Semarak International Journal of Agriculture, Forestry and Fisheries

Journal homepage:
https://semarakilmu.my/journals/index.php/sijaff/index
ISSN: 3030-5667

Ferns in Behrang Reserved Forest, Tanjung Malim, Perak, Malaysia

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ARTICLE INFO

Article history:
Received 18 September 2024
Received in revised form 27 December 2024
Accepted 30 June 2025
Available online 15 July 2025

Keywords:
Fern; Behrang; taxa

ABSTRACT

The floristic study on the diversity of ferns in Behrang Reserved Forest aims to provide a checklist of fern species, build species identification keys and compare the level of species similarity in the study area with some other areas in Peninsular Malaysia which are Mount Nuang, Lentang Forest Reserve and Ayer Hitam Utara Forest Reserve. The study includes collecting samples and then preserving them with spirit solution and taking them to the laboratory for the drying and identification purposes. The Behrang Forest Reserve accommodates a total of 39 taxa of ferns in 25 genera and 18 families. This includes four taxa from the Lycophyta division and 35 taxa from the Monilophyta. This amount covers 6.03% of the 647 fern taxa recorded in Peninsular Malaysia and 3.34% of the 1,165 fern taxa recorded in Malaysia. The largest families recorded were Athyriaceae and Tectariaceae with five taxa and also represented 25.6% of all fern taxa found in the study area. Hymenophyllaceae is the second largest family with a number of four taxa from two genera or represents 10.3% of all fern taxa recorded in the study area. The smallest family is represented by Lycopodiaceae, Blechnaceae, Didymochlaenaceae, Grammitidaceae, Lindsaeaceae, Marattiacaea, Nephrolepidaceae, Pteridaceae and Thelypteridaceae with one species respectively. The highest percentage of fern species similarity is between Behrang Forest Reserve and Mount Nuang which is 18.7 %.

1. Introduction

Ferns are cryptogamic plants, which do not have either flower or seeds. Fern are one of the oldest plant groups in the world, with fossil records back to the mid-Devonian period, which was back to 383-393 million years ago [1]. Ferns are widely distributed throughout the world, especially in the tropics, except for areas such as deserts and oceans. Fern growth depends on several factors such as habitat, light and temperature [2]. In general, cryptogamic and phenerogamic plants have different characteristics in terms of leaves, reproductive structures, stems and roots. Ferns also have croziers. Ferns have vascular tissue, unlike mosses and algae. Identification of ferns focuses on vegetative structures such as stems, leaves, spores because they are different for some genera. For example,

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https://doi.org/10.37934/sijaff.5.1.1519

the rhizome that grows in a creeping manner is *Lygodium circinatum* while *Tectaria singaporeana* has a rhizome that grows vertically [3].

Now, fern species have been found and identified all over the world and the number of ferns is expected to increase to 12,000 to 15,000 species. In Southeast Asia around 4,400 species of ferns are known and 1,165 species are recorded from the tropical rainforests of Malaysia while in Malaysia, as many as 1,165 taxa of ferns are recorded, namely 647 taxa in Peninsular Malaysia, 750 taxa in Sabah and 615 taxa in Sarawak [4]. However, there are many fern species that have yet to be identified in Behrang Reserved Forest. This study is important to provide information on the number and species of ferns found in Behrang Forest Reserve as well as contributing information on the richness of flora in Malaysian Forests. In addition, this study can also help researchers in obtaining data on fern flora in the Behrang Forest Reserve.

2. Methodology

The research material was obtained while following the Forest Biodiversity Scientific Expedition in Behrang Forest Reserve, Perak organized by the Forestry Department of Peninsular Malaysia for six days from 13th August 2023 until 18th August 2023. The study area involves two trails in part of compartments 24, 25 and 26, Behrang Forest Reserve, South Perak District. The study area also involves the climbing track of Mount Liang, which has two peaks, namely Mount Liang Timur with a height of 1,933 meters and Mount Liang West with a height of 1,932 meters. All specimens collected were curated and identified using identification key provided in books and journals such as Cobb [5], Holttum [6,7], Parriss *et al.,* [7,8] and Tagawa and Iwatsuki [11-14]. All the specimens were kept in Herbarium of Universiti Kebangsaan Malaysia (UKMB).

