

Four new species of Gesneriaceae from Vietnam

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ABSTRACT. The new species *Allocheilos villosus* B.L.Burt ex D.J.Middleton, *Didymocarpus tamdaoensis* D.J.Middleton, *Didymocarpus dalatensis* D.J.Middleton and *Loxostigma vietnamensis* D.J.Middleton from Vietnam are described.

Keywords. *Allocheilos*, Didymocarpoideae, *Didymocarpus*, limestone, *Loxostigma*, Trichosporeae

Introduction

Large numbers of new species of flowering plants have been described from Vietnam in recent years and many more new species are awaiting discovery and description (Middleton et al., 2019). Included amongst these new discoveries from Vietnam have been several new genera and many new species of Gesneriaceae, particularly from the far north and the Central Highlands region (e.g., Nguyen & Kiew, 2000; Xu et al., 2008; Middleton, 2009, 2015, 2018; Middleton et al., 2014, 2021; Möller et al., 2018; Chen et al., 2018, 2020; Tuan et al., 2022). Here, new species in the genera *Allocheilos* W.T.Wang, *Didymocarpus* Wall. and *Loxostigma* C.B.Clarke are described from material collected over many decades and deposited in international herbaria.

Allocheilos is a small genus of only four species, hitherto only known from southern China (Chen et al., 2020). The genus is characterised by two fertile stamens and a corolla with a 4-lobed upper lip and a 1-lobed lower lip. It can easily be distinguished from *Oreocharis* Benth. and *Petrocodon* Hance which have occasional species with a similar corolla lobe arrangement (4+1): most species of *Oreocharis* have four fertile stamens and in the very few species with two fertile stamens, it is the posterior pair that are fertile (anterior pair in *Allocheilos*); only one species of *Petrocodon* has the 4+1 arrangement, *P. coccineus* (C.Y.Wu ex H.W.Li) Y.Z.Wang, and can be distinguished from *Allocheilos* in the red corolla (white in *Allocheilos*) and narrow corolla tube (tube shorter and wider or campanulate in *Allocheilos*). In 1995, Brian Laurence Burt (1913–2008) from the Royal Botanic Garden Edinburgh labelled a specimen from northern Vietnam housed in the Paris Herbarium as '*Allocheilos villosus* B.L.Burt'. I can find no trace that this species has ever been published under any name and I have not found a draft written description by him. I agree with Burt that this is an undescribed species of *Allocheilos* and hence describe it here.

Didymocarpus is a much larger genus with a complex nomenclatural history

(Weber & Burt, 1998; Weber et al., 2000; Nangngam & Maxwell, 2013). The genus is now defined as including plants which are caulescent herbs to subshrubs, having inflorescences with small bracts, flowers with two fertile stamens and capitate stigmas, and orthocarpic fruits. In Vietnam, six species are known (Tran et al., 2020). This contrasts considerably with neighbouring regions where between 31 (Wang et al., 1998) and 38 (GRC, 2023) species are reported from China and about 23 species are known from Thailand (Nangngam & Maxwell, 2013; Nangngam & Middleton, 2014). Two new species, *Didymocarpus tamdaoensis* D.J.Middleton and *Didymocarpus dalatensis* D.J.Middleton, are described here based on historical material from the Paris Herbarium. There is another possible undescribed species but which is only known from inadequate material and should await the discovery of better material to critically assess its taxonomic status. It is a densely pubescent plant with only a single already-dissected flower on the specimen. The calyx is divided to the base and the lobes are obovate. It is not clearly similar to other species and is likely to be undescribed. It is known from the collection *Poilane 6545* (P [P04079344]), collected 18 May 1923, from Nha Trang, a region noted for its high plant diversity and endemic species, coupled with the fact that many species of *Didymocarpus* have rather restricted distributions.

