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Analysis of flora and fauna potential in Moncong Sipolong Ramah Bissoloro tourism

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ABSTRACT

Indonesia, as the country with the second largest biodiversity in the world after Brazil, has great potential for developing nature-based tourism. Camp Moncong Sipolong Ramah in Bissoloro Village, Gowa Regency, is a nature tourism site located in a mountainous area with a natural ecosystem that has potential flora and fauna, and is currently in the development stage. It is managed by the Social Forestry Business Group (KUPS) under the auspices of the Paralappara Forest Farmers Group (KTH). This study aims to identify and measure the potential of flora and fauna at the Moncong Sipolong Ramah Camp Tourism site in order to fill the gap in scientific data related to biodiversity. This study was conducted from January to March 2025. The methods used included flora sampling through five plots using the random sampling method representing the research area, with each plot measuring 20 × 20 m, and fauna analysis using the walk-transect method on two trails, the first trail measuring 700 meters and the second trail measuring 300 meters, to determine the diversity, evenness, and species richness indices. The results showed the presence of 79 individuals from three types of flora, dominated by *Pinus merkusii* with the highest INP of 267.84%, and eight types of fauna, one of which was an endemic species, *Macaca maura*. The fauna diversity of both trails was moderate, species richness was low, and species evenness was high in trail 1 and moderate in trail 2, indicating the need for proper management to maintain species sustainability. These findings confirm that pine forests are the main attraction for ecotourism development in this area, providing a strong scientific basis for the management and conservation of biodiversity and the development of sustainable tourism in the future.

Keywords: flora, fauna, nature tourism, Moncong Sipolong Ramah camp tourism.

INTRODUCTION

Indonesia, located in the tropics with a highly diverse ecosystem, has enormous potential in terms of biological and cultural diversity. The country is known as one of the most megabiodiverse countries in the world, especially in terms of species and genetic diversity (Biodjati and Djarwaningsih, 2017; Kusmana and Hikmat, 2015; Tobing, 2008). This biodiversity plays a vital role in maintaining ecosystem functions that ensure the survival of various species (Ardiansyah and Iskandar, 2022). In addition, Indonesia's unique cultural diversity is also a potential tourist attraction, including historical buildings, cultural attractions, and local traditions (Damayanti and Puspitasari, 2024). This potential not only has ecological value but also significant economic value if managed sustainably, capable of attracting both domestic and international tourists (Katrini Endah Pamungkas et al., 2022; Nengsih, 2020).

One location with natural potential that has not been widely explored is the Moncong Sipolong Ramah Camp in Bissoloro Village, Gowa Regency, South Sulawesi. This area has a mountainous ecosystem dominated by natural pine forests, accompanied by cool temperatures, dense vegetation, and unique fauna. However, the potential of the flora and fauna here has not been scientifically and systematically documented. The lack of data hinders the development of targeted and sustainable tourism and risks neglecting the very important aspect of ecological conservation (Satriya et al., 2025).

In the context of the growing interest in nature and educational tourism, an integrated analysis of flora and fauna is essential for creating high-quality, environmentally friendly tourism products. Area management must pay attention to environmental sustainability while providing meaningful experiences to tourists, including education on biodiversity conservation (Darmayasa et al., 2025; Pratama and Nuryananda, 2025; Vuspitasari, 2025). Camp Moncong Sipolong tourism has the potential to become an educational tourism model that highlights natural wealth as its main attraction (Prasetyo and Nararais, 2023).

However, to date, there have been no scientific studies that identify in detail the types and characteristics of flora and fauna in the area. This is important, given that such data will form the basis for effective management and conservation planning, as well as the economic empowerment of local communities through the development of sustainable tourism (Septemuryantoro, 2020; Wahyuni, 2018). Empowering local communities is the key to the success of independent and sustainable ecotourism (Rahmat and Mirnawati, 2020).

This study was conducted with the main objective of identifying and measuring the potential of flora and fauna in the Moncong Sipolong tourism area in a scientific and structured manner. Through this study, it is hoped that valid data on species diversity can be found, which will form the basis for the development of environmentally friendly and educational nature tourism. This study also aims to develop management recommendations that can preserve the ecosystem while strengthening the role of the community in tourism management. The research hypothesis states that the Moncong Sipolong area has diverse and significant flora and fauna potential as the main attraction for ecotourism development, but data-based management is needed to ensure sustainability.

Thus, this study is expected to contribute new scientific data on biodiversity and strategic recommendations for sustainable tourism development that have not been previously available at Moncong Sipolong Ramah camp tourism.

RESEARCH METHOD

Location

This research was conducted from January to March 2025 at the Moncong Sipolong Ramah camp tourist site. The research location map is shown in Figure 1.

