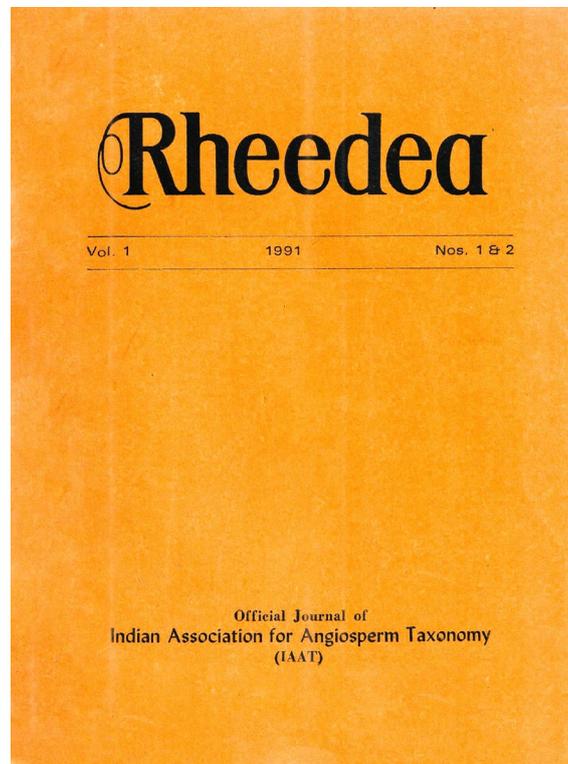




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Comments on *Torenia* (Scrophulariaceae), with a new species from Sarawak

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Abstract

Torenia cyrtandriflora B. L. Burtt is a new, large-flowered species from central Sarawak. Its calyx is divided to just beyond the middle into 5 subequal lanceolate - acuminate lobes, the tube is strongly nerved but not winged; the corolla has a ring of hairs inside the tube, shortly above its base; the disc is undulate at the top and split to the base on one side; the ovary is glabrous at the top and smoothly tapered into the style. These features distinguish the species from sect. *Torenia*. A broad corolla tube and non-costate seeds militate against its inclusion in *Schizotorenia* Yamazaki. The limits of *Torenia* are discussed. It is shown that the type species, *T. asiatica* L., came from Canton and is an earlier name for *T. glabra* Osbeck. Notes are given on *T. cordata* (Griff.) Dutta and *T. travancorica* Gamble. *T. aerinea* Alston, from Sri Lanka, is reduced to a synonym of *T. courtallensis* Gamble.

Generic classification around *Torenia* L. (Scrophulariaceae-Gratioleae) has long been a fruitful ground for taxonomic discussion. The discovery of a new species in the rain - forest of central Sarawak does nothing to relieve that situation, for, despite an obvious superficial resemblance to the type of the genus, *T. asiatica* L., it has a number of anomalous features. The new species, here named *Torenia cyrtandriflora*, is distinguished by the following combination of characters: scrambling habit; calyx divided just beyond the middle into 5 subequal, lanceolate - acuminate lobes, the tube ribbed but not winged; corolla 4-6 cm long, with a band of hairs inside just above the base; filaments of anterior stamens with a well - developed sterile appendage; disc undulate at upper margin, split on one side; ovary glabrous, passing smoothly into the style (no constriction nor hairs near top of ovary, no bend at base of

style), with some minute hairs inside at the base (cf. Yamazaki 1954, fig. 4:5); seeds suborbicular, 'papillate' with remains of outer cell wall (cf. Yamazaki 1955a).

The large flowers and appendiculate anterior filaments immediately suggest that this species should be placed in sect. *Torenia*. That section, however, is further characterized by a slight constriction near the top of the ovary, while the top itself is scabro-pubescent and the base of the style is bent (cf. Yamazaki 1954, fig. 4:4). Sect. *Anodous* Fournier differs from sect. *Torenia* only in the lack of an appendage on the lower filaments. It is, perhaps, over - ranked at section level. Madagascar species may lack a filament appendage (Bonati 1926), but scarcely belong in the same section as *T. fournier* Linden, the type of sect. *Anodous*.

