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Fauna and Flora of Gunung Datuk Recreational Forest, Negeri Sembilan, Malaysia: A Brief Documentation

Abstract

The biodiversity of forests in Negeri Sembilan, such as the Gunung Datuk Recreational Forest, is remarkably diverse and supports a wide array of fauna and flora species. These species play crucial roles in nutrient cycling, pollination, medicinal and providing habitats for other species. The study documented nine (9) plant species of the Kingdom Plantae and family *Ebenacae, Dioscoreaceae, Dipterocarpaceae, Arecaceae, Rubiaceae, Polypodiaceae, Piperaceae* and *Poaceae,* four (4) fungal species of the kingdom Fungi and family *Physalacriaceae, Podoscyphaceae, Omphalotaceae and Amanitaceae* and five (5) animal species from the kingdom Animalia and family *Trigoniulidae, Zephroniidae, Scincidae, Arebidae and Formicida*e. The species abundance in the forest emphasizes the interconnectedness of biodiversity and its role in maintaining the ecological balance. This study integrates ecology, environmental science, and cultural values, providing a holistic framework for managing biodiversity. Preserving the forest biodiversity of Gunung Datuk is crucial for ecological stewardship, safeguarding cultural heritage, and ensuring sustainable development for future generations. This fosters a harmonious coexistence where biodiversity and human needs are harmonized.

Keywords: biodiversity, fauna and flora, family, kingdom and nutrient cycling

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Introduction

The health and resilience of forest ecosystems depend on its rich biodiversity. However, human activities such as deforestation and logging pose significant threats to this delicate balance.[1,2] These practices reduce forest cover and disrupt the intricate structure and composition of these ecosystems, ultimately impacting the variety of species that reside within them.[2] Studies emphasize the need for forest management practices that prioritize biodiversity conservation. For example, the arrangement of the forest canopy significantly influences the diversity of plants growing underneath, highlighting the interconnectedness within the ecosystem.[3] The Gunung Datuk Recreational Forest in Negeri Sembilan, Malaysia, serves as a vital ecosystem within the region's tropical climate, harbouring various animal and plant species.[4] Like other Malaysian rainforests, the Gunung Datuk forest is crucial in sustaining diverse populations of amphibians, reptiles, and plant life, all intricately interconnected within the ecological web.[4] Prior research conducted in various Malaysian forest reserves highlights the importance of documenting the biodiversity within these vital systems.[5] While plant life often receives primary focus in such studies, effective conservation efforts necessitate acknowledging the equally important abundance and diversity of animal species within Gunung Datuk. Therefore, this study aims to comprehensively document the various animal and plant species residing in the Gunung Datuk Recreational Forest.

Materials and methods

Study area

The Gunung Datuk Recreational Forest is situated within the Rembau district of Negeri Sembilan, Malaysia. Positioned within the Titiwangsa Range at coordinates 2.5408° N latitude and 102.1754° E longitude, this compact rainforest area encompasses a diverse array of ecosystems. Reaching an elevation of 884 meters (2,900 feet), the forest serves as a popular destination for hikers and trekkers, with temperatures typically ranging from a comfortable 24°C to 32°C (75°F to 90°F) (Figure 1).

Figure 1 Map of Gunung Datuk Recreational Forest, Negeri Sembilan.

Documentation

A digital HP camera was used to facilitate the field data collection, documenting both plant and animal species. Subsequent identification of these specimens was achieved through a multi-pronged approach, utilizing reputable online resources such as Plants of the World (POWO) and iNaturalist, alongside image recognition software (Google Lens). Additionally, invaluable expertise was provided by a plant taxonomy PhD scholar from the Department of Biology at the University Putra Malaysia. This documentation effort was preceded by a series of comprehensive lectures from the BGY 5404 (Advanced Ecology) course, which focused on key ecological concepts including biodiversity, species abundance, and distribution patterns.

