

DIVERSITY AND SPECIES COMPOSITION OF BUTTERFLIES (LEPIDOPTERA: PAPILIONOIDEA) IN TAKA MELOR AMENITY FOREST, LABIS FOREST RESERVE, SEGAMAT, JOHOR, MALAYSIA

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ABSTRACT

This study was conducted to obtain a preliminary checklist of butterflies in Taka Melor Amenity Forest, Labis Forest Reserve, Johor. Butterflies were sampled between February 2018 to September 2018 using aerial net and baited trap. A total of 88 individual butterflies representing 61 species and 43 genera was recorded. Sampling were done on February, July and September 2018 using aerial nets and baited traps. Result shows that Nymphalidae is the most dominant family with 41 individuals and 31 species recorded. All six families of the butterfly were recorded, Papilionidae, Pieridae, Nymphalidae, Riodinidae, Lycaenidae and Hesperidae. According to the rank abundance curve, the most dominant species within the group is *Pantoporia sandaka* (Nymphalidae) with five individuals recorded. This is followed by *Iambrix salsala* (Hesperidae), *Castalius rosimon* (Lycaenidae), *Ypthima horsfieldi* (Nymphalidae) and *Appias lyncida* (Pieridae) with 4 individuals each. The Shannon Diversity Index for this site is 3.95 with its respective evenness value of 0.9609. Overall the diversity butterflies in Taka Melor is relatively high. This preliminary checklist will provide a baseline data of butterfly species in Taka Melor which may assist conservation management in the future.

Keywords: Butterflies, Lepidoptera, diversity, Labis Forest Reserve, Taka Melor Amenity Forest

ABSTRAK

Kajian ini telah dilakukan untuk mendapatkan senarai semak awal bagi kupu-kupu di Hutan Lipur Taka Melor, Hutan Simpan Labis, Johor. Sebanyak 88 ekor kupu-kupu daripada 61 spesies dan 43 genus telah direkodkan. Persampelan telah dijalankan pada bulan Februari, Julai dan September 2018 menggunakan jaring udara dan perangkap berumpan buah. Nymphalidae merupakan famili yang paling dominan dengan 41 individu dan 31 spesies telah direkodkan. Kesemua enam famili kupu-kupu berjaya direkodkan: Papilionidae, Pieridae,

Nymphalidae, Riodinidae, Lycaenidae dan Hesperidae. Berdasarkan lengkung pangkat kelimpahan, spesies yang paling dominan ialah *Pantoporia sandaka* (Nymphalidae) dengan lima individu. Ini diikuti dengan *Iambrix salsala* (Hesperidae), *Castalius rosimon* (Lycaenidae), *Ypthima horsfieldi* (Nymphalidae) and *Appias lyncida* (Pieridae) dengan empat individu setiap spesies. Nilai Indeks Kepelbagaian Shannon untuk kawasan ini ialah 3.95 manakala nilai Kesamarataan Shannon ialah 0.9609. Secara relatif, kepelbagaian kupu-kupu di Taka Melor adalah tinggi. Senarai semak awal ini adalah maklumat asas bagi spesies kupu-kupu di Taka Melor. Maklumat ini boleh membantu pengurusan pemuliharaan di masa hadapan.

Kata kunci: Kupu-kupu, Lepidoptera, kepelbagaian, Hutan Simpan Labis, Hutan Lipur Taka Melor

INTRODUCTION

Butterflies make good indicators, they are taxonomic-wise relatively stable, commonly known, well distributed, small in size with short reproductive rates and high fecundity (Ashfaq & Hebert 2016; Syaripuddin 2014; Wilson et al. 2013). Another factor contributing to making them a good indicator is that between adults and larvae, their food preference is different (Altermatt & Pearse 2011; Mevi-Schutz & Erhardt 2005). However most important factor as an indicator, butterflies are sensitive to environmental changes; including climate change (Kharouba et al. 2018; Raza et al. 2014; Shaw 2016), fragmentation (Yong et al. 2012) and land use conversion (Koh & Wilcove 2008; Schulze et al. 2010; Vasconcelos et al. 2015). These studies show that butterflies with limited geographical ranges are prone to local and global extinction when facing deforestation. This also includes endemic butterflies that are more commonly found in old-growth forests. This is caused by human-made phenomena that impose negative impact on humankind. Therefore, obtaining an inventory of a taxa in a region is important as a biodiversity snapshot pertaining to the specific time. This information will be useful for future use in conservation management. The objective of this study is to obtain a preliminary checklist of butterflies in Taka Melor Amenity Forest. To the best of our knowledge, there has been no published inventory study done in this forest reserve prior to this study.

