**PROS SEM NAS MASY BIODIV INDON**
Volume 2, Nomor 2, Desember 2016 ISSN: 2407-8050
Halaman: 169-174 DOI: 10.13057/psnmbi/m020209

# Butterflies of Baluran National Park, East Java, Indonesia

## Keanekaragaman kupu-kupu di Taman Nasional Baluran, Jawa Timur, Indonesia

**SANDY LEO♥, NUR AVIFAH, AYU NUR SASANGKA, SHAFIA ZAHRA**
Wildlife Study Group Comata, Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Indonesia. Kampus UI, Depok, West Java, 16424, Indonesia. ♥email: sandy.leo@sci.ui.ac.id

Manuskrip diterima: 5 Oktober 2015. Revisi disetujui: 12 Desember 2016.

**Abstrak.** *Leo S, Avifah N, Sasangka AN, Zahra S. 2016. Keanekaragaman kupu-kupu di Taman Nasional Baluran, Jawa Timur, Indonesia. Pros Sem Nas Masy Biodiv Indon 2: 169-174.* Pulau Jawa merupakan kawasan yang diketahui memiliki keanekaragaman spesies kupu-kupu yang cukup tinggi dan mencapai lebih dari 640 spesies. Berdasarkan beberapa asumsi, keanekaragaman kupu-kupu tersebut tersebar pada beberapa taman nasional, termasuk Taman Nasional Baluran (TNB), Jawa Timur. Akan tetapi, keanekaragaman spesies kupu-kupu di TNB masih belum diketahui dengan jelas. Oleh karena itu, studi awal perlu dilakukan untuk menguji asumsi tersebut. Studi dilakukan pada tiga tipe ekosistem di TNB: hutan manting, savana dan *evergreen*. Studi ini dilakukan pada Agustus 2014 dengan metode *Pollard Walk*. Enam puluh tiga spesies kupu-kupu dari lima famili: Papilionidae (1), Nymphalidae (21), Lycaenidae (14), Pieridae (23) dan Hesperiidae (4) berhasil ditemukan. Savana Bekol memiliki perbedaan komunitas yang paling mencolok dibandingkan dengan ekosistem lainnya. Dua ekoton memiliki kesamaan komunitas dan mirip dengan *evergreen*. Hutan Manting memperlihatkan perbedaan dengan savana dibandingkan dengan *evergreen*. *Ixias venilia* merupakan satu-satunya spesies endemik Jawa yang ditemukan di TNB. Perlu dilakukan inventaris lanjutan pada kawasan lainnya di TNB untuk melengkapi keanekaragaman spesies kupu-kupu yang berguna untuk manajemen konservasi kupu-kupu di TNB.

**Kata kunci**: Biodiversitas, konservasi, kupu-kupu, *pollard walk*

**Abstract.** *Leo S, Avifah N, Sasangka AN, Zahra S. 2016. Butterflies of Baluran National Park, East Java, Indonesia. Pros Sem Nas Masy Biodiv Indon 2: 169-174.* Java Island is well known with its butterfly diversity which may count up to 640 species. Based on several assumptions, these diversities probably were scattered into several national parks, including Baluran National Park (BNP), East Java. However, the butterfly list species in BNP remain unknown. Therefore, a preliminary study should be done to testify the assumption.This study was conducted at three ecosystem types in BNP: Manting forest, savanna, and evergreen. The study was done in August 2014 with *Pollard Walk* method. Sixty-three butterfly species from five families: Papilionidae (1), Nymphalidae (21), Lycaenidae (14), Pieridae (23) and Hesperiidae (4) were recorded. Bekol Savanna has the highest butterfly community dissimilarity than the other ecosystem. Two ecotones have similarity with each other and close to evergreen. Manting Forest shown less dissimilarity with Savanna than Evergreen. *Ixias venilia* is only the Javan endemic species found in the BNP. Further inventory in other areas in BNP is needed to complete the biodiversity of butterfly species, which is useful for the conservation management of butterfly fauna at the.

