

## A revision of the family Sematophyllaceae (Bryophyta) in southern Africa

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**Abstract:** In the Flora of southern Africa area, comprising the countries of South Africa, Namibia, Botswana, Lesotho and Swaziland, the moss family Sematophyllaceae consists of three genera (*Trichosteleum*, *Donnellia* and *Sematophyllum*) and nine species. Core sematophyllous taxa with collenchymatous exothelial cells, long rostrate operculum, linear leaf cells and differentiated alar cells are included in the family. *Meiothecium fuscescens* is transferred to *Donnellia* and a new combination made. *Sematophyllum wageri* is reduced to synonymy under *S. brachycarpum* and a lectotype is designated for *S. dregei*. Each species is described and its distribution mapped.

**Keywords:** Taxonomy, distribution, southern Africa, Sematophyllaceae

### Introduction

Sematophyllaceae, a mostly pantropical family, was initially described as *tribus Sematophyliae* by Mitten (1869) and raised to family rank by Brotherus (1908).

The family has not yet been revised on a worldwide basis, but is believed to have among 20–30 genera, being more than two thirds oligo- or monotypic (Buck & Tan 1989, Tan & Jia 1999) and about 200 species. Sematophyllaceae (sensu Frey & Stech 2009; Goffinet *et al.* 2009) is the third largest family of pleurocarpous mosses and probably the most widespread one in the tropics. Even being relatively easy to recognize at family level, the generic boundaries are not clear. According to Buck & Tan (1989), more than 70% of the specimens deposited in Asian herbaria are misidentified.

The first molecular studies on Sematophyllaceae (Tsubota *et al.* 2001a, b), found that the Sematophyllaceae include two sister clades: the core sematophyllaceous taxa and a clade named by Tsubota *et al.* (2001a) as “the *Brotherella* lineage”.

As the “*Brotherella* lineage” lacks most (or all) of the features considered typical of Sematophyllaceae it was consequently described as the new family Pylaisiadelphaceae (Goffinet & Buck 2004) helping to better circumscribe both family boundaries.

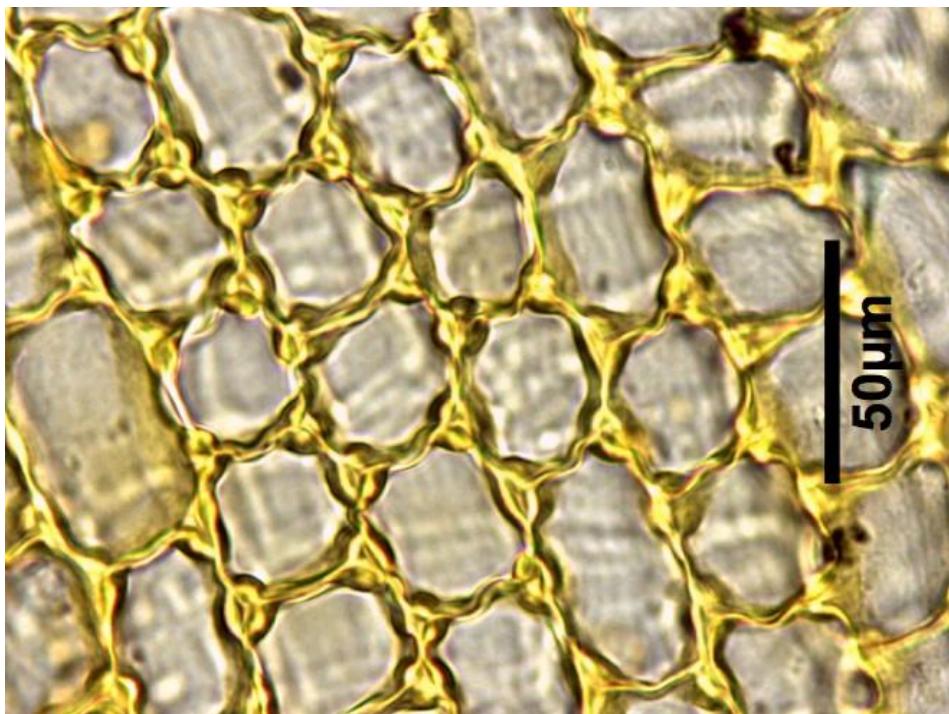
According to Carvalho-Silva *et al.* (2017), with the use of eight molecular markers, the core Sematophyllaceae (sensu strictu) is monophyletic but many of its genera, including the type genus *Sematophyllum* Mitt., are not and some new genera were described to accommodate the segregates.

In this paper we follow the system of classification for Sematophyllaceae by Goffinet *et al.* (2009) and Frey & Stech (2009). Consequently the Sematophyllaceae can be recognized as plants with collenchymatous exothelial cells (Fig. 1), long rostrate operculum, linear leaf cells and developed alar cells (Fig. 2). The Pylaisiadelphaceae will be treated separately.

The family Sematophyllaceae was last revised for southern Africa by Sim (1926). He recognised the genera *Meiothecium* Mitt. (1 species), *Rhaphidorrhynchium* Besch. ex M. Fleisch. (3 species), *Sematophyllum* Mitt. (4 species) and *Trichosteleum* Mitt. (1 species). In their annotated checklist *The bryophytes of southern Africa*, Magill & Schelpe (1979) added the genera *Heterophyllum* (Schimp.) Müll. Hal. ex Kindb. (2 species) and *Wijkia* H.A. Crum (1 species). They also transferred the three species of *Rhaphidorrhynchium* recognised by Sim

(1926) to *Sematophyllum*. This list was kept unchanged for the landmark *Plants of southern Africa: names and distribution* (Van Rooy 1993).

In the most recent checklist of southern African mosses (Van Rooy 2003), the two species of *Heterophyllum* were moved to *Rhacopilopsis* Renauld & Cardot of the family Hypnaceae and *Leptoischyrodon congoanus* Dixon, previously treated in the family Fabroniaceae, was added to the list of Sematophyllaceae. With the addition of *Gammiella ceylonensis* (Broth.) B.C. Tan & W.R. Buck in the latest moss checklist for the country of South Africa (Van Rooy 2006), and a new species of *Sematophyllum* described by Câmara & Van Rooy (2014), six genera and 13 species of Sematophyllaceae were accepted for the region up to this revision.



**Fig 1:** Collenchymatous exothelial cells, a typical feature of Sematophyllaceae and considered as a putative synapomorphy. From Wager CH568 (*Sematophyllum brachycarpum*).

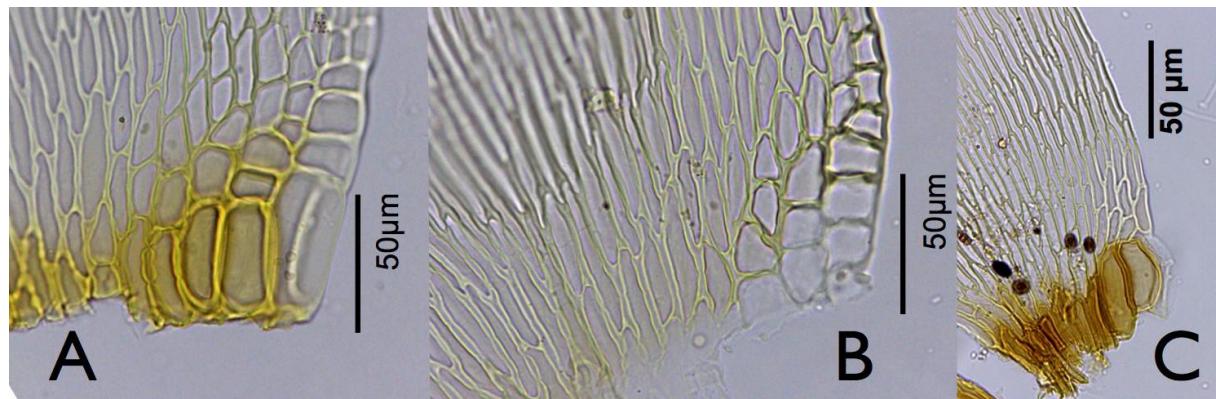
## Material and Methods

A total of 610 specimens from four different herbaria were studied (BM, L, MO and PRE). Specimens were rehydrated in water and mounted in Hoyer's solution (Anderson 1954) when needed. Type species were located by checking the protogues against label data, most of those were studied during our visit to herbarium BM. Measurements and illustrations were made from micropreparations of leaves taken from the middle of the stem. Species are recognized on the basis of morphological differences and are presented in alphabetical order of genera and species.

The morphological terms used here follow Gradstein *et al.* (2001) and Magill (1990). For the alar cells we follow the definition by Tan & Jia (1999), who recognized three main types: acporioid, heterophyllloid and brotherelloid. The South African species only represent the acporioid and heterophyllloid types (Fig. 2).

Author abbreviations follow Brummit and Powell (1992) and abbreviations of journals follow BPH (Lawrence *et al.* 1968). Geographical distribution in southern Africa is based on the specimens studied while worldwide distribution is based on literature (Magill & Schelpe 1979; O'Shea 2006). The study area comprises the Flora of Southern Africa (FSA) area, or the countries of South Africa, Namibia, Botswana, Lesotho and Swaziland. South African Provinces are those currently recognised, however for the localities (i.e below Provinces), we decided to cite the original names as they appear on the labels. For practical purposes, only one specimen is cited for each locality. For the sake of brevity, the lists of 'Representative specimens examined' have been gathered in Appendix.

As this is not a monograph or a taxonomic review, we are aware that some of the names may change as the genera are taxonomically revised in the future and we did not check all the synonyms and their types and do not provide taxonomic comments on them.



**Fig 2:** **A, B:** Heterophyllloid alar cells in *Sematophyllum brachycarpum*; **A** and **B** represent variations found within the same individual. **C:** Acroporioid alar cells in *Sematophyllum zuluense*.  
A & B from Wager CH568, C from Sim 10285, both PRE.

## Results

There are three genera and 9 species of Sematophyllaceae in southern Africa.

### Key to Genera

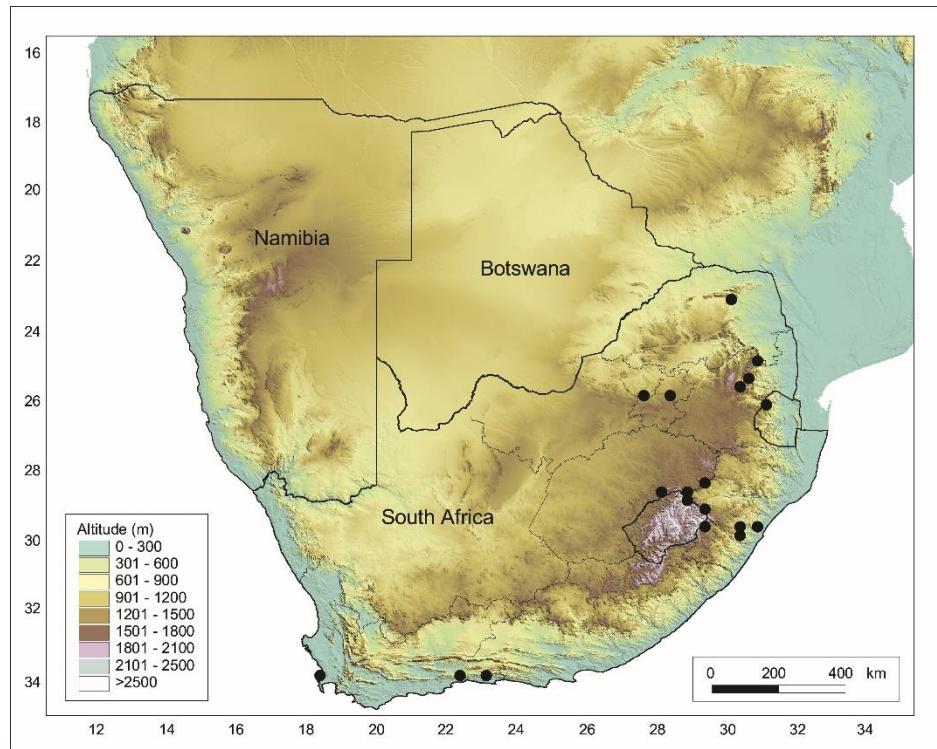
- |   |                         |
|---|-------------------------|
| 1. Leaf cells papillose in at least some leaves.....    | 3. <i>Trichosteleum</i> |
| 1. Leaf cells smooth.....                               | 2                       |
| 2. Alar cells not inflated, margin cells quadrate ..... | 1. <i>Donnellia</i>     |
| 2. Alar cells inflated, margin cells linear .....       | 2. <i>Sematophyllum</i> |

### 1. *Donnellia* Austin, Bull. Torrey Bot. Club 7(2): 15–16. 1880.

*Donnellia fuscescens* (A. Jaeger ex Paris) P. Câmara & M. Carvalho-Silva, **comb. nov.** *Meiothecium fuscescens* (A. Jaeger ex Paris) Broth., Nat. Pflanzenfam. I(3): 1103. 1908. *Pterogoniella fuscescens* A. Jaeger ex Paris, Index Bryol. 1047. 1898. —TYPE: [South Africa]. *Promontorium Bonae Spei*, Bergius s.n. (isotypes: BM!). =*Neckera fuscescens* Müll. Hal., Syn. Musc. Frond. 2: 77. 1850. Invalid.