Glabrous ovary and straight style are found in *Schizotorenia* Yamazaki, a genus

of two species, one in Viet-nam, one in Malaya. This genus also has the calyx divided into 5 segments as in *T. cyrtandri-flora*. However, its distinguishing features are the long corolla-tube, tapering downwards, and the 8-ribbed seeds of the type species *S. finetiana* (Bonati) Yamazaki (Yamazaki 1978). I am not clear whether seeds of the Malayan *S. atropurpurea* (Ridley) Yamazaki have yet been available for study.

The comparison of *Torenia cyrtandri-flora* with *Schizotorenia* shows that this new species considerably reduces the gap between *Schizotorenia* and *Torenia* sect. *Torenia*, and the generic status of *Schizotorenia* will have to be evaluated afresh when *Torenia* itself is more comprehensively defined.

The difficulty, as so often, is that generic limits have been drawn with different emphasis in different regions, and there is no definition of *Torenia* on a world-wide basis. Yamazaki (1955 b, c), working on the species of eastern Asia, separated *Torenia* from *Lindernia/Vandellia* on the size of the corolla: 15–30 mm long in *Torenia*, 8–10 mm long in *Lindernia/Vandellia*. When describing the small-flowered *Torenia lindernioides* from western peninsular India, Saldanha (1967) preferred to go back to the criterion proposed by Pennell (1943), that in *Lindernia* the tips of the calyx-lobes spread away from the capsule, whereas in *Torenia* they invest it completely.

A further complication has recently been added to the African end of the genus. Hepper (1987) and Philcox (1987, 1990) have restricted *Craterostigma* Hochst., to rosette plants, and have transferred the caulescent species to *Torenia*, where some of them had originally been placed. The first action may well be correct, the

second is almost certainly wrong. There is at least one good floral character to separate the caulescent species from *Craterostigma*: in that genus the appendage to the anterior anthers is fused to the corolla, in the caulescent species it is free. The appendage (when present) is also free in *Torenia* but there it is slender and not coloured yellow: in the caulescent *Craterostigma* it is a yellow knob and clearly functions as a dummy anther. The difference between the fused anther-appendage in true *Craterostigma* (also a yellow dummy anther) and the free one of *Torenia polygonoides* has already been the subject of an elegant developmental study (Magin et al. 1989). It must be pointed out that *Torenia polygonoides* has justifiably been segregated as *Lepazgia polygonoides* (Benth.) Yamazaki (Yamazaki 1955c). However, the distinctive features of *Lepazgia* lie in the calyx rather than in the anther-appendages, which do not seem to differ from those of *Torenia* proper.

Reverting to the African caulescent *Craterostigma*, it should be added that neither the subtire leaves with weak venation nor the densely bracteate subcapitate inflorescences show any likeness to *Torenia*.

An interesting feature of *Torenia cyrtandri-flora* is the ring of hairs towards the base of the corolla-tube. At first this was thought to be a unique feature in the genus, but more thorough search has revealed its presence in *T. benthamiana* Hance and it is described by Bonati (1927) for his *T. hirsutissima*: both these species belong to sect. *Torenia*.

Against this rather tangled generic background it would be unwise to insist that *T. cyrtandri-flora* must immediately have a separate section to accommodate

its unique combination of characters. Better to wait until a much wider, more broadly based, classification of the genus can be undertaken. That will require a massive accumulation of data on the detailed structure of flowers, fruits and seeds of all species.

Torenia cyrtandriflora takes its name from the extraordinary resemblance of its flowers to those of an as-yet-undescribed species of *Cyrtandra* from north-east Kalimantan; for this the reciprocal epithet *toreniiflora* will be irresistible. *T. cyrtandriflora* has been collected three times in central Sarawak; twice in the Hose mountains, which lie between the Balleh and Balui rivers (the two largest tributaries of Batang Rejang), and once a little further north between the Balui and the Linau. There is also an unlocalized specimen collected in Kalimantan by Korthals. The plant has a scrambling habit, the long stems making their way up through and over bushes along stream-banks or at the foot of cliffs. Unfortunately I did not investigate the rootstock. The flowers are large and conspicuous but not produced freely. Colour notes for the collections vary somewhat, they are: 'inside of limb white or pink flushed, upper part of tube with dark red dorsal mark' (B. 5069); 'corolla with deep yellow tube, limb pale purple, white in throat' (B. 1134); 'corolla palest mauve, orange in throat, paler than previous collection' (B. 12782).

