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Diversity of Sub Order Rhopalocera in Langsa City Forest Park, Aceh

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Abstract

Background: *Langsa Urban Forest Park is a protected forest area that serves as a natural habitat for various flora and fauna, both wild and cultivated. One of the organisms that can be found there is an insect from the suborder Rhopalocera, namely butterflies. Butterflies play a very important role in supporting ecosystem balance and biodiversity. This study aims to determine the diversity and dominance indices of Rhopalocera suborder (butterflies) species in Langsa City Forest Park, Aceh. The study used observation methods during the rainy season.* **Methodology:** *Sampling was conducted using purposive sampling methods across three locations with varying environmental conditions and vegetation characteristics. Sampling was conducted using sweep net techniques with insect nets at the research sites. The quantitative descriptive analysis calculated was the diversity index and species dominance of butterflies.* **Findings:** *The Rhopalocera species found in Langsa City Forest Park consisted of 41 species belonging to 5 families The dominant family found is Nymphalidae, while the dominant species found is Leptosia nina from the Pieridae family. The overall Rhopalocera diversity index (H` = 3.10) falls into the high category, and all three research sites have moderate diversity indices. The highest diversity was found at Site I (H` = 2.86), which has a variety of plant vegetation and is near a lake. Meanwhile, the lowest diversity was found at location II, which is dominated by tree vegetation. Vegetation diversity creates habitats that support butterfly species development, while homogeneous vegetation structures can limit the availability of food sources and habitats, resulting in low species diversity. The species dominance index is included in low category. The diversity of Rhopalocera (butterflies) and their habitats is crucial to preserve in efforts to conserve the Langsa City Forest Park ecosystem.* **Contribution:** *this study are expected to provide useful information for the management and conservation of the area, as well as to raise public awareness about the importance of preserving biodiversity.*

Keywords: *Butterflies; Diversity; Environment; Urban Forest Park*

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INTRODUCTION

Indonesia is known as one of the countries with the greatest biodiversity in the world, including a wide variety of flora and fauna. The insect group of the order Lepidoptera belongs to a diverse group of fauna. This order is characterized as winged insects covered with scales, belonging to the class insecta and phylum Arthropoda (Krismawanti et al., 2022). The order Lepidoptera consists of two groups, which include nocturnal moths (Heterocera) and diurnal butterflies (Rhopalocera). Butterflies are more commonly known for their activity and bright, attractive wing colors (Hadi & Naim, 2020). The main habitat of members of this order is usually in areas that have various types of plant vegetation.

Langsa City Forest Park is an ecotourism area rich in vegetation that is a habitat for various types of flora and fauna. Syahra et al., (2021) study found 60 species of plant consisting of tree species (33 species), shrubs (6 species), shrubs (11 species), and herbs (8 species). The species that dominates the Langsa City Forest area is Damar (*Agathis dammara* Lamb Rich.). With its diverse vegetation, this is one of the factors that influences the existence of insects from the order Lepidoptera, namely butterflies (suborder Rhopalocera). Because plants as hosts and sources of nutrients that support their lives (Trovicana & Faizah, 2024).

The suborder Rhopalocera or known as butterflies are insects with scales that have patterns and colors on their wings, making them attractive (Rani et al., 2023). In Indonesia, there are about 1,600 species of butterflies, and some of them are included in the redlist of the International Union for the Conservation of Nature and Natural Resources (IUCN) as protected species (Fox, 2019). Based on the regulation of the Minister of Environment and Forestry of the Republic of Indonesia number P.106/MENLHK/SETJEN/kum.1/12/2018 regarding protected plant and animal species, there are 26 species of butterflies consisting of 2 families, namely Nymphalidae and Papilionidae, which have protected status (Setiawan, 2022). The existence of butterflies depends on the carrying capacity of their habitat, namely habitats that have hostplant and foodplant components (Septiani et al., 2023). The diversity of species and distribution of butterflies in an area is influenced by habitat factors, namely environmental factors that are in accordance with the needs of butterflies in nature, such as temperature, humidity, rainfall, as well as topography and vegetation (Yusup & Apriyanto, 2023). Suitable habitat and environmental conditions support the existence of this animal.

Several studies have been conducted to determine the diversity of butterfly species. A study conducted in Bahorok, North Sumatra, analyzed the differences in butterfly diversity between natural and artificial habitats (Ritonga et al., 2025). Research in Senggigi, West Lombok, examined butterfly species diversity in Kerandangan Nature Park (Alawiyah et al., 2025). A study in Nuraksa Forest Park, Lombok, analyzed butterfly species richness and distribution patterns (Ilhamdi et al., 2024). Research in North Sumatra analyzed diversity and abundance based on elevation variation in Sibayak II Forest (Aditya et al., 2024). Finally, a study in Sidoarjo analyzed butterfly diversity in ecotourism habitats in the Abhirama Park Green Open Space area (Nelyzza & Ningsih, 2023). Butterfly research in urban forest and ecotourism areas is crucial to conduct, as it can provide valuable insights for the

management and conservation of biodiversity, as well as support environmental conservation efforts in the region.

Given the role of butterflies not only have a high aesthetic value, but also play an important role in ecosystems as pollinators, herbivores, and Environmental Quality Indicators (Sari & Purwanti, 2023; Ulpa et al., 2023). They are often used as bioindicators, because their sensitivity to environmental changes and can provide valuable information about the health of the ecosystem as a whole. By understanding existing butterfly species and their roles, we can design management strategies that support the sustainability of their habitats. Thus, the study contributes to broader conservation efforts and encourages the adoption of sustainable environmental management practices in urban areas. Research conducted by Sari et al., (2023) in the Langsa Urban Forest Park, 36 species of butterflies from 5 families with a medium Diversity Index were recorded. Previous research by Sari et al., (2023), which only used sweep nets, showed variations in diversity at certain locations and may increase with further research. These studies may be less accurate because some species are difficult to catch and observe. This study offers a new perspective by using a different method or technique from previous research, namely the combination method with bait. Therefore, this new study is very important to update or supplement existing data and provide insight into the importance of conservation efforts especially butterflies and more effective environmental management. It aims to maintain ecosystem balance and support biodiversity in the Langsa City Forest Park area.

