SAINTIFIK@: JURNAL PENDIDIKAN MIPA

E-ISSN: 2598-3822 | P-ISSN: 2087-3816

Available online at https://ejournal.unkhair.ac.id/Saintifik

Keanekaragaman dan Kelimpahan Kupu-Kupu Lokal (Ordo Lepidoptera) di Pulau Ternate

(Diversity and abundance of local butterflies (Order Lepidoptera) in Ternate Island)

Nelly Ardiani Drakel[a*], Abdu Mas'ud[b], Zulkifli Ahmad[b], Sundari [b]

[a] *Undergraduate Biology Education, Faculty of Teacher Training and Education, Universitas Khairun, Ternate, Indonesia, 97735*

[b] *Biology Education, Faculty of Teacher Training and Education, Universitas Khairun, Ternate, Indonesia, 97735*

[*] *Corresponding author: nellyardiani73@gmail.com*

Received 21-08-2025, Revised 07-09-2025, Accepted 16-10-2025, Published 18-10-2025

Keywords:
Butterfly; Lepidoptera; Diversity; Abundance; Ternate Island

ABSTRACT. Ternate Island has a forest ecosystem rich in biodiversity, including butterflies that play an essential role as natural pollinators and biological indicators of Environmental Health. However, pressures from human activities, such as deforestation, land conversion, and the disposal of inorganic waste, lead to habitat degradation, loss of host plants, and a decline in butterfly populations. This study aims to provide the latest information on the diversity and abundance of local butterfly species on Ternate Island, informing conservation efforts. The research employs an exploratory descriptive approach, utilizing a time search method with a wide search radius of 100 m at each research location. The research results found 351 individuals consisting of 18 types of local butterflies from 4 families, namely; 1) family Nymphalidae with 11 species including *Cyrestis acilia, Danaus genutia, Ideopsis vulgaris, Elymnias hypermnestra, Mycalesis terminus, Parantica cleona, Pantopria hordonia, Danaus affinis, Hypolimnas bolina, Ideopsis vitrea,* and *Euploea tulliolus* 2) the Pieridae family of 3 species includes *Eurema hecabe, Catopsilia pyranthe,* and *Catopsilia scyll* 3) the Lycaenidae family includes one species *Lampides boeticus* 4) Family Papilionidae with three species including *Pachliopta polyphontes, Troides criton* and *Troides helena* etc. The value of the local butterfly diversity index in Ternate Island is H' = 2.32.32, which is categorized as moderate diversity. Furthermore, the abundance index analysis yields a value of 100%, which is classified as very high abundance.

INTRODUCTION

Ternate Island boasts a diverse forest ecosystem that supports a rich biodiversity, including numerous endemic species of flora and fauna. However, pressure on the environment continues to increase due to human activities such as illegal logging, forest conversion into agricultural land, and settlement expansion, resulting in habitat fragmentation, decreased ecosystem quality, and reduced biodiversity. This deforestation not only threatens the preservation of forests but also leads to the loss of natural habitat for local species. The need for agricultural land for food and industry contributes to the acceleration of land conversion, which often results in the conversion of natural forests into monoculture farming systems. This change has an impact on the decline in butterfly populations caused by erosion, flooding, and disruption of the hydrological cycle, as well as research on habitat destruction and loss of host plant availability as breeding sites [1].

The impact of environmental degradation due to deforestation also affects the existence of various types of insects, including butterflies belonging to the order *Lepidoptera*. Butterflies not only possess an alluring visual beauty but also play a crucial role in the ecosystem [1]. Butterflies contribute as natural pollinators that help the reproductive process of various plant species. In addition, butterflies also serve as biological indicators that are sensitive to environmental changes, so their presence and diversity reflect the level of stability and quality of an ecosystem. However, the rarity of butterfly species is highly dependent on the preservation of their natural habitat. Environmental damage, such as deforestation and pollution, can threaten butterfly populations and impact the overall ecosystem balance[2].

Damage to butterfly habitats is not only caused by massive landscape changes, but also by the loss of specific plant types due to illegal logging and environmental pollution [3]. Many butterfly species rely on host plants as a site for metamorphosis, especially in the larval stage. If the host plant is lost due to logging or damage caused by human activities, such as dumping waste into forest areas, the butterfly's life cycle will be significantly disrupted. Waste disposal in forest areas is one of the factors contributing to environmental degradation. Inorganic wastes, such as plastics, not only pollute soil and water but also interfere with the growth of wild plants that serve as a food source for adult butterflies and their larvae [4].

