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Bird Diversity in the Indonesian Karst Museum Area Wonogiri, Central Java

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ABSTRACT

The Indonesian Karst Museum area has potential that is beneficial to education and human civilization, especially in terms of conservation and data collection on biodiversity, which has not been widely carried out. The purpose of this study is to determine the variety of bird species in the Indonesian Karst Museum Area. The research was carried out in November 2024. Data were gathered from observations using the point count method and analyzed on-site. The observations were conducted at two places. The observed bird species were then recognized, the number of individual preferences was counted, and the results were entered into the observation table. The findings revealed that there were 21 bird species belonging to 17 families and eight orders. The diversity index value (H') of birds in the Indonesian Karst Museum region in the two lines averaged 1.7, indicating that species diversity was moderate at all study stations. A bird's high or low abundance value may be used to assess its capacity to adapt to environmental conditions. The natural conditions in the Indonesian Karst Museum area are karst, which supports the lifestyles of several bird species, each with its own set of advantages and disadvantages.

Keywords: bird, diversity, museum karst, wonogiri

INTRODUCTION

There are currently three major challenges that are directly tied to everyday life: climate change, biodiversity, and food security. Simply expressed, biodiversity refers to the variety of plants and animals that live in a given location (Saputra et al., 2019). Indonesia is recognized as a mega biodiversity country with a high level of biodiversity. According to National Geographic Indonesia (2019), Indonesia is recognized as a mega biodiversity country with a high level of biodiversity. Indonesia has the highest biodiversity in Southeast Asia and ranks second globally behind Brazil, earning it the title of "the world's mega biodiversity nation" and inclusion in the "biodiversity hotspot nation" category. This is rooted in Indonesia's geographical location. Indonesia is made up of thousands of islands that span the equator and connect Asia and Australia

(Mufti et al., 2011). Avifauna, sometimes known as birds, is one of Indonesia's natural resources. According to recent data from the Indonesian Bird Institute (2025), the diversity of bird species in Indonesia in 2024 grew over the previous year, 2023, from 1826 to 1835. Indonesia has 1835 avian species, 542 of which are endemic, 558 of which are protected, and 164 bird species listed as endangered.

Birds provide numerous benefits, including food, pets, economic support, and aesthetic value. Because of the impact on bird species and natural habitats, the number of individuals who use birds is growing (Rifyant et al., 2021). Birds that live in specific habitats have a special link with the ecosystem and can help to increase the area's biodiversity. Birds play a crucial role in food processing and preservation. For example, some birds eat plants while others eat creatures like insects or earthworms. The interaction between food and all living things in an ecosystem contributes to the abundance of one species over another; identifying bird diversity in a certain place can aid in understanding the ecosystem (Huzni, 2018).

Bird species have an important role in the long-term viability of an ecosystem. This condition is evident in the shape of the chain system and food webs, which are always linked to other ecosystem elements such as animals, insects, and plants (Kartikasari et al., 2024). According to Bachri et al. (2020), the presence of birds in a location reveals environmental indicators, as birds can serve as bioindicator organisms. Bird habitats are primarily used for living, reproducing, and finding food. Birds live in a range of environments, both forest and non-forest, including caverns, grasslands, residential areas, yards, farms, plantations, and water (Sjafani et al., 2022). Birds have economic worth as pets because of their lovely voices and feathers. But because of bird trade and maintenance, commercially valuable birds are becoming more and more in danger of going extinct (Mubarik et al., 2020)

The Indonesian Karst Museum area has potential that is beneficial for education and human civilization, especially in terms of conservation and the collection of biodiversity data. This area has not been widely researched and few ecological studies have been conducted, even though the Indonesian Karst Museum area contains various habitats that support bird populations, including secondary forests, plantations, and residential areas. The Indonesian Karst Museum Area is a tourist attraction that includes caves, hills, and waterways, so each location has potential for accommodation and other interests. However, if left unchecked, there is the potential to destroy the habitats of the creatures that live there, especially bird habitats. Human and environmental threats might endanger the ecology and reduce the diversity found in the Indonesian Karst Museum area.

