Volume 23: 181–186
Publication date: 16 November 2020
dx.doi.org/10.7751/telopea14760

TELOPEA
Journal of Plant Systematics

The Royal Botanic Gardens & Domain Trust

plantnet.rbgsyd.nsw.gov.au/Telopea • escholarship.usyd.edu.au/journals/index.php/TEL • ISSN 0312-9764 (Print) • ISSN 2200-4025 (Online)

# *Cololejeunea reniformis*, a new species from the Wet Tropics of Queensland, Australia (Lejeuneaceae: Marchantiophyta)

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## Abstract

*Cololejeunea reniformis* is described as new based on a single collection from Tully Falls National Park in north-east Queensland. *Cololejeunea reniformis* is similar to *C. cairnsiana* in the size and the falcate leaf lobes and ampulliform lobules, which are distinctive features among Australian species. While *C. cairnsiana* is epiphyllous, the single known gathering of *C. reniformis* was found on bark, and the two species differ in a number of micromorphological characters. *Cololejeunea reniformis* differs from *C. cairnsiana* in having a vitta two or three cells wide, and a stylus two or three cells tall, rather than a vitta 1 cell row wide and a stylus of a single cell. *Cololejeunea reniformis* shares many micromorphological features with the south-east Asian *C. ensifera* but differs in its smaller size and falcate leaf lobes, in addition to other characters. Thirty-nine *Cololejeunea* species are now known for Australia.

## Introduction

*Cololejeunea* (Spruce) Steph. is probably the second largest genus within the Lejeuneaceae, itself the most speciose family of leafy liverwort, after *Lejeunea* Lib. Currently more than 400 species are accepted worldwide (Söderström *et al.* 2016), with 38 species recorded from Australia (Pócs 2016). More than half of Australian species have been reported or described within the past two decades since the completion of the first complete account of Australian species by Thiers (1988). This illustrates well the spring-board effect that comprehensive treatments have on advancing knowledge of regional and global diversity, regardless of the state of knowledge at the time of their completion. Since Thiers (1988), additional collecting efforts throughout Australia, and in the Wet Tropics in particular, have contributed 14 new regional records (Pócs 1994, 2016; O'Shea et al. 1997; Bolin and Henderson 2002; Meagher 2003; Pócs and Streimann 2006; Renner 2011) and two new species (Pócs 2016). Almost all Australian *Cololejeunea* species also occur outside of Australia, most are Malesian or Paleotropical in distribution. To date only four species and one variety (*C. thiersiae* (Pócs) Pócs, *C. iwatsukiana* (Pócs) Pócs, *C. heinari* Pócs, *C. cairnsiana* Pócs, and *C. floccosa* var. *fraseriana* Pócs) are considered endemic to Australia (Pócs 2016). Far from being one of the most challenging genera of Lejeuneaceae, *Cololejeunea* is now one of the best-known in Australia.

During identification and cataloguing of collections from the Wet Tropics made in 2014, a collection of *Cololejeunea* from the Charmillan Creek catchment within Tully Falls National Park, was initially identified to *Cololejeunea cairnsiana*, using the key in Pócs (2016). However, the Charmillan Creek plant differed from *C. cairnsiana* in having a vitta two or three cells wide, and a stylus two or three cells tall, rather than a vitta 1 cell

row wide and a stylus of a single cell. Critical examination of the specimen and consultation with Prof. Tamás Pócs established that its affinities were closer to *C. ensifera* Tixier, a species known from Thailand and Cambodia (Tixier 1969). The Charmillan Creek plant is, however, smaller overall than *C. ensifera* and differs in several microstructural details, including having papillose leaf lobe marginal cells, more ocelli in the vitta, a hyaline border on the lobule antical margin only 2 cells broad, and reniform-elliptic rather than oblong-ovate leaf lobes. Here, the plant from Charmillan Creek is described as the fifth new species of *Cololejeunea* from Australia.

## Taxonomic Treatment

***Cololejeunea reniformis*** M.A.M.Renner *sp. nov.*

**Diagnosis:** *Cololejeunea reniformis* is similar to *Cololejeunea cairnsiana*, but differs by the vitta 2 or 3 cells broad which extends beyond the lobule apex; the 2 or 3 celled stylus, the first lobule tooth usually 4 cells long, and the second lobule tooth capped by a single cell, and the lobule antical margin bordered by 2 rows of cells whose walls are hyaline and thin.

