

## Two new species of *Fissidens* (Fissidentaceae, Musci) from Africa, *Fissidens harringtonii* and *Fissidens artsii*

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**Abstract:** *Fissidens harringtonii* from Sierra Leone and *F. artsii* from Réunion are newly described and illustrated. The taxonomic position of *F. harringtonii* and *F. integerrimus* Mitten in Hook.f & Wilson, with which it is compared, is discussed. *Fissidens artsii* is compared to *F. ovatifolius* R.Ruthe and *F. sublimbatus* Grout.

### ***Fissidens harringtonii* sp. nov. (Fig. 1)**

Species saxicola, aquatica, caule cellulis interioribus parietibus incrassatis, filo centrali destituto, foliis anguste lanceolatis, rigidioribus, saepe gemmis axillaribus multicellularibus ramosis, laminis vaginantibus in parte basali limbatis, laminis dorsalibus et apicalibus irregulariter bistratosis, cellulis 7.5–2 µm longis, levibus, perichaetiis terminalibus, 1–2 setis munitis, peristomiis ex forma scariosa.

*Plants* ca. 10 mm long x ca. 2 mm wide, growing in tufts, submerged. *Stems* brown, unbranched and branched, sparsely foliate in the basal part and more densely foliate in the middle and distal parts with to 23 leaf pairs; without central strand, the outer stem cells slightly smaller than the inner, incrassate walls; rhizoids basal and from cortex in basal part of stem, a few axillary, brown and smooth; axillary hyaline nodules weakly

developed. *Leaves* greenish, obscure, slightly crispate when dry, more or less flat when moistened, linear-lanceolate, linear-oblongate and elliptico-lanceolate, acute to acuminate, apical cell pointed, 1–1.9 mm long and 0.25–0.4 mm wide, L/W 4–5; margin subentire to crenulate, often entire near insertion of vaginant laminae; *vaginant lamina*  $\frac{1}{2}$ – $\frac{3}{5}$  the leaf length, base narrower than stem, more or less straight towards insertion sometimes slightly widening at the base, not decurrent, homostichous, largely unistratose, often bistratose along the costa, but also in isolated areas elsewhere, unequal, ending closer to the margin than to the costa, acute to somewhat rounded, ending at or near the costa in one of the perichaetial leaves; *dorsal lamina* mostly rather wide and rounded at base, reaching insertion, not decurrent. *Dorsal and apical lamina* irregularly bistratose, often bistratose near the costa and the base of the dorsal lamina;

*limbidium* on basal part of vaginant laminae of most leaves reaching  $\pm$  the upper ends of the vaginant laminae in upper leaves of female stems, reaching the insertion, unistratose, 1–7 cells wide, intralaminar; *costa* stout, ending 2–3 cells below apex to percurrent, *bryoides*-type, with 2 guide cells, 1–2 large central cells, and differentiated lateral epidermis; above sheath with 1 row of 2 large cells; *lamina cells* flat, hexagonal,  $\pm$  uniform, in middle of dorsal lamina 7.5–12  $\mu\text{m}$  long and 6–7.5  $\mu\text{m}$  wide, walls firm, smooth, yellowish, often larger alongside *costa* and at insertion of dorsal lamina; hyaline to brown, heavily branched, filamentous gemmae frequently present in leaf axils, whereas some branches have dense clusters of elongated multicellular gemmae growing from and between their basal rhizoids. *Rhizautoicous*, *cladautoicous*, occasionally *synoicous*. *Perigonia* terminal on small plants or short branches with basal rhizoids in upper part of stem, antheridia 250–300  $\mu\text{m}$  long; *perichaetia* and *synoecia* terminal, archegonia 380–400  $\mu\text{m}$  long; *perichaetial leaves* longer than stem leaves, to 2.2 mm long. *Seta* 2.5–3 mm long, smooth, 1–2 per stem; capsule exserted, radially symmetrical to slightly bilaterally symmetrical, somewhat constricted at the mouth or not, 1 mm long x 0.4 mm wide, with 32–38 oblong, collenchymatous exothecial cells; *peristome scariosus*-type, tooth base 49.5  $\mu\text{m}$  wide; operculum rostrate, 0.6–0.7 mm long. *Calyptra* cucullate, smooth. *Spores* papillose, 13.5–16.5  $\mu\text{m}$  long.

