



# Ecological Perspective on Avian Faunal Diversity of Kibber Wildlife Sanctuary, Trans-Himalayan Region, Himachal Pradesh, India

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## Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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## ABSTRACT

It has long been known that the trans-Himalayan region of Himachal Pradesh, India is home to the remarkable biodiversity. The findings in this research paper constitute an important addition to the knowledge of ornithology in Kibber Wildlife Sanctuary. This study gives insight into the habitat preference of bird species in the sanctuary including estimation of their migratory patterns based on altitude and analysis of IUCN status in accordance with field observations. For this meadows, pastures, few waterlogged habitats in the sanctuary were taken into consideration while using both point count as well as random sampling methods. The thorough investigation on said aspects will offer more information related to this landscape in near future. Also, present findings will help in the sanctuary's management plans and efforts to conserve biodiversity.

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## 1. INTRODUCTION

The Himalayan mountain range harbours an array of habitats attracting fauna and flora from various realms due to its unique climatic conditions. Such attributes felicitate the Himalayas with the crown of a distinguished biodiversity being situated at the convergence of four zoogeographic realms. According to [1] and [2] Himalayas is home to about 970 (80%) of the Indian Subcontinent's bird species.

Most of the bird species in the mountainous region of India are concentrated in the Shiwalik Himalayas with only a few species documented in the cold desert regions such as Kinnaur and Lahaul Spiti district [3] and [4]. Whereas the Trans Himalaya is perceived as cold desert because most of the region is characterized by a barren, rocky land that subsumes short grasses, small bushes, exposed bare soil for most part of the year. Along with cooler temperatures and distinct soil conditions the nature promotes desert landscapes with very little green surface only during summer. Since the 1990s there has been a significant enhancement in understanding the distribution and status of fauna in Spiti valley particularly following the release of the various research articles. In the year 1933, Walter Koelz conducted a thorough examination of the valley encompassing the Pin valley and Kibber regions and documented the presence of more than 90 species [5]. Given the significance of the animal distribution in the area many distinguished scientists in the past played a significant role in enhancing the diversity of fauna. However, the research was mainly focused on specific animal groups within the kingdom leading to fragmented and irregular information. Long-term datasets and ongoing surveillance of bird populations can be used to identify signs of ecological change [6].

In the past, Ladakh situated to the east of Spiti valley has encountered few instances of non-native species like the Long-tailed Shrike *Lanius schach* displacing the indigenous Grey-backed Shrike *L. tephronotus* [7]. In the year 2003 [8] also pointed out that there was a significant change in species across different elevations and the birds groups at 1 kilometer altitude displayed few differences. They attributed these variations present in bird populations to diverse climatic conditions present in Himalayas. Out of the 783 Himalayan bird species they found that 154 species breed at altitudes exceeding two thousand metres.

