



New synonyms for *Premna yunnanensis* (Lamiaceae) in China

YUNHONG TAN¹, YONGJUN CHEN² & BO LI^{2*}

¹Key Laboratory of Tropical Forest Ecology, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Mengla, 666303, P. R. China.

²School of Agricultural Sciences, Jiangxi Agricultural University, Nanchang, 330045, P. R. China.

* Author for Correspondence, email: hanbolijx@163.com.

Among 46 species of *Premna* Linnaeus (1771: 587) recognized in the *Flora of China* (Chen & Gilbert 1994), *P. yunnanensis* Smith (1916: 120) and 13 more species form a well supported monophyletic group (Li *et al.* 2016) assigned to ser. *Congestiflorae* P'ei & Chen (1982: 211), under sect. *Premnos* Briquet (1897: 170). *Congestiflorae* is characterized by having cymes in a dense capitate inflorescence, leaves and calyces densely covered with golden, orange or red glands, and calyces with five long distinct calyx-lobes. The 14 species are all endemic to southwest China, particularly to Yunnan and Sichuan provinces. *Premna yunnanensis* is the most widespread, occurring throughout the north of Yunnan and southwest of Sichuan (P'ei & Chen 1982, Chen & Gilbert 1994). This species is characterized by having ovate-lanceolate to ovate leaves, abaxially densely gray circinate pilose, pinkish to purple corolla, and fruiting calyces equal or subequal to fruits (Fig. 1). However, while examining herbarium specimens, it is found that the types of *P. anthopotamica* Handel-Mazzetti (1921: 231) (Fig. 2B), *P. parvilimba* P'ei (1932: 62) (Fig. 2C), *P. pilosa* P'ei (1932: 66) (Fig. 2D), *P. steppicola* Handel-Mazzetti (1936: 902) (Fig. 2E) and *P. subcapitata* Rehder (1917: 458) (Fig. 2F) are morphologically very similar to *P. yunnanensis*. Further critical qualitative and quantitative examination of more herbarium specimens—including types- (from A, CDBI, E, HITBC, IBK, IBSC, KUN, NAS, NY, PE, W and WU herbaria), living plants (field explorations in Yunnan and Sichuan during 2010 and 2014), and protologues, do not support the distinction of these species from *P. yunnanensis*. Furthermore, geographical analysis reveals that the type locality of each species is encompassed in the natural distribution of *P. yunnanensis*. Thus, *P. anthopotamica*, *P. parvilimba*, *P. pilosa*, *P. steppicola* and *P. subcapitata* are determined as conspecific with *P. yunnanensis*.

Taxonomy

Premna yunnanensis Smith (1916: 120). Figs. 1 & 2.

Type:—CHINA. Yunnan: Lijiang County, Tong Shan (Dong Shan Town), Yangze bend, open dry situations amongst rocks, elev. 2700–3050 m, 1 September 1913, *G. Forrest 11240* (holotype E!, isotypes A!).

Celastrus yunnanensis Léveillé (1915: 32). Type:—CHINA. Yunnan: Kiao-Kiao (Qiaojia County), rockies, pied de moux, elev. 400 m, June 1911, *E.E. Maire, s.n.* (holotype E!, isotypes A!, NY!).

Premna anthopotamica Handel-Mazzetti (1921: 231), **syn. nov.** Type:—CHINA. Kweitschou (Guizhou Province): Ad viam Tschenning Huang tsauba in convalle fluminis Hoadjiau-ho in tergo rupestri ad vicum Falang, elev. 900 m, 20 June 1917, *H.R.E. Handel-Mazzetti 10381* (holotype WU!, isotypes A!, W!).

Premna parvilimba P'ei (1932: 62), **syn. nov.** Type: as *Celastrus yunnanensis* Léveillé.

Premna pilosa P'ei (1932: 66). Type:—CHINA. Yunnan: Melliers de San-Kia, elev. 2600 m, no specific date, *E.E. Maire 24* (holotype A!).