Method

Measurement of flora potential

The potential flora at the research site was assessed using the quadrat plot method with a combination of random selection of starting points

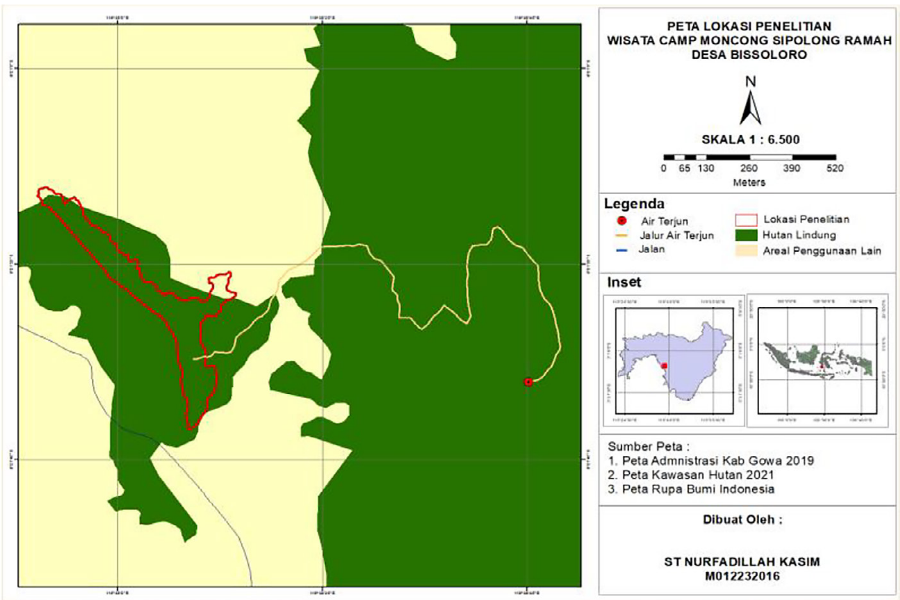


Figure 1. Research location

and systematic placement of subsequent plots to ensure that the entire area was evenly represented and to reduce sampling bias. Each plot measured 20 × 20 m and was designed according to standard forestry research practices, with subplots measuring 2 × 2 m for seedlings, 5 × 5 m for saplings, 10 × 10 m for trees, and the entire 20 × 20 m area for the tree category. This division is based on the stages of vegetation growth, which require different plot sizes in accordance with forest inventory standards in order to obtain accurate data on structure and composition. Data collection in each plot was carried out by recording the type of plant, the number of individuals of each type, diameter at breast height (DBH), basal area (LBDS), branch-free height (TBc), and total height (Ttot) in a Tally Sheet, while for seedlings and saplings, only the type and number of individuals were recorded.

The plot method using a random-systematic system and subdivision based on growth categories has been proven to provide more representative and reliable results for analyzing vegetation diversity, stand structure, and estimating species density, dominance, and distribution in diverse areas. Random placement of starting points prevents location bias, while systematic distribution ensures sample coverage across the entire study area. This technique refers to standard inventory practices used in various forest vegetation studies in Indonesia and takes into account the main recommendations from the tropical forestry literature (Nurlita et al., 2025).

The projection of the canopy and profile diagram on graph paper was carried out by dividing the plot into 2 × 2 m subplots to facilitate the projection of the canopy on a 20 × 20 m plot and the profile diagram on a 10 × 20 m plot, with 2 × 2 m auxiliary lines as the basis for the field and graph paper scale, which illustrates the steps for determining tree position, measuring canopy width, and branch-free height and total height to map the canopy structure horizontally and visually.

Fauna potential assessment

Fauna potential, data collection for fauna is divided into two observations, namely observations of birds and insects, and observations of mammals and reptiles. Data collection uses the line transect method. This walk transect method is a method of observing animals in the form of an observation path with a path width that is adjusted to the observation distance from the animals in the field when the survey is conducted. This walk transect method is carried out by walking slowly along the transect line while observing the left and right sides of the line. If an animal is encountered, the distance between the observer and the observed animal is measured perpendicularly, and the average distance will then determine the width of the line. An example of data collection using the line transect observation method can be seen in Figure 2.

This walk transect method was used on two observation trails. Individuals found along the observation trails were recorded by species and number of species, number of individuals of each species, time and weather conditions when the reptiles were found, reptile activity or behavior, distance between the observer and the reptile, and photographs were taken of the reptiles found. To facilitate the recording of observation results, an observation tally sheet was created. This method was carried out for 2 days in the morning starting at 07:00 WITA and in the afternoon starting at 15:00 WITA. The data recorded during direct encounters included species, activity, number of individuals, and distance of mammals from the observer's position.

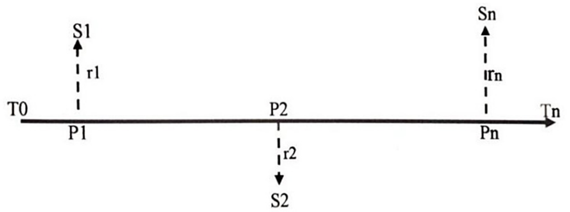


Figure 2. Illustration of the walk transect observation method. T_{0} = starting point of observation; P – observer position; P – observer position; P – observer position; P – observer position; r = distance between the observer and the observation object; T_{n} – end point of observation; → – observation path

Data analysis

Flora

Quantitative analysis was performed by calculating density, relative density, frequency, relative frequency, dominance, relative dominance, and importance value index (INP). Fauna observation data obtained using the Walk Transect method was analyzed using several formulas, including observation plot width, diversity index, density, relative density, frequency, relative frequency, and ecological index.

