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Sporocadaceae, a family of coelomycetous fungi with appendage-bearing conidia

F. Liu[1], G. Bonthond[2,3], J.Z. Groenewald[2], L. Cai[1*], and P.W. Crous[2,4*]

[1]*State key Laboratory of Mycology, Institute of Microbiology, Chinese Academy of Sciences, Beijing, 100101, China;* [2]*Westerdijk Fungal Biodiversity Institute, Utrecht, 3508 AD, The Netherlands;* [3]*Benthic Ecology, GEOMAR Helmholtz Centre for Ocean Research Kiel, Hohenbergstraße 2, 24105, Kiel, Germany;* [4]*WUR, Laboratory of Phytopathology, Droevendaalsesteeg 1, 6708 PB, Wageningen, The Netherlands*

**Correspondence*: L. Cai, cail@im.ac.cn; P.W. Crous, p.crous@westerdijkinstitute.nl

Abstract: Species of *Sporocadaceae* are endophytic, plant pathogenic or saprobic, and associated with a wide range of host plants. Recent molecular studies that have attempted to address familial and generic boundaries of fungi belonging to *Sporocadaceae* were based on a limited number of samples and DNA loci. The taxonomy of this group of fungi is therefore still not fully resolved. The aim of the present study is to provide a natural classification for the *Sporocadaceae* based on multi-locus phylogenetic analyses, using LSU, ITS, *tef-1α*, *tub2* and *rpb2* loci, in combination with morphological data. A total of 30 well-supported monophyletic clades in *Sporocadaceae* are recognised, representing 23 known and seven new genera. Typifications are proposed for the type species of five genera (*Diploceras*, *Discosia*, *Monochaetia*, *Sporocadus* and *Truncatella*) to stabilise the application of these names. Furthermore, *Neotruncatella* and *Dyrithiopsis* are synonymised under *Hymenopleella*, and the generic circumscriptions of *Diploceras, Disaeta*, *Hymenopleella*, *Monochaetia*, *Morinia*, *Pseudopestalotiopsis*, *Sarcostroma*, *Seimatosporium*, *Synnemapestaloides* and *Truncatella* are emended. A total of 51 new species, one *nomina nova* and 15 combinations are introduced.

Key words: Multi-locus phylogeny, New taxa, *Seimatosporium*, *Sporocadus*, Taxonomy.

Taxonomic novelties: New genera: *Distononappendiculata* F. Liu, L. Cai & Crous, *Diversimediispora* F. Liu, L. Cai & Crous, *Heterotruncatella* F. Liu, L. Cai & Crous, *Nonappendiculata* F. Liu, L. Cai & Crous, *Parabartalinia* F. Liu, L. Cai & Crous, *Pseudosarcostroma* F. Liu, L. Cai & Crous, *Xenoseimatosporium* F. Liu, L. Cai & Crous; **New name:** *Sporocadus rosigena* F. Liu, L. Cai & Crous; **New species:** *Bartalinia pini* F. Liu, L. Cai & Crous, *Discosia rubi* F. Liu, L. Cai & Crous, *Distononappendiculata casuarinae* F. Liu, L. Cai & Crous, *Distononappendiculata verrucata* F. Liu, L. Cai & Crous, *Diversimediispora humicola* F. Liu, L. Cai & Crous, *Heterotruncatella acacigena* F. Liu, L. Cai & Crous, *Heterotruncatella aspera* F. Liu, L. Cai & Crous, *Heterotruncatella avellanea* F. Liu, L. Cai & Crous, *Heterotruncatella breviappendiculata* F. Liu, L. Cai & Crous, *Heterotruncatella constricta* F. Liu, L. Cai & Crous, *Heterotruncatella diversa* F. Liu, L. Cai & Crous, *Heterotruncatella grevilleae* F. Liu, L. Cai & Crous, *Heterotruncatella longissima* F. Liu, L. Cai & Crous, *Heterotruncatella proteicola* F. Liu, L. Cai & Crous, *Heterotruncatella quercicola* F. Liu, L. Cai & Crous, *Heterotruncatella singularis* F. Liu, L. Cai & Crous, *Heterotruncatella synapheae* F. Liu, L. Cai & Crous, *Heterotruncatella vinaceobubalina* F. Liu, L. Cai & Crous, *Hymenopleella austroafricana* F. Liu, L. Cai & Crous, *Hymenopleella polyseptata* F. Liu, L. Cai & Crous, *Hymenopleella subcylindrica* F. Liu, L. Cai & Crous, *Monochaetia quercus* F. Liu, L. Cai & Crous, *Morinia crini* F. Liu, L. Cai & Crous, *Nonappendiculata quercina* F. Liu, L. Cai & Crous, *Parabartalinia lateralis* F. Liu, L. Cai & Crous, *Pestalotiopsis hispanica* F. Liu, L. Cai & Crous, *Pestalotiopsis leucadendri* F. Liu, L. Cai & Crous, *Pestalotiopsis spathuliappendiculata* F. Liu, L. Cai & Crous, *Pestalotiopsis terricola* F. Liu, L. Cai & Crous, *Pseudopestalotiopsis solicola* F. Liu, L. Cai & Crous, *Pseudosarcostroma osyridicola* F. Liu, L. Cai & Crous, *Robillarda australiana* F. Liu, L. Cai & Crous, *Sarcostroma africanum* F. Liu, L. Cai & Crous, *Sarcostroma australiense* F. Liu, L. Cai & Crous, *Sarcostroma diversiseptatum* F. Liu, L. Cai & Crous, *Sarcostroma leucospermi* F. Liu, L. Cai & Crous, *Sarcostroma longiappendiculatum* F. Liu, L. Cai & Crous, *Sarcostroma paragrevilleae* F. Liu, L. Cai & Crous, *Sarcostroma proteae* F. Liu, L. Cai & Crous, *Seimatosporium germanicum* F. Liu, L. Cai & Crous, *Seimatosporium soli* F. Liu, L. Cai & Crous, *Seimatosporium vitis-viniferae* F. Liu, L. Cai & Crous, *Sporocadus biseptatus* F. Liu, L. Cai & Crous, *Sporocadus cotini* F. Liu, L. Cai & Crous, *Sporocadus incanus* F. Liu, L. Cai & Crous, *Sporocadus mali* F. Liu, L. Cai & Crous, *Sporocadus microcyclus* F. Liu, L. Cai & Crous, *Sporocadus multiseptatus* F. Liu, L. Cai & Crous, *Sporocadus rotundatus* F. Liu, L. Cai & Crous, *Sporocadus trimorphus* F. Liu, L. Cai & Crous, *Synnemapestaloides juniperi* F. Liu, L. Cai & Crous; **New combinations:** *Discosia tricellularis* (Okane *et al.*) F. Liu, L. Cai & Crous, *Discosia yakushimensis* (Kaz. Tanaka *et al.*) F. Liu, L. Cai & Crous, *Distononappendiculata banksiae* (Crous & Summerell) F. Liu, L. Cai & Crous, *Heterotruncatella lutea* (H.J. Swart & D.A. Griffiths) F. Liu, L. Cai & Crous, *Heterotruncatella restionacearum* (S.J. Lee & Crous) F. Liu, L. Cai & Crous, *Heterotruncatella spadicea* (S.J. Lee & Crous) F. Liu, L. Cai & Crous, *Heterotruncatella spartii* (Senan. *et al.*) F. Liu, L. Cai & Crous, *Hymenopleella endophytica* (Hyang B. Lee *et al.*) F. Liu, L. Cai & Crous, *Hymenopleella lakefuxianensis* (L. Cai *et al.*) F. Liu, L. Cai & Crous, *Morinia acaciae* (Crous) F. Liu, L. Cai & Crous, *Pseudopestalotiopsis elaeidis* (C. Booth & J.S. Robertson) F. Liu, L. Cai & Crous, *Sporocadus cornicola* (Wijayaw. & Camporesi) F. Liu, L. Cai & Crous, *Sporocadus rosarum* (Henn.) F. Liu, L. Cai & Crous, *Sporocadus sorbi* (Wijayaw. *et al.*) F. Liu, L. Cai & Crous, *Xenoseimatosporium quercinum* (Goonas. *et al.*) F. Liu, L. Cai & Crous; **Typifications (basionyms): Epitypes:** *Pestalotia hypericina* Ces., *Pestalotia monochaeta* Desmazières, *Sphaeria artocreas* Tode, *Sporocadus lichenicola* Corda, *Truncatella spadicea* S. Lee & Crous; **Neotype:** *Stilbospora angustata* Pers.

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INTRODUCTION

The name "Coelomycetes" was originally introduced to accommodate the (asexual/mitosporic) genera *Phyllosticta*, *Phomopsis* and *Phloeospora.* However, as these fungi showed considerable variations in their conidiomata (Grove 1919) the group was then extended to include all genera that produce conidia within a cavity or cushion-like fungal matrix (Grove 1935, 1937). Therefore, the name "Coelomycetes" is used for convenience (Kendrick 2000) and identifies an artificial group of fungi instead of a formal taxonomic rank (Taylor 1995), and its members have been revealed to be spread across the *Dothideomycetes*, *Leotiomycetes*, *Sordariomycetes* (Wijayawardene *et al.* 2016b), and even basidiomycetous coelomycetes, e.g. *Basidiopycnis*, *Chaetospermum*, *Fibulocoela* (Nag Raj 1981).

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Studies in Mycology

A large number of coelomycetes are characterised by the production of appendage-bearing conidia, and they are distributed across several classes of *Ascomycota* as well as a few genera of *Basidiomycota*. Although Nag Raj (1993) provided the diagnostic morphological characters for 142 genera of appendaged coelomycetes, their phylogenetic affiliation remains largely unresolved.

The *Sporocadaceae*, also known as pestalotioid fungi, is a typical group of appendaged coelomycetes, including many genera treated by Nag Raj (1993). Pestalotioid fungi are defined as having multi-septate and more or less fusiform conidia with appendages at one or both ends, frequently with some melanised cells, resembling those taxa having affinities with *Pestalotia*. This genus has undergone many rearrangements since it was first introduced (De Notaris 1841). Klebahn (1914) noted that *Pestalotia* was heterogeneous and could be subdivided based on cell numbers in the conidium, designating these groups as quadriloculatae, quinqueloculatae, and sexloculatae. Based on this characteristic, Steyaert (1949) separated the genera *Pestalotiopsis* and *Truncatella* from *Pestalotia*. He defined species of *Pestalotia* as characterised by 6-celled conidia, while *Pestalotiopsis* and *Truncatella* were typified by 5- and 4-celled conidia, respectively. Guba (1961) revised *Pestalotia* and did not accept *Pestalotiopsis* and *Truncatella* as separate genera, yet maintained the sections based on the number of conidial cells as proposed by Steyaert (1949). Sutton (1969, 1980), however, accepted *Pestalotiopsis*, *Truncatella* and *Monochaetia* and transferred many *Pestalotia* species to other genera, although the taxonomic status of *Pestalotia* s. str. remained unresolved.

Pestalotia-like asexual morphs were classified in *Amphisphaeriaceae* (Samuels *et al.* 1987), accommodating 36 genera (Hawksworth *et al.* 1995). Its ordinal level of classification, the *Amphisphaeriales*, was introduced by Eriksson & Hawksworth (1986), but treated as a synonym of *Xylariales* one year later (Eriksson & Hawksworth 1987). This classification was followed by subsequent authors and later supported by molecular data (Hawksworth *et al.* 1995). The order was recently resurrected by Senanayake *et al.* (2015) to include *Amphisphaeriaceae*, *Clypeosphaeriaceae* and another four novel families derived from *Amphisphaeriaceae* (*Bartaliniaceae*, *Discosiaceae*, *Pestalotiopsidaceae* and *Phlogicylindriaceae*). However, the sequence dataset used in Senanayake *et al.* (2015) was largely incomplete and some of the introduced families were not well supported statistically. Subsequently, Jaklitsch *et al.* (2016) synonymised *Bartaliniaceae*, *Discosiaceae*, *Pestalotiopsidaceae* and *Robillardaceae* (Crous *et al.* 2015), and revived the older family name *Sporocadaceae* to accommodate them. Together with the *Amphisphaeriaceae* and *Phlogicylindriaceae*, *Sporocadaceae* was accommodated in the *Xylariales*, and *Amphisphaeriales* was not accepted due to a lack of phylogenetic support in their analysis (Jaklitsch *et al.* 2016). Presently, agreement on the classification and delimitation of the family itself seems to have been reached after intense debate. Fungi in the *Sporocadaceae* (e.g. *Bartalinia*, *Pestalotia*, *Pestalotiopsis, Robillarda*, *Seimatosporium, Seiridium* and *Truncatella*) possess common asexual morphological characters related to their acervular conidiomata, conidiogenesis and conidia.

Another genus within *Sporocadaceae* that has been revised and rearranged repeatedly since its introduction is *Seimatosporium* (Corda 1833, Sutton 1963, 1964, 1973, 1975a, b, 1977, Shoemaker 1964, Shoemaker & Müller 1964, Pirozynski & Shoemaker 1970, Swart & Griffiths 1974, Brockmann 1976, Swart 1979, Nag Raj 1993). Between 1964 and 1980 the generic concept of *Seimatosporium* was broadened to include 15 generic synonyms, and as many as 25 synonyms are listed in Index Fungorum (2018). Sutton (1980) noted the heterogeneity of conidial morphologies in *Seimatosporium* and suggested separating it into smaller genera, either based on conidial septation, pigmentation, sexual links, or a combination of these criteria. Later, Nag Raj (1993) rearranged the *Seimatosporium* complex into five genera, i.e. *Seimatosporium* (syn. *Basipilus*, *Cryptostictis*, *Dochmolopha* and *Seiridina*), *Sporocadus* (syn. *Coryneopsis* and *Leptocoryneum*), *Sarcostroma* (syn. *Amphichaeta*, *Disaeta* and *Labridium*), *Diploceras* (syn. *Allelochaeta* and *Monoceras*), and *Vermisporium*. Based on LSU and ITS phylogenetic analyses, *Vermisporium* was again synonymised under *Seimatosporium* (Barber *et al.* 2011, Tanaka *et al.* 2011). In a subsequent multi-locus phylogenetic study including type species, Crous *et al.* (2018) resurrected the older name *Allelochaeta* (syn. *Discostromopsis, Vermisporium*) to accommodate these taxa.

Discostroma (Clements 1909) was recognised as the sexual morph of *Seimatosporium* (Nag Raj 1993). Although this sexual and asexual connection was linked via molecular analyses by Tanaka *et al.* (2011), this study did not include the respective type species. The type species of *Seimatosporium*, *Sei. rosae* (Corda 1833), was recently epitypified by Norphanphoun *et al.* (2015).

To date, most phylogenetic studies addressing genera of *Sporocadaceae* have been based solely on ITS and LSU sequences (Barber *et al.* 2011, Tanaka *et al.* 2011, Jaklitsch *et al.* 2016), or on concatenated datasets of more genes but with incomplete datasets (Senanayake *et al.* 2015, Wijayawardene *et al.* 2016b). Consequently, the taxonomic concept of, and generic delimitation within *Sporocadaceae* remain unclear.

In addition, members of *Sporocadaceae* are of particular interest with regard to the production of secondary metabolites, e.g. *Pestalotiopsis*, *Bartalinia* and *Morinia* (Collado *et al.* 2006, Gangadevi & Muthumary 2008, Liu *et al.* 2009). *Pestalotiopsis fici* was shown to possess a very high number of gene clusters involved in bioactive compound synthesis (Wang *et al.* 2016). Because genera in this family of fungi share the same evolutionary history, it is unlikely that the diversity of secondary metabolites detected in *Pestalotiopsis* is an exception within the family. Therefore, a large number of potential novel metabolites might be hidden and await discovery. The natural classification system proposed for *Sporocadaceae* in this study could thus present a major step to screen for novel metabolites in future studies.

Numerous strains belonging to *Sporocadaceae* were examined in the present study, including the established genera *Pestalotiopsis*, *Pseudopestalotiopsis*, *Neopestalotiopsis*, *Seiridium*, *Monochaetia*, *Seimatosporium*, *Discosia*, *Bartalinia*, *Truncatella*, *Zetiasplozna* and *Broomella*. The primary objectives were: 1) to delineate the phylogenetic lineages and generic boundaries through a polyphasic approach; 2) to determine generic synapomorphy in *Sporocadaceae*; and 3) to designate appropriate epitypes to stabilise the application of names. To address these issues we performed multi-locus phylogenetic analyses based on LSU, ITS, *rpb2*, *tef-1a* and *tub2* DNA sequence data. Sequences of ex-type strains were included when available.

MATERIALS AND METHODS

Isolates

All isolates of *Amphisphaeriaceae*-related fungi with appendage-bearing conidia were obtained from the culture collection (CBS) of the Westerdijk Fungal Biodiversity Institute (WI), Utrecht, the Netherlands, and the working collection of Pedro Crous (CPC) housed at the WI (Table 1). Sequences from other strains not examined here but published in previous phylogenetic studies were retrieved from GenBank (Table 1). Representative cultures of the new species described in this study were deposited in the CBS culture collection.

DNA extraction, PCR amplification and sequencing

Total genomic DNA was extracted from fresh mycelia grown on malt extract agar (MEA) using the Wizard Genomic DNA Purification Kit (Promega Corporation, Fitchburg, Wisconsin, USA) following the manufacturers' protocols. Five partial loci including the 5.8S nuclear ribosomal DNA gene with the two flanking internally transcribed spacer regions (ITS), the large subunit of the nrDNA (LSU), DNA-directed RNA polymerase II second largest subunit (*rpb2*), and the translation elongation factor 1-alpha (*tef-1α*) and β-tubulin (*tub2*) genes were amplified and sequenced using the following primer pairs: ITS4/ITS5 for ITS (White *et al.* 1990), LR0R/LR5 for LSU (Vilgalys & Hester 1990, Rehner & Samuels 1994), RPB2-5f2/RPB2-7cr for *rpb2* (Liu *et al.* 1999, Sung *et al.* 2007), EF-1/EF-2 for *tef-1α* (O'Donnell *et al.* 1998) and T1/Bt2b for *tub2* (Glass & Donaldson 1995, O'Donnell & Cigelnik 1997). The PCR mixtures for ITS, LSU, *tef-1α* and *tub2* were prepared as in Bonthond *et al.* (2018). For *rpb2*, the PCR mixture consisted of 1 µL genomic DNA, 1 × NH_4 reaction buffer (Bioline, Luckenwalde, Germany), 0.2 µM of each primer, 4 % Bovine Serum Albumin (BSA, New England BioLabs, #B9000S), 40 µM dNTP, 1.6 mM $MgCl_2$, and 0.25 U *Taq* DNA polymerase (Bioline) in a total volume of 12.5 µL. The general PCR conditions were: an initial denaturation step of 5 min at 94 °C followed by 35 cycles of 30 s at 94 °C, 50 s at 52 °C (ITS, LSU) or 55 °C (*rpb2*, *tub2*, *tef-1α*) and 1 min at 72 °C, and a final elongation step of 7 min at 72 °C. The amplicons were sequenced with both forward and reverse primers using an Applied Biosystems 3730xl DNA Analyzer (Thermo Fisher Scientific). Forward and reverse reads were paired and consensus sequences calculated in MEGA v. 7.0.21 and DNASTAR Lasergene SeqMan Pro v. 8.1.3. All new sequences and sequences which were longer in length or had nucleotide differences with published sequences were submitted to GenBank (Table 1).

Phylogenetic analyses

Sequence alignments of the five individual loci (LSU, ITS, *rpb2*, *tub2*, *tef-1α*) were made using MAFFT v. 7 (http://mafft.cbrc.jp/alignment/server/index.html), and were then manually edited in MEGA v. 7.0.21. Maximum Likelihood (ML) and Bayesian analysis (BA) were used for phylogenetic inferences of single gene sequence alignments and the concatenated alignments. The individual gene trees were assessed for clade conflicts between the individual phylogenies.

ML and BA were implemented on the CIPRES Science Gateway portal (https://www.phylo.org/; Miller *et al.* 2012) using RAxML-HPC BlackBox v. 8.2.10 (Stamatakis 2014) and MrBayes v. 3.2.6 (Huelsenbeck & Ronquist 2001, Ronquist & Huelsenbeck 2003), respectively. For ML analyses, a GTR+GAMMA substitution model with 1 000 bootstrap iterations was set. Bayesian analyses were computed with four simultaneous Markov Chain Monte Carlo chains, 100 000 000 generations and a sampling frequency of 1 000 generations, ending the run automatically when standard deviation of split frequencies fall below 0.01. The burn-in fraction was set to 0.25, after which the 50 % majority rule consensus trees and posterior probability (PP) values were calculated. For the concatenated dataset, character sets were defined for each locus, and MrModelTest v. 2.2 (Nylander 2004) was used to determine their optimal nucleotide substitution model settings. The resulting trees were plotted using FigTree v. 1.4.2 (http://tree.bio.ed.ac.uk/software/figtree). Alignments were deposited in TreeBASE (www.treebase.org; S23478).

Morphology

Cultures were cultivated on MEA, cornmeal agar (CMA), potato dextrose agar (PDA), and synthetic nutrient-poor agar (SNA; see Crous *et al.* 2009 for recipes) at 21 °C in a 12 h day/night regime. After 14 d, growth rates were measured and colony characters were noted. Colony colours were rated following the colour charts of Rayner (1970). Morphological observations of reproductive structures were determined using a Nikon AZ100 dissecting microscope and a Nikon Eclipse 80i compound microscope with differential interference contrast (DIC) illumination, both equipped with a Nikon DS-Ri2 high definition colour digital camera. Slide preparations were made with lactic acid except for strains of *Pestalotiopsis* and *Pseudopestalotiopsis*, conidia of which are generally contractive in lactic acid and were thus mounted with water. Measurements and descriptions of microscopic structures were preferentially made from cultures grown on SNA. If sterile on SNA, morphological characters produced on other media were described. At least 30 measurements were taken for each structure, and the mean value, standard deviation and minimum–maximum values were given, with the extreme measurements in parentheses. Length of the conidia was measured from the base of the basal cell to the base of the apical appendage, and conidial width was measured at the widest point of the conidium (Bonthond *et al.* 2018).

RESULTS

Phylogenetic assessment

Single gene alignments of *tub2* and *tef-1α* of all isolates included in this study contained a high number of gaps, indicating a high degree of nucleotide variation, which may result in unreliable sequence alignments and phylogenies. We therefore excluded *tub2* and *tef-1α* from the multi-locus concatenated dataset that was used to construct the overview phylogeny for generic determination.

Overview phylogeny

The concatenated DNA sequence dataset (ITS, LSU and *rpb2*) used to infer delimitation at the family and genus levels

Table 1. Strains used in this study with details of their host, location, and GenBank accessions numbers.

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
Allelochaeta acuta	CPC 16629		Australia	*Eucalyptus dives*	MH554297	MH554086	MH554758	MH554519	MH555000
All. biseptata	CBS 131116 = CPC 13584	ET	Australia	*Eucalyptus oresbia*	**MH554286**	**MH554075**	MH554749	MH554510	MH554987
	CPC 13587		Australia	*Eucalyptus malacoxylon*	MH554287	MH554076	MH554750	MH554511	MH554988
All. elegans	CBS 187.81	ET	Australia	*Melaleuca lanceolata*	MH554234	MH554014	MH554690	MH554448	MH554927
All. falcata	CBS 131117 = CPC 13578	ET	Australia	*Eucalyptus alligatrix*	**MH554217**	**MH553999**	MH554668	MH554426	MH554907
	CPC 13580		Australia	*Eucalyptus alligatrix*	**MH554284**	**MH554073**	MH704626	MH704601	MH554985
All. fusispora	CBS 810.73 = ATCC 26928 = IMI 163446	IT	Australia	*Eucalyptus polyanthemos*	MH554279	MH554067	MH554743	MH554503	MH554980
	CBS 144172 = CPC 17616		Australia	*Eucalyptus* sp.	MH554304	MH554094	MH554767	MH554528	MH555008
All. kriegeriana	CBS 188.81 = NBRC 32679		Australia	*Callistemon sieberi* (= *C. paludosus*)	MH554235	MH554015	MH554691	MH554449	MH554928
All. neoacuta	CBS 115131 = CPC 156	T	South Africa	*Eucalyptus smithii*	JN871209	JN871200	MH704627	MH704602	MH554998
	CBS 110733 = CPC 157		South Africa	*Eucalyptus smithii*	JN871210	JN871201	MH704628	MH704603	MH554999
All. neodilophospora	CBS 144177 = CPC 17161	T	Australia	*Callistemon pinifolius*	MH554300	MH554090	**MH554763**	MH554524	MH555004
All. neoorbicularis	CPC 13581		Australia	*Eucalyptus regnans*	MH554285	MH554074	MH554748	MH554509	MH554986
All. obliquae	CBS 144182 = CPC 20191	T	Australia	*Eucalyptus obliqua*	MH554315	MH554105	MH554778	MH554539	MH555018
All. orbicularis	CBS 131118 = CPC 12935	ET	Australia	*Corymbia henryi*	**MH554218**	**MH554000**	MH554669	MH554427	MH554908
All. paraelegans	CBS 150.71 = NBRC 32674	T	Australia	*Melaleuca ericifolia*	MH554228	MH554007	MH554683	MH554441	MH554923
All. pseudowalkeri	CBS 144195 = CPC 17043	T	Australia	*Eucalyptus* sp.	MH554299	MH554089	MH554762	MH554523	MH555003
All. sparsifoliae	CPC 14502		Australia	*Eucalyptus sparsifolia* (= *E. oblonga*)	MH554293	MH554082	MH704629	MH704604	MH554994
	CBS 144183 = CPC 14529	T	Australia	*Eucalyptus sparsifolia* (= *E. oblonga*)	MH554294	MH554083	MH704630	MH704605	MH554995
All. walkeri	CBS 131119 = CPC 17644	ET	Australia	*Eucalyptus* sp.	**MH554306**	**MH554096**	MH554769	MH554530	MH555010
	CPC 19275		Australia	*Eucalyptus oreades*	MH554312	MH554102	MH554775	MH554536	MH555016
Bartalinia bella	CBS 125525 = CMW 31067		South Africa	*Maytenus abbottii*	**MH554214**	GU291796	**MH554663**	**MH554421**	**MH554904**
	CBS 464.61 = IMI 083535 = IMUR 1520	T	Brazil	Air	**MH554264**	**MH554051**	**MH554727**	**MH554486**	**MH554964**
Bar. pini	CBS 143891 = CPC 24328	T	Uganda	*Pinus patula*	**MH554330**	**MH554125**	**MH554797**	**MH554559**	**MH555033**
	CBS 144141 = CPC 29502		USA	*Acacia koa*	**MH554364**	**MH554170**	**MH554843**	**MH554605**	**MH555067**
Bar. robillardoides	CBS 122615 = CMW 805		South Africa	*Cupressus lusitanica*	**MH554207**	**MH553989**	**MH554657**	**MH554415**	**MH554897**
	CBS 122705	ET	Italy	*Leptoglossus occidentalis*	KJ710438	LT853104	LT853252	LT853202	LT853152
	CPC 12376		Australia	*Eucalyptus* sp.	**MH554283**	**MH554072**	**MH554747**	**MH554508**	**MH554984**
	CPC 25361		South Africa	*Scadoxus puniceus*	**MH554335**	**MH554133**	**MH554806**	**MH554568**	**MH555039**
	CPC 25385		Australia	*Eucalyptus* sp.	**MH554339**	**MH554137**	**MH554810**	**MH554572**	**MH555043**
Beltrania pseudorhombica	CBS 138003 = CPC 23656		China	*Pinus tabulaeformis*	KJ869215	**MH554124**	–	**MH554558**	**MH555032**

Table 1. (Continued).

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
Bel. rhombica	CBS 123.58 = IMI 072432	T	Mozambique	Sand near mangrove swamp	**MH554209**	**MH553990**	**MH704631**	**MH704606**	**MH554899**
Broomella vitalbae	HPC 1154		–	–	**MH554367**	**MH554173**	**MH554846**	**MH554608**	**MH555069**
	MFLUCC 13-0798	ET	Italy	*Clematis vitalba*	KP757749	NR_153610	–	–	–
Ciliochorella castaneae	NBRC 104545		Japan	*Cercidiphyllum japonicum*	AB433277	–	–	–	–
	NBRC 104546		Japan	*Kalopanax pictus*	AB433278	–	–	–	–
Cil. phanericola	MFLUCC 12-0310 = NTCL067		Thailand	Dead leaves	KF827445	KF827444	KF827478	KF827477	KF827479
	MFLUCC 14-0984	T	Thailand	*Phanera purpurea*, dead leaves	KX789681	KX789680	KX789682	–	–
Clypeosphaeria mamillana	CBS 140735	ET	France	*Cornus alba*	**MH554225**	KT949897	**MH704637**	**MH704610**	MF489001
Cly. uniseptata	CBS 114967 = HKUCC 6349		Hong Kong	Wood	**MH554197**	**MH553979**	**MH554638**	**MH704611**	**MH554878**
Diploceras hypericinum	CBS 109058 = No. LYN 251 A		New Zealand	*Hypericum* sp.	**MH554178**	**MH553955**	**MH554614**	**MH554373**	**MH554852**
	CBS 197.36 = NBRC 32647		Switzerland	*Hypericum* sp.	**MH554237**	**MH554017**	**MH554693**	**MH554451**	**MH554930**
	CBS 492.97 = PD 97/645		Netherlands	*Hypericum perforatum*	**MH554267**	**MH554054**	**MH554730**	**MH554489**	**MH554967**
	CBS 143885 = CPC 21115	ET	Netherlands	*Hypericum perforatum*	**MH554316**	**MH554108**	**MH554781**	**MH554542**	**MH555019**
Disaeta arbuti	CBS 143903 = CPC 28304		Australia	*Acacia pycnantha*	**MH554346**	**MH554148**	**MH554821**	**MH554583**	**MH555050**
Discosia artocreas	CBS 124848	ET	Germany	*Fagus sylvatica*	**MH554213**	**MH553994**	**MH554662**	**MH554420**	**MH554903**
Dis. brasiliensis	MFLUCC 12-0429 = NTCL094-2		Thailand	Dead leaf	KF827436	KF827432	KF827469	KF827465	KF827473
	MFLUCC 12-0431 = NTCL095		Thailand	Dead leaf	KF827437	KF827433	KF827470	KF827466	KF827474
	MFLUCC 12-0435 = NTCL097-2		Thailand	Dead leaf	KF827438	KF827434	KF827471	KF827467	KF827475
Dis. fagi	MFLU 14-0299	T	Italy	*Fagus sylvatica*	KM678048	KM678040	–	–	–
Dis. italica	MFLU 14-0298	T	Italy	*Fagus sylvatica*	KM678045	KM678042	–	–	–
Dis. neofraxinea	MFLUCC 13-0204	T	Italy	*Fagus sylvatica*	KR072672	KR072673	–	–	–
	MFLUCC 12-0670 = NTIT469		Italy	*Fagus sylvatica*	KF827439	KF827435	KF827472	KF827468	KF827476
Dis. pseudoartocreas	CBS 136438 = CPC 21117	T	Austria	*Tilia* sp.	KF777214	KF777161	**MH554672**	**MH554430**	**MH554913**
Dis. rubi	CBS 143893 = CPC 25062	T	USA	*Rubus phoenicolasius*	**MH554334**	**MH554131**	**MH554804**	**MH554566**	**MH555038**
	NBRC 32624 = IMI 251648		–	*Quercus fusiformis*	–	03262401	–	–	–
Discosia sp. 1	MAFF 410149		Japan	*Pinus densiflora*	AB593708	AB594776	AB594174	–	–
	NBRC 8975		–	*Poa pratensis*	AB593705	AB594773	AB594172	–	–
Discosia sp. 2	MAFF 242784		Japan	*Machilus thunbergii*	AB593716	AB594784	AB594182	–	–
	MAFF 242783		Japan	*Castanea crenata*	AB593715	AB594783	AB594181	–	–
Discosia sp. 3	NBRC 31640		–	Decayed leaf	–	03164001	–	–	–
	NBRC 31883		Japan	*Prunus mume*	–	03188301	–	–	–
Discosia sp. 4	MAFF 242778		Japan	Unknown leaves	AB593709	AB594777	AB594175	–	–
	MAFF 242779		Japan	Unknown leaves	AB593713	AB594781	AB594179	–	–
	MAFF 242782		Japan	Unknown leaves	AB593714	AB594782	AB594180	–	–

(*continued on next page*)

Table 1. (Continued).

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
Discosia sp. 5	MAFF 242785		Japan	*Hamamelis japonica*	AB593711	AB594779	AB594177	–	–
	MAFF 238070		Japan	*Fallopia japonica*	AB593720	AB594788	AB594186	–	–
Discosia sp. 6	CBS 241.66		South Africa	*Acacia karroo*	**MH554244**	**MH554022**	**MH554698**	**MH554456**	**MH554933**
Discosia sp. 7	CBS 684.70		Netherlands	*Aesculus hippocastanum*	**MH554277**	**MH554064**	**MH554740**	**MH554500**	**MH554978**
Dis. tricellularis	MAFF 237478		Japan	*Rhododendron indicum*	AB593730	AB594798	AB594189	–	–
	NBRC 32705	T	Japan	*Rhododendron indicum*	AB593728	AB594796	AB594188	–	–
Dis. yakushimensis	MAFF 242774 = NBRC 104194	T	Japan	*Symplocos prunifolia*	AB593721	AB594789	AB594187	–	–
Distononappendiculata banksiae	CBS 131308 = CPC 13637	T	Australia	*Banksia marginata*	JQ044442	JQ044422	**MH554670**	**MH554428**	**MH554909**
	CPC 17658		Australia	*Banksia marginata*	**MH554307**	**MH554097**	**MH554770**	**MH554531**	**MH555011**
	CPC 20185		Australia	*Banksia marginata*	**MH554314**	**MH554104**	**MH554777**	**MH554538**	**MH555017**
	CBS 143906 = CPC 28968		Australia	*Banksia formosa*	**MH554354**	**MH554158**	**MH554831**	**MH554593**	**MH555057**
Dist. casuarinae	CBS 143884 = CPC 17253	T	Australia	*Casuarina* sp.	**MH554303**	**MH554093**	**MH554766**	**MH554527**	**MH555007**
Dist. verrucata	CBS 144032 = CPC 29074	T	Australia	*Banksia repens*	**MH554359**	**MH554163**	**MH554836**	**MH554598**	**MH555062**
Diversimediispora humicola	CBS 302.86	T	USA	Soil	**MH554247**	**MH554028**	**MH554705**	**MH554463**	**MH554941**
Heterotruncatella acacigena	CBS 143880 = CPC 15130	T	Australia	*Acacia pedina*	**MH554295**	**MH554084**	**MH554756**	**MH554517**	**MH554996**
Het. aspera	CBS 144140 = CPC 28910		Australia	*Acacia glaucoptera*	**MH554352**	**MH554156**	**MH554829**	**MH554591**	**MH555055**
	CBS 143907 = CPC 28992	T	Australia	*Acacia glaucoptera*	**MH554355**	**MH554159**	**MH554832**	**MH554594**	**MH555058**
Het. avellanea	CBS 143896 = CPC 25377	T	Australia	*Eucalyptus viminalis*	**MH554338**	**MH554136**	**MH554809**	**MH554571**	**MH555042**
	CBS 144033 = CPC 29480		Australia	*Banksia gardneri*	**MH554363**	**MH554169**	**MH554842**	**MH554604**	**MH555066**
Het. breviappendiculata	CBS 143883 = CPC 17239	T	Australia	*Melaleuca quinquenervia*	**MH554302**	**MH554092**	**MH554765**	**MH554526**	**MH555006**
Het. constricta	CBS 143901 = CPC 27578	T	Australia	*Acacia* sp.	**MH554344**	**MH554143**	**MH554816**	**MH554578**	**MH555048**
	CBS 144138 = CPC 27580		Australia	*Acacia* sp.	**MH554345**	**MH554144**	**MH554817**	**MH554579**	**MH555049**
Het. diversa	CBS 143908 = CPC 29040	T	Australia	*Acacia* sp.	**MH554356**	**MH554160**	**MH554833**	**MH554595**	**MH555059**
Het. grevilleae	CBS 143881 = CPC 16997	T	Australia	*Grevillea* sp.	**MH554298**	**MH554088**	**MH554761**	**MH554522**	**MH555002**
Het. longissima	CBS 144137 = CPC 18047		South Africa	*Aspalathus linearis*	**MH554311**	**MH554101**	**MH554774**	**MH554535**	**MH555015**
	CBS 143910 = CPC 29114	T	Australia	*Synaphea* sp.	**MH554361**	**MH554165**	**MH554838**	**MH554600**	**MH555064**
Het. lutea	CBS 349.73 = ATCC 26926 = IMI 168736	IT	Australia	*Acacia pycnantha*	DQ414533	LT853099	LT853246	LT853196	LT853146
Het. proteicola	CBS 144020 = CPC 13700	T	South Africa	*Protea acaulos*	**MH554288**	**MH554077**	**MH554751**	**MH554512**	**MH554989**
	CBS 123029 = PREM 59597 = CMW 22215		South Africa	*Protea acaulis*	**MH554212**	**MH553993**	**MH554661**	**MH554419**	**MH554902**
Het. quercicola	CBS 143895 = CPC 25365	T	USA	*Quercus walshii*	**MH554337**	**MH554135**	**MH554808**	**MH554570**	**MH555041**
Het. restionacearum	CBS 118150 = CMW 17968		South Africa	*Restio filiformis*	**MH554203**	DQ278914	**MH554649**	**MH554407**	**MH554889**

Table 1. (Continued).

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
	CBS 119210 = CMW 18755	T	South Africa	*Ischyrolepis* cf. *gaudichaudiana*	DQ278929	DQ278915	**MH554653**	**MH554411**	**MH554892**
Het. singularis	CBS 144031 = CPC 29042	T	Australia	*Hakea elliptica*	**MH554357**	**MH554161**	**MH554834**	**MH554596**	**MH555060**
Heterotruncatella sp.	CBS 144022 = CMW 22230 = CPC 17913		South Africa	*Platycaulos callistachy*	**MH554309**	**MH554099**	**MH554772**	**MH554533**	**MH555013**
Het. spadicea	CBS 118144 = CMW 18013		South Africa	*Ischyrolepis* sp.	DQ278926	DQ278921	**MH554646**	**MH554404**	**MH554886**
	CBS 118145 = CMW 17958	ET	South Africa	*Cannomois virgata*	DQ278927	DQ278912	**MH554647**	**MH554405**	**MH554887**
	CBS 118148 = CMW 18093		South Africa	*Rhodocoma capensis*	DQ278928	DQ278913	**MH554648**	**MH554406**	**MH554888**
	CPC 17911 = CMW 22206		South Africa	*Elegia filacea*	**MH554308**	**MH554098**	**MH554771**	**MH554532**	**MH555012**
	CPC 28956		Australia	*Sorghum halepense*	**MH554353**	**MH554157**	**MH554830**	**MH554592**	**MH555056**
	PREM 58870		South Africa	*Restio egregius*	–	DQ278918	–	–	–
	PREM 58873		South Africa	*Ischyrolepis capensis*	–	DQ278919	–	–	–
Het. spartii	CPC 17945		Mexico	*Pinus* sp.	**MH554310**	**MH554100**	**MH554773**	**MH554534**	**MH555014**
	CBS 144028 = CPC 23170		Ethiopia	*Pinus radiata*	**MH554325**	**MH554120**	**MH554793**	**MH554554**	**MH555028**
	CPC 23615		China	*Pinus* sp.	**MH554328**	**MH554123**	**MH554796**	**MH554557**	**MH555031**
	CBS 144030 = CPC 24980		Ireland	Bone sample of deer	**MH554333**	**MH554130**	**MH554803**	**MH554565**	**MH555037**
	CBS 143894 = CPC 25363		USA	*Pinus edulis*	**MH554336**	**MH554134**	**MH554807**	**MH554569**	**MH555040**
	MFLUCC 15-0537	T	Italy	*Spartium junceum*	KR092783	KR092794	–	–	–
Het. synapheae	CBS 143909 = CPC 29096	T	Australia	*Synaphea polymorpha*	**MH554360**	**MH554164**	**MH554837**	**MH554599**	**MH555063**
Het. vinaceobubalina	CBS 143897 = CPC 26201	T	France	*Acacia heterophylla*	**MH554341**	**MH554139**	**MH554812**	**MH554574**	**MH555045**
	CBS 143898 = CPC 26343		France	*Acacia heterophylla*	**MH554342**	**MH554140**	**MH554813**	**MH554575**	**MH555046**
Hyalotiella spartii	MFLUCC 13-0397	T	Italy	*Spartium junceum*	KP757752	KP757756	–	KP757764	–
Hya. transvalensis	CBS 303.65 = ATCC 18127 = IMI 137470	T	South Africa	Leaf litter and top soil of *Acacia karroo* community	**MH554248**	**MH554029**	**MH554706**	**MH554464**	**MH554942**
Hymenopleella austroafricana	CBS 143886 = CPC 21940	T	South Africa	*Gleditsia triacanthos*	**MH554320**	**MH554115**	**MH554788**	**MH554549**	**MH555023**
	CBS 144026 = CPC 21946		South Africa	*Bridelia mollis*	**MH554322**	**MH554117**	**MH554790**	**MH554551**	**MH555025**
	CBS 144027 = CPC 22553		Zambia	*Combretum hereroense*	**MH554324**	**MH554119**	**MH554792**	**MH554553**	**MH555027**
Hym. endophytica	EML-AS5-1	T	Korea	*Abies firma*	KX216518	KX216520	–	–	–
Hym. hippophaëicola	CBS 113687 = UPSC 1865		Sweden	*Hippophaë rhamnoides*	**MH554188**	**MH553969**	**MH554628**	**MH554387**	**MH554863**
	CBS 140410	ET	Austria	*Hippophaë rhamnoides*	**MH554224**	KT949901	**MH554678**	**MH554436**	**MH554919**
Hym. lakefuxianensis	HKUCC 7303	T	China	Submerged wood	AF452047	–	–	–	–
Hym. polyseptata	CBS 143887 = CPC 21944	T	South Africa	*Combretum* sp.	**MH554321**	**MH554116**	**MH554789**	**MH554550**	**MH555024**
Hym. subcylindrica	CBS 164.77 = NBRC 32675		India	*Cocos nucifera*	**MH554230**	**MH554009**	**MH554685**	**MH554443**	**MH554925**
	CBS 647.74	T	India	*Gypsophilla* seeds	**MH554275**	**MH554062**	**MH554739**	**MH554498**	**MH554976**
Immersidiscosia eucalypti	NBRC 104195		Japan	*Quercus myrsinifolia*	AB593722	AB594790	–	–	–

(*continued on next page*)

Table 1. (Continued).

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
	NBRC 104196		Japan	*Quercus myrsinifolia*	AB593723	AB594791	–	–	–
	NBRC 104197		Japan	*Ardisia japonica*	AB593724	AB594792	–	–	–
	MAFF 242781		Japan	Unknown dead leaves	AB593725	AB594793	–	–	–
Lepteutypa fuckelii	CBS 140409	NT	Belgium	*Tilia cordata*	KT949902	NR_154123	**MH554677**	**MH554435**	**MH554918**
Lep. sambuci	CBS 131707	T	UK	*Sambucus nigra*	**MH554219**	NR_154124	**MH704632**	**MH704612**	**MH554911**
Microdochium lycopodinum	CBS 125585	T	Austria	*Lycopodium annotinum*	KP858952	KP859016	KP859080	–	KP859125
Mic. phragmitis	CBS 285.71	ET	Poland	*Puccinia teleutosorus*, on *Phragmites australis*	KP858949	KP859013	**MH704636**	–	KP859122
Mic. seminicola	CBS 139951 = KAS3576	T	Switzerland	Maize kernels	KP858974	NR_155375	KP859101	–	KP859147
Monochaetia ilexae	CBS 101009		Japan	Air	**MH554176**	**MH553953**	**MH554612**	**MH554371**	**MH554849**
Mon. monochaeta	CBS 115004		Netherlands	*Quercus robur*	**MH554198**	AY853243	**MH554639**	**MH554398**	**MH554879**
	CBS 199.82	ET	Italy	*Quercus pubescens*	**MH554238**	**MH554018**	**MH554694**	**MH554452**	**MH554931**
	CBS 315.54 = IMI 056698		UK	*Quercus* sp.	**MH554249**	**MH554030**	–	**MH554465**	**MH554943**
	CBS 546.80		Netherlands	Culture contaminant	**MH554270**	**MH554056**	**MH554732**	**MH554491**	**MH554969**
	CBS 658.95		Netherlands	*Quercus robur*	**MH554276**	**MH554063**	–	**MH554499**	**MH554977**
Mon. quercus	CBS 144034 = CPC 29514	T	Mexico	*Quercus eduardi*	**MH554365**	**MH554171**	**MH554844**	**MH554606**	**MH555068**
Morinia acaciae	CBS 100230		New Zealand	*Prunus salicina* cv. 'Omega'	**MH554174**	**MH553950**	**MH554609**	**MH554368**	**MH554847**
	CBS 137994 = CPC 23421	T	France	*Acacia melanoxylon*	**MH554221**	**MH554002**	**MH554673**	**MH554431**	**MH554914**
Mor. crini	CBS 143888 = CPC 21978	T	South Africa	*Crinum bulbispermum*	**MH554323**	**MH554118**	**MH554791**	**MH554552**	**MH555026**
Mor. longiappendiculata	CBS 117603 = F095552	T	Spain	*Calluna vulgaris*	**MH554202**	AY929324	**MH554644**	AY929316	**MH554885**
Mor. pestalozzioides	ATCC No. PTA-3862 = F090354	ET	Spain	*Sedum sediforme*	–	AY929325	–	AY929314	–
Neopestalotiopsis cubana	CBS 600.96 = INIFAT C96/44-4	T	Cuba	Leaf litter	KM116253	KM199347	KM199438	KM199521	**MH554973**
Neo. eucalypticola	CBS 264.37 = BBA 5300	T	–	*Eucalyptus globulus*	KM116256	KM199376	KM199431	KM199551	**MH554935**
Neo. keteleeria	MFLUCC 13-0915		China	*Keteleeria pubescens*	–	KJ023087	KJ023088	KJ023089	–
Neo. mesopotamica	CBS 336.86	T	Iraq	*Pinus brutia*	KM116271	KM199362	KM199441	KM199555	**MH554944**
Neo. paeoniae	CBS 318.74		Nigeria	*Anacardium occidentale*	–	**MH554031**	**MH554707**	–	–
Neo. protearum	CBS 111506 = CPC 1766		Zimbabwe	*Leucospermum cunciforme*	–	**MH553959**	**MH554618**	**MH554377**	–
	CBS 114178 = CPC 1765	T	Zimbabwe	*Leucospermum cuneiforme*	JN712564	LT853103	KM199463	KM199542	**MH554873**
Neo. rosae	CBS 101057	T	New Zealand	*Rosa* sp.	KM116245	KM199359	KM199429	KM199523	**MH554850**
Neo. surinamensis	CBS 450.74	T	Suriname	Soil under *Elaeis guineensis*	KM116258	KM199351	KM199465	KM199518	**MH554962**
Neo. zimbabwana	CBS 111495 = CPC 1777	T	Zimbabwe	*Leucospermum cunciforme*	JX556249	JX556231	KM199456	KM199545	**MH554855**
Nonappendiculata quercina	CBS 116061	T	Italy	*Quercus suber*	**MH554199**	**MH553982**	**MH554641**	**MH554400**	**MH554882**
	CBS 270.82		Italy	*Quercus pubescens*	**MH554246**	**MH554025**	**MH554701**	**MH554459**	**MH554937**
Parabartalinia lateralis	CBS 399.71	T	South Africa	*Acacia karroo*	**MH554256**	**MH554043**	**MH554719**	**MH554478**	**MH554954**
Pestalotiopsis adusta	ICMP 6088	ET	Fiji	On refrigerator door PVC gasket	–	JX399006	JX399037	JX399070	–

Table 1. (Continued).

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
	CBS 263.33		Netherlands	*Rhododendron ponticum*	KM116198	KM199316	KM199414	KM199489	–
Pes. aggestorum	LC6301 = LF1308	T	China	*Camellia sinensis*	KX895129	KX895015	KX895348	KX895234	–
	LC8186 = LF2076		China	*Camellia sinensis*	–	KY464140	KY464160	KY464150	–
Pes. anacardiacearum	IFRDCC 2397	T	China	*Mangifera indica*	–	KC247154	KC247155	KC247156	–
Pes. arceuthobii	CBS 433.65 = ATCC 16338 = WSP 54146(9)		USA	*Arceuthobium campylopodum* f. *abietinum* shoot, on *Abies amabilis*	–	**MH554046**	**MH554722**	**MH554481**	–
	CBS 434.65 = ATCC 16339	T	USA	*Arceuthobium campylopodum* f. *tsugense* seed, on *Tsuga heterophylla*	KM116243	KM199341	KM199427	KM199516	–
Pes. arengae	CBS 331.92	T	Singapore	*Arenga undulatifolia*	KM116207	KM199340	KM199426	KM199515	–
Pes. australasiae	CBS 114126 = CPC 2896	T	New Zealand	*Knightia* sp.	KM116218	KM199297	KM199409	KM199499	**MH554867**
	CBS 114141 = CPC 2949		Australia	*Protea* cv. 'Pink Ice'	KM116203	KM199298	KM199410	KM199501	–
Pes. australis	CBS 114193 = CPC 3011	T	Australia	*Grevillea* sp.	KM116197	KM199332	KM199383	KM199475	**MH554875**
	CBS 118143 = CMW 18285		South Africa	*Thamnochortus fraternus*	–	**MH553985**	**MH554645**	**MH554403**	–
	CBS 119350 = CMW 20013		South Africa	*Brabejum stellatifolium*	KM116209	KM199333	KM199384	KM199476	–
Pes. biciliata	CBS 124463	T	Slovakia	*Platanus* × *hispanica*	KM116224	KM199308	KM199399	KM199505	–
	CBS 200.65		UK	*Taxus baccata*	–	**MH554019**	**MH554695**	**MH554453**	–
	CBS 236.38		Italy	*Paeonia* sp.	KM116214	KM199309	KM199401	KM199506	–
Pes. brachiata	LC2988 = LF196	T	China	*Camellia* sp.	–	KX894933	KX895265	KX895150	–
	LC8188 = LF2078		China	*Camellia* sp.	–	KY464142	KY464162	KY464152	–
Pes. brassicae	CBS 170.26	IT	New Zealand	*Brassica napus*	–	KM199379	–	KM199558	–
Pes. camelliae	CBS 443.62		Turkey	*Camellia sinensis*	KM116225	KM199336	KM199424	KM199512	–
	LC3003 = LF211		China	*Camellia sinensis*	KX895074	KX894934	KX895266	KX895151	–
	MFLUCC 12-0277	T	China	*Camellia japonica*	–	JX399010	JX399041	JX399074	–
Pes. chamaeropis	CBS 113607 = CPC 3080		–	–	KM116211	KM199325	KM199390	KM199472	–
	CBS 186.71	T	Italy	*Chamaerops humilis*	KM116210	KM199326	KM199391	KM199473	–
	CPC 25347		South Korea	*Taxus yeco*	–	**MH554132**	**MH554805**	**MH554567**	–
Pes. clavata	MFLUCC 12-0268	T	China	*Buxus* sp.	–	JX398990	JX399025	JX399056	–
Pes. colombiensis	CBS 118553 = CPC 10969	T	Colombia	*Eucalyptus eurograndis*	KM116222	KM199307	KM199421	KM199488	–
Pes. digitalis	MFLU 14-0208	T	New Zealand	*Digitalis purpurea*	–	KP781879	KP781883	–	–
Pes. dilucida	LC3232 = LF444	T	China	*Camellia sinensis*	KX895092	KX894961	KX895293	KX895178	–
	LC8184 = LF2074		China	*Camellia sinensis*	–	KY464138	KY464158	KY464148	–
Pes. diploclisiae	CBS 115585 = HKUCC 8394		Hong Kong	*Diploclisia glaucescens*	KM116213	KM199315	KM199417	KM199483	–
	CBS 115587 = HKUCC 10130	T	Hong Kong	*Diploclisia glaucescens*	KM116242	KM199320	KM199419	KM199486	–

(*continued on next page*)

Table 1. (Continued).

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
Pes. disseminata	CBS 118552 = CPC 10950		New Zealand	*Eucalyptus botryoides*	–	**MH553986**	**MH554652**	**MH554410**	–
	CBS 143904 = ICMP 21065 = CPC 28705		New Zealand	*Persea americana*	–	**MH554152**	**MH554825**	**MH554587**	–
	CPC 29351		New Zealand	*Eucalyptus* sp.	–	**MH554166**	**MH554839**	**MH554601**	–
Pes. diversiseta	MFLUCC 12-0287	T	China	*Rhododendron* sp.	–	JX399009	JX399040	JX399073	–
Pes. dracontomelon	MFLU 14-0207	T	Thailand	*Dracontomelon dao*	–	–	–	KP781880	–
Pes. ericacearum	IFRDCC 2439	T	China	*Rhododendron delavayi*	–	KC537807	KC537821	KC537814	–
Pes. furcata	CPC 20280 = MFLUCC 12-0054	T	Thailand	*Camellia sinensis*	KM116283	JQ683724	JQ683708	JQ683740	–
Pes. gaultheriae	IFRD 411-014	T	China	*Gaultheria forrestii*	–	KC537805	KC537819	KC537812	–
Pes. grevilleae	CBS 114127 = CPC 2919	T	Australia	*Grevillea* sp.	KM116212	KM199300	KM199407	KM199504	**MH554868**
Pes. hawaiiensis	CBS 114491 = CPC 2215	T	USA	*Leucospermum* cv. 'Coral'	KM116239	KM199339	KM199428	KM199514	–
Pes. hispanica	CBS 115391 = CPC 5193	T	Spain	*Protea* cv. 'Susara'	–	**MH553981**	**MH554640**	**MH554399**	–
Pes. hollandica	CBS 265.33	T	Netherlands	*Sciadopitys verticillata*	KM116228	KM199328	KM199388	KM199481	**MH554936**
Pes. humicola	CBS 115450 = HKUCC 9100		Hong Kong	*Ilex cinerea*	KM116208	KM199319	KM199418	KM199487	**MH554881**
	CBS 336.97	T	Papua New Guinea	Soil in tropical forest	KM116230	KM199317	KM199420	KM199484	–
	CBS 144029 = CPC 24752		Malaysia	*Acacia mangun*	–	**MH554128**	**MH554801**	**MH554563**	–
Pes. inflexa	MFLUCC 12-0270	T	China	Unidentified tree	–	JX399008	JX399039	JX399072	–
Pes. intermedia	MFLUCC 12-0259	T	China	Unidentified tree	–	JX398993	JX399028	JX399059	–
Pes. italiana	MFLU 14-0214	T	Italy	*Cupressus glabra*	–	KP781878	KP781882	KP781881	–
Pes. jesteri	CBS 109350	T	Papua New Guinea	*Fragraea bodenii*	KM116281	KM199380	KM199468	KM199554	–
Pes. jiangxiensis	LC4242 = YH89		China	*Eurya* sp.	–	KX895035	KX895327	KX895213	–
	LC4399 = YH257	T	China	*Camellia* sp.	KX895128	KX895009	KX895341	KX895227	–
Pes. jinchanghensis	LC6636 = LF1281	T	China	*Camellia sinensis*	KX895135	KX895028	KX895361	KX895247	–
	LC8190 = LF2080		China	*Camellia sinensis*	–	KY464144	KY464164	KY464154	–
Pes. kenyana	CBS 442.67	T	Kenya	*Coffea* sp.	KM116234	KM199302	KM199395	KM199502	**MH554958**
Pes. knightiae	CBS 111963 = CPC 2905		New Zealand	*Knightia* sp.	KM116241	KM199311	KM199406	KM199495	–
	CBS 114138 = CPC 2906	T	New Zealand	*Knightia* sp.	KM116227	KM199310	KM199408	KM199497	**MH554870**
Pes. leucadendri	CBS 121417 = CMW 22192	T	South Africa	*Leucadendron* sp.	–	**MH553987**	**MH554654**	**MH554412**	–
Pes. licualicola	HGUP 4057	T	China	*Licuala grandis*	–	KC492509	KC481683	KC481684	–
Pes. linearis	MFLUCC 12-0271	T	China	*Trachelospermum* sp.	–	JX398992	JX399027	JX399058	–
Pes. lushanensis	LC4344 = YH198	T	China	*Camellia* sp.	KX895127	KX895005	KX895337	KX895223	–
	LC8182 = LF2072		China	*Camellia* sp.	–	KY464136	KY464156	KY464146	–
Pes. macadamiae	BRIP 63738b	T	Australia	*Macadamia integrifolia*	–	KX186588	KX186680	KX186621	–
	BRIP 63739a		Australia	*Macadamia integrifolia*	–	KX186589	KX186681	KX186622	–

Table 1. (Continued).

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
Pes. malayana	CBS 102220	T	Malaysia	*Macaranga triloba*	KM116238	KM199306	KM199411	KM199482	–
Pes. monochaeta	CBS 144.97	T	Netherlands	*Quercus robur*	KM116229	KM199327	KM199386	KM199479	–
Pes. novae-hollandiae	CBS 130973	T	Australia	*Banksia grandis*	KM116232	KM199337	KM199425	KM199511	–
Pes. oryzae	CBS 111522 = CPC 2083		USA	*Telopea* sp.	–	KM199294	KM199394	KM199493	–
	CBS 171.26		Italy	–	KM116206	KM199304	KM199397	KM199494	–
	CBS 353.69	T	Denmark	*Oryza sativa*	KM116221	KM199299	KM199398	KM199496	**MH554947**
Pes. papuana	CBS 331.96	T	Papua New Guinea	Soil along the coast	KM116240	KM199321	KM199413	KM199491	–
	CBS 887.96		Papua New Guinea	*Cocos nucifera*	KM116231	KM199318	KM199415	KM199492	–
Pes. parva	CBS 114972 = HKUCC 6037		Hong Kong	Leaf	–	**MH553980**	**MH704625**	**MH554397**	–
	CBS 265.37 = BBA 2820		–	*Delonix regia*	KM116226	KM199312	KM199404	KM199508	–
	CBS 278.35	T	–	*Leucothoe fontanesiana*	KM116205	KM199313	KM199405	KM199509	**MH554939**
Pes. portugalica	CBS 684.85 = NBRC 32685		New Zealand	*Camellia japonica*	–	**MH554065**	**MH554741**	**MH554501**	–
	CBS 393.48	T	Portugal	–	KM116233	KM199335	KM199422	KM199510	**MH554951**
Pes. rhododendri	IFRDCC 2399	T	China	*Rhododendron sinogrande*	–	KC537804	KC537818	KC537811	–
	CBS 144024 = CPC 21130		Zimbabwe	*Pinus* sp.	–	**MH554109**	**MH554782**	**MH554543**	–
Pes. rhodomyrtus	HGUP 4230		China	*Rhodomyrtus tomentosa*	–	KF412648	KF412642	KF412645	–
	LC3413 = LF635		China	*Camellia sinensis*	KX895109	KX894981	KX895313	KX895198	–
Pes. rosea	MFLUCC 12-0258	T	China	*Pinus* sp.	–	JX399005	JX399036	JX399069	–
Pes. scoparia	CBS 176.25	T	–	*Chamaecyparis* sp.	KM116216	KM199330	KM199393	KM199478	–
	CBS 296.58		Netherlands	*Picea* rootstock	–	**MH554026**	**MH554703**	**MH554461**	–
Pes. sequoiae	MFLUCC 13-0399	T	Italy	*Sequoia sempervirens*	KF572344	KX572339	–	–	–
Pestalotiopsis sp. 1	CBS 111576 = CPC 2146		USA	*Leucospermum cunei* × *conocarpodendron*	–	**MH553961**	**MH554620**	**MH554379**	–
Pestalotiopsis sp. 2	CBS 114489 = CPC 2135		USA	*Leucospermum* cv. 'Pink Ice'	–	**MH553978**	**MH554637**	**MH554396**	–
Pestalotiopsis sp. 3	CBS 143892 = CPC 24759		Malaysia	*Eucalyptus deglipta*	–	**MH554129**	**MH554802**	**MH554564**	–
Pestalotiopsis sp. 4	CBS 143905 = CPC 28896		Australia	*Podocarpus* sp.	–	**MH554153**	**MH554826**	**MH554588**	–
Pestalotiopsis sp. 5	CBS 143900 = CPC 27562		Australia	*Corymbia calophylla*	–	**MH554142**	**MH554815**	**MH554577**	–
Pestalotiopsis sp. 6	CPC 27641		Australia	*Banksia attenuata*	–	**MH554145**	**MH554818**	**MH554580**	–
	CBS 143902 = CPC 27649		Australia	*Isopogon* sp.	–	**MH554146**	**MH554819**	**MH554581**	–
	CPC 27696		Australia	*Eucalyptus platypus*	–	**MH554147**	**MH554820**	**MH554582**	–
	CPC 29456		Australia	*Banksia* sp.	–	**MH554167**	**MH554840**	**MH554602**	–
Pestalotiopsis sp. 7	CBS 110326 = MYC 1313		USA	*Pinus* sp.	–	**MH553957**	**MH554616**	**MH554375**	–
	CBS 127.80		Chile	*Pinus radiata*	–	**MH553995**	**MH554664**	**MH554422**	–
Pes. spathulata	CBS 356.86	T	Chile	*Guevina avellana*	KM116236	KM199338	KM199423	KM199513	–
Pes. spathuliappendiculata	CBS 144035 = VPRI 42602 = CPC 29602	T	Australia	*Phoenix canariensis*	**MH554366**	**MH554172**	**MH554845**	**MH554607**	–

(*continued on next page*)

Table 1. (Continued).

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
Pes. telopeae	CBS 114137 = CPC 2952		Australia	*Protea* cv. 'Pink Ice'	KM116219	KM199301	KM199469	KM199559	–
	CBS 114161 = CPC 3083	T	Australia	*Telopea* sp.	–	KM199296	KM199403	KM199500	–
Pes. terricola	CBS 141.69	T	Pacific Islands	Soil	–	**MH554004**	**MH554680**	**MH554438**	–
Pes. trachicarpicola	CBS 111507 = CPC 1784		Zimbabwe	*Leucospermum vestitum*	–	**MH553960**	**MH554619**	**MH554378**	–
	IFRDCC 2440 = OP068	T	China	*Trachycarpus fortunei*	–	JQ845947	JQ845945	JQ845946	–
	CBS 297.76		Spain	Soil	–	**MH554027**	**MH554704**	**MH554462**	–
	CBS 911.96		–	Raw material from agar-agar	KM116204	KM199303	KM199396	KM199503	–
Pes. unicolor	MFLUCC 12-0275		China	Unidentified tree	–	JX398998	JX399029	JX399063	–
	MFLUCC 12-0276	T	China	*Rhododendron* sp.	–	JX398999	JX399030	–	–
Pes. verruculosa	MFLUCC 12-0274	T	China	*Rhododendron* sp.	–	JX398996	–	JX399061	–
Pes. verruculosa?	CBS 100567		Netherlands	*Taxus baccata*	KM116195	**MH553951**	**MH554610**	**MH554369**	**MH554848**
	CBS 175.25		Indonesia	*Juniperus* sp.	–	**MH554012**	**MH554688**	**MH554446**	–
	CBS 265.82		Netherlands	*Cunninghamia lanceolata*	–	**MH554024**	**MH554700**	**MH554458**	–
	CBS 325.76		France	*Cupressus arizonica*	–	**MH554032**	**MH554708**	**MH554466**	–
	CBS 365.54		Netherlands	*Chamaecyparis lawsoniana*	–	**MH554037**	**MH554713**	**MH554472**	–
	CBS 366.54		Netherlands	*Quercus peduncle*	–	**MH554038**	**MH554714**	**MH554473**	–
	CBS 596.73		France	–	–	**MH554059**	**MH554736**	**MH554495**	–
	CBS 888.68		Netherlands	*Thuja occidentalis*	–	**MH554069**	**MH554745**	**MH554505**	–
	CPC 21877		UK	–	–	**MH554114**	**MH554787**	**MH554548**	–
Pes. yanglingensis	LC3412 = LF634		China	*Camellia sinensis*	KX895108	KX894980	KX895312	KX895197	–
	LC4553 = YH420	T	China	*Camellia sinensis*	–	KX895012	KX895345	KX895231	–
Phlogicylindrium eucalypti	CBS 120080 = CPC 12409	T	Australia	*Eucalyptus globulus*	DQ923534	NR_132813	**MH704633**	**MH704607**	**MH554893**
Phl. eucalyptorum	CBS 120221 = CPC 12429	T	Australia	*Eucalyptus globus*	**MH554204**	EU040223	**MH704635**	**MH704608**	**MH554894**
Phl. uniforme	CBS 131312 = CPC 19419	T	Australia	*Eucalyptus cypellocarpa*	JQ044445	JQ044426	**MH704634**	**MH704609**	**MH554910**
Pseudopestalotiopsis ampullacea	LC6618 = LF1263	T	China	*Camellia sinensis*	KX895039	KX895025	KX895358	KX895244	–
Pse. camelliae-sinensis	CGMCC 3.9188		China	*Camellia sinensis*	–	JN943624	JQ683704	JQ683736	–
	CGMCC 3.9192		China	*Camellia sinensis*	–	JN943622	KU562851	KU562850	–
	LC3009 = LF217		China	*Camellia sinensis*	KX895050	KX894935	KX895267	KX895152	–
	LC3010 = LF218		China	*Camellia sinensis*	KX895051	KX894936	KX895268	KX895153	–
	LC3020 = LF228		China	*Camellia sinensis*	KX895054	KX894940	KX895272	KX895157	–
	LC3021 = LF229		China	*Camellia sinensis*	–	KX894941	KX895273	KX895158	–
	LC3022 = LF230		China	*Camellia sinensis*	KX895055	KX894942	KX895274	KX895159	–
	LC3023 = LF231		China	*Camellia sinensis*	KX895056	KX894943	KX895275	KX895160	–
	LC3487 = LF714		China	*Camellia sinensis*	KX895061	KX894984	KX895315	KX895201	–

Table 1. (Continued).

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
	LC3490 = LF718	T	China	*Camellia sinensis*	KX895062	KX894985	KX895316	KX895202	–
	LC3571 = LF799		China	*Camellia sinensis*	KX895063	KX894986	KX895317	KX895203	–
Pse. chinensis	CPC 21009		Turkey	*Actinidia chinensis*	–	**MH554107**	**MH554780**	**MH554541**	–
	CPC 21156		Turkey	*Camellia sinensis*	–	**MH554110**	**MH554783**	**MH554544**	–
	LC3011 = LF219	T	China	*Camellia sinensis*	KX895052	KX894937	KX895269	KX895154	–
	LC3012 = LF220		China	*Camellia sinensis*	KX895053	KX894938	KX895270	KX895155	–
	LC6306 = LF1313		China	*Camellia sinensis*	KX895043	KX895017	KX895350	KX895236	–
	LC6629 = LF1274		China	*Camellia sinensis*	KX895040	KX895026	KX895359	KX895245	–
	LC6711 = LF1391		China	*Camellia sinensis*	KX895046	KX895032	KX895365	KX895250	–
	LC3013 = LF221		China	*Camellia sinensis*	–	KX894939	KX895271	KX895156	–
Pse. cocos	CBS 272.29	T	Indonesia	*Cocos nucifera*	KM116276	KM199378	KM199467	KM199553	**MH554938**
Pse. elaeidis	CBS 413.62 = IMI 061175 = QM 8005	IT	Nigeria	*Elaeis guineensis*	**MH554257**	**MH554044**	**MH554720**	**MH554479**	**MH554955**
	CBS 144023 = CPC 20822		Indonesia	*Acacia crassipes*	–	**MH554106**	**MH554779**	**MH554540**	–
	LC4479		China	*Lauraceae*	–	KX895034	KX895343	KX895229	–
	NBRC 112264 = MM14-F0060		Myanmar	*Averrhoa carambola*	–	LC114025	LC114045	LC114065	–
	NBRC 112265 = MM14-F0066		Myanmar	Unknown plant	–	LC114026	LC114046	LC114066	–
	NBRC 112269		Myanmar	Unknown plant	–	LC114027	LC114047	LC114067	–
	NBRC 112270		Myanmar	Unknown plant	–	LC114028	LC114048	LC114068	–
Pse. ignota	NN42909	T	China	*Camellia sinensis*	–	KU500020	–	–	–
Pse. indica	CBS 459.78	T	India	*Rosa sinensis*	**MH554263**	KM199381	KM199470	KM199560	**MH554963**
Pse. simitheae	MFLUCC 12-0121		Thailand	*Pandanus odoratissimus*	–	KJ503812	KJ503815	KJ503818	–
	MFLUCC 12-0125		Thailand	*Pandanus odoratissimus*	–	KJ503813	KJ503816	KJ503819	–
Pse. solicola	CBS 386.97	T	Papua New Guinea	Soil in tropical forest	–	**MH554039**	**MH554715**	**MH554474**	–
Pseudopestalotiopsis sp. 1	NBRC 112258		Vietnam	Unknown plant	–	LC114036	LC114056	LC114076	–
	NBRC 112259		Vietnam	Unknown plant	–	LC114039	LC114059	LC114079	–
Pse. theae	MFLUCC 12-0055 = CPC 20281	ET	Thailand	*Camellia sinensis*	KM116282	JQ683727	JQ683711	JQ683743	–
	SC011		Thailand	*Camellia sinensis*	–	JQ683726	JQ683710	JQ683742	–
Pse. vietnamensis	CBS 130710		Ghana	*Khaya anthotheca*	–	**MH553998**	**MH554667**	**MH554425**	–
	NBRC 112257		Vietnam	Unknown plant	–	LC114037	LC114057	LC114077	–
Pseudosarcostroma osyridicola	CBS 103.76	T	France	*Osyris alba*	**MH554177**	**MH553954**	**MH554613**	**MH554372**	**MH554851**
Robillarda africana	CBS 122.75 = BCC 38220	T	South Africa	–	KR873281	KR873253	**MH554656**	**MH554414**	**MH554896**
Rob. australiana	CBS 143882 = CPC 17187	T	Australia	–	**MH554301**	**MH554091**	**MH554764**	**MH554525**	**MH555005**

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Table 1. (Continued).

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
Rob. roystoneae	CBS 115445 = HKUCC 10134	T	Hong Kong	*Roystonea regia*	KR873282	KR873254	KR873317	KR873310	**MH554880**
Rob. sessilis	CBS 114312	ET	Germany	Dust	KR873284	KR873256	KR873319	KR873312	**MH554877**
Rob. terrae	CBS 587.71	T	India	Soil	KJ710459	KJ710484	**MH554734**	**MH554493**	**MH554971**
Sarcostroma africanum	CBS 143879 = CPC 13920	T	South Africa	*Pelargonium cucullatum*	**MH554289**	**MH554078**	**MH554752**	**MH554513**	**MH554990**
	CBS 144021 = CPC 15183		South Africa	*Euclea* sp.	**MH554296**	**MH554085**	**MH554757**	**MH554518**	**MH554997**
Sar. australiense	CBS 144160 = CPC 25389	T	Australia	*Daviesia latifolia*	**MH554340**	**MH554138**	**MH554811**	**MH554573**	**MH555044**
Sar. diversiseptatum	CBS 189.81 = NBRC 32681	T	Australia	*Correa reflexa*	**MH554236**	**MH554016**	**MH554692**	**MH554450**	**MH554929**
	CBS 144139 = VPRI 15699 = CPC 28307		Australia	*Correa reflexa*	**MH554347**	**MH554149**	**MH554822**	**MH554584**	**MH555051**
Sar. grevilleae	CBS 101.71 = ATCC 24744	R	Australia	*Grevillea rosmarinifolia*	**MH554175**	**MH553952**	**MH554611**	**MH554370**	–
	CBS 143418 = CPC 32307		Australia	*Grevillea* sp.	**MH554227**	**MH554006**	**MH554682**	**MH554440**	**MH554922**
	CPC 19838		Australia	*Hakea nistata*	**MH554313**	**MH554103**	**MH554776**	**MH554537**	–
	CPC 28904		Australia	*Hakea laurina*	**MH554351**	**MH554155**	**MH554828**	**MH554590**	–
Sar. leucospermi	CBS 111309 = CPC 1420		South Africa	*Leucospermum* cv. 'High Gold'	**MH554290**	**MH554079**	**MH554753**	**MH554514**	**MH554991**
	CBS 111290 = CPC 1422	T	South Africa	*Leucospermum* cv. 'High Gold'	**MH554292**	**MH554081**	**MH554755**	**MH554516**	**MH554993**
Sar. longiappendiculatum	CBS 111308 = CPC 1421		South Africa	*Leucospermum* cv. 'High Gold'	**MH554291**	**MH554080**	**MH554754**	**MH554515**	**MH554992**
	CBS 143890 = CPC 23411	T	France	*Babiana dregei*	**MH554327**	**MH554122**	**MH554795**	**MH554556**	**MH555030**
Sar. paragrevilleae	CBS 111981 = CPC 2937		Australia	*Grevillea* sp.	**MH554183**	**MH553964**	**MH554623**	**MH554382**	**MH554858**
	CBS 114142 = CPC 2948	T	Australia	*Grevillea* sp.	**MH554193**	**MH553974**	**MH554633**	**MH554392**	**MH554871**
	CBS 114143 = CPC 2938		Australia	*Grevillea* sp.	**MH554194**	**MH553975**	**MH554634**	**MH554393**	**MH554872**
	CBS 143416 = CPC 32360		Australia	*Grevillea steiglitziana*	**MH554226**	**MH554005**	**MH554681**	**MH554439**	**MH554921**
	CBS 165.77 = IMI 211586		New Zealand	*Grevillea robusta* var. *forsteri*	**MH554232**	**MH554011**	**MH554687**	**MH554445**	–
	CPC 17628		Australia	*Grevillea aquifolia*	**MH554305**	**MH554095**	**MH554768**	**MH554529**	**MH555009**
	CPC 28309		Australia	*Grevillea rosmarinifolia*	**MH554348**	**MH554150**	**MH554823**	**MH554585**	**MH555052**
	CPC 28310		Australia	–	**MH554349**	**MH554151**	**MH554824**	**MH554586**	**MH555053**
	CPC 28900		Australia	*Banksia* sp.	**MH554350**	**MH554154**	**MH554827**	**MH554589**	**MH555054**
	CPC 29056		Australia	*Grevillea* sp.	**MH554358**	**MH554162**	**MH554835**	**MH554597**	**MH555061**
Sar. proteae	CBS 112001 = CPC 2981		Australia	*Protea magnifica*	**MH554184**	**MH553965**	**MH554624**	**MH554383**	**MH554859**
	CBS 113605 = CPC 3032		Australia	*Protea lorifolia*	**MH554186**	**MH553967**	**MH554626**	**MH554385**	**MH554861**
	CBS 113610 = CPC 3035	T	Australia	*Protea magnifica*	**MH554187**	**MH553968**	**MH554627**	**MH554386**	**MH554862**
	CBS 114189 = CPC 2983		Australia	*Protea magnifica*	**MH554195**	**MH553976**	**MH554635**	**MH554394**	**MH554874**
Sar. restionis	CBS 111311 = CPC 1472		New Zealand	–	**MH554180**	**MH553958**	**MH554617**	**MH554376**	**MH554854**

Table 1. (Continued).

