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# Diversity of Birds at the Romokalisari Adventure Land Tourist Attraction Surabaya

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**Abstract**
Waterbirds are a type of bird that is ecologically dependent on wetlands. The distribution and population of birds in a habitat are influenced by physical or environmental factors such as soil, air, temperature, sunlight, and biological factors including vegetation and other animals. This study aims to analyzed bird diversity and conservation status at Romokalisari Adventure Land, Surabaya. The Romokalisari Adventure Land Surabaya is one of the tourist attractions in Surabaya that offers a mangrove forest area as the landscape. The study were conducted in February 2024. Observation activities began at 06.30-10.00 WIB using the line transect method across three transects of 1.000 meters each, identifying bird species through direct observation and photographic documentation. The number, abundance, and diversity of birds in their habitat are caused by complex ecological interactions and are closely related to the bird community. Whereas Shannon-Wiener diversity index (H') used to determine species diversity index. The bird diversity index value at the Romokalisari Adventure Land is classified as moderate. As a result, 15 species from 10 families of birds were found, 1 species of bird is classified as Endangered based on IUCN Red List, namely the Milky Stork and 6 species of water birds with national protection status. The study emphasizes the importance of preserving mangrove ecosystems as they serve as critical habitats for various bird species.

**Keywords:** Birdwatching; diversity; surabaya; waterbirds; wetlands
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## INTRODUCTION

Birds (avifauna) are one of the natural resources that have an important role in human life in the economic, recreational, and scientific fields (Hernowo and Prasetyo, 1989). Birds have a significant role in the ecosystem. Birds participate in spreading plant seeds which are spread through bird droppings. Birds also help control the number of pests that can damage crops. The presence of birds in an ecosystem indicates that the ecosystem is still healthy. Birds are also interesting animals and have long been kept as pets, studied, and observed (Afif, 2018). Bird populations are influenced by physical factors (soil, air, temperature) and biological factors (vegetation, other animals), making diverse vegetation crucial for bird diversity (Fikriyanti et al., 2018).

Waterbirds are a type of bird that is ecologically dependent on wetlands (Amalia *et al.*, 2019). Wetlands with diverse habitats support a greater variety of waterbird species. The structural complexity of these habitats provides essential resources such as food, shelter, and breeding sites, which are crucial for sustaining diverse waterbird populations (Qiu *et al.*, 2024). A wetland is an area that is flooded with air or has naturally or artificially moist soil. This area includes various ecosystems such as swamps, peat, mangrove forests, and others. Wetland management must be carried out sustainably and based on science. Management must maintain air and soil quality, and ensure that wetlands continue to function as habitats for water birds and other wildlife (Mahrudin and Arsyad, 2020).

Surabaya is one of the cities in Indonesia which is located on the coast, making the city of Surabaya have a seaside ecosystem such as mangrove forests. There are at least 3 tourist attractions in

Surabaya that offer mangrove forest areas as their landscape, one of which is the Romokalisari Adventure Land tourist area which is located on Jl. Romokalisari, Benowo sub-district, Surabaya, which borders Gresik Regency. The Romokalisari ecosystem is part of the coastal area in the city of Surabaya and holds significant ecological potential, particularly due to the presence of mangrove forests. This area has been identified as experiencing ecological stress caused by land-use changes, pollution, and coastal development. The mangrove forests, which previously served as natural barriers against abrasion, habitats for various species, and buffers for coastal ecological systems, have undergone degradation (Alwi *et al.*, 2025). According to research, the reduction of wetland areas such as mangrove forests is feared to result in the decline of local wildlife, including waterbirds (Suriansyah et *al.*, 2016).

Romokalisari has the potential to serve as an important habitat for various bird species, including both resident and migratory birds. Data on the types and numbers of bird species found can serve as indicators of ecosystem health and support the planning of area management that remains wildlife-friendly. Moreover, this information is essential for promoting environmental education, ecotourism activities, and biodiversity conservation efforts amid the growing development of the tourism area. Through this studies, it is hoped that this research can provide data and information related to birds at Romokalisari Adventure Tourist Attraction, Surabaya so the managers and stakeholders can make more informed decisions to maintain a balance between utilization and environmental preservation.

