Two new species of *Sonerila* Roxb. (Melastomataceae) from Laos

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Abstract. Two new species of *Sonerila* Roxb. (Melastomataceae), *S. erectifolia* Phonep., Soulad. & Tagane sp. nov. from southern Laos, and *S. souvannii* Phonep. & Soulad. sp. nov. from central Laos, are described and illustrated. Comparisons with morphologically similar species are presented, along with ecological information and preliminary conservation status. A key to the species of *Sonerila* in Laos is also provided.

Keywords. Bolaven Plateau, flora, Indochina, taxonomy, Vientiane Capital.

Phonepaseuth P., Souladeth P., Souvannakhoummane K., Vongthavone T. & Tagane S. 2021. Two new species of *Sonerila* Roxb. (Melastomataceae) from Laos. *European Journal of Taxonomy* 755: 136–148. https://doi.org/10.5852/ejt.2021.755.1403

Introduction

*Sonerila* Roxb. is a large plant genus in the family Melastomataceae Juss. consisting of about 180 accepted species (POWO 2020). The genus is distinguished from morphologically similar genera in Melastomataceae by the presence of scorpioid cymes and trimerous flowers (Renner et al. 2001). Recent molecular phylogenetic studies have indicated that *Sonerila* is monophyletic (Zhou et al. 2019). The genus is distributed throughout tropical South and Southeast Asia, from India and Sri Lanka to the Indo-Pacific (Suddee et al. 2014; Dang et al. 2016; Shin et al. 2020). The most recent taxonomic treatment of *Sonerila* in Indochinese region is provided by the *Flore générale de l’Indo-Chine* (Guillaumin 1913), which included...
ten species. However, this number has since risen to 15, with 11 species now recognised in Vietnam (Ho 2003; Dang et al. 2016), six in Cambodia (Hansen 1989; Chen & Renner 2001; Cho et al. 2015; Shin et al. 2020), and seven in Laos, namely, *S. bolavenensis* Soulad., Tagane & Suddee, *S. lecomtei* Guillaumin, *S. neodriessenioides* C. Hansen, *S. plagiocardia* Diels, *S. tenera* Royle, *S. vatphouensis* Munzinger & C.V. Martin, and *S. yunnanensis* Jeffrey ex W.W.Sm. (Newman et al. 2017 onwards; Souladeth et al. 2021). In other countries of the region, seven species have been found in China (Chen & Renner 2001; Lin 2015) and 15 in Thailand (Renner et al. 2001; Sae Wai & Hu 2020).

During botanical surveys in Vientiane Capital in central Laos and on the Bolaven Plateau in southern Laos from 2019 to 2020, two unknown species of *Sonerila* were collected and found to be morphologically different from all the other species of the genus known in Laos, as enumerated by Newman et al. (2017 onwards). After critically comparing this material with specimens from herbaria, the first of the two unknown species was found to be similar to *Sonerila violifolia* Hook. f. ex Triana from Myanmar and Thailand. The second species was considered to be most similar to *S. cardamomensis* S.H. Cho from Cambodia, but was also found to share some characters with *S. dongnathamensis* Suddee, Phutthai & Rueangr. and *S. tuberosa* C. Hansen from Cambodia and Thailand. However, this examination also led to the identification of distinct morphological characters with which the two taxa could be readily differentiated from these species, and we thus describe and illustrate them as new species here. We also provide information on their ecology and preliminary conservation status. Consequently, the number of species of *Sonerila* known in Laos is increased to nine, for which we provide an identification key.

**Material and methods**

Field surveys were carried out in Naxaythong District of Vientiane Capital and on the Bolaven Plateau during August 2019 and September 2020. The specimens were photographed and deposited in the herbarium of the National University of Laos (FOF), Herbarier National du Laos (HNL), the Forest Herbarium Bangkok (BKF), the Royal Botanic Garden Edinburgh Herbarium (E) and The Kagoshima University Museum (KAG); acronyms of herbaria follow Index Herbariorum (Thiers continuously updated). The descriptions and illustrations presented here are based on an analysis of these herbarium specimens. Comparisons of diagnostic characters were based on Lao specimens, as well as digital images of specimens held at AAU, AUH, BHL, BKF, BM, E, K, P and PE that are available online, and on relevant taxonomic literature (Hansen 1989; Munzinger & Martin 2000; Chen & Renner 2001; Renner et al. 2001; Suddee et al. 2014; Cho et al. 2015; Lin 2015; Shin et al. 2020). The terminology follows Renner et al. (2001). The specific epithets and the authors’ names are in line with the International Plant Names Index (IPNI continuously updated). The preliminary conservation assessments followed the Guidelines for Using the IUCN Red List Categories and Criteria Version 14 (IUCN 2019).

