Jurnal Biotik. P-ISSN: 2337-9812, E-ISSN: 2549-1768
Vol. 10, No.1 Ed. April 2022, P. 94-103

DIVERSITY AND COMMUNITY STRUCTURE OF BUTTERFLIES (SUPERFAMILY: PAPILIONOIDEA) AT THE SELOGIRI WATERFALL AREA BANYUWANGI REGENCY EAST JAVA

[1]Siti Zulaikha, [2]Nur Qomariyah Pratiwi, [3]Amalya Mira Syarif and [4]Saiful Bahri

[1,2,3,4]Biology Departement, Faculty of Science and Technology, Islamic University of Sunan Ampel Surabaya, Indonesia

Email: zulaikasiti456@gmail.com

DOI: 10.22373/biotik.v10i1.10645

ABSTRAK

Air Terjun Selogiri merupakan kawasan wisata alam yang jauh dari pusat kota Banyuwangi sehingga memiliki tingkat percemaran lingkungan yang rendah. Pencemaran lingkungan yang rendah menjadikan kawasan Air Terjun Selogiri memiliki potensi untuk keberlangsungan hidup berbagai spesies serangga, terutama kupu-kupu. Keberadaan, keragaman dan persebaran spesies kupu-kupu sangat dipengaruhi oleh berbagai faktor diantaranya tipe habitat, kondisi kanopi, vegetasi, dan abiotik. Penelitian ini bertujuan untuk mengetahui keanekaragaman dan struktur komunitas kupu-kupu di kawasan air Terjun Selogiri Kabupaten Banyuwangi. Penelitian ini menggunakan metode *Visual Encounter Survey* dengan mengikuti jalan setapak di kawasan Air Terjun Selogiri. Hasil penelitian didapatkan 24 spesies dari 4 famili dengan 240 individu. Struktur komunitas di kawasan Air Terjun Selogiri memiliki perbedaan keanekaragaman, jumlah spesies dan individu. Nilai indeks keanekaragaman spesies kupu-kupu di lokasi tidak berkanopi H'= 2.4 lebih tinggi dari indeks keanekaragaman kupu-kupu pada lokasi berkanopi H'= 1.8. Berdasarkan hasil indeks keanekaragaman kupu-kupu pada kedua lokasi pengamatan sama-sama berkategori sedang. Keanekaragaman spesies dan jumlah individu pada lokasi berkanopi dan tidak berkanopi dapat mendeskripsikan keanekaragaman dan struktur komunitas di kawasan Air Terjun Selogiri.

Kata Kunci: Air Terjun Selogiri, Keanekaragaman, Kupu-kupu, Struktur Komunitas.

ABSTRACT

Selogiri Waterfall is a natural tourist area that is far from the center of Banyuwangi city, so it has a low level of environmental pollution. Low environmental pollution makes the Selogiri Waterfall area have the potential for the survival of various insect species, especially butterflies. The existence, diversity, and distribution of butterfly species are strongly influenced by various

factors, including habitat type, canopy conditions, vegetation, and biotic factors. This study aims to determine the diversity and structure of the butterfly community in the Selogiri Waterfall area, Banyuwangi Regency. This study uses the *Visual Encounter Survey* method by following the path in the Selogiri Waterfall area. The results obtained 24 species from 4 families with 240 individuals. The community structure in the Selogiri Waterfall area has differences in diversity, number of species, and individuals. The butterfly diversity index value in the not-canopy location H' = 2.4 was higher than the butterfly species diversity index in the H' = 1.8 canopied location. Results based on the butterfly diversity index at the two observation locations, both were in the moderate category. Diversity in species and the number of individuals in the canopied location and not-canopy location can describe the diversity and community structure in the Selogiri Waterfall area.

Keywords: Butterfly, Community Structure, Diversity, Selogiri Waterfall

INTRODUCTION

Selogiri waterfall is a natural tourist area located in Kalipuro District, Banyuwangi Regency with access to a rocky road that passes through the Selogiri forest area and is far from the downtown. This makes the condition of the waterfall area is still clean, maintained and has a low level of environmental pollution. Good environmental conditions in the Selogiri waterfall area will have the potential as a natural habitat for various species of insects, especially butterflies.

Butterflies are insects of medium stature, with bodies and wings that have attractive colored patterns. The structure of the butterfly's body consists of a head (*Cephal*), a chest (*thorax*) and an abdomen. In addition, butterflies have antennas with rounded ends, compound eyes, and a suction type called proboscis [1]. In taxonomics the butterfly is classified in the lepidoptera order because it has wings covered by thousands of delicate scales [2].

