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# KUALA LUMPUR URBAN BIODIVERSITY: BIRDS COMMUNITY IN URBAN PUBLIC PARKS

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## ABSTRACT

*Due to the growing number of human population, numerous developments are needed up until today. Thus, it has caused massive changes to the landscape; from natural to built environment. Consequently, the earth is confronting critical issues on protection and restoration of biodiversity. The impact of urbanization on biodiversity concerns on the relationship between biodiversity and urban ecosystem. The aim of this paper is to investigate abundance of urban biodiversity and its benefits to the urban communities. The triangulation methodology addresses a three-step-approach of biodiversity which are; observation, atmospheric measurement and human dimension. This study will present the abundance of bird observation in year 2010 and 2014. 11 species of birds were identified. The highest number of birds recorded is (Passer Montanus/Eurasian Tree-Sparrow (n=296) in 2010 and (n=116) in 2014. It is recorded that there are decreasing number of birds' species such as Zebra Dove and Magpie Robin. There are new species identified in 2014; the Black Crowned Night Heron and Japanese sparrow hawk which are rarely found in urban area. The study presents an empirical survey on bird species. The declining area of green space in urban vicinity has affected the bird species population. It is suggested that bird conservations in urban context should be emphasized. It could improve the ecosystem services as well as health and well-being benefits of both wildlife and humans.*

**Keywords:** Bird species, Urban park, Urban ecosystem, Urban green space, Urban biodiversity, Birds population.

## Contribution/ Originality

This study is one of very few studies which have been investigated in Kuala Lumpur urban context. Most of bird's ecological studies have been found in rural and forest context. The aim of this paper is to review urban biodiversity and its benefits to the urban community. Hence, it will analyze the current research on both urban biodiversity and planning approach.



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## 1. INTRODUCTION

Since in the early twentieth century, urbanization has been expanding rapidly in most of developing countries. In Malaysia, the number of people living in urban areas has significantly increased from 250, 790 in 1911 to 13,725,609 in 2000 (Yaakob *et al*., 2010). These figures indicate that in a span of 90 years, approximately 13.7 million people have become urban residents and the expansion of urban areas throughout the country, has contributed to the statistical increase in the number of cities with populations of 10,000 or more. So, the expected level of urbanization in 2010 was more than 70 percent of the Malaysia's population living in urban areas (Yaakob *et al*., 2010). Based on these increasing numbers, humans have become one of the global environmental forces that alter the natural biogeochemical processes on earth's surfaces (Kinzig *et al*., 2005). Hence, at some point in the early part of this century, more populations of people choose to live in cities rather than in rural environment. This implies that most people only have daily interaction with nature from their yards and neighborhood parks (Kinzig *et al*., 2005).

In the meantime, according to Douglas (1983) and Bridgeman *et al*. (1995), studies by workers from various fields have identified four major effects on the alteration of ecology in the cities. First, urbanization affects climate which has resulted in urban heat island. So, air temperatures in urban areas tend to be higher than its surroundings which are rural areas. In addition to that, heat waves are also often responsible for the loss of human life. Hence, their expected increase in intensity, duration, as well as geographical range is termed as climate warms. This phenomenon may also affect the community of plants and animals that inhabit in specific area. As a result, this process accelerates the formation of ground-level ozone and other pollutants that adversely affect human health (Heinz, 2008). Apart from the aforementioned effect, studies have also revealed that urbanization does disturb the hydrology, in which cities shed more water as run-off into their streams and rivers. Besides that, cities are also proven to produce a lot of carbon dioxide and contain lower amounts of stored carbon. Thus, in general, cities are widely regarded as having lower biodiversity. In urban and suburban areas, natural habitats are continuously being fragmented due to the reclamation of land for development (Mortberg and Wallentinus, 2000). In addition, rapid urbanization threatens natural habitats of plants and animals, resulting in the loss and elimination of some species and habitats. Due to these alarming issues, Malaysia promotes the quality of living environment in its cities by adapting a sustainable planning and developing its urban environment. The impact of urbanization on biodiversity is related between urban biodiversity and urban ecosystem (Savard *et al*., 2000). However, as the number of people live in cities has increased, restoration, preservation and enhancement of biodiversity in urban areas have become crucial. Thus, in assessing the condition of the environment, ecological indicators are widely used due to its functions as an early- warning signal on ecological problems and resources (Niemi and McDonald, 2004). In establishing a healthy built environment, the presence of strong connection between green open spaces, people's mental and physical wellbeing is important (Karuppannan *et al*., 2013). The demand grows with time, as

stated by Savard *et al.* (2000), where the population of urban residents increases every year in every country. Thus, it becomes important to educate people's view towards the nature of the urban ecosystems. Biodiversity refers to all living things, from the largest species down to the smallest micro-organisms. Biodiversity-concerns are related to the urban ecosystems and can be divided into three major groups; (1) those which are related to the impact of the city itself on adjacent ecosystems; (2) those dealing with the ways to maximize biodiversity within the urban ecosystem and (3) those which are related to the management of undesirable species within the ecosystem (Savard *et al.*, 2000). While species diversity and abundance are often related to the quality of urban life the overabundance of some species can be at times undesirable (Cooper, 1987).

