BIRDS RECORDED IN THE WONOREJO MANGROVES, JAWA TIMUR, INDONESIA

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ABSTRACT

We conducted camera trapping and observational surveys between July 2018 and January 2019 in the Wonorejo Mangroves, an unprotected coastal wetland at the eastern outskirts of the city of Surabaya in northeastern Java. These surveys revealed the presence of 40 bird species comprising 29 resident and 11 migratory species. Combined with data from previous surveys, at least 84 bird species have been recorded in this area since 2010, including species that have been offered for sale in Surabaya's wildlife markets. We recommend surveying the entire mangroves along the northern and eastern coast of Surabaya including the Important Bird Area Pantai Timur Surabaya to acquire the current status and conservation requirements of both resident and migratory birds.

ABSTRAK

Kami melakukan kegiatan survei dengan kamera jebak di Kawasan Mangrove Wonorejo, lahan basah pesisir di sisi timur kota Surabaya yang terletak di sisi timur-laut pulau Jawa. Sejak bulan Juli 2018 sampai Januari 2019, kami mendokumentasi 40 jenis burung terdiri dari 29 jenis burung penetap dan 11 jenis burung bermigrasi. Kawasan ini menjadi habitat bagi paling tidak 84 jenis burung yang sudah teramati sejak tahun 2010, termasuk di dalamnya jenis-jenis burung yang teramati dijual-belikan di Pasar Hewan Surabaya. Kami sangat menyarankan untuk dilakukan kegiatan survei menyeluruh di kawasan pesisir timur Surabaya termasuk kawasan Pantai Timur Surabaya untuk mendapatkan data status dan kebutuhan konservasi burung, baik jenis burung penetap maupun jenis burung bermigrasi.

INTRODUCTION

The Indonesian island of Java is rich in bird diversity, with 541 species having been recorded on the island as of 2021 (Eaton *et al.* 2021). Java hosts 49 Important Bird Areas (IBAs), but 16 IBAs have not been involved in the protected area network as of 2004 (Chan *et al.* 2004). Five of these unprotected IBAs encompass coastal wetlands, which are under pressure because of conversion for commercial use and concomitant pollution by plastic waste (Chan *et al.* 2004; Lestari & Trihadiningrum 2019). Wetlands on Java occupy an area of over 19,000 km^2 and include extensive artificial wetlands (Margono *et al.* 2014). The area of natural mangrove forests decreased from 1,705 km^2 in 1989 to 345 km^2 in 2009, mostly due to conversion for fish and shrimp production (Ilman *et al.* 2011). The restoration of Java's degraded mangrove forests was initiated in 2009 by engaging local people in planting and maintaining mangrove seedlings (Mahardi 2012). However, the importance of mangrove forests as habitat for wildlife is still poorly understood, and the lack of wildlife studies in this habitat hampers the conservation of Southeast Asia's biodiversity (Sodhi *et al.* 2004).

Java's coastal wetlands are important refuges for threatened resident shorebirds and mangrove specialists like the endemic Sunda Coucal *Centropus nigrorufus* and Javan Plover *Charadrius javanicus* (Chan *et al.* 2004; Iqbal *et al.* 2013a). The Javan coast also provides important stopover sites for migratory shorebirds such as the Australian Pratincole *Stiltia isabella*, Red-necked Stint *Calidris ruficollis*, Ruff *C. pugnax*, Sanderling *C. alba*, and Common Sandpiper *Actitis hypoleucos* (Tampubolon 2012; Iqbal *et al.* 2013b; Taufiqurrahman *et al.* 2014a, b; Crossland *et al.* 2014). Despite this zone's international importance on the East Asian-Australasian Flyway, only seven coastal IBAs have been designated in eastern Java, four of which are part of protected areas (Chan *et al.* 2004).

We conducted camera trapping and observational surveys in a coastal wetland in the province of Jawa Timur that is situated between two unprotected IBAs, the Solo Delta north of Surabaya and Pantai Timur Surabaya southeast of this city (Chan *et al.* 2004). Here we report the resident and migratory birds recorded during the surveys.

