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The hepatics, *Symphyogyna podophylla* and *Pallavicinia lyellii* (Pallaviciniaceae) in southern Africa

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Keywords: Hepaticae, Pallaviciniaceae, *Pallavicinia lyellii*, southern Africa, *Symphyogyna podophylla*, systematics

ABSTRACT

A detailed description of *Symphyogyna podophylla*, illustrated with photographs of the thalli and spores, is presented. It is compared to *S. hymenophyllum*, with which it may be conspecific. The subcosmopolitan *Pallavicinia lyellii*, also occurring in southern Africa, is described and illustrated with photographs.

UITTREKSEL

'n Uitvoerige beskrywing van *Symphyogyna podophylla*, geïllustreer met foto's van die tallusse en spore, word gegee. Dit word vergelyk met *S. hymenophyllum* waaraan dit gelyksoortig mag wees. Die subkosmopolitiese *Pallavicinia lyellii*, wat ook in suidelike Afrika voorkom, word beskryf en met foto's geïllustreer.

INTRODUCTION

Symphyogyna podophylla is locally quite widespread but of rarer occurrence in southern Africa than *S. brasiliensis*, the other species recorded for the region. The latter was recently redescribed and illustrated with photographs (Perold 1992) in order to draw attention to its southern African synonyms *Pallavicinia capensis*, *Symphyogyna valida* and *S. lehmanniana* (Grolle 1980). Sporulating material of *S. podophylla* held at PRE is rare, *Koekemoer 991* (which was recently collected), being only the fourth specimen of this species which has spores.

Arnell (1963), Vanden Berghen (1965), Grolle (1979) and Grolle & Piippo (1986) regard *S. hymenophyllum* (Hook.) Nees & Mont. as conspecific with *S. podophylla*, but this has been questioned, since there appear to be some differences in the spore ornamentation, as seen on SEM micrographs and in the chemistry of plants from New Zealand (E.O. Campbell pers. comm.). This description of *S. podophylla*, illustrated with photographs, is given in the hope that it may help to answer the question whether *S. hymenophyllum* is conspecific with *S. podophylla* or not.

The subcosmopolitan *Pallavicinia lyellii* of the same family Pallaviciniaceae Migula, but different subfamily Pallavicinioideae (Migula) Grolle, is also redescribed and illustrated with photographs. Differences between the genera *Symphyogyna* and *Pallavicinia* are briefly discussed in Perold (1992) and under *Pallavicinia lyellii* below.

Symphyogyna podophylla *(Thunb.) Mont. & Nees* in Gottsche, Lindenberg & Nees, Synopsis hepaticarum: 481 (1846); Arnell: 107 (1963); Vanden Berghen: 157 (1965). Type: Cape, 'Promontorium Bonae Spei', leg. *Thunberg* (25945 UPS, holo.!; S, STR, W, iso.).

Jungermannia podophylla Thunb.: 174 (1800); Thunb.: 738 (1823).

S. rigida Steph.: 112 (1914); Steph.: 69 (1917). Syntypes: Rwanda, Rugege-Wald: ca. 1 900 m, leg. *Mecklenburg 842*; Vulkan-gebiet: Ninagongo ca. 3 500 m, leg. *Mecklenburg 2012* (?G). [Syn. fide Vanden Berghen: 159 (1965)].

S. rhizobola (Schwaegr.) Nees & Mont.: 68 (1836). *Jungermannia rhizobola* Schwaegr.: 31 (1814). Type: Réunion (W, iso.). [Syn. fide Grolle: 267 (1979)]. See Arnell: 109 (1963).

S. harveyana Taylor: 408 (1846). Type: Cape of Good Hope, leg.: *W.H. Harvey* (FH, holo.; NY, S, W, iso.). [Syn. fide Sim: 33 (1926)].

Terricolous, on damp soil; thallus, mostly erect, dendroid shoots in loose mats or tufts, green to olive-green, medium-sized; proximal branches, after initial dichotomy, single, ± 4 mm long, then a further 2 or 3 times dichotomously furcate, with 7 or 8(−12) terminal branches, linear to narrowly ovate, up to 11 mm long, 1.6–2.0 mm wide, 125 μm thick over ventrally slightly bulging costa, lacking rhizoids, but with central, brown conducting strand clearly visible and forking at dichotomies; apex rarely progressively narrowed with a reversion to stipe-like condition and arching down, mostly entire or slightly to deeply notched, bearing 2-celled slime papillae, margins of wings dentate, lacking slime papillae, plane, not undulating or hardly so, bilaterally expanded from ascending wingless stipe (Figure 1H), 4–18 mm long, in transverse section 275 × 500 μm, arising from horizontally creeping and much branched, cylindrical brown rhizome, with numerous smooth ventral rhizoids, ± 12.5 μm wide. *Wings* generally unistratose, but medianly bistratose and grading into flattish costa (Figure 1K), laterally with marginal teeth, remote or closer together, occasionally very blunt, usually with 2(or 3) forwardly directed cells, diverging at an angle of ± 45°, basal cell 62.5 × 37.5 μm (rarely with 2 adjacent cells), top cell bluntly conical, 50 × 30 μm; marginal cells ± rectangular to polygonal (40.0–)67.5–90.0 × 27.5–37.5 μm, 30–35 μm thick in transverse section, their walls and those of 1(or 2) rows of inframarginal cells generally somewhat thicker (Figure 1J), coloured pinkish; laminal cells arching toward margins, polygonal, up to 82.5 × 55.0 μm; epidermal cells along costa narrowly rectangular or long-hexagonal, 75.0–125.0 × 37.5 μm, occasionally bearing 2-celled slime papillae above; chloroplasts numerous, ± 5 μm wide,

