



## *Didymocarpus cordifolius* (Gesneriaceae), a new species from southern Yunnan, China

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### Abstract

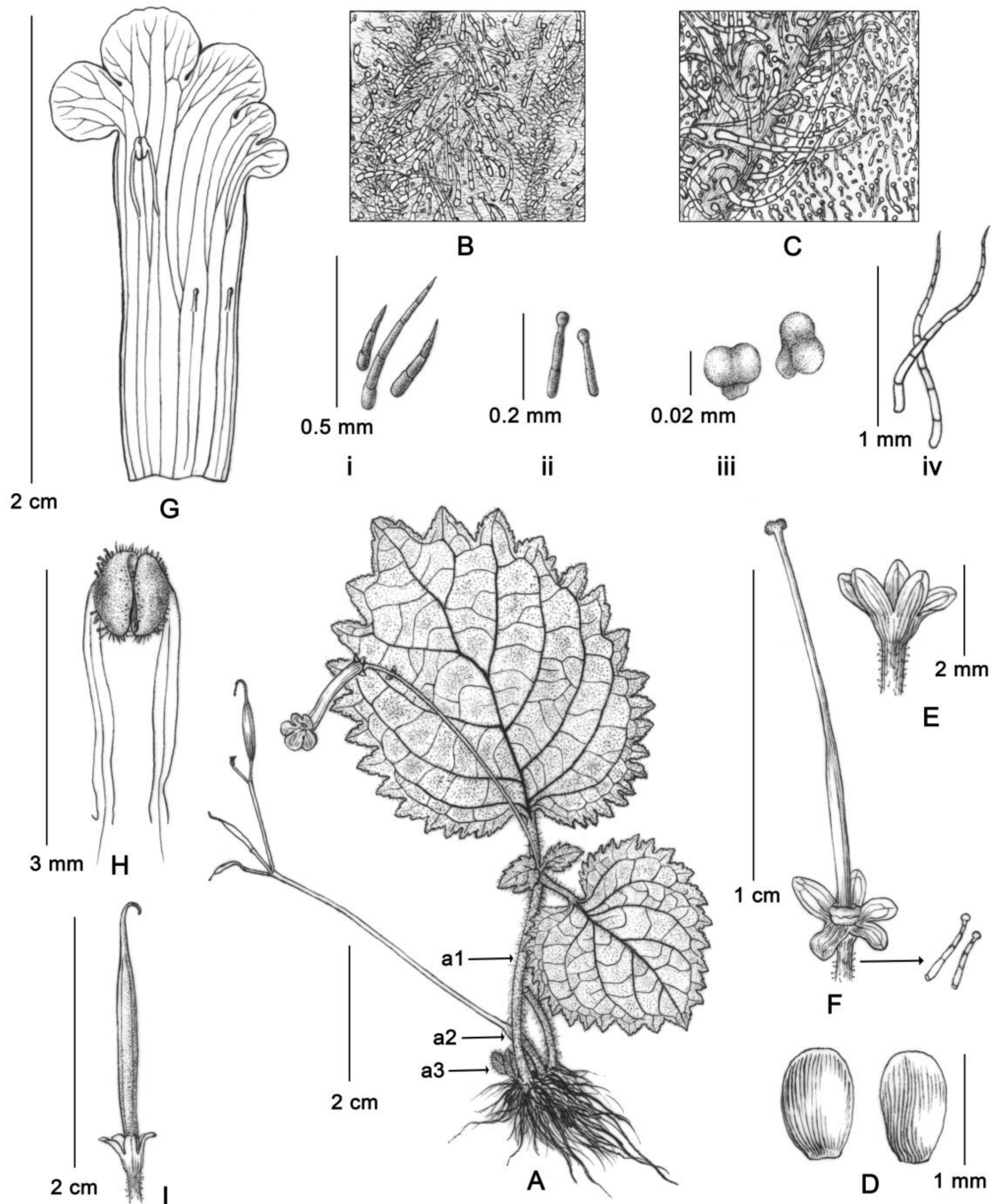
*Didymocarpus cordifolius*, a new species of Gesneriaceae from southern Yunnan Province, China is described and illustrated. The new species is morphologically similar to *D. silvarum* and *D. margaritae*, but can be readily distinguished by its short petioles with both glandular and eglandular hairs, pale purple corolla, hairy anthers, and ovary and style of subequal length.