## 2. THEORITICAL BACKGROUND

In general, urban ecosystems are not only increasingly communal, but they possess important ecological roles. The loss and fragmentation of natural habitats caused by human activities have been extensively studied in landscape ecology, including the implications of landscape spatial patterns, such as size, shape and isolation of habitat remnants, and connectivity in the landscape, for ecological processes and for diverse species (Mortberg and Wallentinus, 2000). These elements have been stressed in the biodiversity management concepts as mentioned by Savard *et al.* (2000). It is believed that the remaining areas of natural and semi-natural vegetation in the cities are very essential to maintain the biodiversity as mentioned by Mortberg and Wallentinus (2000).

As land is converted from one ecosystem type to another, the pattern of the ecosystem in the urban landscape often changes. The suburban expansions may be built in areas that were formerly forests or grasslands, or abandoned farm. So, it increases the chance for those areas to become forest again. On the other hand, changes in the proximity of ecosystems to one another and the way they intermingle can also affect on how these urban ecosystems function as well as the goods and services they provide (Heinz, 2008). It is known that people and nature co-exist in restored urban ecosystems. Ecological restoration can contribute to the sustainability of urban landscapes, not just in term of nature conservation, but also by providing opportunities for people to interact with nature and thus increase an understanding on how people perceive and value landscapes (Standish *et al.*, 2012).The state of the Nation's Ecosystems defines the term 'indicator' as to refer to a specific, well- defined, and measurable variable that reflects some key characteristic that can be tracked through time to signal what is happening within and across ecosystems. Indicator may include biological, physical and chemical measurements (Heinz, 2008). Indicators have long been used to detect changes in nature, but the scientific maturation in indicator development only occurred in the past 40 years (Niemi and McDonald, 2004). Environmental indicators should reflect all the elements of the causal chain that links human activities to their ultimate environmental impacts and the societal responses to these impacts (Niemi and McDonald, 2004).

So, the information gathered through the use of ecological indicators can also be used to forecast future changes in the environment, to identify actions for remediation, and if monitored over time, it can detect changes or trends in indicators themselves (Niemi and McDonald, 2004). Most applications of ecological indicators focus at the species level due to alarming issues raised from endangered species and species conservations. The guild was originally proposed and defined as a group of species that exploit the same class of environmental resources in similar way (Verner, 1984). Indicator species concept comprises of focal species, umbrella species, flagship species or guilds as indicators. O'Connell *et al.* (2000) managed to distinguish 16 behavioral and physiological response guilds of birds and were able to combine their bird community data into a bird community index. Besides, birds are also attractive as ecological indicators and a focus of societal concern because it has a strong relation to other taxa, they can be readily sampled and their taxonomy is well known. The condition of bird communities across the region is anticipated to reflect the overall structural, functional and compositional condition of ecosystems (O'Connell *et al.*, 2000). Species that are vulnerable to changes in land-use can be used as target species in spatial and physical planning (Mortberg and Wallentinus, 2000). Consequently, several studies on urban landscape have been carried out using birds' species as indicators of habitat quality (Mortberg and Wallentinus, 2000).

Declines in bird populations especially of more vulnerable large-bodied species that have imbalanced and sometimes irreplaceable ecological functions, can swiftly diminish certain ecosystem processes (Sekercioglu, 2006). As humans reshape the Earth's surface, other species will increasingly find themselves subject to a shifting mosaic of land-use types, from lightly to heavily human dominated (Kinzig *et al.*, 2005). Multi-scale approach is necessary to have a proper management on bird species richness especially in urban ecosystems. It is influenced both by local and landscape characteristics as birds are visible and quite sensitive to changes in habitat structure and composition. (Savard *et al.*, 2000). Cities are far more obviously altered from its natural state in comparison to forest. Massive reduction in vegetated areas in which places for other living things has been interchanged with the man-made structures. Hence, it is well known that urbanization has increased the deterioration of its ecological effects (Whitford, 2001). Biodiversity is a potential indicator of a sustainable urban environment because it has ecological benefits for its urban population. The aim of this research is to explore the bird guild concept as an alternative ecological indicator species both in biodiversity and its benefit to the urban community.

