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CHEILOLEJEUNEA VITTATA (STEPH. *EX* G. HOFFM.) R.M. SCHUST. & KACHROO (LEJEUNEACEAE: MARCHANTIOPHYTA) – A NEWLY RECORDED SPECIES FROM INDIA

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Abstract

Cheilolejeunea vittata (Steph. *ex* G. Hoffm.) R.M. Schust. & Kachroo is reported and described for the first time in Indian bryoflora from Manipur.

Introduction

Lejeuneaceae is the largest family of the liverworts with more than 1000 species in the world belonging to 68 genera. The genus *Cheilolejeunea* (Spruce) Steph. is one of the largest genera under the family Lejeuneaceae, contains c. 80-100 species, pantropical in distribution (Thiers, 1997; Ye *et al.*, 2015) belonging to nine sections, namely *Anomalolejeunea* (Schiffn.) W.Ye, Gradst. & R.L. Zhu, *Cheilolejeunea*, *Cyrtolejeunea* W.Ye, Gradst. & R.L. Zhu, *Euosmolejeunea* W.Ye, Gradst. & R.L. Zhu, *Leucolejeunea* W.Ye, Gradst. & R.L. Zhu, *Paroicae* W.Ye, Gradst. & R.L. Zhu, *Omphalanthus* W.Ye, Gradst. & R.L. Zhu, *Strepsilejeunea* W.Ye, Gradst. & R. L . Zhu and *Xenolejeunea* B. Thiers. However, in recently published "World checklist of hornworts and liverworts", the number varies to 169 species (incl. 10 uncertain species) belonging to four subgenera viz., subg. *Cheilolejeunea*, *Euosmolejeunea* (Spruce) Kachroo, *Renilejeunea* R.M.Schust. and *Xenolejeunea* Kachroo & R. M. Schust. (Söderström *et al.,* 2016).

The genus is characterized by 1) pale green to yellowish green colour, 2) thin stems with a 2(-4) cells wide ventral merophyte and enlarged epidermis cells, 3) leaf lobules with 1(-2) teeth and a hyaline papilla present distal side of the second tooth, 4) leaf cells with 1 – 3(-5) usually large, coarsely segmented oil-bodies, 5) underleaves usually bifid rarely entire, 6) gynoecia without or with 1 – 2 lejeuneoid or pycnolejeuneoid innovations, 7) perianth with 3 – 5 smooth keels, rarely pluriplicate or without plicae (Zhu *et al*., 2002; Ye *et al*., 2015).

In India, the genus represented by 21 species (Singh *et al.*, 2016) with prevalence in eastern Himalayan bryo-geographical territory (15 species) followed by Western Ghats (12 species). Andaman and Nicobar territory is represented by five species and Central India by 2 species, while four bryo-geographical territories have no representations of the genus. Following Söderström *et al.* (2016) subgeneric concept, the Indian species belong to three subgenera *Cheilolejeunea* (6 species), *Euosmolejeunea* (11 species), and *Xenolejeunea* (4 species). Three species namely, *Cheilolejeunea ghatensis* G. Asthana, S.C. Srivast. & A.K. Asthana, *Cheilolejeunea orientalis* (Gottsche) Mizut. and *Cheilolejeunea udarii* G. Asthana, S.C. Srivast. & A.K. Asthana are endemic to India.

Materials and Methods

Plant materials were collected from the forest along Pung-Pung river of Chandel district, Manipur, North-east India. The plants were growing as epiphyte in moist places. Critical morpho-

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taxonomic investigation of the specimens was performed under Microscopes (Binocular Olympus SZ 51 Stereo zoom microscope & Trinocular Olympus CX 41 biological microscope). The specimens were identified based on the literature. A brief taxonomic description and line drawing illustration is provided. Nomenclature follows Söderström *et al.* (2016).

Table 1. Morphological and anatomical comparison of *Cheilolejeunea trapezia Cheilolejeunea ceylanica* and *Cheilolejeunea vittata.*

Characters	*Cheilolejeunea trapezia* (Dey & Singh, 2012)	*Cheilolejeunea ceylanica* (Zhu & So, 2001; Mizutani, 1980)	*Cheilolejeunea vittata* (our plant)
Plant length & width	18-25 mm long & 1.5-1.9 mm wide	5-15 mm long& 0.7-1.3 mm wide	8-12 mm long; 0.9 – 1.4 mm wide
No of cortical & medullary cells in stem	cort. 9-12 & med. 15-18	cort. 7 & med. 9-13	cort. 7 (-8) & med. 9-11
Ventral merophyte	2-4 cells wide	2 cells wide	2 cells wide
Leaf shape & Size	ovate, 0.8-1.1 mm long & 0.6- 0.75 mm wide	triangular-ovate , 0.4-0.6 mm long & 0.3-0.4 mm wide	ovate, 0.5- 0.7 mm long, 0.4 -0.5 mm wide
Vitta in leaf lobe	absent	often distinct, 3-7 cells long & 3-5 cells wide	distinct, 12 -16 cells long & 6-11 cells wide
Leaf lobule	3/5-2/3 of leaf length	3/5-2/3 of leaf length	(2/5-) 1/2 of leaf length
Second tooth of leaf lobule	1-4 (-5) cells long, erect or slightly curved, as long as the apical portion of leaf lobule near lobe attachment	4-7 cells long, usually curved at apex of leaf, as long as the apical portion of leaf lobule near lobe attachment	1-4 cells long, erect or occasionally slightly curved, usually shorter than the apical portion of leaf lobule near lobe attachment

