

Sinske HATTORI\*: **Two South American Frullanias,  
*F. mirabilis* and *F. pendulostyla***

服部新佐\*: 南米産ヤステゴケ属の 2 種, *Frullania mirabilis*  
と *F. pendulostyla*\*\*

In Stephani's *Icones Hepaticarum* (unpubl.) are illustrated two South American species of subgen. *Frullania* of the *Frullania* (Hepaticae) both of which bear a long-subulate appendage at the dorsal and ventral bases of the stem leaves. One of them, *F. mirabilis*, was studied by Clark and Svihla who (1948, p. 191) stated: "We found a normal subulate stylus, difficult to see on account of the fact that the ventral lobe is so closely pressed to the stem but nevertheless it is present. Hence we do not agree with Jack and Stephani who described as the stylus, the large leaf-like appendage attached to the bases of the leaves. We consider this structure an appendage only.... Whether it should be considered morphologically a part of the ventral or dorsal lobe, we cannot say since only a study of the embryological development of this structure can determine the question beyond doubt."

The other species, *F. pendulostyla*, was studied by Stotler (1969). He (p. 474) stated: "The unique ventral base of the leaf lobes in *F. pendulostyla* readily distinguishes this species from all other species of *Frullania*. Two subulate, subdentate appendages are produced from the postical margins of the leaf lobes, one being pendent along the stem while the other appendage is either suberect or extends laterally across the ventral base of the stem. Although Stephani was of the opinion that the pendent appendage was the stylus (hence the specific epithet "pendulostyla") *the stylus in this species actually a uniseriate filament of three cells.* (Figs. 311-317)" (my italics).

I studied a portion of the type specimen of *F. pendulostyla* and also the

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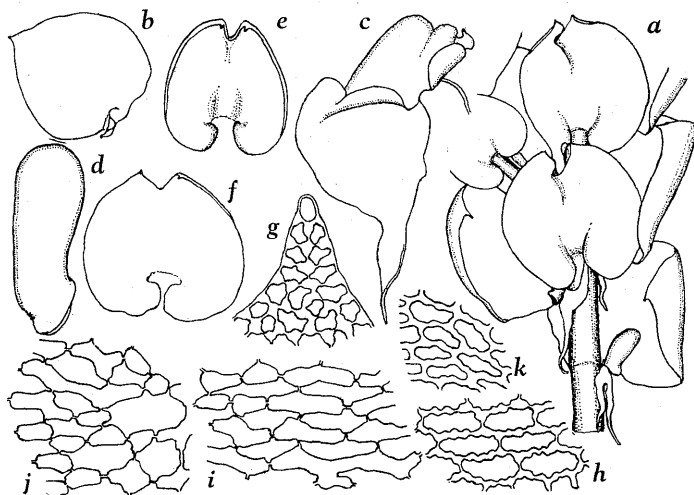


Fig. 1. *Frullania mirabilis* Jack & Steph. a. Portion of stem, ventral view,  $\times 22$ . b. Lobe of stem leaf,  $\times 11$ . c. Lobe of ventral appendage of lobe of stem leaf,  $\times 57$ . d. Lobule of stem leaf,  $\times 57$ . e-f. Stem underleaves,  $\times 22$ . g-j. Cells of lobe of stem leaf, g from apex, h from middle, i from near base, j from base, all  $\times 225$ . k. Cells of lobule of stem leaf,  $\times 225$ . Drawn from type of *F. mirabilis*.

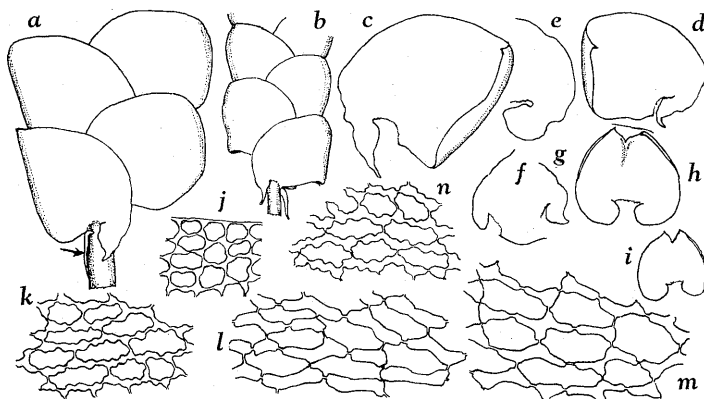


Fig. 2. *Frullania mirabilis* Jack & Steph. a. Portion of stem, dorsal view, arrow showing pendent appendage of leaf-lobe,  $\times 22$ . b. Portion of branch, dorsal v.,  $\times 22$ . c. Lobe of stem leaf,  $\times 22$ . d. Lobe of branch leaf,  $\times 22$ . e-g. Dorsal appendages of lobes branch leaves,  $\times 22$ . h-i. Branch underleaves,  $\times 22$ . j-m. Cells of lobe of stem leaf, j from margin, k from middle, l from near base, m from base, all  $\times 225$ . n. Cells of stem underleaf,  $\times 225$ . Drawn from type of *F. pendulostyla* Steph.