METHOD

Time and Place

The research was conducted at the Langsa City Forest Park located in Paya Bujok Seulamak Village, Langsa Baro District, Langsa City, Aceh, at coordinates 4°29'26.1"N, 97°56'45.8"E in January 2025. There are 3 locations of this study, namely in the flower garden area, conservation forest, and playground area (skateboard), as seen in Figure 1. Flower Garden Area: located at coordinates 4°29'28.1" N 97°56'45.4" E, this area is characterized by a predominance of flowering plant vegetation, which is interesting as a source of feeding adult butterflies. Conservation forest: located at coordinates 4°29'28.9" N, 97°56'42.0" E, the area has a dense canopy of native tree species such as Damar (*Agathis dammara*) providing an ideal habitat for butterflies. The presence of such trees not only provides shelter, but also becomes a source of food for butterfly larvae. Playground Area (Skateboard): found at coordinates 4°29'27.6" N, 97°56'39.0" E, this area is designed for recreational activities and is surrounded by grass and shrubs. Although it is more open, this garden can attract butterflies because there are flowering plants around it, which provide shelter and a source of food.

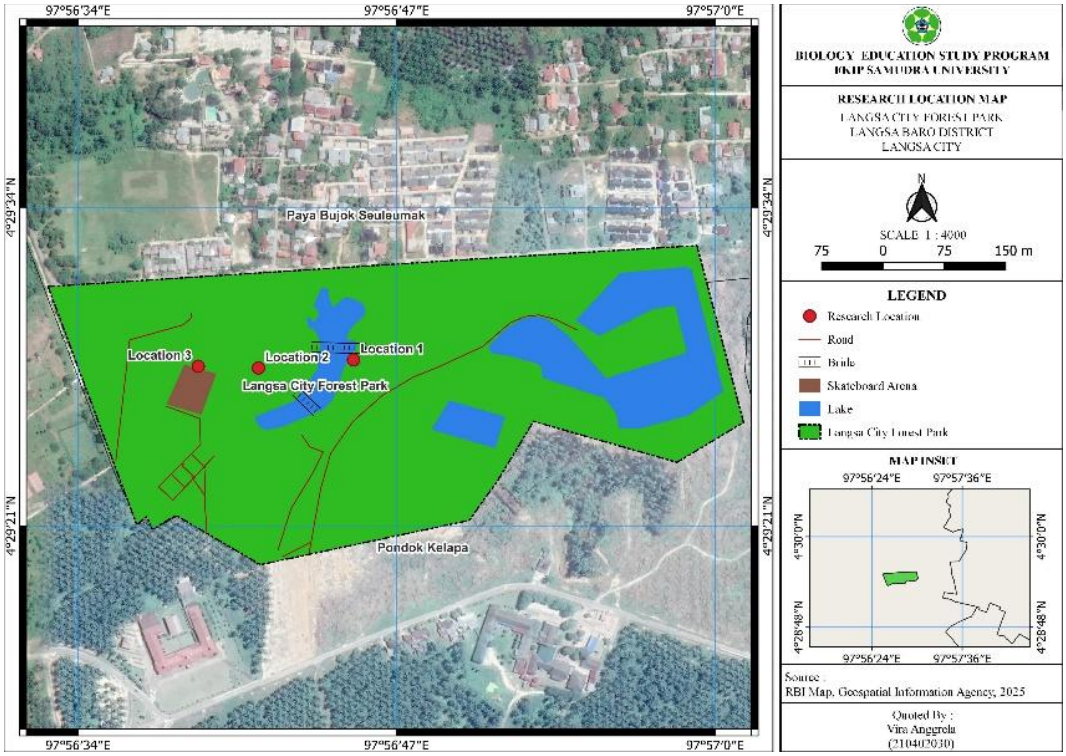


Figure 1. Map of the research location in Langsa City Forest Park, Aceh

Procedure and Data collection

The method used in this study was the transect line method. The study was conducted at three locations, namely a flower garden, a conservation forest, and a playground. The research transect locations were determined purposively. At each location, two transects were established. Each transect was approximately 200 meters long, with a distance of approximately 100 meters between transects. Data collection was conducted along the transect line, with a viewing distance of 10 meters to the right and left of the transect line. Each transect was observed 3 times. This study used a sweep net technique with a fine nylon insect net measuring 30 cm, an aluminum handle measuring 1.5 meters, and a round frame made of wire with a diameter of 25 cm. Data collection also used food bait in the form of a mixture of bananas and sugar placed on a plate to attract butterflies, with three repetitions (Gonggoli et al., 2021). Data collection began at 08.00 - 12.00 AM and continued at 01.00 – 03.00 PM on sunny days during the rainy season.

For identification purposes, individual butterflies from each species found were collected. The butterfly samples found were then stored in papillote paper after the abdomen of the butterfly was injected with 70% alcohol and labeled with a note containing the species name, time, and location of sample collection (Baideng et al., 2024). Species that could not be captured were photographed to facilitate identification. Observations and calculations of the number of species and the number of individuals per species were conducted (Krismawanti et al., 2022). The identification process was carried out at the Biology Laboratory of Samudra University based on morphological characteristics such as the shape and pattern of the butterfly's

wing scales using identification books (Ruslan, 2015; Rohman et al., 2019; Ruslan & Andayaningsih, 2021), journals (Lambkin et al., 2019; Condamine et al., 2023), and the Pictureinsect app.

As supporting data, measurements of environmental factors such as temperature, air humidity, and light intensity were also carried out. Measurement of physical environmental parameters such as temperature and humidity is done using a digital thermometer hygrometer HTC 2, with an error tolerance of +/-1° measurement is done by placing at a height of approximately 1 meter from the ground, in a location away from direct exposure to sunlight. Then the tool is given for 2 minutes to be able to communicate well. Measurement of light intensity with a lux meter, the sensor is continuously directed towards the main light source for light intensity measurement, and is not disturbed by objects. Measurements of environmental parameters were carried out at all times during the study with repeated three times at each location to ensure the accuracy of the data.

Data Analysis

Data were analyzed descriptively quantitatively using the Shannon-Wiener diversity index (H') and Simpson's dominance index (D). In addition, temperature, humidity and light intensity were measured to determine the effect of environmental parameters on Rhopalocera.

