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BUTTERFLY DIVERSITY IN THE FOREST OF BUKUM VILLAGE SIBOLANGIT DISTRICT DELI SERDANG REGENCY NORTH SUMATRA

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ABSTRAK

Kupu-kupu adalah serangga yang aktif di siang hari yang memiliki peranan penting sebagai polinator pada suatu ekosistem dan bioindikator pada suatu lingkungan. Penelitian dilakukan untuk mengetahui diversitas jenis, kemerataan jenis, dan kelimpahan relatif jenis kupu-kupu di Hutan Desa Bukum Kecamatan Sibolangit Kabupaten Deli Serdang Sumatera Utara. Penelitian ini bersifat *survey eksploratif* dengan metode jelajah dan metode VES. Pengambilan sampel menggunakan jaring serangga, di pagi hari pukul 08.00-10.00 WIB dan sore hari 14.00-16.00 WIB. Terdapat 39 jenis kupu-kupu dari 6 famili dengan 473 individu. Indeks diversitas jenis kupu-kupu di Hutan Desa Bukum memiliki nilai rata-rata yaitu 2,93 yang termasuk dalam kategori sedang. Indeks kemerataan jenis kupu-kupu di Hutan Desa Bukum memiliki nilai rata-rata yaitu 0,79 yang termasuk dalam kategori tinggi. Indeks kelimpahan relatif jenis kupu-kupu di Hutan Desa Bukum yaitu jenis kupu-kupu *Ypthima baldus* dengan nilai rata-rata kelimpahan 18,60%. Berdasarkan analisis indeks diversitas, indeks kemerataan, dan indeks kelimpahan relatif jenis menunjukkan bahwa faktor abiotik atau kondisi lingkungan di Hutan Desa Bukum sesuai dengan siklus hidupnya kupu-kupu.

Kata Kunci: Diversitas, Hutan Desa Bukum, Kemerataan, Kelimpahan relatif, Kupu-Kupu

ABSTRACT

Butterflies are insects who active in the day that have an important role as pollinators in an ecosystem and bioindicators in an environment. The study was conducted to determine species diversity, species evenness, and relative abundance of butterfly species in the Forest of Bukum Village Sibolangit District Deli Serdang Regency North Sumatra. This research is an exploratory survey using the roaming method and the VES method. Sampling using insect nets, in the morning at 08.00-10.00 WIB and in the afternoon 14.00-16.00 WIB. There are 39 species of butterflies from 6 families with 473 individuals. The butterfly species diversity index in the Forest of Bukum Village has an average value of 2.93 which is included in the medium category. The evenness index of butterfly species in the

Forest of Bukum Village has an average value of 0.79 which is included in the high category. The relative abundance index of butterfly species in the Forest of Bukum Village is the *Ypthima baldus* butterfly species with an average abundance value of 18.60%. Based on the analysis of the diversity index, evenness index, and relative abundance index of species, it shows that abiotic factors or environmental conditions in the Forest of Bukum Village are in accordance with the life cycle of the butterfly.

Keywords: Diversity, Bukum Village Forest, Equality, Relative Abundance, Butterfly

INTRODUCTION

Bukum Village Forest is located in the Sibolangit District, Deli Serdang Regency, Sumatra Utara with an area ranging from 10.01 km^2 and the coordinate location is 3˚23' N - 9˚ 857' BT. Bukum Village is a village in which there are forests, plantations, settlements, rice fields and rivers [1]. Bukum Village Forest has a fairly high diversity of insect animals, namely butterflies.

Butterflies are insects of the Order Lepidoptera, which means they have scales that cover almost their entire body and give patterns and colors to the wings of butterflies [2]. Of the 17,500 species of butterflies around the world, there are around 2,000-2,500 species in Indonesia, among which arelisted in the *International Union for Conservation of Nature and Natural Resources* (IUCN) [3]. Butterfly has an important function in ecology as a polynator or pollinator of flowering plants that play a role in propagating plants naturally [4]. The butterfly lives in a variety of habitats, including parks, forests, green open spaces, and other environments [5]. Based on observations made in the Bukum Village Forest, there are several habitats that are the place of observation for the discovery of butterfly species, including: 1) rivers, 2) secondary forests, and 3) primary forests.