specimen on which Stephani's (1911, p. 597) record of *F. mirabilis* was based, both from Geneva (G), and found that Stotler's opinion is better supported than that of Clark and Svihla, and that the two species are conspecific with each other and represent a distinct section in the subgen. *Frullania*.

*Frullania* subgen. *Frullania* sect. **Mirabiles** Hatt., sect. nov.

Basis lobi foliorum grosse appendiculata, appendiculo dorsale longe oblongo-triangularato cum subulato acumine, ipso ventrale bifido fere ad basem, lobis longis, subulatis. Species unica: *F. mirabilis* Jack et Steph.

**Frullania** (*Frullania*) **mirabilis** Jack et Steph., Hedwigia 31: 15 (1892); Spec. Hepat. 4: 597 (1911); Clark & Svihla, Bryologist 51: 189, f. 1-14 (1948); Herzog, Rev. Bryol. Lichénol. 20(1/2): 129 (1951); Feddes Repert. 57(1/2): 171, f. 8 (1955). Syn.: *F. pendulostyla* Steph., Spec. Hepat. 6: 547 (1924); Stotler, Nova Hedwigia 18: 473-474, f. 311-317 (1969).

Plants deeply (reddish-) brown in herbaria, robust; stem rigid, large, blackish brown, more than 5 cm long, ca. 0.2 mm in diameter, more or less densely, uni- or bipinnately branched, primary branches obliquely (to widely) spreading, usually less than 10 mm long, secondary branches less than 5 mm long, 0-3 per primary branch. Lobes of stem leaves densely imbricate, widely spreading but concave with strongly involute distal margin, dorsally arching beyond the farther edge of stem, widely ovate to almost circular, ca. 1-1.2 mm long and wide with shortly apiculate-acute apex and large basal appendages both dorsally and ventrally, dorsal appendage long, oblong-triangular with subulate acumen, more or less repand along margin, often lobate-crispate toward the basal portion, ventral appendage\* deeply bifid (to near base), lobes long-subulate, occasionally with few, blunt marginal teeth, one lobe pendent but the other usually suberect (or obliquely patent); marginal cells 12-15×9-12  $\mu$  and with large, subnodulose trigones, median cells 20-35×12-15  $\mu$  and with large, nodulose-confluent trigones and intermediate thickenings, cells near base 37-52×14-18  $\mu$  and with elongate, angular trigones (wall seemingly trabeculate), basal cells 37-45×14-18  $\mu$  and with similar walls, marginal to median cells with orange-yellow cavity and more

\* Clark and Svihla (1948, p. 191) stated: "It is most conspicuous on the leaves of the main stem, variable in shape, with several long attenuate lobes folded lengthwise, with margins dentate to ciliate, and its upper concave part clasping the stem. It is more conspicuous from the ventral than from the dorsal side and is attached to the keel or fold between the ventral and dorsal lobes."

or less deeper-colored walls (+trigones), paler toward the lobe-margin, basal cells with pale reddish-brown cavity and more or less deeper-colored walls. (+trigones); lobules clavate-cylindric with rounded to obtuse apex and more or less wide, obliquely truncate mouth, ca. 0.43 mm long and 0.16 mm wide, contiguous to, and subparallel with, the stem, stylus minute, of a row of 3-4 cells, tipped with slime papilla. Stem underleaves imbricate, more than thrice as wide as the stem, weakly or strongly recurved along margin, when flat widely cordate, ca. 0.5 mm long and 1 mm wide, 1/5-1/6-bifid, sinus subacute, lobes widely triangular, apiculate-acute, base gibbous and strongly appendiculate, the appendages rounded, more or less incurved-folded; rhizoid-initial area below the underleaf-middle, convex, rhizoids short, fasciculate, subhyaline (more or less brownish), insertion subtransverse. Lobes of branch leaves with comparatively distinct acumen and poorly developed appendages. (often obtuse at apex). Dioicous? (gynoecia not seen). Androecia lateral on secondary branches or rarely on primary branches, very short-stalked (stalk with deformed leaves, with *Frullania* type branching), nearly capitate with 3-4 pairs of bracts (bracteoles reduced).