METHODS

Study area

The Wonorejo Mangroves are part of a Mangrove Conservation Area and an ecotourism site at the eastern outskirts of Surabaya (Prasita 2015; Murtini *et al.* 2018). The area borders the coast of the Madura Strait in the east and is wedged between the estuaries of the rivers Wonorejo in the north and Avuur in the south (Figure 1). It encompasses 300 ha comprised of mangrove swamps and brackish ponds. The ponds range in size from 0.3 to 8.5 ha, and most are used for cultivation of fish and mud crabs *Scylla* sp. (Rihadini *et al.* 2022). Five abandoned ponds of about 13 ha in total are left fallow to facilitate natural vegetation regeneration (Management team of the Mangrove Information Center in Gunung Anyar Mangroves, pers. comm. 24 July 2018).

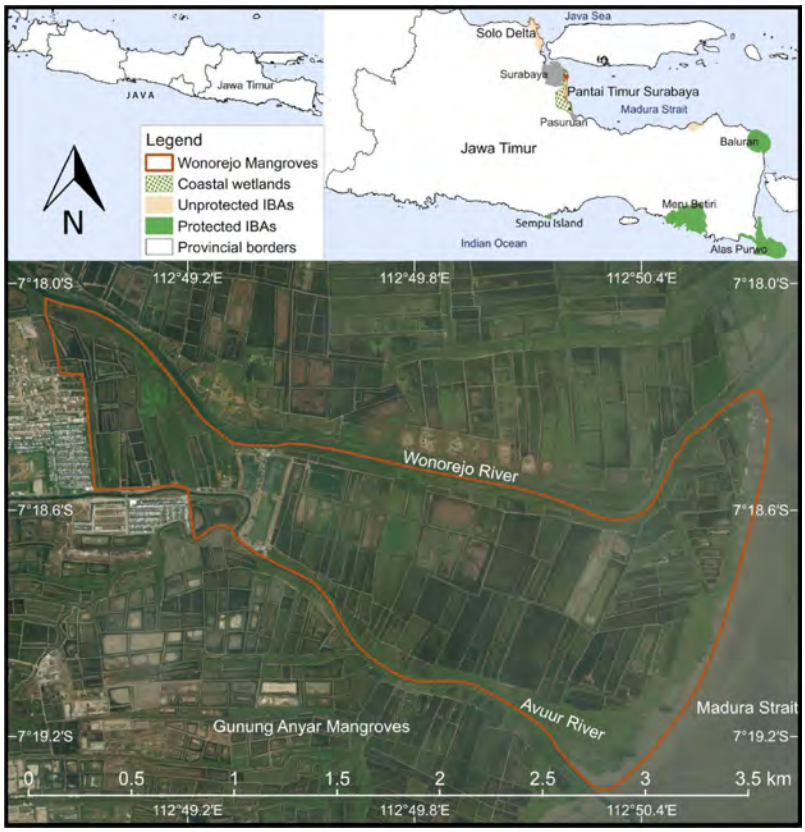

Figure 1. Map showing Java and the study area in the Wonorejo Mangrove

A mixture of mangrove swamps and aquaculture ponds extends continuously southward along the coast over 225 km² up to the city of Pasuruan (Prasita 2015; Maryantika & Lin 2017). These wetlands encompass the unprotected IBA Pantai Timur Surabaya with an area of 56 km² (BirdLife International 2026). A part of the mangrove swamps to the west of this IBA was cleared for the extension of the nearby airport between 1995 and 2015 (Maryantika & Lin 2017).

The Southeast Asian monsoon dominates the climate in the region, which experiences a wet season from November to April and a dry season from July to October (Aldrian & Djamil 2008). Average monthly precipitation ranges from 105 mm in November to 327 mm in January, but decreases to 101 mm in June, while the dry season exhibits about 19 rainy days with a total mean rainfall of 81 mm (WWIS 2020). Temperatures range from a daily average minimum of 22.5°C in August to a daily average maximum of 33.4°C in October (WWIS 2020).

