New Report from Sebelas Maret Avifauna to Support Green Campus Program

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Abstract. The last report on bird identification on the UNS was in 2015 with the results of 50 bird species, while the development and reforestation processes proceeded rapidly after that. Avifauna is a collection of birds that inhabit a certain location, the wealth and abundance of which is the basis for further studies. Birds are one of the animals that are closely related to human life and the process of changing habitats. Birds can be used as indicators of the condition of an environment. In addition, as an ecological function, birds can be seed dispersal agents and natural pollinators. Birds are also used by humans as pets and food, and play a role in various cultures of society. This study aims to identify birds based on dominant species, cosmopolitanism, endemicity, and then make a comparison with the results of previous studies to see the shift in species that inhabit the UNS. Collecting data using Line transect and point count methods for identification, followed by comparing newly obtained data with previous study. The results showed that 55 species were found, with the dynamics of adding new bird species and disappearing birds from old data. Birds are identified in various statuses with habitat adjustments that are currently developing.

Keywords: Avifauna · UNS Kentingan · Green campus program

1 *Introduction*

Birds are one of the animal groups that evolved specific traits to flight (although not all of them are able to fly). Birds main defining characteristics are toothless beak, integument covered in feathers, and has a pair of wings which enables them to move around through the air (Campbell et al., 2019). Birds can be found living, breeding, and nesting in every continent with a tendency to have higher diversity in tropical areas and gradually decreasing in diversity towards the poles (Lovette & Fitzpatrick, 2016). Their versatility might serve as a natural environment indicator since their ecological role is well known (Koskimies et al., 1989). Sebelas Maret University (UNS) has been pointed as one of the model for Indonesian Green Campus development program in 2014 together with Cendrawasih University (UNCEN), Pattimura University, Hasanuddin University (UNHAS),

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and Diponegoro University (UNDIP). The reasoning behind the Green Campus program is to create a healthy, and eco-friendly campus. A previous study by Ridwan in 2015 shows that there are 50 bird species from 24 different families residing in UNS Kentingan campus. From their study, they concluded that the environment in the UNS Kentingan campus is good enough. Since then, there has been massive landscape change due to development of new areas and construction of new buildings in the UNS Kentingan campus. To compensate for the environmental impact due to development and construction of new buildings, UNS came up with several activities such as UNS lake revitalization and car-free day. This study aims to give an update on the bird diversity in the area of UNS Kentingan campus since the last study on birds diversity around UNS Kentingan campus because it is suspected that the development of the UNS Kentingan campus might have affected the habitat and occurrence of birds in the 2015 study.

Preliminary research data in 2015 (Ridwan et al, 2015) reported the number of bird species identified on the UNS Kentingan campus, both diurnal and nocturnal, of 50 species. Eleven Maret University in 2014 has been designated as a model for the development of Green Campus in Indonesia by the Minister of Environment. With an area of more than 60 ha, it has the potential to become an urban forest in Surakarta. The campus area is an urban area with relatively busy human activities.

Human disturbance is caused by the mere presence of people in the environment and is a common, but seldom recognized, form of disturbance. Although it may appear subtle compared to more destructive forms, human presence can have insidious and cumulative effects for birds (Price, 2008). Along with developments that have developed on campus for 7 years, it is appropriate to re-identify to determine the development trend of the potential for avifauna after changes in infrastructure development such as buildings, parks, lakes, and arboretums. Or efforts to reduce carbon emissions with a Car free day policy every first Friday at the beginning of the month or the development of electric cars. All of these efforts are of course aimed at building a green campus climate. Behind the changes that have occurred, natural habitat conditions have also experienced a shift. It is possible that some of the birds recorded in 2015 have shifted and disappeared to be replaced by other introduced birds. For example, in the past, the UNS lake still had a natural habitat for the White-breasted Waterhen, but based on the survey, it has begun to shift to the river near the Faculty of Engineering. This condition provides a big homework for the development of conservation efforts in addition to physical development, of course UNS becomes a conservation agent in an urban environment.