**Holotype:** Australia, Queensland, North Kennedy, Tully Falls National Park, Tully Falls Road, Walters Waterhole Track, to Rhyolite Pinnacle, at river crossing, 17°43'33"S 145°32'20"E, c. 800 m, 27 Aug 2014, *M.A.M. Renner 7221 & L.J. Gray* (BRI). Isotype: NSW 1061475.

Medium-sized corticolous plant adhering to hard bark, forming pale, shiny green patches up to 2 cm in diameter. Shoots up to 0.8–1.2 mm wide, irregularly pinnately branching. Stem 47–59 µm thick, with five cortical and one medullar cell row, ventral merophyte of one row of cells, or two rows within rhizoid field, which contains six rhizoids in each bundle, 8–10 µm wide, short, hyaline. Leaves elliptic-reniform, falcate, 530–740 × 250–420 µm, with rounded apex, postical margin arched, antical margin also arched, tending toward straight along the interior half and above a small auriculate base above the stem insertion; long axis of lobe orientated at 45 degrees to stem. Marginal lobe cells around outer two thirds of lobe margin more or less rectangular, 5–12 × 3.5–6 µm, long axis orientated perpendicular to the margin, cell walls with cordate trigones and occasional intermediate thickenings, each cell bearing a single dome-shaped papilla on its upper surface close to but not on the lobe margin, such that the papilla does not project beyond the lobe margin. Marginal lobe cells in the inner third of the lobe margin are long-rectangular, 9–18 × 3.5–7 µm, with long axis parallel to the lobe margin, and the free external wall is thin-walled and hyaline. Median lobe cells on the antical side of the vitta elongate hexagonal, 7.5–15 × 5.3–8 µm, on the proximal side subquadrate to elongate hexagonal; cell walls more or less continuously thickened or with cordate trigones and intermediate thickenings; each cell bearing a dome-shaped papilla on its dorsal surface. Basal cells on either side of vitta elongate, slightly sinuous, 25–29 × 6–9 µm, cell walls continuously thickened between cordate trigones and with up to three intermediate thickenings. Vitta sharply delimited, 420–460 µm long, 7–9 cells long, and 2 or 3 cell rows wide, comprised of 12-20 large cells and other smaller cells, exceeding length of lobule and extending into the free part of the lobe, in the lower half formed by 2 or 3 rows of ocelli, 37–73 × 16–20 µm, with walls bearing 1–3 intermediate thickenings of varying size and confluency, and cordate trigones at cell wall junctions; the upper half of the vitta formed to 3 or 4 rows of ocelli shorter and narrower than cells in the lower half, 20–27 × 8–13 µm. Lobule half the lobe length, ampulliform, elongate with truncate apex, 250–370 × 140–210 µm, free exterior margin 59–77 µm long, keel nearly straight in outer third, then continuously curved, curvature increasing toward the stem, through nearly 150 degrees; the interior part of this curve laying nearly parallel with the stem, at an angle of around 20–30 degrees so forming an acute sinus between the lobule keel and stem; antical margin bordered by 2 rows of hyaline, thin-walled, elongate cells, other lobule cells subquadrate, 10–14 × 4–8 µm, with thickened walls, with distinct cordate trigones and intermediate thickenings; lobule apex with two teeth that usually cross each other; first tooth lanceolate, kinked at the base, formed by 3–5 moniliform cells; second tooth triangular, formed by 3–7 cells, 2 or 3 cells broad at the base, shorter than the first tooth, apex acute, formed by a single cell; hyaline papilla globose, marginal, filling the base of the sinus between the first and second teeth. Stylus filiform, 2 or 3 cells long. Asexual reproduction by gemmae from the ventral lobe surface, but mature gemmae not seen. Monoicous. Androecia on short determinate lateral branches bearing 3–7 pairs of male bracts; bracts saccate, subisolobous, lobules 150–200 µm long, 80–115 µm wide, apex obtuse, hypostatic, imbricate, hyaline; containing a single antheridium. Gynoecium on leading shoots or short lateral branches, in both situations subtended by a single subfloral innovation; female bracts 480–500 µm long, 220–240 µm wide, obovate, reaching approximately to 2/3 length of perianth; lobule elliptic to obovate, 380–430 µm long, 180–220 µm wide, with truncate and dentate to serrate apex. Perianth broadly cuneate, 415–550 µm long, 380–490 µm wide, apex emarginate with compressed lateral wings whose keels have a rounded outline, and a short rostrum one or two cell tiers tall situated in the shallow medial depression between the two keels, ventrally bulging. Sporophytes not seen.