Butterflies are insects that can be used as indicator of the quality of the environment, this is because butterflies have olfactory nerve stimulation that can be detected by the antenna [3]. Butterflies have important role in the ecosystem, one of which helps the pollination process in flowering plants [4]. Butterflies can be

found in various places such as rice fields, gardens, parks, and forests that can support their life cycle. The presence and distribution of butterfly are strongly influenced by various factors, including diversity and abiotic. This study aims to determine the diversity of butterfly species and the community structure of butterflies in the Selogiri Waterfall area, Banyuwangi regency, East Java.

RESEARCH METHODOLOGY

Study Area

This research was conducted in June 2021 in the Selogiri Waterfall area, Kalipuro District, Banyuwangi Regency, East Java. This research was conducted at 08.00-11.00 WIB along with the flow in the Selogiri Waterfall area with a not-canopy type (8”05’37^{o}S,114”24’36^{o}E) and canopied (8”05’40^{o}S, 114”24’42^{o}E).

Data Collection

Data collection was carried out using the *Visual Encounter Survey* method by following the path in the Selogiri Waterfall source area in a Not-canopied and Canopied. The *Visual Encounter Survey* method is a collection of data by recording the number of species and individual encountered, as well as recording environmental factors such as temperature, humidity and light intensity. Species encountered in this research were recorded, and identified using books [5], [6].

Data Analysis

In this study, the data obtained were analyzed using the Shannon-Wiener Diversity Index (H'). And Relative Abundance According to [7] the formula of two index analysis:

Shannon-Wiener Diversity Index

$$H' = - \sum p_i \, In \, p_i$$

Relative Abundance Index

$$RA = ni / Nx100\%$$

Description:

H’ = Shannon-Wiener Diversity Index

RA = Relative Abundance

p_i = Ratio n_i/N

n_i = Total number individuals belonging to the i

N = Total individuals of population.

RESULT AND DISCUSSION

Based on the results of the identification that has been carried out in two habitat types of butterfly diversity found in the Selogiri Waterfall area, Banyuwangi Regency, East Java, there are 24 species from 4 families with 246 individuals, in the Not-canopied type is 185 individuals and the canopied is 55 individuals.

Table-1. Relative Abundanceof Butterflies

Family	Species	Total	
		Canopied	**Not-Canopied**
Papilionidae	*Papilio memnon*	0.00	3.27
	Papilio polytes	0.00	3.27
	Papilio demoleus	0.00	8.19
	Graphium agamemnon	1.08	0.00
Nymphalidae	*Ideopsis juventa*	0.00	1.63
	Junonia hedonia	1.62	0.00
	Athyma perius	0.00	9.83
	Hypolimnas bolina	0.00	4.91
	Danaus crypsippus	1.62	0.00
	Phalanta phalanta	1.62	0.00
	Cupha erymanthis	13.5	0.00
	Tirumala limniace	0.00	1.63
Pieridae	*Eurema* sp.	11.35	0.00
	Catopsilia pomona	2.16	0.00
	Delias periboea	2.70	0.00
	Cephora iudith	10.81	0.00
	Appias olferna	2.70	0.00
	Catopsilia pyranthe	18.91	9.83
	Appias lybithea	1.62	0.00
	Appias lyncida	8.10	0.00
	Hebomoiaglaucippe	3.78	0.00
	Ixias pyrene	2.70	0.00
	Leptosia nina	8.10	32.78
Lycaenidae	*Castalius rosimon*	7.56	0.00

The value of diversity index in Selogiri Waterfall area is H'=2.6 which belongs to the moderate diversity category. This shows that the quality of the environment is quite good for the survival of the butterfly. The butterfly diversity index value in the Selogiri Waterfall area is higher than the butterfly diversity index in the Rampah Menjangan Waterfall area with a value of H'= 2.478 [8]. While the diversity index value in the

Selogiri Waterfall area is lower than the butterfly diversity index in the Mount Bromo Karanganyar area, Central Java with a value of H'= 2.78 [9].

