

A New One-leaf Plant Species (Gesneriaceae: *Monophyllaea*) from Western Sarawak

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Monophyllaea kazuea Nur Athirah Nabihah & Meekiong, a new one-leaf plant species from Western Sarawak, Malaysia, is described and illustrated. This species is distinguished from *M. glauca* by the presence of hairs on all parts of the plant, whereas *M. glauca* has a glabrous petiolode and peduncle. Apart from the oblong-lanceolate leaf, long uniseriate tapering hairs on all sections of the plant, and a white corolla with a green/yellow mark on the palate, *M. kazuea* is comparable to *M. glauca*. The population is found exclusively on Mount Stulang, suggesting that it may be endemic to this region.

Keywords: Endemic, Gesneriaceae, limestone, *Monophyllaea kazuea*, one-leaf plant, Sarawak

The karst limestone vegetation of Mount Stulang, western Sarawak, Malaysia, differs from neighboring lowland forests not only in species composition but also in appearance (Saw 2010). Despite the limited space it occupies, the flora is incredibly diverse. This diversity is attributed to a wide variety of microhabitats, including screes, gullies, sheer cliffs, caverns, and boulders (Kiew & Rafidah 2021). A dense herbaceous flora, comprising many indigenous species, flourishes on discarded boulders and at the base of cliffs, thriving in severely dark and humid environments (Kiew, 2004).

The species of *Monophyllaea*, the generic name derives from the Greek word for a single-leaf plant, is exclusively in Malesia and has a relatively restricted range (Burt 1978, Kohyama & Hotta 1986). Approximately 38 species, growing predominantly on limestone rocks, in shady woodlands, at cave entrances, and beneath boulders have been described. Sarawak hosts the largest number of species of *Monophyllaea*, totaling 16 (Burt 1978, Kiew 2002, Kiew & Sang, 2013).

We conducted several field trips to limestone hills in Sarawak from 2019 to 2022. Among the sites we explored, we encountered a highly unusual species of *Monophyllaea* near Mount

Stulang on an isolated limestone hill near the Dered Krian limestone complex in the Bau district. We found it on a 10-meter vertical cliff with a sandy clay soil habitat, indicating a preference for a specific substrate. We did not find plants on rock surfaces in limestone niches (such as on cliffs, boulders, screes, and cave mouths) in nearby areas.

Six plants from the population were collected, adhering to the restrictions of the permit [Permit No. SFC.810-4/6/1(2021)-025]. We compared the morphology of the samples in the laboratory of the Faculty of Resource Science and Technology, Universiti Malaysia Sarawak (UNIMAS), with herbarium specimens in the Herbarium of the Forest Department Sarawak (SAR) as well as with descriptions in the monograph by Burt (1978). Based on our observations, we here describe *M. kazuea* as a new species and provide line drawings of the species.

Taxonomic Treatment

Monophyllaea kazuea Nur Athirah Nabihah & Meekiong, **sp. nov.**—Figs. 1 & 2

Similar to *M. glauca* in its cymose inflorescence and

TABLE 1. Comparison between *Monophyllaea kazuea* and *M. glauca*.

Character	<i>M. kazuea</i>	<i>M. glauca</i>
Habit	Pendulous	Erect
Petioloide length (cm)	9–11.5	15–60
Petioloide diameter (cm)	1.5–1.7	1.6–2.9
Petioloide hairs	Uniseriate tapering hairs	Glabrous
Petioloide surface	Heavily encrusted	Slightly encrusted
Leaf texture	Thin	Thick
Leaf width (cm)	11.2–12.5	19.5–22.5
Ratio of leaf width and length	1:2	2:1 (3:1)
Leaf shape	Oblong-lanceolate	Broadly ovate with deeply cordate base
Pedicel hairs	Uniseriate long hairs	Stiff/branched hairs/bulbous-based hairs
Corolla shape (median lobe)	Obovate	Orbicular-spatulate
Corolla tube length (mm)	6.6	4.5
Flower color	White with green/yellow mark on the palate	White with yellow mark and purple bar on the palate
Ovary length (mm)	1.0	1.5
Style length (mm)	1.8	2.5

similar orbicular upper and lateral lobes of the corolla, but differentiated by the hairy peduncle and corolla heavily bearded abaxially.

