

# The Effect of Lockdown During the Covid-19 Pandemic on Bird Species Richness at IPB Dramaga Campus

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IPB Dramaga Campus in Bogor has been recognized to hold a high diversity of birds, while at the same time is also experiencing disturbance due to human activities. During the covid-19 pandemic in 2020-early 2022, most human activities on campus were decreased. Observations made during lockdown indicated that birds were seen more easily in various habitats on campus. The objective of this study was to describe bird species richness and composition before the period of lockdown and after the pandemic (post-lockdown). Bird surveys were conducted monthly in 2019 and from January to May 2023 to obtain a bird species list. Mist nets were set up monthly for 3 months in 2019 and 2023 to obtain demographic data. Descriptive analysis was conducted by comparing the results with previous data collected by Uni Konservasi Fauna (UKF) and Cikabayan Bird Banding Club (CBC). The number of bird species between the two periods did not differ significantly; there were 66 species in while in 2023 there were 60 species. In both periods bird species composition was dominated by the family of Cuculidae, and the dominant feeding guild was insectivores.

Key words: bird species richness, covid-19 pandemic, lockdown

## INTRODUCTION

IPB University campus in Dramaga, Bogor, Indonesia is known for having a high biodiversity (Afrianto and Najah 2017), especially bird diversity (Mulyani *et al.* 2013; Mustari 2021). The high bird diversity in the area is supported by the occurrence of various types of habitats that include rivers, lakes, riparian areas, plantation forests, natural vegetation, and built areas (Mustari 2021; Nugroho *et al.* 2021). The occurrence of various habitat types is important for bird communities (Alikodra 1976). On the other hand, birds are sensitive to changes (Wiens 1922). Research on bird communities on campus has been conducted over the last three decades (Alikodra 1976; Van Balen *et al.* 1986; Mulyani *et al.* 2013; Dewi 2014; Azis *et al.* 2016). However, no study has been conducted on the effect of direct human activities on bird communities.

IPB University is one of the largest higher education institutions in Indonesia, so the number of students is growing every year. The number of human populations doing activities on campus is suspected to influence the bird community. This progress has led to a gradual transformation of the ecological landscape, triggered by the conversion of land into building

structures. This has led to a decline in biodiversity, particularly bird species (Saefullah *et al.* 2015), which face a range of anthropogenic challenges. Birds are a common component of wildlife in the campus environment, providing ecological benefits such as access to food and reduced predation.

In early 2019, COVID-19 struck, and many campuses including IPB University halted many activities on campus. This resulted in a significant decrease in human activities and traffic on campus. Studies by Anthony and Tiwari 2022; Gordo *et al.* 2021 showed that the response of urban birds to Covid-19 lockdown affects the detection of bird presence higher than before in response to quieter and less crowded campuses or cities. This phenomenon raised a question: would the bird diversity on campus be better during and after the lockdown due to covid-19 pandemic?

The objective of this study was to examine the bird species richness and composition in the IPB campus environment before and after lockdown due to COVID 19 pandemic. This study provides baseline information on the effect of lockdown on the use of habitat by bird community. This information on birds can also be used for and management of birds.

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## MATERIALS AND METHODS

**Study Site and Time.** The study was conducted in the IPB Dramaga Campus area, Bogor, West Java. Data was collected by direct observation and mist nets. Observations were conducted monthly as part of Uni Konservasi Fauna activities from January to April and August to December 2019 (early pandemic) and in January-May in 2023 (post-pandemic). The area of observation was divided into three parts, such as in the southern, western, and northwestern parts of campus. (Figure 1). Mist nets were set up from 06.00 to 15.00 one day per month before the lockdown in September, October and December 2019. Mist nets were also set up in March, May, and June 2023 (post-pandemic). The area of observation was divided into three parts: front area (southern part), central area, and back area (west and northwestern part of campus) (Figure 1). Data was collected by the team as a part of Uni Konservasi Fauna and Cikabayan Bird Banding Club bird monitoring program.

**Tools and Objects.** The equipment for bird observation includes binoculars, a digital camera, field guide to the birds of South-East Asia (Robson 2000), Avenza Apps, flagging tape, a tally sheet, and stationery. The equipment for the mist net method such as Indonesian Bird Banding Scheme (IBBS) numbered rings, mist net, banding pliers, removing bands and opening overlapped bands, and stationery.

