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The potential of the special purpose forest area of Lambung Mangkurat University as a biology learning resource

Potensi kawasan hutan dengan tujuan khusus Universitas Lambung Mangkurat sebagai sumber belajar biologi

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Abstract
Special Purpose Forest Area of Lambung Mangkurat University (KHDTK ULM) is a forest area whose management is handed over by the Ministry of Environment and Forestry to Lambung Mangkurat University for education and training purposes. As an educational institution, ULM should already have data regarding the diversity and richness of living species in the forest area. This diversity and wealth must of course be utilized sustainably. This research aims to analyze the potential of KHDTK ULM and its use as a biology learning resource. The method used in research is literature study. The literature in this case is various publications published in the last five years and can be accessed on Google Scholar as well as the Sinta ranking. Quite a lot of plants and animals have been used as research objects, but many still need to be explored in more depth. Research results should not just be turned into articles to be published in scientific journals, but also developed further into learning materials. Conditions like this also show the potential of forest areas as a source of learning biology, not only to increase knowledge but also to train critical thinking skills.

Keyword: critical thinking; forest area; knowledge; learning sources; potential

Abstrak. *Kawasan Hutan Dengan Tujuan Khusus Universitas Lambung Mangkurat (KHDTK ULM) adalah kawasan hutan yang pengelolaannya diserahkan oleh Kementerian Lingkungan Hidup dan Kehutanan kepada Universitas Lambung Mangkurat untuk tujuan pendidikan dan pelatihan. Sebagai lembaga pendidikan, sudah selayaknya ULM memiliki data terkait dengan keragaman dan kekayaan spesies makhluk hidup di kawasan hutan tersebut. Keragaman dan kekayaan itu harus dimanfaatkan berkelanjutan. Penelitian ini bertujuan untuk menganalisis potensi KHDTK ULM dan pemanfaatannya sebagai sumber belajar biologi. Metode yang digunakan dalam penelitian adalah studi pustaka. Pustaka dalam hal ini adalah berbagai publikasi yang terbit dalam kurun lima tahun terakhir dan dapat diakses pada Google Scholar serta pemeringkatan Sinta. Cukup banyak tumbuhan dan hewan yang telah dijadikan obyek penelitian tetapi banyak yang masih perlu diungkap lebih dalam. Hasil penelitian pun seharusnya tidak sekedar dijadikan artikel untuk dipublikasi pada jurnal ilmiah, tetapi juga dikembangkan lebih jauh menjadi bahan pembelajaran. Kondisi seperti ini sekaligus menunjukkan potensi kawasan hutan sebagai sumber belajar biologi, tidak sekedar untuk meningkatkan pengetahuan tetapi juga untuk melatihkan keterampilan berpikir kritis. Kata kunci: berpikir kritis; kawasan hutan; pengetahuan; potensi; sumber belajar*

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INTRODUCTION

Special Purpose Forest Area (KHDTK) is a forestry term that first appeared in Law Number 41 of 1999 concerning Forestry. The complete terms contained in Article 8 are like this. "(1) The government can designate certain forest areas for special purposes. (2) Determination of forest areas with special purposes, as intended in paragraph (1) is necessary for public interests such as: a. research and development; b. education and training; and c. religion and culture. (3) Forest areas with special purposes as intended in paragraph (10), do not change the main function of forest areas as intended in Article 6."

KHDTK was developed in almost all provinces in Indonesia, including South Kalimantan Province, the narrowest province on Kalimantan Island. Four KHDTKs were formed in this province, namely KHDTK Kintap, KHDTK Rantau, and KHDTK Riam Kiwa which are managed by the Center for the Implementation of Standard Instruments for the Environment and Forestry of Banjarbaru (BPSILHK Banjarbaru, 2024) and KHDTK ULM which is managed by Lambung Mangkurat University (KHDTK ULM, 2024a).

The management of the latter forest area was handed over by the Ministry of Environment and Forestry (KLHK) to ULM based on the Decree of the Minister of Forestry and Environment No. 900/Menlhk/Setjem/PLA.0/2016 dated 6 December 2016 for education and training purposes. An area of 1,617 ha located in two locations, namely the Babaris Mountains (1,543 ha) and Mount Waringin (74 ha) is administratively located in Karang Intan District, Banjar Regency.

