

Butterfly Diversity in the Paddy Field Area of Paokmotong Village, Lombok Island

Mohammad Liwa Ilhamdi*, Agil Al Idrus, Ovy Adelia Hidayat

Universitas Mataram, Indonesia

*Corresponding author: liwa_ilhamdi@unram.ac.id

Abstract: Lombok Island harbours a rich butterfly fauna that plays a vital ecological role as pollinators and bioindicators of ecosystem health. This study investigated butterfly species diversity in the paddy field area of Paokmotong Village, East Lombok Regency, using an exploratory survey method across five observation zones: the northern, southern, eastern, and western field edges, and the central field transect. A total of 49 individuals belonging to eight species from three families (Pieridae, Hesperidae, and Nymphalidae) were recorded. *Eurema blanda* and *Leptosia nina* (both Pieridae) were the most abundant species, while Nymphalidae exhibited the highest species richness with five species. The Shannon-Wiener diversity index (H') was calculated at 1.898, indicating moderate diversity. This value reflects a relatively stable habitat condition in terms of food availability, temperature, humidity, wind speed, and light intensity. The moderate diversity level suggests that, while the paddy field ecosystem of Paokmotong provides a reasonably supportive habitat for butterflies, environmental pressures such as pesticide use and low plant diversity may be limiting species richness. Conservation of wild flowering vegetation along field margins is recommended to sustain and enhance butterfly diversity in this agricultural landscape.

Keywords: Butterfly Diversity, Paddy Field, Paokmotong, Shannon-Wiener Index, Lombok

Abstrak: Pulau Lombok memiliki keanekaragaman hayati kupu-kupu yang berperan penting sebagai serangga penyerbuk dan bioindikator kesehatan ekosistem. Penelitian ini mengkaji keanekaragaman spesies kupu-kupu di kawasan persawahan Desa Paokmotong, Kabupaten Lombok Timur, menggunakan metode survei eksploratif pada lima zona pengamatan: pinggir utara, selatan, timur, dan barat sawah, serta jalur tengah sawah. Sebanyak 49 individu yang tergolong dalam delapan spesies dari tiga famili (Pieridae, Hesperidae, dan Nymphalidae) berhasil diidentifikasi. *Eurema blanda* dan *Leptosia nina* (keduanya dari famili Pieridae) merupakan spesies paling melimpah, sedangkan Nymphalidae mencatat kekayaan spesies tertinggi dengan lima spesies. Nilai indeks keanekaragaman Shannon-Wiener (H') yang diperoleh sebesar 1,898, yang mengindikasikan keanekaragaman sedang. Nilai ini mencerminkan kondisi habitat yang relatif stabil dari segi ketersediaan pakan, suhu, kelembapan, kecepatan angin, dan intensitas cahaya. Keanekaragaman yang tergolong sedang menunjukkan bahwa ekosistem persawahan Paokmotong masih menyediakan habitat yang cukup baik bagi kupu-kupu, meskipun tekanan lingkungan seperti penggunaan pestisida dan rendahnya keragaman tanaman dapat membatasi kekayaan spesies. Konservasi vegetasi liar berbunga di pinggiran sawah direkomendasikan untuk mempertahankan dan meningkatkan keanekaragaman kupu-kupu di lanskap pertanian ini.

Kata Kunci: Keanekaragaman Kupu-kupu, Persawahan, Paokmotong, Indeks Shannon-Wiener, Lombok

INTRODUCTION

Insects constitute the most species-rich group of organisms among all phyla (Yumaida, 2020). Dendang (2009) affirms that insects play critical roles in ecosystems, functioning as pollinators, decomposers, predators, and parasitoids. One of the insect groups widely distributed in Indonesia is butterflies. Indonesia is estimated to harbour approximately 2,500 of the world's

20,000 butterfly species, of which around 50% are endemic and distributed across various regions of the archipelago (Rohman, 2019).

Butterflies are found on virtually every surface of the Earth, except in cold climates where they are rarely encountered, as they are poikilothermic (cold-blooded) animals whose body temperature is governed by the surrounding environment. As an archipelago nation, Indonesia hosts many butterfly species that are endemic to particular islands. Of the approximately 17,500 butterfly species known worldwide, around 2,000 are found in Indonesia. Sumatra is estimated to support 890 species, Java approximately 640, Kalimantan at least 800, Sulawesi nearly 560, Nusa Tenggara 350, Maluku around 400, and Papua more than 500 species. These figures likely underestimate true diversity, as many areas in eastern Indonesia remain understudied. The highest level of endemism is found in Sulawesi, with 239 endemic species (Hengkengbala et al., 2020).

