Birds are one of the best-known classes of living organisms, they are important bioindicators of an ecosystem. This study was undertaken to determine the diversity and abundance of birds in Reiek Biodiversity Spot, Mizoram, northeastern India. An intensive study was carried out by line transect method. A total of 117 species of birds belonging to 37 families and 10 orders were recorded and the Shannon-Wiener Diversity index was calculated (H' = 3.85). Family Muscicapidae dominated the area comprising of 16 species, followed by Timaliidae with 6 species. Among all the species recorded, *Alcippe nipalensis* has the highest relative abundance (13.35%), followed by *Staphida castaniceps* (Striated Yuhina) and *Zosterops palpebrosus* (Oriental White Eye) with 8.6007% and 6.03337% each. Family-wise relative abundance revealed that Pycnonotidae has the highest relative abundance (17.45%), followed by Sylviidae (15.91%) and Timaliidae (13.35%). The area supports a rich and diverse avian community, therefore, recommended better management of the entire landscape.

**Keywords:** Abundance, birds, diversity, forest, Reiek Biodiversity Spot.

**Introduction**

Birds are one of the best-known classes of living organisms and bird community is known to play crucial roles in the functioning of an ecosystem in which they are found. They are cosmopolitan and uneven in their distributions; their distribution, diversity and densities depend on various factors such as climate, altitude, vegetation, water availability and anthropogenic activities. India ranks among the top ten countries in the world in terms of the most number of bird species, and harbors about 1200 species of birds which makes up about 13% of the world’s bird species (9600). Lepage recorded 662 species of birds in Mizoram among which 31 falls under the category of globally threatened species. Despite birds being the best-known class of living organisms, there are still substantial gaps in our knowledge regarding their distributions, abundances and densities. Studies on bird diversity are important as it raises an awareness of the need for global conservation of the avian community and to understand the well-being of an ecosystem as a whole and help to delineate the importance of a regional or local landscape for avian conservation. Though Mizoram lies within the Indo-Myanmar biodiversity hotspot, studies on the avian community are scanty. Although there are a few existing studies that deal with pheasants and birds of a particular group and a specific area, more studies are needed to be done in order to show the picture of the Mizoram avian community.
Keeping in view of the above points, the present study was carried out to add baseline information on avian species diversity and abundance in Reiek Biodiversity Spot, Mizoram, northeastern India and to create awareness for their conservation and help in strategic conservation planning. Considering the scarcity of information on the avian diversity as discussed above, the present study is designed to assess the species composition and to investigate the diversity and relative abundance of birds in Reiek Biodiversity Spot, Mizoram, India.

**Materials and Methods**

**Study site**

Reiek is a village located at 23°41’17.36” N longitude and 92°36’07.79” E latitude, Mizoram, northeastern India and lies within the Indo-Myanmar Biodiversity hotspot (Figures 1 & 2). It rests at an elevation of 1,325 m above mean sea level. The village is located at a distance of 28 km from the state capital, Aizawl. The area is covered by semi-evergreen, bamboo forest, and grasses. The major
plant species of the area are Castanopsis tribuloides, Schima wallichii, Atalancia simplifolia and different species of bamboos and orchids.

Some portions of the community forest and its fauna are protected and conserved by the community, with the community heads and members of various non-government organizations within the village playing a vital role in this effort. Despite their efforts, tribal hunting practices using traps, snares, guns and slingshots are still prevalent among some groups of people within the community. Felling of trees and collection of firewood are also still widely prevalent in the village. Recently, the area was declared as a ‘Biodiversity Spot’ by the village in collaboration with Association for Environment Protection (ASEP), one of the leading NGOs in Mizoram for protecting and conserving the environment, in an effort to protect and preserve the pristine state of the protected area and its surrounding.

