

Richness, Diversity, and Conservation Status of Bird Species in Maron Beach, Semarang, Indonesia

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Abstract: Birds are important species that play a role in maintaining ecosystem stability. The land-use functions by humans can cause decreasing diversity of bird species. The purpose of this study was to identify species richness, species diversity, and conservation status of birds in Maron Beach, Semarang. The research was conducted in January 2017 using the point count method by five points. Observations were made at 06.00 - 10.00 WIB with a duration of 15-30 minutes for each point. The results showed that there were 42 bird species from 20 families. The species richness index (R1) showed a 6.629 value which is classified as a high category. Diversity index (H') showed 2.915 value which is classified as a medium category. Conservation status of bird species that were protected by PP No. 7 1999, there were 7 bird species. Protected bird conservation status by P 106 2018, there were 3 bird species. The conservation status by IUCN is classified into 2 categories, that were Near Threatened (NT) and Least Concern (LC). The conservation status of international trade according to CITES indicates that no species are included in the list, but most of the bird species are traded locally.

Keywords: bird; conservation status; diversity; Maron Beach; richness

Abstrak: Burung merupakan spesies penting yang berperan dalam menjaga kestabilan ekosistem dan memiliki banyak manfaat. Pengalihan fungsi lahan oleh manusia dapat menyebabkan penurunan keanekaragaman jenis burung. Tujuan penelitian ini untuk mengidentifikasi kekayaan jenis, keanekaragaman jenis dan status konservasi burung di kawasan Pantai Maron, Semarang. Penelitian dilakukan pada bulan Januari 2017 dengan metode titik hitung sebanyak lima titik. Pengamatan dilakukan pada pukul 06.00 – 10.00 WIB dengan durasi 15 – 30 menit untuk tiap titik. Hasil penelitian menunjukkan terdapat 42 jenis burung dari 20 famili. Indeks kekayaan jenis (R1) sebesar 6,629 yang tergolong kategori tinggi. Indeks keanekaragaman jenis (H') sebesar 2,915 yang tergolong kategori sedang. Status konservasi jenis burung yang dilindungi PP No 7 Tahun 1999 terdapat 7 jenis burung. Status konservasi burung yang dilindungi P 106 Tahun 2018 terdapat 3 jenis burung. Status konservasi keterancaman jenis menurut IUCN tergolong dalam 2 kategori yaitu Near Threatened (NT) dan Least Concern (LC). Status konservasi perdagangan internasional menurut CITES menunjukkan tidak ada spesies yang masuk ke dalam daftar, namun sebagian besar jenis burung yang diperdagangkan di lingkup lokal.

Kata kunci: burung; keanekaragaman; kekayaan; pantai Maron; status konservasi.

INTRODUCTION

Indonesia is one of the countries with the second-highest biodiversity after Brazil. Indonesia has 8,157 species of vertebrate fauna (mammals, birds, herpetofauna, and fish) (LIPI, 2014). Meanwhile of bird species, (Ruskhanidar & Hambal, 2007) stated, that were 1,539 species have been recorded in Indonesia, including migratory birds. Also, Indonesia has a high number of endemic bird species, namely 386 bird species (LIPI, 2014).

Birds have a role as biological agents in controlling various kinds of pests, such as rats and caterpillars. Besides, birds are used as food material by humans, help pollinate flowers, and help in the spread of plant seeds (Whelan et al., 2008). Birds can also be used as bioindicators for environmental changes. Therefore, birds become components of biodiversity that has an important role in maintaining ecosystem stability (Latumahina et al., 2020).

Human activities change the environment such as natural forests into plantations, agriculture, and infrastructure development to increase various types of industrial activities. The diversity of bird species is decreasing due to forest degradation and fragmentation, even causing the extinction of certain bird species that cannot adapt (Sodhi et al., 2011; Narayana, 2013). The development of land-use for human settlements and road construction resulted in a significant reduction in bird numbers (Fahrig & Rytwinski, 2009). Deforestation and changes in the natural environment are the most dominant factors in reducing bird population and diversity (Ayat & L. Tata, 2015).

Maron Beach is a tourist beach located in Tugurejo Village, Tugu District, Semarang City. Maron Beach is near to Semarang Ahmad Yani International Airport. Maron Beach is a type of sandy beach, rocky, and cliffs (Prabowo et al., 2017). The Maron Beach has several types of habitat such as mangrove forests, mudflats, rivers, fields, grasslands, and shrubs. The mangrove forests of the Maron Beach area are composed of *Rhizophora mucronata* and *Avicennia marina* (Tarigan et al., 2017).

