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Five new species of *Didymocarpus* (Gesneriaceae) from Thailand

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ABSTRACT. Five new species of *Didymocarpus* are described from Thailand: *Didymocarpus brevicalyx* Nangngam & D.J.Middleton, *Didymocarpus formosus* Nangngam & D.J.Middleton, *Didymocarpus kasinii* Nangngam & D.J.Middleton, *Didymocarpus pauciflorus* Nangngam & D.J.Middleton and *Didymocarpus tribounii* Nangngam & D.J.Middleton. Full descriptions, distributions, ecology, phenology and colour plates are provided for all taxa.

KEY WORDS: *Didymocarpus*, Gesneriaceae, new species, taxonomy, Thailand.

INTRODUCTION

The delimitation of the genus *Didymocarpus* Wall. has varied considerably over time (see Burtt, 1998) but was largely stabilised by Weber & Burtt (1998) when large numbers of species were removed to other genera, particularly to *Henckelia* Spreng. (although most of those have since been moved to *Codonoboea* Ridl. or *Loxocarpus* R. Br. - see Middleton et al., 2013). There are approximately 70 species left in *Didymocarpus* (Weber et al., 2000).

The Thai species of *Didymocarpus* were enumerated by Burtt (2001), in which he recognised 16 species of which four were newly described. The genus in Thailand has since been fully revised by Nangngam & Maxwell (2013), resulting in 18 species of which three were newly described. Between these two works *Didymocarpus venosus* Barnett was removed from *Didymocarpus* to the new genus *Tribounia* D.J.Middleton (Middleton & Möller, 2012). Several of the species in Nangngam & Maxwell (2013) were found to have rather restricted distributions. It is not surprising, therefore, that with further exploration in previously unexplored or underexplored parts of Thailand new species have come to light. These species, based on new and some previously overlooked collections, all come from relatively poorly known areas of the Flora of Thailand's South-Western, Northern and North-Eastern regions near the borders with Burma and Laos.

We describe five new species here. The Thai names adopted below have been coined by Pranee Nangngam.

Didymocarpus brevicalyx Nangngam & D.J. Middleton, **sp. nov.** *Didymocarpus brevicalyx* is similar to *D. wattianus* Craib in the corolla shape and colour but differs in corolla size (c. 4.5 cm long in *D. brevicalyx*, 6–7 cm long in *D. wattianus*) and in having a very short calyx tube which is only 3 mm long (1.9 cm long in *D. wattianus*).− Type: Thailand, Sakon Nakhon, Huai Wian Phrai, Phu Phan National Park, 340 m, 1 Aug. 1999, *M. Newman 952* (holotype **E!**). Fig. 1A.

Annual, epilithic herb, 8–12 cm tall. *Stem* erect, reddish near nodes, densely covered with multicellular glandular hairs and scattered pigment glands. *Dry season* plants unknown. *Rainy season leaves* opposite, anisophyllous; petioles terete, 2–4 cm long, pairs unequal, light green, covered with hairs as on leaf blades; blades asymmetrically

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ovate, 7–9 cm long, 3.5–4.5 cm wide, apex acute-acuminate, base slightly oblique, obtuse-cuneate, margins serrulate, upper surface densely covered with white multicellular eglandular hairs, light green, lower surface sparsely covered with hairs as on upper surface, light green, secondary veins 4–6 on each side of midrib, venation pinnate, mostly opposite sometime alternate, obscure above, prominent beneath, covered with multicellular eglandular hairs. *Inflorescences* terminal or subterminal, cymose, up to c. 13 cm long; peduncles slender, 5–8 cm long, c. 1.5–2 mm in diameter, light green, covered with multicellular glandular hairs; pedicels c. 3–6 mm long, reddish, glabrous. *Bracts* paired, reddish, triangular, glabrous, c. 2 x 1.5 mm, apex acute, caducous. *Flowers* few. *Calyx* consisting of a tube and 5-lobed margin, symmetrical, campanulate, c. 4 mm, reddish, glabrous; tube c. 3 mm long, 3 mm in diameter; lobes triangular, c. 2 mm long, c. 2 mm wide, apices acute. *Corolla* funnelform, c. 4.5 cm long, glabrous, dark purple-blackish, becoming light purple at base; tube c. 3.5 cm long, base narrow, c. 2 mm in diameter, widening abruptly at c. 1.5 cm from the base, widest at throat, diameter c. 8 mm; anterior (lower) lip 3-lobed, lobes orbicular, c. 7 x 7 mm, more or less equal, apices rounded; posterior (upper) lip 2-lobed, lobes orbicular, c. 5 x 5 mm, apices rounded. *Fertile stamens* inserted c. 2.2 cm from the base of the corolla; filaments slender, glabrous, 7 mm long, vesicular hairs on the connective; anthers oblong, c. 2.5 x 1 mm, tips and bases rounded, white-bearded; staminodes 3, reduced to filaments, c. 3–5 mm long, glabrous, tips with few multicellular glandular hairs. *Disc* cupular, c. 1 mm long, margin irregular. *Ovary* cylindric, c. 3 cm long, densely covered with multicellular glandular hairs; stigma peltate, concave, papillose. *Capsules* unknown.

