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A new terrestrial species of *Colura* (Marchantiophyta: Lejeuneaceae) at tropical high elevations (Boyacá, Colombia)

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ABSTRACT

A new terrestrial species of *Colura* (Dumort.) Dumort., from high elevations in the northern tropical Andes is described. The species differs from other members of the genus in the section *Oidocorys* Jovet-Ast ex Grolle on its unique oversized lobule and reduced lobe, and the smooth surface of the leaf cells. An identification key is provided for northern South America. *Colura stotleri* sp. nov., described here, is found at a single mountain top at 4700 m a.s.l. on peaty soil, with a lack of suitable habitats at higher elevations highlighting the threats posed by climate change on the conservation of mountain flora.

RÉSUMÉ

Une nouvelle espèce terricole de *Colura* (Marchantiophyta: Lejeuneaceae) des hautes altitudes tropicales (Boyacá, Colombie).

Une nouvelle espèce terricole de *Colura* (Dumort.) Dumort., récoltée dans les hauteurs du nord des Andes tropicales, est décrite. L'espèce diffère des autres membres de la section *Oidocorys* du genre *Colura* par son lobule unique et très grand et son lobe réduit, et par la surface lisse des cellules foliaires. Une clé d'identification des espèces de la section *Oidocorys* Jovet-Ast ex Grolle du nord de l'Amérique du Sud est donnée. *Colura stotleri* sp. nov., décrite ici, a été trouvée en un seul endroit à 4700 m d'altitude, sur sol tourbeux, avec une absence d'habitat propice aux hautes altitude mettant en évidence les menaces posées par le changement climatique sur la conservation de la flore de montagne.

KEYWORDS

Andes,
climate change,
Colura,
Section *Oidocorys*,
peat,
new species.

MOTS CLÉS

Andes,
changement climatique,
Colura,
Section *Oidocorys*,
tourbière,
nouvelle espèce.

INTRODUCTION

The genus *Colura* (Dumort.) Dumort. was established by Dumortier (1835) based on *Lejeunea* sect. *Colura*. Jovet-Ast (1953) published the most complete monograph to date, which included a section on morphology and anatomy, in addition to a systematic treatment. In it, the author treated the genus in six sections: *Lingua*, *Heterophyllum*, *Oidocorys*, *Macrorhamphus*, *Eucolura* and *Gamolepis* and included 51 species of which 18 were described as new species to science. Schuster (1980, 1994) proposed treating *C. lyrata* Steph. as a separate genus with the species of *Macrocultura lyrata* (Steph.) R.M. Schust., although some authors did not accept this change; Grolle & Zhu (2002) presented morphological evidence in support of *C. lyrata* being treated as *Macrocultura sagittistipula* (Spruce) R.M. Schust. Grolle & Zhu (2002) also present a conspectus of subgenera which are recognized so far actually within *Colura*. According to Söderström *et al.* (2016) the genus has 83 species organized in these subgenera: *Colura* with four sections and subgenus *Glotta* with two sections. There are around 13 species reported in tropical America (Gradstein *et al.* 2000). Although, recent additions to the Peruvian liverwort flora has included a new species of *Colura* (Pócs 2019).

Colura is easily recognized in presenting a ventral lobule longer than the lobe, ending in an inflated sac, which has a closing and opening mechanism formed by a valve and a hinge; this sac can vary in shape and size (Grolle & Zhu 2002). Most species of *Colura* are epiphylls. However, they can be found as epiphytes on twigs and even on stems of angiosperm plants (Gradstein & Uribe 2016) and sometimes also on rocks (Pócs 1995).

For Colombia, eight species have been recorded (Gradstein & Uribe 2016), *C. cylindrica* Herzog, *C. greig-smithii* Jovet-Ast, *C. naumannii* (Schiffn.) Schiffn., *C. ornithocephala* Herzog, *C. sagittistipula* (Spruce) Steph., *C. tenuicornis* (A.Evans) Steph., *C. tortifolia* (Mont. & Nees) Trevis. and *C. ulei* Jovet-Ast. However, *C. sagittistipula* is treated as *Macrocultura sagittistipula* in Söderström *et al.* (2016).

Unexpectedly, a species of *Colura* was found growing on cushion bogs at 4700 m elevation in the Cocuy massif (Colombia). The plant was growing in small tufts mimicking small flower buds from vascular plants. The tufts were small no more than 2 cm in height and had a golden shine. The only other species of *Colura* found at a similar elevation and also on peat of a bog, is *Colura schusteri* Grolle collected at 4150 m a.s.l. in New Guinea (Grolle 1969). *Colura* plants can be particularly difficult to identify due to their small size, the morphological complexity of the lobe-lobule, and the lack of recent revision. Although, recent additions to the Peruvian liverwort flora has included a new species of *Colura* (Pócs 2019).

