

**NOTES RELATING TO THE FLORA OF BHUTAN: XXIX**  
**Acanthaceae, with special reference to *Strobilanthes***

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Various problems and issues in the Acanthaceae of Bhutan and the Himalaya are considered. The typification of *Thunbergia grandiflora* is discussed, and *T. lacei* and *T. clarkei* are reduced to synonymy. A new species of *Eranthemum*, *E. erythrochilum*, is described, and the characters which separate it from its allies are listed. A new combination, *P. gomezii*, is made in *Phlogacanthus*. The genus *Echinacanthus* is reviewed and redefined. One group of species placed in it is moved to a new genus, *Clarkeasia*, which contains one species with two recognized varieties. The Chinese species, *Strobilanthes lofuensis*, is moved to *Echinacanthus* pending a thorough review of the three Chinese species in the genus. A wide-ranging discussion of *Strobilanthes* is presented, and Bremekamp's division of the genus into some fifty segregate genera is criticized and rejected. Various characters used in dividing the genus including life form (with particular attention to the gregarious flowering of the many plietesial species), anisophylly, inflorescence type, calyx development, corolla shape, pollen and seeds are discussed and reassessed. Although pollen is of minor value in subdividing the genus in the Himalayan region, it is possible to recognize 17 distinct groups of species at infrageneric level. These groups are described and discussed with the hope that they will help towards the reclassification of the *Strobilanthes* group as a whole. Keys are provided for most groups covering species from outside the Himalayan region as well. Thirty-five individual species of *Strobilanthes* are discussed, of which 17 are described as new. SEM photographs and line drawings illustrate the new species and various aspects of the genus discussed in the paper.

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## THUNBERGIA

***Thunbergia grandiflora*** [Roxb. in Hort. Bengal. 45 (1814) ex] Roxb. in Bot. Reg. 6: 495 (1820); non *Flemingia grandiflora* Rottl. in Neue Schriften Ges. Naturf. Freunde Berlin 4: 202 (1803) which is *Thunbergia fragrans* fide Rottler (loc. cit.). Type: not designated, picture in Bot. Reg. 6: 495 (1820) selected as **neotype** here.

Syn.: *Thunbergia grandiflora* var. *racemosa* Nees in A. DC., Prodr. 11: 54 (1847).

Type: India, *Buchanan Hamilton* in *Wallich* 768g (iso. K-W).

*Thunbergia lacei* Gamble in Bull. Misc. Inform., Kew (1913): 116, **syn. nov.** Type: Burma, *Lace* 5419 (holo. K, iso. E).

*Thunbergia clarkei* Yamazaki in J. Jap. Bot. 46(2): 52 (1971), **syn. nov.** Type: Bhutan, *Kanai et al.* 1069 (holo. TI).

In most recent publications the earliest valid publication of *T. grandiflora* is given as that by Rottler in 1803 under the name *Flemingia grandiflora*. Although Rottler referred to a plant of Roxburgh's with the epithet *grandiflora*, he asserted in a footnote that the plant he was describing was earlier known as *Thunbergia fragrans*. This makes *Flemingia grandiflora* a superfluous name and so illegitimate under the International Code (Art. 63). I have not been able to trace a specimen collected by Rottler but think that his plant may indeed have been *T. fragrans*. This is much more widespread in India than *T. grandiflora*, which is not known from the cited locality (Marmelon, Madras) except possibly as a cultivated plant. Moreover, Rottler made no reference to a racemose inflorescence but instead described the inflorescence in these words: 'Pedunculi in axillis foliorum singuli aut bini, uniflori'. This is exactly right for *T. fragrans* and it is unlikely that Rottler would have described *T. grandiflora* without mentioning the usual racemose inflorescence if he had known it in the field.

Earliest valid publication, therefore, is that by Roxburgh himself in the *Botanical Register* in 1820. Significantly, neither here nor in his *Flora Indica* (1832: 36) does he cite Rottler's *Flemingia grandiflora* and there is no evidence to suggest he is using it as a basionym. Roxburgh cited no type so I have selected the picture as a neotype. It is a good representation of the plant showing the blue-flowered form.

*T. grandiflora* is a conspicuous and very vigorous climber found wild in secondary scrub in north-east India and Burma. Its inflorescence was well described by Roxburgh in *Flora Indica* (1832: 35): '... *Peduncles* axillary, solitary or paired; or in brachiate pairs *i.e.* two or three pairs on terminal racemes, which, if not supported, become beautifully bowing like elegant festoons. *Peduncles* of the axillary flowers, and pedicels of the raceme, round, somewhat clavate, as long as the petioles, one-flowered . . .'. In making this description Roxburgh had the benefit of knowing the living plant but many later botanists did not have this advantage. Because of the size of *T. grandiflora* few collections have been made which show both the axillary and terminal racemose inflorescences. One collection I made in Bhutan (*Wood* 7381) does do this, as does another from Darjeeling (*ESIK* 1226), but both require two separate herbarium sheets.

The inevitable result of this situation is that botanists have repeatedly described one or other inflorescence type as a distinct variety or species, thus adding to the synonymy of this plant over the years. Nees (1847) does seem to have recognized the two types of inflorescence in his diagnosis: 'Pedunculi axillaris, solitarii, angulati, petiolo longiores, uniflori, vel elongati

semipedales et racemosi'. However, he confused the situation by describing a separate variety *β racemosa* distinguished by the two-word phrase 'racemo terminali'.

Clarke, writing in the *Flora of British India* (4: 392), took the opposite view. He described the inflorescence of *T. grandiflora* as having 'racemes usually stout . . . dense flowered or more slender . . .'. No mention is made of the solitary or paired axillary flowers. Clarke goes on to describe a new variety *axillaris* but I have not included this in the synonymy of *T. grandiflora* because it is the same plant as Nees described under the name *Thunbergia cordifolia*. This may well be a distinct species but is still represented only by Clarke's and Hooker's collections at Kew. A search for this plant around Theria Ghaut on the north side of the Meghalaya Hills would be a useful project for a botanist with access to this area.

Clarke's incomplete description of the inflorescence has been accepted by later botanists unfamiliar with the plant in the field. This has led to the unnecessary description of two plants which are in fact synonyms of *T. grandiflora*. *T. lacei* was distinguished by Gamble 'ab affine *T. grandiflorae* Roxb. ramulis longe setosis, foliis majoribus palmatis, molliter pubescentibus, floribus axillaribus pedunculatis recedit'. Of the four elements mentioned here the leaf size and indumentum of the type material is well within the range of *T. grandiflora* but the setose hairs found on some of the type specimens are more unusual. However, the related species *T. coccinea* sometimes but not always has these setose hairs and I do not think they are diagnostic. *T. lacei* is, therefore, based only on the axillary flowers which, as has been shown, are also characteristic of *T. grandiflora*.

*T. clarkei* Yamazaki was distinguished by its hastate, glabrous leaves, the form of its stigma and stamens and by its axillary white flowers. Hastate leaves are common in *T. grandiflora* and glabrous forms occur from time to time. Yamazaki did not specify how the stamens and stigma are different, and type material which I have examined seems to match *T. grandiflora* well. Once again this species is seen to be based on the unsound foundation of the axillary flowers seen in the type collection. Consequently I have no hesitation in reducing *T. clarkei* as well as *T. lacei* to synonymy with *T. grandiflora*.

## ERANTHEMUM

*Eranthemum* is a small genus of about fifteen species centred on India and Burma but extending to China, Thailand and Malaysia. It is also known from Sri Lanka and the Andamans. The best-known species is *E. pulchellum* Andrews which is widespread in the Himalayan region and is commonly cultivated for its attractive but short-lived blue flowers. Most species in the genus are like *E. pulchellum* in having a long, narrowly cylindrical corolla tube widened just below the mouth. However, there is a small group, first recognized by C.B. Clarke in *Flora of British India* (4: 417–418), distinguished by their red corolla with a tube strongly ventricose in the upper half. This consists of four species (*E. griffithii*, *E. tubiflorum*, *E. erythrochilum* (described below) and *E. splendens*), all found in the eastern Himalaya and all alike, little known and commonly confused.

The differences between the four species are shown in Table 1 and Fig. 1. Although closely related there are clear differences in inflorescence type, indumentum, bract shape, corolla size and the extent to which the anthers are exerted. All four grow in subtropical scrub between 200 and 1000m but their exact ecology is not known.

TABLE 1. Differences between *Eranthemum griffithii* and its allies.

	Leaf indumentum	Bract indumentum	Bract shape	Length of corolla tube	Length of corolla lobes	Exsertion of anthers	Corolla colour	Type of inflorescence
<i>E. griffithii</i>	glabrous	glabrous (rarely a few hairs near base of midrib)	elliptic, tapered to a short point	2-3cm	0.4-0.6cm	0.5cm	pink	branched
<i>E. tubiflorum</i>	glabrous except the veins which are pubescent below	glandular-pubescent on veins	elliptic, tapered to a short point	3-3.4cm	0.5-0.7cm	0.5cm	crimson	branched
<i>E. erythrochilium</i>	thinly pilose on both surfaces; veins glandular-pilose below	glandular-pubescent	elliptic-obovate, tapered to a point	3.9-4.5cm	1-1.2cm	1.5-2.5cm	brilliant crimson	simple
<i>E. splendens</i>	thinly pilose on both surfaces; densely glandular-pubescent on veins	densely yellow-green, glandular-pubescent	obovate, abruptly narrowed to a short point	2.3-2.8cm	0.5-0.6cm	1-2cm	orange-red	much branched

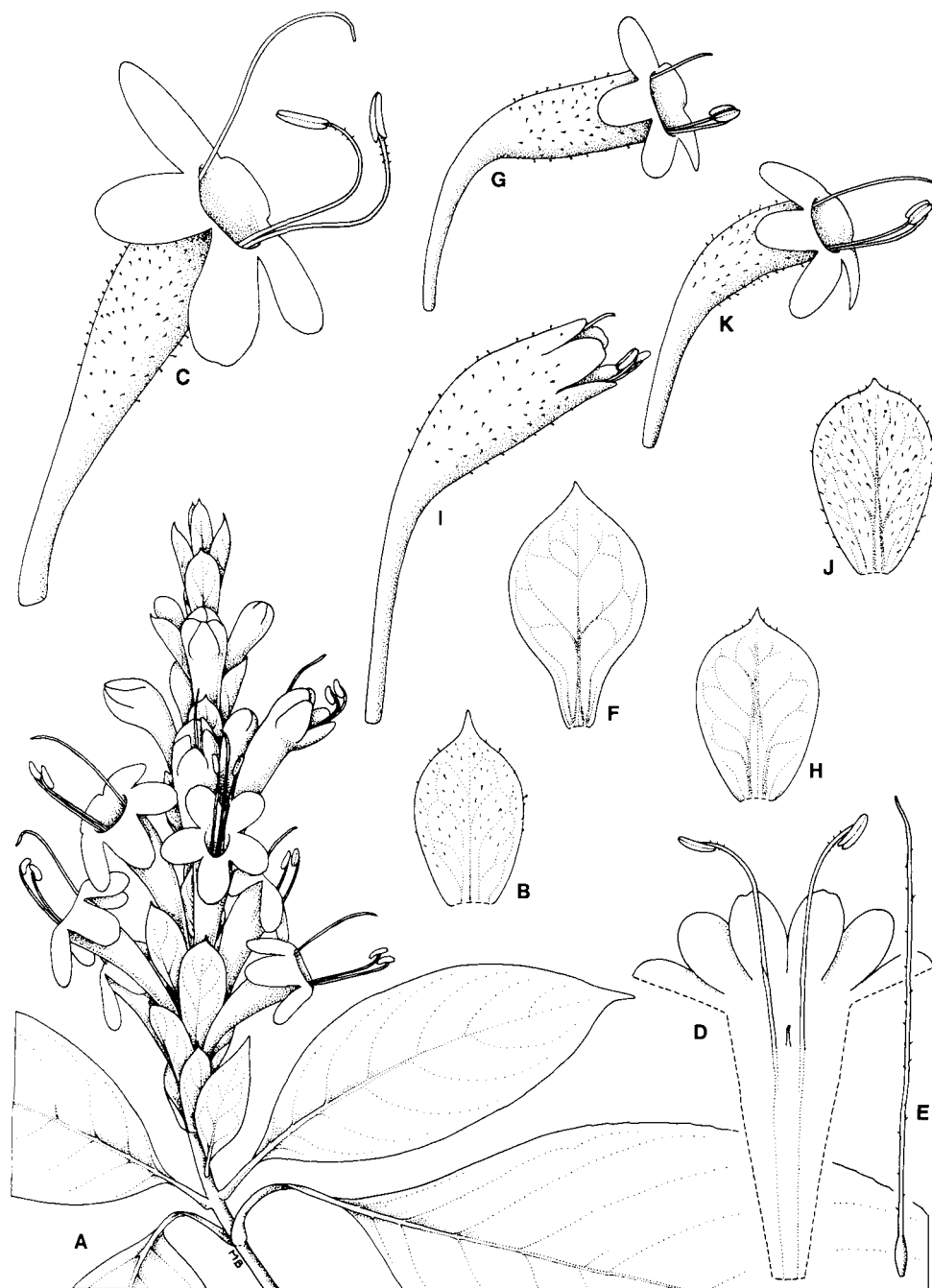


FIG. 1. *Eranthemum erythrochilum* J.R.I. Wood. A, habit and inflorescence,  $\times \frac{2}{3}$ ; B, bract,  $\times 1.5$ ; C, corolla,  $\times 1.5$ ; D, corolla opened out,  $\times 1$ ; E, ovary and style,  $\times 1$ . *E. griffithii* (T. Anders.) Bremek. & Nann.-Bremek. F, bract,  $\times 1.5$ ; G, corolla,  $\times 1.5$ . *E. tubiflorum* (T. Anders.) Radlk. ex Lindau; H, bract,  $\times 1.5$ ; I, corolla,  $\times 1.5$ . *E. splendens* (T. Anders.) Hort. ex Siebert & Voss. J, bract,  $\times 1.5$ ; K, corolla,  $\times 1.5$ . Bracts all taken from middle of the inflorescence. A–E from *Lister* 33 and *Gamble* 6648; F–G from *Wood* 7530; H–I from *Griffith* K.D. 6122; J–K from *Ribu & Rhomoo* s.n. Drawn by Mary Bates.

***Eranthemum griffithii*** (T. Anders.) Bremek. & Nann.-Bremek. in Ver. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. 2, 45(1): 35 (1948). Type: India, Assam, *Griffith* 1437 (lecto. K. chosen here).

Basionym: *Daedalacanthus griffithii* T. Anders., J. Linn. Soc. Bot. 9: 486 (1867).

*E. griffithii* (Fig. 1F, G) is readily distinguished from the other species by the subglabrous indumentum and pink ('flesh-coloured' fide Griffith) corolla. Some specimens are entirely glabrous except for a few glandular hairs on the corolla, whereas in others a few hairs can be detected on the leaf and bract petioles. *E. griffithii* occurs along the borders of Bhutan with West Bengal and Assam from about 89°20'E to 92°E.

Specimens seen:

BHUTAN. Torsa River, Phuntsholing, 200m, 11 ii 1982, *Grierson & Long* 2860 (K, E); *ibid.*, 400m, 19 i 1992, *J.R.I. Wood* 7530 (E); between Kharbandi (Richending) and Sorchen, 700m, 26 xi 1991, *J.R.I. Wood* 7522 (E); *ibid.*, 18 iii 1990, *J.R.I. Wood* 7238 (E); W bank of river at Pinkhua, W of Sarbhang, 310m, 16 iii 1982, *Grierson & Long* 3752 (E); Sarbhang-Damphu, 700m, 19 ii 1988, *J.R.I. Wood* 6149 (E); 1km N of Sarbhang, 500m, 18 ii 1990, *J.R.I. Wood* 7233 (E); without locality (?Deothang), *Griffith* (BM).

WEST BENGAL. Chokerboo, W Duars, 6 ii 1879, *Gamble* 6642 (K).

ASSAM. Ghoorgong, 2 i 1838, *Griffith* 1437 (lecto. K, ?CAL, n.v.); Gauhati, *Simons* (original syntype, ?CAL, n.v.); Goalpara, 1879, *Fisher* (K, BM); Goma Duars, Goalpara District, ii 1877, *Gamble* 694 (K); North of Dharamjuli Tea Estate, Darrang District [26°50'N, 91°57'E], 450m, 1 ii 1971, *Stainton* 6731 (K).

***Eranthemum tubiflorum*** (T. Anders.) Radlk. ex Lindau in Engl. & Prantl, Nat. Pflanzenfam. 4(3b): 311 (1895). Type: India, Arunachal Pradesh, *Griffith*, Kew Distrib. No. 6122 (lecto. K, chosen here).

Basionym: *Daedalacanthus tubiflorus* T. Anders., J. Linn. Soc. Bot. 9: 485 (1867).

*E. tubiflorum* (Fig. 1H, I) is the least well-defined of the four species, being in many ways intermediate between *E. griffithii* and *E. erythrochilum*. It differs from *E. griffithii* in its larger, dark red ('crimson' fide Kingdon Ward) corolla and in its leaves and bracts being pubescent on the veins. From *E. erythrochilum* it is distinguished by the smaller corolla, less hairy leaves and the anthers which are only exserted about 0.5cm. *E. tubiflorum* has more clearly toothed leaves than other species. It is restricted to the eastern part of Arunachal Pradesh, being found on both sides of the Brahmaputra River where it cuts through the mountains.

Specimens seen:

ARUNACHAL PRADESH. Mishmi Hills, near foothills, 1 xii 1836 (fide Griff., Posth. Papers (Journals): 48), *Griffith*, Kew Distrib. No. 6122 (lecto. K); *ibid.* ex Herb. Gamble (K); by the banks of the Brahmaputra River, *Lowther* s.n. (?CAL, n.v.); Abor Hills [28°15'N, 95°30'E], 300m, 4 xii 1928, *Kingdon Ward* 8753 (K).

***Eranthemum erythrochilum*** J.R.I. Wood, *sp. nov.* indica ab omnibus speciebus pariter tubo corollae ventricoso et lobis corollae rubris gaudentibus, propter corollam multo longiorem et inflorescentiam apparenter semper simplicem distincta; affine *E. splendenti* sed bracteis ellipticis vel subobovatis in acumen breve contractis (non obovatis, abrupte mucronatis) recedens; affine *E. tubiflori* sed antheris exsertis usque 2.5cm recedens. **Fig. 1A–E.**

Type: India, West Bengal, *Gamble* 6648 (holo. K).

Small undershrub. *Stems* pubescent, probably eventually glabrescent. *Leaves* elliptic, shortly acuminate at both ends, subentire, 6–22 × 2.5–7.5cm, sparsely hairy on both surfaces and especially on the veins below; cystoliths very prominent on both surfaces; petioles pilose, 2–4cm long. *Inflorescence* a solitary terminal spike, 5–14cm long in all specimens available to me, but probably longer; peduncle 0–1cm long. *Bracts* elliptic-obovate, gradually narrowed to a distinct point, glandular-pubescent, reticulate-veined, 1.7–2.2cm long, 0.9–1.3cm wide. *Bracteoles* linear-lanceolate, scarious, glandular-pubescent, c.0.7mm long. *Calyx* scarious, glandular-pubescent, 1.2–1.3cm long, 5-lobed for about  $\frac{2}{3}$  its length, the lobes linear-lanceolate, acuminate. *Corolla* crimson, glandular-pubescent outside, the tube 3.9–4.5cm long, cylindrical for c.2cm and then gradually widened to about 1cm at the mouth, lobes ovate-elliptic, 1–1.2cm long, 0.7–0.8cm wide. *Ovary* glabrous; style sparsely pilose, exserted 1.5–2.5 cm. *Stamens* inserted just above the base of the corolla; filaments glabrous; anthers exserted 1.5–2.5cm, the cells 3–4mm long. *Capsule* not seen.

Specimens seen:

INDIA. West Bengal: Buxa, 300m, 2 ii 1879, *Gamble* 6648 (holo. K); Buxa, ii 1879, *Brandis* s.n. (K); ridge between Sahralbunga (?Sarbhanga) and Lurraung (?Larrong) rivers, 366m, 10 i 1912, *Lister* 33 (K, E); *ibid.*, *Lister* 31 (BM).

In its indumentum and bract shape *E. erythrochilum* is in many ways intermediate between *E. tubiflorum* and *E. splendens* but its corolla is much larger than in either species and the anthers are more strongly exserted. All specimens I have seen show a simple inflorescence; this is unusual in *Eranthemum* but may not be a reliable character as I do not have much material available. *E. erythrochilum* is apparently rare, being found only in a restricted area on the border of West Bengal and Bhutan in Buxa Duar. The Lister collections may be from here or further east near the Sarbhang River, but the situation is complicated by the various spellings and details on the labels of his collections, and it is impossible to be certain exactly where the collection was made. It is probable that some recent collections by Sikdar & Rao (1984) listed under the name *E. splendens* also refer to this species.

*E. erythrochilum* is so named because of the 'brilliant crimson' (fide Gamble) corolla lobes, fancifully recalling red lips.

***Eranthemum splendens*** (T. Anders.) Siebert & Voss, *Vilm.*, *Blumengärtn.* Ed. 3, 1: 806 (1894). Type: India, Darjeeling, *Griffith*, Kew Distrib. No. 6129 (lecto. K, chosen here). Basionym: *Daedalacanthus splendens* T. Anders., *J. Linn. Soc. Bot.* 9: 486 (1867).

*E. splendens* (Fig. 1J, K) is the best-known and most easily recognizable species in this group. The pubescent indumentum of all vegetative parts and the obovate, abruptly mucronate bracts are very distinct. Like *E. erythrochilum* it has strongly exserted anthers but is immediately distinguished by the much smaller corolla and the branched, paniculate inflorescence. Indeed the inflorescence is more compound and has longer spikes than in any other species in this group.

*E. splendens* is known from eastern Nepal and the Darjeeling district of West Bengal. It is doubtfully recorded from Bhutan.

## Specimens seen:

NEPAL. Ghorwa-Sanichare, 200–300m, *Hara et al.* 4256 (BM, TT).

DARJEELING. Without locality, *J.M. Cowan* s.n. (E); Russu, 24 i 1912, *Ribu & Rhomoo* s.n. (E); Sivoke Hills, 600m, xii 1879, *Gamble* 7562 (K); 'Sikkim', 300–900m, *Hooker* 23 (K, BM); Shekhin, 20 i 1877, *Gamble* 2420 (K); 'Sikkim' Terai, 30 xii 1874, *Treutler* 1207 (K); Panchkilla, 300m, 29 ii 1876, *Clarke* 27079 (K, BM); 'Sikkim' Terai, 600m, i 1872, *Gamble* 3537 (K); Panchkilla, 300m, 14 xii 1876, *Clarke* 31712 (K); Terai, 1867, *T. Anderson* (BM).

I have seen only the one collection cited above from Nepal. It is in several respects different from Darjeeling material, particularly in having the mucro on the bracts almost suppressed and in having very long lanceolate or oblong-elliptic leaves 24–27 × 4–5cm in size. This material merits further investigation when more collections from East Nepal become available.

## PHLOGACANTHUS

***Phlogacanthus gomezii* (Nees) J.R.I. Wood, comb. nov.**

*Basionym*: *Loxanthus gomezii* Nees in *Wall., Pl. Asiat. Rar.* 3: 99 (1832). *Type*: India/Bangladesh, Silhet (?Khasia Hills in Meghalaya), *Gomez* in *Wallich* 7170 (iso. K-W).

*Syn.*: *Phlogacanthus wallichii* C.B. Clarke in *Hook.f., Fl. Brit. India* 4: 511 (1885) nom. illegit. *Type*: as for *Loxanthus gomezii*.

*P. gomezii* is the correct name for the plant described by Clarke as *P. wallichii*. Clarke seems to have adopted a new name because Nees added an extraneous element to his original species concept in his account of *Loxanthus gomezii* in *De Candolle's Prodrum*. A manuscript note in Clarke's handwriting at Kew says 'Nees mixed Griffith's Mergui plant with this, a 4000ft Khasia/Jaintea one and his *Loxanthus gomezii* in DC. *Prodrum* is an amalgam. I therefore propose a new specific name'.

Despite the mix-up by Nees, *Loxanthus gomezii* was validly published and Clarke's name is superfluous. I have therefore reinstated the earlier epithet, which commemorates the work of William Gomez, one of Wallich's collectors.

## ECHINACANTHUS

The genus *Echinacanthus* was described by Nees in his account of the Acanthaceae in *Wallich's Plantae Asiaticae Rariores* 3: 90 (1832). Nees included only one species, *E. attenuatus*, and seems to have based the genus on two characters: the spurred anther cells (Fig. 2H), whence the name *Echinacanthus*, and the distinctive inflorescence. This is formed of short bifid secund cymes which have an intermediate flower at their branching point.

Later, in his account of the genus in *De Candolle's Prodrum* (1847), Nees added three more species: *E. brugmansianus*, *E. lyellianus* and *E. calycinus*. In doing so he introduced three new elements, each of which is discussed below.

*E. brugmansianus* from an unknown locality in Asia, possibly Indonesia, is similar to *E. attenuatus* in its herbaceous habit, entire leaves and secund inflorescence. However, it has muticous anther cells and a distinctly 2-lipped corolla and should have been placed in *Nomaphila* Blume, a genus which Nees also recognized. A few years later Otto Kuntze made the same mistake, describing two further species of *Nomaphila* in *Echinacanthus* as



*E. javanicus* and *E. dichotomus*. All three names in fact represent the same plant, now placed in *Hygrophila* and known as *H. corymbosa* (Blume) Lindau.

*E. lyellianus* from Madagascar does have the spurred anther cells of *E. attenuatus* and a very similar inflorescence and it is not at all surprising that Nees placed it in *Echinacanthus*. He was followed in the same path by Baker who described another Madagascan species as *E. madagascariensis*. Both these plants, in fact, belong to the wholly Afromadagascan genus *Mimulopsis* Schweinfurth which is distinguished from *Echinacanthus* by having only one pair of anther cells spurred instead of both as in *Echinacanthus*.

*E. calycinus* introduces yet another element. This species was originally described from India by Nees in *Asystasia* and is very different from *E. attenuatus*, having toothed leaves, muticous anther cells and a simple secund inflorescence. When Thomas Anderson (1867) revised Nees' generic concepts in his account of the Indian Acanthaceae, it fell clearly within his concept of *Strobilanthes* since it had only two ovules per locule. The plant is today known as *Strobilanthes helicta* T. Anders., as the epithet *calycina* had already been used in *Strobilanthes*.

What Anderson did do, however, was to shift the general concept of the genus away from *Echinacanthus attenuatus* towards *Strobilanthes*. Thus when he found a plant which fitted *Strobilanthes* in every way except for having an 8-seeded capsule, he placed it in *Echinacanthus* under the name *E. parviflorus*, even though he described a specimen of the same species, but without fruit, in *Strobilanthes* under the name *S. violifolia*. It is probably true that Anderson did not see the anthers of his *E. parviflorus* since he did not describe them and the type material at Kew has only a single unopened and undissected corolla. In fact it is representative of a species with muticous anthers.

C.B. Clarke followed Anderson by describing three more species in *Echinacanthus*: *E. andersonii*, *E. longistylus* and *E. pumilio*, all in my opinion conspecific with *E. parviflorus*. Clarke did, however, recognize the problem of the anthers. He clearly had difficulties selecting an appropriate genus to put his new taxa in, variously labelling the type sheets *Strobilanthes*, *Dipteracanthus*, *Hygrophila* and *Aechmanthera* before finally settling on *Echinacanthus*. He then added a note in the *Flora of British India* (4: 414) saying: 'The character of the genus has been here widened to include plants closely resembling *Echinacanthus* except that the anther cells are muticous'. Clarke did not, however, comment on the curious leafy shoots produced on the inflorescence of all three of his new species which are discussed more fully below (page 189).

Efforts to define or extend the definition of *Echinacanthus* have ended here apart from palynological studies. Clarke himself examined pollen, leaving behind sketches of the pollen grains on the type sheets of his new species as well as on a sheet of *E. attenuatus*. He did not, however, comment on the differences which he observed and which Lindau (1895) used to make major divisions in his revised classification of Acanthaceae. *E. attenuatus* has ridged globose triporate pollen ('Rippenpollen') with the pores situated on the ridges, whereas in Clarke's species the pollen is ellipsoid with the pores between the ridges, a major distinction in Lindau's classification (Fig. 2A, B, E, F).

Table 2 summarizes the main distinctions noted by Nees and his successors as prime features of *Echinacanthus* as exemplified by the type of the genus, *E. attenuatus*, and contrasts them with those of *E. parviflorus*.

TABLE 2. Comparison of features of *Echinacanthus attenuatus* and *E. parviflorus*.

	<i>E. attenuatus</i>	<i>E. parviflorus</i>
Life form	Perennial herb	Perennial undershrub
Leaves	Isophyllous, entire	Anisophyllous, dentate
Inflorescence	Small bifid secund cymes with an intermediate flower	Simple secund cymes
Anther cells	Spurred	Muticous
Pollen	Globose, pores on the ridges	Ellipsoidal, pores between the ridges

In my opinion these differences are so significant that the two species cannot be placed in the same genus. Most important are the anther and pollen characters used extensively by Nees and Lindau to distinguish between genera and in this case supporting each other. Also significant are the life form and the leaf margin. The entire leaves and herbaceous habit of *E. attenuatus* place it vegetatively close to *Hygrophila* whereas the toothed leaves and shrubby habit of *E. parviflorus* place it close to *Strobilanthes*. *E. attenuatus* does, in fact, bear a strong superficial resemblance to some forms of *Hygrophila corymbosa*, especially to plants formerly known as *Nomaphila parishii* T. Anderson and *N. siamensis* C.B. Clarke, which may help explain why Nees and Kuntze erroneously described three *Nomaphila* species in *Echinacanthus*.

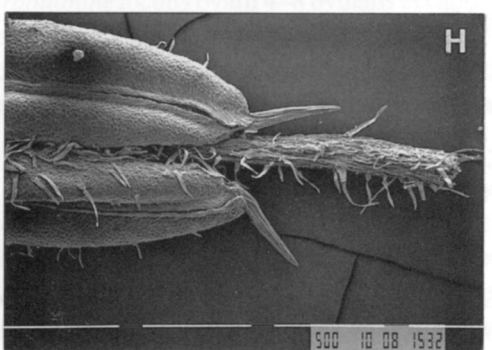
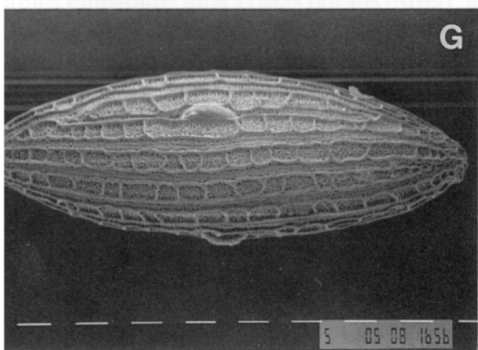
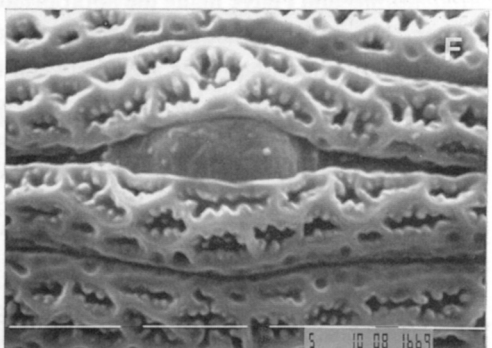
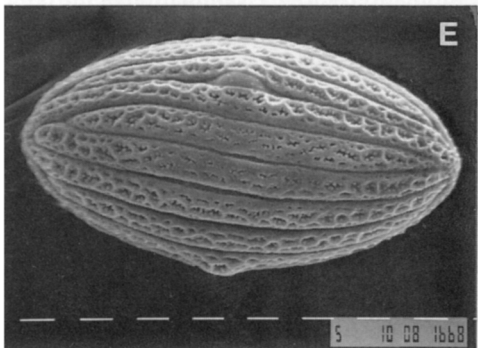
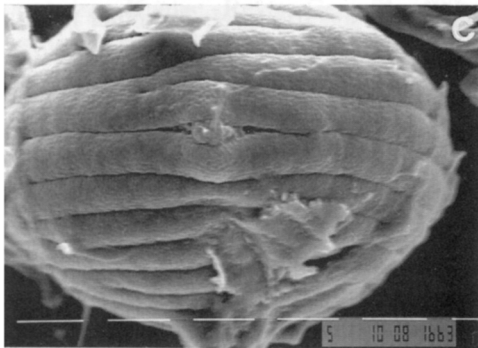
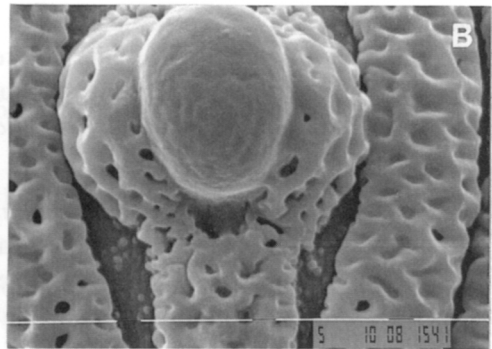
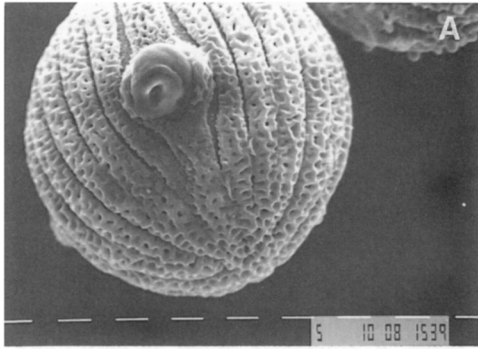
If *Echinacanthus parviflorus* cannot be included in *Echinacanthus*, we find ourselves once again in Clarke's dilemma as to what genus it should be placed in. There are three main possibilities, in all of which pollen similar to that of *E. parviflorus* can be found.

*Strobilanthes* sensu lato. This has to be rejected since the inclusion of *E. parviflorus* with its 8–16-seeded capsule would breach the main definition of *Strobilanthes* as established by Anderson and Clarke, i.e. that it is restricted to species having two ovules per locule and a 4-seeded capsule. The same reason would exclude any of the segregate genera recognized by Bremekamp.

*Hemigraphis*. At first sight this seems a good possibility since *Hemigraphis* is distinguished by its many-seeded capsules, the locules having 3–8 ovules. However, the weedy, herbaceous habit and dense bracteate, spicate inflorescences of *Hemigraphis* contrast very strongly with the shrubby habit, minute bracts and lax secund cymes of *E. parviflorus*.

*Aechmanthera*. This small Himalayan genus seems the best possibility. It is shrubby in habit and has more than two ovules per locule. However, the awned anthers, in

FIG. 2 (opposite). *Echinacanthus attenuatus* Nees. A, pollen, side view; B, pore and detail of ornamentation. *E. lofuensis* (H. Lévl.) J.R.I. Wood; C, pollen, side view; D, pollen, polar view. *Clarkeasia parviflora* (T. Anders.) J.R.I. Wood. E, pollen, side view; F, pore and detail of ornamentation. *Strobilanthes helicta* T. Anders. G, pollen, side view. *Echinacanthus attenuatus* Nees. H, anther base and spurs. A–B, H from *Stainton* 8907; C–D from *Cavalerie* 3288; E–F from *Wood* 7514; G from *Kingdon Ward* 10933. All micron lines = 5µm except H = 500µm. SEM photographs by Jenny Wright. →



which the connective is extended into a point, are not found in *E. parviflorus*. Moreover, the inflorescence is quite different, with the flowers in clusters on the panicle branches, and there are only 3–4 ovules per locule so the capsules are at most 6–8-seeded. It is difficult to place *E. parviflorus* here.

The only satisfactory solution is, therefore, to describe a new genus for *E. parviflorus* and this I have done below using the name *Clarkeasia*, commemorating C.B. Clarke's contribution to the study of Asian Acanthaceae in general and to identifying this genus in particular.

Before doing this it is necessary to look briefly at the fate of *Echinacanthus* this century. It was not included in Bremekamp's *Materials for a Monograph of the Strobilanthinae* and only four species have been described in it. One of these, *E. siamensis* Imlay, is very close to *E. parviflorus* and, in my opinion, cannot be separated at specific level. The other three, all described from China in 1985, are *E. longipes* Lo & D. Fung, *E. longzhouensis* Lo and *E. flaviflorus* Lo & D. Fung. They all seem to have the spurred anthers and entire leaves of *E. attenuatus*. Particularly interesting is *E. longipes*. It is a herb and seems from the illustration in *Acta Botanica Yunnanica* 7: 139 to have exactly the same inflorescence type as *E. attenuatus*, i.e. bifid secund cymes. Unfortunately I have seen material only of *E. flaviflorus* which I believe to be conspecific with *Strobilanthes lofuensis* H. Lév. My attention was drawn to this latter plant by Enayet Hossain's comment (1980: 479) that 'this species is anomalous in *Strobilanthes* in having tailed anthers and smooth, circular, 3-colporate pollen grains with a smooth tectum and many fine bands which are not strictly parallel to one another'. This immediately suggested *Echinacanthus* and I have made the appropriate combination below. Examination of the pollen, however, shows that, although it is similar in shape to that of *E. attenuatus*, the ornamentation is quite different and the pores arise between the ridges, not through them (Fig. 2C, D). Since *E. lofuensis* and *E. longzhouensis* are both shrubby species further investigation is clearly needed before a final decision about the placement of these Chinese species can be made.

*Echinacanthus* as here recognized therefore consists of four known species:

***Echinacanthus attenuatus*** Nees in Wall., Pl. Asiat. Rar. 3: 90 (1832). Type: Nepal, *Wallich* 2345 (iso. K-W). Nepal and India (Darjeeling).

***E. lofuensis*** (H. Lév.) J.R.I. Wood, **comb. nov.** Basionym: *Strobilanthes lofuensis* H. Lév., Repert. Spec. Nov. Regni Veg. 12: 99 (1913). Type: China, *Cavalerie* 3288 (iso. E, K). China (Guizhou and Guangxi).

***E. longipes*** Lo & D. Fung, Acta Bot. Yunnan. 7(2): 138 (1985). Type: China, *Wang Zhengang et al.* 3-1709 (holo. GXMI). China (Guangxi).

***E. longzhouensis*** Lo, Acta Bot. Yunnan. 7(2): 140 (1985). Type: China, *Chun, S.H.* 13793 (holo. SCBI). China (Guangxi).

The other species which have been placed in *Echinacanthus* are as follows:

*Echinacanthus andersonii* C.B. Clarke in Hook.f., Fl. Brit. India 4: 415 (1885). Type: India, Darjeeling, *Clarke* 13633 (iso. K) = ***Clarkeasia parviflora*** (T. Anders.) J.R.I. Wood.

*E. brugmansianus* Nees in A. DC., Prodr. 11: 168 (1847). Type: Asia, *Brugmans* (holo. C) = **Hygrophila corymbosa** (Bl.) Lindau.

*E. calycinus* (Nees) Nees in A. DC., Prodr. 11: 168 (1847). Type: India, *Wallich* 2417 (iso. K-W) = **Strobilanthes helicta** T. Anders.

*E. dichotomus* Kuntze, Revis. Gen. Pl.: 489 (1891). Type: Java, *O. Kuntze* (?NY, n.v.) = **Hygrophila corymbosa** (Bl.) Lindau.

*E. flaviflorus* Lo & D. Fung, Acta Bot. Yunnan. 7(2): 141 (1985). Type: China, *Zheng Xue-Zhong & Huang Jian-hui* 99 (holo. GXMI, iso. K) = **E. lofuensis** (H. Lév.) J.R.I. Wood.

*E. javanicus* Kuntze, Revis. Gen. Pl.: 489 (1891). Type: Java, *O. Kuntze* 4989 (iso. K) = **Hygrophila corymbosa** (Bl.) Lindau.