## 3. METHODOLOGY

A case study method was adopted to present the current pattern of urban bird population and its habitat characteristics in five selected urban parks located in Kuala Lumpur, Malaysia. Kuala Lumpur aims to promote and improve the quality of its living environment and develop a sustainable approach for the development of urban green spaces. Therefore it was applicable to

study the pattern of urban park biodiversity which relates to future planning and development of the city. The result recorded will then be compared to the survey conducted in year 2010; a research conducted by researchers in School of Natural and Built Environments, University of South Australia, Adelaide, Australia.

The survey captured the species name, number of species, habitat, observation time and date, remarks and reference notes. The surveys were conducted to understand the relationship between people's perceptions and scientific data on urban wildlife that could provide significant information pertaining to urban biodiversity issues. The survey will be used transect lines to observe bird species within a measured line. The birds' surveys were conducted in urban Public Park near lake in Kuala Lumpur city. The selected parks consist of Perdana Lake Garden, Titiwangsa Lake Garden, Permaisuri Lake Garden, Kepong Metropolitan Park and Manjalara Lake Garden (Figure 1). The number of transects line in each region will be roughly proportional to the accessible area in each selected park. The observation will count all the birds and record all the birds heard and seen while walking along the transect route at average speed of 15m/min within 30m distance. All transects will be visited several times between a year. This transect technique was adopted from (Buckland, 2006).

**Table-1.** Size and hierarchy of urban parks

| Name | Location/District | Size (Hectare) | Hierarchy |
|---|---|---|---|
| Perdana Lake Garden | CBD | 70 | City Park |
| Kepong Metropolitan Parks | North. Sentul-Manjalara | 127 | District Park |
| Titiwangsa Lake Garden | West. Wangsa Maju - Maluri | 46 | District Park |
| Permaisuri Lake Garden | South West. Bandar Tun Razak – Sg Besi | 50 | District Park |
| Manjalara Lake Garden | North. Sentul - Manjalara | 10.6 | Neighborhood Park |

**Source:** Baharuddin *et al.* (2010).


**Figure-1.** Location of five selected urban parks in Kuala Lumpur

**Source:** Kuala Lumpur Structure Plan 2020

*(Retrieved from: http://www.dbkl.gov.my/pskl2020/images/figure_112.jpg)*

## 4. RESULTS

The result of the observation survey for each case study of the five different parks between the year 2010 and 2014 are presented in following section.

### 4.1. Perdana Lake Garden

In this stage of study, Perdana Lake Garden was visited as the first site for the case study. Perdana Lake Garden was established in 18th century as a green lung for Kuala Lumpur. Perdana Lake Garden, currently known as Perdana Botanical Garden is a famous tourist destination. It is divided into sub-gardens such as Hibiscus Garden, Bird Parks, National Monument and Lake Garden.