The Indonesian Karst Museum Tourism Area in Pracimantoro Subdistrict, which covers an area of 30 ha (Dewandanu & Priyatmono, 2021), was established based on Wonogiri Regency Regulation Number 9 of 2011, which regulates the Wonogiri Regency Spatial Plan for 2011-2031. The tourist area falls under the heading of artificial tourism. The noteworthy aspect of this tourist destination is that, in addition to the museum, it offers natural tourism in the form of karst landscapes. The tourist area's caves include Sodong Cave, Tembus Cave, Gilap Cave, Potro Bunder Cave, Luweng Sapen, and Mrico Cave (Kunardi et al., 2020). The Wonogiri Government

has transformed this area into a tourist attraction, with museums and caves. This must be considered when developing karst museum attractions, as if they reach the level of mass tourism, they may indirectly harm the flora and fauna in their environment due to recreational activities accompanied by a rise in tourist numbers (Mubarik et al., 2020). Birds play significant economic and ecological responsibilities, but are also sensitive to population and biodiversity reductions. Mining activities have the ability to alter the landscape, altering and harming the conditions of the land, water, and air that provide habitat for birds (Humami et al., 2022).

Based on the information provided, this study was conducted to determine the variety of bird species in the Indonesian Karst Museum Area, Wonogiri, Central Java. The richness of bird species in the Indonesian Karst Museum area can serve as valuable information, yielding economic, conservation, and educational benefits for the area's long-term management.

METHOD

Research Location. In November 2024, the study was carried out in Wonogiri, Central Java, in the Indonesian Karst Museum Area. Data was gathered in the vicinity of the Indonesian Karst Museum. Mudal, Gebangharjo, Pracimantoro sub-district, Wonogiri district, Central Java 57664 is the address of the Indonesian Karst Museum. The research is restricted to the tourist trail between caves, which is the primary potential for karst tourism, even though the karst museum region spans 30 hectares in Gebangharjo Village, Pracimantoro District, Wonogiri Regency. Data on birds was gathered between 06.00-09.00 WIB and 15.30-17.00 WIB. Because there is more activity during the day and at night, observations were performed during these periods (Rifyant et al., 2021). Figure 1 depicts the research site.



Figure 1. Research Location Map

Research Object and Tools. The study's object was to determine the number of species and individuals of bird in Museum Karst Wonogiri Area. Research tools used included GPS, camera, binoculars, stationary, e-bird website, iucnredlist.org, and bird identification books of Sumatra, Kalimantan, Java, and Bali (SKJB).

Research Methods and Design. The study's variables were confined to the species and quantity of birds discovered in the Indonesian Karst Museum areaData was collected through observation using the exploration method. The exploration method is a method carried out by walking around the observation area and then recording the birds found during the observation (Rafik et al., 2023).

Data Collection. The observation stations were established by first analyzing the encounter frequency of several bird species. Data collection was conducted during November 2025, when the rainy season had arrived. The first observation was conducted in the afternoon between 3:00 p.m. and 5:00 p.m. WIB, while the second observation was conducted in the morning between 8:00 a.m. and 9:00 a.m. WIB. Furthermore, each spotted species was studied and characterized in terms of morphology, as well as photographed if available. Observations were made not only at observation stations, but also on the way from one location to another (Fadhillah, 2020).

Bird data collecting also included recording and documenting. Bird data collection comprised the number of individual birds, local and scientific names, and threat status according to IUCN and Indonesian rules. Cameras, binoculars, cellphones were utilized to document seen bird species, which were then used to identify the species. Bird species observed in the field were recorded using the Field Notes method and the Bird Identification Guide for Sumatra, Kalimantan, Java, and Bali by Taufiqurrahman et al., (2022).

Data Analysis. Data analysis procedures were descriptive, with bird species identified using field guides. This method involved reviewing the notebook for each observation and creating a complete list of the place and date of observation, as well as supplementary data such as plumage, body size, beak shape, feet, and distinctive traits for identification purposes. The data obtained is presented in tabular format. The information about this bird comes from the IUCN Red List of Threatened Species, which can be found at iucnredlist.org. The present protection status was determined by the Minister of Environment and Forestry Regulation (Permen LHK) No. 106/2018 on the Second Amendment to P.20/MENLHK/SETJEN/KUM.1/6/2018 on Protected Plant and Animal species. Bird data analysis also makes use of the Diversity Index (H') (Shannon - Wienner) (Magurran, 2004).