Results

A total of 18 different species were recorded in the study, including 9 plant species, 4 fungal species, and 5 animal species. The plant species belonged to the Plant Kingdom, specifically within the families *Ebenaceae, Dioscoreaceae, Dipterocarpaceae, Arecaceae, Rubiaceae, Polypodiaceae, Piperaceae*, and *Poaceae.* Fungal species were classified under the Kingdom Fungi, with representatives from the families *Physalacriaceae, Podoscyphaceae, Omphalotaceae, and Amanitaceae*. Lastly, the animal species were part of the Animal Kingdom, identified within the families *Trigoniulidae, Zephroniidae, Scincidae, Ar*ebidae, and Formicidae. Figure 2 displays the plant species, (Figure 3) illustrates the fungal species, and (Figure 4) shows the animal species. The taxonomic classification of the species is presented in Tables 1–3.

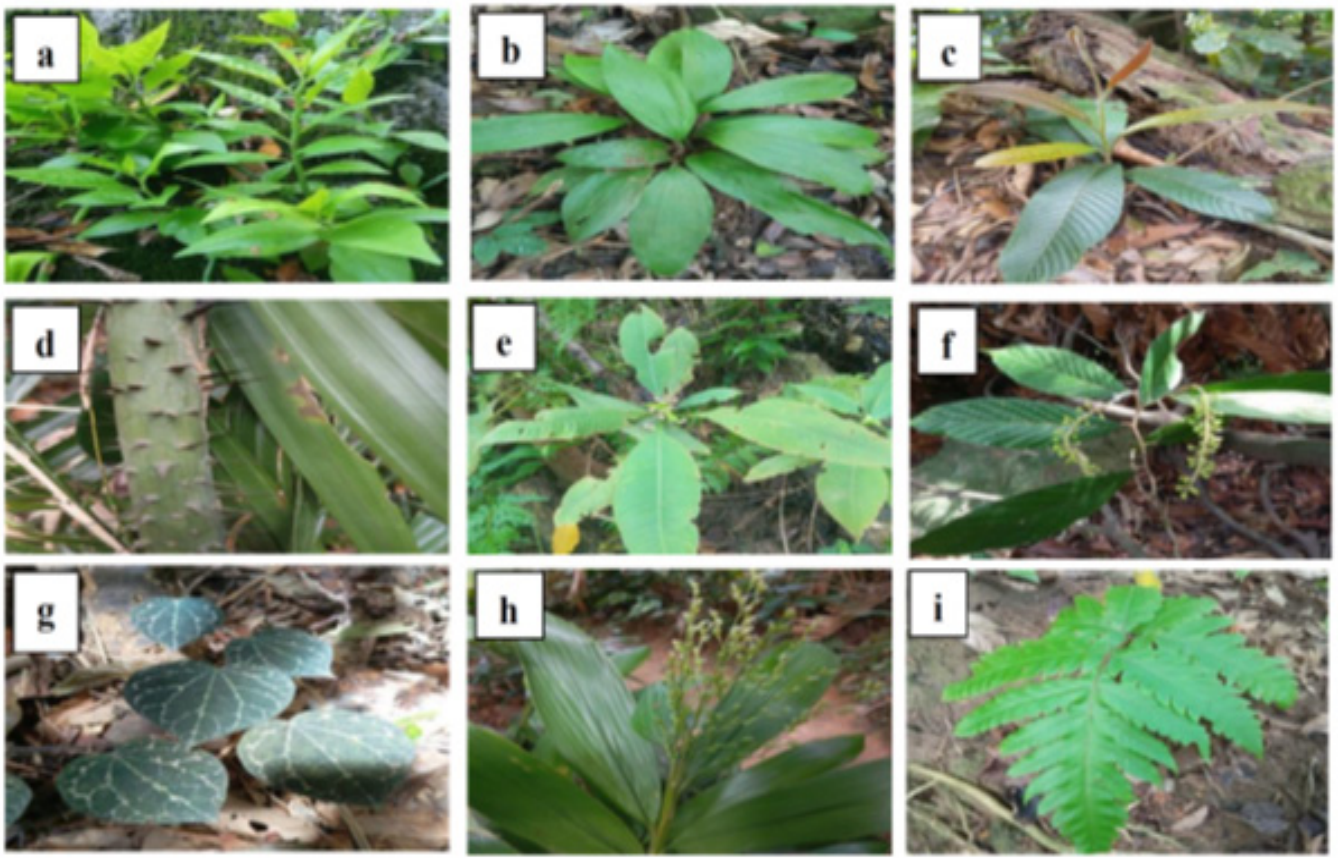

Figure 2 Plant species documented (a) *Justicia gendarussa* (b) *Tacca cristata* (c) *Dipterocarpus grandifloras* (d) *Salacca zalacca* (e) *Greenea corymbosa* (Jack) Voigt (f) *Tectaria fauriei* (g) *Piper porphyrophyllum* (h) *Setaria palmifolia* (i) *Tectaria stenosemioides*.