Premna steppicola Handel-Mazzetti (1936: 902), **syn. nov.** Type:—CHINA. Yunnan: Steppen zwischen Hsindschwang und Hwaping (Djiuyaping) in der str. St. am Yangtse e von Yungbei, elev. 1400–1500 m, 31 October 1916, *H.R.E. Handel-Mazzetti 13017* (holotype WU!, isotype W!).

Premna subcapitata Rehder (1917: 458), **syn. nov.** Type:—CHINA. Western Szech'uan (now Sichuan Province): without precise locality, cliffs, elev. 1200 m, June 1903, *E.H. Wilson 3761* (holotype A!, isotype K!).

Illustrations:—Wu (1977: 432, Plate 102, 14–16); P'ei & Chen (1982: 106, Fig. 56, as *P. steppicola*); Wu & Peter (1998: 60, Fig. 60, 1–3, as *P. steppicola*).

Distribution, habitat:—This species is endemic to southwest China, and distributed mainly around the Jinsha Jiang

River (Fig. 3) in northwest and northeast Yunnan to southwest Sichuan, and extending to West Guizhou and some highlands of west Sichuan. It frequently occurs in the edge of mixed secondary forests along the vicinity of Jinsha Jiang valley, sometimes in the mixed forests on mountain slopes or among rocks.

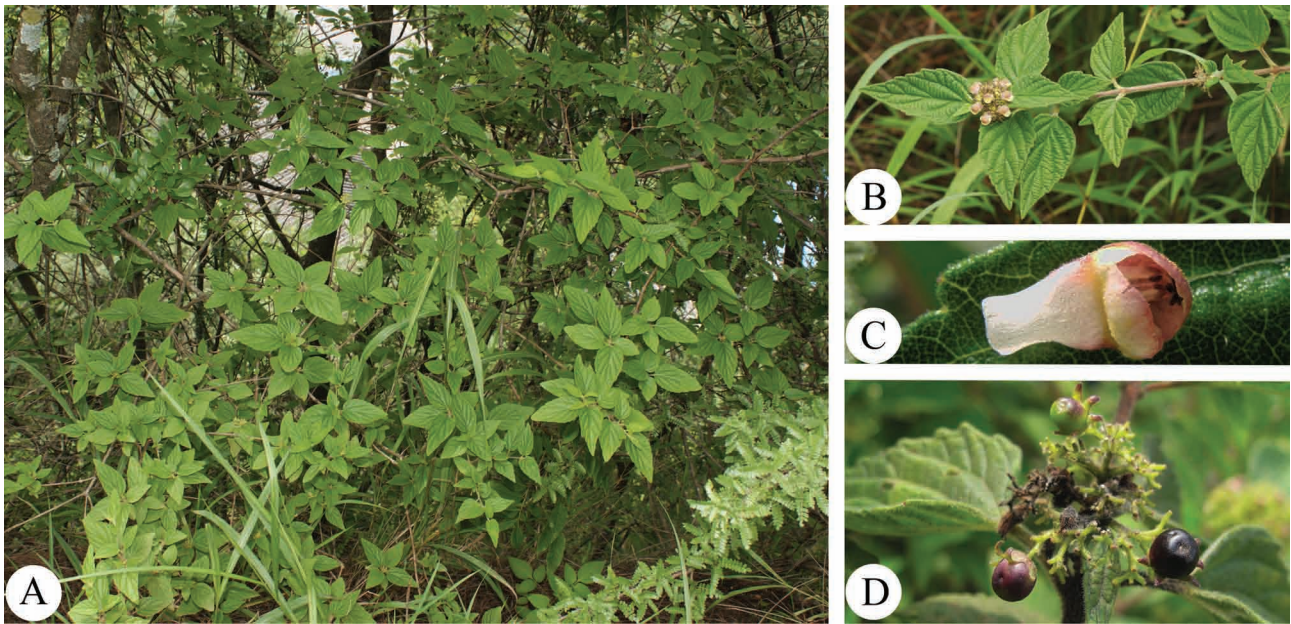


FIGURE 1. *Premna yunnanensis*. A. habit and habitat; B. a branchlet with inflorescence; C. corolla; D. fruits. Photographs A, B, D. from Shigu Town, Lijiang County, Yunnan Province, China by B. Li, C. from Hutiaoxia Town of the same county by C. L. Xiang.

