
Foliicolous *Mycosphaerella* spp. and their anamorphs on *Corymbia* and *Eucalyptus*

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The genus *Eucalyptus* is host to numerous species of *Mycosphaerella*, several of which are only known as anamorphs, and for which no *Mycosphaerella* state is known. In this study new *Mycosphaerella* teleomorph states are described for *Nothostrasseria dendritica* and *Trimmatostroma excentrica*. Two new hyphomycete genera are introduced. Of these, *Cibiessia* gen. nov., with three new species accommodates an arthroconidial synanamorph of *Readeriella*. *Phaeothecoidea* gen. nov. is described for species with brown, thick-walled endoconidia. Four additional new species of *Mycosphaerella* are introduced with several new anamorph species described in *Dissoconium*, *Phaeophleospora*, *Pseudocercospora*, *Ramularia* and *Stenella*. Furthermore, an epitype is designated for *Mycosphaerella molleriana*. This study also presents new *Eucalyptus* host and distribution records including *M. mexicana* from Hawaii, *M. ohnowa* from Australia, *M. acaciigena* from Australia and Venezuela, *M. heimii* from Venezuela and Thailand, *M. kona* from Venezuela, and *M. thailandica* from Thailand.

Key words: *Cibiessia*, *Dissoconium*, DNA sequence comparisons, *Mycosphaerella*, *Phaeotheca*, *Phaeophleospora*, *Pseudocercospora*, *Ramularia*, *Septoria*, *Stenella*, systematics.

Introduction

The genus *Mycosphaerella* includes more than 3000 species names (Aptroot, 2006), and several thousand anamorphs that lack known teleomorph

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connections (Crous and Braun, 2003). The *Mycosphaerellaceae* (*Capnodiales*) (Schoch *et al.*, 2006) includes species that are plant pathogens, saprobes, endophytes (saprobic or plant-pathogenic), or those that have mutualistic (in lichen) associations (Crous *et al.*, 2000, 2001; Verkley *et al.*, 2004).

More than 100 species of *Mycosphaerella* and associated anamorphs have been described from *Corymbia* and *Eucalyptus* (Cortinas *et al.*, 2006; Crous *et al.*, 2004b, 2006d, g; Hunter *et al.*, 2006a, b; Andjic *et al.*, 2007; Carnegie *et al.*, 2007). The fact that these host genera are so extraordinarily species-rich in *Mycosphaerella* spp. might not be surprising, as they include more than 700 species (Brooker and Kleinig, 1994), many of which are known to harbour a wide range of diverse fungal species (Adams *et al.*, 2005; Crous *et al.*, 2006f, b, e; de Beer *et al.*, 2006; Gryzenhout *et al.*, 2006). Although the genera *Corymbia* and *Eucalyptus* are indigenous to Australia, many species also occur in other parts of the world (chiefly *Eucalyptus*), where they are planted as exotics to provide fibre for timber and paper pulp industries.

Several species of *Mycosphaerella* have been associated with *Mycosphaerella* Leaf Disease (MLD) of eucalypts, causing severe leaf spot, defoliation and shoot die-back (Crous, 1998; Crous *et al.*, 2004b, 2006g; Hunter *et al.*, 2006a, b; Burgess *et al.*, 2007). Many species, however, cause minor leaf spots, rarely resulting in severe disease (Crous *et al.*, 2004b, 2006g, Burgess *et al.*, 2007). Although little is known regarding the host-specificity of *Mycosphaerella* species, the majority are thought to be highly host-specific. Several recent studies have reported species of *Mycosphaerella* that are known pathogens of other hosts to be associated with leaf spots of *Eucalyptus*, where they occurred with other *Mycosphaerella* spp. (Crous *et al.*, 2004c; Burgess *et al.*, 2007). The co-occurrence of *Mycosphaerellaceae* on a single leaf spot appears to be a common phenomenon on diverse plant hosts (Crous, 1998; Crous and Groenewald, 2005; Crous *et al.*, 2006a), and it might have led to incorrect assumptions regarding host range and pathogenicity. Crous and Groenewald (2005) also drew attention to the fact that in some cases these species could be major pathogens of hosts other than *Myrtaceae*. The “pogo stick hypothesis” was proposed to explain this unusual behavioural pattern, where propagules of a presumed host-specific species show some restricted ability to colonize dead tissue of a non-host, possibly to produce propagules to facilitate onwards dispersal. In *Mycosphaerella* this behavioural pattern has been observed for teleomorph as well as anamorph states (Crous and Groenewald, unpubl.).

This study is part of a series of investigations, in which *Mycosphaerella* spp. occurring on eucalypts are characterised. The primary aim was to use comparisons of DNA sequence data to clarify obscure anamorph-teleomorph

connections, and also to recognise new species. These are compared with taxa known in culture and from sequence data, contributing to a global database of *Mycosphaerella* names, cultures and sequences (www.Mycobank.org).

Materials and methods

Isolates

Mycosphaerella leaf spots were excised, soaked in water for approximately 2 hours, after which they were placed in the bottom of Petri dish lids, with the top half of the dish containing 2% malt extract agar (MEA; Oxoid). Ascospore germination patterns were examined after 24 h, and single-ascospore and conidial cultures established as described by Crous (1998). Colonies were sub-cultured onto 2% potato-dextrose agar (PDA; Difco) and oatmeal agar (OA; Gams *et al.*, 2007), and incubated at 25°C under continuous near-ultraviolet light to promote sporulation.

DNA isolation, amplification and phylogeny

Fungal colonies were established on MEA plates, and genomic DNA was isolated following the protocol of Lee and Taylor (1990). The primers V9G (Hoog and Gerrits van den Ende 1998) and ITS4 (White *et al.* 1990) were used to amplify part (ITS) of the nuclear rDNA operon spanning the 3' end of the 18S rDNA gene (SSU), the first internal transcribed spacer (ITS1), the 5.8S rDNA gene, the second ITS region and the 5' end of the 28S rDNA gene (LSU). The PCR conditions, sequence alignment and subsequent phylogenetic analysis followed the methods of Crous *et al.* (2004c). To ensure optimal alignment and to simplify the presentation of the trees, the sequence alignment was split into two, whilst keeping phylogenetic lineages together. Sequence data were deposited in GenBank (Table 1) and alignments in TreeBASE (accession number SN3229).

Taxonomy

Fungal structures were mounted in lactic acid and examined under a light microscope. Wherever possible, 30 measurements ($\times 1000$ magnification) were made of structures, with the extremes of spore measurements given in parentheses. Colony colours (surface and reverse) were assessed weekly on PDA, MEA or OA at 25°C in the dark, using the colour charts of Rayner (1970). All cultures obtained in this study are maintained in the culture

collection of the Centraalbureau voor Schimmelcultures (CBS) in Utrecht, the Netherlands (Table 1). Nomenclatural novelties are listed and descriptions have been deposited in MycoBank <www.MycoBank.org>.

Results and Discussion

DNA phylogeny

Two alignments of DNA sequences were subjected to phylogenetic analyses. The resulting neighbour-joining trees were congruent for the separate alignments when the substitution models were changed from uncorrected “p” to the Kimura 2-parameter model and to the HKY85 model as implemented in PAUP. The obtained equally most parsimonious trees mainly differed in the order of taxa at the terminal nodes. The first alignment consisted of 70 taxa including the two outgroups and 512 characters (including alignment gaps) were included in the analyses. Of these characters, 249 were parsimony-informative, 21 were variable and parsimony-uninformative, and 242 were constant. Parsimony analysis with gaps treated as new states yielded 480 equally most parsimonious trees (TL = 897 steps; CI = 0.586; RI = 0.915; RC = 0.536), one of which is shown in Fig. 1. Although the same lineages were found for the neighbour-joining analyses, the order of the lineages at the deeper nodes differed (data not shown). For example, the clade containing *M. fimbriata* and *Colletogloeopsis* spp. is swapped with the clade including *M. mexicana* and the *Readeriella* spp. when compared to the figure. The second alignment consisted of 57 taxa including the two outgroups and 494 characters (including alignment gaps) were included in the analyses. Of these characters, 185 were parsimony-informative, 44 were variable and parsimony-uninformative, and 265 were constant. Parsimony analysis with gaps treated as new state yielded 390 equally most parsimonious trees (TL = 637 steps; CI = 0.597; RI = 0.833; RC = 0.497), one of which is shown in Fig. 2. Similar to the results obtained for the first alignment, the same lineages were found but their order differed in the backbone of the tree. All new species were well-supported, except for the *Septoria* sp. and *Dissoconium eucalypti*. The phylogenetic placement suggested by the sequences is discussed in the descriptive notes below each of the treated species.

Taxonomy

Several anamorph and teleomorph specimens collected in the present study were morphologically and phylogenetically distinct from those presently known. These fungi are described as new taxa as follows:

Table 1. Isolates of *Mycosphaerella* spp. and its anamorphs included for sequence analysis and morphological comparison.

Teleomorph	Anamorph / Synanamorph	Strain no. ¹	Substrate	Country	Collector	GenBank number
<i>Mycosphaerella acaciigena</i>		CPC 13290 = CBS 120740	<i>Eucalyptus</i> sp.	Australia	B. Summerell	EF394822
		CPC 13350	<i>Eucalyptus camaldulensis</i> × <i>E. urophylla</i>	Venezuela	M.J. Wingfield	EF394823
<i>Mycosphaerella associata</i>		CPC 13108 = CBS 120732	<i>Eucalyptus dunnii</i>	Australia	A.J. Carnegie	EF394824
		CPC 13113	<i>Eucalyptus dunnii</i>	Australia	A.J. Carnegie	EF394825
		*CPC 13119 = CBS 120730	<i>Corymbia henryii</i>	Australia	A.J. Carnegie	EF394826
		CPC 13128 = CBS 120731	<i>Corymbia variegata</i>	Australia	A.J. Carnegie	EF394827
		CPC 13375	<i>Eucalyptus tereticornis</i>	Australia	B. Summerell	EF394828
<i>Mycosphaerella dendritica</i>	<i>Nothostrasseria dendritica</i>	*CPC 12709 = CBS 120032	<i>Eucalyptus deanei</i>	Australia	B.A. Summerell	EF394829
		CPC 12820 = CBS 120733	<i>Eucalyptus nitens</i>	Australia	A.J. Carnegie	EF394830
		CPC 12969	<i>Eucalyptus deanei</i>	Australia	B.A. Summerell	EF394831
		CPC 13296 = CBS 120734	<i>Eucalyptus globulus</i>	Australia	C. Mohammed	EF394832
<i>Mycosphaerella elongata</i>		*CPC 13378 = CBS 120735	<i>Eucalyptus camaldulensis</i> × <i>E. urophylla</i>	Venezuela	M.J. Wingfield	EF394833
<i>Mycosphaerella excentrica</i>	<i>Trimmatostroma excentricum</i>	*CPC 13092 = CBS 121102	<i>Eucalyptus agglomerata</i>	Australia	G. Price	EF394834
<i>Mycosphaerella fimbriata</i>		CPC 13321 = CBS 120893	<i>Corymbia</i> sp.	Australia	P.W. Crous	EF394835
		*CPC 13324 = CBS 120736	<i>Corymbia</i> sp.	Australia	P.W. Crous	EF394836
<i>Mycosphaerella heimii</i>		CPC 13276 = CBS 120741	<i>Eucalyptus platyphylla</i>	Australia	P.W. Crous	EF394837
		CPC 13356 = CBS 120743	<i>Eucalyptus urophylla</i>	Venezuela	M.J. Wingfield	EF394838
		CPC 13359	<i>Eucalyptus urophylla</i>	Venezuela	M.J. Wingfield	EF394839
		CPC 13371	<i>Eucalyptus urophylla</i>	Venezuela	M.J. Wingfield	EF394840
		CPC 13474 = CBS 120742	<i>Eucalyptus camaldulensis</i>	Thailand	W. Himaman	EF394841
<i>Mycosphaerella konae</i>	<i>Pseudocercospora</i> sp.	CPC 13469 = CBS 120748	<i>Eucalyptus camaldulensis</i>	Thailand	W. Himaman	EF394842
<i>Mycosphaerella mexicana</i>		CPC 12349 = CBS 120744	<i>Eucalyptus</i> sp.	Hawaii	W. Gams	EF394843
<i>Mycosphaerella molleriana</i>	<i>Colletogloeopsis molleriana</i>	*CPC 13398 = CBS 120746	<i>Eucalyptus</i> sp.	Portugal	P.W. Crous & A.J.L. Phillips	EF394844
<i>Mycosphaerella ohnowa</i>		CPC 13101 = CBS 120745	<i>Eucalyptus dunnii</i>	Australia	A.J. Carnegie	EF394845
<i>Mycosphaerella parkii</i>		*CPC 13373 = CBS 120737	<i>Eucalyptus urophylla</i>	Venezuela	M.J. Wingfield	EF394846
<i>Mycosphaerella</i> sp.	<i>Cibiessia nontingens</i> / <i>Readeriella</i> sp.	*CPC 13217 = CBS 120725	<i>Eucalyptus tereticornis</i>	Australia	B. Summerell	EF394847

Table 1. Isolates of *Mycosphaerella* spp. and its anamorphs included for sequence analysis and morphological comparison.

Teleomorph	Anamorph / Synanamorph	Strain no. ¹	Substrate	Country	Collector	GenBank number
<i>Mycosphaerella thailandica</i>	<i>Pseudocercospora thailandica</i>	CPC 13478 = CBS 120723	<i>Eucalyptus camaldulensis</i>	Thailand	W. Himaman	EF394848
		CPC 13482	<i>Eucalyptus camaldulensis</i>	Thailand	W. Himaman	EF394849
	<i>Cibiessia dimorphospora</i> / <i>Readeriella</i> sp.	*CPC 12636 = CBS 120034	<i>Eucalyptus nitens</i>	Australia	C. Mohammed	EF394850
	<i>Cibiessia minutispora</i>	CPC 12968 = CBS 120749	Leaf litter of <i>Cussonia</i> sp.	South Africa	P.W. Crous	EF394851
		*CPC 13071 = CBS 120894	<i>Corymbia henryii</i>	Australia	A.J. Carnegie	EF394852
	<i>Colletogloeopsis</i> sp.	CPC 13303	<i>Eucalyptus tereticornis</i>	Australia	P.W. Crous	EF394853
	<i>Dissoconium australiensis</i>	*CPC 13282 = CBS 120729	<i>Eucalyptus platyphylla</i>	Australia	P.W. Crous	EF394854
	<i>Dissoconium eucalypti</i>	*CPC 13004 = CBS 120039	<i>Eucalyptus tereticornis</i>	Australia	A. Carnegie	EF394855
	<i>Phaeophleospora stonei</i>	*CPC 13330 = CBS 120830	<i>Eucalyptus</i> sp.	Australia	P.W. Crous	EF394856
	<i>Phaeothecoidea eucalypti</i>	*CPC 12918 = CBS120831	<i>Eucalyptus botryooides</i>	Australia	B. Summerell	EF394857
	<i>Pseudocercospora nogalesii</i>	CBS 115022	<i>Chamaecytisus proliferus</i>	New Zealand	C.F. Hill	EF394858
	<i>Pseudocercospora norchiensis</i>	*CPC 13049 = CBS 120738	<i>Eucalyptus</i> sp.	Italy	W. Gams	EF394859
	<i>Ramularia eucalypti</i>	*CPC 13043 = CBS 120726	<i>Eucalyptus grandiflora</i>	Italy	W. Gams	EF394860
		CPC 13046 = CBS 120727	<i>Eucalyptus grandiflora</i>	Italy	W. Gams	EF394861
		CPC 13304 = CBS 120728	<i>Eucalyptus tereticornis</i>	Australia	P.W. Crous	EF394862
	<i>Septoria</i> sp.	CPC 12358	<i>Eucalyptus</i> sp.	Italy	W. Gams	EF394863
		CPC 13058 = CBS 120739	<i>Eucalyptus</i> sp.	Italy	W. Gams	EF394864
	<i>Stenella eucalypti</i>	*CPC 13302 = CBS 121101	<i>Eucalyptus tereticornis</i>	Australia	P.W. Crous	EF394865
	<i>Stigmia eucalypti</i>	*CPC 13384 = CBS 121100	<i>Corymbia variegata</i>	Australia	G. Price	EF394866

¹CBS: Centraalbureau voor Schimmelcultures, Fungal Biodiversity Centre, Utrecht, Netherlands; CPC: Culture collection of Pedro Crous, housed at CBS.

*Denotes ex-type cultures.