$$Density = \frac{Number\ od\ Individuals}{Area\ of\ sample\ plots} \quad (1)$$

$$Relative\ density = \frac{Density\ of\ a\ type}{Density\ of\ all\ types} \times 100\% \quad (2)$$

$$Frequency = \frac{Number\ of\ tiles\ found\ of\ a\ type}{The\ sum\ of\ all\ tiles} \quad (3)$$

$$Relative\ frequency = \frac{Frequency\ of\ a\ type\ Frekuensi\ Suatu\ Jenis}{Frequencies\ of\ all\ kinds\ Frekuensi\ Seluruh\ Jenis} \times 100\% \quad (4)$$

$$Dominance = \frac{The\ number\ of\ area\ areas\ of\ the\ base}{area\ of\ the\ sample\ plot} \quad (5)$$

$$Relative\ Dominance = \frac{Dominance\ of\ a\ type}{Dominance\ of\ all\ types} \times 100\% \quad (6)$$

$$Indeks\ Nilai\ Penting\ (INP) = Kerapatan\ Relatif\ (\%) + Dominansi\ Relatif\ (\%) + Frekuensi\ Relatif\ (\%) \quad (7)$$

- Observation plot width

$$lr = \frac{r1 + r2 + r3 + \cdots + rn}{n} \quad (8)$$

where: Lr – plot width, r – distance between observer and animal.

- Observation plot area

$$L = length \times width \quad (9)$$

- Diversity index – the Shannon-Wiener species diversity index (H') used to calculate diversity is calculated using the formula:

$$H' = -\sum pi \cdot ln\ pi \quad (10)$$

where: H' – species diversity index, Pi – ratio between ni and N or Pi – ni/N, ni – number of individuals of type I, N – total number of individuals, ln – natural logarithm.

The categories of species richness indices are as follows:
- H' < 1 = low species diversity
- 1 ≤ H' ≤ 3 = oderate species diversity
- H' > 3 = high species diversity

- Species richness index – the species richness index uses the Margalef formula, namely

$$R1 = \frac{(S-1)}{(ln(N))} \quad (11)$$

where: $R1$ – species Richness index, S – number of species found, and N – total number of individuals.

The species richness index value is assessed based on the criteria according to Magguran (1988):
- R < 3.5 = species richness is classified as low
- R = 3.5 – 5.0 = species richness is classified as moderate
- R > 5.0 = high species richness

Type evenness index

The species evenness index refers to the Pielow evenness indices formula (Ludwig and Reynolds, 1988), namely:

$$E = H'/ln\ S \quad (12)$$

where: E – Evenness index, H' – Shannon-Wiener diversity index, S – number of species.

The species richness index value is assessed based on the criteria according to Magguran (1988):
- E < 0.3 = low species evenness and depressed community
- R = 0.3 – 0.6 = moderate species evenness and unstable community
- R > 0.6 = high species evenness and stable/balanced community

RESULTS AND DISCUSSION

Flora

The following is a flora research map showing 5 observation plot points in Figure 3.

Distribution and species composition

Based on vegetation data obtained from five observation plots, the following presents vegetation data for each plot from plot one to plot five, consisting of species names, genera, total number of individuals of each species in each plot, total diameter, and total basal area, as shown in Table 1.

Based on Table 1, vegetation data from 5 sample plots, it is known that two growth levels were found at the research site, namely tree growth level and pole growth level. Tree growth level includes *Pinus merkusii* and *Mangifera indica*. Meanwhile, *Nephelium lappaceum* is categorized as pole growth level. Furthermore, there are 3 plant species consisting of 3 genera, as shown in Table 2.

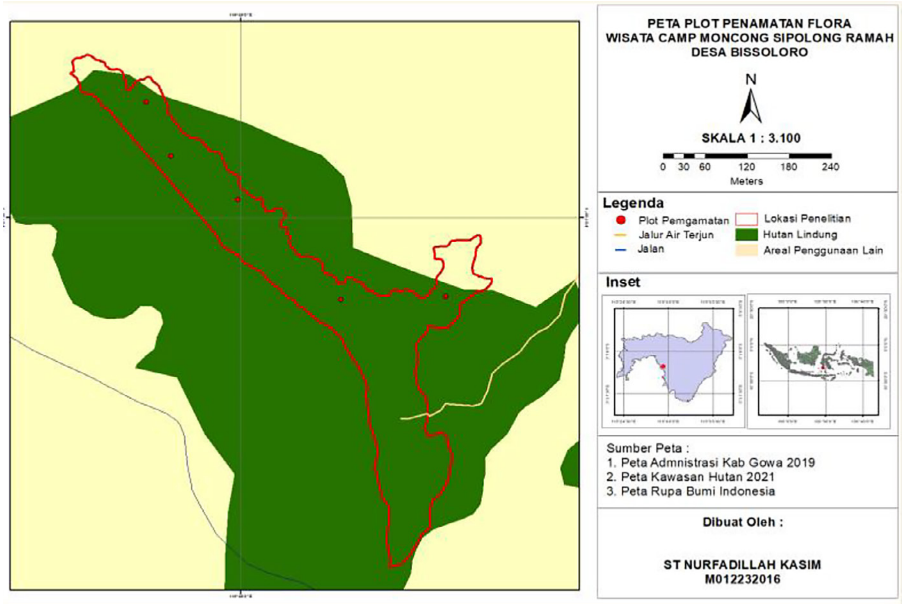


Figure 3. Flora research map

Table 1. Vegetation data for each observation plot at the research location

Plot	Scuentific name	Genus	Total individuals	Total diameter (m)	Total base area (m^2)
Plot 1	*Pinus merkusii*	*Pinus*	16	6.63	2.36
	Mangifera indica	*Mangifera*	1	0.5	0.2
Plot 2	*Pinus merkusii*	*Pinus*	13	5.61	2.09
Plot 3	*Pinus merkusii*	*Pinus*	21	8.56	2.86
Plot 4	*Pinus merkusii*	*Pinus*	13	5.7	2.07
	Nephelium lappaceum	*Nephelium*	1	0.12	0.01
Plot 5	*Pinus merkusii*	*Pinus*	14	6.09	2.13

Table 2 shows the types of plants found at the research site. There were 79 individuals for the entire plot. Based on the table, it can be seen that Pinaceae is the family with the most genera, with 77 individuals, while several families only have 1 genus, namely Anacardiacea and Sapindaceae. The genus with the most species is *Pinus*, and there are 2 genera that each have 1 species, namely Mangifera and Nephelium. The most commonly found plant species is *Pinus merkusii*, with 77 individuals, and there are two plant species that only have one individual each.

