FINAL REPORT OF FAUNA

ASSESSMENT OF BIRD AT LANA CONSERVATION AREA, GLENEALY PLANTATIONS SDN BHD

For

GLENEALY PLANTATIONS SDN BHD
(Sustainability Division)

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EXECUTIVE SUMMARY

Objective

The primary goal of this assessment is to evaluate the existing bird species diversity at Lana Estate, Glenealy Plantations Sdn. Bhd.

This survey seeks to recognize potential influences on fauna specially birds and propose pertinent compensatory and mitigative actions to safeguard and preserve biodiversity in the potentially affected area. To accomplish this, we conducted a thorough preliminary fauna assessment focusing on the birds within the conservation area. This assessment is confined to the impacted biodiversity area and also examines potential direct as well as indirect/induced impacts and risks resulting from ongoing oil palm plantation activities.

Date

This study was conducted from 14 to 17 April 2025.

Methodology

Bird data were collected using three main methods: bird sound recordings (using a Tascam recorder), mist netting, and direct field observations. A total of 20 mist nets were set up across the study area. Tascam recorders were installed at 100-meter intervals along the transect, resulting in five (5) designated recording points. The recorded audio data were then uploaded to BirdNET. Analyzer for species identification and to evaluate bird species diversity.

Result Summary

A total of 85 bird species were recorded in the study area using bird sound recordings via the Tascam Recorder. Additionally, 10 species were captured through mist netting, and 8 species were observed using binoculars during field observations. Among the species recorded by the Tascam Recorder, 39 species are classified as totally protected, including 28 Near Threatened (NT) species, 10 Vulnerable (VU) species, and 1 Critically Endangered (CR) species. The remaining 53 species are listed as Least Concern (LC) on the IUCN Red List.

The Helmeted Hornbill (*Rhinoplax vigil*), the only Critically Endangered species detected in this area, highlights the ecological significance of the site. These findings indicate that the area harbors a high level of bird species diversity and serves as an important habitat for many avian species. Therefore, any activities that could disturb this forest should be strictly avoided, and conservation efforts should be prioritized to protect this valuable ecosystem.

Recommendations

To enhance the protection of these bird species, the following recommendations are proposed:

i. Establish a protected area status for the site to legally safeguard it from logging, development, or other disruptive land-use changes.
ii. Conduct regular biodiversity monitoring to track population trends, detect threats early, and guide conservation strategies.
iii. Implement community education and awareness programs to engage local residents in the importance of bird conservation and sustainable forest use.
iv. Strengthen enforcement against illegal hunting, logging, or trade of protected bird species, particularly targeting the Helmeted Hornbill.
v. Promote eco-tourism as an alternative source of income for local communities, emphasizing bird watching and habitat conservation.
vi. Restore degraded habitats and maintain ecological corridors to support breeding, feeding, and migration of avian species.

We know very little about most of the species inhabiting the site, beyond their mere existence. To effectively conserve this unique ecosystem, it is crucial to implement several strategies. These include:

i. monitoring existing species within conservation area.
ii. initiating tree planting programs particularly with local communities to share awareness on the area.
iii. and legally protecting important areas from disturbance.

Consequently, it is essential to monitor the biodiversity in the region, particularly by inventorying rare, threatened, endangered, and near-extinct species.

1.0 INTRODUCTION AND BACKGROUND

Birds are recognized as vital indicators of environmental health and ecosystem integrity. Their presence, abundance, and behaviour provide valuable insights into the state of various habitats and the impacts of environmental changes. This introductory overview highlights why birds are effective indicators and how they are used in ecological monitoring and conservation efforts. Birds inhabit diverse ecosystems, from forests and grasslands to wetlands and urban areas. This widespread presence makes them suitable for monitoring a variety of habitats. Birds respond quickly to changes in their environment, such as habitat degradation, pollution, and

climate change. These responses can be observed and measured, providing early warnings of ecological disturbances. Birds occupy multiple trophic levels and ecological niches, including predators, herbivores, and scavengers. This diversity allows them to reflect the health of different components of the ecosystem.

Birds are generally conspicuous and easier to observe and identify compared to many other wildlife species. This accessibility facilitates regular monitoring and data collection. Extensive historical data and ongoing research on bird populations provide a robust foundation for assessing trends and making comparisons over time. Bird species composition and abundance can indicate the quality and health of specific habitats. For example, the presence of certain forest-dwelling bird species can signify a well-preserved woodland. Birds, especially those at higher trophic levels, can accumulate contaminants such as pesticides and heavy metals. Monitoring these birds helps assess the levels of pollution in the environment. Changes in bird migration patterns, breeding times, and distribution are valuable indicators of climate change impacts. Shifts in these patterns can provide insights into broader ecological responses to changing temperatures and weather conditions. Bird diversity and abundance serve as proxies for overall biodiversity and ecosystem health. Rich bird communities often correlate with high biodiversity and robust ecosystem functioning. Birds can reflect the impacts of human activities such as urbanization, deforestation, and agriculture. Declines or increases in specific bird populations can indicate the effects of these activities on the environment.

