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Studies in the liverwort genus *Fossombronia* (Metzgeriales) from southern Africa. 3. An amendment to *F. spinifolia*

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ABSTRACT

Fossombronia spinifolia was described by Stephani (1900) from a specimen collected by Breutel at Genadendal (Gnadenthal) during his visit to the Cape, which lasted from November 1853 to April 1854 (Gunn & Codd 1981). This species was not adequately described and illustrated by Stephani or by subsequent workers. Moreover, Scott & Pike (1987) misapplied the epithet, *F. spinifolia*, to specimens Arnell had identified as *F. leucoxantha*, because they (Scott & Pike 1988) overlooked a capsule with ripe spores in the type specimen. An attempt is hereby made to describe and illustrate this species in greater detail in order to prevent more confusion in future.

Fossombronia spinifolia *Steph.* in Species hepaticarum 1: 389 (1900); Sim: 36 (1926); S.W.Arnell: 84 (1963). Type: Africa Australis, Gnadenthal, leg. *Breutel s.n. G 22186*, ex herb. K. Müller Halensis (holo.!).

Plants in dense, overlying mats, green to dark green, leaf margins occasionally yellowed or those of proximal ones tinged with red to purple, rather small and slender; shoots mostly simple, 3.0–7.0 mm long, 1.0–1.2 mm high, 1.7–2.5 mm wide, generally arising from fleshy, tuberous apices (Figure 2A) and laterally from sides of older, mostly leafless stems of various length (Figure 2B), that taper proximally to thin, narrow bases. *Stems* bearing leaves prostrate, these in turn tapering distally, mostly plano-convex in cross section, in male plants at apex (Figure 1M) ± 170 µm (10 cell rows) high, ± 210 µm wide, at base (Figure 1N) 230–240 µm (10 cell rows) high, ± 250 µm wide; in female plants at apex (Figure 1O) 230–240 µm (12 cell rows) high, up to 380 µm wide, at base (Figure 1P) ± 360 µm (14 cell rows) high, ± 500 µm wide. *Rhizoids* purple, 12.5–22.5 µm wide, absent from shoot apices. *Leaves* in male plants (Figure 1A–E) closely spaced, but rarely overlapping, spreading, succubously inserted on stem, oblong to irregularly shaped, 700–1175 × 500–1500 µm, sometimes narrower below, upper margin mostly markedly dentate, with up to 10 teeth, these occasionally expanded into 1 or 2 triangular lobes; in female plants, leaves (Figure 1F–J) spreading to suberect, overlapping (Figure 2E), frequently 'ruched' above, very obliquely succubously inserted, leaving stem exposed, shape irregular, as long as wide, 875–1000 × 800–1075 µm, but sometimes shorter than wide, 1050–1200 × 1300–1625 µm, upper margin (Figure 1K) dentate but often less pronouncedly so than in male leaves, more often with triangular lobes. *Leaf cells* not appreciably different in male and female plants, thin-walled, at margins subquadrate to rectangular across, 20.0–35.0 × 32.5–57.5 µm, in male plants teeth 112.5–270.0 µm long, composed of an apical slime papilla, ± 12.5 × 12.5 µm, followed below by 1–3 single, long-rectangular cells arranged end to end, 27.5–50.0 × 17.5–40.0 µm, gradually broadening to base, usually with 2 or 3 (occasionally more) cells alongside each other, margins in female plants with up to 12 well-spaced papillae, at lower lateral margins cells long-rectangular, 42.5–50.0 × 17.5–25.0 µm, upper laminal cells 5- or 6-sided, 30.0–37.5 × 32.5–40.0 µm, middle laminal cells 47.5–52.5 × 32.5–37.5 µm, basal cells 50.0–62.5 × 40.0–50.0 µm. *Oil bodies* absent from most cells; chloroplasts clumped together along cell walls, ± 5 µm in diameter (Figure 1L).

