

Primulina xiziae sp. nov. (Gesneriaceae) from Zhejiang Province, China

Jian Li, Yue Wang, Guo-Jun Hua and Fang Wen

J. Li, School of Tourism and Health, Zhejiang Agriculture and Forestry Univ., CN-311300 Lin'an, Hangzhou, Zhejiang, PR China. – Y. Wang, R and D Centre, Zhejiang Senhe Seed Co., LTD, no. 3, Xidoumen Street, Wenyixi Rd., Hangzhou, CN-310012 Zhejiang, PR China. – G.-J. Hua, New Dimension Systems Co., Ltd., Room C801, The West Lake International Building of Science and Technology, no. 391 Wener Rd., Hangzhou, CN-310012 Zhejiang, PR China. – F. Wen (wenfang0608@139.com), Guangxi Inst. of Botany, Guangxi Zhuang Autonomous Region and the Chinese Academy of Sciences, CN-541006 Guilin, Guangxi, PR China.

A new species of Gesneriaceae, *Primulina xiziae* Fang Wen, Yue Wang & G. J. Hua, from Zhejiang Province, China, is identified, illustrated and described. It resembles the widespread *P. eburnea*, and the stenochoric *P. pseudoeburnea*, but differs by the leaf blades being ovate-elliptic or ovate, chartaceous with ciliate margins, 8.5–13.8 mm long, slender peduncle, ovate, ca 1.2 × 1.0 cm large bracts that are generally withered but persistent before full-blooming stage, slender tubular-infundibuliform, ca 25.0 × 7.5 mm corolla tube, limb lobes with acute apices, 3 staminodes, and by forming a dormancy bud in winter.

Many species and varieties of *Chirita* (Gesneriaceae tribe Didymocarpeae) have been described in recent years (Li et al. 2006, Wei et al. 2007, Li and Wang 2008, Xu et al. 2008, Wen et al. 2009, Li and Möller 2009, Li and Zhu 2010, Huang et al. 2010a, b, Wei et al. 2010, Xu et al. 2010, Huang et al. 2011). Apart from *C. auriculata* J. M. Li & S. X. Zhu (Li and Zhu 2010), which belong to *Chirita* sect. *Chirita*, all recent novelties belong to sect. *Gibbosaccus*. Section *Gibbosaccus* (Clarke 1883) contains more than 150 taxa which are mainly distributed from southern China to northern Vietnam (Wood 1974, Wang 1985, Wang et al. 1990, 1998, Nguyen and Kiew 2000, Burt 2002, Li and Wang 2004, Shui and Chen 2006, Qin and Liu 2010, Wei et al. 2010). *Wentsaiboea*, one of the relatives of *Chirita*, was described and illustrated in 2004 (Fang and Quin 2004). The most recent report on this genus was on two new species, *W. tiandengensis* Yan Liu & B. Pan and *W. luochengensis* Yan Liu & W. B. Xu (Liu et al. 2010). However, based on the results of a phylogenetic analysis of nrDNA internal transcribed spacer and cpDNA *trnL-F*, all species of sect. *Gibbosaccus* have been removed from *Chirita*. This former section, together with the three small genera *Chiritopsis*, *Wentsaiboea* and *Primulina* make up the recircumscribed genus *Primulina* and form a monophyletic group (Wang et al. 2011).

In 2008, two of the authors (Hua and Wen) found a wild, flowering *Primulina* (former *Chirita*) species during their field work in the subtropical forest of Zhejiang Province, China. At the same time one of the authors (Li) also found this species in Lin'an, Hangzhou. We collected specimens

and took photographs of it. During the past two years, after carefully consulting relevant literature, as well as herbarium specimens, we confirm that it represents a new species of the genus *Primulina*. Until now there are only two species of *Primulina* recorded in Zhejiang Province, namely *P. eburnea* (Hance) Y. Z. Wang and *P. pinnatifida* (Hand.-Mazz.) Y. Z. Wang (Zheng 1993, Wang et al. 2011). Both species are widespread, frequently recorded in the south of China. Thus, the new species reported in this paper is the third *Primulina* species found in Zhejiang Province.

Primulina xiziae Fang Wen, Yue Wang & G. J. Hua as formally described here, is characterized by having a chartaceous, ovate-elliptic or ovate leaf lamina with margins with long and short cilia, a slender peduncle, small, ovate, bracts that are generally withered but persistent before full-blooming period, a slender, tubular-infundibuliform corolla tube, limb lobes with acute apices, 3 staminodes, and by forming a dormancy bud in winter.

