

Bird Diversity in Urban Areas, Yala, Thailand

Sasithorn PANGSUBAN^{1*}, Jaru NIKOM²

¹Major of Biology, Faculty of Science Technology and Agriculture, Yala Rajabhat University, Thailand

²Southern Border Research and Development Institute, Yala Rajabhat University, Thailand

Email: ¹sasithorn.p@yru.ac.th

ABSTRACT

This study was a survey of bird species in Muang District, Yala, Thailand. A number and species of the appeared birds were compared during the summer season and the rainy season. All of which are classified as resident species. However, two species were both resident birds and migratory birds. The most common bird species was in Passeridae family order Passeriformes. Besides, it found that during the summer months, the number of bird species was higher than in the rainy season. Considering the Shannon-Wiener Index, birds in the urban area of Yala were low species diversity and abundance, as well as each survey month, was not significantly different. Considering the similarity of bird species, these found that the resemblance between the two seasons was less. And, the similarities during the rainy season were higher than in the summer. The results of this survey suggest that if in the future the urban ecosystem has increased the population or expanded the size of the city without preserving the trees. As a result, the number and type of birds in the city will reduce.

Keywords

Resident birds, migratory birds, urban ecosystem, biodiversity, the Shannon-Wiener Index

INTRODUCTION

Humans depend on the ecosystem services of the natural ecosystems for food, water, and other important products and services. However, half of the world's human population resides in cities [1]. Changes in ecological conditions that result from human actions in urban areas ultimately affect human health and well-being [2]. Since the urban ecosystems differ from the natural ecosystems in some matter such as in microclimate (they are warmer and have greater precipitation), hydrology (increased runoff), and soils (higher concentrations of heavy metals and organic matter and abundant earthworms) [2]. For this reason, retaining biodiversity of the urban ecosystems is crucial to maintain important ecosystem services [3]. Although the conservation of biodiversity in urban areas is intrinsically important [4], However, our understanding of the impacts of urbanization on biodiversity in cities of Thailand is little information.

Yala is one of the three border provinces of Thailand. The area of Yala composed of mountainous hills and valleys from the central to the southernmost of the province. There are some plains in the north of the province. As a result, Yala is suitable for the habitation of various birds. Nowadays, birds have been widely used as models to investigate the effects of urbanization on biodiversity. Because they respond to urbanization gradients worldwide by changing species richness, abundance, and composition [5]. From Avibase - Bird Checklists of the World [6] there are 1081 species in Thailand. 73 species are recognized as globally threatened species and 6 species were introduced. Moreover, there are 720 species in the south of Thailand. 46 are recognized as globally threatened species and 6 species were introduced. However, in three southern border provinces, there is only any bird species information in Pattani and Narathiwat. While there would be little information on the website <https://ebird.org/science>, reported that 271 bird species were observed in Yala. Particularly, there are no published studies that refer to birds in urban areas. So, we hypothesized that urbanization develops would influence species richness

and bird abundance. We expect bird community similarity between the public parks and a community district.

Hence, the objective of this research was to study the diversity of bird species in the urban area, Muang District, Yala. Moreover, the similarities of bird species in different seasons and the level of seasonal bird abundance were also investigated.

MATERIALS AND METHODS

Study area

The survey was conducted in the municipality of Yala included a community district, where is downtown area, and three public parks: Suan Kwan Mueang, Suan Si Mueang, Sana Chang Phueak (**Table 1**). All public parks are the areas where the townspeople come to take advantage of recreation. They have a wide variety of plant species, many planted and some naturally growing trees shrubs, and partially disturbed vegetation.

Table 1 Location of the selected urban parks and a community district in Yala.

