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Didymocarpus nepalensis (Gesneriaceae), a new species from eastern Nepal

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Abstract: A new species of Gesneriaceae from eastern Nepal, *Didymocarpus nepalensis* Bh.Adhikari & Mich.Möller is described and illustrated. It is morphologically most closely allied to *D. cinereus* D.Don but differs by its well-developed stem, the absence of basal leaves and less deeply divided calyx. A detailed description, colour photographs, line drawings are provided and the morphological differences of relevant species are discussed.

Keywords: *Didymocarpus*, Endemism, Himalayas, Nepal, Taxonomy.

Introduction

Didymocarpus Wall. belongs to the predominantly Old World subfamily Didymocarpoideae (previously Cyrtandroideae) in Gesneriaceae. In the latest classification, the genus was placed in tribe Trichosporeae subtribe Didymocarpinae (Weber *et al.*, 2013). The genus is characterised by a herbaceous habit, few to many flowers in pair-flowered pedunculate cymes, pair of free bracts, free or connate sepals, tubular corolla, one pair of stamens included inside the corolla tube, capitate stigma and a longitudinally dehiscent capsule.

Weber and Burt (1998[“1997”]) divided the genus into two sections: (1) *Didymocarpus* sect. *Didymocarpus* which includes all species except those from South Thailand and Malay Peninsula, (2) *Didymocarpus* sect. *Elati* Ridl., with species from South Thailand and Malay Peninsula. According to the most recent study, the genus *Didymocarpus*

comprises over 100 species (Möller, 2019; Souvannakhommane *et al.*, 2019; Yang *et al.*, 2019; Prasanna *et al.*, this issue) distributed in the Himalayas (Nepal, Bhutan, Northeast India), Myanmar, South and Southwest China, Vietnam, Laos, Cambodia, Thailand, Malay Peninsula and North Sumatra (Weber & Burt, 1998[“1997”]; Möller *et al.*, 2017).

The genus is most diverse in China, India and Thailand, with 35, 24 and 23 species recorded respectively (Wang *et al.*, 1998; Nangngam & Maxwell, 2013; Nangngam & Middleton, 2014; Möller *et al.*, 2017; Möller, 2019; Souvannakhommane *et al.*, 2019; Yang *et al.*, 2019; Prasanna *et al.*, this issue). Twelve species are reported from Nepal (Hara, 1982; Press *et al.*, 2000), eight from Bhutan (Hilliard, 2001) and several from Myanmar, Malay Peninsula, Indonesia, Vietnam and Laos. The discovery of this species *Didymocarpus nepalensis* Bh.Adhikari & Mich.Möller brings the total number of *Didymocarpus* species in Nepal to thirteen.

In Nepal, *D. aromaticus* Wall. ex D.Don (Fig. 1a), *D. oblongus* Wall. ex D.Don (Fig. 1b), *D. pedicellatus* R.Br. (Fig. 1c) and *D. villosus* D.Don (Fig. 1d) are commonly found species on moist ground in mid-hill forests. Other species, such as *D. albicalyx* C.B.Clarke (Fig. 1e), *D. andersonii* C.B.Clarke, *D. cinereus* D.Don (Fig. 1f), and *D. pulcher* C.B.Clarke are known from only few localities in eastern and central Nepal. The proposed new species *D. nepalensis* was collected from eastern Nepal, and is morphologically close to *D. cinereus*. The morphological differences between these two species are presented in Table 1.