**Keywords***:* Biodiversity, conservation, butterflies, *pollard walk*

## INTRODUCTION

Butterflies have main important roles in nature as pollinator and bioindicator of ecosystem change (Thomas 2005; Bonebrake et al. 2010) Butterflies can be used as bioindicator because of its physical appearance which is easily observed, they are also diurnal, mostly not fly too fast and has distinct color patterns (Pe'er and Settele 2008). However, some family such as Hesperiidae and some Papilionidae (*Troides* and *Graphium*) hardly observed due to its speed and its ability to fly over the canopy (Betts and Wootton 1988). Butterflies also can be used as flagship species and as a model for conservation studies. There is no way human kind and any other creatures would survive without them. Therefore, it is important to keep track of its distribution and maintain its diversity by doing regular inventory (Werner and Buszko 2005).

Indonesia as one of 17 megadiversity countries and has two of 25 global biodiversity hotspots(Mittermeier and Mittermeier 1997). One of taxon that show remarkable diversity was Lepidoptera or butterfly. Currently, out of 17500 species of butterflies which are known around the world, about 2000-2500 species of butterflies can be found in Indonesia and around 640 species occupied in Java. This estimation may not represent the real condition because many areas have not been studied yet (Peggie,2011; 2014). Beside that, according to Widhiono (2014), it is currently estimated that 46 butterfly species are endemic to Java.

Baluran National Park as one of the conservation areas in Java is also believed to has great butterfly diversity as it is consisted of several ecosystem types, such as savanna, mangrove forest, monsoon forest and tropical rainforest in the mountain. We assume that butterfly composition in these ecosystems within BNP may differ to each other and

scattered with a specific pattern. However, limited information on the species of butterflies makes this study important to assess the butterflies species that are found in Baluran National Park.

## MATERIALS AND METHODS

### Study Area

Butterfly survey and inventory was done in four days in August, 20th-23rd2014 in the dry season. Survey was conducted at Baluran National Park and covered three types of ecosystem i. e. Manting Forest with *Corypha utan* and *Syzigium polyanthum* as dominant trees and located on the edge of the seashore, Bekol Savanna, Evergreen as the part of monsoon forest, dominated by shrubs and some trees with dense canopies and two ecotones dominated by shrubs (Figure 1). The selection of these survey locations was primarily determined by the ease of accessibility and the limitation of short survey time.

