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Sorbus lushanensis, a new species of Rosaceae from China

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Abstract

Sorbus lushanensis Xin Chen & Jing Qiu, **sp. n.** (Rosaceae), a new simple-leaved species belonging to *Sorbus* subg. *Aria* sect. *Alnifoliae*, is described from Anhui and Jiangxi provinces in China. Illustrations, photographs of wild plants and a distribution map are presented. The new species is morphologically similar to *S. folgneri*, but can be distinguished easily by its abaxially greenish-grey tomentose leaves, scale-like stipules and glabrous styles.

Keywords

Sorbus, new species, taxonomy, China

Introduction

Species of *Sorbus* are mainly distributed in the temperate areas of the Northern Hemisphere, with a centre of the highest diversity in East Asia, especially in China. The genus comprises about 100 (Lu and Spongberg 2003) to more than 250 (Phipps et al. 1990) species, 67 of which are native to China (Lu and Spongberg 2003). During fieldwork carried out in recent years for wild germplasm resources of the genus, a new simple-leaved species from Anhui and Jiangxi provinces in China was discovered and is described here.

Materials and methods

The description was based on data and specimens collected in the field between 2015 and 2018 from Anhui and Jiangxi provinces. Geographical coordinates and elevations were determined using Holux m-241. Voucher specimens were deposited at the Herbarium of Nanjing Forestry University (**NF**).

Taxonomic treatment

Sorbus lushanensis **Xin Chen & Jing Qiu, sp. n.**
urn:lsid:ipni.org:names:77195769-1
Figures 1–3

Type. China. Jiangxi: Lushan City, Lushan National Park, Xianren Cave, 993 m alt., 29°34'06.24"N, 115°57'42.84"E, 05 May 2018, *J. Qiu 1219* (holotype NF-2005029!; isotypes NF-2005027!, NF-2005028!, NF-2005030!, NF-2005031!, NF-2005032!, NF-2005033!, NF-2005034!, NF-2005035!)

Diagnosis. *Sorbus lushanensis* is morphologically most similar to *S. folgneri* (C. K. Schneid.) Rehd., but differs by its leaf blade abaxially greenish-grey tomentose, stipules smaller, pedicels longer, petals larger and styles glabrous.

Description. Tree up to 12 m tall, 14.6 cm in DBH; bole straight, bark grey to dark grey, smooth when young, with fissures, particularly at the base of trunk when mature. Branchlets greyish-brown, sparsely tomentose when young, glabrous or glabrescent at maturity, with pale brown to ochraceous lenticels. Buds turbinate or ovoid, pointed; scales reddish-brown, with white pubescent along margins. Leaves simple; stipules scale-like, 1–1.5 mm long, early deciduous; petiole (9–)13–16 (–19) mm long, greenish-grey tomentose; blades elliptic to broadly ovate, 5.9–9.2 cm long, (3–)4–5.6 cm wide, base cuneate to subcordate, apex acute to shortly acuminate, margin serrate to double serrate, densely greenish-grey tomentose abaxially, sparsely white tomentulose when young, gradually glabrous or glabrescent adaxially; venation craspedodromous, secondary veins 11–16 pairs, slightly impressed adaxially, raised abaxially. Inflorescence a compound corymb, terminal or axillary in the terminal 1–3 leaves, loosely 11–17(–26)-flowered; peduncles 3.9–6 cm long, pedicels 9.4–18.6 mm long, both sparsely white vilous. Flowers 12.5–14.2 mm in diam.; hypanthium campanulate, sparsely white vilous abaxially; sepals triangular-ovate, apex acute, 2.3–3.1 mm long, 2–2.9 mm wide, white vilous on both sides; petals white, broadly ovate or subrounded, apex obtuse, 5.9–7.1 mm long, 4–6.1 mm wide, glabrous, with a short claw at base. Stamens 17–20, 4.9–6.2 mm long, filaments whitish, anthers cream white to slightly yellow. Ovary 2-loculed, white tomentose apically. Styles 2, 3.1–4.6 mm long, connate to 1/3–1/2 of their length, glabrous. Infructescence glabrous, with numerous

Figure 1. Holotype of *Sorbus lushanensis* sp. n. Scanned by Xiaochen Zhang.

