

Studies in the liverwort family Aneuraceae (Metzgeriales) from southern Africa. 4. *Riccardia obtusa*

S.M. PEROLD*

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ABSTRACT

For a clearer understanding of *Riccardia obtusa* S.W.Arnell, it is here described and illustrated in greater detail than in Arnell's (1952) initial publication of his new species. Subsequently, with minor alterations, Arnell (1963) repeated his treatment of *R. obtusa* in *Hepaticae of South Africa*. Wigginton & Grolle (1996) have, however, remarked that this species needs to be clarified, along with the other two Arnellian species of *Riccardia*, namely *R. capensis* and *R. rhodesiae*, which will be treated in detail in future papers.

INTRODUCTION

Riccardia obtusa S.W.Arnell appears to be quite widespread in southern Africa, ranging from Karkloof in KwaZulu-Natal to Joubertina in Eastern Cape and Knysna in Western Cape, according to Arnell (1963). The specimen from Pretoria that Arnell (1963) mentioned, had been identified earlier by Sim as *R. compacta*, which is not correct either, as the thalli are much too thin. According to my own observations, *R. obtusa* is also known from Long Tom Pass and Buffelskloof Nature Reserve, Mpumalanga, as well as Kirstenbosch, Cape Town. Samples of fresh collections of it from Fern Forest, Diepwalle (Figure 1), taken in October 2000, were kept alive for as long as 17 months, in order to observe the branching pattern of the thalli, as well as the oil bodies (see Specimens examined). Although Arnell did not remark upon the oil bodies of *R. obtusa*, they are quite distinctive in being very dark and irregular in shape. By the time Arnell described his new species, the oil bodies must have already disappeared.

***Riccardia obtusa* S.W.Arnell** in *Botaniska Notiser* 1952: 142; S.W.Arnell: 96 (1963). Type: Cape Province, Knysna, Deepwall (= Diepwalle) Forest Reserve, on a wet sandstone slope, *Arnell 1602* (BOL, holo.!, S!).

Thalli prostrate, in densely overlying patches, 2–4 layers thick and tightly adherent to substrate, as well as to each other, often highly contorted and difficult to separate, bottle green and rather brittle; apices of distal branches thickened and fleshy, variously shallowly lobed, margins opaque and obtuse (Figure 2A, B); primary and secondary branches with winged and translucent margins (Figure 2A, C, D); when dry, dark green to brown; smallish to medium-sized. *Main axis* mostly 10–15 mm long, rarely longer, clearly differentiated, distally trifurcate to subpalmately divided, the closely adjoining or overlapping branches lobulate and short, 500–1550 µm wide, their combined width across up to 4.9 mm, apically each branch once, or 2 or 3 times shallowly

notched, with continued growth elongating and becoming fan-shaped and thinner; proximally, main axis generally retaining its dominance, dorsally convex, up to 900 µm wide, narrowing somewhat toward base, branching somewhat irregularly pinnate on both sides, rarely with a much elongated side branch up to 8.5 mm long, similarly branched and in all probability, eventually forming a new main axis. *Primary branches/pinnae* opposite or subopposite, single, 350–2375 µm long, up to 525 µm wide, obliquely spreading at angles of 40°–70° with the main axis and separated by intervals of 825–2300 µm between them; sometimes with only 1 weaker, rarely with 2 (1 on each side) secondary branches/pinnules, so that occasional trifurcate lateral branches arise. *Stolons* (Figure 2C) quite rare, developing laterally from upper or lower part of main axis, or from tip of primary pinna, seldom branched. *Dorsal epidermal cells* in median part of apical segment of main axis from above, 5–7-sided (Figure 2E), cell walls somewhat thickened, 45.0–60.0(–87.5) × 25.0–32.5(–37.5) µm, subdorsal cells larger, 112.5–212.5 × 50–85 µm, subventral cells 105–200 × 52.5–77.5 µm, ventral epidermal cells 50–75 × 25–40 µm. *Oil bodies* very densely crowded at meristematic apical notches of branches and then present in up to 90% of dorsal and ventral epidermal cells, as

