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Ethnoecological Potential of the Pomuan Indigenous Customary Law as a Biology Learning Resource

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Abstract. Schools are strategic settings for integrating local wisdom into scientific learning, particularly through ethnoecology, which links community knowledge and environmental management to biological concepts. This study aims to identify the ethnoecological potential within the Ghimbo Pomuan Indigenous customary law that can be utilized as a resource for biology learning. A descriptive qualitative method with observation, interviews, and documentation using a snowball sampling technique was applied. The results show that *Ghimbo* Pomuan contains strong ethnoecological elements, reflected in biodiversity, indigenous customary law regulations, resource-use practices, and community-based conservation activities, such as kelulut honey cultivation (*Trigona sp.*). These findings indicate that the forest holds substantial potential for contextual biology learning aligned with SDGs 4, 11, and 15 through place-based education, environmental ethics, and conservation-oriented learning activities. Although the forest has been used by university researchers, its application in school-level learning remains limited. This study highlights the need to develop structured teaching materials based on local wisdom to support the integration of ethnoecology into biology education.

1 Introduction

Education in Indonesia must be carried out in accordance with a predetermined curriculum to achieve educational goals. In accordance with the Regulation of the Minister of Education, Culture, Research and Technology Number 12 of 2024, the curriculum is a set of plans and arrangements for objectives, content, learning materials, and methods, serving as guidelines for organizing learning activities to achieve specific educational goals. The implementation of the independent curriculum changes the approach to learning in schools, directing it to be guided by scientific principles as mandated in Permendikbud No. 65 of 2013. This curriculum aims to use a science-based learning process to holistically achieve the expected competencies, involving not only learning tools but also student characteristics and local wisdom. Local knowledge, including conservation values such as environmental awareness,

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creativity, and humanism, can be used as a source of science learning to foster students' conservation character [1, 2]

On the other hand, the concept of ethnoecology, which examines the interactions between humans and the environment within the context of local traditions and wisdom, is increasingly relevant in education. Ethnoecology supports local wisdom-based learning, which aligns with the objectives of Curriculum 2013 to improve students' understanding of the environment through a more contextualized approach. Ethnoecology integrates aspects of anthropology, ethnobiology, agroecology, and geography, and focuses on local communities' knowledge for managing natural resources sustainably [3]. In this context, the *Ghimbo* Pomuan indigenous customary law, managed by indigenous communities with local wisdom, offers significant potential as a resource for biology learning. Ethnoecological learning reinforces meaningful learning and encourages students' positive attitude to solve problems wisely [4].

The management of this indigenous customary law creates ample opportunities for local communities and educational institutions to develop holistic conservation education and foster environmental care, supporting the realization of Sustainable Development Goals (SDGs) 4 (Quality Education), 11 (Sustainable Cities and Communities), and 15 (Life on Land). However, its potential as a source of biology learning remains under-researched. *Ghimbo* Pomuan indigenous customary law has been legally recognized as an indigenous customary law area, where indigenous communities have the right to manage and protect this forest [4]. The management of this indigenous customary law provides ample opportunities for local communities and educational institutions, especially in fostering an understanding of biodiversity and local wisdom-based conservation techniques. However, the potential of these indigenous customary laws as a source of biology learning remains under-researched.

Research on ethnoecology-based learning has shown that integrating local wisdom into education can improve students' understanding and appreciation of the environment and strengthen the link between science and local culture [5, 6]. Indigenous customary laws, as local ecological resources, have been recognized as green laboratories that support experiential learning, enabling students to learn directly from their surroundings. However, studies that specifically utilize the *Ghimbo* Pomuan indigenous customary law as a biology learning resource at the local level are still very limited.

Although there have been many studies on ethnoecology and local wisdom-based learning, research that specifically identifies ethnoecology in the *Ghimbo* Pomuan indigenous customary law and how it can be used as a biology learning resource is still rare. This research makes a new contribution by exploring the potential of the *Ghimb*o Pomuan indigenous customary law to enrich biology learning materials with local wisdom values embedded in indigenous peoples' forest management practices. The approach used also focuses on how this local wisdom can be integrated directly into the learning curriculum.

