

Eight new species of *Microchirita* (Gesneriaceae: Didymocarpoideae) from Thailand

DAVID J. MIDDLETON^{1,*}, NAIYANA TETSANA², SOMRAN SUDDEE² & CARMEN PUGLISI³

ABSTRACT

Eight new species of *Microchirita* (Gesneriaceae) from Thailand are described: *Microchirita candida*, *M. chonburiensis*, *M. formosa*, *M. fuscifaucaia*, *M. poomae*, *M. rayongensis*, *M. striata* and *M. suwatii*. With the addition of these species, 37 species are now recorded for Thailand, considerably more than any other country.

KEYWORDS: endemic, karst limestone, taxonomy.

Accepted for publication: 11 July 2023. Published online: 19 July 2023

INTRODUCTION

Microchirita (C.B. Clarke) Yin Z. Wang is a genus of about 39 species in India, Myanmar, southern China, Thailand, Vietnam, Laos, Cambodia, Peninsular Malaysia, Sumatra, Java and Borneo (Puglisi & Middleton, 2017; Xin *et al.*, 2022). The genus is almost exclusively only found in limestone habitats. Puglisi & Middleton (2017) revised the genus for Thailand, recognising 29 species, by far the highest concentration of species for a country across the range of the genus. Many of those 29 species were described only in recent years (Middleton & Triboun, 2013; Puglisi *et al.*, 2016; Puglisi & Middleton, 2017), mostly based on collections made only shortly before. As new collections of *Microchirita* are made in areas previously insufficiently collected or not collected at all, it is perhaps unsurprising that more new species have come to light. Here we describe eight new species based on collections made by Forest Herbarium staff in 2017, 2021 and 2022 and one new species based on a reexamination of further duplicates of material that could not be determined by Puglisi & Middleton (2017). These new species bring the total number of species for Thailand to 37 and for the genus to 47.

MATERIALS AND METHODS

The new species described here are based on an examination of previously unseen duplicates of collections included in the ‘Incertae sedis’ section in Puglisi & Middleton (2017) and on field collections made in Central and North-Eastern Thailand in 2017, in South-Eastern Thailand in 2021 and in Northern Thailand in 2022. The newly available herbarium material has been compared to previously described species from Thailand and other countries in the region.

DESCRIPTIONS

Microchirita candida C. Puglisi & D.J. Middleton, **sp. nov.**

Similar to *Microchirita huppataensis* C. Puglisi in general appearance and the mostly white corolla of similar overall shape but differs in the larger upper corolla lobes (8–9 × 7–8 mm in *M. candida*, 3–3.5 × 3.5–4 mm in *M. huppataensis*) that are strongly laterally reflexed (not or only weakly laterally reflexed in *M. huppataensis*), the lack of darker markings in the throat (dark purple-brown markings in *M. huppataensis*), the ventral surface with the yellow stripe not being strongly

¹ Singapore Botanic Gardens, National Parks Board, 1 Cluny Road, Singapore 259569.

² Forest Herbarium, Department of National Parks, Wildlife and Plant Conservation, 61 Phahonyothin Road, Lat Yao, Chatuchak, Bangkok 10900, Thailand.

³ Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, U.K.

* Corresponding author: davidmiddletonsing@gmail.com

raised (strongly raised in *M. huppatatensis*) and the ovary glabrous throughout (eglandular pubescent in upper part in *M. huppatatensis*). Type: Thailand, Rayong, Klaeng, Khao Tham Rakhang Thong, 10 m, 18 Sept. 2021, *Tetsana, Suddee, Puudjaa, Thananthaisong, Hemrat, Phankien & Daonurai* 2259 (holotype **BKF** [SN232948]; isotypes **BKF** [SN232947, SN232946], **E, K, SING**). Fig. 1.

Herb to ca 80 cm tall; stem succulent, dark purple at base, purple to greenish purple higher, glossy, stems glabrous or with only occasional eglandular hair. *Leaves* opposite apart from the basal leaf; petioles 1.7–3.6 cm long, glabrous; blades extremely thin, dull green above, dull pale green beneath, ovate, 4–25 × 2.7–14.7 cm, base cordate to rounded, apex short acuminate, margin entire, ciliate, 8–22 pairs of secondary veins, tertiary venation reticulate but largely inconspicuous, with sparse eglandular hairs above and beneath. *Inflorescences* cristate, 1–10-flowered; peduncles reduced; bracts absent; pedicels 16–23 mm long, with occasional eglandular hair. *Calyx* green, lobes narrowly ovate, 6–10 × 1.2–2.6 mm, apex acute to acuminate, ciliate with eglandular hairs and with a few scattered eglandular hairs outside on midline and towards apex, inside with a few hairs near apex. *Corolla* ca 22 mm long, white throughout except for yellow stripe on ventral surface, this slightly raised, tube narrow and strongly curved downwards in lower 2/3, then abruptly widening into wide upper tube, ventrally slightly pouched, upper lip erect with lobes laterally strongly reflexed, sparsely eglandular hairy outside on upper tube and lobes, with shortly-stalked glands inside upper tube and base of upper lobes; tube 13–17 mm long dorsally, 18.5–21 mm long ventrally, 12–14 mm laterally between lips; lobes elliptic, apices rounded, upper lobes 8–9 × 7–8 mm, overlapping, lateral lobes 5–7 × 9–11 mm, ventral lobe 6–9 × 10–11 mm. *Stamens* attached at 7–10 mm above corolla base; filaments curved, ca 2 mm long, glabrous; anthers white, glabrous, 1.5–2 × 2–2.3 mm, held at a right angle, connected at the apices by a ligature; staminodes inconspicuous. *Nectary* annular, margin subentire to 5-crenate, 0.7–0.9 mm high. *Pistil* enantiostylous, 9.5–14 mm long, glabrous throughout; ovary 3–4.5 mm long, ca 1.1 mm diameter, glabrous throughout; style curved, 6–9.5 mm long; stigma ca 1 mm, bilobed, lobes rounded. *Fruit* pale green, 2.3–4.2 cm long, 2–2.3 mm wide, glabrous.

Thailand.— SOUTH-EASTERN: Rayong [Khao Tham Rakhang Thong, *Tetsana et al.* 2259 (**BKF, E, K, SING**)].

Distribution.— Only known from the type locality.

Ecology.— On karst limestone in dry evergreen forest.

Vernacular.— Yat khao la o (หยาดขาวล่อ) (proposed here).

Etymology.— The specific epithet is Latin for glossy white, in reference to the corolla.

Provisional IUCN conservation assessment.— Data Deficient (DD). The species is only known from the type collection. The population size, Extent of Occurrence and Area of Occupancy are unknown.

Notes.— This species is particularly distinctive due to the large upper corolla lobes that are laterally reflexed in the only known material. However, it should be noted that in other species, this character can be variable.

Microchirita chonburiensis D.J.Middleton & C.Puglisi, **sp. nov.**

Similar to *Microchirita hypocrateriformis* C.Puglisi in the overall shape and size of the corolla but differs most conspicuously in the bright yellow corolla (mostly white or mostly blue in *M. hypocrateriformis*) and the indumentum of primarily glandular hairs on the pedicels (eglandular in *M. hypocrateriformis*). Also similar to *M. rayongensis* in the overall shape and size of the flower but differs in the primarily yellow corolla (white in *M. rayongensis*) and the pubescent upper half of the pistil (glabrous in *M. rayongensis*). It is currently the only known yellow-flowered species with a more or less flat-faced corolla and exposed anthers. Type: Thailand, Chon Buri, Bo Thong, Khao Tham Mi, 90 m, 17 Sept. 2021, *Tetsana, Suddee, Puudjaa, Thananthaisong, Hemrat, Phankien & Daonurai* 2258 (holotype **BKF** [SN232944]; isotypes **BKF** [SN232945], **E, SING**). Fig. 2.