**Bird Data Collection.** Bird data collection with direct observation using the area search method described by Lyon (1986). This method allows the observer to move freely within a predetermined area for a set period, during which all birds observed and heard are recorded. The observation area was divided into several grids, typically consisting of 6-8 squares each measuring 100 × 100 metres (equivalent to one hectare). Each grid was surveyed for 15 minutes to record relevant data on species, number, activity, and location. Bird data collection with the mistnets described by Lowe (1989) and Bibby *et al.* (1992). This method is used to capture secretive and cryptic birds, as well as to obtain morphological character information, investigate habitat selection, and other distribution and demographic data.

**Data Analysis.** Data were analyzed descriptively using tables and diagrams. Bird species composition between periods was compared using the Jaccard similarity index (Mueller-Dombois and Ellenberg 1974). Identification of conservation status was based on the IUCN RedList category and Indonesian regulation i.e., Forestry Ministry Regulation P 106/2018. Birds are categorized into feeding guilds, following classification by Lim and Sodhi (2004), Sigel *et al.* (2010), and Panda (2021): (1) carnivore, (2) carnivore-piscivore, (3) frugivore, (4) granivore,

(5) granivore-frugivore, (6) insectivore-piscivore, (7) insectivore-carnivore, (8) nectarivore, (9) omnivore, (10) piscivore (Tabel 1).

## RESULTS

**Species Richness and Composition.** The total number of species using the direct observation method was 77 species from 33 families (Figure 2), which consisted of 66 species before lockdown and 60 species after lockdown (Table 1). The total number of species using the mist net method was 5 species from 4 families before lockdown and 10 species from 9 families after lockdown (Figure 3). Species captured using the mist net method are also included in the direct observation data, so no additional species are collected using the mist net method. Comparison of species composition between periods showed that there was 65.80% similarity in bird species composition between the two periods.

The eight most common species from the direct observation method from the family Cuculidae such as Plaintive Cuckoo (*Cacomantis merulinus*), Brush Cuckoo (*Cacomantis variolosus*), Banded Bay Cuckoo (*Cacomantis sonneratii*), Lesser Coucal (*Centropus bengalensis*), Greater Coucal (*Centropus sinensis*), Chestnut-winged Cuckoo (*Clamator coromandus*), Chestnut-breasted Malkoha (*Phaenicophaeus curvirostris*), and Square-tailed Drongo (*Surniculus lugubris*). The two most common species from the mist net method from the family Estrildidae such as Javan Munia (*Lonchura leucogastroides*) and Scaly-breasted Munia (*Lonchura punctulata*). From the capture, we found breeding birds identified through brood patches. The species with brood patches were Olive-backed Tailorbird (*Orthotomus sepium*) and Rufous-browed Babbler (*Pelorneum capistratum*) in 2019, and the Sunda Pygmy Woodpecker (*Picoides moluccensis*) in 2023.

There were two threatened species observed: Greater Green Leafbird (*Chloropsis sonnerati*) (EN), and Long-tailed Parakeet (*Belocercus longicaudus*) (VU). Both were recorded in 2019. There were 12 bird species protected by P.106/2018, i.e., Crested Serpent-Eagle (*Spilornis cheela*), Oriental Honey-buzzard (*Pernis ptilorhynchus*), Japanese Sparrowhawk (*Accipiter gularis*), Chinese Sparrowhawk (*Accipiter soloensis*), Moluccan Kestrel (*Falco moluccensis*), Peregrine Falcon (*Falco peregrinus calidus*), Malayan Night-Heron (*Gorsachius melanolophus*), Greater Green Leafbird (*Chloropsis sonnerati*), Chestnut-winged Cuckoo (*Clamator coromandus*), Chestnut-winged Cuckoo (*Loriculus galgulus*), Red-breasted Parakeet (*Psittacula alexandri*), and Long-tailed Parakeet (*Psittacula longicauda*).

