



NESTING ECOLOGY OF SELECTED URBAN BIRD SPECIES IN RISHIKESH, UTTARAKHAND, INDIA

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ABSTRACT

Urban landscapes provide important breeding habitats for a variety of bird species that have adapted to human-dominated landscapes. The present study aimed to understand nesting ecology of selected urban bird species in Rishikesh, Uttarakhand, India. The study documented the nesting ecology of six common bird species, viz. *Vanellus indicus*, *Spilopelia chinensis*, *Columba livia domestica*, *Pycnonotus cafer*, *Passer domesticus*, and *Columba livia*. Systematic field surveys were conducted during breeding and non-breeding season at three different sites of Rishikesh. Primary data were recorded through direct observations of active nests at the selected study sites, while secondary data were obtained from authenticated online sources, published papers, and relevant articles. Active nests of six common bird species were monitored to record nest characteristics, nest-site selection, and breeding behaviour. The study demonstrated that all the studied species exhibited species-specific nesting strategies. The outcomes of the present investigation establish reference data on the nesting ecology of urban bird species and highlight the need to conserve urban green spaces and appropriate nesting habitats to support long-term biodiversity conservation.

Keywords: Urban birds, nesting ecology, nest-site selection, human-dominated landscapes, Rishikesh, Uttarakhand

INTRODUCTION

Urbanization is among most significant drivers of global environmental change, transforming natural landscape into ecosystem dominated by human activities (Ding et al. 2025). The behaviour, distribution, and reproductive success of birds are all impacted by the rapid expansion of cities, which also modifies habitat structure, vegetation composition, and availability of food and nesting resources (Ding et al. 2025). Many bird species have successfully adapted to urban environments by taking advantage of man-made structures, despite the fact that urbanisation presents a number of difficulties (Budakoti et al. 2024; Rana et al. 2025). Understanding how birds react to this environmental change is essential for conserving urban biodiversity and maintaining ecological balance (Badola and Mittal 2021; Rana et al. 2025). Nesting ecology is an important aspect of avian biology that deals with nest-site selection, nest architecture, nesting material and clutch size. Nesting behaviour differs among bird species and is influenced by several

ecological factors, including climate change, availability of food resources, predation pressure, and anthropogenic activities (Budakoti et al. 2024; Rana et al. 2025). Rishikesh, situated in the foothills of Himalayas, beside the Ganga River in Uttarakhand, is a rapidly developing urban area comprising residential neighbourhoods, parks, roadside plantation, and open spaces. The diversity of these habitats provides favourable condition for variety of bird species by offering suitable nesting sites and food resources (Kaushik et al. 2022; Bhatt and Joshi 2011). Therefore, this study was carried out to document the nesting ecology of selected urban bird species in Rishikesh, Uttarakhand. The present study primarily focused on six bird species: **Red-vented Bulbul (*Pycnonotus cafer*)**, **Tumbler Pigeon (*Columba livia domestica*)**, **Rock Pigeon (*Columba livia*)**, **Spotted Dove (*Spilopelia chinensis*)**, **House Sparrow (*Passer domesticus*)**, and **Red-wattled Lapwing (*Vanellus indicus*)** (Singh et al. 2025). The objectives were to document nesting behaviour, nest characteristics, clutch size, nesting material, habitat use and contribute

to future urban biodiversity conservation (Chamberlain et al. 2007; Brooks 2013; Singh et al. 2019; Juola 2024; Sheng et al. 2024). Systematic field surveys were conducted during breeding and non-breeding season across the urban and semi-urban landscapes of Rishikesh, Uttarakhand. The results revealed marked interspecific differences in nesting strategies. *Passer domestics*, *Columba livia* and *Columba livia domestica* mainly nested on buildings and other artificial structures, *Pycnonotus cafer* and *Spilopelia chinensis* preferred trees and shrubs, whereas *Vanellus indicus* nested on ground (Naithani and Bhatt 2012; Singh et al. 2025). The findings provide baseline information on the nesting ecology of urban bird species and contribute to understand the avian adaptation in urban ecosystems. The study also highlights the importance of conserving urban green spaces, suitable nesting sites, mature trees, and open habitats to support bird population and sustainable urban biodiversity conservation in the Himalayan foothills.