The condition of Maron Beach is getting worse. The sandy and rocky beach structure is the result of reclamation. The Maron coast area has decreased land due to erosion. Also, the Maron beach environment has begun to be polluted by household waste that is dumped carelessly (Prabowo et al., 2017). Based on this, research was carried out in the Maron Beach to identify the

richness, diversity and conservation status of bird species in the area. The results of this study are also expected to be used as a reference in monitoring the diversity of bird species on the Maron Beach and take action bird conservation policies in the area.

RESEARCH METHOD

Study Area

The research was carried out in January 2017 at the location of the Maron Beach Area - 6.9545634°S, 110.3579064°E. Maron Beach is located in village Tugurejo Village, Tugu District, Semarang City, Central Java Province, Indonesia. (Figure 1). The observation point is based on the habitat varies in the Maron Beach.

Procedures

Data collection was carried out using the point count method (Bibby et al., 2000; Partasasmita et al., 2009; Safanah et al., 2017). There were 5 observation points with a distance between the points of 150 m and a radius of observation was 50 meters (Figure 2). Observations were made in the morning at 06.00 - 10.00 a.m. with a duration of 15-30 minutes at each point. The main data observed were bird species and population. As supporting data, the activity of each bird species was also recorded. The identification of bird species was carried out based on characteristics referring to field guild book of Burung-burung di Sumatra, Java, Bali, & Kalimantan (Mackinnon et al., 2010).



Figure 1. Map of research location in Maron beach, Semarang

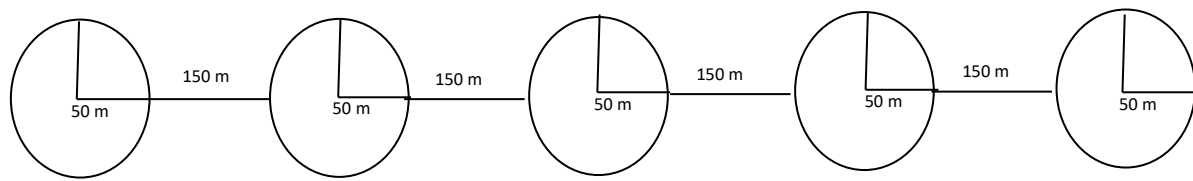


Figure 2. Model of research data collection technique

Data Analysis

Data were analyzed to identify species richness, species diversity and conservation status for each bird species.

Species richness index

The species richness index is the total number of species in a community, the number depends on the area and time of the study. The species richness index (RI) in this study uses the Margalef formula. The classification of the level of Margalef species richness is shown in Table 1 ([Latumahina et al., 2020](#)).

$$R = \frac{(S-1)}{\ln N} \quad (1)$$

Description:

R1 : Margalef's species richness index
S : number of species
N : total number of individuals
Ln : natural logarithm

Table 1. Criteria of species richness index

Value	Category
$R1 < 2,5$	Low-level species richness
$2,5 > R1 < 4$	Medium-level species richness
$R1 > 4$	High-level species richness

Species diversity index

Species diversity index is used to determine the distribution of the individuals found. In this study, the data were analyzed based on the Shannon - Winner species diversity index. The determination of the category of the level of species diversity is based on Table 2 ([Magurran, 2004](#)) ([Safanah et al., 2017](#)) ([Latumahina et al., 2020](#)).

$$H' = - \sum \left(\frac{Ni}{N} \right) \ln \left(\frac{Ni}{N} \right) \quad (2)$$

Description:

H' : Shannon-Wiener's diversity index
Ni : number of individuals per i
N : total number of individuals

Table 2. Criteria of species diversity index

Value	Category
$H' < 1$	Low-level species diversity
$1 > H' < 3$	Medium-level species diversity
$H' > 3$	High-level species diversity

Conservation status

Every bird species found will be identified its conservation status based on the status of Indonesian legal protection (PP No. 7 of 1999 and P 106 of 2018), conservation status based on International Union for Conservation of Nature Redlist (IUCN Redlist), international trade status based on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

RESULT AND DISCUSSION

Bird species richness

Based on the observation, there were 42 bird species from 20 families (Table 3). In Table 1, it showed that most bird species found came from the Ardeidae, Charadriidae, and Alcedinidae families. There were seven bird species found in the Ardeidae family, that were Javan pond-heron (*Ardeola speciosa*), Grey heron (*Ardea cinerea*), Plumed egret (*Ardea plumifera*), Purple heron (*Ardea purpurea*), Green-backed heron (*Butorides striata*), little egret (*Egretta garzetta*) and yellow bittern (*Ixobrychus sinensis*). The Ardeidae family was often found because birds from this family have a habit of living, nesting, and foraging in riverbanks, coastal small rivers, ponds, and coastal areas (MacKinnon et al., 2010). This is by following the conditions of the research location, which is the habitat of rivers, ponds, and coastal waters.

