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Journal of Threatened Taxa

10.11609/jott.2025.17.3.26571-26762
www.threatenedtaxa.org

26 March 2025 (Online & Print)
17(3): 26571-26762
ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

Open Access

40 zoOreach Zoo Outreach Organisation Years

ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

Publisher
Wildlife Information Liaison Development Society
www.wild.zooreach.org

Host
Zoo Outreach Organization
www.zooreach.org

Srivari Illam, No. 61, Karthik Nagar, 10th Street, Saravanampatti, Coimbatore, Tamil Nadu 641035, India
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Cover: A bag worm with its beautiful heap of junk. Acrylics on 300 GSM paper by Dupati Poojitha based on a picture by Sanjay Molur.

Journal of Threatened Taxa | www.threatenedtaxa.org | 26 March 2025 | 17(3): 26669–26679
ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)
https://doi.org/10.11609/jott.9288.17.3.26669-26679
#9288 | Received 09 July 2024 | Final received 12 December 2024 | Finally accepted 21 February 2025
OPEN ACCESS

COMMUNICATION

An avifaunal checklist of the Zanskar Region, Ladakh Himalaya, India

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Abstract: The present study highlights the significant records of the avifauna of the Zanskar Region of Ladakh Trans Himalaya and forms a first record of its kind. The study was conducted from 1 July 2023 to 30 June 2024, focusing on early morning and late evening observations. Using line transect and random encounter methods, around 81 bird species across 11 orders, and 27 families were recorded. Passeriformes emerged as the predominant order with (44 species). Among the avifauna, 45 species were identified as summer visitors, 27 as residents, six as passage migrants, and three as vagrants. Habitat-specific distribution patterns revealed 53 species in alpine meadows and grasslands, 16 in wetlands and riverine areas, and 12 in rocky cliffs and gorges. Notably, all species, except the Lammergeier *Gypaetus barbatus* and the Himalayan Griffon *Gyps himalayensis*, are categorized as 'Least Concern' according to the IUCN Red List. Both the Lammergeier and Himalayan Griffon are classified as 'Near Threatened', underscoring the region's biodiversity conservation importance.

Keywords: Avifauna, biodiversity, conservation status, habitat distribution, line transect, migratory patterns, random encounter methods.

Editor: Gopinathan Maheswaran, Zoological Survey of India, Kolkata, India. **Date of publication:** 26 March 2025 (online & print)

Citation: Hussain, A., Z. Hussain & M. Ali (2025). An avifaunal checklist of the Zanskar Region, Ladakh Himalaya, India. *Journal of Threatened Taxa* 17(3): 26669–26679. https://doi.org/10.11609/jott.9288.17.3.26669-26679

Funding: None.

Competing interests: The authors declare no competing interests.

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Author contributions: AH—contributed to the study design, identification of species, conceptualization and supervision, draft writing, review editing and photography. ZH—contributed to data collection, survey work , photography and table preparation. MA—contributed to data collection , graph preparation and bibliographic study.

Acknowledgements: The authors express their sincere gratitude to the principal Government Degree College, Zanskar, for providing essential equipment during data collection. We also extend our heartfelt thanks to Shri Mohd Ilyaz, forest range officer, Zanskar, for his invaluable support in providing field guide booklets. Additionally, we appreciate the assistance of Murtaza Bashir in the preparation of this article.

INTRODUCTION

Birds are valuable bioindicators of environmental changes, as shifts in their populations, behaviors, and reproductive patterns often reflect the impacts of habitat fragmentation and ecological disturbances (Harisha & Hosetti 2009). Thus, understanding the diversity and structure of bird communities is crucial for avian conservation and landscape management (Kattan & Franco 2004).