**Plants** golden green to pale green. Stems creeping, freely branched, central strand absent. **Pseudoparaphyllia** absent. **Stem and branch leaves** similar, erect, homomallous, lanceolate to ovate-lanceolate, concave, 1.00–1.32 mm long, 0.30–0.52 mm wide; margins entire; apex acute; costae absent or short and double; laminar cells long-linear, smooth, 1.0–1.5 mm long, 0.35–0.56 mm wide; margin cells slightly differentiated, rectangular, apex cell rhomboidal and smaller than the mid leaf cells, 54–67 µm long, 7–11 µm wide; alar region developed, colored, alar cells consisting of 2–3 rows, enlarged, sometimes inflated, colored, supra alar cells consisting of 2–3 rows, quadrate to rectangular. **Asexual** propagule absent. **Autoicous.** **Perichaetial leaves** erect, lanceolate, plane or slightly concave, 0.6–1.7 mm long, 0.3–0.4 mm wide, apex acute to acuminate; costae short and double or absent, laminar cells linear, smooth, 40–60 µm long, ca. 9–12 µm wide; alar cells poorly differentiated. **Setae** elongate, smooth, 1.5–2.0 cm long; capsules erect to suberect, cylindric to urceolate, 0.7–1.0 mm long; exothelial cells collenchymatous; annulus present, operculum obliquely long-rostrate; exostome caducous, with zig-zag line, furrowed, cross-striate below, coarsely papillose above, hyaline tip, trabeculate at back; endostome caducous, with high basal membrane, keeled, not perforated, cilia absent. **Spores** spherical, finely papillose, 15–20 µm across. **Calyptrae** not seen.

**Distribution and habitat:** Occurs as epiphyte or on decaying logs. Endemic to southern Africa, *Donnellia fuscescens* is infrequently collected in the Limpopo, Mpumalanga, Gauteng, Free State, KwaZulu-Natal and Western Cape Provinces of South Africa as well as Swaziland. It is fairly widespread in the Drakensberg Domain, the northern subdivision of Van Rooy & Van Wyk's (2010) Afromontane Region, but only known from the George-Knysna and Table Mountain areas in the southern subdivision, the Cape Domain. Fig. 3.



**Fig 3:** Distribution map for *Donnellia fuscescens* (A. Jaeger ex Paris) P. Câmara & M. Carvalho-Silva.

**Discussion:** Southern African specimens were identified as *Meiothecium fuscescens*, but the alar region of the leaves is different and we can see the complete peristome, although sometimes caducous. *Donnellia fuscescens* is characterized by the concave, lanceolate to ovate-lanceolate leaves with apical cells smaller than central cells and the alar region distinct, with quadrate cells. These specimens sometimes look like *Donnellia commutata* from the neotropics, but the setae in *Donnellia fuscescens* are longer and the exostome is different.

**Representative specimens examined:** see Appendix.

## 2. *Sematophyllum* Mitt., J. Linn. Soc., Bot. 8: 5. 1864

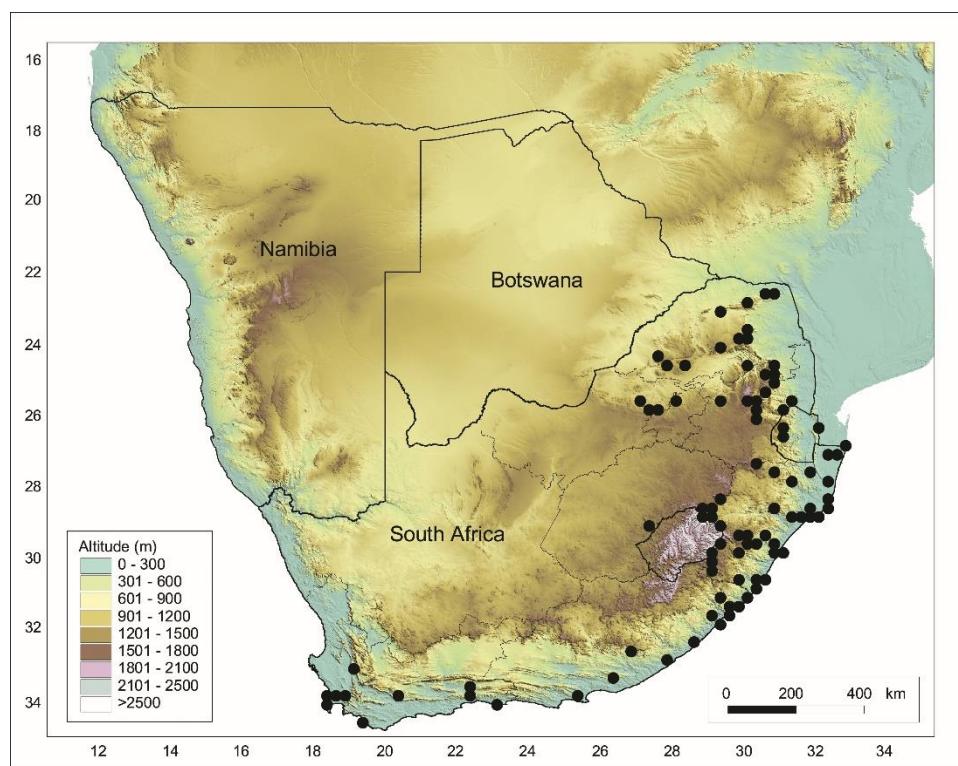
- |   |                             |
|---|-----------------------------|
| 1. Alar cells in 3–4 rows (heterophyllloid kind).....             | 2                           |
| 1. Alar cells in 1–2 rows (acporioid kind).....                   | 5                           |
| 2. Leaves concave.....  | 3                           |
| 2. Leaves complanate.....   | 2.1. <i>S. brachycarpum</i> |
| 3. Apical cells shorter than mid-leaf cells.....                  | 4                           |
| 3. Apical cells same size as mid-leaf cells.....                  | 2.5. <i>S. sphaeropyxis</i> |
| 4. Leaves 0.7–1.2 mm long, alar cells enlarged, colored .....     | 2.6. <i>S. subpinnatum</i>  |
| 4. Leaves 1.9–2.2 mm long, alar cells poorly developed.....       | 2.4. <i>S. magillianum</i>  |
| 5. Leaves falcate.....  | 6                           |
| 5. Leaves straight.....   | 2.7. <i>S. zuluense</i>     |
| 6. Leaf apex long-acuminate, pointed, leaves 0.2–0.3 mm wide..... | 2.2. <i>S. dregei</i>       |
| 6. Leaf apex short-acuminate, blunt, leaves 0.3–0.4 mm wide ..... | 2.3. <i>S. gueinzii</i>     |

### 2.1. *Sematophyllum brachycarpum* (Hampe) Broth., Nat. Pflanzenfam. 11: 431. 1925.

*Hypnum brachycarpum* Hampe, Icon. Musc. 11. 1844. *Rhaphidostegium brachycarpum* (Hampe) A. Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1876–77: 396 (Gen. Sp. Musc. 2: 462). 1878. *Stereodon brachycarpus* (Hampe) Mitt., J. Proc. Linn. Soc. 4: 87. 1859. —TYPE: South Africa, Pappe s.n. (holotype and isotype at BM!). =*Sematophyllum wageri* C.H. Wright ex Wager, Trans. Roy. Soc. South Africa 4: 5. 2 c. 1914. *Rhaphidostegium wageri* (C.H. Wright ex Wager) Dixon, Trans. Roy. Soc. South Africa 18: 260. 1929. —TYPE: Van Reenen, Wager CH568 (holotype: PRE!). *Syn. Nov.* Figure 15A.

**Plants** small, golden green to pale green. Stems creeping, freely branched, central strand absent. **Pseudoparaphyllia** absent. **Stem and branch leaves** similar, erect, complanate, ovate-lanceolate, plane, 1.20–1.35 mm long, 0.25–0.47 mm wide; margins entire; apex acuminate; costae absent; laminal cells linear, smooth, 45–74 µm long, 5.0–8.5 µm wide; alar cells enlarged, not inflated, sometimes colored, consisting of 3–4 rows. **Asexual propagule** absent. **Autoicous.** **Perichaetial leaves** erect, lanceolate or ovate-lanceolate, plane, 1.0–1.6 mm long, 0.25–0.47 mm wide, apex acuminate to acute; costae short and double or absent, laminal cells linear, quadrate near base, smooth, 75–80 µm long, ca. 9–13 µm wide; alar cells poorly differentiated or absent. **Setae** elongate, smooth, ca. 0.6 cm long; capsules erect, ovoid-cylindric, 0.7–1.0 mm long, constricted below mouth when dry; exothelial cells collenchymatous; annulus present, operculum obliquely long-rostrate; exostome with zig-zag line, cross-striate below, coarsely papillose above, trabeculate at back; endostome with high basal membrane, keeled, cilia not seen. **Spores** spherical, finely papillose, 12–20 µm across. **Calyptae** cucullate, naked, smooth.

**Distribution and habitat:** Occurs as an epiphyte, or occasionally on soil or rock, from sea level up to 1900 m. It is widely distributed throughout the Afromontane Region of Van Rooy & Van Wyk (2010) and therefore classified by them (Van Rooy & Van Wyk 2011) in the Widespread Afromontane Subelement, a subdivision of the Afromontane Forest Element. Outside southern Africa it occurs in Kenya, Mozambique, Uganda, Zambia and Zimbabwe. Fig. 4.



**Fig 4:** Distribution map for *Sematophyllum brachycarpum* (Hampe) Broth.

**Discussion:** By far the most common and widespread species of *Sematophyllum* in southern Africa. Gametophytically, this species resembles the widespread American *Donnellia commutata* (Müll. Hal.) W.R. Buck, but as it is frequently found fertile, the sporophyte differences will separate them easily. Under this name we are synonymizing the more rare *Sematophyllum wageri* (with only a few collections known to us). After the study of both types it seems that the confusion may have been caused by the the wide variabilility of the alar cells. Usually plants with a colored and more developed alar region were named as *S. wageri*, whereas the less deveopled, colorless alar region has been associated with *S. brachycarpum*. However, both types of alar cells can be found in the very same individual (Fig. 2 A and B). As all other morphological differences overlap, we decided to treat them as a single species.

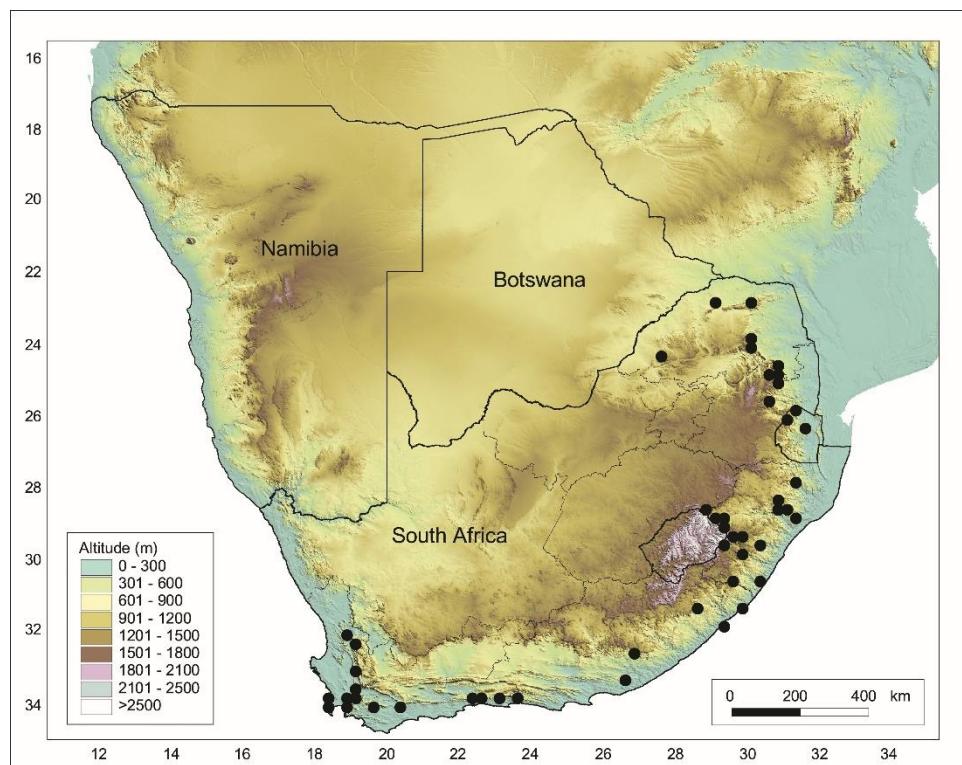
**Representative specimens examined:** see Appendix.