RESULT AND DISCUSSION

Diversity of Bird Species

Based on the results of the survey of bird species in the Museum Karst Indonesia area, Wonogiri, Jawa Tengah, there were 21 bird species with a total of 162 individuals detected throughout all habitat types of Museum Karst (Table 1), with 13 bird species in the path A and 17 bird species in path B. Along route 1, the environmental conditions encountered include

agricultural land, teak trees, and waterways. Meanwhile, along route 2, you will find residential areas, caves, hills, denser canopy, and steep cliffs. The Karst Museum has a diverse range of bird species. On path b, more species were found than on path a, with 17 species in total (Figure 2). Research on avifauna is crucial when an area has a high abundance, as it can indicate a favorable environment. Avifauna play crucial roles in seed distribution, pollination, and predator control (Devi et al., 2020).

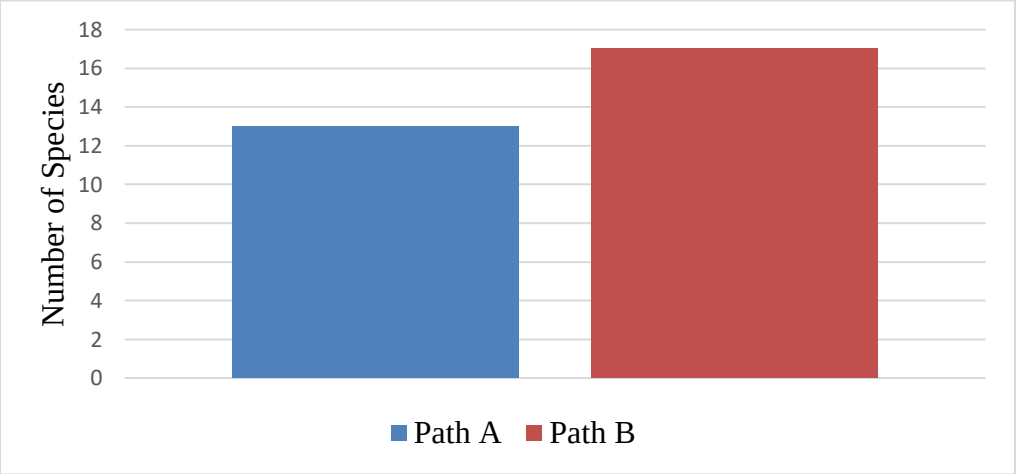


Figure 2. Comparison of The Number of Bird Species in the Wonogiri Karst Museum area

Furthermore, the karst region is still experiencing quite severe damage. This is feared that many species are threatened with extinction and it is likely that there are species that have not been identified to become extinct first (Prakarsa & Ahmadin, 2017). The karst environment is a unique and specialized ecosystem with a high level of biodiversity, including vegetation. This causes various types of animals found in karst to be unique species that adapt specifically to karst environmental conditions, resulting in a cascade of other changes, including changes in microclimate, food availability, niche conditions, and other environmental factors. Making these alterations may have an influence on species that reside in karst areas. Various varieties of karst plants also provide rest, refuge, and play areas for various bird species. Another significant function of vegetation for birds is as a breeding and nesting site. Major perturbations to karst vegetation caused by human activities will result in significant habitat alterations (Kunardi et al., 2020; Putri et al., 2017).

Habitat changes in karst areas will impact the condition of bird species living in the area. According to Putri et al. (2017), bird species that are more adaptable and tolerant of habitat changes are able to adapt and survive, which may lead to an increase in population size. However, the high level of endemism and the presence of vulnerable species in the karst ecosystem highlight the significance of maintaining the forest surrounding the cave so that this species can continue to thrive in the area. To preserve avian variety at the site, local management strategies should involve limiting further development near the cave and forest regions, as well

as strictly enforcing slash-and-burn agriculture practices (Duco et al., 2021). Some bird groups have survived till now because they have succeeded in carving out a unique niche for themselves in order to limit competition for resources and demands as a type of environmental adaptation (Mufti et al., 2011).

