Species Diversity and Bird Feed in Residential Complex

Hadinoto¹ and Eni Suhesti²
¹E-mail: hadinoto@unilak.ac.id
Tel/Fax: +62761 54092
Universitas Lancang Kuning, Pekanbaru, 28265, Indonesia,
²E-mail: hesti1170@yahoo.co.id
Universitas Lancang Kuning, Pekanbaru, 28265, Indonesia

Abstract. Bird is one component of the ecosystem which has an important role in supporting the occurrence of an organism's life cycle. Therefore, the presence of birds in an area is important, because it can affect the existence and distribution of plant species. The purpose of this study is to calculate the diversity of bird species and identify the source of bird feed in the compound. This study was conducted by field surveys in the residential complex. In addition to the birds as a research object vegetation as habitat / foraging birds were also observed. Data were analyzed by using the bird diversity index, richness index, abundance index, dominance analysis, analysis of bird distribution and analysis of the level of meeting types, while vegetation will be analyze based on the type and part of what is eaten by birds. In Pandau Jaya housing complex, found as many as 12 species of birds which consists of seven families. Bird species often present is Cucak Kutilang (Pycnonotus aurigaster) of 20 individuals, Bondol Peking (Lonchura punctulata) 14 individuals and Perkutut Jawa (Geopelia striata) 10 individuals. Bird species diversity (H’) in Pandau Jaya housing complex is still relatively moderate with a value of 2.27, while the Evenness Index (E) of 0.91 and Richenes Index (R) of 2.45. Types of vegetation as a food source, among others: mango, guava, cherry, jackfruit, ketapang, coconut, areca, palm, banana, papaya, flowers and grasses.

Keywords: bird, feed, housing complexes

1. Introduction

Birds are wildlife that is easily found in almost every vegetated environment. Habitats can include different types of ecosystems, from natural ecosystems to artificial ecosystems. This wide spread makes birds as one of the potential sources of Indonesia's biological wealth. In addition to playing a role in the balance of bird ecosystems can be an indicator of environmental change.

Pekanbaru is one of the city that is currently growing rapidly both in the development of facilities and infrastructure and the increase of population. The development of Siak Hulu sub-district has an influence on the development of the surrounding area as a development area. It will certainly have an impact on the availability of green open space or land that can be used as bird habitat becomes less.

Indonesia has a fairly high diversity of birds. Based on this function, the diversity of bird species is also closely related to the diversity of habitat types as well as the diverse functions of each type of habitat present in the housing complex. The sustainability of birds can be maintained by conserving the species preceded by various studies or studies of these animals, including the population, habitat and the environment that affect it. Residential complexes not only serve as human habitation but also...
as a place for birds to find food / habiat on the existing vegetation. With the diversity of existing plant species, housing complexes are expected to support the lives of various species of birds. Bird is one component of the ecosystem that has an important role in supporting the life cycle of an organism. This situation can be seen from food chains and life webs that make up their living systems with other ecosystem components such as plants and insects. Therefore, the existence of birds in a region is very important, because it can affect the existence and spread of plant species.

1.1 Research purposes
The purposes of this study are: (1). Identify the diversity of bird species in residential complexes; (2). Identify the source of bird feed that is in the housing complex

1.2. Benefits of research
This study is expected to provide benefits as a source of information supporting the conservation of bird species that contain residential complexes and considerations for the development of regional development with due attention to ecological functions.

2. Research Methods
2.1. Place and time
This research was conducted in residential complex of Pandau Jaya Village, Siak Hulu Sub-district, Kampar District (Pandau Permai Housing and Mahang Raya Housing). Study time October 2016 - January 2017.

Objects studied in this study are the types of birds, vegetation as a habitat / bird feeding place in the housing complex. Thally sheet as the record material data. The equipment used is: Binoculars (binoculars) with size 30 x 60; Digital SLR camera with lens size 75 - 300 mm; Stationery writing; Recording device for recording sound / bird chirping; Timepiece; Field Guide Introduction Birds: Birds In Java and Bali (MacKinnon, 1991); Birds in Sumatra and Kalimantan (Holmes, 1999); List of Birds Indonesian No.2 (Sukmantoro, 2007); Birds in Sumatra, Kalimantan, Java and Bali (MacKinnon, 2010); Additional Information Birds in Sumatra, Java, Bali and Kalimantan (Balen, 2010); Nurturing the Popular Birds of Speaks (Date, 2010).

2.2. Bird Data Collection Method
All bird data is taken using point count method (Bibby, 2000) with circular plot shape with plot diameter 40 meters at the point that has been determined with plot number of 6 plots for each location. The data were collected by observing the birds at the study site by taking all the data of bird species, the number of individuals, the time of encounter, the behavior and activity of birds, and the type of food.

