



# Bioscene

**Bioscene**  
**Volume- 21 Number- 03**  
**ISSN: 1539-2422 (P) 2055-1583 (O)**  
**[www.explorebioscene.com](http://www.explorebioscene.com)**

## Avifaunal Biodiversity of Zelome, Phek District, Nagaland

Supare Zholia, Ramita Sougrakpam

Department of Zoology, Nagaland University, Lumami, Dist: Zunheboto, Nagaland,  
India

Corresponding Author: **Ramita Sougrakpam**

---

**Abstract :** Birds are one of the most diverse groups of vertebrates. Zelome is a village in Phek District of Nagaland, resides at North-east India which is a part of Himalayan mountain range. The region has steep terrain and abundant evergreen woods, is a biodiversity hotspot rich with flora and fauna. The region is also home to a diverse range of bird species that are important for understanding environmental health. The present study emphasize on the survey of avifauna biodiversity in Zelome, as biodiversity plays a very crucial role in the ecosystem service. A mixed-method research strategy was used, including direct observation and local interviews. The findings gave a prevailing number of bird diversity in the region. There were 53 bird species out of which 45 birds are residents birds' belonging to 11 orders and 31 families, and 8 birds are migratory birds with 3 orders and 5 families. According to the study maximum species of birds are of Passeriformes order. Status of all the species of birds are at Least Concern. This study gives a sample bird population for different regions in the state. Many environmental changes in the region due to shifting farming, deforestation, and hunting are seriously threatening the bird populations. This study revealed the need for conservation efforts and awareness to preserve the region's rich avian species. And also the importance for baseline studies all over Nagaland for protection and conservation of wildlife.

**Keywords:** Birds, Conservation, Hotspot, Mixed-method research, Shifting cultivation, Environment, Conservation, Deforestation, Least Concern, Migratory.

---

### Introduction

Ornithology is a science that deals with the study of birds along with the environment where they reside. Birds are considered one of the most diverse groups of modern vertebrates. The birds evolved from theropod dinosaurs during the Jurassic Era (Brusatte, 2015). As per recent research, there are more than 11,000 species of birds, out of which 1,350 species are globally threatened (Birdlife International, 2023). India is home to 1,353 bird species, representing approximately 12.40% of the global bird diversity. Birds are hugely diverse and distributed across the globe, filling a range of ecological niches and ranging in size from tiny hummingbirds to ostriches. Their feathers are optimized for flight and considered one of the most intelligent organisms on the planet, as given by Brusatte (2015). The study of avifaunal is one of the most critical ecological tools

that acts as an indicator for studying different habitats qualitatively and quantitatively (Samanta et al., 2023). The population of birds in an ecosystem shows the area's environmental quality, pollution level, and, most importantly, the availability of food and the habitat to support the birds (Chaudhari et al., 2016).

Zelome is a beautiful village in Phek district of Nagaland, North-East India. North-East India is a hotspot for biodiversity and is blessed with rich diversity. Among the most crucial fauna, avifauna is one of the most outstanding. North-East serves as the home to 818 species of avian fauna belonging to 339 genera. A total of 487 species of birds have been recorded in Nagaland (Choudary, 2001).

Phek district is a mountainous region rich in flora and fauna, with 70% of its land covered in evergreen forest. The highest mountain is Zanibu, with the summit over 2,400 m (7,900 ft) above mean sea level (AMSL). The region lies between 2,136m to 1,524m above sea level, with a Latitude of 25° 40' 0.12" N and a Longitude of 94° 30' 0.00" E. The largest rivers of the district are the Tizu, Lanyi, and Arachu, and the most important lakes are Shilloi, Chida, and Dziidu, which marked a biodiversity hotspot. Agriculture is the main occupation, with terrace Rice Cultivation (TRC) as the most predominant throughout Phek District. Shifting cultivation, or Jhum Cultivation, is a common practice. Shifting cultivation is a widespread practice in the hills of Nagaland (Solo et al., 2020). Important crops produced in the district include rice, maize, and millet. Every year, new areas have been selected for shifting cultivation, which has led to the disturbance in the community of the birds in the area. Shifting or jhum cultivation practice in the area consists of massive cutting down of trees, felling, drying, and burning, followed by sowing, cultural operation, harvest, and fallowing. All the activities have led the living in that area to shift or search for a new place that is disturbing the birds. Hunting has been going on for ages and is still a common practice in many of the villages of Phek, where catapults, air guns, and traps are used during the open hunting season. The biggest threats to the declining bird diversity are agriculture and residential and commercial developments and also the construction of mobile towers which affects the bird.

