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Original Article

Primulina huichangensis (Gesneriaceae), a new species from Jiangxi Province, ChinaGuo-Liang Xu^{a,*}, Chui-Xiang Wang^b, Ling-Bo Ji^c, Xiao-Hui Zhou^d, Xiao-Hui Zeng^b,
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ABSTRACT

Primulina huichangensis, a new species of Gesneriaceae from the Danxia landform of Huichang County, Jiangxi Province, China, is described and illustrated here. This species resembles *Primulina longnanensis*, *P. jiulianshanensis*, and *P. wenii* morphologically, but differs by its funnel-form corolla tube with a slightly swollen middle portion, the number of bracts and bracteoles, and the presence of glandular hairs on the peduncle, pedicel, both surfaces of petiole and leaf blades, and the abaxial surfaces of the bracts and calyxes. The conservation status of this new species should be assessed as data deficient based on the IUCN Red List Categories and Criteria.

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Introduction

The genus *Primulina* Hance was first described as a monotypic genus in 1883 and typified by *P. tabacum* (Wang et al. 1990). The second species of this genus, *P. guangxiensis* Yan Liu and W. B. Xu, was published in 2011 based only on morphological characteristics. Drawing upon molecular and morphological evidence, *Primulina* underwent subsequent revision and expansion, resulting in the identification of 123 species and eight varieties (Wang et al. 2011; Weber et al. 2011). The revision included most taxa of *Chirita* sect. *Gibbosaccus* Clarke, two species of *Wentsaiboaea* D. Fang and D. H. Qin (2004) and *Chiritopsis* W. T. Wang (1981), which were consolidated into *Primulina* (Zhou et al., 2016; Xu et al. 2023b). Since then, many *Primulina* taxa have been discovered in China and Vietnam. As of June 2025, 266 taxa have been discovered and

published, of which 252 taxa are distributed in China, and 14 taxa are distributed in Vietnam (GRC 2025). Recently, *Primulina* has become the largest genus of Gesneriaceae in China (GRC 2025). Species within *Primulina* are perennial herbs distinguished by their rhizomatous stems, fleshy opposite leaves, corolla with an infundibuliform tube and 2-lipped lobe, two stamens with coherent anthers and a characteristic chiritoid stigma (Wang et al. 2011; Yang et al. 2023). They are predominantly distributed in the karst limestone regions of southern and southwestern China (Weber et al. 2011; Xu et al. 2021), for example, five new species of this genus were reported in the first seven months of 2025, including *P. nanlingensis* J. C. Luo and H. F. Chen (Luo et al. 2025), *P. xingyiensis* X. X. Bai and F. Wen (Gu et al. 2025), *P. aureipurpurea* F. Wen, B. D. Lai and Y. Q. Huang (Lai et al. 2025), *P. yangmingshanensis* F. Wen and K. Liu and *P. longiflora* B. M. Wang and Y. H. Tong (Liu et al., 2025; Tong et al. 2025), these five species were all discovered in the karst landform. While *Primulina* species are predominantly found in karst regions, their diversity in the Danxia landform is relatively limited. For example, currently, there are 15 species of *Primulina* in Jiangxi province (Peng et al. 2021; Xu et al. 2023a; Chen et al. 2024), among them, only five species of

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Primulina are distributed in the Danxia landform, which are *P. suichuanensis* X. L. Yu and J. J. Zhou (Zhou et al. 2016), *P. inflata* Li H. Yang and M. Z. Xu (Xu et al. 2020b), *P. jiulianshanensis* F. Wen and G. L. Xu (Xu et al. 2023a), *P. danxiaensis* (W. B. Liao, S. S. Lin, and R. J. Shen) W. B. Liao and K. F. Chung (Shen et al., 2010; Xu et al., 2012) and *P. arcuata* G. L. Xu and L. Ding (Xu et al. 2023b). So far, the diversity of *Primulina* in the Danxia landform has not been well understood, the field investigations of *Primulina* in the Danxia landform are still not sufficient (Yu et al. 2019).

In April 2023, we found a blooming *Primulina* species in Hanxianyan Scenic Spot, Huichang County, Jiangxi Province, China. It most resembles *P. jiulianshanensis* F. Wen and G. L. Xu, *P. wenii* Jian Li and L. J. Yan (Li et al. 2017), and *P. longnanensis* G. L. Xu (Deng et al. 2024) in many morphological aspects. For instance, the leaves are oblong-elliptic to broadly ovate with obtuse-serrate margins and are densely villous on both surfaces; both the peduncle and pedicel are villous and pubescent; the capsules are linear and villous; the corolla color is bluish purple to reddish purple; and each side of the calyx lobes margin has 1–3 crenate teeth at the apex. However, this species' characteristics of the inflorescence, such as corolla size, corolla tube, bracteoles, and indumentum, are significantly different from those of these species (Figure 1). We carefully observed this wild population for two years and found that the morphology of the corolla, bracteoles, and indumentum was stable. To further confirm its taxonomic status, we carried out more detailed morphological comparisons and molecular phylogenetic analyses. All results from these analyses show that the plants found in Hanxianyan Scenic Spot represent a new species of the *Primulina*, which is described here.

Material and methods

Morphological observation: The specimens were collected and prepared. Both living mature individuals and dried specimens of the newly found species were carefully observed. The size, shape, color, and other characteristics of each part were recorded. The indumentum of the newly found species, together with that of

Primulina jiulianshanensis, *P. wenii*, *P. longnanensis* was observed and compared under an Olympus ML31 dissecting microscope (Guangzhou Mingmei Technology Co., LTD, Guangzhou, China) and an Olympus CX33 optical microscope (Guangzhou Mingmei Technology Co., LTD, Guangzhou, China). Additionally, we conducted a systematic comparative morphological analysis among other *Primulina* taxa, using both living plants and all available specimens from institutions such as IBSC, KUN, PE, and IBK, as well as digital images from JSTOR Global Plants (<http://plants.jstor.org/>) and the Plant Photo Bank of China (<http://ppbc.iplant.cn/>).