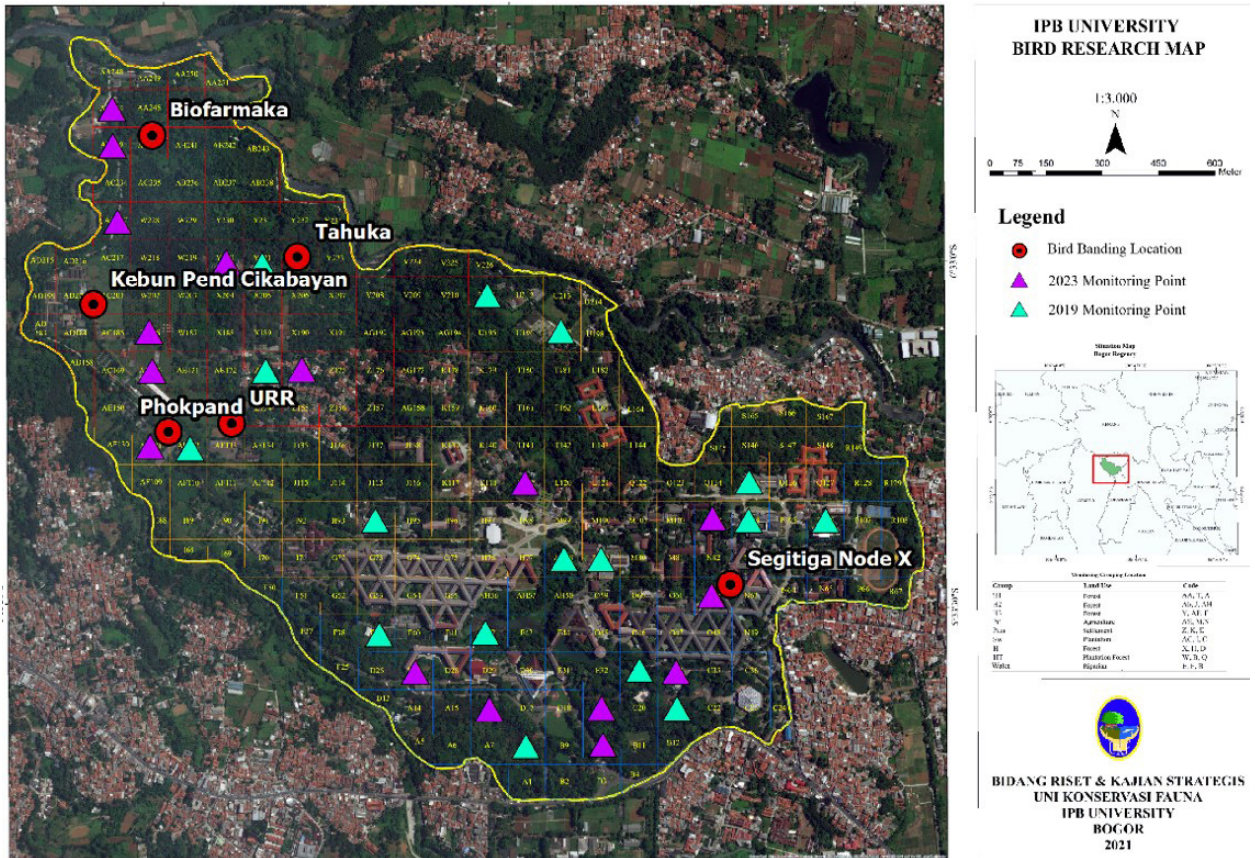


Figure 1. Map of study site in IPB Dramaga Campus

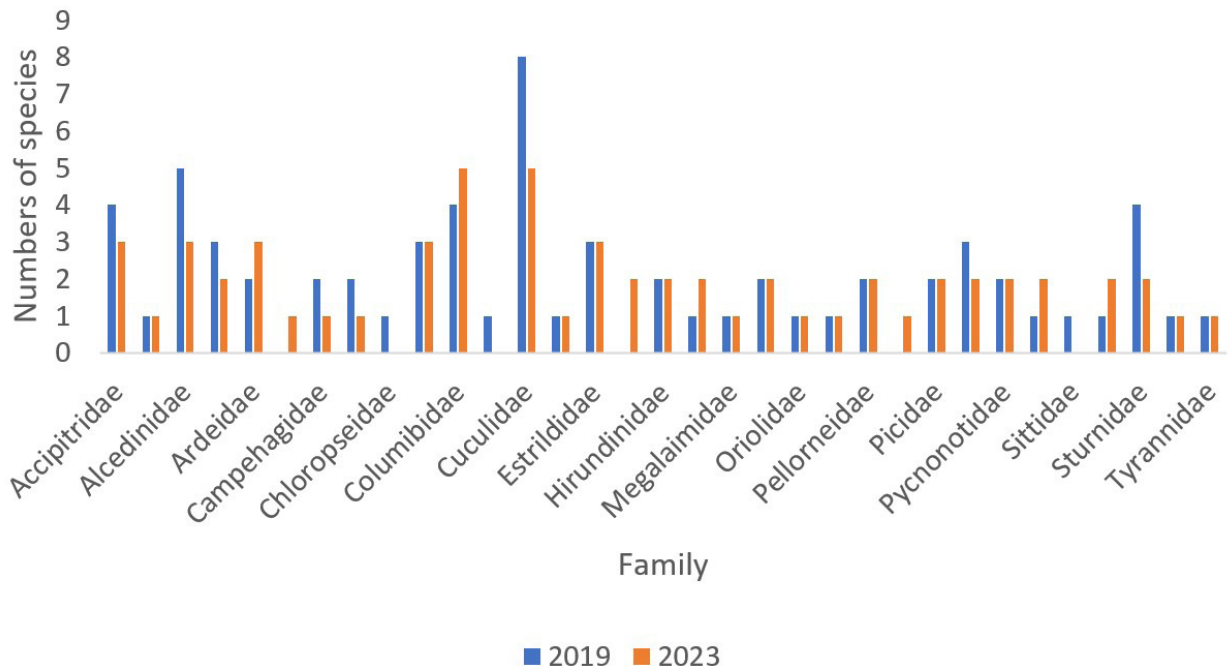


Figure 2. Comparison of bird families between 2019 and 2023 with observation method

