CHECKLIST OF BUTTERFLY FAUNA AT KUALA LOMPAT, KRAU WILDLIFE RESERVE, PAHANG, MALAYSIA

Nur Afny Syazwany Abu Zarim & Amirrudin B. Ahmad*

School of Marine and Environmental Sciences,
Universiti Malaysia Terengganu, 21030 Kuala Terengganu, Terengganu

*Corresponding author: amirrudin@umt.edu.my

ABSTRACT

This study was conducted to record the butterfly fauna at Kuala Lompat, Krau Wildlife Reserve, Pahang in March and May 2013. A total of 302 individuals belonging to 90 species from six families of butterflies were recorded. Family Nymphalidae, the biggest family of butterfly in Peninsular Malaysia was the most diverse (40 species). The least diverse family was Riodinidae with only three species. Shannon index of diversity in May (H' = 3.87) was slightly higher than March (H' = 3.59). High species diversity is expected since this area is less disturbed. More species might be expected if sampling effort were increased.

Keywords. Butterfly, lowland forest, undisturbed, diversity, Malaysia

INTRODUCTION

Butterfly is an insect group from Suborder Rhopalocera (Phylum Insecta: Order Lepidoptera). In the Malay Peninsula, butterfly can be found in various habitats such as riparian, forest, forest fringe, gardens and grasslands. Peninsular Malaysia has an extraordinarily rich butterfly fauna of over more than 1000 species (Corbet *et al*., 1992, Yong *et al*., 2012). Butterflies can be differed from moths (Suborder Heterocera) from the shape of the antennae (Corbet *et al*., 1992). Butterfly antennae is filiform and club-like while moths are usually feather-like or saw edged as seen under naked eye. Butterflies are also usually brightly coloured and mostly active during the day compared to moth which have dull coloured wings and mostly active during night time with an exceptional of some daylight flying moth. As quick guide, when at rest, most butterflies closed its wings in an upright position, revealing the undersides of the wings but moths usually otherwise.

Information on species diversity is crucial for conservation managers to formulate plan to protect a habitat or establish an area for protection. Therefore, it is very important to study species diversity due to various reasons; local and global habitat destruction lead to species lost and for the better understanding of the functional aspect of biological communities in their environment. Studies to document butterfly diversity in Peninsular Malaysia probably begun in the late 1700, and that proliferated in 1800 to the next century by various collectors (Corbet *et al*., 1992). Many new species were described and reported in the early years and today, interest is more on documenting local species richness.

Krau Wildlife Reserve, Pahang which is designated as a reserve area on 1923 was one of the biggest game reserve in Peninsular Malaysia with 55,159 hectares of lowland dipterocarp forest that rich with flora and fauna species. This area was gazetted again in 1965 and 1968 with an increase in the reserve size to 62,395 hectares. We are unaware of any study on butterfly fauna at Kuala Lompat, Pahang field station, hence this study was done to assess the diversity of butterfly species in order to determine the species richness and abundance of butterfly communities in study site.

METHODOLOGY

Study site

This study was conducted at Kuala Lompat field station, Krau during the RHL Krau Biodiversity Inventory Program for two occasions (Figure 1). The survey was done along the foot path at Kuala Lompat in March and May 2013. The study area consists of the open residential area around the field station as well as jungle tracks under an intact lowland forest in between Sungai Lompat and Sungai Krau.

Data collection

Butterflies were captured manually using sweep net along a line transect *circa* 500 m between 0900-1700 hrs for two days. Specimens were identified to the lowest possible taxon using keys and pictorial guide of Corbet *et al*. (1992). Family Riodinidae which was previously placed under family Lyacaenidae as subfamily Riodininae (Campbell *et al*., 2000) is used here. Voucher specimens of certain species which is unable to be identified at the field were kept at General Biology Lab., UMT for further studies.

