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New and reassessed species of *Strobilanthes* (Acanthaceae) in the flora of China

Y. F. DENG[1], J. R. I. WOOD[2]* and R. W. SCOTLAND[2]

[1]*South China Botanical Garden, The Chinese Academy of Sciences, Leyiju, 510650, Guangzhou, P. R. China and Kunming Institute of Botany, the Chinese Academy of Sciences, Heilongtan, 650204, Kunming, P. R. China*
[2]*Department of Plant Sciences, University of Oxford, South Parks Road, Oxford, OX1 3RB, UK*

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Several problems in *Strobilanthes* Blume (Acanthaceae: Ruelliae) are clarified as a result of collaboration between Chinese and western botanists. Examination of pollen has permitted clear delimitation of four morphologically similar species, *Strobilanthes szechuanica* (Batalin) J. R. I. Wood & Y. F. Deng, *S. labordei* H. Lév., *S. wakasana* Wakasugi & Naruhashi and ***S. wilsonii*** J. R. I. Wood & Y. F. Deng, the latter described for the first time in this paper, although first collected more than a hundred years ago. A key is provided to help distinguish these species. The globose, echinulate pollen found in several species from China and Japan and assigned to the genus *Championella* by Bremekamp is shown by SEM photography to be distinct from other pollen hitherto regarded as the same. Three new species, ***S. abbreviata*** Y. F. Deng & J. R. I. Wood, ***S. lihengiae*** Y. F. Deng & J. R. I. Wood and ***S. vallicola*** Y. F. Deng & J. R. I. Wood are described. *S. austinii* C. B. Clarke ex W. W. Sm. is lectotypified to show that it is conspecific with *S. lamiifolia* (Nees) T. Anderson, a species demonstrating trans-Himalayan links. New combinations are made for four species as the authors recognize only a single genus, *Strobilanthes* within the Strobilanthinae as defined by Bremekamp. *S. gongshanensis* Tsui and *S. aenobarba* W. W. Sm. are shown to be only varieties of *S. inflata* T. Anderson. Illustrations are provided for all new species. *Botanical Journal of the Linnean Society*, 2006, **150**, 369–390.

ADDITIONAL KEYWORDS: *Championella* – key – lectotypification – pollen – SEM – varieties.

INTRODUCTION

Strobilanthes Blume *s.l.* is much the largest genus of Acanthaceae in China with some 114 species recognized in the recently published Volume 70 of the *Flora Reipublicae Popularis Sinicae* (Hu, 2002). However, there has been only limited access by Chinese botanists to the collections held in European herbaria and similar limited access by western botanists to collections held in China, so there is an obvious need for collaboration between Chinese and western botanists before the publication of Acanthaceae in the Flora of China project sponsored by Missouri Botanical Garden. In order to further this collaboration visits have been made in 2004 to Oxford by the first author and to China by the second author. This has allowed us to reinterpret a number of species and to identify four undescribed species held in different herbaria. It is hoped that this paper will contribute significantly to the understanding of *Strobilanthes* in China.

The authors differ from those who produced the account of Acanthaceae in the *Flora Reipublicae Popularis Sinicae* in regarding the Strobilanthineae *sensu* Bremekamp (1944) as a single genus, *Strobilanthes*. The results of recent molecular studies (Moylan *et al*., 2004), and statistical analysis (Carine & Scotland, 2002), demonstrate clearly that adequate diagnosis of the majority of groups into which the Strobilanthinae has been divided by Bremekamp (1944) and others (Ramamurthy, 1971; Hsieh & Huang, 1978; Cui, 1990; Hu, 2002) is problematic, and that a single monophyletic expanded *Strobilanthes* should be recognized. This concurs with earlier studies based on pollen and gross morphology by Terao (1983), Wood (1994, 1995),

*Corresponding author. E-mail: jriwood@hotmail.com

Carine & Scotland (1998), Wood, Bennett & Scotland (2003), and Wood & Scotland (2003a, b), which have argued that Bremekamp's segregate genera are mostly ill defined and unsatisfactory on traditional grounds. In this paper, we have sometimes made reference to Bremekamp's segregate genera as a convenient way of describing certain species clusters but we do not wish to imply that we accept his classification at any level.

SPECIES PLACED IN *CHAMPIONELLA* BREMEK.

One of the genera described by Bremekamp (1944: 150) and restricted to China, Korea and Japan is *Championella*. This is a relatively well defined group of mostly weak, decumbent isophyllous herbs, in which the flowers are grouped into few-flowered, terminal spikes in which the bracts are persistent and foliose. The inflorescence is usually covered in prominent, large-celled white hairs, the calyx is subequally 5-lobed to the base and there are four fertile stamens. The corolla of most species is small and funnel-shaped but in some, most notably *Strobilanthes oligantha* Miq. and *S. longiflora* Benoist, it is much larger, reaching 4.5 cm in length, strongly bent and ventricose. Bremekamp claimed (1944: 150) that the pollen was uniformly globose and echinulate with echinulae raised on low ridges, and seemed (1944: 149 infra) to think it was similar to that of those species he placed in *Gutzlaffia*. This is not strictly true and the use of the SEM has allowed us to distinguish at least three different pollen types within the species Bremekamp (1944: 150) and others (Hossain, 1973, 1980; Hu, 2002) assigned to *Championella* (Figs 1–8).

The pollen of four species placed in *Championella*, *Strobilanthes tetrasperma* (Champ.) Druce, *S. japonica* (Thunb.) Miq., *S. oligantha* and *S. longiflora*, is indeed globose but unlike that of species placed by Bremekamp in *Gutzlaffia*, such as *Strobilanthes aprica* (Champ.) T. Anderson ex Benth. (Wang & Blackmore 2003: 85). Close examination shows that the punctate insulae (echinulae) are irregularly developed, sometimes apparently absent and of different size (Figs 1–3). This is an uncommon feature of pollen in *Strobilanthes* but has been noted amongst species assigned to *Hemigraphis* (Moylan, Pennington & Scotland, 2002: 778, fig. 3D). This observation may be of some interest as the species assigned to *Championella* are mostly similar in habit to the somewhat weedy species often assigned to *Hemigraphis*.

In addition, the pollen grain of all four species seems to be weaker than in other species of *Strobilanthes* and commonly collapses in the acetolysis process. This may be the reason why it has never been illustrated, even in publications where it might be expected to appear (Terao, 1982; Wang & Blackmore, 2003), although a sketch appears in *Flora Reipublicae Popularis Sinicae* (Hu, 2002: 95).

The pollen of the three other species we have been able to examine and which are usually considered part of the *Championella* group is rather different. In the case of *S. labordei* H. Lév. it is globose, echinulate with uniform spines developed on the punctate insulae (Figs 5, 6). The ridges on which the insulae are arranged are obscure. This pattern is consistent in all five collections we have examined (Bodinier 2693, Henry 7421, Fan & Li 230, Cavalerie 327, S. K. Lau 4274) and is similar to the pollen of *S. aprica*. In the case of *S. wakasana* Wakasugi & Naruhashi from Japan, the pollen is intermediate between that found in *S. labordei* and that found in the four species discussed in the previous paragraphs, that is, the insulae are mostly perfect but the spines are irregularly developed (Fig. 7). The final species is *Strobilanthes wilsonii* J. R. I. Wood & Y. F. Deng (Fig. 4), in which the pollen is ellipsoid in shape with prominent pseudocolpi but otherwise similar to that described for *S. oligantha* and *S. tetrasperma*. This species is described below.

The *Championella* group of species is relatively easy to distinguish in Japan, where only the three species *S. oligantha*, *S. japonica* and *S. wakasana* occur. However, the situation in China is much more complex. Two species, *S. oligantha* and *S. longiflora* Benoist, are distinguished by their large, ventricose and often curved corolla. The five species with an infundibuliform corolla can be separated by the following key:

1 Leaves ± glabrous on the upper surface although sometimes hirsute on the petiole; pollen with insulae irregularly formed along obscure ridges. 2
Leaves sparsely to densely pubescent on the upper surface; pollen with regularly formed insulae, some or all of these capped with echinulae. 5
2 Leaves entire or undulate; inflorescence devoid of white hairs or nearly so. 3
Leaves crenate or serrate; inflorescence with prominent white hairs. 4
3 Leaves oblong to very narrowly elliptic, tapering at both ends, 2–6 cm long, petiole glabrous or nearly so; calyx with a few scattered large-celled hairs. ..... *Strobilanthes japonica*
Leaves ovate, rounded to broadly cuneate at the base, < 2.2 cm long, petiole puberulent; calyx without large-celled hairs. ..... *Strobilanthes szechuanica*

4 Petiole nearly as long as the leaf blade, coarsely hirsute with large-celled hairs; pollen ellipsoid. ..... ***Strobilanthes wilsonii***
Petiole much shorter than the leaf blade, thinly to densely pubescent with normal hairs; pollen globose. ..... *Strobilanthes tetrasperma*
5 Bracteoles linear, clearly parallel-sided, calyx lobes ciliate on the margins..... *Strobilanthes wakasana*
Bracteoles oblanceolate, clearly widest near the apex; calyx lobes comose but with almost no marginal hairs. ..... *Strobilanthes labordei*

It should be noted that *S. labordei* and *S. wakasana* are very similar although widely separated geographically. It is quite possible that other morphologically similar plants often assigned to *S. tetrasperma* or *S. oligantha* are, in fact, distinct species. This group is in need of thorough revision by someone with access to material both in the field and in the herbarium throughout south and east China.

Strobilanthes wilsonii J. R. I. Wood & Y. F. Deng, **sp. nov.** inter species isophyllas calyce 5-lobato, granula pollinis echinulata, echinulis in series meridionales dispositis Bremekamp ad *Championellam* Bremek. ascripsit, habitu *S. labourdei* H. Lév. et *S. wakasanae* Wakasugi & Naruhashi, sed granulis pollinis ellipticis, foliis subglabris basin longiattenuatis, corolla parviore distincta.

Type: China, Sichuan, E. H. Wilson 4301 (holotype K, sheet with corollas, isotypes K, BM). Figure 9.

Synonym: *Acanthopale debilis sensu* S. Moore in *Journ. Bot*. 63: 167 (1925), non Hemsley (1890).

Isophyllous perennial herb; stems procumbent, rooting at the nodes, eventually ascending to *c*. 30 cm, sulcate, glabrous; flowering branches arising in pairs from the nodes, apparently erect, 3–20 cm long, the stem sparsely bifariously pilose, especially above, with reflexed, whitish, large-celled hairs. Leaves petiolate; petioles 0.5–2 cm long, bifariously hirsute with short, reflexed, whitish hairs; blades 1.5–3 × 1–1.5 cm, narrowly to broadly elliptic to obovate-spathulate, very shortly acuminate to an obtuse apex, at the base attenuate, margin serrate, glabrous except for a few marginal hairs above the petiole, cystoliths prominent above. Inflorescence of shortly pedunculate, axillary and terminal leafy, few-flowered, head-like spikes; peduncles 2–18 mm long, pilose; spikes 1–1.5 cm long; bracts 4–13 × 2–6 mm, diminishing in size upwards, elliptic to obovate-spathulate, ±obtuse at the apex, the margin below entire, ciliate with thick white, spreading hairs below, above toothed, glabrous, outer surface glabrous, inner surface with a few hairs towards the base; bracteoles 2–3 × 0.5 mm, oblanceolate, ±rounded at the apex, ciliate with a few large white hairs up to 2 mm long; calyx *c*. 6 mm long, subequally 5-lobed to *c*. 1 mm above the base, lobes *c*. 4.5–5 × 0.75–1 mm, linear-oblong with a slightly spathulate tip, obtuse, pallid but with green tips, pilose with large-celled, mostly marginal hairs; corolla 1.2–1.5 cm long, funnel-shaped from a very short basal, cylindrical tube *c*. 2 mm long, blue, pilose on the exterior, lobes *c*. 2 × 2.5 mm, ovate, obtuse; stamens 4, didynamous, the longer pair shortly exserted; 1 staminode placed between the staminal pairs; filaments of longer stamens *c*. 5 mm long, glabrous above, sparsely pilose below, filaments of shorter stamens *c*. 2.5 mm long, glabrous; anthers oblong, *c*. 0.75 × 0.2 mm; pollen tricolporate, 55 × 30 μm, ellipsoid, bireticulate, pseudocolpate, echinulate, the echinulae rounded and variable in the degree of development (Fig. 4); ovary pilose; style 12 mm long, pilose. Capsule (immature), *c*. 2.5 mm long, pilose with large-celled hairs, 4-seeded.

