

Frullania riojaneirensis (Raddi) Spruce – an addition to Indian bryoflora*

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Frullania riojaneirensis, reported for the first time from India, belongs to subgenus *Chonantheria*. Key for the species of subgenus *Chonantheria* has been provided.

Key-words- Bryophyta, Hepaticae, Jungermanniales, *Frullania riojaneirensis*.

INTRODUCTION

DURING a plant collection trip to several underexplored localities in Nilgiri Hills, Tamil Nadu (South India) in September, 2002 some interesting and remarkable species of *Frullania* were gathered from Pandalur which comes under the Gudalur region of Nilgiri Hills at an elevation of ca. 1300 m. The plants showed close resemblance with *F. riojaneirensis* (Raddi) Spruce, a species distributed in Sri Lanka (Ceylon), Myanmar (Burma), China, Philippines and North America, but not reported so far from any bryogeographical region of India. This species comes under subgenus *Chonantheria* Spruce, which was previously represented in India by only two species, *F. arecae* (Spreng.) Gott. and *F. neurota* Tayl.

Key to the species of subgenus *Chonantheria*

1. Underleaves longer than broad, flat portion of leaf lobule smaller than the galeate portion with short fold, perianth 4 keeled.....*F. neurota*.
1. Underleaves broader than long, flat portion of lobule 2-3 times as large as the galeate portion with long fold, nearly parallel to the stem, perianth 5 keeled usually with additional plicae.....2
2. Autoicous; gynoecium terminal on the stem, perianth with several (up to 6) additional plicae, bracts and bracteoles prominently dentate*F. arecae*.

2. Paroicous (hypogynous), gynoecium usually terminal on the top of the androecium, perianth without additional plicae, bracts and bracteoles usually entire or sparsely dentate*F. riojaneirensis*.

Frullania riojaneirensis (Raddi) Spruce

Fig. 1:1-14, Fig. 2:1-23

Frullania riojaneirensis (Raddi) Spruce, *Trans. Proc. Bot. Soc. Edinburgh* 15: 23 (1884); St., *Hedw*, 27: 280 (1888); Bihang Till K. Sv. Vet.-Akad.Handl. 23: 20 (1897); Evans, *Bull. Torr. Bot. Club* 38: 220 (1916); Clark, *Bryologist* 48: 56. f 1-16 (1945); Clark & Svihla, *Bryologist* 51: 26 (1948); Clark, *Proc. California Acad. Sci. Ser. 4*, 18: 603 (1953); Abeywickrama, *Ceylon J. Sci. (Bio. Sc.)* 2 (1): 58 (1959); Arnell, *Bryologist* 64: 249 (1981); Hattori & P.-j-Lin, *J.Hattori Bot. lab.* 59: 123-169 (1985).

Type Locality – Tropical America (Stephani, 1909-1911).

Synonyms – *Frullanoides riojaneirensis* Raddi *Mem. Soc. Sci. Ital. Modena* fis 12 : 37 (1823) & 20: p 12, fig.4 (1829).

Jungermannia galeata R., Bl. & Nees; *Nova Acta* 12: 215 (1824)

Frullania galeata (Reinw. et al) Dum., *Rec. d'obs.*: 13 (1835); Verd., *Ann. Bryol. Suppl.* 1: 68,

