

## BIRD USE OF SEVERAL HABITAT TYPES IN AN ACADEMIC CAMPUS OF INSTITUT PERTANIAN BOGOR IN DARMAGA, BOGOR, WEST JAVA

*(Penggunaan Berbagai Tipe Habitat oleh Burung di Kampus Institut Pertanian Bogor, Darmaga, Bogor, Jawa Barat)*

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### ABSTRACT

*This study examined bird diversity in isolated and fragmented habitats in IPB Darmaga Campus, Bogor, West Java Indonesia. Bird surveys were conducted in plots of several habitat types using MacKinnon List and point count methods. A total of 52 bird species were recorded during the study. Use of habitats by several breeding birds, such as Red-breasted Parakeet *Psittacula alexandri* indicated the importance of habitats for the survival of bird community in the area. Monitoring of population, especially those of breeding species, is necessary to assess the suitability of the area as wildlife refuge and to make necessary management recommendation.*

*Keywords: bird, isolated, fragmented, habitat use, population*

### ABSTRAK

Penelitian ini dilakukan untuk mengetahui keanekaragaman burung di habitat yang terisolasi dan terfragmentasi di Kampus IPB Darmaga, Bogor, Jawa Barat. Survey burung dilakukan dalam plot-plot di beberapa tipe habitat menggunakan metode daftar MacKinnon dan *point count*. 52 spesies burung tercatat selama penelitian. Penggunaan habitat oleh beberapa jenis burung yang berbiak seperti betet Biasa (*Psittacula alexandri*) mengindikasikan pentingnya habitat bagi kelangsungan hidup komunitas burung di daerah tersebut. Pengamatan populasi, terutama bagi burung yang berbiak, dibutuhkan untuk mengetahui wilayah yang cocok sebagai tempat perlindungan satwaliar dan untuk membuat rekomendasi pengelolaan yang dibutuhkan.

Kata kunci: burung, terisolasi, terfragmentasi, penggunaan habitat, populasi

### INTRODUCTION

Many studies have suggested that habitat loss and fragmentation influence bird communities; in fact, forest fragmentation is one of the major factors that determine bird community decline (Diamond *et al.* 1987). The needs to improve the livelihood of the growing population in many tropical developing countries, such as in Indonesia, have caused great losses of natural habitats. World Resource Institute (2006) reported that Indonesia has lost 16.1% of its natural forests during the period of 1990-2000.

Bogor Agricultural University or IPB (Institut Pertanian Bogor) is one of the major academic institutions in Indonesia. The main campus was in the City of Bogor (06°26'S, 106°48'E) in West Java, Indonesia, but it had just completely moved to a newly built campus in Darmaga in District of Bogor, approximately 12 km west of the city. The campus area is known to harbor a high diversity of wildlife, especially birds (Mulyani 1985; van Balen 1986; Kurnia 2003).

Rapid development in the District of Bogor has brought about changes in land use. The surrounding campus areas that once were dominated by paddy fields

have been converted into other land uses, especially housings and business zone. Therefore, it is suggested that the remaining vegetated area in campus is becoming more important for wildlife in the area. However, to facilitate academic activities, many buildings have been built and some vegetated areas have been cleared or converted into educational agricultural farm (experimental field) and other facilities. These changes have brought changes to wildlife, especially through habitat fragmentation and the decline in size of available vegetated areas.

Being isolated and fragmented while at the same time might be the only remnant of good habitat in the area, makes IPB Darmaga campus area unique. In fact, the university has declared the IPB Darmaga Campus as a biodiversity campus.

### Objectives

The objectives of the study is to up date the condition of bird diversity in several habitat types in Darmaga Campus.

## STUDY AREA AND METHODS

The study was conducted in IPB Darmaga Campus, in the District of Bogor, West Java, Indonesia. It is located between 145 – 195 m above sea level with level to undulating terrain. High rainfall is recorded for Darmaga, with an average that could reach more than 4000 mm per year, and nine wet months per year. The campus area is bordered by two rivers: Ciapus in the north east and Cisadane in the north, by the main road from Bogor to Leuwiliang in the south, and by the business zone of Babakan Raya in the east (Figure 1). Previous land cover in Darmaga was mainly rubber

plantation and patches of forest-species tree plantation (pine, and arboretums). Currently, there are scattered remnants of rubber plantation.