**2.2. *Sematophyllum dregei* (Müll. Hal.) Magill, Mem. Bot. Surv. S. Africa 43: 7. 1979.**

*Hypnum dregei* Müll. Hal., Syn. Musc. Frond. 2: 311. 1851. *Cupressina dregei* (Müll. Hal.) Müll. Hal., Hedwigia 38: 146. 1899. *Rhaphidorrhynchium dregei* (Müll. Hal.) Broth., Nat. Pflanzenfam. 11: 427. 1925. *Rhaphidostegium dregei* (Müll. Hal.) A. Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1876–77: 407 (Gen. Sp. Musc. 2: 473). 1878. —TYPE: [South Africa] Promontorium Bonae Spei, *Drege* [8040] (**Lectotype designated here:** BM!; isolectotype: L!); Prope Phillipstown, *Gueinzius* s.n.; Prope Zwellendam, *Pappe* s.n. (syntypes not found). Illustration Fig. 12B.

**Plants** small, golden green to pale green. Stems creeping, freely branched, central strand absent. **Pseudoparaphyllia** absent. **Stem** and branch leaves similar, falcate, lanceolate, plane, 1.0–1.6 mm long, 0.2–0.3 mm wide; margins entire; apex long-acuminate, serrate; costae absent; laminal cells linear, smooth, 47–71 µm long, 3–4 µm wide; alar cells enlarged, inflated, usually not colored, consisting of 1 row. **Asexual** propagule absent. **Autoicous**. **Perichaetial** leaves erect, linear-lanceolate, plane, 1.3–2.2 mm long, 0.30–0.45 mm wide, apex acuminate to aristate, serrulate; costae absent or short and double, laminal cells linear, smooth, porose, 67–77 µm long, 4–5 µm wide, quadrate near base; alar cells enlarged, inflated usually colored. **Setae** elongate, smooth, ca. 1 cm long; capsules inclined to pendent, ovoid-cylindric, ca. 1 mm long, constricted below mouth when dry; exothecial cells collenchymatous; annulus present, operculum obliquely long-rostrate; exostome with zig-zag line, cross-striate below, coarsely papillose above, trabeculate at back; endostome with high basal membrane, keeled, cilia absent. **Spores** spherical, finely papillose, 19–21 µm across. **Calyptrae** cucullate, naked, smooth.

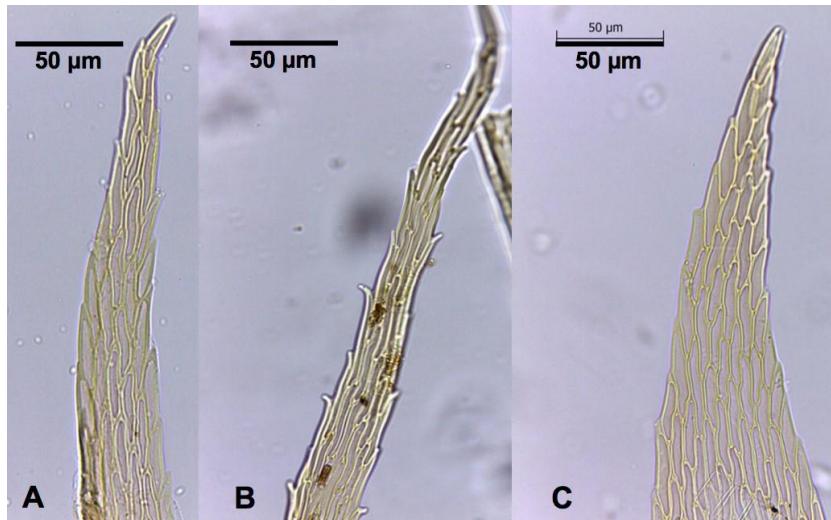
**Distribution and habitat:** Grows as epiphyte or on decaying logs or rarely on rock, from sea level up to 3069 m high in the Drakensberg range. Another species of the Widespread Afromontane Subelement (Van Rooy & Van Wyk 2011), *S. dregei* is widespread throughout the Afromontane region of South Africa, except Gauteng Province. Outside South Africa, it occurs in Kenya, Malawi, Swaziland, Tanzania, Zimbabwe and Namibia. Fig. 5.



**Fig 5:** Distribution map for *Sematophyllum dregei* (Müll. Hal.) Magill

**Discussion:** This species resembles *S. gueinzii*, indeed they seem to be very close and are somewhat difficult to tell apart. We decided to keep them separate based on the wider leaf shape of *S. gueinzii* as well as differences in its apex shape and serrulation, as *S. dregei* has a more narrowly pointed apex (Fig. 6). The porose cells (found on both) and alar cell region resemble some new world species of *Acroporium*.

**Representative specimens examined:** see Appendix.



**Fig 6:** Leaf apex differences between *Sematophyllum dregei* (A and B) and *S. gueinzii* (C). A and B from Drege [8040] (BM) and C from Pappe s.n. (BM).

### 2.3. *Sematophyllum gueinzii* (Hampe) Magill, Mem. Bot. Surv. S. Africa 43: 7. 1979.

*Hypnum gueinzii* Hampe, Icon. Musc. 12. 1844. *Rhaphidorrhynchium gueinzii* (Hampe) Broth., Nat. Pflanzenfam., 11: 428. 1925. *Rhaphidostegium gueinzii* (Hampe) A. Jaeger, Ber. Thätigk. Gallischen Naturwiss Ges. 1876–77: 407 (Gen. Sp. Musc. 2: 473). 1878. —TYPE: South Africa, Pappe s.n. (holotype and isotype at BM!). Fig 12 C.

**Plants** small, golden green to pale green. Stems creeping, freely branched, central strand absent. **Pseudoparaphyllia** absent. **Stem** and branch leaves similar, erect, ovate-lanceolate, plane, falcate, 0.9–1.4 mm long, 0.31–0.40 mm wide; margins entire; apex short-acuminate, rarely serrulate at very apex; costae short and double; laminal cells linear, smooth, 50–71 µm long, 6.0–7.0 µm wide; alar cells enlarged, inflated, colored, consisting of 1 row. **Asexual** propagule absent. **Autoicous**. **Perichaetial** leaves erect, lanceolate, plane, 1.8–2.0 mm long, ca. 0.41 mm wide, apex acuminate, serrulate; costae absent, laminal cells linear, quadrate near base, smooth, 60–80 µm long, 4.5–5.5 µm wide; alar cells enlarged, not inflated. **Setae** elongate, smooth, 0.8–1.0 mm long; capsules inclined, ovoid-cylindric, ca. 1.0–1.5 mm long, constricted below mouth when dry; exothecial cells collenchymatous; annulus present, operculum obliquely long-rostrate; exostome with zig-zag line, cross-striate below, coarsely papillose above, trabeculate at back; endostome with high basal membrane, keeled, cilia absent. **Spores** spherical, finely papillose, 12–14 µm across. **Calyptrae** cucullate, naked, smooth.

**Distribution and habitat:** Occurs as epiphyte or on decaying logs from sea level up to 2000 m, very few specimens were found up to 3000 m in the Drakensberg range. Widespread throughout the Afromontane Region, the species is most frequently collected in the Eastern and Western Cape Provinces. Outside southern Africa, it occurs in Zimbabwe. Fig. 7.

**Discussion:** This species resembles *S. dregei*, see comments there.

**Representative specimens examined:** see Appendix.

### 2.4. *Sematophyllum magillianum* Câmara, P.E.A.S. & Van Rooy, Bryologist 117(3): 297. 2014.

—TYPE: South Africa, Transvaalia: in montibus Kwatlamba supra Lydenburg, J.H. McLea sub A. Rehmann 660 (holotype: PRE!; isotypes: LW, PRE!, UB!). Figure in Câmara & Van Rooy (2014).

**Plants** robust, dark green. **Stems** creeping, freely branched, central strand absent. **Pseudoparaphyllia** absent. **Stem** and branch leaves similar, erect, never homomallous, ovate or orbicular, concave, 1.9–2.2 mm long, 0.8–1.1 mm wide, margins entire; costae absent; cells linear, smooth, 73–80 µm long, 8.5–9.2 µm wide; alar cells in 2–3 rows, poorly developed, non-inflated and usually not colored. **Asexual** propagule absent. **Autoicous**. **Perichaetial** leaves erect, lanceolate to triangular, 1.7–2.5 mm long, 0.5–0.7 mm wide, acuminate, plane; costae absent, cells linear, smooth, 115–170 µm long, 11.5–13.5 µm wide; alar cells not differentiated. **Setae** elongate, smooth, 1.0–1.5 cm long; capsules erect, ovoid-cylindric, ca. 2 mm long, not constricted below mouth when dry; exothecial cells collenchymatous; annulus poorly differentiated, operculum not seen; exostome teeth hyaline, on front surface with thickened zig-zag center line, plates coarsely but sparsely papillose, on back surface trabeculae not projecting, smooth, cross-striate below; endostome with high basal membrane, keeled, cilia not seen. Spores spherical, finely papillose, ca. 17 µm across. **Calyptrae** not seen.

**Distribution and habitat:** The species grows on rock in streams (occasionally submerged) and wet rock faces in wooded kloofs and forests, at elevations of 15 to 1219 m. Endemic to South Africa, it is centered in the Midlands and coastal regions of KwaZulu-Natal and the Pondoland region of the Eastern Cape. It is also found in the Soutpansberg of Limpopo, the Drakensberg escarpment of Mpumalanga and the Magaliesberg of the North-West Province. Two collections are known from Table Mountain in the South Western Cape. Fig. 8.

**Discussion:** This species is mostly aquatic and herbarium specimens were frequently named as *Sematophyllum caespitosum* Mitt. (see Câmara & van Rooy 2014). *Sematophyllum magillianum* can be easily recognized by the size of the plants and the poorly developed alar region of the leaf.

