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Role of Ornamental Vegetation for Birds' Habitats in Urban Parks: Case study FRIM, Malaysia

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Abstract

Rapid and unpredicted rate of urbanization have negatively impacted the lowland tropical forests. Introduced species and destruction are activities that bring harm to the sensitive yet precious wildlife and cause them habitats loss; bird family. This research aims to review the role of urban ornamental vegetation in providing food and shelter for the birds in urban park. The research is conducted by the reviewing of literature and questionnaire survey analysis. It hoped that the review will contribute to the knowledge of landscape architecture on consideration for birds in urban parks.

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Keyword: Bird community; habitat loss; urban open space; ornamental vegetation

1. Introduction

The main cause of aggressively declination of bird species is the habitat loss from the exotic species and habitats destruction (Redford, 1992; Walker, 1992; Malaysia National Biodiversity Policy, 1998; Chapin, et. al, 2000; Gaston et. al, 2003; Luck et. al, 2003; Sekercioglu et. a, 2004; BirdLife International, 2008). Vitousek et. al (1997), observed that almost half of land surface has been transformed, and this represent a dominant influence by a human for the loss of biodiversity. Birds require sufficient habitat to provide a continuous food source as well as nesting places (Heaton, 2000; Birds.com Services & Information, undated). In urban environments, man has created islands of natural habitats as an effort to

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compensate habitat destruction, unfortunately, many of which do not fulfill the needs of birds followed by competition from exotic species (Heaton, 2000). According to Scott et. al. (1991), habitats dominated with exotic vegetation suspected to cause a low harbour for insect preys and insects, which bring to low bird density.

Limited spaces are the challenge for landscape architects for the past years. Gigantic buildings continually develop and open spaces are the last when it comes to designing. Fortunately in Malaysia, with higher awareness of open spaces such recreation park, garden, pathway, corridor, waterway, nature reserve, cemetery, plaza, and more, planners and practitioners start to conserve the spaces and maintain the spaces to becoming more greenish with wildlife and fresh air. Recognised as major contributors to physical and aesthetic values, urban parks and gardens have recently emerged to prevent further biodiversity loss at a local scale (Guideline for the Development of Bird Habitat, undated).

Unfortunately, there are more exotic plants been planted becoming part of local plants scheme. Findings and observed indicate more ornamental plants that do not fulfil habitat function for birds' requirement were planted compared to food plants (Scott et. al, 1991; Reale & Blair, 2005; Nik Hanita, 2010; Rigard, 2010). The choice of vegetation species for each design by landscape architect might be one of the causes which bring to the unsuccessful design towards bird conservation. Vegetation such as palms has been emphasized and be appreciated as a formal and aesthetic only. The problem was identify as there is no or lack of discussion between the landscape architect with arborists, horticulturists and ecologist which their expertise on plants function toward wildlife can't be questioned (Nik Hanita, 2010).

Landscape architects, arborists, horticulturists, ecologist and other practitioners need to provide more collaboration efforts towards improving this present predicament on what need to be done to balance the existing of wildlife especially birds in urban area with vegetation. Hopefully the study of ornamental vegetation in urban park can be a benchmark to explore the understanding of urban park function and its contribute to birds as food and shelter.

2. Literature Review

2.1. Urban parks for birds

In Malaysia, open space is described as 'whichever land that is enclosed or open that are specified or reserve to be specified wholly or in part as a public botanical park, public park, public sports and recreation field, pedestrian walkway or as a public area' (Town and Country Planning Act 1976 [Act 172]). According to Dunnett, et al. (2002), open space or park is defines as a 'mixture of civic space and green space'. Urban parks are divided into three basic forms of values; recreation, ecology, and aesthetic values. The value of the environment may effects by how that space perceived and utilized (Woolley et. al, 2003; Eysenbach, 2008).

Parks offer recreation space for citizens to relief or take a break from the stress of urban environments and daily demands. Moreover, the natural environment of urban park obviously offers health benefits. It can be in the form of a walk or run, reading, watching the birds, and other activities. For ecology, beside man-nature benefit, it also serves as islands of nature or oasis within desert land. It supports biodiversity by offering a home for natural species especially in develop cities. Location of the space within a city is one of the factors to verify in maintaining the natural environment with native ecosystem of urban park. For example, a natural urban park with grassy field or aquatic such as lake or pond help urban birds in food sources, water for thirst-quencher and bird play area. In the same time, the space also affected by its purpose and use for human enjoyable and pleasurable space such as playing fields and sightseeing gardens. For pond or lake, it helps as climate moderator, giving a comfort feeling for both. For aesthetic value of urban park, obviously it a place where people enjoy nature-view especially in depressed urban

environment and called as substituting gray infrastructure. Naturally, the landscape will change and it brings to the changes of habitats which affecting bird community and other wildlife followed the competition from exotic (non-native) species (Donnelly & Marzluff, 2004). Unfortunately, Davies (2007) stated, often more practical for amenity purpose, recreational use and wildlife corridor that inaccessible and contrasting with landscape elements were designed.