Thailand.— NORTH-EASTERN: Sakon Nakhon [Huai Wian Phrai, Phu Phan National Park, 340 m, 1 Aug. 1999, *M. Newman 952* (holotype **E!**); Phu Phan Ratchaniwet Palace, 17˚10′N 104˚09′E, 11 Dec. 1980, *Umpai 608* (paratype **E!**)].

Distribution.— Only known from the type locality in Sakon Nakhon province, North-Eastern Thailand.

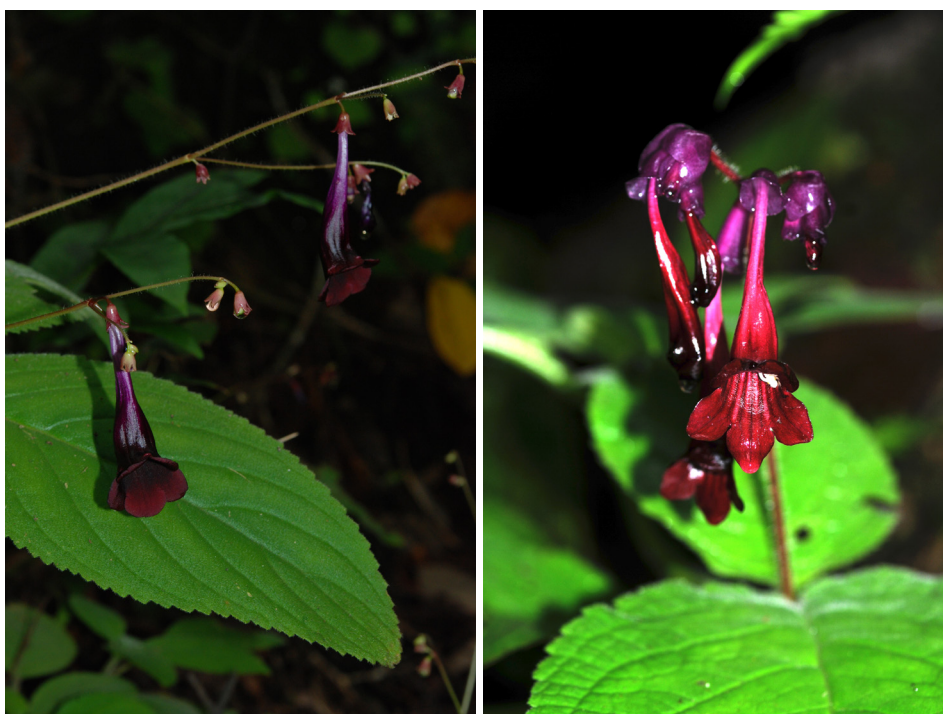

Figure 1. A. *Didymocarpus brevicalyx* Nangngam & D.J.Middleton, B. *D. formosus* Nangngam & D.J.Middleton (photos: P. Triboun).

Ecology.— On sandstone boulders near streams.

Phenology.— Flowering August–December.

Vernacular.— Muang phu phan (ม่วงภูพาน).

Etymology.— The specific epithet refers to the short calyx tube.

Notes.— As well as the similarity to *Didymocarpus wattianus* mentioned in the diagnosis above, *D. brevicalyx* is also similar to the new species *D. formosus* described below. It differs in the much shorter calyx and the hairs on the ovary (glabrous in *Didymocarpus formosus*).

Didymocarpus formosus Nangngam & D.J. Middleton, **sp. nov.** *Didymocarpus formosus* is similar to *D. wattianus* in its dark red-maroon corolla but differs in the glabrous ovary (densely covered with multicellular glandular hairs in *D. wattianus*). − Type: Thailand, Nan, Bo Kluea District, Doi Phu Kha National Park, 1280 m, 15 Aug. 2012, *D.J. Middleton, P. Karaket, S. Suddee & P. Triboun 5604* (holotype **E!**). Fig. 1B.