**Keywords:** *Didymocarpus*; flora of southern Yunnan; Gesneriaceae; morphology; taxonomy

### Introduction

The genus *Didymocarpus* Wallich in Hamilton (1819: 378) is currently treated in tribe Trichosporeae Nees, subfamily Didymocarpoideae Arn of the family Gesneriaceae (Weber *et al.* 2013). It included more than 180 species (Burt & Wiehler 1995) and had long been used as a dumping ground for species with markedly distinct morphology and geographical origin (Burt 1998, Vitek *et al.* 2000). Considering the unwarrantably wide usage of *Didymocarpus*, Weber & Burt (1998) split it into three genera, i.e., *Didymocarpus* s.s., *Henckelia* Sprengel (1817: 402), and *Hovanella* Weber & Burt (1998: 333). After this circumscription, *Didymocarpus* remained a large genus that is comprised of at least 70 species and distributed from northwest India, eastwards through Nepal, Bhutan, northeastern India, Myanmar, southern China, to Vietnam, Thailand, and the Malay Peninsula, with one species [*D. cordatus* Wall. ex de Candolle (1845: 265)] reaching northern Sumatra (Weber *et al.* 2000). Currently, *Didymocarpus* contains ca. 100 species (Möller 2019, Prasanna *et al.* 2020), of which 34 (including four varieties) occur in China (Li & Wang 2004, Weber *et al.* 2011, Wen *et al.* 2013, Li & Li 2014, Li & Wang 2015, Cai *et al.* 2016, Li *et al.* 2016, Yang *et al.* 2019, Xie *et al.* 2020, Zhang *et al.* 2020). The species of *Didymocarpus* in China are classified into two sections, i.e., sect. *Didymocarpus* [= sect. *Eudidymocarpus* Benth (1876: 1022)] and sect. *Heteroboaea* Benth (1876: 1022) (Wang *et al.* 1990, Li & Wang 2004). The former is characterized by caulescent perennial herbs with opposite leaves, connate or free large bracts, and slender or tubular corolla tube, while the latter can be characterized by acaulescent perennial herbs with rosulate leaves, small free bracts, and funnellform corolla tube.

During our field work in southern Yunnan Province in October 2018, we collected some fruiting specimens of an unknown *Didymocarpus* species. Compared to other species in *Didymocarpus* sect. *Didymocarpus* in China, this unknown species is distinct in the extremely short stems and petioles. However, the bullate leaves indicate that it might be related to *D. silvarum* W.W. Smith (1912: 150). We carried out another field investigation and successfully collected specimens with flowers in August 2021. After careful examination of representative collections of *Didymocarpus* in IBK, IBSC, KUN and PE, and the online resources of CAL (<https://archive.bsi.gov.in/phanerogams/en>), Chinese Virtual Herbarium (<https://www.cvh.ac.cn/>), E (<https://data.rbge.org.uk/search/herbarium/>), GBIF (<https://www.gbif.org/>), and JSTOR (<https://plants.jstor.org/>), and referring to related literature (Li & Wang 2004, Nangngam & Maxwell 2013, Wen *et al.* 2013, Li & Li 2014, Li & Wang 2015, Cai *et al.* 2016, Li *et al.* 2016, Yang *et al.* 2019, Prasanna *et al.* 2020, Xie *et al.* 2020, Zhang *et al.* 2020), we confirmed that this unknown species is a new one as described below.



**FIGURE 1.** *Didymocarpus cordifolius*. (A) Habit: a1, current-year shoot; a2, last-year shoot with old fruits; a3, young shoot that will elongate in the next year. (B) Adaxial surface of leaf blade, showing eglanular (i) and glandular (ii–iii) hairs. (C) Abaxial surface of leaf blade, showing glandular (ii–iii) and lanate (iv) hairs along the veins. (D) Bracts. (E) Deeply lobed calyx. (F) Glabrous pistil, annular disc and glandular-pubescent pedicel. (G) Dissected corolla. (H) Stamens, showing glabrous filaments and anthers with glandular and eglanular hairs. (I) Capsule. Based on the holotype.

