
Elatostema recurvum (Urticaceae), a New Cave-dwelling Species from Guangxi, China

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ABSTRACT. A new species, *Elatostema recurvum* W. T. Wang & Y. G. Wei (Urticaceae), from Guangxi, China, is described and illustrated, and its affinities are discussed. It most closely resembles *E. cyrtandrifolium* (Zoll. & Moritz) Miq., from which it differs in the recurved stems and branches, the denticulate margin of the leaf apex, the larger, ovate stipules, the presence of densely distributed cystoliths on the blade midrib, and the glabrous, lineolate achenes. The new taxon was collected from a limestone cave and is considered to be Critically Endangered (CR) according to IUCN Red List criteria.

Key words: China, *Elatostema*, Guangxi, IUCN Red List, Urticaceae.

There are more than 350 species of *Elatostema* J. R. Forst. & G. Forst. (Urticaceae) in the world. A great number of species are distributed in tropical and subtropical Asia and Africa (Wang, 1995), and more than 146 of these occur in China (Lin & Duan, 2008). This genus was established in 1775, belongs to tribe Elatostemeae of Urticaceae, and is most closely related to *Pilea* Lindl. However, the two genera can be easily distinguished by certain characteristics, for example, differences in the pistillate reproductive organs and staminate cymes. There are three tepals on the pistillate flower in species of *Elatostema*; these are very small (shorter than the ovary) or completely degenerated, and its achene has a longitudinal rib. The cymes of most species in *Elatostema*, with few exceptions, are not normally branched. The fertile axis and branches are extremely shortened, with an inconspicuous form and the receptacle visible. At the same time, the bracts of the *Elatostema* cyme form an involucre around the receptacle (Wang, 1980a, 1980b). Weddell (1869) described about 48 species of *Elatostema* in his book on the Urticaceae and divided these into two sections: section *Androsyce* Wedd. and section *Elatostema*.

Wang (1980b) considered that *Elatostema* and *Pellionia* Gaudich. both evolved from the ancestral genus *Pilea*. An increasing number of new taxa of *Elatostema* have been found and described in recent years. These have included two new series, *Elatostema* ser. *Weddelia* W. T. Wang (Lin, 2008) and *Elatostema* ser. *Albopilosoides* Q. Lin & L. D. Duan (Lin & Duan, 2008); 22 species (Wang & Wei, 2007, 2008; Lin, 2008; Lin & Duan, 2008; Wei & Wang, 2009; Duan & Lin, 2010); three varieties (Wang & Wei, 2008; Wei & Wang, 2009); and one new name (Lin, 2008).

During a field trip to Bama County, Guangxi Province, in southwestern China in 2008, we collected several unknown species of Urticaceae. We noted all individuals with remarkable, recurved branches and eventually collected 12 specimens from different locations in one particular cave. Every specimen and all living plants in the cave were noted to have this particular branch characteristic. In total, we collected an additional six specimens at different times since 2008. After carefully observing their vegetable and reproductive organs, we confirmed that these specimens represent a new species of *Elatostema*, assigned to the genus based on the particular characteristics of their pistillate flowers, including the tepals of the pistillate flower and the achene; the collections were easily distinguished from the two similar genera *Pellionia* and *Pilea*. Based on the study of national floras (Wang, 1995; Lin et al., 2003) and relevant literature, the examination of a total of 105 specimens of the related *E. cyrtandrifolium* (Zoll. & Moritz) Miq. in CDBI, HITBC, IBK, and PE, and comparison of approximately 140 species of *Elatostema* from Guangxi and adjacent Guangdong, Guizhou, and Yunnan provinces, we propose this taxon to be a new and undescribed species. The present work is based on herbarium material and living plants from IBK and from the greenhouse at the

