

Studies in the genus *Riccia* (Marchantiales) from southern Africa. 17. Three new species in section *Pilifer*: *R. elongata*, *R. ampullacea* and *R. trachyglossum*

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ABSTRACT

Species in section *Pilifer* Volk (1983) are often very difficult to identify (Perold 1990b). Most of them require close examination of the dorsal cell pillars in reasonably fresh collections, as these cells can seldom be reconstituted in long dried material. The three species, *R. elongata*, *R. ampullacea* and *R. trachyglossum*, here described as new, have been maintained in cultures for lengthy periods, during which their dorsal cells were studied. The spore ornamentation was also quite useful in separating these species. *R. elongata* is known from eastern Transvaal, *R. ampullacea* from the Witteberg Mountains of the eastern Cape Province and the Drakensberg Mountains of Lesotho and Natal, and *R. trachyglossum* is so far known only from the highlands of Lesotho.

UITTREKSEL

Spesies in seksie *Pilifer* Volk (1983) is dikwels baie moeilik om te identifiseer (Perold 1990b). Die meeste vereis deeglike ondersoek van die dorsale selpilare in redelik vars versamelings, aangesien die omvorming van selle in lank gedroogde materiaal na hul oorspronklike toestand, selde moontlik is. Die drie spesies, *R. elongata*, *R. ampullacea* en *R. trachyglossum*, hier as nuut beskryf, is lank in kulture gekweek, waartydens hul dorsale selle bestudeer is. Die spoorornamentasie was ook nuttig om tussen die spesies te onderskei. *R. elongata* is bekend van Oos-Transvaal, *R. ampullacea* van die Witteberge van Oos-Kaapland en die Drakensberge van Lesotho en Natal, en *R. trachyglossum* is tot dusver slegs van die hoogland van Lesotho bekend.

1. *Riccia elongata* Perold, sp. nov.

Thallus ?monoicus, perennis, mediocris, glaucus, nitens, simplex vel furcatus, rami 8.0 mm longi, 1.1(–2.0) mm lati, 0.8–1.1(–1.2) mm crassi, in sectione 1–2 plo latiores quam crassi; squamae hyalinae, rotundatae, imbricatae, undulatae, ultra margines thalli productae. Cellulae dorsales epitheliales globosae, politae, hyalinae, 2 vel 3(vel 4) in columnis separatis, usque ad 200 μm longis dispositae. *Sporae*: (70–)75–85(–90) μm diametro, triangulo-globulares, polares, alatae, imperfecte grosse reticulatae, superficies distalis trans diametrum \pm 5–7 areolis, saepe umbone centrale. *Chromosomatum numerus* $n = 16$ (Bornefeld 1989).

TYPE.—Transvaal, 2629 (Bethal): 5 km NE of Kriel on road to Vandijksdrift, near disused bridge, on dry slope (–AB), S.M. Perold 2018 (PRE, holo.).

Thallus ?monoicous, perennial, in gregarious patches (Figure 2A), sometimes partly overlying each other, bluish green to green, shiny to rather dull proximally, hyaline scales extending beyond thallus margins (Figures 1B; 2B, E); medium-sized, simple or once to several times symmetrically or asymmetrically furcate, branches medium to widely divergent, up to 8.0 mm long, segments 1.0–4.0 \times 1.1 mm (up to 2.0 mm wide when fully expanded (Figure 2B)), 0.8–1.1(–1.2) mm thick, i.e. \pm as wide as thick, to nearly twice wider than thick in section (Figure 1F), ligulate to oblong, apex subacute, dorsally grooved towards apex (Figure 2C), margins somewhat obtuse,

becoming subacute proximally, flanks steep to slightly obliquely sloping, green, covered with scales (Figure 2D); ventrally rounded, green; when dry (Figure 1A), margins tightly inflexed, meeting along midline, with white, wavy scales covering granular, greyish white dorsal face.

Anatomy of thallus: dorsal epithelium (Figures 1E; 2F) consisting of free-standing 2 or 3(or 4)-celled, fragile, hyaline pillars, up to 200 μm long, \pm $\frac{1}{3}$ the thickness of thallus in section, apical cells globose, often wider than long, 40–50(–60) \times 45–65 μm , occasionally conical or mammillose, and rather smaller, 35 \times 45 μm , middle cells 58–75 \times 50–75 μm , basal cells longer than wide, 62–80(–100) \times 40–60 μm ; from above, cells glassy and shiny, bulging, crowded together, top cell smallest, air pores small, mostly 4-sided, occasionally triangular (Figure 1D); assimilation tissue \pm 350 μm thick in section, $\frac{1}{3}$ the thickness of thallus, mostly consisting of 6 cells, 35–47 \times 37–40 μm , in vertical columns, enclosing narrow, 4–6(–7)-sided air canals; storage tissue \pm 450–550 μm thick, occupying ventral $\frac{1}{2}$ of thallus, cells tightly packed, angular, up to 65 μm wide, containing starch granules; rhizoids arising from ventral epidermal cells and base of scales, mostly smooth, occasionally tuberculate, 25 μm wide. *Scales* (Figure 1G) rounded, margins smooth, large, 850–1100 \times 500–600 μm , projecting \pm 200 μm (or more) beyond thallus margins, imbricate, hyaline, base occasionally with some purple-red cells, cells in body of scale long-hexagonal or oblong-rectangular, 125–150 \times 42–60 μm , in part of margin brick-shaped, smaller, 25 \times 62 μm . *Antheridia* not seen. *Archegonia* only seen in immature state in sections. *Sporangia* single, median in proximal part of thallus, dorsally bulging, containing \pm 250 spores each, but

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thalli rarely sporulating. Spores (70–)75–85(–90) μm in diameter, triangular-globular, polar, light brown, semi-