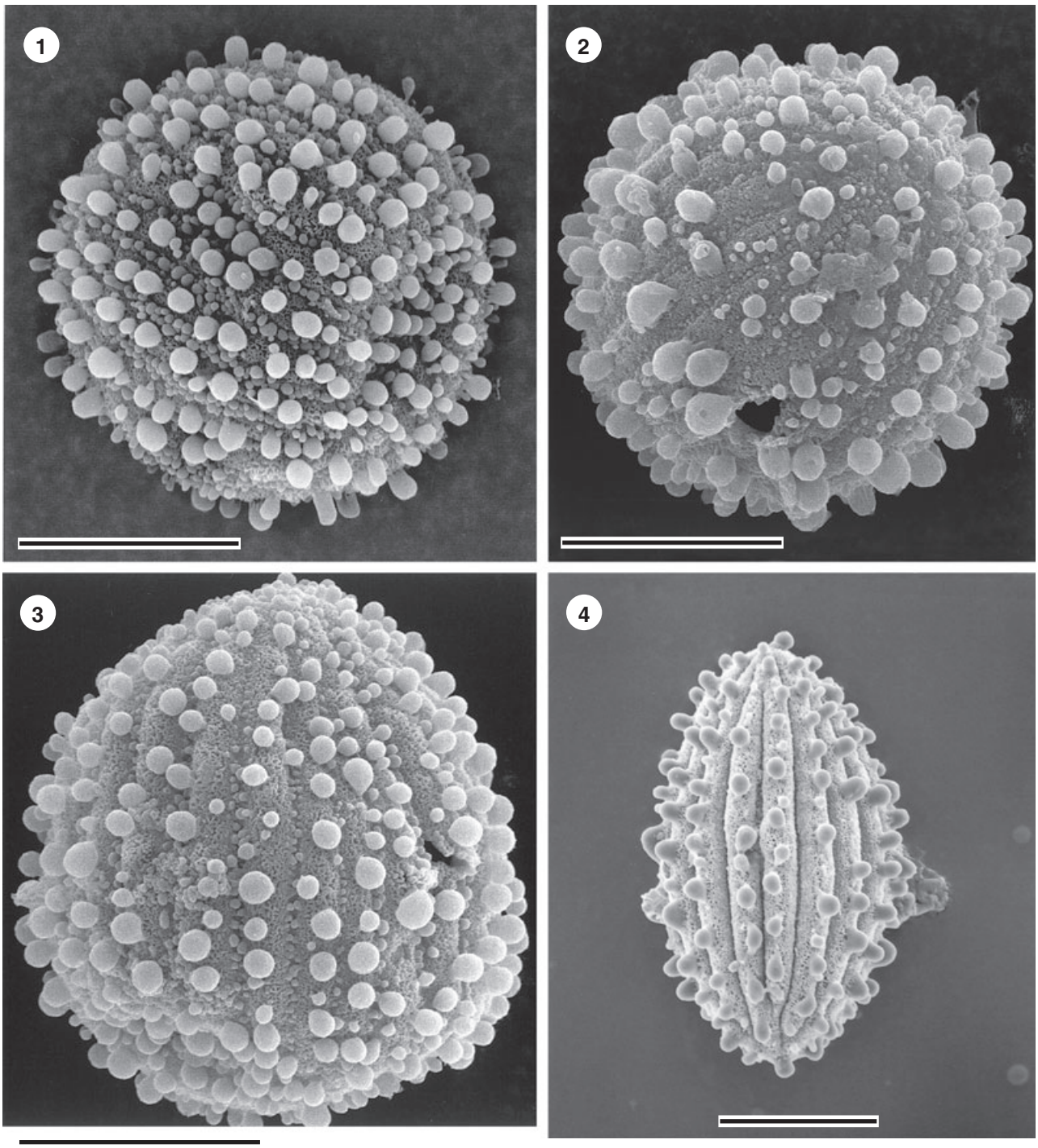
Apart from the distinctive pollen and the presence of a staminode, distinctive features of this species include the long-petiolate, serrate, glabrous leaves and the prominent large-celled white hairs present not only on the calyx and the bracteoles but also on the bracts and petioles.

Type locality: CHINA. Sichuan: Kurting (Leshan), 4.x.1903, E. H. Wilson 4301 (BM, K).

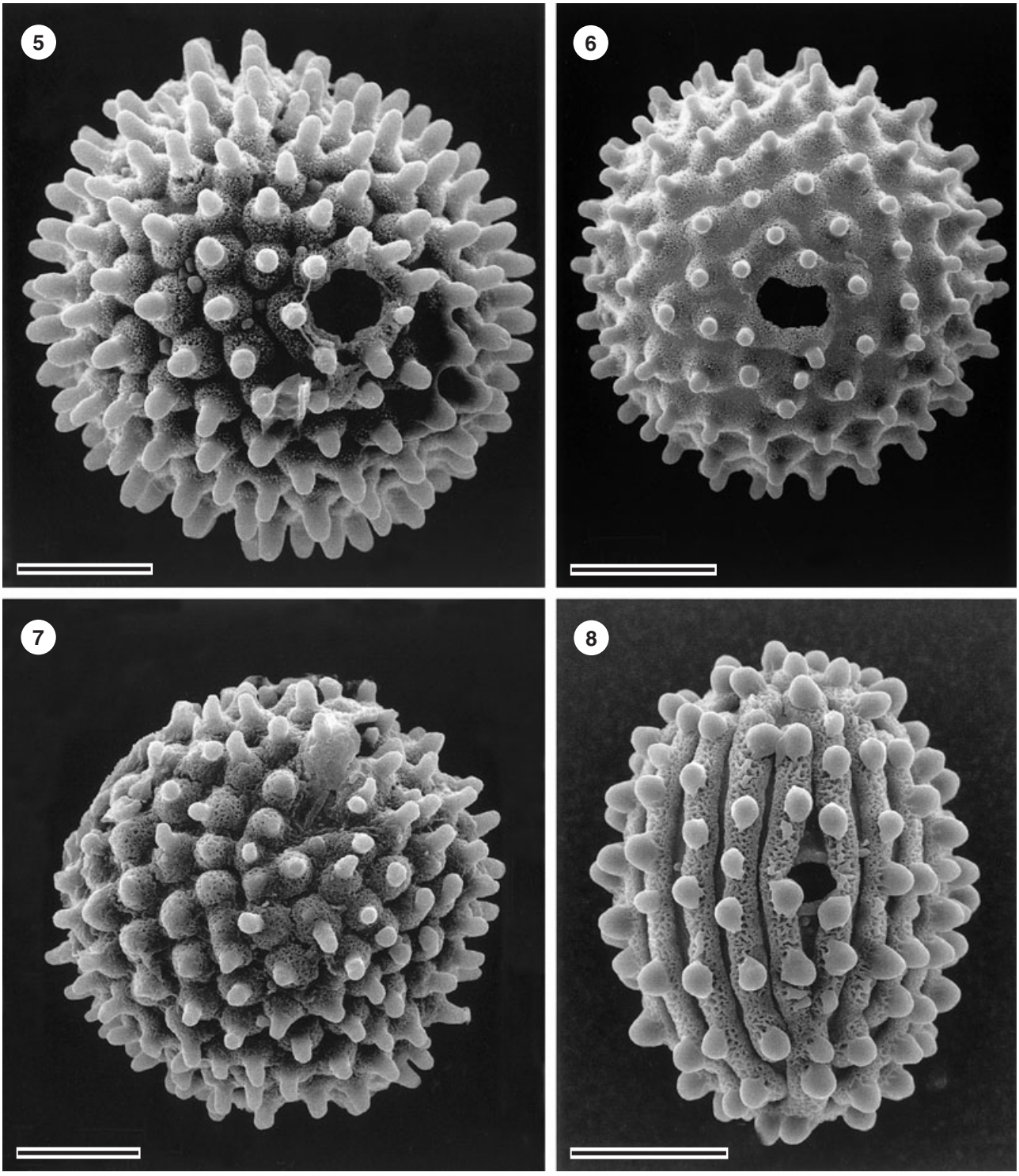
Etymology: The species is named after E. H. Wilson who is famous for his plant collections and for introducing numerous Chinese species to western gardens.

Habitat and distribution: Moist, shady places, but known only from the type collection made from Sichuan, China.

The herbaceous habit and small, funnel-shaped corolla place this species superficially close to *S. tetrasperma* (Champ.) Druce, *S. szechuanica* (Batalin) J. R. I. Wood & Y. F. Deng, *S. labordei* and *S. wakasana* Wakasugi & Naruhashi. From the last two species it can be distinguished by its small corolla and glabrous leaves, and from *S. tetrasperma* and *S. szechuanica*, by its different-shaped, serrate leaves. From all species, which are apparently related, it dif-



Figures 1–4. Pollen of *Strobilanthes* species. Scale bars = 20.0 μm. Fig. 1. *S. japonica* (Thunb.) Miq. from *Cavalerie* 4136. Fig. 2. *S. tetrasperma* (Champ.) Druce from *Li Zhiyu* 1218. Fig. 3. *S. oligantha* Miq. from *Cheng* 8. Fig. 4. ***S. wilsonii*** J. R. I. Wood & Y. F. Deng from E. H. Wilson 4381.



Figures 5–8. Pollen of *Strobilanthes* species. Scale bars = 20 μm. Fig. 5. *S. labordei* H. Lév. from Bodinier 2693. Fig. 6. *S. labordei* H. Lév. from Henry 7421, type of *S. debilis* Hemsl., non C. B. Clarke. Fig. 7. *S. wakasana* Wakasugi & Naruhashi from Kodama 13319. Fig. 8. ***S. vallicola*** Y. F. Deng & J. R. I. Wood from Xuan Shujie 74.

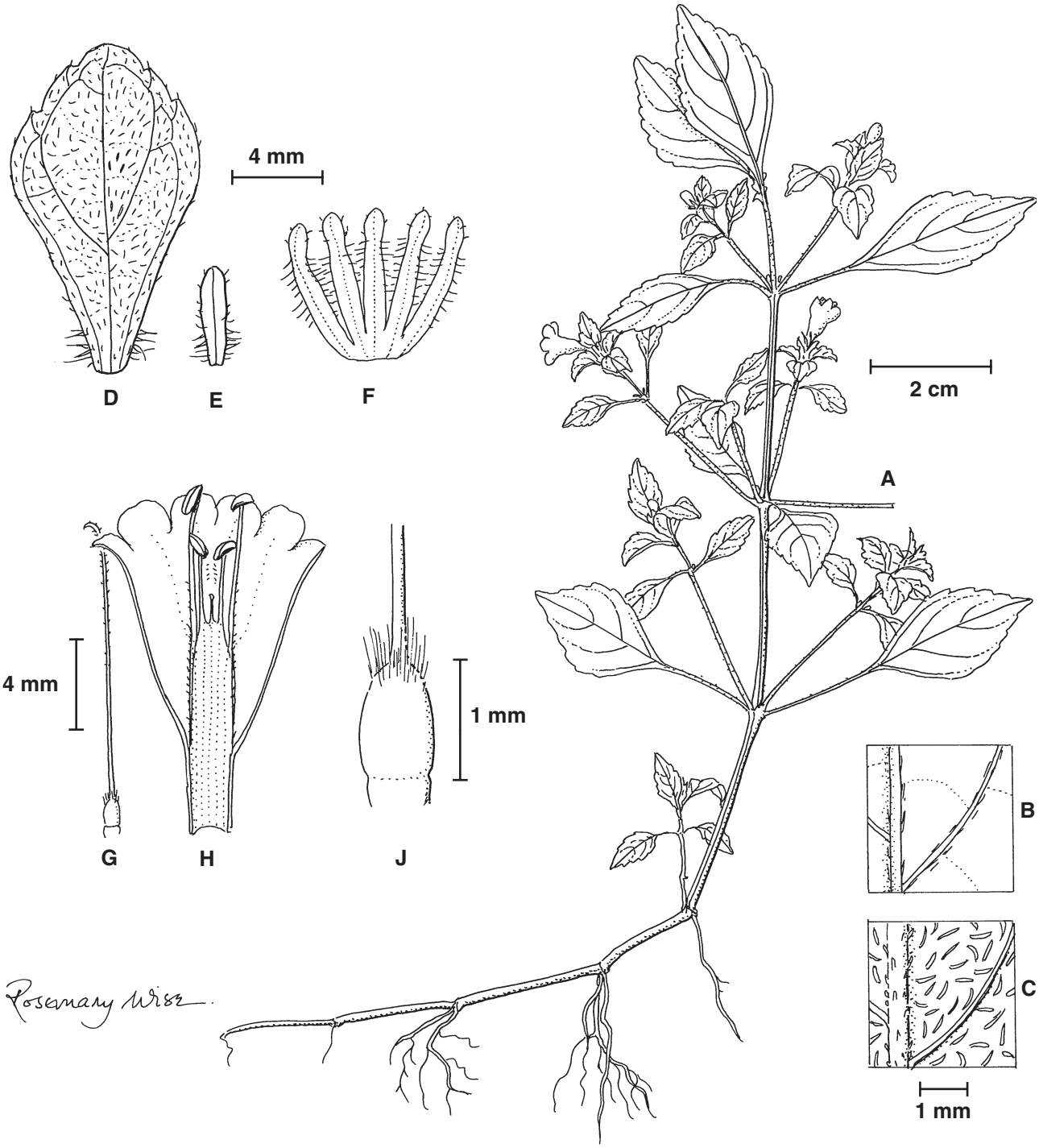


Figure 9. ***Strobilanthes wilsonii*** J. R. I. Wood & Y. F. Deng. A, habit; B, lower surface of leaf; C, upper surface of leaf; D, bract; E, bracteole; F, calyx; G, style; H, corolla, opened out; J, ovary. Drawn from E. H. Wilson 4301 by Rosemary Wise.

fers in its distinctive pollen (Fig. 4). Similar pollen is rare in *Strobilanthes* but is found in a few morphologically and geographically disparate species such as *Strobilanthes mogokensis* Lace from Burma (Wood & Scotland, 2003a: 124), *S. assimulata* S. Moore from Sumatra and *S. vallicola* Y. F. Deng & J. R. I. Wood described below.

Strobilanthes labordei H. Lév. in Fedde, Rep. Sp. Nov. 12: 20 (1913).

Type: China, Guizhou, Laborde in Bodinier 2693 [lectotype E, chosen by E. Hossain (1973: 405)].

Synonyms: *Acanthopale labordei* (H. Lév.) Hand.-Mazz. in *Sinesia* 5: 20 (1934). *Championella labordei* (H. Lév.) E. Hossain in *Notes Roy. Bot. Gard. Edinburgh* 32(3): 405 (1973). *Strobilanthes debilis* Hemsl. in *Journ. Linn. Soc*. 26: 239 (1890), non *S. debilis* C. B. Clarke in Hook. f., *Fl. Br. Ind*. 4: 467 (1885). Type: China, Hubei, *A. Henry* 7421 (lectotype K, chosen here, isolectotype A). *Championella debilis* (Hemsl.) Bremek., in *Verh. Ned. Akad. Wetens. Afd. Nat. Sect*. 2,41(1): 150 (1944).