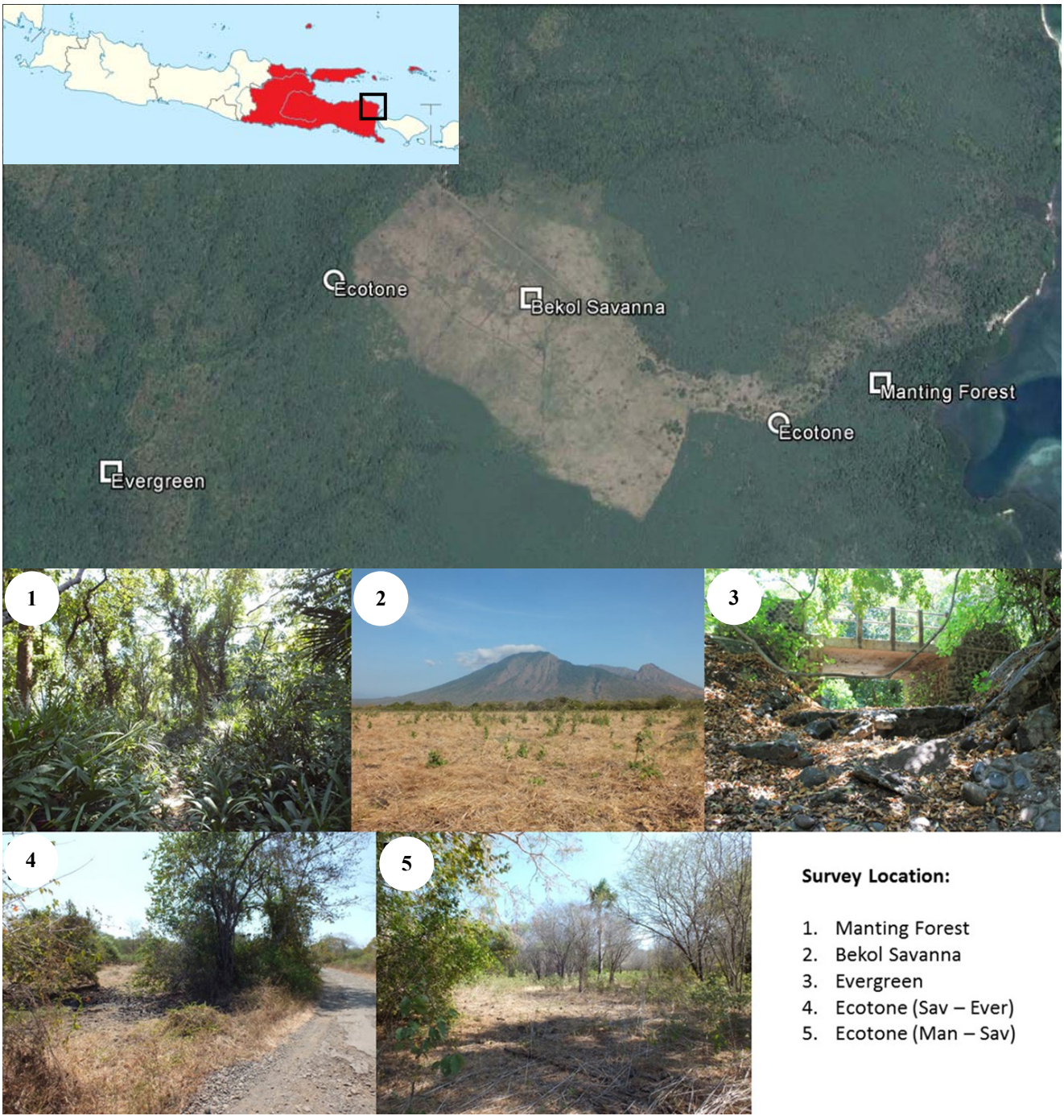


**Figure 1.** Butterfly survey location in Baluran National Park, East Java, Indonesia

## Methods

Survey and inventory were conducted by following the Pollard Walk method and counting butterfly species which is found in the same distance and time for five survey locations (Pollard and Yates 1993; Peggie 2014). Each butterfly species sample was collected and identified. A survey was done for each point with a distance of 500 meters and conducted during 08.00-11.00 WIB and 13.00-16.00 WIB. Butterfly identification was done using references: Piepers and Snellen (1909), Corbet and Pendlebury (1992), Braby (2004), Peggie and Amir (2006), Soekardi (2007) and Kirton (2014). Identified species of butterflies were grouped under different families. Later, data was analyzed by Jaccard Similarity Index using PAST ver. 2.17c.

## RESULTS AND DISCUSSION

### Result

During the survey and inventory, 63 species of butterflies were recorded and classified into five families namely, Papilionidae (1 species), Nymphalidae (21), Lycaenidae (14), Pieridae (23) and Hesperiidae (4). Evergreen has the highest butterfly diversity with 36 species, Bekol Savanna has the lowest butterfly diversity with 8 species, and Manting Forest in the middle with 23 species. Meanwhile, 20 species were found at both of ecotones(Manting Forest-Bekol Savanna) and (Bekol Savanna-Evergreen) (table 1). Based on Jaccard Similarity Index, butterflies similarity among ecosystem types presented in figure 2. Bekol Savanna has the highest butterfly community dissimilarity than the other ecosystems. Two ecotones have similarity with each other and close to Evergreen. Manting Forest shown less dissimilarity with Evergreen than Bekol Savanna. The score of Jaccard Similarity Index also presented in Table 2.

