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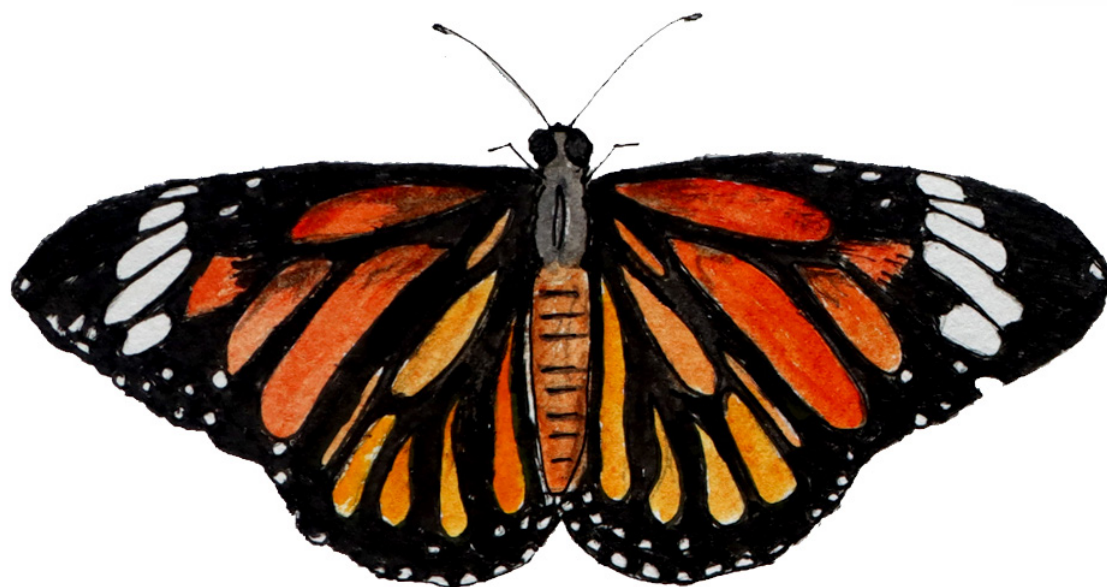
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Cover: Watercolour illustrations—Striped Tiger *Danaus genutia*, Common Silverline *Cigaritis vulcanus*, Tamil Lacewing *Cethosia mahratta*. © Mayur Nandikar.



Lindernia tamilnadensis (Linderniaceae) from Indo-Gangetic plains: no more endemic to the Deccan

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Abstract: This study documents the first record of *Lindernia tamilnadensis* (M.G.Prasad & Sunojkumar) in the states of Uttar Pradesh, Bihar, Jharkhand, and West Bengal. Previously, 16 species of *Lindernia* have been reported from different parts of India. The newly acquired specimen exhibits distinct morphological characteristics compared to previously described taxa from the Indo-Gangetic plains. A brief description, field notes, photographs, location, and distribution of the species are provided to facilitate identification.

Keywords: Amphibious hydrophytes, Bihar, Ganga River Basin, Jharkhand, range extension, tributaries, Tamil Nadu, Uttar Pradesh, West Bengal, Western Ghats wetland.

A biogeographic zone is a geographic region characterized by a distinct set of species and ecological communities that differ from those in other zones. India has been classified into 10 biogeographic zones, further subdivided into 27 biogeographic provinces (Rodgers & Panwar 1988; Singh & Kushwaha 2008). Among these, the Indo-Gangetic plains are particularly notable for their

fertile alluvial soil, which sustains extensive agriculture, and rich diversity of wild flora, each uniquely adapted to the region's environmental conditions.

Linderniaceae is a family of flowering plants consisting of nearly 25 genera recorded from all around the world (POWO 2024). Quite recently segregated from Schrophulariaceae based on molecular studies and the presence of an abaxial staminal filament, Linderniaceae is now recognized as a separate family confirming its monophyly. The centers of diversity of this family are situated in southeastern Asia and Africa (Fischer 1992).

The genus *Lindernia* comprises 200 species, catalogued throughout the tropical and temperate regions of the world (Lewis 2000). It is characterized by the presence of a unique abaxial staminal filament with club shaped appendage (Rahmanzadeh et al. 2005). So far, a total of 28 species, one subspecies, and one variety have been reported from India (Mukherjee

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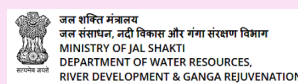
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1945; Sivarajan & Mathew 1983; Tandyekkal & Mohanan 2010).

