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# BUTTERFLY COMMUNITY (Lepidoptera) AT JOBEN TOURISM PARK (JOBEN ECO PARK) REGENCY OF EAST LOMBOK

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**Abstract:** Joben Eco Park is located in the Joben Resort area, Mount Rinjani National Park Center Pesanggarahan Village, Montong Gading Subdistrict, East Lombok Regency. This research is an exploratory, descriptive study that aims to discover the butterfly community in Joben Eco Park, East Lombok Regency. Data collection used a purposive survey method whit a sweeping technique following two predetermined observation lines. The research results were obtained from 375 individual butterflies covering 29 species, with 11 genera and 4 families. Analysis of the butterfly diversity index using the Shannon-Winner formula obtained a butterfly species diversity index value in Joben Eco Park in general of 3.033, which falls into the high category. Analysis of the dominance index using a formula from Simpson obtained a value of 0.06.

**Keywords:** *Diversity, Dominance, Evenness, Butterflies, Joben Eco Park*.

## INTRODUCTION

Joben is located in the forest area of Mount Rinjani National Park (TNGR). Based on the zoning of the Mount Rinjani National Park, the Joben Resort area is in an intensive-use zone that is directly adjacent to the rice fields and gardens of the surrounding community, in which there is a tourist attraction that is widely known by the national and international community, namely the object of "Kokok Brain Bathing Tour" [1]. In the area behind the Otak Kokok bathing area, there is Joben Eco Park which offers educational and conservation tours that play an important role in the sustainability of the forest with all its functions.

Joben Eco Park is located in the Joben Resort area, SPTN II, Mount Rinjani National Park Center (BTNGR) Pesanggarahan Village, Montong Gading District, East Lombok Regency. Joben Eco Park is one of the tourist attractions located on the hiking trail in the southern part of Mount Rinjani, a geopark area used as a protected park tourist attraction. Joben Eco Park is a secondary forest because there is human intervention in forest management. Joben Eco Park has an area of about 9.04 Ha. Besides being famous for its natural beauty and tourist destinations, the Joben Eco Park area also has various wildlife, including butterflies. Butterflies are a group of insects belonging to the order Lepidoptera. Lepidoptera comes from the Latin words Lepido (meaning scales) and Pteron (meaning wings). The scales on the butterfly wings are arranged like tiles and have a beautiful color pattern, making the butterfly wing pattern more attractive [2].

Butterflies have various roles in life; one of the roles of butterflies is as a pollinator that helps the pollination process in flowers, so that plant reproduction takes place properly. In addition, butterflies in the ecosystem are a source of food for carnivorous animals. Therefore, the existence of butterflies is very important for the balance of the ecosystem. The importance of the role and existence of butterflies supports the preservation of butterflies [3]. The presence of their host plants influences the existence of butterflies. The existence of butterflies is determined by their ability to adapt to biotic and abiotic environmental factors. Inadequate or inappropriate environmental management can cause a decrease in the diversity of fauna species that exist in a habitat. In forest ecosystems, butterflies have an important value, namely as pollinators, to maintain plant diversity. One of the roles of butterflies as pollinating insects can help maintain plant species in their habitat [4].

Butterflies, in general, can be found in almost all habitats. Different habitats are one of the factors that cause differences in the butterflies that live in them. The survival of butterflies in a habitat depends on the presence of both host plants that serve as a good food source for the adult and larval phases. The existence of butterfly species is strongly influenced by vegetation conditions, the environment, and human disturbances [5]. Changes in vegetation and the environment can affect species composition [6].

Joben Eco Park is one of the conservation areas in West Nusa Tenggara that offers educational tours. Therefore, data and information related to animals, especially butterflies in Joben Eco Park, are very important to support educational tourism in Joben Eco Park. Research on butterflies, especially in West Nusa Tenggara, has been widely carried out in places such as Suranadi Nature Park, Kerandangan Nature Park, Tunak Hill, Jeruk Manis Forest Area, and other tours. However, research on butterflies in Joben Eco Park, in particular, has never been done.