India, one of the 17 mega-biodiversity countries, is home to 1,358 of the 11,000 bird species identified globally. A study conducted between 2011 and 2020 recorded 226 bird species in Ladakh, comprising 96 summer visitors, 83 passage migrants, 40 residents, and seven winter visitors. These species span 19 orders and 50 families, representing 72.90% of all species known in Ladakh and 18.23% of those in the Indian subcontinent. Among these, one species is classified as 'Endangered', eight as 'Near Threatened', two as 'Vulnerable', and 215 as 'Least Concern' on the IUCN Red List of threatened Species (Spengku et al. 2021).

Located within the Central Asian Flyway, the Union Territory of Ladakh in India serves as a critical stopover for migratory birds. Positioned just to the northern side of the Himalayan range, it provides essential resting and feeding grounds during spring and autumn migrations (Namgail & Yom-Tov 2009). The significance of this region is well-documented (Ali & Ripley 1971; Pfister 2004; Prins & Namgail 2017; Spengku et al. 2021; Newton 2023). According to (Pfister 2004), Ladakh's avian diversity can be categorized into four groups based on seasonal occurrence: resident birds, summer visitors, winter birds, and migrants.

Early avian studies in Ladakh commenced with (Adam 1859), followed by significant surveys throughout the 20th century (Mallon 1987; Mishra & Humbert-Droz 1998; Namgail 2005; Sangha & Naoroji 2005; Hussain & Pandav 2008; Namgail et al. 2013; Motup & Sahi 2013). The majority of research has concentrated on eastern and central Ladakh, with western regions receiving comparatively less attention. Western Ladakh has been primarily documented through sporadic observations rather than comprehensive surveys (Ahmed et al.2015). It has reported 69 bird species in the Rangdum Valley, comprising six passage migrants, 25 resident species, 36 summer visitors, and three vagrants. These species belong to seven orders and 24 families, representing approximately 23% of all documented species in Ladakh (Ahmed et al. 2015).

The Zanskar Valley, part of the Suru Valley in Kargil District of Ladakh, is recognized as an Important Bird and Biodiversity Area (IBA) under the A3 criterion (Rahmani et al. 2016), indicating its significance for species unique to specific biomes. This study aims to document the avian diversity of the Zanskar Region, which remains largely unexplored with sparse documentation on its bird diversity.

MATERIAL AND METHOD

Study area

The Zanskar Valley, situated in the Kargil District of the Union Territory of Ladakh, India, is renowned for its distinctive geography and diverse biodiversity. It is nestled between the Great Himalayan and Zanskar mountain ranges, covering an area of approximately 7,000 km^2. This remote region features a high-altitude desert landscape, with elevations ranging 3,500–7,000 m (Kumar 2020). Zanskar experiences an extreme climate characterized by long, harsh winters and short, cool summers, with minimal precipitation, making it one of India's driest regions (Bhattacharya 2018).

Vegetation in Zanskar is sparse and predominantly consists of cold desert shrubs, alpine grasses, and occasional willow and poplar trees along watercourses. Despite its limited vegetation, the area supports a diverse array of plant life crucial for sustaining various bird species, especially those adapted to high-altitude conditions.

Zanskar's diverse habitats, including river valleys, wetlands, rocky cliffs, and alpine meadows, host a wide variety of bird species. Key avian habitats in the region include wetlands and riverine areas, alpine meadows and grasslands, and rocky cliffs and gorges. These habitats provide critical ecosystems for a range of bird species adapted to the challenging conditions of this remote and rugged terrain (Sharma 2019).

Data collection

The present study was conducted from 01 July 2023 to 30 June 2024, and involved systematic field surveys carried out daily during specific time intervals. Surveys were conducted early in the morning (before 0800 h) and late in the evening (after 1500 h). During the peak winter months of January and February, random surveys were conducted between 1000 h and 1500 h to avoid the extreme cold temperatures. Avifaunal observations were made using both the line transect and random encounter methods (Sutherland et al. 2006). Observations and photographs were captured

