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### Notes on the bryophytes of Madagascar 3. Six new Lejeuneaceae species

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# Notes on the bryophytes of Madagascar 3. Six new Lejeuneaceae species

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## KEY WORDS

Epiphylls,  
endemism,  
Lejeuneaceae,  
Madagascar,  
new species.

## ABSTRACT

As a result of several collecting trips to Madagascar in cooperation with the Parc Botanique de Tsimbazaza (Antananarivo, Madagascar) and the Missouri Botanical Gardens, five species new to science are described: *Cheilolejeunea renigastria* sp. nov., *Cololejeunea translucens* sp. nov., *Drepanolejeunea tubana* sp. nov., *Lejeunea mamilliflora* sp. nov. and *Lejeunea tubulirostris* sp. nov. Former *Lejeunea alata* var. *patriciae* is given species rank under the name of *Lejeunea geisslerae* nom. et stat. nov.

## RÉSUMÉ

*Notes sur les bryophytes de Madagascar 3. Six nouvelles espèces de Lejeuneaceae.*

À la suite de plusieurs voyages de collecte à Madagascar en coopération avec le Parc Botanique de Tsimbazaza (Antananarivo, Madagascar) et du Jardin Botanique de Missouri, cinq espèces nouvelles pour la science sont décrites: *Cheilolejeunea renigastria* sp. nov., *Cololejeunea translucens* sp. nov., *Drepanolejeunea tubana* sp. nov., *Lejeunea mamilliflora* sp. nov. et *Lejeunea tubulirostris* sp. nov. *Lejeunea alata* var. *patriciae* est élevé au rang d'espèce sous le nom de *Lejeunea geisslerae* nom. et stat. nov.

MOTS CLÉS  
Épiphylls,  
endémisme,  
Lejeuneaceae,  
Madagascar,  
espèces nouvelles.

## INTRODUCTION

During the identification process of our numerous epiphyllous collections from Madagascar 11 species turned out as new to the bryoflora of the island (Pócs 2020). At the same time several species of Lejeuneaceae family came into sight, which were not incorporable in any known taxa. The present paper contains the description of these five species new to science and one taxa uplifted from variety to species rank.

## MATERIAL AND METHODS

The collection work during 1990, 1994, 1998 and in 2004 was realized in cooperation with the Parc Botanique et zoologique de Tsimbazaza (TAN) and Missouri Botanic Garden Herbarium (MO). In the collecting expeditions participated along the author Robert E. Magill (MO), Catherine LaFarge-England (ALTA), Gabriella Kis, András Szabó, Sándor Orbán, Sarolta Pócs, András Vojtkó (EGR); Zoltán Tuba (Szt. István University, Gödöllő); Roger Lala Andriamiarisoa, Nivo Rakotonirina and Hery-Lisy Ranaivojaona, (TAN). The collected specimens are deposited in EGR, TAN and partly (mostly the mosses) in MO. A great part of material was sent to specialists of different groups and published by them (enumerated in Pócs 2020). The epiphylls were identified by the author. Much more specimens were collected on other substrates, still waiting to be revised.

## DESCRIPTION OF THE NEW SPECIES

Family LEJEUNEACEAE Rostovzev  
Genus *Cheilolejeunea* (Spruce) Steph.

*Cheilolejeunea renigastria* Pócs, sp. nov.  
(Figs 1A-F; 7E, F)

Sect. *Euosmolejeunea* (Spruce) W.Ye, Gradst. & R.L.Zhu, *Cryptogamie, Bryologie* 36 (4): 324, 2015.

DIAGNOSIS. — Plant comparable to *Cheilolejeunea trifaria* (Reinw., Blume & Nees) Mizut. 1964, but differing by its elongate ovate leaf lobes (length-width ratio 5:4, not orbicular) with almost straight ventral margin and with much smaller underleaves with slightly sinuate insertion, wide sinus and rounded lobe ends.

TYPE. — Madagascar, former Antsiranana Province, Sava Region, Marojejy National Park. Elfin forest on the SE ridge near Camp III, at 1830 m elevation, epiphyllous. T. Pócs, with R.E. Magill & C. LaFarge England, 90114/HY, 26-28.III.1990 (holo-, EGR; iso-, TAN).

ETYMOLOGY. — Named after its reniform underleaves.

### DESCRIPTION

In herbarium yellowish-green shoots 0.8-1 mm wide and up to 15 mm long, remotely branching.

### Stem

50-100 µm in diameter, with 7 cells of hyalodermis (of which 2 belong to ventral merophyte) and 8-10 medullary cells of equally thick walls.

### Rhizoids

Colorless, radially arranged at the base of each underleaf, but not forming a special plate.

### Leaves

Spreading, slightly concave, elongate oval, asymmetric, 400-600 µm long and 320-400 µm wide, length-width ratio 5:4. Lobe apex rounded to subacute, in most cases incurved. Ventral margin almost straight with at least 170° angle to the straight or slightly curved lobule keel. Lobe, lobule and underleaf cells isodiametric or slightly elongate. Median cells 16-25 µm, marginal ones 8-12 µm in diameter, with large but not confluent trigones and smooth surface. Oil bodies in the herbarium specimen not visible. Lobule about ¼ of the lobe length, triangular-ovate, slightly inflated, with an acute, unicellular 2<sup>nd</sup> tooth with a distal hyaline papilla. 3-4 cells at the distal lobule end between the tooth and margin. Free lobe margin with many relatively small cells.

### Underleaves

Reniform, length-width ratio 3:4, width about 4× of the stem and only 60% of the lobe length. Underleaf insertion slightly sinuate, incision ¼-⅓, wide V shaped, lobules with rounded apex. Androecia, archegonia and ways of vegetative reproduction not seen.

### COMMENT

The new species, apart from *Ch. trifaria*, is not similar to any known African species. *Cheilolejeunea krakakammae* (Lindenb.) R.M.Schust. 1963, usually has acute leaf apex and more or less rounded underleaves with cuneate insertion, while the other species are even more different.

Genus *Cololejeunea* (Spruce) Steph.

*Cololejeunea translucens* Pócs, sp. nov.  
(Fig. 2)

Subgenus *Leptocolea* (Spruce) Schiffn.

DIAGNOSIS. — It stands quite isolated with its spinose-dentate female bracts and perianth and acuminate and distantly dentate leaves. The Indomalaysian-South Pacific *Cololejeunea decliviloba* Steph. (*Sp. Hep.* 5: 890, 1915; Steph. Icones 1985: 12185; see also Jones 1953:159 and Tixier 1979: 768), seems to be closely related, but *C. translucens* sp. nov. differs by its much more symmetric lobe shape and by its lobe cells with very small trigones, finally by its smaller lobule reaching only one third of lobe length. The African *Cololejeunea dentata* (E.W.Jones) R.M. Schust, *Beih. Nova Hedwigia* 9: 175, 1963 has similar leaves but its female bracts and perianth completely differ with their entire margins.