Butterflies belong to the order Lepidoptera (Ruslan, 2015). The term Lepidoptera derives from the Greek words *lepis* (scale) and *pteron* (wing), reflecting the defining characteristic of scale-covered wings. The order Lepidoptera is divided into two suborders based on the number of genital openings: *Monotrysia*, characterised by a single genital opening, and *Ditrysia*, which has two (Krenn, 2001).

Butterflies are flying insects that undergo complete metamorphosis, progressing through the stages of egg, larva, pupa, and adult. During the larval phase, butterflies feed on plant material including fruits, seeds, and leaves; the larval mouthparts are therefore adapted for biting and chewing. This morphological change is accompanied by corresponding changes in digestive physiology (Alfida et al., 2016).

Beyond their high aesthetic value owing to their beautifully patterned wings, butterflies fulfil a crucial ecological function as plant pollinators. They also serve as bioindicators of environmental quality, as they are highly sensitive to changes in ecosystem conditions (Zen, 2015).

Mubarok et al. (2025) note that butterflies provide numerous benefits to humans and the environment, spanning economic, research, aesthetic, and ecological dimensions, including the spread of plant species (Ulpa et al., 2023). Their conservation is therefore essential for the well-being of both human communities and natural ecosystems.

Paokmotong Village is located in Masbagik District, East Lombok Regency. The area is dominated by agricultural land, and its paddy field ecosystem serves not only as a key food-production zone for local communities but also as a habitat for various insect species, including butterflies. The surrounding vegetation—wild grasses, flowering weeds, and shrubs along field margins provides food sources and shelter for butterflies. Nevertheless, human activities such as pesticide application, changes in cropping patterns, and land conversion pose potential threats to butterfly populations in this area. It is therefore important to document the butterfly species still present in the paddy fields of Paokmotong Village.

Given the ecological importance of butterflies and the scarcity of information on butterfly diversity in Paokmotong Village, Masbagik District, East Lombok Regency, this study was conducted to investigate butterfly species diversity in the paddy field area of that village.

METHODS

This study was conducted in the paddy field area of Paokmotong Village, Masbagik District, East Lombok Regency, West Nusa Tenggara Province (Figure 1). The study site was focused on paddy field areas distributed across several points within the village. Paddy fields were selected because they constitute open habitats rich in natural food sources for butterflies and are relatively distant from dense residential areas, making them potentially supportive butterfly habitats. Field observations were carried out between 09:00–12:00 and 15:00–17:00 local time.

This study employed an exploratory survey method. The researcher traversed and directly observed butterflies across five observation zones within the paddy field area of Paokmotong Village: the northern, southern, eastern, and western field edges, and the central field transect. Species identification was performed with reference to butterfly identification field guides.