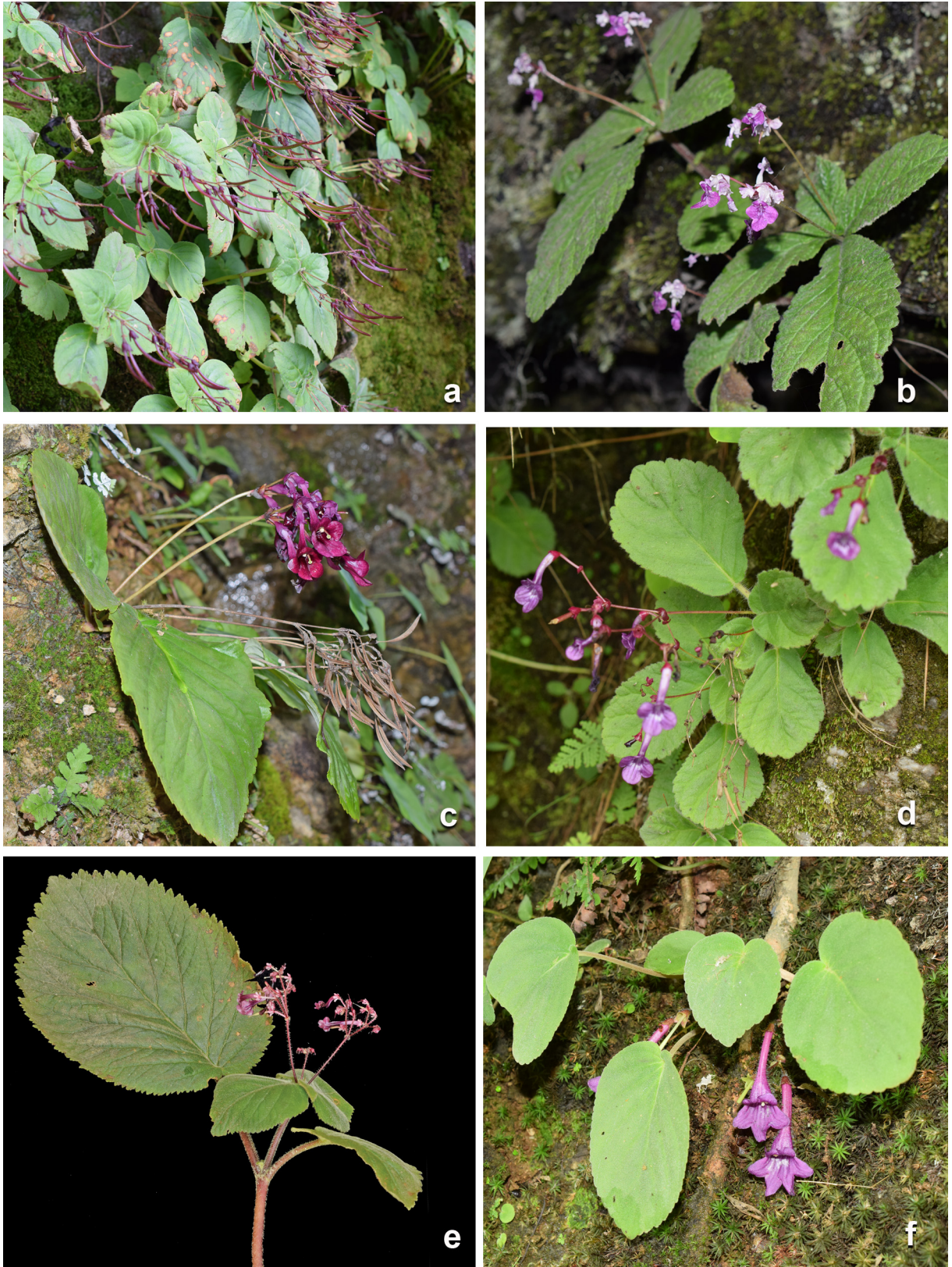


Fig. 1. Selected species of *Didymocarpus* found in Nepal: **a.** *D. aromaticus* Wall. ex D. Don; **b.** *D. oblongus* Wall. ex D. Don; **c.** *D. pedicellatus* R. Br.; **d.** *D. villosus* D. Don; **e.** *D. albicalyx* C. B. Clarke; **f.** *D. cinereus* D. Don; (photos by Bhaskar Adhikari).

Materials and Methods

This study is based on field studies of wild populations of *Didymocarpus* in Nepal in 2014 and 2016 and on herbarium studies of specimens including type specimens from BM, E, K and KATH herbaria. Specimens of the proposed new species were checked against herbarium specimens and flora of adjacent regions. A conservation assessment for the new species was made using the criteria provided by IUCN (2019).

Didymocarpus nepalensis Bh.Adhikari & Mich.Möller, **sp. nov.** Figs. 2 & 3

Didymocarpus nepalensis is most similar to *D. cinereus* but can be distinguished by the absence of basal leaves (*vs.* present), inflorescences shorter than the stems (*vs.* equal to longer) and calyx lobes 1/4–1/3 of the calyx tube (*vs.* half or more than half).

Type: NEPAL, **Dhankuta district**, Pakhribas Municipality, Bokre, 27.08.2014, 1829 m, B. Adhikari, M. Kreuzer & R. Basnet 13 (holo E!; iso KATH!).

