

Research Article

Bird Diversity in Yangoupokpi-Lokchao Wildlife Sanctuary, Manipur North-East India

Angom Aruna Devi^{1,*} , Awadhesh Kumar² , Anurag Vishwakarma³ ,
Yengkhom Roamer Zest² 

¹Department of Forestry, Mizoram University, Tanhril, Aizawl, India

²Wildlife Resource of Conservation Laboratory, Department of Forestry, NERIST, Nirjuli, India

³WWF-India, Western Arunachal Landscape, Dirang, West Kameng, India

Abstract

Yangoupokpi Lokchao Wildlife Sanctuary (YLWLS) in Manipur, India, stands as a vital sanctuary among the nine recognized conservation sites in Manipur, designated as an Important Bird Area (IBA). The sanctuary is situated in the Tengnoupal District of Manipur, North East India, alongside the Indo-Myanmar border within the mega-biodiversity hotspot. From January to May 2020, an extensive study was conducted with the prime objective to determine the species diversity and population density across different habitats within the sanctuary. The point count distance sampling method was meticulously employed to comprehensively assess bird species density and richness in different habitats such as settlements, agriculture fields, forests, bamboo forests, riparian forests, and shrublands present within the sanctuary's precincts. A comprehensive count revealed a total of 103 bird species spanning across 38 families, with a striking tally of 1292 individual birds meticulously documented across 117 sampling sites. The order Passeriformes emerged as the dominant category, boasting 70 species, while the order Gruiformes exhibited the lowest representation with a mere single species. Notably, the forest emerged as the primary habitat nurturing a diverse range of avian inhabitants, accommodating 96 distinct bird species. In close succession, bamboo forests, settlements, riparian forests, shrublands, and agriculture fields hosted 43, 37, 25, 23, and 13 species, respectively, underscoring the diverse microcosm thriving within the sanctuary's confines. Furthermore, the study highlighted the vital role of habitat conditions in shaping the richness, quantity, variety, and distribution of bird species within the sanctuary, emphasizing the nuanced interplay between avian communities and their habitats.

Keywords

Avian Diversity, Population Status, Population Density, Species Richness, Conservation Issues

1. Introduction

"Species diversity often serves as an indicator of a stable and sustainable ecological system [35]. Birds represent one of the most diverse animal groups, distributed across the globe

[31]. The study of bird diversity stands as an essential ecological tool, serving as a crucial biological and environmental marker for evaluating different habitats both qualitatively and

*Corresponding author: arunaangom2@gmail.com (Angom Aruna Devi)

Received: 16 March 2025; **Accepted:** 10 April 2025; **Published:** 24 May 2025



Copyright: © The Author(s), 2025. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

quantitatively [4]. Diversity is frequently viewed as a marker of a robust, sustainable natural system. Given the significant role that avian diversity plays in connecting the food chain within natural ecological systems [19]. Bird species can offer insight into the overall state of terrestrial and aquatic ecosystems. However, habitat loss and degradation, alongside both natural and human-induced disturbances, contribute to the continued decline in global avian diversity [10, 26, 33], exerting a considerable impact on the ecological resilience and recovery of the system.

The Eastern Himalaya, which encompasses Northeast India, represents one of the most crucial global hotspots for biodiversity and functions as an Endemic Bird Area [23, 25, 36]. The northeastern region of India provides a haven, foraging grounds, and migration routes for 922 avian species [12-14]. However, persistent challenges such as habitat loss, forest degradation, changes in forest land utilization, and encroaching urbanization pose serious threats to the avian biodiversity in Northeast India, much of which remains poorly documented and is disappearing unnoticed [34]. Nevertheless, significant research concerning the diversity of bird species has been undertaken in the states of Northeast India [1, 11, 18, 29].

The territory is part of the Indo-Burma Global Biodiversity Hotspot [23, 25] and the Eastern Himalaya Endemic Bird Area [36]. In the vast tapestry of the Indo-Malayan mega-biodiversity hotspot, proximate to the border with Myanmar, the Yangoupokpi-Lokchao Wildlife Sanctuary (YLWLS) stands as a notable Important Bird and Biodiversity Area (IBA) within Manipur. Remarkably, the YLWLS stands as the singular location in India where sporadic sightings of the endangered Green Peafowl (*Pavo muticus*) occur.

Within the area, there persists a prevailing trend of excessive deforestation, particularly for charcoal production, alongside the persistent practice of poaching for bushmeat and the illicit trafficking of live animals, animal derivatives, and forest commodities. These unlawful activities, as elucidated by Devi [17], have evolved into a pressing and formidable concern, underscoring the urgency for comprehensive conservation strategies.

Consequently, an extensive study focusing on the meticulous identification of avian species and their corresponding populations across diverse habitats was conducted within the confines of the YLWLS in Manipur, situated in the northeastern fringes of India. This systematic investigation has contributed pivotal foundational data on the diversity of avian life, serving as a bedrock for informed conservation efforts.

2. Study Area and Methods

Study area

The Yangoupokpi-Lokchao Wildlife Sanctuary (YLWLS) is one among the nine distinguished IBA sites recognized in Manipur, spanning an area of 184.8 square Kilometers within the state. The sanctuary is situated within the Tengnoupal sub-division under Chandel District of Manipur, India (24.32°N 94.23°E) and it lies along the Indo-Myanmar border within the abundant biodiversity of Indo-Malaya. Its altitudinal ranges fluctuates between 276 and 888 meters sea level.

The notification of the Yangoupokpi Lokchao Reserved Forest as the Yangoupokpi-Lokchao Wildlife Sanctuary was implemented by the Government of Manipur under Order No.60/6/86-For, dated the 21st of March 1989, acknowledging its ecological, botanical, zoological, and geomorphological significance and its crucial role in environmental conservation.

Within the sanctuary, a network of fourteen forest villages has been authorized by the State Forest Department, accommodating diverse ethnic communities. As elucidated by Bungnamei and Saikia [7], this coexistence has been established in a harmonious balance, preserving the inherent ethos of the sanctuary.

Furthermore, the encompassing Eco-Sensitive Zone (ESZ), covering an area of 42,647 hectares, functions as a pivotal buffer region for the sanctuary, fostering a meticulously controlled and sustainable land-use system. This zone, as expounded by Nepal and Weber in 1993, plays an integral role in nurturing the diverse wildlife population nestled within the sanctuary's embrace.

Climatic condition

The YLWLS exhibits a tropical 'monsoon' climate characterized by sweltering, humid summers and brisk, dry winters. The average annual temperature stands at 24.3 °C. Temperature fluctuations within the Sanctuary span from 4 °C in January to a peak of 40 °C in June, with humidity levels varying from 35% during the winter months to a significant 80% during the monsoon season [7].

