



Faculty of Resource Science and Technology

**SPECIES DIVERSITY AND DENSITY OF BIRDS IN KUCHING CITY,
SARAWAK, MALAYSIA**

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**Bachelor of Science with Honours
(Animal Resource Science and Management)
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Final Year Project Report

Masters

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**Species Diversity and Density of Birds
in Kuching City, Sarawak, Malaysia**

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The Final Year Project is submitted in partial fulfilment of requirement for degree of
Bachelor of Science with Honours
(Animal Resource Science and Management Programme)

Faculty of Resource Science and Technology
Universiti Malaysia Sarawak
2015

DECLARATION

No portion of the work referred to in this report has been submitted in support of an application for another degree of qualification of this or any other university or institution of higher learning.



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LIST OF ABBREVIATIONS

| | |
|---------------|------------------------------------|
| GPS | Global Positioning System |
| hrs | Hours |
| km | Kilometer |
| UNIMAS | University Malaysia Sarawak |

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Species Diversity and Density of Birds in Kuching City, Sarawak, Malaysia

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ABSTRACT

This research on urban birds was conducted between November 2014 and February 2015 at different part of Kuching City. The purpose of this research was to study the species diversity and density of birds in the old part of Kuching City and the recent develop urban area. Bird observation was carried out twice, morning between 0700 to 1100h and evening, between 1600 and 1800h. The length of each line transect was one kilometer. The data was analyzed using EstimateS 9.1.0, PAST 3.06 and Distance 6.2. A total of 761 individuals comprising of 9 species from 5 families were recorded. Eurasian Tree-Sparrow (*Passer montanus*) was the most abundant species recorded with a total of 262 individuals followed by Rock Pigeon (*Columba livia*) with 224 individuals and Asian Glossy Starling (*Aplonis panayensis*) with 101 individuals. The density of bird was 16.716 individuals/ha in Kuching old City and 11.428 individuals/ha in Kuching new township.

Key words: species diversity, density, bird, line transect, Kuching City.

ABSTRAK

Penyelidikan mengenai burung bandar telah dijalankan antara November 2014 dan Februari 2015 di bahagian yang berbeza dari Bandaraya Kuching. Tujuan kajian ini adalah untuk mengkaji kepelbagaian spesies dan ketumpatan burung di bahagian lama bandar raya Kuching dan kawasan yang baru dibangunkan baru-baru ini. Pemerhatian burung telah dijalankan sebanyak dua kali, pagi antara 0700 hingga 1100h dan petang, antara 1600 dan 1800h. Panjang setiap transek garis adalah satu kilometer. Data yang diperolehi akan dianalisis dengan menggunakan EstimateS 9.1.0, PAST 3.06 dan Distance 6.2. Seramai 761 individu yang terdiri daripada 9 spesies dari 5 famili telah direkodkan. Eurasian Tree-Sparrow (*Passer Montanus*) merupakan spesies yang paling banyak dicatatkan iaitu sejumlah 262 individu diikuti oleh Rock Pigeon (*Columba livia*) sebanyak 224 individu dan Asian Glossy Starling (*Aplonis panayensis*) sebanyak 101 individu. Ketumpatan burung adalah 16,716 individu/ha di bandar lama Kuching dan 11,428 individu/ha di bandar baru Kuching.

Kata kunci: kepelbagaian spesies, ketumpatan, burung, garis transek, bandaraya Kuching.

INTRODUCTION

Birds are in the class Aves. According to Gill *et al.* (2009) they are about 10,347 species of birds known worldwide and can be classified into 39 Orders, 224 Families and 2187 Genera. In Borneo, a total of 673 species are reported on this island, including 59 endemic species (Phillips, 2014). Sarawak has approximately 530 species of bird species to date (Bruno, 2012).

Urbanization is the process of transforming landscape from rural to urban. An urban area (cities, towns) is characterized by high population density, buildings close to each other, motorized vehicle, and an industrial area. An urban area is known as a continuously built up land mass of urban development that is within a labour market (Wendell, 2012). An urban area contains no rural land. In 2014, the population in the world is around 7.25 billion and the world urban population is accounted for 3.9 billion (United Nations-Department of Economic and Social Affairs, 2014).