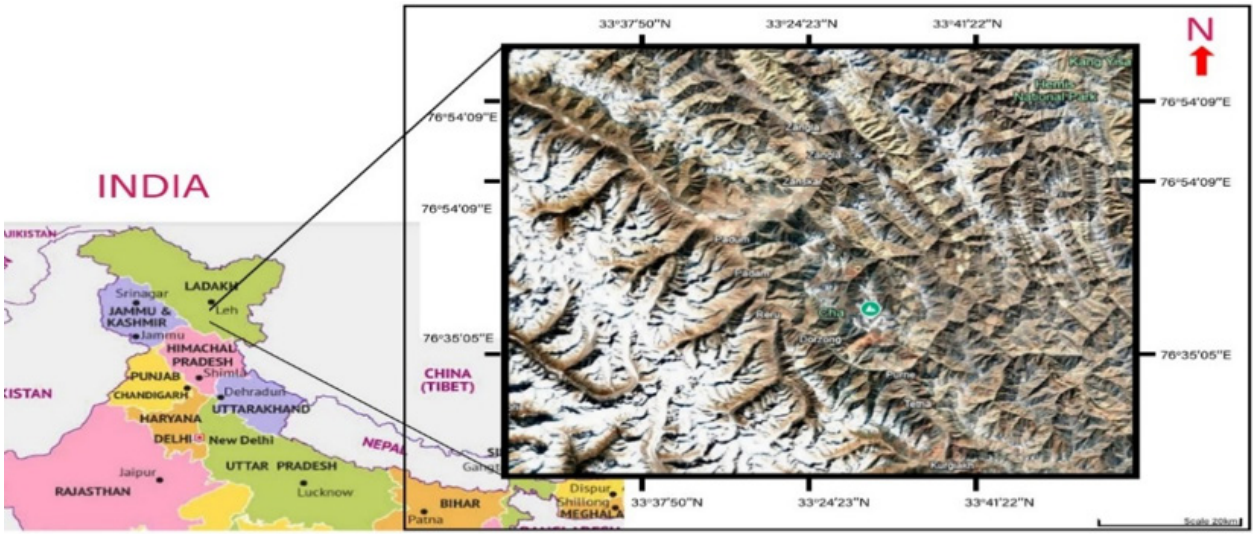

Image 1. Location of the study area (Zanskar).

using a Nikon 10 × 50 binoculars paired with a 200–500 mm lens. Bird identification was facilitated through the use of standard field guides (Ali & Ripley 1987; Grimmett et al. 2016).

The classification of bird sightings considered their threatened status according to the IUCN Red List (IUCN 2022). Birds were categorized based on their frequency of sighting: A – abundant (sighted more than 30 times), C – common (sighted up to less than 15 times), O – occasional (sighted less than 10 times), and R – Rare (sighted less than 5 times), following guidelines adapted from (Mackinnon & Philips 1993) and (Thakur 2008).

RESULTS AND DISCUSSION

In the present study, a total of 81 bird species belonging to 11 orders and 27 families were documented. It accounts for about 27% of the species reported till date from Ladakh. The present findings align with the earlier study conducted by Holmes (1986), Motup & Sahi (2013), Ahmed et al. (2015), and Ajaz et al. (2021). Some similar studies were conducted on the avifauna of Ladakh. Tsewang & Sahi (2013) reported 91 bird species in the Kargil District. Ajaz et al. (2021) documented 136 species in Zanskar and Suru Valley. Ahmed et al. (2015) reported 69 bird species from Rangdum Valley. Holmes (1986) published a checklist of 128 species in Suru Valley. Khan & Kumar (2022) reported 140 bird species in Suru Valley.

Among these, Passeriformes was the most dominant order (50 species) followed by Charadriiformes (nine species), Columbiformes and Anseriformes (five species each), Accipitriformes (four species), Apodiformes and Galliformes (two species each), Bucerotiformes, Cuculiformes, Falconiformes and Pelecaniformes (one species each). The order Passeriformes was reported as the most dominant order in different regions of Ladakh in general and the Zanskar Valley in particular (Holmes 1986; Tsewang & Sahi 2013; Ahmed et al. 2015; Ajaz et al. 2021).

