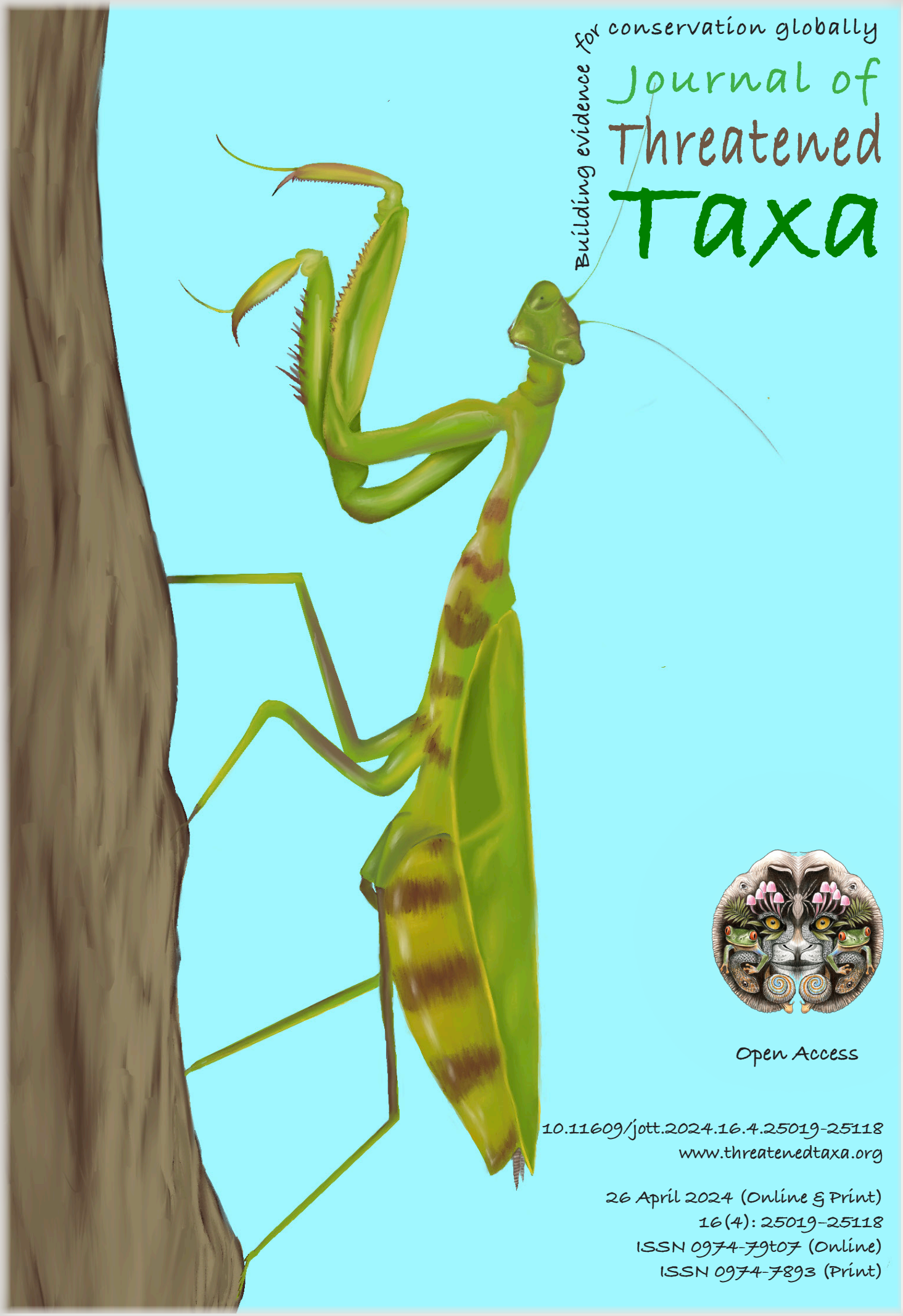

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**Cover: A gravid praying mantis just before she laid her ootheca—digital art on procreate. © Aakanksha Komanduri.**

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COMMUNICATION

# Checklist and comparison of the bird diversity from the Himachal Pradesh Agricultural University, India

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**Abstract:** Agricultural ornithology plays a crucial role in managing and sustaining agroecosystems. In agriculture, birds such as insectivores and raptors serve as natural controllers of insect and rodent pests, contributing to integrated pest management strategies. In this study, a checklist of birds was compiled using data collected over three years (2019–2022) from the agricultural landscape surrounding Himachal Pradesh Agricultural University, Palampur (HPAU), India. The study area comprises varied habitats including agricultural fields, forest patches, water bodies, and tea orchards. A total of 116 avian species, spanning 17 orders and 44 families were documented. Muscicapidae emerged as the most dominant family, comprising 16 species and exhibiting the highest relative diversity index value (13.79). A comparison with previous records revealed that 40 avian species were absent, while 34 bird species were reported for the first time in the study area. These finding revealed the significant shift in avian diversity at HPAU compared to previous assessments (HPAU 2019). The observed decline in avian diversity may be attributed to rapid habitat degradation driven by large-scale shrub trimming and other development activities, particularly construction projects.

**Keywords:** Avifauna, conservation, Kangra, Palampur, species richness, tea orchards.

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**Author contributions:** Praveen Kumar—data collection, data analysis, methodology, writing the original draft. Bharti Parmar—manuscript review & comments. Pardeep Kumar—writing, review & editing.

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## INTRODUCTION

Agricultural ornithology deals with regular monitoring and collection of scientific information on bird diversity in agroecosystems (Dhindsa & Saini 1994), which is a prerequisite for their management sustainably. The birds form a wide range of feeding guilds, viz., frugivore, granivore, insectivore, and nectarivore, and in an ecosystem, they act as primary consumers (herbivorous) to top carnivorous (fish-eating birds) (Kumar 2021a). Birds are an integral part of the food chain and contribute to a healthy ecosystem due to various ecological services rendered by them, viz., seed dispersal and pollination (Burin et al. 2016). In an agricultural landscape, avian diversity plays an essential role in controlling the insect-pest population (Railsback & Johnson 2014), and is thus useful for integrated pest management.

The montane landscapes of the Indian Himalayan Region (IHR) are a biodiversity hotspot (Myer 2000) and contribute about 80% of the avian diversity of the Indian subcontinent (Price et al. 2003; Chandra et al. 2018). In many countries like India, scientific information on bird diversity is limited, particularly for the agriculture landscape for providing input in agricultural sustainability. The large-sized university premises are also the subject of interest to understand the human-induced urban environment and vegetation association (Ali et al. 2013; Aggarwal et al. 2016; Chakdar et al. 2016; Rajashekara & Venkatesha 2017). Many campuses are unexplored and need to be evaluated for preparing a systematic management plan. Agriculture universities are known to possess monoculture or mixed crop with limited wildlife (Şekercioğlu et al. 2019). However, in hilly terrain such universities comprise a variety of habitats and a large area occupied with mixed vegetation that may enhance the bird diversity. The checklist of bird diversity prepared for such areas may be quite helpful for biodiversity conservation and long-term integrated pest management (IPM).

Considering the importance of bird diversity, the present study was carried out at the Himachal Pradesh Agriculture University (HPAU), India. An annotated checklist was prepared that provides baseline information for the conservation and management of bird diversity in a sustainable way.

