

A new species of *Pycnolejeunea* (Marchantiophyta, Lejeuneaceae) from Brazil

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ABSTRACT

The new species *Pycnolejeunea remotistipula* from the state of Amazonas, northern Brazil, is described and illustrated. This species is characterized by sparsely-attached underleaves with obtuse lobes, a rounded leaf apex, large, and rectangular leaf lobules with free margin composed of more than six cells with thickened walls, elongated basal laminal cells forming a poorly differentiated vitta, as well as the absence of ocelli. A key to the Brazilian species of *Pycnolejeunea* is given.

1 | INTRODUCTION

Pycnolejeunea was first described by Spruce (1884), as a subgenus of *Lejeunea* Libert., and later elevated to genus by Schiffner (1893). The first regional taxonomic revision of *Pycnolejeunea* was made by Hoffman (1935), however, his concept of *Pycnolejeunea* diverged from that of Spruce (1884), since he included some other genera of Lejeuneaceae (see He 1999). *Pycnolejeunea* sensu Hoffman was subsequently investigated by Kachroo & Schuster (1961), who transferred taxa with distal hyaline papillae to *Cheilolejeunea*, and those with short leaf insertions and entally positioned hyaline papillae to one of following genera: *Nipponolejeunea* S.Hatt., *Tuyamaella* S.Hatt., and *Siphonolejeunea* Herzog (He 1999).

The current circumscription of *Pycnolejeunea* is still largely based on Spruce's concept (1884), which includes plants with closely imbricate and convex leaf lobe cells, frequent presence of ocelli in the leaves, short or cylindrical lobules, reniform, 2-lobed underleaves, single or paired innovations, and 5-keeled perianths. Additionally, Kachroo & Schuster (1961) recognized aspects of stem anatomy, leaf attachment and leaf lobule as other representative characteristics of the genus. To date, the most complete treatment of *Pycnolejeunea* was published by He (1999), in which nine species were recognized and distributed among two subgenera (*Densistipulae* X.-L.He and *Pycnolejeunea*) and two sections (*Macrolobae* X.-L.He and *Pycnolejeunea*).

The genus *Pycnolejeunea* is distributed throughout the tropics, with eight species restricted to Neotropics, mostly as corticolous epiphytes in tropical lowland forest typically found in secondary forest or plantations due to their xerophytic nature. Indeed, the complex tree architecture in tropical

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rainforests has been suggested to influence the vertical separation of some species in the genus, as exemplified by the distribution of *Pycnolejeunea contigua* (Nees) Grolle, that is mainly limited to the outermost canopy branches of large trees, but also occurs in upper and lower canopy, and of *P. macroloba* (Nees & Mont.) Schiffn., which occurs mostly in lower and middle canopy (He 1999).

To date Brazil is known to host seven species [*Pycnolejeunea contigua* (Nees) Grolle, *P. decurviloba* Steph., *P. densistipula* (Lehm. & Lindenb.) Steph., *P. gradsteinii* Ilk.-Borg., *P. macroloba* (Nees & Mont.) Schiffn., *P. papillosa* X.-L. He e *P. porrectilobula* C.Bastos & O.Yano], all of them widely distributed in the country, but lacking in the Central region possibly due to undersampling (Yano 2008). Two Brazilian species are presently considered of exclusive Amazonian distribution: *P. gradsteinii* (state of Pará) and *P. decurviloba* (Amazonas).

During the taxonomic revision of *Cheilolejeunea* for the Americas (Bastos 2017), one unidentified specimen was found in R.M.Schuster's collections, currently deposited at the Field Museum herbarium (F), as well as an additional material of the same species in the INPA herbarium. However, a morphological comparative analysis of the lobular structure revealed that the specimens belongs to *Pycnolejeunea* due to its prominent first tooth (second tooth is reduced), hyaline papilla situated at the base of the first tooth, and its large, more than 300 μm long, rectangular leaf lobule with thickened free margin cells. Within this genus, these materials clearly represent a new species that is described, illustrated, and discussed below.

2 | TAXONOMY

Pycnolejeunea remotistipula C.J.Bastos & Zartman, *sp. nov.*

This species can be differentiated by the combination of a rectangular lobule, free margin with 15-17 strongly thickened cells, absence of ocelli, remotely-attached bifid underleaves with obtuse lobes and rounded apices, and an acute sinus.

Typus—BRAZIL: Amazonas, Rio Negro, between Manaus and São Gabriel, along BR 307, from São Gabriel, just N of Igarapé Iá-Mirim, near Jerusalém; primary forest, 00°20'N, 66°35'W, 17 July 1979, R.M.Schuster 79-18-835 (holotype: F). (Figure 1).