This research is important for enriching biology teaching materials with relevant local contexts, thereby increasing students' understanding and concern for the natural environment. In addition, this research also supports the utilization of the *Ghimbo* Pomuan indigenous customary law as a form of education-based conservation, where students learn to appreciate and preserve the environment directly from the source [7].

This research is crucial for enriching biology teaching materials with relevant local contexts, increasing students' understanding and concern for the natural environment, and supporting education-based conservation. Students will learn to appreciate and preserve the environment directly at the source, in line with the targets of SDG 4 (Quality Education), SDG 11 (Sustainable Cities and Communities), and SDG 15 (Life on Land). The main problem this study addresses is how to identify and utilize ethnoecology in the *Ghimbo* Pomuan indigenous customary law as a biology learning resource. This study aims to identify the potential of ethnoecology in the *Ghimbo Pomuan* indigenous customary law and examine its relevance in the context of biology learning. Thus, this research is expected to generate recommendations regarding the use of the *Ghimbo Pomuan* indigenous customary law as a local wisdom-based learning resource aligned with the national curriculum and SDG targets.

2 Methodology

This research uses a qualitative descriptive approach to identify and describe ethnoecology in Pomuan Indigenous customary law as a biology learning resource. The method entails structured data collection and systematic analysis to obtain information relevant to local wisdom-based biology learning.

The research was conducted in Koto Perambahan Village, Kampar District, Kampar Regency, Riau. This location was selected for its presence of the Pomuan indigenous customary law, managed by the indigenous community and with strong ethnoecological values that can be utilized as a learning resource.

Sampling was conducted using purposive sampling combined with a snowball approach, which ensures the gradual recruitment of key respondents, starting with initial informants recommended for their involvement in forest management and ethnoecological knowledge. This technique enhances the validity and representativeness of data by continuously identifying relevant participants who are deeply knowledgeable and connected to the research theme.

The research instruments included interview guidelines to elicit in-depth information on ethnoecological practices, along with documentation tools such as cameras for photographs and video recordings to provide empirical evidence to support observations and interviews.

Data collection involved: (1) Observation: Direct observation of community activities in indigenous customary law management at the research site, (2) Interviews: In-depth interviews with indigenous people and key figures to explore ethnoecological values, (3) Documentation: Photographs and videos supporting the triangulation of data from observations and interviews.

Data analysis followed the qualitative data analysis stages: (1) Data reduction: Selecting and focusing on data relevant to ethnoecology and its educational application while discarding irrelevant information, (2) Data categorization: Organizing reduced data into meaningful categories or themes, (3) Interpretation and presentation: Providing descriptive narratives that holistically represent patterns and relations within the ethnoecological practices of the Pomuan indigenous customary law.

This systematic approach, combined with triangulation of observation, interview, and documentation data, ensures the credibility and trustworthiness of the research findings in accordance with qualitative research standards.

3 Result and Discussion

Research carried out in Jawi-jawi Hamlet, Koto Perambahan Village, Kampar Subdistrict, Kampar Regency, Riau resulted in the following interview data from community members:

3.1 Respondent Profile

Data collection was carried out using qualitative descriptive methods with snowball sampling, yielding data from 7 people. Namely, the demographic conditions of the community in Jawi-jawi Hamlet, Koto Perambahan Village, Kampar District, Kampar Regency. The whole number is male; this was taken purposively because the person we met during the interview was the manager of ghimbo pomuan kelulut honey, and the community leader was represented by Datuk Majo Besar. The category of respondents can be grouped by age, so Table 1 is obtained. The following:

Table 1. Age categories of *Ghimbo* Pomuan respondents

No.	Age Category	Total	Persentace
1.	31-40 year	3	42.85
2.	> 40 year	4	57.15

In addition to analyzing the age profile, this study also identifies the occupational distribution of respondents involved in the management of *Ghimbo* Pomuan. The occupational categories of the respondents are presented in **Table 2**.

Table 2. Occupational categories of Ghimbo Pomuan respondents

No.	Occupation	Total	Percentage
1.	Farmer	3	42.85
2.	Self-employed	4	57.15

To further illustrate the demographic background of the *Ghimbo* Pomuan respondents, their last educational attainment was also recorded. The distribution of the respondents' final education levels is summarized in **Table 3**.