Further research needs to be done to determine the species and diversity of butterfly species in Joben Eco Park to obtain accurate data and information. Research needs to be done because every year, butterflies experience changes in the number of species and the number of individuals. It can be caused by environmental changes, as it is known that butterflies are insects that are very sensitive to environmental changes. In addition, data and information about butterflies in Joben Eco Park can be used to consider future management of the Joben Eco Park area.

## RESEARCH METHODS

The research was carried out at Joben Eco Park, Lombok Regency, in October 2021. This research was conducted by following two paths determined by research *purposive*: waterways and paths bordering the forest utilization zone (ZP). The research path can be seen in Figure 1.

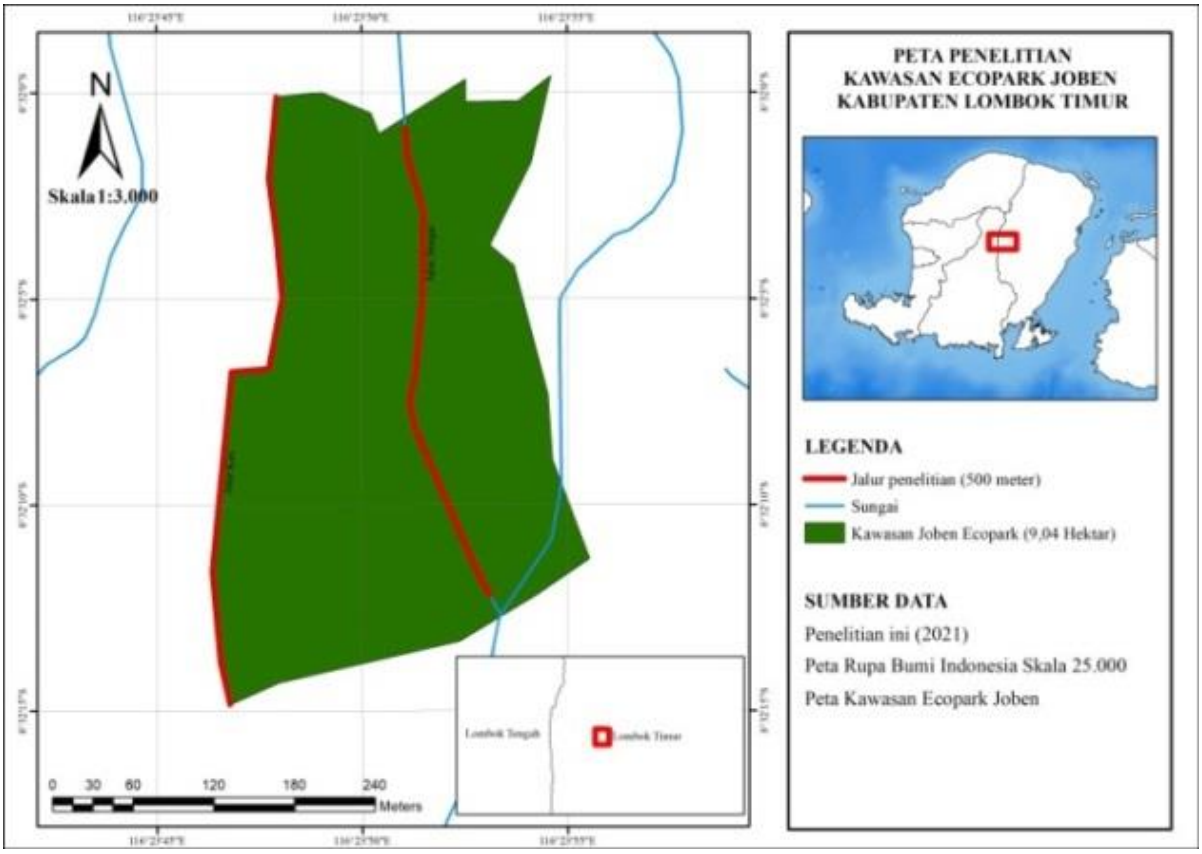


Figure 1. Research site map

Catching butterflies is done by sweeping technique, namely catching with insect nets. Catching using insect nets is carried out if the butterflies found cannot be identified at the time of the study. Butterflies that have been caught are then preserved using 70% alcohol. After being preserved, the butterflies were taken to the Biology laboratory of the FKIP University of Mataram to be identified using the Butterfly Field Guide at TWA Gunung Tunak, the Suranadi Nature Tourism Park Butterfly book, and the book. Butterfly Diversity.