The research was executed in the urban and semi-urban landscape of Rishikesh, situated in the Dehradun district, Uttarakhand India during 2025-2026 following the methodology of Sinha et al. (2019) and Joshi et al. (2023). Rishikesh is located beside the Ganga River in the Himalayan foothills and lies between 30° 10' 33" N latitude and 78° 29' 47" E longitude, at an average elevation of approximately 372 meters (1,220) above sea level. The city is bordered by Haridwar district to the south, Dehradun district to the west, and Pauri Garhwal district to the east across the River Ganga (Rana et al. 2025). The study was carried out at three urban and semi-urban localities of Rishikesh:

- **Indra Nagar:** A densely populated residential area with high human movement.
- **Shanti Nagar:** A suburban residential zone featuring mixed vegetation and household structures.
- **Shyampur:** A peripheral area characterized by open ground spaces and relatively lower urban density.

MATERIALS AND METHODS

Study Area

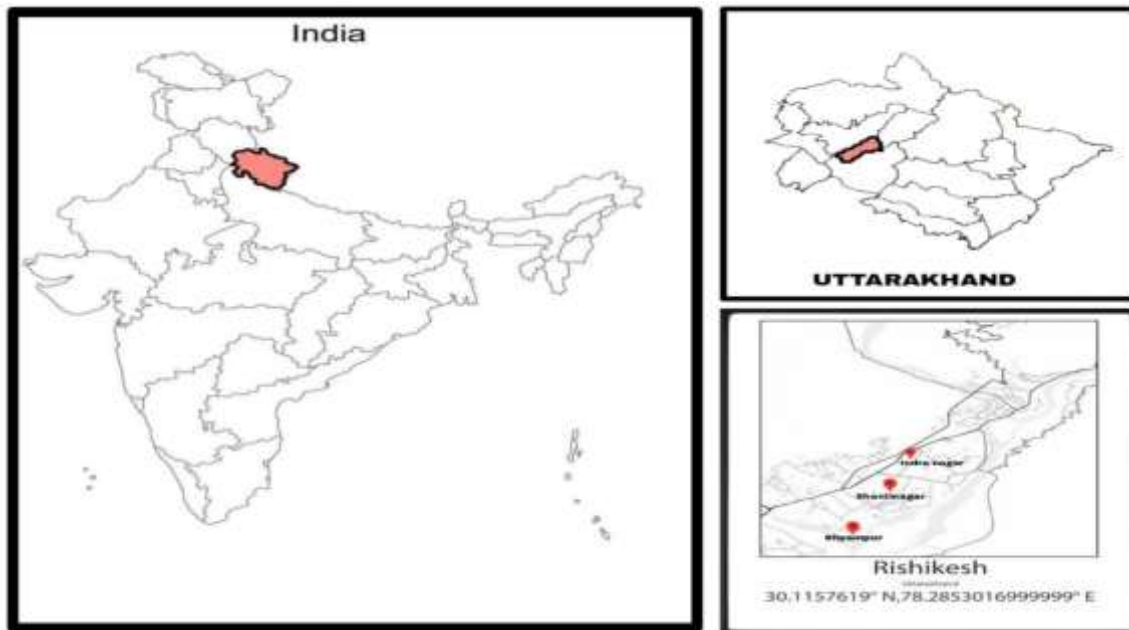


Fig.1 Map of Study Area Rishikesh, Uttarakhand, India

Source: Google

Methods:

For primary data collection a systematic field investigation was carried out during the breeding and non-breeding season to document the nesting ecology of selected urban bird species in different localities of Rishikesh, Uttarakhand. Observations were made during early morning (06:00am-10:00am) and late

afternoon (4:00pm-06:30pm), when birds were actively engaged in feeding, nest building, incubation, and other breeding related activities (Nimisha et al. 2026). Primary data were collected through systematic surveys, photography, nest monitoring, and direct observations at selected study sites. Observation includes characteristics of nest, habitat use, incubation,



clutch size, and breeding behaviour. Secondary data were collected from relevant scientific literature, government reports, books, published articles, and newsletters. Additional information gathered from IUCN Red List and authenticated sources. These secondary sources were used to compare and support the field observation.