METHODS

Leaf length was measured as the distance between the two points of the leaf, and leaf width was the measured perpendicularly to the leaf length line.

TAXONOMY

Colura stotleri

J.C. Benavides, L.V. Campos & Uribe, sp. nov.
(Fig. 1)

HOLOTYPE. — **Colombia.** Boyacá, Guican, Sierra Nevada del Cocuy, Sendero Laguna de los Tempanos. 6.4802N.; 72.2806W. 4700 m; 08.I.2010, J.C. Benavides 4719 (holo-, COL[COL574955]).

ISOTYPUS. — **Colombia.** Boyacá, Sierra Nevada del Cocuy, Sendero Laguna de Los Tempanos, 6.4802N.-72.2806W. 4700 m; 08.I.2010, J.C. Benavides 4720 (COL[COL574956]).

ETYMOLOGY. — The new species is dedicated to Raymond Stotler in recognition to his work on liverwort systematics and taxonomy and as teachers of many bryologists at SIUC.

DISTRIBUTION. — *Colura stotleri* sp. nov. is known only from type locality at Sierra Nevada del Cocuy, in a stream fen with cushion plants (Fig. 2D) between the two streams on the south side of the complex.

DESCRIPTION

Colura stotleri sp. nov. differs from all other species in Sect. *Oidocorys* by its long and large perianth up to 8 mm long, and the number of cells in the valve 54-56.

Terrestrial, growing on peat, light yellow to gold-brown, growing in tufts. Shoots 0.7-1 cm long and 1.7-2 mm wide with imbricate leaves at apex and slightly distant below. Stem 120-170 µm wide, ventral merophyte three cells wide. Leaves ovate 0.8-1.1 mm long and 0.6-0.8 mm wide. Stem leaves 1.4-1.5 mm long, 0.90-0.93 mm wide. Lobes and lobules of equal size, the lobule forming an ovate-shaped sac surrounding the lobe, free margin of lobe lacking. Leaf margin entire, corresponding to the union between lobe and lobule. Valve ovate, medium sized, 162 µm long and 100 µm wide, hinge of two cells, number of median valve cells can be 54-56 and that of surrounding hyaline cells 20-24, Median valve cells more than two. Leaf cells smooth throughout the leaf, apical cells subquadrate 22 × 25 µm, median cells quadrate 17-20 × 15-17 µm, and basal cells subquadrate 23 × 17-25 µm. Cell walls thin and lacking thickenings and trigones. Underleaves V-shaped with segments diverging at approximately 45°, 790 µm long with segments 350 µm long each ending in a hyaline papilla, with 4-5 uniseriate cells at apex. Underleaf insertion straight, 3 cells long. Cells from underleaf segments subquadrate to rectangular (20) 30 × 50 µm. Gemmae lacking. Androecia unknown. Perianths frequent, elongated, 7.5-8.0 mm long, 1.5-2.0 mm wide. Mouth papillose, with 4-5 short horns

DISCUSSION

The new species belongs to subgenus *Colura*, sect. *Oidocorys*, which is characterized by it all the leaves carry a sac, the whole lobule forms a sac much wider than the lobe, surrounding it and its apex is broadly rounded. The valve can be easily released and consists of c. 55 cells and two large medial cells,

