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A note on current status of *Helicobarbula porphyreoneura* (Müll. Hal.) M.J. Cano from semi-arid regions of Rajasthan, India

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The present paper reports the rediscovery of *Helicobarbula porphyreoneura* (Müll. Hal.) M.J. Cano in and around Jaigarh fort of Jaipur, Rajasthan (India). The article not only reports in detail the delimitation of *Pseudocrossidium* and the segregated genus *Helicobarbula*, where *P. porphyreoneura* is currently placed but also provides a detailed description of the species along with illustrations that have not been published yet. Besides this, the current status of the distribution of *Helicobarbula* and *Pseudocrossidium* in India is also discussed.

Keywords: Pottiaceae, *Pseudocrossidium*, range extension, rediscovery

The cosmopolitan moss family Pottiaceae Schimp. is by far the most species-rich moss lineage with more than 1400 species falling under 76 genera, comprising more than 10% of the species known from the entire world (Frey and Stech 2009). The members of this family form a conspicuous portion of the vegetation of ruderal, arid land, alpine or arctic areas and grow on various substrates (Zander 1993). Due to its high diversity, the taxonomy of this family and its constituent genera is very complicated which can be visualized by the fact that its generic circumscription has been the subject of continued debate since the late 19th century which persisted into the 20th century. The family has been divided into five subfamilies (Zander 2017), among which the genus *Pseudocrossidium* R.S. Williams belongs to subfamily Barbulioideae and tribe Bryoerythrophyllae (Zander 2006, Costa 2016). Recently Cano et al. (2022) investigated evolutionary relationships among the species of *Pseudocrossidium* and not only recognized different clades (A–K) within *Pseudocrossidium* but also introduced three new genera to science including the monophyletic genus *Helicobarbula* M.J. Cano belonging to Clade D which accommodates *P. porphyreoneura*. The genus is distributed in tropical regions of Africa, Arabia, southwestern and Central Asia (Magill 1981, Stern 2000, O'Shea 2006, Kürschner and Frey 2020).

In India, the knowledge of the family Pottiaceae has notably improved in the last 12 years mainly due to the work

of Aziz and Vohra (2008) who reported 130 species under 29 genera with wide distribution among all the major biogeographical regions of India. However, as far as the generic account of *Pseudocrossidium* from India is considered, it was Stern (2000) who for the first time reported *P. porphyreoneura* (C. Müll. ex Vent.) Zand. from Kumbhalgarh (Rajasthan without mentioning any precise detail of the specimen. Later several Indian authors (Lal 2005, Alam et al. 2015, Rawat et al. 2015) mentioned this species in their checklist based on the work of Stern (l.c.), but till date no specimens or recent observations have been made since its first collection. During fieldwork this species was found growing on soil covered wall and is rediscovered from Rajasthan after a gap of more than two decades. Detailed taxonomic descriptions along with photographs for easy identification of the species are being provided.

Helicobarbula porphyreoneura (Müll. Hal.) M.J. Cano, J. Syst. Evol. 60: 927. 2022[2021]

≡ *Barbula porphyreoneura* Müll. Hal., Nuovo Giorn. Bot. Ital. 4: 13. 1872

≡ *Tortula porphyreoneura* (Müll. Hal.) C.C. Towns., J. Bryol. 10: 576. 1979

≡ *Pseudocrossidium porphyreoneura* (Müll. Hal.) R.H. Zander, Bull. Buffalo Soc. Nat. Sci. 32: 119. 1993.

Description

Plants growing in loose to dense turfs, yellowish green above and brown to reddish brown below. Stems erect, simple or branched, transverse section rounded, sclerodermis undiffer-

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entiated or weakly differentiated, central strand usually developed. Leaves contorted to spirally twisted when dry, patent to widely spreading when moist, ovate to ovate-lanceolate or oblong-lanceolate to triangular, concave, 0.5–1.8 mm in length, margins recurved to broadly revolute more than 2–3 turns from the apex to the base, entire; lamina unistratose, yellow with KOH, apex obtuse or occasionally acute; costa excurrent in an awn, surface cells dorsally linear and smooth, ventrally quadrate to short-rectangular, papillose, in cross-section at the mid leaf circular to semicircular, with 2 guide cells in single layer, ventral stereid band generally absent but if present then undifferentiated, dorsal stereid band semicircular in shape, hydroids developed, dorsal surface cells differentiated, ventral surface cells differentiated and disposed in one layer; upper and median paracostal cells quadrate-hexagonal

to subquadrate-rectangular, thin to slightly thick-walled, densely papillose, $12\text{--}16 \times 14\text{--}18 \mu\text{m}$ at apex and $8\text{--}10 \times 5\text{--}7 \mu\text{m}$ at median lamina; upper and median marginal cells strongly differentiated, rounded, inflated, thin-walled and papillose, $11\text{--}15 \times 12\text{--}13 \mu\text{m}$ and $6\text{--}12 \times 7\text{--}9 \mu\text{m}$ respectively; basal cells rectangular or quadrate, $13\text{--}15(20) \times 14\text{--}16 \mu\text{m}$, thin-walled. Perichaetial leaves not or scarcely differentiated from vegetative leaves (Fig. 1).

