

# Studies in the liverwort genus *Fossombronina* (Metzgeriales) from southern Africa. 7. *F. capensis* var. *spiralis*, a new variety from Western Cape

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**Keywords:** *Fossombronina* Raddi, *F. capensis* var. *capensis*, *F. capensis* var. *spiralis*, Hepaticae, Metzgeriales, southern Africa, Western Cape

## ABSTRACT

*Fossombronina capensis* S.W.Arnell var. ***spiralis*** Perold, var. nov. from Western Cape is described. It is distinguished from the typical variety by a suite of characters, the most obvious being the strong spirals in the elaters. In *F. capensis* var. *capensis* the spirals are weak except for two Arnell collections in which they are quite strong. Subtle differences in spore ornamentation are then, perhaps, the most definitive character to separate the two varieties.

## INTRODUCTION

Perold (1997) in an amendment to *F. capensis* S.W.Arnell, made the following statement: 'All *F. capensis* specimens from the George/Knysna/Brackenfell/Gouna and Deep Walls Forest and Diep River areas have poorly formed elaters. Collections from the nearby Bloukrans Pass (*Lübenau-Nestlé SA 139/2* and *S.M. Perold 3534, 3539–3541*) have elaters with well-formed spirals, but have been referred here because the spores and plants are closely similar'.

I have since come to the conclusion that the collections from Bloukrans Pass and others like it from elsewhere, should rather be separated as a variety of *F. capensis*.

***Fossombronina capensis* S.W.Arnell var. *spiralis* Perold, var. nov.**

Plantae masculae minores plantis feminis, ut in varietate typica, sed bractae perigoniales antheridia tegentes longius dispersae. *Sporae* 37.5–55.0 µm diametro, superficie distali lamellis 6 ad 8 irregulariter ramosis, interdum debiliter effectis; superficie inter lamellas valde aspera, granulosa vel transverse grosse striata. *Elateres* semper bene evoluti, 75.0–157.5 × 7.5–10.0 µm, omnino bis vel ter spirales, saepe partim bis et partim ter spirales.

**TYPE.**—Western Cape, 3118 (Vanrhynsdorp): Matsikama Mountains, Bo-Drift Farm, at Olyfenhoutsrivier, (–DD), under rocks on island in stream near bridge, *S.M. Perold 3905* (PRE, holo.).

Plants in crowded stands, green; shoots medium-sized in male plants, up to 10 mm long, 1.4–2.2 mm high, 2.8–3.5 mm wide; female plants rather larger, 10–15 mm long, 2.0–2.5 mm high, 3.3–4.5 mm wide, simple or once/twice furcate, segments moderately to widely divergent, apically 2–7 mm long. *Stems* prostrate, slightly or not tapering proximally, dorsally chlorophyllose, ventrally usually

purple, plano-convex in cross section, in male plants apically (Figure 1O) up to 450 µm (10 cell rows) high, 500 µm wide, basally (Figure 1P) 310–350 × 500–550 µm; in female plants (Figure 1M) apically ± 500 µm (10–12 cell rows) high, 650 µm wide, basally (Figure 1N) ± 450 × 600 µm. *Rhizoids* purple, 12.5–20.0 µm wide. *Leaves* overlapping, widely spreading, succubously inserted (Figure 2A, C), smaller apically but soon enlarging, oblong to obovate, sometimes slightly notched above, lobes equal in size or not in male plants (Figure 1A–E), 1300–2125 × 1100–1925 µm, when sides not parallel narrower below, 1000–1300 µm wide; in female plants (Figure 1F–J) mostly larger, 1550–2750 × 1550–2575 µm, below 1075–1750 µm; margins (Figure 1K) generally almost entire, papillae if present, few, only 1 or 2. *Leaf cells* thin-walled, in male and female plants quite similar, at upper margins subquadrate to rectangular across, 20.0–42.5 × 27.5–40.0 (–57.5) µm, at lateral margins long-rectangular, 65–75 × 20.0–37.5 µm; upper laminal cells 5- or 6-sided, 35–50 × 40.0–47.5 µm; middle laminal cells 50–85 × 37.5–62.5 µm; basal cells 62.5–82.5 × 42.5–50.0 µm. *Oil bodies* (Figure 1L) 7–12 per cell, spherical to ovoid, up to 5 µm diam., glistening, homogeneous; chloroplasts numerous, ± 5 µm diam.

