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Exploration of Bird Diversity Potential for Birdwatching Ecotourism in Bangbayang Village, Sumedang, West Java

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Abstract

Sumedang was one of the West Java Province districts with 26 sub-districts, 7 neighbourhoods, and 270 villages. Bangbayang Village, located in the Situraja neighborhood, was one of the villages with ecotourism potential that had not been fully developed. The topography of the village, characterized by hills, had its own charm, and its biodiversity had not been widely explored. One aspect of this biodiversity that had potential for ecotourism was the diversity of bird species. Therefore, the research aimed to explore the potential and diversity of birds in Bangbayang Village, Sumedang, in the context of developing birdwatching science and ecotourism. The study was carried out in January 2023. The bird observed uses the point count method. The results were 35 species of birds in 20 families, of which 12 were endemic to Indonesia; two h NT (Near Threatened) species, two EN (Endangered) species; six species included in the CITES Appendix II category; eight species protected by Ministerial Regulation P. 106 of 2018. The diversity index, species richness index, and evenness index values were high, recorded at 3.343, 7.575, and 0.940, respectively, while no bird species dominated, with a dominance index value of 0.043. Based on their status, there are nine species that have the potential to be an attraction, namely the black eagle, Javan hawk-eagle, crested serpent-eagle, oriental honey-buzzard, flame-fronted barbet, black-banded barbet, bar-winged prinia, black-thighed falconet, and java sparrow.

Keywords: Attraction, Bird, Conservation Status, Ecotourism, Topography

INTRODUCTION

Sumedang is one of the districts in West Java Province, with an area of 155,871.98 hectares. Based on *Peraturan Daerah (PERDA) Kabupaten Sumedang Nomor 2 Tahun 2012 tentang Rencana Tata Ruang Wilayah Kabupaten Sumedang untuk periode 2011-2031*, this district consists of 26 sub-districts, 7 sub-districts, and 270

villages. One of the villages with ecotourism potential that has yet to be fully developed is Bangbayang Village, located in Situraja. The existence of hills in this village gives its own attraction. Bangbayang Village has an area of 8.35 km² with a population of around 945 people. Most of the population works in the agricultural and household industries. The village government and the developer have provided various facilities and developed to support community empowerment, such as the development of coffee plantations, outbound, nature education, and research sites (Imanuddin, 2016; Sumedang Regency Government, 2019).

Various studies have been conducted in Bangbayang Village, which has produced data on biodiversity in the village. The study noted the existence of four species of primates (unpublished), 24 species of herpetofauna (unpublished), 12 species of edible mushrooms (Qonita et al., 2023), and 65 species of medicinal plants (Riany et al., 2024). This biodiversity could support the development of ecotourism in Bangbayang Village. This is also in line with *Peraturan Daerah (PERDA) Kabupaten Sumedang Nomor 10 Tahun 2020 tentang Rencana Induk Pembangunan Kepariwisataan Kabupaten Sumedang Tahun 2021-2025*, that ecotourism is an environment-based tourism activity by prioritising nature conservation, socio-cultural and economic empowerment of local communities, as well as aspects of learning and education.

Birdwatching is one of the ecotourism options offered by destinations with various tour packages. Enthusiasts of birdwatching often form the largest group of tourists and are typically highly educated, financially stable, and deeply committed to environmental conservation. These qualities make them ideal participants in promoting community-based conservation efforts. Birdwatching has significant potential to improve local communities' economic and environmental well-being while also serving as an educational tool to raise awareness about biodiversity and create incentives for protecting natural habitats. (Sekercioglu, 2002).

Based on a literature review conducted by the author, no research has been found on the diversity of bird species as a tourist attraction in Bangbayang Village, Sumedang. Considering the potential of bird ecotourism in supporting sustainable development, this study aims to explore the potential and diversity of birds as an attraction in Bangbayang Village. The benefits of this research are also for the development of science and can be an additional income for the local community in Bangbayang Village.