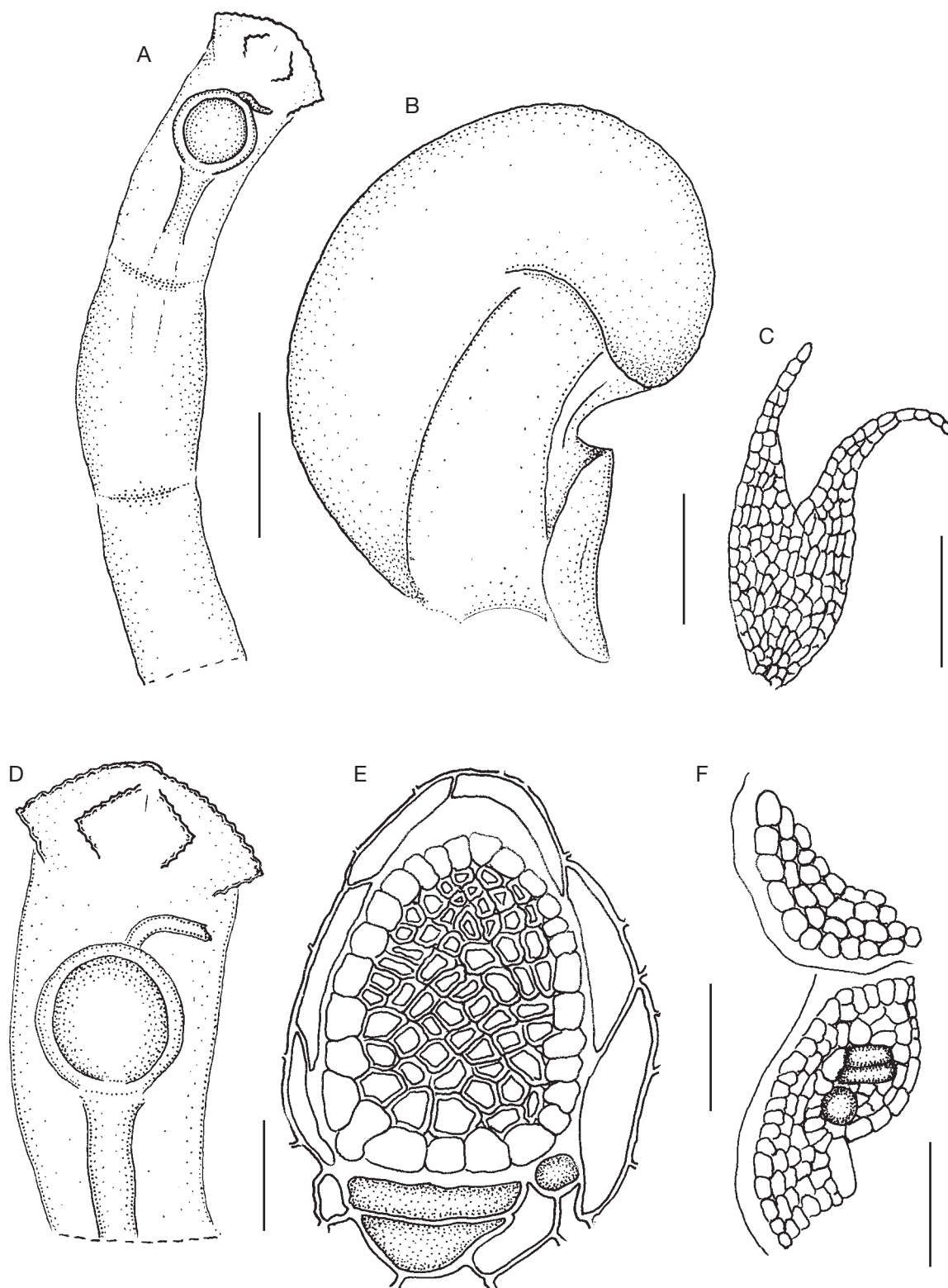


FIG. 1. — *Colura stotleri* sp. nov. **A**, sporophyte; **B**, stem leaf; **C**, underleaf; **D**, sporophyte, apical part; **E**, valve with hinge cells; **F**, hinge cells and hyaline papilla. Drawn from holotype. Scale bars: A, 1600 μ m; B, 200 μ m; C, 150 μ m; D, 900 μ m; E, F, 50 μ m.

hinge of two overlapping cells and perianth with 4-5 horns. The Section *Oidocorys* in Colombia has two species registered (Gradstein & Uribe 2016): *C. naumannii* (Schiffn.) Steph. and *C. ornithocephala* Herzog. The three species, including

C. stotleri sp. nov., can be identified by the next key, adapted from Jovet-Ast (1980)

This is the second record of a species in the genus *Colura* being terrestrial and growing at very high elevation (4700 m a.s.l.).

