Inventory and utilization of understory plants in the Bohulo camp tourist area

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Abstract. The inventory of understorey plants in the Bohulo Camp and Eat Tourist Area was conducted to determine species composition, diversity, and potential utilization in supporting ecosystem conservation. Field observations showed there were 8 species with a total of 50 individuals, consisting of herbs, shrubs, and small trees/bushes. The Shannon-Wiener diversity index value was categorized as moderate, indicating that the understorey strata have important ecological contributions to maintaining the dynamics of the secondary forest ecosystem. The species found, such as *Bambusa sp., Macaranga sp., Trema orientalis, and Cymbopogon sp*., play a role in maintaining soil moisture, water conservation, and supporting natural vegetation regeneration. In addition to their ecological functions, some understorey plant species also have potential value as medicinal, aromatic, and aesthetic plants that support the development of sustainable ecotourism. This inventory provides an important basis for environmentally friendly management of the tourist area, as well as serving as a reference for biodiversity preservation strategies at Bohulo Camp.

1 Introduction

Plants are an essential part of the ecosystem that is very important for the life of humans and other creatures. Besides providing oxygen and maintaining environmental balance, plants also have high economic, social, and cultural value. Indonesia, as a country rich in biodiversity, has a vast number of plants, estimated to be more than 30,000 species, most of which have not yet been recorded and optimally utilized

Plants have an important role in human life, including as a source of food, medicine, economic support, decoration, and education. Indonesia is a megabiodiversity country that possesses complex biogeography, geology, climate, and ecology. As a result, Indonesia has a diversity of endemic and ecological plants [1]. One historical evidence of plant utilization is the Madhawapura inscription from the Majapahit Kingdom, which describes the profession of a traditional herbal medicine (jamu) blender. Furthermore, it is also found in the old manuscript 'Husodo,' written on palm leaves, as well as several relics on temple reliefs in Java that tell about the use of plants as traditional medicine. Documenting local scientific

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knowledge about plant utilization will provide social benefits for life. This activity, which involves inventorying plant utilization derived from community knowledge, also has benefits in the development of environmental education, or what is better known as ecopedagogy, specifically ecopedagogy based on local wisdom [2].

Plant inventory is an activity aimed at classifying a type of plant found in a certain area. This activity is carried out to provide information that serves as a reference for the species of this family present in that area, with the goal of knowing the distribution of this family's species and identifying them [3].

The process of plant inventory aims to determine the identity of previously unknown plants. Inventory can be carried out through several stages, namely describing the plant and using a list of possibilities. The plant to be identified must have all its morphological parts described, including the roots, stems, leaves, flowers, fruits, and seeds. According to its definition, plant morphology not only describes the shape and structure of the body but also serves to determine the function of each part in the life of the plant [4].

2 Research methods

2.1 Location and time of research

The research was conducted in the Bohulo Camp and Eat Tourist Area, Dulamayo Village, Telaga District, Gorontalo Regency, Gorontalo Province. Data collection was carried out on Sunday, November 16, 2025, according to the schedule for the Biodiversity Field Work Practice (PKL) activity.

2.2 Research design

This study focuses on the inventory and utilization of understory plants in the Bohulo Camp and Eat Tourist Area through field observations using a descriptive-ecological approach. The inventory was conducted to identify and record in detail the types of understory plants such as Alpinia zerumbet, Alocasia macrorrhizos (sente), Codiaeum variegatum (puring), Trema orientalis (mengkirai), Bambusa sp. (ampel bamboo), Cymbopogon sp. (lemongrass), Macaranga sp. (mata puti), and Gnetum cf. cuspidatum (bohu). The inventory data was used to understand the existence, number, and distribution of species that play an important role in maintaining ecosystem stability. In addition, the identification results were also used to examine the ecological and functional potential of each species, such as its role in providing shade, preventing erosion, enriching biodiversity, and its aesthetic and educational potential for the development of nature tourism areas. Through this approach, the study provides a comprehensive overview that not only assesses the condition of the understory vegetation but also explores its potential use in supporting the sustainability of ecotourism in the Bohulo Camp Tourism Area.

