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Conservation status of bird collection in ragunan wildlife park jakarta

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Abstract
Bird conservation status reflects the threat level to species in their natural habitats. According to the IUCN Red List, Indonesia has 32 bird species categorized as Critically Endangered (CR), 51 as Endangered (EN), 83 as Vulnerable (VU), 220 as Near Threatened (NT), 1,435 as Least Concern (LC), and 7 as Data Deficient (DD). This highlights the urgency of conservation efforts to preserve bird species and populations. Ragunan Wildlife Park (TMR) in Jakarta serves as one conservation area, but its bird collection's conservation status remains undocumented. This study identified 77 bird species from 14 orders in the TMR collection. Among these, 5 species are CR, 4 EN, 13 VU, 6 NT, 2 DD, and 47 LC. Many species in the CR, EN, and NT categories are endemic to Indonesia, emphasizing the park's role in conserving the country's unique avifauna

Keywords: Bird, conservation status, endemic, ragunan wildlife park, TMR

Introduction
Birds are all animals in the Aves Class of the Animal Kingdom and belong to the Chordata Phylum, Vertebrata Subphylum. This class includes thousands of birds on Earth that inhabit various ecosystems, and play important roles in human ecology, culture, and economy. Birds are also bioindicators of the condition of an ecosystem. In other words, the presence in an area shows the availability of natural resources needed for existence and survival.

In general, birds are included in the type of animals that have high species diversity on Earth. There are approximately 8,800 to 11,000 bird species in the world [1] (Ayat & Tata, 2015). Indonesia ranks fourth among countries with the highest species diversity in the world after Colombia, Peru, and Brazil with the number of bird species in 2024 estimated at 1,836. Among these populations, 558, and 542 are protected and endemic species, while 470 have limited distribution (Figure 1).

Source: Indonesian bird

Fig 1: Bird status in Indonesia

Indonesian endemic birds are only distributed within the administrative boundaries of the country. The taxonomic breakdown also affects the number and composition of endemic birds in Indonesia, estimated at 542 species as of 2024. This number further confirms Indonesia as the country with the most endemic bird species in the world.

Based on conservation status, IUCN divides animals into 7 categories: Extinct (EX), Extinct in the wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), and Data Deficient (DD) (Figure 2). According to the IUCN Red List, the number of bird species in Indonesia included in the CR category is 32 species. In contrast, others include EN is 51 species, VU is 83, NT is 220 species, LC is 1,435 species, and DD with 7 species (Figure 1). Therefore, it is very necessary to carry out conservation or preservation efforts to maintain the existence of bird species and populations in Indonesia.