Figure 3 Fungal species documented (a) *Cryptotama asprata* (b) *Podoscypha gillesii* (c) *Gymnopus dryophilus* (d) *Amanita* specie.

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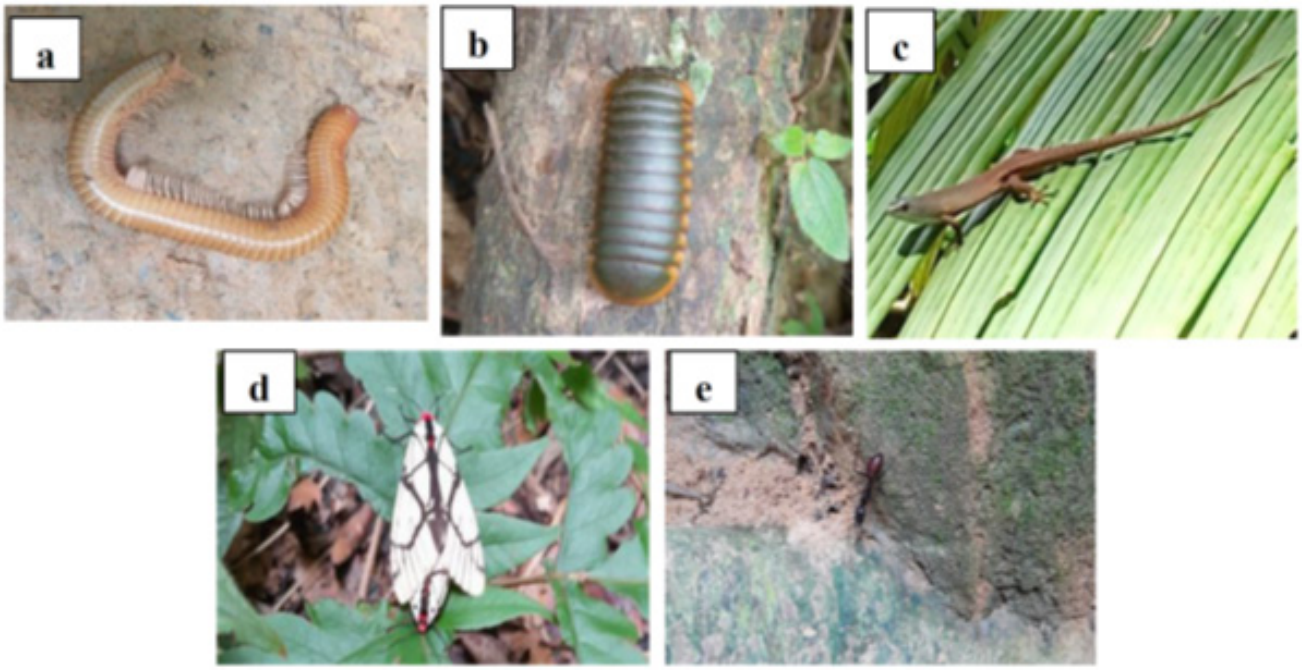

Figure 4 Animal species documented (a) *Trigoniulus corallinus* (b) *Zephronia gigas* (c) *Eutropis rugifera* (d) *Areas galactina* (e) *Dinomyrmex gigas*.

