

TWO NOTEWORTHY SPECIES OF *COLOLEJEUNEA* (MARCHANTIOPHYTA: LEJEUNEACEAE) FROM MIZORAM

S. K. SINGH¹ AND MONALISA DEY²

¹*Botanical Survey of India, Eastern Regional Centre, Shillong-793003, India*

²*Botanical Survey of India, Central National Herbarium, Howrah-711 103, India*

INTRODUCTION

The genus *Cololejeunea* (Spruce) Schiffn. is the largest genus of family Lejeuneaceae, represented by about 400 hundred species in the world (Zhu, 2006; Singh & Barbhuiya, 2013) with preponderance in Tropical countries and oceanic Islands, many of them are epiphyllous. In India, the genus is represented by c. 51 species with the Eastern Himalaya (incl. North-eastern states) harbouring c. 42 species show maximum diversity (Zhu & So, 2001; Asthana & Srivastava, 2003; Das & Singh, 2009; Singh & al., 2010a; Manju & al., 2012; Dey & Singh, 2012; Singh & Barbhuiya, 2012, 2013; Asthana & Alam, 2013; Singh & Singh, 2013).

Study of recent collections by one of the authors (SKS) from different parts of Mizoram showed the occurrence of *C. epiphylla* G.Asthana & A.Shukla and *Cololejeunea gottschei* (Steph.) Mizut. in the State. Of these, while the former so far known from Karnataka only, the latter since its first discovery in Indian bryoflora from Karnataka, has also been reported from Andaman & Nicobar Islands and Assam (Asthana & Srivastava, 2003; Singh & al., 2010b; Singh and Barbhuiya, 2012). The same have been described and illustrated in detail to facilitate their easier identification. The studied specimens are deposited in Cryptogamic Section of herbarium of Botanical Survey of India, Eastern Regional Centre, Shillong (ASSAM).

TAXONOMIC DESCRIPTION

***Cololejeunea epiphylla* G.Asthana & A.Shukla, Cryptog. Bryol. 31: 218. 2010.**

(Fig. 1)

Plants light green when fresh, yellowish green in herbarium, very closely appressed to substratum; shoot 4–8 mm long, 1.5–1.8 mm wide, branching irregular. Stem oval–slightly elliptical in outline in transverse section, 47.5–62.5 × 67.5–85.0 µm, 3 cells across the diameter; cortical cells in 5–6 vertical rows, sub quadrate–polygonal, 10.0–22.5 × 10.0–22.5 µm, thin–walled; medullary cell one, polygonal, 15.0–20.0 × 20.0–22.5 µm, thin–walled. Rhizoids numerous, fasciculate, hyaline. Leaves imbricate, widely–obliquely spreading; leaf lobe ovate–oblong ovate, 0.65–0.93 mm long, 0.43–0.57 mm wide, apex rounded, margin entire, dorsal margin slightly arched, ventral margin nearly straight; marginal leaf cells rectangular–polygonal, 10.0–20.0 × 12.5–27.5 µm; median leaf cells hexagonal–polygonal, 25.0–37.5 × 17.5–30.0 µm; basal leaf cells elongated, polygonal, 37.5–57.5 × 20.0–35.0 µm; walls thin with minute–indistinct trigones, intermediate thickenings absent; surface smooth; oil–bodies not seen; leaf lobule ligulate, 0.16–0.23 mm long, 0.04–0.10 mm wide, parallel to stem, apical portion curved towards stem; hyaline papilla at apex of lobule; stylus 2–3 cells long, uniseriate. Gemmae not seen. Androecial and gynoecial branches not seen.

Habitat: Epiphyllous, growing in moist and shady condition.

Distribution: India, Eastern Himalaya, Mizoram, Western Ghats, Karnataka, (Asthana & Shukla, 2010).

Specimen examined: Mizoram, Mamit, Dampa Tiger Reserve, Teirei range, Bamboo hut area, 23°40'52" N, 92°22'41.1" E, 284 m, 23.11.2011, S.K. Singh & Party 123913.

Notes: *C. epiphylla* is characterized by imbricate, widely–obliquely spreading, ovate–oblong ovate leaves with rounded apices and entire margins, with margins devoid of any specialized or hyaline cells (Fig. 1: 1, 2, 6–11); thin walled leaf cells with minute–indistinct trigones, devoid of intermediate thickenings (Fig. 1: 11–13); ligulate leaf lobule, parallel to stem, with apical portion curved towards stem and with apical hyaline papilla (Fig. 1: 2, 6–10, 14, 15); 2–3 cells long, uniseriate stylus (Fig. 1: 16–19).

