

Microchirita karaketii (Gesneriaceae), a new record for India from Meghalaya

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Abstract: *Microchirita karaketii* D.J.Middleton & Triboun, previously known from northern Thailand and Myanmar, is recorded in India from the northeastern state of Meghalaya extending its distribution further north. A detailed description based on the Indian specimen of *M. karaketii* and a note on the geographical variation with colour photographs are provided.

Keywords: Didymocarpoideae, Trichosporeae, Northeast India

Introduction

The genus *Microchirita* (C.B.Clarke) Yin Z.Wang (subfamily Didymocarpoideae; tribe Trichosporeae) consists of annual herbs that are found exclusively in limestone habitats. Most of the species in the genus are characterized by their cristate inflorescence structure where the paired flowers are arranged in a single row with the youngest inflorescence being developed at the base of the lamina (Puglisi & Middleton, 2017). In a cristate inflorescence the pedicel of the flower curves upright away from the lamina as the flower matures and curves backwards close to the stem during fruiting. Another key character within the genus is the basal leaf, the macrocotyledon, which is single and persistent, with subsequent leaves opposite.

Microchirita consist of 48 species distributed in India and Southeast Asia (GRC, 2024), and its highest species richness is noted in Thailand (37 species and 4 varieties). The distribution of *Microchirita* in Asia, listed by country with the total number of species in

descending order, is Malaysia (7), Vietnam (6), India (4), China (3), Laos (3), Myanmar (2), Cambodia (2), and Indonesia (1). Although the genus has been revised for Thailand (Puglisi & Middleton, 2017) and Malaysia (Rafidah, 2017) it has not been extensively studied in India and other parts of its distribution. In India, to-date the genus is reported to have five species, (i) *M. sahyadriensis* (Punekar & Lakshmin.) A.Weber & D.J.Middleton which is endemic to the Western Ghats of Karnataka, (ii) *M. hamosa* (R.Br.) Yin Z.Wang, from Madhya Pradesh, Gujarat, Meghalaya, and Arunachal Pradesh, (iii) *M. albiflora* D.J.Middleton & Triboun from Meghalaya, (iv) *M. cristata* (Dalzell) D.J.Middleton from Maharashtra, (Punekar & Lakshminarasimhan, 2009; Möller *et al.*, 2017; Middleton, 2018; GRC, 2024) and (v) *M. bimaculata* (D.Wood) A.Weber & D.J.Middleton (specific location not known). Puglisi and Middleton (2017) reported the distribution of *M. bimaculata* in India, although we could not find its occurrence record in any of the digitized herbarium collections (K, E, CAL, SING, P) or any of the public databases (GBIF; JSTOR; GRC, 2024). We therefore suggest that detailed field explorations and studies are required to confirm the presence of *M. bimaculata* in India.

During our recent surveys in Meghalaya (Northeast India), we observed a population of *Microchirita* species that showed morphological affinities with *M. karaketii* D.J.Middleton & Triboun., *M. sahyadriensis*, and *M. bimaculata*. Upon careful examination of protologues and digital images of type specimens of the three morphologically similar species, we identified it as *M. karaketii*. This species has been

previously known to be distributed in northern Thailand and Myanmar (Puglisi & Middleton, 2017), and therefore the present report extends its distribution further to India. We present a detailed taxonomic treatment of the Indian specimen of *M. karaketii* along with its ecology and conservation status and a note on the morphological variations across its geographic distribution.

Materials and Methods

Field surveys were carried out in Northeast India from July to November of 2017. Detailed morphometric measurements were collected from fresh specimens, pickled specimens as well as herbarium specimens using a digital caliper. We consulted the protologue of *M. karaketii* (Middleton & Triboun, 2013), *M. sahyadriensis* (Punekar & Lakshminarasimhan, 2009), and the revised description of *M. bimaculata* (Puglisi & Middleton, 2017) for a comparative study of its morphological characters. Digital images of type specimens of *M. karaketii* (E [E00629480], P[P00966764]), *M. bimaculata* (E [E00155280]), and *M. sahyadriensis* (CAL [CAL0000019224]) were also examined for detailed comparisons. All herbarium vouchers (VG2017ML5028, VG2017ML5029, VG2017ML5030, VG2017ML5031, VG2017ML5032) and associated pickled specimens were deposited at BHPL (located at the Indian Institute of Science Education and Research, Bhopal).