Note

The Indian specimens show minute variation in leaf lamina and costal cells in comparison to *Tortula porphyreoneura* reported by Magill (1981) from South Africa. The South African element has broadly acute to rounded leaf apex with spirally revolute margin and apiculate to short excurrent

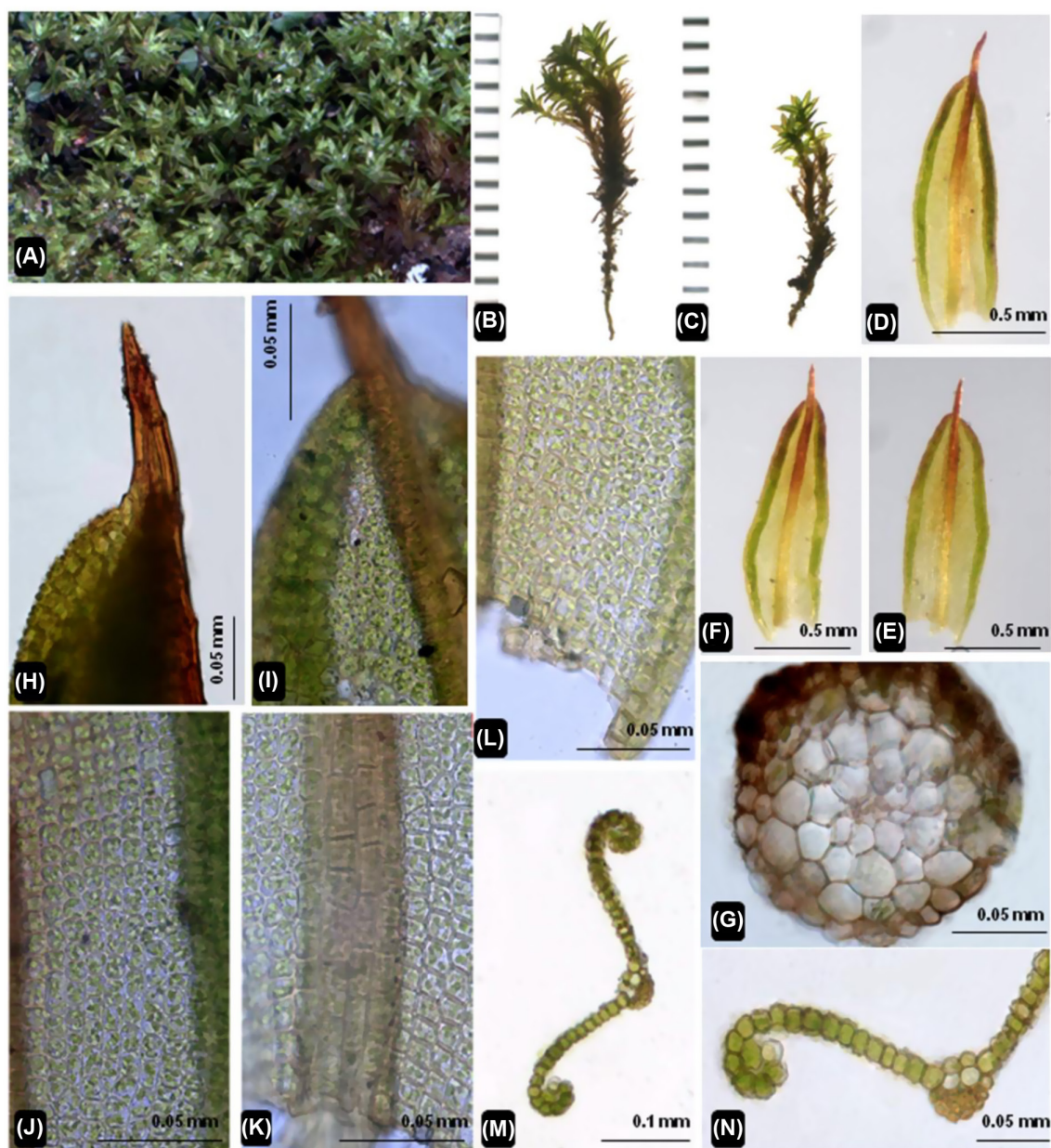


Figure 1. *Helicobarbula porphyreoneura* (Müll. Hal.) M.J. Cano (A) habit, (B and C) plants, (D–F) leaves, (G) cross-section of stem, (H) leaf apex showing excurrent costa, (I) apical laminal cells, (J) middle laminal cells, (K) basal paracostal cells, (L) basal marginal cells, (M) cross-section of leaf showing broadly revolute margin, (N) enlarged view of cross-section of leaf.

costa. However, our specimen has an obtuse to occasionally acute leaf apex having recurved to strongly revolute margin with more than 2–3 turns from the apex to the base.

Besides this, the present study revealed that the genus *Helicobarbula* is reported for the first time from India and the genus *Pseudocrossidium* should be excluded from the Indian checklist. This study could be of paramount importance in not only assessing the conservation status of *H. porphyreoneura* under the IUCN criteria but also of Jaigarh fort on which it is growing luxuriantly, as monuments are placed in Category III of the IUCN Protected Area Categories System. Hence if the monument is conserved then this species will automatically be conserved.

Specimens examined

India, Rajasthan: Jaipur district, on way to Jaigarh Fort, alt. ca 400 m, grows on soil-covered wall, 11 Sep 2021, P. Bansal and party s.n. (RUBL 4B); Jaigarh Fort, alt. ca 400 m, grows on wall, 11 Sep 2021, P. Bansal and party s.n. (RUBL 11B).

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Data availability statement

There are no additional data for this paper.

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