International Journal of Multidisciplinary Sciences and Arts
E-ISSN :2962-1658
Volume 5, Number 2, April 2026
https://doi.org/10.47709/ijmdsa.v5i2.8236

Avifaunal Diversity, Conservation Status, and Ecological Roles in Production Forests of Aceh Besar Regency

T. Dedi Kiswayadi[1*], Eka Sriwulandari[2], Bakruddin Bakruddin[3]
[1,2,3]Sekolah Tinggi Ilmu Kehutanan Pante Kulu, Aceh, Indonesia
[1]dedi.kiswayadi@gmail.com, [2]ekasriwulandari865@gmail.com, [3]bakry.klt@gmail.com

open access

***Corresponding Author**

Article History:
Submitted: 31-03-2026
Accepted: 08-04-2026
Published: 10-04-2026

Keywords:
Avifauna; Biodiversity; Production forest; Conservation; Aceh Besar.

ABSTRACT

Birds (avifauna) play an essential role in maintaining ecosystem balance as seed dispersers, insect predators, and pollinators. However, anthropogenic pressures in production forests threaten their habitats, including in Aceh Besar Regency. This study aims to assess avifaunal diversity, conservation status, and ecological roles in production forest areas. This study was conducted in Kota Jantho, Kuta Cot Glie, and Seulimum at elevations ranging from 250 to 1,700 meters above sea level. Observations were carried out using the line transect method across 10 transects (30 plots, 50 × 50 m). Avifaunal diversity was analyzed using the Shannon–Wiener diversity index (H'), while conservation status referred to the IUCN Red List (2025) and Indonesian regulation (Permen LHK No. P.106/2018). The results recorded 26 bird species, consisting of 22 species categorized as Least Concern (LC) and 1 species as Vulnerable (VU), while 3 species are listed as nationally protected. The diversity index indicated a moderate level of diversity. The presence of frugivorous, insectivorous, and nectarivorous birds highlights their ecological roles in forest regeneration, pest control, and pollination. Lower species richness compared to conservation areas is likely associated with habitat fragmentation and anthropogenic pressures such as shifting cultivation and illegal logging. These findings indicate that production forests still function as important habitats, although they are under ecological pressure. Conservation strategies should include community-based monitoring, biodiversity-based spatial planning, law enforcement, and environmental education.

INTRODUCTION

Birds are widely recognized as key ecological components that contribute to ecosystem stability through seed dispersal, pollination, and insect population control. In addition, birds are highly sensitive to environmental changes and are frequently used as bioindicators of ecosystem health (Simamora et al., 2021; Winarni et al., 2024).

Indonesia is one of the world's megabiodiversity countries, hosting a high diversity of bird species, including many endemic and threatened taxa. However, rapid land-use change, deforestation, and forest degradation have significantly impacted biodiversity across Sumatra (Kementerian Lingkungan Hidup dan Kehutanan, 2024; Putri et al., 2021). Habitat fragmentation and anthropogenic pressures are recognized as major drivers of biodiversity loss and shifts in bird community structure (Bełcik et al., 2020; Martínez-Penados et al., 2024).

Production forests play a dual role as sources of economic resources and habitats for wildlife. Although not formally designated as conservation areas, these landscapes can still support biodiversity when ecological structures are maintained. Previous studies have demonstrated that production forests are capable of retaining bird communities, including species of conservation concern, although often with reduced diversity compared to primary forests (Simamora et al., 2021; Pardede et al., 2025).

Aceh Besar Regency has extensive production forest areas that contribute to both ecosystem services and local livelihoods. However, pressures such as shifting cultivation, plantation expansion, and illegal logging threaten ecological integrity. Despite their importance, studies on avifaunal diversity in these production forests remain limited.

Therefore, this study aims to (1) assess avifaunal diversity, (2) identify conservation status, and (3) evaluate the ecological roles of birds in production forest areas of Aceh Besar Regency.

METHOD

Study Area

The study was conducted in Aceh Besar Regency, specifically in three subdistricts: Kota Jantho, Kuta Cot Glie, and Seulimum, at elevations ranging from 250 to 1,700 meters above sea level. These locations represent production forest areas with varying degrees of disturbance and land cover conditions.