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
	CBS 111935 = CPC 2834		South Africa	*Leucospermum* sp.	**MH554181**	**MH553962**	**MH554621**	**MH554380**	**MH554856**
	CBS 111936 = CPC 2835		South Africa	*Leucospermum* sp.	**MH554182**	**MH553963**	**MH554622**	**MH554381**	**MH554857**
	CBS 114017 = CPC 2832		South Africa	*Leucospermum* sp.	**MH554191**	**MH553972**	**MH554631**	**MH554390**	**MH554866**
	CBS 114130 = CPC 2833		South Africa	*Leucospermum* sp.	**MH554192**	**MH553973**	**MH554632**	**MH554391**	**MH554869**
	CBS 118153 = CMW 17984 = CPC 16911		South Africa	*Ischyrolepis* cf. *sieberi*	DQ278925	DQ278923	**MH554650**	**MH554408**	**MH554890**
	CBS 118154 = CMW 17971 = CPC 16904	T	South Africa	*Restio filiformis*	DQ278924	DQ278922	**MH554651**	**MH554409**	**MH554891**
	CBS 121418 = CMW 22195		South Africa	*Leucospermum conocarpodendron*	**MH554205**	**MH553988**	**MH554655**	**MH554413**	**MH554895**
	CBS 122695 = CMW 22214		South Africa	*Protea acaulis*	**MH554208**	EU552155	**MH554658**	**MH554416**	**MH554898**
	CBS 282.65 = NBRC 32678 = IMI 096703		UK	*Pteridium aquilinum*	AB593736	AB594804	**MH554702**	**MH554460**	**MH554940**
	CPC 29466		Australia	*Acacia glaucoptera*	**MH554362**	**MH554168**	**MH554841**	**MH554603**	**MH555065**
Seimatosporium botan	NBRC 104200 = H4619	T	Japan	*Paeonia suffruticosa*	AB593731	AB594799	LC047770	–	–
Sei. germanicum	CBS 437.87	T	Germany	–	**MH554259**	**MH554047**	**MH554723**	**MH554482**	**MH554957**
Sei. luteosporum	CBS 142599	T	USA	*Vitis vinifera*	KY706309	KY706284	KY706259	KY706334	
Sei. physocarpi	CBS 139968 = MFLUCC 14-0625	T	Russia	*Physocarpus opulifolius*	KT198723	KT198722	**MH554676**	**MH554434**	**MH554917**
	CBS 789.68 = NBRC 32682		Netherlands	*Physocarpus amurensis*	**MH554278**	**MH554066**	**MH554742**	**MH554502**	**MH554979**
Sei. pistaciae	CBS 138865 = CPC 24455	T	Iran	*Pistacia vera*	KP004491	KP004463	**MH554674**	**MH554432**	**MH554915**
	CPC 24457		Iran	*Pistacia vera*	**MH554331**	**MH554126**	**MH554799**	**MH554561**	**MH555035**
Sei. rosae	CBS 139823 = MFLUCC 14-0621	ET	Russia	*Rosa kalmiussica*	KT198727	LT853105	LT853253	LT853203	LT853153
Sei. soli	CBS 941.69	T	Denmark	Forest soil under *Fagus sylvatica*	**MH554282**	**MH554071**	–	**MH554507**	**MH554983**
Sei. vitifusiforme	CBS 142600	T	USA	*Vitis vinifera*	KY706321	KY706296	KY706271	KY706346	
Sei. vitis-viniferae	CBS 123004	T	Spain	*Vitis vinifera*	**MH554211**	**MH553992**	**MH554660**	**MH554418**	**MH554901**
	CBS 116499		Iran	*Vitis vinifera*	**MH554201**	**MH553984**	**MH554643**	**MH554402**	**MH554884**
Seiridium cancrinum	CBS 226.55 = IMI 052256	T	Kenya	*Cupressus macrocarpa*	**MH554241**	LT853089	LT853236	LT853186	LT853137
Seir. cupressi	CBS 224.55 = IMI 052254	ET	Kenya	*Cupressus macrocarpa*	**MH554240**	LT853083	LT853230	LT853180	LT853131
Seir. eucalypti	CBS 343.97	ET	Australia	*Eucalyptus delegatensis*	**MH554251**	**MH554034**	**MH554710**	**MH554469**	**MH554946**
Seir. kartense	CBS 142629 = CPC 20183	T	Australia	*Eucalyptus cladocalyx*	–	LT853100	LT853247	LT853197	LT853147
Seir. kenyanium	CBS 228.55 = IMI 052257	T	Kenya	*Juniperus procera*	**MH554242**	LT853098	LT853245	LT853195	LT853145
Seir. marginatum	CBS 140403	ET	France	*Rosa canina*	**MH554223**	KT949914	LT853249	LT853199	LT853149
Seir. neocupressi	CBS 142625 = CPC 23786	T	Italy	*Cupressus sempervirens*	**MH554329**	LT853079	LT853226	LT853176	LT853127
Seir. papillatum	CBS 340.97 = VPRI 20827	T	Australia	*Eucalyptus delegatensis*	DQ414531	LT853102	LT853250	**MH554468**	LT853150

(*continued on next page*)

Table 1. (Continued).

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
Seir. phylicae	CBS 133587 = CPC 19964	T	Tristan da Cunha	*Phylica arborea*	–	LT853091	LT853238	LT853188	LT853139
Seir. pseudocardinale	CBS 122613 = CMW 1648		Portugal	*Cupressus* sp.	**MH554206**	LT853096	LT853243	LT853193	LT853143
Seir. unicorne	CBS 538.82 = NBRC 32684		New Zealand	*Cryptomeria japonica*	**MH554269**	LT853088	LT853235	LT853185	LT853136
Sporocadus biseptatus	CBS 110324 = MYC 754	T	–	–	**MH554179**	**MH553956**	**MH554615**	**MH554374**	**MH554853**
Spo. cornicola	CBS 143889 = CPC 23235		Germany	*Cornus sanguinea*	**MH554326**	**MH554121**	**MH554794**	**MH554555**	**MH555029**
	MFLUCC 14-0448	T	Italy	*Cornus sanguinea*	–	KU974967	–	–	–
Spo. cotini	CBS 139966 = MFLUCC 14-0623	T	Russia	*Cotinus coggygria*	**MH554222**	**MH554003**	**MH554675**	**MH554433**	**MH554916**
Spo. incanus	CBS 123003	T	Spain	*Prunus dulcis*	**MH554210**	**MH553991**	**MH554659**	**MH554417**	**MH554900**
Spo. lichenicola	CBS 354.90 = NBRC 32677		Germany	*Fagus sylvatica*	**MH554252**	**MH554035**	**MH554711**	**MH554470**	**MH554948**
	CPC 24528		Germany	*Juniperus communis*	**MH554332**	**MH554127**	**MH554800**	**MH554562**	**MH555036**
	NBRC 32625 = NBRC 32625 = IMI 079706	ET	UK	*Rosa canina*	**MH883646**	**MH883643**	**MH883645**	**MH883644**	**MH883647**
Spo. mali	CBS 446.70	T	Netherlands	*Malus sylvestris*	**MH554261**	**MH554049**	**MH554725**	**MH554484**	**MH554960**
Spo. microcyclus	CBS 424.95	T	Germany	*Sorbus aria*	**MH554258**	**MH554045**	**MH554721**	**MH554480**	**MH554956**
	CBS 887.68 = NBRC 32680		Netherlands	*Ribes* sp.	**MH554280**	**MH554068**	**MH554744**	**MH554504**	**MH554981**
Spo. multiseptatus	CBS 143899 = CPC 26606	T	Serbia	*Viburnum* sp.	**MH554343**	**MH554141**	**MH554814**	**MH554576**	**MH555047**
Spo. rosarum	CBS 113832 = UPSC 2172		Sweden	*Rosa canina*	**MH554189**	**MH553970**	**MH554629**	**MH554388**	**MH554864**
	MFLUCC 15-0563	T*[4]	Italy	*Rosa canina*	MG829071	MG828960	–	–	–
	MFLUCC 14-0466	T*[4]	Italy	*Rosa canina*	KT281912	KT284775	–	–	–
Spo. rosigena	CBS 116498		Iran	*Vitis vinifera*	**MH554200**	**MH553983**	**MH554642**	**MH554401**	**MH554883**
	CBS 129166 = MSCL 860		Latvia	*Rhododendron*	**MH554215**	**MH553996**	**MH554665**	**MH554423**	**MH554905**
	CBS 182.50		Netherlands	*Pyrus communis*	**MH554233**	**MH554013**	**MH554689**	**MH554447**	**MH554926**
	CBS 250.49		Netherlands	*Rubus fruticosus*	**MH554245**	**MH554023**	**MH554699**	**MH554457**	**MH554934**
	CBS 466.96		Netherlands	Inner tissue of zoocecidium, caused by *Lasioptera rubi*, on *Rubus* sp.	**MH554265**	**MH554052**	**MH554728**	**MH554487**	**MH554965**
	MFLU 16-0239	T	Italy	*Rosa canina*	MG829069	MG828958	–	–	–
Spo. rotundatus	CBS 616.83	T	Canada	*Arceuthobium pussilum*	**MH554273**	**MH554060**	**MH554737**	**MH554496**	**MH554974**
Spo. sorbi	CBS 160.25		–	–	**MH554229**	**MH554008**	**MH554684**	**MH554442**	**MH554924**
	MFLUCC 14-0469	T	Italy	*Sorbus torminalis*	KT281911	KT284774	–	–	–
Sporocadus sp. 1	CBS 506.71		Italy	*Euphorbia* sp.	**MH554268**	**MH554055**	**MH554731**	**MH554490**	**MH554968**
Spo. trimorphus	CBS 114203 = UPSC 2430	T	Sweden	*Rosa canina*	**MH554196**	**MH553977**	**MH554636**	**MH554395**	**MH554876**
Strickeria kochii	CBS 140411	ET	Austria	*Robinia pseudoacacia*	KT949918	NR_154423	**MH554679**	**MH554437**	**MH554920**
Synnemapestaloides juniperi	CBS 477.77 = NBRC 32676	T	France	*Juniperus phoenicea*	**MH554266**	**MH554053**	**MH554729**	**MH554488**	**MH554966**
Syn. rhododendri	MAFF 239201	T	Japan	*Rhododendron brachycarpum*	LC047744	LC047753	LC047761	–	–

Table 1. (Continued).

Organism name	Strain number[1]	Status[2]	Country	Substrate	GenBank accession numbers[3]				
					LSU	ITS	*tub2*	*tef-1α*	*rpb2*
	MAFF 243052		Japan	*Rhododendron brachycarpum*	LC047748	LC047757	LC047765	–	–
Truncatella angustata	CBS 113.11		Germany	*Picea abies*	**MH554185**	**MH553966**	**MH554625**	**MH554384**	**MH554860**
	CBS 135.97 = INIFAT C96/109		Spain	Decaying bark	**MH554220**	**MH554001**	**MH554671**	**MH554429**	**MH554912**
	CBS 165.25 = NBRC 32688		–	*Prunus armeniaca*	**MH554231**	**MH554010**	**MH554686**	**MH554444**	–
	CBS 208.80		Netherlands	Food	**MH554239**	**MH554020**	**MH554696**	**MH554454**	–
	CBS 231.77 = CBS 296.77		Turkey	*Gossypium* sp.	**MH554243**	**MH554021**	**MH554697**	**MH554455**	**MH554932**
	CBS 338.32		Netherlands	*Lupinus* sp.	**MH554250**	**MH554033**	**MH554709**	**MH554467**	**MH554945**
	CBS 356.33		–	*Prunus* sp.	**MH554253**	**MH554036**	**MH554712**	**MH554471**	**MH554949**
	CBS 393.80		Chile	*Gevuina avellana*	**MH554254**	**MH554041**	**MH554717**	**MH554476**	**MH554952**
	CBS 398.71		Turkey	Soil	**MH554255**	**MH554042**	**MH554718**	**MH554477**	**MH554953**
	CBS 443.54		UK	*Picea abies*	**MH554260**	**MH554048**	**MH554724**	**MH554483**	**MH554959**
	CBS 449.51		–	*Salix* sp. or *Thuja* sp.?	**MH554262**	**MH554050**	**MH554726**	**MH554485**	**MH554961**
	CBS 564.76		Switzerland	*Pyrus malus*	**MH554271**	**MH554057**	**MH554733**	**MH554492**	**MH554970**
	CBS 591.66 = ATCC 18162 = NBRC 8584		USA	Tundra soil	**MH554272**	**MH554058**	**MH554735**	**MH554494**	**MH554972**
	CBS 642.97		Switzerland	*Heterodera carotae* cyst egg mass, on *Daucus carota*	**MH554274**	**MH554061**	**MH554738**	**MH554497**	**MH554975**
	CBS 938.70		Netherlands	*Prunus laurocerasus*	**MH554281**	**MH554070**	**MH554746**	**MH554506**	**MH554982**
	CPC 21354		France	*Vitis vinifera* cv. 'Prunelard'	**MH554317**	**MH554111**	**MH554784**	**MH554545**	**MH555020**
	CBS 144025 = CPC 21359	NT	France	*Vitis vinifera* cv. 'Prunelard'	**MH554318**	**MH554112**	**MH554785**	**MH554546**	**MH555021**
	CPC 21366		France	*Vitis vinifera* cv. 'Prunelard'	**MH554319**	**MH554113**	**MH554786**	**MH554547**	**MH555022**
Undetermined species	CBS 113991 = UPSC 2465		Sweden	*Salix caprea*	**MH554190**	**MH553971**	**MH554630**	**MH554389**	**MH554865**
	CBS 387.77		Finland	Skin of man	KM116277	**MH554040**	**MH554716**	**MH554475**	**MH554950**
Xenoseimatosporium quercinum	CBS 129171 = MSCL 1034		Latvia	*Rhododendron* sp.	**MH554216**	**MH553997**	**MH554666**	**MH554424**	**MH554906**
	MFLUCC 14-1198	T	Germany	*Quercus robur*	NG_059681	NR_155804	–	–	–

[1] ATCC: American Type Culture Collection, Virginia, USA; BCC: BIOTEC Culture Collection, National Center for Genetic Engineering and Biotechnology (BIOTEC), Khlong Luang, Pathumthani, Thailand; BRIP: Queensland Plant Pathology Herbarium, Australia; CBS: Culture collection of the Westerdijk Fungal Biodiversity Institute, Utrecht, The Netherlands; CGMCC: China General Microbiological Culture Collection Center, Institute of Microbiology, Chinese Academy of Sciences, Beijing, China; CMW: Culture Collection of the Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria, Pretoria, South Africa; CPC: Culture collection of Pedro Crous, housed at the Westerdijk Institute; HGUP: Plant Pathology Herbarium of Guizhou University; HHUF: herbarium of Hirosaki University; HKUCC: The University of Hong Kong Culture Collection; HPC: Herbarium of Pedro Crous, housed at the Westerdijk Institute; ICMP: International Collection of Micro-organisms from Plants, Landcare Research, Private Bag 92170, Auckland, New Zealand; IFO: Institute for Fermentation, Osaka, Japan; IFRDCC: International Fungal Research and Development Culture Collection; IMI: International Mycological Institute, CABI-Bioscience, Egham, Bakeham Lane, United Kingdom; IMUR: the Institute of Mycology at the University of Recife, Brazil; LC: working collection of Lei Cai, housed at the Institute of Microbiology, Chinese Academy of Sciences, Beijing, China; MAFF: Ministry of Agriculture, Forestry and Fisheries, Tsukuba, Ibaraki, Japan; MFLU(CC): Mae Fah Luang University Culture Collection; MSCL: Microbial Strain Collection of Latvia; NBRC: Biological Resource Center; PREM: the Herbarium of the National Collection of Fungi, Pretoria, South Africa; UPSC: Uppsala University Culture Collection of Fungi, Sweden; VPRI: Victorian Plant Disease Herbarium, Australia; WSP: Washington State University Plant Pathological Herbarium.

[2] Status: status of the strains. ET: ex-epitype; IT: ex-isotype; NT: ex-neotype; R: reference strain; ST: ex-syntype; T: ex-type.

[3] Newly generated sequences are indicated in bold.

[4] MFLUCC 15-0563: Type of *Seimatosporium rosigenum*; MFLUCC 14-0466: Type of *Seimatosporium pseudorosarum*.

comprised 194 isolates of *Sporocadaceae* and related fungi. The concatenated alignment of ITS (594 characters), LSU (841 characters) and *rpb2* (832 characters) had a total length of 2 267 characters including alignment gaps. The ML search resolved a best tree with a lnL of -37043.320413. MrModelTest recommended that the Bayesian analysis should use Fixed base frequency for ITS and Dirichlet for LSU and *rpb2*. The SYM+I+G model was proposed for ITS, and GTR+I+G model for LSU and *rpb2*. The BA lasted for 1 855 000 generations and the 50 % consensus tree and posterior probabilities were calculated from 2 784 trees from two runs. The alignment contained a total of 1 125 unique site patterns (ITS: 334, LSU: 249, *rpb2*: 542). The ML tree confirmed the same tree topology and the clades as those presented in the Bayesian phylogeny (Fig. 1).

The ITS/LSU/*rpb2* phylogeny revealed three major clades, corresponding to the three previously proposed families "*Bartaliniaceae*, *Discosiaceae* and *Pestalotiopsidaceae*", however with low bootstrap support values/posterior probabilities and short branches. Because these family names were considered synonyms of *Sporocadaceae* by Jaklitsch *et al.* (2016), these groups are referred to as Clade 1 (*Discosiaceae*), Clade 2 (*Pestalotiopsidaceae*) and Clade 3 (*Bartaliniaceae*) for convenience (Fig. 1).

In Clade 3, the type species of *Neotruncatella*, *Dyrithiopsis* and *Hymenopleella* clustered in one clade (Fig. 1). However, the incomplete sequence data of *Neo. endophytica* (EML-AS5-1, lack of *rpb2*) and *Dyr. lakefuxianensis* (HKUCC 7303, lack of *rpb2* and ITS) could have artificially influenced the observed topology, resulting in long terminal branches and a short interior branch. We therefore removed both strains from further 5-locus phylogenetic analyses (see the following result of *Generic and species phylogenies-Clade 3*), and delimited generic boundaries in combination with a comparison of morphological characters. Based on these results, *Neotruncatella* and *Dyrithiopsis* are synonymised under *Hymenopleella*.

From the combined phylogeny (Fig. 1), 30 clades were recognised in the *Sporocadaceae*, of which 23 represented existing genera (i.e. *Allelochaeta*, *Bartalinia*, *Broomella*, *Ciliochorella*, *Diploceras*, *Disaeta*, *Discosia*, *Hyalotiella*, *Hymenopleella*, *Immersidiscosia*, *Monochaetia*, *Morinia*, *Neopestalotiopsis*, *Pestalotiopsis*, *Pseudopestalotiopsis*, *Robillarda*, *Sarcostroma*, *Seimatosporium*, *Seiridium*, *Sporocadus*, *Strickeria*, *Synnemapestaloides*, *Truncatella*). In combination with morphological features, the remaining seven clades are here described as new genera.

The single locus phylogeny of LSU (not shown here) displays relatively low resolution for genera, in which *Allelochaeta*, *Bartalinia*, *Sarcostroma*, and *Seiridium* are shown as paraphyletic. The ITS and *rpb2* single locus phylogenies are congruent with the 3-locus tree (Fig. 1) with regard to all genera except *Allelochaeta*, which separated into two clades of which one is more closely related to *Sarcostroma*.

Generic and species phylogenies

To better infer delimitation of genera and species in *Sporocadaceae*, DNA sequence data of five loci (ITS, LSU, *rpb2*, *tef-1α* and *tub2*) were concatenated in three smaller focused datasets corresponding to Clades 1–3 from the overview tree (Fig. 1), including sequences from all available strains. The same phylogenetic methods were applied as described above.

Clade 1: The dataset consisted of 111 strains with *Lepteutypa fuckelii* (CBS 140409) as outgroup. The final alignment contained a total of 3 776 characters divided into five partitions containing 583 (ITS), 830 (LSU), 832 (*rpb2*), 641 (*tef-1α*), and 877 (*tub2*) characters respectively, including alignment gaps. The ML search revealed a best tree with an lnL of -40746.889283. MrModelTest recommended that the Bayesian analysis should use Dirichlet base frequencies for all data partitions. The HKY+I+G model was proposed for ITS, *tef-1α* and *tub2*, and GTR+I+G model for LSU and *rpb2*. The BA lasted for 3 690 000 generations and the 50 % consensus tree and posterior probabilities were calculated from 5 538 trees from two runs. The alignment contained a total of 1 860 unique site patterns (ITS: 197, LSU: 103, *rpb2*: 458, *tef-1α*: 486, *tub2*: 616).

The topology of the phylogenetic trees generated from the ML and BA methods were congruent (Fig. 2) and were also consistent with the overview tree (Fig. 1). Most strains included in Clade 1 are currently labelled as *Seimatosporium* in the culture collection and in previous publications. However, the multi-locus phylogenies (Figs 1, 2) indicate the presence of well-separated and statistically supported clades, namely *Allelochaeta*, *Disaeta*, *Sarcostroma*, *Seimatosporium*, *Sporocadus* and *Xenoseimatosporium*. The separation of these genera is also supported by consistent morphological characters associated with each clade.

Discosia: The generic type strains of *Discosia* and its sexual morph, *Adisciso*, formed a monophyletic clade in the 5-locus tree (Fig. 2). As only ITS sequences of several *Discosia* species are available, a single ITS tree was then constructed (Fig. 3). The ITS dataset consisted of 30 isolates with *Seimatosporium rosae* (CBS 139823) as outgroup, and contained 534 characters including alignment gaps. The ML search revealed a best tree with an lnL of -1230.494365. MrModelTest recommended that the ITS Bayesian analysis should use Dirichlet base frequency and HKY+I+G model. The BA lasted for 370 000 generations and the 50 % consensus tree and posterior probabilities were calculated from 558 trees from two runs. The alignment contained a total of 76 unique site patterns. The ITS tree contained 15 clades, of which one was recognised as novel species in this study, *Discosia rubi* (Fig. 3).

Clade 2: The dataset consisted of 53 isolates with *Lepteutypa fuckelii* (CBS 140409) as outgroup. The final alignment consisted of 3 687 characters divided into five partitions containing 568 (ITS), 836 (LSU), 832 (*rpb2*), 634 (*tef-1α*) and 807 (*tub2*) characters respectively, including alignment gaps. The ML search revealed a best tree with an lnL of -27744.6726. MrModelTest recommended that the Bayesian analysis should use Dirichlet base frequencies for all data partitions. The GTR+I+G model was proposed for ITS, LSU and *rpb2*, and HKY+I+G model for *tef-1α* and *tub2*. The BA lasted for 1 895 000 generations and the 50 % consensus tree and posterior probabilities were calculated from 5 688 trees from two runs. The alignment contained a total of 1 647 unique site patterns (ITS: 209, LSU: 117, *rpb2*: 384, *tef-1α*: 402, *tub2*: 535).

The phylogenetic trees generated from the ML and BA were congruent (Fig. 4), and the generic divisions were consistent with the overview tree (Fig. 1). However, *Nonappendiculata* was more closely related to *Monochaetia* and *Ciliochorella* in the 5-locus tree, whereas to *Seiridium* in the overview tree. This was probably due to the incomplete sequence dataset of *Ciliochorella* (only LSU sequences of NBRC 104545 and NBRC 104546 are available).

Since for both *Pestalotiopsis* and *Pseudopestalotiopsis* few sequences of *rpb2* are present in the NCBI GenBank nucleotide

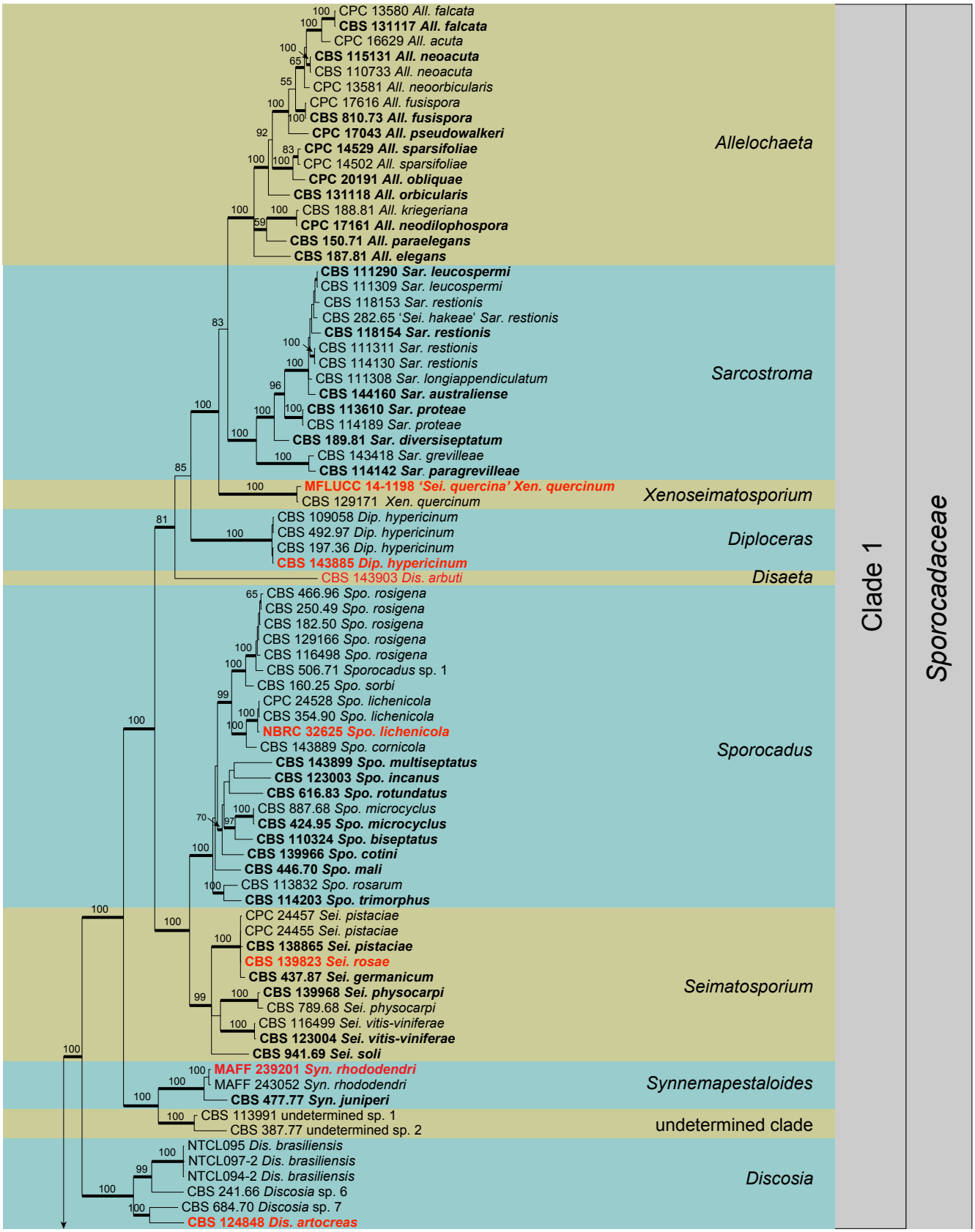

Fig. 1. Overview phylogenetic tree of ***Sporocadaceae*** (50 % majority rule consensus) resulting from a Bayesian analysis of the combined LSU, ITS and *rpb2* sequence alignment. Bayesian posterior probabilities (PP $\geq$ 0.95) are emphasised by thickened branches, maximum likelihood bootstrap support values ($\geq$ 50 %) are shown at the nodes. The scale bar represents the expected number of changes per site. Genera are delimited in coloured boxes, with the genus name indicated to the right. Ex-type strains are represented in bold, and the generic type species are highlighted in red colour. Basionyms are indicated between apostrophes (''). Clades 1–3 are further analysed using combined LSU, ITS, *rpb2*, *tef-1α* and *tub2* sequence alignment, corresponding to Figs 2, 4 and 7. The tree was rooted to *Clypeosphaeria mamillana* (CBS 140735).

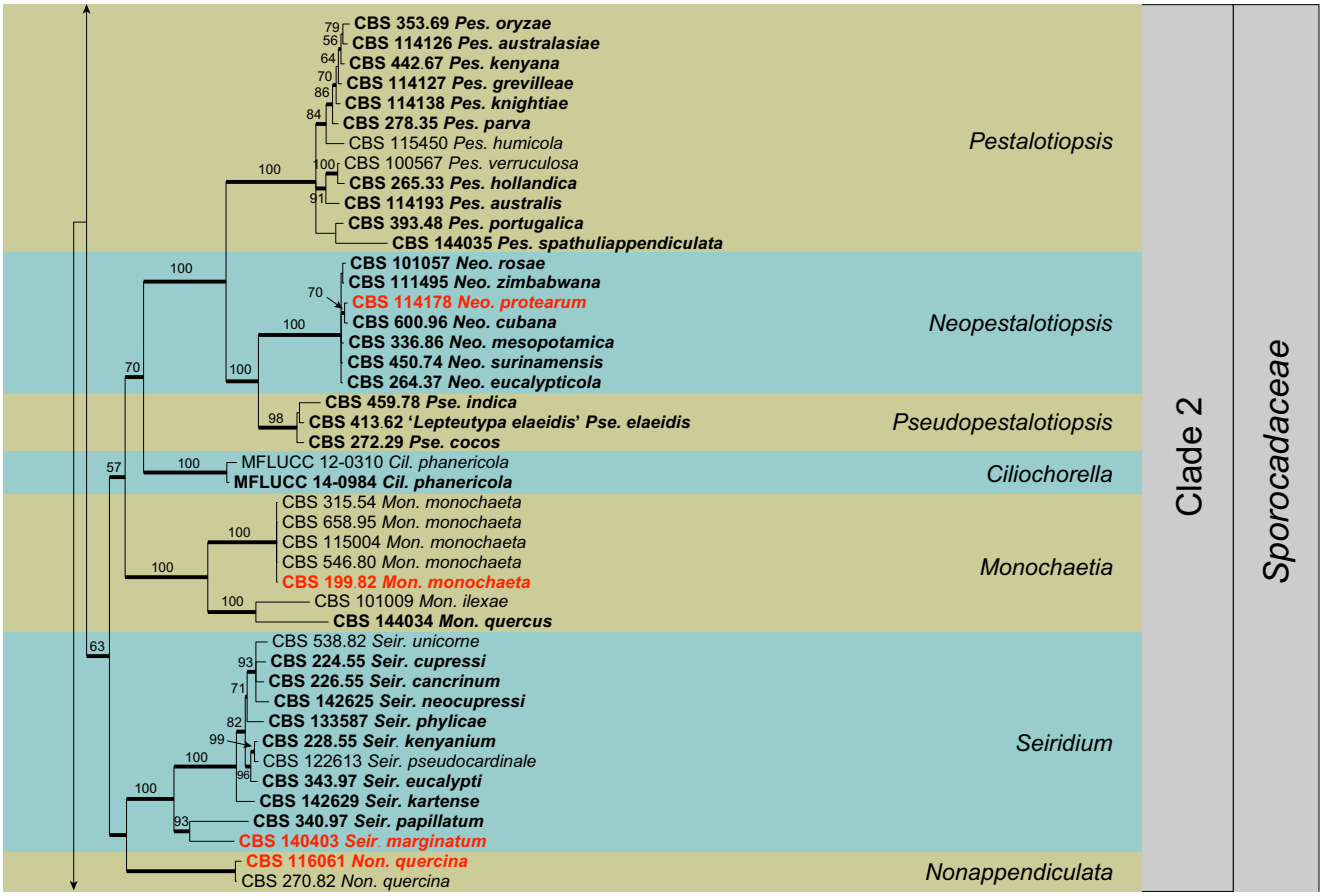

Fig. 1. (Continued).

database, and LSU provides poor species resolution, we constructed 3-locus (ITS, *tef-1α*, *tub2*) trees for both genera.

Pestalotiopsis: The dataset consisted of 124 isolates with *Pseudopestalotioposis theae* (MFLUCC 12-0055) as outgroup. The final alignment contained 1 857 characters divided into three partitions with 544 (ITS), 535 (*tef-1α*), and 778 (*tub2*) characters respectively, including alignment gaps. The ML search resolved a best tree with an lnL of -13833.330715. MrModelTest recommended that the Bayesian analysis should use Dirichlet base frequencies for all data partitions. The GTR+I+G model was proposed for ITS, and HKY+I+G model for *tef-1α* and *tub2*. The BA lasted for 2 420 000 generations and the 50 % consensus tree and posterior probabilities were calculated from 3 632 trees from two runs. The alignment contained a total of 913 unique site patterns. The phylogenetic trees generated from ML and BA methods were in slight disagreement on the location of a few singletons. For example, *Pestalotiopsis* sp. 1 (CBS 111576) and *Pestalotiopsis* sp. 2 (CBS 114489) formed separate lineages in the BA tree (not shown), but clustered together in the ML tree, each with long branches (Fig. 5).

Pseudopestalotiopsis: The dataset consisted of 41 isolates with *Neopestalotiopsis protearum* (CBS 114178) and *Neopestalotiopsis rosae* (CBS 101057) as outgroups. The final alignment contained a total of 1 253 characters divided into three partitions containing 382 (ITS), 488 (*tef-1α*), and 383 (*tub2*) characters respectively, including alignment gaps. The ML search resolved a best tree with an lnL of -3431.856295. MrModelTest recommended that the Bayesian analysis should use Dirichlet base frequencies for all data partitions. The GTR+I model was proposed for ITS, and HKY+G model for *tef-1α* and *tub2*. The BA lasted for 735 000 generations and the 50 % consensus tree and posterior probabilities were calculated from 1 104 trees from two runs. The alignment contained a total of 205 unique site patterns. The phylogenetic trees generated from the ML and BA methods were congruent (Fig. 6). The analyses supported the distinct identity of one new species *Pse. solicola*, and the synonymy of *Pse. myanmarina* and *Lepteutypa elaeidis* under *Pse. elaeidis*.

Clade 3: Ex-type strains of the generic types of *Morinia* (*Mor. pestalozzioides* F090354), *Neotruncatella* (*Neo. endophytica* EML-AS5-1), and *Broomella* (*Bro. robillardoides* MFLUCC 13-0798) were removed from the 5-locus phylogenetic analysis as they lacked a number of sequence loci in the dataset. The final alignment consisted of 87 isolates and a total of 3 687 characters included five partitions containing 565 (ITS), 832 (LSU), 832 (*rpb2*), 672 (*tef-1α*) and 1026 (*tub2*) characters respectively, including alignment gaps. *Beltrania pseudorhombica* (CPC 23656) was used as outgroup. The ML search resolved a best tree with an lnL of -37400.094265. MrModelTest recommended that the Bayesian analysis should use Dirichlet base frequencies for all data partitions. The GTR+I+G model was proposed for ITS, LSU and *rpb2*, and HKY+I+G model for *tef-1α* and *tub2*. The BA lasted for 1 745 000 generations and the 50 % consensus tree and posterior probabilities were calculated from 2 620 trees from two runs. The alignment contained a total of 1 901 unique site patterns (ITS: 190, LSU: 134, *rpb2*: 424, *tef-1α*: 490, *tub2*: 666).

The phylogenetic trees generated from ML and BA methods (Fig. 7) were congruent and revealed 12 phylogenetic genera. The single gene phylogenies (not shown) were congruent on the

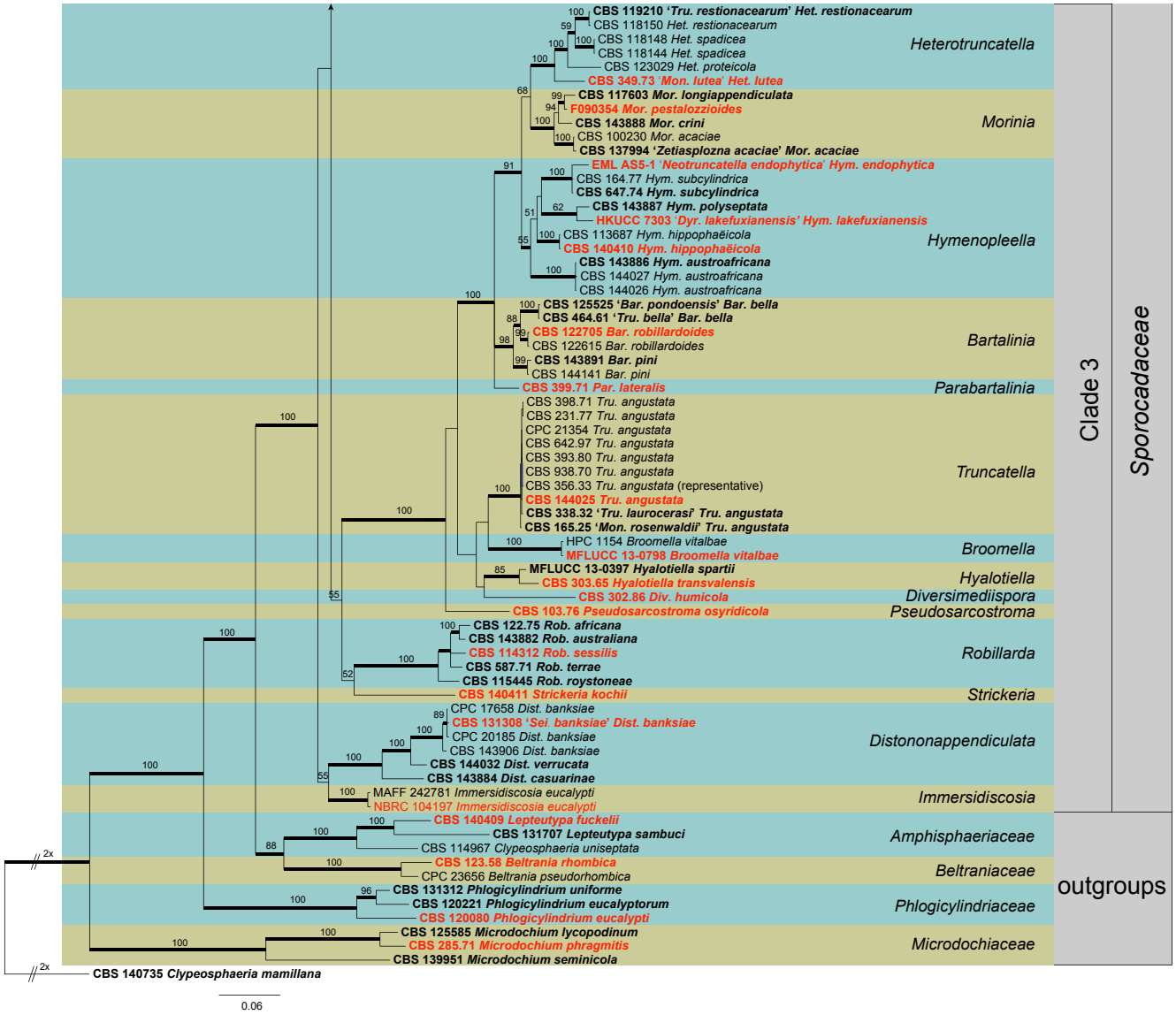

Fig. 1. (Continued).

distinct identity of these genera. Among these genera, five were represented by singleton species and long branches, corresponding to *Broomella vitalbae*, *Hyalotiella transvalensis, Diversimediispora humicola* sp. nov., *Parabartalinia lateralis* sp. nov. and *Pseudosarcostroma osyridicola* sp. nov. All strains that identified as *Truncatella* in previous publications were separated into two distinct clades, namely *Truncatella* and *Heterotruncatella* (Fig. 7).

Taxonomy

Based on the above phylogenetic analyses (Figs 1–7), 30 genera are recognised in *Sporocadaceae*, of which seven are newly introduced. Through morphological examination, as well as habitat and geographical comparisons, a total of 51 new species, 15 new combinations, one *nomina nova*, five epitypifications and one neotypification are proposed. For the species with complete illustrations generated from type specimens, but without ex-type cultures for further molecular research, we provided information about the host and origin. A schematic overview of the conidia and ascospores features of accepted genera in *Sporocadaceae* is provided (Fig. 8). Due to the large number of taxa discussed throughout this manuscript, the generic names are abbreviated with the first three or four letters. *Allelochaeta* was recently treated in a separate study (Crous *et al.* 2018).

Sporocadaceae Corda [as "Sporocadeae"], Icon. Fung. (Prague) 5: 34. 1842.

Synonyms: *Bartaliniaceae* Wijayaw. *et al.*, Fungal Diversity 73: 85. 2015, nom. inval.

Bartaliniaceae Wijayaw. *et al.*, Fungal Diversity 86: 5. 2017.

Discosiaceae Maharachch. & K.D. Hyde, Fungal Diversity 73: 94. 2015.

Pestalotiopsidaceae Maharachch. & K.D. Hyde, Fungal Diversity 73: 106. 2015.

Robillardaceae Crous, IMA Fungus 6: 184. 2015.

Sexual. Asocomata perithecial, immersed in bark, globose to pyriform, scattered or confluent; peridium thick, dark brown, pseudoparenchymatous. *Paraphyses* filiform. *Asci* cylindrical, containing 8 uniseriate or biseriate ascospores, thin-walled. *Ascospores* fusoid or ellipsoidal, septate, pale, yellow to dark brown. *Asexual. Conidiomata* pycnidial, acervular or stromatic in most genera, synnematous or sporodochial in *Synnemapestaloides*,

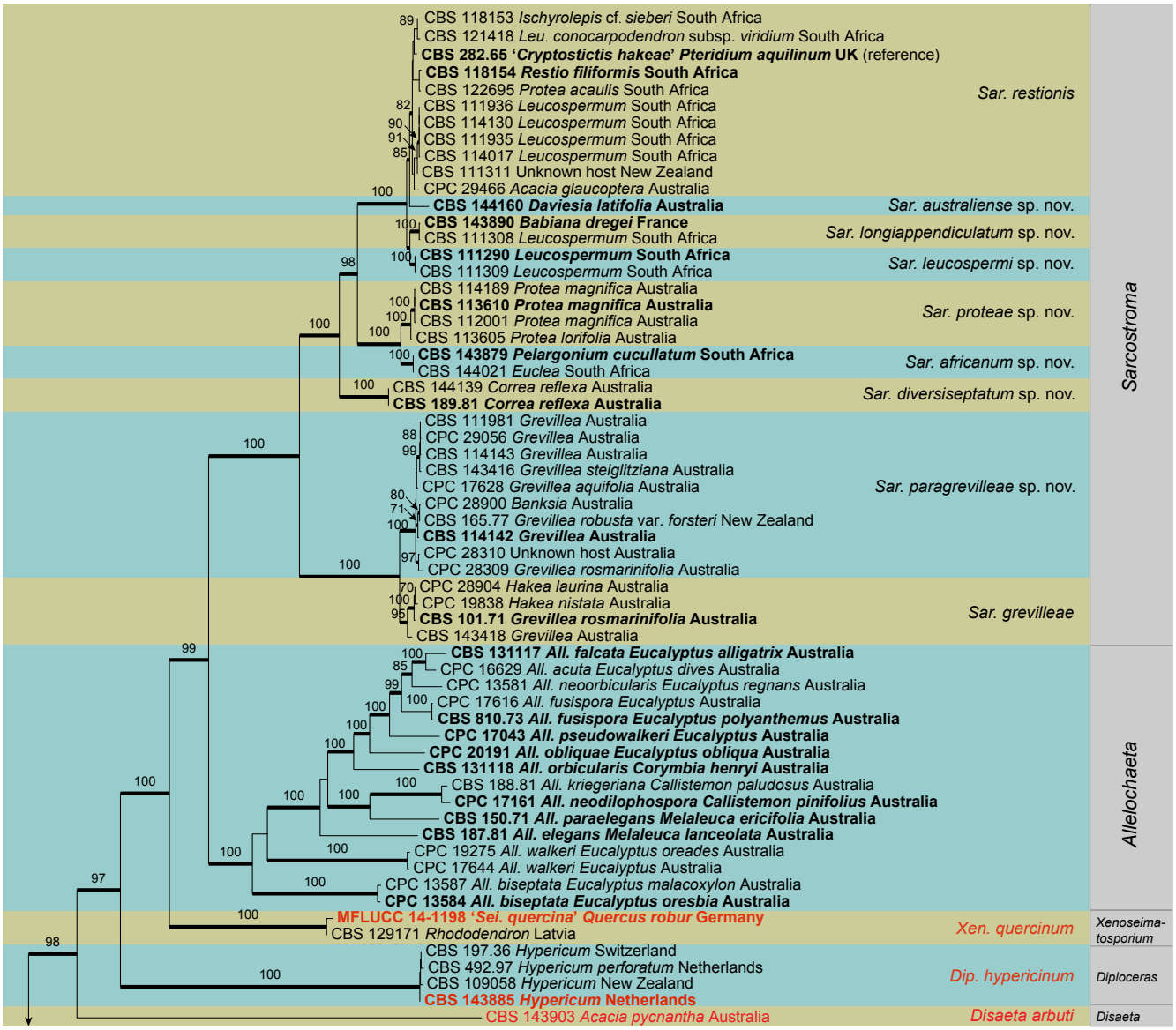

Fig. 2. Phylogenetic tree resulting from a maximum likelihood analysis of the combined LSU, ITS, *rpb2*, *tef-1α* and *tub2* sequence alignment (representing **clade 1** of Fig. 1). Bayesian posterior probabilities (PP $\geq$ 0.95) are emphasised by thickened branches, maximum likelihood bootstrap support values ($\geq$ 50 %) are shown at the nodes. The scale bar represents the expected number of changes per site. Genera are delimited in grey boxes. All taxa names in *Allelochaeta* consist of strain number, species name, host and location (underscore is used to separate species name and host). The taxon names of other genera consist of strain number, host/substrate and location. Ex-type strains are represented in bold, and the generic type species are highlighted in red colour. Basionyms, if present, are indicated between apostrophes (''). The tree was rooted to *Lepteutypa fuckelii* (CBS 140409).

superficial, semi-immersed or immersed, scattered, gregarious or confluent, glabrous, wall of *textura angularis*, *textura globulosa* or sometimes of *textura prismatica*. *Conidiophores* branched or reduced to conidiogenous cells, mostly hyaline, smooth. *Conidiogenous cells* ampulliform, lageniform, cylindrical or subcylindrical, hyaline, sometimes pale brown. *Conidia* septate, smooth, undulate or verruculose, fusoid, subcylindrical or cylindrical, straight or curved; end cells mostly hyaline, or sometimes pale brown; median cells pale brown to dark brown, or sometime almost colourless; appendages on the end cells present, or absent in some genera, if present, tubular, filiform, straight or flexuous, attenuated or not, branched or unbranched.

Type genus: *Sporocadus* Corda, Icon. Fung. (Prague) 3: 23. 1839.

Bartalinia Tassi, Bulletin Labor. Orto Bot. de R. Univ. Siena 3: 4. 1900.

Description: *Conidiomata* stromatic, varying from pycnidioid to indeterminate, subperidermal, intracortical or subepidermal in origin, immersed, uni- to plurilocular, locules occasionally convoluted, dark brown to brown, glabrous, wall of *textura angularis* or *textura globulosa*, sometimes of *textura prismatica*, cells thick-walled and dark brown to brown in the outer layers, becoming thin-walled and paler toward the conidial hymenium. *Conidiophores* arising from the inner layers lining the conidioma, or at the base and extending part way up the side walls, sparsely septate and irregularly branched, often reduced to conidiogenous cells, hyaline, thin-walled, smooth, with percurrent proliferations, and apical periclinal thickenings (collarettes and regeneration of conidiogenous cells absent). *Conidia* cylindrical to fusoid with an acute or blunt apex and a truncate base, straight or slightly curved, 3–4-euseptate, apical cell hyaline and devoid of contents, other cells hyaline to pale brown, wall smooth, with or without constrictions at septa, suprabasal cell longer than the rest, apical appendage single, arising as a tubular extension of the apical cell

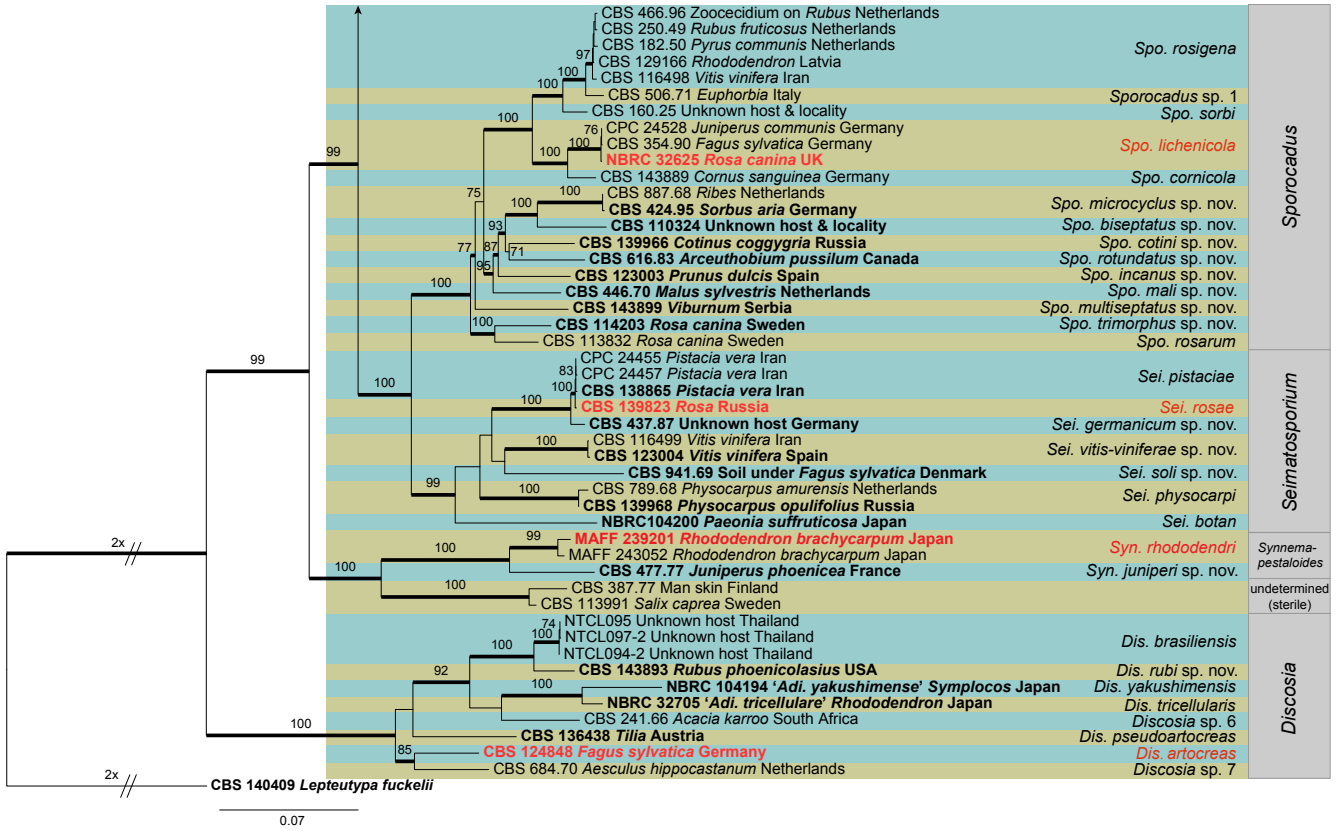

Fig. 2. (Continued).

and not separated from it by a septum, invariably trifid with 2–4, narrow, attenuated, flexuous, divergent branches; basal appendage tubular, single, unbranched, exogenous, filiform, flexuous (emended from Crous *et al.* 2014a).

Type species: *Bartalinia robillardoides* Tassi.

Notes: *Bartalinia* was regarded as synonym of *Seimatosporium* by von Arx (1981), but this was not accepted by Nag Raj (1993) because of the morphological differences between the two genera, especially in conidial appendages. This was supported by the phylogenetic analyses by Tanaka *et al.* (2011) and Crous *et al.* (2014a), as well as in the present study (Fig. 1).

Bartalinia bella (Bat.) Nag Raj, J. Indian bot. Soc. 43: 218. 1964, **emend.** F. Liu, L. Cai & Crous. Fig. 9.
Basionym: *Truncatella bella* Bat., Publicações Inst. Micol. Recife 276: 14. 1960.
Synonym: *Bartalinia pondoensis* Marinc. *et al.*, Mycotaxon 111: 312. 2010.

Culture characteristics: Colonies on MEA umbonate with entire edge, white to pale grey, reaching > 90 mm diam after 14 d at 21 °C, conidiomata black, gregarious, semi-immersed or immersed, stromatic; on CMA flat with entire edge, mouse grey with white margin, reaching 70–71 mm diam after 14 d at 21 °C, conidiomata black, scattered, semi-immersed, acervular, stromatic; on PDA flat with entire edge, vinaceous buff, aerial mycelia white and flocculent, reaching > 90 mm diam after 14 d at 21 °C, conidiomata dark vinaceous, semi-immersed, scattered, acervular; on SNA flat with entire edge, white, reaching 60–61 mm diam after 14 d at 21 °C, conidiomata brown vinaceous to black, scattered, superficial, acervular.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, mostly reduced to conidiogenous cells, smooth, colourless, invested in mucus. *Conidiogenous cells* annellidic, discrete, cylindrical, lageniform or ampulliform, 5–13 × 1–3 µm (av. = 8.6 ± 2.24 × 1.9 ± 0.44 µm), colourless, smooth. *Conidia* cylindrical or subcylindrical, straight or slightly curved, 3-septate, not constricted at septa, smooth, 16.5–25 × 2.5–4 µm (av. = 20.5 ± 2 × 3.3 ± 0.37 µm); basal cell obconic with a truncate base, cylindrical, thin-walled, hyaline, 2.5–6 µm (av. = 3.3 ± 0.74 µm) long; median cells 2, cylindrical, pale brown, thick-walled, ± equal, each 4.5–8 µm (av. = 6.6 ± 0.88 µm) long; apical cell conic with an acute apex, thin-walled, hyaline, 2–4 µm (av. = 2.9 ± 0.49 µm) long; apical appendage with 3 branches, attenuated, tubular, flexuous, (4–) 6.5–13 µm (av. = 9.7 ± 1.42 µm) long; basal appendage single, tubular, not attenuated, unbranched, excentric, 1.5–5.5 µm (av. = 3.6 ± 1.01 µm) long; mean conidium length/width ratio = 6.2:1.

Materials examined: **Brazil**, Recife, air, 1960, isolated by A.C. Batista, (**holotype** of *Truncatella bella* CBS H-23544, ex-type culture CBS 464.61 = IMI 083535 = IMUR 1520). **South Africa**, KwaZulu Natal, Port Edward, Umtamvuna Nature Reserve, Mr. T. Abbott's garden (31° 02′ 948′′ S, 30° 10′ 351′′ E), on *Maytenus abbottii* (*Celastraceae*), 8 May 2008, S. Marincowitz & M. Gryzenhout (**holotype** of *Bartalinia pondoensis* PREM 60359, ex-type culture CBS 125525 = CMW 31067).

Notes: *Bartalinia pondoensis* (Marincowitz *et al.* 2010) is phylogenetically and morphologically equal to *Truncatella bella* (Batista *et al.* 1960), and both species are located in the *Bartalinia* clade (Fig. 7). They are therefore combined under *Bar. bella* following the date priority rule.

Bartalinia pini F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828321. Fig. 10.

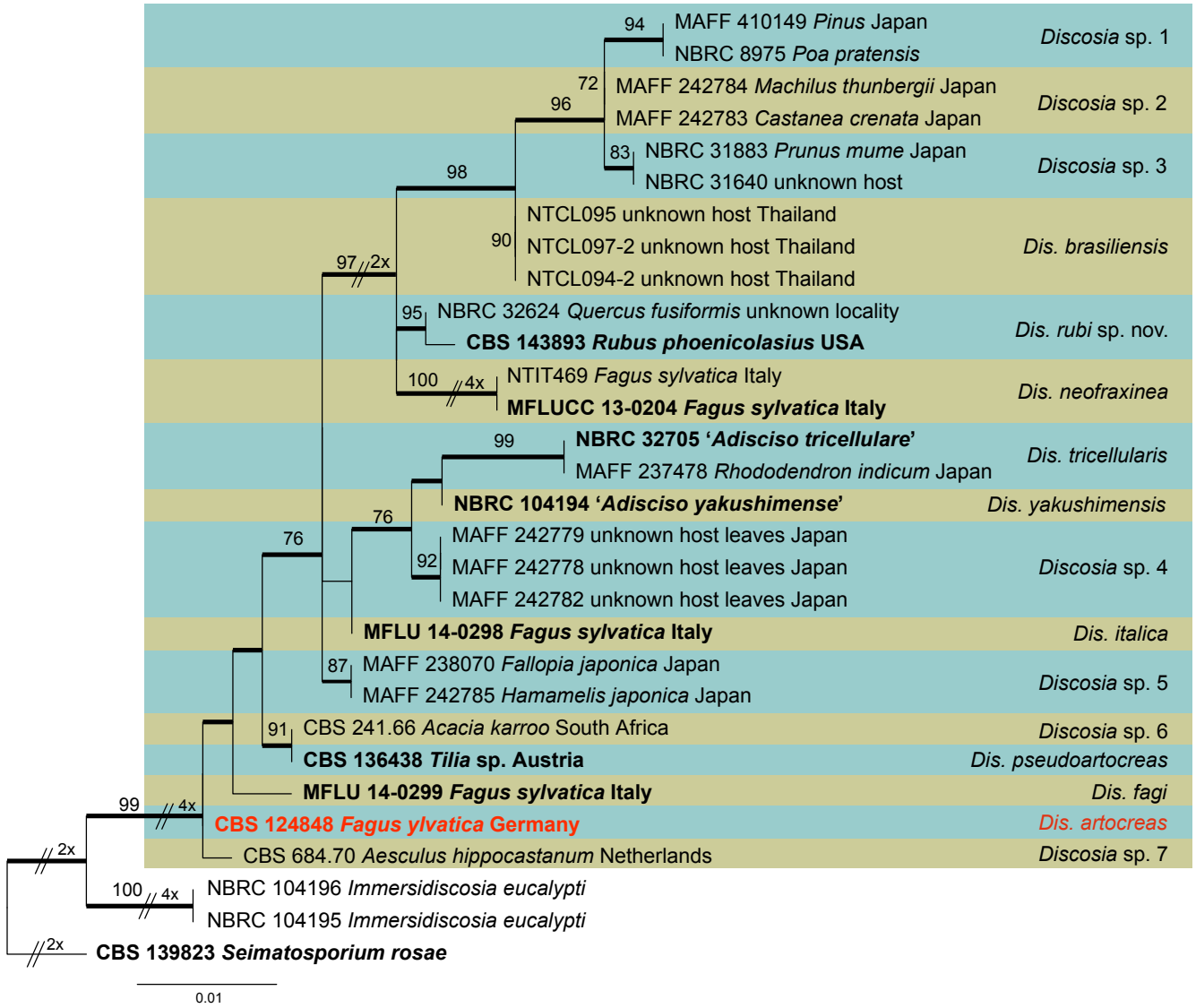

Fig. 3. Phylogenetic tree of ***Discosia*** resulting from a maximum likelihood analysis of the ITS sequence alignment. Bayesian posterior probabilities (PP $\geq$ 0.95) are emphasised by thickened branches, maximum likelihood bootstrap support values ($\geq$ 50 %) are shown at the nodes. The scale bar represents the expected number of changes per site. All taxon names consist of strain number, host/substrate and location. Ex-type strains are represented in bold, and the generic type species are highlighted in red colour. The tree was rooted to *Seimatosporium rosae* (CBS 139823).

Etymology: Named after the host from which it was first collected, *Pinus*.

Culture characteristics: Colonies on MEA flat with entire edge, with ruffle sag on surface, greenish brown, reaching > 90 mm diam after 14 d at 21 °C, conidiomata dark brown to black, semi-immersed or immersed, stromatic; on CMA flat with entire edge, glaucous grey, reaching > 90 mm diam after 14 d at 21 °C, conidiomata honey to brown, scattered, superficial or semi-immersed, acervular; on PDA flat with entire edge, glaucous grey to grey, reaching > 90 mm diam after 14 d at 21 °C, conidiomata dark brown, semi-immersed, scattered, acervular; on SNA flat with undulate edge, colourless, sterile, reaching 47–53 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, reduced to conidiogenous cells, smooth, colourless, invested in mucus. *Conidiogenous cells* annellidic, discrete, lageniform or ampulliform, 4–12.5 × 1.5–2.5 µm, (av. =6.9 ± 2.23 × 2 ± 0.31 µm), colourless, smooth. *Conidia* cylindrical with acute or obtuse ends, straight or slightly curved, mostly 4-septate, occasionally 3-sepata, smooth, 13.5–20.5 × 1.5–3.5 µm (av. = 16.9 ± 1.64 × 3 ± 0.4 µm); basal cell obconic with a truncate base, thin-walled, hyaline, 1.5–2.5 µm (av. = 2 ± 0.3 µm) long; median cells 2–3, cylindrical, grey to pale brown, fairly thick-walled, the second cell from base 4–7.5 µm (av. = 5.5 ± 0.88 µm) long, other median cells ± equal, each 3–4.5(–7) µm (av. = 3.9 ± 0.45 µm) long; apical cell conic with an acute apex, thin-walled, hyaline, 2–3 µm (av. = 2.5 ± 0.32 µm) long; apical appendage with three branches, attenuated, tubular, filiform, flexuous, divergent, 4.5–17 µm (av. = 12.5 ± 3.91 µm) long; basal appendage absent or single, if present, tubular, unbranched, excentric, 2.5–11.5 µm (av. = 7.5 ± 2.05 µm) long; mean conidium length/width ratio = 5.6:1.

Materials examined: **Uganda**, on *Pinus patula* (*Pinaceae*) needles, Jan. 2014, M.J. Wingfield (**holotype** CBS H-23514, ex-type culture CBS 143891 = CPC 24328). **USA**, Hawaii, Oahu, on leaves of *Acacia koa* (*Fabaceae*), 30 Sep. 2015, J. Roux, HPC 780, AK 21, living culture CBS 144141 = CPC 29502.

Notes: Two strains of *Bartalinia pini* formed a distinct clade on the multi-locus tree (Fig. 7). *Bartalinia pini* is morphologically similar to *Bar. lateripes*, a species reported from pods of *Cassia chamaecrista* in the USA, in having 4-septate conidia with three

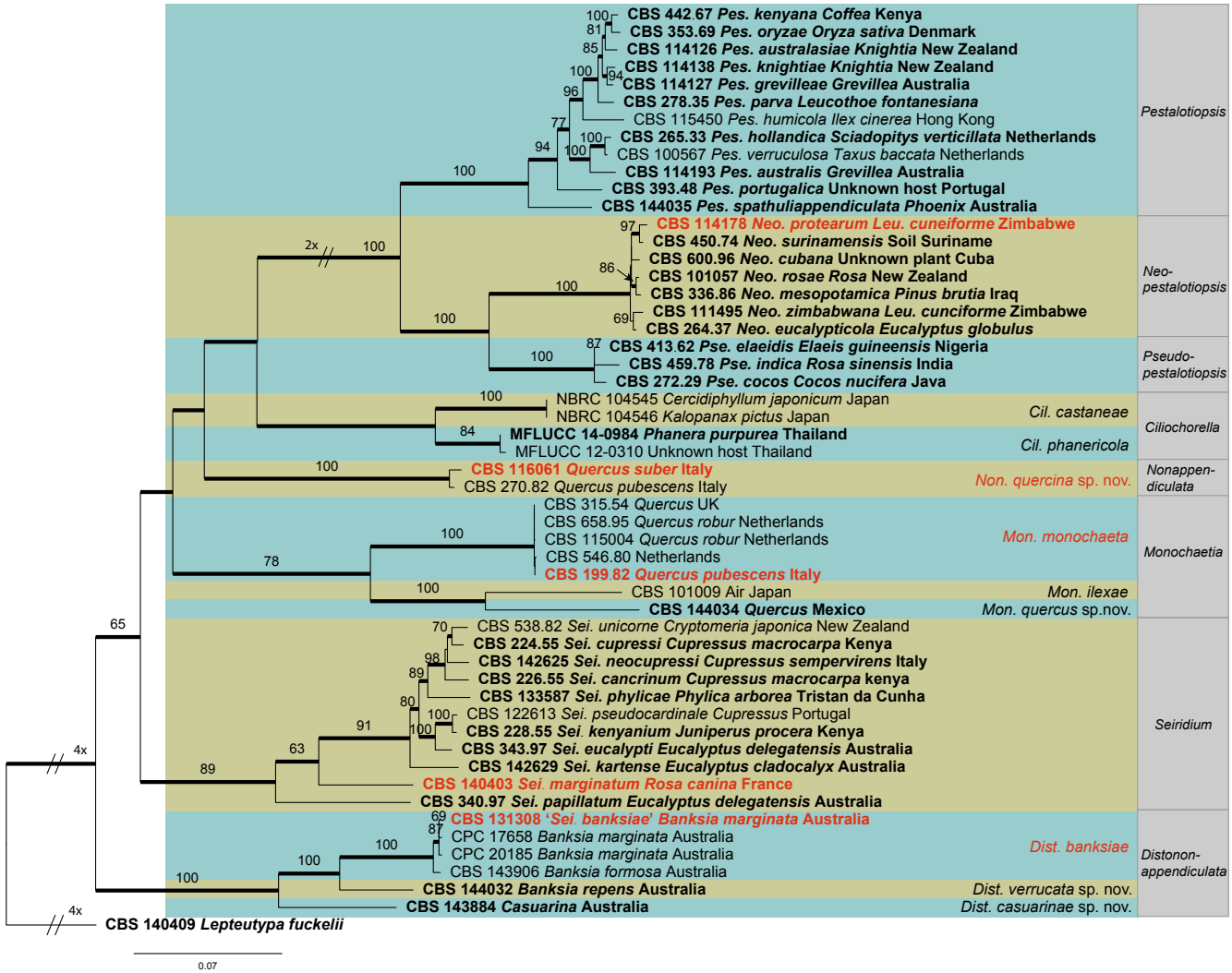

Fig. 4. Phylogenetic tree resulting from a maximum likelihood analysis of the combined LSU, ITS, *rpb2*, *tef-1α* and *tub2* sequence alignment (representing **clade 2** of Fig. 1). Bayesian posterior probabilities (PP $\geq$ 0.95) are emphasised by thickened branches, maximum likelihood bootstrap support values ($\geq$ 50 %) are shown at the nodes. The scale bar represents the expected number of changes per site. Genera are delimited in grey boxes. All taxa names in genera *Pestalotiopsis*, *Pseudopestalotiopsis*, *Neopestalotiopsis* and *Seiridium* consist of strain number, species name, host and location (underscore is used to separate species name and host). Species names in other genera are aligned to the right. Ex-type strains are represented in bold, and the generic type species are highlighted in red colour. Basionyms, if present, are indicated between apostrophes ('). The tree was rooted to *Lepteutypa fuckelii* (CBS 140409).

apical appendage branches and a similar mean conidium length/width ratio. However, it differs from the latter in producing thinner conidia (1.5–3.5 µm vs. 3.5–4.5 µm) and shorter apical appendages (4.5–17 µm vs. 15–21 µm) (Nag Raj 1993). The only species of *Bartalinia* reported on *Pinus* is *Bar. robillardoides* (Farr & Rossman 2018), but it produces longer conidia than *Bar. pini* (20–28 × 3–3.5 µm vs. 13.5–20.5 × 1.5–3.5 µm) and it has a larger mean conidium length/width ratio (7.1:1 vs. 5.6:1) than *Bar. pini* (Nag Raj 1993).

Diploceras (Sacc.) Died., Mykol. Untersuch. Ber.: 342. 1915, **emend.** F. Liu, L. Cai & Crous

Basionym: *Hyaloceras* Durieu & Montagne subgen. *Diploceras* Sacc., Syll. fung. (Abellini) 10: 484. 1892.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* stromatic, acervular or pycnidial, erumpent, glabrous, dark brown to black, scattered to gregarious, oval to subglobose, wall of *textura angularis*, cells thick-walled, brown to dark brown in the outer layers, thin-walled and colourless to almost colourless in the inner layers; ostiole circular to oval, papillate. *Conidiophores* arising from the upper cells of the basal stroma or lining the cavity of the conidioma, reduced to conidiogenous cells or unbranched and septate, occasionally sparsely branched, colourless, smooth, invested in mucus. *Conidiogenous cells* discrete or integrated, ampulliform, lageniform, cylindrical, subcylindrical, conical, or obclavate, mostly colourless, or almost colourless to pale brown in the upper part and colourless below, smooth. *Conidia* fusoid or subcylindrical, straight or slightly curved, 3-septate, wall thin and with or without slight constrictions at the septa, smooth; median cells almost colourless to mid-brown; end cells colourless, bearing single or more appendages at each end; appendages cellular, not separated from the conidium body by septa, branched or unbranched, filiform or attenuated and flexuous; basal appendage excentric (emended from Nag Raj 1993).

Type species: *Diploceras hypericinum* (Ces.) Died.

Notes: *Diploceras* was first introduced as a subgenus of *Hyaloceras* by Saccardo (1892) and later raised to generic rank by Diedicke (1915), who treated the single and generic type species, *Dip. hypericinum*. Sutton (1975b) re-examined *Dip. hypericinum* and considered it within the broad generic limits of

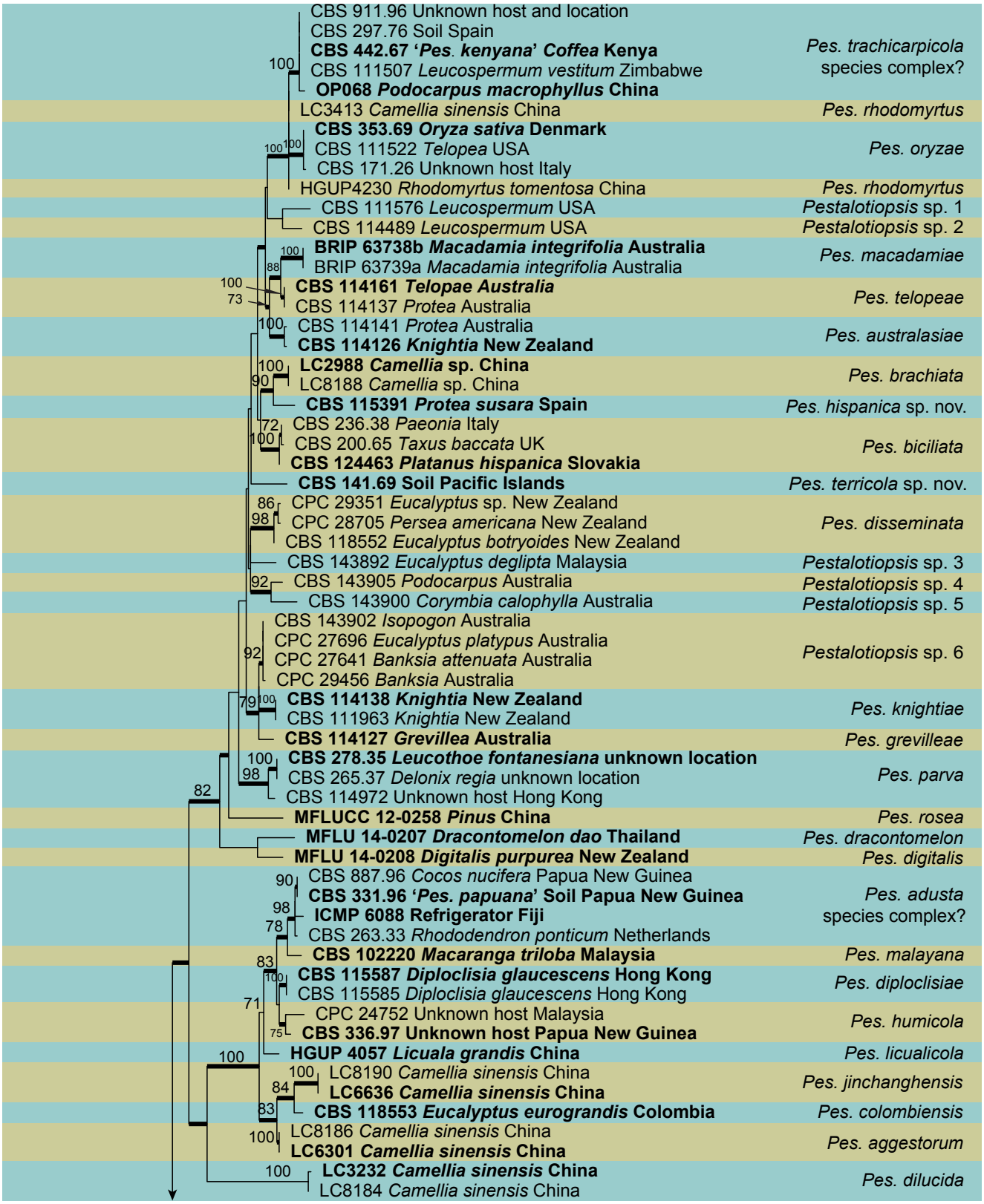

Fig. 5. Phylogenetic tree of ***Pestalotiopsis*** resulting from a maximum likelihood analysis of the combined ITS, *tef-1α* and *tub2* sequence alignment. Bayesian posterior probabilities (PP $\geq$ 0.95) are emphasised by thickened branches, maximum likelihood bootstrap support values ($\geq$ 50 %) are shown at the nodes. The scale bar represents the expected number of changes per site. All taxon names consist of strain number, host and location. Species names are aligned to the right. Ex-type strains are represented in bold. The tree was rooted to *Pseudopestalotioposis theae* (MFLUCC 12-0055).

Seimatosporium, and therefore added *Diploceras* to the list of synonyms of *Seimatosporium*. However, even Sutton considered *Seimatosporium* to be quite heterogeneous, suggesting that it should be divided into smaller genera (Sutton 1980). Nag Raj (1993) restricted the generic concept of *Seimatosporium* to a smaller group of species, and revived *Diploceras* to include *Dip. hypericinum* and similar forms, previously considered as synonyms of *Seimatosporium.* The majority of the other species of *Diploceras* were however shown to belong to *Allelochaeta* (Crous *et al.* 2018).

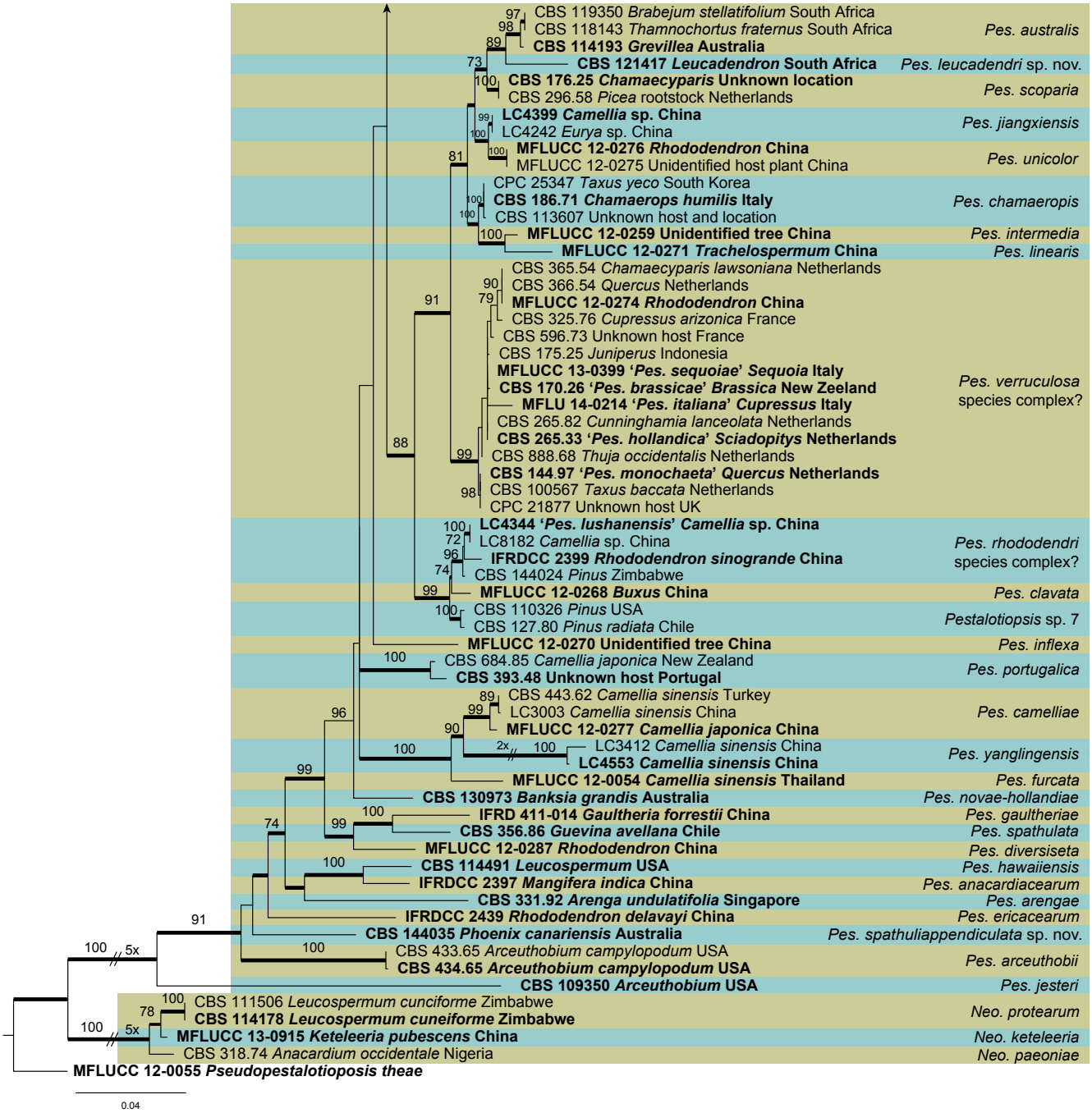

Fig. 5. (Continued).

Diploceras hypericinum (Ces.) Died., Krypt.-Fl. Brandenburg (Leipzig) 9(5): 887. 1915. Fig. 11.

Basionym: *Pestalotia hypericina* Ces., in Rabenhorst, Klotzschii Herb. Viv. Mycol., Ed. II, Cent. 1: no. 64. 1855.

Synonyms: *Seimatosporium hypericinum* (Ces.) B. Sutton, Trans. Brit. Mycol. Soc. 64: 483. 1975.

Hyaloceras hypericinum (Ces.) Sacc., Syll. fung. (Abellini) 10: 485. 1892.