Table 1. Number of bird species recorded in the Indonesian Karst Museum Area, Wonogiri, Central Java

No	Order	Species	Path		Conservation Status
			A	B	
1	Passeriformes	*Pycnonotus aurigaster*	29	52	LC
2	Passeriformes	*Crypsirina temia*	2	0	LC
3	Passeriformes	*Orthotomus sutorius*	1	5	LC
4	Passeriformes	*Orthotomus sepium*	1	0	LC
5	Gruiformes	*Amaurornis phoenicurus*	2	1	LC
6	Columbiformes	*Spilopelia chinensis*	2	11	LC
7	Passeriformes	*Dicaeum trochileum*	1	4	LC
8	Passeriformes	*Aegithina tiphia*	1	1	LC
9	Coraciiformes	*Halcyon cyanoventris*	2	1	LC
10	Piciformes	*Psilopogon javensis*	1	1	LC
11	Piciformes	*Psilopogon haemacephalus*	1	1	LC
12	Apodiformes	*Collocalia linchi*	1	0	LC
13	Cuculiformes	*Cacomantis merulinus*	5	0	LC
14	Passeriformes	*Lonchura leucogastroides*	0	17	LC
15	Cuculiformes	*Centropus bengalensis*	0	1	LC
16	Passeriformes	*Pericrocotus cinnamomeus*	0	10	LC
17	Cuculiformes	*Cacomantis sepulcralis*	0	1	LC
18	Accipitriformes	*Spilornis cheela*	0	3	LC
19	Passeriformes	*Cinnyris jugularis*	0	1	LC
20	Passeriformes	*Malacocincla sepiaria*	0	1	LC
21	Piciformes	*Dendrocopos moluccensis*	0	2	LC

*LC: Least Concern (EBird, 2021; International, 2024).

The high value shown by a bird species such as *Pycnonotus aurigaster* or Sooty-headed Bulbul (Table 1.) found in the Museum Karst Indonesia area can be interpreted as an indication that the bird is able to adapt to environmental conditions, including physical conditions such as weather and landscape, as well as other supporting conditions such as food availability, types of vegetation, and other types of animals that share the environment. For roosting and shelter, *Pycnonotus aurigaster* often choose trees with open landscapes and sparse canopies (Nasihin & Rohmatullayaly, 2023). *Pycnonotus aurigaster* often mix with other *Pycnonotus* species and live in noisy and energetic groups. They prefer areas with open trees or shrubs, forest edges, parks, yards, secondary vegetation, and even large cities (Taufiqurrahman et al., 2022). This implies that certain types of food and environmental factors are necessary for bird survival. The species

and mix of trees in a community can provide specific food sources and environmental conditions for different bird species (Hutami et al., 2022).

H' values of Bird Species at Museum Karst Wonogiri

Based on the Shannon-Wiener diversity index (H') calculation results (Table 2), it can be claimed that the top lane is a rice field region with the maximum H' index value of 1.88 and is classified as medium. 17 bird species were detected, totaling 113 birds. The lowest H' value was in the path A lane at 1.62 and was classified as moderate, with 13 bird species and a total of 49 birds discovered (Table 2). In general, the Shannon-Wiener index (H') calculation results in an average value of 1.7 for both observation lines.

Table 2. H' values of Bird Species at Museum Karst Wonogiri

No	Aspect	Path		Category
		A	B	
1	Number of Species	13	17	-
2	Number of Individuals	49	113	-
3	Diversity Index (H')	1,62	1,88	Medium

According to Magguran (2004), H' 1.7 meets the medium requirement. This diversity index result is considered fairly good, indicating that the habitat in the karst museum region, specifically the karst section, continues to support avian life. This suggests that the vegetation conditions in the karst museum region are ideal for birds to locate food. According to Putra & Nurlaily (2021), the H' value of birds in the three Kemantren falls within the middle group. The Kemantren have balanced ecosystem conditions and mild ecological strain, allowing them to support and meet the needs of numerous bird species. The condition of vegetation structure in the environment influences the high diversity of bird species (Tortosa & Villafuerte, 2000).