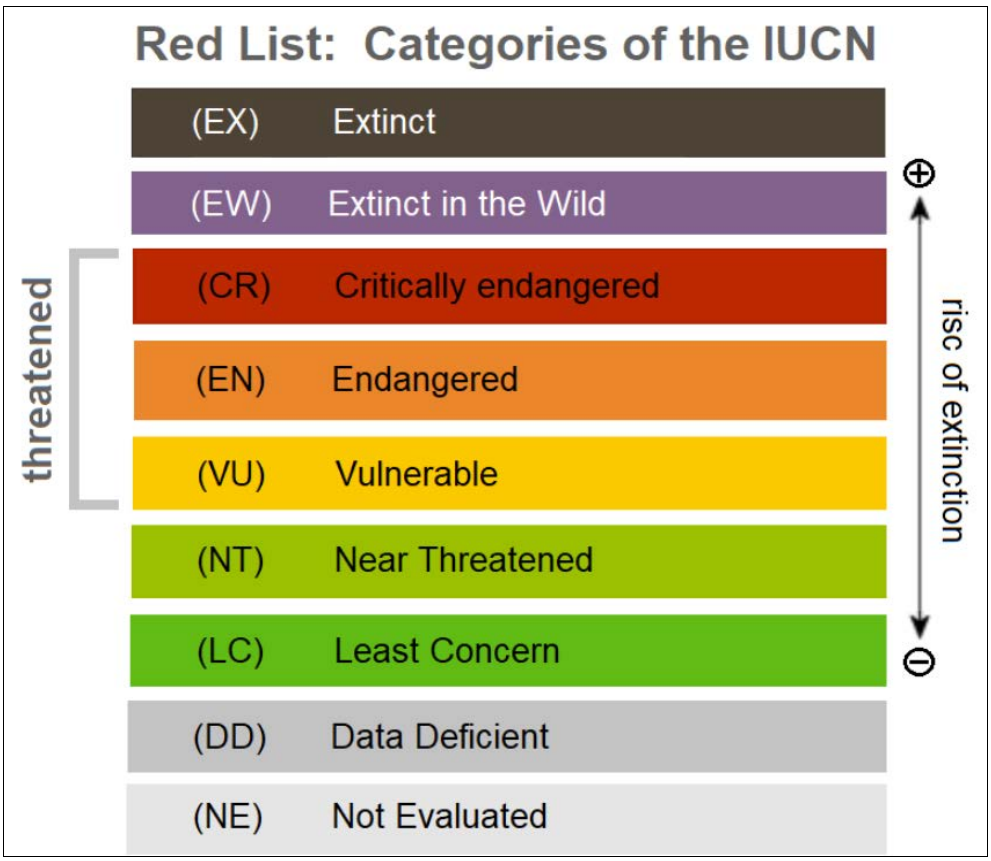

Fig 2: Categories of the IUCN

Conservation of animal or plant species can be carried out in situ (in natural habitat) and ex-situ (outside natural habitat). One of the ex-situ nature conservation areas that serve as a sanctuary for birds in Jakarta is the Ragunan Wildlife Park (TMR) located in South Jakarta. It was established with the main objective of being a wildlife conservation location to ensure the sustainability of wildlife from extinction. A significant effort made by the park is to improve the quality of management and services for animals making the area an ideal place for the breeding process of endangered animals. Aside from being a reservoir for rare animals to breed properly, the Ragunan Wildlife Park is also a means of education and studies. The management is focused on improving the service of using natural laboratories for basic science studies. Opportunities for behavioral and biological studies on animals that may be difficult in the wild will be easier to achieve at the Ragunan Wildlife Park.

This study was conducted due to limited information on the types and conservation status of bird in Ragunan Zoo, Jakarta. The objective was to identify the types of bird and provide data on conservation status.

Method

Location and time of study: This study was conducted at Ragunan Zoo, located at Jl. Harsono RM No.1, Ragunan, Pasar Minggu, South Jakarta City, Special Capital Region of Jakarta. Data collection was carried out in 8 bird cages located at Ragunan Wildlife Park (Figure 4).

The first location was a lake near the north gate inhabited by a colony of pelicans, while the second cage location consists of 2 medium cages located near the Ragunan Zoo management office, Jakarta, marked by a dome cage inhabited by green peacocks, with both cages being slightly separate. The third location was a long cage located opposite the orangutan cage inhabited by several types of chickens and turkeys (Table 1).

The fourth location was a long cage in the form of a bridge marked by the presence of flamingos, and the fifth was a long dome cage located close to the fourth marked by large bird such as hornbills or julang, eagles, and peacocks. The sixth location was farthest east away from the other cages marked by the presence of cassowaries, while the seventh location in the western area was a dome cage containing 8 white-bellied eagles. Finally, the eighth location was an ostrich cage facing the capybara cage (Table 1).

Fig 4: Location of bird cages at ragunan zoo, jakarta

Table 1: Coordinates of bird cage locations in the ragunan wildlife park in jakarta

Cage Number	Coordinates	Description
1	-6.3071461, 106,8204573	Pelican lake
2	-6.3089449, 106,8209448	Near Ragunan Wildlife Park management office
3	-6.3105968, 106,8209934	Long cage with dome cage
4	-6.3088673, 106,8207892	Bridge cage with flamingo
5	-6,3085803, 106,8226748	Smart cockatoo cage
6	-6,3182473, 106,8249278	Cassowary cage
7	-6,310007, 106,817888	Brahminy kite cage
8	-6,311009, 106,818493	Ostrich cage

This study lasted for 8 months, namely from March to October 2024. The time started from the stage of determining the observation location, data collection, and identification of recorded bird samples, to compiling results, and outputs.