Sampling method

Line Transect method was employed for counting and evaluating the abundance and diversity of birds in the study. The study was conducted from January to March 2019. A total of three line transects were laid and followed for recording the presence of birds, viz. transect-1, transect-2 and transect-3 respectively. Transects were of different lengths and were laid on existing path. Transect-1 was laid as long as 2 km passing through the core of the protected area at a geological point of 23°41’23.32″ N and 92°36’19.22″ E, at an altitude of 1290 m. Transect-2 was laid as long as 3.5 km, at a geological point of 23°41’29.72″ N and 92°35’52.61″ E at an altitude of 1077 m above sea level. Transect-3 covered a distance of 2 km, located at 23°42’31.09″ N and 92°36’05.54″ E, at an altitude of 963 m above mean sea level. Transect-3 was laid in a relatively disturbed area where agricultural practices and firewood collection are carried out.

Transects were walked in the morning (0530–0830 hrs) and evening (1400–1700 hrs) at an interval of six days for a period of three months. For each transect, we recorded the bird species and numbers encountered in the area. For the survey, SLR camera (Nikon P900) was used for photography, binocular (Nikon Sporter EX) and the calls of birds were used for observations, recording and identification. For identification and field diagnosis of birds, Grimmet et al.17 and Grewal et al.18 were consulted. For diversity study, in addition to the line transect method, simple bird watching (opportunistic sampling) within the study was also adopted.

Data analysis

PAST (PAleontological STatistics) version 1.93 was used for estimating abundance and diversity indices. The relative abundance of a species was calculated by dividing the abundance of a species by the total abundance of all species combined.6

Bird diversity was calculated using both Shannon-Wiener and Simpson’s diversity indices. Shannon-Wiener diversity Index was calculated using the formula:

\[ H = - \sum_{i=1}^{R} p_i \ln p_i \]

Where \( p_i \) = proportion of individual species and \( R \) = total number of species of the community (numbers seen and heard).

Simpson’s diversity index, \( D \) was calculated using the formula:

\[ D = \frac{\sum n_i (n_i - 1)}{N(N - 1)} \]

Where \( n_i \) = the total no. of birds of each individual species and \( N \) = the total number of birds of all species

The value of \( D \) ranges between 0 and 1. With this index, 1 represents infinite diversity and 0, no diversity.

Result and Discussion

Species composition

A total of 117 bird species, belonging to 37 families and 10 orders were recorded from Reiek Biodiversity Spot (Table 1). Altogether, 110 species were recorded from the transects, while the remaining 7 species were recorded outside the transects through opportunistic sampling. This record is fairly high despite the fact that the study site is being dominated by tribal communities who are known to indulge in various hunting practices and secondly, the site not being under the categories of protected area notified by the government. The relatively high avian species composition could be attributed to the availability of heterogeneous habitat, i.e., primary and secondary forests, grasses, bamboo forest, jhum land and secondly to the conservation efforts of the community where the communal forest is protected and conserved providing home to large number of avifauna. The bird species composition in the present study is lesser than studies that have been carried out in various protected areas around the state such as- a study carried out by Sailo and Lalthanzara in Lengteng Wildlife Sanctuary recorded 126 species of birds belonging to 35 families,15 while the famous Murlen Wildlife Sanctuary is known to harbor more than 150 species of birds.16