The genus *Lindernia* is mainly characterized by erect or prostrate annual herbs. They have opposite, petiolate or sessile leaves. In most cases, the margins of leaf blades are toothed, while in rare instances they are entire whet veins can be pinnate or palmate. Axillary or terminal inflorescences, racemose or pseudo-umbellate, occasionally in panicles or appear solitary. Flowers are either opposite or alternate and sometimes pedicellate. Usually, bracteoles are missing. Five-lobed calyx can be parted, or split on one side, equal or subequal. Corolla of the lower lip is larger and extended, while the upper lip is erect. Typically, four fertile stamens or two anterior reduced where filaments are appendaged. Coherent anthers or apex of locules of anterior ones are either pointed or spurred, mostly two-lamellated styles. Seeds are small and numerous.

METHODS

The present study was conducted to survey the plant diversity along the Ganga, Gandak, Ajay, Rupnarayan, and Damodar rivers in February 2024. Transects were laid, both perpendicular and parallel to the river to document plant diversity in the high flood line (riparian zone). During this survey, we encountered an intriguing *Lindernia* species growing alongside *L. rotundifolia* in the

riparian zones. Specimens of the species were collected for further examination, and detailed photographs were taken to record its habit, habitat, leaves, stem, and flowers. A few specimens were processed by following standard method (Rao & Sharma 1990) and deposited in the Herbarium of Wildlife Institute of India (WII), Dehradun, Uttarakhand, India. On critical examination with the help of relevant literature, the specimen was confirmed as *L. tamilnadensis* Prasad & Sanojkumar. Through the available literature from the states; Uttar Pradesh, Bihar, Jharkhand, and West Bengal (David 1903; Haines 1921–1925; Bennet 1979; Verma 1981; Guha 1984; Naskar 1993; Bhattacharya & Hajra 1998; Bandyopadhyay & Mukherjee 2005; Singh & Ali 2008; Maliya & Bhaskar 2010; Chowdhury & Das 2010; Mandal & Mukherjee 2012; Singh et al. 2013; Singh 2015; Mukherjee & Kumar 2020; Paul & Kumar 2023) it was established that the species is no longer confined or endemic to southern India and has marked its presence in northern Indian states, especially in the Gangetic plains.

L. tamilnadensis was described from Vijayanarayanam village of Tamil Nadu (Prasad & Kumar 2014). *L. tamilnadensis* is allied to well-known *L. rotundifolia* but can be differentiated by characters like coloured blotches at each corolla lobe, lanceolate calyx lobes, absence of trichomes at the base of the anterior corolla lobes,

