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NOTES ON *FISSIDENS FLAVOLIMBATUS* BESCH. AND *F. GHANAE* BIZOT

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Abstract: *Fissidens flavolimbatus* is discussed, and reduced to a synonym of *F. madecassus*, and *F. ghanae* is reinstated, described and figured. *Fissidens madecassus, F. flavolimbatus* and *F. ghanae* are lectotypified.

Keywords: taxonomy, *Fissidens flavolimbatus*, *F. ghanae*

INTRODUCTION

Bruggeman-Nannenga (1993) considered *F. flavolimbatus* Besch. a synonym of *F. intramarginatus* (Hampe) A.Jaeger. Re-examination of the type material of *F. flavolimbatus* showed that the type material contains two species of which only one agrees with the protologue. This specimen is chosen as lectotype. *Fissidens flavolimbatus* is conspecific with *F. madecassus* Schimp. ex Müll.Hal., and the name *F. madecassus* has priority. The 1993-synonym was based on the other species.

Fissidens pellucidus Hornsch. is a species-complex with several not sharply distinct expressions. It appears that expression *F. ghanae* Bizot is distinct and constant. It is therefore reinstated as a species.

RESULTS

On the identity of *Fissidens flavolimbatus*

Bescherelle's herbarium in BM includes two syntypes of *F. flavolimbatus* Besch. That collected by *de L' Isle* is completely semilimbate; the other syntype contains, in addition to the same completely semilimbate species, a species with incompletely limbate vaginant laminae. According to its original description, *F. flavolimbatus* has incompletely limbate vaginant laminae (lamina

vera alte producta tantum e basi ad partem angustiorum limbo flavo marginata), which is supported by the corresponding figure in an unpublished album by Bescherelle (Bescherelle unpublished). The figures in this album were intended as supplement to the paper that includes the original description of *F. flavolimbatus* (Bescherelle 1880), but have never been published. Unfortunately, Bescherelle himself caused some confusion when in his key (Bescherelle l.c.) he distinguished *F. flavolimbatus* as completely semilimbate. Since the original description and the unpublished figure leave no doubt that *F. flavolimbatus* is incompletely semilimbate, the second collection is designated the lectotype. The collector's name (*Frappier*) is lacking on the label, but apart from that the label "Herb. Bescherelle, La Réunion, herb. Mus. Par." matches the wording of the first syntype in the protologue. This choice is further endorsed by the sporophyte in Bescherelle's unpublished figure for which the sporophyte in the lectotype appears to have been the model.

Fissidens madecassus Schimp. ex Müll.Hal., Bot. Zeitung (Berlin) 22: 340, 1864 – Protologue: Insula MADAGASCAR, *Pervilllé* – lectotype (designated here): MADAGASCAR, *Pervillé 51* (BM 000871895, mixed with type of *F. ferrugineus*; isotype: BM 000871896 mixed with type of *F. ferrugineus* and PC as *Pervillé s.n.* and *51* (not seen).

Fissidens flavolimbatus Besch., Ann. Sci. Nat. 6, 9: 332, 1880 – Protologue: La Réunion. *Frappier* (in herb. Mus. Par.); plaine des Palmistes, rive gauche du bras Piton, 10 juillet 1877 ; *G. de L' Isle*; sur rochers humides du bras Pavé, grande Belous, *G. de L'Isle 415* – lectotype (designated here): Herb. Bescherelle, La Réunion, herb. Mus. Par. (BM 00672132, mixed with *F. ferrugineus*). **syn. nov.**

Fissidens pellucidus Hornsch. and *F. ghanae* Bizot

Fissidens pellucidus is a heterogenous species with many synonyms (Bruggeman-Nannenga 1993 (as *F. laxus* Sull. & Lesq.); Bruggeman-Nannenga and Pursell 1995; Pursell 1994; Pursell 2007). Its variability has been discussed by Pursell (1994 and 2007). His fig. 110 A-L (2007) illustrates some of the diversity of this species. These same variations occur in Africa.