Taxonomic description

Cheilolejeunea vittata (Steph. *ex* G. Hoffm.) R.M. Schust. & Kachroo, J. Linn. Soc. Bot. 56: 509. 1961; Mizutani, J. Hattori Bot. Lab. 47: 321. 1980. *Pycnolejeunea vittata* Steph. *ex* Hoffm., Ann. Bryol. 8: 115. 1935.

Plants small, pale green; shoots 8 – 12 mm long, 0.9 – 1.4 mm wide; branching irregulary, *Lejeunea*-type; cross-section of stem subglobose – oval in outline, 78.6 – 105.0 × 66.5 – 80.0 µm, 5 – 6 cells across the diameter; cortical cells in a layer of 7 (–8) cells, subquadrate – rectangular, 15.0 – 32.5 × 10.0 – 20.0 µm, thick-walled, medullary cells 9 – 11, polygonal, 10.0 – 22.5 × 7.5 – 12.5 µm, thick-walled; ventral merophytes 2 cells wide. Leaves imbricate, widely spreading; leaf lobes ovate, 0.51 – 0.70 mm long, 0.41 – 0.52 mm wide, antical margin arched, postical margin straight or sometimes curved, apex rounded, margin entire; marginal leaf cells towards apex small, subquadrate – quadrate, 7.5 – 12.5 × 5.0 – 7.5 µm; median leaf cells pentagonal – hexagonal, 15.0 – 30.0 × 10.0 – 22.5 µm; basal leaf cells elongated hexagonal – polygonal, 17.5 – 45.0 × 10.0 – 30.0 µm; cells thin or slightly thick-walled, with nodular trigones and intermediate thickenings prominent in median and basal leaf cells; vitta about 3/4 the length and 2/5 – 3/5 the