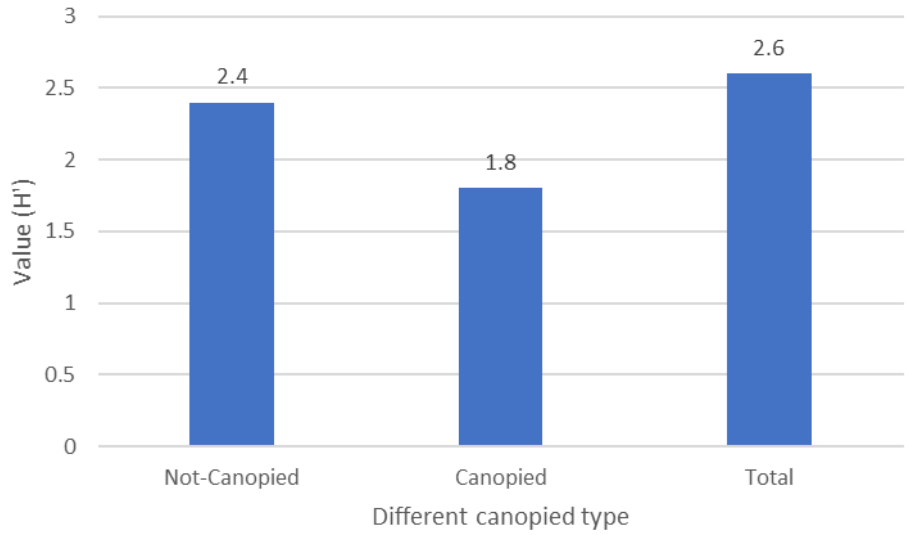

Figure 1. Diversity Index in the Selogiri Waterfall Area

The diversity index value in Not-canopied type H'= 2.4 is greater than the diversity index value in canopied type H'= 1.8. Differences in butterfly diversity index values at a location are influenced by vegetation, canopy cover, and environmental conditions. According to[10] stated that the presence of butterflies is influenced by temperature, humidity, light intensity, environmental conditions and the type of canopy cover.

Different conditions of canopied and vegetation in an area will affect the diversity of butterfly species, because butterflies need vegetation in the form of herbs, shrubs, and grasses for laying eggs, hosts, feed, perches and sunbathing. While the canopy is used to protect when the intensity of sunlight is too high. The canopy is the main factor that can affect the entry of sunlight intensity into the environment, so it will be correlated with the distribution, abundance and presence of butterfly species [11]. In a research from [12] stated that the variety of species found in a place is largely determined by the quality of the habitat.

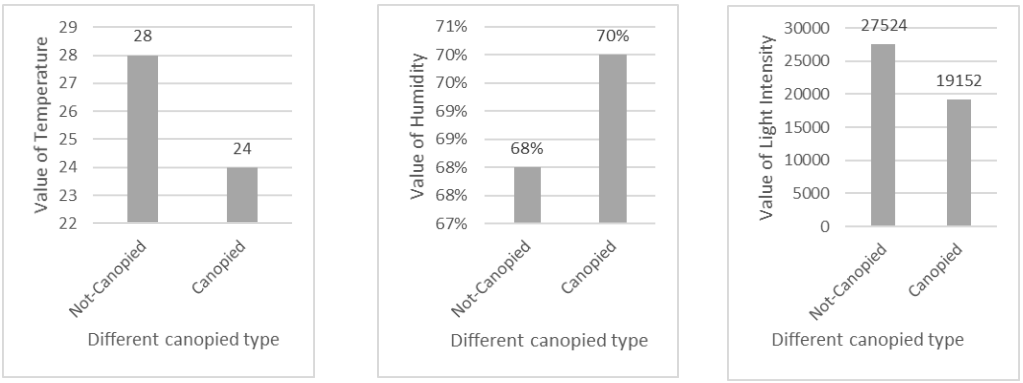

Figure 2. Abiotic Factors

Based on the results of measurements of temperature and humidity as well as light intensity (Figure 2), it is known that the Selogiri Waterfall area has an optimal environment for survival of butterflies. According to [13] optimal temperature and humidity are in the range 20-35 ˚C and humidity less. Meanwhile, the optimal light intensity according to [14] is in the range of 2000-7000lx.

Abiotic factors are a constituent component of habitats to support the survival of butterflies. The measurement data of abiotic factors in the not-canopied type has a higher temperature and light intensity than the canopied type. The condition of the open canopy allows the intensity of light to enter the environment and will affect the air temperature. While the environmental humidity in the closed canopy has a high value, this is due to the condition of the closed canopy and there are many trees that cause the light intensity rate to not enter the environment [15].

