

BIODIVERSITY AND COMPOSITION OF LEPIDOPTERANS AT UNIVERSITI TEKNOLOGI MARA (UiTM) PAHANG, JENGKA CAMPUS

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ABSTRACT

This study was conducted to record the lepidoptera species at UiTM Pahang in July and August 2019. A total of 261 Lepidoptera species belonging to 21 species from four families were recorded. Nymphalidae (54%) was found to be the most dominant followed by Pieridae (31%), whereas Hesperidae (9.2%) and lastly Papilionidae (0.06%) were less common. There were 12 species of Nymphalidae collected followed by 4 species of Pieridae, 4 species of Papilionidae and 1 species of Hesperidae sampled in three study sites comprising forest area, plantation area and urban area. The diversity analysis (Shannon-Wiener index, Dominance index and Evenness index) were used to analyse the biodiversity of the species. The findings of this study contributed to the local fauna database which can be useful for future researchers.

Keywords: Lepidoptera, Biodiversity, Butterfly

1. Introduction

Butterflies and moths can be grouped in the same phylum and order which are Insects and Lepidoptera, respectively. With recent advances in next generation technologies, research on Lepidoptera is moving fast not only in diversity research but also in genomic research. But, it is only available <10 of the 43 Lepidoptera superfamilies, 133 families with a total species more than 157,000 around the world (Triant et al. 2018). The studies of lepidoptera species is needed because they contribute a lot of knowledge related to genome, ecology, biology, conservation and biogeography (Wallbank et al. 2016; Olmstead et al. 2016; Fraïsse et al. 2017; Huang et al. 2019). Some species can be used as indicators because they are very sensitive to climatic changes (Martay et al. 2016). Furthermore, the sudden complex changes in climates can give bad impacts to tropical insect, thus wide monitoring at different level (species and population) of their distribution and developments of conservation strategies to manage distribution shifts across countries is deeply recommended (Bonebrake et al. 2018; Janzen and Hallwachs 2019).

The collection of butterflies has been documented since 1779 and there are more than 1000 recorded species and 117 endemic species in Malaysia (Yap et al. 2018). According to Yap et al. (2018), they found in Terengganu National Park about 30 species from 18 genera and 5 families that make a total discovery around 81 butterflies. Since this species can be a potential pollinating agent and indicator of health and quality of their surrounding environment, it is important for us to explore more about this species especially in UiTM Pahang. UiTM Pahang is situated in a mixed area which is near to the city centre and forest area. It consists of multiple land activities such as agriculture, village orchard, forest reserve and residential area. With the existence of different types of habitats, we are unaware of any study on butterfly fauna at UiTM Pahang, hence this study was done to assess the butterfly's communities in study sites. As such, the objectives of this study are to investigate the diversity of Lepidoptera species and identify the species that exist in UiTM Pahang, Jengka campus.

2. Materials and Method

The study area was conducted in UiTM Pahang, Jengka campus. The study sites can be divided into several types of vegetation which are forest area, plantation area and urban area. The sites were Hutan Simpan Sri Gading UiTM Pahang (Site A), oil palm plantations (Site B) and urban area at admin building (Site C) (Figure 1). The sampling of Lepidoptera species was conducted during daytimes from 0800 hr to 1200 hr and from 1600 hr to 1900 hr in July and August 2019. Sweep sampling method was conducted by using sweep nets around at the sampling sites and any observed Lepidoptera species were caught using the sweep nets. The caught species were collected, and pictures of the samples were taken for identification. The specimens were identified according to Opler (1994), “Peterson First Guides Butterflies and Moths”.



Hutan Simpan Sri Gading UiTM Pahang (Site A)



Oil Palm plantations (Site B)



Admin Building (Site C)

Figure 1: Study sites in UiTM Pahang, Jengka Campus

3. Data Analysis

Several diversity indices such as Shannon-Wiener Diversity Index (H), Dominance Index (D) and Evenness Index (E) were used to calculate the index value using computer software PAST (Hammer et al. 2001).