Perennial herbs. Stems 7–17 cm long, appressed pubescent, hairs *c.* 0.1 mm long. Basal leaves absent, cauline leaves in lower half of the stem or near the middle in whorls of 3 or 4, those in upper half of the stem of same size and shape (if present) opposite, isophyllous to anisophyllous, ovate-elliptic, 4–7 × 0.8–5 cm, base cordate, apex obtuse, margins crenate, surfaces appressed pubescent with yellow sessile glands; uppermost cauline leaves 2–4, opposite-decussate isophyllous to anisophyllous, 1–3.5 × 0.8–3 cm, base cordate, apex obtuse, margins

irregularly crenate, surfaces appressed pubescent with bright yellow sessile glands; petioles 1–14 cm long, uppermost leaves usually sessile or shortly petiolate. Inflorescences 2–6, axillary in uppermost cauline leaves, pair-flowered cymes, flowers 2–6 per cyme; peduncles 1–5 cm long; pedicels 0.5–1 cm long, both glandular pubescent. Bracts in pair, free, ovate-lanceolate, 4.5–5 × 3–3.5 mm, densely glandular pubescent along margins and lower surface. Calyx dark purple, 5–7 mm, glandular pubescent with sessile glands; lobes 5, triangular, 1/4–1/3 of the length of the tube, 1–2 × 1–1.5 mm; tube 4–5 mm long. Corolla dark purple, 3–4 cm long, 2-lipped; upper lip 2-lobed, lobes ovate-triangular, 3–4 × 4–5 mm; lower lip 3-lobed, lobes ovate, 4–5 × 4–5.5 mm, glandular pubescent; tube infundibuliform, cylindric for *c.* 1 cm and gradually widening, slightly vertically compressed, appearing cylindrical from the side, opening oval. Stamens 2, inserted 2–3 cm from the base of the corolla; filaments 7–9 mm long, glabrous; anthers coherent, 3–4 × 1–2 mm, sparsely hairy. Staminodes 3, unequal, two laterals 4–6 mm long, middle one 2–3 mm long. Disc cylindrical, 1.5–2 mm high, margins crenate. Pistils purplish green, 3–3.5 cm long; ovary cylindric, 2.5–3 cm long; style *c.* 0.5 cm long, glabrous; stigma capitate, slightly bilobed. Capsules 3–3.5 cm long, straight in relation to pedicel, valves straight to slightly curved, stipitate, glabrous. Seeds not seen.

Flowering & fruiting: Flowering from June to August and fruiting from July to August.

Habitat: On moist mossy cliffs in south facing forests dominated by *Alnus nepalensis* D.Don.

Table 1. Morphological differences between *D. nepalensis* and *D. cinereus*

Characters	<i>D. nepalensis</i> Bh.Adhikari & Mich.Möller	<i>D. cinereus</i> D.Don
Stems	7–17 cm long, well developed, unbranched.	2–8 cm long, 1–4 additional slender stems arising from the axils of lower cauline leaves and/or basal leaves.
Leaves	Basal leaves absent, lower cauline leaves equal or below the inflorescences, uppermost leaves well developed, 1–3.5 × 0.8–3 cm.	Basal leaves present, basal and/or lower cauline leaves overtopped the inflorescences, uppermost cauline leaves much smaller, 0.5–1.5 × 0.5–1.5 cm.
Calyx	Calyx lobes 1/4–1/3 of the length of the tube.	Calyx lobes more than half of the length of the tube.

