

Studies in the liverwort genus *Fossombronia* (Metzgeriales) from southern Africa. 5. A new species from Northern and Western Cape

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ABSTRACT

A new species of *Fossombronia*, *F. cederbergensis*, from the winter rainfall area of the Northern and Western Cape is described. It is characterized by 'ruched' leaves that are mostly wider than long, by tuberous stem apices that enable the plants to survive the hot, dry summers and by completely or incompletely reticulate spores.

Fossombronia cederbergensis Perold, sp. nov.

Plantae prostratae, crebrae in coloniis. *Folia* imbricata, valde convoluta, forma irregulari, plerumque superne lobata, valde latiora quam longiora. *Rhizoidea* ad apicem ventralem caulis interdum hyalina, proximaliter purpurea. *Caules* apicem versus tuberosi. Dioicae. Plantae masculae rarissimae, parvulae; antheridia bracteis irregulariter formatis tecta. Plantae femineae maiores, pseudoperianthio campanulato, orificio undulato, subplicato vel partim reflexo. *Sporae* 37.5–50.0 μm diametro, ornamentis variis, superficie distali cum reticulo 11 vel 12 areolulis trans diametrum, sed saepe imperfecte reticulata; lamellis tenuibus, interdum subsinuatis, plerumque in nodis prominentibus; superficie proximali cum nota tri-radiata plerumque indistincta vel carenti, cum cristis brevibus irregularibus tenuibus vel pergrossis ramosis. *Elateres* 140–250 \times 7.5–10.0 μm , extremitates versus decrescentes, \pm 5 μm lati, bis vel ter spirales in centro, interdum leviter papilloso.

TYPE.—Northern Cape, 3219 (Wuppertal): 2 km south of Algeria Forest Station, at sandstone rock outcrop, on sandy soil, (–AC), *S.M. Perold* 2359 (PRE, holo.). Western Cape, 3218 (Clanwilliam): 21 km N of Citrusdal, on sandstone rock outcrops above Olifants River, Hex River Estates, (–BD), *S.M. Perold* 2380 (PRE, para.).

Plants in dense mats, fresh apical growth generally entirely green, except for some smaller young leaflets which are often stained throughout with various shades of purple, otherwise only leaf margins and scattered interior cells purple, proximal leaves frequently dying, becoming translucent and crumpled, sometimes only their basal remnants remaining in 2 oblique lines forming a row of disconnected 'Vs' dorsally along stem; shoots simple (Figure 2A) or once/twice furcate, branches sometimes developing from lateral buds; male plants very rare, rather small, up to 3.5 mm long, 0.75 mm high, \pm 1.3 mm wide; female and sterile plants 9–13 mm long, 1.5 mm high, 1.75 mm wide, successive years' growth from apex of old stem, if branched, terminal segments

4–5 mm long, narrowly (Figure 2B) to moderately divergent. *Stems* prostrate, green, but sometimes dorsally pink or purple toward swollen apex, in cross section plano-convex, in male plants (Figure 1M) 280 μm (11 cell rows) high, 500 μm wide, becoming strongly arched and tapering toward base, 250 μm high, 400 μm wide; in female plants apically (Figure 1N) 370 μm (13 cell rows) high, 580 μm wide, basally (Figure 1O) 250 μm high, 320 μm wide. *Rhizoids* at apex of stem sometimes all hyaline, then becoming mixed with purple rhizoids, proximally all rhizoids purple, until next apex, giving rise to new growth, where some are again hyaline, 12.5–20.0 μm wide. *Leaves* in male plants overlapping, spreading, succubously inserted on stem, irregularly shaped, 'ruched' above (Figure 1A–E), 600–1000 \times 650–850 μm , margins with \pm 4 unicellular slime papillae, 20.0–22.5 \times 15.0–17.5 μm , mostly along sides; in female plants leaves (Figure 1F–J) densely overlapping, very frilly (Figure 2C), shape irregular, generally shorter than wide, 575–700(–1625) \times 650–1375(–1875) μm , often lobed above, lobes 250–320 \times 280–450 μm , margins with up to 7 well-spaced papillae. *Leaf cells* not appreciably different in male and female plants, thin-walled, at upper margins subquadrate to rectangular across (Figure 1K), 25–45 \times 27.5–45.0 μm , at lateral margins long-rectangular, 22.5–72.5 \times 20.0–52.5 μm ; upper laminal cells 5- or 6-sided, 35–70 \times 37.5–42.5 μm ; middle laminal cells 50–75 \times 30–45 μm ; basal cells 45.0–87.5 \times 30–45 μm . *Oil bodies* in young leaves (Figure 1L) smooth, round, 7–19 per cell, variable in size, from minute to 2.5 μm diam.; chloroplasts oval or round, 2.5–5.0 μm diam.

