Cryptogamie, Bryologie, 2016, 37 (1): 27-32

Reinstatement of *Cololejeunea indica* Pandé & Misra, a name previously synonymous with *C. spinosa* (Horik.) Pandé & Misra

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Abstract – *Cololejeunea indica* Pandé & Misra (Lejeuneaceae: Marchantiophyta) previously treated as a synonym of *C. spinosa* (Horik.) Pandé & Misra, is reinstated as a distinct species. It is characterised by a 4-celled, elongate vitta accompanied by basal ocelli and the presence of a single-celled stylus. *Cololejeunea planiflora* Benedix is a new synonym of *Cololejeunea indica*. A detailed description is provided, based on new and recent collections of this species from Mizoram.

***Cololejeunea indica* / *Cololejeunea planiflora* / Lejeuneaceae / reinstatement / synonym**

INTRODUCTION

Cololejeunea indica Pandé & Misra was described from the Mungpoo, Darjeeling district of West Bengal in the eastern Himalayas, India, by Pandé and Misra (1943). Benedix (1953), unaware of its publication by Pandé and Misra (1943), described it as *Cololejeunea planiflora* Benedix, with a detailed illustration (Tab. 19 c-g), based on a duplicate of *Physocolea indica* Pandé & Misra *nom. herb.*, deposited in the Herzog Herbarium (JE). Tixier (1985) followed Benedix (1953) in treating the name of *Physocolea indica* Pandé & Misra as an unpublished herbarium name.

Mizutani (1961) revised the Japanese Lejeuneaceae and synonymised this species under *Cololejeunea spinosa*. Later, he treated *C. spinosa* and *C. indica* as two distinct species chiefly based on the presence of a stylus, ocelli, a vitta and gemmae in *C. indica*, while *C. spinosa* does not possesses these characters (Mizutani, 1986).

Srivastava and Srivastava (1989) treated *Cololejeunea indica* as a synonym of *C. spinosa* and discussed the different types of growth patterns of *Cololejeunea spinosa* but without any comment on Mizutani's treatment of these two species as distinct. Mizutani *et al*. (1995) again treated *C. indica* as a distinct species based on collections from Nepal. About six years later, Zhu & So (2001) in their comprehensive work on the epiphyllous liverworts of China treated *C. indica* as synonym of *C. spinosa*, as they could not observe the key characters of gemmae & stylus in the

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doi/10.7872/cryb/v37.iss1.2016.27

isotype of *C. indica* deposited at JE because of the very scanty material that they received. Asthana & Srivastava (2003) in their monograph of Indian *Cololejeunea* treated *C. indica* as a synonym of *C. spinosa* as they could not find gemmae and ocelli in *C. indica*. They remarked that the cells reported as ocelli by Pandé and Misra (1943) are just large basal cells.

During the execution of a project on the bryoflora of Mizoram by one of the authors (SKS), some epiphyllous specimens were collected which were initially thought to represent a new taxon of the genus *Cololejeunea*. Subsequently, more careful study of these samples revealed the presence of a stylus and a vitta (ocelli), the differentiating characters initially proposed by Pandé & Misra (1943) and endorsed by Mizutani (Mizutani, 1986; Mizutani *et al.*, 1995). We have not been able to confirm the presence of gemmae in *C. indica*. They are not present in the material that we have studied, and this corroborates the view of Pandé & Misra (1943). In the collections from Mizoram, we noted that this species grows alongside *C. haskarliana* – a very distinct species which possesses gemmae. A similar circumstance may explain the report of gemmae in *Cololejeunea indica*. The diagnostic characters differentiating *Cololejeunea indica* from allied species are (1) the presence of a 3-4 celled uniseriate vitta and a group of basal ocelli, (2) the presence of a stylus, (3) large spinose papillae on the leaf surface, etc. We consider that these characters justify the treatment of *Cololejeunea indica* as a distinct species.