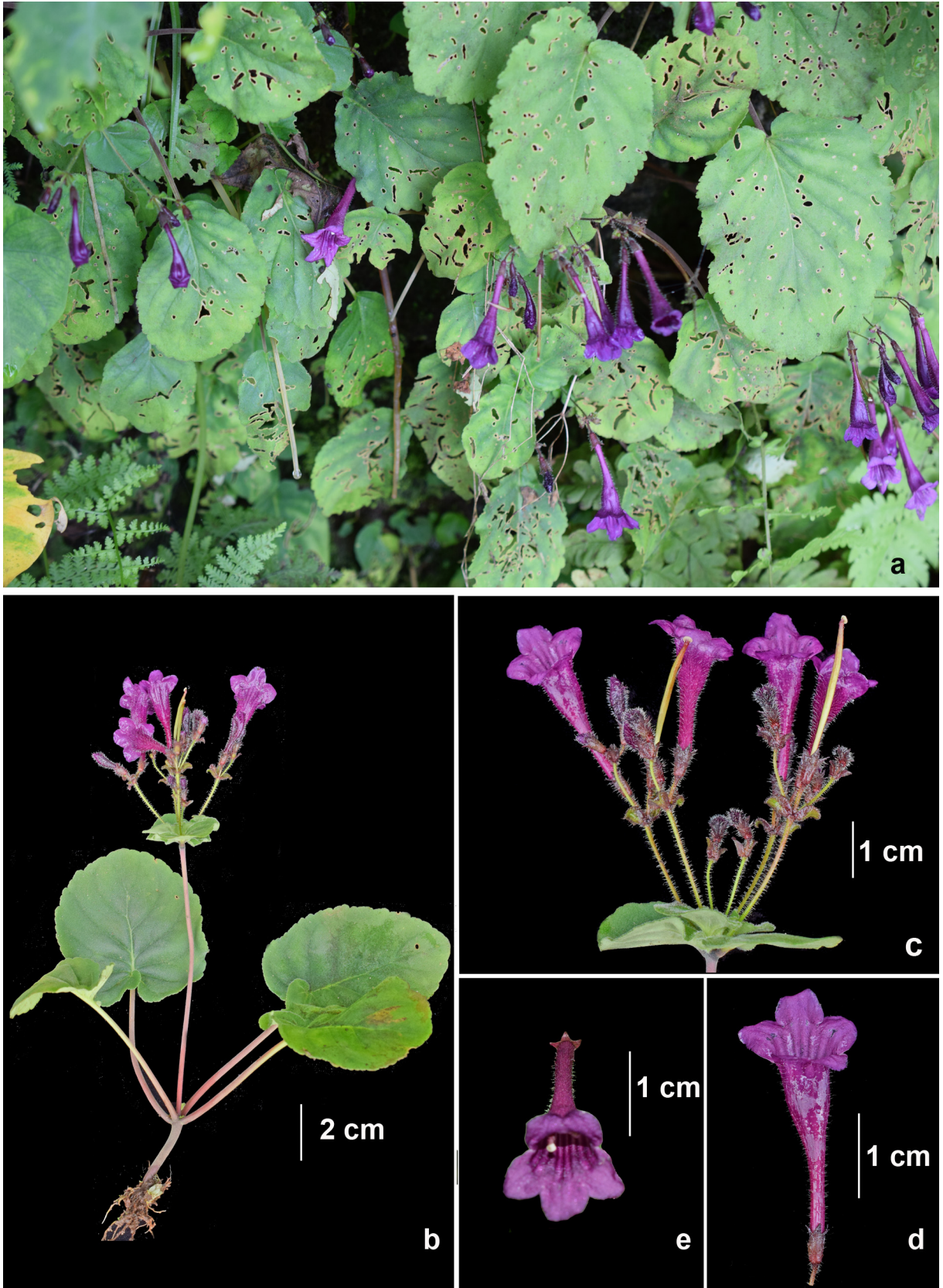


Fig. 2. *Didymocarpus nepalensis* Bh.Adhikari & Mich.Möller: **a.** Habit; **b.** Flowering plant; **c.** Inflorescences; **d.** Flower-oblique side view; **e.** Flower-front view showing enantiostyly (photos by Bhaskar Adhikari).