Table 1 Classification of plant species in Gunung Datuk Recreational Forest

Scientific name	Local name	Kingdom	Phylum	Class	Subclass	Order	Family	Genus	Species
Justica gendarussa	Gendola	Plantae	Streptophyta	Equisetopsida	Magnoliidae	Ericales	Ebenacae	*Justica*	*gendarussa*
Tacca cristata	Keladi Ubi	Plantae	Streptophyta	Eqisetopsida	Magnoliidae	Dioscoreales	Dioscoreaceae	*Tacca*	*cristafa*
Dipterocarpus grandiflorus	Keruing Pasir		Streptophyta	Equisetopsida	Magnoliidae	Malvales	Dipterocarpaceae	*Dipterocarpus*	*grandiflorus*
Salacca zalacca	Salak	Plantae	Streptophyta	Equisetopsida	Magnoliidae	Arecales	Arecaceae	*Salacca*	*zalacca*
Greenea corymbosa	Kacip Fatimah	Plantae	Streptophyta	Eqisetopsida	Magnoliidae	Gentianales	Rubiaceae	*Greenea*	*corymbosa*
Tectaria fauriei	Paku Rawan	Plantae	Streptophyta	Equisetopsida	Polypodiinae	Polypodiales	Polypodiaceae	*Tectaria*	*fauriei*
Piper porphyrophyllum	Sirih Hutan	Plantae	Streptophyta	Equisetopsida	Magnoliidae	Piperales	Piperaceae	*Piper*	*porphyrophyllum*
Setaria palmifolia	ND	Plantae	Streptophyta	Equisetopsida	Magnoliidae	Poales	Poaceae	*Setaria*	*palmifolia*
Tectaria stenosemioides	Paku Rawan	Plantae	Streptophyta	Equisetopsida	Polypodiinae	Polypodiales	Polypodiaceae	*Tectaria*	*stenosemioides*

Keys: ND, not detected

Table 2 Classification of fungal species in Gunung Datuk Recreational Forest

Scientific name	Local name	Kingdom	Phylum	Class	Order	Family	Genus	Species
Cryptotama asprata	ND	Fungi	Basidiomycota	Agaricomycetes	Agaricales	Physalacriaceae	*Cyptotrama*	*Asprata*
Podoscypha gillesii	ND	Fungi	Basidiomycota	Agaricomycetes	Polyporales	Podoscyphaceae	*Podoscypha*	*gillesii*
Gymnopus dryophilus	ND	Fungi	Basidiomycota	Agaricomycetes	Agaricales	Omphalotaceae	*Gymnopus*	*Dryophilus*
Amanita specie	Candawan Amanita	Fungi	Basidiomycota	Agaricales	Agaricales	Amanitaceae	*Amanita*	*Amanita specie*

Keys: ND, not detected

Table 3 Classification of animal species in Gunung Datuk recreational forest

Scientific name	Local name	Kingdom	Phylum	Class	Order	Family	Genus	Specie
Trigoniulus corallinus	ND	Animalia	Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Trigoniulus*	*corallinus*
Zephronia gigas	ND	Animalia	Arthropoda	Diplopoda	Gloremida	Zephroniidae	*Zephronia*	*gigas*
Eutropis rugifera	Cicak Terbang	Animalia	Chordata	Reptilia	Squamata	Scincidae	*Eutropis*	*rugifera*
Areas galactina	Rama-rama	Animalia	Arthropoda	Insecta	Lepidoptera	Arebidae	*Areas*	*galactina*
Dinomyrmex gigas	Semut Raksasa	Animalia	Arthropoda	Insecta	Hymenoptera	Formicidae	*Dinomyrmex*	*gigas*

Keys: ND, not detected

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Plant species

Justicia gendarussa Blanco, commonly referred to as willow-leaved Justicia, is a plant native to the wildlands of Malaysia. Its leaves have long been used in traditional medicine practices in the region.[6] Research indicates that this versatile plant possesses numerous potential health benefits. Specifically, Justicia gendarussa has shown antioxidant, hepatoprotective, anti-inflammatory, and antimicrobial properties.[7] Additionally, certain compounds derived from Justicia gendarussa can inhibit HIV strains that are resistant to conventional antiretroviral drugs.[7] Another indigenous Malaysian plant, *Tacca cristata* Jack, plays a crucial role in maintaining ecological balance. This species is known for its abundant saponins, a group of beneficial phytochemicals that may have antioxidant properties.[8] While some aspects of *Tacca cristata's* ecological behaviour, such as territoriality and home range, are still being investigated, its unique chemical composition suggests potential medicinal and nutritional applications.[9] Interestingly, research has explored the use of biopolymers derived from Tacca cristata for pollutant removal, indicating its potential for applications beyond its natural habitat.[10]

