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Bird Diversity in Ake Jawi Village, Aketajawe Lolobata National Park, Halmahera, North Maluku

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ABSTRACT

Aketajawe Lolobata National Park is located in the Wallacea area with 167,319.32 hectares. The park is home to 108 buffer villages, one of which is a bird-friendly village in Ake Jawi Village. This study aims to determine the types of birds, analyze diversity, dominance, and feeding habits. For data collection the visual encounter survey (VES) method was applied for bird sightings along available paths. The study identified 31 bird species grouped into 23 families and 31genus, 15 of them are Indonesian endemics, and 12 species are endemics to North Maluku. Based on the Shannon-Wiener diversity index, Ake Jawi Village belongs to the medium category, with an index value of 2.889, and a low dominance category with 0.098. The percentage of encounters with insect-eating birds (insectivore) such as the Glossy Swiftlet, Cotton-halmahera, and Goliath Lathe reached 39%, followed by frugivores such as the Papuan Hornbill, White Cockatoo, and Gray-headed Walik by 36%.

Introduction

The Wallaceae zone is a region flora and fauna that lies between the Malesiana and Australasian biogeographic realms. The separation is divided by an imaginary line from the Sunda Shelf to the west by the Wallacea line, and the Weber line for the east in the Sahul Shelf Area[1,2]. Currently, in the Wallacea region, there are 800 species of birds and 300 species of which are endemic birds. Supportive natural conditions greatly help the presence of endemic bird species, such as the expanse of the sea around the land we call an island. The areas included in this area are Sulawesi and its surrounding islands, the Maluku Islands, and the Nusa Tenggara Islands[3,4].

Indonesia has 54 national parks spread across 34 provinces with an area of 16,304,707.13 hectares[5]. The benefits of national parks that can be felt, namely as a place for research, education, culture, tourism, recreation, and a source of income for the surrounding community[6]. Aketajawe Lolobata National Park (TNAL) is a conservation area in North Maluku, Halmahera Island. This area is divided into two forest groups, namely the Aketajawe Forest Group and the Lolobata Forest Group. Geographically, it is located in Tidore City, Central Halmahera Regency, and East Halmahera Regency. The area has an area of 167,319.32 hectares, of which the Aketajawe Forest group covers 77,793.95 hectares and the Lolobata Forest group 89,525.37 hectares, accompanied by quite diverse landscapes [7,8]. A total of 56 species of birds are in four zones in TNAL [9].

One of the wild animals that can live in various types of habitats and is widely used by humans is the bird [10]. North Maluku is one of the areas included as EBAs (Endemic Birds Areas) and has 13 points which are IBA areas (Important Bird Areas) [11]. Ake Jawi Village in TNAL is one of the areas included in the EBAs section, so that becomes an important area for birds, especially endemic birds. It is known that the national park has several zones, where the zone that can be empowered is the utilization zone. Therefore, the interests of natural tourism and other uses are in this zone, because the location, conditions and natural potential are designed to support this [12,13]. This location is in a primary forest area, so the canopy cover of the observation path is very tight.

The beauty of nature and avifauna diversity can be found in one of the buffer villages TNAL, Ake Jawi Village. On August 17, 2019, the village was declared a “Bird Friendly Village” due to the increasing number of bird-watching and photography tourists throughout the year. The birds in Ake Jawi Village are highly valued as assets that can improve the local economy, which makes them more guarded and protected. Various exotic and endemic birds can be found in this village, such as Wallace's Standardwing, Rail Drummers, Ivory-breasted Pitta, North Moluccan Pitta, and members of the Alcedinidae family [14,15,16]. Therefore, information about the diversity of bird species in developing ecotourism activities specifically for bird watching is needed.

This study aims to identify the different types of birds present in Ake Jawi Village, Aketajawe Lolobata National Park, Halmahera, North Maluku, and analyze their diversity, abundance, and feeding habits. The hypothesis posited in this study is that there is a wide variety of bird species, with varying levels of dominance, and diverse types of bird feed available in the study area.

Method

The research was conducted on 21-22 May 2022 in Ake Jawi Village, Aketajawe Lolobata National Park, Halmahera, North Maluku, located between 0°29'34.5" North Latitude and 127°44'35.5" East Longitude (Fig. 1). Data collection is done by following the available paths.

The equipment used in this study included binoculars, digital cameras, writing implements, notebooks, watches, and a field guide book "Birds of the Indonesian Archipelago Greater Sundas and Wallacea" and a booklet "Birds in Indonesia: List and Status 2021[15,17]. Data collection used the Visual Encounter Survey (VES) method or visual encounter survey [18]. Observations do at 07.00-12.00 and 18.00-20.00 [19,20]. The records included: the time of the encounter, the type of bird, and the number of individuals.