Torenia cyrtandriflora B. L. Burtt, *species nova* grandiflora nulli arcte affinis, combinatione characterum sequentium distinguenda. Habitus perennis, subscandens; calyx paulo ultra medium in segmenta 5 subaequalia divisus (nec bilabiatus), tubo costato (nec alato); corollae tubus interne paulo supra basin annulo pilorum praeditus; filamenta antica prope basin

appendicem 3 mm longam gerentia; ovarium apice glabro in stylum rectum leniter transeuns (nec sub apice leviter constrictum et apice ipso scabro-pubescent, stylo basi paulo curvato).

Herbaceous scrambler, to 2 m (but actual stems much longer); *stems* 4-ridged, internodes often c. 10 cm long, glabrous, nodes shortly pubescent. *Leaves* opposite; petiole 5–10 mm long, grooved above and there sparsely pubescent; lamina ovate-lanceolate to ovate or ovate elliptic, always acuminate, 7–12.5 × 2–4 cm, at first very sparsely pubescent above (especially along the midrib), glabrescent, lower surface glabrous, margins sharply serrate, teeth c. 1.5 mm long with pointed incurved tips. *Inflorescences* racemosely subumbellate, commonly 4-flowered, at first terminal later displaced to a pseudoaxillary position by sympodial growth of the shoot. *Bracts* linear-filiform, c. 8 mm long. *Pedicels* 3.5–4.5 cm long, glabrous. *Calyx* glabrous, c. 2.5 cm long at flowering, 3 cm in fruit, divided to just below the middle into 5 lanceolate-acuminate segments c. 1.5 cm long, tube 1 cm, the midribs of the segments forming ridges on the tube. *Corolla* 4–6 cm long; tube c. 4 cm to lateral sinus, glabrous inside except for a band of hairs, 2 mm wide and 7.5 mm above the base, there is also a patch of corrugated tissue between the bases of the anterior filaments; upper lip 10 × 11 mm, rounded, notched at tip; lower lip 3-lobed, laterals 11 × 16 mm, median 14 × 20 mm, all rounded. *Posticous stamens* arising c. 26 mm above base of corolla; filaments simple, 3 mm; anthers 3 mm across; anterior stamens arising within the throat of the corolla, filaments 11 mm long, with a sterile branch 3 mm above base, 3 mm long the upper 1 mm, darker and globular-papillate. *Anthers*

1.75 mm across; all filaments flat expanding at tip to form flat triangular head; all anthers with widely divergent thecae,

sterile near acutely pointed tips, scabropapillose, each theca dehiscing by single median slit. Disc 1.25 mm high, undulate

