

A NEW *LOPHOLEJEUNEA* (SPRUCE) SCHIFFN. (HEPATICAEE: LEJEUNEACEAE) FROM INDIA

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The genus *Lopholejeunea* (Spruce) Schiffn. is globally represented by 30 species referable to three subgenera viz., subgenus *Pholanthus* B.M. Thiers & Gradst. (with a single species confined to Australia and New Zealand), subgenus *Pteryganthus* B.M. Thiers (with four species confined to East Africa) and subgenus *Lopholejeunea* (with 25 species distributed all over the tropics, 17 of which occur in Asia) (Zhu & Gradstein, 2005). In India Awasthi & al. (2000) and Singh & Nath (2004) recorded 11 species and two varieties distributed in Eastern Himalaya (8 taxa), Western Ghats (7 taxa), Western Himalaya, Central India and the Andaman & Nicobar Islands (one species each). However, Zhu and Gradstein (2005), who further grouped the Asiatic species of the subgenus *Lopholejeunea* into sections *Lopholejeunea* (with 9 species characterized by the apex of leaf lobule attached to the leaf lobe across 2 - 8 cells) and *Eulophae* Verd. (with 8 species characterized by the leaf lobule attached to the leaf lobe across a single cell), recognised only 5 species from the country viz., *L. applanata* (Reinw. & al.) Schiffn., *L. eulopha* (Taylor) Schiffn. [= *L. nicobarica* Steph.] and *L. nigricans* (Lindenb.) Schiffn. [= *L. abortiva* (Mitt.) Steph. var. *abortiva*, *L. abortiva* var. *doliiformis* U.S. Awasthi & al., *L. javanica* (Nees) Schiffn., *L. kashyapii* U.S. Awasthi & al., *L. sikkimensis* Steph. var. *dentata* U.S. Awasthi & al., *L. sikkimensis* Steph. var. *sikkimensis*] belonging to sect. *Eulophae*, and *L. recurvata* Mizut. and *L. subfusca* (Nees) Steph. [= *L. nilgiriensis* U.S. Awasthi & al. and *L. indica* Udar & U.S. Awasthi] belonging to sect. *Lopholejeunea*. Later S.K. Singh & D.K. Singh (2006) described a new variety, *L. sikkimensis* var. *tenuicostata* Sushil K. Singh & D.K. Singh from the Western Himalaya, whereas Singh and Nath (2006) described *L. nongstoinii* A.P. Singh & V. Nath from the Eastern Himalaya.

During recent studies on the epiphyllous liverworts of Eastern Himalaya, an interesting population of the genus, referable to sect. *Lopholejeunea*, was observed in West Siang district of Arunachal Pradesh, which on the basis of comparative evaluation of morphological characters of species hitherto known under this section merit the status of a new species.