Data analysis

Several ecological indices were used to measure local diversity (α-diversity) such as Shannon Diversity Index (H'), Richness index (Margalef) and Evenness Index. Abundance data were used to calculate the index value using a program called PAST (Hammer *et al*., 2001).
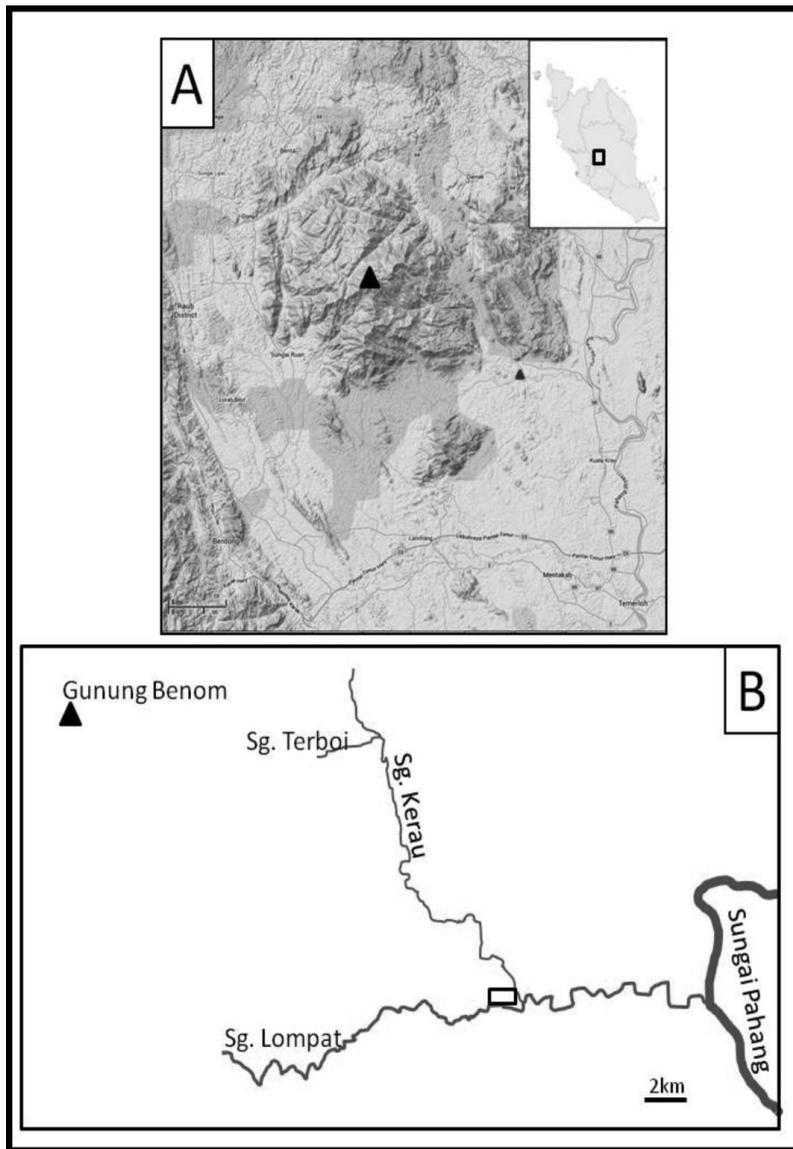
Figure 1.(A) The map showing the location of Kuala Lompat field station (red triangle) where data were collected. The darker shades denote the higher terrain. The solid black triangle indicates Gunung Benom, the highest peak in the area. Inset is the map of Peninsular Malaysia showing the location of the study area. (B). The schematic diagram showing the two main rivers at the study area, Sg. Lompat and Sg. Kerau that flow into Sungai Pahang to the right (east). The black rectangle showed the sampling area located in between the two rivers.

RESULTS

All six families of butterflies reported in Peninsular Malaysia were presented at Kuala Lompat (Table 1). A total of 302 individuals consists of 90 species belong to 56 genera were recorded. The butterfly species composition (Figure 2) clearly showed that family Nymphalidae (39 species) has the highest number of species recorded followed by Lycaenidae (15) and Pieridae (12) while Riodinidae was the least recorded family with three species. Families Papilionidae and Hesperiidae were the other two families documented in this study with 10 species each.

