



Primulina chizhouensis sp. nov. (Gesneriaceae), a new species from a limestone cave in Anhui, China

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Abstract

A new species of *Primulina*, *P. chizhouensis*, from Anhui, China, is described and illustrated. It is similar to *P. nandanensis* and *P. juliae* in leaf and flower shape, but can be distinguished by extraordinary short rhizomes (5–7 mm long), cymes 1–3(–10), peduncles 1.3–5 cm long, ovate bracts acuminate at apex, corolla 4–5 cm long with cylindrical tube and the lower lip to ca. 1.2 cm long, scattered glandular-pubescent filaments, the backside of the anthers bearded, and the plants forming compact dormancy buds in winter.

Introduction

The genus *Chirita* Buch.-Ham. ex Don (1822: 83) of the Gesneriaceae was revised several times (Candolle 1845, Clarke 1883, Wood 1974, Wang 1984, Wang *et al.* 1990, 1998, Wang *et al.* 2011). However, the morphological differences between it and closely related genera are very difficult to define. China, the center of species diversity of the genus, has about 110 species distributed from S China eastward to Zhejiang and northward to Sichuan and Hubei (Wang *et al.* 2011), but with only one species recorded in Anhui province by Guo (1991), *C. fimbrisepala* Handel-Mazzetti (1925: 65). A molecular phylogenetic study recently re-shaped the polyphyletic genus *Chirita* and other associated genera, and as a result *Chirita* sect. *Gibbosaccus* Clarke (1883: 130), together with *Chiritopsis* Wang (1981: 21) is now included in the originally monotypic and now enormously expanded genus *Primulina* Hance (1883: 169) (Wang *et al.* 2011, Weber *et al.* 2011). Two species of this genus were found in Anhui province before 2008, in addition to *C. fimbrisepala* [now *P. fimbrisepala* (Hand.-Mazz.) Yin Z. Wang in Wang *et al.* 2011: 61], also one species endemic to this region, *P. xiuningensis* (Liu & Guo 1989: 51) Mich.Möller & A.Weber in Weber *et al.* (2011: 785).

In June 2008, the authors collected some *Primulina* specimens in the south of Anhui province, China. During the past three years, the living plants were monitored in the field and an ecological survey was carried out. After consulting the relevant literature (Wang 1984, Wang *et al.* 1990, Wang *et al.* 1998, Li & Wang 2004, Liu & Wei 2004, Li *et al.* 2006, Wei *et al.* 2007, Li & Wang 2008, Wen *et al.* 2009, Xu *et al.* 2009, Zhou *et al.* 2009, Wei *et al.* 2010, Liu *et al.* 2010, Huang *et al.* 2010, Xu *et al.* 2010, Liu *et al.* 2011, Tang & Wen 2011, Wu *et al.* 2011, Xu *et al.* 2011a, 2011b), we concluded that it is an hitherto undescribed species.

Taxonomic Treatment

Primulina chizhouensis Xin Hong, S.B.Zhou & F.Wen, *sp. nov.* (Figures 1, 2)

It differs from *P. nandanensis* (S.X.Huang, Y.G.Wei & W.H.Luo) Mich.Möller & A.Weber and *P. juliae* (Hance) Mich.Möller & A.Weber in extraordinary short rhizomes (5–7 mm long), cymes 1–3(–10), peduncles 1.3–5.0 cm long, ovate bracts with acuminate apex, corolla 4–5 cm long, with cylindrical tube, the lower lip to ca. 1.2 cm long, filaments scattered glandular pubescent, backside of the anthers bearded, and forming compact dormancy buds in winter.

Type:—CHINA. Anhui Province: Chizhou city, Tangxi village, growing in the entrance of a limestone cave, elevation ca. 200 m, 8 June 2008 (fl.), S.B.Zhou & Xin Hong 0806001 (holotype ANU!, isotype IBK!).