4. Result and Discussion

The finding of this study contributed to the local fauna database which is useful for future research. Based on table 1, a total of 261 butterflies and moths were collected from 4 different families namely Hesperidae, Papilionidae, Nymphalidae and Pieridae. The total species recorded was 21. Nymphalidae (54%) was found to be the most dominant followed by Pieridae (31%), whereas Hesperidae (9.2%) and Papilionidae (0.06%) were less common. There were 12 species of Nymphalidae collected followed by four species of Pieridae, four species of Papilionidae and one species of Hesperidae sampled in this study. The *Suastus gremius* was the most abundant species with about 24 individuals followed by *Catopsilia Scylla* and *Ypthima baldus* was recorded with 23 individuals. From the study, the highest number of specimens was from site A, followed by site B and site C which are 139, 97 and 95 of Lepidoptera species, respectively. From all species that have been identified, 21 species can be found at site A, 16 species at site B and only 8 species can be found at site C. The picture for all species were taken for future reference (Figure 2).

Table 1: The species of Lepidoptera species recorded in this study at UiTM Pahang, campus Jengka.

No.	Family	Species	Number of Species			Total
			Site A	Site B	Site C	
1	Papilionidae	<i>Papilio polytes</i>	3	0	0	3
2		<i>Graphium agamemnon</i>	3	0	0	3
3		<i>Papilio clytia</i>	5	2	0	7
4		<i>Papilio demoleus</i>	2	0	0	2
5	Pieridae	<i>Eurema hecabe</i>	9	7	3	19
6		<i>Appias libythea</i>	9	13	0	22
7		<i>Catopsilia scylla</i>	13	9	1	23
8		<i>Catopsila pomona</i>	8	6	3	17

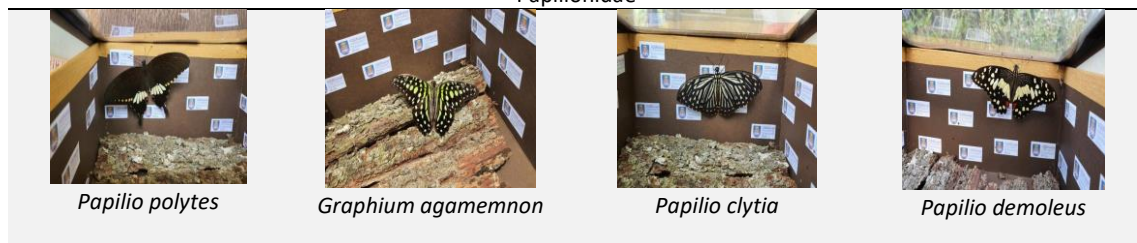
Table 1 (Continued): The species of Lepidoptera species recorded in this study at UiTM Pahang, campus Jengka.

9	Nymphalidae	<i>Junonia atlites</i>	5	0	0	5
10		<i>Cirrochroa malaya</i>	3	0	0	3
11		<i>Euploea mulciber</i>	17	2	1	20
12		<i>Elymnias hypermnestra</i>	5	1	0	6
13		<i>Ypthima baldus</i>	5	14	4	23
14		<i>Parantica aglea</i>	6	5	3	14
15		<i>Hypolimnas bolina</i>	4	9	0	13
16		<i>Euploea sylvester</i>	2	5	0	7
17		<i>Junonia orithya</i>	4	10	7	21
18		<i>Cupha erymanthis</i>	16	4	0	20
19		<i>Lasippa tiga</i>	1	3	0	4
20		<i>Acraea terpsicore</i>	3	2	0	5
21	Hesperiidae	<i>Suastus gremius</i>	16	5	3	24
Total			139	97	25	261