### Study Area

The present study was conducted in the university premise of HPAU Palampur, Himachal Pradesh, India (76.5489°N & 32.1029°E). The study area comes under the agro-climatic zone II, which covers sediments derived from a geologically complex environment with a long-term erosion history that leads to varied geo-botanical landscapes. The study area is located in the foothill region of the Dhauladhar ranges characterized by snow-clad peaks in steep slopes (16–30 % gradient), while the university premise has an area of moderate topography with a 10–15 % gradient. The university premise is situated along the national highway (NH-154) criss-crossed by many linked roads and seasonal drainage.

The study area comprises varied habitat diversity such as agriculture (A), forest (F), grassland (G), tea orchards (T), wasteland (W), and water bodies (WB) (Figure 1). The agricultural fields and organic farms are extensively cultivated with seasonal crops, namely, maize *Zea mays*, wheat *Triticum aestivum*, okra *Abelmoschus esculentus*, cole crops *Brassica* spp. and their genotypes; while the rest of the area is cover with scattered patches of tea garden, wasteland and mixed vegetation forest. The main tree species include *Bauhinia variegata, Callistemon viminalis*, *Cedrus deodara*, *Jacaranda mimosifolia, Populus* sp., and *Salix babylonica*. There are many edible fruit plants such as *Morus alba*, *Psidium guajava*, *Pyrus pashia*, and *Rubus* spp., and many others, as reported by Kumar (2021b) for the foothill region of Dhauladhar ranges. The annual rainfall varies 1,500–1,800 mm. The climate of the study area is a monsoonal-influenced humid subtropical climate (Cwa) as per Köppen & Geiger's classification (Peel et al. 2007).

## MATERIALS AND METHODS

An annotated checklist of bird diversity was meticulously compiled following an extensive field survey conducted across 315 sites (refer to Figure 1) from 2019 to 2022. The survey encompassed both planned observations and numerous opportunistic sightings. The main survey sessions were carried out mainly from 0700 h to 0900 h and in the evening from 1700 h to 1830 h. Opportunistic sightings, on the other hand, were made near experimental farms, playground areas, and water bodies, adding valuable data to checklist. Several surveys were conducted along a specific track from gate 1 to gate 5 under streetlight condition between 1930 h to 2130 h throughout 2019–2020, with the exception of the COVID-19 lockdown period. While a subset of these surveys was meticulously planned and executed over 2–3 days per month, the majority were opportunistic, occurring 3–4 days each week. This survey encompasses

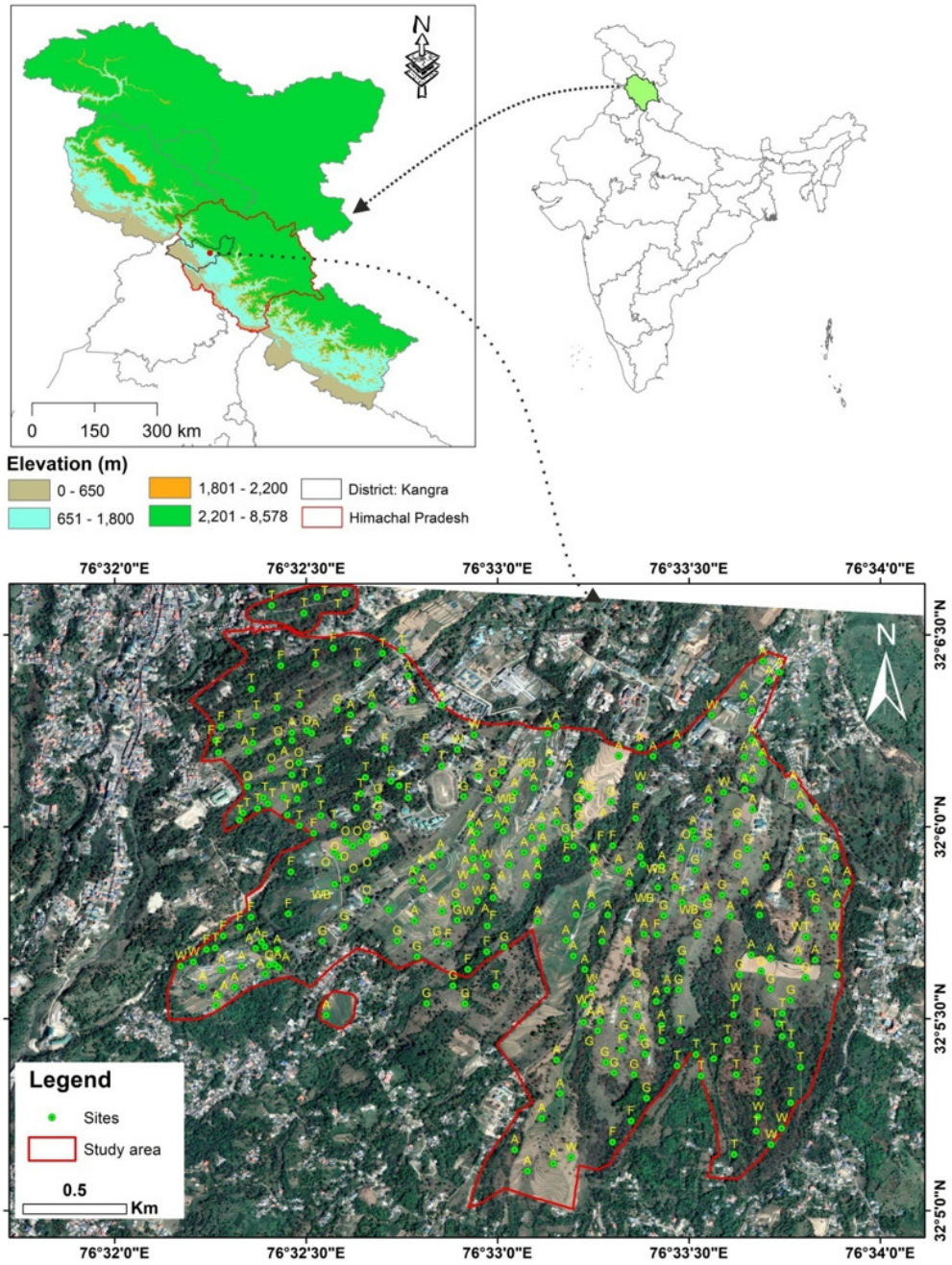


**Image 1. Survey sites in the study area and the location with respect to agroclimatic zone II (651–1,800 m), Himachal Pradesh, India. (Abbreviation: A—agriculture | F—forest | G—grassland | O—orchard | T—tea orchard | W—wasteland | WB—water bodies).**

transects and points established within the university premises across different habitats (A = 130; F = 32; G = 52; O = 17; T = 55; W = 21; WB = 8). Additionally, numerous opportunistic surveys were conducted during university activities, yielding rare sightings recorded once or twice in the study period. The opportunistic surveys primarily occurred while moving to experimental fields, near playground areas, and near water bodies. Observations were recorded using a Hanumex 30 x 60 binocular and Nikon 3300 camera with 70–300 mm zoom lens, while a large proportion of these records were geotagged using a Nikon p900 camera. Bird acoustic signals were also employed for species location. The identification of bird species was facilitated by various field guides (Singh 2015; Grimmett et al. 2016; Grewal & Bhatia 2017; Dhadwal 2018; Kalsi et al. 2020). The study area, characterized by a variety of habitats, necessitated a combination of belt transects (50 m wide), point surveys

and call surveys. The transect length varied 300–500 m depending on habitat accessibility, while point surveys lasted approximately 20–30 minutes at specific locations.

