

Clematis guniuensis (Ranunculaceae), a new species from Eastern China

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Abstract

Clematis guniuensis **sp. nov.**, a new narrowly endemic species of *Clematis*, is described and illustrated from the Huangshan Mountains of Eastern China. A description of *C. guniuensis* is presented along with illustrations, photographs and diagnostic differences between the new species and its putative close allies.

Keywords

Anhui, Early diverging eudicots, Ranunculales, Taxonomy

Introduction

Clematis L. (Ranunculaceae) is a large genus of early diverging eudicots, comprising approximately 280–350 species (Tamura 1987, 1995; Johnson 1997; Grey-Wilson 2000; Wang and Li 2005), out of which 147 species are reported in China, 93 of them being

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endemic to the country (Wang and Bartholomew 2001). The species of *Clematis* are economically important for their chemical properties relating to traditional medicine and also as ornamentals due to their attractive flowers (Grey-Wilson 2000; Wang and Bartholomew 2001). The genus is distributed worldwide, showing a high degree of speciation, with adaptations to a variety of habitats, especially in eastern Asia (Tamura 1993). *Clematis* species also show considerable morphological diversity and plasticity, making the taxonomy and classifications of the genus notoriously difficult (Brandenburg 2000), with different classifications emphasising different morphological characters (e.g. Prantl 1888; Tamura 1995; Johnson 1997; Grey-Wilson 2000; Wang and Li 2005).

During floristic surveys in experimental forestry plots of this Guniujiang National Nature Reserve between 2016 and 2018, a conspicuous species bearing 1-flowered cymes was collected. After thorough comparisons of diagnostic morphological and anatomical features of similar taxa (Lin and Wei 2009; Wang 2004a, 2004b, 2006a, 2006b, 2015a, 2015b; Wang and Bartholomew 2001; Wang and Huang 2014; Wang and Li 2016; Wang and Xie 2007), we have concluded that this specimen belongs to a hitherto undescribed species. We describe this specimen as a new species, presenting a morphological description, illustrations and comments on morphologically related species.

Material and methods

Measurements and morphological character assessments of the putative new species were undertaken using herborised and living specimens observed in the field or cultivated at the Botanical Garden of Anhui College of Traditional Chinese Medicine. All available specimens of *Clematis*, stored in the following herbaria (acronyms according to Thiers 2017+): IBK, IBSC, N, MO, P, PE, SYS, US and some local herbaria were examined. Images of type specimens were obtained from Tropicos.org (<http://www.tropicos.org>) and JSTOR Global Plants (<http://plants.jstor.org>). All morphological characters were studied using a dissecting microscope (SZX16, Olympus, Tokyo, Japan). Characters were described, using the terminology presented by Wang and Bartholomew (2001).

Taxonomy treatments

***Clematis guniuensis* W.Y.Ni, R.B.Wang & S.B.Zhou, sp. nov.**

urn:lsid:ipni.org:names:77200428-1

Figs 1, 2, 3

Diagnosis. Resembles *C. florida* Thunb. and *C. huchouensis* Tamura but can be distinguished from the former one by puberulous leaflet blades, longer petiole, larger flowers with light green sepals, longer stamens and white filaments and from the latter by its longer petioles, 3-lobed leaflet blades, shorter pedicel, larger flowers, 4 sepals, filaments about 3–5 times the length of the anther, persistent style 1.5–2 cm long, and yellow plumose.

