

Research article

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.

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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), Herbar 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*),

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	<i>Sonerila erectifolia</i>	<i>Sonerila violifolia</i> ¹
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
Petal	elliptic-obtuse, 9–11 × 5–6 mm	oblong or ovate, acuminate, 8–10 mm long

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’)].



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. Souvannakhoumane.

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.

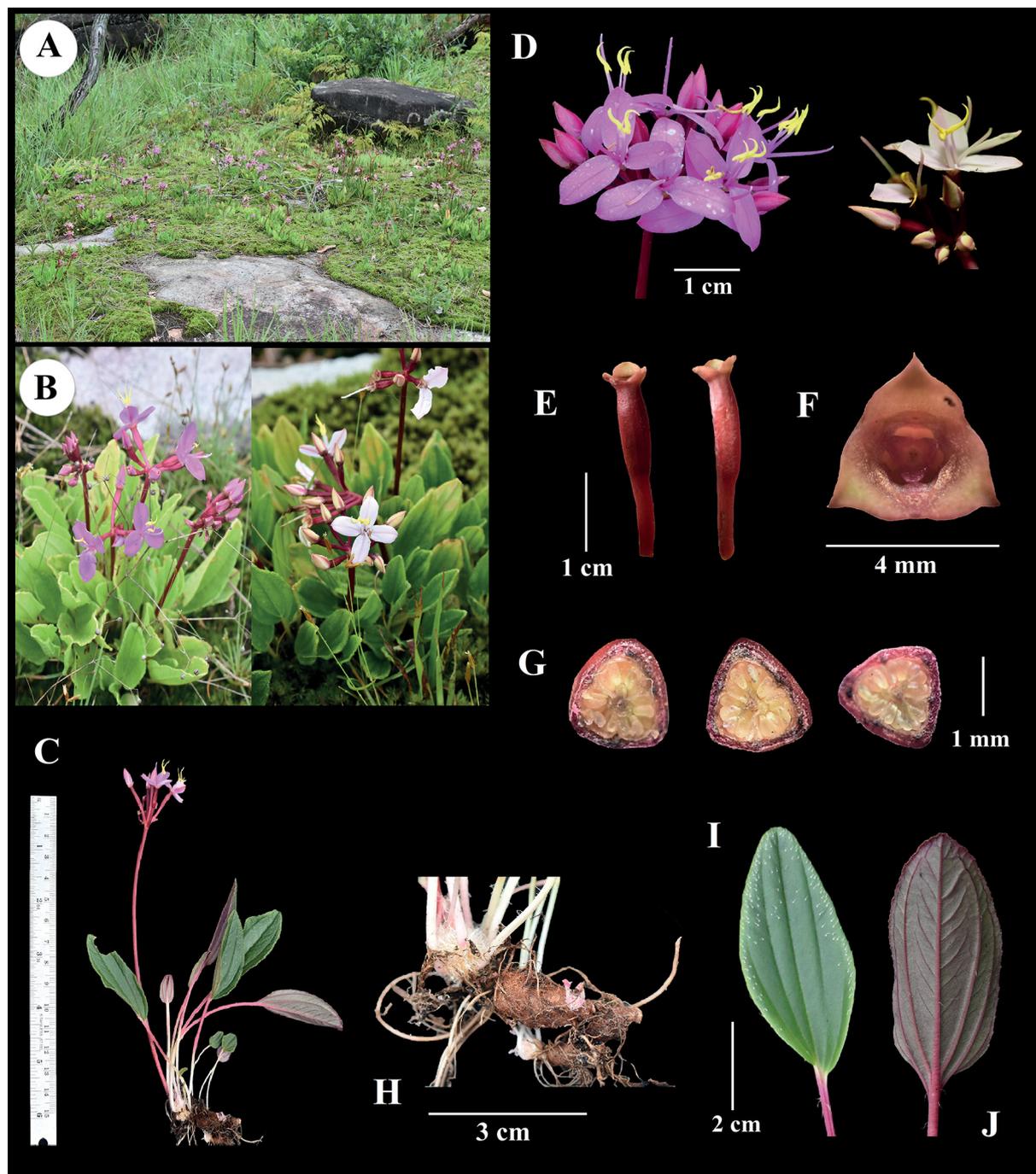


Fig. 2. *Sonerila erectifolia* Phonsep., Soulad. & Tagane sp. nov. **A.** Habitat (on open moss-covered bedrock). **B.** Close-up of plant (left: pink flowers, common; right: white flowers, rare). **C.** Habit. **D.** Inflorescence (left: pink flowers; right: white flowers). **E.** Young fruits. **F.** 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. Phonsepaseuth 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, scorpioid 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	<i>S. souvannii</i>	<i>S. cardamomensis</i> ¹	<i>S. dongnathamensis</i> ²	<i>S. tuberosa</i> 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	scorpioid cyme	scorpioid cymes	scorpioid cymes	scorpioid 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 Keoudone 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

ຊີດິນສວັນ [‘Souvan’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 ciliate, 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 capitate. *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).