*E. longistylus* C.B. Clarke in Hook.f., Fl. Brit. India 4: 415 (1885). Type: India, Darjeeling, *Clarke* 13845 (iso. K) = **Clarkeasia parviflora** (T. Anders.) J.R.I. Wood.

*E. lyellianus* Nees in A. DC., Prodr. 11: 168 (1847). Type: Madagascar, *Lyell* (holo. K) = **Mimulopsis lyelliana** (Nees) Baron ex Benoist.

*E. madagascariensis* Baker in J. Linn. Soc. Bot. 20: 218 (1883). Type: Madagascar, *R. Baron* 1531 (holo. K) = **Mimulopsis madagascariensis** (Baker) Benoist.

*E. parviflorus* T. Anders. in J. Linn. Soc. Bot. 9: 459 (1867). Type: India, Meghalaya/Khasia, *Griffith* (lecto. K) = **Clarkeasia parviflora** (T. Anders.) J.R.I. Wood.

*E. pumilio* C.B. Clarke in Hook.f., Fl. Brit. India. 4: 415 (1885). Type: India, Meghalaya/Khasia, *Clarke* 17801 (iso. K, BM) = **Clarkeasia parviflora** (T. Anders.) J.R.I. Wood.

*E. siamensis* Imlay in Bull. Misc. Inf., Kew (1939): 114. Type: Thailand, *Kerr* 4944 (iso. K, BM) = **Clarkeasia parviflora** (T. Anders.) J.R.I. Wood.

#### CLARKEASIA

**Clarkeasia** J.R.I. Wood **gen. nov.** ab *Echinacantho* antheris muticosis, foliis dentatis, granis pollinis ellipsoidis inter costas poratis differt; a *Strobilanthe* loculis ovarii 4–8 ovulatis et capsulis 8–16 seminibus differt; ab *Aechmanthera* inflorescentia paniculata cymarum axillarum secundarum composita et connectivo supra antheram non producto distincta; ab ceteris generibus suae affinitatis praesentia surculorum foliosorum ad ramos principales inflorescentiae partim effectorum diversa. **Fig. 2E, F; Fig. 3A–I.**

Suffrutices. *Folia* opposita, petiolata, inaequalia, ovata vel elliptica, dentata, saepe basin obliqua. *Inflorescentia* paniculata cymis axillaribus secundis composita; rachis saepe fractiflexa; pedicelli breves; bractae bracteolaeque parvae, lineares. *Calyx* ad basin 5-partitus, lobis linearibus subaequalibus, intus strigosus vel glaber. *Corolla* recta, infundibulariformis, 5-lobata; stamina fertilia 4, didynama, inclusa, tubo corollae inserta; antherae biloculares, loculis oblongis, muticosis, subparallelis; pollinis grana ellipsoidea, e typo ‘Rippenpollen’, triporata, poris inter costas dispositis (Fig. 2E, F); ovarium in quoque loculo (4–)8-ovulatum; stigma inclusa; stylus simplex,

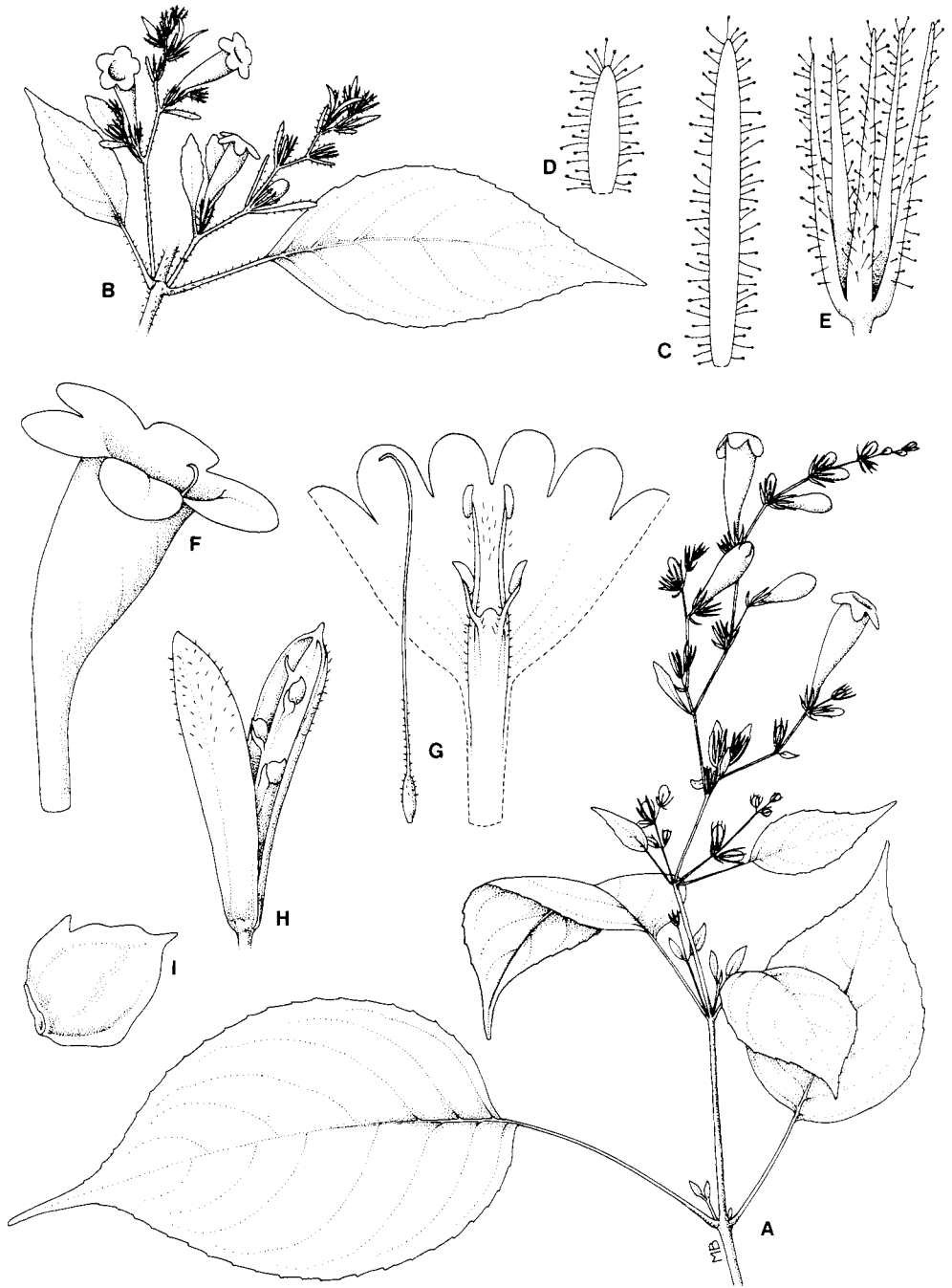


FIG. 3. *Clarkeasia parviflora* (T. Anders.) J.R.I. Wood var. *parviflora*. A, habit,  $\times \frac{2}{3}$ . Var. *albescens* J.R.I. Wood. B, habit,  $\times \frac{2}{3}$ ; C, bract,  $\times 4$ ; D, bracteole,  $\times 4$ ; E, calyx,  $\times 4$ ; F, corolla opened out with style,  $\times 2$ ; H, capsule,  $\times 4$ ; I, seed,  $\times 18$ . A from Wood 7514; B-I from Brandis s.n. and Gamble 6680. Drawn by Mary Bates.

curvatus. *Capsula* (8–)16 sperma, oblonga, retinaculis crassis uncinatis; semina discoidea, pilis muciliginis instructa.

Typus: *Clarkeasia parviflora* (T. Anders.) J.R.I. Wood.

*Clarkeasia* is a monotypic Asiatic genus closely related to *Strobilanthes*, differing principally in the eight ovules in each ovary cell. The only species is somewhat anisophyllous and has asymmetrical leaves, although this is not consistent between specimens or even on the same plant. More remarkable is the production of curious non-developing leafy shoots which seems to be linked to the characteristic zigzag rhachis of the main panicle and of the secund cymes. These small shoots seem to develop at the point of zigzag and represent an abortive continuation of the main rhachis. The rhachis is in fact continued by the side shoot which arises at a sharp angle, hence giving the distinctive zigzag effect apparent on many specimens. The leaves on these shoots are much reduced, often lanceolate and commonly glandular-hairy on otherwise glabrous plants. Quite why or how this strange phenomenon develops is not known but it serves to make the genus distinctive if not unique.

The pollen is ellipsoid and clearly of Lindau's 'Rippenpollen' type. The detailed ornamentation is not typical for *Strobilanthes* (Fig. 6A, B, D–H) but most closely resembles that of *S. cusia* Nees (Scotland, 1993: 494). Both species have an intricate ornamentation on the ribs (Fig. 2F).

***Clarkeasia parviflora* (T. Anders.) J.R.I. Wood, *comb. nov.***

Basionym: *Echinacanthus parviflorus* T. Anders. in J. Linn. Soc. Bot. 9: 459 (1867). Type: India, Meghalaya (Khasia), *Griffith* s.n. (lecto. K, chosen here; CAL, ?isolecto.).

Syn.: *Strobilanthes violifolia* T. Anders. in J. Linn. Soc. Bot. 9: 485 (1867) ex desc.

Type: India, Sikkim, *T. Anderson* s.n. (?CAL ? [Missing]).

*Pteracanthus violifolius* (T. Anders.) Bremek., Verh. Ned. Akad. Wetens. Afd. Nat. 2, 41(1): 200 (1944).

*Echinacanthus andersonii* C.B. Clarke in Hook.f., Fl. Brit. India 4: 415 (1885).

Type: India, Darjeeling, *C.B. Clarke* 13633 (iso. K, BM).

*E. andersonii* var. *viscosus* C.B. Clarke, in Hook.f., Fl. Brit. India 4: 415 (1885).

Type: India, Sikkim, *C.B. Clarke* 25468 (iso. K, BM).

*E. longistylus* C.B. Clarke, in Hook.f., Fl. Brit. India 4: 415 (1885). Type: India, Darjeeling, *C.B. Clarke* 13845 (iso. K, 3 sheets).

*E. pumilio* C.B. Clarke, in Hook.f., Fl. Brit. India 4: 415 (1885). Type: India, Meghalaya (Khasiya), *C.B. Clarke* 17801 (iso. K, BM).

*E. siamensis* Imlay in Bull. Misc. Inf., Kew (1939): 114. Type: Thailand, *Kerr* 4944 (iso. K, BM).

I have included *Strobilanthes violifolia* under *C. parviflora* although I have not seen the type, which may have been lost even before Anderson published his description of it. Anderson's diagnosis, however, leaves no room for serious doubt and could only refer to this plant: '. . . foliis petiolatis, inferioribus rotundis, oblique ovatis, acutis, serratis, basi inaequaliter subcordatis . . . spicis . . . paucifloris; floribus remotis, subsessilibus, solitariis, oppositis; bracteis linearibus'.

Distribution: Nepal, Bhutan, Eastern India, Thailand; not recorded from Burma.

Habitat: Throughout its range *C. parviflora* is found on rocks beside streams in subtropical, 'monsoon' forest.

Specimens seen:

NEPAL. Phusri-Sanguri Bhanjang-Dhari Pani, 16 x 1963, *Hara et al.* 4907 (TI, BM); below Seilung, along Midam Khola, Lamjung Himal, 17 ix 1969, *Wraber* 36638 (BM); Sapt Kosi Gorge [26°50'N, 87°10'E], 200m, 8 xi 1969, *Stainton* 6658 (BM); near Obak, E side of Arun Valley, Sankhuwasabha District [27°36'N, 87°22'E], 1260m, 15 x 1991, *Long et al.* 834 (E).

BHUTAN. W bank of Torsa River, Phuntsholing, 200m, 17 ii 1982, *Grierson & Long* 2987 (E); Charnurchi River, 1 hour above Samchi, 800m, 20 xi 1991, *Wood* 7514 (E, K); Torsa River, Phuntsholing, 300m, 19 i 1992, *Wood* 7533 (E); 15km N of Deothang, 1400m, 18 x 1987, *Wood* 5970 (E, K, THIMPHU).

INDIA. Sikkim: Lingcham, 1200m, 21 x 1875, *Clarke* 25468 (K, BM); without locality, 1878, *G. King* (K). Darjeeling District: Pomong, 900m, 31 x 1870, *Clarke* 13633 (K, BM); Punkabari, 15 xi 1870, *Clarke* 13812 (K, BM); Kurseong, 15 xi 1870, *Clarke* 13845 (K); Panchkilla, 300m, 29 ii 1876, *Clarke* 27079 (BM); Selim, 1100m, 12 x 1884, *Clarke* 36738 (K); Punkabari, 80m, 23 vi 1871, *Clarke* 13897 (BM); Tista Valley, 300m, 7 i 1873, *Gamble* 3565 (K); Kurseong, 1400m, *Gamble* 3574 (K); Kurseong road, 1000m, x 1875, *Gamble* 155A (K); Kurseong, 900m, *Beddome* (K); Pankabari, 750m, xi 1879, *Gamble* 7382 (K). Meghalaya (Khasiya): without exact locality, *Griffith* (K); *ibid.*, ex Hort. Cal. (K, E); Johra (Cherra) Coal Hill, 1400m, 3 xi 1872, *Clarke* 17801 (K, BM). Manipur (Lushai Hills): Howlong, 900m, xii 1927, *N.E. Parry* 421 (K).

THAILAND. Nan, Doi Pu Ka, Maharat, 600m, 27 ii 1921, *Kerr* 4944 (K, BM); Pilog, Thong Pha Phuri, Kanchanaburi, *Chemsirivathana* 1585 (K).

*C. parviflora* is a variable plant, a fact which can be immediately deduced from the rather lengthy synonymy. It is a small undershrub with blue, funnel-shaped flowers. The leaves are narrowly to broadly ovate, the base oblique to equal, cordate, rounded or cuneate. There seems to be little pattern in this variation and quite striking differences can sometimes be seen on the same plant. Cordate, somewhat coriaceous leaves (e.g. *Long et al.* 834) are often more hairy but this is not always the case. Younger leaves, particularly those on the leafy shoots of the inflorescence, are commonly glandular as in the type of *Echinacanthus pumilio* (*Clarke* 17801). The most glandular plant I have seen is the type of *E. siamensis* (*Kerr* 4944) in which the whole plant including the leaves is covered in stalked glands. However, the only other plant I have seen from Thailand, *Chemsirivathana* 1585, is completely eglandular.

Considerable variation is seen in the indumentum of the inflorescence and particularly in the size and indumentum of the calyx. In some specimens, such as *Wraber* 36638, the calyces are barely 7mm long at anthesis, whereas in others, such as *Wood* 7514, they may be 12mm or more. Similar variations in corolla size can be observed. *Clarke's* various collections from Darjeeling and Sikkim (*Clarke* 13633, 13845, 25468, 36738) show similar variations from a geographically restricted area. The same is true for the indumentum of the corolla, style and capsule where variation from glabrous to sparsely hairy can be seen. None of this variation seems to correlate at all and I have somewhat reluctantly seen no option but to reduce all these names to synonymy under *C. parviflora*, the oldest name available.

One group of specimens from the foothills of the Himalaya does look very different and was long kept at both Kew and the British Museum amongst their undetermined material. For a time I believed this might be a distinct species but careful examination shows that the only real



distinction is in the dense white-glandular-pilose indumentum found on the stems, leaves and inflorescence. Since it is so distinct, I am here recognizing it as a variety:

var. **albescens** J.R.I. Wood, var. nov. a varietate typica indumento dense albo glanduloso-piloso differt. **Fig. 3B-I.**

Type: India, West Bengal, *Brandis* s.n. (holo. K).

Specimens seen:

INDIA. West Bengal: Buxa, Western Duars, 300m, ii 1879, *J.S. Gamble* 6680 (K); Western Duars, ii 1879, *Brandis* s.n. (holo. K). Himachal Pradesh: descent to Bel Khate, Kumaon, 24 xii 18?, *J.E. Winterbottom* s.n. (K).

NEPAL. Marek, near Butwal [27°46'N, 83°29'E], 610m, 6 x 1954, *Stainton, Sykes & Williams* 8813 (BM).

The Nepal specimen is in many ways intermediate between var. *albescens* and var. *parviflora*.

## STROBILANTHES

### INTRODUCTION

With 30 species *Strobilanthes* is one of the largest genera in the *Flora of Bhutan* and by far the biggest in the Acanthaceae of Bhutan. As it is of outstanding interest, and because there has been virtually no study of the genus in the Indian subcontinent since the *Flora of British India*, this paper discusses *Strobilanthes* with respect to the whole Himalayan region. This is taken to include all countries from Afghanistan to Arunachal Pradesh, including Tibet, but excludes SW China, Upper Burma and the hills on the Indo-Burmese border (Meghalaya (Khasia), Nagaland and Manipur). Some species from these last three areas are also discussed and sometimes described, but no attempt has been made to cover all *Strobilanthes* species in these areas. Species of *Strobilanthes* occurring elsewhere in India are not considered at all. The Ganges Valley is almost entirely devoid of *Strobilanthes* and only one Himalayan species (*S. auriculata*) occurs south of this river. The *Strobilanthes* flora of southern India is rich and varied but has no connection with that of the Himalaya.

Until recently the adopted gender of *Strobilanthes* has wavered. It was originally treated as feminine by Blume, and this was followed by Nees in Wallich's *Plantae Asiaticae Rariores* (1832). Later Nees unaccountably changed it to masculine in De Candolle's *Prodromus* (1847), and he was followed in this by Anderson and by Clarke. The policy of the *Index Kewensis* has tended to confuse the issue, *Strobilanthes* being treated as masculine in the 6th, 8th and 9th editions but feminine in the 7th, 10th and subsequent editions. However, in the latest (19th) edition it is again treated as masculine. Fortunately, this matter has now been resolved by the acceptance of Stearn's proposal (*Taxon* 41: 786, 1992) at the 1993 International Botanical Congress. Under Art. 76.4, all generic names ending in *-anthes* must be treated as feminine.

Anyone studying or writing about *Strobilanthes* works in the shadow of Bremekamp's study published in 1944 under the title *Materials for a Monograph of the Strobilanthiniae*. While it will be obvious that I do not agree with Bremekamp's division of the Strobilanthiniae into 52 small genera, nor with the delimitation of his genera, the fundamental importance of his work cannot be denied. There is no doubt that many of his genera represent natural groupings,

nor that he drew attention to a range of characters that had been hitherto little used in studying this group.

The problem with *Strobilanthes* is similar to that with *Justicia*: both are large, ill-defined genera. In *Strobilanthes* the corolla is always tubular with five subequal lobes and the anthers are always muticous (plants with spurred anthers are placed in *Echinacanthus*), but in other respects the range of variation is enormous. *Strobilanthes* includes shrubs and herbs. The inflorescence may be axillary or terminal, lax or compact, capitate, spicate or cymose. The calyx lobes may be free to the base or partly joined or joined and 2-lipped. Bracts vary greatly in development, appearance and persistence. Bracteoles may be present or absent. There may be four fertile stamens or only two. The pollen grains may be globose or ellipsoid, echinulate or ribbed, and their detailed ornamentation may also vary. Normally the placenta does not rise from the base of the ripening capsule but in a few species (*S. imbricata* sensu C.B. Clarke, *S. consors* C.B. Clarke) it does. Seeds may be glabrous or not, areolate or not and show a considerable variation in indumentum if they are hairy. It has always, consequently, been difficult to define a genus which contains within it virtually every character used to define genera elsewhere in the Acanthaceae. The traditional solution proposed by Anderson and followed by Clarke, Lindau, Hallier, Benoist and others was to restrict *Strobilanthes* to species having two or one ovule in each cell and 2 or 4 seeds in their capsules. Plants with three or more ovules in each cell were placed in *Hemigraphis* Nees, *Aechmanthera* Nees and *Stenosi-phonium* Nees, to which should be added two other genera, *Sericocalyx* Bremek. and *Clarkeasia* J.R.I. Wood.

This solution was criticized by Bremekamp who argued that it separated apparently related species and was in any case arbitrary and artificial. His first objection is at least partially overcome by the acceptance of the genus *Sericocalyx* to accommodate *Sericocalyx flava* and its allies, which cannot comfortably be placed in either *Hemigraphis* or *Strobilanthes*. His second and more fundamental objection cannot easily be denied.

There seem to be three possible responses to the criticisms voiced by Bremekamp. We can either accept his view and subdivide the group into numerous small genera or we can widen the concept of *Strobilanthes* to include the satellite genera (*Hemigraphis*, *Aechmanthera*, *Sericocalyx*, *Clarkeasia*) or alternatively, we can re-examine the whole group entirely using as wide a range of taxonomic methods as possible and try to establish a new, more coherent system.

If we follow Bremekamp and divide the Strobilanthinae into numerous smaller genera we are immediately faced with a problem of number. Bremekamp accepted 52 genera but in his monograph there is a long list of species, in excess of 100, which he could not place in any of his genera. It seems that the number of genera would have to grow considerably to accommodate these, possibly to as many as a hundred. A more serious objection is that some of Bremekamp's genera are ill-defined and intergrade with each other. In the Himalayan region he accepted 11 genera. Eight of these (*Aechmanthera*, *Ditrichospermum*, *Listerobanthes*, *Baphiacanthus*, *Pseudoaechmanthera*, *Tarphochlamys*, *Sympagis*, *Perilepta*) are either monotypic or represent small clusters of species whose status and relationships with each other and with other groups is unclear. Most species from this region, however, fall into three larger genera, *Pteracanthus*, *Goldfussia* and *Difflugosa*. *Pteracanthus* contains two major distinct elements (Groups 6 and 7 on pages 206 and 208 below) as well as several smaller disparate elements. *Goldfussia*

likewise has two major elements (Groups 9 and 15) as well as some disparate elements. *Difflugossa* contains two separate pollen types as well as two very different types of distribution (Himalayan and Indonesian). While I can see at least five groupings in these three genera, the distinctions between them are hardly sufficient to justify generic status. This can be shown by the problems Bremekamp and his followers have had in assigning plants to these genera. Thus *Strobilanthes paupera* placed in *Difflugossa* by Bremekamp is conspecific with *Strobilanthes oligocephala* which he placed in *Goldfussia*. *Strobilanthes agrestis* was placed in *Pteracanthus* but is conspecific with *S. multidentata* placed in *Goldfussia*. P.R. Shakya (1975) described a new species in *Goldfussia* (*G. acuminata*) which is conspecific with *Strobilanthes angustifrons* which Bremekamp placed in *Pteracanthus*. This species is, in fact, a good example of one that is intermediate in various ways between *Goldfussia* and *Pteracanthus* as understood by Bremekamp. The existence of a number of intermediate species of this type is discussed under the individual groups below and is another strong reason against accepting Bremekamp's system. The arguments for reassessing his system are thus overwhelming. His genera are neither practical nor, in many cases, natural.

The second possible response is to place all the Strobilanthinæ (*Strobilanthes* and the satellite genera such as *Hemigraphis*) within a single expanded *Strobilanthes*, which varies in the number of ovules in each cell as well as in other characters. This approach would lead to the recognition of sections and subsections within *Strobilanthes* corresponding in part to Bremekamp's genera. This is apparently the solution proposed by Hiroshi Terao in an unpublished thesis (Bertel Hansen, pers. comm.). It may be the best solution but it would leave *Strobilanthes* as a very large, unwieldy genus which might not be accepted by other botanists in the absence of thorough research into the whole group of related genera.

The third possible response is to accept the traditional view held by Anderson, Clarke and the majority of botanists since, pending a thorough investigation into the genus. Although this is clearly a temporary solution it avoids both the use of the unsatisfactory system proposed by Bremekamp and the premature acceptance of a single genus for the whole of the Strobilanthinæ. This is the solution I have accepted in this paper and in the accounts of the genus that I have written for the *Flora of Bhutan* and the *Flora of Ceylon*. I have had to describe the genus *Clarkeasia* to accommodate a single anomalous species which cannot be included in the traditional concept of *Strobilanthes* but have otherwise left the status quo intact.

The acceptance of a single genus does not mean that infrageneric differences do not exist. In the following two sections I discuss a number of characters which I have found useful or interesting, before outlining an inventory of 17 groups into which the Himalayan species can be divided. There are many useful characters in the genus which Bremekamp neglected and I believe these help to define groupings which are more natural than his genera. A system which accepts infrageneric groupings is able to accommodate intermediate species far more satisfactorily than Bremekamp's system with its multiple genera.

## CHARACTERS

### LIFE FORM AND FLOWERING PATTERNS

Some species of *Strobilanthes* have long been noted for their monocarpic, or more strictly 'pletiesial', character; that is they grow for a period of 10–15 years, flower gregariously and

then die, in much the same manner as bamboos. As far as I know this phenomenon was first noted in the literature by Nees (1836) when describing *Strobilanthes sexennis* from Sri Lanka, the epithet *sexennis* being derived from the (incorrect) observation that the plant flowered every six years.

Although the phenomenon has been noted, therefore, for well over 150 years, there is comparatively little concrete information about it. It has been observed in Sri Lanka by Trimen (1895: 299), in Indonesia by Van Steenis (1942) but principally in India by Kanjilal (1901), Gamble (1902), Parker (1924), Osmaston (1927), Robinson (1935), Santapau (1950) and Matthew (1970). However, these observations from India refer to only six species in a huge genus: *S. callosa*, *S. echinata*, *S. helicta*, *S. ixiocephala*, *S. kunthiana* and *S. wallichii*. It is very difficult, therefore, to see how Bremekamp could classify some of his genera as plietesial (*Baphiacanthus*, *Perilepta*, *Pteracanthus*, *Goldfussia*, *Difflugossa*, *Listrobanthes*, *Sympagis*) and others as non-plietesial (*Tarphochlamys*, *Sericocalyx*). Bremekamp was quite wrong to do this; well-known non-plietesial species are known to occur in *Perilepta* (*S. auriculata*), *Pteracanthus* (*S. attenuata*), *Goldfussia* (*S. pentstemonoides*) and *Difflugossa* (*S. hamiltoniana*). Several of these are frequent in cultivation and their life form is beyond doubt. The situation is much more complicated than Bremekamp assumed and it is hoped the following comments may be helpful.

All *Strobilanthes* species in the Himalayan region, monocarpic or not, have a distinct flowering season. The majority begin to flower towards the end of the monsoon (August–September) and continue flowering through the autumn. Those that grow at higher altitudes (above about 1500m) stop flowering with the onset of the winter frosts in late October or November. Typical species of this kind include *S. accrescens*, *S. attenuata*, *S. extensa*, *S. lachenensis*, *S. lamiifolia*, *S. oligocephala*, *S. tamburensis* and *S. wallichii*. Those that grow at lower altitudes generally continue flowering sporadically till the end of winter in March. Typical species following this pattern include *S. capitata*, *S. multidentis*, *S. pubiflora* and *S. thomsonii*. One species (*S. sabiniana*) begins flowering in mid-winter.

Some species of *Strobilanthes* are known to be perennials that flower annually. The list of Himalayan species that fall into this category is probably long and certainly includes *S. anisophylla*, *S. attenuata*, *S. auriculata*, *S. capitata*, *S. hamiltoniana*, *S. lachenensis*, *S. lamiifolia*, *S. multidentis*, *S. pentstemonoides*, *S. pubiflora* and *S. sabiniana*. *Strobilanthes frondosa* and *S. subnudata* probably belong to this group.

At least one species, *S. wallichii*, behaves as an annually flowering perennial in part of its range (East Himalaya) while in the other part (West Himalaya) behaves as a plietesial. This phenomenon is probably not unique. It suggests that the life form in *Strobilanthes* is a question not simply of genetics but of a complex interrelationship between genetics and environment in the widest sense. The occurrence of occasional flowering specimens of other plietesial species in non-flowering years also tends to support this view.

A few species of *Strobilanthes* seem to flower gregariously in certain years but do not die and are not, therefore, plietesial. With these species it seems that flowering only takes place in response to some sort of stress, such as a period of drought or an unusually cold spell (Van Steenis, 1942; Whitmore, 1975). This does not seem to be an important factor in the gregarious flowering of *Strobilanthes* in the Himalaya and I have only observed this with one species, *S.*

*oligocephala*. There were unusual flowerings of this species in the upper Thimphu Valley of Bhutan in 1989 and 1992 but the plants did not die. Odd plants could be found in flower in other years.

Gregarious flowering in *Strobilanthes* is normally related to the life form. The so-called plietesials take 10–15 years, usually in fact 12, to mature, flower gregariously and then die. As with bamboos some individuals can be found in flower when the main population is dormant. However, normally plietesial plants flowering out of synchrony with the main population may seem stressed and poorly developed. I first noticed this with *S. divaricata*. Specimens that I observed and collected in 1987 (Wood 6071) and 1991 (Wood 7516), both non-flowering years, have leaves, calyces and corollas significantly smaller than those seen on plants collected in 1992, a year of gregarious flowering. Examination of two other known plietesials, *S. echinata* and *S. helicta*, suggests that something similar happens with these species. There are two distinct forms of *S. echinata* in the East Himalaya. In the one corresponding to the type specimen (Wallich 2356), the calyx lobes are distinctly fimbriate, while in others they are merely obtuse (Cooper 1168). Specimens with obtuse calyx lobes appear less vigorous than the type but I do not doubt they are the same species. In the case of *S. helicta*, I have seen less developed specimens from Tibet (Kingdon Ward 10933), China (Henry 9029) and Burma (Forrest 24866), all of which differ from the type in their smaller corolla, shorter calyx and smaller leaves. It seems probable that these represent stressed plants collected in a non-flowering year. This is probably the explanation for the two forms of *S. wallichii* previously recognized under the name *S. atropurpurea* and *S. wallichii* var. *microphylla* in the Western Himalaya (see p. 265ff.). Care, therefore, needs to be taken before ascribing varietal status to plants apparently differing from a normal population merely in size. They may only be stressed plants of a plietesial species flowering out of synchrony.

The main flowering of plietesial species actually seems to take place over several years rather than in a single year. My own observations tend to support the pattern observed by Santapau (1950) with reference to *S. callosa*, a South Indian species flowering in cycles of 12 years:

1942 A few precursors in flower.

1943 General flowering.

1944 General flowering of plants that had not flowered the previous year.

1945 A few stragglers.

The two plietesial species I have observed most closely in Bhutan, *S. extensa* and *S. accrescens*, both followed this pattern. In the case of *S. extensa* I saw no plants in flower in 1987, 1988 or 1989. In 1990 and 1991 there were a few precursors, particularly in 1991. In 1992 the whole population was in flower over a wide area. In the case of *S. accrescens* I saw no plants in flower from 1987 to 1990; in 1991 I found odd individuals in flower, often after considerable search, but in 1992 the whole population flowered and it would have been impossible to miss the plant.

Apart from *S. wallichii* which is plietesial in the Western Himalaya, the number of Himalayan species which are known certainly to be plietesial is quite small: *S. accrescens*, *S. divaricata*, *S. echinata*, *S. extensa*, *S. helicta* and *S. thomsonii*. *S. accrescens* flowered in 1914 and 1992 and its cycle is not known. *Strobilanthes divaricata* and *S. extensa* both flowered gregariously in 1992 and although there are records from other years no clear pattern can yet be made out.

The information for *S. echinata* and *S. helicta* is more complete. B.B. Osmaston (1904) noted that the former flowered in 1890 and 1902, suggesting a 12-year cycle, and this is confirmed by subsequent records in 1914 and 1938. There should, therefore, be a mass flowering of this species in 1998. *S. helicta* is known to have flowered in 1902, 1974 and 1986, suggesting that it too is flowering in a 12-year cycle. Since *S. wallichii* is known to flower in 12-year cycles in the Western Himalaya and many Sri Lankan and South Indian species are also known to flower in 12-year cycles (Trimen, 1895; Santapau, 1950), it seems that a 12-year cycle is the norm.

Although it is fairly easy to recognize the cycle of some species because the populations over a wide area flower in the same 12-year cycle, this is not always so. In some species, populations in different valleys flower in their own 12-year cycles, thus obscuring the overall pattern of the species. This is well illustrated by *S. thomsonii* in Bhutan. In 1988 all the populations of this species in the Sankosh Valley were in flower. In 1989, it was the turn of the Mangde Chu Valley but in the Sankosh Valley I failed to find any flowering plants. In 1991 *S. thomsonii* was flowering in the Dangma Chu Valley in Eastern Bhutan. There was no sign of flowering plants in the Mangde Chu Valley although I did find a single flowering plant in the far west of Bhutan. The pattern illustrated here, where populations in different valleys flower in different years following their own cycles, is likely to be repeated by other species.

Although only the six Himalayan species listed above and *S. wallichii* are definitely plietesial, several others are almost certainly so. They include *S. inflata*, *S. rubescens*, *S. simonsii*, *S. tamburensis*, *S. tibetica* and doubtless many others. It seems that the explanation for the apparent rarity of many species lies in the fact that they only flower every 12 years or so and are therefore collected very infrequently. *S. accrescens*, for example, was only collected in 1914 before I found it again in 1991 and yet it is a conspicuous shrub 1.5–2m high, abundant and sometimes subdominant along about forty kilometres of the main highway connecting Thimphu with India!

Much further research and, in particular, field observation over long periods is needed before the extent and pattern of flowering in *Strobilanthes* can be fully understood. The situation is extremely complex and poorly understood but there seems no justification for Bremekamp's use of it as a character to distinguish between genera or major groupings. It is certainly of value to distinguish between species but it is a widespread phenomenon occurring within many of Bremekamp's genera, genera which also include perennial, annual-flowering species.

#### ANISOPHYLLY

Anisophylly is a widespread phenomenon in many different Acanthaceae genera throughout the world (Brummitt, 1989), but in South Asia it is predominantly a feature of *Strobilanthes*.

Within *Strobilanthes* anisophylly is very common and occurs in the majority of Himalayan species. However, the degree of anisophylly is very variable. In some species one leaf in each pair is so reduced that at first glance the smaller leaf appears to be absent and the leaves alternate in arrangement. In others the anisophylly is barely perceptible. Between these two extremes all intermediate types of anisophylly can be observed.

Anisophylly is not constant within a species. Different specimens of a single species frequently show a considerable variation, one specimen having leaves subequal while in another specimen one leaf is about half the size of the other. In *S. anisophylla* the usual form

has leaves very unequal but in forma *isophylla* they are quite equal. All manner of intermediates can also be found. Similar variation can be seen in *S. auriculata* and doubtless in other species. There is also some degree of variation within an individual plant; generally anisophylly is more marked on flowering shoots than on sterile branches. This is illustrated on several herbarium specimens, such as Wood 6864 (E) representing *S. multidentis*.

Nevertheless, anisophylly is a useful character at specific level and it is not difficult to divide Himalayan species into three groups:

Isophyllous species in which both leaves in each pair are generally of the same size:

*S. accrescens*, *S. acrocephala*, *S. attenuata*, *S. bheriensis*, *S. candida*, *S. cuneata*, *S. cusia*, *S. esquirolii*, *S. extensa*, *S. hamiltoniana*, *S. imlayae*, *S. jennyae*, *S. kingdonii*, *S. lachenensis*, *S. lamiiifolia*, *S. mekongensis*, *S. oresbia*, *S. oxycalycina*, *S. unilateralis*, *S. wallichii*.

Weakly anisophyllous species in which the leaves in each pair are different in size but not strongly so:

*S. auriculata*, *S. capitata*, *S. echinata*, *S. frondosa*, *S. helicta*, *S. himalayana*, *S. khasyana*, *S. oligocephala*, *S. pentstemonoides*, *S. pubiflora*, *S. rubescens*, *S. saccata*, *S. scoriarum*, *S. secunda*, *S. setosa*, *S. simonsii*, *S. simplex*, *S. subnudata*, *S. tamburensis*, *S. thomsonii*.

Strongly anisophyllous species in which one leaf in each pair is much reduced, of different shape to the other leaf and often early deciduous:

*S. anisophylla*, *S. campaniformis*, *S. chaffonjonii*, *S. clarkei*, *S. discolor*, *S. divaricata*, *S. geniculata*, *S. glomerata*, *S. multidentis*, *S. rhombifolia*, *S. sabiniana*.

It will be clear from the lists above that Bremekamp's use of anisophylly as a generic or group character is largely meaningless. Since it is a useful character at specific level it clearly works for monotypic genera and groups and also occasionally for small clusters of one or two species (e.g. Group 16, see below). However, most major groupings described in this paper and the larger genera accepted by Bremekamp in the Himalayan region (*Goldfussia*, *Pteracanthus* and *Difflugossa*) contain both isophyllous and anisophyllous species. Thus the isophyllous *S. accrescens* and the strongly anisophyllous *S. glomerata* both belong to Group 15 and *Goldfussia* sensu Bremekamp. Similarly, the isophyllous *S. hamiltoniana* was placed in the same genus (*Difflugossa*) as the strongly anisophyllous *S. divaricata*. My Group 9 contains isophyllous species such as *S. bracteata* and *S. hupehensis* together with strongly anisophyllous species (*S. geniculata*, *S. chaffonjonii*) and species intermediate in character (*S. pentstemonoides*). The best that can be said is that anisophylly is common in some groups such as Groups 9, 10 and 15 but rare in others, particularly Groups 6 and 7 (see below).

#### INFLORESCENCE

Although the nature of the inflorescence is one of the most obvious and useful distinctions both between individual species and between groups, the distinctions are by no means as absolute as may at first be apparent. In the Himalayan species there are two fundamental distinctions which I have found useful, even though they may to some extent be artificial:

**HEADS VS SPIKES:** This is one of the great divisions within the genus: species from Groups 1–6 and 11–14 and some of those in Group 10 have flowers in spikes, while those in Groups 7–9 and 15–17 as well as some species in Group 10 have the flowers in heads. However, there are quite a few anomalous species: in *S. cyphantha* in Group 6 the spikes are reduced to a head-like cluster; in *S. multidentis* and to a lesser extent *S. oligocephala* in Group 9 there are two forms, one in which the flowers are strictly capitate and another in which there are scattered flower pairs below the heads. The same phenomenon can be found in *S. kingdonii* in Group 15. Since this sort of variation can be found within an individual species it seems that the heads are essentially reduced spikes rather than fundamentally distinct. Hence I find no problem in the occurrence of both types of inflorescence in Group 10.

**AXILLARY VS TERMINAL:** This is another useful distinction within the genus, which also lacks fundamental significance. In many of the major groups (Groups 1, 6, 9, 10, 15) the flowers appear to be strictly axillary, growing either in axillary spikes or axillary heads. In other groups (Groups 2, 3, 7, 12, 13) it is clear that the flower spikes develop at the apex not only of the main stem but also of numerous axillary branches which in turn develop their own axillary branchlets. Once aware of this phenomenon, close examination of several groups which at first sight appear to have axillary flowers (Groups 2, 9 and 15 in particular) shows that the flowers are, in fact, terminal on short axillary branchlets and not strictly axillary at all. It is probably best, therefore, to see the inflorescence as ‘apparently terminal’ and ‘apparently axillary’ rather than to make a rigid distinction which does not exist.

Groups 8 and 17 are interesting in that the flowers are in axillary heads that only normally arise from the uppermost leaf axils. The heads are usually paired but quite often solitary.

#### BRACTS

These have long been recognized as a useful character in distinguishing individual species and splitting the genus into groups. Clarke (1885), in particular, made great use of it in his account for the *Flora of British India*. Several points seem worth emphasizing:

In species where the flowers are arranged in axillary as well as terminal spikes the lower bracts are usually different from those in the middle of the spike.

In those species where the spikes are terminal the leaves gradually merge with the bracts, the lower bracts being leaf-like.

In the species where the flowers are arranged in heads (except Group 10) there is a clear tendency for the outer bracts to be different from the inner bracts. This is most obvious in Group 15 where the outer, sterile bracts are quite distinct from the inner bracts and are of significance taxonomically.

Clarke (1885) placed considerable importance on whether the bracts were persistent or not. This is undoubtedly a useful character but there is a lot of variation in individual species. I have noted odd specimens of *S. hamiltoniana*, *S. thomsonii*, *S. geniculata*, *S. capitata* and *S. multidentis* where the bracts appear much more persistent than is usual. Care needs to be exercised before describing species simply on the permanence of the bracts. In Group 10 the bracts are usually fugacious, in a few species, such as *S. divaricata* and *S. rhombifolia*, so quickly so that their presence can only be recognized by the scars.