Bird data analysis carried out in a quantitative descriptive manner, including:

1. Species Diversity Index

Used to determine the diversity of bird species. In calculating the value of the species diversity index is determined by the Shannon-Wiener index[21] with the following equation:

$$H' = -\sum pi \ln pi$$

$$pi = \frac{ni}{N}$$

H' = Species diversity index
pi = Proportion of important values of the i-th kind
ln = Natural logarithm
ni = Number of individuals in type 1
N = Number of individuals of all species

The range of the Shannon-Weiner diversity index is as follows [22]:

- H' < 1 value : Low diversity, high ecological pressure
- 1 < H'< 3 value : Medium diversity, moderate ecological pressure
- H' > 3 value : High diversity, low ecological pressure

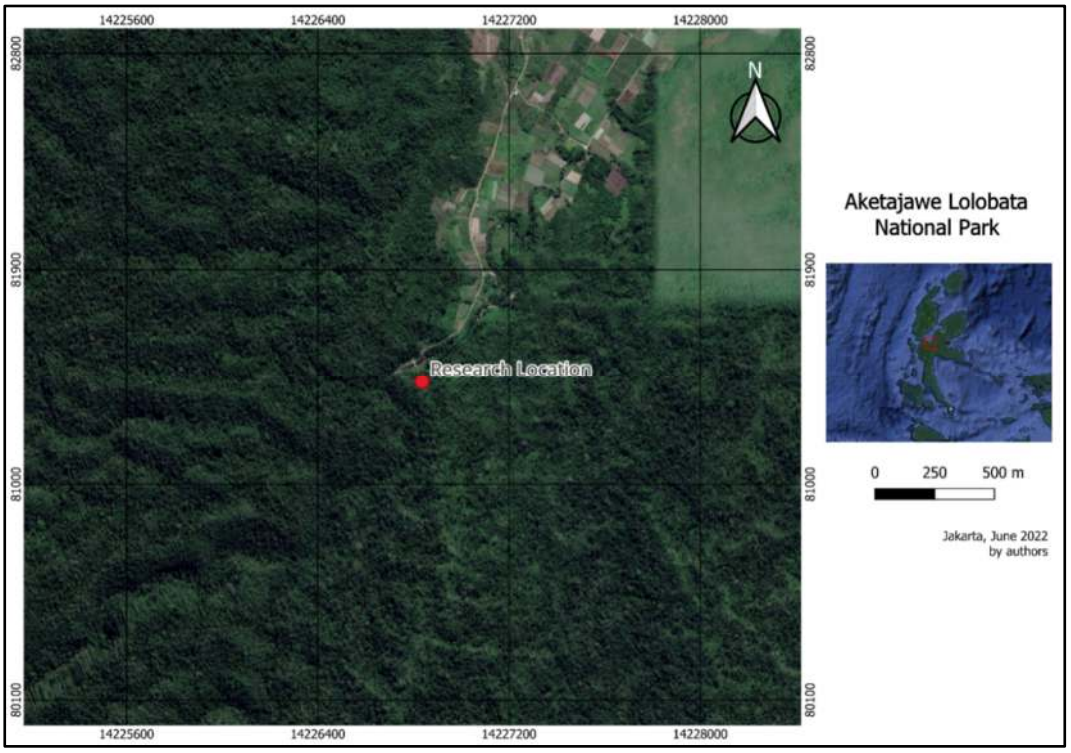

Fig 1. Mapof observation locations in Ake Jawi Village, Aketajawe Lolobata National Park

2. Simpson Dominance Index (D)

Dominance is the ratio between the number of individuals in a species with the number of individuals in the entire species. Dominance value index can be calculated bythese formula [23]:

$$D = \sum (pi)^2$$

$$pi = \frac{ni}{N}$$

D = Simpson dominance index
pi = Proportion of important values in type i
ni = Number of individuals in type 1
N = Number of individuals of all species

The range of the Simpson dominance index is as follows [24]:

- 0 < D < 1 value : Low dominance
- D > 1 value : High dominance

3. Feeding Guilds

Data of bird feeding guilds grouped based on the six types of feeds, such as frugivore birds eat fruit, granivore birds eat grain, nectarivore birds eat nectar, insectivore birds eat insects, piscivore birds eat fish and carnivore birds eat meat [25].

Results and Discussion

There are 31 species of birds from 23 families and 31 genus detected in the field. Consisting of 15 Indonesia endemics and 12 species are endemics to North Maluku (Table 1). The number of birds found did not differ much from the results of the other previous research [9] on the buffer zone, because Ake Jawi Village is in the TNAL buffer zone. However, when compared with recent research, there are 59 species found in the Ake Jawi Resort [26]. The habitat of composition is a heterogeneous forest consisting of mixed gardens, pure gardens, inter-cropping gardens, community forests, rice fields, and horticulture[26]. It makes a variety of bird species encountered, ranging from raptors to water birds can be found there [27,28,29].