Herb to 30 cm tall; stems succulent, lower part greenish purple, upper part green, sparsely puberulent with mix of glandular and eglandular hairs. *Leaves* opposite apart from the basal leaf; petioles 0.4–1.5

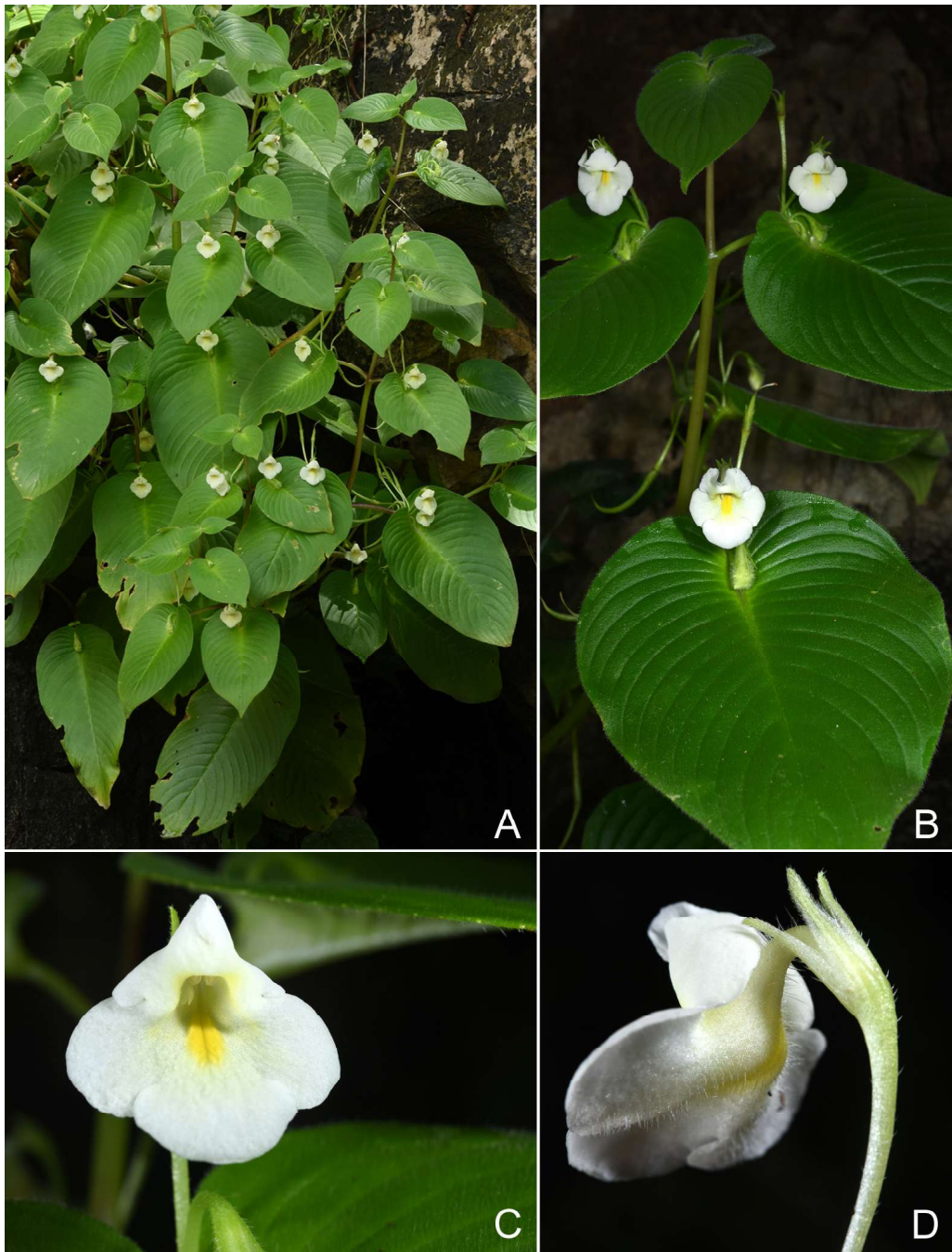


Figure 1. *Microchirita candida* C.Puglisi & D.J.Middleton: A. habitat; B. habit; C. flower, front view; D. flower, back view. Photos by Naiyana Tetsana.



Figure 2. *Microchirita chonburiensis* D.J.Middleton & C.Puglisi: A. habitat; B. habit; C. flower, front view; D. flower, side view. Photos by Naiyana Tetsana.

cm long, sparsely puberulent with mix of glandular and eglandular hairs; blades very thin, dull green, ovate, 6.3–16.3 × 2.9–6.4 cm, base cordate to rounded, apex short acuminate, margin entire, ciliate, 8–16 pairs of secondary veins, tertiary venation obscure, with sparse eglandular hairs and very occasional glandular hair above and beneath. *Inflorescences* cristate, emerging at apex of petiole, ca 8-flowered, with glandular hairs of differing lengths throughout, occasional eglandular hair in lower parts; peduncles reduced; bracts absent; pedicels 10–11.5 mm long, with glandular hairs and few longer eglandular hairs. *Calyx* divided to base, lobes narrowly ovate, 7.5–9 × 0.9–2 mm, apex acute, with glandular and eglandular hairs, ciliate margin mostly eglandular, inside with few eglandular hairs at apex. *Corolla* 23–24 mm long, bright yellow throughout, tube slightly paler, tube narrow, strongly bent downwards in middle, expanding into short upper tube and flat-faced limb, outside mostly eglandular pubescent, partly glandular, inside lower tube glabrous, the mouth papillose and with robust glands on the upper lip and lobes, lower lobes glabrous; tube 13.5–16 mm long dorsally, 18–19 mm ventrally, 13–14 mm laterally between the lips; upper lobes elliptic, 2.5–5 × 4–6 mm, apex obtuse to rounded; lateral lobes broadly ovate, 5.5–6 × 8–9 mm, apex obtuse to rounded, ventral lobe broadly ovate, 5.5–7 × 9.8–11 mm, apex obtuse to rounded. *Stamens* attached at 9.5–11 mm above corolla base; filaments curved, purple, ca 1.8 mm long, sparsely glandular and eglandular puberulent; anthers globose, ca 2 × 2 mm, held at a right angle, covered in hairs that originate from the insertion of the anther onto the filament, connected at the apices by a broad and transparent ligature; lateral staminodes ca 0.7 mm long. *Nectary* annular, margin subentire, ca 0.8 mm high. *Pistil* 10–12 mm long; ovary 4.5–5 mm long, ca 1 mm diameter, lower half glabrous, upper half eglandular puberulent; style 5.5–7 mm long, glabrous; stigma glabrous. *Fruit* (mature?) ca 4.5 cm long.

Thailand.— SOUTH-EASTERN: Chon Buri [Bo Thong, Tham Khao Ha Yot, 100 m, 15 Sept. 2021, *Tetsana et al.* 2238 (BKF [SN232987, SN232988], SING); Bo Thong, Khao Tham Mi, 90 m, 17 Sept. 2021, *Tetsana et al.* 2258 (BKF, E, SING)].

Distribution.— Only known from Bo Thong District in Chon Buri.

Ecology.— On karst limestone in dry evergreen forest.

Vernacular.— Yat si chon (หยาดศรีชล)(proposed here).

Etymology.— This species is named after the province in which it was collected.