Molecular sampling: To evaluate the phylogenetic position of the putative new species, we collected three individuals from its type locality (Hanxianyan Scenic Spot, Junmenling Town, Huichang County, Jiangxi Province, China) to serve as voucher specimens. The vouchers (specimen numbers XGL01, XGL02, and XGL03) were deposited in the Herbarium of Lushan Botanical Garden, Chinese Academy of Sciences. Fresh leaves collected from each specimen were preserved in silica gel for rapid drying and subsequent DNA extraction. Total genomic DNA was extracted from dried leaves using a modified cetyl trimethylammonium bromide (CTAB) protocol (Doyle and Doyle 1987). Based on the findings of recent phylogenetic studies (Li et al. 2017; Xu et al. 2023a; Yang et al. 2023; Luo et al. 2025), we amplified and sequenced the internal transcribed spacer region (ITS) and *trnL*-F regions, following the methods of Smissen et al. (2004) and Möller et al. (2009) respectively. ITS and *trnL*-F sequences of 175 other *Primulina* taxa and two *Petrocodon* species were also downloaded from NCBI GenBank. Two *Petrocodon* species (i.e. *Pet. ainsliifolius* and *Pet. hancei*) were used as outgroup species. Taxa and GenBank accession numbers employed in this study are listed in Table 1.

Phylogenetic analyses: We constructed maximum likelihood (ML) and BI phylogenetic trees for the newly found plants and other taxa using ITS and *trnL*-F sequences with PhyloSuite v.1.2.3 (Zhang et al. 2020). Sequences were aligned using MAFFT v.7.471 (Katoh et al., 2002), and Gblocks 0.91b (Talavera and Castresana 2007) was used to trim the aligned sequences prior to their combination. The optimal nucleotide-substitution model was

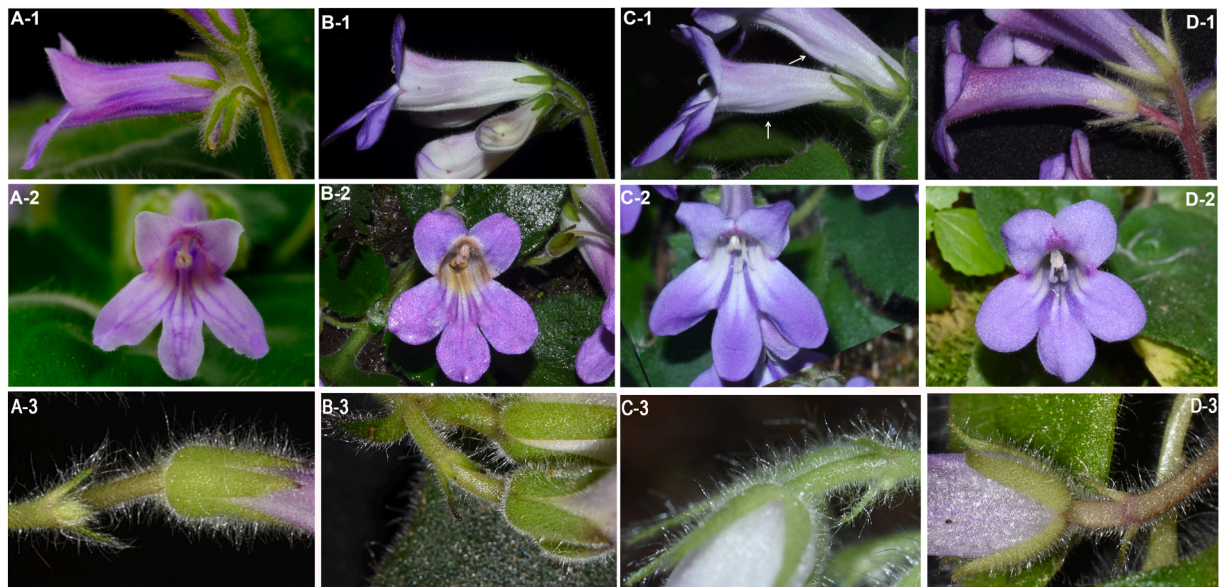


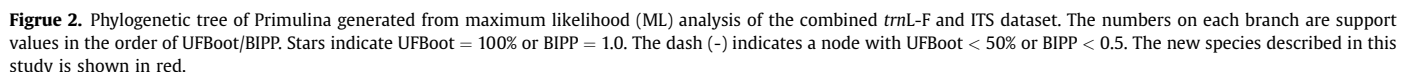
Figure 1. Morphological differences between *Primulina wenii*, *P. jiulianshanensis*, *P. huichangensis*, and *P. longnanensis*; A, *P. wenii*; B, *P. jiulianshanensis*; C, *P. huichangensis*; D, *P. longnanensis*; 1, lateral view of the corolla (arrowhead indicates the swollen portion of the corolla tube); 2, front view of the corolla.

Table 1. Nos. of vouchers and GenBank accession numbers of ITS and *trnL*-F DNA sequences of test *Primulina* Hance and *Petrocodon* Hance plants.