Fortunately, there are plenty of reviews from earlier research stated that urban park or any green spaces should be highlighted as a key of ecological services providers which providing a habitat for urban wildlife, water or air purification, recreational, spiritual and therapeutic value also social integration (Maas et al., 2006; Kane, 2009; James et al., 2009; Gairola & Noresah, 2010).

2.2. Role of birds in urban parks

Donnelly and Marzluff (2004) observed that birds function as biological indicators for wildlife and to overall ecosystem health (healthy preserves). Besides, birds are important for ecosystems and vital in many food webs (Gatti, 2010). Some birds eat small carnivores and help in controlling the population of pest. For large carnivores, the birds help keep down the populations of mice and squirrels. Waterfowl like ducks, geese and swans, control the populations of amphibians. Unfortunately, public perceived that birds have little influence in ecological processes, and the perception is difficult to change (Sekercioglu, 2006).

According to Shwartz et al. (2008), there were four categories of urban birds; alien species, urban adaptors, urban exploiters, and migrants. Alien species are bird that intentionally or accidentally releases in estrange place, while urban adaptors are native species that belong to the area. They can utilise some urban resources such ornamental vegetation as food or shelter. Urban exploiters are species that will take advantage of the urban environment and frequently reaching their maximum densities in urban areas such as crows. Last are migrant birds that only pass through some places during long-distance migration. For this research, bird species of urban adaptors will be focus as the number of this bird species are facing a major decrease with the current global rate of native habitat loss for birds is 1.1 per cent /year (Jenkins, 2003). There are three categories to indicate bird function; ecological, psychological and social. Providing wildlife space is important for ecology factor. Each species perform a function either directly or indirectly which give benefits to the environment and human. For example, some bird disperse seeds from the ground and insectivore birds help plants by controlling the quantity of insects living on bark, leaves and branches. Sekercioglu (2006) is concerned that birds are one of the most diverse groups of ecosystem service providers, whose ecological functions range from creating soil to shaping primate behaviour. Birds are also indicator of abundance of terrestrial wildlife inhabiting on an area as, they generally are less secretive and easy to find within the open space.

For psychological aspect, spending time in a hospital as patient, visitor, or member of staff can be can confuse and feel unfamiliar causing stressful experience. According to Kaplan (1992), incorporating aspects of nature within this environment can enhance people's ability to deal, be familiar and relaxing. It also give opportunities for physical movement and exercise including improved levels of cardio-vascular health and decrease levels of depression among adults by offering a place for individuals to relax. Secondly, nature as a positive distraction which can stimulates all the senses supported by research as: indicating that viewing nature scenes tended to reduce stress (Ulrich et al., 1991; Hartig, 1996; Smith, 2001). According to Amber et. al (2010), parks give opportunities which encourage people to gather together and experience social support. In term of social, there are two subdivisions which aesthetic and real estate value. Aesthetic or visual of plants with flowers, fruits and greenish leaves associated with friendly wildlife such birds give such pleasing quality of peacefulness, relaxation and a sense of pleasure. Furthermore, parks create recreational value where abundant of wildlife population such birds bring opportunities such bird watching activity. For real estate value, improving wildlife habitat in open space

often increased soil moisture, improving water quality and reduced soil erosion. The land value of a housing area is often pricier than housing area that lacking open spaces.