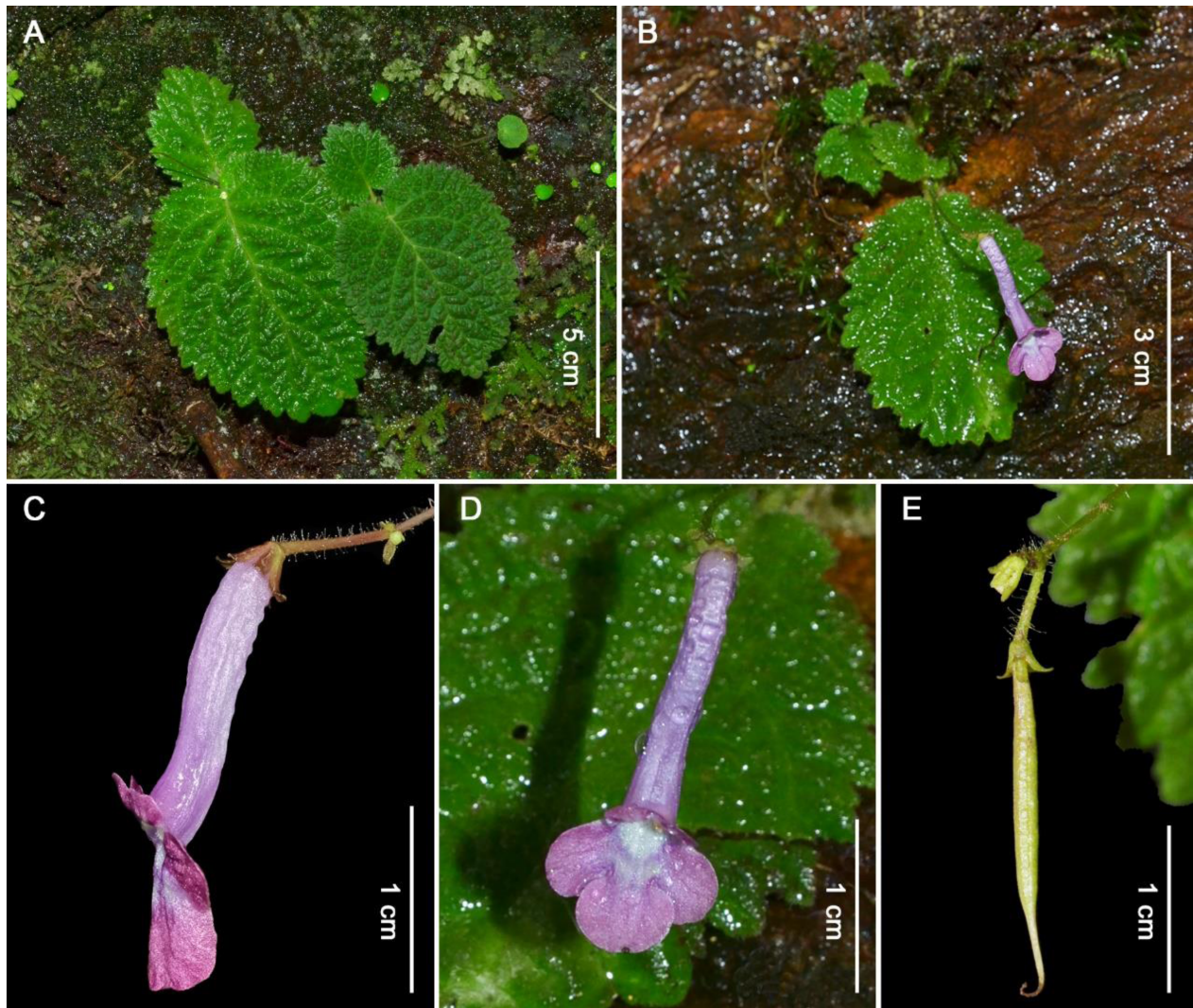
## Taxonomic treatment

*Didymocarpus cordifolius* P.W. Li & Li H. Yang, *sp. nov.* (Figs. 1 & 2)

**Diagnosis:**—*Didymocarpus cordifolius* is morphologically similar to *D. margaritae* Smith (1912: 151), but can be easily distinguished by its short petioles with both glandular and eglanular hairs (vs long petioles with eglanular hairs), glandular pubescent peduncles