Dioicous. *Antheridia* dorsal on stem, in a row, short-stalked, globose, \pm 230 μm diam., mostly soon shed; bracts (Figure 1P–R) remaining, shape irregular, 575–700 \times 650–1375 μm , with up to 3 finger-like processes and 2 or 3 marginal papillae, cells in interior 30.0–37.5 \times 25.0–27.5 μm , basal cells 47.5–60.0 \times 30.0–32.5 μm . *Archegonia* well spaced, in 1 or 2 irregular rows dorsally along stem (Figure 2D), 250–370 μm long, mostly obscured by strongly 'ruched' leaves. *Pseudoperianth* (Figures 1T, U; 2E, F) campanulate, proximal to stem apices, 1375–1625 μm long, projecting \pm 875 μm above leaves, from narrow base widely flaring above, 1950–2575 μm wide across mouth, margin undulating to somewhat plicate or partly reflexed, occasionally with winged outgrowth at side; cells comparable in

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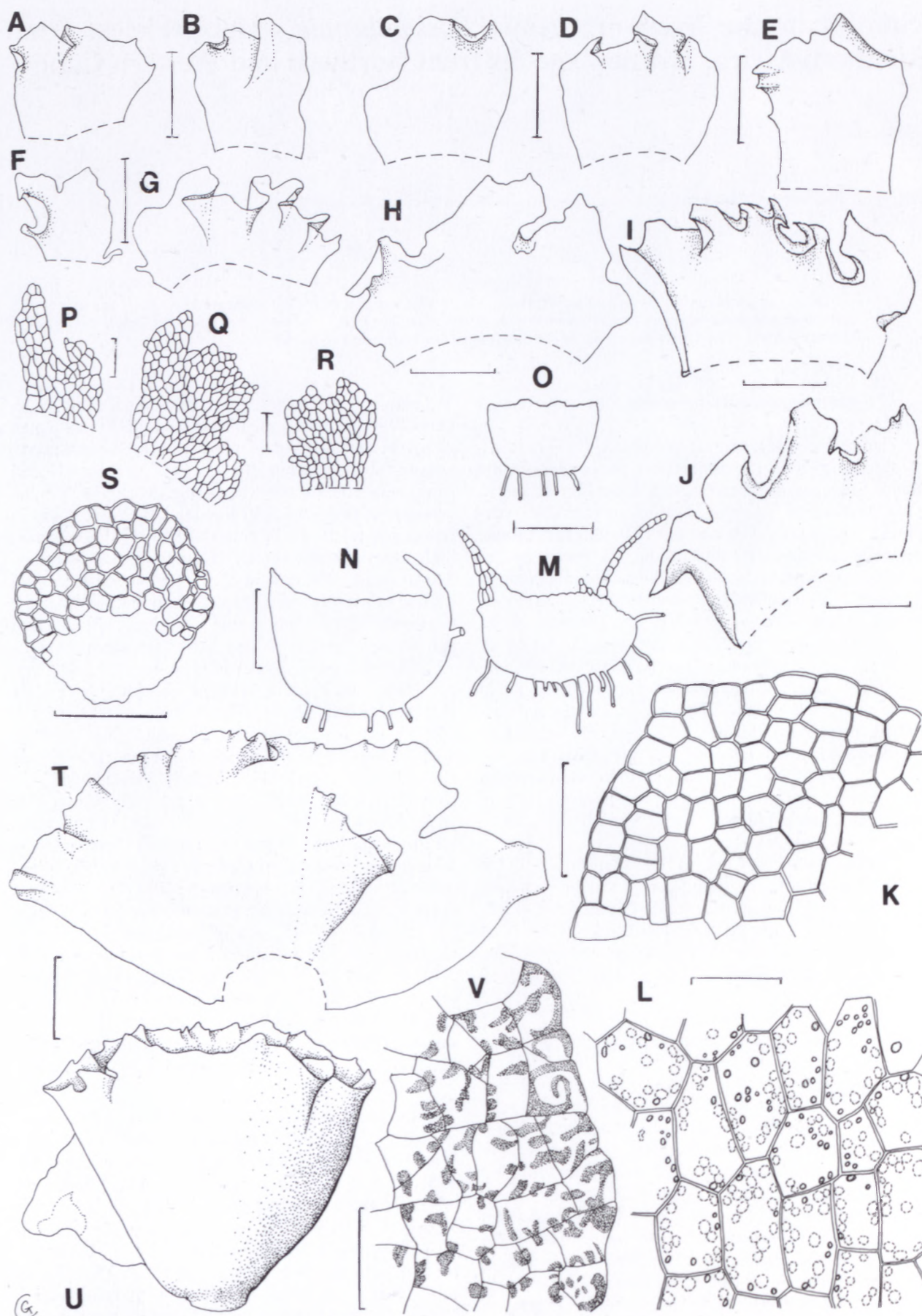