Figure 2. *Sorbus lushanensis* sp. n. **A** habit (A plant at Wulao Peak, Lushan National Park, Jiangxi province) **B** flowering branch and leaves (from the plant of type specimen) **C** young inflorescence (from the same plant as habit).

lenticels. Fruit orange-red, oblong to ovoid-oblong, 7.8–11.3 mm long, 4.2–7 mm in diam., 2-loculed, sparsely lenticellate, with an annular scar of the deciduous sepals and white tomentose inside it apically. Seeds brown, 5.46–6.48 mm long, 2.88–3.62 mm in diam., 2.04–2.72 mm thick.

Phenology. Flowering from late April to early May, fruiting from September to October.

Etymology. The name "*lushanensis*" refers to the type locality, Lushan Mountain, Jiangxi Province, China.

Vernacular name. 庐山花楸 (lu shan hua qiu).

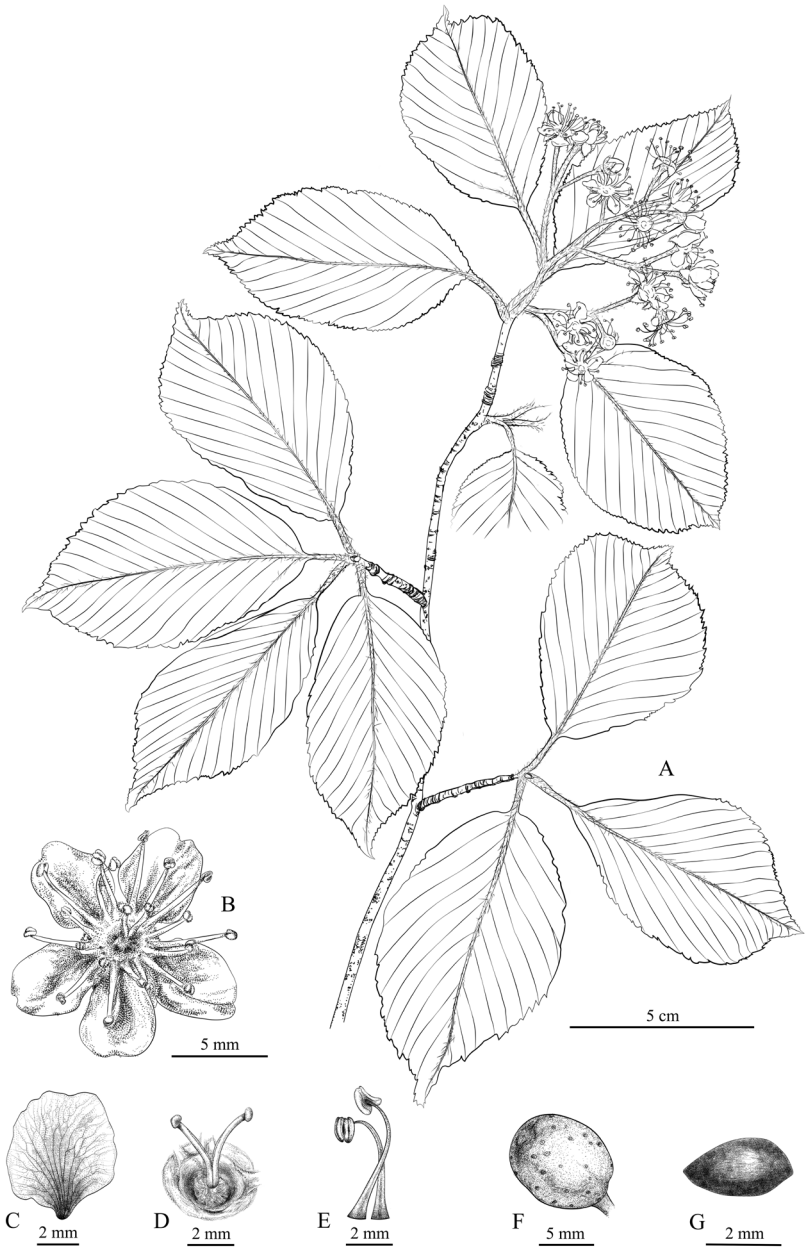

Figure 3. *Sorbus lushanensis* sp. n. **A** flower branch and leaves **B** flower **C** petal **D** styles **E** stamens **F** fruit **G** seed. Drawn by Yuxuan Bao.