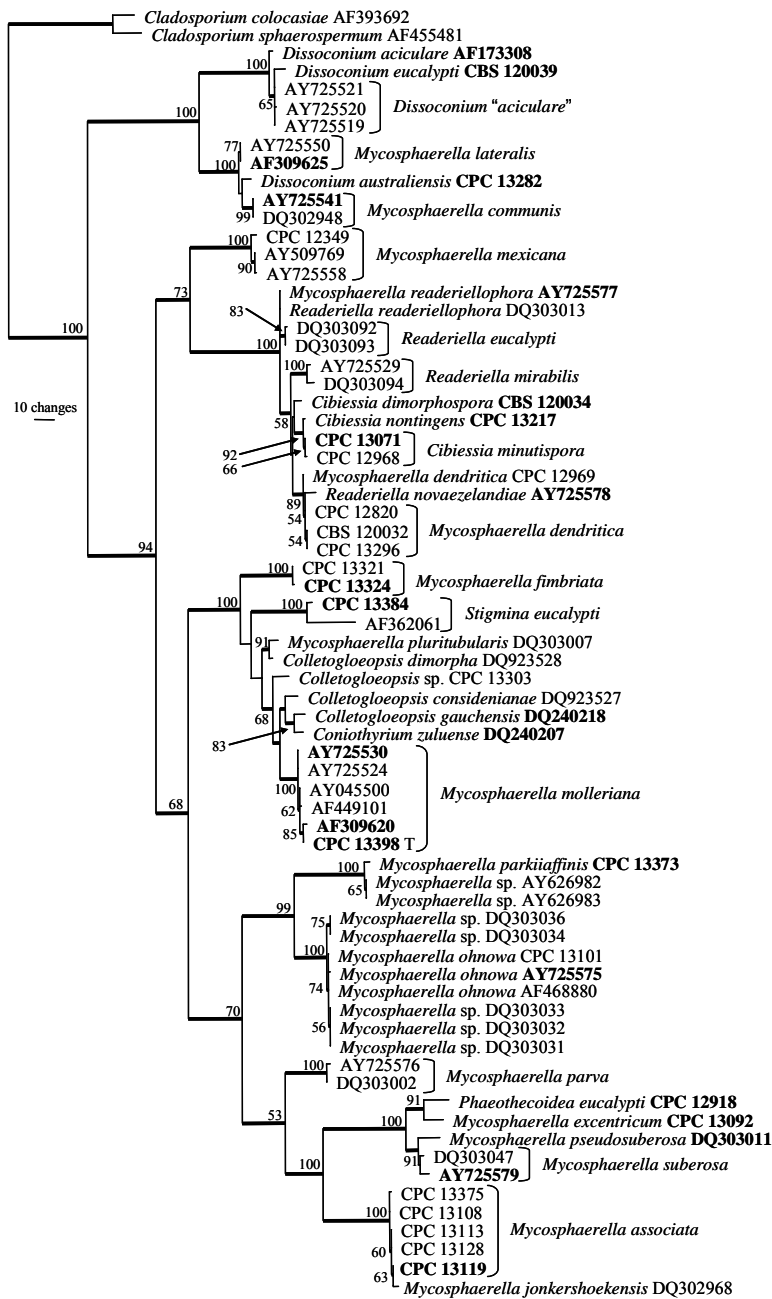


Fig. 1. One of 480 equally most parsimonious trees obtained from a heuristic search with 100 random taxon additions of the ITS sequence alignment. The scale bar shows ten changes, and bootstrap support values from 1000 replicates are shown at the nodes. Thickened lines indicate the strict consensus branches, and ex-type strains are shown in bold print. The tree was rooted to two *Cladosporium* species.

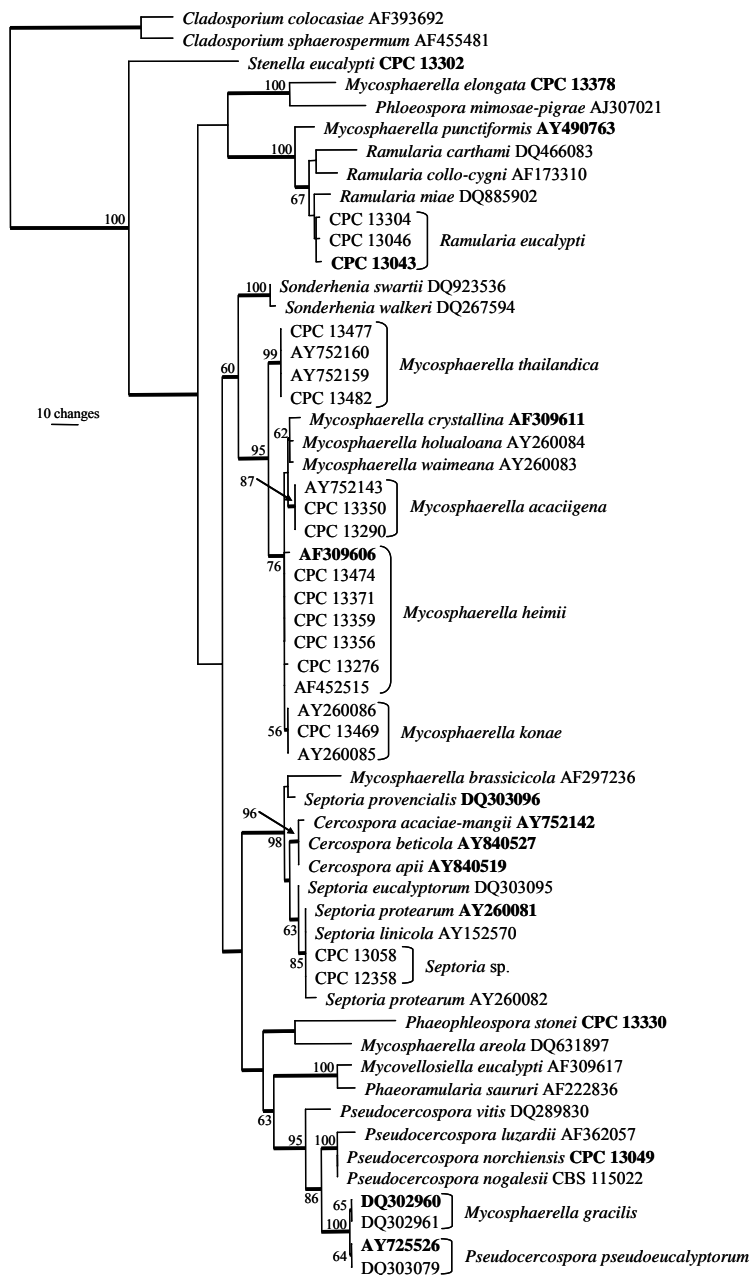


Fig. 2. One of 390 equally most parsimonious trees obtained from a heuristic search with 100 random taxon additions of the ITS sequence alignment. The scale bar shows 10 changes, and bootstrap support values from 1000 replicates are shown at the nodes. Thickened lines indicate the strict consensus branches, and type strains are shown in bold print. The tree was rooted to two *Cladosporium* species.

***Cibiessia* Crous, gen. nov.**

MycoBank: 501091

Etymology: Named for the Centraalbureau voor Schimmelcultures (“CBS”), where the fungus was first discovered by students during a mycological training course. Its unique conidiogenesis captured the imagination of several mycologists who gathered to examine it, and hence the suggestion arose that its name should reflect the unique concentration of mycologically interested persons at CBS.

Genus hyphomycetum ad *Mycosphaerellaceas pertinens*. Hyphae pallide brunneae, leves, 3–5 µm latae, in conidia dilute brunnea, cylindrica, 0–3-septata, utrinque subtruncata disarticulatae, synanamorphe *Readeriella*.

Hyphomycetous, *Mycosphaerellaceae*. *Hyphae* pale brown, smooth, 3–5 µm wide, disarticulating to form pale brown, cylindrical, 0–3-septate conidia with subtruncate ends. A *Readeriella* synanamorph also formed in culture.

Type species: *Cibiessia dimorphospora* Crous & C. Mohammed, sp. nov.

***Cibiessia dimorphospora* Crous & C. Mohammed, sp. nov.**

(Fig. 3)

MycoBank: 501092.

Synanamorph: *Readeriella* sp.

Etymology: Name refers to the two asexual states (anamorphs) with different conidial types.

Arthroconidia dilute brunnea, cylindrica, utrinque subtruncata, 5–9 × 2–3 µm, 1(–)–septata, synanamorphe *Readeriellae* in vitro formata, conidia ellipsoidea vel subcylindrica, dilute brunnea, 4.5–7 × 2–2.5 µm.

Arthroconidia occurring on brown lesions associated with a *Pseudocercospora* sp. *Hyphae* pale brown, smooth, 3–5 µm wide, disarticulating at septa to form short, pale brown, cylindrical conidia with obtusely rounded to subtruncate ends; aseptate conidia 5–7 × 2–3 µm, 1(–)–septate conidia 5–9 × 2–3 µm; conidia developing further, becoming medium brown, predominantly aseptate, verruculose, ellipsoidal to subglobose or globose, 5–7 µm diam, with dehiscence scars clearly visible on conidial body; inner layer of the dehiscence scar extends past the outer layer. *Readeriella* synanamorph: Only observed in culture, and absent in young and older colonies, with *Cibiessia* state dominant. *Conidiomata* oozing a dark brown conidial mass; conidiomata pycnidial, subglobose, unilocular; wall consisting of 3–4 layers of brown *textura angularis*. *Conidiophores* 0–1-septate, subcylindrical to ampulliform, hyaline to pale brown, smooth, 5–8 × 3–4 µm, mono- or polyphialide with visible periclinal thickening, or phialide proliferating percurrently near apex; frequently intermingled with cylindrical paraphyses that can extend 5–10 µm above the conidiophores. *Conidia* narrowly ellipsoid to subcylindrical with rounded ends, pale brown, smooth to finely verruculose, 4.5–7 × 2–2.5 µm.

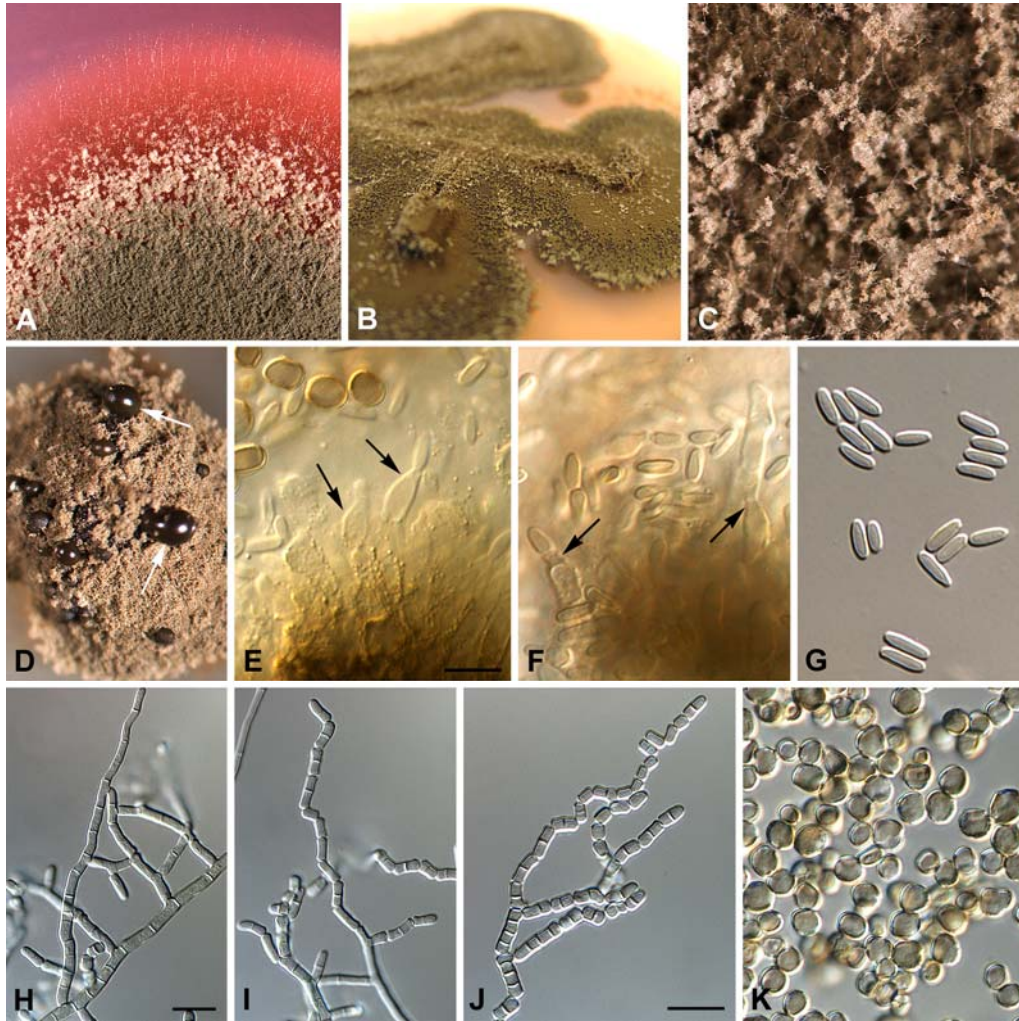


Fig. 3. *Cibiessia dimorphospora* (CBS H-19762). **A–C.** Colonies on PDA. **D.** Slimy conidial mass of *Readeriella* state (arrows). **E, F.** Conidiogenous cells of *Readeriella* state (arrows). **G.** Conidia of *Readeriella* state. **H–K.** Conidia of *Cibiessia* in vitro. Scale bars = 10 μ m.

Cultural characteristics: Colonies on PDA slow growing, reaching 30 mm diam after 2 months at 25°C. Surface appearing grey-olivaceous to green-olivaceous due to aerial mycelium and profuse sporulation; margins regular, smooth to slightly feathery; reverse greenish black; young colonies producing a red soluble pigment, but this is inconspicuous in older colonies.

Specimen examined: **Australia**, Tasmania, on *Eucalyptus nitens* leaves, Oct 2005, C. Mohammed, **holotype** CBS-H 19762, cultures ex-type CPC 12636 = CBS 120034, CPC 12637–12638.

Notes: Although there are several genera available for species with chains of disarticulating conidia (arthroconidia), none are represented in the *Mycosphaerellaceae*, and none have ever been linked to *Readeriella*. As the *Readeriella* synanamorph of *C. dimorphospora* rarely occurs in culture, and was not observed on the host, a new genus has been proposed to accommodate the novel arthroconidial anamorph. Species of *Cibiessia* are present with high bootstrap support (100%) in the *Readeriella* clade.

Cibiessia minutispora Crous & Carnegie, **sp. nov.** (Fig. 4)
MycoBank 501258.

Etymology: Name refers to the conidia that are smaller than those of the other species presently known.

Cibiessiae dimorphosporae similis, vel conidia $4\text{--}6 \times 2\text{--}3 \mu\text{m}$.

Hyphae pale brown, smooth, $2\text{--}3 \mu\text{m}$ wide, disarticulating at septa to form short, pale brown, cylindrical conidia with obtusely rounded to subtruncate ends; aseptate conidia $4\text{--}6 \times 2\text{--}3 \mu\text{m}$, 1(–2)-septate conidia $6\text{--}10 \times 2\text{--}3 \mu\text{m}$; conidia developing further, becoming medium brown, predominantly aseptate, verruculose, ellipsoidal to subglobose or globose, with dehiscence scars clearly visible on conidial body. *Readeriella* synanamorph not seen.

Cultural characteristics: Colonies flat with even margins, spreading with moderate to prominent aerial mycelium, reaching 25 mm diam after 1 month on PDA; colonies on OA iron-grey, becoming olivaceous-grey on surface due to aerial mycelium; having prominent, diffuse red pigment in agar when cultivated on PDA, colony surface and reverse iron-grey.

Specimen examined: **Australia**, New South Wales, South Grafton, Grafton City Council Landfill Plantation, $152^{\circ} 54' 38''$ E, $29^{\circ} 46' 21''$ S, on leaves of *Corymbia henryii*, 16 Feb. 2006, A.J. Carnegie, **holotype** CBS-H 19839, **isotype** DAR 78030, cultures ex-type CPC 13071 = CBS 120894, CPC 13072–13073. **South Africa**, Western Cape Province, Betties Bay, Harold Porter Botanical Garden, leaf litter of *Cussonia* sp., Jan. 2006, P.W. Crous, CPC 12968 = CBS 120749 (single ascospore isolate).