The natural sound and bird song play a particular role in building and maintaining the connection with nature. However, the loss of diversity has led to a decline in the pervasive loss of acoustic diversity (Morrison et al., 2021). Due to the declining environmental condition, there is a decline in the bird population, and slipping closer to extinction. The Red List Index (RLI) for birds has shown a steady decline in the last three decades, increasing the rate of extinction risk. Since 1988, 93 species have been downlisted to lower category due to the improvement, but it has been overtaken 436 species have moved up to higher category due to change in environment and anthropogenic activities (BirdLife International, 2022).

Earlier, the importance of taking up intensive baseline studies in areas such as Satoi, Saramati, Intaki, Fakim, and Dzukou Valley was given by Choudhury (2001). However there is an urgent need to conduct intensive baseline studies all over

Nagaland. And this study will help in drawing a sample bird biodiversity in a region due to various ongoing activities in the nature.

## **Materials and Methods**

### **Study area**

The study was carried out in Zelome village located under the Phek district in the South-Eastern part of Nagaland state, which borders the state of Manipur from December 2023 to June 2024. It is 12km from Pfutsero town and falls under the administrative jurisdiction of Razeba EAC Headquarters. It is surrounded by neighboring villages viz, Zhavame, Tsupfume, and Thetsumi.

### **Climatic conditions**

The area's climatic conditions are moderately warm during summer, with an average temperature of 27°C without exceeding 32°C. Monsoon starts towards the end of May and ends by the end of September. Winters are cold compared to the nearby plains of India, with the temperature dropping to 0°C in the coldest months of January and February. The average annual rainfall is 1,527 mm (About Phek | District Phek, Government of Nagaland | India).

### **Collection of data**

Understanding the biodiversity of bird species is crucial for conservation efforts and ecological research. Several methods can be employed to study the biodiversity of birds. The birds' data was collected using the "mixed method research". Both primary and secondary methods were used. The primary method used was sightseeing, where the different bird species which is encountered in a specific area were observed and then was engaged in the study. The birds were identified using "The Book of Indian Birds" (1997).

Another technique is interviewing local people, such as farmers, hunters, or indigenous communities, who know the birds in the region. These individuals have provided valuable information about species that are difficult to spot or identify through direct observation. Furthermore, interviews with local people have offered insights into bird behaviours, migration patterns, nesting sites, and other ecological aspects that may need to be more readily observable. In addition, we used data already available on the internet to study. The IUCN status was checked using the data from Birdlife International 2024.

## **Result and Discussion**

Checklist of birds recorded during the study

**Table 1: Resident birds of Zelome Village**

Order	Family	Scientific name	Common name	Habitat	Status
Passeriformes	1. Nectariniidae	1. <i>Aethopyga nipalensis</i>	Green-tailed Sunbird	Dense forest, scrub jungle, and garden.	R, LC
		2. <i>Arachnothera longirostra</i>	Little spiderhunter	Moist deciduous and evergreen forests; glades and secondary growth; banana plantations.	R, C, LC
	2. Pellorneidae	3. <i>Alcippe dubia</i>	Rusty-capped fulvetta	Forest undergrowth.	R, C, LC
	3. Alcippeidae	4. <i>Alcippe nipalensis</i>	Nepal fulvetta	Dense growth on steep hillsides.	R, U, LC
	4. Chloropseidae	5. <i>Chloropsis hardwickii</i>	Orange-bellied Leafbird	Tropical wet evergreen forest (dense forest)	R, LC
	5. Corvidae	6. <i>Corvus corone</i>	Carrion crow	Mixed farmland, parks and gardens, forest clearings, moorland, inshore islands, and coastal cliffs.	U, LC
	6. Dicaeidae	7. <i>Dicaeum ignipectus</i>	Fire-breasted flowerpecker	Temperate forests, subtropical or tropical moist lowland forests, and subtropical or tropical moist forests.	R, LC
	7. Dicruridae	8. <i>Dicrurus caeruleus</i>	White-bellied drongo	Terrestrial	R, LC
	8. Muscicapidae	9. <i>Enicurus maculatus</i>	Spotted fork-tail	Rocky forested streams and ravines.	R, LC
	9. Pycnonotidae	10. <i>Hypsipetes leucocephalus</i>	Black bulbul	Forested region, especially in higher elevation	R, LC
		11. <i>Pycnonotus cafer</i>	Red-vented bulbul	Gardens and light scrub jungle, both near and away from human	R, C, LC