Despite having the biggest representative in Peninsular Malaysia, the combination of families Lycaenidae+Riodinidae has insignificant representative at Kuala Lompat. Families Pieridae and Papilionidae were represented by a relatively rich species, which the former with almost 27% and the latter with more than 20% of the total know fauna in the families. Although more butterflies from the family Nymphalidae were collected in this study, the percentage of species recorded in this sampling was less than 15%. Hisperiidae has the lowest contribution with less than 4%. Overall, only 8.6% of over 1 000 species of butterfly fauna known to Peninsular Malaysia recorded in this study. Checklist of butterflies collected from Kuala Lompat field station was presented in Table 2.

Table 1. The percentage of butterfly fauna recorded in the recent study against the currently knows species of each family in Peninsular Malaysia.

Family	No of species in Peninsular Malaysia	No of species recorded	Percentage of species recorded
Nymphalidae	275	39	14.18
Lycaenidae + Riodinidae	411	15 + 3	4.38
Pieridae	45	12	26.67
Hesperiidae	255	10	3.92
Papilionidae	45	10	22.22
Total	**1 031**	**89**	**8.63**

Note. Numbers of species in families Lycaenidae + Riodinidae were combined. Subfamily Riodininae is currently recognised as a valid family (Campbell *et al*., 2000).

Table 2. Checklist of butterfly fauna recorded at Kuala Lompat field station, Krau, Pahang.

Family	Scientific Name
Papilionidae	*Chilasa paradoxa aenigma*
	Graphium agamemnon agamemnon
	Graphium bathycles bathycloides
	Graphium doson evemonides
	Graphium sarpedon luctatius
	Papilio nephelus sunatus
	Papilio polytes romulus
	Papilio prexaspes prexaspes

	Pathysa antiphates itamputi
	Troides amphrysus ruficollis
Nymphalidae	*Athyma matanga*
	Cirrochroa emalea emalea
	Cirrochroa satelitta satelitta
	Cirrochroa surya
	Cupha erymanthis lotis
	Doleschallia bisaltide pratipa
	Erites elegans distincta
	Eulaceura osteria kumana
	Euploea camarelzaman malayica
	Euploea mulciber mulciber
	Euploea radamanthus radamanthus
	Euthalia monina monina
	Faunis canens arcesilas
	Hypolimnas anomala anomala
	Hypolimnas bolina bolina
	Kallima limborghii amplirufa
	Lasippa tiga siaka
	Lexias cyanipardus
	Lexias dirtea merguia
	Lexias pardalis dirteana
	Mycalesis patiana patiana
	Pandita sinope
	Pantoporia hordonia hordonia
	Pantoporia sandaka
	Parantica agleoides agleoides
	Parthenos sylvia lilacinus
	Phalantha alcippe alcesta
	Rhinopalpa polynice eudoxia
	Tanaecia iapis puseda

Table 2. [continue]

Family	Scientific Name
Nymphalidae	*Tanaecia julii bougainvillei*
	Tanaecia pelea pelea
	Terinos atlita teuthras
	Terinos clarissa malayanus
	Terinos terpander robertsia
	Xanthotaenia busiris busiris
	Ypthima huebneri
	Ypthima pandocus corticaria
	Zeuxidia amethystus amethystus
Pieridae	*Appias libythea olferna*
	Appias lycinda vasava
	Appias nero figulina
	Catopsilia pomona pomona
	Delias hyparate metarate
	Eurema ada iona
	Eurema andersonii andersonii
	Eurema blanda snelleni
	Eurema hecabe contubernalis
	Eurema sari sodalis
	Eurema simulatrix tecmessa
	Gandaca harina distanti
	Leptosia nina nina
Lycaenidae	*Allotinus leogoron leogoron*
	Anthene emolus goberus
	Anthene lycaenina miya
	Caleta elna elvira
	Caleta roxus pothus
	Cheritra freja frigga
	Curetis regula
	Jamides celeno aelianus
	Jamides pura pura
	Nacaduba subperusia lysa
	Prosotas dubiosa lumpura
	Prosotas lutea sivoka
	Prosotas pia pia
	Zeltus amasa maximinianus
	Zizina otis lampa