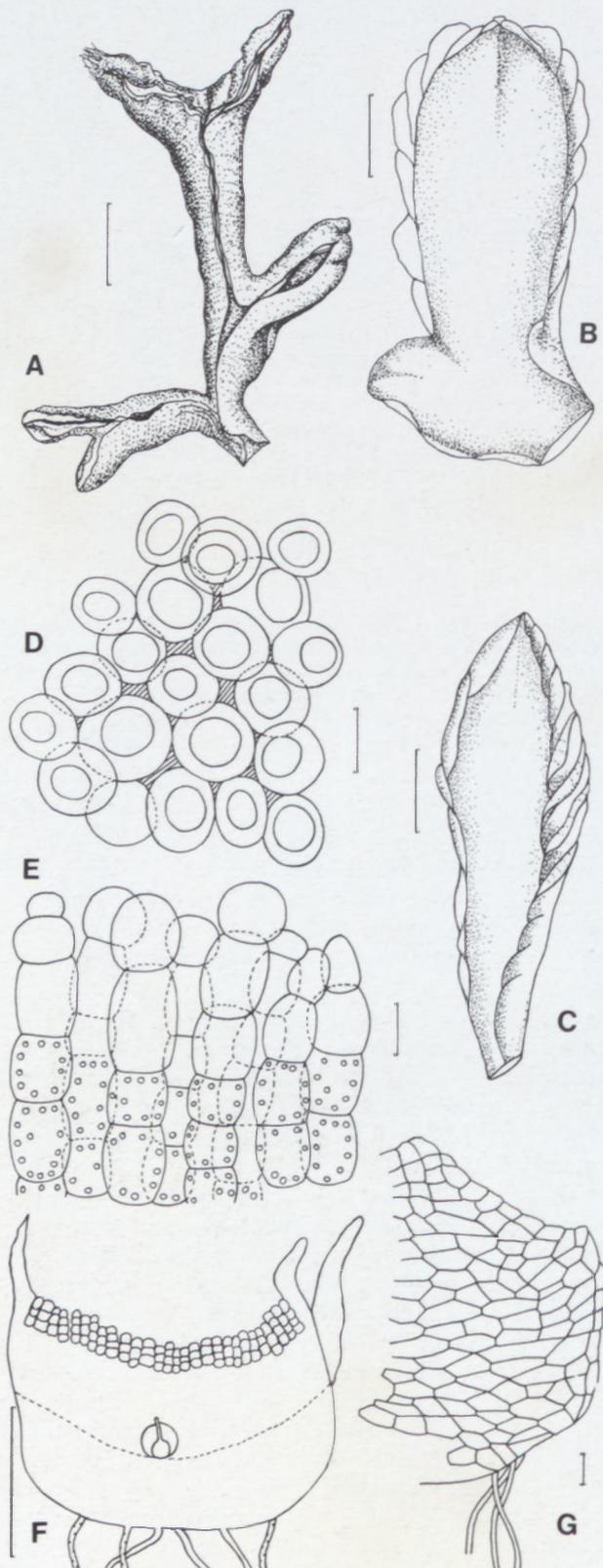


FIGURE 1.—*Riccia elongata*. Morphology and anatomy. A, thallus, dry; B, thallus actively growing and fully expanded; C, thallus generally with partly inflexed sides; D, dorsal cells and air pores (hatched), assimilation tissue and air canals (stippled), as seen from above; E, transverse section through dorsal cell pillars; F, transverse section through branch with scales projecting beyond margins; G, scale. A, D–G, *S.M. Perold* 2476; B, C, *S.M. Perold* 2018. Scale bar on A–C, F = 1 mm; D, E = 50 μm ; G = 100 μm .

transparent; wing 3–5 μm wide, wider at perforated angles, margin smooth to finely crenulate; ornamentation irregularly and incompletely coarsely reticulate, similar on both faces: distal face (Figure 3C, D, F) with 5–7 incomplete areolae across diameter, irregularly shaped and variable in size, 10–25 μm wide, often with central boss (Figure 3E), free-standing or attached, walls thick and prominent, sparsely granular, occasionally raised at nodes, extending onto wing; proximal face (Figure 3A, B) with triradiate mark clearly defined, joined by some areolar walls, areolae incomplete, $\pm 7 \mu\text{m}$ wide, occasionally with central boss, walls nearly smooth, slightly raised at nodes. Chromosome number $n = 16$ [Bornefeld 1989 (as *R. furfuracea*, *S.M. Perold* 424)].

R. elongata has been named for, and can be recognized by its longish, narrow, frequently simple branches, with the sides tightly inflexed when dry, and by large, wavy, white scales. It is rather similar in habit to *R. simii* Perold (1990a) (= *R. albomarginata* auct. non Bisch. sensu Sim) (Volk pers. comm.), but differs from it by its scales being less prominent, and less closely imbricate, by its lower dorsal pillars, spore ornamentation and distribution.

The shiny, round, bulging cells in the dorsal pillars are a character shared by a few other members in section *Pilifer* Volk, e.g. *R. concava* Bisch. (Perold 1989), *R. furfuracea* Perold (1990b) and *R. trachyglossum* Perold (1990b), but these species frequently develop purple colouration on exposure to the sun and differ from *R. elongata* in habit, spore ornamentation and distribution.

R. elongata is rare and is so far known only from a few localities in eastern Transvaal at altitudes of $\pm 1\ 600$ –2 000 m above sea level, with summer rainfall of 800–1 000 mm p.a. It has been found growing on dry slopes in association with grasses and *Exormotheca* sp., on a rock 'island' in a lake, (Elandsmeer) and at a seepage area at the edge of weathered rock outcrops, in association with *R. volkii* S. Arnell, *R. natalensis* Sim, and *R. sorocarpa* Bisch. (Figure 4).

SPECIMENS EXAMINED

TRANSVAAL.—2530 (Lydenburg): 29 km from Dullstroom, at turnoff on dirt road to Boschhoek, near Marmerkop Station, on hillside (–AB), *S.M. Perold* 424 (PRE). 2629 (Bethal): 5 km NE of Kriel on road to Vandijksdrift, on dry slope near disused bridge (–AB), *S.M. Perold* 2476 (PRE). 2630 (Carolina): near Chrissiesmeer, opposite lake, near roadside, weathered rock outcrop and seepage (–AD), *S.M. Perold* 1058 (PRE); Chrissiesmeer, Farm Knock Dhu, Elandsmeer, on soil, on rock 'island' above water level (–AD), *Smook* 4912 (PRE).

It is highly probable that *S.M. Perold* 303 and *Volk* 84–644, both from Mooiriver, Natal, also belong to *R. elongata*, but these gatherings are sterile and cannot be placed here with certainty.

2. *Riccia ampullacea* Perold, sp. nov.

Thallus monoicus, ?annuus, laete viridis vel glaucus, nitens, proximaliter villosus; rami simplices vel 1–2 furcati, usque ad 8,0 mm longi, 1,5–2,5 mm lati, 0,6–0,9(–1,1) mm crassi, 2–2,5-plo latiores quam crassi in sectione; squamae magnae, hyalinae. Epithelium dorsale ex columnis liberis 3- vel 4-cellularibus, 200–250 μm longis constans, cellulis longioribus quam latis, saepe