The Shanon-Wienner diversity index

The Rhopalocera diversity index was analyzed and calculated using the Shanon-Wienner diversity index formula (Yulia et al., 2023; Magurran, 1988).

$$H` = \Sigma\, pi \ln pi \quad \text{..... (1)}$$

Where, pi Value = ni/N

Description:

H`	: Diversity Index;
ni	: Number of Ith individual;
pi	: Proportion of individual species;
N	: Total number of individuals of all species;
ni/N	: Proportion of the number of the i-th species to the total number;
Ln	: Natural logarithm

Table 1. Diversity value criteria according to Shanon-Wienner (Magurran, 1988)

Diversity Index	Criteria
H` < 1	Low Diversity
1 < H` < 3	Moderate Diversity
H` > 3	High Diversity

Dominance Index (D)

The dominance index of Rhopalocera species was calculated using the following formula (Odum, 1933):

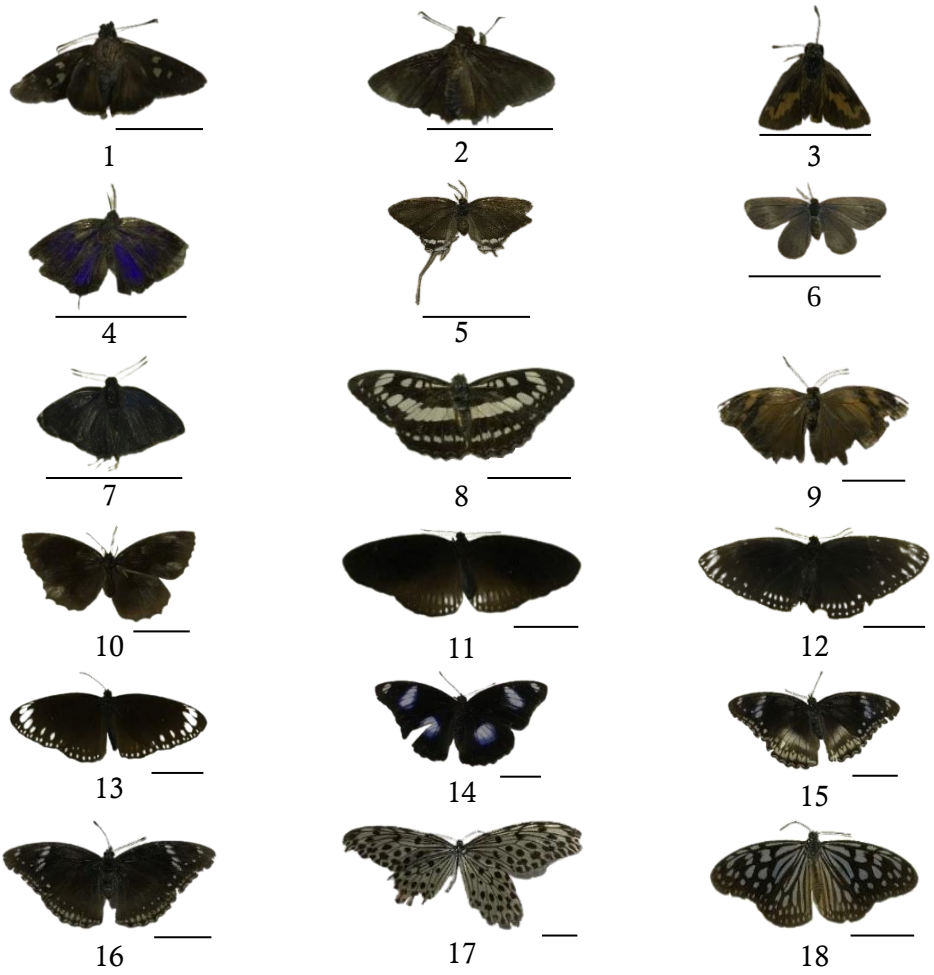
$$D = \Sigma \left(\frac{ni}{N}\right)^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Description:
D: Dominance Index;
ni: Number of individuals of each species;
N: Total number of individuals

The dominance index of butterfly species in the population uses Simpson's dominance with values ranging from 0 to 1. If it is close to 1, it means that the dominance of the specified species is increasing, and if the number is close to 0, it means that there is no particular type of dominance (Diba et al., 2021; Odum, 1933).

RESULT AND DISCUSSION

The results of butterfly (Rhopalocera) research in Langsa City Forest Park obtained a total of 388 individuals, including 41 species and belonging to 5 families namely Hesperidae, Lycaenidae, Nymphalidae, Papilionidae, and Pieridae. Species names and detailed images can be seen in Figure 2.