KHDTK ULM is a natural laboratory, like KHDTK Unmul in Lempake (Fahutan Unmul, 2024) and KHDTK Mungku Baru in Palangka Raya (Bapedalitbang Palangka Raya City, 2024). Objects in the form of living things grow and develop naturally. This object is a source of knowledge, science and technology. Interventions in this area may be carried out, but they are directed in the form of research conducted by, from, and for the community, including in this case teaching staff, educational staff, and ULM students (Andriyani, 2024); planting plants to overcome critical land and increase biodiversity (Hanafi, 2024b; ULM Public Relations, 2024; Santoso, 2024); as well as the construction of facilities and infrastructure to support the smooth and safe operation of research, education and of course recreation (KHDTK ULM, 2024b). Questions arose. What are the potential details of KHDTK ULM? Has this potential been exploited? How to use it?

This research analyzes the potential of KHDTK ULM and its use as a biology learning resource. The results are evaluation material for the sustainability of forest area management by ULM through the Tridharma of Higher Education activities in relation to biology, especially biology education.

RESEARCH METHODS

The method used in this research is a literature review. Research results related to the potential of ULM KHDTK which have been published in scientific journals in the last 5 years are reviewed according to the themes of biodiversity, phytochemistry, ecology and education as well as their benefits and sustainability. The publication was obtained from the Google Scholar database and the Sinta ranking (Ministry of Education, Culture, Research and Technology). The name of the ministry whose nomenclature applies to the Advanced Indonesia Cabinet (2014-2024). The flow of research activities is presented in Figure 1.

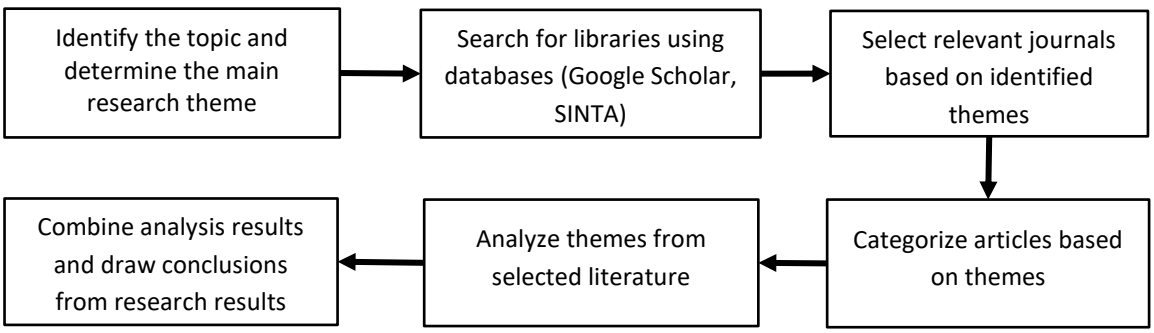

Figure 1 Research procedures

RESULTS AND DISCUSSION

Higher Education as KHDTK Management Institution

Article 34 of Law 41/1999 states that KHDTK management can be given to: a. customary law communities; b. educational institutions; c. research institutes; and d. social and religious institutions. Without intending to rule out giving to other institutions, one of the educational institutions, especially at the tertiary level, that has the opportunity to manage KHDTK is ULM, the oldest university in Kalimantan (Table 1) whose superior field is the wetlands environment.