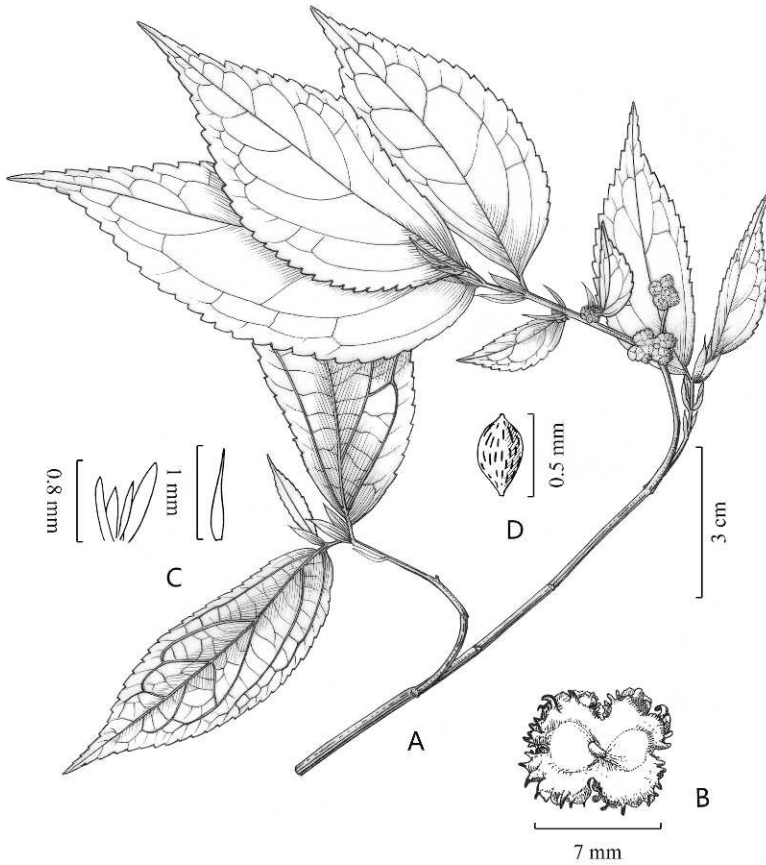


Figure 1. *Elatostema recurviramum* W. T. Wang & Y. G. Wei. —A. Upper portion of fertile stem. —B. Pistillate inflorescence (lower view). —C. Bracteoles. —D. Achene. Drawn by Ying-Bao Sun from the holotype, Y. G. Wei 09135 (PE).

Institute of Botany of Guangxi. Conventional methods of herbarium taxonomy were used. We observed the structure of the capitula, flowers, and other organs with a stereoscopic zoom microscope ($\times 200$; Nikon Corporation, Tokyo, Japan).

Elatostema recurviramum W. T. Wang & Y. G. Wei, sp. nov. TYPE: China. Guangxi Prov.: Bama Co., Poyue Village, 300 m, $107^{\circ}5'E$, $24^{\circ}8'N$, 22 Apr. 2008, Y. G. Wei 09135 (holotype, PE; isotype, IBK). Figure 1.

Haec species *Elatostemati cyrtandrifolio* (Zoll. & Moritz) Miq. et *E. fengshanensi* W. T. Wang & Y. G. Wei affinis, sed a hoc lamina foliari adaxialiter sparse strigosa vel glabrescente, ab illo lamina foliari abaxialiter secus venas raro omnino sparse strigosa, bracteis apice corniculatis atque achenis glabris lineolatis, ab amobus caule et ramis apicem versus recurvatis, stipulis ovatis $7-10 \times 3-4$ mm ad costam cystolithis dense tecta, lamina foliari margine dentata, inflorescentia pistillata sessili capitata semper solitaria, ejus bracteis ca. 18 depresso deltatis $0.2-0.3 \times 0.7-1$ mm atque bracteolis linearibus oblanceolato-linear-

ibus vel anguste ovatis $0.5-0.8$ mm longis apice longe corniculatis glabris differt.

Perennial herb; rhizomatous, stems ca. 45 cm, ca. 3 mm diam. near the base, recurved toward the apex, with 4 recurved branches; branches 1.5–7.5 cm, glabrous; cystoliths densely distributed, ca. 0.2 mm. Leaves petiolate or subsessile, lamina chartaceous, weakly asymmetrical, elliptic, or oblong, (2–)4–9.5 \times 1–3.5 cm, apex acuminate, base weakly asymmetrical, cuneate, margins dentate, adaxial leaf surface sparsely strigose to glabrescent, cystoliths punctiform or bacilliform, very sparse, abaxial surface sparsely strigose along veins, where present, restricted to the nerves, rarely covering the whole lamina, 0.1–0.15 mm, basal 3-nerved, secondary nerves in 3 or 4 pairs, flush with the adaxial surface of the lamina, prominulous or flush with the abaxial surface of the lamina; petioles 1–3 mm, glabrous; stipules 7–10 \times 3–4 mm, ovate, glabrous, midrib with a dense covering of cystoliths, cystoliths 0.1–0.3 mm. Pistillate inflorescences ca. 6 to 10, solitary, axillary,