We did surveys in mixed species plantation (arboretum and remnant of old plantation) pure stands (albizia and pines), parks, and wetlands. Additional observations were conducted in the housing complex and in agricultural farm. Existing condition in bird community (diversity and abundance) was assessed by surveying the vegetated areas in Darmaga Campus. A review of previous studies on birds and wildlife in Darmaga Campus was conducted in addition to field surveys.

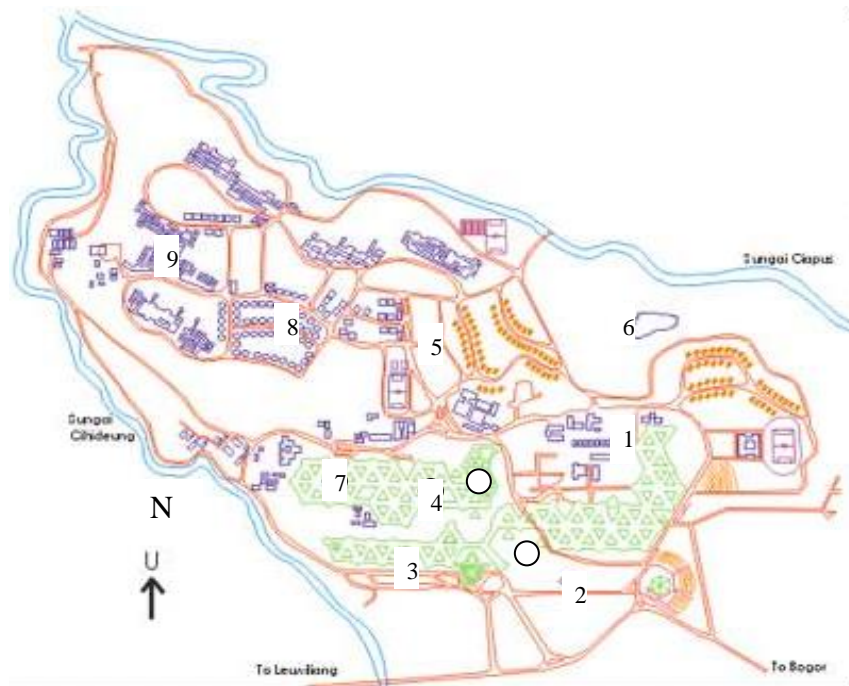


Figure 1. Study area and observation plots (numbers representing observation plots: 1= Arboretum at Faculty of Forestry; 2= Parks and Landscape Arboretum; 3= Albizia plantation; 4=Wetland behind Information Centre; 5= Remnant of old mixed species Plantation; 6= Pine plantation; 7= Wetland behind Faculty of Veterinary Medicine; 8= Housing complex; 9=Agricultural experimental field)

Bird surveys were conducted between September 2007 and January 2008. MacKinnon Species List method was used to assess species richness of birds in the study area. The observations were conducted during different times to record as many diurnal species as possible. Ten to fifteen lists were made for each type of habitats. Bird identification was done both visually and by identifying calls and songs. Bird count was done in 8 types of habitats using point count method (20 minutes observation per point). Three repetitions (points) were placed in each habitat. Counting was done early in the morning and afternoon during clear weather. To examine habitat condition, a vegetation analysis using single plots in each habitat was conducted.

## RESULTS

### Species Richness

A total of 52 species of 26 families were recorded during the study (Appendix 1). The MacKinnon method recorded 40 species while the point count method recorded a total of 45 species. Five species were recorded outside the observation period or outside the observation plots, those are: Crested Serpent Eagle (*Spilornis cheela*), Chestnut-winged Cuckoo (*Clamator coromandus*), Ashy Drongo (*Dicrurus leucophaeus*), and two nocturnal species: Savanna Nightjar (*Caprimulgus affinis*), and Collared Scops Owl (*Otus lempiji*).

