

## **Type studies on *Frullania* subgenus *Meteoriopsis* (Hepaticae). IV. A new species from the Galapagos Islands**

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**Abstract** – *Frullania darwinii* Gradst. & Uribe is described from the Galapagos Islands. The new species belongs to *Frullania* subgenus *Meteoriopsis* and can be recognized by its clavate perianth, plane underleaf margin, underleaf base with small, 60-80 µm long auricles, acute laminar portion of first branch underleaves, and isodiametric median leaf cells.

***Frullania* subgenus *Meteoriopsis* / Hepaticae / Galapagos Islands / taxonomic revision**

**Resumen** – Se describe *Frullania darwinii* Gradst. & Uribe de las Islas Galápagos. La nueva especie pertenece al subgénero *Meteoriopsis* y se puede reconocer por su perianto clavi-forme, anfigastros con márgenes planos y aurículas en la base pequeñas, de 60-80 mm de longitud, porción laminar del primer anfigastro de las ramas aguda y las células de la parte media de las hojas isodiamétricas.

***Frullania* subgénero *Meteoriopsis* / Hepáticas / Islas Galápagos / revisión taxonómica**

### **INTRODUCTION**

Spruce (1884) assigned to *Frullania* subgen. *Meteoriopsis* plants with the following characters: pendent habit and indefinite growth, deeply cordate leaves (with two large auricles, one at the dorsal and one at the ventral leaf base) which are strongly convoluted around the stem when dry and which do not spread widely when moistened, narrow cylindrical lobules, and smooth, three-keeled perianths. Uribe & Gradstein (2003) reported that the pendent habit is not diagnostic for *F.* subgen. *Meteoriopsis* since pendulous plants occur also in other subgenera, including subgen. *Thyposiella*, subgen. *Frullania* and subgen. *Chonanthelia*.

Kron (1988) studied the Venezuelan species of *F.* subgen. *Meteoriopsis*. However, she did not adopt the concept of *Meteoriopsis* as defined by Spruce (1884) and assigned species belonging to *F.* subgen. *Thyposiella* to subgen. *Meteoriopsis*.

The Neotropical center of diversity of *F.* subgen. *Meteoriopsis* are the Galapagos Islands, with four species occurring on the islands including the taxon described here. In total, thirteen species of *Frullania* occur on these islands (Gradstein & Weber, 1982), including seven with a *Meteoriopsis*-like habit: *F. atrata*

(Sw.) Nees, *F. aculeata* Taylor and *F. involuta* Hampe ex Steph. of the subgen. *Thyopsiella* (Uribe & Gradstein, 2003), as well as *F. convoluta* Lindenb. & Hampe, *F. peruviana* Gottsche, *F. phalangiflora* Steph. and the newly described *F. darwinii* of subgen. *Meteoriopsis*.

Gradstein (in Gradstein & Weber, 1982) listed *Frullania darwinii* as a new species, however, the taxon was invalidly published under Article 32.1(c) of the ICBN (Greuter *et al.*, 2000), because no Latin diagnosis was provided. Accordingly, *F. darwinii* is validated here.

## MATERIALS AND METHODS

**Specimens.** Types and others specimens assigned to *Frullania* subgen. *Meteoriopsis* from several herbaria were studied. The specimens here assigned to *Frullania darwinii* were found in the rich holdings of the herbaria of the Universities of Göttingen (GOET) and Utrecht (U).

**Measurements and illustrations.** The leaf-lobe length was measured, as the distance from the basal insertion of the leaf-lobe on the stem to the apex of the leaf-lobe, its width was the widest point perpendicularly to the length. The sizes of cells were measured according to the lumen. The length of the cells is the longest distance of the cell, and the width was measured perpendicularly to the length. All measurements represent minimum-maximum values. The illustrations are microscope drawings, using a drawing tube.