Specim. exam.: Jack & Steph., Hepaticae Wallisiana, *Frullania mirabilis* J. et St., Peruvia, Tambo de la Chauta, 3-4000', M. (=mt.) Rosa, Gustav Wallis leg., 1876 (det. Stephani as *F. mirabilis* in herb. G no. 15421). Bryotheca Ecuadorensis, M. Allioni, *Frullania pendrostyla* St. n. sp. Ad arbores. elatiores in silva "Guayush" 1200 m. Rara. Gualaguiza Oriente—V. Bomboiza, 23 Sept. 1910, legit M. All. (=Allioni) (holotype of *F. pendulostyla* in herb. G no. 13655).

The materials of *F. mirabilis* and *F. pseudopendula* that I studied were few fragmentary shoots, so that my observations were of necessity restricted in some features, though I was able to find androecia in the specimen of *F. mirabilis* and thus describe them. Stephani (1892, p. 15) described the stem as "ad 20 cm" in length\*, and afterwards (1911, p. 597) as "ad 30 cm."\*\* However, Clark and Svihla (1948, p. 189) described: "Leafy shoot to 8 cm.

\* Dioica, robusta, fusco-brunnea apice rubescens, dense caespitans. Caulis usque ad 20 cm longus, basi pauciramcosus, ramis longis strictissimis, regulariter bipinnatis, pinnis pinnulisque brevibus, remotis patentibus." He did not describe the sexual organs; later he (1911, p. 597) described "sterilis."

\*\* Sterilis gigantea robusta, fusco-brunnea, corticola. Caulis ad 30 cm. longus, regulariter bipinnatus, pinnis ad 3 cm. longis, sparsim pinnulatis, ramis longioribus ad 15 cm. longis, similiter pinnulatis.

long, irregularly pinnate; main stem 0.19 mm. thick; primary branches long, secondary ones shorter and tertiary ones only about 2 to 3 mm. long; cells of stem in cross-section thick-walled, 6-sided, same diameter throughout; cortical cells dark brown, 2 to 3 layers thick." Stotler (1969, p. 473) described, under the name of *F. pendulostyla*: "Plants of medium size, dark brown, in appressed mats; stems to 6 cm long, with leaves to 1.5 mm wide, irregularly pinnate or bipinnate; lateral branches frequent, rarely of the *Bryopteris*-type, usually of the *Frullania*-type..."

For *F. mirabilis* Stephani (1911, p. 597) cited the range as "Andes Peruviae, Novae Granadae, Costaricae, Guiana." According to Clark & Svihla (1948), *F. mirabilis* is distributed in Peru, New Granada (northern Peru, Ecuador and Colombia), Guiana, and Costa Rica, and afterwards it was recorded by Herzog (1951 & 1955) from Costa Rica and Colombia respectively. Under *Frullania pendulostyla* Stotler (1969, p. 474) cited nine specimens other than the Ecuadorian type, which came from Costa Rica, Colombia, and Venezuela. Thus *F. mirabilis* seems to be widely distributed in montane areas (as an epiphyte) from the southern part of Central America to the northern part of South America, southward to the Peruvian Andes.

The so-called "stylus" in *Frullania* and its allied genera (such as *Steerea* and *Schusterella*) is unlike the stylus of almost all other leafy Hepaticae, but may be considered to be equivalent to the ventral lobule of the two saccate lobules of the leaves of *Goebeliella*, for instance *G. cornigera* (Mitt.) Steph. (see Schuster 1965, Figs. 1 and 2), the "stylus" of *Gackstroemia* and *Lepidolaena* (see Grolle 1967, Abb. 2-5, 7-14)\*, or the ventral half of the leaf-lobule of genera of Lejeuneaceae and Porellaceae. In *Frullania* and allied genera the leaf-lobule may be considered to possibly originate from dorsal portion of the ventral half of the lateral merophytes, leaving the rest of the ventral half for the development of the "stylus," whereas in other genera (including Porellaceae and Lejeuneaceae) the origin of the leaf-lobule utilizes almost all of the ventral half of the lateral merophyte.

\* Grolle (1967, p. 7) described the "stylus" of Lepidolaenaceae: "Blätter sehr tief in 2 Lappen geteilt, von denen der ventrale mindestens an Hauptsprossen nochmals in zwei grosse Lappen-Stylus- und Helmlappen-geteilt ist. Stylus an Hauptsprossen oft länger und breiter als der Helmlappen, kurz zugespitzt bis grannig auslaufend, ganzrandig bis wimprig, an Ästen distalwärts bald = reduziert, schliesslich meist bis auf eine frühzeitig schwindende Hyalinpapille unterdrückt."