Based on the research results, 11 bird species included in protected status Peraturan Menteri Lingkungan Hidup dan Kehutanan Republik Indonesia Number P.106 of 2018, 5 species have Appendix I status, and four species have Appendix II CITES status, one species has NT (Near Threatened) status, and one species with IUCN EN (Endangered) status (Table 1). However, the areas within and around the national park area are still known to be the most vulnerable locations for the capture and trade of parrot species in Indonesia [30,31,32].

Based on the Atlas Burung Indonesia, the Electus Parrot the fourth most kept and recorded as many as 50 were caught in 2012[33]. Currently, there is also smuggling of two Electus Parrot and several other protected animals. However, this attempt was thwarted by forestry police officers and forest ecosystem controllers Bidang Konservasi Sumber Daya Alam Wilayah I Sorong Balai Besar Konservasi Sumber Daya Alam (BBKSDA) [34]. Besides that, there are still many translocations of parrots, one of BBKSDA East Java to BKSDA Maluku, totaling 17, and one of them is a type of Umbrella Cockatoo [35,36,37].

Table 1. Compositions of bird species based, on protection, trade, and threat status

Family	Scientific Name	Species Name	IUCN	CITES	Permen P.106	Endemic	
						Ind	Malut
Accipitridae	*Haliastrus indus*	Brahminy Kite	LC	I	1		
Accipitridae	*Tachyspiza henicogramma*	Halmahera Goshawk	NT	I	1	√	√
Alcedinidae	*Tanysiptera galatea*	Common Paradise-kingfisher	LC				
Alcedinidae	*Todiramphus diops*	Blue-and-white Kingfisher	LC			√	√
Apodidae	*Collocalia esculenta*	Glossy Swiftlet	LC				
Ardeidae	*Egretta garzetta*	Little Egret	LC				
Bucerotidae	*Rhyticeros plicatus*	Blyth's Hornbill	LC	II	1		

Cacatuidae	*Cacatua alba*	Umbrella Cockatoo	EN	II	1	√	√
Campephagidae	*Lalage aurea*	Rufous-bellied Triller	LC			√	√
Columbidae	*Ptilinopus hyogastrus*	Grey-headed Fruit Dove	LC			√	√
Columbidae	*Macropygia doreya*	Sultan's Cuckoo Dove	LC				
Cuculidae	*Centropus goliath*	Goliath Coucal	LC			√	√
Cuculidae	*Cacomantis variolosus*	Australian Brush Cuckoo	LC				
Dicaeidae	*Dicaeum schistaceiceps*	Halmahera Flowerpecker	LC			√	√
Megapodiidae	*Megapodius freycinet*	Dusky Scrubfowl	LC		1	√	
Meliphagidae	*Melitograis gilolensis*	White-streaked Honeyeater	LC			√	√
Meropidae	*Merops ornatus*	Blue-tailed Bee-eater	LC				
Monarchidae	*Symposiachrus trivirgatus*	Moluccan Spectacled Monarch	LC				
Nectariniidae	*Leptocoma aspasia*	Black Sunbird	LC				
Nectariniidae	*Cinnyris ornatus*	Ornate Sunbird	LC				
Paradisaeidae	*Lycocorax pyrrhopterus*	Halmahera Paradise-crow	LC	II	1	√	√
Paradisaeidae	*Semioptera wallacii*	Wallace's Standardwing	LC	II	1	√	√
Passeridae	*Passer montanus*	Eurasian Tree Sparrow	LC				
Pittidae	*Erythropitta rufiventris*	North Moluccan Pitta	LC		1	√	
Pittidae	*Pitta maxima*	Ivory-breasted Pitta	LC		1	√	√
Psittacidae	*Geoffroyus geoffroyi*	Red-cheeked Parrot	LC	I	1		
Psittacidae	*Eclectus roratus*	Electus Parrot	LC	I	1	√	
Pycnonotidae	*Hypsipetes chloris*	Halmahera Golden Bulbul	LC			√	√
Rhipiduridae	*Rhipidura leucophrys*	Wilie Fantail	LC				

Strigidae	*Otus magicus*	Moluccans cops Owl	LC	I
Strunidae	*Aplonis metallicca*	Metallic Starling	LC	

Notes: Ind= Indonesia; Malut= Maluku Utara

1. Diversity of Bird Species

Based on the Shannon-Wiener diversity index criteria, bird species diversity in Ake Jawi Village TNAL has an index value of 2.889 belongs to moderate diversity. The vegetation structure in a habitat greatly influences the value of bird species diversity [38,39]. It is evident from the other previous research, that mixed vegetation has a greater variety of bird species encountered[40]. Especially if the vegetation becomes a feeding guild and a place for the birds to take shelter, by all means, there will be more and more birds inhabiting that habitat.