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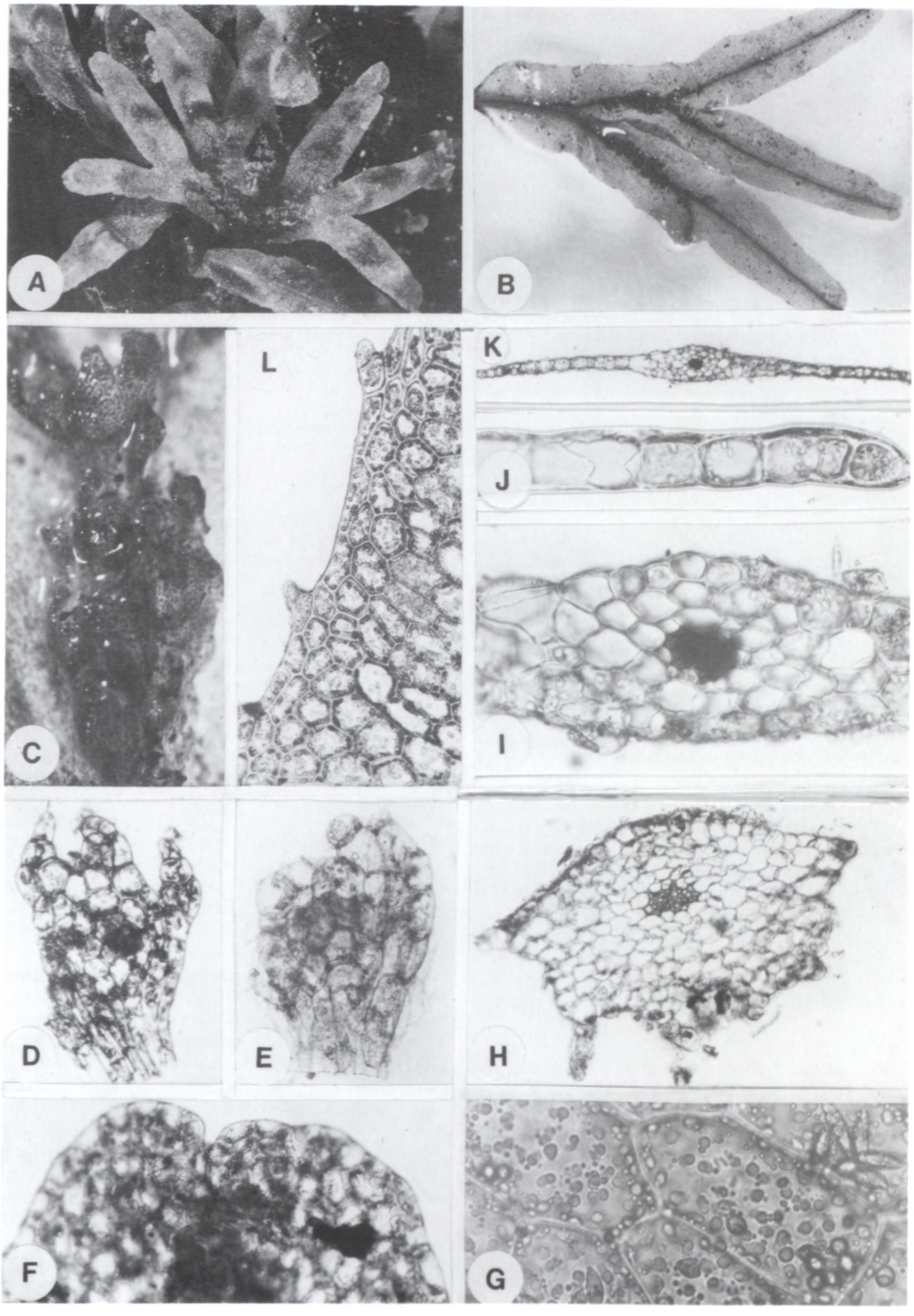


FIGURE 1.—*Symphyogyna podophylla*, plants and androecia. A, male branches in situ; B, branches with rows of antheridial scales along costa, C, some antheridial scales above costa, much enlarged; D, E, excised antheridial scales; F, apex of lobe; G, laminal cells with numerous round chloroplasts and few spindle-shaped oil bodies; H, transverse section of stipe; I, transverse section of costa and central conducting strand, much enlarged; J, transverse section of lateral and thicker-walled marginal cells of lobe; K, transverse section of lobe; L, toothed margin of lobe from above. A–F, H–L, *Koekemoer 991*; G, *Koekemoer 994*. A, × 4; B, × 5; C, × 70; D, E × 100; F, H, L, × 125; G, × 500; I, J, × 250; K, × 50. A–L, LM photographs.