Butterflies are a group of insects with high species diversity and are closely related to environmental factors that affect their presence and abundance in a habitat [5]. Environmental conditions, such as the availability of plants as hosts and food sources, including parks, forests, or green open spaces, significantly influence the diversity of butterflies that inhabit a particular area or habitat. The high diversity of butterflies reflects ecosystem stability and can be used as a bioindicator of environmental health[6].

The abundance of Butterflies is an essential indicator in evaluating the condition of an ecosystem. Abundance refers to the number of individuals of each species found in a region. Regions with high levels of abundance indicate that the ecosystem has adequate availability of resources, such as food, spawning grounds, and protection from predators or environmental disturbances. Conversely, a low abundance of butterflies may indicate the presence of ecological disturbances such as pollution, habitat destruction, or pressure from human activities. Therefore, the observation of the abundance of butterflies not only reflects the dynamics of the population, but also acts as a biological indicator of the stability and quality of the environment [1]; [7]

Environmental factors play a crucial role in shaping the diversity and abundance of butterflies within a habitat. Abiotic factors, such as temperature, light intensity, humidity, and water availability, directly affect the daily activities and physical processes of butterflies, including flight, mating, and egg laying. Meanwhile, biotic factors, such as the presence of vegetation — especially host plants and flowering plants — largely determine the life cycle of butterflies. Human activities such as tree felling, land clearing, and disposal of inorganic waste can also alter microclimate conditions and damage habitats, thus decreasing the environmental carrying capacity for butterfly survival[8]; [4]

Butterfly Conservation is a crucial step in maintaining the balance of the ecosystem and ensuring the sustainability of biological resources. This paper reports the results of research on the types of local butterflies on the islands of North Ternate and South Ternate. The purpose of this study is to update the latest information on the diversity and abundance of local butterfly species on Ternate Island for conservation efforts.

RESEARCH METHODS

This research was conducted in the forest areas of South Ternate and North Ternate, spanning a 16-day research period from July 2025.

Types Of Research

This research is one of non-experimental explorative descriptive research with a quantitative approach, with a time search[9]; [10]. The variables measured in this study were the diversity and abundance of local butterfly species on South Ternate Island and North Island. Tools used in this penitentiary sweepnet (insect nets), stationery, cameras, oil paper/papilot, paper labels, identification books, Bioecology of butterflies on Ternate Island, GPS, thermometer, camphor, raffia dance, meter. Materials used: Chlorophyll. The objects in this study are all types of local butterflies found on South Ternate Island and North Ternate Island.

Research Procedures

The research procedure is to first determine the location of observations based on the presence of vegetation and butterfly activity, then use the Time Search method with an area limitation of 100 m x 50 m, then observe and record the butterflies seen within a radius of 5 meters from the observation path, then capture the butterflies that can not be identified in the sweepnet, then identifies species based on wing morphology and color patterns with the help of identification books, then records the number of individuals of each species, environmental conditions (especially temperature), and location coordinates and then collects data from each location repeated during the observation period.

Data Analysis

Data analysis conducted in this study includes: species diversity index (H'), species funding Index (D), and environmental analysis with the following formula:

Diversity Index

Analysis of the diversity of butterfly species to determine H' used Index *Shannon-Wiener with Mangurran formulation* [11]**.** This H' formulation of Magurran's analysis also considers the number of types and the number of individuals per type, calculated using Equation 1.

$$H' = -\Sigma pi \ ln \ pi \qquad \text{where } Pi = ni/N \text{ dan } N = \Sigma ni \qquad (1)$$

Species Abundance Index (D)

Species abundance index using Ludwig and Reynolds (1981) formulation.