Culture characteristics: Colonies on MEA flat with entire edge, with radial circular lines from the centre, white to rosy buff, reaching 52–58 mm diam after 14 d at 21 °C, conidiomata black, scattered, acervular, stromatic, superficial or immersed; on CMA flat with entire edge, off-white, reaching 65–68 mm diam after 14 d at 21 °C, conidiomata black, stromatic, scattered, covered by aerial mycelia, superficial; on PDA flat with undulate edge, pale grey, sterile, reaching 76–77 mm diam after 14 d at 21 °C; on SNA colourless, sterile, reaching 7–17 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, colourless, smooth, thin-walled, invested in mucus. *Conidiogenous cells* annellidic, discrete or integrated, mostly sub-cylindrical, 5–15 × 1–2.5 µm (av. = 9.7 ± 2.61 × 1.5 ± 0.27 µm), colourless, smooth or verruculose. *Conidia* fusoid, sometimes cylindrical, curved, 3-septate, smooth, slightly constricted at septa, 15–22 × 2.5–4.5 µm (av. = 18.5 ± 1.85 × 3.8 ± 0.47 µm); basal cell short cylindrical, trapezoid, thin-walled, hyaline to pale brown, 2.5–3.5 µm (av. = 3.1 ± 0.27 µm) long; median cells 2, cylindrical, pale brown, relatively thick-walled, second cell from the base 6–8.5 µm (av. = 7.3 ± 0.68 µm) long, the third cell 4–6 µm

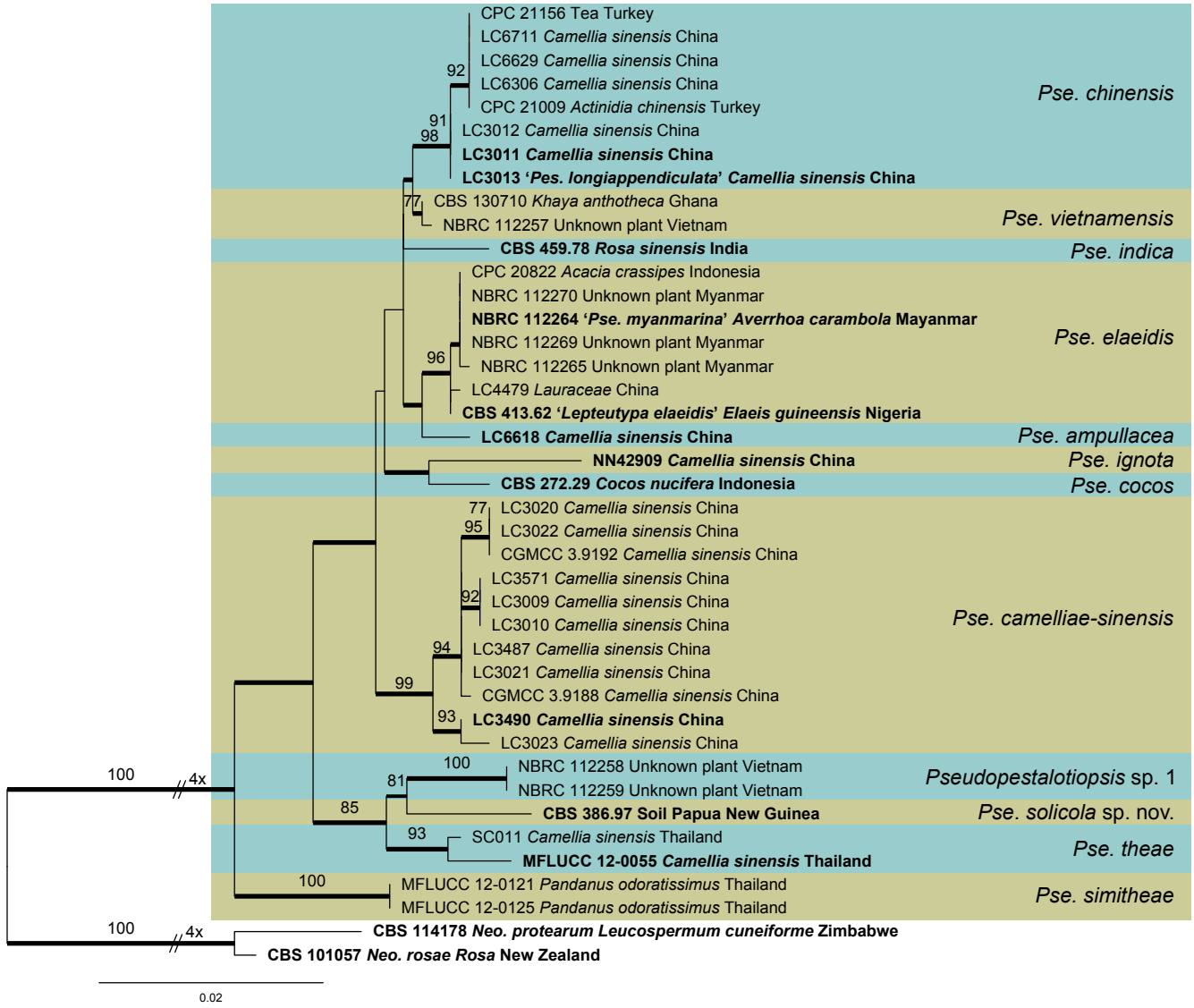

Fig. 6. Phylogenetic tree of ***Pseudopestalotiopsis*** resulting from a maximum likelihood analysis of the combined ITS, *tef-1α* and *tub2* sequence alignment. Bayesian posterior probabilities (PP $\geq$ 0.95) are emphasised by thickened branches, maximum likelihood bootstrap support values ($\geq$ 50 %) are shown at the nodes. The scale bar represents the expected number of changes per site. All taxon names consist of strain number, host and location. Species names are aligned to the right. Ex-type strains are represented in bold. Basionyms, if present, are indicated between apostrophes (''). The tree was rooted to *Neopestalotiopsis protearum* (CBS 114178) and *Neo. rosae* (CBS 101057).

(av. = 5.1 ± 0.56 µm) long; apical cell conic with an obtuse apex, thin-walled, hyaline to pale brown, 2.5–4 µm (av. = 3.1 ± 0.36 µm) long; appendages with independent loci of origin, flexuous, attenuated, unbranched, or dichotomously branched at one appendage; 2 apical appendages, 7.5–20.5 µm (av. = 16 ± 2.09 µm) long; 1–3 basal appendages, excentric, (3.5–)8.5–21.5 µm (av. = 15.4 ± 3.69 µm) long; mean conidium length/width ratio = 4.8:1.

Materials examined: **Italy**, Vercelli, on *Hypericum perforatum* (*Clusiaceae*), unknown collection date, V. de Cesati, Rabenhorst, Klotzschii Herb. Viv. Mycol. Ed. II, no. 64 (HAL, **lectotype designated here**, MBT384683). **Netherlands**, Wageningen, on *Hypericum perforatum* seedlings with leaf spots, Jan. 1997, J. de Gruyter, living culture CBS 492.97 = PD 97/645; on *Hypericum perforatum*, 3 Aug. 2012, W. Quaedvlieg (CBS H-23506 **epitype designated here**, MBT383927, ex-epitype culture CBS 143885 = CPC 21115). **New Zealand**, Auckland, Western Springs, on the leaf of *Hypericum* sp., Aug. 2000, C.F. Hill, living culture CBS 109058. **Switzerland**, on *Hypericum* sp., unknown collection date and collector, isolated by S. Blumer, living culture CBS 197.36 = NBRC 32647.

Notes: *Pestalotia hypericina*, the basionym of *Diploceras hypericinum*, was originally reported from *Hypericum perforatum* from Italy (Cesati 1855). The morphology of CBS H-23506 agrees with the isotype of *Dip. hypericinum* (Nag Raj 1993), and is therefore designated as epitype in this study. As far as currently known, *Dip. hypericinum* only infects *Hypericum* spp.

Disaeta Bonar, Mycologia 20: 299. 1928, **emend.** F. Liu, L. Cai & Crous.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* acervular, intra-epidermal or subcuticular, erumpent, discoid, black. *Conidiophores* septate, branched, colourless, smooth. *Conidiogenous cells* discrete or integrated, cylindrical, subcylindrical, or lageniform, thin-walled. *Conidia* fusoid, straight or curved, 4-septate, collapsed or not collapsed at septa, smooth; basal cell obconic with a truncate base, colourless; median cells cylindrical or doliiform, thick-walled, pigmented; apical cell conical, colourless; apical and basal appendage single, attenuated, unbranched, basal appendage excentric (emended from Bonar 1928).

Type species: *Disaeta arbuti* Bonar.

Disaeta arbuti Bonar, Mycologia 20: 299. 1928, **emend.** F. Liu, L. Cai & Crous. Fig. 12.

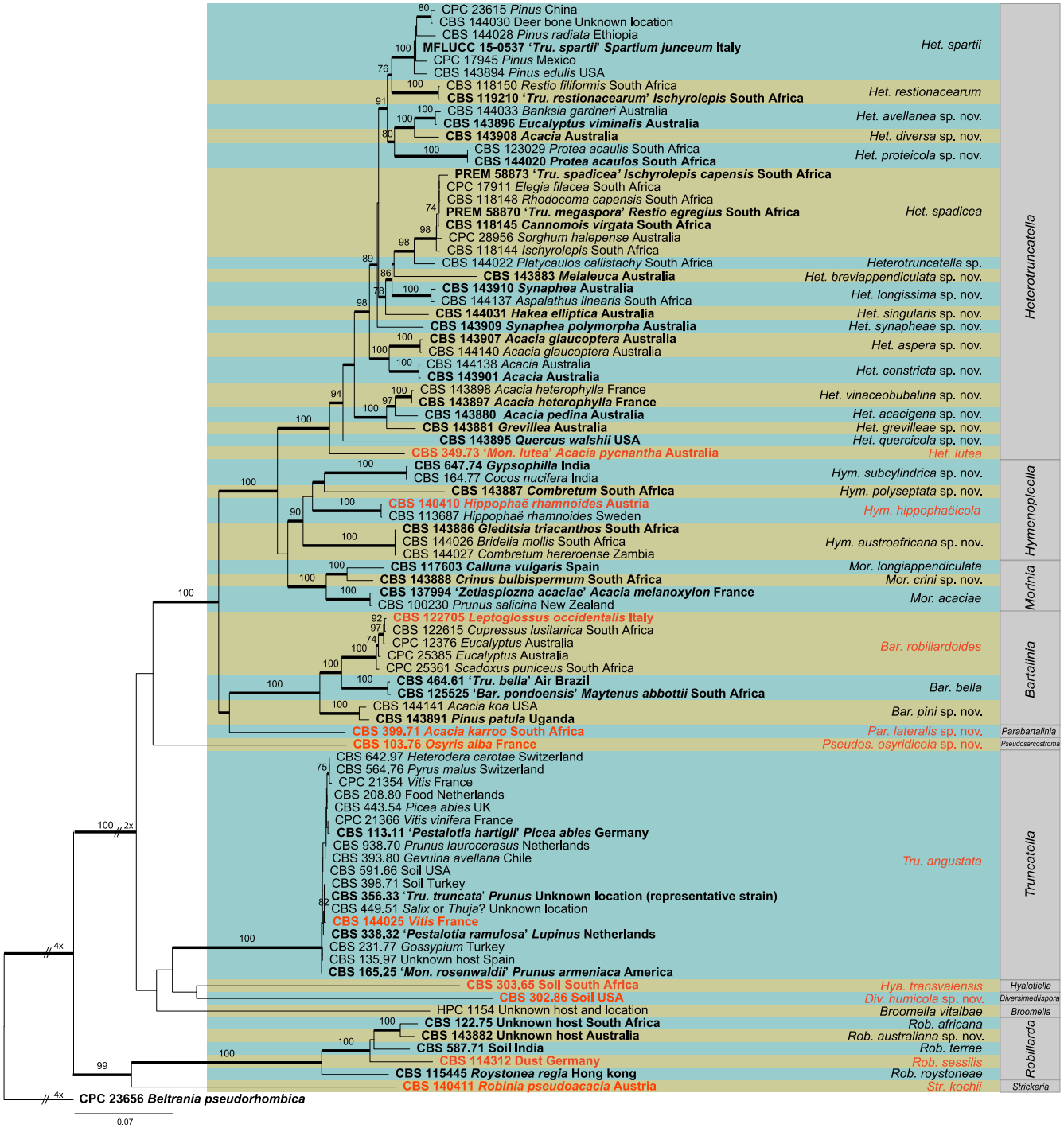

Fig. 7. Phylogenetic tree resulting from a maximum likelihood analysis of the combined LSU, ITS, *rpb2*, *tef-1α* and *tub2* sequence alignment (representing **clade 3** of Fig. 1). Bayesian posterior probabilities (PP $\geq$ 0.95) are emphasised by thickened branches, maximum likelihood bootstrap support values ($\geq$ 50 %) are shown at the nodes. The scale bar represents the expected number of changes per site. Genera are delimited in grey boxes. All taxon names consist of strain number, host and location. Species names are aligned to the right. Ex-type strains are represented in bold, and the generic type species are highlighted in red colour. Basionyms, if present, are indicated between apostrophes ('). The tree was rooted to *Beltrania pseudorhombica* (CPC 23656).

Culture characteristics: Colonies on MEA flat with entire edge, with radial circular lines from the centre, brown vinaceous, reaching 60–61 mm diam after 14 d at 21 °C, conidiomata brown vinaceous, confluent, superficial or immersed, stromatic, acervular; on CMA flat with entire edge, black, reaching 60 mm diam after 14 d at 21 °C, conidial masses black, gregarious, acervular; on PDA flat with entire edge, greenish olivacous to black, reaching 66–68 mm diam after 14 d at 21 °C, conidial masses gregarious, acervular, superficial or immersed; on SNA flat with undulate edge, dark brown, reaching 40–43 mm diam after 14 d at 21 °C, conidial masses black, scattered or gregarious, superficial or immersed, acervular.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, colourless, smooth, thin-walled, invested in mucus. *Conidiogenous cells* discrete or integrated, cylindrical, subcylindrical, or lageniform, variable in size, 2–14 × 1.5–3 µm (av. = 7.2 ± 3.23 × 2.3 ± 0.35 µm), colourless, smooth, with up to two annellations. *Conidia* fusoid, straight or curved, mostly 4-septate, occasionally 3-septate, wall smooth, sometimes collapsed between septa, 14.5–24 × 4.5–7 µm (av. = 17.6 ± 2.08 × 5.6 ± 0.68 µm), bearing appendages; basal cell obconic with a truncate base, periclinal wall thin and colourless in the lower half, becoming thick and progressively darker above, 1.5–3 µm (av. = 2.2 ± 0.43 µm) long; median cells

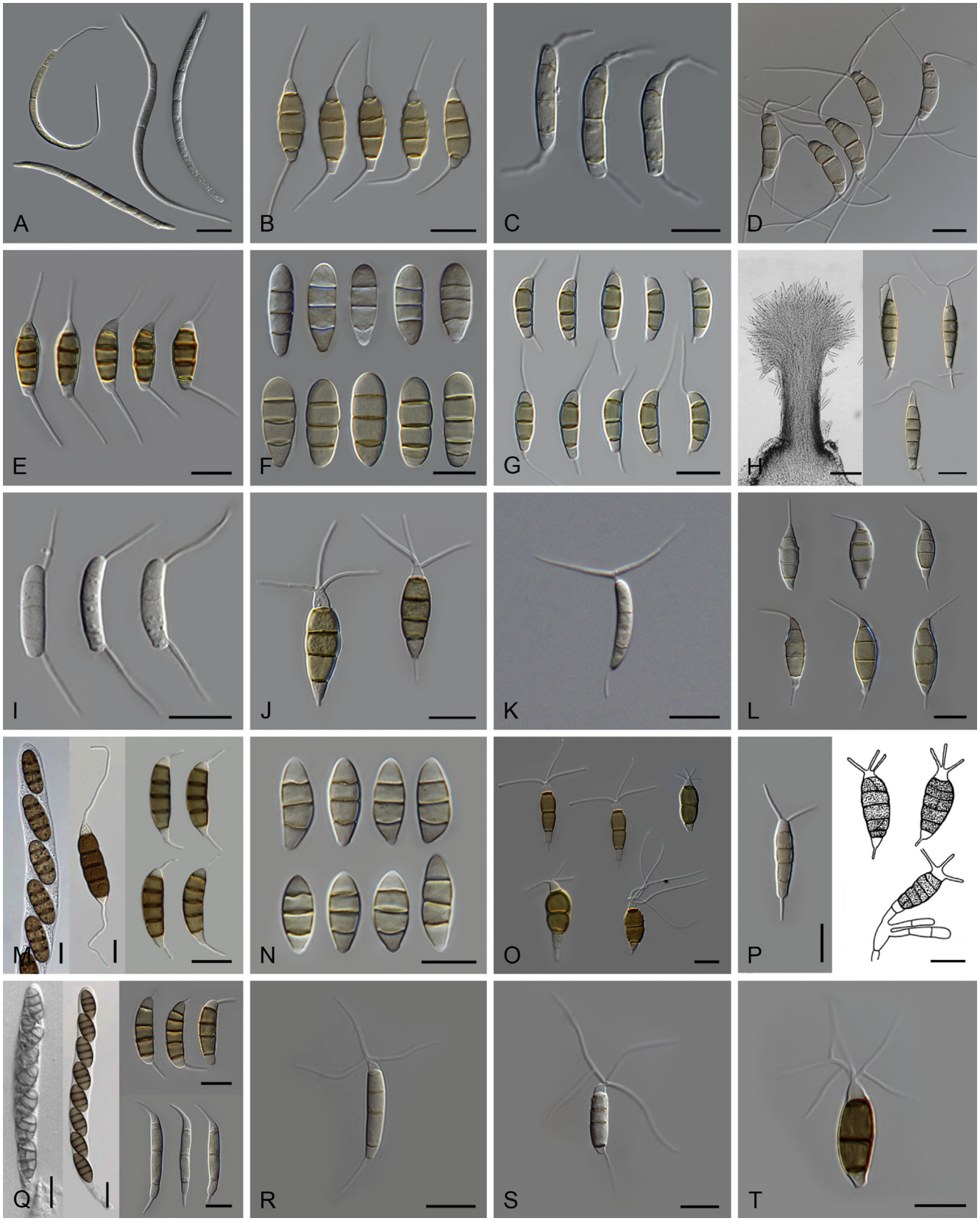

Fig. 8. An illustration of the diversity of conidia and ascospores in different genera of *Sporocadaceae* (the generic order is corresponding to the topology of Fig. 1). **A.** *Allelochaeta* (CBS 144171, CBS 144191, CBS 131119, CBS 144181, from Crous *et al.* 2018). **B.** *Sarcostroma* (CBS 143879). **C.** *Xenoseimatosporium* (CBS 129171). **D.** *Diploceras* (CBS 492.97). **E.** *Disaeta* (CBS 143903). **F.** *Sporocadus* (NBRC 32625). **G.** *Seimatosporium* (CBS 139823). **H.** *Synnemapestaloides* (MAFF 239201, from K. Tanaka). **I.** *Discosia* (CBS 124848). **J.** *Pestalotiopsis* (CBS 143892). **K.** *Ciliochorella* (HHUF 2800, from K. Tanaka). **L.** *Monochaetia* (CBS 199.82). **M.** Ascus, ascospores and conidia of *Seiridium* (CBS 140403, Jaklitsch *et al.* 2016; CBS 343.97, from Bonthond *et al.* 2018). **N.** *Nonappendiculata* (CBS 116061). **O.** *Heterotruncatella* (CBS 143883, CBS 143901, CBS 143908, CBS 143897). **P.** *Morinia* (CBS 143888; F090354, Collado *et al.* 2006). **Q.** Asci, ascospores and conidia of *Hymenopleella* (from left to right: HKUCC 7303, Jeewon *et al.* 2003a; CBS 140410, from Jaklitsch *et al.* 2016; CBS 143886; CBS 647.74). **R.** *Bartalinia* (CBS 143891). **S.** *Parabartalinia* (CBS 399.71). **T.** *Truncatella* (CBS 144025). **U–W.** *Broomella* (MFLUCC 13-0798, U. Ascus; V. Ascospores; W. Conidia; reproduced with permission of A.D.A.C., originally published in Cryptogamie, Mycologie in Li *et al.* 2015). **X.** *Hyalotiella* (MFLUCC 13-0397, reproduced with permission of A.D.A.C. [Association des amis des cryptogames, Paris - France], originally published in Cryptogamie, Mycologie in Li *et al.* 2015). **Y.** *Diversimediispora* (CBS 302.86). **Z.** *Pseudosarcostroma* (CBS 103.76). **AA.** *Robillarda* (CBS 143882). **AB.** Asci, ascospores and conidia of *Strickeria* (CBS 140411, Jaklitsch *et al.* 2016). **AC.** *Distononappendiculata* (CBS 144032). **AD.** *Immersidiscosia* (MAFF 104197, from K. Tanaka). Scale bars = 10 µm.

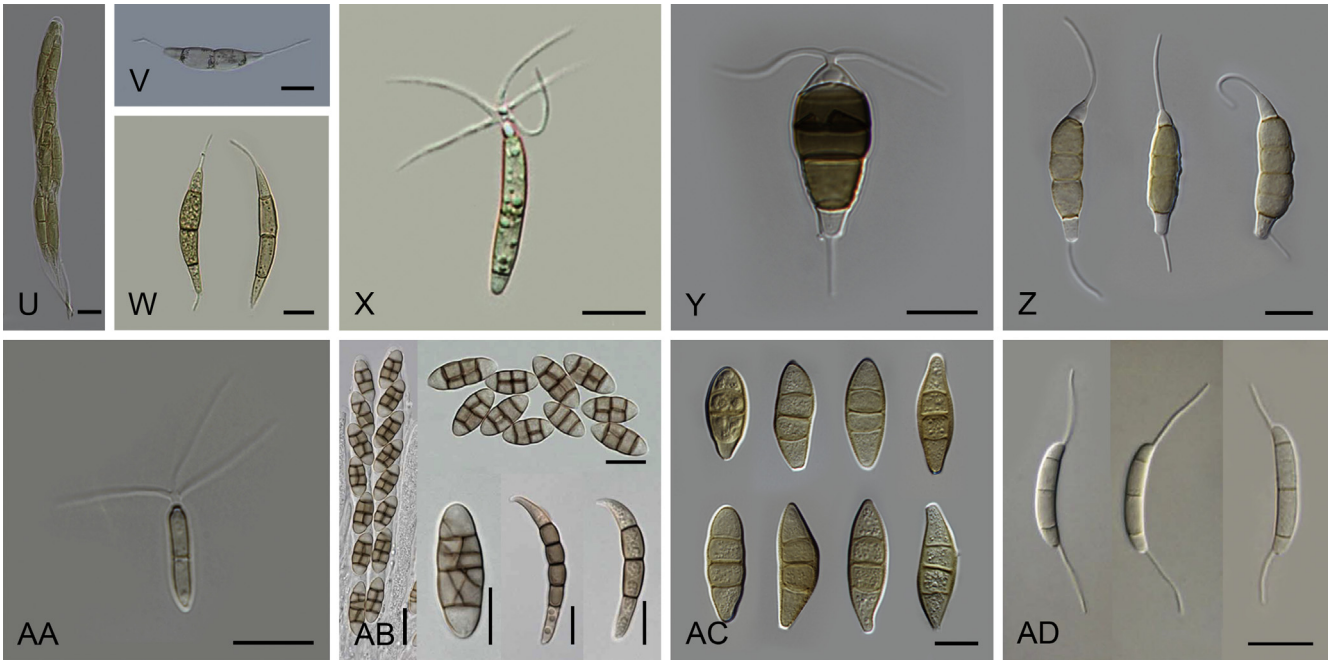

Fig. 8. (Continued)

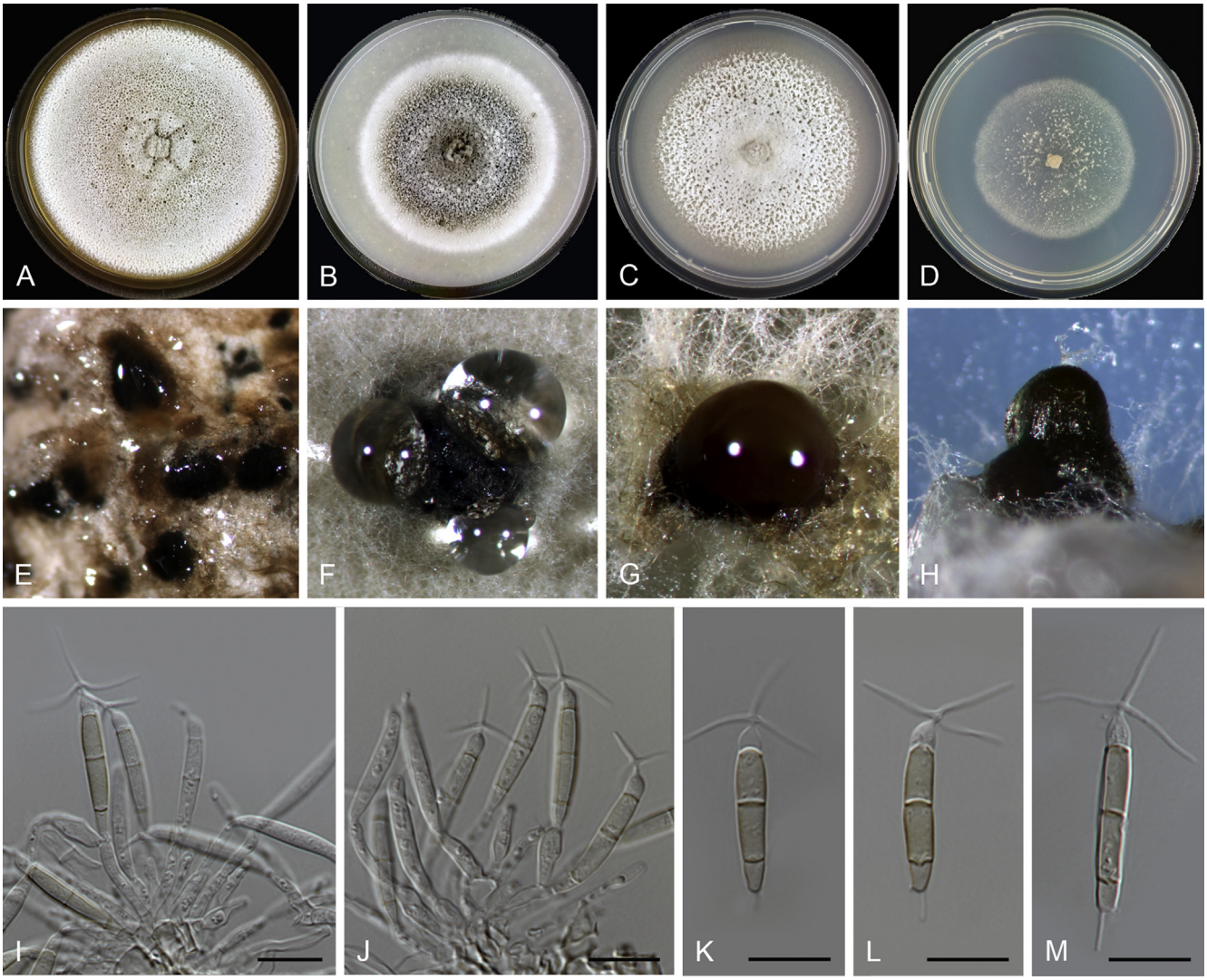

Fig. 9. *Bartalinia bella* (ex-type CBS 464.61). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–J.** Conidiophores. **K–M.** Conidia. Scale bars = 10 µm.

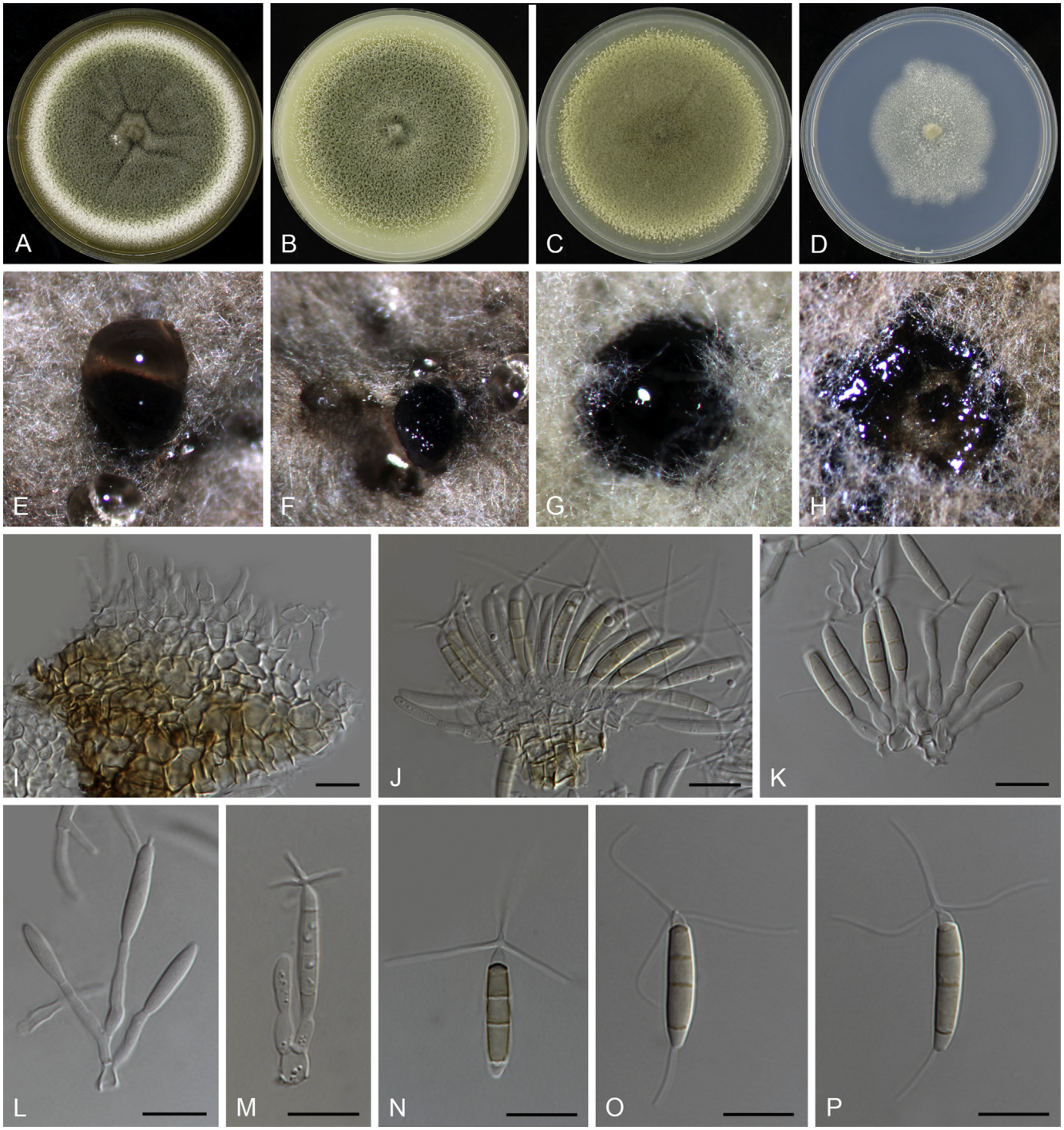

Fig. 10. *Bartalinia pini* (CBS 143891/CPC 24328). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on MEA. **G–H.** Conidiomata on CMA and PDA. **I–M.** Conidiophores, conidiogenous cells and conidia. **N–P.** Conidia. Scale bars = 10 µm.

2–3, cylindrical, doliiform, or trapezoidal, fairly thick-walled, pale to mid brown, or yellowish brown, ± equal, each 2.5–5.5(–8) µm (av. = 3.8 ± 0.66 µm) long; apical cell short-conic with an acute apex, hyaline, 1.5–3 µm (av. = 2.3 ± 0.47 µm) long; apical appendage single, unbranched, attenuated, tubular, 5–16 µm (av. = 11.6 ± 2.72 µm); basal appendage single, unbranched, tubular, excentric, 6.5–17.5 µm (av. = 12.9 ± 3.4 µm) long; mean conidium length/width ratio = 3.1:1.

Material examined: **Australia**, Victoria, on *Acacia pycnantha* (*Fabaceae*), 20 Feb. 1976, unknown collector, CBS H-23528, living culture CBS 143903 = CPC 28304.

Notes: This isolate morphologically resembles the type species of *Disaeta* (*Disaeta arbuti*) in producing 4-septate conidia with bristle-like appendages (Bonar 1928). *Disaeta arbuti* was synonymised as *Seimatosporium arbuti* by Shoemaker (1964). However, neither Bonar (1928) nor Shoemaker (1964) mentioned the type specimen nor where it was deposited. *Seimatosporium* is generally characterised by 3-septate conidia, therefore we propose that *Sei. arbuti* should be excluded from this genus and *Disaeta* should be resurrected. Culture CBS 143903 was isolated from *Acacia pycnantha* from Australia in this study, which does not match the original collection information of *Disaeta arbuti* (from *Arbutus menziesii* in California). Therefore, CBS 143903 is temporarily considered as a representative strain of *Disaeta arbuti* here, and typification of this species awaits further collections.

Disaeta arbuti morphologically resembles *Sarcostroma acacia*, another species reported from *Acacia pycnantha* from

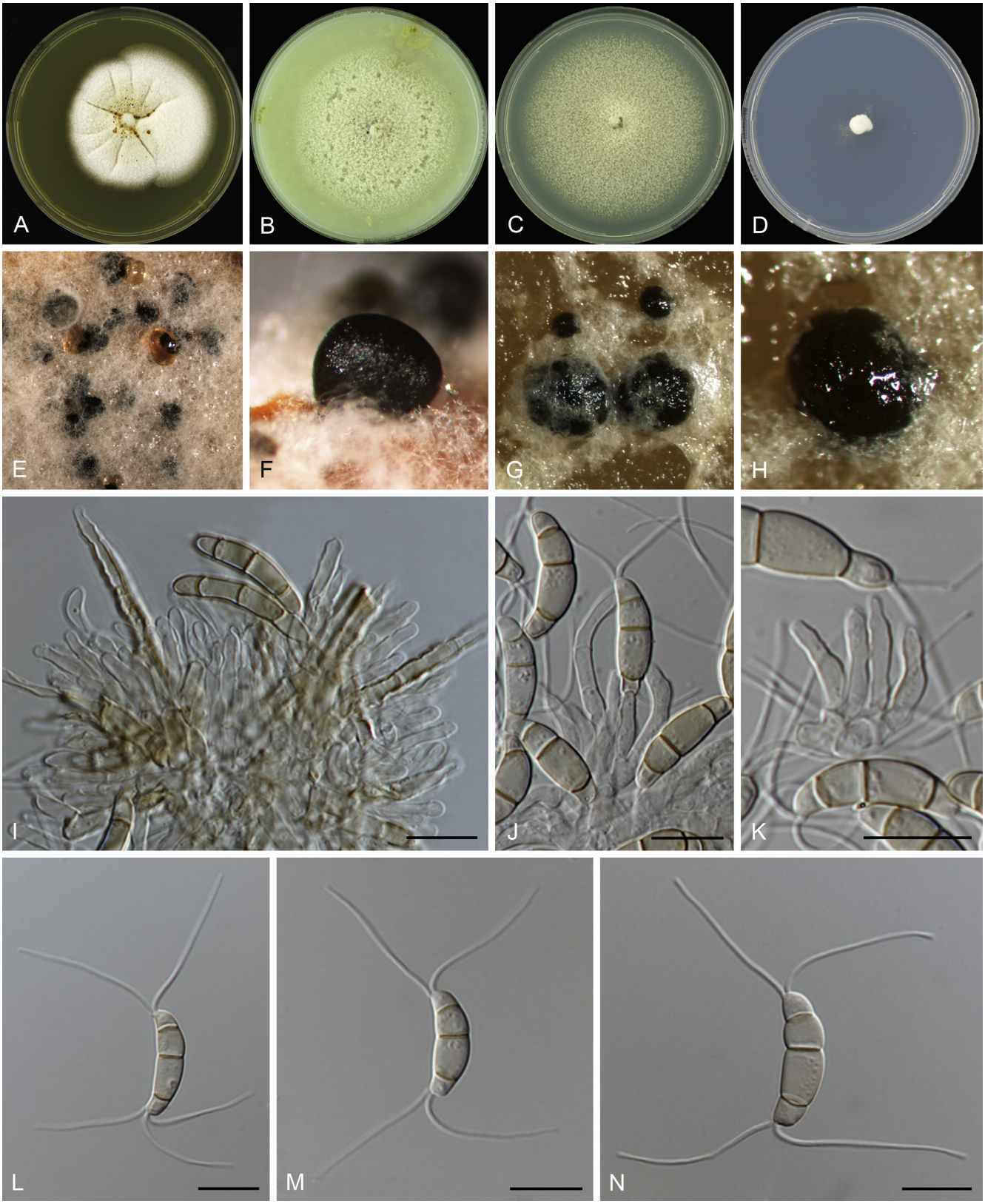

Fig. 11. *Diploceras hypericinum* (**A–I.** CBS 143885/CPC 21115, **J–N.** CBS 492.97). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on MEA. **G–H.** Conidiomata on CMA. **I–K.** Conidiophores, conidiogenous cells. **L–N.** Conidia. Scale bars = 10 µm.

Australia, but it differs from the latter in the length of the appendage (5–17.5 µm vs. 2–4 µm) and the mean conidium length/width ratio (3.1:1 vs. 2.4:1) (Nag Raj 1993).

Discosia Lib., Pl. crypt. Arduenna, fasc. (Liège) 4: no. 346. 1837. *Synonyms*: *Cryptostictella* Grove, J. Bot., Lond. 50: 52. 1912; fide Petrak & Sydow, Ann. mycol. 23: 209–294. 1925. *Discosiospora* A.W. Ramaley, Mycotaxon 35: 101. 1989. *Adisciso* Kaz. Tanaka *et al.*, Persoonia 26: 90. 2011.

Description: *Conidiomata* stromatic, variable from applanate to pycnidioid, intraepidermal to subepidermal or subperidermal in origin, immersed to suberumpent, occasionally appearing as conical blisters, unilocular to plurilocular, glabrous, dark brown to dull or glistening black; basal stroma in applanate conidiomata well developed, of *textura angularis*, cells thick-walled and dark

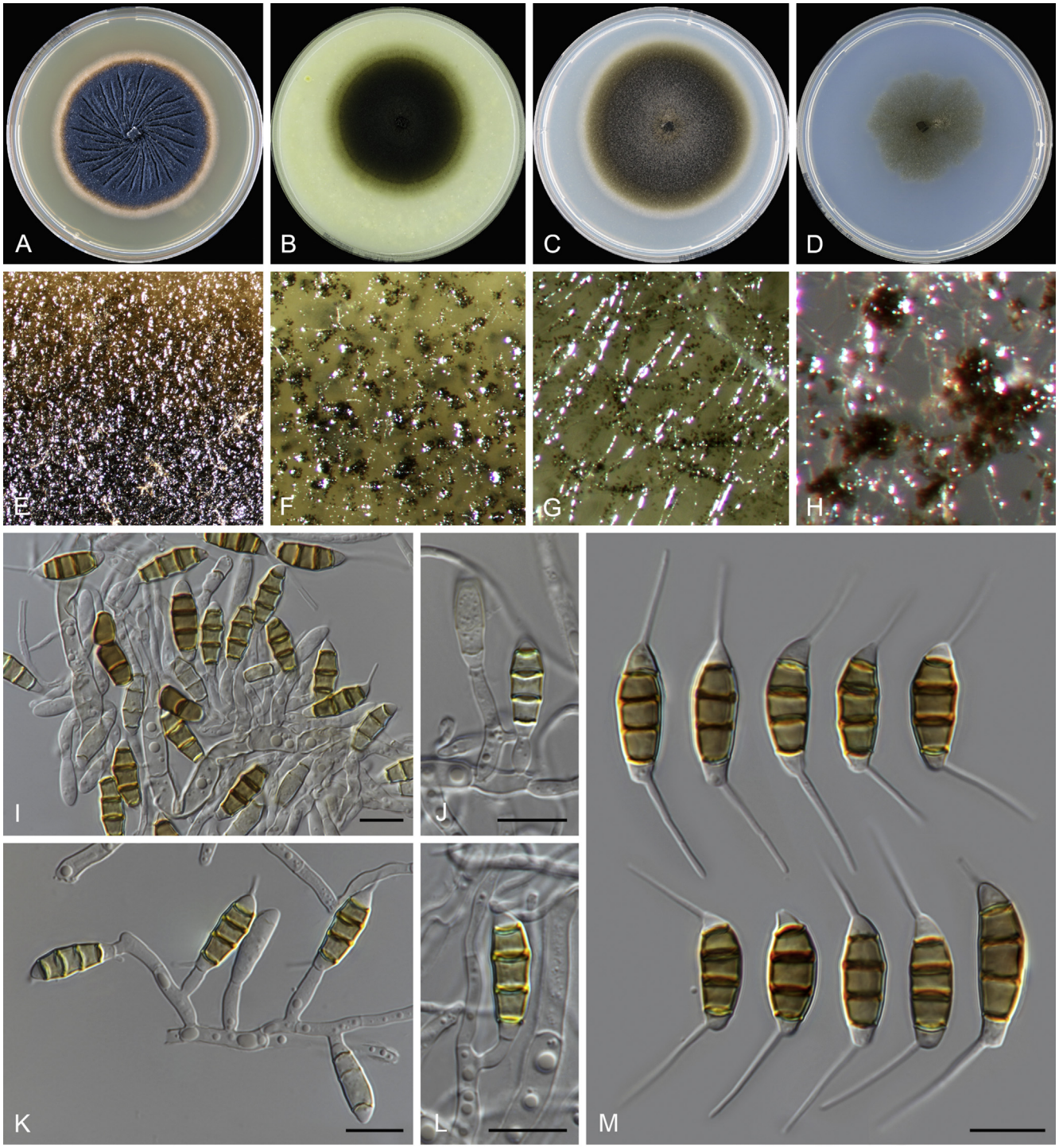

Fig. 12. *Disaeta arbuti* (CBS 143903/CPC 28304). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–L.** Conidiophores, conidiogenous cells and conidia. **M.** Conidia. Scale bars = 10 µm.

pigmented in the basal layers, becoming progressively thin-walled and paler toward the conidial hymenium; covering layer variable in thickness, of *textura angularis* to *textura epidermoidea*, cells thick-walled and brown, often with occluded lumina; walls, in stromatic indeterminate or pycnidioid forms, of *textura angularis*, cells thick-walled and dark brown to brown. *Conidiophores* arising at the base only, or at the base and part way up the sides, or all around the cavity of the conidioma, mostly reduced to conidiogenous cells, or long, septate and irregularly branched in a few species, colourless, thin-walled, smooth, invested in mucus. *Conidiogenous cells* discrete, rarely integrated, ampulliform, clavate, lageniform, narrow conical, subcylindrical, or cylindrical, colourless, thin-walled, smooth. *Conidia* cylindrical, fusoid, naviculate or subcylindrical, straight or curved, euseptate, cells of varying lengths, colourless, pale olivaceous or brown, smooth, bearing a cellular, unbranched or branched, filiform or attenuated appendage at each end; appendages maintaining protoplasmic continuity with conidium body and characteristically inserted on the basal and apical cells on the concave side of the conidium: in subpolar or polar position at the distal ends, medianly, or close to the septa separating the distal cells from the median cells (emended from Nag Raj 1993).

Type species: *Discosia artocreas* (Tode) Fr.

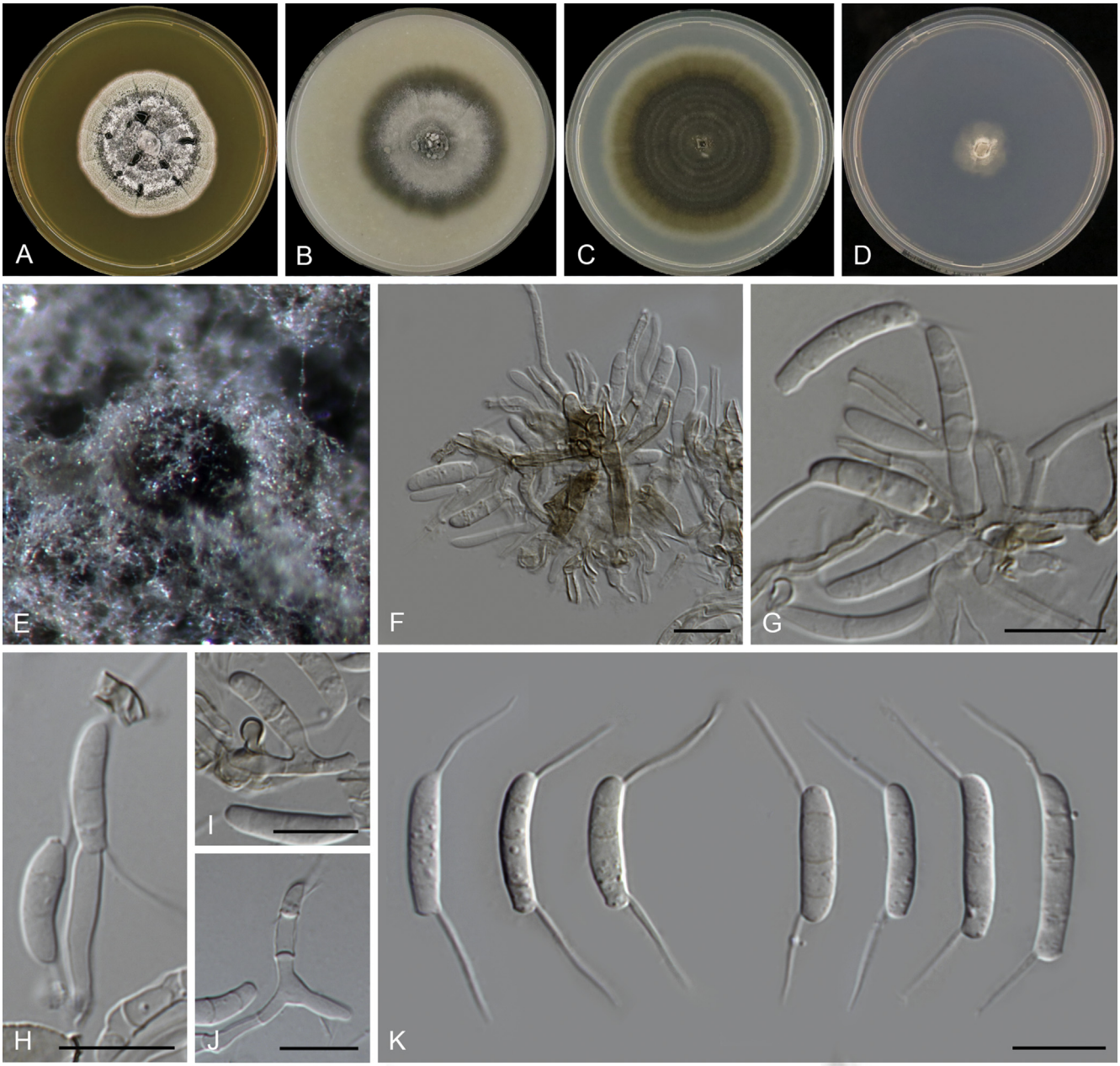

Fig. 13. *Discosia artocreas* (CBS 124848). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidiomata on MEA. **F–J.** Conidiophores, conidiogenous cells and conidia. **K.** Conidia. Scale bars = 10 µm.

Notes: *Adisciso* was introduced as generic name to accommodate sexual *Discosia* spp. (Tanaka *et al.* 2011). Based on the multi-locus phylogenetic analyses, the generic type strain of *Adisciso* (*Adi. yakushimense*) clustered within the genus *Discosia* (Fig. 2). To comply with "One fungus = one name" initiative (Wingfield *et al.* 2012), *Adisciso* is synonymised under *Discosia*.

Discosia artocreas (Tode) Fr., Summa veg. Scand., Sectio Post. (Stockholm): 423. 1849. Fig. 13.
Basionym: *Sphaeria artocreas* Tode, Fung. mecklenb. sel. (Lüneburg) 2: 20. 1791.
Synonyms: See Nag Raj (1993).

Culture characteristics: Colonies on MEA undulate with radial circular lines on surface, glaucous grey to greenish grey, reaching 47–50 mm diam after 14 d at 21 °C, conidiomata black, covered by aerial mycelia, gregarious, stromatic, semi-immersed or immersed; on CMA flat with entire edge, greenish grey, reaching 65–68 mm diam after 14 d at 21 °C, conidiomata scattered or gregarious, pale grey, brown or black, stromatic, semi-immersed; on PDA flat with entire edge, forming concentric circles, olivaceous black, sterile, reaching 69 mm diam after 14 d at 21 °C; on SNA flat with erose or dentate edge, white to pale grey, sterile, reaching 20–22 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, reduced to conidiogenous cells, colourless, smooth, thin-walled, arising from the upper cells of the basal stroma, invested in mucus. *Conidiogenous cells* discrete, mostly cylindrical, subcylindrical, or lageniform, 4–9 × 1.5–3.5 µm (av. = 7.3 ± 1.5 × 2.2 ± 0.47 µm), colourless, smooth; conidia sometimes formed directly from hypha. *Conidia* allantoid, cylindrical, straight or slightly curved, mostly 3-septate, occasionally 1-, 2- or 5-septate, smooth, 10–19 × 2.5–4 µm (av. = 14 ± 2.18 × 3 ± 0.38 µm), bearing appendages; basal cell

trapezoid or cylindrical, thin-walled, hyaline, 1.5–4.5 µm (av. = 2.9 ± 0.66 µm) long; median cells mostly 2, cylindrical, hyaline, thin-walled, ± equal, each 3.5–7 µm (av. = 4.6 ± 0.81 µm) long; apical cell conic with an acute or obtuse apex, hyaline, thin-walled, 1.5–4 µm (av. = 2.5 ± 0.6 µm) long; apical appendage single, unbranched, attenuated, tubular, 2.5–12.5 µm (av. = 9.2 ± 2.47 µm); basal appendage single, unbranched, tubular, excentric, 5.5–13.5 µm (av. = 11.4 ± 1.82 µm) long; mean conidium length/width ratio = 4.7:1.

Materials examined: **Germany**, on dead leaves of *Fagus* (*Fagaceae*), unknown collection date and collector (Tab. 9, fig. 73, in Tode, Fung. Mecklenb. Sel. 2, 1791, **lectotype designated here**, MBT384684); Greifswald, Elisenhain, leaf litter of *Fagus sylvatica*, 4 Jan. 2008, M. Unterseher (CBS H-23558 **epitype designated here**, MBT383928, ex-epitype culture CBS 124848).

Notes: *Discosia* was originally described with two species, *Dis. faginea* and *Dis. strobilina* (Libert 1837). Later, an older name *Sphaeria artocreas* described by Tode (1791) was transferred to *Discosia* (Fries 1849), and the name *Dis. artocreas* was selected as lectotype species of the genus (Vanev 1991). The original collection of Tode's fungus was destroyed. We therefore selected the figure in Tode (1791) as lectotype and designated specimen CBS H-23558 as epitype of *Dis. artocreas* in this study.

Discosia rubi F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828322. Fig. 14.

Etymology: Named after its host plant, *Rubus phoenicolasius*.

Culture characteristics: Colonies on MEA convex with papillate surface, undulate edge, dark green, reaching 23–24 mm diam after 14 d at 21 °C, conidiomata black, gregarious, stromatic, pycnidioid; on CMA flat with undulate edge, dark bluish green, aerial mycelia flocculent, reaching 50–55 mm diam after 14 d at 21 °C, conidiomata gregarious, black, stromatic, usually surrounded with hyaline liquid drops; on PDA flat with undulate edge, pistachio green, reaching 25–26 mm diam after 14 d at 21 °C, conidial masses black; on SNA flat with undulate edge, grey to pale green, reaching 22–24 mm diam after 14 d at 21 °C, conidiomata dark brown to black, scattered, acervular, superficial.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* aseptate, branched, reduced to conidiogenous cells, colourless, smooth, thin-walled. *Conidiogenous cells* discrete, cylindrical, subcylindrical or lageniform, 4.5–9.5 × 1.5–2.5 µm (av. = 7.2 ± 1.07 × 2.1 ± 0.25 µm), colourless, smooth. *Conidia* cylindrical, straight or slightly curved, almost colourless, 3-septate, smooth, without constriction at the septa, 13.5–23 × 1.5–3.5 µm (av. = 18.6 ± 1.95 × 2.5 ± 0.32 µm); basal cell cylindrical, thin-walled, hyaline, 2.5–5 µm (av. = 4.1 ± 0.57 µm) long; median cells 2, cylindrical, hyaline, thin-walled, unequal, the second cell from base 4–8 µm (av. = 6.4 ± 0.85 µm) long, the third cell 3.5–6 µm (av. = 5 ± 0.6 µm) long; apical cell sub-cylindrical with rounded or obtuse apex, hyaline, thin-walled, 2–4.5 µm (av. = 3.3 ± 0.47 µm) long; appendages tubular, slender, flexuous; apical appendage single, unbranched, excentric, 6–15.5 µm (av. = 12 ± 2.51 µm) long, inserted about 1–1.5 µm from the apical septum; basal appendage single, unbranched, excentric, 5.5–19 µm (av. = 14.7 ± 2.81 µm) long, inserted about 1.5–2 µm from the basal septum; mean conidium length/width ratio = 7.4:1.

Material examined: **USA**, Maryland, on *Rubus phoenicolasius* (*Rosaceae*), 4 Sep. 2014, W.L. Bruckart (**holotype** CBS H-23517, ex-type culture CBS 143893 = CPC 25062).

Notes: Two strains of *Discosia rubi* formed a well-supported and distinct clade on the ITS tree (Fig. 3), closely related to *Dis. neofraxinea*. *Discosia rubi* shows 96 % ITS sequence similarity with *Dis. neofraxinea* and 98 % on LSU. Morphologically, *Dis. rubi* is distinct from *Dis. neofraxinea* by producing relatively shorter conidiogenous cells (4.5–9.5 µm vs. 6–40 µm). The second cell from the base is generally longer than the third cell in *Dis. rubi*, which is converse in *Dis. neofraxinea*. In addition, the appendages of *Dis. rubi* formed from the side of the apical and basal cells, but formed from the apex of conidia in *Dis. neofraxinea.* This is the first report of a *Discosia* species from *Rubus phoenicolasius.*

Discosia tricellularis (Okane *et al.*) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828336.
Basionym: *Discostroma tricellulare* Okane *et al.*, Canad. J. Bot. 74: 1339. 1996.
Synonym: *Adisciso tricellulare* (Okane *et al.*) Kaz. Tanaka *et al.*, Persoonia 26: 93. 2011.

Description: See Okane *et al.* (1996), Tanaka *et al.* (2011).

Material examined: **Japan**, Tsukuba, Ibaraki, on leaves of *Rhododendron indicum* (*Ericaceae*), 12 Sep. 1993, unknown collector, (NBRC H-12205 (= IFO H-12205), **holotype** of *Discostroma tricellulare*, ex-type culture NBRC 32705, not seen).

Discosia yakushimensis (Kaz. Tanaka *et al.*) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828337.
Basionym: *Adisciso yakushimense* Kaz. Tanaka *et al.*, Persoonia 26: 92. 2011.

Description: See Tanaka *et al.* (2011).

Material examined: **Japan**, Kagoshima, Yakushima Island, Okenoguchi, near Nakasegawa, 30°16'39"N, 130°37'09"E, on living leaves of *Symplocos prunifolia* (*Symplocaceae*), 21 Oct. 2005, K. Tanaka & T. Hosoya, KT 1907 (HHUF 29671 **holotype**, TNS-F-12443 isotype, monoconidial isolate ex-type MAFF 242774 = NBRC 104194, not seen).

Distononappendiculata F. Liu, L. Cai & Crous **gen. nov.** MycoBank MB828323.

Etymology: Differs from the genus *Nonappendiculata* by its distoseptate conidia.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* acervular, stromatic, superficial to semi-immersed, immersed, black, scattered or gregarious. *Conidiophores* septate and branched at the base, mostly reduced to conidiogenous cells, colourless, smooth. *Conidiogenous cells* annellidic, discrete or integrated, cylindrical, subcylindrical, ampulliform or lageniform, colourless. *Conidia* fusoid, oval, straight or curved, mid-brown to olivaceous, distoseptate, with or without septal pores, smooth or verruculose, thick-walled, concolourous or gradually shallow toward end cells; basal cell with a truncate base; apical cell conical, or obtuse at apex; appendage absent.

Type species: *Distononappendiculata banksiae* (Crous & Summerell) F. Liu, L. Cai & Crous.

Notes: *Distononappendiculata* is distinct from other genera in *Sporocadaceae* in producing distoseptate conidia, and is so far only known from Australia.

Distononappendiculata banksiae (Crous & Summerell) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828338. Fig. 15.
Basionym: *Seiridium banksiae* Crous & Summerell, Persoonia 27: 137. 2011.

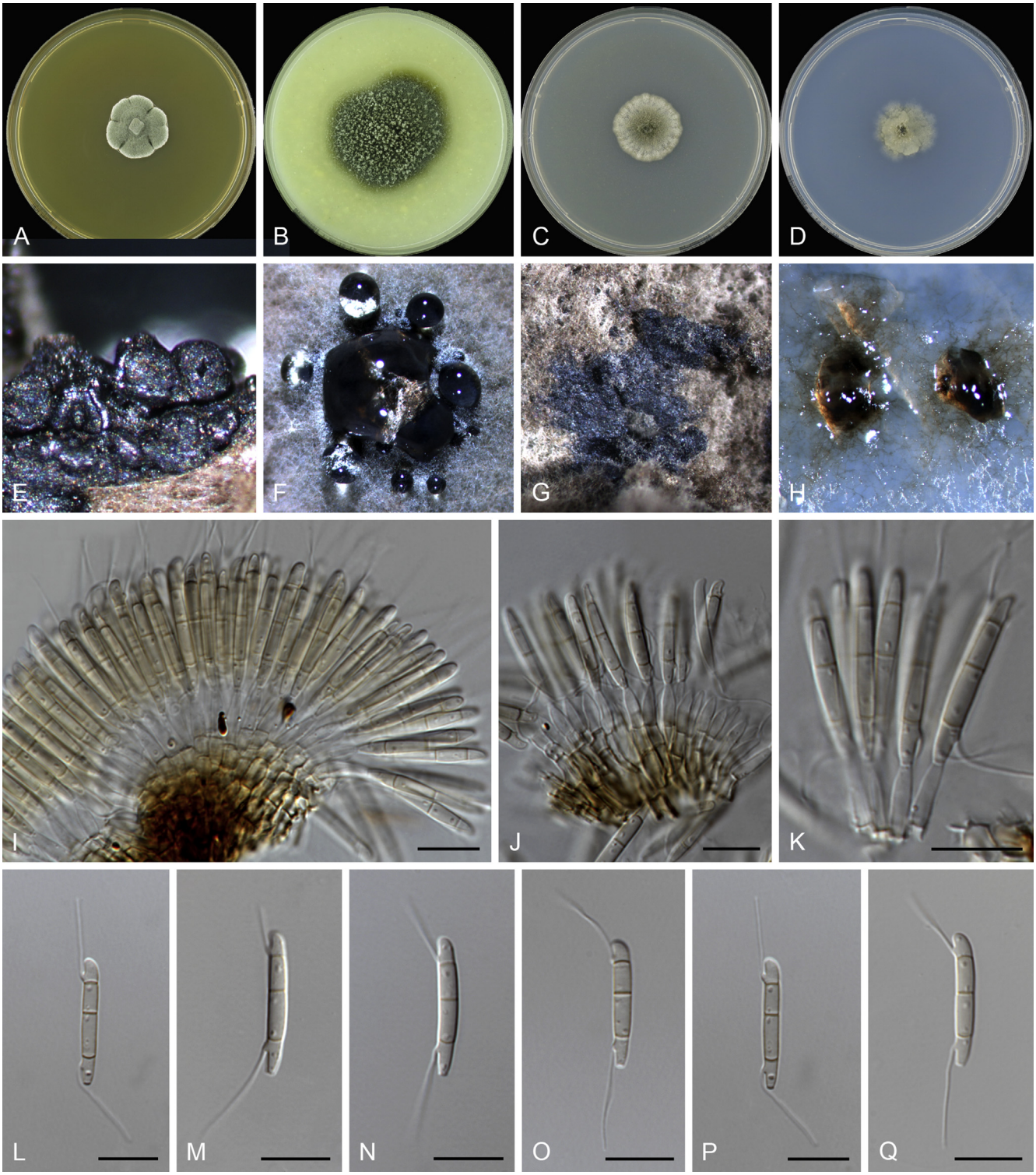

Fig. 14. *Discosia rubi* (CBS 143893/CPC 25062). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–K.** Conidiophores, conidiogenous cells and conidia. **L–Q.** Conidia. Scale bars = 10 µm.

Culture characteristics: See Crous *et al.* (2011).

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* lining the basal cavity, hyaline, 0–2-septate, unbranched, or branched below, smooth, thin-walled, mostly reduced to conidiogenous cells. *Conidiogenous cells* annellidic, discrete or integrated, cylindrical, subcylindrical, ampulliform or lageniform, 7.5–15 × 2.5–4 µm (av. = 11 ± 2.53 × 3.3 ± 0.48 µm), colourless, smooth. *Conidia* fusoid, straight or slightly curved, brown to olivaceous, 3(–5)-distoseptate with visible septal pores, obviously verruculose, thick-walled, without constrictions at the septa, 23–38 × 10–15 µm (av. = 31.8 ± 3.68 × 12.3 ± 1.64 µm), lacking appendages; basal cell with a truncate base, 1.5–4 µm diam.; apical cell attenuated towards apex; mean conidium length/width ratio = 3.3:1.

Materials examined: **Australia**, Kangaroo island, on *Banksia marginata* (*Proteaceae*), 1 Dec. 2011, W. Quaedvlieg, living culture CPC 20185; Tasmania, Crescent Bay, S 43°11'29.7" E 147°51'00.7", on leaves of *Banksia marginata*, 14 Oct. 2006, B.A. Summerell & P. Summerell (**holotype** of *Seiridium banksiae* CBS H-20756, ex-type culture CBS 131308 = CPC 13637); Victoria, on *Banksia marginata*, 17 Oct. 2009, P.W. Crous, living culture CPC 17658; Western Australia, on leaf of *Banksia formosa*, 22 Sep. 2015, P.W. Crous, HPC 618, living culture CBS 143906 = CPC 28968.

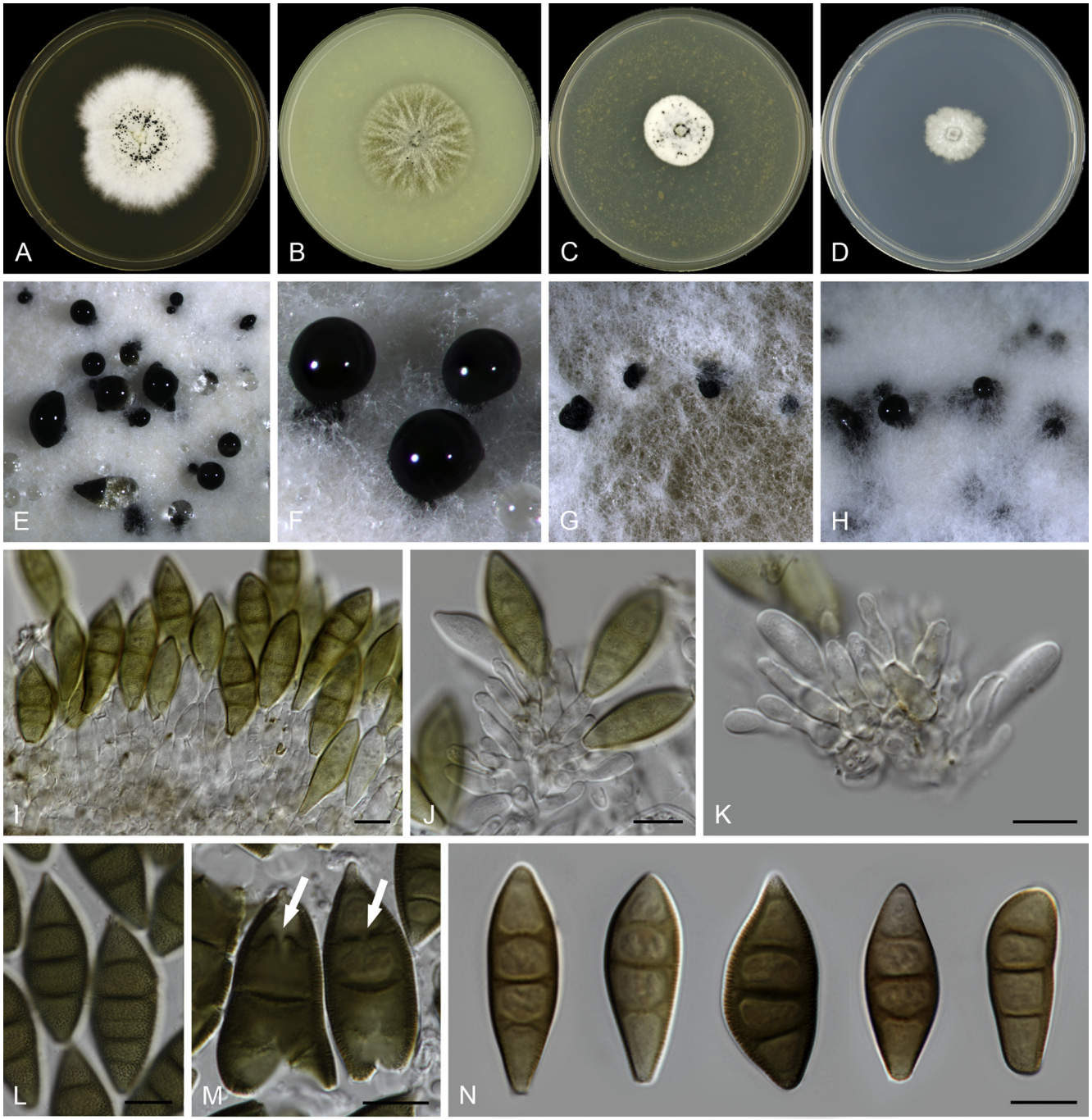

Fig. 15. *Distononappendiculata banksiae* (CBS 143906/CPC 28968). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on MEA. **G.** Conidiomata on CMA. **H.** Conidiomata on PDA. **I–K.** Conidiophores, conidiogenous cells and conidia. **L.** Conidia with verruculose wall. **M.** Conidia with septal pores (arrow). **N.** Conidia. Scale bars = 10 µm.

Notes: This species was originally introduced as *Seiridium banksiae* (Crous *et al.* 2011) but appears phylogenetically distinct from *Seiridium* (Figs 1, 4) and differs morphologically by producing distoseptate and non-appendaged conidia. *Seiridium banksiae* is transferred to *Distononappendiculata*, and a new combination is proposed. All known collections of *Distononappendiculata banksiae* to date have been collected from *Banksia*.

Distononappendiculata casuarinae F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828324. Fig. 16.

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

Culture characteristics: Colonies on MEA flat with entire edge, pale greenish grey, with white margin, reaching 30–35 mm diam after 14 d at 21 °C, conidiomata gregarious, black, superficial, acervular, covered by aerial mycelia; on CMA concave with raised margin, erose or dentate, white, reaching 30–31 mm diam after 14 d at 21 °C, conidiomata scattered or gregarious, black, superficial, acervular; on PDA flat with fimbriate edge, glaucous grey, with white margin, sterile, reaching 46 mm diam after 14 d at 21 °C; on SNA flat with erose or dentate edge, colourless, sterile, reaching 40–41 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, some reduced to conidiogenous cells, colourless, smooth, thin-walled. *Conidiogenous cells* annellidic, discrete or integrated, cylindrical, subcylindrical, sometimes ampulliform or lageniform, 6.5–18.5 × 2–5 µm (av. = 10 ± 2.34 × 3.1 ± 0.69 µm), colourless, smooth. *Conidia* cylindrical, fusoid, obovoid, straight or slightly curved, pale brown or brown, 3-distoseptate with visible septal pores, wall smooth, thick-walled,

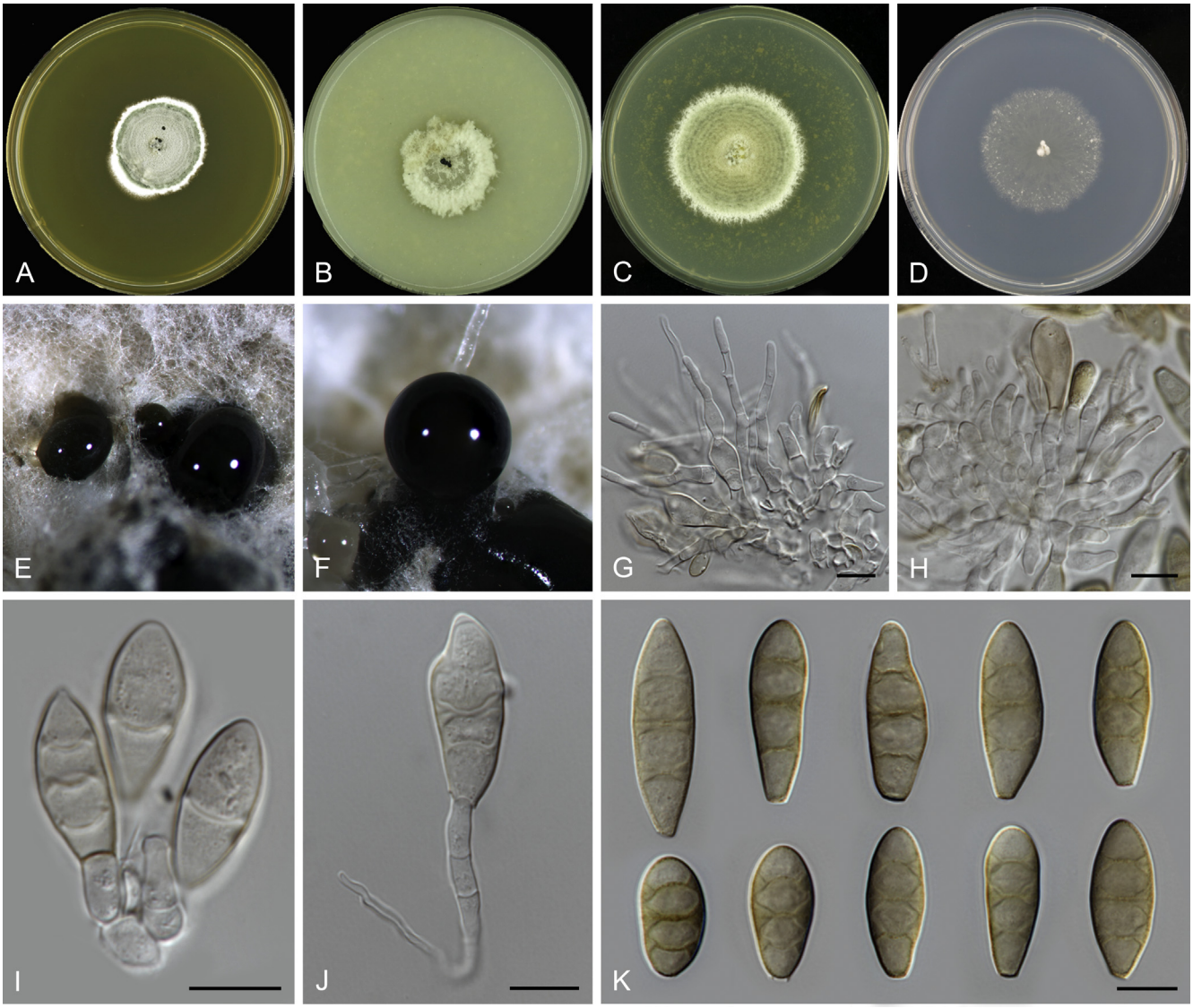

Fig. 16. *Distononappendiculata casuarinae* (CBS 143884/CPC 17253). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E– F.** Conidiomata on MEA and CMA. **G–J.** Conidiophores, conidiogenous cells and conidia. **K.** Conidia. Scale bars = 10 µm.

without constrictions at the septa, 19.5–28.5 × 7.5–11 µm (av. = 23.7 ± 2.52 × 9.2 ± 0.86 µm), lacking appendages; basal cell with a truncate base, 1.5–4 µm (av. = 2.5 ± 0.49 µm) diam; apical cell attenuated towards apex, rounded or obtuse; mean conidium length/width ratio = 3.2:1.

Material examined: **Australia**, Queensland, on needles of *Casuarina* sp. (*Casuarinaceae*) displaying red bands, 9 Aug. 2009, P.W. Crous (**holotype** CBS H-23505, ex-type culture CBS 143884 = CPC 17253).

Notes: *Distononappendiculata casuarinae* is associated with red bands on needles of *Casuarina* sp. It is phylogenetically different from the closely related species *Dist. verrucata* (95 % sequence similarity on ITS, 90 % on *rpb2*, 88 % on *tef-1α*, 86 % on *tub2*). Morphologically, it differs from *Dist. verrucata* in producing smooth-walled conidia with septal pores (vs. verruculose, without visible septal pores in *Dist. verrucata*).

Distononappendiculata verrucata F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828325. Fig. 17.

Etymology: Name reflects the verruca on the conidium surface.

Culture characteristics: Colonies on MEA flat with ruffle lines on surface, erose or dentate edge, white, sterile, reaching 31–32 mm diam after 14 d at 21 °C; on CMA flat with entire edge, white, sterile, reaching 25–26 mm diam after 14 d at 21 °C; on PDA flat with crenate edge, white, rosy buff to vinaceous buff in the centre, reaching 27–28 mm diam after 14 d at 21 °C, conidiomata scattered, olivaceous or black, semi-immersed or immersed, covered by aerial mycelia, acervular; on SNA flat with erose or dentate edge, white, sterile, reaching 19–20 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* aseptate, reduced to conidiogenous cells, occasionally branched at the base, colourless, smooth, thin-walled. *Conidiogenous cells* discrete, cylindrical, 4–24 × 1–3.5 µm (av. = 8.6 ± 5.17 × 2 ± 0.53 µm), colourless, smooth. *Conidia* fusoid, obovoid, straight or slightly curved, brown, 3-distoseptate without visible septal pores, wall verruculose and thicker than septa, without constrictions at the septa, 19–33.5 × 6.5–10 µm (av. = 25.1 ± 3.22 × 8.6 ± 0.96 µm), lacking appendages; basal cell with a truncate base, 1.5–2.5 µm (av. = 2 ± 0.29 µm) diam.; apical cell attenuated towards apex, rounded or obtuse; mean conidium length/width ratio = 2.9:1.

Material examined: **Australia**, Western Australia, on leaves of *Banksia repens* (*Proteaceae*), 21 Sep. 2015, P.W. Crous, HPC 611 (**holotype** CBS H-23538, ex-type culture CBS 144032 = CPC 29074).

Fig. 17. *Distononappendiculata verrucata* (CBS 144032/CPC 29074). **A–D.** Colonies on MEA, CMA, PDA and SNA. **E.** Conidiomata on PDA. **F–J.** Conidiophores and conidiogenous cells bearing conidia. **K–L.** Conidia. Scale bars = 10 µm.

Notes: *Distononappendiculata verrucata* is closely related to *Dist. banksiae* (Figs 1, 4; 97 % sequence similarity on ITS, 93 % on *rpb2*, 87 % on *tef-1α*, 89 % on *tub2*), but differs from the latter in producing thinner conidia (6.5–10 µm vs. 10–15 µm) and having a smaller mean conidium length/width ration (2.9:1 vs. 3.3:1). In addition, the conidia of *Dist. verrucata* are 3-septate without visible septal pores, while the conidia of *Dist. banksiae* are 3–5-septate and with visible septal pores. Strain CBS 144032 only sporulates on PDA.

Diversimediispora F. Liu, L. Cai & Crous, **gen. nov.** MycoBank MB828326.

Etymology: Diversis = different, diverse, in Latin; mediis = medium, in Latin; named after the versicoloured median cells.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* stromatic, acervular to pycnidioid, superficial to semi-immersed, scattered or gregarious, black, erumpent. *Conidiophores* lining the cavity of the conidioma, septate, reduced to conidiogenous cells, colourless, smooth, invested in mucus. *Conidiogenous cells* discrete, cylindrical, lageniform, or ampulliform, colourless, smooth. *Conidia* fusoid, euseptate, bearing appendages; basal cell obconic with a truncate base, thin-walled, colourless to pale brown; median cells doliiform, trapezoid, thick-walled, without or with slight constriction at septa, pale brown to black, the second and third cell from apex darker than other median cells, the basal median cell verruculose; apical cell conic or semi-circle with a small protuberant apex giving rise to appendages, thin-walled, colourless to pale brown; appendages attenuated, tubular, filiform, flexuous, branched or unbranched.

Type species: *Diversimediispora humicola* F. Liu, L. Cai & Crous.

Notes: The second and third cells from the apex of *Diversimediispora* are darker than the rest of conidium, a distinctive character that differs from other genera in *Sporocadaceae*. Based on the multi-locus phylogenetic analyses, *Diversimediispora* is closely related to *Hyalotiella* (97 % sequence similarity on ITS, 99 % on LSU, 83 % on *rpb2*, 86 % on *tef-1α*, and 86 % on *tub2*), but it differs from the latter in producing fusoid conidia (vs. cylindrical or subcylindrical conidia in *Hyalotiella*) and a basal appendage (vs. non-appendaged in *Hyalotiella*).

Diversimediispora humicola F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828327. Fig. 18.

Etymology: Refers to the substrate from which it was isolated, soil.