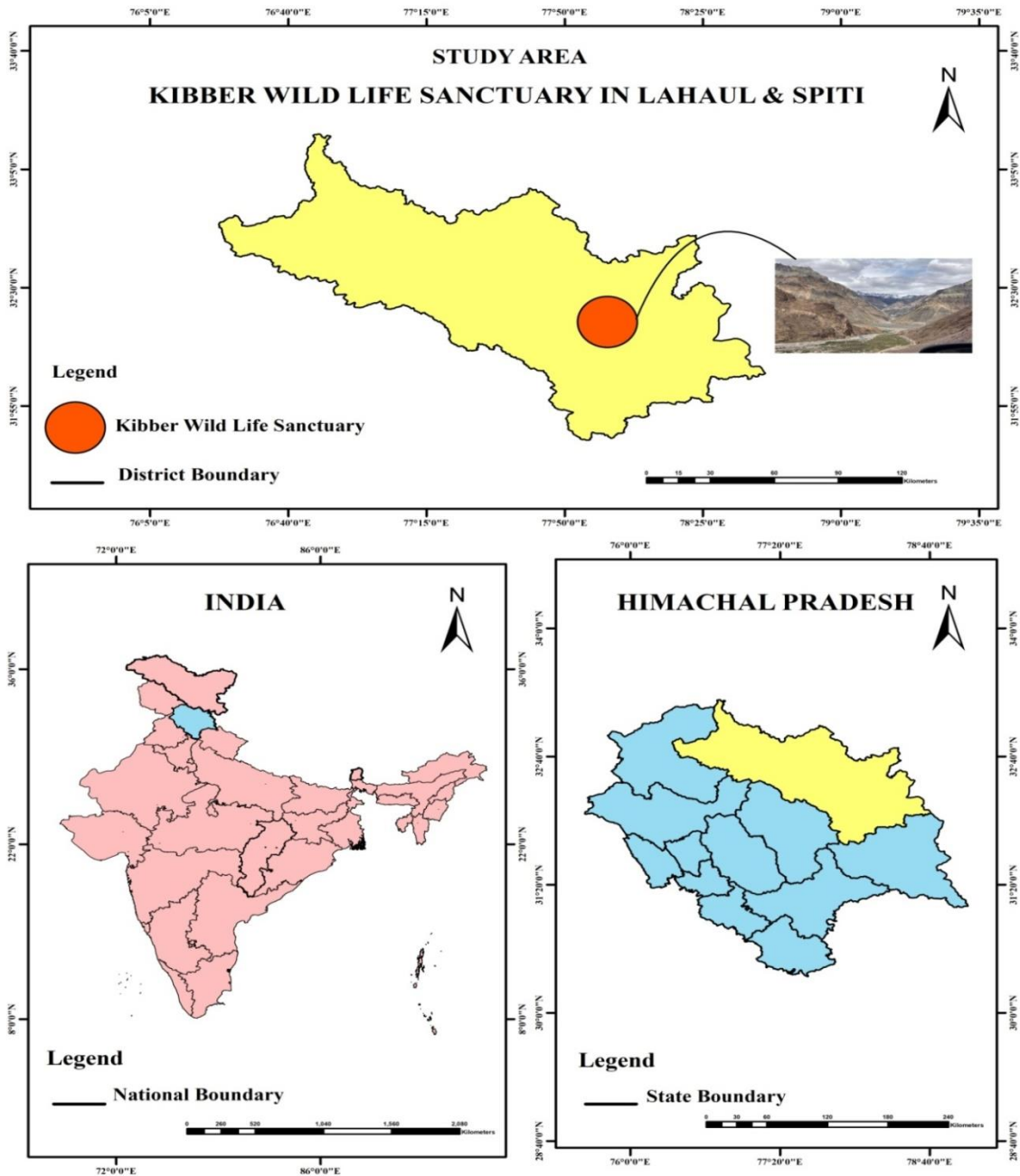
For several reasons avian research is important as birds are essential to ecosystems because they regulate insect populations, facilitate seed and pollens dispersal. The study of birds in sanctuaries is essential to expand our knowledge of ecological dynamics biodiversity and conservation. Considering the need of conservation of fauna of this region our study aimed for the documentation of birds that will help to identify factors influencing avian diversity in the Kibber Wildlife Sanctuary in future. Additionally, fluctuations in bird populations reflect broader ecological trends making birds useful as indicators of the health of the environment. To evaluate the effects of habitat loss, human activity, environmental changes on bird populations some baseline data must be established for Kibber Wildlife Sanctuary.

The Kibber Wildlife Sanctuary (KWS) lacks detailed documentation or any published records of its avifauna status and the absence of scientific research in KWS prompted the current study which aims to address various questions like threats to the avian fauna by evaluating the birds status in the sanctuary.

### 1.1 Study Area

One of the most isolated refuges for birds in Himachal Pradesh is the Kibber Wildlife Sanctuary, which is situated in the Spiti division of the district Lahaul and Spiti. Its latitudes range from 32° 8' 49.082" to 32° 45' 39.903" N, while its longitudes range from 77° 47' 59.726" to 78° 31' 29.452" E. With Ladakh to the north and Tibet to the east, this wildlife sanctuary is situated in the northern watershed of the Spiti River [9]. The sanctuary is mostly divided into Kibber, Langza, and Lalung beats. The frigid desert typically experiences 40°C summer temperatures and -45°C winter temperatures with very little rainfall (less than 60 mm) [10].