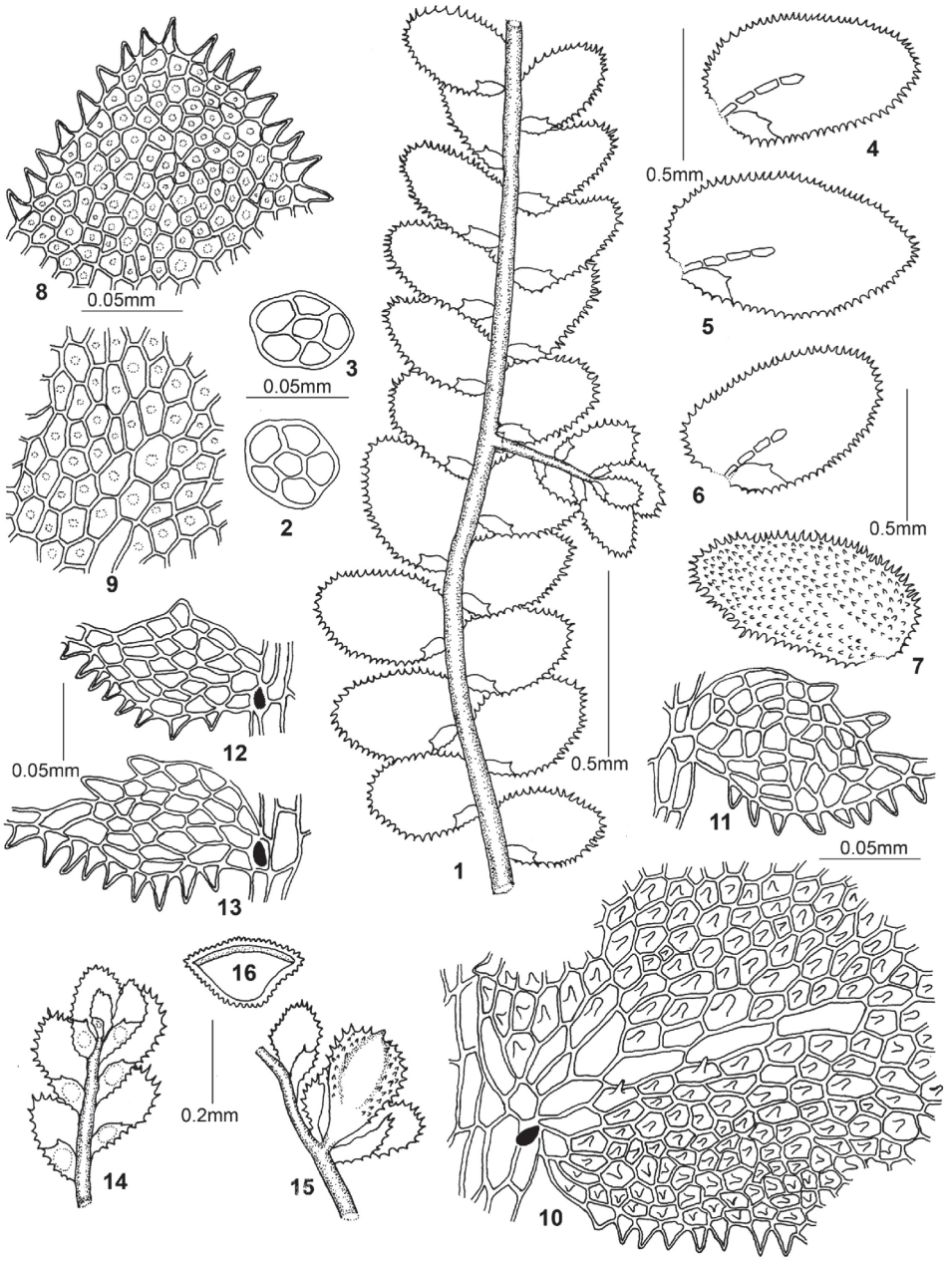
DESCRIPTION

Cololejeunea indica Pandé & Misra, *J. Indian Bot. Soc.* 22: 166. 1943.

