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Research article

FRULLANIA RADDI (MARCHANTIOPHYTA) SPECIES NEW TO AUSTRALIA AND TO SCIENCE I.

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Abstract: During the revision of the liverwort genus *Frullania* for *Australia*, one new species to science is here described, as *Frullania saroltae* sp. nov. (subg. *Frullania* sect. *Microphyllae*). Two new records for the flora are also reported, *Frullania eymae* and *Frullania ornithocephala* var. *intermedia*, (both subg. *Trachycolea*) and previously known only from New Guinea. Descriptions and illustrations of the taxa are provided.

Keywords: Australia, Australasia, endemism, New Guinea, new species

INTRODUCTION

The work on the revision of *Frullania* species for the Flora of Australia started in 1999, encouraged by the late Heinar Streimann. Field collection trips were organised in 1999, 2000 and 2001 financially supported by the Australian Biological Resources Study Participatory Program and in 2004 on the author's own. During these trips thousands of *Frullania* specimens were collected and also borrowed for revision from the Australian National Herbarium in Canberra (CANB). Research has continued sporadically over the past two decades with ongoing progress and publications. Recently the author is endeavouring to complete this project in collaboration with Matt von Konrat (Field Museum) with whom have divided the revision into taxonomic groups, including his own responsibility of revising the subgenera *Fusiorelliogerae, Homotropantha* and *Trachycolea*, of which only the last has numerous (about 36) species.

It is here reported one new species to science as well as two new records for the Australian *Frullania* flora representing ongoing research of this project.

DESCRIPTION OF THE NEW SPECIES
Taxonomic treatment

Frullania saroltae Pócs, sp. nov. (*Figures 1–12*)
Subgenus *Frullania* sect. *Microphyllae* (R.M.Schust.) Gradst., Ilk.Borg., & E.Lima 2020, Phytotaxa 456:122.

Diagnosis: *Frullania saroltae* is similar in several aspects to other members of sect. *Microphyllae* by its small size, usually evenly incrassate, thick cell walls and the scattered red ocelli throughout the leaf-lobe, subcylindric, ampullaceous lobule on a short stalk standing parallel to the stem or incumbent on branches, with narrow underleaves, only 1.5-2 × of the stem width, with parallel segments. It is different from the morphologically allied widespread Asian *Frullania alstonii* Verd. (Verdoorn 1930) by the lack of moniliate ocelli in most of the leaves and by its relatively larger lobules; from Chinese *Frullania punctata* Reim. (Reimers 1931) by its wide, not constructed lobule, from *Frullania perocellata* Onraedt (Onraedt 1978) from Sri Lanka and from the Japanese *Frullania pseudoalstonii* Tsudo and J.Haseg. (Tsudo and Hasegawa 2006) by its entire female perichaetial leaves, without teeth.

Type: AUSTRALIA, NEW SOUTH WALES: Dorrigo National Park E of Dorrigo town. Along Rosewood Creek track, on bark of trees in subtropical notophyll vine rainforest with many epiphytes, 30°22'S, 152°47.8'E, at 600–730 m elevation. 15 Febr. 2000, *S. & T. Pócs* and *E.A. Brown 009/AC* (holotype EGR, isotype: NSW).