Notes:—During the naming of *P. anthopotamica*, the author did not compare the species with any other described taxa of the genus, hence no diagnostic characters were presented. Later *P. anthopotamica* was recognized by P’ei (1932) based on its densely pubescent leaves with crisped appressed hairs beneath, and glabrous but glandular above. However, while revising the genus *Premna*, P’ei & Chen (1982) did not include *P. anthopotamica* in the *Flora Reipublicae Popularis Sinicae*. Later, Chen & Gilbert (1994) followed the same criteria for the *Flora of China*. During the examination of type specimens of *P. anthopotamica* and consulting the protologue, it is found that *P. anthopotamica* is closely identical to *P. yunnanensis*. The diagnostic characters noted by P’ei (1932) are also the same to those of *P. yunnanensis*. Thus *P. anthopotamica* is reduced to *P. yunnanensis* as synonym.

Premna steppicola when described was annotated as different to *P. parvilimba* only in leaf shape. The leaf blades of *P. steppicola* are frequently widely ovate with subrounded bases, while those of *P. parvilimba* [= *Celastrus yunnanensis* Léveillé (1915: 32); P’ei (1932)] are lanceolate to ovate-lanceolate with rounded bases. Subsequently, P’ei & Chen (1982) and Chen & Gilbert (1994) recognized the comparison but none of them have taken *P. yunnanensis* into consideration. In fact, *P. parvilimba* differs from *P. yunnanensis* having only smaller leaves, and the species is known only from the type specimens. The type locality of the species has been visited twice during 2010 and 2012 and we found a population of *P. yunnanensis* instead. Some individuals in dry and rocky habitat are dwarf and have relatively small leaves, which are superficially similar to the type specimens of *P. parvilimba*. Therefore, it is presumed that *P. parvilimba* is simply a dwarf form of *P. yunnanensis* growing in rocky habitat. Moreover, further investigations of herbarium specimens indicate that the leaf shape of *P. steppicola* falls well within the variation range of *P. yunnanensis*. Hence, *C. yunnanensis*, *P. parvilimba* and *P. steppicola* are placed under *P. yunnanensis*.

Premna pilosa was described with the note that it is closely related to *P. subcapitata*. The only difference is that *P. pilosa* have larger inflorescences with more flowers than *P. subcapitata*. However, Wu (1977) thought that the two species cannot be distinguished clearly by this character only and therefore reduced *P. pilosa* to a synonym of *P. subcapitata*. This proposal was followed by P’ei & Chen (1982) and Chen & Gilbert (1994). Wu (1977) stated that *P. subcapitata* is most similar to *P. yunnanensis* but differs from the later in having larger leaves and longer petioles, whereas P’ei & Chen (1982) noted that *P. subcapitata* can be distinguished from *P. yunnanensis* by its fruiting calyces longer than fruit, corolla yellowish and pubescent outside. However, from the protologues and examination of type specimens, it is found that the corollas of both species are sparsely to densely hirsute and golden glandular, and the calyces in both species ca. 4 mm in length. The protologue of *P. yunnanensis* clearly noted that flowers on the holotype (*G. Forrest 11240*) are pale rose, while pale yellow (*G. Forrest 10527*) or dull green (*G. Forrest 10351*) on two paratypes. After critical examination of types as

well as specimens cited or identified by P'ei or Chen, we found that these differences are completely artificial and there are no any consistent differences between *P. subcapitata* and *P. yunnanensis*. In fact, P'ei or Chen had failed to make stable identifications for the same collection. For example, one specimen of *Y.C. Yang 3956* deposited in PE was identified as *P. yunnanensis* by P'ei in March 1959, while its duplicate deposited in NAS was identified as *P. subcapitata* by the same author. Another collection, *C.C. Hsieh 41764* was noted as *P. subcapitata* by Chen in September 1977, while the duplicate in PE was identified as *P. yunnanensis* in March 1978, by the same author too. So it is concluded that *P. subcapitata* and *P. yunnanensis* are conspecific, and therefore *P. pilosa* and *P. subcapitata* were here placed under *P. yunnanensis*.