In Group 5 and Group 9 the bracteoles are usually absent. This has not been recognized as a character of great importance so far but their absence is clearly associated with the presence of scarious bracts and is perhaps worth further investigation.

#### CALYX

Bremekamp (1944: 23–24) was aware of differences in the calyx lobing, some of which he mentioned in his generic descriptions. In all Himalayan species I have examined, the lobes are free to the base (although this is not the case in some South Indian species) but in many the median lobe is distinctly longer than the laterals. This seems to me to be a character of considerable significance, being found in Groups 3, 7–9 and 13 as well as in one species in Group 6, a few in Group 10 and in the South Indian group recognized under the name *Leptacanthus* by Bremekamp. It is nearly always linked with the curved corolla (Type C) and also with a strongly accrescent calyx. In both Groups 7 and 13 the accrescent calyx lobes have a tendency to become spatulate in fruit. It is possible that other arrangements of the calyx lobes are significant. I have noted two longer than the other three in *S. auriculata* and *S. simplex* but cannot say whether this is significant or not.

The indumentum of the calyx has been used as a character to distinguish between species both in *Strobilanthes* and elsewhere in the Acanthaceae. In my experience here and elsewhere (Wood, 1988: 20) there is a tendency for apparently eglandular young calyces to become glandular as the whole inflorescence matures. This is particularly common in Group 10, where several taxa have been described on the basis of the presence or absence of glands on the calyx and bracts. In my opinion this is a very unreliable character and it is unsound to distinguish a species purely on the indumentum of the calyx.

#### COROLLA

Bremekamp (1944: 24) makes a distinction between whether the corolla is resupinate or not and uses this to distinguish between genera in his system. Thus *Difflugossa* is separated from *Goldfussia* largely on the basis of having a non-resupinate corolla. While observation of several *Strobilanthes* species in cultivation confirms Bremekamp's observation that resupination takes place in some species, it has been little reported. According to Bremekamp, it depends in part on the position of the inflorescence and is, in any case, usually impossible to observe on herbarium specimens. Bremekamp seems to have made the assumption that in all species where the corolla is distinctly curved it is also resupinate and in those where it is straight it is not. Thus *S. hamiltoniana* was chosen as the type of the genus *Difflugossa* probably because its corolla is straight, even though gardeners have reported to me that it resupinates.

I have therefore avoided the use of the term *resupinate*, and instead have described corollas according to their shape when fully opened. It is very difficult to be certain of the shape of an immature corolla (Clarke, 1885: 458) and since mature corollas fall easily they are often missing from herbarium specimens. It is very important that they are collected, in a separate container if necessary, as the shape of the mature corolla provides valuable information about the relationship of the plant.

In the Himalayan region there are five basic corolla types, which are illustrated in Fig. 4:

Fig. 4A illustrates the corolla type found in Groups 1–3 only. In this there is a long cylindrical tube which is widened into a short throat below the mouth; the anthers are always exerted. The example shown is of *S. khasyana* in which the corolla is small and only two stamens are fertile.

Fig. 4B illustrates a common corolla type found in Groups 10–16 and in two species in Group 2. In this there is a short cylindrical tube that is gradually widened almost from the base. The anthers are sometimes shortly exerted in Group 10 but are generally included. Corollas of this type are sometimes very large, exceeding 5cm in length.

Fig. 4C illustrates another common corolla type. This is found in Groups 7–9, in Group 17 and in some species in Group 10. In this the corolla is gradually widened almost from the base and gradually bent in the upper half so that the mouth faces 90° away from the axis. Except in Group 17, corollas of this type are associated with the calyx in which the median lobe is lengthened. The stamens are always included.

Fig. 4D illustrates the corolla found in Group 6. Here there is a short cylindrical base above which the corolla is abruptly expanded before being curved sharply about the middle. The stamens are included.

Fig. 4E illustrates the corolla found in Groups 4 and 5. Here the corolla is bent and rapidly expanded above the short basal tube. The stamens are included.

In addition there are a few minor corolla characters that are worth mentioning. In nearly all Himalayan species the corollas are blue, although the occasional albino occurs. In a few the corolla is always white (*S. candida*, *S. jennyae*, *S. khasyana*, *S. nutans*) or bicoloured (*S. versicolor* and *S. campaniformis*) but the only yellow-flowered one I have come across is *S. setosa*. I do not believe the flowers of *S. xanthantha* are yellow.

One corolla character I have found particularly valuable is the indumentum on the exterior, especially in Groups 9 and 10 where it seems to be very reliable in distinguishing between related species. In my experience it is best observed on the buds as it can be hard to see when the corolla is fully open. A minor curiosity is in the position of the hairs. In Group 7 they are almost always on the corolla lobes only, whereas in Group 15 they are usually on the tube; in Group 16 they appear to be in lines. I have not systematically examined the hairs on the inside of the corolla but suspect they may also be a useful character.

#### POLLEN

Pollen was used by Bremekamp (1944) as the basis for his classification of the Strobilanthinae, and all the main dichotomies in his generic key were based solely on pollen. This is an extreme position but there is no doubt that there is considerable correlation between unusual pollen and other characters. However, it is probably no more fundamental than many other characters including the shape of the calyx, development of the bracts etc. Certainly in the Himalayan species its value is limited by the fact that only in four small groups (Groups 1–4) is it particularly unusual. The overwhelming majority of species from this region have very similar pollen (Fig. 6) as also noted by Scotland (1993: 490–492). There is some variation in the number of ribs and in the shape of the grain, which varies from narrowly to broadly ellipsoid, but in only two species in Groups 5–17 (*S. cusia*, *S. candida*) has there been observed any variation

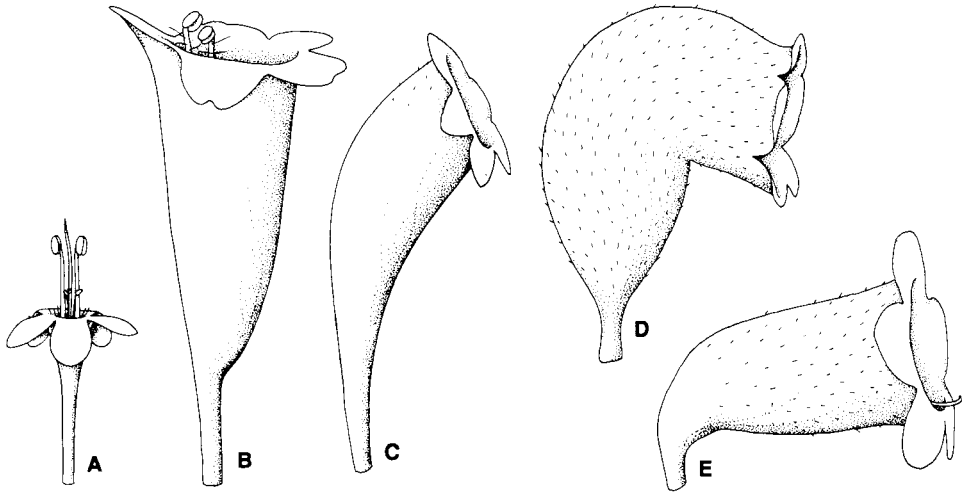


FIG. 4. Corolla types in *Strobilanthes*. A, cylindrical and inflated below the mouth, stamens exserted; B, shortly cylindrical, then gradually widened, stamens shortly exserted as here or included; C, gradually widened and gently curved; D, shortly cylindrical, abruptly inflated, bent about the middle; E, shortly cylindrical, abruptly bent and inflated. All  $\times 2.25$ . A from Griffith s.n. (*S. khasyana* (Nees) T. Anders.); B from Long *et al.* EMAK 164 (*S. hamiltoniana* (Steud.) Bosser & Heine); C from Wood 7351 (*S. lamiifolia* (Nees) T. Anders.); D from Lace 2367 (*S. inflata* T. Anders.); E from Long *et al.* EMAK 139 (*S. tamburensis* C.B. Clarke). Drawn by Mary Bates.

from this pattern. *S. candida* (Fig. 6C) is a little-known species whose position in my Group 10 might be questioned on the basis of its pollen, while *S. cusia* is undeniably an isolated species which I have placed in its own group.

#### SEED COATING

The surface of the seeds of *Strobilanthes* has long been used as a character of some importance and was secondary only to the pollen in Bremekamp's system. Although there is no doubt that it is a useful character (the glabrous shining seeds of some South Indian species are especially distinctive), it is of less value in the Himalayan region for two reasons. In the first place the seeds of many species have never been collected. The seeds of Group 16, for example, are unknown and in many other groups (Group 6 for example), the seeds of only a few species have been seen. In the second place, as with pollen, it is only the seeds of a few species that are really distinct. Only in Groups 2 and 3 is there a well-developed areole; dimorphic hairs are found only in Group 11 (*S. secunda*) and early deciduous hairs in Group 3 (*S. acrocephala*). In all the rest the seeds are pilose or at least hairy with mucilaginous hairs which are elastic when wetted. In Group 6 they appear coarser and more visible when the seeds are dry but I am not sure how significant this is.

## GROUPS AND RELATIONSHIPS

In this part I describe the 17 groups into which the Himalayan species of *Strobilanthes* can be divided. In making this classification I have several purposes. In the first place it should help to make sense of a large, confused and confusing genus by indicating the groups or clusters into which the majority of species fall. Eventually these may help in the construction of a subgeneric classification but it should be emphasized that the groups are not necessarily of equal status and it is probably impossible to work out the classification of part of the genus without looking at it as a whole. Much much more time than I had available will be necessary.

In the second place I am attempting to build on Bremekamp's system, making use of many of his groups but also profoundly criticizing it by breaking up some of his genera and indicating the very fluid margins between some of the groups. It will be plain that these groups cannot be genera in the normally accepted sense since there is so much overlap. I have maintained all his monospecific genera as distinct groups but have not added to these, merely listing additional anomalous species at the end.

In the third place I wish to draw attention to the range of characters outlined earlier which I believe to be important in recognizing species groups in the genus. I do not believe I have 'discovered' any new characters, but Bremekamp's emphasis on seed and pollen characters has led to the neglect of other, often more visible, characters. The overwhelming majority of Himalayan species have almost identical pollen and seed coating but they differ strikingly in inflorescence, corolla shape, calyx and bracts. I have found these characters at least equally as valuable as those related to the pollen and seeds. For each group I have listed the principal characters used to separate it from all the other groups. Each group can, therefore, be compared with all others. In the discussion I have drawn attention to important characters and indicated some anomalous or intermediate species.

I have also provided keys for nearly all the larger groups. I have done this partly to help identification but also to draw attention to the strong links between species from the Indian Himalaya and those from China and SE Asia. The species of *Strobilanthes* from India south of the Ganges Valley and Sri Lanka are very different from the Himalayan species. However, there are strong links along the entire Himalayan chain between species occurring in Pakistan and those occurring in China, Thailand and even Malaysia. Construction of keys has not been easy. I have little (in some cases no) material of several species and it is plain that many species are imprecisely defined and possibly conspecific. The differences between *S. lachenensis*, *S. xanthantha* and *S. nemorosa* are far from clear. The same is equally true of *S. versicolor*, *S. oresbia*, *S. flexa* and *S. grandissima*. Only occasionally have I formally reduced species to synonymy with others, as I have little knowledge of the Chinese species. However, there is an evident need for students of *Strobilanthes* to look at species beyond the boundaries of the country with whose flora they are working. It is hoped, therefore, that despite its imperfections the following tentative classification will stimulate further research and increase understanding of a very complex genus.

An asterisk in the following lists or keys indicates that a species is described or discussed individually in the final part of this paper.

## GROUP 1

*Leaves* unequal, petiolate, toothed, green on both surfaces. *Inflorescence* of dense spikes arising in tufts in the leaf axils. *Bracts* distinct from the leaves, persistent, imbricate, the lower elliptic, much longer than the calyx, the upper narrower, oblanceolate-spathulate, equalling the calyx. *Bracteoles* present, distinct from the bracts, linear. *Calyx* subequally 5-lobed. *Corolla* straight, narrowly cylindrical, abruptly widened below the mouth, the lobes spreading (Fig. 4A). *Fertile stamens* 2, strongly exserted. *Pollen* globose, ribbed, with septa forming crossbars between the ribs. *Seeds* pilose with large-celled hairs which are not mucilaginous. Areole large, distinct.

Group 1 is quite different from all others. The tufted axillary spikes, subtrotate corolla with only two fertile stamens, and globose, ribbed pollen with cross septa are all unique to this group. Recognized by Bremekamp under the name *Listrobanthes* Bremek. this group contains only one species, *S. khasyana*, which is restricted to India.

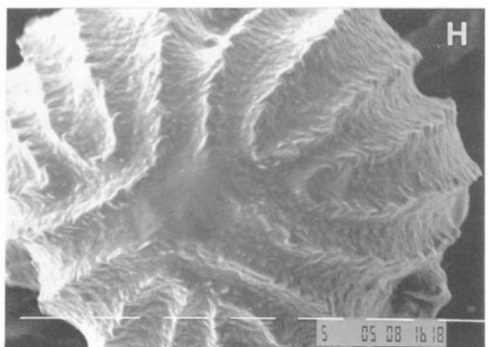
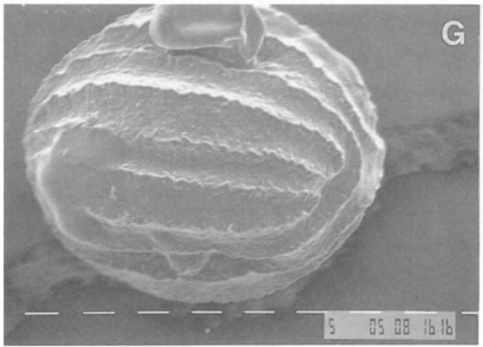
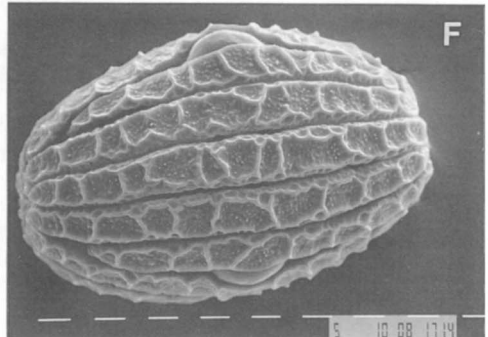
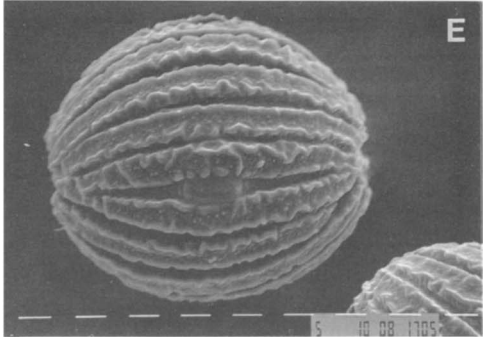
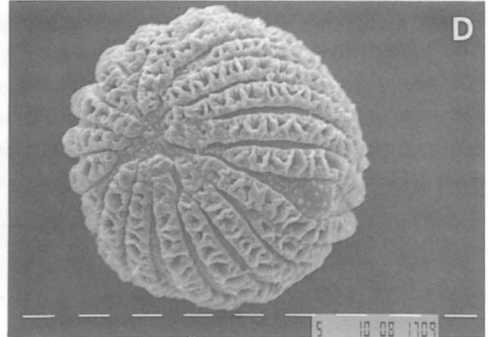
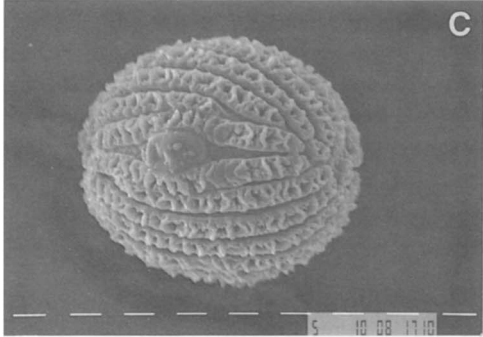
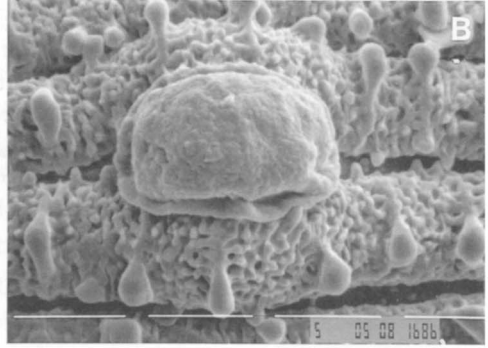
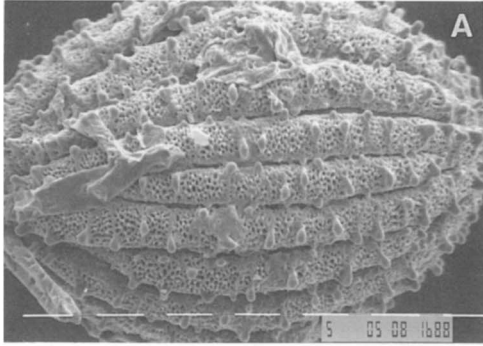
## GROUP 2

*Leaves* unequal or slightly unequal (rarely truly equal), toothed (entire in *S. brunoniana*), green on both surfaces, sometimes spotted (*S. maculata*, *S. himalayana*), attenuate onto the petiole. *Inflorescence* of bracteate spikes terminal on the main stem and on axillary, often leafy, branchlets. Spikes dense with the bracts imbricate or nearly so. *Bracts* oblong, elliptic or obovate, herbaceous, usually toothed and glandular-pubescent, very persistent, equalling or shorter than the calyx. *Bracteoles* present, distinct from the bracts, linear. *Calyx* subequally 5-lobed. *Corolla* straight, either tubular and then abruptly expanded (Fig. 4A) or gradually expanded from the base (Fig. 4B). *Fertile stamens* 4, shortly exserted from the corolla mouth. *Pollen* subglobose, with thin wavy ribs, the pores prominent (Fig. 5G–H, also in Scotland, 1993: 496, figs 69–71). *Seeds* white-pilose with a conspicuous glabrous areole.

This group was recognized by Bremekamp under the name *Sympagis* (Nees) Bremek. (type: *Sympagis brunoniana* (Nees) Bremek.). It is characterized by the spicate inflorescence, distinctive pollen and areolate seeds. It is obviously related to Group 1 not only by the seeds and inflorescence but also by the small corolla with shortly exserted stamens, which in most species is abruptly expanded from a long tubular base.

Group 2 is entirely restricted to Eastern India and the adjacent parts of Burma and Bhutan. *S. tonkinensis* Lindau (*S. nivea* Craib) from Thailand and Indo-China was included in *Sympagis* by Bremekamp but has a terminal inflorescence and is quite unrelated. I therefore recognize six species in this group: *S. brunoniana* Nees, \**S. frondosa*, \**S. himalayana*, *S. maculata* (Wall.) Nees, *S. monodelpha* Nees (*S. petiolaris* Nees) and \**S. tubiflos*. They can be distinguished by the following key:

1. Corolla 2–3cm long, gradually widened from the base \_\_\_\_\_ 2
- + Corolla less than 2cm long, cylindrical in the lower half and then abruptly widened below the lobes \_\_\_\_\_ 3
2. Bracts obovate, acute \_\_\_\_\_ \***S. himalayana**
- + Bracts obovate, truncate and/or emarginate \_\_\_\_\_ \***S. tubiflos**
3. Leaves narrowly oblong-lanceolate, less than 2.5cm wide, entire or undulate \_\_\_\_\_ **S. brunoniana**
- + Leaves ovate-elliptic, 2.5–6cm wide, serrate \_\_\_\_\_ 4



4. Spikes subcapitate, 1–2cm long; leaves pilose \_\_\_\_\_ \***S. frondosa**  
 + Spikes elongate, at least 2cm long; leaves glabrous or with a few hispid  
 hairs above \_\_\_\_\_ 5
5. Bracts elliptic, c.7–8 × 3 mm; spikes much branched; leaves serrate \_\_\_\_\_ **S. monodelpha**  
 + Bracts oblong-ob lanceolate, c.4–5 × 1.5 mm; spikes sparingly  
 branched; leaves crenate \_\_\_\_\_ **S. maculata**

## GROUP 3

*Leaves* equal, petiolate, toothed, green on both surfaces. *Inflorescence* of dense pedunculate spikes, terminal on the main stem. *Bracts* distinct from the leaves, persistent, imbricate. *Bracteoles* present, distinct from the bracts, linear. *Calyx* with the median lobe distinctly longer than the others. *Corolla* straight, narrowly cylindrical for half its length, then abruptly campanulate (Fig. 4A). *Fertile stamens* 4, exserted. *Pollen* globose, echinulate (Bremekamp, 1944: Tab. 111B). *Seeds* pilose, the hairs deciduous before the seed ripens; areole very small.

Group 3 is characterized by the distinctive pollen and seeds but shares the same corolla as Groups 1 and 2. It is the only group of these first three to have the median calyx lobe lengthened. It was recognized by Bremekamp under the name *Tarphochlamys* Bremek. (type: *T. affinis* (Griff.) Bremek. = *S. acrocephala* T. Anders.).

Group 3 consists of two species, *S. acrocephala*, which is widespread in Eastern India, Burma and SW China, and *S. darrisii* H. Lév. from China which is probably conspecific with it.

## GROUP 4

*Leaves* very unequal, sessile, entire or nearly so, bicoloured with the lower surface whitish. *Inflorescence* of axillary spikes, becoming reduced upwards and in *S. tamburensis* forming terminal spikes. *Bracts* persistent, usually more or less imbricate, broad, herbaceous. *Bracteoles* present, distinct from the bracts, linear. *Calyx* subequally 5-lobed, usually small. *Corolla* shortly cylindrical, then sharply bent 90° and abruptly ventricose (Fig. 4E). *Fertile stamens* 4, included. *Pollen* shortly ellipsoid, the ribs echinulate in *S. saccata* and scabrid in the other species (Fig. 5A–F). *Seeds* pubescent with short stiff hairs; areole absent.

This small group was not recognized in any way by Bremekamp and he assigned none of the species to a genus except *S. rubescens* which he placed in *Pteracanthus*. It is very distinctive on account of the sharply bent and inflated corolla, sessile, entire, bicoloured leaves and curious pollen in which the ribs are scabrid or echinulate. The corolla and leaves suggest an affinity with Group 5 but the pollen most resembles that of Group 3.

Group 4 consists of four species only and is entirely restricted to the East Himalayan region including Meghalaya. *S. rubescens* is peripheral to the group in several ways. The corolla is bent and inflated but not as abruptly as in the other species, and the pollen is much less scabrid

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← FIG. 5 (opposite). *Strobilanthes* pollen. *S. saccata* J.R.I. Wood. A, side view; B, pore and detail of ornamentation. *S. sabiniana* (Lindley) Nees. C, side view; D, polar view. *S. tamburensis* C.B. Clarke. E, side view. *S. rubescens* T. Anders. F, side view. *S. frondosa* J.R.I. Wood. G, side view showing large pore; H, polar view. A–B from Flatt 106, C–D from Wood 6165; F from Wood 5979; G–H from Wood 7465. All micron lines = 5µm. SEM photographs by Jenny Wright.

(Fig. 5F). The bracts are also more rapidly deciduous. The four species can be distinguished by the following key:

1. Flowers mostly in a terminal spike; leaves suborbicular \_\_\_\_\_ **S. tamburensis**
- + Flowers in axillary spikes; leaves ovate or elliptic \_\_\_\_\_ 2
2. Corolla glabrous; bracts deciduous as the flowers open; spikes lax,  
the flowers 5–10mm apart \_\_\_\_\_ **S. rubescens**
- + Corolla hairy; bracts persistent; spikes dense, the flowers imbricate \_\_\_\_\_ 3
3. Stem and leaves glabrous; bracts glandular-pilose; calyx lobes  
linear-oblong \_\_\_\_\_ **S. sabiniana**
- + Stem and leaves hirsute; bracts subglabrous; calyx lobes spatulate \_\_\_\_\_ **\*S. saccata**

#### GROUP 5

*Leaves* equal or slightly unequal, sessile, often clasping, denticulate, green on both surfaces. *Inflorescence* of dense, usually pilose, axillary bracteate spikes. *Bracts* distinct from the leaves, imbricate, persistent, usually ciliate. *Bracteoles* absent. *Calyx* slightly 2-lipped with two lobes a little shorter than the other three. *Corolla* shortly cylindrical, then abruptly widened and sharply bent (Fig. 4E). *Fertile stamens* 4, included. *Pollen* ellipsoid, ribbed. *Seeds* pilose with mucilaginous hairs, without an areole.

Group 5 is distinguished by its sessile leaves, axillary spikes, sharply bent corolla and the absence of bracteoles. It was recognized by Bremekamp under the name *Perilepta* Bremek. (type: *P. auriculata* (Nees) Bremek.) and consists either of a single very variable species, *S. auriculata*, which extends from Pakistan along the Himalaya to China, Burma and Thailand, or of a group of about five closely related species including *S. auriculata*, *S. dyeriana* Masters, *S. maccllellandii* C.B. Clarke, *S. siamensis* C.B. Clarke and *S. venusta* Craib. *S. auriculata* is remarkable as the only Himalayan species to be found south of the Ganges, although admittedly only in the Chota Nagpore region of W Bengal and Bihar. *S. dyeriana* is apparently known only as a cultivated species, perhaps originating from Burma.

#### GROUP 6

*Leaves* usually equal, petiolate, toothed, green on both surfaces. *Inflorescence* typically of lax 1-sided axillary spikes, sometimes reduced to single flowers in the leaf axils, sometimes not obviously 1-sided. *Bracts* usually resembling small leaves, petiolate, often diminishing in size towards the branch tips, always very persistent. *Bracteoles* present, distinct from the bracts, usually linear-oblong. *Calyx* subequally 5-lobed, often pale green. *Corolla* rapidly inflated above the base, strongly bent around the middle and sometimes slightly contracted again at the mouth; glabrous or pilose but often silky-grey in bud (Fig. 4D). *Fertile stamens* 4, included. *Pollen* ellipsoid, ribbed (Fig. 2G). *Seeds* villous with coarse, stiff white hairs; areole absent.

This group includes the type of Bremekamp's genus *Pteracanthus* (Nees) Bremek. (*P. alatus* (Well. ex Nees) Bremek. = *S. wallichii* Nees), but his description actually fits Group 7 better. Group 6 is characterized by the distinctive inflated corolla which is bent 90° around the middle. Many but not all species have 1-sided spikes which are very unusual elsewhere in *Strobilanthes* and known only in the quite unrelated *S. secunda* and *S. sexennis*. The seeds and petiolate, leaf-like bracts are also distinctive.

Group 6 is entirely restricted to the Himalaya and the Indo-Burmese border area. Many, perhaps all, species are wholly or partially plectesial and often occur in great abundance in moist



hill forest above 2000m in altitude. I include 16 species in this group: *S. aenobarba*, *S. cyphantha*, *S. flexa* Benoist, *S. grandissima* (H.P. Tsui) J.R.I. Wood **comb. nov.** (basionym: *Goldfussia grandissima* H.P. Tsui in Act. Bot. Yunnan. 12(3): 276 (1990)), *S. helicta*, *S. inflata*, *S. oresbia*, *S. pterygorrhachis* C.B. Clarke, \**S. tibetica*, \**S. unilateralis* J.R.I. Wood, *S. urophylla*, *S. versicolor*, \**S. wallichii*, *S. sp. A* (*Kingdon Ward* 1913 (E) from Burma), *S. sp. B* (*Handel-Mazzetti* 2631 (E) and 12515 (K) from China), *S. sp. C* (*Bor* s.n. (K) from India).

Of the species included in this group two are somewhat anomalous. *S. urophylla* has the median calyx lobe distinctly elongate as in Groups 7–9 but otherwise fits well. *S. helicta* has linear bracts quite unlike its leaves and totally unlike those of other species in Group 6. The bracts and its appearance generally suggest an affinity with *Clarkeasia parviflora*, which perhaps deserves investigation, but in all other respects it fits Group 6 well. Four species, *S. flexa*, *S. grandissima*, *S. oresbia* and *S. versicolor*, are very close and possibly conspecific. They all have very distinctive, deeply serrate, ovate-suborbicular leaves and the differences between them are minor if they exist at all. The most distinctive is *S. oresbia* which on the type specimen (*Kingdon Ward* 1911 (E) from Upper Burma) and many others I have seen has distinctive 1-sided spikes.

The following key should distinguish all species in this group except *S. grandissima*, which I do not know:

1. Corolla glabrous \_\_\_\_\_ 2
- + Corolla hirsute \_\_\_\_\_ 5
2. Bracts linear \_\_\_\_\_ **S. helicta**
- + Bracts leaf-like, ovate, petiolate with an expanded blade \_\_\_\_\_ 3
3. Leaves long-acuminate, exceeding 8cm in length \_\_\_\_\_ 4
- + Leaves acute or shortly acuminate, less than 8cm long \_\_\_\_\_ \***S. wallichii**
4. Spikes strongly bent at the first node; calyx lobes acute \_\_\_\_\_ **S. sp. A**
- + Spikes straight or nearly so; calyx lobes finely acuminate \_\_\_\_\_ **S. sp. B**
5. Flowers in dense heads; calyx densely covered in long, stiff eglandular hairs \_\_\_\_\_ **S. cyphantha**
- + Flowers in spikes, occasionally reduced and apparently in the leaf axils; calyx glabrous or variously hairy \_\_\_\_\_ 6
6. Calyx lobes equal in length \_\_\_\_\_ 7
- + Calyx lobes unequal, one distinctly longer than the others \_\_\_\_\_ **S. urophylla**
7. Flowers in 2-sided spikes (Chinese species) \_\_\_\_\_ 8
- + Flowers in 1-sided spikes \_\_\_\_\_ 9
8. Leaves obovate-spathulate with long petioles 3cm long \_\_\_\_\_ **S. flexa**
- + Leaves oblong-suborbicular; petioles 0–3(–4)cm long \_\_\_\_\_ **S. versicolor**
9. Inflorescence rhachis distinctly winged; leaves broadly elliptic, scarcely longer than broad, acute or very shortly acuminate \_\_\_\_\_ 10
- + Inflorescence not winged or very indistinctly so; leaves ovate or narrowly elliptic, usually distinctly longer than broad, acuminate (except in *S. oresbia*) \_\_\_\_\_ 12

10. Lower bracts suborbicular, rounded; leaves pubescent beneath \_\_\_\_\_ *S. sp. C*  
 + Lower bracts lanceolate or ovate, acuminate; leaves glabrous  
 below \_\_\_\_\_ 11
11. Calyx 1.1–1.2cm long, the lobes obtuse or subacute; capsule  
 glabrous \_\_\_\_\_ *\*S. tibetica*  
 + Calyx 2.6–3.2cm long, the lobes long-acuminate; capsule with a tuft of  
 hairs at the tip \_\_\_\_\_ *S. pterygorrhachis*
12. Inflorescence rhachis pilose with rufous hairs \_\_\_\_\_ *S. aenobarba*  
 + Inflorescence rhachis lacking rufous hairs \_\_\_\_\_ 13
13. Leaves narrowly elliptic, acuminate at both ends, glabrous; inflorescence  
 10cm long \_\_\_\_\_ *\*S. unilateralis*  
 + Leaves ovate or suborbicular, abruptly narrowed to a shortly cuneate  
 base, usually hirsute; inflorescence usually less than 6cm long \_\_\_\_\_ 14
14. Leaves acuminate at the tip, pubescent on both surfaces, serrate or crenate,  
 much longer than broad; calyx white-pubescent \_\_\_\_\_ *S. inflata*  
 + Leaves acute, glabrous or pubescent, deeply and coarsely serrate,  
 suborbicular in outline, scarcely longer than broad; calyx glandular but  
 never with white hairs \_\_\_\_\_ *S. oresbia*

## GROUP 7

*Leaves* equal or slightly unequal, sessile or long-decurrent and pseudo-petiolate or (rarely) petiolate, toothed, green on both surfaces. *Inflorescence* essentially terminal, the flowers in opposite pairs, in long usually lax spikes, terminal on the main stem and on well-developed axillary branches, sometimes becoming compound and paniculate. *Bracts* intergrading with the upper leaves, the lowermost usually sessile and ovate, the upper oblong or elliptic, usually deciduous as the flowers fall. *Bracteoles* present, distinct from the bracts, usually oblong. *Calyx* always (?) glandular-pilose, the median lobe distinctly longer than the others, often slightly accrescent and subspathulate in fruit. *Corolla* gradually expanded from the base, gently curved (Fig. 4C). *Fertile stamens* 4, included. *Pollen* ellipsoid, ribbed. *Seeds* pilose with long mucilaginous hairs; areole absent.

This group was included by Bremekamp within *Pteracanthus* and actually fits his idea of that genus better than its type, *S. wallichii*, which is here placed in Group 6. It is characterized by the terminal, spicate inflorescence and the calyx with the lengthened median lobe. The group is taxonomically difficult, the species differing in leaf shape, the development of the petiole and features of the inflorescence which are hard to define accurately. All species have corollas with a strangely indeterminate indumentum — at first sight glabrous but usually a few hairs on the corolla lobes are apparent with detailed examination. The capsules are always glandular-pubescent at least at the tip.

The group consists of between 7 and 13 species and is entirely restricted to the Himalayan region from Afghanistan to SW China, apart from two species (*S. extensa*, *S. spicata*) occurring in the Khasia region. I have included the seven following species in the key: *\*S. attenuata*, *S. claviculata* (including *S. duclouxii* Benoist and *S. pandurata* Hand.-Mazz. which seem indistinguishable), *S. extensa*, *\*S. forrestii* Diels (including *Diflugossa multiensis* H.P. Tsui, which may be conspecific), *\*S. lachenensis* (including *\*S. xanthantha* Diels and *S. nemorosa* Benoist which seem indistinguishable), *S. spicata* T. Anders. (*S. phyllocaulos* C.B. Clarke, **syn. nov.**

ex descr.) and \**S. subnudata*. I have excluded *S. dryadum* Benoist from the key as I cannot place it correctly, even though it clearly belongs to this group.

1. Spikes relatively dense, the flower pairs mostly less than 1cm apart and often imbricate \_\_\_\_\_ 2
- + Spikes lax and not clearly spicate, the flower pairs mostly about 2cm apart except at the branch tips \_\_\_\_\_ 7
2. Leaves sessile or with a petiole less than 0.5cm long \_\_\_\_\_ 3
- + Leaves petiolate or with a pseudo-petiole 0.5–5cm long \_\_\_\_\_ 4
3. Leaves strictly sessile, lanceolate or oblong-elliptic; middle bracts oblong-elliptic \_\_\_\_\_ \**S. forrestii*
- + Leaves with a petiole 0.1–0.5cm long, ovate; middle bracts ovate \_\_\_\_\_ *S. spicata*
4. Small plant with stems less than 20cm high; middle bracts broadly elliptic, scarcely longer than broad \_\_\_\_\_ \**S. subnudata*
- + Vigorous undershrubs at least 25cm high; middle bracts oblong or elliptic, clearly longer than broad \_\_\_\_\_ 5
5. Inflorescence compound, clearly paniculate, the spikes usually branched; middle bracts linear, less than 2mm wide \_\_\_\_\_ 6
- + Inflorescence spicate, the branches usually simple; middle bracts oblong or elliptic, more than 2mm wide \_\_\_\_\_ \**S. lachenensis*
6. Leaves ovate, cordate, 3–8cm wide \_\_\_\_\_ \**S. attenuata* subsp. *attenuata*
- + Leaves elliptic, attenuate at the base, 2.5–4cm wide \_\_\_\_\_ \**S. attenuata* subsp. *nepalensis*
7. Leaves ovate, 1–5cm wide, densely hairy on both surfaces \_\_\_\_\_ *S. extensa*
- + Leaves oblong or lanceolate, less than 2cm wide, usually glabrous above \_\_\_\_\_ *S. claviculata*

#### GROUP 8

*Leaves* equal or very slightly unequal, toothed, green on both surfaces, petiolate. *Inflorescence* axillary but appearing terminal as the peduncles arise from the uppermost leaf axils only, the flowers in short dense pedunculate spikes; spikes usually simple and often arising from only one leaf axil in each pair. *Bracts* ovate or broadly elliptic, hardened in *S. nutans* but herbaceous in the other species, persistent at least till the flowers fall. *Bracteoles* present, linear, distinct from the bracts. *Calyx* with the middle lobe distinctly longer than the others. *Corolla* gradually expanded from the base and gently curved (Fig. 4C). *Fertile stamens* 4, included. *Pollen* ellipsoid, ribbed. *Seeds* pilose with mucilaginous hairs; areole absent.

A small group closely related to Group 9 but distinguished by the apparently terminal inflorescence, the flowers in spikes rather than heads, the peduncles simple, the bracts relatively persistent and bracteoles present. There are only three species known to me in the group which is distributed along the Himalaya from Nepal to China: *S. hancockii* C.B. Clarke ex W.W. Sm. from Yunnan, *S. lamiifolia* and *S. nutans* from Nepal. Bremekamp did not recognize the group but assigned *S. nutans* to *Goldfussia* and *S. hancockii* and *S. lamiifolia* to *Pteracanthus*. The three species can be distinguished by the following key:

1. Bracts oblong-elliptic, rounded and minutely mucronate; peduncle deflexed; corolla white \_\_\_\_\_ *S. nutans*
- + Bracts ovate, acuminate; peduncle erect; corolla blue \_\_\_\_\_ 2

2. Leaves and bracts entirely glabrous \_\_\_\_\_ **S. hancockii**  
 + Leaves and bracts pubescent \_\_\_\_\_ **S. lamiifolia**

## GROUP 9

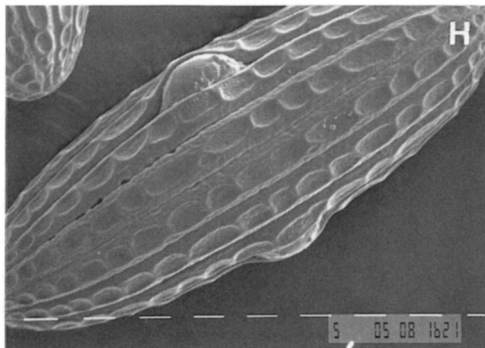
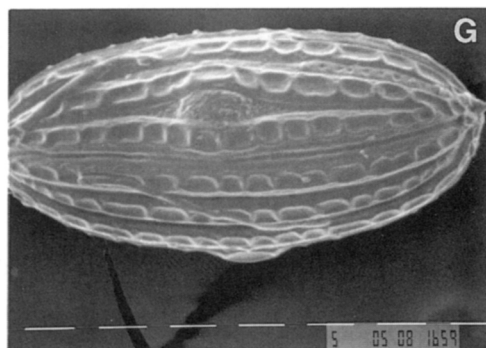
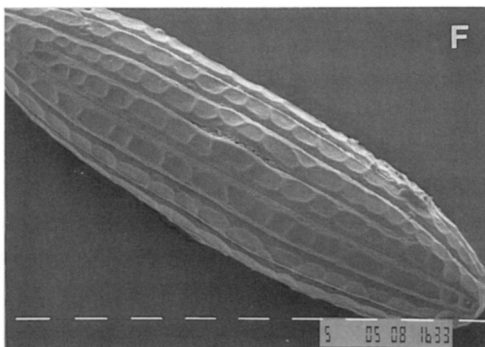
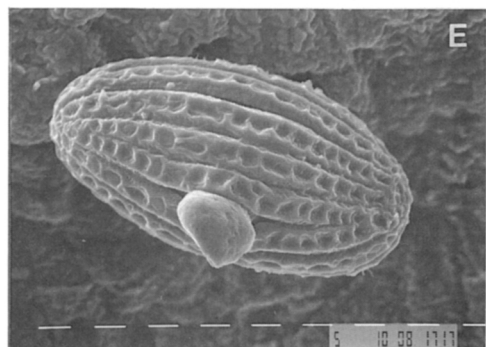
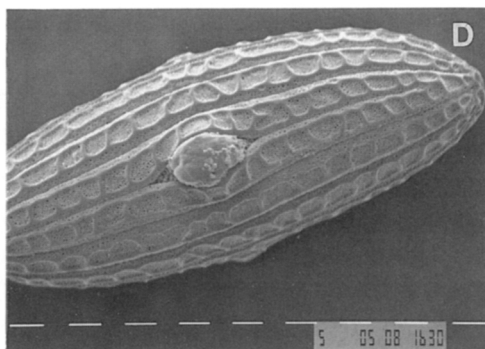
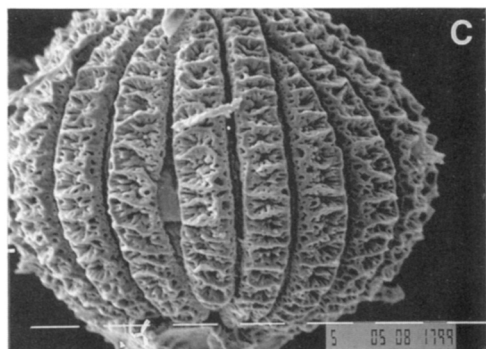
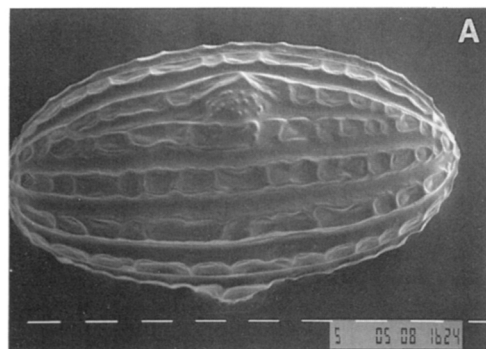
*Leaves* equal, unequal or very unequal, toothed, subsessile or shortly petiolate, green on both surfaces or whitish beneath. *Inflorescence* essentially axillary, the flowers in pedunculate heads borne on trifurcate (rarely simple) axillary branchlets; rarely heads less dense with a few scattered flowers below the main heads. *Bracts* suborbicular, ovate or lanceolate, rounded, acute or acuminate, imbricate, scarious and soon deciduous. *Bracteoles* apparently always absent except in *S. angustifrons*. *Calyx* 5-lobed with the middle lobe distinctly longer than the others, always (?) glandular-pubescent. *Corolla* gradually expanded from the base, gently curved at the mouth (Fig. 4C). *Fertile stamens* 4, included. *Pollen* ellipsoid, ridged (Fig. 6H; also in Scotland, 1993: 491, figs 53–54). *Seeds* pilose with long mucilaginous hairs; areole absent.

