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Diversity of Ferns and Lycophytes of Sungai Chiling, Hulu Selangor, Malaysia

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ABSTRACT

A total of 42 taxa consisting of six lycophytes and 36 taxa monilophytes in 28 genera and 22 families were reported for Sungai Chiling, Selangor. This figure represents 6.49% of the 647 taxa of ferns in Peninsular Malaysia. Selaginellaceae and Polypodiaceae were the largest families, with five taxa recorded, while the smallest families, each represented by one species, included Adiantaceae, Aspleniaceae, Athyriaceae, Davalliaceae, Dennstaedtiaceae, Gleicheniaceae, Lindsaeaceae, Lycopodiaceae, Matoniaceae, Nephrolepidaceae, and Schizaeaceae. Most fern species were found along trails to the riverbank and on the ground such as *Schizaea dichotoma*. Only a few species, such as *Dicranopteris linearis* and *Matonia pectinata* were recorded in limestone trail areas due to their adaptability to dry and barren environments. Several epiphytic species, including *Platycerium coronarium*, *Asplenium nidus*, and the genus *Ctenopterella*, which was a new record to Selangor, were documented. Major conclusions emphasize the importance of these forests as biodiversity hotspots, underscoring the need for targeted conservation efforts to preserve their unique fern flora.

1. Introduction

Ferns are cryptogamic plants, which are lower plants that do not produce flowers or seeds. These plants are among the oldest groups of plants in the world, with fossil records dating back to the mid-Devonian period, approximately 383-393 million years ago [1]. The growth of ferns depends on several factors such as habitat, light, and temperature [2]. The number of identified fern species is approximately 12,000 worldwide, but this figure could potentially increase to 15,000 species.

Ferns have several unique characteristics that distinguish them from other plants. One unique feature of ferns is their production of spores and croziers, along with having both independent gametophyte and sporophyte phases. Additionally, ferns can be heterosporous or homosporous, unlike higher plants, which are exclusively heterosporous [3]. Ferns have elongated or creeping

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stems, usually known as rhizomes. Besides, ferns have vascular tissue that differs from that of seed plants, as their vascular tissue or also known as steles contains only tracheid cells and sieve elements without companion cells for transporting water and nutrients [4]. In Malaysia, a total of 1,165 species of ferns have been reported by Parris and Latiff [5]. Of this total, 647 species are recorded in Peninsular Malaysia, 750 species in Sabah, and 615 species in Sarawak. According to Bidin [6], ferns can be found in a variety of habitats, including terrestrial environments such as exposed or sheltered areas, epiphytes, climbers, and in aquatic environments.

Despite extensive research, many plant species, including ferns, remain unidentified, particularly in regions like Sungai Chiling within the Selangor Royal Heritage Forest, Hulu Selangor. This study aims to document and enhance our understanding of fern diversity in the Sungai Chiling area.

2. Methodology

All specimens were collected over five days during a scientific expedition in Selangor, from September 18th to 22nd, 2023. The ferns were collected along trails organized by the expedition, specifically the Sungai Chiling Trail and the Granite Hill Trail. All collected specimens were curated and identified using identification keys from scientific books and journals such as Holttum [8,9], Parris *et al.,* [10,11] and Tagawa and Iwatsuki [12–15]. All these specimens were deposited at the Herbarium of Universiti Kebangsaan Malaysia (UKMB).

3. Results and Discussion

The Sungai Chiling area, located within the Royal Heritage Forest of Selangor in Hulu Selangor, is also home to the renowned Chiling Fish Sanctuary is a popular recreational destinations among the locals. This study area supported a total of 42 taxa of ferns, spanning 28 genera and 22 families (Table 1). The figure represents six taxa from the division Lycophyta and 36 taxa from the division Monilophyta, accounting for approximately 6.49% of the 647 fern species recorded in Peninsular Malaysia and 3.61% of the total fern taxa recorded in Malaysia. The largest families recorded in the Sungai Chiling area were Selaginellaceae and Polypodiaceae, each with five species, comprising 11.9% of the total fern taxa identified in the study area. This is followed by the families Blechnaceae, Pteridaceae, and Thelypteridaceae, each represented by three species. The smallest families, each with only one species, include Adiantaceae, Aspleniaceae, Athyriaceae, Lycopodiaceae, Davalliaceae, Dennstaedtiaceae, Gleicheniaceae, Lindsaeaceae, Matoniaceae, Nephrolepidaceae, and Schizaeaceae.