Strobilanthes labordei obviously belongs to the *Championella* group by its gross morphology, but differs from other species in its pollen (Figs 5, 6). Of the specimens of this species we have been able to examine, the type of *S. labordei* and that of *S. debilis* Hemsl. have the same pollen and are clearly conspecific. As these two names are wrongly treated as distinct species by Hu (2002: 91, 94), *S. debilis* Hemsl. under *Championella tetrasperma* (Champ.) Bremek and *S. labordei* under *Championella labordei* (H. Lév.) E. Hossain, respectively, we have formally united them above, taking the opportunity to lectotypify *S. debilis* Hemsl.

Apart from the distinctive pollen, this species can be recognized by its small, ovate, crenate leaves which rarely exceed 3 cm in length and are covered on both surfaces with spreading hairs. The inflorescence is covered in numerous prominent, white hairs. *Strobilanthes labordei* is superficially very similar to the Japanese endemic *S. wakasana*, differing in the oblanceolate rather than linear calyx lobes as well as the pollen in which the echinulae are irregularly formed (Fig. 7).

Habitat and distribution: Endemic to China, widespread in the south and centre of the country but with few confirmed records. CHINA. Guangdong: cult. in Hong Kong Botanical Garden ex Lofau Shan, 1883, C. Ford 96 (BM, K); Lofau Shan, 9–27.viii.1917, E. D. Merrill 11095 (CAS); Ruyuan Xian, 27.xi.1957, C. Wang 44323 (IBSC, MO); ibid., Deng Liang 5865 (MO). Guizhou: Kao-Po (Tsin Gay) Mountain, 11.ix.1899, Laborde in Bodinier 2693 (E); Pin-fa [near Guiyang], 26.viii.1902, Cavalerie 323 p.p. (E); Sanhoa, Yaoren-shan, 400–700 m, 10.viii.1930, Y. Tsiang 6383 (IBSC, PE). Hunan: Changning, Yang-Shan, 700 m, 7.xii.1935, C. S. Fan & Y. Y. Li 230 (BM, GH); Hengyang, Gouloufeng Nature Reserve, 300 m, 13.viii.1997, Zuo Jiabu 0895 (MO). Jiangxi: Sai Hang Cheung near Tung Lei Village, Kiennan District, 1–29.viii.1934, S. K. Lau 4274 (BM, GH). Yunnan: probably north-east, Lou Mong Touan, 1902, Cavalerie 323 p.p. (E, K). Hubei: Chienshih [Jianshi], A. Henry 7421 (A, K).

Strobilanthes szechuanica (Batalin) J. R. I. Wood & Y. F. Deng, **comb. nov.**

Basionym: *Hemigraphis szechuanica* Batalin in *Acta Hort. Petrop*. 13: 384 (1894). *Type*: China, Sichuan, Potanin s.n. (holotype LE, n.v., isotype K).

This species is only known from the type. It is similar to *S. tetrasperma* in its subglabrous leaves and puberulent petioles but is readily distinguished by its entire, ovate leaves 5–21 mm in length. The leaves are basally rounded to broadly cuneate and then slightly attenuate at the base. The bracts are ovate and resemble small leaves, unlike those of *S. tetrasperma* which are obovate-spathulate. The inflorescence lacks the large-celled white hairs found in almost every species in this group.

We have been unable to examine the pollen of this species but Lindau's notes on the specimen at St Petersburg agree with Clarke's sketch on the Kew specimen that the pollen is globose and echinulate. Without an SEM photograph we cannot say whether it is similar to that of *S. labordei* or resembles the more common type found in this group of species, as in *S. japonica* and *S. tetrasperma*. It is clear, however, that is not like that of *S. wilsonii*.

The original description by Batalin is misleading as it describes the leaves as hairy on both surfaces. This is not the case and it seems that Batalin probably mistook the very prominent cystoliths seen on both leaf surfaces for hairs.

THE IDENTITY OF *STROBILANTHES AUSTINII*

Strobilanthes austinii (named after Austin Henry) was described by William Smith based on three specimens in the Kew Herbarium representing three different collections annotated with the manuscript name *Strobilanthes austinii* by C. B. Clarke. However, these three collections represent two distinct species. Henry 9956 and 13382 are *S. lamiifolia*, whereas Henry 9159 A is *S. longiflora* described by Benoist four years later. All three sheets are annotated with the name *S. austinii* by Clarke, but his illustration on the herbarium sheet and description of the pollen refer to the ellipsoid, ribbed, scalariform type found in *S. lamiifolia*. Moreover, he separated out the other sheets of Henry 9159, correctly recognizing the pollen as globose and echinulate but not assigning any different name to these sheets.

Smith's description is a composite of elements from the three syntypes, but from his diagnosis he seems to have thought the plant was related to *S. hancockii*

which he described in the same paper. Lectotypification is therefore important to clarify this confused situation, and we have selected Henry 13382 as the better of the two original syntypes which correspond to *S. lamiifolia*. This has the advantage that it maintains the interpretation of *S. austinii* adopted by Bremekamp (1944: 231), Terao (in sched.) and Hu (2002: 161).

Strobilanthes lamiifolia (Nees) T. Anderson in *Journ. Linn. Soc*. 9: 476 (1867).

Synonyms: *Goldfussia lamiifolia* Nees in Wall., *Pl.As. Rar*. 3: 88 (1832). Type: Nepal, Wallich 2347 (lectotype K-W, chosen here). *Ruellia rotundifolia* D. Don, *Prodr. Fl. Nepal*: 120 (1825). Type: Nepal, *Wallich* s.n. (holotype ?BM, ex Herb. Lambert, n.v). *Pteracanthus rotundifolius* (D. Don) Bremek., in *Verh. Ned. Akad. Wetens. Afd. Nat. Sect*. 2,41(1): 199 (1944). *Strobilanthes mahongensis* (‘*makongensis*’) H. Lév., *Cat. Pl. Yunnan*: 6 (1915). Type: China, Yunnan, E. E. Maire s.n. (lectotype E, chosen here, isolectotype BM). *Goldfussia mahongensis* (H. Lév.) E. Hossain in *Notes Roy. Bot. Gard. Edinb*. 32(3): 407 (1973). *Strobilanthes hancockii* C. B. Clarke ex W. W. Sm. in *Notes Bot. Gard. Edinb*. 10: 193 (1918). Type: China, Yunnan, Hancock 104 (lectotype K). *Goldfussia hancockii* (C. B. Clarke ex W. W. Sm.) Bremek., in *Verh. Ned. Akad. Wetens. Afd. Nat. Sect*. 2,41(1): 231 (1944). *Strobilanthes austinii* C. B. Clarke ex W. W. Sm. in *Notes Bot. Gard. Edinb*. 10: 190 (1918). Type: China, Yunnan, A. Henry 13382 (lectotype K, chosen here). *Goldfussia austinii* (C. B. Clarke ex W. W. Sm.) Bremek., in *Verh. Ned. Akad. Wetens. Afd. Nat. Sect*. 2,41(1): 231 (1944).

The above synonymy is more extensive than that accepted by Wood (1994: 247) as we have included *S. hancockii* and S. *austinii* within *S. lamiifolia*.

Habitat and distribution: This is a locally frequent plant of dry valleys, where it is commonly associated with Chir Pine (*Pinus roxburghii* Sarg.), found in three disjunct areas: east-central Nepal; Bhutan and Arunachal Pradesh (India); south-eastern and central Yunnan, just entering Guizhou and Sichuan (China). It grows between 1000 and 3000 m. Figure 10.

Plants from the western part of its range are fairly uniform with pubescent bracts and small, acute, pubescent leaves (up to 6 cm long but commonly about 4 cm). Even here there is variation in leaf shape from ovate and almost rounded to narrowly elliptic, and also in leaf dentation, from crenate to serrate. However, plants from Yunnan are far more variable. Some specimens have entirely glabrous leaves and bracts (Hancock 104, Henry 10027) while most have longer, more obviously elliptic leaves than populations further west, although this is not consistent. Some specimens, Ducloux 4021 or Schneider 2566, for example, have leaves similar in size and shape to those common in Bhutan. In a few specimens, the leaves are unusually large with deeply incised-dentate margins (Ducloux 924, 4022, 5740) and most striking of all, Delavay 242, but these intergrade with the more common serrate-margined leaves. NEPAL. Sin data, Wallich 2347 (K, BM); sin data, Wallich s.n. (W); Bhumludandi to Risingo, 2000 m, 11.ix.1964, *Banerji* 1329 (A); Nagurjong Hill, Bagmati Zone, 1 km NW of Kathmandu, 2000 m, 23.x.1966, Nicolson 2698 (BM); between Sundarijal and Pati-Banjang [27°48′-N, 85°26′-E], 1900 m, 4.ix.1974, de Haas 2614 (BM); Pati Bhanjhang [27°48′-N, 85°28′-E], 2300 m, 9.ix.1974, Stainton 7197 (BM); above Taulo Pakha, 2000 m, 13.x.1975, Schilling 2114 (K); Nagarkot, NE Kathmandu [27°43′-N, 85°31′-E], 1550–1860 m, 22.ix.1993, Himalaustria Project Team 242 (K). BHUTAN. Punakha, Hing Lai La, 2800 m, 24.viii.1949, Ludlow, Sherriff & Hicks 19639 (BM); ibid, Wangdi Phodrang, 1800 m, 11.ix.1967, Bowes Lyon 5002 (BM); ibid, near Lomitsawa, 2100 m, 2.x.1987, J. R. I. Wood 5887 (E, FHO); ibid, near mini-hydel above Thinleygang, 2000 m, 2.ix.1988, J. R. I. Wood 6627 (E); Mongar, 1700 m, 5.xi.1991, J. R I. Wood 7490 (E, FHO); Tashigang, around Tashiyangtse, 1900–2100 m, 8.xi.1991, J. R. I. Wood 7502 (E). INDIA. Arunachal Pradesh**:** Pangchen, Shati, Nam Jang Chu, 2150 m, 3.xi.1938, Ludlow, Sherriff & Taylor 7033 (BM); Gyipo-Karteng, Nyam Jang Chu, 2150 m,

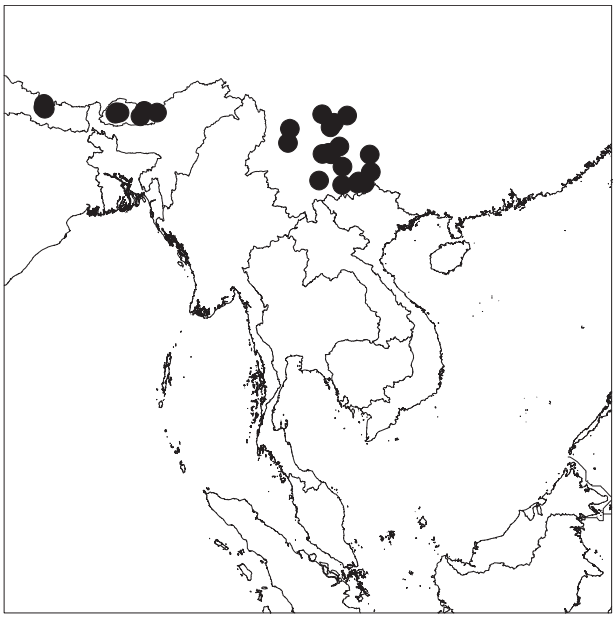


Figure 10. Map showing the distribution of *Strobilanthes lamiifolia* (Nees) T. Anderson.

4.xi.1938, Ludlow et al. 7073 (BM). CHINA. Guizhou: Houang-tsao-pa (near Xingyi), 1916, M. Cavalerie s.n. (P). Sichuan: Butuo Xian, Jiaojihe Qu, Lianhe Xiang, path to Sanchahe, 1400 m, 22.viii.1959, Chuan Jing Liang 5727 (KUN, PE); Dechang Xian, Longwo Qu, 2200 m, 5.ix.1959, Zhu Shuifa 20199 (KUN, PE); Dechang Xian, Longwo Qu, 2100 m, 4.ix.1959, Zhu Shuifa 20185 (KUN, PE); Huidong Xian, 2500 m, 14.ix.1983, Liu Daiming 107 (KUN). Yunnan: Dali Xian, Pingpo Gongshe, 2000 m, 8.viii.1966, Luo Kaijun et al. 613487 (KUN); Fumin Xian, Zhebei to Yangjiachang, 1800–2000 m, 29.x.1964, P. Y. Chiu 596445 (KUN); Guangnan Xian, near Zhetu, 1520 m, 6.xi.1965, Exped. to Wenshan 249 (KUN); Heqing Xian, Ta-Pin-Tze, viii.1882, M. Delavay 242 (K, P); ibid., Hechuang Xiang, 6.x.1958, Wang Wencai Dali-381 (KUN); Kunming, Xishan Qu, Huiwan, 1800 m, 17.viii.1977, P. Y. Chiu 77494 (KUN); Lufeng Xian, Yipinglang Zhen, 1750 m, 6.i.1959, Zhou Xuan 241 (KUN); Mong-tze [Mengzi] Hsien, Tze chuan, 1700 m, 24.x.1939, C. W. Wang 83540 (KUN, PE); Mengtsu [Mengzi], 1200 m, 12.xii.1958, Wang Wencai 10303 (KUN); Mengtze [Mengzi], 950 m, Henry 10027 A (E, K); Mengtze [Mengzi], 1800 m, A. Henry 10027 (E, K); Mengtze [Mengzi], ix.1893, W. Hancock 104 (K); Wenshan Xian, Xiao-ping-ba, 1900 m, 2.viii.1998, Shui Yumin 7358 (KUN); Wenshan, Sanyuandong, 1400 m, 12.x.1958, H. T. Tsai 58–8402 (KUN); Wenshan, Diguangshan, 2200 m, 26.ix.1958, H. T. Tsai 58–8158 (KUN); Xichou Xian, Xisa, 1500 m, 17.x.1958, H. T. Tsai 58–8519 (KUN); Xundian Xian, Yinghe Xiang, 2200 m, 28.viii.1958, Li Xiwen 21 (KUN); Yanshan, Timoho Shan, 1200 m, 12.x.1939, C. W. Wang 84342 (KUN, PE); Yanshan, Kwangying Shan,1300 m, 22.ix.1939, C. W. Wang 83726 (KUN, PE); Yuanjiang Xian, Yangchajie, 2100 m, 9.x.1965, Yin Wenqing 1636 (KUN); ibid., Yangchajie, 1600–1800 m, 22.x.1964, Li Yanhui 5650 (KUN); Mi-lê, Henry 9956 (K); Yuanchay, 1600 m, Henry 13382 (K); Kiao Kia [Qiaojia], 7.vii.1908, F. Ducloux 5740 (P); Kiao Kia [Qiaojia], 19.vii.1908, F. Ducloux 5739 (P); Kiao Kia [Qiaojia], 7.vii.1908, F. Ducloux 924 (P); Yong Pe. 2.vii.1906, F. Ducloux 4421 (P); Tchao Tong [Zhaotong], 13.ii.1905, F. Ducloux 4022 (P); Tchen Hiong, prefecture de Tchao Tong, 13.ii.1905, F. Ducloux 4021 (P); Yunpe, 1920, Simeon Ten 137 (E); San-chan, 800 m, 10.viii.1921, R. P. Maire s. n. (P); Hi-shan, 29.viii.1916, O. Schoch 331 (K); Hay Tien, vi.1904, F. Ducloux 2605 (P); Ma-hong, 2800 m, E. E. Maire s. n. (BM, E); M. Beauvais 482 (P); Io-chau, 3300 m, viii.1913, E. Maire 909 (E); Salween-Irrawady, 2200 m, 1914, C. Schneider 2566 (K).