Study method

This study used a direct observation method (*focal animal sampling*) for birds found in the Ragunan Zoo, Jakarta. The data recorded includes the type of bird, location, description of the cage, and number of birds. Furthermore, the data collected were tabulated for the analysis process.

Data analysis

The data obtained were analyzed descriptively and presented in the form of tables and figures.

Results and Discussions

The results showed 77 bird species at the Ragunan Zoo, Jakarta, from 14 orders (Table 2). Bird order with the most species in collection was Psittaciformes with 20 species, followed by Columbiformes with 12 species, as well as Galliformes, and Passeriformes with 11 species each. The Ciconiiformes order had 4 species, while Accipitriformes, Bucerotiformes, and Struthioniformes orders had 3 species each. The Anseriformes, Falconiformes, Pelecaniformes, and Strigiformes orders had 2 species each while Gruiformes and Phoenicopteriformes orders had 1 species each (Figure 5).

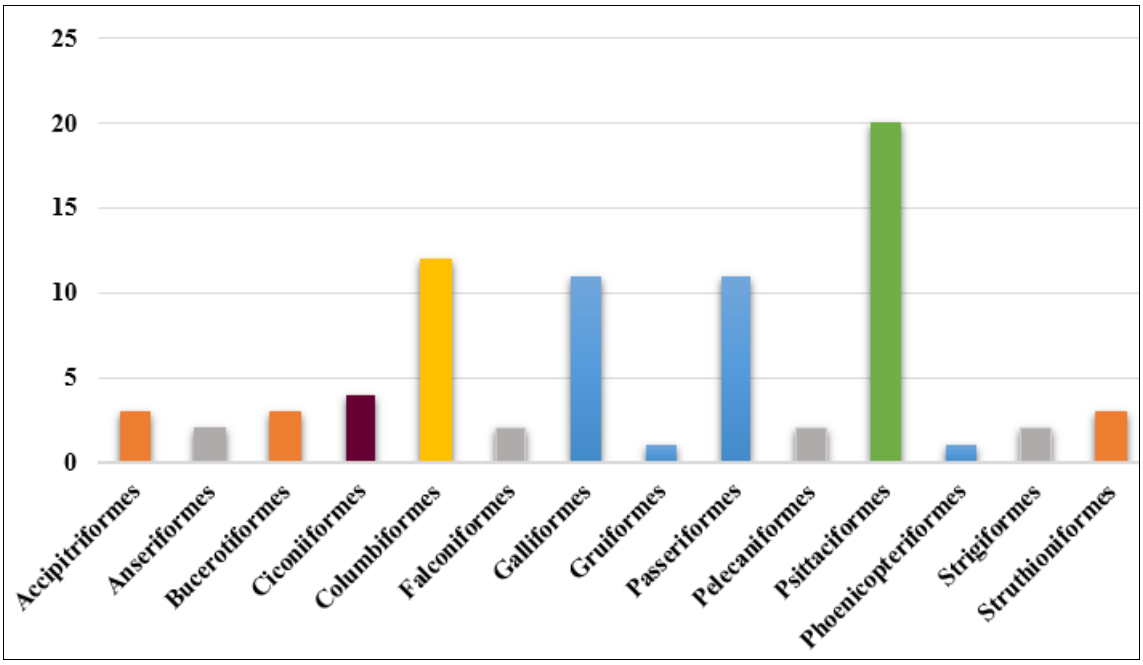

Fig 5: Number of bird species by order

Based on conservation status according to the IUCN *Red List*, among the 77 bird species, 6.49% were in the CR category, 5.19% in EN, 16.88% in VU, 7.79% in NT, and 2.60% in DD. The remaining 61.04% were included in the LC category (figure 6). The CR, EN, VU, and NT bird categories are mostly endemic in Indonesia.

