Urban Forest Patch Functions as Critical Refugia for Avian Communities

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ABSTRACT

Urbanization in Nepal is rapidly altering the structure and ecological function of remnant forest patches, many of which continue to support wide range of biodiversity. Banpale Forest is small patch in Pokhara city amidst the urbanization. The forest is being used for recreational purpose for daily physical exercise, picnics and bird watching. The forest patch refuges several bird diversities however bird database is scattered and lacks recent bird diversity studies. Thus, bird study was conducted from 2022 to 2024. Bird count was carried out each moth along a transect line. Bird database was compiled from the data of this study and reported in the former literatures. Species richness, migratory status, feeding guilds, and conservation status were assessed from the collected data. The study resulted a total of 147 bird species in a Banpale Forest, representing 16 orders. Passeriformes were the most sighted bird group accounting 82 species. The forest refuges resident (116 species), winter visitors (25 species) and summer visitors (6 species). Insectivores are the abundant among the bird composition (70 species). The forest refuges 28 CITES listed birds; five are globally threatened while nine nationally threatened species. The study revealed Banpale Forest supports high bird diversity inferring as the critical refugia in the rapidly urbanizing and bustling Pokhara city. Thus, the study emphasized and initiate protection of the urban forest patches in the city, securing habitat of birds and natural beauty.

Keywords : *Banpale Forest, bird diversity, conservation, Pokhara, urban forest*

INTRODUCTION

Nepal supports 897 bird species which is approximately 8% of the avifaunal diversity of the world (DNPWC & BCN, 2022) and with increasing researches, birdwatching and conservation activities; records of new bird species is increasing. Nepal's diverse topography from lowland to high Himalayas creates a mosaic of habitat, which is a key reason for country being rich in avifauna diversity. Altitudinal variation, combined with the diverse habitat and climatic differences play a key role in supporting a wide range of bird species and distinct community structure (Basnet *et al.*, 2016; Bastola *et al.*,2025). Despite high diversity, many

areas with high ecological value lie close to rapidly expanding urban centers, where habitat structure around them are being chipped away, reshaped, and pressured by new roads, building, and farms. (Simkin *et al*., 2022; Wang *et al*., 2022). Nepali cities are expanding in size and density day by day, remaining forest patches are under increasing pressure from urbanization, leading concerns about their ability to support native biodiversity over time. Urban expansion led to habitat fragments and degrades ecosystem services all of which threaten the long-term sustainability of native wildlife in their patches (Yang *et al*., 2022).

Although urbanization is frequently associated with declining habitat quality, studies increasingly show that forest Patches within cities may retain considerable ecological value when native vegetation, canopy complexity, and reduced disturbance persist (Kang *et al*., 2015; Noe *et al*., 2022). Such forest patches can function as refugia for both resident and migratory species, often supporting higher bird richness than more intensively managed urban parks (Thaweepworadej & Evans *et al*., 2022). Their contribution is particularly significant in biodiversity-rich regions, where even small fragments can maintain specialized guilds or species of conservation concern (Carvalho *et al*., 2025; Labadessa & Ancillotto, 2023). The ecological performance of these patches, however, depends on their size, structural characteristics, and degree of isolation from surrounding development (Maseko *et al*., 2020; Zhu *et al*., 2024).

Banpale Forest, within the Institute of Forestry (IOF) campus in Pokhara, is one of the city last important green spaces, holding special value for nature in the middle of urban growth. (Baral *et al*., 2022; Bhattarai *et al*., 2021). This forest is home to mature broadleaf trees and has remained relatively undisturbed due to protection by the Institute of Forestry. This makes it a rare and ecologically valuable green space in the middle of Pokhara's growing urban landscape. Past studies have shown that the forest support a rich variety of bird species, including several threatened species. (Baral *et al*.,2022). Yet urban ecosystems are dynamic, and species assemblages may change over time due to vegetation succession, anthropogenic modification, and climatic variation (Alberti *et al*., 2020; Staude *et al*., 2023; Urban *et al*., 2024). Continuous monitoring is therefore essential to detect changes in community composition, update baseline inventories, and evaluate the conservation value of urban forest fragments.

This study presents an avifaunal species richness with updated checklist recorded in Banpale Forest along with species composition, migratory status, and nationally and globally threatened species refuging in the small forest patch. The finding emphasizes for the protection of urban forest patches and initiate bird conservation initiatives in rapidly developing securing natural beauty and environment of the cities.