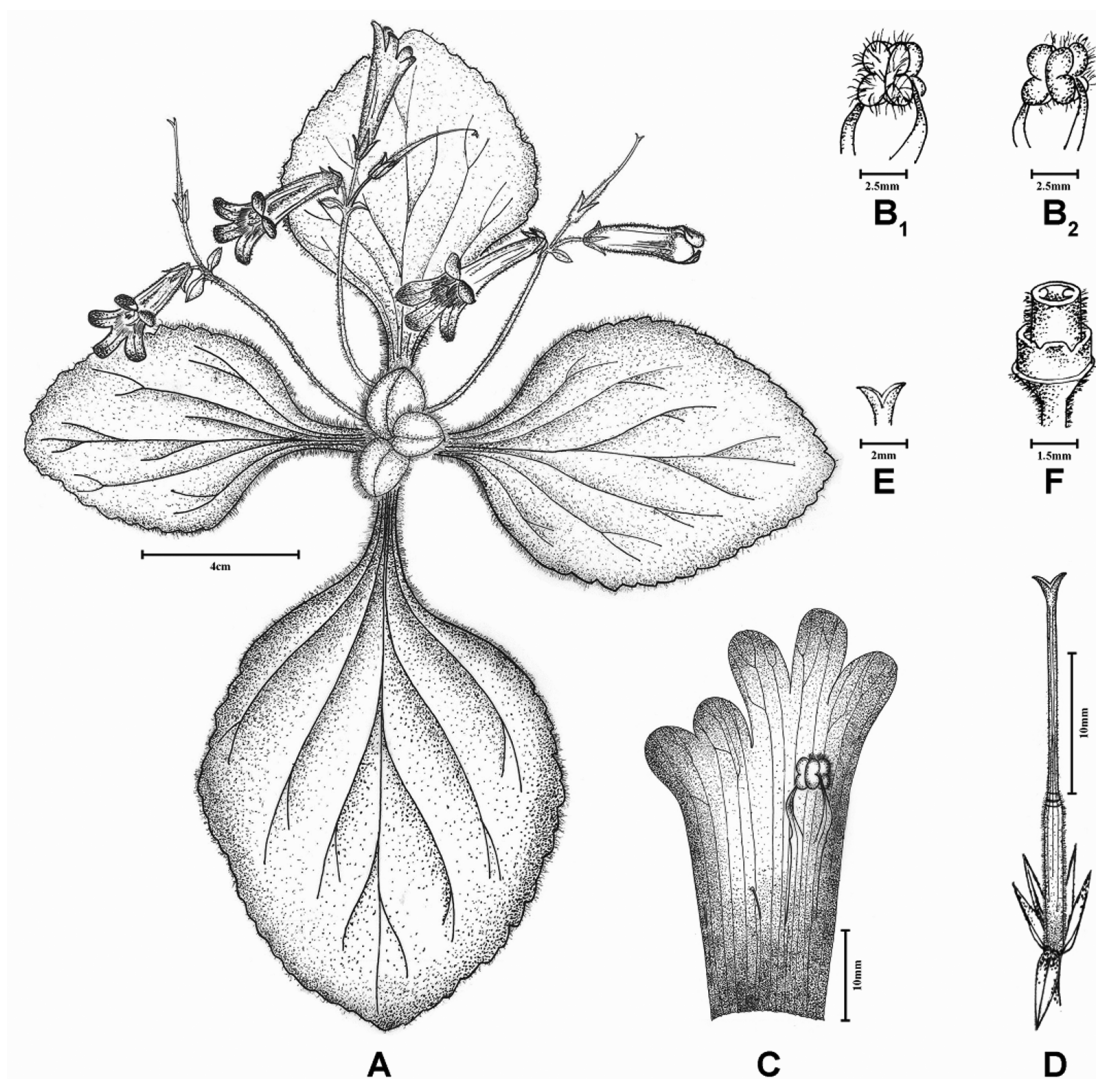


FIGURE 1. *Primulina chizhouensis* sp. nov. (A) habit in flowering period; (B₁) anthers, dorsal view (showing beard); (B₂) anthers, ventral view; (C) dissection of a flower showing stamens and staminodes; (D) calyx and pistil; (E) stigma; (F) disc and cross section of ovary (drawn from the holotype).