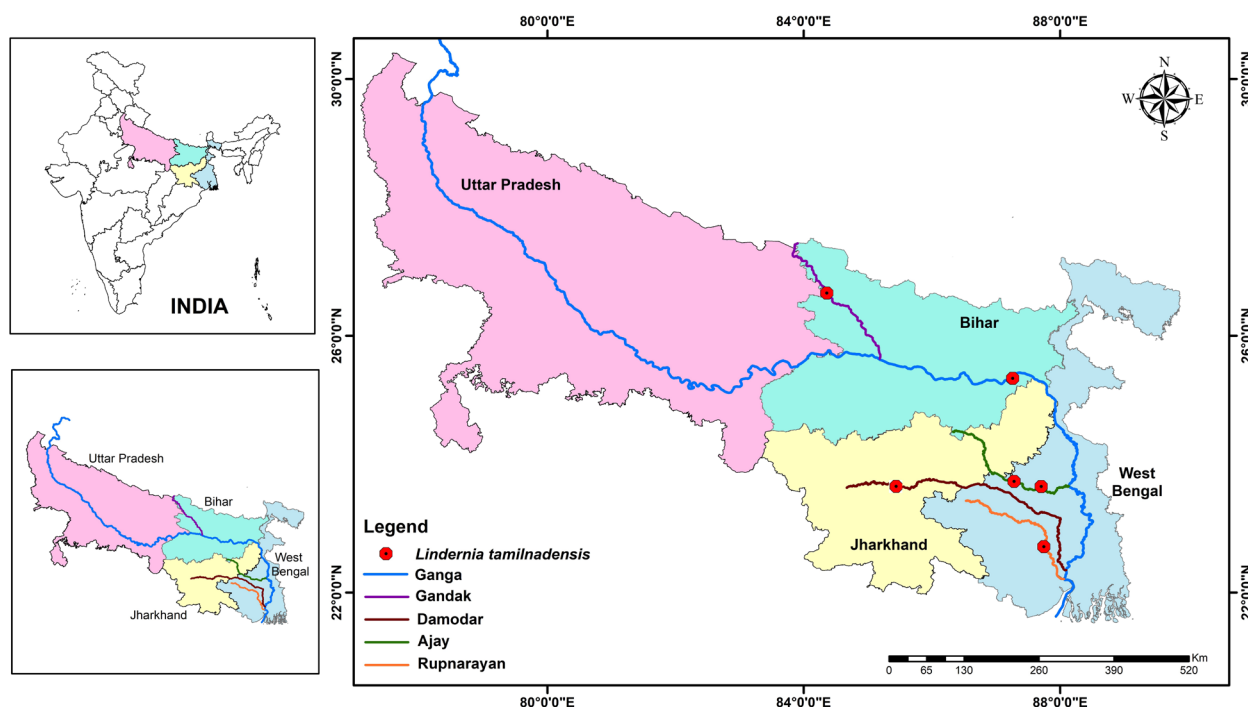


Figure 1. Location map of *Lindernia tamilnadensis* Prasad & Sunojkumar, for the specimens recorded from Indo-Gangetic plains.

undeflexed fruiting pedicels, and globose capsules, and said to be endemic to Western Ghats. Undirwade (2020) reported this species from northern Maharashtra.

A brief description, location/maps, field notes, and photographs are provided for the identification of the species. Hence, this paper can serve as a new distribution for *L. tamilnadensis* from the Gangetic plains covering four states viz. Uttar Pradesh, Bihar, Jharkhand, and West Bengal.

Results

Lindernia tamilnadensis Prasad & Sunojkumar.

Annual, erect or prostrate tufted semi-aquatic herb, stilt roots (from basal nodes of the stem), roughly 15 cm high. Stem herbaceous, weak, smooth (no hair or projections), 4-angled, slender, branches projecting from the base; internodes roughly 2.5 cm long. Leaves sessile, 0.4–1.5 × 0.5–1.2 cm, ovate, subcordate base, apex acute or sometimes rounded, margins entire (older parts) & dentate at apex, glabrous, distinct veins, basally 3–5 nerved, lamina glandular, and punctate. Flowers solitary, axillary, pedicellate, arranged alternately on leaf axils, one per node; pedicel hairy & slender; fruiting pedicel are erect and glabrous. Calyx 1.5–2.5 mm long, 5-lobed, deeply lobed, glandular outside, lanceolate lobes, apex acute. Corolla 3–5 mm long, 2-lipped, white with deep-purple or pale blue blotches on lower lip; corolla tube cylindrical, 3–5 mm long, glabrous hairy; lower lip-3 distinct lobes, rounded, glabrous; upper lip has a small notch or indentation. Stamens 2-perfect stamens, filaments usually 1 mm long, glabrous, glandular hairy throughout, dense yellow glandular hairs at the base of filaments, and corolla tube below, bluish purple towards apex, a distinct spur present just below the staminodal apex, anthers 2-lobed, lobes ovate, acute. Gynoecium 3–3.1 mm long, ovary 1.0 × 0.5 mm, bicarpellary, syncarpous, ovate-acute, sub-globose, glabrous/hairy; style roughly 2 mm long, glabrous; stigma bilobed & simple. The fruit is a globose capsule, 2.5 × 2 mm; capsule spherical, globose, glabrous, shiny, exceeding the length of persistent calyx. Seeds 0.3 × 0.15 mm, minute, distinctly 5-ridged, numerous, golden yellowish.

Specimen in herbarium (with accession number): West Bengal (Rupnarayan, WII/NMCG/UK/22212) and Jharkhand (Damodar, WII/NMCG/UK/22214 and Ajay, WII/NMCG/UK/22213)

Flowering and fruiting: July to March.