Birds, as sensitive and easily monitored components of ecosystems, play a crucial role in indicating the health and integrity of the environment. Their responses to various environmental factors provide valuable data for conservationists, researchers, and policymakers. By monitoring bird populations, we gain essential insights into the state of our natural world and can take informed actions to protect and preserve biodiversity and ecosystem services.

2.0 Significant Studies of Fauna in Plantation Areas

Research on fauna in plantation areas has provided insights into biodiversity, ecosystem services, and the impacts of land use changes. Here are some notable studies and their contributions to our understanding of fauna in plantation environments. This research focused on the biodiversity in oil palm plantations compared to natural forests in Southeast Asia. Findings showed significant reductions in species richness and diversity in oil palm plantations. The study highlighted the need for biodiversity-friendly management practices and the conservation of natural forest fragments within plantation landscapes.

Bird surveys in oil palm plantations are critical for understanding and mitigating the ecological impacts of these agricultural landscapes. Here are several reasons why these surveys

are important. Surveys provide data on the variety of bird species present in oil palm plantations. This helps in assessing the overall biodiversity of the area. Birds often serve as indicators of ecosystem health. Changes in bird populations can signal changes in the environment, such as habitat degradation or pollution. Surveys help in evaluating the quality of habitats within and surrounding the plantations. This information is crucial for developing management strategies to improve or maintain habitat quality. Identifying key bird species and their habitat requirements assists in creating conservation plans and measures to protect vulnerable species and enhance biodiversity.

Bird surveys can reveal the effects of different plantation management practices on wildlife. This includes the impacts of monoculture practices, pesticide use, and deforestation. Data from bird surveys can guide the adoption of more sustainable agricultural practices that support biodiversity, such as agroforestry, organic farming, and the preservation of natural habitats within plantation areas. Birds are sensitive to changes in their environment, making them useful indicators of climate change. Surveys can track changes in migration patterns, breeding times, and distribution, providing valuable data on the impacts of climate change. Regular bird surveys establish baseline data and facilitate long-term monitoring of ecological changes, helping to detect trends and inform timely conservation actions.

Surveys contribute to scientific research on bird ecology, behaviour, and conservation. This knowledge is essential for developing effective conservation strategies and understanding the broader ecological impacts of plantations. Data from bird surveys can inform policy and decision-making at local, national, and international levels, promoting sustainable agricultural practices and biodiversity conservation. Bird surveys in oil palm plantations are essential for understanding and mitigating the ecological impacts of these agricultural systems. They provide valuable data for biodiversity assessment, conservation planning, and sustainable management practices. By monitoring bird populations, we can gain insights into ecosystem health, inform policy decisions, and engage communities in conservation efforts, ultimately contributing to the preservation of biodiversity and the promotion of sustainable agriculture.

3.0 Objectives

The main objective of assessment is to assess baseline data on fauna particularly bird species within the Belaga Estate conservation area.

4.0 DESCRIPTION OF ASSESSMENT AREA

This study was conducted at Conservation are of Belaga Estate.