The results of the study show that there are differences in the number of species at each growth level, as shown in Figure 4.

Figure 4 shows that the tree level has the most species, namely 2, while the pole level has 1 species, and the sapling and seedling levels have none (zero). In addition to differences in the number of species based on growth level, it was also found that the number of individuals at each growth level also differed, as shown in Figure 5. Figure 5 shows that the tree level has the highest number of individuals, followed by the

Table 2. List of plant species found at the research site

No	Scientific name	Genus	Family	Local name	Number of individuals
1	*Pinus merkusii*	*Pinus*	Pinaceae	Pine	77
2	*Mangifera indica*	*Mangifera*	Anacardiaceae	Mango	1
3	*Nephelium lappaceum*	*Nephelium*	Sapindaceae	Rambutan	1
Total			79		

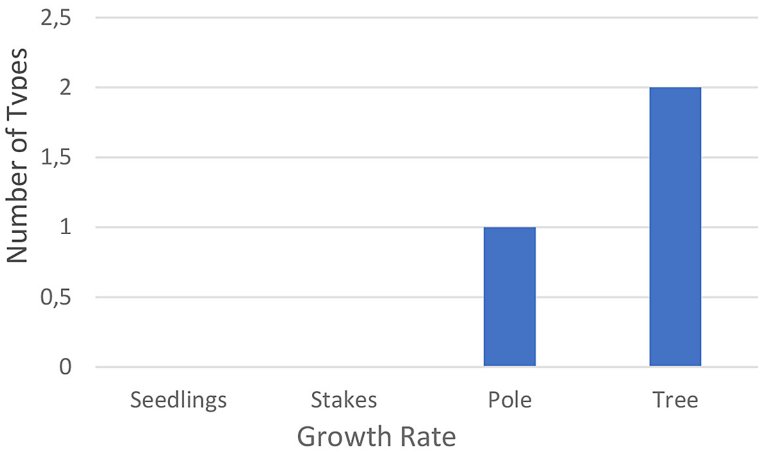


Figure 4. Distribution of plant species based on growth level at the research site in Moncong Sipolong Ramah tourism camp

pole level, but it can be seen that the tree level has more individuals than the pole level. The results of this study show that Pinus merkusii is the dominant species in all plots. This is what makes Camp Moncong Sipolong Ramah famous for its beautiful pine forests, which are the main attraction for tourists. According to Wijayanti (2011), the environmental factor that affects growth is altitude. Elevation affects species richness, the structure and composition of understory vegetation, soil conditions, temperature, light intensity, and water. The distribution of the number of individuals and species for all growth stages, from seedlings, saplings, poles, and trees, can be seen in the diagrams in Figures 4 and 5. These figures show that the largest number of individuals is at the tree stage with 77 individuals, and the largest number based on growth stage is trees with 2 species. Several types of fruit plants cultivated by the community were also found at the research site, such as *Nephelium lappaceum*, *Mangifera indica*, *Durio zibethinus*, and several types of timber trees. This is in line with the opinion of Zuhri and Mutaqien (2011), who stated that easy access and proximity to residential areas are important factors in changes in the composition and diversity of vegetation types.

Importance value index

The vegetation analysis data obtained was used to calculate the importance value index (IVI) for each species found at each growth level. Each species at each growth level had a different IVI. The tree-level Importance Value Index is presented in Table 3.

Based on Table 2, it is known that Pinus merkusii has the highest INP value with an INP value of 267.84% and the lowest INP is *Mangifera indica* with 20.09%. The importance value index of plant