				habitations.	
		12. <i>Pycnonotus flavescens</i>	Flavesc ent bulbul	Scrub jungle.	R, LC
		13. <i>Pycnonotus flaviventris</i>	Blacke d - Crested yellow bulbul	Scrub jungle, shrubbery around cultivation and on the outskirts of the forest.	R, C, LC
10. Leiothrichidae		14. <i>Leiothrix argentauris</i>	Silver-eared mesia	Bushes and forest undergrowth in evergreen biotopes, especially in more open areas.	R, LC
11. Estrilidae		15. <i>Lonchura punctulata</i>	Scaly-breasted Munia	Cultivation, gardens, secondary forest, and bush-covered hillsides.	R, C, LC
		16. <i>Lonchura striata</i>	White-rumped munia	Open cultivated country. (terrestrial)	R, C, LC
12. Paradoxornithidae		17. <i>Paradoxornis gularis</i>	Grey-Headed parrotbill	Reed bamboo, high grass, scrub jungle.	R, LC
13. Paridae		18. <i>Parus monticolus</i>	Green-backed Tit	Common resident of wooded country, edge of cultivation from 1500 to 9000m above msl.	R, LC
14. Passeridae		19. <i>Passer domesticus</i>	House sparrow	Varied habitats and climates near human development.	R, C, LC
15. Campephagidae		20. <i>Pericrocotus brevirostris</i>	Short-billed Minivet	Edges of evergreen forest.	R, LC
16. Cisticolidae		21. <i>Prinia superciliosa</i>	Black-throated Prinia	Wooded hills, grasslands, and scrubby areas.	R, LC
17. Eurylaimidae		22. <i>Psarisomus dalhousiae</i>	Long-tailed broadbill	Tropical and subtropical evergreen biotope up to 2000m above msl.	R, LC
18.		23. <i>Rhipidura</i>	White-	Forest, groves,	R,

	Rhipiduridae	albicollis	throated Fantail	secondary growth, ravines, and gardens.	LC
Columbiformes	19. Columbidae	24. Chalcophaps indica	Emerald Dove	Bamboo jungle and deciduous as well as evergreen forest. Partial to tangles of castor plants growing up on the site of abandoned forest clearings.	R, C, LC
		25. Treron phayrei (Blyth 1862)	Ashy-headed green pigeon	Tropical wet evergreen forest	R, UC, LC
		26. Streptopelia chinensis	Indian spotted dove	Open, well-wooded, and cultivated country avoids arid tracts.	R, LC
		27. Streptopelia orientalis	Oriental Turtle dove	Open forest and cultivation from foothills.	R, LC
Accipitriformes	20. Accipitridae	28. Accipiter trivirgatus	Crested goshawk	Forest dwellers in open deciduous to evergreen forests.	R, LC
		29. Ictinaetus malayensis	Black Eagle	Forested slopes and mountainous terrain, where there is ample forest cover.	R, LC
		30. Buteo refute	Himalayan buzzard	Temperate forests, grassland, and shrublands.	R, LC
Strigiformes	21. Strigidae	31. Athene Noctua	Little owl	Terrestrial	R, LC
		32. Bubo nepalensis	Forest eagle owl	Dense evergreen and moist deciduous forests.	R, U, LC
		33. Glaucidium cuculoides	Asian Barred Owlet	Evergreen jungle in the foothills.	R, LC
Piciformes	22. Picidae	34. Dendrocopos macei	Freckle breasted	Open forest and wooded country. Damp	R, C, LC