Notes: *Cibiessia minutispora* is similar to *C. dimorphospora* in producing a prominent red pigment in agar, but is distinct due to the absence of a *Readeriella* synanamorph, and in the fact that it has much smaller conidia. This species is known from two collections, and seems to not be host specific. The South African collection arose from an actively discharged ascospore [using the technique as explained in Summerell *et al.* (2006), with spores shot upwards onto clean plates], while the Australian isolates occurred with several *Mycosphaerella* spp. on leaves of *E. henryii*.

Cibiessia nontingens Crous & Summerell, **sp. nov.**

(Fig. 5)

Mycobank 501259.

Synanamorph: Readeriella sp.

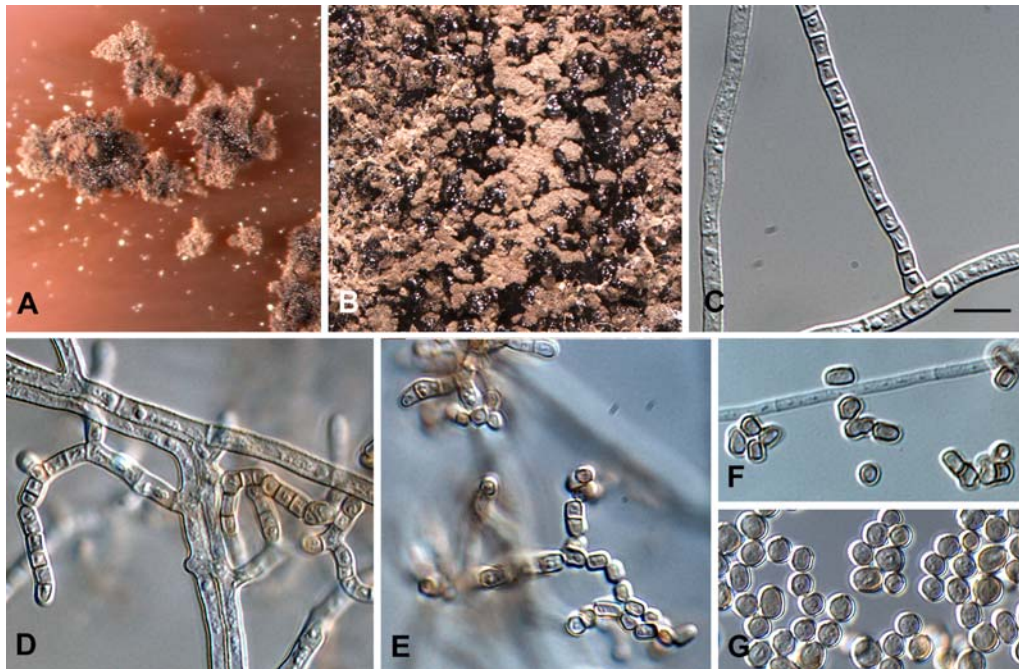


Fig. 4. *Cibiessia minutispora* (CBS H-19839). **A, B.** Colonies *in vitro* on PDA. **C–G.** Conidia and conidiogenous cells *in vitro*. Scale bar = 10 μ m.

Teleomorph: Mycosphaerella sp.

Etymology: Lacking a red pigment in culture, that is present in other species of the genus presently known.

Cibiessiae dimorphosporae similis, sed synanamorphe *Readeriellae* et pigmento rubro diffundente carens.

Leaf spots amphigenous, irregular to subcircular; spots variable from small specks (1 mm diam) to larger spots (7 mm diam), or coalescing to form larger blotches, medium brown, with a raised border and thin, red-purple margin. *Ascomata* pseudothecial, amphigenous, but predominantly epiphyllous, black, subepidermal, globose, up to 90 μ m wide; apical ostiole 5–10 μ m wide; wall consisting of 2–3 layers of medium brown textura angularis. *Asci* aparaphysate, fasciculate, bitunicate, sessile, obovoid to narrowly ellipsoid to subcylindrical, straight to slightly curved, 8-spored, 35–45 \times 8–11 μ m. *Ascospores* tri- to multi-seriate, overlapping, hyaline, guttulate, thin-walled, straight, fusoid-ellipsoidal with obtuse ends, widest just above the septum, medianly 1-septate, constricted at the septum, tapering towards both ends, but

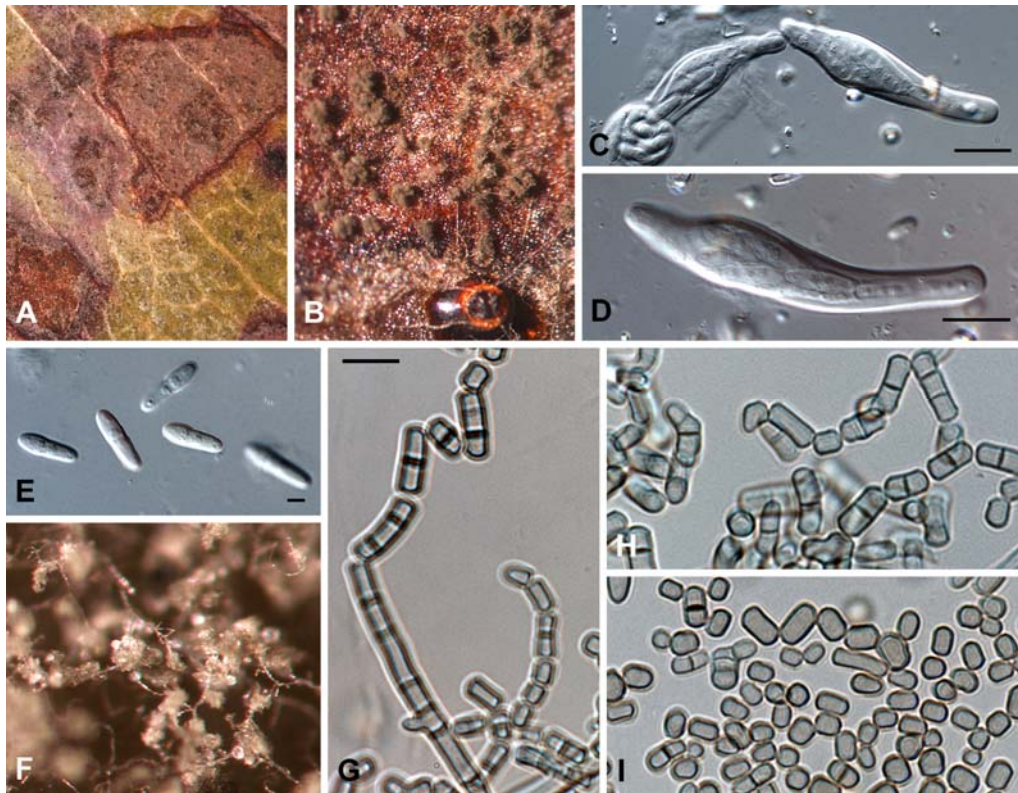


Fig. 5. *Cibiessia nontingens* (CBS H-19840). **A.** Leaf lesion. **B.** Colonies *in vivo*. **C, D.** Asci. **E.** Asci. **F–I.** Conidia *in vitro*. Scale bars = 10 μm .

more prominently towards the lower end, (9–)10–11 \times 2–3(–3.5) μm ; several ascospores showed remnants of a mucus sheath; no single ascospore cultures were obtained to confirm the anamorph link, though the anamorph formed on top of these ascomata, and the synanamorph among these ascomata. *Hyphae* pale brown, smooth, 3–5 μm wide, disarticulating at septa to form short, pale brown, cylindrical conidia with obtusely rounded to subtruncate ends; aseptate conidia 4–10 \times 3–5 μm , 1(–3)-septate conidia 7–12 \times 3–5 μm ; conidia developing further, becoming medium brown, predominantly aseptate, verruculose, ellipsoidal to subglobose or globose, with dehiscence scars clearly visible on conidial body; inner layer of the dehiscence scar extends past the outer layer. *Readeriella* synanamorph: Not observed in culture. *Conidiomata* intermingled among ascomata of a *Mycosphaerella* sp.; oozing a dark brown conidial mass; conidiomata pycnidial, subglobose, unilocular; wall consisting of 3–4 layers of brown *textura angularis*. *Conidiophores* 0–1-septate, subcylindrical to ampulliform, hyaline to pale brown, smooth, 5–7 \times 3–4 μm ,

mono- or polyphialidic. *Conidia* narrowly ellipsoid to subcylindrical with rounded ends, pale brown, smooth, $4\text{--}6 \times 2\text{--}3 \mu\text{m}$.

Cultural characteristics: Colonies flat, spreading, with moderate aerial mycelium and even margins, reaching 40 mm diam after 1 month on OA at 25°C , 50 mm diam on PDA. Colonies on OA olivaceous-grey, on PDA iron-grey to greenish black, with numerous mucus droplets on colony surface; colonies greenish black in reverse.

Specimen examined: **Australia**, New South Wales, McWilliam Drive, Douglas Park 34 11 0 S 150 43 0 E, on leaves of *Eucalyptus tereticornis*. Open woodland (Cumberland Plains Woodland) of *E. molucanna* and *E. tereticornis* on shale derived clay, Jul. 2006, B. Summerell, **holotype** CBS-H 19840, cultures ex-type CPC 13217 = CBS 120725, CPC 13218–13219.

Notes: Characteristic differences between *C. nontingens* and *C. dimorphospora* are the absence of the *Readeriella* synanamorph in culture, as well as the diffuse red pigment, which are prominent features in the latter species.

Key to species of *Cibiessia*

1. Red pigment produced in colonies on PDA 2
1. Red pigment absent in colonies on PDA, aseptate conidia up to $10 \mu\text{m}$ long and $5 \mu\text{m}$ wide ...
..... *C. nontingens*
2. *Readeriella* state produced in culture; aseptate *Cibiessia* conidia up to $7 \mu\text{m}$ long and $2.5 \mu\text{m}$ wide *C. dimorphospora*
2. *Readeriella* state not produced in culture; aseptate *Cibiessia* conidia up to $6 \mu\text{m}$ long and $3 \mu\text{m}$ wide *C. minutispora*

***Dissoconium australiensis* Crous & Summerell, sp. nov.** (Fig. 6)

MycoBank 501260.

Etymology: Named for Australia, the country of origin.

Dissoconio communi simile, sed conidiis minoribus, $(20\text{--})23\text{--}25(\text{--}27) \times (3\text{--})4(\text{--}5) \mu\text{m}$, distinguendum.

Mycelium internal and external, consisting of branched, septate, smooth, hyaline to pale brown hyphae, $2\text{--}3 \mu\text{m}$ wide. *Conidiophores* separate, arising from hyphae, subcylindrical, subulate or lageniform, tapering to a bluntly rounded or truncate apex, straight to curved, smooth, medium brown, aseptate, $20\text{--}27 \times 4\text{--}5 \mu\text{m}$; loci terminal and lateral, indistinct. *Conidia* $(20\text{--})23\text{--}25(\text{--}27) \times (3\text{--})4(\text{--}5) \mu\text{m}$, solitary, pale olivaceous-brown, smooth, ellipsoid to obclavate, 1-septate, apex obtuse, base obconic-truncate, hilum unthickened, $1\text{--}1.5 \mu\text{m}$ wide. *Secondary conidia* not observed on MEA or on SNA.

Cultural characteristics: Colonies on MEA reaching 30 mm diam after 1 month at 25°C ; erumpent with sparse aerial mycelium, hazel to isabelline, with feathery margins; umber in reverse.

Specimen examined: **Australia**, Queensland, Cairns, nr Kuranda, S 16° 56' 23.3", E 145° 32' 34.6", on leaves of *Eucalyptus platyphylla*, 26 Aug. 2006, P.W. Crous, **holotype** CBS-H 19837, culture ex-type CPC 13282 = CBS 120729.

Notes: Morphologically and phylogenetically *D. australiensis* is similar to *D. commune* and *D. dekkeri* (= *M. lateralis*). Conidia of *D. australiensis* (20–) 23–25(–27) × (3–)4(–5) μm are on average smaller than those of *D. commune* (20–30 × 4–5 μm, av. 25 × 4.5 μm), and somewhat larger than the common range of *D. dekkeri* (15–)17–21(–35) × (2–)3.5–4(–4.5) μm (Crous, 1998). Although the present strain failed to produce microconidia on various culture media, this cannot be seen as a species character until more strains have been collected and studied.

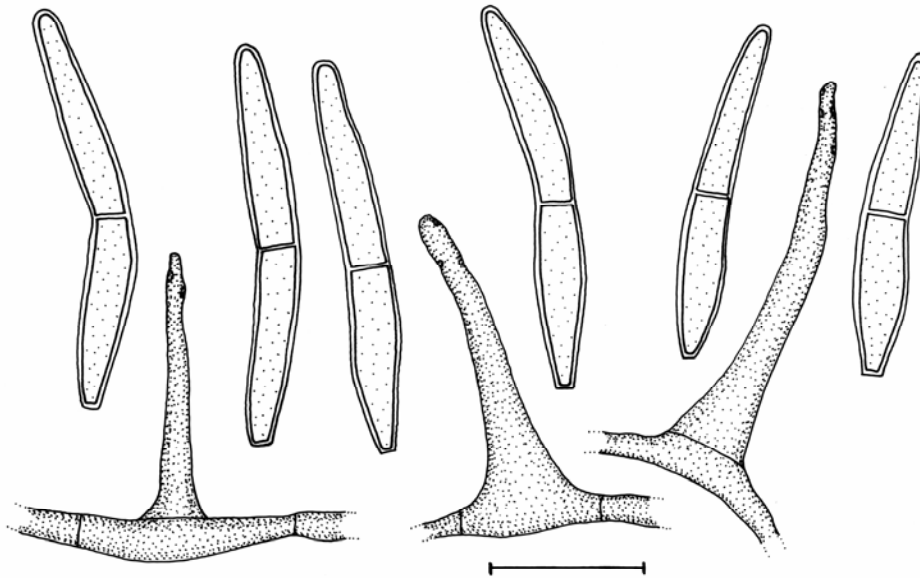


Fig. 6. *Dissoconium australiensis* (CBS H-19837). Conidia and conidiogenous cells *in vitro*. Scale bar = 10 μm.

***Dissoconium eucalypti* Crous & Carnegie, sp. nov.**

(Fig. 7)

MycoBank 501103.

Etymology: Named after its host plant, *Eucalyptus*.

Dissoconia aciculari simile, sed conidiis primariis minoribus, (8–)10–12(–14) × (4.5–) 5–6 μm, secundariis majoribus, 4–7 × 2.5–3 μm, differens.