Group 9 is usually easily recognized by the distinctive pedunculate flower-heads, but in a few species the flowers are merely capitellate at the branch tips with a few flowers on the peduncle below. Other distinguishing features are the scarious, deciduous bracts, the absence of bracteoles (except in the peripheral species *S. angustifrons*), the lengthened median lobe of the calyx and the large, gently curved corolla. The bracts are of considerable importance taxonomically and it is therefore unfortunate that they are often deciduous very early. A few, however, can usually be found clinging to the sticky calyces long after they have actually fallen. There has been a tendency to lump several of these species within *S. pentstemonoides* but they are mostly quite distinct and this can be confirmed by examining the bracts. Other common features of the group include the shortly but distinctly petiolate leaves and the glandular calyx and capsule.

The group was entirely included in *Goldfussia* Nees by Bremekamp and is one of the two main elements in his concept of that genus; the other is Group 15, to which it is not very closely related and to which belongs the type of *Goldfussia* (*G. capitata* Nees = *S. capitata* (Nees) T. Anders.). It is, however, very close to both Groups 8 and 10; *S. oligocephala*, for example, shows some approach to Group 8 in its usually solitary flower-heads from the upper leaf axils only. Species with capitellate flowers in Group 10, included by Bremekamp in *Difflugossa*, are also very close, and *S. straminea* could perhaps have been included here. They all differ, however, in the presence of bracteoles and herbaceous bracts. The median calyx lobe is poorly developed and the corolla is usually straight.

Group 9 is widely distributed along the Himalaya from Pakistan to China, with a few species extending south to Thailand. I recognize 15 species, seven from the Indian subcontinent: \**S. angustifrons*, \**S. bracteata*, *S. geniculata*, \**S. multidentis*, \**S. oligocephala*, \**S. pentstemonoides* (Nees) T. Anders. (incl. var. *dalhousieana*) and \**S. pubiflora*; six from China: *S. chaffonjonii* H. Lév., *S. equitans* H. Lév., *S. hupehensis* W.W. Sm., *S. marchandii* H. Lév., \**S. oligocephala*, (*S. feddei* H. Lév.) and *S. psilostachys* C.B. Clarke ex W.W. Sm.; and three from mainland SE

FIG. 6 (opposite). *Strobilanthes* pollen, all side views. A, *S. accrescens* J.R.I. Wood; B, *S. campaniformis* J.R.I. Wood; C, *S. candida* J.R.I. Wood; D, *S. clarkei* J.R.I. Wood; E, *S. imlayae* J.R.I. Wood; F, *S. jennyae* J.R.I. Wood; G, *S. kingdonii* J.R.I. Wood; H, *S. pubiflora* J.R.I. Wood. A from Wood 7581; B from Ludlow & Sherriff 2336; C from Kingdon Ward 13063; D from Kingdon Ward 18901; E from Bor 6792; F from Wood 7459; G from Kingdon Ward 7654; H from Wood 7517. All micron lines = c.5µm. SEM photographs by Jenny Wright. →



Asia: *S. anfractuosa* C.B. Clarke, *S. articulata* Imlay and *S. rex* C.B. Clarke. I believe these are all good species even though the relationship between the Chinese and the Indian species has not been previously considered and many are poorly known. It is hoped that the following key will help botanists link the two areas. I have used leaf and bract characters principally as the leaves are often distinctive. Anisophylly is a marked feature of several species which have a very different facies from the isophyllous taxa such as *S. angustifrons* and *S. hupehensis*.

1. Plant strongly anisophyllous, the smaller leaf in each pair less than  $\frac{1}{3}$  the length of the larger one; stem often zigzag upwards \_\_\_\_\_ 2
- + Plant isophyllous or weakly anisophyllous, the smaller leaf in each pair at least half the length of the larger one; stem straight or nearly so \_\_\_\_\_ 8
2. Corolla glabrous; bracts densely sticky glandular-pubescent; some flower pairs often present below the main head \_\_\_\_\_ **S. multidentis**
- + Corolla pubescent, at least in bud; bracts glabrous or nearly so; flowers strictly in heads \_\_\_\_\_ 3
3. Stem, leaves and peduncles hairy (sometimes only on the veins); flower-heads all solitary \_\_\_\_\_ 4
- + Stem, leaves and peduncles glabrous; flower-heads usually borne on trifurcate branchlets, rarely entirely solitary \_\_\_\_\_ 5
4. Bracts lanceolate, acuminate, 9–10mm long \_\_\_\_\_ **S. articulata**
- + Bracts broadly elliptic or obovate, acute, 5–6mm long \_\_\_\_\_ **S. psilostachys**
5. Upper leaves distinctly ovate; lower leaves narrowly elliptic; calyx lobes obtuse \_\_\_\_\_ **S. marchandii**
- + Leaves all broadly elliptic; tapered at both ends; calyx lobes acute \_\_\_\_\_ 6
6. Bracts at least 1.5cm long (India) \_\_\_\_\_ **S. geniculata**
- + Bracts 1–1.3cm long (China) \_\_\_\_\_ 7
7. Bracts hardened, drawn out to a long fine point; corolla less than 3cm long \_\_\_\_\_ **S. equitans**
- + Bracts not hardened, acute or acuminate to an obtuse point; corolla more than 3cm long \_\_\_\_\_ **S. chaffonjonii**
8. Bracts suborbicular, rounded \_\_\_\_\_ 9
- + Bracts ovate or lanceolate, acute or acuminate \_\_\_\_\_ 10
9. Corolla glabrous; peduncles usually glandular-pubescent \_\_\_\_\_ **S. pentstemonoides**
- + Corolla pubescent at least in bud; peduncles glabrous \_\_\_\_\_ **S. pubiflora**
10. Heads arising from the uppermost leaf axils only, usually solitary and often with scattered flower pairs below the main head; bracts ovate, acute; leaves whitish beneath \_\_\_\_\_ **S. oligocephala**
- + Heads borne on divided branchlets arising from most leaf axils, strictly capitate or not; bracts ovate, acuminate; leaves green or whitish beneath \_\_\_\_\_ 11

11. Leaves completely glabrous on both sides, distinctly unequal in each pair \_\_\_\_\_ **S. rex**  
 + Leaves pubescent at least on the upper surface (sometimes only a few hairs) but if glabrous then leaves equal in each pair \_\_\_\_\_ 12
12. Leaves thinly but uniformly pubescent above; bracts and peduncles hairy; flowers strictly capitate \_\_\_\_\_ 13  
 + Leaves glabrous or with a few scattered hairs above; bracts and peduncles glabrous; heads often with flower pairs below \_\_\_\_\_ 14
13. Calyx lobes oblanceolate-spathulate; leaves softly hairy above, very large, usually more than 15cm long \_\_\_\_\_ **S. bracteata**  
 + Calyx lobes linear; leaves scabrid above, usually 10–15cm long \_\_\_\_\_ **S. anfractuosa**
14. Leaves oblong-elliptic, 3–6cm wide; corolla less than 3cm long; bracteoles absent \_\_\_\_\_ **S. hupehensis**  
 + Leaves ovate or broadly elliptic, 5–10cm wide; corolla 3–4 cm long; bracteoles present \_\_\_\_\_ **S. angustifrons**

## GROUP 10

*Leaves* usually very unequal (equal in *S. candida* and *S. oxycalycina*), petiolate, toothed, often bicoloured, usually glabrous. *Inflorescence* always essentially axillary but of three distinct types: either in heads borne on small axillary branchlets, or in lax spikes, or (*S. hamiltoniana*) in loose panicles. *Bracts* herbaceous, distinct from the leaves, usually fugacious and difficult to find. *Bracteoles* present similar to the bracts but reduced in size. *Calyx* subequally 5-lobed or in a few species (*S. thomsonii*, *S. straminea*, *S. shanensis*) with the median lobe slightly longer, characteristically glabrous when young but accrescent and in many species becoming glandular at maturity. *Corolla* gradually expanded from the base either straight (Fig. 4B) or curved (Fig. 4C). *Fertile stamens* 4, included or shortly exserted. *Pollen* ellipsoid, ribbed (Fig. 6B, D); the pollen of *S. candida* (Fig. 6C) is atypical. *Seeds* pilose with mucilaginous hairs, without an areole.

Group 10 is characterized by a cluster of characters but especially by the bracts and calyx. Unlike Group 9, both bracts and bracteoles are present. They are herbaceous, typically fugacious and often extremely difficult to find. The bracteoles resemble reduced bracts, often, for example, being lanceolate in shape when the bracts are ovate. In two species, *S. simplex* and *S. straminea*, the bracts are relatively persistent and in the latter case slightly scarious. *S. straminea* is clearly intermediate with Group 9.

The calyx is also unusual. At anthesis it is small and glabrous in most species. However, it is usually strongly accrescent in fruit, perhaps doubling its length and becoming glandular-pilose. Careful examination of young calyces often shows the sessile glands which will later grow as the calyx enlarges. In at least three species these two states have incorrectly been given taxonomic status: *S. hamiltoniana*/*S. crinita*, *S. scoriarum*/*S. shweliensis*, *S. discolor*/*S. discolor* var. *nudicalyx*.

Group 10 was recognized by Bremekamp under the name *Difflugossa* Bremek. (type: *D. colorata* (Nees) Bremek. = *S. hamiltoniana* (Steud) Bosser & Heine). I do not know if the Indonesian species placed by him in this genus belong here and certainly one of the Indian species (*S. paupera*) was wrongly placed. However, his genus does include all the very diverse inflorescence types which I also accept. Like Group 2 there are also two distinct corolla types. I would regard the curved corolla and also the slightly lengthened median calyx lobe with which

it is often associated as demonstrating the close links between this group and Group 9. The leaves in Group 10 are quite variable but in the majority of species they are very shortly petiolate, lanceolate or ovate, strongly acuminate and very unequal in each pair. Indeed Group 10 contains some of the most markedly anisophyllous species in the whole of *Strobilanthes*.

Group 10 consists of 14 species centred on the region where India, Burma and Tibet meet. Only two extend to Nepal, one to Yunnan and none at all to Thailand. *S. candida* J.R.I. Wood, *S. shanensis* (Bremek.) J.R.I. Wood **comb. nov.** (basionym: *Difflugosa shanensis* Bremek., Verh. Ned. Akad. Wetens. Afd. Nat. 2, 41(1): 238 (1944)) and *S. straminea* W.W. Sm. are Burmese endemics. *S. clarkei* J.R.I. Wood, *S. rhombifolia* C.B. Clarke and *S. simplex* J.R.I. Wood are restricted to the Indo-Burmese border region, while the remainder are Himalayan species.

- |    |  |                        |
|----|--|------------------------|
| 1. | Flowers in heads _____   | 2                      |
| +  | Flowers in spikes or open panicles _____   | 9                      |
| 2. | Leaves equal or slightly unequal, distinctly petiolate _____   | 3                      |
| +  | Leaves very unequal with the smaller leaf less than $\frac{1}{3}$ as long as the larger, both subsessile or very shortly petiolate _____ | 6                      |
| 3. | Corolla pubescent; calyx lobes finely pointed _____  | <b>S. oxycalycina</b>  |
| +  | Corolla glabrous; calyx lobes obtuse to subacute _____   | 4                      |
| 4. | Heads subtended by a pair of flower-bearing leaflets; bracts persistent; peduncles simple _____  | <b>S. simplex</b>      |
| +  | Heads not subtended by leaflets; bracts fugacious; peduncles divided _____   | 5                      |
| 5. | Leaves falcate, long-acuminate, whitish beneath, unequal; calyx in flower 4–6mm long _____   | <b>S. discolor</b>     |
| +  | Leaves shortly acuminate, not falcate, green beneath, ?subequal; calyx in flower 8–9mm long _____  | <b>S. shanensis</b>    |
| 6. | Corolla completely glabrous; leaves distinctly petiolate, falcate, whitish beneath _____   | <b>S. discolor</b>     |
| +  | Corolla pubescent at least in bud; petioles very short or 0; leaves not falcate, greenish on both surfaces _____                         | 7                      |
| 7. | Leaves lanceolate, 1–1.5(–3)cm wide; flowering branches very short, usually less than 3cm long _____                                     | <b>S. anisophylla</b>  |
| +  | Leaves ovate to subrhomboid, usually at least 3cm wide; flowering branches at least 5cm long _____                                       | 8                      |
| 8. | Bracts glabrous, fugacious; leaves subrhomboid, acute; corolla blue _____  | <b>S. rhombifolia</b>  |
| +  | Bracts glandular, usually present at anthesis; leaves ovate-acuminate; corolla straw-yellow with pinkish lines _____                     | <b>S. straminea</b>    |
| 9. | Inflorescence a large lax open panicle with the flowers often solitary on capillary branches _____                                       | <b>S. hamiltoniana</b> |
| +  | Inflorescence of axillary spikes (sometimes appearing cymose) occasionally aggregated to form a panicle _____                            | 10                     |



10. Corolla pubescent at least in bud \_\_\_\_\_ **S. thomsonii**  
 + Corolla glabrous even in bud \_\_\_\_\_ 11
11. Leaves equal, gradually narrowed into a long petiole; corolla pure white \_\_\_\_\_ **S. candida**  
 + Leaves very unequal, abruptly narrowed into a short petiole; corolla blue  
 (very rarely white) \_\_\_\_\_ 12
12. Corolla straight, anthers very shortly exerted \_\_\_\_\_ 13  
 + Corolla curved, anthers included \_\_\_\_\_ 14
13. Corolla less than 2.5cm long; inflorescence completely glabrous;  
 upper leaves subcordate \_\_\_\_\_ **S. campaniformis**  
 + Corolla c.3cm long; inflorescence soon glandular; leaves all  
 cuneate-based \_\_\_\_\_ **S. scoriarum**
14. Leaves ovate, cordate; inflorescence much branched forming axillary  
 panicles; calyx lobes obtuse \_\_\_\_\_ **S. clarkei**  
 + Leaves lanceolate, much longer than broad; inflorescence of simple,  
 few-flowered axillary spikes; calyx lobes finely acuminate \_\_\_\_\_ **S. divaricata**

## GROUP 11

*Leaves* unequal, petiolate, crenate or subentire, green on both surfaces. *Inflorescence* of very lax, axillary and terminal secund spikes forming a terminal panicle. *Bracts* herbaceous, distinct from the leaves, small, fugacious. *Bracteoles* present, resembling small bracts. *Calyx* subequally 5-lobed, glabrous, accrescent in fruit. *Corolla* yellow with a purple tube, curved (Fig. 4C). *Fertile stamens* 4, included. *Pollen* ellipsoid, ribbed. *Seeds* shortly hairy with a distinct small areole surrounded with a tuft of long rigid hairs.

Group 11 was recognized by Bremekamp under the name *Ditrichospermum* Bremek. (type: *D. secundum* (T. Anders.) Bremek.) and consists of a single species, *S. secunda* T. Anders. It is distinctive partly because of the dimorphic seed indumentum and partly because of the inflorescence. Secund spikes are unusual in *Strobilanthes*, being found only in Group 6 and the Sri Lankan *S. sexennis* Nees.

The fugacious bracts and bracteoles combined with the accrescent calyx suggest a strong link with Group 10, and this is confirmed by the unequal glabrous leaves. Indeed, *S. secunda* has sometimes been identified as a form of *S. divaricata* Nees. There is also a slight superficial resemblance to the inflorescence of Group 12. Clarke (1885: 468) suggested that *S. secunda* might have been a wild form of *S. cusia* Nees but neither Bremekamp (1944: 189) nor I can see any reason for this. Equally, I cannot accept Bremekamp's view that *S. pterygorrhachis* C.B. Clarke (Group 6) or *S. panichanga* (Nees) T. Anders. are in any way related.

## GROUP 12

*Leaves* subequal (?always), toothed, subsessile or petiolate, green on both surfaces. *Inflorescence* of lax, divaricately branched axillary and terminal spikes, often forming a terminal panicle, the flower pairs distinct and usually at least 1cm apart. *Bracts* intergrading with the upper leaves, linear or lanceolate, herbaceous, persistent. *Bracteoles* present, usually linear. *Calyx* subequally 5-lobed. *Corolla* gradually widened from the base, straight or nearly so (Fig. 4B). *Fertile stamens* 4, included. *Pollen* ellipsoid, ribbed (Scotland, 1993: 492-493, figs 59-60). *Seeds* pilose with mucilaginous hairs, without an areole.

Group 12 is characterized by the long, divaricately branched spikes which form the inflorescence. There is a superficial resemblance to Group 7 but the corolla is straight, the calyx is subequally 5-lobed and the branching of the spikes is quite different.

Group 12 was not recognized by Bremekamp, who placed most of the following species in his list headed 'Genus Adhuc Incertum', but it appears to be widespread in SE Asia, just reaching the Himalayan regions of Eastern India but not China. From the Himalaya I have seen *S. aborensis*, *S. elongata* and *S. tenax*. *S. furcata* Biswas is probably conspecific with *S. elongata*, judging by the picture in *Assam Forest Records Bot.* 1: 23 (1934). From Burma and Thailand there are at least four other species: *S. lancifolia* T. Anders., *S. farinosa* C.B. Clarke, *S. pateriformis* Lindau and *S. sp. E* (Kingdon Ward 9184 (BM, E) from Burma). I am not very familiar with this group and it would be premature to construct a key.

#### GROUP 13

*Leaves* equal, petiolate, toothed, dark green on both surfaces. *Inflorescence* of lax, leafy axillary spikes. *Bracts* leaf-like, petiolate, persistent, narrowly obovate. *Bracteoles* present, linear-oblongate. *Calyx* 5-lobed with the median lobe longer than the others, accrescent and becoming spatulate in fruit. *Corolla* gradually widened from a cylindrical base, straight, large (Fig. 4B). *Fertile stamens* 4, included. *Pollen* ellipsoid, ribbed with distinct crossbars joining the ribs (Scotland, 1993: 494, figs 61–62). *Seeds* pilose with a small areole.

Recognized by Bremekamp under the name *Baphiakanthus* Bremek. (type: *B. cusia* (Nees) Bremek.), Group 13 consists of a single species, *S. cusia* Nees. It is distinguished by its possibly unique pollen and a combination of other characters. The persistent petiolate bracts are similar to those of Group 6, whereas the elongate median calyx lobe shows a relationship with Groups 7–9. The very large straight corolla, however, resembles that of Groups 14 and 15. Dried specimens are characteristically dark green, probably because of the presence of a blue pigment which is the source of Assam indigo. *S. cusia* is probably native in the Indo-Burmese border region but has been widely cultivated in east Asia.

#### GROUP 14

*Leaves* equal, petiolate, serrate, whitish beneath. *Inflorescence* of short axillary spikes. *Bracts* herbaceous, persistent, leaf-like, petiolate. *Bracteoles* present, linear. *Calyx* subequally 5-lobed, pubescent inside. *Corolla* gradually widened from a cylindrical base, straight, large (Fig. 4B). *Fertile stamens* 4, included. *Pollen* ellipsoid, ribbed. *Seeds* pilose, without an areole.

Recognized by Bremekamp under the name *Pseudaechmanthera* Bremek., Group 14 consists of a single Himalayan species *S. glutinosa*. The leaf-like, petiolate bracts, large corolla and axillary spikes suggest an affinity with Group 13 but the calyx is subequally 5-lobed and the distinctive pollen is not present. There is also a possible affinity with Group 6 but the corolla shape is quite wrong. Bremekamp drew attention to the calyx being pubescent on the inside and suggested an affinity with *Sericocalyx*. However, I doubt the significance of this as the character seems to occur randomly in other species such as *S. caudata* T. Anders. from Sri Lanka.

#### GROUP 15

*Leaves* equal to very unequal, petiolate, toothed, usually green on both surfaces, nearly always asymmetric, often strongly so. *Inflorescence* axillary, the flowers in dense pedunculate heads borne on small axillary branchlets, often becoming compound and forming axillary panicles of flower-heads. *Bracts* herbaceous,

usually persistent (early deciduous in *S. capitata* and *S. sp. D*), often well-developed, leaf-like with a toothed margin and terminal appendage, usually much exceeding the calyx, of two kinds, intergrading with each other — outer sterile bracts and inner flower-bearing bracts. *Bracteoles* present, distinct from the bracts, linear-oblong. *Calyx* subequally 5-lobed (with a strongly accrescent apex in *S. accrescens*). *Corolla* cylindrical and then gradually widened to the mouth, straight or nearly so (Fig. 4B). *Fertile stamens* 4, included. *Pollen* ellipsoid, ribbed (Fig. 6A, G). *Seeds* pilose with long mucilaginous hairs, lacking an areole.

Group 15 is recognized by its distinctive inflorescence. The flowers are in heads borne on short axillary branchlets. The heads may be solitary or compound forming axillary panicles. The structure of the flower-heads is quite different from that of Group 9; there are two types of bracts and bracteoles are always present as well. The outer bracts, sometimes referred to as floral leaves, are sterile and different in shape and size from the inner flower-bearing bracts. Both, however, are herbaceous, persistent (except in *S. capitata* and *S. sp. D*), usually toothed and often with a distinct leaf-like appendage. The calyx is subequally 5-lobed and the corolla straight. Other distinctive features include the large corolla and the asymmetric leaves which are found in nearly every species in this group.

Group 15 was included in *Goldfussia* Nees by Nees and Bremekamp, and since *S. capitata* was selected by Bremekamp (1944: 226) as the lectotype of *Goldfussia* this name must remain associated with this group. It is not closely related to the other main element of *Goldfussia* sensu Bremekamp, Group 9, which can be distinguished by its calyx with an elongate median lobe, scarious deciduous bracts, the absence of bracteoles and a distinctly curved corolla.

Group 15 is distributed from Nepal eastwards to China, where it is very poorly represented, and thence south through SE Asia to Borneo. I have been able to identify 11 species that belong to the group: *S. accrescens*, *S. calvata* J.R.I. Wood, *S. capitata*, *S. echinata*, *S. glabrata* Nees, *S. glomerata*, *S. kerrii* Craib, *S. kinabaluensis* Stapf, *S. kingdonii*, *S. simonsii* and *S. sp. D* (*Kingdon Ward 8754* (K) from Arunachal Pradesh). All these species appear to fit the group well, although the heads are poorly developed in *S. kingdonii* and the corolla is unusually broad in *S. echinata*. They can be distinguished by the following key:

1. Plant strongly anisophyllous, the smaller leaf less than  $\frac{1}{3}$  the length of the larger leaf in each pair \_\_\_\_\_ 2
- + Plant isophyllous or weakly anisophyllous, the smaller leaf about  $\frac{1}{2}$  the length of the larger leaf in each pair or more \_\_\_\_\_ 5
2. Corolla white, glabrous; leaves lanceolate or narrowly oblong-elliptic \_\_\_\_\_ **S. simonsii**
- + Corolla blue, pubescent at least on the tube; leaves broadly ovate or elliptic \_\_\_\_\_ 3
3. Bracts not much exceeding the calyx, the outermost ovate and much shorter than the inner bracts \_\_\_\_\_ **S. kerrii**
- + Some or all the bracts much overtopping the calyx so the flower-heads appear eared; outer bracts long \_\_\_\_\_ 4
4. Leaves glabrescent above; bracts narrowly lanceolate; corolla puberulent on the tube only, less than 3cm long \_\_\_\_\_ **S. kinabaluensis**
- + Leaves densely pubescent on both surfaces; bracts broadly oblong-lanceolate; corolla densely pilose, more than 4cm long \_\_\_\_\_ **S. glomerata**

5. Heads very lax, often subspicate with scattered flowers below the capitellate tips \_\_\_\_\_ **S. kingdonii**  
 + Heads strongly capitate \_\_\_\_\_ 6
6. Flower-heads usually solitary on each branchlet \_\_\_\_\_ 7  
 + Branchlets divided bearing 3 or more flower-heads \_\_\_\_\_ 10
7. Plant glabrous or virtually so \_\_\_\_\_ 8  
 + Leaves, stem, bracts and calyx pubescent \_\_\_\_\_ 9
8. Bracts ovate, finely acuminate \_\_\_\_\_ **S. glabrata**  
 + Bracts oblong, obtuse \_\_\_\_\_ **S. calvata**
9. Bracts narrowly lanceolate-oblong, c.3mm wide, deciduous; branchlets leafless \_\_\_\_\_ **S. sp. D**  
 + Bracts ovate, at least 5mm wide, persistent; branchlets bearing 2 or more persistent leaves \_\_\_\_\_ **S. echinata**
10. Calyx lobes with a mucronate tip strongly accrescent and glandular in fruit; leaf bases decurrent onto the petiole \_\_\_\_\_ **S. accrescens**  
 + Calyx acute, not accrescent in fruit, eglandular; leaf bases cuneate, not decurrent \_\_\_\_\_ **S. capitata**

## GROUP 16

*Leaves* equal, subsessile, toothed, green on both surfaces. *Inflorescence* of shortly pedunculate axillary heads, sometimes reduced to axillary clusters. *Bracts* entirely leaf-like, persistent. *Bracteoles* present, distinct from the bracts, linear-oblong. *Calyx* subequally 5-lobed. *Corolla* gradually widened from the base, straight (Fig. 4B), distinctive because of the hairy veins on the exterior. *Fertile stamens* 4, included. *Pollen* ellipsoid, ribbed (Shakya, 1975: 102, fig. 4). *Seeds* not known.

Group 16 is similar to Group 15 in its capitate inflorescence, but in this group the heads are sessile or very shortly pedunculate, and less well-developed without the sterile outer bracts. A curious feature is the presence of lines of hairs along the veins on the exterior of the corolla. I have seen nothing like this elsewhere in species from the Himalaya but it is also seen on *S. laxa* Nees from Ceylon.

This group consists of two species placed by Shakya (1975) in Bremekamp's genus *Dossifluga*, but on what evidence I do not know. *Dossifluga* as described by Bremekamp was monotypic and based on *S. suborbicularis* Imlay, known from two collections from Thailand. I can see no obvious reason why Shakya's two species are unrelated to this but nonetheless a link between Nepal and Thailand seems improbable.

**S. bheriensis** (Shakya) J.R.I. Wood, **comb. nov.** (basonym: *Dossifluga bheriensis* Shakya, J. Jap. Bot. 50(4): 97 (1975)) and **S. cuneata** (Shakya) J.R.I. Wood, **comb. nov.** (basonym: *Dossifluga cuneata* Shakya, J. Jap. Bot. 50(14): 99 (1975)) can be distinguished as follows:

1. Flowers in shortly pedunculate heads; stems bifariously pubescent \_\_\_\_\_ **S. bheriensis**  
 + Flowers sessile in the leaf axils; stems glabrous \_\_\_\_\_ **S. cuneata**

## GROUP 17

*Leaves* equal or slightly unequal, petiolate, serrate, paler beneath, usually hairy. *Inflorescence* of dense sessile or very shortly pedunculate, bracteate heads, terminal on the main stem and, less commonly, on short axillary branchlets, usually densely covered in white or rufous hairs. *Bracts* distinct from the leaves, persistent, herbaceous, commonly elongate and ciliate, the outer bracts sterile and larger than the inner ones. *Bracteoles* present, often linear. *Corolla* gradually expanded from a shortly tubular base, gently curved (Fig. 4C). *Fertile stamens* 4, included. *Pollen* ellipsoid, ribbed (Fig. 6E). *Seeds* pilose with mucilaginous hairs, without an areole.

Group 17 is a large and easily identified group which has not previously been recognized. Bremekamp placed the species mostly in his list headed 'Genus Adhuc Incertum'. It is characterized by the usually sessile, terminal bracteate heads which are densely clothed in white or rufous hairs. The leaves are nearly always hairy and the corolla distinctly curved.

Group 17 consists of at least nine species: *S. imlayae* J.R.I. Wood from India and Burma; *S. esquirolii* H. Lév. from China and Burma; *S. brandisii* T. Anders. and *S. falconeri* T. Anders. from Burma; and *S. anamitica* O. Kuntze, *S. bombycina* Imlay, *S. consors* C.B. Clarke, *S. evradii* Benoist and *S. leucocephala* Craib from Thailand and Indo-China. Amongst these *S. consors* is remarkable because the placenta rises from the base of the ripening capsule as in the genera *Rungia* and *Dicliptera*. This character is known to occur elsewhere in *Strobilanthes* but perhaps randomly; it does not seem to be characteristic of Group 17, not occurring, for example, in *S. esquirolii*.

## CHECKLIST OF HIMALAYAN SPECIES

The following checklist summarizes our knowledge of the distribution of all Himalayan *Strobilanthes*. Distribution is given by political division as follows: Afghanistan, Pakistan, North India (Kashmir-Uttar Pradesh), Nepal, Sikkim, Darjeeling, Arunachal Pradesh and Tibet. Since the last two areas are so poorly documented I have cited the source on which the record is based. I have not included China and Burma partly because the mountains of this area are not always regarded as part of the Himalaya and partly because I have insufficient information. Species discussed individually in the final part of this paper are indicated by an asterisk. The order follows that of the 17 recognized groups, with a few unplaced species listed at the end.

An examination of the checklist shows that there are 61 species of *Strobilanthes* from the Himalayan region as defined above, distributed as follows:

- Afghanistan : 1
- Pakistan: 5
- North India: 7
- Nepal: 23
- Sikkim: 10
- Darjeeling: 20
- Bhutan: 24
- Arunachal Pradesh: 26
- Tibet: 15

The figures reveal how the number of species increases eastwards. Arunachal Pradesh has the largest total despite being the least well-known, with several common species such as *S. capitata* unrecorded. The total for Sikkim is low but this is because there are no lowlands and the area in question is quite small. The total for Tibet is surprisingly high but many species are known only from the extreme south-east.

## GROUP 1

**S. khasyana** (Nees) T. Anders. (*Listrobanthes khasyana* (Nees) Bremek.)  
Darjeeling; also Meghalaya.

## GROUP 2

\***S. frondosa** J.R.I. Wood  
Bhutan; also Manipur, Burma.

\***S. himalayana** J.R.I. Wood (*S. petiolaris* auct.; *S. maculata* auct.; *Sympagis petiolaris* auct.)  
Sikkim, Darjeeling, Bhutan.

\***S. tubiflos** (C.B. Clarke) J.R.I. Wood (*S. petiolaris* Nees var. *tubiflos* C.B. Clarke)  
Arunachal Pradesh (*Griffith* K.D. 6095, 6103).

## GROUP 3

**S. acrocephala** T. Anders. (*Tarphochlamys affinis* (Griff.) Bremek.)  
Nepal (fide Hara (1982: 177)); also Meghalaya, Nagaland, Manipur, Burma, China.

## GROUP 4

**S. rubescens** T. Anders. (*Pteracanthus rubescens* (T. Anders.) Bremek.; *Strobilanthes boerhaavioides* T. Anders. **syn. nov.**; *Pteracanthus boerhaavioides* (T. Anders.) Bremek.)  
Darjeeling, Bhutan; also Meghalaya.

**S. sabiniana** (Lindley) Nees  
Nepal, Darjeeling, Bhutan; also Meghalaya.

\***S. saccata** J.R.I. Wood  
Nepal.

**S. tamburensis** C.B. Clarke  
Nepal, Bhutan, Arunachal Pradesh (*Kingdon Ward* 14186).

## GROUP 5

**S. auriculata** Nees (*Perilepta auriculata* (Nees) Bremek.; *Strobilanthes edgeworthiana* Nees; *Perilepta edgeworthiana* (Nees) Bremek.)  
Pakistan, North India, Nepal, Darjeeling; also Bihar and West Bengal (Chota Nagpur), Manipur, Bangladesh (Chitagong), Burma and China.

This is the only Himalayan species occurring south of the Ganges.

## GROUP 6

**S. aenobarba** W.W. Sm.  
Tibet (*Forrest* 19238); also Burma.

**S. cyphantha** Diels

Arunachal Pradesh/Tibet (*Kingdon Ward* 20221); also China.

**S. helicta** T. Anders. (*Pteracanthus calycinus* (Nees) Bremek.)

Sikkim, Darjeeling, Bhutan, Tibet (*Kingdon Ward* 10933), Arunachal Pradesh (Rao & Joseph in Bull. Bot. Surv. Ind. 7: 149 (1965)); also Burma, China.

**S. inflata** T. Anders. (*Pteracanthus inflatus* (Nees) Bremek.; *Strobilanthes wardii* W.W. Sm. **syn. nov.**)

Sikkim, Darjeeling, Arunachal Pradesh (*Kingdon Ward* 13930), Tibet (*Rock* 23248); also Burma, China.

**S. oresbia** W.W. Sm.

Tibet (*Ludlow & Sherriff* 1905, 5238; *Kingdon Ward* 10953, 19640), Arunachal Pradesh (*Kingdon Ward* 8386); also Burma, China.

**\*S. tibetica** J.R.I. Wood

Arunachal Pradesh (*Kingdon Ward* 8674), Tibet (*Kingdon Ward* 10942); also Nagaland.

**S. urophylla** (Nees) Nees (*S. urophylla* var. *sikkimensis* C.B. Clarke **syn. nov.**; *Pteracanthus urophyllus* (Nees) Bremek.)

Darjeeling; also Meghalaya.

**S. versicolor** Diels (*Pteracanthus versicolor* (Diels) H.W. Li)

Tibet (fide H.W. Li in Fl. Xizangica); also China.

**\*S. wallichii** Nees (*S. atropurpurea* Nees; *Pteracanthus alatus* (Wall.) Bremek.)

Pakistan, North India, Nepal, Sikkim, Darjeeling, Bhutan, Arunachal Pradesh (*Kingdon Ward* 13836), Tibet (*Kingdon Ward* 11962); also Burma, China.

## GROUP 7

**\*S. attenuata** (Nees) Nees subsp. **attenuata** (*S. alata* auct.; *Pteracanthus urticifolius* (O. Kuntze) Bremek.)

Afghanistan, Pakistan, North India.

**\*S. attenuata** subsp. **nepalensis** J.R.I. Wood

Nepal.

**S. claviculata** C.B. Clarke ex W.W. Sm.

Bhutan; also China.

**S. extensa** (Nees) Nees

Nepal (*Nicolson* 2189), Bhutan; also Meghalaya.

**\*S. lachenensis** C.B. Clarke (*Pteracanthus lachenensis* (C.B. Clarke) Bremek.; *P. urticifolius* auct. sensu Hara (1982) & H.W. Li (1985); *Sympagis petiolaris* sensu Hara (1982))

Nepal, Sikkim, Bhutan, Arunachal Pradesh (*Kingdon Ward* 14095), Tibet (*Hingston* 309, *Polunin* 869); also ?China.

**\*S. subnudata** C.B. Clarke (*Pteracanthus subnudatus* (C.B. Clarke) Bremek.)

Nepal, Sikkim, Darjeeling.

## GROUP 8

\***S. lamiifolia** (Nees) T. Anders. (*Pteracanthus rotundifolius* (D. Don) Bremek.; *Strobilanthes mahongensis* H. Lév.)

Nepal, Darjeeling, Bhutan, Arunachal Pradesh (*Ludlow, Sherriff & Taylor* 7033, 7073); also China.

**S. nutans** (Nees) T. Anders. (*Goldfussia nutans* Nees)

Nepal.

## GROUP 9

\***S. angustifrons** C.B. Clarke (*Goldfussia edgeworthiana* Nees; *G. acuminata* P.R. Shakya; *Pteracanthus angustifrons* (C.B. Clarke) Bremek.)

North India, Nepal.

\***S. bracteata** (Nees) J.R.I. Wood (*Goldfussia bracteata* Nees; *Strobilanthes quadrangularis* C.B. Clarke)

North India, Nepal.

\***S. geniculata** C.B. Clarke (*S. burkillii* Dunn; *Goldfussia geniculata* (C.B. Clarke) Bremek.)

Arunachal Pradesh (*Griffith* s.n., *Burkill* 37107).

\***S. multident** C.B. Clarke (*Goldfussia multident* (C.B. Clarke) Bremek.; *Strobilanthes agrestis* C.B. Clarke; *Pteracanthus agrestis* (C.B. Clarke) Bremek.)

Nepal, Darjeeling, Bhutan; also Meghalaya and Nagaland.

\***S. oligocephala** C.B. Clarke (*Goldfussia thomsonii* Hook.; *G. oligocephala* (C.B. Clarke) Bremek.; *Strobilanthes paupera* C.B. Clarke; *S. feddei* H. Lév.; *Difflugossa paupera* (C.B. Clarke) Bremek.)

Nepal, Sikkim, Darjeeling, Bhutan, Arunachal Pradesh (*Kingdon Ward* 14164); also Meghalaya, China.

\***Strobilanthes pentstemonoides** (Nees) T. Anders. var. **pentstemonoides** (*Goldfussia pentstemonoides* Nees; *Ruellia capitata* D. Don)

North India, Nepal, Bhutan; records from other areas are errors.

\***Strobilanthes pentstemonoides** var. **dalhousieana** (Nees) J.R.I. Wood (*Goldfussia dalhousieana* Nees)

Pakistan, North India, Nepal.

\***Strobilanthes pubiflora** J.R.I. Wood (*S. pentstemonoides* auct. mult. quoad Darjeeling plants)

Darjeeling, Bhutan; also Nagaland.

## GROUP 10

\***S. anisophylla** (G. Lodd.) T. Anders. (*Goldfussia anisophylla* (G. Lodd.) Nees)

West Bengal (Buxa), Bhutan; also in Meghalaya.

\***S. campaniformis** J.R.I. Wood

Tibet (*Ludlow & Sherriff* 2336).

\***S. discolor** (Nees) T. Anders. (*Goldfussia discolor* Nees; *Difflugossa nagaensis* Bremek.)

Arunachal Pradesh (*Kingdon Ward* 14202); also in Meghalaya, Nagaland and Manipur.