Dipterocarpus grandiflorus (Blanco) Blanco, known for its pinnate leaves with smooth edges and bent petioles, is an important species that significantly contributes to the health of forests.[11] The optimized structure of its leaves allows for efficient photosynthesis by capturing sunlight for energy production. Furthermore, the bent petioles strategically position the leaves to maximize exposure to light, while the smooth edges enable effective exchange of gases and regulation of water. The impressive size and dense canopy of this tree provide essential habitat for a diverse array of birds and mammals, thereby enhancing the biodiversity of the forest.[11] Additionally, the decomposition of fallen leaves replenishes the soil with nutrients, promoting the growth of other plant species.[12] *Salacca zalacca* (Gaertn.) Vos commonly known as snake fruit, is a valuable fruit tree native to tropical regions such as Malaysia. It is easily recognizable by its scaly peel and oval shape. The internal fibrovascular bundles of the fruit serve multiple functions, including providing structural support, facilitating the transport of water and essential nutrients throughout the plant, and acting as a storage site for important resources.[13] Notably, the peel of the snake fruit is rich in bioactive compounds that have potential health benefits. These compounds, such as ferulic acid, proline, flavonoids, and tannins, have anti-diabetic and antioxidant properties.[14] Moreover, research has shown that extracts from the fruit have inhibitory effects on the xanthine oxidase enzyme, suggesting a possible application in the management of gout.[14]

Greenea corymbosa (Jack) Voigt, a flowering plant indigenous to Malaysian forests, has received limited scientific exploration regarding its potential medicinal uses.[15] However, valuable insights can be gleaned from studying its close relatives within the Rubiaceae family. *Ficus deltoidea* Jack, for example, a plant with a well-established role in traditional Malay medicine, has been extensively researched, revealing its phytochemical composition and diverse biological activities, including promising anti-diabetic effects.[16] Similarly, *Oldenlandia corymbosa* has a documented history of medicinal application, particularly in cancer treatment.[16] *Tectaria fauriei* Tagaw, a fern native to eastern Asia. The text examines the influence of co-occurring plant species on its habitat distribution within Malaysia.[17] *Tectaria fauriei* plays a critical role in maintaining ecosystem health by facilitating nutrient cycling, soil organic matter transformation, and fostering interactions with surrounding plant and microbial communities.[18] Notably, its classification as a natural hybrid suggests that *Tectaria fauriei* may possess unique ecological adaptations compared to its parent species.[18]

Piper porphyrophyllum (Lindl. ex-Blandy) has a well-documented history of traditional medicinal use. Recent research suggests that it may have cytotoxic properties and the ability to promote the differentiation of osteoblasts, which indicates its potential role in maintaining bone health.[19] Moreover, extracts from the leaves of *Piper* species have been found to exhibit antibacterial activity and can inhibit the growth of the fungus *Colletotrichum gloeosporioides*.[20] A species distribution model in Malaysia has successfully identified the presence of *Piper porphyrophyllum* in Kelantan.[21] *Setaria palmifolia* (J. Koenig) Stapf, commonly known as palm grass, offers a combination of aesthetic appeal and practical value. This versatile species can serve as both an ornamental plant and a vegetable crop.[22] Within the *Poaceae* family, Setaria strata can be distinguished by its distinctive morphological features, such as a textured upper anther (papillose upper anthecium) with transverse wrinkles and a membranous lower lemma.[23] This dual functionality underscores its significance in both landscaping and agricultural applications. Additionally, its unique morphological characteristics contribute to its scientific classification and understanding within the grass family (*Poaceae*).

Tectaria stenosemioides (Alderw.) C. Chr plays a vital role in maintaining Malaysia's ecological well-being. It supports the country's diverse forest biodiversity by providing habitats and sustenance for various wildlife species. The presence of *Tectaria stenosemioides* in undisturbed environments with high humidity and shade acts as a bioindicator of a healthy ecosystem.[24] Additionally, ferns such as *Tectaria stenosemioides* are crucial for nutrient cycling and soil conservation, contributing to the overall health of forest ecosystems (Table 1).[24]