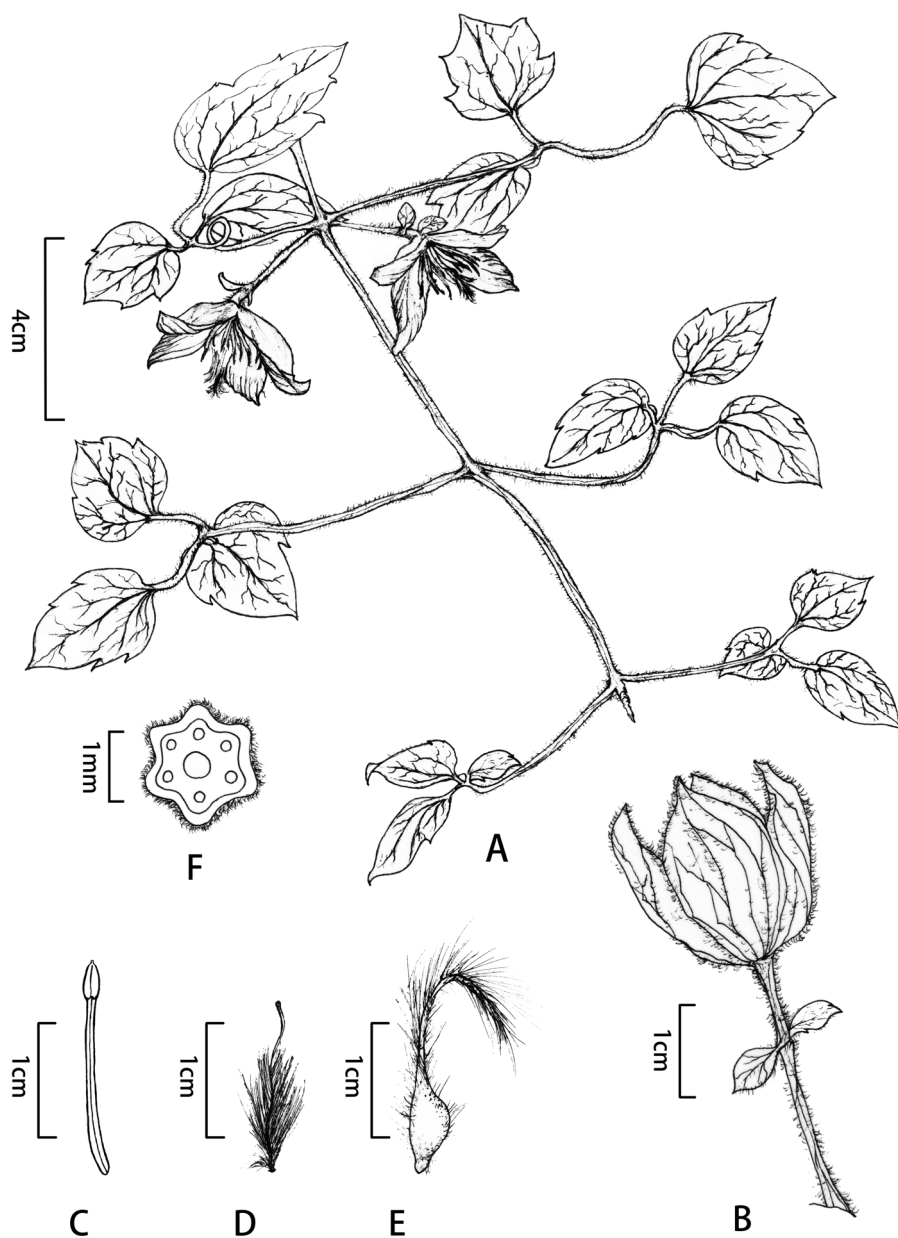


Figure 1. *Clematis guniuensis* W.Y.Ni, R.B.Wang & S.B.Zhou. **A** Habitat in flowering period **B** Inflorescences with budding flower, showing the bracts **C** Stamen **D** Pistil **E** Achene **F** Stem cross-section.

Type. CHINA. Anhui Province: Qimeng County, Guniujiang National Nature Reserve, Huangshan City, 30°0'57.02"N, 117°29'37.17"E, 550 m a.s.l., 15 May 2018, flowering, Rong-Bin Wang, WRB201805068 (holotype: ANUB!; isotypes: AHU!, PEI, WUH!).