Survey approach

Our camera trapping survey was designed to document the presence of small carnivores. We used six Enkeeo PH730 camera traps and set them to be active for 24 hours per day, taking two to three photographs within an interval of one second followed by a video of 20 seconds. We mounted them singly 30–45 cm above ground without bait and deployed them on dykes between ponds, in silted-up areas inside ponds and in mangrove patches along Avuur River. The camera traps operated for between 6 and 117 days at each location. We determined their geographical coordinates using the GPS function of a mobile phone, model Xiaomi Redmi 4X. Camera traps were deployed, checked and moved in the mornings, so that we define a camera trap day as a full 24-hour

day. Consecutive photographs of the same species taken within 30 minutes at the same location were considered a single notionally independent event (NIE). In addition to the camera trapping surveys, we recorded opportunistic sightings of birds during some of our visits to the study area.

To place our results in a broader context, we reviewed published studies to develop a comprehensive list of bird species recorded in the Wonorejo Mangroves since 2010. Common and scientific names of bird species follow Version 13.2 of the IOC World Bird List (Gill *et al.* 2023).

RESULTS

Our camera trap survey lasted from 18 July 2018 to 6 January 2019 with a total survey effort of 519 camera trap days. This survey yielded photographs of 19 bird species in 293 notionally independent events (NIEs), comprising 18 resident and one migratory species (Table 1). We observed a further 11 resident and 10 migratory species during this period (Table 1).

Table 1. Birds recorded by camera traps and sighted in the Wonorejo Mangroves between 18 July 2018 and 6 January 2019. Abbreviations: notionally independent events (NIEs); pond embankments (A); inside ponds and reservoirs (B); flying over pond (C); mangrove patch (D); dykes between ponds (E); silted-up area in abandoned pond (F); shoreline (G). See Appendix 1 for scientific names.

Species common name	Sighted	Camera	Microhabitat and no. of locations						
		NIEs (trap days)	A	B	C	D	E	F	G
Common Sandpiper	Yes	85 (23)	2						
White-breasted Waterhen		67 (44)	2			1	6		
Javan Pond-heron	Yes	32 (14)	3			1	1	1	
Purple Heron	Yes	31 (16)	1	3			1		
Little Egret	Yes	23 (15)	3	1					
Eastern Spotted Dove		19 (16)	1				3		
Ruddy-breasted Crake		9 (9)	1				2		
Sunda Coucal	Yes	5 (5)					3	1	
Green-backed Heron	Yes	5 (4)	1				1		
Great White Egret	Yes	3 (3)					2		
Javan Myna		3 (2)					1		
Watercock		2 (2)					1		
Cerulean Kingfisher	Yes	2 (2)			1			1	
Common Moorhen	Yes	2 (2)			1		1		
Yellow-vented Bulbul		1 (1)					1		
Sunda Pied Fantail		1 (1)						1	
Plain Prinia		1 (1)	1						
Sunda Collared Dove		1 (1)					1		
Nycticorax sp.		1 (1)					1		
Little Black Cormorant	Yes			1	1				
Javan White-eye	Yes						1		
Black-winged Stilt	Yes			1			1		3
Little Tern	Yes								1
Gull-billed Tern	Yes			1					
Whiskered Tern	Yes								1
Pacific Swallow	Yes			2					
Eurasian Whimbrel	Yes			2					
Common Redshank	Yes			1					
Javan Plover	Yes			4					
Lesser Sandplover	Yes			5					1
Curlew Sandpiper	Yes			4					1
Red-necked Stint	Yes			5					1
Pacific Golden Plover	Yes								1
Wood Sandpiper	Yes		1	10					1
Common Greenshank	Yes			4					1
Sunda Teal	Yes			1					
Intermediate Egret	Yes			1					1
Collared Kingfisher	Yes						1		
Sacred Kingfisher	Yes			1	1		1		
Freckle-breasted Woodpecker	Yes						1		

While 96% of NIEs recorded single birds, the Little Egret *Egretta garzetta* was detected in groups in four NIEs, including flocks of 62, 14 and three individuals. The Javan Pond-heron *Ardeola speciosa* and Eastern Spotted Dove S*pilopelia chinensis* were recorded in duos in five and four NIEs, respectively. Most birds were recorded walking or flying past the camera traps. Thirteen NIEs comprising 128 photographs and 64 videos captured the hunting behaviour of a Purple Heron *Ardea purpurea* in the early mornings and late afternoons on six consecutive days (Figure 2).