Floral Diversity

The vegetation within YLWLS predominantly consists of tropical moist deciduous forest, prominently governed by the Teak-Gurjan-forest. Interwoven within are the riverine forest strands. YLWLS provides a sanctuary to a variety of notable botanical species, including *Dipterocarpus tuberculatus*, *Dipterocarpus turbinatus*, *Tectona grandis*, *Melonarrhoea usitata*, *Duabanga Sonnoroeodes*, *Dillenia pentagyna*, *Terminalia tomentosa*, *Cedrela toona*, *Cedrela serrata*, *Gmelina arborea*, along with select species of the *Quercus* genus and *Bauhinia* species. Additionally, the sanctuary showcases a range of bamboo variants, orchids, and other plant specimens.

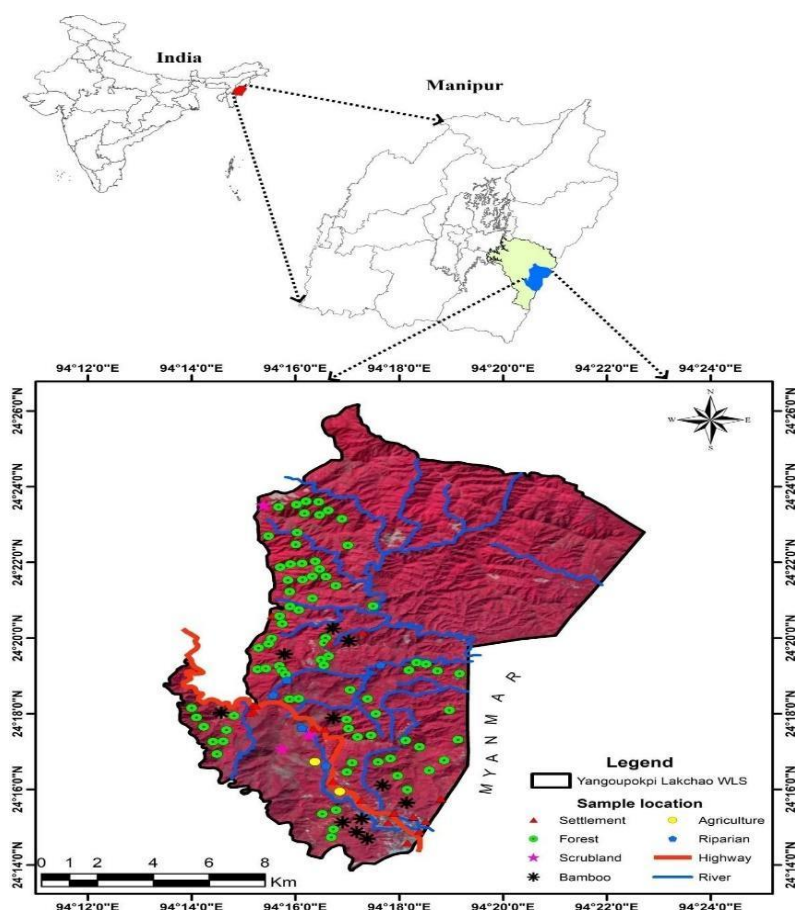


Figure 1. Map of study area: Yangoupokpi-Lokchao Wildlife Sanctuary, Manipur.

Faunal Diversity

The Faunal Diversity Sanctuary serves as a habitat for various rare and endangered species of wildlife, many of which are exclusive to the eastern Himalayas and South-East Asia. Notable inhabitants of this sanctuary include the Malayan sun bear, Clouded leopard, Capped langur, Porcupine, Chinese Pangolins, Western Hoolock gibbon, Serow, Cobra, Krait, Python, Lizards, Water monitor lizards, Tortoise, Tokke gekko, Burmese peafowl, Blyth's tragopan, Mrs. Hume's bar-backed pheasant, Red Jungle fowl, and others, along with three species of Hornbills - the Great Indian Hornbill, Rufous-necked hornbill, and Wreathed hornbill [15, 38]. Additionally, Mohilal [24] documented the presence of 39 species of nematodes across 25 genera in the soil of the sanctuary, showcasing the diverse ecosystem within its bounds.

3. Methods

According to Ralph [28], a bird census entails an endeavor to find and count every bird in a specific area during a particular period of time. To construct a checklist of bird species in YLWLS, the point Count distance sampling approach, which involves counting birds by the observer and recording all the birds seen and heard from a point count station for a

predetermined period of time was chosen. Each place was visited for 20 minutes, after which 5 minutes were allotted for settlement. All point count stations were situated in a landscape at least 500 m apart to prevent bird contact overlap [21]. Several unidentified bird species were photographed. The widely used field guide 'The Birds of North America' and 'The book of Indian birds' by Salim Ali [2] were used for identification. The point count stations were all placed along established hiking or woodland trails. Because a species' visibility or detectability varies with the season and the time of day [3, 30], the survey was carried out in two phases: in the morning from 6:00 to 10:00 a.m. and in the late afternoon from 15:00 to 17:30 p.m. [29], just before the sun set. While noting the species of bird seen, its name, number of individuals, height at which they perch, and distance from the observer were also recorded.

3.1. Estimation of Bird Diversity and Its Distribution Pattern Within a Habitat

The Shannon-Weiner diversity Index was used to determine species diversity in the Paleontological Statistics (PAST) software. The Shannon-Weiner diversity index takes into account both species richness and evenness.

$$H' = \sum_{i=1}^S \left[(i \ln i) - ip \right]$$

Where; P_i the relative abundance of each species, calculated as the proportion of individuals of a given species to the total number of individuals in the community n_i/N . The index's score falls between 1.5 and 5.0 (low species evenness and richness to high species evenness and richness). The dominance index was also used to determine the likelihood of selecting at random two individuals from different species. Dominance, which goes from 0 to 1, counts how many common species are present in the ecosystem.

3.2. Estimating Bird Density Within Habitats

Bird densities were estimated from the point count data for each point within a 1 km² grid for all three seasons (autumn, winter and summer). Because the density estimated from raw counts may be substantially skewed due to species detectability differences, the detection bias in the density computation was addressed by fitting a detection function in the program DISTANCE 7.3 [39].

4. Results

4.1. Documentation of Bird Species

All together 1292 numbers of individual birds were recorded from 103 species belonging to 11 orders and 38 families of birds (Annexure 1) from the YLWLS in 117 sampling points. The maximum number of the bird species were recorded from order Passeriformes (70 species), followed by Piciformes (6 species), Cuculiformes (5 species), Accipitri-formes (4 species), Columbiformes (4 species), Buceroti-formes (3 species), Coraciiformes (3 species), Galliformes (3 species), Pelecaniformes (2 species), Psittaciformes (2 species) and Gruiformes (1 species) **Figure 2**.

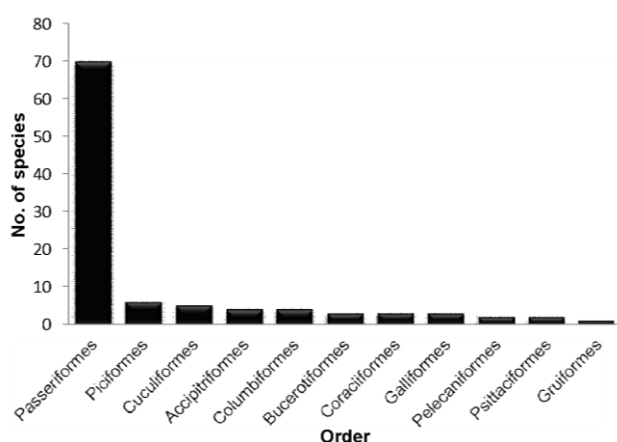


Figure 2. Number of bird species recorded under different orders in YLWLS.