Primulina xiziae Fang Wen, Yue Wang & G. J. Hua sp. nov. (Fig. 1, 2)

Primulinae eburneae and *P. pseudoeburneae* affinis, sed foliis chartaceis, late ellipticis vel ovatis, 10–15 × 7.0–11.5 cm, margine ciliatis, pedunculis 8.5–13.8 mm longis, gracilibus, 1.5–2.0 mm in diametro, bracteis parvis, ovatis, circa 1.2 × 1.0 cm, ante anthesin emorientibus, corollis gracilibus tubulari-infundibuliformibus, circa 25.0 × 7.5 mm, staminodiis 3 differt.

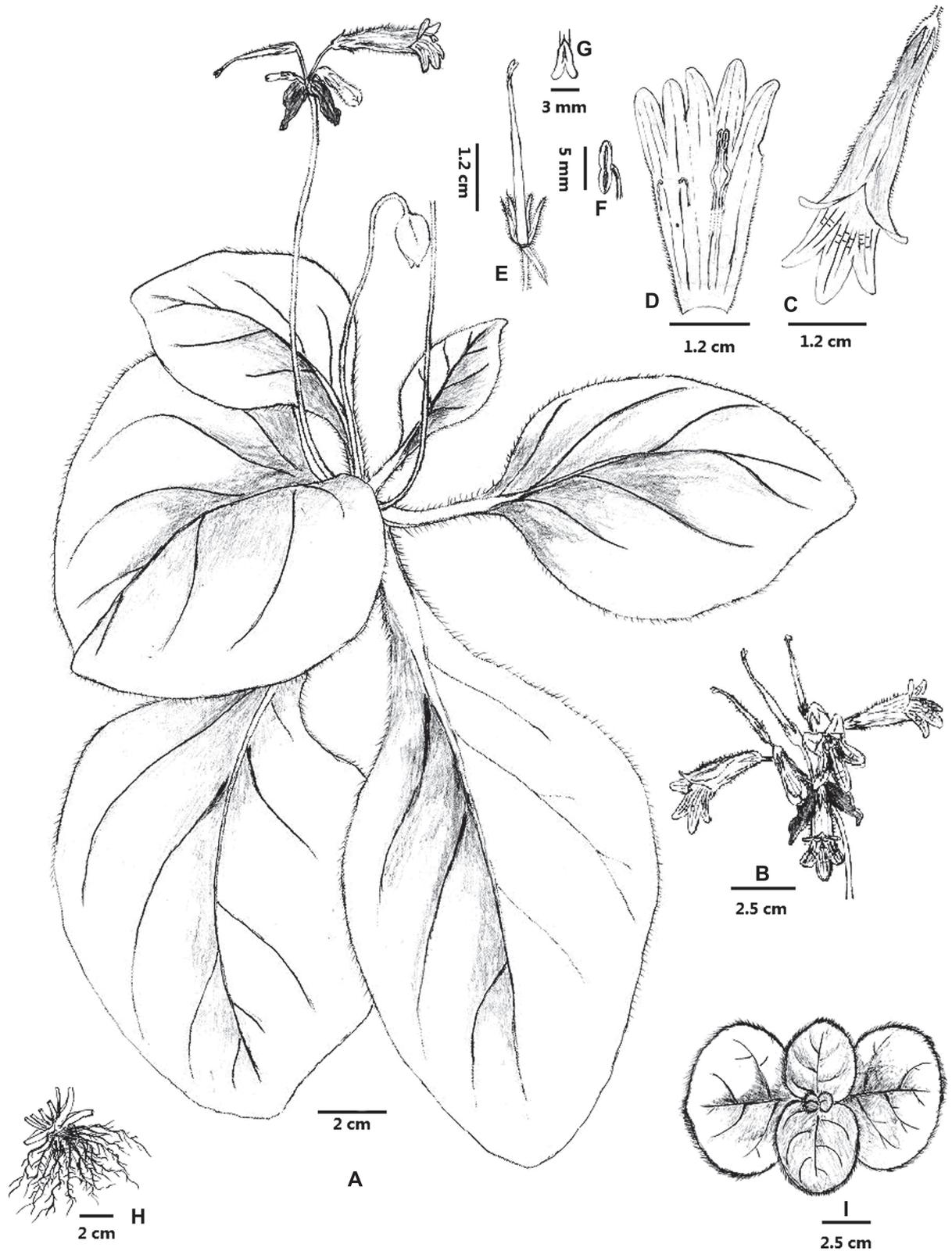


Figure 1. *Primulina xiziana* Fang Wen, Yue Wang & G. J. Hua. (A) habit, (B) inflorescence, (C) flower, (D) corolla opened with stamens and staminodes, (E) calyx and pistil, (F) stamen, (G) stigma, (H) stem, (I) dormancy bud. From the holotype Fang Wen et al. HZ20080601 (IBK).