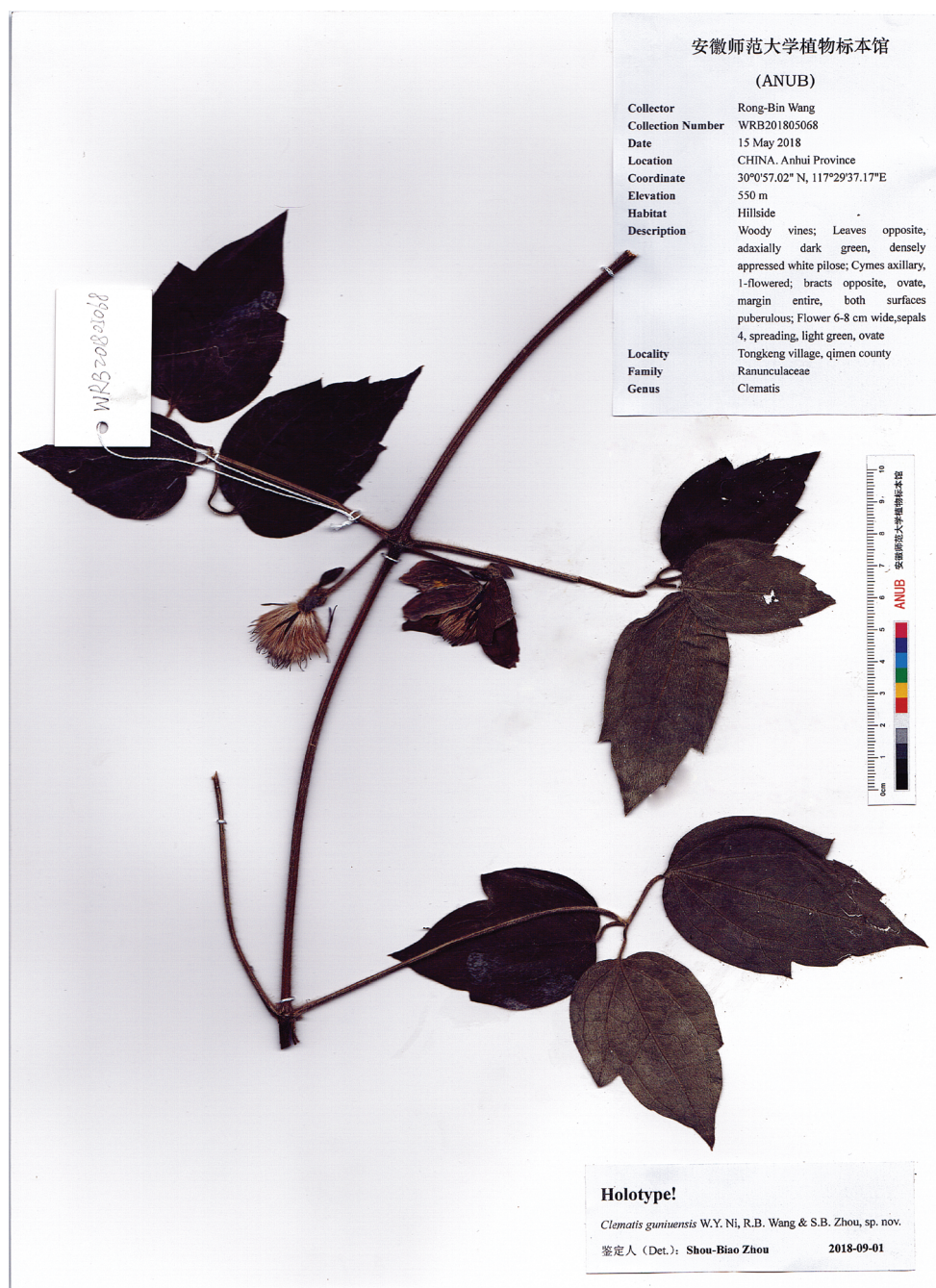


Figure 2. Holotype of *Clematis guniuensis* W.Y.Ni, R.B.Wang & S.B.Zhou.

Description. Vines herbaceous, perennial; branches inconspicuously longitudinally 6-sulcate to sub-terete, densely primrose yellow puberulous covering when young, becoming glabrescent with age. Root fusiform. Leaves opposite, ternate; peti-

