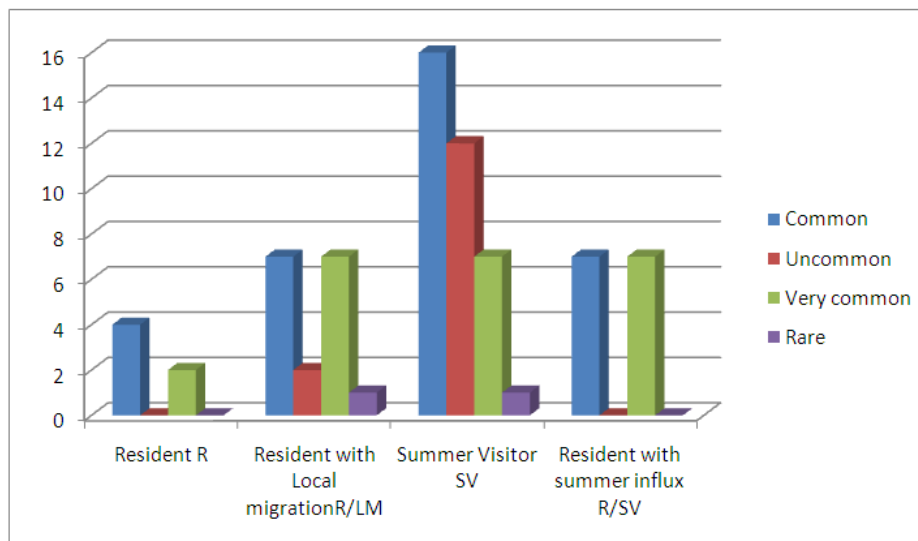


Fig. 4: Comparative residential status and relative abundance of birds in Rakchham-Chhitkul wildlife sanctuary.

IV. Discussion

Presence of only 73 species of birds in present study areas can be correlated with extremely harsh and cold climatic conditions, topography and scanty rainfall of Rakchham-Chhitkul wildlife sanctuary. This petite diversity of birdlife can be justified with earlier work of Price *et al.* (2003) who attributed the change in bird diversity with altitude in Himalayas to various climatic factors mainly precipitation. Similarly, Rahbek and Graves (2001) correlated the bird diversity of South America with topography, precipitation and an interaction between topography and latitude.

Biodiversity plays an important role in maintaining ecosystem productivity, stability, sustainability and other ecosystem services like clean water and air, soil formation and protection, pollination, pest control, food, fuel, medicine etc. that are essential for human well-being (Millennium Ecosystem Assessment, 2005). Biodiversity provides other important things and services such as cultural, recreational, and spiritual

nourishment that plays an important role in maintaining our personal life as well as social life. Thus human depends completely on environment and biodiversity for its survival. Excessive anthropogenic pressures, causing habitat modification and destructions in recent times have been resulting in loss of biodiversity. Impact of these pressures is aggravated further in a fragile ecosystem like that of Rakchham-Chhitkul wildlife sanctuary in Kinnaur District of Himachal Pradesh.

Presence of unique and Himalayan endemics like Bearded Vulture, Himalayan Griffon, Golden Eagle, Himalayan Snowcock, Chukor, Impeyan Monal, Hill Pigeon, Snow Pigeon, Horned Lark, Brown Dipper, Rufous-breasted Accentor, Himalayan Rubythroat, Red-mantled Rosefinch, Tibetan Snowfinch, Yellow-billed Cuckoo etc. in the present study area is encouraging but at the same time a large human population is dependent on forests for their livelihood, either fully or partially in the sanctuary and this dependence is in the form of collection of a variety of non-timber forest produce, collection of fuel and fodder for subsistence and livelihood purposes and lifestyles such as shifting cultivation or pastoral nomadism exerting pressure on natural resources. At the same time local communities have been continuing with diverse sets of ownerships, rights and concessions over the use of natural resources such as forests, inland waters, coastal areas, and alpine meadows etc.

This study provides a baseline data on the avian diversity of Rakchham-Chhitkul wildlife sanctuary giving vital information for the future research and conservation activities. The sanctuary requires conservation planning of the area as it represents a fragile and sensitive ecosystem where increasing human activities beginning to show its baleful effect on the total biodiversity including avifauna.

References

- [1]. Ali, S. and S.D. Ripley, 1983. A Pictorial Guide to the Birds of the Indian Subcontinent. Bombay Natural History Society/Oxford University Press, New Delhi. 177 pp.
- [2]. Grimmett, R., C. Inskipp and T. Inskipp, 1999. Pocket Guide to the Birds of the Indian Subcontinent. Oxford University Press, New Delhi, 384 pp.
- [3]. Mc Kinnon J. and K. Philips, 1993. The Birds of Borneo, Sumatra, Java and Bali. Oxford University Press, Oxford.
- [4]. Millennium Ecosystem Assessment 2005. Ecosystems and Human Well-being: Synthesis. World Resources Institute, Washington.
- [5]. Narang, M.L. 1989. Birds of Sangla Valley. Newsletter for Birdwatchers 29 (5-6): 8.
- [6]. Price, T., J. Zee, K. Jamdar and N. Jamdar, 2003. Bird species diversity along the Himalaya: A comparison of Himachal Pradesh with Kashmir. J. Bombay Nat. Hist. Soc. 100 (2&3): 394-410.
- [7]. Rahbek, C. and G.R. Graves, 2001. Multiscale assessment of patterns of avian species richness. Proc. Natl. Acad. Sci. USA 98: 4534-4539.
- [8]. Singh, J., M.L. Thakur and H.S. Banyal, 2014. Avifauna of Prashar lake and its surrounding area in Mandi District (Himachal Pradesh), India. Asian Journal of Biological Sciences 7 (2): 47-56.
- [9]. Singh, V. and H.S. Banyal, 2013 b. Avian Fauna of Khajjiar Lake, District Chamba, Himachal Pradesh, India. Proceedings of the Zoological Society, 66 (2): 130-136.
- [10]. Snedecore, G.W. and W.G. Cochran, 1993. Statistical Methods. Oxford and IBH Publ. Co., New Delhi.
- [11]. Thakur, M.L. 2013. Bird species composition along the altitudinal gradient in Himachal Pradesh (western Himalaya), India. International Journal of Advanced Biological Research, 3 (4): 556-562.
- [12]. Wynter-Blyth, M.A. 1948. An expedition to Sangla in Kunawar. J. Bombay Nat. Hist. Soc. 47 (4): 565-585.