FIGURE 2. Type specimens of six *Premna* taxa. A. holotype of *P. yunnanensis* (E); B. isotype of *P. anthopotamica* (A); C. isotype of *P. parvilimba* (A); D. holotype of *P. pilosa* (A); E. holotype of *P. steppicola* (WU); F. isotype of *P. subcapitata* (K). With the permissions from the Harvard University Herbaria (A), the Herbarium of Royal Botanic Garden Edinburgh (E), the Kew Herbarium (K) and Herbarium of University Vienna (WU).

Additional specimens examined:—CHINA: Sichuan Province: E'bian County, 14 October 1939, *T.N. Liou & C. Wang 1430* (PE!); E'bian County, Wanshou Temp, 18 August 1939, *Z.W. Yao 4623* (NAS!, PE!); E'meishan County, E'meishan Mountain, 17 October 1938, *T.N. Liou 10157* (PE!); Luding County, Daduhe River, 29 June 1951, *Y.W. Cui 4146* (PE!); Luding County, Daduhe River, 22 May 1974, *Luding Exp. 6812* (CDBI!, PE!); Luding County, Dewei Town, 7 August 2010, *E.D. Liu 2617* (PE!); Luding County, Erlangshan Mountain, 11 June 1963, *X.L. Jiang & J.H. Xiong 34392* (IBK!, PE!); Luding County, 11 July 1951, *W.G. Hu & Z. He 10323* (PE!); Luzhou County, Mujiagou, 16 September 1938, *T.P. Wang 9740* (PE!, WUK!); Kangding County, 15 September 1959, *Y.C. Yang 3956* (PE!, NAS!); Kangding County, Jiangzui

Town, 3 May 1974, *Sichuan Forest Exp.* 05269 (CBDI!, PE!); Miyi County, October 1982, *D. Liu* 23990 (CBDI!); Muli County, 2 August 1960, *G.M. Fen* 638 (CBDI!); Muli County, Chabuli Town, 5 September 1983, *Qinghai-Tibet Exp.* 13598 (KUN!); Shimian County, Tianwan Town, 8 July 1980, *Q.Q. Wang & Z.A. Liu* 22618 (CBDI!, IBSC!, WUK!); Shimian County, Ximagu, 1955, *C.C.Hsieh* 40733 (IBSC!, WUK!); Tianquan County, 20 August 1982, *D.Y. Peng* 46329 (IBSC!); Yanyuan County, 14 July 1983, *Anonymous* 21 (HITBC!); Yanyuan County, Maoniushan Mountain, 10 June 1960, *S. Jiang* 5952 (PE!); Yunnan Province: Binchuan County, Dawang Temple, 8 September 1933, *Anonymous* 2431 (PE!); Fengqing County, Hsiaopingkai, 15 May 1938, *T.T. Yu* 15883 (KUN!, PE!); Lijiang County, Shigu Town, 8 June 1981, *Qinghai-Tibet Exp.* 396 (HITBC!, KUN!, PE!); Lijiang County, Shigu Town, 4 July 1960, *S. Jiang* 9682 (KUN!, PE!); Lijiang County, Dajubei Town, 18 August 1962, *Zhongdian Exp.* 1252 (PE!); Lijiang County, Hutiaoxia Town, 20 July 1981, *Anonymous s.n.* (PE!); Lijiang County, Xueshandagu, 26 August 1942, *K.M. Feng* 9173 (KUN!, PE!); Lijiang County, Northwest of the Yangtze bend, 1 July 1913, *G.Forrest* 10351 (PE!); Zhongdian County, Haba Town, 20 September 1962, *Zhongdian Exp.* 2224 (KUN!, PE!); Zhongdian County, Baidi Village, 10 July 1963, *Zhongdian Exp.* 3323 (KUN!); Zhongdian County, Haba Snow Mountain, 2 July 1963, *Zhongdian Exp.* 3005 (KUN!).

