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BUTTERFLIES (LEPIDOPTERA: PAPILIONOIDEA) DIVERSITY AT ENDAU-ROMPIN JOHOR NATIONAL PARK, MALAYSIA AND PRIORITISING THE POTENTIAL GROUPS FOR NATURE TOURISM PRODUCT

Norradihah Ismail[1], *Maryati Mohamed[1], Kahirol Mohd Salleh[2], Phon Chooi Khim[3] & Lili Tokiman[4]

[1]Centre of Research for Sustainable Uses of Natural Resources, Faculty of Applied Sciences and Technology, Universiti Tun Hussein Onn Malaysia, Campus Pagoh, KM 1 Jalan Panchor, 84000 Muar, Johor, Malaysia.
[2]Faculty of Technical and Vocational Education, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia.
[3]Forest Research Institute Malaysia, 52109 Kepong, Selangor, Malaysia.
[4]Johor National Parks Corporation, Level 1, Dato' Mohamad Salleh Perang Building, Kota Iskandar, 79100 Nusajaya, Johor, Malaysia.

*Corresponding author's email: maryati@uthm.edu.my

ABSTRACT

From a total of 17,461 species of butterfly described worldwide, at least two-third are from the tropics. Peninsular Malaysia is home to 1038 butterfly species. Endau-Rompin Johor National Park (ERJNP) in particular recorded 349 species as analysed from collections of 1987 to 2015. It represents 34% of butterfly fauna in Peninsular Malaysia. This paper aims (i) to document the diversity of butterfly in ERJNP and (ii) identify potential groups of butterfly that satisfy six criteria for good nature tourism product. The criteria are reliability of sighting, safe, with unique morphology and behaviour, rare or endemic and with cultural linkage. The samplings were done manually using aerial net and trapping using fruit baits along two 1 km transects in the eastern part of ERJNP (Nature Education and Research Centre and Kuala Jasin) from February 2014 to July 2015. This study successfully recorded 131 species comprising of 491 individuals from five families. Nymphalidae was the most dominant family, making up 51% of butterfly abundance and richness. Five dominant species were recorded with 31 to 43 individuals per species. The values of Shannon diversity index (H') and species evenness index (E') were 4.123 and 0.471 respectively. Significantly, eight

species collected were protected under the Wildlife Conservation Act, 2010 and 14 were considered rare and uncommon. Butterflies are frequently encountered, morphologically and behaviourally unique. These attributes fascinate visitors of the park, thus butterfly has a potential to be promoted as new attraction for nature tourism in ERJNP.

Keywords: Endau-Rompin Johor National Park, butterfly diversity, nature tourism

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INTRODUCTION

Endau-Rompin Johor National Park (ERJNP) is the most prominent tropical lowland rainforest in the southern-most part of Peninsular Malaysia and situated between two states, Johor and Pahang, with 38,780 ha in Pahang (Kiew *et al*., 1987) and 48,905 ha in Johor (Chew, 2007). In Johor, it can be accessed from Selai (western part) and Peta (eastern part). Logging activity was active during end of 1980 to early 1990. ERJNP was officially established as a national park on 2nd September 1993 and fully governed under Johor National Park Corporation (JNPC) (Aiken, 1984; DWNP, 1996). Significantly, it is considered as an old tropical rainforest with the oldest rock dated at least 248 million years old and the oldest plant fossil was reported to be at least 160 million years old (Idris *et al*., 1987). ERJNP harbors rich biodiversity and has high diversity of flora and fauna including butterflies. The high diversity of butterflies in ERJNP was noted through records of several general collections, research projects as well as scientific expeditions conducted by researchers from 1985 to 2013 (Kirton & Kirton, 1987; Sofian-Azirun *et al*., 2005; Zaidi *et al*., 2009; Maryati *et al*., 2013).

Together with moths, butterflies belong to order Lepidoptera, considered as the second largest order after Coleoptera in term of species richness (Gullan & Cranstan, 2010). Butterflies are among the best-known insect group with estimated 17,461 described species in the world and at least two-thirds of species

recorded from the tropical region (Pogue, 2009). The tropical region harbours more butterfly species compared to the temperate region. For instance, 482 species are recorded in Europe (Van Swaay *et al*., 2010) and 292 from Canada (Kerr, 2001). Comparatively there is a total of 1038 species reported in Peninsular Malaysia (Eliot & Kirton, 2000) and 944 in Borneo (Otsuka, 2001).

Butterflies are ecologically important as pollinators and biological indicators for habitat and environmental changes. They are also known as the winged beauties as their slow, fluttering flights often reveal dazzling wings' colours and patterns (Morrell, 1960; Peggie & Amir, 2006). Several studies have introduced insects including butterflies as a potential nature tourism product and had been a part of tourism activities, which is better known as Entomotourism (Lemelin, 2009; Maryati *et al*., 2014; Hamdin *et al*., 2015). For example some butterfly parks have been successfully developed across Malaysia, including in Kuala Lumpur, Penang, Melaka, Cameron Highlands and Sabah as part of family leisure destinations and indirectly educate the public on the conservation of butterflies (Butterfly-Insect.com, 2010). Moreover, Tamat (2004) indicated that 93% of tourists are interested in Entomotourism and most of them (63%) are attracted to butterflies due to their uniqueness and stunning colouration.