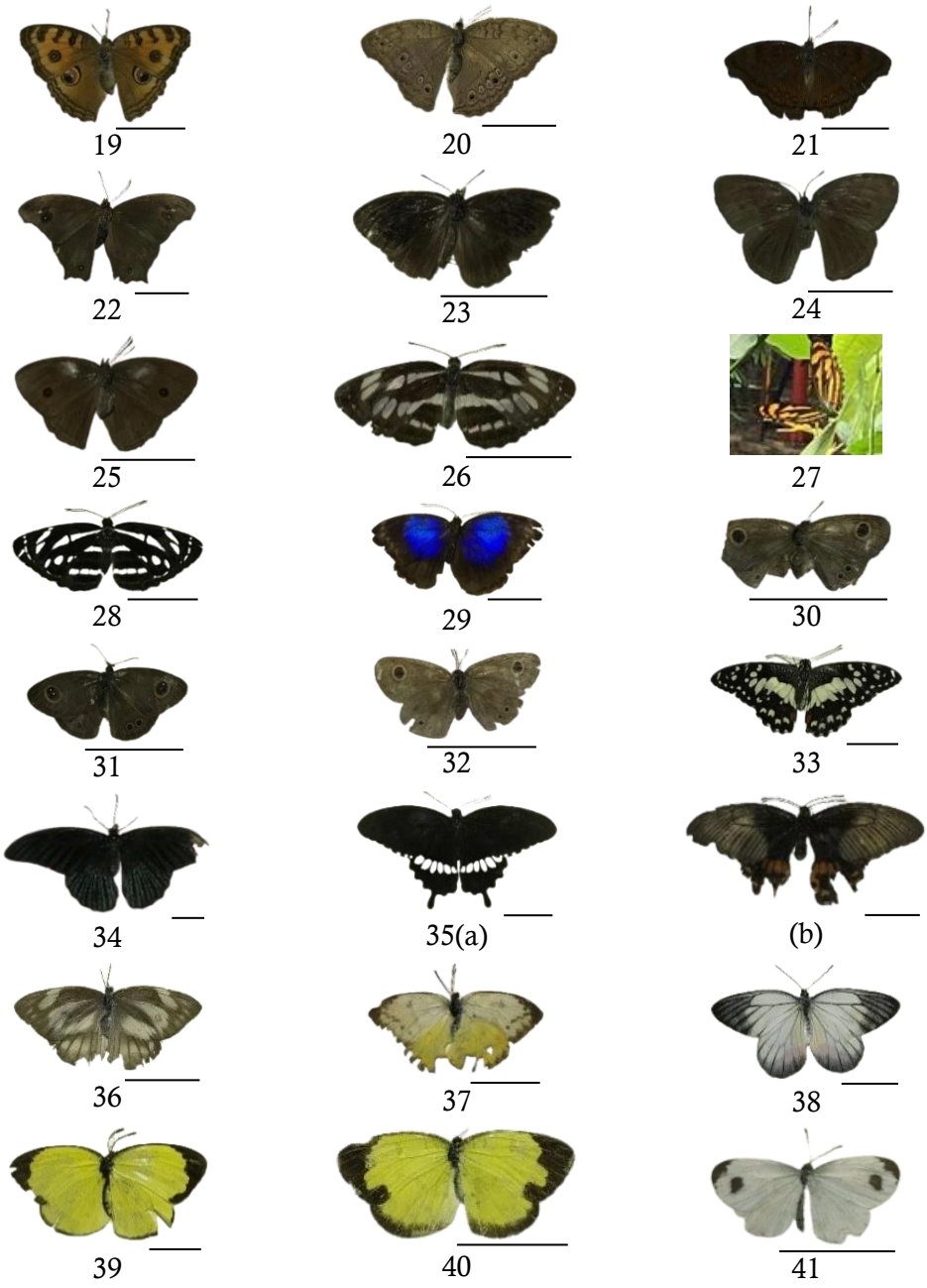


Figure 2. Rhopalocera species found in Langsa City Forest Park, 1. *Asbolis capucinus*, 2. *Matapia aria*, 3. *Potanthus omaha*, 4. *Arhopala meander*, 5. *Cheritra freja*, 6. *Pseudozizeeria maha*, 7. *Rapala manea*, 8. *Athyma perius*, 9. *Doleschallia bisaltide*, 10. *Elymnias hypermenestra*, 11. *Euploea eyndhovii*, 12. *Euploea klugii*, 13. *Euploea midamus*, 14. *Hypolimnas bolina*, 15. *Hypolimnas sp.1*, 16. *Hypolimnas sp.2*, 17. *Idea stolli*, 18. *Ideopsis vulgaris*, 19. *Junonia almana*, 20. *Junonia atlites*, 21. *Junonia hedonia*, 22. *Melanitis leda*, 23. *Mycalesis janardana*, 24. *Mycalesis mineus*, 25. *Mycalesis perseus*, 26. *Neptis hylas*, 27. *Neptis miah*, 28. *Neptis leucoporos*, 29. *Thaumantis klugius*, 30. *Yptima baldus*, 31. *Yptima horsfieldii*, 32. *Yptima huebneri*, 33. *Papilio demoleus*, 34. *Papilio Memnon*, 35. *Papilio polytes* (a) ♂ (b) ♀, 36. *Appias libythea*, 37. *Catopsilia scylla*, 38. *Delias hyparete*, 39. *Eurema blanda*, 40. *Eurema hecabe*, 41. *Leptosia nina* (Bar scale: 2.5 cm).

Based on Figure 2, it is known that the dominant butterfly family found is the Nymphalidae family, which consists of 25 species. This is because Nymphalidae is the largest group of butterflies that have extraordinary ecological adaptability, their polyphagous and cosmopolite nature allows them to survive in various environments and are widely distributed in various regions (Nurman et al., 2024). In accordance with the research of Awanni et al., (2024), the Nymphalidae family was found the most because the habitat or research location was supportive such as having shrub vegetation cover and there were many diverse plants as a source of food and shelter. Environmental conditions in Langsa City Forest Park which have various types of plant vegetation support the existence of these butterflies. Meanwhile, the Pieridae family found 6 species, followed by the Lycaenidae family with 4 species and the Hesperidae and Papilionidae families found in smaller numbers of 3 species each. The low number of species can be attributed to certain habitat preferences and dependence on specific host plants.

Tabel 2. Distribution of Butterflies by Family and Species in Langsa City Forest Park

No	Family	Spesies	Location			Conservation Status by IUCN
			1	2	3	
1.	Hesperidae	1) *Asbolis capucinus*	+	+	-	NE
		2) *Matapia aria*	-	+	-	NE
		3) *Potanthus omaha*	-	+	-	NE
2.	Lycaenidae	4) *Arhopala meander*	+	-	-	NE
		5) *Cheritra freja*	+	-	+	LC
		6) *Pseudozizeeria maha*	+	-	+	NE
		7) *Rapala manea*	-	+	-	NE
3.	Nymphalidae	8) *Athyma perius*	-	-	+	NE
		9) *Doleschallia bisaltide*	-	-	+	NE
		10) *Elymnias hypermenestra*	+	+	+	NE
		11) *Euploea eyndhovii*	+	-	+	NE
		12) *Euploea klugii*	+	-	-	NE
		13) *Euploea midamus*	+	-	-	NE
		14) *Hypolimnas bolina*	+	-	+	NE
		15) *Hypolimnas sp.1*	-	-	+	NE
		16) *Hypolimnas sp.2*	-	-	+	NE
		17) *Idea stolli*	+	-	-	NE
		18) *Ideopsis vulgaris*	+	-	+	LC
		19) *Junonia almana*	-	-	+	NE
		20) *Junonia atlites*	+	+	+	NE
		21) *Junonia hedonia*	+	+	-	NE
		22) *Melanitis leda*	+	-	-	LC
		23) *Mycalesis janardana*	+	+	+	LC
		24) *Mycalesis mineus*	+	+	+	NE
		25) *Mycalesis perseus*	+	+	+	NE

No	Family	Spesies	Location			Conservation Status by IUCN
			1	2	3	
		26) *Neptis hylas*	+	-	+	NE
		27) *Neptis miah*	+	-	-	NE
		28) *Neptis leucoporos*	+	+	-	NE
		29) *Thaumantis klugius*	+	-	-	NE
		30) *Yptima baldus*	+	+	+	NE
		31) *Yptima horsfieldii*	+	+	+	NE
		32) *Yptima huebneri*	+	+	+	NE
4.	Papilionidae	33) *Papilio demoleus*	-	+	+	NE
		34) *Papilio memnon*	+	+	+	NE
		35) *Papilio polytes*	+	+	+	NE
5.	Pieridae	36) *Appias libythea*	+	-	+	NE
		37) *Catopsilia scylla*	-	-	+	NE
		38) *Delias hyparete*	+	+	+	NE
		39) *Eurema blanda*	+	+	+	NE
		40) *Eurema hecabe*	+	+	+	LC
		41) *Leptosia Nina*	+	+	+	NE