Dioicous. *Antheridia* dorsal on stem, in 1 or 2 rows (Figure 2A, B), short-stalked, globose or ovoid, 220–250 µm diam., each shielded by a perigonial bract (Figure 1Q–T), irregular in shape, 370–450 × 200–300 µm, sometimes 2 adjacent ones joined together, margins mostly without papillae, cells in interior 4- or 5-sided, 50–75 × 27.5–37.5 µm. *Archegonia* in 1 or 2 rows (Figure 2C, D) along stem, naked; sometimes 2 in acropetal sequence or 2 adjacent (Figure 2E) on a branch becoming fertilised. *Pseudoperianth* (Figures 1U, V; 2F) near apex to rather more proximal, campanulate, projecting up to 800 µm above leaves, raised on a short stalk, then widely flaring above, 1625–2250 µm long, 2000–3125 µm wide across mouth, margin undulating or sometimes sparsely and shallowly lobed, very rarely with some angular projections, occasional vertically split along side, lateral outgrowths quite common; cells at margin and immediately below comparable in shape and size to those of leaves, but larger at ± midlength, 100–165 × 32.5–50.0 µm, and at base, 175–195 × 75–80 µm. *Cap-*

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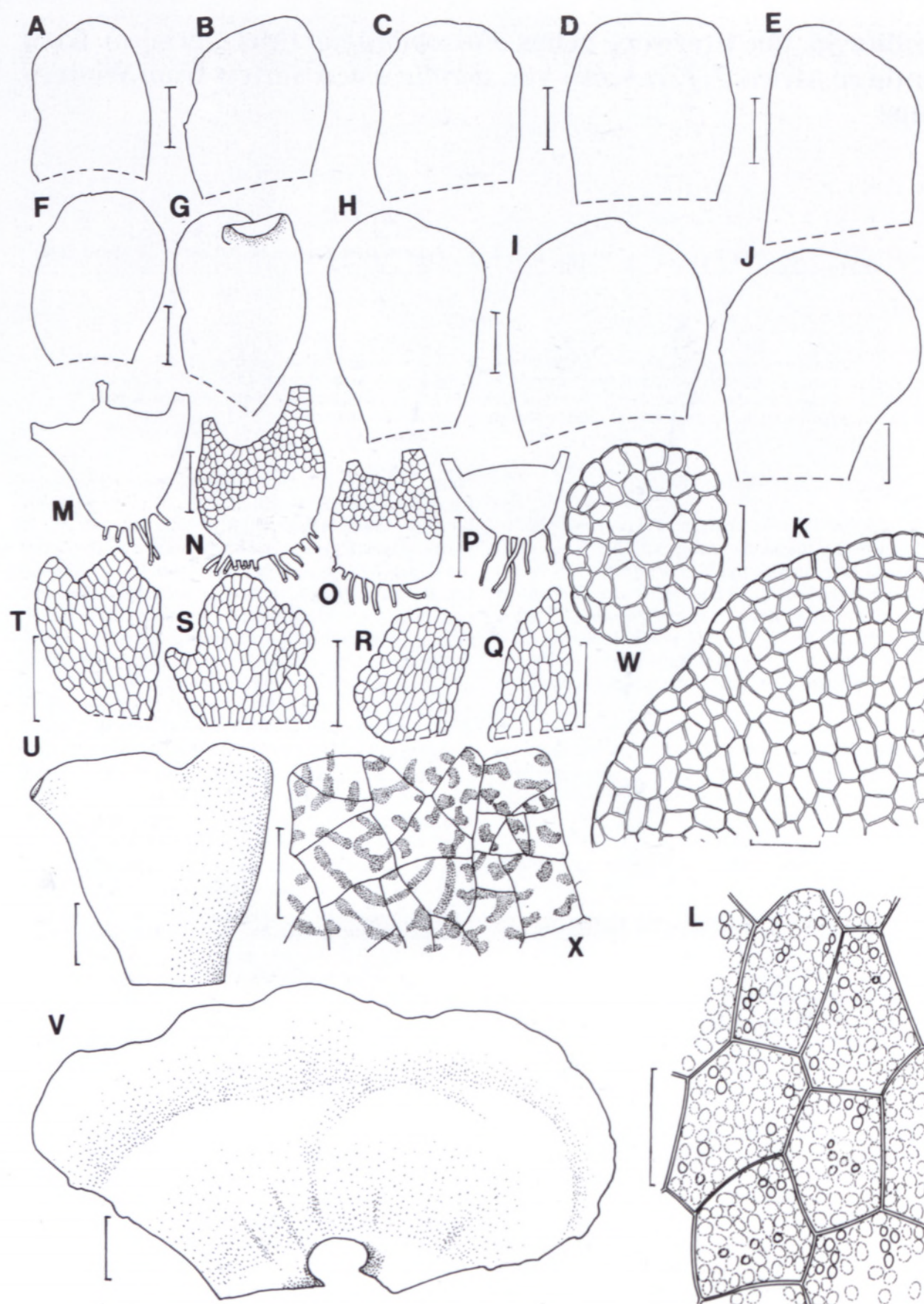