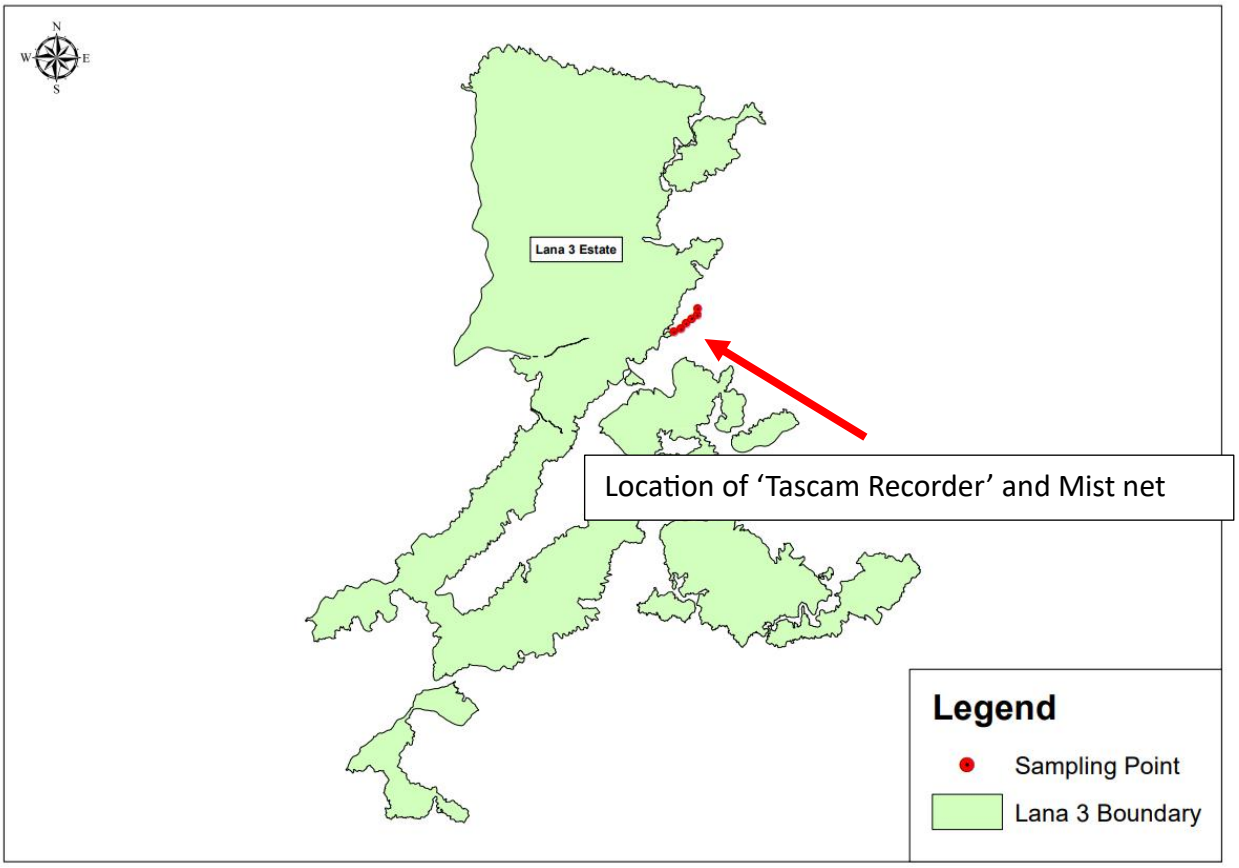

Figure 1: Location of study area in conservation area at Belaga Estate

5.0 BIODIVERSITY ASSESSMENT TEAM

There are dedicated personnel from UPMKBs (Table 1) comprises of researchers and students who work tirelessly to advance our understanding of complex scientific concepts and push the boundaries of innovation. Their collaborative efforts are driven by a shared passion for discovery and a commitment to excellence. By integrating diverse expertise and fresh perspectives, they tackle challenging problems, develop cutting-edge technologies, and contribute to significant breakthroughs in their respective fields. Their work not only enhances academic knowledge but also paves the way for practical applications that can benefit society at large. Together, they embody the spirit of curiosity, creativity, and relentless pursuit of knowledge.

Table 1: Fauna Assessment Team

No.	Name & Responsibility	Expertise & Experience
1	Dr. Zamri Bin Rosli (Project Leader)	Wildlife management and ecology - Has 22 years services with UPM as a researcher and lecturer -Published more than 30 papers in JCR, WOS and indexed journal. -Presented more than 20 papers at national and international levels -Receive more than 1 million research grant from university, ministry, agency and government sectors. -Published 5 books related to wildlife -Actively involved in community engagement project such as in tree planting programme and education training.
2	Mr. Muhamad Syafiq Che Shafine	- Has over 15 years services with forest Department Peninsular Malaysia and Wildlife Department Peninsular Malaysia - Taking PhD in the field of wildlife management and currently study on birds using sound recorder (Tascam Recorder)

6.0 APPROACH AND METHODOLOGY OF THE ASSESSMENT

There are Two (2) methods were used in order to obtain bird diversity in this area. The bird song recorder via 'Tascam Recorder' were used to detect the existence of bird using their song or voice. The recorded audio data were then uploaded to Bird NET. Analyzer for species identification and to evaluate bird species diversity. The mist netting method was used to capture cryptic bird species which cannot be detected using binoculars such as those species that belong to the understorey level. All birds captured were identified by using 'Field Guide to the Birds of Borneo' by Phillip. Birds were then released immediately after identification.

Figure 2: Record bird song using ‘Tascam recorder’

Figure 3: Setting up mist net

7.0 ASSESSMENT AND FINDINGS

Assessment of birds was conducted from 14th to 17th April 2025. Data collection was done from 8:00am in the morning up to 3.30pm. The results of the fauna assessment are as follows:

7.1 Result of bird's survey using 'Tascam Recorder'

A total of 85 bird species were recorded in the Belaga Conservation Area using a Tascam recorder, as shown in Table 1. Among these, only one species (1.2%) is classified as Critically Endangered (CE) : the Helmeted Hornbill (*Buceros vigil*) (Table 2). One species (1.2%) considered Endangered (E): Wrinkled Hornbill (*Rhabdotorrhinus corrugatus*) (Table 3). Additionally, 9 species (10.6%) are categorized as Vulnerable (V), this represented by including the Grey-cheeked Bulbul (*Alophoixus tephrogenys*), Great Argus (*Argusianus argus*), Rhinoceros Hornbill (*Buceros rhinoceros*), Short-toed Coucal (*Centropus rectunguis*), Cinnamon-headed Green-Pigeon (*Treron fulvicollis*) Cinnamon-rumped Trogon (*Harpactes orrhophaeus*), Bornean Bristlehead (*Pityriasis gymnocephala*), Great Slaty Woodpecker (*Mulleripicus pulverulentus*), and Wreathed Hornbill (*Rhyticeros undulatus*) (Table 4). 29 species (34.1%) fall under Nearly Threatened (NT) by IUCN Red List as shown in Table 5, while 45 (52.9%) species fall under Least Concern (LC) as shown in Table 6.

