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New Records of Terrestrial Pteridophytes in Genting Highlands, Pahang, Malaysia

Salifah Hasanah Ahmad Bedawi*, Rusea Go and Muskhazli Mustafa
Department of Biology, Faculty of Science, Universiti Putra Malaysia,
43400 UPM, Serdang, Selangor, Malaysia
**E-mail: sali_xoxo@yahoo.com*

ABSTRACT

Genting Highlands is the common name for a general area including a group of summits around Gunung Ulu Kali and their ridges. Located at the border between the State of Selangor to the west and Pahang to the east, the entire area was a virgin forest until 1967, when the roadwork was begun. To date, there have been fragmented reports in botanical studies in Genting Highlands. The previous works by Ridley, Holttum, Parris, Latiff and Piggott are lacking on studies, specially the ones focusing on pteridophytes in selected study sites. Fieldworks were conducted to assess the species list of terrestrial pteridophyes on April and September of 2005. From these expeditions, a total of 32 species of terrestrial pteridophytes were collected from two sites in Genting Highlands with 21 species being new records for the area. Two species namely, *Diplazium subintegrum* and *Taenitis dimorpha,* were found to be endemic to Peninsular Malaysia.

Keywords: Endemic, fern, fern-allies, Genting Highlands, pteridophytes

INTRODUCTION

Genting Highlands is a common name for the general area, including a group of summits around Gunung Ulu Kali and their ridges (Chua and Saw, 2001). It is located at the southernmost high mountain in the main range in Peninsular Malaysia and is situated only 30 km (in a direct line) from Kuala Lumpur (Stone, 1981). The range is also the border between the State of Selangor to the west and Pahang to the east. The summit of Genting Highlands is formed by Gunung Ulu Kali and it is the site of a hotel complex. Genting Highlands is located in Pahang, with ca. 3,596,400 ha in size, and only 1,523,252.41 ha or 42 percent of the land designated as the total permanent forest reserve (Table 1).

The vegetation and flora of the summit region of Genting Highlands consists of two vegetation types, the upper montane forest and elfin forest, with the transition between them (Stone, 1981). Meanwhile, the mountainous backbone is largely composed of granite (Whitmore and Burnham, 1969), the soil in the upper montane is peaty gley podzols with thin iron pan, and spread with a blanket of peat near the summit (Whitmore and Burnham, 1969), which is always associated with acidic peat with pH 3.3-3.6 (Burgess, 1969).

The scientific study of pteridophytes in Malaysia dated back since the early 1900s. There were many botanists collecting and enumerating pteridophytes in Malaysia including Ridley, Holttum, Stone, Piggot, Bidin and Latiff. Ridley

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*Corresponding Author

TABLE 1
Permanent forest reserves of Pahang, Malaysia

Forest district	Area (ha) in 31st December 2003
Kuantan/ Pekan/ Maran	240,942.68
Rompin	195,381.39
Temerloh/ Bera	154,539.00
Jerantut	387,917.00
Lipis	257,273.15
Bentong	99,112.24
Raub/ Cameron Highlands	188,086.95
Total	1,523,252.41

Source: Pahang Department of Forestry (http://forestry.pahang.gov.my/web/info_status.htm.)

(1926) in his book *Ferns of Malaya* enumerated 420 species of terrestrial pteridophytes in Peninsular Malaysia. Later in 1954, Holttum reported that there were 480 species of ferns, while Turner (1995) listed 616 species of ferns and 63 species of fern-allies in Peninsular Malaysia. The latest and most comprehensive species list of pteridophytes in Malaysia was reported by Parris and Latiff (1997), which was published in *The Malayan Nature Journal*. They brought together the information compiled from herbarium specimens and numerous publications including the references cited above. As a result, a provisional list of 1,165 Malaysian pteridophytes species has been compiled, 647 of which occur in Peninsular Malaysia, 750 in Sabah and 615 in Sarawak.

Considering a substantial gap between 1997 and the present, the composition of pteridophytes might have increased or perhaps decreased in time. Thus, the latest assessment is much needed. To date, there are fragmented reports in botanical studies on biodiversities in Genting Highlands. There are records of species done by Ridley, Holttum, Parris, Latiff and Piggott, but their works covered wide areas and do not specifically focus on pteridophytes. Therefore, there is no species list for pteridophytes in the study sites. With all the above inadequacy on the botanical information and documentation, this study was hence aimed to: (1) study the diversity of terrestrial pteridophytes in the four selected trails in Genting Highlands and (2) prepare a preliminary checklist of the terrestrial pteridophytes for the selected trails.

METHODOLOGY

Collection was done twice; on 24-25 April 2005 and 17 September 2005. The first collection covered two trails along a waterfall and a river near Genting View Resort (cited later as site A). The second trip covered two trails (*Fig. 1*) in an uphill jungle track and Gunung Bunga Buah old road from Goh Tong Jaya (cited later as site B), as shown in *Fig. 1*. Only specimens, which were structurally complete with rhizome, stalk, frond and sori, were collected. The plant specimens were cut using a pair of scateurs, put into plastic bags and secured with plastic rope before transferring them to the laboratory.