The data collected includes the name of the species and the number of individual butterflies found in each lane. The species data obtained were then analyzed using the Diversity Index formula Shannon-Wiener, Species Evenness IndexPielou, and Dominance IndexSimpsons.

## RESULTS AND DISCUSSION

### Butterfly Species found in Joben Eco Park

The results of research on butterfly communities conducted at Joben Eco Park, East Lombok Regency, can be seen in Table 1. It shows that there were 29 species, with 21 genera and 4 families. The Papilionidae family consists of 2 genera with 4 species, the Nymphalidae family consists of 13 genera with 19 species, the Pieridae family consists of 4 genera with 4 species, and the Lycaenidae family consists of 2 genera with 2 species. The number of butterfly species found in each research line varies. The number of butterfly species found in 2 research lines, namely the waterway and the path bordering the forest use zonecan be seen in Table 1. It shows that the most common butterfly species in Joben Eco Park are Orsotriaena medus, Catopsilia pamona, Papilio

memnon, and Eurema hecabe. Butterfly species such as Elymnias hypermnestra, Tanaecia palguna, Tirumala septentrionis, Leptotes sp., and Jamides celeno (Table 1) were the fewest species found at the study site.

All butterfly species belong to four families: Papilionidae, Nymphalidae, Pieridae, and Lycaenidae. The Nyimphalidae family is the family with the highest number of findings, namely 19 species. The number of Nymphalidae families is abundant at the research location because the Nymphalidae family is a butterfly family that has the largest number of species among other species [4]. Therefore, the Nymphalidae family is the most commonly found family in the study. Similarly, research conducted by [7] of the 35 species found in the Kerandangan Nature Tourism Park, 18 of them came from the Nymphalidae family. In addition, research [8] at Suranadi Nature Park found 28 species of butterflies, 11 of which belong to the Nymphalidae family.

Table 1. List of Species and Number of Individuals of Each Butterfly Species in 2 Research Paths at Joben Eco Park, East Lombok

| No | Family | Species | Research path | | Amount |
|---|---|---|---|---|---|
| | | | Water | ZP | |
| 1. | Papilionidae | *Graphium doson* | 11 | 3 | 14 |
| 2. | | *Papilio demoleus* | 4 | 0 | 4 |
| 3. | | *Papilio Memnon* | 14 | 12 | 26 |
| 4. | | *Papilio polytes* | 8 | 7 | 15 |
| 5. | Nymphalidae | *Cupha erymanthis* | 7 | 4 | 11 |
| 6. | | *Elymnias hypermnestra* | 0 | 2 | 2 |
| 7. | | *Euploea core* | 6 | 2 | 8 |
| 8. | | *Euploea leucostictos* | 0 | 2 | 2 |
| 9. | | *Hypolimnas anomalous* | 1 | 3 | 4 |
| 10. | | *Hypolimnas bolina* | 0 | 7 | 7 |
| 11. | | *Juvenile Ideopsis* | 9 | 0 | 9 |
| 12. | | *Junonia almanaa* | 10 | 8 | 18 |
| 13. | | *Junonia erigone* | 5 | 4 | 9 |
| 14. | | *Junonia iphita* | 8 | 4 | 12 |
| 15. | | *Melanitis leda* | 3 | 5 | 8 |
| 16. | | *Melanitis phedima* | 1 | 6 | 7 |
| 17. | | *Mycalesis mineus* | 11 | 10 | 21 |
| 18. | | *Neptis Hylas* | 10 | 11 | 21 |
| 19. | | *Orsotriaena medus* | 16 | 36 | 52 |
| 20. | | *Tanaecia palguna* | 2 | 0 | 2 |
| 21. | | *Tirumala hamate* | 5 | 0 | 5 |
| 22. | | *Tirumala septentrionis* | 2 | 0 | 2 |
| 23. | | *Ypthima baldus* | 8 | 8 | 16 |
| 24. | Pieridae | *Catopsilia pamona* | 19 | 17 | 36 |
| 25. | | *Delias sp.* | 8 | 10 | 18 |
| 26. | | *Eurema Hecabe* | 11 | 14 | 25 |
| 27. | | *Leptosia nina* | 8 | 9 | 17 |
| 28. | Lycaenidae | *Jamides celeno* | 2 | 0 | 2 |
| 29. | | *Leptotes sp.* | 2 | 0 | 2 |
| Amount | | | 191 | 184 | 375 |