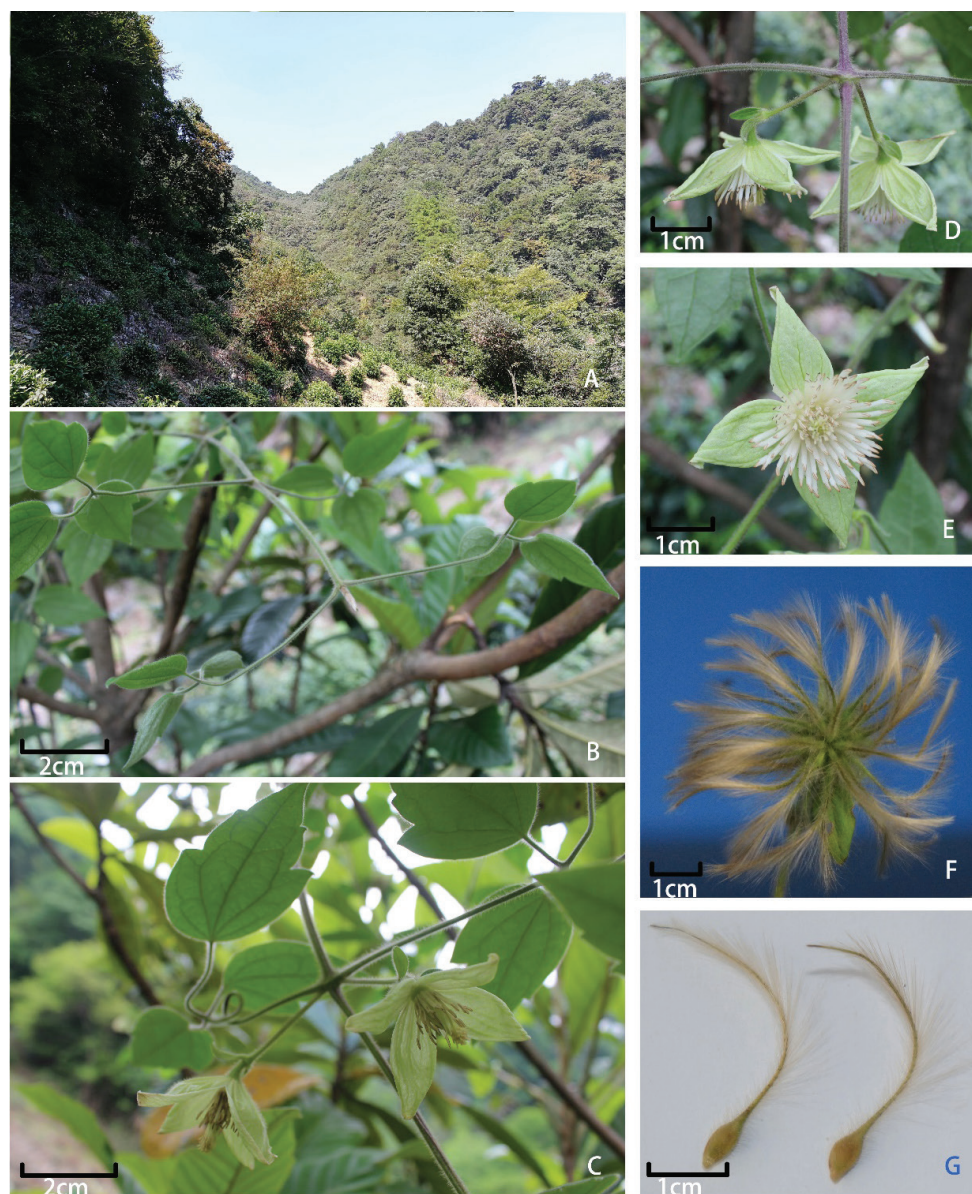


Figure 3. *Clematis guniuensis* W.Y.Ni, R.B.Wang & S.B.Zhou. **A** Habitat **B** Young branches, showing stems 6-grooved, puberulous **C** Inflorescences, showing style and abaxial surface view of leaf blade **D** Dorsal view of cymes, showing peduncles and bracts **E** Frontal view of flower, showing stamens **F** Fruit **G** Achenes, showing persistent style.

ole 7–10 cm long; leaflets 3-lobed, ovate to narrowly-ovate; central lobe 6–7.5 × 3.5–4 cm, lateral lobes 4–5 × 2.8–3.5 cm, margin coarsely dentate to entire, apex acuminate or sometimes caudate, base broadly cuneate to rounded, papery, adaxially dark green, densely appressed white pilose, abaxially light green, sparsely puberulous to sub-gla-

