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Notes on *Cololejeunea standleyi* (Steph.) Herz., *C. subscariosa* (Spruce) Schust., *C. linopteroides* Robins. (Hepaticae Lejeuneaceae)

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Résumé – Les descriptions originales de *Cololejeunea subscariosa* (Spruce) Schust. et de *C. standleyi* (Steph.) Herz. sont revues, et des caractères permettant de les distinguer sont ajoutés. Des brefs commentaires nomenclaturaux concernant ces deux espèces sont présentés. *Cololejeunea standleyi* est comparé à *C. linopteroides* Robins. et en particulier à *C. sigmoidea* Jovet-Ast *et* Tixier, dont elle est très proche. *Cololejeunea subscariosa* est mentionné pour la première fois du Costa Rica.

Abstract – The original descriptions of *Cololejeunea subscariosa* (Spruce) Schust. and *C. standleyi* (Steph.) Herz are revised, and characters allowing separating them are added. Brief comments on the nomenclature of both species are included. *Cololejeunea standleyi* is compared to *C. linopteroides* Robins. and *C. sigmoidea* Jovet-Ast *et* Tixier, to which it is closely allied. *Cololejeunea subscariosa* is a new record for Costa Rica.

Costa Rica / Hepaticae / Lejeuneaceae / *Cololejeunea*

In 1884, Spruce described a new species of *Lejeunea* from Rio Negro, Brazil, as *Lejeunea* subgen. *Colo-Lejeunea subscariosa.* It is a reddish foliicolous plant, whose leaves have very a small lobule and dead, hyaline cells at their apices; the perianth is flattened. This species is now named *Cololejeunea subscariosa* (Spruce) Schust. (Schuster, 1963)

Schiffner (1895, cited by Evans, 1911) separated *Cololejeunea* in two subgenera: *Physocolea,* containing species with inflated, five keeled perianths, and *Leptocolea,* having compressed perianths with a dorsal keel. Spruce's species belonged to the latter genus. Evans (1911) suggested elevating those subgenera to generic rank; he kept the name *Leptocolea* and replaced the name *Cololejeunea* by *Physocolea.* Stephani (1916) erroneously reported *Physocolea subscariosa* from Costa Rica based on plants that belonged to an unknown species, which Herzog (1951) later described as *C. standleyi. Cololejeunea standleyi* (Steph.) Herz. is recognized by its suborbicular leaves with a subtriangular lobule, a hyaline margin and sigmoid cells. Dauphin *et al.* (1998) recorded the species from Costa Rica. The

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specimens misidentified by Stephani (1916), are deposited at the Boissier Herbarium in Geneva. The holotype of *Lejeunea* (*Colo-Lejeunea*) *subscariosa* Spruce from Manchester, and *C. standleyi* from Jena, were also studied.

The objectives of the present paper are to include additional characters (i.e., gemmae and stem structure) to the original descriptions of *Cololejeunea subscariosa* and *C. standleyi*, to compare these two species and to discuss the similarities between *C. standleyi* and both *C. linopteroides* Robins. and *C. sigmoidea* Jovet-Ast *et* Tixier.

Cololejeunea subscariosa (Spruce) Schust. Figs 1-4

Plants pale red, foliicolous, very delicate, appressed to the substrate. Stems subpinnate, branches short. Leaves plane, imbricate, oblong rounded, to 0.60 × 0.33 mm, but usually smaller. Merophyte one cell wide. Antical border semicordate, partially covering the stem; apical margin irregular, provided with finger-like hyaline projections; postical border convex (Fig. 1), lobule minute, almost absent, trapezoid, formed by 3-10 cells, the apical cell long, with a hyaline papilla on its apex. Leaf cells subpellucid, not or very little incrassate, some of them (those that are becoming gemmae), tightly surrounded by an opaque ring, basal cells 20 × 40 µm with large trigones, medial cells 18 × 28 µm, with smaller trigones and thickenings, marginal cells 14 × 20 µm and apical cells hyaline and finger-like (Figs 1,2). Gemmae of 22-24 cells (Fig. 3).