2.3. *Ornamental vegetation for urban areas*

Enhancement on vegetation present not only for human, but for ecology. They give protection from micro climate, protection toward environment such noise and air pollution. More than that, for us as direction, divider, improve and stabilize ecology and biology diversity and aesthetic, improve life styles, economy, research and education. According to Kemp (2004), fauna do not have the ability to obtain energy directly from the sun; they are depending on vegetation to do it for them as plants perform as vital in producing food energy. Besides, vegetation can adapt in any range of environmental condition which allowed them to survive. Cook and Howes divided ornamental vegetation into three broad categories, native, naturalistic and exotic plants (as cited in Nik Hanita, 2010, p. 65). Native plants are vegetation that grows naturally in the local area. When non-native plants spread and become established in wild areas, they are referred to as naturalized or naturalistic plants. Naturalistic plants are imported plants that adapted to the local environment over thousands of years. Normally, they are vigorous and hardy, which capable to survive at the local climate. Once established, they require minimum or no irrigation or fertilization. They become functional for food resource, nesting space, and of course aesthetic value. Exotic plants are vegetation species that been bought from other countries or region and introduced to native area. Once they familiar with the new habitat, they may conquer natural areas and out compete or smother native plants and spread beyond control. Damages associated with uncontrolled exotic plant species including blocking river transportation, clogging water supply, and growing wild around open spaces. Ornamental vegetation or garden plants are typically grown in the flower garden. Most commonly they are grown for the display of their flowers, leaves, bark and stem. For plants to be considered as ornamental, they may require specific work and activity by a gardener. According to Eysenbach (2008), ornamental vegetation is known as aesthetic plants. Usually, it is planted in urban area. Ornamental vegetation also has its own contribution towards birds especially for the habitat element provided, fruiting season, deciduous or evergreen and the size of mature tree (Mel, 2006). Based on Malaysia National Landscape Guideline on suggestion section, contributions of ornamental vegetation will be focused. Unfortunately, there are more introduced plants (naturalistic or exotic plants) were planted and become part of local plants scheme. Some exotic plants can bring harm to native species (Kenneth, 2002). Observation and data documentation analysis had been made and found more ornamental plants that don't have the attraction towards birds' requirement were planted.

2.4. *Role of ornamental plant as food and shelter for urban birds*

Generally, birds are one of the species that have specific habitat, food resources, barrier between human and themselves and water. The absence of any needs will influence the birds to look elsewhere that can fulfill the requirement. Mostly, birds in urban area comprise generalize species, most abundant and abandon near human habitation and able to tolerate human disturbances (Rodgers et. al, 1991). Their adaptability in the alternative way of finding nest and food enables the generalists to be successful under diverse conditions or 'commensal of human'. Generalist species often comprise omnivores (feed on both plants and small animals), insectivores (feed only insects), granivores (grains diet) and frugivores (fruit diet). For example, *Artocarpus bilimbi* [Belimbing Besi] is food plant for frugivores and granivores birds while *Gardenia carinata* [Kembang Cina] as a food plant for nectar eater. There are also plants that provide one or more food resource for various bird species. Yellow Vented Bulbul [*Pycnonotus goiavier*] and Magpie Robin [*Copsychus saulari*] are attracted to insects as their diet, but, Bulbul need another food

resource such fruits and nectars. Roughly, it seems to be balance and no competition. Species such Common Myna [*Acridotheres tristis*]-fruit and insect eater, Eurasian Tree Sparrow [*Passer montanus*]-grain eater, Zebra Dove [*Geopelia striata*]-grain eater, Spotted Dove [*Streptopelia chinensis*]-grain eater and Common Iora [*Aegithina tiphia*]- insect eater live in the same space and fight for food and shelter because of limited food resource and space. These bring to a decrease of bird species and its density as they have the same diet, and difficulty to find other food source. This situation result in a rapid declination of bird populations that are sensitive (Malaysia National Landscape Guideline, 2008; Subang Jaya Municipal Council (MPSJ), Department of Wildlife and National Parks of Malaysia, 1999; Chih et. al, 2003; Amar-Singh, 2009).

Often, ornamental vegetation is one of the alternative methods in greening urban areas as well as for aesthetic and ecological values. Unfortunately, more selection and variety of ornamental vegetation species were planted based on the beauty appearance only. More exotic vegetation species were planted as some species are fast growth. In a new habitat, this exotic vegetation species may have fewer natural pests or predators and climate conditions which kept the plants in check bring to uncontrollable growth. This phenomenon not only brings disastrous effects to native vegetation, native wildlife also affected and decrease in numbers. Bird species is one of wildlife species most affected. Vegetation is one of the most important features to any wildlife habitats as often provide the most available or even all for their needs; food and cover (Slattery et al., 2003). According to Scott et. al (1991), the densities of native birds in urban neighbourhoods' landscape were more closely correlated with native vegetation compared to urban areas dominated by exotic plants. He believes that the low correlation between bird densities in urban area is expected when substantial percentage of exotic plants is dominant and brings to the less of available resources. It is important to preserve a large area of natural vegetation as to ensure an effective planning for open spaces. Connections between the large vegetated areas with smaller patches or natural corridor are capable to maintain the biodiversity (Rao, 1997). According to Cook (2002), native vegetation support ten to fifty times more benefits to native wildlife than exotic vegetation. Native wildlife especially birds have adapted to utilise native vegetation which provides food, cover, shelter or a combination of resources. Supporting the statement, Walker (2004) discussed, habitats dominated by exotic vegetation are suspected to harbor low levels of insect prey which interrupt insectivorous food chain. He also added, in order for birds to success in breeding season in urban, optimal nesting option are the best for birds.