TYPE. — Madagascar, Fianarantsoa prov., Haute Matsiatra reg., Parc national de l'Andringitra. Mossy montane rainforest along a

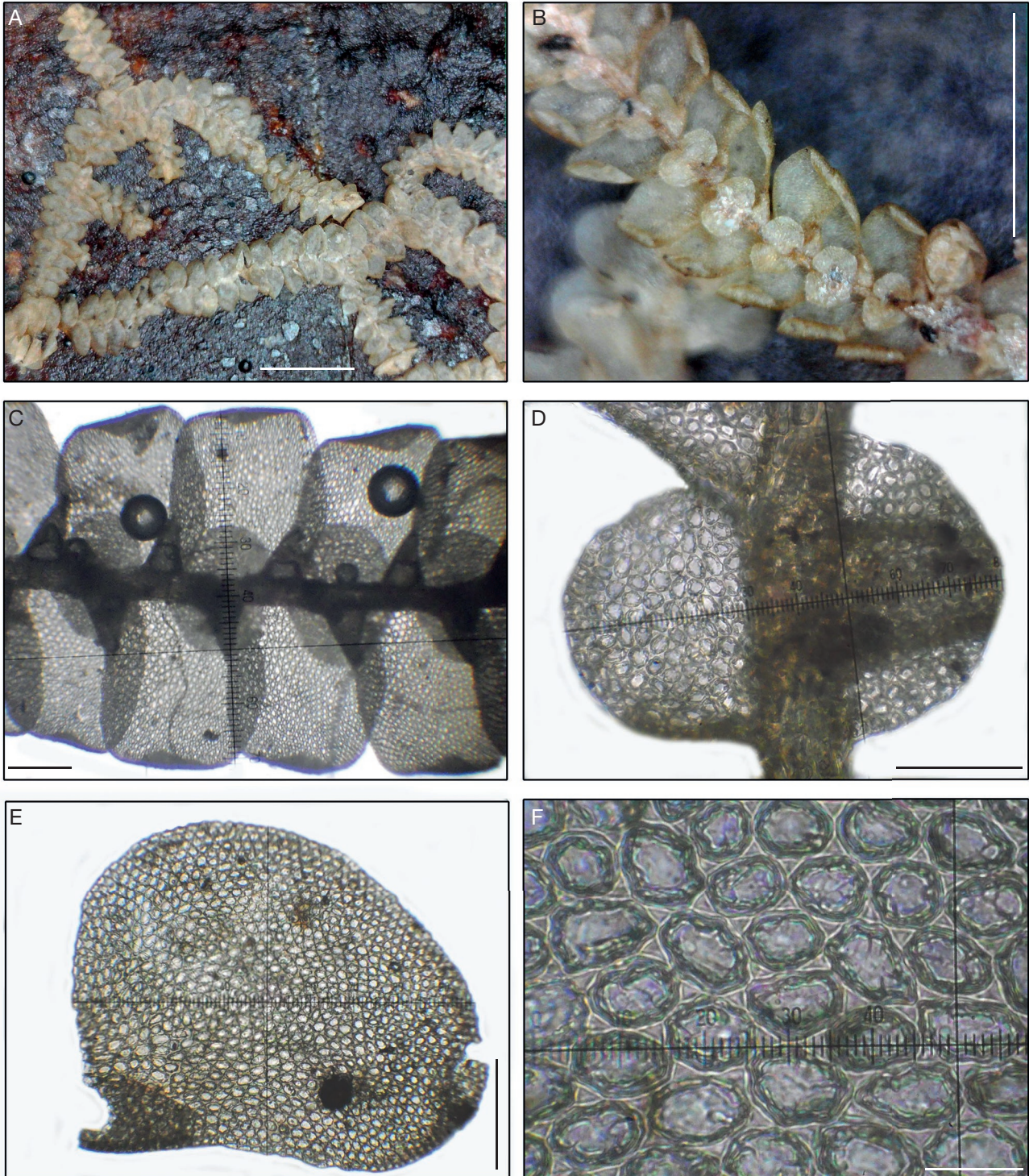


FIG. 1. — *Cheilolejeunea renigastria* Pócs, sp. nov.: **A-C**, habit, dorsal and ventral views; **D**, underleaf; **E**, leaf; **F**, median lobe cells. (All from the type). Scale bars: A, B, 1 mm; C, E, 200  $\mu$ m; D, 100  $\mu$ m; F, 25  $\mu$ m.

W tributary of Korokoro river, near camp III, 1000-1270 m, epiphyllous, 22°12'40"S, 47°0'E, T. Pócs, G. Kis & A. Szabó, 9473/GR, 20-23.IX.1994 (holo-, EGR).

ETYMOLOGY. — The name expresses its shiny, translucent habit.

#### DESCRIPTION

Dry specimens shiny, translucent, small, epiphyllous. Shoot more or less appressed to the leaf surface, up to 5 mm long and 0.8 mm wide, densely and irregularly branching.

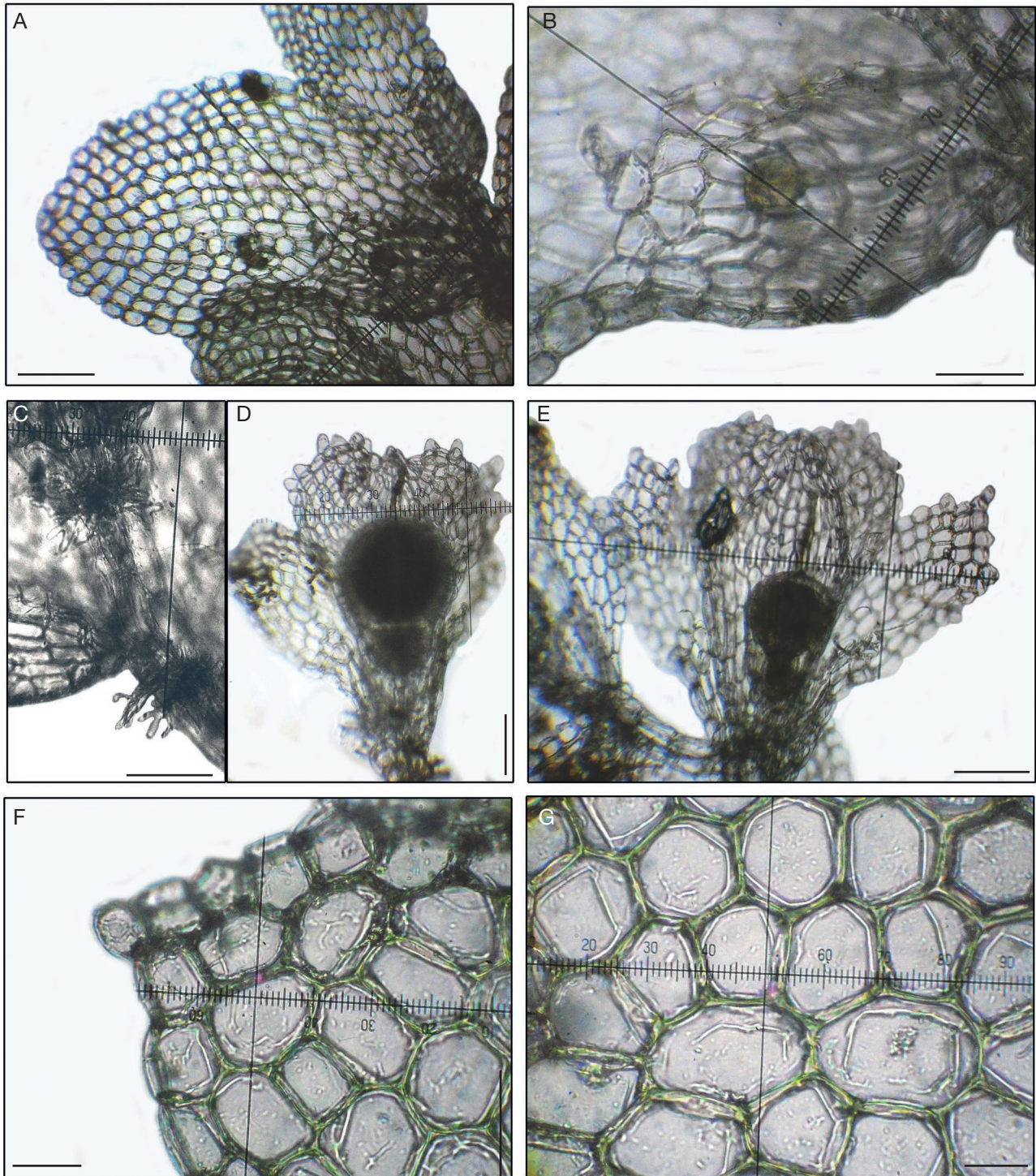


FIG. 2. – *Cololejeunea translucens* Pócs, sp. nov.: **A**, leaf; **B**, lobule; **C**, rhizoids; **D-E**, female branches with perianth and bract; **F**, lobe apex; **G**, median lobe cells. (All from the type). Scale bars: A, C-E, 100  $\mu$ m; B, 50  $\mu$ m; F, G, 25  $\mu$ m.