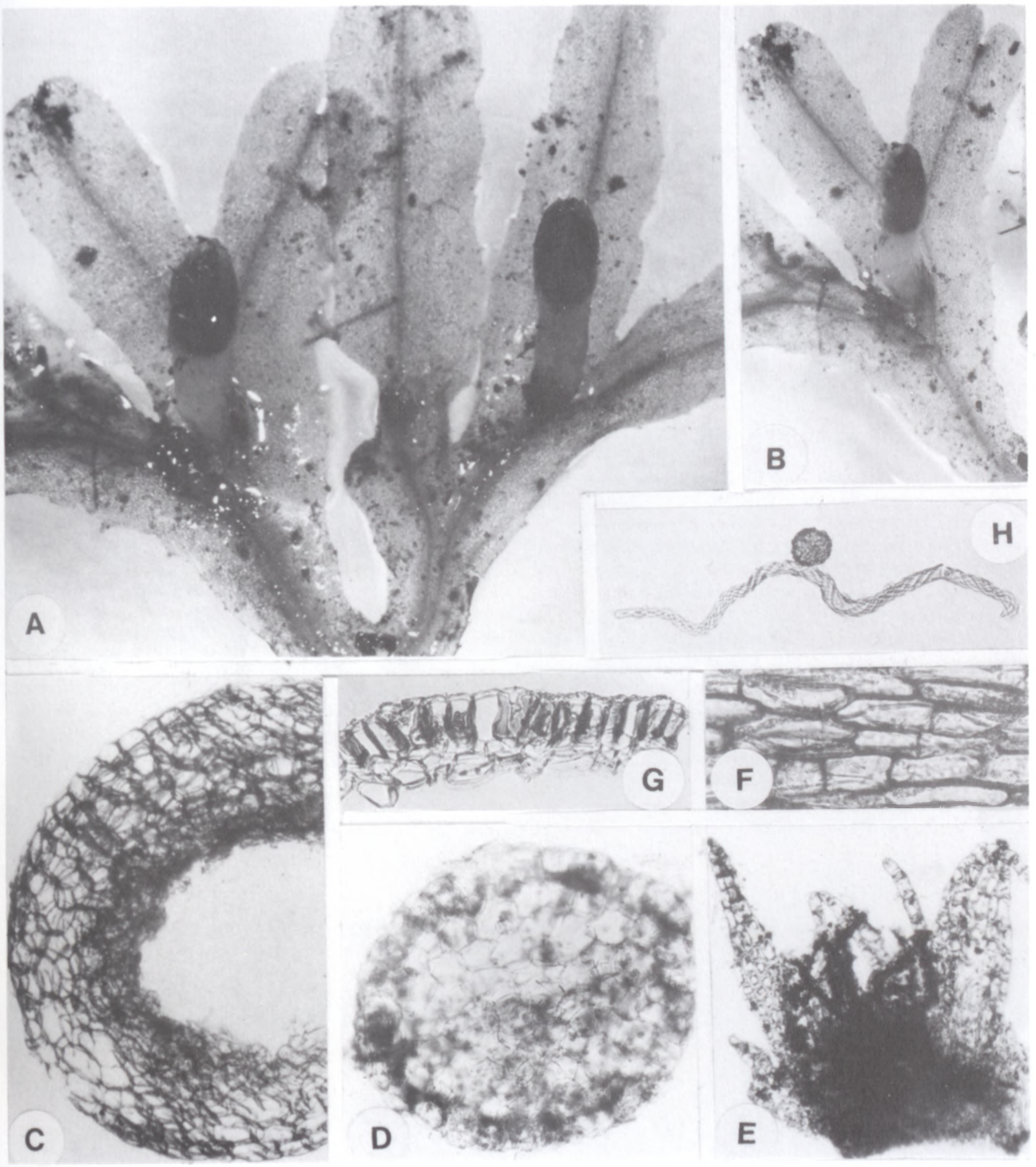


FIGURE 2.—*Symphyogyna podophylla*, female plants. A, B, female branches with capsules above bifurcation of costa; C, part of shoot calyptra in transverse section; D, young seta in transverse section; E, involucral scale and cluster of archegonia; F, outer cells of capsule wall; G, transverse section of capsule wall; H, spore and elater. A–G, *Koekemoer 991*. A, × 10; B, × 8; C, × 100; D, × 125; E, × 50; F, G, × 250. A–G, LM photographs.

entirely filling cells, or clustered along cell walls, several oil bodies also present, spindle-shaped (Figure 1G) and ± 7.5 μm long, or round when viewed end-on. *Costa* with central conducting strand, 37.5 × 50.0 μm, consisting mostly of 12 small, ± 10 × 10 μm, brown, thick-walled, angular cells, surrounded above and below by 3 rows of larger, thin-walled parenchymatous cells (Figure 1I), 20.0–22.5 × 25.0–37.5 μm.

Dioicous. *Androecia* in 1 or 2 dorsal rows over the costa (Figure 1A–C); antheridia 200 × 175 μm, short-stalked, each one individually covered and well hidden by irregularly shaped, forwardly directed scale-like involucre (Figure 1D, E), 175 μm wide at base, up to 450 μm long, irregularly incised at apex. *Gynoecia* generally 2 per frond, dorsally situated above costa at bifurcation of conducting strand (Figure 2A, B), containing several archegonia and subtended by posteriorly inserted involucre (Figure 2E), 675 μm wide at base, deeply laciniate to filiform above, cells short- to long-rectangular, 45.0–125.0 × 27.5–47.5 μm. *Calyptra* thickening and enlarging into a fleshy shoot calyptra, ± 4 mm long and up to 8 cell

rows or 250 μm thick in transverse section (Figure 2C), with several unfertilized archegonia remaining attached near the top (Figure 2A). *Capsule* cylindrical, 1800 × 850 μm, opening along several longitudinal valves, remaining attached above, wall brown, 2 cell layers thick (Figure 2G), outer cells elongate (Figure 2F), 62.5–107.5 × 17.5 μm, walls thickened, inner cells thin-walled. *Seta* erect when young, 480 μm in diameter, with ± 36 cortical cells, ± 50.0 × 32.5 μm, medullary cells slightly larger, 62.5 × 37.5 μm, angular, thin-walled (Figure 2D). *Spores* light brown, ± globular, 20–25 μm in diameter, ornamentation nodular, with some very irregular, broad flattened granular ridges (Figure 3A–C), meshes sometimes distinct, but mostly not; proximal face with small round area with compact, punctate ornamentation (Figure 3D, E). *Elaters* brown, hardly tapering toward ends, 305–330 × 7.5 μm, 2-spiral (Figures 2H; 3F).

Symphyogyna podophylla is quite rarely collected in the Transvaal and Natal, but fairly frequently in southwestern, southern and eastern Cape. There are no records from the Orange Free State (Figure 4). From other parts of Africa, Arnell (1960) has reported it from Ethiopia (= Abyssinia) and Vanden Berghen (1965) has also been reported it from Ethiopia (= Abyssinia) as well as from Tanzania and the Congo Republic (Kivu Province). Best (1990) records both *S. podophylla* as well as its synonym, *S. harveyana*, from Zimbabwe. Váňa *et al.* (1979) report *S. podophylla* from Zaïre, Rwanda and Réunion; Bizot & Pócs (1974) found it to occur in Kenya on Mt Kenya and the Aberdare Mountains in montane mossy forests and subalpine moorland; Bizot *et al.* (1976) report it from Malawi. Some of these specimens may, however, belong to *Jensenia spinosa* (= *Pallavicinia spinosa*), with which *S. podophylla* has sometimes been confused (Grolle 1979).

DISCUSSION

In such a wide ranging species one would expect some local variation. A Sim specimen, *PRE-CH 1491*, from Table Mountain has bistratose wing margins, and medianly there are four layers of cells. The determination was kindly confirmed by Dr Grolle. Arnell (1963) regarded the size of the marginal teeth in *S. podophylla* as having no taxonomic significance, nor the thickness of the walls in the marginal cells. He also did not find distinct differences between the erect and procumbent forms, there being a continued gradation between the two.

In a comparison of transverse sections taken at the middle of the apical lobes of specimens of *S. podophylla* and of *S. hymenophyllum* from Juan Fernandez, Arnell (1956) stated that the thickness of the 'nerves' and the size of the teeth in the margin of the thalli vary but little. Arnell (1963) also compared specimens of *S. hymenophyllum* from Tristan da Cunha and Inaccessible Island as well as from Réunion and from Kilimanjaro, with numerous specimens of *S. podophylla* from the Cape (e.g. Thunberg's collections) and could not find any real difference between them. On the other hand, Gottsche *et al.* (1846) distinguished *S. podophylla* from *S. hymenophyllum* by the 'frondis laciniis basi attenuatis subpetiolatis' of the former.

