

Short Note

Noteworthy Fern Records from Sabah, Malaysian Borneo: The Discovery of *Oreogrammitis yoderi* (Polypodiaceae)

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The genus *Oreogrammitis* Copel. (Polypodiaceae: Grammitidoideae) comprises small to medium-sized epiphytic ferns mainly distributed across tropical Asia and the Pacific (Parris, 1990; Hassler, 1994–2025). It was described by Edwin B. Copeland in 1917 for *O. clemensiae*, collected by Mary Clemens on Mount Kinabalu, Sabah, in 1915. Copeland distinguished the genus by its fused sori, superficial sporangia, filamentous stipes, and conspicuously scaly rhizomes.

Parris (1980, 1983) subsequently reduced *Oreogrammitis* to synonymy with *Grammitis* after observing that specimens from the type locality displayed varying degrees of soral fusion, rendering the genus indistinct based on sorus morphology. Later studies revealed that *Grammitis* sensu lato was an artificial assemblage (Parris, 1997, 1998; Ranker et al., 2004). Consequently, *Grammitis* sensu stricto was restricted to black-margined species such as *G. marginella*, while *Oreogrammitis* was reinstated by Parris (2007) for species possessing dorsiventral rhizomes and setose sporangia. Concurrently, *Radiogrammitis* was established for species with radial rhizomes, and *Themelium* for bipinnatifid to bipinnate grammitids characterised by dorsiventral rhizomes, glabrous clathrate scales, free veins, and round, non-immersed sori (Parris, 1997, 2004, 2010).

Phylogenetic analysis by Sundue et al. (2014) demonstrated that *Oreogrammitis* is polyphyletic and nested in three places within *Radiogrammitis*, and *Themelium* is nested within a clade containing polyphyletic *Oreogrammitis* and *Radiogrammitis*. Subsequent studies by Bauret et al. (2017) and Sirimalwatta (2019) largely support these findings (Parris & Sundue, 2020). However, as the type species of the genus, *O. clemensiae*, has not yet been sequenced, further taxonomic changes could be possible.

Oreogrammitis is currently defined (Parris & Sundue, 2020; Yang et al., 2023) as follows: rhizomes dorsiventral, with stipes arranged in two rows, sometimes articulated to phyllopodia,

or radial, with stipes in whorls. Rhizome scales concolorous or clathrate, glabrous or occasionally bearing a small apical gland, or sometimes absent. Laminae entire to bipinnate, not dimorphic; veins in pinnae or primary lobes always branched, not simple; margins without marginal vein or dark sclerotic border; sori on abaxial surface of lamina, superficial or sunken in depressions or pits in lamina, not marginal, not (or very rarely) coenosoroid, not sunken in grooves, not protected by pouches in lamina nor by folded pinnae; glandular receptacular paraphyses, if present, without rough, sticky or waxy deposit; sporangial usually with setae at apex of sporangium adjacent to annulus but not on it, setae contiguous at base, if more than one present on a sporangial face, or sporangia sometimes glabrous; if sporangia glabrous and rhizome scales present, then setae almost always present on stipe and/or lamina (if setae absent then lamina entire), all other hairs, if present unbranched.

The genus *Oreogrammitis* is particularly species-rich in Borneo, with 42 species listed by Hassler (1994–2025), many confined to montane and submontane forests. Extensive taxonomic studies by Parris (1997, 1998, 2007), Parris and Sundue (2020), and Parris et al. (1992) have thoroughly documented this diversity, significantly enhancing the understanding and classification of grammitid ferns in Malesia. The exceptional richness of the genus in Borneo likely reflects the island's wide elevational range, high rainfall, and largely intact montane habitats that provide optimal conditions for epiphytic ferns.

Previously, Andi et al. (2022) reported 41 *Oreogrammitis* species in Sabah; however, three have now been reassigned to different genera, resulting in 38 acknowledged species. A specimen collected by H. Winkler in 1924 from Bukit Raja, Kalimantan, and identified as *Polypodium yoderi* (Christensen, 1928), serves as the earliest known record of *O. yoderi* in Borneo, although it was omitted from earlier checklists. The recent discovery of *O. yoderi* on Mount Sinsing, Sabah, represents the first confirmed record from Malaysian Borneo and the second from the island, elucidating its morphology and extending its known distribution. The voucher specimen was deposited in the Sandakan Herbarium (SAN), with duplicate vouchers distributed to the Sabah Parks Herbarium (SNP) and the BORNEENSIS Herbarium (BORH).