Deciduous, epilithic, perennial herb, 40 cm tall, c. 4 mm in diameter. *Stem* erect, green, sparsely covered with multicellular eglandular hairs. *Dry season leaves*: blades subcoriaceous, dull brown, symmetrically ovate, c. 1.5 x 1 cm, apex acute, base obtuse, margin concealed by multicellular eglandular hairs. *Rainy season leaves*: 3–4 arranged in opposite, decussate, anisophyllous pairs; petioles green, 2–12 cm long, covered with multicellular eglandular hairs; blades papery, slightly asymmetrically ovate, 7–19 cm long, 4–12 cm wide, apex acuminate-attenuate, base oblique, truncate on one side, cordate on the other side, margins serrate or sometimes doubly serrate, upper and lower surfaces covered with an indumentum as on the petioles, green above, light green beneath, secondary veins 6–8 on each side of midrib, venation pinnate, mostly opposite, sometimes alternate, obscure above, prominent beneath, covered with multicellular eglandular hairs, tertiary veins reticulate, obscure on both sides. *Inflorescences* solitary, terminal, cymose, 14 cm long; peduncles green, tinged red, c. 12 cm long, densely covered with multicellular glandular hairs; pedicels c. 2–3 mm long, covered with indumenta as on peduncle. *Bracts* paired, purple, orbicular, c. 7 x 8 mm, apex rounded, embracing the calyx in bud, caducous. *Flowers* several, pendulous. *Calyx* consisting of a tube and 5-lobed margin, symmetrical, campanulate, pinkish, glabrous; tube c. 13 mm long, 5 mm in diameter; lobes triangular, c. 1 mm long, c. 2 mm wide, apices acute. *Corolla* funnelform, c. 6 cm long, glabrous, dark red-maroon without streaks at throat, slightly paler to purplish-pinkish towards the base; tube 4 cm long, c. 1 cm in diameter, widening at 3 cm from the base; anterior (lower) lip 3-lobed, lobes orbicular, c. 1 x 1 cm, apices rounded; posterior (upper) lip 2-lobed, lobes elliptic, c. 8 × 8 mm, apices rounded. *Fertile stamens* inserted at c. 3.5 cm above the base of the corolla; filaments c. 1 cm long, glabrous; anther locules oblong, c. 4 x 2 mm, tips and bases rounded, white-bearded, cream; staminodes 3, reduced to filaments, c. 2–3 mm long, glabrous. *Disc* cylindric, 2 mm long, margin irregularly lobed. *Ovary* cylindric, 5 cm long, sparsely covered with a vesicular indumentum; stalk and style glabrous; stigma capitate, whitish. *Capsules* unknown.

Thailand.— NORTHERN: Nan [Bo Kluea District, Doi Phu Kha National Park, 1280 m, 15 Aug. 2012, *D.J.Middleton, P. Karaket, S. Suddee & P. Triboun 5604* (holotype **E!**)].

Distribution.— Only known from the type locality, Nan province, Northern Thailand.

Ecology.— On boulders in shade by river in evergreen forest.

Phenology.— Flowering August.

Vernacular.— Soi muang nan (สร้อยเมืองน่าน).

Etymology.— The specific epithet, *formosus*, is Latin for beautiful, referring to the particularly handsome flowers of this species.

Notes.— As well as its similarity to *Didymocarpus wattianus* it is also similar to *Didymocarpus brevicalyx* described above but differs in the characters noted under that species.

Didymocarpus kasinii Nangngam & D.J.Middleton, **sp. nov.** *Didymocarpus kasinii* is similar to *D. aureoglandulosus* C.B.Clarke in the corolla being purplish with dark purple streaks on the lobes but differs in size and shape (c. 1.8 cm long and salverform in *D. kasinii*, c. 3 cm long and funnelform in

D. aureoglandulosus) and in the inflorescences being in the axils of leaves along the stem (often in the upper leaf axils or terminal in *D. aureoglandulosus*).− Type: Thailand, Nan, Doi Phu Kha National Park, 1750 m, 26 July 1999, *P. Srisanga 917* (holotype **E!**; isotype **QBG!**). Fig. 2.