Figure 2. Purple Heron *Ardea purpurea* catching fish in a pond on 23 July 2018. Photo © Yayasan Eksai and Wild Cat Network.

A total of 84 bird species were recorded in the Wonorejo Mangroves between 2010 and 2019, comprising 40 species during our study and a further 33 resident and 12 migratory species during previous studies (Appendix 1).

DISCUSSION

Our camera trapping survey and opportunistic sightings revealed that the Wonorejo Mangroves provide important habitat for diverse migratory and resident bird species. We documented the presence of 40 bird species comprising 29 resident and 11 migratory species. Our records of Sunda Coucal, Ruddy-breasted Crake *Zapornia pusca* (Figure 3).

Watercock *Gallicrex cinerea* (Figure 4), Javan Myna *Acridotheres javanicus*, Pacific Swallow *Hirundo tahitica*, Sunda Teal *Anas gibberifrons* and Freckle-breasted Woodpecker *Dendrocopos analis* are likely to be the first published observations in the Wonorejo Mangroves.

The Common Sandpiper was the most frequently recorded bird, with records limited to shallow pond embankments. Its use of fishponds in our study area has previously been documented by Rihadini *et al.* (2012) and Putera *et al.* (2014). The White-breasted

Figure 3. Ruddy-breasted Crake *Zapornia pusca* on a dyke on 19 November 2018. Photo © Yayasan Eksai and Wild Cat Network.

Figure 4. Watercock *Gallicrex cinerea* on a dyke on 12 December 2018. Photo © Yayasan Eksai and Wild Cat Network.

Waterhen *Amaurornis phoenicurus* (Figure 5), Javan Pond-heron, Purple Heron and Little Egret were less often recorded, but at more locations in various habitats. In contrast, Rihadini *et al.* (2012) observed

Figure 5. White-breasted Waterhen *Amaurornis phoenicurus* on a dyke on 19 November 2018. Photo © Yayasan Eksai and Wild Cat Network.

the White-breasted Waterhen only in abandoned fishponds and the Little Egret only in used fishponds. The Green-backed Heron *Butorides striata*, Great White Egret *A. alba* and Common Moorhen *Gallinula chloropus* were previously also observed only in ponds (Rihadini *et al.* 2012), whereas our camera traps recorded them foraging on dykes as well. We therefore concur with other authors that camera trapping is beneficial for detecting birds and their habitat use (O'Brien & Kinnaird 2008; Brooks *et al.* 2018; Vaughan *et al.* 2022).

Our sightings of the Javan Plover and Cerulean Kingfisher *Alcedo coerulescens* in pond embankments underpin the critical value of this artificial biotope for both species. In this habitat of the Wonorejo Mangroves, the Javan Plover breeds in May and October (Febrianto *et al.* 2016), and the Cerulean Kingfisher displays courtship behaviour as early as February (Martin & Putera 2017).

The presence of Javan Munia *Lonchura stroides*, Scaly-breasted Munia *L. punctulata*, Yellow-vented Bulbul *Pycnonotus goiavier*, Javan Myna, Plain Prinia *Prinia inornata*, Eastern Spotted Dove, Zebra Dove *Geopelia striata*, Sunda Collared Dove *Streptopelia bitorquata*, Sunda Coucal, Sunda Pied Fantail *Rhipidura javanica*, Pacific Swallow and Long-tailed Shrike *Lanius schach* in the Wonorejo

Mangroves is noteworthy, as they have all been offered for sale in the three wildlife markets of Surabaya (Chng & Eaton 2016). We found and removed a few slings during our survey, but our camera traps did not photograph people hunting or carrying birds. However, given the proximity of Surabaya's wildlife markets, bird hunting is a potential threat in Wonorejo and neighbouring mangrove sites. Van Balen *et al.* (2023) reported bird lime being used for trapping birds in the Wonorejo Mangroves.