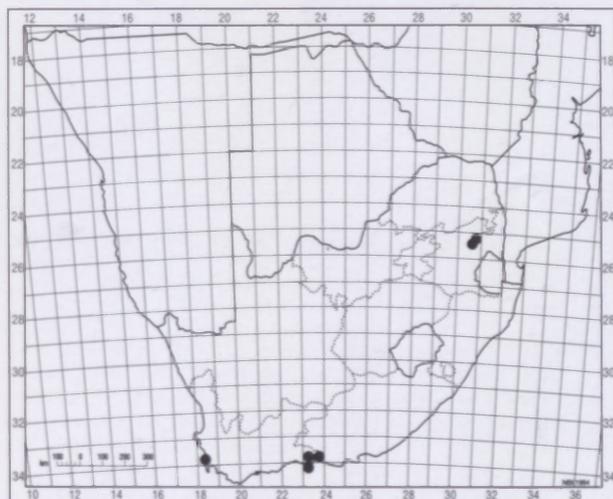


FIGURE 1.—Distribution of *Riccardia obtusa* in southern Africa.

* National Botanical Institute, Private Bag X101, 0001 Pretoria. MS. received: 2002-06-27.

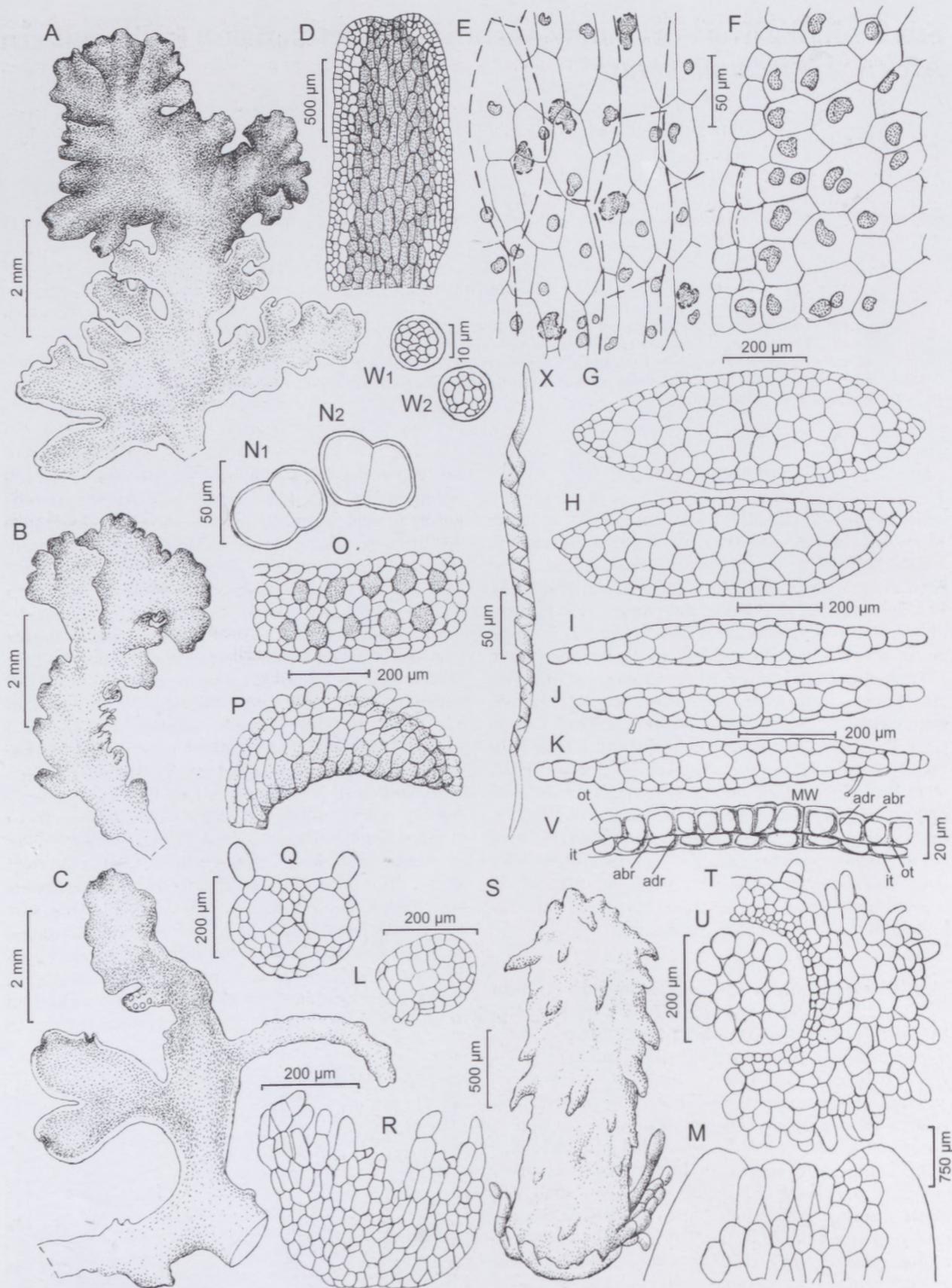


FIGURE 2.—*Riccardia obtusa*. A–C, thallus: A, with subpalmate distal branching and irregularly pinnate lateral branching; B, with several gynoecial branches; C, with single male branch and a stolon. D, primary branch. E, median dorsal epidermal cells (solid lines) of ultimate segment of axis with smaller oil bodies, and large subdorsal cells (stippled lines) with larger oil bodies (oil globules indicated by stippling); F, marginal cells of ultimate segment of axis, oil bodies stippled; G, H, c/s axis at \pm middle of ultimate segment; I–K, c/s primary branches; L, c/s stolon; M, mucilage papillae at ventral apical notch of branch; N₁, N₂, gemmae. O–Q, antheridial branch: O, from above; P, from side; Q, c/s. R, gynoecial branch from side; S, calyptra; T, c/s calyptra wall; U, c/s seta; V, c/s part of bistratose wall of capsule valve showing different cell walls: abr, abaxial radial; adr, adaxial radial; it, inner tangential; mw, median; ot, outer tangential. W₁, W₂, spores; X, elater. A, B, L, N–Q, S, Perold & Koekemoer 4456; C, F, H–K, R, T, V–X, Perold & Koekemoer 4457; D, Koekemoer 2246; E, Perold, Burgoyne & Smithies 4743; G, M, Perold & Koekemoer 4462; U, Perold & Koekemoer 4460.