Table 1. List of birds recorded during the study

Family	Common name	Scientific name	2019		2023	
			Direct observation	Mist net	Direct observation	Mist net
Accipitridae	<i>Crested Serpent-eagle</i>	<i>Spilornis cheela</i>	+		+	
Accipitridae	<i>Oriental Honey-buzzard</i>	<i>Pernis ptilorhynchus</i>	+		+	
Accipitridae	<i>Japanese Sparrowhawk</i>	<i>Accipiter gularis</i>	+			
Accipitridae	<i>Chinese Sparrowhawk</i>	<i>Accipiter soloensis</i>	+		+	
Falconidae	<i>Spotted Kestrel</i>	<i>Falco moluccensis</i>			+	
Falconidae	<i>Peregrine Falcon</i>	<i>Falco peregrinus</i>			+	
Aegithinidae	<i>Common Iora</i>	<i>Aegithina tiphia</i>	+		+	
Alcedinidae	<i>Blue-eared Kingfisher</i>	<i>Alcedo meninting</i>	+		+	
Alcedinidae	<i>Oriental Dwarf-kingfisher</i>	<i>Ceyx erithaca</i>	+			+
Alcedinidae	<i>Javan Kingfisher</i>	<i>Halcyon cyanoventris</i>	+		+	
Alcedinidae	<i>Collared Kingfisher</i>	<i>Todiramphus chloris</i>	+		+	
Alcedinidae	<i>White-breasted Kingfisher</i>	<i>Halcyon smyrnensis</i>	+			
Apodidae	<i>Little Swift</i>	<i>Apus affinis</i>	+		+	
Apodidae	<i>Edible-nest Swiftlet</i>	<i>Aerodramus fuciphagus</i>	+			
Apodidae	<i>Cave Swiftlet</i>	<i>Collocalia linchi</i>	+		+	
Ardeidae	<i>Little Egret</i>	<i>Egretta garzetta</i>			+	+
Ardeidae	<i>Black-crowned Night-heron</i>	<i>Nycticorax nycticorax</i>	+		+	
Ardeidae	<i>Malayan Night-heron</i>	<i>Gorsachius melanolophus</i>			+	
Ardeidae	<i>Yellow Bittern</i>	<i>Ixobrychus sinensis</i>	+			
Artamidae	<i>White-breasted Woodswallow</i>	<i>Artamus leucoryn</i>			+	
Campehagidae	<i>Pied Triller</i>	<i>Lalage nigra</i>	+			
Campehagidae	<i>Small Minivet</i>	<i>Pericrocotus cinnamomeus</i>	+		+	
Megalaimidae	<i>Coppersmith Barbet</i>	<i>Psilopogon haemacephalus</i>	+		+	
Caprimulgidae	<i>Savanna Nightjar</i>	<i>Caprimulgus affinis</i>	+			
Caprimulgidae	<i>Large-tailed Nightjar</i>	<i>Caprimulgus macrurus</i>	+		+	
Chloropseidae	<i>Greater Green Leafbird</i>	<i>Chloropsis sonnerati</i>	+			
Columbidae	<i>Grey-capped Emerald Dove</i>	<i>Chalcophaps indica</i>	+		+	
Columbidae	<i>Zebra Dove</i>	<i>Geopelia striata</i>			+	