**Representative specimens examined:** see Appendix.

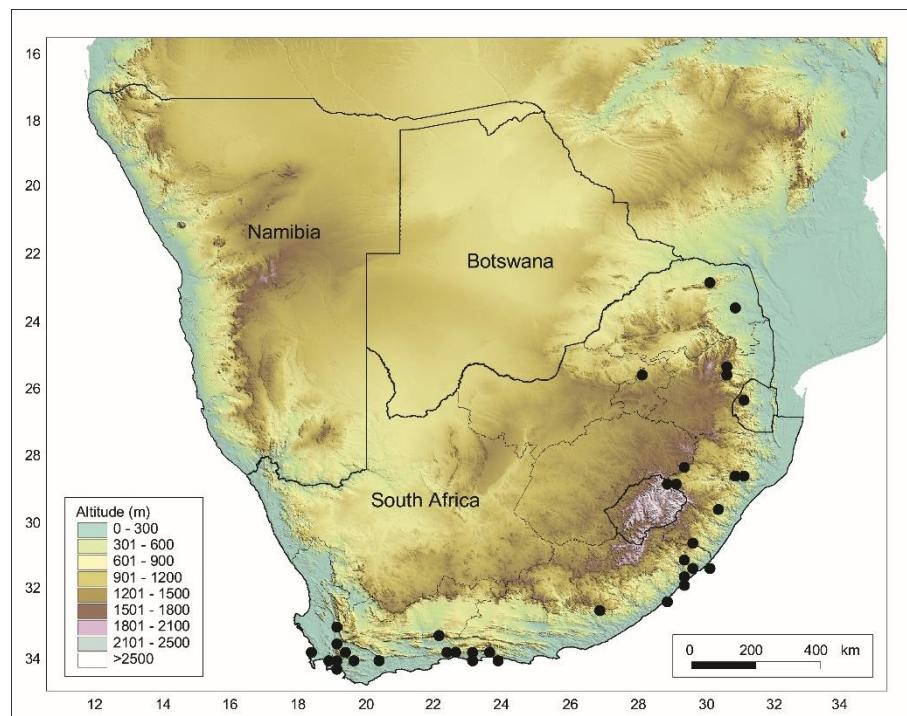


Fig 7: Distribution map for *Sematophyllum gueinzii* (Hampe) Magill

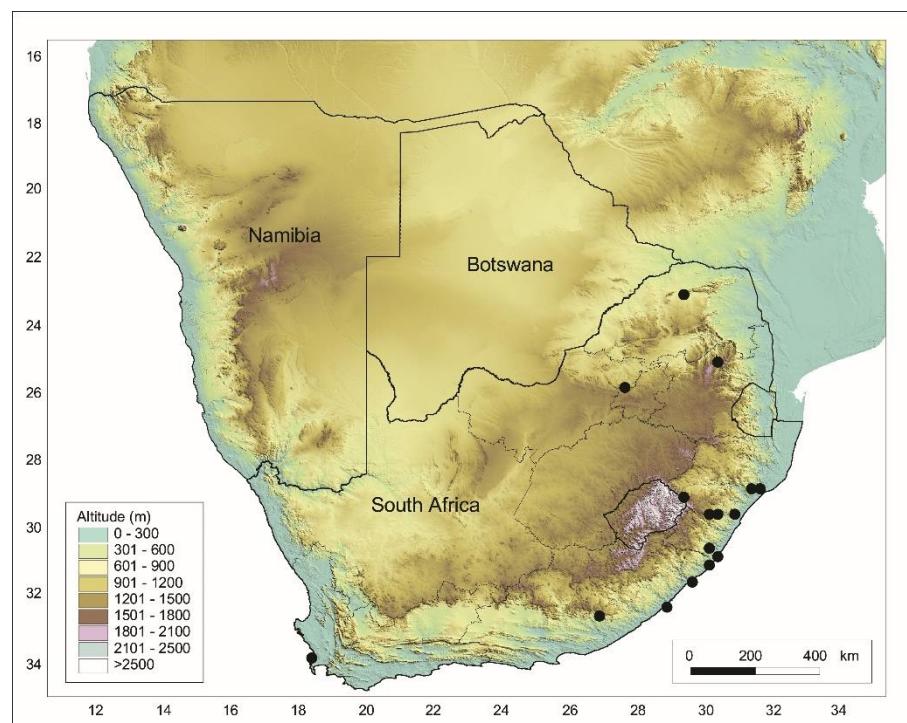


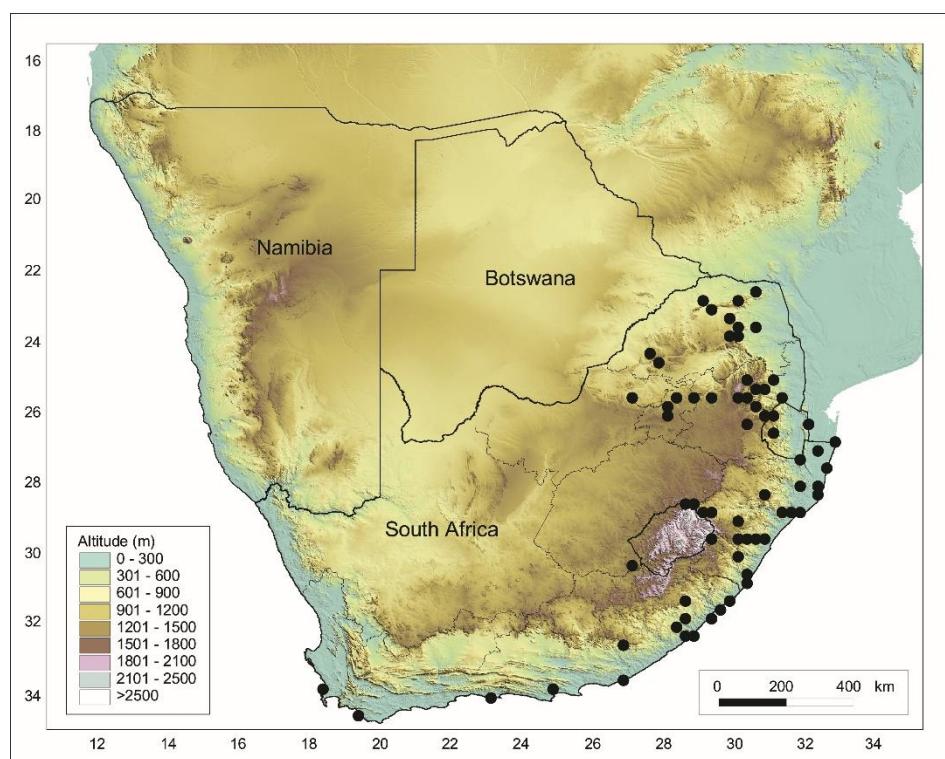
Fig 8: Distribution map for *Sematophyllum magillianum* Câmara & Van Rooy.

## 2.5. *Sematophyllum sphaeropyxis* (Müll. Hal.) Broth., Nat. Pflanzenfam. 11: 432. 1925.

*Aptychus sphaeropyxis* Müll. Hal., Hedwigia 38: 141. 1899. *Rhaphidostegium sphaeropyxis* (Müll. Hal.) Paris, Index Bryol. Suppl. 297. 1900. —TYPE: South Africa, Natal, Inchanga, Rehmann 372 (holotype at B, probably lost; isotypes: BM!, L!, PRE!). Fig 12D.

**Plants** small, golden green to dark green. **Stems** creeping, freely branched, central strand absent. **Pseudoparaphyllia** absent. **Stem** and branch leaves similar, erect, oblong-lanceolate, galeate, concave, 1.5–1.6 mm long, 0.38–0.46 mm wide; margins entire; apex acuminate; costae absent; laminal cells linear, smooth, 71–81 µm long, 6.0–7.5 µm wide; alar cells enlarged, not inflated, colored, consisting of 3 rows. **Asexual** propagule absent. **Autoicous**. **Perichaetial** leaves erect, lanceolate, plane, 1.8–2.0 mm long, 0.32–0.43 mm wide, apex acuminate, entire; costae absent, laminal cells linear, quadrate near base, smooth, 75–115 µm long, 7–10 µm wide; alar cells poorly differentiated. **Setae** elongate, sometimes twisted, smooth, 1.0–1.5 cm long; capsules erect to horizontal, ovoid-cylindric, 1–2 mm long, constricted below mouth when dry; exothelial cells collenchymatous; annulus present, operculum long-rostrate; exostome with zig-zag line, cross-striate below, coarsely papillose above, trabeculate at back; endostome with high basal membrane, keeled, perforated, cilia absent. **Spores** spherical, finely papillose, 15–17 µm across. **Calyptrae** cuculate, naked, smooth.

**Distribution and habitat:** The species is mostly epiphytic or on decaying logs from sea level up to 2893 m high in the Maloti Mountains of Lesotho. In southern Africa it is frequently collected in the northern part of the Afromontane Region (Drakensberg Domain) and infrequently in the southern part or the Cape Domain (Van Rooy & Van Wyk 2010). *Sematophyllum sphaeropyxis* is also known from Zimbabwe. Fig. 9.



**Fig 9:** Distribution map for *Sematophyllum sphaeropyxis* (Müll. Hal.) Broth.

**Discussion:** With its concave and galeate leaves, this very abundant species resembles the new world *Sematophyllum galipense* and *S. cuspidiferum*.

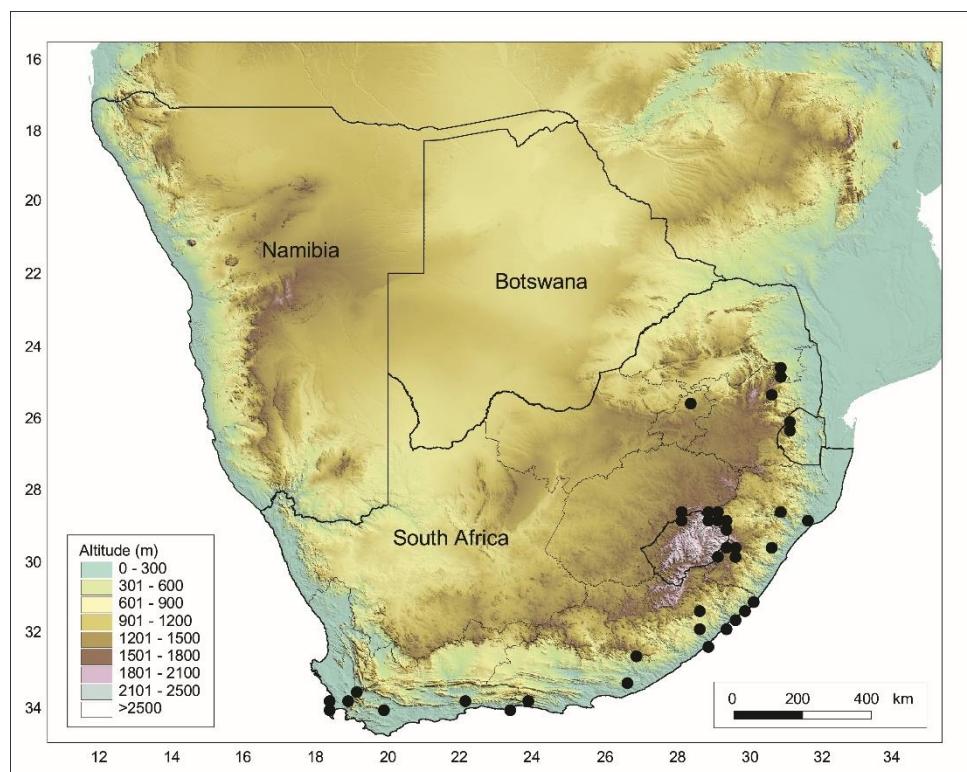
**Representative specimens examined:** see Appendix.

## 2.6. *Sematophyllum subpinnatum* (Brid.) E. Britton, Bryologist 21(2): 28. 1918.

*Leskea subpinnata* Brid., Muscol. Recent. Suppl. 2: 54. 1812. *Hypnum subpinnatum* (Brid.) Arn., Mém. Soc. Linn. Paris, 5: 302. 1827. *Rhaphidostegium subpinnatum* (Brid.) E. Britton, Bryologist 21: 28. 1918. —TYPE: In Hispaniola ad arbores habitat, Poiteau s.n. (holotype at B; isotype: NY!). =*Leskea caespitosa* Sw., Fl. Ind. Occid. 3: 1807. 1806. *Hom. Illeg. Sematophyllum caespitosum* [Sw.] Mitt., J. Linn. Soc., Bot. 12: 479. 1869. *Rhaphidostegium caespitosum* (Mitt.) Besch., Ann. Sci. Nat., Bot., sér. 6, 3: 247. 1876. Fig. 12 E.

**Plants** small to medium size, golden green to dark green. Stems creeping, freely branched, central strand absent. **Pseudoparaphyllia** absent. **Stem** and branch leaves similar, usually homomallous, ovate to oblong-ovate, concave, 0.7–1.2 mm long, 0.30–0.45 mm wide; margins entire; apex acute or short acuminate; costae absent; laminal cells linear at mid leaf becoming shorter and rhomboidal in the apex, smooth, 55–78 µm long, 6.5–8.5 µm wide; alar cells enlarged, not inflated, colored, consisting of 3–4 rows. **Asexual** propagule absent. **Autoicous**. **Perichaetial** leaves erect, oblong-ovate, plane, 1.0–1.3 mm long, 0.3–0.5 mm wide, apex acuminate; costae absent, laminal cells long-rhomboidal, smooth, 60–112 µm long, 7–15 µm wide; alar cells not differentiated. **Setae** elongate, smooth, 0.5–1.0 cm long; capsules erect to suberect, short-cylindrical, ca. 1 mm long, constricted below mouth when dry; exothecial cells strongly collenchymatous; annulus not differentiated, operculum obliquely long-rostrate; exostome with zig-zag line, cross-striate below, coarsely papillose above, trabeculate at back; endostome with high basal membrane, keeled, cilia not seen. **Spores** spherical, finely papillose, 15–20 µm across. **Calyptrae** cucullate, naked, smooth.

**Distribution and habitat:** In the FSA area, *S. subpinnatum* occurs as an epiphyte or saxicolous, rarely rupicolous, from sea level up to 2174 m. Widespread throughout the Afromontane Region of Van Rooy & Van Wyk (2010), but absent from the Limpopo Province in the north. Outside southern Africa, the species is widespread throughout tropical and subtropical Africa. It is also widespread in the Americas, ranging from southern USA to South Brazil. Fig. 10.



**Fig 10:** Distribution map for *Sematophyllum subpinnatum* (Brid.) E. Britton

**Discussion:** Usually easily recognized in the New World by its curved branches and homomallous leaves with bordered appearance, but in southern Africa it happens to be a highly variable species, and may actually contain more than one species filed under this name. Unfortunately for this study it was not possible to differentiate between groups and to address this question more deeply. Consequently we decided to recognize a wider concept of *S. subpinnatum*. Also the relationships with the new world specimens need to be investigated, but this is beyond the scope of this work.