Mycelium internal and external, consisting of branched, septate, smooth, hyaline to pale brown hyphae, 2–3 μm wide. *Conidiophores* separate, arising from hyphae, subcylindrical, subulate or lageniform, tapering to a bluntly rounded or truncate apex, straight to once geniculate, smooth, medium brown, aseptate, 10–30 × 4–8 μm; loci terminal and lateral, visible as slightly

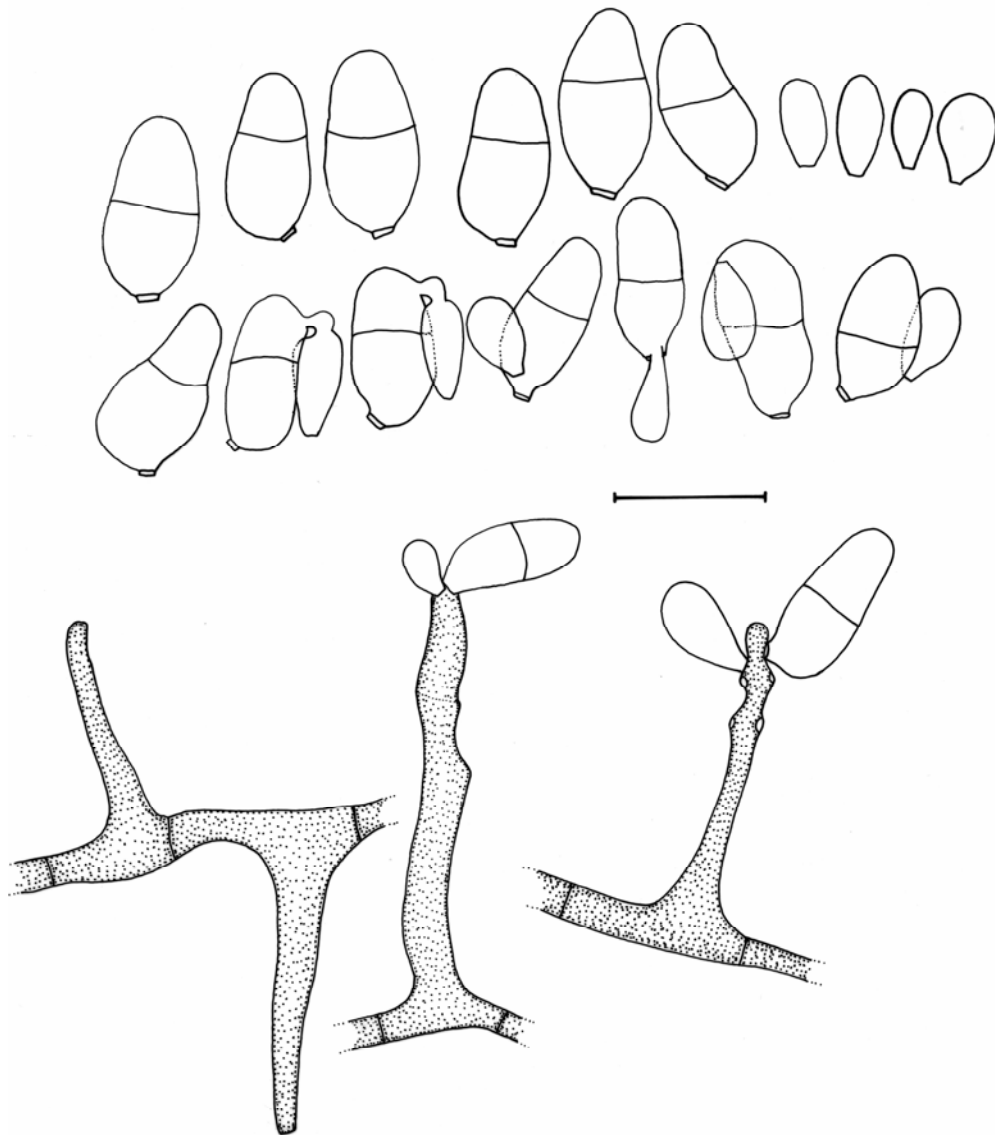


Fig. 7. *Dissoconium eucalypti* (CBS H-19770). Conidia and conidiogenous cells *in vitro*. Scale bar = 10 μm .

thickened, darkened scars, 0.5–1 μm wide. *Conidia* (8–)10–12(–14) \times (4.5–)5–6 μm , solitary, pale olivaceous-brown, smooth, ellipsoid to obclavate, 1-septate, apex obtuse, base obconic-truncate, hilum thickened, somewhat darkened, 1–1.5 μm wide. *Secondary conidia* developing adjacent to primary

conidia, pale olivaceous to subhyaline, aseptate, pyriform, with a truncate base, $4\text{--}7 \times 2.5\text{--}3 \mu\text{m}$; anastomosing with primary conidia after active discharge.

Cultural characteristics: Colonies on MEA reaching 15 mm diam after 3 weeks at 25°C; erumpent with sparse aerial mycelium, buff to olivaceous-buff, with feathery margins; cinnamon in reverse.

Specimen examined: **Australia**, New South Wales, Morpeth Park, Plantation, Bonalbo, 152° 36' 47" E, 28° 46' 3", on leaves of *Eucalyptus tereticornis*, 8 Feb 2006, A. Carnegie, **holotype** CBS-H 19770, cultures ex-type CPC 13004 = CBS 120039, CPC 13005–13006.

Notes: Although several species of *Dissoconium* have been described from *Eucalyptus* (Crous *et al.*, 2004b), *D. eucalypti* is distinct in having smaller primary and larger secondary conidia than those species known to date. Phylogenetically it clusters close to the ex-type strain of *D. aciculare*, which has larger primary ($12\text{--}25 \times 3.5\text{--}6 \mu\text{m}$), and secondary ($7.5\text{--}12 \times 3.5\text{--}6 \mu\text{m}$) conidia (De Hoog *et al.*, 1983). However, *D. eucalypti* differs with 5 nucleotides in the ITS1 region when compared to strains identified as *D. aciculare*.

***Mycosphaerella associata* Crous & Carnegie, sp. nov.** (Fig. 8)
Mycobank 501261.

Etymology: Name refers to its co-occurrence with other species of *Mycosphaerella* on the same leaf spots.

Ascospores fusioideae-ellipsoideae, $(12\text{--})13\text{--}16(\text{--}17) \times (3.5\text{--})4\text{--}5(\text{--}6) \mu\text{m}$.

Leaf spots amphigenous, irregular to subcircular, 4–6 mm diam, medium brown, with a thin, raised, dark brown border on the adaxial surface; dark brown with patches of grey due to the lifting cuticle on the abaxial surface, displaying numerous small cracks within the lesion tissue. *Ascomata* pseudothecial, amphigenous, but predominantly hypophyllous, black, subepidermal to erumpent, globose, up to 120 μm wide; apical ostiole 10–15 μm wide; wall consisting of 2–3 layers of medium brown *textura angularis*. *Asci* paraphysate, but with remains of hamathecium visible, fasciculate, bitunicate, sessile, obovoid to broadly ellipsoidal, straight to slightly curved, 8-spored, $30\text{--}38 \times 9\text{--}12 \mu\text{m}$. *Ascospores* tri- to multi-seriate, overlapping, hyaline, guttulate, thick-walled, straight, fusoid-ellipsoidal with obtuse ends, widest in middle of apical cell, medianly 1-septate, constricted at the septum, tapering towards both ends, but more prominently towards the lower end, $(12\text{--})13\text{--}16(\text{--}17) \times (3.5\text{--})4\text{--}5(\text{--}6) \mu\text{m}$; ascospores with persistent mucus sheath. Ascospores germinate from polar ends, with germ tubes parallel to the long axis of the spore; spore distorting and becoming prominently constricted at the septum, verruculose and brown; germ tubes pale brown, not straight and even, but irregularly crenate, 5–8 μm wide, at times developing 1–2 additional spore septa and additional germ tubes (germination Type H *sensu* Crous, 1998).

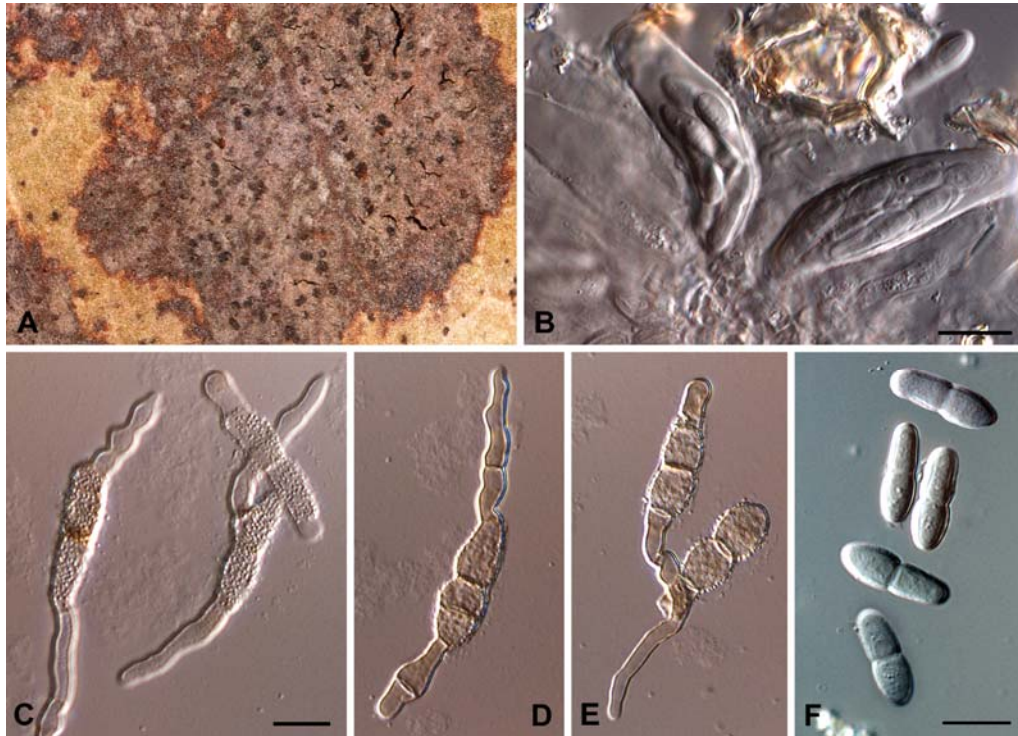


Fig. 8. *Mycosphaerella associata* (CBS H-19833). **A.** Leaf spot. **B.** Asci. **C–E.** Germinating ascospores. **F.** Ascospores. Scale bars = 10 μ m.

Cultural characteristics: Colonies erumpent with moderate aerial mycelium; margins catenulate, smooth; surface uneven on OA, olivaceous-grey with patches of pale olivaceous-grey to iron-grey, reaching 15 mm diam after 1 month at 25°C (on OA and PDA); on PDA olivaceous-grey with patches of pale olivaceous-grey to grey-olivaceous.

Specimens examined: **Australia**, New South Wales, South Grafton, Grafton City Council Landfill Plantation, 152° 54' 38" E, 29° 46' 21" S, on leaves of *Corymbia henryii*, 16 Feb. 2006, A.J. Carnegie, **holotype** CBS-H 19833, **isotype** DAR 78031, cultures ex-type CPC 13119 = CBS 120730, CPC 13120 (occurring with *Lembosina* sp.); New South Wales, Bungawalbin, Robertson Plantation, 153° 15' 39" E, 29° 5' 34" S, on leaves of *Corymbia variegata*, 23 Jan. 2005, A.J. Carnegie, DAR 78032, cultures CPC 13128 = CBS 120731, CPC 13129–13130 (occurring with *Lembosina* sp.); New South Wales, Bungawalbin, Robertson Plantation, 153° 15' 39" E, 29° 5' 34" S, on leaves of *Eucalyptus dunnii*, 14 Feb. 2006, A.J. Carnegie, cultures CPC 13108 = CBS 120732, CPC 13109–13110, 13113–13114 (occurring with *M. suberosa*).

Notes: *Mycosphaerella associata* frequently colonizes lesions of other ascomycetes, but it also occurs singly. Although several species have overlapping ascospore dimensions that overlap with those of *M. associata* (Crous, 1998), none share its rather unique mode of ascospore germination.

Mycosphaerella jonkershoekensis (GenBank DQ302968) clusters with 100% bootstrap support in the *M. associata* clade, but differs with one nucleotide in both the ITS1 and ITS2 region from this species.

Mycosphaerella dendritica Crous & Summerell, **sp. nov.** (Fig. 9)
Mycobank 501102.

Anamorph: Nothostrasseria dendritica (Hansf.) Nag Raj, Can. J. Bot. 61: 25. 1983.

(Basionym) *Spilomyces dentriticus* Hansf., Proc. Linn. Soc. N. S. W. 81: 32. 1956.

Ascospores fusoid-ellipsoid, (11–)12–13(–15) × 3–3.5(–4.5) µm, anamorphe *Nothostrasseria dendritica* formata in vitro.

Leaf spots amphigenous, irregular to subcircular, 2–8 mm diam, pale to gray-brown, with raised borders and thin, dark brown margins. *Ascomata* pseudothecial, amphigenous, black, subepidermal, globose, up to 150 µm wide; wall consisting of 2–3 layers of medium brown *textura angularis*. *Asci* paraphysate, fasciculate, bitunicate, sessile, broadly ellipsoid, straight to slightly curved, 8-spored, 25–50 × 9–11 µm. *Ascospores* bi- to triseriate, overlapping, hyaline, guttulate, thin-walled, straight, fusoid-ellipsoidal with obtuse ends, widest just above the septum, medianly 1-septate, not to slightly constricted at the septum, tapering towards both ends, but more prominently towards the lower end, (11–)12–13(–15) × 3–3.5(–4.5) µm; encased in a mucus sheath. Ascospores germinate irregularly, but mostly from polar ends, with germ tubes parallel to the long axis, but also with secondary germ tubes forming on the spore, at right angles to the long axis of the spore (Type D or I, *sensu* Crous 1998); spore distorting, becoming constricted, but remaining hyaline, 3.5–4.5 µm diam. *Conidiomata* black, globose, pycnidial, scattered, immersed in leaf tissue, but immersed to almost superficial on agar, up to 250 µm diam. *Conidiophores* ampulliform to lageniform, hyaline, smooth, 0–1-septate, mono- to polyphialidic, rarely proliferating percurrently, rarely branched, with loci terminal but also lateral, 5–10 × 2.5–4 µm. *Conidia* consisting of an ellipsoid body with obtuse apex, tapering to a tubular basal appendage; body medium brown, verruculose, 6–12 × 3–4 µm; tubular appendage separated from the conidium body by a septum, unbranched, hyaline, smooth, 4–15 × 1–1.5 µm.

Cultural characteristics: Colonies on PDA reaching 35 mm diam after 5 weeks at 25°C; colonies erumpent, with moderate, woolly aerial mycelium, pale olivaceous-grey to olivaceous-grey, margins smooth, regular; reverse iron-grey with zones of olivaceous-grey; colonies produce a faint, diffuse, pink pigment in agar. Colonies form numerous erumpent, black, globose, dark brown to black conidiomata on PDA and MEA.

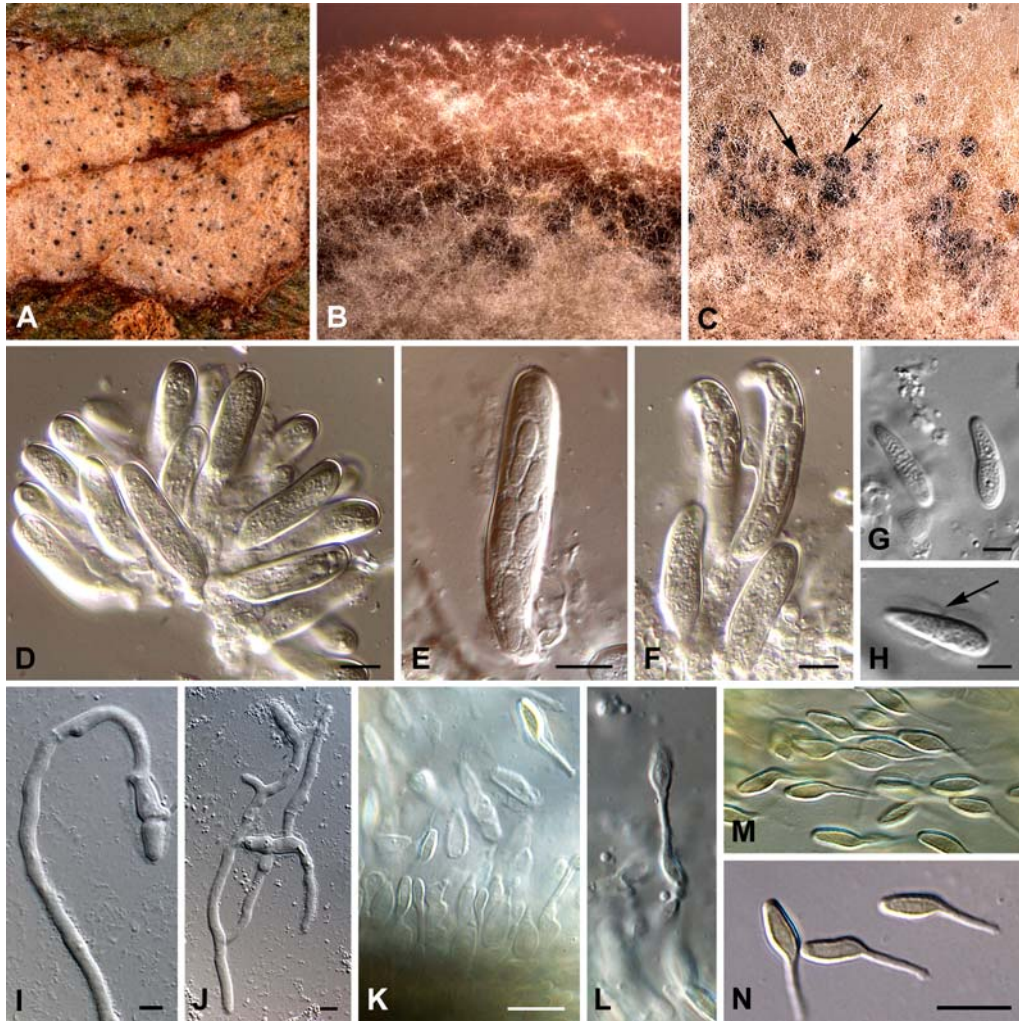


Fig. 9. *Mycosphaerella dendritica* and its anamorph, *Nothostrasseria dendritica* (CBS H-19772). **A.** Leaf spot. **B, C.** Colonies on MEA (arrows indicate conidiomata). **D–F.** Asci. **G, H.** Ascospores (arrow indicates sheath). **I, J.** Germinating ascospores. **K, L.** Conidiogenous cells. **M, N.** Conidia. Scale bars: E, F, K, N = 10, G–J = 3.5 μ m.