In most taxa of *Frullania* the stylus stops growth early, remaining far smaller than the saccate lobule. However, in some species it becomes a little larger. Hattori (1972, Figs. 1-9) showed the larger styli to be composed of a stylose hair of a row of several, small cells and of a large, multicellular disc with 1 to several teeth. The extreme at this is seen in *Steerea mastigophoroides*, which Hattori and Kamimura (1971, p. 434) described as "stylus exiguus, 2-3 cellularibus (uniseriatis) constructus, apice papilla hyalina notato, basibus grosse appendiculatis, appendiculis maximis, irregulariter spinosi-dentatis (fere ad basem)," and figured it clearly (see Figs. 1 and 3). I wish to propose here the term "stylides" to discriminate the larger stylus of *Steerea*, *Frullania*, and *Lepidolaena* from the usual stylus of other genera.

This study endeavors to clarify the nature of the peculiar appendage of *Frullania mirabilis* and whether it belongs to the leaf-lobe or is, in fact, the stylus. At first I suspected that it might be the stylus, as in the case in *Steerea*. However, I found that it does not belong to the stylus but is better regarded as the ventral appendage of the leaf-lobe, as already pointed out by Stotler.

#### References

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中南米産のヤスデゴケ属のうち、長い附属物を葉基部の背腹両面につける点で他からひどく変った種がある。*Frullania mirabilis* と *F. pendulostyla* の両種がそれで、私は (1) この両種は同種と考えてよいのではないか、(2) この附属物のうち腹面から見えるものは *stylus* かどうか、一以上の 2 点を調べてみたいと思っていた。*Frullania* の或種や単型属の *Steerea* では *stylus* が大形となり、形が複雑化して、クサリゴケ、クラマゴケモドキその他一般の苔類の *stylus* とは相当異っていて、以前からはっきりさせたいと思っていたので、この点も考えた。借覧した標本、*F. mirabilis* は *Stephani* がそれを基にして本種をペルーから記録した標本で、*F. pendulostyla* はタイプであった。どちらも古い茎の断片わずかばかりであって、十分な研究は出来なかった。然し Jack & Stephani (1892), Stephani (1911, 1924) の考えたような *stylus* ではなくて、Clark & Svihla (1948) や Stotler (1969) の見解が正しいと思われた。Clark & Svihla はこの附属物が *stylus* ではなく、葉の基部の附属物といって、それが葉の上片の附属物か下片の附属物かの断定は慎重に保留したが、Stotler ははっきり葉の上片の附属物といった。私は Stotler の見解でよいと思う。

上記の標本を調べ、文献を参照した結果、前述の 2 種は同一であり、そして新しい節を代表するに足るものと考えて、sect. *Mirabiles* を提案した。また一般に *stylus* と呼ばれているものを 2 分する必要を認め、必要な場合大型のものを *stylides* と呼ぶことを提唱した。そしてこの 2 型はその発生の起源に於ても異なるものと考えた。

□志村義雄：日本シダ植物生態写真集成，B5 判約 600 ページ，1972 年 12 月，採集と飼育の会発行，¥ 7,000 円。著者は静岡大学教授，20 余年にわたって全国のシダ植物を調査研究したかたわら，撮りためた写真を，分類順に並べて出版したもの。原色写真 4 ページ (6 図版)，本文写真 530 ページ (610 図版) がおもな内容で，各種についてキャビネ版くらいの写真 1 枚，ものによっては 2~3 枚，または小さい接写の付いたものもある。シダの種類は日本に自生するもの 520 種で，北海道から奄美群島に及び，ほとんど全部が著者自身の撮影によるものである。写真はどれも非常によく撮れていて印刷もよく，普通の図鑑ではよくわからない葉の出方や傾きなど，それに葉のつやなどもよくわかる。また最近発表された種や他の書物にない種などもあって役に立つ。説明は簡単ながら学名 (出典も)，和名などのほかに，撮影地の環境や月日と，分布ならびに生態を記録してある。生態には写真に出ない色，地下部，繁殖型，胞子の熟期，その他注意すべき点などが述べてあるので，生き生きした写真を一そうわかりやすいものになっている。巻末に「日本産シダ植物総略目録」として本書に写真のないものも含めて，771 種 (内 105 種は雑種) が載せてある。これは現在最も新しい日本のシダのリストである。

(伊藤 洋)