Holotype: Sierra Leone, by stream above Drighons Dam no 1. Sugar loaf valley, Freetown Peninsula. Partly submerged on sloping boulder surface by stream. 30 X 1966. *Harrington 678* (BM).

Distribution: Africa, Sierra Leone, known from the type locality only.

This species is named in honour of Dr. Alan Harrington who collected the type specimen during his residence in Nigeria.

*Fissidens harringtonii* is unlikely to be confused with any other aquatic species in Africa, if only by its inner stem cells, all of which have incrassate

walls, a character that might be unique in the genus. Other outstanding features include the lack of a central strand, an intralaminar limbidium on the vaginant laminae of most leaves, stiff, narrow leaves, axillary, branched filamentous gemmae, 1–2 sporophytes per perichaetium, and a *scariosus*-type peristome.

The closest relatives of *F. harringtonii* appear to be *F. integerrimus* Mitten in Hook.f. & Wilson from Australia (Victoria and Tasmania) and New Zealand, and *F. waiensis* J. Beever from New Zealand. All three of these species are found on rocks that are often submerged. Moreover, in all three species the *costa* ends short of the leaf apex, the limbidium is restricted to the vaginant laminae, and the lamina cells are smooth. *Fissidens harringtonii*, however, differs from the other two species by the absence of a central strand. Moreover, it has narrower leaf tips, dorsal laminae ending in a wide, rounded base, and clusters of elongate, multicellular gemmae.

The systematic position of these three species is not obvious. Their gametophytes suggest that they belong in section *Fissidens*, along with other poorly limbate species, for example, expressions of *F. leucocinctus* Hampe and *F. crassipes* subsp. *warnstorffii* (M.Fleisch.) Brugg.-Nann. However, there is one essential difference. Whereas the two last named species have a *bryoides*-type peristome, which is characteristic of section *Fissidens*, *F. harringtonii* and *F. integerrimus* have a *scariosus*-type peristome (the sporophyte of *F. waiensis* is unknown), which is restricted to subgenus *Aloma* (Bruggeman-Nannenga & Berendsen 1990; Pursell & Bruggeman-Nannenga in press). Considering that the peristome type is the most reliable character, *F. harringtonii* and *F. integerrimus* occupy a unique position in subgenus *Aloma*.

#### ***Fissidens artsii* sp. nov. (Fig. 2)**

*Species foliis limbidio unistratosa circumductis, costa in apice terminante vel percurrente, laminis dorsalibus supra insertionem terminantibus, cellulis laminaribus levibus, in medio laminae dorsalis 4.5–7.5  $\mu\text{m}$  longis leviter*