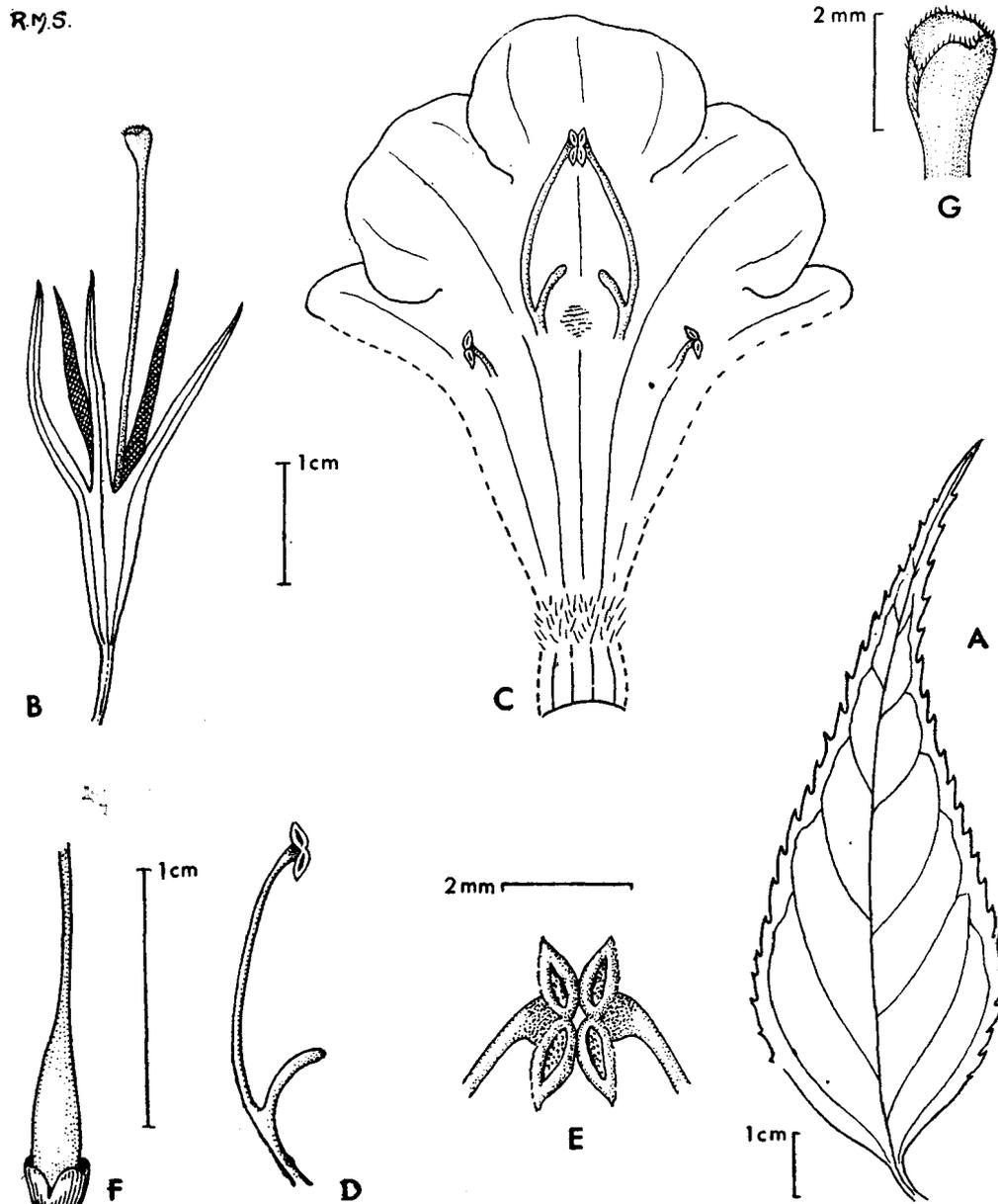


Fig. 1. *Torenia cyrtandriiflora* B. L. Burtt. A, leaf; B, calyx with style and stigma; C, corolla, dissected; D, anterior stamen; E, pair of anterior anthers; F, ovary and gland, showing base of style; G, stigma. (from dried material of *Burtt* 5069).

on upper edge, split on one side. *Ovary* 7 mm long, cylindrical, conic at tip, quite glabrous, passing smoothly into 27 mm, straight glabrous style; stigma bilobed, the lobes rounded, ciliate on the margins. *Capsule* c. 2.5 cm long, completely invested by the calyx, the tips of the segments projecting beyond it, seemingly dehiscing by irregular breakdown of wall (old fruits only seen). *Seeds* numerous, nearly suborbicular 0.5×0.4 mm, 'papillate' with dried remains of outer cell walls.

Type: Sarawak, 7th div., Kapit distr., SE end Hose Mts, near Ulu Melinau falls, c. $2^{\circ}6'N$, $113^{\circ}42'E$, 22. 8. 1967, *Burtt & Martin* 5069 (holo. E; iso BO, SAR).

Sarawak. Seventh div., Belaga distr., Linau-Balui divide, Bukit Dema, c. $2^{\circ}25'N$, $114^{\circ}12'E$, 28. 8. 1978, *Burtt* 11343 (E); Kapit distr., S. Hose Mts. E of Bukit Sanpandai, c. 4500ft, 3. 4. 1980, *Burtt* 12782 (E).

Kalimantan. *Sine loc.*, *Korthals* (L, sheet 908232-1539).

Notes on other species.

Before describing *Torenia cyrtandri-flora* it was necessary to learn something about the genus, especially about the type species, *T. asiatica*. This proved to be quite an intricate investigation, which is set out below. It is followed by notes on *T. cordata*, *T. courtallensis* and *T. travancorica* which seemed worth putting on record.

Torenia asiatica L., Sp. Pl. 2: 619 (1753) excl. syn. & Gen. Pl. ed. 5, 270 (1754); Osbeck, Voyage to China and E. Indies (trans. J. R. Forster) 337 (1771); Lam., Tab. Encycl. Meth. t. 523 f. 1 (1797). Lectotype: LINN 770.1 (LINN).