*Stem*

35-56  $\mu$ m thick with 1 ventral merophyte, composed of 5 cortical and one medullar cell rows.

*Rhizoids*

Originate at each leaf basis, colorless, in irregular bundles.

*Leaves*

Distant, symmetric obovate up to 400  $\mu$ m length and 300  $\mu$ m width. Lobe acuminate with 6-10 remote, unicelled, triangular teeth all along of its margin. Lobule about one third of lobe length, ovate, with a larger, bicellular first tooth ending in a round cell and an unicellular, triangular second tooth.

Hyaline papilla at the proximal base of first tooth. There are only 1-2 cells at the distal lobule end between the first tooth and lobe margin. The free lobule margin consists of 6-8 cells behind the second tooth.

#### *Autoicous*

Male branches hanging on the stem, subglobose and consist of 1:3 pairs of very concave, acuminate bracts.

#### *Archegonia*

Also on short lateral (sometimes apical) branches.

#### *Female bracts*

Cuneate, with 1-3 apical teeth, reaching to three third or subequal to the perianth.

#### *Perianth*

Cordate, compressed, ventrally inflated. The two side keels with mamillose apical teeth. Beak short or inconspicuous, only one cell high. Sporophyte and ways of vegetative reproduction not seen.

Genus *Drepanolejeunea* (Spruce) Steph.

#### *Drepanolejeunea (Drepanolejeunea) tubana* Pócs, sp. nov. (Fig. 3A-D)

DIAGNOSIS. — The only species possessing similar leaf and underleaf shape, is *Drepanolejeunea teysmannii* (Gottsche) Steph., *Hedwigia* 35 (3): 84, 1896 (see Fig. 3E, F). But while *Drepanolejeunea tubana* sp. nov. has horizontally spreading leaves, the leaves of *D. teysmannii* both in wet and dry state are very obliquely inserted, forming an angle about 30° to the stem. Even more important, that while each cell of *D. teysmannii* on the outer leaf surface has an acute papilla, both leaf surfaces of *D. tubana* sp. nov. are completely smooth, lacking papillae or mamillae. From the somewhat similar *Drepanolejeunea pentadactyla* (Mont.), *Sp. Hepat.* 5: 537, 1913 it differs by the other leaf shape, more and scattered ocelli and by its forward directed underleaf lobes.

TYPE. — Madagascar, Fianarantsoa prov., Atsinanana reg; parc National de Ranomafana. Along the N side of main road at the head the big waterfalls on the Namorona river. Dripping granitic cliffs surrounded by montane rainforest, 1080-1150 m, 21°14.70-86'S, 47°23.82'E. *S. & T. Pócs, 04126/QD, 29.VII.2004* (holo-, EGR).

ETYMOLOGY. — *Drepanolejeunea tubana* sp. nov. is named in honor of the late professor Zoltán Tuba, who organized, sponsored and participated our 2004 Madagascar collecting trip.

#### DESCRIPTION

Pale green, 3-5 mm long, hardly branching shoots of 0.5-0.6 mm width.

#### *Stems*

Up to 60 µm diameter, with 7 cortical cell rows, including 2 ventral merophytes.

#### *Rhizoids*

Scarcely develop.

#### *Leaves*

Contiguous, horizontally spreading, ventral margin at an angle of 60-90° to the stem, acute triangular ovate, 250-320 µm long and 200-240 µm wide, anticlinal with (3-)5-8, postically 1-2 large, triangular teeth of 1-3 cells high and wide at base, giving the leaf a lobulate character. Lobe apex acute and mostly incurved.

#### *Lobe cells*

Subrectangular or elongate 5-6-gonal, 20-30 µm long and 15-20 µm wide, with thin walls. Small triangles and 1-2 intermediate thickenings are present on the longitudinal walls. Both dorsal and ventral surface smooth, without papillae or mamillae. Ocelli 1-5, scattered, same size and shape as average cells, in herbarium specimens with age usually disappear. Oil bodies also disappeared. Lobule near half of lobe length, ovate-lanceolate, inflated, with inflexed free margin. Therefore the lobule teeth hardly visible, both are acute, falcate and unicellular, 20-30 µm long, with only one cell between them.

#### *Underleaves*

Of about 3× stem width, with 4 cells wide, cuneate base and with forward directed, at base 2 cells wide, 5-6 cells long, acute lobes with a U-shaped sinus.

#### *Gametoecia and vegetative reproduction*

Unknown.

Genus *Lejeunea* Lib.

#### *Lejeunea geisslerae* (Pócs) Pócs, nom. et stat. nov. (Fig. 4)

*Lejeunea alata* var. *patriciae* Pócs, *Candollea* 56 (1): 72 (2001). Blocking name: *Lejeunea patriciae* Schäf.-Verw., *Candollea* 56 (1): 64 (2001).

TYPE. — Madagascar, Prov. Antsiranana, "Réserve Spéciale de Manongarivo (13°59'N, 48°26'E), on the rain forest covered north ridge leading to the 1869 m high summit of Manongarivo Massif, Epiphyllous". *P. Geissler 19856/1* (holo-, G; iso-, EGR, JE, TAN).

ETYMOLOGY. — Named after the late Patricia Geissler, hepaticologist and former curator of the bryophyte collection of Geneva herbarium, who first collected this taxon. As the name of *Lejeunea patriciae* is already applied to another taxon, a new name was necessary, *Lejeunea geisslerae* nom. et stat. nov.

