

Cheilolejeunea hyalomarginata, a remarkable new species of Lejeuneaceae (Marchantiophyta) from New Caledonia

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ABSTRACT. The new species, *Cheilolejeunea hyalomarginata* (Lejeuneaceae) from New Caledonia, is described and illustrated. The species is easily distinguished from all other species of *Cheilolejeunea* by the hyaline denticulate margin of the leaf lobe. Further diagnostic characters include the entire underleaves, the lobular apex connate with 4–6 lobe cells, and the spinose, unicellular, strongly thick-walled lobular tooth with a very small lumen at the base.

KEYWORDS. Epiphyllous liverworts, Hepaticae, Pacific region, *Xenolejeunea*.



Cheilolejeunea (Spruce) Schiffn., a large and diverse genus widely distributed in tropical and subtropical regions, was established by Schiffner (1893). It is the third largest genus of Lejeuneaceae (following *Cololejeunea* (Spruce) Schiffn. and *Lejeunea* Lib.) (Ye & Zhu 2010). Traditionally, *Cheilolejeunea* was characterized by the bilobed underleaves (Grolle & Piippo 1990). Recent molecular-phylogenetic work on Lejeuneaceae has introduced a broader concept of the genus (Wilson et al. 2007; Ye 2010). Several small, related genera with entire underleaves such as *Aureolejeunea* R.M.Schust, *Evansiolejeunea* Vanden Berghen (Ye 2010), *Cyrtolejeunea* A.Evans (Grolle et al. 2002), *Leucolejeunea* A.Evans (Ye & Zhu 2010), and *Omphalanthus* Lindenb. & Nees (Ye et al. 2011) have been proposed to be merged into *Cheilolejeunea*.

New Caledonia is one of the world's biodiversity hotspots with a very distinct bryophyte flora. Five hundred and twenty six species of mosses and 464 of liverworts and hornworts have been reported. 39% of which are thus far only known from New Caledonia (Müller 2011, 2012; Thouvenot & Bardat 2010; Thouvenot et al. 2011). The taxonomic status of the majority of the "endemic" taxa is poorly known and only ca. 13% are proven endemic (Thouvenot et al. 2011). While examining the epiphyllous liverwort collections from New Caledonia made by the second author in 2001, we found a very interesting taxon of Lejeuneaceae with entire underleaves, a narrow stem with only 2-cells wide ventral merophyte, a distal hyaline papilla of the leaf lobule, a hyaline denticulate margin of the leaf lobe, a lobular apex widely connate with the leaf lobe across 4–6 cells, smooth leaf cells with large trigones, and a strongly elongated, long and strongly thick-walled, unicellular apical lobular tooth with a very small lumen at the base (Figs. 1 & 2). Our study reveals that this interesting plant represents a new species of *Cheilolejeunea*.

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DOI: 10.1639/0007-2745-115.2.217

