

Studies in the liverwort genus *Fossombronia* (Metzgeriales) from southern Africa. 2. An amendment to three species from Western Cape, described by S.W. Arnell

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ABSTRACT

Subsequent to his visit to South Africa in 1951, S.W. Arnell (1952), described three new *Fossombronia* species from Western Cape, namely *F. capensis*, *F. densilamellata* and *F. montaguensis*. Unfortunately, however, they were not described in detail, nor were they fully illustrated. An attempt is hereby made to augment Arnell's descriptions and to illustrate his species more completely, with the aid of drawings and SEM micrographs. A distribution map is also provided. Scott & Pike (1988), after examining many *Fossombronia* specimens of world-wide origin, concluded that the above three species were good species, a conclusion I support.

1. *Fossombronia capensis* S.W. Arnell in Botaniska Notiser 3: 314 (1952); S.W. Arnell: 81 (1963). Type: Western Cape, 3423 (Knysna): Bracken Hill Forest, (–AA), roadside, S.W. Arnell 1376 (S, holo.!, PRE, iso.).

Plants in crowded colonies, green; shoots medium-sized in male plants, 10–15 mm long, 1.3–2.0 mm high, 2.8–3.0 mm wide; female plants more common and rather larger, simple, up to 18 mm long, 1.5–2.5 mm high, 2.5–4.0 mm wide, or once/twice to repeatedly furcate, segments moderately to widely divergent, 4.0–6.0 mm long. *Stems* prostrate, tapering proximally, chlorophyllose, occasionally ventral row of cells purple, sometimes with a lateral bud or side branch, plano-convex in cross section, in male plants (Figure 1I) 250–350 µm (11 cell rows) high, 420–610 µm wide, in female plants (Figure 1J) 270–350 µm (10–12 cell rows) high, 400–610 µm wide. *Rhizoids* purple, ± 15 µm wide. *Leaves* overlapping, widely spreading, succubously inserted (Figure 2A), apically small, free margin rounded, soon becoming larger, obovate, short- or long-rectangular, or irregularly shaped, occasionally slightly notched and shortly bilobed; in male plants rather smaller (Figure 1A–D), 1125–1375 × 1225–1350 µm; in female plants (Figure 1E–G) mostly larger, 1000–2750 × 1150–2575 µm above, sometimes, when sides not parallel, narrower below, 1075–1750 µm wide; margins almost entire or with ± 6 well-spaced slime papillae, ± 25.0 × 17.5 µm. *Leaf cells* thin-walled, in male plants not appreciably different from those of females, at upper margins (Figure 1H) rectangular across, 22.5–32.5 × 37.5–45.0 µm, at lateral margins long-rectangular, 40.0–62.5 × 20.0–25.0 µm, upper laminal cells 5- or 6-sided, 37.5–57.5 × 35.0–50.0 µm, middle laminal cells (Figure 1K) 65.0–87.5 × 50.0–57.5 µm, basal cells 67.5–87.5 × 50.0–62.5 µm. *Oil bodies* quite variable in number, 17–37 per cell, larger ones ± 5 µm in diameter and granular, others much smaller and smooth; chloro-

plasts numerous, mostly rounded, ± 5 µm in diameter, sometimes elongate, 7.5 µm long (Figure 1K).

Dioicous. *Antheridia* dorsal on stem, generally in 2 crowded rows (Figure 2B), short-stalked, globose or ovoid, 160–250 µm in diameter, each shielded by a bract (Figure 1M–P), 480–770 × 330–640 µm, sometimes 2 adjacent ones joined together, margins with 3 or 4 projecting papillae or processes, cells in interior 4- or 5-sided, 42.5–75.0 × 37.5–67.5 µm. *Archegonia* in 1 or 2 rows (Figure 2C, D) along stem, naked; sometimes several per branch, at intervals (Figure 2E) or 2 adjacent, becoming fertilized. *Pseudoperianth* (Figure 1Q, R) campanulate, proximal to apex, as tall as leaves or projecting somewhat above them, raised on a short stalk, then widely flaring above, 1875–2125 µm long, 1625–2125 µm wide across mouth, margin with 10–15 angular projections, each with a papilla, ± 20.0 × 17.5 µm, often with winged outgrowths on outside (Figure 2F); cells comparable in shape and size to those of leaves. *Capsules* globose, ± 850 µm in diameter, wall bistratose, cells in inner layer irregularly shaped (Figure 1T), 32.5–50.0 × 27.5–35.0 µm, each cell wall with 1–3 dark brown, nodular and sometimes semi-annular thickenings. *Seta* 2.8–4.0 mm long, 250–300 µm in diameter, 6–8 cells across (Figure 1L). *Spores* golden brown to brown, hemispherical, 42.5–55.0 µm in diameter, including lamellae projecting at margin; distal face (Figure 3A, B) convex, with up to 8 lamellae, ± 5 µm high and 5–10 µm apart running across face, sometimes in different directions or parallel to each other (Figure 3C), occasionally anastomosing and forming a few to several areolae, surface between lamellae with fine cross striations (Figure 3D); proximal face (Figure 3E) lacking triradiate mark, flat, covered with irregularly shaped papillae and short ridges, sometimes with scattered granules, 12–16 'spines' (i.e. 'end-on' view of terminations of lamellae from the distal face) projecting around spore periphery and joined by a 5 µm wide, incomplete membranous wing or perispore. *Elaters* (Figure 1S) mostly delicate, outer wall collapsing on drying, rather short and stout, blunt at tips, 62.5–125.0 × 10.0–12.5 µm, loose spirals faintly greenish yellow, strands often difficult to distinguish, but