#### COMMENT

When *Lejeunea alata* var. *patriciae* was described, it was thought to be a local variation of the palaeotropical *Lejeunea alata*, although even at its type locality was collected in several places. Now, as it was found at more than 900 km to the south, in Andringitra National park, in three localities at a wide elevation range, two cases together with *Lejeunea alata* but without any transitional form between the morphologically distinct taxa. Therefore the author became convinced that they are separate species and uplifted *Lejeunea alata* var. *patriciae* to the species rank. The most striking difference

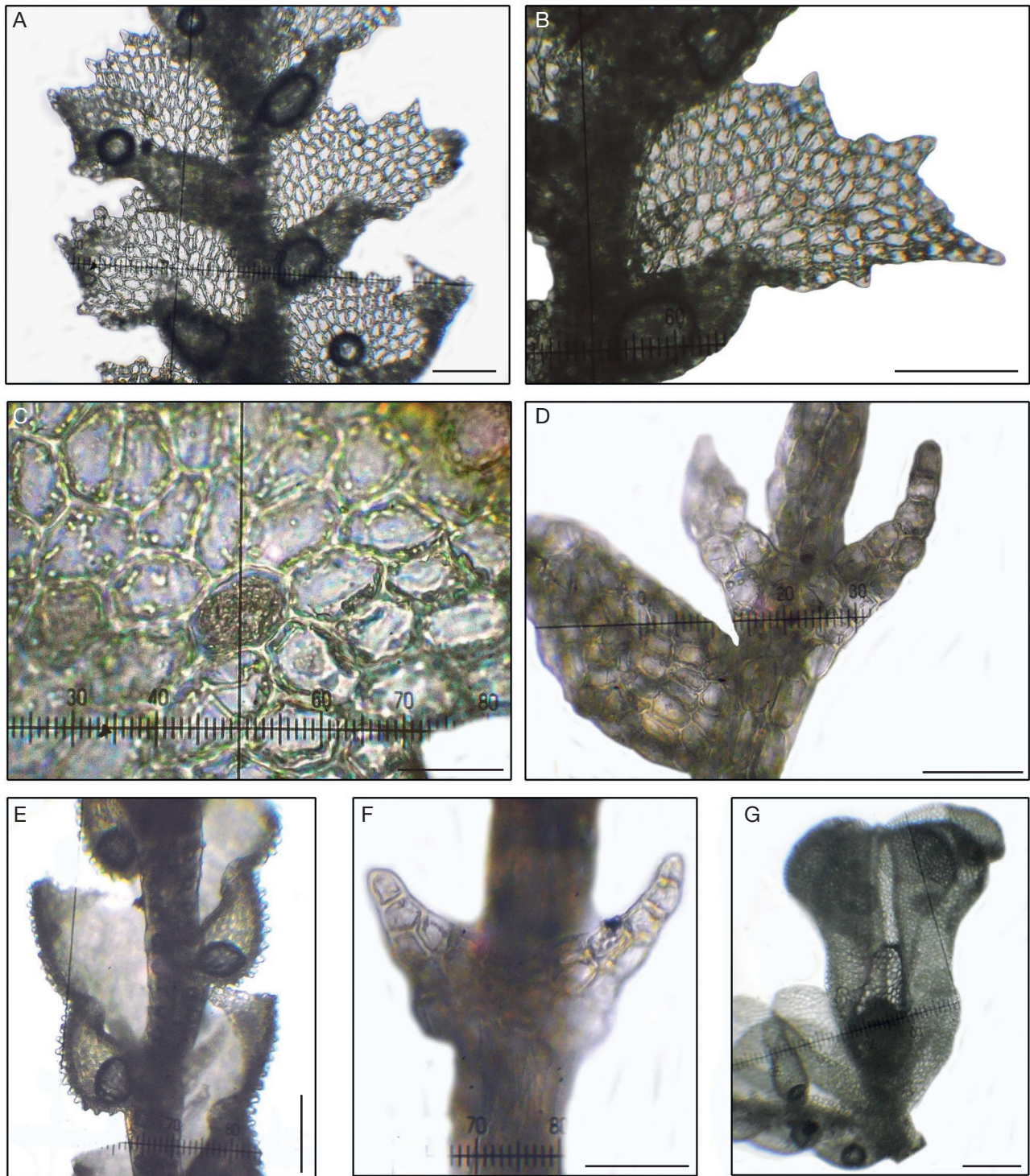


FIG. 3. – *Drepanolejeunea tubana* Pócs, sp. nov.: **A**, habit, ventral view; **B**, leaf; **C**, median lobe cells with 2 ocelli; **D**, underleaf and lobule. (All from the type). *Drepanolejeunea teysmannii* (Gottsche) Steph.: **E**, habit, ventral view; **F**, underleaf. (For comparison, from Thailand, Nakhon Si Thammarat, Khao Ramrone summit, Pócs 1209/G, det. S.Chantanaorrapint). *Lejeunea alata* Gottsche: **G**, perianth. (For comparison, from Madagascar, Andringitra Mts., Pócs 9473/HD). Scale bars: A, B, E, 100 µm; C, 25 µm; D, F, 50 µm; G, 200 µm.

between the two species is in their perianth shape. While the perianth of *Lejeunea alata* (see Fig. 3G) is more urn shaped with 5 sharp keels, the keels extend above as auricles, 0.10–0.105 mm wide; beak 2 cells long, (G.E. Lee, 2013: 396), the perianth of *Lejeunea geisslerae* nom. et stat. nov. has

longer body with parallel walls and at its apex is prolonged into 5 inflated horns turning downwards (Fig. 4A–C), which seem from above very different from those of *L. alata* (see Fig. 4B). The beak is also different. Although it is in both cases 2 cells high, in *L. alata* the beak is only 25 µm long