Provisional IUCN conservation assessment.— Vulnerable VU D2. The species is only known from two collections, neither of them in a protected area.

Notes.— This is one of a group of species, along with *Microchirita hypocrateriformis* and *M. rayongensis*, with a very similar corolla shape but differing in a number of other characters, including most obviously corolla colour.

Microchirita formosa D.J.Middleton, sp. nov.

Similar to *Microchirita candida* C.Puglisi & D.J.Middleton in the overall shape and size of the corolla but differs in the long hairs on the anthers (glabrous in *M. candida*) and the hairs on the upper part of the ovary and on the style (glabrous in *M. candida*). It is also similar to *M. huppatatensis* C.Puglisi in general appearance but differs in the lack of dark markings in the corolla throat (present in *M. huppatatensis*) and the long hairs on the anthers (only short hairs in *M. huppatatensis*). Type: Thailand, Phitsanulok, Noen Maprang, Tham Pha Tha Phon Wildlife Non-hunting area, 74 m, 18 Aug. 2022, *Tetsana, Puudjaa, Hemrat, Jirakorn & Trakulthip* 2531 (holotype BKF [SN240510]; isotype BKF [SN240511]). Fig. 3.

Herb to 65 cm tall; stems succulent, pale green, red around nodes, with sparse white hairs. *Leaves* opposite apart from the basal leaf; petioles 0.5–2.5 cm long, with sparse white hairs; blades very thin, dull green above, pale green beneath, ovate to elliptic, 5.3–28 × 2.5–12.6 cm, base rounded to obtuse, apex short acuminate, margin entire, 8–18 pairs of secondary veins, tertiary venation obscure, pubescent above and beneath. *Inflorescences* cristate, emerging at apex of petiole and base of lamina, ca 4-flowered; peduncles reduced, with sparse white hairs; bracts absent; pedicels 4–19 mm long, with sparse eglandular hairs. *Calyx* divided almost to base, lobes narrowly ovate, ca 5.5 × 2 mm, apex acute, with long eglandular hairs, occasionally also

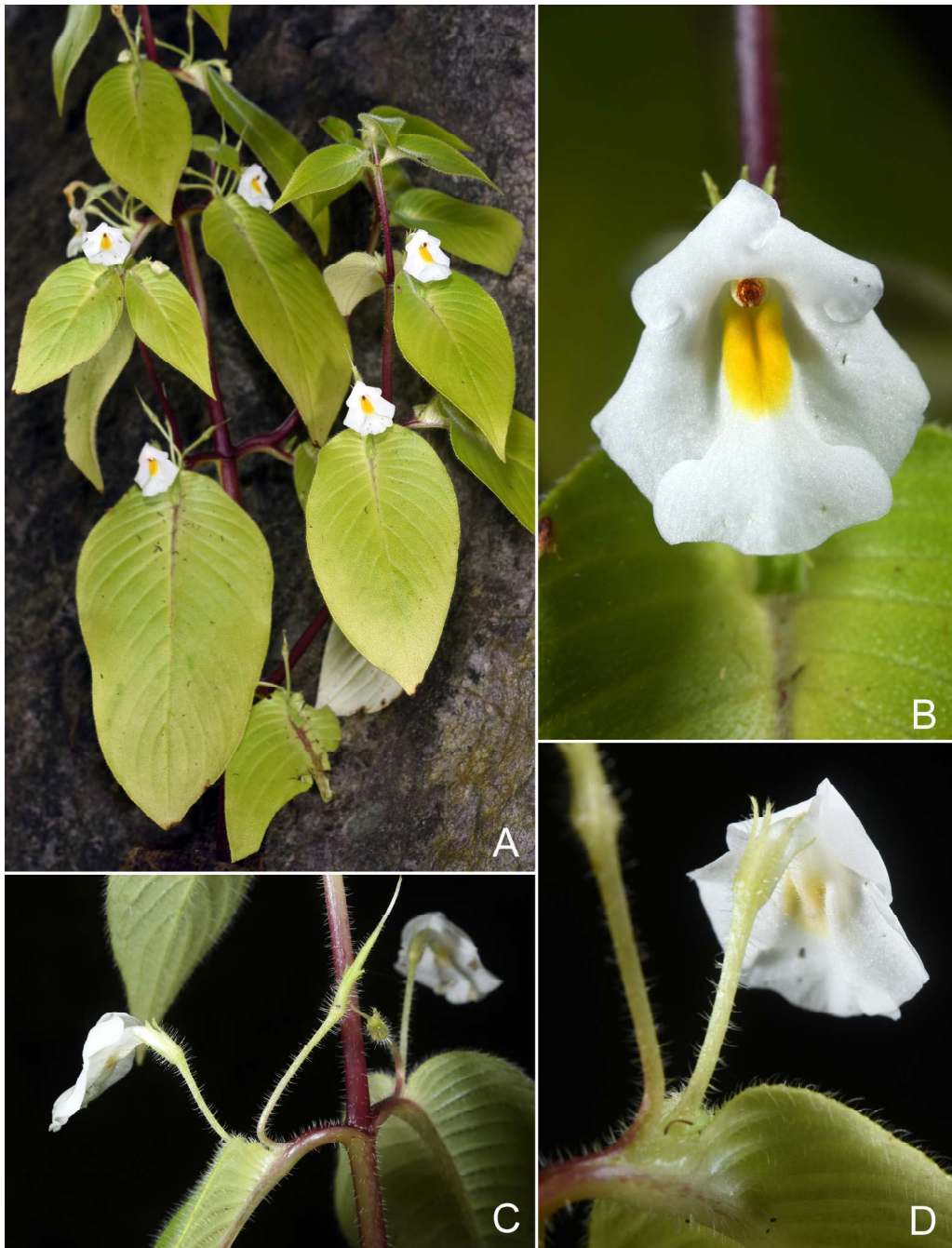


Figure 3. *Microchirita formosa* D.J.Middleton: A. habit; B. flower, front view; C. flower, side view; D. flower, back view. Photos by Naiyana Tetsana.

with few long glandular hairs. *Corolla* 20–22.5 mm long, white throughout except for ventral portion of the lower lip and upper tube yellow, this part strongly raised in two lines, tube narrow at base, strongly bent downwards in middle, upper tube gradually flaring to limb, lower lip prominent, all lobes reflexed or not, outside tube glabrous at base, upper tube and base of lobes with long glandular hairs; tube 12.5–13 mm long dorsally, 16–18 mm ventrally, 10–11 mm laterally between lips; upper lobes compressed orbicular, apices rounded; upper lobes compressed orbicular, 3–4 × 6–7.6 mm, lower lip with lateral lobes compressed orbicular, 4–5.5 × 6.5–12.5 mm, apices rounded, ventral lobe elliptic, 5.5–5.7 × 8.7–11 mm, apex rounded. *Stamens* attached at 8–8.5 mm above corolla base; filaments short, 1.8–2 mm long, glabrous or with few short hairs; anthers 1.5–1.8 × 1.3–2 mm, with long brown hairs dorsally, apices connected by a ligature; lateral staminodes 1 mm long, medial staminode not seen. *Nectary* annular, 0.5–1 mm long, margin subentire. *Pistil* enantiostylous, ca 14.7 mm long; ovary 3–5.7 mm long, with few to denser short hairs at apex; style 3–9 mm long, with sparse to dense short hairs; stigma lobes small.