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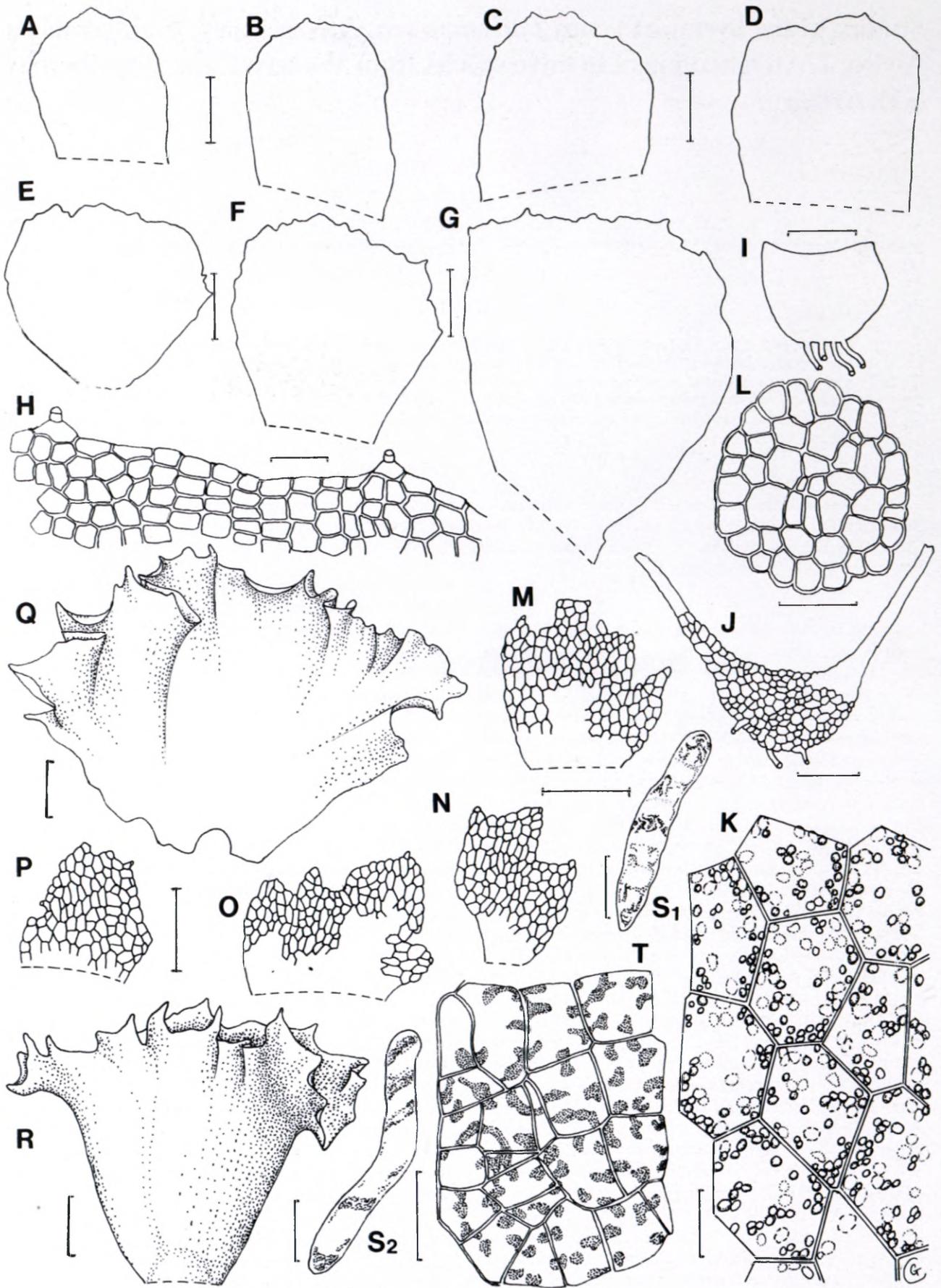


FIGURE 1.—*Fossombronina capensis*. A–D, male leaves; E–G, female leaves; H, detail of upper margin of leaf; I, cross section of male stem; J, cross section of female stem; K, median leaf cells with oil bodies (solid lines) and chloroplasts (dotted lines); L, cross section of seta; M–P, bracts; Q, opened pseudoperianth; R, pseudoperianth from side; S₁, S₂, elaters; T, cells in capsule wall. A, B, *Koekemoer 998*; C–K, M–R, *S.M. Perold 3494*; L, S, T, *S.M. Perold 3492*. Scale bars: A–G, Q, R, 500 μ m; I, J, M–P, 250 μ m; L, 100 μ m; H, K, T, 50 μ m; S₁, S₂, 25 μ m.

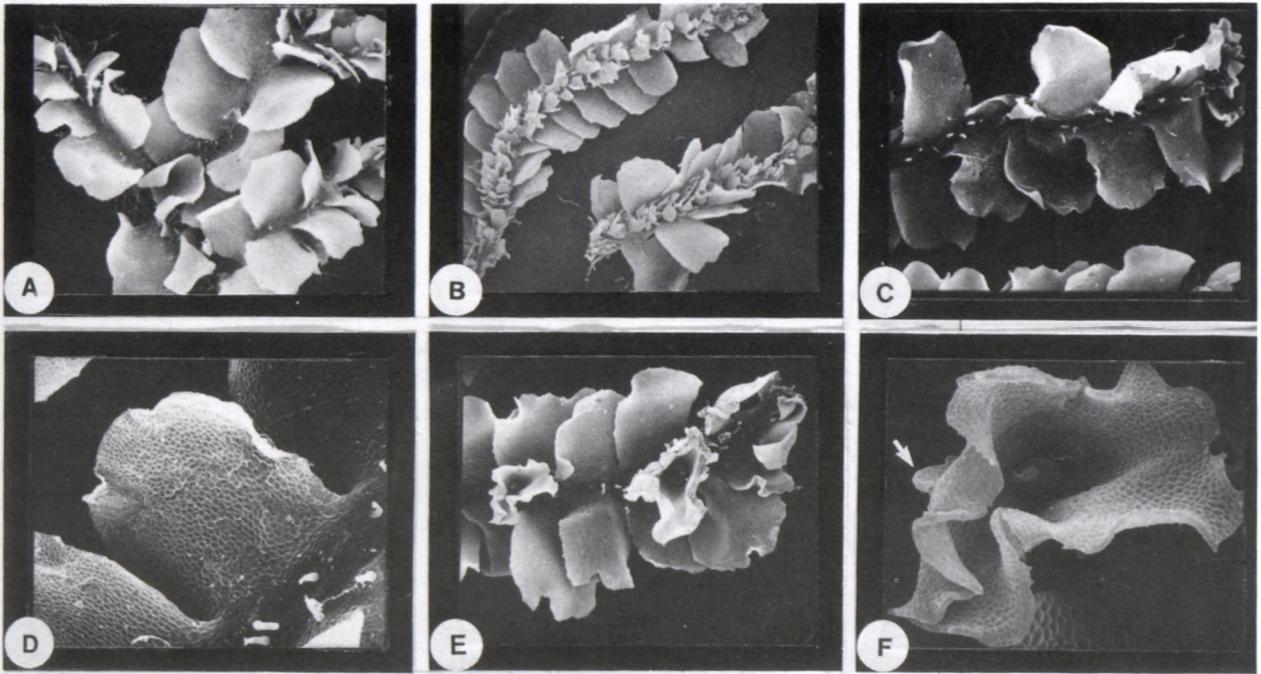


FIGURE 2.—*Fossombronina capensis*. A, thallus branches; B, male plants with rows of bracts; C, female plant with 1 or 2 rows of archegonia; D, detail of female plant with archegonia; E, female plant with 2 pseudoperianths; F, young pseudoperianth from above with outgrowth (see arrow). A, S.M. Perold 3497; B–F, Koekemoer 998. A, B, C, E, $\times 7$; D, F, $\times 30$.

sometimes better developed, with brown rings or even 3 spirals and narrowed at tips, 5 μm wide (Figure 3F).