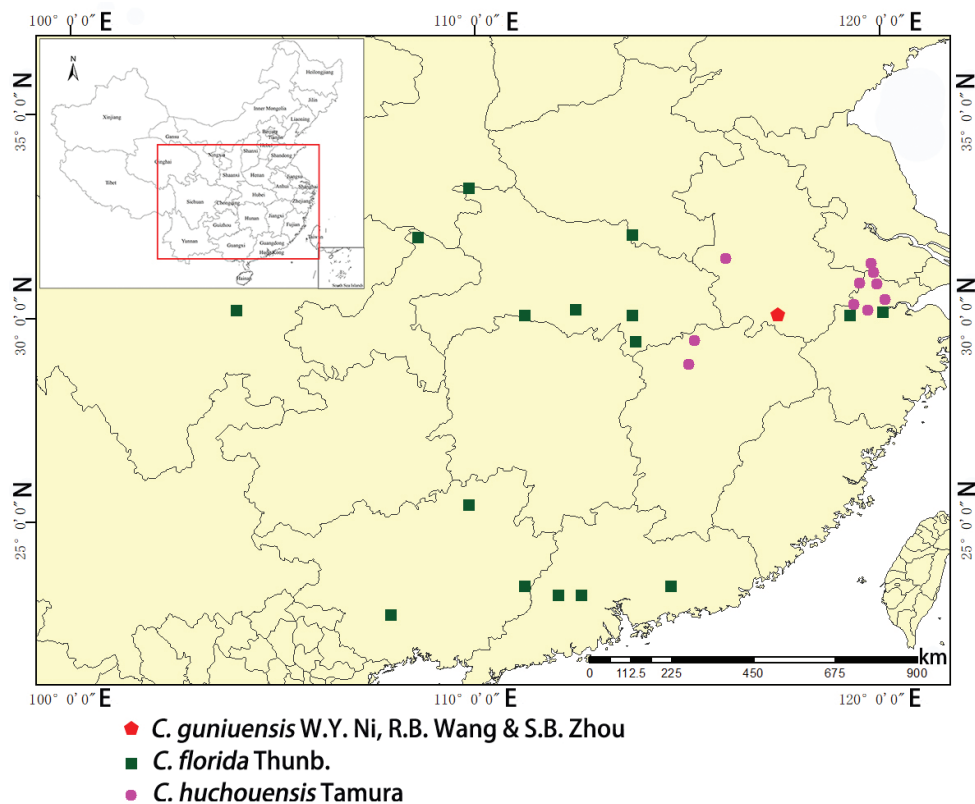


Figure 4. Distribution map of *Clematis guniuensis* (pentagon, red) and its congeners *C. huchouensis* (round, violet) and *C. florida* (square, green).

brous, basal veins abaxially slightly prominent; and with petiolule 1–2 cm long. Cymes axillary, 1-flowered; peduncles 3–6 cm long, densely puberulous; bracts opposite, sessile, ovate, 1.2–1.7 × 5–7 mm, margin entire, both surfaces puberulous. Flowers 6–8 cm diam.; pedicels ca. 2 cm long, conical, sulcate, green, densely puberulous; sepals 4, spreading, light green, ovate, ovate-lanceolate or broad-lanceolate, 3.5–4.5 × 1.8–2.3 cm, apex acute, adaxially glabrous, abaxially sparsely white pubescent, trinerved; stamens numerous, 1–3 cm long, filaments linear, glabrous, about 3–5 times the length of the anthers, anthers narrowly oblong, ca. 6 mm long, white, glabrous, apex shortly apiculate; ovaries ellipsoidal, pubescent, style densely yellow-villose. Achenes dark-brown, strongly compressed, ovate to broadly ellipsoidal, ca. 3 × 1 mm wide, pubescent; persistent style 1.5–2 cm long, yellow-plumose.

Phenology. Flowering from April to May; fruiting from October to November.

Etymology. The specific epithet is derived from the type locality, Guniujiang National Nature Reserve.

Vernacular name. Gǔ Niú Tiě Xián Lián (Chinese pronunciation); 牯牛铁线莲 (Chinese name).

Table 1. Diagnostic character differences amongst *Clematis guniuensis*, *C. buchouensis* and *C. florida*.

| Characters | <i>Clematis guniuensis</i> | <i>Clematis buchouensis</i> | <i>Clematis florida</i> |
|------------------------------|---|--|--|
| Petioles | 7–10 cm long | 1.7–3 cm long | 2–4 cm long |
| Shape of leaflet blades | 3-lobed | 2- or 3-lobed or undivided | undivided |
| Indumentum of leaflet blades | puberulous | puberulous | glabrous |
| Flower per cyme | 1-flowered | 1–3-flowered | 1-flowered |
| Size of bracts | 1.2–1.7 cm long | 2–3 cm long | 1.4–3 cm long |
| Size of pedicels | ca. 2 cm long | 1.2–3 cm long | 3.7–8.5 cm long |
| Size of flowers | 6–8 cm wide | 2–3 cm wide | 3.6–5 cm wide |
| Number of sepals | 4 | 4 | 6 |
| Colour of sepals | light green | white | white |
| Size of sepals | 3.5–4.5 × 1.8–2.3 cm | 1.4–2.2 × 0.3–0.6 cm | 2–3 × 1–1.5 cm |
| Size of anthers | ca. 6 mm long | 2.5–3.2 mm long | 2.5–3.5 mm long |
| Filaments | about 3–5 times the length of the anther, white | equal to the length of the anther, white | shorter than anthers, purple |
| Persistent styles | 1.5–2 cm long, yellow plumose | 0.8–1.3 cm long, appressed yellowish pubescent | ca. 8 mm long, basally spreading puberulous, apically glabrous |

