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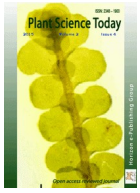

Research Communication

Cololejeunea microscopica var. *exigua* (A. Evans) Pócs: new to Asia

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Abstract

Cololejeunea microscopica var. *exigua* (A. Evans) Pócs has been discovered from Kodaikanal, Tamil Nadu, South India, which is a new record for the country as well as for Asia showing extended distribution of the taxon from Europe, America and Africa to Asia.

Keywords
Cololejeunea; *Aphanolejeunea*; new record; India; Asia

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Introduction

During a survey of bryophyte collection from Kodaikanal (Palni hills), Tamil Nadu, South India, an interesting tiny leafy liverwort was identified. On critical investigation and comparison with known species, it was identified as *Cololejeunea microscopica* var. *exigua* (A. Evans) Pócs which belongs to the subgenus *Aphanolejeunea* (Evans) Benedix of the genus *Cololejeunea* (Spruce) Schiffn. (Lejeuneaceae). A thorough review proved it to be a new continental record of the Liverwort (Evans, 1911; Pócs, 2009 in Gradstein and Ilkiu-Borges 2009; Pócs and Bernecker, 2009). The species was previously known from Europe, America and Africa (Pócs and Bernecker, 2009). The discovery of this taxon from India constitutes a new liverwort record for the country (India) as well as for the continent (Asia).

Earlier, Evans (1911) segregated the genus *Aphanolejeunea* (A. Evans) from *Cololejeunea* and instituted the taxon *Aphanolejeunea exigua* A. Evans. But the recent molecular – phylogenetic studies revealed that *Aphanolejeunea* cannot be separated from *Cololejeunea* at generic rank (Ahonen 2004; Wilson *et al.*, 2006; Gradestein *et al.*, 2006; Pócs, 2009 in Gradstein and Ilkiu-Borges 2009; Pócs and Bernecker, 2009) as earlier considered by Benedix (1953), Mizutani (1961, 1996), Stotler and Crandall-Stotler (1977), Tixier (1979) and Asthana and Srivastava (2003). Now all the known species of the genus *Aphanolejeunea* have been transferred under the genus *Cololejeunea* and thus *Aphanolejeunea exigua* A. Evans has also been treated as *Cololejeunea microscopica* var. *exigua* (A. Evans) Pócs (Pócs, 2009 in Gradstein and Ilkiu-Borges 2009; Pócs and Bernecker, 2009, Söderström *et al.*, 2012).

Materials and Methods

The plants were collected from Coasan Road, Kodaikanal (Palni Hills) South India by the authors themselves in the month of February 2011 and have been deposited in Lucknow University Herbarium (LWU). The plants were critically examined under Stereoscopic Zoom Binocular Microscope (Carl Zeiss, M140, Germany) and Compound Microscope (Olympus OIC 72653). The line drawing illustrations were made with the help of Camera Lucida.