Annual, epilithic herb. *Stem* erect, 4–24 cm tall, c. 2–4 mm in diameter, light green, covered with multicellular eglandular hairs. *Dry season* plants unknown. *Rainy season leaves* almost alternate at base, opposite higher, anisophyllous; petioles terete, 2–9 cm long, pairs unequal, light green, covered with white multicellular eglandular hairs; blades asymmetrically ovate, 6–17 cm long, 3–7 cm wide, apex acute-acuminate, base slightly oblique, obtuse-cuneate, margins serrate, upper surface covered with white multicellular eglandular hairs, green, lower surface sparsely covered with hairs as on upper surface, light green, with scattered brown peltate pigment glands on both sides, secondary veins 4–8 on each side of midrib, venation pinnate, mostly opposite, sometimes alternate, obscure above, prominent beneath, covered with multicellular eglandular hairs. *Inflorescences* axillary, arising from the leaf axils along stem, cymose, c. 9–10 cm long, many-flowered; peduncles slender, c. 1–2 mm long, glabrous, light green; pedicels 5–7 mm long, glabrous, light green. *Bracts*

Figure 2. *Didymocarpus kasinii* Nangngam & D.J.Middleton; Isotype (photo: P. Nangngam).

paired, orbicular, c. 1.5–2 x 1.5–2 mm, overlapping, glabrous, light green to pale pinkish. *Flowers* several. *Calyx* consisting of a tube and 5-lobed margin, lobed only 1/3 way to the base, symmetrically salverform, 3 mm long, light green to pale pinkish-whitish, glabrous; tube c. 2 mm long, 3 mm diameter; lobes triangular, c. 1 mm long, apex acute. *Corolla* salverform, purplish with dark purple streaks on lobes, c. 1.8 cm long; tube c. 1 cm long; anterior (lower) lip 3-lobed, lobes orbicular, c. 4 x 4 mm, more or less equal, apices rounded; posterior (upper) lip 2-lobed, lobes orbicular, c. 3 x 4 mm, apices rounded. *Fertile stamens* inserted c. 6 cm from the base of the corolla; anthers oblong, c. 1.5 x 1 mm; filaments slender, 2 mm long, glabrous, with vesicular hairs on the connective; staminodes 3, minute, c. 0.5 mm long, glabrous. *Disc* cylindric, c. 0.5–1 mm long, margin entire. *Ovary* cylindric, c. 1.1 cm long, c. 1 mm in diameter, glabrous; stigma peltate, concave. *Capsules* erect, symmetrically cylindric, glabrous, 2-valved, loculicidally dehiscent, 1.7 cm long, 0.2 cm wide, style persistent, 5 mm long.

Thailand.— NORTHERN: Nan [Doi Phu Kha National Park, 1750 m, 26 July 1999, *P. Srisanga 917* (holotype **E!**; isotype **QBG!**); Trail from Lan Du Dao to Doi Phukha National Park, 1700 m, 26 June 2008, *R. Pooma & M. Tamura 7103* (paratype **BKF**, **E**)].

Distribution.— Only known from the type locality, Nan province, Northern Thailand.

Ecology.— On rock, in hill evergreen forest.

Phenology.— Flowering July–August.

Vernacular.— Pradap pha doklek (ประดับผาดอกเล็ก).

Etymology.— The specific epithet honours Prof. Kasin Suvatabundhu (1916–1979), a pioneer botanist at the Bangkok Herbarium (BK), Thailand.

Notes.— Doi Phu Kha National Park in northern Thailand has been found to be a rich source of Thai endemic species, including *Didymocarpus kasinii*. The park has a very varied topography and range of soil types with many rivers and caves.

Didymocarpus pauciflorus Nangngam & D.J. Middleton, **sp. nov.** *Didymocarpus pauciflorus* is similar to *D. aureoglandulosus* in its corolla being whitish with dark violet-red streaks on the inside of the lower three lobes. It differs in the fewer flowers (2–3 in *D. pauciflorus*, > 3 in *D. aureoglandulosus*), the smaller overall size, smaller corolla (c. 1.5 cm long in *D. pauciflorus*, c. 3 cm long in *D. aureoglandulosus*), the glabrous ovary (sparsely covered with multicellular glandular hairs in *D. aureoglandulosus*).−Type: Thailand, Kanchanaburi, Sangkhla Buri, Khao Laem National Park, 1220 m, 6 Aug. 2012, *D.J.Middleton, P. Karaket, S. Suddee & P. Triboun 5272* (holotype **E!**; isotype **BKF!**). Fig. 3.