The data collected from the well-planned survey (replicated twice) and opportunistic survey in the study period were complied and categorized based on encounter rate and sightings frequency into very common (VC), common (C), and rare (R) categories (MacKinnon & Phillipps 1993). VC denoted species sighted over 10 times across all seasons, C represented sightings occurring 7–9 times in specific habitats, and R indicated species sighted once or twice during the study period. The relative diversity (RDi) of families was calculated using a specified formula (Torre-Cuadros et al. 2007).

$$RDi = \frac{\text{Number of bird species in a family}}{\text{Total number of species}} \times 100$$

## RESULTS

The annotated checklist of the HPAU- 2019–2022 revealed that a total of 116 bird species belonging to 17 orders and 44 families occur on the university premises. Muscicapidae family dominates over other families. The checklist reveals the Muscicapidae family contributes to 16 species followed by Picidae (7), Cisticolidae (6), Columbidae (5), Accipitridae, Ardeidae, Corvidae, Paridae, Psittaculidae, Strigidae, Sturnidae (4 each), Cuculidae, Dicruridae, Hirundinidae, Motacillidae, Phasianidae, Pycnonotidae, Timaliidae (3 each), and Fringillidae, Megalaimidae, Nectariniidae, Passeridae, Phylloscopidae, Rallidae, & Stenostiridae (2 each). While the remaining 19 families are poorly reported (Table 1). The RDi value was also calculated highest for the family Muscicapidae followed by other Picidae and Cisticolidae (Table 2). The family Muscicapidae was also reported as dominant in various studies (Sankar et al. 2006; Yaseen et al. 2011; Koli 2014). It is the largest family of birds in the Indian context (Manakadan & Pittie 2001).

The present checklist was also compared with the annotated checklist prepared by Kottawa-Arachchi (2022) and the checklist prepared for the Central University of Himachal Pradesh (CUHP) 2015–2018 located in the foothill region of Dhauladhar ranges, Himachal Himalaya, India (Kumar 2021a). The CUHP is a university operating on a temporary campus with no agricultural activities, while the HPAU is characterized by a wide agricultural landscape and a large area under unmanaged tea orchards. These universities (viz., HPAU and CUHP) are separated by an aerial distance of approximately ~40 km. Table 1 represents the checklists and their comparison for the occurrence of bird species in two university premises and previously published records. The opportunistic sightings particularly near playground areas, agricultural fields, and wetland habitats provided a significant contribution to the observation of rare birds species. A comparison with the previous records, specifically HPAU-2019, revealed notable differences in the presence and abundance of common species. Many previously common species were not found during the study period, while others that were once abundant were either missing or now considered rare. Therefore the primary focus of this study lies in comparing the diversity and distribution across similar and varied landscape (refer to Table 1). Bird species newly recorded in the study area, compared to HPAU-2019, are shown in Images 2 & 3. Additionally, Kumar (2021a) has already provided photographic records of common species observed in CUHP 2015–2018 and HPAU 2019.

The present checklist HPAU 2019–2022 showed 98 common bird species and 18 species are new records while comparing the checklist CUHP 2015–2018. The difference in species composition can be correlated to the variation in habitat diversity, human intervention, and size of the study area. The checklist HPAU 2019–2022 was also compared with the previous records (i.e., HPAU 2019) that showed 82 species are common while a huge difference with new records, which are reported 34 in number, while, 40 bird species were found absent even considering the wide timeframe. Many common bird species (viz., Scaly-breasted Munia *Lonchura punctulata,* Fire-breasted Flowerpecker *Dicaeum ignipectus*, Brahminy Starling *Sturnia pagodarum*, Indian Robin *Saxicoloides fulicatus*, Black-throated Thrush *Turdus atrogularis*, Green Bee-eater *Merops orientalis*) are not reported, which can easily be seen in their specific habitats as per their time of seasonal migration in the study area (Table 1).

Considering the similar timeframe, many species such as Little Cormorant *Microcarbo niger*, Brahminy Starling *Sturnia pagodarum*, and Black-throated Thrush *Turdus atrogularis*, were reported each year, found absent. Some raptor species, viz., Indian Scops Owl *Otus bakkamoena*, Barn Owl *Tyto alba*, and Brown Boobook *Ninox scutulata*, were also found unnoticed. Many common species recorded in the previous checklist (HPAU 2019) were either absent (40) or rarely seen. It has been reported that food resources, safe roosting sites,

**Table 1. Checklist of the bird diversity from the Himachal Pradesh Agriculture University (HPAU 2019-2022) along with the previous records.**

| | English name | Scientific name | Abundance | CUHP (2015–2018) | HPAU (2019) | HPAU (2019–2022) present study |
|---|---|---|---|---|---|---|
| GALLIFORMES | | | | | | |
| Phasianidae (partridges, pheasants, grouse) | | | | | | |
| 1 | Common Quail | *Coturnix coturnix* (Linnaeus, 1758) | R | + | - | + |
| 2 | Black Francolin | *Francolinus francolinus* (Linnaeus, 1766) | R | + | + | + |
| 3 | Red Junglefowl | *Gallus gallus* (Linnaeus, 1758) | R | + | + | + |
| COLUMBIFORMES | | | | | | |
| Columbidae (pigeons) | | | | | | |
| 4 | Rock Pigeon | *Columba livia* (Gmelin, JF, 1789) | VC | + | + | + |
| 5 | Oriental Turtle Dove | *Streptopelia orientalis* (Latham, 1790) | C | + | + | + |
| 6 | Eurasian Collared Dove | *Streptopelia decaocto* (Frivaldszky, 1838) | R | + | - | + |
| 7 | Spotted Dove | *Streptopelia chinensis* (Scopoli, 1786) | VC | + | + | + |
| 8 | Asian Emerald Dove | *Chalcophaps indica* (Linnaeus, 1758) | R | - | + | + |
| CUCULIFORMES | | | | | | |
| Cuculidae (cuckoos) | | | | | | |
| 9 | Greater Coucal | *Centropus sinensis* (Stephens, 1815) | C | + | + | + |
| 10 | Indian Cuckoo | *Cuculus micropterus* (Gould, 1838) | - | - | + | - |
| 11 | Asian Koel | *Eudynamys scolopaceus* (Linnaeus, 1758) | R | + | + | + |
| 12 | Banded Bay Cuckoo | *Cacomantis sonneratii* (Latham, 1790) | - | - | + | - |
| 13 | Common Cuckoo | *Cuculus canorus* (Linnaeus, 1758) | R | + | - | + |
| 14 | Common Hawk-cuckoo | *Hierococcyx* varius (Vahl, 1797) | - | - | + | - |
| GRUIFORMES | | | | | | |
| Rallidae | | | | | | |
| 15 | Brown Crake | *Zapornia akool* (Sykes, 1832) | C | + | - | + |
| 16 | White-breasted Waterhen | *Amaurornis phoenicurus* (Pennant, 1769) | R | + | + | + |
| PELECANIFORMES | | | | | | |
| Ardeidae (herons) | | | | | | |
| 17 | Indian Pond Heron | *Ardeola grayii* (Sykes, 1832) | R | + | + | + |
| 18 | Cattle Egret | *Bubulcus ibis* (Linnaeus, 1758) | C | + | + | + |
| 19 | Great Egret | *Ardea alba* (Linnaeus, 1758) | - | - | + | - |
| 20 | Grey Heron | *Ardea cinerea* (Linnaeus, 1758) | R | - | - | + |
| 21 | Black-crowned Night Heron | *Nycticorax nycticorax* (Linnaeus, 1758) | R | - | - | + |
| SULIFORMES | | | | | | |
| Phalacrocoracidae (cormorants) | | | | | | |
| 22 | Little Cormorant | *Microcarbo niger* (Vieillot, 1817) | R | + | - | + |
| 23 | Indian Cormorant | *Phalacrocorax fuscicollis* (Stephens, 1826) | - | - | + | - |
| CHARADRIIFORMES | | | | | | |
| Charadriidae (plovers & lapwings) | | | | | | |
| 24 | Red-wattled Lapwing | *Vanellus indicus* (Boddaert, 1783) | C | + | + | + |
| Scolopacidae (sandpipers) | | | | | | |
| 25 | Green Sandpiper | *Tringa ochropus* (Linnaeus, 1758) | R | + | - | + |
| 26 | Common Sandpiper | *Actitis hypoleucos* (Linnaeus, 1758) | - | - | + | - |
| ACCIPITRIFORMES | | | | | | |
| Accipitridae (kites, hawks and eagles) | | | | | | |
| 27 | Egyptian Vulture | *Neophron percnopterus* (Linnaeus, 1758) | R | + | + | + |
| 28 | White-rumped Vulture | *Gyps bengalensis* (Gmelin, J.F. 1788) | - | + | - | - |