The correct collector's number of the holotype specimen is *Arnell 1376* and not *1876* (Arnell 1952). *Fossombronina capensis* is confined to the southeastern Western Cape, in the winter rainfall region (Figure 4). It grows on

soil, rarely extending onto slate, in forests, at roadsides, or in clearings, on streambanks or on vertical, shaded rock walls in soil pockets. It is distinguished by the relatively large size of the female plants with overlapping leaves and exposed stems, by fairly common, smaller male plants with large bracts subtending 2 rows of adjacent antheridia, by the spore ornamentation with widely separated lamellae and marginally by 12–16 projecting 'spines' joined by

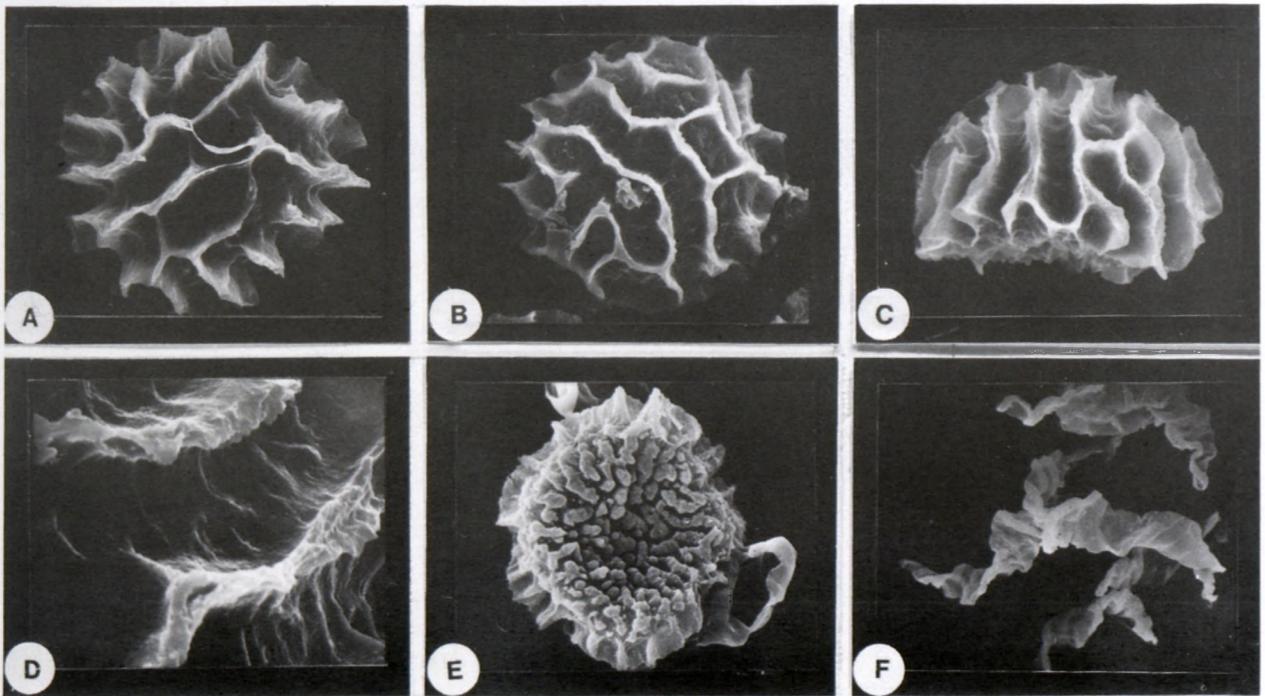


FIGURE 3.—*Fossombronina capensis*. Spores. A, B, distal face; C, side view of distal face; D, detail of lamellae and spore surface on distal face; E, proximal face; F, elaters. A, *Arnell 1783*; B, *Arnell 1555*; C, S.M. Perold 3494; D, *Arnell 1470*; E, *Koekemoer 998*; F, *Arnell 1477*. A, $\times 612$; B, $\times 672$; C, $\times 625$; D, $\times 2755$; E, $\times 739$; F, $\times 406$.

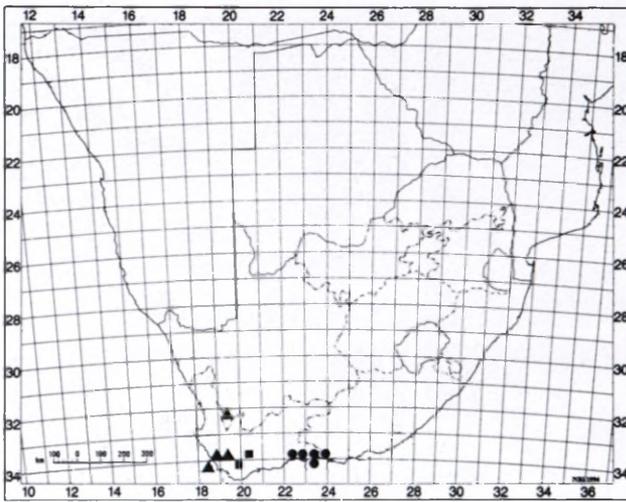


FIGURE 4.—The distribution of *Fossombronia capensis*, ●; *F. densilamellata*, ▲; and *F. montaguensis*, ■, in southern Africa.

an incomplete membranous wing or perispore and also by generally reduced, delicate elaters. Arnell (1952, 1963) referred to the latter as 'leaf-like'. Poorly formed elaters are also present in *F. cristula* (Piippo 1991; Scott & Pike 1987) and in *F. foveolata* var. *cristula* (Schuster 1992). Schuster treated *cristula* as a variety of *F. foveolata*, although it is regarded by Scott & Pike (1987) as a complex [in which they include the southern African *F. zeyheri* (Perold in press)]. According to Scott & Pike (1987), curious and variously malformed elaters are quite common and they found *cristula*-type elaters occurring in individuals apparently belonging to a number of other taxa, with spores unlike those of the *F. foveolata* complex. They admit, however, that *F. cristula* and *F. foveolata* are perhaps not distinct, but on the evidence of dioicisism versus monoicisism, they presently maintain them as separate species. All *F. capensis* specimens are dioicisous and those from the George/Knysna/Brackenfell/Gouna and Deep Walls Forests and Diep River areas have poorly formed elaters. Collections from the nearby Bloukranz 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.

The strong aromatic smell referred to by Arnell was not observed. Arnell (1952) stated that the spores of *F. capensis* and *F. pusilla* had the same appearance, but he distinguished *F. capensis* from the latter because it was dioicisous and had large bracts subtending the antheridia in the male plants. Initially Arnell (1953) thought that *F. pusilla* did not grow in South Africa, but in his *Hepaticae of South Africa* (Arnell 1963) he included it. Its presence here still needs to be confirmed. Earlier reports of it (Lehmann 1829; Gottsche *et al.* 1846; Sim 1926) are most probably based on misidentifications. Best (1990) lists *F. pusilla* as present in Zimbabwe. Vána *et al.* (1979) reported the presence of *F. capensis* and *F. pusilla* in Rwanda and Burundi, but they doubted the determination of *F. capensis* for a specimen from Rwanda. Examination of the spores of *De Sloover 18574* (BR) from Rwanda shows it to belong to a different species. *De Sloover 13.345* and *19.118* are sterile. *F. capensis* appears to be confined to a relatively small area in the southeastern part of Western Cape which has winter rainfall. Its spores ripen in spring and summer.

2. *Fossombronia densilamellata* S.W.Arnell in *Botaniska Notiser* 1952: 317 (1952); S.W.Arnell: 80 (1963). Type: Western Cape, 3318 (Cape Town): Lion's Head near Kloofnek, (–CD), S.W. Arnell 295 (S, lecto.!, here designated; PRE, isolecto.).