DESCRIPTION

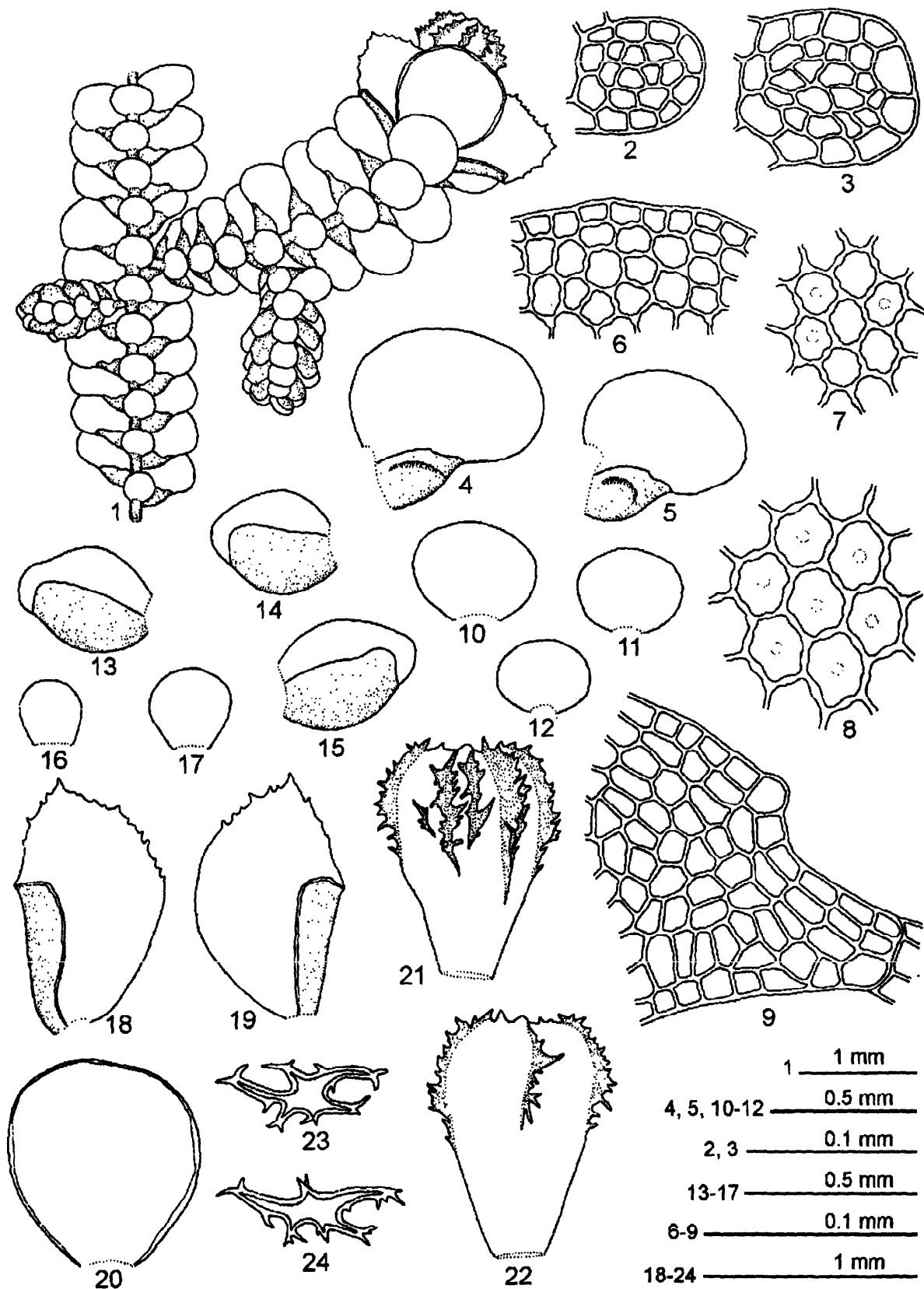
***Lopholejeunea udarii* M. Dey & D.K. Singh, sp. nov.**

(Figs. 1 - 24)

Lopholejeunea soae R.L. Zhu & Gradst. similes, sed caulibus in diametrum 82.5 - 107.5 × 65.0 - 87.5 µm; medullosa-cellulis caulicis verticaliter 8 - 16-seriatis; hemispherico-protruberationibus in basaliocellulis et in aliquot mediano-cellulis praesentibus; bracteolis femineas magnioribus, 0.85 - 1.0 mm longis, 0.80 - 0.95 mm latis; perianthiis magnioribus, 1.10 - 1.30 mm longis, 0.75 - 0.90 mm latis, obovatis, 6-carinatis, intra carinas paucidentatis differt.

Typus: India, Eastern Himalaya, Arunachal Pradesh, West Siang district, on way to Dupu from Rungo (Naying), c. 750 m, 29. 12. 1984, D.K. Singh 994D/1984 (Holo : ASSAM).

