

A further new species of Lejeuneaceae (Marchantiophyta) from the Chocó of Colombia: *Pycnolejeunea chocoensis*

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Abstract – We describe *Pycnolejeunea chocoensis* M.E.Reiner & Gradst. sp. nov. from wet lowland rainforest along the Pacific coast of Colombia (Chocó). The new species is distinguished by small decurved lobules, absence of ocelli and small, distant underleaves. *Pycnolejeunea chocoensis* is a further addition to the unusually rich flora of the Chocó region.

Chocó region / liverworts / Neotropics / *Pycnolejeunea* / taxonomy

INTRODUCTION

The region extending along the Pacific coastal area of northern South America, also described as the “Chocó/Darién/Western Ecuador hotspot”, is well known for its exceptional biological diversity and high concentration of endemic species (Myers *et al.*, 2000). The rich biodiversity is explained by the long-time separation of the region from the rest of South America due to the uplift of the Andes in the Tertiary, and the exceptionally high rainfall, up to 12000 mm annually (Frahm, 2012). In the recently published *Catalogue of the Plants and Lichens of Colombia* (Bernal *et al.*, 2016), more than 5500 plant species have been recorded from the Chocó. Also bryophytes, specially liverworts, are well represented in the region (Frahm, 1994, 2012; Vasco *et al.*, 2002; Gradstein & Uribe, 2016).

A large number of liverworts were collected by the second author in 1992 in the framework of an exploration of the bryophyte flora of the everwet rainforests along the Pacific coast of Colombia. This “Chocó Expedition 1992” was a joint project between the Universities of Duisburg (Germany), Utrecht (The Netherlands) and the National University of Colombia, Bogotá, sponsored by the National Geographic Society. Numerous bryophyte species and results were already published (e.g., Frahm, 1994, 2012; Gradstein, 1994; Rangel & Gradstein, 2004; Gradstein &

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Reiner-Drehwald, 2017a, 2017b). When revising the unidentified Lejeuneaceae collections from this expedition, the first author found three taxa new to science. Two of them, *Cheilolejeunea schiavoneana* M.E.Reiner et Gradst. and *Cyclolejeunea glimeana* M.E.Reiner et Gradst., have recently been published (Gradstein & Reiner-Drehwald, 2017a, 2017b). Here we describe the third taxon, a new species of *Pycnolejeunea* (Spruce) Schiffn.

The genus *Pycnolejeunea* was monographed by He (1999), who recognized nine species worldwide. In the recently published *World Checklist of Hornworts and Liverworts* (Söderström *et al.*, 2016) 14 species are accepted, plus seven poorly known or unresolved taxa. *Pycnolejeunea* is a pantropical genus, with the main diversity in the Neotropics where ten species are known (He, 1999; Bastos & Yano, 2002; Ilkiu-Borges, 2011, Ye *et al.* 2015, Bastos & Zartman 2017). The species of *Pycnolejeunea* are corticolous epiphytes of trunks, branches and twigs in lowland and submontane rainforests and are typical canopy epiphytes or grow in secondary vegetation or plantations (He, 1999; Gradstein *et al.*, 2001). Characteristic morphological features of *Pycnolejeunea* are the imbricate leaves and underleaves, the convex leaf lobes, entire to crenulate-denticulate margins, presence of ocelli in leaf lobes and female bracts (ocelli absent in *P. decurviloba* and *P. remotistipula*), small or large rectangular lobules with a proximal hyaline papilla, well developed trigones of leaf cells, gynoeceia with 1(-2) pycnolejeuneoid innovations and sharply 5-keeled perianths (He, 1999, Bastos & Zartman 2017). In a molecular-phylogenetic analysis, Heinrichs *et al.* (2014) resolved *Pycnolejeunea* as monophyletic and placed the genus in the subtribe Pycnolejeuneinae Heinrichs & Schäf.-Verw. of Lejeuneaceae.

The new species of *Pycnolejeunea* here described stands out by the small, inflated and decurved lobules with a large hyaline papilla, the absence of ocelli and the distant underleaves.

TAXONOMIC TREATMENT

Pycnolejeunea chocoensis M.E.Reiner & Gradst., **sp. nov.**

Figs 1-2

Diagnosis. Plants *ca* 1.5 mm wide. Stems fragile, epidermis thick-walled, ventral merophyte 2-cells wide. Leaf lobes flat, oblong-ovate, apex broadly rounded, margins entire, cells with distinct trigones and intermediate thickenings, ocelli absent. Lobules decurved, small, 1/6× leaf length, tooth short and blunt, hyaline papilla proximal-marginal, lobule cells very small, thin-walled. Underleaves broadly ovate, 2-3× stem width, bifid to 1/2, lobes broadly triangular and acute, bases rounded. Dioicous (?). Gynoeceia with (0-)1(-2) pycnolejeuneoid innovations, bracts and bracteoles narrowly elongate, bract lobe and lobule subequal in length, bracteole slightly shorter than bract. Perianth 5-keeled.