**S. divaricata** (Nees) T. Anders. (*Difflugossa divaricata* (Nees) Bremek.)

Nepal, Sikkim, Darjeeling, Bhutan; also in Meghalaya.

**S. hamiltoniana** (Steud.) Bosser & Heihe (*S. colorata* auct.; *S. crinita* Nees; *S. laevigata* C.B. Clarke; *Difflugossa colorata* (Nees) Bremek.; *D. crinita* (Nees) Bremek.)

Nepal, Darjeeling, Bhutan, Arunachal Pradesh (fide Kanjilal et al. 1939: 434), Tibet (*Kingdon Ward* 10196); also in Meghalaya, Nagaland, Manipur and Burma and cultivated throughout the tropics.

\***S. oxycalycina** J.R.I. Wood

Arunachal Pradesh (*Kingdon Ward* 7690, 8732, 8748).

\***S. scoriarum** W.W. Sm. (*S. shweliensis* W.W. Sm.; *Difflugossa shweliensis* (W.W. Sm.) E.

Hossain; *Goldfussia scoriarum* (W.W. Sm.) Bremek.; ?*G. medogensis* H.W. Li)

Tibet (fide Li, 1985: 413).

**S. thomsonii** T. Anders.

Nepal, Sikkim, Darjeeling, Bhutan, Arunachal Pradesh (*Ludlow, Sherriff & Taylor* 14202).

#### GROUP 11

**S. secunda** T. Anders. (*Ditrichospermum secundum* (T. Anders.) Bremek.)

Arunachal Pradesh (*Griffith* K.D. 6122, *Khan* 64); also Burma.

#### GROUP 12

**S. aborensis** Dunn

Arunachal Pradesh (*Burkill* 35757); also Manipur.

**S. elongata** C.B. Clarke (?*S. furcata* Biswas)

Arunachal Pradesh (*Griffith* K.D. 6183).

**S. tenax** Dunn

Arunachal Pradesh (*Burkill* 36785, *Kingdon Ward* 7855).

#### GROUP 13

**S. cusia** Nees (*S. flaccidifolia* Nees; *Baphiacanthus cusia* (Nees) Bremek.)

Bhutan, Arunachal Pradesh (*Bailey* s.n.); also Meghalaya, Nagaland, Manipur, Burma, China, Thailand.

#### GROUP 14

**S. glutinosa** Nees (*Pseudaechmanthera glutinosa* (Nees) Bremek.)

Pakistan, North India, Nepal.

#### GROUP 15

\***S. accrescens** J.R.I. Wood subsp. **accrescens**

Bhutan.

\***S. accrescens** subsp. **teraoui** J.R.I. Wood

Bhutan.

**S. capitata** (Nees) T. Anders. (*Goldfussia capitata* Nees)

Nepal, Darjeeling, Bhutan, Tibet (*Kingdon Ward* 6379); also in Meghalaya, Manipur, Nagaland and Burma.

**S. echinata** Nees (*S. pectinata* T. Anders.; *S. pectinata* var. *daltonii* C.B. Clarke; *Goldfussia echinata* (Nees) N.P. Balakr.)

Darjeeling, Sikkim, Bhutan; also in Meghalaya, Nagaland, Burma, China and Thailand.

**S. glomerata** (Nees) T. Anders. (*Goldfussia glomerata* Nees)

Arunachal Pradesh (*Kingdon Ward* 8754); also in Meghalaya, Burma and China.

\***S. kingdonii** J.R.I. Wood

Arunachal Pradesh (*Kingdon Ward* 7654, 10313), Tibet (*Kingdon Ward* 7158).

**S. simonsii** T. Anders.

Bhutan, Arunachal Pradesh (*Griffith*); also Nagaland and Assam (Mikir Hills).

**S. sp. D**

Arunachal Pradesh (*Kingdon Ward* 8754).

#### GROUP 16

**S. bheriensis** (Shakya) J.R.I. Wood (*Dossifluga bheriensis* Shakya)

Nepal.

**S. cuneata** (Shakya) J.R.I. Wood (*Dossifluga cuneata* Shakya)

Nepal, Tibet (*Polunin* 851).

#### UNPLACED SPECIES

**S. hygrophiloides** C.B. Clarke ex W.W. Sm. (*Pteracanthus hygrophiloides* (C.B. Clarke ex W.W. Sm.) H.W. Li)

Tibet (fide Li, 1985: 415).

Closely related to and possibly conspecific with *S. yunnanensis* Diels, this species shows some affinity with Group 17 but the flowers are apparently in opposite pairs in the leaf axils, only becoming congested upwards.

\***S. jennyae** J.R.I. Wood

Bhutan.

Superficially resembling Group 8 but distinctive on account of its trailing herbaceous habit, subequally divided calyx and straight corolla.

**S. macrostegia** (Nees) C.B. Clarke

Arunachal Pradesh (*Griffith* s.n.); also Meghalaya, Bangladesh (Chittagong) and Burma.

Probably part of a distinctive group which includes *S. cystolithigera* Lindau.

**S. mekongensis** W.W. Sm.

Tibet (*Kingdon Ward* 10934, 12081).

Possibly related to *S. hygrophiloides* but easily distinguished by its pedicelled, axillary flowers, bicoloured leaves and softly pilose corolla.

*S. sp. F* unmatched

Arunachal Pradesh (*Kingdon Ward 8718 (K)*).

Possibly related to *S. wallichii* Nees.

#### INDIVIDUAL SPECIES

In the following part 35 individual species are described and discussed. They are arranged in alphabetical order for ease of reference.

***Strobilanthes accrescens* J.R.I. Wood sp. nov.** plietesialis propter flores in capitulis axillaribus pedunculatis aggregatos *S. capitata* facile confusa et per anthesin foliis in petiolum valde decurrentibus difficile distinguenda sed fructu apicibus loborum calycis glandulosis, viscidis, mire ad 3cm accrescentibus distinctissima. **Fig. 7.**

Type: Bhutan, *J.R.I. Wood 7464* (holo. E; iso. K, THIMPHU).

Plietesial, isophyllous shrub, much branched from near the base with ascending or erect stems, 1.5–2m high. *Stems* dark green, weakly quadrangular, sulcate, glabrous. *Leaves* subequal, always petiolate, broadly elliptic or ovate, shortly acuminate, 5–25cm long, 2–11cm wide, diminishing in size upwards, base attenuate and decurrent onto the petiole, the margin serrate, both surfaces glabrous and green, the veins below often prominent and brownish; petiole 1–7cm long. *Inflorescence* of pedunculate axillary heads, solitary on each peduncle or aggregated on small branchlets to form axillary panicles up to 20cm long; peduncles 1–2 per axil, glabrous, 0.5–2cm long; heads 1–1.5cm long, 1–2cm wide. *Bracts* of 3 types: outer bracts sterile, herbaceous, strongly concave, ovate or broadly elliptic with a darker green terminal appendage, entire except for the crenate appendage, glabrous, 1.3–1.8cm long, 0.7–0.8mm wide, persistent till the flowers fall; inner bracts flower-bearing, concave, broadly elliptic, acute, pale green with black sessile glands near the tip, ciliate in the upper half, 1.2–1.4cm long, 0.6cm wide, about 1mm longer than the bracteoles; bracteoles concave, oblong-elliptic, tapering to an obtuse apex, c.1.2 × 0.3cm, the dorsal surface dotted with black glands and minutely puberulent. *Calyx* 5-lobed nearly to the base, c.1.1cm long in flower, inside glabrous, the lobes subequal, pale green, linear-oblongate, mucronate, dotted with black glands, ciliate in the upper half; in fruit the mucro growing to 3cm, curved, sticky-glandular-pilose. *Corolla* bluish-purple (white in *Wood 7576*), curved, 3.3–3.7cm long, pilose with long hairs on the central part of the tube; tube 1.5mm wide at the base, cylindrical and dirty-white for 1cm, then gradually widened to c.1cm at the mouth, the lobes ovate, rounded, c.0.5cm long and wide. *Stamens* 4, didynamous, glabrous except for a few hairs near the base of the filaments; filaments of longest pair c.8mm long, of the shortest pair c.2mm long; anthers included, the cells whitish, broadly ellipsoid, muticous, c.2mm long; pollen 3-porate, ellipsoid, of the ‘Rippenpollen’ type, the pores between the ribs, c.60 × 40µm (Fig. 6A). *Style* thinly glandular-pilose below, glabrous above, c.2.7cm long; stigma simple, curved; ovary with a few glandular hairs. *Capsule* 4-seeded, oblong, apiculate, glabrous except for 1 or 2 glandular hairs near the tip, 1.2–1.3cm long; seeds hairy, without an areole.

Specimens seen:

BHUTAN. Chukka District: Chukka, 1550m, 18 xi 1914, *Cooper 3612* (BM, E); below Chimakothi, 1800m, 29 ix 1991, *Wood 7462* (E, K); between Chimakothi and Chukka, 1600m, 29 ix 1991, *Wood*



FIG. 7. *Strobilanthes accrescens* J.R.I. Wood subsp. *accrescens*. A, habit,  $\times 0.5$ ; B, corolla,  $\times 1$ ; C, corolla opened up,  $\times 1$ ; D, outer bract,  $\times 2$ ; E, inner bract,  $\times 2$ ; F, bracteole,  $\times 2$ ; G, capsule,  $\times 3$ ; H, young calyx,  $\times 2$ ; I, older calyx,  $\times 2$ ; J, fruiting calyx,  $\times 2$ . Subsp. *teraoi* J.R.I. Wood. K, habit,  $\times 0.5$ ; L, outer bract,  $\times 2$ . A-I from Wood 7464 & 7469; J from Cooper 3612; K-L from Wood 7474. Drawn by Mary Bates.

7464 (holo. E; iso. K, THIMPHU); between Chukka and Taktichu [Awakha], 1700m, 29 ix 1991, *Wood* 7469 (E, K); by turning to Lobneka, between Bunakha and Chapcha, 2200m, 20 ix 1992, *Wood* 7576 (E, K); Asinabari, between Gedu and Chukka, 1900m, 20 ix 1992, *Wood* 7581 (E, K).

***Strobilanthes accrescens* J.R.I. Wood subsp. *teraoi* J.R.I. Wood subsp. nov.** A subspecies typica statura parviore, foliis ovatis subtus tomentosis, bracteis cinereo-pubescentibus, capitulis brevipedunculosis vel sessilis, capsulis pilosis differt. **Fig. 7.**

Type: Bhutan, *J.R.I. Wood* 7472 (holo. E; iso. K, THIMPHU).

Subspecies *teraoi* differs essentially from the typical subspecies in its indumentum. The stems are pubescent and gland-dotted, the leaves pubescent above and grey-tomentose below, the bracts and bracteoles grey-pubescent and the capsule pilose in the upper half. It is also generally smaller in stature reaching only about 1m in height, the leaves not exceeding 12 × 9cm, the heads only 0.8–1.2cm wide and the corolla only 2.5–3cm in length. The leaves are ovate rather than elliptic, being abruptly rounded at the base before being decurrent onto the petiole, and the outer bracts are clearly ovate, acuminate. The inflorescence is very compact, the heads sessile or on peduncles up to only 1cm long.

Specimens seen:

BHUTAN. Tongsa District: Tashiling, Tongsa, 2700m, 10 ix 1914, *Cooper* 2062 (E); *ibid.*, 2300m, 7 x 1914, *Cooper* 2325 (E, BM); 1km W of Tashiling, 2500m, 18 x 1991, *Wood* 7472 (holo. E, iso. K); Tashiling, 2500m, 18 x 1991, *Wood* 7474 (E); 1km W of Tongsa, 2100m, 19 x 1991, *Wood* 7475 (E); Mangde Chu gorge below Tongsa, 1800m, 19 x 1991, *Wood* 7478 (E). Punakha District: Mo Chu, 1750m, 7 x 1967, *Bowes Lyon* 5169 (BM).

Subspecies *teraoi* is named after Hiroshi Terao who prepared a PhD thesis on *Strobilanthes* and its allies in the early 1980s and recognized the anomalous specimens collected by Cooper, although he was unable to place them satisfactorily.

*S. accrescens* is endemic to Bhutan. Subspecies *accrescens* is restricted to the lower Wang Chu Valley in Chukka District from around Gedu to just north of Bunakha. It is abundant in moist, leech-infested, secondary scrub cleared from broad-leaved hill forest and is occasionally locally dominant. It is found from 1500 to 2200m. Subspecies *teraoi* is found in the Tongsa region of central Bhutan where it is abundant and sometimes dominant in clearings in moderately dry *Quercus lanata* forest. It also grows in moist places in the same area in scrub-filled gullies and in marsh, reaching an altitude of about 2700m. It is therefore characteristic of rather drier and higher areas than subspecies *accrescens*.

There is also a single collection from the Mo Chu Valley (*Bowes Lyon* 5169) which is intermediate between the two subspecies, although somewhat closer to subsp. *teraoi*. It seems probable that further collections from this valley, which lies between the Wang Chu and the Mangde Chu, may reveal a population intermediate between the two recognized and very distinct subspecies.

Neither of the two subspecies is attractive to grazing animals and these plants often flourish where other species have been chewed down. Overgrazing may encourage their proliferation and the sticky calyx lobes doubtless help seed dispersal.

*S. accrescens* is a remarkable species on two counts. It is a plietesial species completing its life cycle in around 12–14 years. Like several other known plietesial species such as *S. wallichii*

and *S. callosa* it is locally extremely abundant, if not subdominant, although this may not be apparent except in the years when it comes into flower.

*S. accrescens* is also remarkable for the awn-like tips of the calyx lobes. These are merely mucronate when the plant is in flower and at this stage it is extremely similar to the widespread *S. capitata*. However, as the fruit matures, the calyx lobes develop long, curved, sticky-glandular awns. I am not aware of this phenomenon in any other species of *Strobilanthes*.

***Strobilanthes angustifrons*** C.B. Clarke in Hook.f., Fl. Brit. India 4: 466 (1885). Type: India, Dehra, *T. Thomson* s.n. (lecto. K, chosen here).

Syn.: *Pteracanthus angustifrons* (C.B. Clarke) Bremek. in Verh. Ned. Akad. Wetens. Afd. Nat. Sect. 2, 41(1): 200 (1944).

*Goldfussia edgeworthiana* Nees in A. DC., Prodr. 11: 173 (1847). Type: India (Upper Ganges), *Edgeworth* (lecto. GZU, chosen here), non *Strobilanthes edgeworthiana* Nees (1847).

*Goldfussia acuminata* P.R. Shakyia in J. Jap. Bot. 50: 99 (1976), **syn. nov.** Type: Nepal, *Stainton, Sykes & Williams* 9059 (holo. BM).

*Pteracanthus agrestis* sensu Hara p.p. in Enum. Fl. Plants Nep. 3: 143 (1982), non (C.B. Clarke) Bremek.

*S. angustifrons* is a strangely neglected and misunderstood species, despite having been described as long ago as 1847 (under the name *Goldfussia edgeworthiana*) and despite being distributed over much of the central Himalayan region in Himachal Pradesh, Kumaon and Nepal. In many ways it is intermediate between *S. bracteata* and *S. attenuata*. As in *S. bracteata* the corolla is pubescent (although almost glabrous in *Stainton, Sykes & Williams* 9059, the type of *Goldfussia acuminata*) and the bracts are lanceolate or narrowly ovate, acuminate and soon deciduous. Most specimens in herbaria are in fact completely bractless and this, combined with the large ovate leaves and the less strongly capitellate flowers of older specimens, gives mature specimens a strong superficial resemblance to *S. attenuata*. This even led Collett in his *Flora Simlensis* (1902: 374) to reduce the two species to synonymy.

*S. angustifrons* has also been confused with *S. pentstemonoides* but the bracts are not suborbicular nor scarious. In addition, *S. angustifrons* has linear bracteoles which are clearly distinct from the bracts, unlike *S. pentstemonoides* and its allies where the bracteoles are suppressed.

Although Parker (1918: 389) and A.E. Osmaston (1927: 394) suggest *S. angustifrons* is quite common, I have seen comparatively few specimens, and these mostly very old, so I am taking the opportunity to list them below. Nearly all come from the Dehra Dun area.

#### Specimens seen:

INDIA. Adek Valley, 1500–2150m, ix 1830, *Edgeworth* s.n. (GZU, type of *Goldfussia edgeworthiana*); in upper Ganges Valley, 1200–1800m, xi 1830, *Edgeworth* s.n. (GZU, original syntype of *Goldfussia discolor*); Dehra, *T. Thomson* s.n. (lecto. K); Kangra, 914m, 16 x 1874, *Clarke* 23633 (K, original syntype); Kalaputthur, 914m, *Madden* 366 (E); Rajpur, Dehra Dun, 914m, ix 1889, *Gamble* 27230 (K); Laswani Khala, Malkot, 1372m, xii 1898, *Gamble* 27499 (K); near church, Rajpur, Dehra Dun, 701m, xi 1895 (K); Robbers Cave, Dehra Dun, 762m, *Gamble* 24580 (K); Dehra Dun, 600–760m, 1896, *Gamble* 24581, 25277, 22315 (K); Nalapani, Dehra Dun, 914m, *Gamble* 24602 (K); Rajpur, Dehra Dun, 914m,

x 1891, *Gamble* 23164 (K); Thamo, Dehra Dun, 914m, xii 1898, *Gamble* 27506 (K); W Sangui, Tehri-Gahrwal, 1219m, ix 1898, *Gamble* 27204 (K); Dehra Dun, x 1891, *Gammie* s.n. (K).

NEPAL. Dana, Kali Gandaki, 1676m, 30 ii 1954, *Stainton, Sykes & Williams* 8283 (BM); Baghung, 914m, 31 x 1954, *Stainton, Sykes & Williams* 9213 (BM), Bhuji Khola, 2134m, 16 x 1954, *Stainton, Sykes & Williams* 9059 (BM, holo. of *Goldfussia acuminata*); Surkhet, 1525m, 29 xi 1964, *Burnett* 38 (BM); Belor Luhn, Bheri River, 1675m, 8 ix 1952, *Polunin, Sykes & Williams* 3286 (BM); Milke Danda, 2743m, 24 x 1980, *Schilling* 2459 (K).

There are very few field notes on the specimens of *S. angustifrons* but it appears to flower annually from September to December. It grows in moist gullies, usually beside streams from about 600 to about 2750m.

***Strobilanthes anisophylla*** (G. Lodd.) T. Anders., Cat. Pl. Calcutta 43 (1865).

Basionym: *Ruellia anisophylla* G. Lodd. in Bot. Cab. 11(7), pl. 1070 (1826). Type: illustration (Icon. 1070) in Bot. Cab. (1826), said to be based on a cultivated plant grown from seed received from France.

Syn.: *Goldfussia anisophylla* (G. Lodd.) Nees in Wall., Pl. Asiat. Rar. 3: 88 (1832).

*S. anisophylla* is a well-known species widely cultivated since the 1820s. It is remarkable for its strongly anisophyllous character in which one leaf in each pair is much reduced and soon deciduous so the leaves often appear to be alternate. This is the sole character which distinguishes *S. anisophylla* from another widely cultivated species *S. isophylla*. Unlike *S. anisophylla*, *S. isophylla* is unknown as a wild plant and this led C.B. Clarke (1885: 463) to suggest that it was merely a reversionary form of *S. anisophylla*. This view is supported by Parker (1918: 389) who notes:

‘*Strobilanthes isophylla* is a form with the leaves in equal pairs. Intermediates (with *S. anisophylla*) are common and the relative size of the leaves in the same pair is by no means constant on the same plant.’

Examination of herbarium material confirms Parker’s observation that there are many intermediate plants.

In this situation it would normally be best to reduce *S. isophylla* to synonymy with *S. anisophylla*, but since it is readily distinguished and widespread in cultivation it seems appropriate to recognize it as a form:

***Strobilanthes anisophylla* forma *isophylla*** (Nees) J.R.I. Wood, **comb. et stat. nov.**

Basionym: *Goldfussia isophylla* Nees in Wall., Pl. Asiat. Rar. 3: 88 (1832). Type: India, *Wallich* 71462 (iso. K-W).

Syn.: *Strobilanthes isophylla* (Nees) T. Anders., Cat. Pl. Calcutta 43 (1865).

Cultivated plants of *S. anisophylla* and forma *isophylla* are remarkably uniform except in their leaves, and this may be because they all derive from the same source, a plant originally cultivated in Calcutta in the 1820s. Wild specimens of *S. anisophylla* are more variable but there are very few specimens of wild provenance in the herbaria I have had access to. They vary in leaf size and in the compactness of the inflorescence, particularly the length of the peduncle and the nature of the branching. Further collections from wild populations would help to document this variation.

*S. anisophylla* is known wild from the Khasia Hills in Meghalaya (India), Buxa Duar in West Bengal (Sikdar, 1981) and from three localities in Bhutan.

***Strobilanthes attenuata*** (Nees) Nees in A. DC., Prodr. 11: 193 (1847).

Basionym: *Ruellia attenuata* Nees in Wall., Pl. Asiatic. Rar. 3: 83 (1832). Type: ?India, Wallich 2346 (lecto. K-W, chosen here), not Wallich 2345 as cited by Nees; see below.

Syn.: *Pteracanthus attenuatus* (Nees) Bremek. in Verh. Ned. Akad. Wetens. Afd. Nat.

Sect. 2, 41(1): 199 (1944). Type: as for *Ruellia attenuata*.

*Strobilanthes alata* Nees in A. DC., Prodr. 11: 194 (1847). Type: India, Simla, *Lady Dalhousie* (iso. K, E), nom. illeg., non Blume (1826).

*S. reflexa* Nees in DC., Prodr. 11: 194 (1847). Type: India, Royle (LIV, n.v.).

*Pteracanthus reflexus* (Nees) Bremek. in Verh. Ned. Akad. Wetens. Afd. Nat. Sect. 2, 41(1): 199 (1944). Type: as for *Strobilanthes reflexa*.

*Strobilanthes newii* Beddome ex C.B. Clarke in Hook.f., Fl. Brit. India 4: 464 (1885) **syn. nov.** Type: India, 'Mysore', *New s.n.* (K).

*Mackenzia newii* (Beddome ex C.B. Clarke) Bremek. in Verh. Ned. Akad. Wetens. Afd. Nat. Sect. 2, 41(1): 183 (1944). Type: as for *Strobilanthes newii*.

*Strobilanthes urticifolia* Wall. ex O. Kuntze, Revis. Gen. Pl. 2: 499 (1891). Type: Wallich 2346 (iso. K-W).

*Pteracanthus urticifolius* (Wall. ex O. Kuntze) Bremek. in Verh. Ned. Akad. Wetens. Sect. 2, 41(1): 199 (1944). Type: as for *Strobilanthes urticifolia*.

*Strobilanthes attenuata* appears to be the correct name for the plant long known to Indian botanists as *S. alata* Nees. *S. alata* is illegitimate because it is a later homonym of *Strobilanthes alata* Blume from Indonesia. It should also be noted that *Ruellia alata* Wall. is *Strobilanthes wallichii*, not *S. alata* Nees.

The typification of Nees' *Ruellia attenuata* presents several problems. When Nees examined Wallich 2345 he found two different species both labelled with the same manuscript name, *Ruellia attenuata*. One of these he distinguished as No. 2345 'bis' which he designated as the type of the genus *Echinacanthus* in *Plantae Asiaticae Rariores* 3: 90 (1832). The other he described under the name *Ruellia ? attenuata* in the same volume but on page 83, citing Wallich 2345 but without 'bis'. It is not clear why he used the question mark but it could be doubt as to whether the plant was truly a *Ruellia* or whether it should be included within Wallich's unpublished *Ruellia attenuata*. Neither of these points, however, is material as it is clear that Nees indicated two separate specimens as the types of his two species.

In his account of Acanthaceae in De Candolle's *Prodromus*, Nees used the name *Strobilanthes attenuata*, apparently taking up a Jacquemont manuscript name but citing *Ruellia attenuata* in the synonymy. The use of the epithet *attenuata* would seem to indicate that Nees intended a straightforward transfer to a different genus but this is complicated by the fact that he prefixed the citation with a question mark. Normally this should be taken to indicate that Nees was in doubt as to whether his *Ruellia attenuata* should be included in *Strobilanthes attenuata* but I think in this case, whatever the reason he had for using the question mark, he did not mean to exclude *Ruellia attenuata*. On the contrary, his very lengthy diagnosis of *Ruellia attenuata* is repeated verbatim in the diagnosis of *Strobilanthes attenuata* with the addition of only two



minor phrases indicated by brackets below. He presumably added these phrases as more material (the Jacquemont collection and those made by Edgeworth and Hooker) were now available to him:

'foliis cordatis serratis candato-acuminatis [plus minus] hirtis, petiolis alatis, pedunculis axillaribus terminalibusque trifidus hirsutis, spicis brevibus interruptis [calycibusque hirsutis et glandulosis] bracteis bracteolisque lanceolato-linearibus obtusis, calycis lacinia supera longiore'

I think this indicates conclusively that Nees is basing his *Strobilanthes attenuata* on the earlier *Ruellia attenuata*. It should perhaps be added that the diagnosis gives a very accurate thumbnail description of the species, picking out the cordate leaves and linear-lanceolate bracts which serve to separate it from the most closely allied species *S. lachenensis* C.B. Clarke.

Examination of the Wallich herbarium shows that No. 2345 is represented by three sheets, all clearly identifiable with *Echinacanthus attenuatus*. No sheet there nor in the general herbarium at Kew numbered *Wallich 2345* can be identified with *Strobilanthes attenuata*. However, examination of the numbers around 2345 in the Wallich herbarium is illuminating:

- 2343 *Strobilanthes collina* Nees
- 2344 *Strobilanthes urophylla* (Nees) Nees
- 2345 *Echinacanthus attenuatus* Nees
- 2346 *Strobilanthes urticifolia* O. Kuntze
- 2347 *Strobilanthes lamiifolia* (Nees) T. Anders.
- 2348 *Asystasia macrocarpa* Nees

*Wallich 2346* is the only plant which was not taken up and described by Nees, even though there is a perfectly good specimen. Even more remarkable is the fact that this plant is, in fact, Nees' *Strobilanthes attenuata*. Although it is speculation it seems reasonable to presume that Nees received *Wallich 2346* unlabelled and unnumbered in sequence after *Wallich 2345* and so described the two different species separately using the same epithet but citing *Wallich 2345* as the type of both. I am, therefore, selecting *Wallich 2346* as the lectotype of *Strobilanthes attenuata*, choosing the sheet in the Wallich herbarium as I have been unable to find another sheet elsewhere either at Kew or in Nees' own herbarium at Graz. In passing it is worth noting that Nees seems to have made exactly the same mistake with *Wallich 2357*. Under this number he described two species, *Strobilanthes heyneana* and *Goldfussia bracteata*, although *Wallich 2358* is, in fact, the collection that should have been cited as the type of *Goldfussia bracteata*.

A brief comment on the inclusion of *Strobilanthes newii* in the synonymy is perhaps called for. The type is said to have been collected in Mysore, which is totally out of the recognized range of *S. attenuata*. The locality is either an error or the specimen was a cultivated plant; *S. attenuata* is not monocarpic and is occasionally cultivated so this is quite possible. The correct identity of *S. newii* was first realized by H. Terao and I am in full agreement with him.

Throughout most of its range *S. attenuata* is quite constant and readily recognized by the terminal panicle inflorescence (formed of compound spikes), the small, linear, deciduous bracts and the ovate, cordate leaves, decurrent as a wing along the length of the petiole. However, in Nepal there is a population with elliptic leaves which look quite distinct. Since

these plants are geographically isolated and readily distinguished from the main population of *S. attenuata*, I propose the recognition of two subspecies as follows:

***Strobilanthes attenuata* subsp. *attenuata***

This is distinguished by its ovate cordate leaves, 3–8cm wide.

Subspecies *attenuata* is distributed from Nuristan in Afghanistan along the southern slopes of the Himalaya through northern Pakistan, Kashmir and India east to the Kumaon region of Uttar Pradesh. Throughout its range it appears to be the commonest species of *Strobilanthes* and extends further west than any other species. Records from Nepal eastwards including Tibet appear to be errors. Certainly the plant figured in *Flora Xizangica* (Tibet) on page 414 under the name *Pteracanthus urticifolius* cannot be placed here because it lacks the distinct ovate cordate leaves.

***Strobilanthes attenuata* subsp. *nepalensis* J.R.I. Wood subsp. nov. foliis ellipticis, 2.5–4cm latis, basin semper attenuatis non cordatis distincta.**

Type: Nepal, *Stainton, Sykes & Williams* 4353 (holo. BM).

Subspecies *nepalensis* is distinguished by its elliptic leaves (2.5–4cm wide) which are attenuate, never cordate at the base. In other respects it seems to be identical to subsp. *attenuata*, although the calyx (8–12mm long) and capsule (11–14mm long) may be shorter.

Specimens seen:

NEPAL. Thankot, W of Kathmandu, 1676m, viii 1956, *Codrington* 247 (BM); Thankot, 8 miles W of Kathmandu, 1981m, 1956, *Codrington* 272 (BM); Phulchoke, SW of Kathmandu, in damp grass in *Quercus* woodland, 2338m, 27 viii 1965, *Schilling* 605 (K); near Gurjakhani [28°36'N, 83°13'E], 2440m, 11 ix 1954, *Stainton, Sykes & Williams* 4353 (BM); Chiyanglung, Seti Khola [28°21'N, 83°59'E], 2300m, 11 ix 1954, *Stainton, Sykes & Williams* 8553 (BM); W of Pokhara, above Birathanti, 2300m, *Spring-Smythe* s.n. (K).

Subspecies *nepalensis* appears to be restricted to Nepal from Kathmandu westwards and is the only subspecies found in Nepal. One specimen, *Stainton, Sykes & Williams* 8898 (BM) from Sattewati [28°03'N, 83°29'E], is intermediate between the two subspecies and has not been cited above. There are two plants on the same sheet, one with distinctly ovate, cordate leaves and the other with broadly elliptic leaves, but in neither case are the leaves as wide as in subsp. *attenuata*. This is the only specimen intermediate between the two subspecies that I have seen.

*S. attenuata* is closely related to two other Himalayan species, *S. lachenensis* and *S. subnudata*. All three species are similar in their calyx, corolla and capsule, flower during the monsoon season and occur at relatively high altitudes, above 1500m and usually higher.

***Strobilanthes bracteata* (Nees) J.R.I. Wood, comb. nov.**

Basionym: *Goldfussia bracteata* Nees in Wall., Pl. Asiat. Rar. 3: 88 (1832). Type: Nepal, *Wallich* 2357b (lecto. K-W, chosen here).

Syn.: *Strobilanthes quadrangularis* C.B. Clarke in Hook.f., Fl. Brit. India 4: 460 (1885).

Type: *Wallich* 2358 (iso. K-W).

*Goldfussia pentstemonoides* sensu Hara p.p. in Enum. Fl. Pl. Nepal 3: 141 (quoad West Nepal records).

In describing *Goldfussia bracteata* Nees appears to have made the same mistake as he did with *Ruellia attenuata*, that is, he cited it under the same number as the previous species in the Wallich catalogue. Thus the type of *Strobilanthes heyneana* Nees is Wallich 2357 but the same number is also cited for the quite different *Goldfussia bracteata* instead of Wallich 2358.

In the Wallich herbarium there is a specimen annotated by Nees with the name *Goldfussia bracteata* and numbered, possibly later, Wallich 2357b, and this is the sheet that I select as the lectotype for *Goldfussia bracteata*. I have chosen this in preference to Wallich 2358 since, although it is the same species, there is no annotation by Nees and no evidence that he saw this sheet. Wallich 2358 labelled *Ruellia quadrangularis* is the type of *Strobilanthes quadrangularis* C.B. Clarke and is so labelled by him, but this is a later synonym of Nees' plant.

*S. bracteata* is an apparently rare plant of Western Nepal and Kumaon (Uttar Pradesh). It has often been confused with *Strobilanthes pentstemonoides* but can always be distinguished by its pubescent corolla. Young plants are distinctive on account of the ovate, acute, pubescent bracts but these are deciduous very quickly and are absent from most flowering specimens. Additionally, *S. bracteata* can be recognized with experience by its distinctive leaves. These are relatively large, 10–20 × 5–9cm, obovate-elliptic and strongly decurrent to the base of the petiole. *S. bracteata* has hairy peduncles but, unlike those of *S. pentstemonoides*, they are eglandular. It bears quite a close resemblance to *S. hupehensis* W.W. Sm. from China.

Specimens seen:

INDIA. Uttar Pradesh (Kumaon): Kalamundi, 2600m, *Strachey & Winterbottom* (K, BM); Girgoon, 1800m, *Strachey & Winterbottom* (K); Mohargari, 2000m, *Strachey & Winterbottom* (K); near Kuliya Ghat, Kalemondee, Garhwal, 2440m, *Madden* s.n. (E).

NEPAL. Between Dhampus and Lumle, 1900m, ix 1969, *Flatt 104a* (BM); Lumle, 1705m, 13 x 1976, *Dawson 553* (BM); Nepal, Wallich 2357b, 2358 (K-W); Lumsum, 2135m, 9 ix 1954, *Stainton, Sykes & Williams 4302* (BM, E); Mugu, between Gum and Lumsa, Karnali Valley, 1980m, 14 viii 1952, *Polunin, Sykes & Williams 5204* (BM, E).

***Strobilanthes calvata* J.R.I. Wood sp. nov.** *S. echinatae* affinis sed ramis, foliis, bracteis calycibusque glabris, foliis denticulatis, corolla augustiore et bracteis oblongis distincta.

Type: Burma, *Kingdon Ward 3482* (holo. E).

Small anisophyllous shrub 1–2m high, glabrous in all parts. *Stems* rounded, woody below. *Leaves* unequal in each pair (but not asymmetric as in *S. echinata*), narrowly oblong-elliptic, acuminate at both ends, 2–16 × 1–5cm, above dark green, beneath paler, cystoliths prominent on both surfaces, margins denticulate; petiole 0–3cm long. *Flowers* in dense bracteate heads terminal on small, leafy, simple or trichotomously divided axillary branchlets; branchlets distinctly shorter than the subtending leaves, mostly 4–6cm long; heads oblong, 2.5–3.5 × 1–1.5cm. Outer sterile bracts narrowly ovate-elliptic, acute, 0.9–1.6 × 0.6–0.8cm, denticulate, often absent; inner flower-bearing bracts broadly oblong, narrowed to an obtuse apex, sometimes concave, 2.2–3 × 0.8–1.4cm, denticulate or crenate in the upper half; bracteoles oblong, rounded and usually fimbriate at the tip, 1.2–1.8 × 0.2–0.4cm, calyx 1.1–1.4cm long, subequally 5-lobed to the base, glabrous, lobes oblong, abruptly narrowed to a subacute tip. *Corolla* pale to dark purple, glabrous outside, 4.6–5cm long, gradually widened from a shortly cylindrical base to 1–1.4cm at the mouth, lobes narrowly ovate, finely acute, c.10mm long and 5mm wide; inside glabrous. *Stamens* 4,

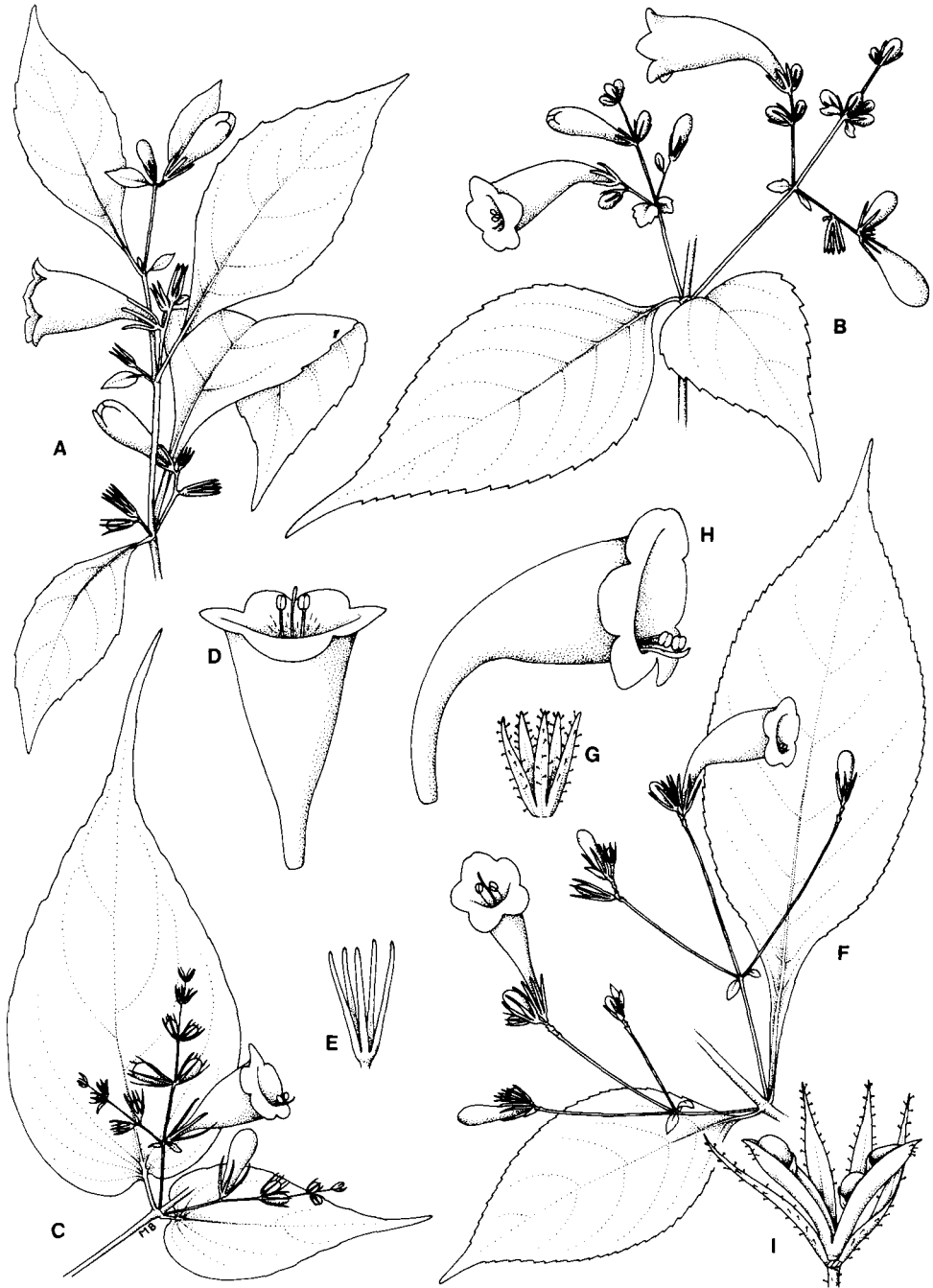


FIG. 8. *Strobilanthes candida* J.R.I. Wood. A, habit,  $\times \frac{2}{3}$ . *S. clarkei* J.R.I. Wood. B, habit,  $\times \frac{2}{3}$ . *S. campaniformis* J.R.I. Wood. C, habit,  $\times \frac{2}{3}$ ; D, corolla,  $\times 1.5$ ; E, calyx,  $\times 1.5$ . *S. oxycalycina* J.R.I. Wood. F, habit,  $\times \frac{2}{3}$ ; G, young calyx,  $\times 1.5$ ; H, corolla,  $\times 1.5$ ; I, fruiting calyx (1 sepal removed), capsule and seed,  $\times 2$ . A from *Kingdon Ward* 13063; B from *Kingdon Ward* 12553 & 18901; C-E from *Ludlow & Sherriff* 2336; F-I from *Kingdon Ward* 7690. Drawn by Mary Bates.

didynamous; filaments glabrous, the shorter pair 3mm long, the longer pair 6mm long, anthers oblong, mucicous 2.5–3.5mm long; pollen not seen; ovary glabrous. *Style* minutely pubescent. *Capsule* oblong, 1.4–1.5cm long, glabrous, 4-seeded; seeds 4mm long, pilose with mucilaginous hairs.