Loxostigma was previously characterised as having seeds with a short projection at either end (Weber, 2004). However, when the concept of the genus was expanded by Möller et al. (2014) through the inclusion of a number of species formerly placed in *Briggsia* Craib, species were included in *Loxostigma* that lacked the seed appendages. Using this expanded delimitation, GRC (2023) lists 13 species for the genus, of which three are recorded for Vietnam. Historical and recent collections from the central Highlands region of Vietnam that lack the seed appendages but otherwise match *Loxostigma* based on the overall habit, wide corolla tube which is ventricose ventrally, and four fertile stamens, are here identified as a previously undescribed species.

All species here described belong to subfamily Didymocarpoideae, tribe Trichosporeae (Weber et al., 2013, 2020). The material used to describe the new species below has been compared to material of their congeners in A, BM, E, K, L, MO, NY, P, SING and US (Thiers, continuously updated) and to the descriptions of species in Pellegrin (1930), Phạm (1993), Wang et al. (1998) and the cited works above. The descriptions of the new species are made from dried herbarium material except for the flower characters which were measured from flowers rehydrated for dissection. All Paris and Leiden specimens cited can be viewed online through their collections' catalogues. The global conservation categories and criteria follow the IUCN Standards and Petitions Committee (2022).

Species descriptions

1. *Allocheilos villosus* B.L.Burt ex D.J.Middleton, **sp. nov.**

Differs from other *Allocheilos* species by the dense long villous hairs on all plant parts and the elliptic lower corolla lobe (narrowly triangular in other species). – TYPE:

[Vietnam], Tonkin, [Lao Cai], Environs de Chapa [around Sa Pa], Massif du Sung ta Van [Sang Ta Van], 1600 m, August 1932, *Pételot s.n.* (holotype P [P00634331]). (Fig. 1)

Rosulate herb, lithophytic, perennial (presumed). **Leaves** all basal; petiole 6–11.5 cm long, densely villous with patent eglandular uniseriate hairs to 3.5 mm long; lamina slightly asymmetric, ovate to elliptic, 5–11.2 × 4.2–8 cm, base subcordate, apex rounded, margin coarsely crenate, venation craspedodromous, 5–6 pairs of secondary veins, tertiary venation obscure, densely villous above and beneath. **Inflorescences** scapose, all axes densely villous, flowers in a cyme, c. 20-flowered; peduncle c. 10 cm long; bracts 2, opposite, linear, 8.5–11 × 0.6–1.8 mm, densely villous; pedicels 4.5–11 mm long; flowers 5-merous, zygomorphic. **Calyx** lobes narrowly elliptic, ventral 2 lobes free except at very base, c. 5 × 1 mm, lateral lobes and dorsal lobe fused at base for c. 1 mm, lateral 2 lobes slightly falcate, c. 4.5 × 0.8 mm, dorsal lobe c. 3.5 × 0.8 mm, densely villous outside and inside. **Corolla** white, c. 8.5 mm long, 2-lipped, upper lip 4-lobed with 2 reflexed lateral lobes and the 2 dorsal lobes fused for most of their length with a bifid apex of 2 acute lobes, lower lip 1-lobed, outside with sparse long hairs at base of tube, densely villous at top of tube and on lobes, inside glabrous except for few sessile glands at base of dorsal lobes; tube c. 5.5 mm long to sinus of upper and lower lips; upper lip c. 3 × 6 mm, lateral lobes deltoid, c. 1 × 1.5 mm, apices acute, fused dorsal lobes c. 1.7 × 1.2 mm altogether, free parts c. 0.5 × 0.5 mm; lower lip elliptic, c. 3 × 2.8 mm, apex acute. **Fertile stamens** 2, inserted at c. 4 mm from corolla base, slightly exserted from mouth of corolla; filaments narrow, c. 3.5 mm long, glabrous; anthers c. 1.4 × 1.8 mm, thecae divergent; lateral staminodes c. 0.4 mm long. **Nectary** a ventral lobe, c. 0.8 mm long. **Ovary** c. 5.5 mm long, densely villous; style c. 8.5 mm long, densely villous, exserted from corolla. **Fruit** not known.

Distribution. Currently known only from the type collection from Lao Cai province, Vietnam.

Habitat and ecology. On a limestone fissure in forest at 1600 m.

Etymology. The epithet *villosus* refers to the dense hair covering on all parts of the plant.