FIGURE 1.—*Fossombronia cederbergensis*. A–E, male leaves; F–J, female leaves; K, detail of upper leaf margin; L, median leaf cells with oil bodies (solid lines) and chloroplasts (dotted lines); M, cross section of apical part of male stem; N, cross section of apical part of female stem; O, cross section of basal part of female stem; P–R, bracts; S, cross section of seta; T, opened pseudoperianth; U, pseudoperianth from side; V, cells in capsule wall. A–E, M, O–R, *S.M. Perold* 2380; F, S–V, *S.M. Perold* 2359; G, *S.M. Perold* 2093; H–J, *S.M. Perold et al.* 3044; K–L, N, *Koekemoer* 1209. Scale bars: A–J, T, U, 500 µm; K, S, 100 µm; L, V, 50 µm; M–R, 250 µm. Artist: G. Condy.

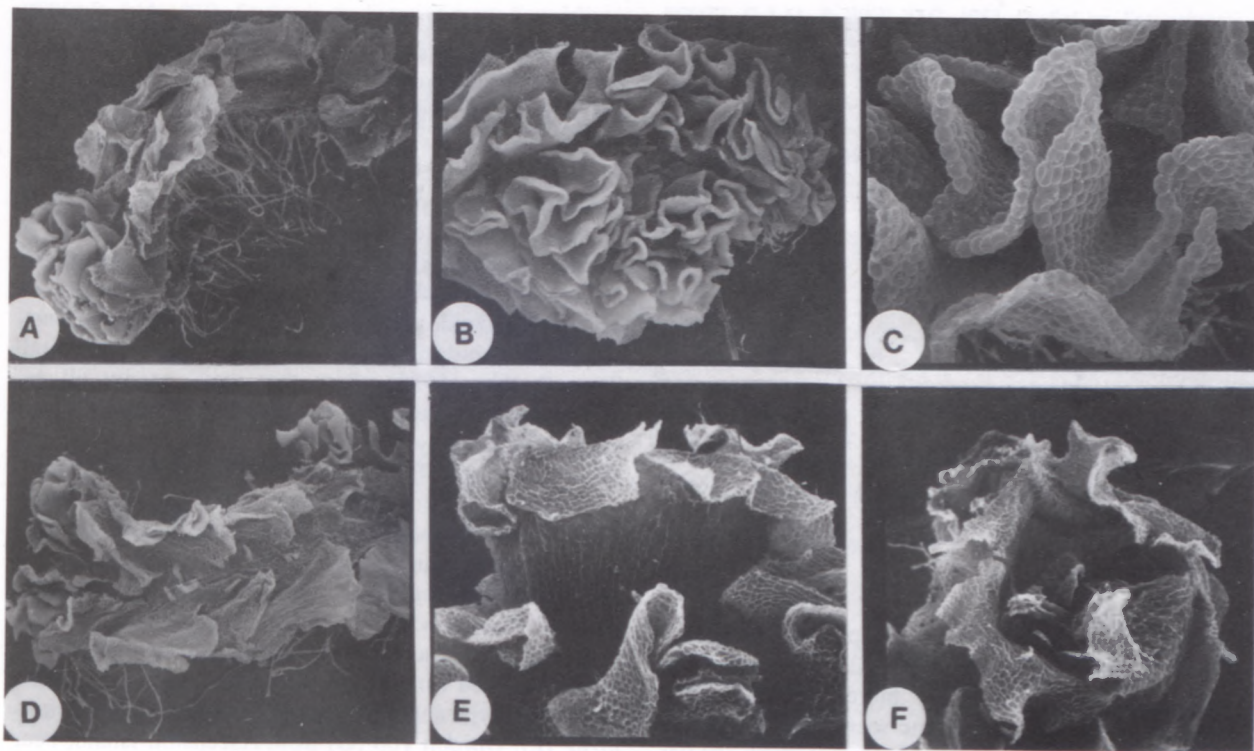


FIGURE 2.—*Fossombronia cederbergensis*. A, arched terminal segment from side, fresh young growth at apex; B, shoot with two narrowly divergent terminal segments; C, very frilly leaves in female plant; D, archegonia in 2 rows on stem, between leaves. E, F, pseudoperianth: E, from side; F, from above. A, D, Koekemoer 1209; B, C, E, F, S.M. Perold 2359. A, $\times 18$; B, $\times 17$; C, $\times 83$; D, $\times 16$; E, $\times 31$; F, $\times 22$.

shape and size to those of leaves, except for rather longer, thin-walled basal cells, $90.0\text{--}137.5 \times 37.5\text{--}47.5 \mu\text{m}$. *Capsules* globose, $\pm 700 \mu\text{m}$ diam., wall bistratose, cells of inner layer polygonal, $25.0\text{--}42.5 \times 25\text{--}35 \mu\text{m}$, each cell wall (Figure 1V) with 1–3 brown nodular and occasionally semi-annular thickenings. *Seta* 1.4–5.5 mm long, $\pm 170 \mu\text{m}$ or 10 cell rows diam. (Figure 1S). *Spores* light to dark brown, hemispherical, $(37.5\text{--})40.0\text{--}47.5$

$(\text{--}50.0) \mu\text{m}$ diam., including spines projecting at periphery (Figure 3D); distal face convex, ornamentation with a mesh of 11 or 12 small, up to $5 \mu\text{m}$ wide, complete areolae (Figure 3C) across diam., but often incompletely reticulate (Figure 3A, B), lamellae thin, sometimes slightly sinuous, mostly raised at the nodes; proximal face with triradiate mark (Figure 3E) generally indistinct or lacking, with short, irregular, fine to very coarse,