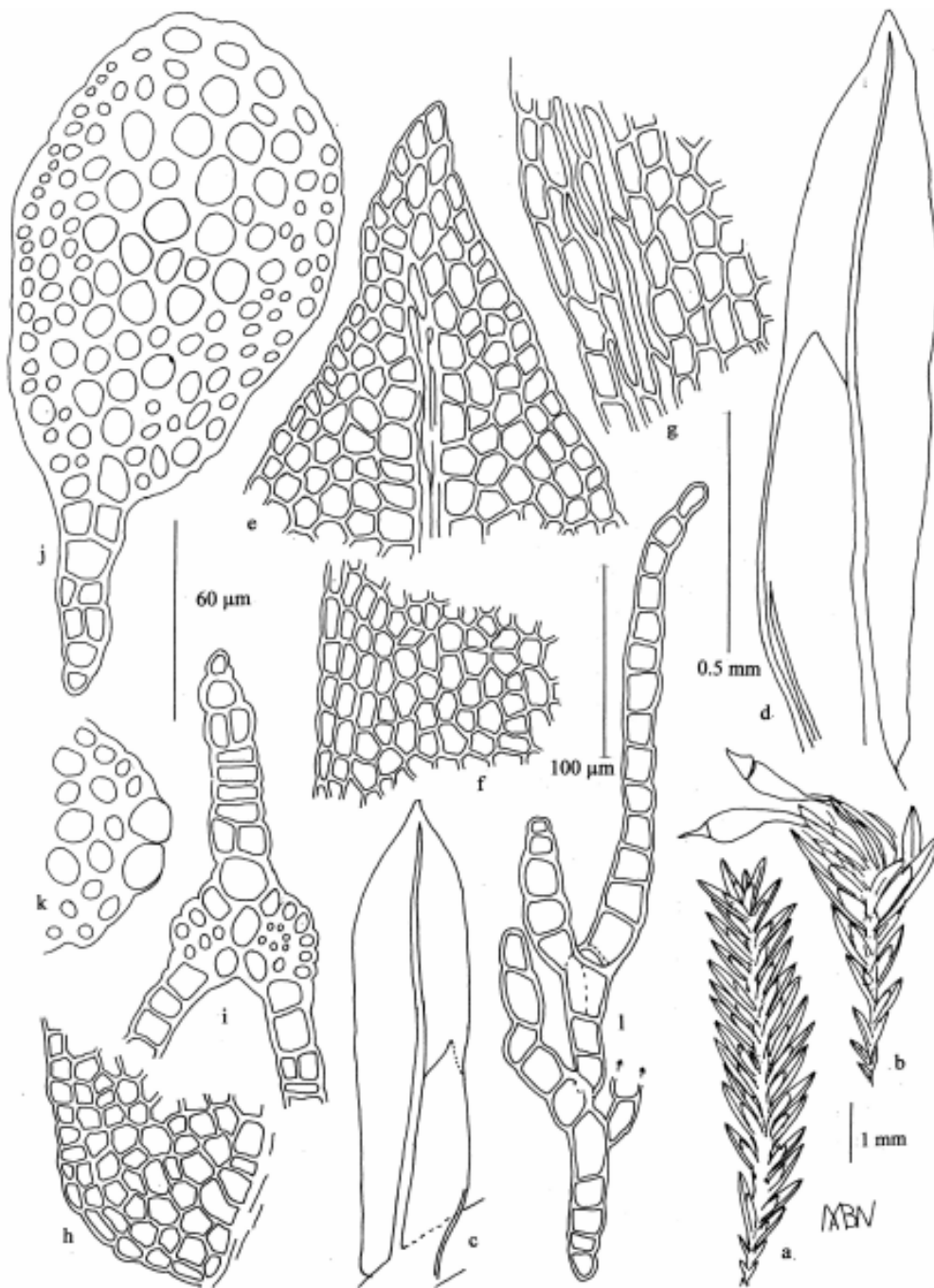


Fig. 1. *Fissidens harringtonii* type specimen - a: plant; b: plant with 2 sporophytes; c and d: leaves; e: leaf apex; f: margin mid dorsal lamina; g: insertion of vaginant lamina; h: basal part of dorsal lamina; i: cross-section of leaf; j: cross-section of stem and basal part of leaf; k: cross-section of weakly developed axillary nodule; l: branched gemmae.