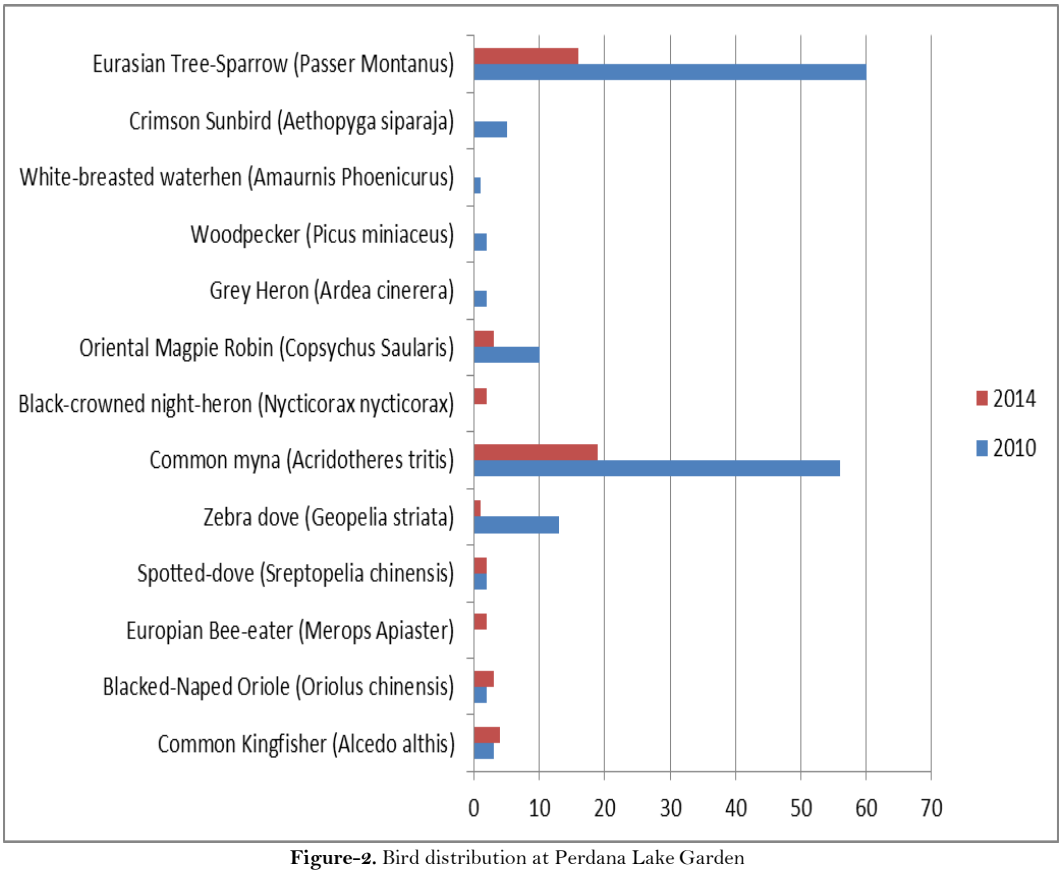


**Figure-2.** Bird distribution at Perdana Lake Garden

Thirteen bird species were identified in the park. The highest number of birds recorded were *Passer Montanus* (Eurasian Tree-Sparrow) (n=60) in 2010, (n=16) in 2014 and *Acridotheres tritis* (Common myna) (n=56) in 2010 and (n=19) in 2014 the dominant bird species as well as in other parks. In this study, the distributions of different bird species had been observed in the year 2010 and 2014. It was recorded that there was decreasing number of particular species such as *Geopilia striata* (Zebra dove) (n=13) in year 2010 compared to year 2014 (n=1). The other species

identified was *Copsychus Saularis* (Oriental magpie-Robin). Remarkably, new species of birds were identified during the observation in the year 2014, such as the rare species; *Nycticorax nycticorax* (Blacked-crowned night heron).

### Rare and Protected Bird Species

**Figure-3.** *Merops philippinus* (Blue-Tailed Bee-Eater) found in open country with scattered trees usually near freshwater marshes. Bee-eaters predominantly eat flying insects, especially bees. *(Photographed by Nadia Rusli,,2014)*

**Figure-4.** *Nycticorax nycticorax* (Blacked-crowned night heron) spends the day roosting in trees above water. *(Photographed by Nadia Rusli, 2014)*

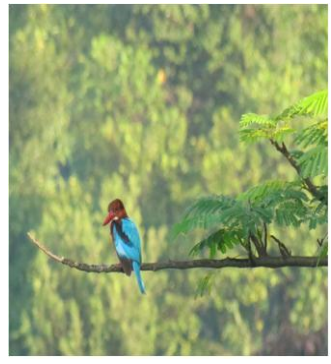

**Figure-5.** *Halcyon smyrnensis* (White- throated Kingfisher) was found during the pilot in one of the local institution in Gombak, Selangor. This kind of bird is a very successful bird that has adapted well to disturbed habitat. *(Photographed by Nadia Rusli, 2014)*

### Common Bird Species

**Figure 6.** *Acridotheres tritis* (Common myna), an omnivorous, adaptable, and the most numerous and successful bird in various environment changing. *(Photographed by Nadia Rusli, 2014)*

**Figure 7.***Passer Montanus* (Eurassioan Tree-Sparrow) most dominantly in towns including rural and villages. An insectivore birds, very thin and sound monotonous chip-chip. *(Photographed by Nadia Rusli, 2014)*

**Figure 8.** *Oriolus chinensis* (Black-naped oriole) feeds on fruit and large insects also found in Kuala Lumpur Urban Parks. *(Photographed by Nadia Rusli,2014)*

### 4.2. Kepong Metropolitan Park

Kepong Metropolitan Park is a former mining land which has now been developed as a successful district park with varies facilities and activities. Kite-flying is the main attraction of the local citizens in the large green park area. Located next to the residential area, it promotes a good

accessibility to the park. In this park, 14 different bird species had been recorded during the observation in the year 2010 (Baharuddin *et al.*, 2010). Meanwhile, in year 2014 only 10 species were identified during the observation. It shows decreasing number of total bird species in the park compared to the year 2010.