Among these, 45 species were summer visitors, 27 species were residents, six species were passage migrants, and three species were vagrants. The data analysis revealed that the majority of bird species observed were summer visitors (55.6%), followed by resident species (33.3%), passage migrants (7.4%), and vagrants (3.7%). Similar findings were reported by Ahmed et al. (2015) and (Holmes 1986). The availability and accessibility of resources during the summer season can be correlated with a higher percentage of summer visitor birds in the region provide breeding and feeding habitat (Holmes 1986; Hussain & Pandav 2008; Namgail et al. 2009; Ahmed et al. 2015). Further, Ahmed et al. (2015) recorded 69 species in Rangdum Valley in which the resident status of *Passer domesticus* contradicts the present finding as it was found that the *Passer domesticus* is a summer visitor.

Among the 81 recorded species, 53 were found in alpine meadows and grasslands, 16 species were observed in wetlands and riverine areas, and 12 species were spotted in rocky cliffs and gorges. The majority of the bird's species were found in the Alpine meadows and grasslands (65.4%) followed by wetland and

Table 1. List of avifauna found in the Zanskar Region and their IUCN Red List status.

	Species	Common name	Status	IUCN Red List status	Sighting status	Habitat status
	Order (Family) Anseriformes (Anatidae)					
1.	*Mergus merganser*	Common Merganser	Resident	LC	Common	WL & RA
2.	*Tadorna ferruginea*	Ruddy Shelduck	Summer Visitor	LC	Occasional	WL & RA
3.	*Mareca penelope*	Eurasian Wigeon	Summer Visitor	LC	Occasional	WL & RA
4.	*Anas querquedula*	Garganey	Passage \Migrant	LC	Rare	WL & RA
5.	*Anas acuta*	Northern Pintail	Passage migrant	LC	Rare	WL & RA
	Apodiformes (Apodidae)					
6.	*Apus apus*	Common Swift	Summer visitor	LC	Common	RC & GL
7.	*Apus pacificus*	Fork-tailed Swift	Summer Visitor	LC	Common	RC & GL
	Passeriformes (Cinclidae)					
8.	*Cinclus cinclus*	White-throated Dipper	Resident	LC	Rare	WL & RA
9.	*Cinclus pallasii*	Brown Dipper	Resident	LC	Rare	WL & RA
	Bucerotiformes (Upupidae)					
10.	*Upupa epops*	Common Hoopoe	Summer visitor	LC	Abundant	AM & GL
	Cuculiformes (Cuculidae)					
11.	*Cuculus canorus*	Eurasian Cuckoo	Summer visitor	LC	Common	AM & GL
	Galliformes (Phasianidae)					
12.	*Alectoris chukar*	Chukar Partridge	Resident	LC	Abundant	RC & G
13.	*Tetraogallu shimalayensis*	Himalayan Snowcock	Resident	LC	Occasional	RC & G
	Columbiformes (Columbidae)					
14.	*Columba livia*	Rock Pigeon	Resident	LC	Abundant	AM & GL
15.	*Columba rupestris*	Hill Pigeon	Resident	LC	Abundant	RC & G
16.	*Columba leuconota*	Snow Pigeon	Resident	LC	Abundant	AM & GL
17.	*Streptopelia orientalis*	Oriental Turtle Dove	Summer visitor	LC	Abundant	AM & GL
18	*Streptopelia senegalensis*	Laughing Dove	Passage migrant	LC	Rare	AM & GL
	Charadriiformes (Pteroclidae)					
19.	*Tringa totanus*	Common Redshank	Summer visitor	LC	Common	WL & RA
20.	*Tringa nebularia*	Common Greenshank	Summer Visitor	LC	Abundant	WL & RA
21.	*Actitis hypoleucos*	Common Sandpiper	Passage migrant	LC	Occasional	WL & RA
22	*Calidris minuta*	Little Stint	Summer Visiter	LC	Occassional	WL & RA
23.	*Tringa glareola*	Wood Sandpiper	Summer Visitor	LC	Common	WL & RA
	Charadriiformes (Charadriidae)					
24.	*Ibidorhycha struthersii*	Ibis-bill	Summer visitor	LC	Common	WL & RA
25.	*Himantopus himantopus*	Black-winged Stilt	Passage migrant	LC	Abundant	WL & RA
26.	*Charadrius mongolus*	Lesser Sand Plover	Summer visitor	LC	Common	WL & RA
	Charadriiformes (Laridae)					
27.	*Sterna hirundo*	Common Tern	Summer visitor	LC	Rare	AM & GL
	Accipitriformes (Accipitridae)					
28.	*Gypaetus barbatus*	Lammergeier	Resident	NT	Rare	RC & G
29.	*Gyps himalayensis*	Himalayan Griffon	Resident	NT	Rare	RC & G
30.	*Accipiter nisus*	Eurasian Sparrow Hawk	Summer visitor	LC	Common	RC & G
31	*Aquila chrysaetos*	Golden Eagle	Resident	LC	Rare	RC & G

