

A taxonomic revision of the genus *Justicia* (Acanthaceae) in Peninsular India

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Abstract: A detailed taxonomic account of the genus *Justicia* L. in Peninsular India is provided, with 18 species recognized. Lectotypifications of six names are carried out. Nine taxa are treated as synonyms: *Justicia diffusa* var. *orbiculata* C.B. Clarke of *J. diffusa* Willd.; *J. nilgherrensis* (Nees) Wall. ex C.B. Clarke and *J. tamilnadensis* P. Raja & Soosairaj of *J. trinervia* Vahl; *J. nagpurensis* V.A.W. Graham, *J. notha* C.B. Clarke and *J. pathanamthittensis* Remadevi & Binojk. of *J. procumbens* L.; *J. quinqueangularis* var. *kawalii* Annamma & Venu of *J. quinqueangularis* J. Koenig ex Roxb.; *J. salsoloides* T. Anderson of *J. tranquebariensis* L.f. and *J. vahlii* var. *rupicola* (J.L. Ellis) Pull., Moulali & Sandhyar. of *J. vahliana* Schult. Detailed descriptions, photographic images and a key for identifying species in Peninsular India are provided along with data on phenology, distribution and conservation status.

Keywords: Conservation Assessment, Justicieae, Lectotypification, Synonymization.

Introduction

Justicia L. is the most species-rich and taxonomically challenging genus within the tribe Justicieae of the family Acanthaceae. The genus is distributed through Africa, tropical and subtropical Asia to southwest Pacific and tropical and subtropical America with 917 accepted names (POWO, 2023). Previous revisionary studies suggested that there were only about 700 species worldwide (Graham, 1988; Deng, 2020), a discrepancy that highlights the need for a comprehensive study of this genus globally.

The taxonomic history of *Justicia* begins with *Hortus Malabaricus*, dealing with the medicinal plants of

the Malabar region by van Rheede tot Draakestein (1678–1693). Four species of the present-day *Justicia* namely ‘*Adel-odagam*’ (Hort. Malab. 9: 81, t. 43, 1689) (= *Justicia adhatoda* L.); ‘*Bem-curini*’ (Hort. Malab. 2: 33, t. 21, 1679) (= *Justicia betonica* L.); ‘*Vada-kodi*’ (Hort. Malab. 9: 79, t. 42, 1689) (= *Justicia gendarussa* Burm.f.) and ‘*Tsjeru-tardavel*’ (Hort. Malab. 10: 187, t. 94, 1690) (= *Justicia procumbens* L.) were treated in this work in Latin. The generic name, *Justicia* was proposed in honour of the 18th century Scottish horticulturist James Justice and was first used by Linnaeus in *Genera Plantarum* (1737) with reference to de Tournefort’s *Adhatoda* (de Tournefort, 1700). Linnaeus’s (1753) provided a concept of the genus by giving a generic description in his *Species Plantarum* in which, he recognized eleven species within the class *Diandria monogynia*.

One of the earliest accounts of this genus in India was provided by the Scottish botanist Roxburgh (1795) in his *Plants of the Coast of Coromandel* in which he described and illustrated five species of *Justicia*. Roxburgh (1814) listed 29 species of *Justicia* under the class *Diandria monogynia* in his *Hortus Bengalensis*. Roxburgh (1820) provided descriptions of 32 species of *Justicia* in three sections in the *Flora Indica*, subsequently edited by Carey incorporating plants discovered by Wallich (Roxburgh, 1832). Nees von Esenbeck (1832, 1847) rejected the broad concept of *Justicia* by splitting *Justicia* into several small, segregated genera (*Adhatoda* Mill., *Amphiscopea* Nees, *Beloperone* Nees, *Gendarussa* Nees, *Hemichoriste* Nees, *Justicia*., *Leptostachya* Nees, *Rhaphidospora* Nees, *Rostellaria* Nees and *Rostellularia* Reich). Anderson

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(1863) followed the broad concept of *Justicia* and enumerated 48 species from Africa under five sections, and later described 14 species from Sri Lanka and 36 species from India (Anderson, 1864, 1867).

Bentham (1876) attempted to widen the generic limits of *Justicia* by placing *Hemichoriste* Nees, *Gendarussa* Nees, *Rostellaria* Nees, *Harnieria* Solms, *Monechma* Hochst., *Amphiscopia* Nees, *Anisostachya* Nees, *Rhaphidospora* Nees, and *Sarcotheca* Kuntze in *Justicia* subtribe *Eujusticieae*, and treated *Adhatoda* Mill., *Beloperone* Nees and *Jacobinia* Moric. as separate genera under the same subtribe.

In the *Flora of British India*, Clarke (1885) treated *Justicia* and *Adhatoda* as separate genera, and described 50 species of *Justicia*, including 13 new species and 12 new varieties, under six sections (*viz.*, sect. *Hemichoriste*, sect. *Betonica*, sect. *Calophanoides*, sect. *Gendarussa*, sect. *Rhaphidospora*, and sect. *Rostellularia*). Only two species were included under the genus *Adhatoda* (*A. vasica* Nees and *A. beddomei* C.B. Clarke). Similarly, in the *Flora of Tropical Africa*, Burkill and Clarke (1900) mentioned 81 species of *Justicia* under six sections (*viz.*, sect. *Ansellia*, sect. *Betonica*, sect. *Calophanoides*, sect. *Gendarussa*, sect. *Harnieria* and sect. *Rostellularia*) and treated *Adhatoda* as a separate genus with six species. In the *Flora of Malayan Peninsula*, Clarke (1907) treated *Justicia* and *Adhatoda* as separate genera. He made a detailed taxonomic account of 18 species including 10 new taxa under four sections (sect. *Bracteatae*, sect. *Calophanoides*, sect. *Gendarussa* and sect. *Rostellularia*). *Adhatoda vasica* Nees was the only species mentioned under the genus. In the *Flora Capensis*, Clarke (1912) treated 25 species of *Justicia* under five sections (sect. *Betonica*, sect. *Calophanoides*, sect. *Rostellularia*, sect. *Gendarussa* and sect. *Ansellia*). In this work also, he mentioned *Adhatoda* as a separate genus. Similarly, Gamble (1921) in the *Flora of the Presidency of Madras* considered *Justicia* and *Adhatoda* as separate genera. Altogether, he treated 21 species of *Justicia* and two species of *Adhatoda* without any sectional delimitations.

Bremekamp (1948) accepted the narrow generic concept of Nees von Esenbeck (1832, 1847), and placed *Justicia* species under several genera (*i.e.*, *Adhatoda*, *Beloperone*, *Calophanoides* Ridl., *Gendarussa*, *Leptostachya*, *Mananthes* Bremek., *Rhaphidospora*, and *Rostellularia*). However, Stearn (1971) disagreed strongly with Nees's opinion and stated that, if the narrow generic concept of *Justicia* was accepted, none

of the American species and many of the Asian and African species do not belong to *Justicia s.s.* Moreover, he revealed the scope and significance of pollen in the classification of *Justicia*, and this broad concept of *Justicia* was adopted by subsequent authors (*e.g.* Stewart, 1972; Graham, 1988; Malik & Ghafoor, 1988; Cramer, 1998; Hu *et al.*, 2011; Deng, 2020).

Graham (1988) proposed a worldwide infrageneric classification of *Justicia* by adopting the broad concept and treated its species under 16 sections and seven subsections based on inflorescence type, corolla and anther shape, seed and pollen morphology. Of these, seven sections were distributed in the Old World and nine sections in the New World with few overlaps. However, many Indian species did not fit into any of Graham's sections and sometimes, the characteristics appeared to overlap in some sections. Recent molecular-phylogenetic studies globally suggested a better delimitation of *Justicia* and its related taxa (Kiel *et al.*, 2017).

Vollesen (2010) transferred all the African species of *Rungia* Nees to *Justicia*, which was supported by previous works (*e.g.*, Imlay, 1938; Hansen, 1989; Darbyshire & Vollesen, 2007). Darbyshire *et al.* (2010) elaborated on Vollesen's work in the *Flora of Tropical East Africa*, treating *Justicia* and *Rungia* as congeneric. Wood (2014) proposed a wider concept of *Justicia* including Indian species of *Rungia* stating that placental elasticity is the only character that differentiates *Rungia* from *Justicia*. However, we did not follow this broad concept here because the two genera are morphologically distinct in India, which is consistent with recent phylogenetic studies (Deng *et al.*, 2016; Kiel *et al.*, 2017; Deng, 2020; Niu *et al.*, 2023). Similarly, a few major studies on the family Acanthaceae also considered both *Justicia* and *Rungia* as distinct genera (Karthikeyan *et al.*, 2009; Hu *et al.*, 2011; Deng, 2020; Deng & Gao, 2020; Do *et al.*, 2021; Lin *et al.*, 2022; Manzitto-Tripp *et al.*, 2022).

The genus is represented by 51 species and five varieties in India (Karthikeyan *et al.*, 2009) with a high level of endemism in Peninsular India. Due to a diverse inflorescence structure and floral morphology (including size, shape and colour of the flowers), the genus presents a challenge in infrageneric circumscription, leading to the discovery of many species and varieties from India (Clarke, 1885; Ellis, 1969; Graham, 1988; Remadevi & Binoj Kumar, 2008; Annamma *et al.*, 2016; Prabhukumar *et al.*, 2016).

As part of ongoing systematic studies, we revised the taxonomy of the genus *Justicia* in Peninsular India based on extensive field studies and by consulting herbarium specimens deposited in major herbaria. Eighteen species are recognized in Peninsular India, and the resolution of taxonomic problems resulted in six typifications and nine new synonyms. However, due to discrepancies noticed in the ongoing molecular studies with the sectional treatments based on morphology, we refrain from proposing sectional classification based on Peninsular Indian species only. Similarly, due to uncertainty in the generic delineation of *Justicia* and *Rungia*, we have not included species presently regarded as belonging to *Rungia* in the present revision.

Materials and Methods

The present study primarily relied on the authors' collections and field observations. In addition, we consulted herbarium specimens housed in the following herbaria BLAT, BSI, BSID, CAL, CALI, CMPR, FRC, LWG, MH, RHT, SKU and TBGT, and referenced digital images from BM, B-W, C, E, G, GZU, K, L, LD, LINN, M, NY, P, S and UPS (acronyms of herbaria as per Thiers, updated continuously). Detailed morphological descriptions were prepared after examining both fresh and herbarium specimens, utilising the terminology of Stearn (1988) and Simpson (2006, 2019). Living plants of all species were cultivated in the Calicut University Botanical Garden (CUBG) to monitor variation in size and hairiness of vegetative parts under cultivation in different habitats. Habitat and distributional data were gathered during field studies and extracted from herbarium labels. Morphological studies and measurements were conducted with the assistance of a M80 stereo microscope (Leica, Wetzlar, Germany), outfitted with an EC3 digital camera. Herbarium specimens were prepared using the wet method of De Vogel (1987). Synonyms provided were based on the critical examination of protologues, types and the synonymy listed in the taxonomic literature pertaining to India and surrounding regions. Distribution maps were constructed with the help of packages such as *ggmap* (Kahle & Wickham, 2013), *sf* (Pebesma, 2018; Pebesma & Bivand, 2023), and *ggsn* (Baquero, 2019) in R ver. 4.3.0 (R Core Team, 2023). The code used in this study was uploaded to the GitHub repository under the file name 'peninsular india map' (Alan, 2024). For map with a large number of occurrences, the size argument of the *geom_point*

function of *ggmap* was kept as 1 while maps with fewer occurrences, the value was set to 2. The Area of Occupancy (AOO) and Extent of Occurrence (EOO) were calculated using GeoCAT (<https://geocat.iucnredlist.org/>; Bachman *et al.*, 2011). Conservation assessments were formulated according to the IUCN (2022) guidelines.

Taxonomic Treatment

Justicia L., Sp. Pl. 1: 15. 1753; Roxb., Hort. Bengal. 3. 1814; Fl. Ind. 1: 115. 1820; Nees in Wall., Pl. Asiat. Rar. 3: 108. 1832; in DC., Prodr. 11: 426. 1847; T.Anderson, J. Linn. Soc. Bot. 9: 509. 1867; C.B.Clarke in Hook.f., Fl. Brit. India 4: 524. 1885; Lindau in Engl. & Prantl (eds.), Nat. Pflanzenfam. 4(3B): 346. 1895; Gamble, Fl. Madras 2: 1075. 1921; Stearn, J. Arnold Arbor. 52: 636. 1971; R.R.Stewart in E.Nasir & S.I. Ali (eds.), Fl. W. Pakistan 676. 1972; Malik & Ghafoor in E.Nasir & S.I.Ali (eds.), Fl. Pakistan 188: 29. 1988; V.A.W.Graham, Kew Bull. 43: 581. 1988; Pull. & Moulali, Fl. Andhra Pradesh 2: 715. 1997; L.H.Cramer, Revis. Handb. Fl. Ceylon 12: 109. 1998; J.R.I.Wood in A.J.C. Grierson & D.G. Long (eds.), Fl. Bhutan 2(3): 1286. 2001; M.R.Almeida, Fl. Maharashtra. 4: 639. 2003; Sasidh., Biodivers. Doc. Kerala Part 6: Fl. Pl. 344. 2004; T.S.Nayar *et al.*, Fl. Pl. Kerala 21. 2006; Karthik. *et al.*, Fl. Pl. India Dicotyledons 24. 2009; Remadevi & Binojk. Fl. Kerala. Acanthaceae 90. 2009; J.O.Hu, Y.F.Deng & T.F.Daniel in Z.Y.Wu, P.H.Raven & D.Y.Hong (eds.), Fl. China 19: 449. 2011; T.S.Nayar *et al.*, Fl. Pl. Western Ghats 1: Dicots 31. 2014; Y.F. Deng in D.Y. Hong (ed.). Fl. Pan-Himalaya 46. 395. 2020. *Lectotype* (designated by Hitchcock, 1929): *Justicia hyssopifolia* L.

Adhatoda Mill., Gard. Dict. Abr. ed. 4: 39. 1754; C.C.Hu, Fl. Reipubl. Popularis Sin. 70: 275. 2002. *Lectotype* (designated by Heine, 1966): *Adhatoda vasica* Nees (≡*Justicia adhatoda* L.).

Gendarussa Nees in Wall., Pl. Asiat. Rar. 3: 103. 1832; in DC., Prodr. 11: 410. 1847; C.C.Hu, Fl. Reipubl. Popularis Sin. 70: 299. 2002. *Justicia* sect. *Gendarussa* (Nees) T.Anderson, J. Proc. Linn. Soc., Bot. 7: 41. 1863. *Justicia* subgenus *Gendarussa* (Nees) Lindau in Engl. & Prantl (eds.), Nat. Pflanzenfam. 4(3B): 347. 1895. *Type: Gendarussa vulgaris* Nees (≡*Justicia gendarussa* Burm.f.).

Rostellaria Nees in Wall., Pl. Asiat. Rar. 3: 76. 1832, *nom. illeg.*, non C.F.Gaertner, Suppl. Carp.: 135, t. 207: f. 1. 1807. *Justicia* sect. *Rostellaria* T. Anderson, J. Linn. Soc., Bot. 7: 38. 1863. *Justicia* subsect. *Rostellaria*

(T.Anderson) V.A.W.Graham, Kew Bull. 43: 596. 1988. *Rostellularia* Reich., Handb. Nat. Pfl. Syst. 190. 1837; Nees in DC., Prodr. 11: 370. 1847; C.C.Hu, Fl. Reipubl. Popularis Sin. 70: 302. 2002. *Justicia* sect. *Rostellularia* (Reich.) C.B.Clarke in Hook.f., Fl. Brit. India 4: 536. 1885. Type (designated by Bremekamp ING card 01967, 1956): *Rostellaria procumbens* (L.) Nees ($\equiv$ *Justicia procumbens* L.).

Rhaphidospora Nees in Wall., Pl. Asiat. Rar. 3: 115. 1832, *Justicia* sect. *Rhaphidospora* (Nees) T.Anderson, J. Proc. Linn. Soc., Bot. 7: 43. 1863. Type: *Rhaphidospora glabra* (J.Koenig ex Roxb.) Nees ($\equiv$ *Justicia glabra* J.Koenig ex Roxb.).

Hemichoriste Nees in Wall., Pl. Asiat. Rar. 3: 76, 102. 1832. *Justicia* sect. *Hemichoriste* (Nees) Benth. & Hook.f., Gen. Pl. 2: 1109. 1876. Type: *Hemichoriste montana* Nees ($\equiv$ *Justicia montana* (Nees) Wall. ex T.Anderson).

Harnieria Solms, Sitzb. Ges. Naturf. Fr. Berlin. 21. 1864. *Justicia* Sect. *Harnieria* (Solms) Benth. in Bentham & Hooker (eds.), Gen. Pl. 2: 1109. 1876. Type: *Justicia dimorphocarpa* Solms ($\equiv$ *Justicia heterocarpa* T.Anderson).

Nicoteba Lindau, Bot. Jahrb. Syst. 18: 56. 1893; Lindau in Engl. & Prantl (eds.), Nat. Pflanzenfam. 4(3B): 329. 1895. Type (designated by Graham, 1988): *Nicoteba betonica* (L.) Lindau ($\equiv$ *Justicia betonica* L.).

Calophanoides (C.B.Clarke) Ridl., Fl. Mal. Penins. 2: 592. 1923. *Justicia* sect. *Calophanoides* C.B.Clarke in Hook.f., Fl. Brit. India 4: 530 1885. Type (designated by Bremekamp ING card 000178, 1956): (*Calophanoides quadrifaria* (Nees) Ridl. ($\equiv$ *Justicia quadrifaria* (Nees) T.Anderson).

Mananthes Bremek., Verh. Kon. Ned. Akad. Wetensch., Afd., Natuurk., Sect. 2. 45(2): 58. 1948. Type: *Mananthes sumatrana* (Miq.) Bremek. ($\equiv$ *Justicia sumatrana* Miq.).

Annual or perennial, herbs, subshrubs or shrubs. Stem erect, decumbent or prostrate sometimes with woody rootstock, angular or terete (rarely cylindric), dichotomously branched. Leaves simple, opposite, rarely decussate, sessile or petiolate, chartaceous to coriaceous, shape variable, margins usually entire, sometimes slightly crenate, dentate, sinuate, serrate or undulate. Inflorescence simple spike or compound with dichasial cyme, panicle or spicate subunits, sometimes reduced to sessile axillary flowers; bracts variable in shape, small and

inconspicuous or prominent, equalling or exceeding the calyx, with or without a scarious margin, green or variously coloured; bracteoles similar to or smaller than bracts. Flowers sessile or pedicellate, one (secund or not) or two per inflorescence node, subtended by one bract and two bracteoles. Calyx 4 -or 5-lobed; lobes equal or unequal, glabrous or pubescent often accrescent; lobes usually narrow, linear to lanceolate, oblong, triangular, ovate, elliptic or subulate; margins green, variously coloured or scarious, apex obtuse, acute or acuminate. Corolla with short or elongate tubular base; limb strongly 2-lipped, usually white, pink or purple; upper lip erect, entire to minutely bilobed; lower lip 3-lobed, slightly recurved, throat usually pubescent. Stamens 2, attached to the corolla tube; filaments declinate, usually hairy at base; anthers bitheous, the lower theca sometimes sterile; thecae superposed, parallel to perpendicular or oblique, mostly unequal with small spur like appendage at the base of lower theca. Ovary 2-loculed, 2 ovules per locule, conical to ellipsoid or fusiform, pale green, pubescent at apex or throughout; style hirsute in lower half or throughout; stigma simple or weakly 2-lobed; nectariferous disc cup-shaped. Capsule commonly with a narrowly elongate sterile base and an expanded usually 4-seeded, rarely 2- or 3-seeded apical part, clavate to oblong, ellipsoid, ovoid or obovoid, glabrous or pubescent. Seeds compressed or not, supported by retinacula, shapes variable. Testa smooth or variously ornamented, rugulose to alveolate, tuberculate, pubescent, echinate or hispid.

Distribution: Africa, tropical and subtropical Asia to southwest Pacific, tropical and subtropical America (POWO, 2023).

Key to the species of *Justicia* in Peninsular India

1. Inflorescence a cymose panicle..... *Justicia scandens*
1. Inflorescence a simple or compound spike 2
2. Flowers secund *J. sivadasanii*
2. Flowers not secund..... 3
3. Calyx equally 5-lobed 4
3. Calyx equally 4-lobed, or unequally 5-lobed with fifth lobe much reduced 12
4. Spikes with 1 flower per node..... 5
4. Spikes with 2 or more flowers per node 8

5. Bracts petiolate, spatulate to oblanceolate or orbicular; appendage forked 6
 5. Bracts sessile, ovate to lanceolate or elliptic; appendage pointed 7
 6. Leaves ovate to elliptic with acute apex; bracts and bracteoles with long setae along margins *J. glauca*
 6. Leaves orbicular to obovate or spatulate with rounded or emarginate apex; bracts and bracteoles with fine cilia along margin *J. tranquebariensis*
 7. Perennial erect shrubs; leaves petiolate, broadly elliptic to lanceolate or ovate with acuminate apex *J. betonica*
 7. Annual decumbent herbs; leaves sessile, narrowly elliptic to oblong with obtuse or acute apex *J. trinervia*
 8. Bracts $\geq$ calyx lobes, obovate to elliptic or ovate to oblong, 3–7-veined 9
 8. Bracts $<$ calyx lobes, linear to narrowly lanceolate or triangular, usually single-veined 11
 9. Bracts ovate to widely lanceolate, less than half of the corolla, upper lip oblong *J. santapau*
 9. Bracts obovate to oblanceolate or elliptic to oblong, greater than half of the corolla, upper lip ovate to elliptic 10
 10. Corolla >1.5 cm long, whitish with purple striations on the lower lip *J. adhatoda*
 10. Corolla <1.5 cm long, whitish without any striations *J. beddomei*
 11. Peduncles densely pubescent with glandular hairs; corolla tube shorter than the upper lip *J. wynaadensis*
 11. Peduncles glabrous and eglandular; corolla tube equal or slightly longer than the upper lip *J. gendarussa*
 12. Herbs <10 cm tall; bracts without scarious margin *J. ekakusuma*
 12. Herbs or subshrubs >10 cm tall; bracts with scarious margin 13
 13. Bracts and bracteoles very slender, exceeding or equalling corolla with long setae on margin *J. micrantha*
 13. Bracts and bracteoles not slender, shorter than corolla with cilia on margin 14
 14. Calyx deeply 4-lobed with lobes equal or sub-equal 15
 14. Calyx deeply 5-lobed with one segment much reduced 16
 15. Bracts and bracteoles linear to narrowly lanceolate or triangular; anthers without abaxially bearded upper theca; style 3–3.5 mm long *J. diffusa*
 15. Bracts and bracteoles ovate; anthers with abaxially bearded upper theca; style 5–7 mm long *J. vahliana*
 16. Calyx, bracts and bracteoles appressed to the axis; flowers lax in slender spikes; bracts and bracteoles $\leq$ calyx lobes, margin minutely ciliate *J. prostrata*
 16. Calyx, bracts and bracteoles diverging from the axis; flowers dense in stout spikes; bracts and bracteoles $\geq$ calyx lobes, margin densely ciliate 17
 17. Leaves ovate to elliptic or lanceolate to oblong or orbicular; length to width ratio < 3 *J. procumbens*
 17. Leaves linear to narrowly elliptic or lanceolate to oblong, length to width ratio > 3 *J. quinqueangularis*
- Justicia adhatoda* L., Sp. Pl. 1: 15. 1753; Roxb. Fl. Ind. 1: 127. 1820; T. Anderson, J. Linn. Soc. Bot. 9: 509. 1867; Stearn, J. Arnold Arbor. 52: 640. 1971; L.H. Cramer, Revis. Handb. Fl. Ceylon 12: 111–112. 1998; Malik & Ghafoor in E. Nasir & S.L. Ali (eds.), Fl. Pakistan 188: 39. 1988; V.A.W. Graham, Kew Bull. 43: 584. 1988; J.R.I. Wood in A.J.C. Grierson & D.G. Long (eds.), Fl. Bhutan 2(3): 1287. 2001; J.Q. Hu, Y.F. Deng & T.F. Daniel in Z.Y. Wu, P.H. Raven & D.Y. Hong (eds.), Fl. China 19: 456. 2011. *Adhatoda vasica* Nees in Wall., Pl. Asiat. Rar. 3: 103. 1832; in DC., Prodr. 11: 387. 1847; C.B. Clarke in Hook.f., Fl. Brit. India 4: 540. 1885; Gamble, Fl. Madras 2: 1082. 1921; C.C. Hu, Fl. Reipubl. Popularis Sin. 70: 277. 2002. *Ecbolium adhatoda* (L.) Kuntze, Revis. Gen. Pl. 2: 487. 1891. *Lectotype* (designated by Manning & Getliffe, 1985): SRI LANKA (Ceylon), *Herb. Hermann.* 2: 43, No. 16 (BM [BM000621656 digital image!]); *Epitype* (as lectotype, designated by Graham, 1988): *Herb. Hermann.* 5: Icon. 226 (BM [BM000621001 digital image!]).**
- Adhatoda zeylanica* Medik., Hist. & Commen. Acad. Elect. Sci. Theo.-Palat. 6: 393. 1790. *Type*: Not designated.

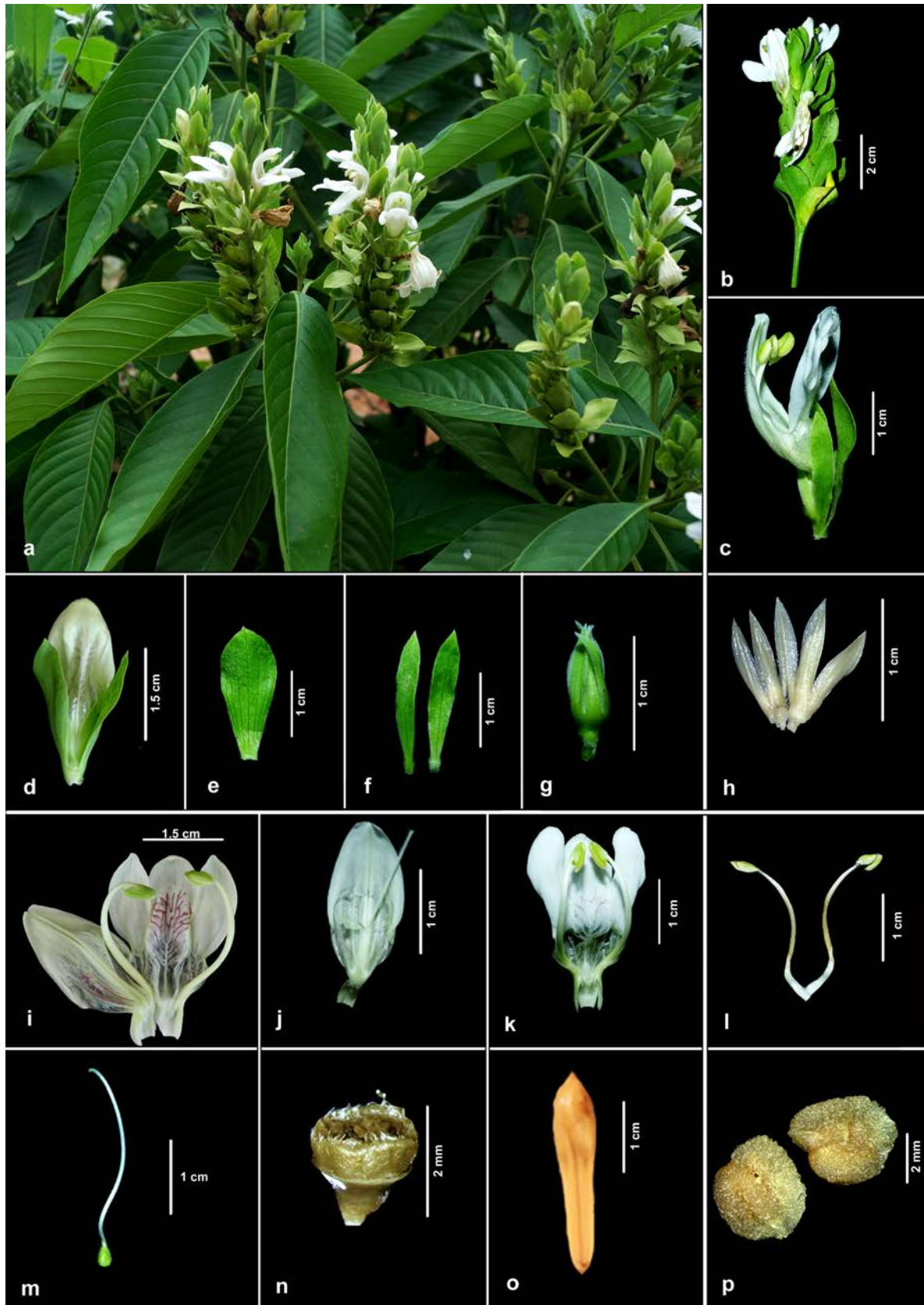


Fig. 1. *Justicia adhatoda* L.: **a.** Habit; **b.** Inflorescence; **c.** Flower; **d.** Flower bud; **e.** Bract; **f.** Bracteoles—adaxial (left) and abaxial side (right); **g.** Calyx; **h.** Calyx—opened; **i.** Corolla—opened; **j.** Upper lip; **k.** Lower lip; **l.** Stamens; **m.** Gynoecium; **n.** Nectariferous disc; **o.** Capsule; **p.** Seeds (from P. Soumya & P. Sunojkumar 157555; photos by P. Soumya).

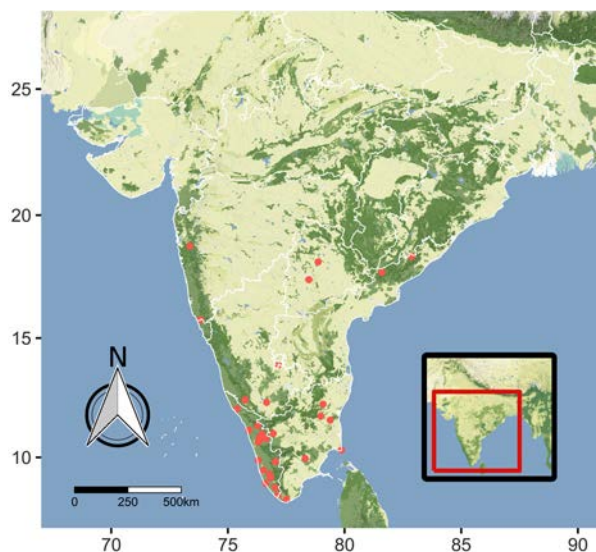


Fig. 2. Distribution of *Justicia adhatoda* L. in Peninsular India. Drawn using R (R Core Team, 2023).

Perennial shrubs up to 5 m tall. Stems erect, angular, branched; branches many, stout, green to pale brown, glabrous to pubescent; internodes 1–7 cm long. Leaves petiolate; laminae elliptic to lanceolate, 10–30 × 3–10 cm, base cuneate, margins entire or slightly undulate, apex acuminate, chartaceous, glossy, glabrous; veins prominent, secondary veins 5–14 pairs, venation simple craspedodromous; petioles 1–6 cm long, glabrous. Inflorescence terminal or axillary spikes, up to 14 cm long, 8–15-flowered, compact; peduncles 2–10 cm long, puberulous. Flowers sessile, two per floral node, 2.5–3 × 1.75–2 cm; bracts foliaceous, obovate to oblanceolate or elliptic to oblong, 1.7–3 × 0.7–1.8 cm, margin entire, slightly ciliate, sometimes undulate, apex acute or obtuse, 5–7-veined, greenish, puberulous; bracteoles linear to oblanceolate, 1.4–2 × 0.3–0.5 cm, margin entire, minutely ciliate, apex narrowly acute, 1–3-veined, greenish. Calyx deeply 5-lobed, 1–1.25 × 0.35–0.5 cm at anthesis, accrescent to 1.3–1.5 × 0.5–0.75 cm in fruit, greenish, pubescent outside; lobes equal, lanceolate to oblong, margins weakly scarious, ciliate, apex acute. Corolla creamy white with purple striations on lips, pubescent outside, glabrous inside except in the throat; tube cylindrical, 1.2–1.6 × 0.35–0.5 cm; upper lip erect, ovate, c. 1.7 × 1.3 cm, apex obtuse or notched; lower lip obovate or orbicular, 3-lobed; lobes unequal, middle lobe broadly oblong, c. 1.5 × 0.8 cm, apex obtuse, lateral lobes c. 1.7 × 0.6 cm, narrowly oblong, recurved, apex rounded or obtuse. Stamens exserted; filaments 1.7–2 cm long, declinate, white or pale yellow, basally sericeous; anthers thecae superposed, equal, elliptic, 3.5–4 mm

long, pale or yellowish green, glabrous; appendage white, c. 3 mm long, apex rounded or obtuse. Ovary ovoid, c. 3 × 2 mm, pale greenish, hirsute at apex or throughout; style filiform, 2.25–2.7 cm long, recurved, white, hirsute in lower half; stigma simple; nectariferous disc c. 1.5 × 2.25 mm, pale green. Capsule clavate, 1.5–2.5 × 0.5–1 cm, apex acute, shortly pointed, greenish brown, pubescent; base sterile, 9 mm long and flattened. Seeds 4, sub-orbicular to reniform, compressed, c. 6 × 5 mm, glabrous; testa rugulose to alveolate.

Flowering & fruiting: Flowering from November to February and fruiting from March to April.

Habitat: Seen under cultivation as medicinal herbs or as hedge plants, typically below 800 m. Frequent along roadsides, dry slopes, open waste places and forest margins near human settlements as escapes from cultivation.

Distribution: Afghanistan to Indochina, now extensively cultivated and naturalized in various other tropical regions.

Specimens examined: INDIA, **Andhra Pradesh**, Anantapur district, Hottebetta R.F., 01.10.1982, *T. Pullaih & N. Yesoda s.n.* (MH); East Godavari district, Tiger Camp, Maredumilli, 17.02.1994, *s.coll.* 101264 (MH); Hyderabad district, Nampally, 28.04.1959, *K.M. Sebastine* 8047 (CAL); Vishakhapatnam district, Araku Valley, 17.09.1961, *N.P. Balakrishnan* 665 (CAL); Kilagada, 09.03.1965, *G.V. Subba Rao* 22571; *Ibid.*, 04.01.1976, *G.V. Subba Rao* 29577 (MH); *Ibid.*, *s.d.*, *S.K. Nazeeruddin* 27658 (CAL). **Goa**, North Goa district, Pernem taluk, Tamboxem, 18.11.1962, *Seshagiri Rao Rolla* 84934 (CAL). **Karnataka**, Kodagu district, Madikeri, 15.06.1977, *B.C. Baneyei* 11768 (CAL); Mysore district, Someshwar Ghat road, 06.02.1960, *R.S. Raghavan* 69423 (CAL). **Kerala**, Alappuzha district, Aroor, 07.05.1993, *C.N. Sunil* 1591 (CAL); Idukki district, Calvary mount to Erattayar road, 14.10.1982, *C.N. Mohanan* 74621 (CAL, MH); Kannur district, Pazhassidam, 21.01.1978, *V.S. Ramachandran* 59063 (CAL, MH); Kasaragod district, Karimbam, 15.05.1980, *V.J. Nair* 73935; Kumbala, 25.01.1979, *V.J. Nair* 59886 (CAL, MH); Kollam district, common in hedges, 06.05.1913, *M.M. Rama Rao* 1094 (FRC); Kottayam district, Changanacherry, Vazhappally, 16.11.1984, *V.T. Antony* 988 (CAL); Pulluparai to Peruvanthanam, 22.01.1965, *K. Vivekanandan* 22939 (MH); Malappuram district, C.U. Campus,

17.03.1989, *Elsie Ouseph* P. 51487; Nilambur, Chungathara, 07.03.1985, *A. Babu* 38374; *Ibid.*, Kanjirakkadavu, 04.03.1982, *Philip Mathew* 33976 (CAL); Palakkad district, Mannarkad, 14.09.2007, *K.A. Anilkumar* 2121 (CMPR); Olavakkode., 16.10.1963, *J. Joseph* 17744 (MH); Ottappalam, Ananganadi, 05.03.2018, *P. Soumya & P. Sunojkumar* 157550 (CALI); Pathanamthitta district, Ayroor Grama panchayat, Pannikunnu, 26.01.1992, *R. Chandrasekaran* 96678 (MH); Thiruvananthapuram district, Kollayil, 21.02.1996, *Dhruvan, T.* 27976 (TBGT); Neyyar, 16.04.1973, *J. Joseph* 44175 (MH); *Ibid.*, 27.09.2018, *P. Soumya & P. Sunojkumar* 151858 (CALI); Palode, JNTBGRI garden, 05.12.2017, *P. Soumya & P. Sunojkumar* 138557 (CALI); Pulimath, 11.03.1990, *N. Mohanan* 54522 (CAL, MH); Thrissur district, Vazhani dam, 10.04.1976, *K. Ramamurthy* 48282 (CAL); Wayanad district, Mananthody, *s.d.* *R.T. Balakrishnan* 41675 (CAL). **Maharashtra**, Pune district, Khandala waterfalls, 03.02.1951, *P.V. Balu* 247; Khadakwasla range, 23.09.1963, *K.V. Billone* 115337; Law college hill, 06.02.1957, *G.H.K.* 9767; Mulshi, Kolwan, 22.11.1956, *S.K. Jain* 9504; Sinhagad, *s.d.*, *S.K. Jain* 374; *Ibid.*, 08.03.1962, *John Cherian* 77745 (CAL). **Tamil Nadu**, Coimbatore district, BSI Campus, 23.01.2016, *P. Soumya & P. Sunojkumar* 138552; *Ibid.*, 05.03.2018, *P. Soumya & P. Sunojkumar* 157555 (CALI); R.S Puram, 18.05.1967, *M. Chandrabose* 28989 (MH); Cuddalore district, Annamalai nagar, 31.01.1958, *K.M. Sebastine* 5240; Nanjalur, 17.09.1979, *K. Ramamurthy* 64139 (MH); Sirupakkam R.F., 11.02.1963, *K. Ramamurthy* 90402 (CAL); Kallakurichi district, *s.loc.*, 08.09.1977, *K.R. Ramesh* 50682 (MH); Kanyakumari district, Thovalai, 24.01.1978, *A.N. Henry* 53269 (CAL, MH); Madurai district, Thiruvathavur, *s.d.* *K. Ravikumar* 2283 (CAL); Nagapattinam district, Point Calimere, 07.08.1960, *K.M. Sebastine* 10614 (CAL, MH); Ramanathapuram district, Pondiyoor, 30.12.1989, *V. Balasubramaniam* 2356 (CAL, MH); Salem district, Namakkal, Kolli hills, 19.04.1978, *A. Mohan* 13160 (CAL); Thanjavur district, Pattukkottai to Adiramapatnam, 13.09.1977, *K. Ramamurthy* 51206 (CAL, MH); *s.loc.*, 04.08.1962, *Rabindranath Behara* 738 (FRC); *s.loc.*, 04.08.1962, *N. Sathagunam* 739 (FRC); Tirunelveli district, Papanasam, 31.05.1978, *V.J. Nair* 57195 (MH); Tiruvannamalai district, Tiruvannamalai to Kallakurichi, 25.09.1978, *N. Venugopal & C. Manoharan* 17811 (CAL); Vellore district, Panapakam, 15.06.1969, *G.V. Subba Rao* 31886 (MH). **Telangana**, Hyderabad district,

besides the road Nampali, 28.04.1959, *K.M. Sebastine* 8047(CAL); Siddipet district, *s.loc.*, 02.1976, *s.coll. s.n.* (CAL); Herb. Ind. Or. Hook.f. & Thomson, Malabar & Concan, *Hook & Law s.n.* (MH). **Peninsula Indiae Orientalis**, Herb. Wight. Propr. 2260, 2679 (CAL).