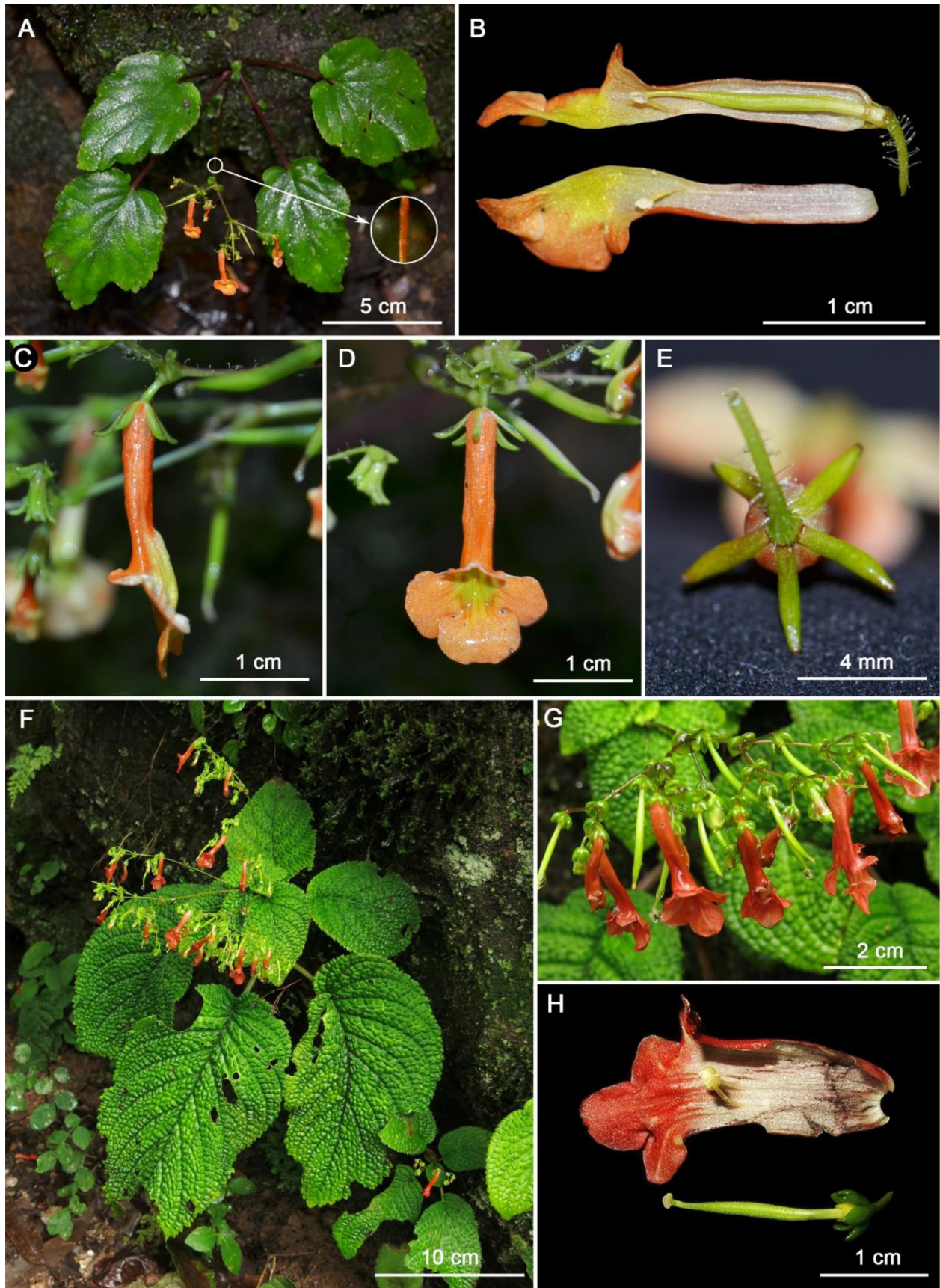
(vs glabrous), short calyx tubes (vs calyx without a tube), pale purple corollas (vs orange corollas with yellow patches on the ventral side), hairy anthers (vs glabrous), and ovary and style of subequal length (vs ovary much longer than style) (Fig. 3A–E).

**Type:**—CHINA. Yunnan: Yuanyang County, Ga'niang Town, near Yangping village, on the moist cliff along the roadside, 23°3'47.96" N, 102°55'2.7" E, 2096 m, 21 August 2021, *L.H. Yang & P.W. Li* YLH1203 (holotype IBSC!; isotypes IBSC!, PE!).