Another study executed by Lalthanzara and Sailo17 in Lungleng-1, a non-protected area recorded 114 species of birds belonging to 40 families, though the number of species recorded is higher in the present study, the number of the family is higher in
| Order          | Family           | Scientific Name         | Common Name                     | Status      |
|---------------|------------------|-------------------------|---------------------------------|-------------|
| Accipitriformes | Accipitridae     | Accipiter badius        | Shikra                          | LC          |
|               |                  | Accipiter virgatus      | Besra                           | LC          |
|               |                  | Pernis ptilorhyncus     | Oriental Honey Buzzard          | LC          |
|               |                  | Spilornis cheela        | Crested Serpent Eagle          | LC          |
| Falconiformes | Falconidae       | Falco tinnunculus       | Common Kestrel                 | LC          |
|               |                  | Falco peregrines        | Peregrine Falcon               | LC          |
| Galliformes   | Phasianida       | Arborophila rufogularis | Rufous-throated Hill Partridge | LC          |
|               |                  | Bambusicola fytchii     | Mountain Bamboo Partridge       | LC          |
|               |                  | Gallus galus            | Red Jungle Fowl               | LC          |
| Columbiformes | Columbidae       | Streptopelia chinensis  | Spotted Dove                  | LC          |
|               |                  | Ducula aenea            | Green Imperial Pegion          | LC          |
|               |                  | Ducula badia            | Mountain Imperial Pegion       | LC          |
| Strigiformes  | Strigidae        | Glaucidium cuculoides   | Asian Barred Owlet             | LC          |
|               |                  | Strix leptogrammica     | Brown Wood Owl                 | LC          |
| Cuculiformes  | Cuculidae        | Phoenicopsruestris      | Green-billed Malkoha           | LC          |
|               |                  | Hierococcyx varius      | Common hawk-Cuckoo             | LC          |
|               |                  | Surniculus lugubris     | Square-tailed drongo Cuckoo    | LC          |
|               |                  | Centropus sinensis      | Greater Coucal                 | LC          |
| Passeriformes | Pycnonotidae     | Ixos mcclellandii       | Mountain Bulbul                | LC          |
|               |                  | Pycononotus cafer       | Red-Vented Bulbul              | LC          |
|               |                  | Pycononotus flavescens  | Flavescent Bulbul              | LC          |
|               |                  | Allophoicus flavoeulus  | White-Throated Bulbul          | LC          |
|               |                  | Hypopetes leucocophalus | Black Bulbul                   | LC          |
|               |                  | Hemixos flavala         | Ashy Bulbul                    | LC          |
|               |                  | Pycononotus flaviventris| Black-crested Bulbul           | LC          |
|               |                  | Dicaeum ign.icapiceps   | Fire-breasted Flowerpecker     | LC          |
|               |                  | Zosterops palpebrossus  | Oriental White-eye             | LC          |
|               |                  | Copsychus malabaricus   | White-rumped Shama             | LC          |
|               |                  | Ficedula albicilla      | Taiga Flycatcher               | LC          |
|               |                  | Ficedula hodgsoni       | Slaty-backed Flycatcher        | LC          |
|               |                  | Enicurus schistaceus    | Slaty-backed Forktail          | LC          |
|               |                  | Anthipes monileger      | White-gorgeted Flycatcher      | LC          |
|               |                  | Saxicola ferreus        | Grey Bushchat                  | LC          |
|               |                  | Phoenicurus frontalis   | Blue-fronted Redstart         | LC          |
|               |                  | Enicurus leschenaultia  | White-crowned Forktail         | LC          |
|               |                  | Cyornis unicolor        | Pale-blue Flycatcher           | LC          |
|               |                  | Muscicapa daurica       | Asian Brown Flycatcher         | LC          |
|               |                  | Niltava vivida          | Vivet Niltava                  | LC          |
|               |                  | Niltava grandis         | Large Niltava                  | LC          |
|               |                  | Niltava macgrgoriae     | Small Niltava                  | LC          |
|               |                  | Tarsiger ruftatus       | Himalayan Blue Tail            | LC          |
|               |                  | Culicicapa ceylonensis  | Grey-headed Canary Flycatcher  | LC          |
|               |                  | Niltava sundara         | Rufous-bellied Niltava         | LC          |
|               |                  | Cospsychus malabaricus  | White-rumped Shama             | LC          |
|               |                  | Ficedula albicilla      | Taiga Flycatcher               | LC          |
|               |                  | Ficedula hodgsoni       | Slaty-backed Flycatcher        | LC          |
| Order         | Family                  | Species                        | Common Name            | IUCN Status |
|--------------|-------------------------|--------------------------------|------------------------|-------------|
| Nectariniidae| Aethopyga gouldiae      | Mrs. Gould's Sunbird           | LC                     |