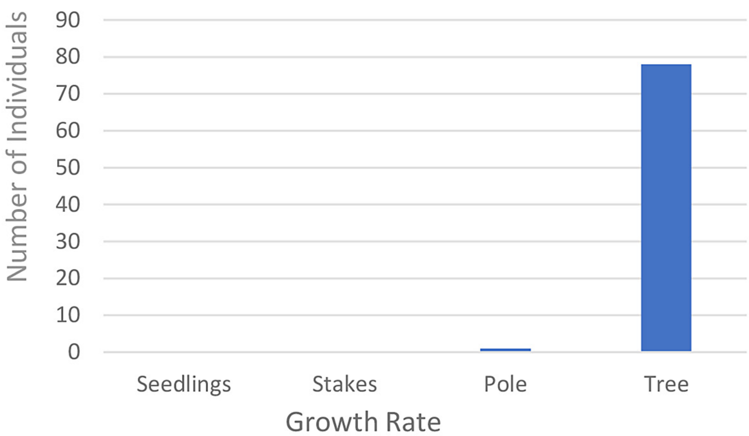
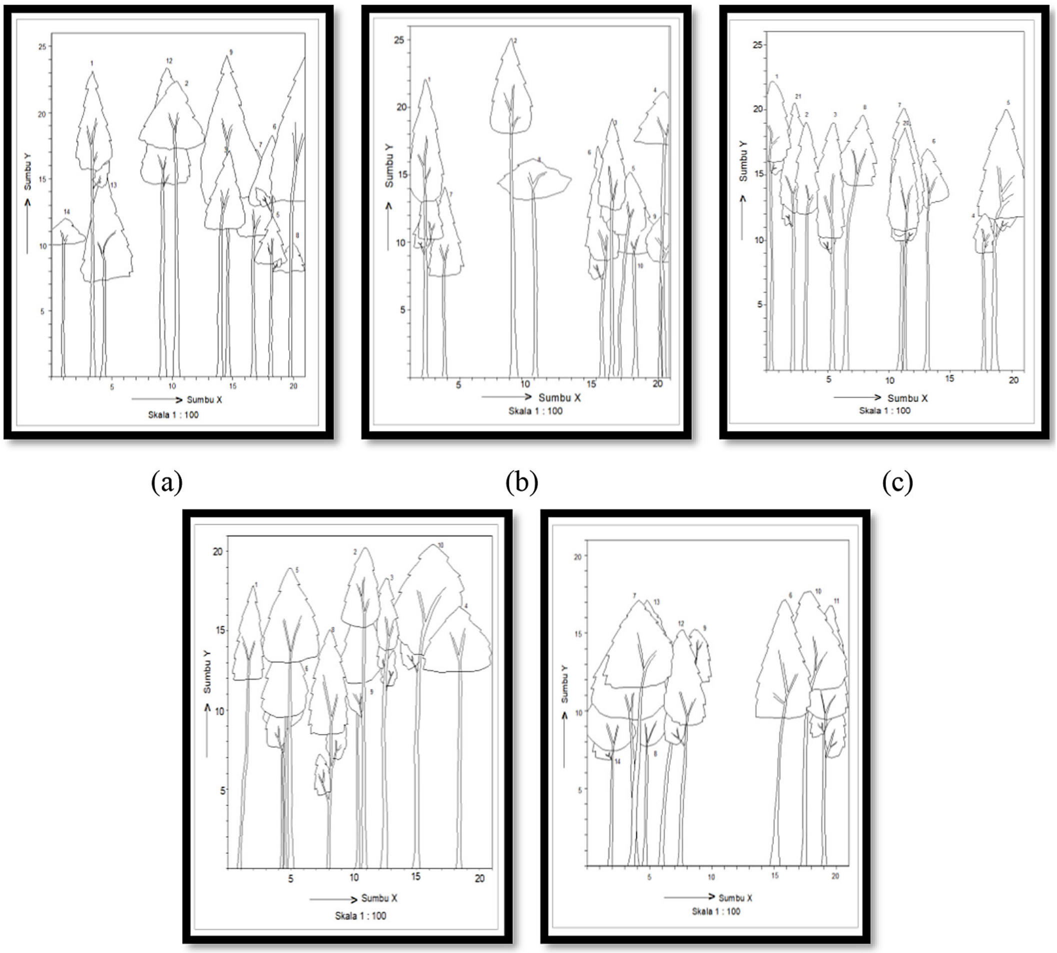


Figure 5. Distribution of plant individuals based on growth level at the research site at Wisata Camp Moncong Sipolong Ramah

Table 3. Tree-level INP at the research site in Moncong Sipolong Ramah tourism camp

No	Scientific name	Local name	K	KR	F	FR	D	DR	INP
1	*Pinus merkusii*	Pine	46	98.21	1.00	71.43	0.982	98.21	267.84
2	*Mangifera indica*	Mango	0.8	1.71	0.2	14.29	0.017	1.71	17.70
3	*Nephelium lappaceum*	Rambutan	0.04	0.09	0.2	14.29	0.001	0.09	14.46
Total			46.84	100	1.4	100	1	100	300

species in a community is one of the parameters that indicates the role of these plant species in the community. The presence of a plant species in a certain area indicates its ability to adapt to the habitat and tolerate environmental conditions. The higher the INP value of a species, the greater its dominance in the community, and vice versa (Saharjo and Cornelio, 2011). Based on the results of vegetation analysis at the research site, there are only two growth levels, namely tree and pole levels, and several species were found with different INP values. The tree level with the highest INP of 279.91% is *Pinus merkusii*, while the other is *Mangifera indica* with 20.09%. The shrub layer only has one species, *Nephelium lappacium*, with an INP value of 300%. The high importance value index (INP) is due to density and dominance, while for trees and poles, it is also due to a higher frequency value. In addition, the measured diameter also affects the INP value of a plant. Based on the research data, *Pinus merkusii* has a high value because it is found in every plot that has been made, has the largest number compared to other plant species, and has a large diameter.