FIGURE 1.—*Fossombronina capensis* var. *spiralis*. A–E, male leaves; F–J, female leaves; K, detail of upper leaf margin; L, median leaf cells with oil bodies (solid lines) and chloroplasts (dotted lines); M, c/s apical part of female stem; N, c/s basal part of female stem; O, c/s apical part of male stem; P, c/s basal part of male stem; Q–T, perigonal bracts; U, pseudoperianth from side; V, opened pseudoperianth; W, c/s seta; X, cells in capsule wall. A–K, M–X, *S.M. Perold* 3905; L, *S.M. Perold* 3899. Scale bars: A–J, U, V, 500 µm; K, W, 100 µm; L, X, 50 µm; M–P, Q–T, 250 µm.



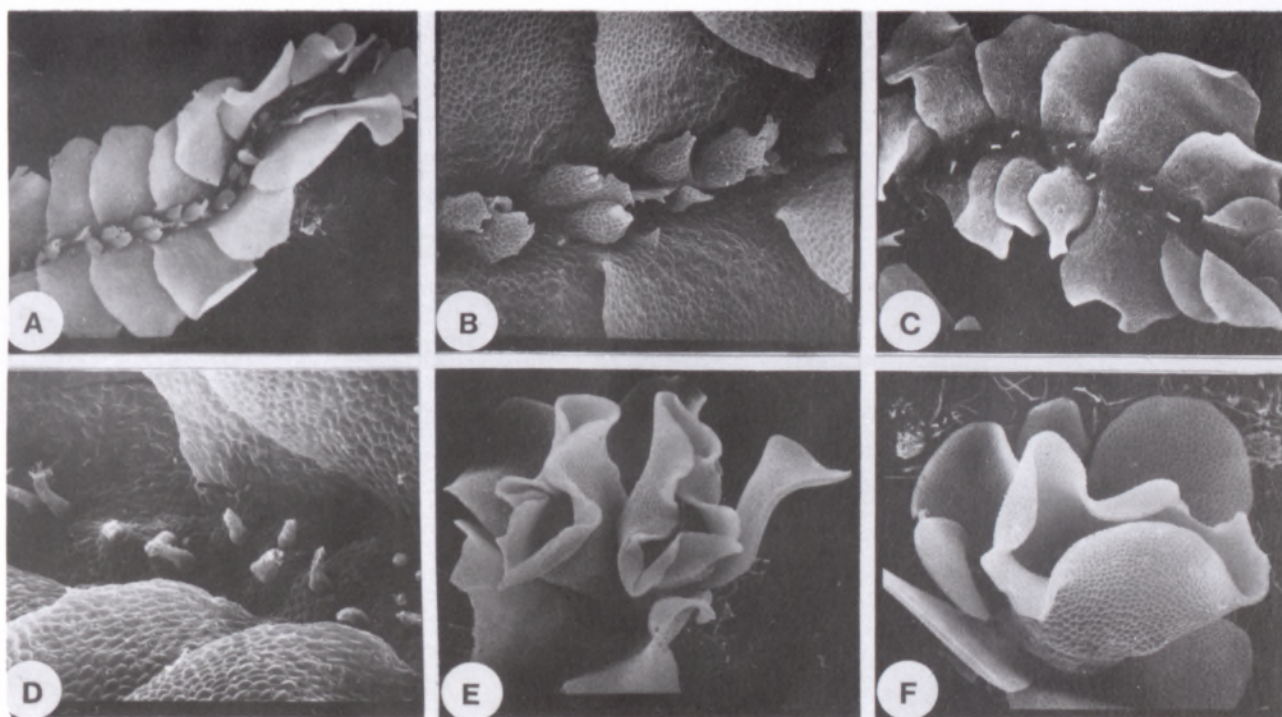


FIGURE 2.—*Fossombronia capensis* var. *spiralis*. A, male branch with perigonal bracts; B, close-up of bracts; C, female branch with archegonia; D, close-up of archegonia; E, 2 pseudoperianths alongside each other, F, single pseudoperianth. A, B, *S.M. Perold* 3980; C, *S.M. Perold* 3394; D, *S.M. Perold* 3539; E, F, *S.M. Perold* 3905. A,  $\times 8.3$ ; B,  $\times 25$ ; C,  $\times 9$ ; D,  $\times 36$ ; E,  $\times 13.8$ ; F,  $\times 21$ .

*sules* globose,  $\pm 850 \mu\text{m}$  diam., wall bistratose, cells in inner layer irregularly shaped, some trapezoidal, others triangular or rectangular (Figure 1X),  $35.0\text{--}42.5 \times 17.5\text{--}37.5 \mu\text{m}$ , each cell wall with (1)2 or 3 dark brown, nodular and occasionally semi-annular thickenings. *Seta*  $2.9\text{--}4.0 \text{ mm}$  long,  $290\text{--}300 \times 240 \mu\text{m}$  in transverse section, 5 or 6 cells across (Figure 1W). *Spores* golden brown to darker brown, hemispherical,  $37.5\text{--}55.0 \mu\text{m}$  diam., including lamellae projecting at margin; distal

face (Figure 3A–D) convex, with 6–8 irregularly branching and sometimes poorly developed lamellae,  $\pm 5 \mu\text{m}$  high and  $5\text{--}10 \mu\text{m}$  apart running across face, a few parallel to each other, others in different directions, occasionally anastomosing and forming some complete or incomplete areolae, rarely with a central tubercle, surface between lamellae highly uneven, granular or mostly coarsely striated; proximal face (Figure 3E) lacking tri-radiate mark, flat, covered with irregularly shaped papil-