Fungal species

Cryptotrama asprata is a saprotrophic fungus decomposes decaying wood from a variety of broadleaf and coniferous trees.[25] It has a wide range of hosts, including white fir, sugar maple, various maple species, gray alder, beech species, spruces, ponderosa pine, other pines, poplars, and oaks.[26] Originally identified in Asia, recent molecular data suggests that *Cryptotrama asprata* may be a species complex consisting of at least two distinct species: *Cryptotrama asprata* and *Cryptotrama chrysopepla*.[27] *Podoscypha gillesii:* Information on this fungus in Malaysia is limited. However, based on existing research on related fungal species and Malaysia's diverse ecosystems, it is likely present throughout Peninsular Malaysia, Sabah, and Sarawak.[28] *Podoscypha gillesii* belongs to the Basidiomycota phylum, which is renowned for its various roles within ecosystems. For example, this phylum forms mycorrhizal associations with plant roots, aiding in nutrient uptake, and is commonly found in terrestrial environments.[29] Interestingly, a study by[30] suggests that *Podoscypha* species may have paraphyletic relationships with other fungi in the same Basidiomycota lineage.

Gymnopus dryophilus is a saprotrophic fungus thriving in diverse habitats such as mountain forests and peat bogs.[31] Its presence has been documented in studies on macrofungal diversity and distribution in protected mountain forest areas and birch bogs in Poland.[32,33] Notably, *Gymnopus dryophilus* tends to accumulate significant levels of toxic cadmium, highlighting its role in the bioaccumulation of heavy metals in mushrooms.[34] *Amanita* species: These fungi play a crucial role in forest ecosystems by forming symbiotic relationships with plants, primarily through ectomycorrhizal associations with various host trees.[35] Found in diverse forest types worldwide, Amanita species contribute significantly to ecosystem health by promoting nutrient cycling and enhancing plant growth, particularly in ectomycorrhizal ecosystems dominated by five-needle pines.[36] However, it is important

to note that specific Amanita species, such as Amanita phalloides, Amanita virosa, and Amanita verna, contain amatoxins, powerful toxins that can cause severe illness if ingested (Table 2).[37]

Animal species

Trigoniulus corallinus, also known as the Rusty Millipede, is a detritivore. It has a reddish-brown cylindrical body and contributes significantly to nutrient cycling by consuming decomposing plant matter.[38] As a defence mechanism common among millipedes, it secretes a cyanide-containing compound to deter predators.[39] Reproduction involves the male depositing spermatophores on the substrate for the female to collect and fertilize. The female then lays eggs in the soil, where they hatch into juvenile millipedes.[40] *Zephronia gigas*, also referred to as the Giant Pill Millipede, is a fascinating inhabitant of Malaysian forests. It employs a unique anti-predator strategy by rolling up into a compact ball when threatened, effectively deterring potential predators.[41] The region harbours a rich variety of these giant pill millipedes, but they remain comparatively understudied.[42]

Eutropis rugifera, also known as the Rough-scaled Skink, is a forest-dwelling skink that has a broad distribution ranging from Nicobar Island to Peninsular Malaysia. A scientific investigation employing morphological and mitochondrial DNA analysis (16S rRNA, 584 bp) has confirmed that populations on Nicobar, Bali, and Bawean Islands belong to the same species.[43] *Areas galactina*, also known as the Milky Tiger Moth, is a vibrantly colored moth that is frequently mistaken for a butterfly due to its superficial resemblance. It flourishes in mountainous regions such as Gunung Datuk.[44] Its distribution encompasses China, India, the Philippines, and Malaysia.[45] *Dinomyrmex gigas*, also called the Giant Rainforest Ant, was previously known by the taxonomic synonym *Camponotus gigas*. This large ant species is a prominent resident of Southeast Asian rainforests.[46] It can reach lengths of 2.5 cm and thrives in humid environments characterized by dense vegetation. Primarily nocturnal, this species constructs nests in soil or decaying wood and forages in large groups at night. These activities play a crucial role in regulating insect populations and facilitating decomposition processes within the ecosystem (Table 3).[46]