MATERIALS AND METHODS

Study area

The study was conducted in Banpale Forest, located within the Institute of Forestry, Pokhara Campus (IOF-PC), Tribhuvan University, in Pokhara Metropolitan City–15, Kaski District, Nepal (28.18°N, 83.99°E). The Institute encompasses approximately 15 ha of built campus area and an adjoining 31.85 ha of forest, forming one of the largest and most ecologically significant urban green spaces in the Pokhara Valley. The forest extends across an elevational range of 750–915 m and is bordered by the Seti Gorge to the west, with agricultural land, grazing fields, shrubland, and human settlements surrounding the remaining perimeter (Bhattarai et al., 2021).

Banpale represents a subtropical mixed broadleaf forest**,** with a canopy dominated by Chilaune (*Schima wallichii*) and Katus (*Castanopsis indica)*. The forest also supports diverse native tree species such as, Sissoo (*Dalbergia sissoo)*, Chaap (*Michelia champaca)*, *Albizia* spp., and

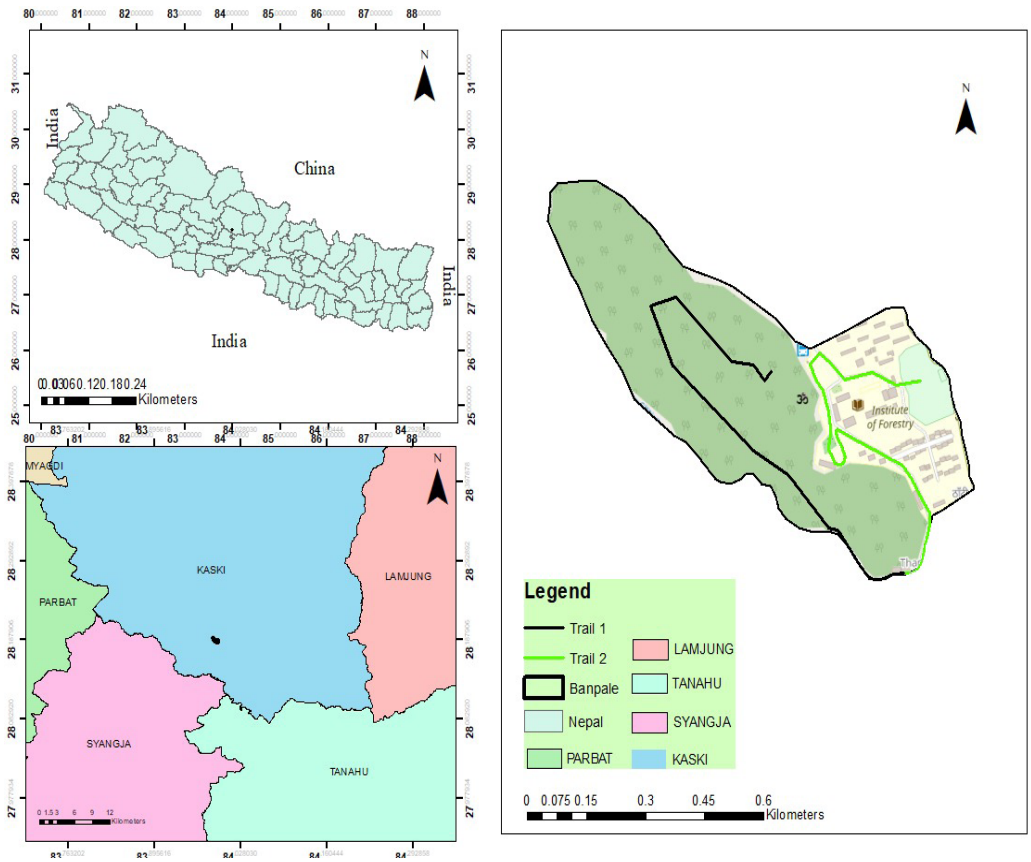

Fig 1: Study Area of Banpale Forest

Bambusa spp. A total of 331 plant species has been reported from Banpale Forest and campus premises (Miya & Gautam, 2021). Faunal species such as Rhesus macaque (*Macaca mulatta*), Common leopard (*Panthera pardus*), Large Indian civet (*Viverra zibetha*), etc, are found in Banpale underscoring the ecological value of this semi-protected forest fragment. Pokhara Valley experiences a humid subtropical monsoon climate, receiving approximately 4,000 mm of annual precipitation (Gautam *et al*., 2019), with strong seasonal variation. The mean annual temperature is around 21°C, with seasonal averages of approximately 14°C in winter, 22°C in pre-monsoon, 26°C during the monsoon, and 23°C in the post-monsoon period (Miya & Gautam, 2021). These climatic conditions, combined with the valley's topography and vegetation, support pronounced seasonal turnover in bird communities.

Despite its biodiversity value, Banpale Forest experiences variable levels of disturbance. Interior sections remain relatively intact due to IOF stewardship and restricted development, while edge zones are subject to pressures from human activity, invasive plant species, and free-ranging dogs. However, its accessibility, structural complexity, and semi-protected status make Banpale Forest an important site for long-term ecological research and a critical refuge for avifauna in the rapidly urbanizing Pokhara Valley.