**FIGURE 2.** *Didymocarpus cordifolius*. (A–B) Habit. (C) Flower, side view. (D) Flower, top view. (E) Capsule.

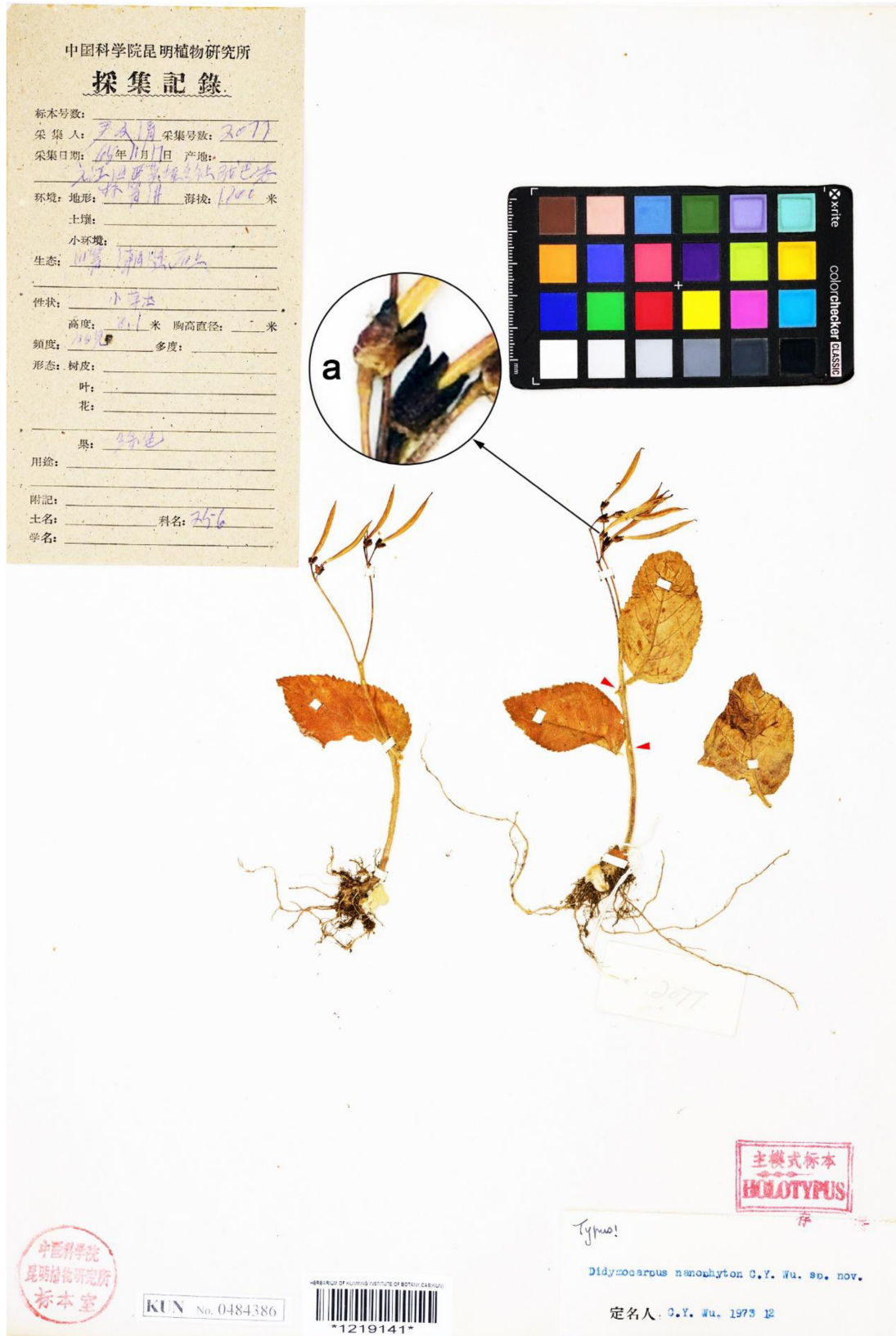
Perennial herbs with annual or monocarpic flowering stems. Stems 1.5–3 cm long, densely woolly hairy, intermixed with short glandular hairs. Leaves 2–4, opposite, distinctly unequal, crowded at stem apex; petioles 0.4–1.2 cm long, densely covered with glandular and eglandular hairs; leaf blade somewhat bullate, broadly ovate to cordate, 3.5–9 × 3–9 cm, base cordate, margin double serrate, apex obtuse or round, adaxially glandular and eglandular pubescent, abaxially glandular pubescent, lanate along veins; lateral veins 4–6 on each side of midrib, conspicuous. Cymes axillary, 1- to 2-branched, 1- to 6-flowered. Peduncles 2.5–6 cm long, glandular pubescent. Bracts 2, free, oblanceolate to oblong, 1–3 × 0.7–1.9 mm, margin entire, apex obtuse, glabrous on both sides. Pedicels 3–6 mm long, glandular pubescent. Calyx 5-lobed nearly to base, tubes 0.5–0.8 mm long, lobes slightly unequal, 1.3–1.7 × 0.7–1 mm, margin with inconspicuous tooth, apex obtuse, glabrous on both sides. Corolla pale purple, glabrous, narrowly tubular; tube 1.4–1.6 cm long, 2–3 mm in diameter; limb distinctly bilabiate, adaxial lip 2-lobed to near base, lobes suborbicular, 2–2.3 × 2.5–2.9 mm; abaxial lip 3-lobed to middle, lateral lobes suborbicular, 3.4–4.4 × 3.6–5 mm, ventral lobe reniform, 4.4–4.6 × 5.6–5.9 mm. Stamens 2, inserted at ca. 1 cm above the corolla base; filaments ca. 3 mm long, glabrous; anthers coherent, glandular and eglandular hairy, thecae divaricate. Lateral staminodes glabrous, ca. 1 mm long, adnate to ca. 6 mm above corolla base; dorsal staminode not seen. Disc ring-like, ca. 0.5 mm high, glabrous. Pistil included, glabrous; ovary linear oblong, ca. 5 mm long; style linear, ca. 7 mm long; stigma disclike. Capsules straight, 1.1–1.8 cm long, bivalved, dehiscing loculicidally.