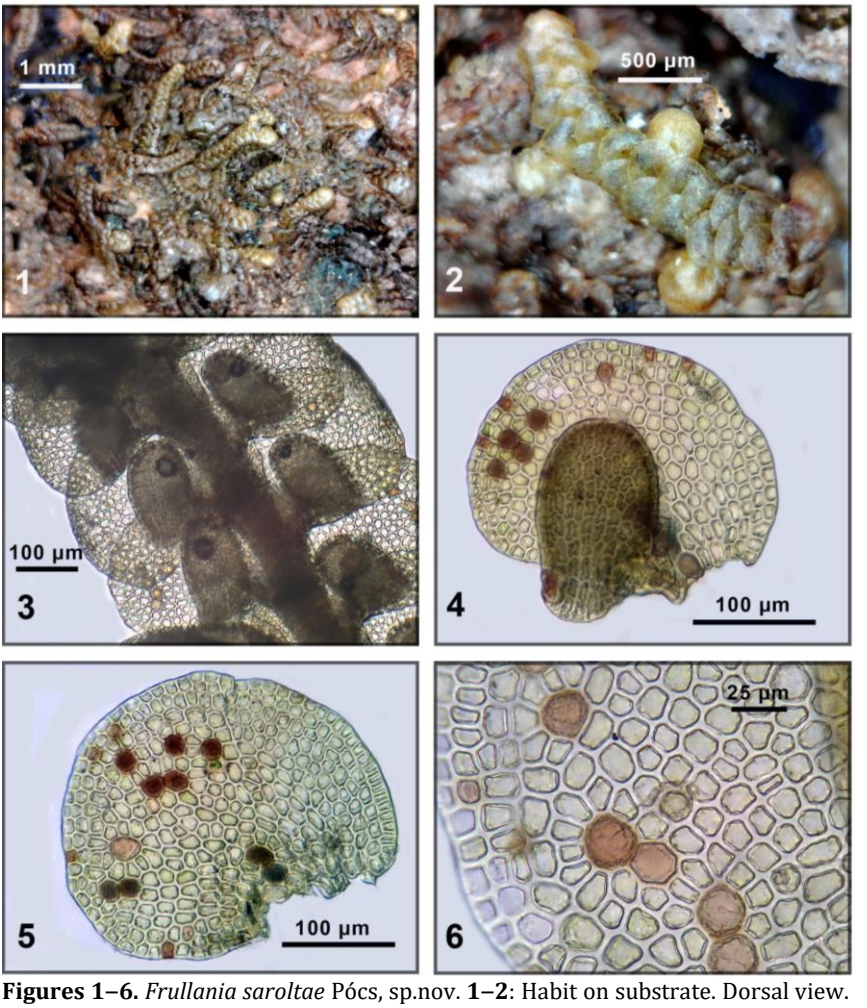
Description: Small, green when alive, in herbarium olive-green plants with a silky shine. Even by a handlens glistening ocelli are visible scattered in the lobe. It forms wefts of 5–8 cm diameter on bark. Dioicous, specimens of both sexes quite fertile. **Shoots** 300–450 μm wide, up to 12 mm long, irregular pinnately branching. Stem 40–80 μm thick, surrounded by 12–18 rows of thick walled, brownish-yellow pigmented, 10–20 × 4,5–6 μm cortical cells. First branch underleaves consist of one unlobed ventral and one unlobed dorsal segment of more or less equal size. Rhizoids short, reddish brown, not commonly develop at the base of underleaves. **Leaf lobes** slightly convex, imbricate, sometimes caducous, asymmetric ovate-reniform, 250–400 × 200–320 μm (20–35 cells long and 16–28 cells wide), with 4–16 scattered, brownish- or pale red ocelli. Moniliate ocelli, composed of 2–4 cells (occur only in very few, in the 1–2 % of the leaves). The dorsal lobe base extending a little beyond the

opposite side of the stem. Cell walls straight, equally (2–3 μm) thickened, at the border square, with a lumen of 6–8 μm, median cells polygonal, 8–12 μm. Basal cells similar. Cuticle smooth, translucent. The ocelli are larger, of 12–20 μm diameter and a little protruding from the leaf surface. **Lobules** subcontiguous, on side branches imbricate, campanulate with slightly widening, open mouth, decorated by 1–4 ocelli in its distal margin, other cells have flexuose walls, 10–15 × 4–8 μm. Lobule size 150–176 × 74–100 μm, their length is about 2/3 of the lobe width. The surface of their ventral projection, compared to that of the whole lobe, much larger than in most species of Section *Microphyllae*, covering in average 26,68%. (For example, lobule length in *F. alstonii* is only about 2/5 of lobe width and about 8,5 % of the whole lobe surface). **Stylus** formed by 3–5 uniseriate cells tipped by a hyaline papilla. **Underleaves** narrow, oblong-linear with cuneate base and almost straight incision line, 1,5–2,2 stem width, 350–400 × 100–115 μm, without ocelli, with narrow, V shaped incision of its 1/5 length. Segments parallel, 4–5 cells wide at base, 6–10 cells long, entire, with obtuse apex. The **androecium** is on short side branches, globular, of 350–400 μm diameter, composed of 4–5 pairs of male bracts. **Gynoecium** at the end of longer side branches, with or without innovations, with only one or seldom two sets of perichaetial leaves. The female bracts have rounded apex and almost equal sized, but acute lobules, fused by their half length to the lobe. These and the bracteole have entire margins without any dentition and with many scattered ocelli. The perianth is elongated heart shaped, trialate with two sharper side keels and a third blunt ventral one. In the perianth wall there are much more than hundred scattered ocelli. The beak is 90–110 μm long and 50–80 μm wide with truncate and papillose apex. The type specimen had mature **sporophytes** with already open capsules. Seta about 700 μm long. The capsule segments are 800–840 μm long and 240–250 μm wide, most with 8 unispiral elaters, 800–840 μm long and 14–18 μm thick. Spiral thickenings are rust coloured. Spori olive brown, roughly globose of 36–41 μm diameter, each with 28–30 rosettes.