Epiphytic or epilithic annual herb. *Dry season* plants unknown. *Rainy season* new vegetation densely covered with red-brown, peltate pigment

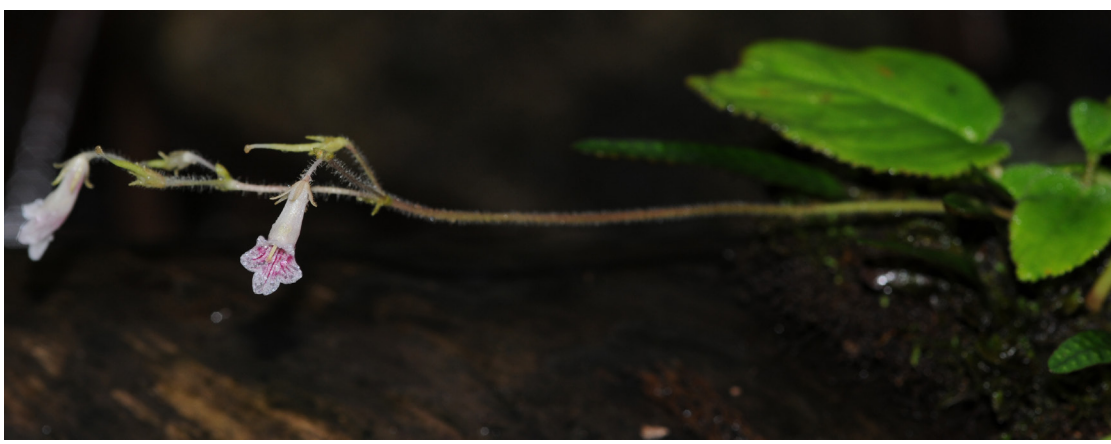

Figure 3. *Didymocarpus pauciflorus* Nangngam & D.J.Middleton (photo: P. Triboun).

glands. *Stem* erect, 2 cm high, c. 2–4 mm diameter. *Leaves* opposite, 2–3 pairs, anisophyllous, sometimes ternate or 3-pseudoverticillate in the lower part; petioles 3–5 cm long, slightly covered with whitish multicellular eglandular hairs; blades subcoriaceous, slightly asymmetrically elliptic-oblong, 6–11 cm long, 3–6 cm wide, apex acute-obtuse, base cuneate or cordate, sometimes oblique, margins serrate to rough denticulate, secondary veins 5–7 on each side of midrib, mostly opposite, obscure above, prominent beneath, without hairs (glabrous), upper surface densely covered with hairs as on petiole, green, lower surface slightly covered with hairs as on petiole, light green, with scattered red-brown, peltate pigment glands. *Inflorescences* terminal, cymose, 4–15 cm long; peduncles 4–12 cm long, c. 1–1.5 mm in diameter, densely covered with multicellular eglandular hairs, light green; pedicels c. 5 mm long, densely covered with hairs as on peduncle. *Bracts* paired, light green, lanceolate, c. 5 mm long, 1 mm wide, apex acute, covered with multicellular eglandular hairs. *Flowers* few. *Calyx* 5-lobed to the base, light green, lobes symmetrically linear-lanceolate, c. 4 mm long, c. 1.5 mm wide, tips acute, outside sparsely covered with multicellular glandular hairs, sometimes also with eglandular hairs, margin entire. *Corolla* asymmetrically campanulate, 1.5 cm long, glabrous, pale pink, inside with dark red streaks on lower three lobes; tube 1 cm; anterior (lower) lip 3-lobed, lobes orbicular, c. 3 x 3 mm, apices rounded; posterior (upper) lip 2-lobed, lobes orbicular, c. 2 x 2 mm, apices rounded. *Fertile stamens* inserted at 3–4 mm from the base of the corolla; filaments c. 4 mm long, glabrous, cream-whitish; anther locules oblong, c. 1.5 x 1 mm, tips rounded, glabrous, cream; staminodes 3, reduced to filaments, c. 1–2 mm long, glabrous, whitish. *Disc* c. 1 mm long, margin irregularly lobed. *Ovary* cylindric, c. 1.2 cm long, 1 mm in diameter, glabrous, light green; style glabrous, light green; stigma cream. *Capsules* unknown.