Perennial herbs, rhizomes terete, 5–7 mm long, 0.4–0.5 mm in diameter. Leaves 4–7, all basal; petiole flattened, 2–10 × 0.5–1 cm, densely strigose; blade thick papery, ovate to oblong, 4–14 × 3–10 cm, asymmetric, cuneate at base, margin with crenations from the middle to the apex, obtuse at apex, densely villous on both surfaces, lateral veins 5, not reaching the leaf margin. Compact dormancy buds with 2–3

villous cataphylls, acaulescent, nearly orbicular, 0.8–1.5 × 0.7–1.7 cm, formed in winter. Cymes 1–3(–10), axillary, 1–3 branches, 1–6-flowered; peduncles 1.3–5 cm long, ca. 0.1 cm wide, densely pubescent; bracts 2, opposite, ovate, acuminate at apex, 0.4–0.6(–1.1) × 0.3–0.5 cm, outside puberulous, inside glabrous, entire; pedicels 0.5–1.5 cm long, ca. 0.1 cm wide, villous. Calyx 5-parted to the base, narrowly linear, 0.6–1 × 0.2–0.3 cm, densely villous. Corolla purple, 4–5 cm long, pubescent from base to orifice outside; tube cylindrical, ca. 2.4 cm long, orifice ca. 0.8 cm in diameter; adaxial lip ca. 6 mm long, 2-parted to the middle, orbicular-ovate; abaxial lip 0.9–1.2 cm long, 3-lobed to the base. Stamens 2, adnate to corolla tube ca. 1.5 cm above the base; filaments linear, ca. 5 mm long, scattered glandular pubescent; anthers fused by their entire adaxial surfaces, oblong, 3–4 × ca. 2 mm, bearded on the back. Staminodes 2, glabrous, adnate to corolla tube ca. 8 mm above the base, 2–3 mm long. Pistil ca. 3 cm long; ovary linear, ca. 1.5 × 0.2 cm, style pubescent, 1.5–1.8 cm long; stigma bipartite, lobes narrowly lanceolate, 0.1–0.2 mm long. Capsule linear, slightly curved, ca. 3 cm long, pubescent when young.