Table 3. List of bird species in Maron beach, Semarang

No	Family	No	Species	English Name	Indonesian Name	Total
1.	Alcedinidae	1.	<i>Halcyon cyanoventris</i>	Javan Kingfisher	Cekakak Jawa	1
		2.	<i>Todirhampus sanctus</i>	Sacred Kingfisher	Cekakak Austrlia	1
		3.	<i>Todirhampus chloris</i>	Collared Kingfisher	Cekakak Sungai	3
		4.	<i>Alcedo coerulescens</i>	Cerulean Kingfisher	Raja Udang Biru	9
2.	Anatidae	5.	<i>Anas gibberifrons</i>	Sunda Teal	Itik Benjut	2
3.	Apodidae	6.	<i>Apus pacificus</i>	Fork-tailed Swift	Kapinis Laut	3
4.	Artamidae	7.	<i>Artamus leucorhyn</i>	White-breasted Wood-swallow	Kekep Babi	3
		8.	<i>Hirundo rustica</i>	Barn Swallow	Layang-layang Api	1
		9.	<i>Collocalia linchi</i>	Cave Swiftlet	Walet Linchi	62
5..	Ardeidae	10.	<i>Ardeola speciosa</i>	Javan Pond-Heron	Blekak Sawah	56
		11.	<i>Ardea cinerea</i>	Grey Heron	Cangak Abu	3
		12.	<i>Ardea plumifera</i>	Plumed Egret	Kuntul Perak	1
		13.	<i>Ardea purpurea</i>	Purple Heron	Cangak Merah	3
		14.	<i>Butorides striata</i>	Green-backed Heron	Kokoan Laut	2
		15.	<i>Egretta garzetta</i>	Little Egret	Kuntul Kecil	9
		16.	<i>Ixobrychus sinensis</i>	Yellow Bittern	Bambangan Kuning	7
6.	Champephagidae	17.	<i>Pericrocotus cinnamomeus</i>	Small Minivet	Sepah Kecil	6
7.	Charadriidae	18.	<i>Charadrius alexandrinus</i>	Kentish Plover	Cerek Tilil	24
		19.	<i>Charadrius hiaticula</i>	Common Ringed Plover	Cerek Kalung Besar	32
		20.	<i>Charadrius dubius</i>	Little Ringed Plover	Cerek Kalung Kecil	5
		21.	<i>Charadrius javanicus</i>	Javan Plover	Cerek Jawa	2
		22.	<i>Pluvialis fulva</i>	Pacific Golden-plover	Cerek Kernyut	28
8.	Chloropseida	23.	<i>Aegithina tiphia</i>	Common Iora	Cipoh Kacat	2
9.	Columbidae	24.	<i>Geopelia striata</i>	Zebra Dove	Perkutut Jawa	1
		25.	<i>Spilopelia chinensis</i>	Eastern Spotted Dove	Tekukur Biasa	29
10.	Cuculidae	26.	<i>Centropus bengalensis</i>	Lesser Coucal	Bubut Alang-alang	3
11.	Dicaeidae	27.	<i>Dicaeum trochileum</i>	Scarlet-headed Flowerpecker	Cabai Jawa	13
12.	Estrildidae	28.	<i>Lonchura maja</i>	White-headed Munia	Bondol Haji	2
		29.	<i>Lonchura leucogastroides</i>	Javan Munia	Bondol Jawa	15
		30.	<i>Lonchura punctulata</i>	Scaly-breasted Munia	Bondol Peking	7
13.	Laniidae	31.	<i>Lanius schach</i>	Long-tailed Shrike	Bentet Kelabu	2
14.	Muscicapidae	32.	<i>Rhipidura javanica</i>	Pied Fantail	Kipasan Belang	4
15.	Nectarinidae	33.	<i>Cinnyris jugularis</i>	Olive-backed Sunbird	Burung Madu	8
16.	Picidae	34.	<i>Picoides moluccensis</i>	Sunda Woodpecker	Caladi Tilik	1
		35.	<i>Dendrocopus macei</i>	Fulvous-breasted Woodpecker	Caladi Ulam	2
17.	Ploceidae	36.	<i>Passer montanus</i>	Eurasian Tree Sparrow	Burung Gereja	6
18.	Pycnonotidae	37.	<i>Pycnonotus aurigaster</i>	Sooty-headed Bulbul	Erasia	97
19.	Scolopacidae	38.	<i>Actitis hypoleucos</i>	Common Sandpiper	Cucak Kutilang	14
		39.	<i>Tringa glareola</i>	Wood Sandpiper	Trinil Pantai	6
20.	Silviidae	40.	<i>Orthotomus sutorius</i>	Common Tailorbird	Trinil Semak	5
		41.	<i>Prinia inornata</i>	Plain Prinia	Cinenen Pisang	2
		42.	<i>Gerygone sulphurea</i>	Golden-bellied Gerygone	Perenjak Padi	3
					Remetuk Laut	