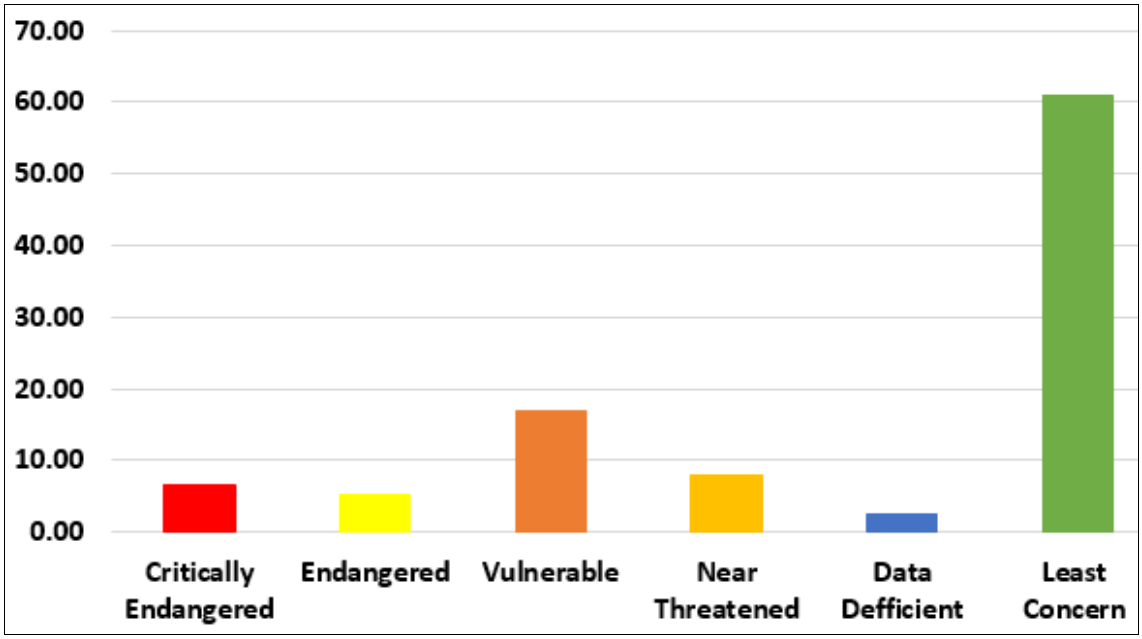

Fig 6: Conservation status of birds in the ragunan wildlife park collection

Among the species of bird, 15 were endemic to Indonesia and 1 was endemic to Australia. The endemic bird include *Nisaetus bartelsi* (Javan hawk-eagle) endemic to Java Island. *Leucopsar rothshcildi* (Bali starling) endemic to Bali Island, *Macrocephalon maleo* (maleo senkawar) endemic to Sulawesi Island, as well as *Cacatua sulphurea crinocristata* (chrysanthemum cockatoo) and *Sumba hornbill* (Rhyticeros everetti) endemic to Sumba Island. *Cacatua alba* (white-crested cockatoo), *Cacatua goffiniana* (red-cheeked goffin cockatoo), *Cacatua moluccensis* (Moluccan cockatoo), *Cacatua sulphurea* (sulphurea cockatoo), *Lorius domicella* (purple-naped lory) were endemic to Maluku. *Gaura cristata* (crowned dove), *Gaura victoria* (crowned dove), *Henicophaps albifrons* (copperhead dove), *Pssithricas fulgidus* (king lory), *Casuarius casuarius* (double-wattled cassowary), and *Casuarius unappendiculatus* (single-wattled cassowary) were endemic to Papua;. At the same time, *Nymphicus hollandicus* (Australian parakeet) was endemic to Australia.