Etymology: The new species is dedicated to my late wife Sarolta, its co-collector, who helped me so much during the Australian trips.

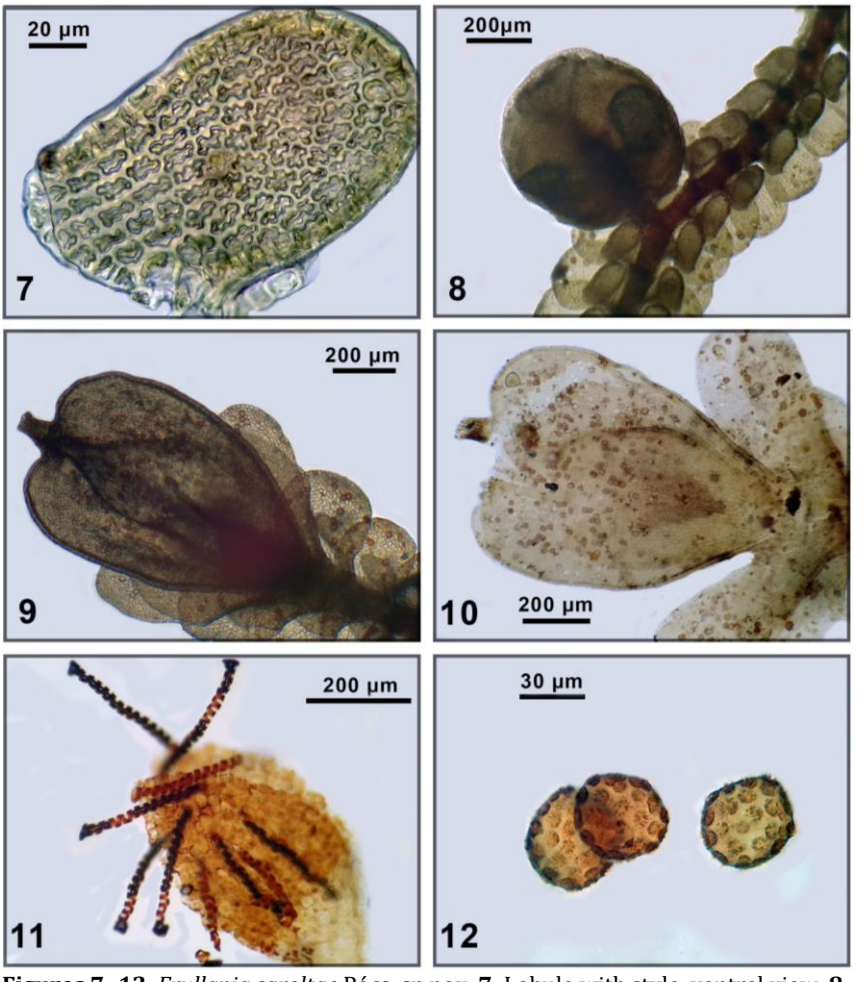
Distribution: The new species is possibly endemic to New South Wales. We came across only one more specimen from the same locality, collected at the same day on a fallen canopy twig: *S.* & *T. Pócs*

and *E.A. Brown 009/DH* (CANB paratype, EGR isoparatype on microslide).



Figures 1–6. *Frullania saroltae* Pócs, sp.nov. **1–2**: Habit on substrate. Dorsal view. **3**: shoot, ventral view. **4**: Leaf, ventral view. **5**: Lobe after removal of lobule. **6**: Marginal and median lobe cells (All photographed from the type).

Taxonomic notes: The *Frullania fragilifolia* complex characterized by their small size, narrow underleaves and many times with caduceus lobes within *Frullania* sect. *Frullania* (*"F. tamarisci* complex" with ocellate species) was distinguished as subsect. *Microphyllae* R.M.Schust, Phytologia 57(5): 370, 1985.



Figures 7–12. *Frullania saroltae* Pócs, sp.nov. **7**: Lobule with style, ventral view. **8**: Male branch, ventral view. **9**: Perianth, ventral view. **10**: Perianth, vetral view, cleared by Hoyer solution to show the numerous ocelli. **11**: two capsule segments covering each other. The front one bears 8 elaters. **12**: spori (All photographed from the type).