MATERIALS AND METHODS

Study Site

Taka Melor Amenity Forest is part of Labis Forest Reserve. It is a lowland dipterocarp forest located near Kampung Tenang, Labis, Johor. This forest reserve is directly connected to Endau Rompin National Park. It plays a huge role acting as a buffer zone between the national park and the bordering oil palm plantations. Due to the rapid development of Johor, this forest reserve is under constant threat to land use conversion to agriculture and infrastructural development. The objective of this study is to record the diversity of butterflies in Taka Melor Amenity Forest, Labis Forest Reserve, Johor.

Butterfly Sampling

Butterflies were collected manually using aerial nets and baited traps. Sampling by aerial nets were done along a 1 km transect during peak butterfly flight periods of 0900 to 1700 hr. Butterflies were sampled between February 2018 to September 2018. Eleven checkpoints were marked along the 1 km transect starting from CP0 to CP10. Each checkpoint is tagged with a GPS coordinate. About 10 traps baited with rotting fruit (i.e. banana and pineapples)

were hung 1.5 m above ground level and placed 100 m apart along the transect starting from CP0 onwards. Manual collection was done along the transect within a distance of 10 m on left and right sides (Figure 1). Captured butterflies are tagged with the coordinate of its nearest checkpoint. Collections were done in triplicate for each study site for each sampling time (February, July and September). For every visit, the sampling period would be of at least three consecutive days with at least two persons on the field. In total, there are 90 trap days for all ten sites. Thus, for Taka Melor Amenity Forest samplings were carried out for a total of 9 days.