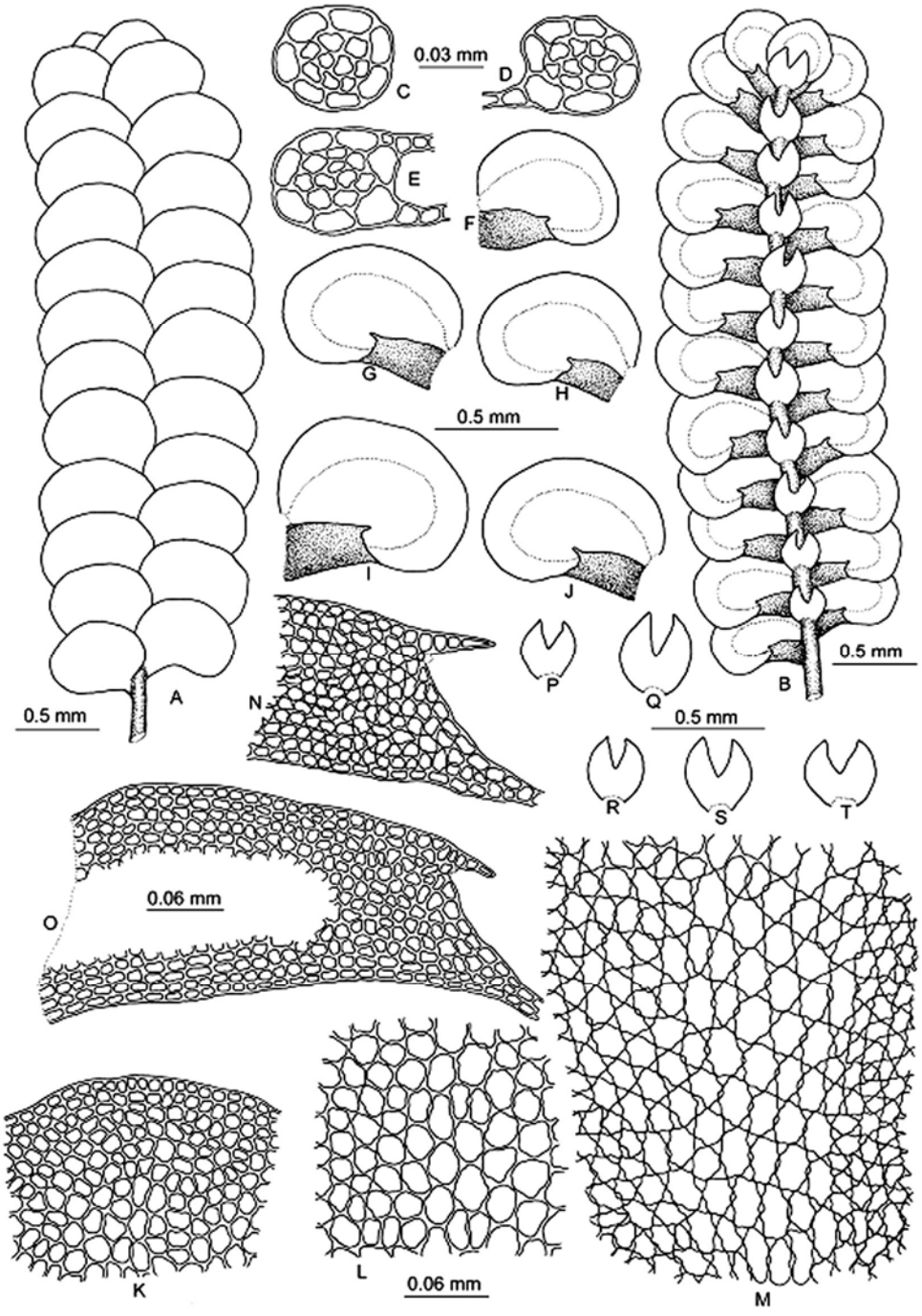

Fig. 1. **Cheilolejeunea vittata** (Steph. *ex* G. Hoffm.) R.M. Schust. & Kachroo: A. A portion of plant in dorsal view; B. The same in ventral view; C – E. Cross-sections of stem; F – J. Leaves; K. Marginal leaf cells; L. Median leaf cells; M. Basal leaf cells; N, O. Leaf lobules; P – T. Underleaves.

width of the leaf lobe, 12 – 16 cells long, 6 – 11 cells wide; cuticle slightly mammillose; oil-bodies not observed; leaf lobules inflated, rectangular, 1/2 (-2/5) as long as the lobe, 0.25 – 0.35 mm long, 0.15 – 0.18 mm wide, apex truncate, first tooth obsolete, second tooth elongated, 1 (-2) – 4 cells long in a row, hyaline papilla small, present at the distal side of second tooth. Under leaves distant, suborbicular, 2 – 3 times as wide as the stem, 0.20 – 0.33 mm long, 0.18 – 0.31 mm wide, bilobed to 3/5 of its length, lobes triangular, apex acute, sinus "V"-shaped, margin entire. Androecial and gynoecial branches not observed.

Habitat: Epiphytic, growing in moist and shady places.

Distribution: India [Manipur – present study], China (Zhu & So, 1999; Zhu *et al.,* 2002), Indonesia (Söderström *et al.,* 2010), Malaysia (Chuah-Petiot, 2011), Papua New Guinea (Grolle & Piippo 1984), Sri Lanka (Rubasinghe & Long, 2014), Thailand (Lai *et al.*, 2008; Pócs & Podani, 2015), Philippines (Mizutani, 1980), Australia (Thiers, 1992, 1997).

Specimen examined: Manipur, Chandel district, Pung-Pung river, 24°15´36.3´´N, 94° 17´ 37.2´´E, 220 m, 22.06.2014, *Shashi Kumar*, TSLI – 194, 195, 215 (ASSAM).

Notes: Cheilolejeunea vittata (belongs to subg. *Xenolejeunea)* is characterized by its leaf lobe cells forming a vitta (about 3/4 the length and 2/5 – 3/5 the width of leaf lobe, 12 – 16 cells long, 6 – 11 cells wide) and with sub-nodular – nodular or bulging trigones and few, small – prominent intermediate thickenings; leaf lobules rectangular, (2/5-) 1/2 as long as lobe with elongated 1 – 4 cells long, erect or slightly curved apical tooth which usually shorter than the apical portion of leaf lobule. However, it shows affinity with *Cheilolejeunea ceylanica* in having similar habit of plants, similar arrangement of leaves, robust leaf lobule with elongated apical tooth and under leaf structure, but the latter differs from the former in having comparatively larger leaf lobule 2/3 as long of the leaf lobe length with very long apical tooth which is 5 – 7 cells long and curved toward apex, usually as long as the apical portion of leaf lobule, leaf lobes usually triangular-ovate with elongate median and basal cells often forming a distinct (or indistinct) vitta (extending to the middle portion) vitta 3 – 7 cells long (Zhu & So, 2001). It also shows similarity with *Cheilolejeunea trapezia* in large leaf lobule, and lobular tooth (1 – 4 cells long, erect or occasionally slightly curved), but latter differ from the former in its leaf cells which is not forming vita and ventral merophyte 2 – 4 cells wide (Zhu & So, 2001; see also table 1).

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