Columbidae	<i>Eastern Spotted Dove</i>	<i>Spilopelia chinensis</i>	+		+	
Columbidae	<i>Grey-cheeked Green-Pigeon</i>	<i>Treron griseicauda</i>	+		+	
Columbidae	<i>Pink-necked Green-Pigeon</i>	<i>Treron vernans</i>	+		+	
Corvidae	<i>Large-billed Crow</i>	<i>Corvus macrorhynchos</i>	+			
Cuculidae	<i>Blaintive Cuckoo</i>	<i>Cacomantis merulinus</i>	+		+	
Cuculidae	<i>Brush Cuckoo</i>	<i>Cacomantis variolosus</i>	+			
Cuculidae	<i>Banded Bay Cuckoo</i>	<i>Cacomantis sonneratii</i>	+		+	
Cuculidae	<i>Lesser Coucal</i>	<i>Centropus bengalensis</i>	+		+	
Cuculidae	<i>Greater Coucal</i>	<i>Centropus sinensis</i>	+			
Cuculidae	<i>Chestnut-winged Cuckoo</i>	<i>Clamator coromandus</i>	+			
Cuculidae	<i>Chestnut-breasted Malkoha</i>	<i>Phaenicophaeus curvirostris</i>	+		+	
Cuculidae	<i>Square-tailed Drongo-cuckoo</i>	<i>Surniculus lugubris</i>	+	+	+	
Dicaeidae	<i>Scarlet-headed Flowerpecker</i>	<i>Dicaeum trochileum</i>	+		+	
Hirundinidae	<i>Striated Swallow</i>	<i>Cecropis striolata</i>			+	+
Hirundinidae	<i>Tahiti Swallow</i>	<i>Hirundo tahitica</i>	+		+	
Hirundinidae	<i>Barn Swallow</i>	<i>Hirundo rustica</i>	+			
Laniidae	<i>Long-tailed Shrike</i>	<i>Lanius schach</i>	+		+	
Laniidae	<i>Tiger Shrike</i>	<i>Lanius tigrinus</i>			+	
Nectariniidae	<i>Brown-throated Sunbird</i>	<i>Anthreptes malacensis</i>	+	+	+	
Nectariniidae	<i>Olive-backed Sunbird</i>	<i>Cinnyris jugularis</i>	+		+	
Oriolidae	<i>Black-naped Oriole</i>	<i>Oriolus chinensis</i>	+		+	
Picidae	<i>Freckle-breasted Woodpecker</i>	<i>Dendrocopos analis</i>	+		+	
Picidae	<i>Sunda Pygmy Woodpecker</i>	<i>Picoides moluccensis</i>	+		+	
Estrildidae	<i>Javan Munia</i>	<i>Lonchura leucogastroides</i>	+		+	+
Estrildidae	<i>White-headed Munia</i>	<i>Lonchura maja</i>	+		+	+
Estrildidae	<i>Scaly-breasted Munia</i>	<i>Lonchura punctulata</i>	+		+	
Passeridae	<i>Eurasian Tree Sparrow</i>	<i>Passer montanus</i>	+		+	+
Psittacidae	<i>Blue-crowned Hanging-parrot</i>	<i>Loriculus galgulus</i>	+	+	+	+
Psittacidae	<i>Red-breasted Parakeet</i>	<i>Psittacula alexandri</i>	+		+	
Psittacidae	<i>Long-tailed Parakeet</i>	<i>Belocercus longicaudus</i>	+			