Plants in dense colonies or overlying mats, pale green to yellow-green, older leaves dying, turning yellow-brown and translucent, lower part of stem occasionally almost denuded of leaves; shoots smallish to medium-sized in male plants, up to 12 mm long, 1.1 mm high, 2.5 mm wide; female plants far more common and rather larger, shoots sometimes simple, 9–14 mm long, 1.4–1.7 mm high, 1.6–3.8 mm wide, at pseudoperianth up to 4.4 mm wide, mostly bifurcate with terminal segments (Figure 6A) closely to moderately divergent and of unequal length, 2–4 mm long. *Stems* prostrate, green, occasionally central core purple, sometimes apically very shortly branched, with dorsal bud-like layers of small leaves at tips, lateral branches often developing from latero-ventral buds, plano-convex in cross section, in male plants (Figure 5I) apically 210 µm (9 cell rows) high, 400 µm wide, basally 350 µm high, 350 µm wide, in female plants apically swollen (Figure 5J), 460 µm (± 16 cell rows) high, 700 µm wide, gradually tapering toward base (Figure 5K), 280 µm high, 430 µm wide. *Rhizoids* purple, 12.5–20.0 µm wide, sometimes with flat tips. *Leaves* erect, imbricate, undulate along upper margin, succubously inserted, markedly decurrent on stem (Figure 6B), subquadrate to rectangular, sometimes wider above than below, apex truncate or with several low triangular or toothed projections, in male plants (Figure 5A–C) 1125–1750 × 1125–1625 µm, in female plants mostly larger (Figure 5D–G), 1625–2750 µm long, width above 1250–2125 µm, below 825–1250 µm; margins with up to 13 slime papillae, 25.0 × 22.5 µm, mostly at angulations and often more numerous on distal (leading) edge (Figure 5C) than on proximal (trailing) edge. *Leaf cells* (Figure 5H) above somewhat thicker-walled than below, in male plants not appreciably different from those of females, at upper margins rectangular across, 27.5–35.0 × 32.5–57.5 µm, at lateral margins long-rectangular, 52.5–75.0 × 20.0–22.5 µm, mostly longer at proximal edge, up to 140.0 × 17.5 µm, upper laminal cells 4- or 5-sided, 45–50 × 45–50 µm, middle laminal cells 6- or 7- sided, walls bulging, 82.5–95.0 × 50.0–55.0 µm, basal cells 100–125 × 25–60 µm. *Oil bodies* (Figure 5L) very variable in number, in young leaves some cells with 8–10, in others much more numerous, round or bean-shaped, up to 2 µm in diameter; chloroplasts numerous, rounded, ± 5 µm in diameter.

Dioicisous. *Antheridia* dorsal on stem, in 1 or 2 rows, globose, ± 180 µm in diameter, each shielded by a bract (Figures 5M–O; 6C), 300–450 × 320–400 µm, with several projections, mostly topped by a mucilage papilla, cells in body 4–7-sided, ± 62.5 × 25.0 µm. *Archegonia* (Figure 6D) in a row dorsally along stem, naked, sometimes several per branch becoming fertilized, occasionally next to each other or even surrounded by the same pseudoperianth. *Pseudoperianth* (Figures 5P, Q; 6F) campanulate, proximal to apex (Figure 6E), projecting ± 750 µm above top of leaves, raised on a short stalk, ± 425 × 500–700 µm, then widely flaring above, 2250–2750 µm long, 2375 µm wide across mouth, its margin with toothed or angular projections, 200–250 µm long, crowned with papillae,

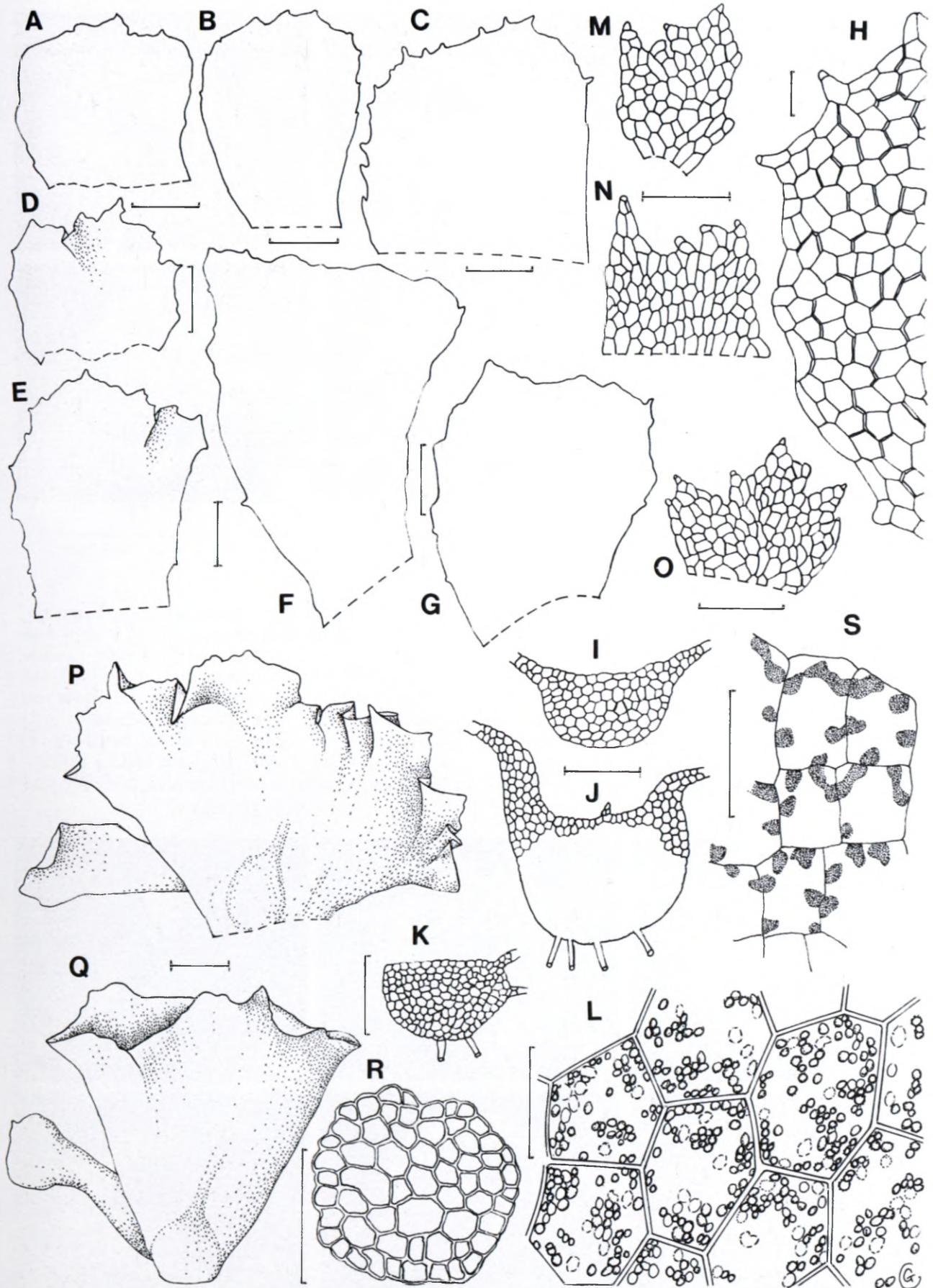


FIGURE 5.—*Fossombronia densilamellata*. A–C, male leaves; D–G, female leaves; H, detail of distal margin of male leaf; I, cross section of male stem; J, cross section of apical part of female stem; K, cross section of basal part of female stem; L, median leaf cells with oil bodies and chloroplasts; M–O, bracts; P, opened pseudoperianth; Q, pseudoperianth from side; R, cross section of seta; S, cells in capsule wall. A, B, E–G, I–K, M, O, P–S, *S.M. Perold* 3349; C, H, N, *Garside* 6510; D, L, *S.M. Perold* 629. Scale bars: A–G, P, Q, 500 μ m; H, R, 100 μ m; I–L, S, 50 μ m; M–O, 250 μ m.