Specimens seen:

BURMA. Chawngmaw [26°20'N, 98°17'E], 1800–2150m, 10 viii 1919, *Kingdon Ward* 3482 (E); hills E of Mali Hka [27°30'N], 600–900m, 29 vii 1937, *Kingdon Ward* 12842 (BM).

*S. calvata* is a rare plant possibly restricted to the hills of northern Burma. It is closely related to both *S. echinata* Nees and *S. glabrata* Nees but is distinguished from both by its broadly oblong, obtuse bracts. The outer bracts are smaller than the inner ones and often missing. Both specimens of *S. calvata* cited above are completely glabrous, hence the epithet *calvata*, but there is a specimen at Kew from Nagaland in Eastern India (*Bor* 6246) which is identical except that it is sparsely pubescent. I have not cited it as it seems geographically distant from the main population, but it may be conspecific.

***Strobilanthes campaniformis* J.R.I. Wood, sp. nov.** *S. divaricatae* affinis sed inflorescentia axillare ramosa spicata, corollis parvioribus, rectis, campaniformibus et antheris exsertis distincta. **Fig. 8C–E.**

Type: China, Tibet, *Ludlow & Sherriff* 2336 (holo. BM, iso. E).

Anisophyllous undershrub 2–3m high. *Stems* erect, slightly sulcate, bifariously puberulent. *Leaves* very unequal, ovate, acuminate, falcate, 3–13 × 2–5.5cm, base rounded or subcordate, serrulate, glabrous, above green and with numerous cystoliths, beneath paler; petioles 0–5mm long, the smaller leaf subsessile. *Inflorescence* of simple or bifurcate, lax axillary spikes, 3–6cm long bearing a small pair of elliptic leaflets at the branching point; rhachis bifariously pubescent; flowers in opposite pairs, 3–11mm apart. *Bracts* obovate-oblong, 2.5–3mm long, glabrous, herbaceous, fugacious; bracteoles similar but c. 1.5mm long. *Calyx* 12mm long in flower, 5-lobed to the base, lobes subequal, narrowly oblong-elliptic, acuminate, glabrous or with a few hairs. *Corolla* nearly white but dull purple on the lobes, glabrous, straight, campanulate, 2.5cm long, widened gradually from 2mm at the base to 1–1.5cm at the mouth, inside pilose, lobes broadly ovate, rounded, c. 3mm long and 8mm wide; filaments pilose below, glabrous above, the shorter pair 7–8mm long, the longer pair 9–10mm long; anthers more or less exserted, 1mm long, nodding; pollen 3-porate, ribbed, c. 55 × 22µm, oblong-ellipsoid, of the 'Rippenpollen' type, the pores between the ribs (Fig. 6B). *Style* glabrous, 2.7–2.8cm long; ovary completely glabrous. *Capsule* not seen, presumably glabrous.

Specimen seen:

TIBET. Lung, Chayne Chu [28°21'N, 93°09'E], 2750m, 10 vii 1936, *Ludlow & Sherriff* 2336 (BM, E).

*S. campaniformis* is related to both *S. divaricata* and *S. discolor* in its very unequal, falcate, glabrous leaves and fugacious, herbaceous bracts and bracteoles, but is readily identified by its spicate inflorescence and campanulate corolla with anthers shortly exserted. It has been found only once, in dense, mixed forest near the border between Tibet and Arunachal Pradesh.

***Strobilanthes candida*** J.R.I. Wood **sp. nov.** fere glabra inter species ex affinatate *S. discoloris* corolla alba lobis brevibus latis instructa et calyce ovarioque glandis sessilibus bene referta distincta. **Fig. 8A.**

Type: Burma, *Kingdon Ward* 7532 (holo. K).

Undershrub 0.5–6m high, almost completely glabrous. *Stem* woody below, glabrous or obscurely bifariously pubescent. *Leaves* somewhat unequal especially on the inflorescence, elliptic or oblong-elliptic, acuminate at both ends, 4–13 × 1.5–4.5cm, glabrous, green on both surfaces, cystoliths few above, apparently absent beneath; petioles 0.3–3.5cm long. *Inflorescence* of small 2–6-flowered axillary spikes; spikes 2–3.5cm long; flowers sessile in opposite pairs mostly c. 1cm apart. Bracts obovate, glabrous, 1.5–2.5mm long, herbaceous, fugacious; bracteoles similar but oblanceolate, c. 2mm long. *Calyx* 0.8cm long in flower, accrescent to 1.1–1.2cm in fruit, glabrous, gland-dotted, lobes linear, acuminate, subequal. *Corolla* white, glabrous outside, curved, 2.5–3cm long, gradually expanded to 1.2–1.5cm wide at the mouth, inside pilose; lobes broad, rounded, c. 4mm long and 9mm wide; filaments glabrous, the shorter pair only 1mm long, the longer pair c. 5mm long; anthers conical, muticous, 1.75mm long; pollen 3-porate, spherical, c. 45 × 45µm, of the ‘Rippenpollen’ type but deeply grooved and with strong ornamentation on the ribs, the pores between the ribs (Fig. 6C). *Style* 2cm long, glabrous; ovary with numerous, small sessile glands. *Capsule* not seen.

Specimens seen:

BURMA. Mountains E of Fort Hertz [27°30'N, 97°57'E], 915m, 3 ix 1926, *Kingdon Ward* 7352 (K); valley of the Nam Tamai [27°50'N, 97°57'E], 1070m, 27 viii 1937, *Kingdon Ward* 13063 (BM).

*S. candida* is a nearly glabrous undershrub with pure white flowers in the same group as *S. discolor*, having fugacious but herbaceous bracts and bracteoles, small axillary spikes and a gradually expanded corolla. The sessile glands on the calyx, ovary and presumably the capsule are distinctive, but may become stalked when the plant is in fruit.

*S. candida* is a rare plant of streamsides and moist banks in forest shade. It is gregarious and probably flowers only at long intervals.

***Strobilanthes clarkei*** J.R.I. Wood **sp. nov.** anisophylla, eglandulosa, fere glabra ex affinatate *S. discoloris* sed paniculis trichotome ramosis terminalis et in axillis foliorum dispositis, valde distincta. **Fig. 8B.**

Type: India, Manipur, *C.B. Clarke* 42006 (holo. K).

Syn.: *S. rhombifolia* sensu C.B. Clarke in *J. Linn. Soc. Bot.* 25: 54 (1889), non C.B. Clarke in *Hook.f., Fl. Brit. India* 4: 461 (1885).

Anisophyllous undershrub 0.5–1.75m high. *Stems* erect, rounded, glabrous. *Leaves* very unequal in each pair, ovate, acuminate, 1.2–12 × 1.2–6cm, base broadly cuneate, becoming rounded upwards, serrate, glabrous on both surfaces, above dark green and with numerous cystoliths, beneath paler but with prominent veins, shortly petiolate; petioles 0–9mm long. *Inflorescence* of small, trichotomously branched axillary and terminal panicles 3–13cm long, usually rather dense when young but becoming laxer later, bearing a pair of small ovate leaflets at the branching point. *Bracts* obovate, 3-toothed, 4–5mm long, herbaceous, fugacious; bracteoles similar but oblanceolate, entire, rounded at the tip, 2.5mm long. *Calyx* 5–6mm in flower, accrescent to 8mm in fruit.

divided nearly to the base, the lobes equal, oblong or narrowly oblong-elliptic, subacute, glabrous when young but with a tuft of eglandular hairs at the tip when older. *Corolla* glossy violet, glabrous, curved, 2.6–3.2cm long, gradually widened from 1mm to 9–10mm at the mouth, lobes rounded, 5mm long; filaments glabrous, the shorter pair 2mm long, the longer pair 5mm long; anthers nodding, broadly ellipsoid, c.1.5mm long; pollen 3-porate, oblong-ellipsoid of the 'Rippenpollen' type, ribbed, c.75 × 30µm, the pores between the ribs (Fig. 6D). *Style* obscurely hairy; ovary minutely puberulent at the tip. *Capsule* oblong, 9mm long, glabrous except for a few eglandular hairs at the tip, 4-seeded; seeds rounded, 2.5mm long, thinly pilose with mucilaginous hairs.

Specimens seen:

INDIA. Manipur: Karong, 1065m, 14 xi 1885, *Clarke* 42006 (holo. K); Moa, 1775m, 26 x 1885, *Clarke* 41208 (K). Nagaland: Zakhoma [25°40'N, 94°07'E], 1685m, 19 x 1949, *Kingdon Ward* 18901 (BM); Ches-wez-umi, 1525–1675m, 25 xi 1935, *Kingdon Ward* 12553 (BM).

*S. clarkei* is similar to *S. discolor* in its very unequal leaves, glabrous corolla and fugacious, but not scarious, bracts and bracteoles. It is, however, distinct from all related species in its small but well-developed axillary and terminal panicles. *S. clarkei* is named after C.B. Clarke who first collected this plant. It is strange that no *Strobilanthes* has been named after Clarke before this, given the size of his contribution to the study of Acanthaceae in general and to *Strobilanthes* in particular.

Little is known of the ecology of *S. clarkei*. It is apparently a plant of rocky streamsides in hill forest between about 1000 and 1800m. It may be a pleitesial species but there is no evidence for this at present.

**Strobilanthes discolor** (Nees) T. Anders. in J. Linn. Soc. Bot. 9: 477 (1867). **Fig. 12G–J.** Basionym: *Goldfussia discolor* Nees in A. DC., Prodr. 11: 172 (1847). Type: India, Meghalaya (Khasia), *Griffith* ex Herb. Hooker (lecto. K, chosen here).

Syn.: *S. discolor* var. *nudicalyx* C.B. Clarke in Hook.f., Fl. Brit. India 4: 462 (1885),

**syn. nov.** Type: India, Meghalaya (Khasia), *Hooker* s.n. (K).

*Difflugossa nagaënsis* Bremek. in Verh. Ned. Akad. Wetens. Afd. Nat. Sect 2, 41(1): 237 (1944), **syn. nov.** Type: India, Nagaland, *Meebold* 7381 (holo. B (?)) [missing], n.v.; iso. K).

In describing *Goldfussia discolor*, Nees cited two types, a collection by Edgeworth from the Upper Ganges and the Griffith collection from Khasia, cited above. The Edgeworth collection was excluded by Clarke (1885: 462) and represents *Goldfussia edgeworthiana* Nees, now known as *Strobilanthes angustifrons* C.B. Clarke. The material examined by Nees in Hooker's herbarium at Kew consists of two sheets both annotated by Nees, and the sheet almost completely covered with pieces of *S. discolor* is here selected as lectotype of *S. discolor*.

*S. discolor* has been confused by Anderson, Clarke and others who have included various extraneous elements under this name. *S. discolor* is an undershrub with petiolate, elliptic or ovate leaves which are falcate, slightly oblique, always acuminate (often strongly so), strongly bicoloured (hence the name *discolor*), completely glabrous and usually very unequal in each pair. The flowers are capitellate at the ends of small, trifurcate branchlets bearing lanceolate-elliptic leaflets at the branching point (Fig. 12G). The small obovate bracts and oblanceolate, truncate bracteoles are herbaceous but fugacious as in other related species in Group 10. The

calyx is subequally 5-lobed, glabrous and quite small (c.7–8mm long) on young plants but eventually becomes glandular-pubescent and is accrescent to 12mm. The corolla is strictly glabrous outside, straight and gradually widened from the base.

As understood here *S. discolor* is widely distributed on the hills in Eastern India. I have seen the following collections but all other specimens cited by Clarke and Anderson and perhaps by other authors should be excluded. The records for Bhutan and Sikkim are certainly errors.

Specimens seen:

INDIA. Meghalaya: Khasia, *Griffith* s.n. (K); Mausmai Falls, Khasia, *Griffith* s.n. (K); Khasia, 1250m, *Hooker & Thomson* s.n. (K). Manipur: Kapru, 1800m, xi 1907, *Meebold* 6466 (K); Laimatak, 1550m, xi 1907, *Meebold* 7726 (K); Sirhoi [25°10'N, 94°29'E], 1400–1700m, 11 x 1948, *Kingdon Ward* 18205 (BM, NY). Nagaland: Sarpung, Naga Hills, 1550m, xii 1907, *Meebold* 7299 (K); Sialsuk, Lushai Hills, 1550m, xii 1927, *Parry* 415 (K); South Lushai, 1190–1320m, xi 1931, *Wenger* 382 (K). Arunachal Pradesh: Dirang Dzong [27°20'N, 92°15'E], 1550–1860m, 5 ix 1938, *Kingdon Ward* 14202 (BM).

*S. discolor* is a plant of forest undergrowth between about 1190 and 1860m.

***Strobilanthes forrestii*** Diels in Notes Roy. Bot. Gard. Edinb. 5: 162 (1912). Type: China, Yunnan, *Forrest* 2760 (lecto. E, chosen here).

Syn.: *S. panpienkaiensis* H. Lév., Cat. Pl. Yun-Nan 6 (1915). Type: China, Yunnan, *Maire* s.n. (holo. E).

In reducing *S. panpienkaiensis* to synonymy with *S. forrestii*, Enayet Hossain (1980: 478) commented on the variability of *S. forrestii* which had 'a large number of forms and colour variants'. This variability is not, however, the result primarily of habitat or gene mutation as suggested by Enayet Hossain but rather of the fact that Diels included two distinct elements in his description.

Diels cited four *Forrest* collections as types (*Forrest* 2456, 2760, 4551 and 4553) but examination of this material at Edinburgh shows that the first of these, *Forrest* 2456, is actually *S. versicolor* which Diels described elsewhere in the same paper. I am rejecting this specimen from consideration as a lectotype for two reasons. First it differs specifically from the other three specimens cited and fits another species described by Diels. Secondly it is in conflict with the protologue of *S. forrestii* in at least two important points. *S. forrestii* is described as having sessile leaves and a calyx with one lobe 'cetera superans' whereas in *Forrest* 2456 the leaves are petiolate and the calyx lobes equal.

I am selecting *Forrest* 2760 as a lectotype as it is the only sheet showing a mature inflorescence with both flowers and fruit.

*S. forrestii* is actually one of the most distinct species in Group 7 as it is the only one known to me which has truly sessile leaves. The long terminal spikes with persistent, narrowly ovate, obtuse bracts seen on mature specimens are also distinct. It continues, however, to be confused with the quite unrelated *S. versicolor* from which it can be distinguished by its sessile leaves, calyx with one lobe longer than the others and by its corolla which is nearly glabrous, gradually widened from the base and only gently curved at the apex.

*S. forrestii* is apparently restricted to north-western Yunnan and Sichuan.



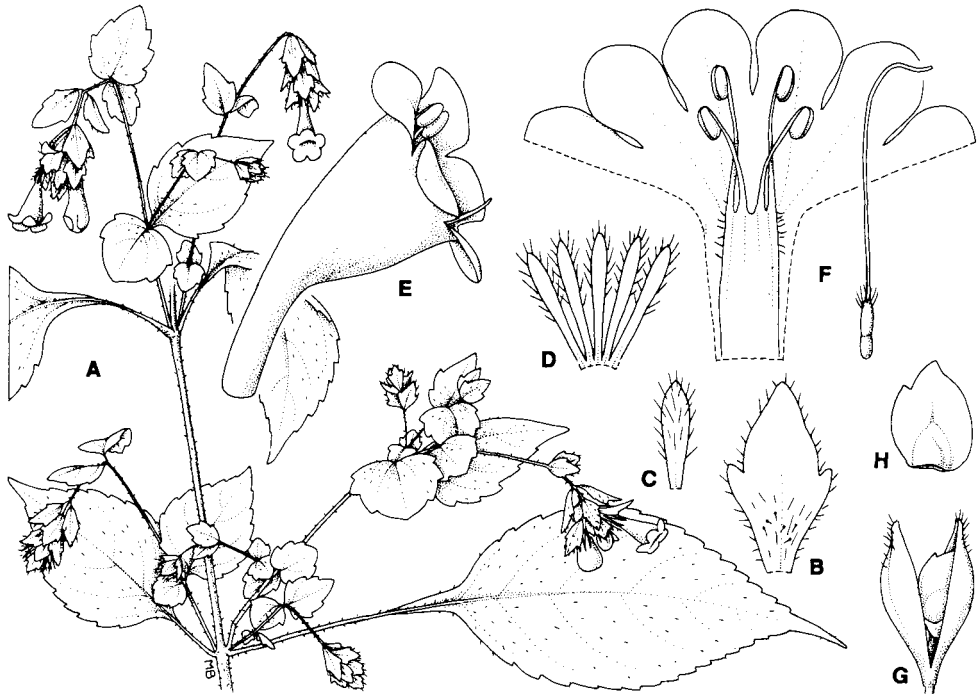


FIG. 9. *Strobilanthes frondosa* J.R.I. Wood. A, habit,  $\times \frac{2}{3}$ ; B, bract,  $\times 3$ ; C, bracteole,  $\times 3$ ; D, calyx,  $\times 3$ ; E, corolla,  $\times 3$ ; F, corolla opened out to show stamens, ovary and style,  $\times 3$ ; G, capsule,  $\times 4.5$ ; H, seed,  $\times 6$ . Drawn from Wood 7465 by Mary Bates.

***Strobilanthes frondosa* J.R.I. Wood sp. nov.** *S. maculatae* affinis, a qua differt foliis pilosis, bracteis humeratis, non-maculatis, obovatis, subacutis et floribus in spicis subcapitatis, brevibus, dispositis. **Fig. 9.**

Type: Bhutan, *J.R.I. Wood* 7465 (holo. E; iso. K, THIMPHU).

Anisophyllous perennial herb. *Stems* decumbent or ascending to 30cm, rooting at the nodes, often nodding near the tips, woody below, sulcate, pilose. *Leaves* unequal (one leaf in each pair about half the size of the other), serrate, green and pilose on both surfaces, diminishing in size upwards, the lower leaves petiolate, elliptic, acuminate, cuneate at the base, up to 12.5cm long and 6cm wide, the upper leaves sessile, ovate, as small as 0.8cm long and 1cm wide; petiole 0–4cm long, pilose. *Inflorescence* of short, nodding, subcapitate spikes terminal on simple or sparingly branched axillary branchlets which typically bear 1–2 pairs of reduced leaves; peduncles pilose, 0.8–2.5cm long; spikes dense, 1–2cm long, 0.8–1cm wide; flowers sessile, imbricate. *Bracts* one per flower, herbaceous, broadly elliptic-ovate, subacute, shouldered, with one distinct marginal tooth on either side, pilose and with scattered orange gland dots, 7–8mm long, 4mm wide, persistent at least till fruit; bracteoles 2 per flower, green, pilose, linear, subacute, 5–8mm long. *Calyx* 5-lobed to the base, pilose outside, gland-dotted, 6–7mm long, the lobes subequal, pale green with darker tips, linear, obtuse. *Corolla* straight, 1.5–1.8cm long, the tube white, glabrous outside, cylindrical, c. 1.5mm wide for 0.5cm, then gradually widened for c. 0.5cm to 6mm at the

mouth; the lobes spreading, pale blue, pilose, ovate, obtuse, c.5mm long and wide. *Stamens* 4, didynamous, glabrous; filaments of the longest pair c.3mm long, of the shortest pair c.2mm long; anthers included or very shortly exerted, the cells oblong-ellipsoid, mucous, c.1mm long; pollen 3-porate, c.55 × 50µm, spherical, with prominent wavy flanges similar to that illustrated in Scotland (1993: 496, figs 69–70), the pores very prominent, positioned between the flanges (Fig. 5G–H). *Style* thinly pilose, shortly exerted, c.1.2cm long; stigma simple, curved; ovary pilose. *Capsule* 4-seeded, oblong-elliptic, pilose near the tip, 5–7mm long; seeds pubescent, with a small areole.

Specimens seen:

BHUTAN. Chukka District: between Chukka and Chimakothi, 1600–1700m, 29 ix 1991, *Wood* 7465 (holo. E; iso. K, THIMPHU); between Awakha and Takti Chu, 1600m, 20 ix 1992, *Wood* 7580 (K, E).

INDIA. Manipur: Sirhoi [25°10'N, 94°29'E], 2300m, 20 vii 1948, *Kingdon Ward* 17823 (BM, ?NY).

BURMA. Mount Victoria, on road to Mindok, 25 v 1924, *Cooper* 5943A (E).

*S. frondosa* is a plant of shaded stream-sides in moist hill forest. In Bhutan it is restricted to the Chukka area but could easily be found elsewhere as it is an inconspicuous plant of wet, leech-infested areas flowering towards the end of the monsoon. Kingdon Ward's plant from Manipur is a very good match and the Cooper specimen from Burma is also very similar except for the very small leaves (all less than 2.5cm long). It seems likely that the plant has been overlooked in other parts of Eastern India even though it probably flowers every year.

*S. frondosa* clearly belongs to the complex of species placed in the genus *Sympagis* by Bremekamp (Group 2), consisting of *S. maculata* Nees, *S. himalayana* J.R.I. Wood, *S. monadelphina* Nees and *S. brunoniana* Nees, but is immediately distinguished from all of them by the hairy leaves and short, subcapitate spikes. The leaves are not spotted as in *S. himalayana* and *S. maculata*. The name *frondosa* alludes to the leafy branchlets which subtend and almost hide the flowers.

***Strobilanthes geniculata*** C.B. Clarke in Hook.f., Fl. Brit. India 4: 459 (1885). Type: India, Arunachal Pradesh (Mishmi), *Griffith*, K.D. 6116 (lecto. K, chosen here).

Syn.: *Goldfussia geniculata* (C.B. Clarke) Bremek. in Verh. Ned. Akad. Wetens. Afd. Nat. Sect. 2, 41(1): 233 (1944).

*Strobilanthes gracilis* T. Anders. in J. Linn. Soc. 9: 474 (1867), nom. illeg., non Beddome in Madras J. Lit. of Sci., Ser. 3, 1: 55 (1864). Type: India, Arunachal Pradesh (Mishmi), *Griffith* (iso. K).

*S. geniculata* var. *integra* C.B. Clarke in Hook.f., Fl. Brit. India: 459 (1885), **syn. nov.** Type: India, Meghalaya (Khasia), *Clarke* 21919 (lecto. K, chosen here).

*S. burkillii* Dunn in Bull. Misc. Inf., Kew (1920): 208, **syn. nov.** Type: India, Arunachal Pradesh (Abor Hills), *I.H. Burkill* 37107 (iso. K).

*S. persistens* C.B. Clarke, *nom. nud.*

*S. geniculata* is a distinctive species related to *S. pentstemonoides*. Both species lack bracteoles but have flower-heads enclosed by conspicuous, glabrous scarious bracts which are usually deciduous but sometimes persist quite late. In *S. geniculata*, however, the bracts are narrowly

ovate and acuminate as in *S. bracteata*, *S. chaffonjonii* H. Lév., *S. articulata* Imlay and several other species from China and SE Asia.

Other distinctive features include the strongly anisophyllous habit, the ovate upper leaves, rounded at the base, and the zigzag stem from which the epithet *geniculata* is derived. Specimens with the flower-heads borne on simple branchlets are similar to *S. articulata* Imlay from Thailand but can be separated immediately by the glabrous stem and leaves. *S. geniculata* can best be distinguished from the closely related Chinese species, *S. chaffonjonii* H. Lév. and *S. equitans* H. Lév., by the much larger bracts which are mostly 1.5–1.8cm long. These rarely exceed 1.2cm in the two Chinese species. In *S. geniculata* the flowering branchlets are quite short, not exceeding 10cm in length, and are often themselves curved or geniculate.

*S. geniculata* appears to be rare and I have only seen the three collections cited in the synonymy above.

***Strobilanthes himalayana* J.R.I. Wood sp. nov.** ex affinitate *S. maculatae* et specierum generis *Sympagis* Bremekamp sed corolla infundibulare (non cylindrica tum crateriforme), pubescente, longiore (2–3cm) et bracteis obovatis, acutis distincta.

Type: India, 'Sikkim' (probably Darjeeling), *O. Kuntze* 6661 (holo. E, iso. K).

Syn.: *Strobilanthes petiolaris* auct. sensu C.B. Clarke in Hook.f., Fl. Brit. India. 4: 458 (1885) et auct. mult., non Nees (1847) quae est *S. monodelpha* Nees.

Nees cited two Griffith collections from Eastern India in Hooker's herbarium as types of *S. petiolaris*. When Clarke examined these he found that one, the specimen from Khasia, was, in fact, *S. brunoniana* Nees (Clarke 1885: 457). He therefore linked the name *S. petiolaris* with the second, Assam, collection. This he equated with the plant that he and many other botanists knew from Darjeeling, and the Darjeeling plant has since been known as *S. petiolaris*.

The Darjeeling plant is usually easily distinguished by its corolla from allied species which were placed in the small genus *Sympagis* by Bremekamp. It is relatively large (2–3cm long), pubescent and distinctly shaped, being gradually widened from the base rather than abruptly widened from a cylindrical tube nearly half the length of the corolla. The Griffith collection from 'Assam', on which Clarke based his concept of *S. petiolaris*, is unfortunately very poor. There are no open corollas, no capsules and no complete inflorescence. However, it is clear from the nearly glabrous buds and the elliptic or very narrowly obovate bracts that it is not the same as the Darjeeling plant and is almost certainly conspecific with the earlier *S. monodelpha* Nees. This view is confirmed by the existence of a duplicate of the Griffith collection, originally in Bentham's herbarium and now also at Kew, which is clearly *S. monodelpha* and was so identified by Clarke. I therefore consider that *S. petiolaris* is a synonym of *S. monodelpha* and that the Darjeeling plant called *S. petiolaris* should be treated as a new species, *S. himalayana*, as described above.

*S. himalayana* is a small isophyllous undershrub with a deeply sulcate, bifariously pubescent stem. From *S. brunoniana* it can be immediately distinguished by the broadly elliptic, coarsely serrate leaves, 4–14 × 4–6cm, acuminate at both ends and with a distinct petiole up to 3cm long. The leaves are not unlike those of *S. frondosa* but almost glabrous except for a few scattered hispid hairs on the upper surfaces. From *S. maculata* and *S. monodelpha* it can be distinguished by the funnel-shaped corolla gradually widened from the base which is pubescent and, at 2–3cm

long, relatively large. The bracts are obovate, acute,  $5-7 \times 2-3$ mm, the tips often recurved so the spikes appear squarrose. The inflorescence is clearly spicate (not subcapitate as in *S. frondosa*) with the spikes densely glandular-pubescent, 2-7cm long borne on sparingly branched, sometimes leafy, axillary and terminal branchlets. The capsule is pubescent, 6-7mm long, the seeds pilose.

Specimens seen:

INDIA. Darjeeling: 'Sikkim', 1857, *Thomson* s.n. (K); Rishap, 1219m, 16 ix 1869, *Clarke* 9133 (K); Rishap, 914m, 5 vi 1870, *Clarke* 11949 (K); Rungpo Valley, 1219m, 19 ix 1875, *Gamble* 3556 (K); Mongpo, 914m, 24 ix 1875, *Clarke* 24778 (K); Kurseong, x 1875, *Gamble* 3557 (K); Kalimpong, 1219m, 15 x 1875, *Clarke* 26366 (K); 'Sikkim', 1219m, xi 1875, *O. Kuntze* 6661 (holo. E, iso. K); Mongpo, 1067m, x 1881, *Gamble* 9903 (K); without exact locality, *Cowan* s.n. (E).

SIKKIM. Yakla, 3048m, 15 x 1875, *Clarke* 26366 (K).

BHUTAN. Without exact locality, 1837, *Griffith* 2403 (K).

*S. himalayana* is entirely restricted to the Himalayan regions of Darjeeling, Sikkim and Bhutan. Nothing is known of its ecology except that it has a wide altitude range, being found between 900 and 3050m. I have excluded the Mishmi plants included by Clarke as var. *tubiflos*, which I regard as a separate species (page 264).

***Strobilanthes imlayae* J.R.I. Wood sp. nov.** ex affinitate *S. consortis* C.B. Clarke sed bracteis parvioribus acutis, ellipticis, obovatis vel rhombeis et foliis angustioribus, valde acuminatis distincta. **Fig. 13F-G.**

Type: India, Nagaland, *Bor* 6795 (holo. K).

Gregarious undershrub up to c. 1m high. *Stems* bifariously pubescent, sulcate, dark green. *Leaves* equal or slightly unequal, ovate or elliptic, acuminate, slightly falcate,  $3-10 \times 1.5-4$ cm, base narrowly cuneate, margins serrate, pubescent, above pubescent on the midrib but glabrous elsewhere except for a few scattered hispid hairs, cystoliths numerous, beneath pubescent on the veins, paler; petiole 0.4-2.5cm long, pubescent and sparsely hispid. *Inflorescence* of sessile or shortly pedunculate terminal and axillary heads, densely covered in long, silky, rufous hairs; heads  $1.5-3 \times 1.5$ cm, very compact; peduncles 0-1.4cm long. *Bracts* imbricate, somewhat variable in size and shape; outer bracts obovate or subrhomboid, acute, distinctly angled on each side,  $1.5-1.7 \times 0.5-0.7$ cm, densely villous; inner bracts obovate, subacute, angled,  $10-11 \times 5$ mm, villous; bracteoles oblanceolate, obtuse,  $9 \times 1$ mm, shorter than the calyx, ciliate. *Calyx* 1-1.1cm long, villous, 5-lobed to about 3mm above the base, the lobes  $7-8 \times 0.5$ mm, linear-oblong, obtuse, ciliate, two slightly shorter than the other three. *Corolla* 3.2-4.5cm long, cylindrical for 8-10mm then gradually widened to 10-12mm, the tube curved, white, outside sparsely pubescent, inside glabrous, the lobes blue or mauve, glabrous, ovate, obtuse, 3mm long, 5mm wide; filaments pilose, the longer pair 5mm long, the shorter 2mm long; anthers 2.5mm long, oblong, acute at the base; pollen ellipsoid, ribbed (Fig. 6E). *Style* 3.3cm long, glabrous below, pubescent above; ovary villous. *Capsule* not known, but presumably hairy.

Specimens seen:

INDIA. Manipur/Nagaland: Padi, Naga Hills, 1524m, 18 v 1935, *Bor* 2672 (K); Wokha Hill, Naga Hills, 1524-1829m, 21 ix 1935, *Bor* 6194 (K); Tsutuh, Naga Hills, 2134m, 6 xi 1935, *Bor* 6792 (K); Takiya, Naga Hills, 1676m, 6 xi 1935, *Bor* 6795 (holo. K); Psopama, 1981m, 1935, *Kingdon Ward* 12559 (BM);

Ukhrul, Manipur, 1676m, 12 iii 1948, *Kingdon Ward* 17080 (BM, NY); Sirhoi, Manipur, 2500m, 18 vii 1948, *Kingdon Ward* 17817 (BM, NY).

BURMA. Mount Victoria, Arakan, 1676m, 4 xi 1956, *Kingdon Ward* 22662 (BM).

*S. imlayae* appears to be widespread on the higher hills on the Indo-Burmese border, occurring between 1500 and 2500m. It is a plant of evergreen and bamboo forest but survives, for some time at least, in areas from where the forest cover has been lost.

*S. imlayae* is closely related to *S. consors* from Thailand, differing in its sparser indumentum, narrower more acuminate leaves and in particular in its bracts. These are obovate or elliptic but distinctly angled, so often appearing rhomboid particularly as they terminate in a blunt point. This contrasts with the larger, oblong or oblong-obovate rounded bracts of *S. consors*. Unfortunately the capsule of *S. imlayae* has never been collected so it is impossible to compare the fruit with that of *S. consors*. The capsule of *S. consors* is remarkable in *Strobilanthes* because it is one of the very few species in which the placenta rises up from the base as the seeds ripen so, presumably, helping seed dispersal. Other aspects of *S. imlayae* are also unknown. Field notes describe it as gregarious and since almost all the collections were made in 1935 and 1948 it is probably a plietesial species flowering in cycles of 12–13 years. Another curious feature is that all the herbarium sheets are of flowering shoots 5–15cm long, suggesting that the branches are unusually short in this species.

*S. imlayae* is named after Joan Imlay, who published a major study of the Acanthaceae of Thailand in 1939 and rightly recognized the *Bor* collections of this species at Kew as being closely related to *S. consors* from Thailand.

***Strobilanthes jennyae* J.R.I. Wood sp. nov.** habitu, indumento, forma foliorum, corollaque *S. nutantis* similans, sed bracteis oblong-ellipticis, pilosis, herbaceis et calyce ciliato lobis subaequalibus distincta. **Fig. 10.**

Type: Bhutan, *J.R.I. Wood* 7499 (holo. E).

Isophyllous perennial herb. *Stems* decumbent, 10–30cm long, densely pilose, the hairs large-celled, brown. *Leaves* equal, petiolate below, subsessile above, ovate-elliptic, acute, 3.5–6cm long, 1.5–5cm wide, gradually or abruptly narrowed to a shortly cuneate base, the margin crenate, both surfaces dark green and roughly pilose; petioles 0–2.5cm long. *Inflorescence* of short pseudo-terminal spikes 2–3cm long; peduncles c.1cm long, pilose; flowers subsessile. *Bracts* herbaceous, oblong-elliptic, acute, entire, pilose with brownish hairs; 0.9–1.5cm long, 0.4cm wide, persistent at least till the flowers fall; bracteoles linear, acute, 6–9mm long, ciliate with white hairs and a few purple glandular hairs at the tip. *Calyx* 5-lobed nearly to the base, 5–7mm long in flower, accrescent to c.10mm in fruit, the lobes equal, linear, acute, very pale green with a darker midrib and margin, ciliate. *Corolla* cream, straight, c.2.8cm long, densely glandular-hairy outside, the tube c.1.5mm wide at the base, then gradually widened to c.1.2cm at the mouth, the lobes ovate, broadly obtuse, c.3.5mm long and wide. *Stamens* 4, didynamous; filaments glabrous, the longer ones c.3mm long, the shorter ones c.1mm long; anthers included, the cells nodding, ellipsoid, muticous, c.1mm long; pollen 3-porate, oblong-ellipsoid, of the 'Rippenpollen' type, c.90 × 25µm, the ribs smooth and not very prominent, the pores lying between the ribs (Fig. 6F). *Style* pilose, reddish, 1.6cm long; stigma curved; ovary with a few hairs at the tip. *Capsule* not known.

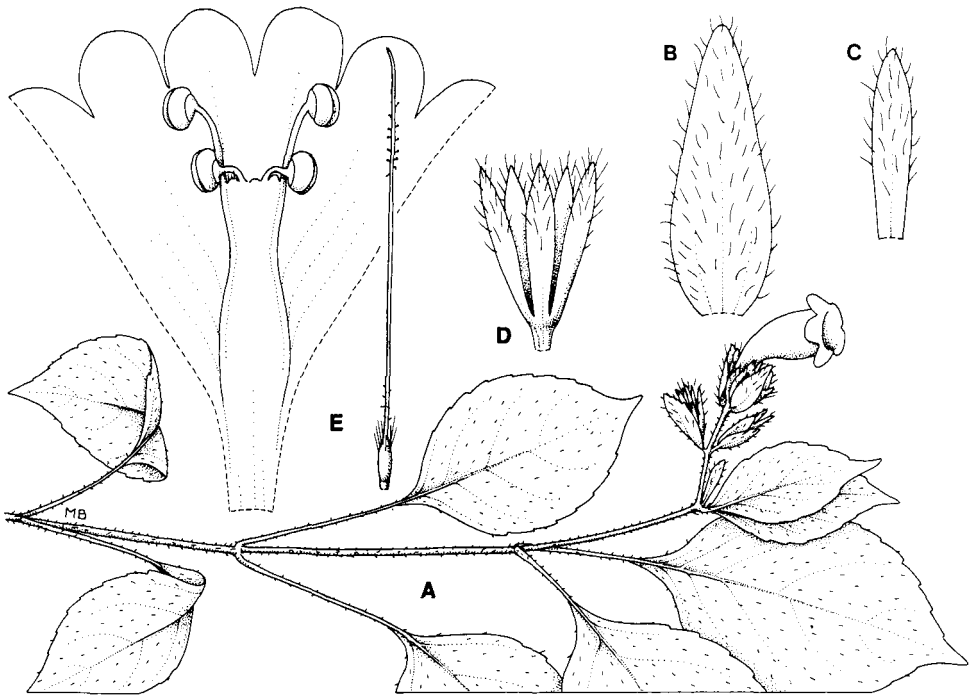


FIG. 10. *Strobilanthes jennyae* J.R.I. Wood. A, habit,  $\times \frac{2}{3}$ ; B, bract,  $\times 3$ ; C, bracteole,  $\times 3$ ; D, calyx,  $\times 3$ ; E, corolla opened out to show stamens, ovary and style,  $\times 3$ . Drawn from Wood 7499 by Mary Bates.

#### Specimens seen:

BHUTAN. Tashigang/Tashiyangtse District: Lumphi, ridge E of Tashiyangtse, 2350m, 14 viii 1915, Cooper 4446 (BM, E); between Tashiyangtse and Bumdeling, 2100m, 8 xi 1991, Wood 7499 (holo. E).

*S. jennyae* is endemic to Bhutan and apparently restricted to the Tashiyangtse area where it grows by streams and in marsh in partial shade in broad-leaved forest between 2100 and 2350m. It is quite unlike any other species known from Bhutan but is similar in many ways to *S. nutans* from Nepal, although the nature and shape of the bracts and calyx is very different. The fruit has never been collected and the description is based on the two collections cited above, neither of which is very satisfactory. It is likely that *S. jennyae* is an annual-flowering species.

I have taken the opportunity to name this plant after Jenny Sutherland, who accompanied me on the trip when the type of *S. jennyae* was found. This small but very distinctive plant with pale flowers and brown indumentum is, I hope, an appropriate recognition of the help she has given me over several years.

***Strobilanthes kingdonii* J.R.I. Wood, sp. nov.** ex affinitate *S. glomeratae* et *S. capitatae* sed floribus in capitulis laxis elongatis, saepe pare florum sub capitulo, dispositis et bracteis anguste oblongis-ellipticis vel lanceolatis distincta. **Fig. 13H.**

Type: India, Arunachal Pradesh, Kingdon Ward 7654 (holo. K).

Gregarious undershrub usually 2–3m high. *Stems* branched, glabrescent below, bifariously pilose above. *Leaves* equal or slightly unequal, elliptic-obovate, acute or shortly acuminate, 3–10 × 1.3–5cm, base attenuate, margin serrate, above green and adpressed pubescent, beneath grey, densely pubescent or subtomentose; petioles pubescent, 0.5–2cm long. *Flowers* in elongate bracteate heads terminal on short, simple or bifurcate branches, sometimes also in opposite pairs in the axils of bracts below the main head; branchlets 3–8cm long. *Bracts* of three types: outer, barren bracts leaf-like, lanceolate or oblong-elliptic, dentate, pubescent, 1.3–2.7 × 0.3–0.6cm, persistent; inner bracts ovate or elliptic, concave, obtuse, sinuate-margined, pubescent, 9–10 × 2mm, persistent; bracteoles linear, acute, pubescent, 7–7.5mm long. *Calyx* 0.9–1.1cm long, not accrescent in fruit, glandular-pubescent outside, glabrous inside, 5-lobed to the base, the lobes subequal or two slightly larger than the others, linear-oblong, acute. *Corolla* glossy violet, thinly glandular-hairy especially on the tube, 3.5–4.2cm long, the tube 1.5–2mm wide at the base, cylindrical for c.7mm, then gradually curved and widened to 1–1.2cm at the mouth, lobes rounded or slightly emarginate, c.7 × 6mm. *Stamens* 4; filaments pilose, the shorter pair 3.5mm long, the longer pair 8mm long; anthers 1.25mm long, ellipsoid, nodding; pollen 3-porate, oblong-ellipsoid of the ‘Rippenpollen’ type, ribbed, c.50 × 25 µm, the pores between the ribs (Fig. 6G). *Style* with scattered glandular hairs; ovary with a few hairs at the tip. *Capsule* oblong, 10mm long, glandular-pubescent at the tip, 4-seeded, seeds 3 × 1.75mm, flattened, ellipsoid, hairy.