Conservation status: This species is provisionally evaluated as Least Concern [LC] as it is widely distributed throughout peninsular India, either under cultivation as medicinal plants and as garden escapes.

Justicia beddomei (C.B.Clarke) Bennet, Indian J. Forest. 5 (4): 326. 1982; K.M.P.Kumar *et al.*, Phytotaxa 350(1): 71–78. 2018. *Adhatoda beddomei* C.B.Clarke in Hook.f., Fl. Brit. India 4: 540. 1885; Gamble, Fl. Madras 2: 1082. 1921; J.L.Ellis, Bull. Bot. Surv. India 20(1–4): 172. 1978. *Ecbolium beddomei* (C.B.Clarke) Kuntze, Revis. Gen. Pl. 2: 980. 1891. *Type:* INDIA, South Travancore hills, 12.1880, *Beddome* 11 (holo K [K000884079 digital image!]).

Justicia gingiana Sebastine & Ramam., Bull. Bot. Surv. India 6: 99. 1964. *Type:* INDIA, **Tamil Nadu**, South Arcot district, Gingee Reserve forest, 22.03.1961, *K.M. Sebastine & K. Ramamurthy* 12360 (holo CAL [CAL0000020256!]; iso MH [MH00000838!, MH00000839!, MH00000840!, MH00000841!]).

Fig. 3

Perennial shrubs up to 2.5 m tall. Stems erect, sub-tetragonal, branched; branches stout, diffuse, greenish to pale-brown, glabrous; internode 1–4 cm long. Leaves petiolate; laminae widely elliptic to lanceolate, 14–20 × 3–6 cm, base narrowly cuneate, margins entire, apex acuminate, chartaceous, glabrous or puberulous; veins prominent, secondary veins 7–11 pairs, venation simple craspedodromous; petioles 0.7–2 cm long, puberulous. Inflorescence terminal or axillary spike, up to 8 cm long, 4–10 flowered; peduncles short, 1.5–3 cm long, puberulous. Flowers sessile, two per floral node, 1.3–1.5 × 1–1.25 cm; bracts foliaceous, elliptic, 1.5–2 × 0.7–1.25 cm, margin entire, apex narrowly acute, obscurely 3–5-nerved, greenish, puberulous; bracteoles elliptic to oblanceolate, *c.* 1 × 0.25 cm, margins entire, apex acute, whitish green, puberulous. Calyx deeply 5-lobed, *c.* 4 × 2.5 mm at anthesis, accrescent, whitish green, sparsely pubescent outside; lobes equal, lanceolate to ovate, margin entire, apex acute. Corolla whitish without striations on lips, pubescent outside, glabrous inside except in the throat; tube cylindrical, *c.* 6 × 3 mm, enlarged in throat; upper lip erect, oblong, *c.* 8 × 4 mm, apex notched, hooded;

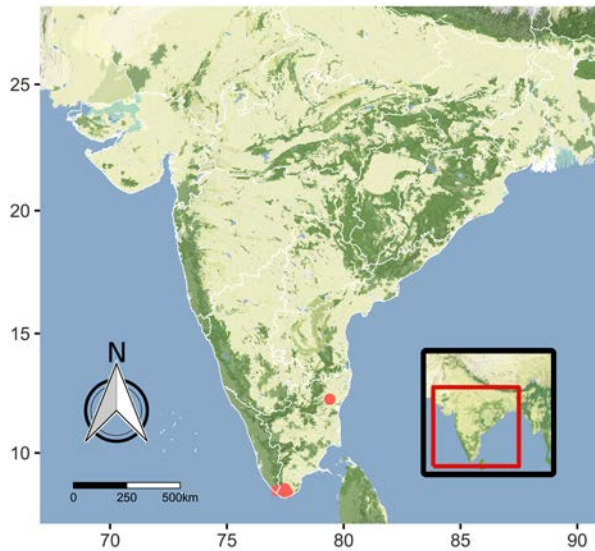


Fig. 3. Distribution of *Justicia beddomei* (C.B.Clarke) Bennet in Peninsular India. Drawn using R (R Core Team, 2023).

lower lip obovate, 3-lobed, c. 7×6 mm; lobes equal, oblong, middle lobe broad, lateral lobes narrow and recurved, apex obtuse to rounded. Stamens exserted; filaments c. 6 mm long, declinate, white, basally hirsute; anther thecae superposed, equal, elliptic, c. 1 mm long, pale green, glabrous; appendage white, c. 4 mm long, apex rounded. Ovary c. 1.3×1 mm, ovate, yellowish green, glabrous or hirsute at apex; style filiform, c. 6 mm long, whitish, hirsute in lower half; stigma minutely bifid. Capsule clavate, c. 1.5×0.6 cm, apex acute, brownish, glabrous; base sterile, 7 mm long, flattened. Seeds 4, compressed, sub-orbicular, c. 4×3 mm, glabrous; testa rugose.

Flowering & fruiting: Flowering from December to May; fruiting from May to June.

Habitat: Found in dry and moist evergreen forests between 120 and 914 m. It is also cultivated for medicinal use in gardens and nurseries.

Distribution: Endemic to South India.

Specimens examined: INDIA, **Karnataka**, Bangalore district, FRLHT garden, 30.03.2005, Indira Balachandran, A.B. Remasree, & Geetha S. Pillai 02322 (CMPR); *Ibid.*, 22.04.2005, K. Ravikumar 71764 (CAL). **Kerala**, Malappuram district, Kottakkal, Herb Garden, 22.03.2015, K.M. Prabhukumar 7878 (CMPR); *Ibid.*, 07.05.2013, Biju John 7043 (CMPR); *Ibid.*, 29.06.2016, P. Soumya, Prabhukumar & P. Sunojkumar 157527 (CALI); Thiruvananthapuram district, Kollayil, 17.11.1990, P. Deepthi Das 26424 (TBGT); Palode, JNTBGRI, 12.12.2017, P. Soumya & P. Sunojkumar 138514 (CALI); Wayanad district,

MSSRF garden, 19.02.2003, Satheesh George & K. V. Thushar 1228 (CMPR). **Tamil Nadu**, Kanyakumari district, Beyond Sengumal estate, Panagudi, 09.02.1972, B.D. Sharma 40062 (MH); South Arcot district, Gingee R.F., 22.03.1961, K.M. Sebastine & K. Ramamurthy 12360 (CAL); *Ibid.*, 26.05.1962, K.M. Sebastine & K. Ramamurthy 17592 (MH); Tirunelveli district, Kalakkad Mundanthurai Tiger Reserve, Thirukurungudi range, Dohnavur estate, 18.02.2014, Ravikumar & Umesh Kumar Tiwari 119778 (FRLH).

Conservation status: Based on herbarium reference, occurrence of this species has been noticed only in nine different locations in Kerala, Karnataka, and Tamil Nadu. Four of these locations are in gardens. Among the wild populations, two are in protected areas (Kalakkad Mundanthurai Tiger Reserve and Gingee Reserve Forest) and three on the outskirts of forests (Kollayil, Panagudi and South Travancore hill). Based on natural populations, the estimated AOO is limited, measuring only 16 km². Given its restricted AOO, this species falls under the category Endangered [EN B2ab (iii,iv,v)].

Notes: *Justicia beddomei* closely resembles and is frequently mistaken for the widespread species *J. adhatoda*. They share the same habit and floral characters. However, *J. beddomei* can be distinguished from *J. adhatoda* by its flowers measuring less than 1.5 cm in length (vs. 2–3 cm long), ovate to lanceolate bract (vs. obovate to oblanceolate or elliptic to oblong), absence of striations on the lower lip (vs. presence of purple striations) and glabrous ovary (vs. hirsute at apex or throughout). Sebastine and Ramamurthy (1965) described a new species *Justicia gingiana* Sebastine & Ramam. from the Gingee Reserve Forest of Tamil Nadu and this was subsequently merged with *J. beddomei* by Ellis (1978). Prabhukumar *et al.* (2018) mentioned that the discovery of *J. gingiana* in the Gingee forest marked the first collection of *J. beddomei* since the type collection. The present study aligns with the findings.

Justicia betonica L., Sp. 1: Pl. 15. 1753; Roxb., Fl. Ind. 1: 129. 1820; T.Anderson, J. Linn. Soc. Bot. 9: 510. 1867; C.B.Clarke in Hook.f., Fl. Brit. India 4: 525. 1885; Gamble, Fl. Madras 2: 1078. 1921; L.H.Cramer, Revis. Handb. Fl. Ceylon 12: 110–111. 1998; V.A.W.Graham, Kew Bull. 43: 586. 1988. *Adhatoda betonica* (L.) Nees in Wall., Pl. Asiat. Rar. 3: 103. 1832.. *Ecbolium betonica* (L.) Kuntze Revis. Gen. Pl. 2: 487. 1891. *Lectotype* (designated by Immelman, 1986): CEYLON (Sri Lanka), *s.d.*, Paul Hermann *s.n.*

(BM [BM000621793 digital image!]).

Justicia ramosissima Roxb. ex Hornem., Suppl. Hort. Bot. Hafn.: 112. 1819. *Lectotype* (designated by Turner, 2021): INDIA, Hortus Botanicus Calcuttensis, *N. Wallich s.n.* (C [C10004941 digital image!]).

Justicia ramosissima Roxb., Fl. Ind. 1: 130. 1820 *nom. illeg.*, non Roxb. ex Hornem. 1819; *Adhatoda ramosissima* Nees in Wall., Pl. Asiat. Rar. 3: 103. 1832. *Justicia betonica* L. var. *ramosissima* (Nees) C.B. Clarke in Hook.f., Fl. Brit. India 4: 525. 1885; Karthik. et al., Fl. Pl. India Dicotyledons 25. 2009. *Lectotype* (designated by Turner, 2021): Icones Roxburghianae 1930 (K).

Justicia betonica L. var. *villosa* C.B. Clarke in Hook.f., Fl. Brit. India 4: 525. 1885; Gamble, Fl. Madras 2: 1078. 1921; Karthik. et al., Fl. Pl. India Dicotyledons 25. 2009. *Lectotype* (designated by Turner, 2021): INDIA, **Chota Nagpore**, Parasnath 4500 feet, 3 Oct 1873, C.B. Clarke 20196 (K [K001129739 digital image!]).

Figs. 4 & 5

Perennial under-shrubs, up to 2.5 m tall. Stems erect, cylindrical, dichotomously branched; branches striate, greenish, glabrescent; internode 2–13 cm long, purplish. Leaves petiolate; laminae lanceolate to elliptic, 3–15 × 3–6 cm, base attenuate, margins dentate, sometimes sinuate, apex acuminate, chartaceous, glossy, glabrous, sparsely hairy on veins; veins prominent, secondary veins 3–7 pairs, venation simple craspedodromous; petioles 2–4 cm long, pubescent. Inflorescence terminal or axillary spike, up to 15 cm long, many-flowered; peduncles 1.75–4 cm long, puberulous. Flowers sessile, one per floral node but not secund, 1.2–1.6 × 0.9–1.2 cm; bracts foliaceous, oblanceolate to oblong 0.8–2 × 0.7–1 cm, margins ciliate, apex acuminate, 3-veined, whitish nerves green; bracteoles similar to bracts but narrower, 0.8–1.5 × 0.5–0.8 cm. Calyx deeply 5-lobed, 4–5 × 1.75–2.75 mm at anthesis, accrescent, c. 5 × 3 mm in fruits, greenish, densely pubescent outside; lobes equal, lanceolate to subulate, margins ciliate, apex acuminate. Corolla creamy white with purple striations on lips, pubescent outside, glabrous inside, throat hairy; tube cylindrical, 4–4.5 × 2.75–3 mm, throat slightly enlarged; upper lip erect, ovate to triangular, 6–8 × 5–5.5 mm, margin entire, apex notched, hooded; lower lip 3-lobed, oblong to obovate; lobes unequal, middle lobe ovate to lanceolate, 8.5–9 × 3–3.5 mm, apex acute or obtuse, lateral lobes narrowly oblong to elliptic, 6–7 × 1.75–

2 mm, recurved, apex rounded. Stamens exserted; filaments 5–6 mm long, white, basally hirsute; anther thecae superposed, equal, elliptic, 1–1.5 mm long, creamy white with purplish margin, upper theca dorsally hirsute, lower theca glabrous; appendage c. 1 mm long, apex pointed, white. Ovary 1.5–2 × c. 1.2 mm, elliptic to oblong, pale green, pubescent at apex or throughout with glandular hairs; style filiform, c. 9 mm long, recurved, whitish, hirsute in lower half; stigma slightly bifid; nectariferous disc c. 1 × 1.5 mm, yellowish white, margins undulate. Capsule clavate to oblong, c. 1.5 × 0.5 mm, apex mucronate, pale brown, densely pubescent throughout; base sterile, 6 mm long, flattened. Seeds 2, sub-orbicular or discoid, 3–3.5 × 4–4.2 mm, tuberculate, pale brown.

Flowering & fruiting: Flowering from September to March; fruiting from April to May.

Habitat: On the margins of evergreen forests, grasslands, plains, along roadsides at an elevation of 50 to 1000 m.

Distribution: Indian Subcontinent, tropical and southern Africa; also from America (Hawaii) as an introduced species.

Specimens examined: INDIA, **Andhra Pradesh**, Ananthapur district, Yadiki, 13.11.1982, P.V. Yesoda & T. Pullaiah 1108 (MH); Chittoor district, Srikalahasti, 18.01.1988, D. Ranga Charyulu 1986 (MH); Guntur district, Rajupalem, 06.05.1900, C.A. Barber 1555 (MH); Kurnool district, Chelama, 07.12.1963, J.L. Ellis 17968 (MH); Nallamala hill, 15.08.1921, C.E.C. Fischer 4668 (FRC); *Ibid.*, 17.11.1969, J.L. Ellis 32433; Upper Ahobilam, 29.08.1965, J.L. Ellis 25553 (MH); Visakhapatnam district, Ananthagiri, 17.10.1969, G.V. Subba Rao 21717; *Ibid.*, 26.12.1969, G.V. Subba Rao 32818 (MH); Birmisala, 13.04.1976, G.V. Subba Rao 47321 (CAL, MH); Chintapalli, way to Gudem hill, 13.11.1970, J.L. Ellis 37120 (MH); Simhachalam hill slopes, 05.05.1964, G.V. Subba Rao 19345 (MH). **Karnataka**, Bagalkot district, Mantur, 28.11.1902, C.A. Barber 4934 (MH); Chamarajanagar district, Bandipur R.F., 23.01.1965, B.D. Naithani 23118 (MH); Mysore district, St. Philomena's college, 10.03.1964, K.M. Sebastine 18709 (MH); Uttara Kannada district, Sirsi, 21.12.2005, P.S. Udayan et al., 03936 (CMPR). **Kerala**, Alappuzha district, Kayamkulam R.S., s.d. Sunil C.N. 1398 (CALI); Ernakulam district, Malayattoor, 18.03.1913, M.M. Ram Rao 966 (FRC); Idukki district, Chinnar riverside, 16.03.1965, E. Vajravelu 23572; Kumily, 23.04.1960, B.V.

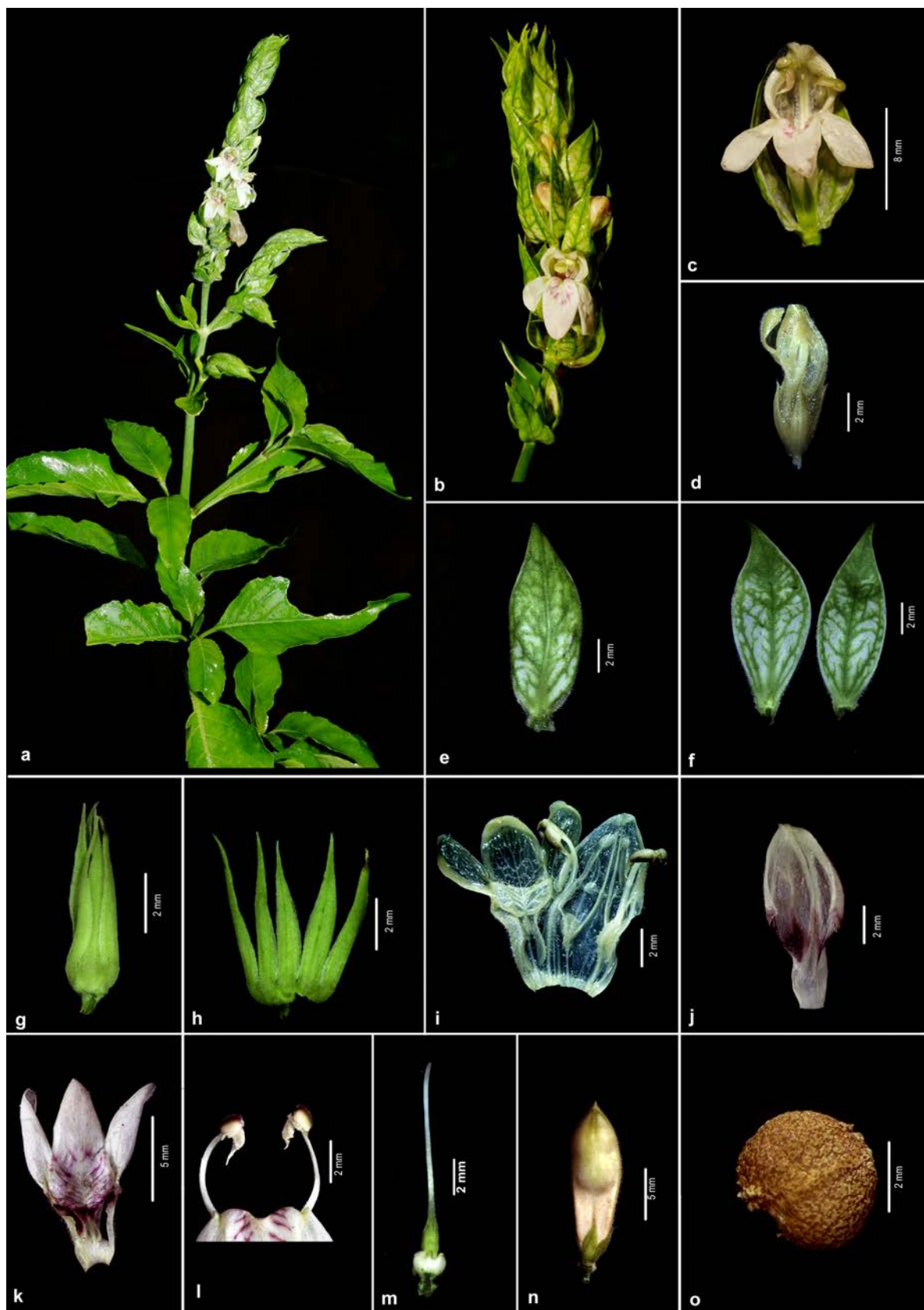


Fig. 4. *Justicia betonica* L.: **a.** Habit; **b.** Inflorescence; **c.** Flower; **d.** Flower bud; **e.** Bract; **f.** Bracteoles—adaxial side; **g.** Calyx; **h.** Calyx—opened; **i.** Corolla—opened; **j.** Upper lip; **k.** Lower lip; **l.** Stamens; **m.** Gynoecium with nectariferous disc; **n.** Capsule; **o.** Seed (from P. Soumya & P. Sunojkumar 138513; photos by P. Soumya).

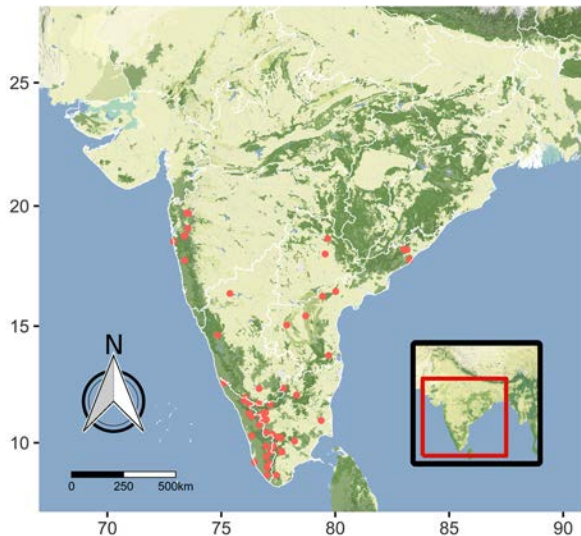


Fig. 5. Distribution of *Justicia betonica* L. in Peninsular India. Drawn using R (R Core Team, 2023).

Shetty 10268; Painavu, 16.12.1982, C.N. Mohanan 76153; Pulluparai-Peruvanthanam, 22.05.1965, K. Vivekananthan 23958 (MH); Kollam district, Kadambupara, 20.04.1984, E. Vajravelu 80536 (CAL); Malappuram district, Karuvarakundu to Kalikavu, 29.04.1971, N.C. Radha Krishnan 38122 (MH); *Ibid.*, 11.03.1984, N.C. Nair 81188 (CAL, MH); Nilambur, Canoly plot, 13.12.1980, Philip Mathew 32342 (CALI); Palakkad district, Mully, 03.02.1996, A.E. Shanavas 29612 (TBGT); Valliyaparathode, 07.10.1979, M.C. Nair 65364 (CAL, MH); *Ibid.*, 15.01.1980, M.C. Nair 65448 (MH); Pathanamthitta district, Achankovil, 19.05.1979, C.N. Mohanan 61297 (MH); Konni forest division, Thora-Mannarapara area, 19.04.1982, K. N. Subramanian 8258 (FRC); Plappally, 20.09.1988, N. Anilkumar 940; *Ibid.*, 23.02.1979, C.N. Mohanan 61184 (MH); Thiruvananthapuram district, Nedumangad, 29.11.1905, C.A. Barber 7167 (MH); Palode, JNTBGRI garden, 12.12.2017, P. Soumya & P. Sunojkumar 138513 (CALI); Thrissur district, Chikkali, 22.01.1919, R Rajan 72915 (CAL); Sholayar, 12.12.1988, N. Sasidharan 5235 (CALI); Vazhachal forest division, Athirapally forest area, 21.01.1988, N. Venkatasubramanian & K.R. Sasidharan 14075 (FRC); Wayanad district, Begur R.F., 03.09.1979, V.S. Ramachandran 62022 (MH); *Ibid.*, 23.11.1983, K. N. Subramanian 9774 (FRC); Wayanad Ghat road, 3rd to 5th hairpin bend, 18.12.2017, P. Soumya & P. Sunojkumar 138528 (CALI); Sulthan Bathery - Kalpatta road, 10.02.1987, N. Venkatasubramanian 13687 (FRC); Tholpetty village, 22.11.1977, V.S. Ramachandran 52283 (MH); *s.loc.*, *s.d.* Ratheesh

Narayanan M.K. 2440 (CALI). **Maharashtra**, Nashik district, Igatpuri, 13.09.1962, R.S. Rao 81330 (CAL); Palghar district, Ambewadi forest, 09.10.1983, P.L. Narasimhan 166035 (BSI); Kohoj fort hilltop, 12.09.1968, K.V. Billore 116673 (BSI, CAL); Vaitarna river bank, 28.10.1967, K.V. Billore 113278 (BSI); Pune district, Bhimashankar, 12.10.1955, G.S. Puri 8452 (BSI); *Ibid.*, 16.10.1957, Vasudeva J.A. 29051 (CAL); Hanuman talao, 10.10.1962, K.P. Janardhanan 81823; Junnar, Durga Khilla, 29.10.1964, K. Hemadevi 104234 (BSI); Khandala-Meroli road, 15.09.1957, S.D. Mahajan 16754 (CAL, BSI); Lonavala, 26.09.1964, B. Venkata Reddi 99182 (CAL); *Ibid.*, near Valvan dam, 01.12.1964, B. Venkate Reddi 99182; Mulshi, 20.11.1956, S.K. Jain 9446 (BSI); Paud, 18.10.1956, S.K. Jain 8201 (BSI); Raigad district, Korlai fort forest area, 22.12.1963, B. Venkatta Reddi 93315 (CAL); Ratnagiri district, Khed, Koliya jungle, 07.12.1961, K.P. Janardhanan 76370 (BSI); Satara district, Mahabaleshwar, 07.01.1957, S.D.M. 13203 (BSI); Thane district, Vihigaon range, 30.08.1967, K.V. Billore 111608 (BSI). **Tamil Nadu**, Coimbatore district, Aliyar submergible area, 25.11.1962, K.M. Sebastine 15388 (CAL, MH); Anakkatty forest, 28.05.1994, S.K. Mundal 7117 (CAL); Andipara shola, 24.03.1969, R. Marutham 31765 (MH); Maruthaamalai near temple, 07.01.2017, P. Soumya & P. Sunojkumar 138532 (CALI); Mettupalayam range, Kunukkumuduvu, Odanthurai, 01.03.1974, K.N. Subramanian 4762 (FRC); Noyyal riverside, 01.08.1968, M. Chandrabose 30561 (MH); Perumalmudi, 29.12.1969, M.V. Viswanathan 341; Sadivayal, 06.08.1960, A.N. Henry 72 (MH); *Ibid.*, near nursery, 03.04.1963, K.N. Subramanian 205 (FRC); Siruvani, 28.12.1956, K. Subramanyam 1843 (CAL); *Ibid.*, Sundakamuthur, 14.06.1968, D.B. Deb 30252; *Ibid.*, 3.01.1978, N.C. Nair 41487 (MH); Thanipallam, 09.10.1960, A.N. Henry 680; *Ibid.*, 25.10.1968, D.B. Deb 31097 (MH); Thekkumalai, 06.12.1956, K.M. Sebastine 1626 (CAL); Valankulam, 05.09.1968, M. Chandrabose 30663; *Ibid.*, 04.10.1968, M. Chandrabose 31101; Waterfalls estate, 10.07.1961, J. Joseph 12810 (MH); Dharmapuri district, Buddireddipatti, 19.12.1913, *s.coll.* 9672 (MH); Dindigul district, Kodaikanal, Oothu village, 20.12.1988, C. Sudhesan 608 (CAL); Erode district, Hasanur, 10.03.1931, K.C. Jacob 81307 (MH); Sathy, Hasanur-Karaepalayam, 10.01.1987, N. Venkatasubramanian N.V.61 (FRC); *Ibid.*, Kurubithikadu, Germalam range, 23.10.1987, N. Venkatasubramanian N.V. 913 (FRC); Krishnagiri district, Anchetty, 20.02.1927, K.C. Jacob 18040

(MH); Madurai district, Alagar kovil, 20.04.1991, S.R. Srinivasan 94495 (MH); Namakkal district, Kolli hills, 04.10.1903, S.K. Nazeeruddin 24861 (CAL); Nilgiris district, Benne forest, 20.01.1961, B.V. Shetty 11954 (CAL, MH); Coonoor - Mettupalayam road, 06.09.1970, B.D. Sharma 36068; Coonoor ghat region, 01.02.1985, M.C. Lawson s.n. (MH); Kotagiri, 06.01.1957, K. Subramanyam 1951 (CAL); Kunjapani R.F., Sundapatty, 25.11.1970, E. Vajravelu 37066 (MH); Ooty, on the way to naduvattam, 24. 11.2008, P. Soumya & P. Sunojkumar 138536 (CALI); Segur bridge, 21.11.1970, G.V. Subba Rao 37292 (MH); Pudukkottai district, Cambel road, 23.06.1965, K. Ramamurthy 24913 (MH); Ramanathapuram district, Ayyanarkovil forest, 17.03.1970, E. Vajravelu 33873 (MH); Chittaru river bank, 17.02.1979, N.C. Nair 60609 (CAL); Karkathakudi, 15.01.1989, V. Balasubramanian 2095 (CAL, MH); Salem district, Yercaud Cauvery peak, 04.11.1968, D.B. Deb 31320 (MH); Sivaganga district, Piranmalai, 19.12.1964, K. Ramamurthy 22787 (MH); Tenkasi district, Chittar riverside, 17.02.1973, N.C. Nair 60909 (MH); Therkumalai road, 23.04.1957, K. Subramanyam 2856 (CAL, MH); Thanjavur district, Kumbakonam, 06.03.1987, B. Ragupathy 306 (CAL, MH); Theni district, Combai, 14.06.1961, K.M. Sebastine 12561 (CAL); Thalaiyar MHEP areas, 18.10.1986, K. Ramamurthy 51596; *Ibid.*, 18.10.1986, J.C. Mari 51599 (MH); Tirunelveli district, Manjolai, Tiger falls, 30.06.1957, K.M. Sebastine 3716 (CAL, MH); Panagudi, 04.02.1972, B.D. Sharma 39941; Sengumal estate, 10.02.1972, B.D. Sharma 40069 (MH); Virudhunagar district, Kansapuram to Srivilliputhur R.F., 18.07.1965, E. Vajravelu 24757; *Ibid.*, way to Alagar kovil, 20.04.1991, S.R. Srinivasan 94495 (MH). **Telangana**, Peddapalli district, Manthani, 27.12.1986, M.R. Rajendra Prasad 192; Pakhal R.F., 27.11.1960, K.M. Sebastine 11645 (MH); Warangal urban district, Hanmkonda, 20.09.1995, R.K. Premanath 105369 (MH).

Conservation status: This species is assessed as Least Concern [LC] as it is widely distributed throughout India.

Justicia diffusa Willd., Sp. Pl. 1: 87. 1797; T.Anderson, J. Linn. Soc. Bot. 9: 512. 1867; C.B. Clarke in Hook.f., Fl. Brit. India 4: 538. 1885; R.R. Stewart in E. Nasir & S.I. Ali (eds.), Fl. West Pakistan, Karachi 676. 1972; L.H. Cramer, Revis. Handb. Fl. Ceylon 12: 121. 1998; Malik & Ghafoor in E. Nasir & S.I. Ali (eds.), Fl. Pakistan 188: 37. 1988; V.A.W. Graham, Kew

Bull. 43: 597. 1988; J.Q. Hu, Y.F. Deng & T.F. Daniel in Z.Y. Wu, P.H. Raven & D.Y. Hong (eds.), Fl. China 19: 452. 2011; P. Soumya & Sunojk., Phytotaxa. 415 (3): 130–136. 2019. *Rostellaria diffusa* (Willd.) Nees in Wall., Pl. Asiat. Rar. 3: 100. 1832. *Rostellularia diffusa* (Willd.) Nees in DC., Prodr. 11: 371. 1847. *Ecbolium diffusum* (Willd.) Kuntze, Revis. Gen. Pl. 2: 487. 1891. *Lectotype* (designated by Malik & Ghafoor, 1988): INDIA, Nandaradak, 17.10.1794, Klein 724 (B-Herb. Willd. [B-W 00326-010 digital image!]).

Rostellaria hedyotidifolia Nees in Wall., Pl. Asiat. Rar. 3: 100. 1832. *Rostellularia hedyotidifolia* (Nees) Nees in DC., Prodr. 11: 370. 1847. *Justicia diffusa* var. *hedyotidifolia* (Nees) C.B. Clarke in Hook.f., Fl. Brit. India 4: 538. 1885; Gamble, Fl. Madras 2: 1081. 1921. *Rostellularia diffusa* var. *hedyotidifolia* (Nees) Kumari in A.N. Henry et al., Fl. Tamil Nadu Ind., Ser 1, Analysis 2: 158. 1987. *Justicia hedyotidifolia* (Nees) Remadevi & Binojk., Fl. Kerala Acanthaceae: 97. 2009. *Lectotype* (designated by Soumya & Sunojkumar, 2019b): INDIA, s.loc., s.d., B. Heyne 2450 (Wall. Cat. 2450) (K [K001116056 digital image!]).

Rostellaria rotundifolia Nees in Wall., Pl. Asiat. Rar. 3: 100. 1832. *Rostellularia rotundifolia* (Nees) Nees in DC., Prodr. 11: 370. 1847. *Justicia orbiculata* Wall. ex T. Anderson in J. Linn. Soc., Bot. 9: 512. 1867. *Justicia diffusa* var. *orbiculata* C.B. Clarke in Hook.f., Fl. Brit. India 4: 538. 1885, **syn. nov.** *Rostellularia diffusa* var. *orbiculata* (C.B. Clarke) J.L. Ellis in Biol. Mem. 2 (1 & 2): 109. 1977. *Justicia nepalensis* V.A.W. Graham, Kew Bull. 43: 597. 1988, **nom. invalid.** *Lectotype* (designated by Deng, 2020): NEPAL, s.loc., 1821, Herbs Wight in Wall. Cat. 2489 (K-Wall. [K001116176 digital image!]).

Justicia gambleana K.M.P. Kumar, Robi & Hareesh, Phytotaxa 39: 71. 2016. **Type:** INDIA, **Kerala**, Palakkad district, Dhoni forest, way to Korakkalu, 26.09.2013, K.M. Prabhukumar 7547 (holo CMPR!; iso CALI, CATH, MH [MH00003372!]). **Figs. 6–8**

Annual erect or decumbent herbs, to 90 cm tall. Stems angular, base woody, dichotomously branched; branches slender, diffuse, greenish, sparsely pubescent to dense white tomentose; internodes 1–7 cm long, purplish. Leaves petiolate; laminae elliptic to ovate or orbicular 1.25–5.5 × 1.2–3.7 cm, base cuneate to obtuse or oblique, margins entire or sub-crenate, ciliate, apex acute to obtuse or sub-acuminate, chartaceous, glabrous to densely pubescent, secondary veins 3–6 pairs, venation

eucamptodromous; petioles 0.4–1.5 cm long, pubescent. Inflorescence terminal or axillary spike, slender, dense or lax, 2.5–8 cm long; peduncles short, 0.3–3 cm long, pubescent. Flowers sessile, two flowers per floral node, $5.5\text{--}7 \times 3\text{--}4$ mm; bracts linear to narrowly lanceolate or triangular, $1.5\text{--}3.8 \times 0.4\text{--}1$ mm, margins scarious, minutely ciliate, apex narrowly acute, greenish, glabrous; bracteoles similar to bracts but narrower, $2\text{--}3.5 \times 0.5\text{--}0.8$ mm. Calyx deeply 4-lobed, $3\text{--}3.7 \times 1\text{--}1.5$ mm at anthesis, accrescent, $3.8\text{--}4.5 \times 3\text{--}4$ mm in fruits, greenish; lobes linear to lanceolate, equal, margins scarious, ciliate, apex narrowly acute, glabrous. Corolla white or purplish white with white striations on lower lip, sparsely pubescent outside, glabrous inside except in the throat; tube cylindrical, $2\text{--}2.5 \times 1\text{--}1.3$ mm, slightly enlarged in throat, white; upper lip erect, triangular to ovate, $2.2\text{--}3 \times 1.7\text{--}2.2$ mm, apex minutely 2-lobed, slightly hooded; lower lip orbicular to obovate, $3.5\text{--}5 \times 3\text{--}4$ mm, 3-lobed; lobes ovate, imbricate, middle lobe slightly wider than lateral lobes, apex rounded. Stamens exserted; filaments. 1.5–2.5 mm long, declinate, white, basally villous; anther thecae superposed, equal or sub-equal, elliptic, c. 0.5 mm long, purplish brown with yellow shades, upper theca muticous, dorsally hirsute, lower theca glabrous; appendage 0.5–0.7 mm long, apex acute or obtuse, white. Ovary ellipsoid, $1\text{--}1.5 \times 0.5$ mm, pale green, hirsute at apex; style slender, 3–3.5 mm long, whitish, hirsute in lower half; stigma slightly bilobed; nectariferous disc c. 0.5 mm tall, pale yellow. Capsule clavate to fusiform, $4\text{--}5.5 \times 1\text{--}1.75$ mm, apex cuspidate or acute, pale brown, glabrous or slightly pubescent at apex. Seeds 4, compressed, cordate to ovate, oblong or sub-orbicular, $0.75\text{--}1.5 \times 0.8\text{--}1.3$ mm, pale brown to dark brown; testa rugulose.

Flowering & fruiting: Flowering from July to February; fruiting March.

Habitat: This species grows on moist rocks, in wet humus along Ghat roadsides, hill slopes, stream banks and rock crevices in grasslands at elevations ranging from 350 to 1300 m. It can be seen as undergrowth in moist shady parts of evergreen forests.

Distribution: It is distributed throughout Eritrea to Ethiopia in East Africa, southern Arabian Peninsula, Indian Subcontinent to South China, Indo-China, and Taiwan.