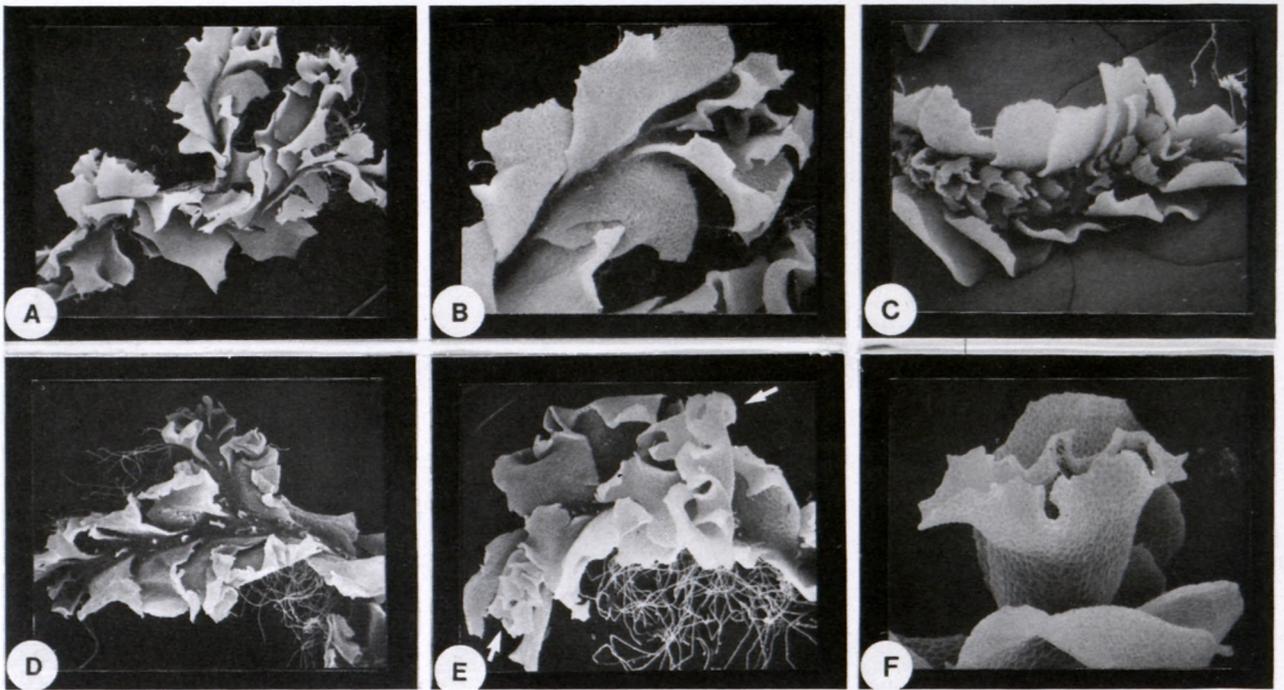


FIGURE 6.—*Fossombronina densilamellata*. A, thallus branches; B, apical leaves; C, male plant with rows of bracts; D, female plant with row of archegonia; E, female plant with 2 pseudoperianths (see arrows); F, pseudoperianth. A–C, *S.M. Perold 3346*; D–F, *S.M. Perold 3349*. A, D, $\times 7$; B, $\times 17$; C, $\times 13$; E, $\times 9$; F, $\times 20$.

$\pm 22.5 \times 17.5 \mu\text{m}$, sometimes with a winged outgrowth at the side, $\pm 1925 \mu\text{m}$ long, $775 \mu\text{m}$ wide at apex; cells comparable in shape and size to those of leaves. *Capsules* globose, $700\text{--}875 \mu\text{m}$ in diameter, cells in inner layer of bistratose wall (Figure 5S) irregularly shaped, $35.0\text{--}50.0 \times 27.5\text{--}37.5 \mu\text{m}$, each cell wall with 2 or 3 nodular and sometimes semi-annular thickenings. *Seta* (Figure 5R) $5.0\text{--}9.5 \text{mm}$ long, $140\text{--}150 \mu\text{m}$ in diameter, up to 8 cells across. *Spores* light brown or yellow-brown, hemispheri-

cal, $40\text{--}45 \mu\text{m}$ in diameter, including 'spines' projecting $\pm 2.5 \mu\text{m}$ at margin, these not connected by a wing; distal face convex, with 12–16 thin, parallel, curving lamellae, $2.5 \mu\text{m}$ high (Figure 7C) running across (Figure 7A), central ones usually longer, sometimes branched, lateral ones (Figure 7D) shorter and \pm radiating, separated by $\pm 2.5 \mu\text{m}$, sometimes interconnected by slender threads (Figure 7B); proximal face (Figure 7E) mostly lacking a distinct triradiate mark, rarely more pronounced, generally orna-