Specimens seen:

INDIA. Arunachal Pradesh: Kahao, Lohit Valley [28°18'N, 97°00'E], 1220–1525m, 16 xi 1926, *Kingdon Ward* 7654 (K); Lohit Valley, 610m, 18 iii 1933, *Kingdon Ward* 10313 (BM).

TIBET. Kahao, Zayul Valley, 1525m, 20 vii 1926, *Kingdon Ward* 7158 (K).

*S. kingdonii* is named after its discoverer, Frank Kingdon Ward, whose travels and plant collections in the East Himalaya have added so much to our knowledge of this region. The majority of the *Strobilanthes* species described in this paper were in fact found by him. Many, including *S. kingdonii*, have never been collected by anyone else.

*S. kingdonii* is clearly closely related to *S. glomerata* and *S. capitata* but the heads are elongate and not truly capitate as in those species. Usually there is a pair of flowers in the bracts below the main head as well. The outer bracts are also distinctive, being relatively long and narrow and quite unlike those of the other two species. It is an isophyllous species and not strongly anisophyllous like *S. glomerata*.

*S. kingdonii* is apparently a gregarious species of open places in ‘thickets’, growing from around 600 to 1500m.

***Strobilanthes lachenensis*** C.B. Clarke in Hook.f., Fl. Brit. India 4: 465. Type: Sikkim, *Hooker* s.n. (lecto. K, chosen here).

Syn.: *Ptercanthus lachenensis* (C.B. Clarke) Bremek. in Verh. Ned. Akad. Wetens. Afd. Nat. Sect. 2, 41(1): 200 (1944).

*Sympagis petiolaris* auct. sensu Bernardi in Candollea 18: 248 (1963) and Hara in Enum. Fl. Pl. Nepal 3: 114 (1982), non (Nees) Bremek.

*Strobilanthes glutinosa* auct. sensu Yamazaki in Fl. East Himal. 1: 305 (1966), non Nees.

*S. lachenensis* is a confused and neglected species which extends from Central Nepal to Arunachal Pradesh. There are now quite a lot of specimens and those that I have seen are cited below.

Specimens seen:

NEPAL. Ling Dang Busti, 1829m, 30 viii 1935, *F.M. Bailey's collectors* s.n. (BM); near Langtang River, shaded thicket, 3353m, 25 vi 1949, *Polunin* 587 (BM); Langtang-Ghosa Tabela, damp gully, 3000–3600m, 26 vii 1976, *Durham University Expedition* D2 (BM); Toketey, 3962–4267m, 1930, *Lall Dwoj* 594 (E, BM); Bilbatay Bhanjang-Hatisar, 2200–2700m, 27 x 1983, *Hara et al.* 6303695 (TI, K, BM); Namche Bazaar to Dudh Kosi, 2750m, 17 x 1954, *Zimmermann* 1743 (G, K); Tinjure Ridge, between Door Pani and Chanki [27°10'N, 87°26'E], 2900m, 29 viii 1989, *KEKE* [Kew, Edinburgh, Kathmandu Expedition] 55 (KATH, K, E); Chimang Lekh, East Nepal, 3650m, *J.B. Shrestha & M.S. Bista* (BM); Tinjure Darda [27°10'N, 87°20'E], 2750m, 4 vii 1969, *Williams* 1118 (BM); Dunche-Tricali Khola-Singum Gompah, 2600m, 22 viii 1972, *Kanai et al.* 1805 (TI, BM); Ghasa, S of Tukuchu, Kali Gandaki, 3050m, 4 vii 1954, *Stainton, Sykes & Williams* 1523 (BM); *ibid.*, 3200m, 4 vii 1954, *Stainton, Sykes & Williams* 1603 (BM); near Balangoa Pass, 3700m, 19 vii 1952, *Polunin, Sykes & Williams* 2510 (BM); near Gurjakhani, 2660m, 21 vii 1954, *Stainton, Sykes & Williams* 3557 (BM); *ibid.*, *Stainton, Sykes & Williams* 3561 (BM); Lamjung Himal, 3050m, 17 vii 1974, *Stainton, Sykes & Williams* 6410 (BM); Langtang, 3350m, vi 1949, *Polunin* 602 (BM); Larjung, S of Tukuchu [28°41'N, 83°37'E], 3000m, 17 x 1954, *Stainton, Sykes & Williams* 8179 (BM); *ibid.*, 15 ix 1954, *Stainton, Sykes & Williams* 7852 (BM); Ghurchi Lekh between Lumra and Murma [29°28'N, 82°07'E], 11 viii 1952, *Polunin, Sykes & Williams* 5126 (BM).

SIKKIM. Lachen, meadows, 3048m, 31 vii 1849, *Hooker* s.n. (lecto. K).

BHUTAN. W side of Pele La, in juniper forest, 3000–3200m, 19 x 1991, *Wood* 7480 (E, K, THIMPHU); between Denchung and Dzulu amongst rhododendrons, 2134m, 20 vii 1949, *Ludlow, Sherriff & Hicks* 21305 (BM).

ARUNACHAL PRADESH. Senge Dzong [27°26'N, 92°07'E], in shade on an open slope with secondary growth, 2743m, viii 1938, *Kingdon Ward* 14095 (BM).

TIBET. Rongshar Valley, 3355m, 21 vi 1924, *Hingston* 309 (K); Lende Khola, 2450–2900m, 9–11 vii 1949, *Polunin* 869 (BM).

*S. lachenensis* appears to be a plant of grassy places in open woodland and scrub, possibly growing close to bushes for protection from grazing animals. It flowers from June to October.

*S. lachenensis* is an unusually variable species which is not always easy to identify. The typical plant has well-developed side branches and the inflorescence is clearly of long, lax, simple, terminal spikes. The leaves are usually obovate and attenuate at the base and decurrent onto the petiole but ovate leaves are seen on several specimens including the type, *KEKE* 55 (K, E) and *Lall Dwoj* 594 (BM). In most specimens the leaves are distinctly serrate, but in some specimens they are clearly crenate. In *Zimmermann* 1743 (G, K) and *Stainton, Sykes & Williams* 8179 (BM), both collected late in the season, the strongly crenate leaves are associated with small, axillary inflorescences, branched in the case of the second collection. It is difficult to assess the significance of this variation but I suspect it may be the result of grazing or some other environmental factor, especially in the case of the *Zimmermann* collection. Most remarkable of all is *Polunin, Sykes & Williams* 5126 (BM), collected at Ghurchi Lekh in western Nepal. This is a low plant with numerous short erect stems, sessile leaves and persistent bracts, and I was tempted to describe it as a new species. However, I can match its growth with side shoots on more typical specimens and strongly suspect it is some sort of freak. The need for further collections of *S. lachenensis* cannot be overstressed.



***Strobilanthes lamiifolia*** (Nees) T. Anders. in J. Linn. Soc. Bot. 9: 476 (1867).

Basionym: *Goldfussia lamiifolia* Nees in Wall., Pl. Asiat. Rar. 3: 88 (1832). Type: Nepal, *Wallich* 2347 (iso. K, K-W).

Syn.: *Ruellia rotundifolia* D. Don, Prodr. Fl. Nepal.: 120 (1825). Type: Nepal, *Wallich* s.n. (iso. BM ex Herb. Lambert), non *Strobilanthes rotundifolia* Benoist (1922). *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), **syn. nov.** Type: China, Yun-Nan (Ma Hong), *E.E. Maire* s.n. (iso. E, BM).

*Goldfussia mahongensis* (H. Lév.) E. Hossain in Notes Roy. Bot. Gard. Edinb. 32: 407 (1973).

*Strobilanthes lamiifolia* is the correct name for this species despite Bremekamp's suggestion (1944: 38 infra) that it was illegitimate. The types of *Ruellia rotundifolia* and *Goldfussia lamiifolia* are not the same.

Examination of type material of *S. mahongensis* at Edinburgh shows that it is an extremely good match for material of *S. lamiifolia* collected in Bhutan and Nepal. *S. lamiifolia* is thus a good example of a plant which extends through the Eastern Himalaya from Central Nepal to Yunnan. I have seen specimens from nearly all this area, including the very poorly known Arunachal Pradesh (*Ludlow, Sherriff & Taylor* 7033 (BM) and *Kingdon Ward* 12421 (BM)). There is, however, only one old unlocalized record from Sikkim and Darjeeling, but this is not surprising since in Nepal and Bhutan *S. lamiifolia* is a plant of the dry valleys, often occurring in or near open *Pinus roxburghii* woodland.

Another Chinese species, *Strobilanthes hancockii* C.B. Clarke ex W.W. Sm., is also very close to *S. lamiifolia* and was apparently regarded as conspecific with it by Hiroshi Terao. It appears to have glabrous leaves and a somewhat different facies, and until further collections become available it is difficult to decide what its status should be.

***Strobilanthes multidens*** C.B. Clarke in Hook.f., Fl. Brit. India 4: 461 (1895). Type: Bhutan, *Griffith* 2398 (lecto. BM, chosen here).

Syn.: *Goldfussia multidens* (C.B. Clarke) Bremek. in Verh. Ned. Akad. Wetens. Afd. Nat. Sect. 2, 41(1): 234 (1944).

*Strobilanthes agrestis* C.B. Clarke in Hook.f., Fl. Brit. India 4: 466 (1885), **syn. nov.** Type: India, Darjeeling, *Clarke* 13911 (lecto. K, chosen here).

*Pteracanthus agrestis* (C.B. Clarke) Bremek. in Verh. Ned. Akad. Wetens. Afd. Nat. Sect. 2, 41(1): 200 (1944).

*Strobilanthes agrestis* var. *hemiotis* C.B. Clarke in Hook.f., Fl. Brit. India 4: 466 (1885), **syn. nov.** Type: India, Meghalaya (Khasia), *Watt* s.n. (lecto. E, chosen here).

In his description of *S. multidens*, Clarke cited two collections, one by Hooker from Sikkim (probably, in fact, from Darjeeling) and the other, *Griffith* 2398, from Bhutan. In choosing a lectotype I have selected the BM specimen of *Griffith* 2398 which is labelled in Clarke's handwriting:

*Strobilanthes multidens* (commonly known as the 'Sikkim Dalhousianus')

There is an extremely poor duplicate of this at Kew. I have rejected the Hooker collection because the three sheets represent a mixed gathering (one sheet is *S. pubiflora* and the other two are *S. multidentis*) and according to his attached label they were only identified as *S. multidentis* by Clarke in 1900. It is not certain therefore whether he used these sheets in preparing his description of *S. multidentis*.

Clarke did not place *S. agrestis* close to *S. multidentis* in the *Flora of British India* but it is clear from his descriptions that the two plants differ only in their inflorescence. In *S. multidentis* the flowers are in heads at the branch tips whereas in *S. agrestis* they are paired in elongate spikes with 'capitellate tips'. In fact there are many specimens intermediate between the two extremes, including the lectotype, *Griffith* 2398, which has scattered flowers below the capitellate tips. Other intermediate specimens include *Wood* 7467 (E), *Wood* 6175 (E), *Ludlow & Sherriff* 18540 (BM) and *Clarke* 27050 (K).

*S. agrestis* var. *hemiotis* cannot be maintained either. The type specimen consists only of a flowering shoot with a reduced cordate leaf below the inflorescence. It bears a close resemblance to a portion of the lectotype.

*S. multidentis* is a very variable species. Most specimens show the flowers clearly capitellate at the tips of the branches but some specimens, particularly from near Dumsong in Darjeeling district, e.g. *Clarke* 26405(K) and *Ribu & Rhomoo* s.n. (E), have very lax inflorescences with flowers scattered in opposite pairs along the rachis. There is also considerable variation in indumentum, with some plants almost glabrous, such as *Wood* 7215 (E) and *Wood* 7476 (E), both from Bhutan, and *Beddome* 234 (K) from Sureil near Darjeeling, while the majority are hairy with the inflorescence densely glandular-pilose. The bracts also vary in size, with two collections from Eastern Bhutan, *Wood* 7492 (E) and 7494 (E), having bracts almost 1cm long and apparently persistent. I feel, however, that it is premature to recognize any of this variation formally.

Despite its variability *S. multidentis* has a number of distinctive features which serve to distinguish it. It is strongly anisophyllous and the difference in size between the leaves in each pair is more striking than in any closely related species. The glabrous corolla distinguishes it from *S. pubiflora* and *S. oligocephala*, while the usually hairy leaves distinguish it from *S. discolor* and its allies, as well as *S. pubiflora*. The inflorescence is very varied in appearance but the strongly bearded peduncles are as characteristic of mature plants as are the sticky glandular, deciduous, ovate-suborbicular bracts of younger plants.

*S. multidentis* is common in Bhutan and the Darjeeling district of West Bengal and is also recorded from East Nepal (*Kanai et al.* 6303699 (TI, BM)), Meghalaya (*Watt* s.n. (K, E)) and Nagaland (*Clarke* 40978 (K), 41808 (K), *Kingdon Ward* 11104 (BM, CAL)).

***Strobilanthes oligocephala*** T. Anders. ex C.B. Clarke in Hook.f., Fl. Brit. India. 4: 461 (1885). Type: Sikkim/Darjeeling, *Hooker* s.n. (lecto. K, sheet annotated by Anderson, chosen here).

Syn.: *Goldfussia oligocephala* (T. Anders. ex C.B. Clarke) Bremek. in Verh. Ned.

Akad. Wetens. Afd. Nat. Sect. 2, 41(1): 234 (1944).

*Strobilanthes oligocephala* var. *treutleri* C.B. Clarke in Hook.f., Fl. Brit. India 4: 461 (1885), **syn. nov.** Type: India, Darjeeling, *Clarke* 12959 (lecto. K, chosen here).

*Goldfussia thomsonii* Hook. in Bot. Mag. 75: 5119 (1859), **syn. nov.** Type: Icon. 5119 in Bot. Mag., drawn from a plant collected by Thomson in Sikkim (lecto., chosen here; original drawing at K), non *Strobilanthes thomsonii* T. Anders. (1867).

*Strobilanthes paupera* C.B. Clarke in Hook.f., Fl. Brit. India 4: 463 (1885), **syn. nov.** Type: India, Meghalaya (Khasia), *Hooker & Thomson* s.n. (iso. K).

*Difflugossa paupera* (C.B. Clarke) Bremek. in Verh. Ned. Akad. Wetens. Afd. Nat. Sect. 2, 41 (1): 246 (1944).

*Strobilanthes feddei* H. Lév. in Repert. Spec. Nov. Regni Veg. 12: 20 (1913), **syn. nov.** Type: China, Yunnan, *E. Bodinier* s.n. (holo. E).

*Goldfussia feddei* (H. Lév.) E. Hossain in Notes Roy. Bot. Gard. Edinb. 32: 407 (1973).

*S. oligocephala* is a small undershrub, usually less than 50cm high, closely allied to *S. pentstemonoides*. It is usually easily identified by the pseudo-terminal pedunculate flower-heads combined with the glandular-pilose corolla and the ovate, acute soon scarious, caducous bracts. The only other similar species in which most of the flower-heads are terminal is *S. lamiifolia*, but this species is a herb with clearly elongate heads borne on usually simple branchlets. There is considerable variation in the amount of glandular hairs on the corolla but they are always present, at least in small quantity on the lobes. The bracts are usually absent from flowering specimens but they are more clearly pointed than in *S. pentstemonoides* but not acuminate as in *S. lamiifolia*, *S. bracteata* and *S. geniculata*. The whitish undersides of the leaves are also distinctive, and the heads are slightly elongate, resembling those of *S. pentstemonoides* rather than *S. pubiflora*. As in all related species the calyx and capsule are glandular-hairy.

The oldest name for this species is *Goldfussia thomsonii* but it cannot be transferred to *Strobilanthes* because of the prior existence of *S. thomsonii*. *Goldfussia thomsonii* was described by W.J. Hooker in the *Botanical Magazine* but no type was cited. The picture was apparently based on a cultivated plant grown from seed collected by Thomson in Sikkim. The illustration is very good, showing clearly the distinctive white undersides of the leaves and the pseudo-terminal inflorescence. Although Anderson (1867: 477) and Clarke (1885: 471) considered this plant to be the same as *S. wallichii* they were quite wrong in this; even the calyx in the illustration is shown with the longer median lobe which is incorrect for *S. wallichii*. There is a specimen at Kew collected by Thomson from Sikkim but it comes from the Calcutta Botanical Garden and is annotated *Strobilanthes pentstemonoides* by Anderson, and was probably never seen by Hooker or used in preparing his description. I have, therefore, chosen the illustration, whose original by Fitch is at Kew, as a lectotype.

As a lectotype of *S. oligocephala* I have selected the specimen at Kew collected by J.D. Hooker in Sikkim/Darjeeling and annotated by Anderson and subsequently Clarke with the name *Strobilanthes oligocephala*.

I have included both *S. oligocephala* var. *treutleri* C.B. Clarke and *S. paupera* C.B. Clarke in *S. oligocephala*. I have failed to find a Treutler specimen annotated by Clarke at Kew so I have selected Clarke 12959 from Tambok (?Sikkim) as the lectotype of var. *treutleri*. This is the best sheet at Kew fully annotated by Clarke. Both this and the type material of *S. paupera* clearly match *S. oligocephala* and cannot be maintained as distinct. A minor but interesting

confirmation of my view of the identity of *S. paupera* is the name under which the type specimen was originally distributed by J.D. Hooker and Thomson. This is *Goldfussia thomsonii*, and since W.J. Hooker refers to specimens from Khasia in the protologue of *Goldfussia thomsonii* it may well be that he used these specimens to help draw up his description.

The inclusion of *S. feddei* from China requires more explanation. The type material (*E. Bodinier* s.n.) is very poor but it clearly shows the pseudo-terminal inflorescence, the ovate, acute, concave scarious bracts, bicoloured leaves and glandular corolla of *S. oligocephala*. It is a particularly good match for *Cooper* 2379 (E, BM) from Bhutan, and this specimen led both me and Hiroshi Terao to link *S. feddei* with *S. oligocephala*. Both *Cooper* 2379 and the Bodinier collection have acute leaves rather than the characteristically acuminate, even caudate leaves more usual in *S. oligocephala*, but the leaves in this species are quite variable, as in several other species of *Strobilanthes*.

*S. oligocephala* is distributed from Eastern Nepal through Sikkim, Bhutan and Arunachal Pradesh to Yunnan in SW China. It also occurs in Meghalaya.

***Strobilanthes oxycalycina* J.R.I. Wood, sp. nov.** floribus in capitulis dispositis facile *S. pentstemonoides* confusa sed foliis discoloribus et bracteis bracteolisque parvis herbaceis manifeste ex affinitate *S. discoloris* sed corolla hirsuta, foliis subaequalibus et lobiis calycis subtiliter acutis distincta. **Fig. 8F–I.**

Type: India, Arunachal Pradesh, *Kingdon Ward* 8748 (holo. K).

Undershrub 1–2.5m high, forming a small bush (fide *Kingdon Ward*). *Stems* rounded, somewhat sulcate, glabrous, often whitish above because of the numerous cystoliths. *Leaves* subequal or slightly unequal, broadly elliptic to oblong-elliptic, acuminate at both ends, 5–14 × 2–7cm, margin serrate, both surfaces glabrous with prominent cystoliths, dark green above, whitish beneath; petiole 0.5–1.7cm long, glabrous. *Flowers* in dense, usually elongate heads terminal on simple or (usually) trifurcate axillary branchlets, often with a few flowers on the peduncle below the main head; peduncles glabrous, 2–4cm long; heads up to 20-flowered, the axis 1–2cm long. *Bracts* ovate, shortly acuminate, 7 × 3mm, thinly pubescent, herbaceous, fugacious; bracteoles similar but oblong-obovate, acute, 3 × 1–2mm. *Calyx* c.9mm long in flower, accrescent to 11mm in fruit, 5-lobed nearly to the base, the lobes equal, linear or narrowly oblong-elliptic, finely acute, pubescent and glandular, inside glabrous. *Corolla* blue, nearly straight, thinly glandular-pubescent, 3–4cm long, gradually widened from c.1mm at the base to c.9mm at the mouth, lobes ovate, rounded, c.5mm long; stamens 4, filaments finely pubescent, the shorter pair 3.5mm long, the longer pair 8mm long; anthers nodding, rounded, 1.25mm long; pollen not known. *Style* finely pilose, c.2.5cm long; ovary gland-tipped. *Capsule* oblong, 1.1–1.2cm long, glandular-pubescent in the upper half, 4-seeded; seeds hairy, 3mm wide, without an areole.

Specimens seen:

INDIA. Arunachal Pradesh: Lohit Valley [28°00'N, 96°35'E], 6–900m, 3 xii 1926, *Kingdon Ward* 7690 (K); Nizamghat [28°15'N, 95°45'N], 305m, 28 ii 1928, *Kingdon Ward* 8732 (K); Dambuk [28°00'N, 95°30'E], 305m, 2 xii 1928, *Kingdon Ward* 8748 (holo. K).

*S. oxycalycina* has a superficial resemblance to both *S. pentstemonoides* and *S. discolor* since the flowers are arranged in pedunculate heads. From *S. pentstemonoides* it is readily distinguished by having all five calyx lobes equal in length and in having small, acute herbaceous bracts which

contrast strongly with the suborbicular, scarious bracts of *S. pentstemonoides*. These characters, together with the presence of bracteoles and bicoloured leaves, place it close to *S. discolor*, but it is not anisophyllous and the corolla is glandular-pubescent. The finely acute calyx lobes seem to distinguish it from all related species.

*S. oxycalycina* is a plant of low-altitude subtropical forest between 300 and 900m at the head of the Brahmaputa River, occurring in the valleys of all three major branches: the Lohit, Dihang and Dibing rivers.

***Strobilanthes pentstemonoides*** (Nees) T. Anders. in J. Linn. Soc. Bot. 9: 477 (1867).

Basionym: *Goldfussia pentstemonoides* Nees in Wall., Pl. Asiat. Rar. 3: 88 (1832). Type: Nepal, Wallich 2340 (iso. K-W, E, K).

Syn.: *Goldfussia flexuosa* Nees in Wall., Pl. Asiat. Rar. 3: 88. Type: Nepal, Wallich 2412 (iso. K-W, E, K).

*Ruellia capitata* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. 120 (1825), non *Goldfussia capitata* Nees nec *Strobilanthes capitata* (Nees) T. Anders. Type: Buchanan-Hamilton s.n. (iso. BM).

Although *S. pentstemonoides* was known only from the type specimen for many years, there are now extensive collections from Nepal, principally at the BM, which enable us to get a clear understanding of this species. It is an anisophyllous undershrub with strictly glabrous stems and leaves. The leaves are very variable in size but are essentially elliptic in shape. Most specimens from Central Nepal have the larger leaf in each pair narrowly elliptic and about 7–10 × 2–3cm in size, but plants with much longer leaves can be found as well as forms in which the leaf is broadly elliptic, scarcely longer than broad. This latter is the only form known in Bhutan but also occurs in Nepal and is probably not worthy of recognition. The flowers are in pedunculate, bracteate heads terminal on axillary branchlets. The branchlets are usually relatively long, clearly exceeding the leaves and bearing a pair of relatively persistent leaflets at the branching point. The peduncles are usually glandular-pilose but never bearded as in *S. multidentis*. The flower-heads are usually distinctly elongate (up to 3cm long) and when young enclosed by glabrous, scarious, suborbicular bracts which give them a fanciful but striking resemblance to rattlesnake tails. The bracts are more persistent than in many related species and it is almost always possible to find some bracts, even on fruiting specimens. The calyx is glandular-hairy, the corolla glabrous and curved (but never strongly bent) and the capsule is glandular-hairy at the tip only (Fig. 11).

The only difference between *S. pentstemonoides* and *S. dalhousieana* from the Western Himalaya is in the indumentum of the leaves and stem. In the former it is quite glabrous whereas in *S. dalhousieana* the stems and leaf veins are distinctly hairy. This is a relatively minor difference and there is some evidence that the populations are mixed in the Kumaon area of Uttar Pradesh (A.E. Osmaston 1927: 394), but since they are largely separate geographically I think it best to recognize two varieties of *S. pentstemonoides* as follows:

***S. pentstemonoides* var. *pentstemonoides***

This is distinguished by its glabrous leaves and stem. It is not particularly common except in Central Nepal.

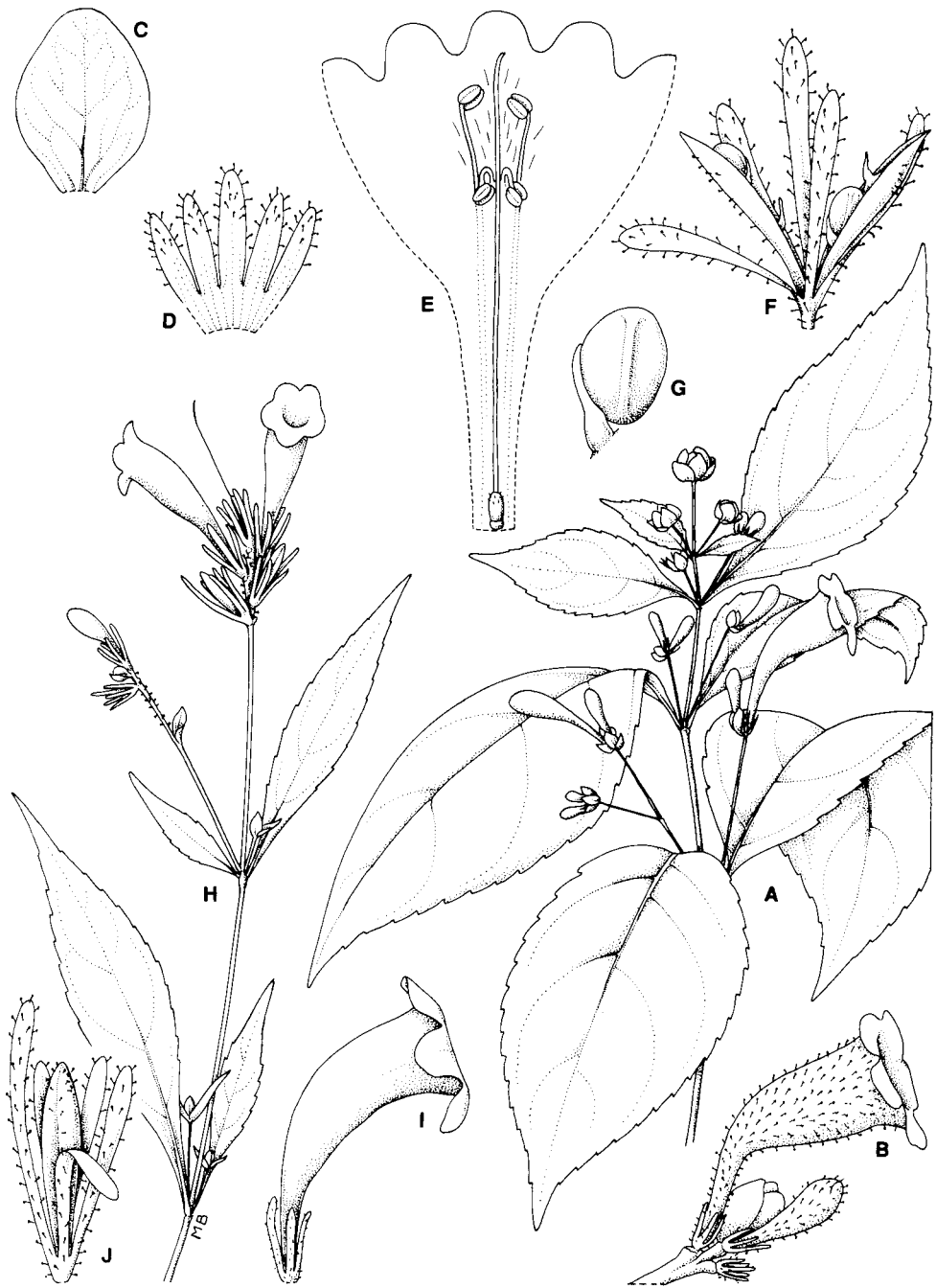


FIG. 11. *Strobilanthes pubiflora* J.R.I. Wood. A, habit,  $\times 0.5$ ; B, flower-head with corolla,  $\times 1$ ; C, bract,  $\times 3$ ; D, young calyx,  $\times 3$ ; E, corolla opened out,  $\times 1.5$ ; F, capsule with fruiting calyx,  $\times 2$ ; G, seed,  $\times 4$ . *S. pentstemonoides* (Nees) T. Anders. H, habit,  $\times 0.5$ ; I, corolla,  $\times 1$ ; J, capsule with fruiting calyx,  $\times 2$ . A–E from Wood 6089 and 7524; F–G from Wood 6154; H–I from Wigram 215. Drawn by Mary Bates.

## Specimens seen:

INDIA. Uttar Pradesh: Kumaon, 1250m, vi 1969, *P.N. Mehra* 9 (K); Dhauaulti, Tehri Gahrwal, 2175m, viii 1944, *R.R. Stewart* s.n. (K).

NEPAL. Godavari, S of Kathmandu, 1600m, *Schilling* 677 (K); Latsu-Pati Bhanjang-Borlang, 1700–2400m, 30 viii 1972, *Kanai et al.* 72830 (BM, TI); Syarpagoan, 2750m, 23–31 viii 1949, *Polunin* 1843 (BM); Pokhara, 1500m, 31 x 1954, *Stainton, Sykes & Williams* 8314 (BM); Lumle, 1705m, 4 xi 1974, *Dawson* 244 (BM); Godavari-Mt Pulchuki, 10 miles SE of Kathmandu, 2200m, 3 ix 1966, *Nicholson* 2248 (BM); Godavari, 2200–2800m, 27 xi 1948, *Bande* 49 (BM); Thosey, 2800–3400m, 1930, *Lal Dwoj* 0351 (E, BM); Helumbu, Malenchi, 3400m, 18 ix 1974, *Stainton* 7215 (BM); near Lumsum, 3400m, 17 vii 1954, *Stainton, Sykes & Williams* 3522 (BM); Dhumpur Lumle, 1900, 1 x 1969, *Flatt* 104 (BM); between Sundarjal and Pati: Banjang [27°40'N, 85°26'E], 2500m, *de Haas* 2636 (BM); Tashi Thong, S of Tharke Gyong, 2550m, 7 ix 1974, *de Haas* 2679 (BM); Galchi, 1525m, 18 xi 1935, *F.M. Bailey's collectors* (BM); Khare Khola-Khanigaon, 1700–2100m, 14 ix 1983, *Ohba et al.* 8332090 (TI, E); Shivalaya-Bhandar, 1800–2300m, 17 ix 1985, *Ohba et al.* 8530830 (E).

BHUTAN. Between Goen Gaza and Gaza Zam [27°54'N, 87°48'E], 2450m, 13 ix 1984, *Sinclair & Long* 4982 (E); 10km below Nobding, 2190m, 11 x 1984, *Sinclair & Long* 5633 (E).

***S. pentstemonoides* var. *dalhousieana* (Nees) J.R.I. Wood, stat. nov.**

Basionym: *Goldfussia dalhousieana* [*'dalousiana'*] Nees in *A. DC., Prodr.* 11: 174 (1847). Type: India, Simla, *Lady Dalhousie* (iso. E, K).

This variety is distinguished by its pubescent stems and leaves, which are hairy at least on the veins below. Clarke (1885: 460) suggests that the calyx is glabrous but although this is true in some cases and is never the case in var. *pentstemonoides*, specimens with glandular-pubescent calyces are not unusual. The leaves of var. *dalhousieana* are usually larger and characteristically narrowly elliptic (c. 10–20 × 4–6cm).

## Representative specimens:

PAKISTAN. Brewery woods, Muree Hills, 2 ix 1915, *E.M. Saunders* s.n. (K); Potha, Muree Hills, 1350m, 3 x 1949, *Stewart & Gorrie* 23503 (K).

KASHMIR. Basaoli, 1372m, 26 ix 1876, *Clarke* 31566 (K).

HIMACHAL PRADESH. Simla, 1525–2135m, x 1887, *Watt* (K, E); *ibid.*, 1829m, x 1885, *Collett* 870 (K); Maleasu, Simla, *Edgeworth* s.n. (K); 16km to Dalhousie, 1111m, 12 x 1977, *van der Maesen* 2895 (K); Dalhousie, 2134m, 10 ix 1874, *Clarke* 22030 (K); Dhurmsala, 2134m, 17 x 1874, *Clarke* 23997 (K); Kalel Khad, Chamba, 15–2100m, 28 ix 1896, *Lace* 1512 (E); Perganun Chuari, Chamba, 2100m, 27 xi 1919, *Parker* 5554 (K); Chatri, 2100m, 15 x 1987, *McBeath* 1974 (E).

UTTAR PRADESH. Jakolani, 2338m, ix 1898, *Gamble* 27271 (K); Adwani, 1981m, 3 x 1919, *A.E. Osmaston* 1161 (K); Naini Tal, 2134m, *Strachey & Winterbottom* (K); Jaunsar, 2134m, x 1898, *Gamble* 27382 (K); Kanisar, Jaunsar, 1981m, *Raizada* 7183 (E); Gracemount, Mussoorie, x 1917, *A. Anderson* s.n. (E).

NEPAL. Tozke to Okhaldunga, 1990m, 2 xi 1954, *Zimmermann* 1990 (K, G).

Both varieties are plants of mountain forest in the Himalaya, growing between 1350 and 3400m. They do not occur at lower altitudes despite Clarke's comment (1885: 460) which was the result of his inclusion of *S. pubiflora* within *S. pentstemonoides*. Var. *dalhousieana* is common from the Indus east to Kumaon (Uttar Pradesh), with a single collection from Nepal, whereas var. *pentstemonoides* is restricted to Nepal, with two collections from Kumaon and two from Bhutan.

All other records of *S. pentstemonoides* from eastern India, Burma, Thailand, Indo-China, Tibet and China are, in my opinion, errors.

*S. pentstemonoides* is arguably the most misunderstood species in the whole genus and has been used as a dumping ground for any plant bearing flowers in apparently ebracteate clusters at the branch tips. Since the bracts are often diagnostic but deciduous very early the confusion is understandable. The list of species with which it has been confused is lengthy. It includes *S. angustifrons* and *S. bracteata* from the Western Himalaya, *S. pubiflora*, *S. oligocephala*, *S. multidentis*, *S. discolor*, *S. oxycalicina* and *S. rhombifolia* from the East Himalaya, *S. straminea*, *S. anfractuosa* and *S. rex* from Burma, Thailand and Indo-China and *S. chaffonjonii*, *S. marchandii* and *S. hupehensis* from China. This list is not exhaustive and could be extended to include undescribed species from China as well as the plant called *S. pentstemonoides* on page 419 in the *Flora Xizangica* (Tibet), which is clearly a different species on account of its pubescent corolla and equal calyx lobes.

Some aid to distinguishing these species is given in the keys on pages 212 and 214.

***Strobilanthes pubiflora* J.R.I. Wood sp. nov.** capitulis longipedunculosis et bracteis suborbicularibus, scariosis, caducis ad *S. pentstemonoides* accedens sed corolla extus pubescenti, pedicellis glabris et capitulis brevioribus, subrotundatis ab ea recedens. **Fig. 11.**

Type: Bhutan, *J.R.I. Wood* 7524 (holo. E; iso. K, THIMPHU).

Syn.: *Strobilanthes pentstemonoides* auct. mult. incl. C.B. Clarke p.p. in Hook.f., Fl.

Brit. India 4: 460 (1885) quoad Sikkim and Bhutan records, non (Nees) T.

Anders.

*S. discolor* sensu T. Anders. p.p. in J. Linn. Soc. Bot. 9: 477 (1867) quoad Bhutan records.

Much branched, anisophyllous undershrub 0.5–1m high. *Stems* ascending or erect, glabrous. *Leaves* moderately unequal, broadly oblong-elliptic, shortly acuminate, slightly falcate, 6–20cm long, 2–7cm wide, base attenuate, margin serrate, green above, paler beneath, glabrous on both surfaces, cystoliths numerous; petioles 0.3–2cm long. *Flowers* in dense pedunculate heads borne on axillary branchlets; branchlets 1–6cm long, shorter than the leaves, bi- or trifurcate with a pair of reduced deciduous leaves at the branching point; peduncles 1–2.5cm long, glabrous; heads suborbicular, bracteate when young, not elongating with age. *Bracts* 2–9mm long, suborbicular, rounded, concave, glabrous, reticulate, the outer larger than the inner ones, pale green when young, becoming scarious, deciduous as the flowers open; bracteoles absent. *Calyx* 5–7mm long in flower, accrescent to 20mm in fruit, sticky glandular-pubescent outside, glabrous within, lobes linear, acute, one c.2mm longer than the others. *Corolla* 3.2–5cm long, pubescent, tube white, gradually widened from c.2mm at the base to 1.2–1.6cm at the mouth, slightly curved, lobes blue, ovate, rounded, c.5mm long, 7mm wide. *Stamens* 4, didynamous; filaments pilose, the longer pair 5–6mm long, the shorter pair c.2mm long; anthers included, the cells muticous, ellipsoid, c.1mm long; pollen 3-porate, ellipsoid of the 'Rippenpollen' type, the pores between the ribs, c.90 × 30µm (Fig. 6H). *Style* glabrous, reddish, c.3cm long; stigma simple, curved; ovary glandular-puberulent. *Capsule* 4-seeded, oblong, finely glandular-pubescent, 1.4–1.5cm long; seeds with mucilaginous hairs, without an areole, c.2mm long.



## Specimens seen:

BHUTAN. Above Kharbandi (Rinchending), 1100m, 12 xi 1987, *Wood* 6089 (E, THIMPHU); 15km from Sarbhang towards Chirang, 1100m, 19 ii 1988, *Wood* 6154 (E, THIMPHU); between Dakpai and Tintibi, 1000m, xi 1989, *Wood* 7227 (E); in valley forest, 1km S of Dorokha, 1000m, 22 xi 1991, *Wood* 7517 (E, K); between Kharbandi (Rinchending) and Sorchen, 800m, 26 xi 1991, *Wood* 7524 (holo. E, iso. K); Kamjee, between Gedu and Phuntsholing, 1700m, 18 i 1992, *Wood* 7527 (E); Bhutan, without locality, 1837, *Griffith* 2399 (K, BM); *ibid.*, *Griffith* 2400 (K).

DARJEELING. 'Sikkim' (probably Darjeeling), *Hooker* (K); Nangklas, 914–1219m, 6 ix 1881, *Gamble* (K); Kalimpong, 1067m, 15 xi 1875, *Clarke* 26364 (K, BM); Tinkdah (Takdah), 1524m, 21 xi 1875, *Gamble* 305 (K); Kurseong, 1372m, 27 ix 1884, *Clarke* 35943 (BM); Surreil, 1542m, *Gamble* 9904 (K); Dumsong Forest, 900m, 8 ix 1923, *Cowan* s.n. (E).

NAGALAND. Bosty Jaboea, near Naga Hills, ii 1899, *Prain's collector* 741 (BM); Lachan, Naga Hills, 1050m, 16 ii 1935, *Bor* 6737 (K), with doubt, specimen very poor; Lakhumi, Naga Hills, 300–500m, 2 i 1949, *Kingdon Ward* 18378 (BM, NY).

MANIPUR. Milestone 35, Dimapur Road, 1200m, 4 i 1945, *Bullock* 882 (K — atypical).

*S. pubiflora* is locally common in SW Bhutan and the adjacent Darjeeling district of West Bengal. The plants from Nagaland and Manipur seem indistinguishable but as none of the specimens cited has bracts there must remain some doubt about their correct identification. I have seen no specimens from Arunachal Pradesh.

*S. pubiflora* has been confused with *S. discolor*, *S. pentstemonoides* and *S. multidentis*, from all of which it can be immediately distinguished by its pubescent corolla. It is closest to *S. pentstemonoides* but the peduncles are glabrous and the heads are rounded with no tendency to elongation as the flowers fall. The capsule is glandular-pilose except at the very bottom. The leaves are completely glabrous.

*S. pubiflora* grows from 800 to 1700m in open, well-drained woodland and in secondary scrub. It thus occurs at much lower altitudes than *S. pentstemonoides*, which is found between 1350 and 3400m.

***Strobilanthes rhombifolia*** C.B. Clarke in Hook.f., Fl. Brit. India 4: 461 (1885). [Avowed substitute for *Goldfussia sessilis* Nees.] Type: as for *Goldfussia sessilis* Nees.