Thailand.— NORTHERN: Phitsanulok [Noen Maprang, Tham Pha Tha Phon Wildlife Non-hunting area, 74 m, 18 Aug. 2022, *Tetsana et al.* 2531 (BKF); *ibid.*, Wat Thamyai Nakkarat, 102 m, 18 Aug. 2022, *Tetsana et al.* 2535 (BKF); *ibid.*, Ban Mung, Tham Khun Suk, 82 m, 29 Oct. 2022, *Tetsana et al.* 2619 (BKF), 2620 (BKF)]; *ibid.*, Ban Mung, Wat Pa Mamuang, 79 m, 20 Aug. 2022, *Tetsana et al.* 2547 (BKF); *ibid.*, 73 m, 29 Oct. 2022, *Tetsana et al.* 2617 (BKF).

Distribution.— Only known from the Noen Maprang District in Phitsanulok.

Ecology.— On karst limestone at 74–102 m elevation.

Vernacular.— Yat noen maprang (หยาดเนินมะปราง)(proposed here).

Etymology.— The specific epithet *formosa* means beautiful.

Provisional IUCN conservation assessment.— Vulnerable VU D2. This species is only known from four localities, only one of which is in a protected area and the others at sites subject to human disturbance.

Notes.— This species is superficially similar to *Microchirita candida* and *M. huppatatensis* but can be differentiated as given in the diagnosis. It is also similar to *M. woodii* D.J.Middleton & Triboun but differs in the lack of a dark coloration in the corolla throat and having only one hair type on the anthers.

***Microchirita fuscifauca* C.Puglisi & D.J.Middleton, sp. nov.**

Similar to *Microchirita woodii* D.J.Middleton & Triboun in the overall shape and size of the corolla but differs in the dark coloration of the throat forming an almost continuous ring (only in line with the lateral lobes of the lower lip in *M. woodii*), the lack of hairs on the anthers (with a dimorphic indumentum of long brown hairs and short white hairs in *M. woodii*) and the glabrous pistil (papillose at the base, pubescent above in *M. woodii*). Also similar to *M. huppatatensis* in general appearance but corolla only slightly raised along a ventral line (distinctly so in *M. huppatatensis*), anthers glabrous (small patch of short hairs in *M. huppatatensis*) and pistil glabrous (glabrous in the basal $\frac{2}{3}$, apically glandular hairy in *M. huppatatensis*). Type: Thailand, Rayong, Khao Chamao, Tham Neramitra, 70 m, 17 Sept. 2021, *Tetsana, Suddee, Puudjaa, Thananthaisong, Hemrat, Phankien & Daonurai* 2251 (holotype BKF [SN232985]; isotypes BKF [SN232986], E, SING). Fig. 4.

Herb to ca 30 cm tall; stems succulent, subglossy green, with occasional white hair. *Leaves* opposite apart from the basal leaf; petioles 0.4–2 cm long, glabrous; blades very thin, dull green above, pale green beneath, ovate, 8.5–30 × 5.2–16.5 cm, base cordate to rounded, apex short acuminate, margin entire, 6–18 pairs of secondary veins, tertiary venation obscure, sparsely to mid pubescent above and beneath. *Inflorescences* cristate, emerging at apex of petiole and base of lamina, ca 8–12-flowered; peduncles reduced, glabrous; bracts absent; pedicels 5–9 mm long, with sparse glandular hairs. *Calyx* divided almost to base, lobes narrowly ovate, 9.5–14 × 1.8–3.5 mm, apex acute to acuminate, margin sparsely ciliate towards apex, outside glabrous or with few glandular hairs along the midrib and by the apex, inside with few glandular hairs at the tip. *Corolla* 21–28 mm long, white outside, outer part



Figure 4. *Microchirita fuscifauca* C.Puglisi & D.J.Middleton: A. habitat & habit; B. inflorescence; C. inflorescences and side view of flowers; D. flower, front view. Photos by Naiyana Tetsana.

of lobes white inside, throat dark purplish red to brown in a ring, pale greenish yellow ventrally turning into a yellow slightly raised portion on the lower lip, pale diffused yellow at base of all lobes inside, tube narrow at base, slightly bent downwards in middle, upper tube gradually flaring to limb, outside tube glabrous at base, upper tube and base of lobes with long eglandular hairs, inside with a ring of short glandular hairs around throat, these sparse or absent ventrally; tube 18–19 mm long dorsally, 15–17 mm ventrally, 13–16 mm laterally between lips; upper lobes compressed orbicular, apices rounded, entire upper lip ca 5 × 11 mm with the two lobes only slightly distinct with a sinus of ca 1.5 mm, lower lip with lateral lobes compressed orbicular, ca 7 × 9.5–11 mm, apices rounded, ventral lobe elliptic, ca 8.5 × 13 mm, apex rounded. *Stamens* attached at 8–10 mm above corolla base; filaments short, curved, 1.2–1.5 mm long, glabrous; anthers 1–1.6 × 2–2.5 mm, glabrous, apices connected by a ligature; staminodes inconspicuous. *Nectary* annular, ca 0.7–1.1 mm, margin subentire. *Pistil* enantiostylous, ca 13–14 mm long, entirely glabrous; ovary 5–7 mm; style ca 8 mm long; stigma bilobed, ca 1 mm long. *Fruit* 3.5–4 cm long, ca 2.5 mm wide.

Thailand.— SOUTH-EASTERN: Rayong [Khao Chamao, Tham Neramitra, 70 m, 17 Sept. 2021, *Tetsana et al.* 2251 (**BKF**, **E**, **SING**); *ibid.*, Khao Noi Subdistrict, Wat Tham Suwan Phu Pha, 50 m, 25 Nov. 2020, *Tetsana et al.* 1965 (**BKF**)].

Distribution.— Only known from Khao Chamao District in Rayong.

Ecology.— On karst limestone in dry evergreen forest.

Vernacular.— Yat neramit (หยาดเนรมิตร) (proposed here).

Etymology.— The specific epithet refers to the dark throat of the corolla.

Provisional IUCN conservation assessment.— Vulnerable VU D2. The species is only known from two collections, neither of them in a protected area.

Microchirita poomae D.J.Middleton, **sp. nov.**

Similar to *Microchirita tubulosa* (Craib) A. Weber & D.J.Middleton in the crested inflorescence, large flower, narrow lower corolla tube and abruptly wider upper tube, and in the hairs on the anthers, but differs

in the larger corolla (27–32 mm long in *M. poomae* and 17–25 mm long in *M. tubulosa*), the corolla being predominantly purple with no darker lines either side of the ventral yellow stripe in *M. poomae* (white and with dark lines either side of the ventral yellow stripe in *M. tubulosa*), and the much less hairy plant overall in *M. poomae*. It is also similar to *M. suwatii* D.J.Middleton & C.Puglisi in the overall shape and colour of the flower but the corolla is smaller (27–32 mm long vs 36–41 mm long), there are glandular hairs on the outside of the corolla (eglandular hairs only in *M. suwatii*), and the ovary is glabrous (densely pubescent in *M. suwatii*). *Microchirita poomae* differs from *M. tetsanae* C.Puglisi in being overall much less pubescent, the corolla lobes not overlapping nearly as much, and the corolla tube abruptly flaring (gradually so in *M. tetsanae*); from *M. limbata* C.Puglisi, it differs in the longer corolla (14–16 mm in *M. limbata*), the straight filaments (geniculate in *M. limbata*) and the lack of glandular indumentum; from *M. albocyanea* C.Puglisi, it differs in the slightly larger corolla (21–25 mm in *M. albocyanea*) which broadens more abruptly in *M. poomae*, the straight filaments (geniculate in *M. albocyanea*) and the lack of dimorphic anther indumentum. Type: Thailand, Saraburi, Phraphutthabath [Phra Phutthabat], Khunkhol [Khun Khlon], Tham Makak, 50 m alt., 20 Nov. 2005, *Pooma, Berg & Poopath* 5719 (holotype **BKF** [SN180974]; isotypes **BKF** [SN174470], **E** [E00629478], **L**). Fig. 5.