Because of its elevation the sanctuary can support the rare alpine herbs like gentians and primulas which adds to its ecological significance and aesthetic appeal. There was a noticeable abundance of grasses in this area indicating that the species like *Calamagrostis*, *Berginia stracheyi* and *Rheum* were supporting a healthy ecology. Arya and Samant [11] examined a variety of mixed communities and found important insights into the dynamics of interactions between plant species.



**Map1. Kibber wildlife sanctuary in Lahaul and Spiti distt of Himachal Pradesh**

## 2. MATERIALS AND METHODS

Spiti valley generally experiences significant temperature fluctuations due to high atmospheric transparency and intense sunlight from morning to noon leading to warmth. However, rapid cooling occurs in the evening and night hours, coupled with strong winds, causing extreme coldness, so monitoring was done in early morning and late evening also sometimes from sunny morning to evening. Field surveys were

conducted in the study area in the year 2023. The present study was conducted by using point count method and random sampling in Kibber Wildlife Sanctuary. The focus was on observing meadows, pastures, few waterlogged habitats in the sanctuary. Bird observations were made using naked eyes, a 10x50 super Zenith field binocular, Nikon CoolpixP1000 (125 x Optical Zoom, 3000 mm Super telephoto lens) camera. The locations of these sighted birds were noted and geo co-ordinates were taken

precisely. Standardized literature and field guides [12-14] as well as a confirmed avian database [15] were used to identify the avifauna. Bird identification and nomenclature was aided by field guides [16].

### 3. RESULTS AND DISCUSSION

Following are the ecological notes on the recorded bird's species from Kibber Wildlife Sanctuary.

#### 3.1 Horned Lark (*Eremophila alpestris* Linnaeus, 1758)

This little passerine is a widely spread species of songbirds with extensions of its range from tundra to deserts and grasslands in all the 5 continents on the globe [17]. *Eremophila alpestris* also known as the horned lark is a bird found across the northern hemisphere. During the survey the bird appeared to be foraging for small arthropods while sitting on the ground. It appeared as squat-looking bird with short legs and a low-profile body. Adult male had a sandy-brown color with a white belly. The namesake horns were seen on the head of adult male and it was the most striking feature. The head pattern was quite striking with a black mask and chest band. However, the throat colour can vary from yellow to white and sometimes they have blurry streaks on the sides of their breast. These tiny hornlike structures are the tuft of feathers that remain stick to the head [18]. At a little distance we came across female horned larks that had a dusky breast band and lacked both black eye patch around the eyes as well as horns. Horned lark typically nests on the ground and has aptness to blend in with its surroundings to keep from harm [19]. Their preferences for habitat fluctuate according to seasonal variations and geographic location allowing them to adapt to a wide range of environments. The ecology and behaviour of Horned Larks are well-understood [20] also the various patterns followed in grassland by birds [21] which throw light on the habitat preferences and breeding tactics of the birds. The *Eremophila alpestris* was one of the most common finches of the upper plateau habitat in Kibber Wildlife Sanctuary being present in almost all the grass grounds and in other diverse habitats surveyed.