This study aims to determine the species diversity index, type evenness index, and relative abundance index of butterfly species in three habitats in the Bukum Village Forest.

RESEARCH METHODS

Place and Time of Research

This research was carried out in three habitats, namely rivers, secondary forests, and primary forests in the Bukum Village Forest Sibolangit District Deli Serdang Regency North Sumatra. In December 2021-February 2022.

Research Methods

The cruising method and the VES (*Visual Encounter Survey*) [6] method are the methods used in this study. The cruising method is a method by exploring paths that can represent the ecosystem type of butterfly species in the research area and the VES method is the taking of butterfly species based on direct encounters on the research path.

Data Collection Techniques

Data collection was carried out at selected stations, namely rivers, secondary forests, and primary forests in the Bukum Village Forest, by creating 1 transect line measuring 500 m/each observation station and divided into 5 sampling points along the transect line with a distance between transects of 100 m/sampling point.

Research Procedure

Implementation in the field: observations are carried out in the morning at 08.00-10.00 WIB and in the afternoon 14.00-16.00 WIB, this is because the initial activity of the butterfly begins in the morning by visiting flowers at 08.00-10.00 WIB when the sun is shining or it can dry its wings to fly in search of food. This feeding period also occurs in the afternoon by looking for flowers that still have nectar at 14.00-16.00 WIB, so that data collection for research and collection can be done when butterfly activity takes place in the morning and evening [7]. It further measures the physical factors of the environment at each observation station such as, wind speed, light intensity, air humidity, and air temperature. Sampling using insect net. It then turns off the butterfly by pressing its thoracic part and placing it into papilot paper, then labeled as a mark. Next store the sample on an insect box and given camphor as a preservative. Implementation in the laboratory: identification and validation of butterfly samples is carried out at the Biosystematics Laboratory, Faculty of

Mathematics and Natural Sciences, Universitas Negeri Medan.

Data Analysis

From the results of identification descriptively qualitatively include morphological characteristics and quantitatively by calculating the diversity index, evenness index and relative abundance index of butterfly species [6].

1. Diversity Index (H') with Shannon-Wiener formula:

$$H' = -\sum Pi \ln(Pi),$$
$$Pi = (\frac{ni}{N})$$

2. Evenness Index (E), with the formula:

$$E = \frac{H'}{Ln\ S}$$

Contains research results that have been obtained and a discussion of

3. Relative Abundance Index (KR), with the formula:

$$KR = \frac{ni}{N} \text{ x } 100\%$$

RESULTS AND DISCUSSION

Species of Butterflies in the Forest of Bukum Village Sibolangit District

Based on the results of research on the diversity of butterflies conducted in three habitats in the Bukum Village Forest, 39 species of butterflies were obtained which include 6 families, namely Hesperiidae (3 species), Lycaenidae (3 species), Nymphalidae (27 species), Papilionidae (2 species), Pieridae (3 species), and Riodinidae (1 species). The species of butterflies found arepresented in table 1. these results. (the subtitles could be costumized).

Tabel 1. Species of Butterflies Obtained in the Bukum Village Forest

No	Family	Species	River	Secondary Forest	Primary Forest	∑ Ind.
1	Hesperiidae	*Erionata thrax*	-	8	-	8
2		*Notocrypta paralysos*	3	3	-	6
3		*Koruthaialos sindu*	16	4	10	30
4	Lycaenidae	*Drupadia ravindra*	2	6	8	16
5		*Allotinus leogoron*	-	2	-	2
6		*Jamides pura*	3	-	-	3
7	Nymphalidae	*Ypthima asterope*	-	1	-	1
8		*Ypthima pandocus*	22	49	9	80
9		*Ypthima baldus*	-	60	28	88
10		*Mycalesis janardana*	-	20	-	20
11		*Mycalesis orseis*	4	11	16	31
12		*Mycalesis gotama*	-	2	-	2
13		*Mycalesis anapita*	-	1	-	1