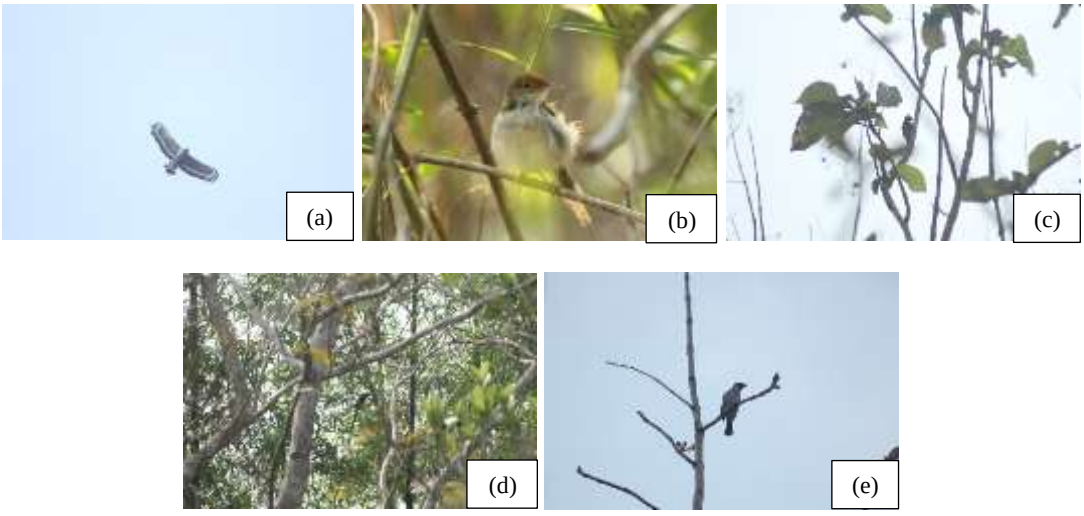


Figure 3. Bird species (a) *Spilornis cheela* (b) *Orthotomus sutorius* (c) *Dendrocopos moluccensis* (d) *Crypsirina temia* (e) *Pycnonotus aurigaster*

Bird diversity is heavily impacted by habitat conditions. A decent habitat helps birds find food and shelter (Rumanasari et al., 2017). Birds find the habitat safe and comfortable due to the interactions between physical components and the presence of numerous species (Riefani et al., 2019). Therefore, it is essential to keep stepping up efforts to lessen the degree of disturbance that human activity causes in and around the habitat and to promote the use of environmental services that put sustainability and conservation first (Az-Zahra et al., 2023). Future conservation initiatives for caves and karsts also require more care and attention (Prakarsa et al., 2022). This is because it takes more time to monitor and evaluate habitat protection initiatives (Prakarsa et al., 2025).

Figure 3 shows some documented observations of bird species in the Indonesian Karst Museum Area, Wonogiri, Central Java. The birds photographed include *Spilornis cheela* (Elang-Ular Bido), *Orthotomus sutorius* (Cinenen Pisang), *Dendrocopos moluccensis* (Caladi Tilik), *Crypsirina temia* (Tangkar Cetrong), and *Pycnonotus aurigaster* (Cucak Kutilang). The Wonogiri karst area is home to only one variety of raptor: Elang-Ular Bido. Raptors are predatory birds that belong to the Accipitridae and Falconidae families. They are at the top of the food chain and play a vital role in maintaining ecosystem equilibrium. Raptors are attractive because to their morphology and unusual flying styles, which include soaring, gliding, and undulating. According to Minister of Environment and Forestry Regulation No. 106/(2018), nine bird species are protected: Elang-alap Jambul, Elang Hitam, Elang Jawa, Elang-ular Bido, Alap-alap Sapi, Serindit Jawa, Kipasan Bukit, Kipasan Ekor-merah, and Luntur Harimau. These species are not under threat of extinction, but they may become endangered if trading continues without regulations (Mubarik et al., 2020; Widiana et al., 2017).