3. Results

A total of 39 taxa within 25 genera and 18 families were identified in Behrang Reserved Forest. List of specimens collected were tabulated in Table 1. This includes four taxa in two genera and two families of Lycophyta, and 23 genera and 16 families of Monilophyta. These taxa represent 6.03% of the 647 fern taxa recorded in Peninsular Malaysia and 3.35% of the 1,165 fern taxa recorded in Malaysia. In the Behrang Forest Reserve, the largest families recorded are Athyriaceae and Tectariaceae, each with five taxa in two genera, making up 25.6% of the total fern taxa found in the study area. The second largest family is Hymenophyllaceae, with four taxa from two genera, representing 10.3% of the total fern taxa recorded. The smallest families, each represented by a single species, include Lycopodiaceae, Blechnaceae, Didymochlaenaceae, Grammitidaceae, Lindsaeaceae, Marattiaceae, Nephrolepidaceae, Pteridaceae, and Thelypteridaceae, each accounting for 2.6% of the total fern taxa found.

Table 1
List of fern taxa recorded in Behrang Forest Reserve, Tanjung Malim, Perak, Malaysia

Division/Family	Genus	Species
Lycopodiaceae	*Huperzia*	*Huperzia phlegmaria*
Selaginellaceae	*Selaginella*	*Selaginella intermedia* var. *intermedia*
		Selaginella stipulata
		Selaginella willdenowii
Adiantaceae	*Antrophyum*	*Antrophyum callifolium*
	Coniogramme	*Coniogramme fraxinea*
	Haplopteris	*Haplopteris ensiformis*
Aspleniaceae	*Asplenium*	*Asplenium nidus*

		Asplenium normale
		Asplenium tenerum
Athyriaceae	*Athyrium*	*Athyrium anisopterum*
	Diplazium	*Diplazium cordifolium* var. *cordifolium*
		Diplazium cordifolium var. *pariens*
		Diplazium pallidum
		Diplazium tomentosum
Blechnaceae	*Blechnum*	*Blechnum finlaysonianum*
Cyatheaceae	*Cyathea*	*Cyathea moluccana*
		Cyathea latebrosa
Didymochlaenaceae	*Didymochlaena*	*Didymochlaena truncatula*
Dryopteridaceae	*Elaphoglossum*	*Elaphoglossum crassifolium*
	Teratophyllum	*Teratophyllum aculeatum*
Grammitidaceae	*Calymmodon*	*Calymmodon gracillis*
Hymenophyllaceae	*Hymenophyllum*	*Hymenophyllum blandum*
	Trichomanes	*Trichomanes maximum*
		Trichomanes minutum
		Trichomanes sublimbatum
Lindsaeaceae	*Lindsaea*	*Lindsaea scandens*
Marattiaceae	*Angiopteris*	*Angiopteris angustifolia*
Nephrolepidaceae	*Nephrolepis*	*Nephrolepis hirsutula*
Polypodiaceae	*Microsorum*	*Microsorum musifolium*
		Microsorum scolopendria
	Selliguea	*Selliguea laciniata*
Pteridaceae	*Taenitis*	*Taenitis blechnoides*
Tectariaceae	*Pleocnemia*	*Pleocnemia irregularis*
	Tectaria	*Tectaria crenata*
		Tectaria grandidentata
		Tectaria polymorpha
		Tectaria singaporeana
Thelypteridaceae	*Thelypteris*	*Thelypteris crassifolia*

The level of diversity in the Behrang Forest Reserve is low when compared to other areas in the state of Perak. For example, Mount Korbu has recorded 108 taxa of ferns [15]. This may be due to the level of humidity and the size of the area which affects the level of species diversity in a certain place. Among the most dominant ferns in the study area are *Tectaria singaporeana, Didymochlaena truncatula* and *Pleocnemia irregularis* which thrive in protected terrestrial areas. Most ferns of the genus *Diplazium* are also found in terrestrial areas. Meanwhile, the group of ferns that live in exposed areas that represent 31 % of the entire taxon of this study are *Blechnum finlaysonianum, Lindsaea scandens, Cyathea moluccana, Angiopteris angustifolia* (Figure 1) and *Taenitis blechnoides*. Unlike ferns in sheltered terrestrial areas, ferns in exposed terrestrial areas have a higher growth rate because they receive a lot of sunlight.

Fig. 1. *Angiopteris angustifolia*: A) Habit, B) Sorus on the lamina and C) Pulvinus

4. Conclusions

In conclusion, a total of 39 fern taxa belonging to 25 genera and 18 families have been recorded in the Behrang Reserved Forest, Tanjung Malim, Perak. This number represents 6.03 % of the 647 fern taxa reported in Peninsular Malaysia and 3.34 % of the 1,165 number of fern taxa recorded in Malaysia. The diversity of fern species in the study area has been successfully studied, and the data from this study can help researchers especially in the field of botany in the future. Comprehensive studies need to be continued in this area because there are still many areas in the Behrang Forest Reserve that have not been explored.

Acknowledgement

Special thanks to Forestry Department of Peninsular Malaysia for organising this expedition and Universiti Kebangsaan Malaysia (UKM) for giving opportunity for us to participate in this expedition.

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