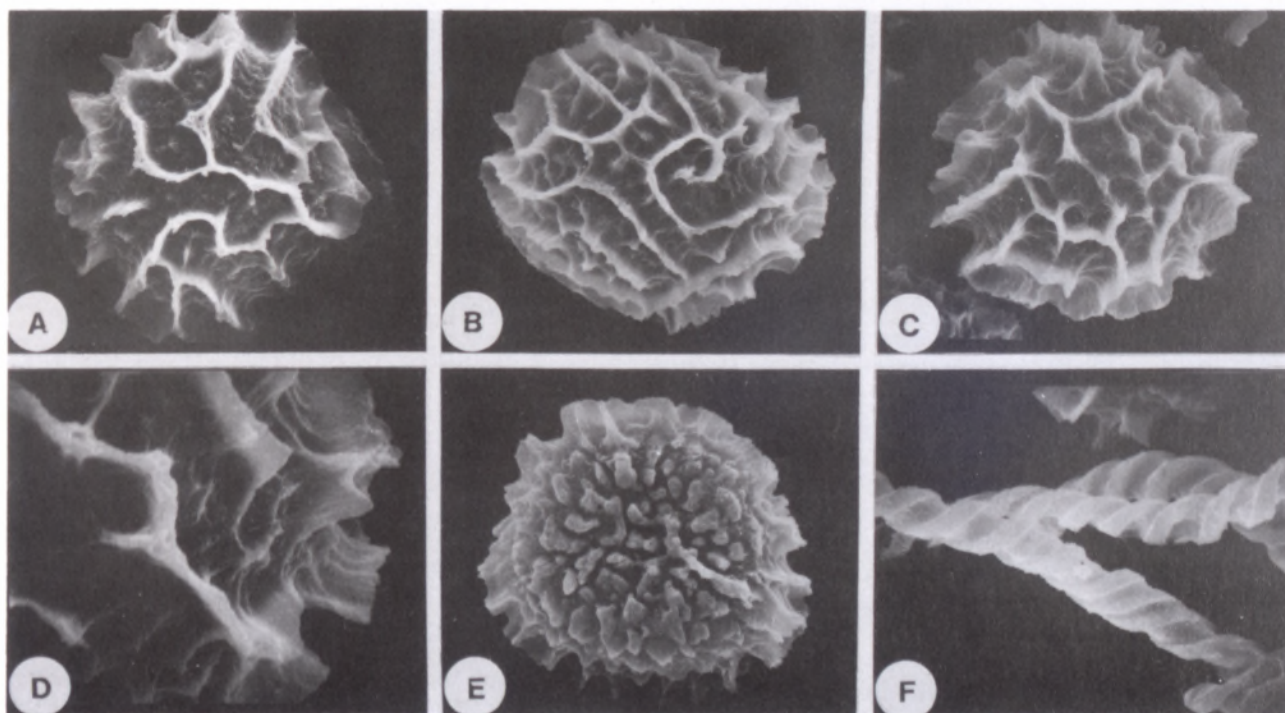


FIGURE 3.—*Fossombronia capensis* var. *spiralis*. Spores and elaters. A–C, distal face; D, distal surface and lamellae near margin; E, proximal face; F, elaters. A, *S.M. Perold* 3541; B, E, *S.M. Perold* 3905; C, D, F, *S.M. Perold* 3814. A,  $\times 835$ ; B,  $\times 867$ ; C,  $\times 789$ ; D,  $\times 1560$ ; E,  $\times 863$ ; F,  $\times 748$ .



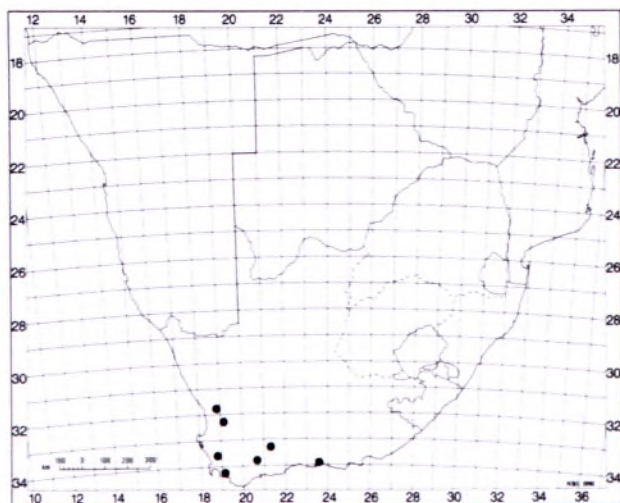


FIGURE 4.—The distribution of *Fossombronia capensis* var. *spiralis*.

lae and fine granules in between as well as marginally, up to 20 'spines' projecting around spore periphery, few of them joined by sections of incomplete wing. *Elaters* (Figure 3F) yellow,  $75.0\text{--}157.5 \times 7.5\text{--}10.0\text{ }\mu\text{m}$ , tapering to the tips or not, smooth, entirely 2-spiral or 3-spiral, often partly 2-spiral and partly 3-spiral, rarely branched.