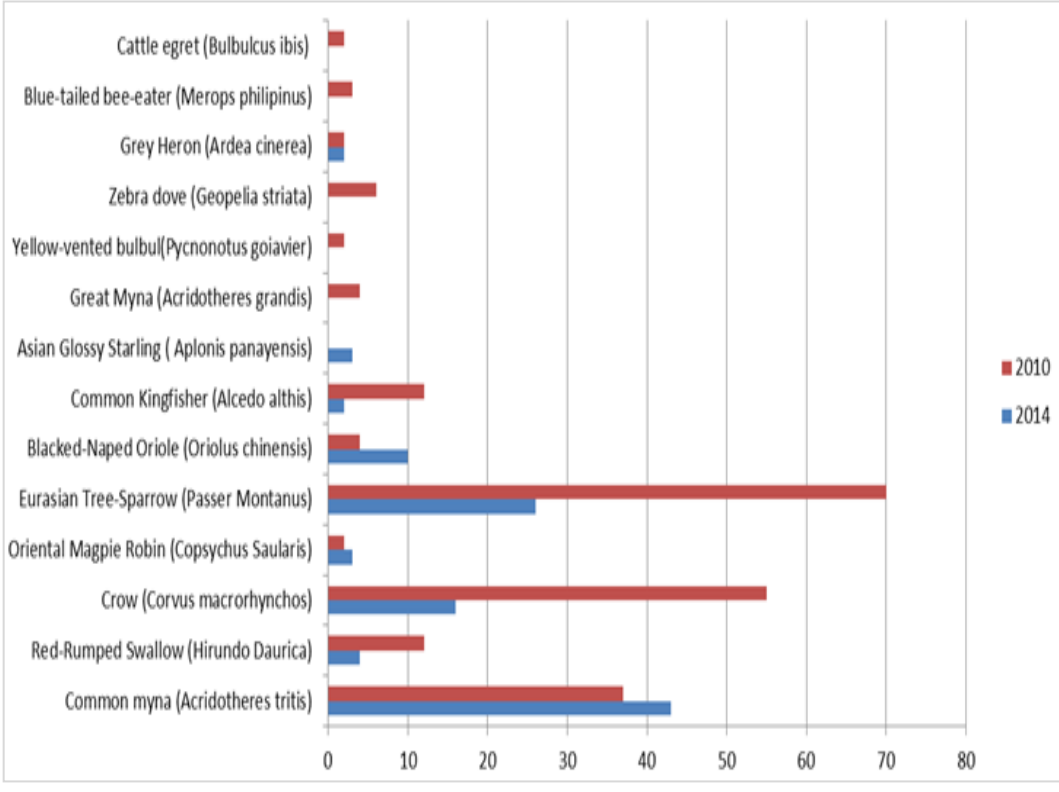


**Figure- 9.** Bird distribution at Kepong Metropolitan Park

In year 2010, eight species of birds found in the park were protected species and two species were rarely found at other parks. They were *Merops philippinus* (Blue tailed Bee-Eater) (n=3) and *Bulbucus ibis* (Cattle egret) (n=2). However, in year 2014, both of these rare species were not found in the park. It includes species of birds named *Acridotheres grandis* (Great Myna), *Pycnonotus goiavier* (Yellow-vented bulbul) and *Geopelia striata* (Zebra dove). Remarkably, one species of bird, *Aplonis panayensis* (Asian Glossy Starling) (n=3), had been identified as new species found in year 2014. This bird was known as well-adapted bird species to disturbed woodlands, towns, gardens and most environments (Strange, 2000). Three dominant bird species had been recorded in the same years which are *Passer Montanus* (Eurasian Tree-Sparrow) (n=70) in 2010, (n=26) in 2014, *Corvus macrorhynchos* (Crow) (n=55) in 2010, (n=16) in 2014 and *Acridotheres tritis* (Common Myna) (n=37) in 2010, (n=43) in 2014.

### 4.3. Titiwangsa Lake Garden

Titiwangsa Lake Garden is located in the northern part of Kuala Lumpur, where it is the most popular recreational park among the urban dwellers. The Lake Garden is categorized as District Park stretches over a sprawling area of 46 hectares of land adjacent to the city center and surrounded by the National Library, Art Museum and National Theatre (Istana Budaya). It provides good facilities which attract more users to come and conduct their recreational activities.