METHOD

1. Time and Location

The research was carried out in January 2023 in Bangbayang Village, Sumedang, West Java, between 06°54'55.8" North Latitude and 107°58'38.2" East Longitude. Observations were made in the morning between 07.00 and 10.00 WIB. Data was collected in communities in the ecotone area until it entered the secondary forest. The

map of the location of the bird observation point in Bangbayang Village is presented in Figure 1.

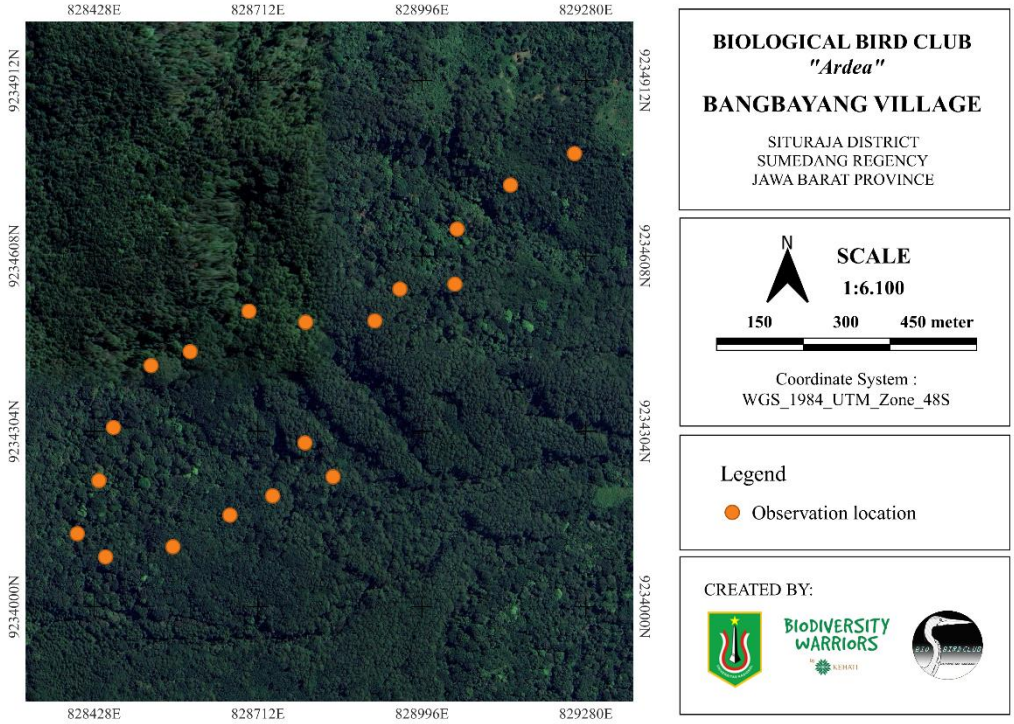

Figure 1. Research Map Location

2. Research Equipment

The equipment used in this study is binoculars, digital cameras, stationery, notebooks, digital watches, GPS (Global Positioning System), and field guide book "Birds of the Indonesian Archipelago Greater Sundas and Wallacea" and a booklet "Birds in Indonesia: List and Status 2021 (Burung Indonesia, 2021; Eaton *et al.*, 2021).

3. Data Collection Method

Bird observation uses the point count method, where the observer walks along the path and silently observes the presence of birds at a predetermined observation point (Bibby et al., 2000). Observations were carried out for 5 minutes with an observation radius of ± 50 meters and a distance between points of 100 m at each counting point so there would be no repetition of recording. The number of observation points is 19 from ecotone communities entering secondary forests, the consideration in choosing a survey location is to see the potential for biodiversity. The parameters observed were the number of species and individuals in the three observation sites in each of the different communities (Buckland et al., 2015).