RESULTS AND DISCUSSION

Systematic field observations and local bird sighting records from urban and semi-urban areas of Rishikesh provided valuable information about nesting ecology of some urban birds in Rishikesh, Uttarakhand, India. During study six common bird species were recorded in different habitat of Rishikesh, including parks, residential areas, temples, open grounds, roadsides,

vacant plots, and commercial areas (Table 1 and Table 2). Clutch size was documented through photographs for some species and direct observations for others when photography was not feasible (Table 2). According to IUCN Red List among the recorded bird species, five are classified as Least Concern (LC), while the Tumbler pigeon is a domesticated breed of the Rock Pigeon and is therefore not evaluated by the IUCN (Singh et al. 2025). Among the six species Rock Pigeon, Spotted Dove, and Tumbler Pigeon belong to the family **Columbidae**, the House Sparrow belongs to the family **Passeridae**, the Red-vented Bulbul belongs to the family **Pycnonotidae**, and the Red-wattled Lapwing belongs to the family **Charadriidae** (Table 1).

Table 1. General information on the urban bird species recorded during the study:

S. No.	Common Name	Scientific Name	Family	IUCN Status
1	House Sparrow	<i>Passer domesticus</i>	Passeridae	Least Concern (LC)
2	Red-vented Bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	Least Concern (LC)
3	Rock Pigeon	<i>Columba livia</i>	Columbidae	Least Concern (LC)
4	Spotted Dove	<i>Spilopelia chinensis</i>	Columbidae	Least Concern (LC)
5	Red-wattled Lapwing	<i>Vanellus indicus</i>	Charadriidae	Least Concern (LC)
6	Tumbler Pigeon	<i>Columba livia domestica</i>	Columbidae	Domesticated form

Table 2. Nesting characteristics of selected urban bird species in Rishikesh, Uttarakhand:

S. No.	Common Name	Preferred Nest Site	Nest Material	Clutch size
1	House Sparrow	Residential buildings, markets	Grass, feathers, straw	3-5
2	Red-vented Bulbul	Garden, parks, residential areas	Roots, fibres, fine twigs	2-3
3	Rock Pigeon	Building, temples	Straw, twigs	2-3
4	Spotted Dove	Residential backyards, gardens, shady trees	Thin twigs, grass, stem, roots, and dry leaves	2
5	Red-wattled Lapwing	Open ground, riverbanks, vacant plots	Pebbles, dry grass	3-4
6	Tumbler Pigeon	Buildings and rooftops	Twigs and straw	1-2



Fig 2: *Vanellus indicus*
Source: © Photo by Esha Negi



Fig 3: Clutch of four eggs of *Vanellus indicus* in a ground nest. Source: © Photo by Esha Negi



Fig 4: *Columbia livia* incubating eggs in a nest
Source: Photo by Esha Negi



Fig 5: Clutch of two eggs of *Columbia livia*
Source: Photo by Esha Negi



Fig 6: *Columba livia domestica* incubating eggs in a nest
Source: Photo by Esha Negi



Fig 7: A single egg of a *Columba livia domestica* inside a nest
Source: Photo by Esha Negi



Fig 8: Two white eggs of *Spilopelia chinensis*
Source: Photo by Esha Negi



Fig 9: *Spilopelia chinensis* incubating a two-egg clutch in a tree nest
Source: Photo by Esha Negi



Fig 10: *Passer domesticus*
Source: Photo by Esha Negi



Fig 11: *Passer domesticus*
Source: Photo by Esha Negi



Fig 12: Nest of *Passer domesticus*
Source: Photo by Esha Negi

House Sparrow (*Passer domesticus*)

The *Passer domesticus* is a small passerine bird that is strongly associated with human dominant areas (Fig. 10 & 11). During present field study in urban and semi-urban areas of Rishikesh (Garhi Shyampur, Shanti Nagar) it was one of the most frequently observed bird species in institutional campuses, commercial areas, and human settlements (Fig. 12 & 13). This species primarily constructed its nests on selected artificial cavities, ventilators, wall crevices, roof spaces, and ledge of buildings. The nests were compact and constructed using dry grass, feathers, straw, small twigs, leaves, paper pieces and cotton fibres. In Garhi Shyampur, Rishikesh *Passer domesticus* shows a highly specific nesting behaviour by collecting leaves from palm-like plants. It broke these leaves into small pieces to build nest inside a house chimney. The *Passer domesticus* heavily lined the nest interiority with small soft feathers and animal fur to make the inner bowl soft and warm. The clutch size observed during the study ranged from 3-5 eggs. The frequent use of buildings and artificial structures indicates the species strong adaptation to urban ecosystems (Joshi et al. 2022; Bala et al. 2024).