	Species	Common name	Status	IUCN Red List status	Sighting status	Habitat status
	Falconiformes (Falconidae)					
32	*Falco tinnunculus*	Common Krestel	Summer visitor	LC	Rare	RC & G
	Pelecaniformes (Ardeidae)					
33	*Ardeola grayii*	India Pond Heron	Summer visitor	LC	Rare	WL & RA
	Passeriformes (Laniidae)					
34	*Lanius schach*	Long-tailed Shrike	Summer visitor	LC	Common	AM & GL
35	*Lanius tephronotus*	Grey-backed Shrike	Summer visitor	LC	Common	AM & GL
36	*Lanius minor*	Lesser Gray Shrike	Summer visitor	LC	Common	AM & GL
	Passeriformes (Muscipidae)					
37	*Monticola solitariius*	Blue Rock Thrush	Summer visitor	LC	Rare	AM & GL
38	*Myophonus caeruleus*	Blue Whistling Thrush	Summer visitor	LC	Occasional	AM & GL
39	*Calliope pectoralis*	Himalayan Ruby Throat	Summer visitor	LC	Rare	AM & GL
40	*Luscinia svecica*	Bluethroat	Summer visitor	LC	Rare	AM & GL
41	*Phoenicurus ochruros*	Black Redstart	Summer visitor	LC	Abundant	AM & GL
42	*Phoenicurus leucocephalus*	White-capped Redstart	Summer visitor	LC	Occasional	AM & GL
43	*Phoenicurus erythrogastrus*	White-winged Redstart	Resident	LC	Common	AM & GL
44	*Phoenicurus phoenicurus*	Common Redstart	Resident	LC	Common	AM & GL
	Passeriformes (Corvidae)					
45.	*Pica pica*	Eurasian Magpie	Resident	LC	Occasional	AM & GL
46.	*Pyrrhocorax pyrrhocorax*	Red-Billed Chough	Resident	LC	Abundant	AM & GL
47.	*Pyrrhocorax graculus*	Yellow-Billed Chough	Resident	LC	Abundant	AM & GL
48.	*Corvus splendens*	House Crow	Vagrant	LC	Rare	AM & GL
49.	*Corvus corone*	Carrion Crow	Resident	LC	Rare	AM & GL
50.	*Corvus corax*	Common Raven	Resident	LC	Rare	AM & GL
	Passeriformes (Sturnidae)					
51.	*Sturnia pagodarum*	Brahminy Starling	Summer visitor	LC	Rare	AM & GL
	Passeriformes (Paridae)					
52.	*Parus cinereous*	Cinereous Tit	Resident	LC	Rare	AM & GL
	Passeriformes (Hirundinidae)					
53.	*Hirundo rupestris*	Eurasian Crag Martin	Summer visitor	LC	Common	RC & G
54.	*Delichon urbicum*	Northern House Martin	Summer visitor	LC	Common	RC & G
	Passeriformes (Fringillidae)					
55.	*Serinus pusillus*	Fire-fronted Serin	Resident	LC	Common	AM & GL
56.	*Carduelis carduelis caniceps*	European Goldfinch	Summer visitor	LC	Abundant	AM & GL
57.	*Leucosticte nemoricola*	Plain Mountain Finch	Summer visitor	LC	Abundant	AM & GL
58.	*Leucosticte brandti*	Brandts's Mountain Finch	Resident	LC	Abundant	AM & GL
59.	*Carpodacus erythrinus*	Common Rosefinch	Summer visitor	LC	Abundant	AM & GL
60.	*Carpodacus rubicilla*	Great Rosefinch	Resident	LC	Abundant	AM & GL
61.	*Carpodacus puniceus*	Red-fronted Rosefinch	Resident	LC	Abundant	AM & GL
	Passeriformes (Turdidae)					
62.	*Turdus unicolor*	Tickell's Thrush	Resident	LC	Occasional	AM & GL
	Passeriformes (Alaudidae)					
63.	*Alauda gulgula*	Oriental Skylark	Summer visitor	LC	Common	AM & GL
64.	*Eremophila alpestris*	Horned Lark	Resident	LC	Abundant	AM & GL
65.	*Galerida cristata*	Crested Lark	Summer visitor	LC	Abundant	AM & GL