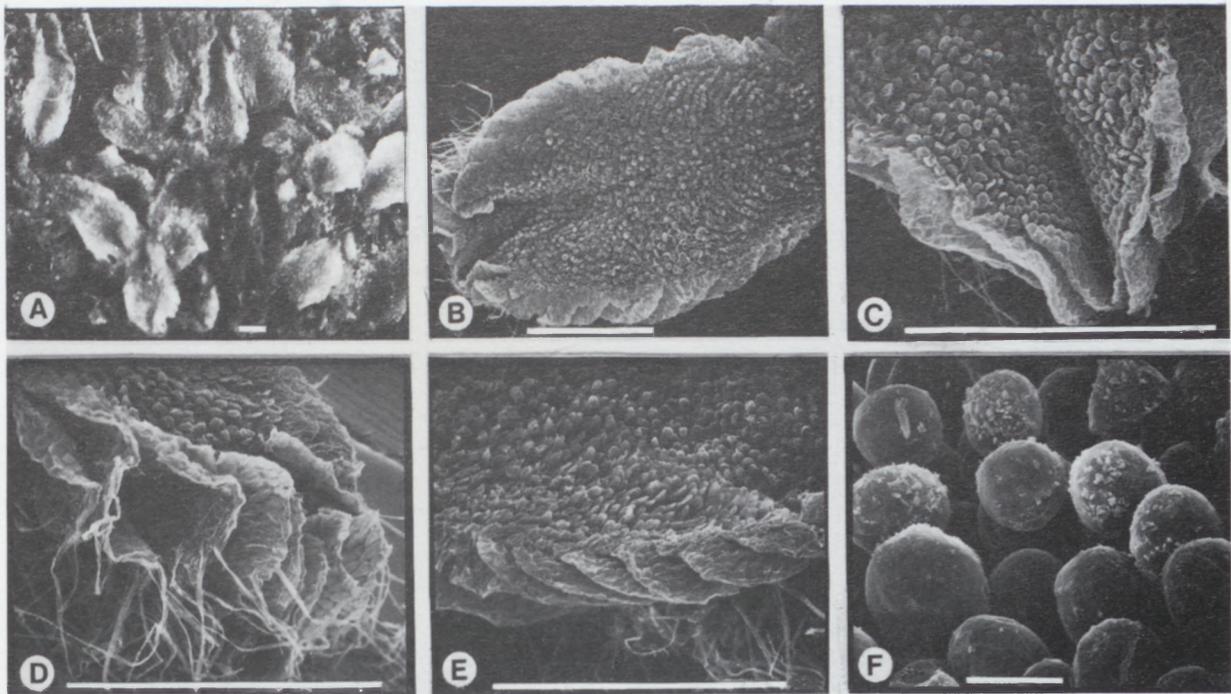


FIGURE 2.—*Riccia elongata*. Morphology and anatomy. A, thalli in cultivation; B, branch seen from above; C, apex with groove and scales; D, apical scales seen from the side; E, marginal scales and dorsal cells; F, dorsal cell pillars. A–F, S.M. Perold 2018. A, by A. Romanowski; B–E, SEM micrographs. Scale bar on A–E = 1 mm; F = 50 μ m.

medio aliquantum constrictis, ampullaceis (inde nomen).
Spores: 90–95(–105) μ m diametro, triangulo-globulares,
 polares, alatae, subtiliter reticulatae et in superficie distali
 cum cristis pluribus crassis radiantibus. *Chromosomatum*
numerus n = 16 (Bornefeld 1989).

TYPE.—Lesotho, 2929 (Underberg): Sani Pass, mountain slopes W of Border Post, on soil in small cave (–CB), Van Rooy 3573 (PRE, holo.).

Thallus monoicous, ?annual, in crowded gregarious patches (Figure 5A), bright green to bluish green,

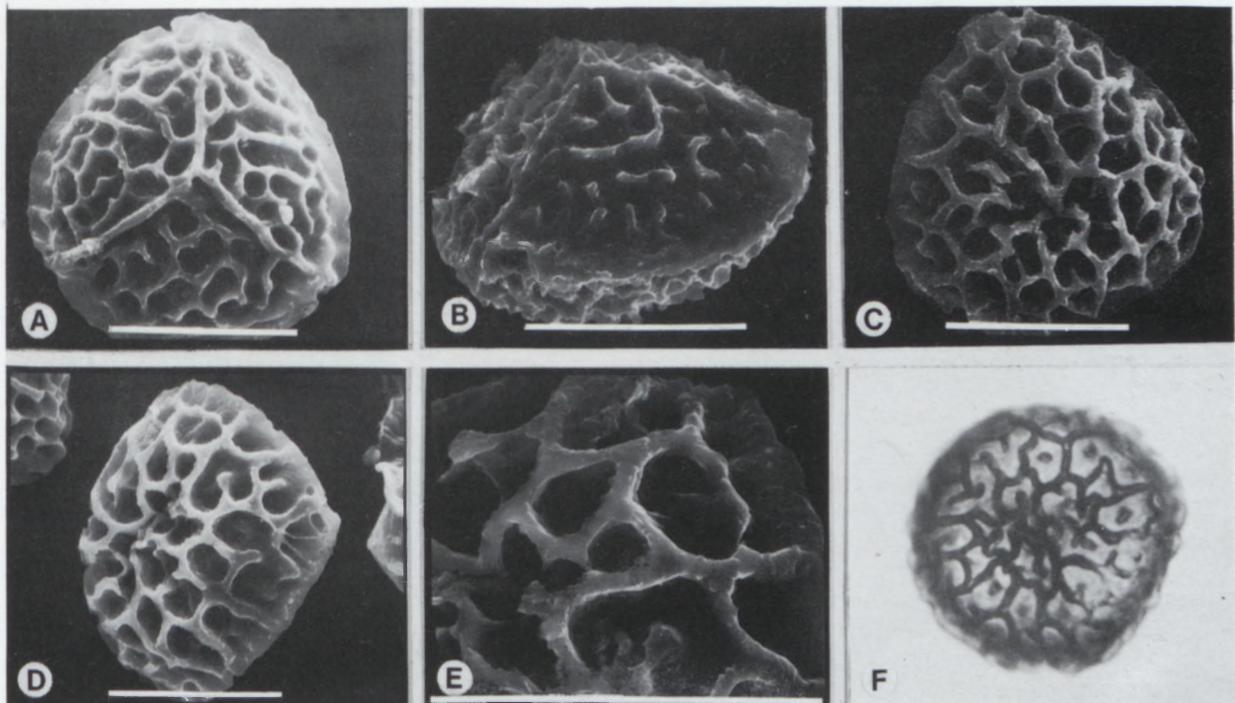


FIGURE 3.—*Riccia elongata*. Spores. A, proximal face; B, proximal face, side view; C, F, distal face; D, distal face, side view; E, areolae partly subdivided, one with central papilla. A–F, S.M. Perold 2018. A–E, SEM micrographs; F, LM photograph. Scale bar on A–E = 50 μ m; diameter of spore on F \pm 80 μ m.