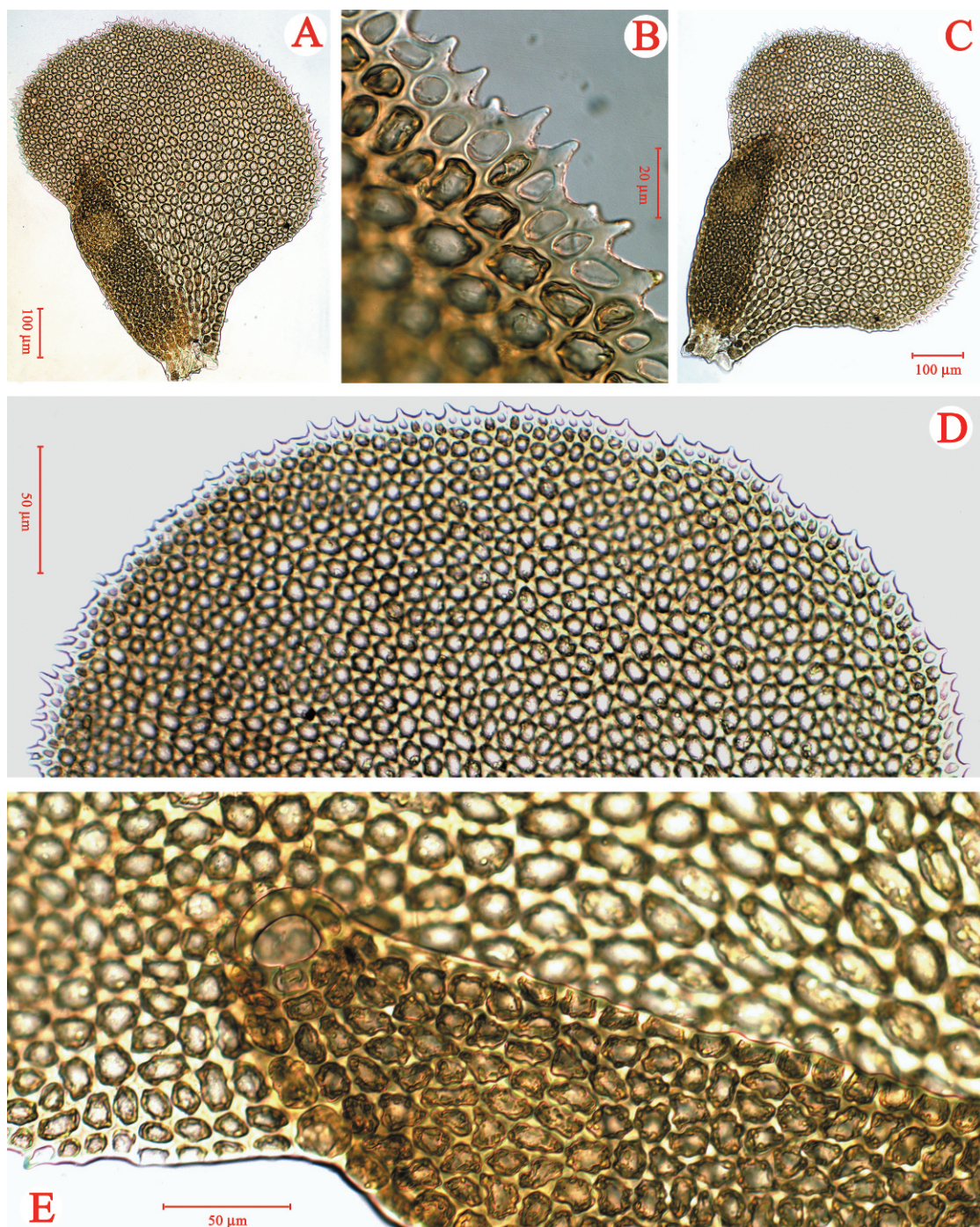


Figure 1. *Cheilolejeunea hyalomarginata*. A. Leaf, dorsal view. B. Marginal cells of leaf lobe. C. Leaf, ventral view. D. Margin of leaf lobe, showing a white, denticulate margin. E. Leaf lobule, showing free marginal cells (flattened). All from the type.

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Müll., *sp. nov.* **Figs. 1 & 2**

Cheilolejeunea hyalomarginata is similar to
Cheilolejeunea ventricosa (Schiffn.) X.L.He, but

differs in 1) the entire underleaves, 2) the unicellular, spinose lobular tooth with a strongly thickened wall, and 3) the hyaline, denticulate margin of the leaf lobe.