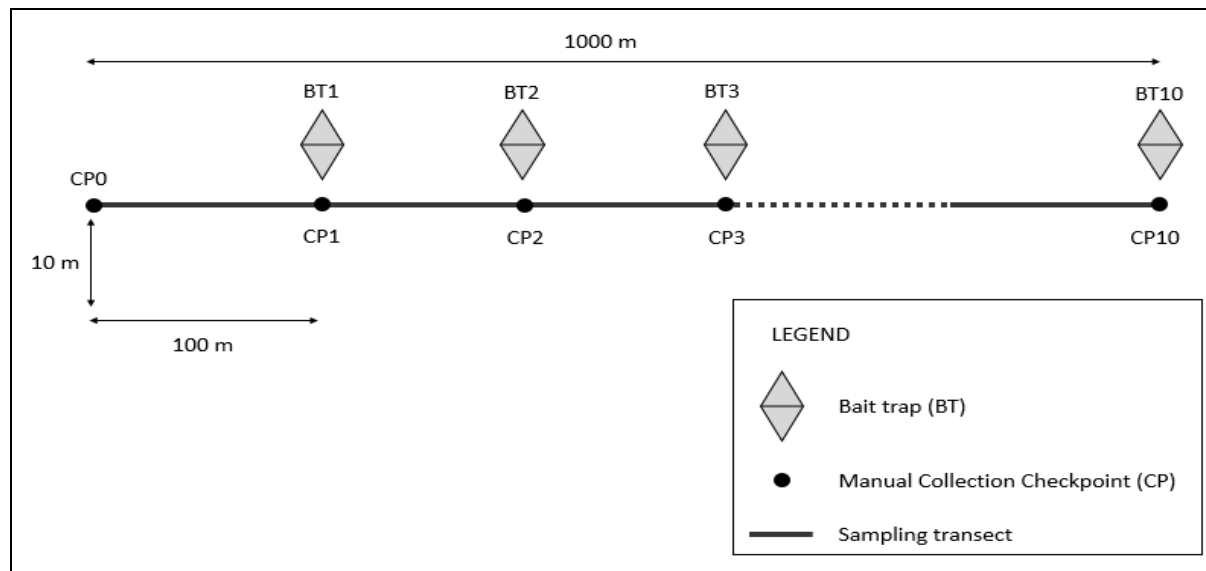


Figure 1. Transect design

Butterfly Curation and Identification

Butterfly collected in the field were paralyzed by gently pinching the thorax. They are then preserved temporarily in glassine envelopes while being transported to the laboratory. In the laboratory, each specimen was softened, spread out, pinned and dried in the oven for at least one week at 40°C (Figure 3.14). All butterfly specimens were identified using keys, plates, photos and description from Corbet and Pendlebury (1992), Kirton (2014), Kirton (2018), Otsuka (2001) and Yong (2000) based on their wing patterns, palpi and sex organ. The two general criteria in distinguishing species was noted, namely wingspan/size and color/pattern. Wingspan measurements were taken from curated and spread samples. The wings were measured from the tip of the left forewings to the thorax. Also, specimens were brought to Centre for Insect Systematic, Universiti Kebangsaan Malaysia and Forest Research Institute Malaysia for verification. Identified specimens were deposited at Centre of Research for Sustainable Uses of Natural Resources, Faculty of Applied Sciences and Technology, Universiti Tun Hussein Onn Malaysia as a reference collection.

Data Analysis

To analyze butterfly species assemblages, statistical software and applications such as Microsoft Excel 2016 and PAST (Hammer et al. 2001) were used. Species diversity will be analyzed using Shannon diversity index (H'). To evaluate distribution pattern evenness index was calculated using Shannon's Evenness (E_H) value (Magurran 2004).

RESULTS AND DISCUSSION

In this study, a total of 88 individuals comprising of 61 species (Table 1) was recorded from Taka Melor Amenity Forest, which is part of Labis Forest Reserve. All six butterfly families were represented. Nymphalidae is the most dominant family with 41 individuals making up 46.6% of abundance. The 31 species of Nymphalidae made up 50.8% of species diversity (Figure 2). This was followed by 13 species (21.3%) of Lycaenidae, 7 species (11.5%) of Hesperidae, 7 species (11.5%) of Pieridae, 2 species (3.3%) of Papilionidae and 2 species (3.2%) of Riodinidae. The high number of Nymphalidae recorded may be due to the baited traps that were used in this study to supplement manual collection. This contradicts the works of Corbet and Pendlebury (1992); they documented family Lycaenidae to be the most species rich family followed by Nymphalidae. Nevertheless, this result agreed with that obtained by Ismail (2017) who employs the same sampling method combining manual collection and baited trapping.

Table 1. Checklist of butterflies in Taka Melor Amenity Forest

No.	FAMILY Species
	PAPILIONIDAE
1	<i>Graphium antiphates itamputi</i>
2	<i>Troides</i> sp.
	PIERIDAE
3	<i>Appias lyncida vasava</i>
4	<i>Eurema ada iona</i>
5	<i>Eurema blanda snelleni</i>
6	<i>Eurema hecabe contubernalis</i>
7	<i>Eurema tilaha nicevillei</i>
8	<i>Gandaca harina distanti</i>
9	<i>Leptosia nina nina</i>
	NYMPHALIDAE
10	<i>Danaus genutia genutia</i>
11	<i>Dophla evelina compta</i>
12	<i>Euploea mulciber mulciber</i>
13	<i>Euploea radamanthus radamanthus</i>
14	<i>Euploea tulliolus ledereri</i>
15	<i>Hypolimnas bolina jacintha</i>
16	<i>Idea stollia logani</i>
17	<i>Ideopsis similis persimilis</i>
18	<i>Junonia almana javana</i>
19	<i>Junonia hedonia ida</i>
20	<i>Lebadea martha malayana</i>
21	<i>Lexias pardalis dirteana</i>
22	<i>Melanitis leda leda</i>
23	<i>Mycalesis intermedia distanti</i>
24	<i>Mycalesis mineus macromalayana</i>
25	<i>Mycalesis oroatis ustulata</i>