Table 2: [continue]

| Family	Scientific Name
Riodinidae	*Paralaxita damajanti damanjanti*
	Paralaxita orphna laocoon
	Zemeros emesoides emesoides
Hesperiidae	*Ancistroides nigrita maura*
	Celaenorrhinus ladana
	Hasora leucospila
	Hasora terminatus
	Hasora vitta vitta
	Koruthaialos sindu sindu
	Pirdana distanti distanti
	Potanthus omaha omaha
	Pseudokerana fulgur
	Tagiades japetus atticus
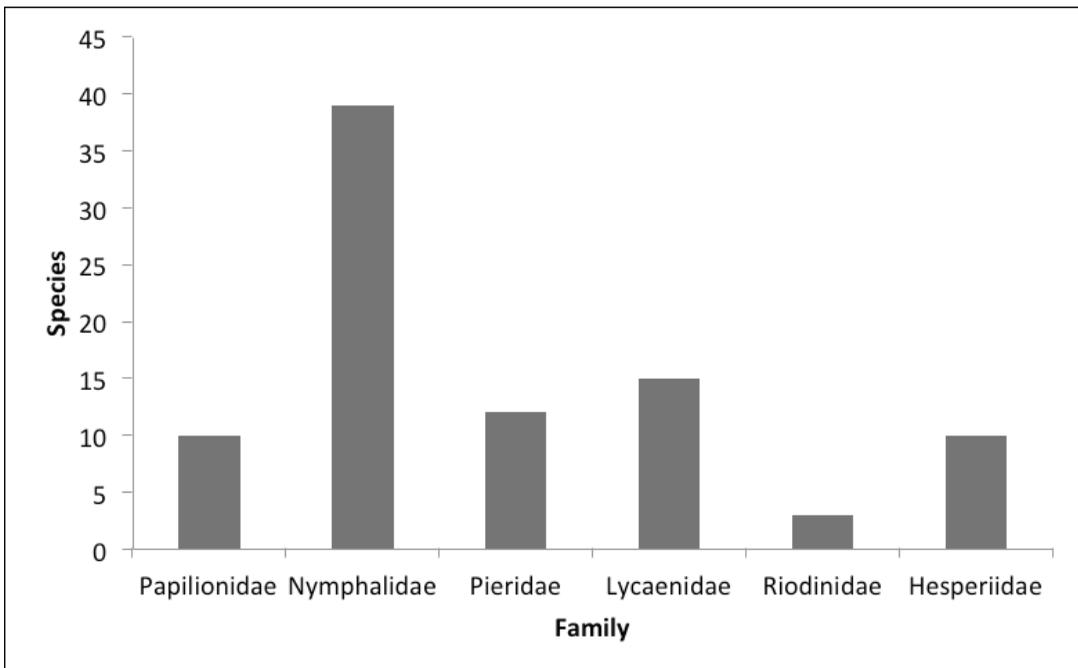
Figure 2. Species composition of butterfly fauna for each family recorded at Kuala Lompat field station showing uneven distribution of species richness.

Rank-abundance curve (Figure 3) plotted based on data collected at Kuala Lompat field station indicated that many species recorded in this study can be considered rare (DeVries *et al*., 1997).