	Species	Common name	Status	IUCN Red List status	Sighting status	Habitat status
66.	*Melanocorypha maxima*	Tibetan Lark	Summer visitor	LC	Occasional	AM & GL
	Passeriformes (Passeridae)					
67.	*Passer domesticus*	House Sparrow	Summer Visitor	LC	Abundant	AM & GL
68.	*Montifringilla adamsi*	Tibetan Snowfinch	Resident	LC	Rare	AM & GL
	Passeriformes (Prunellidae)					
69.	*Prunella rubeculoides*	Robin Accentor	Resident	LC	Common	AM & GL
	Passeriformes (Emberizidae)					
70.	*Emberiza cia*	Rock Bunting	Summer visitor	LC	Abundant	AM & GL
	Passeriformes (Motacillidae)					
71.	*Motacilla alba*	White Wagtail	Summer visitor	LC	Abundant	AM & GL
72.	*Motacilla citreola*	Citrine Wagtail	Summer visitor	LC	Abundant	AM & GL
73.	*Motacilla flava*	Yellow Wagtail	Summer visitor	LC	Occasional	AM & GL
74.	*Motacilla cinerea*	Grey Wagtail	Summer visitor	LC	Rare	AM & GL
	Passeriformes (Sylviidae)					
75.	*Phylloscopus collybita*	Common Chiffchaff	Passage migrant	LC	Abundant	AM & GL
76.	*Phylloscopus sindianus*	Mountain Chiffchaff	Summer visitor	LC	Common	AM & GL
77.	*Phylloscopus neglectus*	Plain Leaf Warbler	Vagrant	LC	Rare	AM & GL
78.	*Phylloscopus affinis*	Tickell's Leaf Warbler	Summer visitor	LC	Occasional	AM & GL
79.	*Phylloscopus griseolus*	Sulphur-bellied Warbler	Summer visitor	LC	Common	AM & GL
80.	*Phylloscopus fuscatus*	Dusky Warbler	Vagrant	LC	Rare	AM & GL
81.	*Sylvia curruca*	Lesser Whitethroat	Summer visitor	LC	Occasional	AM & GL

WL—Wetlands | RA—Riverine areas | AM—Alpine meadows | GL—Grasslands | RC—Rocky cliffs | G—Gorges | LC—Least Concern | NT—Near Threatened.