Specimens examined: **Australia**, New South Wales, Wollemi National Park, on leaves of *Eucalyptus deanei*, Feb 2006, B.A. Summerell, **holotype** CBS-H 19772, cultures ex-type CPC 12709 = CBS 120032, CPC 12710–12711; New South Wales, Laurel Hill, Bago State Forest, research trial, on leaves of *E. nitens*, 22 Dec. 2005, A.J. Carnegie, CPC 12820 = CBS 120733; Tasmania, on leaves of *E. globulus*, 31 Aug. 2006, C. Mohammed, CPC 13296 = CBS 120734, CPC 13297–13298.

Notes: As far as we could establish, this is the first record of *Nothostrasseria dendritica* grown in pure culture. This is also the first record of

its teleomorph, which is a species of *Mycosphaerella*, described here as *M. dendritica*. Phylogenetically *Nothostrasseria* clusters with species of *Readeriella*, but is different from *R. novaezealandiae* at three nucleotide positions in the ITS1 region and one in the ITS2 region. Although species of *Readeriella* have brown conidia that have up to three obtuse, apical projections, they lack basal appendages, and are thus tentatively retained as separate genera. The conidiogenesis of both genera is, however, similar, with conidia forming on mono- or polyphialides, which can also proliferate percurrently.

Mycosphaerella elongata Crous & M.J. Wingf., **sp. nov.** (Fig. 10)
Mycobank 501262.

Etymology: Named after its characteristic long ascospores.

Ascospores fusoid-ellipsoideae, (18–)20–25 × (4–)4.5(–5) µm.

Leaf spots amphigenous, irregular to subcircular, 3–13 mm diam, medium brown, with a thin, raised, dark brown to red-brown border. *Ascomata* pseudothecial, amphigenous, but predominantly epiphyllous, dark brown, subepidermal to somewhat erumpent, globose, up to 150 µm wide; apical ostiole up to 30 µm wide; wall consisting of 2–3 layers of medium brown *textura angularis*. *Asci* paraphysate, fasciculate, bitunicate, sessile, obovoid to broadly ellipsoidal, straight to slightly curved, 8-spored, 45–60 × 11–15 µm. *Ascospores* tri- to multi-seriate, overlapping, hyaline, guttulate, thin-walled, straight to slightly curved, fusoid-ellipsoidal with obtuse ends, widest in middle of apical cell, 1-septate, constricted at the septum, tapering towards both ends, but more prominently towards the lower end, (18–)20–25 × (4–)4.5(–5) µm; basal cell frequently 1–4 µm longer than apical cell. Ascospores germinate from both ends, with germ tubes parallel to the long axis of the spore; spore not darkening, nor distorting, becoming up to 5 µm wide (germination Type C *sensu* Crous, 1998).

Cultural characteristics: Colonies on MEA erumpent, convex, radially striated; margins smooth, even; surface cinnamon with patches of pale vinaceous aerial mycelium in centre; reverse brown-vinaceous; reaching 11 mm diam after 2 months at 25°C.

Specimen examined: **Venezuela**, El Piñal Lotes farm near Acarigua, on leaves of *Eucalyptus camaldulensis* × *urophylla*, Oct. 2006, M.J. Wingfield, **holotype** CBS-H 19824, cultures ex-type CPC 13378 = CBS 120735, CPC 13379–13380.

Notes: *Mycosphaerella elongata* has characteristically long ascospores (up to 25 µm long), somewhat reminiscent of *M. longibasalis* (22–30 × 3.5–5 µm; Crous, 1998), but shorter. It also has different lesions, with those of *M. longibasalis* being pale brown in colour.



Fig. 10. *Mycosphaerella elongata* (CBS H-19824). **A.** Leaf spot. **B–D.** Asci and ascospores. **E–G.** Germinating ascospores. Scale bar = 10 μ m.

Mycosphaerella excentrica Crous & Carnegie, **sp. nov.**
Mycobank 501263.

(Fig. 11)

Anamorph: *Trimmatostroma excentricum* B. Sutton & Ganap., N.Z. J. Bot. 16: 529. 1978.

Ascospores fusoidae-ellipsoideae, (10–)15–18(–23) \times (3–)4 μ m, anamorphe *Trimmatostroma excentrica* formata in vitro.

Leaf spots amphigenous, irregular, corky, medium to dark brown, raised, with an irregular margin and thin, red-brown border, 2–12 mm diam. *Ascomata* amphigenous, separate, dark brown, subepidermal, becoming superficial, globose, up to 160 μ m wide; apical ostiole up to 20 μ m wide, but frequently opening by means of irregular rupture; wall of 2–3 layers of dark brown, thick-walled *textura angularis*. *Asci* fasciculate, bitunicate, aparaphysate (through remains of the hamathecium observed in some ascomata), 8-spored, obovoid to broadly ellipsoidal, straight to slightly incurved, 40–50 \times 8–10 μ m. *Ascospores*

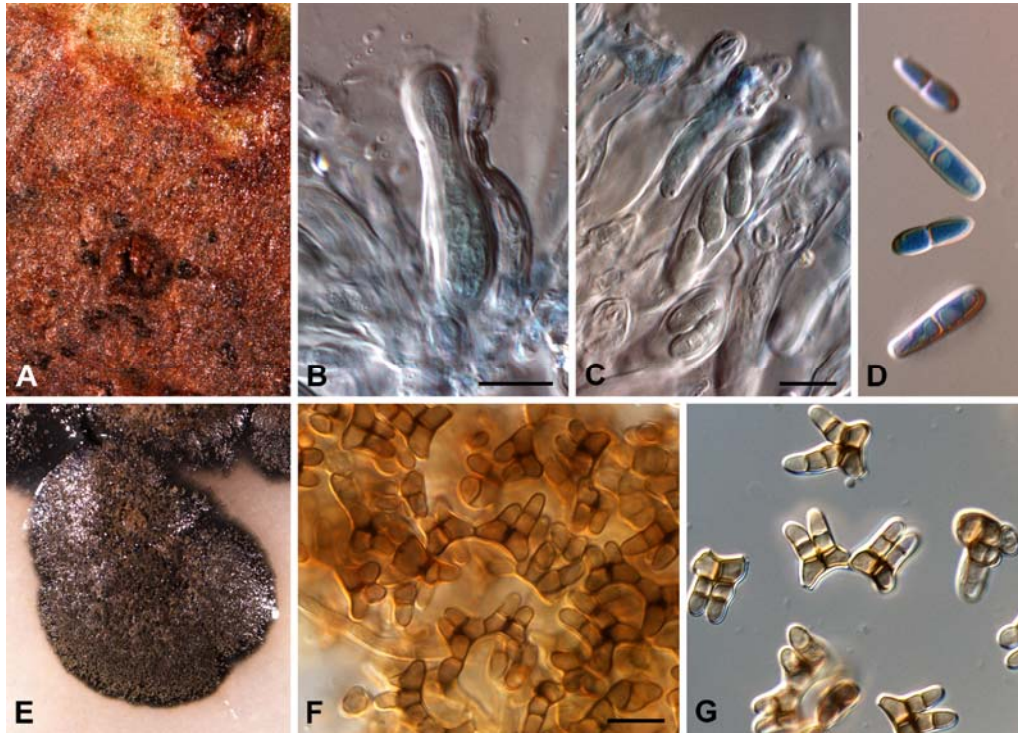


Fig. 11. *Mycosphaerella excentrica* and its anamorph *Trimmatostroma excentricum* (CBS H-19829). **A.** Leaf spot. **B, C.** Asci. **D.** Ascospores. **E.** Colony on OA. **F, G.** Conidia and conidiogenous cells *in vitro*. Scale bars = 10 μ m.

tri to multiseriate, fusoid-ellipsoidal with obtuse ends, hyaline, smooth, but pale brown and verruculose in old asci, becoming 3-septate, not constricted at median septum, thick-walled, guttulate, widest in the middle of the apical cell, with persistent mucous sheath, (10–)15–18(–23) \times (3–)4 μ m. *Conidia in vitro* formed in basipetal chains, smooth, medium brown, 4-celled, consisting of two basal cells with truncate lateral sides (adhesion scars present when catenulate), each giving rise to a secondary globose apical cell, that can extend and develop two additional septa in some cases; primary cells 9–11 \times 3–4 μ m, secondary cells 2.5–4.5 μ m wide, 4–6 μ m long, but with additional septa these arms can become up to 15 μ m long (excluding the basal cell); septa separating the primary and secondary cells are dark-brown and thick-walled.

Cultural characteristics: Colonies on OA erumpent, black, powdery, uneven with catenulate margins; aerial mycelium absent, reaching 10 mm diam after 2 months on OA at 25°C; fertile forming anamorph.

Specimen examined: **Australia**, New South Wales, Mackenzie Creek Road, Kempsey, Byrne Plantation, 152° 27' 47" E, 30° 53' 15" S, on leaf spots of *E. agglomerata*, 13 Apr. 2005,

G. Price, **holotype** CBS-H 19829, **isotype** DAR 78033, culture ex-type CPC 13092 = CBS 121102.

Notes: No teleomorph has previously been linked to *T. excentricum*, and this is the first record of this species grown in pure culture. Although the anamorph has a different conidial morphology to those of other species of *Trimmatostroma*, it clusters with other members of the genus based on its DNA phylogeny.

Mycosphaerella fimbriata Crous & Summerell, **sp. nov.** (Fig. 12)
Mycobank 501264.

Etymology: Named after its characteristic leaf spots with radiating hyphal strands.

Ascospores obovoidea, (18–)22–17(–30) × (6–)7(–8) μm.

Leaf spots amphigenous, irregular to circular, 5–15 mm diam, medium to dark brown, with radiating superficial mycelium, spreading from ascomata that are predominantly in the middle of the lesion; hyphae red-brown, 5–8 μm wide, thick-walled, verruculose, aggregating in hyphal strands (also *in vitro*), with chlamyospore-like cells, up to 15 μm diam, aggregating in clusters; forming spermatogonia in the outer region of the lesion (also formed *in vitro*). *Ascomata* pseudothecial, amphigenous, black, subepidermal, but becoming erumpent, globose, up to 120 μm wide; apical ostiole 15–20 μm wide; wall consisting of 6–8 layers of medium brown *textura angularis*. *Asci* paraphysate, fasciculate, bitunicate, sessile, obovoid to broadly ellipsoidal, straight to slightly curved, 8-spored, with the endotunica having 3–5 well differentiated layers, visible when mounted in clear lactic acid, 30–90 × 17–22 μm. *Ascospores* multi-seriate, overlapping, hyaline, guttulate, thin-walled, straight to slightly curved, obovoid, with obtuse ends, widest near the apex of the apical cell, mostly medianly 1-septate, constricted at the septum; larger ascospores tend to be unequally 1-septate, with the upper cell being up to 13 μm long, and the bottom cell up to 17 μm long, tapering towards both ends, but more prominently towards the lower end, (18–)22–17(–30) × (6–)7(–8) μm; ascospores frequently with a persistent mucous sheath. Ascospores germinate from both ends, but not necessarily polar, with 2–4 germ tubes more or less parallel to the long axis of the spore (or germ tubes 3–4 irregular); original spore becoming transversely septate, constricted, with mucus sheath prominently visible; spore becoming up to 10 μm wide, darkening and becoming verruculose (germination Type I *sensu* Crous, 1998).

Cultural characteristics: Colonies on MEA slow growing, reaching 5 mm diam after 2 months; colonies erumpent, with moderate aerial mycelium and uneven, feathery margins; surface olivaceous-grey, at times fawn in centre due to superficial mycelium; reverse dark-brick. On OA erumpent, spreading with

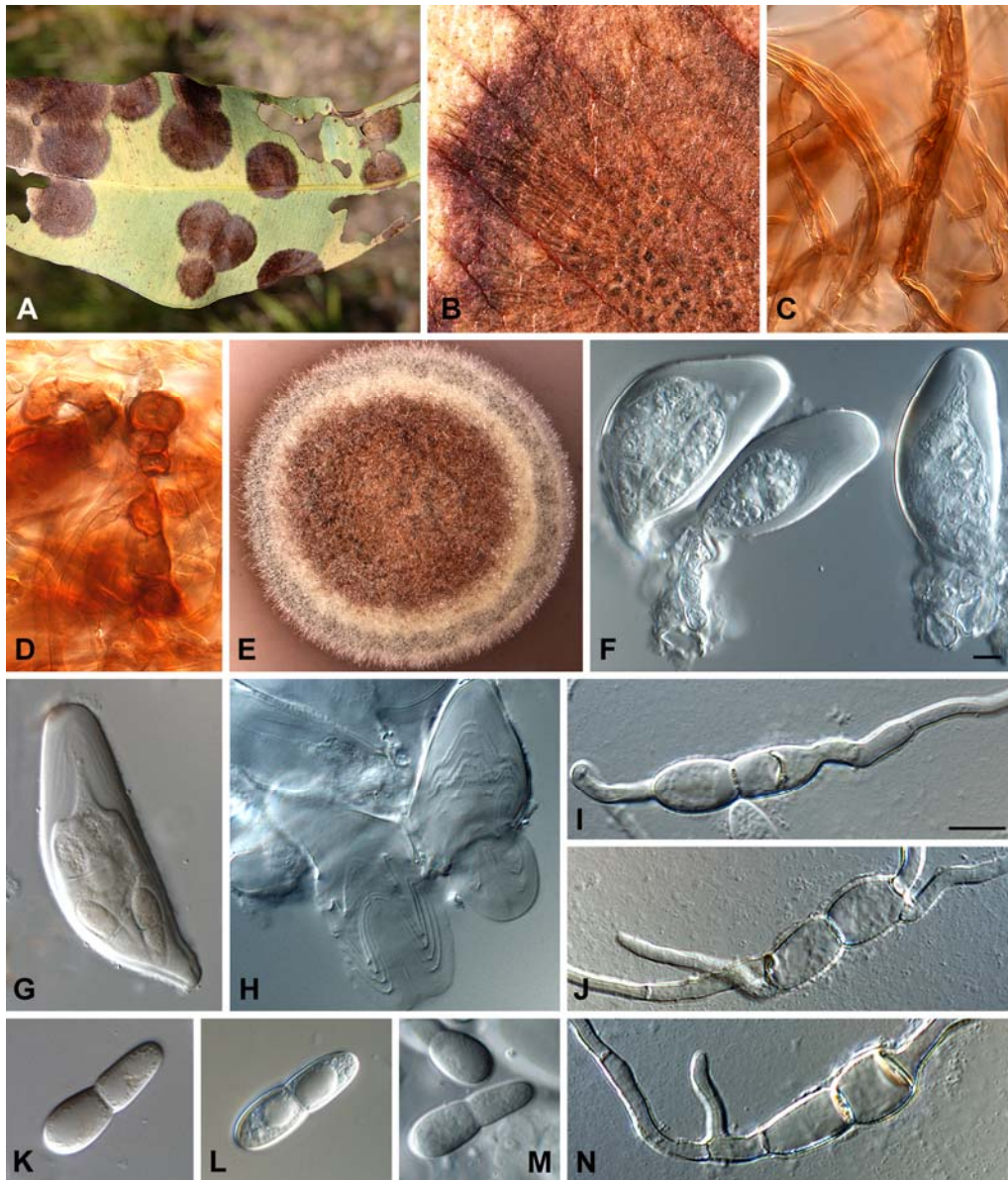


Fig. 12. *Mycosphaerella fimbriata* (CBS H-19828). **A, B.** Leaf spots with radiating superficial hyphae. **C.** Hyphal strands. **D.** Chlamydo-spore-like structures. **E.** Colony on OA. **F–H.** Asci, with layered endotunica. **I, J, N.** Germinating ascospores. **K–M.** Ascospores. Scale bars: F = 7, I = 10 μ m.

even, smooth margins; surface dark-brick in centre, outer zone olivaceous-grey, forming a diffuse, dark-vinaceous pigment in the agar, reaching 10 mm diam

after 2 months at 25°C; colonies forming numerous spermatogonia when inoculated onto OA.

Specimen examined: **Australia**, Queensland, Cairns, S 16° 56' 23.3", E 145° 32' 34.6", on leaves of *Corymbia* sp., 26 Aug. 2006, P.W. Crous, **holotype** CBS-H 19828, cultures ex-type CPC 13324 = CBS 120736, CPC 13325–13326; Cairns, Mareeba Wetlands, Peninsula Development Road, S 16° 47' 11.3", E 145° 21' 3.2", 380 m, on leaves of *Corymbia* sp., 27 Aug. 2006, P.W. Crous, CBS-H 19827, cultures CPC 13321 = CBS 120893, CPC 13322–13323.