Taxa	Specimen number	GenBank accession number		Taxa	Specimen number	GenBank accession number	
		ITS	<i>trnL</i> -F			ITS	<i>trnL</i> -F
<i>Petrocodon ainsliifolius</i>	CWH88	KF202291	KF202298	<i>Primulina gemella</i>	GEME	MK747146	MK746254
<i>Petrocodon hancei</i>	CIPeng22903	KY796057	KY796059	<i>Primulina longii</i>	XWB	JX506917	JX506809
<i>Primulina alutacea</i>	YD07	KY394847	KY393441	<i>Primulina longnanensis</i>	WF216	OP243286	OP243282
<i>Primulina argentea</i>	YMBC	KY394848	KY393442	<i>Primulina longzhouensis</i>	P22963	JX506918	JX506810
<i>Primulina baishouensis</i>	GXLG05	KY394849	KY393443	<i>Primulina lunglinensis</i>	GZXY04	KY394930	KY393524
<i>Primulina balansae</i>	BALAN	MK747141	MK746274	<i>Primulina lunglinensis</i> var. <i>amblyosepala</i>	LCDE	MK747105	MK746281
<i>Primulina beiliuensis</i>	GXBLBC	KY394850	KY393444	<i>Primulina lungzhouensis</i>	GXJX10	KY394931	KY393525
<i>Primulina beiliuensis</i> var. <i>fimbribracteata</i>	SGQJ04	KY394851	KY393445	<i>Primulina luochengensis</i>	LCWCGL01	KY394932	KY393526
<i>Primulina bicolor</i>	SLHLCB	KY394852	KY393446	<i>Primulina lutea</i>	1844	JX506921	JX506813
<i>Primulina bipinnatifida</i>	GXLG04	KY394853	KY393447	<i>Primulina lutescens</i>	PBL01	MK747135	MK746263
<i>Primulina bobaiensis</i>	BBGL01	KY394854	KY393448	<i>Primulina lutvittata</i>	KFC4149	MK369978	MK369993
<i>Primulina bogneriana</i>	WF7	MK747166	MK746225	<i>Primulina luzhaiensis</i>	HYH019	KC190197	KC190204
<i>Primulina brachytricha</i>	DWDMCZ	KF498048	KY393450	<i>Primulina mabaensis</i>	SZY02	KY394937	KY393531
<i>Primulina brachytricha</i> var. <i>magnibracteata</i>	KFC4193	MK369979	MK369994	<i>Primulina macrodonta</i>	GXIB	JX506923	JX506815
<i>Primulina brunnea</i>	BRUN	MK747142	MK746275	<i>Primulina maculata</i>	Xu11916	KU220604	KU220609
<i>Primulina bullata</i>	GXJX06	KF498071	KY393451	<i>Primulina maguanensis</i>	YNMG	MK747127	MK746267
<i>Primulina cangwuensis</i>	GXLG04	KY394853	KY393447	<i>Primulina malipoensis</i>	YNMLP01	MK747123	MK746240
<i>Primulina cardaminifolia</i>	GXLB	MK747131	MK746255	<i>Primulina medica</i>	GXPLCM	KY394940	KY393534
<i>Primulina carinata</i>	NTBC	KY394858	KY393452	<i>Primulina melanofilamenta</i>	GXXA	MK747158	MK746277
<i>Primulina cataractarum</i>	N1	MW900263	MW960358	<i>Primulina minor</i>	WXXH1	MK747160	MK746290
<i>Primulina chizhouensis</i>	JXFY01	KY394860	KY393454	<i>Primulina minutimaculata</i>	GXLZ10	KY394941	KY393535
<i>Primulina colaniae</i>	WF8	MK747167	MK746224	<i>Primulina moi</i>	SGWY03	KF498115	KY393536
<i>Primulina confertiflora</i>	GDYS05	MK747101	MK746253	<i>Primulina mollifolia</i>	GXESWC	KY394943	KY393537
<i>Primulina cordata</i>	HYH010	KC190200	KC190207	<i>Primulina multifida</i>	DLXHGL01	KY394946	KY393540
<i>Primulina cordifolia</i>	GXRA02	KY394863	KY393457	<i>Primulina napoensis</i>	GXIB	JX506930	JX506821
<i>Primulina cordistigma</i>	GDYCXZ	MK747118	MK746251	<i>Primulina ningmingensis</i>	NMGL01	KY394949	KY393543
<i>Primulina crassirhizoma</i>	CJGL01	KY394864	KY393458	<i>Primulina obtusidentata</i>	GZJK01	KF498096	KY393544
<i>Primulina crassituba</i>	HNSP	MK747147	MK746230	<i>Primulina ophiopogoides</i>	GXFS01	KF498062	KY393545
<i>Primulina curvituba</i>	GXHJ01	MK747137	MK746242	<i>Primulina orthandra</i>	ZRBC2	MK747128	MK746286
<i>Primulina danxiaensis</i>	P22865	JX506886	JX506778	<i>Primulina parvifolia</i>	GGSL01	KY394952	KY393546
<i>Primulina dryas</i>	HKDMS	KY394875	KY393469	<i>Primulina pengii</i>	W0397	KU220603	KU220610
<i>Primulina debaoensis</i>	DBGLO1	KY394868	KY393462	<i>Primulina petroclosmeoides</i>	SHDBC	KY394953	KY393547
<i>Primulina depressa</i>	DXS02	KY394869	KY393463	<i>Primulina pinnatifida</i>	MS02	KY394954	KY393548
<i>Primulina diffusa</i>	PJGL01	KY394871	KY393465	<i>Primulina polyccephala</i>	GDLZ06	KY394955	KY393549
<i>Primulina dongguanica</i>	DGBC	KY394872	KY393466	<i>Primulina porphyrea</i>	DNGL01	KU173793	KU173799
<i>Primulina drakei</i>	YNCP01	KY394873	KY393467	<i>Primulina pseudoeburnea</i>	KY394958	KY394958	KY393552
<i>Primulina duanensis</i>	DABC	KY394877	KY393471	<i>Primulina pseudoglandulosa</i>	GXYS06	KF498138	KY393482
<i>Primulina eburnea</i>	P22908	JX506891	JX506783	<i>Primulina pseudoheterotricha</i>	XWB	JX506933	JX506824
<i>Primulina effusa</i>	KFC4167	MK369976	MK369991	<i>Primulina pseudolinearifolia</i>	JXY	MK747140	MK746280
<i>Primulina fengkaiensis</i>	KFC4130	MK369975	MK369990	<i>Primulina pseudomollifolia</i>	JMMXHX1	MK747134	MK746244
<i>Primulina fengshanensis</i>	KFC4195	MK369970	MK369985	<i>Primulina pseudoroseoalba</i>	JFHGL01	KY394959	KY393553
<i>Primulina fimbrisepala</i>	P22863	JX506894	JX506786	<i>Primulina pungitipsepala</i>	JEGLO1	KY394962	KY393556
<i>Primulina fimbrisepala</i> var. <i>mollis</i>	GXIB	JX506895	JX506787	<i>Primulina pteropoda</i>	HNCJ01	KY394960	KY393554
<i>Primulina flavimaculata</i>	KFC3988	MK369974	MK369989	<i>Primulina purpurea</i>	ZHGL01	KY394964	KY393558
<i>Primulina floribunda</i>	DHGL01	KY394886	KY393480	<i>Primulina qingyuanensis</i>	GDQX01	KY394965	KY393559
<i>Primulina fordii</i>	LJM1207202	MG727881	MG727878	<i>Primulina renifolia</i>	GXDA02	KY394966	KY393560
<i>Primulina fordii</i> var. <i>dolichotricha</i>	DHS01	MK747125	MK746247	<i>Primulina repanda</i>	GXBMO3	KY394968	KY393562
<i>Primulina glabrescens</i>	GZLBSM	MK747132	MK746278	<i>Primulina rongshuiensis</i>	GXRS01	KF498088	KY393565
<i>Primulina glandacestriata</i>	GXLCHW	MK747114	MK746256	<i>Primulina roseoalba</i>	LDGL01	KY394972	KY393566
<i>Primulina glandulosa</i>	GXPLCG	KY394887	KY393481	<i>Primulina rosulata</i>	GXPLO5	KU528874	KU528884
<i>Primulina gongchengensis</i>	GCGLO1	KY394889	KY393483	<i>Primulina rotundifolia</i>	OO3	KY394975	KY393569
<i>Primulina grandibracteata</i>	YNHK	MK747121	MK746266	<i>Primulina rubribracteata</i>	JH01R	KU173791	KU173797
<i>Primulina guigangensis</i>	GXGGBC	KY394892	KY393486	<i>Primulina sclerophylla</i>	GXDA01	KY394979	KY393573
<i>Primulina guihaiensis</i>	GXLG036	KY394893	KY393487	<i>Primulina secundiflora</i>	GZQZ	MK747119	MK746279
<i>Primulina guizhongensis</i>	GXGZBC	KY394894	KY393488	<i>Primulina shouchengensis</i>	GXYF02	KY394980	KY393574
<i>Primulina halongensis</i>	HLW01	KY394895	KY393489	<i>Primulina sichuanensis</i>	SCBC	MK747162	MK746264
<i>Primulina hedyotidea</i>	XWB	JX506905	JX506797	<i>Primulina sinovietnamica</i>	Peng21956	MK369973	MK369988
<i>Primulina heterochroa</i>	GXMES01	KY394898	KY393492	<i>Primulina spinulosa</i>	GXFS02	KF498063	KY393576
<i>Primulina heterotricha</i>	HNBT01	KY394899	KY393493	<i>Primulina subrhomboides</i>	GXYS02	KY395018	KY393577
<i>Primulina hezhouensis</i>	HZXH	MK747143	MK746258	<i>Primulina subulata</i>	GDYA01	KY395020	KY393579
<i>Primulina hiepii</i>	WF2	MK747144	MK746223	<i>Primulina subulata</i> var. <i>guilinensis</i>	GXHYXH	KY394967	KY393561
<i>Primulina hochiensis</i>	GXIB	JX506903	JX506795	<i>Primulina subulatisepala</i>	CQAYH01	MK747122	MK746246
<i>Primulina huaijiensis</i>	GDHJ02	KF498127	KY393495	<i>Primulina suichuanensis</i>	GDLC07	KY395021	KY393580
<i>Primulina huangii</i>	WF12	MK747138	MK746231	<i>Primulina swinglei</i>	GXR01	KY395022	KY393581
<i>Primulina hunanensis</i>	Xu11697	KU220602	KU220608	<i>Primulina tabacum</i>	LZ01	KY395023	KY393582
<i>Primulina jiangyongensis</i>	HNJY01	KY394902	KY393496	<i>Primulina tenuifolia</i>	GXBMO1	KY395024	KY393583
<i>Primulina jingxiensis</i>	LZXHGL01	KY394903	KY393497	<i>Primulina tenuituba</i>	GZGY01	KY395025	KY393584
<i>Primulina jiulianshanensis</i>	WF217	OP243287	OP243283	<i>Primulina tiandengensis</i>	GXTD03	KY395027	KY393586
<i>Primulina jiuwanshanica</i>	JWS	MK747116	MK746260	<i>Primulina tribracteata</i>	GXFS04	KY395028	KY393587