Plants autoicous. Perianth obcordate, cuneate, flattened, 0.6 × 0.5 mm, apex emarginate, slightly umbonate, margin irregular, with narrow wings. Dorsal surface subplane, ventral surface gibbous-convex, without a definite keel, capsule globose-elliptic (Figs 4, 4a). Perichaetial bracts obovate, at maturity somewhat smaller than the perianth, cells with small trigones. Male bracts in 3-6 pairs, with two antheridia each.

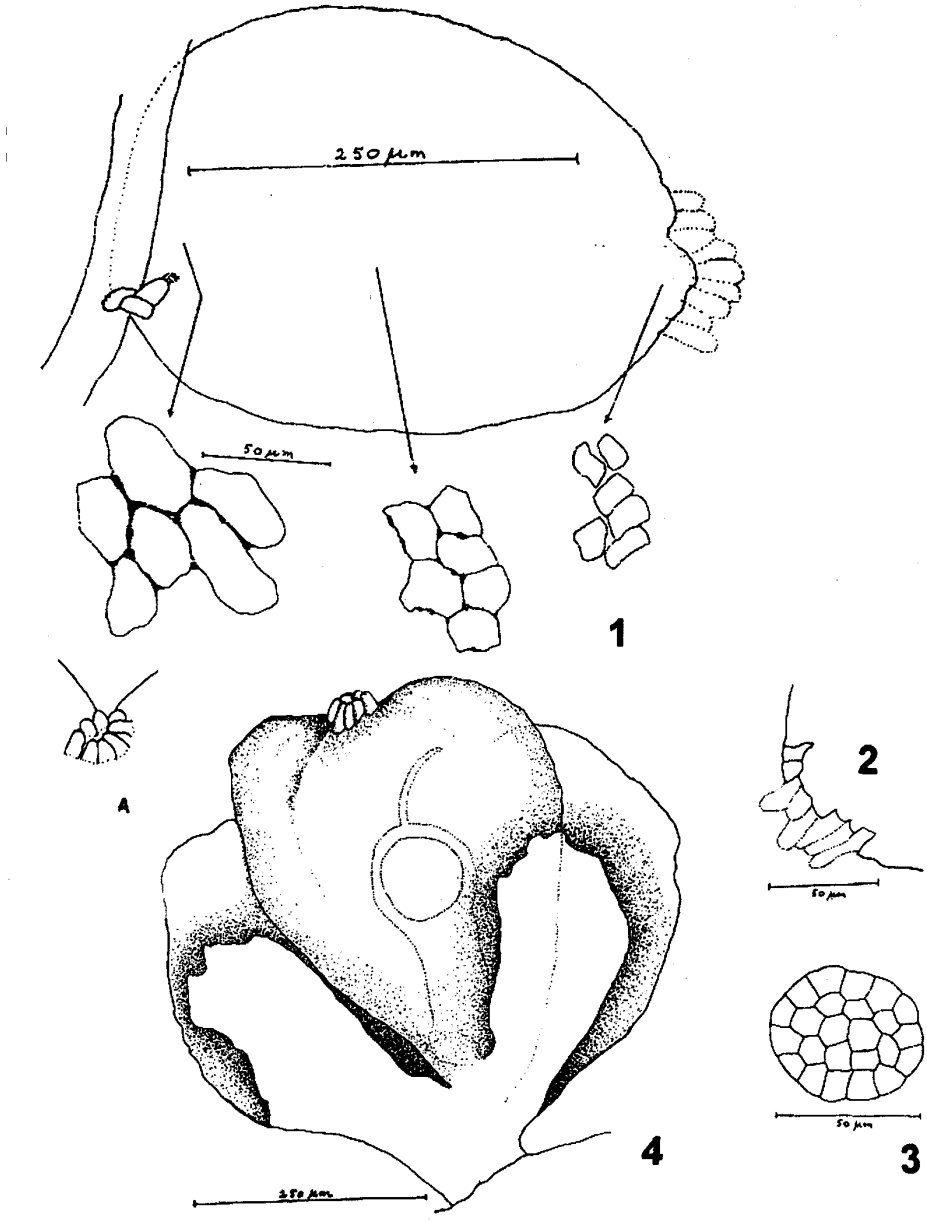
Examined material

BRAZIL: AMAZONAS, Sao. Gabriel, *Cololejeunea subscariosa* Spruce. L 104, MANCH 18839. L 556, MANCH 18838. S. Gabriel, Spruce s.n., MANCH 