26	<i>Mycalesis visala phamis</i>
27	<i>Neptis duryodana nesia</i>
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28	<i>Pantoporia sandaka sandaka</i>
29	<i>Polyura athamas athamas</i>
30	<i>Ragadia makuta siponta</i>
31	<i>Rhinopalpa polynice eudoxia</i>
32	<i>Tanaecia iapis puseda</i>
33	<i>Tanaecia pelea pelea</i>
34	<i>Terinos terpander robertsia</i>
35	<i>Thaumantis klugius lucipor</i>
36	<i>Xanthotaenia busiris busiris</i>
37	<i>Ypthima baldus newboldi</i>
38	<i>Ypthima fasciata torone</i>
39	<i>Ypthima horsfieldii humei</i>
	RIODINIDAE
40	<i>Abisara geza niya</i>
41	<i>Stiboges nymphidia nymphidia</i>
	LYCAENIDAE
42	<i>Caleta roxus pothus</i>
43	<i>Castalius rosimon rosimon</i>
44	<i>Curetis felderi</i>
45	<i>Heliophorus ila malaya</i>
46	<i>Jamides alecto ageladas</i>
47	<i>Jamides elpis pseudelpis</i>
48	<i>Jamides malaccanus malaccanus</i>
49	<i>Jamides pura pura</i>
50	<i>Jamides virgulatus nisanca</i>
51	<i>Loxura atymnus fuconius</i>
52	<i>Nacaduba kurava nemana</i>
53	<i>Prosotas dubiosa lumpura</i>
54	<i>Prosotas nelides</i>
	HESPERIIDAE
55	<i>Iambrix salsala salsala</i>
56	<i>Iambrix stellifer</i>
57	<i>Idmon distanti</i>
58	<i>Koruthaialos rubecula rubecula</i>
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59	<i>Koruthaialos sindu sindu</i>
60	<i>Potanthus mingo ajax</i>
61	<i>Psolos fuligo fuligo</i>
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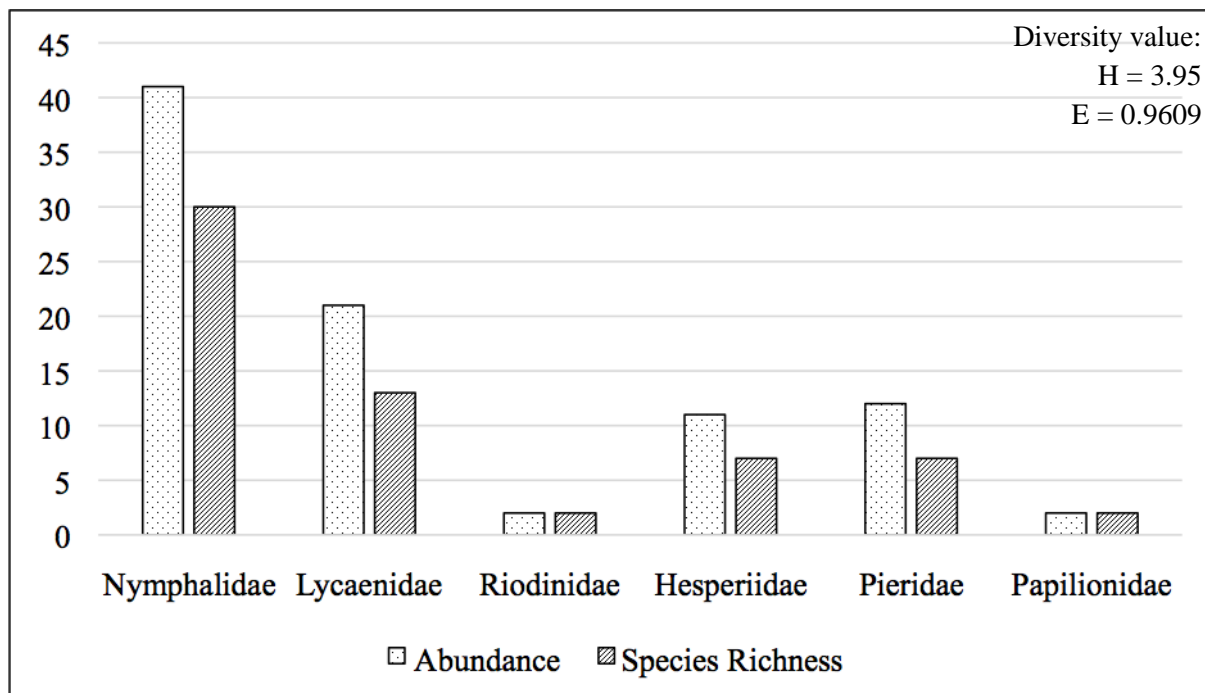