Table 1. Continued

Family	Common name	Scientific name	2019		2023	
			Direct observation	Mist net	Direct observation	Mist net
Pycnonotidae	<i>Sooty-headed Bulbul</i>	<i>Pycnonotus aurigaster</i>	+		+	
Pycnonotidae	<i>Yellow-vented Bulbul</i>	<i>Pycnonotus goiavier</i>	+		+	+
Rallidae	<i>White-breasted Waterhen</i>	<i>Amaurornis phoenicurus</i>	+		+	
Rallidae	<i>Red-legged Crane</i>	<i>Rallina fasciata</i>			+	
Phylloscopidae	<i>Arctic Warbler</i>	<i>Phylloscopus borealis</i>			+	
Cisticolidae	<i>Common Tailorbird</i>	<i>Orthotomus sutorius</i>	+		+	
Cisticolidae	<i>Olive-backed Tailorbird</i>	<i>Orthotomus sepium</i>	+		+	
Cisticolidae	<i>Brown Prinia</i>	<i>Prinia polychroa</i>	+		+	+
Sittidae	<i>Velvet-fronted Nuthatch</i>	<i>Sitta frontalis</i>	+	+		
Strigidae	<i>Sunda Scops-owl</i>	<i>Otus lempiji</i>	+		+	
Strigidae	<i>Spotted Wood-owl</i>	<i>Strix seloputo</i>			+	
Sturnidae	<i>Javan Myna</i>	<i>Acridotheres javanicus</i>	+		+	
Sturnidae	<i>Common Myna</i>	<i>Acridotheres tristis</i>	+			
Sturnidae	<i>Short-tailed Starling</i>	<i>Aplonis minor</i>	+			
Sturnidae	<i>Asian Glossy Starling</i>	<i>Aplonis panayensis</i>	+		+	
Pellorneidae	<i>Horsfield's Babbler</i>	<i>Malacocincla sepiaria</i>	+		+	
Pellorneidae	<i>Rufous-browed Babbler</i>	<i>Pellorneum capistratum</i>	+		+	
Turnicidae	<i>Barred Buttonquail</i>	<i>Turnix suscitator</i>	+	+	+	+
Tyrannidae	<i>Sangkar White-eye</i>	<i>Zosterops melanurus</i>	+	+	+	