(a) (b) (c)

(d) (e)

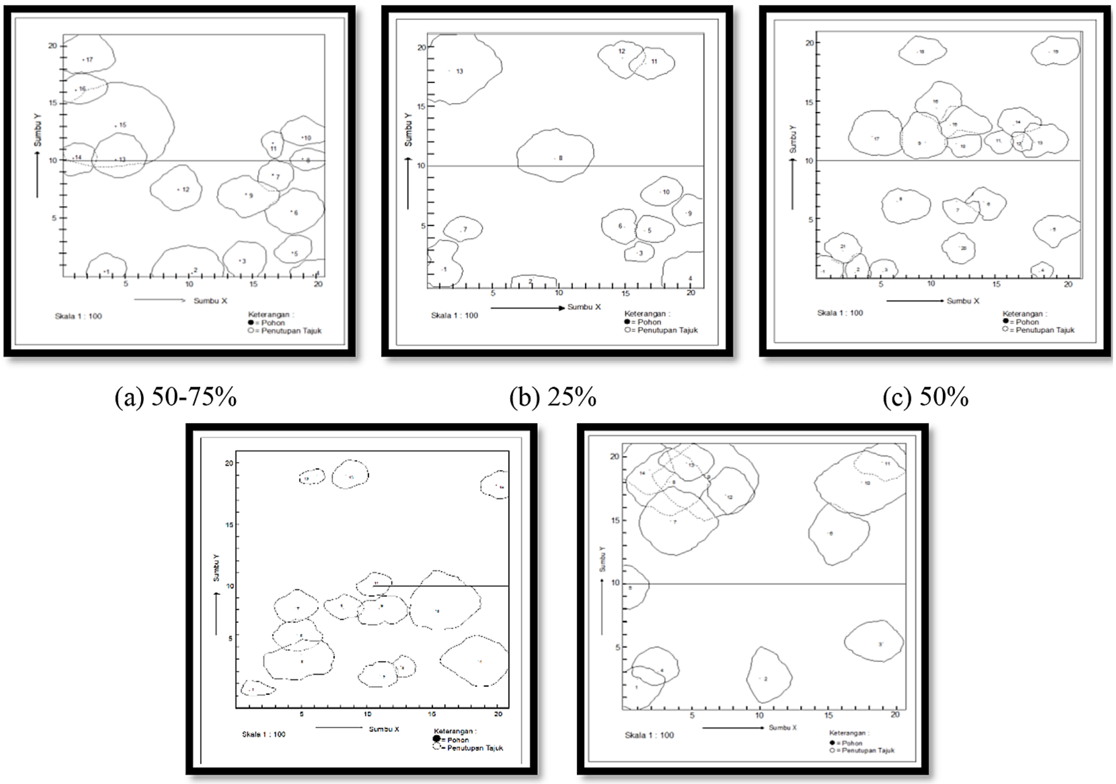
Figure 6. Profile diagram (a) Plot 1, (b) Plot 2, (c) Plot 3, (d) Plot 4, and (e) Plot 5

Vegetation structure and forest canopy cover

Vegetation structure is described using profile diagrams, each of which shows canopy layers. Each observation plot has different heights and canopy layers. Only the pole and tree levels are drawn for the vegetation structure. The seedling and sapling levels are limited to counting their numbers and types. The canopy layer itself consists of three strata – the uppermost canopy strata reaches a height of 20–30 meters, while the second canopy strata has a height of 4–19 meters. The third canopy strata is the forest floor layer, where the plants are less than 4 meters tall. Meanwhile, the vegetation structure on plot 1 is shown in Figure 6, and the canopy cover is shown in Figure 7. The results of the profile diagram (vertical structure) show varying conditions in each plot. All plots have two strata of tree canopy. The uppermost canopy strata reached a height of 20–30 meters, and the second canopy strata had a height of 4–19 meters. There were more plant species in the second layer than in the uppermost canopy layer.

The existence of differences in canopy layers (stratification) and differences in height of the same species may be influenced by a species' tolerance to sunlight. As we know, each plant species is different; some are tolerant to light, while others are intolerant to light. This is in line with Indriyanto's (2010) explanation, which states that tree species that are tolerant to light and have the opportunity to grow in full sunlight will grow quickly and reach the top of the canopy, but trees that are intolerant to light and are shaded by other trees will have their growth inhibited and are unlikely to survive in dense forests. Conversely, light-tolerant trees will grow well if shaded by taller trees; in fact, light-tolerant trees need to be adjacent to other trees as shade providers for optimal growth. Thus, this tolerance automatically creates canopy layers in the forest. Ewusie (1986) explains that each plant is able to naturally regulate its relationship with other plants, resulting in harmonious coexistence and forming a structure in the stratification of the natural forest canopy.

The results of canopy projection mapping (horizontal structure) show varying canopy closure conditions in each plot. In Plot 1 Figure (a) no. 15 Mangifera indica, Plot 4 Figure (d) Nephelium lappaceum, and the rest are Pinus merkusii. The largest canopy cover plot with a range of 50–75% is in plot 1, and the lowest canopy cover with a range of 25% is in plot 2. The extent of



(a) 50-75% (b) 25% (c) 50%

(d) 25-50% (e) 25-50%

Figure 7. Projected canopy and canopy cover

canopy cover in all observation plots made at the Camp Moncong Sipolong Ramah tourist site is influenced by competition between species. This competition affects both the canopy cover and the height of each tree. According to Whitmore (1975), the density of canopy cover and the height of trees occupying the top layer of a forest stand create space in the lower canopy, which is then filled by certain species, resulting in multiple canopy layers. This causes the overall canopy cover to become denser due to the overlapping process.

Fauna

The following is a map of the fauna research route showing two routes in Figure 8.