(continued on next page)

Taxa	Specimen number	GenBank accession number		Taxa	Specimen number	GenBank accession number	
		ITS	trnL-F			ITS	trnL-F
<i>Primulina juliae</i>	LJM1210011	MG727889	MG727873	<i>Primulina tribracteata</i> var. <i>zhuana</i>	1877	JX506952	JX506843
<i>Primulina langshanica</i>	LSCZ	KY394907	KY393501	<i>Primulina tsoongii</i>	ZSGL01	KY395029	KY393588
<i>Primulina latinervis</i>	XIN1	KY394908	KY393502	<i>Primulina varicolor</i>	GXNP01	KF498086	KY393589
<i>Primulina lechangensis</i>	GDLC12	KY394910	KY393504	<i>Primulina verecunda</i>	LBJX01	KY395031	KY393590
<i>Primulina leei</i>	LSGL01	KY394911	KY393505	<i>Primulina versicolor</i>	GDYD01	MK747155	MK746252
<i>Primulina leiophylla</i>	GJXJ07	KY394912	KY393506	<i>Primulina vestita</i>	QZXI	MK747156	MK746282
<i>Primulina lepingensis</i>	JXLP01	KY394913	KY394913	<i>Primulina villosissima</i>	QXY01	KY395032	KY393591
<i>Primulina leprosa</i>	GXMS055	KY394914	KY393508	<i>Primulina wenii</i>	WENI	MK747148	MK746284
<i>Primulina lianpingensis</i>	CHLT016	MH343910	MH344542	<i>Primulina wentsaii</i>	GXLZ047	KY395033	KY393592
<i>Primulina liboensis</i>	GJXJ08	KY394917	KY393511	<i>Primulina wuae</i>	WSBC	MK747159	MK746265
<i>Primulina liguliformis</i>	GXIB	JX506912	JX506804	<i>Primulina xinningensis</i>	GGGL01	KY394891	KY393485
<i>Primulina lijiangensis</i>	GLS01	KY394919	KY393513	<i>Primulina xiziae</i>	ZJHZ01	KY395038	KY393597
<i>Primulina linearicalyx</i>	KFC4141	MH032854	MH032841	<i>Primulina yangchunensis</i>	GDYC01	KY395039	KY393598
<i>Primulina linearifolia</i>	GXNN01	KY394921	KY393515	<i>Primulina yangshanensis</i>	DXNO01	KY395040	KY393599
<i>Primulina lingchuanensis</i>	LCTXHGL01	KY394922	KY393516	<i>Primulina yangshuoensis</i>	GXY507	KY395042	KY393601
<i>Primulina linglingensis</i>	LLBC	KY394923	KY393517	<i>Primulina yingdeensis</i>	YD03	KU528876	KU528886
<i>Primulina liujiangensis</i>	LJGL01	KY394924	KY393518	<i>Primulina yungfuensis</i>	GXIB	JX506953	JX506848
<i>Primulina lobulata</i>	GDQX04	KF498054	KY393519	<i>Primulina zhoui</i>	WF18	MK747104	MK746222
<i>Primulina longgangensis</i>	P22948	JX506916	JX506808	<i>Primulina huichangensis</i>	XGL01		
<i>Primulina longicalyx</i>	GXGL01	KY394927	KY393521	<i>Primulina huichangensis</i>	XGL02		
<i>Primulina ronganensis</i>	GXRA01	KF498135	KY393564	<i>Primulina huichangensis</i>	XGL03		



determined using ModelFinder (Kalyaanamoorthy et al. 2017) in PhyloSuite v.1.2.3. The ML analysis was performed with IQ-TREE 1.6.12 (Nguyen et al. 2015), applying the GTR+R6 model and 5000 ultrafast bootstrap replicates. Bayesian Inference analyses were conducted with MrBayes 3.2.6 (Ronquist et al. 2012) using two runs of four Markov Chain Monte Carlo chains, for one million generations, with one tree sampled every 1000 generations, and the first 25% of trees was discarded as burn-in.