			d woodpe cker	mixed forest in lowlands and uplands, preferring open forest, edge, and secondary growth.	
	23. Pamphostid ae	35. <i>Megalaima asiatica</i>	Blue- throate d Barbet	Lowland and montane forests	R, LC
	24. Megalaimid ae	36. <i>Megalaima viren</i>	Great Barbet	Tropical wet evergreen forest	R, LC
Gallifor mes	25. Phasianidae	37. <i>Bambusicol a fytchii</i>	Mountai n bambo o partrid ge	Open scrub jungles near cultivation in the foothills and adjoining. Mixed scrub of willow, oak, and tall grass along the banks of streams.	R, C, LC
		38. <i>Lophura leucomelan os</i>	Kalij Pheasan t	Dense undergrowth in evergreen forest. Terrestrial	R, LC
		39. <i>Arborophil a atrogularis</i>	White- cheeke d partrid ge	Dense scrub jungle, heavy undergrowth in evergreen jungle.	R, C, LC
Coracif ormes	26. Alcedinidae	40. <i>Alcedo atthis</i>	Commo n Kingfish er	Streams, canals, ditches, ponds, rivers, and lakes in open country.	R, C, LC
Pelacan iformes	27. Ardeidae	41. <i>Ardea intermedia</i>	Interme diate egret	Inland wetlands, marshes, estuaries, paddy fields, etc.	R, U, LC
Caprim ulgifor mes	28. Caprimulgi dae	42. <i>Caprimulg us asiaticus</i>	Indian Nightjar	Scrub and stony country, dry overgrown nullahs, compounds, and groves in the neighborhood of cultivation and human habitations.	R, LC



Psittaciformes	29. Psittaculidae	43. <i>Psittacula krameri</i>	Ringneck parrot	Tropical and subtropical lightly in wooded habitats.	R, LC
Bucerotiformes	30. Upupidae	44. <i>Upupa epops</i>	Hoopoe	Open country, plains, and hills up to 2000m above MSL. Fond of lawns, gardens, and groves in and around villages and towns.	R, LC
	31. Turdidae	45. <i>Zoothera dauma</i>	Scaly Thrush	Dense forest with grassy clearings, thick jungle, sal forest, bamboo brakes, mango topes, etc.	R, LC