Caulescent herb ca 50 cm tall, internodes to 6–13 cm; stems succulent, glabrous except for very occasional isolated small eglandular hair. *Leaves* opposite, apart from the basal leaf; petioles 0.5–1.7 cm long, glabrous except for very occasional and isolated eglandular hair and even more occasional glandular hair; blades green above, paler green beneath, ovate, 7–20 × 3.9–14 cm, 1.4–2.3 times as long as wide, base subcordate to obtuse, apex acute to short acuminate, sparse minute hairs above, even more sparsely so beneath, minutely ciliate along the margin, margin entire, 5–15 pairs of secondary veins, venation slightly raised beneath, tertiary venation inconspicuous. *Inflorescences* cristate, 6–14-flowered; fused peduncle/pedicel bases 2–5 mm long, glabrous except for minute sessile glands; bracts absent; pedicels 7–16 mm long, glabrous except for minute sessile glands. *Calyx* pale green, tube ca 1 mm long,

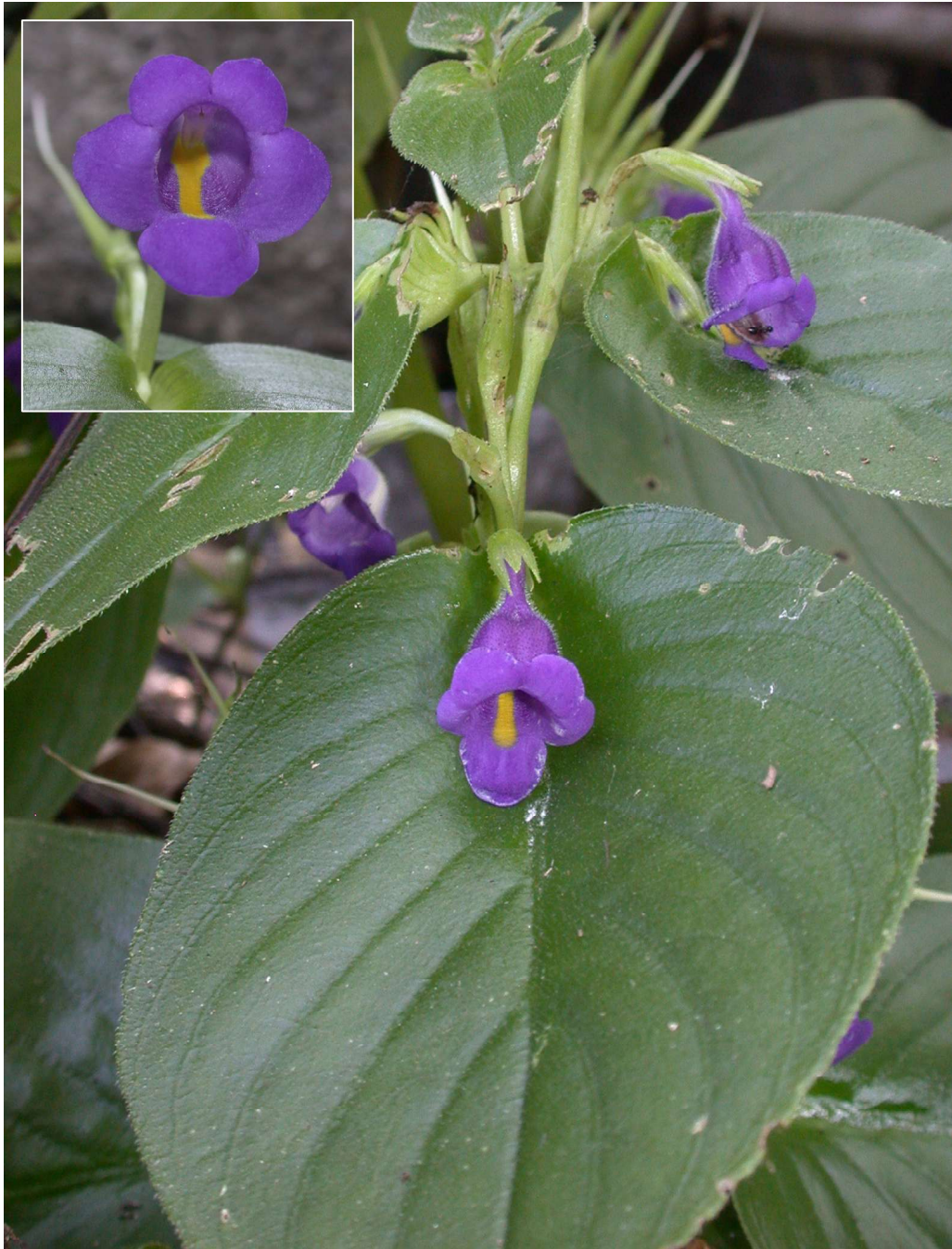


Figure 5. *Microchirita poomae* D.J.Middleton: Main figure. habit; Inset. flower, front view. Photos by Rachun Pooma.

lobes imbricate at base, narrowly lanceolate, 7.5–14 × 2.4–3.8 mm, the 2 ventral lobes slightly smaller than the 3 dorsal lobes, apex acuminate, margin entire, outside with a few minute eglandular hairs on midline of each lobe and along the margins, inside glabrous. *Corolla* 27–32 mm long, tube white at base, turning purple in upper half of narrow lower part, lobes purple, with a bright yellow stripe ventrally, lower tube narrow, strongly curved, abruptly widening into campanulate upper tube, lateral lobes of lower lip and upper lip slightly reflexed, central lobe of lower lip hardly spreading, sparsely mixed glandular and eglandular puberulent on outside of tube except at base and eglandular puberulent on outside of lobes, with sessile glands in tube dorsally; tube 22–27.5 mm long to sinus of upper and lower lips; upper lobes suborbicular, ca 3.5 × 2.8 mm, lateral lobes suborbicular, 4.5–5.5 × 7–8 mm, ventral lobe suborbicular, 5.5–6 × 5–6.5 mm. *Stamens* attached at ca 12 mm above corolla base; filaments straight, white, glabrous, ca 6 mm long; anthers white with an indumentum of long white hairs, ca 1.5 × 3.2 mm, apices of anthers connected by a ligature; lateral staminodes not seen. *Nectary* annular, margin entire, ca 1.1 mm high. *Pistil* ca 24 mm long; ovary ca 8 mm long, glabrous; style ca 15 mm long, glabrous or with occasional hair; stigma ca 1 mm long, bilobed. *Fruit* 2.5–4 cm long, 2–2.5 mm wide, slightly curved.

Thailand.—CENTRAL: Saraburi [Phraphutthabath [Phra Phutthabat], Khunkhol [Khun Khlon], Tham Makak, 50 m alt., 20 Nov. 2005, *Pooma et al.* 5719 (BKF, E, L); Wat Phraphutthabath [Wat Phra Phutthabat], 110 m alt., 22 Sept. 1999, *Wongprasert s.n.* (BKF)].

Distribution.— Only known from two nearby localities in Saraburi.

Ecology.— Shaded on a rather dry scrub limestone hill.

Vernacular.— Yat phu ma (หยาดพุ่มมา) (proposed here).

Etymology.— Named in honour of Dr Rachun Pooma of the Forest Herbarium who was one of the collectors of the type collection.