**FIGURE 3.** *Didymocarpus margaritae* (A–E, photographed in Honghe, Yunnan, China) and *D. silvarum* (F–H, photographed in Lancang, Yunan, China). (A) Habit of *D. margaritae*, inset shows glabrous peduncle; (B) Longitudinal section of corolla; (C) Flower, side view; (D) Flower, top view; (E) Calyx with five free lobes. (F) Habit of *D. silvarum*; (G) Inflorescence, showing ovate to round bracts and glabrous pedicels; (H) Dissection of flower.



**FIGURE 4.** Type specimens of *Didymocarpus andersonii*. (A) Lectotype [India, Sikkim (now West Bengal), Anderson 313, (CAL0000019167)], designated by Weber *et al.* (2000: 452). (B) Isolectotype (CAL0000019165). (C–D) Syntypes [India, Sikkim, J.D. Hooker *s.n.*, (K000820560 and CAL0000019164)].



**FIGURE 5.** Holotype of *Didymocarpus nanophyton* [China, Yunnan, Yuanjiang, W.C. Yin 2017, (KUN1219141)]. Inserted photo (a) shows shallowly lobed calyx. Red arrows indicate nodes.

**Distribution and habitat:**—*Didymocarpus cordifolius* is currently known from Yuanyang County in Yunnan, China, and more field investigation is needed to explore its distribution range. This species grows on moist cliffs under the forest at an elevation of ca. 2000 m.

**Phenology:**—Flowering from July to August and fruiting from August to September.

**Etymology:**—The epithet “*cordifolius*” refers to the cordate leaves of *Didymocarpus cordifolius*. The Chinese name for this new species is “xīn yè cháng shuò jù tái 心叶长蒴苣苔”

**Additional specimens examined (paratype):**—CHINA. Yunnan: Yuanyang County, Ga’niang Township, near Yangping village, 23°3’47.96” N, 102°55’2.7” E, 2096 m, 20 October 2018, *L.H. Yang & H.H. Kong YLH834* (IBSC!).

**Notes:**—*Didymocarpus cordifolius* is similar to *D. silvarum* in the bullate leaves and the narrowly tubular corollas, but they are quite different from each other in stem length, corolla color, and indumentum type on stems, petioles and anthers (Fig. 3F–H). *Didymocarpus cordifolius* is also similar to *D. andersonii* Clarke (1874: 92), which is distributed in eastern Nepal, Bhutan, and northeastern India (Weber *et al.*, 2000), in vegetative characters (Fig. 4). However, the large connate bracts and bracteoles (Fig. 4A–B), the shallowly lobed calyxes (Fig. 4C–D), the narrowly funnel-form corollas (Fig. 4B), and the large limbs (Fig. 4B) of *D. andersonii* are obviously different from those of *D. cordifolius* (Figs. 1–2). In addition, *Didymocarpus cordifolius* is somewhat similar to *D. nanophyton* C.Y.Wu in Li (1983: 32) in length of petioles, but the eglandular hairy stems, the elongated upper internodes, the bilabiate calyx with a relatively long tube, and the long capsules of the latter species (Fig. 5) are distinct from those of *D. cordifolius*. The detailed morphological comparison among the five allied species is provided in Table 1.