Taxonomic Treatment

Microchirita karaketii D.J.Middleton & Triboun, Thai Forest Bull. Bot. 41: 17. 2013. *Type*: THAILAND, **Chiang Mai**, Chiang Dao district, Doi Chiang Dao Wildlife Sanctuary, Tam Pak Piang, 530 m, N 19°24.2', E 98° 55.8', 20.09.2008, *D.J. Middleton, P. Karaket, P. Triboun, U. Kawatkul & R. Meeboonya* 4526 (holo BKF; iso E [E00629480 digital image!], P [P00966764 digital image!], QBG). **Fig. 1**

Lithophytic caulescent herbs, up to 60 cm tall. Stems succulent, glabrous, green with reddish base, internodes 4–7 cm long. Leaves opposite except for an enlarged single cotyledon; petioles 0.3–1 cm long, sparsely pubescent, green; blades ovate, 5–10 × 4–9 cm, base cordate, margins entire, ciliate, apex acuminate, sparse uniseriate hairs above and beneath; 6–16 pairs of secondary veins, steeply

ascending, venation sunken above and raised beneath in the fresh material, flat in the herbarium specimens; tertiary venation reticulate, adaxial surface dark green, abaxial surface pale green. Inflorescence cristate, peduncles emerging to 10 mm long; bracts absent; pedicels 4–14 mm long, very sparsely hairy, pale green. Calyx bilabiate; lower lobes 3, free to base; upper lobes 2, unequal, irregularly fused, green; lobes narrowly lanceolate, 1–5 × 0.8–1.3 mm, margins entire, apex acuminate, sparsely hairy. Corolla white with a central yellow stripe in the throat and one lavender patch on each side of the yellow stripe, lobes white, tube narrow, curved downwards, 12.2–15.1 mm long above, 12–16 mm below, uniseriate hair outside, glabrous inside; lobes orbicular to elliptic, upper lobes, spreading, 3.2–4.4 × 3.3–5.2 mm; lateral lobes 3.7–4.4 × 4.2–5.2 mm; lower lobes 3.5–4.4 × 3.8–4.7 mm, apices rounded and sometimes obtuse. Stamens 2, filaments arising 4.4–6.5 mm above corolla base, straight, 2.3–3.5 long, *c.* 0.4 mm in diam., glabrous, creamy white; anthers 1.3–2 × 0.9–1.2 mm, sparse long indumentum at insertion, pale yellow, cohering face to face. Disk absent or a ventral half ring. Pistil 9.5–15 mm long; ovary 3.6–5 mm long, *c.* 1 mm in diam., papillose, pale green; style 6–7 mm long, pubescent, creamy white; stigma chiritoid, *c.* 1 mm long, creamy white. Undehisced mature fruit 4–5 cm long, *c.* 2 mm in diam., glabrous at the base with pubescence in the upper half, green. Seeds narrowly elliptic, *c.* 0.4 × 0.2 mm, brown.

Flowering & fruiting: Flowering is between July to October and fruiting is between September to November.

Habitat & floral ecology: It is found on moist, moss-covered rocks in tropical evergreen forests. Pollinator visitation study was carried out in September in three separate patches for two days by three independent observers (that is for a total of 24 observation hours, with each observation carried out from 8 AM to 12 PM resulting in 8 hours per observer). No floral visitors or pollinators were recorded during this time although abundant fruit sets were recorded in the population (Fig. 1). The fruits in *M. karaketii* have pubescence in the upper

half, which may be from the persistent pubescent style. Similar partial pubescence in the fruit has also been noted in other *Microchirita* species from Thailand described by Puglisi and Middleton

(2017). While we did not carry out detailed nectar analyses for *M. karaketii* we did note that nectar was absent in open and unbagged flowers that we checked (n=15). Further, although we did not test