Table 1: List of bird species recorder using 'Tascam Recorder' at Lana Conservation Area

No.	Common Name	Scientific name	Status
1.	Rufous-collared Kingfisher	Actenoides concretus	NT
2.	Yellow-bellied Bulbul	*Alophoixus phaeocephalus*	LC
3.	Gray-cheeked Bulbul	*Alophoixus tephrogenys*	VE
4.	House Swift	*Apus nipalensis*	LC
5.	Little Spiderhunter	*Arachnothera longirostra*	LC
6.	Great Argus	*Argusianus argus*	VE
7.	Blyth's Frogmouth	*Batrachostomus affinis*	LC
8.	Gould's Frogmouth	*Batrachostomus stellatus*	NT
9.	Puff-backed Bulbul	*Brachypodius eutilotus*	NT
10.	Barred Eagle-Owl	*Bubo sumatranus*	NT
11.	Rhinoceros Hornbill	*Buceros rhinoceros*	VE
12.	Helmeted Hornbill	*Buceros vigil*	CE
13.	Sunda Brush Cuckoo	*Cacomantis sepulcralis*	LC
14.	Green Broadbill	*Calyptomena viridis*	NT
15.	Short-toed Coucal	*Centropus rectunguis*	VE
16.	Blue-winged Leafbird	*Chloropsis cochinchinensis*	LC
17.	Lesser Green Leafbird	*Chloropsis cyanopogon*	NT
18.	Violet Cuckoo	*Chrysococcyx xanthorhynchus*	LC
19.	White-rumped Shama	*Copsychus malabaricus*	LC

20.	Rufous-tailed Shama	*Copsychus pyrropygus*	NT
21.	Dusky Broadbill	*Corydon sumatranus*	LC
22.	Chestnut-winged Babbler	*Cyanoderma erythropterum*	LC
23.	Malaysian Blue Flycatcher	*Cyornis turcosus*	NT
24.	Gray-chested Jungle-Flycatcher	*Cyornis umbratilis*	NT
25.	Scarlet-backed Flowerpecker	*Dicaeum cruentatum*	LC
26.	Orange-bellied Flowerpecker	*Dicaeum trigonostigma*	LC
27.	Greater Racket-tailed Drongo	*Dicrurus paradiseus*	LC
28.	Green Imperial-Pigeon	*Ducula aenea*	NT
29.	Mountain Imperial-Pigeon	*Ducula badia*	LC
30.	Garnet Pitta	*Erythropitta granatina*	NT
31.	Black-crowned Pitta	*Erythropitta ussheri*	NT
32.	Indigo Flycatcher	*Eumyias indigo*	LC
33.	Malaysian Rail-babbler	*Eupetes macrocerus*	NT
34.	Banded Broadbill	*Eurylaimus javanicus*	NT
35.	Black-and-yellow Broadbill	*Eurylaimus ochromalus*	NT
36.	Rufous-chested Flycatcher	*Ficedula dumetoria*	LC
37.	Diard's Trogon	*Harpactes diardii*	LC
38.	Narcissus Flycatcher	*Ficedula narcissina*	NT
39.	Red-naped Trogon	*Harpactes kasumba*	NT
40.	Orange-breasted Trogon	*Harpactes oreskios*	LC
41.	Cinnamon-rumped Trogon	*Harpactes orrhophaeus*	VE
42.	Whiskered Treeswift	*Hemiprocne comata*	LC
43.	Moustached Hawk-Cuckoo	*Hierococcyx vagans*	NT
44.	Bornean Banded-Pitta	*Hydrornis schwaneri*	LC
45.	Black-naped Monarch	*Hypothymis azurea*	LC
46.	Streaked Bulbul	*Ixos malaccensis*	NT
47.	Bat Hawk	*Macheiramphus alcinus*	LC
48.	Fluffy-backed Tit-Babbler	*Macronus ptilosus*	NT
49.	Abbott's Babbler	*Malacocincla abbotti*	LC
50.	Horsfield's Babbler	*Malacocincla sepiaria*	LC
51.	Sooty-capped Babbler	*Malacopteron affine*	NT
52.	Scaly-crowned Babbler	*Malacopteron cinereum*	LC
53.	Moustached Babbler	*Malacopteron magnirostre*	LC
54.	Rufous-crowned Babbler	*Malacopteron magnum*	NT
55.	Bold-striped Tit-Babbler	*Mixornis bornensis*	LC
56.	Great Slaty Woodpecker	*Mulleripicus pulverulentus*	VE
57.	Brown Boobook	*Ninox scutulata*	LC
58.	Red-bearded Bee-eater	*Nyctyornis amictus*	LC
59.	Dark-throated Oriole	*Oriolus xanthonotus*	LC
60.	Ferruginous Babbler	*Pellorneum bicolor*	LC
61.	Black-capped Babbler	*Pellorneum capistratum*	LC
62.	Short-tailed Babbler	*Pellorneum malaccense*	NT
63.	Temminck's Babbler	*Pellorneum pyrrogenys*	LC
64.	Chestnut-bellied Malkoha	*Phaenicophaeus sumatranus*	NT
65.	Maroon-breasted Philentoma	*Philentoma velata*	NT

