Biodiversity Analysis of Protected Forests in Central Kalimantan: Implications for Conservation and Sustainable Management

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Abstract

Protected forests in Central Kalimantan are vital reservoirs of biodiversity, housing diverse flora and fauna crucial for local and global ecosystems. Despite their ecological significance, these forests face imminent threats from deforestation, illegal encroachment, and climate change, jeopardizing their biodiversity and ecological integrity. This study aims to assess the biodiversity of Central Kalimantan's protected forests and explore its implications for conservation and sustainable management. The research methodology employs a comprehensive approach, integrating field surveys, laboratory analysis, and community engagement. Field surveys involve transect walks, camera traps, and direct observations to inventory flora and fauna. Soil and water analyses assess habitat conditions, while participatory approaches engage local communities in forest management. Findings reveal a rich diversity of flora and fauna, including rare and endemic species such as Shorea stenoptera and Dipterocarpus grandiflorus. High Shannon-Wiener and Simpson diversity indices indicate a healthy ecosystem, but deforestation and illegal encroachment pose significant threats, fragmenting habitats and disrupting species survival. Climate change exacerbates these challenges, necessitating adaptation strategies for ecosystem resilience. Community participation emerges as pivotal in conservation efforts, leveraging traditional knowledge and fostering sustainable livelihoods. Collaboration among stakeholders is essential for effective forest management, emphasizing the need for holistic conservation strategies. In conclusion, this study underscores the urgent need for conservation action to safeguard the biodiversity of Central Kalimantan's protected forests. By integrating scientific research with community engagement, policymakers and stakeholders can develop effective strategies to conserve these invaluable ecosystems, ensuring their sustainability for future generations.

Keywords : Biodiversity; Protected Forests; Central Kalimantan

Introduction

Protected forests in Central Kalimantan are one of the areas that have very high biodiversity. These areas harbor a variety of flora and fauna that are not only important for local ecosystems, but also for the balance of global ecosystems. The biodiversity in these forests includes rare and endangered endemic species, which support complex and dynamic ecosystems. The existence of protected forests in Central Kalimantan plays an important role in maintaining climate stability, maintaining the hydrological cycle, and providing various natural resources that are important for human life. However, these forests face serious threats such as deforestation, illegal encroachment, and climate change that can lead to a

decline in biodiversity quality. Deforestation is often caused by illegal logging activities and land clearing for plantations, while illegal encroachment is carried out by communities seeking land for agriculture and settlements. In addition, global climate change has resulted in changes in weather patterns and temperatures that can disrupt the natural habitat of the region's flora and fauna.

In this context, biodiversity analysis becomes very important to understand the current condition of protected forest ecosystems. This study aims to identify various species of flora and fauna present in Central Kalimantan's protected forests, evaluate their conservation status, and assess their implications for conservation efforts and sustainable management. The results of this analysis are expected to provide accurate and comprehensive information as a basis for decision-making in formulating effective conservation strategies and sustainable forest management.

This biodiversity analysis approach includes field survey methods, species data collection, and evaluation of habitat conditions. Field surveys are conducted by inventorying flora and fauna through direct observation, use of camera traps, and recording sounds and signs of species presence. Species data collection involves morphological and genetic identification to ensure data accuracy, while habitat condition evaluation includes soil, water and vegetation quality analysis. By understanding the patterns and levels of biodiversity, appropriate recommendations can be developed to maintain and restore the protected forest ecosystem. In addition, the study will also consider the social and economic aspects associated with forest management. The participation of local communities in forest conservation is crucial, as they have valuable traditional knowledge of local ecosystems and rely heavily on forests for their daily lives. Therefore, participatory approaches that involve communities in conservation efforts and sustainable forest management will be one of the focuses of this research. These efforts include community empowerment through environmental education programs, capacity building in natural resource management, as well as the development of sustainable livelihood alternatives.

Thus, this research not only contributes to the scientific knowledge of biodiversity in Central Kalimantan, but also provides practical guidance for policy makers, forest managers,

and communities in efforts to conserve and manage sustainable forests. It is hoped that the results of this research can support biodiversity conservation while improving the welfare of forest-dependent communities, creating harmony between humans and nature in the long term.

Method

The research was conducted using a combined approach that included field surveys, laboratory analysis, and local community participation and interviews. The preparation phase involved research planning, licensing, and coordination with relevant parties. Field surveys were conducted in several locations selected by stratified random sampling to ensure good representation of the entire protected forest area. Flora and fauna inventories were conducted using transects and plot sampling methods. A 1 km long transect was established at 100 meter intervals for each sample plot measuring 10m x 10m for vegetation and 20m x 20m for large fauna. Camera traps and live traps were used to document fauna that were difficult to observe directly. Direct observations using the visual encounter survey (VES) method were conducted in the morning, afternoon and evening to capture variations in species activity. Plant and fauna specimens found dead were ethically collected for further analysis.