2 *M*ethod

Data retrieval was carried out using the line transect method by following a different path determined and point count (taking area based on land cover and observing for one hour). Data collection through observations was carried out using binoculars and cameras equipped with telephoto for documentation purposes. Observations were made in the morning at 06.00–10.00 am and in the afternoon at 03.30–05.00 pm in January to December 2021. The data recorded included the name of the bird species, the time of the encounter, and the activities the birds were doing. Identification of bird species names was carried out using a book entitled Birds in Sumatra, Java, Bali and Kalimantan (Mckinnon et al., 2010) and Atlas Burung Indonesia (Akbar et al., 2020).

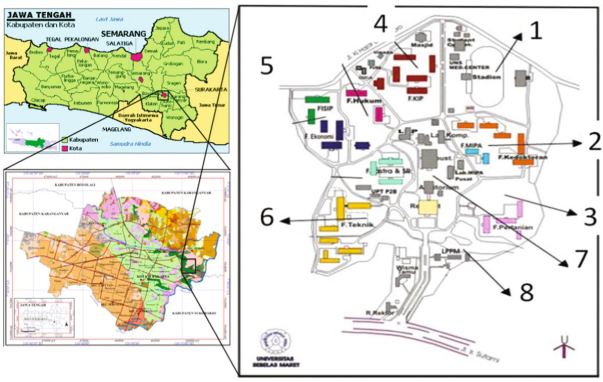

Fig. 1. Avifauna Research Locations on the UNS campus to support the Green Campus Program. (Ridwan et al 2015)

The research locations were divided into eight observation zones namely: Zone 1 covering the UNS Sports center, football field, Medical Center, student and alumni bureau office, Student Center and student activity units building; Zone 2 includes the Faculty of Mathematics and Natural Sciences and the Faculty of Medicine; Zone 3 includes the Faculty of Agriculture and Kentingan Lake; Zone 4 includes Faculty of Teacher Training and Education and Postgraduate Programs; Zone 5 includes the Faculty of Economics, the Faculty of Social and Political Science, and the Faculty of Law; Zone 6 includes the Faculty of Engineering; Zone 7 includes the Rector's Building, Central Laboratory, Central Library, and Communication Center; Zone 8 includes the LPPM office, Central Education Office, SPMB Office and PPLH Office. As shown in the image (Fig. 1):

3 Result and Discussion

Based on the observation of the eight locations around UNS Kentingan campus, the research found 55 species of birds from 27 families with different IUCN conservation status. The data show belong Table 1.

Species listed as Least Concerned (LC) in the IUCN Red List means that there is low risk of their extinction on the global scale. The LC category is characterized by widespread distribution and a high number of individuals. But, mismanagement and disturbance may risk the decline of the population. In the data gathered from our observation, there are 50 species listed as Least Concerned. There are 2 species of birds that fall into the Vulnerable (VU) category, which is Javan Myna (*Acridotheres javanicus*) and Sangkar White-eye (*Zosterops melanurus*). Both species are declining in numbers due to loss of habitat (Fig. 2).

Variety of ecosystems, like aquatic, rice fields, dry agricultural land, and mixed gardens (agroforestry) is sufficient to support the behavior of birds in utilizing habitats (Iswandaru et al., 2020). The most common bird in campus UNS is Eurasian Tree Sparrow. Birds use the area of campus as a habitat for nesting and raising their family. The campus area tends to develop into urban green spaces that can function as bird habitat like an island (Suripto et al., 2020). The species of birds found in each habitat

Table 1. Data on bird observations in 8 research zones in 2021 (the data consist of name of family, species local name, common name and conservation status)