Results

The ITS matrix had a length of 686 characters, with 456 (66.5%) variable characters and 223 (32.5%) parsimony-informative characters. In comparison, the *trnL*-F matrix had a length of 766 characters with 241 (31.5%) variable characters, and 94 (12.3%) parsimony-informative. The combined ITS and *trnL*-F matrix with an aligned length of 1452 base pairs, contained 597 (41.1%) variable characters and 452 (31.1%) parsimony-informative. Consensus

trees from the Bayesian Inference analyses exhibited almost identical topologies to those from the ML tree. The phylogeny reconstructed from the combined dataset using both methods is presented in Figure 2. The newly found species and *Primulina longnanensis* were sister groups with a high support values [Bayesian posterior probabilities (BIPP) = 0.957, ML ultrafast bootstrap support values (UFBoot) = 97%], both of them formed a sister clade with *P. wenii* (BIPP = 0.814, UFBoot = 96%).

Taxonomic treatment

Primulina huichangensis G. L. Xu and L. B. Ji, sp. nov., (Figure 1C, Figure 3, Figure 4, Figure 5).

Type. CHINA. Jiangxi Province, Huichang County, Junmenling Town, Hanxianyan scenic spot, 25°11'44.99"N, 115°47'23.36"E, altitude ca. 339 m, 13 April, 2025, Guo-Liang Xu, XGLHXY20250413 (Holotype: SYS!, isotype: LBG!).

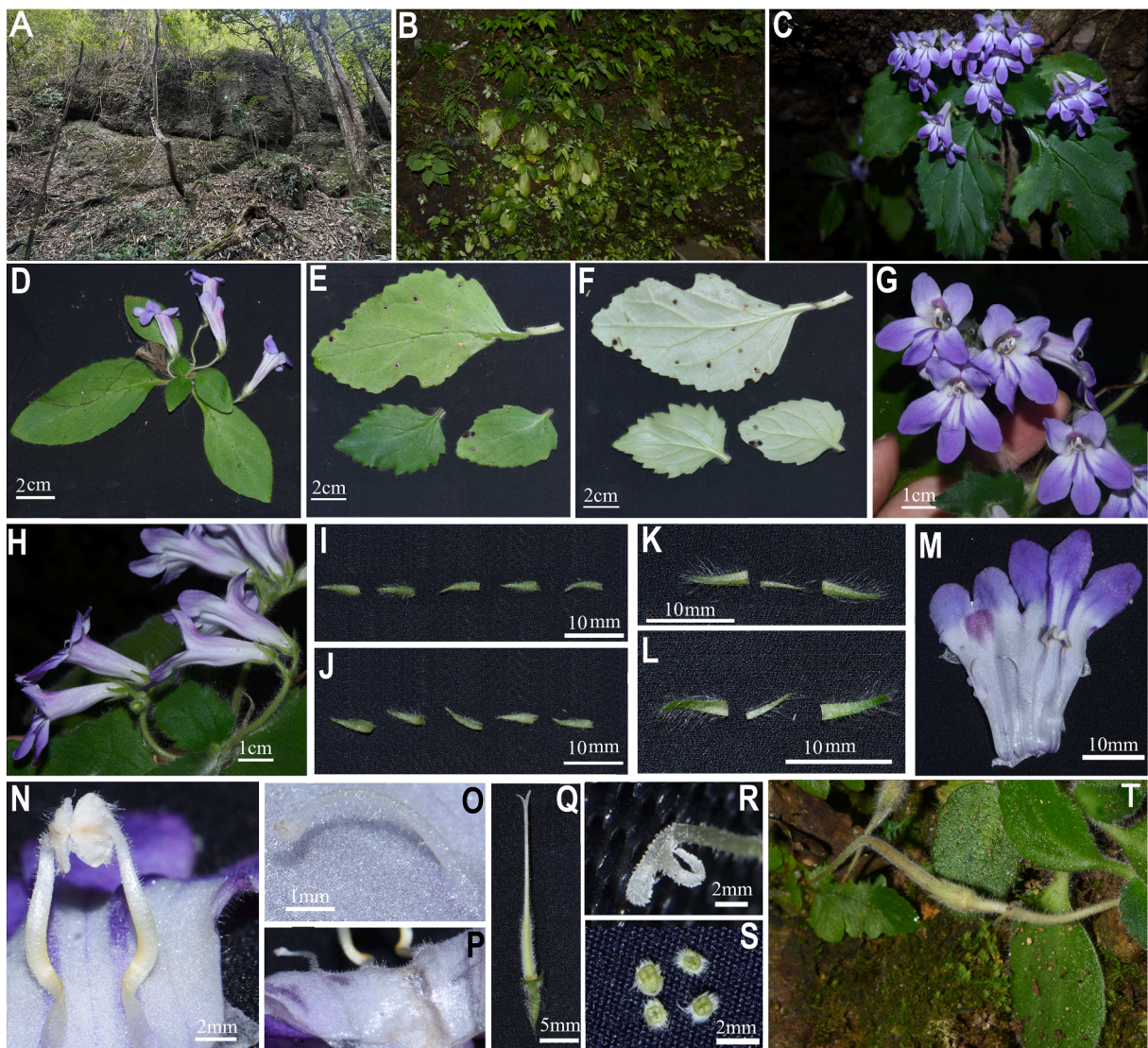


Figure 3. *Primulina huichangensis* sp. nov. A, habitat; B, population; C, plants; D, inflorescence; E, adaxial surface of basal leaves; F, abaxial surface of basal leaves; G, front view of the corolla; H, lateral view of the corolla; I, abaxial surfaces of the calyx lobes; J, abaxial surfaces of the calyx lobes; K, abaxial surfaces of the bracts; L, adaxial surfaces of the bracts; M, opened corolla; N, stamen; O, lateral staminode; P, indumentum inside of the corolla; Q, pistil; R, stigma; S, transverse sections of the capsule; and T, immature capsule.