Many species were represented by small number of individual; a total of 71 species were represented by five or less specimens. The Colonel, *Pandita sinope* (Family Nymphalidae) is the most common butterflies species at the study site (15 individuals) followed by *Jamides celeno aelianus* (14 individuals), *Cirrochroa surya* and *Prosotas dubiosa lumpura* with 12 individuals each.
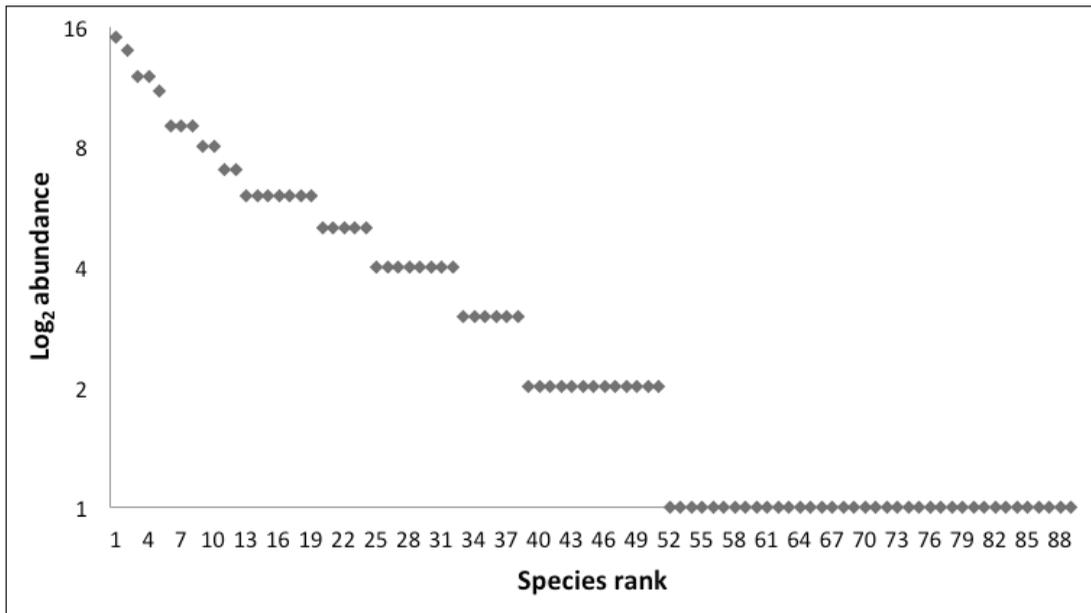

Figure 3. Rank-abundance distribution of butterflies in Kuala Lompat, Krau, Pahang which shows that there were more rare species collected than the common ones.

The species diversity, richness and evenness indices of butterfly at Kuala Lompat field station in general are high. Shannon Diversity Index (H') for March 2013 sampling was 3.87 and 3.58 for May 2013. There was a slight decreased in the H' value between the two months. Richness index measured using Margalef formula (R1) gave a opposite pattern where low richness in March (9.0) compared to that of May (13.4). Evenness Index (J) in May (0.69) was found to be lower than that of March (0.80).

DISCUSSION

To date, there was no previous study on butterflies in this area known to us. The finding of this study contributed to the local fauna database which can be useful for further research. In total, about 9% Rhopalocera of Peninsular Malaysia found at Kuala Lompat field station. Some places recorded approximately 5-10% of the total Rhopalocera known in this region.

This site was dominated by species from the family Nymphalidae compared to the other butterfly families due to their property of being taxonomically recognized, broader range of species description and larger family size with many subfamilies and species compared to the others (Corbet *et al*., 1992; DeVries, 1997). The proportion of species collected to family Nymphalidae was however, ranked third after Peiridae and Papilionidae that contributed more than 20% of the known species in Peninsular Malaysia. Despite contributing 41 species, research conducted by Norela *et al*. (2011) showed that Nymphalidae contributed slightly less than 15% of butterfly fauna at Hutan Air Terjun Parit and Gunung Jasar, Cameron Highland, which the highest composition of species:family ratio led by Pieridae (24.44%).

The common pattern of distribution where very few common species but many rare was also demonstrated by butterfly fauna collected at the study sites (Figure 3). In many cases, singletons dominated the catch and only few species has more than one individual (e.g., Norela *et al*., 2011). Few common species usually came from the family Nymphalidae. Other families usually represented by a few individual.

Diversity indices are often computed as a measure of species diversity of a community. It provide information about community composition than simply observed species (i.e., the number of species recorded) that taking into consideration the relative abundances of different species in the sample. Even distribution (i.e., similar of number of individual captured) tend to increase the value of Shannon diversity index (H') and the evenness index. In this study, the values of H' was relatively high. This gave a strong indication that no species really dominating the catch. These may be related to the pristine environment and complex vegetation structure that able to support more butterfly species (Vu and Vu, 2011).

This study is still preliminary but provides additional information on butterfly at Kuala Lompat field station, Krau. The finding is essential to increase baseline knowledge of fauna presence at the study area. The result of this study may help in planning conservation program and managing the reserved to safeguard its flora and fauna for future generation.

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