Observations are made in the morning and afternoon between 06.00 - 08.00 WIB and at 16.00.00 - 18.00 WIB in good weather, in the observation track that has been determined with the observation time every 20 minutes. Special observations were made for nocturnal birds. Especially for night birds data taken is the type and amount, for one region. To ensure visibility and recognition of bird species, the observation is done at night at 19.00 - 21.00 WIB by recognizing his voice or seeing the bird species directly.

Recording of bird species is done by direct and indirect combination method. The method of recording is directly done by looking at birds (both visible and using binoculars) with the help of the Bird Recognition Field Manual (Holmes, 1999; Sukmantoro 2007; MacKinnon 1991, 2010) and indirectly based on the sound of birds and nests.

Observation Stage (Bibby 2000): Observers observe birds on each plot; The observer records the name and number of species present in each plot; Recording done during 20 minutes interval; Observer moves on another plot; Every bird observation plot is observed twice a day in the morning and afternoon.
2.3. Data analysis

Diversity Index
To determine the diversity of species Shannon-Wiener diversity index used with the formula: \( H' = - \sum p \ln p_i \) (\( H' \) = Shannon diversity index; \( p_i = (n_i / N) \); \( N \) = Total number of individuals; \( \ln \) = natural logarithm). According to Maguran (1998) in Rahmawaty (2006), the index value of species diversity ranges from 1.5 to 3.5. A value of <1.5 indicates a low species diversity, then a value of 1.5 to 3.5 indicates a moderate diversity of >3.5 values indicates high biodiversity.

Evenness Index
To determine the proportion of species abundance present in each type of urban forest, the Index of Evenness is used, ie the number of individuals of a species or abundance of each species in a community (Setiawan 2006; Dewi 2007) : \( E = H' / \ln S \) (\( E \) = fairness index (range 0 - 1); \( H' \) = Shannon diversity index; \( S \) = number of types; \( \ln \) = natural logarithm)

Richness Index
To calculate species richness at each location using Margalef Index (Setiawan 2006) as follows: \( R = (S-1) / N \) (\( R \) = Margalef Index; \( S \) = Number of Types; \( N \) = Number of Individuals; \( \ln \) = Natural logarithm)

Domain Type Domination Analysis
The dominant analysis of bird species was used to see the dominant, sub dominant and rare bird species composition in observed bird communities. The analysis used relative density parameters according to the category proposed by Jorgensen (1974), the dominant bird category when relative density > 5%, sub dominant if relative density between 2% - 5% and rarely if relative density <2 %. The formula used to analyze was dominance: Density Type (K) = The number of bird species/ Sample plot example; Relative Density (KR) = (Density of a type/ Density of all types) x 100%.

Bird Spread Analysis
Spread analysis is used to view the horizontal distribution of each observation habitat by using the frequency value of the bird species found in the sample plots. The formula used is: Frequency Type (Fj) = The number of plots found in bird species/ number of whole sample plots; Relative Frequency (FR) = (Frequency of a type/ Frequency of all types) x 100%

Type of Meeting Rate Analysis
This analysis was used to calculate the level of encounter for each species of bird present in the study site, it was by dividing the total number of each bird species recorded by the total observation time multiplied by ten (10), resulting in a meeting rate of each bird species per ten hours of observation. Then the results of the calculation are categorized, whether including "rare", "not common", "often", "general" or "overflow". The division of the categories uses the table of bird type encounter rates by Lowen et al., (1996) in Bibby (2000) as in Table 1.

| Abundance category (individual number per 10 hours observation) | Abundance Value | Order scale |
|---------------------------------------------------------------|-----------------|-------------|
| < 0,1                                                         | 1               | Rare        |
| 0,1 – 2,0                                                    | 2               | General Not |
| 2,1 – 10,0                                                   | 3               | Often       |
| 10,1 – 40,0                                                  | 4               | General     |
| > 40,0                                                       | 5               | Overflow    |

Table 1. Use of meeting level to show the scale of the abundance sequence (Lowen et al. 1996 in Bibby 2000)
3. Results and Discussion

3.1. Location observation Housing Pandau Permai
At this location found 12 species of birds belonging to the 7 families. Types of birds that are often present are Cucak Kutilang (*Pycnonotus aurigaster*) as many as 12 individuals, Bondol Peking (*Lonchura punctulata*) with the number of individuals found each of 9 individuals and Merbah Cerukcuk (*Pycnonotus flavescens*) as many as 8 individuals. The bird species at Panda Permai Housing observation location are listed in Table 2.