Fauna diversity

The diversity of fauna species at Moncong Sipolong Ramah Camp can be seen in Table 6. Trail 1 is 700 meters long and trail 2 is 300 meters long. The number of fauna species found at Moncong Sipolong Ramah Camp on trail 1 is 7 species with a total of 27 individuals, and on trail 2 there are 6 species with a total of 66 individuals. Butterflies, dragonflies, sparrows, church birds, and crows are species that appear in both land cover types, while monkeys only appear on trail one and green insects only appear on trail 2. Based on Table 4, there are 8 species of fauna, including endemic animals such as *Macaca maura* (monkeys). According to CITES, *Macaca maura* (monkeys) are listed in Appendix 2. They are also protected under Ministerial Regulation No. 106 of 2018. The difference in the number of species and individuals is due to the forest area that serves as their habitat. In addition, the existence of plantations owned by the community around the Camp Moncong SIpolong Ramah tourist area is one of the factors causing the difference in the number of species and total individuals. This is in accordance with Himakova's (2013) statement that human intervention in the habitat can also cause changes in species distribution.

Density and frequency

Fauna density was obtained from the number of individuals of each species in each sample area at each observation time. Meanwhile, fauna frequency was calculated based on the number of sub-paths of mammal species encounters at for each land cover at each observation time. The number of individuals is calculated based on the highest number of individuals among the repetitions at the observation time in the transect line. The results of the calculation of fauna density and frequency on Line 1 at Moncong Sipolong Ramah Tourism Camp can be seen in Table 3 and Line 2 at Moncong Sipolong Ramah Tourism Camp in Table 5.

Based on the Table 5, the highest density value was found in the Butterfly (*Lepidoptera*) species during the morning observation, while the lowest density value was found in the *species* Monkey

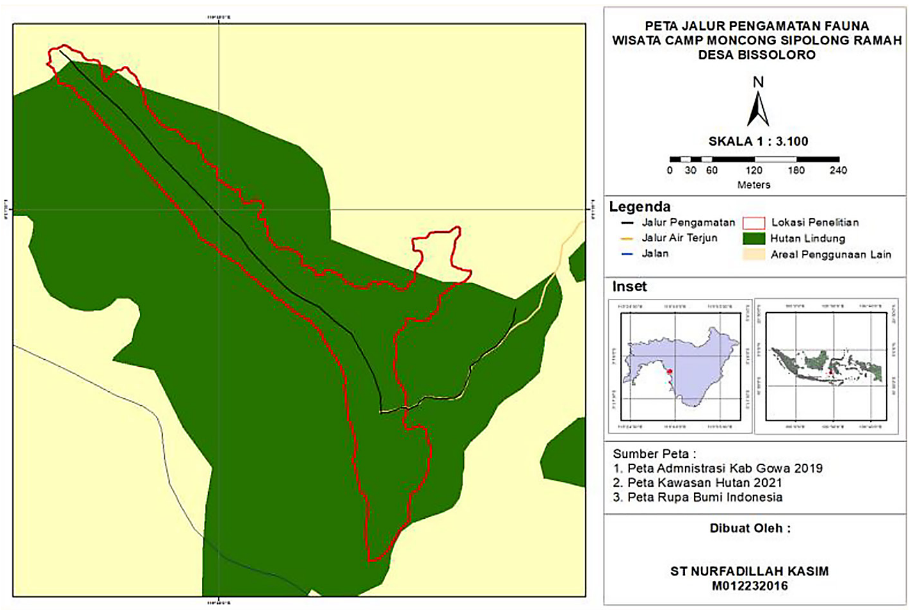


Figure 8. Map of fauna research routes

Table 4. Fauna species diversity in the at Wisata Camp Moncong Sipolong Ramah

No	Local name	Latin name	Number of individuals	
			Path 1	Path 2
1	Butterflies	*Lepidoptera*	11	22
2	Dragonfly	*Anisoptera*	3	8
3	Bulbul	*Pycnonotus aurigaster*	4	7
4	White-rumped shama	*Passeridae*	2	16
5	Raven	*Corvus*	2	0
6	Dare monkey	*Macaca maura*	4	0
7	Green grasshopper	*Atractomorpha crenulata*	0	1
8	Small lizard	*Bengal monitor*	1	1
Total			27	55

(*Macaca maura)*, Lizard (*Varanus bengalensis*), and Crow (*Corvus)* during the morning observation. Based on the table above, it is the same as Trail 2, where the highest density value was found in the Butterfly (*Lepidoptera*) species during the morning observation, while the lowest density value was found in the Green Grasshopper (*Atractomorpha crenulate*) and Lizard (*Varanus bengalensis*) species during the morning observation. Differences in the number of individuals, subpaths encountered by species, and sample observation area affected the density and frequency of all species on each path. The highest population density was found on path 2 in the morning observation. The density and frequency of animals in pine forests are greatly influenced by the structure and condition of the available habitat. This shows that pine forests provide a good habitat for various animal activities. Animal density is also influenced by factors such as climate, animal adaptability, interactions between individuals and species, and changing vegetation conditions, which can affect the composition of communities and the habits of animals in pine forests.