Strobilanthes longiflora Benoist in *Bull. Mus. Hist. Nat. Paris* 28: 94 (1922). *Type*: China, Yunnan, Leduc s.n. (lectotype P, chosen here).

Synonyms: *Championella longiflora* (Benoist) C. Y. Wu & C. C. Hu in *Flora Reip. Pop. Sin*. 70: 91 (2002). *Strobilanthes austinii* C. B. Clarke ex W. W. Sm. in *Notes Bot. Gard. Edinb*. 10: 190 (1918)., *pro parte quoad* Henry 9159 A. *Strobilanthes strigosa* D. Fang & H. S. Lo in *Guihaia* 17: 36 (1997). Type: China, Guangxi, Rao Weiyuan & Yen Kenchien 23693 (holotype GXMI).

Strobilanthes longiflora has pollen typical of the species placed in *Championella* by Bremekamp and also has the distinctive large-celled white hairs on the inflorescence. The spathulate bracteoles are distinct, but even more so is the very long, curved corolla which reaches 4.5 cm in length. The plant appears always to be sterile and is known from very few collections.

Some new species and combinations from China

Strobilanthes abbreviata Y. F.Deng & J. R. I. Wood, **sp. nov.,** colore olivaceo, cystolithis numerosis prominentibus, floris in spicis longis axillaribus dispositis, bracteis persistentibus, textura coloreque loborum calyce, corolla grande, glabra et curvata, manifeste ex affinitate *S. paucinervis* T. Anderson et *S. cystolithigerae* Lindau sed bracteis glandulosissimis, ellipticis, abrupte abbreviatis, mucrone deciduo indutis recedit. Type: Thailand, Chiangmai, H. B. G. Garrett 1225 (holotype K, isotype E). Figure 11.

Isophyllous shrub with rounded, solid, woody ascending stems up to 9 mm in diameter and reaching 3 m in height; bark smooth, dull brown; young stems sulcate, striate, glabrous. Leaves equal in each pair, petiolate; petioles 1–2.5 cm long, glabrous; blades 6–25 × 2.5–9 cm, oblong-elliptic, tapered to a long-acuminate, sometimes falcate apex, at base long-attenuate onto the petiole, margins serrate, glabrous and with numerous small cystoliths on both surfaces, above darker, below paler, olive-green. Inflorescence of single axillary spikes (rarely with a reduced second spike below) in each leaf axil forming a long leafy inflorescence 30–50 cm in length, often with some spikes on the leafless woody, lower stem; spikes 2–14 cm long, characteristically olive-green in colour, very shortly but distinctly pedunculate, peduncles 1–3 mm long, rhachis glabrous; flowers arranged in opposite pairs, both usually fertile; bracts 5–7 × 3–4 mm, persistent into fruit, rigid, concave, broadly oblong-obovate, abruptly truncate and with a short, broad, deciduous, apical mucro; the dorsal surface densely covered in cystoliths, dotted with small sessile brownish glands (these sometimes developing into stipitate glands on fruiting specimens) and often with larger, sticky glandular patches along the midrib; bracteoles 10–13 × 1–2 mm, slightly shorter than the calyx, concave, rather rigid, lanceolate to oblong-lanceolate, obtuse, glabrous

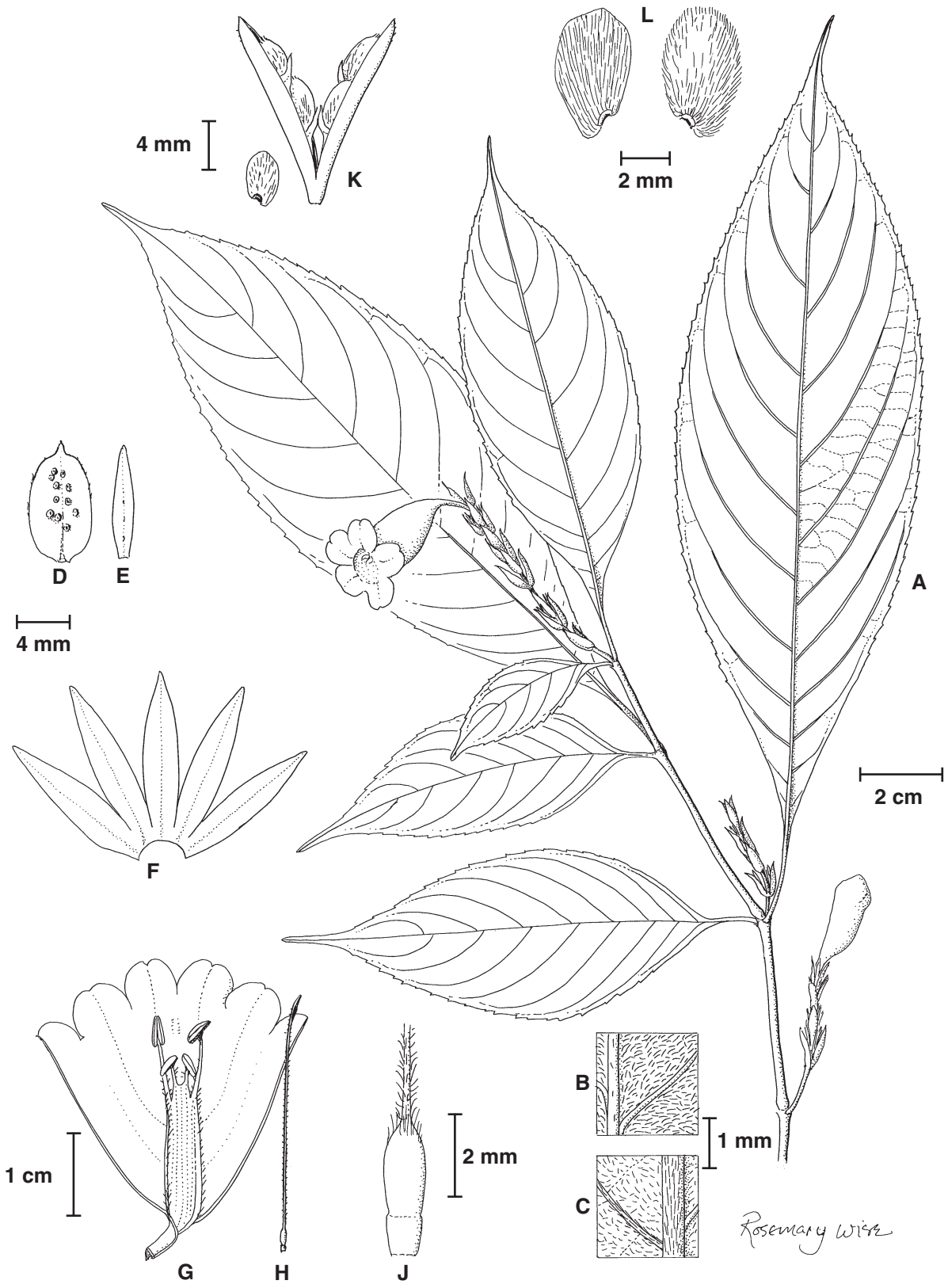


Figure 11. ***Strobilanthes abbreviata*** Y. F. Deng & J. R. I. Wood. A, habit; B, lower surface of leaf; C, upper surface of leaf; D, bract; E, bracteole; F, calyx; G, corolla opened out; H, style; J, ovary; K, capsule; L, seeds. A–J drawn from Garrett 1225 and K–L from Maxwell 97–130 by Rosemary Wise.

or (rarely) scurfy along the margin, the dorsal surface densely covered in cystoliths and with scattered sessile glands, sometimes becoming stipitate in fruit; calyx 12–15 mm long, slightly accrescent in fruit, subequally 5-lobed to just above the base, lobes 10–14 × 1–2 mm, narrowly lanceolate, acute to acuminate, eglandular except for a few sessile glands near the apex, glabrous except for the apical glands which sometimes become stipitate, densely covered in cystoliths; corolla 4–4.5 cm long, glabrous externally, bluish-purple, strongly ventricose to *c*. 10 mm wide and sometimes bent above a basal cylindrical tube 7–8 × 1.5 mm, lobes ovate, 5 × 5 mm; stamens included, didynamous, filaments with scattered setae, the longer pair *c*. 4 mm long, the shorter pair *c*. 2 mm long, anthers 3 × 0.5 mm, narrowly oblong; pollen 65 × 40 μm, tricolporate, ellipsoid, bireticulate, the pseudocolpi scalariform, similar to that shown in Fig. 17; style *c*. 25 mm long, densely villous, ovary comose. Capsule 17–18 × 3 mm, oblong in outline, comose with a few hairs, 4-seeded; seeds ovoid, flattened, densely pilose with mucilagineous hairs and a small glabrous areole.

Habitat and distribution: Scattered in seasonal dry forest from 200 to 1500 m in north-east India (Mizoram), Burma (Myanmar), Thailand, Cambodia and south-west China (Yunnan). Figure 12. BURMA. Kyundaing-ywa-kyeni-in, Maymyo, 5.ix.1938, Maung Po Khant 16376 (K). CAMBODIA. Sarpurrongtong, iv.1870, Pierre 1189 (K, P). CHINA. Yunnan: Cangyuan Xian, Nanla Gongshe, Dahedi, 1000–1100 m, 28vi.965, Li Yanhui 12536 (KUN); Chengkang, Maliling, 1100 m, 17.viii.1938, T.T.Yu 17371 (A, KUN, PE); Luchun Xian, Daheishan, Xiangjiaolin, 630 m, 2.x.1973, Tao Deding 432 (KUN, PE); Lincang Xian, Yi Qu, Mayidui, Nanbohe, 24.viii.1957, Xin Jingsan 312 (KUN, PE). INDIA. Mizoram: Chakang, 1600 m, ii.1927, A. W. Parry 114 (K); Phongpui, Lushai Hills, 1600 m, i.1928, N. E. Parry 578 (K). THAILAND. Chantaburi: Tap Sai (Khao Soi Dao), 200 m, 11.xii.1924, A. F. G. Kerr 9607 (BM, K); Khao Soi Dao [13°00′-N, 102°15′-E], 900–1200 m, 13.xi.1969, van Beusekom & Smitinand 2185 (AAU). Chiangmai: Doi Angka, 1450 m, 15.iii.1937, C. R. Carpenter 5 (A, K); banks of the Me Haw, Doi Chiengdao, 450 m, 11.i.1941, H. B. G. Garrett 1225 (E, K); East side of Doi Chieng Dao, area of Pa Blawng caves, 550 m, 15.i.1989, J. F. Maxwell 89–53 (CAS); ibid, 11.iii.1989, J. F. Maxwell 89–326 (MO); Sahn Gahm Pang, Doi Lohn, above Mae Gahm Bawng village on western border of Jae Sawn National Park, 1375 m, 10.ii.1997, J. F. Maxwell 97–130 (BKF, CAS); Doi Inthanon National Park, road to Mae Chaem, 1700, 25.xii.1996, T. Ohkubo A221 (BKF); Nakhon Ratchasima (Korat): Kao Lem, 800 m, 10.i.1925, A. F. G. Kerr 9908 (BM, K); Kan Lan, 25.xii.1930, Put 3511 (BM, K); Nan: Doi Phukha, 1500 m, 19.x.1994, R. Pooma 889 (BKF); Phrae: Huay Hom, 20.iii.1961, Chanthamuk 35 (K).