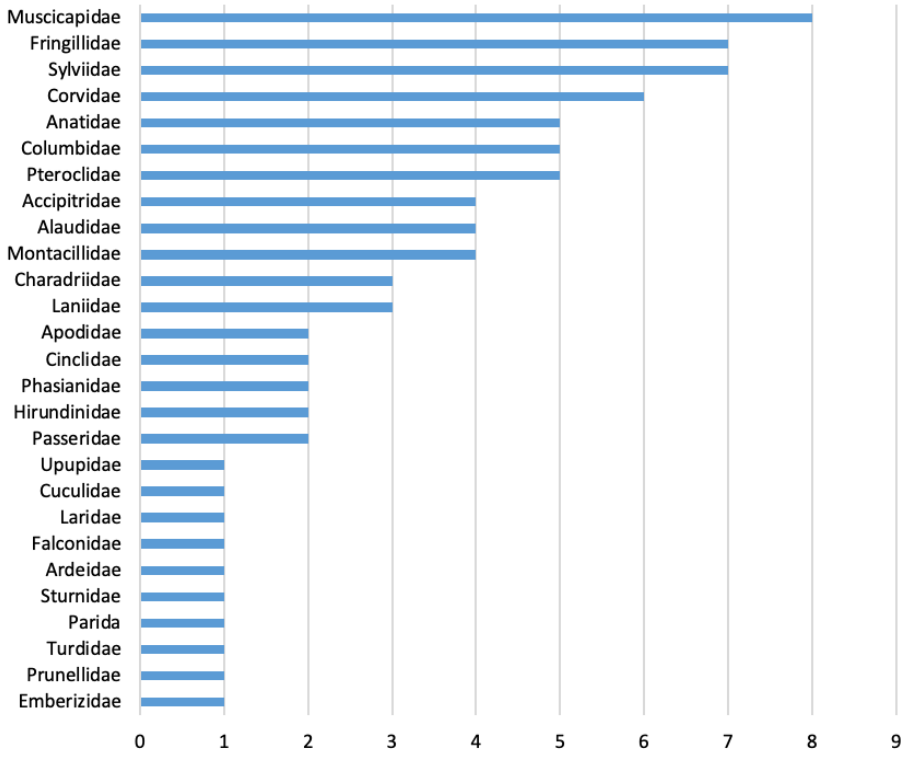

Figure 1. Species richness across different bird families.

riverine areas (19.8%) and least in the rocky cliffs and gorges (14.8%.). Ahmed et al. (2015) also reported the maximum number of bird species along the herbaceous meadows of Zanskar Region.

All bird species identified in the Zanskar Region are classified as 'Least Concern' according to the IUCN Red List, except for two species, the *Gypaetus barbatus* Lammergeier and the *Gyps himalayensis* Himalayan Griffon, which are categorized as 'Near Threatened'. Khan & Kumar (2022) also reported *Gypaetus barbatus* and *Gyps himalayensis* in addition to *Umenius arquata* and *Locustella* species in the Suru Valley of Ladakh Region.

The Zanskar Valley harbor is home to several bird species found in the Indian subcontinent. It also acts as an important stopover and important summer migration site for the summer visitor birds of the Valley. Besides, the occurrence of 'Near Threatened' species like *Gypaetus barbatusa* and *Gyps himalayensis* listed under IUCN Red list shows the importance of the valley regarding avifaunal diversity. A low diversity of avifauna in Zanskar Valley can be attributed to its fragile ecosystem with harsh climatic conditions, low vegetative cover, freezing temperatures, and scanty rainfall. In addition, overgrazing, urbanization, and habitat destruction pose significant threats to the valley's bird species diversity. The forest cover is mainly in the form of salix and poplar trees, which are often preferred habitats for birds, and is utilized on a larger scale for construction purposes, thereby reducing the bird diversity in the valley. The agricultural expansion by the native people is disrupting the local ecosystem. Moreover, the Zanskar Valley is a beautiful and unique tourist destination and the rising influx of tourists at an enormous scale poses a significant concern for the native birds and the wildlife populations of the Zanskar Valley.