**Representative specimens examined:** see Appendix.

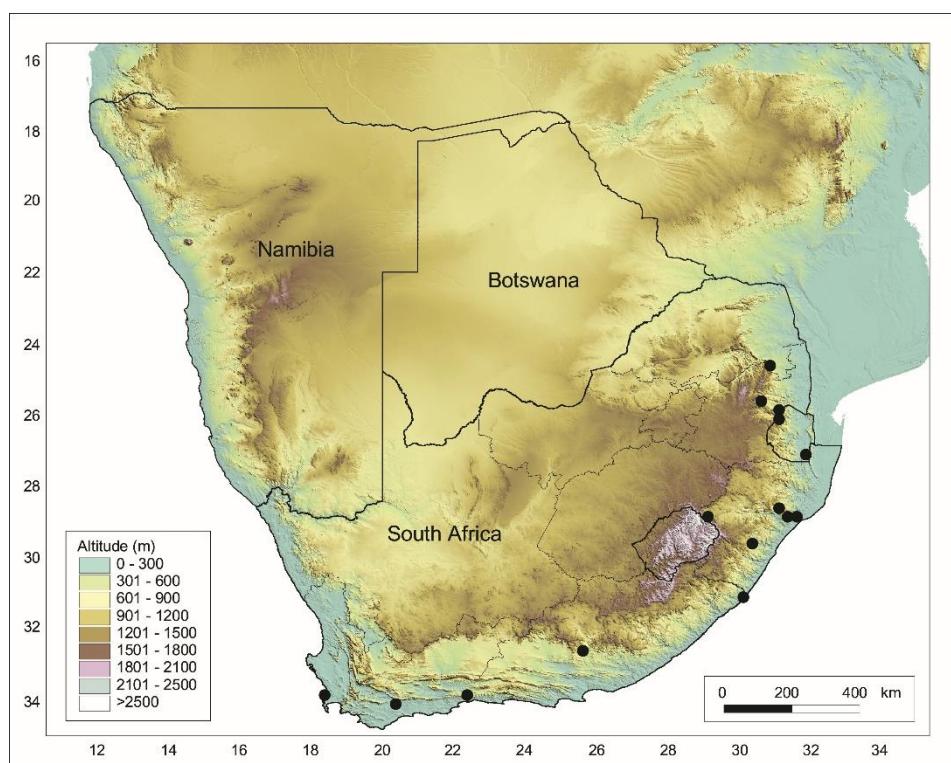
**Nomenclatural notes:** Most (if not all) of the collections of this species in herbarium PRE were named *Sematophyllum caespitosum* Mitt. This name was widely (and mistakenly) used for this species for many years both in Africa and South America. Dixon (1920) and Buck (1983) have clarified the correct use of the name for this particular species.

**2.7. *Sematophyllum zuluense* (Sim) Magill, Mem. Bot. Surv. S. Africa 43: 7. 1979.**

*Rhaphidorrhynchium zuluense* Sim., Trans. Roy. Soc. South Africa 15: 438. 1926. —TYPE: South Africa, Ngoya Forest, Zululand, 1000 feet, 1915, Sim 10285. (holotype: PRE!, isotype: BM!). Fig 12 F.

**Plants** medium sized, golden green. **Stems** creeping, freely branched, central strand absent. **Pseudoparaphyllia** absent. **Stem** and branch leaves similar, complanate, strongly lanceolate or linear-lanceolate, plane, 1.2–2.0 mm long, 0.20–0.35 mm wide; margins entire; apex acuminate; costae absent; laminal cells linear, smooth, 53–100 µm long, 5.0–7.5 µm wide, porose; alar cells enlarged, sometimes inflated, colored, consisting of 1 row. **Asexual** propagule absent. **Autoicous. Perichaetial** leaves erect, linear-lanceolate or ovate-lanceolate, plane, 1.5–1.8 mm long, 0.3–0.5 mm wide, apex acuminate to aristate, serrulate; costae absent, laminal cells linear to quadrate, smooth, 32–55 µm long, 7–9 µm wide, porose; alar cells differentiated, in 1 row, often colored. **Setae** elongate, smooth, ca 0.5 cm long; capsules inclined, ovate-oblong, ca. 0.5 mm long, constricted below mouth when dry; exothecial cells collenchymatous; annulus present, operculum long-rostrate; exostome furrowed, cross-striate below, coarsely papillose above, trabeculate at back; endostome with high basal membrane, keeled, perforated, cilia absent. **Spores** spherical, finely papillose, 13–20 µm across. **Calyptrae** not seen.

**Distribution and habitat:** Growing on tree bark or rocks from 300 to 1700 m. Endemic to South Africa, *S. zuluense* is scattered throughout the Afromontane Region of Van Rooy & Van Wyk (2010), as far north as Mariepskop in Mpumalanga. Fig. 11.

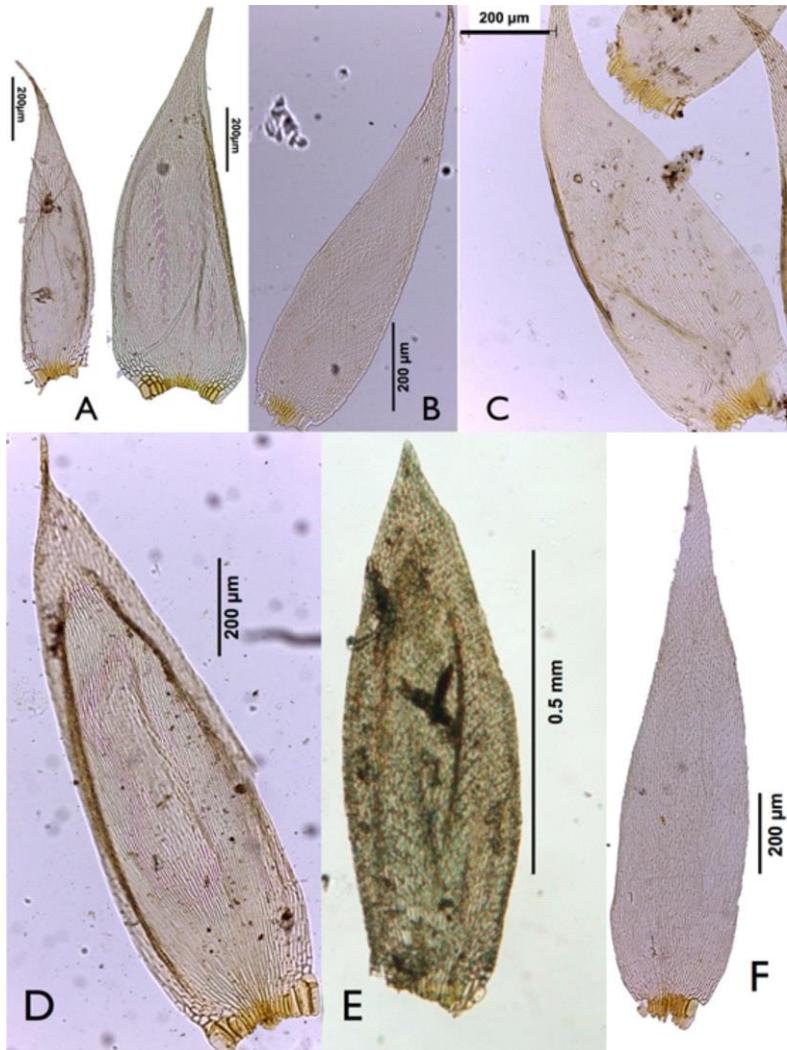


**Fig 11:** Distribution map for *Sematophyllum zuluense* (Sim) Magill

**Discussion:** This remarkable and somehow rare plant bears strong resemblance to representatives of *Acroporium* as well as the new world *Aptychopsis* and it is likely to be transferred to either in the near future as molecular studies may reveal its true relationships. The furrowed exostome suggests its close relationship with *Acroporium* whereas its alar cells relate to both *Acroporium* and *Aptychopsis*.

In the original description (Sim 1926), the author has not seen the endostome and unfortunately the type specimens investigated only had one single capsule, but as other specimens were investigated by us, a more detailed description was possible and presented here.

**Representative specimens examined:** see Appendix.



**Fig 12:** Leaves of **A:** *Sematophyllum brachycarpum*, **B:** *S. dregei*, **C:** *S. gueinzii*, **D:** *S. sphaeropyxis*, **E:** *S. subpinnatum*, **F:** *S. zuluense*. A from Pappe s.n. (holotype, BM), B from Drege [8048] (lectotype, BM), C from Pappe s.n. (holotype, BM), D from Rehmann 372 (BM), E from Rehmann 421 (PRE) and F from Sim 10285 (PRE).

### 3. *Trichosteleum* Mitt., J. Linn. Soc., Bot. 10: 181. 1868.

*Trichosteleum perchlorosum* Broth. & Bryhn, Forh. Vidensk-Selsk Kristiania 1911(4): 24. 1911.

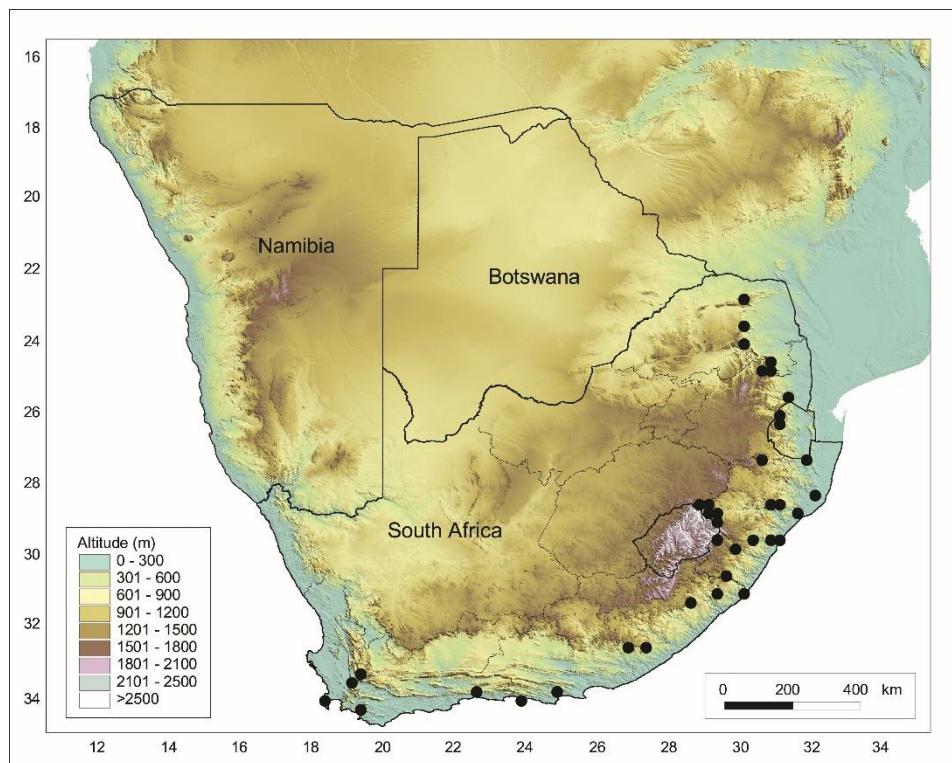
—TYPE: [South Africa]. Zululand, Ekombe, in Sylva Ntingwe, Titlestad s.n. (C). Fig. 14.

**Plants** medium sized, golden green to yellow. **Stems** creeping, freely branched, central strand absent. **Pseudoparaphyllia** absent. **Stem and branch leaves** similar, incurved, lanceolate, falcate, 1.1–1.5 mm long, 0.28–0.33 mm wide; margins entire to denticulate above; apex acuminate to aristate; costae absent; laminal cells linear, smooth to papillose, 60–70 µm long, 4.5–6.0 µm wide; alar cells enlarged, inflated, colored. **Asexual** propagule absent. **Autoicous. Perichaetial** leaves erect, oblong-lanceolate, plane, 1.1–1.4 mm long, 0.3–0.4 mm wide, apex acuminate to aristate, serrulate; costae absent, laminal cells linear, smooth to papillose, 60–70 µm long, 7.0–8.5 µm wide; alar cells poorly differentiated. **Setae** elongate, smooth, 0.5–0.7 cm long; capsules inclined to pendent, ovoid-cylindric, ca. 3 mm long, constricted below mouth when dry; exothecial cells collenchymatous; annulus present, operculum obliquely long-rostrate; exostome with zig-zag line, cross-striate below, coarsely papillose above, trabeculate at back; endostome with high basal membrane, keeled, cilia single, shorter than exostome teeth. **Spores** spherical, finely papillose, ca. 15 µm across. **Calyptrae** cucullate, naked, smooth.