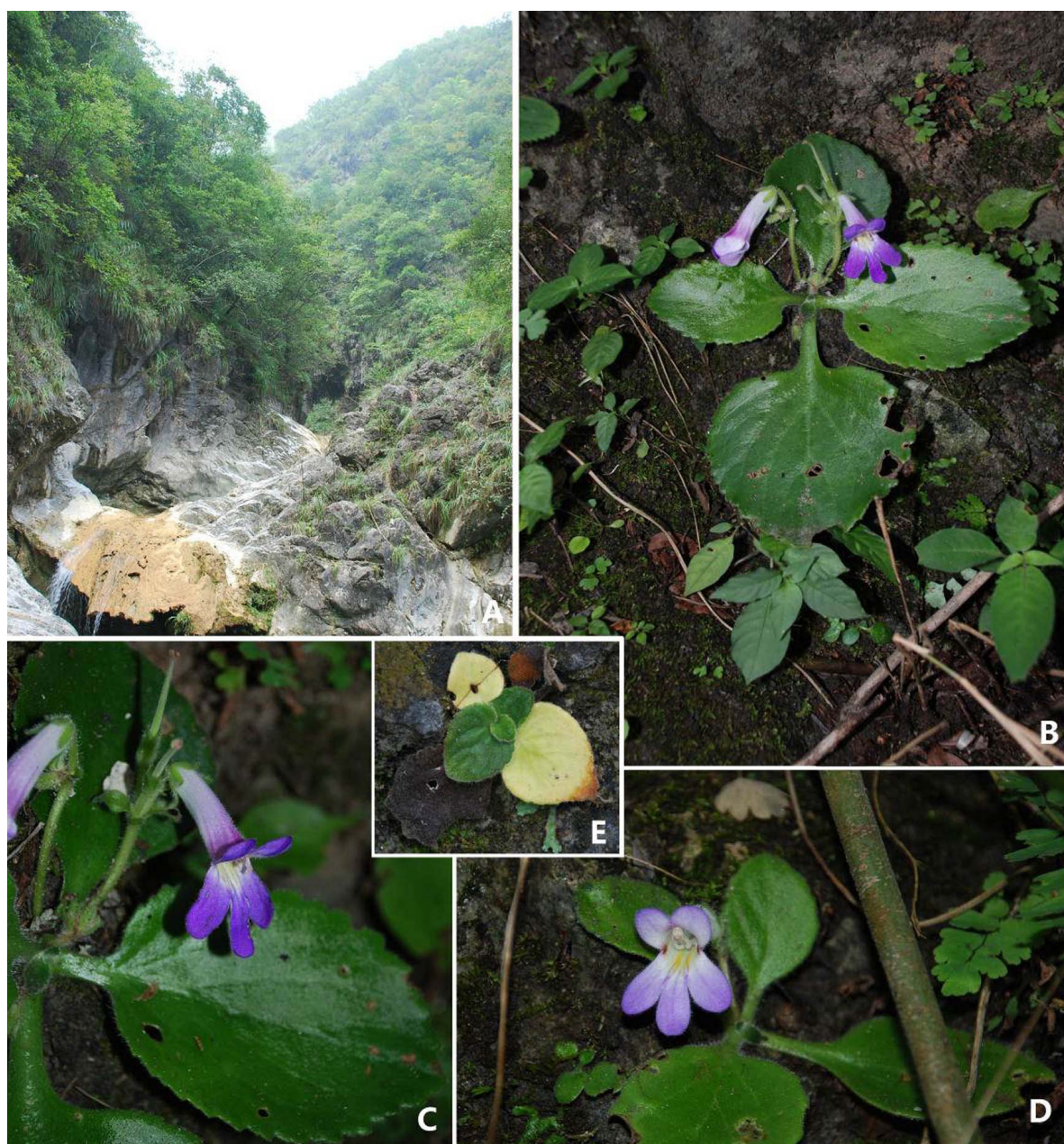


FIGURE 2. *Primulina chizhouensis* sp. nov. (A) habit; (B) flowering plants; (C) flower, frontal view; (D) flower, side view; (E) plant in winter (with dormancy bud).

Distribution:—China (narrow endemic and only known from the type locality, i.e. Tangxi village (30°19'N, 117°35'E) ca. 16 km south of Chizhou City in southern Anhui Province of eastern China) (see Figure 3).



FIGURE 3. Distribution map of *Primulina chizhouensis* sp. nov.

Habitat & Ecology:—*Primulina chizhouensis* is locally abundant. It grows in rocky crevices on moist shady cliffs at the entrance of a limestone cave, at an elevation of 200 m a.s.l. The average temperature of Tangxi County is 16.5°C, the average annual precipitation is ca. 1525 mm. The forest where *P. chizhouensis* occurs is subtropical evergreen broad-leaved forest, with the main community types of *Castanopsis sclerophylla* (Lindl. & Paxton) Schottky and *Cyclobananopsis gracilis* (Rehder & E.H.Wilson) W.C.Cheng & T.Hong. Flowering from the end of May to the middle of June.

Etymology: —The species is named after Chizhou City in Anhui province.

Vernacular name: —China: chizhoubaochunjutai.

Additional collections (paratypes):—CHINA. Anhui Province: Chizhou city, Tangxi village, ca. 200 m, 10 June 2008, *S.B.Zhou & Xin Hong 0806012* (IBK!); *ibid.*, 220 m, 23 May 2011, *Xin Hong 201105089* (ANU!), *201105090* (ANU!).

Similar species:—*Primulina chizhouensis* is morphologically close to *P. nandanensis* (Huang, Wei & Luo 2010: 139) Mich.Möller & A.Weber (in Weber *et al.* 2011: 783) and *P. juliae* (Hance 1883: 168) Mich.Möller & A.Weber (in Weber *et al.* 2011: 782) based on leaf shape and the color of the flowers, but it can be easily distinguished by several other characters (see Table 1).

TABLE 1. Diagnostic character differences between *Primulina chizhouensis*, *P. nandanensis* and *P. juliae*.