**TABLE 1.** Morphological comparison between *Didymocarpus cordifolius* and its allied species.

| Characters                | <i>D. cordifolius</i>                           | <i>D. margaritae</i>                         | <i>D. silvarum</i>                                | <i>D. andersonii</i>                          | <i>D. nanophyton</i>                 |
|---------------------------|---|--|---|---|--------------------------------------|
| Stem length               | 1.5–3 cm  | 0.7–2 cm                                     | 7–15 cm   | 1–2.89 cm                                     | 2.5–7 cm                             |
| Stem surface              | eglandular and glandular hairy                  | eglandular hairy                             | densely appressed eglandular hairy                | eglandular hairy                              | eglandular hairy                     |
| Upper internodes          | short   | short  | elongated   | short   | elongated                            |
| Leaf blades               | bullate   | without bullation                            | bullate   | without bullation                             | without bullation                    |
| Petioles                  | 0.4–1.2 cm long, glandular and eglandular hairy | 3–10 cm long, eglandular hairy               | 3–6.5 cm long, densely appressed eglandular hairy | 1.3–4(–6.6) cm long, densely eglandular hairy | 0.2–3 long, densely eglandular hairy |
| Peduncles                 | glandular hairy                                 | glabrous                                     | glabrous  | eglandular hairy                              | glandular hairy                      |
| Bracts                    | free, glabrous                                  | free, glabrous                               | free, glabrous                                    | connate, eglandular hairy                     | free, indumentum unknown             |
| Pedicels                  | glandular hairy                                 | glandular hairy                              | glabrous  | eglandular hairy                              | glandular hairy                      |
| Calyx                     | deeply lobed, tube 0.5–0.8 mm long              | without a tube                               | without a tube                                    | shallowly lobed, tube 0.7–1 cm long           | bilabiate, tube 1.7–1.9 mm long      |
| Corolla color             | pale purple                                     | orange with yellow patch on the ventral side | red   | dark purple                                   | unknown                              |
| Corolla tubes             | narrowly tubular                                | narrowly tubular                             | narrowly tubular                                  | narrowly funnel-form                          | unknown                              |
| Anthers                   | eglandular and glandular hairy                  | glabrous                                     | glabrous  | glabrous                                      | unknown                              |
| Length of ovary and style | subequal  | ovary is longer than style                   | ovary is longer than style                        | ovary is longer than style                    | unknown                              |
| Capsule length            | 1.1–1.8 cm                                      | 1.9–2.2 cm                                   | 1.5–2.2 cm  | 1.6–2.5 cm                                    | 2–2.7 cm                             |