|              | Aethopyga siparaja      | Crimson Sunbird                | LC                     |
|              | Aethopyga saturate      | Black-throated Sunbird         | LC                     |
|              | Aethopyga ignicauda     | Fire-tailed Sunbird            | LC                     |
|              | Arachnothera magna      | Streaked Spiderhunter          | LC                     |
|              | Arachnothera longirostra| Little Spiderhunter            | LC                     |
| Carvidae     | Cissa chinensis        | Common Green Magpie            | LC                     |
|              | Corvus macrorhynchos    | Jungle Crow                    | LC                     |
|              | Dendrocitta formosae    | Grey Treepie                   | LC                     |
|              | Dendrocitta vagabunda   | Rufous Treepie                 | LC                     |
| Turdidae     | Zoothera divxi          | Long-tailed Thrush             | LC                     |
|              | Myophonus caeruleus     | Blue-whistling Thrush          | LC                     |
|              | Zoothera dauma          | Scaly Thrush                   | LC                     |
|              | Turdus obsures          | Eye-browed Thrush              | LC                     |
| Campephagida | Pericrocotus flammeus   | Scarlet Minivet                | LC                     |
|              | Coracina melanochistos  | Black-winged Cuckooshrike      | LC                     |
|              | Pericrocotus cinnamomeus| Small Minivet                  | LC                     |
|              | Tephrodornis virgatus   | Large Woodshrike               | LC                     |
|              | Tephrodornis paniculatus| Common Woodshrike              | LC                     |
| Chloropseida | Chloropsis hardwickii  | Orange-bellied Leafbird        | LC                     |
|              | Chloropsis cochinchinensis| Blue-winged Leafbird       | LC                     |
|              | Chloropsis aurifrons    | Gold-fronted Leafbird          | LC                     |
| Monarchidae  | Hypothymis azurea       | Black-naped Monarch            | LC                     |
| Oriolida     | Oriolus chinensis       | Black-naped Oriole             | LC                     |
| Emberizidae  | Emberiza pusilla        | Little Bunting                 | LC                     |
| Cisticolida  | Emberiza rutila         | Chesnut Bunting                | LC                     |
|              | Orthotomus sutorius     | Common tailorbird              | LC                     |
|              | Orthotomus cuculatus    | Mountain tailorbird            | LC                     |
|              | Prinia atrociliaris     | Black-throated Prinia          | LC                     |
|              | Prinia crinigera        | Striated Prinia                | LC                     |
|              | Prinia rufescens        | Rufescent Prinia               | LC                     |
| Aegithinidae | Aegithina tibia         | Common Iora                    | LC                     |
| Sittidae     | Sitta castanea          | Chesnut-bellied Nuthatch       | LC                     |
|              | Sitta frontalis         | Velvet-fronted Nuthatch        | LC                     |
|              | Sitta hmytaylaensis     | White-tailed Nuthatch          | LC                     |
| Eurylaimidae | Psarismus dalhousiae    | Long-tailed broadbill          | LC                     |
| Rhipiduridae | Rhipidura albicollis    | White-throated Fantail         | LC                     |
| Vangidae     | Hemipus picatus         | Bar-winged flycatcher Shrike   | LC                     |
| Motacillidae | Anthus hodgsoni         | Olive-backed Pipit             | LC                     |
| Sylviiida    | Phylloscopus xanthochistos| Grey-hooded Warbler          | LC                     |
|              | Alcippe nipalensis      | Nepal Fulvetta                 | LC                     |
|              | Phylloscopus inornatus  | Yellow Bowed Warbler           | LC                     |
|              | Phylloscopus trochiloides| Greenish Warbler               | LC                     |
|              | Phylloscopus whistleri  | Whister's Warbler              | LC                     |
|              | Seicercus poliogenys   | Grey-cheeked Warbler           | LC                     |
| Laniidae     | Lanius schach          | Long-tailed Shrike             | LC                     |
| Passeridae   | Passer montanus        | Eurasian Tree Sparrow          | LC                     |
| Fringillidae | Carpodacus erythrinus  | Common Rosefinch               | LC                     |
| Paridae      | Melanochlora sultanea  | Sultan Tit                     | LC                     |
| Vireonidae   | Erpornis zantholeuca   | White bellied Erpornis         | LC                     |
| Piciformes   | Capitonidae            | Megalaima asiatica            | LC                     |
|              | Megalaima virens       | Great Barbet                   | LC                     |
|              | Megalaima haemacephala  | Coppersmith Barbet             | LC                     |
| Picidae      | Picus flavinucha       | Greater Yellownaped Woodpecker  | LC                     |
|              | Sasia ochracea          | White-browed Piculet           | LC                     |
|              | Picumnus innominatus    | Speckled Piculet               | LC                     |
|              | Dendrocopus nanus       | Brown-capped Pygmy Woodpecker  | LC                     |
|              | Blythipicus pyrrothi    | Bay-Woodpecker                 | LC                     |
| Apodiformes  | Apodidae               | Apus acuticauda                | VU                     |
| Coraciiformes| Upupidae               | Upupa epops                    | LC                     |