#### 3.2 Ruddy Shelduck (*Tadorna ferruginea* Pallas, 1764)

The bird ruddy shelduck is popularly known as Brahminy duck in India. Main breeding areas of *Tadorna ferruginea* stretches from southeast

Europe across the Palearctic to Lake Baikal, western China and Mongolia. Eastern populations of Ruddy Shelduck migrate and spend their winters in the Indian subcontinent [22]. We encountered a pair of ruddy shelduck on moist ground near a small, waterlogged habitat in Kibber Wildlife Sanctuary. The birds were seen enjoying the surrounding in the cloudy morning. The male ruddy shelduck had orange-brown body plumage and a lighter orange-brown head and neck. A slim black collar seemed to separate the head from rest of the body. The female was quite similar, but her head and neck were paler and more whitish. The female ruddy shelduck had no black collar like male [23]. The occurrence of *Tadorna ferruginea* in the Kibber Wildlife Sanctuary is intriguing as there is no large permanent water reservoir inside the sanctuary however the nearest confirmed reported site of its occurrence is Chandertal lake [24]. Also the Brahminy duck was commonly observed in the ponds of village Mote Majra in neighbouring state Punjab as a migratory bird [25]. The in-depth knowledge of the ruddy shelduck's ecology and conservation requirements will help to develop management plans that will better preserve this iconic species of waterfowl for coming generations. The long-term studies can help us to know that how adaptable this species is to various environments such as lakes, rivers, marshes, and farmland. To protect the ruddy shelduck and its habitats for future generations, cooperative conservation efforts and ongoing research are crucial.



Fig. 1. Male horned lark

#### 3.3 Robin Accentor (*Prunella rubeculoides* Moore, F 1854)

The robin accentor is scientifically known as *Prunella rubeculoides*. During field visits we often came across many individuals of this species at each location and it appeared that they were spread throughout the sanctuary in their preferred habitats. An individual was



**Fig. 2. Female horned lark**

spotted perching near the ground displaying the calm and unobtrusive behaviour. It had a greyish appearance with a chestnut-brown chest. Its head, throat, upper body, wings and tail were all smokey brown in color. We noticed a faint black stripe on its upper back. Between its gray throat and chestnut-brown chest it had a narrow black collar. The rest of its body was a pristine white in color. The Himalayan highlands between 3,000 and 5,000 meters above sea level are the main habitats for the robbin accentor. It lives in a range of environments including as scrub vegetation, alpine meadows and rocky slopes. This species is frequently found in regions with little vegetation and rocky outcrops because it is well suited to cold conditions. Belonging to the Prunellidae family the robbin accentor is a mysteriously coloured bird found in central Asian high altitudes. Despite its unassuming look this species is an important insectivore and seed disperser in alpine settings. The amazing adaptations that allow bird species to flourish in harsh alpine habitats are best shown by the robbin accentor. Its preferences for habitat, ecology of feeding, methods of reproduction, interactions with the surrounding environment demonstrate the complex ecological dynamics at work in high mountain environments [26]. Conservation efforts can be more effectively directed to protect the delicate balance of alpine biodiversity by developing a clearer understanding of the ecological requirements of the robbin accentor. For the species to survive over the long term in the face of continual environmental changes more investigation into how it responds to these changes is necessary. This bird can be found in Bhutan, China, India, Nepal and Pakistan is exclusive to the Palearctic region [27]. This species was classified as a least concerned species and listed on the IUCN's 2016 Red List as a species of least concern (LC).



