

Additions to the Fern Flora of the Trus Madi Range, Sabah, Malaysia

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ABSTRACT.

This paper reports the addition of seven species of ferns to the flora of the Trus Madi Range. *Leptochilus* cf. *decurrens* Bl. is reported as new to Sabah. These new records are among the 72 species of ferns collected during an ecological study at the northwestern part of Mount Trus Madi in the Tambunan District. With these additions, the number of ferns recorded in the Trus Madi Range stands at 179 species in 76 genera and 23 families.

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Introduction

The Trus Madi Range is one of the major mountain ranges in Sabah, Malaysian Borneo. This range is approximately 80 km in length and it extends primarily through the districts of Ranau and Keningau. It consists of five major forest zones, i.e., the summit scrub zone (2500 – 2640 m a.s.l.), upper montane zone (2000 – 2500 m a.s.l.), lower montane zone (1500 – 2000 m a.s.l.), upland mixed dipterocarp zone (600 – 1499 m a.s.l.) and lowland mixed dipterocarp zone (up to 599 m a.s.l.).

The Trus Madi Range constitutes a vital water catchment area for numerous water bodies such as the Liwagu, Labuk, Pegalan and Kinabatangan rivers. The largest catchment area (approximately 513 km²) is the headwaters of the Pegalan River where a number of tributaries, which includes the Ambual, Kaingaran, Keinop, Linsudon, Mailo, Monsok, Sembuan, Sungei and Sook, flow in a westerly direction and eventually into the South China Sea. The smallest catchment covers an area of 85 km² and is irrigated by several tributaries of Sungai Liwagu eastward and finally channels into the Sulu Sea.

The first preliminary checklist of ferns from the Trus Madi Range was published by Adam & Muhammad (1989). They managed to report the presence of 39 genera of ferns comprising of 72 species, collected within 300 to 1400 m a.s.l. However, most of the ferns documented by Adam & Muhammad (1989) were collected from disturbed habitats in close proximity to local villages, for example Kuala Monsok, Kionop, Nandal, Tathoh, Mompisas and Sinua vilages, and the surrounding areas of Mile 8.

Subsequently, several authors have made significant updates to the fern flora of Mount Trus Madi, the highest peak along the Trus Madi Range (Andi *et al.*, 2011; Kulip & Lapongan, 2011; Sugau, 2011; Sugau & Andi, 2014). More importantly, these updates included many species from less disturbed and more pristine habitats, especially at higher elevation. Based on the compilation of previous records, the total number of ferns in the Trus Madi Range stands at 172 species in 75 genera and 23 families.

Materials and methods

An ecological study was conducted from April 2015 to September 2015 at the northwestern region of Mount Trus Madi. A total of 15 square plots of 400 m² were established at five elevational sampling sites (1000, 1400, 1800, 2200 and 2600 m a.s.l.). Three elevational sampling sites (1800, 2200 and 2600 m a.s.l.) were adjacent to the Kaingaran Trail, while the other two were approximately one hour trek away from the old main logging road. Forest conditions of the plots varied from less disturbed to pristine. Specimens of ferns were collected from all the plots. In additions, some specimens were randomly collected outside the plots or along the Kaingaran Trail.

Voucher specimens were deposited at the BORNEENSIS Herbarium (BORH) of the Institute for Tropical Biology Conservation, Universiti Malaysia Sabah and a set of duplicates was sent to the Herbarium of the Sabah Forestry Department (SAN). Family delimitation followed that of Christenhusz *et al.* (2011) and Rothfels *et al.* (2012) via WORLD FERNS: Checklist of Ferns and Lycophytes of the World (www.worldplants.webarchiv.kit.edu/ferns).

Results and discussion

Among the 72 species of ferns collected during this study, seven species in six genera and six families were new records for the Trus Madi Range (Appendix 1). Most of the species were terrestrial except for members of the family Hymenophyllaceae. These two filmy epiphytes, *Hymenophyllum nitidulum* and *H. productum*, were restricted to higher elevation (≥ 1600 m a.s.l.) of Mount Trus Madi. *Hymenophyllum nitidulum* is particularly minute and easily overlooked since it prefers to grow on fully shaded branches. The Trus Madi Range is the second locality for this species in Sabah (Said, 2005).

Another species documented in this study was *Mesophlebion dulitense* which was originally discovered on Mount Dulit, Sarawak. This species is endemic to Borneo and has been reported in the Kinabalu Park (Beaman & Edwards, 2007) and the Crocker Range Park (Parris, 1997a) in Sabah. In the Trus Madi Range, members of this species were found in pristine pockets of forested area, about one kilometer away from the Kaingaran Trail.

Among the seven new records, two species were encountered only once during this study and thus are considered as rare for the Trus Madi Range, namely *Diplazium poiense* and *Lindsaea oblancoolata*. *Diplazium poiense* is also an endemic to Borneo. The other five species were encountered several times at different elevations but were less abundant compared to other common ferns found in the study area, such as *Hymenophyllum acanthoides* and *Diplazium riparium*. Another

noteworthy species, *Leptochilus cf. decurrens* is a new record for Sabah (Said, 2005; GBIF, 2015). This species is previously reported from Kalimantan, thus its occurrence in Sabah is expected (IUCN, 2013). It has been assessed by IUCN (2013) and classified as a species of Least Concern.