Type: Colombia. Departamento Chocó: municipio Nuquí, around Biological Station “El Amargal”, coastal lowland rainforest, *ca* 30 m s.n.m., on liana, 6 August 1992, S.R. Gradstein 8877 (holotype, COL!; isotypes, GOET!, PC!).

Plants to 2 cm long and 1.2-1.8 mm wide, prostrate, dull green to brownish-green when dry, without lustre, irregularly and sometimes rather densely pinnate, branches *Lejeunea*-type, frequently rather short and microphyllous with reduced leaf-lobes. Stems 0.1-0.13 mm in diameter, epidermis cells in ventral view rectangular (30-55 × 35-40 μm), in cross-section made up of 7 rows of large, thick-walled

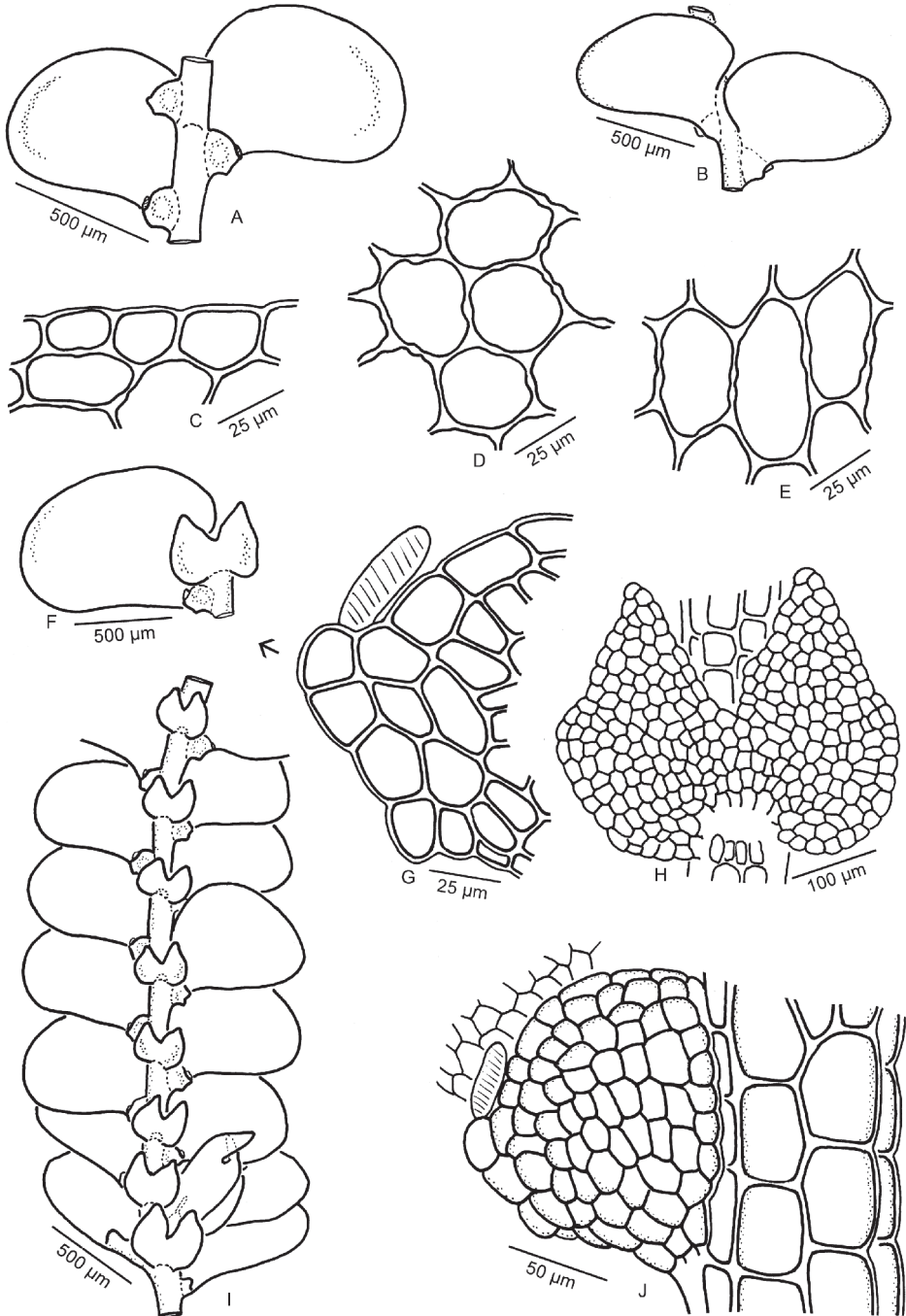


Fig. 1. *Pycnolejeunea chocoensis*. **A.** Shoot sector, ventral view. **B.** Shoot sector, dorsal view. **C.** Marginal cells of leaf lobe. **D.** Median cells of leaf lobe. **E.** Basal cells of leaf lobe. **F.** Leaf and underleaf. **G.** Apex of leaf lobule (detail of Fig. F). **H.** Underleaf. **I.** Habit, with gynoecium and pycnolejeuneoid innovation. **J.** Leaf lobule in situ. (All drawn from the type).