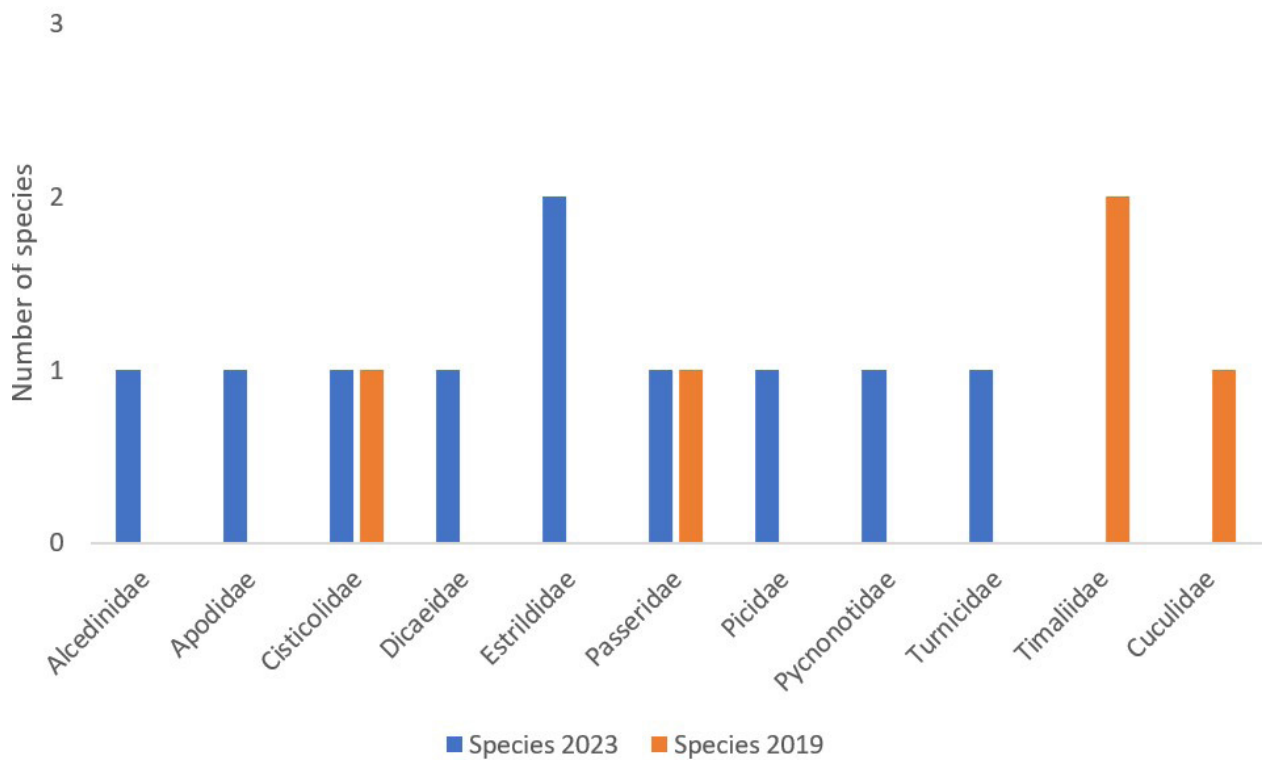


Figure 3. Number of species based on families captured by mist net

**Feeding Guild.** The birds that found in the area are divided into 11 groups classified by feeding guild. The most dominant group are insectivore (38%), omnivore (15%), and granivore (10%) (Figure 4). The number of species found by feeding guilds between the two periods showed differences, in 2019 there were 25 species of insectivorous birds, while in 2023 there were 22 species. Slight differences in feeding group findings also occurred in omnivorous birds,

there were 12 bird species found in 2019, while in 2023 only 8 species were found.

**DISCUSSION**

The bird species richness and composition did not differ significantly between the two periods. The value of the similarity index (65.8%) indicates that bird species composition is somewhat similar between the