Discussion

Plant species

Plants like *Justicia gendarussa* have leaves that boast antioxidant, anti-inflammatory, and anticancer properties. Studies have shown promise in their ability to combat drug-resistant HIV strains and promote liver health.[47] Compounds from Justicia gendarussa, such as "*Patentiflorin A*," inhibit drug-resistant HIV strains.[48] Research has also explored their hepatoprotective and antioxidant activities, indicating their potential to promote liver health and manage oxidative stress. The leaf is rich in phenolic and flavonoid compounds, contributing to its medicinal value.[49] In forest environments, plant species like *Tacca cristata* play a significant role. This Malaysian native attracts pollinators like female biting midges. Its high saponin content suggests antioxidant properties and potential medicinal applications. Research has also explored its biopolymer flocculant for pollutant removal.[50]

The ecologically and economically valuable species *Dipterocarpus grandiflorus* faces vulnerability due to its unique leaf characteristics and wood density. It plays a significant role in the diet of Sumatran orangutans and is a source of dammar resin. Additionally, it holds promise for phytochemical studies.[51,52] The tropical plant *Salacca zalacca* possesses bioactive compounds in its peel with anti-diabetic and antioxidant properties. Research on its molecular markers, synthesis of silver nanoparticles for antibacterial purposes, and the potential use of its peel waste for heavy metal removal demonstrate its diverse applications.[53] *Zalacca's* extracts inhibit the xanthine oxidase enzyme, suggesting potential therapeutic applications for conditions like gout.[54]

While not extensively studied, related species to *Greenea corymbosa* in Malaysia have shown promise for medicinal purposes. These relatives, like Ficus deltoidei and *Oldenlandia corymbosa*, used in Malay and Chinese traditional medicine, respectively, have been researched for their phytochemical composition and diverse biological activities, including anti-diabetic and anti-cancer effects.[55] The fern species *Tectaria fauriei* has been studied for its ecological role in Eastern Asia. This knowledge helps understand the distinct ecological niche of *Tectaria fauriei* and its interactions with the environment.[56] In Malaysia, plants like *Piper porphyrophyllum* are traditionally used as medicine. This plant has been investigated for its cytotoxic, antibacterial, and bone-growth promoting properties.[57] Metabolomics studies of *Piper betle* L. variants have identified characteristic compounds, indicating the rich medicinal potential of the *Piperaceae* family.[58] The antioxidant and anti-inflammatory activities of plants like Piper betle further highlight the therapeutic possibilities within this plant genus.[59] The ecologically significant grass *Setaria palmifolia* plays a vital role in adapting to changing environments. Numerous studies have highlighted its importance and its ability to adapt to changing environments.[60] These studies have focused on various aspects of its biology, environmental requirements, and impacts. Despite its significance, plant is not classified with other *Setaria* species due to its unique evolutionary trajectory. This distinction is important because it demonstrates that *Setaria* is not monophyletic and places *Setaria palmifolia* in a separate lineage. This phylogenetic distinction emphasizes the unique evolutionary trajectory of *Setaria palmifolia* within the Poaceae family.[60] Fern plants such as *Tectaria stenosemioides* have long contributed to Malaysia's forest health by providing habitat and food for wildlife species.[61] The plants are essential for nutrient recycling and soil conservation, further enhancing the overall health of forest ecosystems.[62]

Fungal species

Fungi play a crucial role in Malaysian ecosystems, but many aspects of them remain mysterious. *Cryptotrama asprata*, a fungus that grows on decaying wood, was previously thought to be one species. However, recent molecular studies have revealed that there is hidden diversity within this group, and *Cryptotrama chrysopepla* has emerged as a distinct species.[63,64] This demonstrates the power of molecular techniques in uncovering the variety of fungi and emphasizes the need for further exploration. Additionally, a study in Asia has identified different *Cryptotrama* species with unique physical characteristics, highlighting the importance of both morphological examination and molecular analysis.[65] Another lesser-known fungus that may be present in the Malaysian tropics is "*Podoscypha gillesii*," which belongs to the Basidiomycota phylum. Based on related studies and the country's diverse ecosystems, scientists believe that *Podoscypha gillesii* might exist in Malaysia.[66] This fungus forms associations with plant roots, known as mycorrhizal associations, and plays a crucial role in nutrient uptake for terrestrial ecosystems. *Gymnopus dryophilus*, a fungus that feeds on decaying matter, is found in various habitats and has significant ecological importance. While it aids in decomposition, research has shown that it can also accumulate toxic cadmium, illustrating the complex role that fungi play in the cycling of nutrients and the bioaccumulation of heavy