In spite of its variability, *F. pellucidus* Hornsch. s.l. is easily recognized by the combination of elimbate leaves, short vaginant

laminae and large, clear, often guttulate cells with smooth, more or less incrassate,1–3 (–5) µm thick walls. Young plants are pale green often tinged with red-brown; older stems often become rusty brown. Similar cells are found in the Asian *F. crassinervis* Sande Lac., in *F. guangdongensis* Z.lwats. & Z.-H.Li, and in the heterogeneous African *F. porrectus* Mitt. This last species differs from *F. pellucidus* in dorsal and apical laminae with differentiated, incrassate margins and limbate vaginant laminae. *Fissidens porrectus, F. guangdongensis* and *F. pellucidus* not only have similar laminal cells, but also are genetically close (Budke *et al.* 2022; Suzuki *et al.* 2018). Because of their smooth cells these species are traditionally classified in sect. *Aloma*. In molecular analyses they are resolved in the otherwise mammillose-pluripapillose sect. *Antennidens* (= *Semilimbidium*) (Budke *et al.* 2022; Suzuki *et al.* 2018). In this context it is interesting to note that these smooth-celled species frequently have unipapillose marginal cells.

Since 1993 more material has become available and thus it has become clear that the African expression *F. ghanae*, is distinct and constant and needs to be reinstated.

Fissidens ghanae Bizot, Rev. Bryol. Lichénol. 40 (2): 105, Pl. 2C, 1974 – Protologue: Ghana, Eastern Region, Ankasa Forest Reserve, by the Ankasa River, covering bole of *Vitex microphylla* from ca. 1 m. above ground up to the crown. *E. W. Jones 1367* (herb. Bizot & Jones) – Lectotype (designated here): Ghana, Western Region, Ankasa Forest Reserve. By the Ankasa River, covering bole of *Vitex microphylla* from ca.1 m. above ground up to the crown. 14 II 1971, *Jones 1367* (PC-0096391).

Remark: according to the protologue the type was collected in the Eastern Region, but this is obviously an error. The type-label in Jones' handwriting says "Western region" which agrees with geographical information in Wikipedia.

Fissidens ghanae is characterized by short costae. Within the *F. pellucidus*-complex short costae are further known from the neotropical *F. pellucidus* var. *asterodontius* (Müll.Hal.) Pursell and the Asian *F. guangdongensis* Z.lwats. & Z.-H.Li. *Fissidens p.* var. *asterodontius* differs from var. *pellucidus* by broader leaves and costae that end 6–23 cells below the apex (Pursell 2007). According to its original description, *F. guangdongensis* differs from *F. p.* var. *pellucidus* amongst others by costae that end 6–9 cells below the

apex. The here reinstated African *F. ghanae* is characterized by short costae ending (0–) 5–11 (–19) cells below the apex and its characteristic gradually attenuated leaf tips (*Figures 1C* and *D*). This apex differentiates it from *F. p.* var. *asterodontius* and *F. guangdongensis.* The original description is incomplete therefore an additional one is here provided. *Description* based on *Jones 1367*, *O'Shea U 5556A*, *Jones 1314* and *Shevock 49981*.

Growing in dense mats, *stems* without central strand, branched or not, pinnately foliated, 5–21 × 1–2 mm; *rhizoids* brown, smooth; *axillary cells* not differentiated; *leaves* variable in size, often zones of small leaves alternating with zones of larger ones, 11–60 pairs, mostly distant, pale green frequently with small reddish areas, almost flat when dry, lanceolate with long, acute apex, 0.5–1.5 × 0.15–0.3 (–0.4) mm, 3–4 (–5) times as long as wide, elimbate margin crenulo-serrulate, entire near the insertion of vaginant laminae; proximal marginal cells of vaginant lamina frequently narrowly oblong; *vaginant laminae* short, 1/2 or less the leaf length, at the insertion about half as wide as the stem, towards the insertion rounded and suddenly narrowed and then widening again; unequal, lesser lamella ending closer to the costa than to margin; *dorsal lamina* at the insertion narrow to wide, reaching the insertion, occasionally ending well above, not decurrent; dorsal and apical laminae unistratose occasionally with a few bistratose cells alongside the costa; *costa* ending (0–) 5–11 (–19) cells below the leaf apex, in cross-section *bryoides* type; *laminal cells* clear, mostly guttulate; *lumina mid dorsal laminal cells* (7–) 11–18.5 (–20.5) × (5–) 5.5–12.5 μm, walls pale, firm, 2–4 μm thick, plane to slightly convex, smooth, marginal cells often unipapillose; *lumina mid vaginant laminal cells* (7–) 9–16.5 (–18.5) × (4.5–) 6.5–10.5 (–12) μm, walls pale, firm, 1.5–2.5 μm thick, plane to slightly convex, smooth. *Gemmae* not seen.