Plants dark brown - blackish brown in herbarium; shoot 6.0 - 13.0 mm long, 1.0 - 1.4 mm wide, branching 'Lejeunea' type, irregular, throughout the plant. Stem oval - rectangular in outline in transverse section, 82.5 - 107.5 × 65.0 - 87.5 µm, 5 - 6 cells across the diameter; cortical cells in 10 - 13 vertical rows, rectangular - polygonal, 20.0 - 35.0 × 15.0 - 25.0 µm, slightly thick-walled; medullary cells in 8 - 16 vertical rows, polygonal, 12.5 - 22.5 × 10.0 - 15.0 µm, slightly thick-walled with small trigones. Leaves imbricate, widely - obliquely spreading; leaf lobe ovate, 0.58 - 0.72 mm long, 0.45 - 0.60 mm wide, apex rounded, margin entire, dorsal



Figs. 1. (1 - 24) *Lopholejeunea udarii* M.Dey & D.K.Singh. : 1. A portion of plant bearing androecial and gynoecial branches in ventral view (rhizoids not drawn); 2 & 3. Transverse sections of stem; 4 & 5. Leaves; 6. Apical leaf cells; 7. Median leaf cells; 8. Basal leaf cells; 9. Apex of leaf lobule; 10 - 12. Underleaves; 13 - 15. Male bracts; 16 & 17. Male bracteoles; 18 & 19. Female bracts; 20. A female bracteole; 21. A perianth in ventral view; 22. The same in dorsal view; 23 & 24. Transverse sections of perianth.

margin strongly arched, ventral margin slightly arched; apical leaf cells sub quadrate rectangular, $7.5 - 12.5 \times 10.0 - 15.0 \mu\text{m}$; median leaf cells hexagonal, $15.0 - 25.0 \times 15.0 - 22.5 \mu\text{m}$; basal leaf cells hexagonal - polygonal, $27.5 - 40.0 \times 17.5 - 30.0 \mu\text{m}$; walls slightly thick with distinct trigones, intermediate thickenings prominent; cuticle smooth or with dorsal protrusions; dorsal protrusions hemispherical, $5.0 - 7.5 \mu\text{m}$ in diameter, present only in basal and few median cells, absent in marginal and majority of median cells; oil-bodies not seen; leaf lobule inflated, $2/5 - 1/2$ as long as the leaf lobe, ovate rectangular, $0.27 - 0.33 \text{ mm}$ long, $0.16 - 0.21 \text{ mm}$ wide; apex attached to leaf lobe across (2-) 3 (- 4) cells, apical tooth unicellular, indistinct; keel arched, smooth. Underleaves contiguous - distant, 2.5 - 3.5 times as wide as the stem, sub orbicular - reniform, $0.24 - 0.35 \text{ mm}$ long, $0.30 - 0.41 \text{ mm}$ wide, usually slightly wider than long, apex rounded, margin entire. Rhizoids few, fasciculate near the base of underleaves.

Monoecious. Androecia terminal on short lateral branches, $0.9 - 1.4 \text{ mm}$ long, $0.45 - 0.75 \text{ mm}$ wide; bracts in 4 - 6 pairs, densely imbricate; bract lobe ovate - oblong ovate, $0.36 - 0.45 \text{ mm}$ long, $0.29 - 0.34 \text{ mm}$ wide, apex obtuse, margin entire; bract lobule strongly inflated, $3/4 - 4/5$ as long as the bract lobe; bracteoles present throughout the androecium, sub orbicular - obovate, $0.20 - 0.24 \text{ mm}$ long, $0.18 - 0.23 \text{ mm}$ wide, apex rounded, margin entire. Gynoecia terminal on lateral branches without sub floral innovations; bract lobe oblong - obovate, $0.90 - 1.10 \text{ mm}$ long, $0.62 - 0.72 \text{ mm}$ wide, apex acute - apiculate, margin dentate; bract lobule sub triangular - rectangular, about $3/5$ as long as the bract lobe, margin entire, revolute; bracteole sub orbicular - obovate, $0.85 - 1.0 \text{ mm}$ long, $0.80 - 0.95 \text{ mm}$ wide, apex rounded, margin entire, revoluted; perianth obovate, $1.10 - 1.30 \text{ mm}$ long, $0.75 - 0.90 \text{ mm}$ wide; keels 6 (2 lateral, 3 ventral, 1 dorsal), extending from apex to $1/2 - 3/5$ of perianth length, strongly laciniate - dentate; surface with few dentitions in between keels; beak 2 - 3 cells long; mature sporophyte not seen.

Habitat & Ecology: Epiphyllous, growing on dicot leaves in moist and shady places, in association with *Drepanolejeunea fleischeri*, *Lejeunea punctiformis* and *L. tuberculosa*.