$D = \frac{ni}{N}$ x 100% (2)

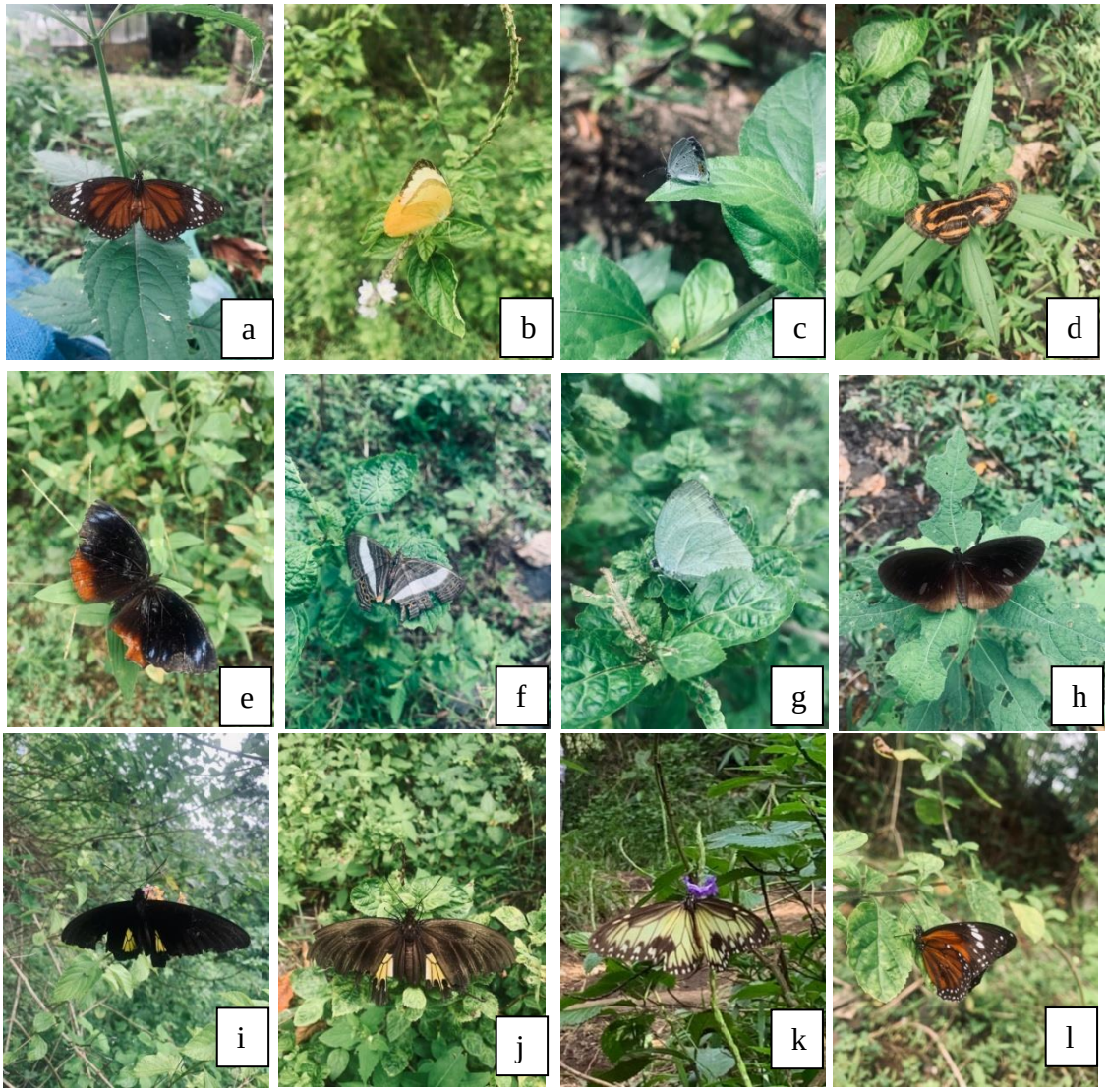
Environmental Analysis

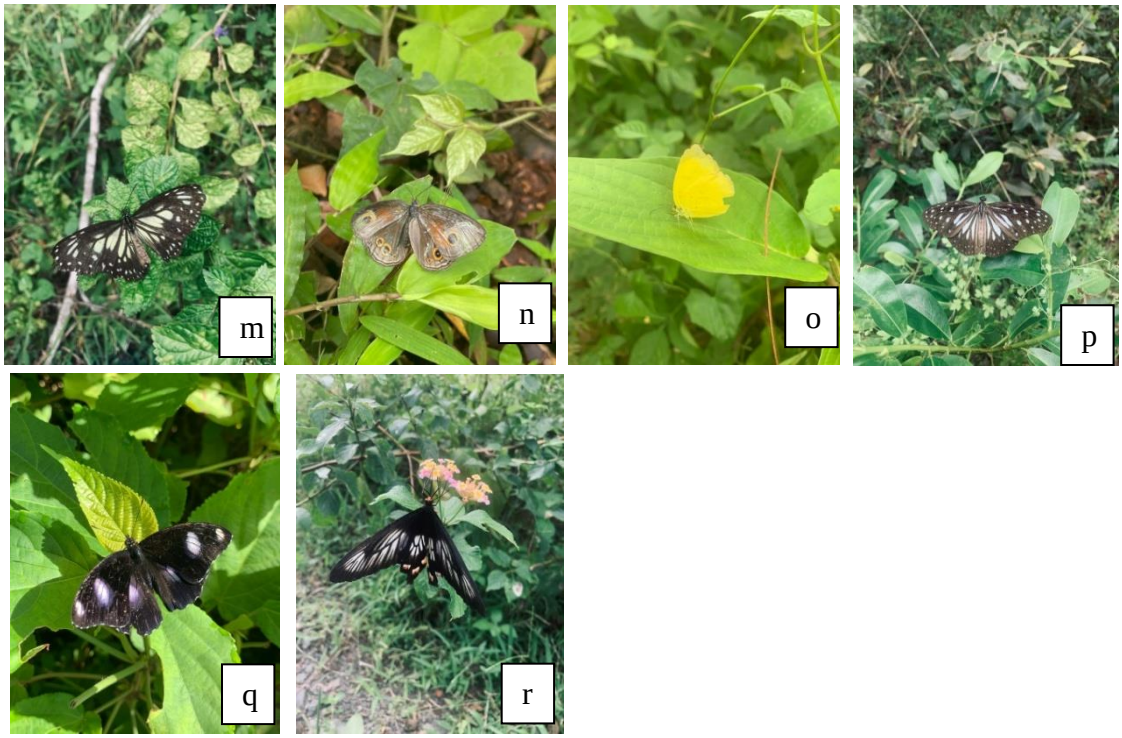
An environmental analysis was conducted in this study to determine the influence of environmental factors on the level of diversity and abandonment of butterflies on Ternate Island, using Principal Component Analysis (PCA).

RESULTS AND DISCUSSION

Identification of local butterflies in North Ternate and South Ternate

Based on the research results, there are several types of butterflies found in both locations from 4 families, namely Nymphalidae with 11 types, namely *Cyrestis acilia, Danaus genutia, Ideopsis vulgaris, Elymnias hypermnestra, Mycalesis terminus, Parantica cleona, Pantoporia hordonia, Danaus affinis, Hypolimnas bolina, Ideopsis vitrea, Euploea tulliolus.* Then there are three types of the Pieridae family, namely *Eurema hecabe, Catopsilia Scylla, and Catopsilia pyranthe.* Next is the Papilionidae family, which consists of 3 types, namely *Pachliopta polyphontes, Troides criton, Troides helena,* and 1 type of Lycaenidae family, namely *Lampides boeticus.* The types of butterflies found at the two research sites are shown in Figure 1.





Figures 1. Types of butterflies in Tubo Village, North Ternate City, and Sasa Village, South Ternate City