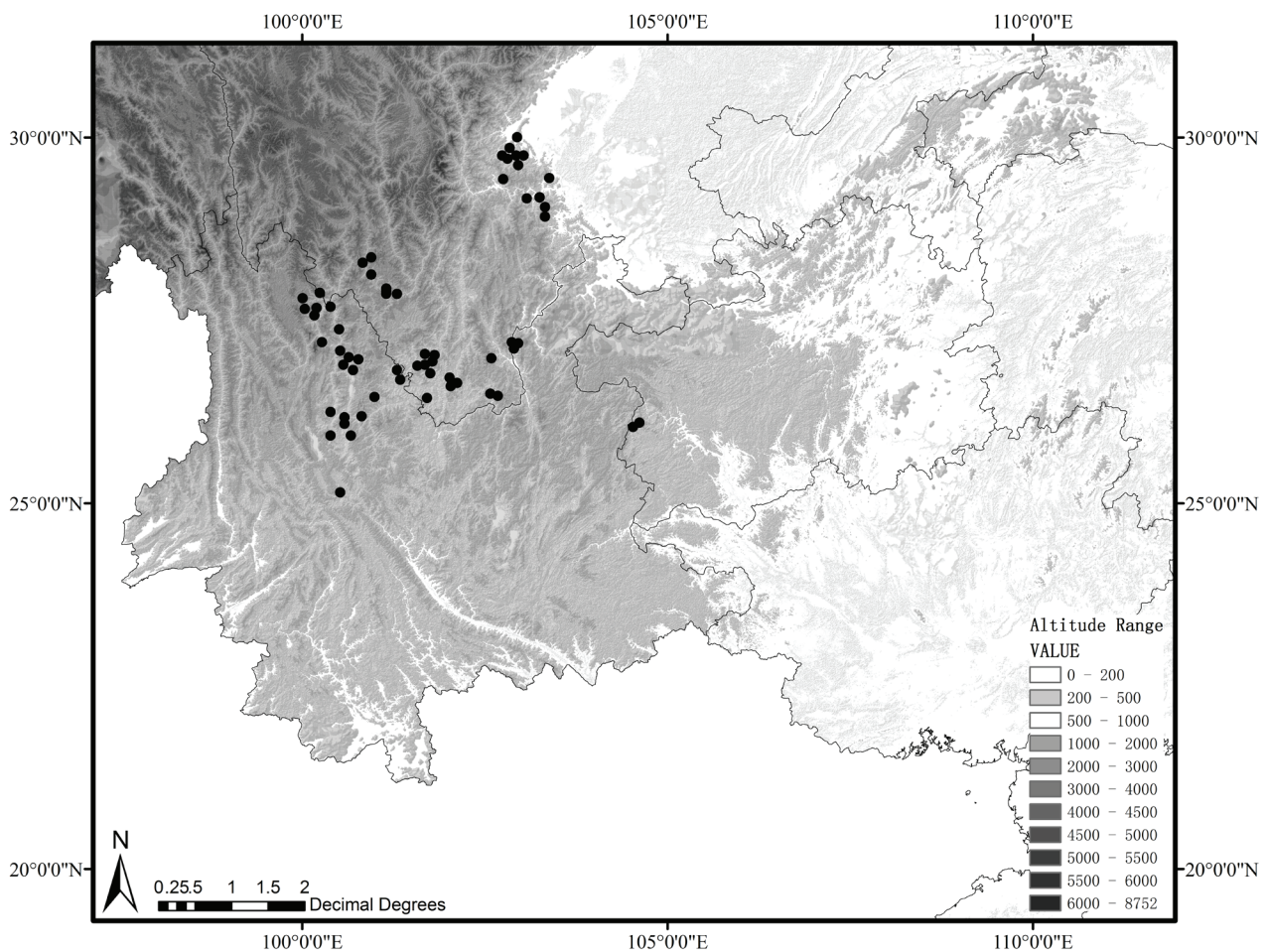


FIGURE 3. Distribution map of *Premna yunnanensis*.