Proposed IUCN conservation assessment.— Endangered (EN B1ab(iii)). In recent decades the Phra Phutthabat limestone mountains have been heavily quarried for cement and marble resulting in

the severe deterioration of the limestone vegetation in this region. The area immediately around the temple is relatively protected as it is one of the most sacred Buddhist temples in Thailand but this is a relatively small portion of the wider locality.

Notes.— In Puglisi & Middleton (2017) the collection *Pooma et al.* 5719 from Saraburi was placed in a list of ‘Incertae sedis’ material as the specimen then seen was inadequate to satisfactorily place in a species or describe as new. A better duplicate of the same collection, along with a spirit collection and photographs of the plant in the field have now been seen and we are confident that it is an undescribed species. We, therefore, describe it here and name it after one of the collectors of the type collection.

Microchirita rayongensis C. Puglisi & D.J. Middleton, **sp. nov.**

Similar to *Microchirita chonburiensis* in the overall shape and size of the flower but differs in the primarily white corolla (yellow in *M. chonburiensis*) and the glabrous pistil (eglandular puberulent in upper half in *M. chonburiensis*). It also resembles *M. hypocrateriformis* but differs in the indumentum of eglandular and glandular hairs on the pedicels (eglandular only in *M. hypocrateriformis*) and the glabrous pistil (eglandular puberulent in upper half in *M. hypocrateriformis*). Type: Thailand, Rayong, Khao Chamao, Wat Tham Khao Prathun, 80 m, 15 Sept. 2021, *Tetsana, Suddee, Puudjaa, Thananthaisong, Hemrat, Phankien & Daonurai* 2230 (holotype BKF [SN232990]; isotypes BKF [SN232989, SN232991, SN232992], E, K, L, QBG, SING). Fig. 6.

Herb to 30 cm tall; stems succulent, lower part purple, upper part purplish green to green, glabrous. *Leaves* opposite apart from the basal leaf; petioles 0.5–1.9 cm long, glabrous or with few hairs; blades very thin, dull green with dark green secondary veins above, pale green beneath, ovate, 3.8–20 × 2.3–11 cm, base cordate to subcordate, apex short acuminate, margin entire, 6–15 pairs of secondary veins, tertiary venation obscure, sparsely to mid pubescent above and beneath. *Inflorescences* cristate, emerging at apex of petiole, ca 4–5-flowered (but more maybe yet to develop), with sparse eglandular and glandular hairs of differing lengths throughout; peduncles reduced; bracts absent; pedicels 8–18 mm long.



Figure 6. *Microchirita rayongensis* C.Puglisi & D.J.Middleton: A. habit; B. flower, front view; C. flower, side view; D. flower, back view. Photos by Naiyana Tetsana.

Calyx green, divided to base, lobes narrowly ovate, 7.5–10 × 2–2.6 mm, apex narrowly acute, with sparse long hairs on midline of lobes and margins, few hairs at very tips of lobes inside. *Corolla* 27–29 mm long, white, pale yellow in throat and base of lower lip, tube narrow, strongly bent downwards in middle, expanding into short upper tube and flat-faced limb, outside densely eglandular pubescent except at base of tube, inside lower tube glabrous, the mouth papillose and with glandular hairs, these sometimes robust, on the upper lip and lobes, lower lobes glabrous; tube ca 13 mm long dorsally, 16.5–19 mm ventrally, 11.5–15 mm laterally between the lips; upper lobes orbicular, ca 5 × 5 mm, apices rounded, lateral lobes broadly ovate, ca 7 × 8 mm, apices rounded, ventral lobe ca 11 × 10 mm, apex rounded. *Stamens* attached at 9–10 mm from corolla base; filaments curved, white, 1.5–2 mm long, glabrous; anthers dark purple, globose, 2.1–2.5 × 2–2.5 mm, covered in long hairs that originate from the insertion of the anther onto the filament, apices of anthers connected by a ligature; staminodes not seen. *Nectary* annular, margin entire, 0.5–1 mm high. *Pistil* enantiostylous, ca 16 mm long; ovary ca 7 mm long, ca 1 mm diameter, glabrous; style 9 mm long, with occasional hair near apex. *Fruit* 2.7–5 cm long, ca 2 mm wide, glabrous.

Thailand.— SOUTH-EASTERN: Rayong [Khao Chamao, Wat Tham Khao Prathun, 80 m, 15 Sept. 2021, *Tetsana et al.* 2230 (BKF, E, K, L, QBG, SING)].

Distribution.— Only known from the type locality.

Ecology.— On karst limestone in dry evergreen forest.

Vernacular.— Yat si rayong (หยาดศรีระยอง) (proposed here).

Etymology.— This species is named after the province in which it was collected.

Provisional IUCN conservation assessment.— Data Deficient (DD). The species is only known from the type collection. The population size, Extent of Occurrence and Area of Occupancy are unknown.

Notes.— See note under *Microchirita chonburiensis*.

Microchirita striata D.J.Middleton & C.Puglisi, **sp. nov.**

Similar to *Microchirita micromusa* (B.L.Burt) A.Weber & D.J.Middleton but differs in the longer and differently shaped corolla (ca 29 mm and ventrally slightly pouched in *M. striata*, 20–26 mm long and gradually flaring from narrow base in *M. micromusa*), the red lines in the corolla tube (absent in *M. micromusa*), glabrous filaments (sparsely eglandular hairy in *M. micromusa*) and anthers with a monomorphic hair type (dimorphic in *M. micromusa*). Also similar to *M. elphinstonia* (Craib) A.Weber & D.J.Middleton but differs in the pubescent stems (glabrous in *M. elphinstonia*) and the red lines in the corolla tube (two dark spots and no lines in *M. elphinstonia*). Type: Thailand, Lop Buri, Chaibadan, Wat Khao Tambol, 112 m, 11 Oct. 2017, *Suddee, Hemrat & Kiewbang* 5314 (holotype BKF [SN232936]; isotypes BKF [SN232937], SING). Fig. 7.

Herb to 25 cm tall; stems succulent, pubescent with hairs of various lengths, slightly scabrid. *Leaves* opposite apart from the basal leaf; petioles 0.6–1.5 cm long, short pubescent and with occasional longer hairs; blade ovate, 5.5–10 × 2.2–4.5 cm, apex short acuminate, margin entire, 6–9 pairs of secondary veins, short pubescent above and beneath. *Inflorescences* cristate, emerging at apex of petiole and base of lamina, 6–8-flowered; peduncles reduced, glabrous; bracts absent; pedicels 9–11 mm long, densely eglandular pubescent. *Calyx* lobes divided almost to base, slightly asymmetrical or not, narrowly ovate, 10.5–12 × 2.5–3 mm, outside sparsely pubescent on midline, margin ciliate. *Corolla* 29–35 mm long, bright yellow throughout outside, slightly paler on lower tube, bright yellow inside and on lobes, ventral tube slightly darker, orangish, with five thin dark red lines from insertion of stamens to throat, tube narrow at base, slightly bent downwards and suddenly widening and pouched ventrally, upper and lateral lobes slightly reflexed, ventral lobe prominent, outside sparsely eglandular pubescent on tube and lobes except at base of tube, inside glabrous except for small glandular hairs dorsally and papillose ventrally; tube 21–24 mm long dorsally, 22–23 mm ventrally, 21–24 mm laterally between lips; upper lobes compressed orbicular, ca 2.2–4.5 × 1.3–4.5 mm, apices rounded, lower lip with lateral