CONCLUSION

Bird species found in the Indonesian Karst Museum area totalled 21 species from 8 orders, namely 10 species from the Passeriformes order (*Pycnonotus aurigaster, Crypsirina temia, Orthotomus sutorius, Orthotomus sepium, Dicaeum trochileum, Aegithina tiphia, Lonchura leuncogastroides, Pericrocotus cinnamomeus, Cinnyris jugularis, Malacocincla sepiaria*), 1 species from the order Gruiformes (*Amaurornis phoenicurus*), 1 species from the order Columbiformes (*Spilopelia chinensis*), 1 species from the order Coraciiformes (*Halcyon cyanoventris*), 3 species from the order Piciformes (*Psilopogon javensis, Psilpogen haemacephalus, Dendrocopos moluccensis*), 3 species from the order Cuculiformes (*Cacomantis merulinus, Centropus bengalensis, Cacomantis sepulcralis*), 1 species from the order Apodiformes (*Collocalia linchi*), and 1 species from the order Accipitriformes (*Spilornis cheela*).

According to the criteria for determining the diversity index value (H') of birds in the Indonesian Karst Museum region in the two lines averaged 1.7, indicating that species diversity was moderate at all study stations. A bird's high or low abundance value might be taken as an indicator of its ability to adapt to environmental conditions. The natural conditions in the

Indonesian Karst Museum area are karst, which supports the lifestyles of several bird species, each with its own set of advantages and disadvantages. Therefore, it is crucial to maintain and minimize the level of disturbance caused by human activities in and around karst areas.

REFERENCES

Association, B. I. (2025). *Burung Indonesia*. https://burung.org/

Az-Zahra, N., Alifah, F., Noorfamaza, A., Nurrohimah, K., Novitasari, N., Erindra Maharani, F., Indira Oktaviani, V., Cahya Jasinda, R., Arlianti Azzahra, S., Debora Aprillia Siagian, S., & Prakarsa, T. B. P. (2023). Cave Bats (Yangochiroptera and Yinpterochiroptera) in Gunung Sewu Geopark: Study of Karst Caves in Wonogiri Regency. *Indonesian Journal of Bioscience (IJOBI)*, *1*(1), 15–23. https://doi.org/10.21831/ijobi.v1i1.107

Bachri, M., Zayadi, H., & Hayati, A. (2020). Profil sebaran burung di pohon peneduh sepanjang jalan mt. haryono dan tlogomas kecamatan lowokwaru kota malang. *Biosaintropis (Bioscience-Tropic)*, *5*(2), 17–23. https://doi.org/10.33474/e-jbst.v5i2.201

Devi, S. R., Hasyim, M. A., Mulyono, R. M., Firizki, D. T., Hasanuddin, M. A., & Pratama, M. R. (2020). Inventarisasi avifauna diurnal di coban kodok desa sukomulyo kecamatan pujon kabupaten malang. *Biotropika: Journal of Tropical Biology*, *8*(3), 163–170. https://doi.org/10.21776/ub.biotropika.2020.008.03.04

Dewandanu, A., & Priyatmono, A. F. (2021). Studi Keberadaan Signed Obyek Wisata (Studi Kasus Museum Kaarst Indonesia). *Seminar Ilmiah Arsitektur II*, *8686*, 317–3. http://siar.ums.ac.id/

Duco, R. A. J., Fidelino, J. S., Duya, M. V., Ledesma, M. M., Ong, P. S., & Duya, M. R. M. (2021). Bird Assemblage and Diversity along Different Habitat Types in a Karst Forest Area in Bulacan, Luzon Island, Philippines. *Philippine Journal of Science*, *150*(S1), 399–414. https://doi.org/10.56899/150.s1.30

EBird. (2021). *eBird: An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York.* http://www.ebird.org.

Fadhillah, D. N. (2020). Identifikasi aves di kawasan taman nasional gunung merbabu sebagai bahan pembuatan multimedia interaktif biologi sma. *Journal of Biology Learning*, *2*(1), 50–57. https://doi.org/10.32585/.v2i1.832

Humami, D. W., Sujono, P. A. W., Muzaki, F. K., Fadhlillah, A. P., Drianto, E., & Lestari, Y. I. (2022). Diversity and feeding guild of birds along gradient of revegetated area in karst ecosystem: A case study from rembang, central java. *Biosaintifika*, *14*(3), 373–382. https://doi.org/10.15294/biosaintifika.v14i3.36531