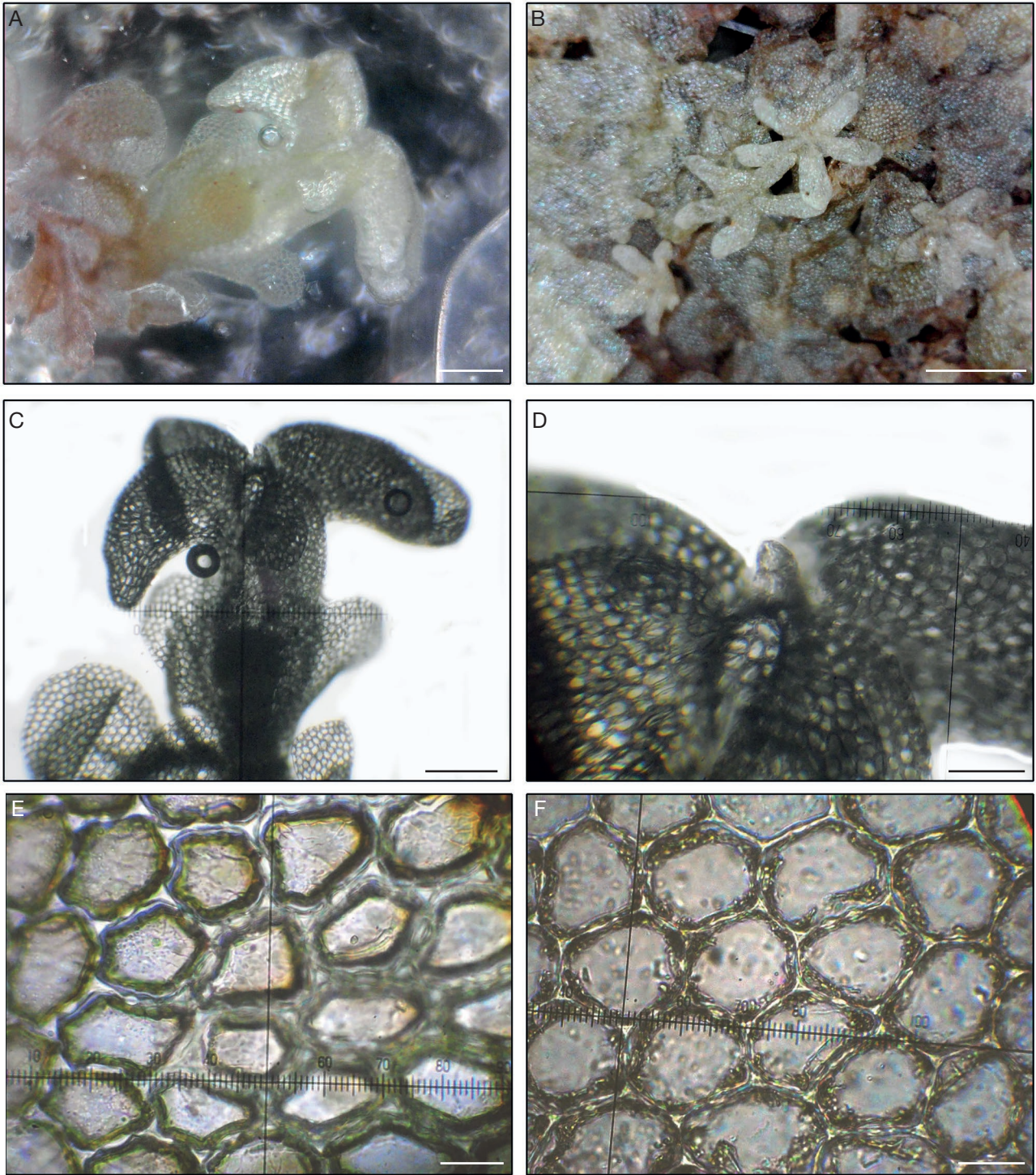


FIG. 4. – *Lejeunea geisslerae* (Pócs) Pócs, nom. et stat. nov.: **A, C**, perianths from side view; **B**, perianths seen from above; **D**, perianth apex with beak; **E**, cells of perianth horns; **F**, median leaf cells. (All from Madagascar, Andringita Mts., Pócs 9472/AP). Scale bars: A, C, 200  $\mu$ m; B, 1 mm; D, 100  $\mu$ m; E, F, 25  $\mu$ m.

in average, not longer than wide. In *L. geisslerae* nom. et stat. nov. the cells are much more prolonged resulting in a longer (50  $\mu$ m) beak (Figs 4D; 7B). While intermediate thickenings are unknown in the lobe cells of *L. alata*, they are abundant in *L. geisslerae* nom. et stat. nov. (Fig. 4E, F). Oil bodies minute, numerous, *Massula* type (not known in

*L. alata*). The hyaline papilla on the proximal side of first lobule tooth is also different. In *L. alata* small, ovate while in *L. geisslerae* nom. et stat. nov. stretched, club shaped (Fig. 7A). The lobule and underleaf formation are similar in the two species. *Lejeunea alata* is a species of plaeotropical distribution, known from East Africa, Tanzania through

the Seychelles, Madagascar and the Mascarene Islands to Indomalaya and the Pacific (Zhu & So 2001; Wigginton 2018). *Lejeunea geisslerae* nom. et stat. nov. seems to be an endemic species locally evolved in Madagascar.

NEW LOCALITIES OF *LEJEUNEA GEISSELERAE*. — Madagascar, Fianarantsoa Prov., Haute Matsiatra reg., Parc national de l'Andringitra. Montane rainforests on the W side of Korokoro river, around camp II, 750-1000 m, 22°13'S, 47°01-02'E. *T. Pócs, G. Kis & A. Szabó*, 20-23.IX.1994, 9472/AP and BF (EGR, TAN, MO); Mossy montane rainforest along a W tributary of Korokoro river, near camp III, 1000-1270 m, 22°12'40"S, 47°0'E, *T. Pócs, G. Kis & A. Szabó*, 9473/GS, 20-23.IX.1994 (EGR, TAN); Montane evergreen forest below Vohitratsiva saddle on the slopes of Mt. Vohipia, at 1300-1515 m, 22°10'S, 47°03'E, *T. Pócs, G. Kis 9470/AJ*, 24.IX.1994 (EGR).

*Lejeunea mamilliflora* Pócs, sp. nov.  
(Figs 5; 7D)

DIAGNOSIS. — The species is characterised by the extremely large, blister like mamillae on the two ventral perianth carinae. Mamillae on the perianths occur in some other *Lejeunea* species too, but never so large, blister like ones arranged in increasing size. The other character is the very frequent, alternating development of male and female gamaeoecia on the main stem.

TYPE. — Madagascar, Fianarantsoa Prov., Haute Matsiatra reg., Parc national de l'Andringitra. Montane rainforests on the W side of Korokoro river, around camp II, 750-1000 m, 22°13'S, 47°01-02'E. *T. Pócs, G. Kis & A. Szabó*, 20-23.IX.1994, 9472/BG (holo- on microslide, EGR).

ETYMOLOGY. — Named after the large mamillae increasing in size downwards on the ventral perianth carinae.

OTHER SPECIMEN OBSERVED. — Same locality as the type, *T. Pócs et al.*, 9472/AK (para-, TAN). At the type locality it is very rare, hopefully will turn up from other localities too.

DESCRIPTION

Dry specimens in herbarium greenish yellow, shoots 1.2-1.5 mm wide, up to 12 mm long, slightly branching. Stem up to 80 µm wide, with hyalodermis and two ventral merophytes. The leaves are slightly imbricate to contiguous, horizontally spreading at an angle of 90° to the stem, 700-900 × 560-650 µm, more or less parallel sides or slightly falcately ovate with rounded apex. Lobe cells isodiametric hexagonal, 25-30 µm in diameter, with thin wall, medium sized, well developed trigones and intermediate thickenings. Marginal cells somewhat smaller, 20-25 µm, forming a slightly crenulate border. Oil bodies not seen. Lobules small, inflated, triangular or ovate, 160 × 120 µm. The only lobule tooth circular with an ental hyaline papilla at its proximal base. It is separated only by one cell from the keel. Underleaf lobes at base 3-5 cells wide and 6-7 cells long, acute lanceolate, stretching to about 6× stem width, with a very wide, U shaped sinus. Rhizoids colorless, forming irregular bundles at underleaf bases. *Autoicous* or sometimes *paroicous*. Male and female gametangia densely and randomly alternating on very short side branches along the main stem. Androecium globose, about of 200 µm diameter, hang at an angle

of 40-60° in postical direction and consist of 2-3 pairs of concave male bracts. Only one small bracteole below the first pair of bracts. Gynoecia turn at 60° towards antical direction. Female bracts about half perianth length, ovate with rounded apex. Bracteole equal length of bracts, its apex only to 1-2 cells depth bilobed. Perianth cordate, 400-500 × 325-360 µm, compressed with two side wings and two ventral keels, which are decorated by 2-3 rows of densely arranged, blisterlike, globose mamillae growing in size downwards from 20 to 30 µm diameter. On the side wings these mamillae develop only weakly, in one row. Beak 2-3 cells high, up to 50 µm length. Sporophyte and vegetative reproduction not known.

*Lejeunea tubulirostris* Pócs, sp. nov.  
(Figs 6; 7C)

DIAGNOSIS. — Two features are characteristic for this species. The very long, tube like perianth beak, which can reach more than 160 µm (6 cells) length, is unique among the African *Lejeunea* species, although can occur in several Asian taxa (e.g. *Lejeunea pectinella* Mizut., 1970), but even there is never combined with acute lobe form. The other feature: grooved stem with hollows between the ridges of longitudinal cell walls seems to be unique in the whole genus.

TYPUS. — Madagascar, Fianarantsoa prov., Haute Matsiatra reg., Parc national de l'Andringitra. Mossy montane rainforest along a W tributary of Korokoro river, near camp III, 1000-1270 m, epiphyllous, 22°12'40"S, 47°0'E. *T. Pócs, G. Kis & A. Szabó 9473/GL*, 20-23.IX.1994. (holo-, EGR; iso-, TAN).

