

## Rediscovery, distribution and conservation status of *Leptodermis riparia* R.Parker (Rubiaceae) in Western Himalaya, India

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### Abstract

*Leptodermis riparia* R.Parker (Rubiaceae) is rediscovered after a gap of 90 years from its Type locality in the eastern part of Uttarakhand, Western Himalaya. Recent field studies have found two additional localities for this species in the state. All three populations were found in the riparian zone especially on rocky substrate rich in limestone. We observed that the Type locality of this species has been severely eroded due to a major flash flood in Kali river during 2013. In this article, we present a description, habitat characteristics, known distribution, and conservation status of *L. riparia* in the Western Himalaya.

### Introduction

The genus *Leptodermis* Wall. (Rubiaceae) is distributed in the northern hemisphere mainly confined to Himalaya, Japan and China. The generic name is derived from the Greek 'leptos' meaning thin and 'derma' meaning skin or membrane, referring to the thin membranous bractlets that form connate tubes. The genus is characterized by opposite leaves, often in fascicled pairs with small persistent stipules. All the species are shrubby in habit and leaves emit foetid smell when bruised. The genus is represented by 48 species (<http://www.gbif.org/species/2893425#>) across the world. The literature reveals that most of the species show confined distribution in their preferred habitats which lead to the high level of endemism. Out of 34 species recorded from China, 30 are endemic. In the Himalayan region, there are 10 species reported, of which, 3 are found in the Western Himalaya (Osmaston 1927; Naithani 1990). Among the *Leptodermis* species reported from Himalayan region, *L. lanceolata* Wall. has the widest distribution from Pakistan to Arunachal Pradesh (India). *Leptodermis kumaonensis* R.N. Parker, *L. stapfiana* H.Winkl., *L. virgata* Edgew., *L. amoena* Springate and *L. ludlowii* Springate are confined to certain mountain ranges of the Himalaya between Pakistan, India, Nepal and Bhutan, whereas *L. griffithi* Hook.f., (Khasi Hills, Meghalaya, India), *L. scabrida* Hook.f. (Mishmi hills, Arunachal Pradesh), *L. parkeri* Dunn (Himachal Pradesh, India), and *L. riparia* R.N. Parker (Uttarakhand) are narrow range endemic species. Perusal of regional taxonomic literature (Hara et al. 1978; Osmaston 1927) reveals that *L. riparia* was first reported by R.N. Parker (1924) from the western bank of Kali valley in the eastern part of Uttarkhand and it is considered a narrow range endemic of the Western Himalaya. The Type locality and surrounds on either side of Kali River are of much botanical interest as this area forms the inner limit of distribution for *Shorea robusta* Gaertn. (Dipterocarpaceae) in the Himalaya. It also forms the western limit for the many east Himalayan plant species such as *Macaranga pustulata* King ex Hook.f. (Euphorbiaceae) and

*Ficus nervosa* B. Heyne ex Roth. (Moraceae). Very few botanists have conducted serious exploration of the Kali valley since R.N. Parker. The Kali River forms the international boundary between India (state of Uttarakhand) and Nepal. This valley, being remote, is still under-explored and warrants further floristic surveys.

As part of ecological studies on the vegetation of eastern Uttarakhand, we made special efforts to locate the rare endemic species reported from the region (Figs 1, 2). Here we present a brief taxonomic account, a key to species in Western Himalaya, morphology for field identification and conservation status of this little known species.