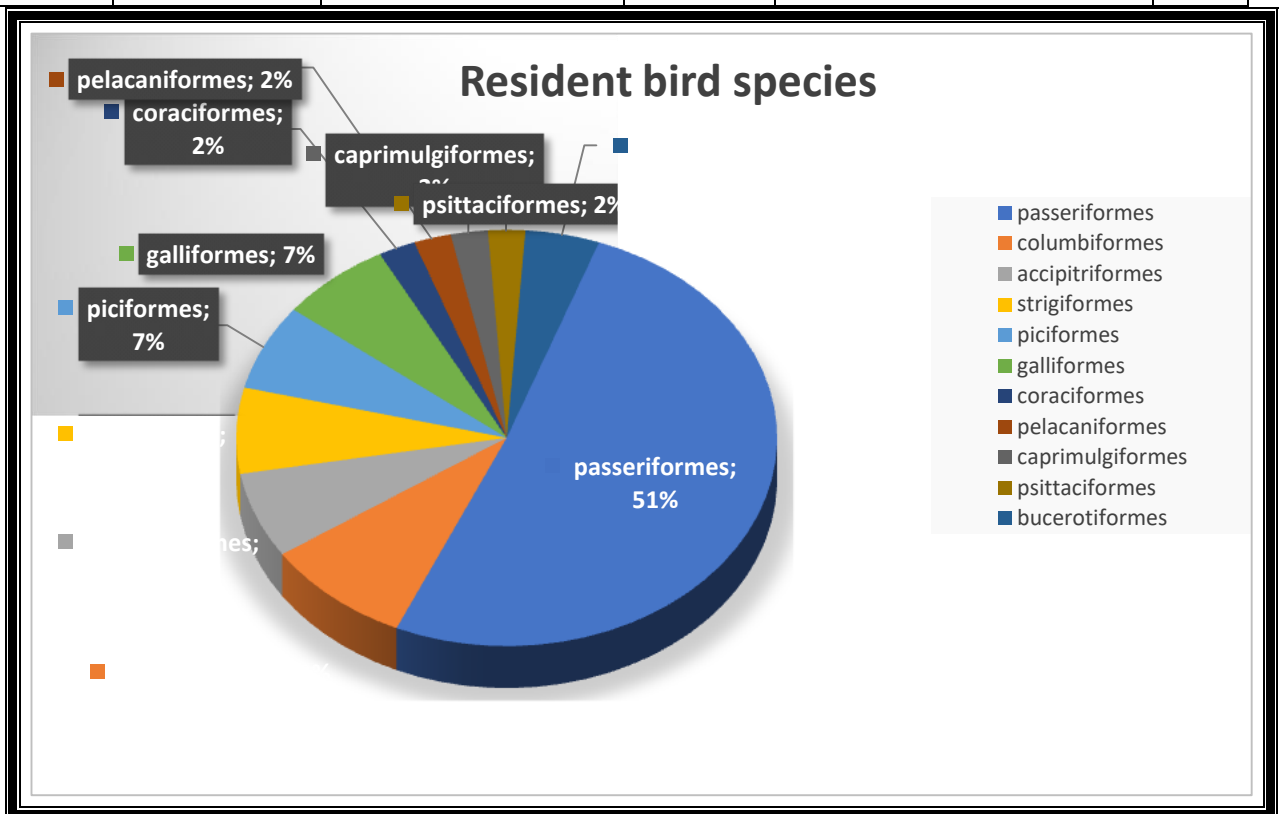


Fig 1: Percentage representation of resident bird species according to their orders.

**Migratory birds of Zelome village****Table 2a: Migratory birds wintering in village**

Order	Family	Scientific name	Common name	Habitat	Status
Passeriformes	1. Motacillidae	Anthus hodgsoni	Olive-backed pipit(m)	Open country. In the south, in evergreen woodland. In the north, groves and wooded biotopes.	W, C, LC

**Table 2b: Migratory birds migrating during the breeding season**

Order	Family	Scientific name	Common name	Habitat	Status
Cuculiformes	1. Cuculidae	Cuculus poliocephalus	Lesser Cuckoo	Terrestrial, well-wooded country and orchards.	Bm, LC
		Cuculus saturates	Himalayan cuckoo	Well wooded country and orchards.	Bm, LC
Passeriformes	2. Hirundinidae	Delichon urbicum	Common house martin	Meadows, fields, grassland, and open woodlands.	Bm, LC
	3. Motacillidae	Dendronanthus endicus	Forest Wagtail	Evergreen and deciduous forests. Haunts cardamom and coffee plantations.	Bm, LC

**Table 2c: Altitudinal migratory birds migrating outside the village**

Order	Family	Scientific name	Common name	Habitat	Status
Accipitriformes	1. Accipitridae	Haliaeetus albicilla	White-tailed Eagle	Large rivers in winter.	M, LC
		Phylloscopus peliogenys	Gray-cheeked Warbler	Boreal forests, especially those with spruce and fir trees.	M, LC

**Table 2d: Winter migratory birds that winter outside the village**

Order	Family	Scientific name	Common name	Habitat	Status
Passeriformes	1. Phylloscopidae	Phylloscopus pulcher	Buff-barred Warbler	Inhabits dense bushes, grass, and sedges.	W, LC