Specimens examined: INDIA, **Andhra Pradesh**, Chittoor district, Kakuladibba, 31.12.1975, G.V. Subba

Rao 46895 (CAL); Talakona waterfall, 03.08.2018, P. Soumya, Geethika & P. Sunojkumar 157524 (CALI); East Godavari district, Devarkonda, 07.10.1920, V. Narayanaswami 473 (CAL); Kadapa district, s.loc., 07.1884, J.S. Gamble 15190; Nellore district, Inukurthi, 11.1898, T.L. Walker s.n.; Udayagiri, 28.08.1917, s.coll. 4144 (CAL); Srikakulam district, Saluru forest, 10.09.1962, N.P. Balakrishnan 1081 (CAL); Vishakhapatnam district, Sunkarametta, 29.08.1960, Subba Rao, G.V. 10929 (CAL). **Karnataka**, Bellary district, Sanduru, 10.01.1980, B.R. Ramesh & S.B. Manohar 10717 (CAL); Bengaluru district, Devanahalli, 30.11.1905, C.E.C. Fischer 484 (CAL); Chamarajanagar district, Bandipur, 24.08.1964, B.D. Naithani 21115; *Ibid.*, 25.08.1964, B.D. Naithani 21190 (MH); *Ibid.*, Gundlupet, 10.1910, A. Meebold 11435 (CAL); Haveri district, Byadgi, 12.1888, W.A. Talbot 1775 (CAL); Uduppi district, Kollur hills, 01.09.1913, M. Ram Rao 1592; s.loc., 10.1910, A. Meebold 11407 (CAL). **Kerala**, Idukki district, Karimanal, 12.09.2016, P. Soumya, Drisya & P. Sunojkumar 138522; Kumily, 06.11.1993, Jomy Augustine 12546; Peerumade, 12. 1910, A. Meebold 12905 (CAL); Ramakkalmedu 08.08.2017, P. Soumya & P. Sunojkumar 138511; *Ibid.*, 18.09.2018, P. Soumya & P. Sunojkumar 138524; Thekkady, 28.05.1995, Jomy Augustine 15312 (CALI); Kollam district, Thannithode, 10.08.1984, C.N. Mohanan 69317 (CAL); Palakkad district, Aruvanpara, 21.08.1982, Sabu, T. 10669 (CALI); Dhoni hills, 19.01.1910, C.E.C. Fischer 1596 (FRC, CAL); *Ibid.*, 26.09.2013, Prabhukumar K.M. 07547, 07549 (CMPR); *Ibid.*, 17.08.2018, P. Soumya, Sasikumar & P. Sunojkumar 157528 (CALI); Gudaloor road, 02.10.1981, Philip Mathew 28799 (CALI); Malampuzha, s.d., Robi A.J. 07029 (CMPR); Mannarkkad, Perumalmedu, 23.10.2011, K.A. Anilkumar 4124; Mannarkkad, 10.10.2012, K.A. Anilkumar 4605; *Ibid.*, Varadimala, 30.04.2008, K.A. Anilkumar 3032 (CMPR); *Ibid.*, Venthapetty, 09.10.2007, K.A. Anilkumar 2390 (CMPR); Nelliampathy, near Pothundy dam, 19.09.2013, Prabhu kumar, K.M. 07375; *Ibid.*, 19.09.2013, Prabhu kumar K.M. 07354 (CMPR); *Ibid.*, way to Minnampara, 21.09.2013, Prabhu kumar, K.M. 07540 (CMPR); *Ibid.*, 15.10.2017, P. Soumya & P. Sunojkumar s.n. CU 138543 (CALI); Silent valley, 30.08.1983, S. Chand Basha 9573 (FRC); Walayar range, Varalapadi, 18.09.1975, K. N. Subramanian 5336 (FRC); Pathanamthitta district, Ranni forest division, Pamba-Kalkki dam site, 25.01.1984, N. Venkatasubramanian 10342 (FRC); Wayanad district, Periya, Gurukula, 21.07.2016, P.

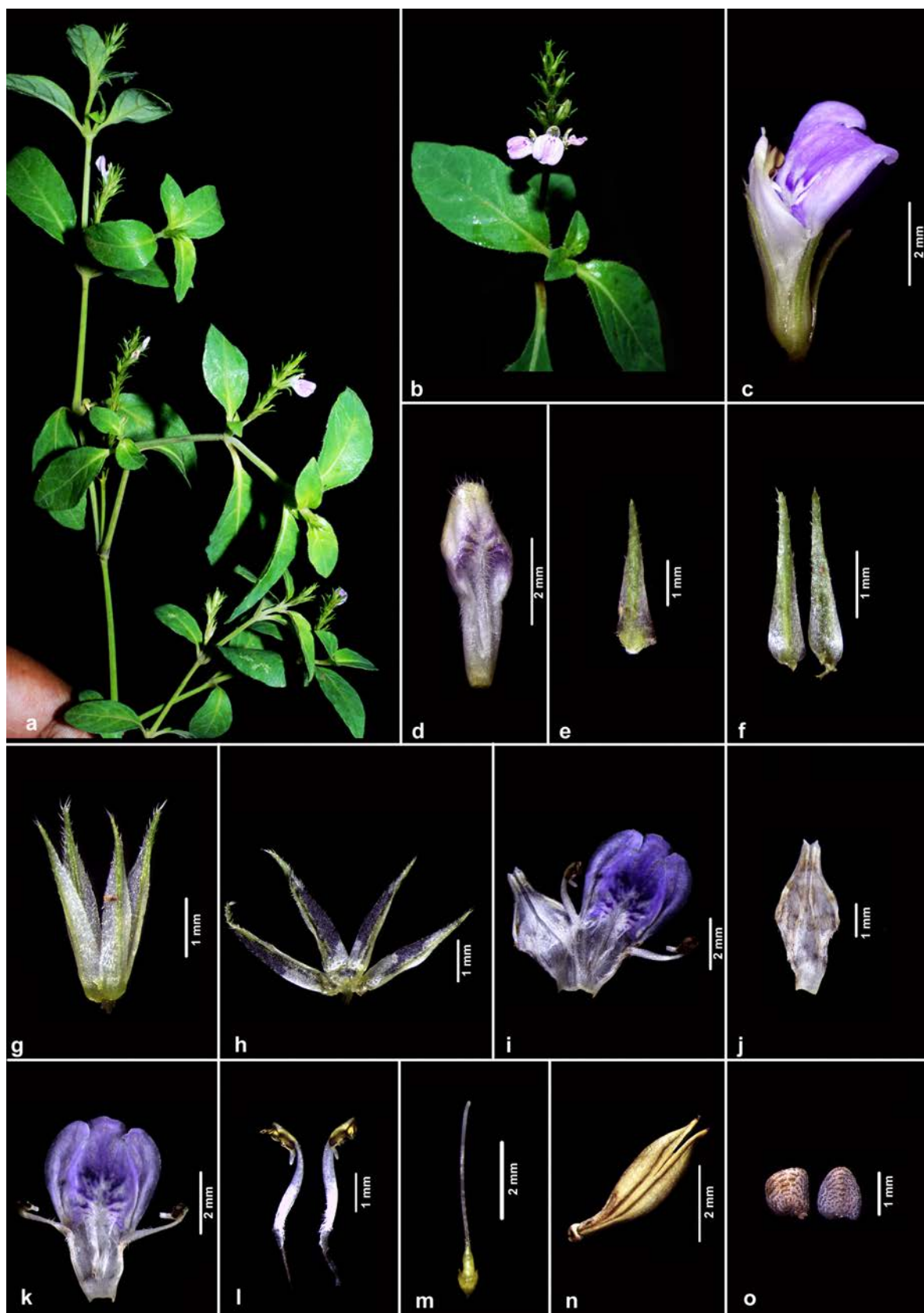


Fig. 6. *Justicia diffusa* Willd.: **a.** Habit; **b.** Inflorescence; **c.** Flower; **d.** Flower bud; **e.** Bract; **f.** Bracteoles—abaxial (left) and adaxial side (right); **g.** Calyx; **h.** Calyx—opened; **i.** Corolla—opened; **j.** Upper lip; **k.** Lower lip; **l.** Stamens; **m.** Gynoecium with nectariferous disc; **n.** Capsule; **o.** Seeds (from P. Soumya & P. Sunojkumar 138500; photos by P. Soumya).



Fig. 7. *Justicia diffusa* Willd.: a–e: Variations in Habit and Leaf

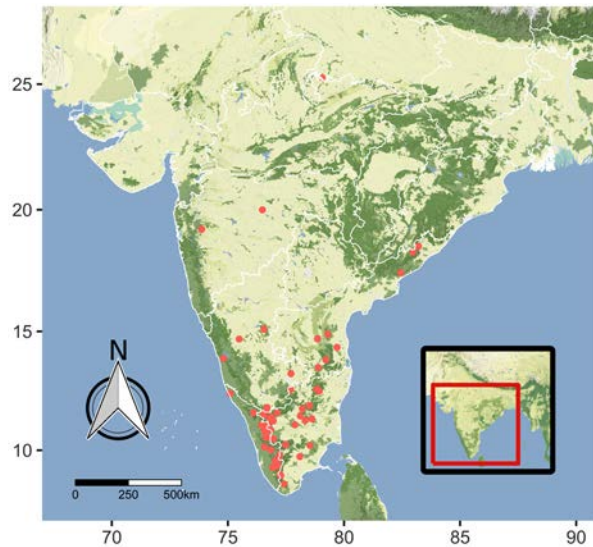


Fig. 8. Distribution of *Justicia diffusa* Willd. in Peninsular India. Drawn using R (R Core Team, 2023).

Soumya & P. Sunojkumar 145381 (CALI); Puthurvayal, 08.04.2001, Ratheesh Narayan M.K 2528 (CALI); Thiruvananthapuram district, *s.loc.*, *s.d.* C.C. Calder & M.S. Ramaswami 1583 (CAL). **Maharashtra**, Buldhana district, Lonar lake area, 24.11.1983, P.G. Diwakar 171218 (BSI); Pune district, Ranipur, 10.08.1965, R.D. Pataskan 101409; *Ibid.*, 19.08.1965, R.D. Pataskan 105844 (CAL); Shivneri hill, East Junnar, 27.01.1965, Hemadevi 89976 (CAL). **Tamil Nadu**, Coimbatore district, Karadimadai, 30.07.1929, S.R. Raja & Ratnavelu 1950 (MH); Siruvani, Adivaram bamboo experimental plot, 02.07.1963, K. N. Subramanian 780; Valparai road from Aliyar dam, near five miles, 24.08.1963, K. N. Subramanian 787 (FRC); Velliangiri mountains, 22.02.1957, K.M. Sebastine 2423 (CAL); *Ibid.*, 12.08.2017, P. Soumya, Nikhil, Pradeep A.K. & P. Sunojkumar 138500 (CALI); Dharmapuri district, Harur, Sitheri hills, 12.08.1978, K.M. Matthew 16675 (CAL); Dindigul district, Kodaikanal shola, 16.07.1912, *s.coll.* 52 (CAL); Erode district, Kodumudy, 10.07.1959, K.M. Sebastine 8421 (CAL); Sathy Taluk, Dhimbam to BannariGhat road, 24.01.1987, N. Venkatasubramanian N.V. 235; *Ibid.*, hairpin bends 27-26, 4.10.1987, N. Venkatasubramanian N.V. 842; *Ibid.*, *s.d.*, N. Venkatasubramanian N.V. 456 (FRC); Krishnagiri district, Denkanikotta, Thally hills, 10.09.1978, K.M. Mathew & N. Venugopal 17325 (CAL); Namakkal district, Kolli hills, 20.04.1978, A. Mohan 13218 (CAL); Rasipuram, 31.07.1978, N. Venugopal 15893; Maisor & Carnatic, *Herb. Ind. Or. Hook f. & Thomson s.n.* (CAL); Nilgiris district, Coonoor, 11.02.1899, D.I. Prain *s.n.* (CAL); *Ibid.*, 10.1910,

s.coll. 12016, 12026; Kotagiri, Aravenu, 24.10.1956, K. Subramanyan 1104 (CAL); *Ibid.*, Mamaram, 06.01.1957, *s.coll.* 1972 (CAL); Ooty, Needle view point, 02.01.2017, Shinoj, P. Soumya & P. Sunojkumar 145340; *Ibid.*, 03.09.2018, P. Soumya & P. Sunojkumar 145361; Salem district, Yercaud, Shevareys lake side, 07.11.1978, N. Venugopal 19066 (CAL); Tenkasi district, Courtallam, 29.06.1901, C.A. Barber 3294 (CAL); Tiruchirappalli district, Pachaimalai hill top 06.08.1958, K.M. Sebastine 6165 (CAL); Tirunelveli district, Manjolai, 05.09.2018, Shinoj, P. Soumya & P. Sunojkumar 157539 (CALI); Tiruvannamalai district, Javadi hills, 22.11.1975, K. N. Subramanian 95582 (FRC); Pattarikad R.F., Polur range, 21.11.1975, K. N. Subramanian 5488 (FRC); Vellore district, On the way to Kambukudi, 08.09.1958, K. Subramanyam 6491 (CAL); Tenkasi district, Sengottai to Aryankavu, 08.09.1913, C.C. Cader & M.S. Ramaswami 661; Courtallam falls, 23.07.1957, K.M. Sebastine 3753 (CAL). **Peninsula Indiae Orientalis**, *Herb. Wight. Propr.* 662 (CAL).

Conservation status: This species is distributed across all Indian states; thus, it is assessed here as Least Concern (LC).

Notes: This highly variable species exhibits significant morphological diversity across altitudes. The height ranges from 30–90 cm, with sessile to petiolate leaves that vary in shape from linear to ovate or orbicular. Occasionally, white flowers were also observed. At high altitudes (above 1000 m), the plants are shorter and grow from a woody rootstock with compact internodes and smaller leaves. When grown in a greenhouse at lower altitudes, these plants' shorter habit, internodal length and leaf size gradually mature into the typical herbaceous form, after a few flowering seasons.

Clarke (1885) treated *Rostellaria hedyotidifolia* Nees as *Justicia diffusa* var. *hedyotidifolia* (Nees) C.B. Clarke distinguishing it by its woody stems, petiolate and ovate leaves, short and dense spikes with ciliate sepal tips. However, these characters are observed in the typical variety *J. diffusa*. The same situation applies to *J. diffusa* var. *orbiculata* C.B. Clarke characterised by ovate, petiolate leaves with dense hairs. A woody nature, along with more or less ovate, petiolate leaves and short dense spikes can be observed in *J. diffusa* from high-altitude regions. Considering the degree of fluctuation in morphological characters linked to altitudinal differences (below 350 & 1300 m), all these varieties were treated as synonyms of *J. diffusa*.

Justicia ekakusuma Pradeep & Sivar., Rheedea 1: 40. 1991; Pramod & Pradeep, Fl. Madayippara 544. 2020. *Type*: INDIA, **Kerala**, Cannanore district, Payangadi, Madaipara, Pradeep 50401 (holo MH [MH00003207!], iso CALI [CALI110599!, CALI110600!]).

Figs. 9 & 10

Annual diffuse herbs, up to 9 cm tall. Stems erect, branched, quadrangular with minutely retrorse hairs at each angle; internodes 1–1.5 cm long, purplish. Leaves shortly petiolate; laminae ovate to elliptic, 0.5–1.5 × 0.4–0.9 cm, base cuneate, margins entire, apex acute or obtuse, glabrous or with scattered minute hairs, midrib distinct, lateral nerves indistinct; petioles 1–4 mm long, puberulous. Inflorescence terminal spike, up to 2 cm long or solitary flowers. Flowers sessile, two per floral node, 4–6 × 2–3 mm; bracts ovate to elliptic, foliaceous, 6–13 × 4–7 mm, apex acute, puberulous; bracteoles 2, linear or spatulate, 2–4.5 × 0.5–1.2 mm, green, glabrous, margins with scattered long setose hairs. Calyx deeply 4-lobed, 3–4 × 1–2 mm at anthesis, accrescent, pinkish green; lobes linear to lanceolate, equal, apex acute, glabrous, margins scarious with long setose hairs. Corolla pinkish with white striations on lower lip; tube c. 2 × c. 1 mm, white, glabrous outside and pubescent inside at throat; upper lip erect, triangular to ovate, c. 2.5 × 2 mm, apex emarginate, lobes rounded, cucullate; lower lip orbicular to obovate, c. 3 × 2.8 mm, 3-lobed at apex, lobes imbricate, apex obtuse. Stamens exserted; filaments 2 mm long, white, basally hirsute; anther thecae slightly superposed, equal, elliptic, 0.4 mm long, pinkish with yellow margin, glabrous; appendage c. 0.3 mm long, apex acute, white. Ovary ellipsoid, c. 1 × 0.5 mm, pale green, hirsute at apex; style slender, 2.5–3.25 mm long, whitish with pinkish tinge, hooked, hairy in lower half; nectariferous disc c. 0.4 mm high, pale yellow; stigma bifid. Capsule oblong, constricted around the middle, 3–3.5 × 1–1.3 mm, apex acute, purplish green to brown, minutely puberulous, retacula minute. Seeds 4, cordate to oblong or sub-orbicular, compressed, 1–1.2 × 0.7–1 mm, distinctly margined, pale brown to black, margins shortly winged; testa rugulose.

Flowering & fruiting: Flowering towards the end of June to September; fruiting from September to October.

Habitat: Grows in humus on wet lateritic rocks at an elevation of around 45 m.

Distribution: Endemic to South India, hitherto known only from its type locality.

Specimens examined: INDIA, **Kerala**, Kannur district, Madayippara, near Madayikkavu., 25.07.2011, A.K.Pradeep & C.Pramod 126698; *Ibid.*, near KSEB, 01.08.2010, s.coll.126509; *Ibid.*, near Joothakulam, 05.07.2017, P. Soumya & P. Sunojkumar 138542; *Ibid.*, 12.07.2018, P. Soumya, Adhitya & P. Sunojkumar 145390; *Ibid.*, on rocks near Madayi College, 02.08.2019, P. Soumya & P. Sunojkumar 157531 (CALI).

Conservation status: *Justicia ekakusuma* is known from the type locality Madayippara in Kannur district (earlier as 'Cannanore district'). During the present field study, first author observed about 30 mature individuals from the lateritic plateau near Joothakulam. The calculated AOO is 8 km². The type locality faces challenges as a tourist destination with its lateritic habitat adversely affected by waste dumping and use as a playground. Consequently, the population of this species has declined over the last three years. Considering these factors, this species is assessed here as Critically Endangered [CR B2ab(ii, iii, iv, v), D].

Justicia gendarussa Burm.f., Fl. Ind. 10. 1768; Roxb. Fl. Ind. 1: 129. 1820; T.Anderson, J. Linn. Soc. Bot. 9: 513. 1867; C.B.Clarke in Hook.f., Fl. Brit. India 4: 532. 1885; Gamble, Fl. Madras 2: 1079. 1921; L.H.Cramer, Revis. Handb. Fl. Ceylon 12: 115–116. 1998; Malik & Ghafoor in E.Nasir & S.I.Ali (eds.), Fl. Pakistan 188: 43. 1988; V.A.W.Graham, Kew Bull. 43: 589. 1988; J.R.I.Wood in A.J.C.Grierson & D.G.Long (eds.), Fl. Bhutan 2(3): 1287–1288. 2001; J.Q.Hu, Y.F.Deng & T.F.Daniel in Z.Y.Wu, P.H.Raven & D.Y.Hong (eds.), Fl. China 19: 457. 2011. *Gendarussa vulgaris* Nees in Wall., Pl. Asiat. Rar. 3: 104. 1832; Wight, Icon. t. 468. 1841; Nees in DC., Prodr. 11: 410. 1847. *Ecbolium gendarussa* (Burm.f.) Kuntze Revis. Gen. Pl. 2: 487 1891. *Lectotype* (designated by Deng, 2020): INDONESIA, **Java**, s.d., s.coll. s.n. (LINN [LINN-HS46-7 digital image!]). **Figs. 11 & 12**

Annual or perennial woody shrubs, up to 2 m tall. Stems erect, sub-terete, much branched; branches stout, purplish green, glabrous; internodes 3–8 cm long, nodes swollen. Leaves sub-sessile to petiolate; laminae narrowly lanceolate to elliptic, 3–10 × 1.5–2.5 cm, base cuneate, margins entire, apex acuminate to narrowly acute, chartaceous, glossy, glabrous on both surfaces; veins prominent,

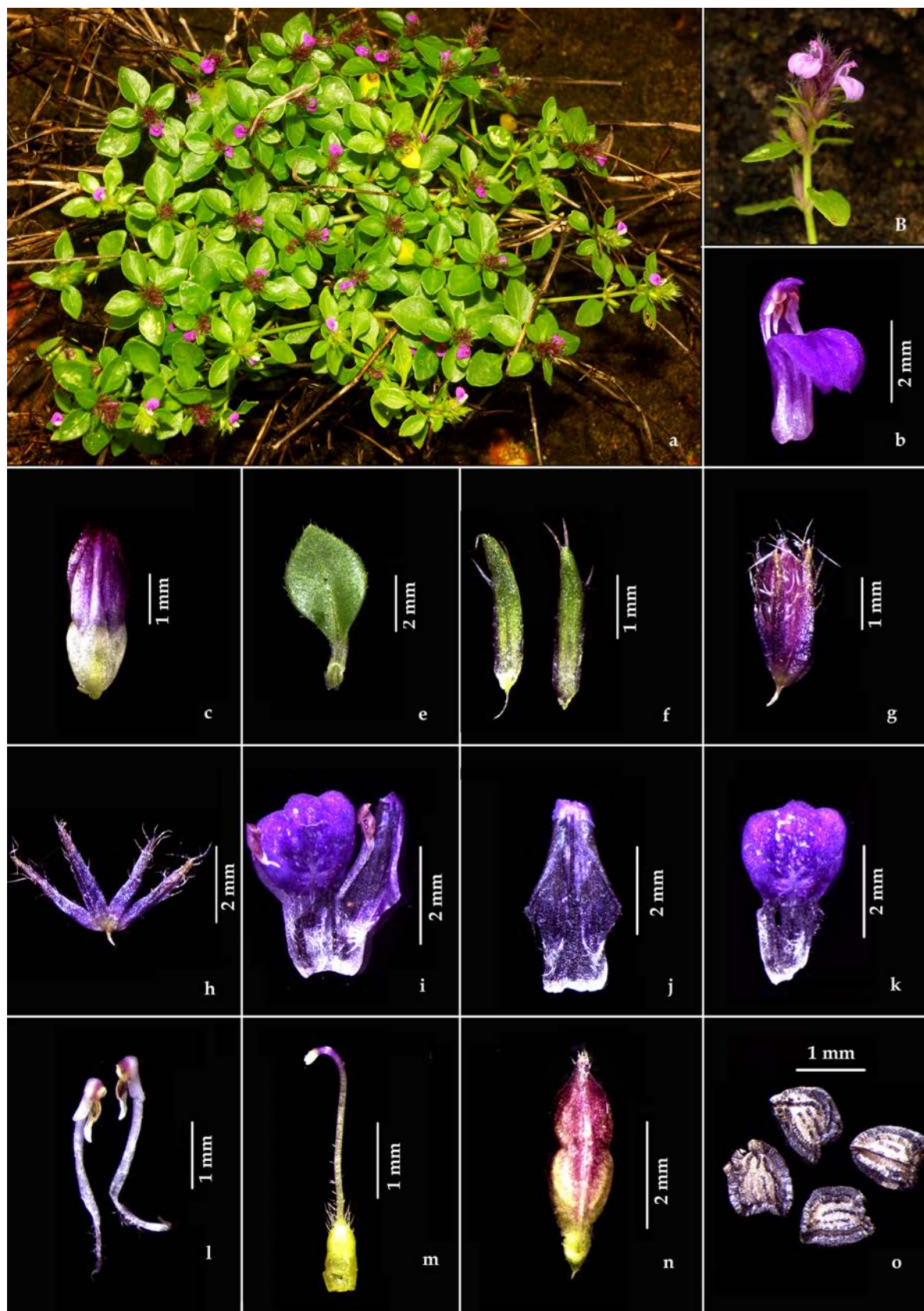


Fig. 9. *Justicia ekakusuma* Pradeep & Sivar.: **a.** Habit; **b.** Inflorescence; **c.** Flower; **d.** Flower bud; **e.** Bract; **f.** Bracteoles—adaxial side; **g.** Calyx; **h.** Calyx—opened; **i.** Corolla—opened; **j.** Upper lip; **k.** Lower lip; **l.** Stamens; **m.** Gynoecium; **n.** Capsule; **o.** Seeds (from P. Soumya & P. Sunojkumar 138542; photos by P. Soumya).

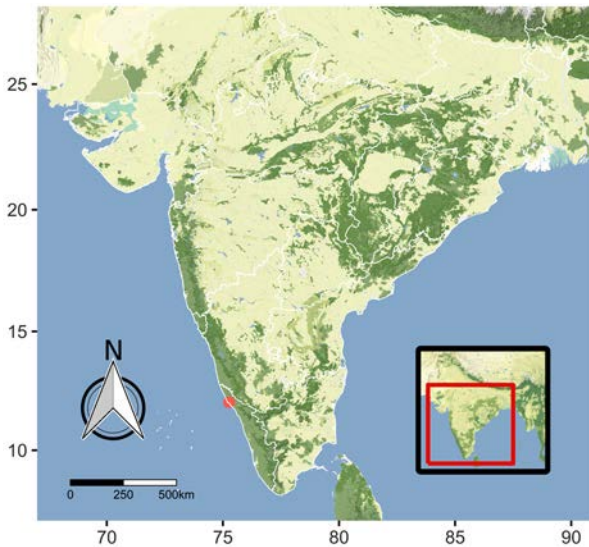


Fig. 10. Distribution of *Justicia ekakusuma* Pradeep & Siv. in Peninsular India. Drawn using R (R Core Team, 2023).

reddish brown, secondary veins 5–8 pairs, venation simple craspedodromous; petioles 3–8 mm long, puberulous. Inflorescence terminal dense spike, up to 12 cm long, many-flowered or solitary in lower axils; peduncles 0.5–1.5 cm long, glabrous. Flowers sessile, two per floral node, 1.5–1.8 × 0.5–0.7 cm; bracts narrowly lanceolate to triangular, 3.5–4 × c. 1 mm, margins ciliate, apex acuminate, single veined; bracteoles similar to bracts but narrower, c. 3.5 × 1 mm. Calyx 5-lobed, 6–8 × 2–2.5 mm at anthesis, accrescent, purplish green, pubescent outside; lobes narrowly lanceolate to triangular, sub-equal, 3–4.5 × 0.5–0.75 mm, margins narrowly scarious, ciliate, apex acuminate, puberulous. Corolla creamy white with purple striations on lips, puberulous outside, glabrous inside except in the throat; tube cylindrical, 6–8 × 2–25 mm; upper lip erect, triangular to ovate, 6–7 × 3.5–4 mm, apex acute, hooded; lower lip obovate to widely elliptic, 8–9 × 6.5–7 mm, 3-lobed; lobes equal, middle lobe broadly oblong, lateral lobes narrowly oblong and recurved, apex obtuse or acute. Stamens exserted; filaments 6–7 mm long, white, basally minutely hirsute; anther thecae superposed, equal, elliptic, 1.25–1.5 mm long, yellowish, glabrous; appendage, white, c. 1 mm long, apex acute, pointed. Ovary ellipsoid, 1.5–3 × 1.2–1.5 mm, pale green, glabrous; style slender, 1–1.25 cm long, recurved, whitish, minutely pubescent in lower half; stigma simple, capitate; nectariferous disc c. 0.7 × 1 mm, yellowish white. Capsule clavate, c. 1.2 × 0.3 cm, pale brown, glabrous. Seeds 2–4, ovoid to orbicular or sub-orbicular; testa tuberculate.

Flowering & fruiting: Flowering from November to April; fruiting from May to June.

Habitat: Found on the margins of evergreen forests and Ghat roadsides at an elevation of 50 to 1300 m. This species is commonly cultivated as medicinal plant and often as hedges and thickets on roadsides.

Distribution: It is native to South and Southeast Asia, but is widely cultivated and naturalized.

Specimens examined: INDIA, **Karnataka**, Bengaluru district, *s.loc.*, 01.1988, W. Cameroon 85 (MH). **Kerala**, Alappuzha district, Kayamkulam, *s.d.*, C.N. Sunil 1431 (CALI); Idukki district, Chinnar, 26.09.1910, C.E.C. Fischer 2233 (FRC); Rajakkad roadside, 28.08.2018, P. Soumya & P. Sunojkumar 138510 (CALI); Kasaragod district, Peradala, 07.05.1982, V.J. Nair 71045 (MH); Kollam district, Munroe Island, 26.12.1978, C.N. Mohanan 59666 (MH); Palakkad district, Ottapalam, Ananganadi, 20.03.2017, P. Soumya & P. Sunojkumar 145362; Silent valley, 16.02.1983. K.S. Prasannan 11135 (CALI); Pathanamthitta district, Kodumon 12.12.1979, C.N. Mohanan 63735 (MH); Thiruvananthapuram district, Palode, JNTBGRI campus, 14.12.2011, Glasmin Syrin 71224 (TBGT); Thrissur district, Vazhani Dam, 10.04.1977, K. Ramamurthy 49288 (MH); Wayanad district, Puthoorvayal, 13.01.2000, Ratheesh Narayanan M.K. 1184; Vythiri veterinary collage, 13.02.2019, P. Soumya & P. Sunojkumar 138525 (CALI). **Tamil Nadu**, Coimbatore district, IFGTB forest campus, 25.09.2001, N. Venkatasubramanian & R. Tamilarasi *s.n.* (FRC); Cuddalore district, Annamalai Nagar, 31.01.1958, K.M. Sebastine 5236 (MH); Krishnagiri district, Kottur R.F., 16.03.1978, M. Mohanan 54651 (MH); Madurai district, *s.loc.*, 09.11.1911, C.E.C. Fischer 3161 (FRC); Mayiladuthurai district, Sirkazhi, 17.04.1987, S. Ragupathy 392 (MH); Nilgiris district, Gudalur to Kollur, 23.02.1973, E. Vajravelu 43693 (MH); Sivaganga district, Karaikudi, 30.11.1977, N.C. Nair 52985 (MH); Thanjavur district, Pattukottai, 16.09.1977, K. Ramamurthy 51270 (MH); Tirunelveli district, *s.loc.*, 09.11.1959, K.M. Sebastine 9600; Manimuthar Tiger falls, 11.10.1957, K.M. Sebastine 4359 (MH); Vellore district, Nellipattu, 03.04.1987, M.B. Viswanathan 1400 (MH); Mysore & Carnatic, Herb. Ind. Or. Hook. f. & Thomson, G. Thomson *s.n.* (MH).

Conservation status: This species is assessed here as Least Concern (LC) as it is widely distributed and

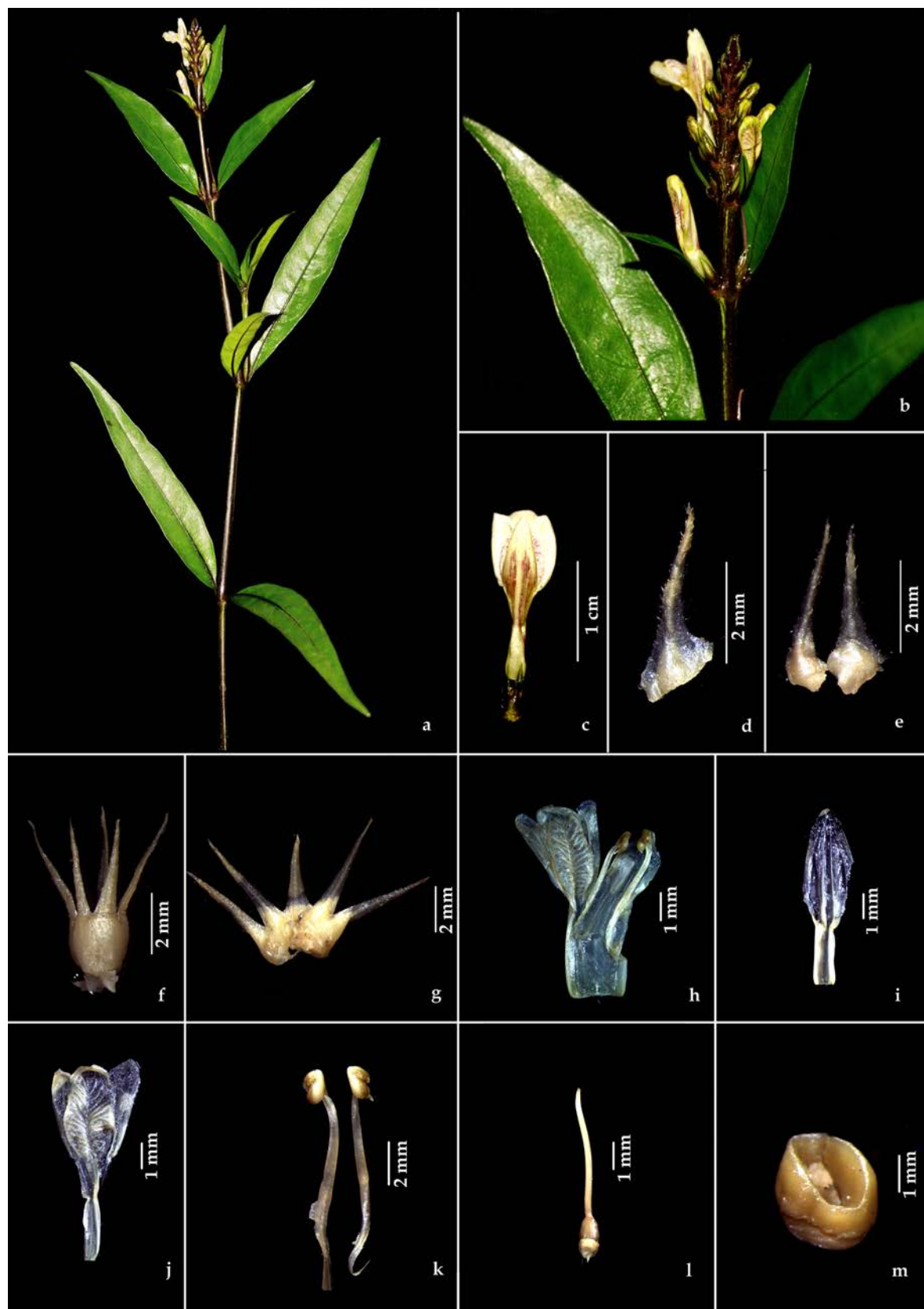


Fig. 11. *Justicia gendarussa* Burm.f.: **a.** Habit; **b.** Inflorescence; **c.** Flower; **d.** Bract; **e.** Bracteoles—abaxial side; **f.** Calyx; **g.** Calyx—opened; **h.** Corolla—opened; **i.** Upper lip; **j.** Lower lip; **k.** Stamens; **l.** Gynoecium; **m.** Nectariferous disc (from P. Soumya & P. Sunojkumar 138525; photos by P. Soumya).

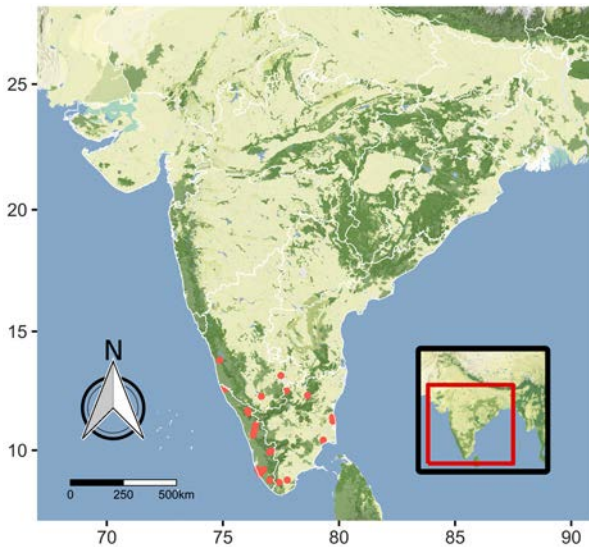


Fig. 12. Distribution of *Justicia gendarussa* Burm.f. in Peninsular India. Drawn using R (R Core Team, 2023).

cultivated in Karnataka, Kerala, and Tamil Nadu.

Justicia glauca Rottler, Ges. Naturf. Freunde Berlin Neue Schriften 4: 219. 1802; C.B. Clarke in Hook.f., Fl. Brit. India 4: 529. 1885. Gamble, Fl. Madras 2: 1079. 1921; Remadevi & Binojk. Fl. Kerala. Acanthaceae 97. 2009. *Lectotype* (designated by Turner, 2022): INDIA, **Tamil Nadu**, Wandawash (Vandavasi), 06.01.1800, J.P. Rottler s.n. (E [E00273664 digital image!]).

Justicia orixensis J.Koenig ex Roxb., Fl. Ind. 1: 133. 1820. *Gendarussa orixensis* (J.Koenig ex Roxb.) Nees in Wall., Pl. Asiat. Rar. 3: 104. 1832. *Adhatoda orixensis* (J.Koenig ex Roxb.) Nees in DC., Prodr. 11: 400. 1847. *Lectotype* (designated here): INDIA, Samulcota, s.d., J.G. König s.n. (S [S-G-3459 digital image!]).

Adhatoda diversiformis Nees in DC., Prodr. 11: 399. 1847. *Type*: INDIA, **Peninsula India Orientalis**, s.d., Wight 1998 (n.v.).