Notes: *Mycosphaerella fimbriata* is unique among the species known on *Eucalyptus* in having distinct brown leaf spots covered by strands of red-brown, radiating hyphae, and having a multi-layered ascus endotunica. Phylogenetically it is related to *Stigmina eucalypti* and *Colletogloeopsis* spp.

***Mycosphaerella parkii*affinis** Crous & M.J. Wingf., **sp. nov.** (Fig. 13)
Mycobank 501265.

Etymology: Name refers to its morphology which is similar to that of *Mycosphaerella parkii*.

Ascospores fusoid-ellipsoid, (8–)9–10 × 3(–3.5) µm.

Leaf spots amphigenous, irregular to subcircular, 6–30 mm diam, pale to medium brown, with a thin, raised, dark brown border, and a red-purple margin. *Ascomata* pseudothecial, amphigenous, dark brown, subepidermal to somewhat erumpent, globose, up to 80 µm wide; apical ostiole 10–15 µm wide; wall consisting of 2–3 layers of medium brown *textura angularis*. *Asci* paraphysate, fasciculate, bitunicate, subsessile, obovoid to ellipsoidal, straight to slightly curved, 8-spored, 18–30 × 7–10 µm. *Ascospores* tri- to multi-seriate, overlapping, hyaline, guttulate, thin-walled, straight, fusoid-ellipsoidal with obtuse ends, widest in middle of apical cell, medianly 1-septate, constricted at the septum, tapering towards both ends, but more prominently towards the lower end, (8–)9–10 × 3(–3.5) µm. Ascospores germinate from both ends, with germ tubes parallel or irregular to the long axis of the spore, with 2–4 germ tubes developing; spore not darkening, but distorting, becoming up to 6 µm wide (germination Type D *sensu* Crous, 1998).

Cultural characteristics: Colonies on MEA reaching 18 mm diam after 2 months at 25°C; colonies erumpent, spreading, with moderate aerial mycelium, and smooth, but somewhat feathery margins; surface olivaceous-grey in the centre, pale olivaceous-grey in outer region; reverse olivaceous-black.

Specimen examined: **Venezuela**, near Acarigua, on leaves of *Eucalyptus urophylla*, Oct. 2006, M.J. Wingfield, **holotype** CBS-H 19823, cultures ex-type CPC 13373 = CBS 120737, CPC 13374.

Notes: In comparison to other *Mycosphaerella* spp., *M. parkii*affinis has small, nondescript spores, and an irregular ascospore germination pattern (Type D), similar to species in the *M. parkii* complex. It is distinct in lacking a

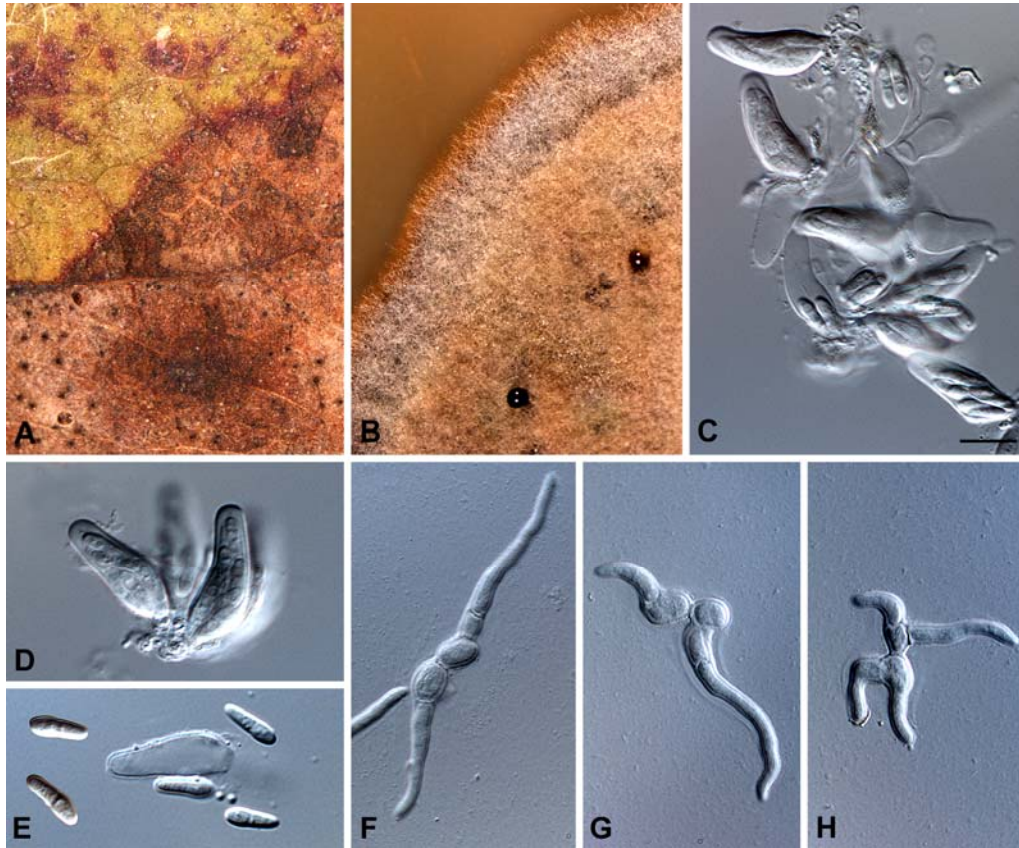


Fig. 13. *Mycosphaerella parkiiaffinis* (CBS H-19823). **A.** Leaf spot. **B.** Colony on MEA. **C, D.** Asci. **E.** Ascospores. **F–H.** Germinating ascospores. Scale bar = 10 μ m.

Stenella anamorph, and having smaller ascospores than those of *M. parkii*, which are up to 15 μ m long (Crous, 1998; Crous *et al.*, 2006g). Phylogenetically, it is most closely related to *M. ohnowa*.

***Phaeophleospora stonei* Crous, sp. nov.**

(Fig. 14)

Mycobank 501266.

Etymology: Named for Dr. Jeff Stone, who collected this fungus with P.W.C. along the river bank in Kuranda before the IMC8 congress.

Phaeophleosporae lilianae similis, sed conidiis minoribus, (25–)30–33(–35) \times (3.5)4(–5) μ m, distinguenda.

Leaf spots amphigenous, circular to subcircular, pale brown with a raised, dark brown border, and thin, red-purple margin, 1–4 mm diam. *Conidiomata* amphigenous, subepidermal with a central ostiole, from where conidia exude in a brown cirrus; scattered, globose, dark brown, up to 200 μ m diam; wall of 3–4 layers of dark brown *textura angularis*. *Conidiogenous cells* pale brown,

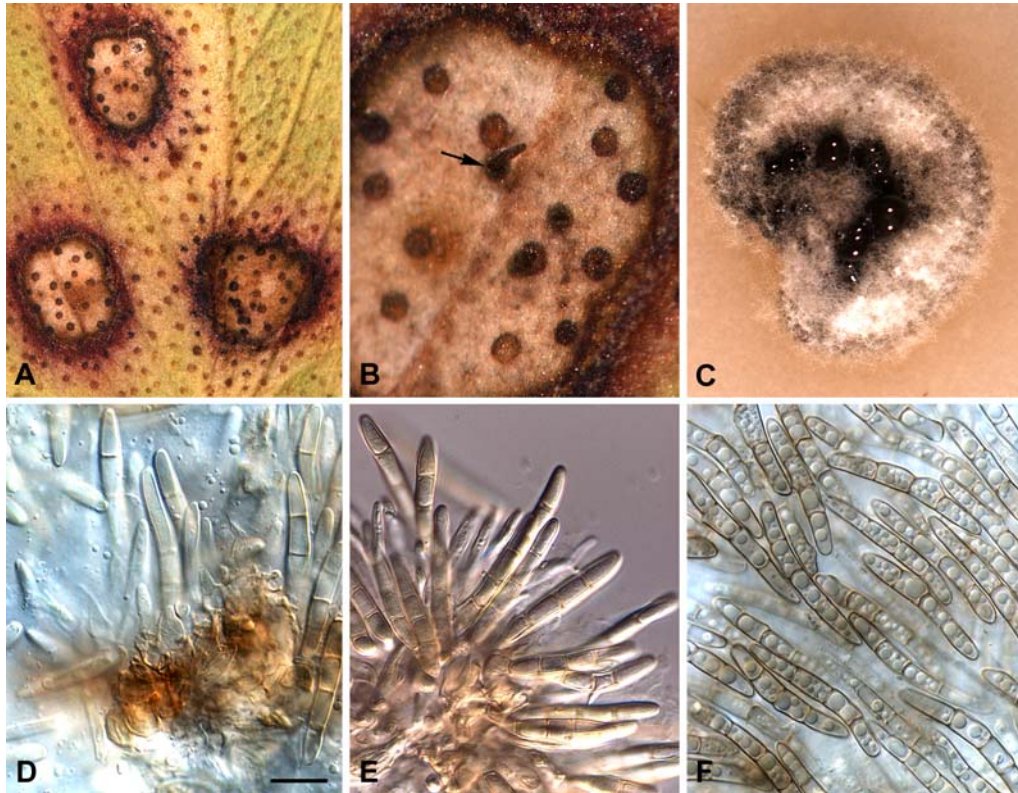


Fig. 14. *Phaeophleospora stonei* (CBS H-19835). **A, B.** Leaf spots (arrow indicates conidial cirrus). **C.** Colony on OA. **D, E.** Conidiogenous cells and conidia. **F.** Conidia. Scale bar = 10 μm .

smooth, ampulliform to doliiform, $3\text{--}7 \times 3\text{--}5 \mu\text{m}$, proliferating percurrently near apex. *Conidia* subcylindrical to narrowly obclavate, widest at basal septum, tapering to a subtruncate, flattened hilum with minute marginal frill, and tapering in the apical cell to an obtuse apex; cellular content granular to not so in vivo, conidia 3(–6)-euseptate (septa appear thicker in Shear’s than in clear lactic acid, but never distoseptate); conidia guttulate and darker brown *in vitro*, but similar in dimensions, $(25\text{--})30\text{--}33(–35) \times (3.5)4(–5) \mu\text{m}$.

Cultural characteristics: Colonies slow-growing, reaching 7 mm diam on OA after 2 months at 25°C ; erumpent, with moderate aerial mycelium and uneven, but smooth margins, pale mouse-grey to olivaceous-grey.

Specimen examined: **Australia**, Queensland, Cairns, Kuranda, Karoomba River Walk, S $16^{\circ} 49' 08.8''$, E $145^{\circ} 38' 24.7''$, on leaves of *Eucalyptus* sp., 19 Aug. 2006, P.W. Crous & J. Stone, **holotype** CBS-H 19835, culture ex-type CPC 13330 = CBS 120830, CPC13331–13332.

Notes: Swart and Walker (1988) erected the genus *Sonderhenia* to separate taxa with distoseptate conidia from those with transversely euseptate

conidia. Walker *et al.* (1992) placed several similar taxa with eu-septate conidia in a new genus, *Kirramyces*. Crous *et al.* (1997) treated *Kirramyces* as synonym of *Phaeophleospora*. The type species of *Kirramyces* (*K. epicoccoides*) clusters apart from that of *Phaeophleospora* (*P. eugeniae*) within the *Mycosphaerellaceae*. The fact that *P. stonei* does not cluster with the type of *Phaeophleospora* nor *Kirramyces*, suggests that *Phaeophleospora* is polyphyletic, as are most anamorph genera in the *Mycosphaerellaceae*. The phylogenetic analysis places it closest to *M. areola* and *Pseudocercospora* spp.

***Phaeothecoidea* Crous, gen. nov.**

Mycobank 501267

Etymology: Its characteristic endoconidia resemble *Phaeotheca*, but the structures are always dark and thick-walled.

Phaeothecae similis, sed structuris omnino fuscis et crassitunicatis.

Hyphomycetous, *Mycosphaerellaceae*. *Hyphae* pale to medium brown, verruculose, 4–6 µm wide, end cells dividing into several endoconidia. *Endoconidia* pale to medium brown, verruculose, thick-walled, ellipsoid to obovoid, obclavate or irregularly triangular, 4–10 × 4–5 µm, becoming 1(–2) septate, medium to dark brown, verruculose to verrucose, 10–15 × 5–7 µm, giving rise to additional endoconidia.

Type species: *Phaeothecoidea eucalypti* Crous & Summerell., sp. nov.

***Phaeothecoidea eucalypti* Crous & Summerell, sp. nov.**

(Fig. 15)

Mycobank 501268.

Etymology: Named after its host genus, *Eucalyptus*.

Conidia matura brunnea, verruculosa, crassitunicata, ellipsoidea vel irregulariter triangularia, 4–10 × 4–5 µm.

Hyphae in vitro creeping, subhyaline, verruculose, branched, septate, 4–6 µm wide, becoming swollen, up to 15 µm wide, verruculose, medium brown; end cells dividing into several endoconidia, which are released upon rupture of the cell wall. *Endoconidia* pale to medium brown, verruculose, thick-walled, ellipsoid to obovoid, obclavate or irregularly triangular, 4–10 × 4–5 µm after liberation; swelling, becoming 1(–2) septate, medium to dark brown, verruculose to verrucose, 10–15 × 5–7 µm; conidia giving rise to 1–2(–4) additional endoconidia, with outer wall of primary conidium visible as prominent collarete around endoconidia during rupture, and on outer wall of primary conidium after conidial release.

Cultural characteristics: Colonies on OA and PDA black, slimy, shiny, irregular, elevated with a catenulate margin, lacking aerial mycelium, but having slimy droplets on the surface; growing 5 mm diam in 3 weeks on OA, 1 cm on PDA.

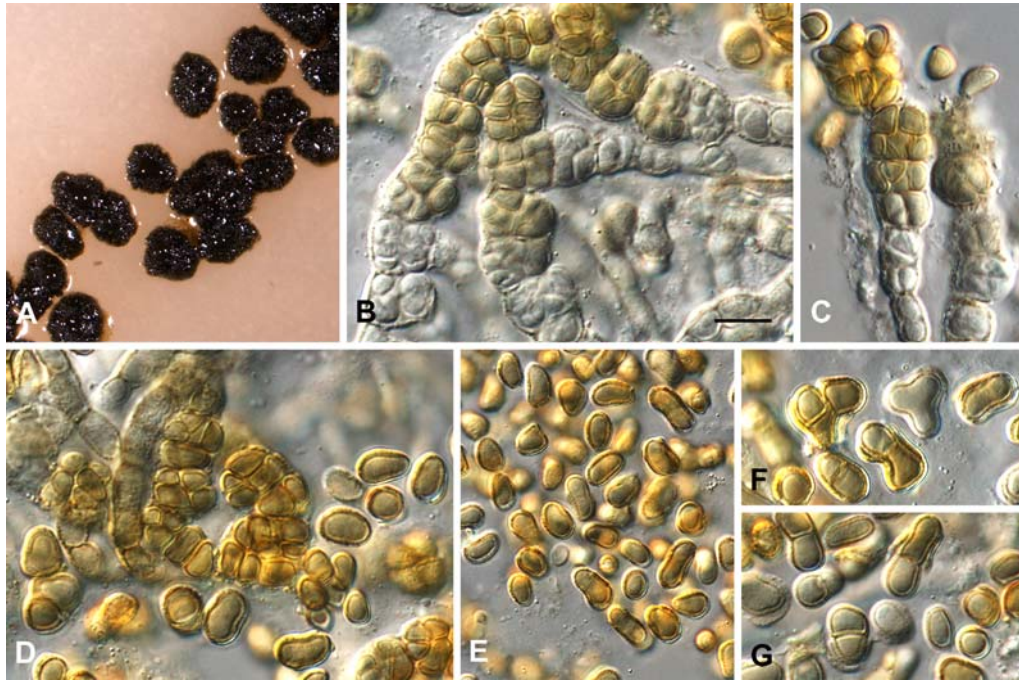


Fig. 15. *Phaeothecoidea eucalypti* (CBS H-19836). **A.** Colonies on OA. **B, C.** Hyphal ends with endoconidia. **D–F.** Conidia. Scale bar = 10 μ m.

Specimen examined: **Australia**, New South Wales, Clareville Beach Reserve, on leaves of *Eucalyptus botryoides*, Feb. 2006, B. Summerell, **holotype** CBS-H 19836, culture ex-type CPC 12918 = CBS 120831.