Ecology: Grows primarily in marshy habitats and also as marginal plant alongside flowing waters, along with *Grangea maderaspatana*, *Wahlenbergia marginata*,

Table 1. A comparative analysis of *Lindernia tamilnadensis* Prasad & Sunojkumar with other closely related species of northern India, *L. rotundifolia* (L.) Alston.

Distinguishing characters	<i>L. tamilnadensis</i> Prasad & Sunojkumar	<i>L. rotundifolia</i> (L.) Alston
Calyx	Calyx lobes 2.5–4.2 mm long and are unequal with sparsely scattered glandular hairs.	Calyx lobes are 7–9.2 mm long and are equal with dense glandular hairs.
Corolla	Almost less than half the size of <i>L. rotundifolia</i> (1 × 1 mm) and trichomes absent at base of lobes.	About 3.5 × 3 mm with trichomes present at the base of lobes.
Staminode	0.5–0.6 mm long	2–2.2 mm long
Pedicel	Deflexed or undeflexed during fruiting	Undeflexed during fruiting

Table 2. Locations of *Lindernia tamilnadensis* Prasad & Sunojkumar, for the specimens recorded from Indo-Gangetic plains.

River	Latitude/ Longitude	Elevation (m)	Location
Ganga	25.339°N, 87.261°E	48	Bateshwar, Bhagalpur District, Bihar
Gandak	26.667°N, 84.360°E	99	Jabahi Dayal, Kushinagar District, Uttar Pradesh
Rupnarayan	22.706°N, 87.738°E	16	Dirghagram, Paschim Medinipur District, West Bengal
Damodar	23.643°N, 85.525°E	331	Ramgarh cantonment, Hazaribagh District, Jharkhand
Ajay	23.618°N, 87.709°E	58	Bolpur, Birbhum District, West Bengal
Ajay	23.732°N, 87.278°E	79	Bhimgara, Birbhum District, West Bengal

Torenia crustacea, *Gnaphalium polycaulon*, *Eclipta alba*, *Glinus oppositifolius*.

Distribution: India: Tamil Nadu, Maharashtra, Gujarat, and now from Uttar Pradesh, Bihar, West Bengal, and Jharkhand.

Photographic evidences: Uttar Pradesh and Bihar (Image 1)

REFERENCES

- Bandyopadhyay, S. & S.K. Mukherjee (2005). Diversity of aquatic and wetland vascular plants of Koch Bihar district, West Bengal. *Plant Taxonomy: Advances and Relevance* 1: 223–244.
- Bennet, S.S.R. (1979). *Flora of Howrah District*. International Book Distributors, 406 pp.
- Bhattacharya, R.P. & P.K. Hajra (1998). *Flora of West Champaran District Bihar*. Botanical Survey of India, 572 pp.
- Chowdhury, M. & A.P. Das (2010). Hydrophytes of different wetlands in the Maldah district of West Bengal, India. *Environmental Biology and Conservation* 15: 22–28.
- David, P. (1903). *Bengal plants, Volume II*. Bishen Singh Mahendra Pal

Lindernia rotundifolia (L.) Alston

Lindernia tamilnadensis Prasad & Sunojk



Image 1. *Lindernia tamilnadensis* along with allied species *Lindernia rotundifolia* for comparative studies. ©: Revan Y. Chaudhari.