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Lungleng-1 community forest as compared to Reiek biodiversity Spot. A study executed by Syiem et al. at Nongkhyllem landscape in Meghalaya which includes Nongkhyllem Wildlife Sanctuary and its surrounding matrix recorded a total of 94 species which is lesser than species recorded from the present study site.

Family-wise species composition indicates that Muscicapidae has the largest family comprising of 16 species, followed by Timaliidae comprising of 10 species, and Pycnonotidae with 7 species, Nectariniidae with 6 species. 5 families, viz. Dicruridae, Camppephagidae, Cisticolidae, Sylviidae and Pididae were represented by 5 species. Accipitriformes, Cuclidae, Turdidae and Corvidae were represented by 4 species each. Chloropsidae, Sittidae, Capatonidae, were represented by 3 species each. Strigidae and Emberizidae consist of 2 species each. 17 families were represented by single species (Figure 3). The recorded highest species richness in Muscicapidae family is in accordance with records from various parts of Mizoram, as well as the entire Northeast region. This could be due to their ability to adapt to different habitats including human-modified habitats. Meanwhile, it has been reported that Timaliidae family has the greatest number of species in Lengteng Wildlife Sanctuary, Mizoram in a study executed by Sailo and Lalthanzara. Saikia and Saikia also reported that Sylvidae has the largest family in northeast India represented by 153 species and 44 genera.

As expected, Passeriformes being the most diverse group of birds, order-wise species composition revealed that Passeriformes has the highest species composition with 89 species recorded under this order, followed by Piciformes, comprising of 8 species, Accipitriformes and Cucliformes came third in the list with 4 species each (Figure 4).

The family Passeriformes was represented by 27 families, topping the list of orders having the highest number of families, followed by Piciformes represented by 2 families. The remaining 8 orders were represented by 1 family each (Figure 5).

A total of 8 raptor species were recorded while 3 ground bird species and a species belonging to the most aerial birds of all families, i.e. Dark-rumped Swift were recorded from the present study. Of all the birds recorded, only Dark-rumped Swift (Apus acuticauda) falls under the Vulnerable category of the IUCN Red List of Threatened Species (2018), while the remaining 116 species belong to the Least Concern category.

Most of the species recorded from Reiek Biodiversity Spot belong to the Least Concerned category of the IUCN Red List of Threatened Species could probably be due to the fact that the area is under constant interaction with human, and that species under Threatened, Near Threatened, Vulnerable and other special categories tend to avoid humans and are usually specialist species requiring certain conditions to thrive well in a place.

**Species diversity**

The Shannon-Wiener diversity for Reiek Biodiversity Spot was calculated to be $H^\prime = 3.858$. This record is fairly high and indicates that the area has great potential for avian conservation site, dominance $D = 0.04146$ and Simpson Diversity was calculated to be 0.9585. Reiek landscape, providing heterogeneous habitats could be the reason for the relatively high diversity index.