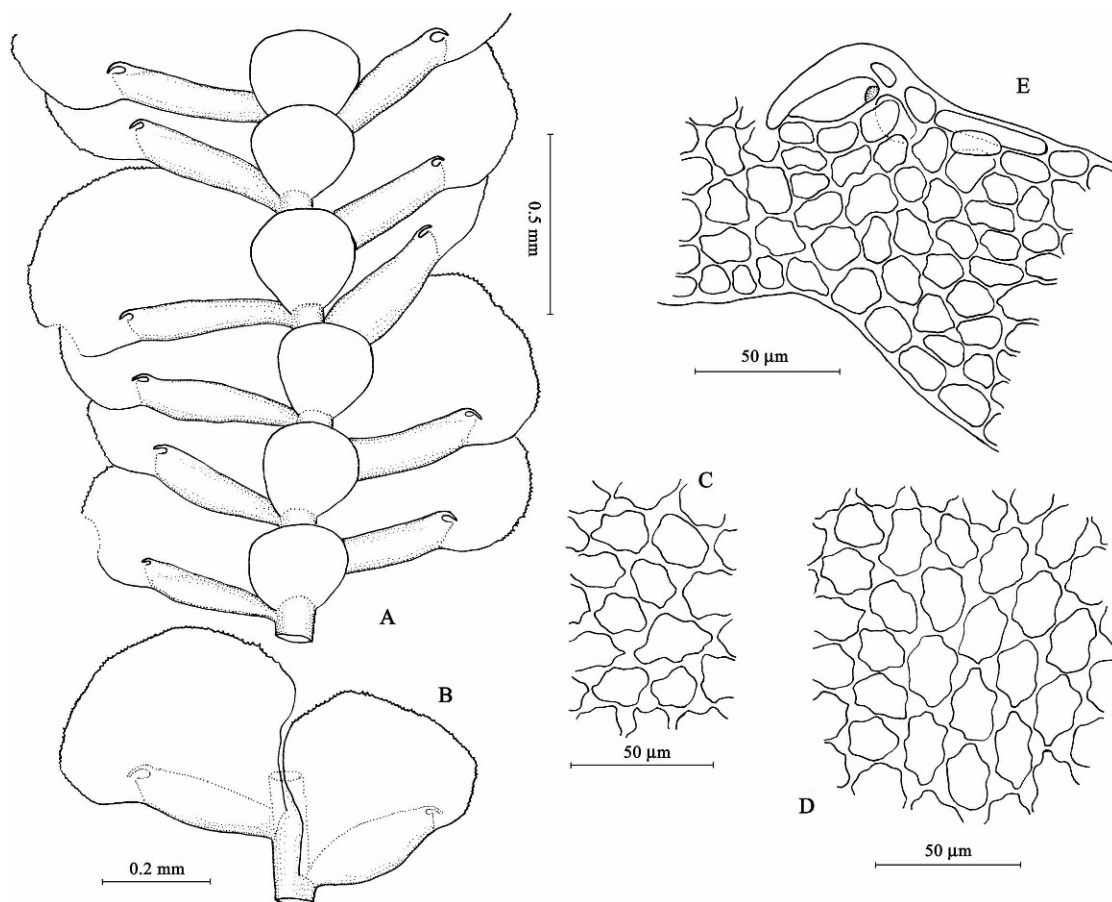


Figure 2. *Cheilolejeunea hyalomarginata*. **A.** Portion of shoot, ventral view. **B.** Portion of shoot, dorsal view. **C.** Median cells of leaf lobe. **D.** Basal cells of leaf lobe. **E.** Apex of leaf lobule, showing the spinose apical tooth, hyaline papilla, and the connate portion of lobule and lobe. All from the type.

TYPE. NEW CALEDONIA. Mont Panié, Aufstieg entlang des Wanderwegs von der Straße RPN 3 bis zum Gipfel, ca. 900–1300 m, sehr feuchter Regenwald, epiphyll, 14 Sept. 2001, *F. Müller NC18L* (holotype: HSNU; isotype: DR).

Description. Plants olive green to light brown when dry, 3 to 8 mm long. Shoots (0.80–) 1.00–1.50 mm wide, irregularly branched, branches *Lejeunea*-type, leaf sequence of vegetative branches lejeuneoid. Stems 90–115 µm in diameter, in transverse section with 7 cortical cells (15–27 × 11–19 µm) and about 7–11 medullary cells (9–17 × 8–13 µm), hyalodermis absent, ventral merophyte 2 cells wide. Rhizoids at base of underleaves, numerous, tufted, usually hyaline, rhizoid disc absent. Leaves imbricate, diverging from stem at an

angle of (45–) 60–85°; leaf lobes asymmetrically obovate, usually concave, slightly falcate, 0.50–0.85 mm long, 0.40–0.70 mm wide, margins strongly denticulate, but usually crenulate to almost entire near base, denticulations formed by the strongly thickened cell walls, apex rounded, plane, ventral margin straight or weakly sinuate, dorsal margin strongly arched at middle; leaf lobules long rectangular, 0.30–0.50 mm long, 0.10–0.15 mm wide at middle, strongly inflated, 2/3–3/4 as long as the lobes, base inserted to stem by 2–4 stem cells, keel almost straight and smooth, lateral free margin usually slightly incurved (except at apex), formed by 15–20 subquadrate to rectangular marginal cells towards its proximal base, and 0–3 linear cells next to the tooth, apex obliquely truncate with the lobule apex extending beyond the sinus, connate with 4–6

cells to leaf lobe, with a unicellular, strongly elongate, curved apical tooth directed towards leaf apex, the tooth strongly spinose, linear, 45–65 μm long, 8–12 μm wide at middle, with strongly thickened walls and a very small lumen at the base; hyaline papilla oblong, situated at the distal base of the apical tooth. Cells of the leaf lobe with thick walls and very large, bulging or somewhat cordate trigones, without intermediate thickenings, at leaf margin usually hyaline, quadrate to rectangular, 10–20 $\times$ 6–12 μm , cell walls strongly thickened and tooth-like pointing outwards, in the middle $\pm$ hexagonal, 20–32 $\times$ 12–23 μm , near base similar to median cells in shape, but slightly larger, 25–36 $\times$ 15–23 μm . Oil bodies not seen. Ocelli absent. Underleaves remote to contiguous, usually wider than long, (2.0–)2.5–3.0 times as wide as stem, unlobed, margin nearly entire, insertion line subtransverse to slightly arched, base cuneate (never cordate). Androecia and gynoecia not seen. Vegetative reproduction possibly by caducous leaves.