Based on field observations, various species of butterflies representing several major families of the order *Lepidoptera* were identified, namely: (a) *Danaus affinis*, (b) *Catopsilia scylla*, (c) *Lampides boeticus*, (d) *Pantoporia hordonia*, (e) *Elymnias hypermnestra*, (f) *Cyrestis acilia*, (g) *Catopsilia pyranthe*, (h) *Euploea tulliolus*, (i) *Troides criton*, (j) *Troides helena*, (k) *Ideopsis vitrea*, (l) *Danaus genutia*, (m) *Parantica cleona*, (n) *Mycalesis terminus*, (o) *Eurema hecabe*, (p) *Ideopsis vulgaris*, (q) *Hypolimnas bolina*, and (r) *Pachliopta polyphontes*. The diversity of these species indicates a high level of butterfly biodiversity in the study area, reflecting relatively healthy ecosystem conditions that support pollinator populations. Species belonging to the family *Nymphalidae*, such as (a), (e), (l), (m), and (q), were generally found in open areas with abundant wildflowers, while members of the family *Papilionidae*, including (i), (j), and (r), were more frequently observed in forested or humid habitats with moderate canopy cover. Meanwhile, species from the family *Pieridae*, represented by (b), (g), and (o), were commonly found along garden edges and grasslands with high light intensity. The species from *Lycaenidae*, such as (c), tended to inhabit shrubs or cultivated areas with specific host plants. These findings suggest that plant diversity and microhabitat conditions play a crucial role in determining the distribution and abundance of butterflies within natural ecosystems.