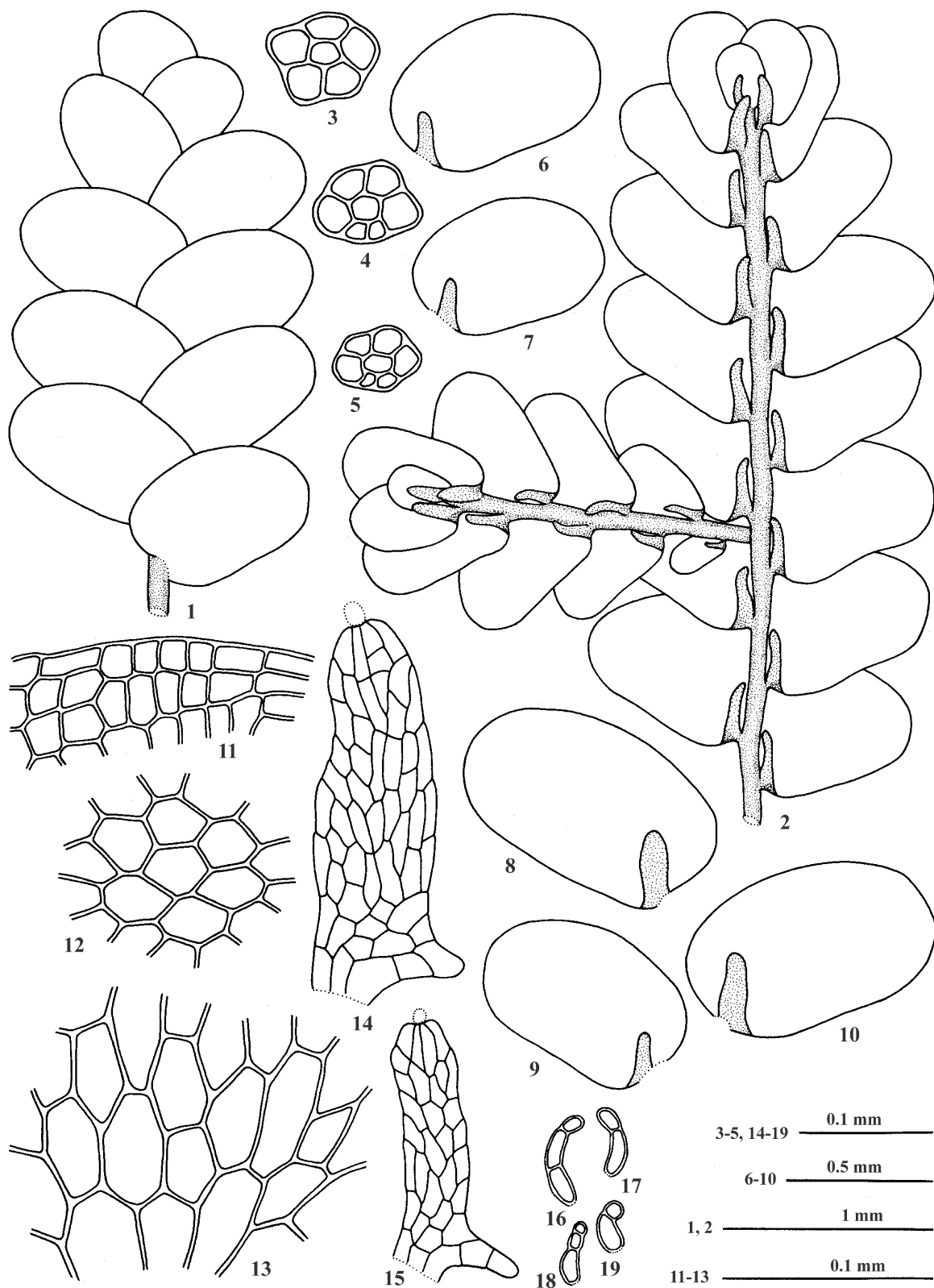


Fig. 1. : *Cololejeunea epiphylla* G. Asthana & A. Shukla : 1. A portion of plant in dorsal view; 2. The same in ventral view (rhizoids not drawn); 3-5. Transverse sections of stem; 6-10. Leaves; 11. Apical leaf cells; 12. Median leaf cells; 13. Basal leaf cells; 14, 15. Leaf lobules; 16-19. Styli. [All drawn from S.K. Singh & Party 123913 (ASSAM)]

