

## Studies in the Marchantiales (Hepaticae) from southern Africa. 7. The genus *Cryptomitrium* (Aytoniaceae) and *C. oreades* sp. nov.

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**Keywords:** Aytoniaceae, *Cryptomitrium*, *C. oreades*, Hepaticae, Lesotho, Marchantiales, *Reboulia*, Rebouliaioideae, taxonomy

### ABSTRACT

As far as is known, the rare genus *Cryptomitrium* is reported here for the first time for the whole continent of Africa with the description of a new species, *C. oreades*, from the mountain Kingdom of Lesotho in southern Africa. The specimen, attributed to the genus *Reboulia* from southern Africa, was misidentified.

### UITTREKSEL

Die seldsame genus *Cryptomitrium* word hier, sover bekend, die eerste maal vir die hele vasteland van Afrika vermeld met die huidige beskrywing van 'n nuwe spesie, *C. oreades*, vanaf die bergagtige Koninkryk van Lesotho in suidelike Afrika. Die eksemplaar wat aan die genus *Reboulia* vanuit suidelike Afrika toegeskryf is, is verkeerd geïdentifiseer.

*Cryptomitrium* Austin ex Underw. in Bulletin Illinois State Laboratory of Natural History 2: 36 (1884); Schiffn.: 33 (1893); Steph. 221 (1899); M. Howe: 43 (1899); A. Evans: 45 (1923); Hässel: 120 (1963). Type species: *C. tenerum* (Hook.) Austin.

*Platycoaspis* Lind. in Lind. & Arnell: 11 (1889).

Thalloid, smallish to medium-sized, margins purple, thin, medianly thicker and rather flat to slightly concave, green, in loose patches; at seepage, on soil overlying rocky outcrops. Branches simple or rarely once pseudo-dichotomously furcate; thickened over midrib, thinning toward scalloped or irregularly crenate margins, laterally striate from above; apex slightly notched, dorsally not grooved along midline. *Dorsal epidermis* hyaline, cell walls thickened, especially at the corners, but not bulging, some cells containing an oil body; air pores simple, small, slightly raised, surrounded by 3 concentric rings of cells without radial thickening of the walls and leading below into topmost layer of individual empty air chambers, in 2 or 3(4) storeys, bounding walls unistratose, chlorophyllose; storage tissue with angular cells, not restricted to keel; rhizoids of both kinds, smooth as well as pegged. *Scales* dark red or reddish pink, in 2 forwardly directed ventral rows, not imbricate, roughly triangular to transversely rectangular, with 1 or 2(3) filiform appendages. Autoicous. *Antheridia* in groups, sunken into dorsal tissue along midline and opening into projecting, conical papillae above. *Carpocephalum* single, raised on stalk with one rhizoidal furrow, lacking air chambers and arising dorsally at apical notch of thallus or ventrally along margin, head disciform-round, with 1 or 2 layers of air chambers, separated from one another by unistratose cell plates and opening above via compound air pores; 3–6 capsules borne below, protruding between membranous lips of in-

volucres; capsular wall apically bistratose, inner cells with thickening bands, remainder of wall unistratose, cells thin-walled. *Spores* triangular-globular, winged, distal face with  $\pm$  reticulate ornamentation, or thick sinuate ridges; proximal face with high, thin, conspicuous triradiate mark, each facet with incomplete areolae. *Elaters* long, tapering, bispiral.

### *Cryptomitrium oreades* Perold, sp. nov.

*Thallus* statura mediocri, late linearis vel ovatus, dorso viridi, marginibus tenuibus, striatis, crenatis; ventraliter atropurpureus, utrimque costae serie squamarum prorsum versarum, deltoidearum, purpurearum vel rubescentium, appendicibus filiformibus. Cavernulae vacuae. Autoicous. *Androecium* grex antheridiorum immersorum, cervicibus exsertis. Carpocephalum disciforme, stipitatum, ventraliter sub latere thalli exoriens, lateraliter emergens, prope antheridia, cum sulco unico rhizoidali. *Spores* (77.5)–85.0–95.0  $\mu$ m diametro, deltoideo-globulares, alatae, superficie distali plerumque cristis crassis sinuatis, superficie proximali nota triradiata gracili, alta; superficiebus minoribus cristis incompletis. *Chromosomatum numerus* ignotus.