In the present study, a photograph of the transverse section of a lobe (Figure 1K) was compared with the drawing of a section, taken midway of a terminal lobe, by Hässel de Menéndez (1961a: fig. 10c) and the resemblance is unmistakable. It may thus be that Arnell (1963) was indeed correct in placing *S. hymenophyllum* in synonymy under *S. podophylla*. Scott (1985) also recognizes the Australian species as *S. podophylla*. Should

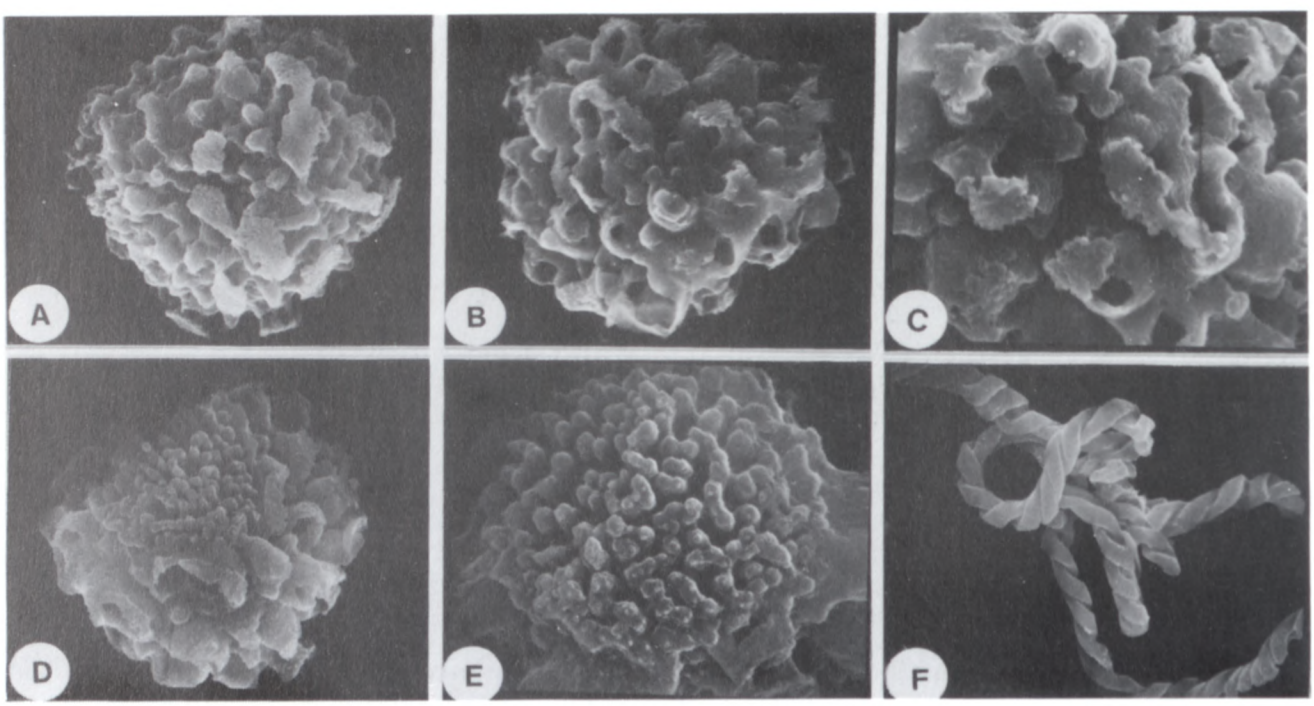


FIGURE 3.—*Symphyogyna podophylla*, spores and elaters. A, B, distal face; C, distal face much enlarged; D, part of proximal face with punctate area; E, punctate area on proximal face, much enlarged; F, elaters. A, *Koekemoer 991*; B–E, *Doidge 168*; F, *Hilner CH 1499*. A, × 1835; B, D, × 1530; C, E, × 2524; F, × 720.

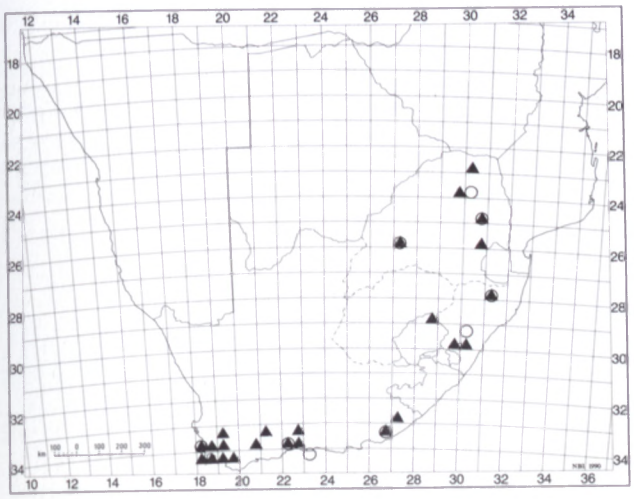


FIGURE 4.—Distribution of *Symphyogyna podophylla*, ▲; and *Pallavicinia lyellii*, ○, in southern Africa.

S. podophylla and *S. hymenophyllum* eventually conclusively prove to be conspecific, then *S. podophylla* would be circumsubantarctic in its range, since *S. hymenophyllum* is reported to occur in South America, and New Zealand is the type locality. Pócs (1976), in discussing the presence of subantarctic bryophytes in tropical Africa, remarks on the high number of subantarctic elements that are present and reckons that they may have migrated northwards by means of mountain hopping.

Symphyogyna podophylla is a less common and smaller plant than *S. brasiliensis*. It can be distinguished by: its growth form which is generally flabellate from an erect stalk arising from a creeping rhizome; the lobe margins which are toothed and hardly undulate; it rarely fruits and the spore ornamentation is characterised by broad, flat, roughened, irregular ridges, sometimes forming 'loops', and not by narrow, erect ridges as in *S. brasiliensis*. *Symphyogyna podophylla* and *S. brasiliensis* are the only two species of *Symphyogyna* occurring in southern Africa and are placed in the subfamily Symphyogynoideae (Trev.) Grolle.

Note: the collector of the type specimens of *S. rigida* is stated to be Mildbraed by Stephani (1917) and Geissler & Bischler (1990). However, Mildbraed was the publisher of 'Wissenschaftliche Ergebnisse der Deutschen Zentral-Afrika-Expedition 1907–1908'; the leader of the expedition, Adolf Friedrich, Duke of Mecklenburg, should be cited as collector, as was done by Vanden Berghen (1965) and now by me.