| | English name | Scientific name | Abundance | CUHP (2015–2018) | HPAU (2019) | HPAU (2019–2022) present study |
|---|---|---|---|---|---|---|
| 29 | Shikra | *Accipiter badius* (Gmelin, J.F. 1788) | R | + | + | + |
| 30 | Eurasian Sparrowhawk | *Accipiter nisus* (Linnaeus, 1758) | - | + | - | - |
| 31 | Black Kite | *Milvus migrans* (Boddaert, 1783) | C | + | + | + |
| 32 | Besra | *Accipiter virgatus* (Temminck, 1822) | - | - | + | - |
| 33 | Mountain Hawk-eagle | *Nisaetus nipalensis* (Hodgson, 1836) | - | - | + | - |
| 34 | Lesser Fish-eagle | *Haliaeetus humilis* (S. Müller & Schlegel, 1841) | - | - | + | - |
| 35 | Oriental Honey Buzzard | *Pernis ptilorhynchus* (Temminck, 1821) | - | - | + | - |
| 36 | Himalayan Buzzard | *Buteo refectus* (Portenko, 1935) | R | - | - | + |
| CAPRIMULGIFORMES | | | | | | |
| Apodidae | | | | | | |
| 37 | House Swift | *Apus nipalensis* (Hodgson, 1837) | - | - | + | - |
| STRIGIFORMES | | | | | | |
| Strigidae (owls) | | | | | | |
| 38 | Asian Barred Owlet | *Glaucidium cuculoides* (Vigors, 1831) | C | + | + | + |
| 39 | Collared Owlet | *Taenioptynx brodiei* (Burton, E. 1836) | - | - | + | - |
| 40 | Barn Owl | *Tyto alba* (Scopoli, 1769) | R | - | - | + |
| 41 | Indian Scops Owl | *Otus bakkamoena* (Pennant, 1769) | C | - | - | + |
| 42 | Brown Boobook | *Ninox scutulata* (Raffles, 1822) | R | - | - | + |
| BUCEROTIFORMES | | | | | | |
| Bucerotidae (hornbills) | | | | | | |
| 43 | Indian Grey Hornbill | *Ocyceros birostris* (Scopoli, 1786) | C | + | + | + |
| Upupidae (hoopoes) | | | | | | |
| 44 | Common Hoopoe | *Upupa epops* (Linnaeus, 1758 | R | + | + | + |
| PICIFORMES | | | | | | |
| Picidae (woodpeckers) | | | | | | |
| 45 | Speckled Piculet | *Picumnus innominatus* (Burton, E. 1836) | R | + | + | + |
| 46 | Back-rumped Flameback | *Dinopium benghalense* (Linnaeus, 1758) | R | + | - | + |
| 47 | Lesser Yellow-naped Woodpecker | *Picus chlorolophus* (Vieillot, 1818) | R | + | - | + |
| 48 | Grey-headed Woodpecker | *Picus canus* (Gmelin, J.F. 1788) | R | + | + | + |
| 49 | Grey-capped Pygmy Woodpecker | *Dendrocopos canicapillus* (Blyth, 1845) | C | + | + | + |
| 50 | Fulvous-breasted Pied Woodpecker | *Dendrocopos macei* (Vieillot, 1818) | R | + | + | + |
| 51 | Brown-fronted Pied Woodpecker | *Dendrocopos auriceps* (Vigors, 1831) | - | + | - | + |
| 52 | Scaly-bellied Woodpecker | *Picus squamatus* (Vigors, 1831) | - | - | + | - |
| Megalaimidae | | | | | | |
| 53 | Great Barbet | *Psilopogon virens* (Boddaert, 1783) | C | + | + | + |
| 54 | Brown-headed Barbet | *Psilopogon zeylanicus* (Gmelin, J.F. 1788) | - | + | - | - |
| 55 | Blue-throated Barbet | *Psilopogon asiaticus* (Latham, 1790) | C | + | + | + |
| 56 | Coppersmith Barbet | *Psilopogon haemacephalus* (Müller, PLS, 1776) | - | - | + | - |
| CORACIIFORMES | | | | | | |
| Coraciidae (rollers) | | | | | | |
| 57 | Indian Roller | *Coracias benghalensis* (Linnaeus, 1758) | - | + | - | - |
| Alcedinidae (kingfishers) | | | | | | |
| 58 | White-throated Kingfisher | *Halcyon smyrnensis* (Linnaeus, 1758) | R | + | + | + |