Table 3. Last Education Category of Ghimbo Pomuan Respondents

No.	Last Education	Total Respondent	Percentage
1.	SD	3	42.86
2.	SMP	1	14.28
3.	SMA	3	42.86

Some parts of the results of interviews with village officials, *ninik mamak*, and residents that researchers met in the field, with questions about history, preservation, taboos or prohibited things, and ceremonies that are usually carried out.

3.2 History of Jawi-jawi Village

Based on the questions given to respondents, they explained the history of Jawi-jawi village, which originated from the name of a tree, namely the Jawi-jawi tree, a type of *banyan* tree. There are many Jawi-jawi trees in the hamlet, hence the name Jawi-jawi hamlet. According to respondents, the tree is very easy to grow in the area.

Kampa Sultanate is one of the Malay kingdoms located in central Sumatra, specifically in Kampar Regency, Riau Province. The Kampa Sultanate was founded by Datuk Rajo Nan Sati in the 16th century and served as the center of government for the Kampar Sultanate, established in 1520.

Table 4 presents the names of *Datuks* and their respective ethnic origins in Ghimbo Pomuan. *Datuk* is an honorary title given to key leaders or figures in the traditional community, with each ethnic group represented by distinct individuals. Understanding the distribution of *Datuk* titles and their ethnic affiliations offers valuable insight into the cultural diversity and social structure underlying the management and leadership of the indigenous customary law area [8].

The Sultanate of Kampa is related to the Kingdom of Malacca, Malaysia. The Sultanate is also known as the propagator of Islam in Kampar. The Kampa Sultanate has a palace located in Koto Perambahan Village, Kampa District. The Kampa Sultanate ended in 1939 because the last king had no descendants and the royal family returned to Malaysia. Since then, the Kampa Sultanate palace has been neglected and damaged by time. The palace was only rebuilt in 2018 based on the research and paintings of a Kampar culturalist, A Latif Hasyim Datuk Bagindo.

Table 4. List of *Datuks* and Their Ethnic Origins in *Ghimbo Pomuan*

No.	***Datuk* Name**	**Ethnic Origins**
1.	Datuk Tumenggung	Domo
2.	Datuk Besar	Piliang
3.	Datuk Majo Besar	Pitopang
4.	Datuk Tiawan	Melayu
5.	Datuk Bijo Anso	Domo
6.	DatukSamad Dirajo	Bendang
7.	Datuk Marajo	Kampai
8.	Datuk Paduko Tuan	Kampai

In 1963, people started living in Koto Perambahan Village. The majority of the population came from the old village of Kampung Pasir Amo, which has a tribal-based social structure. Currently, there are 10 tribes in Koto Perambahan Village, with 5 from the old village and 5 from Koto Perambahan Village. These tribes are: Domo, Putopang, Malay, Piliang, Kampai and Bendang (PDKP). Kampa Kenegrian is led by 8 (eight) *Datuks*:

There are three areas included in the protected forest area: Bonca Lida (100 Ha), Ghimbo Pomuan (57 Ha), and Ghimbo Cubodak (controlled by the community), in Ghimbo is managed by the community, while Bonca Lida and Ghimbo Pomuan are under indigenous customary law. The origin of *Ghimbo Pomuan* comes from the word *Pomuan* which means equipment, which is used to build houses.

3.3 Environmental Conservation

Environmental conservation encompasses a series of measures aimed at safeguarding both the carrying capacity and the assimilative capacity of the environment. The carrying capacity of the environment refers to its ability to support human life and other living organisms, ensuring that the ecological balance and the needs of various species are sustained over time. Meanwhile, the assimilative capacity refers to the environment's ability to absorb, process, and neutralize substances, energy, and other components introduced into it without degrading. Integrating these concepts into comprehensive evaluation frameworks, as exemplified by recent multidimensional studies, is essential for advancing sustainable development. Such approaches highlight the need for continuous adjustment of regional ecological, economic, and social factors to secure the enduring viability of resources, maintain systemic resilience, and promote progressive environmental stewardship aligned with the Sustainable Development Goals (SDGs) [9].