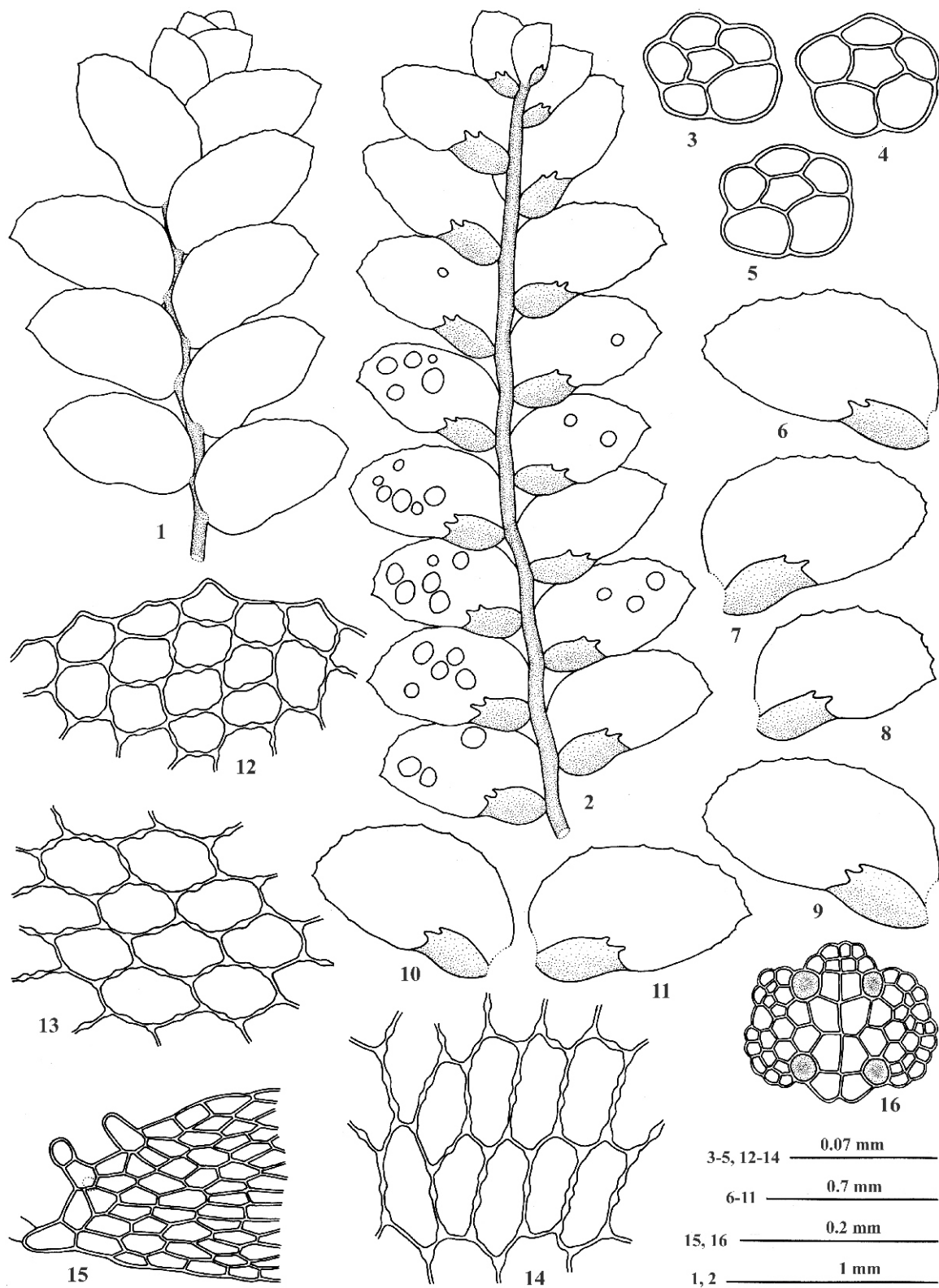


Fig. 2. : *Cololejeunea gottschei* (Steph.) Mizut. : **1.** A portion of plant in dorsal view; **2.** The same in ventral view (rhizoids not drawn); **3-5.** Transverse sections of stem; **6-11.** Leaves; **12.** Apical leaf cells; **13.** Median leaf cells; **14.** Basal leaf cells; **15.** Apex of leaf lobule; **16.** A gemma. [All drawn from S.K. Singh & Party 123904A (ASSAM)]