Characters	<i>P. chizhouensis</i>	<i>P. nandanensis</i>	<i>P. juliae</i>
rhizomes	ca. 0.5–0.7 cm long	ca. 1–1.8 cm long	ca. 2–3 cm long
blade margin	with crenation from middle to apex	with crenation from base to middle	basally dentate to pinnately lobed or crenate
presence of compact dormancy buds in winter	yes	no	no
petiole size (cm)	2–10 × 0.5–1	1–7 × 0.2–0.3	3–17 × 3–4
cymes	1–3(–10)	8–15	2–3
peduncles	1.3–5 cm long	5–10 cm long	4–11 cm long
bracts (cm)	ovate, 0.4–1.1 × 0.2–0.6	narrowly lanceolate, 0.6 × 0.1	narrowly lanceolate, 0.5–1.3 × 0.6–1.2
corolla length (cm)	4–5	2–3.2	3.5–4.5
corolla tube	cylindrical, ca. 2.4 cm long	infundibuliform-cylindrical, ca. 1–1.5 cm long	infundibuliform-cylindrical, ca. 2.2–3.3 cm long
filaments	scattered glandular pubescent	glabrous	scattered glandular pubescent or glabrous
anthers	bearded	glabrous	glabrous
lobes of stigma	narrowly lanceolate	narrowly lanceolate	narrowly oblong
flowering time	May–June	May	July–October

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References

- Candolle, A.L.P.P. de (1845) Cyrtandraceae. *In: Prodrum systematis naturalis regni vegetabilis* 9. Treuttel & Würtz, Paris, pp. 258–286, 564.
- Clarke, C.B. (1883) Cyrtandraceae. *In: Candolle, A.L.P.P. de & Candolle, A.C.P. de (eds.) Monographiae phanerogamarum* 5(1). Masson, Paris, pp. 1–303, 32 pl.
- Don, D. (1822) Descriptions of two new genera of Nepal plants. *Edinburgh Philosophical Journal* 7: 82–86.
- Guo X.H. (1991) Gesneriaceae. *In: Qian, X.H. (ed.) Flora of Anhui* 5. Chinese Forecast Press, Anhui, pp. 401–410.
- Hance, H.F. (1883) New Chinese *Cyrtandreae*. *Journal of Botany* 21: 165–170.
- Handel-Mazzetti, H. von (1925) Plantae novae sinenses diagnosibus brevibus descriptae (33. Fortsetzung). *Anzeiger der Akademie der Wissenschaften in Wien, Mathematisch-Naturwissenschaftliche Klasse* 62: 64–67.
- Huang, S.X., Wei, Y.G. & Luo, W.H. (2010) *Chirita nandanensis* (Gesneriaceae), a new species from Guangxi, China. *Annales Botanici Fennici* 47: 139–140.