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metals.[67] Amanita species of fungi, known for their toxicity, have received increased attention in East Asia due to the discovery of new lethal varieties.[68] Genomic analyses have provided valuable insights into the development of cyclic peptide genes in poisonous agarics like *Amanita phalloides* and *Amanita bisporigera*.[69] In Malaysia, researchers have utilized morphological and molecular analyses of Amanita species to better understand the diversity within this genus, which plays a crucial role in ectomycorrhizal ecosystems worldwide.[70]

Animal species

Arthropods are ecologically significant species found in Southeast Asia, particularly in Malaysia. The millipede *Trigoniulus corallinus* contributes to nutrient cycling in forests and has defence mechanisms such as cyanide production. However, pesticides like carbendazim and lambda-cyhalothrin can impact the population of *Trigoniulus corallinus*.[71] The absence of terpene synthases in its genome may affect secondary metabolism and allergen production.[39] According to Dong et al.,[40] *Trigoniulus corallinus* contributes to overall biodiversity and species richness in forest ecosystems. Another important millipede species, *Zephronia gigas*, plays a crucial role in enhancing forest complexity and biodiversity. Studying its distribution, behaviour, and ecological functions can provide valuable insights for conservation efforts. Genetic studies have also revealed significant variation within the *Zephronia* genus, suggesting the presence of undiscovered species.[73] *Zephronia gigas rolls* into a ball when threatened and plays a significant ecological role in Malaysian forests, increasing habitat complexity and biodiversity.[72] The lizard species *Eutropis rugifera* has attracted scientific interest due to its complex taxonomy. Amarsinghe et al.,[43] conducted a comprehensive study on the systematics of *Eutropis rugifera*, providing insights into its distribution, taxonomy, and evolutionary relationships by redescribing the holotype and examining its morphological characteristics. Additionally, Karin et al.,[74] discusses the expansion of the human-commensal lizard *Eutropis multifasciata* into the fringes of Southeast Asia, suggesting that environmental factors such as the xeric, savannah-like conditions of the exposed Sunda Shelf during climatic fluctuations may have shaped the distribution of these lizard species.

The butterfly species in Malaysia showcases distinct subspecies across its geographical range, highlighting its evolutionary adaptations and distribution patterns. Multiple subspecies of *Areas galactina* have distinct geographical distributions and morphological characteristics, contributing to a better understanding of its evolutionary relationships and ecological adaptations.[75] Research on Areas galactina, a species found in Malaysia and various regions including China, Taiwan, the northwestern Himalayas, India, Nepal, Bhutan, Bangladesh, Indochina, the Philippines, Indonesia, and Sundaland, has provided valuable insights into its taxonomy, distribution, and subspecies.[75] This giant ant species, *Dinomyrmex gigas*, plays a vital role in maintaining insect populations and organic decomposition in rainforests. Although this ant species does not produce chemicals of medical significance, research on ants indicates the potential for uncovering powerful antimicrobial compounds. This emphasizes the significance of *Dinomyrmex gigas* and other ants as promising sources of bioactive substances with applications in medicine and other fields, underscoring their ecological and potential biomedical importance.[76] This study lays the groundwork for important ecological research in the Gunung Datuk Recreational Forest. It highlights the importance of conducting thorough taxonomic surveys to enhance our understanding of the forest's biodiversity. In the future, it is crucial for research efforts to focus on identifying a diverse range of species, including invertebrates and microbes, and investigating their ecological roles and interactions. Additionally, establishment of long-term monitoring programs is vital for assessing changes in biodiversity, ecosystem health, and potential threats in the forest. Moreover, this study aims to raise public awareness about the forest's ecological services and garner wider support for conservation initiatives. In addition, the fauna and flora species documented will serve as a baseline for future monitoring and management plans, ensuring the long-term health and sustainability of the ecosystem.

Conclusion

The Gunung Datuk Recreational Forest in Negeri Sembilan, Malaysia, supports a rich biodiversity, emphasizing the critical need for conservation efforts to safeguard the ecosystem from human-induced threats. Comprehensive documentation and analysis of its species underscore the urgency of informed conservation decisions to preserve ecological balance and ensure sustained biodiversity for future generations.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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