Study site	Point	Coordinates	
		Latitude	Longitude
a community district	1	6°33'02.9"	101°16'59.4"
	2	6°33'53.5"	101°16'38.5"
	3	6°32'53.0"	101°17'23.1"
Suan Kwan Mueang Park	1	6°32'20.1"	101°16'26.5"
	2	6°32'28.3"	101°16'25.1"
	3	6°32'40.7"	101°16'26.6"
Sanam Chang Phueak Park	1	6°32'46.4"	101°16'51.0"
	2	6°32'45.5"	101°16'53.4"
	3	6°32'49.1"	101°16'52.6"
Suan Si Mueang Park	1	6°34'20.0"	101°17'41.0"
	2	6°34'03.3"	101°17'28.5"
	3	6°33'01.6"	101°17'11.1"
	4	6°33'31.5"	101°17'49.9"

Bird census

This study was carried out from March 2018 to August 2018. The number and species of the appeared birds were compared during the summer reason (from March to May) and the rainy season from (June to August). Bird species were explored and recorded using a point count [7]. According to the geographical characteristics of each survey site, 3-4 survey points were placed in each site for sampling bird communities. The area of point counts was set 50 x 50 meters in size. Point counts were performed by walking to explore within the area at each point in the morning, beginning with increased bird activity, and finishing around 5 hours later. The time for sampling in each point was 15 minutes. Point counts were located at a minimum distance of 250 m from each other to ensure survey independence [7]. The surveys were conducted every 2 weeks for 6 months. We avoided performing point counts in days with rain and stronger wind. Bird species were classified by the bird study manual of Thailand [8], Avibase - Bird Checklists of the World, <https://ebird.org/science>, and <http://www.thaibirding.com>. We assigned species to

the categories ‘resident’ for species that remained in the urban areas throughout the year. We also used the Birdlife Datazone database to classify the threat status of species on the IUCN Global Red List.

DATA ANALYSIS

To test the observed patterns of species richness and abundance, bird species diversity was calculated for each study site using Shannon-Wiener index. The Sorenson index was used to analyze the similarity between seasons regarding their number of species [9]. ANOVA was used to compare bird richness and abundance in summer and rainy seasons in each study site.

RESULTS AND DISCUSSION

This was the first time of bird census in urban areas of Yala. We recorded 2,387 individual birds belonging to 6 orders, 15 families, 20 genera, 21 species as detailed in **Table 1**. The majority of them were placed in Passeriformes order that corresponded to the study of species diversity and species abundance of birds in Phutthamonthon Park Nakhonpathom Province of Thailand [10]. While the number of individuals was not different between the summer reason (1,138birds) and rainy reason (1,249birds) as showed in **Table 2**.

Table 1 The number of orders, families, genera, and species of all birds found.

orders	families	genera	species
Columbiformes	1	4	4
Coraciiformes	2	3	3
Ciconiiformes	1	1	1
Cuculiformes	1	1	1
Passeriformes	9	10	11
Piciformes	1	1	1
Total	15	20	21

The families only found in summer consists of 7 families: Sturnidae, Dicaeidae, Rhipiduridae, Halcyonidae, Meropidae, Ardeidae, and Megalaimidae. 2 families were only found in the rainy season, consisted of Corvidae, and Ploceidae. While 8 families: Passeridae, Pycnonotidae, Muscicapidae, Oriolidae, Sturnidae, Corvidae, Columbidae and Cuculidae were found in both summer and rainy season, as shown in **Figure 1**. The seasonal appearance was significantly different. It is noteworthy that the bird families in summer were found much more than in the rainy season. Moreover, the parks contained a large number of green spaces. However, these green spaces did not guarantee high bird diversity [11]. The results suggested that bird diversity was likely to vary across seasons. The increase in population diversity might be related to the increase in food abundance, and probably to the reduction in predation pressure.

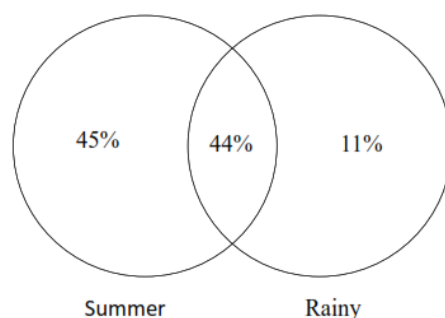


Figure 1Percentage of recorded bird families in each season.

In total, 2,387 resident bird species were found within the sites. Two of them were both resident and migratory birds, the Asian koel (*E. scolopaceus*) and the Malaysian pied fantail (*R. javanica*). (**Table 2.**) The presence of house sparrow (*P. montanus*) was the most common in all seasons. This was not surprising, since the house sparrows have been found to be a dominant species in the communities where they occur all over the world and played a crucial role in determining species richness and abundance of avian communities [12]. Moreover, the majority of the threatened status of birds was the least concern. However, the presence of the Asian golden weaver (*P. hypoxanthus*) is a matter of concern. Since it is listed under the category ‘Near Threatened’ in the IUCN Global Red List.