Provisional IUCN conservation assessment. Data Deficient (DD). The species is only known from one collection made in 1932.

Notes. In the material studied, the anthers were free rather than coherent as in other *Allocheilos* species but this could be an artefact of the specimen preservation and its preparation for study.

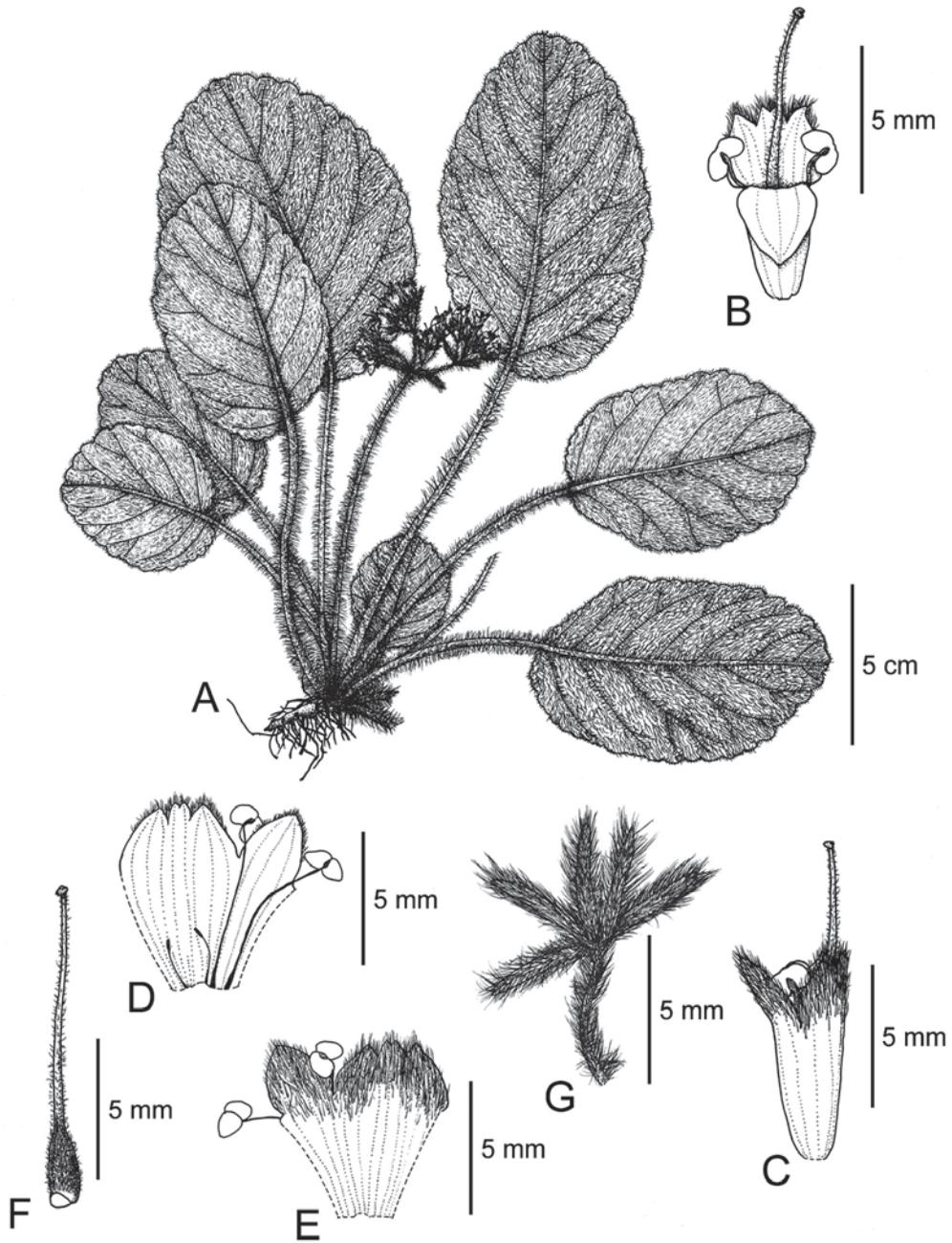


Fig. 1. *Allocheilos villosus* B.L.Burt ex D.J.Middleton. **A.** Habit. **B.** Flower. **C.** Flower, side view. **D.** Corolla dissection, internal. **E.** Corolla dissection, external. **F.** Pistil. **G.** Pedicel and calyx. Drawn from *Pételot s.n.* (P [P00634331]) by Evonne Koh.