Figs. 13 & 14

Perennial subshrubs, up to 70 cm tall. Stems erect, sub-terete, stout, dichotomously branched; branches numerous, diffuse, striate, purplish green, densely pubescent; internodes 2–10 cm long. Leaves petiolate; laminae ovate to elliptic (rarely orbicular), 1.5–7 × 1.5–4 cm, base rounded to cuneate, margins entire, finely ciliate, sometimes slightly undulate, apex acute or obtuse, chartaceous, puberulous on both surfaces with dense hairs on veins, secondary veins 3–5 pairs, venation simple craspedodromous; petioles 0.5–2.5 cm long, green, tomentose. Inflorescence terminal or axillary spike, up to 17 cm long, many-flowered or sometimes solitary in the lower axils; peduncles

0.5–6 cm long. Flowers sessile, one per floral node, not secund, 8–10 × 5.5–7 mm; bracts spatulate to oblanceolate or orbicular, 5–9 × 4–7 mm, foliaceous, shortly petiolate, margins serrate with long setaceous hairs, apex acute or obtuse, 5-nerved, greenish, puberulous; bracteoles 2, spatulate to oblanceolate, 2–6 × 1–1.5 mm, margin serrate with long setaceous hairs, apex acute or shortly acuminate, greenish, pubescent. Calyx deeply 5-lobed, 4–5 × 3–3.5 mm at anthesis, accrescent, 5–6.25 × 3.75–4.5 mm in fruits, greenish; lobes lanceolate, equal, densely pubescent, margins scarious, ciliate, apex acuminate. Corolla purplish white with dark purple striations of lower lip, hirsute outside and glabrous inside except in the throat; tube cylindrical, 2.75–3 × 1–1.25 mm, slightly enlarged in throat; upper lip erect, ovate to triangular with dark brownish red spots on palate, 4.5–5 × 2.5–3 mm, apex minutely 2-lobed, slightly hooded; lower lip obovate to orbicular, 5–6.5 × 6–6.5 mm, 3-lobed at apex; lobes obtuse or rounded, imbricate. Stamens exserted; filaments 3–3.25 mm long, declinate, creamy white with reddish brown spots, basally hirsute; anther thecae superposed, equal, ellipsoid, c. 1–1.25 mm long, yellowish with brownish red markings, upper theca dorsally hirsute, lower theca glabrous; appendage c. 0.6 mm long, apex forked, creamy white. Ovary ellipsoid, 1.5 × 0.8 mm, pale green, hirsute at apex or throughout; style filiform, 4.5–6 mm long, whitish, recurved, hirsute throughout; stigma slightly bifid; nectariferous disc c. 0.5 mm high, pale green, margins undulate. Capsule clavate to fusiform, 4–7 × 2.5–3 mm, apex cuspidate to acute, pale brown, densely pubescent at apex or throughout; base sterile, 1–2 mm long. Seeds 2, orbicular or sub-orbicular, 1.3–1.8 × 1.5–2.2 mm, pale or dark brown; testa echinate.

Flowering & fruiting: Flowering from August to February; fruiting March.

Habitat: Grows in deciduous forests, on rocky hill slopes, along forest margins and roadsides at an elevation of 190 to 980 m.

Distribution: Peninsular India.

Specimens examined: INDIA, **Andhra Pradesh**, Anantapur district, Penna Ahobilum, 17.09.1981, T. Pullaiah & Yesoda 336 (MH); Chittoor district, Gurramkonda, s.d., K. Subramanyam 6347 (MH); Srikalahasti, 18.01.1988, D. Ranga Charyulu 2001 (MH); *Ibid.*, 19.09.2018, P. Soumya & P. Sunojkumar 157520 (CALI); East Godavari district, Devipatnam

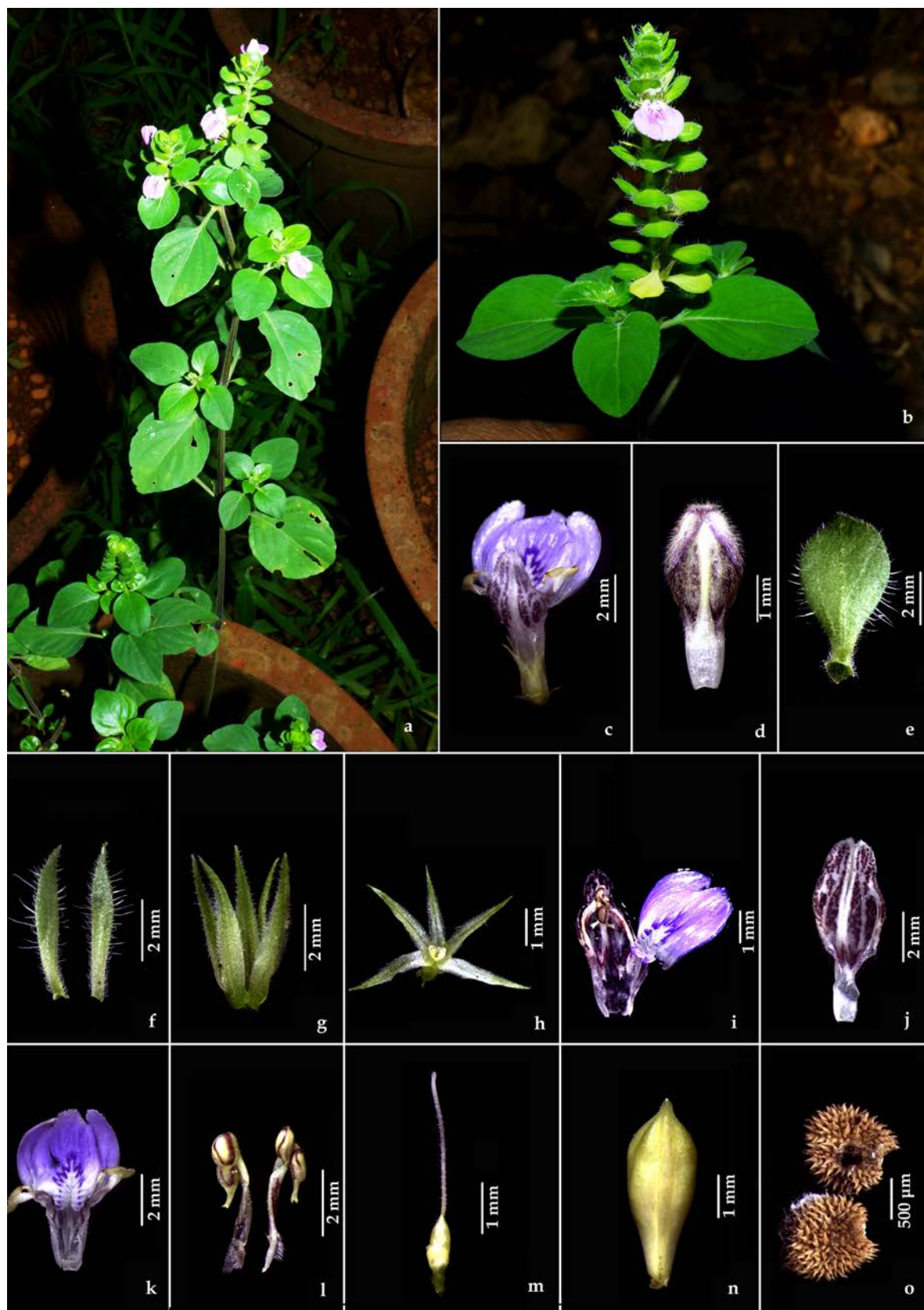


Fig. 13. *Justicia glauca* Rottler: **a.** Habit; **b.** Inflorescence; **c.** Flower; **d.** Flower bud; **e.** Bract; **f.** Bracteoles—adaxial side; **g.** Calyx; **h.** Calyx—opened; **i.** Corolla—opened; **j.** Upper lip; **k.** Lower lip; **l.** Stamens; **m.** Gynoecium with nectariferous disc; **n.** Capsule; **o.** Seeds (from P. Soumya & P. Sunojkumar 138570; photos by P. Soumya).

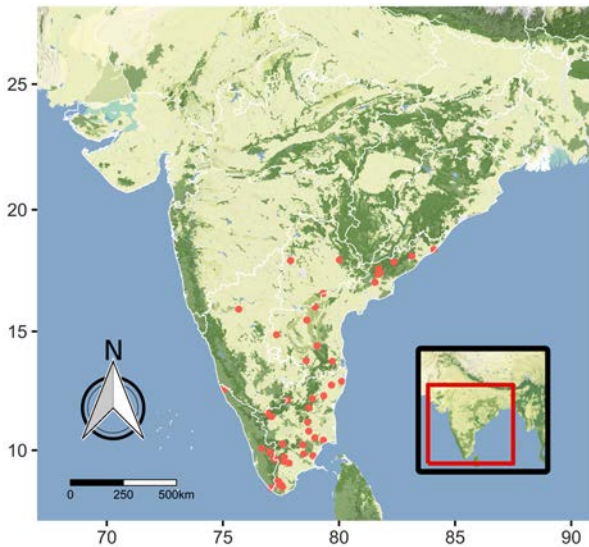


Fig. 14. Distribution of *Justicia glauca* Rottler in Peninsular India. Drawn using R (R Core Team, 2023).

& Rampachodavaram, 19.09.1980, G.V. Subba Rao 67556; Maredumilli near Tiger Camp, 21.09.1980, G.V. Subba Rao 67583; *Ibid.*, 17.02.1994, M. Mohanan 101269 (MH); Rachapalli, 20.07.1964, G.V. Subba Rao 20150 (MH); Kurnool district, Chelama-Nallamali hills, 12.08.1921, C.E.C. Fischer 4674 (FRC); *Ibid.*, 05.07.1963, J.L. Ellis 16748; *Ibid.*, Mahanandi, 22.08.1972, J.L. Ellis 25456; *Ibid.*, 22.08.1972, J.L. Ellis 42321; Srisaillam, 06.12.1969, J.L. Ellis 32711 (MH); Srikakulam district, Lakshmiapuram, 06.1900, C.A. Barber 1806 (MH); Visakhapatnam district, Chintapalli, 30.08.1966, G.V. Subba Rao 28196; *Ibid.*, 12.11.1970, J.L. Ellis 37100; Circuit house, 04.10.1964, G.V. Subba Rao 21435 (MH); Vizianagaram district, Srungavarapukota, 04.09.1960, N.P. Balakrishnan 11030 (MH); West Godavari district, Devarapalli, 20.12.1993, M. Mohanan 100795 (MH). **Karnataka**, Bagalkot district, Badami, 25.10.2017, P. Soumya & P. Sunojkumar 138545 (CALI). **Kerala**, Idukki district, Chinnar, 06.08.1986, K. Ramamurthy 78354 (MH); *Ibid.*, 14.05.2018, P. Soumya, Dilsha, Manu & P. Sunojkumar 145334; *Ibid.*, 05.06.2019, P. Soumya & P. Sunojkumar 145395 (CALI); Kumily lower camp, 26.12.1974, K. Vivekananthan 45706 (MH); Marayoor to Chinnar, 29.05.2003, P.S. Udayan et al. 01550 (CMPR); Kasaragod district, Perdala, 07.05.1982, V.J. Ansari 71039 (MH); Malappuram district, Nadukani Ghat road, 05.09.1969, B.V. Shetty 32245 (MH); Thiruvananthapuram district, Neyyatinkara, 08.10.2019, P. Soumya & P. Sunojkumar 157538; NIIST campus, 18.09.2018, P. Soumya & P. Sunojkumar 157542 (CALI); *s.loc.*,

s.d., K. Narayana Iyer *s.n.* (TBGT). **Tamil Nadu**, Chengalpattu district, Thambaram, 24.08.1982, K.N. Subramanian 8458 (FRC); Dharmapuri district, Hogenakkal, 24.11.1964, E. Vajravelu 21917 (MH); Dindigul district, Kodaikanal Ghat, 17.11.1897, *s.coll. s.n.*; Sirumalai, 31.07.1920, *s.coll.* 16693 (MH); Erode district, Sathy Taluk, Bhavanisagar, 03.10.1987, N. Venkatasubramanian 740 (FRC); Nilgiris district, Thengumarahada, 06.12.1970, G.V. Subba Rao 37467 (MH); Pudukkottai district, Adhanankkottai, 20.09.1977, K. Ramamurthy 51333; Melakadu-Sivaganga, 17.12.1964, K. Ramamurthy 22749; Okkur forest, Sivaganga, 19.08.1964, K. Ramamurthy 20974 (MH); Ramanathapuram district, Ayyanar Kovil, 24.09.1971, E. Vajravelu 38732 (MH); Sivaganga district, Piranmalai, 29.11.1977, N.C. Nair 52908 (MH); Srivilliputhur district, Muthaliaroothu, 19.09.1917, *s.coll.* 15019 (MH); Thanjavur district, Pattukottai, 16.09.1977, K. Ramamurthy 51275 (MH); Theni district, Suranganur waterfalls, 23.06.1959, K. Subramanyam 8157; Thalaiyar MHEP area, 18.10.1986, K. Ramamurthy 84403; Vannathiparai 17.10.1959, K. Subramanyam 9407 (MH); Tiruchirappalli district, Palakarai, 20.09.1957, K. Subramanyam 4273 (MH); Sengattupatti, 27.10.1958, K.M. Sebastine 6996 (MH); Tirunelveli district, Kalakkad R.F., 09.11.1962, J. Joseph 15221 (MH); *Ibid.*, on roadsides, 08.06.1964, K. N. Subramanian 1434 (FRC); Manimuthar riverside, 24.06.1957, K.M. Sebastine 3537; Papanasam lower dam side, 05.1959, K.M. Sebastine 8299; Thirukkurungudi, 16.04.1916, *s.coll.* 13119 (MH); Tiger falls, 04.03.1988, K.M. Sebastine 5505 (MH); Virudhunagar district, Thulukkamottai, 28.02.1999, E.S. Santhosh & P.C. Suresh 40848 (TBGT); Tiruvallur district, Ennore, 14.09.1985, D. Narasimhan 924 (MH); Tiruvannamalai district, Mamandur, 05.03.1914, *s.coll.* 10231; Sathanur Dam forest, 26.01.1977, E. Vajravelu 52090 (MH); Villupuram district, Gingee forest, Pakkamalai R.F., 22.01.1978, K. Ramamurthy 53517; Gomuki-Vellimala Ghat, 06.02.1983, K. Ramamurthy 77356; Parigam R.F., 07.09.1977, K. Ramamurthy 50656 (MH); Virudhunagar district, Seithur hills, 08.11.1989, K.R. Srinivasam 86906 (MH). **Telangana**, Medak district, Pettagutta, 26.09.1958, K.M. Sebastine 6768 (MH); Nalgonda district, Nagurjuna Sagar, 12.12.1959, K.M. Sebastine 9721 (MH); Warangal district, Western bridge of Pakhal lake, 08.08.1961, K.M. Sebastine 13130 (MH).

Conservation status: The species is widely distributed in Andhra Pradesh, Kerala, Tamil Nadu, and

Telangana, with a few populations in Karnataka. Hence it is classified as Least Concern (LC).

Notes: *Justicia glauca* is very similar to *J. tranquebariensis* but differs by its taller habit reaching up to 70 cm (vs. up to 40 cm) ovate to elliptic leaves, rarely orbicular, with an apex that is acute or obtuse (vs. orbicular to obovate or spatulate leaves with apex rounded to emarginate).

Typification: Roxburgh (1820) validated the *nomen nudum*, *Justicia orixensis* Roxburgh (1814) with a brief description and type locality as “in the vicinity of Samulcota”. Later Nees von Esenbeck (1832, 1847) transferred this species to *Gendarussa* and *Adhatoda* respectively. After an exhaustive search of various herbaria, we traced a single sheet at S with the annotation “The vicinity of Samulcota, Koenig” with Koenig’s handwriting. This certainly indicates that Koenig collected the specimen from Samulcota (which was historically part of Coromandel). It is plausible to suggest that Roxburgh used Koenig’s material when describing *J. orixensis*. Hence, the specimen collected by Koenig at S can qualify as original material according to Art. 9.4 a) of the ICN (Turland *et al.*, 2018). Among the two specimens mounted on the sheet, the one on the lower side is from Rottler’s collection (barcode S-G-3460) whereas the upper right specimen appears to be from Koenig’s collection (barcode S-G-3459) which is selected here as the lectotype.

Justicia micrantha Wall. ex C.B. Clarke in Hook.f., Fl. Brit. India 4: 536. 1885; Gamble, Fl. Madras 2: 1080. 1921; P. Soumya & Sunojk., Phytotaxa 453 (2): 151. 2020. *Rostellaria crinita* Nees in Wall., Pl. Asiat. Rar. 3: 101 1832. *Rostellularia crinita* (Nees) Nees in DC., Prodr. 11: 373. 1847. *Lectotype* (designated by Soumya & Sunojkumar, 2020): INDIA, *s.loc.*, *s.d.*, B. Heyne 2449 (GZU [GZU000251601 digital image!])

Justicia neesii Ramamoorthy in C.J. Saldanha & Nicolson, Fl. Hassan district, 551. 1976 *nom. illeg.*, *nom. superfl.* *Rostellularia neesii* A.K. Mukh. Fl. Pachmarhi & Bori Reserves: 236. 1984, *nom. illeg.* **Figs. 15 & 16**

Annual herbs, up to 35 cm tall. Stems erect, terete, dichotomously branched; branches slender, greenish, densely pubescent with strigose hairs; internodes 1.5–9 cm long, purplish. Leaves petiolate; laminae ovate to elliptic, 2.5–5 × 1.3–3 cm, base cuneate to rounded or oblique, margins entire or crenate, finely ciliate, apex acute or obtuse, chartaceous, puberulous sometimes densely pubescent; veins

prominent, secondary veins 4–5 pairs; venation weak brochidodromous; petioles 0.5–2.5 cm long, densely pubescent. Inflorescence terminal or axillary spike, up to 4 cm long; peduncles 0.5–1 cm long, pubescent. Flowers sessile, two per inflorescence node, 6–7 × 3–4 mm; bract and bracteoles similar, linear to narrowly lanceolate, 7–8 × 0.4–0.6 mm, margins scarious with long setose hairs, apex acute, glabrous. Calyx deeply 4-lobed, 5–7 × 1.5–2 mm at anthesis, accrescent, greenish or pinkish green; lobes slender, linear to narrowly lanceolate, unequal, two smaller lobes 4–5 mm long and two larger ones 6–7 mm long, margins scarious with long setose hairs, apex acute. Corolla purplish white with white striations on lower lip, hirsute outside, glabrous inside except in the throat; tube cylindrical, c. 3 × c. 1.3 mm; upper lip erect, triangular to ovate, 2.5–3 × 1.5–2 mm, enclosing the stamens, apex bifid; lower lip obovate, 4–4.5 × 2.5–2.8 mm, 3-lobed at apex; lobes imbricate, apex acute. Stamens exserted; filaments c. 2 mm long, white, basally hirsute; anther thecae superposed, equal, elliptic, c. 0.5 mm long, pale green with purple margin, upper theca dorsally hirsute, lower theca glabrous; appendage c. 0.4 mm long, apex obtuse or rounded, white. Ovary c. 1 × 0.5 mm, ellipsoid, pale green, glabrous or hirsute at apex; style 4–5 mm long, slender, white, hirsute throughout or in lower half; stigma emarginate; nectariferous disc c. 0.5 × 0.8 mm, pale yellow, margins undulate. Capsule oblong with a constriction near the middle, 2.5–4 × 0.8–1 mm, apex cuspidate, pale brown, pubescent at apex. Seeds 2–4, compressed, cordate to ovate or sub-orbicular, c. 1.8 × 2 mm, brownish; testa rugulose.

Flowering & fruiting: Flowering from August to March; fruiting late February to March.

Habitat: Grows in grasslands and margins of moist deciduous forests, along Ghat roadsides, under pine woods at an elevation of 80 to 1900 m.

Distribution: Peninsular India.

Specimens examined: INDIA, **Andhra Pradesh**, Chittoor district, Kambakam hill, 03.1903, *s.coll.*, 10263; *Ibid.*, 04.1903, *s.coll. s.n.*; Talakona waterfalls, 07.11.1987, D. Ranga Charyulu 1764 (MH); *Ibid.*, 04.08.2019, P. Soumya, Geethika & P. Sunojkumar 157518 (CALI); Kadapa district, Cuddapah forest areas, *s.d.*, *Beddome s.n.* (MH); Kurnool district, Chelama-Nallamali hills, 05.07.1963, J.L. Ellis 16741; Mahanandi, 23.08.1965, J.L. Ellis 25524 (MH); Medak district, Pegarikutta, K.M. Sebastine 6650

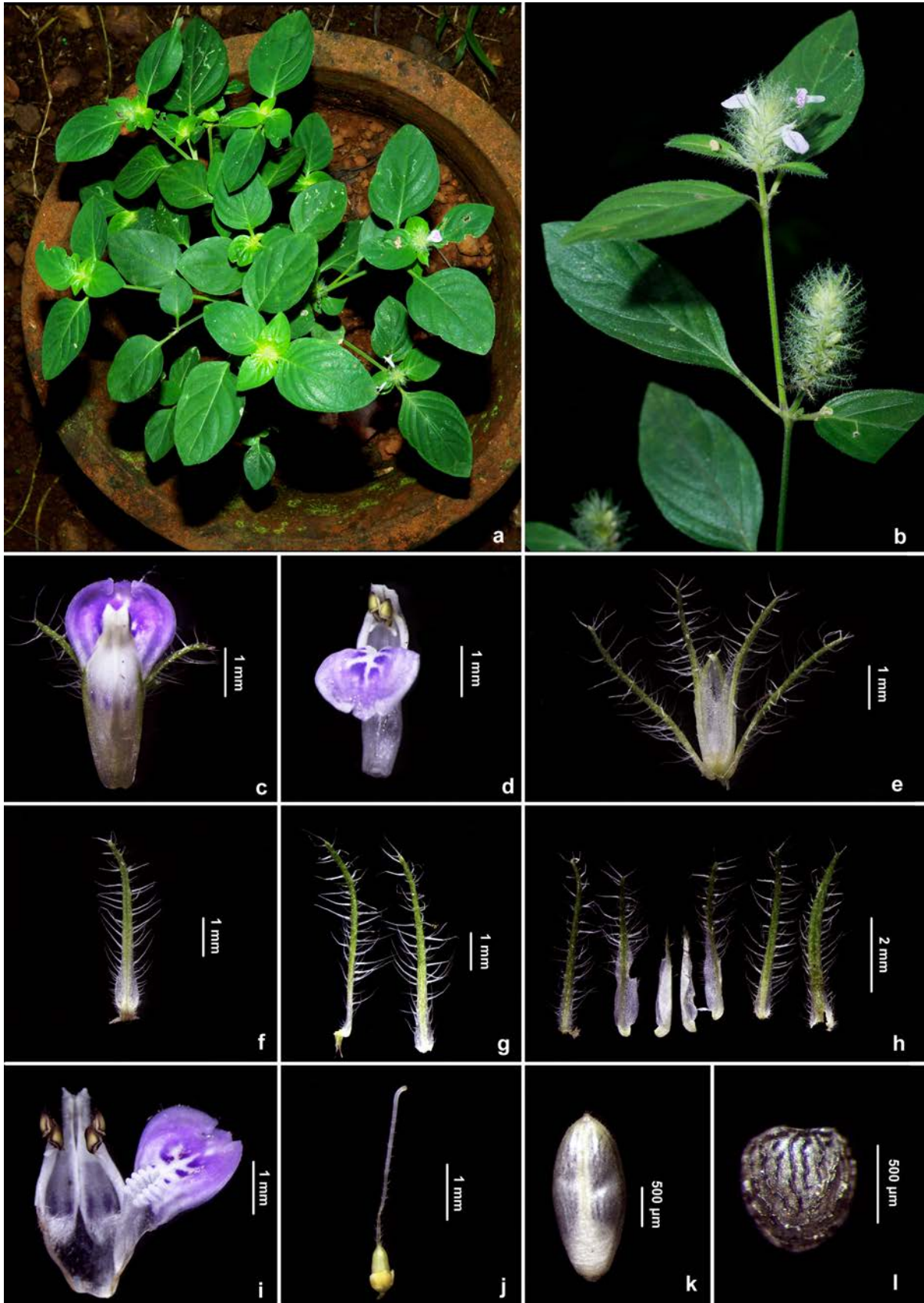


Fig. 15. *Justicia micrantha* Wall. ex C.B. Clarke: **a.** Habit; **b.** Inflorescence; **c** & **d.** Flower; **e.** Calyx; **f.** Bract; **g.** Bracteoles—adaxial (left) and abaxial side (right); **h.** Calyx—opened; **i.** Corolla—opened; **j.** Gynoecium; **k.** Capsule; **l.** Seed (from P. Soumya & P. Sunojkumar 157518; photos by P. Soumya).

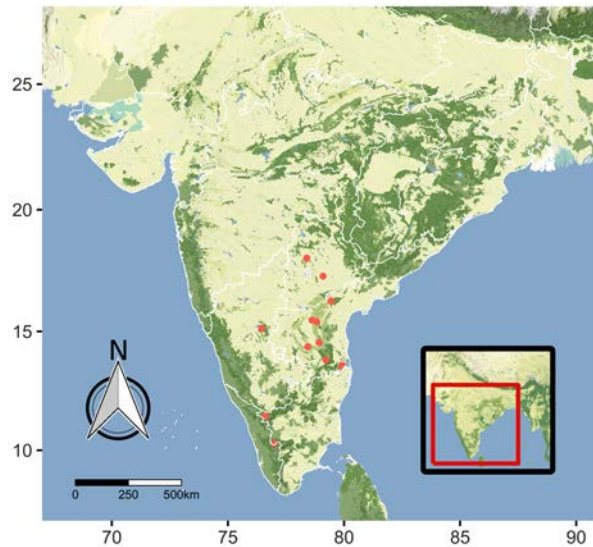


Fig. 16. Distribution of *Justicia micrantha* Wall. ex C.B. Clarke in Peninsular India. Drawn using R (R Core Team, 2023).

(MH); Prakasam district, Diguva Metta, 16.11.1969, J.L. Ellis 32410 (MH). **Karnataka**, Bellary district, Ramandurg, 04.10.1904, Lushingtons.n. (FRC); Kadapa district, Vempalle, 22.07.1964, G.V. Subba Rao 20186 (MH). **Tamil Nadu**, Coimbatore district, Anamalai hills, s.d., R.H. Beddome s.n. (MH); Nilgiris district, Naduvattam to Ooty, s.d., P. Soumya, S. Resmi & P. Sunojkumar 157576 (CALI). **Telangana**, Yadadri, Bhuvanagiri district, Ramannapeta, 28.08.1917, J.L. Ellis 14966 (MH).

Conservation status: Based on our field data and the examination of herbarium specimens, it has been determined that this species is present in four states in Peninsular India. As per IUCN criteria, *Justicia micrantha* is classified here as Least Concern (LC).

***Justicia procumbens* L.**, Sp. Pl. 15. 1753; Roxb., Fl. Ind. 1: 133. 1820; T. Anderson, J. Linn. Soc. Bot. 9: 511. 1867; C.B. Clarke in Hook.f., Fl. Brit. India 4: 539. 1885. Gamble, Fl. Madras 2: 1080. 1921; R.R. Stewart in E. Nasir & S.I. Ali (eds.), Flora of West Pakistan, Karachi 676. 1972; L.H. Cramer, Revis. Handb. Fl. Ceylon 12: 119–121. 1998; Malik & Ghafoor in E. Nasir & S.I. Ali (eds.), Fl. Pakistan 188: 36. 1988; V.A.W. Graham, Kew Bull. 43: 597. 1988; J.Q. Hu, Y.F. Deng & T.F. Daniel in Z.Y. Wu, P.H. Raven & D.Y. Hong (eds.), Fl. China 19: 452. 2011. *Rostellaria procumbens* (L.) Nees in Wall., Pl. Asiat. Rar. 3: 101. 1832; *Rostellaria procumbens* (L.) Nees in DC., Prodr. 11: 371. 1847. *Lectotype* (designated by Malik & Ghafoor, 1988): Herb. Linnaeus No. 28.14 (LINN).

Justicia japonica Thunb., Syst. Veg., 14: 63. 1784; Y.F. Deng, Fl. Pan Himalaya 46: 407. 2020. *Rostellularia japonica* (Thunb.) J.L. Ellis, Bull. Bot. Surv. India 22: 196. 1982. *Lectotype* (designated here): JAPAN, s.loc., s.d., C.P. Thunberg s.n. (UPS-THUNB 386 [UPS barcode V-000386 digital image!]).

Justicia simplex D. Don, Prodr. Fl. Nepal. 118. 1825; C.B. Clarke in Hook.f., Fl. Brit. India 4: 539. 1885. Gamble, Fl. Madras 1080. 1921; R.R. Stewart in E. Nasir & S.I. Ali (eds.), Flora of West Pakistan, Karachi 676. 1972; V.A.W. Graham, Kew Bull. 43: 597. 1988; J.R.I. Wood in A.J.C. Grierson & D.G. Long (eds.), Fl. Bhutan 2(3): 1288. 2001. *Justicia procumbens* var. *simplex* (D. Don) Yamazaki, Fl. E. Himalaya 302. 1966. *Type*: NEPALIA (NEPAL), s.d., Wallich (n.v.).

Rostellaria mollissima Nees in Wall., Pl. Asiat. Rar. 3: 101. 1832. *Rostellularia mollissima* (Nees) Nees in DC., Prodr. 11: 373. 1847. *Justicia mollissima* (Nees) Y.F. Deng & T.F. Daniel, Fl. China 19: 451–452. 2011. *Lectotype* (designated by Deng, 2020): NEPAL, s.loc., Wall. Cat. 2445 (K-W [K001116046 digital image!]).

Rostellularia procumbens (L.) var. *serpyllifolia* Benth., in Hohen., Pl. India Orient. 571. 1847. *Justicia simplex* D. Don var. *serpyllifolia* (Benth.) C.B. Clarke in Hook.f. Fl. Brit. India 4: 539. 1885. *Justicia serpyllifolia* (Benth.) Gamble, Fl. Madras 1080. 1924, *nom. illeg.* *Rostellularia serpyllifolia* (Benth.) Bremekamp, Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. 45(2): 62. 1948. *Justicia nagpurensis* V.A.W. Graham, Kew Bull. 43: 597. 1988, *syn. nov.* *Justicia hansenii* Sivar. & P. Mathew, Taxon 38: 486. 1989. *Rostellularia nagpurensis* (V.A.W. Graham) M.R. Almeida Fl. Maharashtra 4A: 90. 2003. *Lectotype* (designated here): INDIA, **Karnataka**, Mangalore, s.d., Hohenacker 571 (K [K000884085 digital image!]).

Justicia procumbens var. *latispica* C.B. Clarke in Hook.f., Fl. Brit. India 4: 539. 1885. *Justicia latispica* (C.B. Clarke) Gamble, Fl. Madras 1080. 1921. *Rostellularia latispica* (Gamble) Bremek. Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Sect. 2 45(2): 71. 1948. *Justicia procumbens* subsp. *latispica* (C.B. Clarke) L.H. Cramer, Revis. Handb. Fl. Ceylon 12: 120. 1998. *Rostellularia khasiana* var. *latispica* (C.B. Clarke) C.Y. Wu ex C.C. Hu Fl. Reipubl. Popularis Sin. 70: 305. 2002. *Type*: Wight, Icon. Pl. India Orient 4: t. 1539. 1850.

Justicia khasiana C.B. Clarke in Hook.f., Fl. Brit. India 4: 537. 1885. *Rostellularia khasiana* (C.B. Clarke) J.L. Ellis Bull. Bot. Surv. India 20(1-4): 172. 1978. *Lectotype* (designated by Deng, 2020): INDIA, **Assam**,

Khasia hills, *s.d.*, *J.D. Hooker s.n.* (K [K000884094 digital image!]; islecto K [K000884095 digital image!]).

Rostellularia simplex Wight, Icon. Pl. India Orient. 4: t. 1542. 1850. *Justicia notha* C.B. Clarke in Hook.f., Fl. Brit. India 4: 537. 1885, **syn. nov.**; V.A.W. Graham, Kew Bull. 43: 597. 1988. *Ecbolium nothum* (C.B. Clarke) Kuntze, Revis. Gen. Pl. 2: 980. 1891. *Type: INDIA, s.loc., s.d., Wight s.n.* (K [K000884096 digital image!]).

Justicia pathanamthittensis Remadevi & Binojk., J. Econ. Taxon. Bot. 32: 660. 2008, **syn. nov.**; Karthik. et al., Fl. Pl. India Dicotyledons 27. 2009. *Type: INDIA, Kerala, Pathanamthitta district, Thannithode, 23.11.2001, Remadevi 615 (holo CALI; iso MH!).* **Figs. 17–19**

Annual herbs, up to 90 cm tall. Stems angular, erect or decumbent, dichotomously branched, sometimes in zig zag fashion, rooting at lower nodes; branches slender, diffuse, pubescent with strigose or hispid hairs; internodes 2–10 cm long, green or purplish green. Leaves sessile to petiolate; laminae ovate to elliptic, oblong to lanceolate or orbicular, 0.7–6 × 0.6–3 cm, base cuneate or obtuse, margins entire or distantly crenate, ciliate, apex acute or obtuse, chartaceous, glabrous or pubescent; veins prominent, secondary veins 3–7 pairs, venation weak brochidodromous; petioles 0.3–2 cm long pubescent; Inflorescence dense terminal or axillary spike, up to 7 cm long, many-flowered; peduncles 0.5–5 cm long, pubescent. Flowers sessile, two per floral node, 5–8 × 3–4.5 mm; bracts linear to lanceolate or elliptic to ovate or rhomboid, 4–5.5 × 1.3–2.5 mm, margin scarious, densely ciliate, apex acute or shortly acuminate; bracteoles similar to bracts but narrower, 4–5.5 × 0.5–1.5 mm. Calyx deeply 5-lobed, 3.75–4.5 × 1.5–3 mm at anthesis, accrescent, 4.5–5.5 × 2.5–3.5 mm in fruits, green or purplish green; lobes unequal, the fifth lobe much reduced, linear to lanceolate or elliptic, margins scarious, ciliate, apex narrowly acute. Corolla purplish white with white striations on lower lip, sparsely pubescent outside, glabrous inside except in the throat; tube cylindrical, 2–3.5 × 1.5–3 mm, slightly enlarged in throat; upper lip erect, slightly hooded, ovate-elliptic, 3–5 × 3.25–4 mm, apex minutely 2-lobed; lower lip orbicular to obovate, 3.5–6 × 4–5.5 mm, apex 3-lobed, lobes imbricate, apex rounded. Stamens exerted; filaments 2.5–3 mm long, slightly bended at apex, white, basally villous; anther thecae superposed, sub-equal, ellipsoid, 0.5–0.8 mm long, purplish with yellow margins, upper theca smaller, muticous,

dorsally hirsute, lower theca glabrous; appendage c. 0.6 mm long, apex acute, white. Ovary ellipsoid, 0.8–1.25 × 0.6 mm, pale green, densely hirsute; style slender, 3.5–5.5 mm long, whitish, hirsute in lower half; stigma slightly bilobed; nectariferous disc c. 0.5 mm high, pale yellow. Capsule oblong with a constriction near the middle, 3–5 × 1–1.75 mm, apex acute, pale brown, hirsute. Seeds 4, compressed, ovate to orbicular or oblong, 0.7–1.2 × 0.6–1 mm, brown; testa rugulose.

Flowering & fruiting: Flowering from August to February; fruiting from March to April.

Habitat: This is a common plant in grasslands, along forest margins and roadsides appearing after monsoon rains in August. It is also common on moist hill slopes and in rock crevices at low to high elevations between 56 and 2286 m.

Distribution: Tropical and subtropical Asia to Central China.