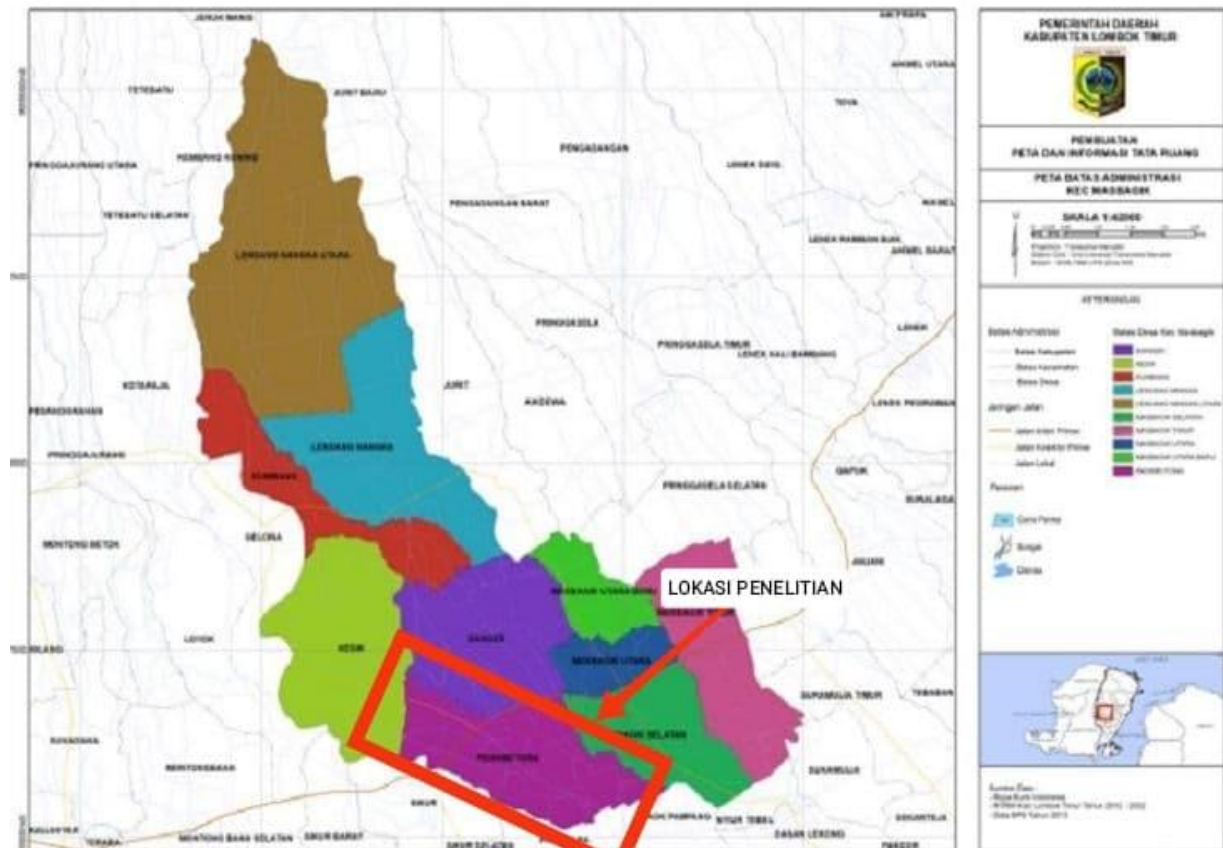


Figure 1. Map of the research location

The data obtained were analysed using the Shannon-Wiener diversity index (H') to quantitatively assess the level of species diversity within the community. The formula used is as follows:

$$H' = - \sum_{i=1}^S P_i \ln P_i$$

Where:

H' : Shannon-Wiener diversity index

n_i : number of individuals of each species

N : total number of individuals of all species at the study site

The H' values were interpreted according to the following criteria: $H' < 1$ indicates low diversity, $1 < H' < 3$ indicates moderate diversity, and $H' > 3$ indicates high diversity.

RESULTS AND DISCUSSION

Based on the field survey conducted across five observation zones in the paddy field area of Paokmotong Village, Masbagik District, East Lombok Regency, a total of eight butterfly species comprising 49 individuals were recorded: *Eurema blanda*, *Erynnis funeralis*, *Neptis hylas*, *Parantica sita*, *Melanitis leda*, *Elymnias hypermnestra*, *Leptosia nina*, and *Euploea core*. These eight species belong to three families: Pieridae, Hesperiiidae, and Nymphalidae. The complete data are presented in Table 1.

Across all five observation zones, the most abundant species was *Eurema blanda* (family Pieridae), which favours open habitats such as grasslands, cultivated fields, roadsides, and forest edges, particularly where its host plants and nectar sources are available.

The second most abundant species was *Leptosia nina* (family Pieridae), which occupies a broad range of habitats from lowlands to lower montane zones and prefers open yet partially sheltered environments.

Table 1. Butterfly Species Recorded in the Paddy Field Area of Paokmotong Village, Masbagik District, East Lombok Regency

No	Species Name	Family	Northern Paddy Field Edge	Southern Paddy Field Edge	Eastern Paddy Field Edge	Western Paddy Field Edge	Central Paddy Field Transect	Total
1	<i>Eurema blanda</i>	Pieridae	4	1	2	5	1	13
2	<i>Erynnis funeralis</i>	Hesperiidae	1	1	0	2	0	4
3	<i>Neptis hylas</i>	Nymphalidae	1	3	0	0	0	4
4	<i>Parantica sita</i>	Nymphalidae	2	1	1	3	1	8
5	<i>Melanitis leda</i>	Nymphalidae	1	0	2	1	0	4
6	<i>Elymnias hypermnestra</i>	Nymphalidae	1	1	1	0	0	3
7	<i>Leptosia nina</i>	Pieridae	4	2	1	1	3	11
8	<i>Euploea core</i>	Nymphalidae	1	0	0	1	0	2

Members of the family Pieridae are small to medium-sized butterflies (forewing length 22–35 mm). Some species are migratory and are frequently found in large aggregations near water. Their wings lack tails, and in several species the wings are capable of absorbing ultraviolet light, which assists in mate recognition. Male wings are typically more vividly coloured than those of females. Pieridae are generally white, yellow, or yellowish-orange, with bright outer hind-wing surfaces. Flight behaviour within the family varies: genera such as *Eurema*, *Elodina*, and *Leptosia* fly relatively slowly and weakly, close to the ground, and tend to move in groups (Krenn et al., 2001).