## Species Composition

Based on major habitat used, the birds in the study area can be categorized into: forest birds, wetland birds, open woodland birds, and raptor (1 species). The species composition based on major feeding guild (according to MacKinnon 1990) consisted of insectivores, frugivores, granivores, carnivores and piscivores (Appendix 1).

Sooty-headed Bulbul *Pycnonotus aurigaster* was very common in the area. It was recorded in 110 of 135 MacKinnon lists, followed by Common Tailorbird (*Orthotomus sutorius*) (108 list) and Cave Swiftlet (*Collocalia linchi*) (105 lists). Black Drongo (*Dicrurus macrocercus*) and Black-winged Flycatcher Shrike *Hemipus hirundinaceus*, and Asian Brown Flycatcher (*Muscicapa dauurica*) were the least common (only recorded once), followed by Black-capped Babbler

*Pellorneum capistratum*, Eurasian Tree Sparrow (*Passer montanus*), Barred Buttonquail (*Turnix suscicator*), and Brown-throated Sunbird (*Anthreptes malaccensis*) (2 recorded in two lists). Sooty-headed Bulbul was also the most abundant species in every plot.

## Bird diversity in different habitat types

There were differences in the number of species and diversity indices among different types of habitats. Using MacKinnon Species List, the highest number of bird species was recorded in the housing complex, whilst the lowest was found in the pine plantation (Figure 2; Appendix 2). In general the number of species started to level off after the fifth to the tenth list. Therefore, it could be said that this study has recorded most of the bird species occurred during the observation period.