Based on Figure 1, it is known that the dominant butterfly species at both research locations are: Tubo Village has seven dominant types of butterflies, namely Ideopsis vulgaris, Danaus genutia, Eurema hecabe, Lampides boeticus, Pachliopta polyphontes, Catopsilia pyranthe, *and Mycalesis terminus*. Sasa Village has five dominant types of butterflies, namely Eurema hecabe, Danaus genutia, Ideopsis vulgaris, Lampides boeticus, and Catopsilia scylla. The dominance of this type of butterfly is due to its high adaptability to various habitats, the availability of abundant host plants, and a source of food in the form of nectar, which is easily found in gardens and shrubs. In addition, these species have relatively short life cycles and flexible foraging behavior, allowing their populations to grow faster than those of other species. The difference in the number of dominant species between the two locations indicates that Tubo Sub-District has a more terrogenic habitat, characterized by extensive gardens and shrubs, which supports the existence of more dominant species. In contrast, in the Sasa Sub-District, the more open habitat conditions and higher environmental pressures result in only a few types of generalist butterflies surviving and dominating [12].

Diversity of local butterfly species in North Ternate and South Ternate

The results of research on the diversity of local butterfly species in North Ternate and South Ternate were obtained using a time search method with an area limitation of 100 m x 50 m. The results of the study on species diversity of local butterflies in North Ternate and South Ternate are presented in Table 1.

Table 1. Number of Butterfly Individuals in North Ternate and South Ternate

No	Species Name	Amount	H' Value
1	*Eurema hecabe*	65	-0,31
2	*Pachliopta polyphontes*	17	-0,14
3	*Troides criton*	7	-0,07
4	*Cyrestis acilia*	5	-0,60
5	*Danaus genutia*	67	-0,31
6	*Ideopsis vulgaris*	71	-0,32
7	*Elymnias hypermnestra*	4	-0,05
8	*Mycalesis terminus*	20	-0,16
9	*Catopsilia pyranthe*	14	-0,12
10	*Lampides boeticus*	32	-0,21
11	*Troides Helena*	4	-0,05
12	*Danaus affinis*	9	-0,09
13	*Parantica cleona*	5	-0,06
14	*Pantoporia hordonia*	11	-0,10
15	*Catopsilia Scylla*	14	-0,12
16	*Hympolimnas bolina*	2	-0,02
17	*Ideopsis vitrea*	1	-0,01
18	*Euploea tulliolus*	3	-0,04
	Amount	**351**	**2,32**

Based on the analysis of the local butterfly diversity index in North Ternate and South Ternate, the obtained result of H' = 2.32 is categorized as medium butterfly diversity, according to the criteria of the diversity index value Shannon-Wiener [11]. This indicates that the number of butterfly types varies significantly, but the level of diversity is relatively low.

Several factors can cause the conditions. First, there is a predominance of certain types whose population is higher than that of other types, resulting in an uneven distribution of individuals between species. Second, environmental factors such as the availability of host plants and nectar sources have not varied optimally, so they only support the presence of particular species. Additionally, the pressures of human activities, such as land conversion, logging, or the conservation of green areas, can also impact the presence and spread of butterflies in a location.

This explanation aligns with opinion [13], which states that the level of butterfly diversity is influenced by the availability of vegetation as a habitat, food sources, and the level of human disturbance in the ecosystem. Similarly, [14] notes that low butterfly diversity can occur due to the dominance of particular species, as well as limited habitat resources (such as host vegetation and food sources) that do not support all types equally.

Abundance of local butterfly species in North Ternate and South Ternate

The results of the study on the abandonment of local butterfly species in North Ternate and South Ternate were obtained using a time search method with an area limitation of 100 m x 50 m. The results of the study on the abandonment of local butterfly species in North Ternate and South Ternate are shown in Table 2.