Distribution, ecology and conservation status. *Sorbus lushanensis* is presently known only from Anhui and Jiangxi provinces (Figure 4). It was observed growing in broad-leaved and mixed conifer broad-leaved forests at altitudes between 853 m

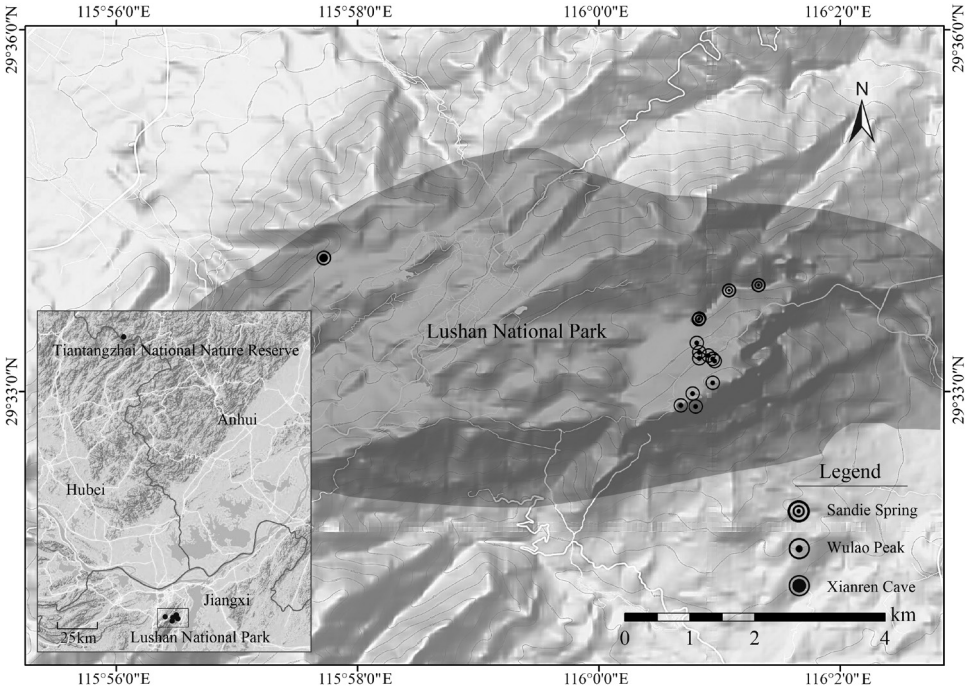

Figure 4. Geographic distribution of *Sorbus lushanensis* sp. n. Drawn by Junsheng Shu.

and 1354 m, together with *S. alnifolia* (Siebold & Zucc.) K. Koch and *S. folgneri* from the same genus and *Pinus taiwanensis* Hayata, *Carpinus cordata* var. *chinensis* Franch., *Cornus kousa* subsp. *chinensis* (Osborn) Q. Y. Xiang, *Cyclobalanopsis glauca* (Thunb.) Oerst., *Fraxinus chinensis* Roxb., *Litsea elongata* (Nees ex Wall.) Benth. & Hook. f., *Prunus serrulata* Lindl. etc. Its natural habitat is at core Lushan National Park and Tiantangzhai National Nature Reserve, which are perfectly protected. No threats were identified though only about 26 individuals were found along the collection routes. The diameter of individuals ranged from 1.5 to 14.6 cm, denoting the species regenerated well naturally. Adequate data on its distribution and population status need to be further collected for we investigated just along the tourist route without entering the inner forest. At present, we assign the conservation status of *S. lushanensis* as "Data Deficient (DD)" following the IUCN Red List Criteria and Categories (IUCN 2017).