In year 1995, the population in Malaysia is 20 725 374 and after 10 years the population increased to 25 843 466. According to Malaysia Statistic Department, the population in year 2014 is around 30.34 million which had increased about 10 million from the last 19 years. To add the urban population is more than 22000000. In Kuching, the population is 567,200 in 2005 and increase to 650,000 in year 2014. The urban area is 70 square miles or 181 km² in year 2014 (Demographia World Urban Areas, 2014).

The rapid process of urbanization had caused the loss of the world's biodiversity and the homogenization of the species, for an example in bird. Most of the urban birds are native in the city but there are also some birds which are cosmopolitan, such as the Rock pigeon (*Columba livia*). It is known that bird diversity declines as a result of urbanization. There are only 8% of native birds species can remain at a particular place after the process

of urbanization (Aronson *et al.*, 2014). Examples of this native species are from pigeons, dove, swallows, swifts and sparrow. This is because some of this species will use the structures of the buildings to build their nest especially in the city area which had many houses and buildings. A research that compare the species diversity and density of birds in Kuching old City and the recent develop urban area had not been done before thus it is important to carry out this study.

Research Questions

As towns and cities expand, there will always be an old town centre and a new township.

Is there any differences between the species diversity and density of birds in the new township and the old part of Kuching City?

What are the impact of urbanization on the species diversity and density of birds in Kuching City?

Objectives

- To determine the species diversity and density of birds in old part of Kuching City and new township.
- To compare the species diversity and density of birds in old part of Kuching City with the new township.

Hypothesis

H₀: There is no significant difference between species diversity and density of birds in old part of Kuching City and the Kuching new township.

H_A: There is significant difference between species diversity and density of birds in old part of Kuching City and the Kuching new township.

LITERATURE REVIEW

2.1 Species diversity and density of birds

Philippe *et al.*, (1998) studied the bird abundance and diversity along an urban-rural gradient at two different cities which are Rennes and Quebec. Rennes is a city that has around 200,000 residents in Bretagne, France. The place was well vegetated and mostly surrounded by agricultural areas. The second study site is Quebec which has 650,000 residents and located on the north shore of the St. Lawrence River. The place was surrounded mainly by forested landscapes. They surveyed the two cities by walking and observing along the plots and records all the birds they had seen or heard. The surveys were conducted in 1995 and 1996 during spring (March to June) and winter (January to February) time. From the study, they had found that the most three occurred species were the House Sparrow (*Passer domesticus*), European Starling (*Sturnus vulgaris*) and Rock Dove (*Columba livia*).

Esteban (2000) used the line transect method to study the avifaunal in an urban area in Madrid, Spain. He had recorded 14 species of bird at a wooden street and 24 species of birds at an urban park. The study was carried out in year 1997 and 1998 for four months from May to August.

Manoj *et al.*, (2012) study the impact of urbanization on avian population at Amravati city, Maharashtra in India from January 2010 to February 2010. Amravati city was well-protected and surrounded by greenery, thus it was an important place for bird watching and studying. Using the line transect method, they had observed 61 birds species which 57 are resident species and 4 are winter migrant species using line transect method. Rose-ringed Parakeet (*Psittacula krameri*) was the most common bird been found during the study. The 4 winter migrant species was the Black Red Start (*Phoenicurus ochruros*),

Common Sandpiper (*Tringa hypoleucos*), Pallid Harrier (*Circus macrourus*), and White Wagtail (*Motacilla alba*).

According to Rey Mauricio and Glenn (2012), their study was conducted at Las Pinas–Paranaque Critical Habitat and Ecotourism Area in Manila Bay. These two places were covered by mudflats, mangrove forest and wetland. The study was carried out during the months of January and February in year 2004–2012. The method used was the bird monitoring surveys at different point locations. An average of 23 avifaunal species and 3405 individual birds was recorded over the 9-year period. Endemic (*Anas luzonica*) and migratory (*Himantopus himantopus*) birds were the most common birds observed during the study.

Next, a study of bird species diversity and richness in Dagona-Waterfowl sanctuary Borno State, Nigeria was carried out in 2009 by Lameed. He used the line transect method and a total of 135 bird species in 40 families was recorded during the study.

