

Mitrastemonaceae: A New Family Record for the Philippines

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Mitrastemonaceae is represented by a sole genus – *Mitrastemon* – with only two known species worldwide, which parasitize on roots of many trees. This paper reports the discovery of *Mitrastemon yamamotoi* from Mt. Malambo, Mindanao, Philippines. Mitrastemonaceae is revealed to be a new family record for the Philippines. Added to its taxonomic description, its habitat characterization, phenology, conservation status, and implications are also discussed.

Key words: Mindanao, *Mitrastemon yamamotoi*, Mt. Malambo, Philippines, root parasite

INTRODUCTION

Mitrastemonaceae contains only one genus, *Mitrastemon*, a non-photosynthetic plant parasitic on the roots of many tree species (Rutherford 1970, Rao & Balakrishnan 1972) and is amphipacific in distribution (Meijer & Veldkamp 1993). The family is represented with only two species worldwide – *Mitrastemon matudae* Yamam. found in Central America and *M. yamamotoi* Makino found in tropical and subtropical Asia (Meijer & Veldkamp 1993).

Meijer and Veldkamp (1993) considered the genus *Mitrastemon* under Rafflesiaceae, banking on the works of Hayata (1913) and Watanabe (1933a–b, 1934a–d, 1935a–b, 1936a–d, 1937a–b). However, despite these investigations, the precise taxonomic position of the genus is still not clear. Recent work considered the taxa in separate family Mitrastemonaceae (Mir *et al.* 2016). The latter classification is adopted in this work.

Mitrastemon yamamotoi is transpacific in distribution. The plant is reported in India, Thailand, Cambodia, Vietnam, China, Japan, Taiwan, Sumatra, Borneo, and Papua New Guinea (Rao & Balakrishnan 1972, Meijer & Veldkamp

1993), but has not been reported in the Philippines.

We report herein *Mitrastemonaceae*, a new family record with its species *Mitrastemon yamamotoi* for the Philippines. Added to its taxonomic description, its habitat characterization, phenology, conservation status, and implications are also discussed.

MATERIALS AND METHODS

Fieldworks were conducted in Mt. Malambo, Marilog Forest Reserve, Davao City, Mindanao, Philippines on 24–25 Mar 2018, 7–12 May 2018, and 23–28 Jul 2018 (Figure 1). All data and dimensions were either collected in the field from live plants or from the respective herbarium type cited in this manuscript. Herbarium specimens were processed following conventional herbarium techniques and a spirit collection was also prepared. The Marilog Forest Reserve was explored after securing a Wildlife Gratuitous Permit from the Department of Environment and Natural Resources (DENR), in accordance with the DENR streamlining/procedural guidelines (DAO No. 2004–55), in order to collect herbarium specimens for taxonomic purposes.