**Table 1.** List of butterfly species in several sites at the Baluran National Park

| No | Species | Manting Forest | Ecotone (Man-Sav) | Bekol Savanna | Ecotone (Sav-Ever) | Evergreen |
|---|---|---|---|---|---|---|
| **Hesperiidae** | | | | | | |
| 1 | *Coladenia agnioides* | V | | | | |
| 2 | *Hasora badra* | | V | | | V |
| 3 | *Pelopidas conjunctus* | | V | | | |
| 4 | *Taractrocera archias* | | | V | | V |
| **Lycaenidae** | | | | | | |
| 5 | *Arhopala pseudocentaurus* | | | | | V |
| 6 | *Castalius rosimon* | | V | V | V | V |
| 7 | *Catochrysops panormus* | V | | | | |
| 8 | *Catochrysops strabo* | | V | V | | V |
| 9 | *Chilades lajus* | | | | | V |
| 10 | *Discolampa ethion* | | V | | | |
| 11 | *Euchrysops cnejus* | | | V | | |
| 12 | *Euchrysops strabo* | | | | V | |
| 13 | *Everres lacturnus* | | | V | | V |
| 14 | *Hypolycaena erylus* | | | | | V |
| 15 | *Leptotes plinius* | | V | | | V |
| 16 | *Niphanda asialis* | | V | | | |
| 17 | *Rapala iarbus* | | | | | V |
| 18 | *Zizina Otis* | | V | V | V | V |
| **Nymphalidae** | | | | | | |
| 19 | *Cupha erymanthis* | V | | | | V |
| 20 | *Danaus chrysippus* | | V | | | |
| 21 | *Danaus genutia* | | | | | V |
| 22 | *Elymnias hypermnestra* | V | | | | |
| 23 | *Euploea camaralzeman* | | | | V | |
| 24 | *Euploea Eunice* | V | | | | V |
| 25 | *Euploea tulliolus* | V | | | | |
| 26 | *Hypolimnas bolina* | V | | | V | |
| 27 | *Ideopsis juventa* | V | | | | V |
| 28 | *Junonia hedonia* | | | | | V |
| 29 | *Junonia orithya* | | | V | | |
| 30 | *Mycalesis horsfieldi* | V | | | | V |
| 31 | *Mycalesis* sp. | V | | | | |
| 32 | *Neptis hylas* | | V | | V | V |
| 33 | *Phaedyma columella* | V | V | | | |
| 34 | *Phalanta phalanta* | | | | | V |
| 35 | *Tirumala hamata* | | | | | V |
| 36 | *Tirumala septentrionis* | V | | | | |
| 37 | *Yoma Sabina* | | | | | V |
| 38 | *Ypthima baldus* | V | | | | |
| 39 | *Ypthima horsfieldii* | V | | | | V |
| **Papilionidae** | | | | | | |
| 40 | *Papilio demoleus* | | | | | V |
| **Pieridae** | | | | | | |
| 41 | *Appias albina* | | | | | V |
| 42 | *Appias libythea* | | | | | V |
| 43 | *Appias lyncida* | V | | | V | V |
| 44 | *Appias olferno* | | | | V | |
| 45 | *Appias* sp. | | | | V | |
| 46 | *Belenois java* | | V | V | | |
| 47 | *Catopsilia pyranthe* | | V | | V | V |
| 48 | *Cepora iudith* | | | | | V |
| 49 | *Cepora nerissa* | | V | | V | V |
| 50 | *Delias* cf. *belisama* | | | | V | V |
| 51 | *Elodina andropis* | | | | V | |
| 52 | *Eurema alitha* | V | V | | | V |
| 53 | *Eurema andersonii* | | V | | V | V |
| 54 | *Eurema blanda* | V | | | V | |
| 55 | *Eurema hecabe* | | V | | V | V |
| 56 | *Eurema* sp. | V | V | | V | |
| 57 | *Hebomoia glaucippe* | V | | | V | |
| 58 | *Ixias pyrene* | | V | | | |
| 59 | *Ixias venilia* | | V | | V | V |
| 60 | *Leptosia nina* | V | | | V | V |
| 61 | *Pareronia anais* | V | | | | |
| 62 | *Pareronia* sp. | V | | | | |
| 63 | *Pareronia valeria* | V | | | | V |
| | **Total** | 23 | 20 | 8 | 20 | 36 |

**Plate 1.** Few butterfly species in Baluran National Park; Upper left to right: *Hebomoia glaucippe; Belenois java; Ixias venilia* (♂); Lower left to right: *Ixias venilia* (♀); *Danaus chrysippus; Delias* cf. *belisama*

