The rediscovery of *Strobilanthes tubiflos* (Acanthaceae) in north east India

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Summary. The recently rediscovered *Strobilanthes tubiflos* (C.B.Clarke) J.R.I.Wood is fully described for the first time. A key and photographs are provided to enable identification of similar species found in north east India. The rediscovery of *S. tubiflos* is discussed in the context of the botanical exploration of the region and the implications for conservation.

Key Words. Conservation, key, taxonomy.

Introduction

As understood here, *Strobilanthes* Blume consists of around 400 species, thus making it the second largest genus in Acanthaceae (Mabberley 2017) after *Justicia* L. Historically there has long been uncertainty and disagreement about the limits of *Strobilanthes* with Nees (1832, 1847) and later Bremekamp (1944) dividing the Strobilanthinae sensu Bremekamp (1944) into many smaller genera whereas the opposite tendency was seen in publications by Anderson (1867), Clarke (1884), Terao (1983) and others. Our concept of the genus coincides with that of Terao (1983) who was the first to suggest that all species in the Strobilanthinae should be treated in a single genus. However, it is only since molecular studies have shown these segregate genera were nested within *Strobilanthes* (Moylan *et al.* 2003) that the broad concept of *Strobilanthes* has been generally accepted (Deng *et al.* 2006; Wood & Scotland 2009; Hu *et al.* 2011; Wood 2014; Deng 2019).

Despite its species richness, *Strobilanthes* is almost entirely restricted to tropical and subtropical Asia and is essentially a genus of hill forest enjoying a monsoon climate. In India, there are two centres of diversity: the central and southern parts of Peninsular India, from where about 65 species are recorded, and the Himalayas and hills of NE India with approximately 85 species. These two regions are separated by the Gangetic plain and have quite distinct *Strobilanthes* floras (Wood 1994: 202) with only one or two weedy species occurring in both regions. Species numbers rise rapidly along the Himalayan chain from west to east, one species is known from Afghanistan, 23 from Nepal, 30 from Bhutan (Wood 1994), but around 85 are found in

the NE corner of India in the small eastern states of Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur, Mizoram and Tripura (unpublished information).

Although the Khasi Hills of Meghalaya and the lowlands of Assam were relatively well-known to botanists in the 19th century, other areas of this north eastern region were rarely visited and poorly known botanically throughout the 19th and 20th centuries. New plant records were associated with major expeditions, such as those recorded by Burkill in the Abor Hills in 1911, or with adventurous botanists and plant hunters, such as William Griffith and Frank Kingdon Ward. A large number of the species collected in the 19th and early 20th century were not recollected for many years after the end of the colonial era. However, in the last fifteen years almost all have been rediscovered and photographed by Indian botanists (Wood 2016), amongst whom the second author, Dipankar Borah has played an important role.

One of Griffith's discoveries in 1836 was *Strobilanthes tubiflos*, which was described as a variety of *Strobilanthes petiolaris* by Clarke (1884). It was subsequently collected by Kingdon Ward in March 1949 but there was no further evidence of its survival until it was rediscovered by Dipankar Borah and Momang Taram in February 2020. As this is a species that has never been fully described or illustrated, a full description is provided below together with photographs and information on its habitat and conservation status.

***Strobilanthes tubiflos* (C.B.Clarke) J.R.I.Wood, Edinburgh J. Bot. 52: 264 (1994).**

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Strobilanthes petiolaris var. *tubiflos* C.B. Clarke (1884: 458). Type: India, Arunachal Pradesh, Lohit, “Ghalooms”, Griffith Kew Distribution No. 6095 (lectotype K000883127 chosen by Wood (1994: 264).