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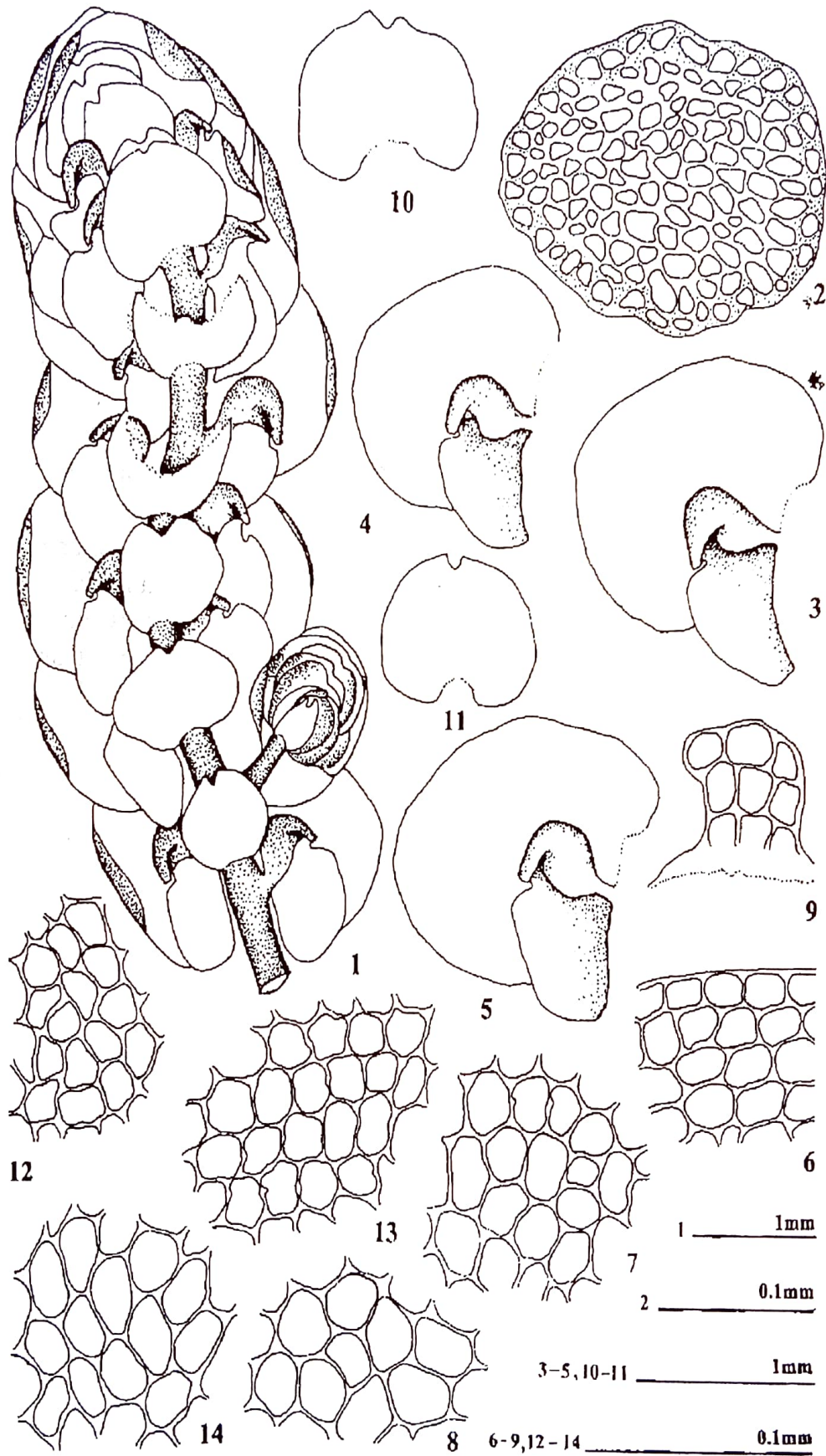


Fig. 1. *Frullania riojaneirensis* (Raddi) Spruce :

1. A vegetative plant (ventral view), 2. T.S. Stem, 3-5. Leaf lobes with lobules, 6. Apical cells of leaf lobe, 7. Median cells of leaf lobe, 8. Basal cells of leaf lobe, 9. Stylus (cellular), 10-11. Underleaves, 12. Apical cells of underleaf, 13. Median cells of underleaf, 14. Basal cells of underleaf.

f. 105-106 (1930); Hattori; *J. Hattori Bot. Lab.* 36: 138, f. 20-21 (1972); 51: 61 (1982).