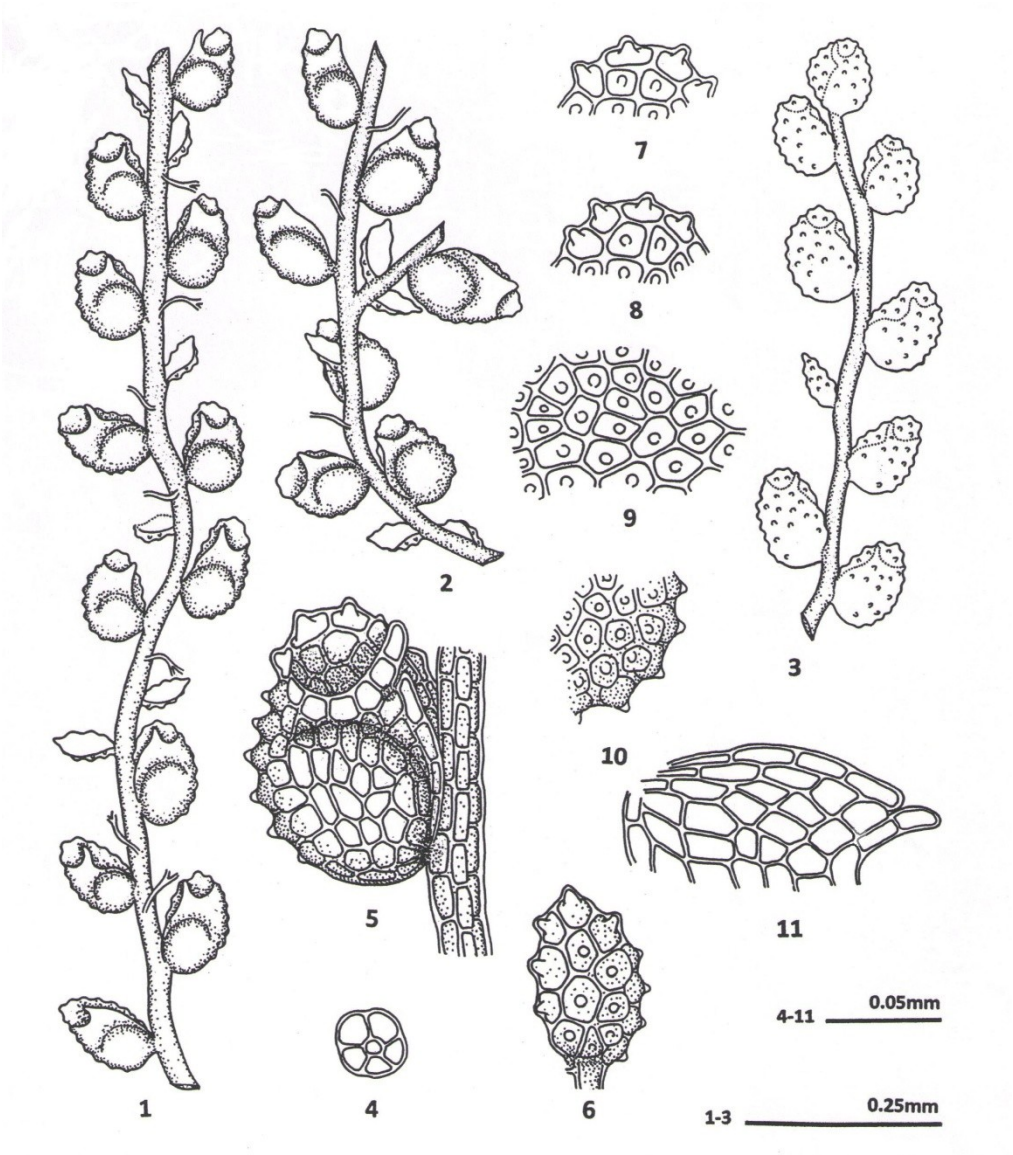

Fig. 1. *Cololejeunea microscopica* var. *exigua* (A. Evans) Pócs. 1,2. Portion of plants (ventral view). 3. A portion of plant (dorsal view). 4. Transverse section of stem. 5. Fully developed leaf showing inflated leaf-lobule, teeth and hyaline papilla (ventral view). 6. Reduced leaf (dorsal view). 7,8. Apical leaf-cells. 9. Median leaf-cells. 10. Basal marginal leaf cells along keel. 11. A portion of lobule showing teeth. (All figures drawn from 21293/11 (LWU).

Taxonomic Description:

***Cololejeunea microscopica* (Taylor) Schiffn. var. *exigua* (A. Evans) Pócs,** Memoirs of the New York Botanical Garden 76(4): 73, 2009 (Fig 1-11).

Basionym: *Aphanolejeunea exigua* A. Evans, Bulletin of the Torrey Botanical Club 38: 273, 1911.

Aphanolejeunea microscopica (Taylor) A. Evans var. *exigua* (A. Evans) Bernecker & Pócs (Pócs, 2009 in Gradstein & Ilkiu-Borges 2009).