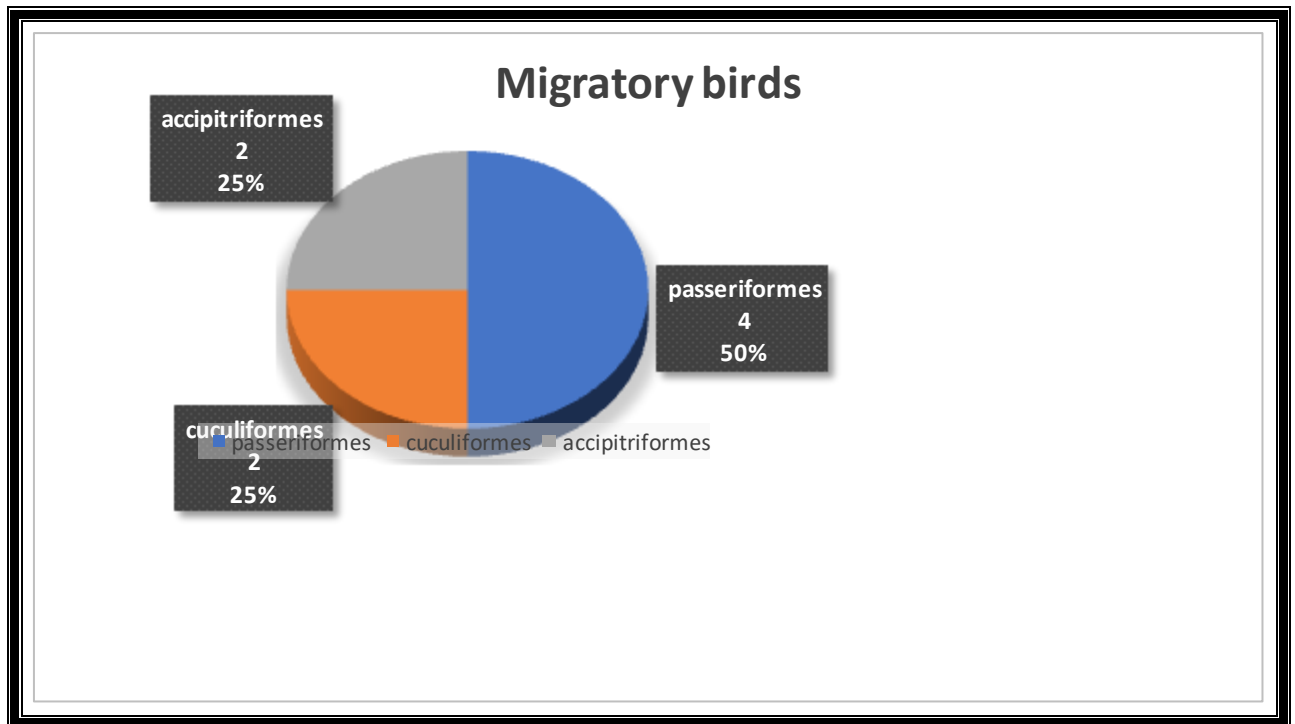


Fig 2: Percentage representation of migratory bird species according to their orders.

Status: R = resident; W = winter visitor; M = migrant; Bm = breeding migrant

Abundance: C = common; U = uncommon

IUCN status: LC = Least Concern

A total of 53 species belong to 12 orders, and 35 families have been recorded. Our study found 45 resident birds, under 11 orders and 31 families as shown in Table 1. These resident birds include common and uncommon birds. Of all the recorded resident birds, 51% belonged to the order Passeriformes, 9% to order Columbiformes, 7% to orders Accipitriformes, Strigiformes, Piciformes, and Galliformes, 4% to order Bucerotiformes, and 2% each to orders Coraciformes, Pelacaniformes, Caprimulgiformes, and Psittaciformes given in Fig.1. All the resident birds are identified under the Least Concern status according to IUCN status. The resident birds inhabit broad terrain occupying the dense forest on steep hillsides, moving down towards heavy forest undergrowth, open deciduous to evergreen forest, moist deciduous and evergreen forest, and open shrub jungle near cultivation in the foothills. These resident birds also inhabit the paddy fields,

dry, overgrown drains, compounds, and groves in the cultivation and human habitat neighborhood.

On the other hand, eight species of migratory birds were identified in the area belonging to 3 orders and 5 families. Of which 50% belonged to order Passeriformes, 25% to order Accipitriformes, and 25% to order Cuculiformes. Tab. 2a shows migratory birds wintering in village with 1 species of order Passeriformes under family Motacillidae. Tab. 2b shows migratory birds migrating during the breeding season with 2 species of order Cuculiformes under family Cuculidae, 1 species of order Passeriformes under family Hirundinidae and 1 species of order Passeriformes under family Motacillidae. Tab. 2c shows altitudinal migratory birds migrating outside the village with 2 species of order Accipitriformes under family Accipitridae. Tab. 2d shows winter migratory birds that winter outside the village 2 species of order Passeriformes under family Phylloscopidae. Fig 2 shows percentage representation of migratory bird species according to their orders. *Anthus hodgsoni* winters in the region, while *Phylloscopus pulcher* migrates from the area to its wintering ground. *Cuculus poliocephalus*, *Coccyus saturatus*, *Delichon urbicum*, and *Dentronanthus endicus* were found only during their breeding season. *Haliaeetus albicilla* and *Phylloscopus peliogenys* were the altitudinal migrants migrating towards the lower altitude. These migratory birds' occupy a vast habitat.

Singh et al., (2018) studied bird diversity on the Gorakhpur University campus and found 45 bird species belonging to 23 families. The variety of trees on the campus contributed to the richness of bird species. Laruatkimi et al., (2019) studied the diversity and abundance of birds in the Reiek biodiversity spot Mizoram, Northeastern India, and found 117 species of birds belonging to 37 families and ten orders. The study found family Muscicapidae dominated with 16 species.