Notes: The genus *Melanothecoidea* is reminiscent of the genera *Hyphospora* (teleomorph: *Cumminutispora*) and *Phaeotheca*, which both have endoconidia, and are placed in the Dothideomycetes. However, neither of these genera cluster within *Mycosphaerella*, and they are also morphologically distinct by tending to have more thin-walled conidia, that become pigmented with age (Zalar *et al.*, 1998). *Melanothecoidea eucalypti* clusters among species of *Trimmatostroma* within *Mycosphaerella*, but is distinct in that members of *Trimmatostroma* generally have dry, disarticulating conidia, while colonies of *Melanothecoidea* are wet and slimy, and have endoconidia. The phylogenetic analysis places it closest to *M. excentrica* and *M. suberosa*.

***Pseudocercospora norchiensis* Crous, sp. nov.**

(Fig. 16)

Mycobank 501269.

Etymology: Named after the type locality in Italy, Norchia, Prov. Viterbo.

Conidia obclavata, (0–)5–9(–12)-septata, (50–)80–120(–140) \times (5–)6(–7) μ m.

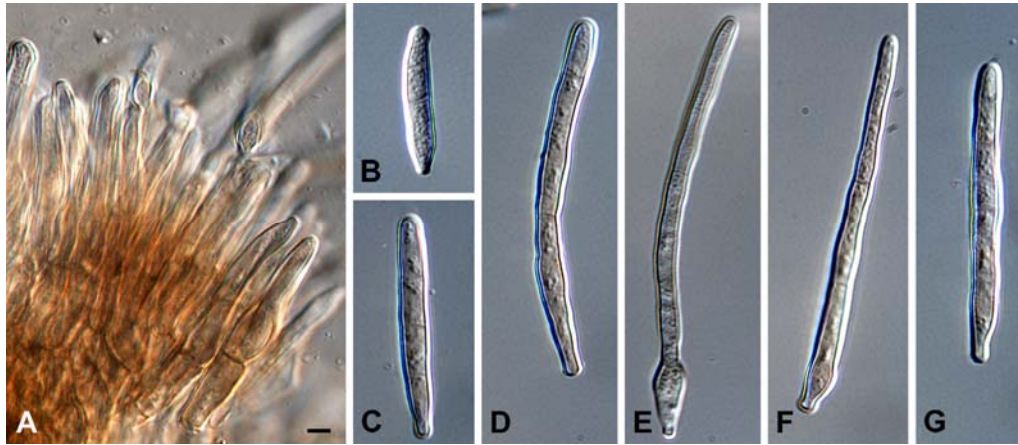


Fig. 16. *Pseudocercospora norchiensis* (CBS H-19841). A. Conidiophores. B–F. Conidia. Scale bar = 10 μm .

Leaf spots amphigenous, irregular to subcircular, 2–6 mm diam, medium brown with a raised border, and a thin red-purple margin. Mycelium internal, smooth, consisting of branched, septate, smooth, pale brown hyphae, 3–4 μm wide; superficial mycelium developing once incubated in moist chambers. *Caespituli* fasciculate, epiphyllous, pale brown on leaves, up to 160 μm wide and 150 μm high. *Conidiophores* aggregated in highly dense fascicles arising from the upper cells of a brown stroma up to 160 μm wide and 90 μm high; conidiophores medium brown, smooth, 3–5-septate, subcylindrical, straight to variously curved, unbranched, 40–70 \times 4–7 μm . *Conidiogenous cells* terminal, unbranched, medium brown, smooth, tapering to flat-tipped apical loci, proliferating sympodially, rarely percurrently near apex, 12–45 \times 4–6 μm . *Conidia* solitary, medium brown, smooth, prominently guttulate, obclavate, apex subobtuse, base short obconically truncate, straight to slightly curved, (0–) 5–9(–12)-septate, (50–)80–120(–140) \times (5–)6(–7) μm ; hila inconspicuous, 2–3 μm wide.

Cultural characteristics: Colonies on MEA erumpent, raised, convex, with moderate aerial mycelium and feathery, uneven margins; on MEA surface pale olivaceous-grey, with patches of smoke-grey; outer margin olivaceous-grey to iron-grey; reverse iron-grey, reaching 20 mm diam after 2 months at 25°C.

Specimen examined: **Italy**, Viterbo, Norchia, on leaves of *Eucalyptus* sp., Apr. 2005, W. Gams, **holotype** CBS-H 19841, cultures ex-type CPC 13049–13051 = CBS 120738, CPC 13050–13051.

Notes: The ITS sequence of *P. norchiensis* is identical to that of *P. nogalesii*, which was described from *Chamaecytisus* in New Zealand (Braun *et al.*, 2003). It can be distinguished morphologically, however, by having

extremely dense caespituli, lacking superficial mycelium, having conidia that are more obclavate in shape, and also being larger and wider than those of *P. nogalesii* (20–70 × 2.5–5 µm; Braun *et al.*, 2003). Based on the key of Braun and Dick (2002), as well as recently described species (Crous *et al.*, 2004b; Hunter *et al.*, 2006a), *P. norchiensis* is morphologically distinct from the taxa presently known from *Eucalyptus*.

***Ramularia eucalypti* Crous, sp. nov.**

(Fig. 17)

MycoBank 501270.

Etymology: Named after its host plant genus, *Eucalyptus*.

Conidia catenulate, levigata, hyalina, subcylindrica vel fusoido-ellipsoidea, 0–1-septata, (10–)12–15(–18) × (2.5–)3(–4) µm.

Leaf spots amphigenous, irregular, subcircular or angular, confined by leaf veins, medium brown with a thin, red-brown border, specks 1–2 mm diam, or larger spots and blotches up to 4 cm diam. *Mycelium* internal and external, hyaline, smooth, consisting of branched, septate, hyphae, 3–4 µm wide. *Caespituli* fasciculate, amphigenous, hyaline, up to 80 µm wide and 50 µm high, situated on a poorly developed substomatal stroma, up to 40 µm wide. *Conidiophores* arising in dense fascicles from a subhyaline stroma (rarely separate on superficial mycelium), smooth, hyaline, 1–7-septate, subcylindrical, straight to geniculate-sinuuous, unbranched or branched below, 10–60 × 3–4 µm. *Conidiogenous cells* terminal or lateral, integrated, hyaline, smooth, tapering to flat-tipped apical loci, 10–20 × 2.5–3.5 µm; scars darkened, refractive, thickened, 1–1.5 µm wide. *Conidia* catenulate in branched chains, smooth, hyaline; ramiconidia subcylindrical to fusoid-ellipsoidal, 0–1-septate, (10–)12–15(–18) × (2.5–)3(–4) µm; secondary conidia fusoid-ellipsoidal, occurring in branched chains of up to 15 µm long, (5–)6–7(–8) × 3(–3.5) µm; hila darkened, thickened, refractive, up to 1 µm wide.

Cultural characteristics: Colonies on MEA spreading, erumpent, convex with uneven, convoluted surface, radially striated, with sparse to moderate aerial mycelium and submerged, uneven, feathery margins; surface dirty white, reverse brown-vinaceous in centre, becoming fawn in middle zone, and brown-vinaceous in outer region; reaching 20 mm after 2 months at 25°C.

Specimens examined: **Italy**, Norchia, on living leaves of *Eucalyptus grandiflora*, Apr. 2006, W. Gams, **holotype** CBS-H 19832, culture ex-type CPC 13043 = CBS 120726, CPC 13044–13045; Viterbo, on living leaves of *E. grandiflora*, Apr. 2006, W. Gams, CPC 13046 = CBS 120727, CPC 13047–13048. **Australia**, Queensland, Cairns, Kuranda, Karoomba River Walk, S 16° 49' 08.8", E 145° 38' 24.7", on leaves of *Eucalyptus* sp., 19 Aug. 2006, P.W. Crous & J. Stone, CPC 13304 = CBS 120728.

Notes: Presently this is the only true member of *Ramularia* known from *Eucalyptus*, as *Ramularia pitereka* and aggregate species are now accommodated in the genus *Quambalaria* (*Quambalariaceae*) (De Beer *et al.*,

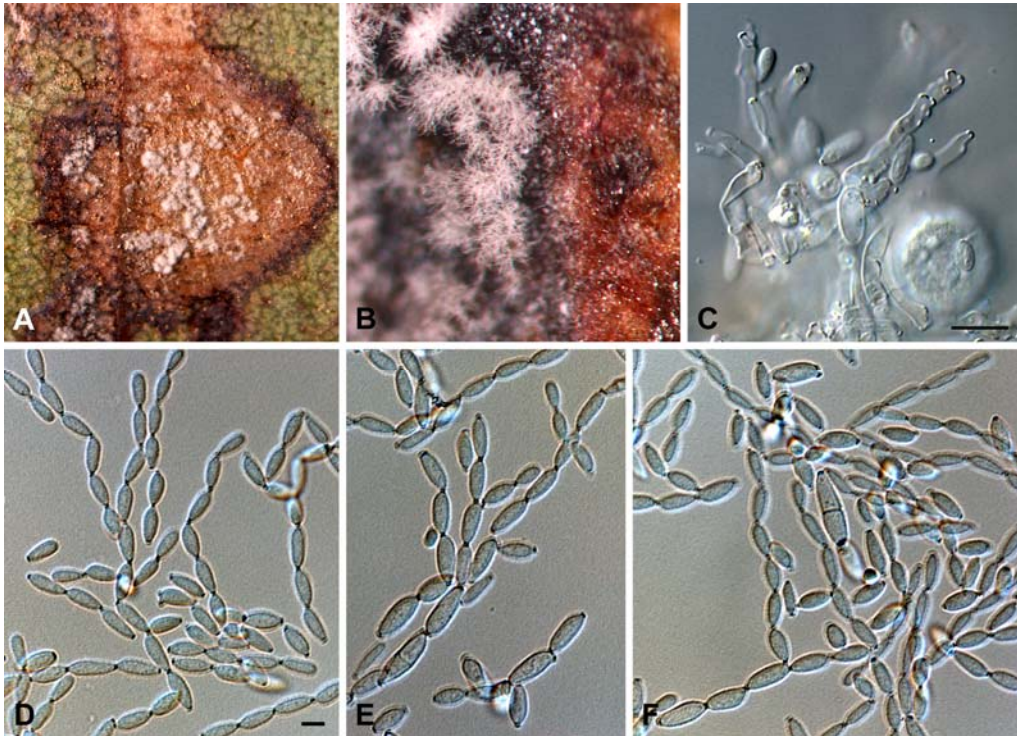


Fig. 17. *Ramularia eucalypti* (CBS H-19832). **A, B.** Leaf spots. **C.** Conidiophores. **D–F.** Conidia in chains. Scale bars: C = 10, D = 6 μ m.

2006). *Ramularia eucalypti* was collected from several locations in Italy, where it was associated with severe leaf spotting symptoms of mature *Eucalyptus* trees. It is interesting that the disease has not previously been reported from Australia, where eucalypts are native. Based on the species of *Ramularia* known from culture, *R. eucalypti* appears to be new, though further collections from other hosts will have to address the potential host specificity of this species. Currently *Ramularia* is accepted as being a host-specific genus of phytopathogenic fungi (Braun, 1998), though some exceptions are likely to emerge.

***Septoria* sp.**

(Figs 18, 19)

Leaf spots absent, conidiomata associated with leaf litter. *Mycelium* internal, consisting of smooth, branched, septate, pale brown, 1.5–2 μ m wide hyphae. *Conidiomata* pycnidial, immersed, brown, globose in OA, up to 100 μ m diam; wall consisting of 3–4 cell layers of *textura angularis*. *Conidiogenous cells* lining the inner layer of the conidioma, densely aggregated, ampulliform to subcylindrical, straight to curved, unbranched,

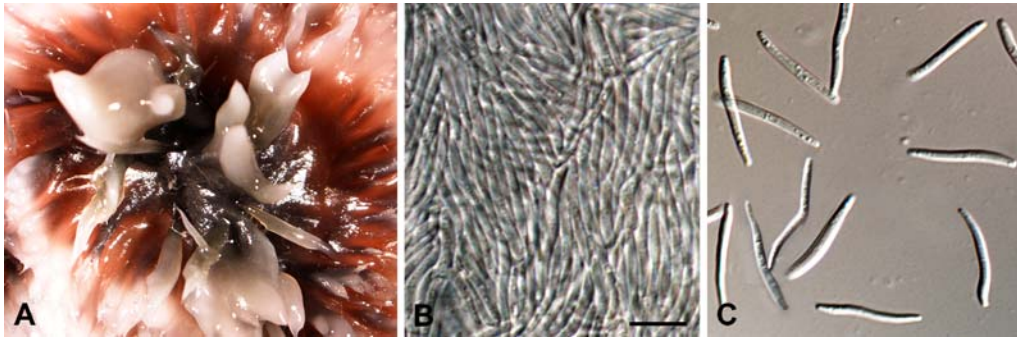


Fig. 18. *Septoria* sp. (CBS H-19831). **A.** Colony on OA. **B, C.** Conidia. Scale bar = 10 μ m.

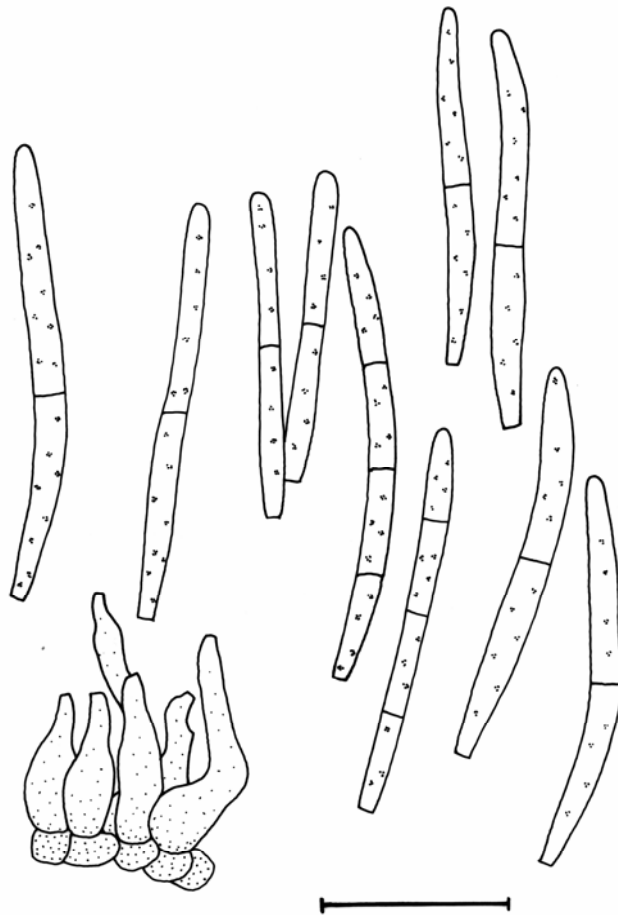


Fig. 19. Conidia and conidiogenous cells of *Septoria* sp. (CBS H-19831). Scale bar = 10 μ m.

hyaline, smooth, proliferating sympodially near the apex, $6\text{--}12 \times 3\text{--}8 \mu\text{m}$. *Conidia* solitary, hyaline, smooth, finely guttulate or not, subcylindrical to narrowly obclavate, with subobtuse apex, and long subtruncate base, straight to curved, 1(–3)-septate, $(9\text{--})17\text{--}20(\text{--}24) \times 1.5(\text{--}2) \mu\text{m}$; hila inconspicuous, $0.5\text{--}1 \mu\text{m}$ diam.

Cultural characteristics: Colonies erumpent, spreading, with even, lobate margins; on OA with moderate, dirty pink to white aerial mycelium, umber in outer region, which lacks aerial mycelium; reaching 35 mm diam after 1 month at 25°C; on PDA erumpent, central part with dense tufts of dirty white aerial mycelium, outer zone chestnut; reverse chestnut; reaching 25 mm diam after 1 month at 25°C.

Specimen examined: **Italy**, Viterbo, Norchia, on leaves of *Eucalyptus* sp., Apr 2005, W. Gams, CBS-H 19831, cultures CPC 13058 = CBS 120739, CPC 13059–13060.

Notes: Based on their ITS DNA sequence data, these isolates are similar to those of *S. protearum* Viljoen & Crous, known from *Protea* leaf spots in South Africa (Crous *et al.*, 2004a). However, the conidia are somewhat narrower than those of *S. protearum*. Additional genes will therefore have to be sequenced to fully resolve the status of the *Eucalyptus* isolates.

***Stenella eucalypti* Crous & Summerell, sp. nov.**

(Fig. 20)

Mycobank 501271.