Our sighting of the Javan White-eye *Zosterops flavus* underlines the importance of mangrove habitats for the species. It has been sighted in the Wonorejo Mangroves regularly since 2008, but the sighting frequency and number of individuals observed declined over the period 2018–2019 (Iwan Febrianto, Cipto Dwi Handono & Ragil Rihadini, pers. obs.). It has been documented in bird markets in western and eastern Java (Chng *et al.* 2015; Chng & Eaton 2016). White-eye species have experienced a significant increase in popularity among songbird owners since 2007 (Marshall *et al.* 2020). Field surveys targeting the Javan White-eye at 19 sites along Java's northern coast indicate that the population declined by about 80% between 2006–2009 and 2018–2019 (Van Balen *et al.* 2023).

The Chinese Egret *Egretta eulophotes*, Kentish Plover *Charadrius Alexandrines* and Common Ringed Plover *C. hiaticula* have been reported in the Wonorejo Mangroves by Rihadini *et al.* (2012) but were not recorded during our survey. Similarly, during a month-long birdwatching event in January 2020, the Kentish Plover was among the least sighted waterbirds, while both Chinese Egret and Common Ringed Plover were not sighted at all across 2,417 grid squares of 6.9x6.9 km in Java and Bali (Squires *et al.* 2021).

A total of 98 bird species were sighted in spring 1988 in the coastal wetlands between the Solo Delta north of Surabaya and south to Probolinggo, including 56 species in the Wonorejo Mangroves and adjacent wetlands east of Surabaya (Erftemeijer & Djuharsa 1988), whereas 84 species were recorded in the Wonorejo Mangroves between 2010 and 2019 (Appendix 1). Five of these species are listed as globally threatened in the IUCN Red Lists, namely Javan White-eye (Endangered; BirdLife International 2021), Far Eastern Curlew *Numenius madagascariensis* (Endangered; BirdLife International 2024), Sunda Coucal (Vulnerable; BirdLife International 2025a), Javan Myna (Vulnerable; BirdLife International 2020) and Chinese Egret (Vulnerable; BirdLife International 2025b). Twenty species are protected by Indonesian law (Appendix 1).

To date, the Wonorejo Mangroves have neither been listed as an Important Bird Area (IBA) (Chan *et al.* 2004), nor is this area officially included into the IBA Pantai Timur Surabaya, the next closest IBA along the coastline of the Madura Strait (BirdLife International 2026). The latter IBA was last assessed

in 1999 as meeting the criteria A4iii as it is thought to regularly harbour at least 20,000 waterbirds (BirdLife International 2026). As pointed out by Runge *et al.* (2015), the current protected areas are insufficient to conserve the majority of migratory birds. We therefore recommend updating the assessments of both sites (see Donald *et al.* 2019). Since the Wonorejo Mangroves provide habitat for at least six bird species endemic to Indonesia and five globally threatened species, it is warranted to evaluate whether this site together with the adjacent Gunung Anyar Mangroves qualify to be integrated into the IBA Pantai Timur Surabaya.

Involving members of bird clubs in collecting information on bird diversity (e.g. Squires *et al.* 2021) is a worthwhile approach to consider as part of assessments and for promoting public stewardship for bird conservation. Large extents of unprotected wetlands along Java's coast remain to be surveyed to acquire data on birds and their habitats. We hope birders will contribute to fill the knowledge gaps, especially in areas that are not yet afforded any form of protection.

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Appendix 1. Birds observed in the Wonorejo Mangroves between 2010 and 2019 and their protection status under Indonesian law (Minister of Environment and Forestry of the Republic of Indonesia 2018).