The first objective of this study is to provide for a current checklist of butterflies in ERJNP. Secondly, based on current and previous findings, this paper would identify potential groups of butterflies that satisfy six criteria for nature tourism product. The criteria are reliability of sighting, safe, uniqueness in morphology and behaviour, rare or endemic and with link to local culture.

METHODOLOGY

Study Area

The collections were conducted in the eastern part of ERJNP covering Nature Education Research Centre (NERC) and Kuala Jasin; within latitudes 2° 32'N and longitudes 103° 24'E (Figure 1). Samplings were carried out along logging tracks, forest trails, around hostels/chalets and along riverbank within altitudes of 10 to 100 m a.s.l. The vegetation comprised of logged over and lowland mixed dipterocarp forest. Dominant plant species are families Dipterocarpaceae, Burseraceae, Leguminosae, Melastomataceae, forest floor herbs, ferns and bamboos (Wong *et al*., 1987). The chosen sampling transects are easily accessible and convenient for tourist activities.

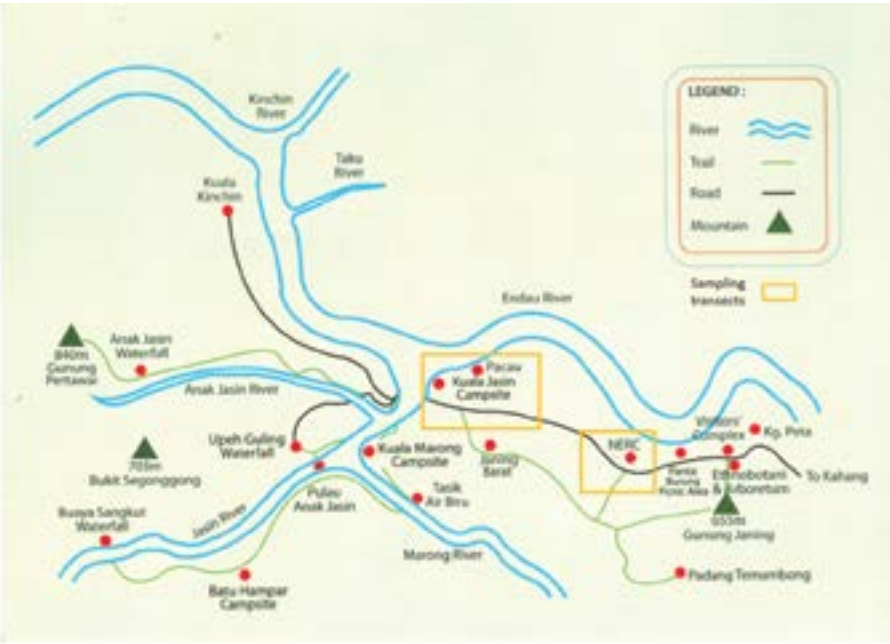

Figure 1 Map showing two sampling transects (Source: Living Life a Live Utan Ujan Way, 2012)

Data Collection

Ecological data

Butterflies were surveyed along two 1 km transects within width of 10 m on either side of transects from 09:00 h to 17:00 h. Two main techniques were employed; manual collection using aerial nets and fruit baits trapping (using over-ripe banana and pineapples as baits). Samplings were conducted during ten visits from February 2014 to July 2015. In the field, butterfly specimens were manually sacrificed by pinching the thorax using thumb and forefinger and then temporarily kept in envelopes. In the laboratory, each specimen was spread out and pinned on the mounting board. Then, dried in the oven for one to two weeks at low temperature (45 to 50°C). All butterfly specimens were identified using keys in Corbet and Pendlebury (1992). Butterflies collections were deposited at Repository Room of Centre of Research for Sustainable Uses of Natural Resources, Universiti Tun Hussein Onn Malaysia.

Preliminary questionnaire surveys on visitors

Surveys were carried out on the visitors in ERJNP. The total number of respondents was 76 and the questionnaire consisted of closed ended questions and divided into two parts; demography and entomotourism. In general, the questionnaire aims to test the effectiveness of a module used to gauge knowledge of visitor about insects and educate them on use of insects as one of nature tourism products. This paper emphasises on a part of the questionnaire, pertaining to the cluster of criteria for good nature tourism product. The criteria are reliable sighting, morphological and behavioural attractiveness, rare or/and endemic, safe and culturally linked.

Data analysis

The species diversity was determined using Shannon diversity index (H'). In addition, pattern of species distribution in an assemblage was analysed by species evenness index (E'). All data were calculated using statistical software Past (version 1999-2013) (Hammer *et al*., 2001). Quantitative data, collected using questionnaire were analysed using Statistical Package for Social Sciences (SPSS Version 18) to determine mean value for each item of the criteria.