The result of the diversity index revealed that Transect-3 has the highest Shannon-Wiener diversity index, followed by Transect-1 and Transect-2 respectively (Table 2). Even though Transect-3 was laid in a fairly disturbed area where shifting cultivation site and secondary forest from shifting cultivation occurs, it recorded the highest Shannon-Wiener Diversity index as compared to the two transects. This could be attributed to the area is a mixture of secondary forest and agricultural land offering a more heterogeneous habitat than the other two transects, hence it allows various species of birds to co-exist and bird species are easier to

| Family | Domicance | Shannon, $H'$ | Simpson_1-D |
|--------|-----------|--------------|-------------|
| Accipitriformes | 0.3333 | 1.242 | 0.6667 |
| Strigidae | 0.5556 | 0.6365 | 0.4444 |
| Phasianidae | 0.4489 | 0.8823 | 0.5511 |
| Columbidae | 0.4286 | 0.9557 | 0.5714 |
| Cuclidae | 0.5 | 0.8676 | 0.5 |
| Pycnonotidae | 0.1948 | 1.774 | 0.8052 |
| Dicruridae | 0.2676 | 1.445 | 0.6779 |
| Timaliidae | 0.3221 | 1.475 | 0.6779 |
| Muscicapidae | 0.08587 | 2.598 | 0.9141 |
| Nectariniidae | 0.3979 | 1.203 | 0.6021 |
| Corvidae | 0.3086 | 1.273 | 0.6914 |
| Turdidae | 0.46 | 0.8979 | 0.54 |
| Camppephagidae | 0.6966 | 0.6751 | 0.3034 |
| Chloropseidae | 0.4063 | 0.9743 | 0.5938 |
| Emberizidae | 0.625 | 0.5623 | 0.375 |
| Cisticolidae | 0.24 | 1.505 | 0.76 |
| Sittidae | 0.375 | 1.04 | 0.625 |
| Sylviidae | 0.7106 | 0.6571 | 0.2694 |
| Capatonidae | 0.4897 | 0.8 | 0.5103 |
| Picidae | 0.2711 | 1.415 | 0.7289 |
Figure 3 | Family-wise species composition.

Figure 4 | Order-wise species composition.

Figure 5 | Number of families belonging to different orders.