Table 2. Diversity Index Calculation

No	Species Name	Σ	pi	ln pi	pi ln pi
1	<i>Eurema blanda</i>	13	0.265	−1.326	−0.352
2	<i>Erynnis funeralis</i>	4	0.081	−2.505	−0.204
3	<i>Neptis hylas</i>	4	0.081	−2.505	−0.204
4	<i>Parantica sita</i>	8	0.163	−1.812	−0.295
5	<i>Melanitis leda</i>	4	0.081	−2.505	−0.204
6	<i>Elymnias hypermnestra</i>	3	0.061	−2.793	−0.171
7	<i>Leptosia nina</i>	11	0.224	−1.493	−0.335
8	<i>Euploea core</i>	2	0.040	−3.198	−0.130
H'					1.898

The family with the highest species richness across all five observation zones was Nymphalidae, represented by five species. Nymphalidae are broadly distributed, prefer well-lit habitats, and can be found in gardens, forests, and sites with decaying matter (Dendang, 2009). They are small to medium-sized butterflies (body length 2.5–15 cm; forewing length 1.5–7 cm). The defining characteristic of Nymphalidae is the reduced forelegs, which in males are covered by dense scale tufts resembling a brush hence the common name "brush-footed butterflies" (Peggie & Amir, 2006). When perching, these butterflies use only four of their six legs, as the forelegs are folded against the body.

Nymphalidae are cosmopolitan in distribution, found in diverse habitats worldwide. Their polyphagous larval feeding habit whereby females can oviposit on a range of host plant species

from families such as Annonaceae, Leguminosae, Compositae, and Poaceae confers broad ecological flexibility and high survival capacity across habitat types (Krenn et al., 2001).

The family Hesperidae, also recorded at Paokmotong Village, comprises medium-sized butterflies that are sometimes confused with moths; however, they are readily distinguished by their characteristic brownish wings with white or yellow spots and their rapid, darting flight (Ruslan, 2015).

Based on the diversity index calculations presented in Table 2, the butterfly diversity in the paddy field area of Paokmotong Village yielded a Shannon-Wiener index value of $H' = 1.898$, which falls within the moderate diversity category ($1 < H' < 3$). This value indicates that the natural conditions in Paokmotong Village are still relatively stable, with adequate habitat quality, food availability, and abiotic environmental parameters including temperature, air humidity, wind speed, and light intensity.

Nkongolo and Bapeamoni (2018) state that the presence of animal species in a habitat is determined by the diversity and abundance of available food resources—such as pollen and nectar, rotting fruits, animal dung and bird droppings, tree sap, salts, and perspiration—as well as by prevailing environmental conditions. Where conditions are favourable, species tend to establish and reproduce; where they are not, species richness declines. Butterfly diversity tends to increase with habitat scale and the structural complexity of vegetation.

Habitat diversity is one of the most important factors influencing butterfly species richness. In Paokmotong Village, paddy field habitats support a range of pollinating insects, including butterflies, which depend on the availability of host plants and nectar sources from flowering vegetation. There is thus a close relationship between butterfly species richness and the condition and quality of the habitat.

Wild vegetation along paddy field margins including wildflowers, grasses, and shrubs constitutes an important habitat for butterfly larvae and a food source for adults. The open central transects of the paddy fields also provide flight corridors and resting sites for nectar-foraging butterflies. However, the moderate species richness recorded may also reflect environmental stressors such as pesticide application, clearance of field-margin shrubs, or the low botanical diversity of the cultivated crop itself. The presence of Nymphalidae and Hesperidae—families generally regarded as more sensitive to habitat disturbance—nevertheless indicates that the paddy field environment of Paokmotong Village has not yet been severely degraded.

Estalita et al. (2012) note that butterfly species composition varies among localities and is closely linked to physical environmental factors such as soil, water, temperature, and light, as well as biological factors including vegetation structure and associated fauna (Purwowidodo, 2015). The moderate butterfly diversity recorded at Paokmotong Village highlights the important role that plant diversity within agricultural landscapes plays in supporting pollinating insects. These results underscore the need for measures to increase flowering plant diversity in paddy field margins as ecological buffer zones for biodiversity conservation in rural areas.