14		*Tanaecia iapis*	6	3	3	12
15		*Tanaecia pelea*	-	-	19	19
16		*Neptis* sp.	-	12	-	12
17		*Neptis clinia*	-	-	1	1
18		*Parantica aspasia*	-	1	-	1
19		*Parantica aglea*	1	-	-	1
20		*Hestinalis nama*	2	4	-	6
21		*Euploea mulciber*	2	2	2	6
22		*Cyrestis nivea*	-	1	-	1
23		*Melanitis phedima*	2	1	-	3
24		*Chersonesia rahria*	-	11	9	20
25		*Junonia iphita*	-	9	-	9
26		*Faunis gracilis*	3	3	8	14
27		*Ragadia makuta*	4	4	8	16
28		*Amnosia decora*	-	1	-	1
29		*Orsotriena medus*	-	1	-	1
30		*Symbrenthia hypselis*	3	-	-	3
31		*Actinote pyrrha*	1	-	-	1
32		*Neorina lowii*	1	-	-	1
33		*Danaus melanippus*	-	1	-	1
34	Papilionidae	*Troides amphrysus*	-	5	7	12
35		*Papilio memnon*	11	2	3	16
36	Pieridae	*Eurema blanda*	-	11	-	11
37		*Eurema hecabe*	1	-	4	5
38		*Leptosia nina*	-	4	-	4
39	Riodinidae	*Zemeros flegyas*	2	6	-	8
Total			**89**	**249**	**135**	**473**

CONCLUSION

Table 1. Shows the total number of individuals obtained in three habitats that is 473 individuals. Secondary forest locations have the most individuals namely 249 individuals, while primary forest locations have 135 individuals, and river locations have the fewest individuals namely 89 individuals.

From the data above, the secondary forest location is the location that butterflies like the most, because it has more open vegetation with enough sunlight for butterflies to carry out their activities, such as sunbathing before flying to obtain energy and optimum temperature. This is because at the time of observation the air temperature of the secondary forest location had an average air temperature of 22.87-25.50°C. In accordance with previous studies that state that to carry out

activities such as flying and sunbathing butterflies require an air temperature of around 24-41°C, so that the air temperature in secondary forests is included in the appropriate category for butterflies [8].

The family Nymphalidae is the most common family found at various observation sites, as much 27 species. The family Nymphalidae belongs to the family that has the largest number in the order Lepidoptera, as well as having a high survivability in various habitats due to its polyphage [9].

Diversity Index Value, Evenness Index and Relative Abundance Index of Butterfly Species on Three Habitat in the Bukum Village Forest

Based on the results of observations on three habitats, the values of the diversity index, evenness index, and relative abundance indeks of species were obtained in the three habitats in the Bukum Village Forest presented in table 2.

Contains conclusions from the research that has been done and suggestions related to the results of research that have been obtained.

Table 2. Diversity Index, Evenness Index and Relative Abundace Indeks

No.	Location	H'	E	KR
1	River	2,46	0,84	*Ypthima pandocus* (24,72%)
2	Secondary forest	2,67	0,78	*Ypthima baldus* (24,10%)
3	Primary forest	2,44	0,90	*Ypthima baldus* (20,74%)
Average		**2,93**	**0,79**	*Ypthima baldus* (18,60%)

Information:

H’: Diversity Index, E : Evenness Index, KR : Relative Abundace Index.

Table 2. shows that the diversity index of butterfly species in three habitats in the Bukum Village Forest has an average value of 2.93 which is included in the medium category. This is because species diversity is influenced by the number of species, the number of individuals of each species, biotic and abiotic factors, as well as the number of butterflies found in three habitats in the Bukum Village Forest. Moderate diversity signifies communities of moderate complexity in habitat structure and diversity of vegetation forms [10]. The butterfly evenness index in three habitats in the Bukum Village Forest is 0.79 which indicates that the evenness is in the

high category. This is because there is no dominating species in three habitats in the Bukum Village Forest.