According to Hirst (2010), the best selection of ornamental vegetation species is the one that helps to provide birds with food and shelter. The vegetation species should be able to produce food supply all-year-round as natural food sources are the best dietary. The selection of vegetation especially in urban areas should offered all-year-round needs, including vegetation with a variety of produces such as seeds, nuts, berries or other fruits, or nectar and some attract insects (Slattery et al., 2003). Stanley Smith Horticultural Trust (2012) emphasize on native vegetation (trees, shrubs, and vines) as the most likely vegetation species that provide the right mix, size, and nutritional value for native birds. Beside food source, Hirst (2010) suggest selecting an evergreen vegetation species to help improvement of bird habitat. Crucial factors in selection of vegetation species are to choose a broadleaf and multi stemmed species as it is prove to offer a better shelter throughout extreme climatic change and predators. Planting vegetation species in vary of height and mixed species may also attract birds for long-residents.

Table 1. Contribution of vegetation to birds in urban parks

Characteristic	Native and Naturalistic Plants	Exotic Plants
Origin	They are the foundation of our native ecosystems, or natural communities.	Bring from outside
Condition	The natural balance keeps each species in check, allowing it to thrive in conditions where it is suited, but preventing it from running amok.	Conquer surrounding as the natural pests, diseases or climate conditions which kept the plants in check in their homeland are absent here.
Contribution	Member of a community that includes other plants, animals and microorganisms Improves water quality, help to enrich the soil Their root systems help rainfall percolate into the soil, reducing erosion and runoff	Native community get nothing from these species
Food and Shelter	Provide food and shelter for birds, butterflies and other desirable wildlife	Some provide shelter
Pest and Disease	Resistant to most pests and diseases	Some disease can't be prevented by local climate or pest control
Maintenance Level	Need "low-maintenance" gardening and landscaping-matured plant no need fertilizer	High maintenance due to fertilizer, watering and cost to buy

(Source: Adapted from Malaysia National Landscape Guideline, 2008; Mel, 2006)

Table 2. Comparison between native and exotic plants

Category	Example of Plants Species	
Food Plants	Fruits (Frugivorous bird species)	<i>Artocarpus bilimbi</i> (Belimbing Besi)
	Nectars (Nectarivores bird species)	<i>Spathodea campanulata</i> (Pancut-pancut)
	Grains (Granivores bird species)	<i>Sandorium koetjape</i> (Sentol)
	Attract Insect (Omnivores bird species)	<i>Psidium guajava</i> (Jambu Batu)
Shelter	Multi-stem plants	<i>Adenantha pavonina</i> (Pokok Saga)
	Single-stem plants	<i>Cananga odorata</i> (Kenanga)
	A dense canopy	<i>Cinnamomum iners</i> (Kayu Manis)
	A thin canopy	<i>Cerbera odollam</i> (Pong-pong)
	Evergreen	<i>Cinnamomum iners</i> (Kayu Manis)
	Deciduous	<i>Alstonia angustiloba</i> (Pulai)

(Source: Malaysia National Landscape Guideline, 2008; Subang Jaya Municipal Council (MPSJ); Department of Wildlife and National Parks of Malaysia, 1999; Chih et. al, 2003; Amar-Singh, 2009)

Table 2 shows the significant of preserving native vegetation in environment. Based on the finding of basic comparison, native and naturalistic vegetation significantly offer more benefit in maintenance and providing more food and better shelter for wildlife.

Table 3 and 4 were developed in order to support analysis of literature review in Table 2. The table was divided into two benefits part of vegetation; food source and shelter. The first column of plant part is the food sources while the second column explained on shelter based on Mel (2006) and Malaysia National Landscape Guideline (2008).