Cololejeunea gottschei (Steph.) Mizut., J. Hattori Bot. Lab. 28: 117. 1965. *Physocolea gottschei* Steph., sp. Hepat. 5: 894. 1916. *Cololejeunea dentifolia* Udar & G. Srivast., J. Bryol. 12: 229. 1982. **(Fig. 2)**

Plants light green when fresh, yellowish–pale brown in herbarium; shoot 3–7 mm long, 1.4–1.8 mm wide, branching irregular. Stem sub orbicular–slightly oval in outline in transverse section, $55.0\text{--}62.5 \times 65.0\text{--}72.5\ \mu\text{m}$, 3 cells across the diameter; cortical cells in 5 vertical rows, polygonal, $15.0\text{--}27.5 \times 22.5\text{--}37.5\ \mu\text{m}$, thin-walled; medullary cell one, pentagonal, $17.5\text{--}20.0 \times 22.5\text{--}27.5\ \mu\text{m}$, thin-walled. Rhizoids hyaline, fasciculate. Leaves imbricate–contiguous, widely–obliquely spreading; leaf lobe oblong, $0.70\text{--}0.95\ \text{mm}$ long, $0.43\text{--}0.56\ \text{mm}$ wide, apex apiculate, acute or rounded–obtuse, margin irregularly dentate, dorsal margin arched, ventral margin nearly straight–slightly arched; apical leaf cells rectangular–polygonal, $15.0\text{--}25.0 \times 22.5\text{--}30.0\ \mu\text{m}$; median leaf cells hexagonal, $37.5\text{--}55.0 \times 22.5\text{--}27.5\ \mu\text{m}$; basal leaf cells elongated, polygonal, $45.0\text{--}67.5 \times 17.5\text{--}25.0\ \mu\text{m}$; walls thin with medium–large trigones, intermediate nodular thickenings small, 1–3 along each side of the wall; surface smooth; oil-bodies not seen; leaf lobule inflated, $1/3$ as long as the lobe, oblong–ovate, $0.26\text{--}0.35\ \text{mm}$ long, $0.14\text{--}0.19\ \text{mm}$ wide, bidentate; first tooth 2 cells long, 1 cell wide; second tooth small, unicellular; hyaline papilla present at the inner surface of the base of first tooth; keel slightly arched, smooth; stylus unicellular. Gemmae discoid, on the ventral surface of leaf lobe, 38–62-celled, $105.0\text{--}162.5 \times 122.5\text{--}195.0\ \mu\text{m}$, with 4 adhesive cells. Androecial and gynoecial branches not seen.

Habitat: Epiphyllous, growing in moist and shady condition in association with *Caudalejeunea* sp., *Cololejeunea* spp., *Lejeunea* sp., *Leptolejeunea* sp. and *Microlejeunea* sp.

Distribution: INDIA [Eastern Himalaya (Assam, Mizoram – present study), Western Ghats (Karnataka), Andaman & Nicobar Islands (Andaman)], BANGLADESH, CAMBODIA, CHINA, MALAYSIA, NEW GUINEA, PHILIPPINES, SRI LANKA, TAIWAN, THAILAND, VIETNAM (Mizutani, 1965; Zhu & So, 2001; Asthana & Srivastava, 2003; Lai & al., 2008; Singh & al., 2010b; Wang & al., 2011; Singh & Barbhuiya, 2012).

Specimens examined: Mizoram, Mamit, Dampa Tiger Reserve, Teirei range, Bamboo hut area, $23^{\circ}40'47''\text{N}$, $92^{\circ}22'33.4''\text{E}$, 278 m, 23.11.2011, S.K. Singh & Party 123890E, 123892D, 123893F; Bamboo hut area, $23^{\circ}40'51.5''\text{N}$, $92^{\circ}22'36''\text{E}$, 275 m, 23.11.2011, S.K. Singh & Party 123904A.

Notes: *C. gottschei* is characterized by imbricate–contiguous, widely–obliquely spreading leaves with apiculate, acute or rounded–obtuse apices and irregularly dentate margins (Fig. 2: 1, 2, 6–12); thin walled leaf cells with medium–large trigones and small intermediate thickenings, 1–3 along each side of the wall (Fig. 2: 12–14); oblong–ovate, inflated, bidentate leaf lobule, $1/3$ as long as the lobe with 2 celled first tooth and small, unicellular second tooth; hyaline papilla present at the inner surface of the base of first tooth (Fig. 2: 2, 6–11, 15); 38–62-celled discoid gemmae present on the ventral surface of leaf lobe with 4 adhesive cells (Fig. 2: 16).