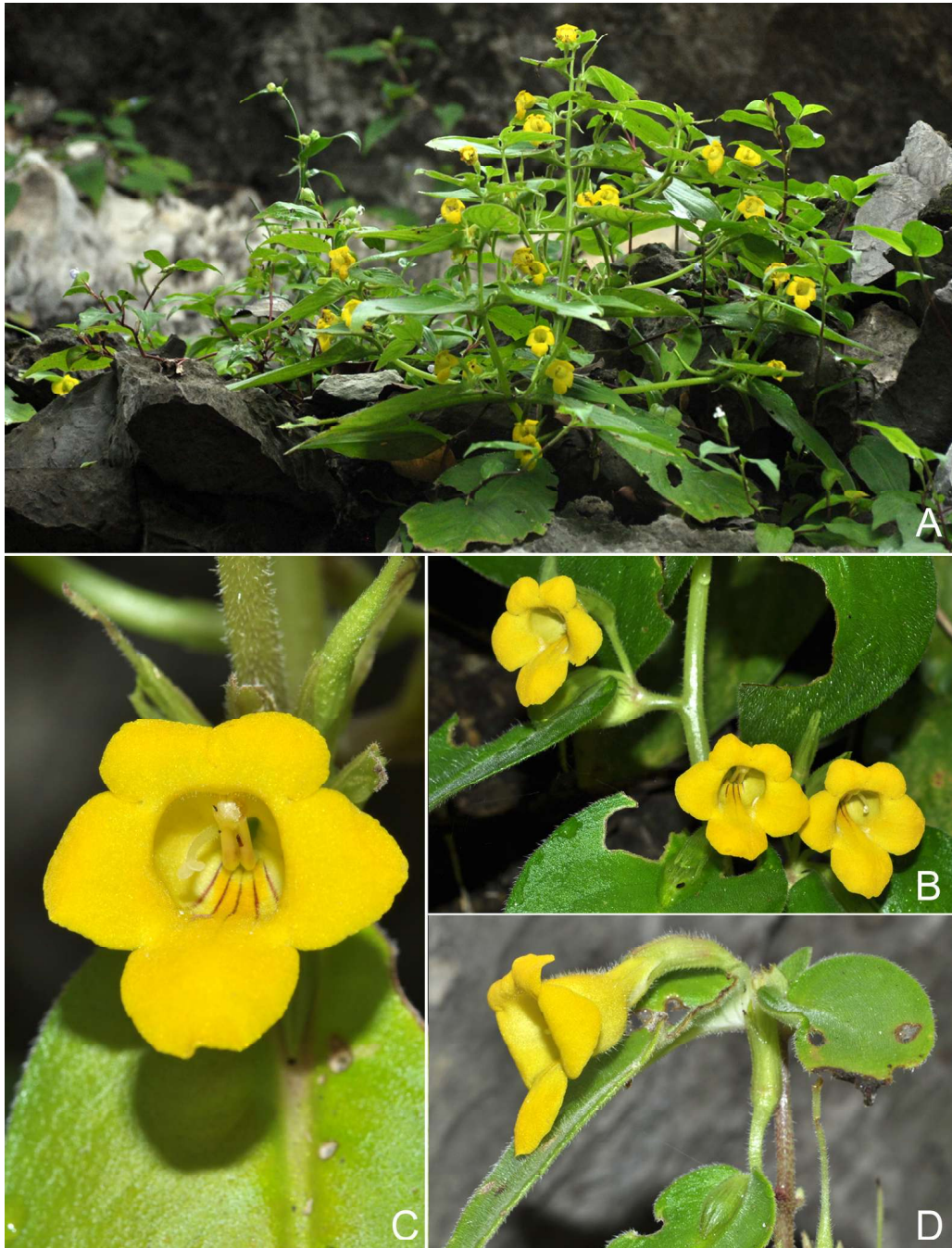


Figure 7. *Microchirita striata* D.J.Middleton & C.Puglisi: A. habitat; B. habit and inflorescences; C. flower, front view; D. flower, side view. Photos by Wittawat Kiewbang.

lobes compressed orbicular, 4–6.5 × 6–7 mm, apices rounded, ventral lobe orbicular, 5.5–7.5 × 7.5–8 mm, apex rounded. *Stamens* pale yellow throughout, attached at 12–13 mm from corolla base; filaments glabrous, slightly geniculate at base, 6–7 mm long; anthers 1.5–1.8 × 2.5–2.7 mm, with dense long straight hairs on the proximal side, pointing inwards towards the filament, apices connected by a ligature; lateral staminodes ca 1.5 mm long, medial staminode inconspicuous. *Nectary* ca 0.7–0.9 mm, annular, margin entire. *Pistil* enantiostylous, pale green, 17.5–23 mm long; ovary 8.5–10 mm long, glabrous in lower half, upper half eglandular pubescent; style 9–13 mm long, eglandular pubescent; stigma lobes 1–1.5 mm long. *Fruit* not seen.

Thailand.— CENTRAL: Lop Buri [Chaibadan, Wat Khao Tambol, 112 m, 11 Oct. 2017, *Suddee et al.* 5314 (BKF, SING)].

Distribution.— Only known from the type locality.

Ecology.— On limestone in mixed deciduous forest.

Vernacular.— Yat chaibadan (หยาดชัยบาดาล) (proposed here).

Etymology.— The specific epithet refers to the red lines ventrally in the corolla.

Provisional IUCN conservation assessment.— Data Deficient (DD). The species is only known from the type collection. The population size, Extent of Occurrence and Area of Occupancy are unknown.

***Microchirita suwatii* D.J.Middleton & C.Puglisi, sp. nov.**

Similar to *Microchirita tetsanae* C.Puglisi, *M. thailandica* C.Puglisi and *M. poomae* C.Puglisi & D.J.Middleton in the relatively large purple-blue flowers but differs in the larger corolla 36–41 mm long (17–26 mm long in *M. tetsanae*, ca 23 mm long in *M. thailandica*, 27–32 mm long in *M. poomae*), the pistil being densely eglandular pubescent except at very base (glabrous at least in lower $\frac{1}{3}$ – $\frac{1}{2}$ in *M. tetsanae* and *M. thailandica*, glabrous throughout in *M. poomae*). Also similar to *M. albocyanea* C.Puglisi but corolla larger (21–25 mm long in *M. albocyanea*), upper corolla tube purple (whitish in *M. albocyanea*) and anther hairs white (orange in *M. albocyanea*). *Microchirita suwatii* differs from

M. limbata C.Puglisi in having larger corolla (14–16 mm long in *M. limbata*) and eglandular hairs on the inflorescence (glandular in *M. limbata*). Type: Thailand, Loei, Mueang, Kud Pong, Phu Bo Bid Forest Park, 528 m, 12 Oct. 2017, *Suddee, Hemrat, Suwannachat & Kiewbang* 5317 (holotype BKF [SN232940]; isotypes BKF [SN232939], SING). Fig. 8.