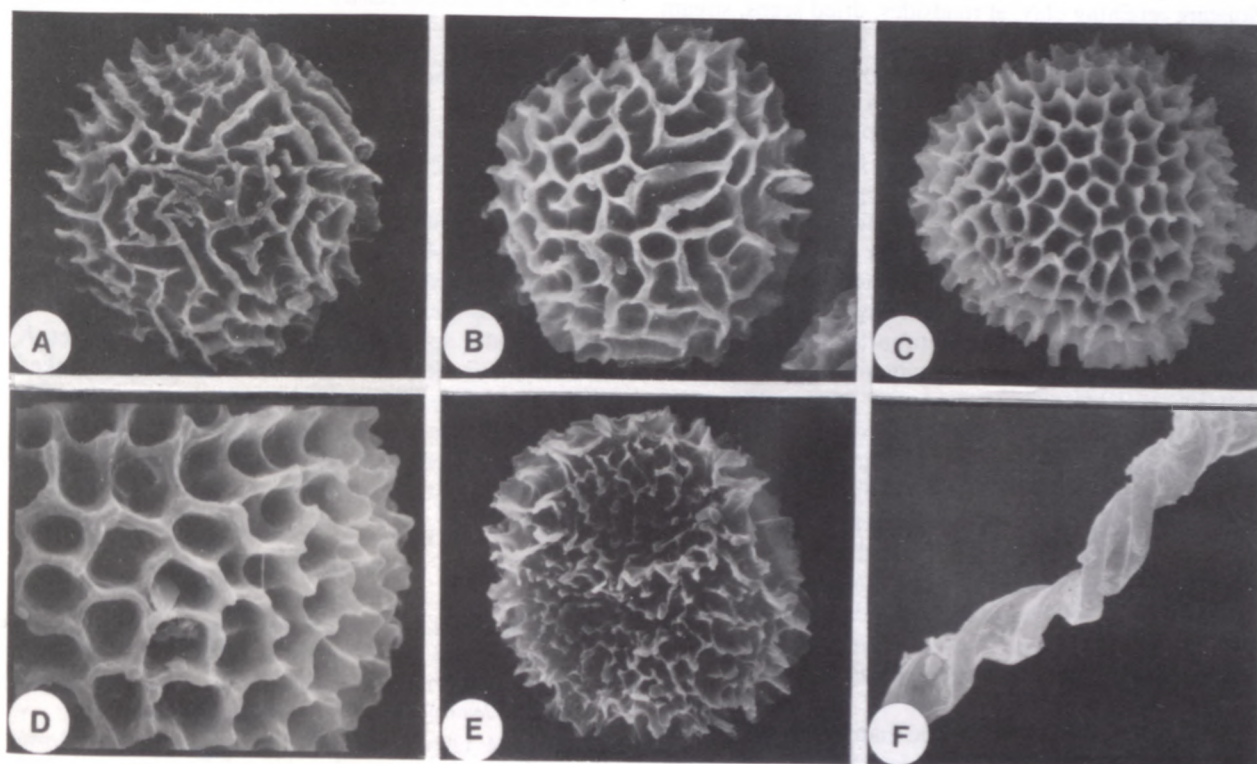


FIGURE 3.—*Fossombronia cederbergensis*. A–E, spores: A–C, distal face; D, detail of areolae on distal face; E, proximal face. F, elater. A, B, E, S.M. Perold 2359; C, D, F, S.M. Perold 2380. A, $\times 771$; B, $\times 990$; C, $\times 693$; D, $\times 1560$; E, $\times 918$; F, $\times 994$.

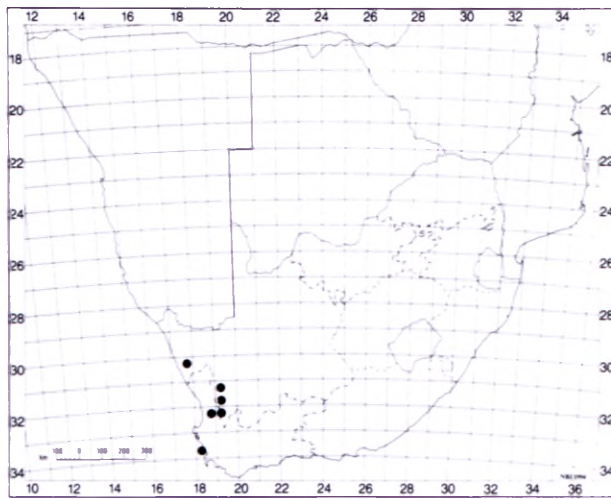


FIGURE 4.—The distribution of *F. cederbergensis* in Northern and Western Cape.

branched ridges, sometimes a few papillae present in between, around spore periphery ± 25 low spines projecting ± 2.5 μm , occasionally more, (but difficult to count their number as only some seen 'end-on'), others with sides of lamellae showing. *Elaters* (Figure 3F) yellow-brown, $140\text{--}250 \times 7.5\text{--}10.0$ μm , tapering to tips, ± 5 μm wide, bi- or sometimes trispiral in centre, occasionally finely papillose.

Fossombronia cederbergensis has been named for the Cederberg, where I first collected it. The species is known from several localities in the winter rainfall areas of Northern and Western Cape (Figure 4), with vegetation types, Northwestern Mountain Renosterveld and Mountain Fynbos (Low & Rebelo 1996). The plants often grow on slightly acid, rather sandy soil overlying sandstone outcrops, but sometimes on fine-grained, moisture retaining clay, at roadsides, dried seeps, stream banks or pond margins. Of the 12 specimens referred here, only three had spores, and they show rather wide variation in the ornamentation, from completely reticulate in *S.M. Perold* 2380 to incompletely reticulate in *S.M. Perold* 2359 and *Powrie* 182. The specimens that lack spores could be identified by vegetative characters. The swollen tuberous apices of the stems help the plants to survive the hot, dry summers. In some plants up to three seasons' growth could be detected. A sample of the specimen *Koekemoer* 1209, quickly resumed growth from the stem apices, nine months after collection, when kept wet in a closed plastic container for a few days.