**TYPE.**—Lesotho: 1 km from New Oxbow Lodge on road to Mokhotlong,  $\pm$  1/2 km from bridge to the left, along Tiholohatsi River, at interface between basalt rock slope and grassy fringe, under large boulder in wet seepage area on soil, in alpine heath-grassland, alt.  $\pm$  2 900 m, April 1994, Perold & Duckett 3228 (PRE, holo.).

*Thallus* medium-sized, broadly linear (Figure 1A) to oblong, sometimes apically rather wider; dorsally flat to slightly concave along centre, green, toward margins striate across with deep purple of ventral face showing through thin dorsal tissue, walls of air chambers beneath faintly visible, when wet; margins irregularly crenate to wavy, flanks ventrally deep purple, incurved and arched over or clasped together above dorsal epidermis, when

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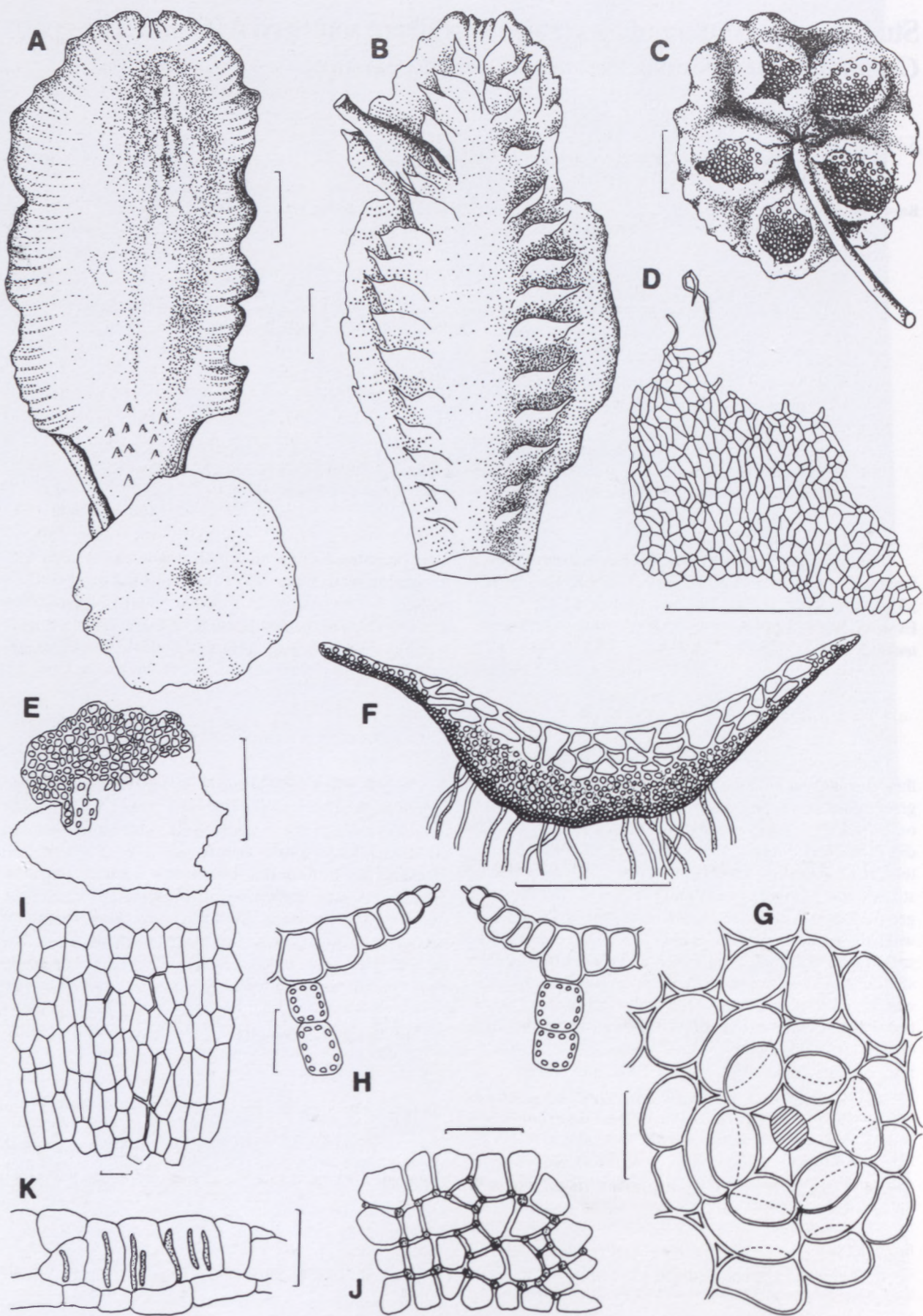