Site selection was carried out using purposive sampling to represent different habitat types:

- Dense forest (relatively intact)

International Journal of Multidisciplinary Sciences and Arts
E-ISSN :2962-1658
Volume 5, Number 2, April 2026
https://doi.org/10.47709/ijmdsa.v5i2.8236

- Secondary forest with low canopy cover
- Non-forest or degraded areas

Figure 1. Administrative Map of Aceh Besar Regency
Source: https://petatematikindo.wordpress.com/wp-content/uploads/2013/04/administrasi-aceh-besar-a1-1.jpg

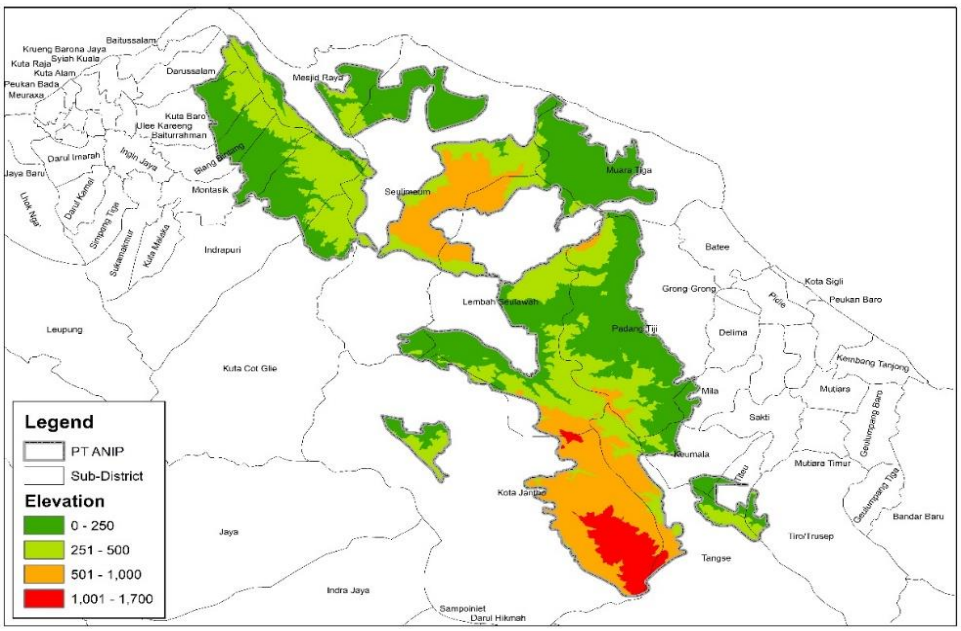

Figure 2. Elevation Map of the Study Site

Sampling Design

A total of 10 observation transects were established, comprising 30 plots measuring 50 × 50 m. The transects were distributed as follows:

- 6 transects in dense forest
- 3 transects in secondary forest
- 1 transect in non-forest areas

This design was intended to capture variations in avifaunal diversity across a gradient of habitat conditions.

International Journal of Multidisciplinary Sciences and Arts
E-ISSN :2962-1658
Volume 5, Number 2, April 2026
https://doi.org/10.47709/ijmdsa.v5i2.8236

Avifauna Observation

Bird observations were conducted using the line transect method along approximately 1 km routes. Observations were carried out during peak bird activity periods:

- Morning: 08:00–12:00
- Afternoon: 15:00–18:00

The equipment used included binoculars (8×42), a digital camera, and bird identification guides. Species identification was based on morphological characteristics and vocalizations, supported by relevant literature (BirdLife International, 2004).

Data Analysis

Avifaunal diversity was analyzed using the Shannon–Wiener diversity index (H'). Conservation status was determined based on:

- IUCN Red List (2025)
- Indonesian regulation (Permen LHK No. P.106/2018)

Ecological roles of bird species were categorized based on feeding guilds, including frugivores, insectivores, and nectarivores.