## MATERIALS AND METHODS

The research was conducted in the Romokalisari Adventure tourist area Jl. Romokalisari I, Romokalisari, District. Benowo, Surabaya, East Java (Figure 1) in 25 and 29 February 2024. Bird observation activities are carried out during bird migration season. Birds from colder northern regions flew to warmer tropical regions, including Indonesia, to find food and avoid winter which generally lasts between September and April. Observation activities started at 06.30-10.00 WIB using a birdwatching approach and the line transect method (Bibby *et al.*, 2000). The line transect method is a method used to observe birds by traveling and recording the types of birds encountered (Rachmawaty *et al.*, 2006). A transect line measuring 1,000 meters was systematically established along a route where birds were frequently encountered. The observer walked slowly along the transect at a consistent pace, recording all individual birds seen or heard within 20 meters on both sides of the line. Each bird encounter were documented in detail, including species name, number of individuals, and behavior. To improve data accuracy, the observations were repeated over two consecutive days using the same transect route. Observation activities were carried out with the help of supporting tools such as Nikon Binocular Aculon A211 10x42, Canon EOS 100D Rebel SL1 camera, sheets/notebooks, identification books, and cellphones with the Burungnesia application installed for identification.

The birds are identified based on morphological characteristics such as body color, head shape, beak shape, leg shape, foot color, body size, and the behavior of the birds collected. The book Mackinnon *et al.*, (2010) and the digital application Burungnesia were also used for the identification purposes. The birds were then analyzed based on The Minister of Environment and Forestry Regulation No P.106/MENLHK/SETJEN/KUM.1/12/2018 which regulates the preservation of plant and animal species and based on the International Union for Conservation of Nature (IUCN) as a guide to determine the protection status of birds. Observations are carried out by walking along the ponds and river mouths on foot and using boats. The search is carried out by photographing the birds that are found as much as possible and recording them in a previously prepared observation book including the type of bird, activity, and number, also not forgetting to record the date and time of the observation.

The value of the Shannon-Wiener Diversity Index (Odum, 1993) can be determined using the formula calculation:

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

$$H' = \frac{ni}{N} . \ln \frac{ni}{N}$$

Description:
pi = $\frac{ni}{N}$
H′ = Diversity Index
ni = Number of Population i

N = Total population
Criteria:
H′ < 1 : Low Diversity
1 < H′ < 3.322 : Medium diversity
H′ > 3.322 : High diversity

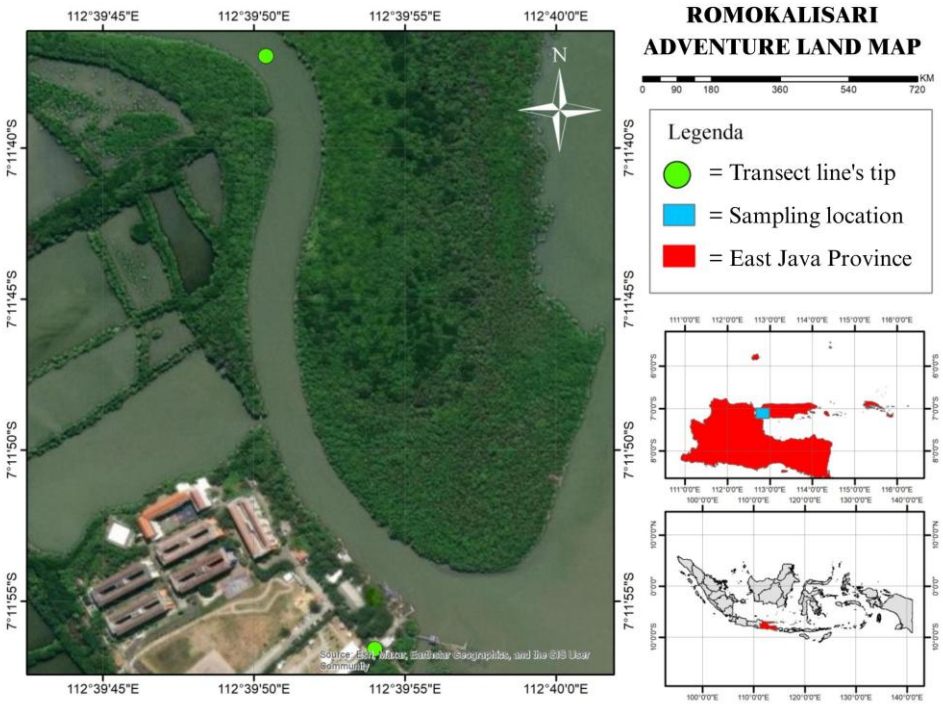


**Figure 1.** Romokalisari Adventure Land location.

## RESULTS

There were 15 species of birds found in Romokalisari Adventure tourist area, which belongs to 10 families, namely Phalacrocoracidae, Ardeidae, Ciconiidae, Charadriidae, Scolopacidae, Laridae, Hirundinidae, Apodidae, Passeridae, and Estrildidae (Table 1, Figure 1). Among the 15 species observed, 2 species of migratory birds were obtained, namely the Common Tern (*Sterna hirundo*) and the White-winged Tern (*Chlidonias leucopterus*). Meanwhile, other species are resident/non-migratory bird species.