4. Data Analysis

a. Conservation Status

All data is obtained, tabulated, and sorted by family. The conservation status of the species recorded refers to the IUCN Red List of Threatened Species, CITES, and Peraturan Menteri Lingkungan Hidup dan Kehutanan P.106/MENLHK/SETJEN/KUM.1/12/2018.

b. Species Diversity Index

The Shannon-Wiener species diversity index is used to determine the level of diversity of flora and fauna species. In the calculation of the value of the species diversity index, the Shannon-Wiener Index (Magurran, 1988) is determined with the following equation:

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

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

Notes:

H' = Shannon-Weaner diversity index
pi = The proportion of essential values of each species
ln = Natural Logarithms
ni = Number of individuals on each species
N = Number of individuals of all species
The range of the Shannon-Weaner diversity index is as follows (Fachrul, 2012):
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

c. Margalef Richnees Index

The Margalef richness index assesses species richness in a community or ecosystem. The value of Margalef richness (Magurran, 2004) can be calculated as follows:

$$D_{mg} = \frac{(S - 1)}{LN(N)}$$

Keterangan:

D_{mg} = Margalef richness index

S = Number of species found

The range of Margalef richness index is as follows:

D_{mg} < 2,5 value: Low richness

2,5> D_{mg} > 4 value : Medium richness

D_{mg} > 4 value : High richness

d. Eveness Index

The evenness of bird species in a community can be calculated using the formula of the species equality index according to (Fachrul, 2012) as follows:

$E = \frac{H'}{ln(S)} \times 100\%$Notes:

E = Evenness index

e. Dominance

The Simpson species dominance index measures the extent to which some species dominate a community in terms of the number of individuals. The value of dominance (Daget, 1976) can be calculated as follows:

$$D = \Sigma\left(\frac{ni}{N}\right)^2$$

Notes:

D = The Simpson dominance index

The range of Simpson's dominance index is as follows (Krebs, 1978):

0 < D < 1 value : Low dominance

D > 1 value : High dominance

RESULT

1. Conservation Status

Based on the research results, 35 species of birds were found to belong to 20 families, with 12 of them being endemic to Indonesia. A total of 31 species are classified as LC (Least Concern) in the IUCN Red List. However, two species are in NT (Near Threatened) status, namely takur tulung-tumpuk dan perenjak jawa, as well as two species that are categorized as EN (Endangered), namely the javan eagle and gelatik jawa. In addition, six species (black eagle, javan eagle, crested serpent-eagle, oriental honey-buzzard, black-thighed falconet, and java sparrow) are included in the CITES Appendix II category. Eight species (black eagle, javan eagle, crested serpent-eagle, oriental honey-buzzard, flame-fronted barbet, black-banded barbet, black-thighed falconet, and java sparrow) are also protected by Peraturan Menteri Lingkungan Hidup dan Kehutanan Nomor 106 Tahun 2018. The full list of bird species found during the survey can be seen in Table 1.

Table 1. List of conservation status of birds encountered

No.	Family	Species Name	Local Name	English Name	Conservation status			
					IUCN	CITES	Permen	Endemic
1.	Accipitridae	*Ictinaetus malayensis*	Elang hitam	Black Eagle	LC	II	√	-
2.		*Spizaetus bartelsi*	Elang jawa	Javan Hawk-eagle	EN	II	√	√
3.		*Spilornis cheela*	Elang-ular bido	Crested Serpent-eagle	LC	II	√	-
4.		*Pernis ptilorhynchus*	Sikep-madu asia	Oriental Honey-buzzard	LC	II	√	-
5.	Aegithalidae	*Pnoepyga pusilla*	Berencet kerdil	Pygmy Cupwing	LC	-	-	-
6.		*Halcyon cyanoventris*	Cekakak jawa	Javan Kingfisher	LC	-	-	√
7.	Alcedinidae	*Alcedo meninting*	Raja-udang meninting	Blue-eared Kingfisher	LC	-	-	-
8.	Apodidae	*Collocalia linchi*	Walet linci	Cave Swiftlet	LC	-	-	-
9.	Campephagidae	*Pericrocotus miniatus*	Sepah gunung	Sunda Minivet	LC	-	-	√
10.		*Pericrocotus flammeus*	Sepah hutan	Scarlet Minivet	LC	-	-	-
11.	Capitonidae	*Megalaima armillaris*	Takur tohtor	Flame-fronted Barbet	LC	-	√	√
12.		*Megalaima javensis*	Takur tulung-tumpuk	Black-banded Barbet	NT	-	√	√
13.		*Megalaima australis*	Takur tenggeret	Yellow-eared Barbet	LC	-	-	√
14.	Cuculidae	*Cacomantis merulinus*	Wiwik kelabu	Plaintive Cuckoo	LC	-	-	-
15.		*Cacomantis variolosus*	Wiwik uncuing	Brush Cuckoo	LC	-	-	-
16.	Cisticolidae	*Prinia familiaris*	Perenjak jawa	Bar-winged Prinia	NT	-	-	√
17.	Dicruridae	*Dicrurus macrocercus*	Sriguntin g hitam	Black Drongo	LC	-	-	-
18.		*Dicrurus leucophaeus*	Sriguntin g kelabu	Ashy Drongo	LC	-	-	-
19.		*Dicrurus remifer*	Sriguntin g bukit	Lesser Racquet-tailed Drongo	LC	-	-	-
20.	Dicaeidae	*Dicaeum trigonostigma*	Cabai bunga-api	Orange-bellied Flowerpecker	LC	-	-	-
21.		*Dicaeum sanguinolentum*	Cabai gunung	Blood-breasted Flowerpecker	LC	-	-	√