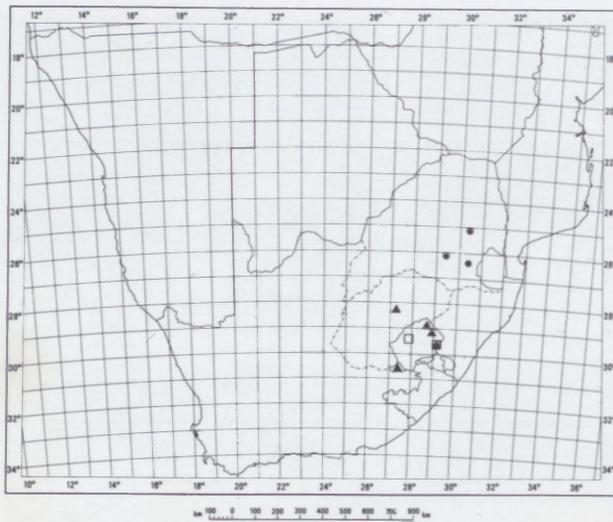


FIGURE 4.—Distribution map of *R. elongata*, ●; *R. ampullacea*, ▲ and *R. trachyglossum*, □, in southern Africa.

glistening to dull and shaggy-haired proximally, with hyaline scales extending beyond thallus margins (Figures 5A; 6B); medium-sized, branches simple or once or twice furcate, branches variously divergent, up to 8.0×1.5 – 3.0 mm, 0.6 – 0.9 (– 1.1) mm thick, i.e. ± 2 – 3 times wider than thick in section (Figure 5E), broadly oblong, apex rounded, shortly emarginate, grooved apically (Figure 5B), otherwise flat, margins acute, flanks sloping obliquely outward and upward, green, covered with hyaline scales; ventrally slightly rounded to flat, green; when dry, whitish green, felt-like, concave dorsally, margins incurved (Figure 5B), occasionally inflexed and rarely meeting along midline, scales hyaline, imbricate, slightly wavy.

Anatomy of thallus: dorsal epithelium (Figures 5C; 6E) consisting of free-standing, 3–4-celled pillars, 200 – 250 μm long, $\frac{1}{4}$ – $\frac{1}{3}$ the thickness of thallus in section, cells fragile, hyaline, longer than wide, often somewhat constricted in the middle, top cell conical, 45 – 67 (– 80) \times 30 – 37 μm , second cell 50 – 70 \times 35 – 52 μm ; third cell 80 – 110 \times 37 – 50 μm , basal cell with sides sometimes bulging, 50 – 75 \times 52 μm ; from above, when fresh, cell pillars distally inflated, erect, shiny, more proximally many upper cells already collapsed, not in rows, air pores small, up to 25 μm wide, 4–5-sided; assimilation tissue 300 – 400 μm thick in section, $\frac{1}{3}$ – $\frac{1}{2}$ the thickness of thallus, consisting of 7 or 8 cells in vertical columns, 37 – 42 (– 50) \times 25 – 35 μm , enclosing 4–6(–8)-sided air canals (Figure 5D); storage tissue up to 400 μm thick, $\pm \frac{1}{2}$ the thickness of thallus, cells round or angular, ± 50 μm wide; rhizoids arising from ventral epidermal cells and base of scales, mostly smooth, rarely tuberculate, 15 – 25 μm wide. Scales rounded, imbricate (Figure 6D), hyaline, occasionally dark red toward base, large, 1000 – 1100 \times 500 μm , cells in body of scale 5- or 6-sided, 100 – 125 \times 45 μm , smaller and brick-shaped toward margin (Figure 5F), 50 – 62 \times 25 μm . Antheridia numerous, with conspicuous hyaline necks, ± 180 μm long, at intervals along middle of thallus, often in very close proximity to archegonial necks. Archegonia with long thread-like, purple necks. Sporangia bulging dorsally, overlying tissue disintegrating and exposing dark spore mass enclosed in sac (Figure 6F), often with archegonial

and juxtaposed antheridial necks still partly intact; sporangium with ± 480 spores each. Spores 90 – 95 (– 105) μm in diameter, triangular-globular, polar, chestnut brown, semi-transparent to nearly opaque, with wing ± 5 μm wide, margin crenulate, marginal angles perforated;

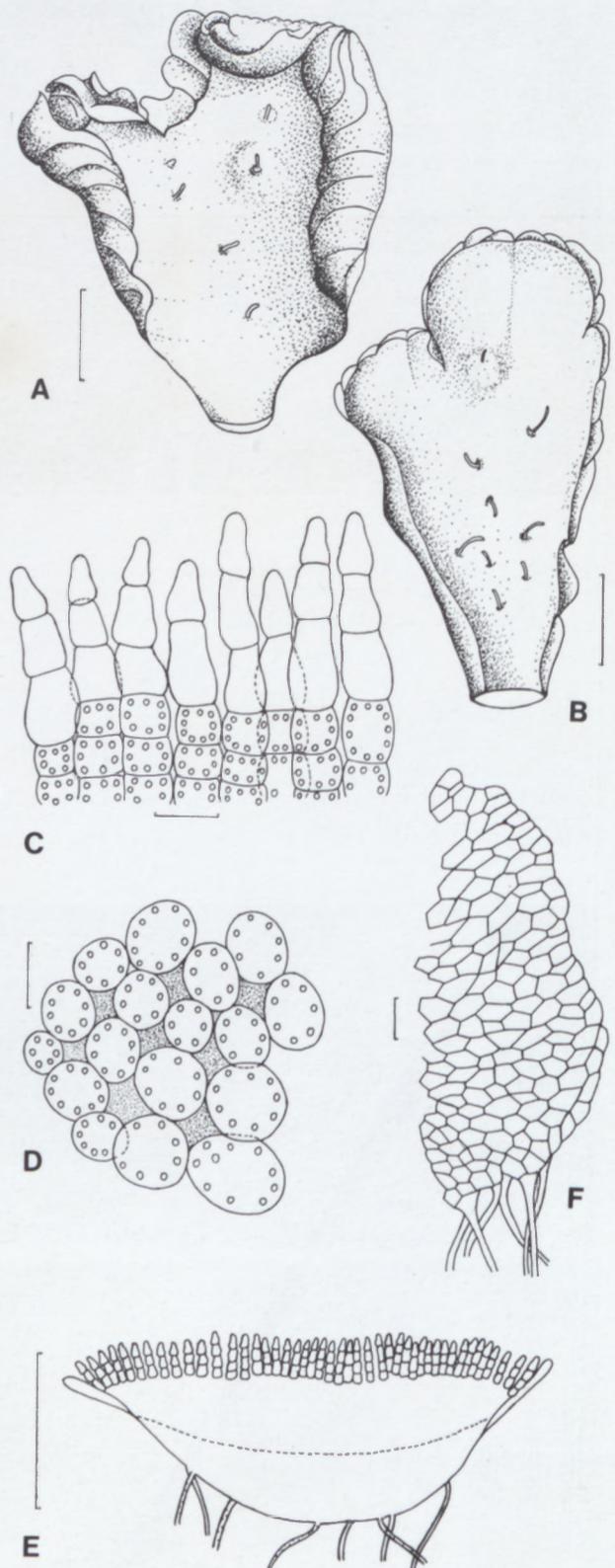


FIGURE 5.—*Riccia ampullacea*. Morphology and anatomy. A, thallus dry; B, thallus wet; C, transverse section through dorsal cell pillars; D, paradermal section through assimilation tissue, air canals stippled; E, transverse section through branch; F, scale. A–F, Van Rooy 3573. Scale bar on A, B, E = 1 mm; C, D, = 50 μm ; F = 100 μm .