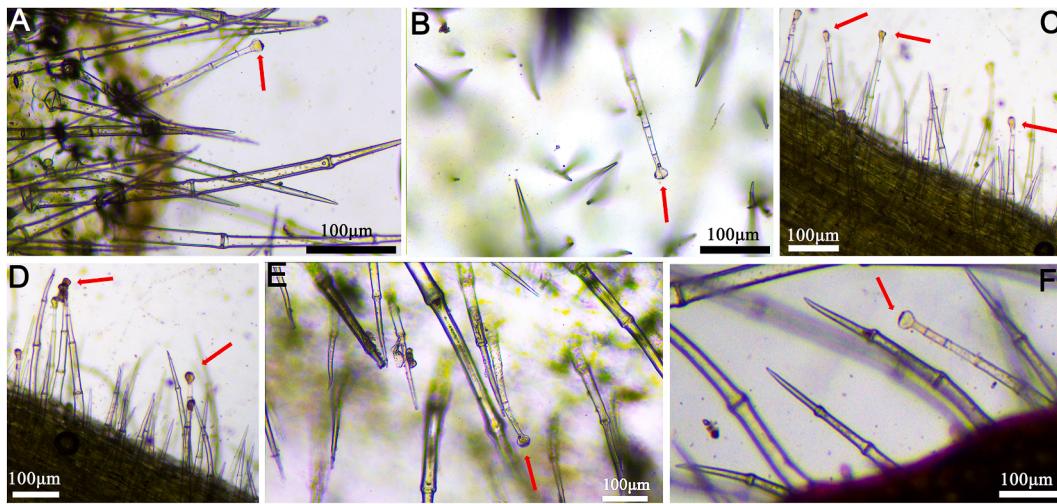


Figure 4. Glandular hairs on different parts of *Primulina huichangensis* (arrowhead indicates the glandular hairs) A, petiole; B, leaf blade; C, pedicel; D, peduncle; E, abaxial surfaces of the calyx lobes; F, abaxial surfaces of the bracts.

Diagnosis. It resembles *Primulina longnanensis*. However, this species can be distinguished from the latter by funnel-form corolla tube, with the middle portion slightly swollen (vs. slender-tubular or curved-tubular, not swollen); lateral bracts entire, central bracts persistent (vs. with 1–3 teeth at apex, caducous); lateral staminodes glandular-puberulent (vs. glabrous).

Description. Herbs, perennial. Rhizome subterete, 3–5 × 1–2 cm, internodes indistinct. Leaves basal, 3–7; petiole compressed, 1–3 × 0.3–0.6 cm, densely villous and mixed with sparsely glandular-pubescent; adaxial surfaces green to dark green, abaxial surfaces light green, chartaceous or herbaceous, oblong-elliptic to broadly ovate, 4–16 × 4–10 cm, apex obtuse or subacute, margin crenate, both surfaces densely white-villous and mixed with sparsely glandular-pubescent hairs; lateral veins 3–4 on each side. Cymes 3–4, axillary, with 3–6 flowers per cyme; peduncle green, 4.0–8.0 cm long, densely white villous and mixed with sparsely glandular-pubescent hairs, pedicel 0.5–2.0 cm long, with indumentum as on the peduncle; bracts 3, entire, narrowly lanceolate, opposite on both sides, 5–7 × ca. 1.5 mm; the middle one 3–5 × ca. 0.5 mm, abaxial surfaces and margin villous and mixed with sparsely glandular-pubescent, adaxial surfaces sparsely pubescent; bracteoles 2, homomorphic to the bracts, with indumentum as on the bracts, 2–4 × 0.5–1 mm; calyx 5-parted, lobes lanceolate, 5–7 × 1–2 mm, abaxial surfaces and margins villous and mixed with sparsely glandular-pubescent, adaxial surfaces sparsely pubescent, margin entire but each side of calyx lobes with 1–3 crenate teeth at the apex. Corolla pink-purple to blue-purple, 2.8–3.2 cm long; corolla tube funnel-form, with the middle portion slightly swollen, 2.2–2.4 cm long, orifice 1.0–1.2 cm in diameter, base ca. 3 mm in diameter, outside covered with short glandular hairs, inside from the middle to the base glandular-puberulent, and the upper part subglabrous; with two obvious longitudinal ridges on the abdomen inside the corolla tube, and with a blue-purple lump in the throat of the inner corolla tube, ovate or spatulate, densely covered with glandular hairs. Limb obviously 2-lipped, upper lip 2-lobed, lobes triangular-oblate or semicircular, 6–8 × 5–7 mm, apex rounded, margin entire; lower lip 3-lobed to the middle, elliptical or oblong, 8–10 × 6–8 mm, apex rounded, margin entire. Stamens 2, filiform, adnate to ca. 1.5 cm above the base of the corolla tube, 6–8 mm long, light yellow, geniculate, sparsely glandular-

pubescent; anthers cream-white, middle slightly narrowed in the middle, densely pubescent. Staminodes 3, white, lateral ones ca. 6 mm long, adnate to 10–13 mm from the base of the corolla tube, sparsely glandular-puberulent, terete, capitate, the middle one adnate to ca. 4 mm above the base of the corolla tube, ca. 1 mm long. Disk annular, ca. 2 mm in diameter, margin undulate. Pistil 2.2–2.5 cm long, style 1.3–1.5 cm, densely glandular-pubescent, ovary orbicular, with a parietal placenta, densely villous and glandular-pubescent; stigma deeply 2-lobed, lobes linear; capsule linear, 2.5–4.5 cm long, densely villous and glandular-pubescent.

Phenology: Flowering from March to April, and fruiting from April to June.

Etymology: The species epithet "huichangensis" is derived from the type locality, Hanxianyan Scenic Spot, Junmenling Town, Huichang County, Jiangxi Province, China.

Vernacular name: 会昌报春苔苔 (Chinese name); Hùi Chāng Bào Chūn Jù Tái (Chinese pronunciation).

Distribution and habitat. *Primulina huichangensis* is only known from its type locality, Hanxianyan Scenic Spot, Junmenling Town, Huichang County, Jiangxi Province, China (Figure 4). It grows in clusters on the moist rock surfaces of the Danxia landform. This new species is mainly accompanied by *Oberonioides microtatantha* (Schltr.) Szlach., *Viola changii* J. S. Zhou & F. W. Xing, *Crepidomanes minutum* (Blume) K. Iwats. and *Elatostema sinense* H. Schroet.