Data Collection and Analysis

Bird study was conducted between 2022 and 2024. A single visit each month was carried out in the pre-delineated transect by Baral *et al*. (2022) maintaining methodological consistency and compatibility with earlier datasets. Birds seen and heard were recorded and an absolute bird count was conducted walking at a constant speed of 1 km/hour (Gregory *et al*., 2004) over a total of 2.17 km during each 2-hour survey period. A survey was conducted between 7:00-11:00 A.M. considering the peak active time of the most forest birds (Bried *et al*., 2011). A team of two observers was deployed to collect data, avoiding the inability of a single observer to spot the birds and record data simultaneously (Sutherland *et al*., 2004). The birds alongside the transect were observed using Nikon and Vortex 8*42 wide angle binoculars and recorded. Photographs of birds were taken using Canon EOS 500D camera for photographic evidence. The Helm Field Guide "Birds of Nepal" (Grimmett *et al*. 2016) and Merlin Bird ID application were used for identification of birds. Bird species recorded in monthly surveys and bird data from published articles were compiled documenting the checklist of the birds of the study area. Species Richness was calculated from the compiled data. The migratory status of birds and feeding guilds were sorted following Helm Field Guide "Birds of Nepal" (Grimmett *et al*., 2016). CITES appendix was assorted following the official checklist of Birds of Nepal (DNPWC & BCN, 2022)

Figure 1*: Peculiar bird species observed in the Banpale Forest, Spotted Owlet (top left), Siberian Rubythroat (top right), Speckeled Wood Pigeon (bottom left) and Wedge-tailed Green Pigeon (bottom right)*

RESULTS

Avian Diversity in Banpale Forest

A total of 147 species of birds belonging to 16 orders were recorded from Banpale Forest based on combined field observations between 2022 and 2024 and previously published articles. Of the total birds, 22 species were additional bird species recorded in the present study. Birds in the Banpale Forest, when assorted by migratory status, comprised of 116 resident species**,** 25 winter visitors and six summer visitor migrants, indicating that Banpale functions both as a year-round habitat and as a seasonal refuge for migratory birds.

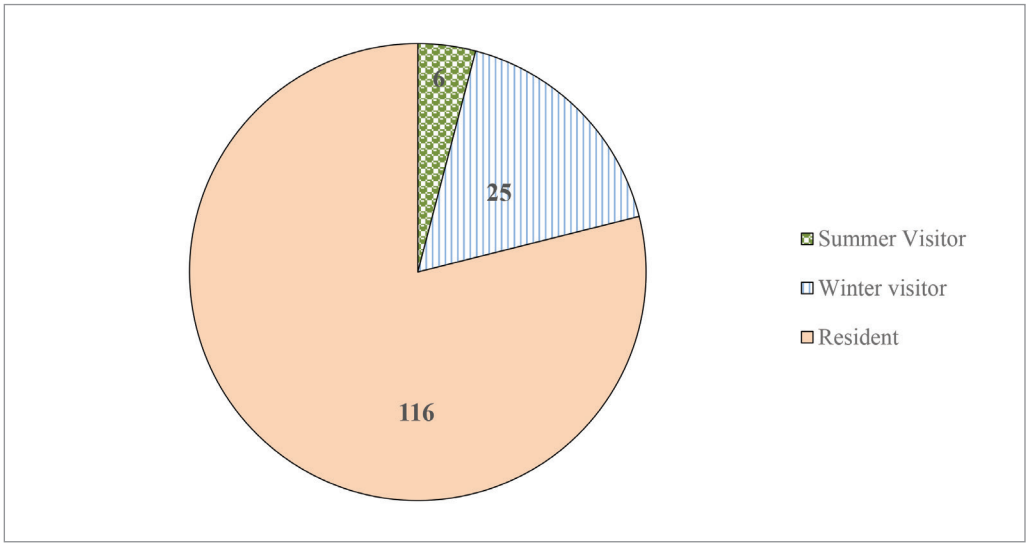

***Figure 2**: Migratory status avifaunal community of Banpale Forest.*

The order Passeriformes was the most species-rich, contributing 81 species (55.8%) to the avifaunal community of Banpale Forest. This was followed by Accipitriformes with 18 species (12.2%), Piciformes with 9 species (6.1%), and the orders Columbiformes, Cuculiformes, and Coraciiformes, each contributing 6 species (4.1%). Other represented orders included Strigiformes (5 species), Pelecaniformes (4 species), Psittaciformes (3 species), Caprimulgiformes (2 species), and the orders Falconiformes, Bucerotiformes, Suliformes, Gruiformes, Charadriiformes, and Galliformes, each represented by a single species.