Culture characteristics: Colonies on MEA flat with undulate edge, with radial lines on surface, off-white, reaching 56–59 mm diam after 14 d at 21 °C, conidiomata black, forming concentric circles, scattered, superficial or immersed, acervular; on CMA flat with entire edge, white, reaching 56 mm diam after 14 d at 21 °C, conidiomata black, superficial or immersed, scattered, acervular; on PDA flat with entire edge, white to off-white, reaching 78–79 mm diam after 14 d at 21 °C, conidiomata black, scattered or gregarious, superficial or semi-immersed, acervular; on SNA flat with undulate edge, colourless, conidial masses black, superficial or immersed, scattered.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* reduced to conidiogenous cells, smooth, colourless. *Conidiogenous cells* discrete, cylindrical, subcylindrical, lageniform or ampulliform, 6.5–14.5(–24) × 1.5–5 µm, (av. = 9.5 ± 2.2 × 3.3 ± 0.72 µm), colourless, smooth. *Conidia* fusoid or sub-fusoid, straight, occasionally slightly curved, mostly 4-septate, sometimes 3- or 6-septate, the second top septum darker than other septa, barely and slightly constricted at the septa, 20–26.5(–34) × 8.5–11.5 µm (av. = 23.9 ± 1.72 × 10.4 ± 0.76 µm); basal cell obconic with a truncate base, fairly thick-walled, hyaline to pale brown, 2.5–4.5 µm (av. = 3.2 ± 0.42 µm) long; median cells mostly 3, doliiform, trapezoid, thick-walled, the second and third cells from apex dark brown to black, smooth, ± equal, each 4–6 µm (av. = 5.1 ± 0.44 µm) long, the third median cell mid-brown to brown, or yellowish brown, verruculose, 5–8 µm (av. = 6.6 ± 0.71 µm) long; apical cell conic or semi-circle with a small protuberance at apex giving rise to appendages, thin-walled, hyaline to pale brown, short, 1.5–3(–4) µm (av. = 2.3 ± 0.46 µm) long; 2–4 apical appendages, arising at the same point, attenuated, tubular, filiform, flexuous, unbranched, or occasionally dichotomously branched at the base of the 1–2 appendages, (7.5–) 16–36.5 µm (av. = 27 ± 4.52 µm) long; basal appendage single, tubular, centric, 5–21.5 µm (av. = 11.2 ± 3.49 µm) long; mean conidium length/width ratio = 2.3:1.

Material examined: **USA**, soil, unknown collection date, Meylan, deposited by F. Seigle-Murandi (**holotype** CBS H-23539, ex-type culture CBS 302.86).

Notes: *Diversimediispora humicola* is characterised by versicoloured median cells and septa, i.e. its first and second median cells from the apex are darker than the other cells and the second septum from the apex is uniquely darker than the other septa. In addition, the basal median cell of *Div. humicola* generally becomes verruculose with age, while the rest of the conium body remains smooth.

Heterotruncatella F. Liu, L. Cai & Crous, **gen. nov.** MycoBank MB828340.

Etymology: Morphologically similar to but phylogenetically different from *Truncatella*.

Description: *Ascomata* solitary or gregarious, scattered, immersed under minute clypeus, uniloculate, globose to subglobose, coriaceous, papillate or apapillate, brown. *Ostiole* central, wide, rounded. *Papilla* composed of cells of *textura porrecta* and internally lined with hyaline periphyses. *Peridium* comprising light yellow or brown, thick-walled cells of *textura prismatica* in the upper part, and thick-walled, hyaline to pale brown cells of *textura angularis* in other parts. *Hamathecium* comprising numerous hypha-like, septate paraphyses, slightly constricted at the septa, tapering towards the ends. *Asci* 8-spored, unitunicate, cylindrical to cylindrical-clavate, pedicellate, apically rounded, with a J- apical ring. *Ascospores* biseriate or overlapping tri-seriate, hyaline when young, sometimes pale greyish-brown with doliiform median cells and yellowish to pale greyish-brown end cells or brown at maturity, fusoid, glabrous, thick-walled, straight or inequilaterally curved, with pointed ends, 1–3-septate with constrictions at the septa and bearing unbranched, terminal appendages or ornamented wall (from Senanayake *et al.* 2015, as *Truncatella spartii*).

Conidiomata stromatic, acervular to pycnidioid, immersed to semi-immersed, glabrous, brown to black. *Conidiophores* lining the cavity of the conidioma, septate and branched, colourless, smooth, invested in mucus. *Conidiogenous cells* discrete or integrated, cylindrical, subcylindrical, ampulliform, lageniform, annellidic, colourless, smooth. *Conidia* fusoid, euseptate, straight or curved, constricted or not constricted at

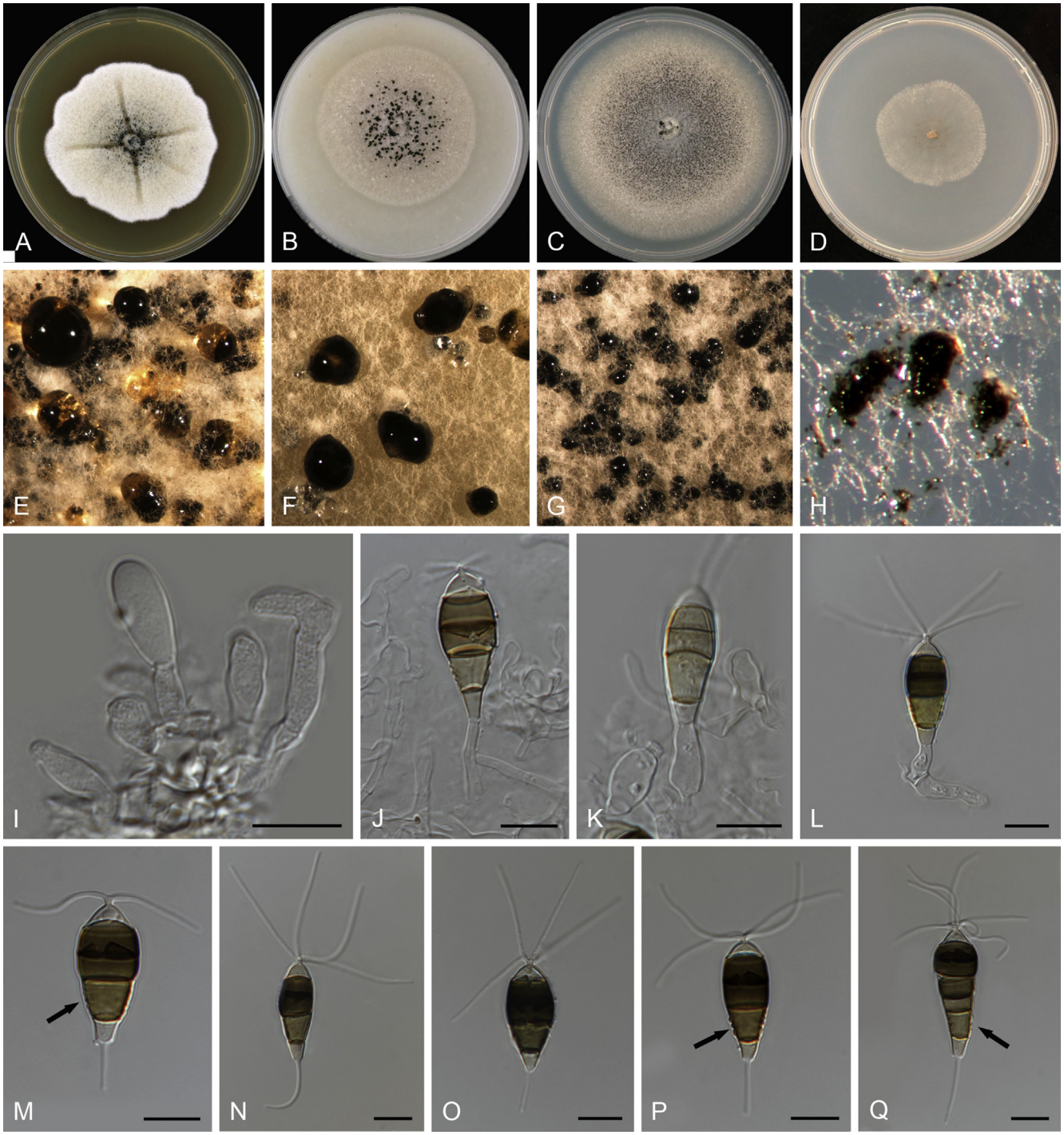

Fig. 18. *Diversimediispora humicola* (CBS 302.86). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I.** Conidiophores. **J–L.** Conidiogenous cells and conidia. **M–Q.** Conidia (arrows point to the verruculose wall of the first median cell from the basal cell). Scale bars = 10 µm.

septa; basal cell trapezoid or obconic with a truncate base, thin-walled, most colourless, sometimes pale brown; median cells doliiform to subcylindrical, wall thick, often verruculose, yellowish brown to brown and concolourous; apical cell conic, thin-walled, colourless; apical appendages cellular, unbranched, occasionally branched, attenuated or not attenuated, tubular, filiform, flexuous; basal appendage usually absent, when present, single, occasionally two, tubular, filiform, unbranched, centric.

Type species: *Heterotruncatella lutea* (H.J. Swart & D.A. Griffiths) F. Liu, L. Cai & Crous.

Notes: Although species in this clade are currently accepted in *Truncatella*, the phylogenetic analyses (Figs 1, 7) show that *Heterotruncatella* is more related to *Bartalinia*, *Hymenopleela* and *Morinia* than the clade including the generic type of *Truncatella*. Indeed, morphologically fungi from *Truncatella* and *Heterotruncatella* are similar in having 3-septate conidia, yellowish brown to brown median cells and branched or unbranched apical appendages.

Heterotruncatella acacigena F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828342. Fig. 19.

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

Culture characteristics: Colonies on MEA raised with concave edge, pale brown, reaching 80 mm diam after 14 d at 21 °C, conidiomata black, superficial, acervular; on CMA flat with entire edge, white to pale grey, reaching > 90 mm diam after 14 d at

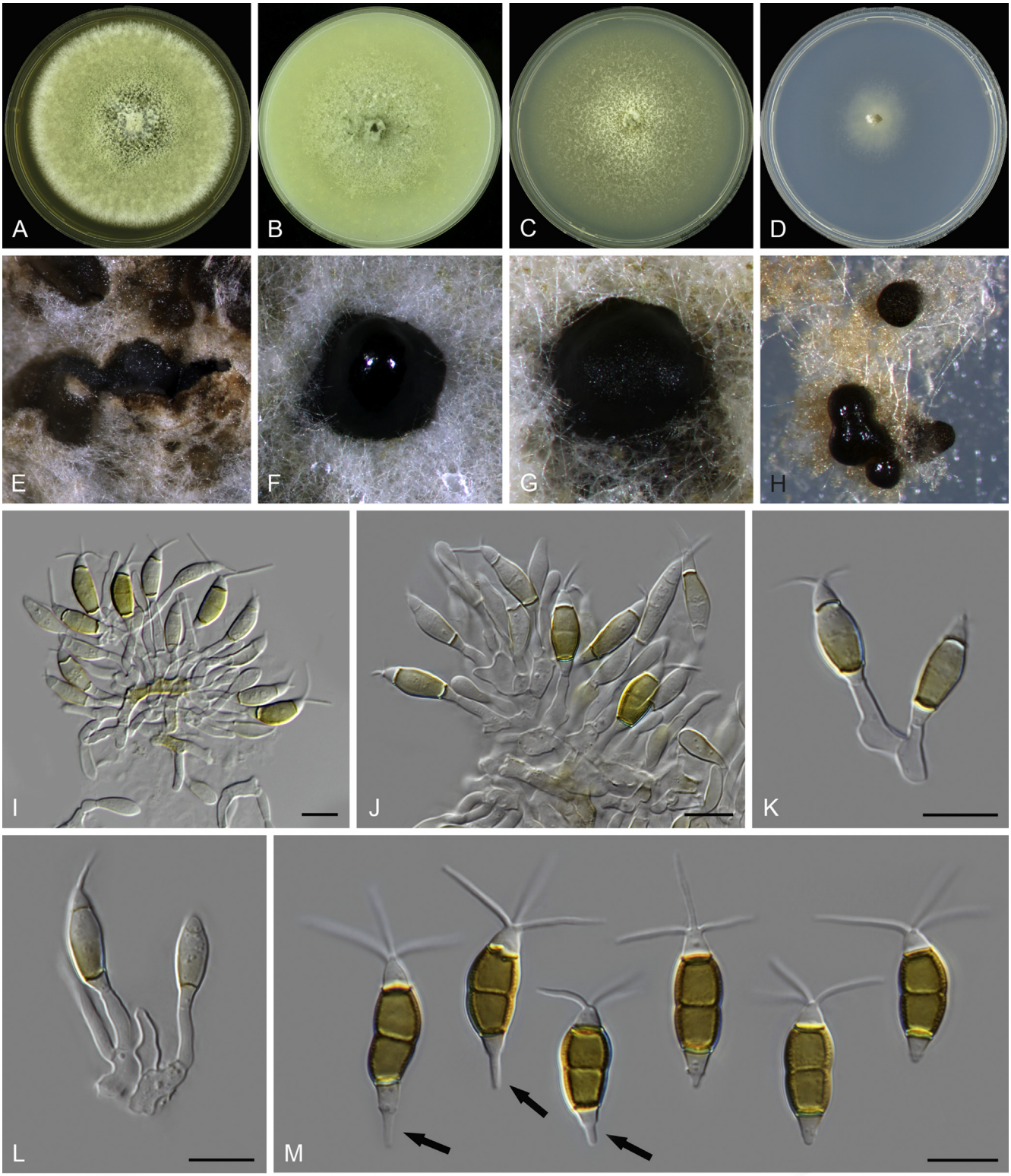

Fig. 19. *Heterotruncatella acacigena* (CBS 143880/CPC 15130). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–J.** Conidiophores. **K–L.** Conidiogenous cells and conidia. **M.** Conidia (arrows point to the untypical basal appendages). Scale bars = 10 µm.

21 °C, conidiomata dark brown to black, semi-immersed, scattered or gregarious, covered by mycelia; on PDA flat with entire edge, off-white, reaching > 90 mm diam after 14 d at 21 °C, conidiomata black, scattered or gregarious, superficial, often covered by aerial mycelia, stromatic; on SNA flat with fimbriate edge, colourless, reaching 33–35 mm diam after 14 d at 21 °C, conidiomata black, scattered or gregarious, superficial, stromatic.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, usually branched at the base, mostly reduced to short conidiogenous cells, colourless, smooth, invested in mucus. *Conidiogenous cells* discrete or integrated, cylindrical, subcylindrical, lageniform or ampulliform, 4–15 × 1.5–3 µm (av. = 9 ± 2.97 × 2 ± 0.51 µm), colourless, smooth. *Conidia* fusoid, straight, 3-septate, sometimes distal septa thicker than the median septum, smooth, 13.5–22 × 4.5–7 µm (av. = 16.8 ± 2.22 × 5.9 ± 0.67 µm); basal cell obconic with a narrow truncate base, hyaline, 2–4.5 µm (av. = 3 ± 0.49 µm) long; median cells 2, doliiform, fairly thick-walled, yellowish brown, ± equal, each 4.5–6 µm (av. = 5.4 ± 0.45 µm) long; apical

cell conic with an acute or narrow truncate apex, thin-walled, hyaline, 2–4 µm (av. = 3.1 ± 0.46 µm) long; 2–3 apical appendages, arising at different points, tubular, unbranched, 7.5–18 µm (av. = 11.1 ± 2.59 µm) long; basal appendage single or absent, if present, tubular, attenuated, (1–)2–6 µm (av. = 3.1 ± 1.17 µm) long; mean conidium length/width ratio = 2.8:1.

Material examined: **Australia**, New South Wales, Mount Annan Botanical Garden, on *Acacia pedina* (*Fabaceae*), 10 Apr. 2008, B.A. Summerell (**holotype** CBS H-23500, ex-type culture CBS 143880 = CPC 15130).

Notes: *Heterotruncatella acacigena* is closely related to *Het. grevilleae* (99 % sequence similarity on ITS, 98 % on *rpb2*, 92 % on *tef-1α*, 92 % on *tub2*) and *Het. vinaceobubalina* (99 % sequence similarity on ITS, 98 % on *rpb2*, 94 % on *tef-1α*, and 95 % on *tub2*) (Fig. 7). The basal appendages of these three species are not typical of other appendaged coelomycetous genera, which are more or less like protrusions continuing with the conidium body. *Heterotruncatella acacigena* is morphologically different from the related species in conidial length (13.5–22 µm in *Het. acacigena* vs. 19.5–27 µm in *Het. grevilleae*, 17–31.5 µm in *Het. vinaceobubalina*) and median cell length (each 4.5–6 µm in *Het. acacigena* vs. 6.5–9.5 µm in *Het. grevilleae*, 5–11.5 µm in *Het. vinaceobubalina*), as well as the mean conidium length/width ratio (2.8:1 vs. 3.5:1, 3.7:1). In addition, the apical appendages of *Het. acacigena* and *Het. grevilleae* are attenuated, while those of *Het. vinaceobubalina* are consistently with spathulate tips.

Heterotruncatella aspera F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828345. Fig. 20.

Etymology: Name reflects the rough surface of the apical appendage.

Culture characteristics: Colonies on MEA flat with entire edge, white, reaching 57 mm diam after 14 d at 21 °C, conidiomata pale brown to brown, stromatic, gregarious, semi-immersed; on CMA flat with undulate edge, white, reaching 56–58 mm diam after 14 d at 21 °C, conidiomata black, scattered, acervular; on PDA flat with undulate edge, rosy buff, reaching 50–54 mm diam after 14 d at 21 °C, conidiomata brown or black, semi-immersed or immersed, acervular or stromatic; on SNA flat with fimbriate edge, white, sterile, reaching 15–16 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, mostly reduced to conidiogenous cells, smooth, colourless, invested in mucus. *Conidiogenous cells* annellidic, discrete or integrated, cylindrical, subcylindrical, lageniform or ampulliform, 5.5–12.5 × 1.5–3 µm, (av. =8.9 ± 2.3 × 2.4 ± 0.35 µm), colourless, smooth. *Conidia* fusoid or subfusoid, straight or curved, wall smooth or verruculose, 3-septate, distal septa thicker than median septum, barely constricted at the septa, 16.5–24.5 × 4.5–6.5 µm (av. = 20.5 ± 1.84 × 5.6 ± 0.46 µm); basal cell cylindrical or obconic with a truncate base, trapezoid, thin-walled, hyaline, 3–8 µm (av. = 4.5 ± 1.02 µm) long; median cells 2, doliiform or trapezoid, yellowish brown or mid-brown, thick-walled, ± equal, each 4.5–8 µm (av. = 6.2 ± 0.72 µm) long; apical cell conic with a truncate or acute apex, thin-walled, hyaline, 2.5–5.5 µm (av. = 3.5 ± 0.59 µm) long; 2–3 apical appendages, occasionally 1, arising at different points, attenuated, tubular, flexuous, rough, unbranched, sometimes 1–2 appendages dichotomously branched, 4.5–23 µm (av. = 12.3 ± 3.65 µm) long; basal appendage single or absent, if present, tubular, attenuated, 4–12 µm (av. = 8.1 ± 1.67 µm) long; mean conidium length/width ratio = 3.7:1.

Materials examined: **Australia**, Western Australia, on *Acacia glaucoptera* (*Fabaceae*), 22 Sep. 2015, P.W. Crous (**holotype** CBS H-23532, ex-type culture CBS 143907 = CPC 28992); on *Acacia glaucoptera*, 22 Sep. 2015, P.W. Crous, living culture CBS 144140 = CPC 28910.

Notes: *Heterotruncatella aspera* is closely related to *Het. constricta* (Fig. 7, 93 % on ITS, 97 % on *rpb2*, 89 % on *tef-1α*, and 90 % on *tub2*), but differs from the latter in producing thinner conidia (4.5–6.5 µm vs. 5.5–9.5 µm) and having a larger mean conidium length/width ratio (3.7:1 vs. 3:1). In addition, the conidia of *Heterotruncatella aspera* are usually not constricted at the septa and its apical appendages are rough and sometimes branched. However, *Het. constricta* produces conidia with constricted septa and smooth apical appendages. This is the first report of a *Sporocadaceae* species on *Acacia glaucoptera*.

Heterotruncatella avellanea F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828347. Fig. 21.

Etymology: Name reflects the hazel colour of median cells in mature conidia.

Culture characteristics: Colonies on MEA flat with entire edge, pale grey, reaching > 90 mm diam after 14 d at 21 °C, conidiomata covered by mycelia, black, acervular, stromatic, scattered, superficial or semi-immersed; on CMA flat with entire edge, white, reaching > 90 mm diam after 14 d at 21 °C, conidiomata covered by mycelia, brown, stromatic, erumpent, scattered, semi-immersed; on PDA flat with entire edge, off-white, reaching > 90 mm diam after 14 d at 21 °C, conidiomata black, acervular, superficial, scattered; on SNA flat with entire edge, colourless, reaching 56–59 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, smooth, colourless, invested in mucus. *Conidiogenous cells* annellidic, discrete or integrated, mostly cylindrical or subcylindrical, 7–30.5 × 1–2.5 µm, (av. =20.3 ± 6.06 × 1.8 ± 0.41 µm), colourless, smooth. *Conidia* fusoid, straight, wall undulate, 3-septate, 21.5–31.5 × 6–9 µm (av. = 26.4 ± 2.72 × 7.8 ± 0.67 µm); basal cell obconic with a truncate base, trapezoid, thin-walled, hyaline, 3.5–8 µm (av. = 4.6 ± 0.94 µm) long; median cells 2, doliiform or trapezoid, vinaceous buff to hazel, thick-walled, ± equal, each 6–10 µm (av. = 7.7 ± 0.96 µm) long; apical cell conic with a truncate apex, with three small but distinct protuberances at the apex, thin-walled, hyaline, 4–6.5 µm (av. = 5 ± 0.69 µm) long; 3–4 apical appendages, arising at different points, attenuated, filiform, flexuous, unbranched, sometimes dichotomously branched at one appendage, variable in size, 19–80 µm (av. = 47 ± 17.87 µm) long; basal appendage absent, if present, single, 8–20 µm (av. = 11.7 ± 3.68 µm) long; mean conidium length/width ratio = 3.4:1.

Materials examined: **Australia**, on *Eucalyptus viminalis* (*Myrtaceae*), 7 Nov. 2014, P.W. Crous, HPC 89 (**holotype** CBS H-23520, ex-type culture CBS 143896 = CPC 25377); Western Australia, on *Banksia gardneri* (*Proteaceae*), 20 Sep. 2015, P.W. Crous, HPC 750, living culture CBS 144033 = CPC 29480.

Notes: *Heterotruncatella avellanea* is closely related to *Heterotruncatella diversa* (Fig. 7, 99 % sequence similarity on ITS, 85 % on *rpb2*, 90 % on *tef-1α*, and 95 % on *tub2*), but morphologically different from the latter in the number of apical appendages (3–4 vs. 4–6) and mean conidium length/width ratio (3.4:1 vs. 2.9:1).

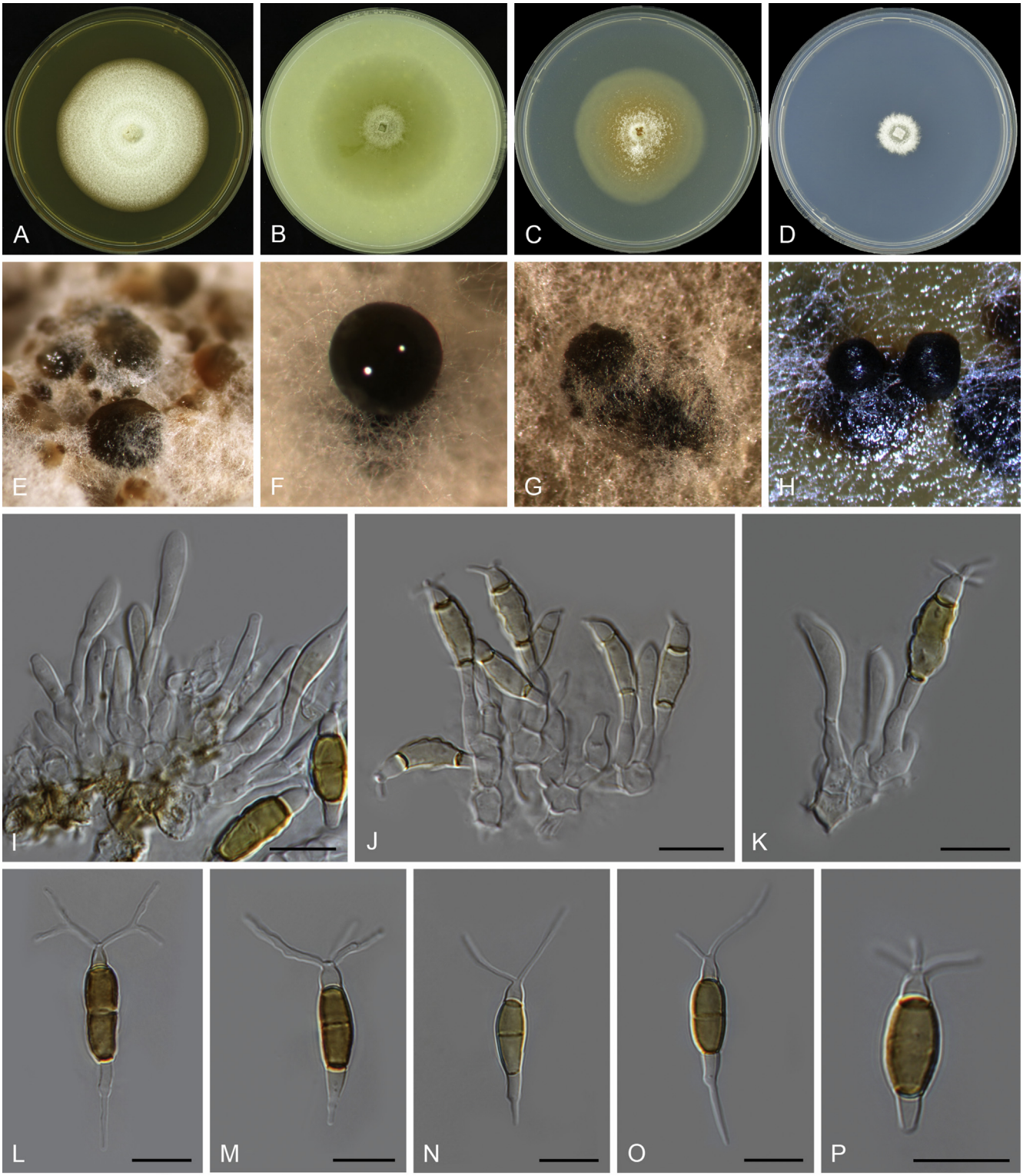

Fig. 20. *Heterotruncatella aspera* (CBS 143907/CPC 28992). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on MEA and CMA. **G–H.** Conidiomata on PDA. **I–K.** Conidiophores and conidiogenous cells. **L–P.** Conidia. Scale bars = 10 µm.

This is the first report of a *Heterotruncatella* or morphologically similar species associated with *Eucalyptus viminalis* and *Banksia gardneri.*

Heterotruncatella breviappendiculata F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828349. Fig. 22.

Etymology: Name reflects its short apical appendages.

Culture characteristics: Colonies on MEA flat with undulate edge, white to straw, reaching 58–62 mm diam after 14 d at 21 °C, conidiomata scattered, black, acervular, superficial; on CMA flat with entire edge, buff, reaching > 90 mm diam after 14 d at 21 °C, conidiomata scattered, dark brown to isabelline, acervular, superficial; on PDA flat with fimbriate edge, white, reaching 54–60 mm diam after 14 d at 21 °C, conidiomata scattered, black, acervular, stromatic, superficial; on SNA flat with undulate edge, colourless, sterile, reaching 42 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, mostly reduced to conidiogenous cells, smooth, colourless, invested in mucus. *Conidiogenous cells*

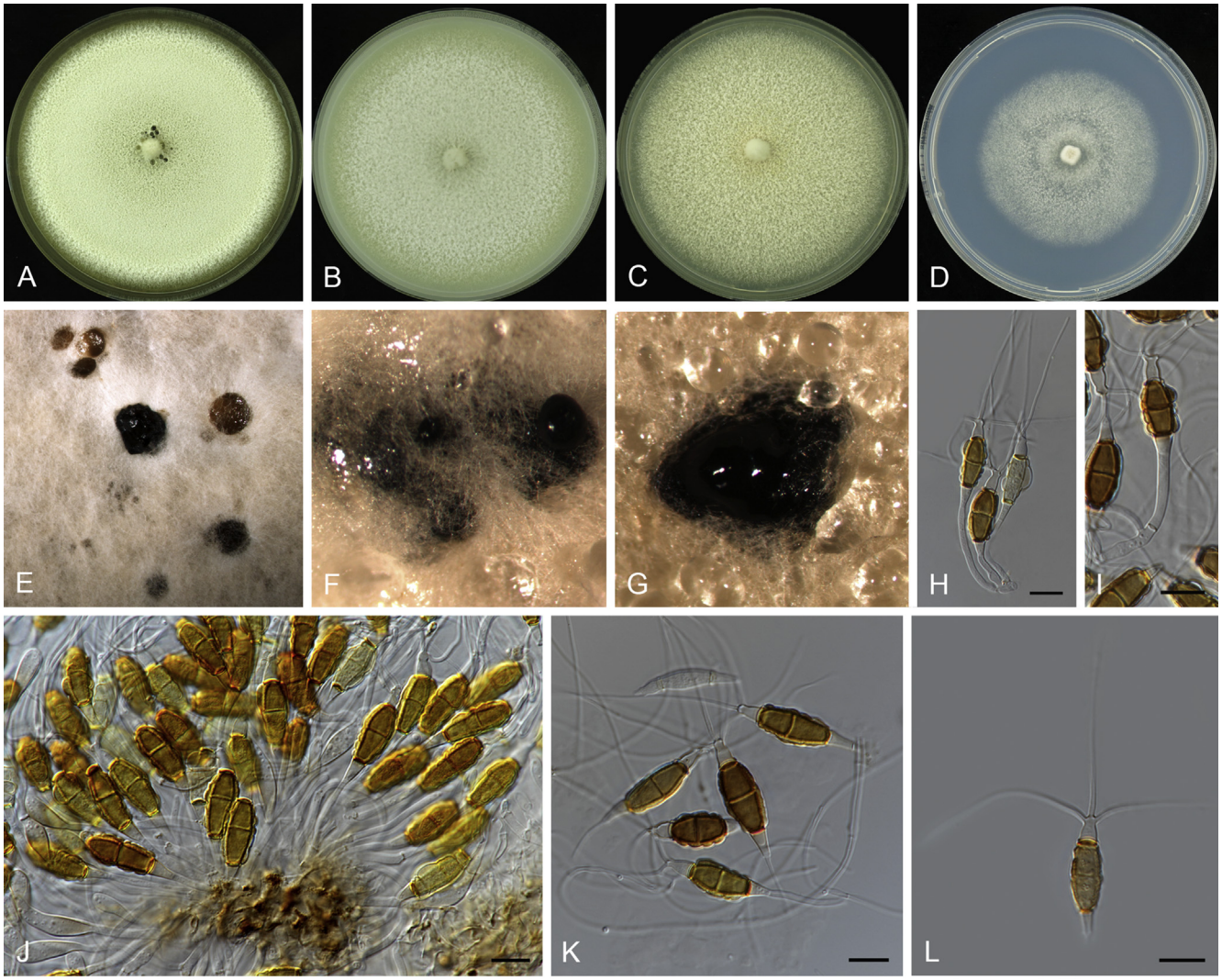

Fig. 21. *Heterotruncatella avellanea* (CBS 143896/CPC 25377). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–G.** Conidiomata on MEA, CMA and PDA, respectively. **H–J.** Conidiophores and conidiogenous cells. **K–L.** Conidia. Scale bars = 10 µm.

discrete, or sometimes integrated, cylindrical or subcylindrical, 6–20 × 1.5–3 µm, (av. =11.6 ± 3.16 × 2.3 ± 0.33 µm), colourless, smooth. *Conidia* fusoid, straight, smooth, 3-septate, distal septa usually thicker than median septum, slightly constricted at the septa, 15–24.5 × 6–10 µm (av. = 19.8 ± 1.79 × 8 ± 1.13 µm); basal cell trapezoid, subcylindrical, thin-walled or fairly thick-walled, hyaline, 1.5–5 µm (av. = 3 ± 0.8 µm) long; median cells 2, doliiform, mid-brown, thick-walled, ± equal, each 5.5–8 µm (av. = 6.6 ± 0.81 µm) long; apical cell conic with a truncate apex, thin-walled, hyaline, 1.5–4 µm (av. = 2.7 ± 0.66 µm) long; 2–4 apical appendages, arising at different points, not attenuated, tubular, rough, unbranched, occasionally dichotomously branched at one appendage, 1.5–9 µm (av. = 4.8 ± 1.9 µm) long; basal appendage absent; mean conidium length/width ratio = 2.5:1.

Material examined: **Australia**, Queensland, on *Melaleuca quinquenervia* (*Myrtaceae*), 10 Aug. 2009, P.W. Crous (**holotype** CBS H-23504, ex-type culture CBS 143883 = CPC 17239).

Notes: *Heterotruncatella breviappendiculata* is most closely related to *Het. longissima* (Fig. 7), but with relative low sequence similarity (98 % on ITS, 97 % on *rpb2*, 83 % on *tef-1α*, and 89 % on *tub2*). The short apical appendages of *Het. breviappendiculata* distinguish it from other known species in *Heterotruncatella*.

Heterotruncatella constricta F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828350. Fig. 23.

Etymology: Named after its constricted mature conidia.

Culture characteristics: Colonies on MEA flat with undulate edge, white, reaching 58–62 mm diam after 14 d at 21 °C, conidiomata black, covered by mycelia, scattered, acervular, superficial; on CMA flat with entire edge, off-white to buff, reaching 63–65 mm diam after 14 d at 21 °C, conidiomata black, superficial, scattered or gregarious, acervular, stromatic; on PDA flat with undulate edge, white, cinnamon in the center, reaching 42–58 mm diam after 14 d at 21 °C, conidiomata saffron to cinnamon, acervular, superficial, scattered or gregarious; on SNA flat with fimbriate edge, white, reaching 21–25 mm diam after 14 d at 21 °C, conidiomata cinnamon to black, stromatic, immersed.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, mostly reduced to short conidiogenous cells, colourless, smooth, invested in mucus. *Conidiogenous cells* 3-annellidic, discrete or integrated, cylindrical, subcylindrical, lageniform or ampulliform, occasionally directly generated from mycelia, variable in size, 3–14 × 1.5–4 µm (av. = 7.7 ± 2.59 × 3 ± 0.52 µm), colourless, smooth. *Conidia* fusoid, straight, 3(–4)-septate, smooth or verruculose, always constricted at the septa, 17.5–31 × 5.5–9.5 µm (av. = 22.8 ± 2.81 × 7.6 ± 0.97 µm); basal cell obconic with a truncate base, trapezoid, thin-walled, hyaline, 2–7 µm (av. = 4.7 ± 1.33 µm) long; median cells mostly 2, doliiform or trapezoid, pale to mid-

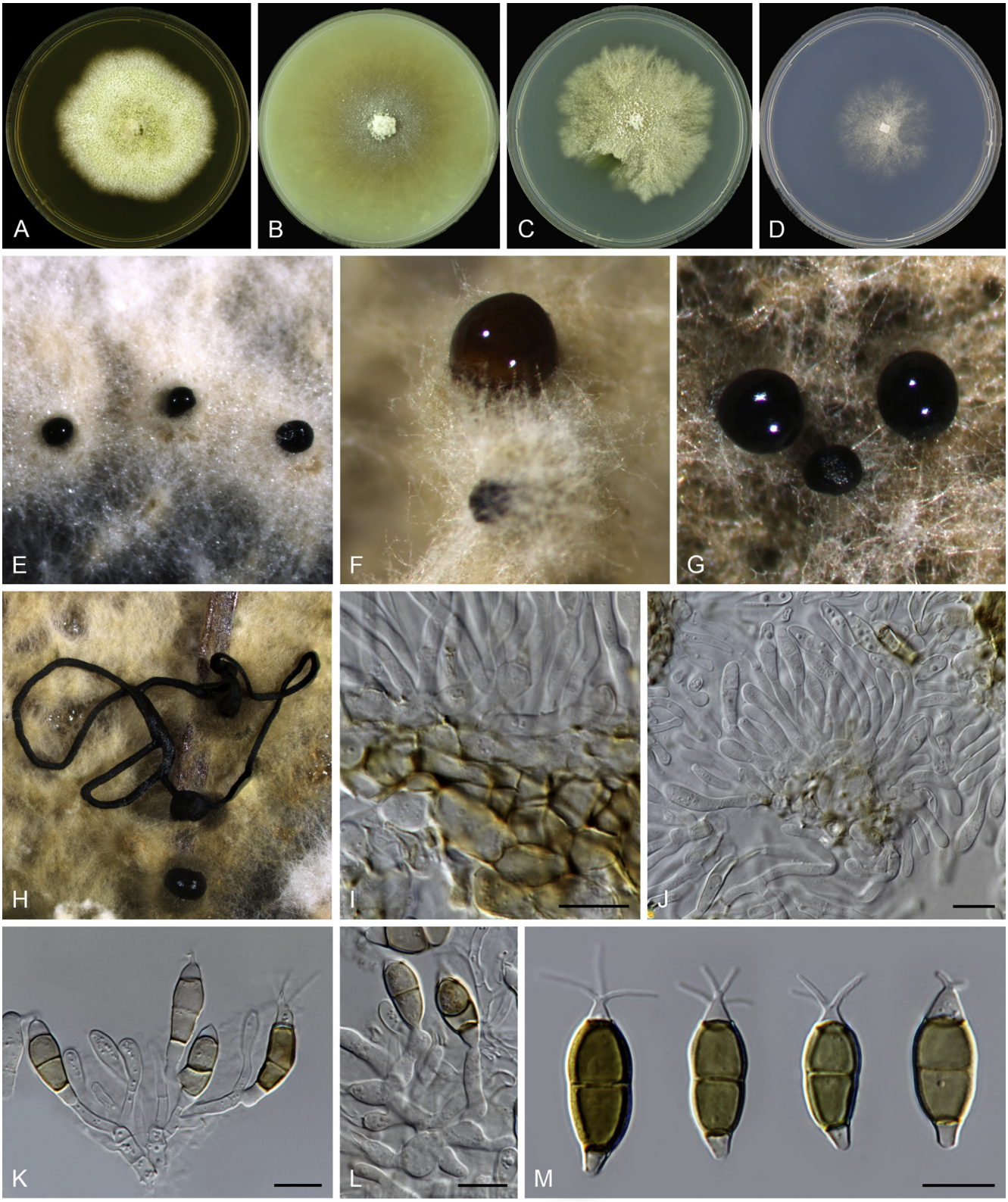

Fig. 22. *Heterotruncatella breviappendiculata* (CBS 143883/CPC 17239). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–G.** Conidiomata on MEA, CMA and PDA, respectively. **H.** Conidial lines on pine needle. **I.** Vertical section of conidioma. **J–L.** Conidiophores, conidiogenous cells and conidia. **M.** Conidia. Scale bars = 10 µm.

brown, thick-walled, ± equal, each 5–8.5 µm (av. = 7 ± 0.87 µm) long; apical cell conic with an acute apex, thin-walled, hyaline, 2.5–5.5 µm (av. = 3.5 ± 0.66 µm) long; 2–3 apical appendages, arising at different points, tubular, unbranched, 3–16 µm (av. = 9.8 ± 3.93 µm) long; 0–1 basal appendage, if present, 2–10 µm long; mean conidium length/width ratio = 3:1.

Materials examined: **Australia**, Western Australia, Perth, Cawarra Park, on leaves of *Acacia* sp. (*Fabaceae*), 16 Jun. 2015, P.A. Barber, HPC 499 (**holotype** CBS H-23526, ex-type culture CBS 143901 = CPC 27578 = PAB_F013); *ibid*., living culture CBS 144138 = CPC 27580.

Note: See notes under *Het. aspera*.

Heterotruncatella diversa F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828353. Fig. 24.

Etymology: From the Latin word “diversus”, named after the diverse number of apical appendages.

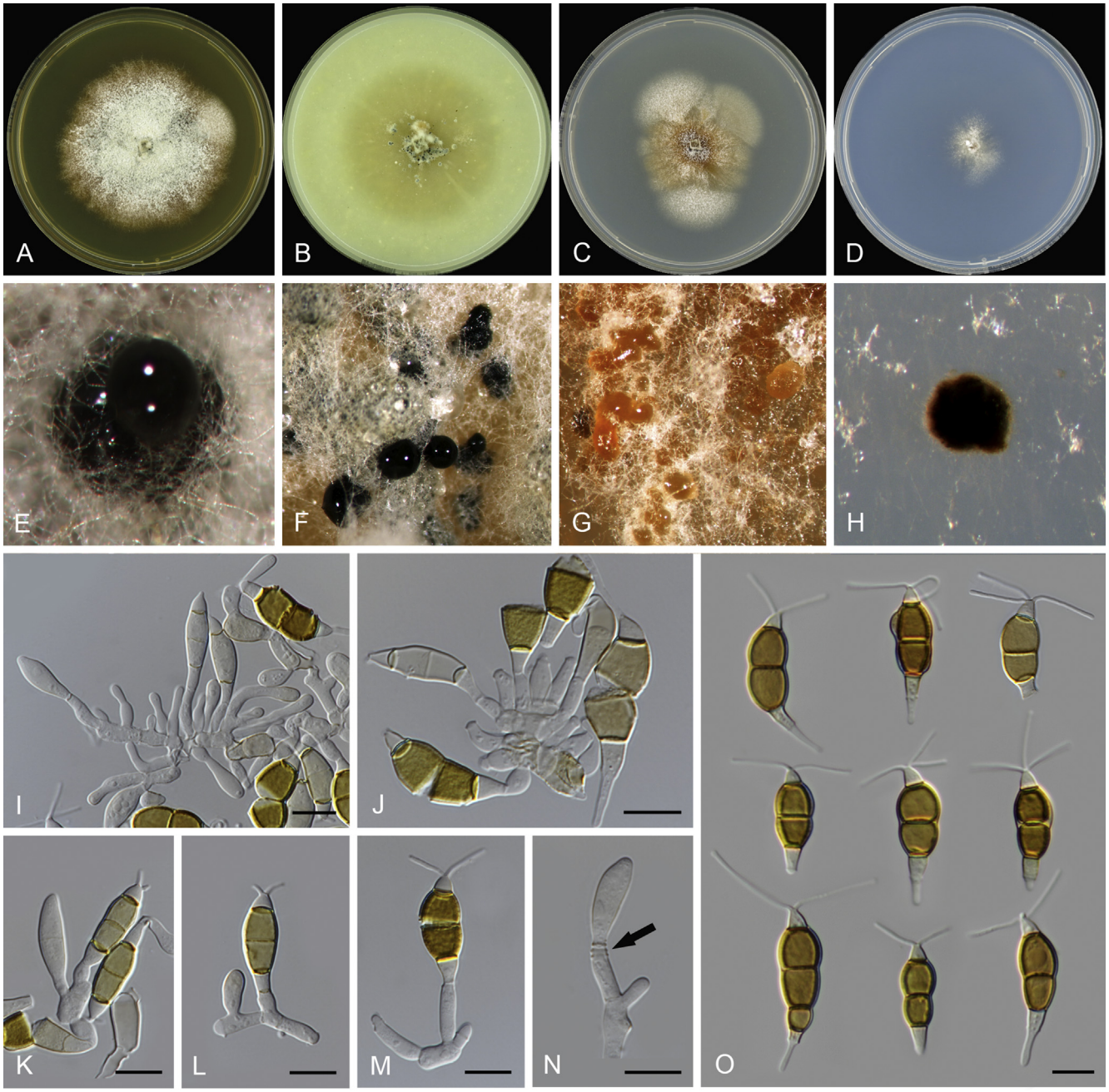

Fig. 23. *Heterotruncatella constricta* (CBS 143901/CPC 27578). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–J.** Conidiophores. **K–N.** Conidiogenous cells and conidia (arrow points to the annellations). **O.** Conidia. Scale bars = 10 µm.

Culture characteristics: Colonies on MEA flat with entire edge, white to pale brown, reaching 67–68 mm diam after 14 d at 21 °C, conidiomata black, acervular, stromatic, scattered, superficial; on CMA flat with entire edge, white to off-white, reaching > 90 mm diam after 14 d at 21 °C, conidiomata brown, stromatic, scattered, superficial or semi-immersed, covered by aerial mycelia; on PDA flat with entire edge, white, reaching 58 mm diam after 14 d at 21 °C, conidiomata black, acervular, superficial; on SNA flat with entire edge, colourless, reaching 61–62 mm diam after 14 d at 21 °C, only sporulating near the inoculation, conidiomata black, acervular, superficial.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, colourless, smooth, invested in mucus. *Conidiogenous cells* annellidic, discrete or integrated, mostly cylindrical or subcylindrical, 8.5–19.5 × 1.5–2 µm, colourless, smooth. *Conidia* fusoid, straight or barely curved, 3-septate, verruculose, slightly constricted at the septa, 19.5–29.5 × 7–9 µm (av. = 23.7 ± 2.32 × 8 ± 0.54 µm), distal septa thicker than median septa; basal cell obconic with a narrow truncate base, trapezoid, thin-walled, hyaline, 2.5–6.5 µm (av. = 4.2 ± 0.81 µm) long; median cells 2, cylindrical or doliiform, mid-brown, thick-walled, ± equal, each 5.5–10 µm (av. = 7.4 ± 1.16 µm) long; apical cell conic with a truncate apex, thin-walled, hyaline, 3.5–5.5 µm (av. = 4.7 ± 0.51 µm) long; 4–6 apical appendages, arising at different points, attenuated, filiform or flexuous, unbranched, occasionally dichotomously branched at one appendage, variable in size, 27–52 µm (av. = 38 ± 4.7 µm) long; 0–1 basal appendage, if present, tubular, unbranched, attenuated, 2.5–9.5 µm (av. = 5.3 ± 2.36 µm) long; mean conidium length/width ratio = 2.9:1.

Material examined: **Australia**, Western Australia, Albany, on *Acacia* sp. (*Fabaceae*), 20 Sep. 2015, P.W. Crous, HPC 720 (**holotype** CBS H-23533, ex-type culture CBS 143908 = CPC 29040).

Note: See notes under *Heterotruncatella avellanea*.

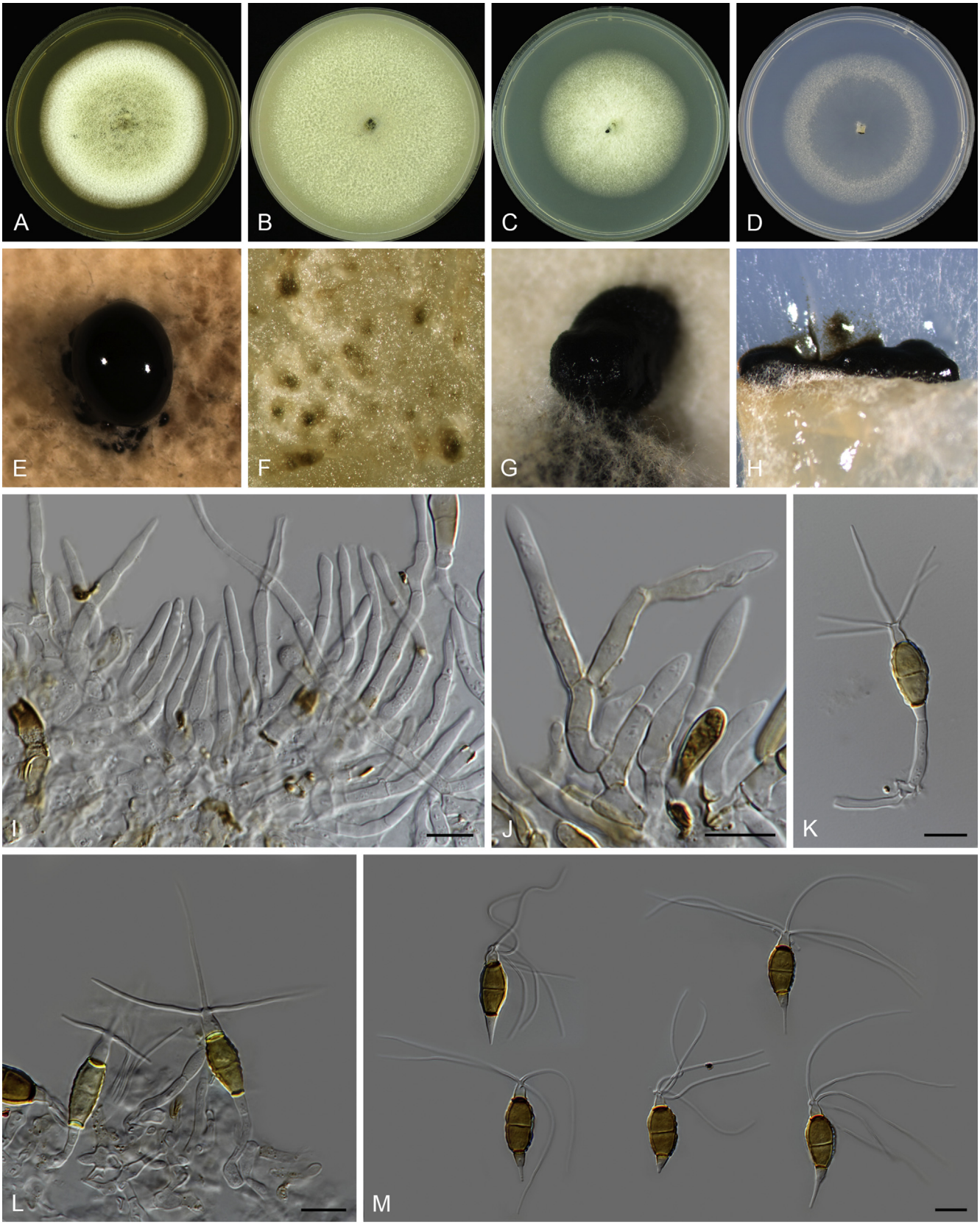

Fig. 24. *Heterotruncatella diversa* (CBS 143908/CPC 29040). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–L.** Conidiophores, conidiogenous cells and conidia. **M.** Conidia. Scale bars = 10 µm.

Heterotruncatella grevilleae F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828354. Fig. 25.

Etymology: Name reflects the host genus it was isolated from, *Grevillea*.

Culture characteristics: Colonies on MEA flat with entire edge, white to grey, reaching 82 mm diam after 14 d at 21 °C, conidiomata black, acervular, stromatic, scattered, superficial; on CMA convex with raised, yellow-green pigmented, reaching > 90 mm diam after 14 d at 21 °C, conidiomata black, scattered or confluent, superficial to semi-immersed, acervular, stromatic; on PDA flat with entire edge, off-white to yellow-green, reaching 80–82 mm diam after 14 d at 21 °C, conidiomata black, scattered or gregarious, stromatic; on SNA flat with rhizoids edge,

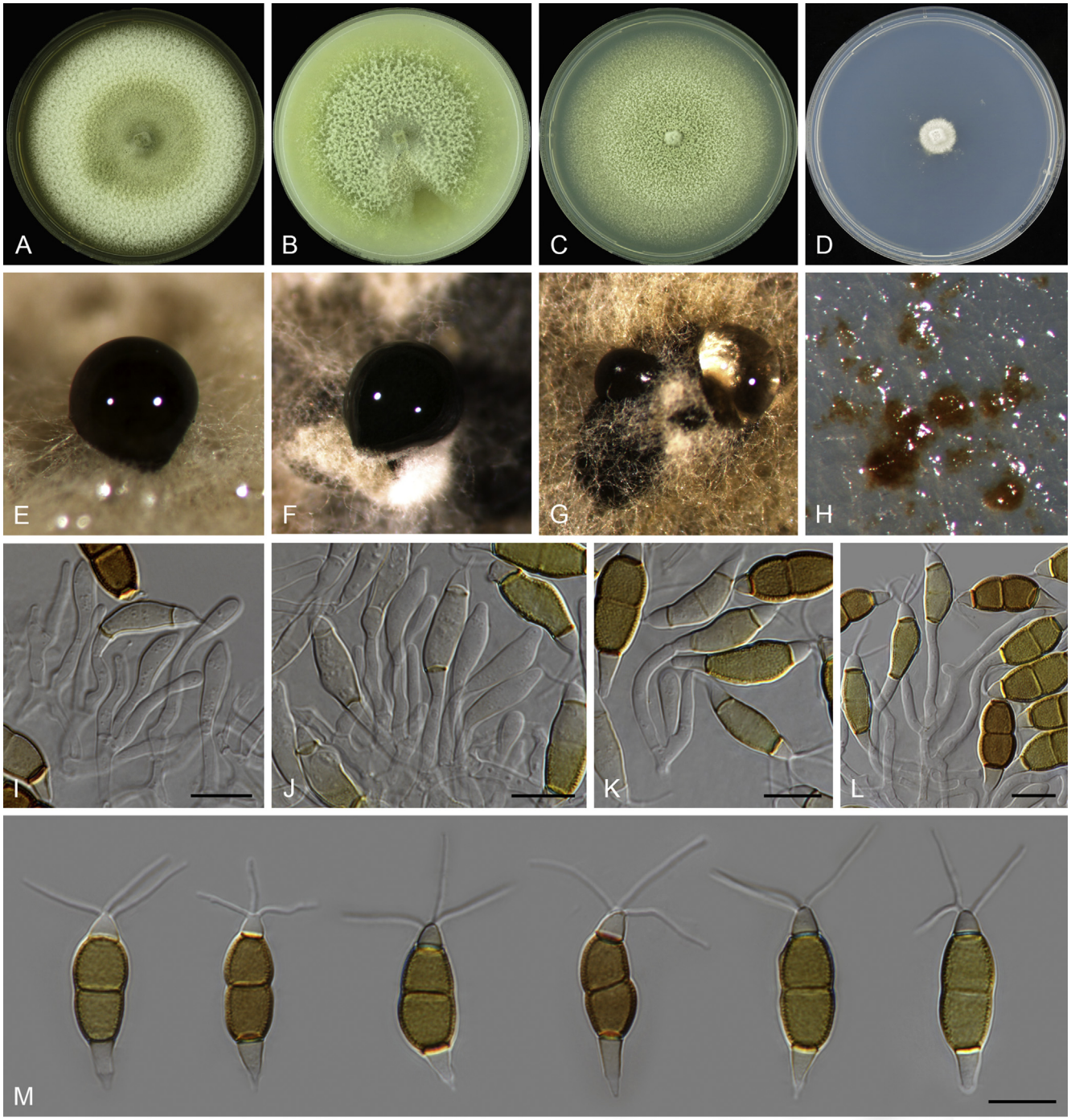

Fig. 25. *Heterotruncatella grevilleae* (CBS 143881/CPC 16997). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–L.** Conidiophores, conidiogenous cells and conidia. **M.** Conidia. Scale bars = 10 µm.

colourless, reaching 13–22 mm diam after 14 d at 21 °C, conidial masses ochreous.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, smooth, colourless, invested in mucus. *Conidiogenous cells* annellidic, discrete or integrated, mostly cylindrical or subcylindrical, sometimes lageniform, 7–24.5 × 1.5–2.5 µm, (av. =14.3 ± 4.52 × 1.9 ± 0.33 µm), colourless, smooth. *Conidia* fusoid, subfusoid, straight, occasionally slightly curved, verruculose, 3-septate, distal septa always thicker than median septum, slightly constricted at the septa, 19.5–27 × 4.5–9 µm (av. = 23.7 ± 1.86 × 6.8 ± 0.96 µm); basal cell obconic with a truncate base, trapezoid, thin-walled, hyaline, 2.5–6 µm (av. = 4.7 ± 0.82 µm) long; median cells 2, doliiform, pale brown, yellowish brown or brown, thick-walled, ± equal, each 6.5–9.5 µm (av. = 7.6 ± 0.83 µm) long; apical cell conic with an acute or obtuse apex, thin-walled, hyaline, 2.5–5.5 µm (av. = 3.3 ± 0.55 µm) long; 2–4 apical appendages, arising at different points, attenuated, tubular, flexuous, unbranched, sometimes dichotomously branched at one appendage, variable in size, 4–16.5 µm (av. = 10.5 ± 3.18 µm) long; 0–1 basal appendage, if present, subulate and very short; mean conidium length/width ratio = 3.5:1.

Material examined: **Australia**, Queensland, on *Grevillea* sp. (*Proteaceae*), 13 Jul. 2009, P.W. Crous (**holotype** CBS H-23502, ex-type culture CBS 143881 = CPC 16997).

Notes: This is the first report of a truncatella-like species on *Grevillea.* Also see the notes under *Heterotruncatella acacigena*.

Fig. 26. *Heterotruncatella longissima* (CBS 143910/CPC 29114). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on MEA and SNA. **G–H.** Conidiogenous cells and conidia. **I–L.** Conidia. Scale bars = 10 µm.

Heterotruncatella longissima F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828355. Fig. 26.

Etymology: Named after its very long apical and basal appendages.

Culture characteristics: Colonies on MEA flat with ruffle sag on the surface, off-white, reaching 57–65 mm diam after 14 d at 21 °C, conidiomata black, acervular, stromatic, scattered, superficial; on CMA flat with entire edge, white to buff, sterile, reaching > 90 mm diam after 14 d at 21 °C; on PDA flat with entire edge, white, buff or pale brown, sterile, reaching 57–58 mm diam after 14 d at 21 °C; on SNA flat with fimbriate edge, colourless, reaching 37–43 mm diam after 14 d at 21 °C, conidiomata black, acervular, stromatic, scattered or gregarious, superficial.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, smooth, colourless, invested in mucus. *Conidiogenous cells* annellidic, discrete or integrated, cylindrical, subcylindrical or lageniform, 6.5–16.5 × 1.5–3 µm, (av. =11.1 ± 2.46 × 2.3 ± 0.46 µm), colourless, smooth. *Conidia* fusoid to oval, straight, wall smooth or verruculose, mostly 3-septate, slightly constricted at the septa, 19.5–24.5 × 7–12.5 µm (av. = 22 ± 1.41 × 10.4 ± 1.06 µm); basal cell obconic with a narrow truncate base, trapezoid, thick- or thin-walled, hyaline, 2–4 µm (av. = 2.9 ± 0.54 µm) long; median cells 2, doliiform, yellowish brown or mid-brown, thick-walled, ± equal, each 5.5–9 µm (av. = 7.7 ± 0.97 µm) long; apical cell conic with a truncate apex, thin-walled, hyaline, 2–4 µm (av. = 2.7 ± 0.47 µm) long; 3–5 apical appendages, arising at different points, filiform, flexuous, attenuated, unbranched, sometimes dichotomously branched at one appendage, variable in size, (18–)41–90 µm (av. = 66 ± 14.08 µm) long; 0–1 basal appendage, if present, 5–32.5 µm (av. = 15.7 ± 6.88 µm) long; mean conidium length/width ratio = 2.1:1.

Materials examined: **Australia**, Western Australia, on *Synaphea* sp. (*Proteaceae*), 18 Sep. 2015, P.W. Crous, HPC 709 (**holotype** CBS H-23535, ex-type

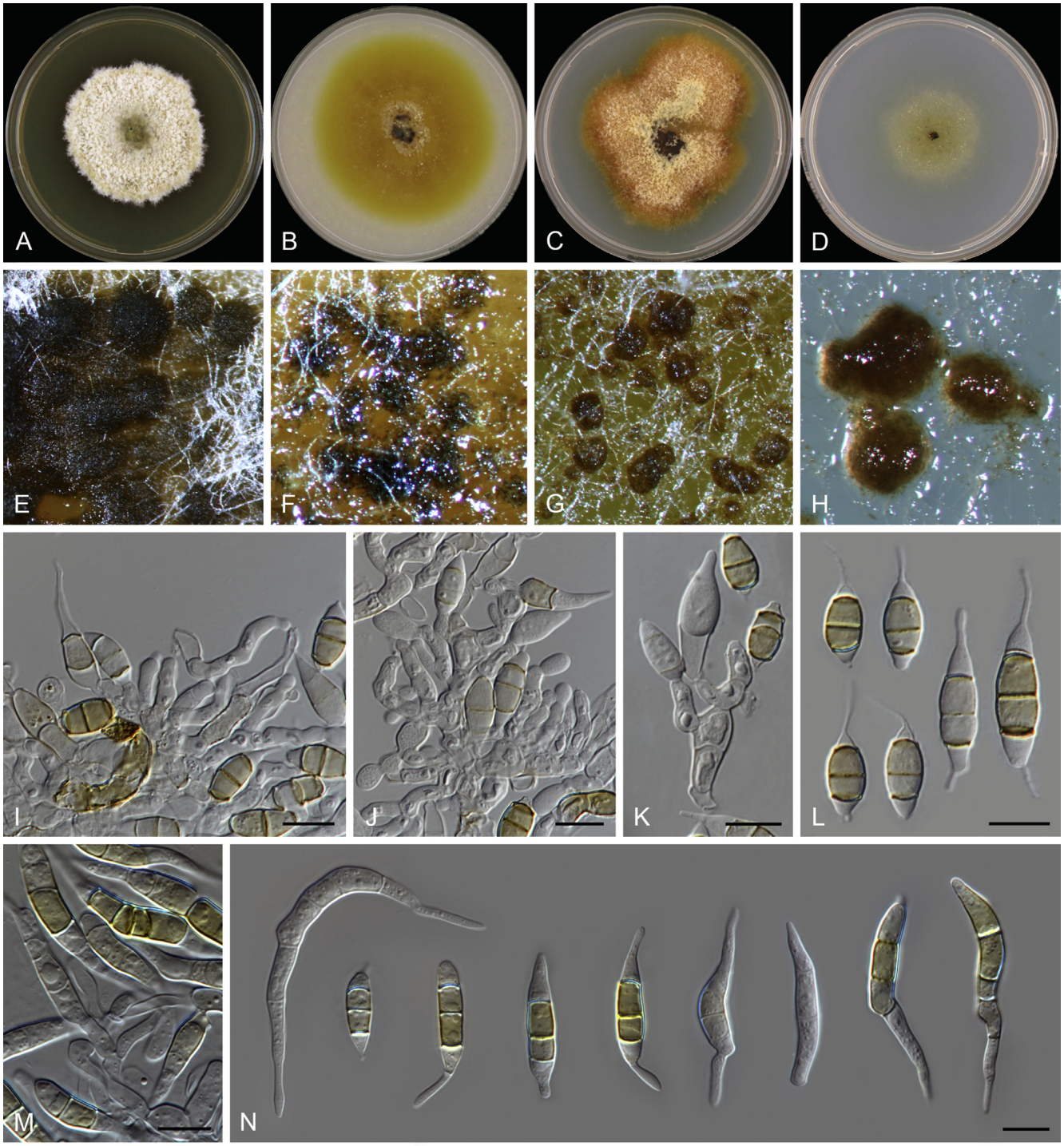

Fig. 27. *Heterotruncatella lutea* (CBS 349.73). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–K.** Conidiophores and conidiogenous cells on SNA. **L.** Conidia on SNA. **M.** Conidiogeneses. **N.** Conidia on MEA. Scale bars = 10 µm.

culture CBS 143910 = CPC 29114). **South Africa**, on *Aspalathus linearis* (*Fabaceae*), 8 Sep. 2009, S. Lamprecht, living culture CBS 144137 = CPC 18047.

Notes: The two strains of *Heterotruncatella longissima* formed a distinct clade on the multi-locus tree (Fig. 7). Morphologically, it differs from all other species in *Heterotruncatella* in producing quite long apical and basal appendages and having a small mean conidium length/width ratio. This is the first report of a *Sporocadaceae* species from *Aspalathus linearis* and *Synaphea.*

Heterotruncatella lutea (H.J. Swart & D.A. Griffiths) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828356. Fig. 27.

Basionym: *Monochaetia lutea* H.J. Swart & D.A. Griffiths, Trans. Brit. Mycol. Soc. 62: 152. 1974.

Culture characteristics: Colonies on MEA raised with crenate edge, straw to pure yellow, aerial mycelia flocculent, reaching 50–52 mm diam after 14 d at 21 °C, conidiomata brown to black, scattered or gregarious; on CMA flat with entire edge, pale luteous, reaching 70 mm diam after 14 d at 21 °C, conidiomata brown to black, superficial, scattered or confluent; on PDA flat with undulate edge, pale luteous, buff or honey, reaching 56–68 mm diam after 14 d at 21 °C, conidiomata yellow brown, dark brown or isabelline, scattered or gregarious, superficial,

acervular; on SNA flat with fimbriate edge, straw, reaching 40–42 mm diam after 14 d at 21 °C, conidiomata pale luteous, brown, scattered, superficial, acervular.

Description (*On SNA*): Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched at the base, mostly reduced to conidiogenous cells, colourless, smooth, invested in mucus. *Conidiogenous cells* discrete or integrated, mostly lageniform or ampulliform, sometimes cylindrical or subcylindrical, 1.5–15.5 × 1.5–4.5 µm (av. = 7.6 ± 3.08 × 2.8 ± 0.72 µm), colourless, smooth. *Conidia* fusoid or ovoid, straight, 3-septate, smooth, distal septa thicker than the median septum, 13–20.5 × 5–7 µm (av. = 14.8 ± 1.6 × 6.2 ± 0.44 µm); basal cell obconic with a truncate or obtuse base, thin-walled, hyaline, 1.5–4.5 µm (av. = 2.4 ± 0.77 µm) long; median cells 2, doliiform, pale to mid-brown, thick-walled, ± equal, each 3.5–6 µm (av. = 4.7 ± 0.57 µm) long; apical cell conic with an acute apex, thin-walled, hyaline, 1–5 µm (av. = 2.4 ± 0.9 µm) long; apical appendage single, attenuated, tubular, unbranched, 1–9 µm (av. = 5.5 ± 2.21 µm) long; 0–1 basal appendage, when present, attenuated, tubular, unbranched, 0.5–5.5 µm (av. = 2.6 ± 1.46 µm) long; mean conidium length/width ratio = 2.4:1.

Material examined: **Australia**, Victoria, Field Naturalists Reserve Ocean Grove, on *Acacia pycnantha* (*Fabaceae*) phyllode, unknown collection date, J. Withers, isolated by H.J. Swart in Aug. 1972 (**isotype** of *Monochaetia lutea* CBS H-7353, ex-isotype culture CBS 349.73 = ATCC 26926 = IMI 168736).

Notes: Based on the multi-locus phylogenetic analyses, the ex-isotype of *Monochaetia lutea* clustered in the clade representing the genus *Heterotruncatella* (Fig. 7). *Monochaetia lutea* is therefore transferred to *Heterotruncatella*, and a new combination is proposed. It was originally described with very short apical and basal appendages, less than 1 µm (Swart & Griffiths 1974), while, in the present study, it usually produced longer appendages (1–9 µm) on SNA (Fig. 27). In addition, conidia are variable in shape on MEA (fusoid, falcate to lunate, or irregular), but often without appendage or with very short appendages.

The 3-septate main conidial body of *Het. lutea* is typical of *Heterotruncatella*; however, its single apical and basal appendage is more comparable to the related genus *Hymenopleella*. This may explain its basal position in *Heterotruncatella* (Fig. 7), and its intermediate state of differentiation and speciation.

Heterotruncatella proteicola F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828357. Fig. 28.

Etymology: Name refers to the host plant it was isolated from, *Protea*.

Culture characteristics: Colonies on MEA flat with entire edge, buff, reaching > 90 mm diam after 14 d at 21 °C; on CMA flat with entire edge, white to buff, reaching > 90 mm diam after 14 d at 21 °C; on PDA flat with entire edge, white, reaching > 90 mm diam after 14 d at 21 °C; on SNA flat with erose or dentate edge, white, reaching 51–54 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* not forming on artificial agar media, but sporulating like hyphomycetes. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* cylindrical, subcylindrical, or lageniform, 6.5–14.5 × 1.5–3 µm, (av. =10.5 ± 3 × 2.3 ± 0.49 µm), colourless, smooth. *Conidia* fusoid, subcylindrical, straight, mostly 3-septate, occasionally 4- or 6-septate, verruculose, not constricted at the septa, 17.5–32 × 4.5–7 µm (av. = 24 ± 3.58 × 6.1 ± 0.52 µm); basal cell obconic with a truncate base, subcylindrical, cylindrical, thin-walled, hyaline, 1.5–6 µm (av. = 3.9 ± 0.99 µm) long; median cells 2, cylindrical or doliiform, pale brown to brown, thick-walled, ± equal, each 5.5–9.5 µm (av. = 7.1 ± 0.88 µm) long; apical cell cylindrical, trapezoid, or sometimes conic with a truncate apex, thin-walled, hyaline, 2.5–5 µm (av. = 3.7 ± 0.62 µm) long; 2–6 apical appendages, arising at different points, tubular, flexuous, attenuated, unbranched, occasionally dichotomously branched at one appendage, 13–33 µm long; basal appendage absent; mean conidium length/width ratio = 3.9:1.

Materials examined: **South Africa**, on *Protea acaulos* (*Proteaceae*), Jan. 2006, S. Lee (**holotype** CBS H-23498, ex-type culture CBS 144020 = CPC 13700); Jonkershoek, on *Protea acaulos* (leaf litter), Aug. 2000, S. Lee, PREM 59597, living culture CBS 123029 = CMW 22215.

Notes: In contrast to all other species in *Heterotruncatella*, conidiomata of *Het. proteicola* are not observed on artificial agar media and conidia are formed directly on mycelia. In addition, it differs from closely related species *Het. avellanea* and *Het. diversa* in lacking basal conidial appendages.

Heterotruncatella quercicola F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828358. Fig. 29.

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

Culture characteristics: Colonies on MEA flat with undulate edge, white, sterile, reaching 67–69 mm diam after 14 d at 21 °C; on CMA flat with entire edge, straw to ochreous from outside region to the centre, sterile, reaching 72–74 mm diam after 14 d at 21 °C; on PDA flat with entire edge, pure yellow, sterile, reaching 78–79 mm diam after 14 d at 21 °C; on SNA flat with entire edge, colourless, reaching 61–62 mm diam after 14 d at 21 °C.

Description: Sexual morph: see Senanayake *et al.* (2015). Asexual morph: *Conidiomata* produced on barley leaves and filter paper in SNA plates, brown to black, stromatic, superficial, scattered or gregarious. *Conidiophores* septate and branched at the base, colourless, smooth, invested in mucus. *Conidiogenous cells* annellidic, discrete, mostly cylindrical, subcylindrical, or lageniform, 4.5–11.5 × 1.5–4.5 µm (av. = 8 ± 1.83 × 2.5 ± 0.61 µm), colourless, smooth. *Conidia* fusoid, straight or slightly curved, mostly 3-septate, occasionally 4-septate, verruculose, slightly constricted at the septa, 22.5–30 × 5–9 µm (av. = 26.2 ± 1.77 × 7.4 ± 0.88 µm); basal cell obconic with a narrow truncate base, thin-walled, hyaline, 2.5–6 µm (av. = 4.6 ± 0.78 µm) long; median cells 2, cylindrical or doliiform, pale to mid-brown, thick-walled, ± equal, each 6–10.5 µm (av. = 8.3 ± 0.94 µm) long; apical cell conical, thin-walled, hyaline, 3–6.5 µm (av. = 4.8 ± 0.8 µm) long; 3–5 apical appendages, arising at different points, tubular, filiform, flexuous, attenuated, unbranched, occasionally dichotomously branched at one appendage, 28–44 µm (av. = 36.9 ± 4.52 µm) long; basal appendage single, occasionally two, unbranched, tubular or flexuous, attenuated, centric or excentric, 2.5–17.5 µm (av. = 8.9 ± 3.64 µm) long; mean conidium length/width ratio = 3.5:1.

Material examined: **USA**, Utah, on *Quercus welshii* (*Fagaceae*), 1 Oct. 2014, M.J. Wingfield, HPC 54 (**holotype** CBS H-23519, ex-type culture CBS 143895 = CPC 25365).

Notes: According to the phylogenetic analysis (Fig. 7), *Het. quercicola* is distinct from *Tru. angustata*, the only *Truncatella*

Fig. 28. *Heterotruncatella proteicola* (CBS 144020/CPC 13700). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiogenous cells bearing conidia. **I–L.** Conidia. Scale bars = 10 µm.

species that is thus far reported from *Quercus* (Farr & Rossman 2018). Morphologically, it differs from other *Heterotruncatella* species in its ability to produce two basal appendages.

Heterotruncatella restionacearum (S.J. Lee & Crous) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828359.
Basionym: *Truncatella restionacearum* S.J. Lee & Crous, Stud. Mycol. 55: 184. 2006.

Illustration and description: See Lee *et al.* (2006).

Materials examined: **South Africa**, Western Cape Province, Jonkershoek Nature Reserve, culm litter of *Ischyrolepis* cf. *gaudichaudiana* (*Restionaceae*), 31 Jul. 2001, S. Lee (**holotype** PREM 58871, ex-type living culture CBS 119210 = CMW 18755); on dead culm of *Restio filiformis* (*Restionaceae*), 15 Jun. 2001, S. Lee, living culture of *Tru. restionacearum* CBS 118150 = SL0777 = CMW 17968.

Notes: This species was reported as *Tru. restionacearum* (Lee *et al.* 2006). Phylogenetic analysis (Fig. 7) located the ex-type strain of *Tru. restionacearum* in the genus *Heterotruncatella*, and a new combination was therefore proposed here.

Heterotruncatella singularis F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828360. Fig. 30.

Etymology: Named after its single apical appendage.

Culture characteristics: Colonies on MEA flat with entire edge, white, aerial mycelia flocculent, sterile, reaching > 90 mm diam after 14 d at 21 °C; on CMA umbonate with entire edge, white to buff, sterile, reaching > 90 mm diam after 14 d at 21 °C; on PDA low convex with entire edge, pale luteous, sterile, reaching > 90 mm diam after 14 d at 21 °C; on SNA flat with erose or dentate edge, hyaline, sterile, reaching 60–64 mm diam after 14 d at 21 °C.

Description (*in planta*): Sexual morph: unknown. Asexual morph: *Conidiomata* on plant leaves black, semi-immersed or

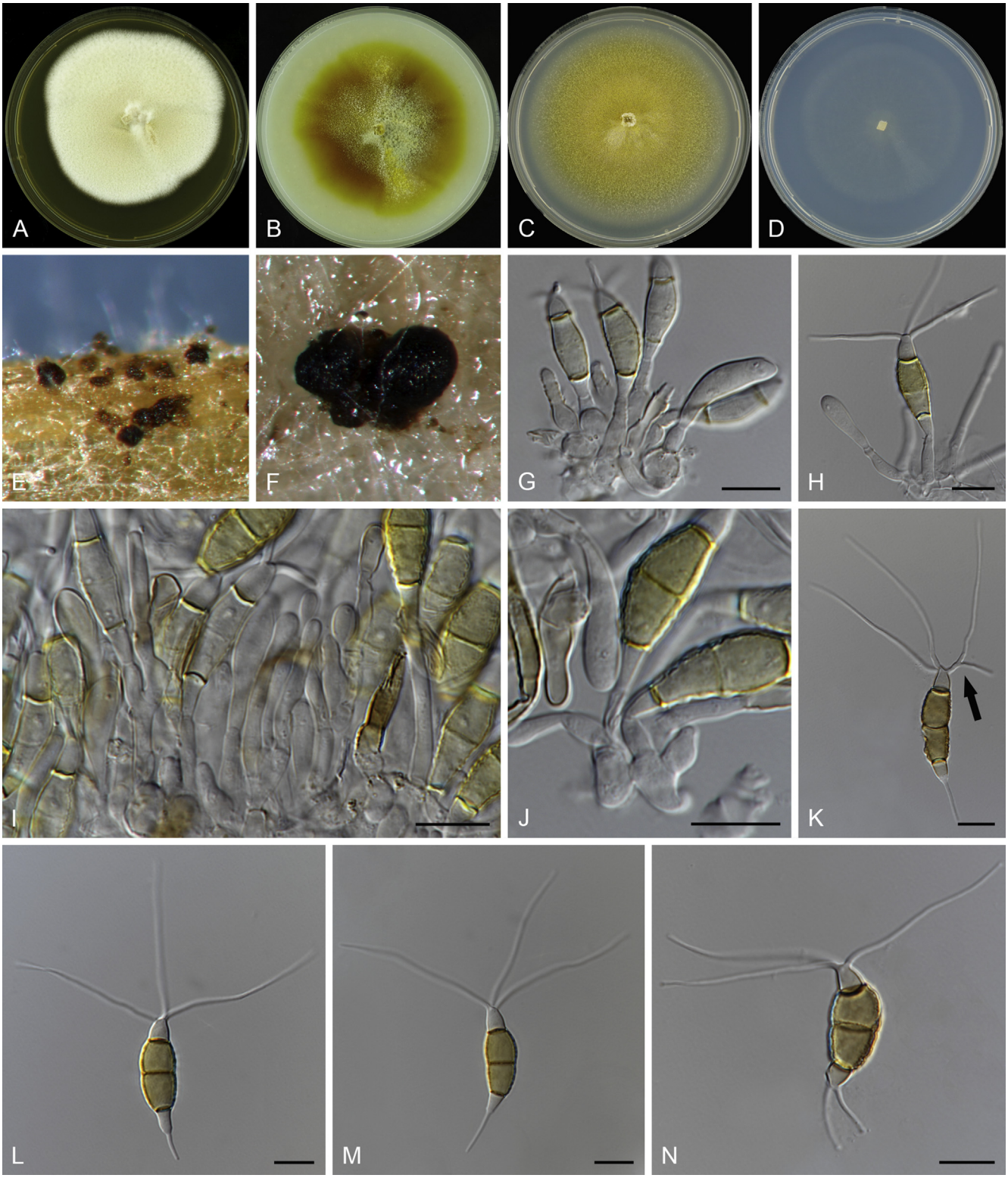

Fig. 29. *Heterotruncatella quercicola* (CBS 143895/CPC 25365). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidiomata on barley leaves. **F.** Colonies on filter paper. **G–J.** Conidiophores, conidiogenous cells and conidia. **K–N.** Conidia (arrow points to branched apical appendage). Scale bars = 10 µm.

immersed, erumpent, acervular. *Conidiophores* aseptate, unbranched or branched at the base, mostly reduced to conidiogenous cells, smooth, colourless, invested in mucus. *Conidiogenous cells* not annellidic, discrete, cylindrical, 5.5–26.5 × 1.5–2.5 µm, (av. =13.4 ± 5.83 × 1.7 ± 0.23 µm), colourless, smooth. *Conidia* fusoid, straight, smooth, 3-septate, not constricted at the septa, 16.5–21 × 7–8.5 µm (av. = 18.9 ± 1.14 × 7.8 ± 0.29 µm); basal cell short obconic or cylindrical with a truncate base, thin-walled, hyaline, or pale to mid-brown, 1–2.5 µm (av. = 1.7 ± 0.27 µm) long; median cells 2, doliiform, pale brown to dark brown, thick-walled, ± equal, together 12.5–16 µm (av. = 14.6 ± 0.86 µm), each 6.5–8.5 µm (av. = 7.4 ± 0.48 µm) long; apical cell short conic, thin-walled, hyaline, 0.5–2.5 µm (av. = 1.5 ± 0.4 µm) long; apical appendage single, not attenuated, filiform, flexuous, unbranched or branched, smooth or rough, variable in size, 13–30.5 µm (av. = 20.4 ± 4.57 µm) long; basal appendage absent; mean conidium length/width ratio = 2.4:1.