| | English name | Scientific name | Abundance | CUHP (2015–2018) | HPAU (2019) | HPAU (2019–2022) present study |
|---|---|---|---|---|---|---|
| FALCONIFORMES | | | | | | |
| Falconidae (falcons and caracaras) | | | | | | |
| 59 | Common Kestrel | *Falco tinnunculus* (Linnaeus, 1758) | R | + | + | + |
| PSITTACIFORMES | | | | | | |
| Psittaculidae (Old World parrots) | | | | | | |
| 60 | Slaty-headed Parakeet | *Psittacula himalayana* (Lesson, 1832) | R | + | - | + |
| 61 | Plum-headed Parakeet | *Psittacula cyanocephala* (Linnaeus, 1766) | R | + | + | + |
| 62 | Alexandrine Parakeet | *Psittacula eupatria* (Linnaeus, 1766) | C | + | + | + |
| 63 | Rose-ringed Parakeet | *Psittacula krameri* (Scopoli, 1769) | R | + | - | + |
| PASSERIFORMES | | | | | | |
| Campephagidae (minivets and cuckooshrikes) | | | | | | |
| 64 | Orange Minivet | *Pericrocotus flammeus* (Forster, J.R. 1781) | R | + | - | + |
| 65 | Long-tailed Minivet | *Pericrocotus ethologus* (Bangs & Phillips, 1914) | - | - | + | - |
| 66 | Small Minivet | *Pericrocotus cinnamomeus* (Linnaeus, 1766) | - | - | + | - |
| Dicruridae (drongos) | | | | | | |
| 67 | Black Drongo | *Dicrurus macrocercus* (Vieillot, 1817) | C | + | + | + |
| 68 | Ashy Drongo | *Dicrurus leucophaeus* (Vieillot, 1817) | C | + | + | + |
| 69 | Hair-crested Drongo | *Dicrurus hottentottus* (Linnaeus, 1766) | R | + | + | + |
| 70 | Crow-billed Drongo | Dicrurus annectens (Hodgson, 1836) | | - | + | - |
| Cinclidae | | | | | | |
| 71 | Brown Dipper | *Cinclus pallasii* (Temminck, 1820) | - | - | + | - |
| Pittidae | | | | | | |
| 72 | Indian Pitta | *Pitta brachyura* (Linnaeus, 1766) | - | - | + | - |
| Cettiidae | | | | | | |
| 73 | Brownish-flanked Bush Warbler | *Horornis fortipes (*Hodgson, 1845) | - | - | + | - |
| 74 | Grey-sided Bush Warbler | *Cettia brunnifrons* (Hodgson, 1845) | - | - | + | - |
| Phylloscopidae | | | | | | |
| 75 | Ashy-throated Warbler | *Phylloscopus maculipennis* (Blyth, 1867) | - | - | + | - |
| 76 | Blyth's Leaf Warbler | *Phylloscopus reguloides* (Blyth, 1842) | - | - | + | - |
| 77 | Greenish Leaf Warbler | *Phylloscopus trochiloides* (Sundevall, 1837) | - | - | + | - |
| 78 | Whistler's Warbler | *Phylloscopus whistleri* (Ticehurst, 1925) | - | - | + | - |
| Alaudidae | | | | | | |
| 79 | Indian Bushlark | *Mirafra erythroptera* (Blyth, 1845) | - | - | + | - |
| 80 | Oriental Skylark | *Alauda gulgula* (Franklin, 1831) | - | - | + | - |
| Dicaeidae | | | | | | |
| 81 | Fire-breasted Flowerpecker | *Dicaeum ignipectus* (Blyth, 1843) | R | - | - | + |
| Sylviidae | | | | | | |
| 82 | Yellow-eyed Babbler | *Chrysomma sinense* (Gmelin, J.F. 1789) | - | - | + | + |
| Acrocephalidae | | | | | | |
| 83 | Blyth's Reed Warbler | *Acrocephalus dumetorum* (Blyth, 1849) | - | - | + | - |
| Estrildidae | | | | | | |
| 84 | Indian Silverbill | *Euodice malabarica* (Linnaeus, 1758) | - | - | + | - |
| Laniidae | | | | | | |
| 85 | Brown Shrike | *Lanius cristatus* (Linnaeus, 1758) | - | - | + | - |
| 86 | Long-tailed Shrike | *Lanius schach* (Linnaeus, 1758) | - | + | + | - |

| | English name | Scientific name | Abundance | CUHP (2015–2018) | HPAU (2019) | HPAU (2019–2022) present study |
|---|---|---|---|---|---|---|
| Rhipiduridae (fantails) | | | | | | |
| 87 | White-throated Fantail | *Rhipidura albicollis* (Vieillot, 1818) | R | + | + | + |
| Corvidae (crows and jays) | | | | | | |
| 88 | Rufous Treepie | *Dendrocitta vagabunda* (Latham, 1790) | C | + | - | + |
| 89 | Grey Treepie | *Dendrocitta formosae* (Swinhoe, 1863) | R | + | - | - |
| 90 | Yellow-billed Blue Magpie | *Urocissa flavirostris* (Blyth, 1846) | C | + | + | + |
| 91 | Red-billed Blue Magpie | *Urocissa erythroryncha* (Boddaert, 1783) | R | + | + | + |
| 92 | Large-billed Crow | *Corvus macrorhynchos* (Wagler, 1827) | C | + | + | + |
| 93 | Black-headed Jay | *Garrulus lanceolatus* (Vigors, 1830) | - | - | + | - |
| Monarchidae (monarchs & paradise flycatchers) | | | | | | |
| 94 | Indian Paradise-flycatcher | *Terpsiphone paradisi* (Linnaeus, 1758) | R | + | + | + |
| Nectariniidae (sunbirds) | | | | | | |
| 95 | Purple Sunbird | *Cinnyris asiaticus* (Latham, 1790) | R | + | - | + |
| 96 | Crimson Sunbird | *Aethopyga siparaja* (Raffles, 1822) | R | + | + | + |
| Estrildidae (waxbills) | | | | | | |
| 97 | Scaly-breasted Munia | *Lonchura punctulata* (Linnaeus, 1758) | C | + | - | + |
| Passeridae (sparrows, snowfinches, and allies) | | | | | | |
| 98 | House Sparrow | *Passer domesticus* (Linnaeus, 1758) | VC | + | + | + |
| 99 | Russet Sparrow | *Passer cinnamomeus* (Gould, 1836) | VC | + | + | + |
| Motacillidae (wagtails and pipits) | | | | | | |
| 100 | Paddyfield Pipit | *Anthus rufulus* (Vieillot, 1818) | C | + | + | + |
| 101 | Long-billed Pipit | *Anthus similis* (Jerdon, 1840) | - | - | + | - |
| 102 | Grey Wagtail | *Motacilla cinerea* (Tunstall, 1771) | R | + | + | + |
| 103 | White-browed Wagtail | *Motacilla maderaspatensis* (Gmelin, J.F. 1789) | C | + | - | - |
| 104 | White Wagtail | *Motacilla alba* (Linnaeus, 1758) | C | + | + | + |
| Fringillidae (finches, euphonias, and Hawaiian honeycreepers) | | | | | | |
| 105 | Common Rosefinch | *Carpodacus erythrinus* (Pallas, 1770) | R | + | + | + |
| 106 | Yellow-breasted Greenfinch | *Chloris spinoides* (Vigors, 1831) | R | + | + | + |
| Emberizidae (Old World buntings) | | | | | | |
| 107 | White-capped Bunting | *Emberiza stewarti* (Blyth, 1854) | R | + | - | - |
| Stenostiridae (fairy-flycatcher and crested-flycatchers) | | | | | | |
| 108 | Yellow-bellied Fairy-fantail | *Chelidorhynx hypoxanthus* (Blyth, 1843) | C | + | + | + |
| 109 | Grey-headed Canary-flycatcher | *Culicicapa ceylonensis* (Swainson, 1820) | R | + | + | + |
| Paridae (tits, chickadees) | | | | | | |
| 110 | Coal Tit | *Periparus ater* (Linnaeus, 1758) | R | + | - | + |
| 111 | Cinereous Tit | *Parus cinereus* (Vieillot, 1818) | VC | + | - | + |
| 112 | Himalayan Black-lored Tit | *Machlolophus xanthogenys* (Vigors, 1831) | R | + | + | + |
| 113 | Green-backed Tit | *Parus monticolus* (Vigors, 1831) | - | - | + | - |
| 114 | Black-throated Tit | *Aegithalos concinnus* (Gould, 1855) | - | - | + | + |
| Sittidae | | | | | | |
| 115 | White-tailed Nuthatch | *Sitta himalayensis* (Jardine & Selby, 1835) | - | - | + | - |
| Cisticolidae (cisticolas) | | | | | | |
| 116 | Zitting Cisticola | *Cisticola juncidis* (Rafinesque, 1810) | R | + | - | - |
| 117 | Grey-breasted Prinia | *Prinia hodgsonii* (Blyth, 1844) | C | + | + | + |
| 118 | Jungle Prinia | *Prinia sylvatica* (Jerdon, 1840) | R | + | + | + |