The group of birds found in the Charadriidae family were a five of plover species. The species of birds found were Kentish plover (*Charadrius alexandrinus*), Little ringed plover (*Charadrius dubius*), Common ringed plover (*Charadrius hiaticula*), Javan plover (*Charadrius javanicus*) and Pacific golden plover (*Pluvialis fulva*). The third family was Alcedinidae, contains four species of birds, that were Javan kingfisher

(*Halcyon cyanoventris*), Sacred kingfisher (*Todirhampus sanctus*), Collared kingfisher (*Todirhampus chloris*) and Cerulean kingfisher (*Alcedo coerulescens*). The plover and kingfisher groups have a habit of foraging on the banks of rivers near the coast, mud and grass near the coast and even grass near the airport (MacKinnon et al., 2010).

The Margalef species richness index in the Maron Beach obtained a value of 6.629. This value showed that the Maron Beach area has a high level of species richness because the value was more than 4 ([Latumahina et al., 2020](#)).

Bird species diversity

Based on the research results, it was found that the diversity index was 2,915. This shows that it is classified into a medium level of species diversity because it ranges from $1 > 2,915 < 3$. This shows that the Maron coastal area has varied habitats and is quite suitable for the survival of birds. Heterogeneous habitat variations can provide bird needs and increase species diversity ([Araneda et al., 2018](#)) ([Jemal et al., 2020](#)).

The existence of an animal species is determined by its food source and habitat suitability ([Warsito & Bismark, 2010](#)). According to Alikodra (2010), the high diversity of bird species in an area is supported by the high diversity of habitats because the habitat for wildlife generally functions as a place to find food, rest and nest. Habitat changes can lead to changes in bird composition and abundance components ([Dewi, 2005](#)).

The condition of bird species diversity can decrease due to increased land use ([Rudini et al., 2016](#)). The conversion of land functions is the main key controlling species diversity current and in the future ([Luck et al., 2003](#)) ([Agvei-Ohemeng et al., 2017](#)).



Figure 3. Bird species of Kentish plover (*Charadrius alexandrinus*)

Conservation status

Conservation status under Indonesian law, according to IUCN and international trade by

CITES are shown in Table 4. Status protection under Indonesian law, PP No. 7 of 1999 shows that there are seven species of birds protected. The protected birds are Cerulean kingfisher (*Alcedo coerulescens*), Collared kingfisher (*Todirhamphus chloris*), Sacred kingfisher (*Todirhamphus sanctus*), Javan kingfisher (*Halcyon cyanoventris*), Pied fantail (*Rhipidura javanica*), Olive-backed sunbird (*Cinnyris jugularis*) and Little egret (*Egretta garzetta*). Meanwhile, the protection status according to P. 106 of 2018 shows that there are three protected bird species. The protected birds are Javan plover (*Charadrius javanica*), Kentish plover (*Charadrius alexandrinus*) and Pied fantail (*Rhipidura javanica*). Based on this, it shows that there are bird species protected by these two regulations, that is Pied fantail (*Rhipidura javanica*).

According to the IUCN Redlist, the threat status of bird species in the Maron Beach is classified into two categories, that are Near Threatened (NT) and Least Concern (LC) (IUCN, 2012). There are two species of birds that are classified as NT, that are Sunda teal (*Anas giberifrons*) and Javan plover (*Charadrius javanica*). The conservation status of NT indicates that it is necessary to obtain conservation action so that it does not become extinct. Meanwhile, for the bird species classified in the LC, there are forty species. This shows that these bird species are at low risk of extinction and are still large in number, but further research is needed to determine population changes ([Dewi et al., 2019](#)).