RESULTS AND DISCUSSION

Checklist of Butterflies in ERJNP

As listed in Appendix 1, a total of 131 species comprising 491 individuals from five families were recorded during the inventory from two sampling transects in ERJNP (NERC and Kuala Jasin). The total number of species collected in this study, represented 13% of total butterfly fauna in Peninsular Malaysia (1,038 species recorded) (Eliot & Kirton, 2000). This study updated the checklist of butterflies in ERJNP as it successfully added 27 new records when compared with previous reports of 1987, 2005, 2009 and 2013 (Kirton & Kirton, 1987; Sofian-Azirun *et al*., 2005; Zaidi *et al*., 2009; Maryati *et al*., 2013). The 27 new records are two papilionids (*Graphium doson evemonides* and *Pachliopta neptunus neptunus*), one pieriids (*Eurema brigitta senna*), 13 nymphalids (*Mycalesis intermedia distanti, Mycalesis perseus cepheus*, *Amathusia ochraceofusca*

ochraceofusca, *Amathusia phidippus phidippus*, *Dichorragia nesimachus deiokes*, *Euthalia aconthea gurda*, *Euthalia kanda marana*, *Euthalia monina monina*, *Junonia hedonia ida*, *Lasippa heliodore dorelia*, *Pantoporia dindinga*, *Polyura hebe chersonesus* and *Charaxes solon echo*), 10 lycaenids (*Abisara geza niya*, *Allotinus apries apries*, *Allotinus portunus maitus*, *Arhopala overdijkinki unda*, *Jamides bochus nabonassar*, *Jamides elpis pseudelpis*, *Jamides talinga*, *Nacaduba pactolus odon*, *Ritra aurea volumnia* and *Zizeeria karsandra*) and one hesperiid (*Notocrypta pria*).

Species Composition at Two Sampling Transects

Overall, Nymphalidae was the most well represented family with 67 species collected. This was followed by Lycaenidae with 29 species recorded. Next, Pieridae recorded 15 species and Papilionidae, 13. Lastly, Hesperiidae has the lowest number of butterfly species with only 7 species recorded (Figure 2). Pattern of diversity is almost similar at the two sampling transects where Nymphalidae was the most diverse and Hesperiidae being the least diverse.

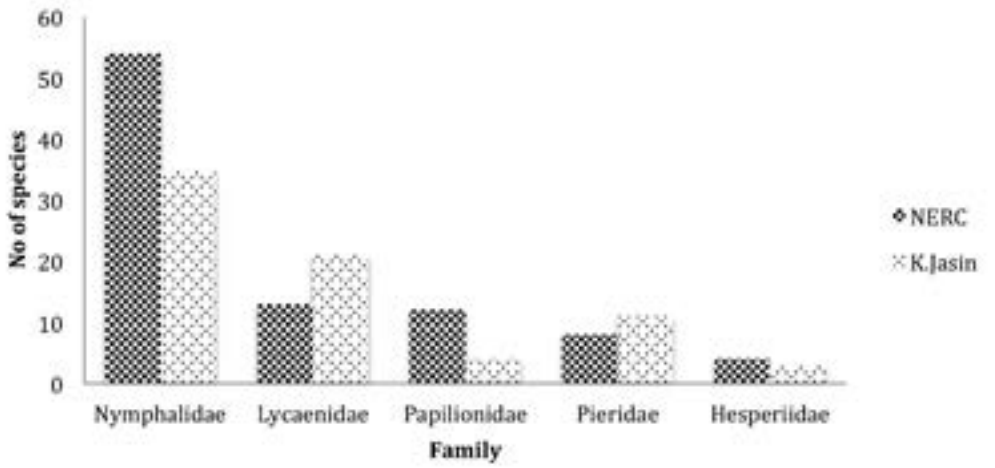

Figure 2 Composition of butterfly species at two sampling transects in ERJNP

In term of abundance, the collection was dominated by Nymphalidae (51%) contributing more than half of total individuals recorded in ERJNP. This was followed by Lycaenidae (22%), Papilionidae (15%) and Pieridae (10%). The least abundant family was Hesperiidae (2%). The use of baited traps had successfully collected more species from Nymphalidae, especially fruit feeding

nymphalids to the collections. This is supported by Min (2014) who found that traps baited with rotten banana had successfully lured highest number of fruits feeding nymphalids. In fact, nymphalid species are easily found as they are active fliers, polyphagous and inhabit various kinds of habitat (Abang & Fauzi, 2004; Lodh & Agarwala, 2013). In contrast, Hesperiidae was poorly presented during the survey because they are difficult to see in flight as they are fast fliers and morphologically resembling moths. In fact, many hesperiid species are considered rare and uncommon (Corbet & Pendlebury, 1992; Kirton, 2014).

Diversity of Butterfly in ERJNP

Two indices were used to determine species diversity and evenness in ERJNP. The Shannon diversity index (H') and species evenness index (E') were 4.123 and 0.471 respectively. This indicates that the species diversity in ERJNP is high with evenly distributed species distributions.