18837. COSTA RICA: PUNTARENAS: Osa Peninsula, 0-100 m, 30-31 October 1993, G. Dauphin s.n., (USJ 48100). *ibid*., Mogos Region, in premontaje wet forest, 18 February 1999, N. Sánchez s.n. (USJ 59642). Boruca Reserve, Ceibón stream, gallery forest, 180 m, 30 September 2004, Oscar M. Chaves P81 (USJ 60557). Sierpe river, 10m, September 2005, L.G. Obando s.n. (USJ 60558).

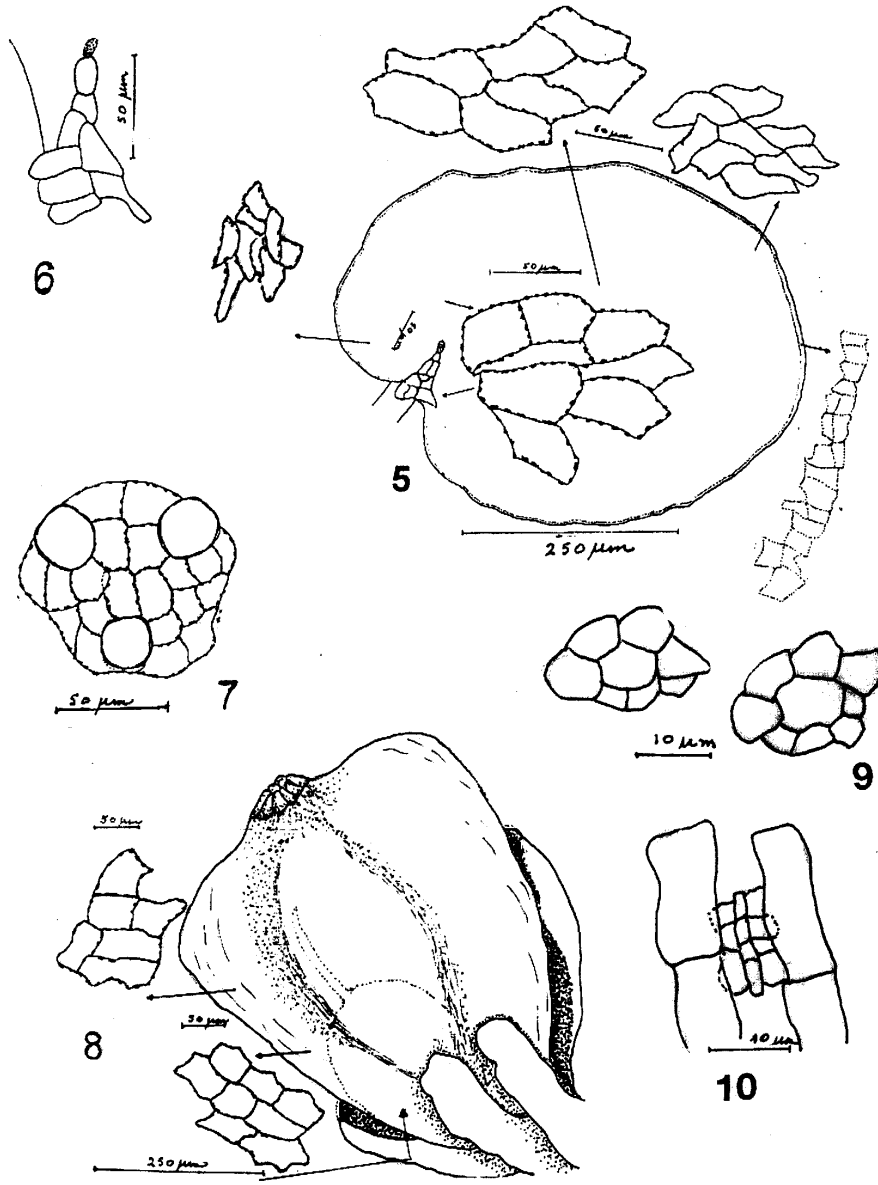
The type of *C. subscariosa* is glued to cardboard and several characters of the plant are difficult to observe. Even though, the reddish color of the plant, the small leaves, and the compressed perianth are evident.