FIGURE 1.—*Cryptomitrium oreades*. Morphology and anatomy of thallus. A, dorsal face of thallus with carpocephalum on stalk emerging at side of thallus; B, ventral face of thallus; C, carpocephalum seen from below; D, ventral scale; E, transverse section of stalk; F, transverse section of thallus; G, air pore and surrounding cells seen from above; H, transverse section of air pore and dorsal cells; I, thin, unistratose portion of wall; J, bistratose apical portion of capsule wall with thickenings, from above; K, transverse section of bistratose portion of capsule wall. A–C, E, F, I–K, Van Rooy 3051; D, G, H, Perold & Duckett 3228. Scale bars: A–C, F, 1 mm; D, 500 μm; E, 250 μm; G–K, 50 μm.



dry; in loose patches, simple or once pseudodichotomously furcate. *Branches* mostly up to  $12 \times 3\text{--}5\text{--}(6)$  mm,  $(450\text{--})600\text{--}800$   $\mu\text{m}$  thick over midrib, laterally thinning out into wings, apex slightly notched, purple filiform tips of scale appendages reflexed over edge; margins thin, acute; flanks sloping very obliquely upward and outward; ventral face medianly rounded, on either side of midrib with a row of apically directed,  $\pm$  triangular to transversely rectangular, purple or reddish scales (Figure 1B).