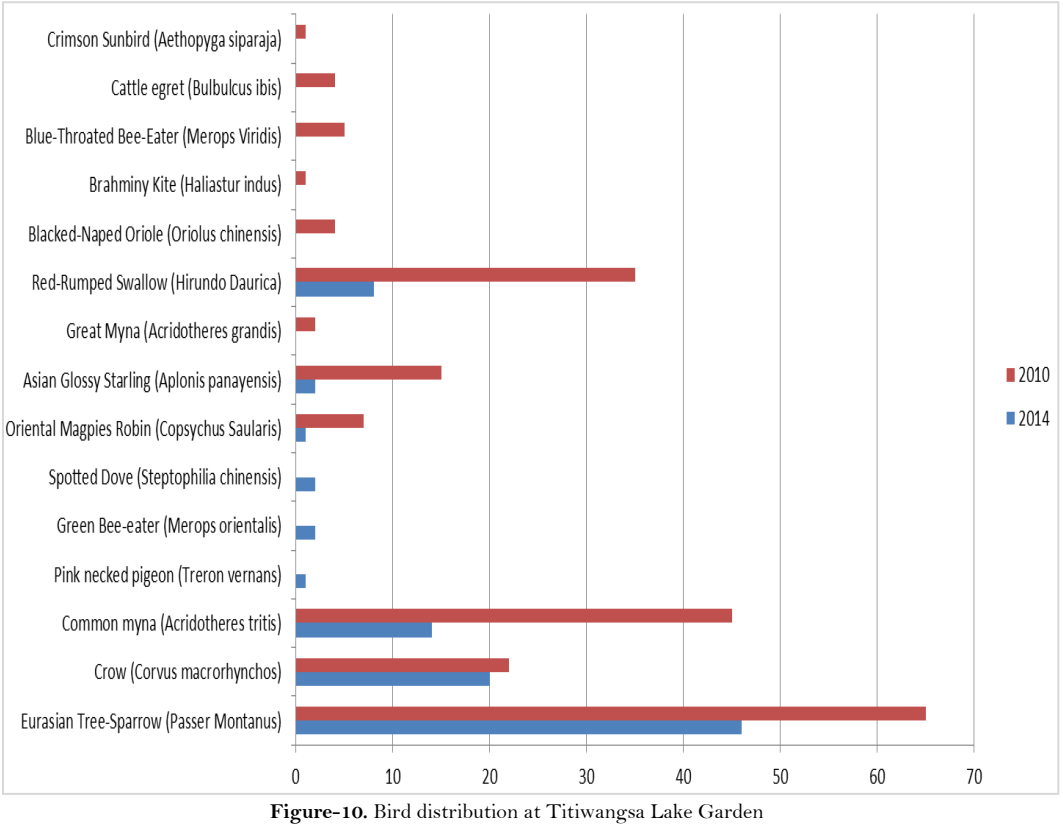


**Figure-10.** Bird distribution at Titiwangsa Lake Garden

Titiwangsa Lake Garden had been recorded with 15 different bird species based on the observation in year 2010 and 2014. However, only 9 bird species were identified in year 2014 compared to 2010, 12 bird species had been recorded. Among all the bird species, only 3 bird species were dominant. The most frequently found was *Passer montanus* (Eurasian Tree-Sparrow) (n=65) in 2010 and (n=46) in 2014.

These birds are well associated with humans, thus, the distribution does not really change across time. It does not occur in any strictly wild habitats (Strange, 2000). In addition, *Acridotheres tritis* (Common myna) was also commonly found in the cities. The birds sometimes feed on fruit high in the treetops and sometimes on insect on the grass. Other species were less in number, perhaps they were rare species such as *Hilliastur indus* (Brahminy kite) (n=1) and

*Aethopyga siparaja* (Crimson Sunbird) (n=1). Both of these birds were recorded in 2010 but none was recorded in 2014.

### 4.4. Permaisuri Lake Garden

Permaisuri Lake Garden is categorized as a District Park located in the constituency of Bandar Tun Razak – Sg. Besi. A 50-hectare lake garden is recognized as a 'green lung' for the local citizen in Cheras, where it provides recreational space for various activities and occasions.