| | English name | Scientific name | Abundance | CUHP (2015–2018) | HPAU (2019) | HPAU (2019–2022) present study |
|---|---|---|---|---|---|---|
| 119 | Ashy Prinia | *Prinia socialis* (Sykes, 1832) | R | + | + | + |
| 120 | Common Tailorbird | *Orthotomus sutorius* (Pennant, 1769) | C | + | + | + |
| 121 | Plain Prinia | *Prinia inornata (Sykes, 1832)* | R | - | + | + |
| 122 | Himalayan Prinia | *Prinia crinigera* (Hodgson, 1836) | R | - | + | + |
| Hirundinidae (swallows) | | | | | | |
| 123 | Red-rumped Swallow | *Cecropis daurica* (Laxmann, 1769) | VC | + | + | + |
| 124 | Barn Swallow | *Hirundo rustica* (Linnaeus, 1758) | R | + | + | + |
| 125 | Wire-tailed Swallow | *Hirundo smithii* (Leach, 1818) | R | - | - | + |
| Pycnonotidae (bulbuls) | | | | | | |
| 126 | Black Bulbul | *Hypsipetes leucocephalus* (Gmelin, J.F. 1789) | C | + | + | + |
| 127 | Himalayan Bulbul | *Pycnonotus leucogenis* (Gray, J.E. 1835) | VC | + | + | + |
| 128 | Red-vented Bulbul | *Pycnonotus cafer* (Linnaeus, 1766) | VC | + | + | + |
| Phylloscopidae (Old World leaf warblers ) | | | | | | |
| 129 | Lemon-rumped Warbler | *Phylloscopus chloronotus* (J.E. & G.R. Gray, 1847) | C | + | + | + |
| 130 | Grey-hooded Leaf Warbler | *Phylloscopus xanthoschistos* (Gray, JE and Gray, GR, 1847) | C | + | + | + |
| Aegithalidae (long-tailed tits) | | | | | | |
| 131 | Black-throated Tit | *Aegithalos concinnus* (Gould, 1855) | R | + | + | + |
| Zosteropidae (white-eyes and yuhinas) | | | | | | |
| 132 | Oriental White-eye | *Zosterops palpebrosus* (Temminck, 1824) | C | + | + | + |
| Timaliidae (scimitar babblers and allies) | | | | | | |
| 133 | White-browed Scimitar Babbler | *Pomatorhinus schisticeps* (Hodgson, 1836) | R | + | - | - |
| 134 | Rusty-cheeked Scimitar Babbler | *Erythrogenys erythrogenys* (Vigors, 1831) | C | + | + | + |
| 135 | Black-chinned Babbler | *Cyanoderma pyrrhops* (Blyth, 1844) | R | + | + | + |
| 136 | Puff-throated Babbler | *Pellorneum ruficeps* (Swainson, 1832) | R | + | + | + |
| Leiothrichidae (babblers, laughing thrushes, and allies) | | | | | | |
| 137 | Jungle Babbler | *Argya striata* (Dumont, 1823) | VC | + | - | - |
| 138 | Streaked LaughingThrush | *Trochalopteron lineatum* (Vigors, 1831) | R | + | - | - |
| 139 | Rufous Sibia | *Heterophasia capistrata* (Vigors, 1831) | R | + | + | + |
| Certhiidae (treecreepers) | | | | | | |
| 140 | Bar-tailed Treecreeper | *Certhia himalayana* (Vigors, 1832) | C | + | + | + |
| Sturnidae (starlings) | | | | | | |
| 141 | Common Starling | *Sturnus vulgaris* (Linnaeus, 1758) | - | + | - | - |
| 142 | Brahminy Starling | *Sturnia pagodarum* (Gmelin, J.F. 1789) | R | + | - | + |
| 143 | Chestnut-tailed Starling | *Sturnia malabarica* (Gmelin, J.F. 1789) | R | + | + | + |
| 144 | Common Myna | *Acridotheres tristis* (Linnaeus, 1766) | VC | + | + | + |
| 145 | Jungle Myna | *Acridotheres fuscus* (Wagler, 1827) | R | + | + | + |
| Muscicapidae (chats and flycatchers) | | | | | | |
| 146 | Indian Robin | *Copsychus fulicatus* (Linnaeus, 1766) | C | + | - | + |
| 147 | Oriental Magpie Robin | *Copsychus saularis* (Linnaeus, 1758) | VC | + | + | + |
| 148 | Rufous-bellied Niltava | *Niltava sundara* (Hodgson, 1837) | R | + | - | + |
| 149 | Verditer Flycatcher | *Eumyias thalassinus* (Swainson, 1838) | VC | + | + | + |
| 150 | Spotted Forktail | *Enicurus maculatus* (Vigors, 1831) | R | + | - | + |
| 151 | Blue Whistling Thrush | *Myophonus caeruleus* (Scopoli, 1786) | VC | + | + | + |

| | English name | Scientific name | Abundance | CUHP (2015–2018) | HPAU (2019) | HPAU (2019–2022) present study |
|---|---|---|---|---|---|---|
| 152 | White-tailed Rubythroat | *Calliope pectoralis* (Gould, 1837) | C | + | - | - |
| 153 | Slaty-blue Flycatcher | *Ficedula tricolor* (Hodgson, 1845) | R | + | + | - |
| 154 | Blue-fronted Redstart | *Phoenicurus frontalis* (Vigors, 1831) | C | + | - | + |
| 155 | Plumbeous Water Redstart | *Phoenicurus fuliginosus* (Vigors, 1831) | VC | + | + | + |
| 156 | White-capped Water Redstart | *Phoenicurus leucocephalus* (Vigors, 1831) | VC | + | + | + |
| 157 | Chestnut-bellied Rock Thrush | *Monticola rufiventris* (Jardine & Selby, 1833) | R | + | + | + |
| 158 | Common Stonechat | *Saxicola torquatus* (Pallas, 1773) | R | + | + | + |
| 159 | Pied Bushchat | *Saxicola caprata* (Linnaeus, 1766) | R | + | + | + |
| 160 | Asian Brown Flycatcher | *Muscicapa dauurica* (Pallas, 1811) | - | - | + | + |
| 161 | Rusty-tailed Flycatcher | *Ficedula ruficauda* (Swainson, 1838) | - | - | + | - |
| 162 | Rufous-gorgeted Flycatcher | *Ficedula strophiata* (Hodgson, 1837) | - | - | + | - |
| 163 | Blue-capped Redstart | *Phoenicurus coeruleocephala* (Vigors, 1831) | R | - | - | + |
| 164 | Grey Bushchat | *Saxicola ferreus* (Gray, JE and Gray, GR, 1847) | VC | + | + | + |
| 165 | Himalayan Bush Robin | *Tarsiger rufilatus* (Hodgson, 1845) | R | - | - | + |
| Turdidae (thrushes) | | | | | | |
| 166 | Grey-winged Blackbird | *Turdus boulboul* (Latham, 1790) | R | + | + | - |
| 167 | Black-throated Thrush | *Turdus atrogularis* (Jarocki, 1819) | C | - | - | + |
| CORACIIFORMES | | | | | | |
| Meropidae | | | | | | |
| 168 | Blue-tailed Bee-eater | *Merops philippinus* (Linnaeus, 1767) | R | - | + | - |
| 169 | Green Bee-eater | *Merops orientalis* (Latham, 1801) | R | - | - | + |

C—common | VC—very common | R—rare.

human disturbances, and environmental factors such as air, light, and noise pollution, and global warming affect the functional diversity of birds (Dutta 2017; Rajashekara & Venkatesha 2019; Matuoka et al. 2020). These factors also contribute to the varied distribution of bird diversity in the study area.