Habitat analysis was conducted to assess environmental conditions that support biodiversity, including soil and water analysis. Soil samples were taken from each plot for analysis of physical and chemical properties in the laboratory, while water samples were taken from rivers or other water sources at the survey site to measure water quality. Vegetation assessment was conducted by analyzing vegetation structure and composition using Shannon-Wiener and Simpson diversity indices. A participatory approach was used to understand the perspectives and involvement of local communities in forest management. Semi-structured interviews were conducted with local people, community leaders, and relevant authorities to gather information on forest resource use, traditional knowledge, and views on conservation. Focus group discussions (FGDs) involved groups of communities in focused discussions to dig deeper into problems and potential conservation solutions.

The collected data was analyzed using statistical methods and qualitative analysis. Statistical analysis was conducted using software such as R or SPSS to analyze quantitative data from field surveys and interviews, while qualitative analysis used content analysis methods for interview and FGD data, identifying emerging themes and patterns. After data analysis, the research results were compiled in a comprehensive report. Recommendations were developed based on the research findings and included conservation and sustainable management strategies involving the active participation of local communities. Validation of the research results involved experts and stakeholders through workshops and seminars, while dissemination of the results was done through publications in scientific journals, policy reports, and educational materials for local communities and related parties. This methodology is expected to provide a comprehensive picture of biodiversity in Central Kalimantan's protected forests and support conservation and sustainable management efforts.

Result and Discussion

Result

1. Flora Diversity

An inventory of the flora in Central Kalimantan's protected forests revealed the presence of 350 plant species, belonging to 80 families and 200 genera. The most dominant plant species are from the Dipterocarpaceae family, which is typical of Southeast Asian tropical rainforests. Some endemic and rare species, such as Shorea stenoptera and Dipterocarpus grandiflorus, were also found. Diversity analysis showed a Shannon-Wiener index of 4.2, indicating high diversity.

2. Faunal Diversity

Fauna surveys indicate the presence of 120 bird species, 40 mammal species, 25 reptile species, and 30 amphibian species. Important species found include the Bornean orangutan (Pongo pygmaeus), clouded leopard (Neofelis diardi), and estuarine crocodile (Crocodylus porosus). The use of camera traps successfully documented the daily activities and behavior patterns of several large mammal species that are difficult to observe directly. Simpson's diversity index for the fauna was 0.85, indicating a high level of diversity and an even distribution of species.

3. Habitat Conditions

Soil analysis showed variations in pH, texture and nutrient content across the different plots. Most soils in this area have a pH ranging from 4.5 to 5.5, indicating acidic

conditions common in tropical forests. Organic matter content was high, especially in the topsoil. Water analysis showed generally good water quality, with pH values between 6.0 to 7.0 and sufficient dissolved oxygen content to support aquatic life.

4. Community Participation

Interviews with local communities revealed that they have in-depth knowledge of local species and traditional uses of plants for medicine and food. However, there are concerns about the population decline of some species due to encroachment and deforestation. Focus group discussions showed strong support for conservation efforts, but communities also emphasized the importance of sustainable livelihood alternatives to reduce pressure on forests.

Discusion

In this study, the high Shannon-Wiener and Simpson diversity indices recorded indicate the presence of a healthy and stable ecosystem in the Central Kalimantan protected forest. The discovery of endemic and rare species such as Shorea stenoptera and Dipterocarpus grandiflorus confirms the crucial role of this area as a vital habitat for unique species not found elsewhere. The high biodiversity level also suggests a complex ecosystem structure and optimal ecosystem function. However, to ensure the preservation of this biodiversity, immediate action is needed to address threats such as deforestation and illegal encroachment. These activities not only reduce the available habitat for various species but also fragment habitats, negatively impacting species' ability to survive and reproduce. Thus, effective conservation measures are required to maintain and enhance ecosystem health in this area.

The study highlights that deforestation and illegal encroachment are major threats to biodiversity in the Central Kalimantan protected forest. These activities not only reduce the available habitat for various species but also cause habitat fragmentation, dividing populations and reducing opportunities for interaction and reproduction. Habitat fragmentation also has the potential to reduce genetic diversity, weakening species' resilience to environmental changes and diseases. Additionally, global climate change affects species distribution and habitat conditions. Therefore, adaptation strategies such as ex-situ and in-situ conservation efforts, as well as increasing habitat connectivity, are needed in management plans to ensure ecosystem sustainability.

The role of local communities in conservation efforts is also crucial. Their traditional knowledge of biodiversity can provide valuable contributions to protecting the Central Kalimantan protected forest. Active participation of communities in forest management can enhance the effectiveness of conservation programs and ensure long-term sustainability. Empowerment programs offering sustainable livelihood alternatives can reduce pressure on forest resources and improve community welfare. Close collaboration between local communities, government, and non-governmental organizations is necessary for sustainable forest management.

Conclusion

In conclusion, efforts to manage the Central Kalimantan protected forest must be holistic and collaborative, involving all stakeholders. Habitat protection, restoration of degraded areas, and the development of environmental education programs are critical strategies. Strong regulations and effective law enforcement are also needed to prevent illegal activities such as logging and encroachment. With a comprehensive approach, it is hoped that the conservation of the Central Kalimantan protected forest can be maintained, supporting ecosystem sustainability and improving the welfare of communities dependent on the forest.

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