| No. | Local Name         | Scientific Name         | Family             | Numbers of Individuals |
|-----|--------------------|-------------------------|--------------------|------------------------|
| 1   | Perkutut Jawa      | *Geopelia striata*      | Columbidae         | 6                      |
| 2   | Bondol Peking      | *Lonchura punctulata*   | Estrildidae        | 9                      |
| 3   | Burung Madu Sriganti | *Nectarinia jagularis* | Nectarinididae     | 2                      |
| 4   | Burung Madu Kelapa | *Anthreptes malacensis* | Nectarinididae     | 4                      |
| 5   | Burung Madu Polos  | *Anthreptes simplex*    | Nectarinididae     | 3                      |
| 6   | Pijantung Kecil    | *Arachnothera longirostra* | Nectarinididae   | 2                      |
| 7   | Cinenen Kelabu     | *Orthotomus ruficeps*   | Silviidae          | 4                      |
| 8   | Cucak Kutilang     | *Pycnonotus aurigaster* | Pycnonotidae       | 12                     |
| 9   | Merbah Cerukcuk    | *Pycnonotus flavescens* | Pycnonotidae       | 8                      |
| 10  | Prenjak Jawa       | *Prinia familiaris*     | Sylvidae           | 5                      |
| 11  | Cabak Kota         | *Caprimulgus affinis*   | Caprimulgidae      | 2                      |
| 12  | Cabai Jawa         | *Diacum trchileum*      | Dicaeidae          | 4                      |

Total Individu 61

Source: Processed Data, 2017.

3.2. Location observation Mahang Raya Housing
At this location found as many as 8 species of birds belonging to 6 families. Types of birds that are often present are Cucak Kutilang (*Pycnonotus aurigaster*) of 8 individuals, Bondol Peking (*Lonchura punctulata*) as many as 5 individuals and Perkutut Jawa (*Geopelia striata*) as many as 4 individuals as listed in Table 3.

| No. | Local Name         | Scientific Name         | Family             | Number of Individu |
|-----|--------------------|-------------------------|--------------------|--------------------|
| 1   | Perkutut Jawa      | *Geopelia striata*      | Columbidae         | 4                  |
| 2   | Bondol Peking      | *Lonchura punctulata*   | Estrildidae        | 5                  |
| 3   | Burung Madu Kelapa | *Anthreptes malacensis* | Nectarinididae     | 2                  |
| 4   | Burung Madu Polos  | *Anthreptes simplex*    | Nectarinididae     | 3                  |
| 5   | Cinenen Kelabu     | *Orthotomus ruficeps*   | Silviidae          | 2                  |
| 6   | Cucak Kutilang     | *Pycnonotus aurigaster* | Pycnonotidae       | 8                  |
| 7   | Prenjak Jawa       | *Prinia familiaris*     | Sylvidae           | 2                  |
| 8   | Cabai Jawa         | *Diacum trchileum*      | Dicaeidae          | 2                  |

Total Individu 28

Source: Processed Data, 2017.
3.3. Types of birds at all observation sites
From the results of collecting data on bird species observation in 2 locations found as many as 12 species of birds consisting of 7 families. The types of birds that are often present are Cucak Kutilang (*Pycnonotus aurigaster*) of 20 individuals, Bondol Peking (*Lonchura punctulata*) as many as 14 individuals and Perkutut Jawa (*Geopelia striata*) as many as 10 individuals as listed in Table 4.

| No. | Local Name        | Scientific Name          | Family       | Number of Individu |
|-----|-------------------|--------------------------|--------------|--------------------|
| 1   | Perkutut Jawa     | *Geopelia striata*       | Columbidae   | 10                 |
| 2   | Bondol Peking     | *Lonchura punctulata*    | Estrildidae  | 14                 |
| 3   | Burung Madu Sriganti | *Nectarinia jagularis*   | Nectariniidae| 2                  |
| 4   | Burung Madu Kelapa | *Anthreptes malacensis*  | Nectariniidae| 6                  |
| 5   | Burung Madu Polos  | *Anthreptes simplex*     | Nectariniidae| 6                  |
| 6   | Pijantung Kecil   | *Arachnothera longirostra* | Nectariniidae| 2                  |
| 7   | Cinenen Kelabu    | *Orthotomus ruficeps*    | Silvidae     | 6                  |
| 8   | Cucak Kutilang    | *Pycnonotus aurigaster*  | Pycnonotidae | 20                 |
| 9   | Merbah Cerukcu    | *Pycnonotus flavescens*  | Pycnonotidae | 8                  |
| 10  | Prenjak Jawa      | *Prinia familiaris*      | Sylvidae     | 7                  |
| 11  | Cabak Kota        | *Caprimulgus affinis*    | Caprimulgidae| 2                  |
| 12  | Cabai Jawa        | *Dicacum trchileum*      | Dicaeidae    | 6                  |
|     | **Total Individu**|                          |              | **89**             |