In addition, the density and openness of the canopy also affect encountered bird diversity. The more open habitat canopy, the greater encounter number of birds, and vice versa. However, if the open-titled habitat has a lot of human activity, it will reduce encounters with birds. The birds are sensitive to movement and sound around them, which can cause birds not to return to that location [40,41,42,43].

2. Dominance of Bird Species

Based on the Simpson dominance index criteria, the dominance of bird species in Ake Jawi Village, TNAL has a low dominance index value of 0.098, indicating that area has relatively equal representation and no species dominate over the others [44,45,46]. Despite having a relatively high frequency of sightings, with an average encounter value of 12.5 the Blyth's Hornbill (*Rhyticeros plicatus*) does not contribute significantly to the dominance index.

Common Blyth's Hornbill are found living in groups, sometimes two, three, or even up to five or six individuals. Its habitat preference is lowland forest that is still undisturbed, accompanied by the presence of tall trees with large crowns. Generally, used by the hornbill as a feeding guild and nesting sites [47,48].

3. Feeding Guilds

Based on research conducted, 39% of insectivore birds are more common in Ake Jawi Village (Fig 2). As for the types of insect-eating birds found, namely: Glossy Swiftlet, Rufous-bellied Triller, Goliath Coucal, Australian Brush Cuckoo, White-streaked Honeyeater, Blue-tailed Bee-eater, Moluccan Spectacled Monarch, North Moluccan Pitta, Ivory-breasted Pitta, Halmahera Golden Bulbul, Wilie Fantail, and Moluccanscops Owl. One of the commodities in the buffer zone is coconut trees. The presence of coconut trees attracts many insects to the nectar and flower buds of young coconuts [9,49,50].

Apart from eating insects, there are 36% of frugivore (Fig 2). The types of fruit-eating birds encountered were: Blyth's Hornbill, Umbrella Cockatoo, Grey-headed Fruit Dove, Sultan's Cuckoo Dove, Halmahera Flowerpecker, Dusky Scrubfowl, Halmahera Paradise-crow, Wallace's Standardwing, Red-cheeked Parrot, and Electus Parrot. It is because many trees support bird feed, one of which is *Ficus benjamina*, infested by the Blyth's Hornbill [9]. These fruit-eating birds play a role in the seed dispersal process, making this role very important in the forest regeneration process [51,52].

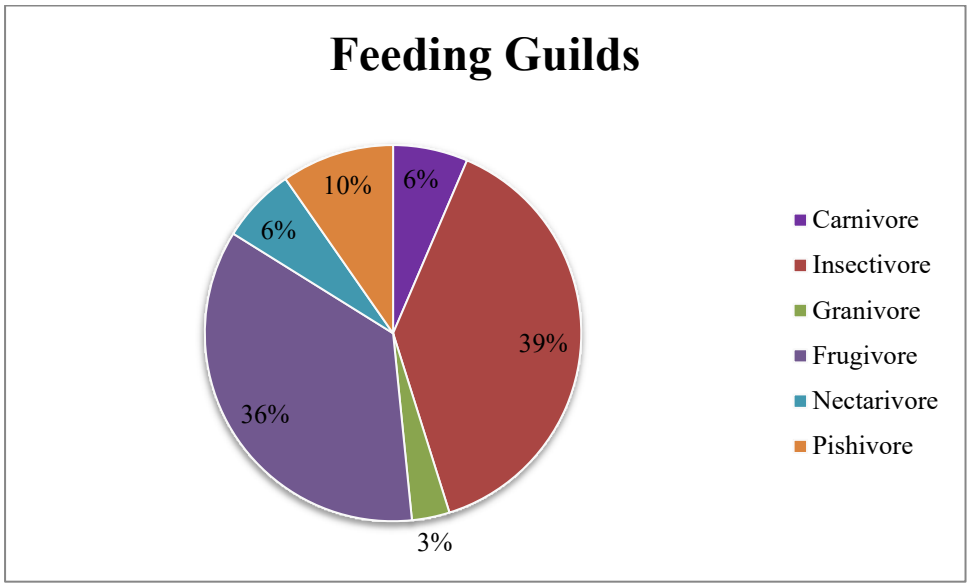

Fig 2. Percentage of feeding guilds in Ake Jawi Village, Aketajawe Lolobata National Park

Conclusion

The results of this study found as many as 31 species of birds from 23 families and 31 genus, 15 of them are endemics to Indonesia, and 12 species are endemics to North Maluku. Ake Jawi Village, Aketajawe Lolobata National Park is included in the moderate diversity category with a diversity index value of 2.889; while the dominance is low with a value of 0.098; and the type of feed that dominates is the type of bird that eats insects (insectivore).

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