The status of international trade according to CITES shows that there are no bird species that need to be highlighted ([CITES, 2020](#)). Even so, bird species in Maron beach are traded, that are Eastern spotted dove (*Spilopelia chinensis*), Zebra dove (*Geopelia striata*), Lesser coucal (*Centropus bengalensis*), Collared kingfisher (*Halcyon chloris*), Fulvous-breasted woodpecker (*Dendrocopus macei*), Common iora (*Aegithina tiphia*), Sooty-headed bulbul (*Pycnonotus aurigaster*), Long-tailed shrike (*Lanius schah*), Javan munia (*Lonchura leucogastroides*), and Scaly-breasted munia (*Lonchura punctulata*) ([Haryoko, 2010](#)). Based on this, it shows that these bird species are still traded locally.

Table 4. Conservation status of bird species in Maron beach, Semarang

No	Species	Conservation Status			
		IUCN Redlist	CITES	Indonesian Law	
				PP 7 1999	P 106 2018
1.	<i>Actitis hypoleucos</i>	Least Concern	-	-	-
2.	<i>Aegithina tiphia</i>	Least Concern	-	-	-
3.	<i>Alcedo coerulescens</i>	Least Concern	-	v	-
4.	<i>Anas gibberifrons</i>	Near Threatened	-	-	-
5.	<i>Apus pacificus</i>	Least Concern	-	-	-
6.	<i>Ardea cinerea</i>	Least Concern	-	-	-
7.	<i>Ardea plumifera</i>	Least Concern	-	-	-
8.	<i>Ardea purpurea</i>	Least Concern	-	-	-
9.	<i>Ardeola speciosa</i>	Least Concern	-	-	-
10.	<i>Artamus leucorhynchus</i>	Least Concern	-	-	-
11.	<i>Butorides striata</i>	Least Concern	-	-	-
12.	<i>Centropus bengalensis</i>	Least Concern	-	-	-
13.	<i>Charadrius alexandrinus</i>	Least Concern	-	-	v
14.	<i>Charadrius dubius</i>	Least Concern	-	-	-
15.	<i>Charadrius hiaticula</i>	Least Concern	-	-	-
16.	<i>Charadrius javanicus</i>	Near Threatened	-	-	v
17.	<i>Cinnyris jugularis</i>	Least Concern	-	v	-
18.	<i>Collocalia linchi</i>	Least Concern	-	-	-
19.	<i>Dendrocopus macei</i>	Least Concern	-	-	-
20.	<i>Dicaeum trochileum</i>	Least Concern	-	-	-
21.	<i>Egretta garzetta</i>	Least Concern	-	v	-
22.	<i>Geopelia striata</i>	Least Concern	-	-	-
23.	<i>Gerygone sulphurea</i>	Least Concern	-	-	-
24.	<i>Halcyon cyanoventris</i>	Least Concern	-	v	-
25.	<i>Hirundo rustica</i>	Least Concern	-	-	-
26.	<i>Ixobrychus sinensis</i>	Least Concern	-	-	-
27.	<i>Lanius schach</i>	Least Concern	-	-	-
28.	<i>Lonchura leucogastroides</i>	Least Concern	-	-	-
29.	<i>Lonchura maja</i>	Least Concern	-	-	-
30.	<i>Lonchura punctulata</i>	Least Concern	-	-	-
31.	<i>Orthotomus sutorius</i>	Least Concern	-	-	-
32.	<i>Passer montanus</i>	Least Concern	-	-	-
33.	<i>Pericrocotus cinnamomeus</i>	Least Concern	-	-	-
34.	<i>Picoides moluccensis</i>	Least Concern	-	-	-
35.	<i>Pluvialis fulva</i>	Least Concern	-	-	-
36.	<i>Prinia inornata</i>	Least Concern	-	-	-
37.	<i>Pycnonotus aurigaster</i>	Least Concern	-	-	-
38.	<i>Rhipidura javanica</i>	Least Concern	-	v	v
39.	<i>Spilopelia chinensis</i>	Least Concern	-	-	-
40.	<i>Todirhampus chloris</i>	Least Concern	-	v	-
41.	<i>Todirhampus sanctus</i>	Least Concern	-	v	-
42.	<i>Tringa glareola</i>	Least Concern	-	-	-

CONCLUSION

Based on the results and discussion, the following conclusions can be drawn:

1. In the Maron Beach, that were 42 bird species from 20 families were found with a species richness index (R1) of 6.629 which was high-level category.
2. The diversity index of bird species in the Maron Beach was 2,915 which was classified as medium-level category.

3. Conservation status of bird species, there were 7 protected species PP No. 7 of 1999, 3 protected species P 106 of 2018, classified as 2 IUCN categories (NT and LC) and not included in the internationally traded by CITES.

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