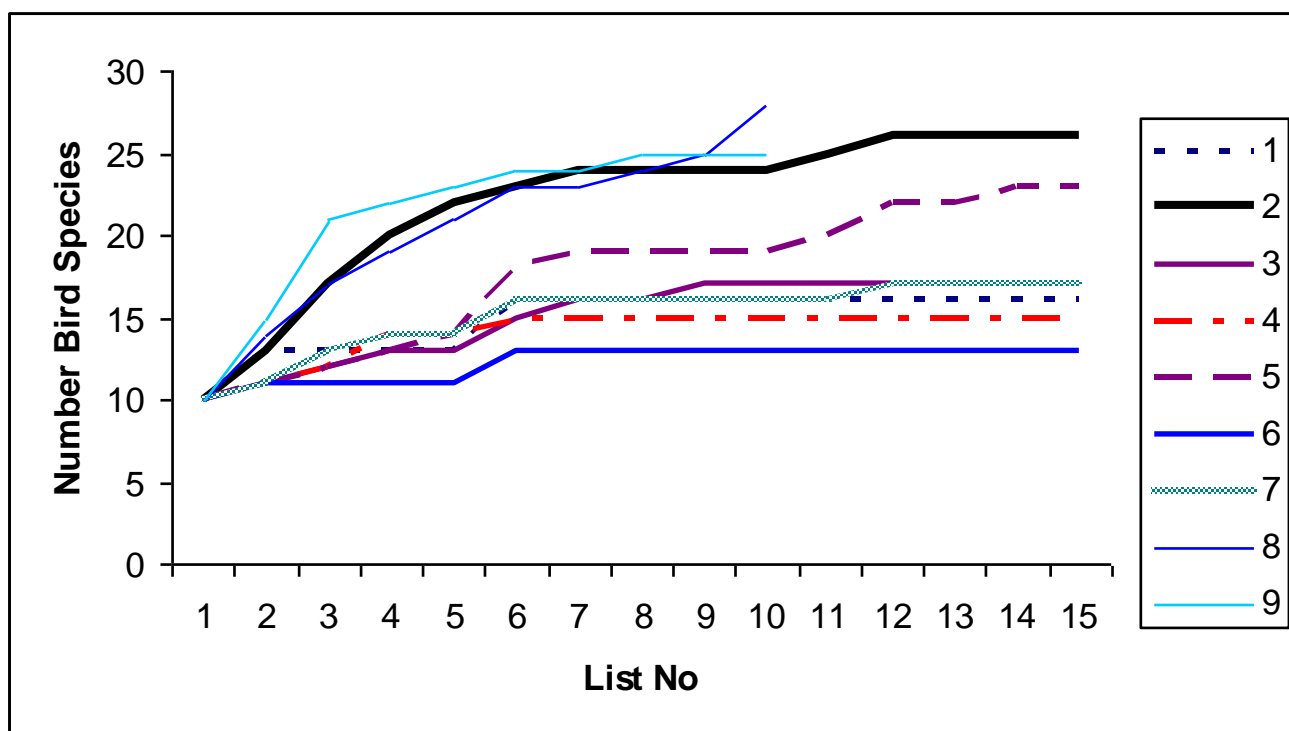


Figure 2. MacKinnon Species list curve for each observation plot (1= Arboretum at Faculty of Forestry; 2= Parks and Landscape Arboretum; 3= Albizia plantation; 4=Wetland behind Information Centre; 5= Remnant of old mixed species Plantation; 6= Pine plantation; 7= Wetland behind Faculty of Veterinary Medicine; 8= Housing complex; 9=Agricultural experimental field)

There is also a slight difference in the number of birds assessed by MacKinnon Species List and point count (Table 1). In general, the diversity indices and the evenness are low. Wetlands held the lowest diversity indices compared to other habitat types. The diversity index in albizia plantation is quite similar to those in the remnant old plantation, although those two habitats are

very different in vegetation and topographical characteristics. The bird diversity in Arboretum of Faculty of Forestry was surprisingly lower than those in pure stands of *Paraserianthes falcataria* or *Pinus merkusii*, although the vegetation was more diverse in the former habitat.

Table 1. Bird species number and diversity indices in the observation plots

Observation plot	Habitat type	Dominant Vegetation	Number of Bird Species (S)		Shannon* Diversity Index (H')	Evenness* (E)
			MacKinnon List	Point Count		
Arboretum - Forestry	Mix tree species	<i>Altingia excelsa</i>	16	14	1,91	0,72
Parks and Landscape Arboretum	Parks, mix trees and ornamental plants	<i>Agathis sp</i>	26	28	2.70	0.81
Albizia Plantation	Pure stand of <i>Paraserianthes falcataria</i>	<i>Paraserianthes falcataria</i>	17	17	2.35	0.83
Wetland-LSI	Wetland surrounded by rubber trees and lower vegetation	<i>Hevea brasiliensis</i>	15	11	1.86	0.78
Remnant old plantation	Mix tree species	<i>Sphatodea campanulata</i> ; <i>Pipper aduncum</i>	22	27	2.36	0.72
Pine Plantation	Pure stand of <i>Pinus merkusii</i>	<i>Pinus merkusii</i> ; lower vegetation dominated by <i>Amaranthus sp</i> and <i>Nephrolepis bisserata</i>	13	16	2.04	0.74
Wetland-Veterinary Faculty	Wetland surrounded by shrubs/lower vegetation	Cyperaceae	17	16	1.79	0.65
Housing Complex	Backyard Garden	Fruits and ornamental plants	28	n.a	n.a	n.a
Agricultural Experimental Field	Agricultural plantation, lower vegetation	Maize, young rubber	25	15	2.35	0.87

\* The calculation used data from point count; no IPA was conducted in housing complex

### Habitat Use by birds

Bird activities recorded during the survey include feeding, roosting, singing, preening and flying. Nests recorded during the observation include those of Red-breasted Parakeet, Javan Munia (*Lonchura leucogastroides*), Cave Swiftlet (*Collocalia linchi*), Common Iora (*Aegithina tiphia*), Oriental White-eye (*Zosterops palpebrosus*) and Olive-backed Sunbird (*Nectarinia jugularis*). A colony of Black-crowned Night-heron *Nycticorax nycticorax* uses trees around the wetland to roost.