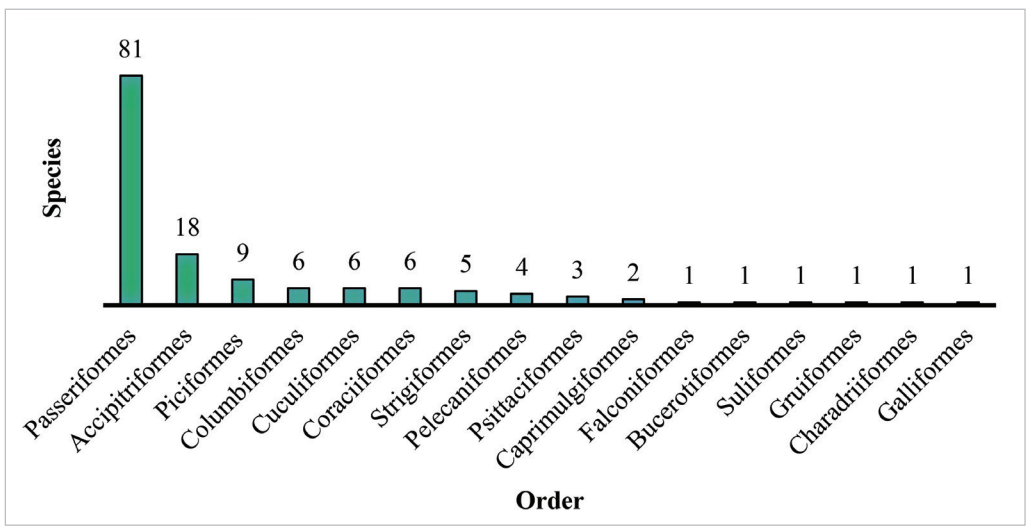

***Figure 3:** Composition of Bird species in Banpale Forest*

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Among the feeding guilds, the highest number of species belonged to the insectivorous guild (70 species), followed by carnivorous (27 species), omnivorous (15 species), granivorous (13 species), frugivorous (8 species), scavengers (7 species), nectarivorous (4 species) and piscivorous (3 species) birds. This dominance of insectivores, along with the presence of specialized frugivores, nectarivores and scavengers, suggests that Banpale Forest supports a structurally complex and functionally diverse avifaunal community.

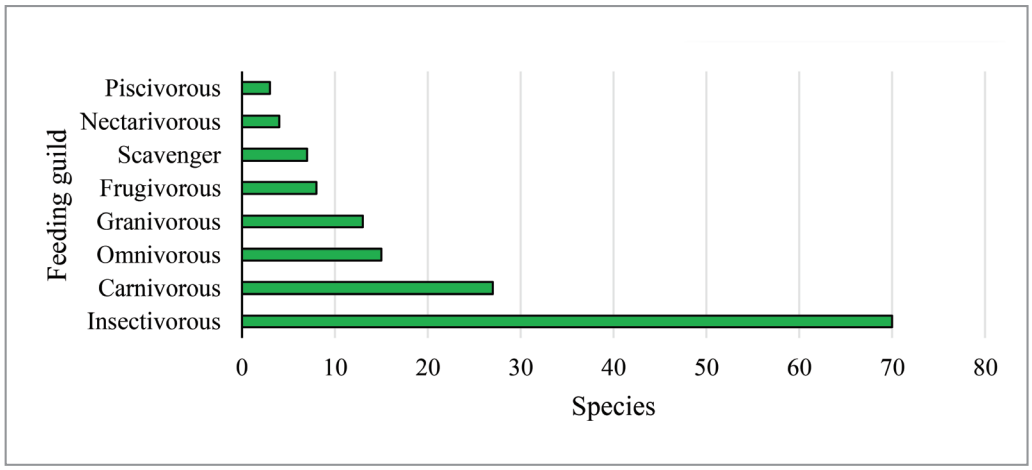

Figure 4: *Feeding guild of birds in Banpale Forest*

Status of recorded birds

A total of 28 species of birds observed in Banpale Forest are conservation significance, including globally critically endangered Slender-billed Vulture, White-rumped Vulture, and Red-headed Vulture and globally endangered Egyptian Vulture and Steppe Eagle. Including these species nine bird species sighted in the forest patch are nationally threatened birds. Meanwhile, 28 species are regulated by CITES appendices (Table 1).