**Results**

**Descriptions of new species**

**Class Magnoliopsida Brongn.**

**Order Myrtales Juss. ex Bercht. & J. Presl.**

**Family Melastomataceae Juss.**

**Genus Sonerila Roxb.**

*Sonerila erectifolia* Phonep., Soulad. & Tagane sp. nov.

urn:lsid:ipni.org:names:77217798-1

Figs 1–2

**Diagnosis**

*Sonerila erectifolia* sp. nov. is similar to *Sonerila violifolia* in its scorpioid or subumbelliform inflorescence, but it differs in the length of stem (ca 1 cm long in *S. erectifolia* sp. nov. vs 10–18 cm long in *S. violifolia*),
the venation of the leaves (2 veins running from the base of lamina vs pinnately veined with 2–3 lateral primary veins), hairiness of leaves (sparsely covered with whitish hairs on veins abaxially vs glabrous), the length of the petiole (6–10 cm long vs 1–7 cm long), and number of flowers per inflorescence (5–12(–18) flowers vs 1–9 flowers). For further comparison see Table 1.

### Material examined

#### Type

LAOS • Champasak Province, Dong Hua Sao National Protected Area, near Nong Luang Village, on rocks in open grassland at the summit of the Bolaven Plateau; at 1230–1270 m a.s.l.; 17 Sep. 2020; Souladeth, Souvannakhoummane, Phonepaseuth & Vongthavone L3950; holotype: FOF!; isotypes: BKF, E, KAG.

#### Paratype

LAOS • Champasak Province, Dong Hua Sao National Protected Area, near Nong Luang temple, on rocks in open grassland; 1154 m a.s.l.; 16 Sep. 2020; Souladeth, Souvannakhoummane, Phonepaseuth & Vongthavone L3823; E, FOF!, HNL, KAG.

#### Etymology

The specific epithet refers to the plant having erect leaves.

#### Vernacular name

ຊີດິນໃບຕັ້ງ [‘Seedin Baitung’ (meaning: ‘Sonerila with erect leaves’)].

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**Table 1.** Comparison of Sonerila erectifolia Phonep., Soulad. & Tagane sp. nov. and S. violifolia Hook.f. ex Triana. ¹ = from Renner et al. 2001.

| Characters               | Sonerila erectifolia                                  | Sonerila violifolia¹ |
|--------------------------|-------------------------------------------------------|----------------------|
| Habit                    | acaulescent herb or with rhizomatous stem, 10–14(–20) cm tall including inflorescences | somewhat succulent rhizomatous herb or with stem, 10–18 cm tall |
| Rhizome                  | cylindrical, 2–3 cm long and 5–10 mm in diam, with long blonde hairs | succulent |
| Stem                     | ca 1 cm long, with long blonde hairs; internodes almost absent | 10–18 cm tall, cover with conspicuous 4–6 mm long; internodes up to 4 cm long; reddish brown setae, especially at the nodes |
| Petiole                  | 6–10 cm long, light green to reddish green, sparsely covered with long pale green hairs | 1–7 cm long, glabrous |
| Lamina (ordinary leaves) | elliptic-oblong, ovate-elliptic, 4–6 × 2–2.5 cm | ovate or elliptic-ovate, 3–8(–11) × 1.5–4(–7) cm |
| Number of lateral primary veins | 2 pairs | 2–3 pairs |
| Peduncle length          | 10–15 cm long | 2–9 cm long |
| Pedicel length           | 6–12 mm long | 2–3 mm long |
| Number of flowers per inflorescence | 5–12(–18) flowers | 1–9 flowers |
| Hypanthium               | cylindrical, 8–9 × 2 mm campanulate, 5–6 × ca 2 mm | oblong or ovate, acuminate, 8–10 mm long |
| Petal                    | elliptic-obtuse, 9–11 × 5–6 mm | oblong or ovate, acuminate, 8–10 mm long |
Fig. 1. *Sonerila erectifolia* Phonep., Soulad. & Tagane sp. nov. A. Habit. B. Front view of flower. C. Flower bud. D. Hypanthium and style. E. Stamens. Line drawings from holotype (*Souladeth et al. L3950*) by K. Souvannakhoummane.
Description
Herbs acaulescent or with a short rhizomatous stem, 10–14(–20) cm tall including inflorescences. Rhizome cylindrical, 2–3 cm long and 5–10 mm in diam, covered with long blonde hairs, hairs 3–4 mm long.