The utilization of understorey plants in the Bohulo Camp Tourist Area has a strategic role in supporting the development of a conservation and sustainable ecotourism-based area because understorey vegetation not only functions to maintain ecological stability but also has direct and indirect benefits for tourism activities. Plants such as Cymbopogon sp. (lemongrass) and Alpinia zerumbet have the potential to be utilized as medicinal and aromatic plants that can be developed into environmental education products or local processed goods with economic value. Aesthetic species like Codiaeum variegatum (croton) are capable of beautifying the tourist area without disrupting the ecosystem balance, while Bambusa sp. and Macaranga sp. play an important role in soil and water conservation in

sloping areas. Other species like Trema orientalis and Gnetum cf. cuspidatum also have ecological functions in maintaining vegetation dynamics and supporting natural regeneration processes. The main focus of this utilization is to optimize the ecological function of all understorey plants without damaging the regeneration process, and to make them part of visitor education regarding the importance of biodiversity. Thus, the utilization of understorey plants not only provides added value for tourism development but also strengthens conservation awareness and ecosystem sustainability in the Bohulo Camp area.

2.3 Data collection

Data collection was carried out by regularly observing and recording in the field using GPS to find the position of each location, cameras to take pictures of plants, and writing instruments to record the number of each type of plant and its name. The collected data was then analyzed using ecological methods such as the Shannon-Wiener Diversity Index (H') to draw conclusions about the stability of the ecosystem and its potential uses. The focus of observation was on understory plants growing under the canopy, such as grasses, shrubs, small trees, and tree seedlings, where the number of individuals for each species was recorded in an inventory table, for example, *Bambusa sp.* there were 18 individuals, *Macaranga sp.* 9 individuals, *Codiaeum variegatum* 7 individuals, *Trema orientalis* 5 individuals, *Cymbopogon sp.* 4 individuals, and other species such as *Alpinia zerumbet, Alocasia macrorrhizos,* and *Gnetum cf. cuspidatum*. This data collection method provides a better understanding of the distribution, dominance, and ecological function of each plant species growing on the forest floor, making it possible to assess their contribution to maintaining soil moisture, assisting the natural regeneration process, and supporting the sustainability of the secondary forest ecosystem in the Bohulo Camp and Eat Tourist Area.

3 Results and discussion

The inventory of understory plants in the Bohulo Camp and Eat Tourism Area provides important information about how the understory is formed, which is very important for maintaining the balance of the secondary forest ecosystem. From the data collected in the field, eight plant species with a total of fifty individuals were found. These species include herbs, small trees, shrubs, and other types of understory plants such as *Alpinia zerumbet, Alocasia macrorrhizos, Codiaeum variegatum, Trema orientalis, Bambusa sp., Cymbopogon sp., Macaranga sp., and Gnetum cf. cuspidatum*. The condition of the understory structure indicates that the Bohulo area still has a fairly active forest in supporting plant regrowth, although not as tall as the large trees above.

Table 1. Calculation of Total Individuals.

No	Local Name	Class/Family	Species	Number of Individuals
Lower level				
1	Alpinia zerumbet	Zingiberaceae	*Alpinia zerumbet*	*3*
2	Sente	Araceae	*Alocasia macrorrhizos*	*2*
3	Puring	Euphorbiaceae	*Codiaeum variegatum*	*7*
4	Mengkirai	Cannabaceae	*Trema orientalis*	*5*
5	Bambo ampel	Poaceae	*Bambusa sp.*	*18*
6	Serai	Poaceae	*Cymbopogon sp.*	*4*
7	Mata puti	Euphorbiaceae	*Macaranga sp.*	*9*

8	Bohu	Gnetaceae	*Gnetum cf. cuspidatum*	*2*
amount				*50*

Table 2. Diversity, evenness, and species richness indices in plant stands at the research location.