Tabel 1: *Conservation significant species recorded in Banpale forest.*

Common Name	Scientific Name	Conservation Status		CITES Appendix
		Global	National	
Slender-billed Vulture	*Gyps tenuirostris*	CR	CR	II
White-rumped Vulture	*Gyps bengalensis*	CR	CR	II
Red-headed Vulture	*Sarcogyps calvus*	CR	EN	II
Egyptian Vulture	*Neophron percnopterus*	EN	VU	II
Steppe Eagle	*Aquila nipalensis*	EN	VU	II
Himalayan Griffon	*Gyps himalayensis*	NT	VU	II

Cinereous Vulture	*Aegypius monachus*	NT	EN	II
Brown Fish-Owl	*Ketupa zeylonensis*	LC	VU	II
Barn Owl	*Tyto alba*	LC	VU	II
Kalij Pheasant	*Lophura leucomelanos*	LC	NT	III
Slaty-headed Parakeet	*Psittacula himalayana*	LC	NT	II
Plum-headed Parakeet	*Psittacula cyanocephala*	LC	NT	II
Red-billed Leiothrix	*Leiothrix lutea*	LC	NT	II
Asian Barred Owlet	*Glaucidium cuculoides*	LC	NT	II
Jungle Owlet	*Glaucidium radiatum*	LC	NT	II
Spotted Owlet	*Athene brama*	LC	NT	II
Osprey	*Pandion haliaetus*	LC	NT	II
Oriental Honey-buzzard	*Pernis ptilorhynchus*	LC	NT	II
Crested Serpent-eagle	*Spilornis cheela*	LC	NT	II
Shikra	*Accipiter badius*	LC	NT	II
Eurasian Sparrowhawk	*Accipiter nisus*	LC	NT	II
Black Kite	*Milvus migrans*	LC	NT	II
Black-eared Kite	*Milvus migrans*	LC	NT	II
Griffon Vulture	*Gyps fulvus*	LC	NT	II
Booted Eagle	*Hieraaetus pennatus*	LC	NT	II
Common Kestrel	*Falco tinnunculus*	LC	NT	II
Bonelli's Eagle	*Aquila fasciata*	LC	NT	II

CR- Critically Endangered; E-Endangered; V-Vulnerable; NT-Near Threatened; LC-Least Concern

DISCUSSION

The avifaunal assessment of Banpale Forest demonstrates that this urban forest fragment continues to function as an important refuge for birds despite the ongoing anthropogenic pressures. A total of 147 species were recorded, expanding earlier survey (Baral *et al*., 2022). This underscores the ecological value of this semi-protected habitat within the rapidly urbanizing Pokhara Valley. The dominance of insectivorous and the substantial representation of carnivores, frugivores and scavengers indicate that Banpale supports a structurally complex habitat capable of sustaining multiple trophic levels. This is consistent with studies elsewhere showing that heterogeneous vegetation and microhabitat diversity promote functional richness in urban bird assemblages (Peng *et al*., 2024; Schillé *et al*., 2025).The presence of 31 migratory species highlights the importance of the forest's role as a seasonal refuge, which aligns with the findings that small forest patches along the urban gradients can facilitate the movement and persistence of migratory birds (Buron *et al*., 2022).

Banpale supports several globally threatened raptors including three

critically endangered vultures- Slender-billed Vulture (*Gyps tenuirostris*), White-rumped Vulture (*Gyps bengalensis*), and Red-headed Vulture (*Sarcogyps calvus*) as well as endangered Egyptian Vulture (*Neophron percnopterus*) and Steppe Eagle (*Aquila nipalensis*). These species have undergone dramatic declines across South Asia due to poisoning, electrocution, food limitation, and human disturbance (Kumar *et al*., 2025). The continued presence of Himalayan Vulture (*Gyps himalayensis*) and Cinereous Vulture (*Aegypius monachus*), both nationally threatened, indicates that Banpale offers suitable foraging and roosting conditions within the urban matrix. Nationally vulnerable species such as the Brown Fish-owl (*Ketupa zeylonensis*) and Barn owl (*Tyto alba*) further emphasize importance of the forest for birds.

In addition to globally and nationally threatened birds, Banpale contains a wide suite of CITES Appendix II and III species, including pheasants, parakeets, owls, and numerous raptors. Urban areas often host trade-sensitive species due to their adaptability and the proximity to human settlements, increasing risks of capture and trafficking (Mendoza *et al*., 2022). The coexistence of these species alongside threatened vultures suggests a mosaic of ecological niches still intact within the forest, reinforcing the value of urban green spaces as biodiversity reservoirs when habitat structure and patch connectivity are maintained (Archiciński *et al*., 2024; Kang *et al*., 2015).

Comparisons with broader urban biodiversity studies reveal parallels with global patterns of bird persistence in human-modified landscapes (Patankar *et al*., 2021). The high species richness observed in Banpale aligns with research showing that well-vegetated campuses and institutional forests can harbor disproportionately high biodiversity relative to their size due to lower disturbance levels, long-term protection, and vegetation complexity (Wang *et al*., 2021). The forest's ability to sustain both specialist and generalist species supports the concept of urban forest fragments acting as stepping stones that maintain regional connectivity (Yabuhara *et al*., 2019), a particularly important function in rapidly growing cities like Pokhara.