well as in marginal and internal cells, mostly 1, but occasionally 2 or 3 per cell, smaller in dorsal and ventral epidermal cells, $12.5\text{--}20.0 \times 12.5\text{--}17.5 \mu\text{m}$, larger in internal cells, $25.0\text{--}32.5 \times 15.0\text{--}27.5 \mu\text{m}$, irregular or kidney-shaped, occasionally subspherical, very dark, composed of many tiny globules. *Margins* of ultimate segments of main axis (Figure 2F) with outer cells generally somewhat smaller than intramarginal ones, from above $42.5\text{--}57.5 \times 27.5\text{--}47.5 \mu\text{m}$, rectangular to subquadrate, free walls bulging slightly outward, most cells with a single oil body, $12.5\text{--}20.0 \times 10\text{--}20 \mu\text{m}$; intramarginal cells 5- or 6-sided, $57.5\text{--}100.0 \times 35.0\text{--}62.5 \mu\text{m}$, with 1, occasionally 2 oil bodies each. *Cross section* at \pm middle of ultimate segment of main axis biconvex (Figure 2G, H), $840\text{--}1040 \mu\text{m}$ wide and 5–8(–11) cell rows or up to 325 μm thick medianly, gradually tapering to obtuse margins, thickness of dorsal cells $12.5\text{--}15.0 \mu\text{m}$, subdorsal cells $25\text{--}30 \mu\text{m}$, medullary cells ($40\text{--}60\text{--}100 \mu\text{m}$, subventral cells $\pm 30 \mu\text{m}$ and ventral cells $\pm 15 \mu\text{m}$; base of main axis generally narrower than younger part further along, $\pm 680 \mu\text{m}$ wide, 6 cell rows or $\pm 200 \mu\text{m}$ thick, margins shortly acute; cross section of primary branch/pinna (Figure 2I–K) $85\text{--}110 \mu\text{m}$ or 3 or 4 cell layers thick medianly, unistratose margins 3 or 4 cells wide; cross section of secondary branch/pinnule $\pm 55 \mu\text{m}$ or 3 cell layers thick; cross section of stolons (Figure 2L), oval to elliptical, $\pm 140 \times 210 \mu\text{m}$. *Mucilage papillae* (Figure 2M) ventral, crowded together at shallowly notched apex of branch and then in 2 spaced rows, one on either side of midline, $150\text{--}225 \mu\text{m}$ between successive ones, club-shaped, $50\text{--}80 \mu\text{m}$ long, $17.5\text{--}37.5 \mu\text{m}$ wide above, tapering to foot, $10.0\text{--}12.5 \mu\text{m}$ wide. *Rhizoids* ventral along branches, $10.0\text{--}12.5 \mu\text{m}$ wide. *Asexual reproduction* by gemmae (Figure 2N) occasionally observed on dorsal surface of upper branches, consisting of 2 cells joined together, $\pm 65 \times 40 \mu\text{m}$.

Monoicous. *Antheridial branches* rather few in number, arising laterally on main axis (Figure 2C), immediate-

ly below base of primary branch or subopposite to base of primary branch, sometimes 2 together, sometimes shortly stipitate, oblong-linear, $1125\text{--}1300 \mu\text{m}$ long, width $250\text{--}270 \mu\text{m}$, in cross section $\pm 240 \mu\text{m}$ high, bearing up to 11 pairs of antheridia, on same plant occasionally shorter male branches, $460\text{--}830 \mu\text{m}$ long, width up to $220 \mu\text{m}$, with 4–9 pairs of antheridia, antheridial cavities from above $50.0\text{--}62.5 \times 32.5\text{--}47.5 \mu\text{m}$, surrounding cells $37.5\text{--}42.5 \times \pm 30 \mu\text{m}$, 1 or 2 adjoining cells between pairs of cavities; margins (Figure 2O) crenulate, with single erect layer of swollen cells, $65.0\text{--}87.5 \times 45\text{--}65 \mu\text{m}$. *Gynoeical branches* (Figure 2R) short, arising laterally on same side along length of main axis, 2 or 3 in a row, sometimes in pairs on opposite sides of primary branch, $\pm 260 \mu\text{m}$ high, $450 \mu\text{m}$ wide, surrounding paraphyses up to $310 \mu\text{m}$ long, composed of 3 or 4 cells joined end to end, archegonia in 2 rows. *Calyptra* (Figure 2S) clavate, length $2.0\text{--}3.5 \text{ mm}$, $\pm 0.85 \text{ mm}$ wide above and narrowing below to $\pm 0.6 \text{ mm}$; cross section of wall (Figure 2T) $170\text{--}200 \mu\text{m}$ or up to 8 cell layers thick, many cells of outermost row markedly protuberant, $115\text{--}135 \times \pm 25 \mu\text{m}$, cells in corona up to $175 \mu\text{m}$ long. *Seta* $\pm 5.7 \text{ mm}$ long, $220\text{--}280 \mu\text{m}$ wide, with 4 inner and 12 outer cell rows, i.e. 4 cells diam. (Figure 2U). *Capsule* ellipsoidal, $1150\text{--}1675 \mu\text{m}$ long, with 4 valves, $\pm 325 \mu\text{m}$ or 21–23 cell rows wide, bistratose; cells of epidermal layer in external longitudinal view (Figure 3A) $67.5\text{--}90.0 \times 10.0\text{--}12.5 \mu\text{m}$, end walls straight or oblique, with vertical (nodular) thickenings; in cross section (Figure 2V) cells rectangular in shape, thickenings on adaxial radial and inner tangential walls, bands on one side of median wall alternating in a mirror image with those on the other side; inner cells in internal longitudinal view, $65\text{--}90 \times 10.0 \times 17.5 \mu\text{m}$, without nodular thickenings (Figure 3B); in cross section (Figure 2V) cells faintly thickened on adaxial radial walls. *Spores* $12.5\text{--}15.0 \mu\text{m}$ diam., finely scabrate, pink with internal green areas. *Elaters* $115\text{--}340 \times \pm 12.5 \mu\text{m}$, reddish, with single spiral band, $7.5\text{--}10.0 \mu\text{m}$ wide, the tapered tips at one or both ends without spirals.