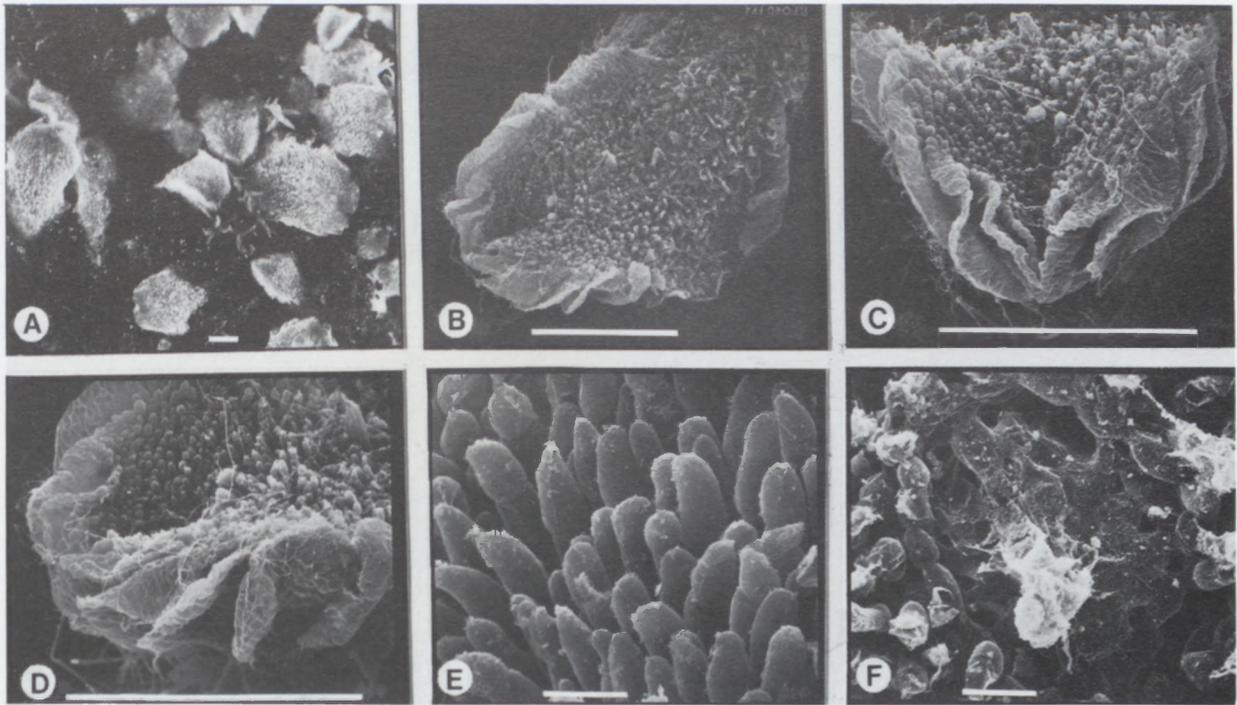


FIGURE 6.—*Riccia ampullacea*. Morphology and anatomy. A, thalli in cultivation; B, branch seen from above; C, apex with groove and scales; D, apical scales seen from the side; E, dorsal cell pillars; F, sporangium emerging through dorsal cell covering, antheridial neck obscuring archegonial neck. A–F. *Van Rooy 3573*. A, by A. Romanowski; B–E, SEM micrographs. Scale bar on A–D = 1 mm; E, F = 50 μ m.

ornamentation finely reticulate and radiately ridged; distal face with areolae $\pm 3-5 \mu$ m wide, but rarely complete, mostly confluent and walls anastomosing into thick, high ridges, radiating from the centre to the margin (Figure 7C–F); proximal face with triradiate mark distinct or

indistinct, numerous small, less than 5 μ m wide, mostly incomplete areolae on each facet, walls granulate, raised at nodes, sometimes anastomosing into short, semi-radiating ridges (Figure 7A, B). *Chromosome number* $n = 16$ (Bornefeld 1989).