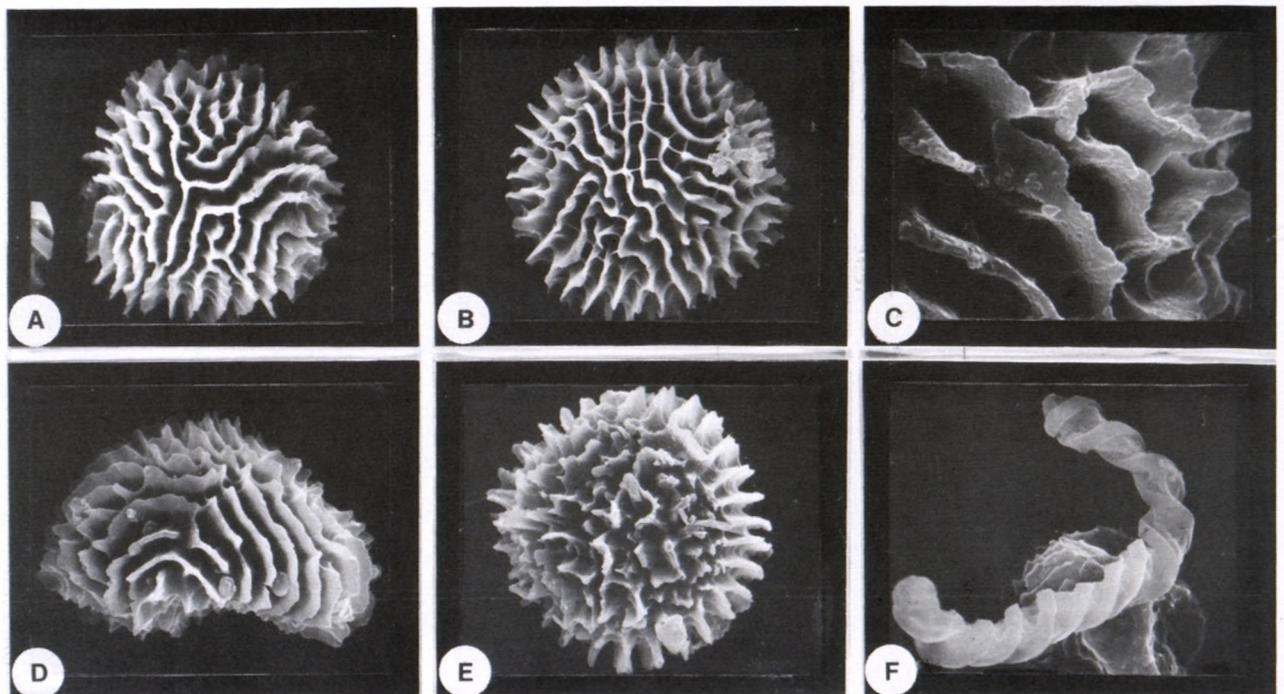


FIGURE 7.—*Fossombronina densilamellata*. Spores. A, B, distal face; C, detail of lamellae on distal face; D, side view of distal face; E, proximal face; F, elater. A, *Garside 6510*; B, *Duthie CH 1651*; C, D, *Arnell & Garside 260*; E, *S.M. Perold 629*; F, *S.M. Perold 2355*. A, $\times 719$; B, E, $\times 772$; C, $\times 2795$; D, $\times 865$; F, $\times 805$.

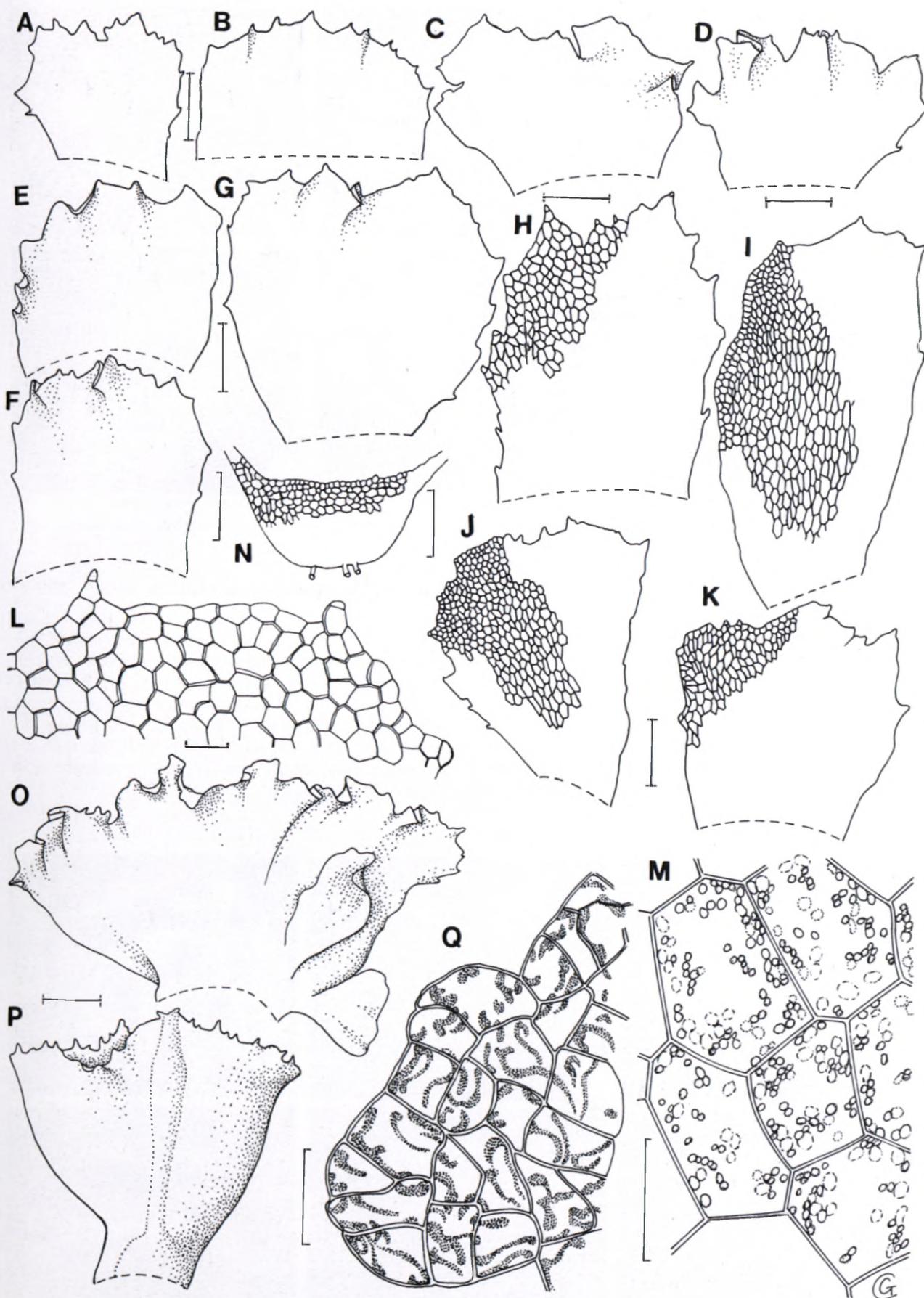


FIGURE 8.—*Fossombronia montaguensis*. A–D, young apical leaves; E, F, K, older leaves; G–J, proximal leaves; L, detail of upper margin of leaf; M, median leaf cells with oil bodies and chloroplasts mostly clumped together; N, cross section of stem; O, opened pseudoperianth; P, pseudoperianth from side; Q, cells in capsule wall. A, F–J, L–Q, *S.W. Arnell 731*; B, E, K, *S.W. Arnell 724*; C, D, *S.M. Perold 3454*. Scale bars: A–K, O, P, 500 µm; L, 100 µm; M, Q, 50 µm; N, 250 µm.