66.	Oriental Bay-Owl	*Phodilus badius*	LC
67.	Bornean Bristlehead	*Pityriasis gymnocephala*	VE
68.	Black Magpie	*Platysmurus leucopterus*	LC
69.	Chestnut-backed Scimitar-Babbler	*Pomatorhinus montanus*	LC
70.	Gold-whiskered Barbet	*Psilopogon chrysopogon*	LC
71.	Blue-eared Barbet	*Psilopogon duvaucelii*	LC
72.	Red-throated Barbet	*Psilopogon mystacophanos*	NT
73.	Red-eyed Bulbul	*Pycnonotus brunneus*	LC
74.	Yellow-vented Bulbul	*Pycnonotus goiavi er*	LC
75.	Wrinkled Hornbill	*Rhabdotorrhinus corrugatus*	EN
76.	Raffles's Malkoha	*Rhinortha chlorophaea*	LC
77.	Malaysian Pied-Fantail	*Rhipidura javanica*	LC
78.	Wreathed Hornbill	*Rhyticeros undulatus*	VE
79.	Spectacled Bulbul	*Rubigula erythropthalmos*	LC
80.	Rufous Piculet	*Sasia abnormis*	LC
81.	Chestnut-rumped Babbler	*Stachyris maculata*	NT
82.	Gray-throated Babbler	*Stachyris nigriceps*	LC
83.	Black-throated Babbler	*Stachyris nigricollis*	NT
84.	Cinnamon-headed Green-Pigeon	*Treron fulvicollis*	VE
85	Large Wren-Babbler	*Turdinus macrodactylus*	NT

CE – Critically Endangered, **EN** – Endangered, **VE** – Vulnerable, **NT**– Nearly Threatened, **LC -** least Concern

Table 2: list of Critically Endangered (CE) Species

No.	***Sceintific name***	**Species name**
1.	*Buceros vigil*	Helmeted Hornbill

Table 3: List of Endangered species

No.	***Sceintific name***	**Species name**
1.	*Rhabdotorrhinus corrugatus*	Wrinkled Hornbill

Table 4: List of 'Vulnerable' (VE) species

No.	***Scientific name***	**Species name**
1.	*Centropus rectunguis*	Short-toed Coucal
2.	*Pityriasis gymnocephala*	Bornean Bristlehead
3.	*Mulleripicus pulverulentus*	Great Slaty Woodpecker
4.	*Harpactes orrhophaeus*	Cinnamon-rumped Trogon
5.	*Rhyticeros undulatus*	Wreathed Hornbill
6.	*Buceros rhinoceros*	Rhinoceros Hornbill
7.	*Argusianus argus*	Great Argus
8.	*Treron fulvicollis*	Cinnamon-headed Green-Pigeon
9.	*Alophoixus tephrogenys*	Gray-cheeked Bulbul

Table 5: List of 'Nearly Threatened' species (NT)

No.	*Scientific name*	Species name
1.	*Stachyris maculata*	Chestnut-rumped Babbler
2.	*Stachyris nigricollis*	Black-throated Babbler
3.	*Turdinus macrodactylus*	Large Wren-Babbler
5.	*Psilopogon rafflesii*	Red-crowned Barbet
6.	*Pellorneum malaccense*	Short-tailed Babbler
7.	*Phaenicophaeus sumatranus*	Chestnut-bellied Malkoha
8.	*Philentoma velata*	Maroon-breasted Philentoma
9.	*Malacopteron magnum*	Rufous-crowned Babbler
10.	*Malacopteron affine*	Sooty-capped Babbler
11.	*Macronus ptilosus*	Fluffy-backed Tit-Babbler
12.	*Harpactes kasumba*	Red-naped Trogon
13.	*Erythropitta granatina*	Garnet Pitta
14.	*Erythropitta ussheri*	Black-crowned Pitta
15.	*Eupetes macrocerus*	Malaysian Rail-babbler
16.	*Eurylaimus javanicus*	Banded Broadbill
17.	*Eurylaimus ochromalus*	Black-and-yellow Broadbill
18.	*Ducula aenea*	Green Imperial-Pigeon
19.	*Cyornis umbratilis*	Gray-chested Jungle-Flycatcher
20.	*Copsychus pyrropygus*	Rufous-tailed Shama
21.	*Calyptomena viridis*	Green Broadbill
22.	*Ixos malaccensis*	Streaked Bulbul
23.	*Hierococcyx vagans*	Moustached Hawk-Cuckoo
24.	*Ficedula narcissina*	Narcissus Flycatcher
25.	*Cyornis turcosus*	Malaysian Blue Flycatcher
26.	*Chloropsis cyanopogon*	Lesser Green Leafbird
27.	*Bubo sumatranus*	Barred Eagle-Owl
28.	*Brachypodius eutilotus*	Puff-backed Bulbul
29.	*Batrachostomus stellatus*	Gould's Frogmouth

