EDINBURGH JOURNAL OF BOTANY 73(1): 133–138 (2016)
© Trustees of the Royal Botanic Garden Edinburgh (2016)
doi:10.1017/S096042861500030X

LECTOTYPIFICATION OF THE CRITICALLY ENDANGERED SUBSHRUB *PHYLLANTHUS TALBOTII* (PHYLLANTHACEAE)

R. Kr. Singh & A. Garg

The critically endangered *Phyllanthus talbotii* Sedgw. (Phyllanthaceae) is endemic to the northern part of the Western Ghats in Goa and Karnataka, India. The species was described in 1921 from collections made in 1883, 1918 and 1919, and then rediscovered in 1969. We report here a new locality, Netravali Wildlife Sanctuary, South Goa district, Goa. The species is lectotypified and a detailed description is provided, including distribution, IUCN threat status, conservation measures and nomenclatural notes.

Keywords. Goa, Karnataka, Netravali Wildlife Sanctuary, Phyllanthaceae, *Phyllanthus*.

Introduction

Phyllanthus L. (Phyllanthaceae) is represented by c.833 species in tropical and subtropical regions of the world (Govaerts *et al.*, 2000), with 51 species and two varieties found in India (Chakrabarty *et al.*, 2012) of which 18 species and one variety are endemic. The critically endangered *Phyllanthus talbotii* has been poorly known taxonomically because earlier works (Webster, 1956, 1957, 1958; Kathriarachchi *et al.*, 2006) did not treat it, owing to its narrow endemism and lack of herbarium specimens. Finally, in 2007, Balakrishnan and Chakrabarty placed it in *Phyllanthus* subgenus *Eriococcus* (Hassk.) Croizat & Metc. (Balakrishnan & Chakrabarty, 2007).

Phyllanthus talbotii was described by L. J. Sedgwick in 1921 from collections made at Jog Falls, Shivamogga district, Karnataka in 1883 by Talbot and in 1919 by Sedgwick & Bell, and at Supa, Uttara Kannada district, Karnataka in 1918 by Sedgwick & Bell. After a lapse of about five decades this species was rediscovered in 1969 by Raghavan at Agumbe Ghat, Shivamogga district. Subsequent surveys of this locality revealed, however, that it was no longer extant here so the species was listed in the *Red Data Book of Indian Plants* (Nayar & Sastry, 1990). Later, in 1997 and 2010, the species was relocated in a few localities in Sanguem Taluka, South Goa district, Goa, near streams (Naik *et al.*, 2013). During an assessment of the endemic and threatened angiosperm taxa of the northern Western Ghats in Goa, Karnataka and Maharashtra from 2007 to 2012, an intensive search was carried out to locate *Phyllanthus talbotii* in the entire area. The existence of the species was confirmed in a

Botanical Survey of India (BSI), Central Regional Centre (CRC), 10-Chatham Lines, Allahabad – 211 002, Uttar Pradesh, India. E-mail for correspondence: rksbsiadsingh@yahoo.co.in

https://doi.org/10.1017/S096042861500030X Published online by Cambridge University Press

few localities of Sanguem Taluka, South Goa district and, in 2012, during these surveys, it was also discovered in a new locality in Netravali Wildlife Sanctuary, South Goa district with an extant population of c.80 individuals. *Phyllanthus talbotii* is currently confined to the South Goa district of Goa state, having been lost from all previously recorded localities in Karnataka. These localities are all near to each other and exhibit narrow endemism within their confines.

The habitat-sensitive *Phyllanthus talbotii* thrives in the rocky beds of rivulets, streams, waterfalls and along the banks of reservoirs in the northern Western Ghats regions of Goa and formerly in Karnataka. Such a specific habitat is susceptible to alteration, with recurrent floods and anthropogenic pressures, which is probably one of the causes of its disappearance from its type localities as well as the rediscovered locality of 1969. The extant populations at Sanguem Taluka and the new site at Netravali Wildlife Sanctuary are exposed to similar threats which are detrimental to the survival of the species in nature. The exact causes of decline of this species in nature are the subject of further research.

After *Phyllanthus talbotii* was collected at the new site at Netravali Wildlife Sanctuary, the species was critically studied taxonomically and it was found necessary to select a lectotype. In carrying out this lectotypification, we have followed the guidelines of Art. 9.2 of the Melbourne Code (McNeill *et al.*, 2012).