Provisional conservation status. Currently, only one population of the new species, with no more than 300 mature individuals, has been found at the type locality. However, as documented in previous cases (e.g. Yang 2019; Shi et al. 2025), field investigations of newly discovered species are often insufficient at the time of description. This is likely also true for our study, given the wide distribution of Danxia landforms in South China. Therefore, further fieldwork is required to determine the exact geographical distribution of *Primulina huichangensis*. Following the IUCN Red List Categories and Criteria (IUCN 2024), and based on the currently limited information, we recommend that the conservation status of this new species be assessed as data deficient.

Taxonomic note. Phylogenetic analysis indicates that *Primulina huichuanensis* is most closely related to *P. longnanensis*, *P. jiulianshanensis*, and *P. wenii*, which is consistent with their close morphological resemblance. However, it can be distinguished



Figure 5. Holotype of *Primulina huichangensis* sp. nov.

from *P. jiulianshanensis* by its slightly swollen middle portion of the corolla tube slightly swollen (vs. not swollen); bracteoles 2 (vs. 3); peduncle and pedicel cover with glandular hairs (vs. without glandular hairs); and stigma deeply 2-lobed, lobes linear (vs. slightly 2-lobed, lobes acute-triangular). It can be distinguished from *P. wenii* by the petiole, leaf blades, peduncle, pedicel, abaxial surfaces of the bracts and calyxes being covered with glandular hairs (vs. without glandular hairs); the middle portion of the corolla tube being slightly swollen (vs. not swollen); bracteoles 2

(vs. 3); and a more slender corolla tube than that of the latter, the ratio of the corolla tube than that of the latter; the ratio of the corolla length to the orifice diameter is about 2.12–2.31 (vs. 1.62–1.64).

Based on our careful observation of the populations of *Primulina huichangensis*, *P. jiulianshanensis*, *P. longnanensis*, and *P. wenii*, the numbers of bracteoles are rather stable, *P. jiulianshanensis* and *P. wenii* obviously have three bracteoles, but individuals of *P. longnanensis* and *P. huichangensis*, which have only with two

bracteoles, lack the central bracteoles (Figure 1). In addition, based on our observation of different individuals of these four species under an optical microscope, we found that their indumentum traits on different parts are also stable. For example, we could find all parts of *P. huichangensis* with glandular hairs except the adaxial surfaces of the bract and calyx (Figure 4), but we could not find glandular hairs on these parts of *P. wenii*. Therefore, we adopt the differences in bracteole number and indumentum traits as the diagnostic characteristics to distinguish them.

The habitats of *Primulina huichangensis*, *P. jiulianshanensis*, *P. longnanensis*, and *P. wenii* are not all the same (Table 2). Both *P. huichangensis* and *P. jiulianshanensis* grows in the Danxia landform, but *P. longnanensis* grows in a shale area, and *P. wenii* grows in a limestone area (Li et al. 2017; Xu et al. 2023a; Deng et al. 2024). Additionally, these four species have only been found at their type localities to date (Figure 6). Compared with other *Primulina* taxa, they are similar to each other morphologically, but they can be

clearly distinguished by differences in indumentum, bracts, corolla tube shape, and bracteole number, with detailed comparisons in Table 2 (Li et al. 2017; Xu et al. 2023a; Deng et al. 2024).

Based on a detailed comparison with the other fifteen species of *Primulina* that are distributed in Jiangxi Province (Wang et al. 1990 1998; Chen et al. 2024; Deng et al. 2024), an identification key to these sixteen species is provided.

1. Bracts 3

2. Petiole, leaf blade, bract covered with glandular hairs

3. Both side of leaf blade pubescent and glandular-pubescent, calyx lobes entire.....*P. adenopoda*

3'. Both side of leaf blade villous and glandular-pubescent, each side of calyx lobes with several crenate at apex

4. Bracteoles 3

5. Funnel-form corolla tube.....*P. jiulianshanensis*

5'. Curved-tubular corolla tube*P. arcuata*

4'. Bracteoles often 2

6. Curved-tubular corolla tube or slender-tubular, middle portion not swollen.....*P. longnanensis*

6'. Funnel-form corolla tube, middle portion slightly swollen.....*P. huichangensis*

2'. Petiole, leaf, bract with no glandular hairs

7. Outside corolla puberulent, stigma 3-lobed.....*P. lepingensis*

7'. Outside corolla glandular-puberulent, stigma 2-lobed

8. Leaf blade, bracts, calyx lobes, peduncle villous, and pubescent.....*P. wenii*

8'. Leaf blade, bracts, calyx lobes, and peduncle pubescent.....*P. xinpingensis*

1'. Bracts 2

9. Corolla throat with few to many purple spots inside.....*P. fimbrispala*

9'. Corolla throat with no purple spots inside

10. Stamines 2

11. Leaf blade margin lobed

12. Leaf blade base cordate, filaments glabrous.....*P. danxiaensis*

12'. Leaf blade base cuneate, filaments glandular-puberulent.....*P. pinnatifida*

11'. Leaf blade margin not lobed

13. Corolla tube obvious swollen, bracts rhombic.....*P. dongguanica*

13'. Corolla tube not swollen, bracts lanceolate-linear.....*P. juliae*

10'. Stamines 3

14. Corolla tube obvious swollen, upper throat of corolla tube with no lump inside.....

Table 2. Comparison of morphological characteristics between *Primulina huichangensis*, *P. longnanensis*, *P. jiulianshanensis*, and *P. wenii*.

Characters	<i>P. huichangensis</i>	<i>P. longnanensis</i>	<i>P. jiulianshanensis</i>	<i>P. wenii</i>
Indumentum	Peduncle, pedicel, both surfaces of petiole and leaf blades, abaxial surfaces of bracts and calyxes villous and mixed glandular-pubescent; peduncle, pedicel, abaxial surfaces of bracts and calyxes villous and pubescent; lateral stamens glandular-puberulent	Both surfaces of petiole and leaf blades, abaxial surfaces of bracts and calyxes villous and mixed glandular-pubescent; peduncle, pedicel, abaxial surfaces of bracts and calyxes villous and pubescent; lateral stamens glandular-puberulent	Both surfaces of petiole and leaf blades, abaxial surfaces of bracts and calyxes villous and mixed glandular-pubescent; peduncle and pedicel villous and pubescent, lateral stamens glandular-puberulent	Peduncle, pedicel, both surfaces of petiole and leaf blades, abaxial surfaces of bracts and calyxes villous and pubescent; lateral stamens glabrous
Corolla tube	Funnel-form, middle portion slightly swollen; the ratio of the corolla tube length to the orifice diameter is about 2.12–2.31	Slender-tubular or curved-tubular, middle portion not swollen; the ratio of the corolla tube length to the orifice diameter is about 2.15–2.45	Funnel-form, middle portion not swollen; the ratio of the corolla tube length to the orifice diameter is about 1.85–1.95	Tubular or funnel-form, middle portion not swollen; the ratio of the corolla tube length to the orifice diameter is about 1.62–1.64
Numbers of bracteoles	2	2	3	3
Stigma	Deeply 2-lobed, lobes linear	Deeply 2-lobed, lobes linear	Slightly 2-lobed, lobes acute-triangular	Deeply or slightly 2-lobed, lobes linear or acute-triangular
Bract	Lateral ones 5–7 × ca. 1.5 mm, entire; central ones persistent, 3–5 × ca. 0.5 mm	Lateral ones 6–13 × 2.0–2.5 mm, entire but each side with teeth at apex; central ones 1–3 × 1.0–1.5 mm, caducous	Lateral ones 4–9 × ca. 2 mm, entire; central ones persistent, 2–5 × 1.0–1.5 mm	Lateral ones 14–16 × 2.5–3.0 mm, entire; central ones persistent, 10–12 × 1.3–1.6 mm
Habitat	Danxia landform	Shale area	Danxia landform	Limestone area