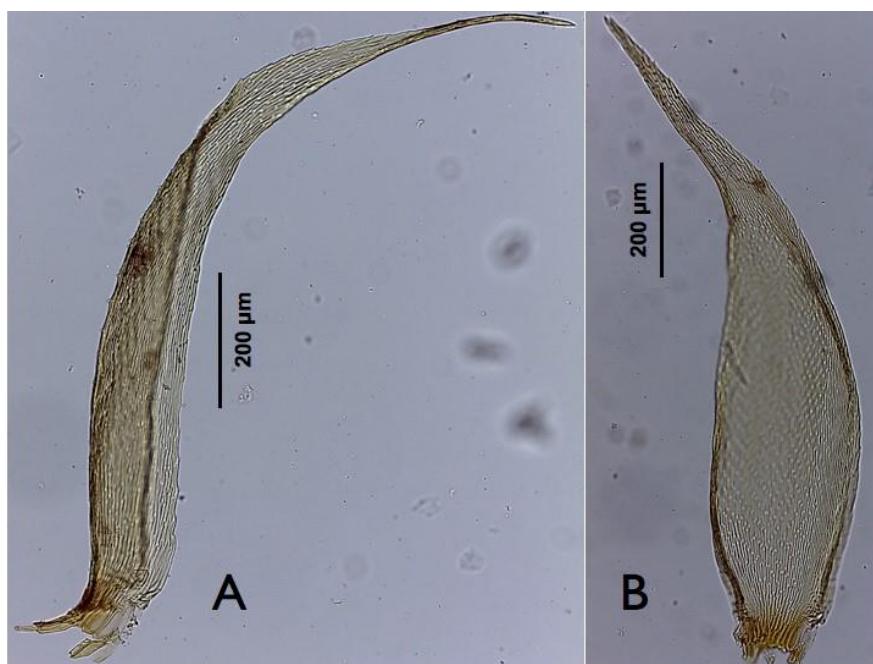
**Distribution and habitat:** Occurs as epiphytes and also on decaying logs or rock from sea level up to 3090 m high (Drakensberg). It is widespread throughout the Afromontane Region of Van Rooy and Van Wyk (2010), but unknown from the Gauteng Province. It was listed for Zimbabwe by O'Shea (2006), but we had not seen any voucher from there. Fig. 13.

**Discussion:** This is the only papillae-bearing Sematophyllaceae in southern Africa. It is a very unique feature that helps to identify this species. However, it is not always easy to see its papillae under the light microscope, so it is important to look carefully, especially on leaves that are folded, which makes the papillae more visible. We have found leaves with and without papillae on the same plant. The falcate leaves also help to identify this species. This species closely resembles the New World *Trichosteleum glaziovii* (Hampe) W.R. Buck as they both share the papillose falcate leaves, however, the latter is of a much smaller size.

**Representative species examined:** see Appendix.



**Fig 13:** Distribution map for *Trichosteleum perchlorosum* Broth. & Bryhn



**Fig 14:** Leaves of *Trichosteleum perchlorosum* Broth. & Bryhn. (A and B). From Titlestad s.n. (C).

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## References

- Brotherus V.F. (1908): Bryales, in part. I (3): 1057-1152. In: Engler H.G.A. & Prantl K.A.E. (eds): Nat. Pflanzenfam., Engelmann, Leipzig.
- Brummitt R.K. & Powell C.E. (eds) (1992): Authors of Plant Names. A list of authors of scientific names of plants, with recommended standard form of their names including abbreviations. Royal Botanic Gardens, Kew, [4] 732 pp.
- Buck W.R. (1983): Nomenclatural and taxonomic notes on West Indian Sematophyllaceae. – Brittonia 35: 309-311.
- Buck W.R. & Tan B.C. (1989): The Asiatic genera of Sematophyllaceae associated with *Trichosteleum*. – Acta Bryol. Asiat. 1: 5-19.
- Câmara P.E.A.S. & Van Rooy J. (2014): A new species of *Sematophyllum* (Sematophyllaceae) from South Africa and a key to the southern African species of the genus. – The Bryologist 117 (3): 297-300.
- Carvalho-Silva M., Stech M., Soares-Silva L.H., Buck W.R., Wickett N., Liu Y. & Câmara P.E.A.S. (2017): A molecular phylogeny of the Sematophyllaceae s.l. (Hypnales) based on plastid, mitochondrial and nuclear markers, and its taxonomic implications. – Taxon 66(4): 811-831.
- Dixon H. N. (1920): *Rhaphidostegium caespitosum* (Sw.) and its affinities. – J. Bot. 58: 81-89.
- Frey W. & Stech M. (2009): Bryophytes and seedless vascular plants 3: I-IX. In: Syl. Pl. Fam. ed. 13. Gebr. Borntraeger Verlagsbuchhandlung, Berlin, Stuttgart.
- Goffinet B. & Buck W.R. (2004): Systematics of the Bryophyta (mosses): from molecules to a revised classification, 205–239 pp. In: Goffinet B., Hollowell V. & Magill R.E. (eds): Molecular systematics of bryophytes. – Monogr. Syst. Bot. Missouri Bot. Gard vol. 98, Missouri Botanical Garden, St. Louis.
- Goffinet B., Buck W.R. & Shaw A.J. (2009): Morphology, anatomy, and classification of the Bryophyta, 55-138 pp. In: Bryoph. Biol. Ed. 2. Cambridge University Press, Cambridge, U.K.
- Gradstein S.R., Churchill S.P. & Salazar Allen N. (2001): Guide to the bryophytes of tropical America. – Mem. New York Bot. Gard. 86, 577 pp.
- Lawrence G.M.H., Buchheim A.F.G., Daniels G.S. & Dolezal H. (1968): B-P-H; Botanico-Periodicum-Huntianum. Hunt Botanical Library, Pittsburgh, Penn., 1063 pp.
- Magill R.E. (1990): Glossarium polyglottum bryologiae: a multilingual glossary for bryology. – Monogr. Syst. Bot. Missouri Bot. Gard. 33, 297 pp.
- Magill R.E. & Schelpe E.A. (1979): The bryophytes of southern Africa: an annotated checklist. – Mem. Bot. Surv. S. Africa 43, 38 pp.
- Mitten W. (1869): Musci Austro-American. – J. Linn. Soc., Bot. 12, 659 pp.
- O'Shea B.J. (2006): Checklist of the mosses of sub-Saharan Africa. – Trop. Bryol. Res. Rep. 6: 1-252.
- Sim T.R. (1926): The Bryophyta of South Africa. – Trans. Roy. Soc. South Africa 15, 475 pp.
- Tan B.C. & Jia Y. (1999): A preliminary revision of Chinese Sematophyllaceae. – J. Hattori Bot. Lab. 86: 1-70.
- Tsubota H., Akiyama H., Yamaguchi T., & Deguchi H. (2001a): Molecular phylogeny of the Sematophyllaceae (Hypnales, Musci) based on chloroplast rbcL sequences. – J. Hattori Bot. Lab. 90: 221-240.
- Tsubota H., Akiyama H., Yamaguchi T. & Deguchi, H. (2001b): Molecular phylogeny of the genus *Trismegistia* and related genera (Sematophyllaceae, Musci) based on chloroplast rbc L sequences. – Hikobia 13: 529-549.
- Van Rooy J. (1993): Musci, 17-46 pp. In: Arnold T.H. & De Wet B.C. (eds): Plants of southern Africa: names and distribution. – Mem. Bot. Surv. S. Afr. 62. National Botanical Institute, Pretoria.
- (2003): Bryophyta, 2-37 pp. In: Germishuysen G. & Meyer N.L. (eds): Plants of southern Africa: an annotated checklist. – Strelitzia 14. National Botanical Institute, Pretoria.
- (2006): Bryophyta, 1-30 pp. In: Germishuysen G., Meyer N.L., Steenkamp Y. & Keith M. (eds): A checklist of South African plants. – Southern African Botanical Diversity Network Report 41. SABONET, Pretoria.
- Van Rooy J. & Van Wyk A.E. (2010): The bryofloristic regions of southern Africa. J. Bryol. 32: 80-91.
- (2011): The bryofloristic elements of southern Africa. J. Bryol. 33: 17-29.

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## APPENDIX: REPRESENTATIVE SPECIMENS EXAMINED.

***Donnellia fuscescens***— **Free State:** Meiringspoort Nature Park, *Van Rooy* 336, 338 (PRE). **Gauteng:** Donkerpoort, *Doidge & Bottomley s.n.* (PRE); Hartebeeshoek Satellite tracking station, *Van Rooy* 3984 (PRE). **KwaZulu-Natal:** Goodoo pass, *Bews* sub *Sim* 8396 (PRE); Sani Pass area, *Magill* 7039, 7258, 7292, 7314 (MO); Cathedral Peak area, *Magill* 6867, 6894 (MO); between Eston and Richmond, *Van Rooy* 1026 (PRE); Inanda, *Rehmann* 422 (PRE); Knoll, Hilton road, *Sim* CH7961 (PRE); Royal Natal National Park, *Crosby & Crosby* 7831 (PRE, MO); Van Reenen, *Wager* 195, 551, 7741B (PRE). **Limpopo:** Entabeni Sate Forest, *Glen* 3918 (PRE); **Mpumalanga:** Mount Sheba Nature Reserve, *Knox* 12 (PRE); Rooiwal, *Bosman* CH6384 (PRE); Waterval-Boven, *Van Rooy & Perold* 3824 (PRE). **Western Cape:** George, *Perold* 926 (PRE); Knysna, *Russel* 2573 (PRE); Table Mountain, *Pillans* 3988 (PRE), *Sim* 9158 (PRE). **Swaziland:** Malolotja Nature Reserve, *Braun* 719 (PRE).