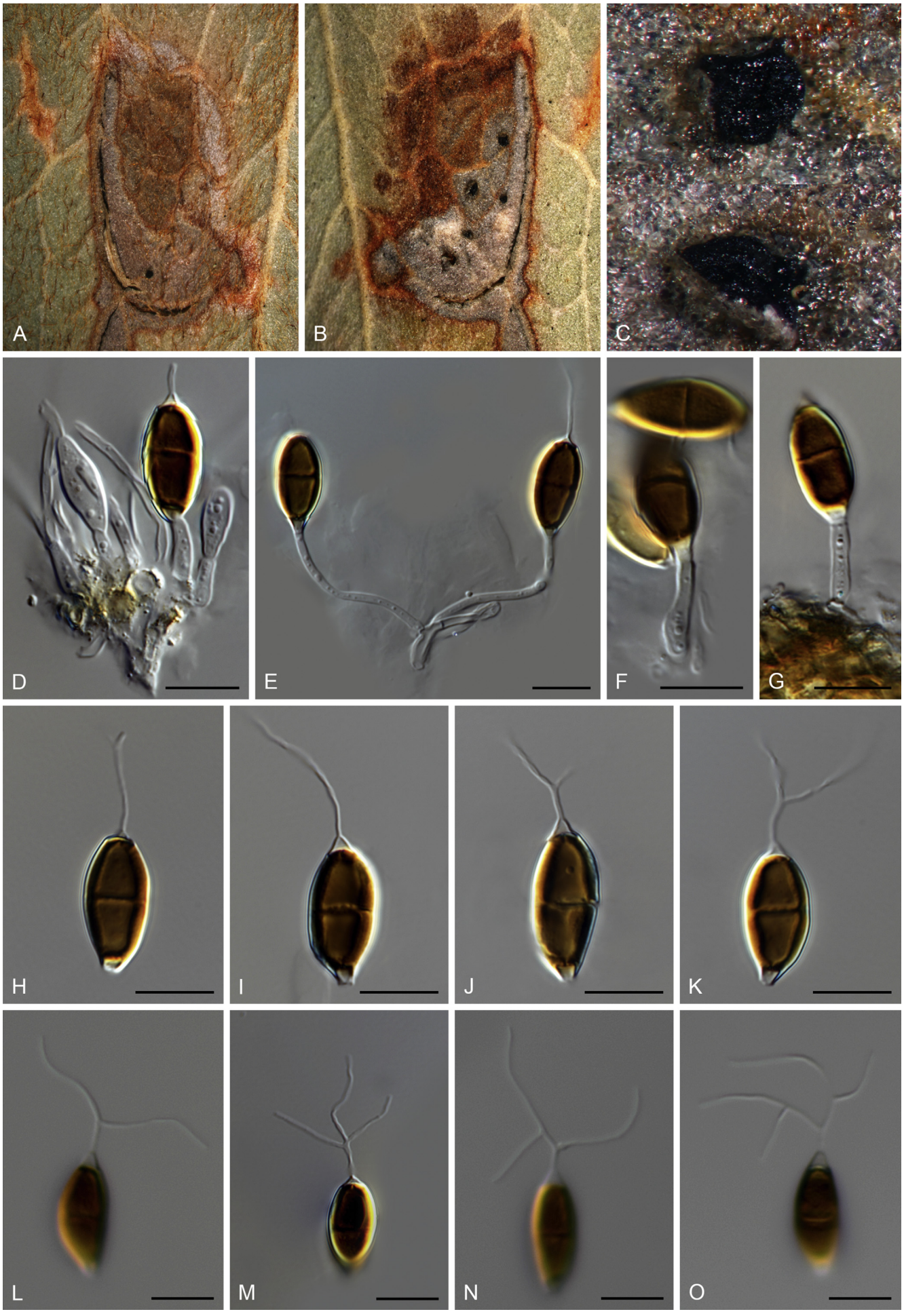

Fig. 30. *Heterotruncatella singularis* (HPC 721). **A–B.** Disease symptoms on the front and back of the leaves. **C.** Conidiomata. **D–G.** Conidiophores and conidiogenous cells bearing conidia. **H–O.** Conidia. Scale bars = 10 µm.

Material examined: **Australia**, Western Australia, on *Hakea elliptica* (*Proteaceae*), 20 Sep. 2015, P.W. Crous, HPC 721 (**holotype** CBS H-23605, ex-type culture CBS 144031 = CPC 29042).

Notes: Although represented by a single strain, *Het. singularis* is distinct from all other species on the multi-locus tree (Fig. 7). Morphologically, it differs from other *Heterotruncatella* species in producing a single and branched apical appendage. In addition, the apical and basal cell of conidia of *Het. singularis* are short compared to those of the other species. This is to our knowledge the first report of a *Sporocadaceae* species on *Hakea elliptica.*

Heterotruncatella spadicea (S. Lee & Crous) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828361. Fig. 31.
Basionym: *Truncatella spadicea* S. Lee & Crous, Stud. Mycol. 55: 185. 2006.
Synonym: *Truncatella megaspora* S. Lee & Crous, Stud. Mycol. 55: 184. 2006.

Description (*On CMA*): Sexual morph: unknown. Asexual morph: *Conidiomata* black, stromatic, scattered, semi-immersed. *Conidiophores* arising from the entire periphery of the inside of the conidiomata, septate, branched, colourless, smooth. *Conidiogenous cells* discrete or integrated, cylindrical, subcylindrical, lageniform, 4–15.5 × 1.5–3.5 µm, (av. = 8.9 ± 2.33 × 2.2 ± 0.39 µm), colourless, smooth. *Conidia* fusoid, subcylindrical, straight or slightly curved, mostly 3-septate, occasionally 5–6-septate, smooth, not constricted at the septa, 15–24 × 4.5–6 µm (av. = 18.3 ± 2.36 × 5.2 ± 0.42 µm); basal cell obconic with a truncate base, trapezoid, thin-walled, hyaline or sometimes pale brown, 2–5.5 µm (av. = 3.2 ± 0.84 µm) long; median cells 2, doliiform, cylindrical, pale brown or yellowish brown, thick-walled, ± equal, each 4–8 µm (av. = 5.6 ± 0.82 µm) long; apical cell conical, thin-walled, hyaline, 1.5–4.5 µm (av. = 2.9 ± 0.76 µm) long; 1–4 apical appendages, arising at the same point, not attenuated, tubular, branched, variable in size, 6–41 µm long; basal appendage absent; mean conidium length/width ratio = 3.5:1.

Materials examined: **Australia**, Western Australia, on *Sorghum halepense* (*Poaceae*) weed, 19 Sep. 2015, P.W. Crous, living culture CPC 28956. **South Africa**, Western Cape Province, Jonkershoek, on culm litter of *Ischyrolepis capensis*, 5 Apr. 2001, S. Lee (**holotype** of *Truncatella spadicea* PREM 58873); on dead culm of *Cannomois virgata* (*Restionaceae*), 15 Jun. 2001, S. Lee (**epitype** of *Truncatella spadicea* **designated here** CBS H-23556, MBT383972, living culture CBS 118145 = SL0762 = CMW 17958); on dead culm of *Ischyrolepis* (*Restionaceae*), 31 Jul. 2001, S. Lee, living culture CBS 118144 = SL0867 = CMW 18013; Kirstenbosch, on dead culm of *Rhodocoma capensis* (*Restionaceae*), 3 Dec. 2001, S. Lee, living culture CBS 118148 = SL 1071 = CMW 18093; Kogelberg Nature Reserve, culm litter of *Restio egregius*, 3 Nov. 2000, S. Lee (**holotype** of *Truncatella megaspora* PREM 58870); Western Cape, on dead culms of *Elegia filacea* (*Restionaceae*), Dec. 2001, S. Lee, living culture CPC 17911 = CMW 22206.

Notes: *Truncatella megaspora* and *Tru. spadicea* were originally described from *Restio egregius* (*Restionaceae*) and *Ischyrolepis capensis* (*Restionaceae*), respectively (Lee *et al.* 2006). Unfortunately, no living culture was obtained for either species, and only ITS sequences are available (Lee *et al.* 2006). Two type specimens (*T. megaspora,* PREM 58870 & *T. spadicea*, PREM 58873) formed one well-supported clade with five other strains (Fig. 7), indicating that they represented the same species. Although a living culture CBS 118144 from same host plant and same location as *Tru. spadicea* was obtained in this study, it was sterile. We therefore designated CBS H-23556, dried culture of living culture CBS 118145 from the same host family (*Restionaceae*) as an epitype. *Truncatella spadicea* is lectotypified and combined as *Het. spadicea* in this study.

Conidia of *Het. spadicea* are variable in size. According to Lee *et al.* (2006), *Tru. megaspora* was characterised by producing larger conidia (25–36 × 9–13 µm) than any other related species, and the conidia of *Tru. spadicea* (PREM 58873) are 20–23 × 7–8.5 µm. The conidial length of the epitype (15–24 µm) is comparable to *Tru. spadicea* (PREM 58873), but differs in the width of conidia (4.5–6 µm vs. 7–8.5 µm). The number and length of apical appendages are consistent in these strains and specimens.

Heterotruncatella spartii (Senan. *et al.*) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828362. Fig. 32.
Basionym: *Truncatella spartii* Senan. *et al.*, Fungal Diversity 73: 91. 2015.

Culture characteristics: Colonies on MEA flat with undulate edge, with radial lines on the surface, pale luteous, reaching 59–60 mm diam after 14 d at 21 °C, conidiomata black, scattered, superficial, often covered by aerial mycelia, acervular, stromatic; on CMA flat with entire edge, white, reaching 70 mm diam after 14 d at 21 °C, conidiomata black, scattered, superficial or semi-immersed, acervular; on PDA flat with entire edge, off-white, reaching 71 mm diam after 14 d at 21 °C, conidiomata dark brown to black, scattered, superficial, acervular; on SNA flat with entire edge, colourless, reaching 24–25 mm diam after 14 d at 21 °C, conidiomata black, scattered, superficial, acervular or stromatic.

Description: Sexual morph: see Senanayake et al. (2015). Asexual morph: *Conidiophores* septate, branched at the base, colourless, smooth, invested in mucus. *Conidiogenous cells* annellidic, discrete, mostly cylindrical, subcylindrical, or lageniform, 8.5–23 × 1.5–4.5 µm, (av. =13.2 ± 4 × 2.1 ± 0.55 µm), colourless, smooth. *Conidia* fusoid, straight or curved, mostly 3-septate, smooth or verruculose, barely constricted at the septa, 20.5–37 × 6–9 µm (av. = 26.7 ± 3.83 × 7.6 ± 0.78 µm); basal cell obconic with a truncate base, thin-walled, hyaline, 2.5–6.5 µm (av. = 4.7 ± 0.83 µm) long; median cells 2, cylindrical or subcylindrical, mid-brown to brown, thick-walled, ± equal, each 5–12 µm (av. = 9.1 ± 1.57 µm) long; apical cell conic with an acute or truncate apex, thin-walled, hyaline, 4–6.5 µm (av. = 5.1 ± 0.87 µm) long; 3–4 apical appendages, arising at different points, tubular, rough, unbranched or dichotomously branched at one appendage, variable in size, (4–) 11.5–52(–63) µm long; single basal appendage or absent, if present, tubular, unbranched, centric, occasionally dichotomously branched, 4.5–25(–44) µm long; mean conidium length/width ratio = 3.5:1.

Materials examined: **China**, on *Pinus* sp. (*Pinaceae*), unknown collection date, P.W. Crous, living culture CPC 23615. **Ethiopia,** on *Pinus radiata*, Jun. 2013, P.W. Crous, living culture CBS 144028 = CPC 23170. **Ireland**, on bone sample of deer, unknown collection date, Dr. Wagner, living culture CBS 144030 = CPC 24980. **Italy**, Province of Forlì-Cesena [FC], Galeata, Passo delle Forche, on branch of *Spartium junceum* (Fabaceae), 9 Nov. 2013, E. Camporesi (**holotype** of *Truncatella spartii* MFLU 15-0721, ex-type culture MFLUCC 15-0537, not seen). **Mexico**, Texcoco, on *Pinus* sp., 8 Dec. 2009, M. de Jesus Yanez Morales, living culture CPC 17945. **USA**, Utah, on *Pinus edulis*, Oct. 2014, M.J. Wingfield, HPC 53, CBS H-23518, living culture CBS 143894 = CPC 25363.

Notes: According to the phylogenetic analyses (Fig. 7), the ex-type of *Tru. spartii* (MFLUCC 15-0537) (Senanayake *et al.* 2015) is located in the new genus *Heterotruncatella*, and it is therefore combined as *Het. spartii*. The conidia of *Tru. spartii* were described as 8–12 × 4–5.5 µm in Senanayake *et al.*

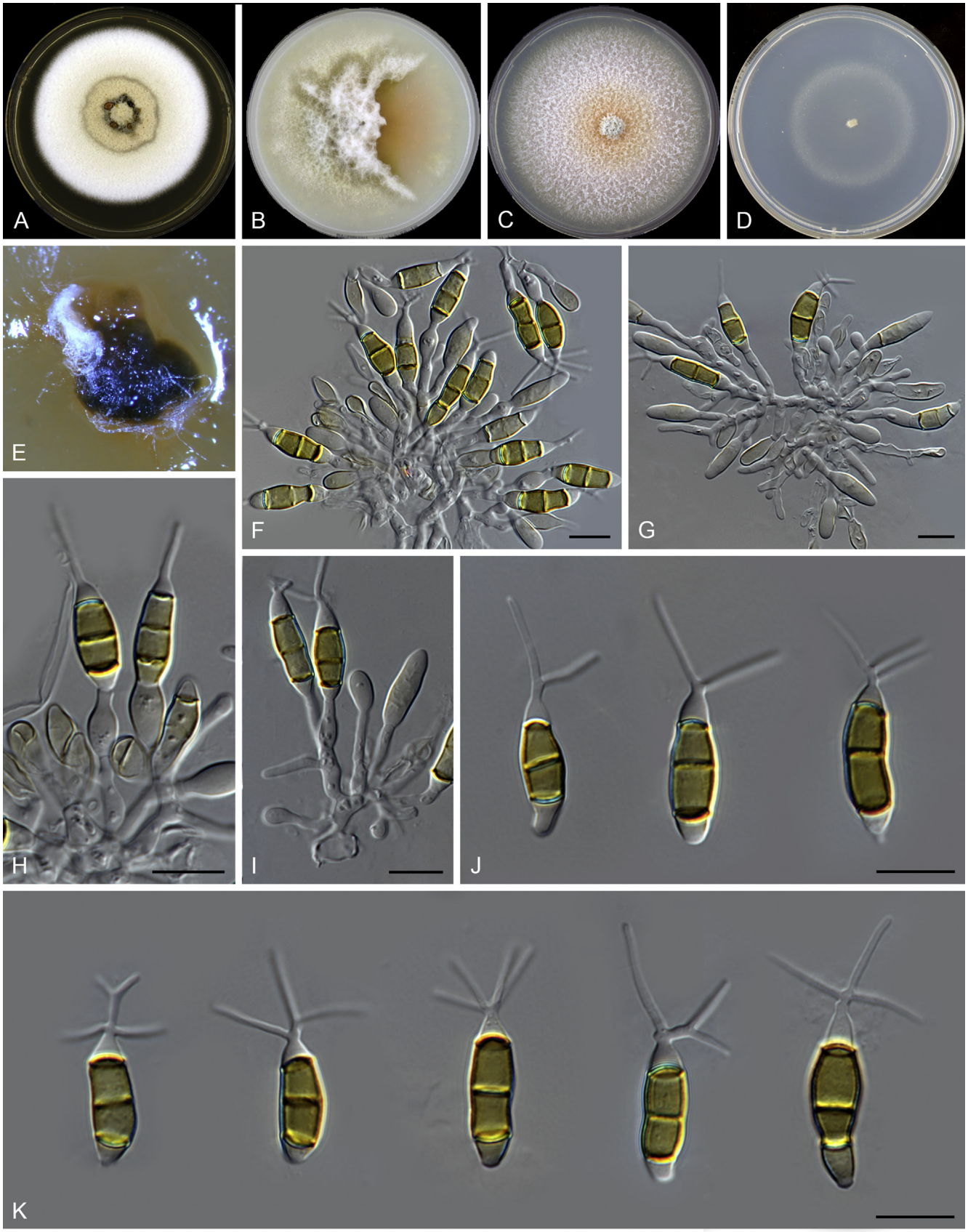

Fig. 31. *Heterotruncatella spadicea* (CBS 118145). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidioma on CMA. **F–I.** Conidiophores and conidiogenous cells bearing conidia. **J–K.** Conidia. Scale bars = 10 µm.

(2015). However, these are much longer and wider in the photoplate of that publication (fig. 8 in Senanayake *et al.* 2015). We therefore redescribed the asexual morph using the phylogenetically similar strain CBS 143894 (Fig. 7).

Heterotruncatella synapheae F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828363. Fig. 33.

Etymology: Name reflects the host genus it was isolated from, *Synaphea*.

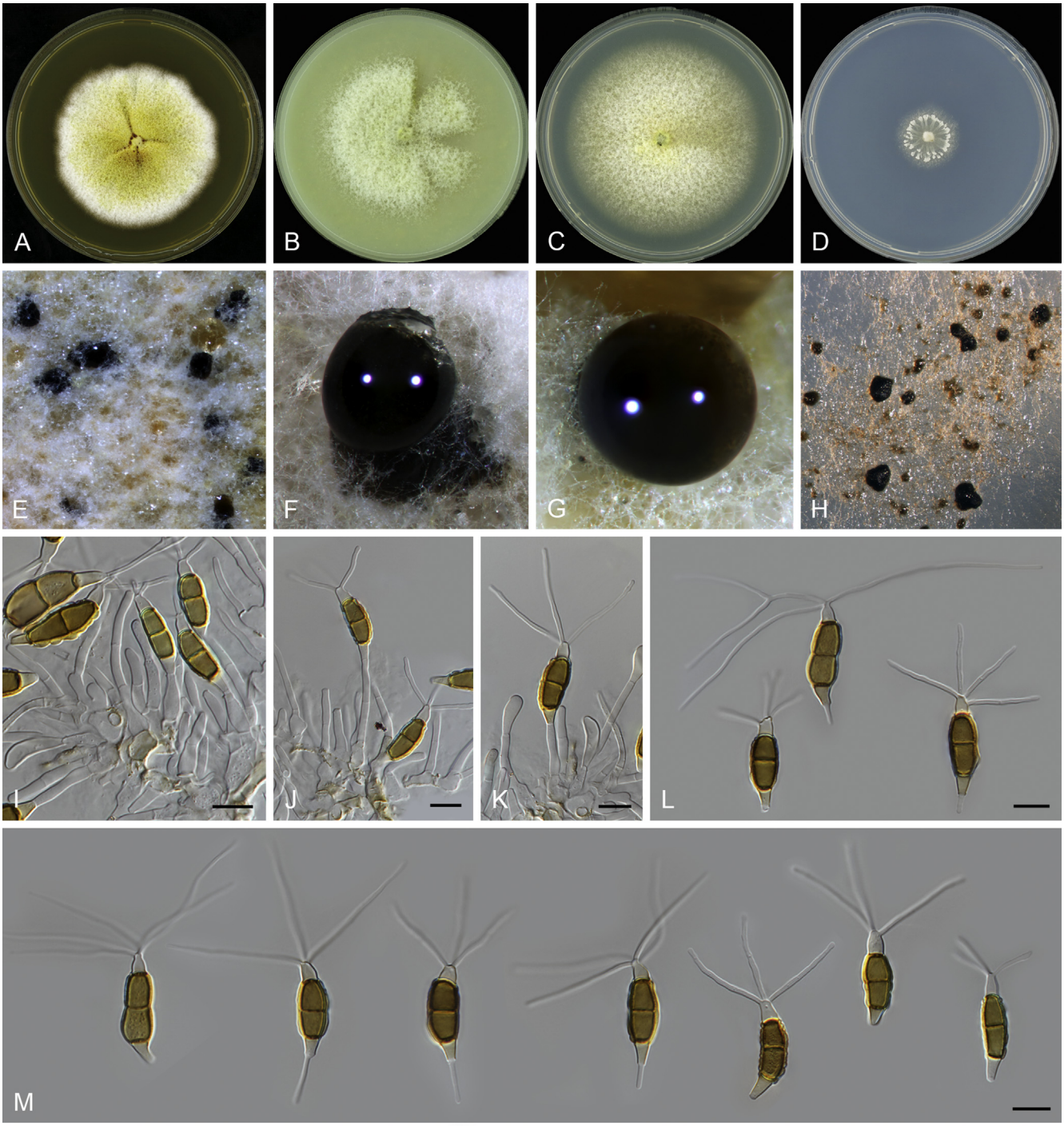

Fig. 32. *Heterotruncatella spartii* (CBS 143894/CPC 25363). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA respectively. **I–K.** Conidiophores, conidiogenous cells and conidia. **L–M.** Conidia with 3–5 appendages. Scale bars = 10 µm.

Culture characteristics: Colonies on MEA raised with convex edge, white to buff, reaching 51–55 mm diam after 14 d at 21 °C, conidial masses black, superficial; on CMA flat with entire edge, pale brown to dark vinaceous, sterile, reaching 76–80 mm diam after 14 d at 21 °C; on PDA flat with entire edge, buff to honey, sterile, reaching 58–60 mm diam after 14 d at 21 °C; on SNA flat with entire edge, colourless, sterile, reaching 50–51 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, reduced to conidiogenous cells, smooth, colourless. *Conidiogenous cells* annellidic, discrete, cylindrical or subcylindrical, 2.5–9.5 × 1.5–2 µm, (av. = 5 ± 1.82 × 1.8 ± 0.27 µm), colourless, smooth. *Conidia* fusoid, subfusoid to oval, straight or curved, wall rough or verruculose, mostly 3-septate, occasionally 4–5-septate, distal septa thicker than median septum, constricted at the septa, 20.5–29 × 8–10.5 µm (av. = 25.6 ± 2.06 × 9.5 ± 0.81 µm); basal cell obconic with a truncate base, sub-cylindrical, thin-walled, hyaline to pale brown, 2–6 µm (av. = 4.3 ± 0.8 µm) long; median cells 2, occasionally 3–4, doliiform, brown, thick-walled, ± equal, each 6–10.5 µm (av. = 8.3 ± 0.93 µm) long; apical cell conic with a truncate apex, or irregular, thin-walled, hyaline to pale brown, 1.5–3.5 µm (av. = 3 ± 0.62 µm) long; 3–5 apical appendages, arising at different points, attenuated, flexuous, unbranched, 21–46 µm (av. = 32 ± 7.04 µm) long; basal appendage absent; mean conidium length/width ratio = 2.7:1.

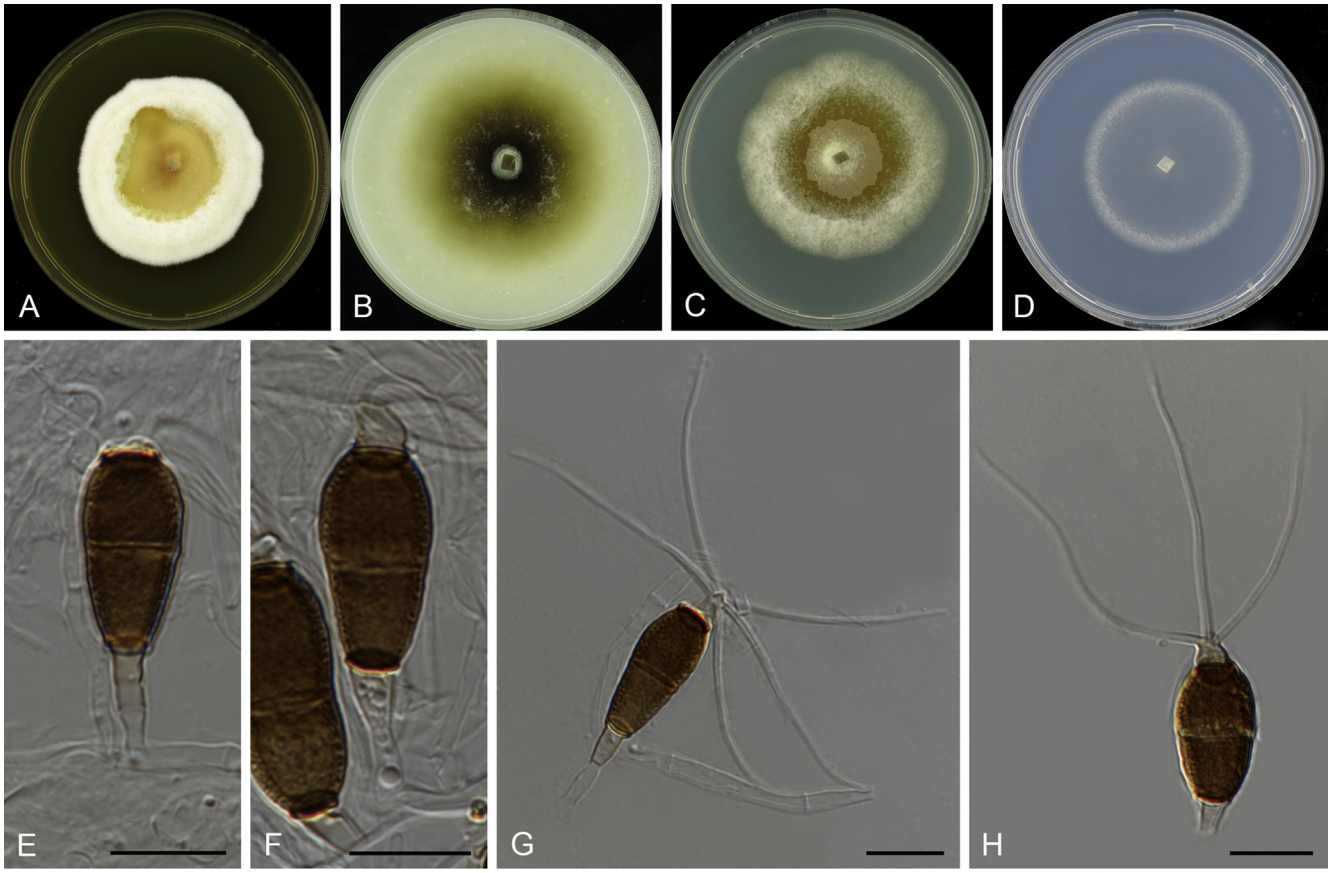

Fig. 33. *Heterotruncatella synapheae* (CBS 143909/CPC 29096). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiogenous cells and conidia. **G–H.** Conidia. Scale bars = 10 µm.

Material examined: **Australia**, Western Australia, Fitzgerald River National Park, Twertap road, on *Synaphea polymorpha* (*Proteaceae*), 22 Sep. 2015, P.W. Crous, HPC 667 (**holotype** CBS H-23534, ex-type culture CBS 143909 = CPC 29096).

Notes: Typical conidiomata were not formed in *Het. synapheae*, and only black conidial masses were observed on MEA. *Heterotruncatella synapheae* is closely related to *Het. singularis*, but with low sequence similarity (94 % on ITS, 95 % on *rpb2*, 85 % on *tef-1α*, and 89 % on *tub2*). Morphologically, *Het. synapheae* produces longer and wider conidia (20.5–29 × 8–10.5 µm vs. 16.5–21 × 7–8.5 µm) than *Het. singularis*. In addition, the 3–5 apical appendages of *Het. synapheae* are unbranched and long (21–46 µm), while *Het. singularis* produces only a single, branched or unbranched and relatively shorter appendage (13–30.5 µm). This is to our knowledge the first report of a *Sporocadaceae* species on *Synaphea polymorpha.*

Heterotruncatella vinaceobubalina F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828364. Fig. 34.

Etymology: Name reflects the colour of its median cells, vinaceous buff.

Culture characteristics: Colonies on MEA flat with entire edge, off-white to grey, reaching 50–54 mm diam after 14 d at 21 °C, conidiomata black, stromatic, scattered, semi-immersed; on CMA flat with entire edge, glaucous sky blue to greenish glaucous, reaching 70–74 mm diam after 14 d at 21 °C, conidiomata black, acervular, scattered, semi-immersed; on PDA flat with undulate edge, smoke grey, rosy buff around centre, reaching 54–58 mm diam after 14 d at 21 °C, conidiomata black, scattered, acervular, semi-immersed; on SNA flat with fimbriate edge, colourless, sterile, reaching 27–29 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* branched at the base, smooth, colourless, invested in mucus. *Conidiogenous cells* annellidic, discrete or integrated, cylindrical, subcylindrical, sometimes lageniform or ampulliform, 5.5–19.5 × 1.5–3 µm, (av. =10.8 ± 3.37 × 2.2 ± 0.34 µm), colourless, smooth. *Conidia* fusoid, straight, having verrucous particles on the surface, mostly 3-septate, occasionally 5-septate, distal septa thicker than median septum, slightly constricted at the septa, 17–31.5 × 5–8.5 µm (av. = 23.2 ± 2.9 × 7 ± 0.82 µm); basal cell obconic with a truncate base, or cylindrical, thin-walled, hyaline, 2–6.5 µm (av. = 4.1 ± 1.14 µm) long; median cells 2, doliiform, vinaceous buff, thick-walled, ± equal, each 5–11.5 µm (av. = 7.6 ± 1.17 µm) long; apical cell conic with a truncate apex, thin-walled, hyaline, 2–6 µm (av. = 3.3 ± 0.88 µm) long; 2–3 apical appendages, arising at different points, tubular, flexuous, not attenuated, always with spathulate apexes, unbranched, barely dichotomously branched at one appendage, 9–32(–42) µm (av. = 20.1 ± 7.21 µm) long; basal appendage 0–1, if present, tubular, attenuated, 3.5–9.5(–12.5) µm (av. = 5.5 ± 1.9 µm); mean conidium length/width ratio = 3.7:1.

Materials examined: **France**, La Réunion, on *Acacia heterophylla* (*Fabaceae*), 7 Mar. 2015, P.W. Crous, HPC 261 (**holotype** CBS H-23522, ex-type culture CBS 143897 = CPC 26201); on *Acacia heterophylla*, 7 Mar. 2015, P.W. Crous HPC 255, CBS H-23523, living culture CBS 143898 = CPC 26343.

Note: See notes under *Het. acacigena*.

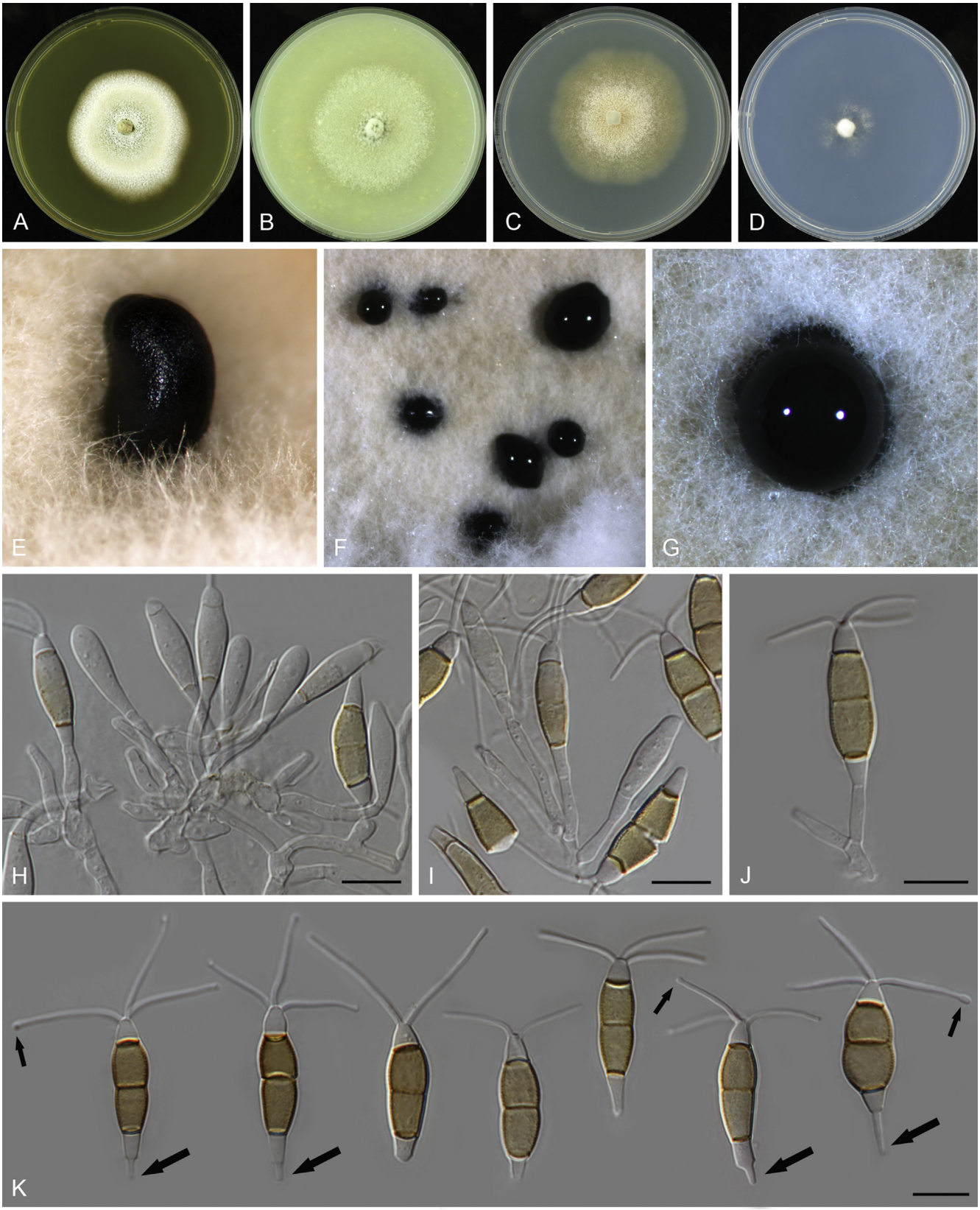

Fig. 34. *Heterotruncatella vinaceobubalina* (CBS 143897/CPC 26201). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–G.** Conidiomata on MEA, CMA and PDA, respectively. **H–J.** Conidiophores and conidiogenous cells. **K.** Conidia (thick arrows point to the atypical basal appendages; thin arrows point to the spathulate tips). Scale bars = 10 µm.

Hyalotiella Papendorf, Trans. Brit. Mycol. Soc. 50: 69. 1967.

Description: *Conidiomata* stromatic, pycnidial, immersed, vase-shaped with a well-defined venter and a long neck, venter unilocular or irregularly divided, glabrous, brown to dark brown, ostiolate; *wall of textura* angularis, cells thick-walled, dark brown to brown in the outer layers becoming progressively thin-walled and paler toward the interior. *Conidiophores* arising all around the cavity of the venter, reduced to conidiogenous cells, or septate and branched only at the base, invested in mucus. *Conidiogenous cells* discrete, cylindrical, lageniform to

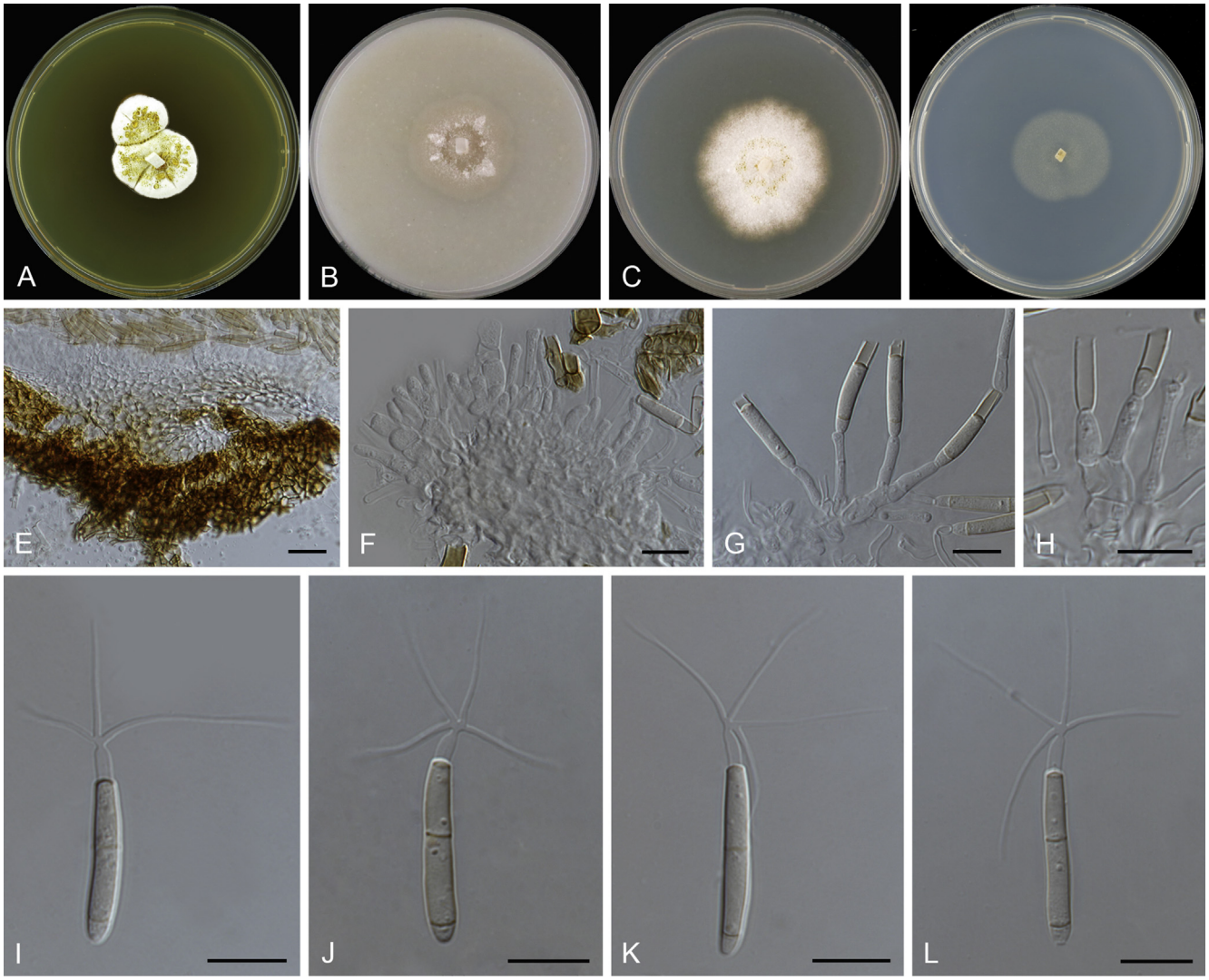

Fig. 35. *Hyalotiella transvalensis* (CBS 303.65). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Vertical section of conidioma. **F–H.** Conidiophores and conidiogenous cells. **I–L.** Conidia. Scale bars: E = 20 um, F–L = 10 µm.

ampulliform, colourless, smooth. *Conidia* cylindrical, euseptate; apical cell subcylindrical, colourless; median cells almost colourless to pale brown, longer than end cells, smooth; appendage cellular, arising from the apical cell and maintaining protoplasmic continuity with it, branched close to the point of origin; branches 2–4, attenuated, flexuous (emended from Nag Raj 1993).

Type species: *Hyalotiella transvalensis* Papendorf.

Hyalotiella transvalensis Papendorf, Trans. Brit. Mycol. Soc. 50: 69. 1967, **emend.** F. Liu, L. Cai & Crous. Fig. 35.

Culture characteristics: Colonies on MEA convex with papillate surface, undulate, white, producing yellow droplet, sterile, reaching 27 mm diam after 14 d at 21 °C; on CMA flat with undulate edge, colourless, sterile, reaching 32–33 mm diam after 14 d at 21 °C; on PDA flat with erose or denate edge, white, producing yellow droplet, sterile, reaching 46–47 mm diam after 14 d at 21 °C; on SNA flat with undulate edge, colourless, conidiomata stromatic, black, immersed, scattered.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, mostly reduced to conidiogenous cells, smooth, colourless, invested in mucus. *Conidiogenous cells* annellidic, discrete or integrated, mostly lageniform or ampulliform, sometimes cylindrical, 4.5–12 × 1.5–3.5 µm, (av. = 7.8 ± 2.25 × 2.4 ± 0.44 µm), colourless, smooth. *Conidia* cylindrical with obtuse ends, straight or slightly curved, 3-septate, smooth, 25–31.5 × 2.5–4 µm (av. = 28.5 ± 1.74 × 3.1 ± 0.33 µm); basal cell obconic with an obtuse or round base, thin-walled, colourless to pale grey, 2–3.5 µm (av. = 2.9 ± 0.46 µm) long; median cells 2, cylindrical, pale grey, thick-walled, ± equal, each 8.5–13 µm (av. = 11 ± 1.19 µm) long; apical cell conic with an acute apex, thin-walled, hyaline, 3.5–5 µm (av. = 4.1 ± 0.51 µm) long; 2–4 apical appendage branches, attenuated, tubular, flexuous, 5–25 µm (av. = 14.8 ± 5.23 µm) long; basal appendage absent; mean conidium length/width ratio = 9.2:1.

Further descriptions: See Papendorf (1967).

Material examined: **South Africa**, North West Province, Potchefstroom, from leaf-litter and top soil of *Acacia karroo* (*Fabaceae*) community, 1964, M.C. Papendorf (**holotype** PRE 43026, ex-type culture CBS 303.65 = ATCC 18127 = IMI 137470).

Notes: The ITS sequence of the ex-type of *Hya. transvalensis* (CBS 303.65) shows 99 % similarity to the ex-type of *Hya. spartii* (MFLUCC 13-0397), differing by only 3 nucleotide bases. The *tef-1α* sequence of *Hya. spartii* (GenBank KP757764) was generated with a primer pair different from this study (EF1-983F/EF1-2218R) and therefore not included in the multi-locus phylogenetic analyses. Other sequences of *Hya. spartii* are

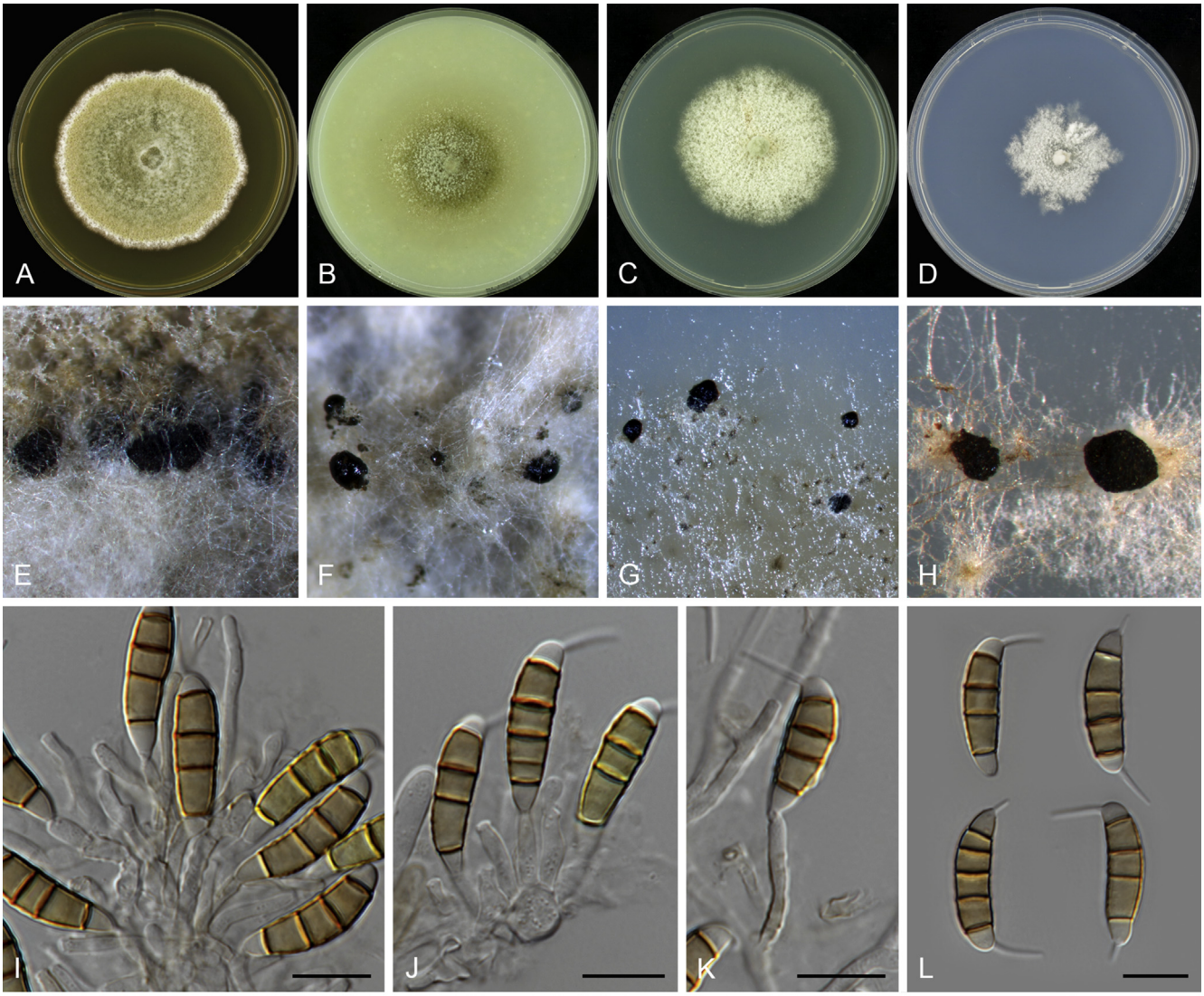

Fig. 36. *Hymenopleella austroafricana* (CBS 143886/CPC 21940). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–K.** Conidiophores, conidiogenous cells and conidia. **L.** Conidia. Scale bars = 10 µm.

unavailable for comparison. Morphologically, *Hya. transvalensis* differs from *Hya. spartii* in the dimension and shape of conidiomata (Nag Raj 1993, Li *et al.* 2015) and branch numbers of conidial appendages (2–4 vs. 5–6) (Li *et al.* 2015).

Hymenopleella Munk, Dansk bot. Ark. 15(no. 2): 89. 1953, **emend.** F. Liu, L. Cai & Crous.
Synonyms: *Dyrithiopsis* L. Cai *et al.*, Mycologia 95: 912. 2003. *Neotruncatella* Hyang B. Lee & T.T.T. Nguyen, Fungal Diversity 80: 198. 2016.

Type species: *Hymenopleella hippophaëicola* Jaklitsch & Voglmayr, Persoonia 37: 96. 2016.

Description: Sexual morph: *Ascomata* perithecial, immersed or semi-immersed, subglobose, blackened, coriaceous, papillate, ostiole, periphysate. *Peridium* pseudoparenchymatous, 2-layered, dark brown. *Paraphyses* hypha-like, sparse, septate, tapering towards the ends. *Asci* unitunicate, cylindrical, with eight uni- to partially biseriate ascospores, apically rounded, discoid, subapical ring. *Ascospores* oblong, ellipsoid or fusoid, symmetric, transversely septate or muriform, euseptate, light yellow- to reddish brown, smooth, partly turning dull green in Lugol, lacking a sheath (emended from Jeewon *et al.* 2003a, Jaklitsch *et al.* 2016). Asexual morph: *Conidiomata* globose to subglobose, black. *Conidiogenous cells* hyaline, ampulliform, subcylindrical, cylindrical, formed from the inner cells of the peridial wall. *Conidia* fusoid, subcylindrical, straight or curved, 3–7-septate, bearing appendages; basal cell obconic, colourless and thin-walled, smooth; median cells doliiform or cylindrical, thick-walled, yellow to yellowish-brown at maturity, wall smooth or verruculose; apical cell conical, almost colourless, thin-walled, smooth; appendages tubular, attenuated; apical appendage single, unbranched; basal appendage absent or single, centric or excentric (emended from Hyde *et al.* 2016).

Notes: Generic type strains of *Neotruncatella* (asexual morph), *Dyrithiopsis* and *Hymenopleella* (sexual morph) formed one clade in the multi-locus phylogenetic tree (Fig. 1), and their sexual-asexual relationship is therefore confirmed in this study (Fig. 1). Although *Neotrucatella* was recently synonymised with *Monochaetinula* because of the phenotypic similarities of the asexual morph and same lifestyle (Perera *et al.* 2018), it awaits confirmation using molecular data. Therefore, *Monochaetinula* is not synonymised here.

Hymenopleella austroafricana F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828365. Fig. 36.

Etymology: Named after the continent where this fungus was isolated, Africa (South Africa and Zambia).

Culture characteristics: Colonies on MEA flat with undulate edge, greyish green, reaching 50–52 mm diam after 14 d at 21 °C, conidiomata scattered or gregarious, black, usually covered with aerial mycelia, stromatic; on CMA flat with entire edge, buff at the margin, brown near the centre, reaching 70 mm diam after 14 d at 21 °C, conidiomata black, scattered, acervular, forming on the aerial mycelia; on PDA flat with undulate edge, off-white, reaching 56–68 mm diam after 14 d at 21 °C, conidiomata brown or black, scattered, superficial or immersed, acervular; on SNA flat with rhizoid edge, white, reaching 40–42 mm diam after 14 d at 21 °C, conidiomata black, scattered, superficial, stromatic.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, mostly reduced to conidiogenous cells, colourless, smooth, invested in mucus. *Conidiogenous cells* discrete or integrated, mostly sub-cylindrical or lageniform, 4–11.5 × 1.5–3 µm (av. = 6.8 ± 1.91 × 2 ± 0.33 µm), hyaline or pale brown, smooth. *Conidia* fusoid, subcylindrical or reniform, straight or curved, 3–5-septate, mostly 4-septate, smooth, without constriction at the septa, 12.5–21.5 × 4–5.5 µm (av. = 16.5 ± 2.03 × 4.8 ± 0.4 µm); basal cell obconic with a truncate base, thin-walled, hyaline, 2–4.5 µm (av. = 3.5 ± 0.71 µm) long; median cells mostly 3, cylindrical, trapezoid, mid-brown or yellowish brown, thick-walled, ± equal at the second and third cells from apex, each 2–4.5 µm (av. = 3.2 ± 0.62 µm) long, the fourth cell 3–7 µm (av. = 4.5 ± 0.91 µm) long; apical cell conic with an acute apex, thin-walled, hyaline, 1.5–4.5 µm (av. = 2.9 ± 0.67 µm) long; 0–1 apical appendage, when present, tubular, attenuated, unbranched, 3.5–7.5 µm (av. = 4.8 ± 1.83 µm) long; 0–1 basal appendage, when present, tubular, attenuated, unbranched, 1.5–5.5 µm (av. = 3 ± 1.36 µm) long; mean conidium length/width ratio = 3.4:1.

Materials examined: **South Africa**, Limpopo Province, Klein Kariba Holiday Resort, *Gleditsia triacanthos* (*Fabaceae*), 22 Jan. 2013, P.W. Crous (**holotype** CBS H-23509, ex-type culture CBS 143886 = CPC 21940); on *Bridelia mollis* (*Phyllanthaceae*), 22 Jan. 2013, unknown collector, living culture CBS 144026 = CPC 21946. **Zambia**, on *Combretum hereroense* (*Combretaceae*), 28 Mar. 2013, P.W. Crous, living culture CBS 144027 = CPC 22553 = OM4158.

Notes: *Hymenopleella austroafricana* is morphologically similar to *Hym. polyseptata* in producing fusoid, straight or curved, yellowish brown and single appendaged (if present) conidia, but they can be distinguished from each other by the number of septa (3–5 vs. 4–7) and conidial dimensions (12.5–21.5 × 4–5.5 µm vs. 24.5–33 × 6.5–8 µm), as well as the mean conidium length/width ratio (3.4:1 vs. 4:1). In addition, *Hym. austroafricana* is phylogenetically distinct and shares low sequence similarity with *Hym. polyseptata* (88 % on *rpb2*, 81 % on *tef-1α*, 84 % on *tub2*). This is the first report of a member of *Sporocadaceae* associated with *Bridelia mollis* and *Combretum hereroense.*

Hymenopleella polyseptata F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828366. Fig. 37.

Etymology: Refers to its diverse number of septa.

Culture characteristics: Colonies on MEA flat with entire edge, glaucous, reaching 80–82 mm diam after 14 d at 21 °C; on CMA flat with entire edge, off-white, olivaceous in the centre, reaching 72–74 mm diam after 14 d at 21 °C; on PDA flat with entire edge, buff, reaching > 90 mm diam after 14 d at 21 °C; on SNA flat with entire edge, pale buff, reaching 45–47 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: Sterile on MEA, PDA and SNA. On CMA, *conidiomata* black, semi-immersed, scarce and scattered. *Conidiophores* septate, branched, colourless, smooth, invested in mucus. *Conidiogenous cells* annellidic, discrete or integrated, cylindrical, subcylindrical, or lageniform, 8.5–22 × 1–3.5 µm (av. = 13.4 ± 3.48 × 2 ± 0.43 µm), colourless, smooth. *Conidia* fusoid, straight or slightly curved, 4–7-septate, smooth, barely constricted at the septa, 24.5–33 × 6.5–8 µm (av. = 29.4 ± 1.97 × 7.3 ± 0.46 µm); basal cell obconic with a truncate or obtuse base, thin-walled, hyaline, 2.5–7 µm (av. = 4 ± 0.79 µm) long; median cells 3–6, cylindrical or doliiform, pale to mid-brown, thick-walled; in 4-septate conidia, median cells ± equal, each 3.5–8 µm (av. = 6.5 ± 0.66 µm) long; in 5-septate conidia, median cells not equal, the two short cells 2.5–5 µm (av. = 3.7 ± 0.48 µm) long, the other two long cells 5.5–9 µm (av. = 5.3 ± 0.71 µm) long; in 6-septate conidia, the distal four median cells usually ± equal, each 2.5–4.5 µm (av. = 3.7 ± 0.42 µm) long, the median cell 4–7.5 µm (av. = 6.3 ± 0.8 µm) long; in 7-septate conidia, median cells ± equal, 2.5–6 µm (av. = 3.6 ± 0.58 µm) long; apical cell conic with an acute or obtuse apex, thin-walled, hyaline, 2.5–5 µm (av. = 3.4 ± 0.56 µm) long; apical appendage single, attenuated, tubular, unbranched, 4–9 µm (av. = 7 ± 1.27 µm) long; 0–1 basal appendage, when present, attenuated, tubular, unbranched, 2.5–6.5 µm (av. = 5 ± 1.09 µm) long; mean conidium length/width ratio = 4:1.

Material examined: **South Africa**, Limpopo Province, Klein Kariba Holiday Resort, on *Combretum* sp. (*Combretaceae*), 22 Jan. 2013, P.W. Crous (**holotype** CBS H-23510, ex-type culture CBS 143887 = CPC 21944).

Notes: This species is morphologically distinct from other species by producing 4–7-septate conidia. See also the notes under *Hym. lakefuxianensis* and *Hym. austroafricana*.

Hymenopleella endophytica (Hyang B. Lee *et al.*) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828367.
Basionym: *Neotruncatella endophytica* Hyang B. Lee *et al.*, Fungal Diversity 80: 198. 2016.

Description: See Hyde *et al.* (2016).

Material examined: **Republic of Korea**, Jeonnam Province, garden of the Chonnam National University located in Gwangju (35°10'N, 126°55'E), on *Abies firma* leaf, 3 Aug. 2015 (**holotype** of *Neotruncatella endophytica* EML-AS5-1, ex-type culture CNUFC-EMLAS5-1 = JMRC:SF:012333, not seen).

Notes: The single species of the monotypic genus *Neotruncatella*, *Neo. endophytica*, was introduced by Hyde *et al.* (2016), and subsequently synonymised under *Monochaetinula terminaliae* (Perera *et al.* 2018) because of the phenotypic similarity of their asexual morphs and the similar lifestyle. However, *Monochaetinula terminaliae* lacks sequences derived from type material and further research using molecular data is thus required to confirm them as synonymous. *Neotruncatella endophytica* is located in the genus *Hymenopleella* based on LSU and ITS analyses (not shown), and a new combination is therefore proposed here as *Hymenopleella endophytica.*

Hymenopleella lakefuxianensis (L. Cai *et al.*) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828369.

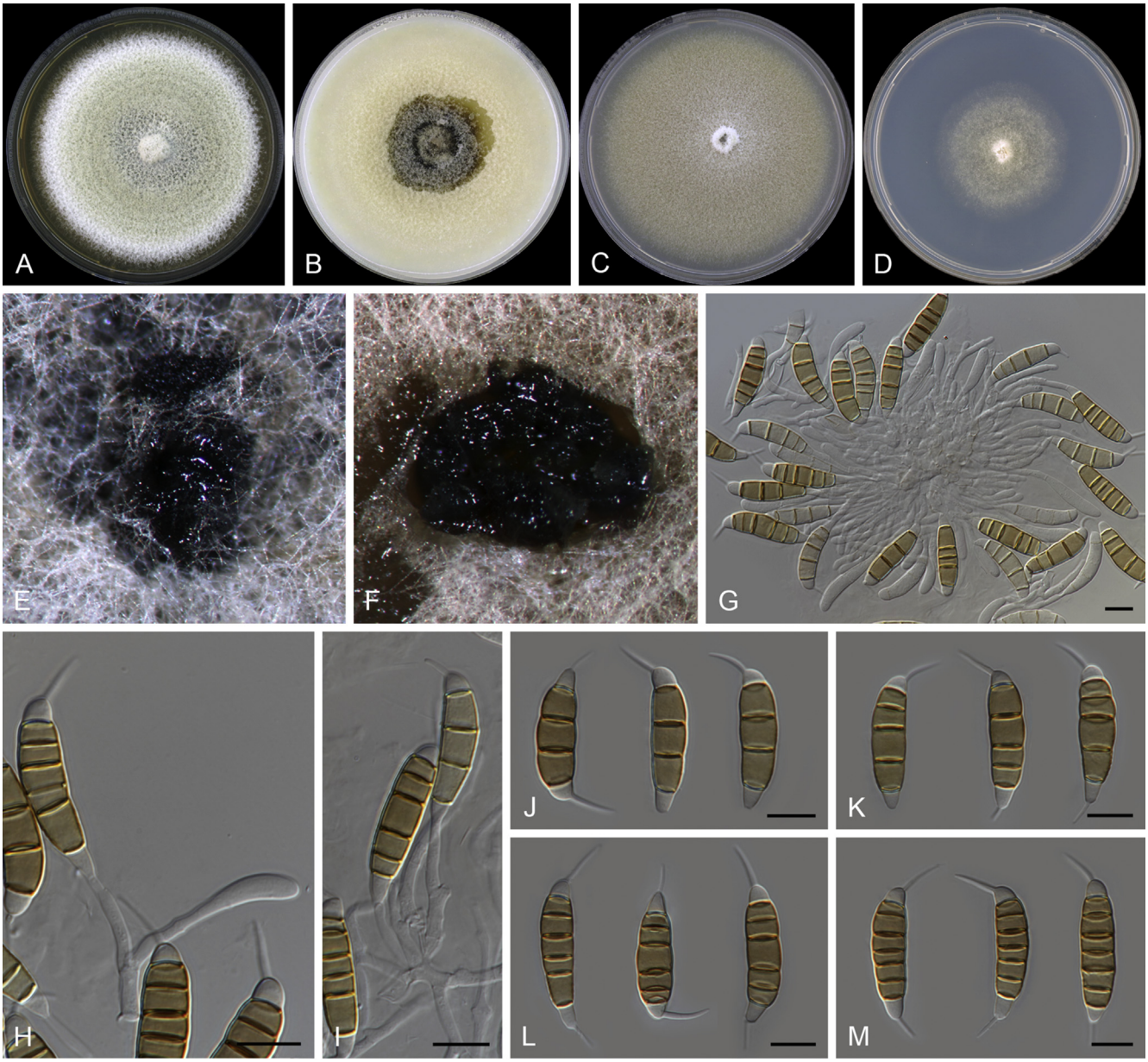

Fig. 37. *Hymenopleella polyseptata* (CBS 143887/CPC 21944). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on CMA. **G.** Conidiophores. **H–I.** Conidiogenous cells bearing conidia. **J.** 4-septate conidia. **K.** 5-septate conidia. **L.** 6-septate conidia. **M.** 7-septate conidia. Scale bars = 10 µm.

Basionym: *Dyrithiopsis lakefuxianensis* L. Cai *et al.*, Mycologia 95: 913. 2003.
Synonym: *Monochaetiopsis lakefuxianensis* L. Cai *et al.*, Mycologia 95: 914. 2003.

Description: See Jeewon *et al.* (2003a).

Material examined: **China**, Yunnan Province, Cheng Jiang, Fuxian Lake, on submerged twig, 28 Aug. 2000, L. Cai, R. Jeewon & K.D. Hyde (**holotype** of *Dyrithiopsis lakefuxianensis* HKU(M) 8280, living culture HKUCC 7303, not seen).

Notes: Only a LSU sequence of the basionym *Dyrithiopsis lakefuxianensis* (ex-type HKUCC 7303) was available for comparison (from Jeewon *et al.* 2003a), and this species is closely related with *Hym. polyseptata* (Fig. 1, 99 % sequence similarity). Morphologically, *Hym. lakefuxianensis* produces 4-septate (occasionally 5-septate) conidia, while conidia of *Hym. polyseptata* are 4–7-septate. In addition, *Hym. lakefuxianensis* was reported from a submerged twig in a lake in China, while *Hym. polyseptata* was isolated from leaves of a *Combretum* sp. in South Africa.

Hymenopleella subcylindrica F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828370. Fig. 38.

Etymology: Named after the subcylindrical shape of its conidia.

Culture characteristics: Colonies on MEA flat with entire edge, white, reaching 55–56 mm diam after 14 d at 21 °C, conidiomata gregarious, black, semi-immersed, usually covered with aerial mycelia; on CMA flat with entire edge, isabelline to olivaceous, reaching 38–40 mm diam after 14 d at 21 °C, conidiomata black, scattered, acervular, semi-immersed; on PDA flat with entire edge, off-white, sterile, reaching 56–58 mm diam after 14 d at 21 °C; on SNA flat with feathery margin, white, reaching 15–22 mm diam after 14 d at 21 °C, conidiomata luteous to olivaceous, scattered or gregarious, superficial, acervular.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate and branched at the base, mostly reduced to conidiogenous cells, colourless, smooth. *Conidiogenous cells* discrete, sub-cylindrical or lageniform, 3.5–12 × 1–3 µm (av. = 6.2 ± 1.95 × 2.1 ± 0.41 µm), hyaline, smooth. *Conidia*

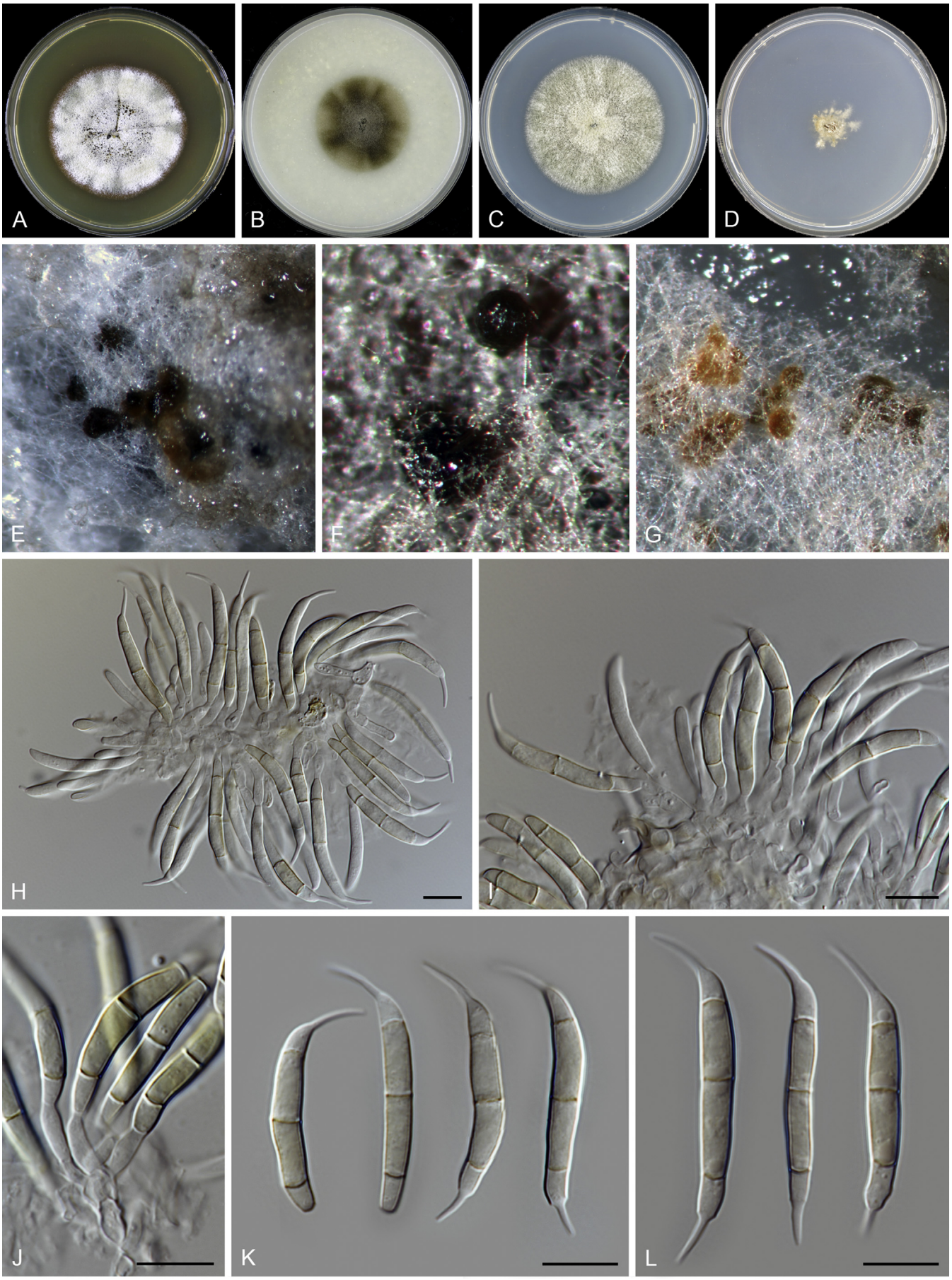

Fig. 38. *Hymenopleella subcylindrica* (CBS 647.74). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–G.** Conidiomata on MEA, CMA and SNA, respectively. **H–J.** Conidiophores and conidiogenous cells bearing conidia. **K.** Conidia on SNA. **L.** Conidia on MEA. Scale bars = 10 µm.

cylindrical, subcylindrical, straight or slightly curved, pale brown, 3-septate, smooth, fairly thick-walled, without constriction at the septa, 21.5–33.5 × 2–3.5 µm (av. = 28.1 ± 2.9 × 2.9 ± 0.25 µm); basal cell subcylindrical, thin-walled, hyaline to pale brown, 3–6 µm (av. = 4.8 ± 0.71 µm) long; median cells 2, cylindrical, pale brown, together 18–23 µm (av. = 20.6 ± 1.26 µm) long, each cell 8.5–12 µm (av. = 10.5 ± 0.85 µm) long; apical cell conical, hyaline to pale brown, 3–6 µm (av. = 4.6 ± 0.71 µm) long; apical appendage single, tubular, attenuated, unbranched, 6.5–8.5 µm (av. = 7.3 ± 0.24 µm) long; basal appendage single, tubular, attenuated, unbranched, 2.5–7.5 µm (av. = 4.8 ± 1.33 µm) long; mean conidium length/width ratio = 9.7:1.

Materials examined: **India**, Karnataka, Coconut Res. Station, Arsikere, on *Cocos nucifera* (*Arecaceae*) leaves, 9 Feb 1977, V.V. Sullamath, living culture CBS 164.77 = NBRC 32675; New Delhi, on *Gypsophila* (*Caryophyllaceae*) seeds, 1974, K.G. Mukerji (**holotype** CBS H-17993, ex-type living culture CBS 647.74).

Notes: Based on the phylogenetic analysis (Fig. 1), the two strains (CBS 647.74 and CBS 164.77) representing *Hym. subcylindrica* are closely related to *Hym. endophytica* (92 % sequence similarity on ITS; 100 % identical on LSU), but morphologically differ from the latter in producing thinner conidia (2–3.5 µm vs. 3–5 µm) and having a longer basal appendage (2.5–7.5 µm vs. 1–3.5 µm).

Monochaetia (Sacc.) Allesch., Rabenh. Krypt.-Fl., Edn 2 (Leipzig) 1(7): 665. 1902, **emend.** F. Liu, L. Cai & Crous.
Basionym: *Pestalotia* subgen. *Monochaetia* Sacc. [as 'Pestalozzia'], Syll. fung. (Abellini) 3: 797. 1884.
Synonym: *Lennisia* Nieuwl., Am. Midl. Nat. 4: 380. 1916.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* acervular or acervuloid, immersed to semi-immersed, unilocular, glabrous; dehiscence irregular; basal stroma of *textura angularis*. *Conidiophores* arising from the upper cells of the basal stroma or restricted to the base and part way up the side walls, septate and branched or reduced to conidiogenous cells, colourless, smooth, invested in mucus. *Conidiogenous cells* discrete or integrated, ampulliform, lageniform, cylindrical, subcylindrical or irregular, annellidic, colourless to pale brown, smooth. *Conidia* fusoid, straight or slightly curved, euseptate, bearing appendages; basal cell obconic with a truncate base, hyaline to pale brown; median cells with thick, smooth or ornamented walls, pigmented and concolourous; apical cell conical, hyaline to pale brown; appendages cellular, unbranched, attenuated; apical appendage single; basal appendage usually absent, when present, single, unbranched, centric (emended from Nag Raj 1993, Sutton 1980).

Type species: *Monochaetia monochaeta* (Desmazières) Allescher.

Notes: Guba (1961) accepted 41 *Monochaetia* species in three sections based on conidial septation (3-, 4- and 5-septate). Species in section Quadriloculatae with 3-septate conidia have been transferred to *Truncatella* or *Seimatosporium*, and the Sexloculatae section with 5-septate conidia to *Seiridium* (Sutton 1980). A small set of 14 species in the section Quinqueloculatae was accepted in *Monochaetia* s. str., including the type species *Mon. monochaeta* (Guba 1961, Sutton 1980, Nag Raj 1993). This genus is characterised by acervular conidiomata, fusoid and transversely septate conidia, with brown median cells and a single cellular apical and basal (when present) appendage. So far there are 123 *Monochaetia* epithets in Index Fungorum and MycoBank (2018), and most have been transferred to other genera, e.g. *Diploceras*, *Monochaetinula*, *Sarcostroma*, *Seimatosporium* and *Seiridium* (Nag Raj 1993).

Monochaetia monochaeta (Desm.) Allesch., Rabenh. Krypt.-Fl. 1(7): 667. 1902, **emend.** F. Liu, L. Cai & Crous. Fig. 39.
Basionym: *Pestalotia monochaeta* Desm., Ann. Sci. Nat., Bot., sér. 3, 10: 355. 1848.

Culture characteristics: Colonies on MEA low convex with entire edge, straw to pure yellow, reaching 58–60 mm diam after 14 d at 21 °C, conidiomata dark brown, acervular, semi-immersed, scattered or gregarious, with extruding apricot or olivaceous conidial masses; on CMA, low convex with entire edge, white, aerial mycelia flocculent, reaching 51 mm diam after 14 d at 21 °C, conidiomata umber, scattered, superficial or semi-immersed, acervular; on PDA flat with entire edge, white, reaching 58–59 mm diam after 14 d at 21 °C, conidiomata olivaceous to black, scattered, acervular, semi-immersed; on SNA flat with undulate edge, buff, reaching 26–30 mm diam after 14 d at 21 °C, conidiomata black, scattered or gregarious, superficial or semi-immersed, acervular, stromatic.

Description (*On SNA*): Sexual morph: unknown. Asexual morph: *Conidiophores* septate and branched, hyaline or pale brown, thin-walled. *Conidiogenous cells* annellidic, discrete or integrated, cylindrical, subcylindrical, variable in size, 2.5–21.5 × 1.5–3 µm (av. = 10.3 ± 4.54 × 2.4 ± 0.29 µm), hyaline or pale brown, smooth or verruculose. *Conidia* fusoid, straight, mostly 4-septate, occasionally 5-septate, wall smooth or undulate, not constricted at the septa, but commonly collapsed at septa, 17–23 × 4.5–7 µm (av. = 20 ± 1.53 × 5.9 ± 0.83 µm); basal cell obconic with a truncate base, thin-walled, hyaline, 2–4 µm (av. = 3 ± 0.47 µm) long; median cells 3, trapezoid or subcylindrical, pale to mid-brown, thick-walled, the first median cell from base 4–7.5 µm (av. = 5.5 ± 0.73 µm) long, the second cell 2.5–5 µm (av. = 4.3 ± 0.45 µm) long, the third cell 3.5–5 µm (av. = 4.3 ± 0.45 µm) long, together 13–16 µm (av. = 14.2 ± 0.94 µm) long; apical cell conic with an acute apex, thin-walled, hyaline, or occasionally pale brown, 2.5–4 µm (av. = 3.2 ± 0.5 µm) long; appendages tubular, attenuated, unbranched, variously bent; single apical appendage, 7–14.5 µm (av. = 10.1 ± 1.64 µm) long; basal appendage absent, or when present, single, unbranched, centric, 1.5–7.5 µm (av. = 4.2 ± 1.51 µm); mean conidium length/width ratio = 3.4:1.

Materials examined: **France**, on wilting and dry leaf of *Quercus ilex* (*Fagaceae*), 1848, unknown collector (FH00822894, issued in Desmazières, Pl. Crypt. N. France, Ed. I, fasc. 35, no. 1734, **lectotype** designated here, MBT384685). **Italy**, Lizzano in Belvedere, Toscane, on leaf of *Quercus pubescens*, 27 Sep. 1981, H.A. van der Aa (CBS H-14562 **epitype designated here**, MBT383993, ex-epitype culture CBS 199.82). **Netherlands,** Utrecht, Baarn, contaminant in other fungus, Aug. 1980, D. Heytmeyer, CBS H-14563, living culture CBS 546.80; Baarn, on *Quercus robur* leaf, 9 Aug. 1995, H.A. van der Aa and G. Verkley, living culture CBS 658.95; Soest, De Stompert, on leaf of *Quercus robur* (endophytic isolate), isolated by G. Verkley, Jun. 2002, living culture CBS 115004. **UK**, England, Lincolnshire, Bardney Forest, on *Quercus* sp., unknown collection date and collector, isolated and deposited by T.R. Peace, living culture CBS 315.54 = IMI 056698.