The specimens collected were cleaned immediately by draining them in tap water to remove all the dirt and dust. The methodology employed next for preservation, drying, pressing and mounting of specimen was described by Jain and Rao (1977). All the specimens placed on mounting paper were labelled and deposited in the herbarium of Department of Biology, Faculty of Science, Universiti Putra Malaysia (UPM).

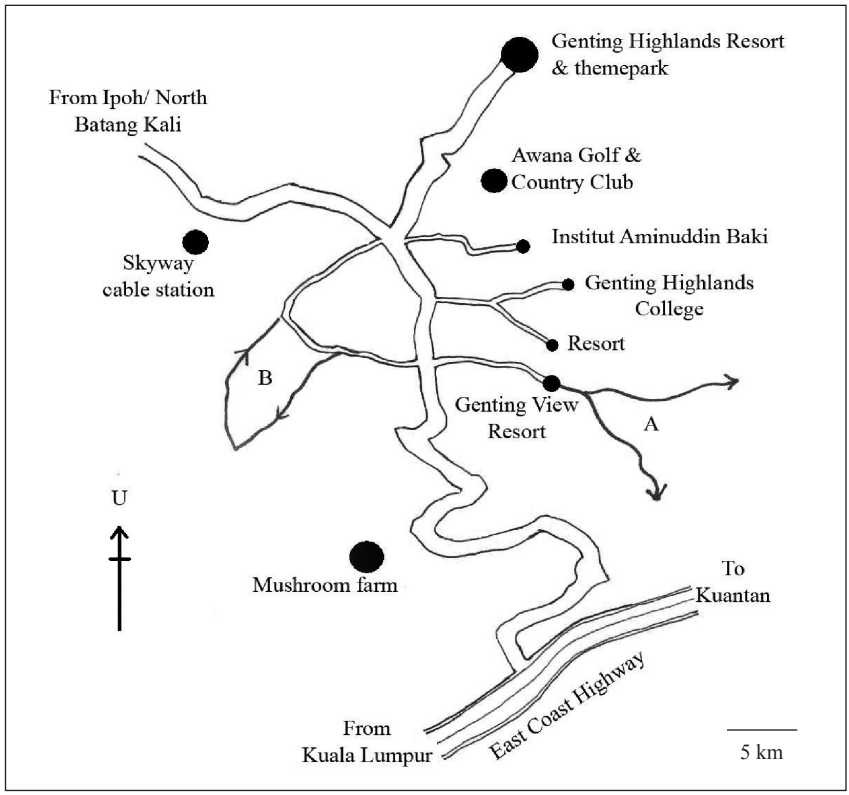

Fig. 1: Map of Genting Highlands, Pahang, Malaysia, showing the study sites A and B

RESULTS AND DISCUSSION

Thirty-two species of terrestrial pteridophytes from twelve families and twenty three genera were collected from two sites in Genting Highlands (Table 2). Out of this number, 21 species (65.6%) were identified as the new records for Genting Highlands. Among the 12 families, nine were true fern families namely *Adiantaceae, Dennstaedtiaceae, Dryopteridaceae, Gleicheniaceae, Marattiaceae, Nephrolepidaceae, Pteridaceae, Thelypteridaceae, Woodsiaceae*, three others were fern-allies namely *Equisetaceae*, *Lycopodiaceae* and *Selaginellaceae*.

The list of species found in Genting Highlands during this research showed relatively higher differences in the number between true ferns species (26) and fern-allies species (6). The family *Thelypteridaceae* has the most number of genera (5 spp.). Out of 32 species of terrestrial pteridophytes collected, two were endemic species to Peninsular Malaysia, namely *Taenitis dimorpha* and *Diplazium subintegrum.*

Some literature reviewed in this paper was taken from the studies conducted at Gunung Ulu Kali, considering the obvious flora accounts that are substantially the same. The new records of the terrestrial pteridophytess represent a large portion of the findings (65.6%). This new record was found by comparing the species list during this study and the species list by Piggott (1977) in Gunung Ulu Kali. These new species were probably introduced to the study site vegetation by the development during the course of time. Many new infrastructures and facilities were built around the study sites to enhance the structure of the soil around, such as roadside verges, drains, granite walls, and many road cuttings and small