Fig. 2. Sonerila erectifolia Phonep., Soulad. & Tagane sp. nov. A. Habitat (on open moss-covered bedrock). B. Close-up of plant (left: pink flowers, common; right: white flowers, rare). C. Habit. D. Inflorescence (left: pink flowers; right: white flowers). E. Young fruits. F. Top view of young fruit. G. Cross sections of young fruit. H. Rhizome. I. Upper surface of lamina. J. Lower surface of lamina. Photos by P. Phonepaseuth on 17 September 2020.
Leaves simple, forming a basal rosette, erect; lamina elliptic-oblong, ovate-elliptic, 4–6 × 2–2.5 cm, membranous, green, sparsely covered with whitish hairs on margin and tip adaxially, pale green, sparsely covered with whitish hairs on veins abaxially, apex mucronate or rounded, base cuneate or attenuate (to truncate), margin finely crenate and sparsely long ciliate, with 2 pairs of primary lateral veins arising from base of lamina; petiole 6–10 cm long, light green to reddish-brown, sparsely covered with long pale green hairs. Inflorescence terminal, scorpionid cyme or subumbelliform cymes, 5–12(–18)-flowered; peduncle 10–15 cm long, 2–2.5 mm in diam., glabrous to sparsely hairy. Bracts minute. Hypanthium cylindrical, 8–9 mm long, 2 mm in diam., reddish brown, glabrous, Calyx lobes 3 (or rarely 4), triangular, ca 1 × 2.5 mm, apex short acuminate; pedicel 6–12 mm long, 0.9–1 mm in diam., glabrous. Petals 3 (or rarely 4), elliptic-oblong, 9–11 × 5–6 mm, pinkish purple to light pink, rarely white adaxially, pearl pink abaxially tinged with dark pink along midvein. Stamens 3 (or rarely 4), anthers lanceolate, 7–8 mm long, curved, basally inflated and deeply cordate, bright yellow; filaments 6–8 mm long, glabrous, usually pale pink. Ovary 3-locular (or rarely 4), ellipsoid, style 11–13 mm long, glabrous, pale pink, sometimes pale green to white, stigma capitate, glabrous, white. Fruits and Seeds not seen.

Distribution, habitat and phenology
Sonerila erectifolia Phonep., Soulad. & Tagane sp. nov. grows on exposed, open, moss-covered bedrock on the Bolaven Plateau, where it is found together with Boesenbergia burttii (K.Larsen & Jenjitt.) Mood & L.M.Prince (Zingiberaceae Martinov) and several fern species including Oleandra undulata (Willd.) Ching (Oleandraceae Ching ex Pic.Serm.), Nephrolepis cordifolia (L.) K.Presl (Nephrolepidaceae Pic. Serm.), and Leucostegia truncata (D.Don) Fraser-Jenk (Hypodematiaceae Ching), at 1230–1270 m a.s.l. Flowering in September.

Preliminary conservation status
Sonerila erectifolia Phonep., Soulad. & Tagane sp. nov. is found only at the top of the Bolaven Plateau (near Nong Luang Village). The number of mature individuals is estimated to be fewer than 250, which together generate an area of occupancy of less than 10 km². The area is a well-known tourist attraction with associated habitat disturbance that could affect the survival of this species. Therefore, we assess the species as Critically Endangered (CR) B2ab(iii) (IUCN 2019).