Table 1 KHDTK managed by universities

No.	Name of KHDTK and its management	Decree on the determination, location and area of KHDTK
1	HPP Universitas Syah Kuala	SK.1267/MENLHK/SETJEN/HPL.1/12/2022, 21 Desember 2022; Aceh, 500,00 ha
2	HPP Universitas Lancang Kuning	SK.279/MENLHK/SETJEN/PLA.0/4/2019, 10 April 2019; Riau, 103,00 ha
3	HP Universitas Bengkulu	SK.9060/MENLHK-PKTL/KUH/PLA.2/10/2019; 24 Oktober 2019; Bengkulu, 217,20 ha
4	HPP Universitas Muhammadiyah Bengkulu	SK.425/Menlhk/Setjen/PLA.0/6/2016, 07 Juni 2016; Bengkulu, 2.000,00 ha
5	HPP Kehutanan dan Gunung Walat; Fakultas Kehutanan IPB	SK.188/Menhut-II/2005, 08 Juli 2005; Jawa Barat, 359,00 ha
6	HP Gunung Geulis; Institut Teknologi Bandung	SK 633/Menlhk/ Setjen/PLA.0/11/2017, 10 November 2017; Jawa Barat, 338,31 ha
7	HPP (Universitas Gadjah Mada) Blora-Ngawi	SK.373/Menlhk-PKTL/Kuh/Pla.2/1/2021, 27 Januari 2021; Jawa Tengah, 10.867,19 ha
8	PP Kehutanan Universitas Jenderal Sudirman	SK.125/MENLHK/SETJEN/PLA.0/2/2023, 13 Februari 2023; Jawa Tengah, 100 ha
9	HPP Universitas Sebelas Maret	SK.177/Menlhk/Setjen/PLA.0/4/2018, 09 April 2018; Jawa Tengah, 122,78 ha
10	HPP Wanagama I; Universitas Gadjah Mada	SK.493/Menlhk-Setjen/2015, 10 Oktober 2015; Yogyakarta, 622,25 ha
11	HPP Karang Ploso Universitas Brawijaya	SK.676/Menlhk-Setjen/2015, 31 Desember 2015; Jawa Timur, 514,00 ha
12	HPP Kehutanan Universitas Muhammadiyah Malang	SK.157/MENLHK/SETJEN/PLA.0/2/2019, 20 Februari 2019; Jawa Timur, 75 ha
13	HPP Universitas Teknologi Sumbawa	SK.89/MENLHK/SETJEN/PLA.0/2/2018, 13 Februari 2018; Nusa Tenggara Barat, 510,00 ha
14	HP Universitas Mataram	SK.392/Menhut-II/2004, 18 Oktober 2004; Nusa Tenggara Barat, 225,70 ha
15	HPP Universitas Muhammadiyah Mataram	SK.405/Menlhk/Setjen/PLA.0/6/2016, 02 Juni 2016; Nusa Tenggara Barat, 90,00 ha
16	HPP Universitas Tanjungpura	SK.656/Menlhk/Setjen/PLA.0/8/2016, 26 Agustus 2016; Kalimantan Barat, 19.622,00 ha.
17	HP Universitas Muhammadiyah Palangka Raya	SK.611/Menhut-II/2014, 08 Juli 2014; Kalimantan Tengah, 4.910,00 ha.
18	HP Hampangen Universitas Palangka Raya	SK.311/Kpts-II/1993, 17 Juni 1993; Kalimantan Tengah, 5.000,00 ha
19	HPP Universitas Lambung Mangkurat	SK.900/Menlhk/Setjen/PLA.0/12/2016, 06 Desember 2016; Kalimantan Selatan, 1.617,00 ha.
20	HPl-Pd Universitas Mulawarman	SK.160/Menhut-II/2004, 04 Juni 2004; Kalimantan Timur, 20.271,00 ha.
21	HPP Kehutanan Fakultas Kehutanan Universitas Mulawarman (Lempake)	SK.241/MENLHK/SETJEN/PLA.0/6/2020, 04 Juni 2020; Kalimantan Timur, 299,03 ha.
22	HP Universitas Gorontalo	SK.396/Menhut-II/2004, 18 Oktober 2004; Gorontalo, 10.000,00 ha.
23	HP Universitas Muhammadiyah Palu	SK.260/Menhut-II/2011, 12 Mei 2011; Sulawesi Tengah, 5.100,00 ha.
24	HPP Universitas Tadulako	SK.661/Menlhk/Setjen/PLA.0/8/2016, 26 Agustus 2016; Sulawesi Tengah 1.813,00 ha.
25	HPP Kehutanan Universitas Muhammadiyah Makassar	SK.1097/MENLHK/SETJEN/PLA.0/10/2022, 17 Oktober 2022; Sulawesi Selatan, 229,00 ha.
26	HP Universitas Hasanuddin	SK.86/Menhut-II/2004, 04 April 2004; Sulawesi Selatan, 1.460,50 ha