Table 3. List of native plant species

PLANT SPECIES	PLANT PART									
	For Food Source				For Shelter					
	F	N	G	AI	MP	SP	DC	TC	E	D
TREES										
<i>Calophyllum inophyllum</i> (Penaga Laut)		X		X	X		X		X	
<i>Cananga odorata</i> (Kenanga)		X		X		X	X		X	
<i>Cinnamomum iners</i> (Kayu Manis)		X		X	X		X		X	
<i>Dyera costulata</i> (Jelutong)				X	X		X			X
<i>Erythrina orientalis</i> (Indian Coral Tree/Dedap)				X	X		X			X
<i>Fragasa fragrans</i> (Tembusu Padang)	X	X	X	X	X		X			X
<i>Ficus benjamina</i> (Beringin)	X	X	X	X	X		X		X	
<i>Hopea odorata</i> (Merawan Siput Jantan)		X		X	X		X		X	
<i>Lagerstroemia floribunda</i> (Kedah Bungor)		X			X		X			X
<i>Melaleuca cajuputi</i> (Whitewood/Gelam/Kayu Putih)				X	X		X		X	
<i>Mesua ferrea</i> (Iron Wood/Penaga Lilin)		X		X	X		X		X	
<i>Michelia champaca</i> (Cempaka Kuning)				X	X		X		X	
<i>Mimusops elengi</i> (Tanjung)		X		X	X		X		X	
<i>Peltopherum pterocarpum</i> (Yellow Flame/Batai Laut)		X			X		X		X	
<i>Pteleocarpa lamponga</i> (Tembusu Tikus)				X	X		X			X
<i>Saraca cauliflora</i> (<i>Saraca thaipingensis</i>) (Gapis)				X	X			X	X	
PALMS										
<i>Areca catechu</i> (Betel nut Palm/Pinang)	X	X	X	X		X		X		
<i>Caryota mitis</i> (Fishtail Palm)					X		X			
<i>Cryostachys labba</i> (Pinang Merah)				X	X		X			
<i>Chrysalidocarpus lutescens</i> (Pinang Kuning)					X		X			
<i>Licuala grandis</i> (Palma Kipas)				X	X		X			
<i>Livistona rotundifolia</i> (Serdang)					X		X			
<i>Ravenala madagascariensis</i> (Pisang Kipas)						X		X		

Table 4. List of exotic plant species

PLANT SPECIES	PLANT PART									
	For Food Source				For Shelter					
	F	N	G	AI	MP	SP	DC	TC	E	D
TREES										
<i>Bauhinia</i> spp. (Tapak Kuda)					X		X		X	
<i>Cassia fistula</i> (Golden Shower)		X			X		X		X	
<i>Delonix regia</i> (Semarak Api)		X			X		X		X	
<i>Erythrina variegata</i> (Dedap Batik)					X		X		X	
<i>Erythrina glauca</i> (Dedap Hijau)		X			X			X	X	
<i>Filicium decipiens</i> (Kiara Payung)					X		X		X	
<i>Khaya senegalensis</i> (Khaya)		X			X		X		X	
<i>Plumeria</i> spp. (Kemboja)		X		X	X			X	X	
<i>Spathodea campanulata</i> (Pancut-pancut)		X		X	X		X		X	
<i>Tabebuia pentaphylla</i> (Tabebuia)		X		X	X			X		X
<i>Xanthostemon chrysanthus</i> (Jambu Kuning)					X			X	X	
PALMS										
<i>Archontophoenix alexandrae</i> (Alexander Palm)						X		X		
<i>Bismarckia nobilis</i> (Bismakia)					X		X			
<i>Borassus flabellifer</i> (Palmyra Palm/Tar)						X		X		
<i>Livistona chinensis</i> (Serdang Cina)				X	X		X			
<i>Ptycosperma macarthurii</i> (Macarthur Palm)				X	X		X			
<i>Roystonea regia</i> (Royal Palm)					X		X			
<i>Wodyetia bifurcate</i> (Foxtail Palm)					X		X			
SHRUBS										
<i>Bougainvillea</i> spp. (Bunga Kertas)		X		X	X		X			
<i>Caesalpinhia pulcherrima</i> (Bunga Merak)		X		X	X		X			
<i>Duranta plumieri</i> (Golden Dew Drop)				X	X		X			
<i>Heliconia</i> spp. (Heliconia))				X	X		X			
<i>Hibiscus</i> spp. (Bunga Raya)		X		X	X		X			
<i>Hymenocallis littoralis</i> (Spider Lily)		X		X		X		X		
<i>Exora</i> spp. (Siantan)		X		X	X		X			

F = Fruit, N = Nectar, G = Grain, AI = Attract Insect, MP = Multi-stem Plant, SP = Single-stem Plant, DC = Dense Canopy, TC = Thin Canopy, E = Evergreen, D = Deciduous