Table 2. The number of individual butterflies was observed at two observation sites, and the results of the analysis of butterfly abandonment in North Ternate and South Ternate were obtained.

No	Family	Amount	Relative Abundance (%)
1	Nymphalidae	198	56,41
2	Pieridae	93	26,49
3	Lycaenidae	32	9,11
4	Papilionidae	28	7,97
	Amount	**351**	**100%**

Based on the data in Table 2, the analysis of the abandonment index of local butterflies in North Ternate and South Ternate yielded results with a spread of 100%. The category of abandonment **is high** in these two locations, based on the criteria outlined by Odum (1993) in [15] for the abandonment index value. This is thought to be because environmental conditions at both locations continue to provide an abundance of resources.

Environmental conditions that can provide the basic needs of butterflies, both in the form of host plants for larvae and food sources in the form of flower nectar for the imago. The availability of sufficient and diverse feed resources allows butterflies to survive in a large number of populations. In addition, the butterflies found are dominated by species that have high adaptability to variations in habitat conditions, making it easier to breed and dominate the community.

This explanation aligns with opinion [15], which states that the high abundance of butterflies is influenced by their ability to adapt well to local environmental conditions and utilize available food plants. Meanwhile,[7] adding that butterfly families such as Nymphalidae tend to be abundant because they have a wide range and generalist characteristics in choosing host plants and feed sources, so their presence often dominates communities in various habitats.

The Family Nymphalidae has the highest relative abundance of 56.41%, with several individuals as high as 198, thus becoming the most dominant family in the study site. The Family Pieridae ranks second with 93 individuals, or 26.49%. Furthermore, the family Lycaenidae recorded as many as 32 individuals, representing 9.11% of the total, and the family Papilionidae has the lowest relative abundance, at 7.97%, with a total of 28 individuals. The dominance of Nymphalidae is suspected because this family exhibits high adaptability to environmental conditions, enabling it to be found in diverse habitats, including forests, gardens, and open areas. In addition, Nymphalidae utilize a variety of host plants and nectar sources, making it easier to obtain Oak than other families. Their relatively high reproductive ability also contributes to their widespread decline in the wild. These factors make Nymphalidae more common than Pieridae, Lycaenidae, and Papilionidae [16]; [17].

The family Papilionidae has the lowest relative abundance, which is thought to be because Papilionidae generally exhibit high specialization on specific host plants, making their populations highly dependent on the availability of suitable vegetation for larval development. If the host plant is limited in number or not even distributed at the research site, then the number of Papilionidae is also low. In addition, this family generally requires relatively stable habitat conditions and minimal disturbance. Consequently, in ecosystems that have undergone changes or fragmentation, their existence becomes less prevalent among the generational butterflies. These results are in accordance with the findings [16], which State that the low abundance of Papilionidae is closely related to limited feed sources, larval specialization, and sensitivity to habitat changes.

Environmental Data

Observations of environmental factors were conducted to determine the abiotic conditions that can affect the presence of butterflies at the research site. Parameters measured include air temperature, light intensity, and relative humidity. The results of measurements at two research sites, namely North Ternate and South Ternate, are presented in Figure 2 below.

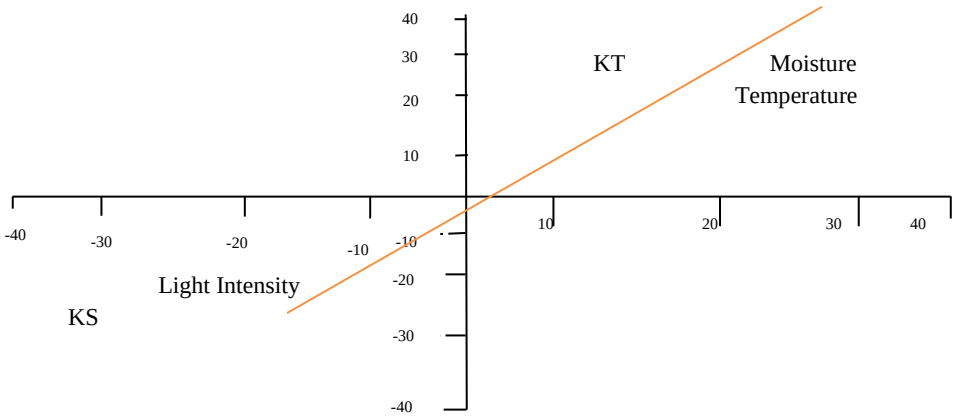


Figure 2. Data on environmental influences on the diversity and abundance of butterflies in Ternate Island.

