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Bird Community in Burung Island, Karimunjawa National Park, Central Java

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ABSTRACT

Burung Island is one of many islands in the Karimunjawa Islands that belong to Karimunjawa National Park conservation area. The purpose of this study is to discover the structure of bird community especially the species diversity and its habitat structure in Burung Island. The study was conducted on June 2006, November 2006, and June 2007 in Burung Island. The study was conducted by using point count method. The radius of each point is approximately 20 meters, while the time interval of observation on each count is 10 minutes. The distance between each point in this study is 100 m. The habitat observation was conducted by using habitat profile of tree cover vertical structure which was done descriptively by looking at the function of cover level to the present of bird or the relation between level and the present of bird in that location. The study's result indicated that there are 15 recorded bird species from 10 family in the location, in which five species (five family) among them are protected by the government, which are *Sterna sumatrana*, *Egretta sacra*, *Nectarinia jugularis, Caloenas nicobarica*, and *Falco moluccensis*, and two of them were included in CITES (Convention on International trade in Endangered Species) appendices 1 and 2, which are *Caloenas nicobarica* and *Falco moluccensis*. The highest values of species diversity index (H') and evenness index (E') can be seen from the observation's result of June 2007, which are 1.8837 and 0.836. The habitat of Burung Island is very suitable for *Caloenas nicobarica, Egretta sacra, Sterna sumatrana*, and *Sterna bergii* as a place for breeding. The use of vegetation level by bird in Burung Island is dominated by the use of low and base levels.

Key words: Bird, community, Burung Island, Karimunjawa National Park

INTRODUCTION

Community is a whole population of species that live in the same time and space (Begon et al. 1990; Magurran 1994). Bird community is a group of several bird species individuals that live together in the same time and space (Wiens 1989). Bird community is affected, among others, by topographic factor, history and the influence of the island biogeography, climate and natural resource seasonal changes, habitat diversity, habitat change, and the influence of its competitor: bird or any other animal groups.

Various studies which are aiming to identify the biodiversity of certain region, in correlations with the habitat change pattern as well as environmental issue, are using bird as their indicator. Birdlife International (2003) stated that a list of bird species collected by bird experts to study biodiversity is very abundance. The reason for this is because birds are easy to detect and their taxonomy data are more comprehensive. Therefore, bird species is generally easy to identify and its monitoring time is much more efficient (Dale et al. 2000; Seto et al. 2004).

Burung Island is one of 22 islands that belong to Karimunjawa National Park (Decree of the Minister of Forestry No 161/MenHut II/1998) and has been stipulated as an island that belong to the protection zone (Decree of Dirjen PHKA No 79/IV/set-3/2005) (Department of Forestry Central Java, 2006). The purpose of a protection zone is to protect the nucleus zone which is a reserved area that support the protection of species and the ecological processes within them. Burung Island is located on the west side of Karimunjawa Islands and it is geographically located on 5° 53' 33" - 5° 53' 31" SL and 110° 20' 33" - 110° 20' 30" EL, about 11 km away from Karimunjawa Island and 81 km away from Jepara, Central Java. The land area of Burung Island in only 1 hectare and it consists of coastal forest ecosystem with thick shrubs. There are no settlement or above water housing within or around this island which is usually use by fishermen as a place to stay or a temporary abode while catching a fish.

The existence of biodiversity in Karimunjawa National Park need to be managed and protected. Until recently, the management of biodiversity in Karimunjawa National Park is only focused on sea biodiversity. While the land biodiversity potention has not been managed optimally although it is as important as sea biodiversity. The variety of ecosystem types and the specific characteristic of a number of its islands are also a potential factor that affected the biodiversity including bird community in Karimunjawa National Park.

The study of bird community in Burung Island is an effort to manage the potential of biodiversity in Karimunjawa National Park. The reason for this is that bird can become an indicator of biodiversity, environmental quality change, and the stipulation of conservation area. These conditions are supported by bird characteristics, such as live in various habitats, sensitive to environmental change, and their

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position in taxonomy and their well-known distribution pattern (Sujatnika et al. 1995).

The purpose of this study is to discover the structure of bird community especially its species diversity and its habitat structure in Burung Island. Hopefully, the result of this study can support the biodiversity conservation effort especially bird conservation in Karimunjawa National Park and can become a consideration for the local government in planning the development of ecotourism physical infrastructure in Karimunjawa National Park.