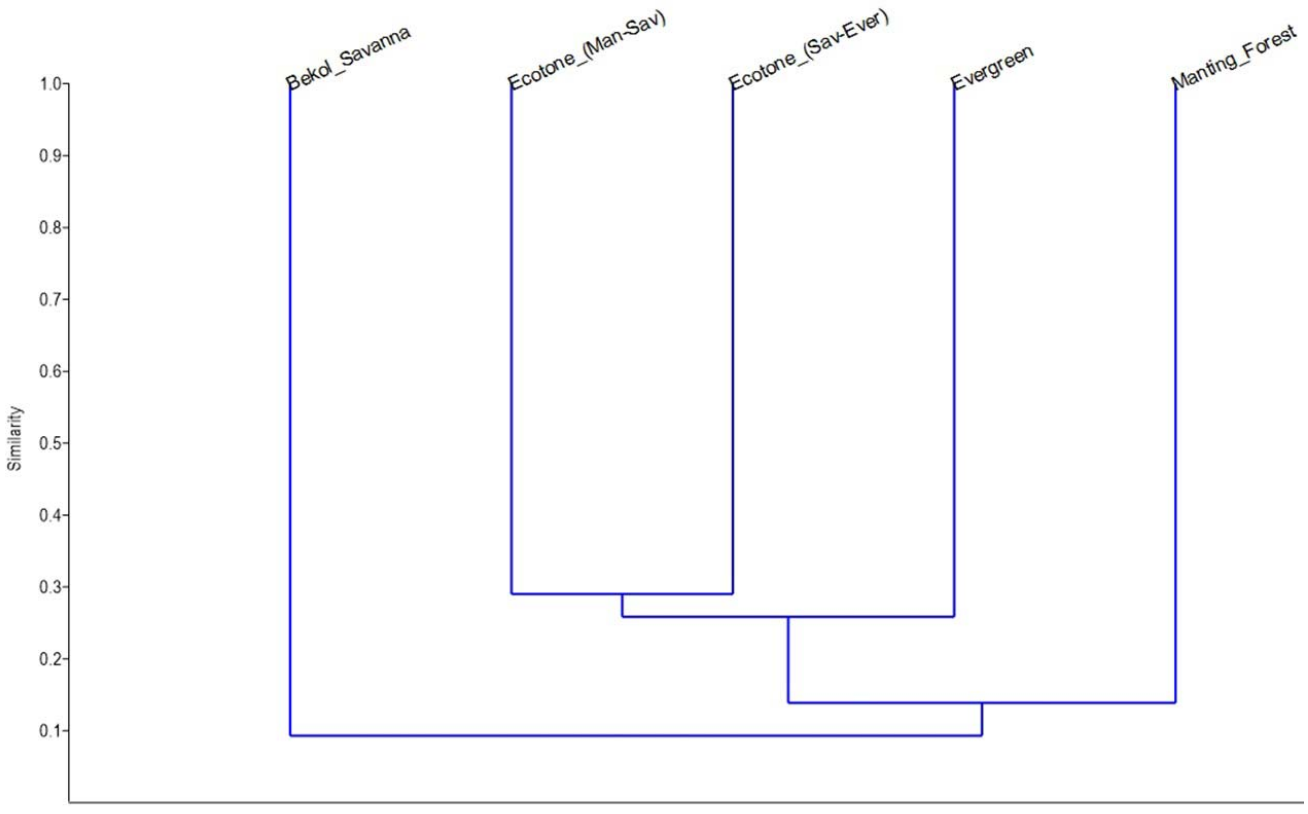


**Figure 2.** Dendogram of the similarity of butterfly communities among habitat types based on Jaccard Similarity Index

**Table 2.** Score of Jaccard Similarity Index

| Ecosystem Types | Manting_Forest | Ecotone_(Man-Sav) | Bekol_Savanna | Ecotone_(Sav-Ever) | Evergreen |
|---|---|---|---|---|---|
| Manting_Forest | | 0.075 | 0 | 0.16216 | 0.18 |
| Ecotone_(Man-Sav) | | | 0.16667 | 0.29032 | 0.27273 |
| Bekol_Savanna | | | | 0.076923 | 0.12821 |
| Ecotone_(Sav-Ever) | | | | | 0.24444 |
| Evergreen | | | | | |

**Discussion**

Butterfly species in five survey locations is not evenly distributed in each ecosystem types. This may be directly linked with the presence of host plants and canopy shade which support the population existence of the various butterfly species (Rahayu and Basukriadi 2012). Besides canopy shades and host plants, the other factors that may influence butterfly diversity are altitude, temperature, humidity, light intensity, weather and seasons (Basset et al. 2011; Munyuli 2012). Larval preferred host plant also affect the species distribution among ecosystem types. Hesperiidae had a preference for Poaceae, Lycaenidae had a preference for Fabaceae and Mimosaceae, Nymphalidae preferred Acanthaceae, Malvaceae and some species (subfamily Satyrinae) preferred Poaceae. Papilionidae had a preference for Rutaceae and Pieridae preferred Capparaceae and Caesalpiniaceae (Tiple et al. 2011).