*Dorsal epidermis* unistratose, cells hyaline, from above oval or rounded or irregularly shaped, with trigones prominent, but not bulging, walls slightly thickened,  $25.0\text{--}42.5 \times 20.0\text{--}32.5$   $\mu\text{m}$ , in transverse section rectangular, up to 35  $\mu\text{m}$  high, vertical walls thick, with some cells containing an oil body; marginal cells variable in shape,  $27.5\text{--}30.0 \times 32.5\text{--}50.0$   $\mu\text{m}$ ; air pores simple, raised  $\pm 25$   $\mu\text{m}$  above dorsal cells (Figure 1H), oval or round, up to  $32.5 \times 27.5$   $\mu\text{m}$ , surrounded by 3 concentric rings of cells, walls not radially thickened (Figure 1G), innermost ring consisting of 6–8 cells, thin-walled and wedge-shaped,  $\pm 8.0 \times 15.0$   $\mu\text{m}$ , collapsed and often fragmentary, next row of cells transversely oblong,  $15.0\text{--}17.5 \times 27.5\text{--}35.0$   $\mu\text{m}$ , partly overlying outer row of 6–8 cells,  $17.5\text{--}25.0 \times 27.5\text{--}42.5$   $\mu\text{m}$ , these in turn partly overlying dorsal cells; assimilation tissue 280–450  $\mu\text{m}$  thick, medianly with 3 layers of vertical, empty air chambers (Figure 1F), sloping toward margins, 125–240  $\mu\text{m}$  wide,  $\frac{1}{2}$  or more the thickness of thallus, bounded by unistratose, chlorophyllose walls, cells  $20.0\text{--}37.5\text{--}(55.0) \times 25.0\text{--}37.5$   $\mu\text{m}$ , occasionally with an oil body; storage tissue 125–350  $\mu\text{m}$  thick, cells closely packed and angular,  $35.0\text{--}62.5$   $\mu\text{m}$  wide, here and there a few cells with an oil body,  $\pm 30$   $\mu\text{m}$  wide, almost filling cell; rhizoids arising from swollen, ventral epidermal cells, mostly smooth and up to 25  $\mu\text{m}$  wide, others pegged, 10.0–22.5  $\mu\text{m}$  wide. *Scales* dark red or reddish pink, in 2 ventral rows on either side of midrib (Figure 1B), not imbricate,  $300\text{--}410 \times 600\text{--}750$   $\mu\text{m}$ , roughly triangular (Figure 1D) to transversely rectangular, with 1 or 2(3) filiform appendages, 150–590  $\mu\text{m}$  long, of which basal cells in 2 rows, but soon just in a single string, rectangular,  $\pm 70 \times 27$   $\mu\text{m}$ ; cells along scale margins brick-shaped or polygonal,  $\pm 27.5 \times 62.5$   $\mu\text{m}$ , sometimes with slime papillae,  $25.0 \times 12.5$   $\mu\text{m}$ , projecting here and there, cells in body of scale 5- or 6-sided,  $50.0\text{--}75.0 \times 22.5\text{--}37.5$   $\mu\text{m}$ , walls sometimes sinuous; 6–9 small clear cells (the oil bodies no longer present),  $\pm 17.5 \times 22.5$   $\mu\text{m}$ , scattered in between cells of scale.

*Autoicous. Androecia* in diffusely arranged groups of antheridia (Figure 1A) sunken into dorsal tissue, their conical necks 200  $\mu\text{m}$  wide at base and projecting  $\pm 150$   $\mu\text{m}$  above surface, each with an opening leading into antheridial cavity below. *Carpoccephalum* raised on stalk, mostly single, rarely two adjacent, disciform-round, not lobed (Figure 1A), green, turning brown with age, 2.5–4.2 mm in diameter, rather flattish on top, with one layer of elongated air chambers, opening via compound air pores encircled by 4 concentric rings of cells (2 above and 2 below surface), scattered oil cells present; 3–6 capsules borne below (Figure 1C), each on short seta and initially protruding only slightly through elongated radial clefts which eventually widen, the lips becoming membranous and functioning as an involucre; capsules globose, 1100  $\times$  850  $\mu\text{m}$ , basal  $\frac{2}{3}\text{--}\frac{3}{4}$  urn-shaped with delicate, hyaline,