Distribution and habitat. To date, *C. guniuensis* is only known from the type locality, Guniujiang National Nature Reserve, Huangshan City, Anhui Province (Fig. 4). Currently the species is known from a few collections and there is only one known population with ca. 20 individuals at the type locality. The species is mostly found in tea plantations or forest edges along valleys of evergreen broad-leaved forests, at an elevation of 1,500 m a.s.l.

Conservation assessment. Based on the present field investigations, *C. guniuensis* is currently only known from the type locality and with a very small population size (ca. 20 individuals). The species should be given the IUCN status of Critically Endangered (CR) based on criteria D: “Population size estimated to number fewer than 50 mature individuals” (IUCN 2016).

Notes. A morphological comparison between *C. guniuensis* and morphologically related species, *C. florida* and *C. buchouensis*, is provided in Table 1. A total of 17 species of this genus was found in the Anhui province, with this new species being easily distinguished from the other species in this region by its 3-lobed leaflets, 1-flowered cymes, flowers 6–8 cm diam., sepals 4 and light green and glabrous filaments.

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(1908085QC126), Key Projects for Academic Support of Top-level Talents in Colleges and Universities in Anhui Province (No. gxbjZD2016106), National traditional Chinese medicine resources survey project (caishe [2017] no. 66).

References

- Brandenburg WA (2000) *Meclatis* in *Clematis*: Yellow flowering *Clematis* species. Systematic studies in *Clematis* L. (Ranunculaceae), inclusive of cultonomic aspects. Wageningen: Wageningen Universiteit.
- Grey-Wilson C (2000) *Clematis* the genus. Portland, Oregon: Timber Press.
- IUCN (2016) Guidelines for using the IUCN Red List categories and criteria. Version 12. Prepared by the Standards and Petitions Subcommittee. <http://jr.iucnredlist.org/documents/>
- Johnson M (1997) Släktet *Klematis*. Södertälje: M. Johnsons Plantskola AB.
- Lin CR, Wei YG (2009) *Clematis liuzhouensis* (Ranunculaceae), a new species from China. *Novon* 19(2): 194–196. <https://doi.org/10.3417/2007089>
- Prantl K (1888) *Clematis*. Beiträge zur Morphologie und Systematik der Ranunculaceen. Botanische Jahrbuecher 9: 325–373.
- Tamura M (1987) A classification of genus *Clematis*. *Acta Phytotaxonomica et Geobotanica* 38: 33–44. [In Japanese]
- Tamura M (1993) Ranunculaceae. In: En Kubitzki K, Rohwer JG, Bittrich V (Eds) The families and genera of vascular plants, 2. Flowering plants-Dicotyledons. Springer-Verlag, Berlin, 563–583. https://doi.org/10.1007/978-3-662-02899-5_67
- Tamura M (1995) *Clematis*. In: Hiepko P (Ed.) Die Natürlichen Pflanzenfamilien. Zwei Aufl 17a (4). Berlin: Ducker und Humboldt, 368–387.
- Thiers B (2017) Index herbariorum: a global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Available at <http://sweetgum.nybg.org/science/ih/> [Accessed on 10 October 2017]
- Wang WT (2004a) A revision of *Clematis* sect. *Aspidanthera* (Ranunculaceae). *Zhiwu Fenlei Xuebao* 42(2): 97–135.
- Wang WT (2004b) A revision of *Clematis* sect. *Brachiatae* (Ranunculaceae). *Zhiwu Fenlei Xuebao* 42(4): 289–332.
- Wang WT (2006a) A revision of *Clematis* sect. *Pterocarpa* (Ranunculaceae). *Guihaia* 26(4): 341–344. <https://doi.org/10.1360/aps050049>
- Wang WT (2006b) A revision of *Clematis* sect. *Naraveliopsis* (Ranunculaceae). *Zhiwu Fenlei Xuebao* 44(6): 670–699. <https://doi.org/10.1360/aps050090>
- Wang WT, Xie L (2007) A revision of *Clematis* sect. *Tubulosae* (Ranunculaceae). *Zhiwu Fenlei Xuebao* 45(4): 425–457. <https://doi.org/10.1360/aps06114>
- Wang WT (2015a) *Clematis diebuensis*, a new specis of Ranunculaceae from Gansu. *Bulletin of Botanical Research* 35(1): 1–3.
- Wang WT (2015b) A New Species of the Genus *Clematis* (Ranunculaceae) from Yunnan, China. *Plant Diversity & Resources* 37(2): 139–140.