**Table 1**. Bird species in the Romokalisari Adventure tourist area, Surabaya.

| No. | Family | Common Name | Scientific Name | Amount |
|---|---|---|---|---|
| 1. | Phalacrocoracidae | Little Black Cormorant | *Phalacrocorax sulcirostris* | 4 |
| 2. | Ardeidae | Javan Pond Heron | *Ardeola speciosa* | 6 |
| 3. | | The great Egret | *Ardea alba* | 17 |
| 4. | | Striated Heron | *Butorides striata* | 2 |
| 5. | | The Little Egret | *Egretta garzetta* | 54 |
| 6. | Ciconiidae | Milky Stork | *Mycteria cinerea* | 2 |
| 7. | Charadriidae | Oriental plover | *Charadrius veredus* | 11 |
| 8. | Scolopacidae | Common Whimbrel | *Numenius phaeopus* | 3 |
| 9. | | Common Sandpiper | *Actitis hypoleucos* | 3 |
| 10. | Laridae | Common Tern | *Sterna hirundo* | 26 |
| 11. | | White-winged Tern | *Chlidonias leucopterus* | 17 |
| 12. | Hirundinidae | Pacific swallow | *Hirundo tahitica* | 2 |
| 13. | Apodidae | Cave swiftlet | *Collocalia linchi* | 15 |
| 14. | Passeridae | Eurasian tree sparrow | *Passer montanus* | 20 |
| 15. | Estrildidae | Javan Munia | *Lonchura leucogastroides* | 17 |

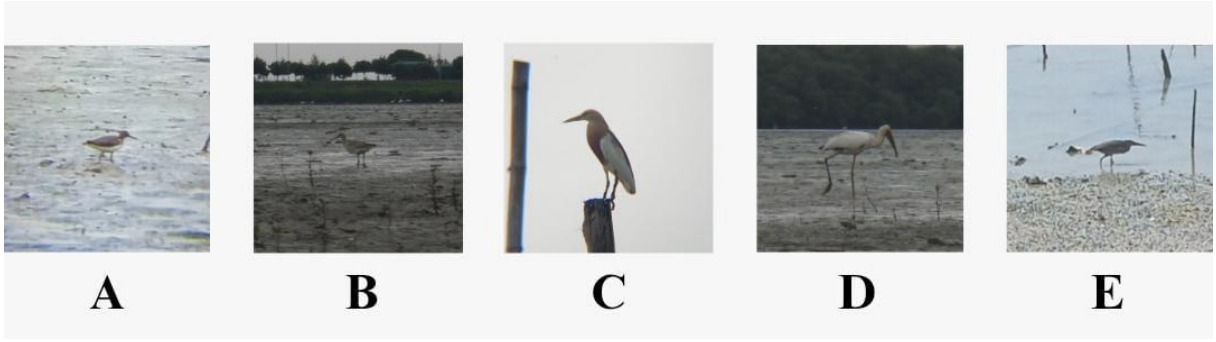


**Figure 2.** Several birds found in Romokalisari Adventure Land A. Common Sandpiper, B. Common Whimbrel, C. Javan Pond Heron, D. Milky Stork, E. Striated Heron.

Observation data shows the presence of 11 species of waterbirds and four non-waterbird species in the Romokalisari Adventure Land tourist area. The waterbird group belonged to five different families, with the most abundant species recorded being the Little Egret (*Egretta garzetta*) (n=54). One species of significant conservation concern, the Milky Stork (*Mycteria cinerea*), was recorded (n=2) and holds an IUCN Endangered status (Table 3). Conversely, the four non-waterbird species observed were the Pacific Swallow (*Hirundo tahitica*), Cave Swiftlet (*Collocalia linchi*), Eurasian Tree Sparrow (*Passer montanus*), and Javan Munia (*Lonchura leucogastroides*), with the Eurasian Tree Sparrow being the most numerous in this group (n=20). Three of these four non-waterbirds, *H. tahitica* (Hirundinidae), *P. montanus* (Passeridae), and *L. leucogastroides* (Estrildidae), are classified under the order Passeriformes (singing birds).