Table 6: list of 'Least Concern' (LC) species

No.	Common Name	Scientific name
1.	Yellow-bellied Bulbul	*Alophoixus phaeocephalus*
2.	House Swift	*Apus nipalensis*
3.	Little Spiderhunter	*Arachnothera longirostra*
4.	Blyth's Frogmouth	*Batrachostomus affinis*
5.	Sunda Brush Cuckoo	*Cacomantis sepulcralis*
6.	Blue-winged Leafbird	*Chloropsis cochinchinensis*
7.	Violet Cuckoo	*Chrysococcyx xanthorhynchus*
8.	White-rumped Shama	*Copsychus malabaricus*
9.	Dusky Broadbill	*Corydon sumatranus*
10.	Chestnut-winged Babbler	*Cyanoderma erythropterum*
11.	Scarlet-backed Flowerpecker	*Dicaeum cruentatum*

12.	Orange-bellied Flowerpecker	*Dicaeum trigonostigma*
13.	Greater Racket-tailed Drongo	*Dicrurus paradiseus*
14.	Mountain Imperial-Pigeon	*Ducula badia*
15.	Indigo Flycatcher	*Eumyias indigo*
16.	Rufous-chested Flycatcher	*Ficedula dumetoria*
17.	Diard's Trogon	*Harpactes diardii*
18.	Orange-breasted Trogon	*Harpactes oreskios*
19.	Whiskered Treeswift	*Hemiprocne comata*
20.	Bornean Banded-Pitta	*Hydrornis schwaneri*
21.	Black-naped Monarch	*Hypothymis azurea*
22.	Bat Hawk	*Macheiramphus alcinus*
23.	Abbott's Babbler	*Malacocincla abbotti*
24.	Horsfield's Babbler	*Malacocincla sepiaria*
25.	Scaly-crowned Babbler	*Malacopteron cinereum*
26.	Moustached Babbler	*Malacopteron magnirostre*
27.	Bold-striped Tit-Babbler	*Mixornis bornensis*
28.	Brown Boobook	*Ninox scutulata*
29.	Red-bearded Bee-eater	*Nyctyornis amictus*
30.	Dark-throated Oriole	*Oriolus xanthonotus*
31.	Ferruginous Babbler	*Pellorneum bicolor*
32.	Black-capped Babbler	*Pellorneum capistratum*
33.	Temminck's Babbler	*Pellorneum pyrrogenys*
34.	Oriental Bay-Owl	*Phodilus badius*
35.	Black Magpie	*Platysmurus leucopterus*
36.	Chestnut-backed Scimitar-Babbler	*Pomatorhinus montanus*
37.	Gold-whiskered Barbet	*Psilopogon chrysopogon*
38.	Blue-eared Barbet	*Psilopogon duvaucelii*
39.	Red-eyed Bulbul	*Pycnonotus brunneus*
40.	Yellow-vented Bulbul	*Pycnonotus goiavi er*
41.	Raffles's Malkoha	*Rhinortha chlorophaea*
42.	Malaysian Pied-Fantail	*Rhipidura javanica*
43.	Spectacled Bulbul	*Rubigula erythropthalmos*
44.	Rufous Piculet	*Sasia abnormis*
45.	Gray-throated Babbler	*Stachyris nigriceps*

Table 7 highlights the 19 most frequently captured bird species groups. Leading the list is the babbler group, comprising 19 species (22.3%). Following are the bulbul and flycatcher groups, each with 7 species (8.2%). The broadbill, hornbill, and trogon groups are represented by 4 species each (4.7%). Additionally, the barbet, cuckoo, pigeon, pitta, and shama groups each include 3 species (3.5%). The remaining groups—flowerpecker, frogmouth, leafbird, malkoha, owl, swift, and woodpecker—are each represented by 2 species (2.3%).

Table 7: List of 17 most recorded species by Group

No.	Group	No of individuals
1.	Babbler	19
2.	Bulbul	7
3.	Flycatcher	7
4.	Broadbill	4
5.	Hornbill	4
6.	Trogon	4
7.	Barbet	3
8.	Cuckoo	3
9.	Pigeon	3
10.	Pitta	3
11.	Shama	3
12.	Flowerpecker	2
13.	Frogmouth	2
14.	Leafbird	2
15.	Malkoha	2
17	Owl	2
18.	Swift	2
19.	Woodpecker	2

7.2 Birds captured using mist-netting method

An assessment of bird species using the mist netting method recorded ten bird species, including the Scarlet-breasted Flowerpecker (*Prionochilus thoracicus*), Grey-cheeked Bulbul (*Criniger bres*), Scaly-crowned Babbler (*Malacopteron cinereum*), White-rumped Shama (*Copsychus malabaricus*), White-chested Babbler (*Pellorneum rostratum*), Green-winged Pigeon (*Chalcophaps indica*), Jambu Fruit Dove (*Ptilinopus jambu*), Rufous Piculet (*Sasia abnormis*), Maroon Woodpecker (*Blythipicus rubiginosus*), and Red-eyed Bulbul (*Pycnonotus brunneus*) (Figures 4–13). Additionally, two bat species were captured: the Horseshoe Bat (*Rhinolophus malayanus*) and the Short-nosed Fruit Bat (*Cynopterus brachyotis*) (Figures 14 & 15).