Typus. MALAYSIA, Borneo, Sarawak, Kuching, Bau District, Gunung Stulang, sandy soil, vertical cliff, limestone habitat. 23 Nov. 2022. *Nur Athirah Nabihah M.M. et al.* NAN0033 (holo- SAR, iso- Herbarium of Universiti Malaysia Sarawak, HUMS).

Herbs. Petioloide 9–11.5 cm × 1.5–1.7 cm, densely hairy with long white uniseriate tapering hairs, heavily encrusted with crystalline chalky pustules, green. Leaf 20–28 cm × 11.2–12.5 cm, lanceolate-oblong to ovate, base cordate, lobes sometimes unequal, apex attenuate, both adaxial and abaxial surfaces densely hairy with white or sometimes light-brown long uniseriate tapering hairs, encrusted on abaxial surface with crystalline chalky pustules, younger parts densely hairy with white uniseriate tapering hairs, lateral veins 1.2–1.5 cm apart, adaxial midrib sunken, abaxially prominent, tertiary veins reticulate. Inflorescences 1 or 2, arising from leaf base, densely hairy with long white uniseriate tapering hairs; fruiting pedicels deflexed, flowering pedicels erect, reddish brown. Peduncle 8–20 cm × 1.9–2.4 mm; hairy, floriferous part 2.5–3 cm long. Flowers ca. 0.9 mm apart; pedicel 4–6 mm long. Calyx 3.1–4.6 mm × 1.8–2.9 mm, dorsal calyx lobe 5.6 mm × 2.7 mm, acute, reddish brown, with light brown long-tapering hairs; tube ca. 5 mm long; seg-

ments 5, 5.6 mm long. Corolla 7.3–10.5 mm long, white, with green or sometimes yellow mark on center of palate; tube 6.6 mm long, heavily bearded above filament all around, densely papillose; upper lobes 3.2–3.3 mm × 2.4–2.6 mm, orbicular, lateral and median lobes connate for ca. 2 mm, lateral lobes 4.2–4.3 mm × 3–3.4 mm, orbicular, median lobe 4.5 mm × 3.1 mm, obovate, all ciliolate, slightly curved. Stamens: posterior filaments arising 1.6 mm above base of tube, more or less straight, 1.7–1.8 mm long, with a hooked apical tooth, anterior filament ca. 1.7 mm long; anther 0.5 mm long. Disc 0.4–0.6 mm × 0.7–1.2 mm, yellow. Ovary ovoid, 0.9–1 mm in diameter, glabrous, pale green; style 1.8 mm long, glabrous. Capsule 5–7 mm long, globose, apex truncate, thin walled, crowned by short persistent style with swollen base; fruiting calyx open, lobes erect at 90°. Seeds 0.3–0.4 mm long, ellipsoid, mucronate, dark brown, ornamentation reticulate, irregularly raised with irregular cross connections.

Etymology. The species epithet honors Mrs. Kazue Sakai, a dedicated woman who served as a coordinator for the Japan-Malaysia Association in Sarawak and contributed significantly to maintaining a positive relationship between Japan and Malaysia. She has also had a significant impact

on the environment in Sarawak, Malaysia, especially regarding the preservation and restoration of species.

Distribution. Sarawak. Currently recorded only from a single limestone hill (type locality) in Bau District, Kuching, Sarawak.

Habitat. Sandy soil on a shaded vertical limestone cliff at an elevation of 52 m, 1°21'10"N, 110°3'35"E. The vertical cliff is estimated to be 10 m high.