SPECIMENS EXAMINED

TRANSVAAL.—2230 (Messina): Zoutpansberg, Piesanghoek, at Waterfall, (–CC), *M. Bosman 206* (PRE); Piesanghoek, (–CC), *M. Bosman 943* (PRE); Entabene, (–CC), *M. Bosman 1774* (PRE); Entabene, (–CC), *Bottomley 2865* (PRE); De Hoek State Forest, Grootbosch Hiking Trail, ± 9.5 km from start, (–CC), *Koekemoer 991* (PRE); Zoutpansberg, (–CC), *Obermeyer 1941C* ex herb. Tvl. Museum, *Obermeyer 3109* (PRE). 2329 (Pietersburg): Haenertsburg, (–DD), *H.A. Wager CH 3808* (PRE). 2430 (Pilgrims Rest): Graskop, Fairyland, (–DD), *Glen 2982* (PRE); Hebron Mountain, in second cleft on plateau, against vertical stream wall, (–DB), *Vorster 1000* (PRE); Hebron Mountain, northern slope, gallery forest along stream in plantation, on stone and soil, (–DB), *Vorster 1635* (PRE); Mariepskop, Blyde River footpath, on wet earth bank along stream in forest, (–DB), *Vorster 1516* (PRE). 2527 (Rustenburg): Magaliesberg, lower Tonquani Kloof, cliff face, in dripping water, (–CA), *H. Anderson 1249, 1250* (PRE); Magaliesberg range, Crystal Waters, 13 km E of Rustenburg, in constant drip of waters of sheer chasm, into a stream a few feet below, (–CA), *Mogg 34818* (PRE). 2530 (Lydenburg), Kaapsche Hoop, (–DB), *V.A. Wager 62* (PRE).

NATAL.—2731 (Louwsburg): Zululand, Vryheid Dist., Ngoni Forest, (– CD), *Forester CH 1505, CH 1529, CH 1530* (PRE). 2828 (Bethlehem): Mont-aux-Sources, (–DD), *Doidge 168* (PRE). 2929 (Underberg): Donnybrook, Gala Bush, (–DD), *Doidge CH L3112* (PRE). 2930 (Pietermaritzburg): Edendale, Gordon Falls, (–CB), *T.R. Sim CH 1495* (PRE); Hilton Road, (– CB), *T.R. Sim 8242* (PRE).

CAPE.—3227 (Stutterheim): Hogsback, Victoria East, (–CA), *Van der Bijl 75* (PRE); Hogsback, in shade, streambank, (–CA), *Young CH 1507* (PRE); Evelyn Valley, (–CB), *T.R. Sim CH 1522* (PRE). 3318 (Cape Town): Table Mountain, Disa Gorge, (–CD), *S. Arnell 1059, 1099, 3932* (PRE); Table Mountain, Window Gorge, (–CD), *Bews CH 1517* (PRE); Table Mountain, Skeleton Gorge, (–CD), *Bews 8482* (PRE); top of Table Mountain, (–CD), *Bews 8516* (PRE); Table Mountain, Woodhead Tunnel Gorge, (–CD), *Bews 8519* (PRE); in spring at base of Lion's Head, (–CD), *Bews CH 1490* (PRE); Table Mountain, (–CD), *Bolus CH 1496* (PRE); Table Mountain, Skeleton Ravine, (–CD), *Bolus CH 1521* (PRE); Table Mountain, (–CD), *Michell CH 1489* (PRE); eastern slopes of saddle between Table Mountain and Devil's Peak, on wet and partly shaded rocks, (–CD), *Pillans 3548* (PRE); Devil's Peak, The Grottos, (–CD), *T.R. Sim CH 1492* (PRE); Table Mountain, Window Gorge waterfall, (–CD), *T.R. Sim CH 1493* (PRE); Table Mountain, Slongoli, (–CD), *T.R. Sim CH 1494* (PRE); Table Mountain, Woodhead tunnel intake, (–CD), *T.R. Sim CH 1506* (PRE); Cape Town, Platteklip stream, (–CD), *T.R. Sim CH 1511* (PRE); Newlands ravine, (–CD), *T.R. Sim CH 1527, CH 1528* (PRE); Table Mountain, (–CD), *H.A. Wager 4* (PRE). Without locality, *H.A. Wager 3828* (PRE); Stellenbosch, Paradise Ravine, growing in dense masses, (–DD), (label in Duthie's handwriting), ex Herb., *Sim CH 1510* (PRE); Stellenbosch Mountain, above Brandwacht, lower slopes facing west, wet streamside, (–DD), *Oliver 9028* (PRE). 3319 (Worcester): Tulbagh Dist., Sneeugat Valley, (–AA), *Thorne CH 2877* (PRE); Groot Drakenstein Mountains, (–CC), *Primos CH 1504* (PRE). 3320 (Montagu): Tradouw Pass, S of Barrydale near waterfall in forested kloof, (–DC), *Magill 6174* (PRE). 3321 (Ladismith): Seven Weeks Poort, (–AD), *Thorne CH 1543* (PRE). 3322 (Oudtshoorn): Meiringspoort, in deep shade in cracks of vertical rock wall, almost under waterfall, (–BC), *Jacobsen 2253* (PRE); Montagu Pass, wet rock face near Stinkhoutdraai, (–CD), *S.M. Perold 1547* (PRE); The Wilderness, George, (–CD), *Taylor CH 1519* (PRE); Saasveld, Groeneweide, (–DC), *Koekemoer 994* (PRE). 3326 (Fort Beaufort): near Grahamstown, Paradise Kloof, Coldstream, (–BC), *Hilner CH 1499* (PRE). 3227 (Stutterheim): Hogsback, (–CA), *Van der Bijl CH 1497* (PRE); Hogsback, in shade, streambank, (–CA), *Young CH 1507* (PRE); Evelyn Valley, (–CB), *T.R. Sim CH 1522* (PRE). 3418 (Simonstown): kloof near Chaplin Point, (–AB), *T.R. Sim CH 1501* (PRE); Kogelberg, near Gordon's Bay, (–BB), *Mogg CH 939* (PRE); Hottentot Hollands Mts, (–BB), *Thorne CH 3096* (PRE). 3419 (Caledon): Riviera Kloof, Hermanus Dist., (–AC), *Louwrens CH 2889* (PRE); Mossel River, (–AD), *Potts 26* (PRE); Oudebos, Zonder Einde, (–BB), *Thorne CH 3106* (PRE).