MATERIALS AND METHODS

This study is conducted on Burung Island, Karimunjawa National Park Central Java (Figure 1a and 1b). The study is conducted on June 2006, November 2006, dan June 2007

All bird data were obtained by using point count method. With this method, observer will stop at certain point to record bird species and count bird individuals that were detected durung certain period (Bibby et al. 2000; Javed & Rahul 2000; Hostetler & Main 2001). Direct Record method was conducted by observing bird object using Nikon 8 x 30 binocular and Nikon 20 x 60 monocular. Indirect Record method was conducted based on bird voices. The distance between each point count in this study is 100 m, radius of each point count is about 20 m, observation duration of each point count is 10 minutes. Observation was conducted at the time when bird activity is high, that is between 06.00 – 13.00 WIB (Catry et al. 2000; Young & Deborah 2001; Lian et al. 2002; Chetri et al. 2005).

Bird species identification based on the study' s result was conducted descriptively using bird field guide in Sumatera, Kalimantan, Java, and Bali (MacKinnon et al. 1993). The scientific and local names of each bird species are used according to Andrew (1992) and Mac Kinnon *et al.* (1993). The status of each bird observed are recorded based on IUCN criteria (2004), goverment regulation status, and trade status (Soehartono & Mardiastuti 2001).

The Shannon-Wiener index is used in order to determine the value of bird species diversity (Magurran 1988), which is:

$$H' = \sum_{i-1}^{s} pi \log pi$$

pi= bird species no-i / the total number of bird

The Shannon index of Equitability or Evenness, referred in Magurran (1988) is used in order to determine the abundanceness proportion of bird species in each habitat type and land landscape. They are as follows:

E = H '/ln s
s = the number of species

The dominancy index is used in order to determine dominant bird in research area, reffered by Van Helvoort (1981) :

$$Di = \frac{Ni}{N} x100\%$$

Di = dominancy index; Ni= number individu of species;
N = number of individu all species

Criteria:

Di = 0 – 2 % un dominant species
Di = 2 – 5 % subdominant species
Di = >5% dominant species

Habitat profile analyzes on the vertical structure of tree cover coverage is conducted descriptively by studying the function of tree cover levels to bird present or its level relation with bird present in that location (Figure 2).