Nymphalidae



Papilionidae



Pieridae

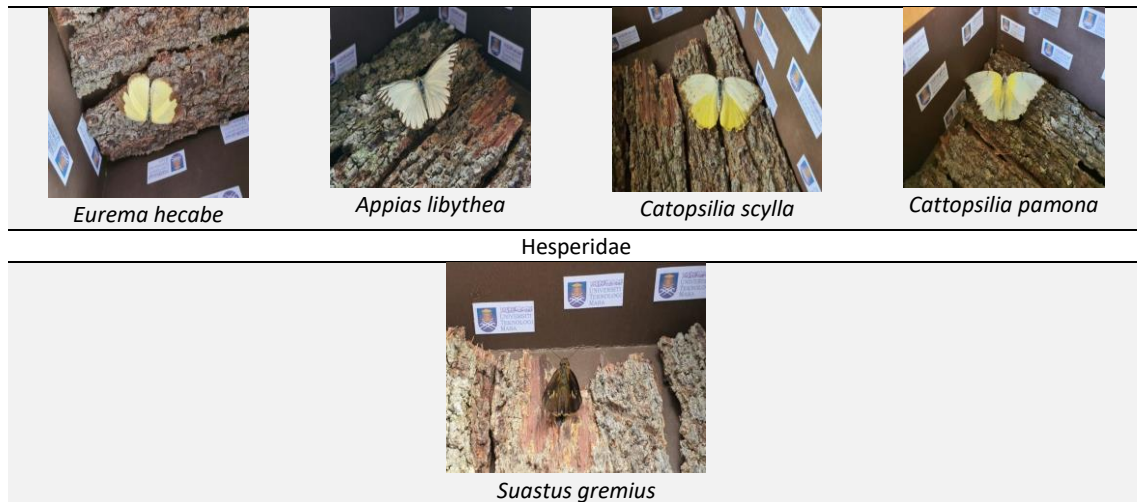


Figure 2: Species of Lepidoptera found in UiTM Pahang, campus Jengka.

Table 2 shows the differences in species diversity indices of Lepidoptera species in the three study sites. The highest Shannon-Wiener index value found in the study site is at Site A with the value of 2.80, followed by site B with the value of 2.57 and lastly site C with the value of 1.93. Hill (1973) states that the value H' , $1 \leq H' \leq 3$ means diversity is at a moderate level and shows that the stability of the community is still stable. Dominance index is used to determine the extent to which a species dominates other groups. The table 2 shows that the dominance index at each location is different with highest value at Site C, followed by Site B and the lowest is at site A with dominance value of 0.165, 0.088 and 0.073, respectively. According to Odum (1971), when the dominance value close to 0 ($<0,5$) indicates no dominant species, and if the dominance value close to 1 ($>0,5$) indicates the dominance of certain types. Even the value for site C is the highest, but the value for all sites comparatively low. The highest evenness index value was found on site B, followed by site C and lastly is site A. This suggests that on site B, there is no species dominating and the community is more stable compared to the others. The lowest evenness index value was found in site A. This shows that there are some species that have high in the number of individuals per species. This can be found on the species of *Euploea mulciber* that have a high value in number compared to other species. It can be predominantly found in the forest reserve area. Even though there are differences in the value, there is no significant difference between all the study sites. All sites show high stability in the Lepidoptera species community.

Table 2: Species Diversity Indices at each location

No.	Sampling Location	H	D	E
1.	Site A	2.80	0.073	0.920
2.	Site B	2.57	0.088	0.927
3.	Site C	1.93	0.165	0.926

The high number of Nymphalidae species in this study is very common because species under this family are very large and broad with many subfamilies and species compared to the others (Corbet et al. 1992). The availability of different types of plants and existence of nectar plants can attract more butterfly species to this area (Murugesan et al. 2013, Kunte 1997; Krishnakumar et al. 2008; Gaude & Janarthanam 2015). Usually, the vegetation structure gives

effect to the composition of the butterfly in a certain area (Ramos 2000). UiTM Pahang is known for their rich floral diversity. Furthermore, the land is fully used for human activities such as oil palm plantation, village orchard and education purposes. The existence of fruit farms and many kinds of flowers around the campus has become one of the reasons to attract the fruit-feeding and nectar-feeding species butterflies, especially Nymphalidae species to the study site. According to Molleman et al. (2005), adult butterflies feed on a variety of substrate including honeydew, tree-sap, flower, fruit, mud and nectar. Fruit feeding butterflies are easily attracted to feed on rotting fruit because of the production of volatiles by the fermentation process that occur in the fruit, while nectar feeding butterflies are mostly attracted by colours displayed by the flowers (Young, 1975, Sourakov et al. 2012). Koneri and Saroyo (2012) reported that shrub vegetation can increase the richness and abundance of butterfly species. As the campus is surrounded with reserve forests that consist of several types of plants including tall trees, wildflowers and shrubs, it has potential to become the habitat for the Lepidoptera species.

5. Conclusion

This preliminary study was to increase baseline knowledge of fauna. This research can be improved by increasing the sampling time and sampling during different seasons to gather more species available in the study site. Hopefully it may help in planning conservation programs and managing the safety of its flora and fauna for future generations.

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