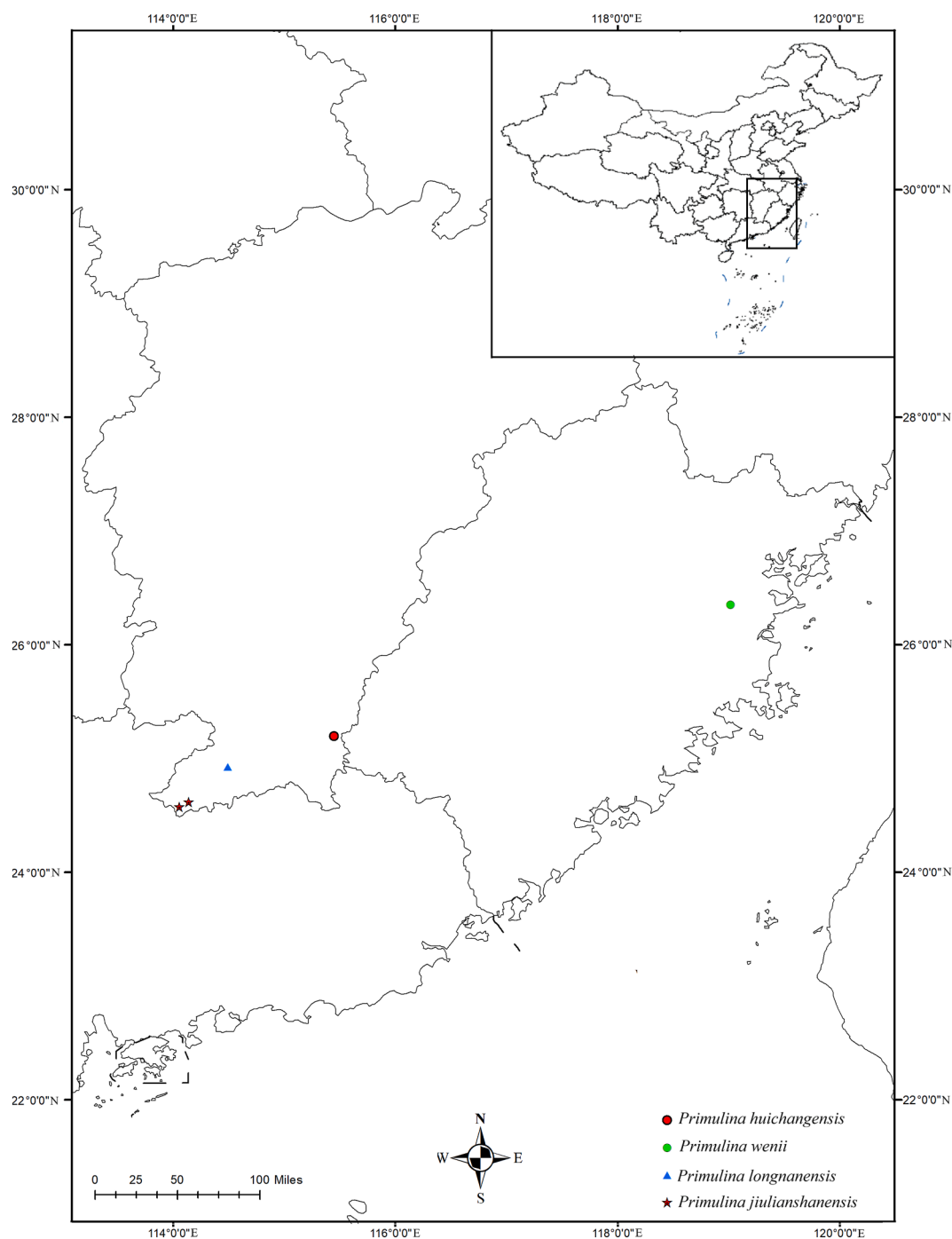


Figure 6. Type localities of *Primulina huichangensis*, *P. longnanensis*, *P. jiulianshanensis*, and *P. wenii*.

.....*P.*
inflata
 14'. Corolla tube not swollen, upper throat of corolla tube
 with a lump inside
 15. Leaf blade margin entire, parietal placenta.....*P.*
*P.*
suichuanensis

15'. Leaf blade crenate, axile placenta.....
*P.*
depressa

Additional specimens examined (paratype): CHINA. Jiangxi
 Province: Huichang County, Hanxianyan scenic spot,
 25°11'44.79"N, 115°47'23.16"E, altitude ca. 349 m, 23 April, 2025,

Guo-Liang Xu, XGLHXY20250423 (LBG); 25°11'44.70"N, 115°47'23.19"E, altitude ca. 370 m, 21 April, 2025, Guo-Liang Xu, XGLHXY20250421 (LBG).

CRedit authorship contribution statement

Guo-Liang Xu: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Chui-Xiang Wang:** Writing – review & editing, Writing – original draft, Supervision. **Ling-Bo Ji:** Writing – review & editing, Writing – original draft, Investigation. **Xiao-Hui Zhou:** Writing – original draft, Investigation. **Xiao-Hui Zeng:** Writing – original draft, Investigation. **Pei-Qi Yi:** Writing – original draft, Investigation. **Xin-Jun Gan:** Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Chi Xiong:** Writing – review & editing, Visualization, Resources, Investigation, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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