2. *Didymocarpus tamdaoensis* D.J.Middleton, sp. nov.

Similar to *Didymocarpus punduanus* Wall. ex R.Br. but bracts fused across the node (free in *D. punduanus*), pedicels glabrous or with occasional eglandular and glandular hairs (densely glandular pubescent in *D. punduanus*), and outside of corolla glabrous (sparsely pubescent in *D. punduanus*). It differs from *Didymocarpus purpureobracteatus* W.W.Sm. in the inflorescence pubescent in lower parts (glabrous in *D. purpureobracteatus*), shorter calyx (3.8–6 mm vs 8–12 mm) and pistil glabrous throughout (vs sparsely pubescent). – TYPE: [Vietnam], Tonkin, Massif du Tam Dao [Tam Dao National Park], 1100 m, April 1931, *Pételot s.n.* (holotype P [P03934202]; isotypes P [P03934203, P03934204]).

Perennial herb to 25 m tall; stems densely pubescent with patent hairs to 1.2 mm long. **Leaves** crowded towards stem apex, opposite; petiole 0.6–2.2(–5.5) cm long, densely pubescent; lamina ovate to elliptic, (1.5–)3.2–10 × (1–)2.1–4.2 cm, base obtuse to cuneate, apex acute, margin shallowly crenate to serrate, secondary veins 6–9 pairs, tertiary venation obscure or laxly reticulate, pubescent throughout above, pubescent on midrib and secondary veins beneath and occasionally also on tertiary veins; no pigment glands. **Inflorescences** subterminal, cymose, few-flowered, 5.5–11 cm long, axes slender, with a mixture of longer eglandular hairs and shorter glandular hairs at base, becoming glabrous distally; peduncle 2.6–5.5 cm long; bracts paired, 2.5–3.5 mm long, rounded, bases of the pair fused across the axis, glabrous; pedicels 5.5–6.5 mm long, glabrous or with occasional eglandular and glandular hairs. **Calyx** consisting of a tube and shallow 5-lobed margin, the lobing rather irregular with lobes of differing sizes within a single flower, campanulate, 3.8–6 mm long, lobes deltoid, 1–1.5 × 1–1.8 mm, apex obtuse to rounded, glabrous. **Corolla** red, funnellform, 26–34 mm long, glabrous; tube 18–22 mm long to sinus between upper and lower lips; upper lip 2-lobed, lobes orbicular, c. 4 × 5 mm, apices rounded; lower lip 3-lobed, lateral lobes orbicular, c. 6 × 5.5 mm, apices rounded, middle lobe orbicular, c. 6 × 6 mm, apex rounded. **Fertile stamens** 2, inserted at c. 15 mm from corolla base; filaments slender, c. 4.5 mm long, glabrous; anthers c. 1.3 × 2.2 mm, hairy at base, attached face to face; staminodes not seen. **Nectary** annular, c. 1.8 mm long, margin crenate. **Pistil** c. 20 mm long, glabrous throughout; ovary c. 17 mm long; style and stigma c. 3 mm long. **Fruit** not seen.

Distribution. Currently known only from the type collection from Tam Dao National Park, Vietnam.

Habitat and ecology. On rocks in a waterfall at 1100 m.

Etymology. The epithet *tamdaoensis* refers to the type locality.

Provisional IUCN conservation assessment. Data Deficient (DD). The species is only known from one collection made in 1931.

Notes. There are two fruiting collections which may also be this species but without flowers it is difficult to be sure. These are *Balansa 4295* (P [P04060434]) and *D'Alleizette s.n.* (L [L.2824040]), both from Mt Bavi in northern Vietnam, around 100 km from Tam Dao. The plants have the pubescence and bracts of *Didymocarpus tamdaoensis* but in both plants the leaves are broader, the apex more rounded, and the margin has a coarser serration than in the Tam Dao plants. The description above does not include these features.