Threats including encroachment, invasive species, edge disturbances, and free-ranging dogs indicate that Banpale Forest remains vulnerable. Research on urban fragmentation consistently shows that even moderate increases in disturbance can negatively impact sensitive species and functional guilds, reduce reproductive success, and shift community composition (Silva *et al*., 2016). Long-term monitoring, active management of edge zones, and restoration of degraded microhabitats are therefore essential to maintain the site's ecological integrity.

Overall, the results highlight Banpale Forest as an important urban refuge for biodiversity, characterized by high species richness and a substantial presence of

conservation-priority birds. The revised avifaunal inventory offers a strengthened baseline for future ecological monitoring and underscores the importance of safeguarding remaining urban forest fragments of Nepal.

CONCLUSION

The updated survey of Banpale Forest documents 147 bird species, including 22 newly recorded taxa, affirming the forest's status as a key urban biodiversity refuge within Pokhara. The presence of globally and nationally threatened species, along with a diverse assemblage of resident and migratory birds, underscores the ecological importance of this forest fragment. These findings provide an essential baseline for future monitoring and highlight the need for continued protection and informed management of urban green spaces to sustain avian diversity amid ongoing urban expansion.

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Annex: Species name

S.N.	Order	Species	Scientific Name	Migratory Status
1	Accipitriformes	Slender-billed Vulture	*Gyps tenuirostris*	R
2	Accipitriformes	Osprey	*Pandion haliaetus*	W
3	Bucerotiformes	Eurasian Hoopoe	*Upupa epops*	W
4	Coraciiformes	Blue-bearded Bee-eater	*Nyctyornis athertoni*	R
5	Coraciiformes	Asian Green Bee-eater	*Merops orientalis*	R
6	Coraciiformes	Chestnut-headed Bee-eater	*Merops leschenaulti*	S
7	Coraciiformes	Indian Roller	*Coracias benghalensis*	R
8	Coraciiformes	White-throated Kingfisher	*Halcyon smyrnensis*	R
9	Coraciiformes	Pied King-fisher	*Ceryle rudis*	R
10	Piciformes	Coppersmith Barbet	*Psilopogon haemacephalus*	R
11	Piciformes	Great Barbet	*Psilopogon virens*	R
12	Piciformes	Blue-throated Barbet	*Psilopogon asiaticus*	R

13	Piciformes	Rufous Woodpecker	*Micropternus brachyurus*	R
14	Piciformes	Greater Yellownape	*Chrysophlegma flavinucha*	R
15	Piciformes	Lesser Yellownape	*Picus chlorolophus*	R
16	Piciformes	Gray-headed Woodpecker	*Picus canus*	R
17	Piciformes	Fulvous-breasted Woodpecker	*Dendrocopos macei*	R
18	Psittaciformes	Plum-headed Parakeet	*Psittacula cyanocephala*	R
19	Psittaciformes	Rose-ringed Parakeet	*Psittacula krameria*	R
20	Passeriformes	Indian Golden Oriole	*Oriolus kundoo*	S
21	Passeriformes	Black-hooded Oriole	*Oriolus xanthornus*	R
22	Passeriformes	Long-tailed Minivet	*Pericrocotus ethologus*	R
23	Passeriformes	Scarlet Minivet	*Pericrocotus flammeus*	R
24	Passeriformes	Indian Cuckooshrike	*Coracina macei*	R
25	Passeriformes	Black-winged Cuckooshrike	*Lalage melaschistos*	R
26	Passeriformes	Black Drongo	*Dicrurus macrocercus*	R
27	Passeriformes	Ashy Drongo	*Dicrurus leucophaeus*	R
28	Passeriformes	Lesser Racket-tailed Drongo	*Dicrurus remifer*	R
29	Passeriformes	Hair-crested Drongo	*Dicrurus hottentottus*	R
30	Passeriformes	Long-tailed Shrike	*Lanius schach*	R
31	Passeriformes	Gray-backed Shrike	*Lanius tephronotus*	W
32	Passeriformes	Rufous Treepie	*Dendrocitta vagabunda*	R
33	Passeriformes	Gray Treepie	*Dendrocitta formosae*	R
34	Passeriformes	Red-billed Blue Magpie	*Urocissa erythroryncha*	R
35	Passeriformes	Common Green Magpie	*Cissa chinensis*	R
36	Passeriformes	House Crow	*Corvus splendens*	R
37	Passeriformes	Large-billed Crow	*Corvus macrorhynchos*	R
38	Passeriformes	Yellow-bellied Fairy-fantail	*Chelidorhynx hypoxanthus*	R
39	Passeriformes	Grey-headed Canary-flycatcher	*Culicicapa ceylonensis*	R
40	Passeriformes	Asian Tit	*Parus cinereus*	R
41	Passeriformes	Himalayan Black-lored Tit	*Machlolophus xanthogenys*	R
42	Passeriformes	Striated Prinia	*Prinia crinigera*	R
43	Passeriformes	Common Tailorbird	*Orthotomus sutorius*	R
44	Passeriformes	Barn Swallow	*Hirundo rustica*	R