### Discussion

Idris (2002) listed 43 species in Bogor Botanical Garden ( $\pm 100$  ha, 9 km east of Darmaga), while Solihati (2007) recorded 29 species in Dramaga Experimental Forest ( $\pm 60$  ha, 3 km north-east of the study site). Compared to those two habitats, a relatively high number

of bird species recorded in the study area, despite the rapid infrastructure development in the area. This might indicate the importance of the study area for the survival of birds.

Factors influencing bird diversity in an area include (but not limited to) size, habitat diversity, degree of isolation, and disturbance (e.g. MacArthur & Wilson 1967). The difference in the number of bird species and diversity between habitats in the study area might be due to one or more of these reasons. The low diversity in Arboretum of Forestry might have resulted from the small and isolated characteristics of this site. Unlike the result of Mulyani (1985) and Kurnia (2003) that reported more species in the Arboretum of Forestry ( $\pm 0.36$  ha) than in pine plantation ( $\pm 2$  ha then;  $\pm 1$  ha at present), this study showed that Arboretum with mixed species of trees and lower vegetation held lower bird diversity. The previous studies were conducted before and during the development of buildings (dormitory and academic

building) nearby the arboretum, therefore habitat connection with rubber plantation and other green open spaces was still available. At present the Arboretum of Forestry is surrounded by buildings in every direction, connected with other green spaces by corridor of road side trees.

The habitat types of parks and landscape arboretum, housing, and agricultural experimental field held relatively higher number of birds and diversity compared to other types of habitat in the study area. Size and habitat diversity might explain for the condition in the parks and housing complex, while size and distance to other habitats might explain the condition in agricultural experimental field. Many fruit bearing trees and flowering vegetation are planted in the area, providing food for bird community in the housing area and parks.

Some forest birds, such as White-rumped Shama (*Copsychus malabaricus*), the Orange-headed Thrush (*Zoothera citrina*) and the Hill Blue Flycatcher (*Cyornis banyumas*) that were recorded in the previous studies (van Balen *et al* 1986; Kurnia 2003) were no longer recorded in this study. The disappearance of these birds that depend on some stratified vegetation might indicate the degradation of their habitat. Another reason might be human disturbance. These birds are also in high demand in the market because of their beautiful song. Therefore, the quite easy access has encouraged people to capture birds in the area. Although the campus management had tried to prevent poaching by putting up signs and fencing the area, no sanction or law enforcement has been done to poachers. Additionally, as a big academic campus the high level of regular activities might also influence the species survival. According to Platt and Lill (2006) pedestrian traffic in urban fragments could influence the composition bird assemblages by reducing the representation of disturbance-sensitive species. The effect of disturbance might explain the low diversity of

birds in Arboretum at Faculty of Forestry. This might be due to the frequency of human (academic) activity that is more intensive around the Forestry Faculty.

The importance of campus area for the survival of some species was also shown by the use of habitat for breeding. The Red-breasted Parakeet, which is a hole-nesting species, could find the nest tree more easily in campus area compared to the surrounding business zone around campus areas. However, no information on nesting success of any species in the study area is available, let alone their population trends. It might be more important to assess this function of this area in supporting the long term survival of birds. Thorington & Bowman (2003) reported that nest predation increased with changes of habitat structure due to infrastructure development in suburban habitat. Although no native mammalian predator have been recorded in the area, there are many feral cats that may harm the breeding communities. Furthermore, reptilian predators, especially snakes, are common in the area.

A fluctuation in the number of species shown from various studies in the area might have been due to the different methods applied in each study (Table 1). For example, the high number of species reported by Kurnia (2003) was a result of longer and more intensive study, while the number of species reported by van Balen (1986) was a result of a compilation of observation from 1976 to 1985, including those reported by Putro (1982) and Mulyani (1985).

Despite its isolation and on going infrastructure development the vegetated areas of IPB Darmaga campus hold a relatively high number of bird species. This indicates the importance of this area for wildlife refuge, especially birds. However, monitoring of population, especially for breeding communities, is necessary to evaluate the suitability of the area and to make necessary recommendation for the management.