3. *Didymocarpus dalatensis* D.J.Middleton, **sp. nov.**

Similar to *Didymocarpus jaesonensis* Nangngam & J.F.Maxwell in the glandular hairs on the pedicels, the shape of the calyx, the narrow corolla tube and much larger lower lip than upper lip but differs in the much shallower leaf margin serration, the white corolla (violet in *D. jaesonensis*), and the glandular pubescent pistil (glabrous in *D. jaesonensis*). Of the known *Didymocarpus* species in Vietnam, it shares the characters of deep leaf margin serration and tubular calyx with *D. poilanei* Pellegr. but differs in the white corolla (red in *D. poilanei*), the smaller corolla (21.5–26 mm long in *D. dalatensis*, 35–38 mm in *D. poilanei*), and the tube narrower than in *D. poilanei*. – TYPE: [Vietnam], Annam, Haut Donai [Lam Dong], N of Dalat, 1500 m, 2 September 1940, *Poilane 30293* (holotype P [P04060395]; isotype P [P04079329]). (Fig. 2)

Herb to 38 cm tall; stems densely pubescent with a mix of long eglandular hairs and slightly shorter and fewer glandular hairs. **Leaves** opposite or in whorls of 3; petiole 1.5–7.2 cm, with a mix of long eglandular and glandular hairs; lamina slightly to distinctly asymmetrical at base, ovate to elliptic, 6.5–15.5 × 2.9–7.8 cm, base obtuse to cuneate, sometimes unequal base obtuse on one side and cuneate on the other, apex acuminate, margin coarsely serrate, 5–10 pairs of secondary veins, scattered eglandular hairs throughout above, also with occasional glandular hairs on margin, with long eglandular hairs and very occasional glandular hairs on venation and occasionally elsewhere beneath; no pigment glands. **Inflorescences** subterminal, cymose, 4–13-flowered, 5–9 cm long, axes slender, with long glandular hairs throughout and occasional eglandular hairs; peduncle 2.8–3.8 cm long; bracts paired and opposite at each node, almost free to fused across axis, to 2.7 mm long, glabrous; pedicels 4–6 mm long, glabrous or with glandular hairs. **Calyx** consisting of a tube and 5-lobed margin, campanulate, 2.7–3.2 mm long, lobes deltoid, slightly spreading, 0.8–1.2 × 1.5–1.8 mm, apex obtuse to rounded, glabrous. **Corolla** white, salverform, 21.5–26 mm long, lower lip distinctly larger than upper lip, glabrous outside and inside; tube 16–17 mm long to sinus between upper and lower lips; upper lip 2-lobed, c. 2 mm long, lobes orbicular, c. 1.8 × 2.5 mm, apices rounded; lower lip 3-lobed, 5.5–9 mm long, lateral lobes orbicular, 3.8–4 × 5.2–6.5 mm, apices rounded, middle lobe orbicular, 3.5–4 × 5.5–6.2 mm, apex rounded. **Fertile stamens** 2, inserted at c. 15 mm from corolla base; filaments slender, straight, c. 4.7 mm long, glabrous; anther thecae strongly divergent, c. 0.8 × 2.7 mm, with few short hairs dorsally and longer at apices, attached face to face; lateral staminodes c. 2.3 mm long, medial staminode c. 0.6 mm long. **Nectary** annular, c. 1.8

mm long, apex lobed. **Pistil** c. 15 mm long, glandular pubescent throughout; ovary c. 11.5 mm long; style and stigma c. 3.5 mm long. **Fruit** not seen (but see notes below).

Distribution. Only known with certainty from the type locality.

Habitat and ecology. On rocks at 1500 m.

Etymology. The epithet *dalatensis* refers to the type locality.

Provisional IUCN conservation assessment. Data Deficient (DD).