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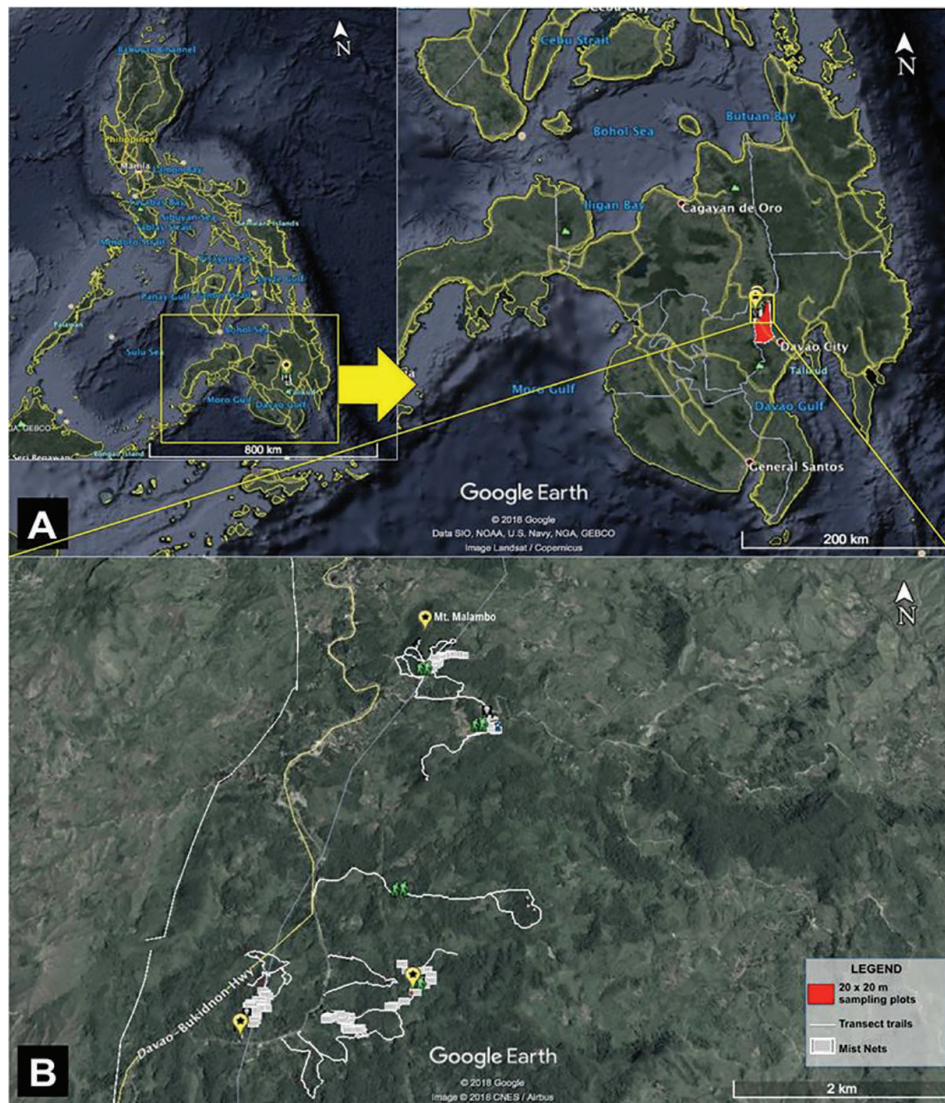


Figure 1. Mt. Malambo, Marilog District, Mindanao, Philippines – A) Philippines (inset); B) Mt. Malambo (upper quadrant) and other forest patches (lower quadrant) in the Marilog District explored by the study (©2018 Google, image ©2018 CNES/Airbus).

The identification was done using relevant literature *e.g.*, digitized plant specimens available in Global Plants on JSTOR. Photographs were made from representative plant specimens. Stereomicroscopy (Figure 3D–G) was done to examine dissections made from the plant.

TAXONOMIC TREATMENT

***Mitrastemon yamamotoi* Makino, Bot. Mag. (Tokyo) 23: 326. 1909 [“*Mitrastemma*”]**

Parasitic on host roots, herbaceous, bisexual, protandrous, all parts off-white becoming dark brown upon maturity,

erect, cylindrical up to 6.5 cm from fusion with host root to reproductive structures. *Cupule* 1.1–1.5 cm in diameter, subterranean, yellow green to reddish brown, subspherical to cylindrical, occurring singly, sometimes two flowers; from one cupule (Figure 2F). *Aerial stems* erect, soft, fleshy, white or pale yellow, vascular bundle up to 1 cm in diameter. *Bracts* persistent, sessile, simple, smooth, waxy, white becoming dark brown or black towards the apex, up to seven pairs, decussately opposite, margin entire, apex obtuse, base broad, ovate, ovate-oblong, fingernail-like or slightly cucullate, 9–13 mm width and 8–40 mm long. *Flowers* solitary, terminal, bisexual, headlike in appearance, obovoid, 2.2–2.6 cm long, 1 cm in diameter, pinkish brown becoming dark brown or black. *Perianth* fleshy white becoming