Notes: *Monochaetia monochaeta* was originally reported on wilting and dry leaves of *Quercus* sp. in France. Other reported host plants include *Castanea crenata*, *Rhododendron linearifolium* var. *macrosepalum*, and *R. maximum* (Nag Raj 1993). Five strains isolated from *Quercus* spp. from Europe (Italy,

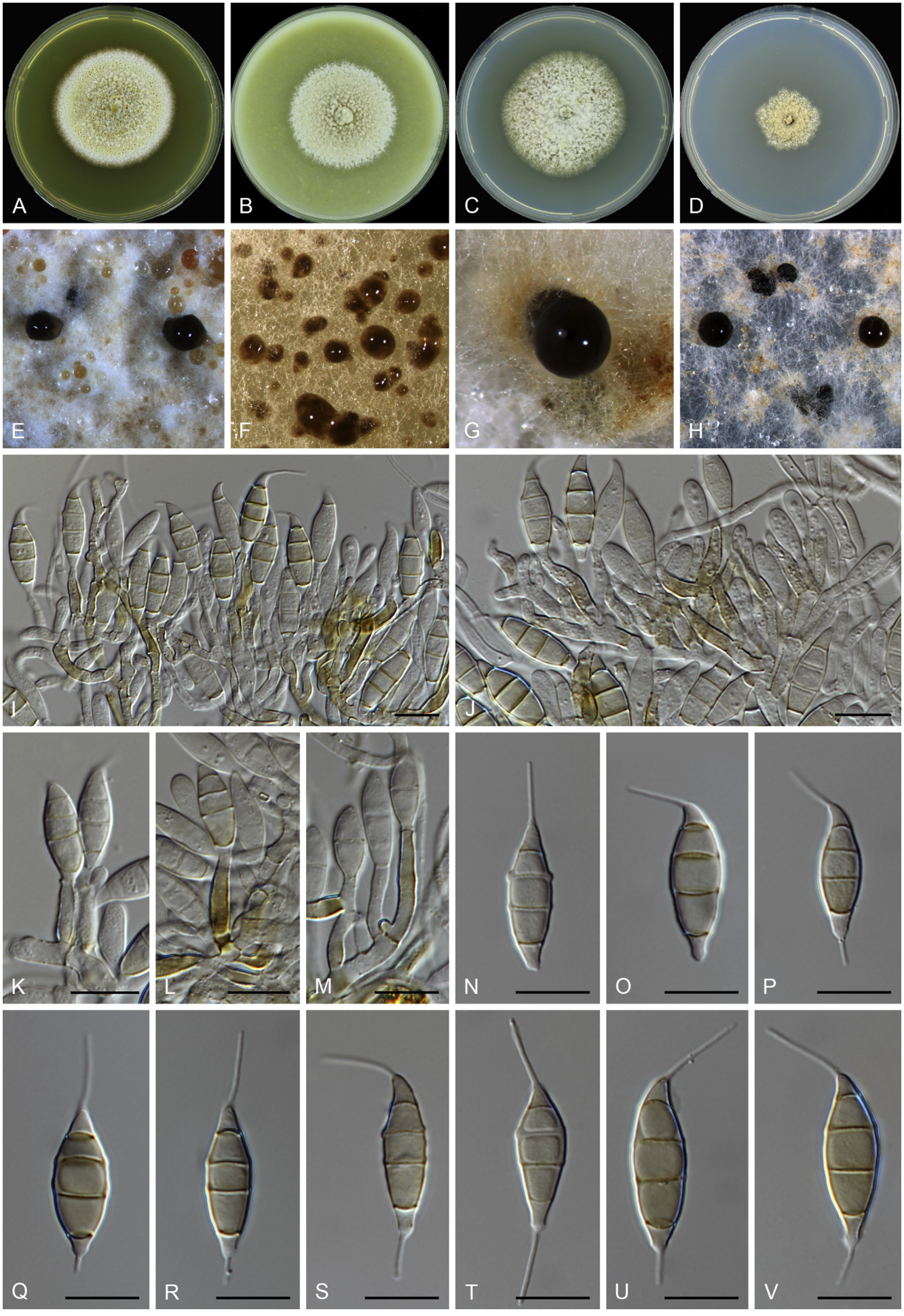

Fig. 39. *Monochaetia monochaeta* (CBS 199.82). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–J.** Conidiophores. **K–M.** Conidiogenous cells bearing conidia. **N–V.** Conidia. Scale bars = 10 µm.

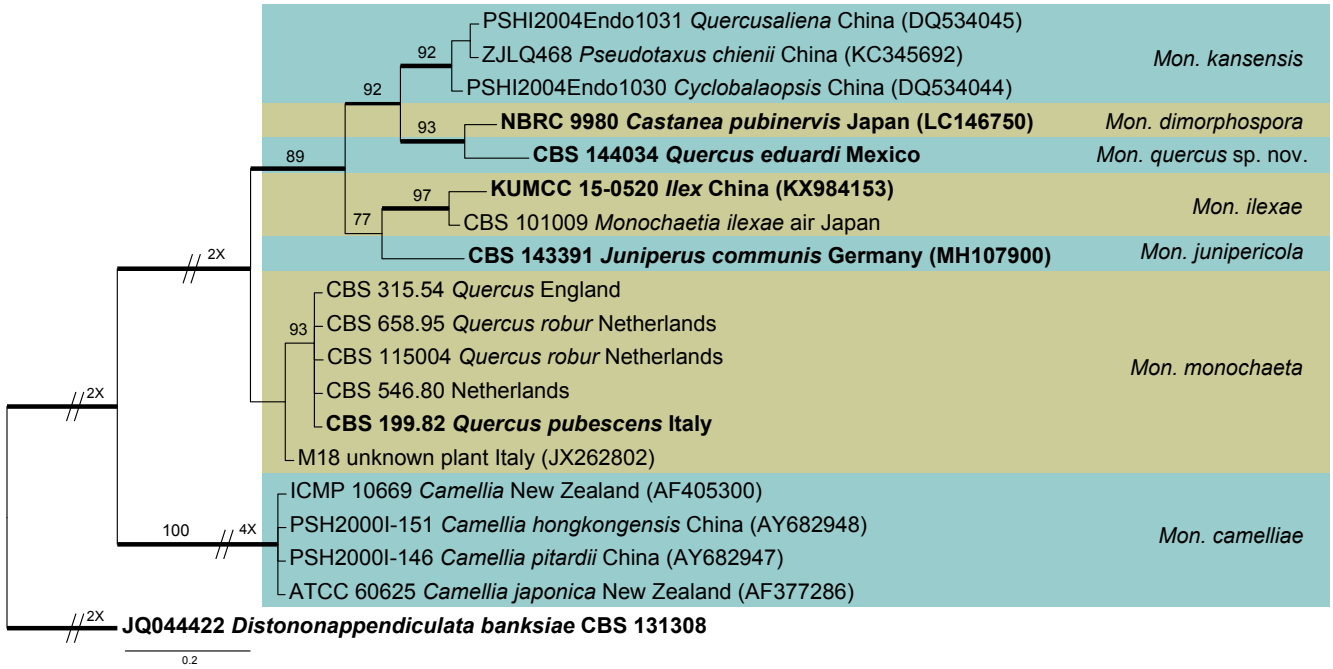

Fig. 40. Phylogenetic tree of ***Monochaetia*** resulting from a Bayesian analysis of the ITS sequence alignment. Bayesian posterior probabilities (PP $\geq$ 0.95) are emphasised by thickened branches, maximum likelihood bootstrap support values ($\geq$ 50 %) are shown at the nodes. The scale bar represents the expected number of changes per site. All taxon names consist of strain number, host and location, and with GenBank accession number in the bracket. Species names are aligned to the right. Ex-type strains are represented in bold.

England and the Netherlands) in this study clustered together in a monophyletic clade in the multi-locus (Fig. 1) and ITS tree (Fig. 40), and morphologically resemble *Mon. monochaeta* (Nag Raj 1993). Therefore, specimen CBS H-14562, a dried culture of CBS 199.82, was designated here as epitype to stabilise the application of this genus and species.

Monochaetia quercus F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828371. Fig. 41.

Etymology: Name reflects the host genus it was isolated from, *Quercus*.

Culture characteristics: Colonies on MEA flat with entire edge, white, reaching > 90 mm diam after 10 d at 21 °C, conidiomata black, acervular, semi-immersed, scattered; on CMA, flat with entire edge, white to pale luteous, aerial mycelia flocculent, sterile, reaching > 90 mm diam after 10 d at 21 °C; on PDA flat with lobate edge, white with ochreous edge, sterile, reaching 81 mm diam after 10 d at 21 °C; on SNA flat with entire edge, colourless, sterile, reaching 81–82 mm diam after 10 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate and branched, mostly reduced to conidiogenous cells, colourless, smooth, thin-walled. *Conidiogenous cells* discrete, mostly cylindrical, occasionally subcylindrical, 6.5–21.5 × 1.5–3.5 µm (av. = 12.4 ± 1.6 × 2.4 ± 0.3 µm), hyaline, smooth. *Conidia* fusoid, straight, mostly 4-septate, occasionally 3-septate, smooth, usually not constricted at the septa, 22.5–29 × 4.5–7 µm (av. = 25.6 ± 1.55 × 6.4 ± 0.43 µm), bearing appendages; basal cell obconic with a narrow truncate base, trapezoid, periclinal wall thin, hyaline, 3.5–5 µm (av. = 4.1 ± 0.43 µm) long; median cells 2–3, doliiform, cylindrical, trapezoid, thick-walled, pale to mid-brown, together 15–20 µm (av. = 17.3 ± 1.22 µm) long; if 3-septate, the first median cell from apex 8–10 µm (av. = 9 ± 0.49 µm) long, second cell 5.5–8 µm (av. = 7 ± 0.77 µm) long; if 4-septate, the first two median cells ± equal, 3.5–6.5 µm (av. = 5.3 ± 0.69 µm) long, the third cell 5.5–8.5 µm (av. = 6.8 ± 0.63 µm) long; apical cell conic, hyaline, 3.5–5.5 µm (av. = 4 ± 0.45 µm); appendage tubular, attenuated, single, unbranched; apical appendages single, straight or oblique, 7–17.5 µm (av. = 12.9 ± 2.63 µm) long; basal appendage single, centric, 4.5–15 µm (av. = 10.4 ± 2.22 µm); mean conidium length/width ratio = 4:1.

Material examined: **Mexico**, Aguascalientes, on *Quercus eduardi* (*Fagaceae*), 14 Aug. 2015, O. Moreno-Rico, HPC 789 (**holotype** CBS H-23536, ex-type culture CBS 144034 = CPC 29514).

Notes: Six *Monochaetia* species have been reported from *Quercus* spp., i.e. *Mon. bicornis*, *Mon. hysteriiformis*, *Mon. ilicina*, *Mon. kansensis*, *Mon. monochaeta*, and *Mon. saccardoi* (Nag Raj 1993). *Monochaetia quercus* is morphologically most similar to *Mon. bicornis* but differs in the number of conidial septa (3–4 vs. 4), wall ornamentation of median cells (smooth vs. verruculose), conidial length (22.5–29 µm vs. 14–19(–22) µm) and the mean conidium length/width ratio (3.4:1 vs. 4:1) (Nag Raj 1993). *Monochaetia quercus* only sporulated on MEA in this study.

Based on a blastn search of NCBIs GenBank nucleotide database, the closest hit using the ITS sequence of *Mon. quercus* is GenBank LC146750 (identity = 474/480 (99 %), no gaps), a sequence from the type strain of *Mon. dimorphospora* (NBRC 9980). However, other sequences of NBRC 9980 are unavailable for comparison. Morphologically, *Mon. quercus* differs from *Mon. dimorphospora* in the lack of arthroconidia and producing longer conidia (22.5–29 × 4.5–7 µm vs. 18–20 × 4–4.5 µm) (Yokoyama 1975). In addition, the three median cells of *Mon. quercus* are generally variable in length, in contrast to the equal length of the median cells in *Mon. dimorphospora* (Yokoyama 1975).

Morinia Berl. & Bres., Annuario Soc. Alpinisti Trident., 14: 82. [1887–88]. 1889, **emend.** F. Liu, L. Cai & Crous.

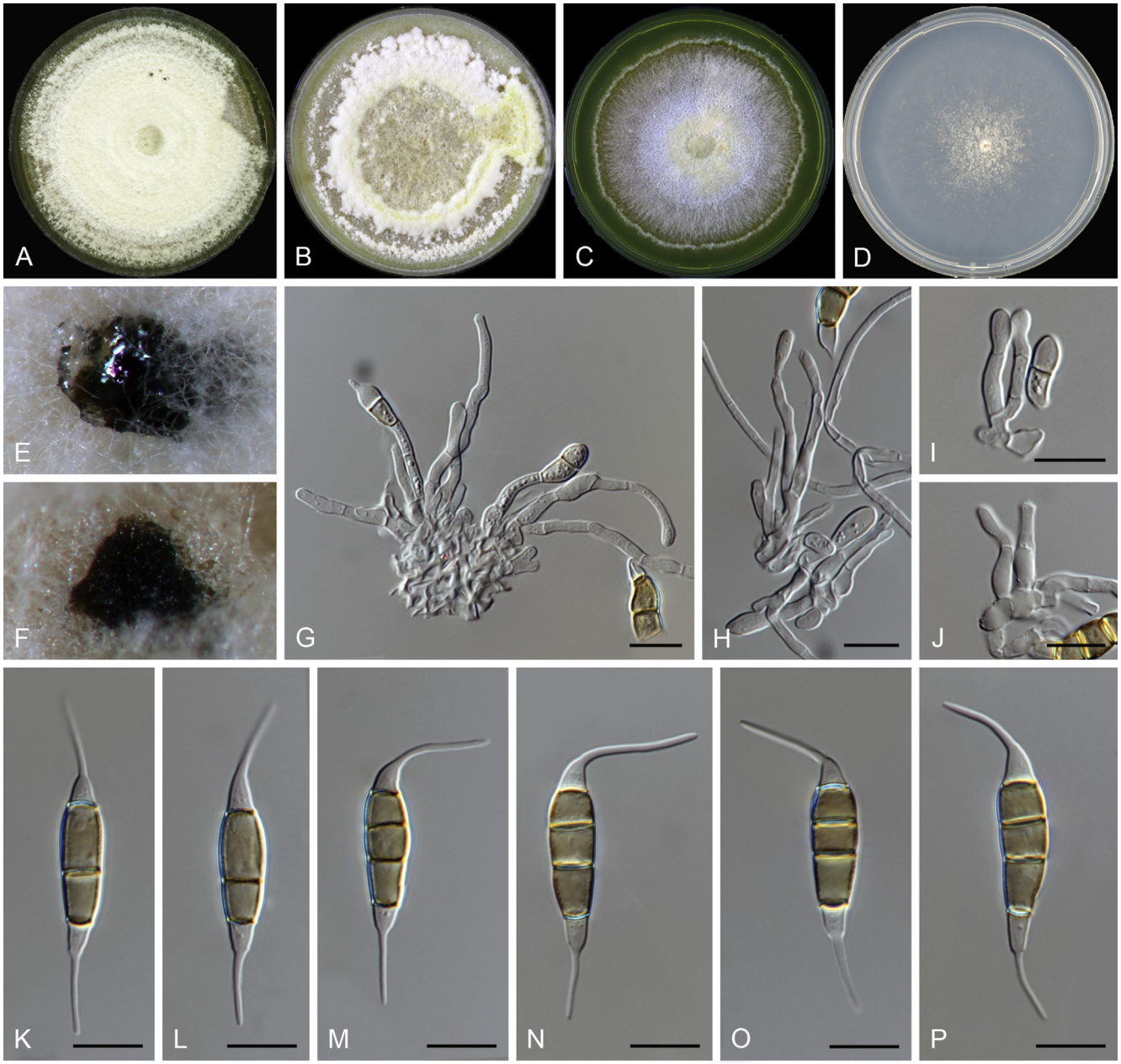

Fig. 41. *Monochaetia quercus* (CBS 144034/CPC 29514). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata. **G–J.** Conidiophores and conidiogenous cells. **K–P.** Conidia. Scale bars = 10 µm.

Type species: *Morinia pestalozzioides* Berl. & Bres., Ann. Soc. Alpinisti Tridentini 14: 82. [1887–88]. 1889.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* acervular, stromatic, pycnidioid, superficial or semi-immersed, erumpent, scattered, globose or subglobose, glabrous brown, dark; wall of *textura angularis*. *Conidiophores* arising from all around the cavity of the conidioma from the innermost wall layer, septate and branched, or reduced to conidiogenous cells, colourless, smooth, invested in mucus. *Conidiogenous cells* ampulliform, cylindrical, subcylindrical, lageniform, colourless, smooth. *Conidia* fusoid, ellipsoidal, subcylindrical, transversely euseptate, muriformly septate or not, straight to slightly curved, smooth or verruculose, with or without constriction at the septa, median cells pale brown to brown, end cells colourless or pale brown, bearing appendages; appendages attenuated or not attenuated, unbranched, tubular, flexuous or not; appendages on apical cell several, inserted at different loci; basal appendage single, rarely two, centric or excentric.

Notes: *Morinia* is characterised by muriform and appendage-bearing conidia in acervular conidiomata (Collado *et al.* 2006) and previously included two asexual species, *Mor. pestalozzioides* and *Mor. longiappendiculata*. In this study, two species characterised by only transverse conidia are incorporated in this genus, i.e. *Mor. acacia* (*Basionym*: *Zetiasplozna acaciae*) and *Mor. crini*.

Morinia acaciae (Crous) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828372.
Basionym: *Zetiasplozna acacia* Crous, Persoonia 32: 249. 2014.

Description: See Crous *et al.* (2014b).

Material examined: **France**, Nice, Nice Botanical Garden, N43°41'08.2" E007°12'34.4", on leaves of *Acacia melanoxylon* (*Fabaceae*), 20 Jul. 2013, P.W. Crous (**holotype** of *Zetiasplozna acacia* CBS H-21708, ex-type CBS 137994 = CPC 23421). **New Zealand**, Hastings, Hawkes Bay, on *Prunus salicina* cv. *Omega* (*Rosaceae*), unknown collection date, C. Martin, living culture CBS 100230.

Notes: The genus *Zetiasplozna* was established to accommodate species that are bartalinia-like in general morphology (Nag

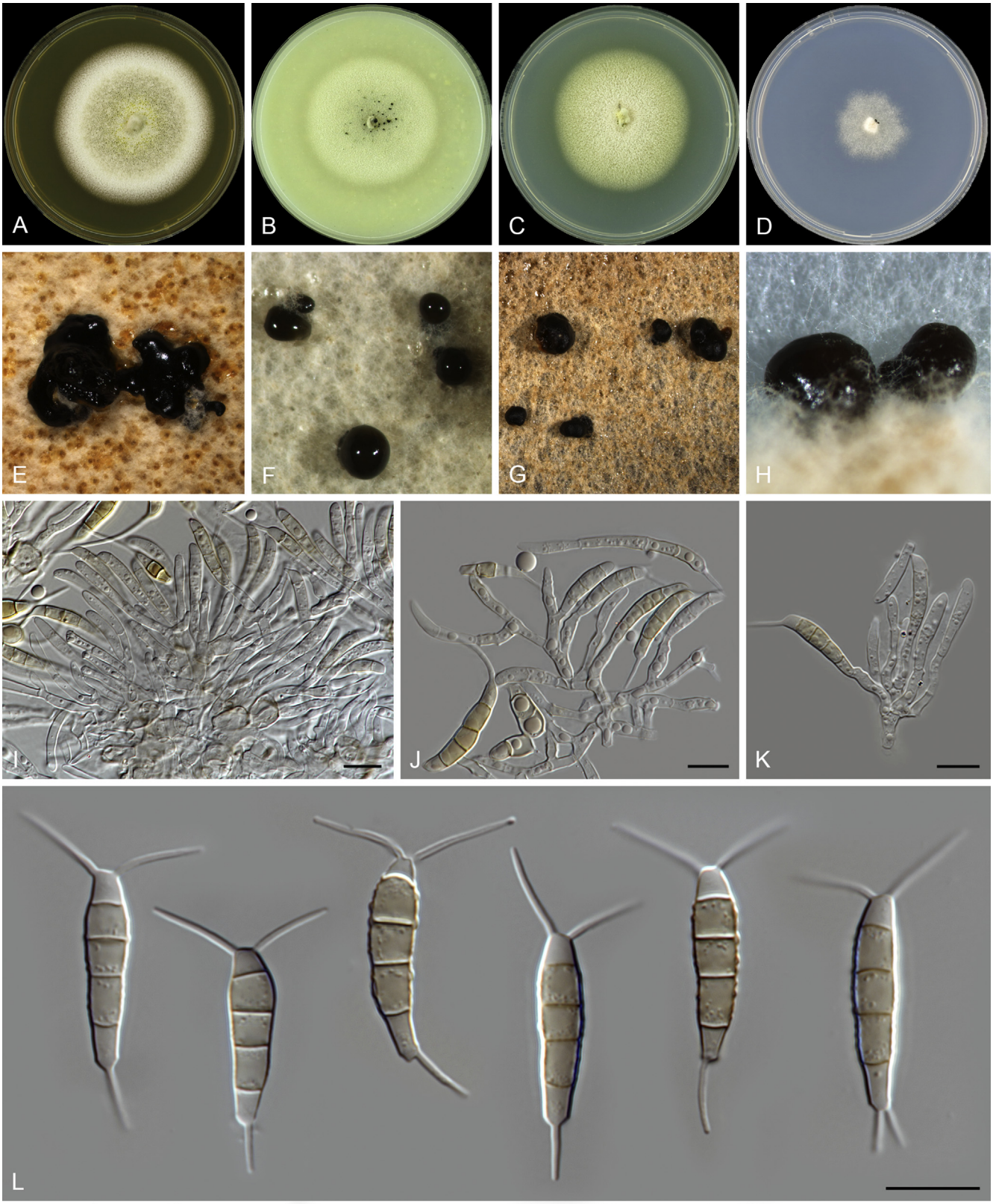

Fig. 42. *Morinia crini* (CBS 143888/CPC 21978). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on CMA. **G–H.** Conidiomata on PDA and SNA. **I–K.** Conidiophores and conidiogenous cells. **L.** Conidia. Scale bars = 10 µm.

Raj 1993). However, its phylogenetic location is still undetermined due to the lack of sequences of the generic type *Zet. unicola.* In the present study, *Zet. acacia* is phylogenetically located in the *Morinia* clade (Fig. 1) and also shows morphological resemblance, which is therefore used as basis to introduce a new combination, *Mor. acaciae*.

Morinia crini F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828373. Fig. 42.

Etymology: Name reflects the host plant genus it was isolated from, *Crinus*.

Culture characteristics: Colonies on MEA flat with entire edge, milk white at the margin, then successively grey and straw to the centre, reaching 62–64 mm diam after 14 d at 21 °C, conidiomata black, gregarious, acervular, stromatic, superficial; on CMA flat with entire edge, greyish blue-green, reaching 53–54 mm diam after 14 d at 21 °C, conidiomata black,

scattered, superficial, acervular, stromatic; on PDA flat with entire edge, off-white to pink, reaching 53–55 mm diam after 14 d at 21 °C, conidiomata black, acervular, stromatic, scattered, superficial; on SNA flat with undulate edge, white, reaching 34–35 mm diam after 14 d at 21 °C, conidiomata black, acervular, scattered, superficial.

Description (*On SNA*): Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, colourless, smooth, invested in mucus. *Conidiogenous cells* 3-annellidic, integrated, mostly cylindrical, subcylindrical, sometimes lageniform, variable in size, 5.5–20.5 × 1.5–3 µm (av. = 11 ± 3.59 × 2.4 ± 0.44 µm), colourless or pale brown, smooth. *Conidia* cylindrical, subcylindrical, sometimes lunate, straight or slightly curved, 2–5-septate, mostly 4-septate, not constricted at the septa, 17.5–22 × 3.5–5 µm (av. = 19.8 ± 1.14 × 4.2 ± 0.35 µm); basal cell obconic with a truncate base, subcylindrical, thin-walled, colourless to pale brown, smooth, 2.5–5 µm (av. = 3.9 ± 0.54 µm) long; median cells mostly 3, cylindrical or subcylindrical, pale brown, thick-walled, verruculose, together 9.5–14.5 µm (av. = 12.5 ± 0.96 µm) long, ± equal in the first two median cells from apex, each 3.5–5 µm (av. = 4.1 ± 0.42 µm) long, the third cell 4–6 µm (av. = 5 ± 0.52 µm) long; apical cell conic with an acute or truncate apex, thin-walled, colourless to pale brown, smooth, 1.5–3.5 µm (av. = 2.9 ± 0.46 µm) long; two apical appendages, on the apical cell axial and lateral, attenuated, tubular, unbranched, or occasionally dichotomously branched at one appendage, 7.5–11.5 µm (av. = 9.7 ± 1.03 µm) long; single basal appendage, occasionally two, centric or excentric, 4–9 µm (av. = 6.1 ± 1.13 µm) long; mean conidium length/width ratio = 4.7:1.

Material examined: **South Africa**, Free State Province, Bloemfontein, Bloemfontein Botanical Garden, on *Crinum bulbispermum* (*Amaryllidaceae*), 19 Jan. 2013, P.W. Crous (**holotype** CBS H-23511, ex-type culture CBS 143888 = CPC 21978).

Notes: Although *Morinia crini* is closely related to *Mor. longiappendiculata* and *Mor. pestalozzioides* (Fig. 1), it resembles *Mor. acaciae* in morphology, producing subcylindrical, transversely-septate conidia with one excentric apical and one lateral appendage (Crous *et al.* 2014b). However, *Morinia crini* differs from *Mor. acaciae* in the length of conidia (17.5–22 µm vs. 31–41 µm), apical and basal appendages (apical: 7.5–11.5 µm vs. 12–17 µm, basal: 7–9 µm vs. 2–8 µm). In addition, their mean conidium length/width ratio is quite distinct (4.7:1 in *Mor. crini* vs. ca. 8:1 in *Mor. acaciae*). *Morinia crini* also resembles *Zet. thuemenii* (Nag Raj 1993), except that it has shorter conidia (17.5–22 µm vs. 20–32 µm) and smaller mean conidium length/width ratio (4.7:1 vs. 5.7:1). This is the first report of *Morinia* species from *Crinum bulbispermum.*

Nonappendiculata F. Liu, L. Cai & Crous, **gen. nov.** MycoBank MB828374.

Etymology: Reflecting its non-appendaged conidia.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* black, scattered, acervular, stromatic, globose, semi-immersed. *Conidiophores* septate, unbranched or branched at the base, colourless, smooth, often reduced to conidiogenous cells. *Conidiogenous cells* cylindrical, subcylindrical or lageniform, colourless, smooth. *Conidia* fusoid, straight or slightly curved, 3-septate (septal pores present or not), smooth, not constricted at the septa; basal cell obconic with a truncate or obtuse base, colourless to pale grey; median cells doliiform, pale brown, thick-walled; apical cell conical, colourless to pale grey; appendages absent.

Type species: *Nonappendiculata quercina* F. Liu, L. Cai & Crous

Notes: *Nonappendiculata* is closely related to *Seiridium* on the 3-locus (LSU+ITS+*rpb2*) phylogenetic tree (Fig. 1) but presents a distinct clade on the 5-locus tree (Fig. 4). It produces 3-septate, non-appendaged and fusoid conidia, a character that distinguishes it from *Seiridium* (generally with 5-septate and appendaged conidia) (Bonthond *et al.* 2018).

Nonappendiculata quercina F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828375. Fig. 43.

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

Culture characteristics: Colonies on MEA flat with entire edge, grey to pale glaucous sky blue, sterile, reaching 43–45 mm diam after 14 d at 21 °C; on CMA, flat with entire edge, glaucous grey, sterile, reaching 37–39 mm diam after 14 d at 21 °C; on PDA flat with entire edge, pale grey, sterile, reaching 42–43 mm diam after 14 d at 21 °C; on SNA flat with entire edge, pale grey, reaching 27–30 mm diam after 14 d at 21 °C.

Description (*On SNA*): Sexual morph: unknown. Asexual morph: *Conidiomata* black, scattered, covered by aerial mycelia, acervular, stromatic. *Conidiophores* septate, unbranched or branched at the base, colourless, smooth, often reduced to conidiogenous cells. *Conidiogenous cells* discrete, cylindrical, subcylindrical, variable in size, 3–19 × 1–3 µm (av. = 12.5 ± 3.35 × 1.7 ± 0.37 µm), colourless, smooth. *Conidia* fusoid, straight, 3-septate, smooth, not constricted at the septa, 13–18 × 5–7 µm (av. = 15.7 ± 1.16 × 6.2 ± 0.42 µm); basal cell obconic with a truncate base, thin- or fairly thick-walled, pale grey, 3–4.5 µm (av. = 3.8 ± 0.54 µm) long; median cells 2, doliiform, pale brown, thick-walled, ± equal length, each 3–4.5 µm (av. = 3.8 ± 0.42 µm) long; apical cell conic with an acute or rounded apex, hyaline to pale grey, 2.5–5 µm (av. = 4 ± 0.68 µm); lacking appendages; mean conidium length/width ratio = 2.5:1.

Materials examined: **Italy**, on *Quercus suber* (*Fagaceae*) bud, unknown collection date and collector, deposited by F. Marras (**holotype** CBS H-23555, ex-type culture CBS 116061); Toscana, Lizzano in Belvedere, on leaf of *Quercus pubescens*, 27 Sep. 1981, H.A. van der Aa, living culture CBS 270.82.

Notes: The two strains of *Non. quercina* formed a distinct clade in both single gene (not shown here) and multi-locus trees (Figs 1, 4). It differs from closely related genera by producing 3-euseptate conidia without appendages. On OA, conidia are longer but thinner than on SNA (16–22.5 × 4–5.5 µm, av. = 18.6 ± 1.6 × 4.9 ± 0.5 µm vs. 13–18 × 5–7 µm, av. = 15.7 ± 1.16 × 6.2 ± 0.42 µm).

Based on a blastn search of NCBIs GenBank nucleotide database, the closest hits using the LSU sequence are *Seiridium* species (99 %), and the closest hits using the ITS sequence are *Discosia* sp. from an olive tree in Portugal (GenBank KU325138, identity = 100 %; unpublished) and *Discosia* sp. from *Hamamelis japonica* in Japan (GenBank AB594779, identity = 95 %; Tanaka *et al.* 2011).

Parabartalinia F. Liu, L. Cai & Crous, **gen. nov.** MycoBank MB828376.

Etymology: The name refers to the morphological similarity with genus *Bartalinia*, but is phylogenetically distinct.

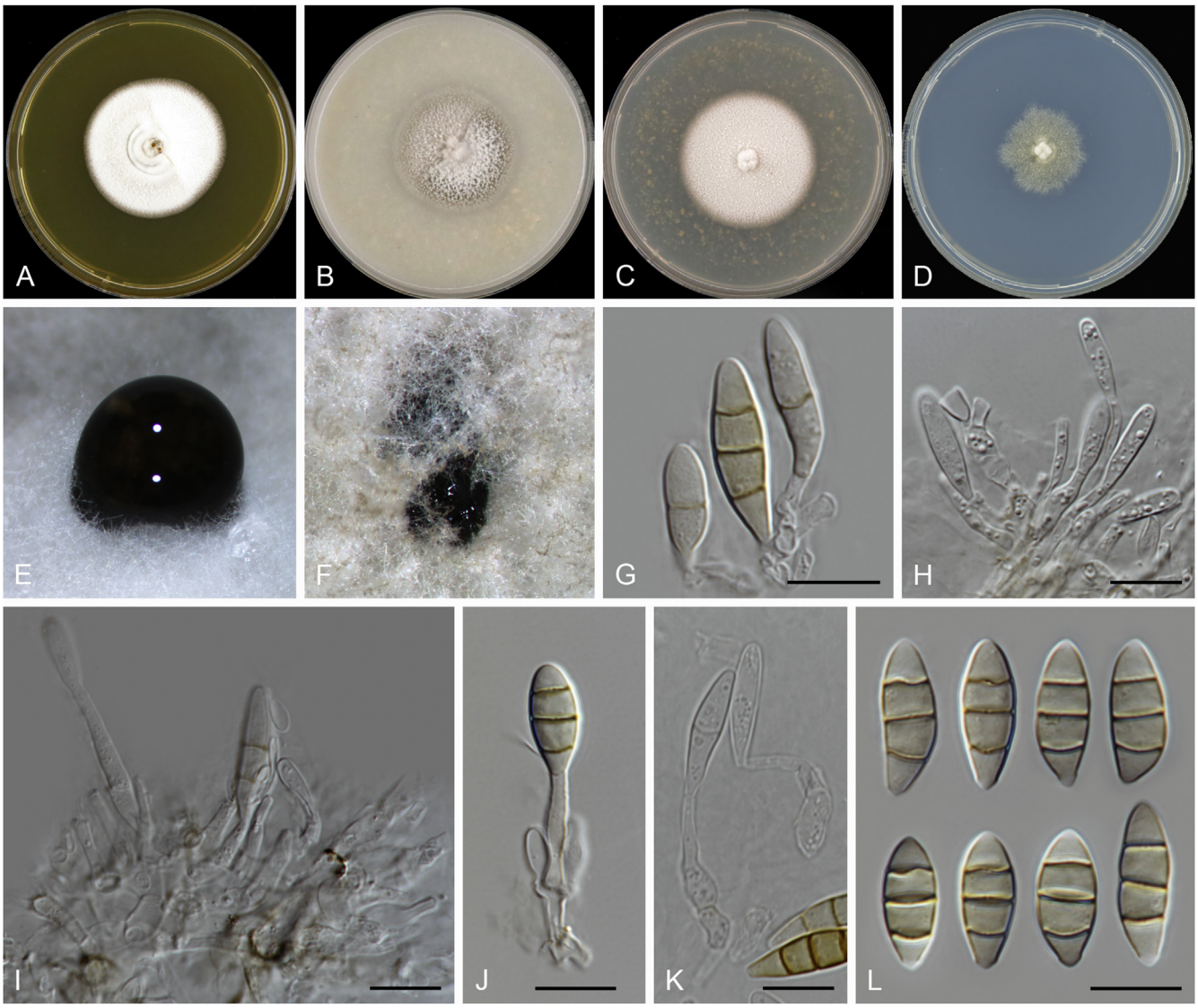

Fig. 43. *Nonappendiculata quercina* (CBS 116061). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on OA and SNA. **G–K.** Conidiophores, conidiogenous cells and conidia. **L.** Conidia. Scale bars = 10 µm.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* acervular, stromatic, superficial or semi-immersed, erumpent, dark brown to black, wall of *textura angularis* or *textura globulosa*, cells thick-walled and dark brown to brown in the outer layers, becoming thin-walled and paler toward the conidial hymenium. *Conidiophores* arising from the inner layers of the wall all around the cavity of the conidioma, sparsely septate and branched at the base, often reduced to conidiogenous cells, colourless, invested in mucus. *Conidiogenous cells* ampulliform, cylindrical, colourless, thin-walled, smooth. *Conidia* cylindrical to fusoid with a rounded or obtuse apex and a truncate base, straight or slightly curved, 4-septate, smooth, apical and basal cell colourless, median cells pale brown, without or with slight constriction at the septa, suprabasal cell longer than the rest, bearing appendages; apical appendage arising laterally from the apical cell, 3–5 divergent branches, attenuated, filiform, flexuous; basal appendage single, filiform, unbranched, exogenous.

Type species: *Parabartalinia lateralis* F. Liu, L. Cai & Crous

Notes: *Parabartalinia* is proposed to accommodate the single species *Par. lateralis*, which is closely related to *Bartalinia* in the multi-locus gene trees (Figs 1, 7) but distinct from the latter in each of the single gene trees (data not shown). Morphologically, the conidial apex of *Par. lateralis* is rounded and with laterally branched appendages, while it is conical with an acute or blunt apex in *Bartalinia* and its apical appendages arise from the conidial apex. We therefore propose a new monotypic genus to accommodate this species.

Parabartalinia lateralis F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828378. Fig. 44.

Etymology: Name reflects lateral formation of apical appendage on the apical cell.

Culture characteristics: Colonies on MEA flat, radially striate with entire edge, white to greenish glaucous, reaching 73–75 mm diam after 14 d at 21 °C, conidiomata dark brown to black, gregarious, semi-immersed; on CMA flat with entire edge, smoke grey, reaching 48–49 mm diam after 14 d at 21 °C, conidiomata dark brown to black, scattered or gregarious, acervular, semi-immersed; on PDA flat with entire edge, white to pale grey, reaching 70–71 mm diam after 14 d at 21 °C, conidiomata olivaceous, scattered or gregarious, superficial or semi-immersed; on SNA flat with entire edge, white, reaching 46–46 mm diam after 14 d at 21 °C, conidiomata olivaceous, scattered or gregarious, superficial.

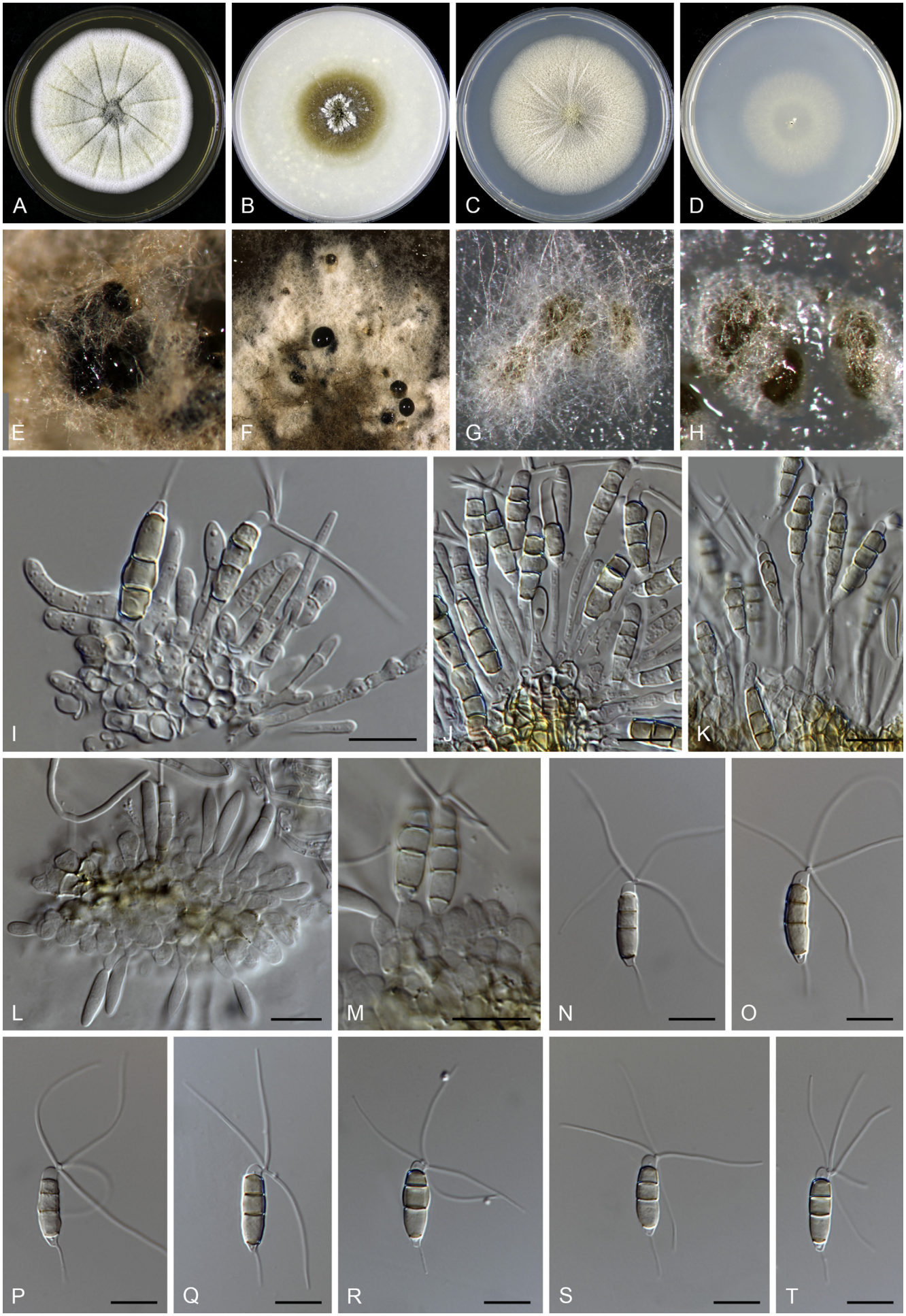

Fig. 44. *Parabartalinia lateralis* (CBS 399.71). (I–K, Q–T. on OA. L–P. on SNA). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on MEA and CMA. **G–H.** Conidiomata on SNA. **I–M.** Conidiophores and conidiogenous cells bearing conidia. **N–T.** Conidia. Scale bars = 10 µm.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, mostly reduced to conidiogenous cells, smooth, colourless, invested in mucus. *Conidiogenous cells* discrete, mostly cylindrical, ampulliform, 4–26 × 1–2.5 µm, (av. =11.2 ± 6.58 × 1.4 ± 0.33 µm), colourless, smooth, thin-walled. *Conidia* cylindrical or fusoid, straight, 4-septate, wall smooth or undulate, not constricted or slightly constricted at the septa, septa darker than the rest of conidia, 14–20 × 3–6 µm (av. = 17.2 ± 1.3 × 4.1 ± 0.6 µm); basal cell short obconic with a truncate base, thin-walled, hyaline, 0.5–2.5 µm (av. = 1.6 ± 0.31 µm) long; median cells 3, subcylindrical, pale brown, fairly thick-walled, together 10.5–16 µm (av. = 13.5 ± 1.1 µm) long, ± equal of the first two median cells from apical cell, each 3–4.5 µm (av. = 3.8 ± 0.37 µm) long, the third cell 4–6.5 µm (av. = 5.8 ± 0.5 µm) long; apical cell with rounded apex, not conical, thin-walled, hyaline, 1.5–2.5 µm (av. = 2 ± 0.29 µm) long; 3–5 apical appendages branches, laterally formed on the apical cell, attenuated, flexuous, unbranched or branched, 15–30 µm (av. = 22.9 ± 3.44 µm) long; basal appendage single, unbranched, filiform, excentric, 2.5–9 µm (av. = 5.9 ± 1.71 µm) long; mean conidium length/width ratio = 4.2:1.

Material examined: **South Africa**, Karoo Desert, on *Acacia karroo* (*Fabaceae*) leaf litter, 12 Mar. 1971, M.C. Papendorf (**holotype** CBS H-23542, ex-type culture CBS 399.71).

Notes: Based on the multi-locus analyses, *Par. lateralis* is more closely related to *Bartalinia*, and the sequence similarities between *Par. lateralis* and *Bar. pini*, for example, are 99 % (819/828) in LSU, 98 % (504/516) in ITS, 92 % (763/830) in *rpb2*, 83 % (298/360) in *tef-1α*, and 82 % (561/684) in *tub2*. For morphological differences, see notes under the genus *Parabartalinia*.

Pestalotiopsis Steyaert, Bull. Jard. bot. État Brux. 19: 300. 1949.

Description: *Conidiomata* acervular or pycnidioid, immersed to erumpent, unilocular to irregularly plurilocular with the locules occasionally incompletely divided, glabrous, brown to black; stroma or walls of *textura angularis*, globulosa, prismatica or intricata. *Conidiophores* branched and septate, or reduced to conidiogenous cells, colourless, smooth, invested in mucus. *Conidiogenous cells* discrete or integrated, cylindrical, ampulliform or lageniform, colourless, smooth. *Conidia* fusiform, straight or slightly curved, euseptate, bearing appendages; basal cell obconic with a truncate base, almost colourless to colourless, thin-walled; median cells pigmented, concolourous or versicoloured, with thicker walls than the end cells, smooth or verruculose; apical cell conical to hemispherical, colourless to almost colourless, thin-walled; appendages arising as tubular extensions and maintaining protoplasmic continuity with the conidium body, filiform or attenuated; apical appendages one to many, branched or unbranched, with or without spathulate tips, arising irregularly or in an apical crest or in tiers; basal appendage 0–3, branched or unbranched, centric.

Type species: *Pestalotiopsis guepinii* (Desm.) Steyaert.

Notes: In general, the three loci (ITS, *tef-1α*, *tub2*) used in *Pestalotiopsis* analysis showed low specific resolution, especially in the top part of the phylogenetic tree (Fig. 5), with short branches and low terminal bootstrap values/posterior probabilities. Many strains analysed in this study were shown as singletons and coincidently located in the top part (Fig. 5), and had limited morphological and phylogenetic differences from relatives, we therefore named them as informal species (*Pestalotiopsis* spp. 1–6). To facilitate further research, their morphological characters are described below.

In addition, the *Pestalotiopsis* phylogenetic analysis with additional isolates compared to previous studies (Maharachchikumbura *et al.* 2014, Liu *et al.* 2017) indicated that a few known species might be synonyms (*e.g. Pes. kenyana* and *Pes. trachicarpicola*; *Pes. adusta* and *Pes. papuana*; *Pes. brassicae*, *Pes. hollandica*, *Pes. italiana*, *Pes. monochaeta*, *Pes. sequoiae* and *Pes. verruculosa*; *Pes. lushanensis* and *Pes. rhododendri*). More informative gene loci are required to help solve these issues.

Pestalotiopsis disseminata (Thüm.) Steyaert, Bull. Jard. bot. État Brux. 19: 319. 1949. Fig. 45.
Basionym: *Pestalotia disseminata* Thüm., Inst. Coimbra: no. 578. 1879.

Culture characteristics: Colonies on MEA flat with undulate edge, white, reaching 43–53 mm diam after 10 d at 21 °C, conidiomata black, acervular, superficial; on CMA flat with undulate edge, white, sterile, reaching 73–75 mm diam after 10 d at 21 °C; on PDA flat with undulate edge, white, sterile, reaching 84–86 mm diam after 10 d at 21 °C; on SNA flat with undulate edge, white, sterile, reaching 59–62 mm diam after 10 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched at the base. *Conidiogenous cells* discrete or integrated, cymbiform, cylindrical, clavate or obclavate, hyaline, smooth-walled, 7–24.5 × 2–5 µm (av. = 15.9 ± 4.76 × 3.1 ± 0.85 µm). *Conidia* fusoid, straight, 4-septate, occasionally 3-septate, slightly constricted at the septa, 15–26.5 × 4.5–8 µm (av. = 21.9 ± 2.58 × 6.3 ± 0.9 µm); basal cell sub-cylindrical, obconic with an obtuse base, hyaline, thin-walled, 2–5.5 µm (av. = 4.2 ± 0.93 µm) long; three median cells doliiform or trapezoid, 9.5–17 µm (av. = 14.7 ± 2.15 µm) long, smooth-walled, concolourous, brown, septa darker than the rest of the cells, ± equal, each 3–6.5 µm (av. = 4.8 ± 0.81 µm) long; apical cell 2–4 µm (av. = 3.2 ± 0.49 µm) long, hyaline, conic with a truncate base, thin-walled; with 1–3 tubular apical appendages (mostly 3), unbranched, flexuous, rough, attenuated, 5–12.5 µm (av. = 8.2 ± 1.96 µm) long; basal appendages single, occasionally 2, tubular, unbranched, 2–5 µm (av. = 3.3 ± 0.62 µm) long; mean conidium length/width ratio = 3.5:1.

Materials examined: **New Zealand**, Auckland, on *Persea americana* (*Lauraceae*), 1 May 2015, Merje, CBS H-23529, living culture CBS 143904 = ICMP 21065 = CPC 28705; on *Eucalyptus* sp. (*Myrtaceae*), unknown collection date and collector, living culture CPC 29351; North Island, Kerikeri, on *Eucalyptus botryoides* living leaves, 17 Oct. 2003, M.A. Dick, living culture CBS 118552 = CPC 10950.

Notes: Strains CPC 29351, CPC 28705 and CBS 118552 clustered together in a well-supported and distinct clade (Fig. 5). They are morphologically similar to *Pes. disseminata*, a species originally reported from *Eucalyptus botryoides* from Portugal (Thümen 1879). Since our strains were isolated from a different location, New Zealand, CBS 118552 is only considered as a representative strain of *Pes. disseminata* in this study. Although there have been a few *Pestalotiopsis* species reported from *Persea americana* (Farr & Rossman 2018), this is the first report from New Zealand.

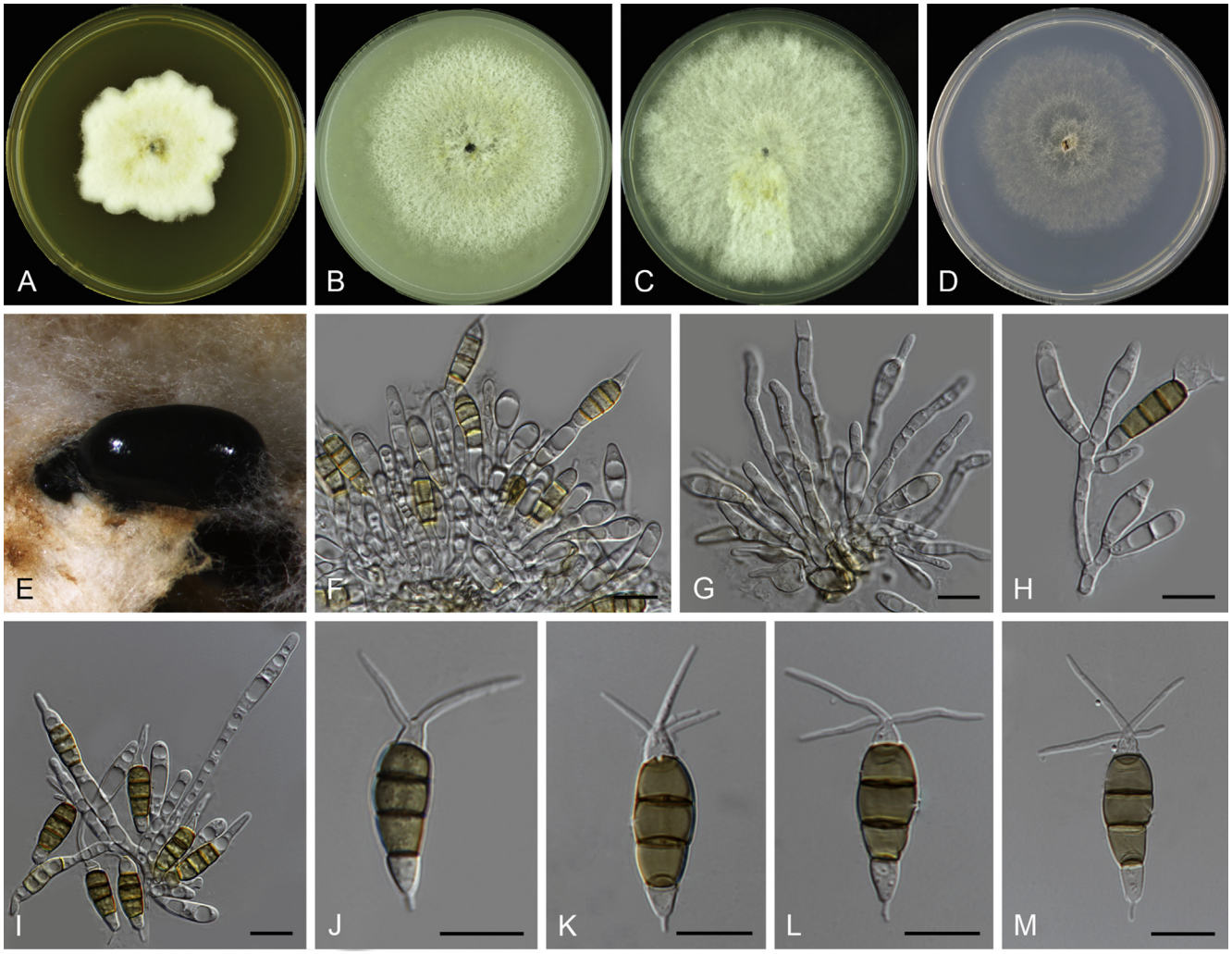

Fig. 45. *Pestalotiopsis disseminata* (CBS 143904/CPC 28705). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidiomata on MEA. **F–I.** Conidiophores, conidiogenous cells and conidia. **J–M.** Conidia. Scale bars = 10 µm.

Pestalotiopsis hispanica F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828379. Fig. 46.

Etymology: Latin name for Spain, where this fungus was collected.

Culture characteristics: Colonies on MEA flat with lobate edge, white, sterile, reaching 63–67 mm diam after 10 d at 21 °C; on CMA flat with entire edge, white to rosy vinaceous, sterile, reaching 65–66 mm diam after 10 d at 21 °C; on PDA flat with undulate edge, white, reaching 74–76 mm diam after 10 d at 21 °C, conidiomata black, scattered, semi-immersed or immersed, acervular; on SNA flat with erose or dentate edge, colourless, reaching 52–54 mm diam after 10 d at 21 °C, conidiomata black, scattered or gregarious, superficial to semi-immersed.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* hyaline, septate, branched. *Conidiogenous cells* discrete or integrated, cylindrical or sub-cylindrical, hyaline, smooth-walled, 3–24 × 1–3 µm (av. = 12.5 ± 5.06 × 2 ± 0.51 µm). *Conidia* fusoid to oval, straight, 4-septate, 16.5–29 × 6–9.5 µm (av. = 23.3 ± 2.99 × 8.3 ± 0.61 µm); basal cell cylindrical, obconic with a truncate base, hyaline, thin-walled, 3–5 µm (av. = 4 ± 0.56 µm) long; three median cells doliiform or trapezoid, 14–18.5 µm (av. = 17 ± 0.94 µm) long, smooth-walled, concolourous or the top two median cells darker than the third cell, pale brown to brown, the two median septa usually darker than distal septa, ± equal, each 4.5–6.5 µm (av. = 5.6 ± 0.39 µm) long; apical cell 2–4.5 µm (av. = 3.1 ± 0.61 µm) long, hyaline, sub-cylindrical or conical with a truncate or acute base, thin-walled; with 2–4 tubular apical appendages, arising from apex or laterally from apical cell, unbranched, or branched at one appendage, 2–14 µm (av. = 9.2 ± 2.53 µm) long; 0–1 basal appendages, when present, tubular, unbranched, centric, 1.5–4.5 µm (av. = 3.4 ± 0.67 µm) long; mean conidium length/width ratio = 2.8:1.

Material examined: **Spain**, Madeira, Gardens, on *Protea 'Susara'* (*Proteaceae*), 1 Apr. 2002, S. Denman (**holotype** CBS H-23554, ex-type culture CBS 115391 = CPC 5193 = JT1086).

Notes: *Pestalotiopsis hispanica* is closely related to *Pes. brachiata* (Fig. 5), but can be clearly differentiated by the length of its apical (2–14 µm vs. 16–28.5 µm) and basal (1.5–4.5 µm vs. 5.5–9.5 µm) appendages, as well as the number of basal appendages (0–1 vs. 1–4) (Liu *et al.* 2017). Compared to the apically produced appendages of *Pes. brachiata*, the apical appendages of *Pes. hispanica* arise from the apical crest or laterally from the apical cell.

Pestalotiopsis leucadendri F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828380. Fig. 47.

Etymology: Name reflects the host genus from which it was collected, *Leucadendron*.

Fig. 46. *Pestalotiopsis hispanica* (CBS 115391). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidioma on PDA. **F.** Conidiomata on SNA. **G–H.** Conidiophores, conidiogenous cells and conidia. **I–L.** Conidia. Scale bars = 10 µm.

Culture characteristics: Colonies on MEA flat with un dulate edge, white, sterile, reaching 50–52 mm diam after 10 d at 21 °C; on CMA flat with undulate edge, white, sterile, reaching 52–53 mm diam after 10 d at 21 °C; on PDA flat with entire edge, white, reaching 60 mm diam after 10 d at 21 °C, conidiomata brown, semi-immersed, gregarious, stromatic; on SNA flat with undulate edge, colourless, sterile, reaching 44–46 mm diam after 10 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* often reduced to conidiogenous cells, septate and branched at the base. *Conidiogenous cells* discrete or integrated, cylindrical, subglobose, ampulliform or lageniform, hyaline, smooth-walled, 3–14 × 1.5–5.5 µm (av. = 7.6 ± 3.07 × 3 ± 0.93 µm). *Conidia* fusoid, mostly straight, 4-septate, 21–28.5 × 5–9 µm (av. = 24.9 ± 1.86 × 7.3 ± 1.19 µm); basal cell obconic with a truncate base, hyaline, thin-walled, 2.5–5.5 µm (av. = 4 ± 0.78 µm) long; three median cells doliiform or trapezoid, 14.5–20 µm (av. = 17.5 ± 1.31 µm) long, smooth-walled, minutely verruculose, concolourous or median cell darker than other cells, pale brown to dark brown, septa darker than the rest of cell, ± equal, each 4.5–7 µm (av. = 5.8 ± 0.65 µm) long; apical cell 2.5–5 µm (av. = 3.7 ± 0.65 µm) long, hyaline, trapezoid or conic with a truncate base, thin-walled; with 2–3 tubular apical appendages (mostly 3), unbranched, filiform, flexuous, (5–) 10–24.5 µm (av. = 15.9 ± 3.08 µm) long; 0–1 basal appendages, if present, tubular, unbranched, centric, 1–8.5 µm (av. = 4.5 ± 1.97 µm) long; mean conidium length/width ratio = 3.4:1.

Material examined: **South Africa**, Western Cape Province, Kleinmond, on *Leucadendron* sp. (*Proteaceae*) leaf litter, 11 Jul. 2000, S. Marincowitz (**holotype** CBS H-23557, ex-type culture CBS 121417 = SL528 = CMW 22192).

Notes: *Pestalotiopsis leucadendri* is closely related to *Pes. australis* (Fig. 5, 100 % identical on ITS and *tef-1α*, 94 % on *tub2*); however, morphologically it is different in having shorter conidia (21–28.5 × 5–9 µm vs. 26–36 × 7–8.5 µm) and basal

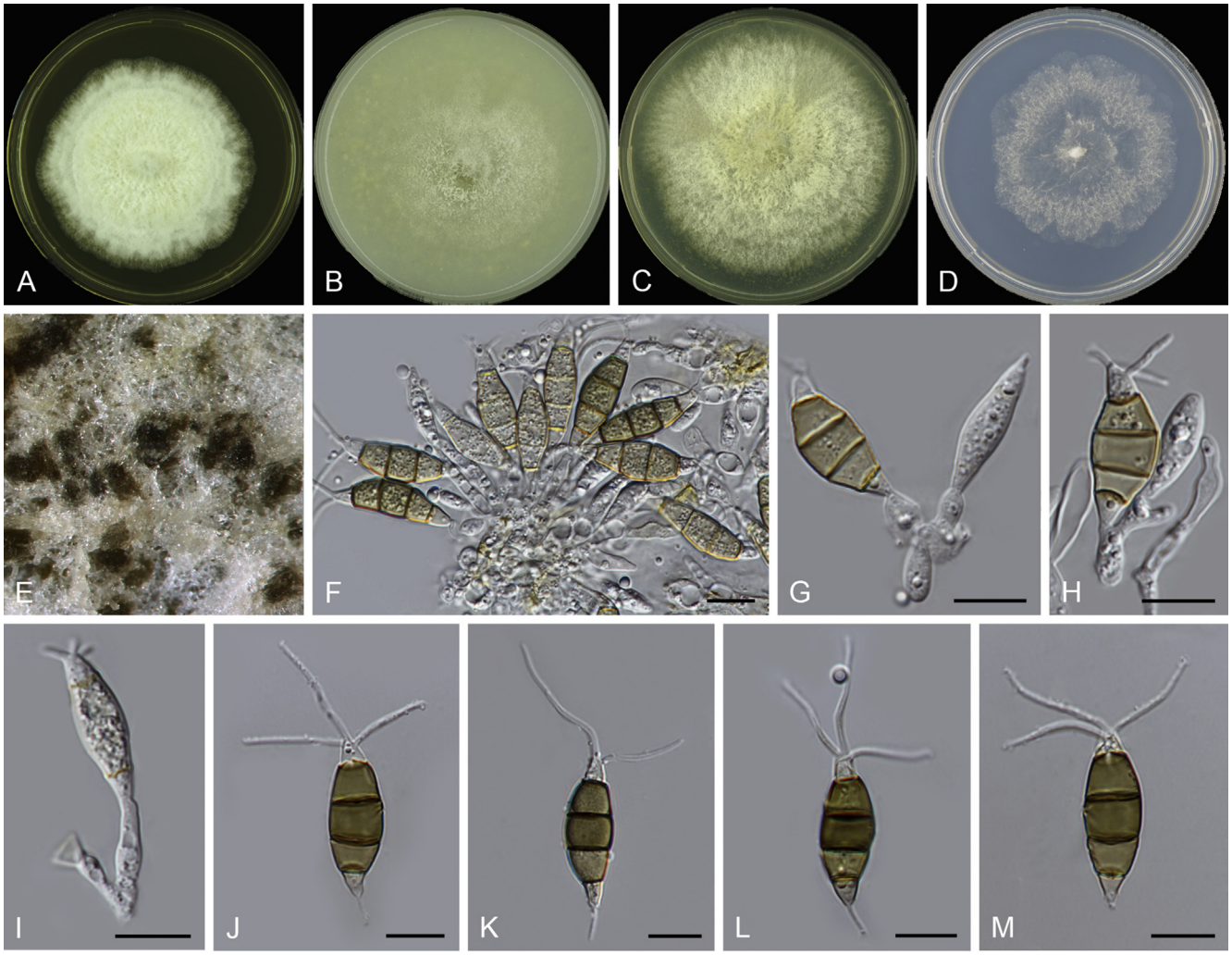

Fig. 47. *Pestalotiopsis leucadendri* (CBS 121417). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidiomata on PDA. **F–I.** Conidiophore, conidiogenous cells and conidia. **J–M.** Conidia. Scale bars = 10 µm.

cells (2.5–5.5 µm vs. 6–10 µm), as well as a smaller mean conidium length/width ratio (3.4:1 vs. 4:1) (Maharachchikumbura *et al.* 2014).

***Pestalotiopsis* sp. 1.** Fig. 48.

Culture characteristics: Colonies on MEA flat with lobate edge, white, reaching 78–80 mm diam after 10 d at 21 °C, conidiomata buff at immature stage, exuding black conidial masses when mature, scattered or gregarious, acervular, stromatic, semi-immersed, erumpent; on CMA flat with entire edge, colourless, reaching 76 mm diam after 10 d at 21 °C, conidiomata black, scattered or gregarious, superficial, semi-immersed or immersed, stromatic; on PDA convex with papillate surface, brown to olivaceous, reaching > 90 mm diam after 10 d at 21 °C, conidiomata dark brown to olivaceous, scattered, semi-immersed, stromatic, erumpent; on SNA flat with lobate edge, colourless, reaching 65–71 mm diam after 10 d at 21 °C, conidiomata black, scattered, superficial or immersed.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* hyaline, reduced to conidiogenous cells. *Conidiogenous cells* discrete, ampulliform, ovoid or clavate, hyaline, smooth-walled, 4–10.5 × 1.5–4 µm (av. = 6 ± 1.73 × 2.7 ± 0.66 µm). *Conidia* fusoid, mostly straight, 4-septate, 20–25.5 × 7–9 µm (av. = 22.4 ± 1.48 × 8.2 ± 0.65 µm); basal cell obconic with a truncate base, hyaline or pale grey, thin-walled, 2–5.5 µm (av. = 3.1 ± 0.73 µm) long; three median cells doliiform or trapezoid, 15.5–18 µm (av. = 16.5 ± 0.58 µm) long, smooth-walled, concolourous or median cell darker than other median cells, mid-brown to brown, septa darker than the rest of cell, ± equal, each 4.5–6.5 µm (av. = 5.4 ± 0.58 µm) long; apical cell 2–3.5 µm (av. = 3.1 ± 0.4 µm) long, hyaline, sub-cylindrical or conic with a truncate base, thin-walled; with 3–4 tubular apical appendages (mostly 3), arising from different points, unbranched, or dichotomously branched at one appendage, attenuated, flexuous, 6.5–18 µm (av. = 12.8 ± 2.38 µm) long; 0–1 basal appendages, when present, tubular, unbranched, centric, 1.5–6 µm (av. = 3.6 ± 1.12 µm) long; mean conidium length/width ratio = 2.7:1.

Material examined: **USA**, Hawaii, on *Leucospermum cunei* × *conocarpodendron* (*Proteaceae*), 16 Dec. 1998, P.W. Crous, CBS H-23548, living culture CBS 111576 = CPC 2146 = JT 617 = STE-U 2146.

Notes: *Pestalotiopsis* sp. 1 is closely related to *Pestalotiopsis* sp. 2 based on the ML analysis (Fig. 5, 99 % sequence similarity on ITS, 96 % on *tef-1α*, 100 % on *tub2*), but it differs from the latter in the width of conidia (7–9 µm vs. 4.5–7.5 µm), length of median cells (15.5–18 µm vs. 11.5–16.5 µm), and the mean conidium length/width ratio (2.7:1 vs. 3.7:1). The median cell of *Pestalotiopsis* sp. 1 is darker than other median cells. In contrast, median cells of *Pestalotiopsis* sp. 2 tend to be concolourous. However, the phylogenetic position of *Pestalotiopsis* sp. 1 is

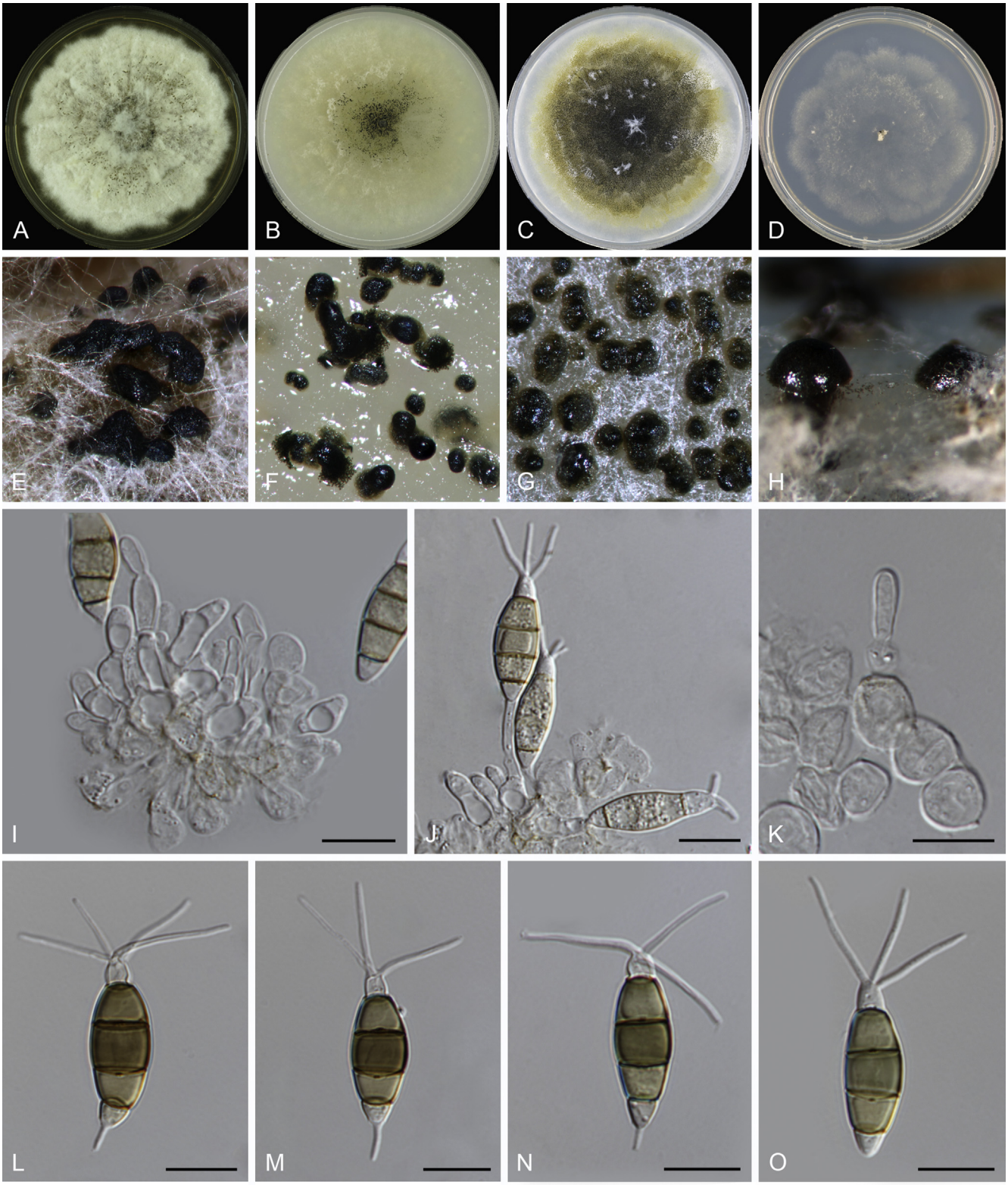

Fig. 48. *Pestalotiopsis* sp. 1 (CBS 111576). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–K.** Conidiophores, conidiogenous cells and conidia. **L–O.** Conidia. Scale bars = 10 µm.

unstable under different arithmetic analyses (not shown here). This is probably a novel species, and awaits further study.

According to Farr & Rossman (2018), three *Pestalotiopsis* species have been reported from *Leucospermum* from Hawaii, namely *Pes. aquatica*, *Pes. hawaiiensis*, and *Pes. vismiae*. *Pestalotiopsis hawaiiensis* is located in the basal part of the *Pestalotiopsis* tree (Fig. 5) and is obviously distinct from *Pestalotiopsis* sp. 1. Although another two species *Pes. aquatic* and *Pes. vismiae* are not represented by type-derived sequences, they can be morphologically distinguished from *Pestalotiopsis* sp. 1 by the thinner conidia (6–7 µm in *Pes. aquatic*, 5–6.5 µm in *Pes. vismiae* vs. 7–9 µm in *Pestalotiopsis* sp. 1) (Petrak 1950, Ellis & Everhart 1889).

***Pestalotiopsis* sp. 2.** Fig. 49.

Culture characteristics: Colonies on MEA flat with lobate edge, white to honey, sterile, reaching > 90 mm diam after 10 d at 21 °C; on CMA flat with entire edge, isabelline, reaching 75 mm

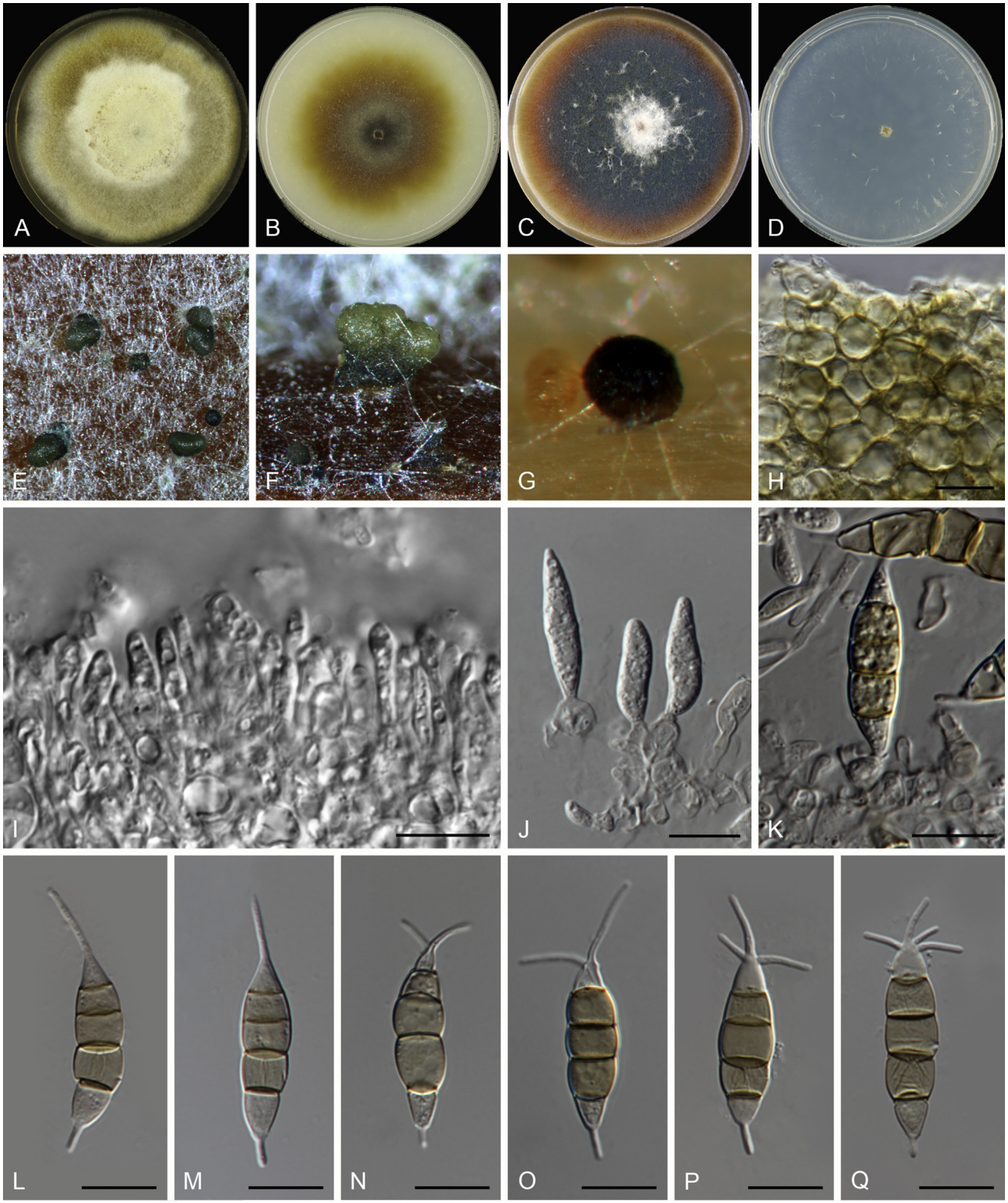

Fig. 49. *Pestalotiopsis* sp. 2 (CBS 114489). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–G.** Conidiomata on CMA, pine needle and barley leaves, respectively. **H.** Conidiomatal wall. **I–K.** Conidiophores and conidiogenous cells. **L–Q.** Conidia. Scale bars = 10 µm.

diam after 10 d at 21 °C, conidiomata yellow green to pistachio green, glaucous blue-green, scattered or gregarious, superficial, stromatic; on PDA flat with entire surface, dark olivaceous, sterile, reaching > 90 mm diam after 10 d at 21 °C; on SNA flat with entire edge, colourless, sterile, reaching 80–82 mm diam after 10 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* hyaline, often reduced to conidiogenous cells, occasionally septate and branched at the base. *Conidiogenous cells* mostly discrete, sphaeriform, ampulliform, ellipsoidal, hyaline, smooth-walled, 2.5–8.5 × 2–7 µm (av. = 5.4 ± 1.33 × 4 ± 1.2 µm). *Conidia* fusoid, straight or curved, constricted at septa, 4-septate, occasionally 2- or 5-septate, 20–26.5 × 4.5–7.5 µm (av. = 23.7 ± 1.6 × 6.4 ± 0.74 µm); basal cell obconic with a truncate base, hyaline to pale grey, thin-walled, 4–6.5 µm (av. = 4.9 ± 0.83 µm) long; three median cells doliiform,

11.5–16.5 µm (av. = 15 ± 1.25 µm) long, smooth-walled, minutely verruculose, concolourous, pale brown, septa darker than the rest of cell, ± equal, each 3.5–6 µm (av. = 4.6 ± 0.52 µm) long; apical cell 2.5–6 µm (av. = 4.5 ± 0.67 µm) long, hyaline, conic with a truncate base, thin-walled; with 1–4 tubular apical appendages, arising from different points, unbranched, tubular, 3.5–9 µm (av. = 6.8 ± 1.36 µm) long if more than one appendage, 7.5–16 µm (av. = 11 ± 2.1 µm) long if only one appendage; one basal appendage, tubular, unbranched, centric, 2.5–7.5 µm (av. = 3.8 ± 1.3 µm) long; mean conidium length/width ratio = 3.7:1.

Material examined: **USA**, Hawaii, Harry Lui, on *Leucospermum* cv. Pink Ice (*Proteaceae*), 16 Dec. 1998, P.W. Crous, CBS H-23552, living culture CBS 114489 = CPC 2135 = JT 630.

Notes: See notes under *Pestalotiopsis* sp. 1.

***Pestalotiopsis* sp. 3.** Fig. 50.

Culture characteristics: Colonies on MEA flat with lobate edge, white, reaching 79–82 mm diam after 10 d at 21 °C, conidiomata black, superficial or semi-immersed, acervular; on CMA flat with undulate edge, white, reaching 60–63 mm diam after 10 d at 21 °C, conidiomata black, scattered or gregarious, superficial, acervular; on PDA flat with undulate edge, white, reaching 78–82 mm diam after 10 d at 21 °C, conidiomata black, superficial, gregarious, stromatic; on SNA flat with erose or dentate edge, colourless, reaching 57–62 mm diam after 10 d at 21 °C, conidiomata black, superficial, scattered, acervular.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* often reduced to conidiogenous cells. *Conidiogenous cells* discrete, mostly cylindrical, hyaline, smooth-walled, 6.5–16 × 1–2.5 µm (av. = 10.8 ± 2.84 × 1.8 ± 0.46 µm). *Conidia* fusoid, straight or occasionally slightly curved, 4-septate, 16.5–24 × 5–7.5 µm (av. = 20.8 ± 2.08 × 6.4 ± 0.67 µm); basal cell trapezoid, or conic with a truncate base, hyaline or pale brown, thin-walled, 2.5–5 µm (av. = 3.7 ± 0.63 µm) long; three median cells doliiform or trapezoid, 12.5–16 µm (av. = 14 ± 0.91 µm) long, smooth-walled, concolourous, brown, septa darker than the rest of cell, ± equal, each 3.5–5.5 µm (av. = 4.7 ± 0.46 µm) long; apical cell 2.5–4 µm (av. = 3.3 ± 0.45 µm) long, hyaline, conic with a truncate base, thin-walled; with 2–3 tubular apical appendages, unbranched, 9.5–23 µm (av. = 15.2 ± 3.3 µm) long; single basal appendage, tubular, unbranched, centric, 1.5–7.5 µm (av. = 5.6 ± 1.6 µm) long; mean conidium length/width ratio = 3.3:1.