22.		*Dicaeum trochileum*	Cabai jawa	Scarlet-headed Flowerpecker	LC	-	-	√
23.	Estrildidae	*Eurylaimus javanicus*	Sempur-hujan rimba	Banded Broadbill	LC	-	-	-
24.	Falconidae	*Microhierax fringillarius*	Alap-alap capung	Black-thighed Falconet	LC	II	√	-
25.	Laniidae	*Lanius schach*	Bentet kelabu	Long-tailed Shrike	LC	-	-	-
26.	Nectariniidae	*Anthreptes malacensis*	Burung-madu kelapa	Brown-throated Sunbird	LC	-	-	-
27.		*Arachonthera longirostra*	Pijantung kecil	Little Spiderhunter	LC	-	-	-
28.	Paridae	*Parus major*	Gelatik-batu kelabu	Sultan Tit	LC	-	-	-
29.	Ploceidae	*Padda oryzivora*	Gelatik jawa	Java Sparrow	EN	II	√	√
30.	Pycnonotidae	*Pycnonotus goiavier*	Merbah cerukcuk	Yellow-vented Bulbul	LC	-	-	-
31.	Silviidae	*Orthotomus ruficeps*	Cinenen kelabu	Ashy Tailorbird	LC	-	-	-
32.		*Orthotomus sutorius*	Cinenen pisang	Common Tailorbird	LC	-	-	-
33.	Timaliidae	*Stachyris thoracica*	Tepus leher-putih	White-bibbed Babbler	LC	-	-	√
34.		*Macronous flavicollis*	Ciung-air jawa	Grey-cheeked Titbabbler	LC	-	-	√
35.	Vangidae	*Hemipus hirundinaceus*	Jingjing batu	Black-winged Flycatcher-shrike	LC	-	-	-

2. Species Diversity Index

Based on species diversity index (H') analysis from the study site, the species diversity index result is 3,343. According to Fachrul (2012), if the species diversity index values are more than 3, the species diversity index results show a high diversity index.

3. Margalef Richness Index

Based on the study site's margalef richness index (Dmg) analysis, the margalef richnees index result is 7,575. According to Magurran (2004), if the margalef richness index value is more than 4, the species diversity index results in showing a high richness diversity.

4. Eveness Index

Based on the pilot evenness index (E) analysis from the study site, the evenness index result is 0,940. According to Fachrul (2012), if the evenness index value is more than 0,5, species diversity index results show a stable evenness.

5. Dominance

Based on the dominance index (D) analysis from the study site, the dominance index result is 0,043. According to Daget (1976), if the dominance index value is lower than 1, the dominance index value shows a low dominance of species.