Notes. The fruiting specimen *Schmid VN 2152* from Ta Dung in Lam Dong province, around 100 km from the type locality, may also be this species but this is far from certain, so the dimensions are not included in the description above. The leaves are smaller and more densely pubescent and lack the occasional glandular hairs of the type. The fruits are 2–2.7 cm long.

4. *Loxostigma vietnamensis* D.J.Middleton, **sp. nov.**

Distinct from all other *Loxostigma* species by the combination of being densely appressed pilose on both leaf surfaces and the relatively short corolla (≤ 25 mm long in *L. vietnamensis*, mostly > 30 mm long in all other species, rarely down to 25 mm). – TYPE: Vietnam, Kon Tum, Dak Gley District, about 12 km N of Dak Gley town, near Mang Khen village, 1100–1200 m, 14 November 1995, *Averyanov et al. VH 1635* (holotype P [P03934192]).

Terrestrial caulescent herb to 100 cm tall; stems densely appressed pilose with multicellular uniseriate eglandular hairs. **Leaves** opposite, those of a pair slightly anisophyllous; petioles 0.7–4.5 cm long, pubescence as on stems; lamina elliptic, 3.7–19 \times 1.5–5.2 cm, base cuneate, apex acuminate, margin entire, 5–7 pairs of secondary veins, tertiary venation mostly obscure or laxly reticulate, densely appressed pilose above and beneath. **Inflorescences** from axils of upper leaves, cymose, 4–8-flowered, 9.5–15 cm long, axes slender and sparsely glandular pubescent throughout; peduncle 5.8–6.6 cm long; bracts 2 at a node, opposite, narrowly elliptic, to 5 mm long, densely to sparsely appressed pilose or ciliate; pedicels 11–39 mm long. **Calyx** of 5 lobes free almost to base, tips of lobes yellow, lobes narrowly triangular, 5.3–6.1 \times 0.8–1.2 mm, apices acuminate, appressed eglandular pilose, sometimes with very few hairs. **Corolla** dark purple-brown, tube wide, ventricose ventrally, 22–25 mm long, with sparse glandular and eglandular hairs outside; tube 14–16 mm long; upper lip 2-lobed, lobes c. 3 mm long; lower lip 3-lobed, lateral lobes c. 5 mm long, middle lobe c. 7 mm long, all lobes with rounded apices. **Fertile stamens** 4, cohering in 2 pairs; filaments glabrous; anthers glabrous. **Nectary** an annular ring, thick, lobed. **Pistil** glabrous. **Fruit** a straight capsule, 4.5–6 cm long, c. 3.5 mm wide, apex acuminate; seeds ellipsoid, 0.4–0.6 \times 0.2–0.3 mm, appendages absent.