unistratose wall, of which apical  $\frac{1}{4}\text{--}\frac{1}{3}$  part bistratose (Figure 1K), forming an operculum that is shed at an annulus by dehiscence, outer layer  $\pm 37.5$   $\mu\text{m}$  thick, continuous with rest of thin-walled cells (Figure 1I), 4- or 5-angled,  $\pm 52.5\text{--}100.0 \times 27.5\text{--}40.0$   $\mu\text{m}$ , inner layer of cells restricted to apical part, thicker-walled (Figure 1J), smaller,  $20.0\text{--}32.5 \times 25.0\text{--}35.0$   $\mu\text{m}$ , with narrow, brownish, rod-like thickenings (Figure 1K); stalk of carpoccephalum erect, arising ventrally from below flank of thallus and emerging laterally, close to site of antheridial group (Figure 1A), basally red and partly covered with purple scales, otherwise yellowish, apically surrounded by a few hyaline, filiform scales, with 1 rhizoidal furrow (Figure 1E), length 3–5 mm, diameter 400–490  $\mu\text{m}$ , in transverse section with cortical cells  $12.5\text{--}17.5 \times 12.5\text{--}22.5$   $\mu\text{m}$ , outer wall rounded and slightly thickened, medullary cells angular, closely packed ( $12.5\text{--}$ ) $25.0\text{--}30.0 \times 17.5\text{--}25.0$   $\mu\text{m}$ . *Spores* light brown, semitransparent, triangular-globular,  $(77.5\text{--})85.0\text{--}95.0$   $\mu\text{m}$  in diameter, wing 7.5  $\mu\text{m}$  wide, undulating and somewhat plicate (Figure 2D), margin irregular; distal face (Figure 2A–C) convex with ornamentation hardly reticulate or with thick, sinuate ridges up to 5  $\mu\text{m}$  high, irregularly branched and wavy, separated by deep fissures; proximal face (Figure 2D) with conspicuous triradiate mark, thin, tortuous,  $\pm 7.5$   $\mu\text{m}$  high, extending onto wing, each facet with irregular, branching ridges, forming incomplete areolae. *Elaters* light brown, bispiral (Figure 2E, F), 210–275  $\mu\text{m}$  long and 10  $\mu\text{m}$  wide at widest part, tapering to tips, 5  $\mu\text{m}$  wide. *Chromosome number* not known.

## DISCUSSION

This species is characterized by a disciform-round carpoccephalum, borne on an erect, uni-furrowed stalk which arises ventrally at the margin and emerges laterally to the thallus in close proximity to the dorsally situated antheridial group. Worldwide only two other species have been described in this genus; firstly *C. tenerum* from North America (Alameda, California, Washington and Mexico) as well as from Costa Rica, Guatemala, Chile and Argentina, and secondly *C. himalayense* (Kashyap 1915) from India (Mehra & Sokhi 1977). *Cryptomitrium oreades* differs from the other two species mainly by the lateral position of its stalk; in *C. tenerum* and *C. himalayense* the stalk is dorsally situated near the apex of the thallus; their thalli are also thinner and more delicate than those of our species. The genus *Cryptomitrium* is classified in the family Aytoniaceae and in the subfamily Reboulloideae Grolle, together with *Asterella*, *Mannia* and *Reboulia*. The genus *Reboulia* does not occur in southern Africa (Perold 1994); Arnell's (1963) only record of it from Rustenburg Kloof, *Collins 775C*, is a specimen of *Asterella wilmsii* and was clearly misidentified. So far, *C. oreades* is known from only two localities in Lesotho (Figure 3), growing at high altitude in association with the moss *Gymnostomum aeruginosum* J.E. Sm.

The specific epithet, *oreades*, is derived from the Greek word 'oread', meaning 'mountain nymph' and was chosen because of the mountainous location of this species.