Syn.: *Torenia glabra* Osbeck, Dagbok ofwer en Ostindsk Resa 210 (1757); Reise nach Ostindien und china (trans. Georgi) 275 (1765); Merrill in Amer. J. Bot. 3: 586 (1917) excl. syn.

The name *Torenia asiatica* L. has had a tortured history. Linnaeus recorded the plant given to him by Toren, a ship's chaplain and one of his botanical students, as coming from India and equated it with the 'Kaku - pu' of *Hortus Malabaricus* (Rheede 1689).

For a long time *T. asiatica* was therefore accepted as an Indian species and when *The Flora of British India* was written (Hooker, 1884) it was recognized as a complex one with several varieties. Perhaps it was Gamble who first realized that Linnaeus's name had from the beginning covered to different plants. In his *Flora of Madras* (Gamble 1923) he omitted *T. asiatica* altogether, assigned materials previously referred there to other species (chiefly to one he himself proposed, *T. travancorica* Gamble) and suggested that 'Kaku-pu' was *T. bicolor* Dalzell. Alston (1931) followed Gamble's lead and removed the name *T. asiatica* from the Ceylon flora. However, Stearn (1951) maintained *T. asiatica* for *T. bicolor*, holding that this agreed with both Rheede's 'Kaka-pu' and Linnaeus's specimen. Stearn's view had to be abandoned, however, when it became clear that the specimen given by Toren to Linnaeus could not have come from India. The name *Torenia* first appeared in a thesis *Nova Genera Plantarum* defended by Chenon on 19 Oct. 1751. Toren only visited India on his second voyage (1750-1752); the specimen given to Linnaeus must have been collected on his first voyage to China (cf. Saldanha 1967, Nicolson *et al.* 1988), as is amply

confirmed by Osbeck's account (see below). This work had been done from the Indian angle: the correct application of the name to a Chinese plant was, it seems, left to chance! To that we must now turn, and here another name has to be introduced, *T. glabra* Osbeck.

Osbeck's journal of his travels was published in 1757, 5 years after his return. Under the entry for 10 Sept. 1752 there is given a Latin description of *Torenia glabra* a plant that he had collected just outside Canton. The various species described by Osbeck in his journal were largely ignored by later authors and *T. glabra* was not included in the original *Index kewensis*. Merrill (1917) for some unfathomable reason, took up *T. glabra* as the older name for *T. benthamiana* Hance, a species from the same area but distinguished by being densely pubescent all over. For a time his judgment was followed, but later *T. glabra* and *T. benthamiana* were recognized as distinct species. Thus, in the twentieth century two old eighteenth century names have been injected into the Chinese flora: both plants came from around Canton, the area first accessible to European traders.

Osbeck reached Canton on 24 Aug. 1751 a few days after the arrival of Toren, who had left Sweden the previous year and had a long stay on the west coast of India. Either or both of them would probably have known that the genus *Torenia* had been included by Linnaeus in a dissertation shortly to be published. Osbeck and Toren no doubt saw each other frequently while anchored below Canton though it appears that they were not allowed to go plant-hunting together; one always had to remain on board his ship (Hansen & Maule 1973). The two ships arrived back in Sweden on 26 June

1752, and Toren died in 1753. When Osbeck prepared his journal for publication in 1757 he added after the description of *T. glabra*. "It may serve now as a monument of the discoverer, Mr. Toren, and remind his friends of their loss" (Forster's trans.). This shows beyond doubt that Toren's specimen came from Canton. In 1751 the epithet *asiatica* had not yet been applied to *Torenia* by Linnaeus; that was only added in *Species Plantarum* in 1753. It was presumably an oversight that Osbeck did not alter *glabra* to *asiatica* when publishing his journal in 1757, nor eight years later in the German translation, when Schreber, its editor, noted that Osbeck had made some amendments to the original Swedish text. *T. asiatica*, however, was the name used in Forster's English version, which though translated from the German, clearly included some changes of his own. It was unfortunate that Merrill exhumed *T. glabra* Osbeck from the Swedish *Dagbok* without realizing that the name had been corrected to *T. asiatica* in the German and English editions.

