

Algaria nataliei (Pottiaceae), a new moss genus and species from the Western Cape Province of South Africa

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SUMMARY

We describe *Algaria nataliei*, a new genus and species from the Worcester-Robertson Karoo region, Western Cape Province, South Africa. Particularly distinctive features of the new genus are the strongly dimorphic leaves with the upper toothed to lacinate-margined, apically notched on one side, and long-awned and the lower entire, weakly but distinctly cucullate and with the costa ending in the apex, the laminal cells bulging ventrally and smooth to weakly papillose but flattened dorsally and strongly papillose, the immersed macrostomous eperistomate capsules with flat to umbonate opercula and flattened or indented bases, and long-conic to mitrate, prorate-papillose calyptrae.

KEYWORDS: Worcester-Robertson Karoo Centre, arid zone bryophytes, semi-desert, Cape Floristic Region, CFR, ephemeral mosses.

INTRODUCTION

The semi-desert areas of South Africa's Western Cape Province are widely recognised as a major centre of plant diversity and endemism (Cowling & Hilton-Taylor, 1999; Myers *et al.*, 2000; van Wyk & Smith, 2001; Klak, Reeves & Hedderson, 2004). Although the bryophyte flora remains poorly studied, recent research (Perold, 1999; van Rooy, 2003; Hedderson & Zander, 2007a,b, 2008) has revealed the existence of a unique, highly specialised and apparently largely endemic element in this group of plants as well.

Many of the novel taxa are highly seasonal (e.g. Perold, 1999; Hedderson & Zander, 2007b, 2008). Normally appearing during, or immediately after, the winter rainy season, many do not appear at all in years with insufficient rain. Given this, and the small size of most such ephemeral taxa, it is perhaps unsurprising that so many distinctive entities have remained so long undetected.

In the present paper, we describe another new genus and species of ephemeral Pottiaceae from the karoo of South Africa.

DESCRIPTION

Algaria nataliei Hedd. & R.H. Zander **gen. et sp. nov.** (Fig. 1)

Caules breves, usque 1 mm, funiculo centrali praesenti. Folia inferiora late obovata vel ovata, in apice subcucullata, rotundato-acuta, ad margines integra; folia superiora ovata vel ovato-lanceolata, in apice paulo canaliculata, acuta, aristata, dentata vel laciniata, saepe in margine altera incisuram instructa; costa ad medium folii in sectione transversali epidermide dorsali, strato stereidarum unico, funiculo hydroideo, cellulis ducum ventraliter apertis; cellulae superiores laminales medialiter quadratae vel rotundato-hexagonae, 9–12 (–14) μm latae, 1:5–2:1, dorsaliter papillis simplicibus praeditae, sed laeves atque ventraliter magis prominenti quam in superficie dorsali; cellulae marginales ad apicem elongatae, parietibus crassis, laeves, limbos dentatos formantes; cellulae basales laminales rectangulatae, augmentae, laeves. Autoicae, antheridiis fasciculatis, in axillis foliorum inferiorum dispositis. Seta brevis. Capsula in foliis perichaetii immersa, brevicylindracea vel urceolata, macrostomica, ad basem truncata, peristomio carens. Operculum planum vel paulo umbonatum. Calyptra longi-conica vel mitrata, cellulis prorato-papillosis. Sporae dense papillosae, 19–27 μm . Lamina in KOH flava vel paulo aurantiaco-flava reagens.

TYPE: South Africa. Western Cape Province. Robertson District, W side of the Langeberg, Dassieshoek Nature Reserve. On soil crusts among shrubs, 33°45'14"S 19°53'15"E, ca 500 m. *Hedderson 15555*. HOLOTYPE BOL; ISOTYPE MO.