Notes:
1. HP = Hutan Pendidikan, Educational Forest; HPP = Hutan Pendidikan dan Pelatihan, Education and Traininig Forest; HPl-Pd = Hutan Penelitian dan Pendidikan, Research and Education Forest; PPK = Pendidikan dan Pelatihan Kehutanan, Forestry Education and Training
2. SK = Surat Keputusan, Decree

ULM certainly must take advantage of this opportunity as much as possible. Not many universities have the opportunity to be involved in forest area management. Even though not all objects in the implementation of the *Tri Dharma* of Higher Education (teaching, research and community service) related to ULM's superior fields are fulfilled in this area, ULM must of course be careful not to lose state-trusted

assets. Management is reported regularly to the Ministry of Environment and Forestry (since 20 October the nomenclature has changed to the Ministry of Forestry). This was also approved by the Ministry of Environment and Forestry, thus giving ULM the opportunity to manage KHDTK in the long term (Hanafi, 2024a).

Potential of KHDTK ULM

There are two types of resources at KHDTK ULM, namely physical resources and biological resources. Physical resources in general are land, water and air, while biological resources are plants, animals and microorganisms.

Some physical resources have been used directly for people's lives and welfare. Soil is a place for plants to live which together form the landscape and views that people can enjoy. In this regard, KHDTK ULM has become a camping site and the development of paragliding sports. Water from KHDTK ULM flows to the area below via (one of them) the Mandiangin River to become infrastructure for hygiene (bathing, washing) and recreation. The oxygen produced by plants is freely available for breathing. You can enjoy clean and refreshing air. Research related to physical factors was also carried out (such as by Suryanto et al., 2024).

In some cases, the use of physical resources requires careful calculations. Calculations are a mandatory requirement when land, rocks or mineral content are physically used for commercial purposes. If this is implemented, negative impacts and problems will arise. KHDTK no longer functions for the purposes of education and training which in fact are long-term investments, but is like a "cash cow" which can make money but one day can become a source of ecological disaster or economic disaster in society.

Regarding the biological resources of KHDTK ULM, what needs to be noted is that several species or groups of plants have been identified, such as orchids (Syaifuddin et al., 2023), understory plants (Fahrina et al., 2021), and woody plants (Alfiannoor et al., 2023; Arifin et al., 2021; 2021; Pranata et al., 2023; Susilawati et al., 2023). This includes fungi (Ayunisa et al., 2020). These plants are objects of research related to biodiversity, ecology, carbon content, phytochemical or secondary metabolite content, and education (Noorannisa et al., 2022). Apart from that, several species or groups of animals were identified, such as birds (Purbaya et al., 2020; Saputra et al., 2021).

Other research is related to ecology. Research topics include distribution patterns of pasak bumi and meranti saplings, forest health analysis, necromass estimation, sub-watershed classification analysis and management efforts (Alfiannoor et al., 2023; Arifin et al., 2021; Pratama et al., 2023; Pranata et al. al., (2023); Suryanto et al., 2024).

However, not all of this research can contribute as a practical biology learning resource. Most of the research leads to knowledge that ends in published articles only and is not designed as biology teaching material. Indeed, there are several studies that have been designed as teaching materials through product development in the form of field guides and popular scientific books. However, the products they develop are not easily accessible to students, because they are not sold freely on the market, are not printed in sufficient quantities, or are not widely disseminated via electronic media. At the same time, electronic media cannot be accessed for free at KHDTK ULM, except with paid access. Most of the forest areas are blank spot areas, so it is not easy for students to carry out electronic media-based field practicums.