The location of the Not-canopied is an area that is dominated by shrubs, *Chromolaena odorat*a (Family Asteraceae), with open canopies with trees at several points. The Not-canopied condition in the Selogiri Waterfall area is a suitable habitat for several types of butterflies as a place to rest, sunbathe, and an

abundance of forage plants. In the Not-canopied type, there were 185 individuals from 4 families Papilionidae, Pieridae, Nymphalidae, and Lycaenidae. In the not-canopied, 17 species were found, namely *Graphium agamemnon*, *Junonia hedonia*, *Danaus crypsippus*, *Phalanta phalanta*, *Cupha erimanthis*, *Eurema* sp., *Catopsiliapomona*, *Deliasperiboea*, *Cephoraiudith*, *Appiasolferna*, *Catopsiliapyranthe*, *Appiaslybithea*, *Appiaslynchida*, *Hebomiaglaucippe*, *Ixias pyrene*, *Leptosianina* and *Castaliusrosimon*. A lot diversity of butterflies in the open canopy is caused by variety of herbaceous plants and shrubs. So, it can be seen that the availability and diversity of forage plants can affect the presence and population of various butterfly species. This is reinforced by the statement [16] that host and forage plants can support the butterfly life cycle at a location.

Canopied type locations are tightly closed canopy habitats and lots of trees at various points. The condition of the canopied in the Selogiri Waterfall area is a fairly good habitat for several species of butterflies. At this location, 55 individuals from the Papilionidae, Nymphalidae and Pierdae families were found.

At this location found 8 species that were not found in the Not-canopied type, namely *Papiliomemnon*, *Papiliopolytes*, *Papiliodemoleus*, *Ideopsisjuventa*, *Athymaperius*, *Hypolimnasbolina*, *Tirumala limniace*, and *Catopsilia pyranthe*. Butterfly species found in closed canopy habitat types are certain species with a high degree of adaptation to the environment. The low number of species in the canopied type is because butterflies is an animal that need heat to keep their bodies warm, so low temperatures in an environment will affect the rate of activity and will inhibit the metabolism in the butterfly's body [17]. In addition, the location with the canopied type has higher humidity than the open canopy at 24°C and 70%, this makes only certain species found in the canopied type.

Catopsilia pyranthe is a butterfly species that has the highest relative abundance value in the not-canopied type with 18.91%. This species is a group of butterflies from the family Pieridae. In this study, 35 individuals of *Catopsilia pyranthe*

were found in the not-canopied type. The morphological feature of *Catopsilia pyranthe* has a white upper and lower wings color. Thorax, abdomen and the legs are yellowish white color. In addition, there are black patches on the apical wings and black circles on the lower wings [5].

Catopsilia pyranthe is a species that has the speed move when flying [15] and is found flying individually. *Catopsilia pyranthe* is also found in the closed canopy type. Because *Catopsilia pyranthe* is able to fly high to reach the canopy and has a long migration rate. This statement is reinforced by [18] that *Catopsilia pyranthe* is a species with high flying speed and agility.

The result of relative abundance in closed canopy type was *Leptosia nina* with 32.78% belonging to the Pieridae family. At the time of research, *Leptosia nina* found as 20 individuals. The morphological characteristics this species have a small body size, thorax, white abdomen, white wings with spots on the forewings and rounded black wings margins [5]. In addition, the lower hind wings are brownish white with streaks that follow the area and venation of the wings [15].

Figure 6. *Leptosia nina*

Leptosia nina is a species that has a weak and low flight ability [5] and was found to fly individually. In this study, *Leptosia nina* was found in both canopy types, but the number of individuals it was found more in the closed canopy type. Because the open canopy type is an inappropriate habitat and there are few forage plants. The food plant of *Letopsia nina* comes from the Capparaceae and Rhamnaceae families. This statement is supported by [15] which states that the unavailability of host and forage plants will affect the presence and population of species in a location.

CONCLUTION

Based on this research, it can be concluded there are 24 species of butterflies in Selogiri waterfall area with 240 individuals. The butterfly diversity index in Selogiri Waterfall area is H'=2.6 which is included in moderate diversity category. The not-canopied location has a value H'=2.4, while the canopied location value H'= 1.8. *Catopsilia pyranthe* has the highest relative abundance in the not-canopied type with 18.91% and *Leptosia nina* has the highest relative abundance in the canopied type with 32.78%.