*tumidisque, in apice folii majoribus, 15 µm longis planisque. Cetera ignota.*

*Plants* 7 mm long x 1.7 mm wide, in loose mats, green, on soil. *Stems* erect, green, unbranched, with to 17 leaf pairs; central strand of  $\pm$  9 small, thin-walled cells present; 1-2 tiers of hyaline inner and 1-2 tiers of coloured outer cortical cells; rhizoids basal, brown and smooth; axillary cells differentiated, hardly bulging. *Leaves* green, somewhat crispate when dry, lanceolate, 0.8-1.2 mm long and 0.2-0.25 mm wide, L/W 4-5, apex pale, acute to acuminate, composed of large, clear cells; *margin* entire, infrequently serrulate at leaf apex, limbate on all laminae, limbidium marginal throughout, often branched, ending in leaf apex, confluent at upper ends of vaginant laminae, reaching insertion of the vaginant laminae, fusing with costa in lower part of dorsal lamina, unistratose, 1-4 cells wide (4.5-7.5 µm) in mid dorsal lamina, to 11 cells wide at base of vaginant laminae, mostly thinner than rest of lamina; *vaginant laminae* 3/5 the leaf length, acute, slightly unequal, at base about as wide as stem, slightly rounded,  $\pm$  straight at insertion, not decurrent, unistratose, *dorsal lamina* usually ending above insertion, or ill-defined, consisting of limbidium fused with costa below; costa pale, stout, ending in leaf apex to percurrent, *bryoides*-type, with 2 guide cells, 1 large central cell, lateral epidermis not differentiated; *lamina cells* rather uniform, obscure, often quadrate,  $\pm$  7.5 µm long and 4.5-6 µm wide in middle of dorsal lamina, with pale, smooth, bulging and convex, or bulging with flattened apex, walls, in leaf tip larger  $\pm$  15 µm long and clearer; *juxtacostal basal cells* of vaginant laminae oblong, flat, to 19.5 µm long. *Sporophyte* and *calyptra* not seen.

Holotype: Réunion, La Caverne de la Glacière, sentier du Grand Bénard. On earth layer underneath overhanging volcanic rock. 2460 m. 8 III 1997. Arts 13/09 (BR; isotype, U)

The type of *F. artsii* was collected by the late Theo Arts and his wife during their last collecting visit to Réunion. Theo had been collecting bryophytes on this island for several years. His aim to write a moss flora of Réunion, however, he was sadly prevented by his untimely death. Theo and I were working on the species of

*Fissidens* when he died, and I hope to have our joint paper ready for publication soon. This new species is named in Theo's honour.

*Fissidens artsii* is characterized by limbate leaves, a dorsal lamina that ends above the insertion, a clear leaf apex that contrasts with the remainder of the leaf, and bulging lamina cells. The species can be confused with *F. ovatifolius* R. Ruthe (southern Europe and northern Africa) and *F. sublimbatus* Grout (western North America, Morocco, and the Canary Islands), which also have limbate leaves, a short dorsal lamina, bulging lamina cells, and often obscure leaves with a contrasting clear apex of larger cells (best seen in *F. ovatifolius* and *F. artsii*). However, *F. artsii* differs from *F. ovatifolius* in its narrower leaves (4-5 times as long as wide vs. 2-3 times as long as wide), and the unistratose limbidium that is often thinner than the lamina (fig. 2 b and j) whereas in the latter species the limbidium is 1-4-stratose and extends well above and below the level of the lamina. Both *F. artsii* and *ovatifolius* are distinct from *F. sublimbatus* in having a marginal to infrequently weakly intralaminar limbidium on all laminae that reaches the insertion of the vaginant and dorsal laminae. Limbidia of *F. sublimbatus* on the contrary can be on all laminae or be restricted to the vaginant laminae, they are marginal but towards the insertion of the vaginant laminae they become conspicuously intralaminar and then vanish altogether, so that the insertion is elimbate.

#### Acknowledgements

I am grateful to Dr. Jessica Beever who presented me with an isotype of *F. waiensis* and with whom I discussed this new species and its resemblances to *F. integerrimus* Mitt. in Hook and *F. waiensis* Beever, to Dr. Ron Pursell for critical reading of the manuscript and to NY for the loan of the type specimen of *F. integerrimus*.

#### References

- Bruggeman-Nannenga, M. A. and Berendsen, W. 1990.** On the peristome types found in the Fissidentaceae and their importance for the classification. *J. Hatt. Bot. Lab.* 68: 193-234.