Cololejeunea standleyi (Steph.) Herz. Figs 5-10

Plant large for the genus, monoicous, yellowish. Stems very branched at base, branches separate, forming flat patches 1-3 cm. diameter; branches with leaves to 2 mm wide, with fasciculate rhizoids. Stems ca. 80µm diameter, formed by one medullary cell and 7(8) cortical cell rows: four large, dorsally arranged, and three or four small ventral rows (Figs 9, 10), very much like in *Cololejeunea linopteroides* Robins. (Bernecker-Lücking & Morales, 1999). Merophyte of 2-4 cells wide. Main shoot leaves flat, covering completely the stem, contiguous to



Figs 1-4. *Cololejeunea subscariosa* **1.** Leaf – **2.** Apical cells – **3.** Gemma – **4.** Perianth with perichaetial leaves – **4a.** Detail of the mouth of the perianth.



Figs 5-10. *Cololejeunea standleyi* **5.** Leaf – **6.** Lobule – **7.** Gemma – **8.** Perianth with perichaetial leaves. **9-10.** Transverse section of the stem.

slightly imbricate, 0.6-0.7 × 0,5-0.6 mm, with a very narrow base, obliquely inserted, widely ovate, rounded apex, antical margin subauriculate. Cells very small, marginal cells hyaline, surrounding almost the whole leaf. Apical cells long hexagonal, subflexuose, 30 × 20 µm, basal cells large, oblong and sigmoid on the margin and basal auricles; trigones minute, wall thickenings in the form of small

beads, especially on the apical chlorophyllose cells and leaf auricles (Fig. 5). Cuticle coarsely verruculose. Lobule minute, appressed, sub triangular, with an apical tooth 2-3 cells long (Fig. 6). Gemmae scanty, consisting of 23 cells, three of them modified as cells of attachment (Fig. 7).

Inflorescence lateral in a short branch, with a rarely fertile innovation, perichaetial leaves very unequal in size, the smaller about a third of the size of the perianth, oblong, obtuse, with a narrow hyaline border. Perianth ca 3/4 the leaf length, plane, obcuneate, apex slightly obcordate, wingless, with keels on both sides, ventral surface convex, faintly keeled, dorsal surface smooth, partly covered by stem leaves (Fig. 8). Androecium with two antheridia each, bracts 3-4.

Examined material

HONDURAS: Lancetilla Valley, near Tela, 20-600 m, no. 54827. COSTA RICA, PUNTARENAS: Carara Nacional Park, 30 m, G. Dauphin & P. Döbbeler s.n. 13 September 1991 (USJ 47961). *Ibid.,* W. Alfaro, s.n., March 1997 (USJ 59360). *Ibid.,* C. Sánchez s.n. 30 January 1997, (USJ 60315). Near Quepos, 0-50 m, L. G. Obando, 7 August, 1998.

The original French and Latin on the labels of the following material, belonging to the Boissier Herbarium, have been kept. All have been identified as *Cololejeunea subscariosa* Spruce.

COSTA RICA: Forêts du Río Naranjo, 200-250 m. Mars 1893. Communicavit W. Barbey, Collegit Ad. Tonduz, N° 3077 d (N° Vetter). Herbier Boissier 2618/7. Forêts du Río Naranjo, 200-250 m. Mars 1893. Communicavit W. Barbey, Collegit Ad. Tonduz, N° 3077 e (N° Vetter). Herbier Boissier 2618/5. Forêts du Río Naranjo, 200-250 m. Mars 1893. Communicavit W. Barbey, Collegit Ad. Tonduz, N° 3077 g (N° Vetter). Herbier Boissier 2618/6. cum *Taxilejeunea surinamensis*, cum *Radula stenocalyx* Mont. Forêts du Río Naranjo, versant Pacifique du Costa Rica, 200-250 m. Mars 1893. Communicavit W. Barbey, Collegit Ad. Tonduz, Stephani Octobre 1894, N° 3077 e* (N° Vetter). Herbier Boissier 2618/9. Le numero manquant, F. Vetter en a mis un quel conque 3077 e).