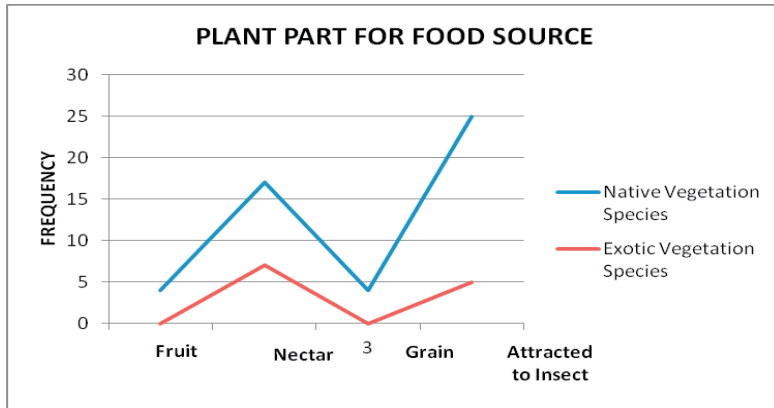


Fig 1. Frequency contribution of plant part from native and exotic vegetation

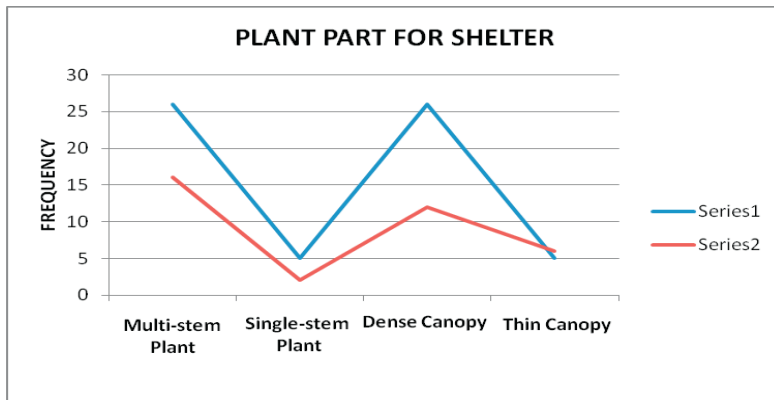


Fig 2. Frequency contribution of plant part from native and exotic vegetation

Findings in Fig. 1 and 2 indicate that most native vegetation provide more benefits for birds' need in food source and shelter, while exotic vegetation give less benefit. This shows that native vegetation always giving the best and most deal to any native wildlife and human. This was expected as native vegetation spent centuries adapting to local climate. They only take less work in management such as fertilizing and watering, and rarely become invasive as there is natural predator keeping them in check.

3. Methodology

A case study was used for this research. This required the development of a site selection, survey method, and sample.

3.1. Case study

Forest Research Institute Malaysia in Kepong was selected as the case study. Evolutions of space from forest reserve to remnant of dipterocarp forest and from nature environment to urban park are the major factor this case study was chosen.

FRIM Kepong was also selected based on several factors. These are as followed a) plant categories for native, naturalistic and exotic species; c) unique biodiversity of birds and d) it is a large area of urban park with the most disturbances level by human (common traffic vehicles, water activities and on foot human disturbances). The researcher only focuses on ornamental vegetation species within FRIM Kepong and according to documented data by FRIM botanist.

3.2. Sampling method and size

In this research, the selection of respondents was based on their knowledge and experience on the field. Local authorities' officers, academicians, and environmental organization (practitioners from the corporate sector and nongovernment organisations) are the group that can support in this study.

Total respondents of 72 comprise 14 officers from local authorities within urban cities in Malaysia, 40 academicians in related department and 18 environmental organisations officers (Forestry Research Institute Malaysia [FRIM], Landscape Architecture Department of Malaysia [JLN], Wildlife and National Parks Department [PERHILITAN], Selangor Development Corporation [PKNS], nongovernment organization: Malaysian Nature Society [MNS] and World-Wide Fund [WWF] Malaysia) were selected. This group was chose to response the questionnaire as their expertise will not be questioned.

3.3. The survey

3.3.1. Results and findings

Out of 72 survey questionnaires distributed, 49 of the respondents responded by email and post. The majority group of respondent were academicians (55.1%), officers from local authorities (28.6%), and 36.7.4% were officers from environmental organizations. This low response rate is due to the semester break and do not have any intention to entertain the questionnaire by selected respondents.

3.3.2. Basic knowledge on bird species

Table 5. Urban bird species in FRIM, Malaysia

Statements	N	Mean
<i>Passer montanus</i> (Eurasian Tree-sparrow / Ciak Rumah)	49	2.73
<i>Oriolus chinensis</i> (Back-naped Oriole / Burung Kunyit Besar)	49	2.63
<i>Aplonis panayensis</i> (Philippine Glossy Starling / Perling Mata Merah)	49	2.47
<i>Copsychus saularis</i> (Magpie Robin / Murai Biru Siberia)	49	2.43
<i>Acridotheres tristis</i> (Common Myna / Tiong Gembala Kerbau)	49	2.41
<i>Corvus splendens</i> (House Crow / Gagak)	49	1.80

This list of urban bird species were developed according to secondary data from Ong (2003) book. Table 5 reveals the list of common urban bird species according to their appearance in urban parks. The most common bird species to urban parks is *Passer montanus* (Eurasian Tree-sparrow/Ciak Rumah) with mean 2.73 as they are most common to human presence. The lowest is *Corvus splendens* (House Crow/Gagak) (mean: 1.80). In any planning, House Crow will not be entertained as it is one of nuisance bird to have. Pan (2010) from Forest Research Institute Malaysia stated that conserve bird species in urban parks need to be considered either it can be harm to urban park or/and also give a bad impact to the development.