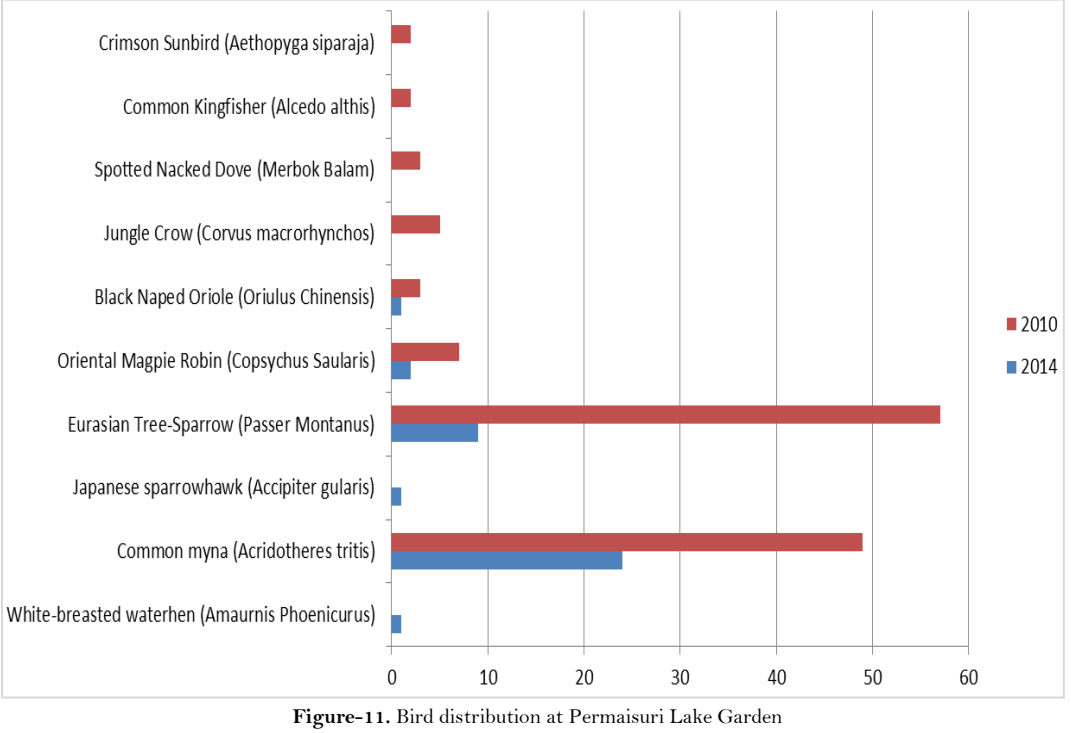


**Figure-11.** Bird distribution at Permaisuri Lake Garden

Based on the observation, 2 birds' species had been identified as dominant species during the site visit. It was well recognized as frequently found species in other Lake Garden and parks as well as their well-adapted capability to the urbanization. *Passer Montanus* (Passer Montanus) (n=57) in 2010, (n=9) in 2014 and *Acridotheres tritis* (Common myna) (n=49) in 2010, (n=24) in 2014 were commonly found in Permaisuri Lake Garden. Even though the number of the bird species decreasing according to the year, but these bird species still show the highest population. In spite of that, 4 bird species identified in year 2010 were absent in the year 2014. The bird species were *Aethopyga siparaja* (Crimson sunbird), *Alcedo althis* (Common kingfisher), *Streptophilia chinensis* (Spotted Nacked Dove) and *Corvus macrorhynchos* (Jungle crow). Interestingly rare bird species have been found in year 2014 in Permaisuri Lake Garden known as *Accipiter gularis* ( Japanese Sparrowhawk) (n=1) and *Amaurornis phoenicurus* (White-breasted waterhen) (n=1).

**Figure-12**. *Amaurornis phoenicurus* (Whited-breasted waterhen) This bird loves to appear in the open spaces and flies readily but often dives into cover when disturbed. *(photographed by Nadia Rusli, 2014)*

**Figure-13.** *Accipiter gularis* (Japanese sparrow hawk) A fairly common bird found in Permaisuri Lake Garden. Recognized as silent bird, it is commonly found in semi-open country and around villages. *(photographed by Nadia Rusli, 2014)*

### 4.5. Manjalara Lake Garden

Located between Kepong and Bandar Sri Damansara, Manjalara Lake Garden has its own attraction to the local community. Surrounded by residential and commercial areas, this park plays as the main role to promote a high quality lifestyle to the local community as they have the opportunities to have outdoor activities. During the site visit, most Chinese people were practicing their Yoga activities early in the morning, with the sound of water drops and chirps of the birds as the background creates soothing environment.