In all six habitats, maximum bird species were documented in the Forest land habitat (96 species) followed by Bamboo forest (43 species), Settlement area (37 species), Riparian forest (25 species), Shrubland (23 species) and Agriculture field (13 species) (**Table 1**). Similarly, Forest land also recorded the highest number of birds abundance accounting 621 individuals followed by settlement area (304), Bamboo forest (150), Shrubland (81), Agriculture field (47) and minimum in Riparian area (46) (**Table 1**).

Table 1. Species abundance and no. of individuals documented in YLWLS.

Habitat	Species	No. of individual
Forest	96	621
Bamboo	43	150
Settlement	37	304
Riparian	25	46
Shrub land	23	81
Agriculture	13	47

Out of 103 avifauna species two threatened species, one Vulnerable (VU) Wreathed hornbill (*Rhyticeros undulatus*) and one Endangered (EN) Green Peafowl (*Pavo muticus*) and one near threatened (NT) Red-breasted Parakeet (*Psittacula alexandri*) species has been recorded [15].

4.2. Diversity of Avifauna in Different Habitats

Out of 119 sampling point counts laid in different habitat types for recording the bird diversity, all together 103 bird species were recorded from six different habitats. Whereas highest covered habitat is Forest (80 sampling points) followed by Settlement (18 sampling points), Bamboo Forest (11 sampling points), Riparian forest (05 sampling points), Shrub land (03 sampling points) and Agriculture (02 sampling points) (**Table 2**). The result shows that species richness and number of individual species are varied because of variation of sampling efforts in different habitats and may be dependency in particular habitat due to preference for breeding, nesting and feeding.

The study found that only 5 species were documented in all six habitats others were restricted in one habitat (35 species), two habitats (29 species), three habitats (23 species), four habitats (7 species), five habitats (4 species) (**Figure 3**). The species' richness and bird abundance were higher in habitats with less human disturbance such as Forest whereas in other habitats with more human disturbance the species richness and bird abundance were varied (**Figure 4**). The species' dominance was higher in habitat with human more human activity such as Agriculture and lowest in Forest with less

human disturbance (Figure 5). Species evenness was observed in different trends, it was higher in riparian forest followed by

agriculture, Shrub land, Forest, bamboo forest and settlement (Figure 6).

Table 2. Diversity of bird species in different habitats of YLWLS.

Habitat	Number of sampling points	Diversity measures			
		Individuals	Dominance D	Shannon H	Evenness $e^{H/S}$
Settlement	18	304	0.07	2.98	0.53
Agriculture	02	47	0.14	2.22	0.71
Forest	80	621	0.02	4.15	0.66
Bamboo	11	150	0.07	3.21	0.59
Riparian	05	46	0.06	3.05	0.84
Shrub land	03	81	0.09	2.77	0.69

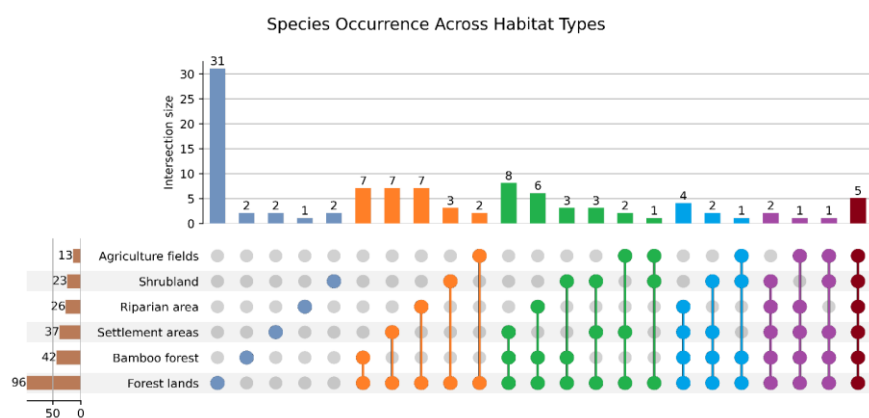


Figure 3. Upset plot showing number of bird species documented in the number of habitats.

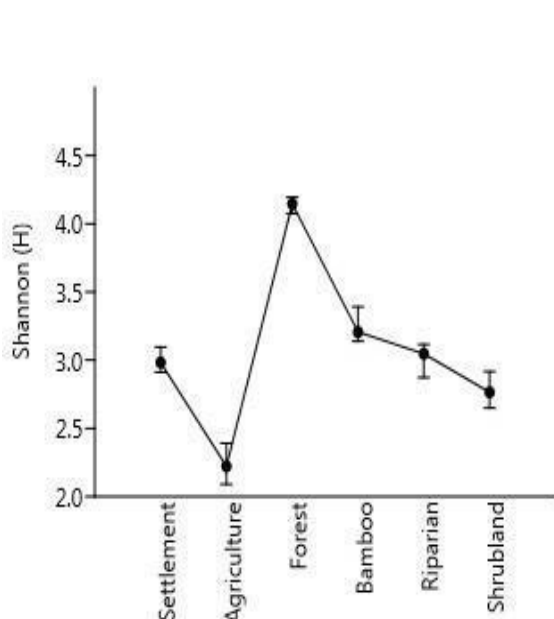


Figure 4. Bird species richness in YLWL Sanctuary, Manipur.

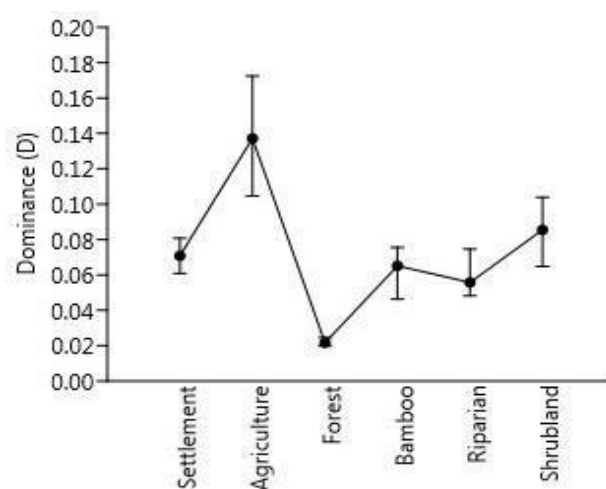


Figure 5. Bird species dominance in YLWL Sanctuary, Manipur.