- Singh, Dehradun, 617 pp.
- Fischer, E. (1992).** Systematik der afrikanischen Lindernieae (Scrophulariaceae). *Tropische und Subtropische Pflanzenwelt* 81: 1–365.
- Guha, D.N.B. (1984).** *Flora of Murshidabad District, West Bengal, India*. Scientific Publishers, 441 pp.
- Haines, H.H. (1921–1925).** *The Botany of Bihar and Orissa*, Part III–IV. Alder & Sons and West Newman, 225–754 pp.
- Lewis, D.Q. (2000).** A revision of the New World species of *Lindernia* (Scrophulariaceae). *Castanea* 65(2): 93–122.
- Maliya, S.D. & D. Bhaskar (2010).** A contribution to the flora of Katarniyaghat Wildlife Sanctuary, Baharaich district, Uttar Pradesh. *Journal of Economic and Taxonomic Botany* 34(1): 42–68.
- Mandal, S.K. & A. Mukherjee (2012).** Diversity of Dicotyledonous plants in Wetlands of Puruliya District, West Bengal, pp 403–409. In Maiti, G. & S.K. Mukherjee (eds.). *Multidisciplinary Approaches in Angiosperm Systematics Vol 1*. Department of Botany, University of Kalyani, Kalyani, India, 448 pp.
- Mooney, H.F. (1950).** *Supplement to the Botany of Bihar and Orissa*. Catholic Press, 294 pp.
- Mukherjee, P. & J. Kumar (2020).** Floristic studies on aquatic and semi aquatic angiosperms of major water bodies of Jharkhand. *The Journal of Indian Botanical Society* 100(3 & 4): 119–133.
- Mukherjee, S.K. (1945).** Revision of Indo-Burmese species of *Lindernia* All. *Journal of Indian Botanical Society* 24: 127–134.
- Naskar, K. (1993).** *Plant Wealth of the Lower Ganga Delta, Vol 2*. Daya Publishing House, Delhi, 834 pp.
- Paul, T.K. & A. Kumar (2023).** *Flora of Mahananda Wildlife Sanctuary, Darjeeling, West Bengal*. Botanical Survey of India, Kolkata, 91 pp.
- Philcox, D. (1968).** Revision of the Malesian species of *Lindernia* All. (Scrophulariaceae). *Kew Bulletin*, 22: 1–72. <https://doi.org/10.2307/4107820>
- POWO (2024).** Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. <http://www.plantsoftheworldonline.org/>. Retrieved 20 May 2024.
- Prasad, M.G. & P. Sunojkumar (2014).** A new species of *Lindernia* (Linderniaceae) from India. *Phytotaxa* 162(1): 57–60. <https://doi.org/10.11646/phytotaxa.162.1.6>
- Rahmanzadeh, R., K. Müller, E. Fischer, D. Bartels & T. Borsch (2005).** The Linderniaceae and Gratiolaceae are further lineages distinct from the Scrophulariaceae (Lamiales). *Plant Biology* 7: 67–78. <https://doi.org/10.1055/s-2004-830444>
- Rao, R.R. & B.D. Sharma (1990).** *A manual for herbarium collections*. BSI, Calcutta, 25 pp.
- Rodgers, W.A. & H.S. Panwar (1988).** Planning a wildlife protected area network in India. 2 vol. Project FO: IND/82/003. FAO, Dehradun, 339, 267 pp.
- Singh, A. (2015).** Observations on the flora of Varanasi district in Uttar Pradesh state of India. *Global Journal of Environmental Science and Technology* 3(10): 368–389.
- Singh, M. & S.J. Ali (2008).** A study on aquatic Angiosperms of district Mau (East U.P.). *Journal of East African Natural History* 32: 877–890.
- Singh, S.C., E. Gupta, R. Yadav, G.D. Bagchi, R. Govind & B. Kumar (2013).** Species Diversity amongst Aquatic and Wetlands of Lucknow District, U.P. Uttar Pradesh State Biodiversity Board.
- Singh, S.P. & S.P.S. Kushwaha (2008).** Forest biodiversity and its conservation in India. *International Forestry Review* 10(2): 237–247. <https://doi.org/10.1505/for.10.2.292>
- Sivarajan, V.V. (1983).** *Lindernia calemeriana*, a new species of Scrophulariaceae from India. *Tropical Plant Science Research* 1: 351–352.
- Sivarajan, V.V. & P. Mathew (1983).** The genus *Lindernia* All. (Scrophulariaceae) in India. *Journal of the Bombay Natural History Society* 80(1): 131–140.
- Tandyeckal, D. & N. Mohanan (2010).** *Lindernia ciliata* subsp. *sivarajanii* subsp. nov. (Scrophulariaceae) from India. *Nordic Journal of Botany* 28: 202–205. <https://doi.org/10.1111/j.1756-1051.2009.00632.x>
- Undirwade, D. (2020).** Noteworthy new additions to flora of Jalgaon district, Maharashtra. *Bioinfolet* 10: 29–34.
- Verma, S.K. (1981).** *Flora of Bhagalpur, Dicotyledons*. Today & Tomorrow's Printers and Publishers, New Delhi, 414 pp.



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