Notes. Studies conducted around the hill and other nearby limestone hills revealed no other populations of *Monophyllaea kazuea*. *Monophyllaea kazuea* occupies an extremely narrow niche and is deemed endemic to Mount Stulang. The populations, comprising only two significant groups, each with 15–20 mature plants, were discovered on two vertical cliffs in the northeastern portion of Mount Stulang. Young plants also grew on the cliffs, and some had yet to bloom. Additionally, the absence of old peduncles on the mature plants indicates that *M. kazuea* is

monocarpic. There are now 17 known species of *Monophyllaea* in Sarawak. Given that a few other specimens are ambiguous and under study, there could be as many as 20 species in total. Research on the interactions of *M. kazuea* with other species in Western Sarawak is ongoing. More information will be provided in subsequent studies. *Monophyllaea kazuea* was discovered coexisting with *M. tenuis* and *M. glauca*, two known species. *Monophyllaea tenuis* was found alongside *M. kazuea* on the same cliff, while *M. glauca* was found on the ground below the cliff. The shape of the upper and lateral lobes of *M. kazuea* is similar to those of *M. glauca* except for the median lobes. *M. glauca* has stiff or bulbous-based hairs and is sometimes branched while *M. kazuea* has uniseriate long hairs. Hybridization with *M. glauca* is considered unlikely due to the significant dissimilarities in their characteristics (Table 1).

Additional specimens examined. Sarawak, Kuching, Bau District, Gunung Stulang, sandy soil, vertical cliff, limestone habitat. 15 Feb. 2022, Nur Athirah Nabihah M.M. et al. NAN0024 (SAR); NAN0025 (HUMS); 23 Nov. 2022, Nur Athirah Nabihah M.M. et al. NAN0034 (SAR); NAN0035 (SAR); NAN0036 (HUMS); NAN0037 (HUMS); NAN0038 (HUMS).

Field key to *Monophyllaea* species of western Sarawak
(modified from Burtt 1978)

- 1a. Flowers arising in continuous zone on adaxial surface of petiolode* and/or on midrib; pedicel 1, 2, or 3 with short peduncle *M. singularis*
- 1b. Flowers in pedunculate inflorescence from base of leaf or just below it on petiolode, sometimes with smaller flowers scattered on midrib 2
- 2a. Inflorescence branched 3
- 2b. Inflorescence unbranched 4
- 3a. Hairs branched *M. merrilliana*
- 3b. Hairs simple *M. tetrasespala*
- 4a. Pedicel shorter than or equal to calyx, eventually disarticulating just above base and leaving regular row of stubs; fruit wall not valvular 5
- 4b. Pedicel longer than calyx, not usually disarticulating regularly; fruit wall valvular 6
- 5a. Peduncle glabrous or shortly pilose; corolla bearded inside *M. glauca*
- 5b. Peduncle hairy; corolla heavily bearded abaxially *M. kazuea*
- 6a. Base of upper corolla lobes oblique *M. glandulosa*
- 6b. Base of upper corolla lobes straight or slightly oblique 7
- 7a. Margins of corolla lobes recurved, appearing acute; glandular hairs coarse; apex of calyx segment erose *M. selaborensis*
- 7b. Margins of corolla lobes flat, rounded; glandular hairs slender; apex of calyx segments entire *M. tenuis*

* The term petiolode is a petiole-like axis derived from a hypocotyl (Jong & Burtt 1975, Ayano *et al.* 2005) and has been called a stem (Burtt 1978).