This is the first study that has been carried out extensively in the village and recorded. Avian populations are rapidly changing due to extensive environmental change because of ruralization. These changes will accelerate over the coming decades (Gregory et al., 2009). There is a rapid loss in the diversity of birds due to anthropogenic activities (Rapoport, 1993). Rapid forest loss in many parts of the tropics leads to the multiple forest-dependent species being elevated to higher extinction risk categories. These human activities seriously affect avian diversity and bring changes that may lead to local and even worldwide extinction of avian fauna (Sumaila et al., 2020). In addition, all the species of birds are considered edible by the indigenous people of Nagaland. Many species are legally protected under Schedule 1 (highest protection accorded within India) of the Wild Life (Protection) Act of India, which prohibits their killing and capture, dead or alive. However, it is recent in the enforcement of even the protected areas as most people are unaware of this legal status. The protected area in Nagaland covers insignificant habitat (only 1.33% of the state's geographical location). The protected regions (all wildlife sanctuaries) are Intanki (202.02 km sq.),

Puliebadzie (9.23 km sq.), Fakim (6.42 km sq.), and Rangapahar (4.70 km sq.). Except for Intanki, all are tiny and hardly cover any sizeable habitat. The main threats faced by the forest birds are the destruction of the forest through the felling of trees and jhum cultivation, while all species are threatened by poaching for food and the local trade. Nagaland's closed forest (canopy cover 40% and above) is less than 20% by 2000 (Choudhury, 2001). In many developing countries, much wildlife survives outside protected areas (Bolwig et al., 2006, Hitchmough and Dunnett, 2004).

The abundance of species at a local scale in forests is mainly dependent on the regional forest structures (Balestreari et al., 2015, Czeszczewik et al., 2015, Diaz et al., 2005). Despite Nagaland being a small state, it possessed a variety of forest types distributed throughout the state, from evergreen to temperate types (Chatterjee, 2006). The addition of trees in a vegetation series disproportionately affects the addition of species (Willson, 1974). Farmland and naturally regenerating fallows sustained higher species richness than old-growth forests in shifting cultivation landscapes (Borah et al., 2022). It is commonly found that habitats with a more complex or variegated structure contain more species than more superficial habitats (MacArthur et al., 1966).

### **Conclusion**

This is the first study carried out in Zelome. The region showed rich bird biodiversity. Extensive environmental change is going on for rural development leading to the destruction of the habitat which may lead to the extinction of many wild lives including the avifauna. Our study has revealed that there is a need for the conservation of the forest canopy as well as rural areas. It also indicates the importance of protecting not only the natural habitats of native wildlife but also the areas where birds commonly exist. Massive steps, including conservation measures with awareness and strict action, should be taken to conserve a favourable environment for the birds to live in.

### **Acknowledgment**

SZ carried out the field survey and compiled data. RS conceived the study and helped to draft the manuscript. The authors have read the manuscript and agreed to its content. The authors thank the Biodiversity Management Committee, Zelome Village, for assisting with the survey. Authors have no conflict of interest. This research did not receive any specific grant from any funding agencies in the public, commercial, or not-for-profit sectors.