Table 1. Morphological comparison of *Elatostema recurviramum* with the related *E. cyrtandrifolium* and another typical troglomorphic species, *E. fengshanense*.

	<i>E. recurviramum</i>	<i>E. cyrtandrifolium</i>	<i>E. fengshanense</i>
Stems	recurved toward the apex	ascending or erect	ascending
Branches	with 4 recurved branches	branched or rarely simple	simple
Stipules	ovate, 7–10 × 3–4 mm, midrib with dense covering of cystoliths	narrowly lanceolate or subulate, 3–5 × 0.5–1 mm, with cystoliths	narrowly ovate or lanceolate, ca. 7 × 2–2.6 mm, midrib green
Leaf laminae			
Shape	weakly asymmetrical, elliptic, or oblong	obliquely elliptic	obliquely narrowly elliptic or narrowly ovate
Size	(2–)4–9.5 × 1–3.5 cm	5–15 × 2.2–5 cm	(0.7–)3–10 × (0.5–)1.3–4 cm
Margins	dentate	sharply serrate	narrower side 5- to 11-serrate, broader side 5- to 14-serrate
Abaxial surface	sparsely strigose along veins, rarely covering the whole lamina	sparsely puberulent or glabrescent along veins	sparsely strigose
Adaxial surface	sparsely strigose to glabrescent, sparse cystoliths punctiform, bacilliform	sparsely strigillose, cystoliths slightly conspicuous, dense	glabrous
Pistillate inflorescence	solitary, capitate	solitary or in pairs	in pairs
Peduncle	sessile	sturdy, 0.5–2 mm	sturdy, ca. 0.5 mm
Receptacle	ca. 6.8 × 4.8 mm, oblong, green when fresh, glabrous	2–10 mm diam.	broadly oblong, ca. 2.6 × 2 mm, 2-lobed in the middle, glabrous
Bracts	depressed-deltate, 0.2–0.3 × 0.7–1 mm, ca. 18, apex 0.2–0.6 mm, corniculate	ovate or broadly ovate, ca. 0.25 mm long, ca. 5, sparsely pubescent	opposite pairs larger, flat, broadly ovate, 0.5–0.6 × 1–1.2 mm, apex 0.8–1 mm, corniculate; the 6 remaining pairs broadly ovate, 0.3–0.4 × ca. 0.6 mm, apex ca. 0.5 mm, corniculate, pubescent
Bracteoles	linear, oblanceolate-linear, or narrowly ovate, 0.5–0.8 mm, apex long corniculate, glabrous	spatulate or linear-lanceolate, ca. 0.8 mm, apical white hairs	broadly linear or spatulate, 0.3–0.5 mm, apex truncate, densely ciliate

sessile, capitate; receptacle ca. 6.8 × 4.8 mm, oblong, green when fresh, glabrous; bracts 0.2–0.3 × 0.7–1 mm, ca. 18, depressed-deltate, apex 0.2–0.6 mm, corniculate; bracteoles numerous per inflorescence, 0.5–0.8 mm, linear, oblanceolate-linear, or narrowly ovate, positioned on the receptacle, apex long corniculate, glabrous. Staminate inflorescences not seen. Achenes ca. 0.5 mm, brownish, elliptic, striped.

Distribution and habitat. *Elatostema recurviramum* is endemic to the type locality in Bama County, Guangxi Province, China, at an altitude of 300 m. We investigated other similar caves as well as suitable environments around this cave for a distance of ca. 1.5 km on six visits since 2008. The new species is commonly found at the type locality—a large limestone cave; however, we could not find any individuals outside the cave, even at a distance of only 5 m from the cave entrance. We therefore consider the

new species to be a strict troglophile. The principal plant species accompanying the new taxon were *Chiritopsis repanda* W. T. Wang (Gesneriaceae), *E. coriaceifolium* W. T. Wang, and *Begonia bamaensis* Yan Liu & C. I Peng (Begoniaceae), which were also found in this cave at the type locality.