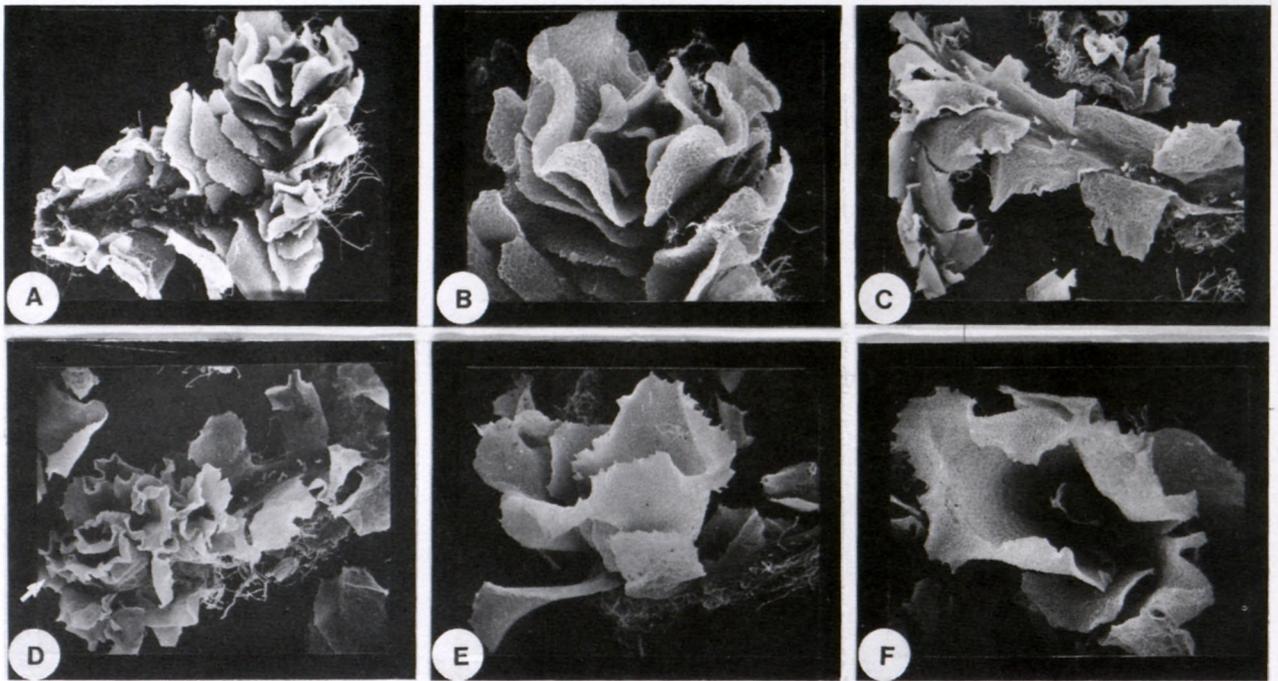


FIGURE 9.—*Fossombronina montaguensis*. A, thallus branches; B, apical leaves; C, female plant with archegonia; D, female plant with pseudoperianth near apex (see arrow); E, pseudoperianth from the side; F, pseudoperianth from above. A, B, *S.M. Perold 3453*; C–F, *S.W. Arnell 731*. A, $\times 12$; B, $\times 24$; C, $\times 8$; D, $\times 7$; E $\times 9$; F, $\times 11$.

mented with coarse or slender pointed processes or short, uneven ridges, around circumference up to ± 30 projecting lamellar 'spines'. *Elaters* (Figure 7F) light brown, $120\text{--}180 \times 7.5\text{--}10.0 \mu\text{m}$, tapering to tips, smooth, bispiral, rarely trispiral, occasionally branched.

Fossombronina densilamellata is known only from Western Cape and grows on partially shaded earth banks at roadsides or on river banks. It has been collected at

Kloofnek, Round House, Lion's Head, Newlands in Cape Town and at Camps Bay, as well as at Franschoek, Stellenbosch and Algeria Forest (Figure 4). At PRE, the specimen *Arnell 762* from Cogman's Kloof, was labelled *F. densilamellata*, but the packet contains no plant material, only a slide preparation of the capsule wall without any spores; the determination could thus not be verified and Cogman's Kloof cannot with certainty be included in its distribution range.

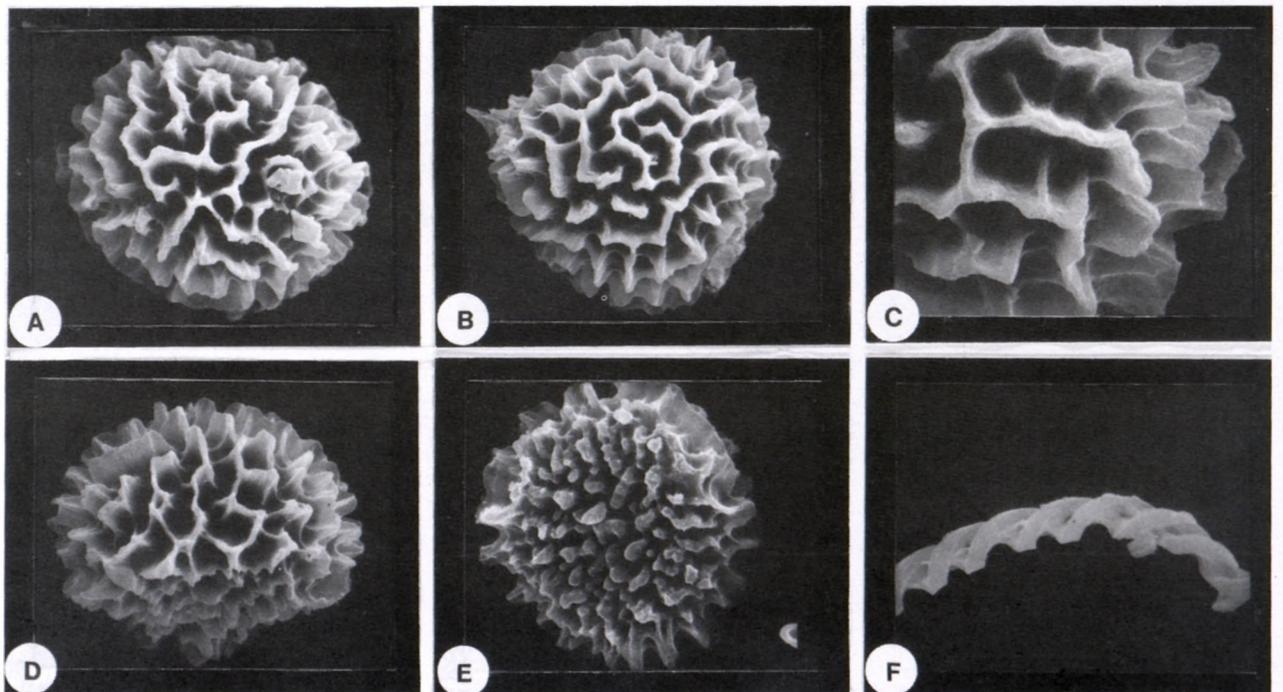


FIGURE 10.—*Fossombronina montaguensis*. Spores. A, B, distal face; C, detail of lamellae and spore surface on distal face; D, side view of distal face; E, proximal face; F, elater. A–F, *Arnell 731*. A, $\times 745$; B, $\times 699$; C, $\times 1637$; D, $\times 779$; E, $\times 759$; F, $\times 852$.

Fossombronia densilamellata is distinguished by its undulating, decurrent leaves, rare and somewhat smaller male plants with bracts shielding the antheridia and by the spore ornamentation with 12–16 narrowly spaced, thin, parallel lamellae on the distal face. The species fruits in late winter and early spring and soon dies off, and only the tuberous stem apices survive the dry summers. In specimen *S.M. Perold 2356*, from Algeria Forest, some of the capsules bore spores with thick, granular ridges, not thin lamellae; repeated samplings eventually turned up spores with typical lamellae. Arnell had previously named this species *F. confertilamellata* and his specimen 265, held at S, still bears this epithet in his handwriting. Arnell (1952) did not designate a holotype from the syntypes he cited, *Arnell 257, 265, 295, 762*. The specimen *Arnell 295* (S), is selected as lectotype because it closely matches the protologue and a duplicate is held at PRE.