With these new records, the current documented number of ferns of the Trus Madi Range is 179 species in 76 genera and 23 families. Undeniably, this figure bears a stark contrast to the fern flora of the Kinabalu Park with 590 taxa (Beaman & Edwards, 2007). The high richness of ferns recorded in the Kinabalu Park could be due to a more comprehensive fern collection conducted since 1851 as well as its wider range of habitats which includes ultramafic and subalpine scrub zones, both of which are able to support numerous species of ferns. Despite that, the richness of fern species of the Trus Madi Range is higher than that of the Crocker Range Park with 158 taxa (Parris, 1997a), Imbak Canyon Conservation Area with 111 taxa (Shim *et al.*, 2011) and Tawau Hills Park with 83 taxa (Bidin & Jaman, 1999).

Conclusion

The relatively small area surveyed in this study has discovered seven new records of ferns of the Trus Madi Range with one new record for Sabah. This finding demonstrates that there is still incomplete knowledge of the fern richness of this huge area which has diverse habitats. Thus, more explorations are needed in order to ascertain the richness and diversity of ferns throughout this range.

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APPENDIX 1: New records of ferns for the Trus Madi Range.

The following is a list of ferns reported for the first time for the Trus Madi Range. It is arranged alphabetically according to families.

ATHYRIACEAE

Diplazium poiense C.Chr. (Figure 1)

Habit: Terrestrial. Found in upland mixed dipterocarp forest at 1500 m a.s.l. and close to the main old logging road, *M.A.F. Suis & F. Anthony 045*. Light to deep shaded.

Coordinates: N 05.57457°, E 116.47806°.

Other localities in Sabah: Kinabalu Park (Parris *et al.*, 1992); Crocker Range Park (Parris, 1997a).



Figure 1: *Diplazium poiense*

DENNSTAEDTIACEAE

Dennstaedtia ampla (Bak.) Bedd.

Synonym: *Dicksonia ampla* Bak. **Habit:** Terrestrial. Found in lower montane forest at 1600 - 1800 m a.s.l., *M.A.F. Suis & F. Anthony 030, 042*. Light to deep shaded. **Coordinates:** N 05.56665°, E 116.48883°. **Other localities in Sabah:** Penampang (Tagawa, 1974); Kinabalu Park (Beaman & Edwards, 2007).

HYMENOPHYLLACEAE

Hymenophyllum nitidulum (v.d.Bosch)
Ebihara & K.Iwats. (Figure 2)

Synonym: *Microtrichomanes nitidulum* (v.d.Bosch) Copel.; *Trichomanes nitidulum* (v.d.Bosch). **Habit:** Epiphyte. Found on tree trunks and branches at 1600 – 2600 m a.s.l., *M.A.F. Suis & F. Anthony 061, 079*. Deep shaded. **Coordinates:** N 05.55796°, E 116.50063°. **Other locality in Sabah:** Kinabalu Park (Gibbs, 1914; Parris *et al.*, 1992).



Figure 2: *Hymenophyllum nitidulum*

***Hymenophyllum productum* Kze.**

Synonym: *Mecodium productum* (Kunze) Copel. **Habit:** Epiphyte. Found on tree trunks and branches in montane forest at 1700 – 2200 m a.s.l., *M.A.F. Suis & F. Anthony 051, 067*. Deep shaded.

Coordinates: N 05.55755°, E 116.50021°. **Other localities in Sabah:** Kinabalu Park (Parris *et al.*, 1992); Crocker Range Park (Parris, 1997a).

LINDSAEACEAE***Lindsaea oblanceolata* Alderw. (Figure 3)**

Habit: Terrestrial. Found in lower montane forest at 1800 m a.s.l., *M.A.F. Suis & F. Anthony 028*. Light to deep shaded.

Coordinates: N 05.56665°, E 116.48883°. **Other localities in Sabah:** Kinabalu Park (Parris *et al.*, 1992); Crocker Range Park (Parris, 1997a); Imbak Canyon (Shim *et al.*, 2011); Maliau Basin (Hazebroek *et al.*, 2004).



Figure 3: *Lindsaea oblanceolata*

POLYPODIACEAE***Leptochilus cf. decurrens* Bl. (Figure 4)**

Synonym: *Acrostichum lanceolatum* Hook.; *Leptochilus lanceolatus* Fee. **Habit:** Terrestrial. Found in upland mixed dipterocarp forest at 1000 - 1400 m a.s.l., *M.A.F. Suis & F. Anthony 005, 037*. Light to deep shaded. **Coordinates:** N 05.59302°, E 116.44770°. **New to Sabah.**



Figure 4: *Leptochilus cf. decurrens*

This species is characterized by creeping rhizome with diameter of 10 – 13 mm. The fronds are 0.6 – 2.1 cm apart, entire and its midrib raised on both surfaces. The specimens have the characteristics of *L. decurrens* but its identity could not be verified due to the absence of fertile fronds.

THELYPTERIDACEAE***Mesophlebion dulitense* Holtt.**

Synonym: *Cyclosorus dulitensis* (Holttum) Mazumdar & Mukhop. **Habit:** Terrestrial. Found in upland mixed dipterocarp forest at 1000 – 1400 m a.s.l., *M.A.F. Suis & F. Anthony 049, 052*. Light to deep shaded. **Coordinates:** N 05.59302°, E 116.44770°. **Other localities in Sabah:** Kinabalu Park (Parris *et al.*, 1992); Crocker Range Park (Parris, 1997a).