In Malaysia, a study of bird abundance in Kota Kinabalu Wetland included Mangrove Forest Reserve had recorded 3526 individuals that comprised of 83 species from 31 families and 60 genera (Andy *et al.*, 2005). The study was conducted for seven days, starting from 14th to 20th November 2005 and point count method was used.

Next, Rizuan (2006) had carried a study on bird's diversity in UNIMAS, study area include the forest between east and west campus on August 2005 to March 2006. The method use was line transect. Rizuan had recorded a total number of 2478 individuals from 66 species and 27 families. Eurasian Tree-Sparrow (*Passer montanus*) was the most abundance with a number of 418 individuals. The second highest species was Asian Glossy Starling (*Aplonis panayensis*) with 333 individuals. Next, were Black-headed Munia (*Lonchura Malacca*) with 231 individuals and Dusky Munia (*Lonchura fuscans*) with 140 individuals.

Ghani (2008) had carried out a study focusing on the use of line transect method to determine the diversity and abundance of avifauna. The study was started in November 2007 for about 10 days in UNIMAS campus. He had recorded 52 species of 22 families around UNIMAS. From his data, Asian Glossy Starling (*Aplonis panayensis*) was the most abundance species to be seen which had a total number of 749 individuals and followed by Black-headed Munia (*Lonchura Malacca*) with 365 individuals and Pacific Swallow (*Hirundo tahitica*) with 291 individuals. Besides that, 14 species of migrating birds were also been recorded.

Syuhada (2011) had also carried out a study on avifauna diversity in UNIMAS campus from July 2010 to December 2010 using line transect method. Syuhada had recorded a total of 2162 individuals from 39 species and 22 families. Asian Glossy Starling (*Aplonis panayensis*) was the most abundant species to be seen with 439 individuals and followed by Black-headed Munia (*Lonchura Malacca*) with 364 individuals and Eurasian Tree-Sparrow (*Passer montanus*) with 304 individuals.

A study of birds diversity in Putrajaya wetlands include forested area in March 2007 and 2008 by Ahmad, Faid and Syaizwan (2012) shows that more than 1000 individual birds, comprised of a total of 82 species from 32 families, were recorded during the study. The method used was the line transect.

A study of birds diversity by Audrey Voon (2012) had recorded a total of 11863 individuals comprised of a total of 77 species from 43 families in UNIMAS east and west campus. The method used was line transect. From the study, Asian Glossy Starling (4917 individuals) was the most dominant birds recorded followed by Eurasian Tree-Sparrow (867 individuals) and Yellow-vented Bulbul (752 individuals).

Zakaria and Rajpar (2013) had carried out their study about the density and diversity of water birds and terrestrial birds at man-made Marsh, Malaysia in March 2009

to June 2010. They had recoded a total of 20010 bird individuals of 102 species using line transect method. From the 102 species of bird recorded, it is found that 79 species was belonged to terrestrial bird and 23 species was from water bird.

All the above studies as summaries in Table 1 below were conducted in areas that have been left undeveloped (wetland, forest area) for the purpose of ecotourism and bird watching. There is only very few study that was conducted in the urban area but is at the forested landscapes, urban park, wooden street and well-protected area surrounded by greenery. From the paper that had been found there were none of the studies that has been conducted in residential and commercial areas of the city.

Table 1: Summaries of the previous study on the avifaunal.

| Study | Objective | Location | Sampling period | Method | Results |
|---------------------------------|--|----------------------------|---|---------------|--|
| Philippe <i>et al.</i> , (1998) | Studied the bird abundance and diversity along an urban-rural gradient at two different cities -Rennes and Quebec. | Rennes and Quebec | 1995 and 1996 during spring (March to June) and winter (January to February). | Line transect | The most three occurred species were the House Sparrow (<i>Passer domesticus</i>), European Starling (<i>Sturnus vulgaris</i>) and Rock Dove (<i>Columba livia</i>). |
| Esteban (2000) | To study the avifaunal in an urban area in Madrid, Spain. | Madrid, Spain. | 1997 and 1998 for four months from May to August. | Line transect | 38 species (14 species of bird at a wooden street and 24 species of birds at an urban park). |
| Manoj <i>et al.</i> , (2012) | Study the impact of urbanization on avian population at | Amravati city, Maharashtra | January 2010 to February | Line transect | 61 species (57 are resident species and 4 |