Red-vented Bulbul (*Pycnonotus cafer*)

The *Pycnonotus cafer* is medium-sized omnivorous bird frequently found in parks and urban green spaces. During the present field survey in different areas of Rishikesh, Uttarakhand, the species was recorded constructing nests on small trees, bushes, roadside plantations and ornamental plants. The nests of the *Pycnonotus cafer* were open cup-shaped and constructed from dry grass, fine twigs, roots and spider web. A clutch size of 2-3 eggs was recorded during study. The species predominantly prefers vegetated habitats for nesting. Nests concealed within dense vegetation provide protection from predators and improve breeding success (Naithani and Bhatt 2012).

Rock Pigeon (*Columba livia*)

During systematic field survey the species commonly observed in different local areas of Rishikesh, including Shanti Nagar, Shyampur, and Indra nagar. The species was commonly recorded in markets, temples, and residential buildings. Dry plant material, twigs, straw, and feathers formed the main nesting

Fig 13: Nest of *Passer domesticus*
Source: Photo by Esha Negi

materials. The clutch size varied from 2-3 eggs (Fig. 4 & 5). The *Columba livia* nested on balconies, bridges, rooftops, and abandoned structure. The species capacity to advantage of urban infrastructure that resembles its natural cliff habitats, allowing for effective breeding in densely populated regions, is reflected in the widespread usage of artificially constructed structures (Rawat et al. 2021).

Spotted Dove (*Spilopelia chinensis*)

The *Streptopelia chinensis* is medium-size dove distinguished by its characteristic black and white spotted collar. It was frequently encountered in institutional campuses, parks, gardens and roadside trees in several areas of Rishikesh, Uttarakhand. Grass stems, dry leaves, roots, and thin twigs are commonly used for nesting material (Fig. 8 & 9). The nests were loose platform structures that appeared relatively fragile. The observed clutch size was 2 eggs (Kabir 2024).

Red-wattled Lapwing (*Vanellus indicus*)

The *Vanellus indicus* falls under the family **Charadriidae** and is a medium sized ground-dwelling wader recognized by its long legs, black breast, and distinctive red facial wattles. During the study, it was primarily observed in open grounds, riverbanks, vacant plots, and sparsely vegetated areas. In the farm field of Shyampur, Rishikesh, the species is recorded nesting on open grounds, particularly in sparsely vegetated areas and barren patches. It lays its eggs lined with pebbles, small stones, dry grass, and dry leaves. The clutch size ranged from 3-4 eggs (Fig. 2 & 3). Although ground nesting is unique reproductive strategy that uses camouflage to shield eggs, these nests are however susceptible to disruption from domestic animals, predators, and human activity (Sethi et al. 2011).

Tumbler Pigeon (*Columba livia domestica*)

The *Columba livia domestica* is a domesticated variety of Rock Pigeon that frequently resides near human habitation. It mostly builds its nests on rooftops, balconies, lofts, and other human-made buildings. Twigs, feathers, straw, and dry grasses were used to constructed the basic platform nests. There was one egg in the clutch (Fig 6 & 7). Due to its need on areas controlled by humans, the species was closely linked to



residential structure and pigeon lofts. The *Columba livia domestica* is not include in the IUCN Red List since it is a domesticated species, in contrast to other species (Kabir 2021).

Conclusion

The present study provides an assessment of the nesting ecology of selected urban bird species in Rishikesh, Uttarakhand, India. The findings revealed that each species exhibited distinct nesting strategies in terms of nest-site selection, clutch size, nesting materials and habitat use. House Sparrow, Tumbler Pigeon, and Rock Pigeon utilized man-made buildings and other artificial structures for nesting, whereas Spotted Dove and Red-vented Bulbul preferred trees and shrubs. In contrast, the Red-wattled Lapwing nested on open grounds using shallow scrape lined with pebbles and dry grass. These observations demonstrate

the ability of urban birds to exploit a variety of natural and artificial habitats for successful breeding. According to **IUCN Red List**, five of the six recorded species are categorised as **Lest Concern**, while the Tumbler Pigeon is domesticated breed and is therefore not evaluated by the IUCN. Although these species currently occur commonly in the study area, rapid urbanization, habitat alteration, and increase human disturbance may reduce the availability of suitable nesting habitats. The present study establishes baseline information on the nesting ecology of urban birds in Rishikesh and highlights the importance of conserving urban green spaces, mature trees, and appropriate nesting sites. Such conservation measures will contribute to sustaining urban bird diversity and supporting effective urban biodiversity management in the Himalayan foothills.

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