Based on Figure 2, environmental factors such as temperature and humidity correlate positively, while light intensity correlates negatively with the diversity and abundance of butterflies on Ternate Island. This suggests that in North Ternate and South Ternate, increasing temperature and humidity tend to support the diversity and abundance of butterflies on Ternate Island, while increasing light intensity has the potential to decrease them. In addition to abiotic environmental factors, habitat types also play an essential role in determining diversity and abundance.

Temperature and humidity are environmental factors that play an essential role in supporting the existence of butterflies. Relatively warm temperatures help increase the physical activities of butterflies, such as flight, foraging, and reproduction. Meanwhile, the high humidity can maintain the balance of body fluids. This is

supported by the availability of green vegetation as a host plant for larvae, as well as a source of food in the form of nectar for the imago [18].

CONCLUSION

The diversity of local butterflies on Ternate Island, especially in North Ternate and South Ternate, is categorized as moderate, with high abundance. The results of butterfly collection and identification were obtained from 351 individuals, comprising 18 types of local butterflies from four families: Nymphalidae, Pieridae, Lycaenidae, and Papilionidae.

Habitat conservation needs to be improved, especially by maintaining the availability of host plants and feed sources for butterflies, so that the more specific Papilionidae family remains sustainable. Additionally, environmental education for local communities about the importance of butterflies as pollinators needs to be improved to support conservation efforts.

REFERENCES

[1] P. C. Latue, "Analisis Spasial Temporal Perubahan Tutupan Lahan di Pulau Ternate Provinsi Maluku Utara Citra Satelit Resolusi Tinggi," *Buana J. Geogr. Ekol. dan Kebencanaan*, vol. 1, no. 1, pp. 31–38, 2023, doi: 10.56211/buana.v1i1.339.

[2] E. Tukuboya, A. Kurniawan, and A. Fatrawana, "Keanekaragaman Jenis Kupu-Kupu (Rhopalocera) Di Sungai Oba Kecamatan Oba Utara Kota Tidore KepulauanKeanekaragaman Jenis Kupu-Kupu (Rhopalocera) Di Sungai Oba Kecamatan Oba Utara Kota Tidore Kepulauan," *J. For. Isl.*, vol. 2, no. 2, pp. 6–13, 2024, doi: 10.33387/foris.v2i2.157.

[3] N. Jainuddin, "Dampak Deforestasi Terhadap Keanekaragaman Hayati Dan Ekosistem," *J. Humaniora, Sos. Dan Bisnis*, vol. 1, no. 2, pp. 131–140, 2023.

[4] L. Muhelni, "Inventarisasi Kupu-Kupu (Rhopalocera) pada Kawasan Tempat Pembuangan Akhir (TPA) Air Dingin, Balai Gadang, Kota Padang," *Biosf. J. Biol. dan Pendidik. Biol.*, vol. 7, no. 2, 2022, doi: 10.23969/biosfer.v7i2.6884.

[5] H. Ruslan, A. Satiyo, and Y. Yenisbar, "Keanekaragaman kupu-kupu (Lepidoptera: Papilionoidea) di Kawasan Pusat Pendidikan Konservasi Alam Bodogol, Taman Nasional Gunung Gede Pangrango, Jawa Barat," *J. Entomol. Indones.*, vol. 20, no. 1, pp. 10–21, 2023, doi: 10.5994/jei.20.1.10.

[6] H. Raya, T. Provinsi, S. Tengah, N. M. Manopo, and A. Sudhartono, "KEANEKARAGAMAN JENIS KUPU-KUPU (Lepidoptera) DI KAWASAN TAMAN," vol. 22, no. 4, pp. 365–371, 2024.

[7] S. Hengkengbala, R. Koneri, and D. Katili, "Keanekaragaman Kupu-Kupu di Bendungan Ulung Peliang Kecamatan Tamako Kepulauan Sangihe, Sulawesi Utara," *J. Bios Logos*, vol. 10, no. 2, p. 63, 2020, doi: 10.35799/jbl.11.2.2020.28424.