Ecological index

This study used three types of ecological indices, namely the Shannon-Wiener species diversity index to show the species diversity value in the observation area, the Margalef species richness index to show the species richness of each species in a community encountered, and the Ludwig-Reynold species evenness index to determine the evenness of each species in each community encountered. The ecological index values for each land cover can be seen in Table 7. Based on the above ecological index results, the results of the species diversity index (H') analysis for both paths are in the moderate category ($1 \leq E \leq 2$), while the results of the species richness index (Dmg) analysis are in the low category (Dmg = 0.47 and 0.74, $R < 3.5$), and the results of the species evenness index (E) analysis on route 1 are in the high category ($E = 0.87$, $R > 0.6$), while on route 2 they are in the moderate category ($E = 0.46$, $R = 0.3 – 0.6$). Based on the results of the analysis, the diversity index values for the two trails at Camp Moncong Sipolong Ramah were

Table 6. Fauna density and frequency on Trail 2 at Moncong Sipolong Ramah camp tourism. D – density; DR – relative density; F = frequency; FR = relative frequency, P = morning, S = afternoon)

No	Scientific name	Local name	D		DR (%)		F		FR (%)	
			P	S	P	S	P	S	P	S
1	*Lepidoptera*	Butterflies	38.60	22.74	42.31	37.93	1	1	16.67	25
2	*Atractomorpha crenulata*	Green grasshopper	3.51	0.00	3.85	0	1	0	16.67	0
3	*Anisoptera*	Dragonfly	21.05	4.13	23.08	6.90	1	1	16.67	25
4	*Passeridae*	Church bird	14.04	24.81	15.38	41.38	1	1	16.67	25
5	*Yellow-browed Bulbul*	White-cheeked Bulbul	10.53	8.27	11.54	13.79	1	1	16.67	25
6	*Bengal monitor lizard*	Lizard	3.51	0.00	3.85	0	1	0	16.67	0
Total			91.23	59.95	100	100	6	4	100	100

Table 7. Ecological indices at the Moncong Sipolong Ramah Tourism Site ( )

No.	Path	Species diversity (H')	Species Richness (Dmg)	Species Evenness (E)
1	Path 1	2	0.47	0.87
2	Route 2	1	0.74	0.46

as follows. The species diversity index value for Trail 1 was 2, which falls into the category of moderate species diversity, with a moderate distribution of individuals per species and moderate community stability. Meanwhile, the diversity index value on Trail 2 is 1, so the diversity index value is classified as low (H'<1). Ludwig and Reynold (1988) in Mustari et al. (2020) concluded that a low species diversity value means that the distribution of each species and community stability are also low.

In addition to the species diversity index value, the evenness value of the two trails at Camp Moncong Sipolong Ramah is 0.47 on trail 1 and 0.74 on trail 2. When categorized, the evenness index value of trail 1 is classified as moderate species evenness and an unstable community. Meanwhile, trail 2 is classified as high species evenness and a stable/balanced community. Both species evenness values for trail 1 and trail 2 are close to one, meaning that the distribution of individuals of each species is relatively even (Husin, 1988 in Mustari, 2020). Nabila et al, (2022) states that if the evenness value is close to one, then the condition of a community can be said to be good. Therefore, each measured index value is influenced by the number of species and individuals of each species found (Gunawan et al., 2008)

Continuous forest degradation can destroy habitats, leading to population decline and loss of biota species. As is well known, all types of flora and fauna, both small and large, play an important role in the ecosystem, such as soil fertility, plant dispersal agents, and control of undergrowth populations (Zulkarnain, et al., 2018; Sulistyadi, 2012). Therefore, steps are needed to preserve their existence, as concluded by Mustari (2020), namely: 1) inventorying species, populations, and distribution in the area; 2) identifying species and populations that are threatened with population decline; 3) identifying the causes of population decline; 4) analyzing problems and population and area management plans; and 5) improving mammal conservation education programs for the community. Sutoyo, (2010) adds that efforts to overcome threats and damage to biodiversity require science and technology, as well as policies or legal instruments in their management system.

The diversity of wildlife in a nature tourism site will attract visitors and can be an attraction in itself. Camp Mocong Sipolong tourism is classified as low in terms of wildlife due to several factors, such as the environment, because easy access to the site causes the animals to feel disturbed or uncomfortable. This can be overcome if the management pays attention to how the animals can settle in the site in the future.

CONCLUSIONS

Based on the results of research at Moncong Sipolong Ramah tourism camp, 79 individuals of three types of fauna were found spread across five research plots. There are two levels of trees and one type of pole plant as the main components of the flora. *Pinus merkusii* showed the highest importance value index of 279.91%, dominating the diversity of the flora in this area and becoming the main attraction of tourism. The horizontal structure of this area shows the existence of two strata, with the highest stratum at a height of 4–19 meters and the largest canopy cover ranging from 50–75%, which shows the characteristics of a pine forest that is still relatively natural even though the composition of species is limited and shows low diversity and evenness of species.

In terms of fauna, eight species were found, including *Macaca maura* (monkey), which is classified as an endemic species, thus requiring intensive attention in terms of conservation management. The diversity index on trail 1 shows a moderate category with a value of 2, while trail 2 is in the moderate to low category with a value of 1, indicating that species diversity still needs to be improved through better habitat management and conservation. The diversity of flora and fauna in the area confirms its great potential as an ecotourism destination, particularly due to its distinctive pine forests and rare fauna species. The vegetation structure and fauna diversity, which have never been comprehensively documented, open up opportunities for the development of sustainable tourism based on scientific data. Furthermore, it provides a basis for conservation management and tourism destination development that supports environmental preservation and local community empowerment. Thus, this study not only confirms the area's potential as an educational and conservation tourism destination but also paves the way for further research into biodiversity management and integrated sustainable tourism models.

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