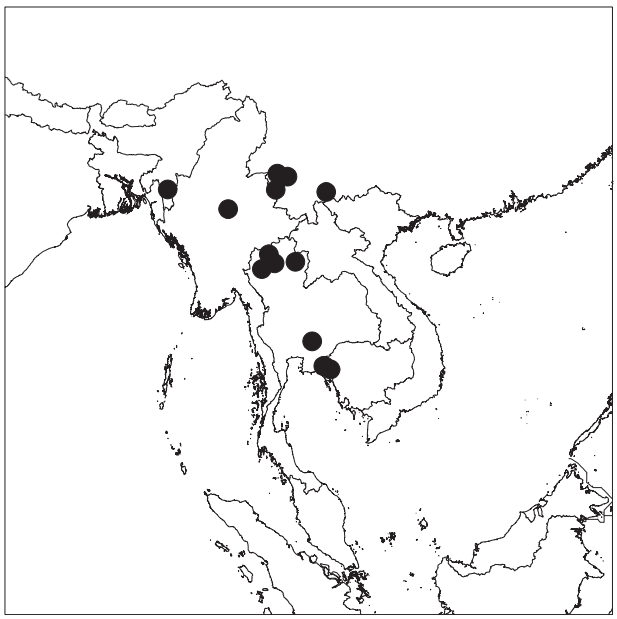


Figure 12. Map showing the distribution of ***Strobilanthes abbreviata*** Y. F. Deng & J. R. I. Wood.

Strobilanthes abbreviata is part of a complex of species involving *S. paucinervis* T. Anderson, *S. myura* H. Lév., *S. cystolithigera* Lindau, *S. longispicata* Hayata, *S. longzhouensis* H. S. Lo & D. Fang and *S. myriostachya* D. Fang & H. S. Lo. With all of these species it shares an olive-green colour created by the abundant cystoliths, an inflorescence of axillary, bracteate spikes in which the bracts, bracteoles and calyx lobes are similar in shape and texture, and a large glabrous corolla. From all of these it can be distinguished by the oblong-obovate bracts truncate at the apex with a short, broad, often deciduous mucro. In addition the bracts have large, squamous glands along the midrib as well as smaller sessile glands which frequently become stipitate as the flowers mature.

Strobilanthes lihengiae Y. F. Deng & J. R. I. Wood, **sp. nov.** floribis in capitulis bracteatis dispositos et bracteis pilis longis, multicellulosis instructis *S. torrentinum* Benoist et species ad *Eriostrobilum* Bremekamp ascripsit simulans sed bracteis rotundis recedit. Typus, China, Yunnan, Li Heng, Dao Zhiling & Yin Liwei 13630 (holotype CAS, isotype KUN). Figure 13.

Perennial isophyllous herb to 40 cm. Stems apparently ascending, bifariously pubescent to subglabrous, rouded to weakly sulcate. Leaves equal, shortly petiolate, 0.2–4 cm long, pilose with large, white, multicellular hairs, blades 1.5–11 × 0.5–6 cm, ovate or ovate-elliptic, shortly acuminate, base cuneate, margins dentate to crenate, pilose on both surfaces, especially on the veins, with large-celled, white hairs but more sparsely on the upper surface. Inflorescence of bracteate heads terminal on the main stem and on small axillary branchlets; bract at base of inflorescence intermediate in size and shape between true leaves and floral bracts, pilose with large-celled white hairs; floral bracts 8–11 × 6–9 mm, obovate, rounded, entire, shortly and densely greenish-tomentose and also pilose with long, large-celled, white, gland-tipped and eglandular hairs; bracteoles 6 × 1.5–2 cm, oblong-oblanceolate, long-ciliate; calyx subequally 5-lobed to *c*. 1 mm above the base, the lobes 8–9 × 1.25 cm, lanceolate-oblong, obtuse, exceeding the bracteoles, long-ciliate, green-tipped; corolla 3.2–4 cm long, sparsely pilose on the lobes, the tube whitish, 8–10 × 1 mm, bent above the tube and expanded, ventricose, the expanded part and the lobes blue, lobes ovate, acute, *c*. 5 mm broad and long; filaments very short, coarsely pilose, the longer pair *c*. 5 mm long, the shorter pair *c*. 3 mm long; anthers narrowly oblong, 3 × 0.5 mm; pollen tricolporate, ellipsoid, bireticulate with scalariform pseudocolpi, similar to that shown in Fig. 17; ovary villous; style 2.5–3 cm long, sparsely pilose below. Capsule 12 × 3 cm, cylindrical, comose, 4-seeded; seeds 2.5 × 2 mm, lenticular, pilose with mucilagineous hairs.

Habitat and distribution: A plant of disturbed broad-leaved evergreen forest around 2000 m known from three collections, two from near Kunming and a third from the Gaoligong Shan. Figure 15. CHINA. Yunnan: Kunming, Xishan, Sanqinggong, 6.xi.1938, K. M. Feng 142 (KUN); Kunming, Qiongzusi, 25.iv.1947, Qiu Bingyun 54473 (KUN); Tengchong Xian, Shaba Cun, Lidazhai Community Forest, west side of Gaoligong Shan [25°23′28″-N, 98°41′53″-E], 2000 m, 23.xii.2000, Li Heng et al. 13630 (CAS, KUN).

This species appears to be related to those species like *S. torrentium* Benoist and *S. esquirolii* H. Lév. in which the flowers are arranged in short head-like spikes with prominent, persistent bracts, a ventricose, pilose corolla and distinctive white, yellowish or reddish inflorescence hairs. It differs by its rounded bracts and whitish hairs from all similar species. It is named after Li Heng of the Kunming Institute of Botany, the Chinese Academy of Sciences, for her extensive collections of over 10 000 specimens in the Gaoligong Shan region, several of which are cited in this paper.

Strobilanthes vallicola Y. F. Deng & J.R.I. Wood, **sp. nov.,** isophylla, foliis grandibus aequalibus, floribus in spicis longis, terminalibus dispositis, calyce subaequaliter 5-lobato *Strobilanthes collina* Nees similis sed spicis multifloris densis hirsutis et granis pollinis ellipticis, costis spinulis obtusis ornatis statim dignoscenda. *Type*: China, Yunnan, Xuan Shujie 74 (holotype KUN no. 0426822, isotype KUN). Figure 14.

Isophyllous perennial herb 80–150 cm high; stems glabrous, dark, quadrangular, sulcate above. Leaves petiolate; petioles 1.3–2.5 cm long, glabrous; blades 15–25 × 6.5–11 cm, oblong-elliptic, apex acuminate, base cuneate, margin serrate, glabrous on both surfaces, cystoliths prominent on both surfaces, paler beneath with prominent veins covered in cystoliths; 6–9 lateral veins either side of midrib. Inflorescence of terminal branched or rarely unbranching spikes; spikes 15–25 cm long, the flowers arranged in opposite pairs, 0.8–2 cm apart; rachis densely pilose with large-celled hairs; flowers sessile; bracts 8–12 × *c*. 4 mm, ovate-oblong, pilose with large-celled hairs, some gland-tipped, persistent; bracteoles 9–13 × 1.1–1.3 mm, lanceolate, pilose with large-celled hairs, some gland-tipped, persistent; calyx 14–18 × 1–1.5 mm, pilose with large-celled hairs, some gland-tipped, persistent; corolla 3–3.5 cm long, 'white' (fide Xuan Shujie), outside glabrous except the margin of lobes, inside glabrous except for the hairs retaining the style, the cylindrical basal portion of the tube 1–1.5 cm long, then gradually ventricose, strongly bent 1.5–2.5 cm above the base, lobes 4 × 5 mm, ovate, obtuse; stamens 4, included; filaments glabrous, longer pair 3–5 mm long, shorter pair 2–3 mm long, thecae 3–4 × *c*. 1 mm, oblong, glabrous; pollen tricolporate, 70 × 50 μm, ellipsoid, bireticulate with blunt spines arranged along the pseudocolpi (Fig. 8); ovary 3 × 1 mm, glabrous, style 2.5 cm long. Capsule 15–20 × 2–3 mm, oblong, narrowed at both ends, comose, 4-seeded; seeds *c*. 3 mm long and broad, ovate or suborbicular, pilose with mucilaginous hairs.

Habitat and distribution: In wet places, stream and river sides in forest in the Honghe (Red River) Valley at very low altitudes in south-eastern Yunnan at around 22°36′-N, 103°58′-E. Figure 15. CHINA. Yunnan: Hekou Xian, Mafengzhai, 220 m, 25.iv.1953, Cai Kehua 582 (KUN); Hekou Xian, Mahuangbao, 160 m, 2.vi.1953, Fan Wenxuan 91 (KUN, PE); Hekou Xian, Kekou Qu, Binglangzhai, 180 m, 29.vi.1953, Liu Weixin 137 (KUN); Hekou Xian, Shi Yan Chang, vi.1956, Sino-Soviet Yunnan Exped. 2278 (KUN, PE); Hekou Xian, Mahuangbao, 320 m, 18.iv.1961, Xuan Shujie 74 (KUN); Hekou Xian, sin coll. 655 (PE);

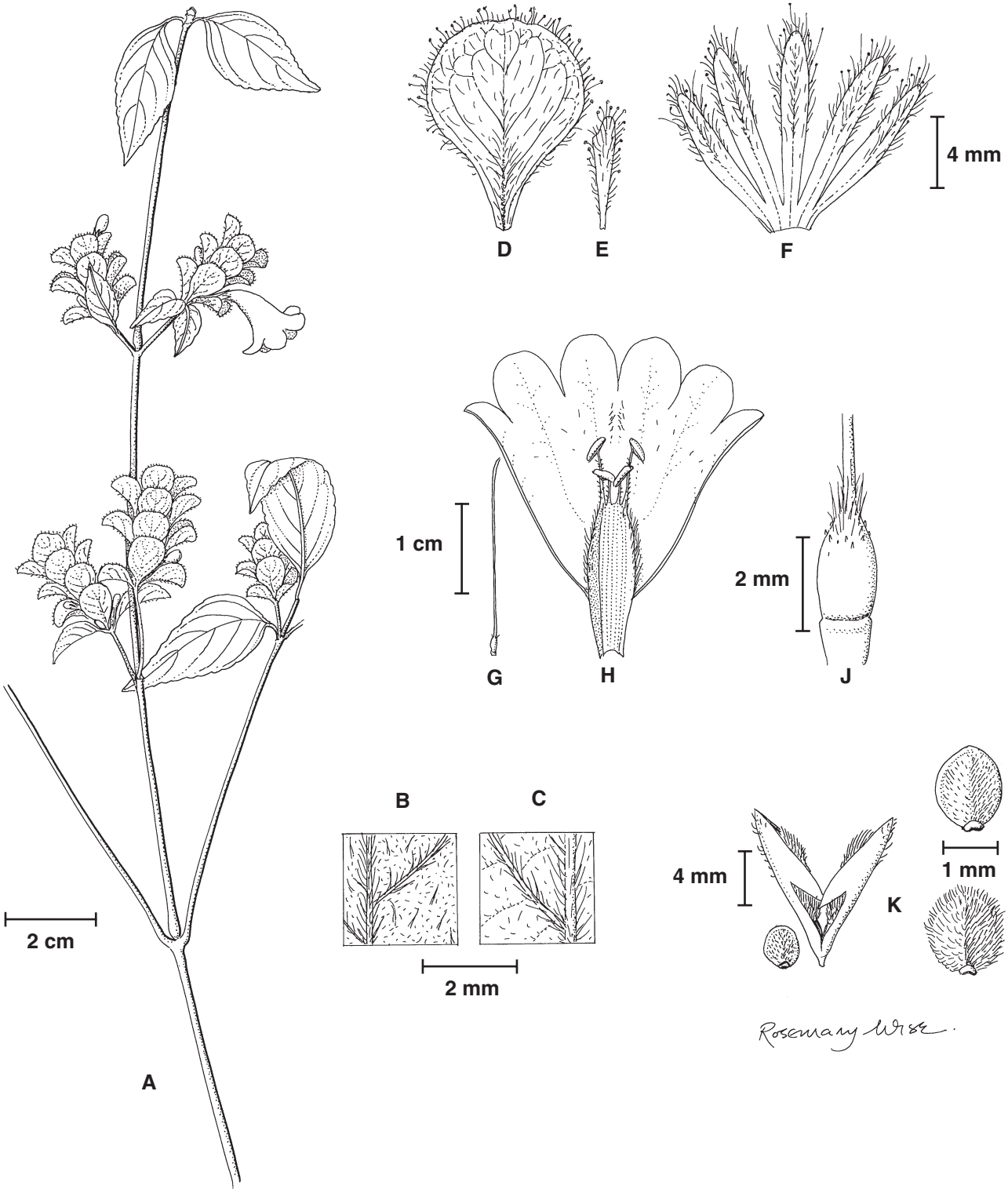


Figure 13. ***Strobilanthes lihengiae*** Y. F. Deng & J. R. I. Wood. A, habit; B, lower surface of leaf; C, upper surface of leaf; D, bract; E, bracteole; F, calyx; G, style; H, corolla, opened out; J, ovary; K, capsule and seeds. Drawn from Li Heng 13630 by Rosemary Wise.