**Table 3**. Bird conservation status based on protection status in Indonesia and IUCN status

| No. | Scientific Name | Common Name | Protection Status in Indonesia | IUCN Status |
|---|---|---|---|---|
| 1. | *Phalacrocorax sulcirostris* | Little Black Cormorant | **TD** | **LC** |
| 2. | *Ardeola speciosa* | Javan Pond Heron | **TD** | **LC** |
| 3. | *Ardea alba* | The great Egret | **D** | **LC** |
| 4. | *Butorides striata* | Striated Heron | **TD** | **LC** |
| 5. | *Egretta garzetta* | The Little Egret | **TD** | **LC** |
| 6. | *Mycteria cinerea* | Milky Stork | **D** | **EN** |
| 7. | *Charadrius veredus* | Oriental plover | **D** | **LC** |
| 8. | *Numenius phaeopus* | Common Whimbrel | **D** | **LC** |
| 9. | *Actitis hypoleucos* | Common Sandpiper | **TD** | **LC** |
| 10. | *Sterna hirundo* | Common Tern | **D** | **LC** |
| 11. | *Chlidonias leucopterus* | White-winged Tern | **D** | **LC** |
| 12. | *Hirundo tahitica* | Pacific swallow | **TD** | **LC** |
| 13. | *Collocalia linchi* | Cave swiftlet | **TD** | **LC** |
| 14. | *Passer montanus* | Eurasian tree sparrow | **TD** | **LC** |
| 15. | *Lonchura leucogastroides* | Javan Munia | **TD** | **LC** |

Description:
TD = Not Protected by National Conservation status
D = Protected by National Conservation status
LC = Least Concern
EN = Endangered

Protection status at the national level is based on The Minister of Environment and Forestry Regulation Number P.106/MENLHK/SETJEN/KUM.1/12/2018 of 2018 regarding Protected Types of Plants and Animals, while the IUCN Red List is a list published by the International Union for Conservation of Nature (IUCN) that shows the conservation status of species that have been assessed based on established conservation criteria. This list is used to assess the conservation status of species and assist in making effective conservation decisions. The appendix of The Minister of Environment and Forestry Regulation Number P.106/MENLHK/SETJEN/KUM.1/12/2018 of 2018 on Protected Plant and Animal Species includes a list of protected bird at the species level. During the observation at Romokalisari Adventure, out of 11 waterbird species, 1 species, Milky stork (*Mycteria cinerea*), has IUCN Endangered conservation status (Table 3). The other 10 species have IUCN Least Concern or Low Risk conservation status. At the National Conservation status, 6 waterbird species are protected

nationally: The great Egret, Milky Stork, Oriental plover, Common Whimbrel, Common Tern, and White-winged Tern.

Diversity involves a diversity index formula that is determined by the number of different species present in a community and the ratio of each species to the overall population of the community. In the diversity index, if the H' value < 1 then diversity is considered low. If the H' value is between 1 and 3.322 then diversity is considered moderate. Meanwhile, if the H' value is > 3.322 then diversity is considered high. Based on Table 4, it is known that the Diversity Index value is 2.29. This means that the diversity of birds at the Romokalisari Adventure tourist attraction is classified as moderate.

**Table 4**. Bird diversity index at the Romokalisari Adventure tourist attraction for each species

| No. | Scientific Name | Common Name | Amount | H′ |
|---|---|---|---|---|
| 1. | *Phalacrocorax sulcirostris* | Little Black Cormorant | 4 | -0.08 |
| 2. | *Ardeola speciosa* | Javan Pond Heron | 6 | -0.11 |
| 3. | *Ardea alba* | The great Egret | 17 | -0.21 |
| 4. | *Butorides striata* | Striated Heron | 2 | -0.05 |
| 5. | *Egretta garzetta* | The Little Egret | 54 | -0.35 |
| 6. | *Mycteria cinerea* | Milky Stork | 2 | -0.05 |
| 7. | *Charadrius veredus* | Oriental plover | 11 | -0.16 |
| 8. | *Numenius phaeopus* | Common Whimbrel | 3 | -0.06 |
| 9. | *Actitis hypoleucos* | Common Sandpiper | 3 | -0.06 |
| 10. | *Sterna hirundo* | Common Tern | 26 | -0.27 |
| 11. | *Chlidonias leucopterus* | White-winged Tern | 17 | -0.21 |
| 12. | *Hirundo tahitica* | Pacific swallow | 2 | -0.05 |
| 13. | *Collocalia linchi* | Cave swiftlet | 15 | -0.19 |
| 14. | *Passer montanus* | Eurasian tree sparrow | 20 | -0.23 |
| 15. | *Lonchura leucogastroides* | Javan Munia | 17 | -0.21 |
| | | -∑ | | **-2.29** |