Perennial herb with fibrous roots; stems weakly quadrangular, sulcate, bifariously pubescent with pubescence in hollows, upwardly some hairs gland-tipped, glabrescent especially below, brownish when dry. Leaves petiolate, lamina 4.5–16 × 1.8–9 cm, ±elliptic to oblong-elliptic or ovate-elliptic, apex acuminate, base broadly cuneate and then tapering onto the petiole, margin (serrate-)dentate, glabrous, cystoliths prominent on both surfaces, adaxially rugose, glabrous, abaxially paler, pubescent on veins to subglabrous, lateral veins 6–10 pairs; petioles up to 4 cm long. Inflorescence of simple or sparingly branched, axillary and terminal spikes mostly 2.5–5.5 cm long, these arising from the upper leaf axils; peduncles 1–3.5 cm, glabrous (to thinly glandular pilose); rachis pubescent; bracts at branching points resembling small subsessile leaves, reduced to 7 × 4 mm; floral bracts 5–6 × 3–3.5 mm, obovate-spathulate, rounded to emarginate, yellow-green, densely covered in yellow-green, sticky, sessile and stipitate glands, bracteoles 4 × 1.5 mm, oblanceolate, obtuse, indumentum as for floral bracts; calyx subequally 5-lobed to base, lobes linear, 5.5–6.5 × c. 1 mm, usually slightly exceeding bracts, comose; corolla 2.75–3 cm long, blue (violet fide Kingdon-Ward) with white basal tube, funnel-shaped, shallowly 5-lobed, lobes subequal, c. 3 × 5 mm, rounded, the exterior pubescent; stamens 2, filaments c. 15 mm long, white, anthers 2 mm long, acute, included; staminodes 2, 12 mm long, white; pollen c. 86 × 64 µm, ellipsoidal, tricolpate, pseudocolpate; style c. 20 mm long, white, included; disc glabrous, ovary comose. Capsule 6 mm long, oblong, 4-seeded, comose; seeds 2 × 2 mm, lenticular, appressed pubescent with mucilaginous hairs. Fig. 1.

HABITAT & DISTRIBUTION. Endemic to Arunachal Pradesh in NE India, where it is found in the Upper Brahmaputra river valley by the Lohit, and Siang (Dihang) rivers (or their tributaries), growing on partially shaded rocky banks above streams at altitudes below 600 m.

SPECIMENS EXAMINED. INDIA. Arunachal Pradesh: Mishmi hills, [Lohit Distr.], banks of the Lohit R., near “Ghalooms”, W. Griffith Kew Dist. 6095 (lectotype K 000883127); Mishmi hills, W. Griffith Kew Dist. 6103 (K 000883128/9); Mishmi, [Lohit Distr.], Kamlang R., in jungle sere, along the river bank, 750 ft (c. 230 m), 14 March 1949, F. Kingdon-Ward 18409 (BM, NY); East Siang Distr., Pasighat, near to Sirki waterfalls, 28°06'09.2"N 95°15'42.8"E, 500 m, 21 Feb. 2020,

Dipankar Borah & Momang Taram 10356; *ibid.*, 10357; *ibid.*, 10359 (Herbarium of Rajiv Gandhi University, Arunachal Pradesh).

CONSERVATION ASSESSMENT. *Strobilanthes tubiflos* is known from two or possibly three locations in the region where the Brahmaputra River emerges from the Himalayas. We have no information about the Lohit location except that it was near the Kamlang River, but it probably lies within the Kamlang Wildlife Sanctuary (27°40'N 96°26'E approx.), a protected area established in 1989. Dipankar Borah and Momang Taram's discovery of a new population in the Siang (Dahang) valley extends the known distribution of *Strobilanthes tubiflos*. The Siang location is represented by a single population of about 150 individuals growing on rocky slopes and on pebbled ground resulting from a landslide near the Sirki waterfalls. The area is shaded for about half the day. It is associated with scattered plants of *Phoenix rupicola* T. Anderson, *Impatiens* sp., *Pandanus* sp., *Ficus* sp., etc. at an altitude of just above 500 m. Although the population does not seem to be expanding, no direct threats were observed. It is to be hoped it is relatively secure in this habitat but it could be threatened by landslides, which are common here, or, possibly, by future hydro-electric projects.

Further populations of *Strobilanthes tubiflos* may be found in this poorly known region, where other branches of the Brahmaputra River, such as the Dibang, emerge from the mountains, so this species should be classified provisionally as Data Deficient within IUCN (2012). It may well prove to be vulnerable (VUL) as suggested by Wood *et al.* (2003) because of the small number of populations, but there is insufficient evidence for a firm categorisation at the present time.

NOTES. *Strobilanthes tubiflos* was originally described under the name *S. petiolaris* var. *tubiflos* C.B. Clarke (1884) and belongs to a group of species placed by Bremekamp (1944) in a separate genus, *Sympagis* (Nees) Bremek. *Strobilanthes tubiflos* is perhaps closest to *S. kachinensis* J.R.I. Wood & J.R. Benn. from Myanmar which also has only two fertile stamens but differs in the shorter obovate-spathulate, rounded to emarginate floral bracts 5–6 × 3–3.5 mm (not oblong, acute 6–12 × 3.5 mm) and globose, rather than ellipsoid pollen. The bracts of the two species are illustrated and compared in Wood *et al.* 2003: 169.