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## References

- Bentham, G. (1876) Gesneriaceae. In: Bentham, G. & Hooker, J.D. (Eds.) *Genera plantarum*. Lovell Reeve & Co., Londini, pp. 990–1025.
- Burt, B.L. (1998) Taxonomic history of *Didymocarpus* and *Henckelia* (Gesneriaceae). *Beitraege zur Biologie der Pflanzen* 70: 365–375.
- Burt, B.L. & Wiehler, H. (1995) Classification of the family Gesneriaceae. *Gesneriana* 1: 1–4.
- Cai, L., Cai, J. & Shui, Y.M. (2016) *Didymocarpus anningensis* (Gesneriaceae), a new species from Yunnan, China. *Phytotaxa* 255: 292–296.  
<https://doi.org/10.11646/phytotaxa.255.3.12>
- Clarke, C.B. (1874) *Commelynaceae et Cyrtandraceae Bengalenses*. Thacker, Spink, and Co.; Thacker, Vining and Co.; W. Thacker and Co., Calcutta; Bombay; London, pp. 1–133.
- de Candolle, A. (1845) *Prodromus systematis naturalis regni vegetabilis*. Fortin, Masson et sociorum, Parisiis, 573 pp.
- Hamilton, F. (1819) Notice on the progress of botanical science in Bengal, being the substance of a letter from Dr. Wallich, superintendent of the botanical garden near Calcutta, to Francis Hamilton, M. D. F. R. S. & F. A. S. L. & E. *Edinburgh Philosophical Journal* 1: 376–380.
- Li, H.W. (1983) Notulae de Gesneraceis Yunnanensibus. *Bulletin of Botanical Research* 3: 1–55.
- Li, J.M. & Li, S.J. (2014) *Didymocarpus heucherifolius* var. *yinzhengii* (Gesneriaceae), a new taxon from Hunan, China. *Phytotaxa* 156: 187–190.  
<https://doi.org/10.11646/phytotaxa.156.3.10>
- Li, J.M., Sun, W.J., Chang, Y. & Yang, W.G. (2016) Systematic position of *Gyrocheilos* and some odd species of *Didymocarpus* (Gesneriaceae) inferred from molecular data, with reference to pollen and other morphological characters. *Journal of Systematics and Evolution* 54: 113–122.  
<https://doi.org/10.1111/jse.12169>
- Li, J.M. & Wang, F.S. (2015) *Didymocarpus tonghaiensis* sp. nov. (Gesneriaceae) from Yunnan, China. *Nordic Journal of Botany* 33: 68–70.  
<https://doi.org/10.1111/njb.00465>
- Li, Z.Y. & Wang, Y.Z. (2004) *Plants of Gesneriaceae in China*. Henan Science and Technology Publishing House, Zhengzhou, 721 pp.
- Möller, M. (2019) Species discovery in time: An example from Gesneriaceae in China. *Guangxi Sciences* 26: 1–16.
- Nangngam, P. & Maxwell, J.F. (2013) *Didymocarpus* (Gesneriaceae) in Thailand. *Gardens' Bulletin Singapore* 65: 185–225.
- Prasanna, N.S., Liu, D.T., Saryan, P., Duan, S.Z., Cai, L. & Gowda, V. (2020) *Didymocarpus sinoindicus* (Gesneriaceae), a new species from India and China. *Rheedea* 30: 135–142.  
<https://doi.org/10.22244/rheedea.2020.30.01.07>
- Smith, W.W. (1912) New Burmo-Chinese species of *Didymocarpus*. *Notes from the Royal Botanic Garden Edinburgh* 5: 149–155.
- Sprengel, K. (1817) *Anleitung zur kenntniss der gewächse*, ed. 2. Halle, 502 pp.
- Vitek, E., Weber, A. & Burt, B.L. (2000) Names, types and current placement of the species hitherto referred to *Didymocarpus*, *Loxocarpus*, *Codonoboa*, *Platyadenia* and *Henckelia* (Gesneriaceae). *Annalen des Naturhistorischen Museums in Wien Serie B Botanik und Zoologie* 102B: 477–530.
- Wang, W.T., Pan, K.Y. & Li, Z.Y. (1990) Gesneriaceae. In: Wang, W.T. (Ed.) *Flora Reipublicae Popularis Sinicae*. Science Press, Beijing, pp. 125–581.
- Weber, A. & Burt, B.L. (1998) Remodelling of *Didymocarpus* and associated genera (Gesneriaceae). *Beitraege zur Biologie der Pflanzen* 70: 293–363.
- Weber, A., Burt, B.L. & Vitek, E. (2000) Materials for a revision of *Didymocarpus* (Gesneriaceae). *Annalen des Naturhistorischen*



*Museums in Wien Serie B Botanik und Zoologie* 102B: 441–475.

- Weber, A., Clark, J.L. & Möller, M. (2013) A new formal classification of Gesneriaceae. *Selbyana* 31: 68–94.
- Weber, A., Wei, Y.G., Puglisi, C., Wen, F., Mayer, V. & Möller, M. (2011) A new definition of the genus *Petrocodon* (Gesneriaceae). *Phytotaxa* 23: 49–67.  
<https://doi.org/10.11646/phytotaxa.23.1.3>
- Wen, F., Qiu, Y.L., Huang, J., Zhao, B. & Wei, Y.G. (2013) *Didymocarpus dissectus* sp. nov. (Gesneriaceae) from Fujian, eastern China. *Nordic Journal of Botany* 31: 316–320.  
<https://doi.org/10.1111/j.1756-1051.2012.00057.x>
- Xie, W.Y., Zhou, J.J., Hong, X. & Wen, F. (2020) *Didymocarpus lobulatus* (Gesneriaceae), a new species from Zhejiang province, east China. *Phytokeys*: 145–153.  
<https://doi.org/10.3897/phytokeys.157.30349>
- Yang, B., Ding, H.B., Fu, K.C., Yuan, Y.K., Yang, H.Y., Li, J.W., Zhang, L.X. & Tan, Y.H. (2019) Four new species of Gesneriaceae from Yunnan, southwest China. *Phytokeys*: 183–203.  
<https://doi.org/10.3897/phytokeys.130.34001>
- Zhang, C.F., Tian, J., Peng, S., Wang, J.J., Wang, Y., Hu, G.W. & Wang, Q.F. (2020) *Didymocarpus longicalyx* (Gesneriaceae), a new species from southwestern Yunnan, China. *Phytotaxa* 475: 59–66.  
<https://doi.org/10.11646/phytotaxa.475.1.6>