The greater presence of butterfly in Evergreen, but less in Bekol Savanna also indicates butterflies habitat preferences. Hesperiidae butterflies were found more in Evergreen and ecotone Manting Forest-Savanna. Butterfly species from Lycaenidae were found more in Evergreen, Bekol Savanna, and ecotone Manting Forest-Savanna. Nymphalidae butterflies were found more in Manting Forest and Evergreen, *Papilio demoleus* found only in Evergreen and butterfly species from Pieridae were found more in Evergreen, Manting Forest, and both ecotones. The scarce of Papilionidae butterfly species may be correlated with lack of host plant around survey sites, Pieridae and Nymphalidae butterflies preferences in Evergreen and Manting Forest may be correlated with necessary of feed on water and mineral nutrients from moist ground sites in habitat with canopy (Koh 2007; Widhiono 2015). Butterflies in dry climates of Baluran National Park need to find some moist and shady places to prevent evaporation and water loss from the body. Some butterfly species i.e. *Eurema* spp. and *Hypolimnas bolina*undergoa reproductive diapause in the dry season because of the lack of host plants as a food source for the larvae and wait for the wet season for laying eggs. Knowledge about the influence of climate and season on butterfly adaptation is important for the conservation and management of various species of butterflies (Bonebrake et al. 2010).

Dendrogram based on the Jaccard Similarity Index value (Figure 2; Table 2) revealed the similarity score between species composition across the three ecosystem types and two ecotones. Bekol Savanna butterfly species are totally different with Manting Forest (score: 0). However, few butterfly species found in Manting Forest also found in Evergreen (score: 0.18). Few butterfly species found in Evergreen also found in Bekol Savanna (score: 0.12821) and dominated by Lycaenidae butterflies. This result indicates, some butterfly species *Cupha erymanthis*, *Euploea eunice*, *Ideopsis juventa*, *Mycalesis horsfieldi*, *Ypthima horsfieldii*, *Eurema alitha*, *Leptosia nina* and *Pareronia valeria* may be flying across Bekol Savanna between Manting Forest and Evergreen, but not adaptable with the dry condition and high temperature in Bekol Savanna. In contrast, some Lycaenidae butterflies may be adapted to the dry condition and high temperature in Bekol Savanna (Braby 2008).

One of the butterfly species *Ixias venilia* is endemic to Java (Whitten et al. 1996). According to Piepers and Snellen (1909), *I. venilia* has widespread distribution in the low region below than 700 feet asl from west to east Java. This species flies not far from the ground.*Ixias venilia* is also found in Jakarta, Tuban, Bojonegoro, Kediri, Sidoardjo and Situbondo in Java island (GBIF 2013). *Belenois java* found in Baluran National Park is known to spread into Australia (Hawkeswood 2005).

We find it interesting that most species of butterflies found in Baluran National Park have more species similarity with Ujung Kulon than with Mount Tangkuban Parahu or Mount Slamet. Basically 34 species of 177 total species found in Ujung Kulon National Park also found in BNP (Peggie 2012), while only 2 species of 23 total species found in Mount Tangkuban Parahu also found in BNP (Tati-Subahar et al. 2007) and 11 species from 99 total species found in Mount Slamet also found in BNP (Widhiono 2015). More butterfly species similarity may be due to the similar type of habitats and altitude of Ujung Kulon National Park and Baluran National Park in several sites.

Further survey and inventory in other areas in BNP are needed to complete the recording of butterfly species which is useful for conservation management at the Baluran National Park.

**ACKNOWLEDGEMENTS**

Grateful thanks are due to KSHL Comata exploration team 2014, Baluran National Park, East Java, Indonesia, Dimas Haryo Pradana, Nurul Winarni, Djunijanti Peggie,

Ardiantiono, Sri Yuliasih Wiyati and Butterfly Society of Indonesia who helped the authors to carry out this study.

## REFERENCES

Basset Y, Eastwood R, Sam L, Lohman DJ, Novotny V, Treuer T, Miller SE, Weiblen GD, Pierce NE, Bunyavejchewin S, Sakchoowong W, Kongnoo P, Osorio-Arenas MA. 2011. Comparison of rainforest butterfly assemblages across three biogeographical regions using standardized protocols. J Res Lepid 44: 17-28.