IUCN Red List category. *Elatostema recurviramum* is evaluated here as Critically Endangered (CR A2c) according to IUCN Red List criteria (IUCN, 2001), based on our investigation of the type locality. Many tourists visit this cave and they represent the main threat to this species.

Phenology. *Elatostema recurviramum* was observed in flower in April, according to information for the holotype and isotype, and as noted at the type locality for living, mature plants.

Discussion. *Elatostema recurviramum* most closely resembles *E. cyrtandrifolium* (Zoll. & Moritz) Miq.

Elatostema fengshanense W. T. Wang & Y. G. Wei is another typical troglophile, which has been found only in four limestone caves in Fengshan County, near Bama County. However, the new species can be easily distinguished from both of these species by its stems and branches that are always apically recurved; the ovate stipules, 7–10 × 3–4 mm; the blade midribs that are densely covered by cystoliths; the dentate lamina margins; the sparsely strigose to glabrescent adaxial blade surface; the abaxial blade surface that is sparsely strigose along the veins, rarely covering the whole lamina; the pistillate inflorescence that is solitary, capitate, sessile, with no evident peduncle; ca. 18 depressed-deltate, pistillate bracts, 0.2–0.3 × 0.7–1 mm, with a corniculate apex, 0.2–0.6 mm; and the pistillate bracteoles that are linear, oblanceolate-linear, or narrowly ovate, 0.5–0.8 mm, with a long corniculate, glabrous apex. The three species are distinguished from each other in Table 1.

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Literature Cited

- Duan, L. D. & Q. Lin. 2010. *Elatostema cataractum* (Urticaceae), a new species from Guizhou Province, China. *Ann. Bot. Fenn.* 47: 229–232.
- IUCN. 2001. IUCN Red List Categories and Criteria, Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland, and Cambridge, United Kingdom.
- Lin, Q. 2008. A revision of *Elatostema* section *Weddellia* series *Salvinioidea* (Urticaceae). *Bot. J. Linn. Soc.* 158: 62–66.
- Lin, Q. & L. D. Duan. 2008. Two new species and a new series of *Elatostema* (Urticaceae) from China. *Bot. J. Linn. Soc.* 158: 674–680.
- Lin, Q., I. Friis & C. M. Wilmot-Dear. 2003. *Elatostema*. Pp. 127–163 in Z. Y. Wu & P. H. Raven (editors), *Flora of China*, Vol. 5. Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis.
- Wang, W. T. 1980a. *Classificatio Specierum Sinensium Pellionae* (Urticaceae). *Bull. Bot. Lab. N.E. Forest. Inst.* 6: 45–66.
- Wang, W. T. 1980b. *Classificatio Specierum Sinensium Elatostematis* (Urticaceae). *Bull. Bot. Lab. N.E. Forest. Inst.* 7: 1–96.
- Wang, W. T. 1995. *Elatostema* J. R. Forst. & G. Forst. Pp. 187–317 in W. T. Wang & C. J. Chen (editors), *Flora Reipublicae Popularis Sinicae*, Vol. 23(2). Science Press, Beijing.
- Wang, W. T. & Y. G. Wei. 2007. Five new species of *Elatostema* J. R. & G. Forst. (Urticaceae) from Guangxi, China. *Guihaia* 27(6): 811–816.
- Wang, W. T. & Y. G. Wei. 2008. *Elatostema duyunense*, a new species of Urticaceae from Guizhou, China. *Guihaia* 28(1): 1–3.
- Weddell, H. A. 1869. Urticaceae. Pp. 32–235 in A. de Candolle (editor), *Prodromus Systematis Naturalis Regni Vegetabilis*, Vol. 16(1). Masson, Paris.
- Wei, Y. G. & W. T. Wang. 2009. Three new species and one new variety of *Elatostema* J. R. & G. Forst. (Urticaceae) from Guangxi. *Guihaia* 28(1): 1–3.