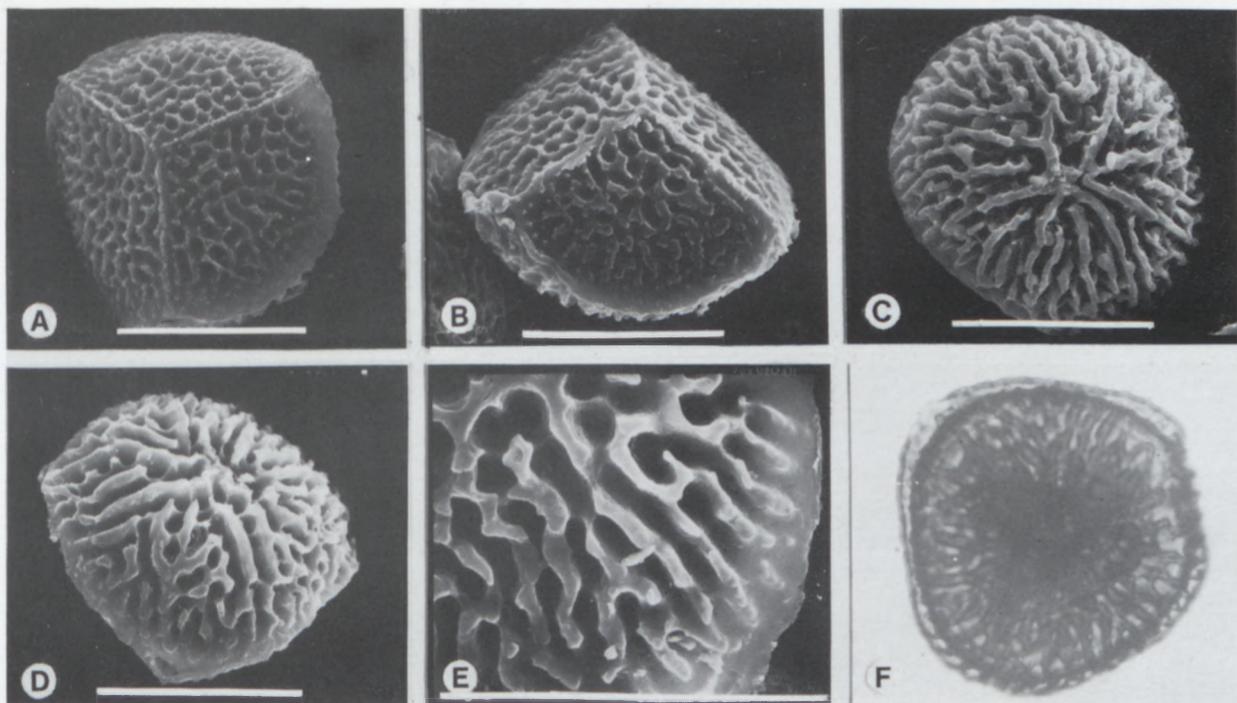


FIGURE 7.—*Riccia ampullacea*. Spores. A, proximal face; B, proximal face, side view; C, F, distal face; D, distal face, side view; E, radiating ridges on distal face. A, B, D–F, *Van Rooy 3573*; C, *Van Rooy 3164a*. A–E, SEM micrographs; F, LM photograph. Scale bar on A–E = 50 μ m; diameter of spore on F $\pm 100 \mu$ m.

R. ampullacea is rather similar to *R. parvo-areolata* Volk & Perold (1984), as both have wide, concave thalli when dry, with large hyaline scales and dorsal cell pillars consisting of 3–4 elongated cells. However, in *R. ampullacea* the dorsal cells are frequently somewhat constricted in \pm the middle and ampulla-shaped (ampulla = small antique Roman glass phial, used for collecting and storing tears, and variously shaped, but generally constricted at the neck or in the middle), hence the specific epithet. Furthermore, its numerous antheridial necks are conspicuous and often in very close association with the archegonial necks, resulting in the fertilization of many archegonia. The spores generally have thick radiating ridges on the distal face. Geographically the two species are widely separated, as *R. ampullacea* appears to be restricted to high altitudes of 2 000–3 000 m above sea level, at mountainous localities in the Drakensberg of Lesotho and Natal, and the Witteberg of the eastern Cape Province, whereas *R. parvo-areolata* is known only from the western Cape. *R. ampullacea* grows in association with *Riccia montana* Perold, *Plagiochasma* sp. and with the moss species, *Bryum alpinum* Huds. ex With. and *Brachymerium acuminatum* Harv. in Hook., in damp places on humus-rich soil overlying basalt outcrops.

SPECIMENS EXAMINED

NATAL.—2929 (Underberg): Sani Pass, along basalt cliffs below escarpment, E of Border Post (–CA), *Van Rooy 3635* (PRE).

O.F.S.—2927 (Maseru): Thaba Patswa, between Hobhouse and Tweespruit, on top of plateau (–AC), *Du Preez 2106a* (PRE).

LESOTHO.—2828 (Bethlehem): 5 km from New Oxbow Lodge, on road to Mokhotlong, at waterfall over basalt cliff, in tributary of Fanana River, near Maluti Club Ski Chalet, S aspect, alpine heath-grassland (–DC), *Van Rooy 2971* (PRE); 6 km from New Oxbow Lodge, on road to Mokhotlong, at waterfall over basalt outcrops (–DC), *Van Rooy 3045* p.p., 3050 (PRE). 2928 (Marakabei): Khubelu River crossing between Tlokoeng and Mapholaneng, cliffs along river banks, SE aspect (–BB), *Van Rooy 3240* (PRE); 19 km from Mokhotlong to Tlokoeng, along small tributary of Senqu River, wooded stream in grassland with cultivation (–BD), *Van Rooy 3164a* (PRE); 35 km from Mokhotlong on road to Butha Buthe, between Tlokoeng and Mapholaneng, cliffs overlooking Khubelu River, S aspect (–BD), *Van Rooy 3207* (PRE).

CAPE.—3027 (Lady Grey): Witteberg Mountains, basalt cliffs at top of Jouberts Pass, 10 km E of Lady Grey (–CB), *Van Rooy 2724* (PRE).

3. *Riccia trachyglossum* Perold, sp. nov.

Thallus monoicus, ?annuus, glaucus, nitens, proximaliter furfuraceus ut in lingua exasperata (inde nomen); rami usque ad 5,0 mm longi, 1,0–2,0 mm lati, 0,7–0,9 mm crassi, 1,5–2 plo latiores quam crassi in sectione; squamae hyalinae, aliquantum ultra margines thalli productae. Epithelium dorsalis ex columnis liberis 2 vel 3 (vel 4)-cellularibus \pm 180 μ m longis constans, cellulis globosis. *Sporae*: (70–)80–87(–92) μ m diametro, trianguloglobulares, polares alatae, imperfecte reticulatae, superficie distali trans diametrum cum \pm 8 areolis irregularibus. *Chromosomatum numerus* \bar{n} = 16 (Bornefeld 1989).

TYPE.—Lesotho, 2929 (Underberg): Sani Top, mountain slopes west of Border Post, on soil bank of small pond in bog (–CA), *Van Rooy 3539* (PRE, holo.).

Thallus monoicus, ?annual, in crowded gregarious patches or in partial rosettes or scattered, blue-green,

glistening, proximally dull and roughened, with hyaline scales extending slightly beyond thallus margins (Figures 8A; 9A); smallish, once to twice symmetrically or asymmetrically furcate, branches narrowly to medium divergent (Figure 9B), up to 5,0 \times 1,0–2,0 mm, 0,7–0,9