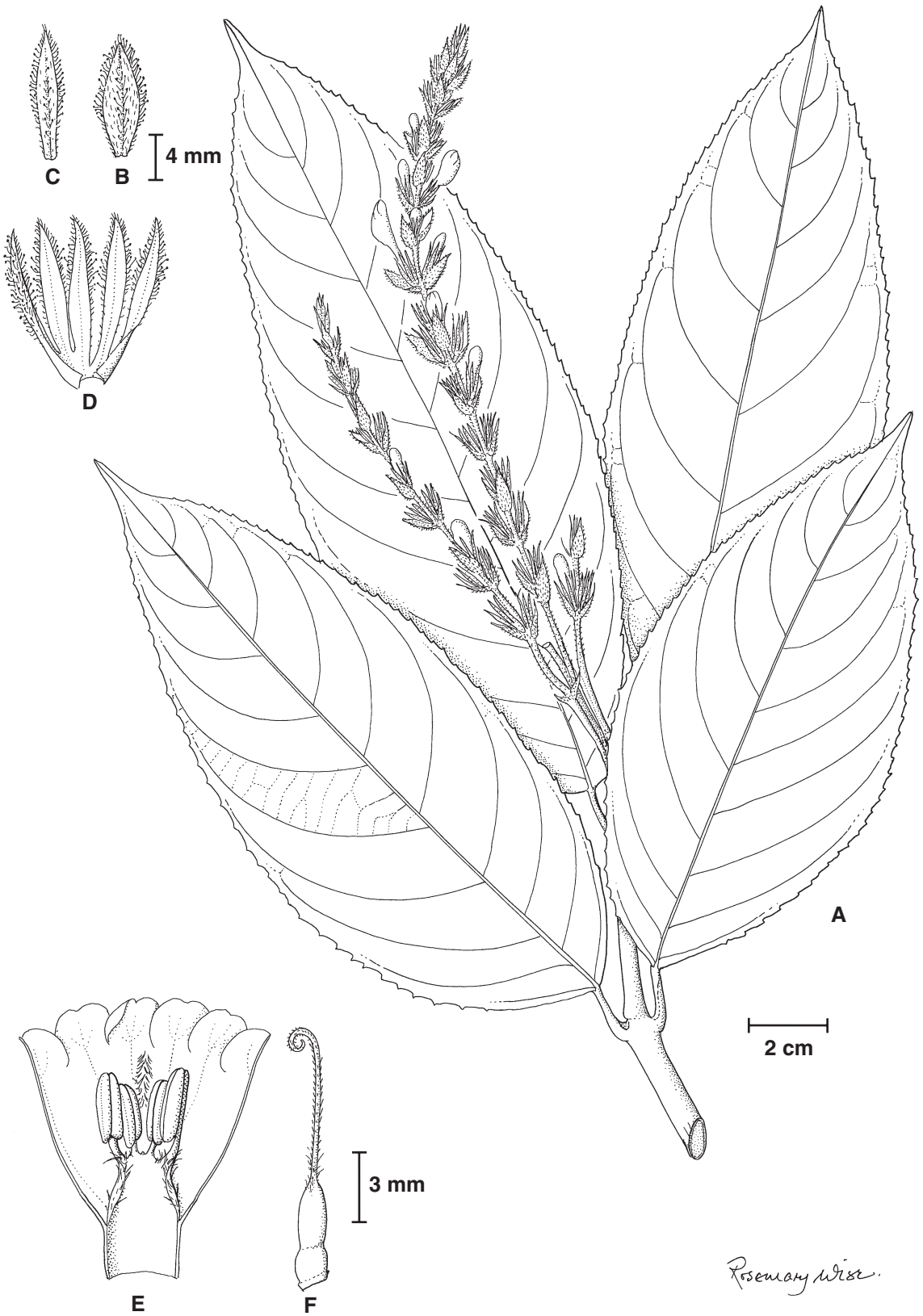


Figure 14. ***Strobilanthes vallicola*** Y. F. Deng & J. R. I. Wood. A, habit; B, bracteole; C, bract; D, calyx; E, corolla opened out; E, style and ovary. Drawn from Xuan Shujie 74 by Rosemary Wise.

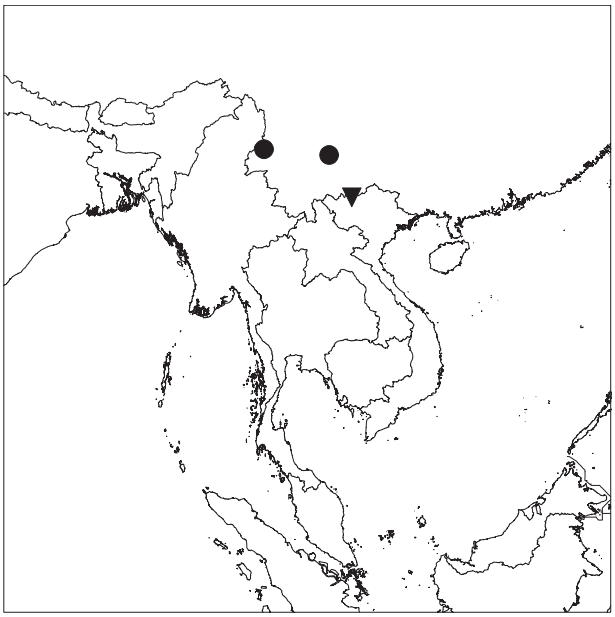


Figure 15. Map showing the distribution of ***Strobilanthes lihengiae*** Y. F. Deng & J. R. I. Wood (●) and ***S. vallicola*** Y. F. Deng & J. R. I. Wood (▼).

Hekou Xian, sin coll. 433 (PE); Hekou Xian, sin coll. 2286 (PE).

This new species is remarkable for the very low altitudes at which it is found. It is superficially similar to *S. collina* Nees, another low altitude species. Both species appear to be isophyllous with unusually large leaves and an inflorescence of long-terminal spikes. In *S. vallicola* the spikes are longer, many-flowered and densely covered in shortly pilose indumentum. In addition, whereas *S. collina* has pollen of the common ribbed, scalariform type, in *S. vallicola* blunt spines are arranged along the pseudocolpi (Fig. 8).

Strobilanthes medogensis (H. W. Li) J. R. I. Wood & Y. F. Deng, **comb. nov.**

Goldfussia medogensis H.W. Li in C.Y. Wu, Fl. Xizangica 4 : 413 (1985). *Type*: China, Xizang (Tibet), Qinghai-Xizang Complex Exped. 74–4911 (holotype KUN, isotype PE).

Strobilanthes campaniformis J. R. I. Wood in Edin. Joun. Bot. 51 (2): 235 (1994). *Type*: China, Xizang (Tibet), Ludlow & Sherriff 2336 (holotype BM, isotype E).

Habitat and distribution: Restricted to two deep valley areas in southern Xizang (Tibet) where it is a plant of broad-leaved forest in ravines. CHINA: Xizang (Tibet): Lung, Chayul Chu [28°21′-N, 93°09′-E], 2700 m, 10.vii.1936, Ludlow & Sherriff 2336 (BM, E); Mêdog Xian [29°19′-N, 95°19′-E], Gedang, 2400 m, 27.viii.1974, Qinghai-Xizang Complex Exped.74–4911 (KUN, PE); ibid., hill behind Gedang Qu, 2450 m, 11.ix.1982, Li Bosheng & Cheng Shizhi 814 (PE); ibid., Gedang, 1940 m, 13.x.1982, Cheng Shuzhi & Li Bosheng 1457 (PE); ibid., Pangxin Qu, 1100 m, xii.1982, Cheng Shuzhi & Li Bosheng 3238 (PE).

Strobilanthes medogensis was originally described by Li (1985) in the genus *Goldfussia* as *G. medogensis* and then mistakenly reduced to synonymy with *Strobilanthes scoriarum* W. W. Sm. by Wood (1994: 258) on the basis of the illustration accompanying the prologue. Hu (2002: 175) followed Wood's treatment and treated it under *Diflugossa scoriarum* (W. W. Sm.) E. Hossain in *Flora Reipublicae Popularis Sinicae*. However, examination of the type at KUN shows that it is distinct in its shortly exserted anthers and small axillary flower spikes. We consider *Strobilanthes campaniformis* to be conspecific with *S. medogensis* differing only in its eglandular inflorescence.

Strobilanthes longispica (H. P. Tsui) J. R. I. Wood & Y. F. Deng, **comb. nov.**

Adenacanthus longispicus H. P. Tsui in C. C. Hu, Flora Reip. Pop. Sin. 70: 348 (2002). *Type*: China, Yunnan, Exped. Pl. Drung Jiang 3793 (holotype KUN, isotype CAS).

Strobilanthes tripartita J. R. I. Wood in Kew Bull. 58 (1): 108 (2003). *Type*: Burma, Kingdon Ward 9184 (holotype BM, isotype E).

Distribution: BURMA. Adung River Valley [28°05′-N, 97°40′-E], 1300–1500 m, 2.ii.1931, Kingdon Ward 9184 (BM, E). CHINA. Yunnan: Gongshan Xian, Dulongjiang Xiang, in the vicinity of Langwangduo, *c*. 5 km SSE of Bapo on the E side of the Dulong Jiang, alt. 1380 m, i.1991, Dulong Jiang Investigation Team 3793 (CAS, KUN); Lushui Xian, Gutanhe, 2400 m, 3.vi.1981, Exped. Hengduanshan 414 (PE).

This is a rare species apparently known only from the three collections cited above. Tsui (in Hu, 2002: 122–3, 348–9) placed this species in *Adenancathus* Nees, but it does not resemble any of species included in *Adenacanthus* by Bremekamp (1944). However, the species is similar to *S. peninsularis* Terao and *S. dryadum* Benoist, from which it differs in its spreading, linear bracts 6–8 mm long and its asymmetrically cuneate, rather than decurrent, lower leaves. In *S. dryadum* the bracts are ovate-lanceolate to elliptic, appressed to the calyx and *c*. 3 mm long.

Strobilanthes inflata T. Anderson in *Journ. Linn. Soc. Bot*. 9: 476 (1868). *Type*: India, Hooker & Thomson 28 (holotype K, isotype BM, NY).

Pteracanthus inflatus (T. Anderson) Bremek. in *Verh. Ned. Akad. Wetens. Afd. Nat. Sect*. 2, 41(1):199 (1944).

Strobilanthes wardii W. W. Sm. in *Notes Royal Bot. Gard. Edin*. 10: 201 (1921). *Type*: Burma, Kingdon Ward 1912 (holotype E). Figures 16–19.

When Wood (1994: 264–5) described *Strobilanthes unilateralis* as a new species, he confidently asserted it to be different from *S. inflata* on the grounds of its distinctive, glabrous leaves and calyx. The two plants have a very different facies despite the similar corolla noted by Wood. However, access to collections from a wider area has led us to re-evaluate the two species.

A series of collections from Sumatra listed below extended the known range of *S. inflata* from the East Himalayas to Indonesia. Although this type of distribution is unusual we have recently found it in a series of species including *S. cruciata* (Bremek.) Terao, *S. atropurpurea* Nees, *S. echinata* Nees and *S. glabrata* Nees. What surprised us was that the Sumatran collections of *S. inflata* were mixed with other specimens that were indistinguishable from *S. unilateralis*, as well several others that did not fit either very well. One collection (de Wilde & de Wilde-Dufjes 16165) has the two 'species' mixed on the same sheet with the same collection number. Since the range of *S. inflata* clearly overlapped with that of *S. unilateralis* in the Kachin Hill district of Burma, it seemed likely that *S. unilateralis* was no more than a glabrous variety of *S. inflata*.

Examination of type material of *Pteracanthus gongshanensis* Tsui (Exped. Pl. Qinghai-Xizang 82–8953) in KUN early in 2004 showed that this was an earlier name for *Strobilanthes unilateralis*, and that Wood's mistake of treating this as a species distinct from *S. inflata* had been repeated in the *Flora Reipublicae Popularis Sinicae* 70 (Hu, 2002: 137, 142). It seems therefore that both forms of *S. inflata* occur in Burma, China and Sumatra, although only typical *S. inflata* is known from Darjeeling and Sikkim.

Yet another species, however, is involved. This is *Strobilanthes aenobarba* W. W. Sm. from Xizang (Tibet). This species differs from *S. inflata* in two characters: the leaves are large and broadly ovate, exceeding 20 cm in length (Fig. 16D) and the inflorescence is covered in long reddish-brown hairs. Once again examination of Sumatran material throws doubt on this species. De Wilde & de Wilde-Dufjes 13818 has the same reddish-brown hairs and similarly large leaves (Fig. 16E). This form is also present in Burma (Kingdon Ward 13129) and indeed, the reddish-brown hairs are present on other specimens such as Rock 23248 from Tibet, although in this case they are associated with much smaller leaves (Fig. 16C). Pollen from populations in Burma and Sumatra also appears identical (Figs 18, 19).

Variation within *S. inflata* is not limited to the characters discussed above. Another distinction is in the leaf dentation. Plants from Sumatra and Burma are normally serrate, those from Sikkim are often obscurely crenate while Rock 23248 and Kingdon Ward 13129 have deeply crenate leaves unmatched elsewhere. Most specimens have strongly caudate leaf tips but several specimens both from the Himalayas and Sumatra have merely acuminate leaf tips. The inflorescence may be distinctly spicate and often one-sided, or can be reduced so appearing axillary, a variation also found in the apparently related *S. atropurpurea*. Another character which varies is the indumentum of the capsule. This is normally glabrous but in some specimens, such as van Steenis 9134 from Sumatra, it is comose.

It is impossible to avoid the conclusion that *S. inflata* is a polymorphic species over all its range and is therefore similar to a number of other widespread *Strobilanthes* such as *S. auriculata* Nees, *S. echinata* and *S. atropurpurea*, whose different forms have been described under different names in different parts of their range. Unlike the cases of *Strobilanthes accrescens* J. R. I. Wood and *S. rufescens* (Roth) T. Anderson where variation is clearly geographically related allowing the recognition of subspecies, this is not the case with *S. inflata*. However, the striking differences in indumentum, which are linked to variations in leaf size, justify the recognition of three varieties, which are set out below. A few specimens are intermediate and cannot be assigned to variety.

Var. *inflata*

This is characterized by its relatively small (usually less than 8 cm long and 6 cm broad), white-hairy leaves and bracts (Fig. 16F–H). However, the leaves are very variable, acuminate or strongly caudate, the margin dentate, serrate or crenate and the base abruptly narrowed but not truly rounded as in var. *aenobarba*.