Pallavicinia lyellii *(Hook.) Carruth.* in Journal of Botany, British and Foreign 3: 302 (1865) (*Pallavicinius*); Sim: 32 (1926); Müller: 519 (1951–1958); Hässel: 264 (1961b); Hodgson: 223 (1968); Grolle & Piippo: 60 (1986).

Jungermannia lyellii Hook.: tab. 77 (1816). Type: England, Hampshire, New Forest, 'Cadman bog', 6 May 1812, *Lyell* (BM, lecto. fide Grolle & Piippo 1986).

Pallavicinia pilifera Steph.: 271 (1891); Steph.: 10 (1900); Arnell: 112 (1963); Vanden Berghen: 164 (1965). Type: W Africa, Sao Tomé Island, *Quintas (G 12058)* (G, holo.; G, M, S, W, syn.). Synonymy fide Vanden Berghen: 150 (1972).

For detailed synonymy see Grolle & Piippo (1986).

Terricolous, growing on damp soil; thallus, prostrate and creeping (Figure 6A), in crowded, overlying, caespitose mats, dark green, mostly simple, occasionally dichotomously branched, or ventrally from the midrib, medium-sized to large, up to 60 × (2.0–)4.0–6.5 mm, 320–350 μm thick over ventrally bulging costa from

which, at intervals, arise dense reddish brown, smooth, translucent rhizoids 12.5–20.0 μm wide; central conducting strand brown, clearly visible from above, forking at dichotomies; apex entire or with shallow notch, bearing 2-celled slime papillae (Figure 5F), also along margins of wings, which are undulating, almost entire or with remote teeth, expanded bilaterally from wingless stipe, 375 × 750 μm in transverse section. *Wings* unistratose, bordered by a row of mostly long-rectangular or 5-sided cells (27.5–)50.0–62.5 × 27.5–45.0 μm, marginal teeth generally small and blunt (Figure 5D), only 1- or 2-celled, 25.0 × 37.5 μm, toward apex often larger, up to 5-celled, forwardly directed (Figure 5E); laminal cells polygonal, some hexagonal, 57.5–87.5 × 27.5–45.0 μm, in transverse section 42.5 μm thick, containing numerous chloroplasts, 5.0–7.5 μm, oil bodies green, nodular, 8–12 per cell

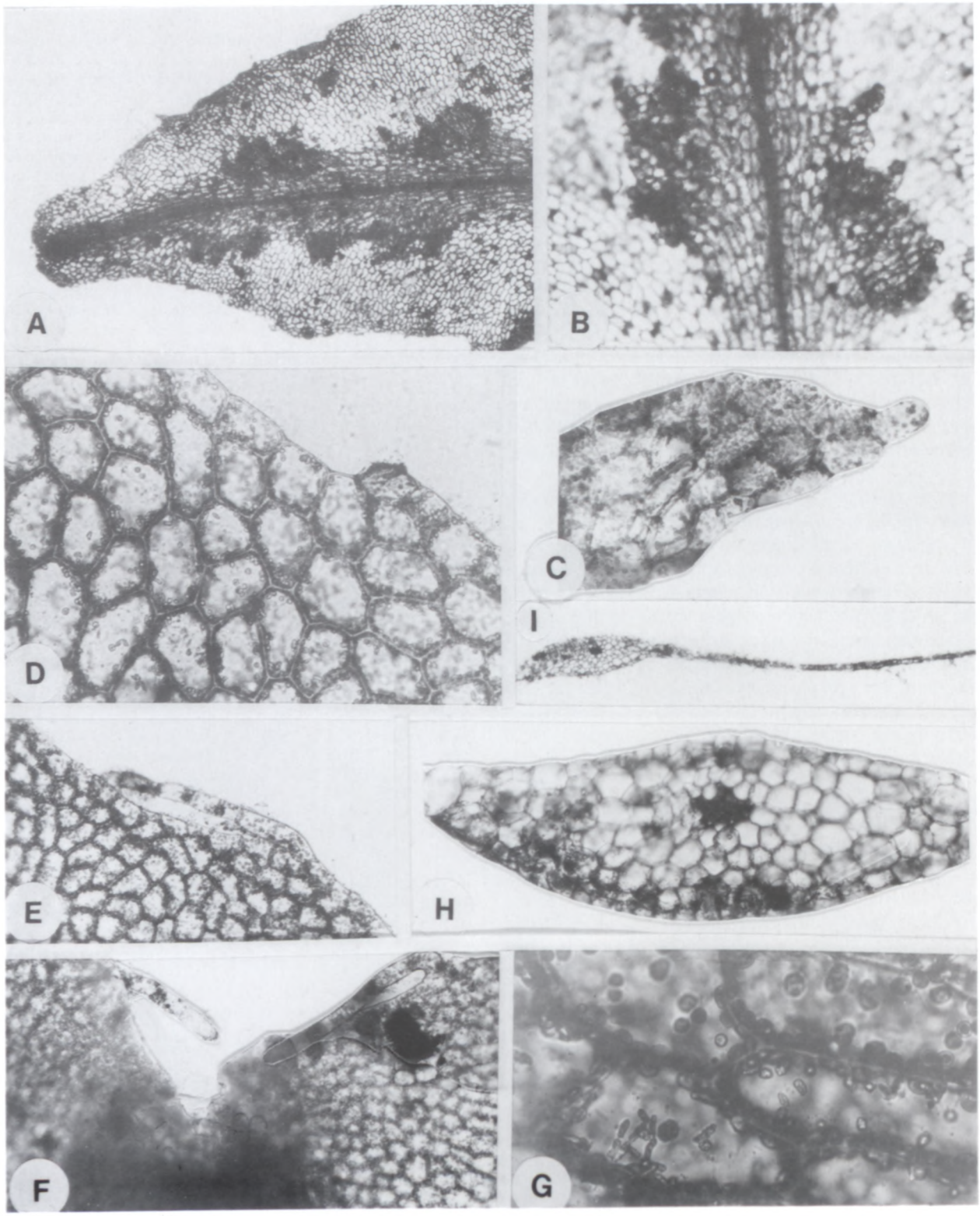


FIGURE 5.—*Pallavicinia lyellii*, plants and androecia. A, male branch with androecia laterally situated above costa; B, male scales more enlarged; C, part of male scale, excised; D, margin of lobe, with blunt tooth; E, long marginal tooth, near apex; F, notched apex with 2-celled slime papillae, and long marginal teeth; G, laminal cells from above, containing chloroplasts and rod-like oil bodies; H, transverse section of costa and central conducting strand, much enlarged; I, transverse section of costa and wing on one side only. A–C, *Glen 2882*; D–I, *Koekemoer 990*. A, × 30; B, × 70; C, × 165; D, × 250; E, F, H, × 125; G, × 500; I, × 25.