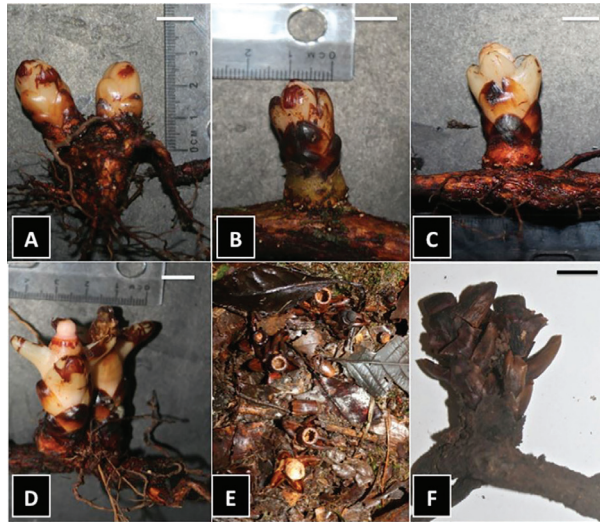


Figure 2. Growth stages of *Mitrastemon yamamotoi* – A) young plant attached to host root system, bracts with black apex, cupule reddish brown; B) young plant, bracts slightly opened, basal bracts are black, cupule is yellow green; C) plant with bracts slightly open, flower beginning to protrude from reddish brown cupule; D) plant in female phase attached to host root; E) dead individuals; F) two flowers from a single cupule. Scale bar = 1 cm.

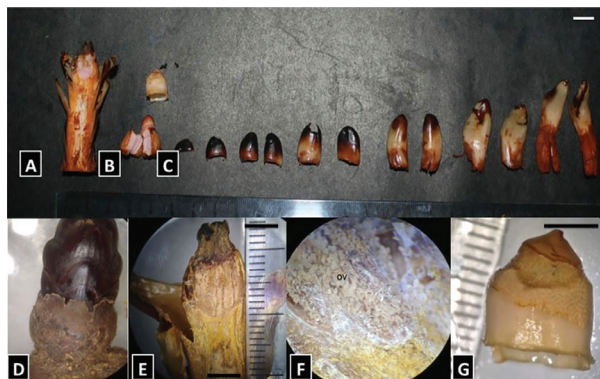


Figure 3. *Mitrastemon yamamotoi* – A) plant longitudinal section; B) male and female flowers; C) bracts; D) plant close up; unopened bracts (upper quadrant), cupule attached to host root (lower quadrant); E) plant longitudinal section of the female flower parts; F) numerous ovules; G) staminal tubule with numerous anther connate into the tube. Scale bar = 1 cm.

becoming brown, cupular, mouth entire or undulate. *Staminal tubule* 12–19 mm long, 10 mm in diameter. *Anther* numerous, connate into the tube, below the sterile apical part with several series of rings of anthers. *Stigma* is emarginate, ovoid up to 7 mm in diameter, 3 mm long, pinkish becoming black upon maturity. *Style* is conical, stout, up to 5 mm in diameter, 2 mm long. *Ovary* globose to ellipsoid, superior sessile ca. 8 mm in diameter, 13 mm long. *Ovules* numerous, anatropous.

Phenology. Flowering of *M. yamamotoi* in the Philippines was observed during March to May.

Habitat and Ecology. *M. yamamotoi* grows in a slope (45–65°), shade of a mixed dipterocarp forest dominated by *Lithocarpus* spp. (Fagaceae) and *Canarium* spp. (Burseraceae). Soil is covered by leaf litters up to 3 in thick. The species was observed as ramet in the area. Plant individuals were observed at 1,311–1,345 m above sea level. Generally, *Mitrastemon* species were reported to be pollinated by insects and birds, and seed dispersal is mostly carried out by birds and small mammals (Meijer 1997). In this work, flies were observed visiting the plant (Figure 4C&D).



