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Orchids of UNIMAS: Diversity in a Developed Campus Landscape

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ABSTRACT

For the past three decades, various biotic components in Universiti Malaysia Sarawak (UNIMAS) natural habitats have been studied but less attention given to the largest family of flowering plants, the Orchidaceae. A preliminary survey in the campus areas has resulted in the discovery of more than ten species of orchids. Therefore, in this study more field samplings were conducted throughout the UNIMAS campus focusing on the developed areas to unveil the potential of UNIMAS-developed areas as a growth ground for orchids. To date, 37 orchid species have been recorded from these areas; mainly found on the planted trees at the roadside and landscaped areas surrounding the academic buildings, while the terrestrial species were found to inhabit different types of disturbed habitat. Among them, *Dendrobium pensile* was identified as a new record to Sarawak while *Dendrobium pseudostriatellum* and *Pinalia biglandulosa* were endemic to Borneo. This study provides an insight into the orchid resiliency towards habitat alteration, landscape phorophytes species that can host orchids, and management of species in a developed landscape.

Keywords: Biodiversity, Borneo, orchids, phorophyte, university ecosystem.

INTRODUCTION

Universiti Malaysia Sarawak (UNIMAS) is a young university (established in 1993) and currently still undergoing some landscape changes for the development of many facilities such as the examination hall and hospital. The campus was initially developed in a lowland area with several natural habitats - which are represented by kerangas forest, mangrove area, peat swamp forest and secondary forest. These natural areas have caught the interest of many researchers to study their various biological components (UNIMAS Institutional Repository, 2022). However, for the past three decades less attention has been given to the largest family of flowering plants, the Orchidaceae. Recent botanical surveys on the campus areas extended from the parking lots of the Faculty of Resource Science and Technology to the forest fringes by the roadside have resulted in the discovery of more than ten species of orchid from different genera. The presence of the orchids outside of UNIMAS natural habitats indicates that its developed landscapes to some extend are suitable for the orchid's growth thus more species are anticipated to be enumerated (Wolken *et al.*, 2001; Stipkova & Kindlmann, 2021). The recorded epiphytic orchids were observed to benefit from the planted trees as hosts while the terrestrials were found to adapt to several types of environments – of which some were acknowledged to be uncommon for orchids (Beaman *et al.*, 2001; Wood, 2014). The capability of the developed landscapes for orchid growth was also evidenced by the high number of individuals among the sighted orchids (McCormick & Jacquemyn, 2013). This situation can infer the orchid's adaptation in disturbed and altered habitats to ensure their survivability. Thus, it is important to assess the species diversity to unveil the potential of UNIMAS-developed areas as a growth ground for orchids. This finding will add information on the orchid's resiliency in disturbed habitats and the planted landscape trees capability as orchid phorophytes in the developed landscapes.

MATERIALS & METHODS

Field Sampling and Samples Collection

This study was conducted at UNIMAS, Samarahan Campus (1° 28' N, 110° 25' E) from

February of 2021 to April of 2023. Convenience sampling (Speak *et al.*, 2018) was employed in a developed landscape of UNIMAS consisting of the areas surrounded by the building complexes and along the paved roads located in the main and east campus (Figure 1). The sighted orchids were photographed and their respective habitats and phorophytes (for epiphytic orchids) were documented accordingly. Samples were collected and kept as living specimens in the Orchidarium of UNIMAS.

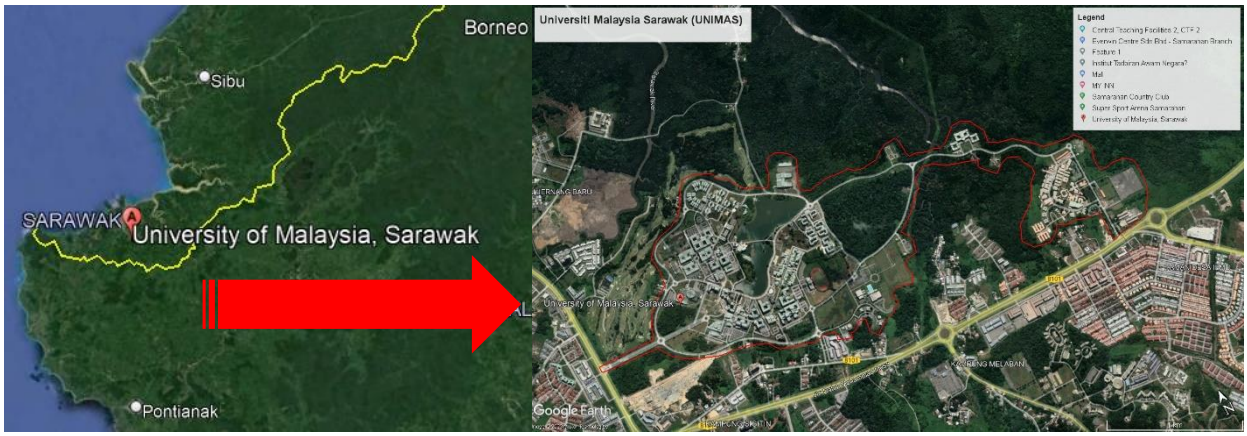

Figure 1. Location of Universiti Malaysia Sarawak (UNIMAS) indicating sampling sites (1° 27’ 34.79” N, 110° 26’ 23.39” E). Photo credit: Google Earth

Species Identification

The orchids’ taxonomic classification and distribution were determined using reliable sources such as Beaman *et al.* (2001), Wood (2014) and Plants of the World website: https://powo.science.kew.org/ (POWO, 2022). For the species that were not able to be identified up to species level (absence of flower), sp. will be denoted. Tree species that served as the phorophytes were identified based on the information provided by Boo *et al.*, (2006), Jabatan Landskap Negara (2008) and the National Parks of Singapore Flora & Fauna website : https://www.nparks.gov.sg/florafauna web/ (Nparks, 2022). The orchid's diversity was assessed *via* species richness where the number of the taxa in UNIMAS-developed campus landscapes was enumerated accordingly (Moore, 2013).

Orchids – Phorophyte Relationship

The analyses that were subjected to the individual counts were not included in this study due to the orchids' growing patterns that mostly documented growing in many clumps consisting of innumerable individuals with different growing phases and commonly found on the high point of host trees. Therefore, the relationships between epiphytic orchids and their phorophytes were analysed using the frequency of phorophytes (FP%) and orchids incidence (OI%). The analyses were adapted from Yulia and Budiharta (2011) with modifications as follows:

a. Frequency of phorophytes (FP%)

$$FP\% = \frac{\text{Number of phorophyte species (Np)}}{\text{Total number of phorophyte}} \times 100\% \quad \text{Eq.(1)}$$

b. Orchids incidences (OI%)

$$OI\% = \frac{\text{Number of incidences of epiphytic orchids (Ni)}}{\text{Total number of incidences}} \times 100\% \quad \text{Eq.(2)}$$

Subsequently, the zonation characteristics of the epiphytic orchids and the phorophyte were determined. For this investigation, a tree species with the highest incidences was chosen as the model phorophyte. The determination of the zonation of epiphytes on the host tree was adapted from Rasmussen and Rasmussen (2018) with a few modifications as follows: a) Zone I, the basal trunk (50 cm from ground), b) Zone II, the trunk (51 cm to primary branch), c) Zone III, basal part of the branch (primary branch to second branch), d) Zone IV, the middle part of the branch (second branch to third branch) and e) Zone V, the outer branch (third branch and its extension). While their respective numbers were enumerated based on the following categories: a) zero individuals b) small clump (1-10