ETYMOLOGY. — The name refers to its very long, tubelike perianth beak.

DESCRIPTION

In herbarium pale green shoots are 1.4-1.8 mm wide and up to 15 mm long, pinnately branching.

*Stem*

80-120 µm, side branches 50-70 µm in diameter, with hyaloderm of 7 cells of which 2 are ventral merophytes and with 12-15 medullary cells with wavy, thin walls. The stem surface is grooved, with deep hollows between the 12-24 µm high ridges formed by the longitudinal cell walls.

*Leaves*

Triangular ovate with acute apex, spreading horizontally at an angle of 90-120° with the stem.

*Lobe cells*

Hexagonal, slightly elongate, 30-50 × 24-40 µm, marginal cells 18-25 µm, slightly protruding, forming a weakly crenulate border. Cell walls with small trigones and intermediate thickenings. Lobules ovate, inflate, about ¼ lobe length, with slightly falcate, unicellular tooth and a hyaline papilla at its proximal base (Fig. 7C). There are 2-3 cells between the lobule tooth and keel. The free lobule margin usually incurved, consists of only 3-5 cells.

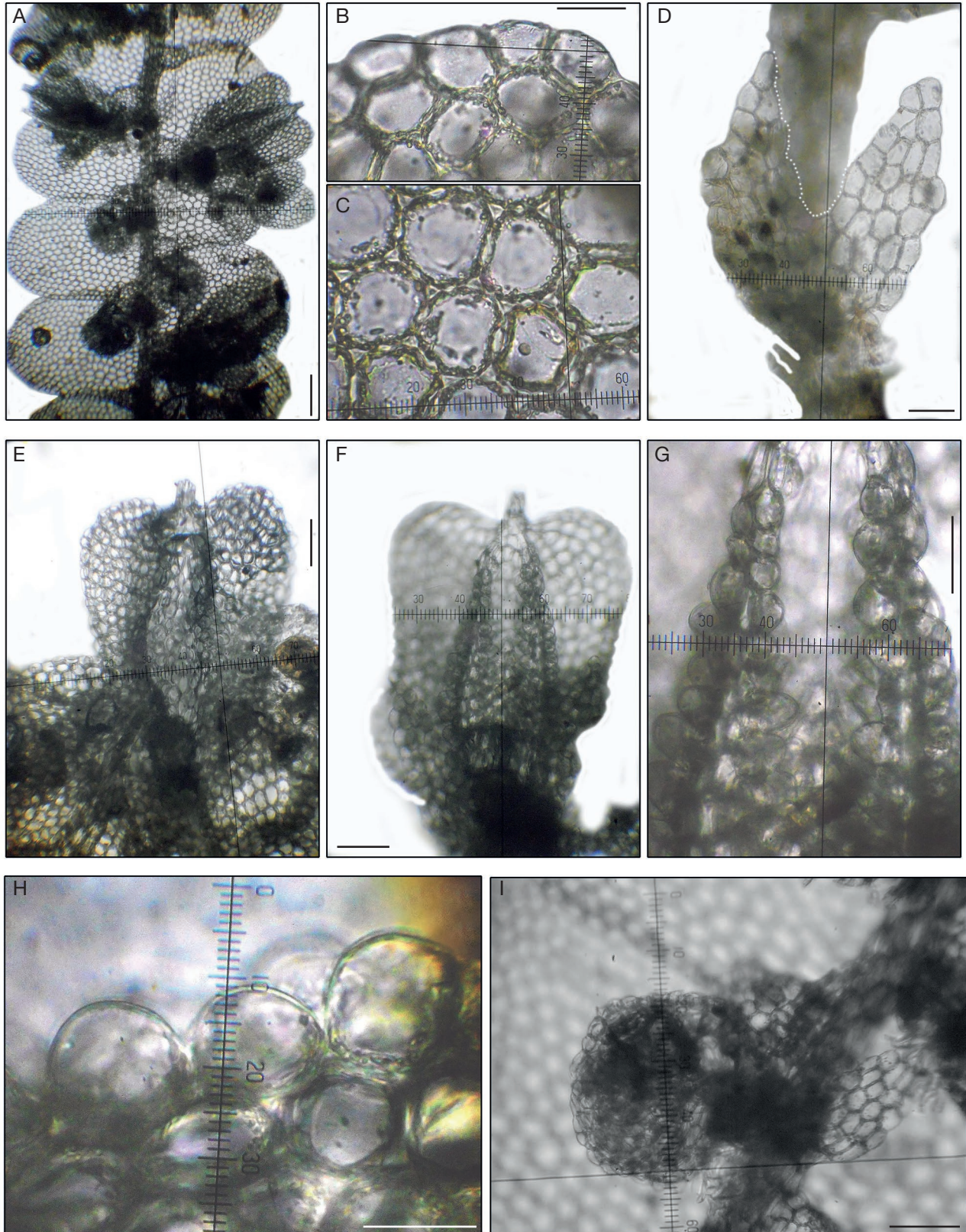


FIG. 5. – *Lejeunea mamilliflora* Pócs, sp. nov.: **A**, habit with gametangia, ventral view; **B**, lobe apex cells; **C**, median lobe cells; **D**, underleaf; **E**, **F**, perianths, dorsal and ventral views; **G**, ventral perianth carenes; **H**, inflated mamillae of the perianth carene; **I**, male branch. (All from the type). Scale bars: A, 200 μm; B, C, H, 25 μm; D, G, 50 μm; E, F, I, 100 μm.