Specimen collection began on Trails 1 and 2, which lead to the Chiling Waterfall. As shown in Figure 1, most of the ferns collected were terrestrial, thriving in both sheltered and exposed forest floor areas. The forest's microclimates, characterized by moist and humid conditions, support the growth of these terrestrial ferns. However, some climbing fern species, such as *Lygodium longifolium* and *Lygodium microphyllum*, were also recorded, contributing only two species (4.76%), while 13 species of epiphytic ferns (30.95%) were noted. Species found at the beginning of these trails include *Lindsaea ensifolia* and *Drynaria sparsisora*, which grow along the trail exposed to sunlight and can be seen on both sides of the path near streams. Other species such as *Selaginella willdenowii*, *Tectaria singaporiana*, and *Schizaea dichotoma* were found thriving on the forest floor, while species such as *Davallia denticulata* and *Haplopteris elongata* were found growing by slightly exposed riverbanks. *Cephalomanes javanicum* from the Hymenophyllaceae family was also found growing well on shaded riverbanks.

In limestone trails, distribution of ferns in the limestone hill area was influenced by the rocky and dry conditions resulting from limestone deposits, which are less favorable for fern growth compared to moist environments. Species such as *Matonia pectinata* and *Dicranopteris linearis* were commonly found along the path to the slopes and up to the peak of the limestone hill. Species from the Blechnaceae family, like *Blechnum finlaysonianum*, were found in sheltered areas on the hill slopes, while *Blechnum vestitum* was found in open areas near the hilltop. The impact of mining activities is very noticeable on the diversity of fern species in the mining area, as most vegetation around the mining site has been destroyed, reducing the overall diversity of flora in the area. Additionally, *Pyrrosia longifolia* and *Pyrrosia piloselloides* were frequently found on tree trunks. Meanwhile, several epiphytic fern species were identified, including *Asplenium nidus* or locally known as *paku langsuyar*, which was commonly found growing on the branches of limestone trees and on rocks near the river leveraging the available structures in the altered landscape.

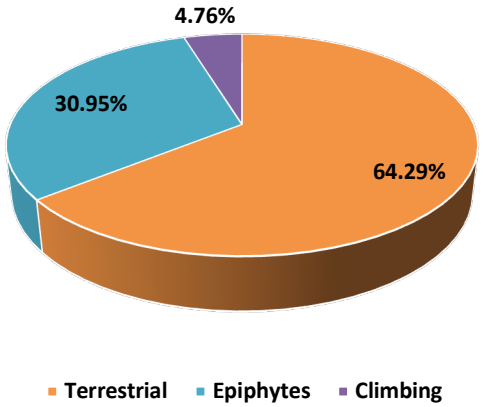

Fig. 1. Habits of Ferns and Lycophytes in Sungai Chiling, Selangor

A notable discovery in this study is the fern species *Taenitis dimorpha* (Figure 2), which is endemic to Peninsular Malaysia as stated in Maideen [16,17]. Sungai Chiling's unique environmental conditions, such as its tropical rainforest climate, high humidity, and consistent rainfall, mirror the broader environmental conditions of Peninsular Malaysia, thus provides an ideal habitat for *Taenitis dimorpha*. Additionally, a new record for the genus *Ctenopterella* in Selangor was documented. According to Parris *et al.,* [10], this genus had not been previously reported in Selangor.

Fig. 2. Spore structure of *Taenitis dimorpha*

Table 1
List of families, genera and taxa of ferns recorded in the Sungai Chiling area: Selangor Royal Heritage Forest, Hulu Selangor