Hutami, A. T., Utami, A. T., Ramadhyanti, D., Sari, D. A. K., Faiqah, J. A., Indriani, L. D., Saputra, M. A., Purwani, Y., & Fitriana, N. (2022). Keanekaragaman Jenis Burung Di Wilayah Taman Kota Spatodea Dan Tabebuya, Jakarta Selatan. *Bioma*, *18*(1), 32–41. https://doi.org/10.21009/bioma18(1).5

Huzni, A. (2018). Keanekaragaman jenis burung pada beberapa habitat di balohan kecamatan sukajaya kota sabang sebagai referensi mata kuliah ornitologi. *Prosiding Seminar Nasional Biotik*, *1*(1), 293–299.

Indonesia., N. G. (2019). *Kepunahan Biodiversitas Tertinggi, Indonesia Peringkat Ke-6.* https://nationalgeographic.grid.id/read/131833161/kepunahan-biodiversitas-tertinggi-indonesia-peringkat-ke-6

International, B. (2024). *Pycnonotus aurigaster. The IUCN Red List of Threatened Species 2024:*

e.T22712699A263801596. https://doi.org/https://dx.doi.org/10.2305/IUCN.UK.2024-2.RLTS.T22712699A263801596.en.

Kartikasari, D., Abidin, A., Agustina, C. S., & Nurdianyoto, I. (2024). Keanekaragaman dan kelimpahan burung pemakan biji di area persawahan tanjungsari, tulungagung. *LenteraBio : Berkala Ilmiah Biologi*, *13*(2), 262–269. https://doi.org/10.26740/lenterabio.v13n2.p262-269

Kunardi, D., Sudrajat, S., & Harini, R. (2020). Dampak perkembangan kawasan wisata museum karst indonesia terhadap kondisi lingkungan di dusun mudal, gebangharjo, pracimantoro, wonogiri. *Jurnal Manusia Dan Lingkungan*, *26*(2), 43. https://doi.org/10.22146/jml.35999

Magurran, A. E. (2004). *Measurung Biological Diversity*. Blackwell Publishing.

Menteri Lingkungan Hidup dan Kehutanan. (2018). Permen LHK No. P.106 Tahun 2018 Tentang jenis Tumbuhan dan Satwa yang dilindungi. *Kementrian Lingkungan Hidup Dan Kehutanan*, 30. http://ksdae.menlhk.go.id/assets/news/peraturan/P.106-2018_JENIS_TSL_.pdf%0Ahttps://jdih.maritim.go.id/id/peraturan-menteri-lingkungan-hidup-dan-kehutanan-no-p106menlhksetjenkum1122018-tahun-2018

Mubarik, A. L., Aditya, Mayrendra, C. T., Latrianto, A., Prasetyo, Y. E., Sukma, R. N., Alifah, E. N., Latifah, T. N., Kusuma, S. P., & Karim, Y. R. Al. (2020). Keanekaragaman burung sebagai potensi pengembangan avitourism di objek wisata girimanik, wonogiri, jawa tengah. *Biotropika: Journal of Tropical Biology*, *8*(3), 152–162. https://doi.org/10.21776/ub.biotropika.2020.008.03.03

Mufti, F., Diniarsih, S., Setyono, J., Amna, M., & Setyobudi, N. (2011). Diversity of birds in tepus village of gunungkidul district of yogyakarta. *Proceeding ICBB (The International Conference on Bioscience and Biotechnology)*, *1*(1), C16–C23.

Nasihin, S. R., & Rohmatullayaly, E. N. (2023). Keanekaragaman Burung di Kawasan Babakan Siliwangi City Forest Path, Kota Bandung. *Jurnal Sumberdaya Hayati*, *9*(1), 1–6. https://doi.org/10.29244/jsdh.9.1.1-6

Prakarsa, T. B. P., & Ahmadin, K. (2017). Diversitas arthropoda gua di kawasan karst gunung sewu, studi gua-gua di kabupaten wonogiri. *Biotropic : The Journal of Tropical Biology*, *1*(2), 31–36. https://doi.org/10.29080/biotropic.2017.1.2.31-36