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45	Passeriformes	Eastern Red-rumped Swallow	*Cecropis daurica*	R
46	Passeriformes	Asian House Martin	*Delichon dasypus*	W
47	Passeriformes	Himalayan Bulbul	*Pycnonotus leucogenys*	R
48	Passeriformes	Red-vented Bulbul	*Pycnonotus cafer*	R
49	Passeriformes	Hume's Leaf Warbler	*Phylloscopus humei*	W
50	Passeriformes	Greenish Warbler	*Phylloscopus trochiloides*	W
51	Passeriformes	Gray-hooded Warbler	*Phylloscopus xanthoschistos*	R
52	Passeriformes	Tickell's Leaf Warbler	*Phylloscopus affinis*	W
53	Passeriformes	Buff-barred Warbler	*Phylloscopus pulcher*	R
54	Passeriformes	Indian White-eye	*Zosterops palpebrosus*	R
55	Passeriformes	Chestnut-bellied Nuthatch	*Sitta cinnamoventris*	R
56	Passeriformes	Velvet-fronted Nuthatch	*Sitta frontalis*	R
57	Passeriformes	Brahminy Starling	*Sturnia pagodarum*	R
58	Passeriformes	Chestnut-tailed Starling	*Sturnia malabarica*	R
59	Passeriformes	Common Myna	*Acridotheres tristis*	R
60	Passeriformes	Jungle Myna	*Acridotheresfuscus*	R
61	Passeriformes	Black-throated Thrush	*Turdus atrogularis*	W
62	Passeriformes	Scaly Thrush	*Zoothera dauma*	W
63	Passeriformes	Oriental Magpie-robin	*Copsychus saularis*	R
64	Passeriformes	Rufous-bellied Niltava	*Niltava sundara*	R
65	Passeriformes	Small Niltava	*Niltava macgrigoriae*	R
66	Passeriformes	Verditer Flycatcher	*Eumyias thalassinus*	R
67	Passeriformes	Blue Whistling-thrush	*Myophonus caeruleus*	R
68	Passeriformes	Snowy-browed Flycatcher	*Ficedula hyperythra*	W
69	Passeriformes	Red-throated Flycatcher	*Ficedula albicilla*	W
70	Passeriformes	Plumbeous Redstart	*Phoenicurus fuliginosus*	R
71	Passeriformes	Gray Bushchat	*Saxicola ferreus*	R
72	Passeriformes	Pied Bushchat	*Saxicola caprata*	R
73	Passeriformes	Siberian Stonechat	*Saxicola maurus*	R
74	Passeriformes	Little Pied Flycatcher	*Ficedula westermanni*	W
75	Passeriformes	Purple Sunbird	*Cinnyris asiaticus*	R
76	Passeriformes	Crimson Sunbird	*Aethopyga siparaja*	R
77	Passeriformes	White-rumped Munia	*Lonchura striata*	R
78	Passeriformes	Scaly-breasted Munia	*Lonchura punctulate*	R
79	Passeriformes	House Sparrow	*Passer domesticus*	R