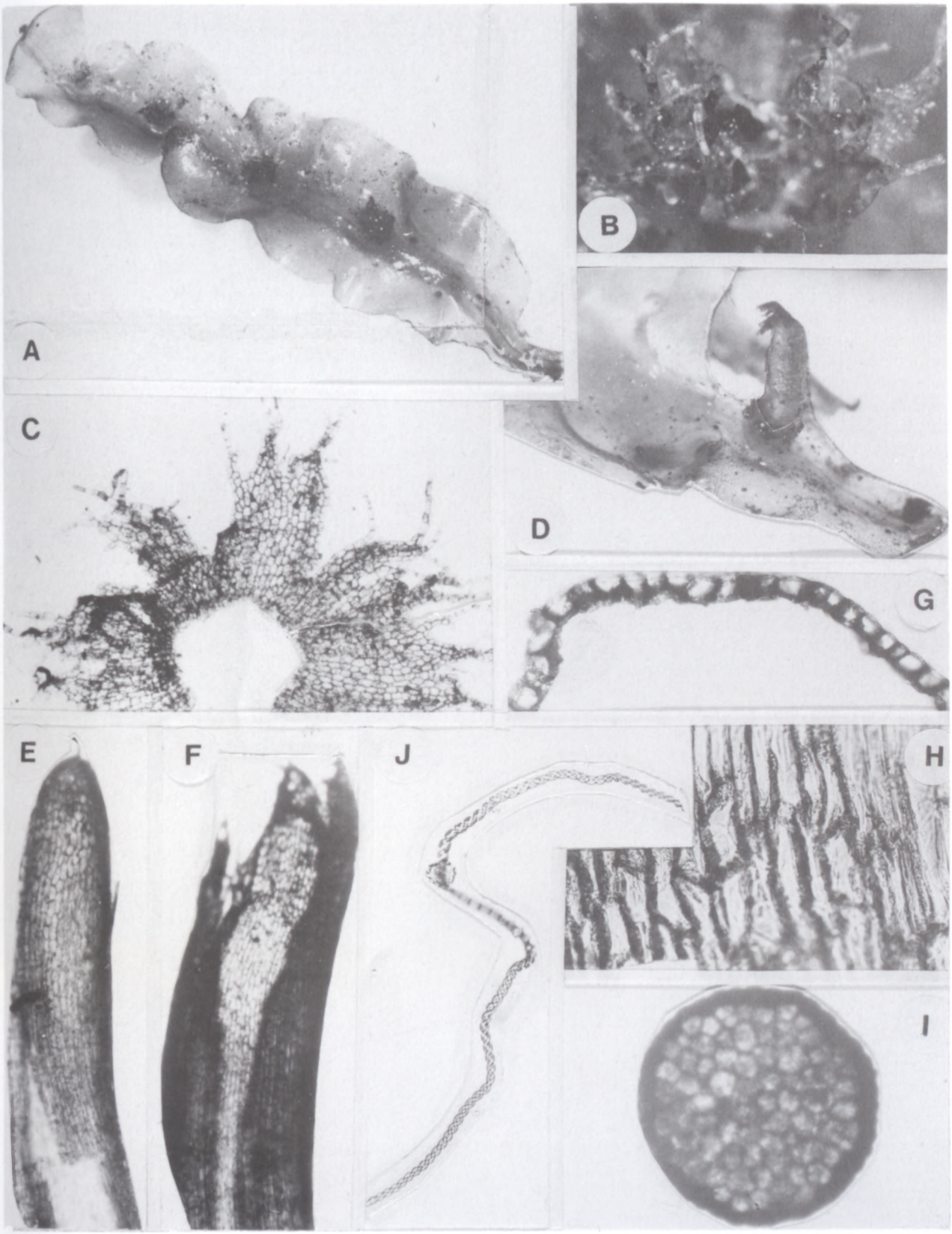


FIGURE 6.—*Pallavicinia lyellii*, female plants. A, lobe with gynoecia along costa; B, involucre much enlarged; C, opened involucre spread out; D, lobe with capsule still enclosed in pseudoperianth; E, calyptra; F, pseudoperianth; G, transverse section of capsule wall; H, outer cells of capsule wall; I, transverse section of seta; J, elater and spore. A–C, *Koekemoer 990*; D–F, I, *Glen 2882*; G, H, J, *Arnell 2084*. A, ·× 5.5; B, × 55; C, × 70; D, × 11; E, F, × 30; G, H, J, × 250; I, × 80.

(Figure 5G), up to 7.5 μm long, thin, others seen end-on and round. *Costa* abruptly grading into wings, overlying epidermal cells long-rectangular, 65–110 × 21–30 μm, sometimes with slime papillae, central conducting strand 50 × 80–125 μm, consisting of about 32 small, ± 10 μm wide, thick-walled, angular brown cells, surrounded by larger, 35–55 μm wide, thin-walled parenchymatous cells, 3 rows above and 4 or 5 rows below (Figure 5H).

Dioicous. *Androecia* in 2 parallel dorsal rows, one on either side of costa (Figure 5A), each a flat band raised shelflike ± 100 μm above lamina and ± 280 μm wide, laterally at free margin, expanded into confluent scales, directed transversely to long axis of shoot (Figure 5B), 210 × 200 μm, with laciniae (1-)2- or 3-celled (Figure 5C), ± 150 × 40 μm; antheridia globular, 170 μm wide, short-stalked and individually placed, hidden by covering scale, central area above midrib lacking antheridia and scales. *Gynoecia* up to 4 or 5 per frond (Figure 6A), acropetally arranged and dorsally situated at intervals along costa, involucre 3–5 layers thick, cup-like, base ± 900 μm high, mouth densely fringed with ciliate laciniae up to 750 μm long (Figure 6B, C), enclosing a group of 20–30 archegonia. *Pseudoperianth* 6 mm long, tubular (Figure 6F), apex brownish, long-piliferous (Figure 6D), developing after fertilization of an archegonium; calyptra (Figure 6E) bistratose, initially enveloping capsule and seta, several unfertilized archegonia flattened against sides and at base, old archegonial neck retained at tip. *Capsule* oblong-cylindrical, 2.3–3.7 mm long, opening along several valves; wall yellow-brown, 2 cell layers thick (only 1 shown in Figure 6G); outer cells elongate, 87.5–150.0 × 12.5–22.5 μm, lacking semi-annular thickenings (Figure 6H). *Seta* with slight swelling at foot, eventually up to 9 mm long, sinuate, 500 μm in diameter, cortical cells darker, one cell deep, ± 35 × 35 μm, in 45 cell rows; medullary cells ± 70, ± 35–60 μm wide (Figure 6I). *Spores* light brown, ± globular, 17.5– 23.0 μm in diameter, ornamentation reticulate with larger areolae on distal face ± 5 μm wide, further subdivided into smaller areolae by finer walls (Figure 7A–D); proximal face with only smaller, irregular areolae (Figure 7C–E). *Elaters* light brown, tapering toward ends, up to 470 μm long, 7.5 μm thick, bispiral (Figures 6J; 7F).