Material examined: **Malaysia**, on *Eucalyptus deglupta* (*Myrtaceae*) leaf, May 2014, M.J. Wingfield, CBS H-23516, living culture CBS 143892 = CPC 24759.

Notes: Although phylogenetically distinct, the phylogenetic position of *Pestalotiopsis* sp. 3 is unstable under different arithmetic analyses (not shown here). In addition, it is represented by a single strain and morphologically similar to *Pes. disseminata*, and thus is not treated further in the present study.

***Pestalotiopsis* sp. 4.** Fig. 51.

Culture characteristics: Colonies on MEA flat with lobate edge, white to pale grey, reaching 78–80 mm diam after 10 d at 21 °C, conidiomata black, scattered, acervular, superficial; on CMA flat with entire edge, white, reaching 80 mm diam after 10 d at 21 °C, conidiomata black, globose, scattered, acervular, superficial; on PDA flat with entire edge, white, reaching > 90 mm diam after 10 d at 21 °C, conidiomata black, globose, scattered, acervular, superficial; on SNA flat with undulate edge, colourless, reaching 65–73 mm diam after 10 d at 21 °C, conidiomata black, globose, scattered, acervular, superficial.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* often reduced to conidiogenous cells, occasionally septate and branched at the base. *Conidiogenous cells* discrete, mostly ampulliform or lageniform, hyaline, smooth-walled, 6–13 × 1–5 µm (av. = 8.5 ± 1.66 × 2.8 ± 0.94 µm). *Conidia* fusoid, straight, 4-septate, 18.5–24 × 5.5–8 µm (av. = 20.5 ± 1.32 × 6.5 ± 0.51 µm); basal cell obconic with a truncate base, hyaline, thin-walled, 2.5–4.5 µm (av. = 3.3 ± 0.58 µm) long; three median cells doliiform or trapezoid, 12.5–17 µm (av. = 14.7 ± 1.15 µm) long, smooth-walled, concolourous or the median cell darker than others, pale to mid-brown, septa darker than the rest of cells, ± equal; apical cell 2–4 µm (av. = 2.6 ± 0.4 µm) long, hyaline, conic with a truncate or acute base, thin-walled; with 2–3 tubular apical appendages (mostly 3), arising from different points, unbranched, flexuous, attenuated, 7.5–16.5 µm (av. = 11.4 ± 1.89 µm) long; basal appendages single, tubular, unbranched, centric, 0.5–5 µm (av. = 2.7 ± 0.82 µm) long; mean conidium length/width ratio = 3.2:1.

Material examined: **Australia**, Western Australia, on *Podocarpus* sp. (*Podocarpaceae*), 27 Sep. 2015, P.W. Crous HPC 632, CBS H-23530, living culture CBS 143905 = CPC 28896.

Notes: According to Farr & Rossman (2018), there are 33 *Pestalotiopsis* species recorded from *Podocarpus*. Most of these species were recorded from China and were identified based on ITS phylogeny but without any comparison to types (*e.g.* Wei *et al.* 2005, 2007, Liu *et al.* 2006, 2010). These species were thus not included in the *Pestalotiopsis* phylogenetic analysis (Fig. 5) due to the lack of *tef-1α* and *tub2* sequences and few nucleotide informative sites in ITS. Therefore, although *Pestalotiopsis* sp. 4 resided in a distinct lineage, we are unsure if CBS 143905 represents a new species or is one of the known species. Besides, we presently only have a single strain, and this species therefore awaits further study.

***Pestalotiopsis* sp. 5.** Fig. 52.

Culture characteristics: Colonies on MEA flat with undulate edge, white, sterile, reaching 86–88 mm diam after 10 d at 21 °C; on CMA flat with undulate edge, white, reaching 80–84 mm diam after 10 d at 21 °C, conidiomata black, scattered, acervular, superficial; on PDA umbonate with entire edge, white, reaching > 90 mm diam after 10 d at 21 °C, conidiomata black, gregarious, stromatic, superficial; on SNA flat with undulate edge, colourless, sterile, reaching 70–75 mm diam after 10 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* often reduced to conidiogenous cells, occasionally branched at the base. *Conidiogenous cells* mostly discrete, cylindrical, ampulliform, hyaline, smooth-walled, 4–24 × 1.5–3.5 µm (av. = 14.2 ± 5.49 × 2.1 ± 0.47 µm). *Conidia* fusoid, straight or occasionally curved, 4-septate, 22–29.5 × 5–7.5 µm (av. = 25 ± 1.86 × 6.4 ± 0.56 µm); basal cell sub-cylindrical, obconic with a narrow truncate or acute base, hyaline, thin-walled, 4–6.5 µm (av. = 4.7 ± 0.66 µm) long; three median cells doliiform, trapezoid or cylindrical, 13.5–18.5 µm (av. = 15.7 ± 1.27 µm) long, smooth-walled, concolourous, mid-brown to brown, septa darker than the rest of cells, ± equal, each 4–6.5 µm (av. = 5 ± 0.61 µm) long; apical cell 2.5–5.5 µm (av. = 3.9 ± 0.61 µm) long, hyaline, conic with a truncate base, thin-walled; with 2–3 tubular apical appendages

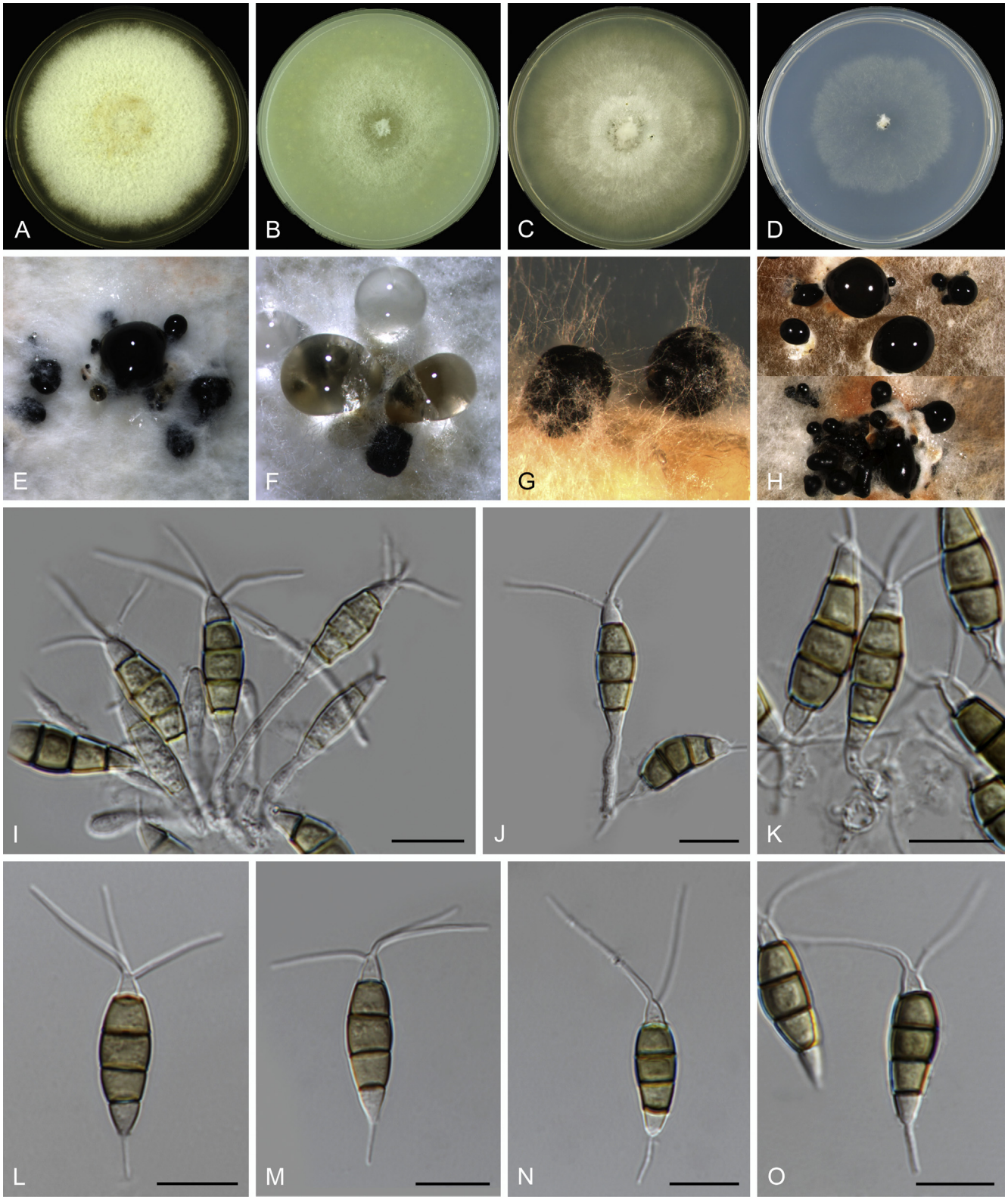

Fig. 50. *Pestalotiopsis* sp. 3 (CBS 143892/CPC 24759). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, PDA, SNA and CMA, respectively. **I–K.** Conidiophores, conidiogenous cells and conidia. **L–O.** Conidia. Scale bars = 10 µm.

(mostly 3), arising from different points, unbranched, 5–21 µm (av. = 13 ± 2.8 µm) long; basal appendages single, tubular, unbranched, centric, 2.5–7 µm (av. = 4.2 ± 1.13 µm) long; mean conidium length/width ratio = 3.9:1.

Material examined: **Australia**, Western Australia, Perth, Chichester Park, on *Corymbia calophylla* (*Myrtaceae*) foliage and fruits, 16 Jun. 2015, P.A. Barber, HPC 491, CBS H-23525, living culture CBS 143900 = CPC 27562 = PAB_F008.

Notes: *Pestalotiopsis* sp. 5 is closely related with *Pestalotiopsis* sp. 4 (97 % sequence similarity on *tef-1α*, 99 % on *tub2*), and they are minutely different from each other in the length of conidia (22–29.5 × 5–7.5 µm vs. 18.5–24 × 5.5–8 µm). *Pestalotiopsis* sp. 5 awaits further study once more isolates and evidence become available.

***Pestalotiopsis* sp. 6.** Fig. 53.

Culture characteristics: Colonies on MEA flat with undulate edge, white, reaching 80 mm diam after 10 d at 21 °C, conidiomata brown or black, superficial or semi-immersed, scattered or

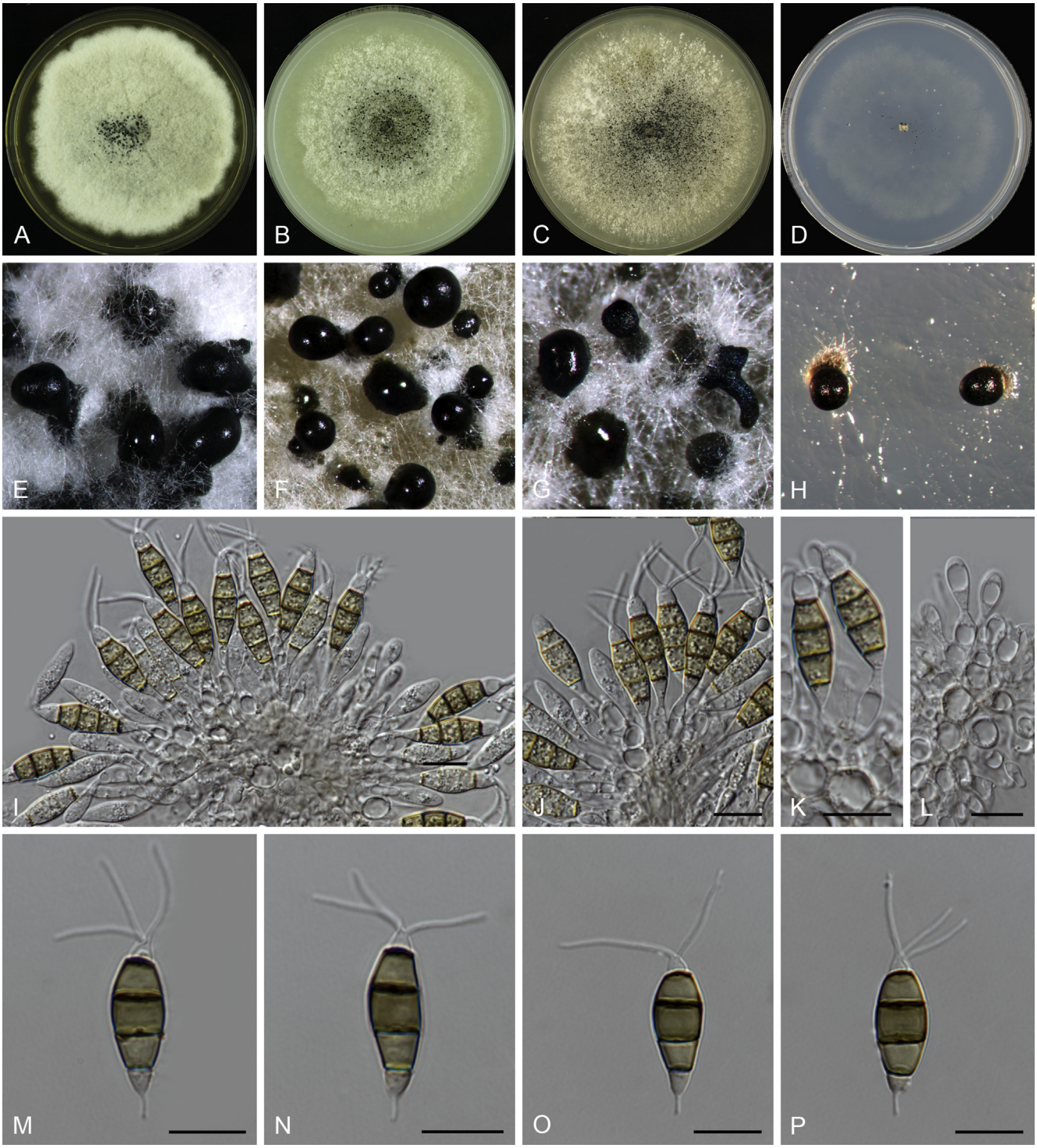

Fig. 51. *Pestalotiopsis* sp. 4 (CBS 143905/CPC 28896). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–L.** Conidiophores, conidiogenous cells and conidia. **M–P.** Conidia. Scale bars = 10 µm.

gregarious, acervular, stromatic, erumpent; on CMA flat with entire edge, white to off-white, reaching 68–71 mm diam after 10 d at 21 °C, conidiomata brown or black, superficial, semi-immersed or immersed, scattered, acervular, stromatic, erumpent; on PDA flat with entire edge, white, reaching > 90 mm diam after 10 d at 21 °C, conidiomata black, superficial, scattered or gregarious, acervular; on SNA flat with undulate edge, colourless, reaching 64–66 mm diam after 10 d at 21 °C, conidiomata black, superficial, semi-immersed, scattered, acervular.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* often reduced to conidiogenous cells. *Conidiogenous cells* integrated, mostly cylindrical, or obclavate, hyaline, smooth-walled, variable in size, 4–23 × 1.5–4 µm (av. = 10.6 ± 4.88 × 2.4 ± 0.62 µm). *Conidia* fusoid, oval, straight, 4-septate, 20–26.5 × 9–11 µm (av. = 22.4 ± 1.67 × 10.2 ± 0.52 µm); basal cell obconic with a truncate or obtuse base, hyaline or pale brown, thin-walled, 1.5–4.5 µm (av. = 3 ± 0.75 µm) long; three median cells doliiform, 15–19.5 µm (av. = 16.8 ± 0.96 µm) long, smooth-walled, median cell sometimes darker than other cells, pale to brown, septa darker than the rest of cell, ± equal, each 4–6.5 µm (av. = 5.1 ± 0.75 µm) long; apical cell 1.5–4 µm (av. = 2.7 ± 0.63 µm) long, hyaline, conic with an acute or obtuse base, thin-walled; with three tubular apical appendages, unbranched, or occasionally branched at one

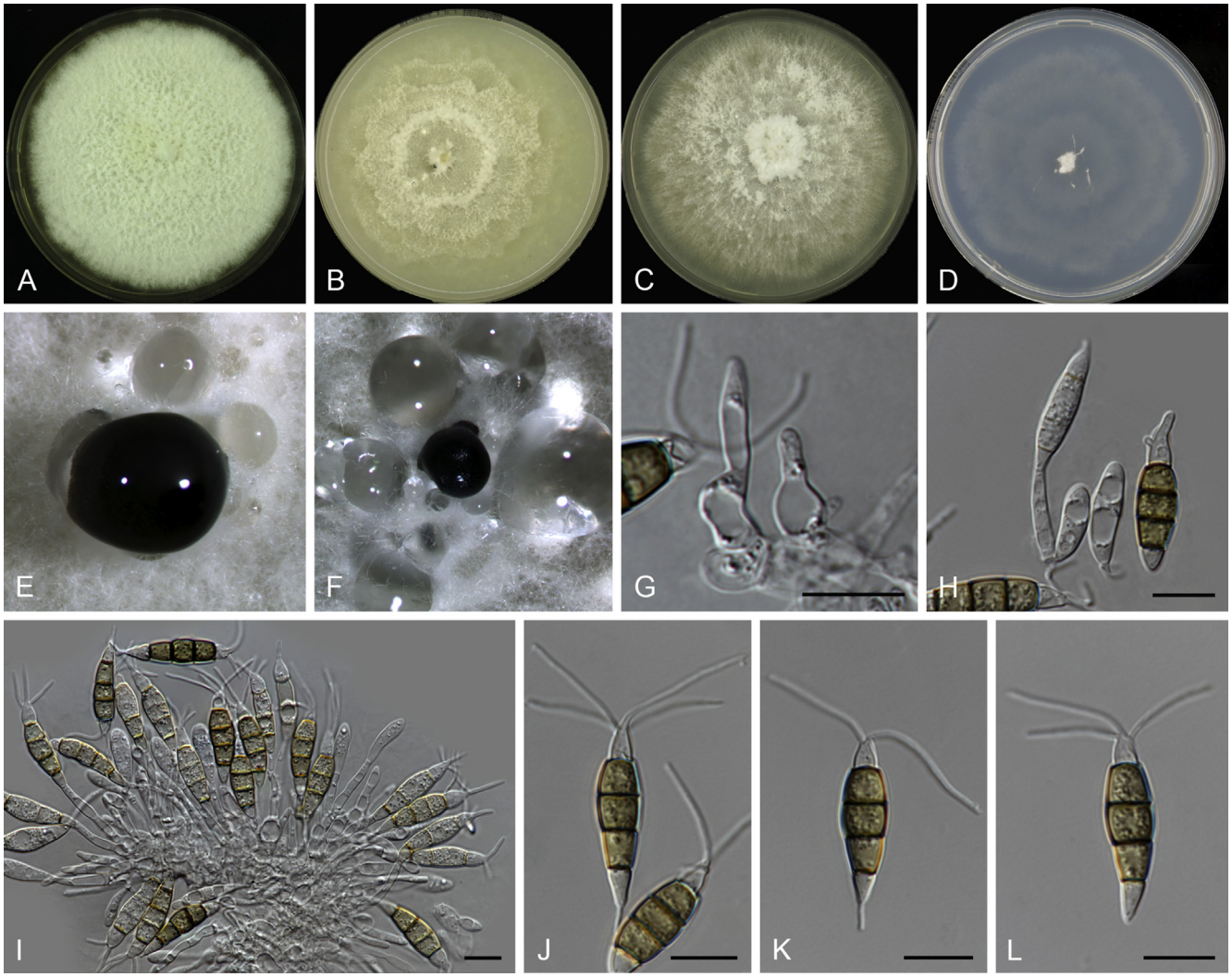

Fig. 52. *Pestalotiopsis* sp. 5 (CBS 143900/CPC 27562). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidiomata on CMA. **F.** Conidiomata on PDA. **G–I.** Conidiophores, conidiogenous cells and conidia. **J–L.** Conidia. Scale bars = 10 µm.

appendage, flexuous, (4.5–)8.5–25 µm (av. = 17.5 ± 4.01 µm) long; 0–1 basal appendages, tubular, unbranched, centric, 1.5–6.5 µm (av. = 4.2 ± 1.28 µm) long; mean conidium length/width ratio = 2.2:1.

Materials examined: **Australia**, Western Australia, Perth, Nanika Park, on *Isopogon* (*Proteaceae*) leaves, 26 Jun. 2015, P.A. Barber, HPC 505, CBS H-23527, living culture CBS 143902 = CPC 27649; Perth, on *Eucalyptus platypus* (*Myrtaceae*), 15 Jun. 2015, P.A. Barber, HPC 502, living culture CPC 27696; Perth, Fernwood Park, on *Banksia attenuata* (*Proteaceae*), 15 Jun. 2015, P.A. Barber, HPC 493, CPC 27641 = PAB F 001; Western Australia, on *Banksia* sp., 23 Sep. 2015, P.W. Crous, living culture CPC 29456.

Notes: *Pestalotiopsis* sp. 6 is closely related with *Pes. knightiae* and *Pes. grevilleae* (Fig. 5), and showed 98 % *tef-1α* sequence similarity to these two species. These three species are all reported from *Proteaceae* but from different geographical areas. Since their morphological characters are indistinguishable, *Pestalotiopsis* sp. 6 is not treated further in this study.

Pestalotiopsis spathuliappendiculata F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828381. Fig. 54.

Etymology: Referring to the spathulate apex of the apical appendages.

Culture characteristics: Colonies on MEA flat with entire edge, white to off-white, sterile, reaching 71 mm diam after 7 d at 21 °C; on CMA raised with concave edge, with undulate margin, white, reaching 65–68 mm diam after 7 d at 21 °C, conidial masses black, forming on the surface of aerial mycelia; on PDA flat with entire edge, white, sterile, reaching 76–80 mm diam after 7 d at 21 °C; on SNA flat with entire edge, colourless, reaching 65–68 mm diam after 7 d at 21 °C, conidiomata forming on pine needle, pale luteous or buff, stromatic, scattered, semi-immersed.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* often reduced to conidiogenous cells, hyaline. *Conidiogenous cells* mostly discrete, cylindrical, lageniform, hyaline, smooth-walled, 4–14.5 × 2.5–4.5 µm. *Conidia* fusoid, straight or curved, 4-septate, 21–30 × 4.5–8.5 µm (av. = 24.4 ± 2.23 × 7 ± 0.78 µm); basal cell obconic with a truncate base, hyaline, thin-walled, 2–5 µm (av. = 3.2 ± 0.66 µm) long; three median cells doliiform, 10.5–16.5 µm (av. = 13.4 ± 1.63 µm) long, smooth-walled, concolourous, pale brown to brown, septa darker than the rest cells, ± equal, each 2.5–5 µm (av. = 4 ± 0.59 µm) long; apical cell 4–8.5 µm (av. = 6.1 ± 1.06 µm) long, hyaline, cylindrical or subcylindrical, thin-walled; with 1–5 tubular apical appendages (mostly 2–3), arising from the top, middle or base of apical cell, unbranched, or sometimes irregularly branched, rough, 7–36 µm long, coarse and spathulate at the tip (about 1.5–3 µm (av. = 2.1 ± 0.51 µm) wide); 0–1 basal appendages, when present, tubular, filiform,

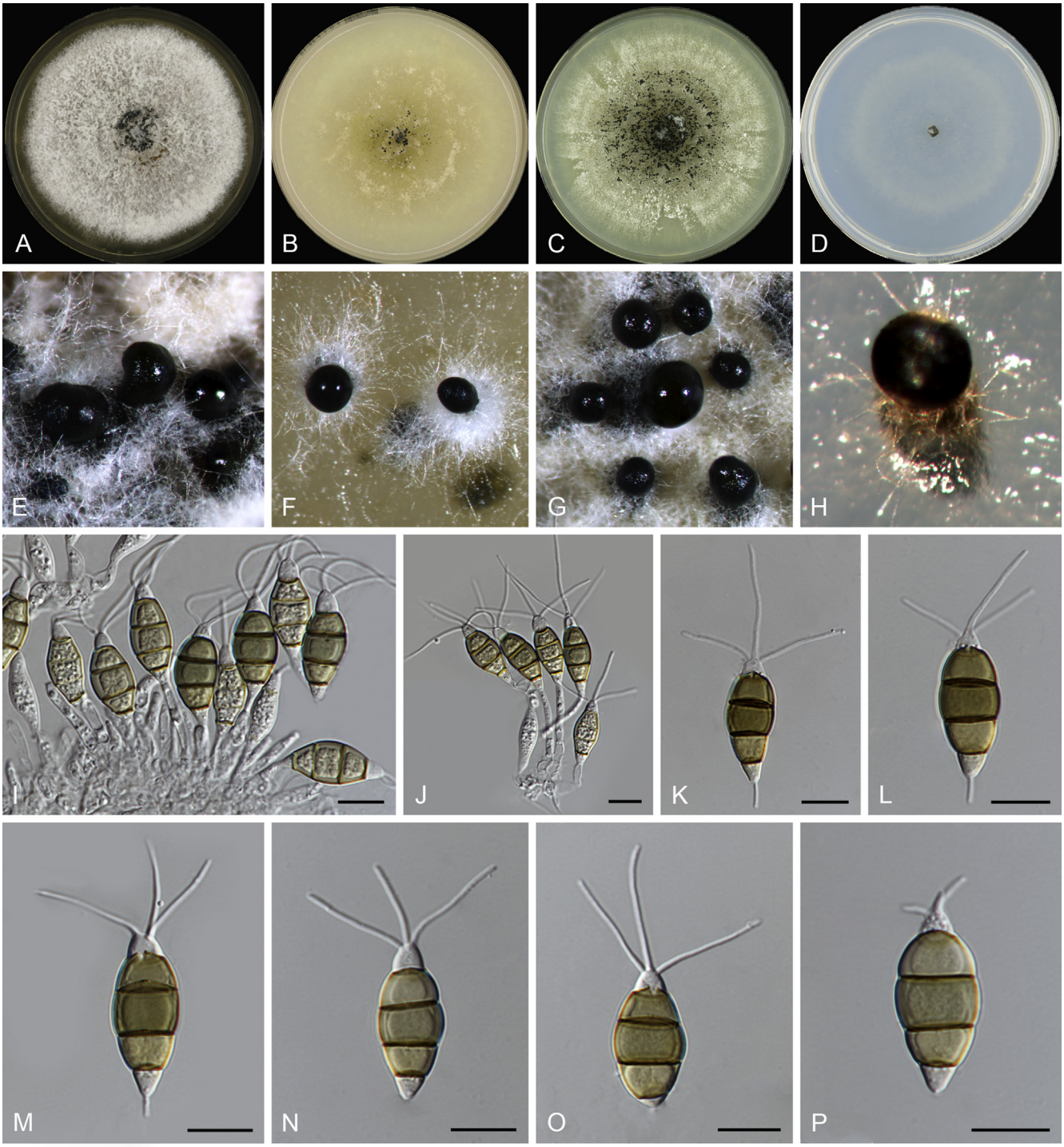

Fig. 53. *Pestalotiopsis* sp. 6 (CBS 143902/CPC 27649). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–J.** Conidiophores and conidiogenous cells. **K–P.** Conidia. Scale bars = 10 µm.

unbranched, centric, 1.5–10.5 µm (av. = 4.9 ± 2.16 µm) long; mean conidium length/width ratio = 3.5:1.

Material examined: **Australia**, Victoria, Bundoora, LaTrobe University Campus, on *Phoenix canariensis* (*Arecaceae*), 27 Mar. 2015, T. Aldous (**holotype** CBS H-23537, ex-type culture CBS 144035 = CPC 29602 = VPRI 42602).

Notes: The conidiomata of *Pes. spathuliappendiculata* differ in colour from typical *Pestalotiopsis* (olivaceous or black), being pale luteous or buff. Furthermore, the arrangement of apical appendages of *Pes. spathuliappendiculata* (arising from the top, middle or base of the apical cell) and shape (coarse and spathulate at the tip) are distinct from all other known *Pestalotiopsis* species.

Pestalotiopsis terricola F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828382. Fig. 55.

Etymology: Named after the habitat of this fungus, terrestrial.

Culture characteristics: Colonies on MEA flat with erose or dentate edge, white, reaching 60–61 mm diam after 7 d at 21 °C, conidiomata gregarious, semi-immersed, buff, exuding black conidial masses; on CMA and PDA flat with erose or dentate edge, white, reaching 71–80 mm diam after 7 d at 21 °C, conidiomata scattered or gregarious, semi-immersed, erumpent, acervular, buff, exuding black conidial masses; on SNA flat with erose or dentate edge, colourless, reaching 52–55 mm diam

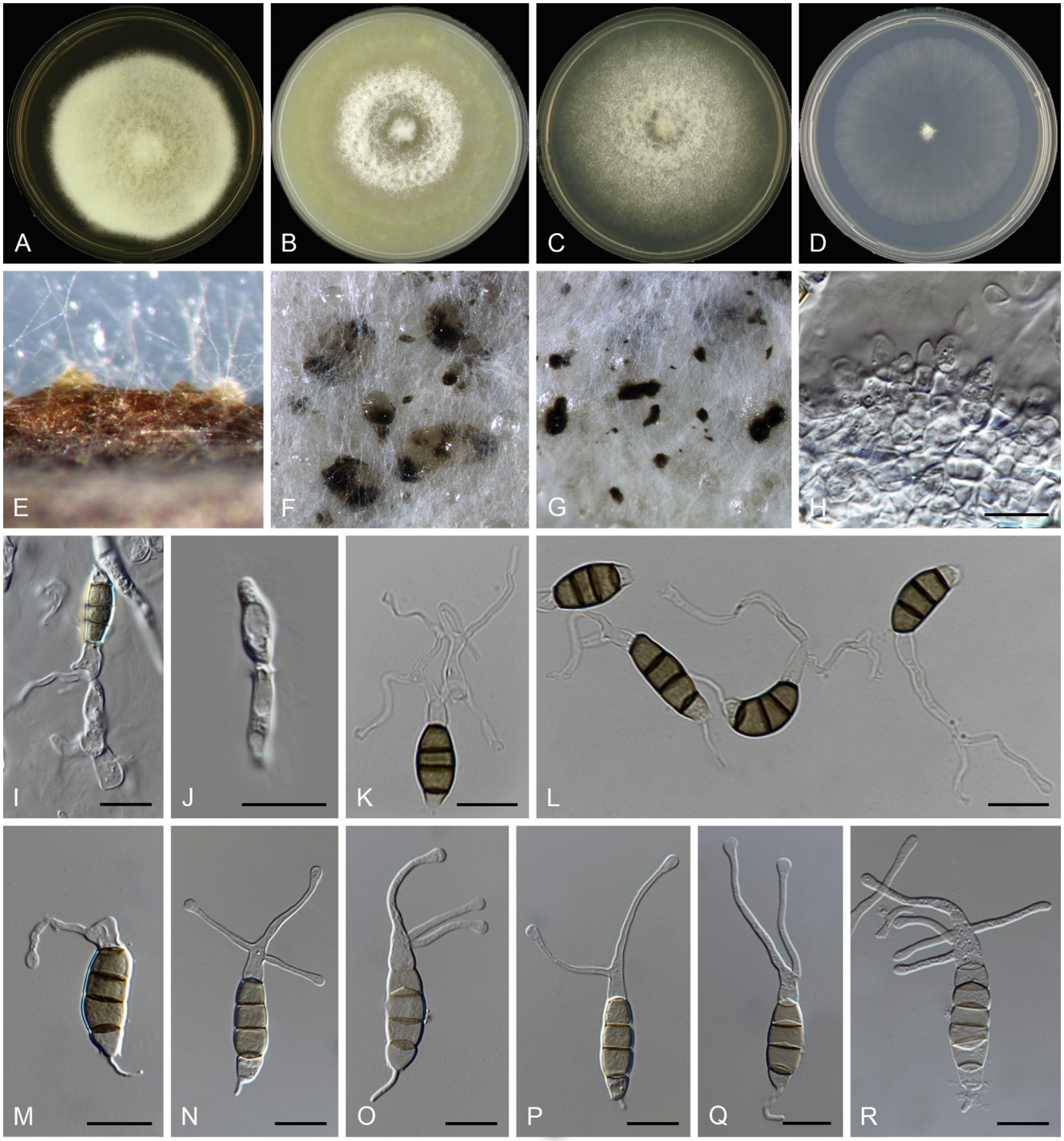

Fig. 54. *Pestalotiopsis spathuliappendiculata* (CBS 144035/CPC 29602). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidiomata on pine needle. **F–G.** Conidial masses on CMA. **H–J.** Conidiophores and conidiogenous cells bearing conidia. **K–M.** Conidia on pine needle. **N–R.** Conidia on CMA. Scale bars = 10 µm.

after 7 d at 21 °C, conidiomata black, scattered, superficial, acervular.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* often reduced to conidiogenous cell, septate and occasionally branched at the base. *Conidiogenous cells* mostly discrete, cylindrical, obclavate, or clavate, hyaline, smooth-walled, 3.5–14.5 × 1.5–3.5 µm (av. = 8.8 ± 2.47 × 2.1 ± 0.53 µm). *Conidia* fusoid, straight, 4-septate, 16.5–21.5 × 5–7 µm (av. = 19.5 ± 1.42 × 6.2 ± 0.44 µm); basal cell subcylindrical, obconic with a narrow truncate base, hyaline, thin-walled, 3–5 µm (av. = 3.9 ± 0.55 µm) long; three median cells doliiform, 10.5–14 µm (av. = 12.9 ± 0.9 µm) long, smooth-walled, concolourous, brown, septa darker than the rest of cell, ± equal, each 3.5–4.5 µm (av. = 4.1 ± 0.38 µm) long; apical cell 2–3.5 µm (av. = 2.6 ± 0.35 µm) long, hyaline, conic with a truncate base, thin-walled; with 2–4 tubular apical appendages (mostly 2–3), arising from the apical crest, unbranched, filiform, tubular, 5–10 µm (av. = 7.9 ± 1.13 µm) long; single basal appendage, tubular, unbranched, centric, 1–3.5 µm (av. = 2.6 ± 0.65 µm) long; mean conidium length/width ratio = 3.1:1.

Material examined: **Pacific Islands,** Tahiti, soil, unknown collection date, A.M. Fontana (**holotype** CBS H-15717, ex-type culture CBS 141.69).

Notes: Although represented by single strain, *Pes. terricola* is well separated from other species (Fig. 5). The short apical and basal appendages of *Pes. terricola* resemble *Pes. licualicola*,

Fig. 55. *Pestalotiopsis terricola* (CBS 141.69). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–L.** Conidiophores, conidiogenous cells and conidia. **M–R.** Conidia. Scale bars = 10 µm.

Pes. papuana and *Pes. parva* (Liu *et al.* 2017). Phylogenetically however, these three species are distant relatives to one another (Fig. 5).

Pseudopestalotiopsis Maharachch. *et al.*, Stud. Mycol. 79: 180. 2014, **emend.** F. Liu, L. Cai & Crous

Description: *Conidiomata* acervular or pycnidial, subglobose, globose, clavate, solitary or aggregated, brown to black, immersed, semi-immersed to erumpent, unilocular; exuding brown to black conidia in a slimy, globose mass. *Conidiophores* often reduced to conidiogenous cells. *Conidiogenous cells* discrete, cylindrical, ampulliform to lageniform, hyaline, smooth- and thin-walled; conidiogenesis initially holoblastic, percurrent proliferations to produce additional conidia at slightly higher levels. *Conidia* fusoid, ellipsoid, subcylindrical, straight to slightly curved, 4- septate, slightly constricted at septa; basal cell conical to cylindrical with a truncate base; three median cells doliiform, concolourous, brown to dark brown or olivaceous, wall smooth or verruculose, septa darker than the rest of the cell; apical cell conic to subcylindrical, thin- and smooth-walled; with tubular apical appendages, one to many, filiform or attenuated, flexuous, branched or unbranched, with or without spathulate tips; basal appendage single, tubular, unbranched, centric (emended from Maharachchikumbura *et al.* 2014).

Type species: *Pseudopestalotiopsis theae* (Sawada) Maharachch. *et al.*

Pseudopestalotiopsis chinensis F. Liu & L. Cai, Scientific Reports 7 (no. 866): 13. 2017.
Synonym: *Pestalotiopsis longiappendiculata* F. Liu & L. Cai, Scientific Reports 7(no. 866): 9. 2017.

Description and illustrations: See Liu *et al.* (2017).

Notes: A sequencing error occurred in the ITS sequence (KX894939.1) of *Pes. longiappendiculata* (CGMCC 3.18153 = LC3013) in Liu *et al.* (2017), which was not detected in the subsequent control and processing steps. *Pestalotiopsis longiappendiculata* therefore became a mistakenly introduced name, and is reduced to a synonymy under *Pse. chinensis* due to its phylogenetic similarity to *Pse. chinensis* (Fig. 6). Furthermore, the ITS sequence of CGMCC 3.18153 has been corrected in GenBank under KX894939.1.

Pseudopestalotiopsis elaeidis (C. Booth & J.S. Robertson) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828383.
Basionym: *Leptosphaeria elaeidis* C. Booth & J.S. Robertson, Trans. Brit. Mycol. Soc. 44: 26. 1961.
Synonyms: *Pestalosphaeria elaeidis* (C. Booth & J.S. Robertson) Aa, Proc. K. Ned. Akad. Wet., Ser. C, Biol. Med. Sci.: 87. 1976.
Lepteutypa elaeidis (C. Booth & J.S. Robertson) Arx, Gen. Fungi Sporul. Cult., Edn 3 (Vaduz): 176. 1981.
Pseudopestalotiopsis myanmarina Nozawa & Kyoko Watan., Mycoscience 58: 331. 2017.

Description: See Nozawa *et al.* (2017).

Material examined: **China**, Jiangxi Province, Yangling National Froest Park, on *Lauraceae*, 5 Sep. 2013, Y.H. Gao, living culture LC4479. **Indonesia**, on *Acacia crassipes*, 22 Jun. 2012, M. Wingfield, living culture CBS 144023 = CPC 20822. **Myanmar**, between Dawei and Myeik, on *Averrhoa carambola*, 13 Nov. 2014, K. Watanabe (**holotype** of *Pseudopestalotiopsis myanmarina* NBRC H-13285, ex-type culture NBRC 112264 = MM14-F0060, not seen); between Dawei and Myeik, unknown host, collection date and collector, living culture NBRC 112265 = MM14-F0066, not seen; Pathein, unknown host plant, collection date and collector, living culture NBRC 112270 = MM14-F0112, not seen; *ibid.* living culture NBRC 112269 = MM14-F0066, not seen. **Nigeria**, on seedling of *Elaeis guineensis* (*Arecaceae*), Sep. 1955, unknown collector (**isotype** of *Leptosphaeria elaeidis* CBS H-281; ex-isotype culture CBS 413.62 = IMI 61175 = QM 8005).

Notes: There is only one base pair difference between the ITS and *tef-1α* sequences of the ex-type cultures of *Leptosphaeria elaeidis* (CBS 413.62) and *Pseudopestalotiopsis myanmarina* (NBRC 112264). These species are morphologically comparable. Since *Lep. elaeidis* was published earlier than *Pse. myanmarina*, it was combined in the genus *Pseudopestalotiopsis* and the latter species synonymised under *Pse. elaeidis.*

Pseudopestalotiopsis solicola F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828384. Fig. 56.

Etymology: Named after the substrate of this fungus, soil.

Culture characteristics: Colonies on MEA convex with papillate surface, crenate edge, amber, reaching 54–75 mm diam after 7 d at 21 °C, conidiomata black, scattered, superficial, acervular; on CMA flat with entire edge, colourless, reaching 68 mm diam after 7 d at 21 °C, conidiomata amber, scattered, semi-immersed, stromatic, acervular; on PDA flat with entire edge, buff, reaching > 90 mm diam after 7 d at 21 °C, conidiomata amber to honey, superficial or semi-immersed, gregarious, stromatic, erumpent; on SNA flat with undulate edge, colourless, reaching 62–68 mm diam after 7 d at 21 °C, conidiomata black, scattered, semi-immersed or immersed.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* reduced to conidiogenous cells, occasionally septate. *Conidiogenous cells* mostly discrete, sphaeriform, ampulliform, ellipsoidal, hyaline, smooth-walled, 4.5–9 × 3.5–6 µm (av. = 6.1 ± 1.15 × 4.8 ± 0.62 µm). *Conidia* fusoid, straight, 4-septate, 18–25.5 × 7–9.5 µm (av. = 21.3 ± 1.66 × 8 ± 0.6 µm); basal cell subcylindrical, obconic with a truncate base, hyaline, thin-walled, 2.5–4 µm (av. = 3.1 ± 0.47 µm) long; three median cells doliiform, 11.5–16.5 µm (av. = 14.7 ± 1.09 µm) long, smooth-walled, concolourous, brown, septa darker than the rest of cell, ± equal, each 4–5.5 µm (av. = 4.7 ± 0.38 µm) long; apical cell 2–5.5 µm (av. = 3.5 ± 1.01 µm) long, hyaline, cylindrical or conic with a truncate base, thin-walled; with 2–4 tubular apical appendages (mostly 3), unbranched, filiform, tubular, slightly swollen at the apex, 13–23.5 µm (av. = 18 ± 2.69 µm) long; 0–1 basal appendages, when present tubular, unbranched, centric, 1.5–6 µm (av. = 3.4 ± 1.27 µm) long; mean conidium length/width ratio = 2.7:1.

Material examined: **Papua New Guinea**, Madang Prov. Brahman, soil in tropical forest, Nov. 1995, A. Aptroot (**holotype** CBS H-23541, ex-type culture CBS 386.97).

Notes: *Pseudopestalotiopsis solicola* is closely related to *Pse. theae* (99 % similarity on *tub2* and 95 % on *tef-1α*) and an unnamed clade (*Pseudopestalotiopsis* sp. 1) that was published in Nozawa *et al.* (2017) (Fig. 6, 99 % sequence similarity on *tub2* and 95 % on *tef-1α*). Morphologically, it is different from *Pse. theae* in producing shorter apical appendages (13–23.5 µm vs. 22.5–31 µm) and a smaller mean conidium length/width ratio (2.7:1 vs. 3.4:1).

Pseudosarcostroma F. Liu, L. Cai & Crous, **gen. nov.** MycoBank MB828385.

Etymology: Based on its morphological similarity to *Sarcostroma*.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* acervular, superficial or immersed, pale brown, wall of *textura rectangularis*, cells thick-walled and colourless to pale brown. *Conidiophores* arising from the inner layers of the conidioma, sparsely septate and branched at the base, often reduced to conidiogenous cells, colourless, invested in mucus. *Conidiogenous cells* lageniform or ampulliform, discrete or integrated, colourless, thin-walled, smooth. *Conidia* fusoid with an acute apex and a truncate or obtuse base, straight or slightly curved, 4–5-septate, wall undulate or verruculose, apical and basal cell colourless, median cells pale brown, without or with slight constriction at the septa, bearing appendages; apical appendage single, attenuated, flexuous, not branched; basal appendage single, tubular, excentric, unbranched.

Type species: *Pseudosarcostroma osyridicola* F. Liu, L. Cai & Crous.

Notes: In the multi-locus (Figs 1, 7) and single gene trees (not shown here), *Pseudosarcostroma* is closely related to *Broomella*, *Bartalinia*, *Truncatella*, *Parabartalinia*, and *Diversimediispora*. Morphologically, it differs from *Bartalinia*, *Truncatella*, *Parabartalinia* and *Diversimediispora* in the type of apical appendage (unbranched vs. branched), and differs from *Broomella* in the number of conidial septa (4–5-septate vs. 2–3-septate). In addition, the distal septa of *Pseudosarcostroma* are thicker than median septa, which are concolourous in the above listed genera. Although *Pseudosarcostroma* is morphologically similar

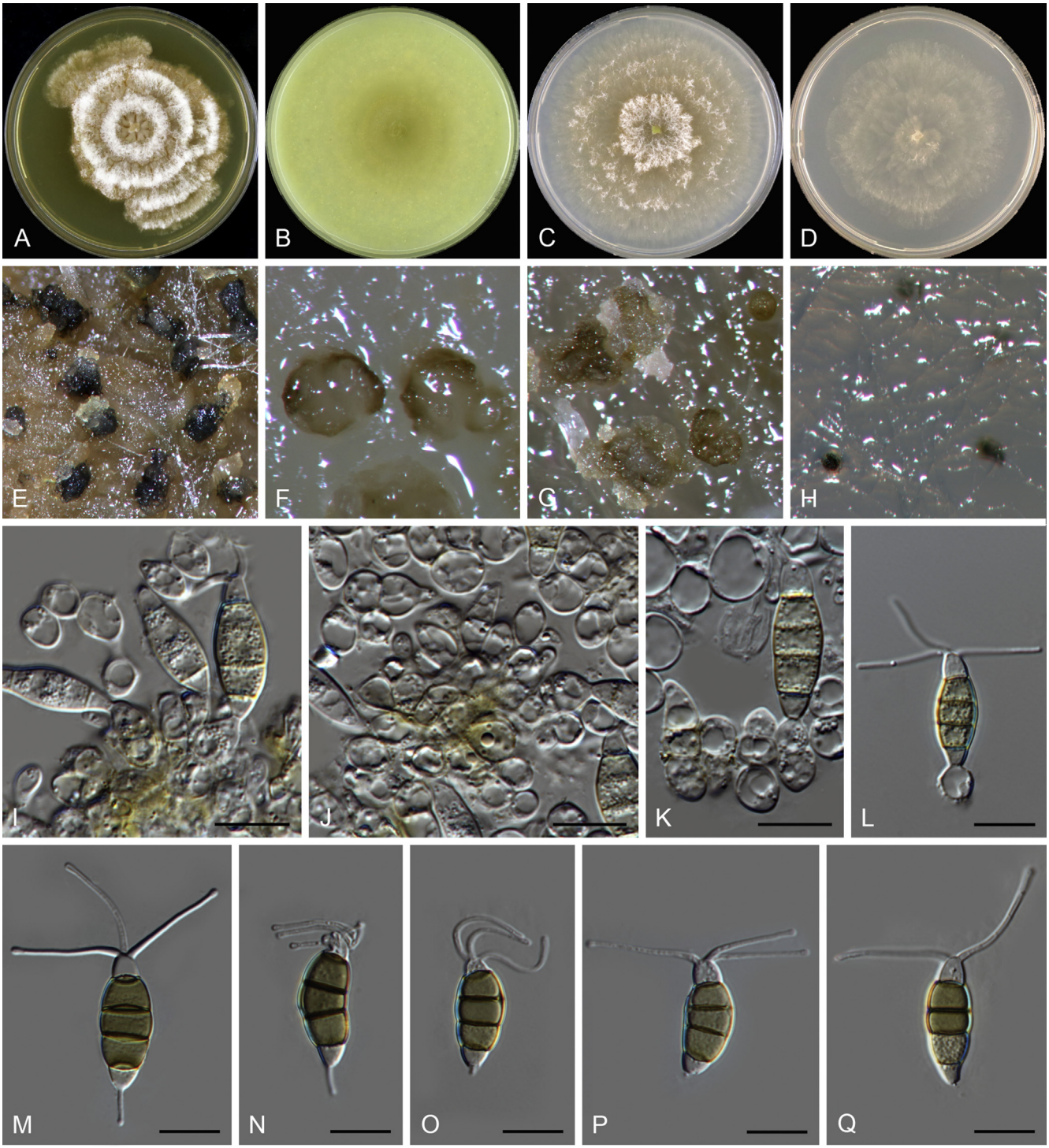

Fig. 56. *Pseudopestalotiopsis solicola* (CBS 386.97). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–L.** Conidiophores and conidiogenous cells. **M–Q.** Conidia. Scale bars = 10 µm.

to *Sarcostroma* in having a single appendage at each end and with an undulate or verruculose conidial wall, they are phylogenetically distinct (Fig. 1).

Pseudosarcostroma osyridicola F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828386. Fig. 57.

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

Culture characteristics: Colonies on MEA flat with entire or undulate edge, rosy buff, sterile, reaching 57–58 mm diam after 14 d at 21 °C; on CMA umbonate with entire edge, white to grey, sterile, reaching 63–64 mm diam after 14 d at 21 °C; on PDA flat with entire edge, rosy buff, sterile, reaching 66–69 mm diam after 14 d at 21 °C; on SNA flat with fimbriate edge, white to grey, reaching 23–27 mm diam after 14 d at 21 °C, conidial masses pale brown, scattered, gregarious or confluent, superficial or immersed, acervular.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, mostly reduced to conidiogenous cells, smooth, colourless. *Conidiogenous cells* discrete, mostly lageniform or ampulliform, 4.5–14.5 × 1.5–3.5 µm, (av. = 8 ± 2.25 × 2.4 ± 0.51 µm), colourless, smooth. *Conidia* fusoid, straight or slightly curved, wall undulate, mostly 4-septate, occasionally 5-septate, distal septa thicker than the rest cell, 18.5–29.5(–33) × 4.5–7.5 µm (av. = 24 ± 2.73 × 5.7 ± 0.7 µm);

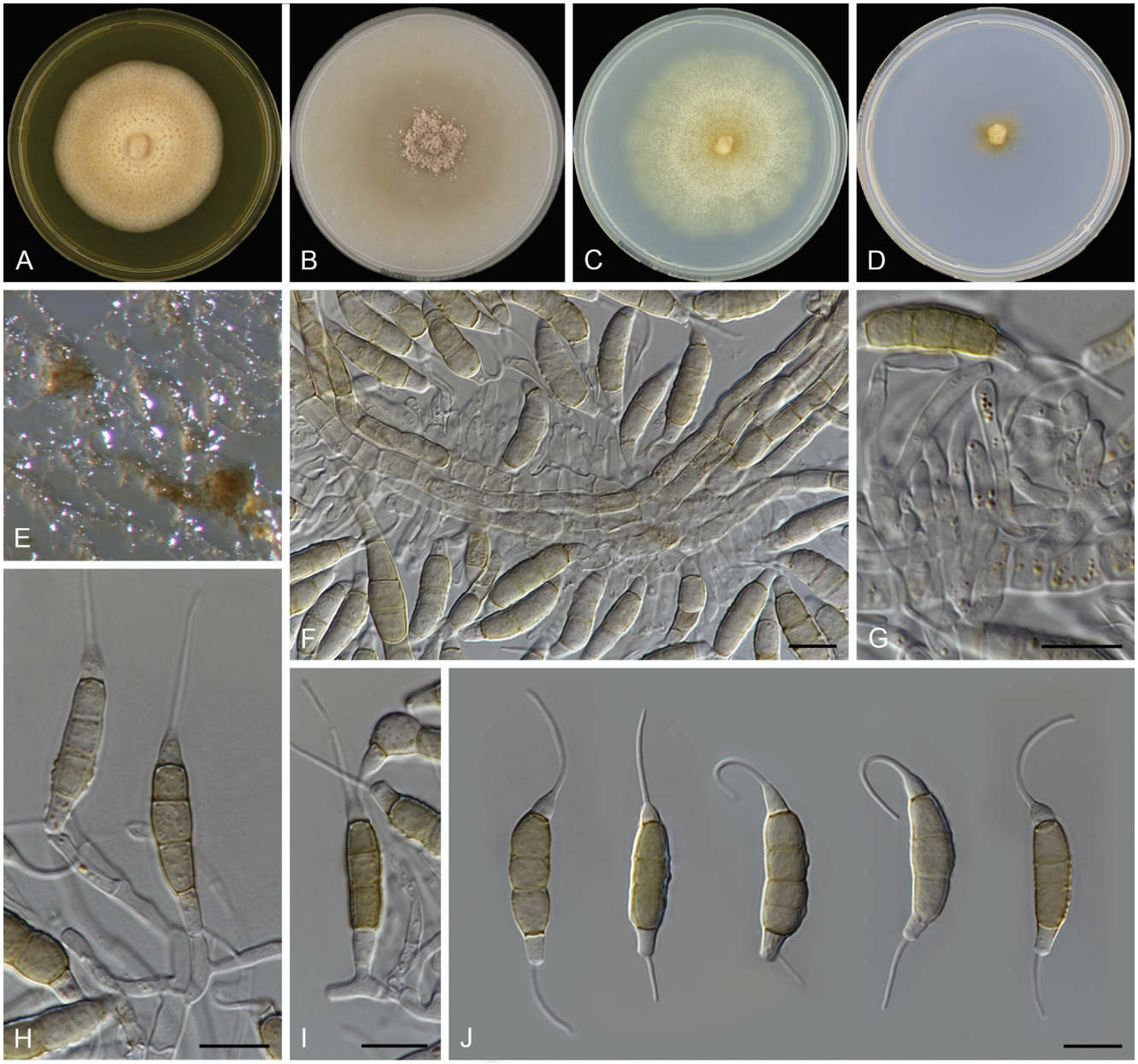

Fig. 57. *Pseudosarcostroma osyridicola* (CBS 103.76). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidial masses on SNA. **F–G.** Immature conidiomatal wall and conidiogenous cells. **H–I.** Conidiogenous cells and conidia. **J.** Conidia. Scale bars = 10 µm.

basal cell obconic with a truncate base, trapezoid, hyaline, thin-walled, 3–5 µm (av. = 4 ± 0.57 µm) long; median cells 2, cylindrical, doliiform, pale brown, thick-walled, ± equal, each 3–8 µm (av. = 5.6 ± 1.07 µm) long; apical cell conic with an acute apex, thin-walled, hyaline, 2–5.5 µm (av. = 3.3 ± 0.72 µm) long; single apical appendage, centric, attenuated, tubular, unbranched, 9.5–20.5 µm (av. = 14.5 ± 2.44 µm) long; single basal appendage, excentric, attenuated, tubular, unbranched, 5.5–19.5 µm (av. = 10 ± 2.99 µm) long; mean conidium length/width ratio = 4.2:1.

Material examined: **France**, St Rémy de Provence, on *Osyris alba* (*Santalaceae*) twigs, 22 Oct. 1974, W. Gams (**holotype** CBS H-14564, ex-type culture CBS 103.76).

Notes: In addition to *Pseudosarcostroma osyridicola*, two other pestalotioid species have been reported from *Osyris alba* (Farr & Rossman 2018), which are *Discostroma osyridis* from Portugal (Sivanesan 1983) and *Monochaetia osyrella* (syn. *Mon. osyridella*, *Pestalotia osyrella*) from Italy, Yugoslavia and Austria (Guba 1961, Nag Raj 1988, 1993). Although type-derived sequences are unavailable for both species, they are morphologically different from *Pseudosarcostroma osyridicola*. The basal appendage of *Pseudosarcostroma osyridicola* is excentric and the distal septa are thicker than the rest of the cell; however, in *Mon. osyrella*, the basal appendage is centric, and the distal septa are as thick and dark as the peripheral wall, but the two median septa are thinner (Nag Raj 1993). *Discostroma osyridis* differs from *Pseudosarcostroma osyridicola* by producing non-appendaged conidia (Sivanesan 1983).

Robillarda Sacc., Michelia 2 (6): 8. 1880, nom. cons.

Description: *Conidiomata* stromatic, pycnidial or pycnidioid, semi-immersed or immersed, erumpent, unilocular to variably loculate with the locule often convoluted, glabrous, dehiscing by an ostiole or by an irregular split in the apical wall and overlying host tissue; wall thick of *textura angularis* to *textura prismatica*. *Conidiophores* reduced to conidiogenous cells or with 1–2 supporting cells lining the cavity of the locule,

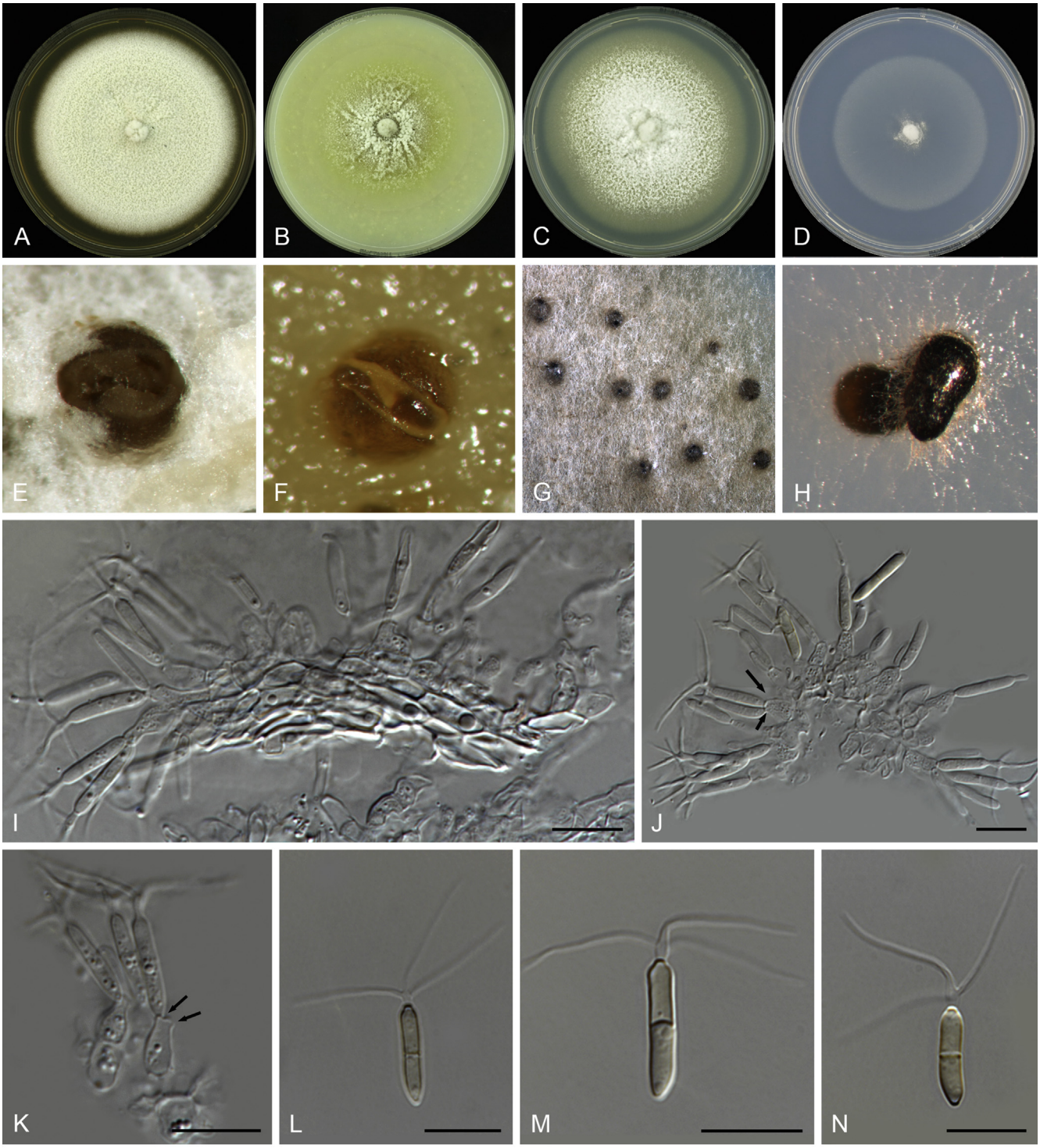

Fig. 58. *Robillarda australiana* (CBS 143882/CPC 17187). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–K.** Conidiophores and conidiogenous cells (arrows point to protuberances). **L–N.** Conidia. Scale bars = 10 µm.

invested in mucus. *Coniodiogenous cells* discrete, ampulliform to lageniform, hyaline, smooth; proliferating sympodially or percurrently near apex. *Conidia* composed of a conidium body and a separate apical cell modified into a branched appendage; conidium body ellipsoid, fusiform or subcylindrical, 1-euseptate, wall smooth, with or without constriction at the septum, hyaline to pale brown, often guttulate; apical cell short-cylindrical at base, then dividing into 2–5 branches, branches thin-walled, tubular, filiform, ends pointed or swollen, flexuous, divergent, smooth, hyaline, devoid of contents (emended from Crous *et al.* 2015).

Type species: *Robillarda sessilis* (Sacc.) Sacc. 1880.

Robillarda australiana F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828387. Fig. 58.

Etymology: Named after the country where it was collected, Australia.

Culture characteristics: Colonies on MEA flat with entire edge, white, reaching 76–77 mm diam after 14 d at 21 °C, conidiomata brown, scattered, erumpent, stromatic, covered by mycelia; on CMA flat with entire edge, aerial mycelia sparse, flocculent,

reaching 58–60 mm diam after 14 d at 21 °C, conidiomata pale brown to brown, superficial or semi-immersed, erumpent, stromatic; on PDA flat with entire edge, white, aerial mycelia villiform, reaching 73–75 mm diam after 14 d at 21 °C, conidiomata dark brown to black, semi-immersed, often covered by aerial mycelia, stromatic; on SNA flat with entire edge, colourless, reaching 57–58 mm diam after 14 d at 21 °C, conidiomata black, scattered, immersed, acervular.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* reduced to very short conidiogenous cells, smooth, colourless. *Conidiogenous cells* discrete, thin-walled, guttulate, lageniform, ampulliform or irregular, 4.5–10.5 × 2–4.5 µm (av. = 7.3 ± 1.53 × 3.1 ± 0.57 µm), colourless, smooth. Each conidiogenous cell producing 2–3 small but distinct protuberances at the apex. *Conidia* composed of a 1-septate conidium body and a septate apical cell modified into a branched appendage. *Conidium body* cylindrical, straight, 1-septate, smooth, hyaline to pale brown, guttulate, not constricted at the median septum, 8.5–13.5 × 1.5–2 µm (av. = 11.1 ± 0.82 × 1.9 ± 0.1 µm), lower cell and upper cell in ± equal length; apical cell cylindrical for 2–3.5 µm (av. = 2.7 ± 0.31 µm) long, then dividing into three divergent branches; apical appendages unbranched, attenuated, 6–16.5 µm (av. = 10.5 ± 3.47 µm) long; basal appendages absent; mean conidium length/width ratio = 5.8:1.

Material examined: **Australia**, Queensland, Noosa Bay, unknown host plant, 27 Jul. 2009, P.W. Crous (**holotype** CBS H-23503, ex-type culture CBS 143882 = CPC 17187).

Notes: *Robillarda australiana* is closely related to *Rob. africana* (99 % sequence similarity on ITS, 97 % on *rpb2*, 93 % on *tef-1α* and 98 % on *tub2*), but it differs from the latter in producing a longer apical cell (2–3.5 µm vs. 1–2.5 µm). The conidia of *Rob. australiana* are not constricted at the median septum, while they are slightly constricted in *Rob. africana.*

Sarcostroma Cooke, Journal of the Quekett microsc. Club 2: 267. 1871, **emend.** F. Liu, L. Cai & Crous.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* stromatic, variable from acervular to acervuloid, pycnidioid or cupulate, innate-erumpent or erumpent, unilocular with the locule often irregularly convoluted, glabrous, dark brown to black; basal stroma of *textura angularis* to *textura prismatica*, cells moderately thick-walled and almost colourless. *Conidiophores* arising from the upper cells of the basal stroma or at the base and part way up the side walls or lining the cavity of the conidioma, sometimes reduced to conidiogenous cells, septate, unbranched or branched, colourless, thin-walled. *Conidiogenous cells* discrete or integrated, ampulliform, lageniform to subcylindrical or cylindrical, colourless, thin-walled, smooth. *Conidia* fusoid, straight or curved, 3–5-septate, occasionally 6–7-septate, bearing appendages; basal cell obconic with a truncate base, colourless and thin-walled, smooth; median cells cylindrical or doliiform, thick-walled, mid-brown to brown, wall smooth, undulate or verruculose; apical cell conical, almost colourless, smooth; appendages cellular, continuous with the conidium body, attenuated, unbranched, filiform, tubular or flexuous; apical appendage single; basal appendage single, excentric (emended from Nag Raj 1993).

Type species: *Sarcostroma foliicola* (Cooke) Nag Raj [≡ *Sarcostroma berkeleyi* Cooke; ≡ *Podisoma foliicola* Cooke].

Notes: *Sarcostroma* was resurrected to accommodate some taxa removed from *Seimatosporium*, characterised by fusoid conidia with four or more cells, pigmented median cells, paler and thin-walled end cells, an attenuated tubular apical appendage and a similar excentric basal appendage (Nag Raj 1993). The holotype of the generic type species (*Bas. Podisoma foliicola*), collected from *Juniperus communis* in England, the UK, in 1828, was unfortunately presumed lost (comm. June 1989 from keeper of the herbarium, Nag Raj 1993).

In this study, we searched without success for type duplicates of *Sar. foliicola* in the herbaria BM, CGE, E, L, LINN, MICH, OXF and PC, where Berkeley could have deposited specimens. Although the sequence of *Sar. foliicola* was unavailable for comparison, morphological characters of *Sarcostroma* species described in this study fit well with the generic characterisation in Nag Raj (1993). We have not been able to obtain suitable material to serve as epitype. The epitypification is therefore awaiting fresh collections and DNA data.

Sarcostroma africanum F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828388. Fig. 59.

Etymology: Refers to the country where it was collected, South Africa.

Culture characteristics: Colonies on MEA flat with radially folded on surface, greenish grey, sterile, reaching 54–55 mm diam after 14 d at 21 °C; on CMA flat with entire edge, glaucous grey, sterile, reaching 67–74 mm diam after 14 d at 21 °C; on PDA low convex with entire edge, smoke grey, aerial mycelia white and flocculent, sterile, reaching 75 mm diam after 14 d at 21 °C; on SNA flat with entire edge, colourless, reaching 54–55 mm diam after 14 d at 21 °C, conidiomata black, scattered, acervular.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, colourless, smooth, thin-walled. *Conidiogenous cells* discrete or integrated, cylindrical, subcylindrical, 9–16.5 × 1.5–2.5 µm (av. = 12.8 ± 0.8 × 2 ± 0.2 µm), colourless, smooth. *Conidia* fusoid, straight, 4-septate, wall undulate, not constricted at the septa, 15.5–19.5 × 5–6 µm (av. = 17.8 ± 0.89 × 5.6 ± 0.33 µm), bearing appendages; basal cell obconic with a truncate base, colourless, 2–3 µm (av. = 2.4 ± 0.28 µm) long; median cells 3, cylindrical or doliiform, thick-walled, mid-brown, ± equal, each 3–5.5 µm (av. = 4.1 ± 0.46 µm) long; apical cell conical, colourless, 2–3.5 µm (av. = 2.7 ± 0.3 µm) long; apical appendage single, filiform, unbranched, attenuated, 7–15 µm (av. = 11.2 ± 2.01 µm) long; basal appendage single, unbranched, filiform, excentric, 7.5–14 µm (av. = 10.7 ± 1.71 µm) long; mean conidium length/width ratio = 3.2:1.

Materials examined: **South Africa**, Western Cape Province, on *Pelargonium cucullatum* (*Geraniaceae*), 1 Apr. 2007, P.W. Crous (**holotype** CBS H-23499, ex-type culture CBS 143879 = CPC 13920); Western Cape Province, on *Euclea* sp. (*Ebenaceae*), 16 Apr. 2008, F. Roets, CBS H-23501, living culture CBS 144021 = CPC 15183.

Notes: Two strains representing *Sar. africanum* formed a well-supported clade closely related to *Sar. proteae* (Fig. 2). They are morphologically similar but only share 98 % sequence similarity on *rpb2*, 96 % on *tef-1α* and 98 % on *tub2*. This is the first report of *Sarcostroma* on *Pelargonium cucullatum* and *Euclea* sp. In contrast, *Sar. proteae* is thus far only known from *Protea magnifica* in Australia (see below).

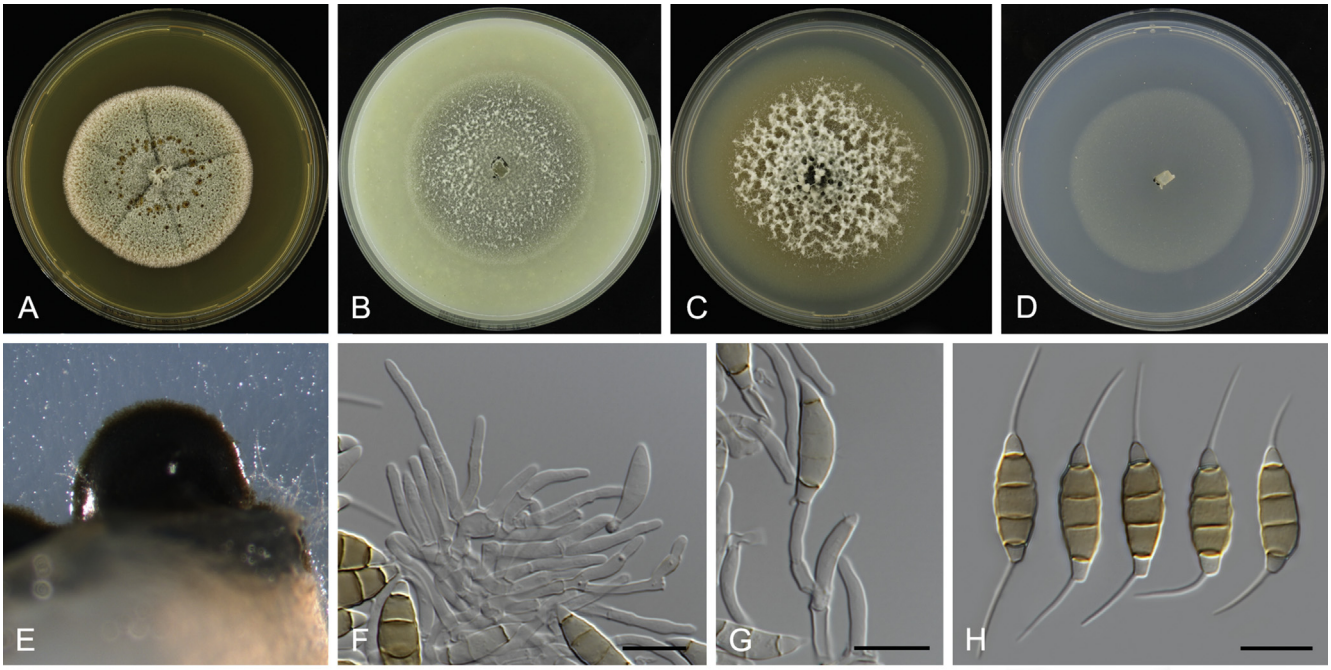

Fig. 59. *Sarcostroma africanum* (CBS 143879/CPC 13920). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidomata on SNA. **F–G.** Conidiophores and conidiogenous cells. **H.** Conidia. Scale bars = 10 µm.

Sarcostroma australiense F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828389. Fig. 60.

Etymology: Referring to the country where it was collected, Australia.

Culture characteristics: Colonies on MEA flat with entire edge, sulphur yellow to pure yellow, reaching 60–63 mm diam after 14 d at 21 °C, conidiomata black, gregarious, semi-immersed, stromatic; on CMA flat with entire edge, white, reaching 65 mm diam after 14 d at 21 °C, conidiomata black, scattered or gregarious, acervular, stromatic, semi-immersed; on PDA flat with entire edge, rosy buff, reaching 72–73 mm diam after 14 d at 21 °C, conidiomata black, gregarious, semi-immersed, acervular; on SNA flat with entire edge, white, reaching 47–48 mm diam after 14 d at 21 °C, conidiomata scattered or gregarious, olivaceous, superficial, acervular.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, colourless, smooth, thin-walled. *Conidiogenous cells* discrete, mostly cylindrical, subcylindrical, 7–16.5 × 1.5–3 µm (av. = 10.9 ± 2.32 × 1.9 ± 0.34 µm), colourless, smooth, with up to three annellations. *Conidia* fusoid, straight, mostly 3–4-septate, occasionally 7-septate, distal septa thicker than the median septum, wall smooth or undulate, not constricted at the septa, 18–22 × 5–6 µm (av. = 20.2 ± 1.07 × 5.5 ± 0.39 µm) long in 4-septate conidia, 15.5–19.5 × 2–4 µm (av. = 18.4 ± 0.95 × 3 ± 0.41 µm) in 3-septate conidia; basal cell subcylindrical, cylindrical, colourless, 2.5–3.5 µm (av. = 3 ± 0.28 µm) long; median cells 2–3, doliiform or subcylindrical, thick-walled, mid-brown, together 12–15.5 µm (av. = 14 ± 0.78 µm) long in 4-septate conidia, 10.5–13.5 µm (av. = 12.4 ± 0.78 µm) in 3-septate conidia; if 4-septate, the second cell from basal cell 5–6.5 µm (av. = 5.5 ± 0.5 µm) long, the third and fourth cells ± equal, each 3–5 µm (av. = 4.3 ± 0.41 µm) long; if 3-septate, the second cell from basal 4.5–6 µm (av. = 5.4 ± 0.38 µm) long, the third cell 6–8 µm (av. = 7.2 ± 0.54 µm) long; apical cell conical, colourless to pale brown, 2–4 µm (av. = 3 ± 0.41 µm) long; apical appendage single, unbranched, attenuated, filiform, 17.5–29.5 µm (av. = 24.8 ± 3.17 µm) long; basal appendage single, unbranched, filiform, excentric, 18.5–31.5 µm (av. = 25.7 ± 2.85 µm) long; mean conidium length/width ratio = 3.7:1 in 4-septate conidia, 6.1:1 in 3-septate conidia.

Material examined: **Australia**, Victoria, The Gurdies, Gurdies Winery, on *Daviesia latifolia* (*Fabaceae*), 7 Nov. 2014, P.W. Crous, HPC 107 (**holotype** CBS H-23521, ex-type culture CBS 144160 = CPC 25389).

Notes: The dimensions of 4-septate and 3-septate conidia of *Sar. australiense* differ. The second cell from the base in 4-septate conidia is distinctly longer than the other median cells (5–6.5 µm vs. 3–5 µm), but shorter than another median cell in 3-septate conidia (4.5–6 µm vs. 6–8 µm). This character could distinguish *Sar. australiense* from other known *Sarcostroma* species.

Another *Sarcostroma* species, *Sar. daviesiae*, was also reported from *Daviesia latifolia* in Australia (Nag Raj 1993), but it only produced 4-septate conidia which are longer and wider than *Sar. australiense* (22–29 × 7–8 µm vs. 18–22 × 5–6 µm). *Sarcostroma australiense* also differs from *Sar. daviesiae* by producing smooth median conidial cells, which are verruculose in *Sar. daviesiae.*

Sarcostroma diversiseptatum F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828390. Fig. 61.

Etymology: Refers to the different number of septa compared to other *Sarcostroma* species.

Culture characteristics: Colonies on MEA flat with entire edge, white, sterile, reaching 75 mm diam after 12 d at 21 °C; on CMA flat with entire edge, white, with black sector, reaching 67 mm diam after 14 d at 21 °C, conidiomata black, scattered or gregarious, acervular, erumpent, rounded in outline; on PDA flat with entire edge, dark mouse grey, with straw aerial mycelia, sterile, reaching 81 mm diam after 12 d at 21 °C; on SNA flat with entire edge, colourless, sterile, reaching 62–63 mm diam after 14 d at 21 °C.