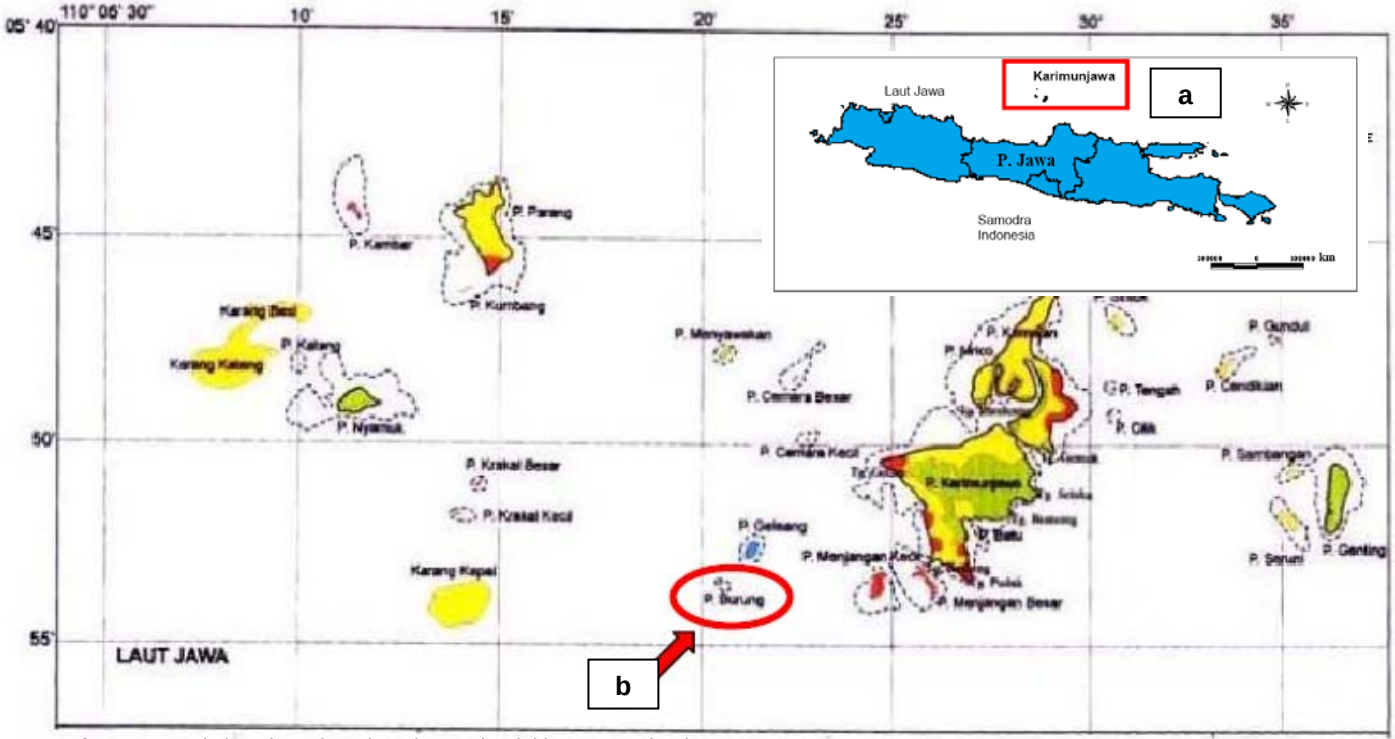

Figure 1. Study location, a) Karimunjawa Island, b) Burung Island

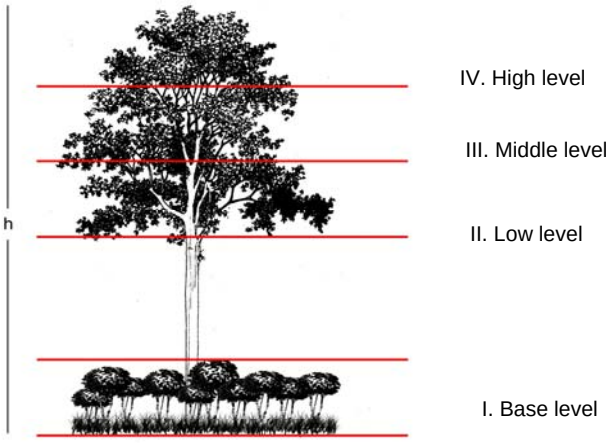

Figure 2. The vertical structure of tree cover coverage

RESULTS AND DISCUSSIONS

The observation of bird species richness in Burung Island on June 2006 resulted in the discovery of nine bird species that belong to eight family. On November 2006, eight species that belong to seven family were discovered and on June 2007, 10 species that belong to eight family were also found (Table 1). The total species richness of these three observations in Burung Island discovered 15 species that belong to 10 families. Of these 15 species, five species among them (five family) are protected by the Government of Indonesia, i.e. by Regulation of Wild Animal Protection 1931, Government Regulation No 7 1999, Decree of the Minister of Agriculture No 327/Kpts/Um/1972 and Decree of the Minister of Agriculture No 421/Kpts/Um/8/1970, and two species among them, which are *Caloenas nicobarica* and *Falco moluccensis* were included in CITES (Convention on International trade in Endangered Species) appendices 1 and 2 (Table 2).

Species diversity is an important aspect in a bio-community. Usually, the species diversity within a community is studied to discover the relation between species diversity and any other aspects of community, such as habitat structure, productivity, and its environmental condition. Bird species diversity can be seen by using various parameters. These parameters, among others, are by using species diversity and evenness indices values. The analysis's result of species diversity index (H') showed that on the observation of June 2006, the diversity index value is 1.753, on November 2006 it was 1.466, and on June 2007 it was 1.837. The analysis of evenness index (E') indicated that on June 2006 the evenness index was 0.798, on November 2006 it was 0.667, and on June 2007 it was 0.836. From the diversity and evenness indices values above, it can be concluded that the highest diversity and evenness indices values were on June 2007, June 2006, and the lowest value of diversity and evenness indices is on November 2006 (Table 3).