Additional specimens examined. China. Anhui: Lu'an City, Tiantangzhai National Nature Reserve, 853 m alt., 31°09'00.84"N, 115°46'07.39"E, 8 May 2015, *W. Du* & *F. Wang 0125* (NF). Jiangxi: Lushan City, Lushan National Park, Wulao Peak, 1354 m alt., 29°32'52.23"N, 116°00'47.78"E, 14 May 2016, *X. Chen, X. X. Fu* & *Q. L. Liu 0285* (NF); Wulao Peak, 1334 m alt., 29°33'04.00"N, 116°00'56.31"E, 14 May 2016, *X. Chen, X. X. Fu* & *Q. L. Liu 0289* (NF); Wulao Peak, 1246 m alt., 29°33'14.84"N, 116°00'57.31"E, 14 May 2016, *X. Chen, X. X. Fu* & *Q. L. Liu 0298* (NF); Wulao Peak, 1210 m alt., 29°33'17.49"N, 116°00'54.14"E, 14

Table 1. Comparison of main features separating *S. lushanensis* and *S. folgneri*.

	S. lushanensis	***S. folgneri***
Leaf blade	denssely greenish-grey-tomentose abaxially	densely white-tomentose abaxially
Stipule	scale-like, 1–1.5 mm long	lanceolate, 3–4.5 mm long
Petiole	sparsely greenish-grey-tomentose	densely white-tomentose
Inflorescence	sparsely white vilous	densely white tomentose
Pedicel	9.4–18.6 mm long	5–8 mm long
Petal	5.9–7.1 mm× 4–6.1 mm	5–5.8 mm× 2.5–4.2 mm
Style	glabrous	tomentose basally

May 2016, *X. Chen, X. X. Fu* & *Q. L. Liu 0302* (NF); Wulao Peak, 982 m alt., 29°33'16.12"N, 116°00'49.56"E, 14 May 2016, *X. Chen, X. X. Fu* & *Q. L. Liu 0316* (NF); Wulao Peak, 1234 m alt., 29°33'15.88"N, 116°00'56.26"E, 25 April 2015, *X. Chen* & *W. Du 0069* (NF); Wulao Peak, 1089 m alt., 29°33'23.85"N, 116°00'48.32"E, 10 May 2015, *W. Du* & *F .wang 0085* (NF); Wulao Peak, 1306 m alt., 29°32'52.74"N,116°00'40.44"E, 15 October 2015, *X. Chen, W. Q. Liu*; *M. W. Geng 0154* (NF); Wulao Peak, 1101 m alt., 29°33'19.14"N, 116°00'49.64"E, 15 October 2015, *X. chen, W. Q. Liu* & *M. W. Geng 0155* (NF); Wulao Peak, 1310 m alt., 29°32'58.59"N, 116°00'46.29"E, 15 October 2015, *X. chen, W. Q. Liu* & *M. W. Geng 0157* (NF); Sandie Spring, 1021 m alt., 29°33'36.10"N, 116°00'49.59"E, 25 April 2015, *X. Chen* & *W. Du 0063* (NF); Sandie Spring, 927 m alt., 29°33'49.98"N, 116°00'56.31"E, 25 April 2015, *X. chen* & *W. Du 0064* (NF); Sandie Spring, 897 m alt., 29°33'52.56"N, 116°01'19.04"E, 15 October 2015, *X. Chen, W. Q. Liu* & *M. W. Geng 0156* (NF); Sandie Spring, 983 m alt., 29°33'35.62"N, 116°00'49.31"E, 15 October 2015, *X. Chen, W. Q. Liu* & *M. W. Geng 0158* (NF); Xianren Cave, 987 m alt., 29°34'06.06”N, 115°57'42.78"E, 14 May 2016, *X. Chen*, *X. X. Fu* & *Q. L. Liu 0267* (NF).

Discussion. Morphological characters, such as sepals persistent or deciduous, leaves glabrous or with white or brown hair, venation craspedodromous or camptodromous, styles free or connate, are of taxonomic significance and useful in classification and delimitation of simple-leaved *Sorbus* taxa (Hedlund 1901, Yu and Lu 1974, Gabrielian 1978, Lu and Spongberg 2003, Aldasoro et al. 2004). In the latest revision of simple-leaved species of *Sorbus* (Aldasoro et al. 2004), species in China are assigned to one subgenus and five sections. The new species is morphologically a member of *S.* subg. *Aria* Persoon sect. *Alnifoliae* (Yu) Aldasoro et al., for it shares the common characters of this section, such as craspedodromous venation, spreading and white petals, coalescent styles and red pomes. *Sorbus* sect. *Alnifoliae* contains five species: *S. alnifolia*, *S. japonica* (Decne.) Hedl., *S. zahlbruckneri* C. K. Schneid., *S. yuana* Spongberg and *S. folgneri*, mainly distributed in China, Japan and Korea (Aldasoro et al. 2004). The new species is morphologically similar to *S. folgneri* in leaf form (Figure 5) and the difference between the two species is summarised in Table 1.