Based on surveys from 1985 to 2015, the number of butterfly species recorded from ERJNP had substantially increased and this indicated that more additional species could be recorded if the surveys continued. So far, the present total species of butterfly recorded in ERJNP is 349 species, comprising 34% of the butterfly fauna in Peninsular Malaysia. This figure is considerably high than other lowland forests such as Batu Apoi Forest Reserve, Brunei with 325 species (Orr & Haeuser, 1996), Tabin Wildlife Reserve, Sabah with 310 species (Jalil *et al*., 2003), Perlis State Park with 178 species (Noack, 2002), Endau-Rompin National Park, Pahang with 89 species (Zaidi *et al*., 2002) and Bau Limestone Forest in Sarawak with 194 species (Karim & Abang, 2004).

Six Criteria of Good Nature Tourism Product for Butterfly

As reported by Kueh *et al*. (2006), organism based tourism such as Anurans Tourism to promote frogs and toads as new market for nature tourism, had been successfully implemented in Sabah. There are seven criteria used to develop a good nature tourism product: endemism, rarity, reliability of sightings, morphological attractiveness, behavioural enticement, safety, and linkage to local cultures (Kueh *et al*., 2006).

In this study, it was found that butterfly satisfied six criteria (reliability of sighting, safe, unique morphology and behaviour, rarity and cultural linkage) and could be promoted as a new attraction for ERJNP. Below the authors discussed each of the criteria.

i. Rarity

In term of conservation status, 12 species considered rare and uncommon; *Amathuxidia amythaon*, *Dichorragia nesimachus*, *Zeuxidia doubledayi*, *Rhinopalpa polynice*, *Agatasa calydonia*, *Charaxes durnfordi*, *Charaxes solon*, *Zizeeria karsandra*, *Arhopala wildeyana*, *Arhopala overdijkinki*, *Neomyrina nivea* and *Eetion elia* were recorded in this study. Meanwhile, two species are very rare to Peninsular Malaysia; *Ritra aurea volumnia* and *Celaenorrhinus ladana* (Fleming, 1987; Corbet & Pendlebury, 1992; Kirton, 2014). Some species were rarely seen as they are cryptic and well camouflaged with dead leaves on the forest floor. Mostly, they inhabit under closed canopy forest and in dense vegetation forests (Kirton, 2014).

Notably, two species namely *Trogonoptera brookiana* and *Troides amphyrysus* were listed in Appendix II of Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) as any trade of the specimens must be controlled to avoid overexploitation of the resources (CITES, 2016). Apart from that, eight species were listed as protected species under Wildlife Conservation Act 2010 [Act 716]; *Trogonoptera brookiana*, *Troides amphyrysus*, *Idea stolli*, *Zeuxidia aurelius*, *Agatasa calydonia*, *Charaxes durnfordi*, *Charaxes solon* and *Prothoe franck*. They are vulnerable to illegal trade because of their great aesthetic appeal and some had been harvested and exported globally (UNEP-WCMC, 2012). However, it is considered illegal to harvest, keep or trade specimen of the protected species without a licence except for research purposes (Wildlife Conservation Act, 2010).

ii. Reliability of sighting

Butterfly is considered reliable in terms of its presence, being abundant and easily sighted, in ERJNP. Reliability of sighting in term of availability of butterfly presence and best observation time are important criteria to facilitate visitors enjoying the diversity of butterflies in the park (Deng *et al*., 2002). Rank abundance was used to rank species by abundance and identify commonness and rarity of the species as shown in Figure 3 (Magurran & Henderson, 2011). The species were divided into four clusters; the most abundant (>30 individuals), common (>10 individuals), moderate (<10 individuals) and rare or least abundant (<3 individuals) (Tiple *et al*., 2012; Anas, 2016).

Five species were considered as the most abundant as the total catch for each of these species during this research was from 31 to 43 individuals. The species with

the highest abundance was *Graphium sarpedon* with 43 individuals (sampling trail by the riverside and this species could be commonly found sipping minerals from wet sand). This was followed by *Bassarona teuta* (34 individuals) collected using baited traps and under closed canopy. Total catch for *Zizeeria karsandra* was also 34 and for *Prosotas aluta,* 31. Observations demonstrated that, high abundance for both species was due to the blooming of flowers of their food sources during the sampling time in April. Interestingly, *Tanaecia palguna* were abundantly found only in Kuala Jasin trail as they were successfully lured into the baited traps using rotten pineapples.

Three species were ranked 5th to 10th are common species, whereas 37 species were classified as moderate. More than half of the species fauna were considered rare, recording 63 singletons and 22 doubletons species including *Dichorragia nesimachus*, *Rhinopalpa polynice*, *Arhopala wildeyana*, *Arhopala overdijkinki*, *Ritra aurea, Celaenorrhinus ladana, Troides amphyrysus*, *Gandaca harina, Pantoporia dindinga, Faunis canens* and *Notocrypta pria*. In fact, some species are reported as rare and uncommon species due to fast flying and cryptic habits (Fleming, 1975; Corbet & Pendlebury, 1992; Kirton, 2014).