3.3.3. Preference towards urban park value

The majority of respondents (73.5%) agreed that function is a type of activities often seen in urban park in Malaysia. It may due to it significant in providing space for active, semi-active or passive activities to urban dwellers. Then, the question on most preferred urban park was asked. The respondents were given six options to choose on the most preferred by them.

Table 6. Value of urban park most preferred

Statements	N	Mean
Function	49	3.92
Ecological	49	3.73
Recreational	49	3.69
Utility	49	3.49
Aesthetic	49	3.16
Contemplative	49	2.80

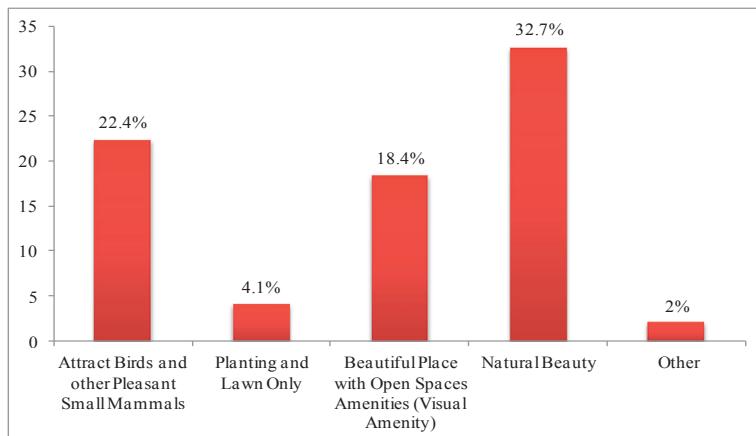


Fig 3. Elements of urban park most preferred

The respondents chose function value as the most preferred urban park (mean: 3.92). In this research, the function value is based on activities that urban park offer for elderly, youth, and children. This results

highlighted the significant value of urban park in positively contribute to a good quality of environment by preserving the nature for urban dwellers.

Then, respondents were given five options to determine the type of elements that they preferred and think should be in an urban park (Fig 3). The highest preferred element is for natural beauty (32.7%), as more individuals are attracted to environment natural setting as it offers the most fitting surrounding for each space and it has its own significant.

3.3.4. Attitude of respondents toward urban bird habitats and vegetation in FRIM Kepong

Table 7. Types of urban habitats for bird in FRIM, Kepong

Statements	N	Mean
Open area / Field	49	2.98
Wetland	49	2.45
Garden / Park	49	2.39
Forest / Edge	49	1.65

Table 7 indicates majority (mean: 2.98) respondents agreed that urban habitats in FRIM Kepong are mostly open area/field, while the lowest is forest/edge (mean: 1.65). This may due to high awareness of preserving open area/field and avoiding any activities in reserve areas. Garden/park mean is 2.39 which bring to second higher as bird habitat in urban area. Providing play area, food, and shelter for birds is the significant it has with the impressive number of plants in the most variety species, vary of volume and height. Wetland has two categories in Forest Research Institute Malaysia; natural and man-made. For natural wetland, it need to be excluded as it is a protected area while for man-made wetland, it develop for one objective; preserve ecology.

Table 8. Plant significant for birds' food

Statements	Percentage
Important	95.9%
Not Important	4.1%

Plant species are the most important factor to bird either as bird food or shelter and in order to conserve them. Table 8 indicates the significant of a plant as a food sources for bird. The highest plant species is the high producing of fruits and flowery trees (mean: 4.22), followed by plant that attract insects (mean: 3.22), flowering shrubs (mean: 3.18), native and forest tree (mean: 3.02) and such least shrubs and ground covers (mean: 2.10). Although this bird species are well adapted to any landscape changes, in order to maintain and preserve urban bird species, question on providing opportunities for bird in urban parks was asked (Table 9)

Table 9. Awareness on providing opportunities for bird habitat in urban parks

Statements	Percentage
Yes	91.8%
No	8.2%

The respondents highly (95.9 %) agreed that it is important to offer opportunities for urban bird species in urban parks. The respondent also listed the answers on why it is important. The researcher then concluded the answer based on keyword. a) to preserve and maintain biodiversity as food chain and promote a place for endangered bird species as habitat; b) to support and balance the biodiversity ecological value for environmental health, germination of plants and attraction to urban dweller as psychological therapy; c) to create as an alternative space for birds and to protect our native bird species as in line with government vision to become a garden nation; and d) to create awareness and educate young generation on bird species and by providing them urban recreational activity to appreciate nature.