Table 1. Species richness and family on June 2006, November 2006, and June 2007

Number of species/family	June 2006	November 2006	June 2007
Species	9	8	10
Family	8	7	8

Table 2. Family/Species richness, the number of individuals, and the protection status in Burung Island

Family/ Scientific names	Local names	Number of individuals			Protection status
		June 2006	Nov 2006	June 2007	
Familia 1: Artamidae					
Artamus leucorhynchus	Kekep babi	8	7	3	UP
Familia 2: Nectariniidae					
Nectarinia jugularis	Burung madu Sriganti	3	6	3	A, B
Familia 3: Rallidae					
Amaurornis phoenicurus	Kareo padi	-	1	-	UP
Familia 4: Zosteropidae					
Zosterops chloris	Kacamata laut	20	24	16	UP
Familia 5: Muscicapidae					
Rhinomyias olivacea	Sikatan rimba dada coklat	-	-	1	UP
Familia 6: Ardeidae					
Butorides striatus	Kokokan laut	-	1	-	UP
Egretta sacra	Kuntul karang	4	1	1	A, B
Familia 7: Alcedinidae					
Todirhampus chloris	Cekakak sungai	3	5	3	UP
Familia 8: Columbidae					
Ducula bicolour	Pergam laut	-	-	18	UP
Caloenas nicobarica	Junai mas	-	-	4	A,B, C,E
Familia 9. Falconidae					
Falco moluccensis	Alap-alap sapi	-	1	-	B,D, F
Famili 10. Fregatidae					
Fregata minor	Cikalang besar	2	-	-	UP
Fregata ariel	Cikalang keci	2	-	-	UP
Famili 11. Sternidae					
Sterna sumatrana	Dara laut tengkuk hitam	26	-	19	A,B
Sterna bergii	Dara laut jambul	4	-	3	UP

Note :
A : Protected by Regulation of Wild Animal Protection 1931
B : Protected by Government Regulation No 7 1999
C : Decree of the Minister of Agriculture No 327/Kpts/Um/1972
D : Decree of the Minister of Agriculture No 421/Kpts/Um/8/1970
E : CITES Appendix 1
F : CITES Appendix 2
UP : Un Protected

The high value of diversity and evenness indices on June 2007 indicated that the habitat is able to provide enough food source that meet the needs of the bird in Burung Island, so it can form high diversity value. The availability of food is due to the condition of June 2007 that already reach rainy season, so there were many vegetation bear flower and fruit such as *lakok-lakok, gabusan, cemara laut,* and *manggisan*. Compare with the observation of November 2006, the habitat of Burung Island and its surrounding areas are much drier due to prolong dry season. The effect is that the availability of food on that month is very limited and not enough to meet bird's needs and cause the diversity and evenness indices values on November 2006 were lower than June 2006 and June 2007. Helvoort (1981) mentioned that there are

relation between species diversity and balance within a community. When species diversity value is high, the inter-species balance is also high, but not the other way around. This species balance can be used to study the relation stability within a community. The distribution of bird community is also affected by the habitat, and dynamically tend to show the relation between bird population and their habitat (O'Connel et al. 2000 in Chettri et al. 2005). Alikodra (2002) mentioned that the high bird species diversity in particular region is supported by high habitat diversity. The reason for this is that habitat has function as a place for feeding, drinking, resting, and breeding. So the high present number of wild animals is due to the availability of life's needs in that habitat.

The evenness index on June 2006 and June 2007 also show relatively high. The high evenness index value indicated that there are un dominant bird species. This indicated that the bird species individual in that community is evenly distributed. The evenness index on November 2006 appeared a little lower than the observation on June 2006 and June 2007. The low evenness index indicated that there is a dominant bird species, which is *Zosterops chloris.* The distribution and population of *Zosterops chloris* on November 2007 is very high compared with the other species. This is also supported by the high dominancy index value of *Zosterops chloris* than the other species (Table 4).

Based on species dominancy index category, on June 2006 there are five bird species that belong to dominant category (>5%), which are *Sterna sumatrana, Zosterops chloris, Artamus leucorhynchus, Sterna bergii,* and *Egretta sacra*; four species belong to sub-dominant category (2-5%), which are *Todirhampus chloris, Nectarinia jugularis, Fregata minor,* and *Fregata ariel.* The analysis's result of the dominancy index on November 2007 indicated that there are four bird species that belong to the dominant category, which are *Zosterops chloris, Artamus leucorhynchus, Nectarinia jugularis, Todirhampus chloris,* and four other species that belong to sub-dominant category, which are *Butorides striatus, Egretta sacra, Falco moluccensis, and Amaurornis phoenicurus* (Table 4).

On June 2006 and November 2007 there are no bird species that belong to un-dominant category. This is different with the analysis of the dominancy index on June 2007, in which there are two bird species that belong to un-dominant category, which are *Sterna sumatrana, Zosterops chloris, Ducula bicolor, Artamus leucorhynchus, Sterna bergii, Todirhampus chloris, Nectarinia jugularis,* and *Caloenas nicobarica* (Table 4).