DISCUSSION

Cololejeunea subscariosa and *C. standleyi* are foliicolous taxa occurring at low elevations. They may be confused by their very similar lobule, which is very small, appressed to the lobe and with a long tooth having an apical hyaline papilla in both species. However, in *C. standleyi* the apical tooth is formed by two or three cells in a row, compared to only one in *C. subscariosa* (Figs 1, 6). Other differences between both species include the unusual stem structure of *C. standleyi* (see Table 1).

Cololejeunea standley seems to be closely related to the Neotropical *C. linopteroides* Robins., and the Asian *C. sigmoidea* Jovet-Ast *et* Tix. (for a description of *C. linopteroides* see Bernecker-Lücking & Morales, 1999, of *C. sigmoidea* see Zhu & So, 1998). All three species have rounded leaves with sigmoid cells and reduced lobules, gemmae with adherent cells and a very similar perianth. *Cololejeunea standleyi,* however, is a larger plant with leaves having always a border of hyaline cells. Moreover, its leaf cells have thickenings in the form of small beads and a verruculose cuticle; its perichaetial leaves are very dissimilar in size.

Table 1. Morphological differences between *Cololejeunea subscariosa* and *Cololejeunea standleyi*.

Character	*C. subscariosa*	*C. standleyi*
Stem anatomy	One medullary cell and 5 cortical cells, merophyte 1 cell wide	One medullary, and 7-8 cortical cells: 4 large dorsal cells and 3-4 small ventral cells, merophyte 2-4 cells wide
Leaf shape & size	Oblong rounded up to 0.6 × 0.34 mm	Widely ovate 0.7 × 0.6 mm
Lef cell outline	Straight	Sigmoid
Trigones	Conspicuous	Minute
Thickenings	Sometimes in median cells	In the form of small beads along the cell walls
Hyaline cells	Finger-like, forming a small group at the leaf apex	Rectangular, around the leaf margin in 1-2 rows
Gemmae	Without adherent cells	With 3 adherent cells
Perichaetial bracts	Almost as long as the perianth	Very unequal in size at maturity the smaller one about 1/3 of the perianth
Androecium	Male bracts small, turgid, ovoid, in 3-6 pairs, with 2 antheridia each	3-4 male bracts with 2 antheridia each

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REFERENCES

BERNECKER-LÜCKING A. & MORALES M.I., 1999 — Notes and additions to *Cololejeunea linopteroides* with special reference to *Cololejeunea sigmoidea* (Hepaticae, Lejeuneaceae). *The bryologist* 102: 437-441.

DAUPHIN G., GRADSTEIN S.R., BERNECKER-LÜCKING A. & MORALES M.I., 1998 — Additions to the hepatic flora of Costa Rica. II. *Lindbergia* 23: 74-80.

EVANS A.W., 1911 — Hepaticae of Puerto Rico. X. *Cololejeunea, Lepicolea and Aphanolejeunea. Bulletin of the Torrey botanical club* 38: 251-286.

HERZOG, T., 1951 — Hepaticae Standleyanae costaricenses et hondurenses. *Revue bryologique et lichénologique* 20: 126-175.

SCHUSTER R.M., 1963 — An annotated synopsis of the genera and subgenera of Lejeuneaceae. *Beihefte zur Nova Hedwigia* 9:1-203.

SCHUSTER R.M., 1980 — *The Hepaticae and Anthocerotae of North America*. Vol. IV. New York, Columbia University Press, xix + 1334 p.

SPRUCE R., 1885 — Hepaticae Amazonicae et Andinae. *Transactions and Proceedings of the botanical society Edinburg* 15: 1-590.

STEPHANI F., 1916 — *Species Hepaticarum.* Vol. 5. Geneva, 1044 p.

ZHU R.L. & So M.L., 1998 — Two epiphyllous liverworts, *Cololejeunea dozyana* (Sande-Lac.) Schiffn. and *Cololejeunea sigmoidea* Jovet-Ast & Tixier (Hepaticae Lejeuneaceae) new to Taiwan. *Botanical bulletin of academia Sinica* 39: 125-129.