Utilization of KHDTK ULM

Utilizing KHDTK ULM as a learning resource can not only support the development of knowledge, but also play an important role in training students' critical and analytical thinking skills. Students involved in field research can learn firsthand methods of species identification, environmental measurement techniques, and how to collect and analyze ecological data. This can increase practical and in-depth understanding of conservation biology, ecology and biodiversity, which is often difficult to obtain through theoretical study alone. Through direct interaction with nature, students will experience for themselves the importance of nature conservation and preservation efforts, so they are able to appreciate the value of KHDTK ULM's biodiversity.

To support this use, teaching products such as popular scientific books can be developed (Table 2). The content of popular science books is no longer general in nature, but is more specific in content that focuses on certain knowledge, traits or characteristics. An example is a popular scientific book about Ficus, written

by Azhari et al. (2024) and about the ethnobotany of the *Cerbera manghas* species, written by Putri et al. (2022).

Table 2 Several published articles about KHDTK ULM which can be continued with biology education research

No.	Themes and topics of publication articles	Material needed as a biology learning resource
1.	**Biodiversity**	
	1. Bird species in three habitat types (Purbaya et al., 2020, Saputra et al., 2021). 2. Macroscopic fungi at KHDTK ULM (Ayunisa et al., 2020). 3. Composition and structure of orchids (Syaifuddin et al., 2023). 4. Diversity and structure of pole level vegetation (Susilawati et al., 2023). 5. Anatomical characteristics of wood (Istikowatil et al., 2019). 6. Benefits of vegetation under rubber stands (*Hevea brasiliensis*) (Fahrina et al., 2021).).	1. Products such as popular science books or guidebooks are necessary. 2. Part or scheme that connects research results with direct application of biology learning; for example related to students' critical thinking or biology learning in the field. 3. Illustrations and pictures so that students can study the material before going to the field. 4. Notes about KHDTK ULM and location details for students starting studies there, because not all habitats can be surveyed 5. Observation of nocturnal birds or animals, because what has been highlighted so far is diurnal birds or animals. 6. An ecological explanation is needed regarding the role of species in the ecosystem to make it easier for students to understand the ecological relevance of species to their habitat. This is important for the sustainability of KHDTK ULM.
2.	**Phytochemicals**	
	1. Phytochemical tests on plants (Wibisono et al., 2020; Muhammad et al., 2021). 2. Phytochemical tests on medicinal plants (Sofia et al., 2022). 3. Analysis of several secondary metabolite compounds (Rahmani et al., 2022). 4. Phytochemical test of poisonous plants (Rahman et al., 2021).	1. Teaching material products developed to support learning. 2. Specific discussions related to the development of students' critical thinking skills or direct links to biology teaching methods in the field. 3. Illustrations or pictures that explain the observation process and mechanisms in the biological processes of these phytochemicals. 4. Research that focuses on several phytochemical compounds to fully describe the potential of plants. 5. Explanation of the mechanism of biological activity of the compound which makes it easier for students to understand the function of the compound in the context of medicine.
3.	**Ecology:**	
	1. Distribution patterns of important or medicinally useful plants (Arifin et al., 2021). 2. Distribution and condition of seedlings or regeneration (Pratama et al., 2023). 3. Analysis of the health of forests or woody plants (Alfiannoor et al., 2023). 4. Estimation of necromass potential (Pranata et al., 2023). 5. Analysis of sub-watershed classification in or around forest areas (Suryanto et al., 2024).	1. Teaching materials and media products (popular scientific books, guides, practical guides) equipped with illustrations or visualizations to support learning. 2. Specific discussion regarding the development of students' critical thinking skills which is directly related to biology teaching methods in the field. 3. Direct connection with learning potential in the surrounding environment. 4. Illustrations or visualizations related to the ecology or interactions of species in ecosystems as well as the spread or distribution of species which make it easier for students to compare or describe field conditions in detail. 5. Detailed explanation of environmental influences on distribution patterns and causes of vegetation damage. Included in this is a learning program.