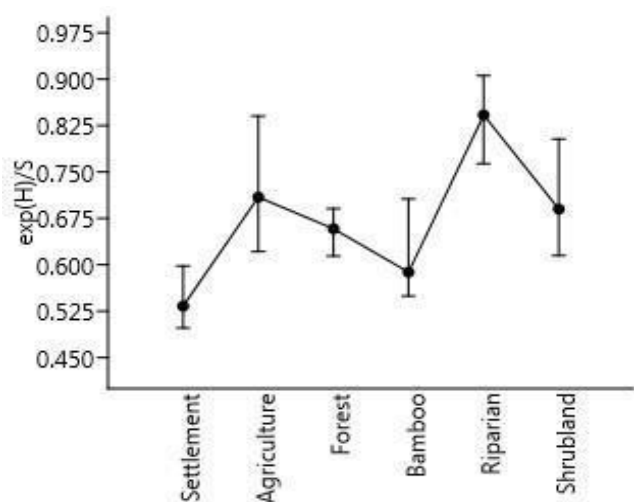


Figure 6. Evenness of species.

4.3. Density of Avifauna in Different Habitats

A total of 119 sampling points were laid in between 500 m interval with 50 m radius in each point. In six different habitats, the highest density of birds was in riparian forest (0.55 ± 0.14), this may be because most of the bird prefer forest edge for perching and foraging, and lowest is bamboo forest (0.1 ± 0.17), which is preferred by small birds usually (Figure 7). Density of cluster is highest in agriculture (0.78 ± 0.32), this may be because small birds and Passeriformes birds are mostly feed grains and small insect which is found in agriculture land and lowest in shrub land because feeding material is very less as compared to other habitats (Figure 7). The species encounter rate was highest in shrub land and lowest in forest. However, the detection of probability is highest in forest land as species observed from very close and easily visible and lowest in Agriculture and Shrubland poor visibility and identification was also difficult with naked eye (Figure 8, Table 3).

Table 3. Density of cluster, Density, Detection probability and Encounter rate of bird species recorded in different habitats of YLWLS.

Habitat	Sampling point	DS (No./Sq m)	D (No./Sq m)	EDR (m)	Detection Probability	Encounter rate
Settlement	18	0.55 ± 0.60	0.15 ± 0.20	8.46 ± 0.36	38.5	24.7
Agriculture	02	0.78 ± 0.32	0.31 ± 0.15	7.8 ± 0.92	24.3	48.8
Bamboo Forest	11	0.66 ± 0.95	0.1 ± 0.17	8.53 ± 0.52	57.8	22.8
Forest	80	0.76 ± 0.78	0.13 ± 0.13	8.03 ± 0.38	83.5	10.8
Riparian Forest	05	0.43 ± 0.11	0.55 ± 0.14	10.73 ± 0.97	49.0	47.6
Scrubland	03	0.21 ± 0.99	0.48 ± 0.24	6.08 ± 0.73	23.0	69.6

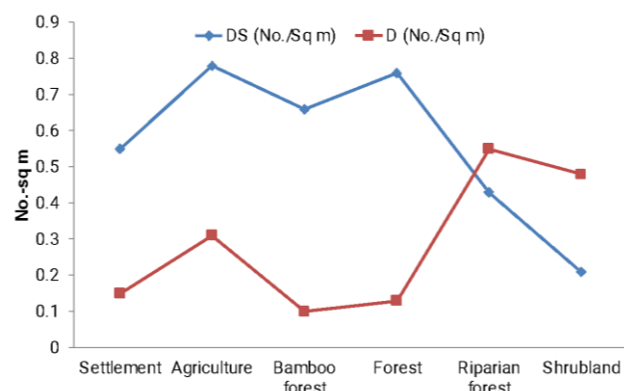


Figure 7. Density of cluster (DS) and density of birds (D) in selected habitats.

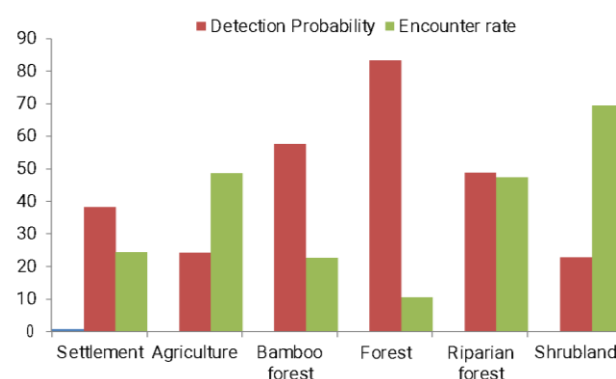


Figure 8. Detection probability and encounter rate of avifauna species.

4.4. Conservation Issues

The major conservation issues observed in the study area YLWLS include clearing of forest land for agriculture and commercial farming, human settlement and developmental project like roads, slash and burn cultivation practice, forest cutting for charcoal making, pole, firewood, forest produce or non-timber forest products (NTFPs) collection, and hunting and poaching of wild animals for bush meat, trade, pet and medicine.

5. Discussion

The avifauna species diversity was higher in the forest as less human activities are done, and more forest cover is there. The species richness and bird abundance are higher in Forest habitat because, it is not surprising that birds respond more to forest structure than composition in YLWLS, as species diversity is known to vary as a function of environmental heterogeneity [27]. Whereas in other habitats the species richness and bird abundance are varied. The higher diversity suggests higher ecological stability compared to human disturbed habitats where less species occur. The prominence of diverse avian species and increased bird population within the Forest habitat can be attributed to the profound impact of the forest's structural characteristics, rather than its composition, as exemplified in the studies conducted by [23]. The bird species density was found to increase towards areas with low human activities and with more vegetation cover. The findings comply with many other studies [9, 16, 32] that higher vegetation cover support higher diversity of birds. The lower species density observed in agricultural land could be caused by continuous clearing, burning, and use of chemical substances like herbicide, pesticide and insecticides, and even chemical fertilizers at large quantities. The investigation further reveals a significant upsurge in bird species density in areas characterized by minimal human intervention and an abundance of lush vegetation cover. These findings align with the conclusions drawn from various other studies [9, 32], emphasizing the positive correlation between increased vegetation cover and a more diverse avian population.

It is noteworthy that the forest habitat, with its nurturing environment, sustains approximately 75% of the entire bird population, whereas human-modified habitats merely support around 45% of the overall avian species, as underscored by BirdLife International (2008) [5]. Anthropogenic activities such as farming, settlement, charcoal making, pole cutting, firewood collection, and other developmental projects like road construction, etc. have extensively leads to degradation of the natural habitat of birds [37].

With the change in the land-use system, most of the birds have been displaced from their native habitat [8]. Maginnis and Jackson [22] stated that increasing environmental degradation is causing a decline in the condition of ecosystem goods and services, intensifying poverty, and reducing human

welfare as well. Birds, being integral constituents of the ecosystem, assume pivotal roles as indicators of environmental health, pollinators of flora, controllers of pest populations, agents of seed dispersion, and architects of transformative landscapes, as underscored by the works of Hadley [20] and BirdLife International [6]. However, their typical songs and calls, glamorous colour, their structure, and looks bring huge joy to our lives as well.