Specimens examined: INDIA, **Andhra Pradesh**, Kurnool district, Sikharam, on the way to Srisailam, 15.12.1967, *K.N. Subramanian* 3275 (FRC); Visakhapatnam district, Araku valley, near Pakel river, 26.08.1960, *N.P. Balakrishnan* 10870 (CAL). **Goa**, Baga jungle, 05.09.1963, *John Cerian* 88592; Platue on the way to Parvorim-Betim, 10.11.1963, *Seshagiri Rao Rolla* 92935 (CAL). **Karnataka**, Bengaluru district, Someshwara temple, 14.10.1962, *R.S. Raghavan* 83226 (CAL); Chikkaballapur district, Nandi hills, 17.09.1911, *Rudho D. Anstead* 108 (MH); Chikmagalur district, Bhababoodangiri, 2.11.2018, *P. Soumya, Drisya & P. Sunojkumar* 138505 (CALI); Kodagu district, Galibeedu behind college, 21.09.1961, *s.coll.* 74454; Gali Kottur, 22.07.1979, *S.B. Manohar & S.R. Ramesh* 8469; Mercara, 20.09.1961, *s.coll.* 74437; Talakaveri, 26.10.1963, *s.coll.* 95123 (CAL); Shimoga district, Agumbe Ghat, 24.10.1960, *R.S. Raghavan* 67908; Edevani, Sagar-Jog road, 27.09.1978, *K.R. Keshava murthy & K.P. Sreenath* 2975 (CAL). **Kerala**, Alappuzha district, Pandavan para to Chengannur, 06.10.1992, *Sunil C.N.* 1291 (CALI); Ernakulam district, Inchippara road, 11.10.19993, *Jomy Augustine* 12605 (CALI); Kochi, Willingdon Island, 31.10.1972, *Rao, T.A.* 9623 (CAL); Kodanad R.F., 21.07.1970, *E. Vajravelu* 34987 (MH); Idukki district, Anamudi, 19.11.1965, *B.V. Shetty* 26554 (MH); Deviculam, 28.01.1964, *K.M. Sebastine* 18503 (MH); Kulamavu, *s.d.* *C.N. Mohanan & B. Ramanujan* 71920 (CAL); *Ibid.*, 17.09.1982, *K.N. Subramanian* 8730

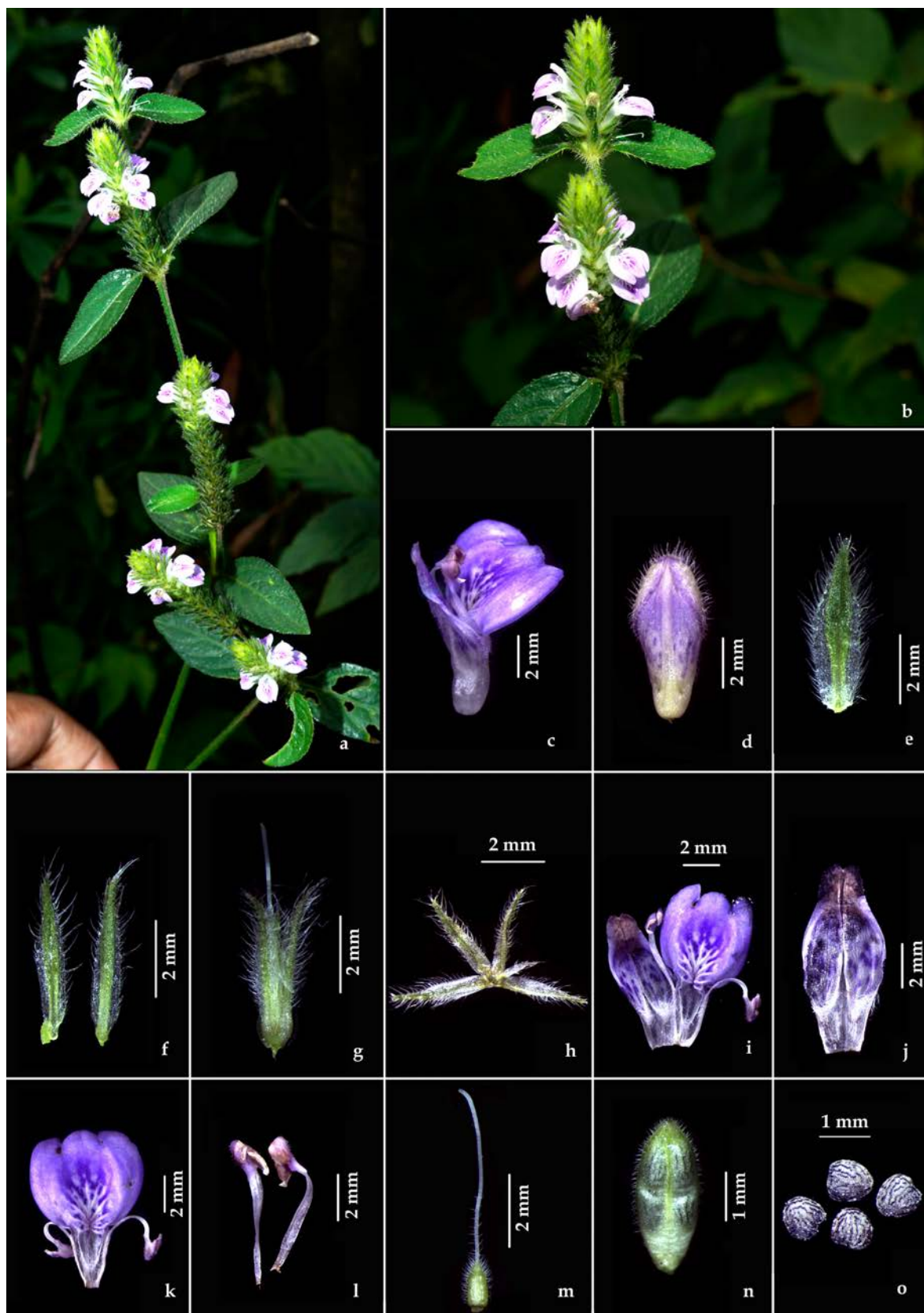


Fig. 17. *Justicia procumbens* L. **a.** Habit; **b.** Inflorescence; **c.** Flower; **d.** Flower bud; **e.** Bract; **f.** Bracteoles—adaxial (left) and abaxial side (right); **g.** Calyx; **h.** Calyx—opened; **i.** Corolla—opened; **j.** Upper lip; **k.** Lower lip; **l.** Stamens; **m.** Gynoecium with nectariferous disc; **n.** Capsule; **o.** Seeds (from P. Soumya & P. Sunojkumar 151820; photos by P. Soumya).



Fig. 18. *Justicia procumbens* L. a-e: Variations in Habit and Leaf

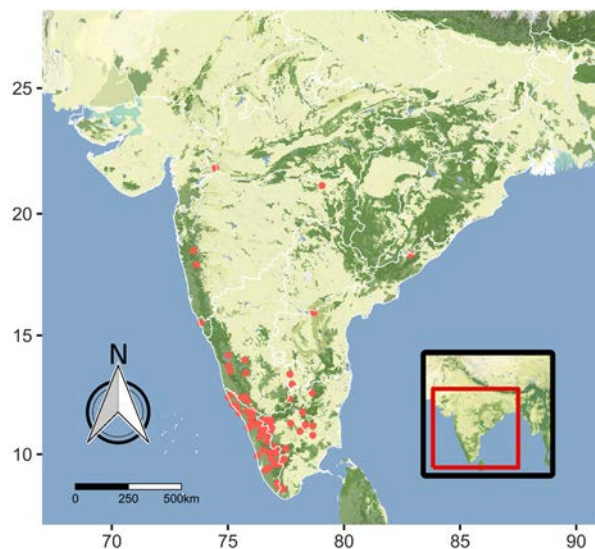


Fig. 19. Distribution of *Justicia procumbens* L. in Peninsular India. Drawn using R (R Core Team, 2023).

(FRC); Kumily, 23.08.1977, K. Vivekananthan 50502 (CAL); Munnar, 22.10.2017, P. Soumya, Drisya & P. Sunojkumar 145337 (CALI); Peermade, 04.04.1913, s.coll. 30; Periyar, Mangaladevi temple, 14.05.2018, P. Soumya, Dilsha, Manu & P. Sunojkumar 151820 (CALI); *Ibid.*, Mangaladevi temple, 10.10.1976, K. Vivekananthan 48647 (CAL); Rajamala, 19.05.1997, S.D. Biju 36590 (TBGT); Thekkady, 05.06.1995, Jomy Augustine 15410 (CALI); Kannur district, Baveli, Begur R.F., 22.06.1973, V.S. Ramachandran 62729; *Ibid.*, Chandanthode, 09.11.1978, V.S. Ramachandran 58622; *Ibid.*, 11.08.1973, V.S. Ramachandran 63903 (CAL); *Ibid.*, 12.08.1979, V.S. Ramachandran 63328; Parassinikadavu, 21.01.1982, R. Ansari 73947 (MH); *Ibid.*, 21.09.1982, R. Ansari 73947 (CAL); Payyannur, 05.10.1979, R. Ansari 64736; Iritty, 16.08.1979, V.S. Ramachandran 63963 (CAL, MH); Taliparambu, 17.07.1981, R. Ansari 70094 (CAL); *Ibid.*, 01.1906, C.A. Barber 7676; Thalassery court road, 17.11.1977, V.S. Ramachandran 52172 (MH); Kasaragod district, Bekal, 21.07.1981, R. Ansari 70983 (CAL); Mulleria, 12.10.1979, R. Ansari 64872 (MH); Kottayam district, Neriyaamangalam, 13.09.2019., P. Soumya & P. Sunojkumar 145373 (CALI); Umaiya Malai, 18.11.1965, B.V. Shetty 26499 (MH); Kozhikode district, Kannothe R.F., 8.11.1978, V.S. Ramachandran 58298 (MH); Malapuram district, Areekode, 24.02.1984, Philip Mathew 34444 (CALI); C.U. campus, 19.11.2003, Swapna Thomas A 94609; *Ibid.*, 02.11.2003, Amrutha M. 93619; *Ibid.*, 05.12.2004, Sajeena L.R. 94532; *Ibid.*, 06.10.2016, P. Soumya & P. Sunojkumar 157541; Idimuzhikkil, s.d., P. Soumya

& P. Sunojkumar 157536; Karimpuzha, 01.10.1982, Philip Mathew 25794; *Ibid.*, 28.10.1983, Philip Mathew 34337; Nedumkayam, 07.11.1981, Philip Mathew 33221; Nilambur, 07.11.1980, Philip Mathew 29145; Thampumala, 13.11.1982, Philip Mathew 33584 (CALI); Palakkad district, Kanjirapuzha submergible area, 26.10.1914, K.M. Sebastine 22313 (MH); Malampuzha, 03.09.2018, P. Soumya, Sasi & P. Sunojkumar 138534 (CALI); Mannarkkad, Thodukki, 26.10.2011, K.A. Anilkumar 4273 (CMPR); *Ibid.*, 16.09.2012, K.A. Anilkumar 4359 (CMPR); *Ibid.*, 10.10.2012, K.A. Anil Kumar 4605; *Ibid.*, Chinnamala, 17.09.2012, K.A. Anil Kumar 4405; *Ibid.*, Injikunnu, 29.09.2008, K.A. Anilkumar 3605 (CMPR); *Ibid.*, Meenvani, 11.10.2012, K.A. Anil Kumar 4837 (CMPR); Nelliampathy, 19.09.2013, K.M. Prabhukumar 07375; *Ibid.*, 19.09.2013, K.M. Prabhukumar 07378; *Ibid.*, 13.10.2013, K.M. Prabhukumar 07487; *Ibid.*, Seethargunde, 03.11.2013, K.M. Prabhukumar 07612 (CMPR); Silent valley, 24.09.1977, R. Ansari 51465 (CAL); *Ibid.*, Dam site, 04.12.1981, Sathish kumar 10208; *Ibid.*, Chembotti, 09.03.1982, Sathish kumar 10502; *Ibid.*, Cheriya Walakkad, 05.02.1982, Sathish kumar 10157 (CALI); Pathanamthitta district, Ranni R.F., 10.9.1918, N. Anilkumar 840 (CAL); *Ibid.*, 24.10.2018, P. Soumya & P. Sunojkumar 145324 (CALI); Thrissur district, Kundazhi R.F., 05.09.1976, K. Ramamurthy 47630 (CAL); Thiruvananthapuram district, Agasthyamala, 06.10.1973, J. Joseph 44590 (MH); *Ibid.*, 13.11.1990, N. Mohanan, 10954 (TBGT); Pongalapara, 24.08.1963, A.N. Henry 17139 (MH); *Ibid.*, 7.02.1988, N. Mohanan, 9516 (TBGT); *Ibid.*, 15.05.1988, N. Mohanan 9761 (CALI, TBGT); *Ibid.*, 08.09.2018, P. Soumya, Resmi, Krishna, Anto & P. Sunojkumar 151826; *Ibid.*, 10.11.2018, P. Soumya, Shinoj & P. Sunojkumar 138575; *Ibid.*, 23.11.2018, P. Soumya, Manudev & P. Sunojkumar s.n. (CALI); Ponmudi, 11.09.1968, K.M. Matthew 9210 (RHT); *Ibid.*, 07.09.1985, Venkatasubramanian & K.R. Sasidharan 11241 (FRC); Wayanad district, Alakuney, 03.07.1999, Ratheesh Narayanan M.K. 0172 (CALI); Pookode, 11.10.1997, Bindhu K.B. 52335 (CALI); Kurichyarmala, 15.08.2001, Ratheesh Narayanan M.K. 1349 (CALI); Thariyode, 17.11.1999, Ratheesh Narayanan M.K. 1223 (CALI). **Maharashtra**, Nandurbar district, Toranmal village, 17.08.1965, R.D. Pataskar 105772; Pune district, Mulshi. 24.08.1956, G.S. Puri 6035; *Ibid.*, 24.08.1956, G.S. Puri 6063; Shivneri hill, 12.10.1962, M.Y. Ansari 83730 (CAL); Satara district, Mahabaleswar, 10.09.1956, S.D. Mahajan 6867 (CAL). **Tamil Nadu**, Coimbatore

district, Akkamalai R.F., 16.04.1963, *J. Joseph* 16171; Chinnathadagam, 22.08.1956, *K.M. Sebastine* 600 (CAL); Kuridimalai, 16.11.1956, *K. Subramanyam* 1344; Maruthamalai, 10.12.1956, *K.M. Sebastine* 1698 (CAL, MH); Velliangiri peak, 21.02.1932, *Raju & Ratnavelu* 216, 220 (MH); Dindigul district, Kodaikanal, 15.03.1956, *J. Pallithanam* 1464; *Ibid.*, 06.08.1988, *K.M. Matthew* 53409; Levinge., s.d., *K.M. Matthew* 454 (RHT); Maharajamettu back side area, 15.08.1990, *V. Lakshmanan* 91163 (MH); Marian shola, U. Palanis, 15.09.1911, *C.E.C. Fischer* 2995; s.loc., 13.12.1909, *C.E.C. Fischer* 2995 (FRC); Vattaparai Village, 17.11.1990, *V. Lakshmanan* 94379; Vattaparai, 17.11.1990, *V. Lakshmanan* 94381 (MH); Nilgiris district, Coonoor, 19.01.1957, *K.M. Sebastine* 2061 (MH); *Ibid.*, 04.04.1916, *C.E.C. Fischer* 3925 (FRC); Hulikal Droog R.F., 10.05.1957, *K.M. Sebastine* 3157; Kookalthorai, 12.05.1963, *K.N. Subramanian* 741 (FRC); Kotagiri, 04.01.1957, *K. Subramanyam* 1890; *Ibid.*, Longwood R.F., 28.07.1971, *E. Vajravelu* 35133; *Ibid.*, Yelagiri hills, s.d., *M.B. Viswanathan* 827; *Ibid.*, 12.02.1972, *E. Vajravelu* 39735; Naduvattam, 22.07.1960, *K. Subramanyam* 10534 (MH); Ooty, Governor shola, 09.07.1970, *J.L. Ellis* 34564; Pykara falls 12.09.1930, *V. Narayanaswami* 80222; *Ibid.*, 26.10.2016, *P. Soumya, Shinoj & P. Sunojkumar* 157532 (CALI); Namakkal district, Kolli hills, 05.02.1979, *P. Perunna & C. Manoharan* 21496 (RHT); *Ibid.*, 20.04.1971, *A. Mohan* 13203 (CAL); Salem district, Yercaud, Marappalam, 30.06.1979, *K.M. Matthew* 23407; *Ibid.*, Kakashola, 12.05.1978, *V. Alphonse Amalraj* 13676; *Ibid.*, Kongampallam, 12.12.1976, *D.I. Arockiasamy* 9998 (RHT); *Ibid.*, Shevaroy's temple, 24.11.1976, *K.M. Matthew & D.I. Arockiasamy* 5014; Tiruchirappalli district, Sengattupatti, 26.07.1970, *K.M. Matthew* 11597 (RHT); Tirunelveli district, Anakatty, 03.09.2018, *P. Soumya, S. Resmi & P. Sunojkumar* 157545 (CALI); Upper Kodayar, 23.09.1975, *K.M. Matthew* 14924 (RHT); *Ibid.*, s.d., *P. Soumya, Shinoj & P. Sunojkumar* 145329 (CALI); s.loc., s.d., *Herb. Wight. Propr.* 2673 (CAL).

Conservation status: Given its extensive distribution across all states, this species is classified as Least Concern (LC).

Notes: *Justicia simplex*, *J. japonica*, *J. mollissima*, *J. notha*, *J. latispica*, and *J. pathanamthittensis* are distinct species in different taxonomic works. However, some authors (Malik & Ghaffoor, 1988; Chang et al., 2014; Deng, 2020), have largely considered some of these

names as synonyms. (e.g., *J. japonica* is regarded as a synonym of *J. procumbens*). In the present study, the first author collected different variants of *J. japonica* and *J. procumbens* from Peninsular India and realized that all the collected specimens represented the same taxon. This complex exhibits great variability in leaf shape, inflorescence length, bract shape and hairiness. These characters vary within populations, even within the same individuals. Leaves show notable variations in shape and may be sessile or petiolate, with petiole length ranging from 0.3–2 cm; inflorescence size range from 0.5–7 cm length, and bract shape (from 4–5.5 mm). The hairiness of the plants depends on the altitude, where plants in plains having less pubescence whereas those at high altitudes show dense pubescence. Thus, in the present study, we treat *J. japonica* and related taxa as synonyms under *J. procumbens*.

The first author collected small herbaceous, highly hirsute forms of this species with short internodes, orbicular to ovate leaves and short inflorescences from a few districts of Kerala. Similar specimens were treated as *Justicia nagpurensis* in certain herbaria. Apart from these overlapping variations in the vegetative characters, no differences in the floral characters are noticed either in the protologue or on the living specimens. Hence, we treat *J. nagpurensis* as a new synonym.

Similarly, Clarke (1885) described *Justicia notha* C.B. Clarke based on Wight's specimen (*Rostellularia simplex* Wight) without mentioning any collection details. In the protologue, Clarke mentioned it may be a Malayan species characterized by sessile oblong leaves, with white setulose hairs, and bracts elliptic with linear to oblong calyx lobes. All these characters completely overlap with the characters of this complex. In POWO (2023), *J. notha* is considered as a synonym of *Rostellularia simplex* Wight. In the present work, *J. notha* is treated as new synonym of *J. procumbens*.

Remadevi and Binojkumar (2008) described *Justicia pathanamthittensis* by considering characteristics like stem branched from base, leaves linear to elliptic, and bracts obovate with obtuse apex as unique. A critical examination of specimens in the present study revealed that the characteristics fall within the circumscription of *J. procumbens* and hence it is reduced to synonymy thereof.

Typification: *Justicia japonica* Thunberg (1784) was originally published in Murray's *Systema Vegetabilium* reference to Thunberg's manuscript without the details of specimens. In the *Flora Japonica*, Thunberg provided more information on the localities as "Papenberg, Kofido and near Nagasaki". According to Stafleu and Cowan (1986), Thunberg's major collections were deposited at UPS, and from 1785 onwards he provided his entire herbarium collections to Uppsala University. Duplicates are also available at various herbaria. After an exhaustive search, we traced three sheets of *J. japonica* collected from Japan, one each at UPS, L and LD. Among them, the sheets kept at UPS (V-000386) and LD (LD1742545) were collected by C.P. Thunberg and the remaining one at L (L3704894) does not contain details of the collector, but it may also be considered as original material, according to Art. 9.4 (Turland *et al.*, 2018). Since Thunberg donated his major collections to UPS and the sheet at UPS bears annotation of Thunberg's herbarium, we select UPS-THUNB 386 (V-000386) as lectotype according to ICN Art. 9.3 (Turland *et al.*, 2018). This sheet also matches the description provided in the protologue.

Rostellularia procumbens (L.) Nees var. *serpyllifolia* Benth. was originally described by Bentham on an exsiccated specimen of Hohenacker with the collection number 571 from *Plantae Indiae Orientalis*. Clarke (1885) transferred this to *Justicia* as *Justicia simplex* var. *serpyllifolia* (Benth.) C.B. Clarke. Subsequently, Gamble (1921) elevated this variety to species rank as *Justicia serpyllifolia*. However, Gamble's name is a later homonym of *Justicia serpyllifolia* Vahl (1804) and hence illegitimate. To address this later homonym, Graham (1988) provided a new name (*Justicia nagpurensis* V.A.W. Graham, citing the type as: India, Hohenacker 571 [holotype K]). It is essential to note that a name validated on an exsiccate specimen label does not have a holotype; all such specimens are considered syntypes. Therefore, Graham's holotype citation is invalid. According to Stafleu and Cowan (1979), Hohenacker, a botanist and collector, issued his exsiccatae containing plants collected by himself and others to different herbaria from 1843 onwards. While searching for Hohenacker's specimen in various herbaria, seven sheets with Hohenacker's annotation were traced: two sheets at K (K000884085, K000884083) and one at C (C10005004), HAL (HAL0113964), LECB (LECB0001817), M (M0186434), TUB

(TUB009942). All of them can be considered original materials according to Art. 9.4 of ICN (Turland *et al.* 2018). Among them, six sheets (K000884085, C10005004, HAL0113964, LECB0001817, M0186434, TUB009942) represent single taxa *Rostellularia procumbens* var. *serpyllifolia* while the one specimen at K (K000884083) is a mixture with two other specimens bearing different barcodes. But this sheet belongs to *Herbarium Benthamianum* and is the only possible specimen consulted by Bentham when describing this variety. Since Bentham ascribed this varietal name, we selected the Kew material (K000884083) as the lectotype in accordance with Art. 9.3 & 9.12 of ICN (Turland *et al.*, 2018).

Justicia prostrata (Roxb. ex C.B. Clarke) Gamble, Fl. Madras 2: 1081. 1921. L.H. Cramer, Revis. Handb. Fl. Ceylon 12: 115. 1998; V.A.W. Graham, Kew Bull. 43: 597. 1988. *Justicia diffusa* Willd. var. *prostrata* Roxb. ex C.B. Clarke in Hook. f., Fl. Brit. India 4: 538. 1885. *Rostellularia prostrata* (Roxb. ex C.B. Clarke) Majumdar, Bull. Bot. Soc. Bengal 25: 75. 1971. *Lectotype* (designated by Soumya & Sunojkumar, 2018): INDIA, *s.loc.*, *s.d.*, Roxburgh *s.n.* (K [K000884088 digital image!]). **Figs. 20 & 21**

Annual prostrate herbs, up to 30 cm tall. Stems angular, scabrous, dichotomously branched with woody root stock; branches slender, greenish, densely pubescent with strigose hairs on each angle; internodes 1–4 cm long. Leaves petiolate; laminae ovate to elliptic, sometimes orbicular, 0.6–3.5 × 0.7–1.8 cm, base cuneate or rounded, margins entire, finely ciliate, apex obtuse to acute or rounded, chartaceous, puberulous sometimes densely pubescent; veins prominent, hairy, secondary veins 3–4 pairs, venation eucamptodromous; petioles 0.3–1.5 cm long, puberulous. Inflorescence slender terminal or axillary spike, up to 7 cm long, many-flowered; peduncles 0.75–3 cm long. Flowers sessile, two per inflorescence node, 4–6 × 3–4 mm; bracts ovate to elliptic, 2–3.3 × 0.8–1.3 mm, margin scarios, minutely ciliate, apex acute, greenish, single-nerved, pubescent; bracteoles similar to bracts but narrower, 1.2–2.5 × 0.5 mm. Calyx deeply 5-lobed, 3.5–4 × 1–1.25 mm at anthesis, accrescent, greenish; lobes unequal, the fifth lobe much reduced, 1 mm long; other lobes 3–3.5 × 0.5–0.8, linear-lanceolate, apex shortly acuminate, margins scarios, ciliate. Corolla purplish white with white striations on lower lip, sparsely pubescent outside, glabrous inside except in the throat; tube cylindrical, c. 2 × 1 mm, slightly

enlarged at throat; upper lip erect, triangular to ovate, $3-3.5 \times 2-2.5$ mm, apex acute or emarginate, hooded; lower lip orbicular to obovate, $3.55-4.5 \times 3-4$ mm, 3-lobed at apex, lobes imbricate, apex acute. Stamens exserted; filaments 2.5–3 mm long, declinate, white, glabrous except base; anther thecae superposed, slightly oblique, elliptic, 0.6–1 mm long, purplish brown with yellowish shades, upper theca dorsally hirsute, lower theca glabrous; appendage c. 0.5 mm long, apex acute or obtuse, white. Ovary ellipsoid, c. 1×0.5 mm, pale green, densely pubescent at apex; style slender, 3–3.5 mm long, whitish, hirsute in lower half; stigma simple, capitate; nectariferous disc cup-shaped, c. 0.4 mm high, pale green, glabrous. Capsule oblong or clavate, $3-4 \times 0.7-1$ mm, pale brown, apex cuspidate, densely pubescent at apex or in lower half. Seeds 4, ovoid to sub-orbicular compressed, $0.7-1 \times 0.8-1.3$ mm, grooved along the back brownish; testa rugulose.

Flowering & fruiting: Flowering from July to December; fruiting in January.

Habitat: This species is predominantly found in deciduous forests, on grassy hill slopes, plains and along roadsides. It is occasionally observed in sandy areas along the coast and in deep evergreen forests at altitudes of around 250 m.

Distribution: India and Sri Lanka.

Specimens examined: INDIA, **Andhra Pradesh**, Chittoor district, Sathyavedu, 07.10.1979, *M. Chandrabose* 45258 (MH); Cuddalore district, Sirupakkam R.F., 08.09.1977, *K. Ramamurthy* 50700 (MH); *Ibid.*, near Pongala cheruva lake, 20.08.1958, *K. Subramanyam* 6306 (CAL); East Godavari district, Devipatnam, 25.06.1965, *G.V. Subba Rao* 24444 (MH); Srikakulam district, Paralakhemundi palace compound, 09.05.1979, *G.V. Subba Rao* 62370 (CAL, MH); Vishakhapatnam district, Nattuvaranam, 06.1900, *C.A. Barber* 1837 (CAL); West Godavari district, Kovvur, 20.11.1970, *J.L. Ellis* 37200 (MH). **Karnataka**, Bengaluru district, Marathahalli R.F., 18.07.1978, *E. Vajravelu* 57862 (MH). **Kerala**, Idukki district, Chinnar, 13.05.2018, *P. Soumya, Dilsha, Manu & P. Sunojkumar* 157549; Thekkady, 05.11.1993, *Jomy Augustine* 12522 (CALI); Kollam district, on road sides, 17.07.1912, *M.M. Rama Rao* 444 (FRC); Thiruvananthapuram district, Neyyanttinkara, near railway track, 05.08.2017, *P. Soumya, Shinoj & P. Sunojkumar* 157540; NIIST campus front gate, 05.12.2017, *P. Soumya, Linu &*

P. Sunojkumar 157554 (CALI). **Maharashtra**, Pune district, Daund, 35.11.1956, *F. Ujari* 9577 (BSI). **Tamil Nadu**, Chengalpattu district, Vandalur, 25.10.1914, *s.coll.* 11067 (MH); Vedanthangal W.B. Sanctuary, 26.01.1976, *A.N. Henry* 47035 (CAL); Chennai district, Chepauk, *s.d.*, *Rama Rao, M.P., s.n.* (FRC); Barkuda, 27.10.1919, *N. Annadale* 1342 (CAL); Southern forest rangers college estate, near research block, 09.09.1969, *K. N. Subramanian* 3777; Villukaradu, 31.08.1910, *C.E.C. Fischer* 2103 (FRC); Coimbatore district, Agri College, 07.09.1968, *M. Chandrabose* 29773 (MH); college estate, 20.11.1967, *K. N. Subramanian* 192 (FRC); Foot of Kuridimalai, 19.09.1956, *K. Subramanyam* 774; Maruthamalai, 07.08.1956, *K.M. Sebastine* 493 (CAL, MH); Nellimalai R.F., 26.05.1962, *K. Ramamurthy* 14134; Madukkari hill, 09.08.1962, *C.P.S. Madhavan* 8 (MH); Cuddalore district, Chidambaram park, 04.10.1964, *M. Chandrabose* 28563 (MH); Dharmapuri district, Marudahalli R.F., 18.07.1978, *E. Vajravelu*, 57862 (CAL); Erode district, Pioneer estate, 31.07.1966, *B.V. Shetty* 28057 (MH); Kanchipuram district, Vandalur R. F. Zoological park area, Thambaram Range, 24.08.1982, *K. N. Subramanian* 8450 (FRC); North Arcot district, vazhiyur, 26.03.1978, *E. Vajravelu* 55602; Tippukadu R.F., on the road to Markanan, 11.01.1959, *K. Subramanyam* 7611; *Ibid.*, 01.07.1963, *K. Ramamurthy* 16635 (CAL); Pudukkottai district, Sivaganga, 14.08.1964, *K. Ramamurthy* 201788 (MH); Sivaganga, 20.08.1964, *K. Ramamurthy* 21012 (MH); Ramanathapuram district, 25.12.1989, *V. Balasubramaniam* 2312 (CAL); Salem district, Attur, Chinnakalrayanas, 27.06.1972, *N. Venugopal* 14410 (CAL); South Arcot district, Paluur, 23.08.1930, *s.coll.* 4115 (CAL); Marakkanam Pondy route, 20.09.1979, *R. Ramamurthy* 64188 (CAL); Thanjavur district, Muthupet, 20.05.1978, *V.J. Nair* 56563; Puthukottai to Aranthangi, 14.09.1979, *K. Ramamurthy* 51233 (CAL); Theni district, Kambam, 05.1917, *Blatter & Hallberg* 520 (CAL); Tirunelveli district, Kodumady, 09.07.1959, *K.M. Sebastine* 8331 (CAL); Tiruvannamalai district, Mamandur valley, 12.10.1958, *K. Subramanyam* 6912 (MH); Sengaltheri, 26.09.1916, *s.coll. s.n.*; Naterikal road, 12.02.1913, *s.coll.* 38405; Sivanaperi, 07.11.1962, *J. Joseph* 15121; Kayamoli, 27.11.1961, *K.M. Subramanyam* 13641 (CAL); Viluppuram district, Marakkanam pond route, 20.09.1979, *K. Ramamurthy* 64188 (MH). **Peninsula Indiae Orientalis**, Herb. Wight. Propr., 2668 (CAL).

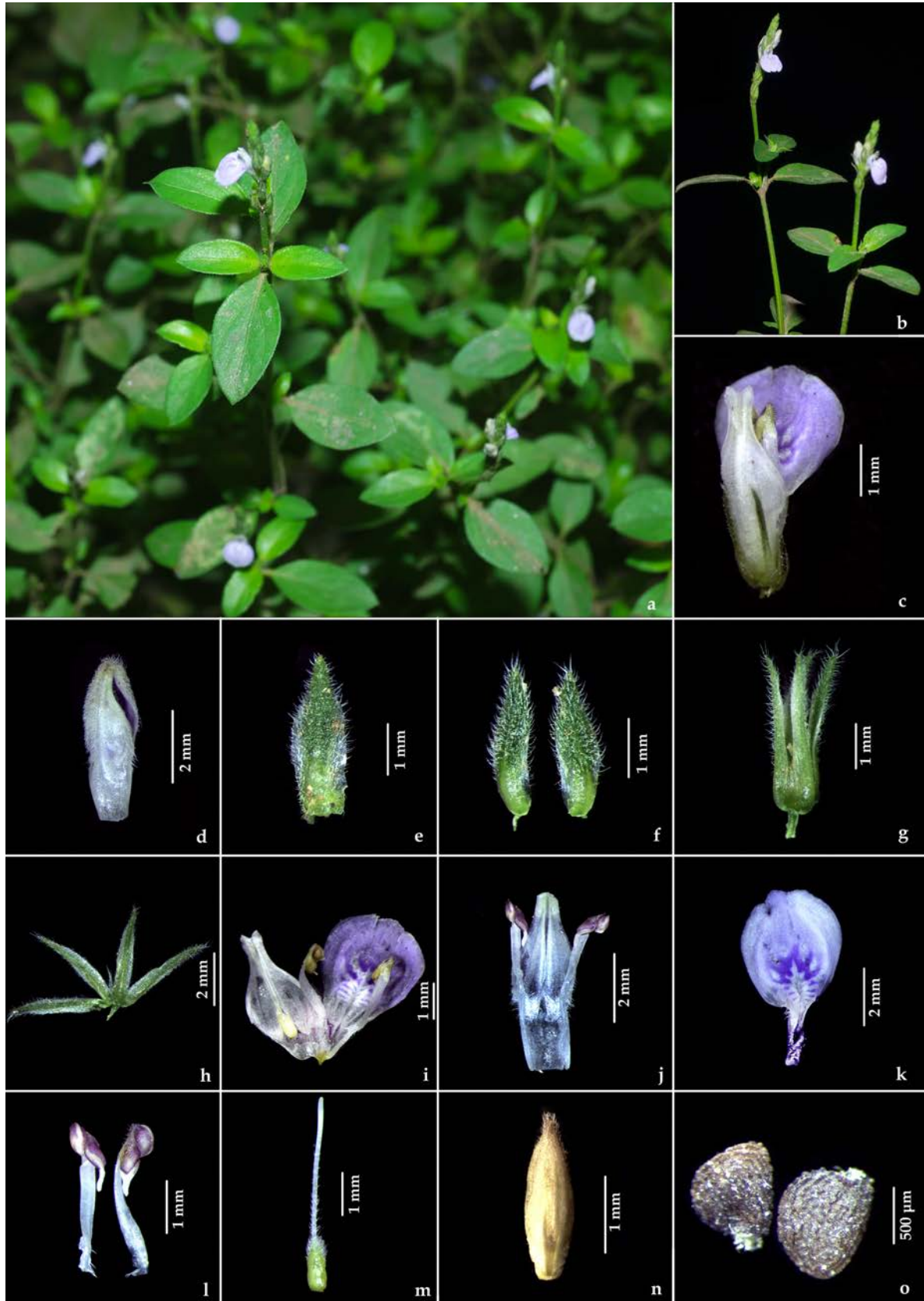


Fig. 20. *Justicia prostrata* (Roxb. ex C.B. Clarke) Gamble: **a.** Habit; **b.** Inflorescence; **c.** Flower; **d.** Flower bud; **e.** Bract; **f.** Bracteoles—abaxial side; **g.** Calyx; **h.** Calyx—opened; **i.** Corolla—opened; **j.** Upper lip; **k.** Lower lip; **l.** Stamens; **m.** Gynoecium; **n.** Capsule; **o.** Seeds (from P. Soumya & P. Sunojkumar 157540; photos by P. Soumya).

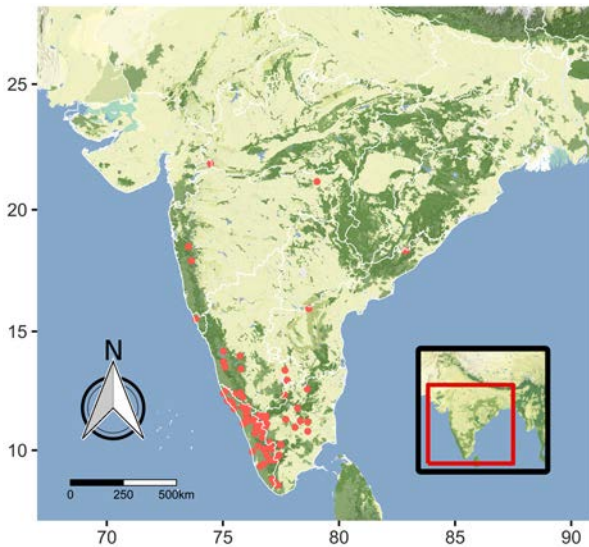


Fig. 21. Distribution of *Justicia prostrata* (Roxb. ex C.B.Clarke) Gamble in Peninsular India. Drawn using R (R Core Team, 2023).

Conservation status: This species is widespread in Peninsular India. Hence it is assessed here as Least Concern (LC).

Notes: *Justicia prostrata* can be easily separated from *J. diffusa* and its other varieties by the 5-lobed calyx with the fifth lobe much reduced against an equally 4-lobed calyx.

Justicia quinqueangularis J.Koenig ex Roxb., Fl. Ind. 1: 134. 1820; C.B.Clarke in Hook.f., Fl. Brit. India 4: 536. 1885; Gamble, Fl. Madras 2: 1081. 1921; V.A.W.Graham, Kew Bull. 43: 597. 1988. *Rostellaria quinquangularis* (J.Koenig ex Roxb.) Nees in Wall., Pl. Asiat. Rar. 3: 101. 1832. *Rostellularia quinquangularis* (J.Koenig ex Roxb.) Nees in DC., Prodr. 11: 375. 1847. *Type:* INDIA, *s.loc.*, *s.d.*, *Banks s.n.* (C [C10004992 digital image!]).

Rostellaria peploides Nees in Wall., Pl. Asiat. Rar. 3: 101. 1832. *Rostellularia peploides* Nees in DC., Prodr. 11: 375. 1847. *Justicia peploides* (Nees) T.Anderson J. Linn. Soc., Bot. 9: 511. 1867; Malik & Ghafoor in E.Nasir & S.I.Ali (eds.), Fl. Pakistan 188: 33. 1988; Y.F.Deng, Fl. Pan Himalaya 46: 407. 2020; V.A.W.Graham, Kew Bull. 43: 597. 1988. *Justicia quinquangularis* J.Koenig ex Roxb. var. *peploides* C.B.Clarke in Hook.f., Fl. Brit. India 4: 536. 1885. *Lectotype* (designated by Deng, 2020): INDIA, Ripa Gangis and Bhagulpur, 1820, Wall. Cat. 2441B (K-W [K001115997 digital image!]).

Justicia quinqueangularis J.Koenig ex Roxb. var. *kawalii* Annamma & Venu, in, Indian J. Forest. 39(2): 179. 2016, **syn. nov.** *Type:* INDIA, **Telangana**,

Adilabad district, Kawal Tiger Reserve, Jannaram Forest Division, Indhanpalli range, 15.09.2014, Annamma P.S. 4044 a (holo CAL [CAL0000024888!]; iso BSID [BSID0017169!]).

Figs. 22 & 23

Perennial herbs, up to 70 cm tall., Stems decumbent to erect, usually rooting at lower nodes, angular, dichotomously branched; branches slender, greenish, scabrous, pubescent with strigose hairs; internodes 2–9 cm long. Leaves sub-sessile or shortly petiolate; laminae linear to lanceolate or elliptic to narrowly oblong, 1.5–8 × 0.4–0.8 cm, base attenuate, scabrous, margins entire to distantly crenate with minute hairs, apex acute or obtuse, chartaceous, puberulous with dense hairs on ribs; veins inconspicuous, secondary veins 4–7 pairs, venation weak brochidodromous; petioles up to 5 mm long, densely pubescent. Inflorescence terminal spike, up to 9 cm long; peduncles 0.5–1.5 cm long, densely pubescent. Flower sessile, two per inflorescence node, 4–9 × 2–4 mm, bracts and bracteoles almost equal to calyx; bracts linear to narrowly oblong or ovate to lanceolate, 3.5–4.5 × 1–1.3 mm, margin scarios, ciliate, apex acute to obtuse or cuspidate; bracteoles similar to bracts but narrower, 2.5–3.5 × c. 1 mm. Calyx deeply 5-lobed, 3.5–5 × 1–1.25 mm at anthesis, accrescent, greenish; lobes unequal, lanceolate, the fifth lobe much reduced, margins scarios, ciliate, apex acute or obtuse. Corolla purplish white with white striations on lower lip, pubescent outside and glabrous inside; tube cylindrical, 2–2.5 × 1–1.3 mm, slightly enlarged at throat, glabrous outside and pubescent inside on throat; upper lip erect, triangular to ovate, 2.5–3.5 × 2–2.2 mm, apex obcordate; lower lip orbicular to obovate, 4.5–5 × 5–5.5 mm, 3-lobed at apex; lobes imbricate, apex rounded or obtuse. Stamens exerted; filaments 2 mm long, declinate, white, basally hirsute; anther thecae slightly superposed, equal, elliptic, c. 0.8 mm long, purplish with pale brown shades, upper theca dorsally hirsute, lower theca glabrous; appendage white, c. 0.5 mm long, apex acute or rounded. Ovary ellipsoid, 1–1.2 × 0.4–0.6 mm, pale green, densely pubescent throughout; style slender, 3.5–4 mm long, whitish, hairy in lower half; stigma slightly bifid; nectariferous disc c. 0.5 mm long, pale green, margins undulate. Capsule oblong, 3.5–4 × 1–1.2 mm, apex acute, pale brown, pubescent at apex and along margins. Seeds 4, reniform to orbicular, compressed, 1–1.2 × 1 mm, brownish; testa rugulose.