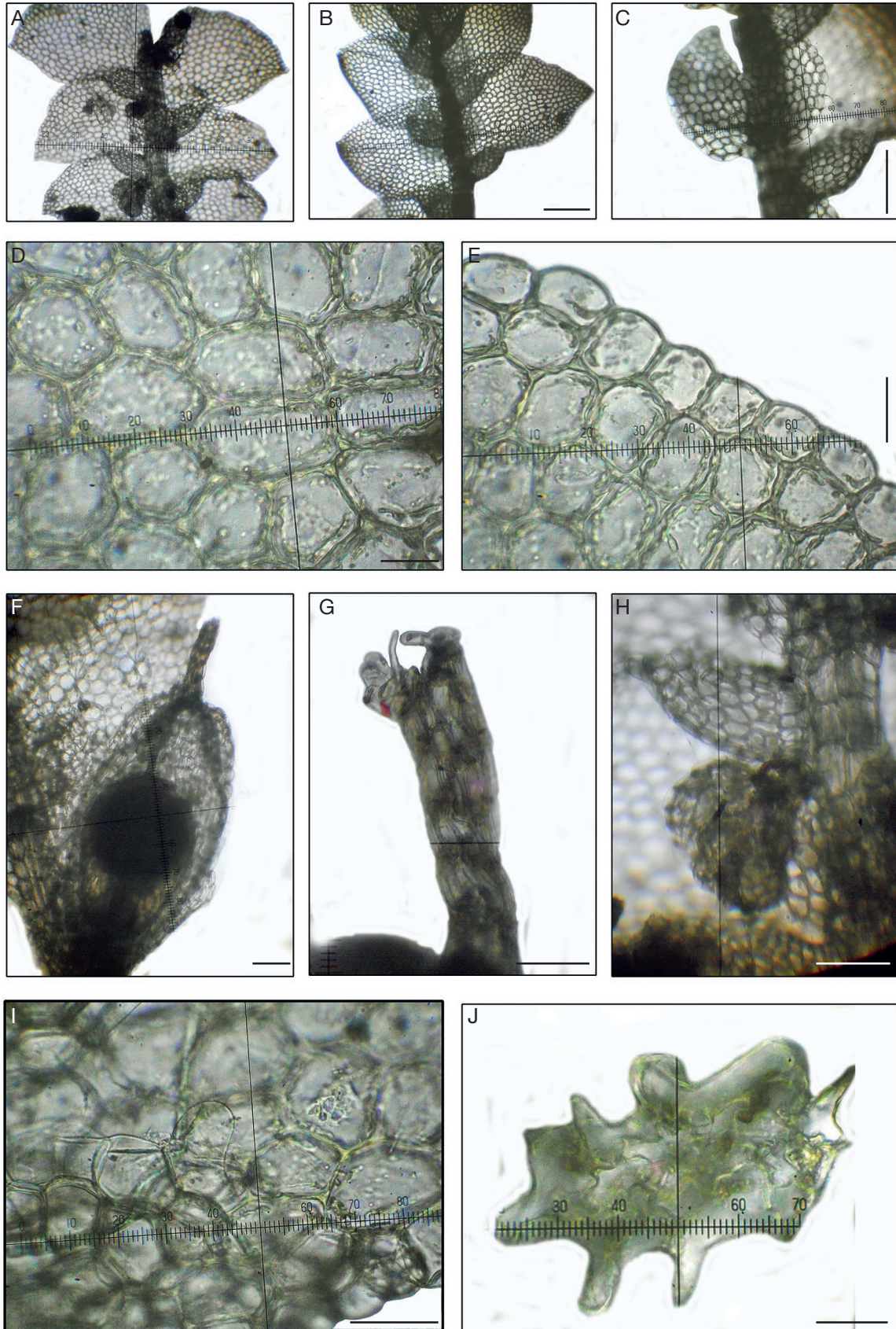


FIG. 6. – *Lejeunea tubulirostris* Pócs, sp. nov.: **A, B**, habit, ventral and dorsal views; **C**, underleaf and lobule; **D**, basal lobe cells; **E**, median and marginal lobe cells; **F**, perianth; **G**, perianth beak; **H**, male branch; **I**, lobule tooth with hyline papilla; **J**, transversal section of stem (in wet state). (All from the type). Scale bars: A, B, 200  $\mu$ m; C, F, 100  $\mu$ m; D, E, I, J, 25  $\mu$ m; H, 50  $\mu$ m.

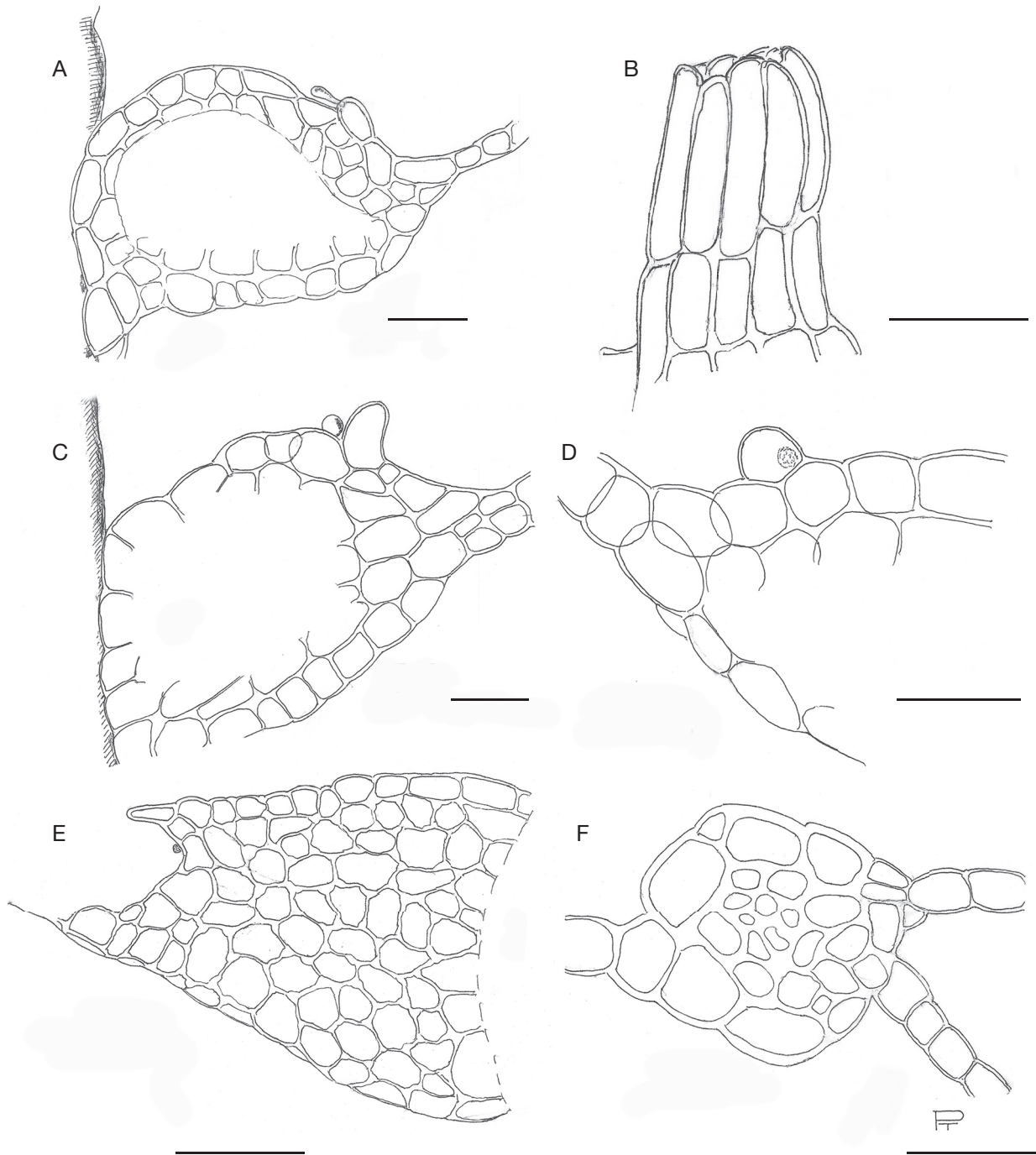


FIG. 7. — *Lejeunea geisslerae* (Pócs) Pócs.: **A**, lobule; **B**, perianth beak. *Lejeunea tubulirostris* Pócs sp. nov.: **C**: lobule. *Lejeunea mamilliflora* Pócs, sp. nov.: **D**, lobule. *Cheilolejeunea renigastria* Pócs, sp. nov.: **E**, lobule; **F**, transversal section of stem. (A, B from Pócs 9472/AP, all others from their type). Scale bars: A, E, F, 50  $\mu$ m; B-D, 25  $\mu$ m.

#### *Underleaves*

Orbicular, about 4 $\times$  stem width, split to about half their length, with a V form sinus and 6-8 cells wide and about 6 cells long lobes with obtuse to acute ends. Underleaf base slightly auriculate with sinuate insertion line.

#### *Autoicous*

Androecia on short side branches, turning postically 40-60° to the main stem, globose in shape, about 200  $\mu$ m in diameter and consist of 2-3 pairs of very concave male bracts. Bracteoles not observed. Gynoecia turning in anterior direction,

at 50–75° to the stem. Female bracts and bracteoles about  $\frac{3}{4}$  of the perianth length, with acute lobes. Bract lobule about  $\frac{2}{3}$  bract length. Bracteole with short (2 cells deep, V shaped) incision.