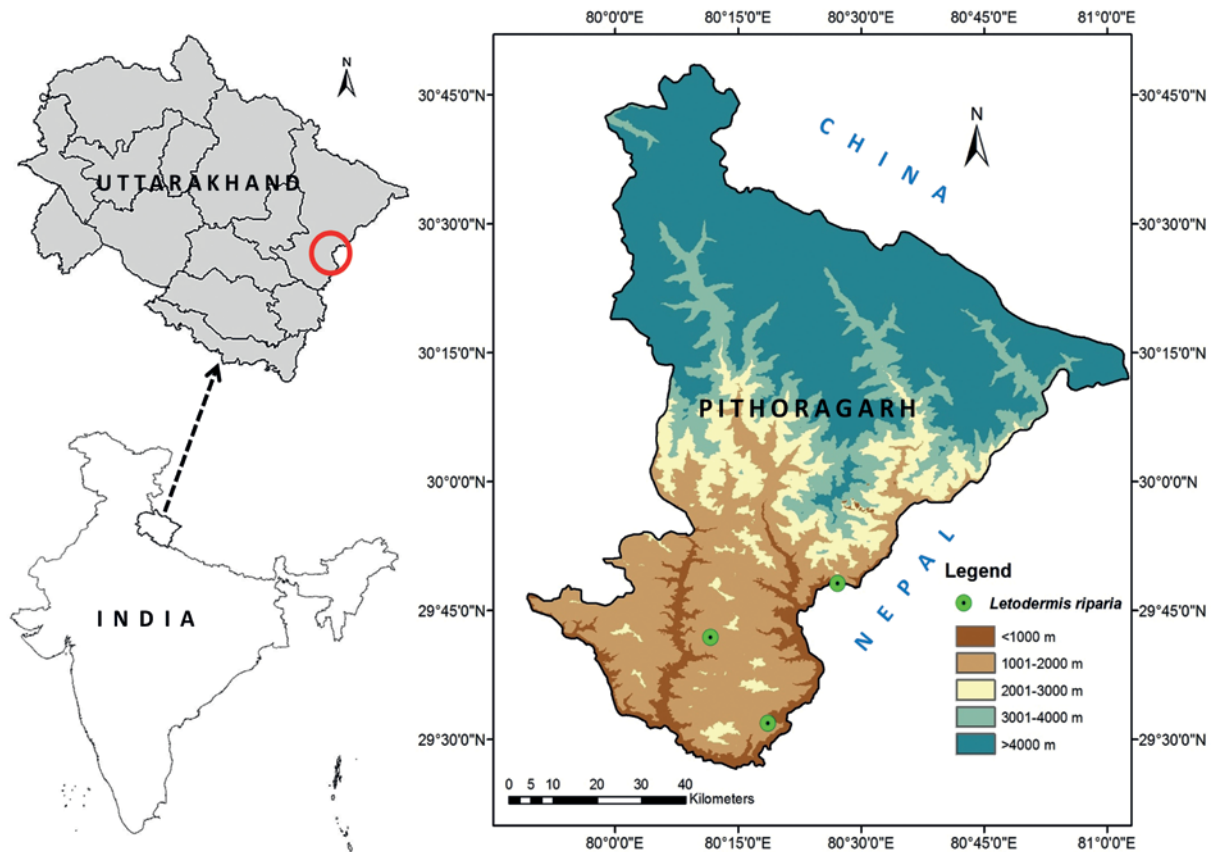


Fig. 1. Location of *Leptodermis riparia* in the Uttarakhand state and Pithoragarh district, Western Himalaya.



**Fig. 2.** *Leptodermis riparia*: **a.** type locality near Balwakot along the bank of Kali river (Nepal in the far left of the photograph); **b.** riparian habit; **c.** habitat on rocky slopes.

### Systematic treatment

Key to the *Leptodermis* species of Western Himalaya:

- 1. Corolla glabrous outside ..... *L. lanceolata*
- 1. Corolla pubescent outside ..... 2
- 2. Leaves usually exceeding 5.5 cm long; lateral nerves 6–10 pairs ..... *L. kumaonensis*
- 2. Leaves not exceeding 5.5 cm long; lateral nerves 4–6 pairs ..... *L. riparia*

***Leptodermis riparia*** R.Parker, *Indian Forester* 50: 398 (1924)

**Type:** India, Uttarakhand, Pithoragarh district, Balwakot (along the bank of river Kali), 900 m, 25 Jul 1923, R.N. Parker 2110, K!

Medium-sized shrub, up to 1.5 m tall; twigs pubescent. *Leaves* 20–40 mm long, 7.5–15 mm wide, lanceolate, scabrid on both surfaces; base slightly attenuate; margin ciliate; apex slightly tapering; lateral nerves 4–6 pairs; petiole 1.2–4 mm long; stipules membranous, herbaceous, c. 1–2 mm long. *Flowers* terminal on slender lateral shoots, 3–5 together in a sub-capitate fascicles, sessile; bracteoles 2, 3–5 mm long, connate, encircling stem. *Calyx* 2.5–5 mm long, green, often with red tinge; lobes 5, ovate, with margin ciliate. *Corolla* white, turning pink at maturity, 1 cm long, narrowly tubular, pubescent outside, pilose inside; tube funneliform; lobes 5, ovate, 4–5 mm long, hairy at base (hairs white) and margin winged (wing forming a distal lobe below apex of corolla lobe); apex slightly apiculate. *Stamens* inserted below throat of corolla; anthers linear, included. *Style* 5-fid distally; stigmas just exerted beyond corolla tube, papillose. *Capsule* nearly 5 mm long; seeds enclosed within a loose fibrous bladder (Fig. 3).