Distribution: Himalayas from Sikkim east to Yunnan; Indonesia (Sumatra). Figure 20. INDONESIA. Sumatra: Gaju & Alas lands, Poetjoek Angasan, 2500 m, 28.i.1937, van Steenis 8363 (K, SING); Mount Loser, 2500 m, 25.iv.1939, S. Dillon Ripley 64 (PH); Gunung Leuser Nature Reserve, Gunung Mamas, 23 km SW from mouth of Lau Ketambe, *c*. 30 km NW

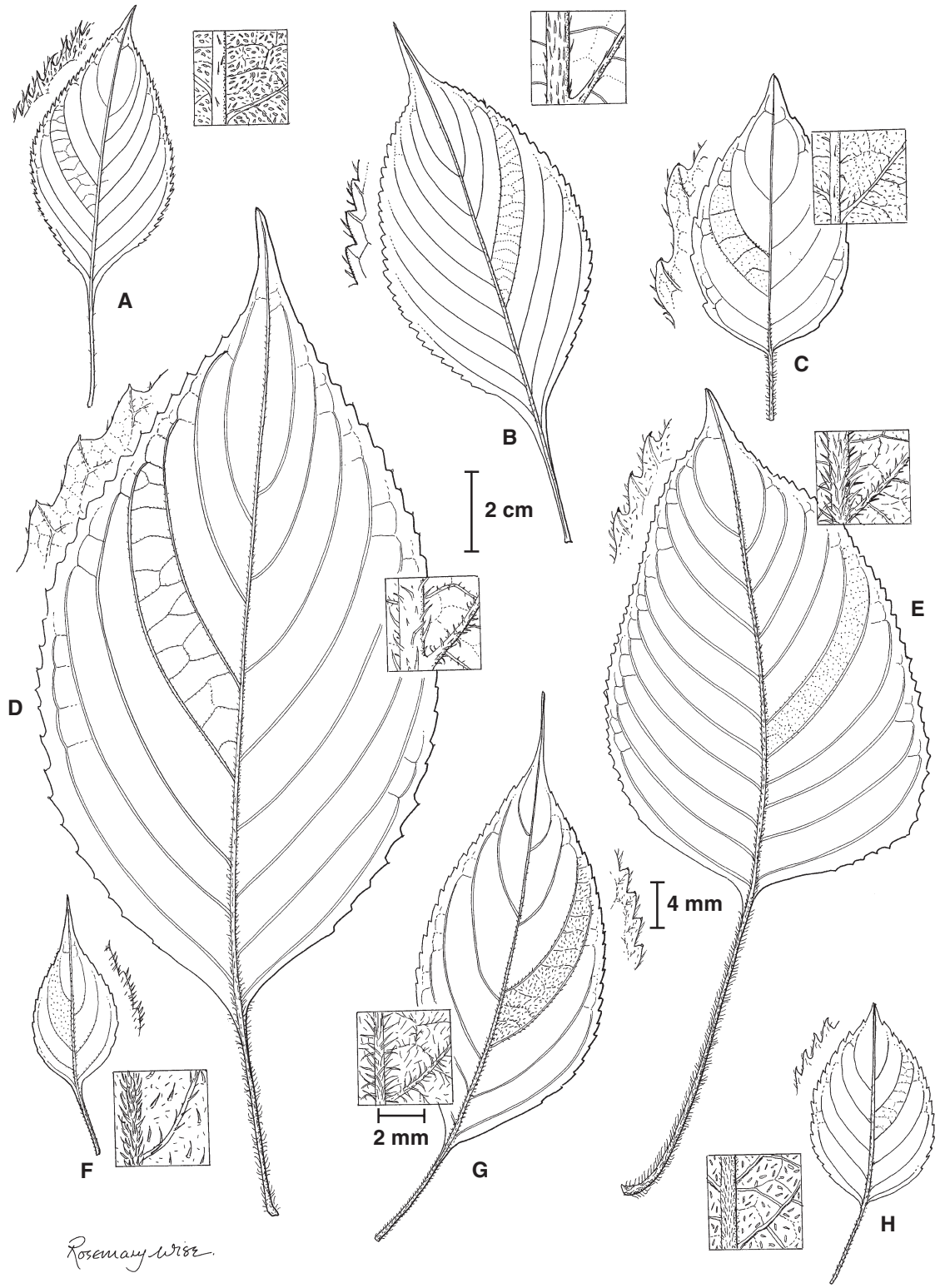
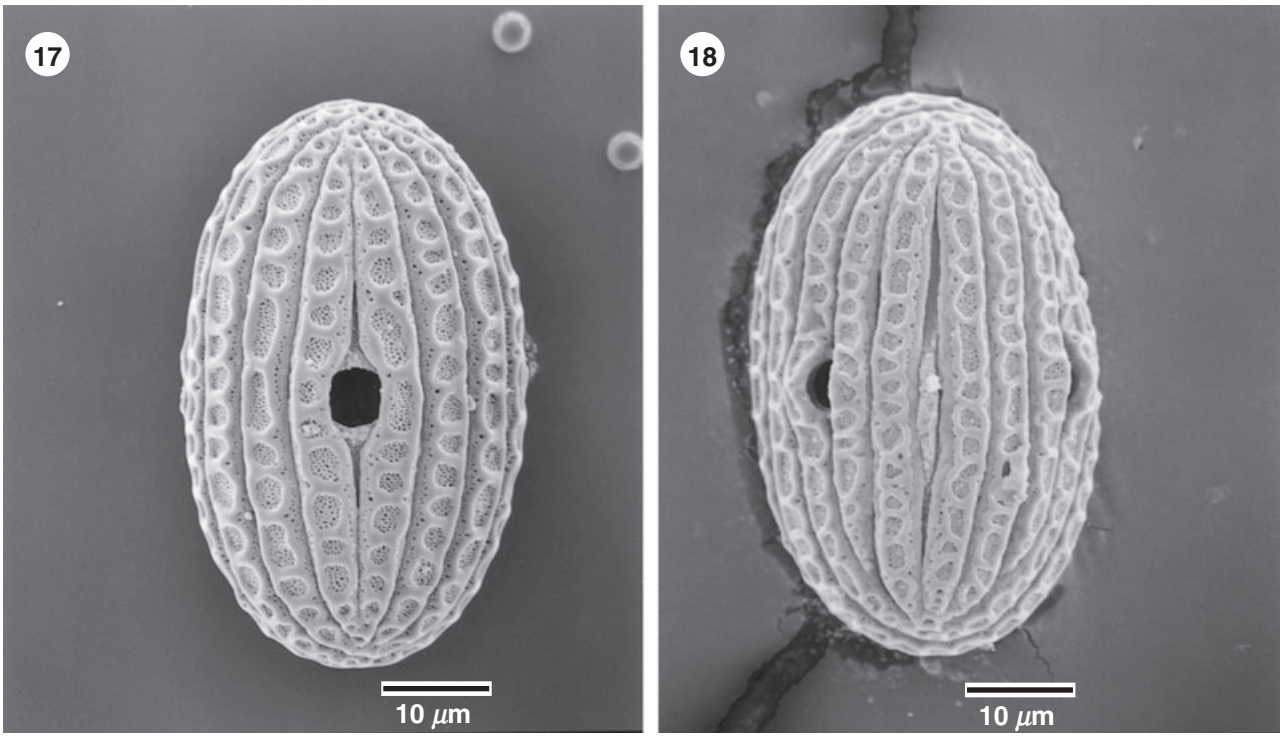


Figure 16. *Strobilanthes inflata* T. Anderson, leaf variation with insets of leaf margin and abaxial midrib. A–B, var. ***gongshanensis*** (H. P. Tsui) J. R. I. Wood & Y. F. Deng; C, unplaced variety; D–E var. ***aenobarba*** (W. W. Sm.) J. R. I. Wood & Y. F. Deng; F–H var. *inflata*. A from de Wilde & de Wilde Duyfjes 15212, B from Kingdon Ward 21280, C from Rock 23248, D from Forrest 19238, E from de Wilde & de Wilde Duyfjes 13818, F from Hooker & Thomson 28, G from Haines 2752, H from Van Steenis 8363, all drawn by Rosemary Wise.



Figures 17 and 18. Pollen of *Strobilanthes* species. Fig. 17. *S. inflata* T. Anderson var. ***aenobarba*** (W. W. Sm.) J. R. I. Wood & Y. F. Deng from Kingdon Ward 13129 (Burma). Fig. 18. *S. inflata* T. Anderson var. ***gongshanensis*** (H. P. Tsui) J. R. I. Wood & Y. F. Deng from van Steenis 9134 (Sumatra).

of Kutajane, 25–2600 m, 12.v.1975, de Wilde & de Wilde-Duyfjes 16845 (L). INDIA. Sikkim: Hooker & Thomson 28. West Bengal (Darjeeling): Mongpo, 2000 m, 29.ix.1884, Clarke 36029 (K, BM). Arunachal Pradesh: Bomte La, 2700 m, Kingdon Ward 13930 (BM). CHINA. Xizang (Tibet): sin, loc., Zhong Buqiu 5959 (PE). Yunnan: N'Maikha-Salween divide [26°20′-N], 2400 m, viii.1919, Forrest 18305 (BM, E, K); sin. loc., 1933–4, H. T. Tsai 57433 (A, IBSC, KUN, PE); sin loc., H. T. Tsai 57389 (IBSC, KUN, PE); Tengchong Xian, Tengchong, Muchengzhai, 23.xi.1954, Yang Jingsheng 1389 (KUN); ibid., Wuhe Xiang, Xiaodifang, W. side of Gaoligong Shan, N. of the new road from Baoshan to Tengchong via Nankang Yakou, 2211 m, [24°51′15′-N, 98°45′26′-E], 22.viii.2003, Gaoligong Shan Biodiversity Survey 17411 (KUN); ibid., Sanyun Xiang,Gaoligong Shan State Natural reserve, Taipingpu area, W. side of Gaoligong Shan on the old trail (south-east silk road) just N and above the old road from Baoshan to Tengchong via Dahaop, elev. 2300 m, [24°57′35″-N, 98°44′31″-E], 4.ix.2003, Gaoligong Shan Biodiversity Survey 18696 (KUN); Bijiang Xian,Gaoligong Shan, Lahe valley, 2700 m, 16.vii.1978, Exped. Bijiang 1299 (KUN); Quanmugulu to Aludeng, 3100–3600 m, 2.viii.1979, Lin Qin 791708 (KUN); Gongshan Xian, way to Dulong, east slope of Gaoligongshan, 3000 m, 26.vii.1982, Exped. Qinghai-Xizang 8642 (PE).

Var. ***aenobarba*** (W. W. Sm.) J. R. I. Wood & Y. F. Deng, **stat. nov.**

Strobilanthes aenobarba W. W. Sm. in *Notes Royal Bot. Gard. Edin*. 13: 185 (1921). *Type*: China, Xizang (Tibet), G. Forrest 19238 (holotype E, isotype K).

This is characterized by the dense, long, yellow-brown indumentum of the inflorescence, stem and petioles combined with the large, broadly ovate leaves, 12–20 cm in length and more than 6 cm in width (Fig. 16D, E). The leaves are abruptly narrowed or rounded at the base.

Distribution: East Himalayas in China (Xizang (Tibet), Yunnan) and Burma; Indonesia (Sumatra). INDONESIA. Sumatra: Gunung Leuser Nature Reserve, Gunung Ketambe, 8–15 km SW from mouth of Lau Ketambe, *c*. 40 km NW of Kutajane, 17–1900 m, 19.vii.1973, de Wilde & de Wilde-Duyfjes 13818 (MO, K, SING). BURMA. Myitkyina, Camp above Hpawte, 18.viii.1938, Naw Mu Pa 17445 (K);

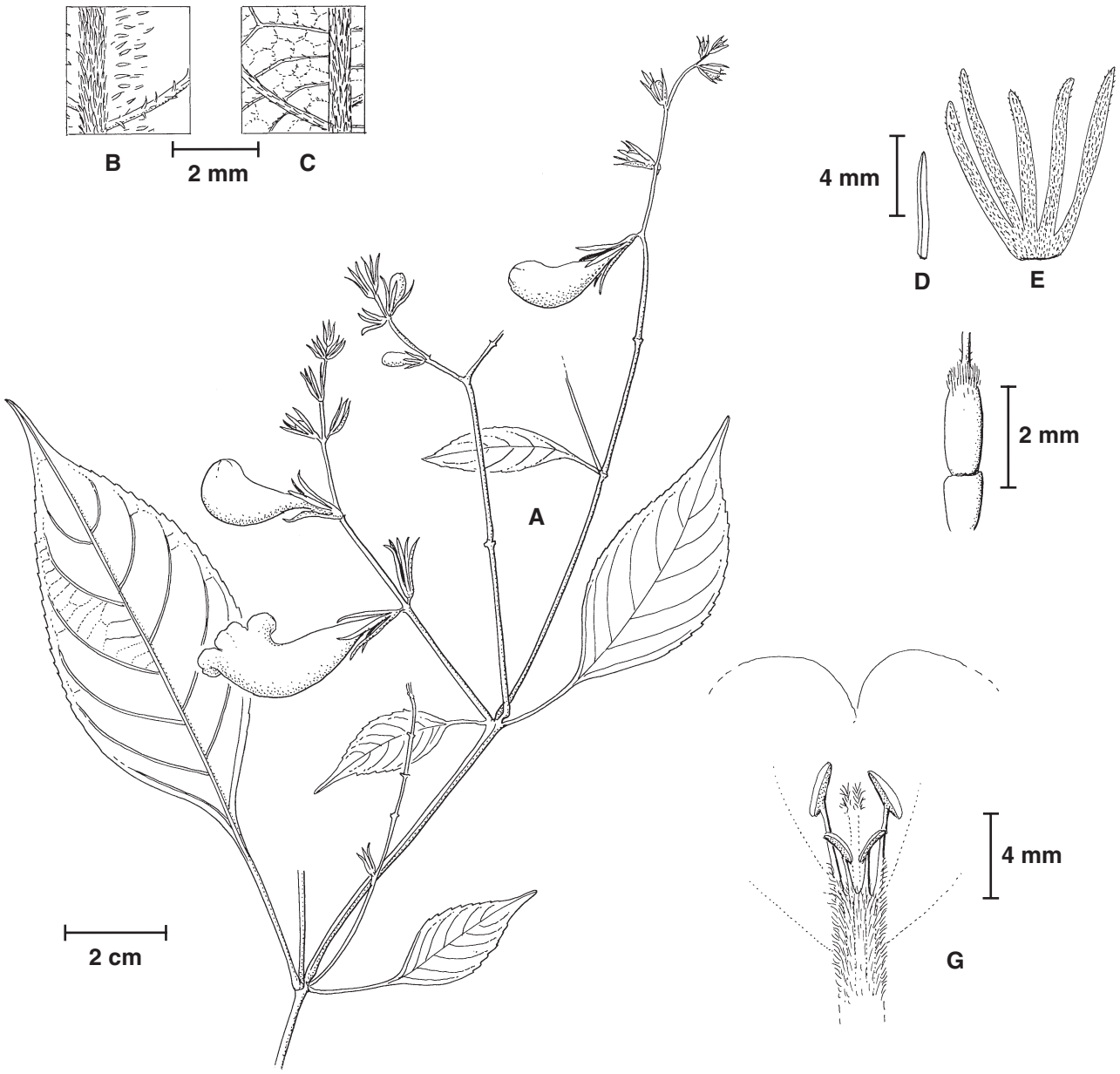


Figure 19. *Strobilanthes inflata* T. Anderson var. ***gongshanensis*** (H. P. Tsui) J. R. I. Wood & Y. F. Deng. A, habit; B, upper surface of leaf; C, lower surface of leaf; D, bracteole; E, calyx; F, ovary; G, corolla opened out. Drawn from Van Steenis 9134 by Rosemary Wise.