Figure 3 also indicates that for both sampling areas, the pattern of abundance were similar, whereby few species were abundant but many more were with low number of individuals. It is probably reflected by thoroughness of the sampling effort, sampling time (some species appear occasionally contributing to low abundance) and ecology of the species (behaviour and conservation status) (Magurran & McGill, 2011).

Analysing degree of overlapping of species, 34 species were found distributed at both NERC and Kuala Jasin. They were *Graphium eurypylus*, *Eurema hecabe*, *Dophla evelina*, *Zemeros emesoides* and *Cirrochroa orissa*. Generally they were commonly found at open canopy area of the forest trail and actively flying, seeking for sunlight. Some of the fruit feeding nymphalid such as *Dophla evelina* were successfully collected using baited trap with the rotten fruits.

In this study, more diverse butterfly species were found during dry season in April to September due to the favourable weather conditions and availability of food sources during those time, possibly enhance the presence of butterflies in ERJNP. Major flowering season of big tree in tropical rainforest occurred in April to May and followed by fruit ripening in July to August, providing more food sources for butterflies (Davison, 1987; Bawa *et al*., 2003). Moreover, dry season also positively increased the butterfly activity and foraging (Ribeiro *et*

al., 2010). Likewise, as reported by Mustaffa (2001), species abundance and richness of butterfly in primary forest of Danum Valley, Sabah highly diverse in April to June.

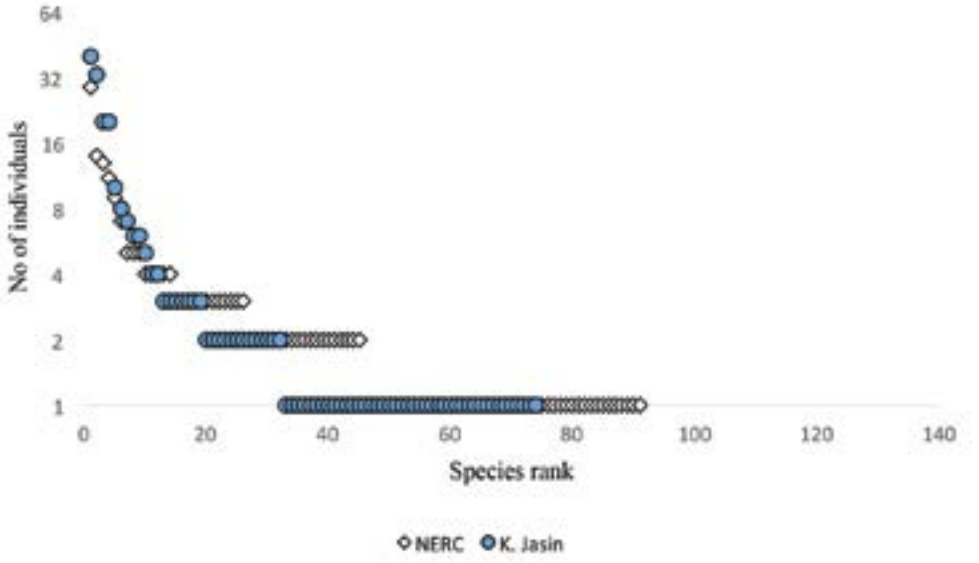

Figure 3 Rank abundance curve of butterfly at two sampling sites in ERJNP. The species were clustered into 4 groups; abundant, common, moderate and rare

iii. Morphological attractiveness

To evaluate morphological and behavioural attractiveness, the questionnaire survey were conducted on 76 local visitors who came to ERJNP. The respondents aged between 19 to 48 years old and varied in their backgrounds such as students, government and private servants. From this survey, they were attracted to a variety of insects in the forests as these were easily encountered during outdoor activities (M=4.18, SD=0.88). Most visitors were fascinated by their morphology, patterns and colours (M=4.18, SD=0.93). It has been noted that butterflies vary enormously in sizes, shapes and colours. Most butterflies are colourful and have bright and striking colours, and could fascinate our vision; some however, are drab brown or grey. As reported by Maryati *et al*. (2014), most visitors in Gunung Ledang National Park were attracted to insects such as butterflies, beetles, odonates, moths, ants and cicadas mainly because of their appealing colours and unique shapes and large sizes.

As an example, in Peninsular Malaysia, the striking Rajah Brooke (*Trogonoptera brookiana*) has a pair of large birdwing, decorated with prominent emerald green triangular bands. Its wings are covered with black background coloration and a splash of metallic blue markings on the underside of its wings. This butterfly species has the potential to be an icon for ERJNP as they can be found in garden at the lodging area and near the river especially during our visit in April and June. Figure 4 shows a photograph of the species found in Kuala Jasin trail.