Description: (+) Found (LC) Least concern
(-) Not found (NE) Not Evaluated

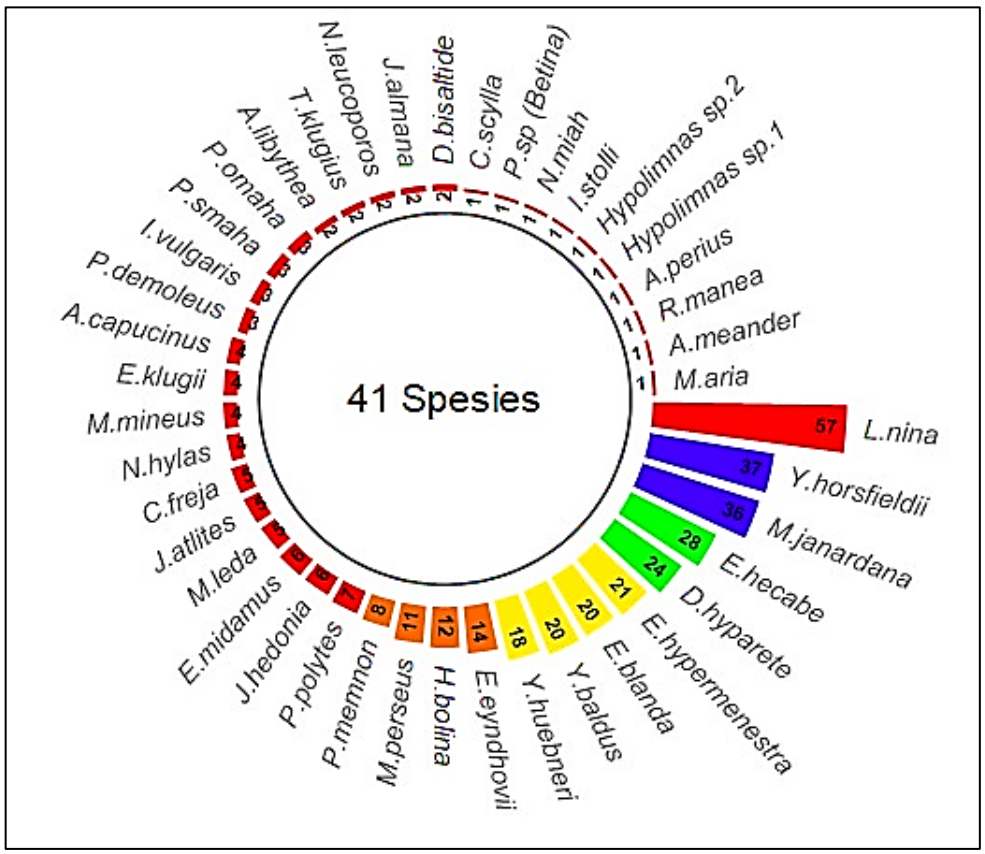


Figure 3. Distribution of Butterfly Species at The Research Site

Based on Table 2 collected 41 species of butterflies obtained at the research site, there are 5 species of butterflies that are included in IUCN (2025) the status such as *Cheritra freja, Ideopsis vulgaris, Melanitis leda, Mycalesis janardana,* and *Eurema hecabe* with low risk category (Least Concern), while 36 other species are still in the category of no evaluation (IUCN). The five species classified in the category of species with a low risk level (LC) is a conservation status that is categorized for species that do not face the risk of extinction in the near future and have stable populations. Based on this LC status, the species has a high degree of adaptation to current environmental conditions and has the potential to have a fairly wide habitat (Wulandari et al., 2024). The five species in Langsa City Forest Park are classified as good, evidenced by the population of these species can still be found in Langsa City Forest Park because this area is a forest area that has plant vegetation with suitable environmental conditions to support the life of butterfly species (Rhopalocera).

Based on the distribution of butterfly species at the research site, it can be seen that the number of butterfly species (Rhopalocera) in Langsa City Forest Park is found *Leptosia nina* species (57 individuals) and *Yptima hoersfieldii* species of 37 individuals. *Leptosia nina* of the family Pieridae is found in the greatest number of individuals. This is in line with the research of Ashari et al., (2022) *Leptosia nina* is the most dominant found because at the research site it is dominated by a variety of shrub vegetation such as Asteraceae. Plants of the Asteraceae family act as a source of food for Butterflies of the Pieridae family, providing nectar that supports their survival.

Diversity Index

The calculation results show that location I is in the flower garden area has the highest diversity index value with a value of H' = 2.86 while location II is in the conservation forest area has a low diversity index value with a value of H`= 2.67, but still in the same category with the medium category.

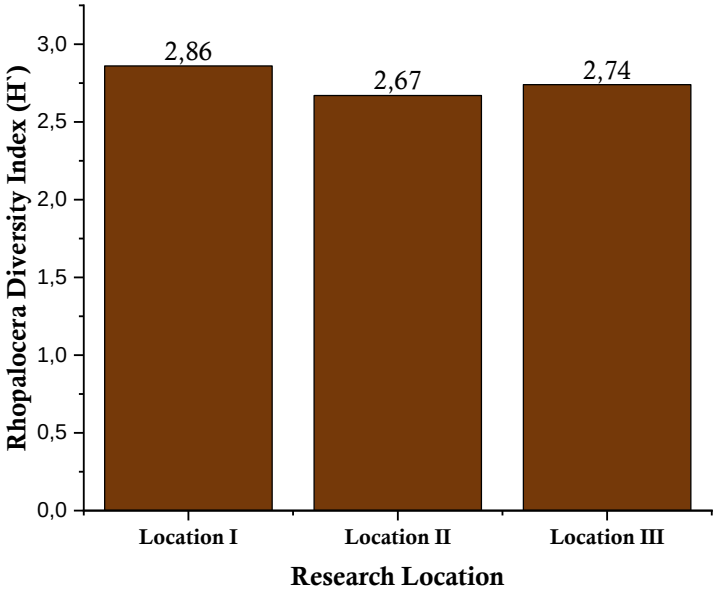


Figure 4. Butterfly diversity index by location

The result of butterfly diversity index calculation in Langsa City Forest Park is generally high (H' = 3,10). This means that the area has a good habitat to be an important indicator for the presence of individual butterflies (Rhopalocera). Based on the three research locations, the calculation results show that each location has different values but still in the same category, namely medium. Location I in the flower garden area has the highest diversity index (H' = 2.86), followed by location III (H`= 2.74) and the last location II (H`= 2.67). Location I and III more commonly found the number of individual species of butterflies, in accordance with the conditions of habitat and environmental carrying capacity there is a variety of plant vegetation such as family Apocynaceae, Arecaceae, Asteraceae, Myrtaceae and Rutaceae as a feed plant for larvae, nectar for imago and as a host plant for butterflies, as well as its location close to water sources, namely the presence of lakes and streams. This is consistent with butterflies that tend to choose habitats with ideal environmental conditions, such as proximity to sources of clean water, as well as the diversity of flowering vegetation that is their food source (Ruslan et al., 2022). The rainy season also affects the presence of the number of butterflies because in this season there are many blooming flowers that are a source of food, on the contrary, during the dry season there are not many plants that affect the number of individual butterflies (Baideng et al., 2024). And the lower diversity index value in location II, namely conservation forest, because the condition is dominated by tree vegetation such as resin tree (*Agathis dammara*) which is towering with a closed canopy and there are also few shrubs affect the existence of butterflies.