Ecology and distribution. *Cheilolejeunea hyalomarginata* grows on living leaves in very moist forests at 900–1300 m, associated with *Cheilolejeunea trapezia* (Nees) R.M.Schust. et Kachroo, *Cololejeunea angustiflora* (Steph.) Mizut., *C. dozyana* (Sande Lac.) Schiffn., *C. paniensis* (Tixier) Grolle, *C. pseudoserrata* Tixier, *Colura corynophora* (Nees et al.) Trevis., *Lejeunea exilis* (Reinw. et al.) Grolle, *Metalejeunea cucullata* (Reinw. et al.) Grolle, *Radula amentulosa* Mitt., *R. tjibodensis* K.I.Goebel, and *Frullania* sp. The species seems to be very rare, and is thus far only known from the type locality.

Discussion. Although androecia and gynoecia of the new species are not known, the distal hyaline papilla, the absence of ocelli in leaf lobes, the 2-cells wide ventral merophyte, entire underleaves, and the long rectangular leaf lobule with a well developed apical tooth (=second tooth) support its position in *Cheilolejeunea*. *Cheilolejeunea hyalomarginata* is well characterized by the spinose, strongly thick-walled, unicellular lobular tooth with a very small lumen at the base (Fig. 2E), the lobular apex widely connate with the leaf lobe across 4–6 cells (Fig. 1E) and especially, the hyaline, denticulate margin of the leaf lobe (Fig. 1B). The latter character is unique in *Cheilolejeunea* and not found in any other species of this genus. A broadly connate lobular apex is also

seen in the paleotropical *C. ventricosa* (Schiffn.) X.L.He (Zhu & Lai 2005) but the latter species is readily distinguished by the bilobed underleaves, the entire, unbordered leaf margins, and the subquadrate, thin-walled apical tooth of the leaf lobule. A unicellular, spinose lobular tooth also occurs in, e.g., *C. chenii* R.L.Zhu & M.L.So from China (Zhu et al. 1999; Zhu & So 2001), *C. larsenii* Mizut. from China and Thailand (Hattori & Mizutani 1969; He & Zhu 2011), *C. obtusifolia* (Steph.) S.Hatt. from China, India, Japan, Korea, Nepal, Russia, and Thailand (Bakalin 2009; Zhu & Long 2003), *C. ulugurica* Malombe et al. from Tanzania (Malombe et al. 2010). *Cheilolejeunea hyalomarginata* differs from all these species by the peculiar hyaline, denticulate leaf margin, the large trigones of the leaf cells, and the broadly connate lobular apex.

Cheilolejeunea hyalomarginata adds a further *Cheilolejeunea* species to the flora of New Caledonia. Thus far, 10 species of *Cheilolejeunea* (excluding *C. ludoviciae* Steph. and *C. savesiana* Steph. which were erroneously placed in *Cheilolejeunea*) were known from New Caledonia, including two endemic ones (Hürlimann 1995; Thouvenot et al. 2011). None of these species bears any close resemblance to *C. hyalomarginata*.

Schuster (1963, 1980) suggested a subdivision of the *Cheilolejeunea* into seven subgenera; four of them, *Cheilolejeunea* subg. *Cheilolejeunea*, *Cheilolejeunea* subg. *Euosmolejeunea*, *Cheilolejeunea* subg. *Strepsilejeunea*, and *Cheilolejeunea* subg. *Xenolejeunea* are also adopted by other authors (e.g., Malombe 2009; Thiers 1992, 1997; Zhu et al. 2002). Recently, five subgenera, *Cheilolejeunea* subg. *Cheilolejeunea*, *Cheilolejeunea* subg. *Leucolejeunea*, *Cheilolejeunea* subg. *Euosmolejeunea*, *Cheilolejeunea* subg. *Omphalanthus*, and *Cheilolejeunea* subg. *Xenolejeunea*, have been proposed, based on morphological and molecular data (Ye 2010). Although the hyaline, denticulate margin of the leaf lobe is a unique feature that has not been observed in any other species of *Cheilolejeunea*, *C. hyalomarginata* fits *Cheilolejeunea* subg. *Xenolejeunea* best by the long rectangular lobules, measuring 2/3–3/4 as long as leaf lobes, the rounded and plane apex of the leaf, the leaf areolation, and the size of the

plants. Data on oil bodies, reproductive structures and, especially, molecular evidence are needed to determine the exact systematic position of the new species.

ACKNOWLEDGMENTS

We are grateful to Miss Qiong He of East China Normal University for the preparation of nice illustrations, and to the curators and staff of EGR, FH, G, GOET, Herb. Schäfer-Verwimp, HIRO, HSNU, JE, NICH, NY, PC and TNS for making specimens including types available for study through loans or visits. This research was sponsored by the National Natural Science Foundation of China (nos. 30825004, 31170190) and 211 Project for the East China Normal University.

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ms received February 7, 2012; accepted March 10, 2012.