Etymology: The species has been named after late Prof. Ram Udar, FNA for his invaluable contributions to Hepaticology in India.

Other specimen examined: *Lopholejeunea soae* R.L.Zhu & Gradst. China: Zhejiang, Fengyangshan Nature Reserve, Shibaku, 1430 m, 01. 11. 1996, R.L.Zhu 9611198 (Holotype: HSNU).

DISCUSSION

Lopholejeunea udarii with the apex of leaf lobule attached to leaf lobe across (2 -) 3 (- 4) cells (Fig. 1: 9), is easily referable to sect. *Lopholejeunea*. The species is characterized by 5 - 6 cells thick stem with 10 - 13 vertical rows of slightly thick-walled cortical cells and 8 - 16 vertical rows of slightly thick-walled medullary cells with small trigones (Fig. 1: 2, 3); ovate leaf lobes with rounded apices and entire margins and strongly arched dorsal margins (Fig. 1: 4, 5); slightly thick-walled leaf cells with distinct trigones and prominent intermediate thickenings (Fig. 1: 6 - 8); leaf cuticle with hemispherical dorsal protrusions present only in basal and few median cells (Fig. 1: 7, 8); sub orbicular reniform underleaves with rounded apices and entire margins (Fig. 1: 1, 10 - 12); terminal androecia with 4 - 6 pairs of bracts and bracteoles present throughout the androecium (Fig. 1: 1); oblong - obovate female bract lobes with acute - apiculate apices and dentate margins and bract lobules with entire, revolute margins (Fig. 1: 1, 18, 19); sub orbicular obovate bracteoles with rounded apices and entire, revolute margins (Fig. 1: 1, 20) and obovate perianth with 6 strongly laciniate-dentate keels, with few dentitions present in between keels (Fig. 1: 21 - 24).

Among the sect. *Lopholejeunea*, *L. udarii* resembles *L. soae* R.L.Zhu & Gradst. in the size of leaf lobe and lobule and the nature of their attachment; size and shape of underleaves, monoecism and the number of male bracts per androecial branch. However, the latter differs from the former in having much robust stem, $110 - 150 \mu\text{m}$ in diameter with 17 - 28 medullary cells; leaf with smooth cuticle throughout; ovate female bracts with obtuse - rounded apices and usually entire - slightly dentate margins; oblong or obcuneate female bract lobule about $2/3$ as long as the bract lobe with entire, recurved margin; smaller, $0.65 - 0.80 \times 0.50 - 0.65 \text{ mm}$ female bracteoles with entire-emarginate apices; smaller, pyriform perianth $0.8 - 0.9 \text{ mm}$ long, $0.5 - 0.62 \text{ mm}$ wide with 5 laciniate - weakly dentate keels, devoid of dentitions in between the keels.

L. udarii, with smooth to mamilliose cuticle; $0.90 - 1.10 \times 0.62 - 0.72 \text{ mm}$ female bracts; $0.85 - 1.0 \times 0.80 - 0.95 \text{ mm}$ female bracteoles and $1.10 - 1.30 \text{ mm}$ long, $0.75 - 0.90 \text{ mm}$ wide perianth, also resembles *L.*

recurvata. However, it can be easily distinguished from the latter which, like *L. soae*, has much robust stem (120 - 170 µm in diameter); leaves with somewhat incurved apical and ventral margins and recurved dorsal base; smaller leaf lobule (1/3 as long as the lobe); much wider, imbricate underleaves with strongly recurved margins and 4 - 5-keeled perianth often without a dorsal keel (see also Zhu & Gradstein, 2005).

ACKNOWLEDGEMENTS

The authors are thankful to the Chief Conservator of Forests, Arunachal Pradesh for facilitating the exploration work, Dr. V.J. Nair, Coordinator, All India Coordinated Project on Taxonomy (Grasses & Bamboos), Southern Regional Centre, BSI, Coimbatore for Latin rendering of diagnosis and to the Ministry of Environment and Forests, New Delhi for financial assistance. One of us (MD) is also grateful to the Director, BSI for financial support under 'Flora of India' project during the tenure of which the present work was completed.

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