Figure 2. Species richness and abundance in Taka Melor Amenity Forest, Labis Forest Reserve according to family

The Shannon Diversity Index for this site is 3.95 with its respective Shannon's Evenness value of 0.9609. This is relatively high since a diversity survey of butterflies done by Suhaimi et al. (2017) in Fraser Hill recorded an H index value of 3.917. According to the rank abundance curve, the most dominant species within the group is *Pantoporia sandaka* (Nymphalidae) with five individuals recorded (Figure 3). This is followed by *Iambrix salsala* (Hesperiiidae), *Castalius rosimon* (Lycaenidae), *Ypthima horsfieldi* (Nymphalidae) and *Appias lycinda* (Pieridae) with 4 individuals each. 46 species are represented by singletons which accounts for 75.4% of the whole sample. This high percentage of singletons could be due to undersampling since Taka Melor Amenity Forest is quite a small area with limited accessibility due to thick undergrowth. Not much of the areas are explored hence limiting the number of species duplicates obtained. However, four species are new records to Johor. These species are *Curetis felderi* (Lycaenidae), *Heliophorus ila* (Lycaenidae), *Prosatas nelides* (Lycaenidae) and *Thaumantis klugius* (Nymphalidae). One of the genera recorded here, *Troides* is protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II and Wildlife Conservation Act 2010. The butterfly was not identified to species level as it was hovering at mid canopy level, at about 5 meters from ground level.

Labis Forest Reserve holds a great diversity of butterflies. Previous study in Sungai Bantang Amenity Forest, also a part of Labis Forest Reserve by Aqilah and Maryati (2019) recorded 68 species of butterflies. A quick Jaccard similarity index calculation for both Sg. Bantang and Taka Melor yielded a value of 0.14. This means that the species composition of both sites is quite dissimilar despite being in the same forest reserve. The dissimilarity further proves that Labis Forest Reserve holds a greater diversity of butterflies that has yet to be discovered. In total so far, 107 species of butterflies have been recorded in Labis Forest Reserve.

Another most recent checklist of butterflies done in close proximity of Taka Melor was by Khew and Tan (2019) within the Bukit Timah Nature Reserve, Singapore. Their study managed to obtain 63 species from the nature reserve and 85 species from the buffer area surrounding the nature reserve. The difference in number of species between Taka Melor and Bukit Timah Nature Reserve is not high. However, in terms of species composition, there were only 14 similar species between the two sites, with a Jaccard similarity index of 0.12. Alternatively, when Taka Melor was compared with the buffer area surrounding Bukit Timah, the Jaccard similarity index is 0.11 with 15 similar species. This shows that there is still potentially more species to be discovered in Taka Melor as it is located within an almost similar geographical area to Bukit Timah, hence should have an almost similar species composition. That being said, the ecology of butterflies and their interaction with their hostplants, the local climate and human disturbance are complex. Therefore, consistent monitoring of the taxa's abundance and diversity is important to ensure their survival.

This study has added the number of butterflies recorded in the state of Johor based on the new records. Previous review of butterfly diversity in Johor was done by Aqilah et al. (2018) with 396 species recorded in Johor. The rapid development in Johor signifies the high need of constant biodiversity monitoring to ensure they are not negatively impacted.

CONCLUSION

This study recorded 61 species from six families and 42 genera of butterflies in Taka Melor Amenity Forest, a part of Labis Forest Reserve, Johor. From this list four are new records for Johor. These species are *Curetis felderi* (Lycaenidae), *Heliophorus ila* (Lycaenidae), *Prosotas nelides* (Lycaenidae) and *Thaumantis klugius* (Nymphalidae). This preliminary study complements records from several parts of the huge Labis Forest Reserve including Sg. Bantang and Endau Rompin National Park. While Taka Melor may only be an amenity forest, it holds a great potential for further diversity and ecological research.

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