Figure 6 | Family-wise relative abundance.
| Sl No | Scientific Name | Common name | Relative abundance % |
|-------|----------------|-------------|----------------------|
| 1     | Accipiter badius | Shikra       | 0.39                 |
| 2     | Pernis ptilorhyncus | Oriental Honey Buzzard | 0.13                 |
| 3     | Spilornis cheela | Crested Serpent Eagle | 0.13                 |
| 4     | Accipiter virgatus | Besra       | 0.13                 |
| 5     | Falco peregrines | Peregrine Falcon | 0.13                 |
| 6     | Arborophila rufagularis | Rufous-throated Hill Partridge | 1.03                 |
| 7     | Bambusicola fytchii | Mountain Bamboo Partridge | 0.77                 |
| 8     | Gallus gallus | Red-Jungle Fowl | 0.13                 |
| 9     | Streptopelia chinensis | Spotted Dove | 0.51                 |
| 10    | Ducula aenea | Green Imperial Pigion | 0.13                 |
| 11    | Ducula badia | Mountain Imperial Pigion | 0.26                 |
| 12    | Glauclidium cuculoides | Asian Barred Owlet | 0.26                 |
| 13    | Strix leptogrammica | Brown Wood Owl | 0.13                 |
| 14    | Phoenica phaeustris | Green-billed Malkoha | 0.51                 |
| 15    | Hierococcyx varius | Common hawk-Cuckoo | 0.13                 |
| 16    | Surniculus lugubris | Square-tailed Drongo Cuckoo | 0.13                 |
| 17    | Ixas mceliandi | Mountain Bulbul | 1.41                 |
| 18    | Pycnonotus cafer | Red-Vented Bulbul | 5.13                 |
| 19    | Pycnonotus flavescens | Flavescent Bulbul | 1.54                 |
| 20    | Alophoixus flaveolus | White-throated Bulbul | 1.93                 |
| 21    | Hynopetes leucocephalus | Black Bulbul | 2.95                 |
| 22    | Hemixos flavula | Ashy Bulbul | 1.54                 |
| 23    | Pycnonotus flaviventris | Black-crested Bulbul | 2.95                 |
| 24    | Dicaeum ignicapus | Fire-breasted Flowerpecker | 1.41                 |
| 25    | Zosterops palpebrosus | Oriental White-eye | 6.03                 |
| 26    | Dicrurus remifer | Lesser Racket-tailed Drongo | 0.51                 |
| 27    | Dicrurus paradiseus | Greater Racket-tailed Drongo | 0.77                 |
| 28    | Dicrurus macrocercus | Black Drongo | 1.67                 |
| 29    | Dicrurus aeneus | Bronzed Drongo | 0.90                 |
| 30    | Dicrurus leucophaeae | Ashy Drongo | 0.26                 |
| 31    | Garrulax leucotophus | White-crested Laughingthrush | 0.51                 |
| 32    | Stachyris nigriceps | Grey-throated Babbler | 0.26                 |
| 33    | Garrulax pectoralis | Greater Necklaced-laughingthrush | 1.67                 |
| 34    | Staphida castaneiceps | Striated Yuhina | 8.60                 |
| 35    | Timia tiliata | Chestnut-capped Babbler | 0.39                 |
| 36    | Yuhina cognata | Black-chinned Yuhina | 0.51                 |
| 37    | Stachyris ruficeps | Rufous-capped Babbler | 0.13                 |
| 38    | Pomatorhinus ferruginosus | Coral-billed scimitar Babbler | 1.03                 |
| 39    | Pellorneum ruficeps | Puff-throated Babbler | 0.13                 |
| 40    | Napothera brevicaudata | Streak wren Babbler | 0.13                 |
| 41    | Enicurus stilicate | Slaty-backed Forktail | 0.51                 |
| 42    | Anthipes manileger | White-gorgeted Flycatcher | 0.13                 |
| 43    | Saxicola ferreus | Grey Bushchat | 0.13                 |
| 44    | Phoenicurus frontalis | Blue-fronted Redstart | 0.13                 |
| 45    | Cyornis unicolor | Pale-blue Flycatcher | 0.13                 |
| 46    | Muscicapa dauurica | Asian Brown Flycatcher | 0.26                 |
| 47    | Niltava vivida | VivetNiltava | 0.26                 |
| 48    | Niltava grandis | Large Niltava | 0.26                 |
| 49    | Niltava macgrigoraias | Small Niltava | 0.51                 |
| 50    | Tarsiger rufilatus | Himalayan Blue Tailed | 0.77                 |
| 51    | Culicicapa ceylonensis | Grey headedcanary Flycatcher | 0.39                 |
| 52    | Niltava sundara | Rufous-bellied Niltava | 0.13                 |
| 53    | Capsycus malabaricus | White-rumpedShama | 0.26                 |
| 54    | Megalaima asiatica | Blue-throated Barbet | 1.28                 |
| 55    | Megalaima vires | Great Barbet | 2.05                 |
| 56    | Megalaima haemacephala | Coppersmith Barbet | 0.13                 |
| 57    | Picus flavinucha | Greater Yellownaped | 0.64                 |
| 58    | Sasia ochracea | White-browed Piculet | 0.13                 |
| 59    | Picumnus innominatus | Speckled Piculet | 0.64                 |
detect for the observer owing to the less dense characteristics. But this cannot rule out the fact that an intact, undisturbed area usually host specialist, important and conservation-worthy species, as such Dark-rumped Swift and important ground birds such as Rufous-throated Hill Partridge, Mountain Bamboo Partridge and Red-jungle Fowl, in this case, were recorded from transect-1 and transect-2 within the protected site. This finding is parallel to the work of Syiem et al. in Ri Bhoi district of Meghalaya, India where non-protected areas have higher diversity than protected areas, however, the protected area supports more special, conservation-worthy species. Raman et al. in their study of avifauna in Dampa landscape, Mizoram also revealed that secondary forests clearly play the role of important habitat for birds.

Among the families of birds observed,
Muscicapidae has the highest Shannon-Wiener diversity index, $H' = 2.598$, followed by Pycnonotidae with an index of $H' = 1.774$ and Cisticolidae with an index of $H' = 1.505$ (Table 3).