*Fossombronia capensis* var. *spiralis* is restricted to the winter rainfall area of South Africa, namely Western Cape (Figure 4). This is referred to as the Fynbos Biome—sclerophyllous, microphyllous vascular plant vegetation—(Cowling *et al.* 1997; Rutherford 1997) or else the area is called the Cape Region—phytogeographic region based on the distribution of vascular plants—(Cowling & Hilton-Taylor 1997). The plants under discussion grow on soil at streambanks, on damp vertical earth walls at roadsides or pathways, near waterfalls, at seepages or at grotto entrances and are apparently more widespread than the typical variety, which has now, for the first time, also been collected at Kirstenbosch (Perold 3955), besides the localities in the southern Cape previously reported (Perold 1997). The new variety is distinguished by: the fairly large, mostly entire leaves; the slightly smaller male plants bearing 1 or 2 rows of perigonal bracts which are less crowded than those in var. *capensis*; the generally undulating margin of the pseudoperianths; the cells in the capsule wall with more numerous semi-annular bands; the spore surface on the distal face with very uneven and rough, often rather poorly developed lamellae; and the elaters with well-formed, strong spirals. The latter character (with rare exceptions) is the most obvious in separating the two varieties and the choice of epithet, '*spiralis*', for this new variety draws attention to this feature. However, the SEM micrograph of the elaters from *F. capensis* var. *capensis*, Arnell 1477 (G) in Perold (1997: fig. 3F), shows rather stronger spirals than are usually encountered in the typical variety, but the spirals appear mostly quite pale and poorly stained, when examined under a compound microscope. Two Arnell specimens, 1715 and 1716, collected in the Gouna Forest and listed in the above publication, but not singled out, have quite strong, well-stained spirals, although the spore ornamentation, probably still the most definitive character, is clearly that of *F. capensis* var. *capensis*. A suite of characters must necessarily be employed for a reliable separation of the two varieties of *F. capensis*.

### Key to the varieties of *F. capensis*

- 1a Male plants bearing large, very crowded perigonal bracts shielding antheridia; leaves with up to 6 scattered papillae at margins and 17–37 oil bodies per median cell; inner capsule wall with few cells (only  $\pm 2$  per field) having semi-annular thickening bands; distal spore face with well-formed lamellae, surface between them with fine cross striations or relatively smooth and appearing to be cleanly 'scooped out'; perispore at spore periphery mostly intact; elaters almost always poorly formed,  $(40.0\text{--})62.5\text{--}125.0\text{ }\mu\text{m}$  long, spiral bands pale when viewed under compound microscope, outer wall collapsing on drying ..... *F. capensis* var. *capensis*
- 1b Male plants bearing fairly large, somewhat spaced perigonal bracts shielding antheridia; leaves generally with few (1 or 2) or no papillae at margins and with 7–12 oil bodies per median cell; inner capsule wall with  $\pm$  half the cells per field having semi-annular thickening bands; distal spore face frequently with poorly developed lamellae, surface between them highly uneven and often coarsely striated; perispore at spore periphery absent or very incomplete; elaters always well-formed,  $(50.0\text{--})75.0\text{--}157.5\text{ }\mu\text{m}$  long with strongly developed spiral bands ..... *F. capensis* var. *spiralis*

### SPECIMENS EXAMINED

#### *F. capensis* var. *spiralis*

Held at PRE, unless otherwise indicated.

Louwrens CH2881, CH2882. Lübenau-Nestlé SA139/2 (private. herb.).

S.M. Perold 2746 pp., 3394, 3407, 3534, 3539–3541, 3814, 3816(b), 3817, 3830, 3858, 3877 (sterile), 3899, 3905 (holotype), 3979, 3980.

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