Frullania sebastianopolitana Lindenb. In G., L. & N., *Syn. Hep.* 412 (1845).

Frullania arietina Tayl. In G., L. & N., *Syn. Hep.*, 413 (1845).

Frullania hypogyna St., *Hedw.* 33: 136 (1898); Verd., *Ann. Bryol. Suppl.* 1: 70 (1930).

Frullania commutata St., *Spec. Hep.* 4: 349 (1910).

(synonymy adopted from Svihla, 1965)

Plants olive green to brownish, in dense appressed mats on bark, large, 2-5 cm long and 3-4 mm wide, irregularly pinnately branched, obliquely spreading. Stem 152 x 190 μm in cross section, with pigmented smaller cortical cells, 7.6-11.5 x 7.0 - 11.5 μm and nonpigmented larger medullary cells, 12.0-22.0 x 12.0-16.0 μm . Leaves incubous, complicate bilobed, leaf lobes densely imbricate, transversely inserted, nearly rotund, concave ventrally with incurved, rounded apices, 1.2-1.5 mm long and 1.0-1.3 mm wide, antical bases arched, posterior bases almost straight, leaf cells thin-walled, lumen pale to subhyaline, trigones small to medium size with occasional intermediate thickenings, apical cells 11.4-15.2 x 7.6-11.4 μm , median cells 15.2-19.0 x 11.4-15.2 μm , basal cells 19.0-26.6 x 15.2-22.8 μm , leaf lobules large, helmet shaped (galeate), dorsal portion almost flat, longly arched, 2.0-2.5 times as large as ventral portion, widely connate with the lobe, the ventral portion inflated, almost parallel to the stem. Underleaves imbricate, large, rotund, reniform, 0.75-0.82 mm long and 0.80-0.92 mm wide (wider than long), appressed to the stem and nearly flat, sinus wide, obtuse, lobes widely apiculate, base gibbous, rounded, appendaged, sinuately inserted, cells thin-walled, lumen pale to subhyaline, trigones small to medium size with occasional intermediate thickenings, apical cells 7.6-15.1 x 7.4-11.4 μm in size, median cells 15.6-19.0 x 11.4-15.7 μm , basal cells 20.2-26.6 x 16.0-29.0 μm , thin-walled with larger trigones. Stylis more or less triangular in shape, 34 μm long and 42 μm wide with

3 rows of cells, cells 11.4 X 7.6 μm .

Monoicous (Paroicous). Male inflorescence lateral on stem & branches, shortly stalked and capitate with 3 pairs of bracts, 0.5-0.6 mm long and 0.4-0.7 mm wide, cells thin-walled, lumen pale to subhyaline, trigones small to medium size with occasional intermediate thickenings, bract apical cells 7.4-15.2 x 7.5-11.4 μm , median cells 15.0-22.8 x 15.8-19.0 μm , basal cells 35.7 - 45.6 x 16.4-22.5 μm , male bracteole ca. 1/2 or less than 1/2 to the bract, bifid, sinus obtuse. Gynoecial branches frequently innovating from the androecial apices, gynoecia with 3 pairs of perichaetial leaves and perianth; inner most pair largest, connate, bracteole bilobed, lobes triangularly acute, entire or sparsely dentate, margin recurved, lateral margin seldom with subulate tooth, innermost bracteole largest, connate with bract lobules at both sides, almost equal in size to the bract lobule, bracts 1.3-1.5 mm long and 0.8-1.2 mm wide, cells thin-walled, lumen pale to subhyaline, trigones small to medium with occasional intermediate thickenings, apical cells 11.4-15.2 x 11.4-15.0 μm , median cells 19.0-22.8 x 15.8-22.9 μm , basal cells 22.7-41.8 x 15.4-23.0 μm . Bracteole 0.4 mm long and 0.2 mm wide, tooth few, cells thin-walled, lumen pale to subhyaline, trigones small to medium with occasional intermediate thickenings, apical cells 11.4-19.0 x 7.6-14.8 μm , median cells 22.8-26.6 x 15.2-19.0 μm , basal cells 22.6-45.3 x 15.4-22.5 μm . Perianth 1/4th exserted, long - pyriform, 5 plicate (2 large obtuse lateral plicae, 2 comparatively sharp ventral plicae and 1 dorsal wide plica, smooth), rostrum small subtruncate, beak large, 0.4-0.5 mm long and 5.0 mm wide, perianth cells 19.0-23.0 x 15.0-19.0 μm . Sporophyte not found.