Wood *et al.* (2003) discussed the *Sympagis* group and listed the nine species that occur in NE India (Wood *et al.* 2003: 141) together with their most recent Indian record: *Strobilanthes asymmetrica* J.R.I. Wood & J.R. Benn., *S. brunoniana* Nees (Fig. 2E, F), *S. frondosa* J.R.I. Wood (Fig. 2C, D), *S. himalayana* J.R.I. Wood (Fig. 2H), *S. imbricata*

Fig. 1. *Strobilanthes tubiflos*. A habitat; B population density; C inflorescence; D corolla opened out to show stamens; E corolla and style; F inflorescence showing bracts; G habit; H pollen. A – G Dipankar Borah & Momang Taram 10356; H Griffith 6095. PHOTOS: A – G DIPANKAR BORAH; H J. R. BENNETT.

Fig. 2. Species of the *Sympagis* group of *Strobilanthes* from north east India. **A** *Strobilanthes monadelphica*; **B** *S. maculata*; **C** – **D** *S. frondosa*; **E** – **F** *S. brunoniana*; **G** *S. khasyana*; **H** *S. himalayana*. PHOTOS: **A**, **E**, **F** DIPANKAR BORAH; **B**, **C**, **D** PRASHANT AWALE; **G** M. SAWMLIANA; **H** SHUVADEEP MAJUMDAR.

Nees, *S. khasyana* (Nees) T. Anderson (Fig. 2G), *S. maculata* (Wall.) Nees (Fig. 2B), *S. monadelpha* Nees (Fig. 2A) and *S. tubiflos* (C.B. Clarke) J.R.I. Wood (Fig. 1). The group is characterised by its spicate inflorescence with imbricate, bracteate flowers and subglobose, triplicate pollen usually

lacking pseudocolpi, although *S. tubiflos* differs in shape from this typical pollen. The Indian species have 4-seeded capsules, the bracts are small and persistent and the calyx subequally 5-lobed. These species can be separated by the following key:

Key to the species of the *Sympagis* group occurring in north east India

1. Fertile stamens 2. 2
Fertile stamens 4. 3
2. Spikes axillary, several in each axil; stamens strongly exerted; corolla white (Meghalaya) *S. khasyana*
Spikes solitary in each axil or terminal; stamens at most weakly exerted; corolla blue (Arunachal Pradesh) *S. tubiflos*
3. Leaves narrowly oblong-lanceolate, <2.5 cm wide, entire or undulate (Meghalaya) *S. brunoniana*
Leaves ovate or elliptic, 2.5 – 6 cm wide, serrate or dentate 4
4. Leaves roughly pilose; bracts shouldered with distinct lateral tooth; inflorescence short, <2 cm long, often nodding (Manipur). *S. frondosa*
Leaves glabrous to thinly pubescent; bracts entire, inflorescence elongate, usually > 2 cm long 5
5. Inflorescence much shorter than the subtending leaves; stems commonly winged (Manipur) *S. imbricata*
Inflorescence as long as or longer than subtending leaves; stems not winged 6
6. Strongly anisophyllous plant with very asymmetric leaves; corolla white (Manipur, Mizoram). *S. asymmetrica*
Isophyllous plants with nearly symmetrical leaves; corolla blue, rarely white 7
7. Corolla 2 – 3 cm long; leaves commonly white-blotched (Darjeeling area) *S. himalayana*
Corolla < 2 cm long; leaves white-blotched or not 8
8. Bracts narrowly obovate; flowers imbricate; leaves not white-blotched; corolla funnel-shaped (Meghalaya) *S. monadelpha*
Bracts obovate; flowers separate; leaves usually white-blotched above and purplish beneath; corolla subcrateriform (NE India) *S. maculata*

When the species list was prepared by Wood *et al.* (2003), none of these nine species had been refound in India since 1950 (the more recent dates cited for *Strobilanthes imbricata* and *S. frondosa* were from Myanmar and Bhutan, respectively). However, since 2003, all these species, except *S. imbricata*, have been refound in India and the first author has seen photographs in every case. Happily, this indicates that comments by Wood *et al.* (2003) that three of these species might be extinct were premature but even today there is still little information about the size of the populations of individual species or threats to their existence so it remains impossible to carry out accurate conservation assessments.

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