Thus there is only one name to be identified. The specimen in the Linnaean herbarium (LINN 770.1) bears the one word *Torenia*: there is no indication of collector or specific name. It is a more or less glabrous plant and the two pieces are quite uniform. Yet in *Species Plantarum* Linnaeus added the note 'Variat foliis glabris et villosis: floribus majoribus et minoribus'; this sounds as though the material he was examining was a mixture of the glabrous plant and the hairy *T. benthamiana*, which has smaller flowers. There is no proof that it is Toren's specimen that we now see in the Linnaean herbarium. It is not impossible that Linnaeus exchanged Toren's mixed gathering for a better one provided by Osbeck. Be

that as it may, LINN 770.1 is clearly the right specimen to take as the lectotype of the species. Osbeck said that *T. glabra* also grew on Dane's island in the estuary. There is at Edinburgh a specimen from just that locality collected in 1824 by W. Brown: it is an excellent match of the specimen LINN 770.1 and it was, from the first, quite correctly identified as *T. asiatica*.

The species to which Chinese specimens of *T. asiatica* are most likely to have been referred, when *T. asiatica* was regarded as an Indian species, is *T. concolor* Lindl. which was originally described from Hong Kong. In Flora Reipublicae Popularis Sinicae (Chin 1979) *T. glabra*, *T. concolor* and *T. asiatica* are each maintained as distinct species. The key to these (translated by Professor Wang Wencai) runs:

- 1a. Calyx short and thick, usually not more than 1.5 cm long at anthesis, not more than 2 cm long in fruit; calyx-teeth triangular; leaf-blade triangular-ovate, slightly longer than wide; corolla blue or blue-purple, lobes without a blue blotch.....2.
- 1b. Calyx long and thin, 1.5—2 cm long at anthesis, 2.5—3 cm long in fruit; calyx-teeth subulate-acuminate; leaf-blade ovate-lanceolate, usually twice as long as wide, seldom suborbicular; corolla dark-purple, lobes of lower lip with a blue blotch on each (Yunnan, Guizhou).....11. **T. asiatica**
- 2a. Corolla exceeding calyx by 4—10 mm; long (Provinces south of Yangze River).....9. **T. glabra**
- 2b. Corolla exceeding calyx 11—21 mm; filament-appendix 2—4 mm long

(Taiwan, Guangdong, Guansi Guizhou).....10. **T. concolor**

The name *T. asiatica* must be transferred to 9. *T. glabra*, and the distinction of this from *T. concolor* is, I think, open to grave doubts. The identity of the plant called *T. asiatica* in this Flora requires careful investigation; it may well be a Himalayan species.

Recently Yamazaki (1990) has described three new species of *Torenia*, from Thailand, Java and Sulawesi respectively. Each of these is compared with '*T. asiatica* L.', but he refers to that as an Indian species and an annual. The new species are all perennials with ovate-lanceolate acuminate leaves; they may well have their true affinity with the group including *T. travancorica*, *T. cyanea* and *T. cordata*; their geographical isolation suggests that specific recognition may be justified, but I have not studied the material. Yamazaki's descriptions, especially of the ovary, make it certain that none of these species is related to *T. cyrtandriflora*.

Torenia cordata (Griffith) Dutta in Bull. Bot. Soc. Bengal 19: 25 (1965).

Treisteria cordata Griffith, Notulae 4: 109 (1854).

Type: Burma, Mergui, Griffith 561 (iso. E). Burma. Tenasserim Div., Tavoy distr., hills west of Paungdaw power Station, c. 14°N 98°30'E, 2400ft, forest floor, Aug. 1961, Keenan, U Tun Aung & Rule 864 (E); *ibidem*, 2500ft, amongst bamboos and shrubs, flowers blue and white, Sept. 1961, Keenan, U Tun Aung & Rule 1571 (E); *ibidem*, 2200 ft. ridge running N-S, forest floor close to waterfall, seldom seen, 1-2 ft high, corolla deep royal blue, inside of lobes cream to white, apex of lobes deep royal blue, Oct. 1961, Keenan, U Tun Aung & Rule 1934 (E).

Dutta seems to have adopted the name *T. cordata* simply as a replacement for *T. asiatica* of the Indian flora. His paper was concerned only with the genus in eastern India, and for *T. cordata* the two specimens cited are from Upper Bengal. The type of *T. cordata* was collected by Griffith at Mergui in southern Burma and is a long-stemmed sprawling or scrambling plant well matched by the three recent collections by Keenan *et al.* cited above. I have not seen similar plants from northern India. Indeed *T. cordata* seems to be very close to the *Torenia* from Courtallum, in southern India, figured in the Botanical Magazine (tab. 4249) and discussed below under *T. travancorica*.