Family	Species	Local Name	Common Name	Conservation Status
Aegithinidae	*Aegithina tiphia (Linnaeus, 1758)*	Cipoh Kacat	Common Lora	Least Concerned
Alcedinidae	*Halcyon cyanoventris (Vieillot, 1818)*	Cekakak Jawa	Javan Kingfisher	Least Concerned
	Todiramphus chloris (Boddert, 1783)	Cekakak Sungai	Collared Kingfisher	Least Concerned
	Alcedo meninting (Horsfield, 1821)	Raja Udang meninting	Blue Eared Kingfisher	Least Concerned
Apodidae	*Collocalia linchi (Horsfield & Moore, 1854)*	Walet Linchi	Cave Swiftlet	Least Concerned
	Aerodramus fuciphagus (Thunberg, 1812)	Walet sarang putih	Edible-nest Swiftlet	Least Concerned
	Apus affinis (Gray, 1830)	Kapinis rumah	Little Swift	Least Concerned
Ardeidae	*Ardeola speciosa (Horsfield,1821)*	Blekok Sawah	Javan Pond Heron	Least Concerned
	Ardea alba (Linnaeus, 1758)	Kuntul Besar	Eastern Great Egret	Least Concerned
	Bubulcus ibis (Linnaeus, 1758)	Kuntul kerbau	Western Cattle Egret	Least Concerned
	Mesophoyx intermedia (Wagler, 1827)	Kuntul perak	Intermediate Egret	Data Deficient
Artamidae	*Artamus leucorynchus (Oberholser, 1917)*	Kekep babi	White Breasted Woodswallow	Least Concerned
Camphepagidae	*Lalage nigra (Horsfield, 1821)*	Kapasan Kemiri	Pied Triller	Least Concerned
	Pericrocotus cinnamomeus (Linnaeus, 1766)	Sepah Kecil	Small Minivet	Least Concerned

(*continued*)

Table 1. (*continued*)

Family	Species	Local Name	Common Name	Conservation Status
Caprimulgidae	*Caprimulgus affinis (Horsfield, 1821)*	Cabak Kota	Savanna Nightjar	Least Concerned
Cisticolidae	*Orthotomus ruficeps (Lesson, 1830)*	Cinenen Kelabu	Ashy Tailorbird	Least Concerned
	Orthotomus sutorius (Temminck, 1836)	Cinenen Pisang	Common Tailorbird	Least Concerned
	Prinia inornata (Sykes, 1832)	Prenjak Padi	Plain Prinia	Least Concerned
	Prinia flaviventris (Delessert, 1840)	Prenjak Rawa	Yellow Bellied Prinia	Least Concerned
Columbidae	*Columba livia (Gmelin, 1789)*	Merpati Batu	Rock Dove	Least Concerned
	Geopelia striata (Linnaeus, 1766)	Perkutut Jawa	Zebra Dove	Least Concerned
	Treron vernans (Linnaeus, 1771)	Punai gading	Pink-necked Green-pigeon	Least Concerned
	Treron griseicauda (Wallace, 1863)	Punai pengantin	Grey-cheeked Green-pigeon	Least Concerned
	Spilopelia chinenesis (Scopoli, 1768)	Tekukur Biasa	Eastern Spotted Dove	Least Concerned
Cuculidae	*Cacomantis merulinus (Muller, 1843)*	Wiwik Kelabu	Plaintive Cuckoo	Least Concerned
	Cacomantis variolosus (Muller, 1843)	Wiwik Uncuing	Brush Cuckoo	Least Concerned
Dicaeidae	*Dicaeum trochileum (Sparrman, 1789)*	Cabe Jawa	Scarlet-headed Flowerpecker	Least Concerned
	Dicaeum trigonostigma (Scopoli, 1786)	Cabe bunga api	Orange-bellied Flowerpecker	Least Concerned

(*continued*)

Table 1. (*continued*)

Family	Species	Local Name	Common Name	Conservation Status
Estrilididae	*Lonchura maja (Linnaeus, 1766)*	Bondol Haji	White-headed Munia	Least Concerned
	Lonchura leucogastroides (Horsfield & Moore, 1856)	Bondol Jawa	Javan Munia	Least Concerned
	Lonchura ferruginosa (Sparrman, 1789)	Bondol oto hitam	White-capped Munia	Least Concerned
	Lonchura punctulata (Linnaeus, 1758)	Bondol Peking	Scaly-breasted Munia	Least Concerned
Hirundinidae	*Hirundo rustica (Scopoli, 1786)*	Layang layang asia	Barn Swallow	Least Concerned
	Hirundo javanica (Sparrman, 1789)	Layang layang batu	Javan Swallow	Least Concerned
	Cecropis daurica (Schlegel, 1844)	Layang layang loreng	Red-rumped Swallow	Least Concerned
Lanidae	*Lanius schach (Horsfield, 1821)*	Bentet Kelabu	Long-tailed Shrike	Least Concerned
Megalamaidae	*Psilopogon haemachepalus (Dumont, 1816)*	Takur ungkut ungkut	Crimson Fronted Barbet	Data Deficient
Muscicapidae	*Ficedula westermanni (Finsch, 1898)*	Sikatan Belang	Little Pied Flycatcher	Least Concerned
Nectarinidae	*Anthreptes malacensis (Scopoli, 1786)*	Burung Madu Kelapa	Brown-throated Sunbird	Least Concerned
	Cinnyris jugularis (Linnaeus, 1766)	Burung Madu Sriganti	Olive-backed Sunbird	Least Concerned
Passeridae	*Passer montanus (Linnaeus, 1758)*	Gereja Erasia	Eurasian Tree Sparrow	Least Concerned
Picidae	*Picoides moluccensis (Gmelin, 1788)*	Caladi tilik	Sunda Pygmy Woodpecker	Least Concerned