Environmental conservation activities carried out based on respondents' information that several prohibitions are not written in customary regulations but are conveyed orally from generation to generation as customary rules. For example, parents instruct their children not to cut down trees or do things that are not good or polite in the indigenous customary law.

This forest can be utilized by the community for timber used to build houses that are used together, of course, with the permission of the *ninik mamak*. Suppose people violate customary rules, for example, taking wood. In that case, they will be given customary sanctions, namely conducting deliberations or basiacuong (exchanging rhymes with the grandfather), and will be fined one goat, valued at IDR 2,500,000.

These rules also apply to manners and etiquette in the Ghimbo, such as not speaking harshly or using foul language, dressing modestly, and not committing immoral acts.

Village officials preserve the forest by creating a forest guardian group, and in late 2020 a Social Forestry Business Group (KUPS) was established with guidance from the World Resources Institute (WRI) NGO. Through this program, a Kelulut Cultivation Group (*Trigona* sp.) was formed in the Ghimbo Pomuan and Bonca Lida indigenous customary law areas as a community-based livelihood initiative that promotes forest conservation.

In addition to institutional approaches, the community also maintains local traditions that strongly support environmental stewardship. The Ghimbo Pomuan area has a pond (dam) that sustains various fish species, including baung (*Hemibagrus nemurus*), kopiek (*Barbonymus schwanenfeldii*), and gadih or hampala (*Hampala macrolepidota*). This pond serves as a communal water reservoir, and harvesting is only conducted once every three years, usually before the month of Ramadan in the Hijri calendar—reflecting a customary practice aimed at maintaining ecological balance.

3.4 Utilization of Plant and Animal Species in the Indigenous customary law

Plants that can be utilized by residents, according to respondents, include forest products such as forest jackfruit or forest cempedak (Artocarpus integer), Durian (Durio sp.), Tampuih (Baccaurea macrocarpa), idan fruit or *redan* (*Nephelium maingayi)*. In addition, there are also earth pegs, rattan seeds. Meanwhile, animals that can be utilized are the fish in the reservoirs within the indigenous customary law area. Harnessing products from forests that don't involve wood, such as fruits or resins, can play an important role in helping communities manage their forests more effectively amid the growing challenges of climate change. These activities don't just help local people earn a living; they also play a part in protecting a wide range of plant and animal species and bolster the overall resilience of forest ecosystems [10].

3.5 Biodiversity

The types of flora found from the respondent in *Ghimbo Pomuan* include dominant plant species such as *meranti (Shorea* sp*.), rengas (Gluta* sp*.)*, *kelat* wood (*Syzygium cerasiforme*), *poniong-poniong (*local knowledge*)*, and nibung palm (*Oncosperma* sp.). These tree species are characteristic of lowland tropical forests in Sumatra and are widely recognized for their ecological roles and conservation value in international forestry literature. These forests support high biodiversity and are recognized globally for their ecological significance, including their designation as World Heritage sites. Dominant tree families such as Dipterocarpaceae, Lauraceae, and Myrtaceae are vital for sustaining ecosystem functions [11].

Faunal diversity is equally notable, with reptiles such as python snakes (Pythonidae) and cobras (*Naja* sp.), and mammals including the Sumatran elephant (*Elephas maximus sumatranus*), Sumatran tiger (*Panthera tigris sumatrae*), tapir (*Tapirus indicus*), *pangolin* (*Manis javanica*), macaques (*Macaca* sp.), *siamangs* (*Symphalangus syndactylus*), and *orangutans* (*Pongo abelii*). The presence of stingless bees (*kelulut*, *Trigona* sp.) is also a significant highlight, as these insects provide economic and ecological value, and their nesting and foraging habits have become subjects of research in Riau and other Indonesian areas in recent years. These species are considered flagship for conservation and have been prioritized in recent biodiversity studies and conservation planning in Sumatra [12, 13].