RESULT

Avifauna Diversity

A total of 26 bird species were recorded in the production forest areas of Aceh Besar Regency. The Shannon–Wiener diversity index (H') indicated a moderate level of diversity, suggesting that the avifaunal community remains relatively stable despite habitat disturbance.

Although species richness was not high, the presence of species with conservation importance indicates that the area still supports ecologically significant bird communities.

Figure 3. Dusky Broadbill *(Corydon Sumatranus)*

International Journal of Multidisciplinary Sciences and Arts
E-ISSN :2962-1658
Volume 5, Number 2, April 2026
https://doi.org/10.47709/ijmdsa.v5i2.8236

Figure 4. Ruby cheeked Sunbird *(Chalcoparia singalensis)*

Figure 5. Crimson Sunbird *(Aethopyga siparaja)*

International Journal of Multidisciplinary Sciences and Arts
E-ISSN :2962-1658
Volume 5, Number 2, April 2026
https://doi.org/10.47709/ijmdsa.v5i2.8236

Figure 6. Orange backed Woodpecker *(Reinwardtipicus validus)*

Conservation Status

Based on the identification results, 22 species were recorded as Least Concern (LC), 1 species as Vulnerable (VU), and 3 species are listed as nationally protected birds under Ministry of Environment and Forestry Regulation No. P.106/2018. These findings indicate that production forests still function as important habitats, both for common birds and species with high conservation value. The presence of species with Vulnerable (VU) status underscores the urgency of conservation-based management efforts.

Table 1. List of Conservation Categories

Conservation Category	Number of Species	Description
Least Concern (LC) – IUCN	22	Common species with stable populations
Vulnerable (VU) – IUCN	1	Threatened species, at high risk of extinction in the wild
Nationally Protected (Ministry of Environment and Forestry Regulation No. 106/2018)	3	Species protected by Indonesian government regulations
Total	**26**	

Ecological Roles

Although the number of species is relatively limited, the presence of functional groups such as frugivores, insectivores, and nectarivores underscores the important role of birds in the ecosystem.

- Frugivores act as seed dispersers that support forest regeneration,
- Insectivores help control the populations of insects that could become pests,
- Nectarivores contribute to the pollination of various plant species.

Thus, the presence of avifauna in the production forests of Aceh Besar still supports the sustainability of ecosystem functions, despite facing anthropogenic pressures.

DISCUSSION

The moderate avifaunal diversity recorded in the production forest area of Aceh Besar Regency indicates that this landscape still retains an important ecological function, although the bird community is likely under pressure from habitat modification. This interpretation is consistent with recent studies showing that bird assemblages in tropical landscapes generally decline in taxonomic diversity and become less even where forest cover is reduced, disturbed, or fragmented (Bełcik et al., 2020; Martínez-Penados et al., 2024). In West Kalimantan, indicator bird assemblages have been used to detect the effects of forest fragmentation and isolation, confirming that bird communities respond strongly to landscape structure and habitat quality (Simamora et al., 2021). Likewise, recent work in tropical landscape mosaics shows that old-growth forest remains disproportionately important for maintaining bird assemblages exposed to slash-and-burn disturbance (Martínez-Penados et al., 2024).

E-ISSN :2962-1658
Volume 5, Number 2, April 2026
https://doi.org/10.47709/ijmdsa.v5i2.8236

The relatively small number of species documented in this study should therefore not be interpreted as ecological insignificance. Instead, the occurrence of species with conservation value suggests that the production forest still functions as a refuge, stepping-stone habitat, or buffer area for bird populations. Comparable Indonesian studies have reported that forest sites may not always hold dramatically higher raw species counts than modified land uses, but they tend to support communities that are more even, more structurally intact, and more strongly associated with habitat-specialist or endemic taxa (Winarni et al., 2024). In Sulawesi, for example, forest sites and non-forest sites could have similar overall numbers of species, but forest communities were more diverse and more even than agricultural areas (Winarni et al., 2024). This implies that habitat quality, not only species richness, should be emphasized in the interpretation of results.