Sonerila souvannii Phonep. & Soulad. sp. nov.
urn:lsid:ipni.org:names:77217799-1
Figs 3–4

Diagnosis
Sonerila souvannii sp. nov. is similar to S. cardamomensis, described from Cambodia, in its acaulescent habit and in the shape of its leaves, but it differs in the shape of its rhizome (cylindrical in S. souvannii vs bulbous in S. cardamomensis), larger leaves (8–10 × 6–9 cm vs 1–4 × 0.9–2.7 cm), petiole length and color (8–15 cm long and light green vs 0.4–2.5 cm long and reddish brown), greater number of flowers per cyme (20–25 vs 5–11), and petal length and pubescence (9–10 × 6–7 mm and glabrous vs 5.5–6 × 3.5–4 mm with glandular trichomes on midveins abaxially). Sonerila souvannii sp. nov. is also similar to S. dongnathamensis from Thailand in the shape of its inflorescences, but differs in the rhizome shape (cylindrical vs globose), the shape of the leaf base (cordate vs obtuse to rounded), pedicel length (10–25 mm long vs 1–4 mm long), the number of flowers per cyme (20–25 vs 5–12), and in the length and outline of the petals (9–10 × 6–7 mm, acute vs 3–5 × 3–4 mm, acuminate with long seta). The new species is also related to S. tuberosa from Cambodia, but distinguished in the rhizome shape (cylindrical vs slightly bulbous), the shape of the leaf base (cordate vs very broadly ovate to orbicular), pedicel length (10–25 mm long vs 5–6 mm long), the number of flowers per cyme (20–25 vs 4–8), and in the length and outline of the petals (9–10 × 6–7 mm, acute vs 5 × 2.7 mm, elliptic, apiculate, pink) (Table 2).
### Table 2. Comparison of Sonerila souvannii Phonep. & Soulad. sp. nov., S. cardamomensis S.H.Cho, S. dongnathamensis Suddee, Phutthai & Rueangr., and S. tuberosa C.Hansen.

1 = from Sinh et al. 2020; 2 = from Suddee et al. 2014; 3 = from Hansen 1989.

| Characters                  | Sonerila souvannii | S. cardamomensis 1 | S. dongnathamensis 2 | S. tuberosa 3 |
|-----------------------------|-------------------|--------------------|----------------------|--------------|
| Rhizome                     | cylindrical, 0.8–1 cm in diam. | bulbous, 0.4–1 cm in diam. | globose (size unknown) | a slightly bulb-shaped tuber, 2–4 mm long and wide, completely covered with a dense 0.5 mm thick layer of pale brown intertwined curly hairs |
| Stem                        | ca 2 cm long, green | 4-sided, tinged purplish, internodes almost absent | absent | acaulescent herb ca 6 cm high |
| Lamina (ordinary leaves)    | ovate, 8–10 × 6–9 cm | ovate, 1–4 × 0.9–2.7 cm | ovate to rounded, 2–7 × 2.5–6 cm | very broadly ovate to orbicular, ca (0.5–)1.6–2 cm long and wide; base very broadly cordate, apex very broadly rounded, margin entire to subdentate |
| Number of lateral primary veins | 4–5 pairs | 2–3 pairs | 2–4 pairs | 7-nerved, all nerves indistinct and only middle one reaching apex |
| Petioles                    | 8–15 cm long, light green, densely villous | 0.4–2.5 cm long, reddish, covered with glandular trichomes | 5–15 cm long, white to pinkish green, densely villous | 3–4 cm long |
| Pedicel                     | 10–25 mm long, sparsely covered with glandular trichomes | 4–5 mm long, covered with glandular trichome | 1–4 mm long, glabrous | 5–6 mm long |
| Inflorescence               | scorpoid cyme | scorpoid cymes | scorpoid cymes | scorpoid cymes |
| Number of flowers per inflorescence | 20(–25) flowers | 5–11 flowers | 5–12 flowers | 4–8 flowers |
| Hypanthium size             | 5–6 × 2–2.5 mm | 3.5 × 1.3–1.5 mm | 1.5–4 × 1.5–2 mm | ca 3.5 x 1 mm |
| Petal                       | 9–10 × 6–7 mm, glabrous | 5.5–6 × 3.5–4 mm, abaxially glandular trichomes on midvein | 3–5 × 3–4 mm, glabrous | 5 × 2.7 mm, elliptic, apiculate, thin, pink |
| Capsule                     | 5–7 × 2.5 mm, glabrous | 3.5–4.0 × 2–2.2 mm, glabrous | 5–7 × 2–2.5 mm long, glabrous | ca 4.5 x 1.5 mm, glabrous |
Material examined

Type
LAOS • Vientiane Capital, Naxaythong District, Darn Sinxay temple area; 210 m a.s.l.; 12 Sep. 2020; Phonepaseuth P012; holotype: FOF!; isotypes: HNL, KAG.