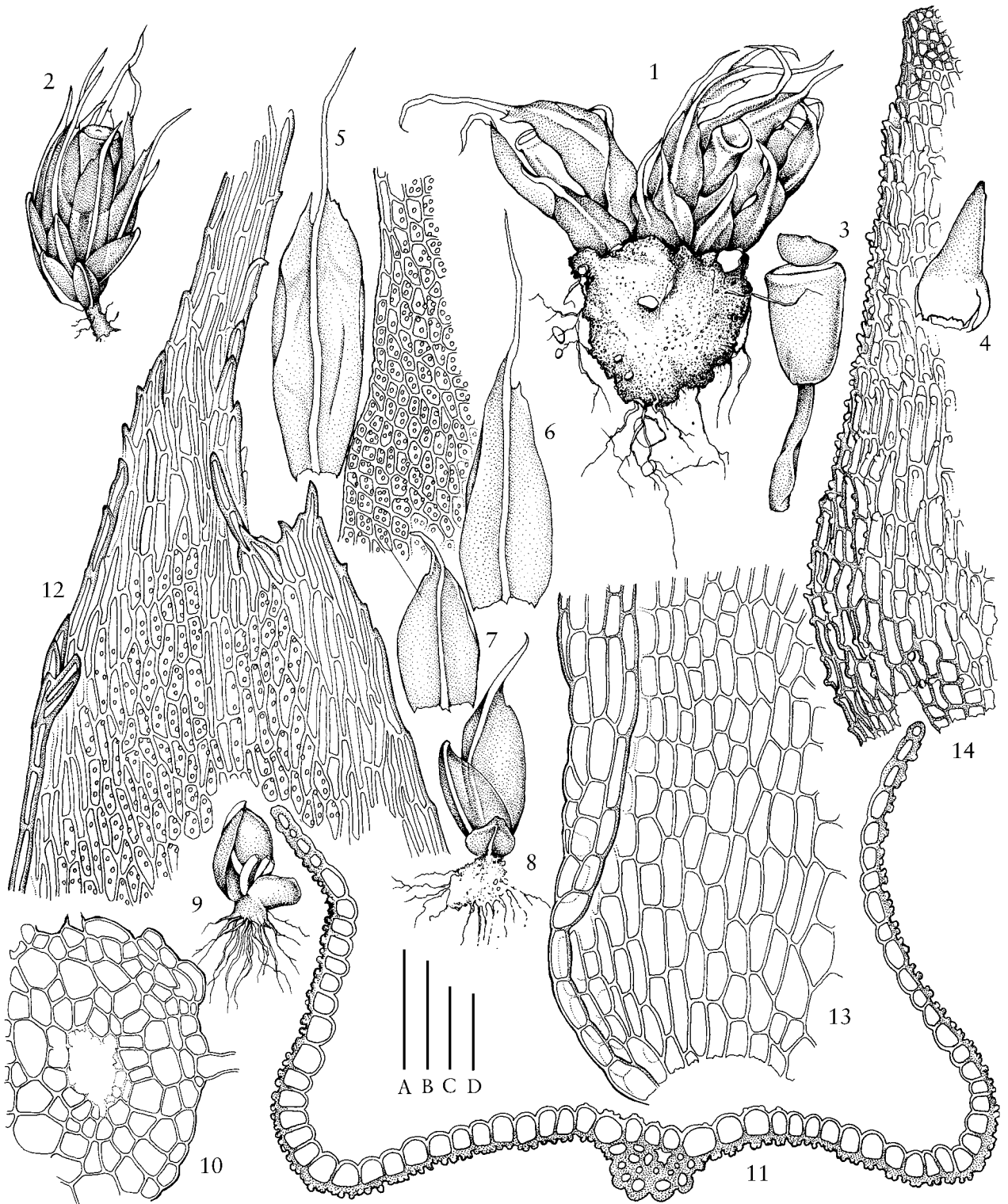


Figure 1. *Algaria nataliei*. 1–2. Habits. 3. Sporophyte. 4. Calyptra. 5–8. Leaves. 9. Antheridia. 10. Stem section. 11. Leaf section. 12. Upper laminal cells. 13. Basal marginal cells. 14. Cells of calyptra. Scale bars: A=1 mm, 1–2; B=0.5 mm, 3–4; C=0.5 mm, 5–9; D=50 μ m, 11–14.

Plants terricolous, scattered, pale green to yellow. *Stems* simple, to 1 mm, transverse section circular to elliptical, central strand present, sometimes hollow, sclerodermis absent, hyalodermis absent, outermost cells with somewhat thickened external walls. *Leaves* broadly obovate to ovate in the lower parts of stem, to ca 0.8 mm; upper leaves ovate to

ovate lanceolate, to 3.5 mm (inclusive of awns), margins plane to broadly incurved, entire in lower leaves but with long, narrow cells forming a dentate to lacinate border in upper ones; costa strong, yellow, percurrent in lower leaves to long excurrent and forming a yellowish, smooth to weakly knotted, awn in upper leaves, superficial cells on both