No.	Themes and topics of publication articles	Material needed as a biology learning resource
4.	**Education**	
	1. Field guide book (Zainudin et al., 2020). 2. The practicality of popular scientific books (Noorannisa et al., 2022; Nufus et al., 2022). 3. The effectiveness of popular scientific books in improving critical thinking skills (Febriyanti et al., 2023; Khatimah et al., 2023).	1. Learning products such as popular science books, field guides, e-books, or practical guides equipped with illustrations and pictures of species, relationships between species and others. 2. Easy access to obtain data and information as well as networks related to the product. Augmented reality (AR) technology or applications should have been implemented. This product is a medium that facilitates students to study local biodiversity and its use, hone field identification skills, and becomes a useful learning resource for students. 3. Data and information from KHDTK ULM related to objects that have been researched or have the potential to be researched.

Another teaching product that can be developed is a field guide. This book, which is equipped with illustrations and pictures, makes it easier for students to recognize or identify both plant and animal species. Images that are clear and easy to read provide a more realistic representation. As a product or teaching medium, books must have advantages, such as an attractive appearance, not boring, and easy to use (Anggraeni et al., 2020; Mulkan et al., 2022). Good quality images or illustrations need to be designed to increase student motivation to read and study (Safitri & Hartati, 2016). This is similar to an e-booklet which is presented more attractively because there are lots of pictures and colors. Students or readers generally prefer reading with little text and lots of pictures or colors. Pictures can increase reading interest because they help readers imagine and imagination can support improving a person's memory performance.

KHDTK ULM has high biodiversity, ranging from lower order plants, such as fungi to higher order plants, such as woody or flowering plants, as well as animals ranging from small ones the size of mosquitoes to large ones the size of wild boars (Figure 2). Of these groups of plants and animals, many species have not been documented. In other words, they still need to be researched in depth, both from their biological aspects and aspects related to their importance for biology education. These living species play an important role in maintaining the stability of the forest ecosystem and of course ultimately for the welfare of society.

Phytochemical research at KHDTK ULM highlights the importance of exploring natural compounds in local flora that have potential for health, such as flavonoids and alkaloids. The results of this research must certainly be applied in the context of biology education. The integration of Problem-Based Learning (PBL) and Project-Based Learning (PjBL) methods can enrich students' experience by being directly involved in compound identification and biological analysis. This approach not only increases students' learning engagement and motivation, but also helps them connect research results with real applications, in accordance with the guidelines. Almulla (2020) and Wahyuni (2019) stated that project-based learning that invites students to experience directly can increase understanding and develop critical thinking skills.

Research on ecology shows how environmental factors, such as light and soil moisture, influence the distribution of species such as pasak bumi and meranti, which are ecologically and economically valuable. With this understanding, ecology-based management is expected to be able to maintain the balance of forest ecosystems and prevent over-exploitation (Hardiansyah et al., 2023). To overcome weaknesses, resulting from limitations, practical guides, for example, need to be equipped with visualization. Visualization makes it easier for students to understand ecological patterns, develop analytical skills, and formulate sustainable management strategies (Baihoki, 2024; Gultom et al., 2016; Murti, 2022; Ziraluo, 2022).

Discussion of educational themes at KHDTK ULM plays an important role in connecting the results of scientific research in the field with classroom learning. Applicable teaching media, such as popular science books and field guides, make it easier for students to improve their observation and ecological analysis skills. Applications such as e-books make it easier for students to access information (Puspitasari & Purbosari, 2021). It is also good to propose digitizing teaching materials to make the materials more accessible and interactive. Augmented Reality (AR) technology is able to provide a more in-depth and comprehensive learning experience, especially in species identification (Meslilesi et al., 2017; Muliana & Anugra, 2023).