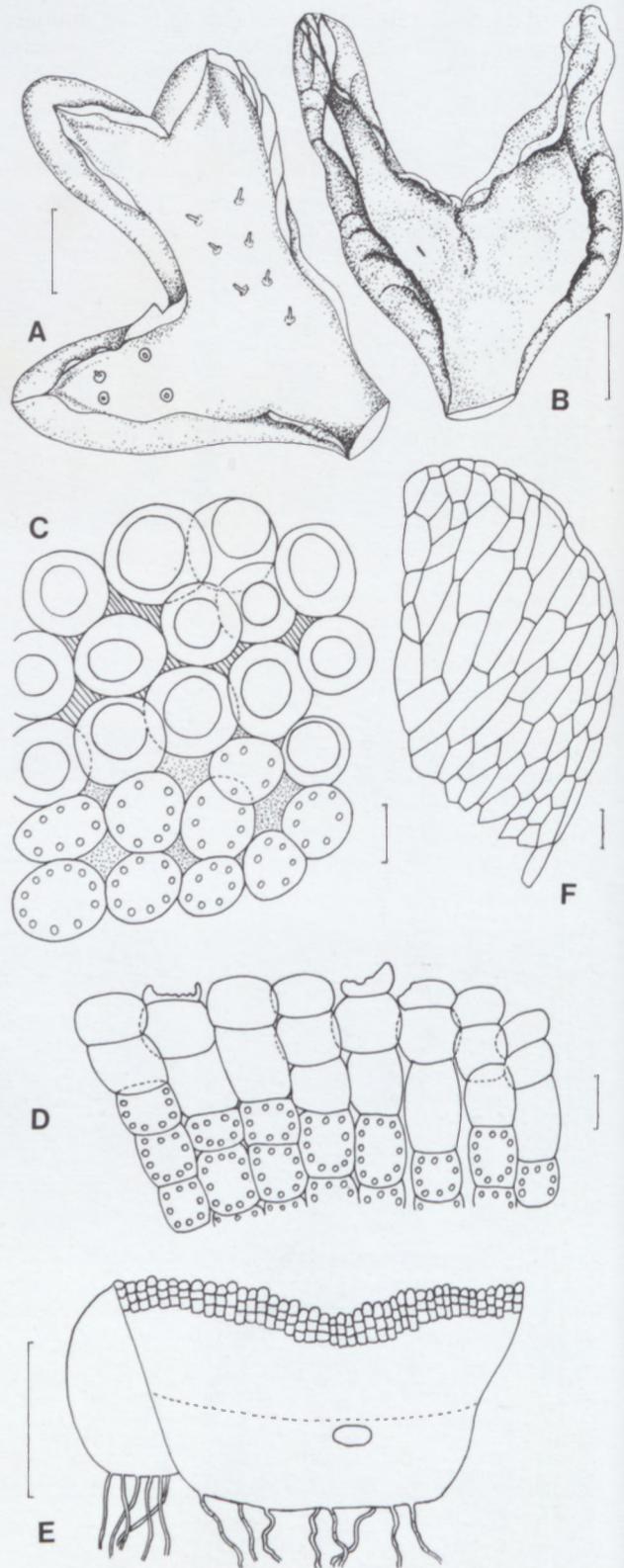


FIGURE 8.—*Riccia trachyglossum*. Morphology and anatomy. A, thallus wet; B, thallus dry; C, dorsal cells seen from above, air pores hatched, below, assimilation tissue with air canals stippled; D, transverse section through dorsal cell pillars; E, transverse section through branch; F, scale. A, C, D, F, S.M. Perold 2530; B, Van Rooy 3539; E, J.M. Perold 33. Scale bar on A, B, E = 1 mm; C, D = 50 μ m; F = 100 μ m.

mm-thick, i.e. 1.5 times to twice wider than thick in section (Figure 8E), obtuse to ovate, apex keeled (Figure 8A), dorsal face distally grooved (Figure 9C), the sides raised, tumid, margins subacute, flanks rather steep to sloping obliquely, green, covered by hyaline scales; ventrally gently rounded to almost flat, green; when dry (Figure 8B), margins apically inflexed, meeting along midline, otherwise raised or incurved, dorsally white, scurfy, scales only apically visible, flanks yellowish to reddish brown occasionally.

Anatomy of thallus: dorsal epithelium in free-standing cell pillars (Figures 8D; 9E), $\pm 180 \mu\text{m}$ tall, $\frac{1}{4}$ the thickness of thallus in section, consisting of 2 or 3 (or 4), fragile, hyaline cells, with bulging sides, top cell \pm globose, rarely conical, $32-45 \times 47-55 \mu\text{m}$, second cell $55-62 \times 47-62 \mu\text{m}$, basal cell $75-100 \times 52-65 \mu\text{m}$; from above, when fresh, dorsal cells irregular in size, inflated, air pores 4-sided (Figure 8C); assimilation tissue $\pm 350 \mu\text{m}$ thick, almost $\frac{1}{2}$ the thickness of thallus in section, generally consisting of 6 or 7 cells in vertical columns, $50-65 \times 58-62 \mu\text{m}$, enclosing (3-)4(-5)-sided air canals (Figure 8C), $\pm 25 \mu\text{m}$ wide; storage tissue up to $350 \mu\text{m}$ thick in section, cells angular, closely packed, $37-55 \mu\text{m}$ wide; rhizoids arising from ventral epidermis and base of scales, mostly smooth, occasionally tuberculate, $15 \mu\text{m}$ wide. Scales rounded, imbricate (Figure 8F; 9D), hyaline, $750 \times 500-550 \mu\text{m}$, cells in body of scale long-rectangular to short-hexagonal, $112-137(-187) \times 42-65 \mu\text{m}$, smaller towards base, at margin brick-shaped to irregularly shaped (Figure 8F). **Antheridia** (Figure 9F) with hyaline necks $\pm 125 \mu\text{m}$ long, in 1 or 2 rows along middle of thallus (Figure 8A). **Archegonia** with thin, purple necks. **Sporangia** bulging dorsally along midline, numerous, containing ± 580 spores each. **Spores** (70-)80-87(-92) μm in diameter, triangular-globular, polar, light brown, semi-transparent,

with wing $\pm 5 \mu\text{m}$ wide, rather wider at perforated angles, margin finely crenulate; ornamentation reticulate, dissimilar on 2 faces: distal face (Figure 10 C-F), with ± 8 angular to irregular areolae across diameter, $5-8 \mu\text{m}$ wide, central ones often incomplete, walls sprinkled with granules, raised at nodes; proximal face with triradiate mark distinct, facets with areolae incomplete, $\pm 3-5 \mu\text{m}$ wide, walls irregular, thin (Figure 10A, B). **Chromosome number** $n = 16$ [Bornefeld 1989 (as *R. furfuracea*, J.M. Perold 33, 34)].

Due to the collapse of many dorsal cells, especially in the proximal part of the thallus, the dorsal face has a rather roughened or scurfy appearance. For this reason, the specific epithet, *trachyglossum* has been chosen. It is derived from a Greek phrase, meaning 'rough tongue'; the word is treated as a noun in apposition to the generic name, and therefore has a neuter ending, even though the name *Riccia* is feminine.

R. trachyglossum is distinguished from other species in section *Pilifer*, which have globose to bulging dorsal cells, by its somewhat smaller size, rather low hyaline scales and raised, tumid margins toward the apex. The spores are generally incompletely reticulate on both faces. It is so far known only from Lesotho, at altitudes $\pm 2\,500-3\,000$ m above sea level, where it grows on soil banks in bogs, together with other *Riccia* spp.: *R. stricta* (Lindenb.) Perold, *R. crystallina* L. emend. Raddi, *R. sorocarpa* Bisch. and with Cyperaceae spp.

SPECIMENS EXAMINED

LESOTHO.—2927 (Maseru): about 37 km E of Maseru, top of Bushman's Pass (Lekhale La Baroa), on soil at edge of exposed flat rock outcrop (-BD), J.M. Perold 33, 34 (PRE). 2929 (Underberg): Sani Top, S of Border Post, between earth dam and bog, on soil banks (-CA), S.M. Perold 2530, 2531 (PRE).