Dioicous. *Antheridia* dorsal on stem (Figure 2C, D), in a row, short-stalked, globose, ± 280 µm in diameter, each shielded by a perigonial bract (Figure 1Q–T), 300–450 × 200–400 µm, margins with 1 or 2 (3) teeth and 2–5 papillae, cells in interior 5- or 6-sided, 52.5–75.0 × 27.5–37.5 µm. *Archegonia* in a well-spaced row along stem (Figure 2F), ± 280 µm long. *Pseudoperianth* (Figure 1U, V) turbinate, near stem apex, mostly projecting somewhat above leaves, from narrow base flaring widely above, ± 1625 µm long, 1500 µm wide across mouth, margin with several very long teeth, 7–12 cells or up to 385 µm long, consisting of an apical papilla followed below by 4 single, long-rectangular cells, arranged end-to-end and then basally by 3–5 cells in pairs, the rest of the cells comparable in shape and size to those of leaves. *Capsule* globose, diameter could not be measured as it was no longer intact, wall bistratose, cells in inner layer (Figure 1W) irregularly shaped, 35.0–42.5 × 20.0–30.0 µm, each cell wall with 1 or 2 yellow or brown nodular and sometimes semi-annular thickenings. *Seta* 1.4–3.5 mm long, ± 100 µm in diameter. *Spores* yellow-brown, hemispherical, 36.0–45.0 µm in diameter, including spines projecting around periphery; distal face convex, with 6 or 7 short irregular ridges ± 5 µm apart and sometimes branched (Figure 3B, C), sides of ridges and surface between them with fine cross striations and granules (Figure 3D), papillae occasionally interspersed in between (Figure 3A); proximal face (Figure 3E) lacking triradiate mark, flat to slightly concave, covered with numerous irregular papillae, around spore periphery up to 25 projecting, 'spines', some conical, others truncate. *Elaters* (Figure 3F) light brown, 105.0–150.0 × 7.5 µm, tapering to looped tips, 3–5 µm wide, some completely bispiral, others partly bi- and trispiral.

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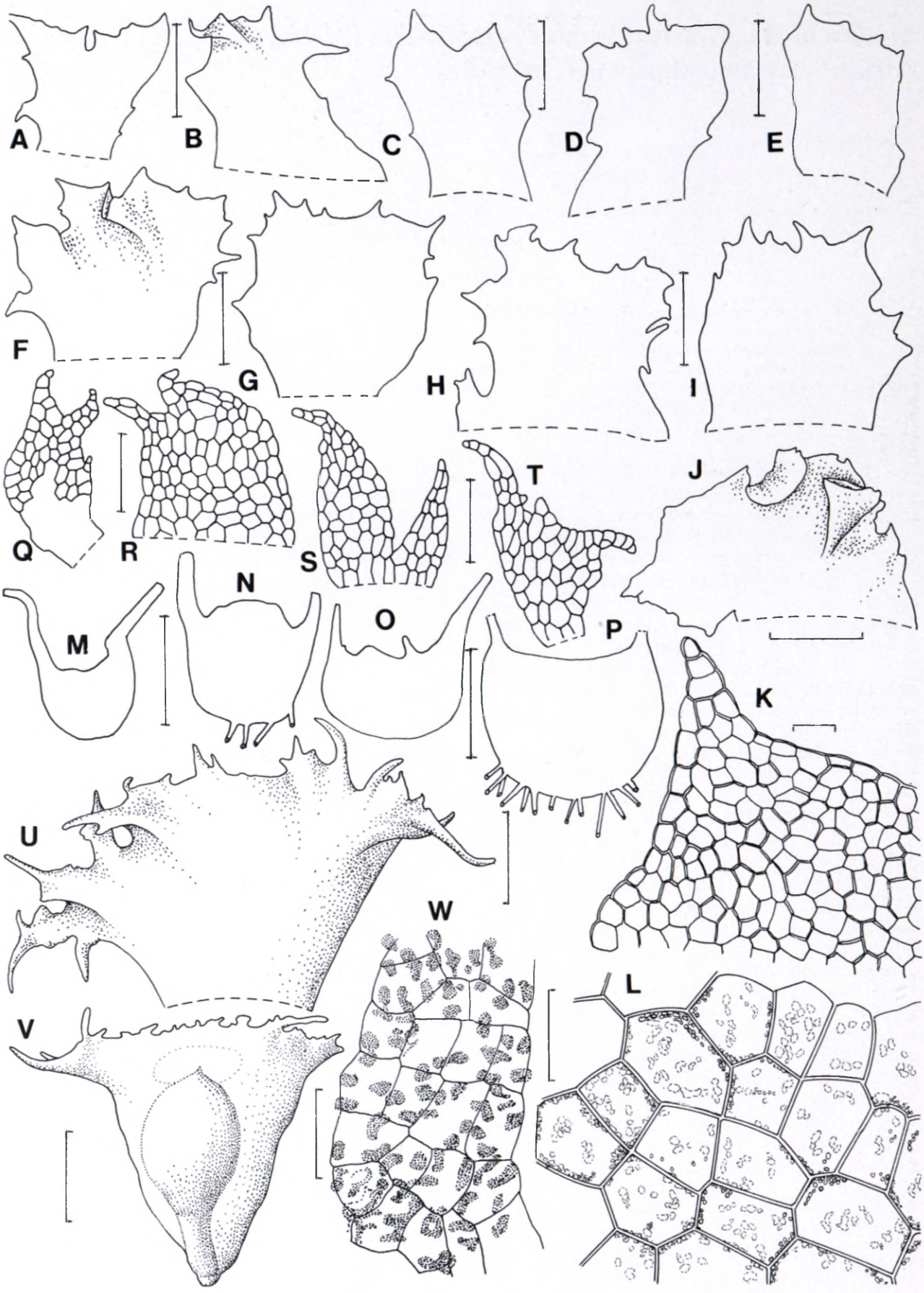