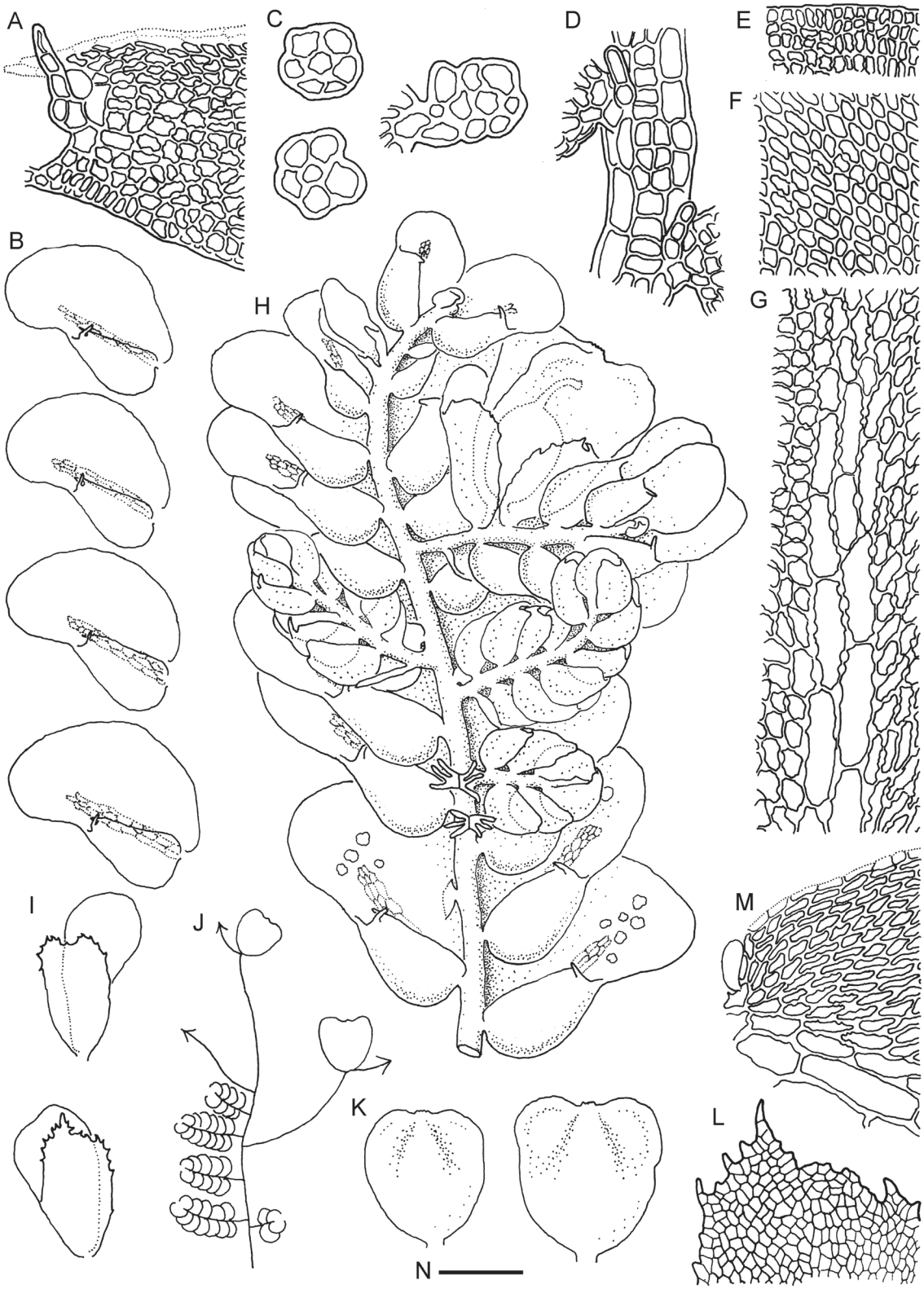


**Figure 1.** *Cololejeunea reniformis* M.A.M.Renner. A: lobule apex showing crossed first and second teeth, the second tooth hyaline and composed of thin-walled cells that are continuous along the antical lobule margin. B: four leaves showing the multi-tiered vitta extending beyond the lobule apex and the reniform leaf-lobe shape. C: three stem sections showing stems between leaves and rhizoids (below), stems with rhizoid field (above), and stem at leaf insertion (right). D: ventral view of stem showing lobule insertion, ventral merophyte and styli. E: lobe marginal cells at outer extremity, papillae not shown. F: lobe medial cells between vitta and margin. G: lobe vitta from its terminus to close to the base. H: habitus showing autoicy, male branches, and perianths; note also the production of gemma initials on the older leaves. I: a pair of female bracts. J: branching diagram. K: two perianths in ventral view showing the ventral keel. L: apex of female bract lobule. M: dorsal leaf lobe margin above stem insertion, note the thin, hyaline, free external cell wall of the marginal cells. N: scale bar, A, C-G, M=40 μm; L=60 μm; B, H, I, K=240 μm; J=not to scale.

**Etymology:** Kidney-shaped, referring to the outline of the leaf-lobe, which is a difference between the new species and *C. ensifera* on the one hand, and a distinctive feature shared with *C. cairnsiana* on the other.

**Distribution and ecology:** *Cololejeunea reniformis* is known by a single gathering made in the Charmillan Creek catchment of Tully Falls National Park. Plants were corticolous on a tree trunk in riparian vegetation within notophyll-vine rainforest to 25 m tall with broken canopy and much *Calamus* in a gully with easterly aspect. The plants formed a series of pure, radiating and interlocking flat, bright green, nitid patches on hard, otherwise naked bark.

**Recognition:** In the key to species provided by Pócs (2016) *Cololejeunea reniformis* will key to *C. cairnsiana* due to its being a relatively large plant with papillose leaf lobe cell surfaces, and a vitta in the leaf lobe (characters which place it in subg. *Taeniolejeunea*), the unequal lobule teeth that cross, the simple papillae on the flask-shaped lobule, and the falcate leaf lobe. Couplet 7 in the key to species of subg. *Taeniolejeunea* will give some pause because the vitta in *C. reniformis* is not single celled. Below a revised couplet 7 and new couplet 7a are provided to accommodate *C. ensiformis* in Pócs (2016)'s key to species of subg. *Taeniolejeunea*

7. Lobe falcate; lobule elongate, with a deeply curved keel whose inner margin is nearly parallel with the stem ..... 7a