Family	Genus	Species
LYCOPHYTA		
Lycopodiaceae	*Lycopodiella*	*Lycopodiella cernua*
Selaginellaceae	*Selaginella*	*Selaginella willdenowii*
		Selaginella roxburgii
		Selaginella stipulata
		Selaginella mayeri
		Selaginella intermedia
MONILOPHYTA		
Adiantaceae	*Antrophyum*	*Antrophyum callifolium*
Aspleniaceae	*Asplenium*	*Asplenium nidus*
Athyriaceae	*Diplazium*	*Diplazium tomentosum*
Blechnaceae	*Blechnum*	*Blechnum vestitum*
		Blechnum finlaysonianum
		Blechum orientale
Cyatheaceae	*Cyathea*	*Cyathea mollucana*
		Cyathea latebrosa
Davalliaceae	*Davallia*	*Davallia denticulata*
Dennstaedtiaceae	*Pteridium*	*Pteridium esculentum*
Dipteridaceae	*Dipteris*	*Dipteris conjugata*
		Dipteris lobbiana
Gleicheniaceae	*Dicranopteris*	*Dicranopteris linearis*
Grammitidaceae	*Ctenopterella*	*Ctenopterella blechnoides*
	Oreogrammitis	*Oreogrammitis universa*
Hymenophyllaceae	*Cephalomanes*	*Cephalomanes javanicum*
	Hymenophyllum	*Hymenophyllum denticulatum*
Lindsaeaceae	*Lindsaea*	*Lindsaea ensifolia*
Lygodiaceae	*Lygodium*	*Lygodium microphyllum*
		Lygodium longifolium
Matoniaceae	*Matonia*	*Matonia pectinata*
Nephrolepidaceae	*Nephrolepis*	*Nephrolepis biserrata*
Polypodiaceae	*Drynaria*	*Drynaria sparsisora*
	Phymatosorus	*Phymatosorus nigrescens*
	Pyrrosia	*Pyrrosia longifolia*
	Platycerium	*Pyrrosia piloselloides*
		Platycerium coronarium
Pteridaceae	*Taenitis*	*Taenitis dimorpha*
		Taenitis blechnoides
	Haplopteris	*Haplopteris elongata*
Schizaeaceae	*Schizaea*	*Schizaea dichotoma*
Tectariaceae	*Tectaria*	*Tectaria vasta*
		Tectaria singaporiana
Thelypteridaceae	*Thelypteris*	*Thelypteris* sp.1
		Thelypteris sp.2
		Thelypteris sp.3

4. Conclusions

In conclusion, while Sungai Chiling is home to a higher number of terrestrial fern species, this study underscores the need for further botanical collections in the area. Since ferns and lycophytes are sensitive to environmental changes, understanding the floristic diversity is crucial for effective conservation planning.

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References

[1] Taylor, Thomas N., Edith L. Taylor, and Michael Krings. *Paleobotany: The biology and evolution of Fossil Plants*. London: Academic Press, 2009.
[2] Abdul Aziz Bidin. *Paku-pakis ubatan di semenanjung Malaysia*. Kuala Lumpur: Dewan Bahasa dan Pustaka, 1985.
[3] Sessa, Emily B, Jo Ann Banks, Michael S Barker, Joshua P Der, Aaron M Duffy, Sean W Graham, Mitsuyasu Hasebe, et al. 2014. "Between Two Fern Genomes." *GigaScience* 3 (1). https://doi.org/10.1186/2047-217x-3-15
[4] Edwin Bingham Copeland. 1958. *Fern Flora of the Philippines*.
[5] Parris, B.S. and Latiff, A. 1997. Towards a pteridophyte flora of Malaysia: A provisional checklist of taxa. *Malayan Nature Journal* 50:235-280
[6] Abdul Aziz Bidin. 1986. *Paku-Pakis Di Sekeliling Kita*.
[7] Cobb B 1963. A Field Guide to the Ferns and Their Related Families.
[8] Holttum, R E. 1968. *A Revised Flora of Malaya Volume II Ferns of Malaya*.
[9] Holttum R E. 1991. Flora Malesiana , Ser. II. 1-132.
[10] Parris, B.S, R. Kiew, Chung, L.G Saw, and E. Soepadmo. 2010 *Flora of Peninsular Malaysia, Series I: Ferns and Lycophytes* **1**
[11] Parris, B.S, R. Kiew, Chung, L.G Saw, and E. Soepadmo. 2013 *Flora of Peninsular Malaysia, Series II:Ferns and Lycophytes* **2**
[12] Tagawa M and Iwatsuki K 1979 *Flora of Thailand* **3** 1
[13] Tagawa M and Iwatsuki K 1985 *Flora of Thailand* **3** 2
[14] Tagawa M and Iwatsuki K 1988 *Flora of Thailand* **3** 3
[15] Tagawa M and Iwatsuki K 1989 *Flora of Thailand* **3** 4
[16] Maideen, H., Damanhuri, A., Jaman, R. & Rusea, G. 2001. Pteridophyte Flora of Ayer Hitam Forest Reserve, Selangor Peninsular Malaysia. *Pertanika Journal of Tropical Agriculture Science* 24(1): 39-41.
[17] Haja Maideen, Nurul Nadhirah, Nur Aliah, and Nik Norhazrina. 2023. "The Anatomy and Morphology of *Taenitis* Willd. Ex Sprengel (Monilophytes) in Peninsular Malaysia." *Sains Malaysiana* 52 (5): 1333–43. https://doi.org/10.17576/jsm-2023-5205-01