Arnell (1952, 1963) seems to have overestimated the number of spines at the periphery of the spore. On SEM micrographs they appear to be nearer to 30 than to 50. Arnell (1963) refers to some similarity between the spores of *F. densilamellata* and *F. wondraczekii*. In the latter they frequently have papillae between the lamellae or sometimes the lamellae anastomose to form a few areolae in the centre. Curiously, Arnell (1952) placed '*F. tumida* Sim' in synonymy under *F. densilamellata*. He must have meant 'sensu Sim' and he seems to have misinterpreted Sim's (1926) drawing and description of the spores of *F. tumida* Mitt. The drawing correctly illustrates the significant features (although not well) and the description reads 'lamellae radiating from a few central areolae, and showing as twenty-four to thirty spines on the margin'. Arnell (1963) did not repeat these observations.

3. *Fossombronia montaguensis* S.W.Arnell in *Botaniska Notiser* 1952: 316 (1952); S.W. Arnell: 83 (1963). Type: Western Cape, 3320 (Montagu): Bath Kloof, (-CC), *S.W. Arnell 731* (S, lecto.!, here designated).

Plants in crowded overlying mats or more loosely aggregated; leaves light green, becoming translucent or not, and then mostly darker green, later on turning yellow at margins or entirely so, sometimes juvenile leaves at apex deep red; shoots medium-sized to large, up to 10 mm long, 1.1–2.0 mm high, 1.8–3.5 mm wide, mostly repeatedly furcate, terminal segments (Figure 9A) 1–5 mm long, moderately divergent. *Stems* prostrate, green or outer layer distally purple, lateral branches occasionally developing from latero-ventral buds, plano-convex in cross section (Figure 8N), 280–380 µm high (12–14 cell rows), 490–750 µm wide, tapering toward base. *Rhizoids* purple, 10–25 µm wide. *Leaves* erect to spreading, frilly and densely crowded apically (Figure 9B), becoming spaced and lax proximally, succubous, subquadrate to long-rectangular, sometimes irregularly shaped and wider above than below, 1375–2500 × (600–) 1175–1950 µm, apical leaves (Figure 8A–D) generally smaller than more proximal ones (Figure 8E–K), frequently shorter than wide, 900–1675 × 1250–1900 µm; margins with triangular or irregular projections, with 6–16 slime papillae, ± 20 × 15 µm, often raised on a basal cell, 30–50 × 20–35 µm. *Leaf cells* at upper margins (Figure 8L) quadrate, rectangular across or irregular, 22.5–37.5 × 35.0–52.5 µm, at lateral

margins long-rectangular, 37.5–90.0 × 15.0–30.0 µm, upper laminal cells 5- or 6-sided, 32.5–45.0 × 32.5–55.0 µm, middle laminal cells 6-sided (Figure 8M), 45.0–125.0 × 25.0–62.5 µm, basal cells 50.0–155.0 × 37.5–75.0 µm. *Oil bodies* and chloroplasts were clumped together and could not be studied adequately in the available material.

?Dioicous. No male plants seen. *Archegonia* in one or two rows dorsally along stem (Figure 9C), naked, sometimes up to three per shoot becoming fertilized. *Pseudoperianth* (Figures 8O, P; 9D–F) campanulate, ± same height as leaves, sometimes slightly stalked, basally ± 875 µm wide, flaring widely above, up to 2575 µm long, 2375–3000 µm wide across cup-like mouth, its margin with ± 30 triangular protrusions on a broad base, ± 160 µm long, and topped with a papilla, 17.5 × 17.5 µm, sometimes open at side, or where two component leaves are joined, with a winged outgrowth; cells comparable in shape and size to those of leaves. *Capsules* globose or slightly flattened at the poles, 775–1050 µm in diameter, cells in inner layer of bistratose wall (Figure 8Q) irregularly shaped, 40.0–60.0 × 32.5–37.5 µm, each cell with 1–3 nodular and sometimes semi-annular thickenings. *Seta* 6.5–7.5 mm long, 200–275 µm in diameter. *Spores* brown, hemispherical, 40.0–47.5 µm in diameter, including lamellae projecting ± 2.5 µm at margin, not joined by a wing; distal face (Figure 10A–D) convex, with up to 10 irregularly branched, long or short, sinuous lamellae, some breaking up into spines, others interconnected by fine ridges running across, sometimes forming incomplete areolae, ± 5 × 5 µm; proximal face (Figure 10E) lacking a distinct triradial mark, ornamented with low, irregular, rather short, branched ridges and with ± 27 irregularly shaped, variously sized, blunt, spine-like papillae projecting at circumference. *Elaters* (Figure 10F) yellow-brown, 137.5–175 µm long, ± 7.5 µm wide in centre, tips looped, ± 5 µm wide, smooth, bispiral throughout or trispiral in centre.

Fossombronia montaguensis is most frequently found on rather dryish soil banks next to footpaths in Western Cape at Bath Kloof and Cogman's Kloof, as well as at Genadendal (Figure 4), where its growth is stunted and far less luxurious than that of the lectotype specimen, *S.W. Arnell 731* (S), which must have grown in shady, damper conditions, close to water. In the specimen *S.W. Arnell 724* (S), both forms are represented: the proximal leaves are large, lax and translucent, whereas the distal leaves are smaller, firm and green, often partly stained with red. Arnell's (1952, 1963) measurements of the spores, 30–32 µm and 30–34 µm respectively, are rather less than mine. Unfortunately my own collections of *F. montaguensis* from Bath Kloof, *S.M. Perold 3453* and *3454 p.p.*, are sterile.

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- Held at PRE, unless otherwise indicated. Bracketed numbers after collectors' name and number refer to the species in the text in alphabetical order, namely: *F. capensis* (1); *F. densilamellata* (2) and *F. montaguensis* (3).
- S.W. Arnell 265 (2) S; 275, 295 (2) S (lectotype), BOL (isolectotype); 724 (3) S; 731 (3) S (lectotype); 785 (3) PRE, S; 1376 (1) S (holotype), BOL (isotype); 1470 (1) PRE, S; 1474 (1) BOL; 1477 (1) G; 1528, 1555 (1) BOL; 1678 (1) S; 1694 (1) BOL; 1715, 1716 (1) S; 1756 (1) BOL; 1757 (1) S; 1783 (1); 1851 (1) S. S.W. Arnell & Garside 215 (2) BOL, S; 259 (2) BOL; 260 (2).
- Cholnoky 388 (1) S.
- Duthie CH 1651 (2).
- Ecklon 7691 (2) W.
- Garside 6226, 6456, 6489, 6575, 6586 (2) BOL.
- Koekemoer 998 (1).
- Lübenau-Nestlé SA 139/2 (1) pte.herb.
- S.M. Perold 629 (2); 919 (1); 2355, 2356 (2); 3343, 3346, 3347, 3349 (2); 3453, 3454 pp. (3); 3492, 3494, 3497, 3498 (1); 3534, 3539, 3540–3541 (1).
- S. Russell 2530 (1).
- Van Zanten et al. 7609809 pp. (2).