Torenia courtallensis Gamble, Fl. Madras 4: 956 (1923); in Kew Bull. 1923: 116 (1923-later).

Lectotype: Not yet chosen.

Syn.: *Torenia areinea* Alston in Trimen, Handb. Fl. Ceylon, 6, Suppl. 212 (1931). Type: Nuwara Eliya, Gardner (PDA)

I have not seen Alston's type of *T. areinea* but take my concept of the species from Cramer 4276 (E), which was collected at Rajamally (Moray Estate) at the foot of Adam's Peak. It matches very closely with Wight 599 from Courtallum determined as *T. courtallensis* by Gamble himself, though not actually cited by him.

Torenia travancorica Gamble, Fl. Madras 4: 957 (1923).

This species has not yet been lectotyped and I refrain from doing more than suggesting a suitable choice, since the species is one I do not properly understand.

Gamble cited the following synonyms for *T. travancorica*: *T. asiatica* sec. Hook.

f., Fl. Brit. Ind. 4: 477 (1884) in part; Wight, Icones t. 862 (1844-45); Bot. Mag. t. 4249 (1846) and also gave descriptive details in the key. No specimens were cited in the Flora, but there are numerous specimens determined by Gamble as *T. travancorica* with the stamp he used for the Flora of Madras, and these must be regarded as 'original material' and therefore eligible for choice as lectotype.

Ballard (1942) applied the name *T. travancorica* to a cultivated plant with a conspicuous orange-yellow throat, and remarked that it matched 'authentic specimens' at Kew: he considered that the plant illustrated in the Botanical Magazine (Hooker 1846) was certainly different and this shows no sign of a yellow throat. Saldanha (1967) followed Ballard and remarked that on all the sheets determined by Gamble that he had examined in the Calcutta and Madras herbaria the flowers had a yellow throat. Yet Gamble says that the flowers are 'white with blue blotches on the lobes of the lower lip'. Ballard considered that this remark was due to Gamble's misidentification of the plate published by Hooker. But if this plate, the subject of which came from Courtallum, is *not T. travancorica*, what is it? The possibility of a close affinity with *T. cordata* (Griff.) Dutta has already been mentioned under that species above; Stearn (1951) assigned the Botanical Magazine plate to *T. cyanea* Alston. There is a specimen at Edinburgh collected at Courtallum by Wight in August 1835 bearing the pencilled number 598; attached to it is a small rectangle of thin paper with the pencilled number 598 in one corner carrying tracings of the floral dissections shown on Wight's published illustration, which was quoted by Gamble under *T. travancorica*. Whether the material is that from which the plate was prepared

can not be certain, but there is little doubt that it represents the same plant; it is a good match, too, of the Botanical Magazine (t. 4229), which also came from Courtallum. Three other sheets at Edinburgh bear the number 598? in ink (obviously a later addition) and are dated July, August and September 1835; a fourth sheet collected by Wight at Quilon bears the pencilled number 701. All these sheets have been determined by Gamble as *T. travancorica*. It is very tempting to take sheet 598, which agrees with the two plates cited by Gamble, as lectotype of *T. travancorica*, but I should not be prepared

to say that it has a yellow corolla-tube, and this is not suggested for the plant illustrated in the Botanical Magazine, where it could scarcely have been overlooked. In view of the fact that the name *T. travancorica* has now become familiar as representing a plant with yellow corolla-tube (Ballard 1942, Stearn 1951, Saldanha 1967, Cramer 1981), it seems unwise to choose a lectotype of *T. travancorica* until the taxonomy of these plants is better understood. There are other names, such as *T. vagans* Roxb. described from Chittagong but used for plants both in northern and southern India, that require clarification.

Acknowledgements

My thanks are due to Miss Gina Douglas, librarian at the Linnean Society of London for the opportunity to examine the specimens of *Torenia* in Linnaeus's herbarium and also for consultation of the Swedish edition of Osbeck's Dagbok. For a photocopy of the relevant pages from the German translation of this work, I am indebted to the librarian in the Botany Department of the Natural History Museum, London. The illustration has been prepared by my colleague Miss R. M. Smith, to whom I am most grateful.

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