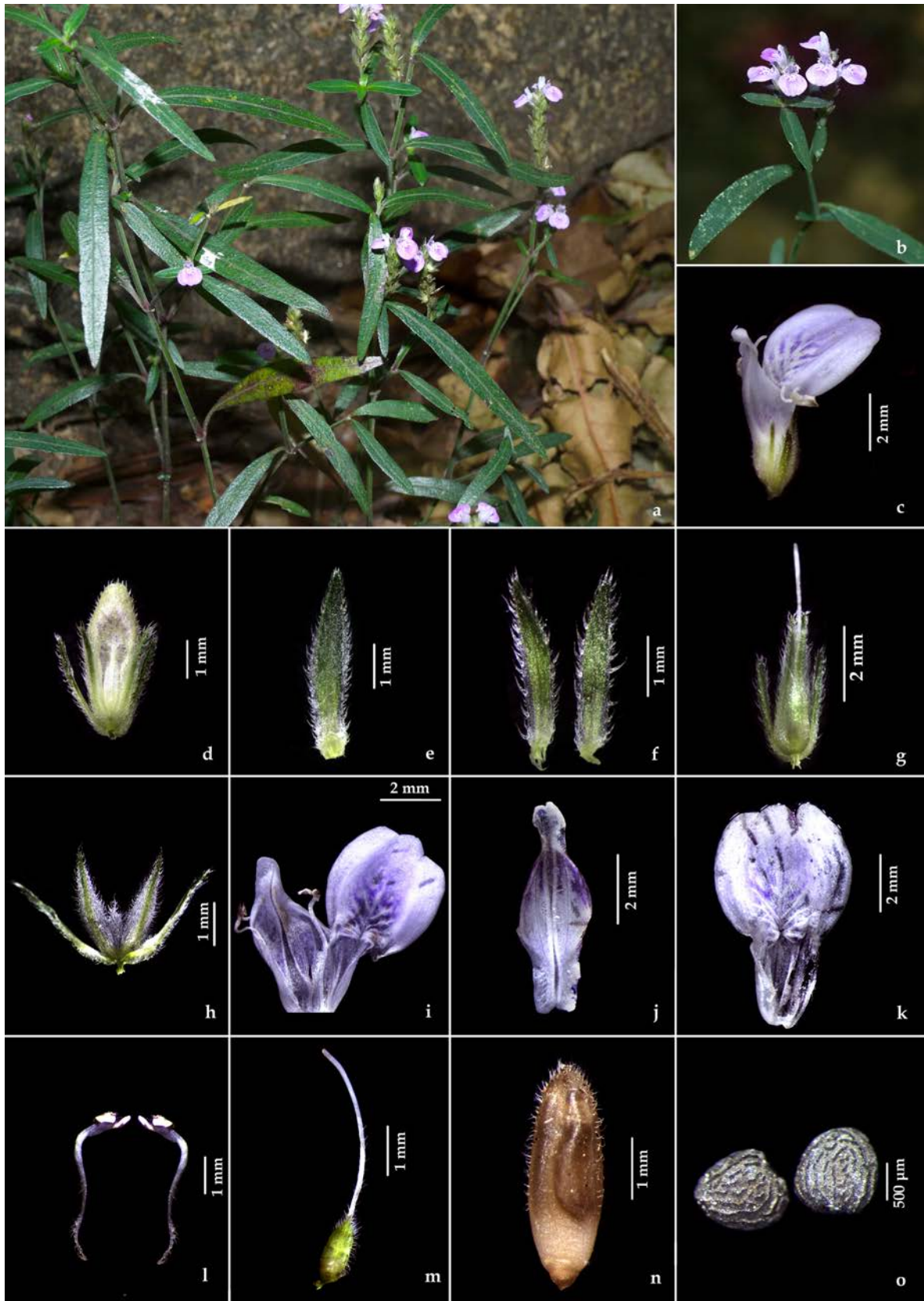


Fig. 22. *Justicia quinqueangularis* J.Koenig ex Roxb.: **a.** Habit; **b.** Inflorescence; **c.** Flower; **d.** Flower bud; **e.** Bract; **f.** Bracteoles—adaxial side; **g.** Calyx; **h.** Calyx—opened; **i.** Corolla—opened; **j.** Upper lip; **k.** Lower lip; **l.** Stamens; **m.** Gynoecium with nectariferous disc; **n.** Capsule; **o.** Seeds (from P. Soumya & P. Sunojkumar 145341; photos by P. Soumya).

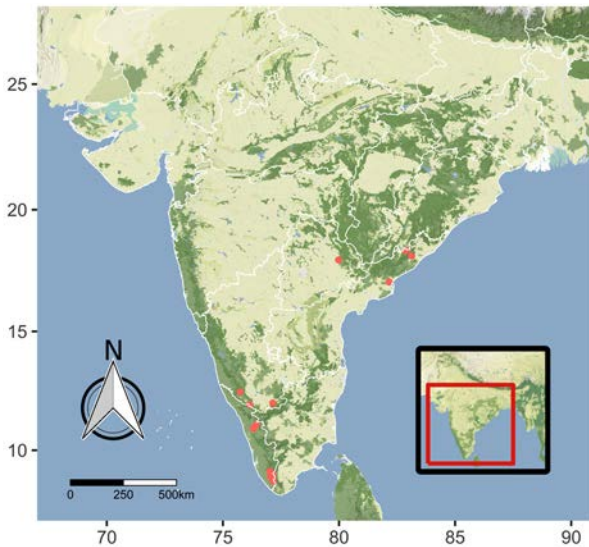


Fig. 23. Distribution of *Justicia quinqueangularis* J.Koenig ex Roxb. in Peninsular India. Drawn using R (R Core Team, 2023).

Flowering & fruiting: Flowering from July to December; fruiting in January.

Habitat: Grows in humus-rich soil, on moist rocks, along the margins of paddy fields and streams at an elevation of 450 to 1100 m.

Distribution: Afghanistan, Bangladesh, China, India, Nepal, Pakistan, Sri Lanka and Taiwan.

Specimens examined: INDIA, **Andhra Pradesh**, East Godavari district, Samalkota, 29.04.1913, s.coll. s.n.; *Ibid.*, 07.01.1917, s.coll. 14024; *Ibid.*, 19.12.1924, G.V. Narayanan 81943 (MH); Prakasam district, Diguvametta, Nallamalais, 18.11.1969, J.L. Ellis 38489 (CAL); Visakhapatnam district, Araku Valley near stream, 23.08.1960, N.P. Balakrishnan 10748; Srungavarpukota, 22.10.1964, G.V. Subba Rao 21824 (MH); Warangal district, Western side of Pakhal Lake, 08.08.1961, K.M. Sebastine 13131 (CAL). **Karnataka**, Kodagu district, Madhapur-Mercara road, 08.10.1961, s.coll. 74985 (CAL); Mysore district, Siligiri Rangan hills, 07.09.1978, S.R. Ramesh 2605 (CAL). **Kerala**, Kollam district, Mannarappara, 15.11.1976, M. Chandrabose 49069 (MH); *Ibid.*, 15.11.1970, M. Chandrabose 49069 (CAL); Palaruvi, 28.11.1961, K.N. Subramanian 77199 (FRC); Kottayam district, Muthuvara, s.d. Robi A.J. 06589 (CMPR); Palakkad district, Kunthipuzha bank, 16.01.1980, P. Bhargavan 65504 (CAL); Silent valley R.F., 11.12.1980, N.C. Nair 69549 (CAL); Thiruvananthapuram district, Bonacaud, 09.10.1973, J. Joseph 44644 (MH); *Ibid.*, 22.12.1987, N. Mohanan 9096 (CALI); *Ibid.*, 17.05.1988, N. Mohanan

9894 (CALI); Kulathupuzha range, Velayankala coup 10, 14.09.1984, K.R. Sasidharan 10482 (FRC); Ponmudi, 18.05.1973, M. Mohanan 54873 (MH); *Ibid.*, 09.11.2018, P. Soumya, Resmi & P. Sunojkumar 138573 (CALI); Wayanad district, Baveli, Begur R.F., 22.06.1979, V.S. Ramachandran 62723 (CAL); Nadavayal, s.d., P. Soumya, Drisya, A.K. Pradeep & P. Sunojkumar 145302 (CALI).

Conservation status: Due to its wide distribution, this species is assessed here as Least Concern (LC).

Notes: This species is often mistaken with another annual species *Justicia vahliana* Schult., based on the similarities in the leaf shape and size. However, *J. quinqueangularis* J.Koenig ex Roxb. can be distinguished from it by its dense cylindrical spikes (vs. less congested spike), a 5-lobed calyx with the fifth lobe much reduced (vs. four lobed), linear to narrowly lanceolate bracts and bracteoles (vs. ovate) with widely scarious margins (vs. narrow scarious). The species exhibits considerable variability in its vegetative characters, with plants in wet and dry habitats often looking different. Its habit varies from small decumbent herb to erect subshrub and the leaves are linear to lanceolate, occasionally elliptic to narrowly oblong.

Annamma et al. (2016) described *Justicia quinqueangularis* var. *kawalii* Annamma & Venu from the Kawal Tiger Reserve in Telangana, differentiating it from other varieties based on characteristics such as cylindrical spikes with flowers of the same size on successive nodes. However, upon further investigation and comparison with different populations from Peninsular India, it was observed that the characteristics used to describe the new variety were inconsistent and varied within individuals of the same population and between populations. Consequently, this variety is treated as a new synonym of *J. quinqueangularis* in the present study.

We also treat *Justicia peploides* (Nees) T.Anderson as a synonym of *J. quinqueangularis*. It was originally described as *Rostellaria peploides* Nees (Nees von Esenbeck, 1832). Anderson (1867) transferred it to *Justicia* as *J. peploides*. Subsequently, Clarke (1885) noticed that *J. peploides* is morphologically similar to *J. quinqueangularis* and reduced it as a variety under the latter based on its diffuse branched stem with oblong or ovate leaves and shorter spikes. In the present study we confirmed that the oblong to ovate

leaf with short spike falls within the variation range represented by *Justicia quinqueangularis*. However, taxon is still treated as a distinct species in some major floras (Stewart, 1972; Malik & Ghafoor, 1988; Graham, 1988; Deng, 2020). The morphological variation in *J. quinqueangularis* primarily pertains to its habit, leaves and inflorescences, with plant size and inflorescences ranging from small to large and leaf shape from linear to lanceolate or elliptic to narrowly oblong. Occasionally, bracts and bracteoles may also exhibit slight variations in shape from linear or narrowly oblong to lanceolate.

Justicia santapau Bennet, J. Bombay Nat. Hist. Soc. 67: 358. 1970. *Hemichoriste montana* Nees in Wall., Pl. Asiat. Rar. 3: 102. 1832; in DC., Prodr. 11: 367. 1847; Wight Ic. t. 1538. 1850. *Justicia montana* (Nees) T. Anderson, in J. Linn. Soc. Bot. 9: 509. 1867 *nom. illeg., non* Roxb. 1805; C.B. Clarke in Hook.f., Fl. Brit. India 4: 525. 1885. Gamble, Fl. Madras 2: 1078. 1921; V.A.W. Graham, Kew Bull. 43: 589. 1988. *Justicia andersonii* Ramamoorthy in C.J. Saldanha & Nicolson, Fl. Hassan district, 551. 1976, *nom. superfl.* *Lectotype* (designated by Graham, 1988): INDIA, Wall. Cat. 2471a (K [K001116149, digital image!]). **Figs. 24 & 25**

Perennial shrubs, up to 2 m tall. Stems erect, angular, dichotomously branched; branches stout, green to purplish green, glabrous or puberulous; internodes 2–13 cm long. Leaves petiolate; laminae elliptic or oblanceolate, 11–28 × 3.5–8 cm, base cuneate, margins entire, slightly undulate, apex acuminate or acute, sub-coriaceous, glabrous; veins prominent, secondary veins 6–11 pairs, venation simple craspedodromous; petioles 2–5 cm long, glabrous. Inflorescence terminal, simple or compound spike, up to 35 cm long, many-flowered, dense towards base and lax at apex; peduncles 1.5–5 cm long, glabrous. Flowers sessile or sub-sessile, fascicled, 1–3 flowers on each side, 2.75–3.5 × 1.5–2 cm; bracts ovate to widely lanceolate, 0.7–1.5 × 0.4–0.7 cm, margins entire, apex acuminate or acute, green or purplish green, pubescent. Bracteoles oblong to elliptic, 0.5–0.7 × 0.25–0.4 cm, apex acute, green, pubescent. Calyx deeply 5-lobed, 0.7–1.3 × 0.4–0.6 cm at anthesis, accrescent, green or purplish green; lobes lanceolate to subulate, equal, densely pubescent, apex acuminate, margins entire, finely ciliate. Corolla whitish with purple striations on lips, pubescent outside, glabrous inside except in throat; tube cylindrical, 4–8 × 4–5.5 mm, slightly enlarged in throat; upper lip erect, elliptic to narrowly oblong,

2–2.3 × 0.6–0.75 cm, apex minutely two lobed, hooded; lower lip obovate to sub-orbicular, 2–2.25 × 1.5–1.75 cm, 3-lobed; lobes sub-equal, middle lobe broadly oblong to ovate, apex rounded; lateral lobes narrowly oblong, apex acute or rounded. Stamens exserted; filaments c. 1.5 cm long, declinate or sometimes curled, white, basally hirsute; anther thecae superposed, equal, elliptic, 3–4 mm long, greenish with yellow margin, upper theca dorsally hirsute, lower theca glabrous; appendage white, c. 1 mm long, apex acute, pointed. Ovary conical, c. 3 × 2 mm, pale green, densely tomentose; ovules 4; style filiform, 2.1–2.4 cm long, whitish recurved, hirsute in lower half; stigma simple; nectariferous disc c. 1.5 × 3 mm, greenish yellow. Capsule clavate, 2.5–3 × 0.5–1 cm, apex acute or shortly pointed, green to brown, densely pubescent; base sterile, 1–1.3 cm long, flattened. Seeds 4, orbicular or sub-orbicular, 2.7–2.9 × 3–3.2 cm, glabrous; testa tuberculate.

Flowering & fruiting: Flowering from November to February; fruiting from March to April.

Habitat: This species is distributed on the margins of evergreen and semi-evergreen forests, along Ghat roadsides and riverbanks at elevations between 550 and 1500 m.

Distribution: South India.

Specimens examined: INDIA, **Karnataka**, Bellary district, *s.d.*, *Law s.n.* (CAL); Chikkamagaluru district, Kemmannugundi, 26.03.1964, R.S. Raghavan 37216 (CAL); Dakshina Kannada district, Shirady Ghat near border, 27.12.1978, P. Prakesh & S.B. Manohar 5523; Someshwar village, 04.02.1980, N. Rameswara Rao 122 (CAL); Hassan district, Yettinahala, 27.01.1971, T.P. Ramamoorthy 1346 (CAL); Kodagu district, Coorg, 04.02.1976, B.C. Banerjee 11553; *Ibid.*, Attic estate, 26.01.1976, B.C. Banerjee 11342 (CAL); Mysore district, *s.loc.*, 01.02.1906, A. Meebold 8502 (CAL); Shimoga district, Agumbe, 05.02.1961, R.S. Raghavan *s.n.* (CAL); Jog falls, 17.01.2018, P. Soumya, V.S. Hareesh, Adithya & P. Sunojkumar 138503 (CAL); Kodachadri range, 07.03.1979, B.R. Ramesh & K.R. Kesava murthy 6164 (CAL). **Kerala**, Ernakulam district, Thundathil range, Bhoothathankettu, 12.02.1970, B.V. Shetty 33487 (MH); Idukki district, Kanchiyar, 17.02.1982, C.N. Mohanan 73328 (MH); *Ibid.*, 23.02.1983, C.N. Mohanan 77953 (CAL, MH); Kulamavu, 14.12.1982, C.N. Mohanan 76054 (CAL, MH); *Ibid.*, 07.11.2018, P. Soumya & P. Sunojkumar 138521 (CAL);

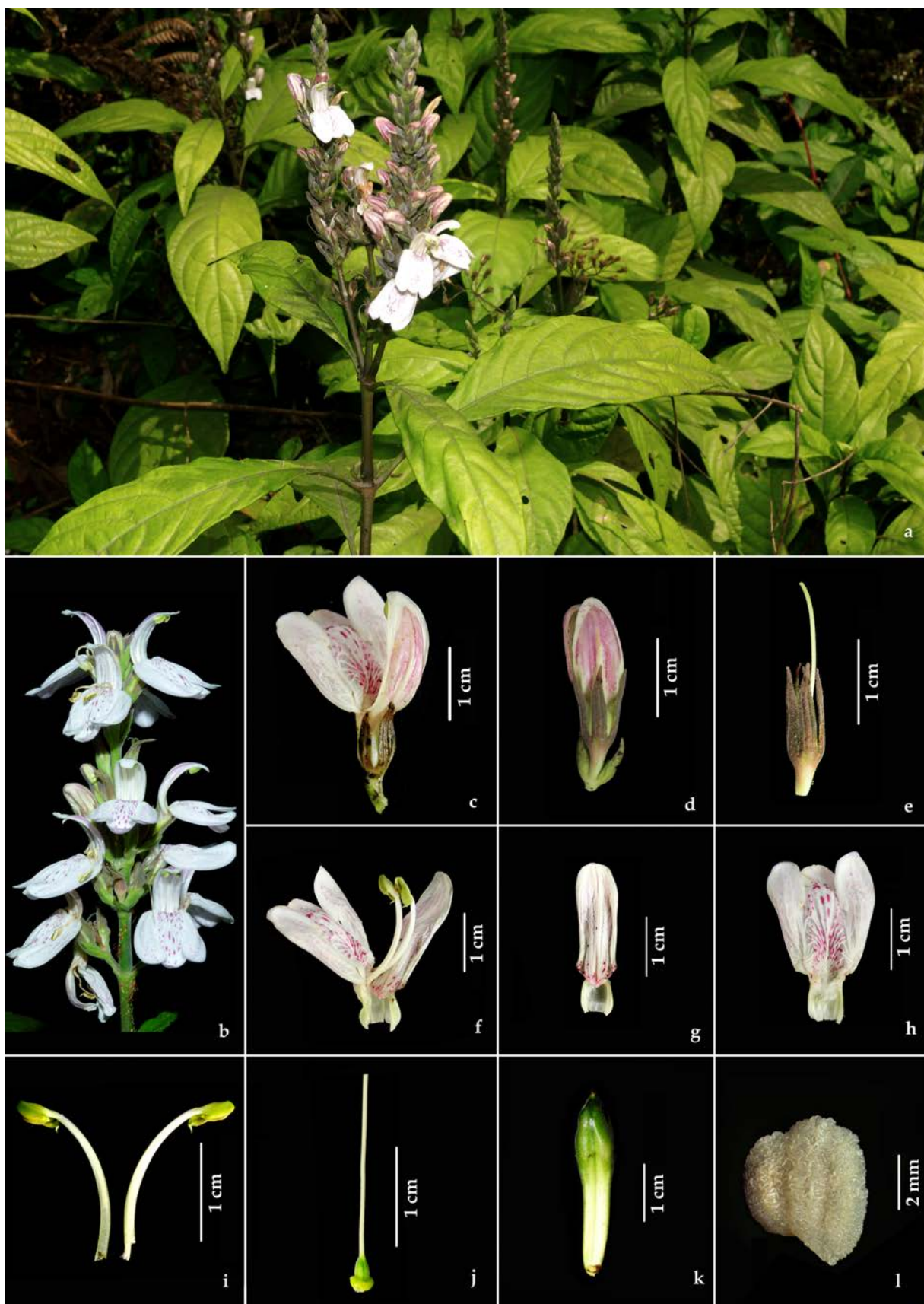


Fig. 24. *Justicia santapauli* Bennet: **a.** Habit; **b.** Inflorescence; **c.** Flower; **d.** Flower bud; **e.** Calyx; **f.** Corolla—opened; **g.** Upper lip; **h.** Lower lip; **i.** Stamens; **j.** Gynoecium with nectariferous disc; **k.** Capsule; **l.** Seed (from P. Soumya & P. Sunojkumar 145338; photos by P. Soumya).

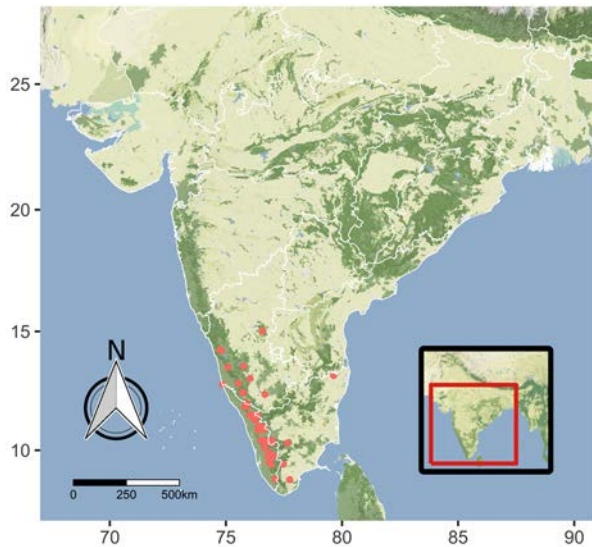


Fig. 25. Distribution of *Justicia santapau* Bennet in Peninsular India. Drawn using R (R Core Team, 2023).

Malappara to Thanipara, 15.03.2009, P.S. Udayan *et al.* 05730 (CMPR); Manaloda, 22.02.1994, Jomy Augustine 13358 (CALI); Meenmutty, 18.02.1982, V.S. Raju 71252 (CAL, MH); Meenmutty to Kulamavu, 25.01.1983, A.G. Pandurangan 76627; *Ibid.*, 25.01.1983, A.G. Pandurangan 76632 (CAL); *Ibid.*, 25.02.1984, A.G. Pandurangan 78085 (CAL, MH); Painavu, 28.04.1984, C.N. Mohanan 81655 (MH); Valara R.F., 07.02.1984, K. Ramamurthy 80898 (MH); Kannur district, Ambayathode, 15.12.1979, V.S. Ramachandran 65227 (CAL); Chanthanathode, 14.02.1978, V.S. Ramachandran 53957; *Ibid.*, 22.02.1979, V.S. Ramachandran 60100 (MH); Kollam district, Way to Plappally, 23.02.1979, C.N. Mohanan 61181 (CAL, MH); Kottayam district, Erumeli, 23.12.1978, C.N. Mohanan 59616 (CAL, MH); Malappuram district, Nilambur, Thalichola, 03.01.1981, Philip Mathew 25662 (CALI); *Ibid.*, 04.02.1982, Philip Mathew 33929 (CALI); Palakkad district, Dhoni hills, 27.03.1910, C.E.C. Fischer 1838 (CAL, FRC); Karappara river, 16.04.1914, E. Vajravelu 48969 (CAL, MH); *Ibid.*, 01.03.1975, E. Vajravelu 46119 (MH); Mannarkkad, Koodam, Muthikkulam, 03.02.2009, K.A. Anilkumar 3814; *Ibid.*, Kuruvampadi, 14.01.2007, K.A. Anilkumar 2711 (CMPR); Olavakkot range, Muthikkulam, 24.03.1976, K. N. Subramanian 5810 (FRC); Silent valley, Cheriya Walakkad, 21.12.1969, E. Vajravelu 33218 (MH); *Ibid.*, 08.04.1978, N.C. Nair 56656 (CAL, MH); *Ibid.*, 11.01.1979, E. Vajravelu 59112 (CAL, MH); *Ibid.*, 04.02.1982, T. Sabu 10044 (CALI); Pathanamthitta district, Plappally, 27.02.1985, N.

Anilkumar 519 (MH); Thrissur district, Chimmini, 21.03.1988, K. Ramamurthy 66243 (CAL, MH); Vellarimala, 06.02.1985, N. Sasidharan 3389 (CALI); Thiruvananthapuram district, Ponmudi, 08.03.1980, M. Mohanan 66611 (MH); *Ibid.*, Upper sanatorium area, 03.02.1986, K. N. Subramanian, B. Gurudev Singh & N. Venkatasubramanian 11719 (FRC); Wayanad district, Adivaram, 22.07.2018, P. Soumya & P. Sunojkumar 138526; Puthumala, 08.04.2001, M.K. Ratheesh Narayanan 2548 (CALI); Wayanad Ghat region, 01.1989, *s.coll. s.n.*; *Ibid.*, 21.01.1903, C.A. Barber 5677 (MH); *s.loc.*, 13.01.1894, T.F. Bourdillon 30 (CAL). **Tamil Nadu**, Coimbatore district, Anamalai, 10.03.1961, J. Joseph 12310; Anamalai waterfall estate, 24.03.1969, R. Maruthan 31752; *Ibid.*, *s.d.*, Beddome *s.n.*; Karian shola, 15.03.1931, V. Narayanaswami 5343; *Ibid.*, 25.02.1942, S.R. Raju 86373 (MH); Karian shola top slip, 11.03.1958, K. Subramanyam 5561 (CAL, MH); *Ibid.*, 06.03.1978, K. N. Subramanian 7155 (FRC); Sanjeevi hill, 14.02.1957, K.M. Sebastine 2309 (CAL, MH); Sholaiyar Dam side, 28.12.1963, K. Ramamurthy 18155; *Ibid.*, 30.3.1965, K. Ramamurthy 22887; Yanaikundhi shola, 29.01.1962, J. Joseph 13818 (MH); Dindigul district, Thandikudi, 27.04.1965, K. Ramamurthy 23495 (MH); Nilgiris district, Devala Rockwood forest, 23.11.1972, E. Vajravelu 43457 (MH); Nadukani Ghat road, *s.d.*, P. Soumya, Shinoj & P. Sunojkumar 145338 (CALI); Tirunelveli district, 1858, Beddome 25 (CAL); Vellore district, Kilandur, 21.03.1964, R.S. Raghavan 37044 (CAL); Virudhunagar district, Sethur hills, 07.03.1981, S.R. Srinasan 68023 (CAL, MH).

Conservation status: In Peninsular India, this species is found in Karnataka, Kerala, and Tamil Nadu with good population in many districts. Currently, the species is classified as Least Concern (LC), following the IUCN criteria (2022).

Justicia scandens Vahl, *Symb. Bot.* 2: 7. 1791. *Rhinacanthus scandens* (Vahl) M.R.Almeida, *Fl. Maharashtra* 4A: 86. 2003 *Type:* INDIA, **Malabar**, *s.d.*, Koenig *s.n.* (C [C10005001 digital image!]).

Justicia glabra J.Koenig ex Roxb., *Fl. Ind.* 1: 132. 1820; T.Anderson, *J. Linn. Soc. Bot.* 9: 516. 1867; C.B.Clarke in Hook.f., *Fl. Brit. India* 4: 535. 1885; Gamble, *Fl. Madras* 2: 1079. 1921; L.H.Cramer, *Revis. Handb. Fl. Ceylon* 12: 117–118. 1998. *Rhaphidospora glabra* (J.Koenig ex Roxb.) Nees in Wall., *Pl. Asiat. Rar.* 3: 115. 1832. Wight, *Icon. Pl. India Orient.* 4: 7. t. 1554. 1850. *Lectotype* (designated by Soumya

& Sunojkumar, 2019a): INDIA, *s.d.*, *Koenig s.n.* (BM [BM001253079 digital image!]). **Figs. 26 & 27**

Annual herbs or subshrubs, up to 1.5 m tall; stems erect, cylindrical, dichotomously branched; branches stout, green, striate, pubescent; internodes 2.5–11 cm long. Leaves petiolate; laminae cordate to widely ovate or widely elliptic, 7–10 × 4–6.5 cm, base rounded to cuneate, margins entire or undulate, apex acuminate, chartaceous, glabrous on both surfaces; veins prominent, secondary veins 4–7 pairs, venation simple craspedodromous; petioles 1–7 cm long, densely pubescent. Inflorescence terminal or axillary dichasial cymes, up to 18 cm long; peduncles slender, 3–9 cm long with divaricately dichotomous branches, densely pubescent with glandular hairs. Flowers pedicellate, 0.85–1 × 0.37–0.45 cm; pedicel 0.5–1.5 cm long, glandular; bracts small, ovate to triangular, 1–1.5 × 0.4–0.6 mm, apex acute, scabrous, greenish, densely pubescent; bracteoles two, similar to bracts. Calyx deeply 5-lobed, 3.5–4 × 1–1.25 mm at anthesis, accrescent, 4.5–5 × 1.25–1.5 mm in fruits, greenish; lobes lanceolate to linear, equal, apex acute, scabrous, densely pubescent. Corolla creamy white with purple striations on lower lip, densely hirsute outside, glabrous inside except in the throat; tube cylindrical, 2.7–3.25 × 1.75–2 mm, slightly enlarged in throat; upper lip erect, ovate to triangular, 4–4.5 × 2.5–3 mm, apex obtuse or acute, hooded; lower lip 3-lobed, lobes unequal, middle lobe ovate to triangular, 5–6 × 2.5–3 mm, apex acute; lateral lobes oblong to elliptic, 4–5 × 1.5–2 mm, recurved, apex acute to rounded. Stamens exserted; filaments c. 3 mm long, declinate, white, basally hirsute; anther thecae superposed, equal, elliptic, c. 1 × c. 0.5 mm, purplish with yellowish shade, upper theca dorsally hirsute, lower theca glabrous; appendage white, c. 6 mm long, apex forked. Ovary ellipsoid to oblong, c. 1.3 × 0.6 mm, pale green, glabrous; style filiform, 5–6 mm high, whitish, hirsute in lower half; stigma bifid; nectariferous disc c. 0.5 mm high, pale green. Capsule clavate to oblong with concentric grooves in middle, 12–15 × 3.5–4 mm, apex cuspidate or acute; basal half sterile, narrow, brown, densely pubescent. Seeds 4, reniform to sub-orbicular, 2.75–3 × 3–3.3 mm, pale or dark brown; testa echinate.

Flowering & fruiting: Flowering from September to March; fruiting in April.

Habitat: Grows in moist deciduous forests, near waterfalls, along riverbanks and stream sides, along forest margins at elevations between 275 and 875 m.

Distribution: Tropical and southern Africa, Madagascar, tropical Asia and India.

Specimens examined: INDIA, **Andhra Pradesh**, Vishakhapatnam district, Marripakala, 26.05.1966, G.V. Subba Rao 27418 (MH); Kurnool district, Ahobilum upper side, 22.11.1969, J.L. Ellis 32588; Gajulapalle, 08.11.1906, C.A. Barber 8067 (MH). **Karnataka**, Bellary district, Sanduru, 08.1901, *s.coll. s.n.* (MH); Mysore district, St. Philomena college, 10.03.1964, K.M. Sebastine 18722 (MH). **Kerala**, Idukki district, Chinnar riverside, 05.04.2016, P. Soumya, Dilsha & P. Sunojkumar 145388; *Ibid.*, 13.05.2018, P. Soumya & P. Sunojkumar 138516 (CALI). **Tamil Nadu**, Coimbatore district, Aliyar submergible area, 24.07.1962, K.M. Sebastine 1456; *Ibid.*, 29.11.1962, K.M. Sebastine 15347; Kuridimalai, 04.12.1956, K. Subramanyam 1603; *Ibid.*, 23.02.1957, K. Subramanyam 2438; Marudhamalai, 11.03.1917, *s.coll.* 14731; *Ibid.*, 13.09.1956, K.M. Sebastine 723; *Ibid.*, 28.09.1956, K.M. Sebastine 882 (MH); Sadivayal, Adivaram Experimental plot, 13.02.1964, K.N. Subramanian 1113 (FRC); Siruvani, 28.08.1960, A.N. Henry 503 (MH); *Ibid.*, 19.01.1982, K.N. Subramanian 7760 (FRC); Valankulam, 31.01.1965, M. Chandrabose 28704; Waterfalls estate, 10.07.1961, J. Joseph 12805 (MH); Dharmapuri district, Buddireddipatti, 20.12.1913, *s.coll.* 9710; Hogenakkal forest, 19.07.1964, E. Vajravelu 20711; *Ibid.*, 25.11.1964, E. Vajravelu 21936 (MH); Krishnagiri district, Rayakottai, 27.12.1916, *s.coll.* 13923 (MH); Madurai district, Gavigundumalai, 21.02.1958, K. Subramanyam 5393; *s.loc.*, *s.d.*, *Beddome s.n.* (MH); Nilgiris district, Kunjapanai slopes, 07.11.1970, E. Vajravelu 36766 (MH); Ramanathapuram district, Ayyanarkovil, 24.02.1979, N.C. Nair 61421 (MH); Theni district, Suranganur waterfalls, 23.06.1959, K. Subramanyam 8173; Vannathiparai, 18.11.1975, K. Vivekananthan 46711 (MH); Villupuram district, Gingee, Pakkamalai R.F., 21.01.1978, K. Ramamurthy 52882 (MH).

Conservation status: The species is primarily found in Tamil Nadu but also occurs in a few places in Andhra Pradesh, Karnataka and Kerala. Considering its occurrence in such a wide area, the species is categorized as Least Concern (LC).

Notes: *Justicia scandens* can be easily distinguished from other species of Peninsular India by its unique dichasial cymose inflorescence with glandular hairs and cordate to ovate leaves with an apiculate apex.

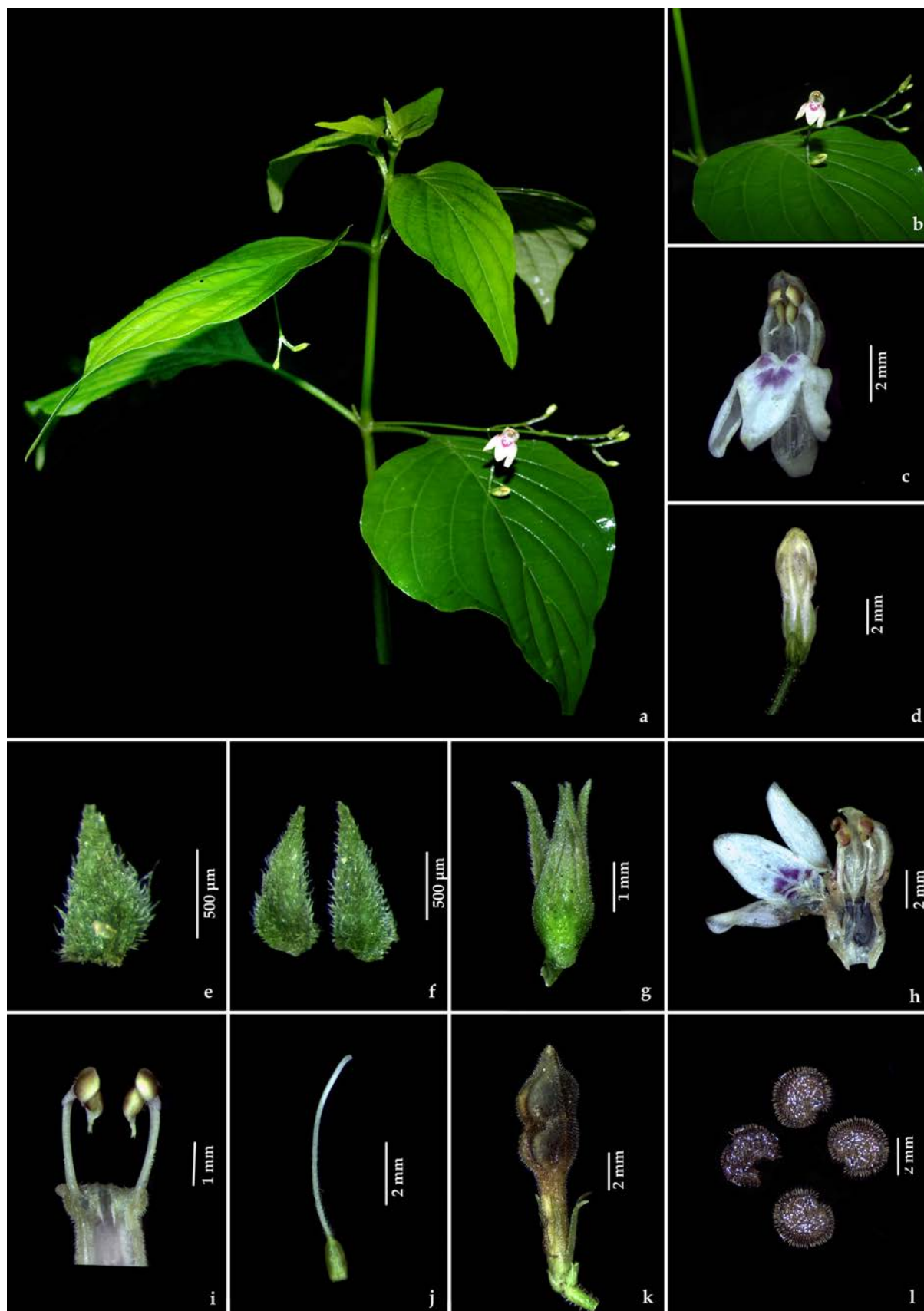


Fig. 26. *Justicia scandens* Vahl: a. Habit; b. Inflorescence; c. Flower; d. Flower bud; e. Bract; f. Bracteoles—abaxial side; g. Calyx; h. Corolla-opened; i. Stamens; j. Gynoecium; k. Capsule; l. Seeds (from P. Soumya & P. Sunojkumar 138516; photos by P. Soumya).