Figure 4 The striking Rajah Brooke (*Trogonoptera brookiana*) was recorded in Kuala Jasin trail

iv. Behavioural enticement

Apart from that, butterfly demonstrates attractive behaviours such as mud-puddling on a moist spot and camouflages well with the surrounding as a survival strategy. Some of them flutter their wings when sipping on flower nectar and glide gracefully in the air, thus revealing their appealing wing patterns. For example an Ashy-white Tree Nymph, Idea stolli named as "Kupu-kupu Surat" in Malay or "letter" glides gracefully in the air similar to a piece of paper blown by wind (Corbet & Pendlebury, 1992).

v. Safety

Safety is an important and critical characteristic for an organism based nature tourism product. Based on response of the 74 respondents, they felt that Entomotourism is safe to be part of their activities (M= 3.89, SD= 0.87). Butterflies are considered safe to be a tourism product, as they do not have sting. Generally scales on the wings are not poisonous and their sizes are relatively small (Maryati & Ismail, 2017).

vi. Cultural linkages

Most respondents believed that insects are associated with local people's culture (M= 3.977, SD= 0.86). Among insects, butterfly is generally associated with belief of indigenous people (Ismail & Maryati, 2014). For example, Jakun ethnic in ERJNP believed that if a butterfly enters their house, it would bring blessing for them and indicator for flowering season. According to Ismail (2015), Temuan ethnic in Ledang referred to a white butterfly such as *Appias albina* as good luck symbol, whereas black butterfly such as *Laxita thuisto* as "Pelampas", would mean bad luck or evil. Indeed, butterfly is best known as the most beautiful creature and believe as a symbol of good fortune, love, livelihood and longevity (Sen, 1983; Abang, 2006).

It is possible to promote butterflies as new attraction for ERJNP as they complied well to most of the criteria for good nature tourism products. Based on Kurnianto *et al*. (2016), butterfly demonstrates high potential as new tourism product in Coban Rais Waterfall, East Java based on several criteria. Results of this research discovered interesting behaviours such as mud-puddling and mating activities. In addition, some are rare and protected species and these could be promoted as new tourist attraction. The knowledge on reliability of sighting, such as hotspots for large population of butterflies, the right seasons and visiting time are important factors and had been facilitating visitors enjoying the diversity of butterflies in Coban Rais Waterfall (Kurnianto *et al*., 2016).

It had been shown that butterfly tourism had been offered at the west central of Mexico, attracted more than 250 000 visitors per season to enjoy aggregations of Monarch Butterfly (*Danaus plexxipus*) that overwintered in Sierra Madre Biosphere (Barkin, 2003).

CONCLUSION

Significantly, this study provided the updated butterfly checklist in ERJNP, which could be a baseline data and reference point for the conservation effort and future biodiversity assessment especially in the state of Johor. The high diversity enhances the credibility of ERJNP as a prominent tourist hotspot with unique microhabitats supporting diverse butterfly species. Apart from common activities such as jungle trekking, hiking, camping and birding, butterfly watching could be introduced as a new attraction for ERJNP. Previously, firefly (Coleoptera: Lampyridae; *Pteropteryx* sp.) brings in tourist to Kampung Kuantan, Kuala Selangor to enjoy fireflies' watching at night and eventually generates income and profits to the local tour operators (Jaafar *et al*., 2010).

As discussed in this paper, butterfly satisfies six criteria of good nature tourism product. Thus, this insect group is potential resource as new attraction for ERJNP and a flagship for terrestrial environment. It is in line with the strategies of the sixth National Key Research Areas (NKRA) to encourage diversification of tourism products (UPE, 2010). However, tourism is not only about the products. The interpretation process is perhaps as important. Human resources (national park staff and tour guide) are key players to successfully promoting butterflies as tourist attraction in ERJNP. In turn, providing them a proper module and training courses would enhance their knowledge in term of butterfly's taxonomy and ecology. At the same time, the environmental protection and local people's welfare should not be jeopardised so as to sustain the credibility and sustainability of nature tourism and conservation of the park.

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Appendix 1 The checklist of butterfly species recorded at two areas; NERC and Kuala Jasin, ERJNP. Species list are arranged according to taxonomic classification order from Corbet and Pendlebury (1992).

Family	Subfamily	No.	Species	NERC	Kuala Jasin
Papilionidae	Papilioninae	1	*Graphium agamemnon agamemnon* (Linnaeus, 1758)	1	0
		2	*Graphium doson evemonides* (Honrath, [1884])	1	0
		3	*Graphium eurypylus mecisteus* (Distant, 1885)	2	10
		4	*Graphium evemon eventus* (Fruhstorfer, [1908])	1	0
		5	*Graphium sarpedon luctatius* (Fruhstorfer, 1907)	3	40
		6	*Pachliopta neptunus neptunus* (Guérin-Méneville, 1840)	2	0
		7	*Papilio demolion demolion* Cramer, [1776]	1	0
		8	*Papilio iswara iswara* White, 1842	0	1
		9	*Papilio memnon agenor* Linnaeus, 1758	1	0
		10	*Papilio nephelus sunatus* Corbet, 1940	3	0
		11	*Pathysa antiphates itamputi* (Butler, 1885)	3	0
		12	*Trogonoptera brookiana* (Wallace, 1855)	2	3
		13	*Troides amphyrysus ruficollis* (Butler, [1879])	1	0
Pieridae	Pierinae	14	*Appias cardena perakana* (Fruhstorfer, 1902)	0	2
		15	*Appias indra plana* Butler, [1879]	2	3
		16	*Appias lyncida vasava* Fruhstorfer, 1910	0	1
		17	*Appias paulina distanti* (Moore, [1905])	0	1
		18	*Catopsilia pomona pomona* (Fabricius, 1775)	0	6
		19	*Delias hyparete metarete* Butler, [1879]	0	8
		20	*Leptosia nina nina* (Fabricius, 1793)	2	2