Oreogrammitis yoderi (Copel.) Parris & Sundue, *Phytotaxa* 436(1): 50 (2020)

Type: PHILIPPINES. Panay, Mount Madias, Apr 1905, *Yoder s.n.* (lectotype MICH!, designated by Parris 1997).

Homotypic synonyms: *Polypodium yoderi* Copel., *Philipp. J. Sci.* 1, Suppl. 2: 161 (1906); *Ctenopteris yoderi* (Copel.) Copel., *Ann. Cryptog. Phytopathol.* 5: 219 (1947).; *Themelium yoderi* (Copel.) Parris, *Kew Bull.* 52(3): 739 (1997).; *Grammitis yoderi* (Copel.) Christenh., *Global Fl.* 4: 50 (2018).

Heterotypic synonym: *Polypodium tamiense* Brause, *Bot. Jahrb. Syst.* 49: 43 (1912). Type. Papua New Guinea. West Sepik, 1600 m, Schultze (33) 61 (B!), lectotype designated by Parris (1997).

Specimen examined. Malaysian Borneo. Sabah: Mount Sinsing, Trusmadi range, 05.617011 N, 116.553808 E, 2,400 m, 18 May 2023, *MAM Andi 2236*, Accession No. 134900 (SAN); previously cited as *Oreogrammitis* sp. (Andi et al., 2024). Fig. 2.

Description. Stipe woody, ca. 2 cm long, bearing scattered, dark reddish setae to 2 mm long, becoming glabrescent towards the base; articulation with the rhizome absent. Frond 8–20 cm long, lanceolate in outline, bipinnate; rachis setose. Rhizome filiform, slender, sparsely clothed with lanceolate-ovate, brown, clathrate scales. Pinnae ascending, ca. 5 mm wide, contiguous; pinna rachis winged. Sterile pinnules very narrow, scarcely 0.25 mm wide at the base, slightly

broader upwards (0.3–)0.4–0.6(–1.0) mm wide and narrowly elliptic, narrowly oblanceolate, or linear-oblanceolate, typically bearing a solitary terminal seta. Fertile pinnules spatulate, bearing a single sorus situated in the upper portion of the pinnule.

Taxonomic notes. This species is morphologically distinct from all other *Oreogrammitis* species known from Borneo. *Oreogrammitis yoderi* resembles *O. taxodioides* (Alderw.) Parris in its bipinnate fronds, ascending pinnae with winged rachises, and montane epiphytic habit. Both species possess slender, filiform rhizomes without articulation to the stipe, a feature typical of several epiphytic Bornean congeners. However, *O. yoderi* differs in the width and shape of its longest sterile lobes: (0.3–)0.4–0.6(–1.0) mm wide and narrowly elliptic to oblanceolate, compared with the narrower (0.2–0.4 mm) linear lobes in *O. taxodioides*.

Distribution. The species occurs in the Philippines, Moluccas (Seram), New Guinea (Irian Jaya, Papua New Guinea), the Solomon Islands, and Borneo (Fig. 1). Within Borneo, it was first collected in Kalimantan in 1924, and newly discovered in Sabah, Malaysian Borneo, during the Heart of Borneo Scientific Expedition organised by the Sabah Forestry Department (15–19 May 2023).

Habitat. Epiphytes on mossy exposed tree roots in upper montane forest at ~2,400 m elevation. It inhabits cloud forest environments under cool, humid, and shaded conditions.