Amidst the burgeoning human and livestock population, along with the absence of suitable developmental endeavours within the Wildlife Sanctuary, a callous attitude has taken root among the local residents toward the wildlife inhabiting in the area. Given that the forest serves as the primary nurturing ground for a diverse range of forest-specific avian species, the continued degradation of this habitat could result in the eventual disappearance of these forest-dwelling bird populations, potentially leading to the irreversible extinction of certain species. The persistent practices of hunting for bushmeat and the illicit collection of avian eggs persist as prominent threats faced by the avifauna within the confines of the Sanctuary and its immediate surroundings.

Despite the commendable efforts undertaken by the forest department and the wildlife division of the YLWL Sanctuary, the scourge of hunting continues to prevail within the forested expanse and its peripheries. Observations reveal that certain youths persist in traversing the village brandishing slingshots or air guns, thereby posing a tangible menace to the avian populace. Furthermore, the use of chemical agents such as insecticides, herbicides, pesticides, and the like, employed in copious quantities within or in the vicinity of the sanctuary, adversely impacts the natural equilibrium of the habitat, thereby exerting direct or indirect repercussions on the diversity of avifauna species.

The considerable alterations observed in the phonological state of the specific region could potentially be ascribed to the impact of climate change, irregular episodes of drought or flooding, or genetic factors, all of which collectively cast a shadow over the prospects of the avifauna species. Notably, the study asserts that any activities that engender changes in the structure of the habitat significantly impact the abundance, diversity, and distribution of the avifauna. Consequently, the findings of this investigation underscore the critical dependence of avifauna species on specific habitats, particularly those characterized by heterogeneous elements, encompassing human settlements, sustenance sources, secure breeding grounds, and shelter. It is imperative to underscore the pivotal role of vegetative cover in sustaining the fundamental survival needs of the avifauna, including roosting, foraging, and nesting, among other vital activities.

6. Conclusion and Recommendations

Compared to human-disturbed ecosystems like agricultural and shifting cultivation regions, the sanctuary's woodland areas reported the highest number of individuals and the

highest prevalence of bird species, indicating a better level of ecological stability. Since generalist bird species prefer unstable diverse habitat, readily adopt and exploit resources, and thrive in the new environmental conditions, highly disturbed habitat is typically dominated by generalist bird species and receives fewer visits from specialized birds. Bird diversity, distribution, abundance, and other factors are being impacted by human activities that alter the natural habitat structure. Several bird species can find a wide range of roosting and breeding locations in the undisturbed woodland, settlement area, river area, and nearby agricultural fields. Agricultural land and settlement areas can also be the focus of conservation efforts since they are bird habitats rather than lost habitats. Keeping all of this in mind, policymakers should build suitable development initiatives that assist local populations economically and highlight the value of bird habitat and ecotourism.

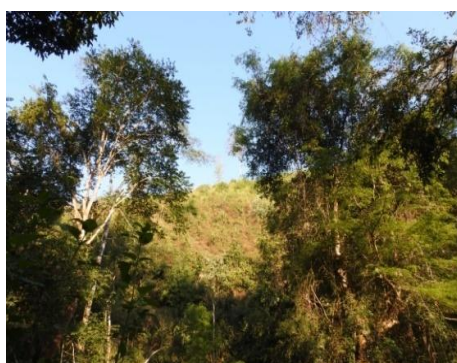
Recommendations

Based on present findings, the following recommendations are suggested for conservation of bird species in YLWL sanctuary:

- a) The hill people should be encouraged to practice agro-forestry system in place of shifting cultivation to not only increase the forest like habitat structure for bird species but also agriculture product sustainability and

doubling farmer income, and side by side reduce the risk of habitat destruction, soil degradation, and water-related problems.

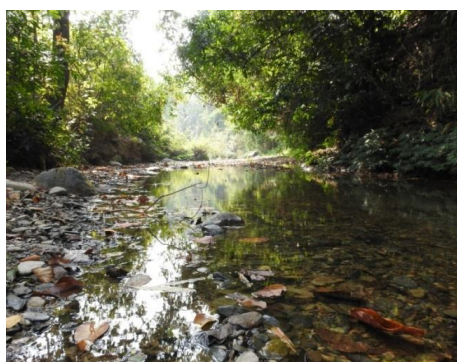
- b) Manage and improve the bird habitat in and around the sanctuary by improving the vegetation cover and quality and availability of water.
- c) A proper record should be maintained concerning the birds population in a protected area through regular monitoring.
- d) To impart knowledge and develop awareness among the villager's especially young minds about the importance of nature, endangered species, and biodiversity, and for that workshop and training programme should be conducted on regular interval involving local inhabitants.
- e) Provide wildlife base education to the growing human population of the YLWL sanctuary area and its nearby areas.
- f) Provide alternatives of forest resources and housing materials to local villagers, particularly whoever living inside and adjoining of the sanctuary area to reduce the dependency on forest.
- g) Encourage local community for community participation programme for conservation of forest resources of the sanctuary for their sustainability and generate alternative livelihood options in the area for local people.



Forest



Agricultural land



Riparian area



Shrubland



Figure 9. Photos of different selected habitats within the YLWLS, Manipur.



Figure 10. Major bird's species recorded in YLWL Sanctuary.

1. Maroon Oriole 2. Salty backed forktail 3. White wagtail 4. Grey Wagtail 5. Blue-throated barbet 6. Oriental White eye 7. Chestnut-tailed starling 8. Common hill Myna 9. Black chested bulbul 10. Bay backed shrike 11. Golden-fronted leaf-bird 12. Scarlet minivet 13. Common Hoopoe 14. Great Myna 15. Black Myna 16. Indian Robin 17. Blyth's reed warbler 18. Pied bushchat (male) 19. Pied bushchate (female) 20. Olive acked pipit 21. Rufoustreepie 22. Ruby-cheeked sunbirds 23. Chestnut-headed bee-eater 24. Black-hooded oriole 25. Black-winged cuckooshrike 26. Asian fairy Blue bird 27. Oriental honey buzzard 28. Asian koel 29. Oriental pied hornbill 30. Black winged kite 31. Jungle crow 32. Bronzed drongo 33. Chinese pond heron 34. Red-breasted parakeet 35. Common hawk cuckoo 36. Indian cuckoo 37. Black redstart 38. Wreathed hornbill 39. Fulvous-breasted woodpecker 40. Hair crested drongo.



Clearing of land for farming



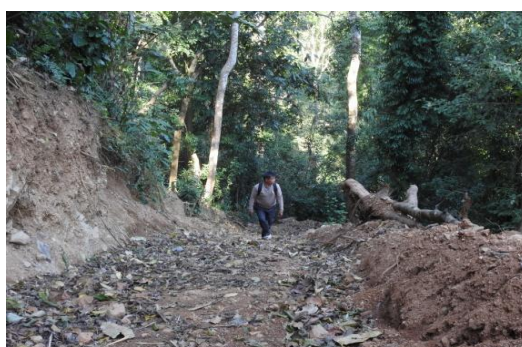
Clearing of land for human settlement



Logging and transportation of timber



Women going for NTFPs's collection



Road construction



Developmental projects

Figure 11. Conservation issues observed during the field work in the YLWLS, Manipur.