Dominance Index

The results of the calculation of the dominance index obtained at the research site has a dominance index that varies in each location, but has the same category that is low. The dominance index of butterfly species in the study site ranged from 0.08 to 0.10 which was included in the low dominance category. The value of the dominance index is close to 0 then included in the category of low dominance (Pahman et al., 2022). This means that there is no dominance and each species is almost the same or comparable, so that the index of evenness and species diversity in an area is quite high (Mukaromah et al., 2019). This is because each research site there is plant vegetation for Rhopalocera species. The dominance of a type of butterfly in an area is not only influenced by habitat factors, vegetation but also by factors of competition between species and the presence of predators (Ramadhan & Satria, 2024).

Tabel 3. Dominance index (D) Butterfly

	Location	Dominance index (D)	Categories
I.	Flower Garden	0.08	Low
II.	Conservation Forest	0.09	Low
III.	Playground Area	0.10	Low

Environmental Parameters

Based on the measurement of environmental parameters (see Table 3) it can be seen that the highest temperature and light intensity are at location III, namely 29.8 C and 1100 lux. While the air humidity at location I.

Tabel 4. Environmental Parameter Measurement Data

Environmental parameters	Location			Average value
	1	2	3	
Temperature (°C)	27.9	26.5	29.8	28.1
Humidity (%)	76.3	78.3	70	74.9
Light intensity (cd)	533.3	416.7	1100	683.3

Based on Figure 5, it can be seen that the relationship between the diversity (H`) of butterflies and environmental parameters at the study site is strongly affected. Based on the analysis of Principal Component Analysis (PCA) showed the influence (high air humidity) at location I and the influence of temperature and high light intensity also at location III. The varying air humidity and the diversity of Rhopalocera are on a fairly close axis. This indicates a strong relationship between the two variables. According to Saifudin et al., (2020) insects cannot live at very high humidity, so they are very difficult to find in areas that have air humidity above 90 %. Based on the results of research the highest air humidity is at location I is 78 %. So that the humidity value is still below the value of 90 % indicates air humidity supports the development and activity of butterflies (Rhopalocera).

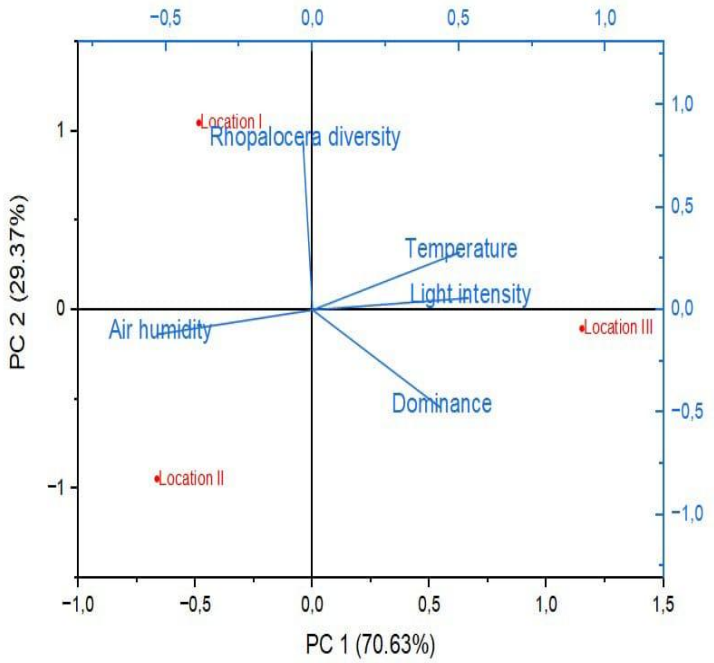


Figure 5. Analysis of The Main Components of Environmental Parameter at the Research Site

While the influence of higher temperatures during the day causes butterflies to become more active. The effective temperature for insects is 15 – 45 °C in addition, the light intensity indicates that butterflies are found more in locations with high light intensity, that is, in open areas. This is in accordance with the environmental parameters in location III which is open close to the source of direct sunlight so that many butterfly individuals can be found in this location. The measurement results at the research site have a range of 533.3 - 1100 cd. Based on sustainable research Lestari et al., (2021) light intensity is still good for butterflies, ranging from 600 to 2000 cd. The data obtained from this study can serve as a baseline to support future butterfly conservation policies. By understanding butterfly diversity, we can identify changes in butterfly populations within the ecosystem, as well as influencing environmental factors that may occur due to climate change or human activities. This information is crucial for supporting effective and sustainable conservation policies and for raising public awareness about the importance of protecting biodiversity, including butterflies in Langsa City Forest Park.

CONCLUSION

This study provides the latest data on the diversity of butterfly species found in Langsa Urban Forest Park. The methods and techniques used in this study produced more complete data on the butterfly species found. Based on the research results, there are 41 butterfly species (Rhopalocera) belonging to 5 families, namely Hesperidae, Lycaenidae, Nymphalidae, Papilionidae, and Pieridae. The Nymphalidae family is the most dominant with the highest number of species (25 species), while the families with the fewest species are Hesperidae and Papilionidae. There are 5 species classified under the IUCN Least Concern status, namely *Cheritra freja*, *Ideopsis vulgaris*, *Melanitis leda*, *Mycalesis janardana*, and *Eurema hecabe*, all categorized as low risk. The diversity index in Langsa City Forest Park is generally high (H` = 3.10), while the dominance index (D = 0.06) is classified as low. These findings enrich the biodiversity database in the region and provide important information for policymakers in understanding biodiversity dynamics. By understanding the diversity of butterfly species and their habitat conditions, authorities can formulate more effective conservation strategies to protect butterfly species and their habitats, such as by establishing butterfly breeding centers. Additionally, this can increase public awareness of the role of butterflies and the importance of maintaining biodiversity in Langsa City Forest Park.

REFERENCES

Aditya, W., Hutasuhut, M. A., & Tambunan, E. P. S. (2024). Diversity of butterfly types (Lepidoptera: Rhopalocera) based on altitude variations in Sibayak II Forest, North Sumatra. *Jurnal Biologi Tropis, 24*(1), 8-15. https://doi.org/10.29303/jbt.v24i1.6330

Alawiyah, R., Azizah, N., Azfani, L. A., Diniah, S., Yasa, I. P., Nanisfi, M., ... & Imami, V. S. (2025). Diversity of Butterfly Species in The Kerandangan Nature

Tourism Park, Senggigi, West Lombok. *Journal of Biology, Environment, and Edu-Tourism, 1*(1), 28-32. https://journals.widhatulfaeha.id/index.php/jbee/article/view/7.