Syn.: *Goldfussia sessilis* Nees in A. DC., Prodr. 11: 172 (1847), non *Strobilanthes sessilis* Nees (1832). Type: India ('Assam'), *Jenkins* s.n. (lecto. K ex Herb. Hooker, chosen here).

At Kew there are two sheets of *S. rhombifolia*, both apparently collected in 'Assam', but one originally from Hooker's herbarium and the other from Bentham's. As *S. rhombifolia* is only a renaming of Nees' *Goldfussia sessilis* I have selected the sheet from Hooker's herbarium as a lectotype. This is the only specimen cited by Nees and has his own annotation on the sheet. There is no firm evidence that he ever saw the sheet from Bentham's herbarium.

*S. rhombifolia* is known only from two collections besides the original material. One of these (*Gamble* s.n.) is so poor that it adds nothing to our knowledge of this species and its identification with *S. rhombifolia* is little more than an inference on my part. The other collection (*Barnard* AHP31) is much more helpful. This is an excellent match with the type material but is much less mature than the *Jenkins*' collection. It is clear from this that, despite C.B. Clarke's opinion, *S. rhombifolia* is not related to *S. pentstemonoides* at all closely but is

instead allied to *S. discolor*. This is clear from the subequal calyx lobes, the presence of distinct bracteoles and the herbaceous, not scarious nature of the fugacious bracts.

In its characters *S. rhombifolia* appears to lie midway between *S. discolor* and *S. straminea*. From the former it can be distinguished by the subrhomboid, acute (not acuminate), sessile leaves, green on both surfaces, the suborbicular leaflets at the inflorescence branching points and by the glandular-pubescent corolla lobes (Fig. 12E). From *S. straminea* it is distinguished by the blue corolla, smaller, few-flowered heads and the small, fugacious, eglandular, herbaceous, not scarious bracts.

Virtually no information about the distribution and ecology of *S. rhombifolia* is known other than that it is restricted to 'Assam' in the widest sense.

Specimens seen:

INDIA ('Assam'). Without locality, *Jenkins* s.n. (K); Khasia, without further details, *Gamble* s.n. (K); Pengare (?), in jungle clearings, 180–230m, 26 xii 1935, *Barnard* AHP31 (BM).

***Strobilanthes saccata* J.R.I. Wood sp. nov.** a *S. sabiniana* caule hirsuto, foliis petiolatis veinis infra hirsutis, spicis laxioribus, floribus haud imbricatis, bracteis subglabris, lobiis calycis, spatulatis distincta; a *S. tamburensis* foliis petiolatis, acuminatis, spicis plerumque axillaribus, tubo corollae glabro distincta. **Fig. 13I.**

Type: Nepal, *Flatt* 106 (holo. BM).

Small anisophyllous herb. *Stems* decumbent or ascending, 30–40cm long, slightly zigzag upwards, pilose with spreading large-celled hairs. *Leaves* unequal, ovate, shortly acuminate, 2–8 × 1–3.5cm, base rounded or broadly cuneate, then attenuate and shortly decurrent onto the petiole, margin entire or obscurely crenulate, above dark green, sparsely pilose, glabrescent, cystoliths numerous, beneath whitish, sparsely pilose on the veins; petioles 0–2cm long, diminishing in length upwards, pilose. *Flowers* in opposite pairs, 5–10mm apart, in axillary and terminal spikes; spikes simple, 4–9cm long; rachis sparsely bifariously pubescent; lowermost bracts leaf-like, sessile, ovate, acute, 0.8–3.2 × 0.9–2.5cm; middle and upper bracts obovate, rounded, often submucronate, sessile, 2.5–5mm long, glabrous or with subsessile glands, persistent; bracteoles oblong-oblan-ceolate, glabrous, 2.5mm long. *Calyx* 6mm long in flower, accrescent to 9mm in fruit, divided to the base, glabrous or pilose when young, becoming glandular when older, lobes subequal or with two slightly longer than the other three, linear-oblan-ceolate, becoming spatulate in fruit. *Corolla* blue, 2.6–3cm long, glabrous on the tube but sparsely pilose on the lips, 1mm wide at the base, cylindrical for 2–5mm then bent 90°, strongly inflated and widened to c.1.5cm, lobes broadly ovate, shallowly emarginate, c.3mm long, 6mm wide; fertile stamens 4; filaments glabrous, the shorter pair 2–3mm long, the longer pair 7–8mm long; anthers 2–2.5mm long, narrowly ellipsoid; pollen 3-porate, ellipsoid, ribbed, echinulate on the ribs, the pores between the ridges, 50 × 35µm (Fig. 5A, B). *Style* pilose, c.2.5cm long; ovary bearded at the tip. *Capsule* oblong, 8–10mm long, glabrous except for a tuft of hairs at the tip, 4-seeded; seeds 1.5mm long, with a narrow areole, pilose with mucilaginous hairs.

Specimens seen:

NEPAL. Dhampus/Lumle [28°40'N, 83°37'E], 1930m, 1 x 1969, *Flatt* 106 (holo. BM); beside Malemchi Khola near bridge between Tarke Ghuang and Malemchigaon [28°01'N, 85°30'E], 2000m, 17 ix 1974, *de Haas* 2773 (BM).



FIG. 12. *Strobilanthes simplex* J.R.I. Wood. A, habit,  $\times \frac{2}{3}$ ; B, bract,  $\times 4$ ; C, bracteole,  $\times 4$ ; D, calyx,  $\times 2$ . *S. rhombifolia* C.B. Clarke. E, habit,  $\times \frac{2}{3}$ . *S. straminea* W.W. Sm. F, habit,  $\times \frac{2}{3}$ . *S. discolor* (Nees) T. Anders. G, habit,  $\times \frac{2}{3}$ ; H, bract,  $\times 4$ ; I, bracteole,  $\times 4$ ; J, young calyx,  $\times 2$ ; K, mature calyx,  $\times 2$ . A–D from Kingdon Ward 18867; E from Barnard AHP 31; F from Keenan *et al.* 3014 with flower from Kingdon Ward 3726; G–I from Griffith KD 6120; J–K from Hooker & Thomson s.n. Drawn by Mary Bates.

*S. saccata* is in some ways intermediate between *S. sabiniana* and *S. tamburensis*, although in appearance it resembles *S. sabiniana* much more closely. It has the same axillary spikes as *S. sabiniana* and the leaves are also superficially similar, although they are smaller and truly petiolate rather than long decurrent as in that species. It differs strikingly in indumentum as well, having a pilose stem, leaves hairy on the upper surface and on the veins beneath but the bracts and bracteoles subglabrous. The spatulate or at least oblanceolate calyx lobes place it closer to *S. tamburensis* but the axillary spikes and petiolate, ovate, acuminate leaves readily distinguish it from that species.

*S. saccata* is only known from two collections. Both of these were made in the interior of Nepal at about 2000m, where it was found growing in moist, shaded places in the early autumn. The habitat and flowering season clearly resemble those of *S. tamburensis*, *S. sabiniana* being a plant of the foothills up to 1000m, flowering from January to April.

***Strobilanthes scoriarum*** W.W. Sm. in Notes Roy. Bot. Gard. Edinb. 10: 199 (1918). Type: China, Forrest 8862 (holo. E).

Syn.: *Goldfussia scoriarum* (W.W. Sm.) Bremek. in Verh. Ned. Akad. Wetens. Afd. Nat. 2, 41(1): 234 (1944).

*Strobilanthes shweliensis* W.W. Sm. in Notes Roy. Bot. Gard. Edinb. 12: 224 (1920), **syn. nov.** Type: China, Forrest 16107 (holo. E).

*Difflugosa shweliensis* (W.W. Sm.) E. Hossain in Notes Roy. Bot. Gard. Edinb. 32(3): 406 (1973).

?*Goldfussia medogensis* H.W. Li in Wu Cheng-yih, Fl. Xizangica 4: 413 (1985). Type: Tibet, Quinghai-Xizang (Tibet) Complex Exp. 74-4911 (holo. KUN, n.v.).

In his diagnosis of *S. shweliensis*, William Wright Smith noted that this species differed from *S. scoriarum*, which he had described two years earlier, by its glandular-pubescent calyx. Examination of the type of *S. scoriarum* (Forrest 8862) shows that although this is superficially true it is quite misleading. Forrest 8862 is a very young plant with its bracts still present. Examination of the calyx shows the presence of very young sessile glands and it is quite obvious that these will develop later as so often happens in *Strobilanthes* and other Acanthaceae. In all other particulars the two types are identical so I have reduced *S. shweliensis* to synonymy with *S. scoriarum*, the earlier name. Added confirmation of this view is given by Smith's treatment of Henry 11183, also collected in Yunnan. After his description of *S. scoriarum*, Smith discussed this specimen saying that it 'differs from *S. scoriarum* in its very glandular calyx but is otherwise very like'. No mention of it is made after the description of *S. shweliensis* but at Edinburgh Smith has annotated the sheet 'Strob. shweliensis W. W. Sm. but very imperfect'.

*Goldfussia medogensis* is illustrated in *Flora Xizangica* 4: 412 next to a picture of '*Goldfussia scoriarum*' which much resembles the original type of *Strobilanthes scoriarum*. The inflorescence of *G. medogensis* is exactly that of *Strobilanthes shweliensis* with the glandular calyces shown. Although I have not seen the specimen it seems very probable that it too is conspecific with *S. scoriarum*.

***Strobilanthes setosa* J.R.I. Wood sp. nov.** partis vegetativis setis longis dispersis bene instructis, ramis inflorescentiae filiformis, flexuosis, unifloris et corolla flava, pendula distinctissima. **Fig. 13D–E.**

Type: Burma, *Kingdon Ward* 13572 (holo. BM).

Undershrub at least 50cm high, glabrous except for the scattered, sometimes gland-tipped setae on all vegetative parts. *Stems* erect, glabrescent below, setose above. *Leaves* unequal in each pair, the larger elliptic, acuminate, 6–13.5 × 2–5cm, the smaller ovate, acute, 2.5–4 × 1.5–3cm, both cuneate at the base, serrulate, dark green and with numerous cystoliths above, paler beneath, setose on the margins and veins and with scattered setae on both surfaces; petioles very short, 0.3–1cm long. *Inflorescence* of branched, axillary spikes bearing a pair of reduced leaves at the branching point and forming a lax terminal panicle; ultimate branches filiform, composed of a series of flexuose zigzags, the rhachis looping from sterile bract pair to bract pair, only the terminal pair flower-bearing; internodes 0.4–0.8cm long. *Bracts* paired, linear, one longer than the other, 2–6 × 0.5mm long, glabrous or sparsely setose, persistent; bracteoles linear, 2mm long, deciduous with the flowers. *Calyx* 1.2–1.3cm long, not accrescent, glabrous or with a few setae, cystoliths prominent, divided nearly to the base, the lobes subequal, linear, long-acuminate. *Corolla* pendulous, pale yellow, glabrous, straight, 3.5–4.5cm long, 2mm wide at the base, gradually widened to 10–13mm, inside glabrous, lobes rounded, c.6mm long; filaments glabrous, the shorter pair c.3mm long, the longer pair c.8mm long; anthers ellipsoid, 3mm long, mucous; pollen 3-porate, oblong-ellipsoid, of the ‘Rippenpollen’ type, the ornamentation, shallow, the pores between the ribs, 85 × 35µm. *Style* glabrous, 3.6cm long. *Capsule* 1.5cm long, narrowly oblong, acuminate, 4-seeded; seeds rounded, 3mm long, villous.

Specimens seen:

BURMA. Hills E of Putao, 460m, 10 xii 1937, *Kingdon Ward* 13572 (BM); without locality or date, *Toppin* 3226 (E).

*S. setosa* is a remarkable species on several counts. It is entirely glabrous except for the scattered, usually eglandular, apparently reddish setae on all vegetative parts. More remarkable still is the inflorescence. The ultimate branches bear several sterile bract pairs and a single terminal pendulous flower. The rhachis is filiform and forms a series of flexuose zigzags from bract pair to bract pair. I have seen nothing similar in *Strobilanthes* although the sterile bract pairs are seen on some specimens of *S. helicta* which also has similar bracts. *S. setosa* is probably most closely related to *S. panichanga* (Nees) T. Anders. from the same area since the two species are similar in general character, although the latter has none of the peculiar features of *S. setosa*.

Nothing is known about the habitat of this strange species other than that it is a very local plant of the foothills in North Burma.

***Strobilanthes simplex* J.R.I. Wood sp. nov.** floribus in capitulis densis pedunculatis (pedunculis plerumque simplicibus) terminalis vel axillis foliorum supremis dispositis *S. lamifolia* (Nees) T. Anders. proxima sed bracteis obovatis herbaceis persistentibus quam calyce multo brevioribus distincta. **Fig. 12.**

Type: India, Nagaland, *Kingdon Ward* 18867 (holo. BM, iso. ?NY).

Isophyllous perennial herb probably 30–50cm high. *Stems* decumbent, rooting at the nodes but eventually ascending, slightly sulcate, obscurely bifariously pubescent. *Leaves* equal or nearly so, broadly elliptic or ovate, shortly acuminate, 2.5–7 × 1.3–5cm, base broadly cuneate and shortly decurrent onto the petiole, thinly pubescent on the veins but soon glabrescent, green on both surfaces but paler below, margins serrate or serrulate; petioles 0.3–1cm long. *Flowers* in dense, pedunculate heads, terminal on the main stem or arising from the uppermost leaf axils; peduncles simple or (rarely) trifurcate, leafless except for a pair of leaflets below the head, bifariously pubescent, 2–6cm long; heads slightly elongate, many-flowered, the two leaflets below the flower-head bearing single flowers in their axils. *Bracts* obovate, herbaceous, pubescent, 7–8mm long, persistent till the flowers fall; bracteoles oblanceolate-elliptic, acute and slightly mucronate, 6–7mm long. *Calyx* 1–1.2cm long in flower, accrescent to 1.7cm long in fruit, pilose with large-celled hairs, 5-lobed to the base, lobes linear, subacute, in fruit two lobes c. 1mm longer than the others. *Corolla* blue, glabrous, gently curved, 3.5–3.7cm long, c. 1.5mm wide at the base, gradually widened to 1.3cm, lobes ovate, rounded, c. 7mm long; filaments glabrous, the shorter pair c. 2mm long, the longer pair c. 8mm long; anthers nodding, 1mm long. *Style* glabrous. *Capsule* 11mm long, oblong-ellipsoid, pilose at the tip, 4-seeded; seeds (immature) pilose with mucilaginous hairs, c. 2 × 1.5mm.

Specimens seen:

INDIA. Nagaland: Zakhoma [25°40'N, 94°07'E], 1525m, 16 x 1949, *Kingdon Ward* 18867 (holo. BM, iso. ?NY); Kohima, 1700m, 24 x 1885, *Clarke* 41127 (K); Viswema, Naga Hills, 1800m, 26 viii 1935, *Bor* 5349 (K). Manipur: Kapru, 2150m, xi 1907, *Meebold* 6479 (K).

*S. simplex* is superficially similar to *S. lamiifolia* in having flowers in heads borne on usually simple peduncles which are terminal on the main stem or arise from the uppermost leaf axils. However, it is probably more closely related to *S. discolor* and *S. rhombifolia*. From both of these it can be distinguished by the relatively large bracts which are not deciduous till the plant is in fruit. An additional distinctive feature is the presence of a leaf pair just below the flower-head. There is usually a single flower in each leaf axil and the leaves often form an involucre for the flower-head.

*S. simplex* grows in disturbed places in moist forest between 1525 and 2150m in the Naga and Manipur Hills of Eastern India.

***Strobilanthes straminea*** W.W. Smith in Notes Roy. Bot. Gard. Edinb. 10: 200 (1918). Type: Burma, *Kingdon Ward* 1986 (holo. E).

*S. straminea* is part of the cluster of species closely related to *S. discolor* and *S. rhombifolia* and in some ways forms a bridge between these species and *S. pentstemonoides* and its allies. Like other Group 10 species it has both bracts and bracteoles and these resemble each other. The bracts are obovate, emarginate, 8–9mm long and the bracteoles oblanceolate, 7–8mm long. However, both become scarious as in Group 9, and another resemblance to this group is seen in the slightly elongate median lobe of the calyx.

*S. straminea* can usually be identified by a combination of five main features: the corolla is sparsely glandular-pubescent; it is straw-yellow with pinkish lines; the bracts are glandular-hairy at the tips; the flower-heads are relatively elongate, many-flowered, 2–4cm long; the leaves are glabrous, subsessile and very unequal in each pair (Fig. 12F). Apart from these

features the leaves are unusually variable. In the type they are ovate but plants with lanceolate-oblong leaves are not so unusual, e.g. *Toppin* 4018 (K, E).

*S. straminea* appears to be restricted to the Kachin Hills in Burma from which all specimens listed below come.

Specimens seen:

BURMA. 40 miles S of Putao, 600m, 22 xii 1914, *Kingdon Ward* 1986 (E); valley of the Nmai Wsa, 900m, 17 xi 1919, *Kingdon Ward* 3726 (E); Nam Tamai, 1200–1500m, 6 xi 1922, *Kingdon Ward* 5506 (E); *ibid.*, 900–1200m, *Kingdon Ward* 75454 (K); Kachin Hills, 300–450m, 1 xii 1930, *Kingdon Ward* 9008 (BM); *ibid.*, 600m, 5 xii 1930, *Kingdon Ward* 9024 (BM); *ibid.*, 450m, 9 xii 1930, *Kingdon Ward* 9031 (BM); Hills S of Fort Hertz, 600–900m, 22 xii 1931, *Kingdon Ward* 10223 (BM); without exact locality, *Toppin* 4018 (E, K); Kachin Hills, *Toppin* 4116 (K); N of Myitkyina on road to Kaupti Long via Mali Hka branch, Kachin Hills, *Toppin* 4307 (E, K); between Mache Ga and Tsuptang, Sumprabum to Kuman Range, Kachin State, 1200–1800m, 26 xii 1961, *Keenan, U Tun Aung & Tha Hla* 3041 (K); between Tsuptang and Kanang, 1200–1800m, 27 xii 1961, *Keenan, U Tun Aung & Tha Hla* 3014 (E).

*Strobilanthes subnudata* C.B. Clarke in Hook.f., Fl. Brit. India 4: 472 (1885). Type: Sikkim, *Hooker* 29 (lecto. K, chosen here).

Syn.: *Pteracanthus subnudatus* (C.B. Clarke) Bremek. in Verh. Ned. Akad. Wetens. Afd. Nat. Sect. 2, 41(1): 200 (1944).

*S. subnudata* has been known only from the type collection for well over a century, but examination of material at the Natural History Museum, London and elsewhere shows that it is quite widespread in East Nepal.

Specimens seen:

NEPAL. Jiri-Those, on shady slopes, 1829m, 23 ix 1964, *Banerji et al.* 2885 (KATH, BM); Dudh Kosi Valley, 1km W of Lukla [27°41'N, 86°44'E], among shrubs in meadows near streams, 2750m, 1 x 1974, *de Haas* 2885 (BM); Sankhuwasabha District, below Tashigaon [27°36'N, 87°15'E], 1900m, 23 ix 1991, *Long et al.* EMAK 179 (E); Salpa Pass, 3658m, 20 xi 1950, *Tilman* s.n. (BM); hill above Lumle, grassland amongst bushes, 2105m, 11 xii 1974, *Dawson* 279 (BM); above Siklis School [28°01'N, 84°06'E], 2500m, 29 viii 1976, *Troth* 1004 (BM); Ulleri Pass, 2300m, 28 viii 1967, *Lange* 13 (K).

SIKKIM. Lachung, 2743m, 16 viii 1849, *Hooker* 29 (lecto. K); without exact locality, *Hooker* s.n. (K).

DARJEELING. Patasi below Tanglu, 1829m, 1 iv 1975, *Chamberlain* 44 (E).

*S. subnudata*, like *S. lachenensis*, seems to be a plant of grassy bushland, possibly making use of bushes as protection from grazing. It seems to begin flowering during the monsoon but to continue much longer than related species. Like *S. lachenensis* it occupies a wide altitude range, being found between 1829 and 3658m.

*S. subnudata* is usually easily recognized by its low stature (less than 20cm high), small elliptic leaves and short, simple terminal spikes. It has often been confused with *S. wallichii* but is immediately distinguished by the short, naked spikes which contrast strongly with the leafy spikes of *S. wallichii*. The middle bracts are quite variable but always small, about 5–10 × 2–5mm in size and conspicuously shorter than the calyx. Close examination of the calyx also shows that one lobe is distinctly longer than the others, and this contrasts with the subequally 5-lobed calyx of *S. wallichii*.

***Strobilanthes tibetica*** J.R.I. Wood, **sp. nov.** ex affinitate *S. pterygorrhachis* C.B. Clarke sed lobii calycis brevioribus usque 12mm longis, subacutis vel obtusis, rachidi inflorescentiae anguste alata et capsula subglabra distincta. **Fig. 13A–C.**

Type: Tibet, *Kingdon Ward* 10942 (holo. BM, iso. E).

Undershrub c.1.5m high, growing gregariously and probably plietesial. *Stems* glabrous or obscurely bifariously pubescent, weakly quadrangular. *Leaves* subequal, ovate or elliptic, shortly acuminate, slightly falcate, 7–14 × 3–9cm, base long-cuneate and decurrent nearly to the base of the petiole, margin strongly serrate, above green with conspicuous cystoliths, nearly glabrous except for a few scattered, short hispid hairs and a strigose or scurfy midrib, beneath paler, nearly glabrous except for a few hairs near the base of the midrib; petiole 1–3cm long, very sparsely pilose. *Inflorescence* of 1-sided axillary spikes, 4–12cm long, sometimes reduced to solitary flowers in the leaf axils; rhachis finely puberulent to glandular pilose, straight or obscurely zigzag, winged, the wing 0.25–1mm wide. *Bracts* glabrous, variable in development: lower bracts leaf-like, ovate, acuminate, petiolate, 1.5–2.5cm long, the petioles up to 4mm long; upper bracts narrowly oblong-elliptic, acuminate, sessile, 1–1.2cm long; bracteoles oblong, obtuse, 2.5–4mm long. *Calyx* 0.9–2cm long, apparently not accrescent, subequally 5-lobed to c.1mm above the base, the lobes linear, obtuse, almost colourless, glabrous or sparsely glandular-pilose. *Corolla* in bud silky-grey; in flower violet, pubescent, 3.2–4cm long, strongly inflated from just above the base and widened to c.1.5cm in the middle and there bent 90° but not narrowed at the mouth, inside glabrous, the lobes ovate, rounded or weakly emarginate, 5mm long, 7mm wide. *Stamens* 4, didynamous; filaments all equal in length, 2.5mm long, glabrous; anthers 1.5mm long, included; pollen ellipsoid. *Style* c.2cm long, glabrous or with a few hairs; ovary pointed, glabrous. *Capsule* 1.1–1.2cm long, glabrous, oblong, apiculate, 4-seeded; seeds oblong, 3 × 2mm, covered in stiff white hairs.

**Specimens seen:**

CHINA. Tibet: Putsang River in Rong Tö Valley, Zayul [28°28'N, 97°02'E], 2338m, 2 xi 1933, *Kingdon Ward* 10942 (holo. BM, iso. E).

INDIA. Arunachal Pradesh: Delei Valley [28°15'N, 96°35'E], 2338–2743m, 26 ix 1928, *Kingdon Ward* 8674 (K). Nagaland: Japvo, 2591m, 29 ix 1935, *Bor* 6508 (K).

*S. tibetica* is an apparently rare forest plant growing along the borders of Tibet and north-eastern India at an altitude of about 2500m. It is gregarious and probably plietesial, as Kingdon Ward observed in 1928 that although it was abundant he could only find a single plant in flower. It is clearly related to *S. pterygorrhachis* C.B. Clarke in having a distinctly winged inflorescence rhachis, but can be easily distinguished by its glabrous capsule, subacute or obtuse calyx lobes and smaller dimensions.

The closely related species *S. pterygorrhachis* is a truly remarkable plant but has never been found in flower except by C.B. Clarke in 1885. Clarke's specimens show a plant with ovate-elliptic leaves about 17 × 11cm when fully developed, an inflorescence rhachis 15–20cm long, huge oblong-elliptic calyx lobes 2.6–3.2cm long with a remarkable acuminate tip and an oblong, pointed capsule with a curious dense tuft of short hairs at the tip. *S. pterygorrhachis* is totally unmistakable and it is strange that it has never been recollected in flower in over a hundred years. The only other collection (*Bor* 6) made in 1930 is of a sterile plant recognizable





FIG. 13. *Strobilanthes tibetica* J.R.I. Wood. A, habit,  $\times \frac{2}{3}$ ; B, corolla,  $\times 1.3$ ; C, capsule and calyx,  $\times 2$ . *S. setosa* J.R.I. Wood. D, habit,  $\times \frac{2}{3}$ ; E, calyx,  $\times 2$ . *S. imlayae* J.R.I. Wood. F, habit,  $\times \frac{2}{3}$ ; G, bract,  $\times 2$ . *S. kingdonii* J.R.I. Wood. H, habit,  $\times \frac{2}{3}$ . *S. saccata* J.R.I. Wood. I, habit,  $\times \frac{2}{3}$ . A–C from Kingdon Ward 10942; D–E from Kingdon Ward 13572; F–G from Kingdon Ward 22662; H from Kingdon Ward 7654; I from Flatt 106. Drawn by Mary Bates.

by the distinctive large leaves with the note 'This plant forms extensive societies in Oak-Magnolia forest at 7–8000 ft. [in the] Naga Hills. I have not been able to collect flowers or fruits.' Quite clearly from this comment, *S. pterygorrhachis* is, like *S. tibetica*, a locally abundant, plectesial species perhaps subdominant on the forest floor.

There is a third, undescribed species related to *S. tibetica* and *S. pterygorrhachis*. This is represented by one sheet at Kew, without number, collected by Bor in the Naga Hills in 1935. This also has the distinctive winged rhachis but is readily distinguished by the small leaves (c.4.5 × 3cm), pubescent beneath, the suborbicular, rounded lower bracts and the densely glandular inflorescence. Although there are plenty of corollas on the specimen, there are no capsules and no other details and I am reluctant to describe a new species from material of this sort.

***Strobilanthes tubiflos* (C.B. Clarke) J.R.I. Wood, comb. et stat. nov.**

Basionym: *Strobilanthes petiolaris* var. *tubiflos* C.B. Clarke in Hook.f., Fl. Brit. India 4: 458 (1885). Type: India, Arunachal Pradesh (Mishmi Hills), Griffith K.D. 6095 (lecto. K, chosen here).

Clarke cited two collections (Griffith K.D. 6095 and K.D. 6102) as types of *S. petiolaris* var. *tubiflos*. Both were collected in the Mishmi Hills in Arunachal Pradesh. I have selected the former as lectotype, simply because it is a better specimen.

Clarke believed his variety to be 'very possibly a distinct species' and I am sure he was right in this. The broadly obovate, truncate, usually emarginate, densely glandular bracts are very distinct and unlike those of any other species in Group 2. It is unfortunate that neither specimen has fully developed corollas but they appear to be funnel-shaped and gradually widened from the base as in *S. himalayana*, rather than cylindrical and then widened below the mouth as in the other species in this group. There seems no real doubt about the status of this plant and I have therefore made the appropriate change above.

***Strobilanthes unilateralis* J.R.I. Wood sp. nov.** floribus in spicis secundis dispositis et corolla valde inflata flexaque ad *S. inflatam* Nees accedens sed foliis bracteisque glabris et calyce longiore statim distincta; ad *S. pterygorrhachem* C.B. Clarke tam accedens sed rachidi inflorescentiae haud alata, foliis angustioribus et ovario capsulaque glabra distinguenda.

Type: Burma, Kingdon Ward 21576 (holo. BM).

Undershrub ?c.1m high ('big' fide Kingdon Ward). Stems somewhat zigzag, glabrous, weakly quadrangular. Leaves slightly unequal in each pair, oblong, acuminate, 5–12 × 2–5.5cm, base long-attenuate, margins dentate, glabrous on both surfaces, cystoliths numerous above but inconspicuous beneath; petioles 7–15mm long. Inflorescence of lax, simple or branched, 1-sided, pedunculate, axillary spikes 14–21cm long; peduncle 2.5–5cm long; rhachis usually geniculate at the first node, thereafter straight, indistinctly winged, glabrous when young, glandular-pubescent when older; flowers sessile, mostly 1–2cm apart. Bracts glabrous, variable in size and shape becoming smaller and more oblong towards the spike tips: lowermost bracts leaf-like, petiolate, ovate, 2–3cm long, serrate, the petioles 3–4mm long; upper bracts sessile, obovate, elliptic or oblong, 0.7–1.4cm long, usually with 1–2 marginal teeth; bracteoles oblong, 2–3.5mm long. Calyx subequally 5-lobed to c.2mm above the base, at anthesis glabrous, c.1cm long, in fruit glandular-

pubescent, accrescent to 1.5cm, lobes linear, obtuse, pale-margined. *Corolla* violet, densely pubescent, 2.5–3.2cm long, at the base c.1.5mm wide, then strongly ventricose and widened to c.1.3mm around the middle where bent 90° and slightly narrowed at the mouth; inside glabrous, the lobes suborbicular, rounded, c.5mm long and 6mm wide. *Stamens* glabrous, included, the longer pair of filaments 5–6mm long, the shorter pair 3–4mm long; anthers oblong, 4mm long, acute at the base; pollen shortly ellipsoid. Ovary glabrous. *Style* c.1.8cm long, sparsely glandular-hairy below. *Capsule* 1.5–1.9cm long, narrowly oblong, glabrous, 4-seeded; seeds broadly elliptic, 3mm long, pilose with mucilaginous hairs.

Specimens seen:

BURMA. North Triangle: Hkinlum, 1067m, 25 viii 1953, *Kingdon Ward* 21280 (BM); Wring Bum, above Ahkail, 2338m, 11 xi 1953, *Kingdon Ward* 21576 (holo. BM).

*S. unilateralis* is clearly related to other species in Group 6. The densely pubescent corolla which appears grey-silky in bud clearly recalls those of *S. inflata* and *S. pterygorrhachis*, but *S. unilateralis* is readily distinguished from the former by its glabrous leaves and bracts and from the latter by its narrower, more acuminate leaves, the poorly developed wing on the inflorescence rhachis and by its entirely glabrous ovary and capsule. The very long, often branched spikes serve to distinguish it from both species.

*S. unilateralis* is a gregarious forest plant probably found usually between 2000 and 2500m. *Kingdon Ward* 21280 was collected in a river-bed and it seems likely that seed was washed down from higher altitudes. It seems probable that this is another plietesial species.

***Strobilanthes wallichii*** Nees in Wall., Pl. Asiat. Rar. 3: 87 (1832). Type: Nepal, *Wallich* 2371a (iso. K-W, K, E).

Syn.: *Ruellia alata* Wall., Pl. Asiat. Rar. 1: 26 (1830), non *Strobilanthes alata* Blume (1826). Type: as for *Strobilanthes wallichii*.

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

*Strobilanthes wallichii* var. *microphylla* Nees in A. DC., Prodr. 11: 193 (1847). Type: India, Uttar Pradesh (Kumaon), *Wallich* 2371b (iso. K-W).

*Strobilanthes atropurpurea* Nees in Wall., Pl. Asiat. Rar. 3: 86 (1832), **syn. nov.** Type: Nepal (?), *Wallich* 2398 (iso. K-W).

*S. wallichii* is one of the most widespread species in the whole genus. It is distributed along the entire Himalayan chain from the Indus River in Pakistan to Hupeh Province in China, with an outlying station on Mount Victoria in Burma (*Cooper* 5930A). *S. wallichii* is also one of the most variable species and over its wide range there is a bewildering array of forms.

Examination of the type material cited above leaves little doubt that the various names all represent a single species so I have no hesitation in reducing them to synonymy under the best-known name, *S. wallichii*. This, however, is a simplistic solution to what is in fact a very complex situation.

In the Western Himalaya (Pakistan and Northern India) *S. wallichii* has long been known as a plietesial species flowering in a 12-year cycle. This was first observed by Edgeworth and mentioned in a footnote by Nees (1847: 193), but more detailed accounts of the periodic

gregarious flowering were given by Kanjilal (1901: 260), Gamble (1902: 518–519), Parker (1924: 387–388), and A.E. Osmaston (1927: 395), all of whom knew the plant in the field in the Kumaon and Simla areas. However, in the wetter Eastern Himalaya *S. wallichii* behaves as a perennial species, flowering annually but not dying. When I first became aware of this situation, I attempted to equate the plietesial plants of the Western Himalaya with Nees' var. *microphylla*, knowing that the type came from Kumaon. However, examination of *Wallich* 2371b and other material from the Western Himalaya shows that although there exists in the Western Himalaya a more vigorous plant with better-developed lateral spikes, larger calyces and larger corollas than the East Himalayan plant, the differences are marginal and not constant in all West Himalayan specimens.

Examination of the literature shows that in the East Himalaya (Sikkim, Bhutan, Tibet, China, Burma and Arunachal Pradesh) only one species has ever been recognized. However, from Nepal westwards two species have generally been recognized, although some authors (Collett, 1902: 374; Parker, 1918: 387; Blatter, 1929 (2): 103) accepted only one, *S. atropurpurea*, with *S. wallichii* var. *microphylla* reduced to synonymy and var. *wallichii* excluded. Those authors that accepted two species all alluded to the fact that they were very similar, and two authors who apparently knew the plant in the field (Parker, 1924: 387–388 and A.E. Osmaston, 1927: 394–396) kept *S. wallichii* separate on the grounds of its paler flowers and perennial, overwintering stem. The flower colour is not obvious on herbarium specimens and I have only seen the stem on one specimen (Parker 19618).

Field observation of an unrelated East Himalayan species, *S. divaricata*, led me to an explanation of the variation observed in the West Himalaya. As with many plietesial species, occasional plants of *S. divaricata* could be found in flower in most years (Wood 6071, 7516), but when I was able to compare these collections with those made in 1992, a year of mass flowering, I found that specimens collected in 1992 (Wood 7574, 7577, 7582) had leaves and corollas almost twice the dimensions of the plants collected in the non-flowering years. Examination of specimens of other known plietesial species from the Himalaya show similar variation. There appear to be vigorous examples of *S. echinata* and *S. helicta* which contrast with non-vigorous specimens, but as the data are so incomplete, I cannot say whether the specimens were collected in flowering or non-flowering years. The two forms are often so distinct that they appear to be different species. Less vigorous forms of *S. echinata*, for example, have obtuse calyx lobes (Cooper 1168) whereas more vigorous forms have fimbriate lobes (Wood 7271, 7380).

I am, therefore, of the opinion that the more vigorous, better-developed specimens of *S. wallichii* collected in the Western Himalaya simply represent plants behaving in a plietesial manner collected in a year of gregarious flowering. East Himalayan specimens and those collected in the west in a non-flowering year have smaller corollas, shorter calyces, less-developed axillary spikes and decumbent stems with the leading shoots dying back each year.

C.B. Clarke seems to have had a different concept of *S. atropurpurea* from that of Parker and Osmaston. He seems to have used this name for a plant with thick, fleshy, hairy, herbaceous stems, ovate, hairy leaves and flowers sessile in the leaf axils. This does not correspond to the type of *S. atropurpurea* (Wallich 2398) and intergrades with more typical forms of *S. wallichii*.

Although some specimens do look rather distinct I do not feel it right to recognize them as a distinct variety.

Although only one species has ever been recognized in the East Himalaya there is a good deal of variation in this region too. Forms corresponding to the type of *S. wallichii* are quite widespread, for example *Cooper* 2671 from Bhutan or *Cooper* 5930A and *Farrer* 1247 from Burma; indeed these typical plants are the only forms I have seen from Burma. However, at high altitudes in the East Himalaya the common form is a plant with small, ovate, acute leaves with the flowers apparently solitary in the leaf axils. This is perhaps an adaptation to semi-exposed habitats at the upper forest limit and certainly these plants intergrade with more typical forms.

In China there is yet another form. I have seen few specimens of this but it is characterized by the production of delicate axillary, flowering spikes which often develop poorly so the flowers are apparently congested near the tops. All Chinese material I have seen seems to belong to this form, of which I take *Forrest* 17620 from Yunnan and *Henry* 7053 from Sichuan to be good examples.

Much the most unusual form of *S. wallichii* I have seen comes from Nepal and is represented by *Long et al.* EMAK 413 and *Stainton* 3974. In this the flowers are congested towards the top of the stem so forming a condensed, head-like spike. This may well be worthy of recognition at varietal level but further collections will be needed before this can safely be done.

Listed below are specimens in the main British herbaria which represent the different forms discussed above:

Plants with thickened, apparently erect stems:

*Parker* 19618 (BM)

Very vigorous, presumably plietesial plants:

*Beesion* 1015 (K); *Duthie* 5877 (BM); *Duthie* 5878 (BM); *Gulab Rai* 27175 (K); *Lace* 1723 (E); *Madden* 365 (E); *B.B. Osmaston* 25013 (K); *A.E. Osmaston* 1140 (K); *Parkinson* 4124 (E); *Polunin, Sykes & Williams* 204 (BM); *Reid* s.n. (E); *Stainton, Sykes & Williams* 1972 (BM); *Stewart* 6393 (K); *Strachey & Winterbottom* 4 (BM).

Plants with thickened, hairy, herbaceous stems (*S. atropurpurea* sensu C.B. Clarke):

*Clarke* 23037 (K); *Drummond* 22745 (K); *Drummond* 22746 (K); *Gamble* 26960 (K); *Imayet* 22079 (K); *Kirkpatrick & McBeath* 1797 (E); *Parkinson* 4075 (E); *Thomson* s.n. (K).

Plants with flowers apparently sessile in the leaf axils:

*Bedi* 597 (K); *Bowes Lyon* 3435 (BM); *Clarke* 10014 (K); *Clarke* 12224 (BM); *Grierson & Long* 2617 (E); *Kingdon Ward* 11962 (BM); *Ludlow & Sherriff* 245 (BM); *Ludlow & Sherriff* 16845 (BM); *Ludlow & Sherriff* 19274 (BM, E); *Ludlow & Sherriff* 21307 (BM); *Stainton* 594 (BM); *Stainton* 811 (BM); *Wood* 6411 (E).

Plants from China with delicate axillary spikes with the flowers clustered towards the tips:

*Forrest* 17620 (E, K); *Henry* 7053 (E, K); *Wilson* 2538 (K).

Plants with flowers in pseudo-terminal heads:

*De Haas* 2348 (BM); *Long et al.* EMAK 413 (E, KATH); *Stainton* 3974 (BM); *Stainton, Sykes & Williams* 8489 (BM).

***Strobilanthes xanthantha*** Diels in Notes Roy. Bot. Gard. Edinb. 5: 163 (1912). Type: China, Yunnan, *Forrest* 4550 (holo. E).

Syn.: *Championella xanthantha* (Diels) Bremek. in Verh. Ned. Akad. Wetens. Afd. Nat. Sect. 2, 41(1): 151 (1944).

For some time I have been puzzled by *S. xanthantha* because of the unusual yellow flowers which give the species its name. Examination of the type material shows that it is a species having flowers in terminal spikes with one calyx lobe longer than the others. It is clearly, therefore, a Group 7 species and is closely related to *S. forrestii*. The corollas, however, are faded and it is impossible to tell their original colour, although the field note clearly records that they are yellow. Yellow corollas are however unknown amongst any related species so I was not surprised to find that *Forrest* 4552 collected from the identical locality and quite clearly conspecific with *S. xanthantha* is recorded as having purplish-blue corollas. The colour can still be made out on the dried specimen. I suspect, therefore, that the type was described as yellow by mistake and that search for further material of this species on the eastern flank of the Dali Range should concentrate on blue-flowered plants.

*S. xanthantha* can be immediately distinguished from *S. forrestii* by its petiolate leaves and elliptic-oblong bracts but is very close to *S. nemorosa* and *S. lachenensis* and may well be conspecific with them. However, in the absence of further Chinese material I am reluctant to make a formal decision.

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