Table 2: Types of bird in the ragunan zoo collection in jakarta

No	Order	Species	Indonesian Name	Conservation Status
1	Accipitriformes	*Haliastur indus*	Brahminy kite	LC
		Nisaetus bartelsi	Javan hawk-eagle	CR
		Spilornis cheela	Bido's Serpent Eagle	LC
2	Anseriformes	*Anseranas semipalmata*	Wasur Hornbill	LC
		Dendrocygna javanica	Plain Heron	LC
3	Bucerotiformes	*Anthacoceros albirostris*	White-bellied Sea Eagle	LC
		Rhyticeros everetti	Sumba Hornbill	VU
		Rhyticeros undulatus	Golden Hornbill	VU
4	Ciconiiformes	*Ardea cinerea*	Grey Heron	LC
		Bubulcus ibis	Cattle Egret	LC
		Leptoptilos javanicus	Black-necked Stork	VU
		Nycticorax nycticorax	Large-tailed Nighjar	LC
5	Columbiformes	*Caloenas nicobarica*	Spotted Dove	NT
		Chalcophaps indica	Emerarald Dove	LC
		Columba livia jacobin	Jacobin Pigeon	LC
		Gaura cristata	Western Crowned Pigeon	NT
		Gaura scheepmakeri	Southern Crowned Pigeon	VU
		Goura victoria	Victoria Crowned Pigeon	VU
		Geopelia striata	Java Sparrow	LC
		Henicophaps albifrons	Copper-throated Dove	LC
		Ptilinopus perlatus	Pink-necked Green Pigeon	LC
		Streptopelia bitorquata	Java Plover	LC
		Streptopelia chinensis	Oriental Skylark	LC
		Streptopelia risoria	Black-winged Kite	DD
6	Falconiformes	*Haliaeetus leucogaster*	White-bellied Sea Eagle	LC
		Ichthyophaga ichthyaetus	Grey-headed Fish Eagle	NT
7	Galliformes	*Chrysolophus amherstiae*	Lady Amherst's Pheasant	LC
		Chrysolophus pictus	Golden Pheasant	LC
		Gallus gallus domesticus	Green Peafowl	DD
			Bankiva Chicken	DD
			Silkie Chicken	DD
			Polish Chicken	DD
		Lophura ignita rufa	Sumatran Ground-cuckoo	NT
		Lophura nycthemera	Silver Pheasant	LC
		Macrocephalon maleo	Maleo	EN
		Meleagris gallopava	Domestic Turkey	LC
		Numida meleagris	Guinea fowl	LC
		Pavo cristatus	Blue Peafowl	LC
			Albino Blue Peafowl	LC
		Pavo muticus	Green peacock	EN
		Phasianus colchicus	Ring necked pheasant	LC
8	Gruiformes	*Balearica pavonina*	Crested Fireback	VU
9	Passeriformes	*Acridotheres javanicus*	Watercock	LC
		Acridotheres melanopterus tertius	White-browed Crake	CR
		Chloropsis sonneroti	Green-backed Tit	LC
		Copsychus saularis	Oriental Magpie-Robin	LC
		Leucopsar rothshcildi	Bali Starling	CR
		Gracula religiosa	Common Hill Myna	LC
		Mino dumontii	Nias Hill Myna	LC
		Oriolus chinensis	Black-naped Oriole	LC
		Padda oryzivora	Java Sparrow	VU
			White Java Sparrow	
		Ploceus manyar	Weaverbird	LC
		Pycnonotus jocosus	Red-vented Bulbul	LC
10	Pelecaniformes	*Ardeola speciosa*	Javan Pond Heron	LC
		Pelecanus conspicillatus	Pelican	LC
11	Psittaciformes	*Agapornis personata*	*Lovebird parblue*	LC
		Aprosmictus erythropterus	Red-winged Parrot	LC
		Ara chloropterus	Green-winged Macaw	LC
		Aratinga solstitialis	Sun Conure	EN
		Cacatua alba	Sulphur-crested Cockatoo	VU
		Cacatua galerita	Yellow-crested Cockatoo	LC
		Cacatua goffiniana	Goffin's Cockatoo	VU
		Cacatua moluccensis	Moluccan Cockatoo	VU
		Cacatua sulphurea	Sulphur-crested Cockatoo	CR