***Sematophyllum brachycarpum***— **Eastern Cape:** Butterworth area, Manubi Forest, *Linder* 1227 (PRE); Bizana, Ndunge forest, *Phephu* 36 (PRE); Grahamstown, *Jacot-Guillarmod* 7806 (PRE); Hluleka Nature Reserve, *Hoffman* 32 (PRE); Hogsback, *Jacot-Guillarmod* CH12578 (PRE); Kwelera River near East London, *Van Rooy* 935 (PRE); Magwa Falls, *Van Rooy* 1899 (PRE); Mlengana, *Van Rooy* 2014 (PRE); Mkambati Game Reserve, *Abbott* 7188 (PRE); Ntabankulu, KuGomo forest, *Phephu* 66 (PRE); Port St Johns, *Wager* 1450 (PRE); Transkei, Ka-Imsizizi, *Stirton* 5702 (PRE); Uitenhage, *Smook* 3823 (PRE). **Free State:** Ladybrand, *Van Rooy* 564 (PRE). **Gauteng:** Hartebeeshoek Satellite Tracking Station, *Van Rooy* 4001 (PRE); Pretoria, *Bosman* 1162A (PRE). **KwaZulu-Natal:** NE of Vryheid, *Magill* 5063 (PRE); between Kranskop and Vryheid, *Magill* 5096 (PRE); Bushmans Nek, *Van Rooy* 1496 (PRE); Capuchin Convent, *Van Rooy* 981 (PRE); Donnybrook, *Scott* CH11224 (PRE); Cathedral Peak Forest Station, *Van Rooy* 1195 (PRE); Cathedral Peak area, *Magill* 6826, 6862, 6901, 6972, 6974, 6986, 6990, 6994, 7010, 7021, 7029 (MO); Cobham Forest Station, *Magill* 7341, 7343, 7351, 7354, 7358, 7368, 7373, 7386 (MO); Giants Castle, *Retief* 1674 (PRE); Royal Natal National Park, *Magill* 6718 (MO); Sani Pass, *Magill* 7251, 7252 (MO); Sani Pass Hotel, *Van Rooy* 1443 (PRE); Richards Bay, *Magill* 5331 (PRE); Durban, Palmiet Nature Reserve, *Lambert* 9 (PRE); Eastern Shores Nature Reserve, *Van Rooy* 194 (PRE); Enseleini Nature Reserve, *s.l. s.n.*, (PRE); Eshowe, Signal Hill, *Van der Plank* 151 (PRE); Everton, *Stirton* 5506 (PRE); 19 km from Greytown to Pietermaritzburg, *Stirton* 5292 (PRE); Harding, *Stirton* 5687 (PRE); Hlabisa District, Mahlonza, *Taylor* 468 (PRE); Hilton Road, *Sim* 8983 (PRE); Imbezane, *Eyles* 1424 (PRE); Inanda, *Perold* 21 (PRE); Ingwavuma, *Smook* 5745 (PRE); Kosi Bay, *Vahrmeijer* 12930 (PRE); Lebombo Mountains, *Magill* 5466 (PRE); Cathkin, *Owen* 52 (PRE); Makakatini Flats, *Magill* 5435 (PRE); Merrivale, *Sim* CH8051 (PRE); Midmar Dam, *Taylor* 444 (PRE); Mtubatuba, *Glen* 2725 (PRE); Mtunzini, *Smook* 1520 (PRE); Ngome Forest Reserve, *Oliver* 7057A (PRE); Oliviershoek Pass, *Magill* 6800 (MO); Pietermaritzburg, *Magill* 7469, 7481 (MO); Pietermaritzburg, *Wells* 64, (PRE); Port Shepstone, *Ellis* M11 (PRE); Ramsgate, *Van Rooy* 969 (PRE); Richards Bay, *Van Rooy* 182 (PRE); Nelspruit, Rooiwal, *Bosman* CH6398 (PRE); Rosetta Farm, *Sim* CH8864 (PRE); Rydal Mount, *Wager* 542 (PRE); St. Lucia, *Wager* 55 (PRE); Tugela Gorge, *Cholnoky* 109 (PRE, S); Umgoye Forest Reserve, *Magill* 5276 (PRE); Van Reenen, *Wager* 1079c (PRE). **Limpopo:** New Agatha Forest Reserve, *Von Breitenbach* 117 (PRE); Jan Trichardt Pass, *Van Rooy* 3894 (PRE); Kruger National Park, Punda Milia, *Magill* 5020 (PRE); Westfalia Estate, *Scheepers* 1223 (PRE); Mariepskop, *Vorster* 293 (PRE); Mount Lejuma, *Magill* 3660 (PRE); Mutale, North of Gundani village, *Koekemoer* 2258 (PRE); Nylstroom, *Vahrmeijer* 12937 (PRE); Houtbosdorp, *Van Vuuren* 1479 (PRE); Sekhukhuneland, Luluberg, *Magill* 3354 (PRE); Mount Lejuma, *Magill* 3669 (PRE); Woodbush, *Brenan* M2788 (PRE); Waterberg, *Smook* 2533b (PRE); Zebediela, *Magill* 3825 (PRE); Zoutpansberg, Piesangoek, *Bosman* CH1417 (PRE). **Mpumalanga:** Mac Mac Falls, *Rankin* 100 (PRE); Belfast, *Stirton* 6719 (PRE); Blyde River Canyon, *Brenan* M3372 (PRE); Buffelskloof Nature Reserve, *Van Rooy* 4173 (PRE); Carolina, *Van Hoepen* 1775, 1777 (PRE); East of Barberton, *Oliver* 7157 (PRE); Pilgrim's Rest, *Magill* 4856 (PRE); Josefsdal, *Phephu* 176 (PRE); Buffelskloof Nature reserve, *Glen* 3312 (PRE); Loskopdam, *Oliver* 7370 (PRE); Manywana River crossing to Sodwana Bay, *Magill* 5387 (PRE); Morgenzon Forest Reserve, *Crosby & Crosby* 7757 (PRE, MO); between Sabie and Graskop, *Cholnoky* 507 (PRE); Wakkerstroom, *Perold* 704 (PRE); 30 km SE of Carolina, *Magill* 3398 (PRE); Waterval-Boven, *Van Rooy & Perold* 3786 (PRE). **North West:** Kromrivier near Buffelspoort, *Bottomley & Doidge* CH10946 (PRE); Magaliesberg, Baviaanskraans, *Magill* 3121 (PRE); **Western Cape:** Constantia Kloof, *Sim* 9337 (PRE); Cape Town, Wynberg, *Garside* 6486 (PRE); Claremont, *Arts RSA03/05* (PRE); Devils Peak, *Sim* 9232 (PRE); George, *Wager* CH11568 (PRE); Knysna, *Lewis* CH12217 (PRE); Kirstenbosch, *Magill* 4100 (PRE); Koloniesbos, *Magill* 6184 (PRE); between Oudtshoorn and George, *Magill* 6082 (PRE); Rondebosch, *Rehmann* 420 (PRE); Rosebank, *Bottomley* CH1376 (PRE); Stellenbosch, *Duthie* CH11023 (PRE); Strandskloof, *Magill* 6265 (PRE); Table Mountain, *Arts RSA08/21* (PRE); Tulbagh, Groot Winterhoek, *Esterhuysen* 19869 (PRE). **Swaziland:** Droxford Farm S of Ngwenya Border Post, *Magill* 3439 (PRE); Forbes Reef, *Magill* 3530 (PRE); Jilobi Forest, *Kemp* 1340 (PRE); Lubombo District, Blue Jay Ranch, *Magill* 3602 (PRE); Mbabane, *Kemp* 748 (PRE); Luyengo, *Kemp* 776 (PRE).

***Sematophyllum dregei***— **Eastern Cape:** Grahamstown, *Farquhar* 64 (PRE); Hogsback, *Oliver* 6789 (PRE); Hluleka Nature Reserve, *Hoffman* 24 (PRE); Mlanlane Forest Station, *Van Rooy* 2217 (PRE); Mkambati Nature

Reserve, *Van Rooy* 1735 (PRE), Pondoland, *Sim* 8061 (PRE). **KwaZulu-Natal:** Cathkin Park Hotel, *Filter 15* (PRE); Champagne Castle, *Cholnoky* 353 (PRE, S); Dhlinza Forest Reserve, *Crosby* 7779 (PRE, MO); Cathedral Peak, *Van Rooy* 1239 (PRE); Cathedral Peak, *Magill* 6819, 6859, 6957, 7005, 7013, 7018 (MO); Sani Pass, *Magill* 7181, 7194, 7256 (MO); Ingeli Forest, *Smook* 1760 (PRE); Knoll, Hilton Road, *Sim* CH7989 (PRE); between Kranskop and Vryheid, *Van Rooy* 69 (PRE); Rosetta Farm, *Sim* CH7974 (PRE); Loteni Nature Reserve, *Phelan* 352 (PRE); Mooi River, *Sim* CH7965 (PRE); Ndedema Forest, *Van Rooy* 1576 (PRE); Ngome Forest Reserve, *Oliver* 7097 (PRE); Tugela valley, *Dodge* CH723 (PRE); Nkandla Forest Reserve, *Magill* 5212 (PRE); Oribi Gorge, *Oliver* 7347 (PRE); Quden Forest, *Magill* 5126 (PRE); Quden Forest Reserve, *Van Rooy* 83 (PRE); Pietermaritzburg, *Wood* 49 (PRE); Xumeni Forest, *Dodge* 31 (PRE). **Limpopo:** Entabeni, *Wager* 287 (PRE); Mariepskop, *Vorster* 1564 (PRE, MO); Wolkberg, Serala Mountain, *von Breitenbach* 133 (PRE); Soutpansberg, Louis Trichardt, *Smook & Phelan* 670 (PRE); New Agatha Forest Rererve, *von Beitenbach* 91 (PRE); Waterberg, *Smook* 2513 (PRE); Wolkberg, Serala Peak, *Venter* 11396 (PRE); Woodbush Forest Reserve, *Crosby* 7533 (PRE, MO). **Mpumalanga:** Berlin Forest Reserve, *von Brietenbach* 277, 443 (PRE); God's Window, *Brenan* 3377 (PRE); Morgenzon Forest Reserve, *Crosby* 7762 (PRE, MO); Tweefontein Forest, *Cholnoky* 517, 639 (PRE, S). **Western Cape:** Cederberg, *Barnard* 48198 (PRE); Constantia kloof, *Sim* 9339 (PRE); Du Toits Kloof, *Esterhuysen* 15657 (PRE); George, *Wager* 293 (PRE); Hottentots-Holland, *Sieben* 39 (PRE); Kliphuis River near Clanwilliam, *Magill & Schelpe* 4050 (PRE); Knysna, Deepwalls, *Bottomley* CH11000 (PRE); Oudebos, Zonder Einde, *Thorne* 50497 (PRE); Montagu Pass, *Rehmann* 409 (PRE); Wemmershoek valley, *Esterhuysen* 24361 (PRE); Saasveld College, *Arts RSA17/07* (PRE); Slanghoek Mountains, *Esterhuysen* 22271 (PRE); Steenbras, *Thorne* 50477 (PRE); Jonkershoek valley, *Stephens* 111 (PRE); Swellendam State Forest, *Perold* 2561 (PRE); Table Mountain, *Esterhuysen* 17550 (PRE); Tsitsikama Forest, *Arts* 19/13 (PRE); Winterhoek Mountains, Sneeuwagat Valley, *Barnard* 50336 (PRE); Kromrivier Kloof, *Esterhuysen* 25386 (PRE). **Swaziland:** Forbes Reef, *Magill* 3541 (PRE); Mbabane, *Kemp* 1054 (PRE); Phophonyane falls, *Perold & Koekmoer* 3157 (PRE).

***Sematophyllum gueinzii*—Eastern Cape:** Dwesa Nature Reserve, *Van Rooy* 2105 (PRE); Hogsback, *Arts RSA21/28* (PRE); Tsitsikamma Forest National Park, *Retief* 407a (PRE); Ntabankulu, *Phephu*, 120 (PRE, MO); Mkambati Nature Reserve, *Van Rooy* 1773 (PRE); Magwa falls, *Russell* 2658 (PRE); Silaka Nature Reserve, *Van Rooy* 1921a (PRE); Hluleka Nature Reserve, *Van Rooy* 2186 (PRE). **Gauteng:** Pretoria, *Mogg* CH1330 (PRE). **KwaZulu-Natal:** Cathedral Peak area, *Magill* 6953 (MO); Indumeni Forest, *Magill* 5611, *Van Rooy* 1647 (PRE); Weza Forest Reserve, *Van Breitenbach* 396 (PRE); Nkandla Forest Reserve, *Magill* 5213 (PRE); Pietermaritzburg, *Van Rooy* 1530 (PRE); Royal Natal National Park, *Crosby* 7841 (PRE, MO); Van Reenen, *Wager* CH11547 (PRE); between Vryheid and Kranskop, *Magill* 5088 (PRE). **Limpopo:** Entabeni Forest, *von Breitenbach* 468 (PRE); Mariepskop, *Crosby* 7626 (PRE, MO). **Mpumalanga:** Berlin Forest Reserve, *von Breitenbach* 454 (PRE); Ngodwana, *Van Rooy* 4060 (PRE); Buffelskloof Nature Reserve, *Van Rooy* 4087 (PRE). **Western Cape:** Bishopscourt, *Sim* 9458 (PRE); Cape Town, Devil's Peak, *Sim* 9245 (PRE); Diepwalle Forest, *Arts RSA26/05* (PRE); George, Geelhoutboomberg, *Geldenhuys* 481 (PRE); George, *Wager* 786 (PRE); Groenkop Forest Reserve, *Crosby* 8083 (PRE, MO); Helderberg, Lourensford, *Pillans* CH13531 (PRE); Villiersdorp, *Sneekop*, *Perold* 626 (PRE); Kirstenbosch, *Esterhuysen* 25641 (PRE); Knysna, *Wager* 784 (PRE); Montagu Pass, *Rehmann* 659 (PRE); Newlands Ravine, *Sim* 9415 (PRE); Oudebos, Zonder Einde, *Thorne* CH3609 (PRE); Palmiet River Mountains, *Barnard* 41677 (PRE); Steenbras, Spitskop, *Thorne* 50478 (PRE); Swartberg Pass, *Stokoe* CH13530 (PRE); Swellendam, Marloth Nature Reserve, *Schelpe* 7661 (PRE); Table Mountain, *Sim* 9129 (PRE); Tsitsikamma Forest, *Arts RSA19/14* (PRE); Wellington, Seven Sisters mountains, *Barnard* CH3100, 49642 (PRE); Tulbagh, Sneeuwagat valley, *Thorne* 50361 (PRE). **Swaziland:** Mount Kelley, *Magill* 3423 (PRE).

***Sematophyllum maglianum*—Eastern Cape:** Dwessa Forest, *Van Rooy* 2093 (PRE, MO); Hogsback, *Seagrief* CH13965 (PRE); Ngabara River crossing, 10 km from Dwessa, *Van Rooy* 2075 (PRE); Silaka Nature Reserve, *Van Rooy* 1931 (PRE); Port St Johns, *Russell* 2678 (PRE). **KwaZulu-Natal:** Ahrens, Lilani Valley, *Oliver* 6754 (PRE); Cathedral Peak area, *Magill* 6868, 6884, 6911 (MO); Eshowe, Signal Hill, *Van der Plank* 229 (PRE); Imbezane, *Eyles* 1401 (PRE); Inanda, *Rhemann* 342 (PRE); Knoll, Hilton road, *Sim* CH8026 (PRE); Ngoya Forest, *Sim* 10338 (PRE); Orbi Gorge, Umzimkulu River, *Cholnoky* 158 (PRE); Sandlundlu River, *Begg* H13135 (PRE). **Limpopo:** Mount Lejuma, *Magill* 3687 (PRE). **Mpumalanga:** Type. **Western Cape:** Blinkwater Ravine above Camps Bay, *Bews* sub *Sim* 8616 (PRE); Table Mountain, *Sim* 9403 (PRE). **North West:** Magaliesberg, Tonquani Ravine, *Crosby & Crosby* 7480 (PRE).