Thailand.— SOUTH-WESTERN: Kanchanaburi [Sangkhla Buri, Khao Laem National Park, 1220 m, 6 Aug. 2012, *D.J.Middleton, P. Karaket, S. Suddee & P. Triboun 5272* (holotype **BKF!**; isotype **E!**); Si Sawat District, 14˚41′N 99˚02′E, 11 Aug. 1968, *Prayad 1496* (paratype **E!**)].

Distribution.— Kanchanaburi province in South-Western Thailand.

Ecology.— Growing on trees and rocks in hill evergreen forest.

Phenology.— Flowering and fruiting in August.

Vernacular.— Krading doklek (กระดิ่งดอกเล็ก).

Etymology.— From *pauci-*, few, and *-flora*, -flowered, referring to the few-flowered inflorescence.

Didymocarpus tribounii Nangngam & D.J. Middleton, **sp. nov.** *Didymocarpus tribounii* is similar to *D. aureoglandulosus* in its purplish-whitish corolla but differs in the corolla lobes lacking violet or red streaks, having a shorter corolla and having a glabrous ovary (sparsely multicellular glandular pubescent in *D. aureoglandulosus*). It is also similar to *Didymocarpus kerrii* Craib in the orbicular to broadly elliptic leaves and serrate leaf margins but differs in the funnelform and more or less straight corolla (salverform and markedly geniculate in *D. kerrii*).− Type: Thailand, Mae Hong Son, Mae Sariang District, Salawin [Salween], Kiew Maehan, 28 July 2007, *A. Keratikorkul 366* (holotype **E!**; isotype **QBG!**). Fig. 4.

Terrestrial, annual herb. *Dry season* plants unknown. *Rainy season* new vegetation densely covered with multicellular eglandular hairs. *Stem* erect, 4–8 cm high, c. 2 mm in diameter. *Leaves* opposite, decussate, 2–3 pairs, anisophyllous; petioles 0.5–1.5 cm long, densely covered with hairs as on stem; blades subcoriaceous, ovate-orbiculate, 3–5 cm long, 3–4 cm wide, apex rounded, base obtuse, sometimes oblique, margin serrate or sometimes doubly serrate, secondary veins pinnate, with 4–5 on each side of midrib, mostly opposite, obscure above, prominent beneath, covered with multicellular eglandular hairs, upper surface densely covered with hairs as on petiole, lower surface sparsely covered with hairs as on petiole, light green-whitish, with scattered red-brown, peltate pigment glands. *Inflorescences* terminal, cymose, 5–10 cm long; peduncles 4–8 cm long, c. 1 mm in diameter, densely covered with multicellular glandular hairs, light green; pedicels c. 3–5 mm long, densely covered with hairs as on peduncle, sometimes glabrous. *Bracts* paired, light green, lanceolate, c. 2 mm long, 1 mm wide, caducous. *Flowers* few. *Calyx* 5-lobed to the base, light green, lobes slightly unequal in length, linear-lanceolate, c. 3 x

1 mm, apex acute, glabrous, margin entire. *Corolla* asymmetrically salverform, c. 1.7 cm long, vesicular pubescent on outside at the top of tube, purplish-whitish, lobes without violet or red streaks, the lower lip much longer than the upper; tube c. 1.1 cm long; anterior (lower) lip 3-lobed, lobes orbicular, c. 3 x 3 mm, apices rounded; posterior (upper) lip 2-lobed, lobes orbicular, c. 1 x 2 mm, apices rounded. *Fertile stamens* inserted at 8 mm from the base of the corolla; filaments 3 mm long, glabrous; anther locules oblong, 1.5 x 1 mm, tips rounded, cream; staminodes 3, minute, c. 0.5 mm long, glabrous. *Disc* 1 mm long, margin undulate. *Ovary* cylindric, c. 8 mm long, 1.5 mm in diameter, glabrous, light green. *Capsules* 2.5 cm long, 2 mm wide, brown, style persistent.

Thailand.— NORTHERN: Mae Hong Son [Mae Sariang, District, Salawin [Salween], Kiew Maehan, 28 July 2007, *A. Keratikorkul 366* (holotype **E!**; isotype **QBG!**)].

Distribution.— Northern Thailand.

Ecology.— In evergreen forest.

Phenology.— Flowering and fruiting in July.

Vernacular.— Krading bai klom (กระดิ่งใบกลม).

Figure 4. *Didymocarpus tribounii* Nangngam & D.J.Middleton; holotype (photo: P. Nangngam).

Etymology.— Named in honour of the Thai Gesneriaceae taxonomist Dr Pramote Triboun.

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