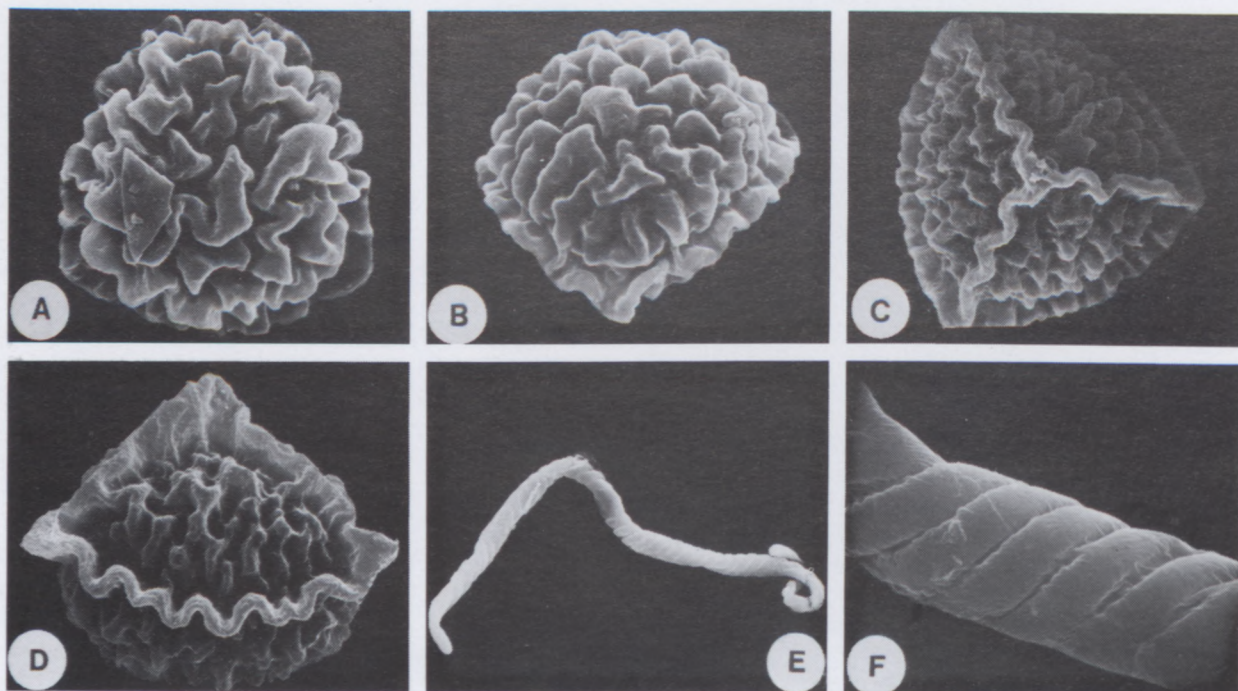


FIGURE 2.—*Cryptomitrium oreades*. A–D, spores: A, distal face; B, distal face seen from side; C, proximal face; D, side view. E, elater; F, part of elater. A, B, E, F, Van Rooy 3051; C, D, Perold & Duckett 3228. A, B,  $\times 470$ ; C,  $\times 77$ ; D,  $\times 493$ ; E,  $\times 324$ ; F,  $\times 1990$ .

#### SPECIMEN EXAMINED

(excluding the type specimen, already mentioned)

LESOTHO.—2828 (Bethlehem): 6 km from New Oxbow Lodge to Mokhotlong, basalt outcrops, alpine heath-grassland, on soil, (–DC), Van Rooy 3051 (PRE).

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was forwarded to him by kind intercession of Prof. O.H. Volk, Würzburg, to whom I had sent it first. The specific epithet was suggested to me by Dr H.F. Glen, who also wrote the Latin translation. I extend my gratitude to him for both these favours, also to Miss M. Koekemoer, curator at PRE, for accompanying me to Lesotho in 1993 when we failed to find more material of *C. oreades*, to the artists, Ms G. Condy and Ms J. Kimpton; to the typist, Mrs J. Mulvenna, and to the photographer, Mrs A. Romanowski, for their valued contributions.

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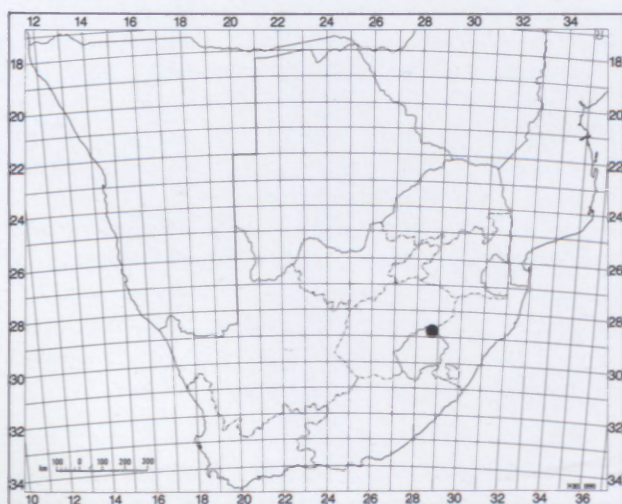


FIGURE 3.—Distribution of *Cryptomitrium oreades* in southern Africa.