It is the need of the hour to protect the avifauna diversity and the fragile environment of the Zanskar Valley. It is the joint responsibility of the administration as well as the local community to conserve the avifauna and its habitats in the Zanskar Valley from the impacts of unchecked development, uncontrolled grazing, and the rising tourism influx. The Ladakh region comprises three protected areas namely Hemis National Park, Karakoram Wildlife Sanctuary, and Changthang Wildlife Sanctuary. It also features two Ramsar sites. The Tsomoriri and Tso-Kar are situated in the Leh District. The Zanskar Valley is concerning in terms of lack of protected areas which poses a threat to the local wildlife population including the bird species. For the conservation of the avifaunal diversity of Zanskar Valley, it is crucial that the administration takes a significant part in establishing these protected areas. It is also the responsibility of every native person to actively contribute to the preservation of avifaunal diversity and its habitats in the Valley.

CONCLUSION

The present survey provides a checklist of the avifauna of the Zanskar Valley, listing 81 bird species belonging to 11 orders and 27 families. Passeriformes was the most dominant order with 50 species. The majority of the birds were summer visitors with 45 species. They migrate to the area as it offers a suitable environment for feeding and breeding needs. The Zanskar Valley is a paradise for avifaunal diversity, the increasing pressure on the delicate ecosystem poses a threat to bird diversity. The agricultural expansion, increasing tourism, and the various developmental projects are directly contributing to declining avifaunal diversity in Zanskar Valley. The information about the avifauna is scanty and further study is needed to explore the avian species of the Valley. Therefore, it is the need of the hour to monitor the region systematically in the rapidly changing environment with a focused study on the conservation of the avifauna of the region.

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Image 2. 1—Himalayan Rubythroat | 2—Chukar Partridge | 3—Bluethroat | 4—White-winged Redstart | 5—White-throated Dipper | 6—Eurasian Magpie | 7—Tickell's Thrush | 8—Common Greenshank | 9—European Goldfinch | 10—Common Tern | 11—Common Rosefinch | 12—Grey Wagtail | 13—Wood Sandpiper | 14—White Wagtail | 15—Black Redstart.

Image 2 cont. 16—House Sparrow | 17—Great Rose Finch | 18—Monglian Finch | 19— Common Redstart | 20—Black-winged Stilt | 21—Desert Wheateater | 22—Critine Wagtail | 23—Ruddy Shelduck | 24—Robin Accentor | 25—Crested Lark | 26—Ibis-bill | 27—Eurasian Wigeon | 28—Lesser Grey Shrike | 29—Common Cuckoo | 30—Yellow-billed Chough.

Image 2 cont. 31—Eurasian Crag Martin | 32—Common Hoopoe | 33—Common Raven | 34—Rock Bunting | 35—Fire-fronted Serin | 36—Sulpher-billed Warbler | 37—Red-billed Chough | 38—Northern Pintail | 39—Blue-whistling Thrush | 40—Little Stint | 41—Horned Lark | 42— Northern Wheateater | 43—Common Redshank | 44—Oriental Turtle Dove | 45—Lesser Sand Plover.

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Journal of Threatened Taxa is indexed/abstracted in Bibliography of Systematic Mycology, Biological Abstracts, BIOSIS Previews, CAB Abstracts, EBSCO, Google Scholar, Index Copernicus, Index Fungorum, JournalSeek, National Academy of Agricultural Sciences, NewJour, OCLC WorldCat, SCOPUS, Stanford University Libraries, Virtual Library of Biology, Zoological Records.

NAAS rating (India) 5.64

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Journal of Threatened Taxa

www.threatenedtaxa.org

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

March 2025 | Vol. 17 | No. 3 | Pages: 26571–26762
Date of Publication: 26 March 2025 (Online & Print)
DOI: 10.11609/jott.2025.17.3.26571-26762

Publisher & Host

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