Abbreviations

D	Density of Birds
DS	Density of Cluster
EN	Endangered
ESZ	Eco-Sensitive Zone
IBA	Important Bird Area
No./Sq m	Number per Square Meter
NT	Near Threatened

PAST	Paleontological Statistics
SE	Standard Error
Vu	Vulnerable
YLWLS	Yangoupokpi-Lokchao Wildlife Sanctuary

Conflicts of Interest

The authors declare no conflicts of interest.

Appendix

Table 4. Checklist of bird species recorded in YLWL Sanctuary, Manipur.

S/N	ORDER	FAMILY	SPECIES	SCIENTIFIC NAME	IUCN STATUS
1	Accipitriformes	Accipitridae	Black-winged kite	<i>Elanus caeruleus</i>	LC
2	Accipitriformes	Accipitridae	Crested serpent eagle	<i>Spilornis cheela</i>	LC
3	Accipitriformes	Accipitridae	Oriental Honey buzzard	<i>Pernis ptilorhynchus</i>	LC
4	Accipitriformes	Accipitridae	Shikra	<i>Accipiter badius</i>	LC
5	Bucerotiformes	Bucerotidae	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>	LC
6	Bucerotiformes	Bucerotidae	Wreathed hornbill	<i>Rhyticeros undulatus</i>	VU
7	Bucerotiformes	Upupidae	Common Hoopoe	<i>Upupa epops</i>	LC
8	Columbiformes	Columbidae	Emerald dove	<i>Chalcophaps indica</i>	LC
9	Columbiformes	Columbidae	Mountain Imperial	<i>Pigeon Ducula badia</i>	LC
10	Columbiformes	Columbidae	Oriental turtle dove	<i>Streptopelia orientalis</i>	LC
11	Columbiformes	Columbidae	Spotted dove	<i>Spilopelia chinensis</i>	LC
12	Coraciiformes	Alcedinidae	Common kingfisher	<i>Alcedo atthis</i>	LC
13	Coraciiformes	Alcedinidae	White-throated kingfisher	<i>Halcyon smyrnensis</i>	LC
14	Coraciiformes	Meropidae	Chestnut-headed bee-eater	<i>Merops leschenaulti</i>	LC
15	Cuculiformes	Cuculidae	Asian koel	<i>Eudynamis scolopaceus</i>	LC
16	Cuculiformes	Cuculidae	Common hawk-cuckoo	<i>Hierococcyx varius</i>	LC
17	Cuculiformes	Cuculidae	Greater coucal	<i>Centropus sinensis</i>	LC
18	Cuculiformes	Cuculidae	Green-billed malkoha	<i>Phaenicophaeus tristis</i>	LC
19	Cuculiformes	Cuculidae	Indian cuckoo	<i>Cuculus micropterus</i>	LC
20	Galliformes	Phasianidae	Green Peafowl	<i>Pavo muticus</i>	EN
21	Galliformes	Phasianidae	Kalij pheasant	<i>Lophura leucomelanos</i>	LC
22	Galliformes	Phasianidae	Red Junglefowl	<i>Gallus gallus</i>	LC
23	Gruiformes	Rallidae	White-breasted Waterhen	<i>Amauromis phoenicurus</i>	LC
24	Passeriformes	Acrocephalidae	Blyth's reed warbler	<i>Acrocephalus dumetorum</i>	LC
25	Passeriformes	Acrocephalidae	Clamorous Reed Warbler	<i>Acrocephalus stentoreus</i>	LC
26	Passeriformes	Aegithinidae	Common iora	<i>Aegithina tiphia</i>	LC
27	Passeriformes	Campephagidae	Black-winged cuckooshrike	<i>Lalage melaschistos</i>	LC
28	Passeriformes	Campephagidae	Indian cuckooshrike	<i>Coracina macei</i>	LC
29	Passeriformes	Chloropseidae	Golden-fronted leafbird	<i>Chloropsis aurifrons</i>	LC
30	Passeriformes	Cisticolidae	Common tailorbird	<i>Orthotomus sutorius</i>	LC
31	Passeriformes	Corvidae	Jungle crow	<i>Corvus macrorhynchos</i>	LC
32	Passeriformes	Corvidae	Red-billed blue magpie	<i>Urocissa erythroryncha</i>	LC
33	Passeriformes	Dicruridae	Ashy drongo	<i>Dicrurus leucophaeus</i>	LC
34	Passeriformes	Dicruridae	Black Drongo	<i>Dicrurus macrocercus</i>	LC

S/N	ORDER	FAMILY	SPECIES	SCIENTIFIC NAME	IUCN STATUS
35	Passeriformes	Dicruridae	Bronzed drongo	<i>Dicrurus aeneus</i>	LC
36	Passeriformes	Dicruridae	Hair-crested Drongo	<i>Dicrurus hottentottus</i>	LC
37	Passeriformes	Dicruridae	Lesser racket-tailed drongo	<i>Dicrurus remifer</i>	LC
38	Passeriformes	Dicruridae	White-bellied Drongo	<i>Dicrurus caerulescens</i>	LC
39	Passeriformes	Emberizidae	Grey-necked bunting	<i>Emberiza buchanani</i>	LC
40	Passeriformes	Estrildidae	White-rumped munia	<i>Lonchura striata</i>	LC
41	Passeriformes	Hirundinidae	Barn swallow	<i>Hirundo rustica</i>	LC
42	Passeriformes	Hirundinidae	Wire-tailed swallow	<i>Hirundo smithii</i>	LC
43	Passeriformes	Irenidae	Asian fairy-bluebird	<i>Irena puella</i>	LC
44	Passeriformes	Laniidae	Brown shrike	<i>Lanius cristatus</i>	LC
45	Passeriformes	Laniidae	Grey-backed shrike	<i>Lanius tephronotus</i>	LC
46	Passeriformes	Laniidae	Long-tailed shrike	<i>Lanius schach</i>	LC
47	Passeriformes	Laniidae	Bay-backed shrike	<i>Lanius vittatus</i>	LC
48	Passeriformes	Monarchidae	Black-naped monarch	<i>Hypothymis azurea</i>	LC
49	Passeriformes	Motacillidae	Blyth's pipit	<i>Anthus godlewskii</i>	LC
50	Passeriformes	Motacillidae	Grey wagtail	<i>Motacilla cinerea</i>	LC
51	Passeriformes	Motacillidae	Olive-backed pipit	<i>Anthus hodgsoni</i>	LC
52	Passeriformes	Motacillidae	White wagtail	<i>Motacilla alba</i>	LC
53	Passeriformes	Muscicapidae	Black-backed forktail	<i>Enicurus immaculatus</i>	LC
54	Passeriformes	Muscicapidae	Common redstart	<i>Phoenicurus phoenicurus</i>	LC
55	Passeriformes	Muscicapidae	Indian Robin	<i>Copsychus fulicatus</i>	LC
56	Passeriformes	Muscicapidae	Oriental Magpie-robin	<i>Copsychus saularis</i>	LC
57	Passeriformes	Muscicapidae	Pied bush chat	<i>saxicola caprata</i>	LC
58	Passeriformes	Nectariniidae	Crimson sunbird	<i>Aethopyga siparaja</i>	LC
59	Passeriformes	Nectariniidae	Purple sunbird	<i>Cinnyris asiatica</i>	LC
60	Passeriformes	Oriolidae	Black-hooded oriole	<i>Oriolus xanthornus</i>	LC
61	Passeriformes	Oriolidae	Black-naped oriole	<i>Oriolus chinensis</i>	LC
62	Passeriformes	Oriolidae	Maroon oriole	<i>Oriolus traillii</i>	LC
63	Passeriformes	Passeridae	Eurasian tree sparrow	<i>Passer montanus</i>	LC
64	Passeriformes	Passeridae	House sparrow	<i>Passer domesticus</i>	LC
65	Passeriformes	Phoenicurus	Black redstart	<i>Phoenicurus ochruros</i>	LC
66	Passeriformes	Phylloscopidae	Blyth's leaf warbler	<i>Phylloscopus reguloides</i>	LC
67	Passeriformes	Phylloscopidae	Grey-hooded warbler	<i>Phylloscopus xanthoschistos</i>	LC
68	Passeriformes	Phylloscopidae	Hume's leaf warbler	<i>Phylloscopus humei</i>	LC
69	Passeriformes	Phylloscopidae	Yellow-browed warbler	<i>Phylloscopus inornatus</i>	LC
70	Passeriformes	Pycnonotidae	Black Bulbul	<i>Hypsipetes leucocephalus</i>	LC
71	Passeriformes	Pycnonotidae	Black-crested bulbul	<i>Pycnonotus flaviventris</i>	LC