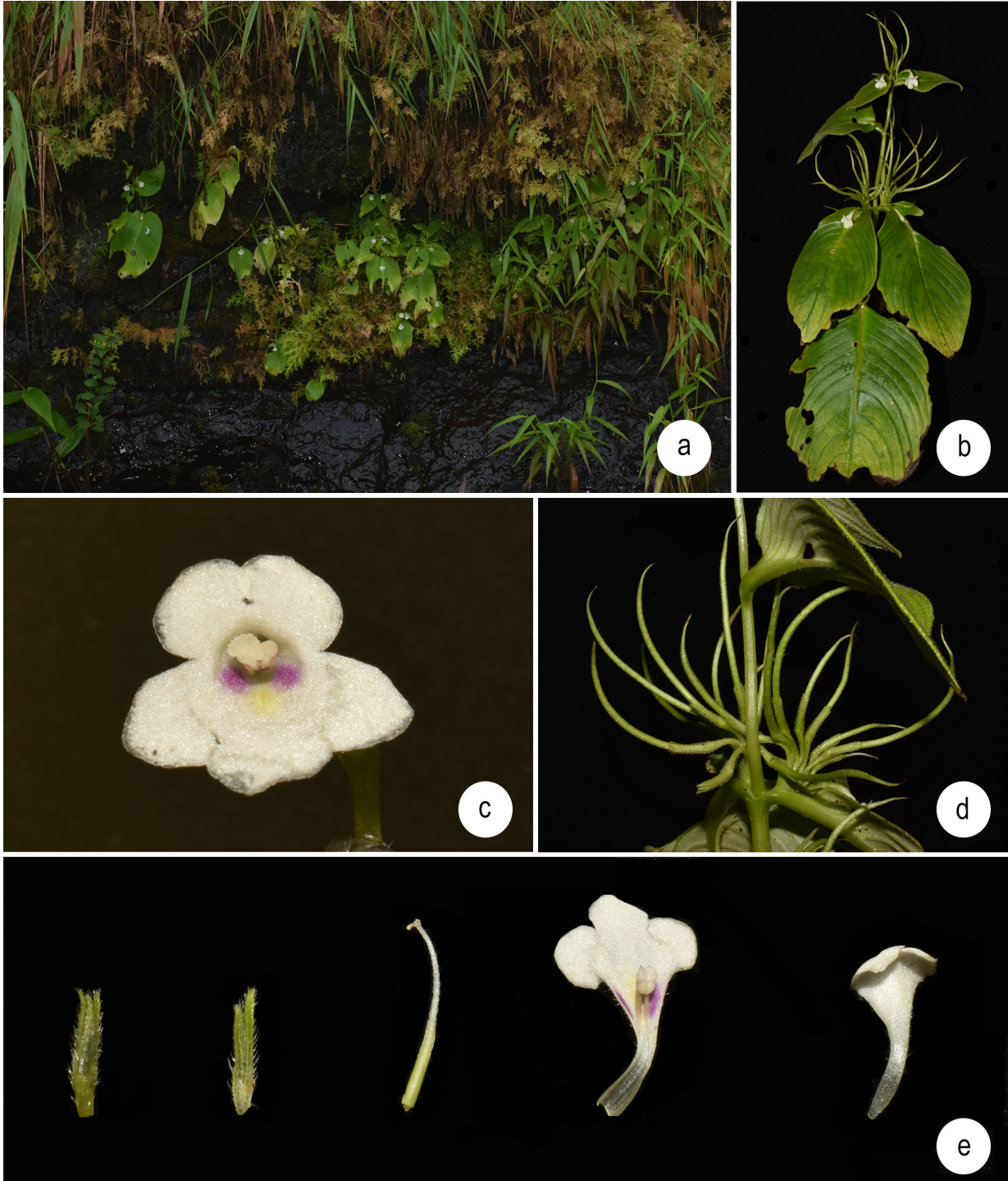


Fig. 1. *Microchirita karaketii* D.J.Middleton & Triboun: **a.** Habitat; **b.** Habit, with a single large cotyledon and subsequent leaves arranged opposite; **c.** Close-up view of flower; **d.** Arrangement of inflorescences and fruits; **e.** Dissected flower showing (from left to right) calyx adaxial surface, calyx abaxial surface, pistil, abaxial half of corolla with stamens and coherent anthers, adaxial half of corolla (from S.B. Rhuthuparna, S. Goray & R. Dandavate VG2017ML5028; photos by S.B. Rhuthuparna)