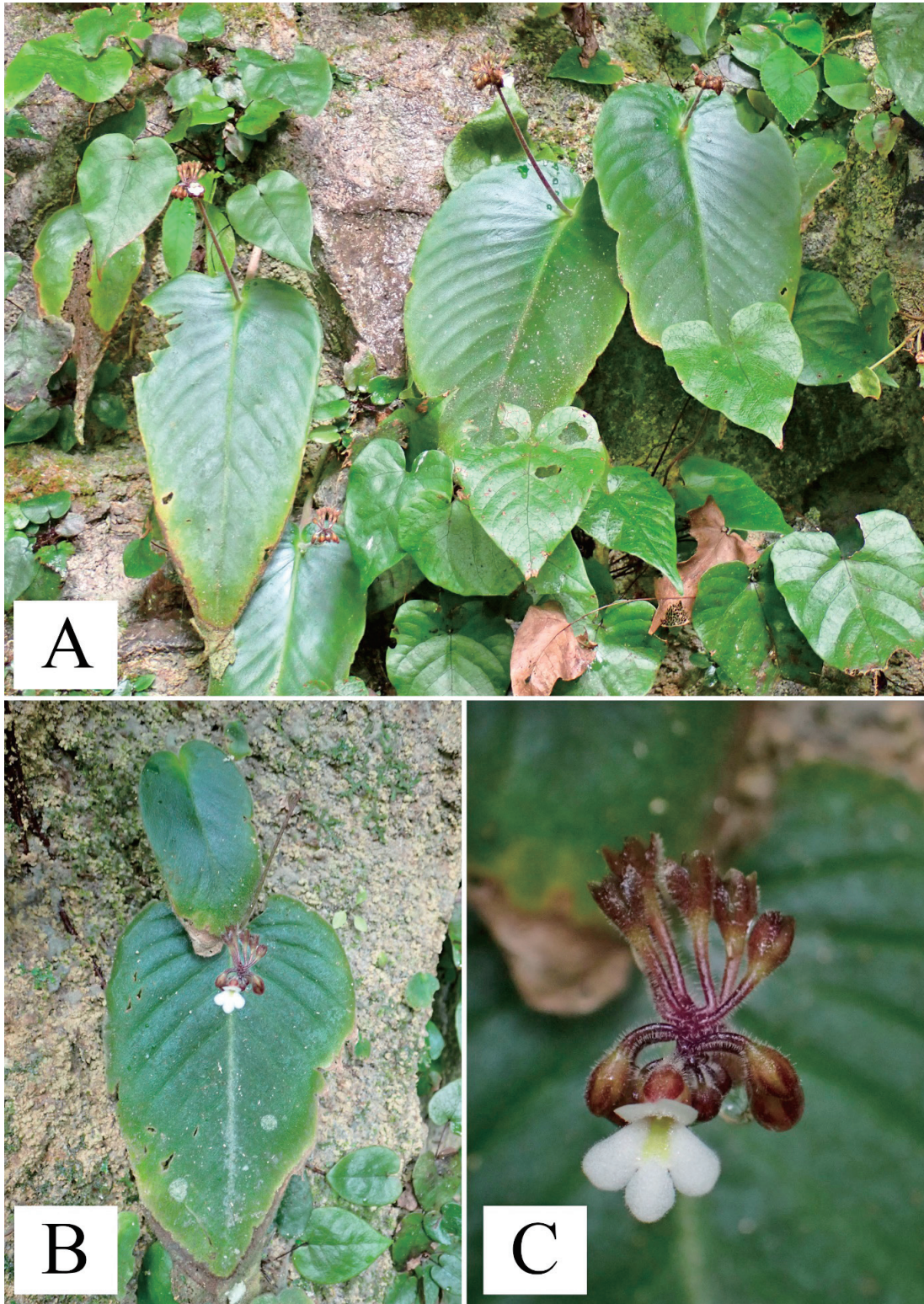


FIG. 1. *Monophyllaea kazuea* Nur Athirah Nabihah & Meekiong sp. nov. **A**, Habit. **B**, Leaf with mature inflorescence and young leaf. **C**, Pedicels and flower.