Table 2 The number and species of birds surveyed in the urban areas during the summer reason (from March to May) and the rainy season (from June to August) 2018.

Orders	Families	Scientific name	Remark	the threat status	% of total in seasonal appearance	
					Summer	Rainy
Columbiformes	Columbidae	<i>Streptopelia chinensis</i>	Resident	Least concern	<1	<1
		<i>Columba livia</i>	Resident	Least concern	19	19
		<i>Geopelia striata</i>	Resident	Least concern	5	7
		<i>Treron bicinctus</i>	Resident	Least concern	-	<1
Coraciiformes	Halcyonidae	<i>Halcyon smyrnensis</i>	Resident	Least concern	<1	-
		<i>Todiramphus chloris</i>	Resident	Least concern	<1	-
	Meropidae	<i>Merops philippinus</i>	Resident	Least concern	<1	-
Ciconiiformes	Ardeidae	<i>Bubulcus ibis</i>	Resident	Least concern	<1	-
Cuculiformes	Cuculidae	<i>Eudynamys scolopaceus</i>	Resident/ Migratory	Least concern	<1	<1

Passeriformes	Passeridae	<i>Passer montanus</i>	Resident	Least concern	44	55
	Pycnonotidae	<i>Pycnonotus goiavier</i>	Resident	Least concern	<1	<1
	Muscicapidae	<i>Copsychus saularis</i>	Resident	Least concern	1	<1
	Oriolidae	<i>Aegithina tiphia</i>	Resident	Least concern	<1	<1
	Sturnidae	<i>Acridotheres tristis</i>	Resident	Least concern	27	16
		<i>Acridotheres grandis</i>	Resident	Least concern	<1	-
	Corvidae	<i>Corvus corone</i>	Resident	Least concern	<1	<1
		<i>Urocissa erythroryncha</i>	Resident	Least concern	-	<1
	Ploceidae	<i>Ploceus hypoxanthus</i>	Resident	Near threatened	-	<1
	Dicaeidae	<i>Dicaeum cruentatum</i>	Resident	Least concern	<1	-
	Rhipiduridae	<i>Rhipidura javanica</i>	Resident/ Migratory	Least concern	<1	-
Piciformes	Megalaimidae	<i>Megalaima haemacephala</i>	Resident	Least concern	<1	-

The number of species and individual birds in the summer season was greatest in March (15 species 405 individual). In the rainy season, the number of species and individual birds was found the highest in June (11 species 442 individual). Moreover, the results showed that the number of species in the summer season was higher than the rainy season but the number of individuals was reversed as showed in **Figure 2**. Although it is known that birds are sensitive to vegetation structure [13]. However, the moving of diverse species into the urban areas in the summer season might cause by the artificially watered urban gardens attracted many birds to the city [14].

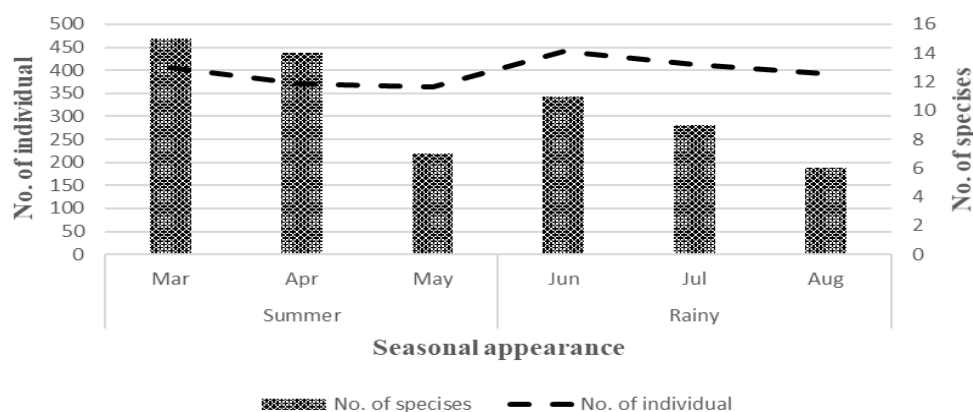


Figure 2 The number of bird species and individual birds appeared in each month.