The dominancy of these bird species indicated the dominant bird species within the community in the study's area. A number of bird species have different abundance values on some habitat types and different observation time. These variations due to the differences of bird's ability to use the existing habitat. Generally, the high abundance of bird was supported by the present habitat's ability to provide food's needs and any other life's needs.

The abundance of certain bird species on some habitat types was different. The dominant bird species can be an indication that they have highest abundance value within their community. Aside from that, at the time of observation, these dominant species are commonly found in groups or couples and form bigger population than the other species.

The spatial use by bird in certain habitat can be observed by watching bird species within certain level in certain vegetation. The spatial use by bird is divided based on vertically vegetation use in certain habitat. Based on the study's result, there are two species that use high level (IV), which are *Artamus leucorhynchus* and *Ducula bicolor*. There are five species that use middle level (III) and low level (II), which are *Todirhampus chloris, Necatarinia jugularis, Zosterops chloris, Egretta sacra,* and *Caloenas nicobarica.* Base level (I) was used by five species, among others S*terna sumatrana, Egretta sacra, Sterna bergii, Amaurornis phoenicurus,* and *Butorides striatus* (Figure 3).

The use of these levels has connection with bird's needs to conduct their activities, such as playing, feeding, resting, and preying. The high level in Burung Island is commonly use by A*rtamus leucorhynchus* to rest and prey, while *Ducula bicolor* only use it to rest. The middle level is commonly use for playing, feeding, and resting, while for *Caloenas nicobarica*, it was used for nesting and breeding. The observation's result on June 2007 recorded four species individuals of C*aloenas nicobaric*a, two mature individuals and two younger individuals (inside the nest and were still not been able to fly). The low level was used for playing, resting, and feeding, while for *Egretta sacra,* it was used for nesting. The base level was widely used by arboreal bird (bird who live on the ground), low layer bird, and bird that breed around the coast such as *Sterna sumatranan*a and *Sterna bergii.* The observation on June 2006 and 2007 found several individuals of these two bird species that were breeding around coral reef of Burung Island. According to Alikodra (2002), bird species that live in forest layer are varied and specifically determine by vegetation type composition and its location. The use of vegetation level by bird in Burung Island was dominated by low and middle levels use. There are four bird species that use more than one vegetation level in conducting their activities. This condition is due to the area of Burung Island which is only 1 hectare, the dominant habitat which is a coastal forest with thick shrubs, and the relatively uniform vegetation. These conditions cause some birds using vegetation levels and types together. Vegetation types which were commonly use by bird around Burung Island, among others are *cemara laut* (*Casuarina equisetifolia*) *, lakok-lakok* (*Rhodamnia cinerea*)*, gabusan* (*Scaevola taccada*)*,* jati pasir (*Guettarda speciosa*), and manggisan (*Carallia brachiata*).

The knowledge regarding bird community in Burung Island which belong to the Karimunjawa National Park, can be used to improve the management of species diversity through bird species protection and the management of bird habitat. The study's result showed that the habitat of Burung Island is very suitable for a number of bird species, such as *Caloenas nicobarica, Egretta sacra, Sterna sumatrana,* and *Sterna bergii* as a place for breeding. Therefore, the management of bird species should included the socialization of bird species that live in Burung Island along with their status and the prohibition of any kind of catch and hunt, especially the protected bird which belong to CITES category and the endemic types, and also the prohibition of cutting and damaging vegetation types that form their habitat.

CONCLUSION

Based on the study's result, it can be concluded that there are 15 bird species of 10 family in Burung Island, in which five of them (five family) are protected by the

government, such as *Sterna sumatrana, Egretta sacra, Necrtarinia jugularis, Caloenas nicobarica,* and *Falco moluccensis,* and two species among them were included in CITES (Convention on International trade in Endangered Species) Category 1 and 2, which are *Caloenas nicobarica* and *Falco moluccensis.* The highest values of species diversity index (H') and evenness index (E') can be seen on the observation's result of June 2007, which are 1.837 and 0.836. The habitat of Burung Island is very suitable for *Caloenas nicobarica, Egretta sacra, Sterna sumatrana,* and *Sterna bergii* as a place for breeding. The use of vegetation level by bird in Burung Island is dominated by the use of low and base levels.

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