Plants robust, ca. 1.4 mm wide, vegetative branches *Lejeunea*-type; stem ca. 100 μm in diameter, in cross-sections 7 cortical cells and 8–9 medullary cells, thick walls; ventral merophytes two cells wide. Leaves spreading, imbricate; lobe 500–700 \times 340–510 μm , ovate-oblong, dorsal margin slightly arched, entire, ventral margin slightly arched, entire, apex rounded; cells plane to slightly mammillose, thin walls, median cells hexagonal, 15–28 \times 13–18 μm , trigones distinct, intermediate thickenings nodulose, cells toward the leaf margin vertically oriented, basal cells 40–45 \times 23–25 μm , elongated, oblong, forming a slightly differentiated *vitta*, trigones distinct; oil bodies not seen; lobule large, rectangular-ovate, 290–360 \times 150–190 μm , slightly inflated, free margin slightly involute, flat distally, formed by 15–17 cells, strongly thickened walls distally, first tooth short,

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straight to vertically oriented, or slightly curved, second tooth incorporated into free margin, hyaline papillae situated at the inner base of first tooth, keel straight, weakly crenate to smooth. Underleaves remotely attached, small, 180–220 × 170–210 μm, bifid to 1/2, sinus acute, lobes obtuse, apex rounded, base cuneate, insertion line curved. Autoicous. Androecia terminal, 4–5 pairs, 2 bracteoles at base of the branch. Gynoecia on short lateral branches, without innovations, lobe bracts ca. 500 × 350 μm, obovate, margin entire, apex rounded, lobule ca. 410 × 110 μm, oblong, apex acute, bracteole ca. 380 × 210 μm, emarginate to short-bifid, perianth oblong, 5-keeled, rostrum short.