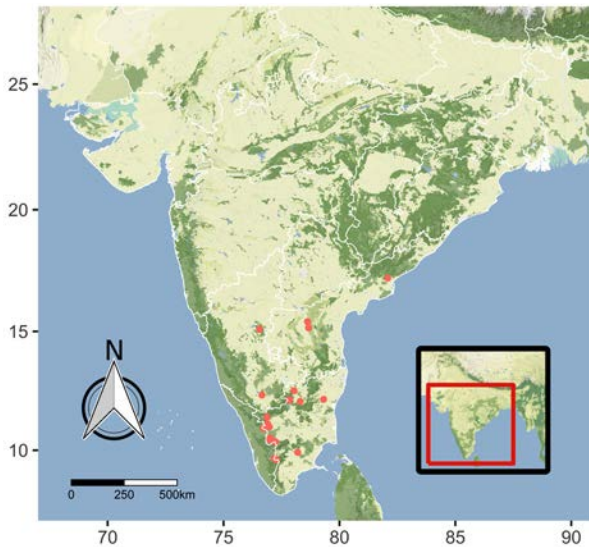


Fig. 27. Distribution of *Justicia scandens* Vahl in Peninsular India. Drawn using R (R Core Team, 2023).

Justicia sivadasanii Sunil, K.M.P.Kumar & Naveen Kum., Kew Bull. 70: 55. 2015. Type: INDIA, Kerala, Ernakulam district, Thundathil forest range, Bhuthathankettu, N 10°08.553', E 076°39.437', 50 m alt., 13.12.2013, C.N. Sunil & V.V. Naveen Kumar 6183 (MH [MH00003324!])

Figs. 28 & 29

Perennial herbs or subshrubs, up to 130 cm tall. Stems erect, terete, striate, divaricately branched; branches slender, dark green, puberulous; internodes 3–8 cm long. Leaves petiolate; laminae elliptic to lanceolate, 4–12 × 1.5–3.5 cm, base attenuate or cuneate, margins sub-entire, apex acuminate or acute, sub-coriaceous, glabrous on both surfaces; veins prominent abaxially, secondary veins 3–11 pairs, venation simple craspedodromous; petioles 0.5–2 cm long, bifariouly pubescent. Inflorescence terminal or axillary spike, up to 20 cm long; peduncles 0.6–2 cm long, bifariouly pubescent. Flowers sessile, one per inflorescence node, secund, 0.8–1 × 0.35–0.4 cm; bracts in opposite pairs, with one sterile and one fertile; sterile bracts triangular to lanceolate, 2.5–3 × c. 1 mm, margins hyaline, ciliate, apex acuminate; fertile bracts lanceolate, 3.5–4 × 1–1.3 mm, margins hyaline, ciliate; bracteoles similar to bracts, but narrower, 3.5–4 × 1 mm. Calyx deeply 4-lobed, accrescent, greenish; lobes subulate to lanceolate, equal, 5–6 × 0.8–1 mm at anthesis, margins scarious, ciliate, apex acuminate, glabrous. Corolla creamy white with purple striations on lips, hirsute outside, glabrous inside; tube creamy white, cylindrical, 2.2–3.5 mm long, slightly enlarged in throat; upper lip erect, 4–5 × 2–2.2 mm, ovate–

triangular, margins entire, apex acute or obtuse, lower lip 3-lobed, obovate to elliptic, 4.5–5.5 × 3.5–4 mm; lobes oblong, equal, apex rounded. Stamens exserted; filaments 2–2.5 mm long, white, glabrous; anther thecae superposed, equal, elliptic, 1–1.2 × 0.3–0.5 mm, purple with yellowish margins, upper theca dorsally hirsute, lower theca glabrous; appendage c. 0.4 mm long, apex acute, white. Ovary ellipsoid, 1–1.4 × 0.3–0.5 mm, pale green, glabrous; style slender, c. 5 mm high, whitish, hirsute in lower half; stigma bifid; nectariferous disc c. 0.5 mm high, pale green, margins undulate. Capsule and seed not seen.

Flowering & fruiting: Flowering from October to March, fruiting not seen.

Habitat: Dense evergreen forest at an elevation of 50 m.

Distribution: Southern Western Ghats.

Specimens examined: INDIA, Kerala, Ernakulam district, Kuttampuzha forest range, Knacherry, 04.01.2014, C.N. Sunil 6181 (SNMH); Thundathil forest range, Bhuthathankettu, 29.12.2017, P. Soumya & P. Sunojkumar 138599; *Ibid.*, 17.02.2018, P. Soumya, Nikhil, K. & P. Sunojkumar s.n. (CALI); *Ibid.*, 14.10.2018, P. Soumya & P. Sunojkumar 157529; *s.loc.*, *s.d.*, *s.coll.* 08406 (CMPR).

Conservation status: The species is currently known from only two nearby localities in the Ernakulam district of Kerala. In the Bhuthathankettu area, we found about 15 mature individuals scattered over 30–50 m². According to Sunil et al. (2015), the second Knacherry locality contained very few plants in a 10 m² area and these have now disappeared due to various anthropogenic activities, especially forest clearance to create jungle paths for tourist access. The AOO calculated is less than 10 km². Therefore, the species is categorized as Critically Endangered (CR) B2ab(ii, iii, iv, v), D.

Notes: *Justicia sivadasanii* can be distinguished from other species of *Justicia* in Peninsular India by its narrow inflorescence with uniquely secund spikes.

Justicia tranquebariensis L.f., Suppl. Pl. 85. 1781; Roxb., Fl. Ind. 1: 131. 1820; T.Anderson, J. Linn. Soc. Bot. 9: 513. 1867; C.B.Clarke in Hook.f., Fl. Brit. India 4: 530. 1885; Gamble, Fl. Madras 2: 1079. 1921; L.H.Cramer, Revis. Handb. Fl. Ceylon 12: 112–113. 1998; Sasidh., Biodivers. Doc. Kerala Part 6: Fl. Pl. 347. 2004; Remadevi & Binojk. Fl. Kerala. Acanthaceae 107. 2009. *Gendarussa tranquebariensis* (L.f.) Nees in Wall., Pl. Asiat. Rar. 3: 105. 1832; Wight,

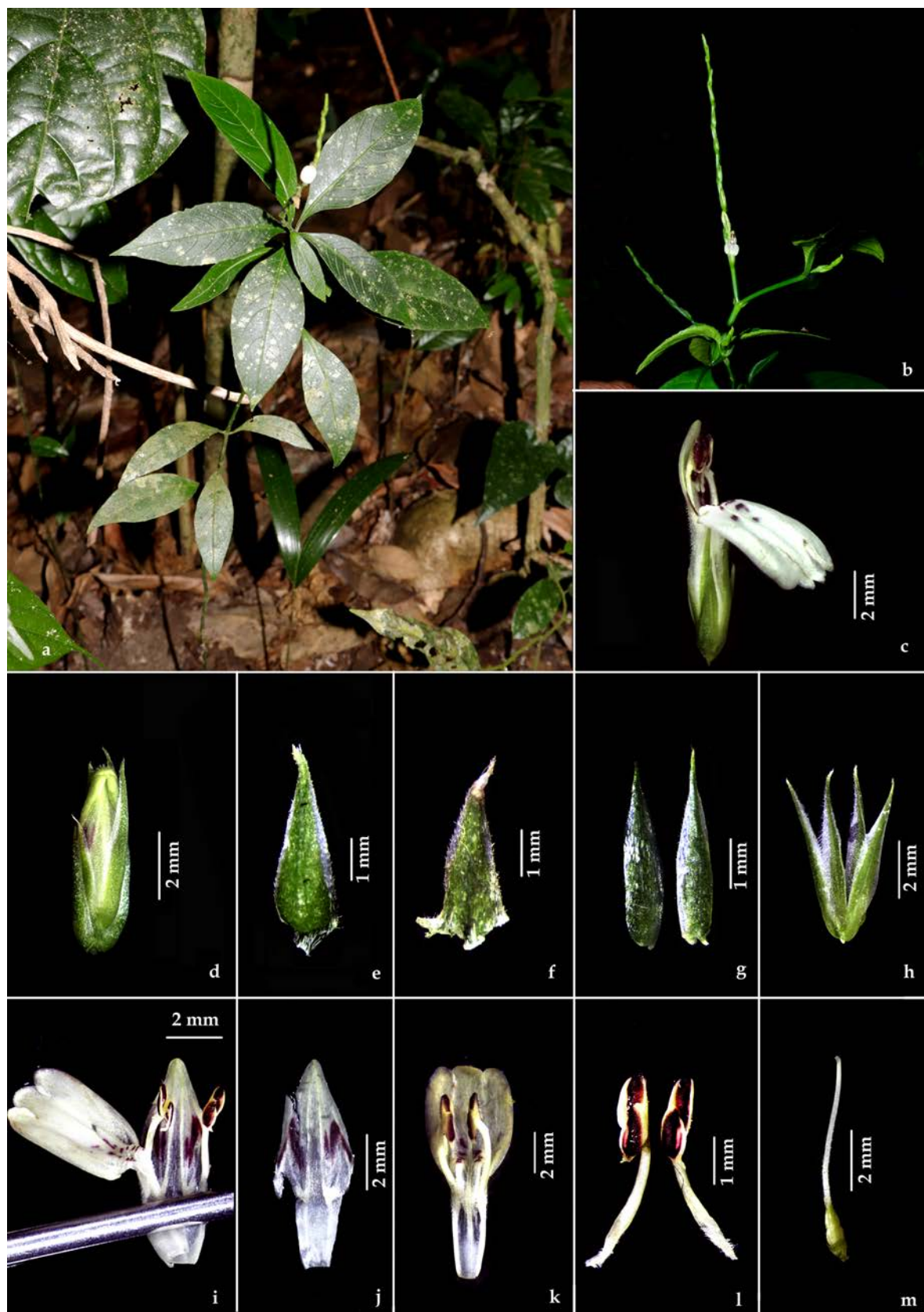


Fig. 28. *Justicia sivadasanii* Sunil, K.M.P.Kumar & Naveen Kum.: **a.** Habit; **b.** Inflorescence; **c.** Flower; **d.** Flower bud; **e.** Fertile Bract; **f.** Sterile Bract; **g.** Bracteoles—abaxial side; **h.** Calyx; **i.** Corolla—opened; **j.** Upper lip; **k.** Lower lip; **l.** Stamens; **m.** Gynoecium with nectariferous disc (from P. Soumya & P. Sunojkumar 138599; photos by P. Soumya).

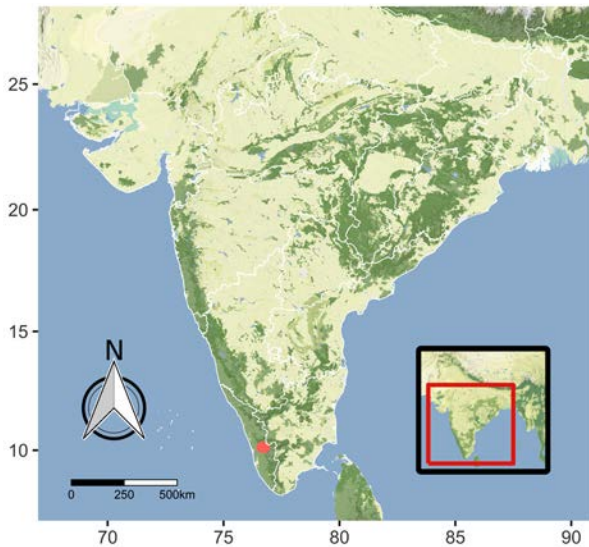


Fig. 29. Distribution of *Justicia sivadasanii* Sunil, K.M.P.Kumar & Naveen Kum., in Peninsular India. Drawn using R (R Core Team, 2023).

Icon. Pl. India Orient. 2: 4t. 462. 1843. *Adhatoda tranquebariensis* (L.f.) Nees in DC., Prodr., 11: 399. 1847. *Ecbolium tranquebariense* (L.f.) Kuntze, Revis. Gen. Pl. 2: 981. 1891. *Lectotype* (designated here): INDIA, Tranquebar (Tharangambadi), 1778, J.G. Koenig s.n. (S [S09-6573 digital image!]).

Justicia salsoloides T.Anderson, J. Linn. Soc., Bot. 9: 514. 1867, **syn. nov.** *Lectotype* (designated by Soumya & Sunojkumar, 2018): INDIA, Mysore & Carnatic, s.d., G. Thomson 126 (K [K000884125 digital image!]; isolecto K [K000884124 digital image!], CAL [CAL0000020253!]).

Figs. 30–32

Annual herbs, up to 40 cm tall. Stems erect, terete, stout with woody rootstock, dichotomously branched; branches numerous, diffuse, purplish green to pale brown, densely white tomentose; internodes 2–5 cm long. Leaves petiolate; laminae orbicular to obovate or spatulate, $1.5\text{--}3 \times 1\text{--}2$ cm, base obtuse to rounded, margins entire, finely ciliate, apex rounded to emarginate, chartaceous, puberulous on both surfaces with dense hairs on ribs; veins prominent, secondary veins 3–4 pairs, venation simple craspedodromous; petioles 0.5–3 cm long, greenish, white tomentose. Inflorescence terminal or axillary spike, 3(5–10) cm long, solitary flowers numerous. Flowers sessile, one per inflorescence node, not secund $8\text{--}11 \times 4\text{--}5$ mm; bracts orbicular to obovate or broadly spatulate, foliaceous, petiolate, $6\text{--}9 \times 6\text{--}13$ mm, margins entire, finely ciliate, apex rounded to obtuse or emarginate, greenish, pubescent; bracteoles 2,

spathulate to oblanceolate, $4\text{--}6 \times 1\text{--}1.3$ mm, margins ciliate with glandular hairs, apex cuspidate, greenish, pubescent. Calyx deeply 5-lobed, $5\text{--}5.5 \times 1\text{--}1.25$ mm at anthesis, accrescent, $5.5\text{--}6.3 \times 1.7\text{--}3.5$ in fruits, greenish; lobes lanceolate to linear, equal, densely pubescent, margins scarious, ciliate, apex acuminate. Corolla creamy white with purple striations on lower lip, hirsute outside, glabrous inside except in the throat; tube cylindrical, $3.75\text{--}4.2 \times 1.25\text{--}1.5$ mm, slightly enlarged in throat; upper lip erect, ovate to triangular with dark brownish red spots, $4.5\text{--}5 \times 3\text{--}3.5$ mm, apex minutely 2-lobed, hooded; lower lip orbicular to obovate, $6\text{--}7.5 \times 7\text{--}7.5$ mm, 3-lobed at apex; lobes imbricate, obtuse to rounded, margin entire. Stamens exserted; filaments 3.5–4 mm long, white with reddish brown spots, basally hirsute; anther thecae superposed, equal, elliptic, c. 1 mm long, yellowish with brownish red markings, upper theca dorsally hirsute, lower theca glabrous; appendage c. 6 mm long, apex forked, yellowish white. Ovary c. 1.5×1 mm, ellipsoid, pale green,



Fig. 30. Lectotype of *Justicia tranquebariensis* L.f. (S09-6573). © The Board of Trustees for the Swedish Museum of Natural History, Sweden, Stockholm. Reproduced with permission.

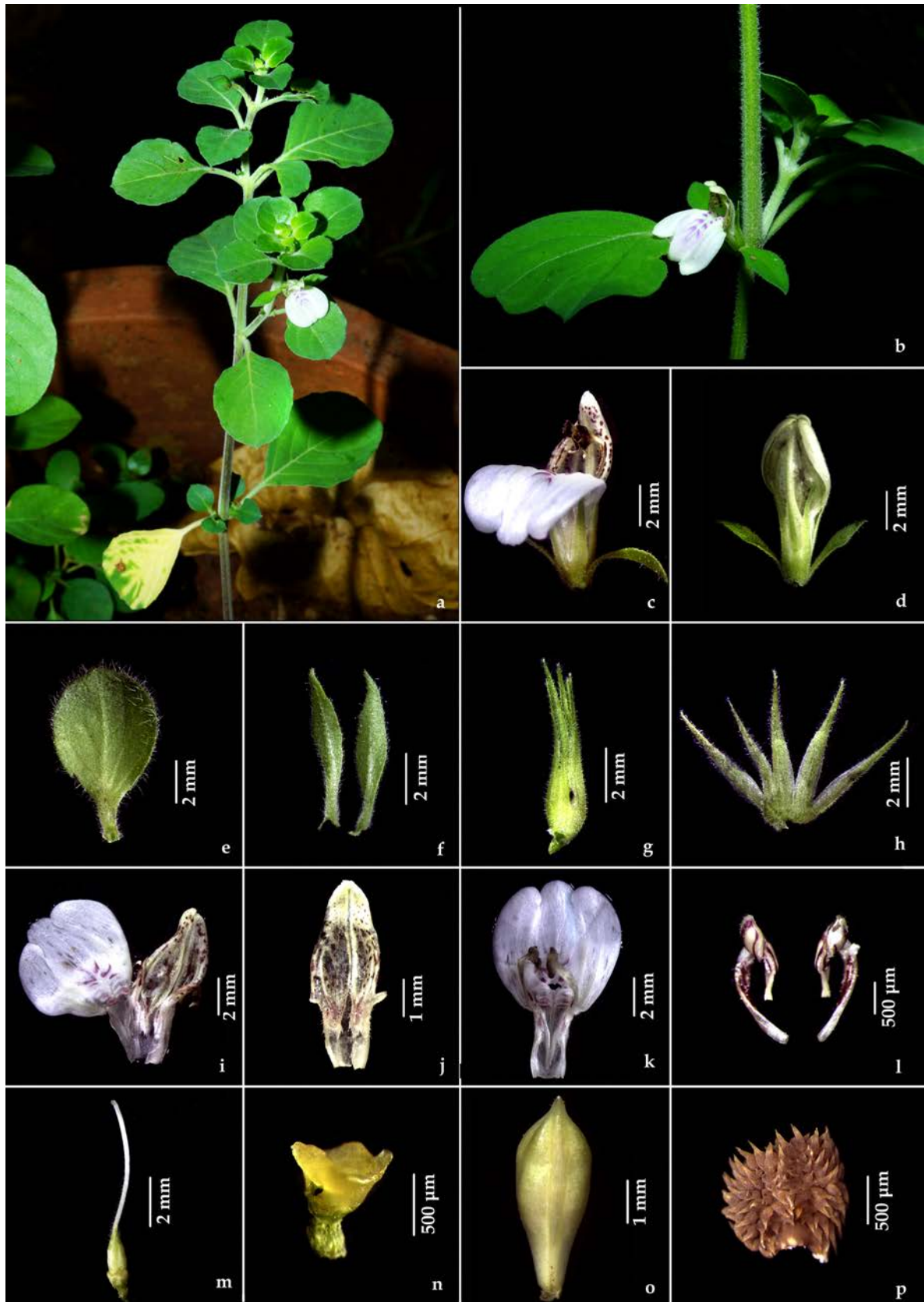


Fig. 31. *Justicia tranquebariensis* L.f.: **a.** Habit; **b.** Inflorescence; **c.** Flower; **d.** Flower bud; **e.** Bract; **f.** Bracteoles—abaxial side; **g.** Calyx; **h.** Calyx—opened; **i.** Corolla—opened; **j.** Upper lip; **k.** Lower lip; **l.** Stamens; **m.** Gynoecium; **n.** Nectariferous disc; **o.** Capsule; **p.** Seed (from P. Soumya & P. Sunojkumar 138541; photos by P. Soumya).

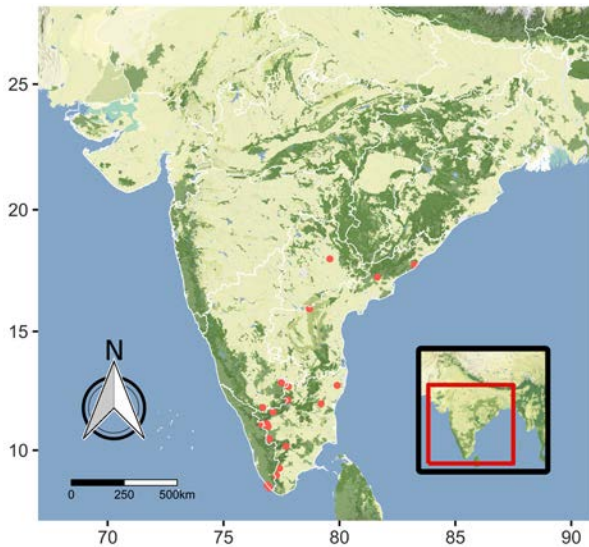


Fig. 32. Distribution of *Justicia tranquebariensis* L.f. in Peninsular India. Drawn using R (R Core Team, 2023).

hirsute at apex or throughout; style filiform, 5–6 mm long, recurved, whitish, hirsute in lower half; stigma slightly bifid; nectariferous disc c. 0.5 mm high, pale green. Capsule clavate to widely oblong, 5–8 × 2.5–3.5 mm, apex cuspidate or acute, pale brown, densely pubescent at apex or throughout; base sterile, 1–2 mm long. Seeds 2, orbicular to cordate, 1.7–2.2 × 1.8–2 mm, pale or dark brown; testa echinate.

Flowering & fruiting: Flowering from November to April; fruiting in May.

Habitat: In deciduous forests, in dry open places along roadsides, in sandy soil among grasses at an elevation of 200 m.

Distribution: India and Sri Lanka.

Specimens examined: INDIA, **Andhra Pradesh**, Kurnool district, Sikharam, way to Srisailam, 15.12.1967, K.N. Subramanian 3279 (FRC); Visakhapatnam district, Simhachalam, 06.05.1964, G.V. Subba Rao 19362 (MH); West Godavari district, Polavaram, 27.04.1900, s.coll. 1490 (MH). **Karnataka**, Bengaluru district, 02.0.1988, Cameroon 148 (MH); Chamarajanagar district, Gundalpet, 27.08.1964, B.D. Naithani 21256 (MH). **Kerala**, Palakkad district, Mannarkkad, Agali, 14.09.2007, K.A. Anilkumar 2127 (CMPR); Thiruvananthapuram district, Kovalam, 31.07.1977, A.N. Henry 49484; Veli, 07.03.1978, M. Mohanan 54605; *Ibid.*, 22.05.1978, M. Mohanan 54882 (MH). **Tamil Nadu**, Coimbatore district, Aliyar Submergile area, 24.07.1962, K.M. Sebastine 14584

(MH); BSI campus 05.03.2018, P. Soumya, Jiji & P. Sunojkumar 145392; *Ibid.*, 17.03.2018, P. Soumya & P. Sunojkumar 151818; *Ibid.*, near fields, 19.01.2019, P. Soumya, Drisya & P. Sunojkumar 157556 (CALI); Chinnathadagam-Thekkumalali, 03.07.1956, K.M. Sebastine 68; *Ibid.*, 09.07.1956, K. M. Sebastine 180 (MH); College nursery, S.F.R.C. estate, 23.09.1967, K.N. Subramanian 2803 (FRC); Disillery road, 03.05.1964, M. Chandrabose 28443 (MH); Forest college estate, 03.12.1962, K.N. Subramanian 358 (FRC); Kuridimalai, slopes, 10.07.1956, K. Subramanyan 237; Melmuduthurai, 25.09.1962, E. Vajravelu & S. Pritamal 14743; Nellimalai R.F., 23.05.1962, K. Ramamurthy 14086; Noyyal riverside, 01.07.1968, M. Chandrabose 30278; Selvapuram coconut garden, 01.06.1968, M. Chandrabose 29948; Sundakkamuthur, 14.06.1968, D.B. Deb 30229; Varapalayam, foot of Lampton peak, 27.04.1956, K. Subramanyam 16 (MH); Varapalayam roadside, 06.07.1956, K. Subramanyam 101 (MH); *Ibid.*, 25.7.1956, K. Subramanyan 396 (MH); Dharmapuri district, Adhiyaman Kottai old temple, 15.07.1978, E. Vajravelu 57810 (MH); Harur, Veppampatti R.F., 14.11.1977, E. Vajravelu 51835 (MH); Hogenakkal roadsides, E. Vajravelu 20713 (MH); Dindigul district, Sirumalai, 22.02.1979, N.C. Nair 61078 (MH); Erode district, Dimbam-Bannari road, 21.09.2009, P. Satyanarayana 125132 (MH); Sathy Taluk, Hassanur-Dhimbam Ghat road, 25.01.1987, N. Venkatasubramanian 205 (FRC); Kallakurichi district, Thirukoilure, 11.09.1977, K. Ramanath 51167 (MH); Kanchipuram district, Palur, 14.06.1907, C.A. Barber 8331 (MH); Kanyakumari district, Cape Comorin, 21.12.1993, s.coll. s.n. (MH); Karur district, Pallapatti, 07.02.1983, K. Ramamurthy 77400 (MH); Krishnagiri district, Hosur Cattle farm, 09.06.1930, V. Narayana Swamy 30330 (MH); Madurai district, Alagar temple, 14.06.1957, K. Subramanyam 3488 (MH); Nagapattinam district, Point Calimere near railway station, 15.08.1960, K.M. Srebastine 10711 (MH); Nilgiris district, Kunjapanai slopes, 10.08.1970, E. Vajravelu 35273; Vagapanai, 05.11.1970, E. Vajravelu 36701; Panaimadal, 20.07.1977, R. Ansari 49921 (MH); Pudukottai district, Sastha Kovil, 23.07.1989, S.R. Srinivasan 90210 (MH); Sittannavasal, 24.06.1965, K. Ramamurthy 24926 (MH); Puttalam district, Kudiramalai, 27.11.1961, K.M. Sebastine 13658; *Ibid.*, s.d., D.Daniel & R.Raju 20465 (MH); Ramanathapuram district, Kamutnakudi,

16.11.1989, V. Balasubramanyam 2257 (MH); Tenkasi district, Chellupuli, Vasudevanallur R.F., 22.03.1970, E. Vajravelu 33958; Courtallam, 07.1901, C.A. Barber 3419; *Ibid.*, 13.09.1915, *s.coll.* 12084; *Ibid.*, 26.04.1957, K. Subramanyam 2942 (MH); Thanjavur district, Adirampattinam, 22.05.1978, V.J. Nair 57041 (MH); Theni district, Genguvarpatti, 18.06.1961, K.M. Sebastine 12639 (MH); Thiruvavur district, Muttupet, 20.05.1978, V.J. Nair 56566 (MH); Thirupattur district, Kandili, 23.01.1986, M.B. Viswanathan 955 (MH); Tiruchirappalli district, Pachamalai, 06.08.1958, K.M. Sebastine 6154 (MH); Villupuram district, Gingee R.F., 09.08.1961, K. Ramamurthy 13063 (MH). **Telangana**, Warangal district, Rampet, 20.11.1957, N.K. Divagaran 94205 (MH).

Conservation status: The species is found in Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, and Telangana states. Due to its widespread distribution across various localities, this species is considered at present as Least Concern (LC).

Notes: *Justicia tranquebariensis* can be distinguished from its closely similar species *J. glauca*, by a combination of characters; annual herbaceous (*vs.* perennial shrubs), dense white tomentose hairs on the stem (*vs.* pubescent), orbicular to obovate or spatulate leaves (*vs.* ovate to elliptic, rarely orbicular) and emarginate or rounded apex (*vs.* acute or obtuse).

Justicia salsoloides T.Anderson was described by Anderson (1867) based on specimens collected by G. Thomson and Wight from the Mysore and Carnatic area. Clarke (1885) stated that it could be distinguished from *J. trinervia* and var. *arneria* by the white-furred branches and narrower non-marginate bracts. Ahmedullah and Nayar (1986) mentioned *J. salsoloides* as a rare and threatened taxon in Karnataka and it was accepted by Henry *et al.* (1987), Karthikeyan *et al.* (2009), and Nayar *et al.* (2014). Apart from the type collection, no collection has been documented from the Western Ghats and no specimens deposited in Indian herbaria. During field observations in northern Tamil Nadu and southern Karnataka, the first author collected a form of *J. tranquebariensis* having much branched, white tomentose stem with small, sessile spatulate leaves bearing axillary or terminal flowers. Critical study of these specimens indicated that this form shares the same characters as described by Anderson for

J. salsoloides. Apart from minor differences in the shape and size of their leaves, bracts, and bracteoles no differences in the floral parts were noticed on these plants with *J. tranquebariensis*. Hence, *J. salsoloides* is treated here as a new synonym under *J. tranquebariensis*.

Typification: *Justicia tranquebariensis* was described by Linnaeus (1781) based on Koenig's specimens collected from Tranquebar. While searching for the specimens in various herbaria, we traced several duplicates, but Linnaeus only studied the material deposited at S and LINN (Stafleu & Cowan, 1981). Consequently, a duplicate at S (S09-6573), which matches well with the description provided in the protologue, is designated here as lectotype according to Art. 9.3 of the ICN (Turland *et al.*, 2018). All other duplicates of Koenig's gathering might be considered isoelectotypes.

Justicia trinervia Vahl, Enum. Pl. 1: 156. 1804; C.B. Clarke in Hook.f., Fl. Brit. India 4: 526. 1885; Gamble, Fl. Madras 2: 1079. 1921; Sasidh., Biodivers. Doc. Kerala Part 6: Fl. Pl. 347. 2004; Remadevi & Binojk. Fl. Kerala. Acanthaceae 108. 2009. *Adhatoda trinervia* (Vahl) Nees in Wall., Pl. Asiat. Rar. 3: 103. 1832; in DC., Prodr. 11: 386. 1847. *Dicliptera trinervia* (Vahl) Juss., Ann. Mus. Natl. Hist. Nat. 9: 169. 1807. *Nicoteba trinervia* Lindau, Bot. Jahrb. Syst. 18(1-2): 56. 1893. **Type:** INDIA, *s.loc.*, *s.d.*, Rottler, *s.n.* (holo C [C10005021 digital image!]).

Adhatoda arenaria Nees, Pl. Asiat. Rar. 3: 103. 1832; in DC., Prodr. 1: 389. 1847. *Justicia trinervia* Vahl var. *arenaria* (Nees) C.B. Clarke in Hook.f., Fl. Brit. India 4: 526, 1885. **Lectotype** (designated here): INDIA, *s.loc.*, *s.d.*, Wall. Cat. 2446C (K [K001116049 digital image!]).

Adhatoda nilgherrensis Nees in Wall., Pl. Asiat. Rar. 3: 103. 1832. *Justicia betonica* var. *nilgherrensis* (Nees) T.Anderson, J. Proc. Linn. Soc., Bot. 7: 118. 1863; T.Anderson, J. Linn. Soc. Bot. 9: 510. 1867. *Justicia nilgherrensis* (Nees) Wall. ex C.B. Clarke in Hook.f., Fl. Brit. India 4: 526. 1885, **syn. nov.** *Ecbolium nilgherrense* (Nees) Kuntze, Revis. Gen. Pl. 2: 980. 1891. *Nicoteba nilgherrensis* Lindau, Bot. Jahrb. Syst. 18: 56. 1894. *Adhatoda nilgherrica* Nees in DC., Prodr. 11: 386. 1847 **nom. illeg.**, **nom. superfl.** **Lectotype** (designated by Graham, 1988): INDIA, Nilgiri, Wallich 2435A (K [K001115966 digital image!]).

Justicia tamilnadensis P.Raja & Soosairaj, Adansonia, 3, 45 (17): 286. 2023, **syn. nov.** **Type:** INDIA. **Tamil**

Nadu, Pudukkottai district, Poosathurai, (N 10°20'58", E 78°47'22"), c. 82 m, 11.10.2021, *P. Raja & S. Soosairaj* 4760 (holo RHT!; iso MH [MH00003603!]). **Figs. 33 & 34**

Annual herbs, up to 30 cm tall. Stem decumbent, dichotomously branched, stout with basal rootstock; branches slender, spreading, striate, glabrous to puberulous; internodes 1.3–6 cm long, green or purplish green. Leaves sessile; laminae elliptic to oblong, 1.5–5 × 0.7–1.5 cm, base cuneate or obtuse, margins finely serrate, slightly undulate, folded inward, apex acute or obtuse, greyish green, glabrous; veins inconspicuous, secondary veins 3–5 pairs, venation weak brochidodromous. Inflorescence terminal or axillary spike, up to 7 cm long; peduncles short, c. 1 cm long. Flowers sessile, one per inflorescence node (not secund), 1.25–1.5 × 0.9–1.2 cm; bracts ovate to lanceolate, foliaceous, 0.7–1.5 × 0.4–0.7 cm, margins scarious and minutely serrulate, apex narrowly acute, 1–3-veined, greenish or purplish green, glabrous; bracteoles 2, similar to bracts but slightly narrower. Calyx deeply 5-lobed, 4–6.5 × 2.75–3.25 mm at anthesis, accrescent; lobes lanceolate to subulate, equal, pubescent outside with glandular and non-glandular hairs, margins scarious, ciliate, apex acuminate, greenish. Corolla creamy white with purplish striations on lips, pubescent outside, glabrous inside except in the throat; tube cylindrical, 4–5 mm long, slightly enlarged in throat; upper lip erect, ovate to elliptic, 6–7 × 3–5 mm, apex acute or slightly bifid, margin entire; lower lip obovate, 3-lobed, spreading; middle lobe broadly oblong, 4–6 × 3–6 mm, apex rounded; lateral lobes oblong to elliptic, 3–6 × 2–3 mm, apex rounded to obtuse. Stamens exserted; filaments 2.5–4 mm long, white, glandular; anther thecae superposed, equal, elliptic, 1–2 mm long, purplish yellow, glabrous; appendage 1 mm long, apex pointed, white. Ovary elipsoid c. 2 × 1 mm, pale green, densely hirsute towards apex with glandular and non-glandular hairs; style slender, c. 1 cm long, whitish, hirsute in lower half; stigma slightly bifid; nectariferous disc c. 0.5 mm high, pale yellow, margins undulate. Capsule clavate, 1–1.3 × 0.35–0.4 cm, apex mucronate, pale brown, densely pubescent throughout, sterile base c. 3–4 mm high, flattened. Seeds 4, orbicular or sub-orbicular, 2.5–3 × 2.5–2.8 mm, brownish; testa densely tuberculate.

Flowering & fruiting: Flowering from November to March; fruiting from April to May.

Habitat: This species is found along forest borders, in open grassland and tea plantations, on roadsides, along railway tracks at elevations between 450–2286 m.

Distribution: Peninsular India.