Etymology
The specific epithet honours Keooudone Souvannakhoummane (Centre for Development and Environment), a plant taxonomist who has greatly contributed to our understanding of plant diversity in Laos through the description of many new species in various families for the flora of Laos.

Vernacular name
ຊີດິນສຸວັນ [ʻSouvan’s Seedin’ (meaning: ‘Souvan’s Sonerila’)].

Description
Lithophytic perennial herb, 12–15 cm tall. Stem cylindrical, ca 2 cm long, 8–10 mm in diam., with a rhizome at the base, rhizome green when young then turning to brown with age, with rudimentary leaves on buds on the rhizome. Leaves forming a basal rosette; lamina (ordinary leaves) ovate, 8–10 × 6–9 cm, membranous when dried, green, covered with hirsute hairs adaxially, pale green, covered with whitish hirsute hairs mainly along the veins abaxially, apex acute, base cordate, margin finely crenate and long ciliolate, midrib sunken abaxially, with 4–5 pairs of lateral primary veins originating from a common point at the base, impressed adaxially, prominent abaxially; petiole 8–15 cm long, light green, densely villous except near base which is glabrous. Rudimentary leaves ovate, 0.2–0.6 cm long, with long spike hairs. Inflorescence terminal, scorpioid cyme, 20–25-flowered, of which 2–3 flowering at a time; peduncle 8–12 cm long, 2–2.5 mm in diam., sparsely covered with villous hairs. Bracts rachis and minute. Hypanthium greenish pink, campanulate, 5–6 mm long, 2–2.5 mm in diam., sparsely covered with villous hairs, Calyx lobes 3, ovate-triangular, ca 1 × 2.5 mm, apex short acuminate; pedicel 1–2.5 cm long, 0.8–1 mm in diam., sparsely covered with glandular trichomes. Petals 3, elliptic, 9–10 × 6–7 mm, pinkish purple adaxially, pale pink tinged with shiny green, with a pinkish purple line along the midrib abaxially. Stamens 3, anthers lanceolate, 5.5–6 mm long, bright yellow, basally inflated and deep cordate, filaments 6–7 mm long, glabrous, white. Ovary 3-locular, elliptical, placentation axillary, style 10–12 mm long, glabrous, white, stigma capitulate. Capsule ovoid-ellipsoid, 5–7 × 2.5 mm, smooth outside. Seeds brown, numerous.

Distribution, habitat and phenology
Sonerila souvannii sp. nov. grows in loose soil in the crevices of shaded rocks at 200–210 m a.s.l. It grows in the understorey of lowland semi-evergreen forest together with Begonia martabanica A.DC. (Begoniaceae C.Agardh), Phyllagathis tuberosa (C.Hansen) Cellin. & S.S.Renner (Melastomataceae Juss.) and Davallia denticulata (Burm. f.) Mett. ex Kuhn (Davalliaceae M.R.Schomb. ex A.B.Frank). Flowering and fruiting in September.

Preliminary conservation status
We found three small sub-populations of S. souvannii sp. nov. with each comprising only 5–6 individuals, about 20 m apart. The species has not yet been found anywhere else. Considering the species grows in a very narrowly restricted area where human activity, such as collection of non-timber forest products (NTFPs) and the logging of wood for local uses, can be seen, we need to pay attention to its conservation. As the number of mature individuals is less than 50, we assess this species as Critical Endangered (CR) criteria D (IUCN 2019).
Fig. 3. *Sonerila souvannii* Phonp. & Soulad. sp. nov. A. Habit. B. Front view of flower. C. Petals. D. Hypanthium and style, with portion of pedicel. E. Cross section of ovary. F. Stamens. G. Style and stigma. H. Capsule. I. Rachis and minute bracts. Line drawings from holotype (*Phonepaseuth P012*) by K. Souvannakhoumann.
Fig. 4. Sonerila souvannii Phonep. & Soulad. sp. nov. A. Habitat (on sandstone rock). B. Habit. C. Petiole densely covered with villous hairs. D. Rhizome and stem with rudimentary leaves. E. Flowers. F. Inflorescence (scorpioid cyme). G. Lateral view of flower. H. Back view of flower. I. Longitudinal section of fruit. J. Top view of fruit. K. Cross section of fruit. L. Infructescence of the last season. Photos by P. Phonepaseuth on 12 September 2020.
Key to the species of Sonerila in Laos