## DISCUSSION

The Ecotourism has a positive impact on development and must be balanced with well-maintained natural conditions so that it can be used as an attraction for tourists or visitors (Ramadesta *et al*., 2022). Romokalisari Adventure Land tourist attraction is located in Romokalisari I, Benowo District, Surabaya which was inaugurated on September 25, 2022. This tourist attraction has the potential to become a high tourist destination, one of which offers a mangrove forest landscape, but existing visitors are still relatively low (Bentri *et al*., 2023). Avitourism focuses on bird observation activities in their natural habitat, which is possible at Romokalisari Adventure Land. Birdwatching activities in nature can be used as research material, environmental education and tourist attractions. In birdwatching ecotourism, visitors can study the morphological forms of birds and the ecological functions of birds (Lakiu *et al*., 2016).

The wetland landscape in Romokalisari Adventure Land makes the location a habitat for many birds, especially water birds. Birds use mangrove vegetation (wetlands) to roost and find food. Mangrove wetlands provide food for birds, namely insects and nectar from mangrove flowers. Insects that fly over the vegetation are also food for birds. The presence of birds, bird diversity, bird activity, habitat utilization by birds in mangrove habitats is an attraction in ecotourism. Information on bird species and their protection status is important to know (Ginantra *et al*., 2020). But based on Alwi (2025), mangrove ecosystem in Romokalisari, Surabaya, has been damaged due to human activities and climate change.

The presence of bird species other than Least Concern (LC) status is evidence of the importance of mangrove availability at the site (Syukur *et al*., 2023). In addition, Endangered (EN) Milky stork species are only found in locations with minimal human activity. Endangered species can be found in locations that have little human disturbance (Gunawardhana *et al*., 2023). Bird morphology is one way to identify them. Morphological characters of waterbirds that are generally considered in identification are feathers, beak shape, and foot shape. There are various beak shapes owned by birds, wide and flat beaks and long and conical beaks are found in many water bird species. This indicates that there is a relationship between the type of food and the foraging process of waterbirds (Ramadhani *et al*., 2022).

Diversity involves a diversity index formula that is determined by the number of different species present in the community and the ratio of each species to the overall community population. (Campbell and Reece, 2008). In the diversity index, if the value of H' < 1 then diversity is low. If the

value of H' between 1 and 3.322 then the diversity is considered moderate. Meanwhile, if the value of H' > 3.322 then the diversity is high. Based on Table 4, the Diversity Index value is 2.29. This means that bird diversity in Romokalisari Adventure tourist attraction is classified as moderate. The presence of diverse bird species, including protected and migratory ones, underscores the ecological significance of the area. However, the moderate diversity index indicates that the habitat may be under stress, potentially due to developmental activities associated in certain area (Salahuddin *et al.*, 2021).

The number, abundance, and diversity of birds in their habitat are caused by complex ecological interactions and are closely related to bird communities. Although this is also influenced by the level of succession achieved by the habitat, rainfall conditions related to insect populations and fruit season, habitat diversity, and the relationship between one habitat and another are largely influenced by physical factors in the form of climate conditions and the structure and vertical composition of the canopy. in each habitat (Mackinnon, 1990).

Waterbirds are divided into two groups: sedentary birds and migratory birds. Resident birds are birds whose entire part or life cycle is in Indonesian territory, while migratory birds regularly move between their breeding areas and one or more non-breeding areas. Waterbirds also play a role in the food chain, eating fish, shrimp, and other animals in wetlands. They also eat mollusks, arthropods, and insects found in other habitats (Jumilawaty, 2012).

The activities of migratory birds can be seen from various aspects, including their ability to find food sources, their adaptability, and their specific schedule for visiting and staying in certain locations. Migratory birds perform very important foraging and resting activities, and their diversity index varies depending on the observation location (Gagarin *et al.*, 2022). The activities of water birds observed at the location are very diverse. Some find food by walking on mud, flying around, and perching in mangrove trees to rest.

## CONCLUSION

Based on this research at Romokalisari Adventure, it is known that the Diversity Index value is 2.29. This means that the diversity of birds at the Romokalisari Adventure Land tourist attraction is classified as moderate. There were 15 species of birds found, 1 of the species was classified as Endangered based on the IUCN Red List and the rest of the 14 species have IUCN Least Concern protection status. Based on Indonesia's National Status Protection, 6 species of water birds have national protection status, namely the great egret, milky stork, oriental plover, common whiprel, common tern, and white-winged tern. Preserving the mangrove ecosystem is very important because mangroves are a habitat for various bird species. Collaborative conservation efforts involving various parties to reduce further ecological damage and improve ecosystems are also important.

## CONFLICT OF INTEREST

There is no conflict of interest.

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