Table 2. Number of bird species in IPB Darmaga Campus, Bogor West Java

Author(s) and Year	Number of Species	Remarks
Alikodra (1976)	18	Observation only in rubber plantation for 15 days
Mulyani (1985)	39	Observation in 3 habitat types (rubber plantation, arboretum, pine plantation) for 36 days
van Balen <i>et al</i> (1986)	68	This study compiled bird species listed during 11 years of observation by several authors (Alikodra 1976, Putro 1982, Mulyani 1985) and information from sightings during bird watching activities during 1985-1986
HIMAKOVA (1986)	25	Observation in 4 habitat types (young rubber plantation, old rubber plantation, agricultural land, housing complex,) for 2 days
Hernowo <i>et al</i> (1991)	68	Observation in 4 habitat types (young rubber plantation, old rubber plantation, agricultural land, mixed species or arboretum) for 4 months
Kurnia (2003)	72	Observation in 10 microhabitat types for 8 months
Mulyani <i>et al</i> (this study) (2008)	52	Observation in 9 habitat types using MacKinnon Species List and Point count

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Appendix 1. List of bird species recorded during the study in IPB Darmaga Campus

Family	No.	Common Name	Scientific Name	Major Habitat*	Major feeding guild	Remarks
Ardeidae	1	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	F,W	Piscivore	
	2	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	O,W	Piscivore, Carnivore	
Accipitridae	3	Crested Serpent Eagle	<i>Spilornis cheela</i>	F	Carnivore	CITES App II; protected by law
Turnicidae	4	Barred Buttonquail	<i>Turnix suscitator</i>	O,W	Granivore	
Rallidae	5	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	W	Insectivore, Granivore	
Columbidae	6	Pigeon	<i>Treron vernans</i>	F	Frugivore	
	7	Spotted Dove	<i>Streptopelia chinensis</i>	O,F	Frugivore	
Psittacidae	8	Red-breasted Parakeet	<i>Psittacula alexandri</i>	F,S	Granivore	CITES App II;
Cuculidae	9	Banded Bay Cuckoo	<i>Cacomantis sonneratii</i>	S,O	Insectivore	
	10	Plaintive Cuckoo	<i>Cacomantis merulinus</i>	S	Insectivore	
	11	Rusty-breasted Cuckoo	<i>Cuculus sepulchralis</i>	S	Insectivore	
	12	Asian Drongo-Cuckoo	<i>Surniculus lugubris</i>	F,S	Insectivore	
	13	Lesser Coucal	<i>Centropus bengalensis</i>	O,S	Insectivore	
	14	Chestnut-winged Cuckoo	<i>Clamator coromandus</i>	S		
Strigiformes	15	Collared Scops Owl	<i>Otus lempiji</i>	O	Insectivore	
Caprimulgidae	16	Savanna Nightjar	<i>Caprimulgus affinis</i>	O	Insectivore	
Apodidae	17	Edible-nest Swiftlet	<i>Collocalia fuciphagus</i>	F,O	Insectivore	
	18	Black-nest Swiftlet	<i>Collocalia maximus</i>	F	Insectivore	
	19	Cave Swiftlet	<i>Collocalia linchi</i>	F,O	Insectivore	
	20	House Swift	<i>Apus nipalensis (affinis)</i>	F,O	Insectivore	
Alcedinidae	21	Blue-eared Kingfisher	<i>Alcedo meninting</i>	F,W	Piscivore	Protected by law
	22	Javan Kingfisher	<i>Halcyon cyanoventris</i>	O,W	Carnivore, Insectivore	Protected by law
	23	Collared Kingfisher	<i>Todirhampus chloris</i>	O,W	Carnivore, Insectivore	Protected by law
Picidae	24	Sunda Pygmy Woodpecker	<i>Picoides moluccensis</i>	F	Insectivore	
Hirundinidae	25	Pacific Swallow	<i>Hirundo tahitica</i>	O	Insectivore	
	26	Striated Swallow	<i>Hirundo striolata</i>	O	Insectivore	
Campephagidae	27	Pied Triller	<i>Lalage nigra</i>	F,O	Insectivore	
	28	Small Minivet	<i>Pericrocotus cinnamomeus</i>	F	Insectivore, Frugivore	
	29	Black-winged Flycatcher-Shrike	<i>Hemipus hirundinaceus</i>		Insectivore	
Aegithalidae	30	Common Iora	<i>Aegithina tiphia</i>	S	Insectivore	
Pycnonotidae	31	Sooty-headed Bulbul	<i>Pycnonotus aurigaster</i>	S	Frugivore, Insectivore	
Laniidae	32	Long-tailed Shrike	<i>Lanius schach</i>	O	Insectivore	
			<i>Pellorneum</i>			
Timaliidae	33	Black-capped Babbler	<i>capistratum</i>	F,S	Insectivore	
	34	Horsfield's Babbler	<i>Malacocincla sepiarium</i>	F,S		
	35	Bar-winged Prinia	<i>Prinia familiaris</i>	S	Insectivore	
	36	Common Tailorbird	<i>Orthotomus sutorius</i>	S	Insectivore	