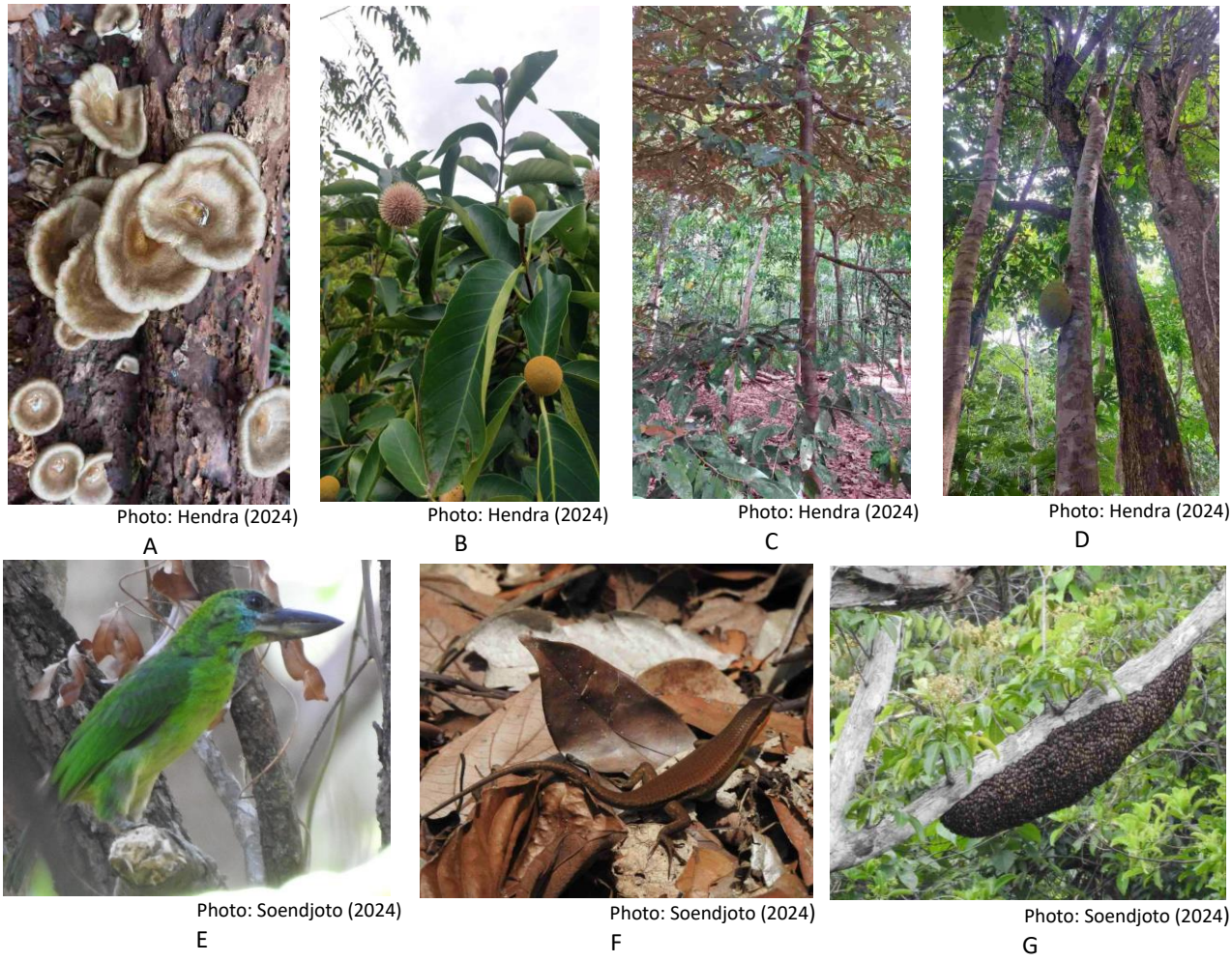

Figure 2. Little biodiversity in KHDTK ULM
A. Macroscopic fungi, B. Bangkal (*Neonauclea* sp.), C. Durian (*Durio zibethinus*), D. Nangka (*Artocarpus heterophylla*), E. Young takur warna-warni (*Psilopogon mystacophanos*), F. Kadal serasah (*Eutropis rudis*), G. A group of bees resting

CONCLUSION

KHDTK ULM has great potential as a biology learning resource because of the diversity and richness of plant, animal and even microorganism species. Research needs to continue and innovative teaching methods can be developed. This area is not only an asset for ULM as an educational institution but also a natural laboratory for learning and developing biology and biology education, related to critical thinking skills.

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