**Relative abundance**

In terms of relative abundance, Nepal Fulvetta (*Alcippe nipalensis*) has the highest relative abundance (13.35%) among all the species observed, which is followed by Striated Yuhina (*Staphida castaniceps*) with relative abundance of 8.6007% and Oriental White-eye (*Zosterops palpebrosus*) with relative abundance of 6.0337% (Table 4). Nepal Fulvetta (*A. nipalensis*) being the highest in terms of relative abundance could be attributed to their feeding habit, preference of habitat and behavior and the same applies for birds that came second and third in the list, Striated Yuhina and Oriental White-eye. These birds are highly gregarious and forage in groups, and this gives them the advantages of foraging success, selection of mate, reduced predation and spotting of forage location. Their relatively gregarious behavior also probably gives the observer an increased chance of sighting and recording them.

Of all the families recorded, Pycnonotidae has the highest relative abundance (17.45%), followed by Sylviidae 15.91% and Timaliidae 13.35% (Figure 6). Pycnonotidae, topping the list in terms of relative abundance could be probably due to the generalist characteristic of this family enabling them to adapt to various types of habitat, feeding on a wide variety of fruits and arthropods. Some Bulbuls are known to have a high tolerance to disturbance and foraging success, selection of mate, reduced predation and spotting of forage location. These birds are highly gregarious and forage in groups, and this gives them the advantages of foraging success, selection of mate, reduced predation and spotting of forage location. Their relatively gregarious behavior also probably gives the observer an increased chance of sighting and recording them.

Of all the families recorded, Pycnonotidae has the highest relative abundance (17.45%), followed by Sylviidae 15.91% and Timaliidae 13.35% (Figure 6). Pycnonotidae, topping the list in terms of relative abundance could be probably due to the generalist characteristic of this family enabling them to adapt to various types of habitat, feeding on a wide variety of fruits and arthropods. Some Bulbuls are known to have a high tolerance to disturbance, and this gives them the advantages of foraging success, selection of mate, reduced predation and spotting of forage location. Their relatively gregarious behavior also probably gives the observer an increased chance of sighting and recording them.

Conclusion

117 species of birds belonging to 37 families and 10 orders were recorded from Reiek Biodiversity Spot, and the Shannon-Wiener Diversity index was calculated to be $H' = 3.85$. Family-wise species composition shows that Muscicapidae has the largest family comprising of 16 species, followed by Timaliidae with 6 species. Among all the species recorded, *Alcippe nipalensis* has the highest relative abundance (13.35%), followed by *Staphida castaniceps* (Striated Yuhina) and *Zosterops palpebrosus* (Oriental White Eye) with 8.6007% and 6.0337% each. Family-wise relative abundance revealed that Pycnonotidae has the highest relative abundance (17.45%), followed by Sylviidae (15.91%) and Timaliidae (13.35%). Among the species recorded *Apus acuticauda* (Dark-rumped Swift) belongs to the Vulnerable Category of the IUCN Red List Category for Threatened Species while the remaining 116 belong to Least Concern category.

This shows that the area supports a rich and diverse bird community in spite of it being an area which is not notified as a protected site by the State Government and has a good potential for avian conservation site and for bird watching tourism as well. This high diversity could be attributed to the heterogeneous habitat of the area and the conservation effort of the people. The present study also revealed that the secondary forest and cultivation site supports a good diversity of birds. The distribution of birds across the landscape and their association with their habitats were not studied due to time and financial constraint, hence, further studies on these regards are recommended.

Better management of the community protected site along with the adjacent secondary forest and cultivation site is recommended. Conservation awareness among the communities should be enhanced especially among the hunters of the community.

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Authors’ contributions

H. Lalthanzara and S.S. Sundaravel designed the study; Lalruatkimi and L. Sailo collected the data; Betsy Zodinpuii, L. Sailo and Lalruatkimi analysed the data; Lalruatkimi, S.S. Sundaravel and H. Lalthanzara prepared the manuscript.

Conflict of interest

The authors declare no conflict of interest.

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