Fig. 2. Coastal rainforest at El Amargal, Chocó: type locality of *Pycnolejeunea chocoensis*. Photograph J.P. Frahm (courtesy B. Frahm).

epidermis cells ($10-20 \times 20-40 \mu\text{m}$) surrounding 12-14 rows of much narrower medullary cells ($10-14 \times 12-20 \mu\text{m}$) with medium thick walls; ventral merophyte 2 cells wide. Leaf lobes rather widely spreading, sometimes slightly falcate, imbricate, convex, asymmetrically oblong-ovate with arched dorsal margin and straight to concavely curved ventral margin, $0.5-1.0 \text{ mm}$ long \times $0.5-0.7 \text{ mm}$ wide, leaf surface smooth, apex broadly rounded, plane, margins entire or with an occasional, bluntly emerging margin cell, dorsal leaf base not extending across the stem, length of dorsal insertion *ca* $1/2$ of leaf width; cells isodiametrical to elongate, $25-40 \times 20-30 \mu\text{m}$ in midleaf, becoming larger to the base $20-30 \times 60-65 \mu\text{m}$ and conspicuously smaller towards the margin, margin cells *ca* $15-25 \mu\text{m}$ high; cell walls with conspicuous, simple-triangular to radiate trigones, the trigones not bulging, intermediate thickenings rather frequent, narrowly elongate to rounded, cuticle smooth; oil bodies not observed; ocelli absent. Lobules very small, *ca* $1/6 \times$ leaf length, ovate-subquadrate, conspicuously decurved with the apex touching the ventral margin of the leaf lobe (or extending slightly beyond the lobe margin), strongly inflated; free margin seen in situ, from base to apex composed of 4-5(-7) narrowly rectangular cells and from apex to keel of 3 (sub)rectangular cells, margin cells larger than inner lobule cells; lobule tooth 1-celled, blunt, *ca* $20 \times 25 \mu\text{m}$, only slightly projecting at the apex; hyaline papilla large, ($10-12 \times 30-40 \mu\text{m}$), narrowly

oblong, proximal and marginal, attached the the proximal side of the tooth and well visible; keel concave, at a straight angle with the stem; lobule cells much smaller than leaf cells and thin-walled, subquadrate, *ca* 12-15 μm , with minute trigones. Underleaves distant, plane, broadly ovate, wider than long, 0.2-0.4 mm long \times 0.2-0.45 mm wide, 2-3 \times stem width, bifid to 1/2, lobes broadly triangular, 7-11 cells wide at base, apex acute by one cell, incision rather widely V-shaped, sinus sharp, margins plane, entire, bases rounded, insertion line curved; underleaf cells smaller than leaf lobe cells but with similar wall thickening, oil bodies and ocelli not observed; rhizoid disc small, rhizoids few, colorless.

Dioicous? (androecia not seen). **Gynoecea** (immature) on short or elongate branches with 1(-2) pycnolejeuneoid innovations (rarely without innovation), with one series of narrowly elongate female bracts and bracteole without ocelli, the bracts and bracteole standing erectly upwards, free; bract lobe oblong, *ca* 0.75-0.85 \times 0.3-0.4 mm, apex rounded, margins entire, bract lobule almost as long as the bract, oblong-lanceolate, apex rounded to obtuse, margins entire, keel short, inconspicuous; bracteole narrowly elliptic, 250 μm wide 600 μm long, *ca* 3/4 \times bract length, bifid to 1/3-1/2, lobes acute, sinus narrow, margins entire. **Perianth** (juv.) 5-keeled. **Vegetative reproduction** by regenerants on leaf margins.

Discussion. *Pycnolejeunea chocoensis* is readily recognized by the small, decurved lobules with the apex touching the ventral margin of the leaf lobe, and by the absence of ocelli. By the decurved lobules and the lack of ocelli *P. chocoensis* is similar only to *P. decurviloba* Steph. (described and illustrated as *Cheilolejeunea decurviloba* (Steph.) X.-L.He; He, 1996), but the latter species is a much larger plant, with wider, reniform underleaves (6-7 \times stem width) and more robust stems with a 4-6 cells wide ventral merophyte. *Pycnolejeunea decurviloba* was transferred to *Cheilolejeunea* by He (1996) but Ye *et al.* (2015) showed that it is a member of *Pycnolejeunea*, in spite of the absence of ocelli. With the addition of *P. remotistipula* and *P. chocoensis*, three species without ocelli are known in the genus *Pycnolejeunea*. *Pycnolejeunea chocoensis* is to date only known from the type locality from coastal everwet rainforest of the Chocó.

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