Perigonia not seen; *perichaetia* terminal; *perichaetial leaves* 1.15–2.0 mm long; *archegonia* 200–230 μm long. *Sporophyte*: *seta* 3 mm, smooth (one seen).

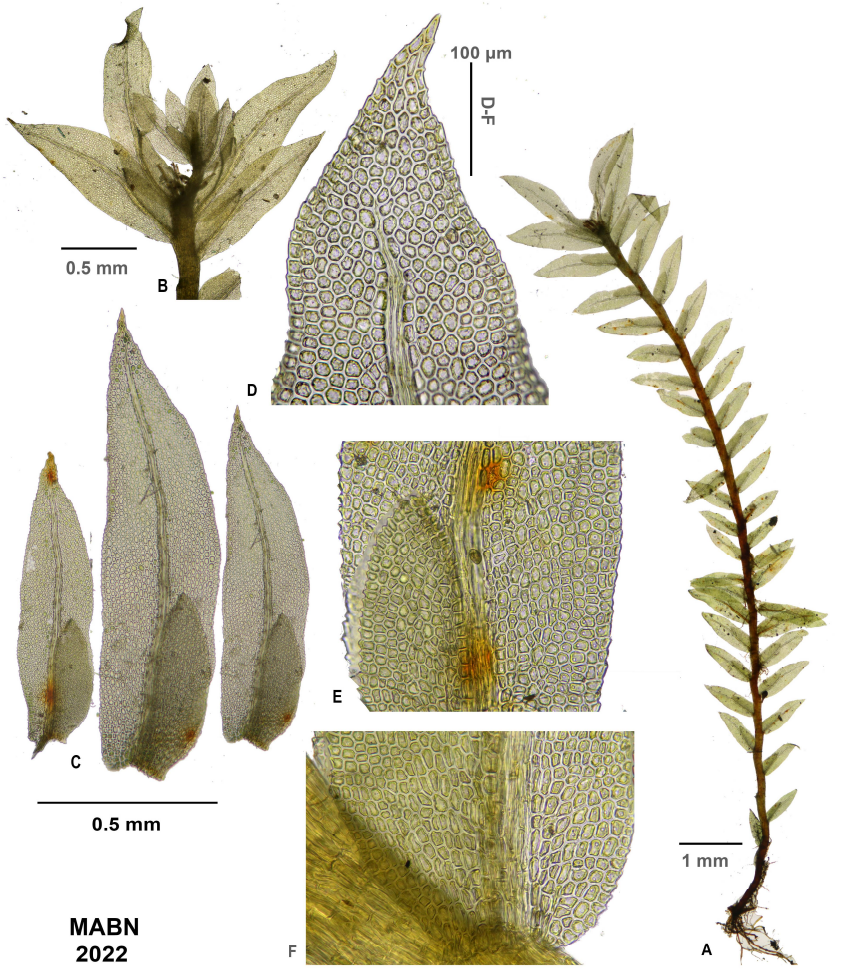

Figure 1. *Fissidens ghanae* **A**: perichaetial stem; **B**: apex of perichaetial stem with young proliferation; **C**: leaves; **D**: leaf apex; **E**: mid leaf; **F**: leaf insertion; A, C, D from Shevock 49981; B, E and F from Assel 1399.

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