The number of butterflies from the Nymphalidae family in one place is because Nymphalidae can adapt to various environmental conditions and have varied host plants as a source of food and shelter [9]. In addition, the Nymphalidae family has the largest number of species, consisting of about 5,000 species spread throughout the world. In addition, butterfly species from the Nymphalidae family are polyphagous, meaning they have more than one type of food [10]. Therefore, even though the main host is not available, the Nymphalidae family can still meet the needs of its food sources. It is very beneficial for the butterfly for its survival.

**Species Diversity Index and Butterfly Evenness Index at Joben Eco Park**

The diversity index can be determined based on data on the number of individual butterfly species found in 2 sampling lines at Joben Eco Park. The value of the butterfly species diversity index can be calculated using the Shannon-

Wienner formula. The value of the species diversity index can be seen in Figure 2.

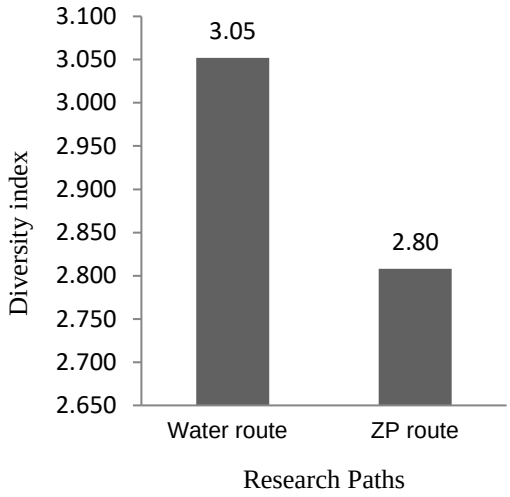


Figure 2. Comparison of Butterfly Species Diversity Index in 2 Research Paths in Joben Eco Park
Note: ZP (Road bordering the Forest Utilization Zone)

Figure 2 shows that the highest butterfly diversity index in the waterway is 3.05 higher than the diversity index value on the path bordering the forest use zone, the forest utilization zone obtained a diversity index value of 2.80. The overall species diversity index value in Joben Eco Park is 3.03.

The diversity of butterfly species in Joben Eco Park obtained a value of 3.03. This value is higher when compared to the diversity index in Kerandangan Nature Park, with the highest diversity index value, namely on the forest tracking route of 2.72 [7]. The diversity index value is lower when compared to research in other locations outside the island of Lombok, such as research conducted in the Pasirlangu area, Cisarau sub-district, West Bandung regency, West Java, showing a diversity index value of 3.43 [11].

The high and low value of the species diversity index found in each study is influenced by the condition of the habitat and vegetation in the area. Joben Eco Park is a forest with vegetation in the form of trees, shrubs, and shrubs. Apart from habitat conditions. The vegetation that grows in an area can also affect the butterfly species diversity index found. [12] explained that the distribution and abundance of host plants and feeding trees strongly influence the presence and diversity of butterflies.