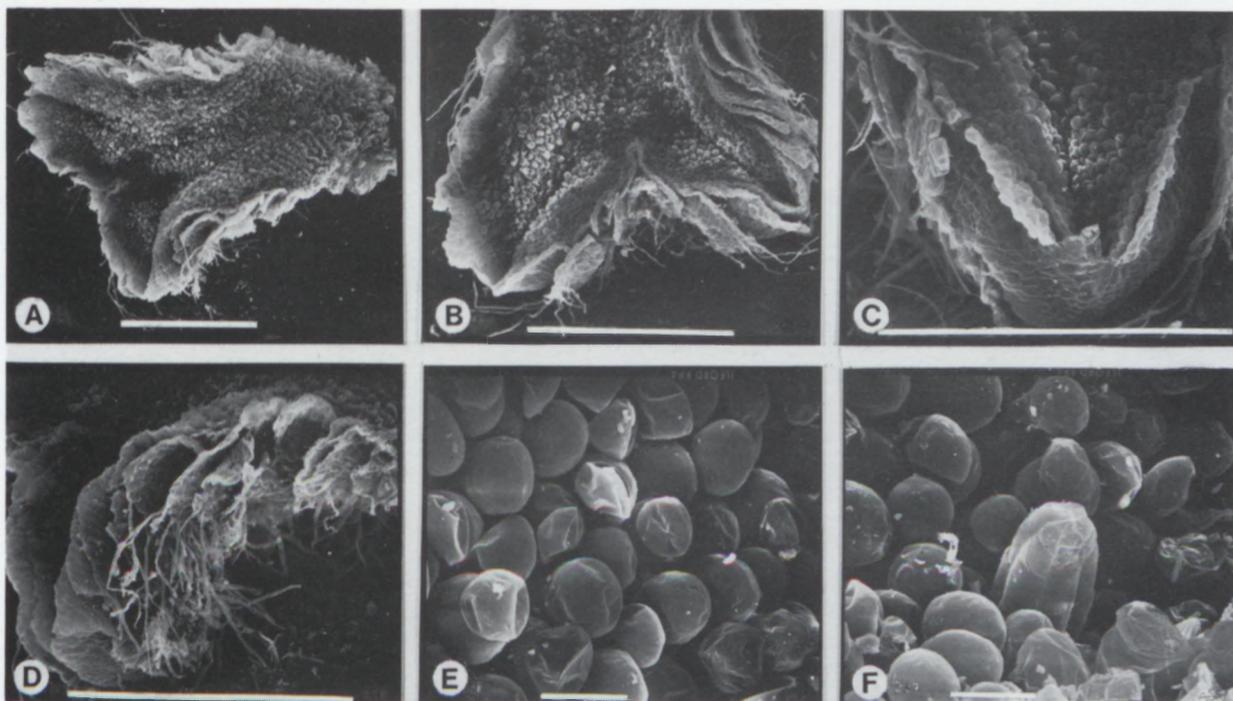


FIGURE 9.—*Riccia trachyglossum*. Morphology and anatomy. A, B, thallus from above; C, apex with groove; D, apical scales seen from the side; E, dorsal cell pillars; F, antheridial neck and dorsal cells. A-F, S.M. Perold 2531. A-F, SEM micrographs. Scale bar on A-D = 1 mm; E, F = 50 μm .

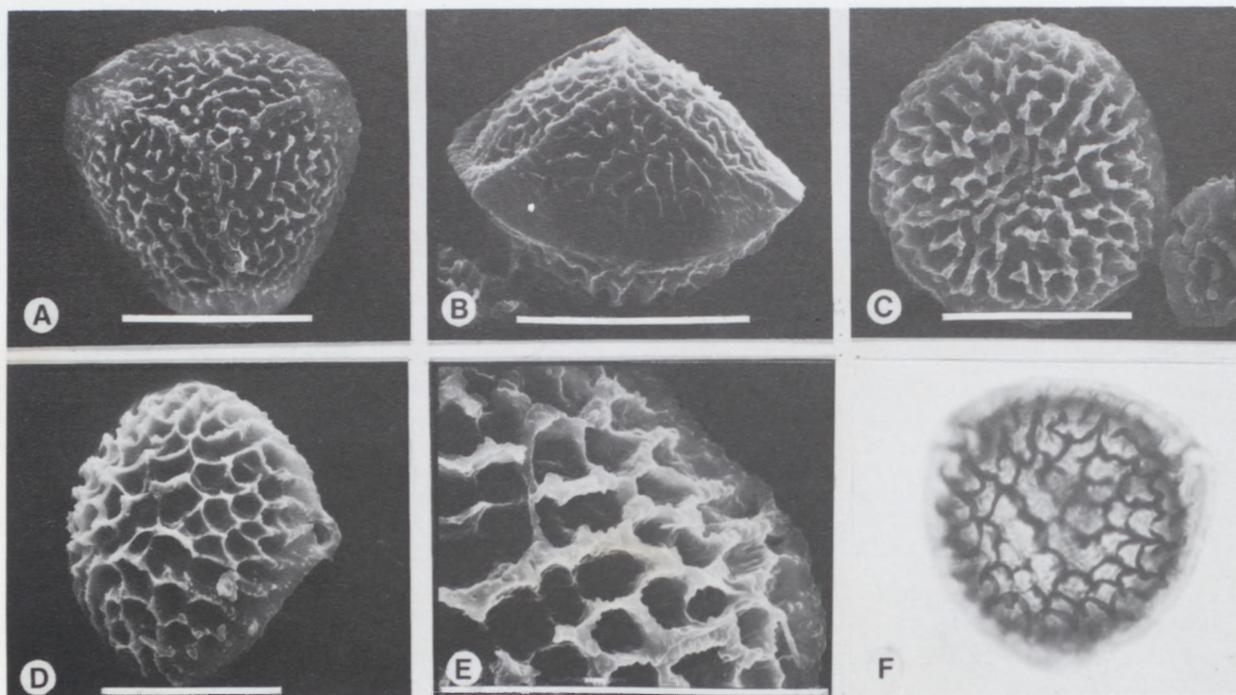


FIGURE 10.—*Riccia trachyglossum*. Spores. A, proximal face; B, proximal face, side view; C, F, distal face; D, distal face, side view; E, areolae on distal face. A, C, J.M. Perold 33; B, S.M. Perold 2530; D–F, Van Rooy, 3539. A–E, SEM micrographs; F, LM micrograph. Scale bar on A–E = 50 μ m; diameter of spore on F \pm 85 μ m. Drawings by J. Kimpton; SEM and LM micrographs by S.M. Perold.

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