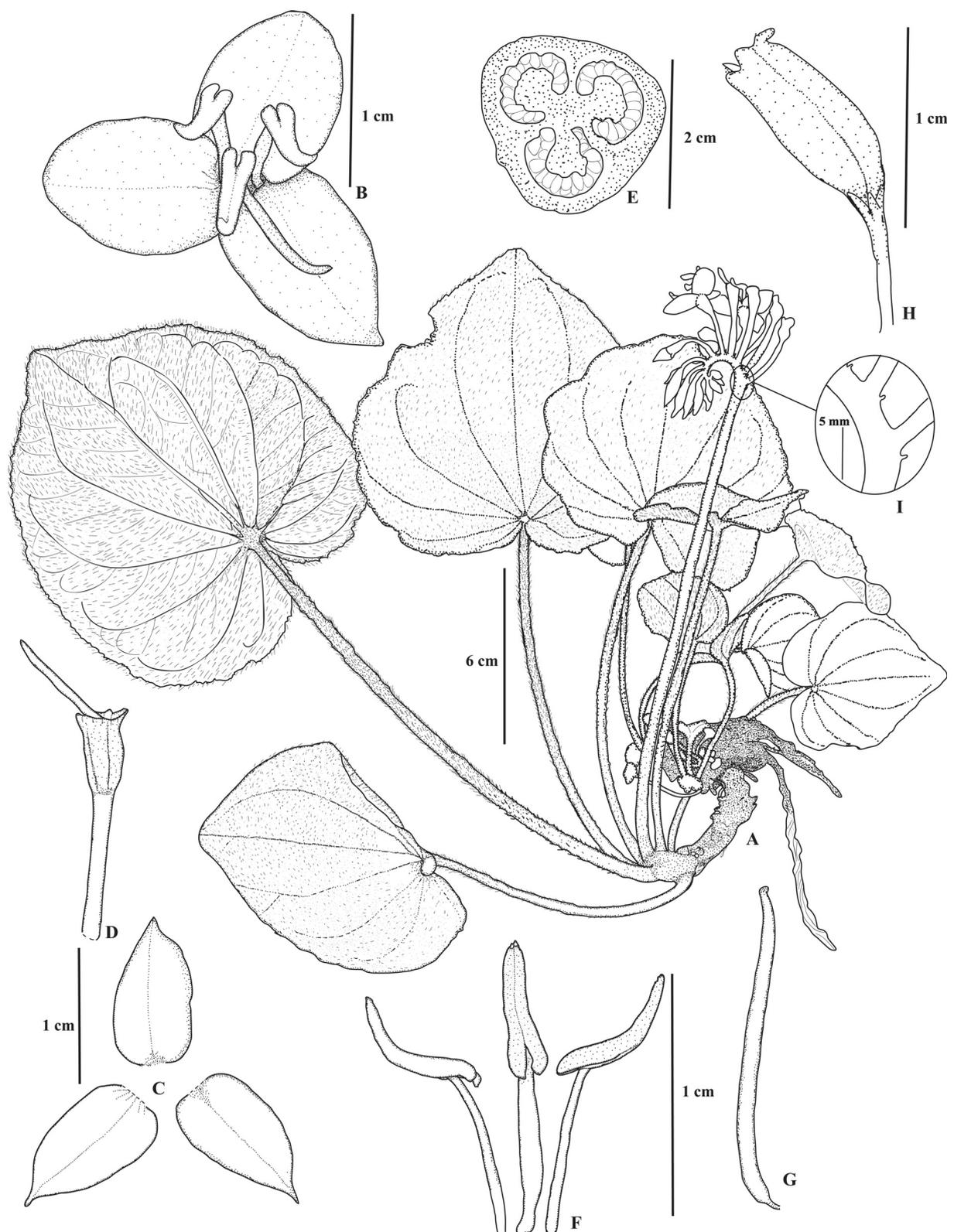


Fig. 3. *Sonerila souvannii* Phonep. & Soulad. sp. nov. **A.** Habit. **B.** Front view of flower. **C.** Petals. **D.** Hypanthium and style, with portion of pedicel. **E.** Cross section of ovary. **F.** Stamens. **G.** Style and stigma. **H.** Capsule. **I.** Rachis and minute bracts. Line drawings from holotype (*Phonepaseuth P012*) by K. Souvannakhoummane.