The Joben Eco Park area is overgrown with various types of vegetation that can be used as food plants for butterflies both in the larval (caterpillar) and imago (adult butterfly) stages. Food plants for the larval phase (*Caterpillars*) that grew at the research site were banyan trees (*Ficus superba*), citrus trees (*Citrus sp.*), awar-awar (*Ficus septica*), and acacia trees (Acacia ducurrens). While forage plants for the imago phase are various types of flowering plants such as orchids (*Orchidaceae*), irises (Iris pseudacorus), ketul (Bidens pilosa) widelia (*Sphagneticola trilobata*), frangipani (*Plumeria*), daughter of shame (*Mimosa pudica*), horse whip (*Stachytarpheta jamaicanensis*), bandotan (*Ageratum conyzoides*), and there are various types of grasses from the Poceae family as well as various types of ferns as a place for butterflies to perch.

The results of calculating the butterfly diversity index value in each path are different. In the waterway, the diversity index value is 3.05. Meanwhile, on the path bordering the forest use zone, the diversity index value is 2.80. The number of species influences the difference in the value of the diversity index in each path, the number of individuals of each species, and the total number of individuals of all species found. [13] stated that the diversity index's high value indicates that the community composition has high species diversity.

The results showed that the waterway has the highest species diversity index value, and many butterfly species are found on this route. The most common species in waterways is Catopsilia pamona of the family Pieridae. This species flies high and perches on the Pterocarpus indicus and trees *cassia sp.*, which grows around waterways and is one of the forage plants for the species *Catopsilia pamona*.

The most common butterfly species found on the path bordering the forest use zone is Orsotriaena medus, which is a species of the Nymphalidae family. This butterfly species has small in size and usually flies and perches on the grass. This species is mostly found in the lane bordering the forest use zone. This species is found flying and perching on elephant grass (Pennisetum purpureum), and alang-alang (*Imperata cylindrica*), which grows on the path bordering the forest use zone.

The butterfly diversity index on the path that borders the forest use zone is lower than the waterway because there are large trees on this path. The habitat conditions are a bit dark, making the butterflies invisible due to hiding in the trees. [14] stated that, butterflies are generally lower in forests with slightly dark or closed conditions and higher in forest fringes and open areas because light can attract butterflies.

Evenness index analysis was calculated using Pielou's formula. The results of the analysis of the butterfly species evenness index data as a whole in Joben Eco Park obtained a value of 0.90, which belongs to the high category. It shows that there are no dominant species in the research location, so the species distribution is evenly distributed. In accordance with the statement [10]

states that, if the evenness value < 0.4 indicates a low level of evenness, an evenness value between 0.4 - 0.6 indicates a moderate level of evenness, and an evenness value of > 0.6 indicates a high level of evenness. Evenness can be used to express whether or not the number of species is evenly distributed at a particular location. The evenness index value shows how the balance of a community.

The high evenness value indicates that the number of individuals of each species at the study site is relatively the same. There are no prominent or dominating species. The more even distribution of an animal in a certain location indicates that the better the environmental conditions at that location can support the animal's survival [15].

The index values of diversity, evenness, and dominance influence each other. High species diversity if the dominance index value is low and the evenness value is high. It means that an area with a high diversity value will result in no dominating species. Therefore, if no dominant species exist in an area, the species distribution will be evenly distributed. Species evenness is the distribution of individuals between species in a balanced community.

**The dominance of Butterfly Species in Joben Eco Park, East Lombok**

The dominance index value of butterfly species in Joben Eco Park can determine butterfly species data found in both research lines. The dominance index value of the butterfly species was calculated using Simpson's dominance index formula. The dominance index value of butterfly species in Joben Eco Park can be seen in Figure 3.