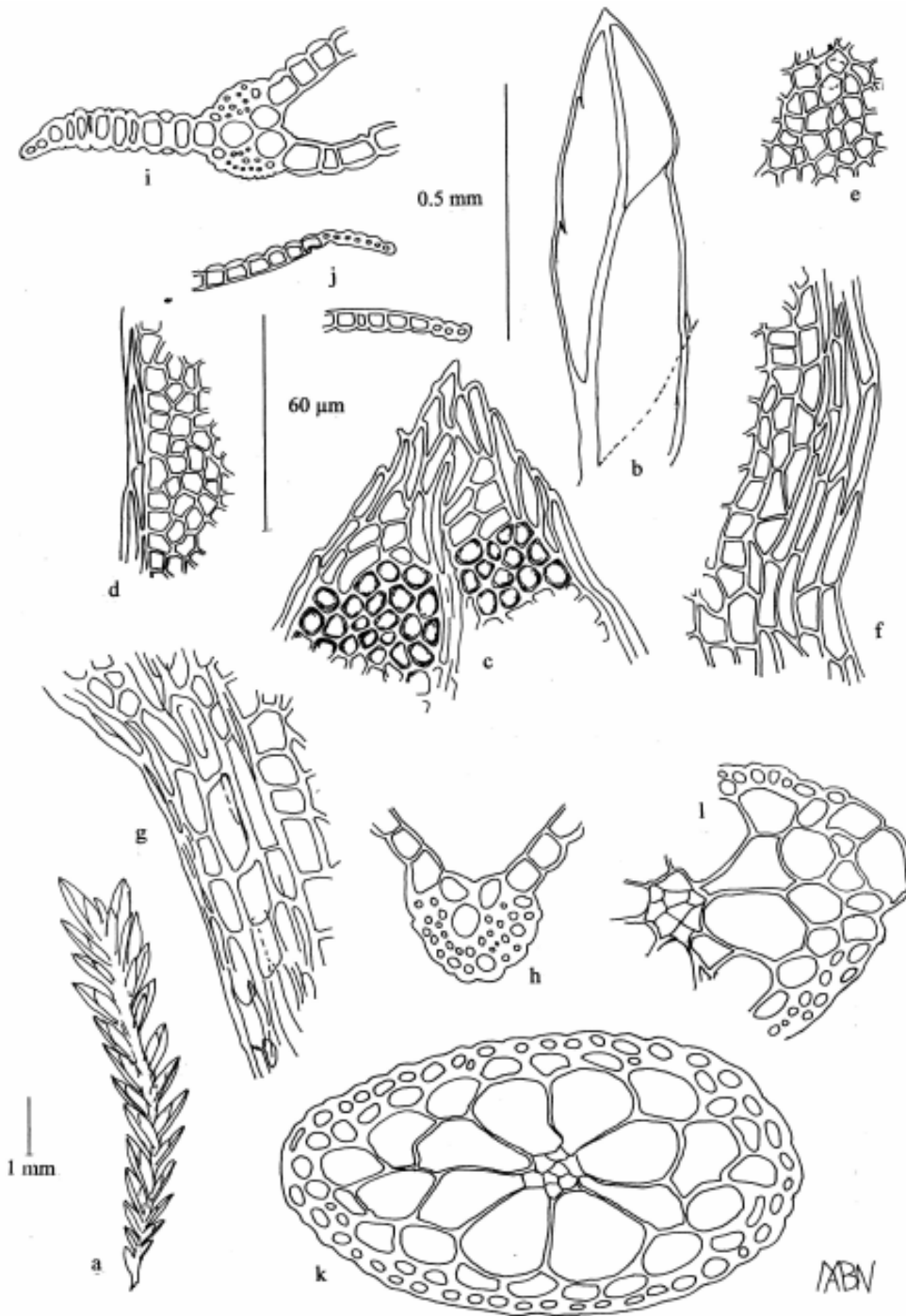


Fig. 2. *Fissidens artsii* type specimen - a: plant; b: leaf; c: leaf apex; d: margin mid dorsal lamina; e: laminal cells mid dorsal lamina; f: insertion of vaginant lamina; g: basal part of dorsal lamina; h: cross-section of basal part of leaf; i: cross-section of leaf above h; j: 2 cross-sections through vaginant laminae; k: cross-section of stem; cross-section of enlarged axillary cells. c-l all drawn at the same magnification.