Betts CR, Wootton RJ. 1988. Wing shape and flight behaviour in butterflies (Lepidoptera: Papilionoidea and Hesperioidea): a preliminary analysis. J Exp Biol 138: 271-288.

Bonebrake TC, Ponisio LC, Boggs CL, Ehrlich PR. 2010. More than just indicators: a review of tropical butterfly ecology and conservation. Biol Cons 143: 1831-1841.

Braby MF. 2004. The complete field guide to butterflies of Australia. CSIRO Publishing, Victoria.

Braby MF. 2008. Biogeography of butterflies in the Australian monsoon tropics. Aust J Zool 56: 41-56.

Corbet AS, Pendlebury HM. 1992. The butterflies of The Malay Peninsula. Malayan Nature Society, Kuala Lumpur.

GBIF [Global Biodiversity Information Facility]. 2013. GBIF backbone taxonomy. Available at: http://www.gbif.org/species/5137750 [accessed 10 October 2015].

Hawkeswood TJ. 2005. Hamilton (1937), an overlooked references concerning three Australian butterfly species (Lepidoptera). Calodema 3: 16-18.

Kirton L. 2014. A naturalist's guide to the butterflies of Peninsular Malaysia, Singapore and Thailand. John Beaufoy Publishing, London.

Koh LP. 2007. Impacts of land use change on South-east Asian forest butterflies: a review. J Appl Ecol 44: 703-713.

Mittermeier RA, Mittermeier CG. 1997. Megadiversity: earth's biologically wealthiest nations. CEMEX, S.A., Mexico City.

Munyuli MBT. 2012. Butterfly diversity from farmlands of Central Uganda. Psyche Article ID 481509, 23 pages http://dx.doi.org/10.1155/2012/481509.

Pe'er G, Settele J. 2008. Butterflies in and for conservation: trends and prospects. Isr J Ecol Evol 54: 7-17.

Peggie D, Amir M. 2006. Practical guide to the butterflies of Bogor Botanical Garden. Pusat Penelitian Biologi LIPI, Cibinong.

Peggie D. 2011. Precious and protected Indonesian butterflies. Binamitra Megawarna, Jakarta.

Peggie D. 2012. A list of the butterflies of Ujung Kulon National Park, Java, Indonesia. Treubia 39: 67-76.

Peggie D. 2014. Mengenal kupu-kupu. Pandu Aksara Publishing, Jakarta.

Piepers MC, Snellen PCT. 1909. The Rhopalocera of Java: Pieridae. William Wesley and Son, London.

Pollard E, Yates TJ. 1993. Monitoring butterflies for ecology and conservation. Chapman & Hall, London.

Rahayu SE, Basukriadi A. 2012. Kelimpahan dan keanekaragaman spesies kupu-kupu (Lepidoptera; Rhopalocera) pada berbagai tipe habitat di Hutan Kota Muhammad Sabki Kota Jambi. Biospecies 5 (2): 40-48.

Soekardi H. 2007. Kupu-kupu di Kampus Unila. Penerbit Universitas Lampung, Bandar Lampung.

Tati-Subahar SS, Amasya AF, Choesin DN. 2007. Butterfly (Lepidoptera: Rhopalocera) distribution along an altitudinal gradient on Mount Tangkuban Parahu, West Java, Indonesia. Raffles Bull Zool 55 (1): 175-178.

Tiple AD, Khurad AM, Dennis RLH. 2011. Butterfly larval host plant use in a tropical urban context: Life history, associations, herbivory, and landscape factors. J Insect Sci 11 (65): 1-21.

Thomas JA. 2005. Monitoring change in the abundance and distribution of insects using butterflies and other indicator groups. Phil Trans R Soc B 360: 339-357.

Werner U, Buszko J. 2005. Detecting biodiversity hotspots using species-area and endemics-area relationships: the case of butterflies. Biodivers Conserv 14: 1977-1988.

Whitten T, Soeriaatmadja RE, Afiff SA. 1996. The ecology of Java and Bali. Periplus Editions, Ltd., Singapore.

Widhiono I. 2014. Keragaman dan kelimpahan kupu-kupu endemik Jawa (Lepidopterra : Rhopalocera) di Hutan Gunung Slamet Jawa Tengah. Biospecies 7(2): 59-67.

Widhiono I. 2015. Diversity of butterflies in four different forest types in Mount Slamet, Central Java, Indonesia. Biodiversitas 16 (2): 196-204.