#### *Perianth* (Fig. 6F)

Oblong-ellipsoid, 600–800  $\mu\text{m}$  long and 300–323  $\mu\text{m}$  wide, terete with 5 equal keels, each with slightly mamillate edge.

#### *Beak* (Fig. 6G)

Tube like, 6 cells (160  $\mu\text{m}$ ) long and 3–4 cells (40  $\mu\text{m}$ ) wide, straight, with irregularly mamillate mouth. Sporophyte and ways of vegetative reproduction not seen.

## DISCUSSION

The Indian Ocean islands have the highest percentage of bryophyte endemism in Africa (Tan & Pócs 2000). According to Vanderpoorten & Hallingbäck (2009), the rate of liverwort endemism in Madagascar is about 20%, which is relatively high level for bryophytes. Madagascar is known as a biodiversity hotspot since long, due to its ancient, Gondwana origin and isolation from African mainland since the Cretaceous (Pócs 1975).

But even within Madagascar, we can distinguish hot spots with higher rate of endemism and rare species. Such are the isolated granitic massifs, like Marojejy and Andringitra Mountains, or the still existing continuous lowland rainforest blocks in the northeastern part of the island. Just as an example, *Radula marojezica* E.W. Jones was described from the mossy elfin forests of Marojejy National Park. In the Andringitra mountains were found, apart from the above described new species: *Ceratolejeunea andringitrae* Pócs, *Colura cataractarum* Pócs, second locality of *Diplasiolejeunea ornata* Pócs & Schäfer-Verwimp, *Plagiochila vandenberghenii* Gradstein (Pócs 2021) and a still undescribed *Sphagnum* species, not mentioning the many rarities known only from their type localities (Pócs 2020). The case is similar also with the quite intact lowland rainforests of Mananara North Biosphere Reserve, from where *Bazzania konratiana* Gyarmati, *Radula pinnata* Pócs, *Xylolejeunea grolleana* (Pócs) X.L.He & Grolle were described, and the second locality of *Drepanolejeunea vanderpoortenii* Gradstein and Pócs (2021) was found, together with the only African occurrence of the moss *Calymperes venezuelanum* (Mitt.) Broth. ex Pitt. What is obvious, there are still many places to be investigated and survey their biodiversity in international cooperation, urged by the continuous deforestation process, when only in national parks can we hope the survival of this biological richness.

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## REFERENCES

- JONES E. W. 1953. — African hepatics. III. *Cololejeunea* and *Leptocolea* with dentate leaves. *Transactions of the British Bryological Society* 2 (2): 158–163. <https://doi.org/10.1179/006813853804878191>
- PÓCS T. 1975. — Affinities between the bryoflora of East Africa and Madagascar, in MIEGE J. & STORK A. (eds), *Origines des Flores africaines et malgaches*. Nature, spéciation. Comptes-rendues de la VIII<sup>e</sup> réunion de l'AETFAT, 1. *Boissiera* 24a: 125–128.
- PÓCS T. 2001. — East African Bryophytes, XVI. New taxa of Lejeuneoideae (Lejeuneaceae) collected by Patricia Geissler in Manongarivo Special Reserve, NW Madagascar. *Candollea* 56 (1): 69–78.
- PÓCS T. 2020. — Notes on the bryophytes of Madagascar 2. New liverwort and hornwort records. *Acta Biologica Plantarum Agriensis* 8 (1): 69–84. <https://doi.org/10.21406/abpa.2020.8.1.69>
- PÓCS T. 2021. — The African species of *Drepanolejeunea vesiculosa* group with description of *Drepanolejeunea vanderpoortenii* sp. nov. (Jungermanniopsida) from Madagascar. *Acta Botanica Hungarica* 63 (1–2): 195–212. <https://doi.org/10.1556/034.63.2021.1-2.11>
- SCHÄFER-VERWIMP A. 2001. — On *Lejeunea patriciae*, nom. nov. for *Lejeunea pilifera* Tixier. *Candollea* 56 (1): 63–67.
- SCHUSTER R. M. 1963. — An annotated synopsis of the genera and subgenera of Lejeuneaceae. I. Introduction; annotated keys to subfamilies and genera. *Beihfte zur Nova Hedwigia* 9: 1–203.
- SÖDERSTRÖM L., HAGBORG A., VON KONRAT M., BARTHOLOMEW-BEGAN S. H., BELL D., BRISCOE L., BROWN E. †, CARGILL D. C., COSTA D. P., CRANDALL-STOTLER B. J., COOPER E. D., DAUPHIN G., ENGEL J. J., FELDBERG K., GLENNY D., GRADSTEIN S. R., HE X., HEINRICHS J., HENTSCHEL J., ILKU-BORGES A., KATAGIRI T., KONSTANTINOVA N. A., LARRAÍN J., LONG D. G., NEBEL M., PÓCS T., PUCHE F., REINER-DREHWALD, E., RENNER M. A. M., SASS-GYARMATI A., SCHÄFER-VERWIMP A., SEGARRA J. G. M., STOTLER R. E. †, SUKKHARAK P. H., THIERS B. M., URIBE J., VAÑA J., VILLAREAL J. C., WIGGINTON M., ZHANG L. & ZHU R. L. 2016. — World checklist of hornworts and liverworts. *PhytoKeys* 59: 1–828. <https://doi.org/10.3897/phytokeys.59.6261>
- STEPHANI F. 1896. — Hepaticarum species novae IX. *Hedwigia* 35 (3): 73–140.
- STEPHANI F. 1915. — *Species hepaticarum* 5. George & Cie, Genève & Bâle: 705–832. <https://doi.org/10.5962/bhl.title.95494>
- STEPHANI F. 1985. — *Icones Hepaticarum*. Jardin Botanique de Genève, Zug 12, 315 p. (165 microfiches).
- TAN B. C. & PÓCS T. 2000. — Bryogeography and conservation of bryophytes, in SHAW A. J. & GOFFINET B. (eds), *Bryophyte Biology*. Cambridge Univ. Press: 403–448. <https://doi.org/10.1017/CBO9781139171304.014>
- TIXIER P. 1979. — Contribution à l'étude du genre *Cololejeunea*. Les Cololejeunoïdes de Nouvelle Calédonie. *Nova Hedwigia* 31: 721–787.
- VANDERPOORTEN A. & HALLINGBÄCK T. 2009. — Conservation biology of bryophytes, in GOFFINET B. & SHAW A. J. (eds): *Bryophyte Biology*, 2<sup>nd</sup> edition. Cambridge Univ. Press, 487–533. <https://doi.org/10.1017/CBO9780511754807.013>
- WIGGINTON M. J. 2018. — Checklist and distribution of the

- liverworts and hornworts of sub-Saharan Africa, including the East African Islands. *Tropical Bryology Research Reports* 9: 1-138.
- YE W., GRADSTEIN S. R., SHAW A. J., HO B. C., SCHÄFER-VERWIMP A., PÓCS T., HEINRICHS J. & ZHU R.-L. 2015. — Phylogeny and classification of Lejeuneaceae subtribe Cheilolejeuneinae (Marchantiophyta) based on nuclear and plastid molecular markers. *Cryptogamie, Bryologie* 36 (4): 313-333. <https://doi.org/10.7872/cryb/v36.iss4.2015.313>
- ZHU R. L. & SO M. L. 2001 — Epiphyllous liverworts of China. *Beihefte zur Nova Hedwigia* 121: 1-418.

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