Family	Subfamily	No.	Species	NERC	Kuala Jasin
	Coliadinae	21	*Eurema ada iona* Talbot, 1939	0	1
		22	*Eurema andersonii andersonii* (Moore, 1886)	1	0
		23	*Eurema brigitta senna* (C. & R. Felder, [1865])	0	1
		24	*Eurema hecabe contubernalis* (Moore, 1886)	1	7
		25	*Eurema sari sodalis* (Moore, 1886)	5	4
		26	*Eurema simulatrix tecmessa* (de Nicéville, [1896])	1	0
		27	*Eurema tilaha* nicevillei (Butler, 1898)	1	0
		28	*Gandaca harina* distanti Moore, [1906]	1	0
Nymphalidae	Danainae	29	*Danaus melanippus hegesippus* (Cramer, [1777])	4	1
		30	*Euploea mulciber mulciber* (Cramer, [1777]	5	0
		31	*Euploea radamanthus radamanthus* (Fabricius, 1793)	9	1
		32	*Idea stolli logani* (Moore, 1883)	13	2
		33	*Ideopsis vulgaris macrina* (Fruhstorfer, 1904)	3	1
		34	*Parantica aspasia aspasia* (Fabricius, 1787)	2	1
	Satyrinae	35	*Elymnias panthera panthera* (Fabricius, 1787)	1	0
		36	*Elymnias penanga penanga* (Westwood, [1851])	3	0
		37	*Melanitis leda leda* (Linnaeus, 1758)	4	0
		38	*Mycalesis fusca fusca* (C. & R. Felder, 1860)	1	1
		39	*Mycalesis intermedia distanti* (Moore, [1892])	1	0
		40	*Mycalesis mineus macromalayana* Fruhstorfer, 1911	1	0
		41	*Mycalesis perseoides perseoides* (Moore, [1892])	1	0
		42	*Mycalesis perseus cepheus* Butler,1867	1	0
		43	*Mycalesis visala phamis* Talbot & Corbet, 1939	0	3

Family	Subfamily	No.	Species	NERC	Kuala Jasin
		44	*Neorina lowii neophyte* Fruhstorfer, 1911	0	1
		45	*Ragadia makuta siponta* Fruhstorfer, 1911	1	0
		46	*Ypthima baldus newboldi* Distant, 1882	0	1
		47	*Ypthima horsfieldii humei* Elwes & Edwards, 1893	4	1
		48	*Ypthima pandocus corticaria* Butler, [1879]	1	0
	Morphinae	49	*Amathusia masina malaya* Corbet & Pendlebury, 1936	2	0
		50	*Amathusia ochraceofusca ochraceofusca* Honrath, [1888]	1	0
		51	*Amathusia phidippus phidippus* (Linnaeus, 1763)	1	0
		52	*Amathuxidia amythaon dilucida* (Honrath, 1884)	4	0
		53	*Faunis canens arcesilas* Stichel, 1933)	1	0
		54	*Zeuxidia aurelius aurelius* (Cramer, [1777])	1	0
		55	*Zeuxidia doubledayi doubledayi* Westwood, [1851]	3	0
	Nymphalinae	56	*Ariadne ariadne ariadne* (Linnseus, 1763)	1	3
		57	*Athyma perius perius* (Linnaeus, 1758)	1	0
		58	*Bassarona teuta* (Doubleday, [1848])	29	5
		59	*Cethosia hypsea hypsina* C. & R. Felder, [1867]	3	0
		60	*Cirrochroa emalea emalea* (Guérin-Méneville, 1843)	2	0
		61	*Cirrochroa malaya malaya* C. & R. Felder, 1860	2	0
		62	*Cirrochroa orissa orissa* C. & R. Felder, 1860	3	3
		63	*Cupha erymanthis lotis* (Sulzer, 1776)	3	2
		64	*Dichorragia nesimachus deiokes* Fruhstorfer, 1913	1	0
		65	*Doleschallia bisaltide pratipa* C. & R. Felder, 1860	0	2