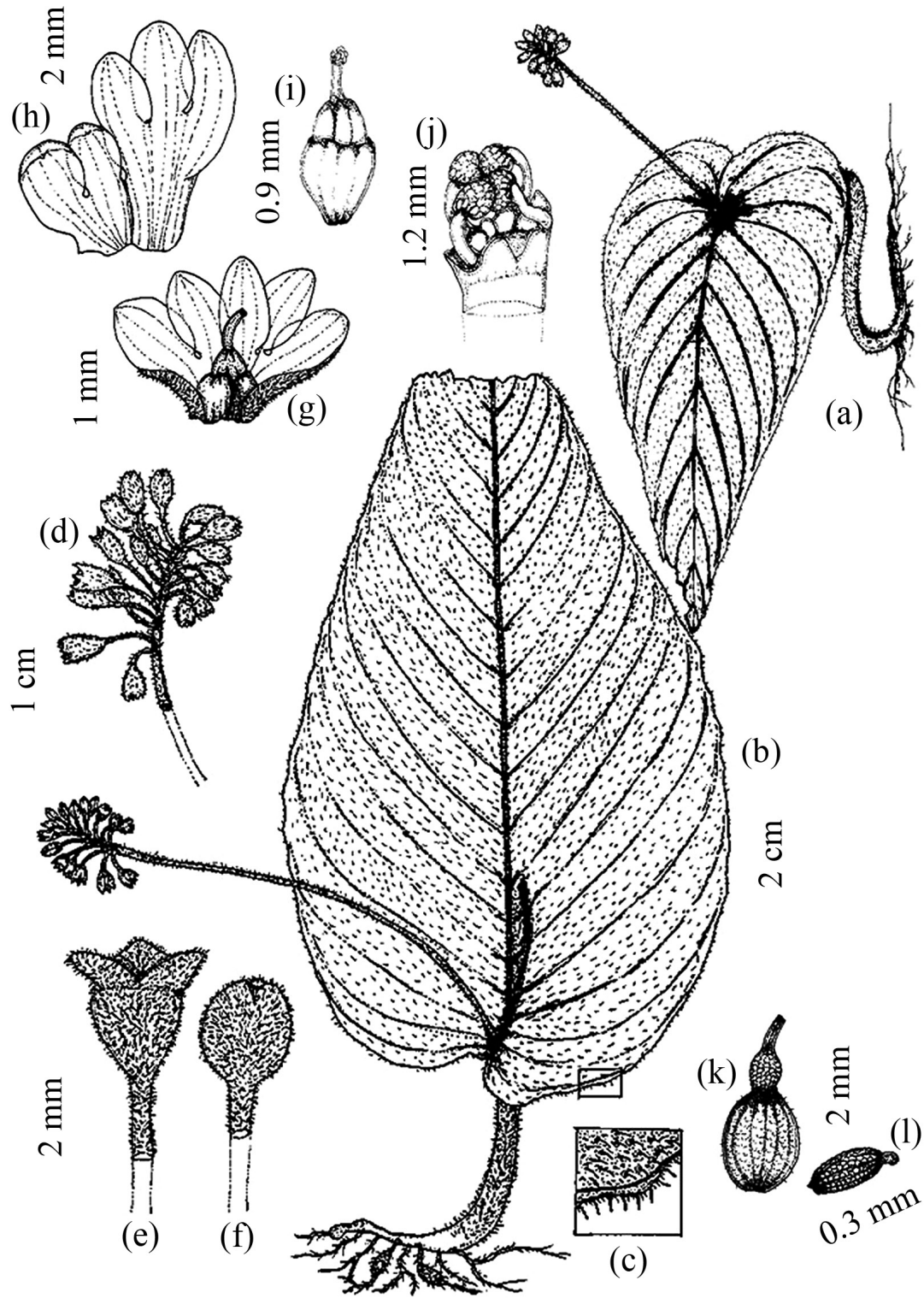


FIG. 2. *Monophyllaea kazuea* Nur Athirah Nabihah & Meekiong. a, habit; b, whole plant; c, uniseriate hairs; d, inflorescence; e, open pedicel; f, close pedicel; g, sepal and ovary; h, corolla; i, ovary; j, anther; k, capsule; l, seed [drawing by Meekiong, K.].

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