Taxonomy

Phyllanthus talbotii Sedgw., J. Indian Bot. 2: 124, f. 2 (1921) (as '*talboti*'); M.P.Nayar & Sastry, Red Data Book Indian Pl. 3: 124 (1990); N.P.Balakr. & Chakrab., Fam. Euphorbiaceae India 374 (2007); N.P.Balakr. *et al.*, Fl. Ind. 23: 461 (2012); S.S.Naik *et al.*, Rheedea 23: 16 (2013). – Type: India, Karnataka, Shivamogga district, Gairsoppa Falls (now Jog Falls), 20 xi 1883, *W.A. Talbot* 828 (lecto BSI [barcode BSI-0000000352], designated here). **Figs 1, 2.**

Subshrub, 1–1.6 m tall, monoecious; stem terete, woody up to middle region; leaf-bearing branchlets 8–30 cm long, puberulous when young, glabrescent. *Leaves* oblong, 4–8.5 × 2–3.5 mm, apiculate or shortly acuminate apically, rounded basally, thinly puberulous on both surfaces, mid nerves prominent, lateral nerves obscure; petioles 0.5–1 mm long, puberulous; stipules lanceolate-deltoid, 1.5–2.5 × 0.9–1.2 mm. *Staminate flowers* solitary or in clusters of 2 or 3 at the proximal axils, 2–2.5 × 1.8–2.1 mm; pedicels 1.5–2.5 mm long, capillary, slightly dilated at apex; bracts lanceolate-ovate, 1.5–2 mm long; bracteoles subulate, 0.7–0.9 mm long; sepals 2+2, obovate-orbicular, 1.9–2.1 × 0.9–1.3 mm, acute to rounded at apex, white with light purplish tinge in middle, wavy along margins; petals absent; disc glands 4, capitate, 0.15–0.25 mm long, yellow; staminal column 0.5–0.6 mm long; anthers 4, in two pairs, 0.3–0.4 mm diam., yellow. *Pistillate flowers* solitary, axillary, 2.5–3 mm diam.; bracts and bracteoles as in staminate flowers; pedicels 3–4 mm long, dilated at apex; sepals 3+3, ovate, 1.5–2 × 0.9–1.3 mm, white with light greenish or purplish tinge in middle,

https://doi.org/10.1017/S096042861500030X Published online by Cambridge University Press



FIG. 1. *Phyllanthus talbotii* Sedgw.

wavy along margins; petals absent; disk 0.6–1 mm diam., annular, slightly 5-lobed, greenish yellow; ovary 0.5–0.7 mm diam., 3-lobed, shortly stipitate; styles 3, 0.5–0.6 mm long, free, deeply bifid above, appressed to ovary. *Capsules* 2.5–3 × 3.5–4 mm, subglobose, distinctly 3-lobed, invaginated at apex, stipitate, hirsute, green; cocci 3. *Seeds* 2 in each coccus, 3-angled, 1.6–1.8 × 0.9–1.1 mm, smooth, brown.

Flowering and fruiting. August–December.

Distribution. Formerly endemic to the states of Goa (South Goa district) and Karnataka (Shivamogga and Uttara Kannada districts) in India. Presently restricted to South Goa district, Goa state.

Habitat. Grows in rocky beds of rivulets, streams of waterfalls and along water reservoirs of dam sites in northern Western Ghats regions of Goa and Karnataka.

Conservation measures. (1) Anthropogenic activity in riverbeds should be avoided as the first step to safeguard the extant population. (2) Seed dormancy and viability experiments are required to check the causes of failure of germination under *ex situ* conditions. (3) Propagation through culture techniques, acclimatisation and reintroduction of juvenile plantlets in natural habitat is suggested, followed by monitoring until they establish.

IUCN threat status. Field observation from 2007 to 2012 showed that *Phyllanthus talbotii* is localised in South Goa district of Goa state within some 5 km^2 area of occupancy. Using the IUCN guidelines of 2013 (IUCN Standards and Petitions Subcommittee, 2013), *Phyllanthus talbotii* is categorised as Critically Endangered [B2b(ii,iii) c(ii,iii)].

Additional specimens examined. INDIA. **Karnataka**: North Kanara, xi 1918, *Sedgwick & Bell* 4869 (BLAT); North Kanara, xi 1919, *Sedgwick & Bell* 7073 (BLAT, 2 sheets). **Goa**: South Goa district, Sanguem, ix 1997, *Joshi & Rajkumar* 1022 & 1070 (Goa University Herbarium);

https://doi.org/10.1017/S096042861500030X Published online by Cambridge University Press



FIG. 2. Lectotype of *Phyllanthus talbotii* Sedgw. (BSI-0000000352, © Botanical Survey of India, WRC, Pune, India).

Selaulim dam site, viii 2010, *Naik* 4001 & 4002 (Goa University Herbarium); Collem stream, ix 2010, *Naik* 4003 & 4004 (Goa University Herbarium); Waddem stream, x 2010, *Naik* 4005, 4006 & 4007 (Goa University Herbarium); Dudhsagar waterfalls, xi 2010, *Naik*

https://doi.org/10.1017/S096042861500030X Published online by Cambridge University Press

4008, 4009 & 4010 (Goa University Herbarium); Netravali Wildlife Sanctuary, xii 2012, *R.Kr. Singh* 185299 (BSI).