Family	Subfamily	No.	Species	NERC	Kuala Jasin
		66	*Dophla evelina compta* Fruhstorfer, 1899	7	1
		67	*Eulacera osteria kumana* Fruhstorfer, 1913	0	1
		68	*Euthalia aconthea gurda* Fruhstorfer, 1906	0	1
		69	*Euthalia kanda marana* Corbet, 1937	1	0
		70	*Euthalia monina monina* (Fabricius, 1787)	5	0
		71	*Junonia hedonia ida* (Cramer, [1775])	1	1
		72	*Lasippa heliodore dorelia* (Butler, [1879])	1	1
		73	*Lasippa tiga siaka* (Moore, 1881)	0	1
		74	*Lebadea martha malayana* Fruhstorfer, [1902]	2	1
		75	*Lexias dirtea merguia* (Tytler, 1926)	1	0
		76	*Lexias pardalis dirteana* (Corbet, 1941)	3	1
		77	*Moduza procris milonia* (Fruhstorfer, 1906)	1	0
		78	*Neptis hylas papaja* Moore, [1875]	0	2
		79	*Neptis leucoporos cresina* Fruhstorfer, 1908	2	0
		80	*Pantoporia dindinga* (Butler, (1879])	0	1
		81	*Parthenos sylvia lilacinus* Butler, [1879]	2	0
		82	*Phalanta alcippe alcesta* Corbet, 1941	2	2
		83	*Polyura hebe chersonesus* (Fruhstorfer, 1898)	1	0
		84	*Rhinopalpa polynice eudoxia* (Guérin- Méneville, 1840)	0	2
		85	*Tanaecia aruna aruna* (C. & R. Felder, 1860)	3	0
		86	*Tanaecia godartii asoka* (C. & R. Felder, [1867])	2	2
		87	*Tanaecia iapis puseda* (Moore, [1858])	1	6
		88	*Tanaecia palguna consanguinea* Distant, 1886	0	33

Family	Subfamily	No.	Species	NERC	Kuala Jasin
		89	*Tanaecia pelea pelea* (Fabricius, 1787)	1	0
		90	*Terinos clarissa malayanus* Fruhstorfer, 1906	1	3
		91	*Terinos terpander robertsia* Butler, 1867	1	2
	Charaxinae	92	*Agatasa calydonia calydonia* (Hewitson, [1854])	4	1
		93	*Charaxes durnfordi durnfordi* Distant, 1884	1	0
		94	*Charaxes solon echo* Butler, 1867	1	0
		95	*Prothoe franck uniformis* Butler, 1885	3	0
Lycaenidae	Riodininae	96	*Abisara geza niya* Fruhstorfer, 1914	0	1
		97	*Paralaxita telesia lyclene* (de Nicéville, 1894)	1	1
		98	*Taxila haquinus haquinus* (Fabricius, 1793)	1	0
		99	*Zemeros emesoides emesoides* C. & R. Felder, 1860	2	4
	Miletinae	100	*Allotinus apries apries* Fruhstorfer, 1913	0	2
		101	*Allotinus portunus maitus* Fruhstorfer 1914	0	1
		102	*Allotinus unicolor unicolor* C. & R. Felder, [1865]	0	2
		103	*Logania distanti massalia* Doherty, 1891	2	0
	Lycaeninae	104	*Arhopala horsfieldi basiviridis* de nicéville, 1891	0	1
		105	*Arhopala overdijkinki unda* (Evans, 1957)	0	1
		106	*Arhopala wildeyana wildeyana* Corbet, 1941	0	1
		107	*Catochrysops strabo strabo* (Fabricius, 1793)	3	0
		108	*Discolampa ethion thalimar* (Fruhstorfer, 1922)	2	0
		109	*Drupadia ravindra moorei* (Distant, 1882)	2	0
		110	*Eooxylides tharis distanti* Riley, 1942	0	1
		111	*Jamides bochus nabonassar* (Fruhstorfer, 1915)	1	0

Family	Subfamily	No.	Species	NERC	Kuala Jasin
		112	*Jamides cyta minna* Riley & Corbet, 1938	1	1
		113	*Jamides elpis pseudelpis* (Butler, [1879])	0	1
		114	*Jamides malaccanus malaccanus* (Rober, 1886)	0	1
		115	*Jamides pura pura* (Moore, 1886)	0	1
		116	*Jamides talinga* (Kheil, 1884)	1	0
		117	*Jamides virgulatus nisanca* (Fruhstorfer, 1915)	1	1
		118	*Loxura atymnus fuconius* Fruhstorfer, [1912]	0	2
		119	*Nacaduba pactolus odon* Fruhstorfer, 1916	0	1
		120	*Neomyrina nivea periculosa Fruhstorfer, 1913*	1	0
		121	*Neopithecops zalmora zalmora* (Butler, 1870)	0	1
		122	*Prosotas aluta nanda* (de Nicéville, 1895)	11	20
		123	*Ritra aurea volumnia* (Fruhstorfer, 1912])	0	1
		124	*Zizeeria karsandra* (Moore, 1865)	14	20
Hesperiidae	Hesperiinae	125	*Ancistroides nigrita Maura* (Snellen, [1880])	0	1
		126	*Celaenorrhinus ladana* (Butler, 1870)	0	1
		127	*Eetion elia* (Hewitson, [1866])	1	0
		128	*Iambrix salsala salsala* (Moore, [1886])	2	0
		129	*Iambrix stellifer* (Butler, [1879])	0	1
		130	*Notocrypta feisthamelii alysos* (Moore, [1886])	1	0
		131	*Notocrypta pria* (H. Druce, 1873)	1	0