| | | | | | |
|---------------------------------|--|--|---|---|---|
| | Amravati city, Maharashtra in India. | in India. | 2010. | | are winter migrant species). |
| Rey Mauricio & Glenn (2012) | Study the avifaunal in Las Pinas-Paranaque Critical Habitat and Ecotourism Area in Manila Bay. | Las Pinas-Paranaque and Manila Bay. | January and February year 2004 to 2012. | Bird monitoring surveys at different point locations. | 3405 individual; 23 species |
| Lameed (2011) | Study of bird species diversity and richness in Dagona-Waterfowl sanctuary Borno State, Nigeria. | Dagona-Waterfowl sanctuary Borno State, Nigeria. | Early wet and late dry seasons in year 2009. | Line transect | 135 species; 40 families |
| (Andy <i>et al.</i> , (2005) | Study of bird abundance in Kota Kinabalu Wetland included Mangrove Forest Reserve. | Kota Kinabalu Wetland included Mangrove Forest Reserve. | Seven days, starting from 14 th to 20 th November 2005. | Point count | Total: 3526 individuals; 83 species; 31 families; 60 genera |
| Rizuan (2006) | Study on bird's diversity in UNIMAS. | Study areas include the forest between east and west campus of UNIMAS. | August 2005 to March 2006. | Line transect | Total: 2478 individuals; 66 species; 27 families. |
| Ghani (2008) | To determine the diversity and abundance of avifauna. | UNIMAS campus. | November 2007 for about 10 days. | Line transect | 52 species; 22 families |
| Syuhada (2011) | Study on avifauna diversity in UNIMAS. | UNIMAS campus. | July 2010 to December 2010. | Line transect | Total: 2162 individuals; 39 species; 22 families |
| Ahmad, Faid and Syaizwan (2012) | A study of birds diversity in Putrajaya wetlands. | Putrajaya wetlands include forested area. | March 2007 and 2008 | Line transect | Total: 1000 individual; 82 species; 32 families |
| Audrey Voon (2012) | Study of birds diversity in UNIMAS. | UNIMAS east and west campus. | 11 th November 2012 to 17 th April 2013 | Line transect | Total: 11863 individuals; 77 species; 43 families |
| Zakaria and | Study about the density and diversity | Marsh, Malaysia. | March 2009 to June | Line transect | Total: 20010 individuals; |

| | | | | | |
|---------------|---|--|-------|--|---|
| Rajpar (2013) | of water birds and terrestrial birds at man-made Marsh, Malaysia. | | 2010. | | 102 species (79 species was belonged to terrestrial bird and 23 species was from water bird). |
|---------------|---|--|-------|--|---|

2.2 Urbanization

Urbanization is a process that in a relatively small areas there are rapid increase of people in the place that eventually forming a city. In 2010 more than half of the world's people live in urban areas and crowded less than 3 percent of the Earth's land area (Schneider, Friedi, & Potere, 2010).

In year 1950, world's urban population was 734 million and it increased to 1,352 million and 3,198 million in 1970 and 2000, respectively (United Nations, 1991). The population in the world was around 7.25 billion in year 2014 and the world urban population accounted for 3.9 billion (United Nations-Department of Economic and Social Affairs, 2014). It is estimated that about 65.0 percent of the world's population will live in urban areas in 2025 (United Nation 2010).

2.3 Urban area

The concept of "Urban" is continuously changed from time to time. The concept of urban was first defined during the 1947 census, in which villages with a population of 1,000 or more were considered an urban area (Del Tufo, 1949). In the 1957 census, the area was expanded to municipalities, town council areas, town board areas, local council areas, new villages, or villages with 2,000 inhabitants or more (Fell, 1960). Then in 1970

census, it is defined as towns with a population of 10,000 or more (Department of Statistics, Malaysia, 1977). In the 1991 and 2000 census was modified again, and urban areas were defined as gazetted areas, that along with their adjoining built-up areas had a combined population of 10,000 or more (Department of Statistics, Malaysia, 1995; 2001a).