In the protologue of *Phyllanthus talbotii*, Sedgwick (1921) cited three gatherings, 'In fluminibus Canarae in Provincia Bombaiensi, apud Supa, Sedg. et Bell 4869, Nov. 1918, et apud Jog (Gaisoppa) Talbot 828, A.D. 1883, Sedg. et Bell 7073, Nov. 1919', but, in keeping with the practice of the time, he did not designate a holotype. Sedgwick's herbarium is in the Blatter Herbarium (BLAT) in St Xavier's College, Mumbai where one sheet of *Sedgwick & Bell* 4869 and two of *Sedgwick & Bell* 7073 have been located. One sheet of *Talbot* 828 has been found at BSI. Of these, *Talbot* 828 (BSI) is designated here as the lectotype as it agrees well with the protologue and is the best preserved. Sedgwick evidently believed this specimen to represent his new species because he used the collector's name Talbot as the epithet.

Although Raghavan (1969) reported the occurrence of *Phyllanthus talbotii* at Agumbe Ghat, Shivamogga district, Karnataka, no specimens can be found to verify this statement.

Acknowledgements

The authors thank the Director, Botanical Survey of India (BSI), Kolkata and Head of Office, BSI, Central Regional Centre, Allahabad for access to facilities and the curators of BLAT, BM, BSI, CAL and K for information and images of type specimens. We are most grateful to the Forest Officials of Goa, Karnataka and Maharashtra for their generous support during field surveys.

References

Balakrishnan, N. P. & Chakrabarty, T. (2007). *The Family Euphorbiaceae in India*, pp. 370–375. Dehra Dun: Bishen Singh Mahendra Pal Singh.

Chakrabarty, T., Gangopadhyay, M. & Balakrishnan, N. P. (2012). Tribe Phyllantheae Dumort. In: Balakrishnan, N. P., Chakrabarty, T., Sanjappa, M., Lakshminarsimhan, P. & Singh, P. (eds) *Flora of India* 23: 407–491. Kolkata: Botanical Survey of India.

Govaerts, R., Frodin, D. G. & Radcliffe-Smith, A. (2000). *World Checklist and Bibliography of Euphorbiaceae (with Pandaceae)*, v. 4. London: Royal Botanic Gardens, Kew.

IUCN Standards and Petitions Subcommittee (2013). *Guidelines for Using the IUCN Red List Categories and Criteria, Version 10.1*. Gland, Switzerland: IUCN Species Survival Commission, and Cambridge, UK: IUCN.

Kathriarachchi, H., Samuel, R., Hoffmann, P., Mlinarec, J., Wurdack, K. J., Ralimanana, H., Stuessy, T. F. & Chase, M. W. (2006). Phylogenetics of the tribe Phyllantheae (Phyllanthaceae; Euphorbiaceae sensu lato) based on nrITS and plastid *matK* DNA sequence data. *Amer. J. Bot.* 93: 637–655.

McNeill, J., Barrie, F. R., Buck, W. R., Demoulin, V., Greuter, W., Hawksworth, D. L. *et al.* (eds) (2012). *International Code of Nomenclature for algae, fungi, and plants (Melbourne Code)*. Adopted by the Eighteenth International Botanical

https://doi.org/10.1017/S096042861500030X Published online by Cambridge University Press

Congress, Melbourne, Australia, July 2011. Ruggell: A. R. G. Gantner Verlag KG/Koeltz Scientific Books [Regnum Veg. 154].
NAIK, S. S., PAGARE, R. S., KRISHNAN, S. & JANARTHANAM, M. K. (2013). Systematic position of *Phyllanthus talbotii* (Phyllanthaceae), a critically endangered species of Western Ghats, India. *Rheedea* 23: 13–18.
NAYAR, M. P. & SASTRY, A. R. K. (1990). *Red Data Book of Indian Plants* 3: 124–125. Calcutta: Botanical Survey of India.
RAGHAVAN, R. S. (1969). *Flora of Agumbe and Tirthahalli area, Shimoga district*. PhD thesis, University of Pune, India.
SEDGWICK, L. J. (1921). New Bombay species. *J. Indian Bot.* 2: 123–131.
WEBSTER, G. L. (1956). A monographic study of the West Indian species of *Phyllanthus*. *J. Arnold Arbor.* 37: 9–122, 217–268 & 340–359.
WEBSTER, G. L. (1957). A monographic study of the West Indian species of *Phyllanthus*. *J. Arnold Arbor.* 38: 51–80, 170–198 & 295–373.
WEBSTER, G. L. (1958). A monographic study of the West Indian species of *Phyllanthus*. *J. Arnold Arbor.* 39: 49–100 & 111–212.

Received 29 January 2015; accepted for publication 20 October 2015

https://doi.org/10.1017/S096042861500030X Published online by Cambridge University Press