S/N	ORDER	FAMILY	SPECIES	SCIENTIFIC NAME	IUCN STATUS
72	Passeriformes	Pycnonotidae	Red-vented	<i>bulbul Pycnonotus cafer</i>	LC
73	Passeriformes	Pycnonotidae	Red-whiskered bulbul	<i>Pycnonotus jocosus</i>	LC
74	Passeriformes	Pycnonotidae	White-throated bulbul	<i>Alophoixus flaveolus</i>	LC
75	Passeriformes	Rhipiduridae	White-throated fantail	<i>Rhipidura albicollis</i>	LC
76	Passeriformes	Sittidae	Indian nuthatch	<i>Sitta castanea</i>	LC
77	Passeriformes	Sturnidae	Chestnut-tailed starling	<i>Sturnia malabarica</i>	LC
78	Passeriformes	Sturnidae	Common hill myna	<i>Gracula religiosa</i>	LC
79	Passeriformes	Sturnidae	Common myna	<i>Acridotheres tristis</i>	LC
80	Passeriformes	Sturnidae	Great myna	<i>Acridotheres grandis</i>	LC
81	Passeriformes	Zosteropidae	Oriental White-Eye	<i>Zosterops palpebrosus</i>	LC
82	Passeriformes	Campephagidae	Scarlet minivet	<i>Pericrocotus speciosus</i>	LC
83	Passeriformes	Corvidae	Rufous treepie	<i>Dendrocitta vagabunda</i>	LC
84	Passeriformes	Estrildidae	Scaly-breasted munia	<i>Lonchura punctulata</i>	LC
85	Passeriformes	Hirundinidae	Red-rumped swallow	<i>Cecropis daurica</i>	LC
86	Passeriformes	Hirundinidae	Striated Swallow	<i>Cecropis striolata</i>	LC
87	Passeriformes	Motacillidae	White-browed fantail	<i>Motacilla maderaspatensis</i>	LC
88	Passeriformes	Muscicapidae	Red-breasted flycatcher	<i>Ficedula parva</i>	LC
89	Passeriformes	Muscicapidae	Siberian rubythroat	<i>Calliope calliope</i>	LC
90	Passeriformes	Muscicapidae	Slaty-backed forktail	<i>Enicurus schistaceus</i>	LC
91	Passeriformes	Nectariniidae	Ruby-cheeked sunbird	<i>Chalcoparia singalensis</i>	LC
92	Passeriformes	Nectariniidae	Streaked spiderhunter	<i>Arachnothera magna</i>	LC
93	Passeriformes	Rhipiduridae	White-throated forktail	<i>Rhipidura albicollis</i>	LC
94	Pelecaniformes	Ardeidae	Cattle egret	<i>Bubulcus ibis</i>	LC
95	Pelecaniformes	Ardeidae	Little egret	<i>Egretta garzetta</i>	LC
96	Piciformes	Megalaimidae	Blue-throated barbet	<i>Psilopogon asiaticus</i>	LC
97	Piciformes	Megalaimidae	Coppersmith barbet	<i>Psilopogon haemacephalus</i>	LC
98	Piciformes	Megalaimidae	Lineated barbet	<i>Psilopogon lineatus</i>	LC
99	Piciformes	Picidae	Common goldenbacked woodpecker	<i>Dinopium benghalense</i>	LC
100	Piciformes	Picidae	Fulvous-breasted woodpecker	<i>Dendrocopos macei</i>	LC
101	Piciformes	Picidae	Rufous-bellied woodpecker	<i>Dendrocopos hypertyrhus</i>	LC
102	Psittaciformes	Psittaculidae	Red-breasted parakeet	<i>Psittacula alexandri</i>	NT
103	Psittaciformes	Psittaculidae	Rose-ringed parakeet	<i>Psittacula krameri</i>	LC