The urban area is a function of sheer population size, land area, human population density, economic and social organization (Weeks, 2008). In Malaysia, the urban area is defined as area that had a population of 10,000 or more. Urban areas are non-agricultural. An urban areas are very developed and the place that had high population of human, building, car and industry area. The transport system is also more advance and convenient.

The distribution of the largest urban area population (500,000 and over) is in Asia as shown in Figure 1. There are also 28 megacities in the world (urban areas over 10 million population). Next, a total of 69 urban areas are shown with 5,000,000 or more population. The urban area with the highest population in the world is Japan at the Tokyo-Yokohama City - the population estimated in year 2014 is 37,100,000 (Demographia World Urban Areas, 2014).

The largest city based on land area is in New York City, United State. The land area recorded for urban area in year 2014 is 4,495 square miles or 11,642 km² (Demographia World Urban Areas, 2014). This is followed by Japan (Tokyo-Yokohama City) with 3300 square miles or 8,547 km².

In Malaysia Kuala Lumpur has the biggest urban area of 1,606 km² in year 2005 and ranked at number 537 in the world (World urban areas, 2005). After 9 years, Kuala Lumpur is ranked at number 45 with 750 square miles or 1,943 km² (Demographia World Urban Areas, 2014). The urban area has increased 130 square miles in Malaysia (Kuala Lumpur).

In Sarawak, Kuching is ranked at number 480 with the urban area 181 km² in year 2014. The population of Kuching estimated in year 2014 was 650,000 (Demographia World Urban Areas, 2014).

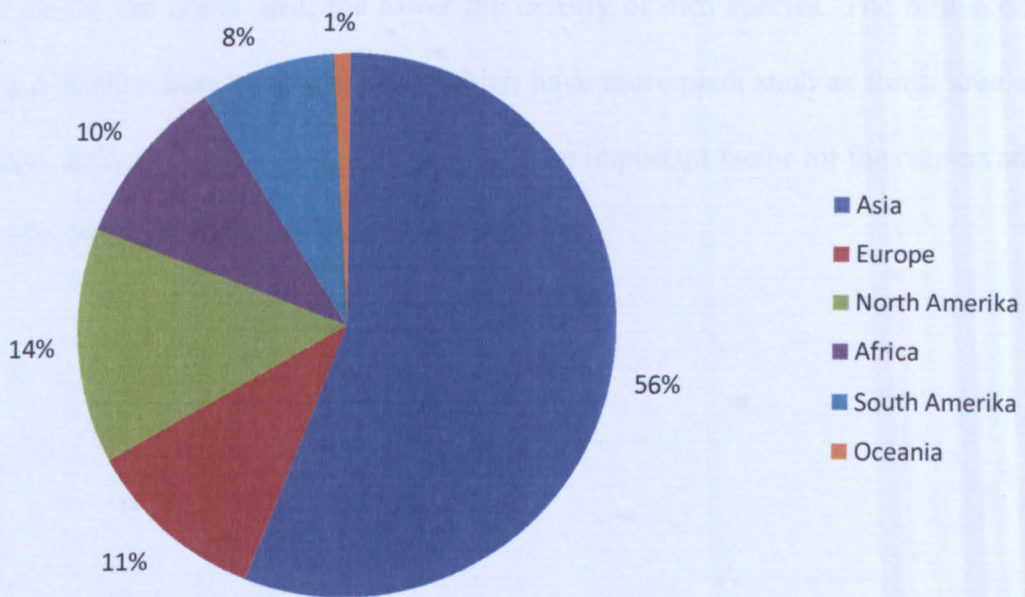


Figure 1: Distribution of Large Urban Area Population in the world.

2.4 Effect of urbanization

According to Siti Zakiah (2007) the reason of increasing in urban population is caused by both internal and international migration to urban centers as well as to develop the areas to the core towns. More amenities such as shopping mall, hotels, restaurants, cultural centers and theatres, home cleaners, private hospitals and clinics, and recreational spaces are required in developing the urban centers. In order to do so they had to clear up a lot of forest area to build up all these amenities. Thus, urbanization will lead to the changes in local biota and homogenize of birds species around the world's cities (La Sorte & Mckinney, 2007). The endemic native species of bird will still remain in the city but their species density declines (Aronson *et al.*, 2014).