Species	Season	Source	Protected
Migratory species (23)			
Eurasian Curlew *Numenius arquata*	2010, 2013, 2016	Desmawati *et al.* 2017	Yes
Far Eastern Curlew *N. madagascariensis*	2010, 2013, 2016	Desmawati *et al.* 2017	Yes
Little Curlew *N. minutus*	2010, 2013, 2016	Desmawati *et al.* 2017	Yes
Eurasian Whimbrel *N. phaeopus*	July – January	Rihadini *et al.* 2012; Putera *et al.* 2014; this study	Yes
Common Sandpiper *Actitis hypoleucos*	August – January	Rihadini *et al.* 2012; Putera *et al.* 2014; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Common Greenshank *Tringa nebularia*	August – January	Rihadini *et al.* 2012; this study	
Wood Sandpiper *T. glareola*	August – January	Rihadini *et al.* 2012; Putera *et al.* 2014; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Common Redshank *T. totanus*	July – January	Rihadini *et al.* 2012; this study	
Marsh Sandpiper *T. stagnatilis*	August – January	Rihadini *et al.* 2012; Putera *et al.* 2014	
Terek Sandpiper *Xenus cinereus*	August – January	Rihadini *et al.* 2012	
Curlew Sandpiper *Calidris ferruginea*	August – January	Rihadini *et al.* 2012; this study	
Red-necked Stint *C. ruficollis*	August – January	Rihadini *et al.* 2012; Iqbal *et al.* 2013b; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Long-toed Stint *C. subminuta*	August – January	Rihadini *et al.* 2012; Putera *et al.* 2014; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Australian Pratincole *Stiltia isabella*	August – January	Rihadini *et al.* 2012	Yes
Common Ringed Plover *Charadrius hiaticula*	August – January	Rihadini *et al.* 2012	
Greater Sand Plover *C. leschenaultii*	August – January	Rihadini *et al.* 2012	
Little Ringed Plover *C. dubius*	August – January	Rihadini *et al.* 2012	
Lesser Sandplover *C. mongolus*	August – January	Rihadini *et al.* 2012; Putera *et al.* 2014; this study	
Pacific Golden Plover *Pluvialis fulva*	August – January	Rihadini *et al.* 2012; Putera *et al.* 2014; this study	
Gull-billed Tern *Gelochelidon nilotica*	August – January	Rihadini *et al.* 2012; this study	Yes
Black-tailed Godwit *Limosa limosa*	August – January	Rihadini *et al.* 2012	
Bar-tailed Godwit *L. lapponica*	April – May	Putera *et al.* 2014	
Sacred Kingfisher *Todiramphus sanctus*	May, July, August, October	Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	

Species	Season	Source	Protected
Resident species (61)			
Javan Plover *Charadrius javanicus*	May, August – January	Rihadini *et al.* 2012; Putera *et al.* 2014; Febrianto *et al.* 2016; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	Yes
Kentish Plover *C. alexandrinus*	August – January	Rihadini *et al.* 2012; Putera *et al.* 2014	Yes
Whiskered Tern *Chlidonias hybrida*	May – January	Rihadini *et al.* 2012; Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	Yes
White-winged Tern *C. leucopterus*	May	Mawardha *et al.* 2021	Yes
Common Tern *Sterna hirundo*	August – January	Rihadini *et al.* 2012	Yes
Little Tern *Sternula albifrons*	August – January	Rihadini *et al.* 2012; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	Yes
Black-winged Stilt *Himantopus himantopus*	May – January	Rihadini *et al.* 2012; Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	Yes
Purple Heron *Ardea purpurea*	May – November	Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Great White Egret *A. alba*	May – October	Rihadini *et al.* 2012; Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	Yes
Intermediate Egret *A. intermedia*	May, October	Mawardha *et al.* 2021; this study	
Javan Pond-heron *Ardeola speciosa*	May – January	Rihadini *et al.* 2012; Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Little Egret *Egretta garzetta*	August – January	Rihadini *et al.* 2012; Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Chinese Egret *E. eulophotes*	August – January	Rihadini *et al.* 2012	Yes
Cattle Egret *Bubulcus ibis*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Green-backed Heron *Butorides striata*	May – January	Rihadini *et al.* 2012; Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Black-crowned Night-heron *Nycticorax nycticorax*	August, October	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data; possibly this study	
Little Black Cormorant *Phalacrocorax sulcirostris*	May – August	Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Common Moorhen *Gallinula chloropus*	July – January	Rihadini *et al.* 2012; Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	