FIGURE 1.—*Fossombronia spinifolia*. A–E, male leaves; F–J, female leaves; K, detail of leaf margin of female leaf; L, median leaf cells with remains of oil bodies (solid lines) and chloroplasts (dotted lines); M, cross section of male stem apex; N, cross section of male stem base; O, cross section of female stem apex; P, cross section of female stem base; Q–T, bracts; U, opened pseudoperianth; V, pseudoperianth from side; W, cells in capsule wall. A, F–I, U–W, *Breutel s.n. G 22186*; B–E, J–T, *Breutel s.n.* (W). Scale bars: A–J, U, V, 500 µm; M–T, 250 µm; K, L, W, 50 µm.

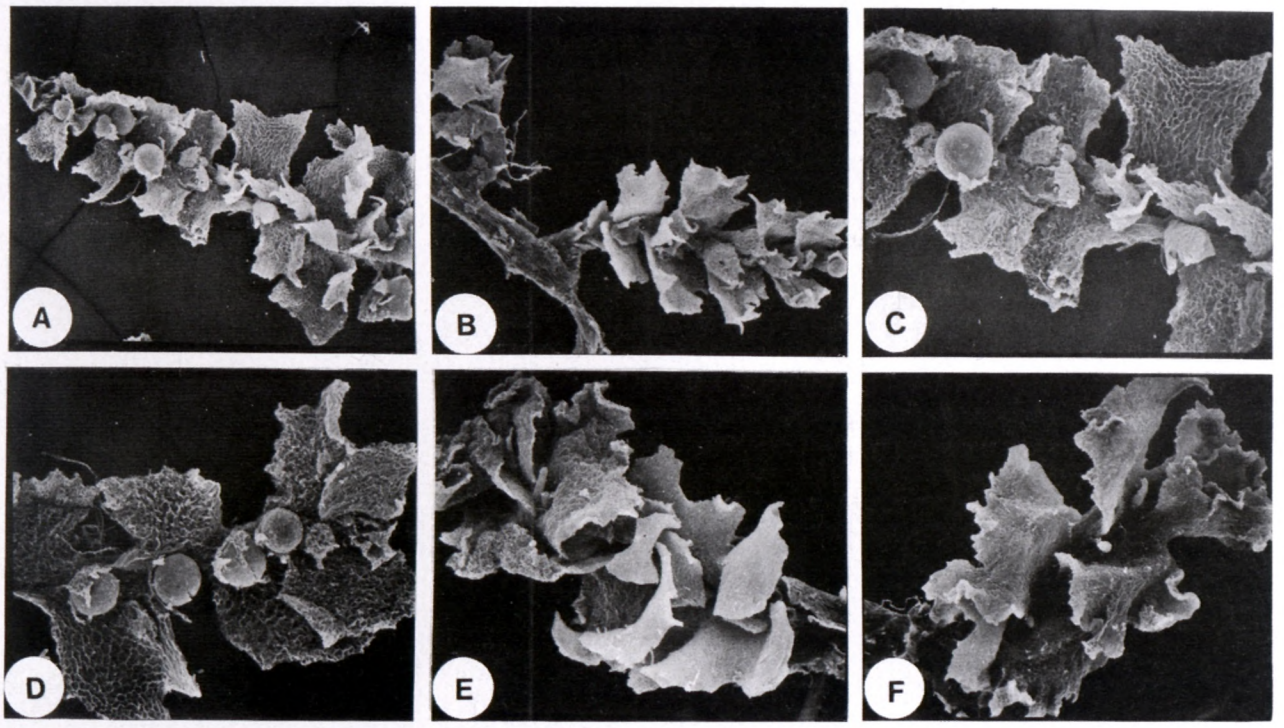

FIGURE 2.—*Fossombronia spinifolia*. A, male branch which arose from apex of older stem; B, two branches arising from side of older, mostly leafless stem; C, D, close view of antheridia and bracts; E, F, larger female branches with suberect, overlapping leaves and archegonia along stem. A–F, *Breutel s.n.* (W). A, × 13.5; B, × 15.4; C, D, × 24.3; E, × 18.2; F, × 14.5.

Fossombronia spinifolia is known only from Genadendal, in Western Cape (Figure 4), where it was collected by Breutel, probably in November or early December 1853, at the start of his visit to the Cape, which included various halts along the way, ending at Hankey in the Eastern Cape (Gunn & Codd 1981). The holotype specimen, *Breutel s.n. G 22186*, consists of a few fragments, which were originally housed in Müller's herbarium and upon his death in 1899, were acquired by Stephani. The packet in G contains Stephani's well-preserved preparations of several leaves, leaved branches and pseudoperianths, which I measured and photographed. The *Icones No. 003053* (Stephani 1985) illustrate, however, only a single dentate leaf, a spore with numerous spines around the circumference and an elater. One of the fragments of the type specimen contains a single antheridium, 2 fragments have immature capsules and another consists of a branch with a pseudoperianth containing a broken capsule with