Type: China. Zhejiang Province, Hangzhou, Taiziwan. Endemic to Zhejiang Province, China, on moist limestone rock face in evergreen broad-leaved forest, located in the

subtropical monsoon region, 30°13.644'N, 120°08.592'E, 70–110 m a.s.l., 1 Jun 2008, Fang Wen, Jia-Jun Zhou, Yue Wang and Guo-Jun Hua, HZ20080601 (holotype: IBK).



Figure 2. (A) *Primulina xiziae*, (B) *P. eburnea*, (C) *P. pseudoeburnea*. (1) habitat, (2) habit, (3) bract view, (4) the top view of flower, (5) the frontal view of flower, (6) dormancy bud of *P. xiziae* in winter and normal plants without dormancy bud in winter of *P. eburnea* and *P. pseudoeburnea*.

Perennial acaulescent herb. Rhizome inconspicuously compressed, rounded to cylindrical, 1.0–1.5 cm long, 0.8–1.2 cm in diameter. Leaves 4–6, basal or clustered at the top of rhizome; leaf lamina chartaceous, ovate-elliptic or

ovate, 10–15 × 7.0–11.5 cm, base oblique, broadly cuneate, margin entire or sinuate, ciliate, apex obtuse or rotund, shortly appressed-pubescent on both sides, 3–4-nerved on each side; petiole compressed, 3.0–10.5 × 1.0 cm, pubescent

and sparsely long-pubescent. Cymes axillary, 1–4, branched once or unbranched, 2–8-flowered; peduncle slender, 8.5–15.0 cm long, 1.5–2.0 mm in diameter, densely pubescent; bracts 2, opposite, small, ovate, 1.2 × 1.0 cm, strigose outside, glabrous inside, caducous or withered before full-blooming period; pedicel 12–15 mm long, densely shortly erect-glandular. Calyx 5-parted to the base, lobes equal, linear-lanceolate, ca 8 mm, densely erect short-glandular outside, glabrous inside. Corolla 3.4–3.6 cm long, orifice ca 7.5 mm in diameter, white with a lavender shading, lilac or fuchsia, the colour of the throat same as corolla without two yellow stripes, infundibuliform–tubular, the upper part of the interior of the corolla with two lines of hairs; tube slender, the upper part of the outer side densely erect-glandular, densely erect-pubescent from the middle to the base; limb distinctly 2-lipped, adaxial lip 2-parted to the middle, lobe ca 8 mm long, slightly oblique linguiform; abaxial lip 3-parted to the middle, lobes oblong, 1.1–1.3 cm long. Stamens 2, adnate to ca 1.1 cm above the corolla base; anthers reniform, ca 4.0–4.5 mm long, slightly constricted at the middle, glabrous; filaments ca 1.2 cm long, the lower half of filaments flaky, base pubescent, geniculate at the middle, the upper half inconspicuously short-glandular; staminodes 3, lateral ones with broad base, gradually narrowed to apex, curved in upper part, apex capitate, glabrous, the third staminode inconspicuous, small head-like; disc annular, 1.2–1.5 mm high. Pistil 2.5–2.8 cm long, densely erect-glandular; ovary linear; style 5–6 mm long. Stigma 2-lobed, 4–5 mm long. Capsule linear, ca 5 cm, slightly contorted.

Etymology

The epithet *xiziae* is used to perpetuate the memory of one of the beauties of Old China, Xishi. It is said that Xishi was so beautiful, having no equal in spring and autumn and the ‘Warring states period’ of China. She was from Zhejiang and her nickname was Xizi.

Distribution, ecology and conservation status

Primulina xiziae grows only on small outcrops of shaded moist limestone cliffs under subtropical evergreen broad-leaved forests in Zhejiang Province (Hangzhou, Yuhang, Lin’an, Jinhua and Lanxi), 70–110 m a.s.l. Before the authors confirmed this species as new to science, it was known as *Primulina eburnea* for many years. *Primulina eburnea* is a widespread species, distributed in Guangxi, Guangdong, Hunan, Hubei, Sichuan, Chongqing, Guizhou (Li and Wang 2004), Yunnan (Shui and Chen 2006). We have visited the above-mentioned sites of this new species five times. At present, a total of six sites are known, with more than 3000 individuals. We propose that *Primulina xiziae* should be considered as ‘Vulnerable’ (VU) according to IUCN red list criteria (IUCN 2001).