Species	Season	Source	Protected
White-breasted Waterhen *Amaurornis phoenicurus*	July – January	this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Slaty-breasted Rail *Lewinia striata*	August – January	Rihadini *et al.* 2012	
Ruddy-breasted Crake *Zapornia pusca*	October – December	this study	
Watercock *Gallicrex cinerea*	December	this study	
Australasian Grebe *Tachybaptus novaehollandiae*	August, October	Hardjono 2018; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	Yes
Sunda Teal *Anas gibberifrons*	August – October	this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Cerulean Kingfisher *Alcedo coerulescens*	July – January	Rihadini *et al.* 2012; Mawardha *et al.* 2021; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Collared Kingfisher *T. chloris*	May, August, October	Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Sunda Coucal *Centropus nigrorufus*	July – October	this study; Van Balen *et al.* 2023	Yes
Racquet-tailed Treepie *Crypsirina temia*	June, August	Budi *et al.* 2015; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	Yes
Long-tailed Shrike *Lanius schach*	May	Febrianto *et al.* 2016	
Slender-billed Crow *Corvus enca*	May	Febrianto *et al.* 2016	
Javan Myna *Acridotheres javanicus*	July – October	this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Blue-tailed Bee-eater *Merops philippinus*	May, August	Mawardha *et al.* 2021; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Javan Munia *Lonchura stroides*	May, August	Mawardha *et al.* 2021; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Scaly-breasted Munia *L. punctulata*	May, August	Mawardha *et al.* 2021; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Eastern Spotted Dove S*pilopelia chinensis*	May, August	Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Sunda Collared Dove *Streptopelia bitorquata*	May, August	Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Pink-necked Green-pigeon *Treron vernans*	May	Mawardha *et al.* 2021	
Zebra Dove *Geopelia striata*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Freckle-breasted Woodpecker *Dendrocopos analis*	August, October	this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	

Species	Season	Source	Protected
White-breasted Woodswallow *Artamus leucoryn*	May	Mawardha *et al.* 2021	
Glossy Swiftlet *Collocalia esculenta*	May	Mawardha *et al.* 2021	
Pacific Swallow *Hirundo tahitica*	July, August	this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Common Iora *Aegithina tiphia*	May, August	Mawardha *et al.* 2021; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Sunda Pied Fantail *Rhipidura javanica*	May, July, August	Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	Yes
Javan White-eye *Zosterops flavus*	July, August	this study; Van Balen *et al.* 2023	Yes
Yellow-vented Bulbul *Pycnonotus goiavier*	May, August	Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Sooty-headed Bulbul *P. aurigaster*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Common Tailorbird *Orthotomus sutorius*	June, August	Budi *et al.* 2015; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Plain Prinia *Prinia inornata*	May, August, October	Mawardha *et al.* 2021; this study; Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Yellow-bellied Prinia *P. flaviventris*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balenunpublished data	
Edible-nest Swiftlet *Aerodramus fuciphagus*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balenunpublished data	
Ashy Tailorbird *O. ruficeps*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Olive-backed Tailorbird *O. sepium*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Savanna Nightjar *Caprimulgus affinis*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Golden-bellied Gerygone *Gerygone sulphurea*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Eurasian Tree Sparrow *Passer montanus*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Pied Triller *Lalage nigra*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
White-shouldered Triller *L. sueurii*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Australian Reed Warbler *Acrocephalus australis*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Brown-throated Sunbird *Anthreptes malacensis*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	
Ornate Sunbird *Cinnyris ornatus*	August	Iwan Febrianto, Cipto Dwi Handono & Sebastian van Balen unpublished data	