Table 8 lists the captured bird species and their conservation status. One species, the Grey-cheeked Bulbul, is categorized as Vulnerable (VU). Three species are classified as Near Threatened (NT) by the IUCN: the Scarlet-breasted Flowerpecker (*Prionichilus thoracicus*), White-chested Babbler (*Pellorneum rostratum*) and Jambu Fruit Dove (*Ptinopus jambu*). The remaining six species are listed under the Least Concern (LC) category.

Table 8: List of birds captured using mist net and their status

No.	Common name	Scientific name	Status
1.	Scarlet-breasted Flowerpecker	*Prionichilus thoracicus*	NT
2.	Grey-cheeked Bulbul	*Criniger bres*	VE
3.	Scaly-crowned Babbler	*Malacopteron cinereum*	LC
4.	White Rumped Shama	*Copsychus malabaricus*	LC
5.	White-chested Babbler	*Pellorneum rostratum*	NT
6.	Green-winged Pigeon	*Chalcophaps indica*	LC
7.	Jambu Fruit Dove	*Ptinopus jambu*	NT
8.	Rufous Piculet	*Sasia abnormias*	LC
9.	Maroon Woodpecker	*Blythipicus rubiginosus*	LC
10.	Red-eyed Bulbul	*Pycnonotus brunneus*	LC

Appendix: Pictures of birds captured using mist net

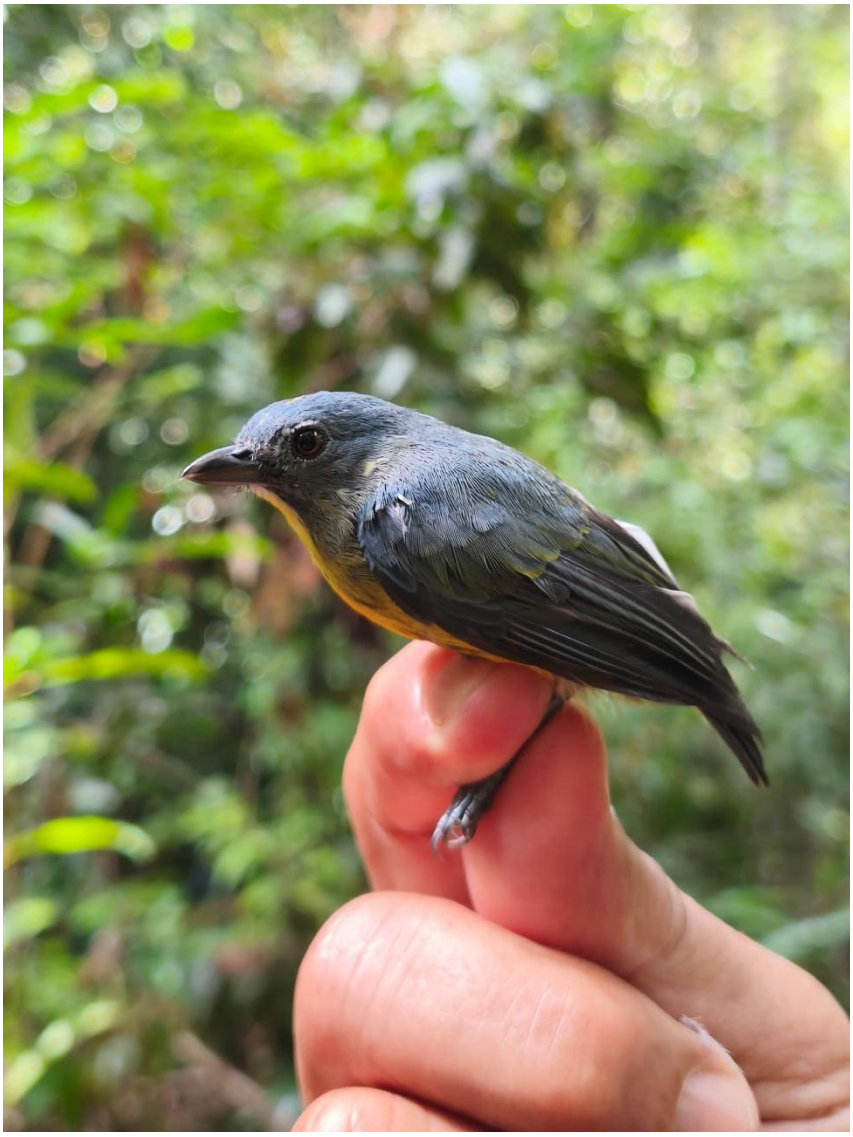

Figure 4: Scarlet-breasted Flowerpecker (*Prionichilus thoracicus*)

Figure 5: Grey-cheeked Bulbul (*Criniger bres*)

Figure 6: Scaly-crowned Babbler (*Malacopteron cinereum*)

Figure 7: White Rumped Shama (*Copsychus malabaricus*)

Figure 8: White-chested Babbler (*Pellorneum rostratum*)

Figure 9: Green-winged Pigeon (*Chalcophaps indica*)