The species can be distinguished by the 'ruched', lobed leaves, which are mostly wider than long, the tuberous stem apices, the completely or incompletely reticulate spores and by the occasional to frequent presence of some hyaline rhizoids. The tuberous apices of the stems bear some resemblance to those of *F. spinifolia* (Perold 1997b), which has markedly dentate leaves in the male plants, spores with 6 or 7 short irregular ridges, and which is only known from Genadendal.

Scott & Pike (1987) described many new species from Australia, one of which, *F. tessellata*, has spores similarly reticulate to those of *F. cederbergensis*, but they are a deep maroon, rather smaller at $30\text{--}41$ μm diam. and the

elaters are mostly shorter than those of the southern African species; its rhizoids are crimson throughout. *F. vermiculata* with purple and hyaline rhizoids mixed on the same stem was newly described by Scott & Pike (1984) and in the same publication they mention that in *F. scrobiculata* the rhizoids are hyaline on most plants but crimson on some, whereas in *F. punctata* they state that the rhizoids are '(?) always) hyaline, not crimson'. A species recently described from southern Africa, *F. straussiana* (Perold 1997a), always has hyaline or brownish rhizoids and in the European species, *F. husnotii*, the rhizoids are characteristically hyaline, although Scott & Pike (1988) claim that they are not all so. Whether having purple and hyaline rhizoids mixed on the same stem is really of taxonomic significance is not yet known. However, failure to observe the presence of hyaline or pale brown rhizoids 'may cause confusion' (Paton 1973). On some spore similarities, but rather poorly portrayed in their figures, Scott & Pike (1988: figs 13, 14) have placed *F. hamato-hirta* Steph. which has 'radicellis pallidis' (Stephani 1894) in synonymy under *F. wondraczekii* which has purple rhizoids. Perhaps this should be investigated further. The spore micrographs which I took of the type and only known specimen of *F. hamato-hirta*, *H.I. Gordon* 108 (G) from Ascension Island, bear quite a close resemblance to those of *F. straussiana* and as mentioned above, both have hyaline rhizoids. It is, however, not possible to make a definite decision on their synonymy with the available material of *F. hamato-hirta*.

SPECIMENS EXAMINED

Held at PRE, unless otherwise indicated.

Koekemoer 1209.

S.M. Perold 2093, 2197 (with *Riccia villosa* Steph.), 2323, 2359* (holotype), 2364, 2380 (paratype)*, 3336 (with *F. leucoxantha* Lehm.), 3339 (with *F. leucoxantha* Lehm.), 3355 (with *F. leucoxantha* Lehm.), *Perold*, *Koekemoer* & *Smook* 3044, *E. Powrie* 182* (BOL).

* sporulating specimens.

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REFERENCES

- LOW, A.B. & REBELO, A. 1996. *Vegetation of South Africa, Lesotho and Swaziland*. Dept. Environmental Affairs & Tourism, Pretoria.
- PATON, J.A. 1973. Taxonomic studies in the genus *Fossombronia* Raddi. *Journal of Bryology* 7: 243–252.
- PEROLD, S.M. 1997a. Studies in the liverwort genus *Fossombronia* (Metzgeriales) from southern Africa. I. Three new species from Northern Province, Gauteng and Mpumalanga. *Bothalia* 27: 17–27.

- PEROLD, S.M. 1997b. Studies in the liverwort genus *Fossombronina* (Metzgeriales) from southern Africa. 3. An amendment to *F. spinifolia*. *Bothalia* 27: 39–42.
- SCOTT, G.A.M. & PIKE, D.C. 1984. New species of *Fossombronina* from Australia. *Journal of the Hattori Botanical Laboratory* 56: 339–349.
- SCOTT, G.A.M. & PIKE, D.C. 1987. Studies on *Fossombronina* in Australia II. Fourteen more new species. *Journal of the Hattori Botanical Laboratory* 62: 367–386.
- SCOTT, G.A.M. & PIKE, D.C. 1988. Revisionary notes on *Fossombronina*. *The Bryologist* 91: 193–201.
- STEPHANI, F. 1894. Hepaticarum species novae. V. *Hedwigia* 33: 1–11.