**Flowering:** July–November

**Etymology:** The species epithet indicates the riparian habitat of the species.

**Habitat and ecology:** The species is distributed between elevations of 725–1525 m in the eastern parts of Uttarakhand (Kumaun region), Western Himalaya, especially along the riparian zone on rocky substrates rich in limestone. The associated woody species were *Leptodermis lanceolata* Wall. ex Roxb., *Spermadictyon suaveolens* Roxb., *Colebrookia oppositifolia* Sm., *Woodfordia fruticosa* (L.) Kurz, *Sapium insigne* (Royle) Trimen and *Lannea coromandelica* (Houtt.) Merr. Herbaceous and graminoid species associated with this include *Pogostemon benghalensis* (Burm.f.) Kuntze, *Eriophorum comosum* (Wall.) Nees and *Thysanolaena maxima* (Roxb.) Kuntze. The newly recorded sites were slightly further from the riparian zone but resembled the habitat characteristics, that is, limestone formations, of the former.

*Distribution in Western Himalaya:* Balwakot (29°48'8.69" N, 80°27'11.63" E, 725 m); Bungachhina (29°41'52.78" N, 80°11'42.22" E, 1460 m); Dungrakot (Wadda) (29°31'53.45" N, 80°18'40.83" E, 1525 m) in Pithoragarh district, Uttarakhand.



**Fig. 3.** *Leptodermis riparia*: **a and b.** Flowering branches; **c.** flower showing styles and pilose surface inside; **d.** mature flower; **e.** flower bud, mature flower and fruits.

**Specimen examined:** Dungrakot (Wadda), 12 Jul 2014 G.S. Rawat 11459; 27 Sep 2014 I.D.Rai & G. Singh 11460 (WII); Balwakot, 28 Sep 2014, I.D. Rai & G. Singh 11461 (WII).

**Conservation status:** *Leptodermis riparia* is only reported from Western Himalaya, India and restricted to elevations between 725–1525 m. During the current survey, three populations of 14–30 mature individuals at each site, in an area of 300–500 m<sup>2</sup> were recorded in the riparian or near-riparian scrub vegetation. The species seems to be highly habitat specific and consequently narrow in its distribution. All the locations were along the road sides where the species appears to be vulnerable to anthropogenic pressures and developmental activities. The Type locality, that is the western bank of Kali, was badly damaged in the severe flood of 2013. As a result, only few individuals were recorded from this locality during the recent studies.

To assess the conservation status of this species, according to the IUCN Red List categories, the three localities of *L. riparia* were imported into GeoCAT (Geospatial Conservation Assessment Tool, designed to produce rapid species level conservation assessments based on IUCN Red List Categories and Criteria (Bachman et al. 2011; <http://geocat.kew.org/>) and the 'extent of occurrence' (EOO) was calculated. Based on the cell width of 2 km, EOO = 297 km<sup>2</sup> (Endangered), while 'area of occupancy' (AOO) = 12 km<sup>2</sup> (Endangered). Therefore, the proposed IUCN category (2012) = EN: B1D (EN = Endangered). It is estimated that the EOO of this species is less than 5000 km<sup>2</sup> (B1), population size estimated to number fewer than 250 mature individuals (D). There is an inferred continuing decline in the area and quality of habitats available for this species. All estimated values meet the criteria for Endangered under the B2ab(iii) criteria (B2 = when criteria is based on AOO; a = severely fragmented; b(iii) = continuing decline in area, extent and/or quality of habitat) of the IUCN red list guidelines (IUCN 2014: version 11).

On the basis of total number of individuals found in three populations, this species requires the implementation of immediate *in-situ* conservation measures. The habitats are critical as the area is under high anthropogenic and natural disturbances. Since this species occurs in an extremely narrow geographical range and the population is fragmented, habitat management interventions are required. Extensive explorations, in similar habitats, should be undertaken to locate any more populations that may exist in the region.

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