without exact locality, 1937–9, Kingdon Ward 13129 (BM). CHINA. Xizang (Tibet): Tsarong, Salween-Kui Chang divide [28°40′-N, 98°15′-E], viii.1919, Forrest 19238 (E, K). Yunnan: Gongshan Xian, Cangnu Fenshuiling, Dayon-Lumba, 3000–3200 m, 25.viii.1940, K. M. Feng 6904 (KUN, PE); ibid., Cikai, Heipushan, 6.x.1940, K. M. Feng 8200 (KUN, PE); Gongshan Xian, Dulongjiang, Sansuo, 22.xi.1990. Exped. Dulongjiang 771 (KUN); ibid., Dulongjiang, Dizhengdang, 1950 m, 28.xi.1990, Exped. Dulongjiang 2213 (KUN); Weixi Xian, Kangnu Fenshuiling, Baimaluo, 2300–2500 m, 4.vi.1940, K. M. Feng 4461 (KUN, PE); Yongde Xian, Daxueshan, Wumulong Ganhe, 2600 m, 22.vi.2002, Wang Lisong 4024 (KUN); ibid., Daxueshan, 2800 m, 25.vi.2002, Wang Lisong 4199 (KUN).

Var. ***gongshanensis*** (H. P. Tsui) J. R. I. Wood & Y. F. Deng, **stat. nov.** Figure 18.

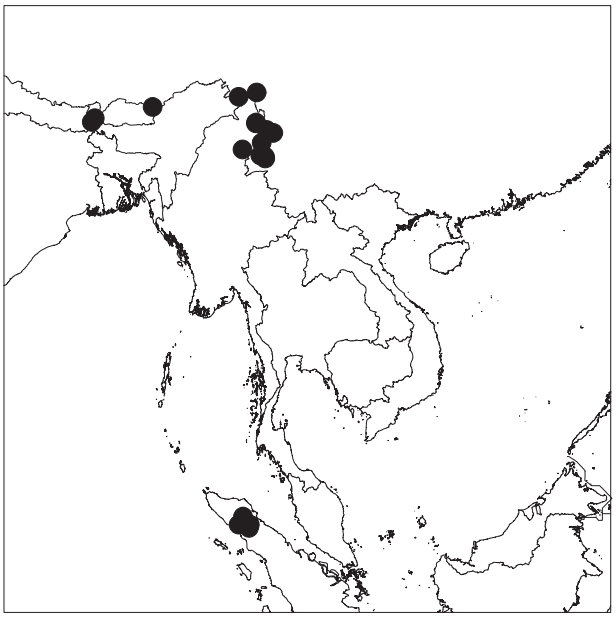


Figure 20. Map showing the distribution of *Strobilanthes inflata* T. Anderson.

Pteracanthus gongshanensis H. P. Tsui in *Acta Bot. Yun*. 12 (3): 277 (1990). *Type*: China, Yunnan, Exped. Pl. Qinghai-Xizang 82–8953 (holotype PE, isotype KUN).

Strobilanthes unilateralis J. R. I. Wood in *Edin. Journ. Bot*. 51(2): 264 (1994). *Type*: Burma, F. Kingdon Ward 21576 (holotype BM).

This is characterized by its subglabrous leaves (except for the margins) and bracts. All specimens of this variety have narrowly ovate-elliptic leaves with serrate margins and are gradually narrowed to a long attenuate base (Fig. 16A, B).

Distribution: China (Yunnan); Burma; Indonesia (Sumatra). INDONESIA. Sumatra: Gaju & Alas lands, below summit of Mt Goh Lemboeh, 2900 m, 21–22.ii.1937, van Steenis 9134 (L. K. A. SING); Gunung Leuser Nature Reserve, Gunung Bandahara, *c*. 10 km NE of Kampong Seldok (Alas valley), *c*. 25 km N of Kutatjane, 2500 m, 2.iii.1975, de Wilde & de Wilde-Duyfjes 14996 (K, L); ibid, 23.ii.1975, de Wilde & De Wilde-Duyfjes 15215 (L); Gunung Leuser Nature Reserve, Gunung Leuser west top, *c*. 25 km SW of Blang Kedjeren, 2750–3150 m, 7.iv.1975, de Wilde & de Wilde-Duyfjes 16165 p.p. (L, MO). BURMA. Hkinlum, North Triangle, 1067 m, 25.viii.1953, Kingdon Ward 21280 (BM); Wring Bum above Ahkail, North Triangle, 2338 m, 11.xi.1953, Kingdon Ward 21576 (BM). CHINA, Yunnan: Gongshan Xian, Gaoligong Shan, Xipo, 2000 m, 26.vii.1982, Exped. Qinghai-Xizang 8825 (KUN, PE); ibid., Dulongjiang to Jiku, 1900–2200 m, 6.viii.1982, Exped. Qinghai-Xizang 8953 (KUN, PE).

Some specimens cannot easily be placed. From Sumatra, Van Steenis 9626 (K) from Mount Kemiri and de Wilde & de Wilde-Duyfjes 16845 (L) from Gunung Manas in the Gunung Leuser Nature Reserve, 23 km SW from mouth of Lau Ketambe, as well as de Wilde & de Wilde-Duyfjes 16165 p.p. (L, MO), are intermediate between var. *inflata* and var. *aenobarba*. Haines 2752 (K) from Darjeeling has leaves larger than normal (Fig. 16G) in var. *inflata* as does Kingdon Ward 1912 from Burma, while Rock 23248 (K, BM) from Tsarong, Tibet is anomalous in many ways, although in leaf size it fits var. *inflata* well (Fig. 16C).

Strobilanthes chinensis (Nees) J. R. I. Wood & Y. F. Deng, **comb. nov.**

Basionym: *Ruellia chinensis* Nees in DC., *Prod*. 11: 147 (1847). *Type*: China, Parker s.n. (holotype K, ex Herb. Benth.).

Synonyms: *Hemigraphis chinensis* (Nees) T. Anderson ex Hemsl. in *Journ. Linn. Soc*. 26: 238 (1891). *Sericocalyx chinensis* (Nees) Bremek., in *Verh. Ned. Akad. Wetens. Afd. Nat. Sect*. 2,41(1): 163 (1944).

This new combination is necessary on account of the inclusion of *Sericocalyx* within *Strobilanthes* (see introductory comments).

Habitat and distribution: In disturbed ground up to about 1300 m in south-east China (Hainan, Guangdong, Guangxi), Thailand, Vietnam and Laos [fide Benoist (1935: 656)]. CHINA. Guangdong: Guangzhou, Faber s.n. (K); ibid., Pakwan, xii/i.1867–8, Sampson 7575 (K); ibid, near White Cloud Monastery, 24.x.1883, Sampson s.n. (K); ibid., Longyandong, Fenghuangshan, 12.iv.1937, Li Yao 2194 (IBSC); Luoding Xian, near Fuhe Linchang, 350 m, 16.x.1991, Liu Nian et al. 1979 (IBSC); Maoming Xian, Dapo Qu, near Gecang Xiang, 9.viii.1956, Deng Liang 2072 (IBSC, KUN, PE); ibid., Huangtang, 18.xi.1951, Zhu Zhisong 1100 (IBSC); ibid., Xieji, Dalupo, Maopo, Dazhangdu, 400 m, 14.x.1956, Xiao Jia 89953 (IBSC); Ruyuan Xian, Xiushui Xiang, 6.ix.1941, Liang Baohan 83176 (IBK); Xinxing Xian, Tiantang Xiang, Liaokeng, Fangtiankeng, 4.x.1958, Liu Yingguang 2479 (IBSC, PE); Yangchun Xian, Guigang Zhen, Baicong, Changtan, 320 m, 6.ix.1990, Exped. Yunkai 60 (IBSC); Yunfu Xian, Yunwushan, Baishikeng, 1300 m, 14.x.1934, C. Wang 37243 (IBK); Guangxi: Luchuan Xian, xi.1960, Wei Caixi 14214 (PE); Beihai, xii.1932, L. Teng 8484 (IBSC); Bobai Xian, Santan

gongshe, Liumutang, 520 m, 21.x.1959, Zhong Shuquan A63504 (IBSC); Bobai, 4.xi.1960, Fang Ding 16453 (PE); Rong Xian, Licun Qu, Liuzhen Xiang, Tanghuatian, 28.x.1955, Wei Zhanye & Lei Damei 40335 (IBK, IBSC). Hainan: sin loc., 21.xii.1933, H. Y. Liang 66531 (K); Baoting Xian, Diaoluoshan, Zouguan Xiang, 5.xi.1954, Exped. Diaoluoshan 2151 (IBK, IBSC, PE); ibid., near Xinglong Shi, 7.iv.1935, F. C. How 71725 (IBK, IBSC); Ch'ang-kiang district, Ka Chik Shan and vicinity, 15.xii.1933, S. K. Lau 2826 (IBSC); Changjiang [Changjiang] Xian, riverside, 10.xii.1933, H. Y. Liang 66020 (IBSC); ibid., 10.xii.1933, H. Y. Liang 66017 (IBSC); ibid., Dongfang village, 14.xii.1933, H. Y. Liang 66212 (IBK, IBSC, PE); ibid., 21.xii.1933, H. Y. Liang 66531 (IBK, IBSC, KUN, PE); Ding'an Xian, Maoxiangshan, 12.i.1934, H. Y. Liang 64533 (IBK, IBSC, PE); ibid., Maoxiang, 28.xii.1933, Huang Zhi 35927 (IBK, IBSC); Dongfang Xian, Huacun Xiang, near Minglongling, 80 m, 8.i.1956, Exped. Hainan 554 (IBSC, KUN, PE); ibid., Guangba Qu, Qicha Xiang, Daling, 100–280 m, 17.xi.1956, S. H. Chun 11152 (IBSC, KUN); Ledong Xian, near Panyangdong, 18.v.1936, S. K. Lau 26800 (IBK, IBSC, KUN, PE); Lingshui Xian, Wushi to Tiantou, 500 m, 20.x.1935, F. C. How 73913 (IBK, IBSC, KUN, PE); ibid., Diaoluoshan, 150 m, 4.xi.1965, Comp. Exped. South China 150 (IBSC); Qiongzhong Xian, Chengpo Qu, Dali Xiang, Shang Cun, Mantouwan, 8.xii.1956, Deng Liang 3594 (IBSC, KUN, PE); Sanya Xian, Ganzaling, boundary of Baoting, X.1987, Li Zexian et al. 2959 (IBSC); Tongza, xii.1954, H. Y. Liang 68279 (IBSC); Yaxian (now Sanya), Nanlin, 16.x.1933, C. Wang 34638 (IBK, IBSC, PE). THAILAND. Nonkhai: Chaiyaburi, 200 m, 19.ii.1924, A. F. G. Kerr 8511 (K).

Strobilanthes fluviatilis (C. B. Clarke ex W. W. Sm.) E. Moylan & Y. F. Deng, **comb. nov.**

Hemigraphis fluviatilis C. B. Clarke ex W. W. Sm. in *Notes Bot. Gard. Edinb*. 10: 182 (1918). *Type*: China, Yunnan, Henry 9535 (holotype K, isotype E).

Sericocalyx fluviatilis (C. B. Clarke ex W. W. Sm.) Bremek., in *Verh. Ned. Akad. Wetens. Afd. Nat. Sect*. 2,41(1): 163 (1944).

Habitat and distribution: A rarely collected but aptly named species of river banks in hot dry valleys in Thailand, Burma (Myanmar) and China. BURMA. Shan: Mongnai, Hengtaway, 230 m, 22.ii.1911, W. A. Robertson 242 (K). CHINA. Guangxi: Tianer Xian, Liupai Xiang, Hongshuihe, 13.v.1989, Exped. Beijing 891322 (PE). Yunnan: Banks of Red River, Manpan, A. Henry 9535 (E, K, PE). THAILAND. Phayao: Me Ing River, A. F. G. Kerr 5090 (BM)

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