Acknowledgements

The authors are grateful to the keepers of A, E, HITBC, IBK, IBSC, LBG, K, KUN, NYBG, PE, W, WU for providing and allowing reproduction of the images of herbarium specimens, to Ms. Hannah Begley and Erin Mann for offering kind assistances for accessing the JSTOR Global Plants, to Dr. Zhonghui Ma and Mr. Zhuqiu Song for field assistances, to Dr. Chunlei Xiang for providing some photos of *P. yunnanensis*. This work was supported by National Natural Science Foundation of China (grant no. 31460044).

References

Briquet, J. (1897) *Premna*. In: Engler, A. & Prantl, K. (Eds.) *Die natürlichen Pflanzenfamilien*, 2ed edition, Vol. 4 (3a). Engelmann,

Leipzig, 170 pp.

- Chen, S.L. & Gilbert, M.G. (1994) *Premna*. In: Wu, C.Y. & Raven, P.H. (Eds.) *Flora of China*, Vol. 17. Science Press, Beijing & Missouri Botanical Garden Press, St. Louis, pp. 16–27.
- Handel-Mazzetti, H.R.E. (1921) *Plantae novae sinenses, diagnosibus brevibus descriptae*. *Anzeiger der Akademie der Wissenschaften in Wien, Mathematisch-Naturwissenschaftliche Klasse* 58: 227–234.
- Handel-Mazzetti, H.R.E. (1936) *Symbolae sinicae: botanische Ergebnisse der Expedition der Akademie der Wissenschaften in Wein nach Südwest-China, 1914–1918*, Vol. 7 (4). Julius Springer, Vienna, 1450 pp.
- Léveillé, H. (1915) *Catalogue des plantes de Yun-Nan, avec renvoi aux diagnoses originales, observations et descriptions d'espèces nouvelles*. Published by the author, Le Mans, 299 pp.
- Li, B., Cantino, P.D., Olmstead, R.G., Bramley, G.L.C., Xiang, C.L., Ma, Z.H., Tan, Y.H. & Zhang, D.X. (2016) A large-scale chloroplast phylogeny of the Lamiaceae sheds new light on its subfamilial classification. *Scientific Reports* 6: 34343. <http://dx.doi.org/10.1038/srep34343>
- Linnaeus, C. (1771) *Mantissa Plantarum*. Salvius, Stockholm, 587 pp.
- P'ei, C. (1932) The Verbenaceae of China. *Memoirs of the Science society of China* 1: 58–91.
- P'ei, C. & Chen, S.L. (1982) *Premna*. In: Pei, C. & Chen, S.L. (Eds.) *Flora reipublicae popularis sinicae*, Vol. 65. Science Press, Beijing, pp. 81–119.
- Rehder, A. (1917) *Premna*. In: Sargent, C.S. (Ed.) *Plantae wilsonianae an enumeration of the woody plants collected in western China for the Arnold Arboretum of Harvard University during the years 1907, 1908 and 1910 by E.H. Wilson*, Vol. 3 (3). The University press, Cambridge, pp. 371–372, 458.
- Smith, W.W. (1916) Diagnoses specierum novarum in herbario horti regii botanici edinburgensis cognitarum (species chinenses.) *CLL-CCL. Notes from the Royal Botanic Garden, Edinburgh* 9: 71–144.
- Wu, C.Y. (1977) *Premna*. In: Kunming Institute of Botany, Academia Sinica (Eds.) *Flora Yunnanica*, Vol. 1. Science Press, Beijing, pp. 418–441.
- Wu, Z.Y. & Peter, H.R. (1998) *Premna*. In: Wu, Z.Y. & Peter, H.R. (Eds.) *Flora of China Illustrations. Verbenaceae through Solanaceae*, Vol. 17. Science Press, Beijing & Missouri Botanical Garden Press, St. Louis, pp. 45–66.