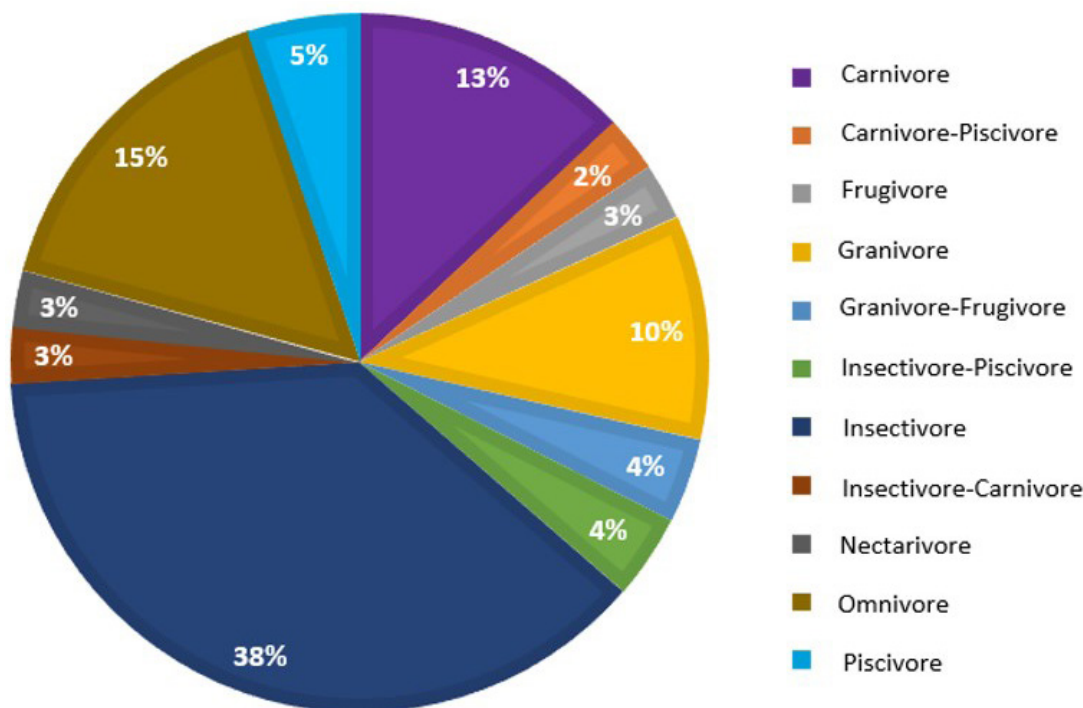


Figure 4. Bird classification based on feeding guilds

two periods (Mueller-Bombois and Ellenberg 1974). Gordo *et al.* (2021) also reported similar result in comparing the response of urban birds to lockdown due to Covid-19 in Spain. However, the difference shows indication of a dynamic in the use of habitat on campus between the two periods.

It is interesting that there were many species of Cuculidae. The Cuculidae family (cuckoos) consisted of birds that showed brood parasitic behavior. These birds do not build their own nest, instead they lay their eggs in other bird's nests, and leave the parental care of their offspring to the hosts. Due to this behavior, cuckoos serve as an indicator of bird species richness, because their occurrence is positively correlated with the occurrence of their host. Since most cuckoos are not host-specific, more cuckoos might indicate that more breeding host species are available (Møller *et al.* 2017). The occurrence of brood patches in Olive-backed Tailorbird, a potential host of cuckoos, is an indication of breeding, and it might explain the high cuckoo activity during the period.

The presence of birds on the Darmaga Campus of IPB is supported by various types of habitats that are important for bird communities (Alikodra 1976; Mustari 2021; Nugroho *et al.* 2021), including breeding areas and migration flyways. During this study, we found the Sunda Pygmy Woodpecker in the breeding stage. Based on bird banding data conducted on campus, breeding was also found in Olive-backed Sunbirds (*Orthotomus sepium*) in 2019.

The observations show that the Darmaga IPB campus is used by migratory birds, especially

raptors, as a resting area. In 2019 and 2023, seven species of migratory birds were found, namely Japanese Sparrowhawk (*Accipiter gularis*), Chinese Sparrowhawk (*Accipiter soloensis*), Oriental Honey-buzzard (*Pernis ptilorhynchus*), Peregrine Falcon (*Falco peregrinus calidus*), White-throated Kingfisher (*Halcyon smymensis*), Malayan Night-Heron (*Gorsachius melanolophus*), and Chestnut-winged Cuckoo (*Clamator coromandus*).

When the distribution of avian foraging and nesting guilds was considered in relation to habitat structure, several general patterns emerged. Insectivores were strongly associated with measures of tree cover and showed an affinity for woodlots. Seed-eaters and omnivorous ground foragers were strongly associated with herbaceous cover and large shade trees, but seed-eaters avoided woodlots (DeGraaf and Wentworth 1986). This is consistent with the study conducted by Saefullah *et al.* (2015), who found that the IPB campus has a different habitat structure with different plant species. The canopy density is open to dense, with the most common plant species of *Litsea* sp., *Tracy lobium*, *Calophyllum soulatri*, *Melia excelsa*, *Dracontomelon dao*, *Khaya grandifolia*, *Strombosia zeylanica*, *Maesopsis eminii*, *Terminalia superbada*, *Pinus merkusii*, *Delonix regia*, *Ceiba pentandra*, *Alstonia scholaris*, *Shorea leprosuladan*, *Nephelium lappaceum*, *Evodia aromatic*, *Bambusa* sp. and *Paraserianthes falcataria*. This diversity of plant species can also provide food and shelter for birds on campus.

In conclusion, bird species richness and composition in IPB Campus Darmaga was relatively similar before and after the lockdown due to Covid-19 pandemic. However, there were differences in the composition of bird species based on feeding guilds between the two periods. Insectivorous and omnivorous bird groups were more common in 2019 during the early pandemic period.

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