## RESULTS

*Frullania darwinii* Gradst. & Uribe **sp. nov.** *Frullania darwinii* Gradst., J. Hattori. Bot. Lab. 52: 148, *nom. inval.* (Art. 32.1(c) ICBN). Type. Galapagos Islands, Isabela, Cerro Azul, 350-500 m, 1976, *Gradstein & Sipman H-450* (holotype, U; Isotypes COL, GOET).

Fig. 1

**Diagnosis** – A *Frullania phalangiflora*, *quae affinis, perianthio clavato, amphigastriis marginibus planis atque auriculis basalibus brevibus, amphigastriis rami primi acutis, atque cellulis medianis foliorum isodiametricis differt.*

### Description

**Plants** of large size, up to 18 cm long and 1.8 mm wide including leaves, dark reddish brown, irregularly pinnate, growing pendent. **Branches** frequent, *Frullania*-type, to 5 cm long. **Stems** to 190  $\mu$ m wide. **Leaf-lobes** imbricate, convoluted around stem when either dry or wet, asymmetrically (sub)ovate, concave, 1500-1525  $\times$  1100-1175  $\mu$ m, apex short apiculate, sometimes slightly recurved, margins entire, dorsal base auriculate, arching over stem, ventral base auriculate, ventral auricle shorter than dorsal one, insertion line straight or curved. **Leaf-lobe cells:** apical cells 20-25  $\times$  10-15  $\mu$ m, median cells 12-15  $\times$  12-15  $\mu$ m, basal cells 27-37  $\times$  17-22  $\mu$ m, cell walls thick, sinuous, trigones conspicuous, intermediate thick-