Ecology : Plants grow as epiphyte with *Frullania ericoides*, *F. inflexa*, *Acanthocoleus yoshinaganus*, *Microlejeunea ulicina*, *Frullanoides tristis*.

Distribution : Sri Lanka (Ceylon), Sumatra, Java, Celebes, Philippines, Thailand, Vietnam, New Guinea, Myanmar (Burma), also widely distributed in tropical S. America, China (see Hattori & P.j-Lin, 1985) and India (new report).

Specimen examined : LWU16074/02,

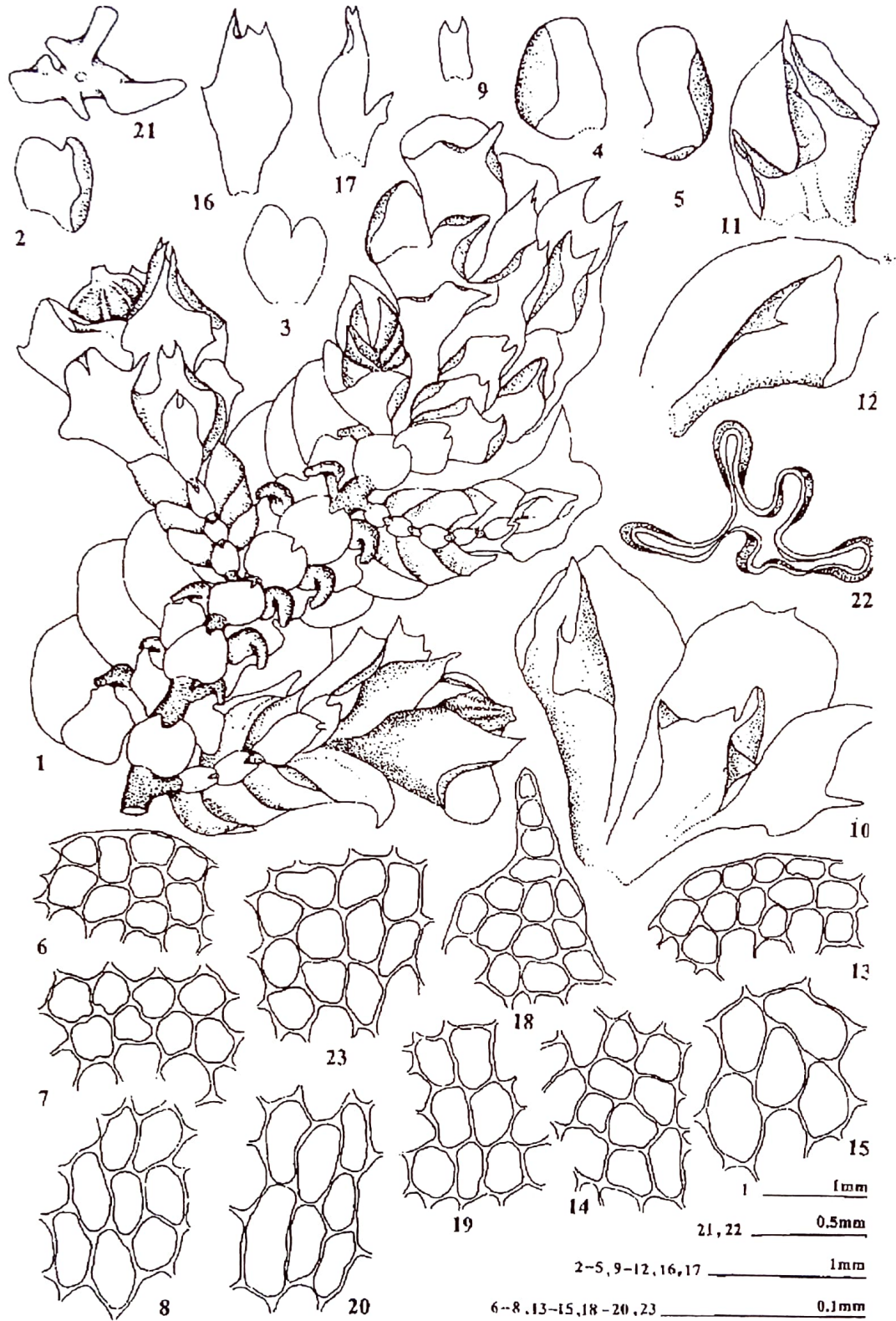


Fig. 2. *Frullania riojaneirensis* (Raddi) Spruce:

1. Fertile plant (ventral view), 2-5 Male bracts, 6. Apical cells of male bract, 7. Median cells of male bract, 8. Basal cells of male bract, 9. Male bracteole, 10-12. Female bracts, 13. Apical cells of female bract, 14. Median cells of female bract, 15. Basal cells of female bract, 16, 17. Female bracteole, 18. Apical cells of female bracteole, 19. Median cells of female bracteole, 20. Basal cells of female bracteole, 21. T.S. of perianth (Apical portion), 22. T.S. of perianth (Middle portion), 23. Cells of perianth.

Loc: Pandalur (Gudalur) Nilgiri Hills (South India):
Alt.ca. 1300 m, Date: 28.09.2002 Leg.: P.K. Verma
& A. Alam; Det.: S.C. Srivastava & A. Alam.

Characteristics of species :

1. Plants paroicous, flat portion of leaf lobule 2-3 times as large as the galeate portion and fold long and parallel to the stem.
2. Female inflorescence usually terminal on the tip of the male inflorescence.
3. The innermost pair of female bracts nearly entire or sparsely dentate.
4. Perianth usually on male branch, long pyriform, 5 keeled, without additional keel.

DISCUSSION