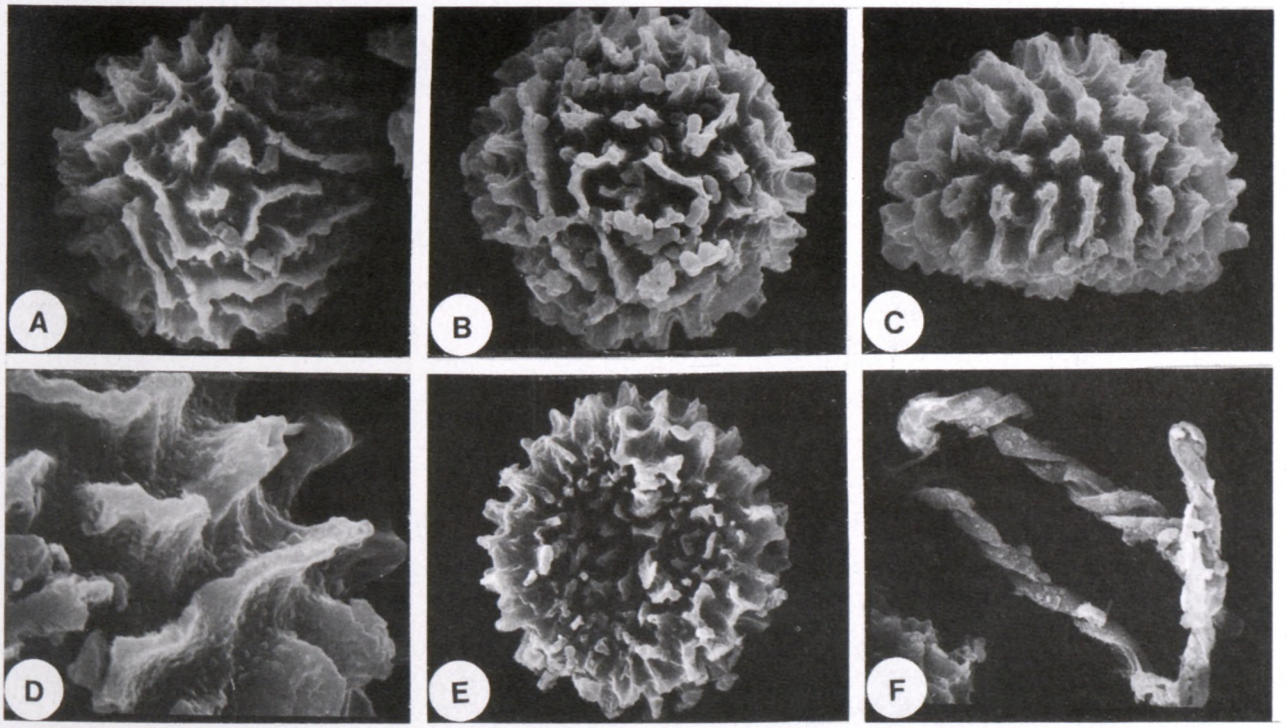

FIGURE 3.—*Fossombronia spinifolia*. Spores. A, B, distal face; C, side view of distal face; D, detail of lamellae at margin of distal face; E, proximal face; F, elaters. A–F, *Breutel s.n. G 22186*. A, × 870; B, × 987; C, × 940; D, × 2434; E, × 856; F, × 866.

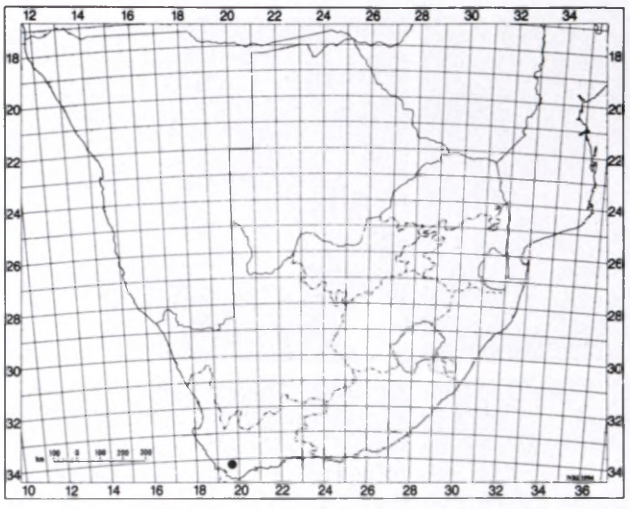

FIGURE 4.—Distribution of *F. spinifolia* in southern Africa.

mature spores. The spores were overlooked by Scott & Pike (1988) and they (Scott & Pike 1987) had previously misapplied the epithet *F. spinifolia* to specimens Arnell had identified as *F. leucoxantha* (Perold 1997 in press). Sim (1926) reports *F. spinifolia* from Jonker's Hoek, Stellenbosch, Genadendal and other southwestern localities. The Jonker's Hoek specimen has not been seen, but the two Stellenbosch specimens, *H.A. Wager 34* (*CH1650*) and *Duthie 3* (*CH1651*), are held at PRE. They have, however, been misidentified. Another *Breutel s.n.* specimen from Genadendal is on loan to PRE from W. It had been determined as *F. pusilla*, but there is no doubt that it is *F. spinifolia*, although unfortunately it lacks pseudoperianths and spores. The specimen is mixed with a fragment of another *Fossombronia* species; it has pseudoperianths with a few low spines at the margin and spores unlike those of *F. spinifolia*. The material of *F. spinifolia* from W comprises numerous specimens, but the leaf cells are rather less well preserved than those in Stephani's preparations. There are several male plants with mature antheridia and a few female plants with archegonia only. Preparations from this specimen were also measured and photographed by LM as well as SEM.

In an attempt to collect fresh material of *F. spinifolia*, I paid a brief visit to Genadendal in October 1995, but failed to find any. The streambanks, which are the most likely site where the species would be found (the exact locality was not stated on the label), are much disturbed and there has also been considerable infestation by alien plants.

SPECIMENS EXAMINED

Breutel s.n. G22186 (holo.!) ex herb. K. Müller Halensis; *W s.n.*

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