Plants prostrate, delicate, fragile, green to whitish green, extremely small, 2-3 mm long, 0.15-0.30 mm wide with leaves, branches without collar. Cross-section of the stem 18-30 µm in diameter with five cortical and single medullary cell. Leaves dimorphic, distant, alternate, obliquely spreading, narrowly attached and not appressed to the substratum; leaf-lobes of the fully developed leaves ovate, arched along the keel near the base, dorsal surface papillose due to projecting cells, margin of the lobe crenulate and the keel roughened due to conical projections, 88-171 µm long (10-13 cells) and 70-149 µm wide (8-10 cells), apex either subacute due to the presence of single projecting cell at the tip of the lobe or obtuse due to the presence of two projecting cells, leaf-cells angular, quadrate to rectangular, thin walled, without trigones and intermediate nodular thickenings, 11-18 x 7-11 µm, cells dorsally elevated due to single conical projection, papillae 3-11 x 3-7 µm, ocelli absent; leaf-lobules of fully developed leaves ovate, inflated, 2/3 to 4/5 of the lobe length, first tooth usually two celled, slightly projecting and falcate while the second tooth single celled and slightly covered by the first tooth, hyaline papilla

present at the base of first tooth; reduced leaves few, ligulate or diamond shaped, with dorsal papillosity, apex often acute due to the presence of single projecting cell, 45-82 µm long (4 to 6 cells) and 18-48 µm wide (3-4 cells), elobulate. Rhizoids few, scattered on the ventral surface of the stem. Plants sterile.

***Habitat*:** Corticolous, found growing on the surface of the bark of angiospermic tree admixed with other bryophyte species such as *Cololejeunea pseudofloccosa* (Horik.) Benedix, *Drepanolejeunea ternatensis* var. *lancispina* Herz., *Metzgeria* sp. and some mosses.

Type Locality: Puerto Rico (America).

***Range*:** Europe, America, Africa (Evans, 1911; Pócs and Bernecker, 2009), Asia (India).

***Distribution in India*:** South India: Tamil Nadu-Palni Hills.

***Specimen examined*:** South India: Tamil Nadu - Palni hills (Kodaikanal) - On Coasan Road, altitude ca. 2310 m a.s.l., G. Asthana & Party, 14 February 2011, 21293/11(LWU).

Discussion

Cololejeunea microscopica var. *exigua* (A. Evans) Pócs is a unique and interesting species. Being very small in size, the plants were first overlooked but after a careful examination of the dry herbarium specimen, they were recognized due to their habit and fragile nature of the plants. The leaves are characteristic being dimorphic having normal inflated lobuled leaves and reduced elobulate leaves (Figs. 1-3). The leaves are not appressed to the substratum.

Cololejeunea microscopica var. *exigua* (A. Evans) Pócs, shows somewhat resemblance with *Cololejeunea grossepapillosa* (Horik.) Pócs. in having small sized plants, distantly arranged leaves and presence of dorsal papillosity on the leaf cells. But these two taxa are quite distinct in having dimorphic leaves (i.e. Fully developed leaves with inflated lobules and reduced leaves which are almost elobulate) in *Cololejeunea microscopica* var. *exigua* while in *Cololejeunea grossepapillosa* (Horik.) Pócs., the dimorphic leaves are not reported (Zhu and So, 2001; Dey and Singh, 2012).

Cololejeunea microscopica var. *exigua* shows some similarities with *Cololejeunea truncatifolia* (Horik.) Mizutani in having small size of plant, distantly arranged dimorphic leaves and dorsal papillosity on the leaf cells. *Cololejeunea microscopica* var. *exigua* distinctly differs in having ovate leaves while they are elongated, elliptical in *Cololejeunea truncatifolia* (Zhu and So, 2001; Asthana and Srivastava, 2003).