Prakarsa, T. B. P., Hadisusanto, S., Pudyatmoko, S., & Maryanto, I. (2025). Roosting ecology, reproduction, and population fluctuations of three Hipposideros species (Chiroptera) in Indonesian caves. *Mammalia*, *89*(1), 53–63. https://doi.org/10.1515/mammalia-2023-0050

Prakarsa, T. B. P., Putri, R. A., Rahmawati, Y. F., & Dalee, A. D. (2022). Diversity of the Cave-Dwelling Bat (Chiroptera) in the Ngobaran Coastal Area, Karst of Gunung Sewu. *Jurnal Biodjati*, *7*(2), 255–233. https://doi.org/10.15575/biodjati.v7i2.20163

Putra, I. L. I., & Nurlaily, N. A.-Z. (2021). Asosiasi jenis-jenis burung di kemantren kraton, ngampilan, dan gondomanan, kota yogyakarta. *Biotropika: Journal of Tropical Biology*, *9*(2), 105–114. https://doi.org/10.21776/ub.biotropika.2021.009.02.02

Putri, I. A. S. L. P., Broto, B. W., & Ansari, F. (2017). Bird responses to habitat change in the karst area of Bantimurung Bulusaraung National Park. *Jurnal Penelitian Kehutanan Wallacea*, *6*(2), 101. https://doi.org/10.18330/jwallacea.2017.vol6iss2pp101-112

Rafik, M., Widiya, Y., Az Zahra, I., Adilla Ramdhani, H., Rifdah, A., Nazulfah, I., Amelia, L., Kholifah, N., Humairoh, M., Dwi Oktaviani, H., Lingga Pratama, T., Yuni Lestari, T., Komariah, S., Ayu Saraswati, D., Elisabeth, F., Basyuni, M., Haryandi, Y., & Aulia Dewi, N. (2023). Inventarisasi avifauna di kawasan ekowisata desa malasari taman nasional gunung halimun salak. *Bioma*, *25*(1), 38–48.

https://ejournal.undip.ac.id/index.php/bioma/issue/view/3480

Riefani, M. K., Soendjoto, M. A., & Munir, A. M. (2019). Short communication: Bird species in the cement factory complex of Tarjun, South Kalimantan, Indonesia. *Biodiversitas*, *20*(1), 218–225. https://doi.org/10.13057/biodiv/d200125

Rifyant, F. A., Octavian, F. R., & Saputra, F. (2021). Keanekaragaman burung di kawasan kampus universitas negeri. *Prosiding SEMNAS BIO*, 249–255.

Rumanasari, R. D., Saroyo, S., & Katili, D. Y. (2017). Biodiversitas Burung pada Beberapa Tipe Habitat di Kampus Universitas Sam Ratulangi. *Jurnal MIPA*, *6*(1), 43. https://doi.org/10.35799/jm.6.1.2017.16153

Saputra, T. A., Yuhanna, W. L., & Ardhi, M. W. (2019). Identifikasi aves di cemoro sewu magetan sebagai bahan penyusun modul biologi materi keanekaragaman hayati. *Prosiding Seminar Nasional SIMBIOSIS IV*, 310–317.

Sjafani, N., Kamaluddin, A. K., & Sapsuha, R. (2022). The diversity of bird types in bukit tanah putih sidangoli, west halmahera regency. *Jurnal Cakrawala Ilmiah*, *1*(12), 2439–2450. https://doi.org/https://doi.org/10.53625/jcijurnalcakrawalailmiah.v1i12.3211

Taufiqurrahman, I., Akbar, P. G., Purwanto, A. A., Iqbal, M., Wibowo, W. K., Tirtaningsih, F. N., & Triana, D. A. (2022). Panduan lapangan burung-burung di indonesia: Sunda besar. In *Birdpacker Indonesia-Interlude* (Issue October).

Tortosa, F. S., & Villafuerte, R. (2000). Habitat selection by flocking wintering common cranes (Grus grus) at los Pedroches valley, Spain. *Etologia*, *8*, 21–24.

Widiana, A., Iqba, R., & Yuliawati, A. (2017). Estimasi luasan dan perkembangan daerah jelajah elang brontok (nisaetus cirrhatus) pasca rehabilitasi di pusat konservasi elang kamojang garut jawa barat. *Jurnal Istek*, *10*(2), 123–137.