Figure 4. *In situ* photographs of *Mitrastemon yamamotoi* – A) plant habit; B) young plant intimately attached to host root; C & D) flies visiting the plant; E & F) *M. yamamotoi* parasitizing on *Tetrastigma* sp. climbing on a tree fern.

The species was reported to grow mainly on roots of *Engelhardia spicata* Blume, *Castanopsis tribuloides* Raf., *Vernonia volkameriifolia* Wall. ex DC., and *Elaeocarpus lancifolius* Roxb. (Rao & Balakrishnan 1972). Further, the species parasitize on *C. acuminatissima* (Blume) A.DC., *C. cuspidata* (Thunb.) Schottky, *Eugenia* sp., *Ilex integra* Thunb., *Limlia uraiana* (Hayata) Masamune & Tomiya, *Lithocarpus elegans* (Blume) Soepadmo, *L. kawakamii* Hayata, *Quercus glauca* Thunb., and *Trigonobalanus verticillata* Forman. (Meijer & Veldkamp 1993). In addition to the above species, *M. yamamotoi* was found to grow on roots of *Lithocarpus elegans* (Blume) Soepadmo, *Psychotria adenophylla* Wall., *Calophyllum polyanthum* Choisy, and *Elaeocarpus floribundus* Blume (Mir *et al.* 2016). In this work, the species were observed to be parasitic to *Lithocarpus* spp. (Fagaceae), *Ficus* spp. (Moraceae), *Macaranga sinensis* (Baill.) Müll. Arg. (Euphorbiaceae), *Palaquium philippense* (Perr.) C.B. Rob

(Sapotaceae), and *Tetrastigma* sp. (Figure 4E&F) – which were common species of trees observed in the forest patches of Marilog District, Mindanao, Philippines where *M. yamamotoi* was observed.

Distribution

Japan, India, Thailand, Cambodia, Vietnam, China, Taiwan, Sumatra, Borneo, Papua New Guinea (Rao & Balakrishnan 1972, Meijer 1997), and Philippines (present study).

Mitrastemon yamamotoi individuals were observed only in Mt. Malambo, Brgy. Datu Salumay, Marilog District, Davao City, in Mindanao, Philippines and has not yet been reported elsewhere in the Philippines. Moreover, *M. yamamotoi* was not observed in neighboring areas that were also dominated by *Lithocarpus* spp. (Fagaceae) in the Marilog District (*e.g.*, five other areas explored in Brgy. Datu Salumay and Baganihan; see Figure 1).

Specimens Examined

PHILIPPINES. Mindanao: Davao City, Marilog District, Brgy. Datu Salumay, Mt. Malambo, 1345 m a.s.l., 7°29.378'N, 125°15.331'E; 25 Mar 2018; V.B. Amoroso 10619 with Mendez and Lagunday (CMUH 10959) (spirit collection).

PHILIPPINES. Mindanao: Davao City, Marilog District, Brgy. Datu Salumay, Mt. Malambo, 1,300 m a.s.l.; 9 May 2018; V.B. Amoroso 10861 with Mendez and Lagunday (CMUH 10960) (herbarium specimen).

Conservation Status. The species was listed as ‘Rare’ by Makino (1911) in Japan and is classified as ‘Endangered’ in the Red Data Book of Indian Plants (Nayar & Sastry 1990). In this paper, *M. yamamotoi* is assessed as ‘Critically Endangered’ [CR B1ab (i)] (IUCN 2012); extent of occurrence is estimated to be less than 10 km². Populations were noted occurring near the summit of Mt. Malambo, Marilog District, Davao City with an estimated number of ten ramet.

Conservation Concerns. The area is under severe threat from habitat destruction posed by excessive anthropogenic pressure due to intensive grazing, tourism activities, soil erosion, landslides, shifting cultivation, and forest fire – all of which are considered as the main culprits for the destruction of wild populations. This calls for *in situ* conservation initiatives by the stakeholders since the site is not a protected area.

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