DISCUSSION

The diversity index at the study site showed a high level, which was in line with the type richness index and the evenness index, which also showed high values (Table 2). In addition, no one type of bird dominates the area (Table 2), so the distribution of birds becomes evener. Estimating variation in species richness and diversity at a location is crucial for both local communities and macroecology, and is often applied in conservation planning and addressing environmental changes. The ratio of green trees to fruiting trees has a positive correlation with bird species richness. A reduction or loss of predation can contribute to a decline in biodiversity. Biodiversity, maintained through interactions between predation and competition, can help reduce competition and thus promote coexistence (Terborgh, 2015; Barrowclough et al, 2016).

According to Sukara et al (2014), rare and protected birds are attracted to birdwatching ecotourism. Based on the findings, birds that have the potential to be an attraction for birdwatching ecotourism in Bangbayang Village include the black eagle, Javan eagle, crested serpent-eagle, oriental honey-buzzard, flame-fronted barbet, black-banded barbet, black-thighed falconet, and java sparrow (Figure 2). Study in Sagita (2021), Jatimulyo Village has 11 species of birds that are interesting to be used for birdwatching ecotourism, namely the Javan sunbird (*Aethopyga mystical*), crested serpent-eagle (*Spilornis cheela*), and nine of them are not endangered birds under the IUCN RedList and are protected, little spiderhunter (*Arachnothera longirostra*), long-billed spiderhunter (*Arachnothera robusta*), common flameblack (*Dinopium javanense*), hill prinia (*Prinia superciliaris*), chestnut-breasted malkoha (*Phaenicophaeus curvirostris*), grey-cheeked titbabbler (*Mixornis flavicollis*), javan kingfisher (*Halcyon cyanoventris*), black-naped fruitdove (*Ptilinopus melanospilus*), and ashy drongo (*Dicrurus leucophaeus*). This can happen because these species are already difficult to find in the wild, have unique behavior, and have beautiful feathers, so they are still attractive to bird watchers.

Figure 2. Several species of birds were documented during the study

The potential of birdwatching ecotourism is evident from the high diversity of species in the area. (Supriatna, 2014). In addition to birdwatching, other ecotourism activities that can be carried out include bird photography, nest adoption, and bird release. These activities show that tourism and bird conservation support each other and benefit birds and local communities (Afif et al, 2023). Birdwatching also has a lower impact compared to other outdoor activities that are often considered ecotourism, such as chasing

cheetahs using vehicles in Masai Mara, using jet boats in New Zealand canyons, or off-road trips that damage soil layers in different parts of the world. (Weaver 1998; Page & Dowling 2002).

Bird habitat preferences, especially in making nests, are a form of sustainable tourism or ecotourism. Research has been carried out to find the species of trees as bird nests are found in Javan eagles. The javan eagle (*Nisaetus Bartelsi*) uses a tree with an open crown (emergent tree); in the study, it is known that the types of trees used as nests are such as *pohon huru* (*Pisonia grandis*), *pohon suren gunung* (*Toona Sureni*), *pohon renghas* (*Gluta renghas*). Javan eagles also use epiphytic plants such as *kadaka* (*Asplenium scolopendrium*) as materials to make nests (Nani (2014). Understanding bird habitat preferences is one of the most important factors in designing ecotourism for birdwatching in Bangbayang Village.

CONCLUSION

Bangbayang Village has strong potential as an ecotourism destination, particularly for birdwatching. Research shows that the diversity index, species richness index, and evenness index all have high values, with no single bird species dominating the area. Additionally, nine bird species have been identified as potential attractions for birdwatching in Bangbayang Village: the black eagle, javan eagle, crested serpent-eagle, oriental honey-buzzard, flame-fronted barbet, black-banded barbet, black-thighed falconet, and Java sparrow.

The existing potential also needs to be improved in several ways, such as strengthening the community's capacity to identify birds to become guides, determining strategic observation points, and inventorying plant species as bird habitats. In addition, the development of supporting infrastructure such as lodging and information flyers to support the sustainability of ecotourism. Thus, birdwatching ecotourism can provide ecological, social, and economic benefits for local communities.

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