Gradstein, Ilkiu-Borges and Lima in Phytotaxa 456 (1): 122, 2020, elevated this group into section rank, counting a number of species in Asia and very few in Europe and in the Americas. These species all differ from each other by minor morphological characters. Heinrichs *et al*. (2010) performed a molecular investigation into the *Frullania tamarisci* complex that revealed even smaller morphological

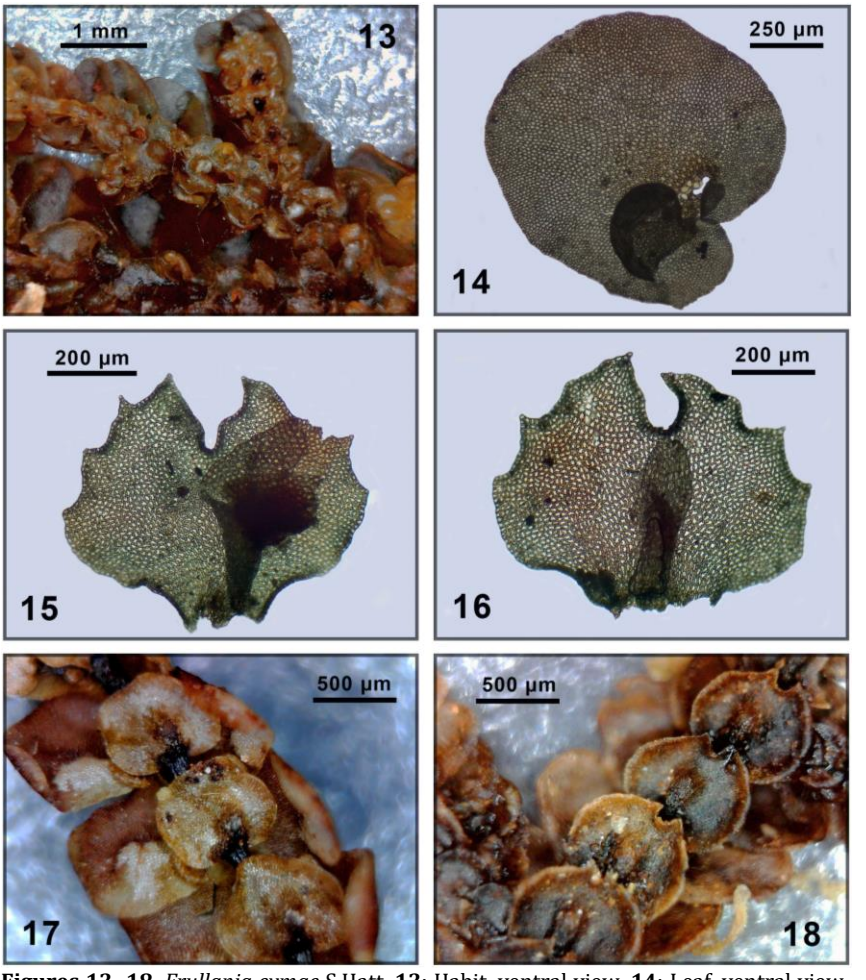
differences reinforced the species rank of these partly sympatric species. This study provides strong support that a similar situation exists for members of section *Microphyllae*, where the above new species belongs. Although some members of this section, like *Frullania alstonii* or *F. microphylla*, are more widespread, the majority of its species are endemic to a smaller area.

TAXA NEW TO THE AUSTRALIAN FLORA

Frullania eymae S.Hatt. J. Hatt. Bot. Lab. 39: 284, 1975.
(*Figures 13–16*).
(Subgenus *Trachycolea* Spruce 1884, Hep. Amaz. Et And. 31, 1884)
Frullania eymae var. *dentistipula* S.Hatt. J. Hatt. Bot. Lab. 44: 527, 1978. Synonymized by Hattori (1982: 250).
Frullania dentella S.Hatt*. sp. nov. nom. nud. in sched*, 1984. (CANB 8302469). Illustrations: Hattori (1975: 285, fig. 142; 1978: 528, fig. 202; Hattori and Streimann 1985: 104, fig. 2)

AUSTRALIA, QUEENSLAND, Atherton Tableland. Yungaburra Road, 2 km SE of Atherton, 17°16'S, 145°29'E, 850 m elevation, Exotic fruit orchard. On *Casuarina* stem*. Streimann 16836* (CANB). Paluma range, Crystal Creek National Park, McClelland's Lookout at the edge of the plateau, at the E side of Paluma village. 19°00'S, 146°12.8'E, at 900 m elev. On bark in montane rainforest opening. *S & T. Pócs, 01109/J,* accompanied by *A. Cairns, E.A. Brown* and *C. Cargill* (CNS, EGR).