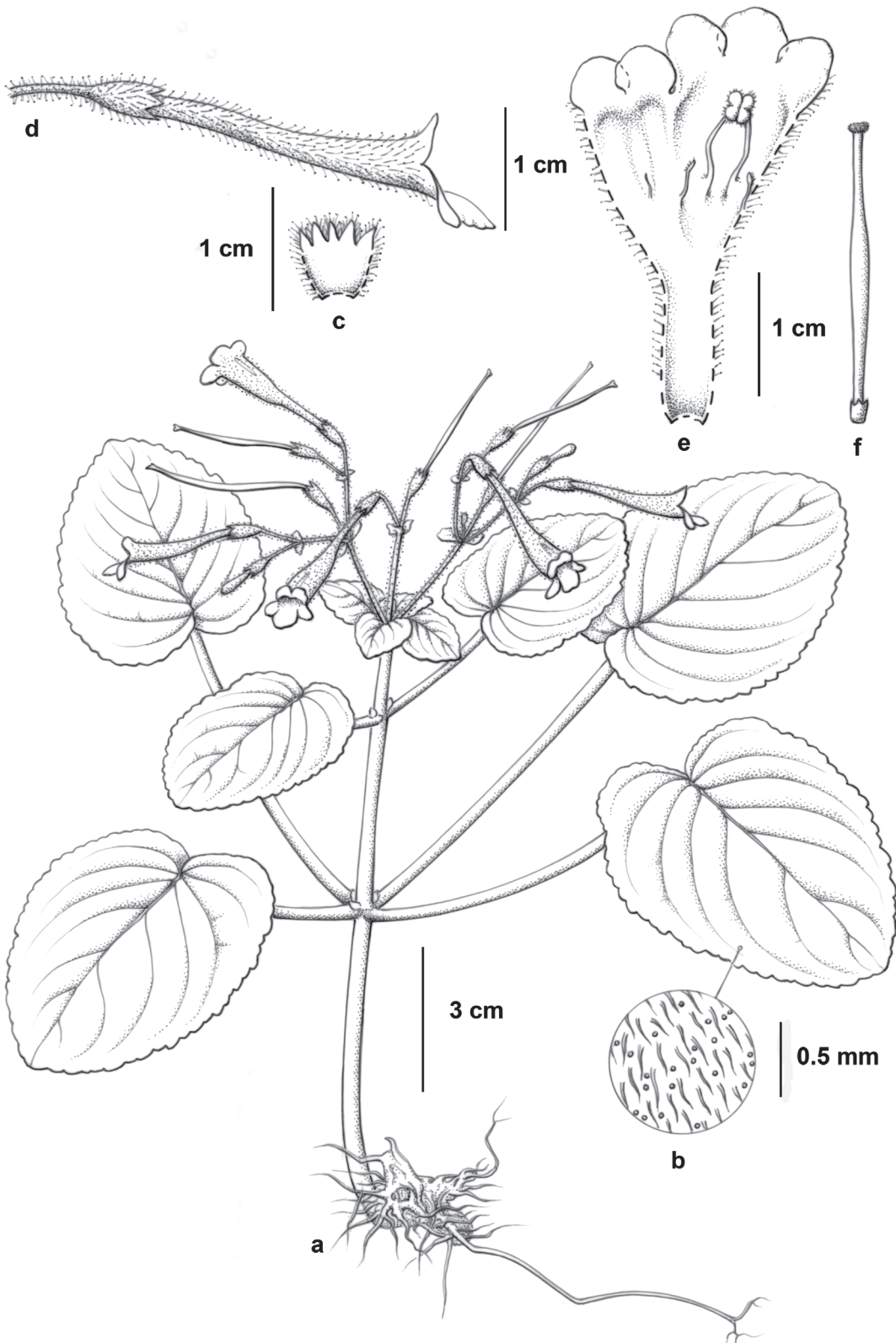


Fig. 3. *Didymocarpus nepalensis* Bh.Adhikari & Mich.Möller. **a.** Habit; **b.** Leaf surface showing hairs and sessile glands; **c.** Opened calyx; **d.** Flower-lateral view; **e.** Opened corolla showing stamens and staminodes; **f.** Pistil (drawn by Claire Banks).

Distribution: Eastern Nepal.

Specimen examined: NEPAL, Dhankuta district, Pakhribas Municipality, Bokre, 27.08.2014, 1829 m, B. Adhikari, M. Kreuzer & R. Basnet 11 (E, KATH).

Conservation status: *Didymocarpus nepalensis* is known from one locality with two small populations in Dhankuta district of East Nepal. Each population consists of around 20–30 mature individuals. More extensive collections from eastern and central Nepal from similar habitats are needed to confirm its conservation status. However, there exist some threats as the populations are located near to a road and some species of *Didymocarpus* are collected by the locals to make incense. At present, it is best to be categorised as Data Deficient (DD) until more information on its uses, threats and status of population numbers becomes available.

Notes: Several *Didymocarpus* species from Nepal and adjacent areas in India are similar to the new species and possess violet to purple corollas (Fig. 1). However, some have cylindrical corolla tubes, such as, *D. albicalyx* (Fig. 1e), *D. andersonii*, *D. macrophyllus* Wall. ex D. Don, *D. oblongus* (Fig. 1b), *D. primulifolius* D. Don and *D. villosus* (Fig. 1d). Other species such as *D. aromaticus* (Fig. 1a), *D. cinereus* (Fig. 1f), *D. pedicellatus* (Fig. 1c), *D. podocarpus* C.B. Clarke and *D. pulcher* have similar infundibuliform corolla tubes but differ by other morphological characters: in *D. pedicellatus* the stem is very short (up to 1.5 cm) or absent. *D. aromaticus* and *D. podocarpus* are easily distinguished from any other and the new species by the position of their leaves; in *D. aromaticus* leaves are distant and alternate in the lower part of the stem whereas in *D. podocarpus* all leaves are crowded towards the apex of the stem. *D. pulcher* differs by its tall stems up to 45 cm, and 2-lipped calyx, and *D. cinereus* (Fig. 1f) differs by the characters given in Table 1. Similar to many other *Didymocarpus* species, but not all (e.g., Nangngam & Maxwell, 2013; Nangngam & Middleton, 2014; Pandey *et al.*, this issue; Prasanna *et al.*, this issue), *D. nepalensis* shows reciprocal enantiostyly, the deflection of the style and stamens to the left or right in opposite directions (Fig. 2e).

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