3.6 Visit from an Educational Institution

Since the issuance of the Minister of Forestry's decree on *ghimbo pomuan*, SK.7504/MENLHK-PSKL/PKTHA/KUM.1/9/2019 was issued on 17 September 2019. This decree recognizes the *Kenegerian Kampa* Customary Law Community and the *Ghimbo Bonca Lida* Indigenous customary law in *Kenegerian Kampa*, *Kampa* Village and *Ghimbo Pomuan* in Koto Perambahan Village, Kampa District, Kampa Regency, Riau Province1. The indigenous customary laws of *Ghimbo Bonca Lida* and *Ghimbo Pomuan* cover 156.8 hectares and include a kelulut honey business group1. This decree is one of the first two decrees recognising indigenous customary law (*hutan adat*) in Riau, which was handed over by President Jokowi on 21 February 2020. The decree aims to provide access and opportunities for indigenous communities to sustainably manage *hutan adat* areas and protect the biodiversity within them.

Research on biodiversity in *Ghimbo pomuan* is still rare. One study conducted is Remina, which analysed vegetation and carbon stocks stored in the *Ghimbo* Bonca Lida Indigenous Protected Forest. This study used the plot method and Kettering's allometric equation (2001) to calculate biomass and aboveground carbon. The study found 76 species and 116 individual plants belonging to 32 families, with the dominant species Syzygium cf filiformis. The total carbon contained in the *Ghimbo* Bonca Lida Customary Protected Forest was 134.53 t/ha [14].

Another study conducted is by Sri Wahyuni in 2017, which examines the diversity of ground surface insects in the *Ghimbo Potai* Kenagarian Rumbio Customary Prohibition Forest. This study used the trap trap method for 72 hours. This study found that ground surface insects in secondary forests comprise 9 orders, 17 families, 29 species, and 1839 individuals, with a diversity index of 2.67.

Based on the number of visits that have been served by the management of *Ghimbo Pomuan*, namely from several universities that have conducted research, such as from Lancang Kuning University, Riau University, Andalas University, Forestry Service, Fisheries Service, World Wide Foundation (WWF), from researchers, while no schools have visited *Ghimbo Pomuan*.

3.7 Implementation in Education

The unique ecological and cultural characteristics identified in *Ghimbo Pomuan* demonstrate the area's significant potential as a valuable learning resource for both formal and informal education. The learning process supports the realization of Sustainable Development Goal 4, which emphasizes inclusive, equitable, and quality education with lifelong learning opportunities for all. Its diverse flora and fauna, alongside embedded indigenous knowledge and environmental management practices, create authentic opportunities for place-based learning that bridge the curriculum with real-world context. This global study found that, at the university and vocational education levels worldwide, the coverage of issues related to services, cultural and social values, and particularly traditional or Indigenous knowledge in forestry education remains very limited, both in curricula and in practice. There is an urgent need for a structured documentation effort concerning traditional knowledge and the legacy of local wisdom in communities. Moreover, ethical protection requires the recognition of rights, benefits, and consent from knowledge-holding communities. Such efforts are believed to ensure the sustainability of intergenerational transmission of local values and secure long-term benefits in future forest management [15]

Teachers can also utilize the surrounding environment as a learning medium for students, even though much of student activity is typically centered in the classroom. Moreover, educators should consistently model environmentally conscious behaviors and actively participate in environmental programs. Through an ethnoecological approach, this consistency can inspire students to enthusiastically follow their teachers in various environmental activities, eventually embedding environmental stewardship into the school's culture(2).

4 Conclusion

The findings of this research indicate that the *Ghimbo Pomuan* indigenous customary law holds substantial potential as a contextual source of biology learning rooted in local wisdom. Ethnoecological values reflected in biodiversity, forest management systems, customary regulations, and community-based conservation practices—such as kelulut honey cultivation and traditional resource harvesting—provide meaningful opportunities for environmentally oriented learning that aligns with SDG 4 (Quality Education), SDG 11 (Sustainable Cities and Communities), and SDG 15 (Life on Land). Although the forest has been utilized by university researchers, its use at the school level remains limited, suggesting that its potential as a learning laboratory has not yet been fully optimized. The integration of ethnoecological knowledge into learning materials is expected to strengthen students' environmental awareness while preserving indigenous ecological practices. Therefore, future research should focus on developing structured learning modules and teaching materials (such as LKPD) that explicitly incorporate local wisdom into the biology curriculum to support place-based and conservation-oriented education.

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