[8] A. Walid, F. Turahmah, and P. Ismarliana, "Ekologia : Jurnal Ilmiah Ilmu Dasar dan Lingkungan Hidup," *Ekol. J. Ilm. Ilmu Dasar dan Lingkung. Hidup*, vol. 20, no. 1, pp. 40–44, 2020, [Online]. Available: https://journal.unpak.ac.id/index.php/ekologia

[9] A. Mas'ud, A. D. Corebima, A. Haerullah, S. Hasan, and A. Alisi, "Jenis Kupu-Kupu Pengunjung Bunga Mussaenda Dan Asoka Di Kawasan Cagar Alam Gunung Sibela Pulau Bacan," *J. Biol. Trop.*, vol. 19, no. 2, pp. 189–196, 2019, doi: 10.29303/jbt.v19i2.1108.

[10] F. Anita, A.- Salatalohy, and A. K. Kamaluddin, "Keanekaragaman Jenis Kupu-Kupu Di Kawasan Air Terjun Tiga Bidadari Kecamatan Wasile Timur Kabupaten Halmahera Timur," *Makila*, vol. 18, no. 1, pp. 103–114, 2024, doi: 10.30598/makila.v18i1.10634.

[11] A. Mas'ud, W. Hariswan, S. Sundari, and M. N. Tamalene, "New Record of Diversity and Distribution Pattern of Local Butterfly in Ternate Island," *J. Biol. Trop.*, vol. 22, no. 4, pp. 1328–1333, 2022, doi: 10.29303/jbt.v22i4.4354.

[12] H. Ruslan, A. Satiyo, and Y. Yenisbar, "Keanekaragaman kupu-kupu (Lepidoptera: Papilionoidea) di Kawasan Pusat Pendidikan Konservasi Alam Bodogol, Taman Nasional Gunung Gede Pangrango, Jawa Barat," *J. Entomol. Indones.*, vol. 20, no. 1, p. 10, 2023, doi: 10.5994/jei.20.1.10.

[13] R. Setiawan, A. M. Siddiq, S. Sudarmadji, and N. A. Wulansari, "Keanekaragaman Spesies Kupu-Kupu (Lepidoptera: Rhopalocera) Di Savana Pringtali Resort Bandealit Taman Nasional Meru Betiri," *BIOLINK (Jurnal Biol. Lingkung. Ind. Kesehatan)*, vol. 5, no. 2, pp. 81–87, 2019, doi: 10.31289/biolink.v5i2.1786.

[14] D. M. Sari and M. T. Harmoko, "Keanekaragaman Jenis Kupu-Kupu (Lepidoptera) Di Kawasan Curug Panjang Desa Durian Remuk Kecamatan Muara Beliti Kabupaten Musi Rawas," *Pros. Semin. Nas. Hayati*, vol.. 7, no. September, pp. 138–143, 2019, [Online]. Available: https://proceeding.unpkediri.ac.id/index.php/hayati/article/view/588

[15] D. R. Sari, M. Hadi, and R. Rahadian, "Kelimpahan dan Keanekaragaman Kupu-kupu di Kawasan Taman Nasional Gunung Merbabu, Jawa Tengah," *Bioma Berk. Ilm. Biol.*, vol. 18, no. 2, p. 173, 2016, doi:

10.14710/bioma.18.2.173-179.
[16] A. S. Modeong, R. Koneri, and F. D. J. Dapas, "Kelimpahan dan Keanekaragaman Kupu-Kupu Nymphalidae di Hutan Kota Kuwil Minahasa Utara Sulawesi Utara," *J. MIPA*, vol. 9, no. 2, p. 70, 2020, doi: 10.35799/jmuo.9.2.2020.28893.
[17] D. Wakano and D. D. Moniharapon, "DIVERSITY OF BUTTERFLY Lepidoptera IN THE CAMPUS AREA OF PATTIMURA UNIVERSITY AMBON MALUKU," *RUMPHIUS Pattimura Biol. J.*, vol. 1, no. 2, pp. 058 062, 2019, doi: 10.30598/rumphiusv1i2p058-062.
[18] N. Millah, "Diversitas dan peranan ekologi kupu-kupu (Rhopalocera) di Area Blok Ireng-Ireng kawasan Taman Nasional Bromo Tengger Semeru," 2020, [Online]. Available: http://digilib.uinsby.ac.id/id/eprint/42958