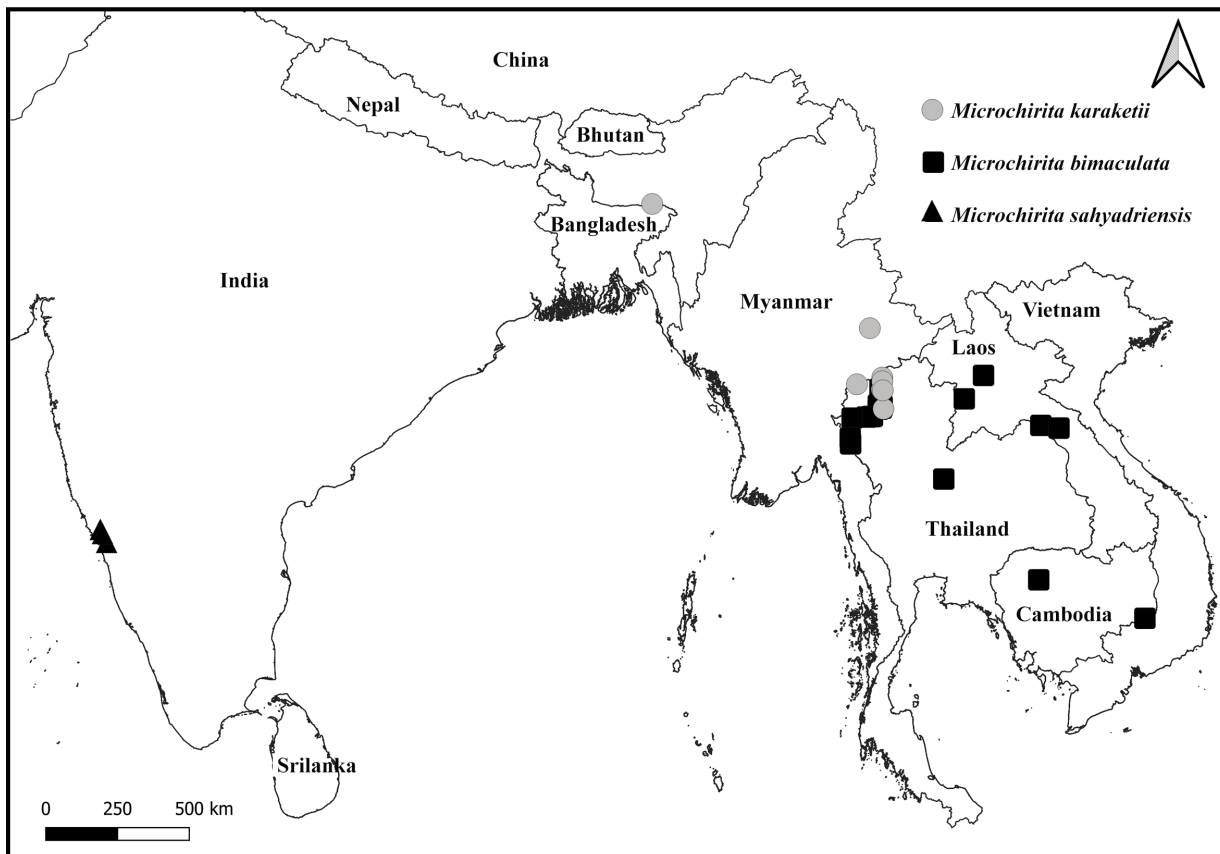


Fig. 2. Map showing the distribution of *Microchirita karaketii* D.J.Middleton & Triboun, *M. bimaculata* (D.Wood) A.Weber & D.J.Middleton and *M. sahyadriensis* (Punekar & Lakshmin.) A.Weber & D.J.Middleton

the nature of the floral marks, we propose that corolla features such as the central yellow stripe in the corolla tube and one lavender patch on either side of this stripe may function as a nectar guide. In the absence of pollination biology studies in *Microchirita*, we recommend detailed ecological and reproductive biology studies to test the above hypothesis and to understand the evolution of floral traits within the genus.