Herb to ca 26 cm tall; stem greenish purple, with sparse eglandular hairs. *Leaves* opposite apart from the basal leaf; petioles 0.2–0.4 cm long, greenish purple, with few eglandular hairs; blades extremely thin, dull green above, dull light green beneath, ovate, 5.5–29 × 3.1–16 cm, base subcordate to rounded, apex short acuminate, margin entire, ciliate, 5–16 pairs of secondary veins, tertiary venation reticulate but largely inconspicuous, with scattered eglandular hairs above and beneath. *Inflorescences* cristate, 3–9-flowered; peduncles reduced; bracts absent; pedicels 10–17 mm long, with sparse eglandular hairs. *Calyx* lobes narrowly ovate, 9.5–13 × 1.5–2 mm, apex acute, ciliate with eglandular hairs and with a few scattered hairs outside towards apex. *Corolla* 36–41 mm long, lower half of tube white, upper half purple, lobes purple-blue, ventral surface inside paler with a yellow stripe, tube narrow at base, then strongly curved downwards and widening slightly, then suddenly expanding at point tube colour changes to purple, upper lip slightly reflexed, sparsely eglandular hairy outside except on midlobe of lower lip, the base of the upper lobes with few glandular hairs inside; tube ca 18 mm long dorsally, 26–28 mm long ventrally, ca 22 mm laterally between lips; lobes suborbicular, apices rounded, upper lobes ca 5.5 × 11 mm, lateral lobes ca 9 × 10 mm, ventral lobe 9–10 × 12.5–13 mm. *Stamens* attached at ca 14 mm above corolla base; filaments slightly geniculate around middle, pale green, tinged purple at knee, glabrous, ca 7 mm long; anthers white, with dense long white hairs at proximal end, ca 2.3 × 2.8 mm, apices of anthers connected by a ligature; staminodes not seen. *Nectary* annular, margin subentire, ca 0.8 mm high. *Pistil* enantiostylous, ca 21 mm long; ovary ca 8.5 mm long, 1.2 mm diameter, densely eglandular hairy throughout except at base for lower ca 2 mm; style strongly curved, ca 12.5 mm long, densely eglandular hairy; stigma ca 0.7 mm, bilobed, lobes rounded. *Fruit* and seeds not seen.

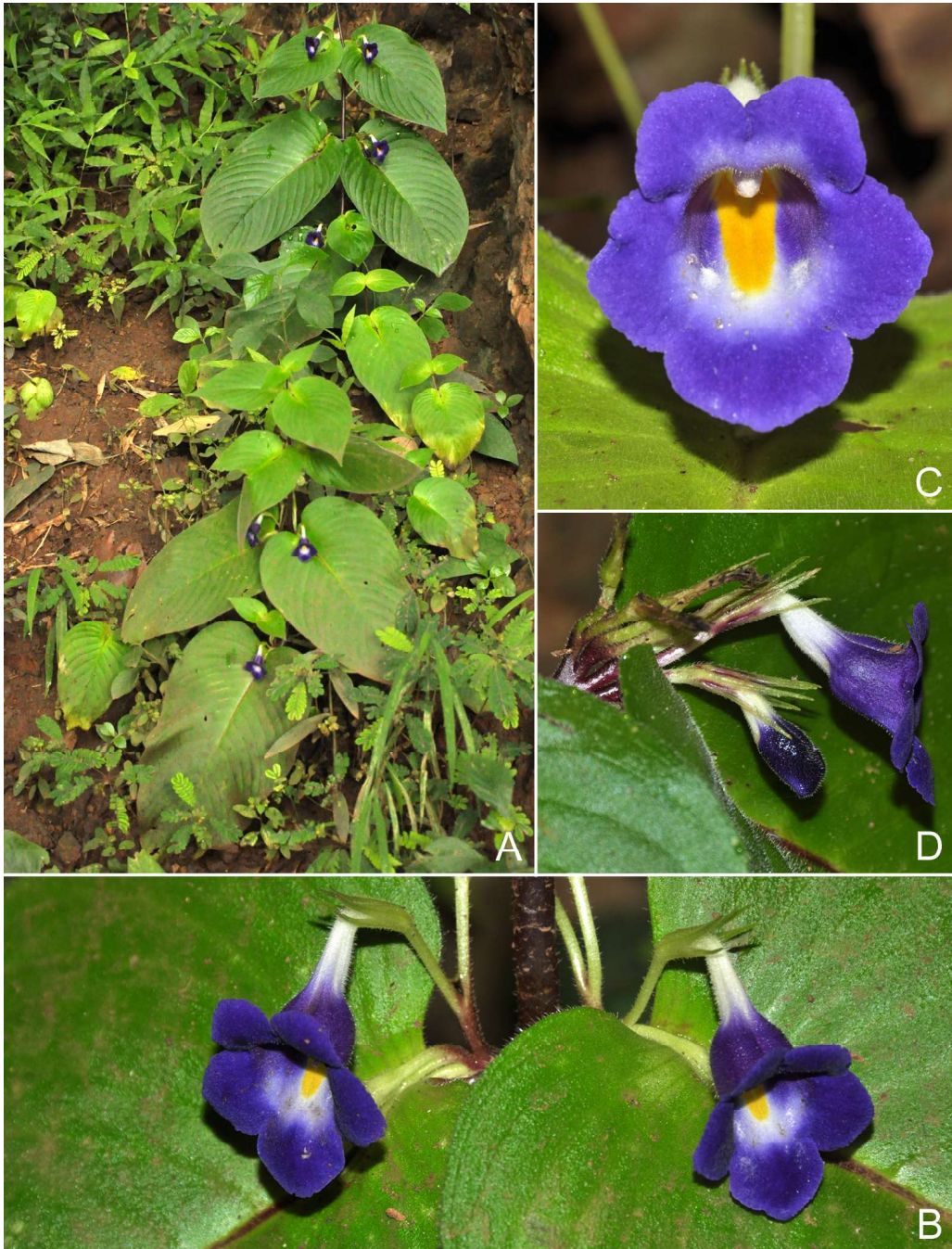


Figure 8. *Microchirita suwatii* D.J.Middleton & C.Puglisi: A. habitat; B. inflorescences; C. flower, front view; D. flower, side view. Photos by Wittawat Kiewbang.

Thailand.— NORTH-EASTERN: Loei [Phu Bo Bid Forest Park, *Suddee et al. 5317* (BKF, SING)].

Distribution.— Only known from the type locality.

Ecology.— On karst limestone in mixed deciduous forest with bamboo.

Vernacular.— Yat si suwat (หยาดศรีสุวัฒน์) (proposed here).

Eymology.— This species is named in honour of Mr Suwat Suwanachat, one of the collectors of the type material.

Provisional IUCN conservation assessment.— Data Deficient (DD). The species is only known from the type collection. The population size, Extent of Occurrence and Area of Occupancy are unknown.

Notes.— This species has the largest flowers of any of the blue- or purple-flowered species in Thailand and only the orange-flowered *Microchirita marcanii* (Craib) A. Weber & D.J. Middleton has larger flowers in the genus.

ACKNOWLEDGEMENTS

We thank the Forest Herbarium (BKF) and Singapore Botanic Gardens (SING) for access to facilities and specimens. We are grateful to the additional collectors of the material cited in this

paper and to the rangers and other custodians of the sites from where the collections were made. We thank Rachun Pooma for the photos in Figure 6. We thank Serena Lee for compiling the photos into the figures. CP thanks the Bentham-Moxon Trust and Serena Lee for supporting her research. NT would like to express her gratitude to the Research Project of Plant Diversity in limestone ecosystems in Thailand. She also thanks the Department of National Parks, Wildlife and Plant Conservation for financial support. DJM thanks Singapore's National Parks Board for support.

REFERENCES

- Middleton, D.J. & Triboun, P. (2013). New species of *Microchirita* (Gesneriaceae) from Thailand. *Thai Forest Bulletin (Botany)* 41: 13–22.
- Puglisi, C. & Middleton, D.J. (2017). A revision of *Microchirita* (Gesneriaceae) in Thailand. *Gardens' Bulletin Singapore* 69(2): 211–284.
- Puglisi, C., Middleton, D.J. & Suddee, S. (2016). Four new species of *Microchirita* (Gesneriaceae) from Thailand. *Kew Bulletin* 71-2: 1–7.
- Xin, Z.-B., Li, R.-F., Maciejewski, S., Fu, L.-F., Do, T.V. & Wen, F. (2022). *Microchirita minor* (Gesneriaceae), a new species from north-western Vietnam. *PhytoKeys* 215: 65–71.