Phenology

Flowering occurs in Jun and the fruiting period occurs in Aug–Sep.

Similar species

Primulina xiziae is similar to *P. eburnea* and *P. pseudoeburnea*, however it differs by forming obvious dormancy buds with apparent white long pubescence in winter, being acaulescent or with an inconspicuous compressed stem, having a chartaceous leaf lamina with oblique, broadly cuneate or nearly truncate base and ciliate margin, a petiole that is ca 3.0–4.5 cm long with short pubescence and sparse long pubescence, having fewer flowers in each cyme, only 2–8, a slender peduncle, only 1.5–2.0 mm in diameter, smaller bracts, 1.2 × 1.0 cm, which are generally withered but persistent before full-blooming stage, a slender, infundibuliform-tubular, 25 mm long corolla tube, an orifice that is ca 7.5 mm in diameter and 3 glabrous staminodes. Differences between the three species are summarized in Table 1.

Table 1. Morphological comparison of *Primulina xiziae*, *P. eburnea* and *P. pseudoeburnea*.

	<i>P. xiziae</i>	<i>P. eburnea</i>	<i>P. pseudoeburnea</i>
Rhizome	inconspicuously compressed	enlarged cylindrical, fleshy	enlarged cylindrical, fleshy
Leaf lamina	chartaceous, ovate-elliptic or ovate, 10–15 × 7.0–11.5 cm, margin ciliate	leathery, ovate to elliptic or obovate, 3.5–17 × 2.0–9.5 cm	leathery, narrowly ovate to elliptic, 2.5–11.0 × 1.2–4.4 cm
Leaf base	oblique, broadly cuneate	attenuate to broadly cuneate	cuneate
Peduncle	8.5–13.8 cm long, slender, only 1.5–2.0 mm in diameter	4–30 cm long, thicker, 3.5–4.0 mm in diam.	10–19 cm, thicker, ca 3.5 mm in diam.
Bracts	ovate, 1.2 × 1.0 cm, often withering before full-bloom stage	ovate to orbicular-ovate, 1.0–4.5 × 0.8–2.8 cm, fresh in flower	lanceolate, ca 11.0 × 1.2 mm, fresh in flower
Corolla tube	tube infundibuliform–tubular, ca 25.0 × 7.5 mm	almost tubular, 30 × 10–14 mm	narrowly funnel-shaped, 20 × 8 mm
Corolla hairs	The upper part outside densely erect-glandular, from the middle to the base densely erect-pubescent	sparsely puberulent	sparsely puberulent outside, with short yellow hairs below stamens and in 4 longitudinal lines inside
Colour of corolla throat	without two yellow stripes, same as corolla	with two yellow stripes	with four longitudinal purple lines
Lip lobes	apex acute	apex rotund	apex acute
Staminodes	3	2	2
Capsule	slightly contorted	straight	straight
Flowering time	only Jun	Apr–May	May–Jun
Dormancy bud in winter	forming dormancy bud with white long pubescence	not formed	not formed

Additional specimens examined (paratypes)

China. Zhejiang Province, Hangzhou, Xihu, Yuhuangshan, 6 Jun 2009, Fang Wen and G. J. Hua 09060602 (IBK); China. Zhejiang Province, Lin'an, 11 Jun 2009, Jian Li G21 (ZJFC).

Acknowledgements – We thank Prof. Yi-Gang Wei (IBK) for his help in checking and identifying specimens, and preparing the paper, we also thank Bo Gao for the handsome drawing, Chia-Cheng Liu (Hong Kong) and Chee Kin (Singapore) for linguistic comments on the manuscript. This work was supported by funds from the Guangxi Natural Science Foundation (2011GXNSFB018050), Science Research Foundation of Guangxi Institute of Botany (Guizhiye11001), Science and Technology Innovation Program of Guangxi Academy of Sciences and West Light Foundation of The Chinese Academy of Sciences.