TABLE 2
List of the pteridophytes species collected in trails 1 and 2

Family	Species
Adiantaceae	*Pityrogramma calomelanos* (L.) Link[b] *Taenitis dimorpha Holtt.* *, **, [b]
Dennstaedtiace	*Histiopteris stipulacea* (Hook.) Copel. [b] *Lindsaya parasitica* (Roxb. ex Griff.) Hieron. *, [a] *Odontosoria chinensis* (L.) J. Sm. var. *divaricata* (Christ.) Kramer[a, b] *Tapeinidium pinnatum* (Cav.) C. Chr. var. *pinnatum**, [b]
Dryopteridaceae	*Didymochlaena truncatula* (Sw.) J. Sm. *, [a] *Pleocnemia irregularis* (C. Presl) Holtt. *, [a] *Tectaria crenata* Cav. *, [a]
Equisetaceae	*Equisetum ramosissimum* Desf. ssp. *debile* (Roxb.) Hauke[b]
Gleicheniaceae	*Dicranopteris linearis* (Burm.) var. *linearis*[a] *Dicranopteris linearis* (Burm.) var. *montana*[a, b] *Sticherus truncatus* (Willd.) Nakai var. *truncatus*[a]
Lycopodiaceae	*Lycopodiella cernua* (L) Pic. Serm. [b]
Marattiaceae	*Angiopteris evecta* (G. Forst.) Hoffm. *, [a, b]
Oleandraceae	*Nephrolepis auriculata* (L.) Trimen*, [a] *Nephrolepis dicksonioides* Christ. *, [b]
Pteridaceae	*Pteris longipinulla* Wall ex Agardh[a] *Pteris tripartita* Sw. [a]
Selaginellaceae	*Selaginella plana* (Desv.) Hieron[a] *Selaginella ornata* (Hook. & Grev.) Spring[a] *Selaginella stipulata* (Blume) Spring[a] *Selaginella wildernowii* (Desv.) Bak.[b]
Thelypteridaceae	*Christella parasitica* (L.) Lev. *, [a] *Mesophlebium motleyanum* (Hook.) Holtt. *, [b] *Pronephrium rubicundum* (v.A.v.R) Holtt. *, [a, b] *Sphaerostephanos penniger* (Hook.) Holtt. *, [a, b] *Trigonospora ciliata* (Benth.) Holtt. *, [a]
Wooodsiaceae	*Diplazium accedens* Bl.[a] *Diplazium cordifolium* Bl. *, [a] *Diplazium subintegrum* Holtt.**, [b] *Diplazium tomentosum* Bl.[b]

* New record (in comparison with Piggott, 1977; Piggott, 1981)
** Endemic to Peninsular Malaysia
a = Species collected from site A (Genting View Resort)
b = Species collected from site B (Gunung Bunga Buah)

clearings were made (Piggott, 1981). These new constructions provide a new habitat to certain plant growth. For example *Nephrolepis dicksonioides* was not listed by Piggott (1977), but was found to occupy a small clearing along the road verges in Goh Tong Town.

A comparison between the availability of the pteridophytess species in this study was made to previous accounts by Piggott (1977; 1981) and Turner (1995). According to Piggott (1977; 1981), there were 128 species of pteridophytes in Gunung Ulu Kali. Sixty-three species were

Fig. 2: Several endemic and new records of the pteridophytes species collected from Genting Highlands. Photos by Joannus Unggang and the authors. I.* Didymochlaena truncatula. *II.* Sticherus truncatus. *III.* Diplazium subintegrum* *IV.* Equisetum ramosissimum. *V.* Odontosoria chinensis. *VI.* Taenitis dimorpha*

terrestrial pteridophytes, while 65 species were either epiphytic or litophytic. From 63 species of terrestrial pteridophytes, a total of 12 (19%) species were found during this study, while 51 other species (80.5%) were not found from the study sites. Thirty-one species of the terrestrial pteridophytes were found when compared to the species list prepared by Turner (1995). This might be because the area covered for Turner's list was wider (covering the whole state of Pahang) than the area assessed by Piggott (12 locations in the forest fragments on Gunung Ulu Kali). Certain names of species listed by Turner were new and changed from the old and out-dated names used by Holttum (1968) or Piggott (1988).

CONCLUSION

The notable finding of this study was the comparatively high percentage of the new records collected as compared to the past 25 years (65.6%). Considering the small areas assessed, this number is high, implying a drastic change in both the vegetation and flora of the area. For the record, the study sites only covered two small areas in Genting Highlands, i.e. around ca. 16-18 km^2. Thus, there were possibilities that many more species could be recorded if the area explored was expanded. Therefore, further detailed studies must be carried out to cover the vast and deeper area of the forest so as to provide a more complete and comprehensive species list. From the authors' observations, much of Genting Highlands area has been affected by human activities and no longer retains its full original biodiversity. The result of this study revealed that a big proportion (80.5%) of the pteridophytes recorded previously by Piggott was no longer found. This number implies how certain species may disappear from their habitat in the name of development. Development in rainforests has a global impact through species extinction, habitat destruction, the loss of important ecosystem services and renewable resources, as well as the introduction of alien

species and pathogens. Beyond the responsible development of the rainforests, efforts to rehabilitate and restore degraded forest lands, along with the establishment of protected areas, are key to securing rainforests for the long-term benefits they can provide to mankind.

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