- Li, J.M. & Wang, Y.Z. (2008) *Chirita longicalyx* (Gesneriaceae), a new species from Guangxi, China. *Annales Botanici Fennici* 45: 212–214.
- Liu, X.L. & Guo, X.H. (1989) A new species of *Chiritopsis* from Anhui. *Bulletin of Botanical Research* 9: 51–54.
- Liu, Y. & Wei, Y.G. (2004) *Chirita lutea* Yan Liu & Y.G. Wei, a new species of Gesneriaceae from Guangxi, China. *Journal of Wuhan Botanical Research* 22: 391–393.
- Liu, Y., Xu, W.B. & Huang, Y.S. (2011) *Primulina guangxiensis* sp. nov. (Gesneriaceae) from a karst cave in Guangxi, China. *Nordic Journal of Botany* 29: 682–686.
- Liu, Y., Xu, W.B. & Pan, B. (2010) *Wentsaiboaea tiandengensis* sp. nov. and *W. luochengensis* sp. nov. (Gesneriaceae) from Karst caves in Guangxi, southern China. *Nordic Journal of Botany* 28: 739–745.
- Li, Z.Y. & Wang, Y.Z. (2004) *Primulina*, *Chirita* and *Chiritopsis*. In: Li, Z.Y. & Wang, Y.Z. (eds.) *Plants of Gesneriaceae in China*. Henan Science and Technology Publishing House, Zhengzhou. pp. 170–282.
- Li, Z.Y., Xing, Q. & Li, Y.B. (2006) *Chirita tribracteata* var. *zhuana* Z.Y. Li, Q. Xing & Y.B. Li (Gesneriaceae), a new variety from Guangxi, China. *Acta Phytotaxonomica Sinica* 44: 649–650.
- Tang, H. & Wen, F. (2011) *Chirita tiandengensis* (Gesneriaceae) sp. nov. from Guangxi, China. *Nordic Journal of Botany* 29: 233–237.
- Wang, Y.Z., Mao, R.B., Liu, Y., Li, J.M., Dong, Y., Li, Z.Y. & Smith, J.F. (2011) Phylogenetic reconstruction of *Chirita* and allies (Gesneriaceae) with taxonomic treatments. *Journal of Systematics and Evolution* 49: 50–64.
- Wang, W.T. (1981) *Quinque genera nova gesneriacearum e Sina*. *Bulletin of Botanical Research* Harbin 1: 21–28.
- Wang, W.T. (1984) *Notulae De Gesneriaceis Sinensibus* (V). *Bulletin of Botanical Research* 4: 9–35.
- Wang, W.T., Pan, K.Y. & Li, Z.Y. (1990) Gesneriaceae. In: Wang, W.T. (ed.) *Flora Reipublicae Popularis Sinicae* 69. Science Press, Beijing, pp. 125–581.
- Wang W.T., Pan, K.Y. & Li, Z.Y. (1998) Gesneriaceae. In: Wu, Z.Y. & Raven, P.H. (eds.) *Flora of China* 18. Science Press, Beijing & Missouri Botanical Garden Press, St. Louis, 322 pp.
- Weber, A., Middleton, D.J., Forrest A., Kiew R., Lim, C.L., Rafidah, A.R., Sontag, S., Triboun, P., Wei, Y.G., Yao, T.L. & Möller, M. (2011) Molecular systematics and remodelling of *Chirita* and associated genera (Gesneriaceae). *Taxon* 60: 767–790.
- Wei, Y.G., Wen, F., Möller, M., Monroe, A., Zhang, Q., Gao, Q., Mou, H.F., Zhong, S.H. & Cui, C. (2010) *Gesneriaceae of South China*. Guangxi Science and Technology Publishing House, Nanning, 777 pp. (in Chinese and English).
- Wei, Y.G., Pan, B. & Tang, W.X. (2007) *Chirita guihaiensis* sp. nov. (Gesneriaceae) from Guangxi, China. *Nordic Journal of Botany* 25: 296–298.
- Wen, F., Wang, Y. & Zhang, Q.X. (2009) *Chirita leei* (Gesneriaceae), a new species from Guangxi, China. *Guihaia* 29: 719–723.
- Wood, D. (1974) A revision of *Chirita* (Gesneriaceae). *Notes from the Royal Botanic Garden Edinburgh* 33: 123–205.
- Wu, W.H., Xu, W.B., Nong, D.X. & Liu, Y. (2011) *Chirita ningmingensis* (Gesneriaceae), a new species from Guangxi, China. *Annales Botanici Fennici* 48: 422–424.
- Xu, W.B., Huang, Y.S., Wu, L. & Liu, Y. (2011a) *Chirita luochengensis* (Gesneriaceae), a new species from limestone areas in northern Guangxi, China. *Brittonia* 63: 314–317.
- Xu, W.B., Liu Y. & Gao, H.S. (2009) *Chiritopsis jingxiensis*, a new species of Gesneriaceae from a karst cave in Guangxi, China. *Novon* 19: 559–561.
- Xu, W.B., Pan, B., Huang, Y.S. & Liu, Y. (2010) *Chirita leprosa* sp. nov. (Gesneriaceae) from limestone areas in Guangxi, China. *Nordic Journal of Botany* 28: 705–708.
- Xu, W.B., Pan, B., Huang, Y.S. & Liu, Y. (2011b) *Chirita lijiangensis* (Gesneriaceae), a new species from limestone area in Guangxi, China. *Annales Botanici Fennici* 48: 188–190.
- Zhou, T.J., Pan, B. & Xu, W.B. (2009) *Chirita pseudoheterotricha* T.J. Zhou, B. Pa & W.B. Xu, a new species of Gesneriaceae from limestone areas in Guangxi, China. *Journal of Tropical and Subtropical Botany* 17: 596–599.