Family	No.	Common Name	Scientific Name	Major Habitat*	Major feeding guild	Remarks
	37	Olive-backed Tailorbird	<i>Orthotomus sepium</i>	S	Insectivore	
Muscicapidae	38	Asian Brown Flycatcher	<i>Muscicapa dauurica</i>	F	Insectivore	
Acanthizidae	39	Golden-bellied Geryone	<i>Gerygone sulphurea</i>	S,F	Insectivore	
Rhipiduridae	40	Pied Fantail Scarlet-headed	<i>Rhipidura javanica</i>	S,O	Insectivore	Protected by law
Dicaeidae	41	Flowerpecker	<i>Dicaeum trochileum</i>	S,O	Granivore	
Nectariniidae	42	Brown-throated Sunbird	<i>Anthreptes malacensis</i>	S,O	Nectarivore	Protected by law
	43	Olive-backed Sunbird	<i>Nectarinia jugularis</i> <i>Arachnothera</i>	S	Nectarivore	Protected by law
	44	Little Spiderhunter	<i>longirostra</i>	F	Insectivore	Protected by law
Zosteropidae	45	Oriental White-eye	<i>Zosterops palpebrosus</i> <i>Lonchura</i>	F,S	Insectivore	
Estrildidae	46	Javan Munia	<i>leucogastroides</i>	O	Granivore	
	47	Scaly-breasted Munia	<i>Lonchura punctulata</i>	O	Granivore	
Ploceidae	48	Eurasian Tree Sparrow	<i>Passer montanus</i>	O	Granivore	
Oriolidae	49	Black-naped Oriole	<i>Oriolus chinensis</i>	F,S	Frugivore	
Dicruridae	50	Black Drongo	<i>Dicrurus macrocercus</i>	O	Insectivore	
	51	Ashy Drongo	<i>Dicrurus leucophaeus</i>	O	Insectivore	
		White-breasted				
Artamidae	52	Woodswallow	<i>Artamus leucorhynchus</i>	O,F	Insectivore	

\*Major habitat: F=forest; O=Open habitat; S= Secondary Growth, W=Wetlands



Appendix 2. Distribution of bird species in the study area based on sightings during survey using MacKinnon List