## DISCUSSION

The study represents the avifaunal diversity in the university premise located in the hilly terrain of the agro-climatic zone-II, Himachal Pradesh, India. The university lies in the foothill region of Dhauladhar ranges which are also known as flyover of many raptor species and is the major passage for local migration of many bird species to low land areas of the valley sub-region. The agricultural landscape within the study area exhibits diverse habitats, encompassing the expanse under agricultural fields. Conversely, the built-up locations predominately reflect the impact of developmental activities and habitat degradation. Areas designated as grasslands and forests are characterized by mixed vegetation, which serves as a significant contributor to bird diversity. Notably, the study area functions as a transition zone between human habitation and agricultural landscapes, encompassing unmanaged tea gardens, patches of forests, and various water bodies. These diverse features effectively draw in both migratory and resident bird species, distinctly augmenting the overall biodiversity of the area.

The data collected over three years for bird diversity was compared with the previous records. We observed that the present checklist (HPAU 2019–2022) showed many discrepancies/variations with the previous record (HPAU) 2019 compiled by Kottawa-Arachchi (2022). Several avian species, viz., Banded Bay Cuckoo *Cacomantis sonneratii*, Indian Cormorant *Phalacrocorax fuscicollis*, Lesser Fish-eagle *Icthyophaga humilis*, Oriental Honey-buzzard *Pernis ptilorhynchus*, Collared Owlet *Glaucidium brodiei*, Scaly-bellied Woodpecker *Picus squamatus*, Coppersmith Barbet *Psilopogon haemacephalus*, and many warbler, shrike, and minivet species were found absent. Most of these species even not recorded outside the university premises and surrounding areas of Palampur city. Some avian species, viz., White-tailed Nuthatch *Sitta himalayensis* and Black-

**Table 2. Relative diversity (RDi) of avian families in Agricultural University Himachal Pradesh, India.**

| | Family | RDi |
|---|---|---|
| 1 | Phasianidae | 2.59 |
| 2 | Columbidae | 4.31 |
| 3 | Cuculidae | 2.59 |
| 4 | Rallidae | 1.72 |
| 5 | Ardeidae | 3.45 |
| 6 | Phalacrocoracidae | 0.86 |
| 7 | Charadriidae | 0.86 |
| 8 | Scolopacidae | 0.86 |
| 9 | Accipitridae | 3.45 |
| 10 | Strigidae | 3.45 |
| 11 | Bucerotidae | 0.86 |
| 12 | Upupidae | 0.86 |
| 13 | Picidae | 6.03 |
| 14 | Megalaimidae | 1.72 |
| 15 | Alcedinidae | 0.86 |
| 16 | Falconidae | 0.86 |
| 17 | Psittaculidae | 3.45 |
| 18 | Campephagidae | 0.86 |
| 19 | Dicruridae | 2.59 |
| 20 | Dicaeidae | 0.86 |
| 21 | Sylviidae | 0.86 |
| 22 | Rhipiduridae | 0.86 |
| 23 | Corvidae | 3.45 |
| 24 | Monarchidae | 0.86 |
| 25 | Nectariniidae | 1.72 |
| 26 | Estrildidae | 0.86 |
| 27 | Passeridae | 1.72 |
| 28 | Motacillidae | 2.59 |
| 29 | Fringillidae | 1.72 |
| 30 | Stenostiridae | 1.72 |
| 31 | Paridae | 3.45 |
| 32 | Cisticolidae | 5.17 |
| 33 | Hirundinidae | 2.59 |
| 34 | Pycnonotidae | 2.59 |
| 35 | Phylloscopidae | 1.72 |
| 36 | Aegithalidae | 0.86 |
| 37 | Zosteropidae | 0.86 |
| 38 | Timaliidae | 2.59 |
| 39 | Leiothrichidae | 0.86 |
| 40 | Certhiidae | 0.86 |
| 41 | Sturnidae | 3.45 |
| 42 | Muscicapidae | 13.79 |
| 43 | Turdidae | 0.86 |
| 44 | Meropidae | 0.86 |

headed Jay *Garrulus lanceolatus* were recorded outside the university premises (Table 1). The previous checklist by Kottawa-Arachchi (2022) also reported many doubtful records such as Crow-billed Drongo *Dicrurus annectens* and Indian Pitta *Pitta brachyura*. Some of these species are not even reported in many birding sites surrounding the study area; moreover, many bird species have few records in the hilly state of Himalaya. Some of these species are mainly widespread residents in the Shivaliks and the foothills region. As most of the species are geotagged with an inbuilt Nikon p900 camera, the huge gap in previous records (HPAU 2019) seems to arise due to misidentification and sampling errors that may cause such reporting.

The more records in HPAU comparison to CUHP was due to the varied habitat diversity and larger study area. The absence of common species indicates the influence of unscientific anthropogenic activities and habitat loss. The results are in line with the findings that suggest the loss of habitat and development activities influences bird diversity (Rajashekara & Venkatesha 2019; Mbiba et al. 2021). The agricultural landscape in the Indian Himalayan region is predominately characterized by human modifications, with the agriculture university premise also exhibiting sign of habitat degradation and fragmentation. Throughout the survey, activities such as clearing new areas for experimental trials, developmental endeavours, large-scale shrub trimming, and unauthorized livestock grazing from the nearby villages have led to significant habitat destruction. However, despite these challenges, the hilly terrain of the agriculture university premise hold vast potential for habitat diversity, featuring wastelands, scattered patches of forest, grasslands, and water bodies. Nonetheless, the agricultural landscape and built-up areas are significantly impacted by habitat degradation, affecting the visitation and migration pattern of many shy bird species. Protection measures are essential for areas far from human habitation to prevent habitat fragmentation. Furthermore, the sites adorned with patches of forest, unmanaged tea orchards, and water bodies hold promise as potential areas for developing conservation strategies aimed at safeguarding avian species.