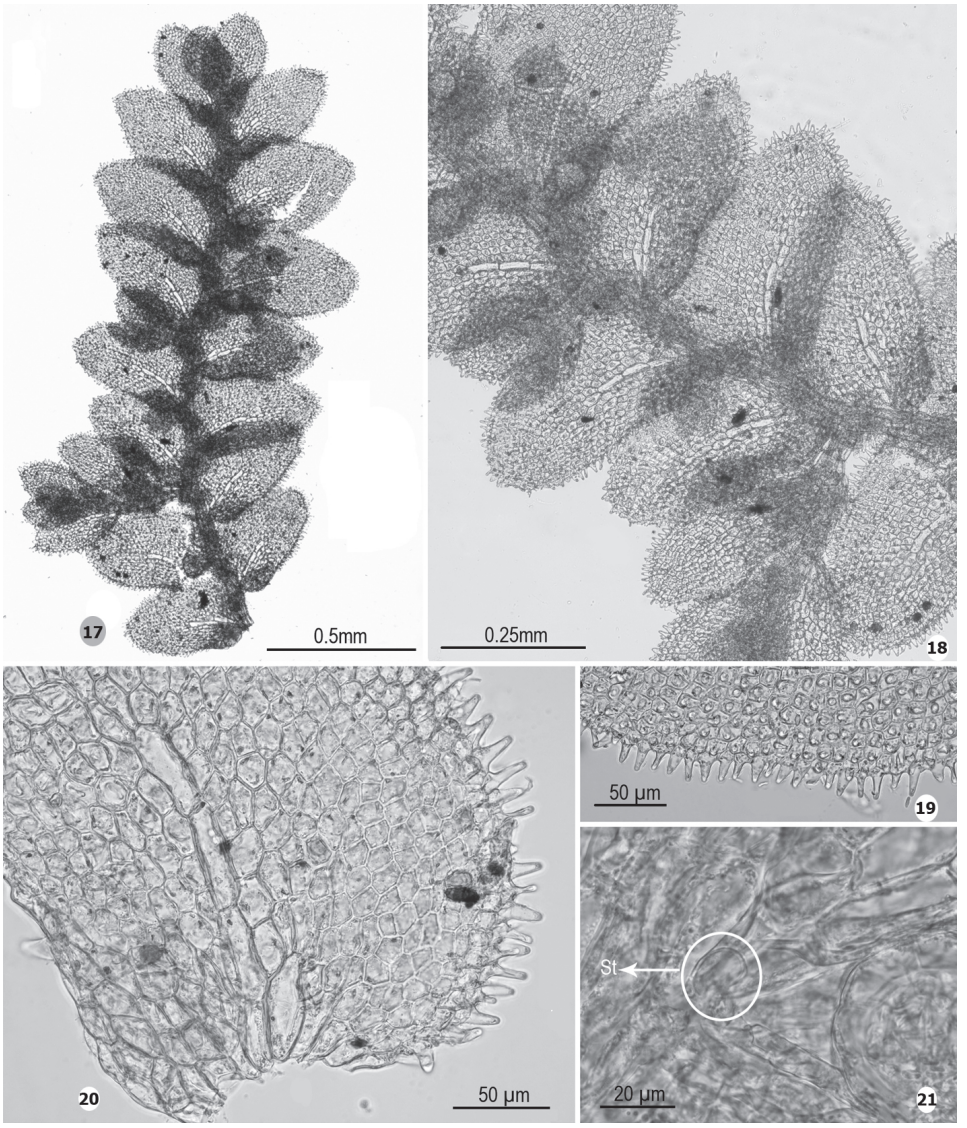
Figs 1-21

Syn.: *Cololejeunea planiflora* Benedix, *Feddes Repert. Beih.* 134: 60. 1953. **syn. nov**.