(*continued*)

Table 1. (*continued*)

Family	Species	Local Name	Common Name	Conservation Status
	Dendrocopos analis (Bonaparte, 1850)	Caladi Ulam	Freckle-breasted Woodpecker	Least Concerned
Psiitacidae	*Agapornis sp. (Selby, 1836)*	Lovebird	Lovebird	Least Concerned
Pycnonotidae	*Pycnonotus aurigaster (Vieillot, 1818)*	Cucak kutilang	Sooty-headed Bulbul	Least Concerned
	Pycnonotus goiavier (Scopoli, 1786)	Merbah cerucuk	Yellow-vented Bulbul	Least Concerned
Rallidae	*Amaurornis phoenicurus (Pennant, 1769)*	Kareo Padi	White-breasted Waterhen	Least Concerned
	Porzana cinerea (Vielliot, 1819)	Tikusan alis putih	White-browed Crake	Least Concerned
	Porzana fusca (Linnaeus, 1766)	Tikusan alis merah	Ruddy Breasted Crake	Data Deficient
Rhipiduridae	*Rhipidura javanica (Sparrman, 1788)*	Kipasan belang	Sunda Pied Fantail	Least Concerned
Sturnidae	*Acridotheres javanicus (Cabanis, 1850)*	Kerak Kerbau	Javan Myna	Vulnerable
Turnicidae	*Turnix suscitator (Gmelin, 1789)*	Gemak Loreng	Barred Buttonquail	Least Concerned
Tytonidae	*Tyto alba (Scopoli, 1769)*	Serak Jawa	Common Barn-owl	Least Concerned
Zoozteropsidae	*Zosterops melanurus (Temminck, 1824)*	Kacamata Biasa	Sangkar White-eye	Vulnerable
	Heleia javanica (Horsfield, 1821)	Opior Jawa	Javan Grey-throated White-eye	Least Concerned

means that the habitat is suitable for the life of the existing bird species, while the species of birds found only in several habitats means that the habitat is not suitable for the needs of the place for bird life (Rumanasari et al., 2017).

UNS which houses buildings with different heights, trees, shrubs, grasses and a playground. All these structures introduce, in one way or another, accommodation,

Fig. 2. Several types of birds found on the UNS campus. The endemic type of Java is exemplified by Javan kingfisher, Javan pond heron, scarlet headed flowerpecker. White breasted waterhen and white browed crake types of water bird from the Rallidae. This type of rock dove is purposely kept on campus

protection, roosting, resting, nesting, mating and feeding purposes to birds (Abd Rabou, 2019) (Fig. 3).

Based on the result of the observation, we found that birds from the Alcedinidae, Ardeidae, Cisticolidae, Capitonidae, Columbidae, Estrildidae, Hirundinidae, Megalaimidae, Picidae, Rallidae, Sturnidae, Turnicidae, Tytonidae Families are dominating in 2021. Number of species in the Ardeidae and Rallidae family showed 50% and 200% increase respectively compared to the number of species in other families in 2021. This is due to the abundance of food sources and easily accessible water sources (UNS Lake).

The Rallidae family's diet is quite diverse, ranging from invertebrates, seeds, and even human leftovers (Lambey, 2013). Ardeidae is a water bird similar to cranes with long beaks and feet as an adaptation to live in wet areas (Howes et al., 2003). This family of birds is dominant around UNS lake which is a strategic place for water birds to search for food. In the area of UNS lake, there are plenty of bushes and trees to provide shelter for birds from the Ardeidae family to nest.