Figure 10: Jambu Fruit Dove (*Ptinopus jambu*)

Figure 11: Rufous Piculet (*Sasia abnormias*)

Figure 12: Maroon Woodpecker (*Blythipicus rubiginosus*)

Figure 13: Red-eyed Bulbul (*Pycnonotus brunneus*)

Figure 14 : Horsesoe Bat (*Rhinolophus malayanus*)

Figure 15 : Short-nose Fruit bat (*Cynopterus brachytis*)

8.0 CONCLUSION

Based on the data collected from the Lana Conservation Area, several key conclusions can be drawn regarding avian biodiversity and conservation priorities. A total of 85 bird species were recorded using acoustic monitoring (Tascam recorder), indicating a rich avian diversity within the Belaga Conservation Area. This diversity underscores the ecological significance of the region and its role as a habitat for various bird species. Among the recorded species, several are listed under threatened categories by the IUCN Red List: Critically Endangered (CR): Helmeted Hornbill (*Buceros vigil*), Endangered (EN): Wrinkled Hornbill (*Rhabdotorrhinus corrugatus*) and Vulnerable (VU): Nine species, including the Grey-cheeked Bulbul (*Alophoixus tephrogenys*), Great Argus (*Argusianus argus*), and Rhinoceros Hornbill (*Buceros rhinoceros*). Approximately 34.1% of the recorded species are categorized as Near Threatened (NT), indicating that a substantial portion of the avian population is at risk of becoming threatened in the near future. This emphasizes the importance of proactive conservation measures to prevent further declines.

Analysis of species groups reveals that babblers are the most frequently captured group, comprising 22.3% of the total. Bulbuls and flycatchers each represent 8.2%, while broadbills, hornbills, and trogons each account for 4.7%. This distribution provides insights into the habitat preferences and ecological niches within the conservation area. The mist netting method successfully recorded ten bird species, including the Scarlet-breasted Flowerpecker (*Prionochilus thoracicus*) and Jambu Fruit Dove (*Ptilinopus jambu*). Notably, this method also captured two bat species, demonstrating its utility in monitoring a range of volant fauna. Among the species captured through mist netting: Vulnerable (VU): Grey-cheeked Bulbul (*Criniger bres*), Near Threatened (NT): Scarlet-breasted Flowerpecker (*Prionochilus thoracicus*), White-chested Babbler (*Pellorneum rostratum*), and Jambu Fruit Dove (*Ptilinopus jambu*).

The presence of multiple threatened and near-threatened species necessitates the development and implementation of targeted conservation strategies. Efforts should focus on habitat preservation, mitigating threats, and continuous monitoring to ensure the long-term survival of these species. Regular monitoring using methods like acoustic recording and mist netting is crucial for tracking population trends, assessing the effectiveness of conservation measures, and making informed management decisions. Such practices enable early detection of population declines and facilitate timely interventions.

In summary, the Lana Conservation Area serves as a vital habitat for a diverse array of bird species, including several that are threatened or near-threatened. The data underscores the importance of ongoing conservation efforts, habitat protection, and continuous monitoring to preserve the region's avian biodiversity

Overall, the results demonstrate the high avian diversity within the Lana Conservation Area, with a notable proportion of species under various threat categories, underscoring the importance of continued conservation and monitoring efforts in the region. Studying birds in these areas is crucial for biodiversity conservation, ecological research, climate monitoring, public engagement, and economic sustainability. Birds are excellent indicators of biodiversity and environmental health. Monitoring bird populations can provide valuable data on the state of ecosystems. Birds play key roles in ecosystems, such as seed dispersal, pest control, and pollination. Studying their interactions within the ecosystem helps in understanding and maintaining ecological balance. This area still contains several important species such as Great Argus, Hornbills and Babbler species which can be used as the indicator of a forest ecosystem.

9.0 RECOMMENDATION

From this study, some recommendations are made as follows:

i. Enhance Protection for At-Risk Species

Launch focused efforts to safeguard bird species at high risk of extinction, especially those listed as Critically Endangered and Vulnerable. Priority should be given to the Helmeted Hornbill and other hornbills, which are essential for forest regeneration through seed dispersal.

ii. *Safeguard and Rehabilitate Natural Habitats*

Conserve the remaining forest ecosystems within the Lana Conservation Area. Additionally, initiate habitat rehabilitation projects in deforested or degraded zones to aid in the recovery of species with shrinking populations and restricted habitats.

iii. *Broaden and Combine Survey Techniques*

Maintain the use of passive acoustic tools, such as Tascam audio recorders, and incorporate other methods like mist-netting and direct observation. A mixed-methods approach will yield a more accurate and holistic view of bird species diversity and trends over time.

iv. *Foster Community Engagement and Education*

Encourage local involvement in bird conservation by raising awareness through outreach programs and promoting community-based ecotourism. These initiatives can help locals recognize the ecological and economic value of protecting avian species.

v. *Implement Ongoing Biodiversity Monitoring*

Carry out routine ecological assessments to track fluctuations in bird populations, species diversity, and conservation statuses. These insights will support data-driven decision-making and flexible management strategies.

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