***Sematophyllum sphaeropyxis*—Eastern Cape:** Butterworth, Manubi Forest, *Linder* 1235 (PRE); Hluleka Nature Reserve, *Van Rooy* 2194 (PRE); Elliotdale, *Van Rooy* 2135 (PRE); Hankey, *Sim* CH8009 (PRE); Hogsback, *Arts RSA22/13* (PRE); Idutywa, *Van Rooy* 2021 (PRE); Mkambati Nature Reserve, *Van Rooy* 1790 (PRE); Mlanlane Forest Station, *Van Rooy* 2243, 2325 (PRE); Nelspruit district, Rooiwal, *Bosman* CH6385 (PRE); Ngabara River crossing from Dwesa, *Van Rooy* 2062 (PRE); Port St. John's, *Russell* 2645b (PRE); Port Alfred, Horseshoe bend, Kowie River, *Bosman* CH1562 (PRE). **Free State:** Zastron, *Van Rooy* 2502 (PRE). **Gauteng:** Boekenhoutskloof, *Mogg* CH3345 (PRE); Ezemvelo Nature Reserve, *Van Rooy* 3945 (PRE); Johannesburg, *Edwards* CH8070 (PRE); Pretoria, Waterkloof, *Mogg* CH1145 (PRE). **KwaZulu-Natal:** Cobham Forest Reserve, *Van Rooy* 1393 (PRE);

lower Sani Pass, *Magill* 7182 (MO); Cathedral Peak Forest Station, *Magill* 5720 (PRE); Sani Pass Hotel, *Perold* 2510 (PRE); Eastern Shores Nature Reserve, *Van Rooy* 197 (PRE); Eshowe, *Van der Plank* 5412 (PRE); Glenside, *Sim CH8054* (PRE); Hlabisa, *Harrison* 6 (PRE); Inanda, *Rehmann* 662 (PRE); Ixopo, *Arnold* 1357 (PRE); Ku-Nkanini stream crossing on Kosi Bay road, *Magill* 5428 (PRE); Lebombo Mountains near Jozini, *Van Rooy* 259 (PRE); Makhathini flats, *Magill* 5432 (PRE); Margate, *Van Rooy* 976 (PRE); Merrivale, *Sim CH8056* (PRE); Lake St Lucia Eastern shores, *Taylor* 453 (PRE); Mtunzini, *Smook* 1529 (PRE); Ndedema Forest, *Van Rooy* 1545 (PRE); Nels Rust, *Sim CH8256* (PRE); Port Shepstone, *Sim CH7955* (PRE); Royal Natal National Park, *Smook* 1464 (PRE); Rydal Mount, *Wager* 1205c (PRE); Sodwana Bay, *Magill* 5399, *Van Rooy* 219 (PRE); Sihangwane on Ingwavuma-Maputa road, *Van Rooy* 245 (PRE); St. Lucia Game Reserve, *Glen* 2719 (PRE); Umgoye Forest Reserve, *Van Rooy* 147 (PRE); between Vryheid and Kranskop, *Van Rooy* 64 (PRE). **Limpopo:** De Hoek Forest Station, *von Breitenbach* 186 (PRE); Haenertsburg, *Brenan* 3369 (PRE); Jan Trichardt Pass, *Van Rooy* 3890 (PRE); Hangklip Forest Reserve, *Smook & Phelan* 668 (PRE); Kruger National Park, Punda Milia, *Magill* 4974 (PRE); Westfalia Estate, *Van Vuuren* 1520 (PRE); Marakele National Park, *Van Rooyen* 4460 (PRE); Messina, Entabeni road, *von Breitenbach* 193 (PRE); Mutale District, valley north of Gundani village *Koekemoer* 2255 (PRE); New Agatha Forest Reserve, *von Breitenbach* 128 (PRE); Spelonken, *Junod* 9 (PRE); Mount Lejuma, *Magill* 3674 (PRE); De Hoek Forest Reserve, Debengeni Falls, *Schelpe CH13529* (PRE); Piesanghoek, *Bosman* CH1351 (PRE). **Mpumalanga:** Belfast, *Bottomley* CH2994 (PRE); Buffelskloof Nature Reserve, *Van Rooy* 4179 (PRE); Bushmans Rock, *Stirton* 9913 (PRE); near Marmerkop Station between Dullstroom and Lydenburg, *Perold* 423 (PRE); Lochiel, *Smook* 4973 (PRE); Lothair, *Gunn* CH11196 (PRE); Loskop Dam, Kanongat, *Oliver* 7372a (PRE); Middelburg, Farm Bankfontein, *Magill* 6378, *Perold* 72 (PRE); Nelshoogte Pass, *Magill* 4731 (PRE); along Sabie-Nelspruit road, *Magill* 4806 (PRE); Waterval-Boven, *Van Rooy & Perold* 3826 (PRE); Kaapmuiden, *Magill* 4767 (PRE); Rietfontein, *Wager* 724 (PRE). **North West:** Magaliesberg, Tiger Kloof, *Magill* 3079 (PRE). **Western Cape:** Claremont, *Duncan* PRE56985 (PRE); Kenilworth, *Duncan* CH7954 (PRE); Knysna, *Duthie* CH7979 (PRE); Strandskloof, *Magill* 6272 (PRE). **Swaziland:** Forbes Reef, *Magill* 3491 (PRE); Jilobi Forest, *Kemp* 1482 (PRE); Mlawula Ranch north of Siteki, *Magill* 3557 (PRE); Malkerns Research Station, *Kemp* 1341 (PRE); Malolotja Nature Reserve *Braun* 704 (PRE); 28 km SE of Siteki, *Kemp* 806 (PRE). **Lesotho:** Maloti Mountains, Moteng Pass west, *Van Rooy* 3101 (PRE).

***Sematophyllum subpinnatum***— **Eastern Cape:** Grahamstown, *Farquhar* 6 (PRE); Hogsback, *Arts RSA21/01* (PRE); Hluleka Nature Reserve, *Van Rooy* 2197 (PRE); Mlanlane Forest Station, *Van Rooy* 2254, 2313 (PRE); Mkambati Nature Reserve, *Van Rooy* 1729, 1734 (PRE); Ngabara River crossing from Dwesa, *Van Rooy* 2044 (PRE); Port St Johns, *Wager* CH1427 (PRE); along road from Elliotdale to The Haven, *Van Rooy* 2147 (PRE); Storms River Gorge, *Schelpe* 7834 (PRE). **Free State:** Kadziberg, *Rehmann* 371 (PRE); Meiringspoort, *Van Rooy* 343 (PRE). **Gauteng:** Pretoria National Botanical Garden, *Van Rooy* 4047a (PRE). **KwaZulu-Natal:** Cathedral Peak area, *Schelpe* 7573 (PRE); Cathkin Peak Forest Reserve, *Crosby* 7913 (PRE, MO); Drakensberg, *Cholnoky* 113 (PRE, S); Cathedral Peak, *Schelpe* 7527 (PRE); Cathedral Peak, *Magill* 6866, 6910 (MO); Indumeni Forest, *Van Rooy* 1633 (PRE); Cobham Forest Station, *Magill* 7316 (MO); Royal Natal National Park, *Magill* 6713 (MO); lower Sani Pass, *Magill* 7038, 7261 (MO); Inanda, *Rehmann* 663 (PRE); Himeville, *Perold & Koekmoer* 4319 (PRE); Ndedema Forest, *Van Rooy* 1566, 1588 (PRE); Oliviershoek, *Schelpe* 7943 (PRE); Quden Forest, *Edwards* 1511, *Magill* 5135 (PRE); Polela, *Sim CH8089* (PRE); Port Edward, *Van Rooy* 964 (PRE); Umgoye Forest Reserve, *Van Rooy* 152 (PRE); Injasuti kloof, *Esterhuysen* 20217B (PRE). **Limpopo:** Mariepskop, *Scott* (PRE). **Mpumalanga:** Buffelskloof Nature Reserve, *Van Rooy* 4199 (PRE); Mount Sheba Nature Reserve, *Knox* 19 (PRE). **Western Cape:** Blinkwater Ravine above Camps Bay, *Bews* sub *Sim* 8589 (PRE); Kirstenbosch Botanical gardens, *Arts RSA03/48* (PRE); Constantia, *Perold* 658 (PRE); Devils Peak, *Rehmann* 421 (PRE); Du Toits Kloof, *Thorne* 51125 (PRE); Kloof Nek, *Bottomley* CH1368 (PRE); Keurbooms River, *Barnard* 49179 (PRE); Newlands ravine, *Sim* 9450 (PRE); Oudebosch, *Thorne* CH6432 (PRE); Robinson Pass, *Thorne* 49756 (PRE); Stellenbosch, Banhoek valley, *Thorne* CH6450 (PRE); Table Mountain, *Thorne* CH6440 (PRE). **Swaziland:** Mt. Kelley, *Magill* 3426 (PRE); on road to Piggs Peak from Forbes Reef, *Magill* 3468 (PRE).

***Sematophyllum zuluense***— **Eastern Cape:** Boschberg, *Sim CH7874* (PRE); Mkambati Nature Reserve, *Smook* 6157, *Van Rooy* 1732 (PRE). **KwaZulu-Natal:** Dhlinza Forest, *Smook* 1366 (PRE); Cathedral Peak Research Area, *Van Rooy* 1242 (PRE); Lebombo Mountains S of Ingwavuma, *Van Rooy* 282 (PRE); Ngoye Forest, *Sim* 10334 (PRE); Nkandla Forest Reserve, *Magill* 5236 (PRE); Pietermaritzburg, *Wells* 61 (PRE); Umgoye Forest Reserve, *Magill* 5282 (PRE). **Mpumalanga:** Mariepskop plantation, *Crosby* 7610 (PRE, MO); Berlin Forest Reserve, *von Breitenbach* 283 (PRE); Saddleback Pass, *Perold & Koekomoer* 3141 (PRE). **Western Cape:** Camps Bay, *Garside* M63 (PRE); George, *Wager* 1499 (PRE); Swellendam, State Forest, *Perold* 2561 (PRE). **Swaziland:** Forbes Reef, *Glen* 3128 (PRE).

***Trichosteleum perchlorosum***— **Eastern Cape:** Hankey, *Sim CH1113* (PRE); Hogsback, *Oliver* 6796 (PRE); Mkambati Nature Reserve, *Smook* 6161 (PRE); Mlanlane Forest Station, *Van Rooy* 2295 (PRE); Ntabankulu, KuGomo Forest, *Phephu* 76 (PRE); Pirie Forest, *Sim* 10294 (PRE). **KwaZulu-Natal:** Indumeni Forest, *Van Rooy* 1616 (PRE); Cathedral Peak, *Magill* 6890 (MO); lower Sani Pass, *Magill* 7266 (MO); Cathkin Park Hotel, *Filter*

25 (PRE); Inanda, *Hood* sub *Sim* 10290 (PRE); Inanda Game Park, *Perold* 17 (PRE); Knoll, Hilton Road, *Sim* CH7961 (PRE); Lebombo Mountains, N'dabeni Forest *Van Rooy* 277 (PRE); Little Switzerland, *Brenan* M3013 (PRE); Mtubatuba, *Taylor* 454 (PRE); Nkandla Forest Reserve, *Magill* 5240 (MO); Ndedema Forest, *Van Rooy* 1605 (PRE); Pongola Bush Nature Reserve, *Glen* 2428 (PRE); Royal Natal National Park, *Pienaar* 50 (PRE); Umgeye Forest Reserve, *Van Rooy* 146 (PRE); Xumeni Forest, *Dodge* CH10 (PRE); Weza Forest Reserve, *Von Breitenbach* s.n. (PRE). **Limpopo:** Entabeni Forest, *Von Breitenbach* 208b (PRE); Serala Mountain, *Von Breitenbach* 136 (PRE); Westfalia Estate, *Van Vuuren* 1509 (PRE). **Mpumalanga:** Barberton, *Oliver* 7126 (PRE); Graskop, God's Window, *Filter* CH13410 (PRE); Mount Sheba Nature Reserve, *Van Rooy* 4207 (PRE); Sabie, Mac Mac pools, *Cholnoky* 635 (PRE, S). **Western Cape:** Bains Kloof, *Esterhuysen* 25589 (PRE); Constantia kloof, *Sim* 9344 (PRE); Kaaimans River W of Wilderness, *Magill* 6051 (PRE); Mitchells Pass, *Magill & Schelpe* 4060 (PRE); Tsitsikamma National Park, *Schelpe* 7845, 7847 (PRE); Vogelgat Nature Reserve, *Perold* s.n. (PRE). **Swaziland:** Forbes Reef store, *Magill* 3534 (PRE); Mbabane, *Kemp* 857 (PRE).