High supporting on opportunity for birds, the respondents who selected based on professional of the field agreed to a proposal of providing guideline for bird habitats in urban open spaces (Table 10).

Table 10. Providing guideline for bird habitats in urban open spaces

Statements	N	Mean
Fruit and Flowery Trees	49	4.22
Flowering Shrubs	49	3.18
Native and Forest Tree	49	3.02
Plant that Attract Insects	49	3.22
Such Least Shrubs and Ground Covers	49	2.10

The question on interest is more on opinion on the naturalistic design approach in Malaysia. The majority (91.8%) respondents agreed towards providing a guideline for bird habitat in urban open spaces. This is due to a) no design guideline available on the type of plants that attract birds; b) to balance and maintain ecological processes in communities; c) to ensure selected plant material species do not give any problems to the urban dweller later on; d) as an initiative for attraction, awareness, and education to public; e) to setting up the standard in planting design at landscape areas besides to consider the maintenance, safety and health of the place.

4. Discussion

This research identified that ornamental vegetation should be considered as one of importance factor in selecting the plant material in urban parks as to increase the quality of environment by enhancing the role of urban bird species in urban park. Moreover, according to Donnelly and Marzluff (2004), birds are biological indicator which help human to indicate a place as healthy or harmful. In order to improve urban bird habitats in urban parks, maintaining the native vegetation is one of the crucial methods to apply. Based on previous research, all studies recommended in order preserving native wildlife, native

vegetation should be maintain as well as planted as ornamental vegetation.

According to Scott et. al (1991), Reale and Blair (2005), and Slattery et al. (2003), they discovered that native vegetation is the most available resource of food and better shelter for native birds. This is due to the ability that native vegetation has in producing continuously food source and all-year-round as a better shelter for birds. There is also suggestion on characteristic of vegetation species. In order to improve conservation of bird habitats, evergreen vegetation with broadleaf and multi-stemmed will offer a better shelter throughout climatic changes and predators. Mixing of vary height and various vegetation species will help enhancing the space and become attraction to birds for a long-residents (Slattery et al., 2003; Hirst, 2010).

Findings from questionnaire indicate high awareness toward the role of ornamental vegetation in urban park. Professionals agreed that in order to improvement urban bird habitat, there should be the main factor in creating or balancing ecology in urban park which is the selection of plant material as ornamental vegetation. This refers to the findings on level of awareness in providing opportunities for bird habitats in urban parks (Table 9). Professionals were listing the crucial method to provide the opportunities for bird in urban parks are by preserving and maintaining biodiversity as food chain and promoting a new place for endangered bird species as habitats with their basic needs. This parallel to statement stated by Maas et al., (2006), Kane (2009), James et al. (2009), Gairola and Noresah (2010), as urban park should be highlighted as key of ecological service provider which benefits to human and wildlife (birds). Findings also show that professionals agreed that urban park should be a space of protection and habitats creation to our native bird species as in line with government vision to become a garden nation besides giving outdoor education to the youth generation.

Majority of respondents have high interest in suggestion of a guideline for bird habitats in urban open spaces. They are aware of the low accessibility of design guideline especially on vegetation species that can attract birds and to ensure selected vegetation species do not give any harm to the urban dweller later on. Some are concern on balancing and maintaining ecological processes in communities. This also stated by Woolley et. al, (2003) and Eysenbach (2008) that urban parks have the significant of recreation, ecology, and aesthetic values which effects by how that space perceived and utilized.

They also interest in human safety when it come to setting up the standard in planting design at landscape areas besides to consider the maintenance, safety and health of the place as well as bring bad impact to the development.

5. Conclusion

Urban areas are created and further developed by the process of urbanization. In order to survive, urban birds need to adapt with urban resources. In urban area, ornamental vegetation were become a must to plant as to bring the aesthetic value. This advantage should be also helps in creating a space for urban bird species.

One of element that urban area can provide is an urban park. In designing an urban park, ecological planning including native vegetation data is a must in order to design an urban park that capable to maintain and balance the native biodiversity. Native vegetation is important in designing an outdoor space because there are ability and availability in producing food all-year-round.

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