C. gottschei was earlier known in India from Western Ghats (Karnataka) and Andaman & Nicobar Islands (Asthana & Srivastava, 2003; Singh & al., 2010b). Recently Singh and Barbhuiya (2012) reported its occurrence from the North-eastern states (Assam). The plants from Western Ghats differ from the Himalayan plants (incl. Assam ones) of the species in having stem with 5–9 cortical and 1–2 medullary cells and leaves with rounded apices as compared to 5 cortical and 1 medullary cell and leaves with apiculate, acute or rounded–obtuse apices in the latter (see Asthana & Srivastava, 2003).

ACKNOWLEDGEMENTS

The authors are thankful to the Director, Botanical Survey of India Kolkata and Head of Office, BSI, ERC Shillong for facilities and encouragements, and financial assistance to one of us (MD) under the A.J.C. Bose Post Doctoral Fellowship programme of the BSI and to the Forest Department, Mizoram for providing logistic support during field exploration.

REFERENCES

ASTHANA, G. AND A. ALAM. 2013. *Cololejeunea clavatopapillata* Steph. – New to Asia. *Trop. Bryol.* 35: 39–42.

- ASTHANA, G. AND A. SHUKLA. 2010. *A new epiphyllous species of Cololejeunea (Lejeuneaceae) from India. Cryptog. Bryol.* 31: 217–221.
- ASTHANA, G. AND S.C. SRIVASTAVA. 2003. Indian *Cololejeunea*. A taxonomic study. *Bryophyt. Biblioth.* 60: 1–155.
- DAS, S. AND D.K. SINGH. 2009. Three new records of Liverworts for Himalayan region from Mehao Wildlife Sanctuary, Arunachal Pradesh. *Nelumbo* 51: 191–198.
- DEY, M. AND D.K. SINGH. 2012. *Epiphyllous Liverworts of Eastern Himalaya*. Botanical Survey of India, Thiruvananthapuram, 415 pp.
- LAI, M.J., R.L. ZHU AND S. CHANTANAORRAPINT. 2008. Liverworts and hornworts of Thailand: an updated checklist and bryofloristic accounts. *Ann. Bot. Fenn.* 45: 321–341.
- MANJU, C.N., T. PÓCS, K.P. RAJESH AND R. PRAKASHKUMAR. 2012. Lejeuneaceae (Marchantiophyta) of the Western Ghats, India. *Acta Biologica Plantarum Agriensis* 2: 127–147.
- MIZUTANI, M. 1965. Studies of little known Asiatic species of hepaticae in the Stephani herbarium 2. On some little known Southeast Asiatic species of the genus *Cololejeunea*. *J. Hattori Bot. Lab.* 28: 107–121.
- SINGH, D., M. DEY AND D.K. SINGH. 2010a. A Synoptic Flora of Liverworts and Hornworts of Manipur. *Nelumbo* 52: 9–52.
- SINGH, D., M. DEY AND G.K. UPADHYAY. 2010b. A preliminary survey of Hepaticae of Little Andaman Island. *Nelumbo* 52: 125–130.
- SINGH, D. AND D.K. SINGH. 2013. Some new and noteworthy records of Family Lejeuneaceae (Marchantiophyta) from Sikkim, India. *Nelumbo* 55: 153–165.
- SINGH, S.K. AND H.A. BARBHUIYA. 2012. A compendium to Marchantiophyta and Anthocerotophyta of Assam, India. *Arch. Bryol.* 149: 1–30.
- SINGH, S.K. AND H.A. BARBHUIYA. 2013. Contributions to the Hepaticae and Anthocerotae of Mizoram VI. *Cololejeunea chenii* new to India. *Acta Bot. Hung.* 55: 135–139.
- WANG, J., LAI, M.J. AND R.L. ZHU. 2011. Liverworts and hornworts of Taiwan: an updated checklist and floristic accounts. *Ann. Bot. Fenn.* 48: 369–395.
- ZHU, R.L. 2006. *Cololejeunea dauphinii* nom. nov. for *Cololejeunea tixieri* M. Morales et G. Dauphin from Panama (Jungermanniopsida: Lejeuneaceae). *J. Bryol.* 28: 277.
- ZHU, R.L. AND M.L. SO. 2001. Epiphyllous liverworts of China. *Beih. Nova Hedwigia* 121: 1–418.