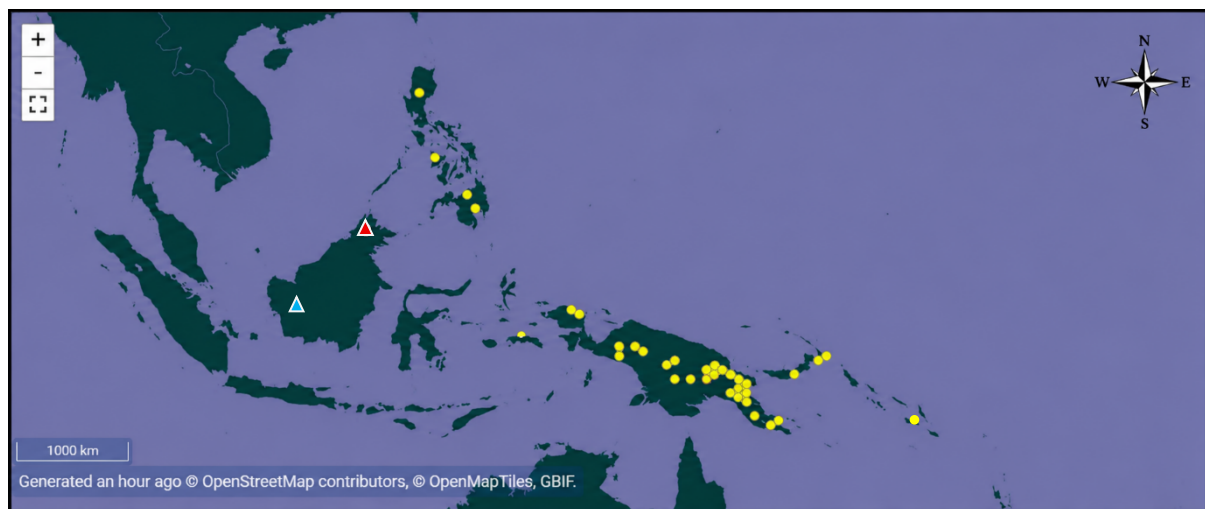


Figure 1: Updated distribution of *Oreogrammitis yoderi* (Copel.) Parris & Sundue. Yellow circles indicate previously known occurrence records based on GBIF Secretariat (2023), whereas triangles represent records from Borneo documented in the present study. Blue triangle denotes previously omitted record from Kalimantan, while red triangle indicates the newly discovered record from Mt. Sinsing, Sabah.

IUCN Red List Assessment (Regional). This species is currently known from only two localities in Borneo: Bukit Raja, Kalimantan (1924) and Mount Sinsing, Sabah (2023). The Area of Occupancy (AOO) is estimated at 8 km² (2 km grid). Despite the lack of population trend data, its highly restricted distribution and limited number of known locations justify assessment as Vulnerable under Criterion D2. There has been no reduction in population size or habitat extent, and the Sabah population occurs within a Totally Protected Forest Reserve, providing strong protection against habitat loss and degradation. Nevertheless, given that there are just two confirmed locations on Borneo and no recent verification of its persistence in

Kalimantan, the species remains vulnerable to stochastic events and localised threats that could rapidly impact its small range. It is consequently assessed as **Vulnerable (VU D2)** in Borneo.



Figure 2: *Oreogrammitis yoderi* (Copel.) Parris & Sundue - Voucher *MAM Andi 2236* (SAN) - **A.** Habit and microhabitat. **B.** Bipinnate lamina with linear-lanceolate segments. **C.** Pinnule detail showing hydathodes.

In conclusion, the identification of *Oreogrammitis yoderi* on Mount Sinsing marks the first verified record from Sabah and the second from Borneo since 1924. This discovery expands the species' known range beyond the Philippines, Moluccas, New Guinea, and the Solomon Islands, increasing the number of *Oreogrammitis* species recorded in Borneo to 44, with 39 known from Sabah (Appendix 1). Due to its extremely limited distribution and confirmation from only two Bornean localities, *O. yoderi* is assessed as Vulnerable (VU D2). Despite the Sabah population occurring within a protected forest reserve, the species' narrow range highlights its susceptibility to stochastic events and reinforces the importance of continued botanical exploration and taxonomic study in the montane forests of Borneo.

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DECLARATIONS

Research permit(s). Not applicable.

Ethical approval/statement. Not applicable.

Generative AI use. We declare that generative AI was not used in this study nor in the writing of this article.

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Supplementary material

Appendix

Authors: Andi et al.

Data Type: PDF

Explanation note: An updated checklist of *Oreogrammitis* species for Borneo and their distribution across the Bornean region (Andi et al. 2022, 2024; Hassler, 1994–2025; Cicuzza et al., 2025*).

Symbols indicated: # Endemic to Borneo; ##SAB Endemic to Sabah; ### Endemic to Sabah and confined to Mt. Kinabalu; ##SAR Endemic to Sarawak; ##BRUN Endemic to Brunei; + New record for Borneo; BRUN – Brunei; KAL – Kalimantan; SAB – Sabah; SAR – Sarawak.

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