- Wang WT, Bartholomew B (2001) *Clematis*. In Flora of China, vol. 6, Wu ZY, Raven P (Eds) Beijing: Science Press, St. Louis: Missouri Botanical Garden Press. 97–165.
- Wang WT, Huang LQ (2014) *Clematis chaohuensis*, a new species of Ranunculaceae from Anhui Province. Bulletin of Botanical Research 34(3): 289–291.
- Wang WT, Li LQ (2005) A new system of classification of the genus *Clematis* (Ranunculaceae). Zhiwu Fenlei Xuebao 43(5): 431–488. <https://doi.org/10.1360/aps040091> [In Chinese]
- Wang WT, Li LQ (2016) Two new species of *Clematis* (Ranunculaceae) from Sichuan. Guihaia 36(Z1): 73–75. [In Chinese]

Appendix I

List of all specimens analyzed for all three species for this study, with voucher number and deposition and origin information. Species are listed in alphabetical order.

Clematis florida Thunb.

CHINA. Anhui Province: Zhu P.Z., 64-0067 (JSPC); Ho Y.Y., Y.Y.Ho-02243 (SYS); **Chongqing City:** Liu Z.Y., Liu Z.Y.-972413 (IMC); **Guangdong Province:** Huang C., Huang-162703 (IBSC); Chen W.Y., Chun Woon Young 8416 (PE); Chun Y.F., Y.F.Chun-30488 (SYS); Shi G.L., Shi G.L.13249 (WUK); **Guangxi Zhuang Autonomous Region:** Mashan Expedition Team, 450124140722047LY (GXMG); Liu Y. et al., Liu & Yu H0094 (IBK); Guangxi Investigation Team, Guangxi-3984 (PE); **Guizhou Province:** Huang W.L. & Tu Y.L., Huang & Tu-0459 (GNUG); Wang Z.R., 522628140720152LY (GZTM); Gao J., Gao2013233024 (QNUN); Li K., DPS2013233024 (QNUN); **Henan Province:** Ye Y.X., 20071024B8 (BJFC); Li G.Q., Li4257 (HEAC); Yang W.G., Yang W.G.58 (HEAC); Xu C.X., Xu 78055 (HENU); Yang X.F., Yang 28 (HENU); Wang X.F., Wang 181 (HENU); Fu J.Q., Fu 2201 (IBK); **Hubei Province:** Wu J.Q. & Ma X.Y., Wu & Ma 8061 (HIB); **Sichuan Province:** Li J.Y., ss201208040024 (BJFC); Chien Y., Y.Chien 5993 (N); Yan J.X., Yan 87029 (PEM); Chien S.S., Chien Sung Shu 5342 (SZ); **Zhejiang Province:** Cheng R.C., R.C. Cheng 1976 (IBSC); Rwan Chia Tsuin, Rwan Chia Tsuin 37 (N); Zhejiang Investigation Team, Shen Jia-Yu 8065 (NAS).

Clematis buchouensis Tamura

CHINA. Guizhou Province: Huo P.Z., Zhi M.G. & Yuan D.X., 520222150126001LY (GZTM); **Jiangsu Province:** Wu W.X., Wu W.X.4205 (NAS); Ding Z.Z. & Wang Y.C., Ding & Wang 0939 (NAS); Wu W.X., W.X. Wu 6087 (NAS); Wu W.X., Wu W.X.4351 (WUK); **Jiangxi Province:** Shen S.J., Shen S.J.381 (PE); Shen S.J., Shen S.J.00565 (PE); **Sichuan Province:** Ju W.B. & Deng H.N., HGX13374 (CDBI); **Zhejiang Province:** Jiang Y.P., HZ008256 (HHBG); Tu Z.B., Tu0104710 (HIB); Chen S., S.Chen 1931 (NAS); Chen M., M.Chen 868 (NAS); Zhang S.R., Zhang S.R.1094 (PE).