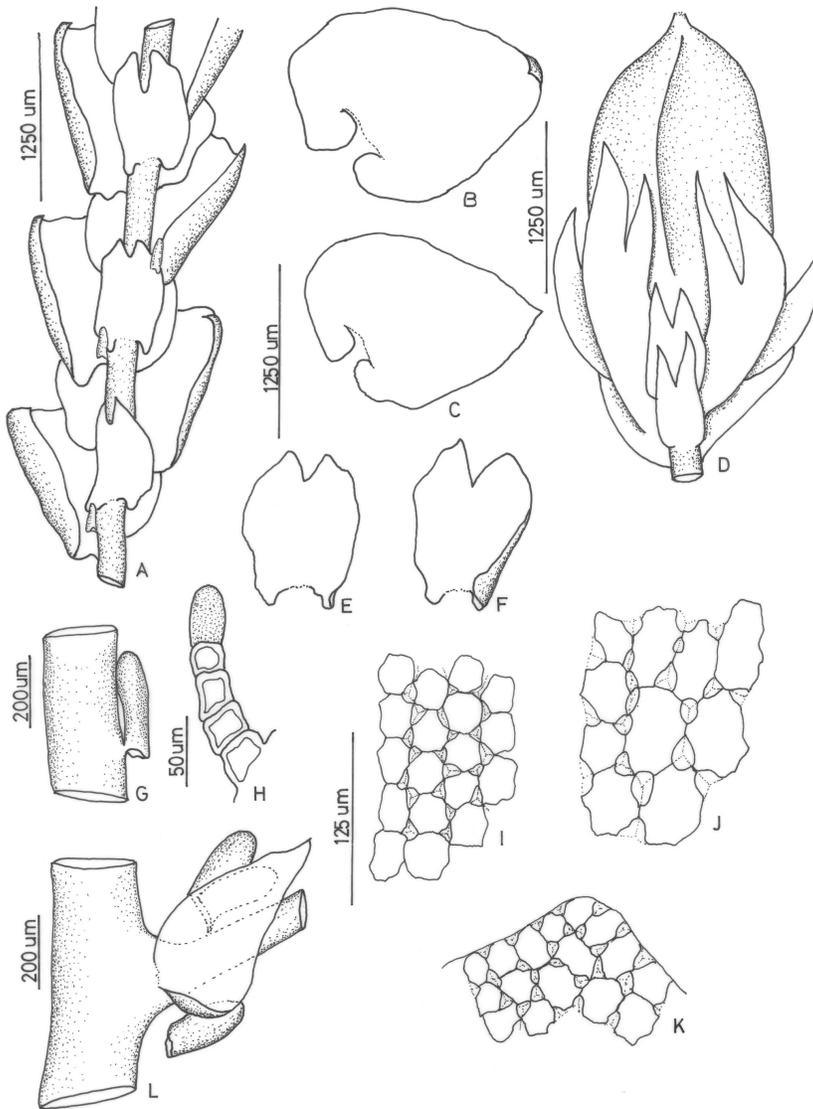


Fig. 1. *Frullania darwinii* Gradst. & Uribe. A. Part of shoot, ventral view; B, C. Stem leaf-lobes; D. Perianth; E, F. Stem underleaves; G. Lobule; H. Stylus; I. Medial leaf-lobe cells; J. Basal leaf-lobe cells; K. Apical leaf-lobe cells; L. First branch leaf and underleaf (BL1 and BUL1). (All from type).

enings present. **Leaf-lobules** cylindrical to long cylindrical, 240-290 × 70-120 µm, contiguous and parallel to stem. **Stylus** filiform, erect, four cells long, with terminal slime papilla. **Underleaves** rectangular to subquadrate, up to 2× wider than stem, 925-975 × 700-725 µm, margin entire, plane, bifid to 1/4 of length, segments acute or obtuse, base auriculate, auricles small, 60-80 µm, slightly undulate, insertion line slightly curved. **Branch appendages:** first branch underleaves (BUL1) divided to base into triangular, entire, lanceolate, ventral segment with acute apex and dorsal saccate segment; first branch leaf-lobes (BL1) transformed into 2 saccate lobules. **Plants dioicous.** **Androecia** on short, capitate, 750 µm long branches, bracts in 4-5 series. **Gynoecea** on short branches, bracts and bracteoles in four series, bracts bifid, margins entire. **Perianth** 2/3 exerted, clavate or obovoid, ca. 2 mm long, smooth, sharply 3-keeled, with short beak.

**Distribution** – This new species is apparently endemic to the Galapagos Islands.

*Frullania darwinii* is distinguished by its clavate perianths, its underleaves with plane margins, the rather short basal auricles of the underleaves (60-80 µm), the asymmetrical leaf base, the leaves with a ventral auricle shorter than the dorsal one, a acute laminar portion of first branch underleaf, and isodiametric median leaf cells.

*Frullania darwinii* is closely related to *F. phalangiflora* Steph. and *F. weberbaueri* Steph. The three species can easily be separated from each other by the characters listed in Table 1.

Table 1. Comparison between the new taxon and allied species.

	<i>F. darwinii</i>	<i>F. phalangiflora</i>	<i>F. weberbaueri</i>
Perianth	clavate	globose	not seen
Underleaf margin	plane	recurved	plane
Underleaf auricles	60-80 µm	180-220 µm	200-230 µm
Leaf-lobe base	asymmetrical	asymmetrical	symmetrical
Ventral segment of BUL1	acute	obtuse	obtuse
Median cells	isodiametric	longer than wide	longer than wide

***Frullania darwinii* specimens examined – ECUADOR. Galapagos Islands.**

**Floreana**, 250-300 m, 24 April 1976, *Gradstein H149* (GOET, COL); **Pinzón**, 400 m, 2 July 1976, *Gradstein H464* (COL); **Rábida**, 1905-1906, *Stewart 3395* (GOET); **San Cristobal**, near El Progreso village, 250-300 m, 19 January 1970, *Balazs I2B* (GOET); west of El Junco, 550 m, 21 May 1976, *Gradstein & Lanier H248* (GOET); **Santa Cruz**, 600-650 m, 17 April 1976, *Gradstein & Weber H98* (GOET); 500 m, 19 April 1976, *Gradstein H131* (COL); NW Academy Bay, 120 m, 16 February 1939, *Taylor TT 61* (GOET).

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