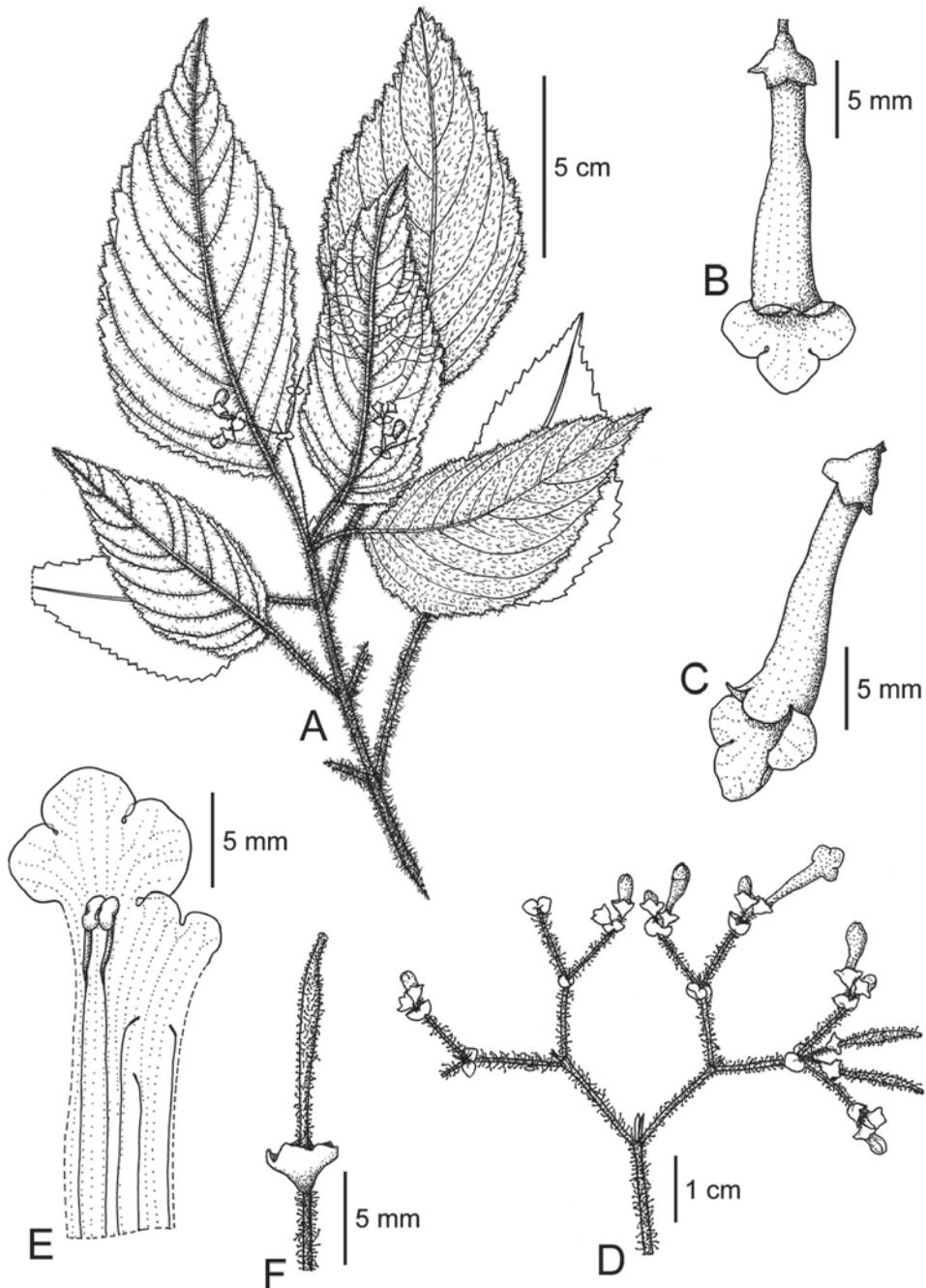


Fig. 2. *Didymocarpus dalatensis* D.J.Middleton. **A.** Habit. **B.** Flower, dorsal view. **C.** Flower, semi-side view. **D.** Inflorescence. **E.** Corolla dissection. **F.** Pedicel, calyx and pistil. Drawn from *Poilane 30293* (P [P04060395]) by Evonne Koh.

Distribution. Endemic to Vietnam, only known from Kon Tum and Quang Nam provinces.

Habitat and ecology. Terrestrial in primary evergreen montane forest on shale and granite at 1000–1200 m.

Etymology. The epithet *vietnamensis* refers to the country to which the species is endemic.

Provisional IUCN conservation assessment. Endangered (EN B1ab(iii)). The Extent of Occurrence can only be estimated but is certainly much less than 5000 km². Currently only four collections are known, one of them from 1941. Although there is still extensive forest in this region, most of it is not in protected areas and subject to forest clearance and degradation.

Additional specimens examined. VIETNAM: **Kon Tum:** Dak Gley District, Dak Man Municipality, Mang La forest, 1000–1050 m, 7 Jan 2009, *Averyanov et al. HAL 12023* (MO); Kon Plong District, Hieu Municipality, 1100–1200 m, 21 Apr 2000, *Averyanov et al. VH 5501* (MO). **Quang Nam:** between the Mòi villages of Go Oi and Mo Oy, 1000–1200 m, 25 Jan 1941, *Poilane 31690* (P [P03934240, P04079318]).

Notes. The available material has very few mature flowers and none that are available for dissection. The description above is therefore somewhat curtailed, especially for the stamen and pistil characters which could only be observed in a dissected flower bud.

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