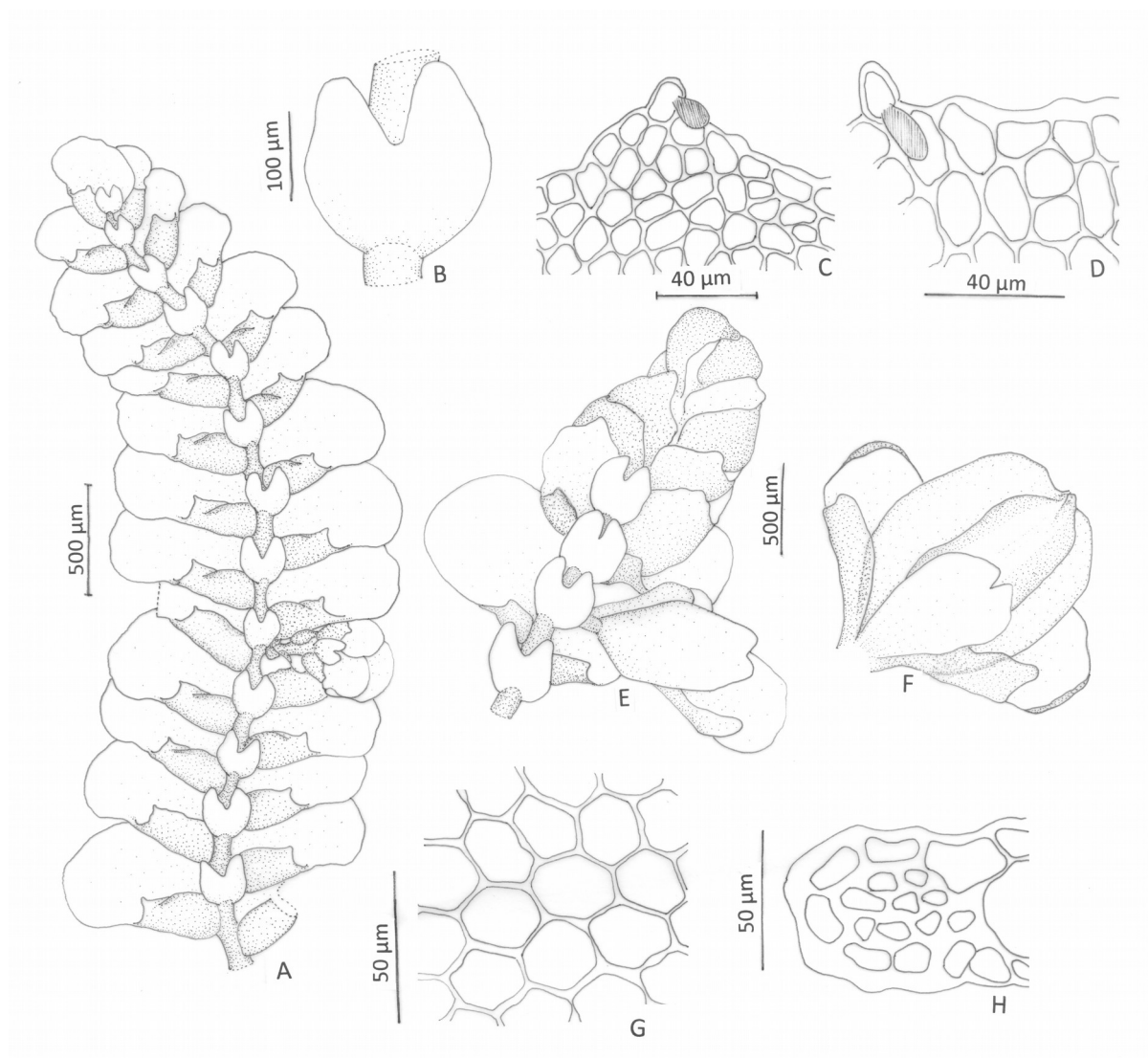


Figure 1. *Pycnolejeunea remotistipula* sp. nov. A. Gametophyte, ventral view. B. Underleaf. C–D. Lobules apex showing hyaline papilla at the inner base of first tooth. E. Androecial and gynoecial branches, ventral view. F. Gynoecium with perianth, ventral view. G. Laminal cells. H. Cross-section of the stem (Figures A–D, G, H from holotype; E–F from paratype).

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Additional material examined (paratype)—BRAZIL: Amazonas, highway between Humaitá and Porto Velho, 60 km of Humaitá, at highway crossing of São João stream, ca. 8°S, 63°W, primary forest, white sand, closed canopy, level terra firme, on fallen log with intact bark, mesic partial shade, 30 Apr 1982, A.J.Fife *et al.* 3982 (INPA).

Etymology—The specific epithet refers to the prominently distant underleaves.

Distribution and ecology—The new species is only known from Brazilian state of Amazonas, where it grows on living tree trunks, in primary rain forest. Associated species are *Archilejeunea crispistipula* (Spruce) Steph. and *Cheilolejeunea aneogyna* (Spruce) A.Evans.

Taxonomic comments—Due to the large number of free margin cells, the new species *Pycnolejeunea remotistipula* may be classified into *Pycnolejeunea* sect. *Macrolobae* X.-L.He, which is defined by large, rectangular lobule and free margin composed of 9–20 cells. However, *P. remotistipula* differs from all known species in the genus by the absence of ocelli, strongly thickened distal portion of the free margin of the leaf lobule, distant underleaves with rounded lobe apices, and a slightly differentiated vitta. The absence of ocelli is also shared with *P. decurviloba*. According to He (1999) and Ye *et al.* (2015), the number of ocelli in the leaves in *Pycnolejeunea* is variable, ranging from 0–5, and may occasionally be absent as typically present in the leaves of *P. contigua*, the type of the genus. The presence of ocelli in the remaining *Pycnolejeunea* species is, however, likely a homoplastic trait since it is also known to occur in *Cheilolejeunea aneogyna* (Spruce) A.Evans (Bastos 2012), as well as in some other genera.

The new species also shares the following morphological similarities with *P. macroloba* (Nees & Mont) Schiffn.: (a) large, 290–360 μm long, rectangular lobule; (b) free margin of lobule composed of more than six cells with strongly thickened walls; (c) elongated basal laminal cells, forming a poorly differentiated vitta; (d) apical tooth lobule unicellular, straight or vertically positioned (see He 1999, figs. 8g–h and 9h). However, the new species differs from *P. macroloba* in its distantly placed underleaves with rounded apices and lack of ocelli.

Identification key for the Brazilian species of *Pycnolejeunea*

- 1. Plants without ocelli 2
- 1. Plants with ocelli 3

- 2. Leaf lobule ovoid-triangular, curved downward; underleaves large, ca. 0.9–1.3 mm wide, reniform, imbricate *P. decurviloba*
- 2. Leaf lobule large, ca. 360 μm long, rectangular, but not curved downward; underleaves small, 170–210 μm wide, ovate, remote *P. remotistipula*

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3. Lobule large, 312–480 µm long, rectangular, free margin composed of 9–20 elongated cells
..... *P. macroloba*
3. Lobule small, less than 300 µm long, ovate, free margin composed of 4-8(-9) elongated cells4
4. Laminal cells and lobule cells strongly papillose *P. papillosa*
4. Laminal cells and lobule cells only mamilllose or slightly papillose 5
5. Plants robust, 1.3–1.7 mm wide, ventral merophyte 4–8 cells wide *P. densistipula*
5. Plants smaller, less than 1.3 mm wide, ventral merophyte 2 cells wide 6
6. Leaf lobule conic, apical margin with narrow, deep, U-shaped sinus 7
6. Leaf lobule, ovate, apical margin no U-shaped sinus *P. contigua*
7. Leaf lobe suborbicular to ovate, laminal cells isodiametric; underleaves sparsely-attached to
contiguous, the base cuneate *P. gradsteinii*
7. Leaf lobe oblong-ovate, falcate, convex; laminal cells oblong; underleaves imbricate, base rounded
..... *P. porrectilobula*

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