The conservation-status pattern in this study also deserves closer interpretation. The dominance of Least Concern species suggests that the landscape still supports common and adaptable birds, but the detection of Vulnerable and nationally protected species indicates that the area has conservation importance beyond its formal status as a production forest. Recent studies show that modified forest landscapes can retain species of conservation concern when habitat structure is partially maintained (Simamora et al., 2021; Kusrini et al., 2025). At the same time, Indonesia remains a global hotspot for threatened biodiversity, including avifauna, highlighting the importance of maintaining habitats even in production landscapes (Kusrini et al., 2025). The legal relevance of nationally protected species should still be anchored to national regulations such as Permen LHK No. P.106/2018 (Ministry of Environment and Forestry, 2018).

The functional composition of the avifauna found in Aceh Besar strengthens the ecological importance of these forests. Frugivorous birds contribute to seed dispersal, which is essential for forest regeneration, particularly in fragmented ecosystems (Quitián et al., 2019; Fricke et al., 2025). Seed dispersal by birds helps maintain plant diversity and supports forest recovery processes. Insectivorous birds play an important role in controlling insect populations and maintaining trophic balance (Pardede et al., 2025). Nectarivorous birds contribute to pollination and support plant reproduction in tropical ecosystems (Mota et al., 2022). Therefore, the presence of these functional groups indicates that key ecosystem processes are still functioning, although potentially under pressure.

Another important point is that anthropogenic pressures such as shifting cultivation, plantations, and illegal logging are likely to reduce species richness and simplify community composition. Studies show that forest degradation can lead to a shift toward disturbance-tolerant species and a decline in specialist species (Bełcik et al., 2020; Wang et al., 2025). In some cases, functional diversity may persist even when taxonomic diversity declines, masking early stages of ecological degradation (Wang et al., 2025). Therefore, the moderate diversity found in this study should be interpreted cautiously, as it may represent a transitional state toward ecological simplification.

From a management perspective, these findings suggest that production forests should not be viewed solely as economic landscapes, but also as biodiversity-supporting ecosystems. Maintaining vegetation complexity, preserving old-growth patches, and ensuring habitat connectivity are critical for sustaining bird diversity (Martínez-Penados et al., 2024). These strategies can help maintain ecological interactions and improve ecosystem resilience in production forest landscapes.

In addition, community participation is essential for effective conservation. Local monitoring can enhance early detection of biodiversity changes, reduce illegal activities, and strengthen conservation awareness. This is particularly relevant in Indonesia, where human–wildlife interactions are closely linked to socio-economic factors (Kusrini et al., 2025). Therefore, conservation efforts should integrate ecological management with community-based approaches and institutional strengthening.

Overall, the results suggest that the production forest area of Aceh Besar still plays a meaningful role in supporting avifaunal diversity, conservation value, and ecological functions. However, the moderate diversity level and limited species richness indicate vulnerability to further habitat degradation. A balanced approach combining sustainable forest management, habitat conservation, and long-term monitoring is necessary to maintain ecological integrity and biodiversity in this landscape (Martínez-Penados et al., 2024; Wang et al., 2025).

CONCLUSION

Production forests in Aceh Besar Regency exhibit moderate levels of avifaunal diversity and continue to support species with conservation importance. Despite relatively low species richness, the presence of Vulnerable and nationally protected species highlights the ecological significance of these landscapes.

The existence of key functional groups demonstrates that important ecosystem processes remain active. However, increasing anthropogenic pressures pose a risk to habitat quality and biodiversity.

Therefore, integrated conservation strategies are needed, including community-based monitoring, biodiversity-oriented spatial planning, law enforcement, and environmental education to ensure the long-term sustainability of production forest ecosystems.

ACKNOWLEDGMENT

The authors would like to thank the Direktorat Penelitian dan Pengabdian kepada Masyarakat (DPPM), Direktorat Jenderal Riset dan Pengembangan, Kementerian Pendidikan Tinggi, Sains, dan Teknologi Republik

E-ISSN :2962-1658
Volume 5, Number 2, April 2026
https://doi.org/10.47709/ijmdsa.v5i2.8236

Indonesia for financial support through the 2025 research grant.