Specimens examined: INDIA, **Andhra Pradesh**, Kadapa district, Sesachalam hills, 13.03.1921, *C.E.C. Fischer* 4619 (CAL). **Karnataka**, Bagalkot district, Badami, 15.09.1979, *S.R. Ramesh & B.R. Ramesh* 9289 (CAL); Bangalore district, September 1910, *A. Meeblod* 11351; Solur, 13.06.1978, *J. Saldhanha & N.S. Ravindra* 1299 (CAL); Chamarajanagar district, Bandipur road side, 29.01.1965, *B.D. Naithani* 23241 (MH); Shimoga district, Kavaledurga, 17.03.1919, *R.S. Raghavan* 96939 (CAL). **Kerala**, Kannur district, Brahmagiri, 05.03.1979, *V.S. Ramachandran* 62127 (CAL, MH); Kurumathur near Taliparamba, 11.03.1915, *s.coll.*, 11933 (MH); Kasaragod district, Peradala, 07.05.1982, *V.J. Nair* 71032 (CAL, MH); Kottayam district, Kangazha, 27.09.1984, *V.T. Antony* 801 (MH); Malappuram district, Kottakal CMPRI, *s.d.*, *P. Soumya & P. Sunojkumar* 157534 (CALI); Palakkad district, Muthuthala, 22.04.2014, *Prabhu kumar, K.M.* 07791 (CMPR); Olipara, 17.04.1917, *E. Vajravelu* 48986 (MH); Parambikulam-Vazhachal, 18.04.1977, *K. Ramamurthy* 49370 (CAL, MH); Walayar near railway station, 22.05.1964, *E. Vajravelu* 19035 (MH); Thrissur district, Machad mountain, 07.04.1977, *K. Ramamurthy* 49249 (CAL, MH); Wayanad district, Pakshipathalam, 14.2.1987, *R.T. Balakrishnan* 42796 (CAL); *Ibid.*, 19.04.1993, *A. Nazarudeen* 16772 (TBGT); Thirunelly to Pakshipathalam, 18.11.2005, *P.S. Udayan et al.* 03834; *Ibid.*, 25.03.2009, *P.S. Udayan et al.* 05805 (CMPR). **Maharashtra**, Sindhudurg district, Chafeli, Pulas jungle, 12.02.1970, *B.G. Kulkarni* 120035; Phondaghat, 24.10.1969, *B.G. Kulkarni* 119072 (BSI). **Tamil Nadu**, Coimbatore district, Karianshola top, 12.03.1970, *Anis A. Ansari* 1198 (CAL); Navakkarai bamboo felling coupe number 1, compartment 13, Coimbatore central forest division, 14.05.1971, *K.N. Subramanian* 4196 (FRC); Sadivayal, on the roadside near bamboo experimental plot, 03.02.1964, *K.N. Subramanian* 1025 (FRC); Velliangiri 7th hill top, 27.04.1969, *S. Karthikeyan & M. Chandrabose* 31828 (MH); Erode district, Arepalayam, 13.06.1922, *s.coll.*, *s.n.*, (MH); Nilgiris district, Naduvattam, 18.03.1987, *M. A. Lawson s.n.*, (MH); Ootacamund, June 1883, *J.S. Gamble* 11828 (CAL); *Ibid.*, 05.1913, *P.F. Fyson* 2485 (FRC); Ooty, Caion hills, 24.04.1916, *C.E.C. Fischer* 3962 (CAL, FRC); *Ibid.*, *s.d.*, *s.coll.*, 39151 (MH);

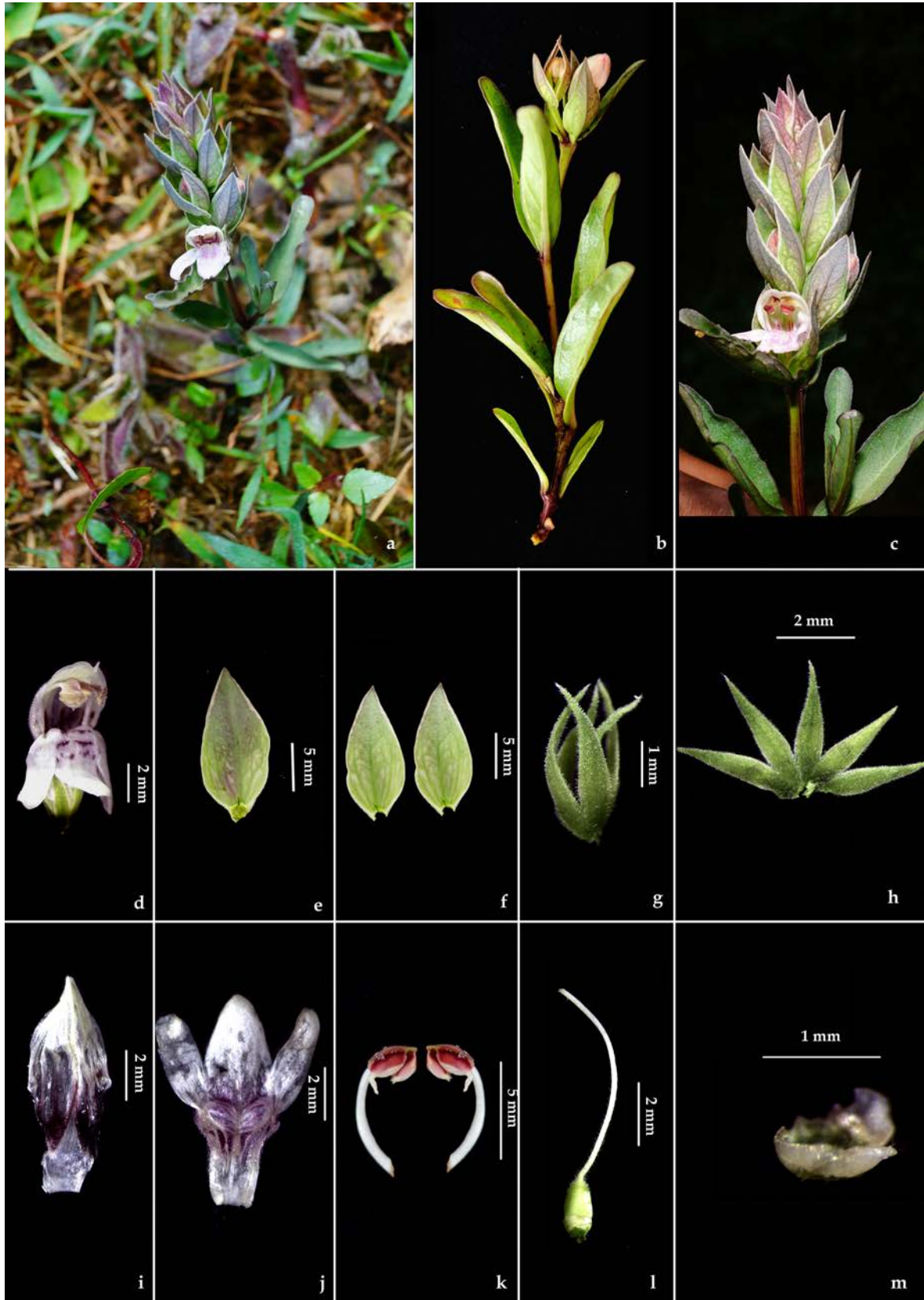


Fig. 33. *Justicia trinervia* Vahl: **a** & **b**. Habit; **c**. Inflorescence; **d**. Flower; **e**. Bract; **f**. Bracteoles–adaxial side; **g**. Calyx; **h**. Calyx–opened; **i**. Upper lip; **j**. Lower lip; **k**. Stamens; **l**. Gynoecium; **m**. Nectariferous disc (from P. Soumya & P. Sunojkumar 145343; photos b, d–m by P. Soumya; a, c by Shinoj K).

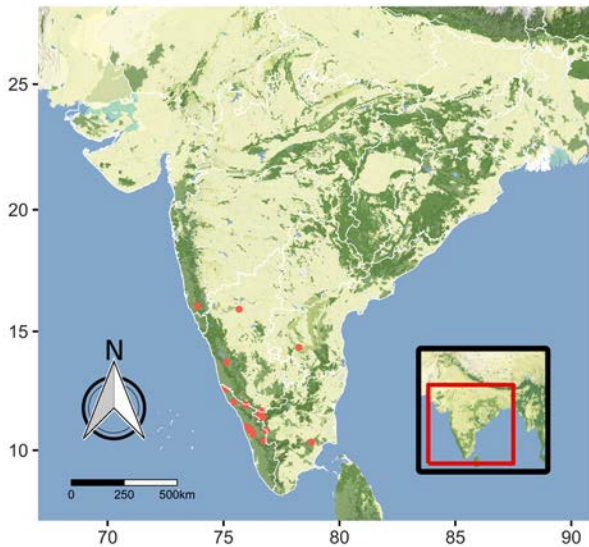


Fig. 34. Distribution of *Justicia trinervia* Vahl in Peninsular India. Drawn using R (R Core Team, 2023).

Pykara falls, June 1884, G.S. Gamble 14238 (CAL); *Ibid.*, 26.05.1900, s.coll. s.n.; *Ibid.*, 00.06.1900, s.coll. s.n. (MH); on grassland near Pykara lake, 19.03.2017, P. Soumya & P. Sunojkumar 145343; *Ibid.*, 24.04.2018, P. Soumya, Shinoj & P. Sunojkumar 145379 (CALI). Peninsula Indiae Orientalis, s.d., *Herb. Wight* 2262 (CAL).

Conservation status: Examining specimens across various herbaria, in conjunction with our field data, we found that *J. trinervia* is distributed widely in Kerala, Karnataka, and Tamil Nadu, and a few localities in Andhra Pradesh and Maharashtra. Hence this species is considered under Least Concern (LC) (IUCN, 2022).

Notes: Careful analysis of the protologue, types and specimens of *J. nilgherrensis* enable us to confirm that the character differences attributed to this taxon are identical to that of *J. trinervia*. Both are annual herbs with woody rootstock, decumbent stems, short branches, narrow leaves, small inflorescences and share other floral features. In their natural habitat, they grow mainly in open grassland of the Nilgiris. Hence, we treat *J. nilgherrensis* as a new synonym of *J. trinervia*.

Justicia tamilnadensis P.Raja & Soosairaj is a species recently described by Raja et al. (2023) based on collections from the Poosathurai, Tamil Nadu. According to the authors it is allied to *Justicia salsoloides* but could be distinguished by “its herbaceous, slender, purplish-green, glabrous, angled stem; elliptic-oblong, glabrous, sub-sessile

leaves; corolla pubescent within and sub-terete capsule”. After examining the type specimen deposited at MH, we realized that *J. tamilnadensis* is identical to *J. trinervia*. Except for the echinate seed, all of the characters stated in the protologue overlap with those of *J. trinervia*. Also, both taxa share common characters like prostrate herbs with woody root stock; stem angled, branches slender, green or purplish green, glabrous; leaves sessile, elliptic to oblong, base cuneate or obtuse, apex obtuse to acute, glabrous; spike within 7 cm long; peduncles within 1 cm long; corolla creamy white with purple striations. In October 2023, the first author visited Poosathurai, the type locality of *J. tamilnadensis* three times, but no such specimen could be seen but an extensive populations of *J. tranquebariensis*. As a result, we concluded that the authors might have, by mistake, taken the seeds of *J. tranquebariensis* for observation or they might have mistaken the tuberculate structure of the seed for echinate (echinate character is seen in *J. tranquebariensis* in Peninsular Indian taxa). The type specimen of *J. tamilnadensis* is otherwise identical to the holotype of *J. trinervia*. Therefore, *J. tamilnadensis* is treated as a new synonym of *J. trinervia*.

Typification: In the protologue of *Adhatoda arenaria*, Nees von Esenbeck (1832) mentioned three collections (*Justicia* spec. *Herb. Madr. Wall. Cat.* no. 2446c, *Justicia trinervia* Wall. *Cat. l.c.*, *Justicia* n. 48. *Herb. Wight.*) without a type designation. Thus, they are syntypes according to Art. 9.5 of the ICN (Turland et al., 2018). After an exhaustive search, we traced a single sheet at K with eight specimens mounted under two barcodes and having the name and Wall. Cat. number mentioned as in the protologue. Among these specimens the bottommost specimen is a different taxon (*A. trinervia* var. β). The specimens at the top (barcode K001116049) and those in the middle (barcode K001116048) are equally qualified as types and among these, we selected the topmost specimens having the number 2446c and barcode K001116049 as lectotype according to Art. 9.2, 9.11 & 9.12 of the ICN (Turland et al., 2018).

Justicia vahliana Schult., Mant. 1: 138. 1822. *Justicia vahlii* Roth, Nov. Pl. Sp. 14. 1821, *nom. illeg.*, *non Justicia vahlii* F.Dietr. 1818; Gamble, Fl. Madras 2: 1081. 1921; R.R.Stewart in E.Nasir & S.I.Ali (eds.), Fl. W. Pakistan, Karachi 676.1972; Malik & Ghafoor in E.Nasir & S.I.Ali (eds.), Fl. Pakistan 188: 35. 1988; V.A.W.Graham, Kew Bull. 43: 598. 1988; *Rostellaria*

vahlia Nees in Wall., Pl. Asiat. Rar. 3: 102. 1832. *Rostellularia vahlia* Nees in DC., Prodr. 11: 376. 1847. *Justicia diffusa* Willd. var. *vahlia* C.B. Clarke in Hook. f., Fl. Brit. India 4: 538. 1885. *Rostellularia vahlia* (Schult.) Mabb. in J. Bot. Res. Inst. Texas 14(2): 250. 2020. *Lectotype* (designated by Deng, 2020): INDIA, *s.loc.*, *s.d.*, J.P. Rottler 585 (C [C10005023 digital image!]).

Rostellularia vahlia Nees var. *rupicola* J.L. Ellis, Bull. Bot. Surv. India 11: 435. 1969. *Justicia vahlia* var. *rupicola* (J.L. Ellis) Pull., Moulali & Sandhyar., Fl. Andhra Pradesh 4: 1404. 2018, *syn. nov.* *Type*: INDIA, **Andhra Pradesh**, Kurnool district, Nallamalais, Srisailam, 12.07.1963, Ellis 16842 (holo: CAL [CAL0000020257!]).

Figs. 35 & 36

Annual herbs, up to 90 cm tall. Stems erect or decumbent, stout with woody rootstock, branched; branches slender, lineolate, scabrous, greenish, densely pubescent; internodes 2.5–14 cm long. Leaves sub-sessile to petiolate; laminae linear to narrowly elliptic, 3–10 × 0.5–1 cm, base narrowly cuneate, margin entire or distantly crenate with minute hairs, apex acute, sub-coriaceous, scabrous, puberulous with dense hairs on ribs; mid rib prominent, secondary veins inconspicuous, 3–5 pairs; petioles 5–12 mm long, scabrous. Inflorescence terminal or axillary spike, up to 17 cm long, many-flowered; peduncles 1.5–6 cm long, densely pubescent. Flowers sessile, two per inflorescence node, 9–11 × 5–6 mm; bracts ovate, 2.5–3.7 × 1.3–1.7 mm, apex acute to sub-acuminate, margins scarious and ciliate; bracteoles similar to bracts but narrower, 2.5–3 × c. 1 mm. Calyx deeply 4-lobed, 2.7–4.8 × 1.7–2.25 mm at anthesis, accrescent, greenish; lobes lanceolate, slightly unequal, apex acute, margins scarious, ciliate. Corolla purplish white with dark purple striations on lower lip, densely pubescent outside and glabrous inside except in the throat; tube white, cylindrical, 3–4 × 2.5–3 mm, slightly enlarged in throat; upper lip erect, triangular, 5–6 × 2.5–3 mm, apex emarginate; lower lip sub-orbicular, 4–5.5 × 4–5 mm, 3-lobed at apex; lobes imbricate, apex rounded. Stamens exserted; filaments 2.5–3 mm long, declinate, white, glabrous; anther thecae superposed, equal, 0.5–1.2 mm long, upper theca muticous and abaxially bearded, lower theca glabrous; appendage c. 0.6 mm long, apex acute, white. Ovary fusiform, 1.4 × 0.5 mm, pale green, pubescent at apex; style slender, whitish, 5.5–7 mm long, hirsute in lower half; stigma slightly 2-lobed; nectariferous disc, c. 0.3 mm high, yellowish

green. Capsule clavate, 6–7 × 2–2.2 mm, apex acute, pale brown, densely pubescent throughout. Seeds 4, compressed, reniform to ovate, c. 2 × 1.6 mm, brown or yellowish-brown; testa prominently tuberculate.

Flowering & fruiting: Flowering from August to December, fruiting in January.

Habitat: In open dry habitats of deciduous forests, on plains and hill slopes at elevations between 350 and 1050 m.

Distribution: Bangladesh, India, Pakistan and Sri Lanka

Specimens examined: INDIA, **Andhra Pradesh**, Chittoor district, Kailasakona hill, 08.01.1976, G.V. Subba Rao 46990; *Ibid.*, *s.d.*, Ranga Charyulu 1733 (MH); East Godavari district, Amalapuram, 06.09.1988, K. Ravikumar & R. Ganesan 88813 (MH); Mantur, 28.11.1962, C.A. Barber *s.n.* (CAL); Palagedda, 11.10.1972, G.V. Subba Rao 42535 (MH); Rampa, chodavaram to Maredumili, 25.10.1994, M. Mohanan 102649 (MH); Rampa, Devara konda, 12.10.1920, V. Narayanaswami 669; Rampa, Kota, 09.10.1920, V. Narayanaswami 547; Rampa hills, 25.10.1920, V. Narayanaswami 45 (CAL); Sukumari hills, February 1885, J.S. Gamble 15981 (CAL, MH); Guntur district, Bairani, Diguvametta beat, 09.12.1967, K.N. Subramanian 2930 (FRC); Koppukonda, 24.12.1967, G.V. Subba Rao 29638 (MH); Lankamala, Yerabetukonta, 15.11.1965, K.N. Subramanian 2410 (FRC); Kurnool district, Ahobilam, 29.08.1965, J.L. Ellis 25545; Chelama, 07.12.1963, J.L. Ellis 17944 (MH); Srisailam-Nallamalais, 12.07.1963, J.L. Ellis 16842 (CAL); *Ibid.*, 12.07.1963, J.L. Ellis 16825; *Ibid.*, 05.12.1969, J.L. Ellis 32698; Mahanandi, 23.08.1972, J.L. Ellis 42330 (MH); Nellore district, Balayapalle, 10.11.1962, J.L. Ellis 14993; Kakula Konda, 23.09.1937, K.C. Jacob 83335 (MH); Prakasam district, Diguvametta, 17.11.1969, J.L. Ellis 32452 (MH); Visakhapatnam district, Anjoda-Genji Gadda, 12.03.1965, G.V. Subba Rao 22608 (MH); Cherukonda, 28.08.1966, G.V. Subba Rao 28176; Cherukonda peak, 26.10.1972, G.V. Subba Rao 42737 (MH); Golugonda, 08.03.1915, K.M. Sebastine 11759; Pithapuram Reserve forest, 09.12.1923, K.C. Jacob 17110 (MH); Warangal district, Pukhal R.F., 28.11.1960, K.M. Sebastine 11654 (MH). **Karnataka**, Bagalkot district, Badami, 00.09.1910, A. Meeblod 11263 (CAL); *Ibid.*, 07.10.2017, P. Soumya, Shinoj & P. Sunojkumar 138546 (CALI); *Ibid.*, 24.08.2018, P. Soumya, Dilsha & P. Sunojkumar 157530 (CALI). **Kerala**, Kollam district, Punalur forest, Chozhiyakode, 29.02.1982, N.

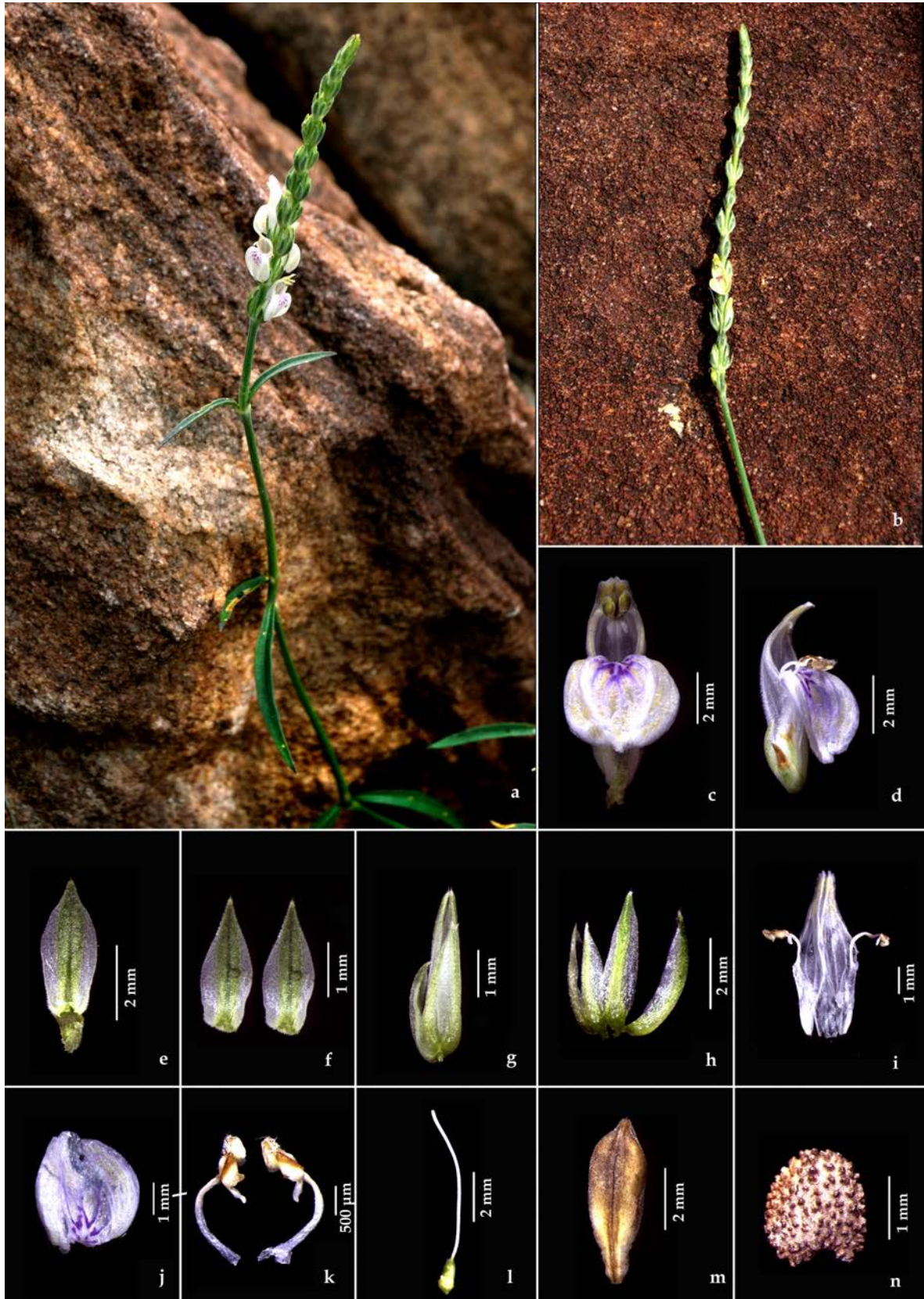


Fig. 35. *Justicia vahliana* Schult.: **a.** Habit; **b.** Inflorescence; **c.** Flower—adaxial view; **d.** Flower—side view; **e.** Bract; **f.** Bracteoles—adaxial side; **g.** Calyx; **h.** Calyx—opened; **i.** Upper lip; **j.** Lower lip; **k.** Stamens; **l.** Gynoecium with nectariferous disc; **m.** Capsule; **n.** Seed (from P. Soumya & P. Sunojkumar 138546; photos by P. Soumya).

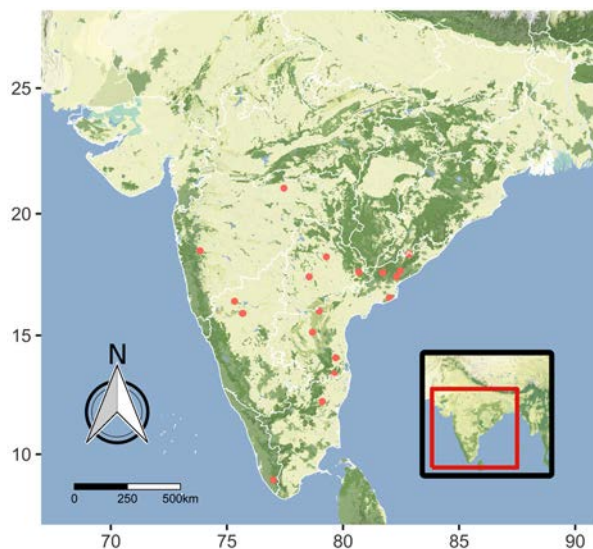


Fig. 36. Distribution of *Justicia vahliana* Schult. in Peninsular India. Drawn using R (R Core Team, 2023).

Venkatasubramanian 8390 (FRC); **Maharashtra**, Puna district, Parvathi hills, 22.07.1960, M.Y. Ansari 64365. **Tamil Nadu**, Tiruvannamalai district, Tippukadu R.F., 30.06.1963, K. Ramamurthy 16622 (MH). **Telangana**, Bhadrachalam district, Bhadrachalam forest, 27.08.1995, R. Chandrasekaran 104314; Parnasala forest, 28.09.1994, R. Chandrasekhara 102466 (MH); Hyderabad district, Secunderabad, Nagarjuna nagar, 13.12.1959, K.M. Sebastine 9742 (MH); Karimnagar district, Eklaspur, 30.12.1964, G.V. Subba Rao 22494 (MH). **Peninsula Indiae Orientalis**, Herb. Wight. Propr., 04.1837, Naggur hills, 2662 (CAL); Herb. Wight. Propr., 2257 (CAL).

Conservation status: The species is provisionally assessed here as of Least Concern (LC) as per the IUCN (2022) guidelines.

Notes: The name *Justicia vahlii* Roth was used for this taxon for a long time. However, it is a later homonym of *J. vahlii* F. Dietr, 1818, and therefore illegitimate under Art. 53.1 of the ICN (Turland *et al.*, 2018). Mabberley *et al.* (2020) took *J. vahliana*, as a replacement name for the illegitimate *J. vahlii* and proposed a new combination *Rostellularia vahliana* (Schult.) Mabb., as he treated the genus *Rostellularia* as distinct. Although he also designated one of Rottler's duplicates at herbarium C (C10005022) as lectotype, lectotypification had already been carried out by Deng (2020) who designated C10005023.

In the *Flora of West Pakistan*, Stewart (1972) treated *Justicia vahlii* Roth as a new synonym of *J. peploides* with a reference to the *Flora of Iran* (Rechinger,

1966). Later in the *Flora of Pan Himalaya*, Deng (2020) treated *J. vahlii* as a new synonym of *J. quinqueangularis*. Both treatments are not accepted here, as our field studies showed *J. vahliana* to be a distinct species though they may look similar in herbarium specimens. *Justicia vahliana* can easily be distinguished from *J. quinqueangularis* by its stout stem with woody rootstock (vs. without woody rootstock), less congested spike (vs. dense spike), broad less scarious bracts and bracteoles (vs. narrow more scarious bract and bracteoles), four-lobed calyx (five-lobed calyx with fifth lobe much reduced), stamens with bearded upper thecae (vs. glabrous upper theca), clavate capsule with tuberculate seeds (vs. oblong capsule with rugulose seeds). Results of molecular phylogenetic studies strongly support the identity of *J. vahliana* as a separate entity (in prep.).

At the same time, *J. vahliana*, grows in different environmental or altitudinal habitat, showing morphological variation in its stem size, branching pattern, leaf shape and inflorescence length. This variation sometimes creates confusion among researchers leading to consider it as different variety. One such ecological variant is *Rostellularia vahlii* var. *rupicola*, described by Ellis (1969) based on collections from Nallamalais in the Kurnool district, Andhra Pradesh. It was differentiated from *Rostellularia vahlii* var. *vahlii* by the decumbent stem radiating from a stout, woody rootstock, sessile linear leaves, and sparse and large cystoliths on the leaves. We collected this taxon from its type locality and found that the differentiating characters mentioned by the author are not stable and overlaps with the characters shown by *J. vahliana*. So, we treat *Rostellularia vahlii* var. *rupicola*, as a new synonym of *J. vahliana*.

Justicia wynaadensis (Nees) T.Anderson, J. Linn. Soc. Bot. 9: 515. 1867; C.B.Clarke in Hook.f., Fl. Brit. India 4: 533. 1885. *Gendarussa wynaadensis* Nees in Wall., Pl. Asiat. Rar. 3: 105. 1832. *Adhatoda wynaadensis* (Nees) Nees in DC., Prodr. 11: 406. 1847. *Ecbolium wynaadense* (B.Heyne) Kuntze, Revis. Gen. Pl. 2: 981. 1891. *Lectotype* (designated here): INDIA, s.loc., s.d., B. Heyne, Wall. Cat. 2474 (K [K001116152 digital image!]).

Figs. 37–39

Perennial shrubs, up to 1.5 m tall. Stems erect, striate, dichotomously branched; branches stout, widely spreading, greenish, glabrous with young branches puberulous; internodes 2–11 cm long.

Leaves petiolate; laminae elliptic to lanceolate, 4–16 × 2–7 cm, base attenuate, margins entire to dentate with minute hairs, apex acuminate, subcoriaceous, finely scabrous, puberulous with dense hairs on ribs; veins prominent, secondary veins 5–9 pairs, venation brochidodromous; petioles 1–3 cm long, bifariously pubescent. Inflorescence terminal or axillary spike, glandular, up to 10 cm long, 3–10 flowered; peduncles 1.5–5 cm long, simple or branched, densely pubescent with glandular and non-glandular hairs. Flowers sessile, two per inflorescence node, 7–12 × 6–8 mm; bracts linear to narrowly lanceolate, small, 3–4 × 0.5–1 mm, apex narrowly acute, greenish, densely pubescent with glandular and non-glandular hairs; bracteoles similar to bracts. Calyx deeply 5-lobed, 6–7.5 × 1.75–2 mm at anthesis, accrescent, greenish, densely pubescent with scattered glandular hairs; lobes linear to narrowly lanceolate, equal, apex acuminate. Corolla whitish or purplish white with dark purple striations on lips, hirsute outside, glabrous inside except in the throat; tube cylindrical, 3.5–4 × 2–2.3 mm, slightly enlarged in throat; upper lip erect, 4.5–6 × 3–4 mm, apex notched and hooded; lower lip 3-lobed, obovate to orbicular, unequal, middle lobe ovate, 5–6.5 × 4.5–5 mm, apex acute or obtuse; lateral lobes narrowly oblong, 5–6 × 1–1.5 mm, lobes rounded, recurved. Stamens exserted; filaments 3–4 mm long, white, basally hirsute; anthers thecae superposed, equal, elliptic, c. 1 × 0.5 mm, greenish yellow, glabrous; appendage white, c. 0.5 mm long, apex acute. Ovary ellipsoid to oblong, c. 2 × 1 mm, pale green, glabrous; style slender, 6–7.5 mm long, whitish, hirsute in lower half; stigma simple, capitate; nectariferous disc c. 0.6 mm high, yellowish white. Capsule clavate to oblong, 1.5–2 × 0.4–0.6 cm, apex cuspidate, pale brown, densely pubescent throughout; sterile base c. 6 mm long, flattened. Seeds 4, sub-orbicular or discoid, 2.5–3 × 3–3.5 mm, brownish, glabrous; testa sparsely rugulose.

Flowering & fruiting: Flowering and fruiting from November to March; fruiting in April.

Habitat: This species grows as undergrowth in moist deciduous and evergreen forests. It is common along forest margins and Ghat roadsides at an elevation of 225–1100 m.

Distribution: Peninsular India.

Specimens examined: INDIA, **Karnataka**, Shimoga

district, Hulikal, 27.02.1962, R.S. Raghavan 77638 (CAL); Uttara Kannada district, Dandeli-Gund road, 09.02.1980, K.P. Sreenath & S.R. Ramesh 10822 (CAL). **Kerala**, Ernakulam district, Thundathil Range, Bhoothathankettu, 12.02.1970, B.V. Shetty 33480 (MH); *Ibid.*, 04.10.2018, P. Soumya & P. Sunojkumar 151870 (CALI); Idukki district, Mullakkudy, 10.01.1994, Jomy Augustine 13121; Kulamavu, 14.08.2018, P. Soumya & P. Sunojkumar 157530 (CALI); Kannur district, Aralam, 26.2.1979, V.S. Ramachandran 61920 (MH); Chembukavu to Kannothe R.F., 20.01.1979, V.J. Nair 59714 (CAL); *Ibid.*, 20.01.1980, V.S. Ramachandran 58794 (CAL, MH); *Ibid.*, s.d., V.S. Ramachandran 54058 (MH); Palakkad district, Dhoni hills, 19.01.1910, C.E.C. Fischer 1598 (CAL, FRC); s.loc., 28.04.1923, s.coll. 17304 (MH); Pottikkal forest, Mukkali, 12.01.1980, N.C. Nair 65409 (CAL); Pathanamthitta district, Konni, 20.12.1902, s.coll., 1319 (CAL); Malappuram district, Manjeri, 30.01.1984, Philip Mathew 34398 (CALI); *Ibid.*, 24.02.1970, J.L. Ellis 33536 (MH); Nedumkayam, New Amarambalam, 23.01.2003, P.S. Udayan et al. 01268 (CMPR); Pathanamthitta



Fig. 37. Lectotype of *Justicia wynaadensis* (Nees) T.Anderson (K001116152). © The Board of Trustees for the Royal Botanic Garden, Kew. Reproduced with permission.

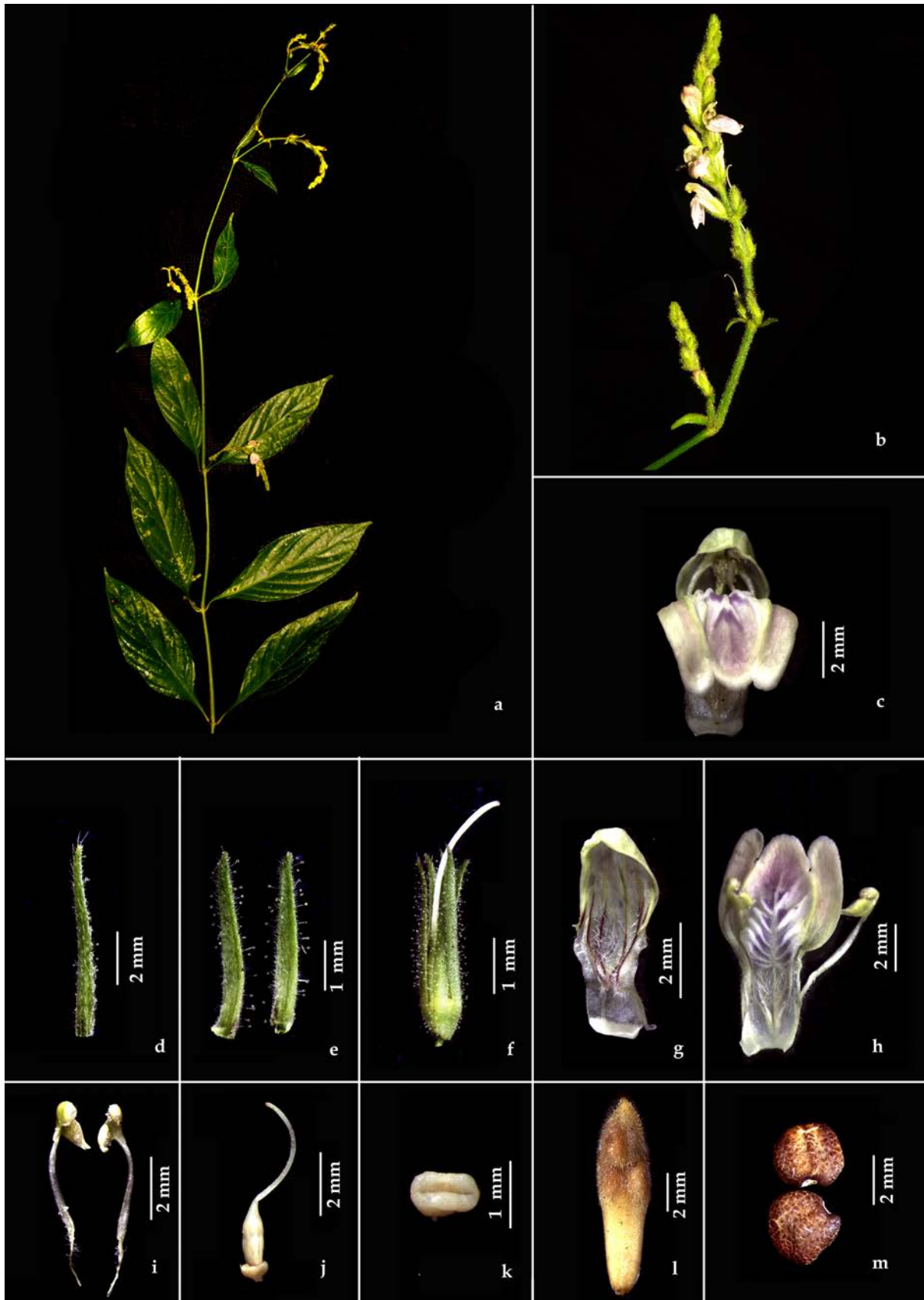


Fig. 38. *Justicia wynadensis* (Nees) T.Anderson: **a.** Habit; **b.** Inflorescence; **c.** Flower; **d.** Bract; **e.** Bracteoles—adaxial side; **f.** Calyx; **g.** Upper lip; **h.** Lower lip; **i.** Stamens; **j.** Gynoecium; **k.** Nectariferous disc; **l.** Capsule; **m.** Seeds (from P. Soumya & P. Sunojkumar 138520; photos by P. Soumya).

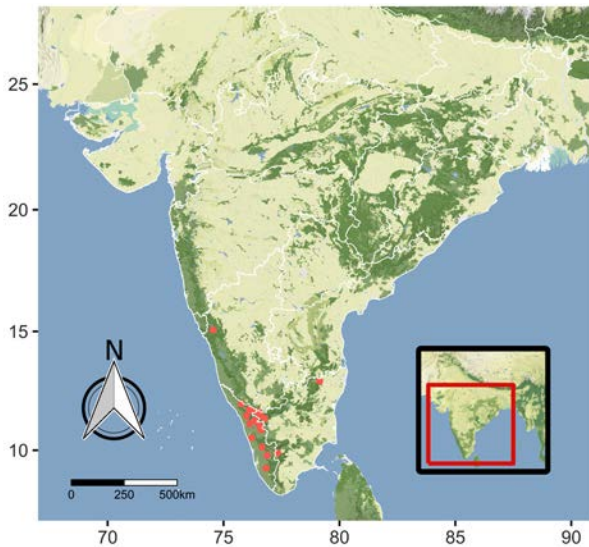


Fig. 39. Distribution of *Justicia wynaadensis* (Nees) T.Anderson in Peninsular India. Drawn using R (R Core Team, 2023).

district, Pamba, 22.01.1997, Jomy Augustine 17146 (CALI); Wayanad district, Ghat region, 22.09.2018, P. Soumya & P. Sunojkumar 151848; Puthoorvayal, 14.01.2000, Ratheesh Narayanan M.K. 1195 (CALI); s.loc., s.d., Ratheesh Narayanan M.K. 0250 (MSSRF); Sulthan Bathery, 08.02.1964, J.L. Ellis 18599 (MH). **Tamil Nadu**, Coimbatore district, Mount Stowest, 29.01.1962, J. Joseph 13805 (MH); Siruvani, 20.02.1957, K. Subramanyan 2389 (CAL, MH); Nilgiris district, Coonor Ghat side, 07.03.1870, s.coll., 10460 (CAL); Mudumalai, Benne-Pattavayal road, 09.03.1991, E. Vajravelu 96105 (MH); Naduvatttam to Pykara road, 24.04.2017, P. Soumya, Shinoj & P. Sunojkumar 145344 (CALI); Theni district, Kombai forest, 23.02.1978, M. Chandrabose 54245 (CAL); s.loc., s.d., C.E.C. Fischer 1598 (CAL); Vellore district, Kilandur, 21.03.1964, R.S. Raghavan 97048 (CAL).

Conservation status: The species is widely distributed in Karnataka, Kerala, and Tamil Nadu and is treated as of Least Concern (LC).

Typification: In the protologue of *Gendarussa wynaadensis*, Nees von Esenbeck (1832) cited Wallich's *nomen nudum* "*Justicia wynaadensis*" (Wallich, 1830), and specimens studied by him (*Justicia wynaadensis* Herb. Heyn. Wall. Cat. n. 2474 and Herb. Wight ex parte. Wall. Cat. n. 2486c. *Justicia lineata* Wall. Cat. n. 2486c). Subsequently, Anderson (1867) transferred this species to *Justicia* (as *J. wynaadensis* (Nees) T.Anderson). While searching for the original material of *J. wynaadensis*, we located three sheets: two at K and one at GZU. Among

these, two sheets (GZU251578, K001116152) have the annotation "*Justicia wynaadensis* and herb. Heyne", while the third sheet (K001116172) belongs to Wight's collection and has the catalogue number Wall. Cat. 2486c (as *Justicia lineata* Wall. Cat. 2486c). All of these can be considered as syntypes according to Art. 9.6 of the ICN (Turland et al., 2018). Among them, the specimen at K (K001116152) is selected here as the lectotype in accordance with articles 9.3 and 9.12 of the ICN (Turland et al., 2018).

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