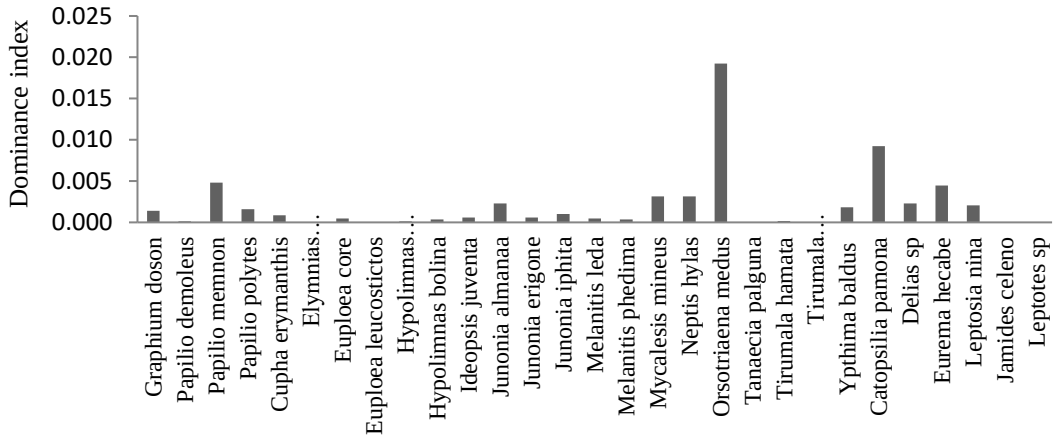


Figure 3. The dominance of butterfly species in Joben Eco Park

Figure 3 shows that the species with the highest dominance index in Joben Eco Park is Orsotriaena medus with a dominance index value of 0.019, then Catopsilia pamona 0.009, and Papilio memnon 0.005. In contrast, the species with the lowest dominance index value are Tirumala septenrionis, Tanaecia palguna, and Hypolimnas anomala, with a value of 0.000.

Based on the butterfly species data found in both research lines, the value of the dominance index and the evenness of butterfly species in Joben Eco Park can be determined. The dominance index value of the butterfly species was calculated using Simpson's dominance index formula. The results of data analysis that have been carried out show that the dominance index value of butterfly species in Joben Eco Park as a whole obtained a value of 0.06 which means close to 0 (zero) which is included in the low category, meaning that there are no dominant butterfly species in the area. The dominance index value < 0.5 indicates that there is no dominating organism [16]. The value of the evenness index influences the value of the dominance index. If the value of the evenness index is higher, the value of the dominance index will be lower, and vice versa. It means that if an area has a high species evenness index value, there are no dominant species, so the distribution is also evenly distributed.

The species dominance index is used to obtain information about the presence or absence of dominant species in a community. The smaller the species dominance index value indicates that no species dominates, and vice versa, the greater the species dominance index value indicates the presence of certain dominant species [17]. The butterfly dominance index can be determined based on the number of individuals in each butterfly species found in the study site. The more the number of individuals of a species, the higher the value of the dominance of that species.

The existence of butterflies is not only influenced by vegetation but also by environmental factors such as temperature and humidity. The butterfly is a poikilothermic organism, meaning that the ambient temperature strongly influences the body temperature, so the butterfly must be in a suitable environment [18]. The data from the

measurement of environmental factors in the form of temperature and humidity in Joben Eco Park can be seen in Table 2.

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Table 2. Environmental Factor Measurement Data at Joben Eco Park

| Environmental factor | Range |
|---|---|
| Temperature | 21 - 26 $^{o}$C |
| Humidity | 66 - 74% |
| Wind velocity | 9.4-20.8 km/h |

The results of environmental temperature measurements at Joben Eco Park, East Lombok, range between 21 $^{o}$C to 26 $^{o}$C, and humidity ranges from 65% to 74%. The temperature and humidity are suitable for the survival of the butterfly. Air humidity is also an environmental factor affecting butterflies' activity in searching for food. Butterflies and caterpillars avoid dry conditions and seek places with sufficient moisture to rest. The optimal environmental humidity ranges from 60% -75% [19]. In general, the effective temperature range for butterflies is a minimum temperature of 15 $^{o}$C, an optimum temperature of 25 $^{o}$C, and a maximum temperature of 45 $^{o}$C [20].

## CONCLUSION

Based on the research, data analysis, and discussion results, it can be concluded that (1) Butterflies found in Joben Eco Park consist of 29 species, which belong to 11 genera and 4 families. The family *Nymphalidae* 19 species, *Papilionidae* 4 species, *Pieridae* 4 species, and *Lycaenidae* 2 species. (2) The index value of species diversity (H') of butterflies in Joben Eco Park is 3.03, with a dominance index value of 0.06 and a species evenness index of 0.90, which belongs to the evenly distributed category.

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