**Reference**

1. About Phek | District Phek, Government of Nagaland | India. Ali, S. (1997). The book of Indian Birds. Bombay natural History Society, pp. 408.
2. Balestrieri, R., Basile, M., Posillico, M., Altea, T., & Matteucci, G. (2017). "Survey effort requirements for bird community assessment in forest habitats." *Acta Ornithologica* 52(1), 1–9.
3. BirdLife International (2022). "The status of the world's birds has deteriorated in recent decades."
4. BirdLife International (2023). State of World's Birds: 2023 Annual Update. BirdLife Data Zone.
5. Bolwig, S., Pomeroy, D., Tushabe, H., & Mushabe, D. (2006). Crops, trees, and birds: Biodiversity change under agricultural intensification in Uganda's farmed landscapes. *Geografisk Tidsskrift-Danish Journal of Geography* 106, 115-130.
6. Borah, J. R., Gilroy, J. J., Evans, K. L., Edwards, D. P. (2022). "The value of shifting cultivation for biodiversity in Northeast India." *Diversity and Distributions* 28(9), 1979-1992.
7. Brusatte SL, O'Connor JK, Jarvis ED (2015). The Origin and Diversification of Birds. *Current biology: CB* 25(19), R888–R898.
8. Chatterjee, S., Saikia, A., Dutta, P., Ghosh, D., & Worah, S. (2006). Review of biodiversity in Northeast India. Background paper 13.
9. Chaudhari-Pachpande, S., & Pejaver, M. K. (2016). A preliminary study on the birds of Thane Creek, Maharashtra, India. *Journal of Threatened Taxa* 8(5), 8797–8803.
10. Choudhury, A. (2001). Some bird records from Nagaland, North-East India. *Forktail* 17, 91–103.
11. Czeszczewik, D., Zub, K., Stanski, T., Sahel, M., Kapusta, A., & Walankiewicz, W. (2015). Effects of forest management on bird assemblages in the Bialowieza Forest, Poland. *iForest - Biogeosciences and Forestry* 8, 377–385.
12. Darekar, P. V., Chougule, S. H., Kumbhar, A. C. (2015). A case study of conservation of Ekhrukh water reservoir (Hipparga lake) of Solapur (M.S.) during Ganesh festival. *Journal of information science* 2229-5836: 44-47.
13. Díaz, I. A., Armesto, J. J., Reid, S., Sieving, K. E., & Willson, M. F. (2005). "Linking forest structure and composition: avian diversity in successional forests of Chiloé Island, Chile." *Biological Conservation* 123(1), 91–101.
14. Gregory, R. D., Willis, S. G., Jiguet, F., Voříšek, P., Klvaňová, A., Van Strien, A., & Green, R. E. (2009). An indicator of the impact of climatic change on European bird populations. *PloS one* 4(3), e4678.
15. Hitchmough, J., Dunnett, N. (2004). Introduction to naturalistic planting in urban landscapes. In *The dynamic landscape*. Taylor & Francis pp. 1-32
16. Lalruatkimi, C., Sundaravel, S. S., Sailo, L., Zodinpuui, B., & Lalthanzara, H. (2019). Diversity and abundance of birds in Reiek Biodiversity Spot, Mizoram, northeastern India. *Science Vision* 19, 109-119.

17. MacArthur, R., Recher, H., & Cody, M. (1966). On the relation between habitat selection and species diversity. *The American Naturalist* 100(913), 319-332.
18. Mariyappan, M., Rajendran, M., Velu, S., Johnson, A. D., Dinesh, G. K., Solaimuthu, K., Kaliyappan, M., & Sankar, M. (2023). Ecological Role and Ecosystem Services of Birds: A Review. *International Journal of Environment and Climate Change* 13(6), 76–87.
19. Morrison, C., Aunins, A., Paquet, J. Y., Trautmann, S., Voříšek, P., Lehikoinen, A., Reif, J., Jiguet, F., Brotons, L., Benko, Z., Chodkiewicz, T., Chylarecki, P., Escandell, V., Eskildsen, D., Gamero, A., Herrando, S., Kalas, J. ka., Kamp, J., & Butler, S., (2021). Bird population declines and species turnover are changing the acoustic properties of spring soundscapes. *Nature Communications* 12, 6217.
20. Rapoport, E. H. (1993). Humans as Components of Ecosystems. In: McDonnell, M. J., Pickett, S. T. A. (eds) .*The Process of Plant Colonization in Small Settlements and Large Cities*. Springer, New York, NY.
21. Samanta, S., Das, D., & Mandal, S. (2023). Diversity, status and guild structure of the avifauna in the Ajodhya Foothills, Baghmundi, Purulia, West Bengal, India. *Trop Ecol.* 64, 211–223.
22. Singh, R., Jaiswal, A., Singh, J., Singh, N., Bhaskar, S. K., Kumar, N., & Singh, D. K. (2018). Study of bird diversity in Gorakhpur University Campus. *Journal of Biodiversity & Endangered Species*. 2018, 6(2), 25-32.
23. Solo, V., & Kikhi, K. (2021). An overview of the farming systems in Nagaland. *Journal of Pharmacognosy and Phytochemistry* 10(1S), 238-243.
24. Sumaila, M., Agyei-Ohemeng, J., Richard, O., Boafo, A. F., & William, A. (2020). Diversity, abundance and distribution of birds in and around Kakum National Park in respect to habitat type. *Ecology and Sustainable Development* 3(2), 23-43.
25. Willson, M. F. (1974). Avian Community Organization and Habitat Structure. *Ecology* 55(5), 1017–1029.