		Cacatua sulphurea citrinocristata	Citron-crested Cockatoo	CR
		Electus roratus	Lovebird	LC
		Eolophus roseicapilla	Galah Cockatoo	LC
		Lorius domicella	Black-headed Parrot	VU
		Melopsittacus undulatus	Budgerigar	LC
		Nymphicus hollandicus	Australian Parekeet	LC
		Probosciger aterrimus	King Cockatoo	LC
		Psittacula longicauda	Long-tailed Parakeet	NT
		Psittacula alexandri	Ring-necked Parakeet	NT
		Psittacus erithacus	African Grey Parrot	EN
		Pssithricas fulgidus	Electus Parrot	VU
12	Phoenicopteriformes	*Phoenicopterus roseus*	Greater Flamingo	LC
13	Strigiformes	*Bubo sumatranus*	Javan Cuckoo	LC
		Ketupa ketupu	Fish Owl	LC
14	Struthioniformes	*Casuarius casuarius*	Double-wattled Caasowary	VU
		Casuarius unappendiculatus	Single-wattled Caasowary	VU
		Struthio camelus	Ostrich	LC

Based on the results, bird collection at Ragunan Zoo Jakarta consists of 77 species from 14 orders, namely Psittaciformes (20 species), Columbiformes (12 species), Galliformes (11 species), Passeriformes (11 species), Ciconiiformes (4 species), Accipitriformes (3 species), Bucerotiformes (3 species), and Struthioniformes (3 species), Anseriformes (2 species), Falconiformes (2 species), Pelecaniformes (2 species), Strigiformes (2 species), Gruiformes (1 species) and Phoenicopteriformes (1 species). The Order Psittaciformes, Columbiformes, Galliformes, and Passeriformes are among the top 10 with the largest number of species in the world out of 49 (Table 3). Consequently, zoo or wildlife park managers make species belonging to these orders collection animals. Several bird orders are part of zoo collection for many important reasons related to the educational appeal, the potential to attract visitors and conservation status [2, 3, 4, 5].

Table 3: Ten bird orders in the world with the largest number of species

No.	Ordo	Number of species
1	Passeriformes	6533
2	Apodiformes	497
3	Piciformes	449
4	Psittaciformes	403
5	Charadriiformes	390
6	Columbiformes	351
7	Galliformes	302
8	Accopitriformes	266
9	Strigiformes	255
10	Gruiformes	188

Source:https://www.worldbirdnames.org/new/classification/orders-of-bird-draft/#:~:text=The%20Passeriformes%2C%20or%20perching%20bird,of%20all%20world%20bird%20species.

All types of bird in collection at the Ragunan Zoo in Jakarta have educational appeal and the potential to attract visitors. Each order collected in this area has distinctive morphological characteristics, behavior, and the ability to interact with visitors. Several orders of bird that have an attractive morphological appearance with bright feather colors include the Orders Columbiformes, Passeriformes, Psittaciformes, and Galliformes.

The Columbiformes order has the characteristics of a large, rounded body with a small to medium size, a wide chest, a small head, a short neck, wings extending to the tail, *anisodactyl* leg type, a slender and short beak with a typical *cere* as a seed-eating beak type. The body is covered in fine feathers, gray, white, brown, or a combination of these colors. [6, 7, 8, 9].

Passeriformes, also known as *songbirds*, is the largest and most diverse order of birds, covering more than half of the global species. The characteristics include a very small to medium body size, a slender body, strong legs, and adaptive for perching with three toes facing forward and one toe facing backward. The beaks vary depending on the type of food, while the body is protected by bright and striking colored feathers such as red, yellow, and orange. Almost all types of members have a complex *syrinx* for various types of songs [10, 11, 12, 13, 14].

The Psittaciformes order consists of hook-billed bird such as cockatoos, parrots, and mynas which are very popular due to the morphology, specifically bright and attractive feather colors. General characteristics include a solid body with medium to large size, strong wings, and bright feather colors often a combination of green, red, yellow, and blue. The shape of the beak is curved and strong, useful for breaking seeds and nuts. Another uniqueness of the members is the very high social ability reflected in their interaction with humans due to the good intelligence and ability to imitate human or animal voices [15, 16, 17].

Bird orders in the collection of Ragunan Zoo in Jakarta with educational appeal, specifically, objects for studies due to the potential as food sources and in traditional culture include Anseriformes, Galliformes, and Columbiformes. The Anseriformes order spends most of the time in water such as ducks, geese, muscovy ducks, and ducks. The majority of members are migratory bird that travel from countries in the north to the south during winter and vice versa. Members of this order are also birds that play a crucial role as a source of animal food and are kept by the community to improve the economy [4, 18, 19].