1. Acaulescent herb without evident erect stems above ground or with a very short rhizomatous stem; leaves forming a rosette .................................................................................................................... 6
   - Caulescent herb with evident stems above ground; leaves distributed along the stem or branchlets ................................................................. 2

2. Opposite leaves on stems isomorphic; lamina linear to elliptic-oblong, less than 3 cm long, acute, cuneate to attenuate at base ................................................................. 3
   - Opposite leaves on stems dimorphic; lamina ovate, more than 3 cm long, cordate to rounded at base ................................................................. 4

3. Stem and branchlets glandular-pilose or puberulous; lamina setose on both surfaces ................................................................. 7. S. tenera Royle
   - Stem and branchlets glabrous; lamina glabrous to glabrescent on both surfaces ................................................................. 4. S. neodriessenioides C.Hansen

4. Petiole glabrous, succulent and winged .......................................................... 5. S. plagiocardia Diels
   - Petiole hairy, not winged ........................................................................................................................................ 5

5. Lamina glabrous except veins abaxially, margin glabrous; petiole 0.3–1.2 cm long ................................................................. 3. S. lecomtei Guillaumin
   - Lamina covered with long brown hairs, margin ciliate; petiole (0.6–)1–3.5 cm long ................................................................. 9. S. yunnanensis Jeffrey ex W.W.Sm.

6. Lamina less than 1.4 cm long; inflorescence 1-flowered ................................................................. 1. S. bolavenensis Soulad., Tagane & Suddee
   - Lamina more than 3 cm long; inflorescence 2- to many-flowered ............................................................................... 7

7. Lamina elliptic-oblong, ovate-elliptic, base acute, cuneate to attenuate; hypanthium 8–9 mm long ................................................................. 2. S. erectifolia Phonep., Soulad. & Tagane sp. nov.
   - Lamina ovate to rounded, base cordate; hypanthium less than 6 mm long ............................................................................... 8

8. Lateral primary veins 3 pairs; inflorescence 2–3-flowered; hypanthium glabrous ................................................................. 8. S. vatphouensis Munzinger & C.V.Martin
   - Lateral primary veins 4–5 pairs; inflorescence 20–25-flowered; hypanthium sparsely covered with villous hairs ............................................................................... 6. S. souvannii Phonep. & Soulad. sp. nov.

Discussion

This paper describes two additional species of the genus Sonerila, bringing the total diversity of this genus in Laos to nine species. A taxonomic key to the nine species is provided. Since Guillaumin (1913), seven additional species have been added to the Indochinese flora. However, intensive surveys of particular places are needed in order to understand the true species diversity of this genus in this region. We expect to find more new species and new records of Sonerila in Laos as compared with the number reported from neighbouring countries. Recently, several new species have been described from the Bolaven Plateau, e.g., Coleus bolavenensis Suddee, Tagane & Rueangr. (Lamiaceae Martinov), Gentiana bolavenensis Nagah., Tagane & Soulad. (Gentianaceae Juss.), and Sonerila bolavenensis Soulad., Tagane & Suddee (Nagahama et al. 2019; Suddee et al. 2020; Souladeth et al. 2021), suggesting that with further floristic surveys in this area and also another National Protected Areas in Laos, more new species will be added to the flora of Laos.
Acknowledgments

We would like to thank the manager and staff of the Dong Hua Sao National Protected Area for permitting our botanical survey in the protected area. Thanks to Dr Somran Suddee (The Forest Herbarium, BKF) for his valuable comments on species identification. We also thanks to Dr Mark Newman (Royal Botanic Garden Edinburgh, E), Dr Stuart Lindsay and Dr David Middleton (Singapore Botanic Gardens, SING), and Stephan Gale (Kadoorie Farm and Botanic Garden, KFBG) for providing useful comments on species description as well as English improvement. We sincerely thank two anonymous reviewers for their thoughtful comments and helpful suggestions. We are grateful to the curators and staff of the following herbaria: FOF, HNL, and KAG for their kind permission to study the herbarium specimens in their care. This study was supported by the Nagao Natural Environment Foundation, Japan and the Medicinal Plant Research and Specimen Collection Project supported by the Lancang-Mekong Cooperation Special Fund.

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Manuscript received: 5 January 2021
Manuscript accepted: 13 April 2021
Published on: 22 June 2021
Topic editor: Frederik Leliaert
Desk editor: Radka Rosenbaumová

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