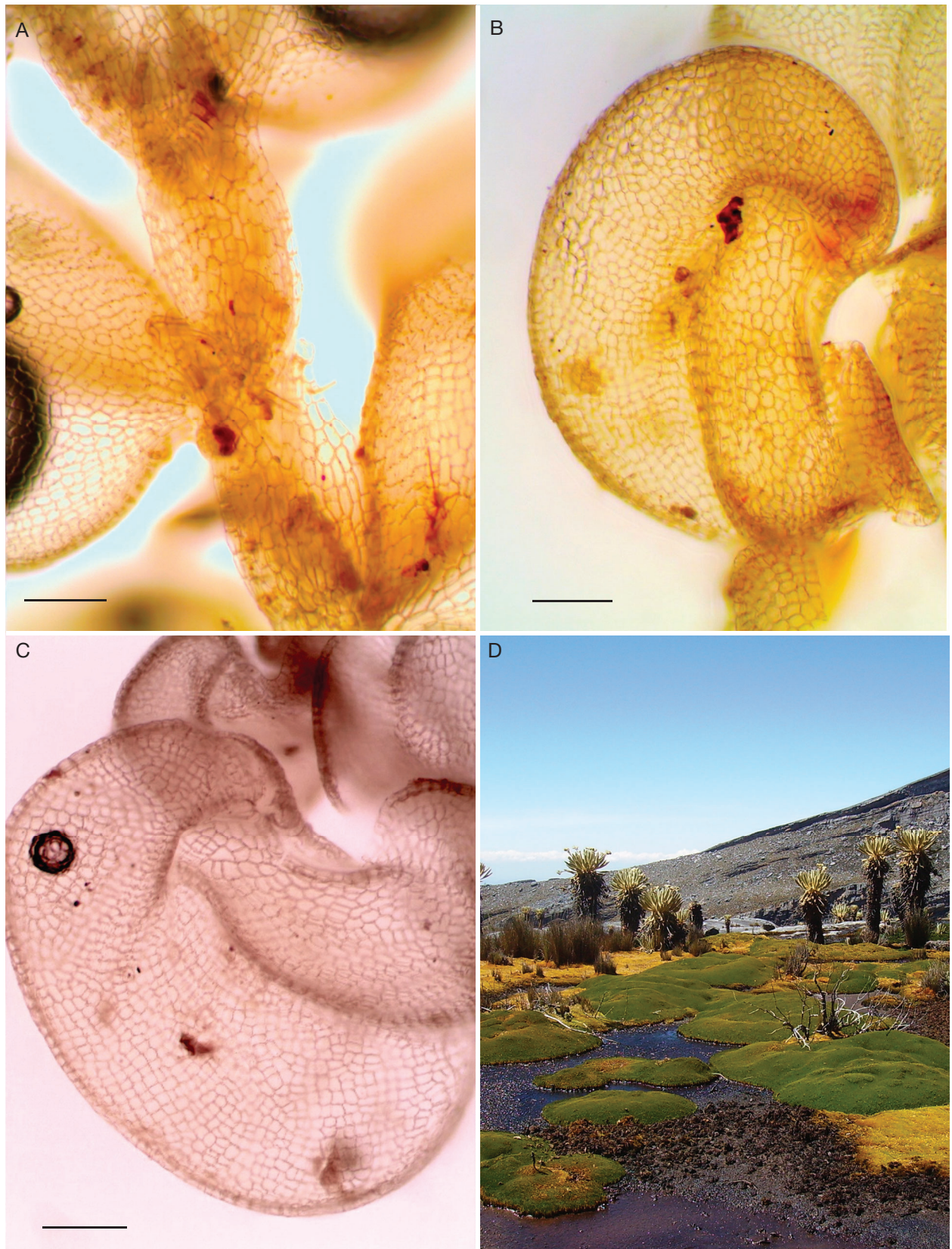


FIG. 2. — *Colura stotleri* sp. nov. **A**, ventral view of plant, showing an underleaf; **B**, stem leaf; **C**, stem leaf, showing inflated lobule; **D**, Habitat, Valle de los cojines, PNN sierra Nevada del Cocuy. Scale bars: A, 190 µm; B, C, 240 µm.

KEY OF *COLURA* (DUMORT.) DUMORT. SPECIES FROM SECT. *OIDOCORYS* JOVET-AST EX GROLLE

1. Length of the lobule 1.5-2 times longer than the length of the lobe; leaf cells with trigones *C. naumannii* (Schiffn.) Steph.
- Length of the lobule of the same size or less than 1.5 the length of the lobe; leaf cells without trigones 2
2. Leaf cells slightly bulging or papillose, sac acute or obtuse, small plant, leaves only 0.3–0.5 mm long *C. ornithocephala* Herzog
- Leaf cells not bulging, smooth, sac broadly rounded, large plant, leaves 1.4–1.6 mm long *C. stotleri* J.C. Benavides, L.V. Campos & Uribe, sp. nov.

Conservation of this new species is threatened by global warming, since the species is so far only found on a single mountain top at a tropical high elevation growing on the surface of peaty soil. The specimen was found on the upper limit of the vegetation, and geomorphological features that can develop peat seems not possible at higher elevations. Climate change in tropical high mountains is indicated a 0.1°C warming per decade shifting approximately 150 m in 50 years (Nogués-Bravo *et al.* 2007, Pepin *et al.* 2015).

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