No.		Number of Species	Diversity index	Equity index	Species richness index
1.	Lower Level	50	1,8103	0,8706	1,7894

Ecologically, understory plants help keep the soil moist, prevent soil erosion, provide shade for plant seedlings, and serve as habitats for insects, small birds, and other animals that live on the ground. The presence of species such as Macaranga sp. and Trema orientalis indicates that this area is semi-open, where both types of plants are commonly found in secondary forests that have been subjected to minor disturbances. On the other hand, the presence of Bambusa sp., which is most commonly found in the lower forest, indicates that there are fairly large open areas, providing opportunities for bamboo to grow well. This pattern also shows that a lot of light can penetrate the forest floor, which has an impact on the types of plants that grow there.

In terms of biodiversity value, the understory has an H' = 1.8103, which is considered moderate. This indicates that although the diversity in the understory is not as high as in the tree layer, the variety of plant species in this layer is still important for the sustainability of the ecosystem. The evenness index (E = 0.8706) shows that plant species are fairly evenly distributed, meaning that no single species dominates, thus keeping the community stable. However, the low species richness index (R1 = 1.7894) indicates that the number of plant species in this layer is still low, possibly due to the influence of canopy thickness, tourism activities, and competition for light.

In terms of utilization, several types of understory plants in the Bohulo area have environmental, economic, and cultural benefits. Cymbopogon sp. (lemongrass) can be developed as a source of fragrance and medicine. Alpinia zerumbet is known to contain active ingredients that can be used for health purposes. Codiaeum variegatum (croton) is also visually appealing, making it a good ornamental plant that supports an environmentally conscious tourism image. On the other hand, Bambusa sp. has many benefits, ranging from craft materials and building supplies to soil and water conservation. Planned utilization of this species can help develop ecology-based tourism (ecotourism) while increasing the income of local communities.

Several understory plants can also be very useful if managed properly. Alocasia macrorrhizos can be used as an ornamental plant and at the same time help maintain soil moisture. Trema orientalis helps improve soil and supports land restoration processes. Macaranga sp. as a pioneer plant can cover open land and provide natural shade. Gnetum cf. cuspidatum is useful as food, traditional medicine, and helps other plants grow. The presence of these plants shows that low-growing plants are not only economically valuable and beautiful, but also important for the ecosystem in the Bohulo area.

However, the use of plants that grow under large trees must be done very carefully so as not to interfere with the natural growth process. If we cut down or take too much of a certain type of plant, this can reduce the forest floor's ability to regrow, especially for plants that provide shade for tree seedlings or are very important in the food cycle. Therefore, plans to protect the environment must focus on preserving the forest floor, creating tourist trails that do not damage plants, and educating visitors to reduce disturbance to shrubs and grasses.

In general, the recording of understory plant species in the Bohulo Camp and Eat Tourism Area shows that these plants are very important for the environment and can be put

to good use if managed wisely. With proper planning, these plants can be an indicator of environmental health and also support the advancement of nature tourism that pays attention to conservation. Combining economic use and conservation efforts is very important to protect biodiversity in Bohulo while increasing social and economic benefits for the surrounding community.

4 Conclusion

An inventory of plants in the Bohulo Camp and Eat tourist area shows that understory plants are very important for maintaining ecosystem balance, even though species diversity is moderate. There are a total of fifty individuals from eight species, where understory plants act as ground cover, aid natural growth, and provide shelter for various small creatures. The presence of species such as *Bambusa sp., Macaranga sp., and Cymbopogon sp.* indicates the characteristics of a healthy secondary forest, and this also provides opportunities for environmentally friendly and economic utilization if managed properly. However, the low number of species indicates that this layer is more susceptible to environmental disturbances, so careful management is needed to ensure plant growth and ecosystem balance are maintained in the future.

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