References

- Burtt, B. L. 2002. New Gesneriaceae: a *Chirita* from Vietnam and a *Monophyllaea* from Sulawesi. – Gard. Bull. Singap. 54: 239–242.
- Clarke, C. B. 1883. Cyrtandreae. – In: De Candolle, A. C. (ed.), Monographiae phanerogamarum 5(1). Masson.
- Fang, D. and Qin, D. H. 2004. *Wentsaiboea* D. Fang & D. H. Qin, a new genus of the Gesneriaceae from Guangxi, China. – Acta Phytotax. Sin. 42: 533–536.
- Huang, S. X. et al. 2010a. *Chirita nadanensis* (Gesneriaceae), a new species from Guangxi, China. – Ann. Bot. Fenn. 47: 139–140.
- Huang, Y. S. et al. 2010b. *Chirita luzhaiensis*, a new species of Gesneriaceae from limestone areas in Guangxi, China. – J. Trop. Subtrop. Bot. 18: 137–139.
- Huang, Y. S. et al. 2011. *Chirita rongshuiensis*, a new species of Gesneriaceae from northern Guangxi, China. – Taiwania 56: 54–57.
- IUCN 2001. IUCN red list categories and criteria, ver. 3.1. – IUCN Species Survival Commission.
- Li, J. M. and Wang, Y. Z. 2008. *Chirita longicalyx* (Gesneriaceae), a new species from Guangxi, China. – Ann. Bot. Fenn. 45: 212–214.
- Li, J. M. and Möller, M. 2009. *Chirita grandibracteata* (Gesneriaceae), a new species from Yunnan, China. – Ann. Bot. Fenn. 46: 125–129.
- Li, J. M. and Zhu, S. X. 2010. *Chirita auriculata* (Gesneriaceae), a new species from China, placed in sect. *Chirita* based on molecular data. – Ann. Bot. Fenn. 47: 221–225.
- Li, Z. Y. and Wang, Y. Z. 2004. Plants of Gesneriaceae in China. – Henan Sci. Technol. Publ. House, in Chinese.
- Li, Z. Y. et al. 2006. *Chirita tribracteata* var. *zhuana* Z. Y. Li, Q. Xing & Y. B. Li (Gesneriaceae), a new variety from Guangxi, China. – Acta Phytotax. Sin. 44: 649–650, in Chinese with English summary.
- Liu, Y. et al. 2010. *Wentsaiboea tiandengensis* sp. nov. and *W. luochengensis* sp. nov. (Gesneriaceae) from Karst caves in Guangxi, southern China. – Nord. J. Bot. 28: 739–745.
- Nguyen, T. H. and Kiew, R. 2000. New and interesting plants from Ha Long Bay, Vietnam. – Gard. Bull. Singap. 52: 185–202.
- Qin, H. N. and Liu, Y. 2010. A checklist of vascular plants of Guangxi. – Science Press, pp. 383–393.
- Shui, Y. M. and Chen, W. H. 2006. Gesneriaceae. – In: Seed plants of the Karst region in China. Vol. 1. Science Press, pp. 163–179.
- Wang, W. T. 1985. Notulae de Gesneriaceae Sinensibus (II). – Bull. Bot. Res. 1: 35–75, in Chinese.
- Wang, W. T. et al. 1990. Gesneriaceae. – In: Wang, W. T. (ed.), Flora Reipubl. Pop. Sin. 69. Science Press, pp. 340–416.
- Wang, W. T. et al. 1998. Gesneriaceae. – In: Wu, C. Y. and Raven, P. H. (eds), Flora of China 18. Science Press, Miss. Bot. Gard., pp. 77–120.
- Wang, Y. Z. et al. 2011. Phylogenetic reconstruction of *Chirita* and allies (Gesneriaceae) with taxonomic treatments. – J. Syst. Evol. 49: 50–64.
- Wei, Y. G. et al. 2007. *Chirita guihaiensis* sp. nov. (Gesneriaceae) from Guangxi, China. – Nord. J. Bot. 25: 296–298.
- Wei, Y. G. et al. 2010. Gesneriaceae of south China. – Guangxi Sci. Technol. Publ. House, pp. 457–490.
- Wen, F. et al. 2009. *Chirita leei* (Gesneriaceae), a new species from Guangxi, China. – Guihaia 29: 719–723.
- Wood, D. 1974. A revision of *Chirita* (Gesneriaceae). – Notes R. Bot. Gard. Edinb. 33: 123–205.
- Xu, H. et al. 2008. A new species of *Chirita* (Gesneriaceae) from Yunnan, China. – Bot. J. Linn. Soc. 158: 269–273.
- Xu, W. B. et al. 2010. *Chirita leprosa* sp. nov. (Gesneriaceae) from limestone areas in Guangxi, China. – Nord. J. Bot. 28: 705–708.
- Zheng, C. Z. 1993. Gesneriaceae. – In: Wang, J. X. et al. (eds), Flora of Zhejiang. Vol. 6. Zhejiang Sci. Technol. Publ. House, pp. 68–70.