*Source: Processed Data, 2017.*

Causes of large numbers of individuals Cucak Kutilang (*Pycnonotus aurigaster*), Bondol Peking (*Lonchura punctulata*), Perkutut Jawa (*Geopelia striata*) and Merbah Cerukcu (*Pycnonotus flavescens*) are the availability of adequate food, habitat fulfillment by vegetation that allows this species of birds to live and flourish. The species of birds above are the type of fruit-eating birds, insects and grains as the main feed. In some observations, the birds were also seen eating a caterpillar, a flower honey essence or grabbing a small flying insect. This type of bird is also in its movement seen active in all observation points that exist in 2 locations of observation.

The number of individuals, types and families of each location of observation for the whole is dominated by Pandau Permai Housing with the total of 68 individuals, 12 species and 7 families while for Mahang Raya Housing with the number of 28 individuals, 8 species and 6 families. This indicates that the location of observations in Pandau Permai Housing the number of individuals and species of birds is higher than in the Mahang Raya housing location but for the number of families is almost the same. This is because in the location of Housing Pandau Permai vegetation quite a lot and varied when compared with Housing Mahang Raya.

In addition to more vegetation conditions in Pandau Permai Housing and become a place of living necessities for birds is available. This happens because Housing Pandau Permai has been built long enough, so the vegetation, especially the trees are quite old. In Mahang Raya housing location the number of vegetation is relatively young and small because the housing is still not long built so the lack of shelter space for birds and coupled with the existence of vehicles that often pass that can disturb the existence of birds.
3.4. The diversity of bird species in the Housing Complex
After analyzing the data on bird species, the highest index of bird species diversity was found on the location of Pandau Permai Housing (2.32) and in Mahang Raya Estate (1.94). However, the overall index of species diversity reached 2.27. The index value of species diversity at all observation sites showed moderate species diversity level (H value 1.5 - 3.5), quite high index of species diversity at Pandau location because the location is a relatively long residential area built. In addition, Pandau Permai Housing area also has a more diverse vegetation compared with other locations that are still considered low and still small in number. In addition to the vegetation conditions that still have little influence in the fulfillment of feeding needs for birds, diverse bird species implies that the existing vegetation is able to provide adequate food with different classes in producing fruit, young leaves for insect food and so on. This fact leads to competition in the seizure of food, space and security is not met, causing the number and types of birds are not much and the index of diversity to be low. This is also in line with the results of Hadinoto, et.al (2012) research in Pekanbaru Urban Forest that species diversity is positively correlated with tree species diversity. The higher the diversity of tree species, the diversity of bird species encountered the higher.

Trees as a component of bird habitat, can serve as cover (shelter from weather and predators, nesting, resting play). In addition to providing tree parts (leaves, flowers, and fruit) a tree can serve as a habitat for various other types of organisms that are food available to birds such as insects. The index of the community structure of birds in each location is relatively the same, except in Tahura Minas which is higher as listed in Table 5

| Location                             | Species | Individu | Family | H'     | E    | R    |
|--------------------------------------|---------|----------|--------|--------|------|------|
| Pandau Permai Housing Complex        | 12      | 61       | 7      | 2.32   | 0.93 | 2.68 |
| Mahang Raya Housing Complex          | 8       | 28       | 6      | 1.94   | 0.93 | 2.10 |

Data Table 5 shows that the wealth index for Pandau Permai Housing with Mahang Raya Housing is relatively the same. The diversity index of Pandau Permai Housing is higher than Mahang Raya Housing. The Evenness Index (E) is used as an indicator of the symptom of dominance among each species within a community. If each type has the same number of individuals, then the community has a maximum "EVENNESS" value. Conversely, when the equity value is small, then in those communities are the dominant species, sub-dominant and the dominated species, the community has a "Evenness" minimum. From the data analysis known bird species evenness highest in observation locations Pandau Housing and Housing Permai Mahang Sangat, namely 0.93. Richness (R) contained in the highest bird observation sites Pandau Permai Housing (2.68) and Housing Mahang Kingdom (2.10), when calculated as a whole, the species richness (R) is a bird of 2.45.