surfaces elongate, smooth below and weakly low prorate-papillose toward apex, transverse section semicircular to rounded distally, dorsal stereid band present or represented by substereid cells, dorsal epidermis present, hydroid strand present, guide cells 2–3, often exposed ventrally, sometimes absent in upper leaves, ventral stereid band absent, ventral epidermis present, on upper leaves differentiated as somewhat enlarged, thin-walled cells, frequently absent below mid-leaf; upper laminal cells quadrate to rounded-hexagonal, 9–12 (–14) μm wide, toward mid-leaf more rectangular, to 1.5–2 : 1, rather evenly thin-walled, papillae mostly present on dorsal surface, small, hollow, simple, 4–5 per cell, ventral surface bulging; marginal cells undifferentiated in lower leaves, but mid and upper leaves with a large distal patch of strongly radially elongated, thick-walled and smooth cells forming a distinct toothed border, often lacinate or V-notched on one side; basal cells strongly differentiated in lower 1/3–1/2, rectangular, 18–22 μm wide, 2.5–3 : 1, thin-walled, smooth. *Autoicous*, antheridia in clusters in axils of cucullate lower leaves. *Perichaetia* terminal, leaves strongly differentiated, larger (to 4 mm), with long awns, sheathing, thin walled cells occupying most of leaf except for the strongly differentiated margins that are usually lacinate-toothed near apex. *Seta* short, 0.4–0.6 mm, 1 per perichaetium, brown, straight. *Capsule* immersed in perichaetial leaves, 0.6–0.9 mm, brown, short cylindrical to urceolate, macrostomous, base truncate, neck poorly differentiated; exothelial cells 14–18 μm wide, rectangular, 4–6 : 1, incrassate, somewhat bulging on outer surface, 3–4 rows at mouth transversely elongated; stomata few and restricted to base, phanerophore; annulus weakly differentiated as a single row of quadrate cells; peristome absent. *Operculum* flat to slightly umbonate, cells quadrate to short rectangular, thin-walled, \pm concentrically arranged. *Calyptra* long-conic to mitrate, ca 0.6 mm long, base entire or with 4–6 lobes, grey to yellowish, cells rectangular, thick-walled, with thickened prorate-papillose upper ends. *Spores* spherical to reniform, light- to yellow-brown, densely papillose, 19–27 μm . *Laminal KOH colour reaction* yellow to somewhat orange-yellow.

The genus name acknowledges the support given to the first author by the Algar family of South Africa. The companionship of Clive and Sue Algar, and their provision of a 4 \times 4 vehicle, has enabled field excursions that would otherwise not have been possible. Furthermore, Clive Algar has played a significant part in ensuring the maintenance of biodiversity in the face of development in southern African countries as well as elsewhere around the world. One of the possible derivations of the family name is from the Saxon Aelfgar – elfin spear – an apposite epithet given the long awns of the upper leaves. The species epithet acknowledges the contribution of Natalie Algar-Hedderson, whose insistence on a lunch break led to the discovery of the new moss.

DISCUSSION

Algaria is another in a series of new Pottiaceous genera from the Cape that exhibit extraordinary combinations of

traits (cf. Hedderson & Zander 2007b, 2008). The new genus is extremely distinctive in the combination of small plants, yellow or orange-yellow in KOH, with strongly dimorphic leaves (the upper toothed to lacinate-margined and long-awned, the lower entire, weakly but distinctly cucullate and with the costa ending in the apex), the laminal cells bulging ventrally and smooth to weakly papillose but flattened dorsally and strongly papillose, and immersed, macrostomous, eperistomate capsules with flat to umbonate opercula and flattened or indented bases, and long-conic to mitrate, prorate-papillose calyptrae.

There are no genera among those reacting yellow in KOH to which *Algaria* bears even remote similarity. It is strongly differentiated from the several Pottioidae genera similarly reacting yellow to KOH solution by the plane leaf margins, the presence of a strongly differentiated, lacinate-toothed border in the upper leaves, lack of lamellae on the ventral surface of the costa, exposed guide cells in the costa, the bulging ventral surface of the relatively small upper laminal cells, which are largely papillose only on the dorsal side, the odd soda-can shaped capsule, and the flat to umbonate operculum.

Our unpublished molecular phylogenies of the Pottiaceae, including more than 100 species representing virtually all the recognised genera, place *Algaria* with very strong bootstrap and Bayesian support as sister to the southern hemisphere genus *Tetrapterum*. This *Tetrapterum-Algaria* clade emerges as one of the deeper branches in the phylogeny, and is strongly excluded from clades containing the superficially similar *Tortula* or *Pterygoneurum*. Thus *Algaria* appears to represent a basally-divergent lineage strongly associated with long-isolated taxa of essentially Gondwanaland distributions.

The cladistic removal of *Algaria* from *Tortula* and *Pterygoneurum* indicates that there are strong phylogenetic and developmental constraints on exactly which traits can be expressed to solve environmental problems, in that even phylogenetically distant genera seem to draw upon a distinctive library of traits characteristic of the family.

The genus is presently known only from the type locality in the Worcester-Roberton Karoo. It occurs at medium elevations in vegetation that is transitional between fynbos and succulent karoo. In such habitats, the soils also are often transitional between nutrient-rich clays derived from shales, and nutrient-poor sandy soils derived from quartzitic sandstones. This transitional habitat is relatively common, and largely untransformed, especially along the eastern slopes of the Langeberg, but is not always easily accessible. There is reason to expect, therefore, that *Algaria* will prove to be more common than the current single record would suggest.

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TAXONOMIC ADDITIONS AND CHANGES: *Algaria nataliei* Hedd. & R. H. Zander gen. et sp. nov.

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Note, post publication: the correct spelling of the epithet is "nataliae."