The highest butterfly species diversity index is found in secondary forest locations with a value of 2.67 which indicates that the diversity index is in the moderate category. This is because secondary forests have more open vegetation with enough sunlight for butterflies to carry out their activities. In addition, the large value of species diversity in secondary forests is due to which support abiotic factors such as light intensity, which has an average light intensity ranging from 4747-1014 lux, this indicates that the light intensity is ideal for butterflies to carry out their activities, where butterflies will sunbathe to obtain energy before flying or doing other activities. The greater the light intensity in a habitat, the greater the diversity of butterflies [11]. The evenness index in secondary forests has a value of 0.78 which indicates the evenness index is in the high category. A high degree of evenness indicates no species dominating secondary forests.

The lowest butterfly species diversity index is found in primary forest locations with a value of 2.44 which indicates the diversity index is in the moderate category. This matter because primary forest sites have a covered vegetation and less sunlight. Primary forests have light intensities ranging from 1511-2712 lux which indicates the light intensity is that low for butterflies to do activities such as sunbathing in the morning. Ideally butterflies require a light intensity of 2000-7,500 lux [12]. The evenness index in primary forests has a value of 0.90 which indicates the evenness index is in the high category. A high level of evenness indicates there is no dominating species in primary forests.

Table 2. shows the largest relative abundance index of butterfly species on three habitat in the Bukum Village Forest, namely the *Ypthima baldus* butterfly species from the family Nymphalidae with an abundance value of 18.60%. At the time of observation of *Ypthima baldus* was found in many secondary forest locations where habitat conditions were more open and there was a lot of sunlight, this caused *Ypthima baldus* to be high in the value of the relative abundance index of its kind.

At the location of the river the relative abundance of butterflies high is the *Ypthima pandocus* butterfly species from the family Nymphalidae with an abundance value of 24.72%. At the time of observation *Ypthima pandocus* was found in the afternoon at the river site with an air temperature of 25.37°C and an air humidity of 99%. This shows that the air temperature is ideal for butterflies, but for air humidity it is not good for butterflies to breed. The currently breeding butterflies need air humidity in the range of 84-92%. In addition, the light intensity at the river site has an average of 5828.33 lux, which indicates that the light intensity is ideal for butterflies, while the wind speed in the afternoon at the river site is not detected or 0.

The secondary forest location has a relative abundance of the largest species of butterfly, namely the *Ypthima baldus* butterfly species from the family Nymphalidae with a relative abundance value of 24.10%. At the time of observation *Ypthima baldus* was found in the afternoon with an air temperature of 25.50°C and an air humidity of 88.33%, indicating that the air temperature and air humidity were ideal for butterflies. Generally, butterflies require air temperatures ranging 24-41°C [8]. In addition, the light intensity at the secondary forest location has an average of 2228 lux, which indicates that the light intensity is ideal for butterflies, while the wind speed in the afternoon at the river site is not detected or 0.

The primary forest location has a relative abundance of the largest butterfly species, namely the *Ypthima baldus* butterfly species from the family Nymphalidae, with a relative abundance value of 20.74%. At the time of observation *Ypthima baldus* was found in the afternoon at a primary forest site with an air temperature of 25.30°C and an air humidity of 84%, This indicates that the air temperature and air humidity are ideal for butterflies. In addition, the light intensity in the secondary forest location has an average of 2418 lux, which indicates that the light intensity is ideal for butterflies, while the wind speed in the afternoon at the river site has an average wind speed of 0.30 m/s, which indicates that the wind speed belongs to the category of shady wind range and is appropriate for butterflies.

Butterflies do not like strong winds because they interfere with their flying activities or when resting, but butterflies also need wind when flying and dry their wings [13]. Wind speeds between 1.6-3.3 m/s are categorized as shady winds [14].

CONCLUSION

The discussion above can be concluded that the diversity index of butterfly species at three locations in the Bukum Village Forest has an average value of 2.93 which is included in the medium category. The evenness index of butterfly species in the three habitat locations has an average value of 0.79 which is included in the high category. The index of relative abundance highest of butterfly species at the river location is the *Ypthima pandocus* butterfly species, whereas in secondary forest and primary forest index of relative abundance of butterfly species the highest was *Ypthima baldus*.

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