Plants pale green; shoots 3-5 mm long, 0.4-0.9 mm wide, branching irregular, very frequently of *Lejeunea*-type; cross section of stem orbicular in outline, 50-55 µm across the diameter, with 5 cortical cells, 12.5-17.5 × 10-15 µm and one medullary cell 12.5 × 15 µm; ventral merophyte one cell wide. Leaves contiguous-imbricate; leaf lobe ovate-oblong ovate with spinose-dentate margin and pointed or subacute apex, 0.30-0.42 mm long, 0.18-0.28 mm wide, antical margin crossing the stem; marginal cells towards apex quadrate-subquadrate or polygonal, 7.5-17.5 × 7.5-12.5 µm, median cells pentagonal-hexagonal, 10-30 × 10-22.5 µm, basal cells slightly larger, hexagonal, 17.5-35 × 12.5-22.5 µm, cells thin-walled with small trigones and without intermediate nodular thickenings; one single dorsal papilla on each leaf cell present, spinose, (7.5-)15-22.5(-30) µm high; vitta (3-)4-celled, uniseriate, sometimes accompanied by a few basal ocelli, each cell 37.5-50 × 15-22.5 µm; oil-bodies not studied. Leaf lobule inflated, 0.08-0.12 × 0.05-0.09 mm, 2-toothed, first tooth 1-2-celled, second tooth small, single-celled, often indistinct, surface smooth, keel broad, inflated, spinose-dentate; stylus present, 1-celled, often invisible. Monoicous. Androecium terminal on lateral branches, bracts in 3-4 pairs, inflated, each with a single antheridium. Gynoecium on short lateral branch, with one subgynoecial innovation; bracts in one pair, almost similar to leaf lobe. Perianth pyriform, 0.25-0.30 mm long, 0.20-0.26 mm wide (at widest part), with or without a visible beak, 3-plicate (two lateral and one broad ventral plicae), surface covered



Figs 1-16. *Cololejeunea indica*. **1**. A portion of plant in ventral view; **2-3**. C.S. stem; **4-7**. Leaves (7-showing dorsal papillosity); **8**. Marginal cells towards apex; **9**. Median cells; **10**. Basal cells with vitta and stylus (characteristic of species); **11-13**. Leaf lobules; **14**. Androecia; **15**. Gynoecial branch showing arrangement of perianth and bracts; **16**. C.S. perianth.



Figs 17-21. *Cololejeunea indica*. **17-18**. Portions of plant in dorsal view (2- enlarged); **19**. Basal portion of leaf showing large papillae; **20**. A portion of leaf showing 4-celled vitta (ocelli); **21**. Stylus.

with spinose papillae. Gemmae absent in the Mizoram plants. In the description by Benedix, based on the Jena specimen of *Physocolea indica*, gemmae are rare, disciform, 60–65 µm in diameter and consist of 16 cells.

Habitat: This species was collected in Champhai district, Mizoram (Fig. 22), where it grows in pure populations or in association with *Radula* sp., *Cololejeunea* spp., *Lejeunea* sp., and *Drepanolejeunea* sp., epiphyllous in moist and dense forests.