Common Name	Species	Habitat								
		1	2	3	4	5	6	7	8	9
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>		√		√					
Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>				√			√		√
Crested Serpent Eagle	<i>Spilornis cheela</i>									
Barred Buttonquail	<i>Turnix suscitator</i>							√		
White-breasted Waterhen	<i>Amaurornis phoenicurus</i>		√		√	√		√	√	√
Pink-necked Green Pigeon	<i>Treron vernans</i>	√	√			√		√	√	
Spotted Dove	<i>Streptopelia chinensis</i>	√	√	√	√	√	√	√	√	√
Red-breasted Parakeet	<i>Psittacula alexandri</i>	√	√	√		√			√	
Banded Bay Cuckoo	<i>Cacomantis sonneratii</i>		√	√	√	√		√	√	√
Plaintive Cuckoo	<i>Cacomantis merulinus</i>	√	√			√	√	√	√	
Rusty-breasted Cuckoo	<i>Cacomantis sepulcralis</i>	√								
Asian Drongo-Cuckoo	<i>Surniculus lugubris</i>								√	
Lesser Coucal	<i>Centropus bengalensis</i>							√		√
Chestnut-winged Cuckoo	<i>Clamator coromandus</i>									
Collared Scops Owl	<i>Otus lempiji</i>									
Savanna Nightjar	<i>Caprimulgus affinis</i>									
Edible-nest Swiftlet	<i>Collocalia fuciphaga</i>								√	√
Black-nest Swiftlet	<i>Collocalia maximus</i>		√							
Cave Swiftlet	<i>Collocalia linchi</i>	√	√	√	√	√	√	√	√	√
House Swift	<i>Apus affinis</i>				√					
Blue-eared Kingfisher	<i>Alcedo meninting</i>		√		√		√	√		
Javan Kingfisher	<i>Halcyon cyanoventris</i>		√			√	√	√	√	√
Collared Kingfisher	<i>Todirhampus chloris</i>						√		√	√
Sunda Pygmy Woodpecker	<i>Picoides moluccensis</i>	√	√	√						
Pacific Swallow	<i>Hirundo tahitica</i>		√							
Striated Swallow	<i>Hirundo striolata</i>				√	√			√	
Pied Triller	<i>Lalage nigra</i>			√	√					
Small Minivet	<i>Pericrocotus cinnamomeus</i>		√	√					√	
Black-winged Flycatcher-Shrike	<i>Hemipus hirundinaceus</i>								√	
Common Iora	<i>Aegithina tiphia</i>	√	√	√	√	√			√	√
Sooty-headed Bulbul	<i>Pycnonotus aurigaster</i>	√	√	√	√	√	√	√	√	√
Long-tailed Shrike	<i>Lanius schach</i>		√	√					√	√
Black-capped Babbler	<i>Pellorneum capistratum</i>					√				
Horsfield's Babbler	<i>Malacocincla sepium</i>	√		√	√	√	√	√	√	√
Bar-winged Prinia	<i>Prinia familiaris</i>							√		√
Common Tailorbird	<i>Orthotomus sutorius</i>	√	√	√	√			√	√	√

Common Name	Species	Habitat								
		1	2	3	4	5	6	7	8	9
Olive-backed Tailorbird	<i>Orthotomus sepium</i>	√	√	√		√	√	√	√	√
Asian Brown Flycatcher	<i>Muscicapa dauurica</i>					√				
Golden-bellied Geryone	<i>Gerygone sulphurea</i>		√	√					√	
Pied Fantail	<i>Rhipidura javanica</i>									
Scarlet-headed Flowerpecker	<i>Dicaeum trochileum</i>	√	√	√		√	√		√	√
Brown-throated Sunbird	<i>Anthreptes malacensis</i>								√	√
Olive-backed Sunbird	<i>Nectarinio ugularis</i>	√	√	√		√	√		√	√
Little Spiderhunter	<i>Arachnothera longirostra</i>					√			√	√
Oriental White-eye	<i>Zosterops palpebrosus</i>	√	√	√		√	√			
Javan Munia	<i>Lonchura leucogastroides</i>		√			√			√	
Scaly-breasted Munia	<i>Lonchura punctulata</i>						√		√	√
Eurasian Tree Sparrow	<i>Passer montanus</i>		√							
Black-naped Oriole	<i>Oriolus chinensis</i>	√	√			√			√	√
Black Drongo	<i>Dicrurus macrocercus</i>					√				
<b>Ashy Drongo</b>	<b><i>Dicrurus leucophaeus</i></b>									
White-breasted Woodswallow	<i>Artamus leucorhynchus</i>									

Habitat: 1= Arboretum at Faculty of Forestry; 2= Parks and Landscape Arboretum; 3= Albizia plantation; 4=Wetland behind Information Centre; 5= Remnant of old mixed species Plantation; 6= Pine plantation; 7= Wetland behind Faculty of Veterinary Medicine; 8= Housing complex; 9=Experimental agricultural farm)

Species recorded not during observation period or outside observation plot