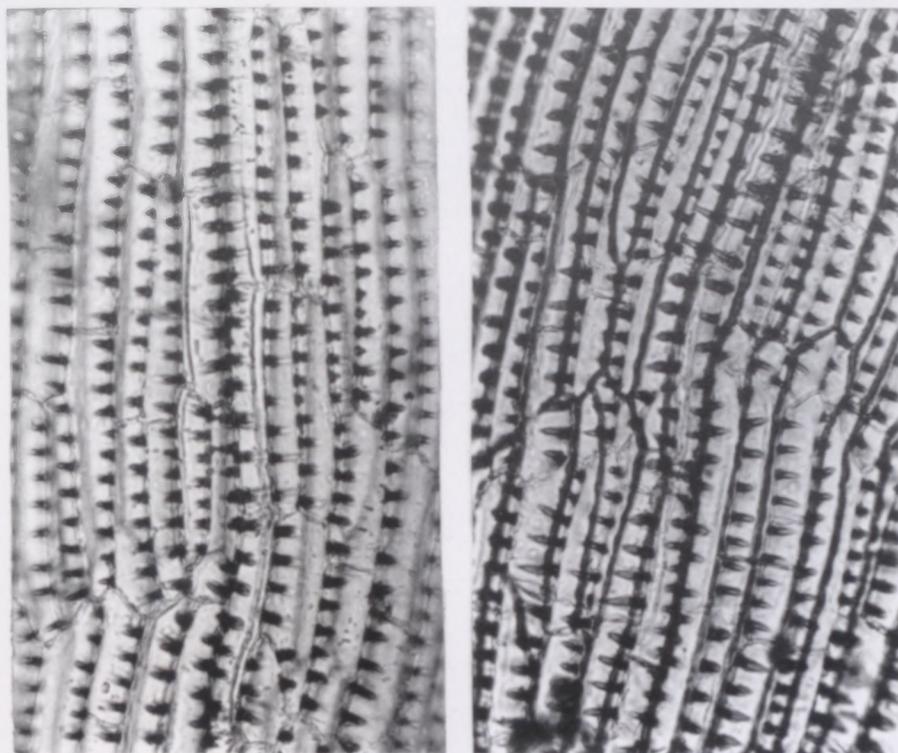


FIGURE 3.—*Riccardia obtusa*. A, cells of epidermal layer of wall of valve in external longitudinal view, $\times 389$. B, cells of inner layer of wall of valve in internal longitudinal view, $\times 389$. A, B, Perold & Koekemoer 4456.

DISCUSSION

In his paper on the genus *Riccardia* in tropical Africa, Jones (1956) remarked that he had not seen specimens 'of *R. campanuliflora* S.Arnell, *R. capensis* S.Arnell or *R. rhodesiae* S.Arnell (*Botaniska Notiser* 1952)', but he made no reference to *R. obtusa* S.W.Arnell, which was published in the same paper as Arnell's other three new species. Later on, Engel (1975) identified a specimen collected on Réunion as *Riccardia* cf. *obtusa* S.Arnell, but added a question mark as follows: 'Wet woods, Forêt de Bebour, 1300 m (?), 10118g' (collecting number of Harold E. Moore). It would appear that this altitude is questionable.