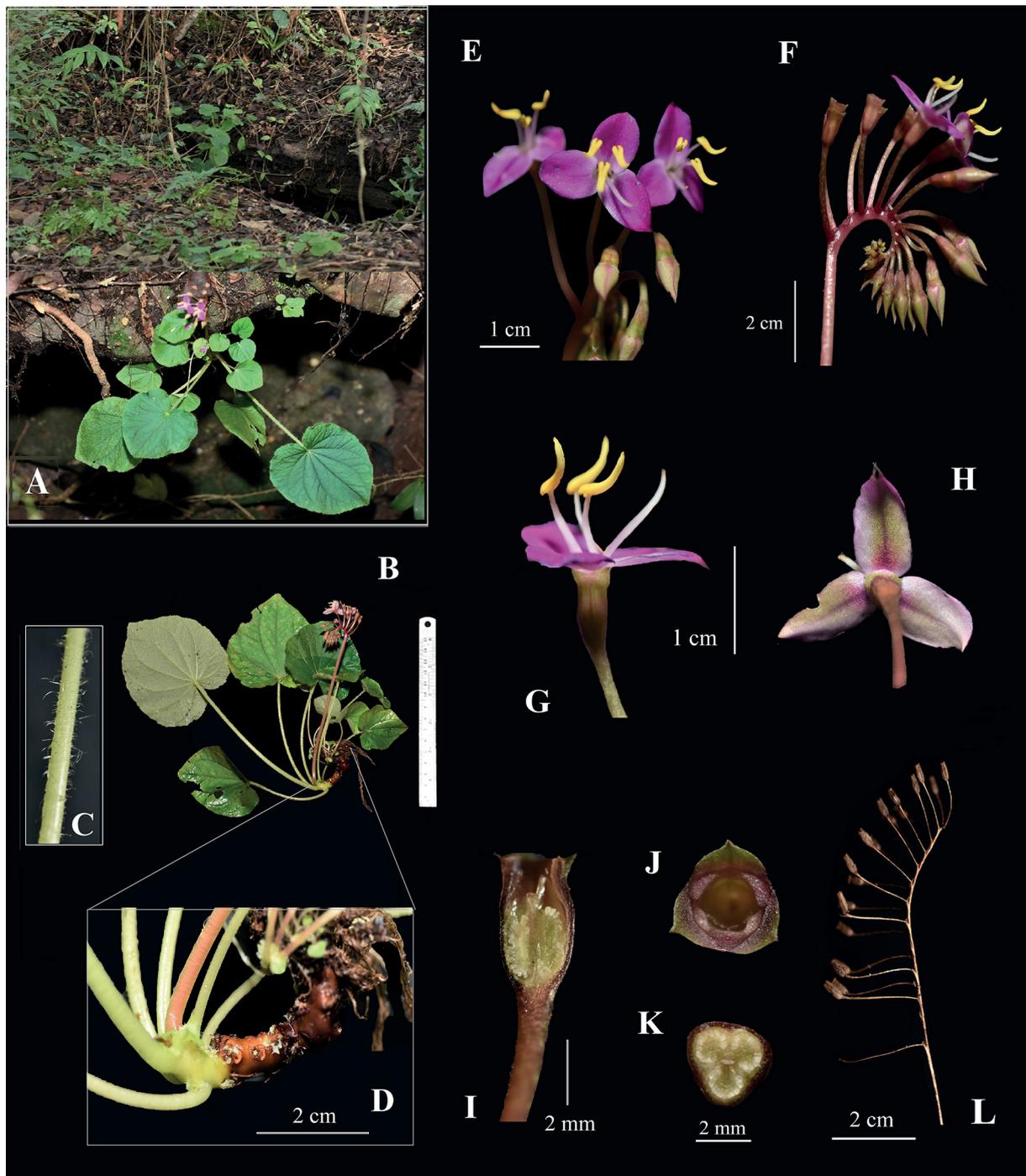


Fig. 4. *Sonerila souvannii* Phonep. & Soulad. sp. nov. **A.** Habitat (on sandstone rock). **B.** Habit. **C.** Petiole densely covered with villous hairs. **D.** Rhizome and stem with rudimentary leaves. **E.** Flowers. **F.** Inflorescence (scorpioid cyme). **G.** Lateral view of flower. **H.** Back 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.

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