In **Table 3**, we calculated bird species diversity and their relative abundance by the Shannon-Wiener index. The results explored that the diversity index in the summer season of Suan Si Mueang Park, Suan Kwan Mueang Park, and the community district was higher than the rainy season, except for Sanam Chang Phueak Park. While the relative abundance in the summer season was higher than the rainy season for the entire areas. However, they were not a significant difference between season and each study site with ANOVA calculating (data not showed). F was 0.43 and the p -value (0.95) was 0.73 for the diversity index, and F was 0.81, and the p -value (0.95) was 0.51 for the relative abundance. We explained this phenomenon by the occurrence of a considerable number of parks in the urban areas. They could lead to a homogenization of the avifauna. So, there was not a negative effect of people and building density in the community district on species richness and abundance. This might be indicated green zone abundance in the urban areas of the city.

Table 3 Bird species diversity and their relative abundance in each season.

Season	Study sites							
	Suan Si Mueang Park		Suan Kwan Mueang Park		Sanam Chang Phueak Park		A community district	
	H'	J'	H'	J'	H'	J'	H'	J'
Summer	1.15	0.57	1.11	0.66	0.95	0.73	1.16	0.94
	(1.05 - 1.26)	(0.52 - 0.61)	(0.85 - 1.31)	(0.53 - 0.78)	(0.60 - 1.19)	(0.55 - 0.97)	(0.78 - 1.72)	(0.56 - 0.71)
	0.83	0.48	0.95	0.67	1.39	0.70	0.90	0.63
Rainy	(0.65 - 0.93)	(0.36 - 0.58)	(0.69 - 1.32)	(0.63 - 0.74)	(1.35 - 1.41)	(0.65 - 0.79)	(0.73 - 1.03)	(0.59 - 0.67)

The range showed in parenthesis.

Table 4 and **Table 5** showed the similarity of bird species between study sites in the summer and rainy season. The results showed that the similarity in the summer season (47.06-66.67) was lower value than in the rainy season (66.67-85.71) when we compared between season. These seasonal variations might because of the unequal ecosystem productivity. Since this ecosystem productivity could decrease or increase due to human intervention in urban areas depending on the regional context where urbanization developed. Moreover, Suan Kwan Mueang Park and Sanam Chang Phueak Park was the maximal similarity (66.67) in the summer season. Suan Kwan Mueang Park was the maximal similarity with Suan Si Mueang Park (85.71) in the rainy season. While the community district showed minimal similarity with the others. Because these parks were the most important and valuable green spaces for many birds. However, the urban areas would continue to grow. Hence, more effort should be made in urban planning to turn the urban areas into a more friendly habitat for a variety of bird species.

Table 4 The similarity of bird species between study sites in the summer season.

Study site	Suan Si Mueang Park	Suan Kwan Mueang Park	Sanam Chang Phueak Park	A community district
Suan Si Mueang Park		53.85	60.00	58.82
Suan Kwan Mueang Park	58.85		66.67	47.06
Sanam Chang Phueak Park	60.00	66.67		61.54
A community district	58.82	47.06	61.54	

Table 5The similarity of bird species between study sites in the rainy season.

Study site	Suan Si Mueang Park	Suan Kwan Mueang Park	Sanam Chang Phueak Park	A community district
Suan Si MueangPark		85.71	80.00	76.92
Suan Kwan MueangPark	85.71		80.00	76.92
Sanam Chang PhueakPark	80.00	80.00		66.67
A community district	76.92	76.92	66.67	

CONCLUSIONS

We researched in the summer and rainy season in 2018 and found that 6 orders, 15 families, 20 genus, and 20 species were observed. Passeriformes order, Passeridae family was found the most. We also analyzed the spatial and seasonal variation in bird community composition in the urban areas of Yala to understand their bird community structure. The results indicated a homogenization of the avifauna in the city. And there was green zone abundance in urban areas of the city. However, green space in general does not guarantee high bird diversity. The results of this survey suggest that if in the future the urban ecosystem has increased the population or expanded the size of the city without preserving the trees. The number and type of birds in the city will reduce. Therefore, a long-term database on the exhaustive and intensive study is required. Since urban planners need better information about the factors affecting the distribution of species to create or maintain biodiversity in urban areas.

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