REFERENCE

[1]W. Buttiker, H., Krenn, & J.F. Putterill. 1996. The proboscis of eye-frequenting and piercing Lepidoptera (Insecta). *Zoomorphology*. 116, 77–83.

[2]Crishtian, A.T., Johnson., & Borror, D.J. 2005. *Borror and DeLong's introduction to the study of insects*, 7th ed. Australia: Thomson, Brooks/Cole.

[3]Perveen, F.K., & Anzela, K. 2017. *Introductory Chapter: Lepidoptera*. in *Lepidoptera* Ed. InTech.

[4]Azizah, I., Mustafa, Z.P., Gama., and Leksono. A. S. 2021. The diversity and abundance of butterfly [Lepidoptera] in several urban green spaces of Malang city. *IOP Conf. Ser. Earth Environ.* Sci. 741 (1), 1-9.

[5]Baskoro, K., Nanang, K., & Irawan, I. 2018. *Lepidoptera Semarang Raya*. Semarang: Haliaster UNDIP.

[6]Rohman, F., Efendi, M.A., & L. R. Andrini. 2019. *Bioekologi Kupu Kupu*. Malang: Universitas Negeri Malang.

[7]Mangguran. 1988. *Bookmatter Ecological Diversity and Its Measu*. New Jersey: Princenton University Press.

[8]Noor, P. 2016. Keanekaragaman Kupu-Kupu Di Kawasan Air Terjun Rampah Menjangan, Loksado, Kabupaten Hulu, Sungai Selatan. Lembaga Penelitian dan Pengabdian Masyarakat, Universitas Lambung Mangkurat. 1, 109-112.

[9]Pertiwi, R.A.P., Sugianto, B.A., &Nayasilana, I.N. 2020. Diversity Of Butterfly (Lepidoptera) In Mount Bromo Forest Area With Special Purpose (FASP),

Karanganyar, Central Jawa. 29 (2), 166-176.

[10]Wijaya, R.P., Diana, A.S., Kusyaifah, E., & Amalia, N 2019. Respon Perilaku Kupu–Kupu pada Kanopi Bercelah dan Kanopi Tertutup di Hutan PPKA Bodogol, Taman Nasional Gunung Gede Pangrango *BIOMA*. 10 (2), 19-23.

[11]Lestari, A., Harmoko., & Susanti, I. 2020. Kupu-Kupu (Lepidoptera) dari Air Terjun Bukit Gatan Kecamatan STL Ulu Terawas Kabupaten Musi Rawas Provinsi Sumatera Selatan. *Biot. J. Ilm. Biol. Teknol. dan Kependidikan*. 8(2), 126-134.

[12]Peggie, D. 2014. Diversitas Dan Pentingnya Kupu-Kupu Nusa Kambangan (Jawa, Indonesia). *Zoo Indonesia*, 23, 45–55.

[13]Panjaitan, R., Atmowidi., & Peggie, D. 2016. Effect of Temperature on Butterfly Community (lepidoptera) at Gunung Meja Recreational Forest Area, Manokwari, Papua Barat. *KnE Soc. Sci*. 19-26.

[14]Harmonis., & Sutedjo. 2021. Diversity and Community Pattern of Butterflies on Degraded Heath Forest in East Kalimantan. *Proceeding of The Joint Symposium on Tropical Studies (JSTS-19)*, Kalimantan Timur, Indonesia: Atlantis Press.

[15]Ilhamdi, M.L., Idrus, A.A., & Santoso, D.. 2018. *Kupu-Kupu Taman Wisata Alam Suranadi*. Lombok Barat, NTB: Arga Puji Press.

[16]Irni, J., Masy'ud, B., & Haneda, N. 2016. Keanekaragaman Jenis Kupu-Kupu Berdasarkan Tipe Tutupan Lahan dan Waktu Aktifnya Di Kawasan Penyangga Tangkahan Taman Nasional Gunung Leuser," *Media Konservasi*. 21(3), 8.

[17]Ashari, F.N., & Addiniyah, N.R. 2019. Diversity of Butterflies (Lepidoptera: Rhopalocera) in Sumber Clangap and Waduk Selorejo, East Java. *Biota*, 12 (1), 32–37.

[18]Mustari, A.H., & Gunadharma, N. 2016. *Kampus Biodiversitas : Kupu-Kupu di Wilayah Kampus IPB Dramaga*. Bogor: IPB Press.