The main characters of this medium size plant are the densely imbricate, elliptic lobes with undulate margin and strongly appendiculate dorsal base, helmet shaped lobuli almost covered by the large, imbricate, non appendiculate, reniform to widely cordate underleaves with wavy, toothed margin. Sinus 3/10 deep, V or U shaped, underleaf lobes triangular with acuminate- acute apex.
Hitherto it was known only from the mountainous areas of New Guinea where it is widespread in 600–2000 m elevation (Hattori 1975, 1978, 1982; Hattori and Piippo 1986). New to Australia.



Figures 13–18. *Frullania eymae* S.Hatt. **13**: Habit, ventral view. **14**: Leaf, ventral view. **15–16**: Underleaves, ventral view (from Streimann 16836). **17**: *Frullania ornithocephala Steph.* var. *intermedia* S.Hatt. Habit, ventral view (from S. & T. Pócs 01079). **18**: *Frullania ornithocephala* Steph var. *ornithocephala* (Steph.) Hatt. Papua-New Guinea, Chimbu prov., Kegslugi (foot of Mt. Wilhelm), at 2600 m, epiphyte in degraded montane forest. De Sloover 42.722 (sub *Frullania pauciramea* Steph. EGR ex NAM).

Frullania ornithocephala Steph. var. ***intermedia*** S.Hatt. J. Hattori Bot. Lab. 65: 439, 1988. (*Figures 17–18*).
(Subgenus *Trachycolea* Spruce 1884, Hep. Amaz. Et And. 31, 1884)
Frullania nobilis Steph. ssp. *nobilis* var. *intermedia* S.Hatt. J. Hattori Bot. Lab. 37: 116, 1973. Synonymized by Hattori (1988: 439).
Illustration: Hattori (1973: 116, fig. 64).

AUSTRALIA: QUEENSLAND, Track to Mt Finigan Range, Cedar Bay National Park, 39 km S of Cooktown. 15°49'S, 145°16'E, at 880 m. Rainforest on steep slope with large rock outcrops. On shaded treelet. *Streimann 57115A, 57120* (CANB); Lamb Range, near Mt. Haig, 20 km SE of Mareeba, 17°05'S, 145°35'E, at 1100 m elevation. Tropical forest on moderate slope. On shaded treelet stem. *Streimann 57656A* (CANB), Atherton Tableland, Hugh Nelson Range. Longlands Gap State Forest. Summit around the telecommunication tower, 22 km S of Atherton. Somewhat disturbed montane rainforest dominated by *Acacia* and *Aphitonia.* On bark and hanging from tree branches. 17°27'S, 145°29'E, at 1235–1240 m elevation. *Pócs* & *Streimann 99109/AD* (CANB, EGR), *S.* & *T. Pócs 01079/B,* accompanied by *A. Cairns, E.A. Brown* and *C. Cargill* (BRI, EGR).

In tropical and subtropical Asia and Australasia there are about ten species with entire, unlobed underleaves. But from Australia this is the only one. *Frullania ornithocephala* var. *intermedia* has large (equal to leaf size), reniform, imbricate, nearly flat underleaves, with round or widely retuse apex. *Frullania ornithocephala* is a very variable plant (Hattori 1982; Hattori and Piippo 1986; Hattori 1988). From Queensland there is one record of *Frullania pauciramea* Steph. (Bolin and Henderson 2002: 223, not yet mentioned in Windorf 1987) which finally became the synonym of *F. ornithocephala*. It is a question, whether this record is really that var. *intermedia* or belongs to var. *ornithocephala.*

DISCUSSION

Dr. Sinske Hattori, former leading Japanese hepaticologist decades ago investigated and described a good number of Australian *Frullania* specimens in the possession of Australian National Herbarium (CANB) of the Centre for Australian National Biodiversity Research (Hattori 1979a, 1979b, 1982, 1983, 1984, 1987a, 1987b, 1988a, 1988b; Hattori and Piippo 1986). He pencil marked provisionally a few specimens, what he suspected to be new to science. These still need further investigation. One of those was the case of *Frullania eymae.* Also further fieldwork and the currently unidentified specimens promise novelties, so that the known number of 69 Australian taxa (McCarthy 2003; von Konrat and Braggins 2003 and the present paper) probably will increase, although several taxa could fall in synonymy.

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