Ashari, R. Y., Ilhamdi, M. L., & Santoso, D. (2022). The Diversity of Butterflies (Lepidoptera) in the Aik Bukak Tourism Park Area. *Journal of Tropical Biology, 22*(1), 23-29. https://doi.org/10.29303/jbt.v22i1.2850

Awanni, S. R. A., & Saputra, H. M. (2024). Diversity and Distribution Patterns of Insect Pollinators on Key Orange (Citrus microcarpa) Plants in Merawang District, Bangka Regency. *Biosilampari Journal: Journal of Biology, 6*(2), 103-113. https://doi.org/10.62112/biosilampari.v6i2.58 **[*In Indonesian language*]**

Baideng, E. L., Angkow, F. K., & Dapas, F. N. J. (2024). Inventory of Butterflies (Lepidoptera) in the Kuwil Kawangkoan Dam Area, North Minahasa Regency. *Jurnal MIPA, 13*(2), 67-70. https://doi.org/10.35799/jm.v13i2.55909 **[*In Indonesian language*]**

Condamine, F. L., Allio, R., Reboud, E. L., Dupuis, J. R., Toussaint, E. F., Mazet, N., ... & Sperling, F. A. (2023). A comprehensive phylogeny and revised taxonomy illuminate the origin and diversification of the global radiation of Papilio (Lepidoptera: Papilionidae). *Molecular Phylogenetics and Evolution, 183*, 107758. https://doi.org/10.1016/j.ympev.2023.107758

Diba, F., Ressiawan, R., & Nurhaida, N. (2021). Community Structure of Superfamily Papilionoidae (Lepidoptera) Butterflies in Budi Watershed Area, Sungai Betung District, Bengkayang Regency, West Kalimantan Province. *Bioma: Biology Scientific Periodical, 23*(1), 77-83. https://doi.org/10.14710/bioma.23.1.77-83 **[*In Indonesian language*]**

Fox, R., Harrower, C. A., Bell, J. R., Shortall, C. R., Middlebrook, I., & Wilson, R. J. (2019). Insect population trends and the IUCN Red List process. *Journal of Insect Conservation, 23*(2), 269-278.

Gonggoli, A. D., Sari, S., Oktofiani, H., Santika, N., Herlina, R., Agatha, T., & Gunawan, Y. E. (2021). Identification of butterfly species (Lepidoptera) at Palangka Raya University. *Bioexperiment: Journal of Biology Research, 7*(1), 16-20. https://doi.org/10.23917/bioeksperimen.v7i1.10361 **[*In Indonesian language*]**

Hadi, M., & Naim, M. A. (2020). Lepidoptera diversity in Jollong agro-tourism area, Pati Regency. *Jurnal Akademika Biologi, 9*(2), 29-38. https://ejournal3.undip.ac.id/index.php/biologi/article/view/29316. **[*In Indonesian language*]**

Ilhamdi, M. L., Al Idrus, A. G. I. L., Santoso, D., Hadiprayitno, G., Syazali, M., & Hariadi, I. (2024). Species richness and dispersion patterns of Lepidoptera (Rhopalocera) in the Nuraksa Forest Park, Lombok, Indonesia. *Biodiversitas Journal of Biological Diversity, 25*(1). https://doi.org/10.13057/biodiv/d250108

IUCN. (2025). IUCN Red List Categories and Criteria: Version 3.1. https://www.iucnredlist.org/resources/categories-and-criteria.

Krismawanti, R., Rostikawati, T., & Prasaja, D. (2022). Insect Diversity (Order Lepidoptera) at the Bogor Javanese Eagle Animal Sanctuary Center. *Ecologia: Scientific Journal of Basic and Environmental Sciences, 21*(2), 54-63. https://doi.org/10.33751/ekologia.v21i2.3893 **[*In Indonesian language*]**

Lambkin, T. A., Braby, M. F., Eastwood, R. G., & Zalucki, M. P. (2019). Taxonomic revision of the Euploea alcathoe complex (Lepidoptera: Nymphalidae) from Australia and New Guinea. *Austral Entomology, 58*(1), 52-75. https://doi.org/10.1111/aen.12299

Lestari, A., Harmoko, H., & Susanti, I. (2021). Butterflies (Lepidoptera) from Bukit Gatan Waterfall, STL ULU Terawas District, Musi Rawas Regency, South Sumatra Province. *Biotik: Scientific Journal of Biology Technology and Education, 8*(2), 126-134. http://dx.doi.org/10.22373/biotik.v8i2.7379 **[*In Indonesian language*]**

Magurran, A. E. (1988). Diversity indices and species abundance models. In Ecological diversity and its measurement. Dordrecht: Springer Netherlands. Pp. 7-45.

Mukaromah, A., Husna, I., Lutfiana, K. N., & Wahyuningsih, R. (2019). Exploration of Butterfly (Lepidoptera) Diversity and Conservation Status in Mount Merbabu National Park, Central Java. *Indonesian Journal of Mathematics and Natural Sciences, 42*(1), 16-22. https://doi.org/10.15294/ijmns.v42i1.22635

Najah, M. K. (2023). Diversity of butterflies (suborder: Rhopalocera) in Ujung Kulon National Park. *Journal of Biogeneration, 8*(1), 334-342. https://doi.org/10.30605/biogenerasi.v8i1.2191 **[*In Indonesian language*]**

Nelyzza, N., & Ningsih, I. K. (2023). Butterfly Diversity (Lepidoptera) in the Green Open Space of Abhirama Park, Sidoarjo Regency. *Sains dan Matematika, 8*(2), 62-68. https://doi.org/10.26740/sainsmat.v8n2.p62-68 **[*In Indonesian language*]**

Nurman, N., Turrahmi, M., Muspa, A., Amrullah, S. H., Indriyanti, N., & Noviana, E. (2024). Butterfly Species Diversity (Suborder: Rhopalocera) and its Relationship with Vegetation Type in the Campus Environment of West Sulawesi University. *Biocoenosis, 2*(1), 103-112. https://journal.unwira.ac.id/index.php/BIOCOENOSIS/article/view/3940 **[*In Indonesian language*]**

Odum, E. P. (1993). Fundamentals of Ecology. Third Edition. Bandung: CV. Remadja Karya. **[*In Indonesian language*]**

Pahman, I., Hernawati, D., & Chaidir, D. M. (2022). Study of butterfly diversity (Papilionoidea) based on altitude in the Galunggung Mountain Area, Tasikmalaya Regency. *Bioscientist: Scientific Journal of Biology, 10*(2), 818-836. https://doi.org/10.33394/bioscientist.v10i2.5742 **[*In Indonesian language*]**