Gratitude is also extended to the Lembaga Penelitian dan Pengabdian kepada Masyarakat (LPPM) of the Sekolah Tinggi Ilmu Kehutanan Pante Kulu for providing institutional support, enabling this research to be successfully carried out.

REFERENCES

Bełcik, M., Kajtoch, Ł., Zmihorski, M., & Ciach, M. (2020). Different response of the taxonomic, phylogenetic and functional diversity of birds to forest fragmentation. Scientific Reports, 10, 18544.

Fricke, E. C., Cook-Patton, S. C., Harvey, C. F., & Terrer, C. (2025). Seed dispersal disruption limits tropical forest regrowth. Proceedings of the National Academy of Sciences, 122(30), e2500951122.

Kusrini, M. D., Tohir, R. K., Hasibuan, M. M., Aprilianti, R., Sunarto, S., et al. (2025). Research trends and outlook for Indonesia's most threatened land vertebrates. Oryx, 59(4).

Kementerian Lingkungan Hidup dan Kehutanan. (2024). Statistik Kehutanan Indonesia 2024. Jakarta: KLHK.

Martínez-Penados, A. L., Arroyo-Rodríguez, V., Morante-Filho, J. C., et al. (2024). Old-growth forests are critical to safeguard tropical birds in complex landscape mosaics exposed to slash-and-burn agriculture. Landscape Ecology, 39, 118.

Mei, Y., Wang, X., et al. (2025). Effects of fruiting plants on frugivorous bird diversity across different disturbed habitats. Diversity, 17(9), 654.

Mota, F. M. M., Heming, N. M., Morante-Filho, J. C., & Talora, D. C. (2022). Climate change is expected to restructure forest frugivorous bird communities in a biodiversity hot-point within the Atlantic Forest. Diversity and Distributions, 28(12), 2886–2897.

Nonsri, P., et al. (2025). Evaluating drivers shaping the structure of bird–plant pollination and seed-dispersal networks within a subtropical evergreen forest. Global Ecology and Conservation.

Orihuela-Torres, A., et al. (2026). Understanding bird diversity in seasonally dry tropical forests. Forest Ecology and Management.

Pardede, L., Iswandaru, D., Rahma Fitriana, Y., Darmawan, A., Kaskoyo, H., Wulandari, C., Safe'i, R., Herwanti, S., Novriyanti, N., & Gumay Febryano, I. (2025). Insectivorous birds dominate across land-use gradient revealing unexpected ecological resilience in tropical forest-coffee landscapes. Jurnal Wasian, 12(1), 22–34.

Quitián, M., et al. (2019). Direct and indirect effects of plant and frugivore diversity on the ecological function of seed dispersal. Ecology Letters, 22(10), 1687–1697.

Simamora, T. I., Purbowo, S. D., & Laumonier, Y. (2021). Looking for indicator bird species in the context of forest fragmentation and isolation in West Kalimantan, Indonesia. Global Ecology and Conservation, 27, e01610.

Ulfiyah, M., et al. (2024). Status konservasi burung di kawasan Air Terjun Tingkat Tujuh Kabupaten Aceh Selatan. Jurnal Kenanga, 4(1).

Wang, Y., et al. (2025). Foraging guilds of birds in continuous and fragmented habitats. Forests, 16(5), 861.

Winarni, N. L., Mitchell, S. L., Anugra, B. G., Deere, N. J., et al. (2024). Bird diversity in the forests and coconut farms of Sulawesi, Indonesia. Oryx, 58(4), 427–436.

IUCN. (2025). The IUCN Red List of Threatened Species. Gland, Switzerland: International Union for Conservation of Nature.

BirdLife International. (2024). Indonesia factsheet and bird-status updates. Cambridge, UK: BirdLife International.

Ministry of Environment and Forestry of the Republic of Indonesia. (2018). Regulation of the Minister of Environment and Forestry No. P.106/MENLHK/SETJEN/KUM.1/12/2018 on Protected Plant and Animal Species. Jakarta, Indonesia.