Sorbus lushanensis and the two sympatric species, *S. alnifolia* and *S. folgneri* are all diploid (2n=2x=34) sexual species (Chen et al. unpubl. data). Our preliminary

Figure 5. Leaf abaxial surface of **A** *Sorbus lushanensis* and **B** *S. folgneri*, show the similar of leaf form and the differences of hairs.

molecular work, based on two chloroplast gene fragments, atpB-rbcL and trnL and four nuclear gene fragments, GBSSI, PGIP, PPO and WD, resolved that *S. lushanensis* formed as sister to *S. alnifolia* var. *angulata* S. B. Liang and they two together were resolved as sister to *S. folgneri*, suggesting that *S. lushanensis* is not most closely related to *S. folgneri* (Chen et al. unpubl. data). The new species can be distinguished from the other five species by its abaxially greenish-grey tomentose laminae.

Key to the species of *Sorbus* sect. *Alnifoliae*

1 Leaves tomentose abaxially.....**2**
– Leaves glabrous or sparsely hairy abaxially.....**4**
2 Leaves orbicular-ovate or suborbicular, margins lobed.....***S. japonica***
– Leaves elliptic to broadly ovate, margins serrate to double-serrate **3**
3 Leaves densely white tomentose abaxially..... ***S. folgneri***
– Leaves densely greenish-grey tomentose abaxially..... ***S. lushanensis***
4 Fruits with a small annular scar apically, sepals deciduous.....***S. alnifolia***
– Fruits with persistent sepals apically.....**5**
5 Leaves elliptic to broadly ovate; fruits much larger, 10–16 × 6–13 mm.....
.....***S. yuana***
– Leaves lanceolate; fruits much smaller, 6–10 × 4–7 mm.....***S. zahlbruckneri***

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References

Aldasoro JJ, Aedo C, Garmendia FM, de la Hoz FP, Navarro C (2004) Revision of *Sorbus* Subgenera *Aria* and *Torminaria* (Rosaceae-Maloideae). Systematic Botany Monographs 69: 1–148. http://www.jstor.org/stable/25027918. https://doi.org/10.2307/25027918

Gabrielian E (1978) The genus *Sorbus* L. in Eastern Asia and the Himalayas. Yerevan: Armenian Academy of Sciences, 264 pp. [62 pls; in Russian, with English summary]

Hedlund T (1901) Monographie der Gattung *Sorbus*. Kongliga Svenska Vetenskaps-Akademiens Handlingar 35: 1–147. https://biodiversitylibrary.org/page/34434617

Lu LT, Spongberg SA (2003) *Sorbus* Linnaeus. In: Wu ZY, Raven PH, Hong DY (Eds.) *Flora of China,* vol. 9. *Rosaceae*. Science Press, Beijing; Missouri Botanical Garden Press, St. Louis, 144–170. http://foc.eflora.cn/content.aspx?TaxonId=130718

Phipps JB, Robertson K, Smith PG, Rohrer JR (1990) A checklist of the subfamily Maloideae Rosaceae. Canadian Journal of Botany 68(10): 2209–2269. https://doi.org/10.1139/b90-288

IUCN (2017) Guidelines for using the IUCN Red List Categories and Criteria, Version 13. Prepared by the Standards and Petitions Subcommittee, 108 pp. http://www.iucnredlist.org/documents/RedListGuidelines.pdf

Yu TT, Lu LT (1974) *Spiraea*, *Dichotomanthes*, *Cotoneaster*, *Sorbus*, *Chaenomeles*. In: Yu TT (Ed.) Flora Republicae Popularis Sinicae 36. Science Press, Beijing, 344 pp. http://frps.eflora.cn/frps/sorbus