References

- [1] Acharya, B. K., Vijayan, L., & Chettri, B. (2010). The bird community of Shingba Rhododendron Wildlife Sanctuary, Sikkim, Eastern Himalaya, India. *Tropical Ecology*, 51(2), 149-159.
- [2] Ali, S., 1996. *The Book of Indian Birds*. 12 Edition. Oxford University Press. Delhi.
- [3] Best, L. B. (1981). Seasonal change in detection of individual Bird species. In: Ralph, C. J; Scott, J. Michael, editors. *Estimating number of terrestrial birds*. *Studies in Avian Biology* 6: 252-261.
- [4] Bilgrami, K. S. (1995). *Concept and conservation of biodiversity*. CBS Publishers and distributors, Delhi, 110-120.
- [5] BirdLife International (2008). *Important Bird Areas in the Caribbean: Key Sites for Conservation*.
- [6] BirdLife International (2019). *Endemic Bird Areas factsheet: Cameroon Mountains*. Birdlife International, Washington DC.
- [7] Bungnamei K, Saikia A (2020) Park in the periphery: land use and land cover change and forest fragmentation in and around Yangoupokpi Lokchao Wildlife Sanctuary, Manipur, India. *Geogr Pol* 93(1): 107–120. <https://doi.org/10.7163/GPol.0165>
- [8] Burgess, N., De Klerk, H., Fjelds å J., Crowe, T. & Rahbek, C. (2000). A preliminary assessment of congruence of biodiversity patterns in Afrotropical forest birds and forest mammals. *Ostrich* 71, 286–290. <https://doi.org/10.1080/00306525.2000.9639929>
- [9] Chace, J. F., and Walsh, J. J. (2006). Urban effects on native avifauna: A review. <https://doi.org/10.1016/j.landurbplan.2004.08.007>
- [10] Chen, I. C., Hill, J. K., Ohlemüller, R., Roy, D. B., & Thomas, C. D. (2011). Rapid range shifts of species associated with high levels of climate warming. *Science*, 333(6045), 1024-1026. <https://doi.org/10.1126/science.1206432>
- [11] Chettri, N., Jackson, R., & Sharma, E. (2005). Birds of Khecheopaltri and Yuksom-Dzongri trekking corridor west Sikkim. *Journal of Hill Research*, 18(1), 16-25.
- [12] Choudhury A. (2009). Significant recent ornithological records from Manipur, north-east India, with an annotated checklist. *Forktail*. 2009; 25: 71-89.
- [13] Choudhury A. U. (1991). Bird observations from Sibsagar district, Assam, India. *Forktail* 6: 35–42.
- [14] Choudhury A. U. (1997). The status of the birds of Dibru-Saikhowa Sanctuary, Assam, India. *OBCBull.*, 25, 27–29.
- [15] Choudhury, A. (2006). The status of endangered species in northeast India. *Journal- Bombay Natural History Society*, 103(2/3), 157-167.
- [16] Clergeau, P., J.-P. Savard, G. Mennechez, and G. Falardeau. (1998). Bird abundance and diversity along an urban-rural gradient: A comparative study between two cities on different continents. *The Condor* 100: 413–425.
- [17] Devi OS. (2012). *Conservation of Globally Threatened Migratory Bird Species of Loktak Lake, A Ramsar site in Manipur, India*. Project submitted to Oriental Bird Club, UK. Conservation Grant No. P916.
- [18] Dutta, N. N., D. Baruah and S. Borah (2011). Avifaunal diversity in an IBA site north east India and their conservation. *Annals of Biological Research* 2(5): 374-384.
- [19] Edison PD, Abagam DA, Vijila (2016). Terrestrial avifauna of St. John's College campus, Tirunelveli District, Tamilnadu, India. *IJAR*. 4(1): 390–395.
- [20] Hadley, A. S., Frey, S. J. K., Robinson, W. D., John Kress, W., & Betts, M. G. (2014). Tropical forest fragmentation limits pollination of a keystone understory herb. *Ecology*, 95, 2202–2212. <https://doi.org/10.1890/13-0929.1>
- [21] Hansen, A. J., McComb, W. C., Vega, R., Raphael, M. G., & Hunter, M. (1995). Bird habitat relationships in natural and managed forests in the west Cascades of Oregon. *Ecological Applications*, 5(3), 555-569. <https://doi.org/10.2307/1941966>
- [22] Maginnis, S., Jackson, W., 2002. *Restoring forest landscapes From*. http://cmsdata.iucn.org/downloads/restoring_forest_landscape_s.pdf (accessed 15.07.10).
- [23] Mittermeier RA, Robles Gil P, Hoffmann M, et al. 2004. Hotspots revisited: Earth's biologically richest and most endangered ecoregions. Arlington, VA: Conservation International.
- [24] Mohilal, N., Pramodini, M., & Bina, L. (2009). Plant and soil nematodes from Lokchao Yangoupokpi Wildlife Sanctuary, Manipur, India. *Journal of Threatened Taxa*, 1(3); 188-189. <https://doi.org/10.11609/JoTT.o1537.188-9>
- [25] Myers, N., R. A. Mittermeier, C. G. Mittermeier, G. A. B. da Fonseca and J. Kent (2000). Biodiversity hotspots for conservation priorities. *Nature* 403: 853-858.
- [26] Rapoport, E. H. 1993. The process of plant colonization in small settlements and large cities. In: Mac Donell, M. J. and Pickett, S. (Eds), *Humans as components of ecosystems*. Springer-Verlag, New York, 190–207.
- [27] Rahbek, C., and G. R. Graves. (2001). Multiscale assessment of patterns of avian species. <https://doi.org/10.1073/pnas.071034898>
- [28] Ralph, C. J. (1981). Terminology used in estimating number of birds. *Studies in Avian Biology* 6: 577-578.
- [29] Raman, T. R. S., G. S. Rawat and A. J. T. Johnsingh. 1998. Recovery of tropical rainforest avifauna in relation to vegetation succession following shifting cultivation in Mizoram, Northeast India. *Journal of Applied Ecology* 35: <https://doi.org/10.1046/j.1365-2664.1998.00297.x>
- [30] Robbins, Chandler S. (1981a). Effect of time of day on bird activity. In: Ralph, C John; Scott, J. Micheal, editors. *Estimating numbers of terrestrial birds*. *Studies in Avian Biology* 6: 275-286.

- [31] Saikia P. K and saikia M. K (2000), Diversity of bird fauna in north east india, journal of the assam science society, 41(4), pp: 379-396.
- [32] Sandstrom, U. G; Angelstam, P. and Mikusinski, G. (2005). Ecological diversity of birds in relation to the structure of urban green space. *Landscape Urban Plan* 77: 39–53.
- [33] Sekercioglu, C. H., Primack, R. B. and Wormworth, J. 2012. The effects of climate change on tropical birds. *Biological Conservation* 148: 1–18.
<https://doi.org/10.1016/j.biocon.2011.10.019>
- [34] Singh, E. J., Singh, N. S., & Singh, N. R. (2009). Biodiversity conservation and natural resources in North East India-with special reference to Manipur. *NeBIO*, 1(1), 42-47.
- [35] Singh, M., & Khare, N. (2018). Distribution, status and conservation of Sangai deer (*Rucervus eldii eldii*) in Manipur, India. *J. Entomol. Zool. Stud*, 6, 732-737.
- [36] Stattersfield, A. J., M. J. Crosby, A. J. Long and D. C. Wege. (1998). *Endemic Bird Areas of the World: Priorities for biodiversity Conservation*. Cambridge, UK: Birdlife International. (Birdlife Conservation Series No. 7). 815 p.
- [37] Storch, D., Konvicka, M., Benes, J., Martinková J., & Gaston, K. J. (2003). Distribution patterns in butterflies and birds of the Czech Republic: separating effects of habitat and geographical position. *Journal of Biogeography*, 30(8), 1195-1205.
<https://doi.org/10.1046/j.1365-2699.2003.00917.x>
- [38] Sunil, K. C. (2016). Biodiversity Impact Assessment Report for Part of Road Sections Passing through Yangoupokpi Lokchao Wild Life Sanctuary Environmental Specialist. South Asia Subregional Economic Corridor (SASEC) Road Connectivity Project -India: 1-13. Pp
- [39] Thomas, L., Buckland, S. T., Rexstad, E. A., Laake, J. L., Strindberg, S., Hedley, S. L., & Burnham, K. P. (2010). Distance software: design and analysis of distance sampling surveys for estimating population size. *Journal of Applied Ecology*, 47(1), 5-14.
<https://doi.org/10.1111/j.1365-2664.2009.01737.x>