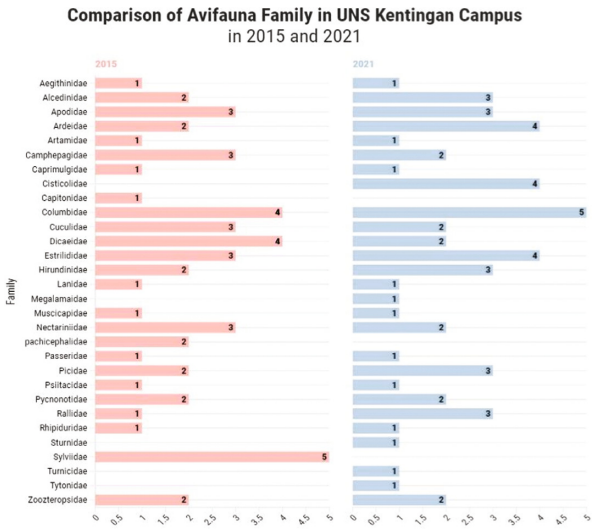

Fig. 3. Comparison of Avifauna Family in UNS Kentingan Campus in 2015 and 2021

On the observation data from 2021, it is also found that there is decline in the occurrence of the Dicaeidae, Campephagidae, Capitonidae, Cuculidae, Nectariniidae, Pachycephalidae, and Sylviidae birds family. The Dicaeidae suffered the most in the declining number of species from the 2015 data compared to 2021 data. There are only 2 species in the Dicaeidae family in 2021 compared to 4 species in 2015. This is due to the fact that during 2021, the UNS Kentingan campus area experienced landscape transformation. There were construction of new buildings replacing green open areas. The declining quality of the environment is caused by declining numbers of vegetation and coincided by increasing human activity. The main cause of aggressive declination of bird species is the habitat loss from the exotic species and habitats destruction. In urban environments, man has created islands of natural habitats as an effort to.(Idilfitri & Mohamad, 2012).

The end result of these factors is losing nesting sites and feeding sites for the Dicaeidae birds family (Nurdin, Nurlaila, Kosasih, & Herlina, 2020). Population density of various birds other than Dicaeidae bird family might show a declining trend in accordance with the transformation of the environment. Pratiwi (2005) argued that birds usually showed up in the area which is suitable for them. Changing the landscape for infrastructure development directly causes declining numbers of vegetation and feeding ground is critical in diversity and population density (Rahayuningsih et al., 2010).

The availability of nesting sites in native and non-native vegetation, houses, uninhabited buildings, a variety of anthropogenic structures such as metal pipes and bridges, and provision of nestboxes influence birds nesting in urban areas worldwide. Despite birds often having higher levels of breeding success in native vegetation (James Reynolds et al., 2019).

Since the presence and activity of birds in a particular area is dependent on the habitat condition and the vegetation around it. Drastic environment transformation will impact

bird livelihood in the UNS Kentingan campus. It is necessary for the stakeholders to come up with a strategy to manage open areas and infrastructure development so that it will not disturb the habitat of the birds. Besides, it is also necessary to periodically census bird species in the area of UNS Kentingan campus. These efforts might increase the awareness to conserve the birds and their habitats (Muhammad et al., 2018).

A natural urban park with grassy field or aquatic such as lake or pond helps urban birds in food sources, water for thirst-quencher and bird play area. In the same time, the space is also affected by its purpose and use for human enjoyable and pleasurable space such as playing fields and sightseeing gardens. Some birds eat small carnivores and help in controlling the population of pest. (Idilfitri & Mohamad, 2012).

4 *Conclusion*

In 2015 the result shows the observations found 50 species of birds from 24 families, but in 2022 research found 55 species of birds from 27 families.

The record of encounters with new species observed in 2022 is as many as 14 species. While 6 species from 2015 data have not been observed anymore.

The new families that dominate are the Rallidae and Ardeidae while those that are starting to disappear are the Dicaidae.

The presence of a bird species is influenced by several factors, such as feed, vegetation, presence of predators, temperature, habitat conditions, and human activities. From some of these factors, the most influencing factors are the presence of food and human activities. Activity Humans have the most influence on the existence of birds.

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