Grolle (1995) refers to the above in his publication, *The Hepaticae and Anthocerotae of the East African Islands. An annotated catalogue*, excluding it from Réunion. In Wigginton & Grolle (1996) it is observed that *R. obtusa* needs to be clarified.

Bearing in mind Meenks' (1987) admonition that herbarium collections of *Riccardia* more than 20 years old, are often useless, Arnell's identification of three collections of *R. obtusa* specimens is accepted, because he had the advantage of studying them when fresh. According to Arnell, this species resembles *R. latifrons*, in that it has short, blunt branches. Schuster (1992) described *R. latifrons* as closely adherent to the substrate and subpalmately branched distally; the epidermal cells of the thalli are, however, typically very large, always thin-walled with colourless walls and the oil bodies are absent near the meristematic tips and in all the epidermal cells. It is also confined to the Northern Hemisphere. There are, therefore, significant differences between these two species.

R. obtusa specimens are distinguished by the following characters: 1, the obtuse margins (hence the specific name) of the distal branches; 2, the distal trifurcate to subpalmate branching pattern; 3, the closely adjoining or overlapping, lobulate apical branches; 4, the markedly thickened ultimate segments of the main axes, 5–8(–11) cell rows thick; 5, the primary and secondary branches with unistratose margins; 6, the prominent cell protrusions on the calyptra wall; 7, the distinct oil bodies, which are very dark and irregular to kidney-shaped or subspherical.

SPECIMENS EXAMINED

Arnell 1602 (holotype), Deepwall (= Diepwalle) Forest Reserve, on a wet sandstone slope (BOL), (isotype) (S), 1620 Deepwall Forest, wet slope (S), 1628, near Parkes Station, Knysna, wet sandstone slope (BOL).

Esterhuysen 24255, N side of Zitzikamma Mts, near Joubertina, wet shaded rock at side of stream on steep slope (BOL).

Koekemoer 2246, Buffelskloof Nature Reserve, south of Lydenburg, in stream south of Research Cottage, on roots and stem of tree fern (PRE).

Perold, Burgoyne & Smithies 4742, 4743, Long Tom Pass, near 'Staircase', ± 25 km from Lydenburg, in gully down steep slope (PRE).

Perold & Koekemoer 4456, 4457, 4460, 4462, Valley of Ferns, on rotting logs, soil or stone along footpaths. 4592, Kirstenbosch, in dark gorge above ladders (PRE).

Schelpé 5154, 'Braco', Karkloof, Natal, on fallen logs in forest (BOL).

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REFERENCES

- ARNELL, S.W. 1952. South African species of *Riccardia*. *Botaniska Notiser* 1952: 138–156.
- ARNELL, S.W. 1963. *Hepaticae of South Africa*. Swedish Natural Science Council, Stockholm.
- ENGEL, J.J. 1975. Hepaticae and Anthocerotae collected by Dr. Harold E. Moore Jr in New Caledonia, Seychelles, Mauritius and Réunion in 1972. *The Bryologist* 78: 361, 362.
- GROLLE, R. 1995. The Hepaticae and Anthocerotae of the East African Islands. An annotated catalogue. *Bryophytorum Bibliotheca* 48: 1–178.
- JONES, E.W. 1956. African hepatics XI. The genus *Riccardia* in tropical Africa. *Transactions of the British Bryological Society* 3: 74–84.
- MEENKS, J.L.D. 1987. Studies on Colombian cryptogams XXVIII. A guide to the tropical Andean species of *Riccardia* (Hepaticae). *Journal of the Hattori Botanical Laboratory* 62: 161–182.
- SCHUSTER, R.M. 1992. *The Hepaticae and Anthocerotae of North America* 5: 1–854. Field Museum of Natural History, Chicago.
- WIGGINTON, M.J. & GROLLE, R. Supplemented by GYARMATI, A. 1996. Catalogue of the Hepaticae and Anthocerotae of sub-Saharan Africa. *Bryophytorum Bibliotheca* 50. Cramer, Berlin, Stuttgart.