7*. Lobe broadly ovate; lobule ovate, inflated, with a curved keel whose inner margin is inclined toward the stem, but not parallel with it ..... 8

7a. Vitta 1 cell wide at base (but may have one or two accessory 'half-rows' of smaller cells at the outer end), comprised of 4–6 evenly thick-walled cells; stylus a single cell; lobule antical margin bordered by 2 rows of cells whose walls are thickened as for the other lobule cells; cell walls of the second lobule tooth also thickened and pigmented; ?dioicous ..... 36. *Cololejeunea cairnsiana*.

7a*. Vitta 2 or 3 cells wide throughout, comprised of 12–20 cells with thin walls bearing conspicuous trigones and intermediate thickenings; stylus 2 or 3 cells in moniliform series; lobule antical margin bordered by 2 rows of cells whose walls are hyaline and thin; cell walls of second lobule tooth also hyaline and thin; monoicous ..... *Cololejeunea reniformis*

As described in the introduction, *Cololejeunea reniformis* shares a number of characters with *C. ensifera*, and might be confused with that species, including the vitta two or three cell rows wide, and the two or three celled stylus. However, *C. reniformis* is smaller overall than *C. ensifera*, with shoots 0.8–1.2 mm wide versus 2.0 mm in *C. ensifera*, with correspondingly smaller leaf lobe (530–740 µm long versus 1000 µm) and lobule (250–370 µm versus 600 µm long), and shorter vitta (420–460 µm versus 600 µm long) with more numerous (12–20 versus 6 or 7 cells) that are smaller (37–73 µm versus 50–100 µm long). The leaf lobe shape is also different, being reniform in *C. reniformis* and ovate-oblong in *C. ensifera*. Finally, the hyaline margin on the lobule is two cells rows wide and includes the second tooth in *C. reniformis*, but four or five cell rows wide and does not include the second tooth in *C. ensifera.*

## Acknowledgements

I thank Prof. Tamás Pócs (EGR) for advice on the plant from Charmillan Creek, details about *C. cairnsiana*, and for providing scans of relevant literature for study; Trevor Wilson and Lindsey Gray for company on two enjoyable and successful field trips to the Wet Tropics Bioregion of north-east Queensland, and DERM and traditional land owners for permission to conduct those field trips.

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Submitted 3 September 2020; accepted 28 September 2020