The order Galliformes is a group of birds that play an important ecological role as seed dispersers, control insect pest populations, a source of food as well as cultural and economic value for humans. Some members of this order also have attractive body shapes and feather colors, such as peacocks and turkeys [20, 21, 22, 23].

Aside from having educational appeal and attracting visitors, the conservation status of birds is also a reason for zoo or wildlife park managers to collect certain species. The aim is to preserve bird species that have a limited distribution, vulnerable, and are threatened with extinction due to habitat

destruction, poaching, and climate change [5, 24, 25]. In zoos or wildlife parks, there are generally breeding programs that aim to increase the population of bird species with a certain conservation status to maintain the existence in nature [26, 27, 28].

Based on conservation status according to the IUCN Red List, among the 77 species of bird in the Ragunan Zoo collection, Jakarta, 6.49% were included in the CR category, 5.19% in EN, 16.88% in VU, 7.79% in NT category, and 2.60% in DD. The remaining 61.04% were included in the LC category (Figure 5).

The data obtained showed that 38.89% of bird collection were protected species in nature. In addition, bird included in the CR, EN VU, and NT categories according to the IUCN Red List were mostly endemic bird in Indonesia. A total of 16 species are endemic bird in several regions, namely *Nisaetus bartelsi* (Javan hawk-eagle) endemic to Java Island, *Leucopsar rothshcildi* (Bali starling) endemic to Bali Island, *Macrocephalon maleo* (maleo senkawar) endemic to Sulawesi Island, as well as *Cacatua sulphurea crinocristata* (cempaka cockatoo) and *Julang sumba* (Rhyticeros everetti) endemic to Sumba Island. *Cacatua alba* (white-crested cockatoo), *Cacatua goffiniana* (red-cheeked goffin cockatoo), *Cacatua moluccensis* (Moluccan cockatoo), *Cacatua sulphurea* (sulphurea cockatoo), *Lorius domicella* (purple-naped lory) were endemic to Maluku. *Gaura cristata* (crowned dove), *Gaura victoria* (crowned dove), *Henicophaps albifrons* (copperhead dove), *Pssithricas fulgidus* (king lory), *Casuarius casuarius* (double-wattled cassowary) and *Casuarius unappendiculatus* (single-wattled cassowary) were endemic to Papua, while and *Nymphicus hollandicus* (Australian parakeet) was endemic to Australia.

Indonesian endemic birds are only distributed within the administrative boundaries of the country [29, 30, 31, 32]. The taxonomic breakdown also affects the number and composition of endemic bird species in Indonesia. Furthermore, the total wealth of endemic bird species in Indonesia was estimated at 542 in 2024. This number further confirms Indonesia as the country with the richest endemic bird species in the world [33, 34, 35].

The natural population of bird species categorized as CR, EN, VU and NT according to the IUCN *Red List* continues to decline. Several factors responsible for the decline include habitat loss, climate change, environmental pollution, illegal hunting and trade, the presence of invasive species, habitat fragmentation, and degradation, as well as disturbances from human activities. Therefore, the presence of bird species in wildlife parks is one of the efforts to preserve the population in nature.

Conclusion

In conclusion, bird collected at Ragunan Wildlife Park includes 77 species from 14 orders. Based on conservation status according to the IUCN *Red List*, 5 species were included in the CR category, 4 in EN, 13 in the VU, 6 in the NT, and 2 in the DD. The remaining 47 species were included in the LC category. Species included in the CR, EN, VU, and NT categories were mostly endemic to Indonesia.

Among all the species of bird collection, 16 were endemic to several regions, namely Nisaetus bartelsi, Leucopsar rothshcildi, Macrocephalon maleo, Cacatua sulphurea crinocristata, Rhyticeros everetti, Cacatua alba, Cacatua goffiniana, Cacatua moluccensis, Cacatua sulphurea, Lorius domicella, Gaura cristata, Gaura victoria, Henicophaps albifrons, Pssithricas fulgidus, Casuarius casuarius, Casuarius unappendiculatus, and Nymphicus hollandicus.

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