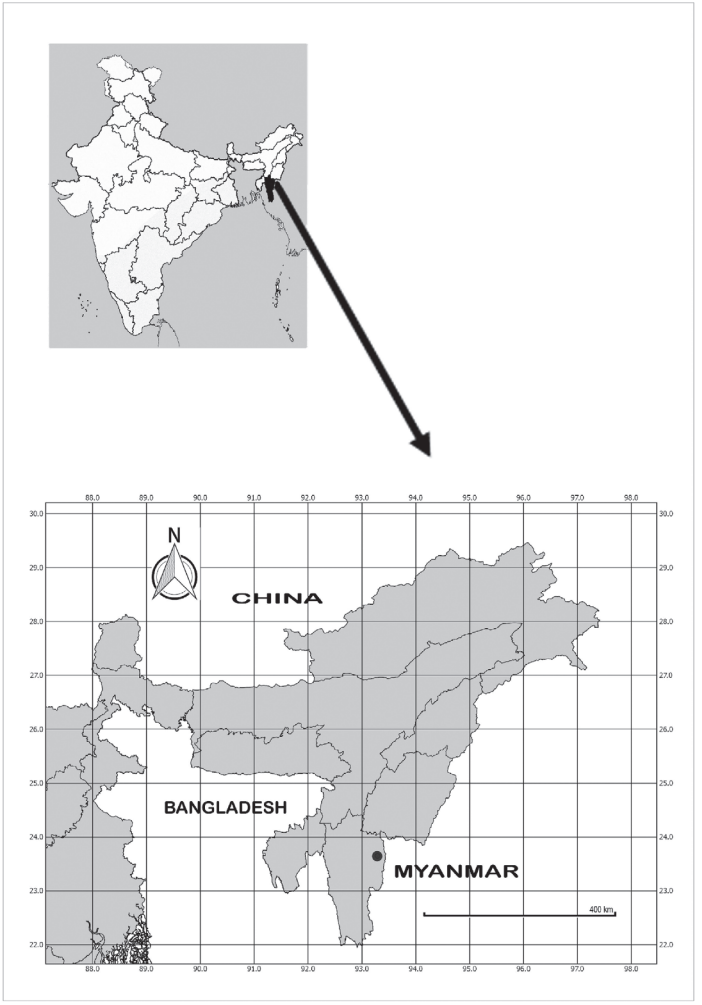


Fig. 22. Map showing collection site.

Distribution: India [West Bengal, Mizoram- present study], Nepal.

Specimens examined: India, Mizoram, Champhai, Murlen National Park, 23°38'56" N, 93°17'17" E, 1650 m, epiphyllous, 22.02.2009, S.K. Singh & Party 120316A; 120319B; 23°38'54" N, 93°17'18" E, 1658 m, 22.02.2009, S.K. Singh & Party 120321B; 23°38'54" N, 93°17'18" E, 1658 m, 22.02.2009, S.K. Singh & Party 120323A; 23°38'46" N, 93°17'20" E, 1743 m, 22.02.2009, S.K. Singh & Party 120358, 120374A, 120375A, 120376B, 120381C. All specimens are deposited in ASSAM.

Notes and differentiation: This species is part of a natural species complex formed by *Cololejeunea spinosa*, *C. hispidissima* and *C. haskarliana*; however, the latter three are quite distinct. *Cololejeunea spinosa* can be easily distinguished as discussed above by the absence of a 4-celled elongate vitta and 1-celled stylus. *C. haskarliana* differs in having ovate to broadly triangular leaf lobes, usually not crossing the stem, and the leaf lobule with the first tooth only 1-celled. Gemmae are

frequently present in *C. haskarliana* (our observation; see also Asthana & Sivastava, 2003), while *C. indica* seen by us does not possess gemmae. *C. hispidissima* differs distinctly in having the first tooth 1-celled, a comparatively much longer leaf lobule and a long auriculate perianth (see also Pócs & Piippo, 2011). Hence, in our view *C. haskarliana*, *C. hispidissima*, *C. indica* and *C. spinosa* should be treated as distinct species.

Acknowledgements. The first author (SKS) is grateful to the Director, Botanical Survey of India, Kolkata for facilities, and the Head of the Office, Eastern Regional Centre, Shillong for encouragement. We also thank Dr D. Singh, Scientist C, BSI, CNH, Howrah and Shri Shashi Kumar, JRF, BSI ERC Shillong for their help with photographs and line drawing illustrations. We also extend sincere thanks to Officials of the Forest Department, Mizoram for logistic support during field explorations.

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