Cololejeunea microscopica var. *exigua* may also be confused with *Cololejeunea papillosa* (Goebel) Mizutani. Both the species are more or less similar in appearance and dimorphic nature of leaves. But these two taxa can be easily differentiated as in *Cololejeunea microscopica* var. *exigua* developed leaves are frequent and the reduced leaves are few, ligulate or diamond shaped, 4-6 cells long and 3-4 cells wide (Figs. 1-3,5,6) while in *Cololejeunea papillosa* fully developed leaves are rare and reduced leaves are frequent, narrowly linear or ribbon like, 3-10 cells long and 2-4 (6) cells wide. Besides, the apex of the leaf lobe in *Cololejeunea microscopica* var. *exigua* is subacute to obtuse while in *Cololejeunea papillosa* the leaf lobe apex is usually rounded to truncate. The papillosity (conical projections) is more prominent along the keel in *Cololejeunea microscopica* var. *exigua* (Figs. 1-3,5) in comparison to *Cololejeunea papillosa* (Pócs, 2009 in Gradstein & Ilkiu-Borges, 2009 & Fig. 43: A-E on page 76).

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References

Ahonen, I. 2004. Molecular phylogeny of the liverwort order Porellales (Marchantiophyta, Jungermanniopsida. In: B. Goffinet, V. Hollowell & R. Magill (eds), *Molecular Systematics of Bryophytes*, pp.168-188, Missouri Botanic Garden Press, St Louis.

Asthana, G. and S. C. Srivastava. 2003. Indian *Cololejeunea*. (A taxonomic study). *Bryophyt Biblioth* 60: 1-155.

Bendix, E. H. 1953. Indomalayische Cololejeuneen. Eine Revision tropischer Lebermoose. *Feddes Repert Beih.* 134: 1-88.

Dey, M. and D. K. Singh. 2012. *Epiphyllous liverworts of Eastern Himalaya.* Botanical Survey of India, Kolkata. pp. 1-415.

Evans, A. W. 1911. Hepaticae of Puerto Rico X. *Cololejeunea, Leptocolea*, and *Aphanolejeunea. Bull Torrey Bot Club* 38: 251-286.

Gradstein, S.R. and A. L. Ilkiu-Borges, 2009. Guide to the Plants of Central French Guiana Part 4. Liverworts and Hornworts. *Mem N Y Bot Gard* 76(4): 1–285.

Gradstein, S. R., E. Wilson, A. L. Ilkiu-Borges, and J. Heinriches. 2006. Phylogenetic relationships and neotenic evolution of Metzgeriopsis (Lejeuneaceae) based on chloroplast DNA sequences and morphology. *Bot J Linn Soc* 151: 293-308

Mizutani, M. 1961. A revision of Japanese Lejeuneaceae. *J Hattori Bot Lab* 24: 115-302.

Mizutani, M. 1996. On *Aphanolejeunea angustiloba. Proc Bryol Soc Japan* 6: 244-246.

Pócs, T. and A. Bernecker. 2009. Overview of *Aphanolejeunea* (Jungermanniopsida) After 25 Years. *Pol Bot J* 54(I): 1-11.

Söderström, L., A. Hagborg, M.R. Crosby and M. Von Konrat. 2012. Early Land Plants Today: Index of Liverworts & Hornworts 2009–2010. *Phytotaxa* 63: 21–68

Stotler, R. and B. Crandall-Stotler. 1977. A checklist of the liverworts and hornworts of North America. *Bryologist* 80, 405-428.

Tixier, P. 1979. Contribution a l´étude du genre *Cololejeunea*. Les Cololejeuneoidees de Nouvelle Caledonie. Essai Monographique.- *Nova Hedwigia* 31, 721-787.

Wilson, R., S. R. Gradstein, H. Schneider, and J. Heinrichs. 2006. Unravelling the phylogeny of Lejeuneaceae (Jungermanniopsida): Evidence for four main lineages. *Molec Phylogenet Evol* 43, 270-282.

Zhu, R. L. and M. L. So. 2001. Epiphyllous liverworts of China. *Nova Hedwigia Beih* 121, 1-418.