Distribution: Northern Thailand, Myanmar, and now from India (Fig. 2).

Specimens examined: INDIA, **Meghalaya**, East Khasi Hills district, Kynrem Falls, N 25°13'25.8348", E 91°42'55.9584", 928 m, 11.09.2017, S.B. Rhuthuparna, S. Goray & R. Dandavate VG2017ML5028; *Ibid.*, N 22°13'35.6556", E 91°42'50.1516", 928m, 11.09.2017, S.B. Rhuthuparna, S. Goray & R. Dandavate VG2017ML5029; *Ibid.*, N 25°13'38.0892", E 91°42'59.9652", 928 m, 11.09.2017, S.B. Rhuthuparna, S. Goray & R.

Dandavate VG2017ML5030; *Ibid.*, N 25°13'26.598", E 91°42'58.3344", 928 m, 11.09.2017, S.B. Rhuthuparna, S. Goray & R. Dandavate VG2017ML5031; *Ibid.*, N 25°13'24.5352", E 91°43'0.9264", 928 m, 11.09.2017, S.B. Rhuthuparna, S. Goray & R. Dandavate VG2017ML5032 (BHPL); MYANMAR, **Shan State**, Taunggyi district, Pinglong township, N 19°58'31.54", E 96°14'8.9", 713 m, 14.09.2015, Y. Baba, Kertsawang, C. Kilgour, C. Puglisi, M. Rodda, P. Srisanga, T. Shin, P.P. Hnin 103215 (E [E01007303 digital image]); *Ibid.*, N 19°58'26.6", E 96°40'13.1", 692 m, 15.09.2015, M. Rodda, K. Kertsawang, C. Kilgour, P.P. Hnin 103284 (E [E01007293 digital image]). THAILAND, **Chiang Mai**, Chiang Dao district, road to Wiang Haeng, N 19°38.9', E 98°57.2', 610 m, 21.09.2008, D.J. Middleton, P. Karaket, P. Triboun, U. Kawatkul & R. Meeboonya 4536 (E [E00629479 digital image]); Chiang Dao district, Kio Phawok border checkpoint, N 19°46'6", E 98°57'0", 750 m, 30.09.2009, D.J. Middleton, S. Lindsay & P. Suksathan

5017 (E [E00547441 digital image]).

Conservation status: The species is currently known from eight locations across three countries: Thailand (6), Myanmar (1), and India (1). Some of these localities in Thailand are situated outside protected areas and are subjected to disturbance (Puglisi & Middleton, 2017). In India, the species is documented from only one population from the state of Meghalaya, with approximately 300 mature individuals growing on moss-covered rocks spread across an almost 250 m-long continuous transect.

We calculated the Area of Occupancy (AOO) using GEOCAT (<https://geocat.iucnredlist.org/>; IUCN, 2022) where we included a total of eight locations from all the herbarium records that were available to us (K, E, CAL, SING, P). A 2 × 2 km grid scale was used as per the IUCN guidelines to calculate AOO. Based on this calculation, the AOO of the species is likely to be 32 km². Therefore, we propose that based on the criteria and conditions of B2ab(iii) of the IUCN Red List guidelines, the species should be considered Vulnerable (VU). The Indian population is located inside Thangkharang Park which is a protected area in the state of Meghalaya. However, this region remains under a constant threat of disturbance due to tourism and other possible developmental activities. Furthermore, we surveyed multiple other potential locations in Northeast India (except Tripura) and could not locate any other population. Based on this, we calculated the AOO to be 4 km² (IUCN, 2022). Therefore, in India, the species should be considered to be Critically Endangered (CR) B2ab(iii).