**Fig. 3. Male ruddy shelduck**



**Fig. 4. Female ruddy shelduck**

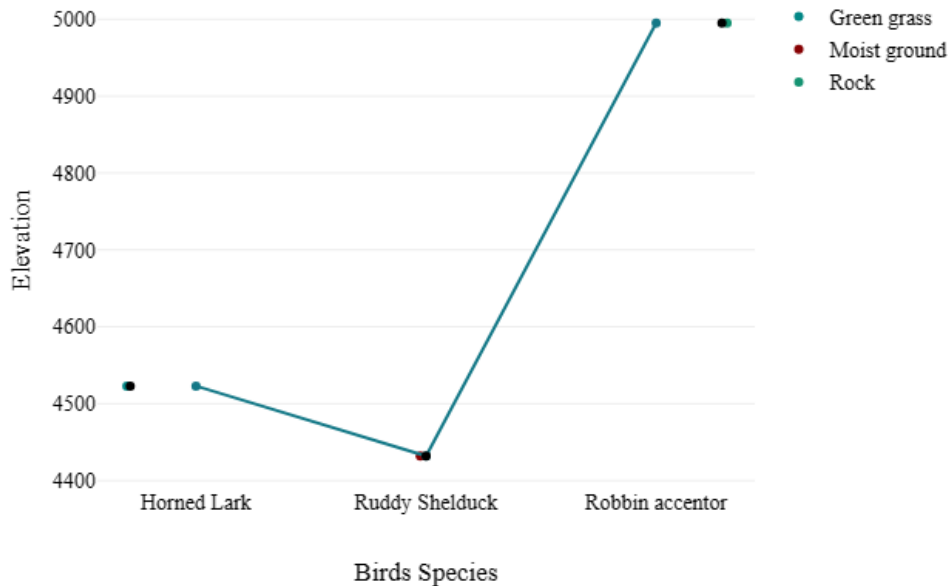


**Fig. 5. Adult robbin accentor**

Horned Larks live in a wide range of elevations from sea level to 13,000 feet. Linnaeus called them "larks of the mountains" (they're now in the *Eremophila* genus). These adaptive birds have demonstrated their resilience in the face of habitat change by successfully adapting to a variety of situations. According to the frequency of sightings of birds ruddy shelduck was rarely

**Table 1. Species information data**

Common Name	Scientific Name	Migratory Status	Habitat	Co-Ordinates
Horned Lark	<i>Eremophila alpestris</i>	Resident	Green grass	32°29780 78°05654
Ruddy Shelduck	<i>Todorna ferruginea</i>	Migratory	Moist ground	32°26934 78°08988
Robbin accentor	<i>Prunella rubeculoides</i>	Resident	Rock	32°23276 78°11762



**Fig. 6. A graph showing the habitat preferences of birds species at different altitudes**

seen however horned lark and robbin accentor were common during the field visits. The presence of ruddy shelduck was quite surprising in the Kibber Wildlife Sanctuary and was distinguished through its unique call. Although this bird favours wetlands and marshy settings but may have adaptation to few rocky surfaces having shallow waterlogged areas using rocks and cracks as roosting and breeding sites. Their extraordinary adaptability to survive in the rocky areas with very less water around highlights the significance of conservation efforts to safeguard their populations. Unique habitat adaptability can be a major reason behind the fact that all these sighted species do not face any major threats and their population appeared to be stable, so the International Union for Conservation of Nature has considered them to be of "least concern" in terms of conservation status. Such species exhibit resilience and flexibility to changing environmental conditions while encountering several obstacles.

#### 4. CONCLUSION

Documenting said bird species during surveys in the Kibber Wildlife Sanctuary highlighted their habitat preferences, IUCN as well as migratory status and range of elevation. This suggests that it's specifically the mountain fauna that requires further study. In addition to biological monitoring programs inventories remain a crucial component of biodiversity research playing a significant role in documenting the distribution of bird species and groups. Our observations of previously unreported species in the Kibber Wildlife Sanctuary demonstrate that even in such a vast territory biological inventory conducted in hard-to-reach areas make valuable contributions to characterize the biodiversity of the Trans Himalayan ecosystem. Each of these species show different patterns of occurrence however it was a preliminary survey of the local bird population in Kibber Wildlife Sanctuary to identify potential habitats and important conservation areas for bird communities.

Finding species closely linked to the different habitats and those more abundant in it show how crucial it is to maintain their record and need strategies to protect this ecosystem from any kind of interference. It is vital to conduct biological studies in such areas to uncover other rare or geographically limited species that rely on the preservation of habitat. The foundation of avian study is baseline data which offers crucial understanding of bird populations and their environments. Through the utilization of varied techniques and adoption of technological innovations scientists can augment their comprehension of avian ecology and provide guidance for conservation tactics aimed at safeguarding birds and their environments. Taking care of its habitat can have a big impact on the overall health of the environment. In addition to biological monitoring programs conducting inventories is still a crucial part of investigating biodiversity. These inventories play a significant role in documenting the distribution of bird species and communities.

#### DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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