80	Passeriformes	Eurasian Tree Sparrow	*Passer montanus*	R
81	Passeriformes	Paddyfield Pipit	*Anthus rufulus*	R
82	Passeriformes	Gray Wagtail	*Motacilla cinerea*	R
83	Passeriformes	White Wagtail	*Motacilla alba*	W
84	Passeriformes	Olive-backed Pipit	*Anthus hodgsoni*	W
85	Passeriformes	Red-billed Leiothrix	*Leiothrix lutea*	R
86	Passeriformes	White-throated Fantail	*Rhipidura albicollis*	R
87	Falconiformes	Common Kestrel	*Falco tinnunculus*	R
88	Galliformes	Kalij Pheasant	*Lophura leucomelanos*	R
89	Columbiformes	Rock Pigeon	*Columba livia*	R
90	Columbiformes	Oriental Turtle Dove	*Streptopelia orientalis*	R
91	Columbiformes	Spotted Dove	*Spilopelia suratensis*	R
92	Columbiformes	Eurasian Collared-Dove	*Streptopelia decaocto*	R
93	Caprimulgiformes	House Swift	*Apus nipalensis*	R
94	Caprimulgiformes	Alpine Swift	*Tachymarptis melba*	W
95	Cuculiformes	Greater Coucal	*Centropus sinensis*	R
96	Cuculiformes	Green-billed Malkoha	*Phaenicophaeus tristis*	R
97	Cuculiformes	Asian Koel	*Eudynamys scolopaceus*	R
98	Cuculiformes	Common Hawk-cuckoo	*Hierococcyx varius*	R
99	Cuculiformes	Indian Cuckoo	*Cuculus micropterus*	R
100	Cuculiformes	Common Cuckoo	*Cuculus canorus*	S
101	Gruiformes	White-breasted Waterhen	*Amaurornis phoenicurus*	R
102	Pelecaniformes	Indian Pond-Heron	*Ardeola grayii*	R
103	Pelecaniformes	Cattle Egret	*Bubulcus ibis*	R
104	Pelecaniformes	Intermediate Egret	*Ardea intermedia*	R
105	Pelecaniformes	Little Egret	*Egretta garzetta*	R
106	Suliformes	Great Cormorant	*Phalacrocorax carbo*	W
107	Strigiformes	Asian Barred Owlet	*Glaucidium cuculoides*	R
108	Strigiformes	Jungle Owlet	*Glaucidium radiatum*	R
109	Strigiformes	Brown Fish-Owl	*Ketupa zeylonensis*	R
110	Accipitriformes	Egyptian Vulture	*Neophron percnopterus*	R
111	Accipitriformes	Red-headed Vulture	*Sarcogyps calvus*	R
112	Accipitriformes	White-rumped Vulture	*Gyps bengalensis*	R
113	Accipitriformes	Steppe Eagle	*Aquila nipalensis*	W
114	Accipitriformes	Shikra	*Accipiter badius*	R
115	Accipitriformes	Black Kite	*Milvus migrans*	R

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116	Accipitriformes	Himalayan Griffon	*Gyps himalayensis*	R
117	Accipitriformes	Oriental Honey-buzzard	*Pernis ptilorhynchus*	R
118	Accipitriformes	Cinereous Vulture	*Aegypius monachus*	W
119	Accipitriformes	Common Buzzard	*Buteo buteo*	W
120	Accipitriformes	Black-eared Kite	*Milvus migrans*	R
121	Accipitriformes	Booted eagle	*Hieraaetus pennatus*	R
122	Accipitriformes	Crested Serpent-eagle	*Spilornis cheela*	R
123	Accipitriformes	Eurasian Sparrowhawk	*Accipiter nisus*	R
124	Accipitriformes	Griffon Vulture	*Gyps fulvus*	W
125	Accipitriformes	Bonelli's Eagle	*Aquila fasciata*	R
126	Charadriformes	Red-wattled Lapwing*	*Vanellus indicus*	R
127	Columbiformes	Wedge-tailed Green Pigeon*	*Treron sphenurus*	R
128	Passeriformes	Dark-sided Flycatcher*	*Muscicapa sibirica*	W
129	Strigiformes	Spotted Owlet*	*Athene brama*	R
130	Strigiformes	Barn Owl*	*Tyto alba*	R
131	Psittaciformes	Slaty-headed Parakeet*	*Psittacula himalayana*	R
132	Piciformes	Speckled Piculet*	*Picumnus innominatus*	R
133	Passeriformes	Long-tailed Broadbill*	*Psarisomus dalhousiae*	R
134	Passeriformes	Siberian Rubythroat*	*Calliope calliope*	W
135	Passeriformes	Taiga Flycatcher*	*Ficedula albicilla*	W
136	Passeriformes	Gray-bellied Tesia*	*Tesia cyaniventer*	R
137	Passeriformes	Bronzed Drongo*	*Dicrurus aeneus*	R
138	Passeriformes	Greater Racket-tailed Drongo*	*Dicrurus paradiseus*	R
139	Passeriformes	Rufous-gorgeted Flycatcher*	*Ficedula strophiata*	W
140	Passeriformes	Black Bulbul*	*Hypsipetes leucocephalus*	S
141	Passeriformes	Chestnut headed Tesia*	*Cettia castaneocoronata*	R
142	Columbiformes	Speckled Wood Pigeon*	*Columba hodgsonii*	R
143	Passeriformes	Orange-bellied Leadbird*	*Chloropsis hardwickii*	R
144	Passeriformes	Chestnut crowned Warbler*	*Phylloscopus castaniceps*	S
145	Passeriformes	Himalayan Prinia*	*Prinia crinigera*	R
146	Passeriformes	Lemon-rumped Warbler*	*Phylloscopus proregulus*	W
147	Passeriformes	Whistler's Warbler*	*Phylloscopus whistleri*	S

*Additional species sighted in the present study in the banpale forest