Mitten (1861) was the first who reported *F. arecae* (Spreng.) Gott. as *F. wallichiana* Mitt. under subgenus *Chonanthelia* from South India. The same species was again reported by Verdoorn (1930) along with another species of *F. neurota* Tayl. of the same subgenus from South India. Both these species were further listed from South India along with the other species of the genus (see Chopra, 1938; Parihar *et al.*, 1994; Nath & Asthana, 1998). Recently Srivastava and Alam (2002) also listed a couple of species under this subgenus along with other species of *Frullania* from Nilgiri hills (South India) and confirmed the occurrence of total 7 species from the region.

Frullania subgenus *Chonanthelia* Spruce is recognized by monoicous sexuality with leaf lobule composed of galeate upper portion and usually larger flat lower portion connecting the leaf by a fold. The perianth is mainly 4-plicate (keeled) but often several additional plicae may also be seen on both dorsal and ventral side. The perianth surface is smooth, almost immersed in large bracts and bracteoles which are

connate with bract lobes on both sides. Since *F. riojaneirensis* belongs to subgenus *Chonanthelia*, it shows some of the above mentioned morphological characters besides paroicous (hypogynous) nature of sexuality with gynoecium usually terminal on the top of the androecial branches and 5 keeled perianth without any additional plicae, with usually entire or sparsely dentate bracts and bracteoles.

Earlier, *F. riojaneirensis* and *F. galeata* were described as separate species based on their geographical distribution rather than morphological characteristics (Verdoorn, 1930), and further the latter was recognized as a synonym of *F. riojaneirensis* (Svihla, 1965).

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