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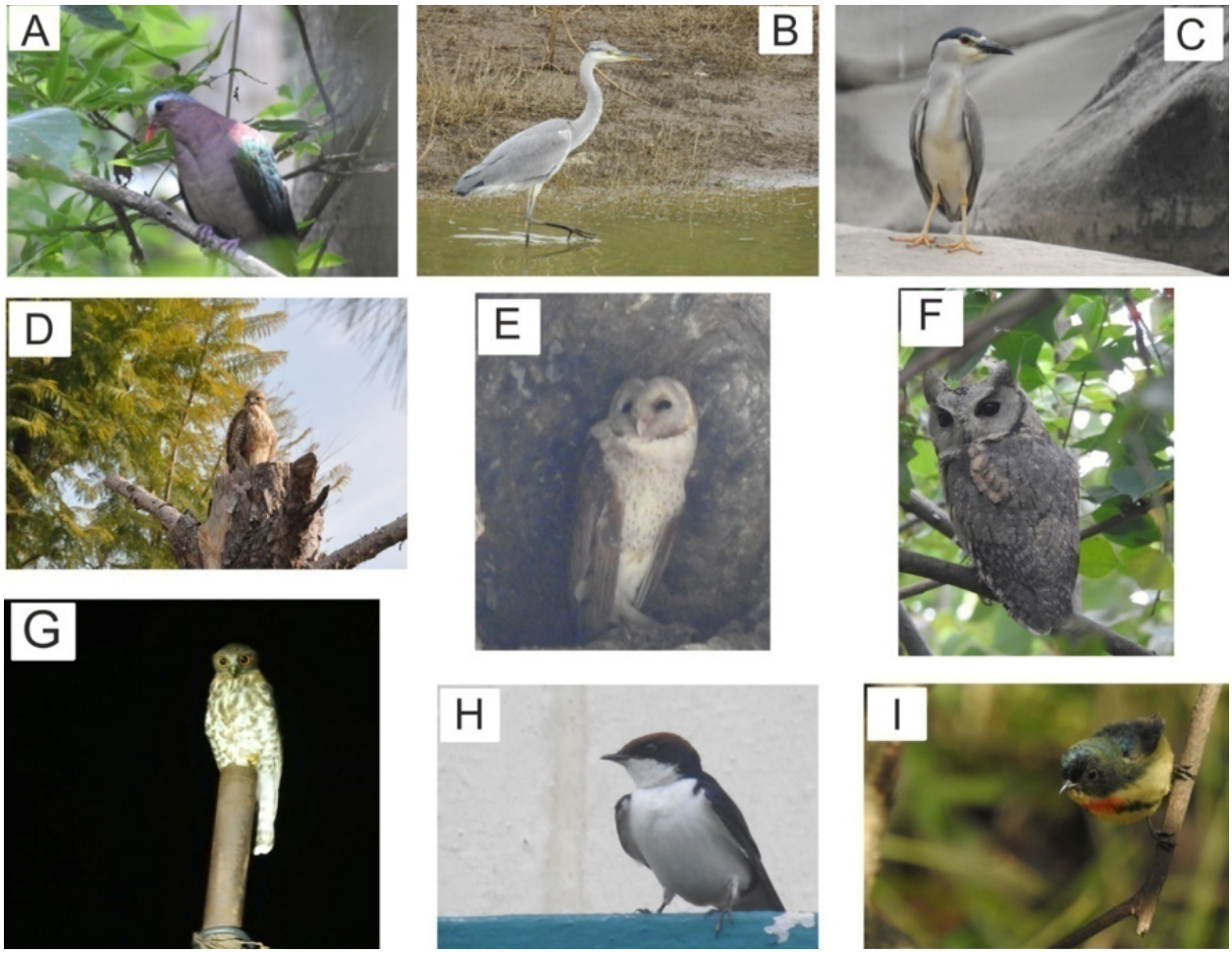


**Image 2. Photographic records of some additional bird species based on present survey [HPAU (2019–2022)] in comparison to previous checklists [CUHP (2015–2018) & HPAU (2019)]. A—Asian Emerald Dove *Chalcophaps indica* | B—Grey Heron *Ardea cinerea* | C—Black-crowned Night Heron *Nycticorax nycticorax* | D—Himalayan Buzzard *Buteo refectus* | E—Barn Owl *Tyto alba* | F—Indian Scops Owl *Otus bakkamoena* | G—Brown Boobook *Ninox scutulata* | H—Wire-tailed Swallow *Hirundo smithii* | I—Fire-breasted Flowerpecker *Dicaeum ignipectus*. © Praveen Kumar.**

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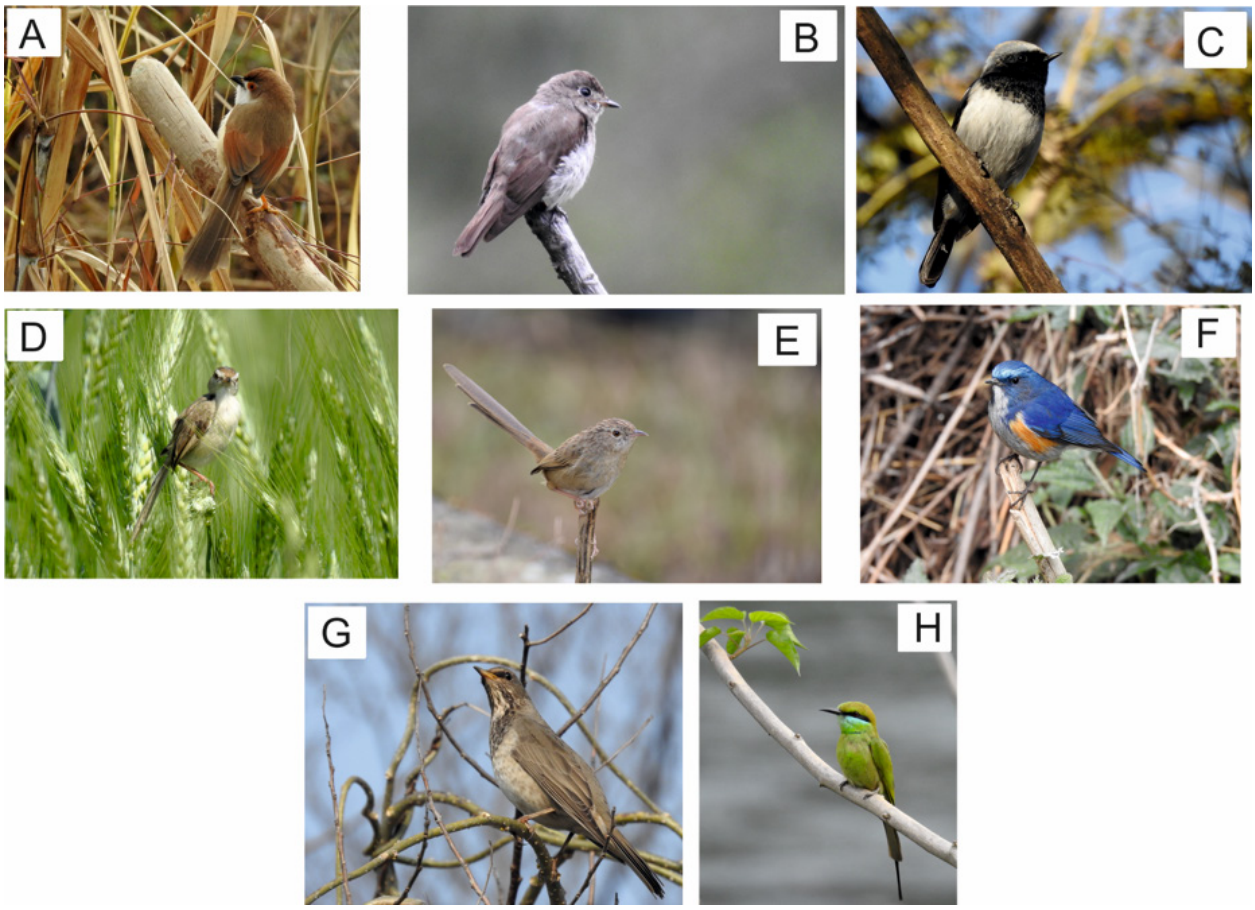


**Image 3. Photographic records of some additional bird species based on present survey [HPAU (2019–2022)] in comparison to previous checklists [CUHP (2015–2018) & HPAU (2019)]. A—Yellow-eyed Babbler *Chrysomma sinense* | B—Asian Brown Flycatcher *Muscicapa dauurica* | C—Blue-capped Redstart *Phoenicurus coeruleocephala* | D—Plain Prinia *Prinia inornata* | E—Striated Prinia *Prinia crinigera* | F—Himalayan Bluetail *Tarsiger rufilatus* | G—Black-throated Thrush *Turdus atrogularis* | H—Green Bee-eater *Merops orientalis*. © Praveen Kumar.**

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