The survey shows tremendous changes in number s of bird species identified over the years of 2010 to 2014. However, the result shows an increasing number of bird species in year 2014. Seven bird species have been identified in year 2014. Three protected species namely *Hinduro rustica* (Barn swallow) (n=2), *Psychonotus goiavier* (Yellow vented bulbul) (n=1) and *Aethopyga siparaja* (Crimson sunbird) (n=1) were identified in the year 2010 in contrast to the year 2014, these species were not found in the park. While the dominant birds found were *Hirundo daurica* (Red-Rumped Swallow) (n=39) in year 2014. These migrant birds are often found in open country during the migration.

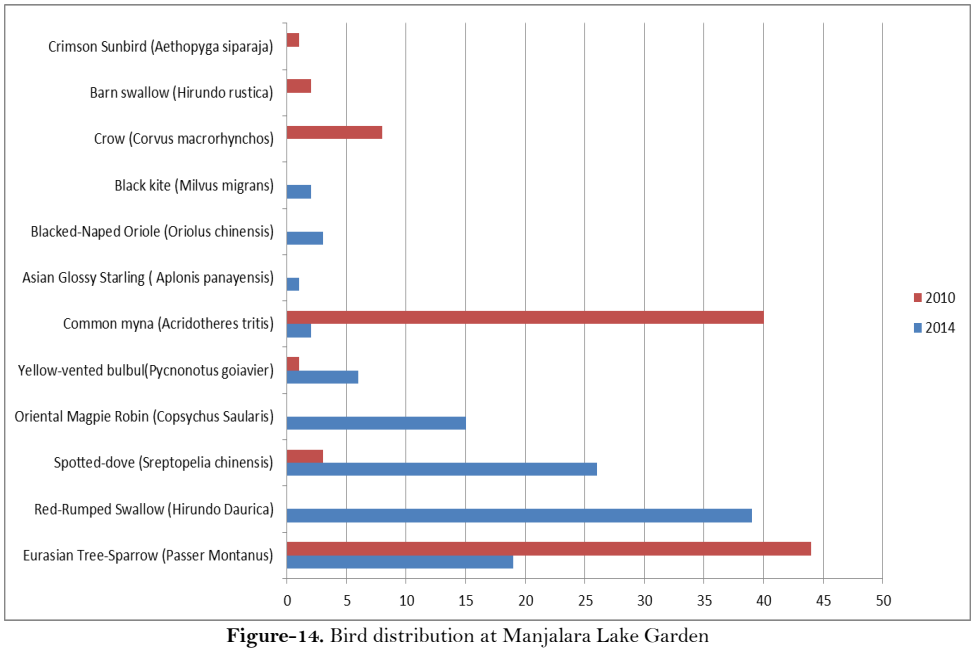


**Figure-14.** Bird distribution at Manjalara Lake Garden

Meanwhile, it is recorded in 2010, the most dominant species was *Acridotheres tritis* (Common myna) (n=40).

## 5. DISCUSSION AND CONCLUSION

Study between the year 2010; conducted by researchers in School of Natural and Built Environments, University of South Australia, Adelaide, Australia and current study in 2014 had found similar predominant bird species in the park. However, the numbers of birds counted were slightly decreased in year 2014. This shows the impact of urbanization and changes in natural habitats to the distribution of urban birds. The most tolerant birds were identified from granivorous and omnivorous birds' taxonomy in the urban park. This was resulted from the types of trees planted in each urban park.

The most common bird species recorded in both years were *Passer Montanus* (Eurasian Tree-Sparrow) (n=296) in year 2010 (n=116) in year 2014. This type of birds is well-adapted in urban developed areas. Due to the eating habits of the birds where it feeds on grain and food scraps, this kind of bird is abundant in most of urban parks based on the study. Besides that, *Acridotheres tritis* species was recorded (Common myna) (n=227) in year 2010, while it became (n=102) in 2014. These birds were also identified as the dominant bird species in this study. Meanwhile, in the year 2014 *Assian Glossy Starling* (Aplonis panayensis) (n=4) were identified in two urban parks; Kepong Metropolitan Park and Manjalara Lake Garden. However, none of this species was recorded in year 2010. This bird species are well known as a well-adapted species on disturbed woodlands, towns, roadsides including gardens (Strange, 2000).

Over the years, the numbers of people reside in cities increased. Kuala Lumpur, as a city center has a huge potential to develop a healthy urban environment which promotes a balance ecosystem for both wildlife and human well-being. The study presents an empirical survey of urban birds in selected urban parks, which suggests a better management and enhancement in promoting a balanced urban ecosystem as a whole. The abundance of birds significantly shows the need to properly design a systematic habitat to create a bird sanctuary in contributing the conservation of urban biodiversity. Furthermore, it is to ensure a healthy number of birds in Kuala Lumpur and promoting *sustainability in urban ecology.*

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