Notes: *Microchirita karaketii* closely resembles *M. bimaculata* which is distributed in northern and northeastern Thailand, Laos, and Vietnam, and *M. sahyadriensis*, a species endemic to the Western Ghats of India. *Microchirita karaketii* differs from *M. bimaculata* in its white flower with a yellow stripe and two lavender patches placed ventrally inside the corolla tube (whereas *M. bimaculata* is bright yellow and has dark brown patches ventrally inside). Furthermore, *Microchirita bimaculata* can be distinguished from *M. karaketii* by the presence of scattered glandular hairs on the upper lobes

and throat which is absent in *M. karaketii*. On the other hand, *M. karaketii* can be differentiated from *M. sahyadriensis* by the presence of sparse long indumentums at the insertion of the anther lobe, which is absent in *M. sahyadriensis*.

The Indian specimens examined here show geographical variation in their floral and fruit morphologies (Table. 1). The Indian specimens have a relatively higher range of pedicel length, and larger corolla tubes compared to the original description (Middleton & Triboun, 2013) from northern Thailand and the updated description provided in Puglisi and Middleton (2017). Additionally, the fruits of the Indian specimen are pubescent where the persistent style starts whereas the fruit is glabrous according to Middleton and Triboun (2013) and Puglisi and Middleton (2017). We noted this difference also in the specimen collected from the Kio Phawok border checkpoint (E00547441), and Wiang Haeng (E00629479), Chiang Dao district, Thailand, where the fruits are hairy where the persistent style starts.

Key to species of *Microchirita* in India

1. Fruits curved, 2–5 cm long 2
1. Fruits straight to slightly curved, 1.2–2 cm long *M. hamosa*
2. Peduncles reduced or emerging or fused 3
2. Peduncles adnate to petiole *M. sahyadriensis*
3. Corolla white with marks inside the tube 4
3. Corolla white *M. cristata*
4. Corolla white with a yellow stripe inside the tube *M. albiflora*
4. Corolla white with a yellow stripe inside the tube with two lavender patches on each side of the stripe *M. karaketii*

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Table 1. Geographical variation in morphology of *M. karaketii* in India, the original description (Middleton & Triboun, 2013), and updated description (Puglisi & Middleton, 2017)

Characters	<i>M. karaketii</i> D.J.Middleton & Triboun		
	Present study (India)	Middleton & Triboun (2013) (Holotype: Thailand)	Puglisi & Middleton, 2017 (Thailand)
Petiole length	0.3–1 mm	0.5–2 mm	0.5–2 mm
Pedicle length	4–14 mm	4.5–9 mm	4.5–10 mm
Corolla tube length	Base to upper lobe 12.2–15.1 mm; base to lower lobe: 12–16 mm	Base to upper lobe 10–13 mm; base to lower lobe 12–14 mm	Base to upper lobe 9–13 mm; base to lower lobe: 9.3–14 mm
Corolla lobe	Upper lobes 3.2–4.4 × 3.3–5.2 mm; lateral lobes 3.7–4.4 × 4.2–5.2 mm; lower lobe 3.5–4.4 × 3.8–4.7 mm	Upper lobes 2.7–3.5 × 2.8–4.7 mm; lateral lobes 2.8–5 × 4–5.8 mm; lower lobe 3–4.7 × 3.8–5.5 mm	Upper lobes 2.7–3.5 × 2.8–4.7 mm; lateral lobes 2.8–5 × 4–5.8 mm; lower lobes 3–4.7 × 3.8–5.5 mm
Filament length	2.3–3.5 mm	2.8–3.2 mm	2.8–3.5 mm
Anther size	1.3–2 × 0.9–1.2 mm	c 1.2 × 2 mm	1.4–2 × 0.8–1.2 mm
Pistil length	0.9–15 mm	-	c. 15 mm
Ovary size	3.6–5 × c. 1 mm	3.5–5 mm	3.5–5 × c. 1 mm
Style length	6–7 mm	6–7 mm	6–7 mm
Stigma length	c. 1 mm	c. 1.2 mm	c. 1.2 mm
Fruit indumentum	Glabrous at base, hairy on the upper half where the persistent style starts	Glabrous	Glabrous

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