3.5. Density, Dominance and Scale of Bird Sequence in Housing Complex
Based on the observation that there are two species of birds have Relative density value (KR) highest Cucak Kutilang (Pycnonotus aurigaster) is 22.47% and the Bondol Peking (Lonchura punctulata) is 15.73% and the value of the smallest KR is Burung Madu Seriganti (Nectarinia jagularis ), Pijantung Kecil (Arachnothera longirostra) and Cabak Kota (Caprimulgus affinis) is 2.25%. This is influenced by habitat conditions were pretty good and the proliferation of this type is quite good as well as the lack of a bird of prey which allows both types are high enough value KR. Some bird species have high dominance values and have common sequence value scores, as listed in Table 6 below.
Table 6. Density, dominance and sakala sequence of birds in residential complexes

| No | Local Name | Scientific Name | K   | KR (%)  | Dominansi | Abudance Category | Abudance Value | Order Scale | Category |
|----|------------|-----------------|-----|---------|-----------|-------------------|----------------|-------------|----------|
| 1  | Perkutut Jawa | Geopelia striata | 6.63 | 11.24   | Dominan   | 8.33              | 3              | Often       |
| 2  | Bondol Peking | Lonchura punctulata | 9.28 | 15.73   | Dominan   | 11.67             | 4              | General     |
| 3  | Burung Madu Sriganti | Nectarinia jagularis | 1.33 | 2.25    | Sub Dominan | 1.67             | 2              | General     |
| 4  | Burung Madu Kelapa | Anthreptes malacensis | 3.98 | 6.74    | Dominan   | 5.00              | 3              | Often       |
| 5  | Burung Madu Polos | Anthreptes simplex | 3.98 | 6.74    | Dominan   | 5.00              | 3              | Often       |
| 6  | Pijantung Kecil | Arachnothera longirostra | 1.33 | 2.25    | Sub Dominan | 1.67             | 2              | General     |
| 7  | Cinenen Kelabu | Orthotomus ruficeps | 3.98 | 6.74    | Dominan   | 5.00              | 3              | Often       |
| 8  | Cucak Kutilang | Pycnonotus aurigaster | 13.2 | 22.47   | Dominan   | 16.67             | 4              | General     |
| 9  | Merbah Cerukcuk | Pycnonotus flavescens | 5.31 | 8.99    | Dominan   | 6.67              | 3              | Often       |
| 10 | Prejak Jawa | Prinia familiaris | 4.64 | 7.87    | Dominan   | 5.83              | 3              | Often       |
| 11 | Cabak Kota | Caprimulgus affinis | 1.33 | 2.25    | Sub Dominan | 1.67             | 2              | General     |
| 12 | Cabai Jawa | Dicacum trchileum | 3.98 | 6.74    | Dominan   | 5.00              | 3              | Often       |

Based on Table 6 above there are 9 species of birds that have high dominance value and there are 2 species of birds that have high order scale value

3.6. Vegetation as a source of bird feed

Vegetation types in bird observation sites vary between trees, herbs, flowers, horticultural crops and grasses as listed in Table 7.

Table 7. Type of vegetation as a source of bird feed

| No | Species Name | Types of vegetation | The part that birds eat | Remark |
|----|--------------|---------------------|-------------------------|--------|
| 1  | Mango        | Tree                | Fruit, insects, flower honey | In addition to foraging, vegetation is also used as a shelter and breed |
| 2  | Jambu Air    | Tree                | Fruit, insects, flower honey |        |
| 3  | Guava        | Tree                | Fruit, insects, flower honey |        |
| 4  | Belimbing    | Tree                | Fruit, insects, flower honey |        |
| 5  | Klengkeng    | Tree                | Fruit, insects, flower honey |        |
| 6  | Chery        | Tree                | Fruit, insects, flower honey |        |
4. Conclusions and Suggestion

After the research on Bird Species Diversity in Pandau Jaya Village Housing Complex can be summarized as follows: (1) In the Village Housing Complex Pandau Jaya, found 12 species of birds consisting of 7 families. The types of birds that are often present are Cucak Kutilang (*Pycnonotus aurigaster*) as many as 20 individuals, Bondol Peking (*Lonchura punctulata*) 14 individuals and Perkutut Jawa (*Geopelia striata*) 10 individuals. The diversity of bird species (H') in the Pandau Jaya Village Housing Complex is still relatively moderate with a value of 2.27, while the Evenness Index (E) is 0.91 and the Wealth Index (R) is 2.45; (2) Types of vegetation as a source of feed include: mango, guava, belimbing, klengkeng, kersen, soursop, jackfruit, coconut, palm, banana, papaya, flowers and grasses

This study would like to propose some as follows: (1) To be monitored regularly to avoid the extinction of birds on various types of land use in the Village Pandau Jaya; (2) A study of bird life, both biological and ecological, includes the available population, habitat and environment.

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