CONCLUSION

A total of eight butterfly species belonging to three families were recorded in the paddy field area of Paokmotong Village, comprising 49 individuals. The most abundant species were *Eurema blanda* and *Leptosia nina* (family Pieridae). Nymphalidae was the most species-rich family with five species, indicating a still relatively supportive environment for butterfly communities. The Shannon-Wiener diversity index value of $H' = 1.898$ places butterfly diversity in the moderate category, reflecting a relatively stable ecosystem condition in the study area.

REFERENCES

- Alfida, A., Hanum, U., & Eliyanti, E. (2016). Kupu-kupu (Rhopalocera) di Kawasan Hutan Kota BNI Banda Aceh. *BIOTIK: Jurnal Ilmiah Biologi Teknologi dan Kependidikan*, 4(2), 117–127.

- Dendang, B. (2009). Keragaman kupu-kupu di Resort Selabintana Taman Nasional Gunung Gede Pangrango, Jawa Barat. *Jurnal Penelitian Hutan dan Konservasi Alam*, 6(1), 25–36.
- Estalita, R. S. (2012). Kelimpahan dan keanekaragaman spesies kupu-kupu (Lepidoptera: Rhopalocera) pada berbagai tipe habitat di Hutan Kota Muhammad Sabki Kota Jambi. *Biospecies*, 5(2).
- Hengkengbala, S., Koneri, R., & Katili, D. (2020). Keanekaragaman kupu-kupu di Bendungan Ulung Peliang Kecamatan Tamako Kepulauan Sangihe, Sulawesi Utara. *Jurnal Bios Logos*, 10(2), 63–70.
- Krenn, H. W., Zulka, K. P., & Gatschnegg, T. (2001). Proboscis morphology and food preferences in nymphalid butterflies (Lepidoptera: Nymphalidae). *Journal of Zoology*, 254(1), 17–26. <https://doi.org/10.1017/S0952836901000528>
- Mubarok, H. M., Nuruzzaman, A., Fitriyah, H., & Qodri, A. (2025). Keanekaragaman kupu-kupu (Lepidoptera) dan tumbuhan pakannya di Kawasan Hutan Dengan Tujuan Khusus (KHDTK) UIN KHAS Jember. *Berkala Ilmiah Biologi*. <https://doi.org/10.22146/bib.v16i3.25032>
- Nkongolo, N. V., & Bapeamoni, F. (2018). The effect of land use type on butterfly diversity at Masako Forest Reserve, Kisangani, Democratic Republic of Congo. *International Journal of Biodiversity and Conservation*, 10(3), 131–144. <https://doi.org/10.5897/IJBC2017.1160>
- Peggie, D., & Amir, M. (2006). *Practical guide to the butterflies of Bogor Botanic Garden / Panduan praktis kupu-kupu di Kebun Raya Bogor*. LIPI.
- Purwowidodo, P. (2015). *Studi keanekaragaman hayati kupu-kupu (sub ordo Rhopalocera) dan peranan ekologisnya di area hutan lindung kaki Gunung Prau Kab. Kendal Jawa Tengah*. UIN Walisongo.
- Rohman, F. (2019). *Bioekologi kupu-kupu*. Universitas Negeri Malang.
- Ruslan, H. (2015). *Keanekaragaman kupu-kupu*. LPU UNAS.
- Ulpa, M., Ilhamdi, M. L., & Hadiprayitno, G. (2023). Keanekaragaman spesies kupu-kupu di Gunung Jae Kabupaten Lombok Barat sebagai materi pengayaan pelajaran biologi SMA. *Bioscientist: Jurnal Ilmiah Biologi*, 11(1), 874–888.
- Yumaida, Y., Syara, Y., Yurnita, Y., & Iqwanda, Y. (2022). Keanekaragaman serangga pohon di ekosistem Pantai Kaca Kacu Pulo Aceh Kabupaten Aceh Besar. *Prosiding Seminar Nasional Biologi, Teknologi dan Kependidikan*, 8(1), 132–143.
- Zen, R. N. S. (2015). Studi keanekaragaman kupu-kupu di bantaran Sungai Batanghari Kota Metro sebagai sumber belajar biologi materi keanekaragaman. *BIOEDUKASI: Jurnal Pendidikan Biologi*, 6(1).