Etymology: Named after its host genus, *Eucalyptus*.

Stenellae pseudoparkii similis, sed conidiis et conidiophoris longioribus distinguenda.

Leaf spots amphigenous, irregular to angular specks, 1–3 mm diam, pale brown with dark brown, with raised, dark brown spots inside lesions, presumably due to insect damage; borders raised, margins absent to red-purple, but the latter may be due to co-colonization of a *Pseudocercospora* sp. *Mycelium* internal and external, consisting of branched, septate, medium brown, finely verruculose hyphae, 3–4 μm wide; terminal hyphal ends characteristically ending in clusters of globose, multi-celled chlamyospore-like structures, frequently surrounded by a mucus sheath; clusters 10–30 μm diam. *Conidiophores* arising singly from superficial mycelium, dark brown, finely verruculose, multi-septate, subcylindrical, straight to geniculate-sinuuous, mostly unbranched, or branched below, $50\text{--}200 \times 5\text{--}8 \mu\text{m}$. *Conidiogenous cells* terminal, mostly unbranched, medium brown, smooth to finely verruculose, tapering to flat-tipped apical loci, proliferating sympodially, $10\text{--}15 \times 4\text{--}5 \mu\text{m}$; scars thickened, darkened, refractive. *Conidia* solitary, pale brown, finely verruculose, guttulate, subcylindrical to narrowly obclavate, apex subobtuse, base long obconically subtruncate to obconically subtruncate, straight to slightly curved, (0–)1–3(–5)-septate, $(10\text{--})20\text{--}35(\text{--}60) \times (2\text{--})3\text{--}4(\text{--}6) \mu\text{m}$; hila thickened, darkened, refractive, $1.5\text{--}2 \mu\text{m}$ wide.



Fig. 20. *Stenella eucalypti* (CBS H-19830). **A.** Leaf spot. **B.** Colony on MEA. **C–E.** Conidiophores. **F, G.** Chlamydospore-like structures. **H.** Conidia. Scale bar = 10 μ m.

Cultural characteristics: Colonies on MEA reaching 15 mm diam after 2 months at 25°C; erumpent, with moderate aerial mycelium and smooth, uneven margins; surface mouse-grey to olivaceous-grey; reverse greenish-black.

Specimen examined: **Australia**, Queensland, Cairns, Eureka Creek, 48 km from Mareeba, S 17° 11' 13.2", E 145° 02' 27.4", 468 m, on leaves of *Eucalyptus tereticornis*, 26 Aug. 2006, P.W. Crous, **holotype** CBS-H 19830, CPC 13302 = CBS 121101.

Notes: Several species of *Stenella* are known from *Eucalyptus* (Crous, 1998; Crous *et al.*, 2006g). *Stenella eucalypti* has conidia that are 10–60 \times 2–6 μ m, 0–5-septate, showing some overlap with those of *S. pseudoparkii* (20–50 \times 2.5–3 μ m, 1–5-septate) and *S. xenoparkii* (12–50 \times 3–5 μ m, 1–2-septate), but is distinct in having somewhat longer and wider conidia, and very long conidiophores. The phylogenetic analysis could not confidently place this species; the parsimony analysis places it basal, whereas with neighbour-joining

it clustered with *Phaeophleospora stonei*. A Blast search with the ITS sequence reveals the highest similarity with species of *Cercospora* and *Septoria*.

New and interesting records

Mycosphaerella acaciigena Crous & M.J. Wingfield, Stud. Mycol. 50: 463. 2004.

Specimens examined: **Australia**, New South Wales, on leaves of *Eucalyptus* sp. Aug. 2006, B. Summerell, CPC 13290 = CBS 120740, CPC 13291–13292. **Venezuela**, El Piñal Lotes farm near Acarigua, on leaves of *E. camaldulensis* × *E. urophylla*, Aug. 2006, M.J. Wingfield, CPC 13350–13352.

Notes: *Mycosphaerella acaciigena* was recently described from leaf spots on *Acacia mangium* leaves collected in Venezuela (Crous *et al.*, 2004c). Although this is the first report of this fungus from *Eucalyptus*, and also the first report from Australia, several species of *Mycosphaerella* are now known to move between *Eucalyptus* and *Acacia* hosts (Crous and Groenewald, 2005).

Mycosphaerella heimii Crous, S. African For. J. 172: 2. 1995.

Specimens examined: **Australia**, Queensland, Cairns, close to Kuranda, Kennedy Highway, S 16° 52' 4.5", E 145° 35' 54.5", on leaves of *Eucalyptus platyphylla*, 26 Aug. 2006, P.W. Crous, CPC 13276 = CBS 120741, CPC 13277–13278. **Thailand**, Thatakiab District, Chachoengsao Province, on leaves of *E. camaldulensis*, 12 Oct. 2006, W. Himaman, CPC 13474 = CBS 120742, CPC 13475–13476. **Venezuela**, on leaves of *E. urophylla*, Aug. 2006, M.J. Wingfield, CPC 13371–13374, 13359–13361, 13356 = CBS 120743, CPC 13357–13358.

Notes: Since *M. heimii* was originally described from *Eucalyptus* leaves collected in Madagascar, it has been reported on this host from several countries (Crous, 1998), including a recent report from Australia (Whyte *et al.*, 2005), which is confirmed by the present collection.

Mycosphaerella konae Crous, Joanne E. Taylor & M.E. Palm, Mycotaxon 78: 459. 2001.

Anamorph: *Pseudocercospora* sp.

Specimen examined: **Thailand**, Thatakiab District, Chachoengsao Province, on leaves of *E. camaldulensis*, 12 Oct. 2006, W. Himaman, CPC 13469 = CBS 120748, CPC 13470.

Notes: *Mycosphaerella konae* is known to be a pathogen of *Banksia* and *Leucospermum* spp. cultivated in Hawaii (Crous *et al.*, 2004a). This is the first report of this fungus on *Eucalyptus* in Thailand. The present collection closely matches the type with regards to ascospore dimensions and germination patterns, and similar cultural characteristics.

Mycosphaerella mexicana Crous, Mycol. Mem. 21: 81. 1998.

Specimen examined: **Hawaii**, Waimea, ascomata occurring on older lesions of *Aulographina eucalypti*, on *Eucalyptus* leaves, Aug. 2005, W. Gams, CPC 12349 = CBS 120744, CPC 12350–12351.

Notes: *Mycosphaerella mexicana* was originally described from eucalypt leaves collected in Mexico (Crous, 1998), and has subsequently been recorded from Australia (Maxwell *et al.*, 2003). This is, however, the first report of this fungus from Hawaii. Although there are a few base pair differences compared to the sequences derived from the Australian cultures, sparse material made it difficult to compare morphologically to *M. mexicana*.

Mycosphaerella molleriana (Thüm.) Lindau in Engler & Prantl., *Natürlichen Pflanzenf.* 1: 424. 1897. (Fig. 21)

(Basionym) *Sphaerella molleriana* Thüm., *Revista Inst. Sci. Lit. Coimbra* 28: 31. 1881.

Anamorph: *Colletogloeopsis molleriana* Crous & M.J. Wingf., *Can. J. Bot.* 75: 670. 1997

Specimens examined: **Portugal**, Lusitania, leaves of *E. globulus*, Jul. 1879, Fr. Moller, K (**holotype** of teleomorph); Abrantes, leaves of *E. globulus*, Jul. 1995, S. McCrae, PREM 54395 (**holotype** of anamorph), cultures ex type CPC 1214 = CBS 111164, CPC 1215 = CBS 111165; Lisbon, N 40° 00' 39", W 8° 36' 2.3", 77 m, on leaves of *Eucalyptus* sp., 13 Oct. 2006, P.W. Crous & A.J.L. Phillips, CBS-H 19826, **epitype of teleomorph designated here**, cultures ex-epitype CPC 13398 = CBS 120746, CPC 13399–13400.

Notes: Crous and Wingfield (1997) described the anamorph of *M. molleriana*, and this culture has since been used as representative of the species. The present collection contains numerous ascomata, and is morphologically and genetically similar to the anamorph strain, while the morphology matches that observed on the holotype of the teleomorph. This fresh collection, which has ample fruiting of both states, can thus be used to epitypify the holomorph.

Mycosphaerella ohnowa Crous & M.J. Wingf., *Stud. Mycol.* 50: 206. 2004.

Specimen examined. **Australia**, New South Wales, Dilkoon, Hourne Plantation, 153° 1' 47" E, 29° 29' 26" S, on leaves of *Eucalyptus dunnii*, 12 Feb. 2006, A.J. Carnegie, CPC 13101 = CBS 120745, CPC 13102–13103.

Notes: *Mycosphaerella ohnowa* is presently known to occur on *E. grandis* leaves in South Africa (Crous *et al.*, 2004b), and this is the first record from Australia. The present collection agrees well with that of the type strain in cultural characteristics (colour, growth rate and slimy aerial hyphal tufts) and morphology.

Mycosphaerella thailandica Crous, Himaman & M.J. Wingf., *Stud. Mycol.* 50: 465. 2004.

Anamorph: *Pseudocercospora thailandica* Crous, Himaman & M.J. Wingf., *Stud. Mycol.* 50: 465. 2004.

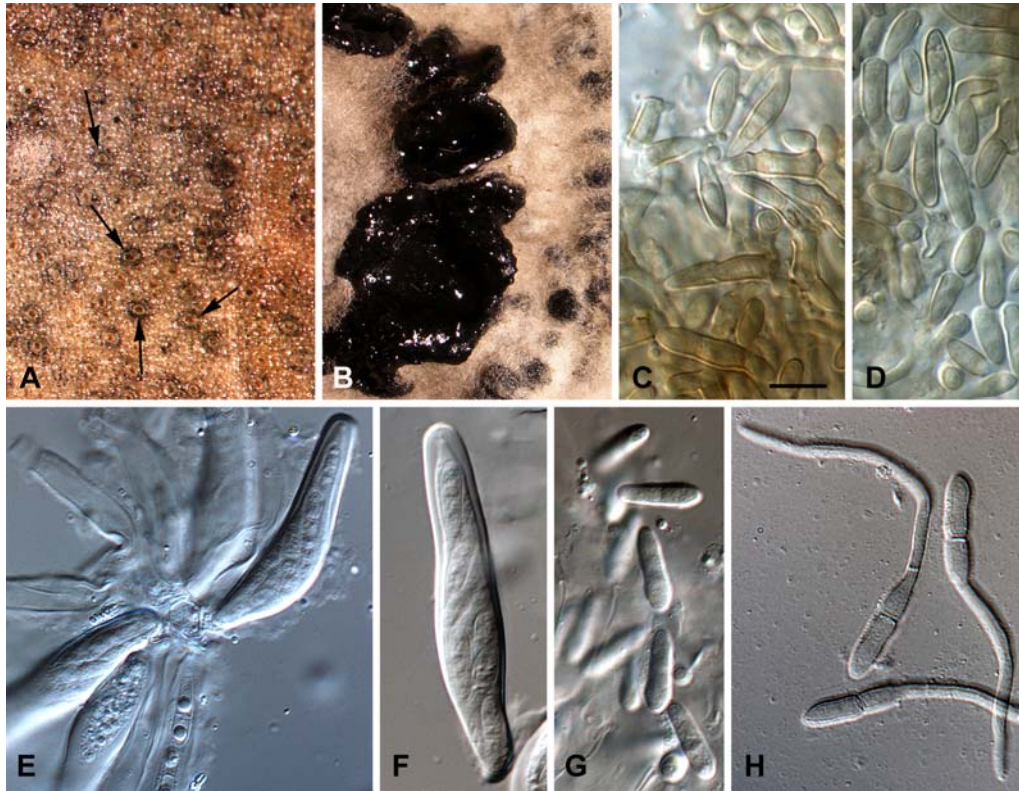


Fig. 21. *Mycosphaerella molleriana* and its anamorph *Colletogloeopsis molleriana* (CBS H-19826). **A.** Leaf spot (arrows indicated subepidermal ascomata). **B.** Sporulation on MEA. **C, D.** Conidia and conidiogenous cells. **E, F.** Asci. **G.** Ascospores. **H.** Germinating ascospores. Scale bar = 10 μ m.

Specimen examined: **Thailand**, Thatakiab District, Chachoengsao Province, on leaves of *E. camaldulensis*, 12 Oct. 2006, W. Himaman, CPC 13477, 13481–13482, 13478 = CBS 120723.

Notes: *Mycosphaerella thailandica* is associated with leaf spots of *Acacia mangium* in Thailand (Crous *et al.*, 2004c). This is the first report of this fungus on *Eucalyptus* in Thailand. The present collection closely matches the type with regards to ascospore dimensions, germination patterns, and cultural characteristics. Cultures remained sterile, and did not produce the anamorph.

Stigmina eucalypti Alcorn, Trans. Brit. Mycol. Soc. 60: 151. 1973. (Fig. 22)

Specimens examined: **Australia**, Queensland, Brisbane, on leaves of *Eucalyptus tessellaris*, 19 Nov. 1969, A. Skoien, **holotype** IMI 161747; **Australia**, New South Wales, Jackadgery, Singh Plantation (adjacent Inglebar State Forest), 152° 32' 13" E, 29° 34' 24" S, on leaves of *Corymbia variegata*, 11 Mar. 2006, G. Price, CBS-H 19834, cultures CPC 13384 = CBS 121100, CPC 13385–13386.

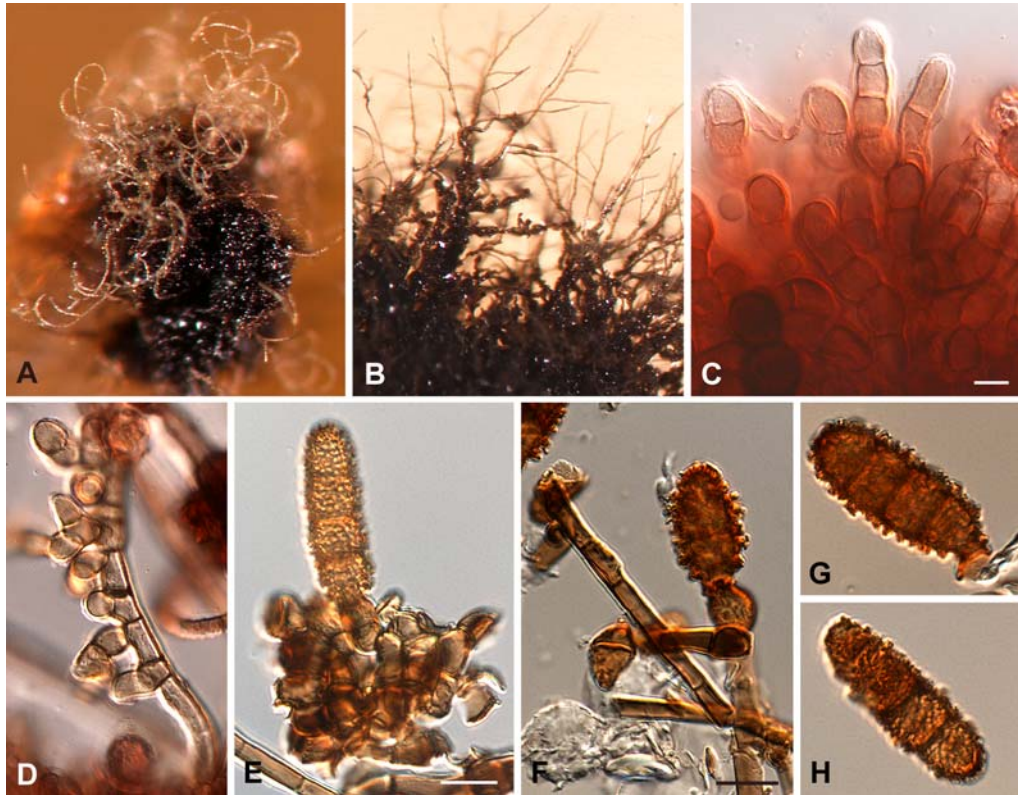


Fig. 22. *Stigmina eucalypti* (CBS H-19834). **A, B.** Colonies on MEA. **C–F.** Conidiogenous cells. **G, H.** Conidia. Scale bars = 10 μm .

Notes: A recent study by Crous *et al.* (2006c) confirmed *Stigmina* to be synonymous with *Pseudocercospora* and *Phaeoisariopsis*. *Stigmina eucalypti*, however, clusters apart from *Stigmina s.str.* (typified by *S. platani*). Because the generic affinity of *S. eucalypti* is uncertain, this species is tentatively retained in *Stigmina* until more molecular data become available.

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