DISCUSSION

Pallavicinia lyellii is widely distributed and regarded as subcosmopolitan. In southern Africa it is known from northern and central Transvaal, Natal, and southwestern, southern and eastern Cape (Figure 4), but not many collections have been made. It is probably more common, but is undercollected.

The very large number of synonyms listed by Grolle & Piippo (1986) are an indication of its variability, resulting from its plasticity. Fertile plants are rare, with male plants generally smaller and abruptly narrowing to the apex of the lobe. The marginal teeth are quite variable: mostly small and blunt, but sometimes up to 5 cells long. In colour, plants are a deeper green than those of *Symphyogyna* species and further differ by the androecial arrangement, by the cup-like involucre, short calyptra, the presence of a pseudoperianth and by the spore ornamentation. The plants described and illustrated as *Pallavinicia lyellii* by Sim (1926) are clearly those of *Symphyogyna brasiliensis*.

SPECIMENS EXAMINED

TRANSVAAL.—2330 (Tzaneen): De Hoek State Forest, Grootbosch Hiking Trail, ± 6.5 km from starting point, (–CC), *Koekemoer 990* (PRE). 2430 (Pilgrim's Rest): Graskop, Fairyland, occasionally on dry stream bank, (–DD), *Glen 2975* (PRE); Mariepskop, Blyde River footpath, on sandstone slab in forest, (–DB), *Vorster 1499* (PRE). 2527 (Rustenburg): Rustenburg Nature Reserve, Cederbergkloof near Utopia, (–CA), *Koekemoer 971* (PRE).

NATAL.—2731 (Louwsburg): Louwsburg Dist., Ngome Forest, Cetshwayo waterfall walk, (–CD), *Glen 2882* (PRE). 2930 (Pietermaritzburg): Blinkwater, (–AB), *J.M. Sim CH 1456* (PRE).

CAPE.—3318 (Cape Town): Table Mountain, (–CD), *Michell CH 1481* (PRE). 3322 (Oudtshoorn): George, Van Riebeeck Gardens, on damp streambank, (–CD), *S.M. Perold 927* (PRE). 3326 (Grahamstown): Paradise Kloof, Cold spring, near Grahamstown, (–BC), *Hilner CH 1478* (PRE). 3423 (Knysna): Knysna, Buffels Nek, streamside, (–AA), *S. Arnell 1515* (PRE); Knysna, Garden of Eden, (–AA), *S. Arnell 2084* (PRE).

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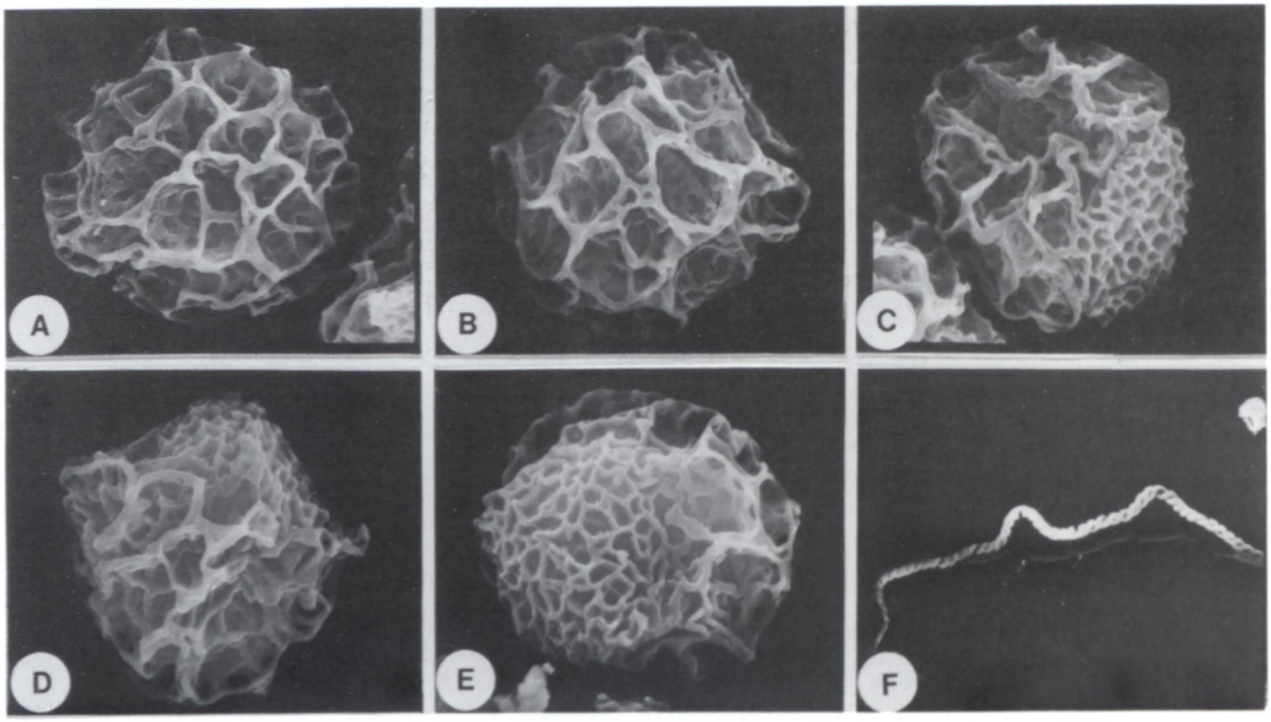


FIGURE 7.—*Pallavicinia lyellii*, spores and elaters. A, B, distal face; C, D, side view; E, proximal face; F, elater. A–F, *S. Arnell 2084*. A, B, D, × 1850; C, E, × 1905; F, × 189.

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