Ramadhan, D. R., & Satria, R. (2024). Butterfly Diversity (Lepidoptera) in Serasah Uwak Waterfall Area, Limau Manis, Pauh District, Padang City, West

Sumatra Province. *Tambusai Education Journal, 8*(1), 10400-10410. https://doi.org/10.31004/jptam.v8i1.13949 **[*In Indonesian language*]**

Rani, M. R. I., Atmowidi, T., & Widarto, T. H. (2023). Variation in Shape and Color of Butterfly and Moth Wing Scales. *Journal of Biological Resources, 9*(4), 164-170. https://doi.org/10.29244/jsdh.9.4.164-170 **[*In Indonesian language*]**

Ritonga, Y. E., Pradwinata, R., & Pendong, L. M. (2025). Butterfly diversity in natural and modified habitat at Bahorok District, Langkat Regency, North Sumatra. *Jurnal Entomologi Indonesia, 22*(1), 17-28. https://doi.org/10.5994/jei.22.1.17 **[*In Indonesian language*]**

Rohman, F., Efendi, M, E., & Andrini, L, R. (2019). Butterfly Bioecology Book. Malang: State University of Malang. https://fmipa.um.ac.id/wp-content/uploads/2021/02/Buku-Bioekologi-Kupu-Kupu-Full_Fatchur-Rohman_compressed.pdf. Accessed on 16Th May 2025 **[*In Indonesian language*]**

Ruslan, H., Ryan, C. F., Musyafa, D., & Mulya, D. (2022). Fluctuations in abundance and diversity of butterflies (Papilionoidea) in the Urban Forest of Arboretum Cibubur Jakarta. *Journal of Natural, 18*(1), 21-24. https://doi.org/10.30862/jn.v18i1.168 **[*In Indonesian language*]**

Ruslan, Hasni, & Dwi Andayaningsih. (2021). Butterflies of Protected Forest, Wildlife Sanctuary, Ecotourism, and Angke Kapuk Nature Park North Jakarta. National University Publishing House, National University Jakarta. http://repository.unas.ac.id/id/eprint/5052. Accessed on 16Th May 2025

Ruslan, Hasni. (2015). Butterfly Diversity. National University Publishing House. Jakarta. ISBN 978-602-0819-02-0. http://repository.unas.ac.id/549/1/Buku%20Kupu-kupu%20Indonesia.pdf. Accessed on 16Th May 2025

Saifudin, M. A., Sufajar, A., As'ari, H., & Nurmasari, F. (2020). Lepidoptera Diversity in SPTN Region 1 Bekol Baluran National Park. *Biosense Journal, 3*(1), 31-45. https://doi.org/10.36526/biosense.v3i1.965 **[*In Indonesian language*]**

Sari, H. P. E., Persada, A. Y., Mustaqim, W. A., Putri, K. A., & Wafa, I. Y.(2023). Butterfly Diversity from Isolated Lowland Area: An Assessment in Langsa Urban Forest, Langsa, Aceh, Indonesia. *Journal of Tropical Biodiversity and Biotechnology, 8*(2), 74610. https://doi.org/10.22146/jtbb.74610

Sari, P., & Purwanti, D. Y. (2023). Nocturnal insect diversity in Teluk Bogam Village Pakalan Bun. *Titian Ilmu: Multi Sciences Scientific Journal, 15*(1), 54-62. https://doi.org/10.30599/jti.v15i1.2102 **[*In Indonesian language*]**

Septiani, N., Nurhadi, N., & Maizeli, A. (2023). Insects Species Found in Kasturi Orange Orchards in Cikarau, Dadok Tunggul Hitam Village, Koto Tangah District, Padang City. *Tambusai Journal of Education, 7*(1), 1660-1663. https://doi.org/10.31004/jptam.v7i1.6040 **[*In Indonesian language*]**

Setiawan, A. (2022). Indonesia's biodiversity: Issues and conservation efforts. *Indonesian Journal of Conservation, 11*(1), 13-21. https://journal.unnes.ac.id/nju/index.php/ijc/article/view/34532 **[*In Indonesian language*]**

Syahra, K. A., Hasanuddin, H., Wardiah, W., Samingan, S., & Andayani, D. (2021). Analysis Of Plant Vegetation In The Forest Park Of Langsa City. *Biology Education Student Scientific Journal, 6*(4), 7-14. https://jim.usk.ac.id/pendidikan-biologi/article/view/16875

Taradipha, M. R. R. (2019). Environmental Characteristics of Insect Community. *Journal of Natural Resources and Environmental Management, 9*(2), 394-404. https://doi.org/10.29244/jpsl.9.2.394-404 **[*In Indonesian language*]**

Trovicana, K. Y., & Faizah, U. (2024). Diversity of Butterflies (Lepidoptera) as a Parameter of Environmental Conditions in the Keputih Bamboo Forest Area Surabaya: Diversity of Butterflies (Lepidoptera) as an Environmental Condition Parameter in the Keputih Bamboo Forest Area of Surabaya. *Science and Mathematics, 9*(1), 8-15. https://doi.org/10.26740/sainsmat.v9n1.p8-15 **[*In Indonesian language*]**

Ulpa, M., Ilhamdi, M. L., & Hadiprayitno, G. (2023). Butterfly Species Diversity in Mount Jae, West Lombok Regency as Enrichment Material for High School Biology Lessons. *Bioscientist: Scientific Journal of Biology, 11*(1), 874-888. https://doi.org/10.33394/bioscientist.v11i1.8679

Wulandari, A. A., Safaraz, B. R., Naafi, D. A. U., & Ramadhan, F. A. (2024). Diversity and Conservation Status of Insects in Nglorog River, Ngrombo Village, Baki, Sukoharjo. *Journal of Review of Education and Teaching (JRPP), 7*(4), 16367-16375. https://doi.org/10.31004/jrpp.v7i4.37548 **[*In Indonesian language*]**

Yulia, Y. R. S., Kenedi, M., Chrisnawati, L., & Mahfut, M. (2023). Diversity of Pollinating Insects in the Lumbok Seminung Biodiversity Park, West Lampung. *Konservasi Hayati, 19*(1), 58-64. **[*In Indonesian language*]**

Yusup, B., & Apriyanto, E. (2023). Diversity of Butterfly Species (Lepidoptera: Rhopalocera) in the Bukit Gatan Protected Forest Area, Musi Rawas Regency, South Sumatra Province. *Journal of Global Forest and Environmental Science, 3*(2), 37-45. https://ejournal.unib.ac.id/jhutanlingkungan/article/view/32187 **[*In Indonesian language*]**

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