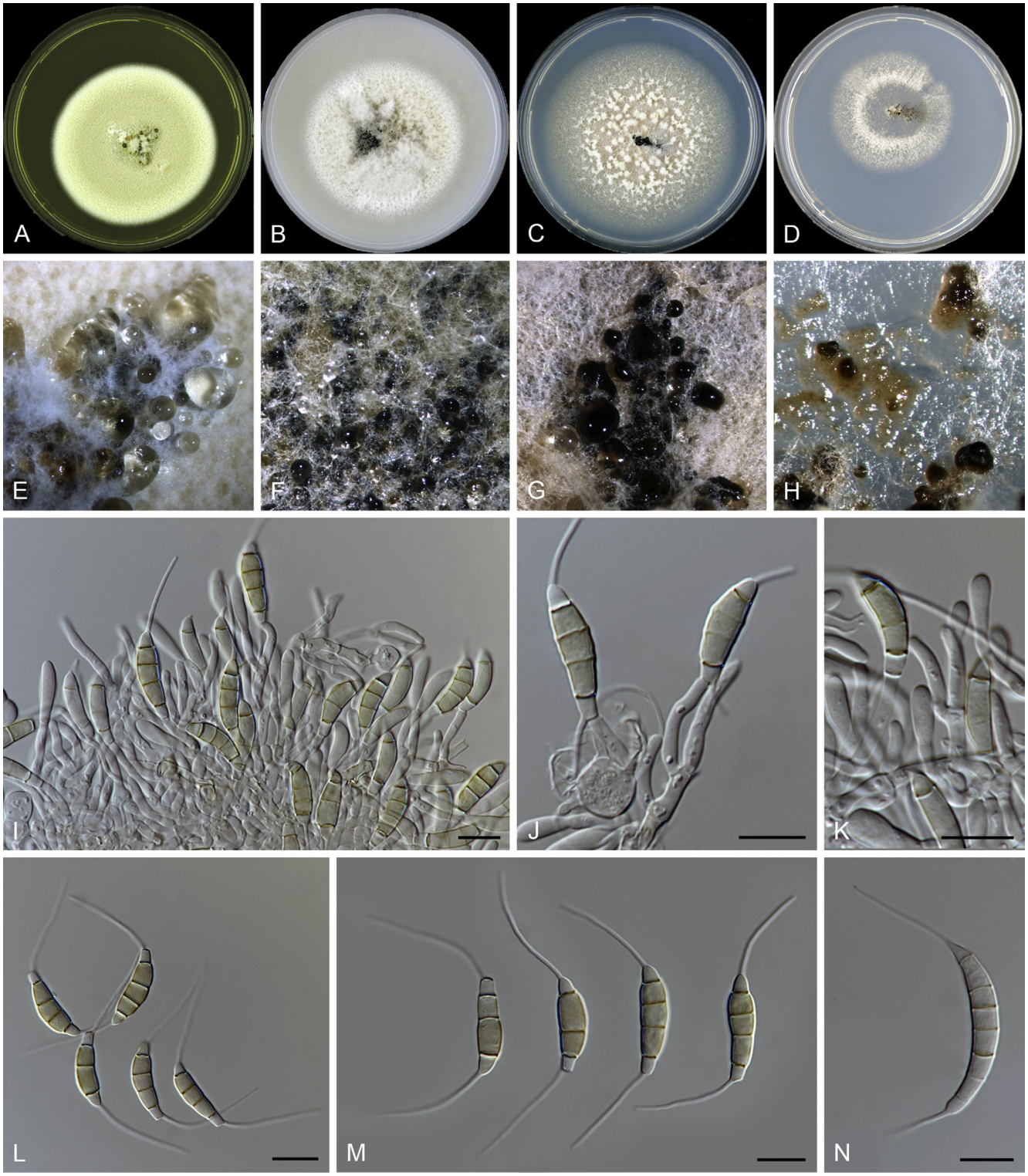

Fig. 60. *Sarcostroma australiense* (CBS 144160/CPC 25389). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–K.** Conidiophores and conidiogenous cells bearing conidia. **L–M.** 2–3-septate conidia. **N.** Rarely 7-septate conidium. Scale bars = 10 µm.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, irregularly branched, colourless, or pale brown, smooth, thin- or thick-walled, often reduced to conidiogenous cells. *Conidiogenous cells* discrete or integrated, mostly cylindrical or ampulliform, variable in size, 2.5–22 × 2–2.5 µm, colourless, smooth, with up to 3 annellations. *Conidia* mostly falcate, sometimes fusoid, 5(–6)-septate, pale to mid-brown, wall smooth or verruculose, sometimes constricted at the septa, 18.5–24 × 4.5–6.5 µm (av. = 21 ± 1.33 × 5.7 ± 0.45 µm), bearing appendages; basal cell obconic with a truncate base, or cylindrical and cuneiform, colourless, 1.5–4.5 µm (av. = 2.8 ± 0.53 µm) long; median cells 4–5, fairly thick-walled, pale to mid-brown, doliiform or cylindrical, ± equal, each 2–4.5 µm (av. = 3.5 ± 0.51 µm) long; apical cell conical, colourless, 1.5–4 µm (av. = 2.7 ± 0.45 µm) long; basal and apical appendage single, unbranched, attenuated, filiform, flexuous; apical appendage 13.5–35 µm (av. = 20 ± 5.45 µm) long; basal appendage excentric, 10–27.5 µm (av. = 18 ± 4.07 µm) long; mean conidium length/width ratio = 3.7:1.

Materials examined: **Australia**, Victoria, Brisbane Ranges National Park, native habitat, on *Correa reflexa* (*Rutaceae*), 28 Jun. 1972, H.J. Swart, living culture

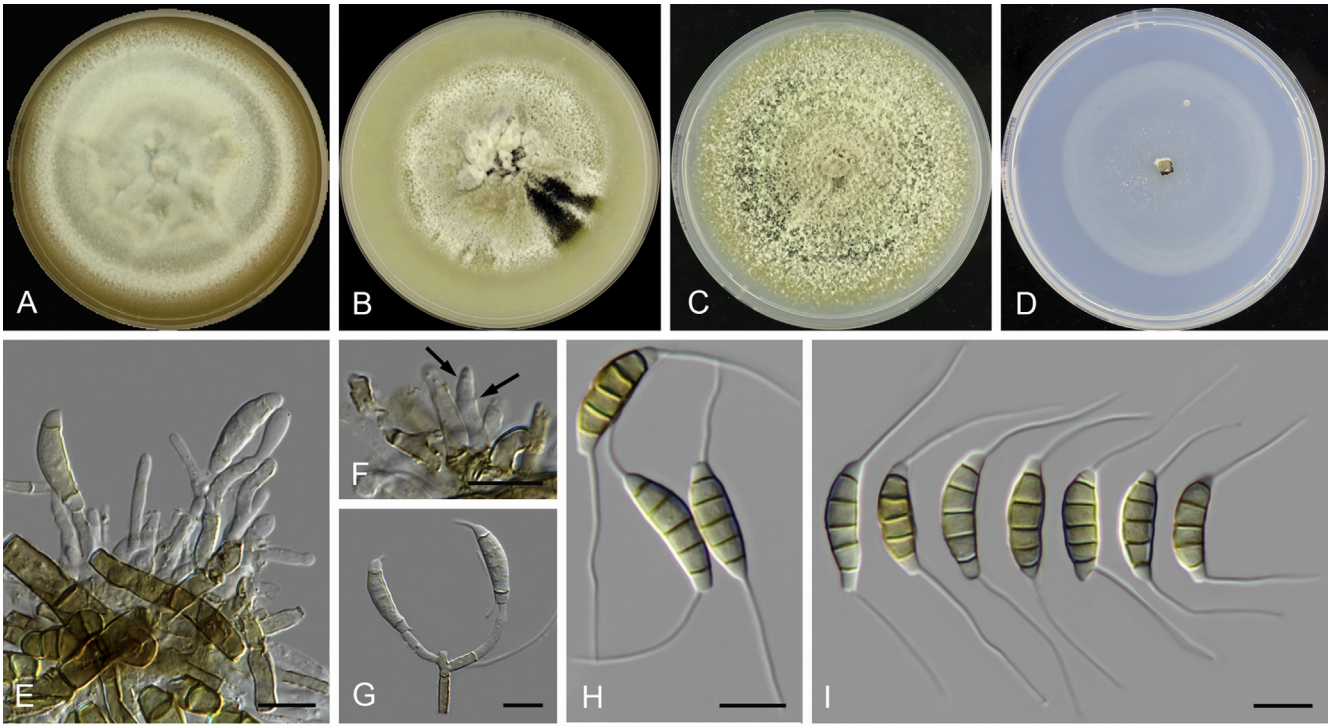

Fig. 61. *Sarcostroma diversiseptatum* (CBS 189.81). **A–D.** Colonies on MEA, CMA, PDA, and SNA, respectively. **E–G.** Conidiophores, conidiogenous cells and conidia (arrows point to the annellations). **H–I.** Conidia. Scale bars = 10 µm.

CBS 144139 = CPC 28307 = VPRI 15699; on *Correa reflexa* living leaf, 28 Jun. 1972, H.J. Swart (**holotype** CBS H-18006, ex-type culture CBS 189.81 = NBRC 32681).

Notes: Two strains of *Sar. diversiseptatum* formed a well-supported and distinct clade (Fig. 2), and are morphologically different from other *Sarcostroma* spp. by producing 5–6-septate conidia. This is the first report of *Sarcostroma* on *Correa reflexa.*

Sarcostroma grevilleae (Loos) M. Morelet, Ann. Soc. Sci. Nat. Arch. Toulon et du Var 37(4): 233. 1985. Fig. 62.
Basionym: *Amphichaeta grevilleae* Loos, Trans. Brit. Mycol. Soc. 33: 41. 1950.

Culture characteristics: Colonies on MEA convex or dome-shaped, with lobate edge, glaucous blue-green, primrose or rosy buff at different regions, reaching 37–39 mm diam after 14 d at 21 °C, conidiomata black, acervular, stromatic, gregarious, semi-immersed; on CMA flat with entire edge, olivaceous buff pigmented, reaching 51 mm diam after 14 d at 21 °C, conidiomata brown to black, acervular or stromatic, superficial, gregarious; on PDA flat, radially striate with lobate edge, white, rosy vinaceous, or black at different regions, reaching 34–41 mm diam after 14 d at 21 °C, conidiomata black, superficial or semi-immersed, acervular, stromatic, scattered; on SNA flat with entire edge, colourless, reaching 28–34 mm diam after 14 d at 21 °C, conidiomata black, scattered or gregarious, acervular, superficial or immersed.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, often reduced to conidiogenous cells, colourless, smooth, invested in mucus. *Conidiogenous cells* discrete or integrated, mostly cylindrical, subcylindrical, sometimes lageniform or ampulliform, 6.5–17 × 1–2.5 µm (av. = 11.5 ± 2.52 × 1.75 ± 0.3 µm), colourless, smooth. *Conidia* fusoid, straight or slightly curved, pale to mid-brown, mostly 4-septate, occasionally 5-septate, verruculose, not constricted, 17–22 × 4.5–7 µm (av. = 19.4 ± 1.27 × 5.6 ± 0.59 µm), bearing appendages; basal cell obconic with a broad truncate base, sometimes short cylindrical, hyaline, 1.5–4.5 µm (av. = 2.46 ± 0.53 µm) long; median cells 3, doliiform or cylindrical, fairly thick-walled and pale to mid-brown, ± equal, each 3–7 µm (av. = 4.75 ± 0.79 µm) long; apical cell short-conic with an acute apex, hyaline, 1.5–3.5 µm (av. = 2.79 ± 0.46 µm) long; apical appendage single, unbranched, attenuated, tubular, filiform, 22–42 µm (av. = 30.5 ± 4.23 µm) long; basal appendage single, unbranched, tubular, filiform, flexuous, excentric, (8–) 14–37 µm (av. = 30 ± 4.93 µm) long; mean conidium length/width ratio = 3.5:1.

Materials examined: **Australia**, New South Wales, Merimbula, on leaves of *Grevillea* sp. (*Proteaceae*), 28 Nov. 2016, P.W. Crous, CBS H-23289, living culture CBS 143418 = CPC 32307; Victoria, Parkville, on *Grevillea rosmarinifolia*, 2 Jul. 1970, H.J. Swart, **reference** living culture CBS 101.71 = ATCC 24744; Western Australia, on *Hakea laurina* (*Proteaceae*), 24 Sep. 2015, P.W. Crous, living culture CPC 28904; on *Hakea laurina*, 13 Jul. 2011, W. Gams, living culture CPC 19838.

Notes: The colonies of single-spore isolates of *Sar. grevilleae* contained two colour sections, one being olivaceous to black and the other white (Fig. 62A, C), which is congruent with the original description of the basionym *Amphichaeta grevilleae* (Loos 1950). In addition, numerous acervuli were formed on the surface of the colourful section, while the white area had abundant mycelia but remained sterile. Since none of our isolates was from the original location of isolation (Sri Lanka), strain CBS 101.71 from *Grevillea rosmarinifolia* from Australia is considered here as reference culture of *Sar. grevilleae*.

Sarcostroma leucospermi F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828391. Fig. 63.

Etymology: Refers to the host plant, *Leucospermum*.

Fig. 62. *Sarcostroma grevilleae* (CBS 101.71). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–M.** Conidiophores, conidiogenous cells and conidia. **N.** Mature and immature conidia. Scale bars = 10 µm.

Culture characteristics: Colonies on MEA flat with entire edge, yellow-green with white edge, sterile, reaching 85–87 mm diam after 14 d at 21 °C; on CMA flat with entire edge, glaucous to smoke grey, sterile, reaching 67–69 mm diam after 14 d at 21 °C; on PDA low convex with entire edge, glaucous, aerial mycelia flocculent, sterile, reaching 85–86 mm diam after 14 d at 21 °C; on SNA flat with entire edge, colourless, sterile, reaching 66–67 mm diam after 14 d at 21 °C.

Description (*on OA*): Sexual morph: unknown. Asexual morph: *Conidiomata* black, scattered, stromatic, covered by aerial mycelia. *Conidiophores* septate, branched, colourless, smooth, thin-walled. *Conidiogenous cells* mostly cylindrical, sometimes lageniform, discrete, 4.5–20.5 × 1.5–2.5 µm, colourless, smooth, with up to 3 annellations. *Conidia* fusoid, straight or sometimes slightly curved, 4(–5)-septate, wall smooth or undulate, 14–21.5 × 5–7.5 µm (av. = 18.3 ± 2.21 × 6.4 ± 0.67 µm), bearing

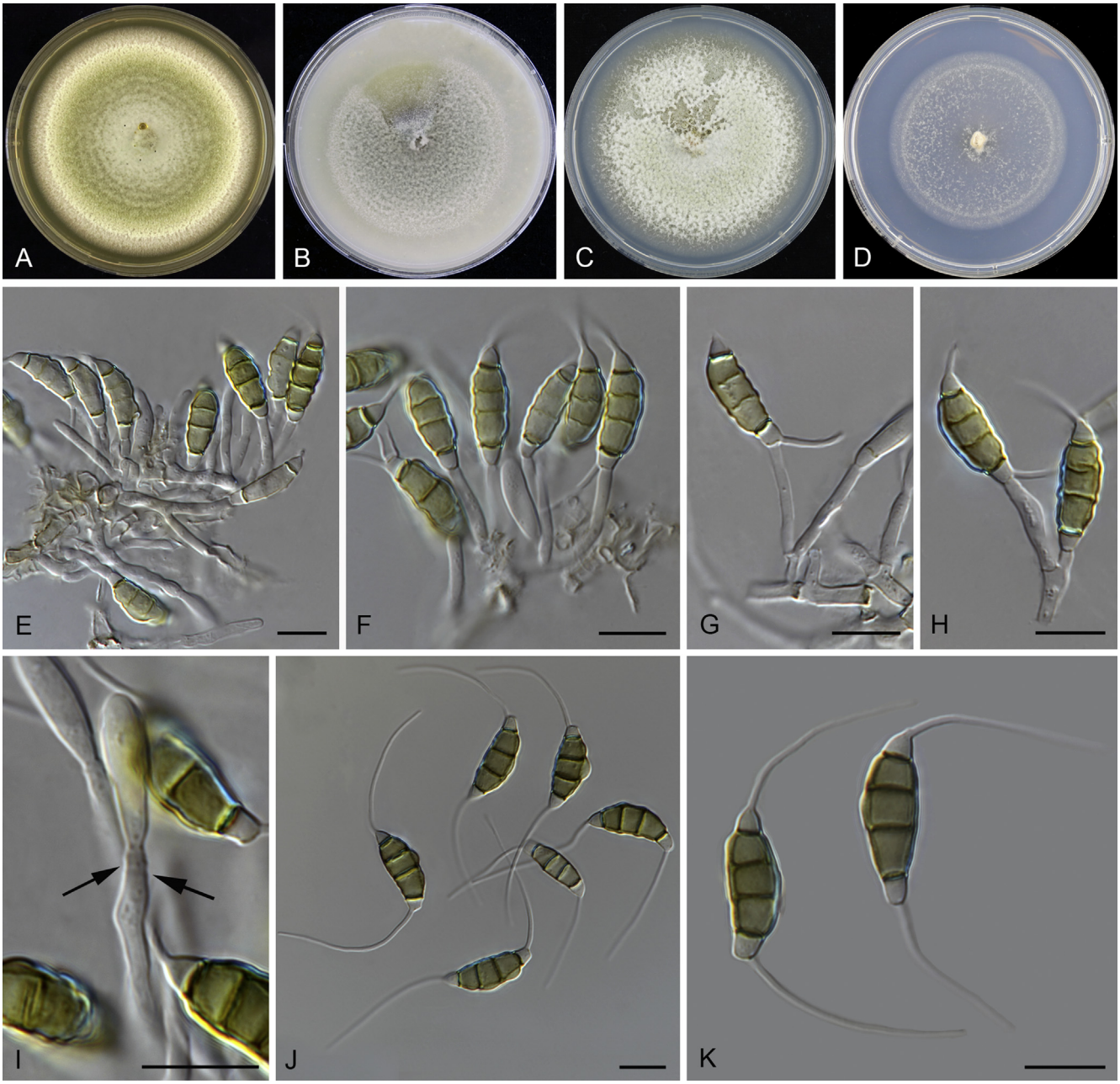

Fig. 63. *Sarcostroma leucospermi* (CBS 111290). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–I.** Conidiophores, conidiogenous cells and conidia (arrows point to annellations). **J–K.** Conidia. Scale bars = 10 µm.

appendages; basal cell obconic with a truncate base, cuneiform, occasionally short cylindrical, periclinal wall thin and colourless, 1.5–3.5 µm (av. = 2.6 ± 0.45 µm) long; median cells 3–4, fairly thick-walled, pale to mid-brown, doliiform or cylindrical, the second cell from base 4–6.5 µm (av. = 5.3 ± 0.62 µm) long, the other median cells ± equal, each 3–5 µm (av. = 4.2 ± 0.5 µm) long; apical cell conical, colourless, 1.5–3 µm (av. = 2.5 ± 0.39 µm) long; basal and apical appendage single, unbranched, attenuated, tubular, filiform, flexuous; apical appendage 18–36 µm (av. = 27.3 ± 4.1 µm) long; basal appendage excentric, 22–35 µm (av. = 16.9 ± 3.34 µm) long; mean conidium length/width ratio = 2.9:1.

Materials examined: **South Africa**, Western Cape Province, Porterville, on *Leucospermum* 'High Gold' (*Proteaceae*), 29 Aug. 1996, S. Denman (**holotype** CBS H-23547, ex-type culture CBS 111290 = CPC 1422); *ibid*., living culture CBS 111309 = CPC 1420.

Notes: Two strains representing *Sar. leucospermi* clustered in a well-supported clade closely related to *Sar. longiappendiculatum* (100 % sequence similarity in ITS, 99 % on *rpb2*, 99 % on *tef-1α* and 98 % on *tub2*) (Fig. 2), but they are morphologically different in conidial characters. The second cell from the base is relatively longer than other median cells in *Sar. leucospermi*, while the length of median cells in *Sar. longiappendiculatum* are ± equal. In addition, the mean conidium length/width ratio in *Sar. leucospermi* is much smaller than in *Sar. longiappendiculatum* (2.9:1 vs. 4.2:1).

Sarcostroma longiappendiculatum F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828392. Fig. 64.

Etymology: Refers to the long appendages observed in this species.

Culture characteristics: Colonies on MEA flat with entire edge, greenish glaucous to yellow-green, with white margin, reaching 75–76 mm diam after 14 d at 21 °C, conidiomata black, gregarious, semi-immersed, acervular; on CMA flat with entire edge, greenish glaucous, reaching 65 mm diam after 14 d at

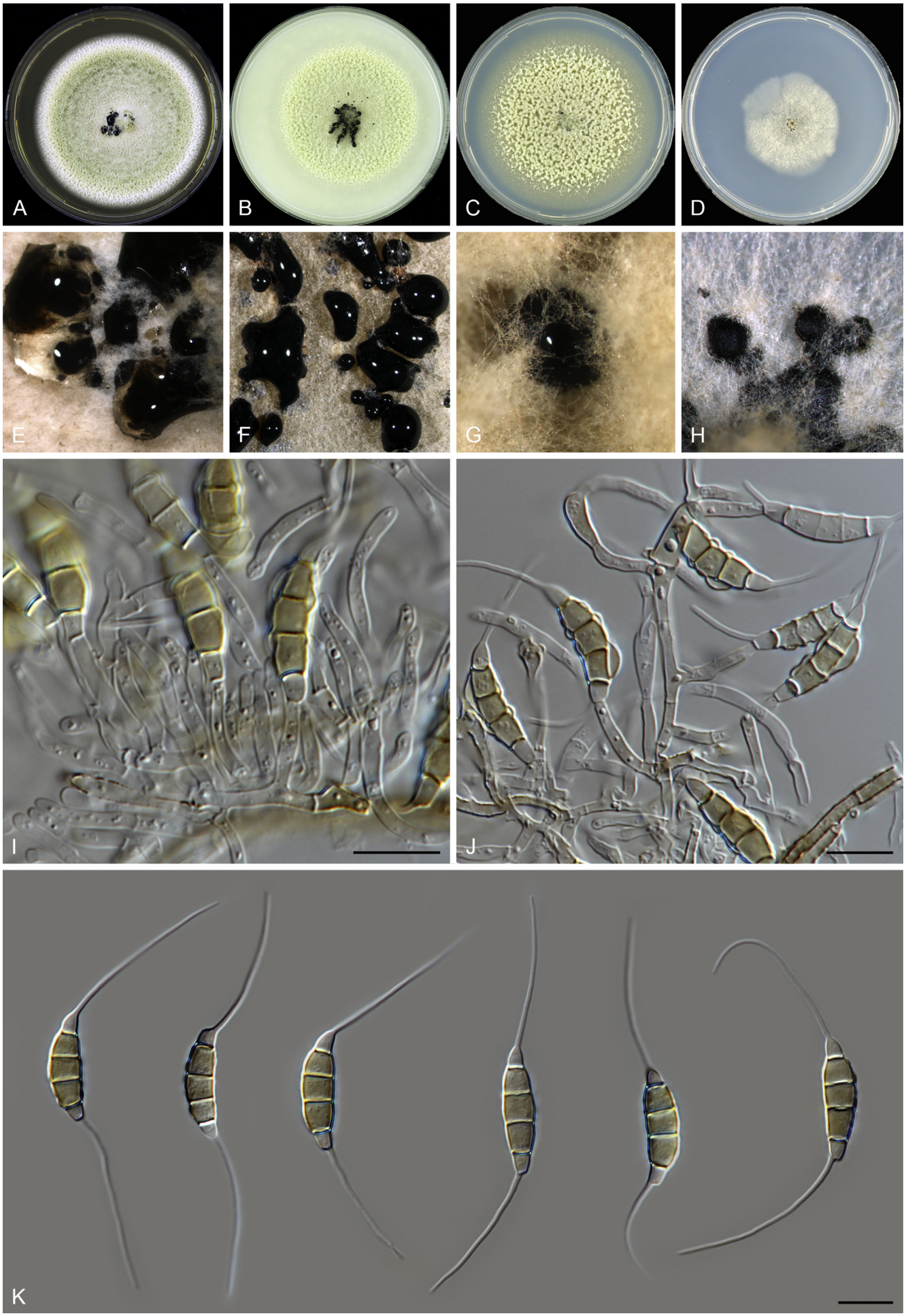

Fig. 64. *Sarcostroma longiappendiculatum* (CBS 143890/CPC 23411). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–J.** Conidiophores. **K.** Conidia. Scale bars = 10 µm.

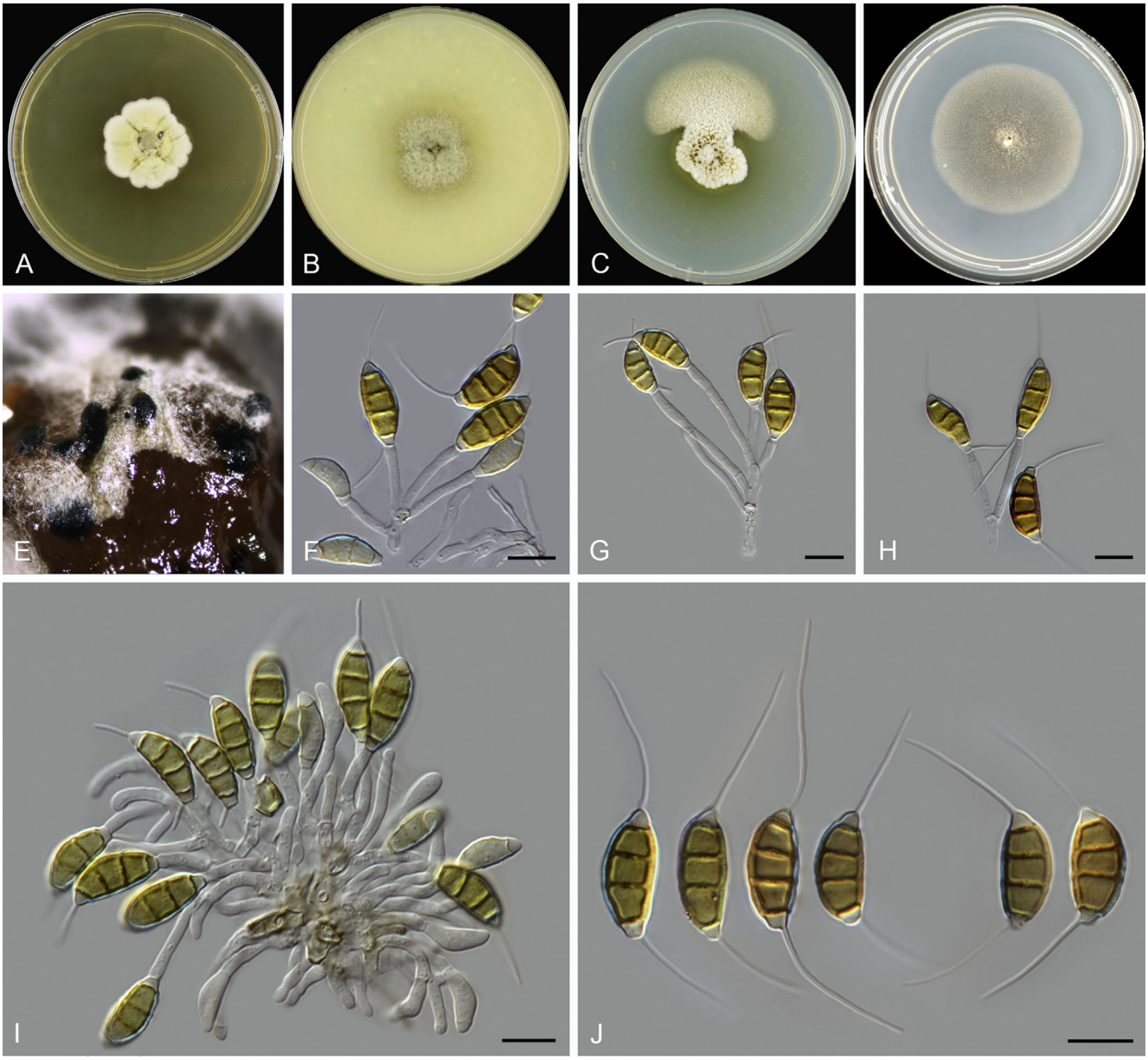

Fig. 65. *Sarcostroma paragrevilleae* (CBS 114142). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidiomata on OA. **F–I.** Conidiophores, conidiogenous cells and conidia. **J.** Conidia. Scale bars = 10 µm.

21 °C, conidiomata black, scattered or gregarious, acervular, superficial or gregarious; on PDA flat with entire edge, with flocculent aerial mycelia, greyish yellow-green, reaching 78–79 mm diam after 14 d at 21 °C, conidiomata black, scattered, acervular; on SNA flat with undulate edge, white, reaching 42–49 mm diam after 14 d at 21 °C, conidiomata black, gregarious, acervular.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, colourless, smooth, thin-walled, sometimes reduced to conidiogenous cells. *Conidiogenous cells* discrete or integrated, mostly cylindrical, subcylindrical, 7–13.5 × 1–2.5 µm (av. = 11 ± 1.64 × 1.7 ± 0.23 µm), colourless, smooth. *Conidia* lunate or fusoid, curved or occasionally straight, 4-septate, wall smooth or undulate, not constricted at the septa, 19–23.5 × 3–6.5 µm (av. = 21 ± 1.06 × 5 ± 0.7 µm), bearing appendages; basal cell obconic with a truncate base, colourless to pale brown, 2.5–4 µm (av. = 3.4 ± 0.32 µm) long; median cells 3, cylindrical or subcylindrical, thick-walled, mid-brown or yellowish brown, together 12.5–15.5 µm (av. = 13.8 ± 0.84 µm) long (each 3.5–5.5 µm (av. = 4.5 ± 0.41 µm)); apical cell conical, colourless or occasionally pale brown, 3–5 µm (av. = 3.8 ± 0.42 µm) long; apical appendage single, filiform, unbranched, attenuated, 25–35 µm (av. = 30 ± 2.15 µm) long; basal appendage single, unbranched, filiform, excentric, 21–37 µm (av. = 28.7 ± 3.45 µm) long; mean conidium length/width ratio = 4.2:1.

Materials examined: **France**, Nice Botanical Garden, on *Babiana dregei* (*Iridaceae*), 24 Jul. 2013, P.W. Crous (**holotype** CBS H-23513, ex-type culture CBS 143890 = CPC 23411). **South Africa**, Western Cape Province, Porterville, on *Leucospermum* 'High Gold' (*Proteaceae*), 29 Aug. 1996, S. Denman, living culture CBS 111308 = CPC 1421 = STE-U 1421.

Notes: This is the first report of *Sarcostroma* on *Babiana dregei.* See notes under *Sar. leucospermi*.

Sarcostroma paragrevilleae F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828393. Fig. 65.

Etymology: Named after its close phylogenetic relationship to *Sarcostroma grevilleae*.

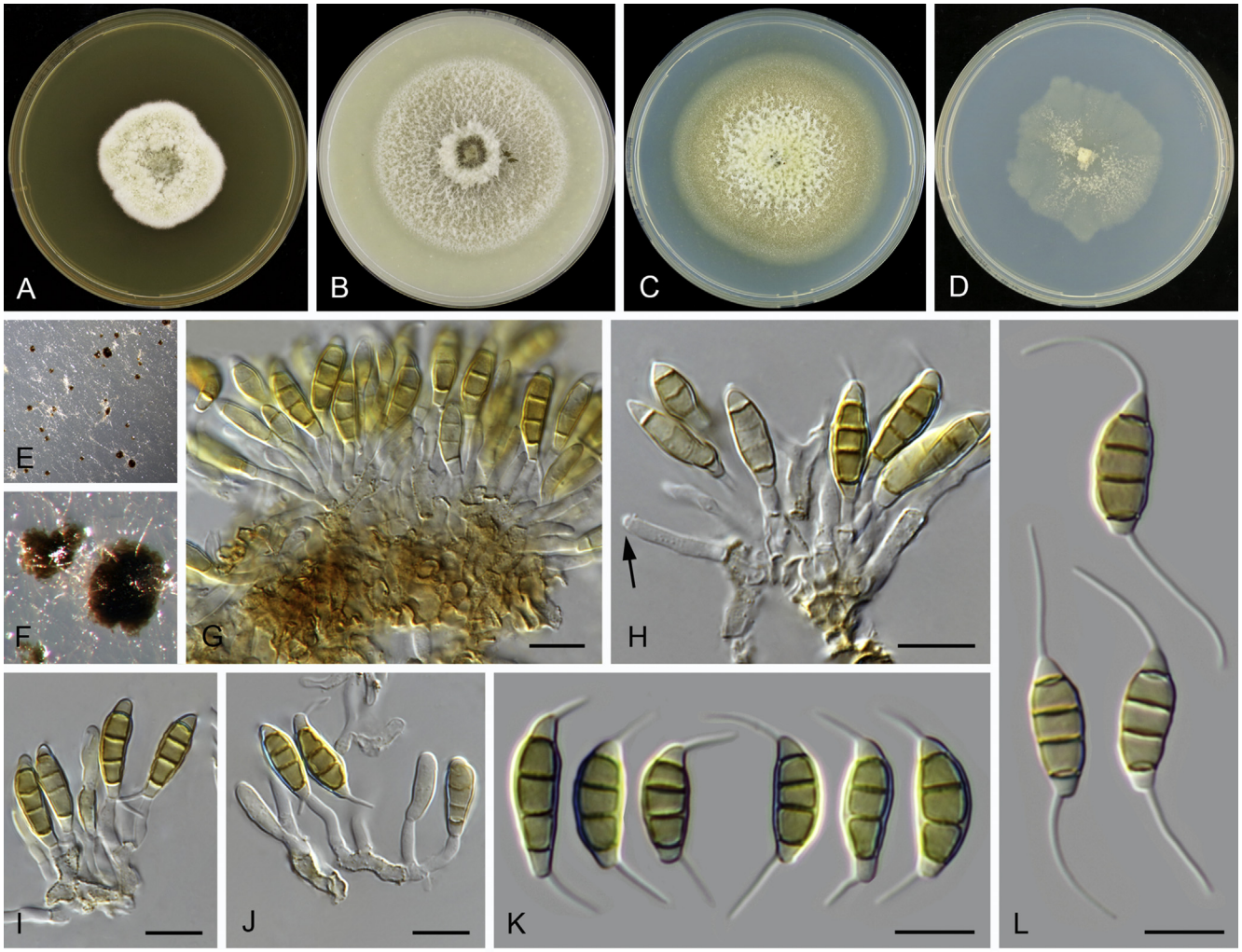

Fig. 66. *Sarcostroma proteae* (CBS 113610). **A-D.** Colonies on MEA, CMA, PDA, OA respectively. **E–F.** Conidiomata on SNA. **G–J.** Conidiophores, conidiogenous cells and conidia (arrow points to the annellation). **K.** Conidia on OA. **L.** Conidia on SNA. Scale bars = 10 µm.

Culture characteristics: Colonies on MEA radially striate with lobate edge, white to olivaceous buff, reaching 32 mm diam after 14 d at 21 °C; on CMA flat with entire edge, white, reaching 38 mm diam after 14 d at 21 °C; on PDA flat with irregular edge, white, with olivaceous buff pigmentation, reaching 26–45 mm diam after 14 d at 21 °C; on SNA flat with entire edge, colourless, reaching 37–39 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: Sterile on MEA, PDA and SNA. On CMA, *conidiomata* only observed around the inoculation point, black, discrete, acervular, stromatic, erumpent. *Conidiophores* septate, irregularly branched, colourless, smooth, thin-walled. *Conidiogenous cells* discrete or integrated, mostly cylindrical, variable in size, 10–40 × 1.5–2.5 µm (av. = 25.5 ± 7.9 × 1.8 ± 0.24 µm), colourless, smooth. *Conidia* fusoid, oval, mostly slightly curved, 4-septate, wall smooth or verruculose, 14.5–21 × 7–8.5 µm (av. = 18.1 ± 1.48 × 7.9 ± 0.44 µm), bearing appendages; basal cell obconic with a narrow or broad truncate base, colourless, 1.5–2.5 µm (av. = 1.9 ± 0.32 µm) long; median cells 3, fairly thick-walled, yellowish brown or mid-brown, doliiform, ± equal, each 3.5–6 µm (av. = 4.7 ± 0.79 µm) long; apical cell short-conic with an acute apex, colourless, 1.5–3 µm (av. = 2.3 ± 0.28 µm) long; basal and apical appendages single, unbranched, attenuated, tubular, filiform, flexuous; apical appendage variable in size, 8–31 µm (av. = 17.6 ± 5.54 µm) long; basal appendage excentric, (5.5–)9–27 µm (av. = 17.6 ± 4.3 µm) long; mean conidium length/width ratio = 2.3:1.

Materials examined: **Australia**, New South Wales, Mangrove Mountain, on *Grevillea* sp. (*Proteaceae*), 12 Oct. 1999, P.W. Crous, living culture CBS 111981 = CPC 2937; on *Grevillea* sp., 12 Oct. 1999, P.W. Crous, living culture CBS 114143 = CPC 2938; Mount Tomah, on *Grevillea* sp., 12 Oct. 1999, P.W. Crous (**holotype** CBS H-23550, ex-type culture CBS 114142 = CPC 2948 = JT 878 = STE-U 2948); Victoria, unknown host, 13 Dec. 1988, unknown collector, living culture CPC 28310; Victoria, Mount Waverley, on *Grevillea rosmarinifolia*, 29 Jun. 1976, unknown collector, living culture CPC 28309; Victoria, Melbourne, Royal Botanical Gardens Melbourne, on leaves of *Grevillea steiglitziana*, 2 Dec. 2016, P.W. Crous, living culture CBS 143416 = CPC 32360; on *Grevillea aquifolia*, 18 Oct. 2009, P.W. Crous, living culture CPC 17628; Western Australia, on *Grevillea* sp., 29 Sep. 2015, P.W. Crous, HPC 756, living culture CPC 29056; on *Banksia* (*Proteaceae*), 23 Sep. 2015, P.W. Crous, living culture CPC 28900. **New Zealand**, Waitakere, on *Grevillea robusta* var. *forsteri* leaf, Feb. 1974, H.J. Boesewinkel, living culture CBS 165.77 = IMI 211586.

Notes: Several strains of *Sar. paragrevilleae* formed a sister clade to *Sar. grevilleae* (Fig. 2), another species from *Grevillea* (99 % sequence similarity in ITS, 94 % on *tef-1α* and 98 % on *tub2*). However, they can be morphologically distinguished from each other by the difference in mean conidium length/width ratio (2.3:1 vs. 3.5:1).

Sarcostroma proteae F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828394. Fig. 66.

Etymology: Refers to the host plant, *Protea magnifica*.

Culture characteristics: Colonies on MEA flat with entire edge, white to grey, with flocculent aerial mycelia, reaching 40 mm diam after 14 d at 21 °C; on CMA flat with entire edge, white, aerial mycelia sparse, with flocculent mycelia around the inoculation point, reaching 61–63 mm diam after 14 d at 21 °C; on PDA low convex with entire edge, with flocculent aerial mycelia, rosy buff, reaching 67–68 mm diam after 14 d at 21 °C; on SNA hyaline, flat with undulate edge, reaching 48–49 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: Sterile on MEA, CMA and PDA. On SNA, *conidiomata* brown to black, scattered or gregarious, acervular, erumpent, globose or irregular. *Conidiophores* septate, irregularly branched at the base, colourless, smooth, thin-walled, often reduced into conidiogenous cells. *Conidiogenous cells* discrete, mostly cylindrical, sometimes ampulliform or lageniform, 5.5–15.5 × 1.5–2.5 µm (av. = 10.7 ± 2.88 × 2 ± 0.24 µm), colourless, smooth, with up to two annellations. *Conidia* fusoid, straight or slightly curved, 4-septate, wall smooth or verruculose, not constricted or slightly constricted at the septa, 13–20.5 × 4–6.5 µm (av. = 16.2 ± 1.48 × 5.5 ± 0.68 µm), bearing appendages; basal cell obconic with a narrow truncate base, periclinal wall relatively thinner than median cells, colourless, 1.5–3.5 µm (av. = 2.5 ± 0.4 µm) long; median cells 3, fairly thick-walled, yellowish-brown, doliiform or cylindrical, ± equal, each 3–5.5 µm (av. = 4 ± 0.52 µm) long; apical cell short-conic with an acute apex, colourless, 2.5–4 µm (av. = 3.1 ± 0.33 µm) long; basal and apical appendage single, unbranched, attenuated, tubular, flexuous; apical appendage 8–24 µm (av. = 17.5 ± 3.62 µm) long; basal appendage excentric, 10–24 µm (av. = 18.4 ± 3.38 µm) long; mean conidium length/width ratio = 2.9:1.

Materials examined: **Australia**, New South Wales, Mount Tomah, on *Protea magnifica* (*Proteaceae*), Aug. 1999, P.W. Crous, living culture CBS 114189 = CPC 2983; on *Protea magnifica*, Aug. 1999, P.W. Crous, living culture CBS 112001 = CPC 2981; New South Wales, Mount Tomah, on *Protea magnifica*, 12 Oct. 1999, P.W. Crous (**holotype** CBS H-23549, ex-type culture CBS 113610 = CPC 3035); New South Wales, Mount Tomah, on *Protea lorifolia*, 12 Oct. 1999, P.W. Crous, living culture CBS 113605 = CPC 3032 = JT 942.

Notes: Four strains representing *Sar. proteae* formed a well-supported clade closely related to *Sar. africanum* (Fig. 2). They are morphologically similar but only share 98 % sequence similarity on *rpb2*, 96 % on *tef-1α* and 98 % on *tub2*. *Sarcostroma proteae* is so far only known from *Protea* in Australia.

Sarcostroma restionis S.J. Lee & Crous, Stud. Mycol. 55: 182. 2006.

Description: See Lee *et al.* (2006).

Materials examined: **Australia,** Western Australia, on *Acacia glaucoptera* (*Fabaceae*), 18 Sep. 2015, P.W. Crous, HPC 727, living culture CPC 29466. **New Zealand**, on unknown host, 12 Aug. 1996, M.E. Palm, living culture CBS 111311 = CPC 1472 = STE-U 1472. **South Africa**, Western Cape Province, Stellenbosch, Jonkershoek Nature Reserve, on *Ischyrolepis* cf. *sieberi* (*Restionaceae*) dead culm, 15 Jun. 2001, S. Lee, living culture CBS 118153 = CMW 17984 = CPC 16911; on leaf litter of *Protea acaulis* (*Proteaceae*), 14 Aug. 2000, unknown collector, living culture CBS 122695 = CMW 22214; Kogelberg Nature Reserve, leaf litter of *Leucospermum conocarpodendron* subsp. *viridium* (*Proteaceae*), 11 Jul. 2000, S. Marincowitz, living culture CBS 121418 = CMW 22195; on *Restio filiformis* (*Restionaceae*), 15 Jan. 2001, S. Lee (**holotype** PREM 58865, ex-type living culture CBS 118154 = CMW 17971 = CPC 16904); Riversdal, Kanetberg Flora, on *Leucospermum*, 27 Aug. 1999, collected by USA quarantine staff, living culture CBS 111936 = CPC 2835 = STE-U 2835; *ibid*., living culture CBS 114130 = CPC 2833 = STE-U 2833; *ibid*., living culture CBS 111935 = CPC 2834 = STE-U 2834; *ibid*., living culture CBS 114017 = CPC 2832 = STE-U 2832. **UK**, England, Cumbria, Roudsea Wood Nature Reserve, on *Pteridium aquilinum* (*Dennstaedtiaceae*) dead petiole, unknown collection date, isolated by J.C. Frankland, reference strain of *Cryptostictis hakeae* CBS 282.65 = NBRC 32678 = IMI 096703.

Notes: *Cryptostictis hakeae* (current name: *Sar. hakeae*, Nag Raj 1993) was originally reported from *Hakea* in Australia, and its reference strain clustered together with *Sar. restionis.* As no isolate from *Hakea* was obtained for epitypification and taxonomic determination of *Sar. hakeae* in this study, we retain the name *Sar. restionis* for this species.

Seimatosporium Corda, in Sturm, Deutschl. Fl., 3 Abt. (Pilze Deutschl.) 3(13): 79. 1833, **emend.** F. Liu, L. Cai & Crous.
Synonym: *Diploceras* (Sacc.) Died., Mykol. Untersuch. Ber.: 342. 1915.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* acervular, pycnidioid, stromatic, semi-immersed to erumpent, glabrous, brown to black, dehiscing by a break in the overlaying host tissues; basal stroma of *textura angularis*. *Conidiophores* arising from the upper layer of cells of the basal stroma or lining the base and sides of the conidioma, septate and branched, colourless, smooth. *Conidiogenous cells* discrete or integrated, subcylindrical, cylindrical, ampulliform or lageniform, annellidic, colourless or almost colourless to pale brown, thin-walled, smooth. *Conidia* fusoid, ellipsoid, ovoid, clavate, euseptate, wall smooth, sometimes constricted at the septa; basal cell obconic with a truncate base, smooth, colourless; median cells pale brown to brown, concolourless; apical cell without apical appendage pale brown and concolourous with the median cells, but apical cell with an appendage paler or almost colourless; conidia with basal appendage only, or with no appendages, or with appendages at both ends, filiform, flexuous, attenuated; apical appendage (when present) single, unbranched; basal appendage single, branched or unbranched, excentric (emended from Nag Raj 1993).

Type species: *Seimatosporium rosae* Corda.

Seimatosporium germanicum F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828395. Fig. 67.

Etymology: Referring to the country where it was collected, Germany.

Culture characteristics: Colonies on MEA flat with entire edge, luteous, reaching 54–55 mm diam after 14 d at 21 °C, conidiomata black, acervular, confluent, superficial; on CMA flat with entire edge, uneven saffron to luteous pigment, reaching 48–51 mm diam after 14 d at 21 °C, conidiomata brown or black, acervular, scattered or confluent, radially arranged, superficial or immersed; on PDA flat with entire edge, saffron, reaching 54–55 mm diam after 14 d at 21 °C, conidiomata black, acervular, scattered or gregarious, superficial; on SNA hyaline, reaching 60–63 mm diam after 14 d at 21 °C, conidiomata brown, smoke brown, acervular, scattered or gregarious, superficial or immersed, radially arranged.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, irregularly branched, colourless to pale brown, smooth. *Conidiogenous cells* discrete or integrated, mostly cylindrical, sometimes ampulliform, 8.5–16 × 1–2.5 µm (av. = 1.2 ± 2.2 × 1.6 ± 0.31 µm), colourless or pale brown, smooth, with up to two annellations. *Conidia* falcate, or straight

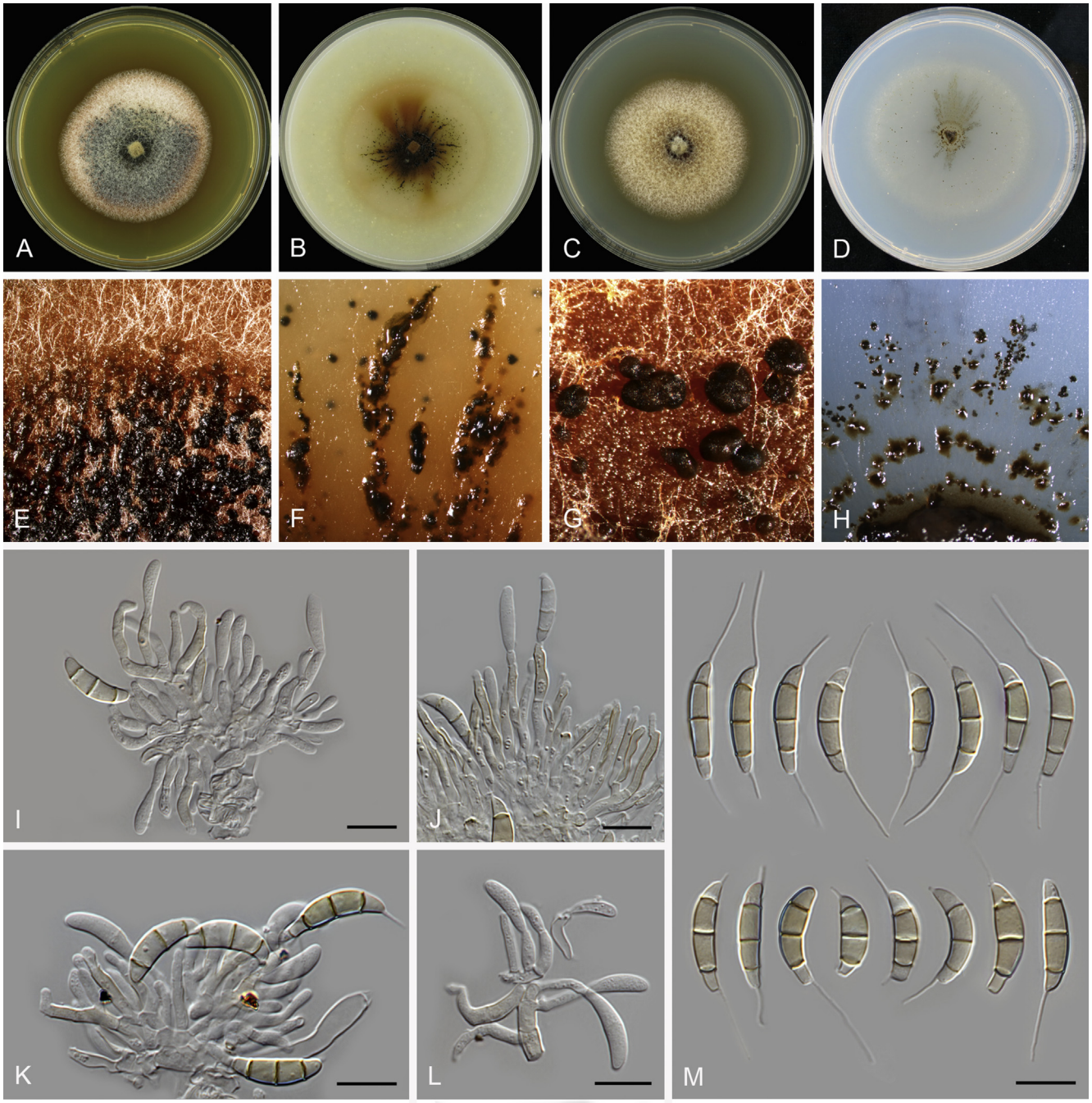

Fig. 67. *Seimatosporium germanicum* (CBS 437.87). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–L.** Conidiophores, conidiogenous cells and conidia. **M.** Conidia with one or two appendages. Scale bars = 10 µm.

with curve at apical cell, 3-septate, wall smooth, 15.5–21.5 × 3–4.5 µm (av. = 18.6 ± 1.42 × 3.6 ± 0.4 µm), bearing appendages; basal cell obconic with a truncate base, or subcylindrical, hyaline, 2.5–4 µm (av. = 3.2 ± 0.42 µm) long; median cells 2, fairly thick-walled and pale brown, cylindrical, ± equal, each 4–8 µm (av. = 5.6 ± 0.71 µm) long; apical cell conic with an acute apex, hyaline, 1.5–5.5 µm (av. = 3.6 ± 0.88 µm) long; apical appendage lacking or, when present, tubular, filiform, single, unbranched, attenuated, 2–16 µm (av. = 9.6 ± 3.62 µm) long; basal appendage lacking or, when present, single, tubular, filiform, unbranched, attenuated, excentric, 1.5–14 µm (av. = 8.7 ± 4.05 µm) long; mean conidium length/width ratio = 5.2:1.

Material examined: **Germany**, Frankfurt, unknown host, collection date and collector, deposited by J. Wink in CBS culture collection (**holotype** CBS H-17989, ex-type culture CBS 437.87).

Notes: *Seimatosporium germanicum* is closely related to *Sei. pistaciae* and *Sei. rosae* (Fig. 2, 99 % sequence similarity on ITS and *rpb2*, 93 % on *tef-1α*, and 99 % on *tub2*), but differs from both species in mean conidium length/width ratio (5.2:1 vs. 4.4:1 and 3:1).

Seimatosporium pistaciae Crous & Mirab., Persoonia 33: 249. 2014. Fig. 68.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* pycnidioid, separate to gregarious, becoming erumpent, oval to elongate, up to 150 µm diam. *Conidiophores* arising from a central stroma, hyaline, 3–4-septate, branched, subcylindrical, 20–45 × 3–4 µm. *Conidiogenous cells* terminal and intercalary, hyaline, smooth, subcylindrical, straight to somewhat curved, 10–15 × 2–2.5 µm, proliferating inconspicuously percurrently at apex. *Conidia* ellipsoid to fusoid, cylindrical, straight or slightly curved, mostly 3-septate, occasionally 5–6-septate, smooth, not

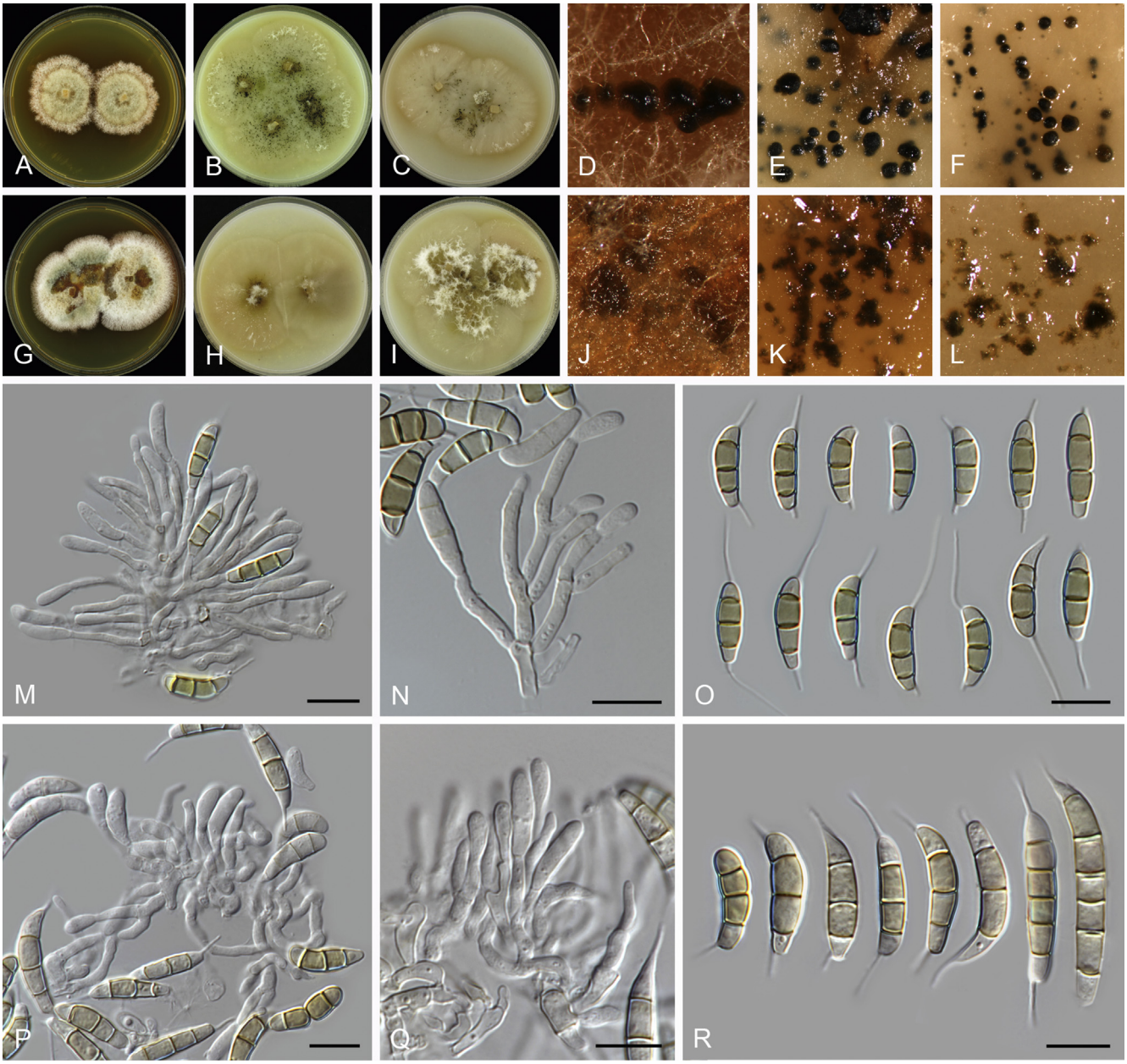

Fig. 68. *Seimatosporium rosae* (A–F, M–O. ex-epitype CBS 139823) and *Sei. pistaciae* (G–L, P–R. ex-holotype CBS 138865). **A, G.** Colonies on MEA. **B, H.** Colonies on CMA. **C, I.** Colonies on PDA. **D–F, J–L.** Conidiomata on MEA, CMA and PDA, respectively. **M, N, P, Q.** Conidiophores. **O, R.** Conidia. Scale bars = 10 µm.

constricted at septa, median cells medium brown, basal and apical cell colourless to pale brown, granular, 14–23 × 3.5–5 µm (av. = 18.6 ± 1.1 × 4.2 ± 0.3 µm), apical cell obtusely rounded or conical with an acute apex; apical appendage, when present, single, unbranched, tubular, filiform, flexuous, 5–14 µm; basal appendage single, unbranched, tubular, filiform, flexuous, excentric, 5–20 µm; mean conidium length/width ratio = 4.4:1 (emended from Crous *et al.* 2014b).

Materials examined: **Iran**, Saveh, on buds of *Pistacia vera* (*Anacardiaceae*), 29 Apr. 2014, M. Mirabolfathy (**holotype** CBS H-21997, ex-type culture CBS 138865 = CPC 24455); *ibid*., living culture CPC 24457.

Note: See notes under *Sei. rosae.*

Seimatosporium rosae Corda, in Sturm, Deutschl. Fl., 3 Abt. (Pilze Deutschl.) 3(13): 79. 1833. Fig. 68.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* acervular, semi-immersed or immersed, glabrous, brown to black; wall cells of *textura angularis*. *Conidiophores* arising from the upper cells of the basal and lateral tissue, septate and branched, colourless, thin-walled, smooth. *Conidiogenous cells* cylindrical or subcylindrical, colourless, thin-walled, smooth, formed from the inner most layer of pycnidium wall. *Conidia* 10–16 × 3–4.5 µm (av. = 13.8 ± 0.8 × 4 ± 0.3 µm), fusoid, reniform, straight or slightly curved, 3-septate; basal cell obconic, thin-walled, colourless, 2–3 µm long (av. = 2.4 ± 0.33 µm); median cells doliiform to cylindrical, not constricted at septa, brown, concolourous, septa darker than the rest of the cell, ± equal, each 3–5.5 µm (av. = 4.5 ± 0.46 µm) long; apical cell colourless or almost colourless, conical, 2–3.5 µm long (av. = 2.6 ± 0.44 µm); appendages tubular, filiform, variable in size; apical appendage single, arising from the apex of the apical cell, 1.5–15 µm long (av. = 6.9 ± 4.89µm); basal appendage single, 1–14.5 µm long (av. = 4.8 ± 4.54 µm); mean conidium length/width ratio = 3.45.

Material examined: **Russia**, Rostov region, Krasnosulinsky district, Donskoye forestry, on dying and dead branches of *Rosa kalmiussica* (*Rosaceae*), 21 May 2014, T. Bulgakov T.056 (**epitype** MFLU 14-0771, ex-epitype culture CBS 139823 = MFLUCC 14–0621).

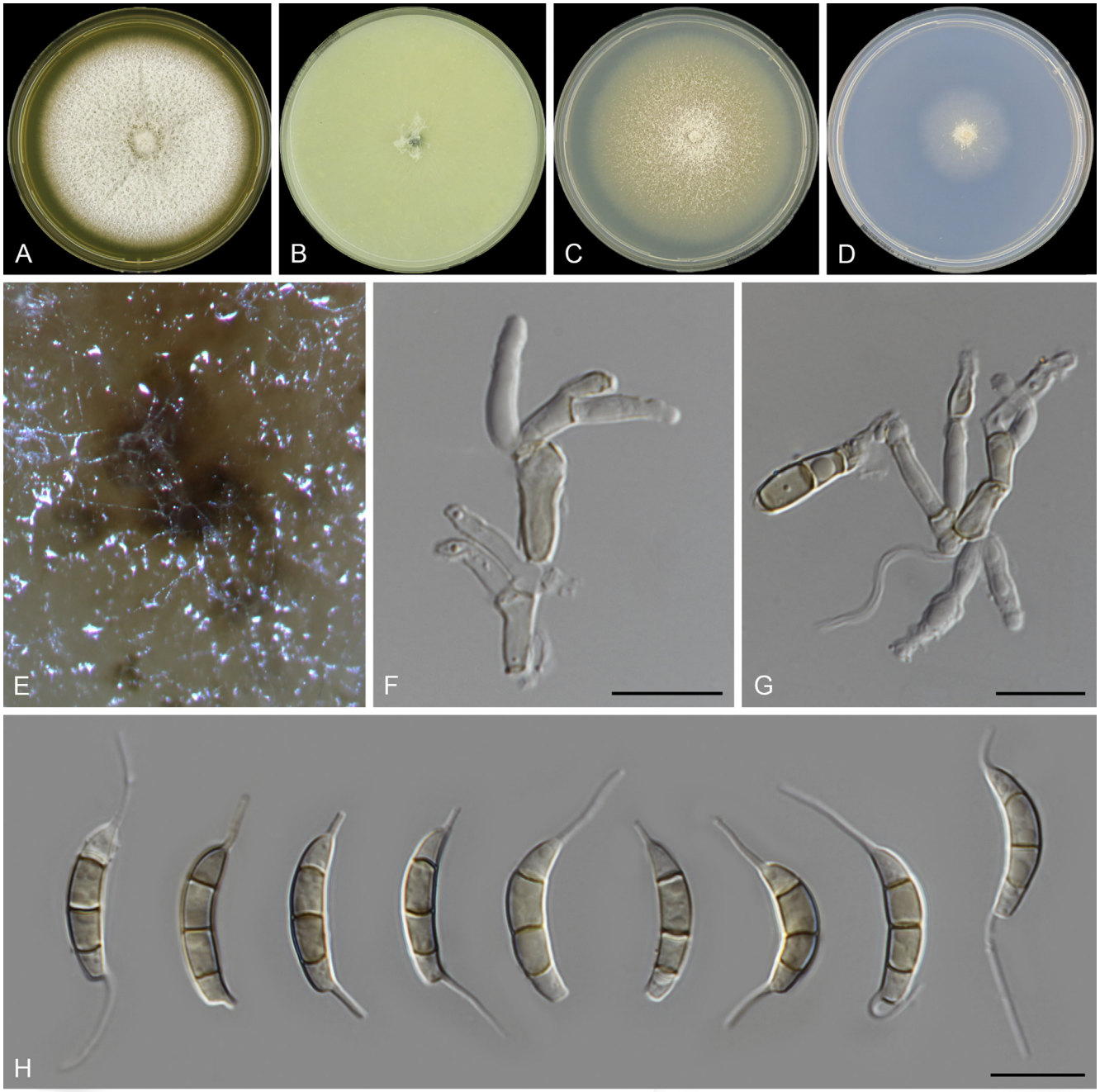

Fig. 69. *Seimatosporium soli* (CBS 941.69). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidiomata on OA. **F–G.** Conidiogenous cells. **H.** Conidia. Scale bars = 10 µm.

Notes: The generic type species *Seimatosporium rosae* (Corda 1833) was recently epitypified by Norphanphoun *et al.* (2015). It shows surprisingly high sequence similarities with *Sei. pistaciae* (Fig. 2, 100 % on ITS and *rpb2*, 99 % on *tef-1α* and *tub2*), but differs from the latter in the morphology of its conidiomata and conidia. The conidiomata of *Sei. rosae* on artificial media (MEA, CMA, PDA) are acervular, scattered, semi-immersed or immersed, while *Sei. pistaciae* usually produces conidial masses rather than acervulous conidiomata, confluent, mostly immersed (Fig. 68). *Seimatosporium rosae* further produces smaller conidia than *Sei. pistaciae* (10–16 × 3–4.5 µm vs. 14–23 × 3.5–5 µm) and different numbers of septa (3-septate vs. 3–6-septate).

Seimatosporium soli F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828396. Fig. 69.

Etymology: Named after the substrate of this fungus, soil.

Culture characteristics: Colonies on MEA flat with entire edge, pale grey, with few radial circular lines from the centre, sterile, reaching 75–76 mm diam after 14 d at 21 °C; on CMA flat with entire edge, colourless, sterile, reaching > 90 mm diam after 14 d at 21 °C; on PDA flat with entire edge, buff, sterile, reaching 78 mm diam after 14 d at 21 °C; on SNA flat with entire edge, colourless, sterile, reaching 35–36 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* branched, reduced to conidiogenous cells, colourless, smooth. *Conidiogenous cells* discrete, mostly cylindrical or subcylindrical, 4.5–12 × 1.5–2.5 µm (av. = 8.5 ± 1.9 × 2.2 ± 0.31 µm), colourless, smooth. *Conidia* fusoid, curved, 3-septate, wall smooth, 13.5–18 × 2.5–4 µm (av. = 16.4 ±

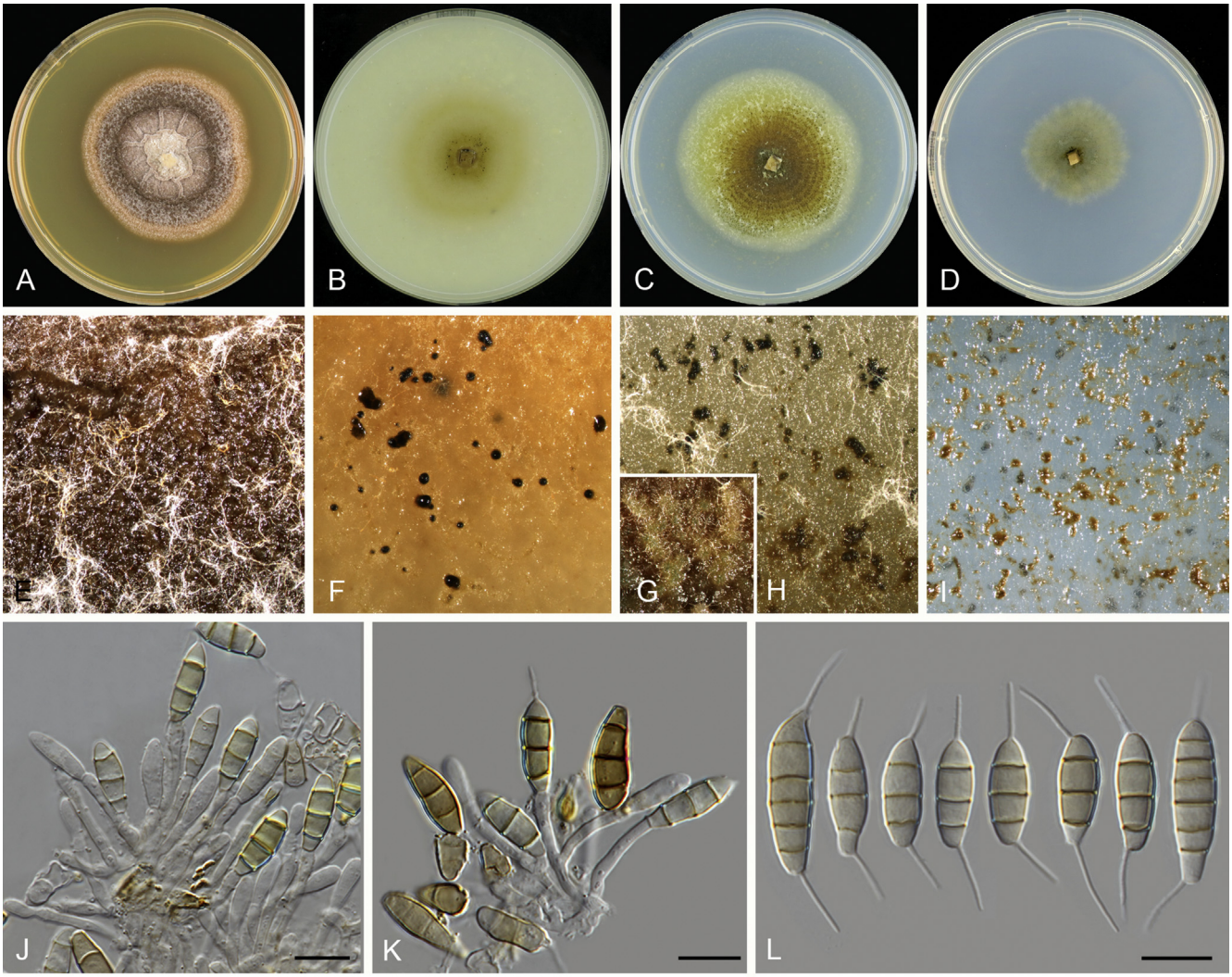

Fig. 70. *Seimatosporium vitis-viniferae* (CBS 123004). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E, F, I.** Conidiomata on MEA, CMA and SNA, respectively. **G–H.** Conidiomata on PDA (G. near the inoculation, H. near the edge). **J–K.** Conidiogenous cells and conidia. **L.** Conidia. Scale bars = 10 µm.

1.23 × 3.3 ± 0.33 µm), bearing appendages; basal cell trapezoid, subcylindrical, thin-walled, hyaline to pale brown, 2–3.5 µm (av. = 3 ± 0.39 µm) long; median cells 2, cylindrical, thick-walled, pale to mid-brown, ± equal, each 3.5–6 µm (av. = 4.7 ± 0.67 µm) long; apical cell conic with an acute apex, thin-walled, hyaline to pale brown, 2.5–4.5 µm (av. = 3.7 ± 0.43 µm) long; apical appendage single, attenuated, tubular, unbranched, hyaline, occasionally pale brown, 2–11(–15) µm (av. = 5.9 ± 2.85 µm) long; basal appendage lacking or, when present, attenuated, tubular, single, unbranched, excentric, (1–)3–11.5 µm (av. = 6 ± 2.4 µm) long; mean conidium length/width ratio = 5:1.

Material examined: **Denmark**, Jutland, from forest soil under *Fagus sylvatica* (*Fagaceae*), unknown collection date, L. Holm (**holotype** CBS H-23545, ex-type culture CBS 941.69).

Notes: The ex-type culture of *Sei. soli* (CBS 941.69) is sterile on MEA, CMA, PDA, OA and SNA, and only a few conidiogenous cells and conidia were observed from the agar that was directly taken from −80 °C. *Seimatosporium soli* is closely related to *Sei. vitis-viniferae* (89 % sequence similarity on ITS, 90 % on *rpb2*, 81 % on *tef-1α*) and *Sei. physocarpi* (89 % sequence similarity on ITS, 90 % *rpb2*, 77 % on *tef-1α*) (Fig. 2), but morphologically differs from both species in the shape of conidia (curved vs. straight to slightly curved) and the mean conidium length/width ratio (5:1 vs. 3.2:1). In addition, the basal appendages of *Sei. soli* are generally shorter than those of *Sei. physocarpi* (3–11.5 µm vs. 12–14 µm).

Seimatosporium vitis-viniferae F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828397. Fig. 70.

Etymology: Name reflects the host plant it was isolated from, *Vitis vinifera*.

Culture characteristics: Colonies on MEA flat with entire edge, olivaceous to purplish grey, reaching 55–56 mm diam after 14 d at 21 °C, conidiomata brown, confluent, immersed; on CMA flat with entire edge, white to pale yellow, reaching 45–46 mm diam after 14 d at 21 °C, conidiomata black, acervular, scattered, superficial or immersed; on PDA flat with entire edge, yellowish brown to mid-brown, reaching 57–60 mm diam after 14 d at 21 °C, conidiomata glaucous grey, mid-brown or black, acervular, scattered or gregarious, superficial; on SNA pale grey, reaching 34 mm diam after 14 d at 21 °C, conidial masses yellowish brown, acervular, scattered or gregarious, superficial or immersed.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, irregularly branched, sometimes reduced to conidiogenous cells, colourless, smooth. *Conidiogenous cells* discrete or integrated, mostly cylindrical, variable in size,

4.5–25 × 2–3 µm, colourless, smooth, with up to two annellations. *Conidia* cymbiform, fusoid, straight, 3(–6)-septate, wall smooth, 13.5–26 × 4.5–6 µm (av. = 16.5 ± 2.63 × 5.2 ± 0.37 µm), bearing appendages; basal cell obconic with a truncate base, subcylindrical, colourless or similar to that of median cells, 2.5–4 µm (av. = 3 ± 0.45 µm) long; median cells 2(–4), fairly thick-walled and pale brown to yellowish brown, ± equal, each 3.5–5.5 µm (av. = 4.5 ± 0.51 µm) long; apical cell obtuse or conical, colourless, sometimes similar to that of median cells, 1.5–4.5 µm (av. = 3.2 ± 0.69 µm) long; apical appendage lacking or, when present, single, unbranched, attenuated, 4–11 µm (av. = 7 ± 1.64 µm) long; basal appendage single, unbranched, excentric, 4–10 µm (av. = 7.9 ± 1.58 µm) long; mean conidium length/width ratio = 3.2:1.

Materials examined: **Iran**, on *Vitis vinifera* (*Vitaceae*, endophyte), unknown collection date, T. Gräfenhan, living culture CBS 116499 = V3055. **Spain**, Madrid, Casa de Campo, Escuela de la Vid, on dead stem of *Vitis vinifera*, 24 Apr. 2008, G. Bills (**holotype** CBS H-20139, ex-type culture CBS 123004 = F-274).

Notes: In addition to *Sei. vitis-viniferae*, six other *Seimatosporium* species have been reported from *Vitis vinifera*, which are *Sei. botan*, *Sei. hysterioides, Sei. lichenicola* (current name: *Spo. lichenicola*), *Sei. lonicerae*, *Sei. parasiticum* and *Sei. vitis* (Farr & Rossman 2018). Based on the phylogeny (Fig. 2), *Sei. vitis-viniferae* is well separated from *Sei. botan* and *Sei. lichenicola*. Although the only existing LSU and ITS sequences of *Sei. vitis* are identical to *Sei. vitis-viniferae*, their conidial dimensions are clearly distinct (34–40 × 14–17 µm in *Sei. vitis* vs. 13.5–26 × 4.5–6 µm in *Sei. vitis-viniferae*). In addition, the description and illustration of conidia from Senanayake *et al.* (2015) indicated that *Sei. vitis* only produces basal appendages, while *Sei. vitis-viniferae* produces appendages basally, or at both conidial ends.

Although the other *Vitis vinifera* related species lack type-derived sequences for comparison, they are morphologically distinct from *Sei. vitis-viniferae*. *Seimatosporium vitis-viniferae* differs from *Sei. hysterioides* in producing smooth conidia that do not have collapsed walls, and more septa (3–6 vs. 3) and a larger mean conidium length/width ratio (3.2:1 vs. 2.5:1) (Nag Raj 1993); and differs from *Sei. parasiticum* in producing shorter conidia (13.5–26 µm vs. 22–35 µm) and smaller mean conidium length/width ratio (3.2:1 vs. 5:1) (Nag Raj 1993). Compared to *Sei. lonicerae* (Nag Raj 1993), *Sei. vitis-viniferae* produces relatively larger conidia (13.5–26 × 4.5–6 µm, av. = 16.5 × 5.2 µm vs. 9–16 × 3.5–5 µm, av. = 13 × 4.4 µm) and with more septa (3–6 vs. 2–3).

Sporocadus Corda, Icon. fung. (Prague) 3: 23. 1839.

Type species: *Sporocadus lichenicola* Corda.

Description: *Conidiomata* stromatic, acervular, erumpent, dark brown to black. *Conidiophores* arising from the upper cells of the basal stroma or lining the cavity of the conidioma, septate and branched, sometimes reduced to conidiogenous cells, colourless, thin-walled. *Conidiogenous cells* discrete or integrated, lageniform, clavate, obclavate, subcylindrical or cylindrical, colourless, thin-walled, smooth. *Conidia* obovoid, ellipsoid, subcylindrical, pyriform or clavate, straight or curved, smooth, 1–7-septate, mostly 3-septate; basal cell obconic with a truncate base, colourless or concolourous with median cells, thin- or thick-walled; median cells cylindrical or doliiform, thick-walled, pale-brown to brown; apical cell conic with round apex, concolourous with median cells; appendage absent in most species, when present, single, unbranched, filiform, tubular, flexuous; basal appendage excentric.

Notes: *Sporocadus* was proposed to accommodate four species (*Spo. herbarum*, *Spo. georginae*, *Spo. lichenicola*, and *Spo. maculans*) but without designation of a generic type (Corda 1839). Later, Hughes (1958) lectotypified *Sporocadus* based on *Spo. lichenicola*.

Sporocadus was subsequently synonymised with *Seimatosporium* under the broad generic concept employed by Sutton (1975a). In contrast, Brockman (1976) and Nag Raj (1993) accepted *Sporocadus* as distinct from *Seimatosporium*, and it was characterised by one type of conidium lacking appendages as in *Spo. lichenicola* (Nag Raj 1993). Based on the multi-locus phylogenetic analyses in the present study, *Sporocadus* and *Seimatosporium* formed two sister clades (Figs 1, 2), and all strains that lack appendages clustered in the *Sporocadus* clade. We therefore resurrect *Sporocadus* and epitypify *Spo. lichenicola* to stabilise the application of the generic name.

This genus is generally characterised by 3-septate, fusoid, cylindrical and obovoid conidia lacking appendages. However, the two basal species of *Sporocadus* (*Spo. trimorphus* and *Spo. rosarum*; Fig. 2) produce non-appendaged as well as appendaged conidia.

Sporocadus biseptatus F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828398. Fig. 71.

Etymology: Name reflects the fact that it has 2-septate conidia.

Culture characteristics: Colonies on MEA flat with undulate edge, fuscous black, reaching 58–61 mm diam after 14 d at 21 °C, conidiomata black, acervular, superficial, confluent; on CMA flat with entire edge, black, reaching 45–46 mm diam after 14 d at 21 °C, conidiomata scattered or gregarious, acervular, superficial or immersed; on PDA flat with entire edge, brown, reaching 74–75 mm diam after 14 d at 21 °C, conidiomata dark brown to black, acervular, scattered or gregarious, superficial or immersed; on SNA fimbriate with rhizoids, pale brown, reaching 28–30 mm diam after 14 d at 21 °C, conidiomata pale brown, acervular, superficial or immersed, scattered, gregarious, or confluent.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, irregularly branched, colourless, smooth. *Conidiogenous cells* discrete or integrated, clavate, cylindrical, obclavate, ampulliform or sometimes subglobose, 3–11.5 × 1.5–2.5 µm (av. = 6.6 ± 2.79 × 1.8 ± 0.29 µm), colourless, smooth. *Conidia* pyriform, obovoid, hyaline to pale brown, 2-septate, wall smooth, some constricted at the septa, 12.5–19.5 × 4.5–9 µm (av. = 15.8 ± 1.77 × 6.9 ± 1.17 µm), lacking appendages; basal cell obconic with a round or acute base, occasionally with narrow truncate base, hyaline, or concolourous with median cells, 3–5.5 µm (av. = 4.1 ± 0.51 µm) long; median cell doliiform, fairly thick-walled and pale brown, 3.5–7.5 µm (av. = 5.1 ± 0.76 µm) long; apical cell conic with round apex, pigmentation similar to that of the median cells, 4.5–8 µm (av. = 5.8 ± 1.06 µm) long; mean conidium length/width ratio = 2.3:1.

Material examined: **Unknown** collection information (**holotype** CBS H-23627, ex-type culture CBS 110324 = MYC 754).

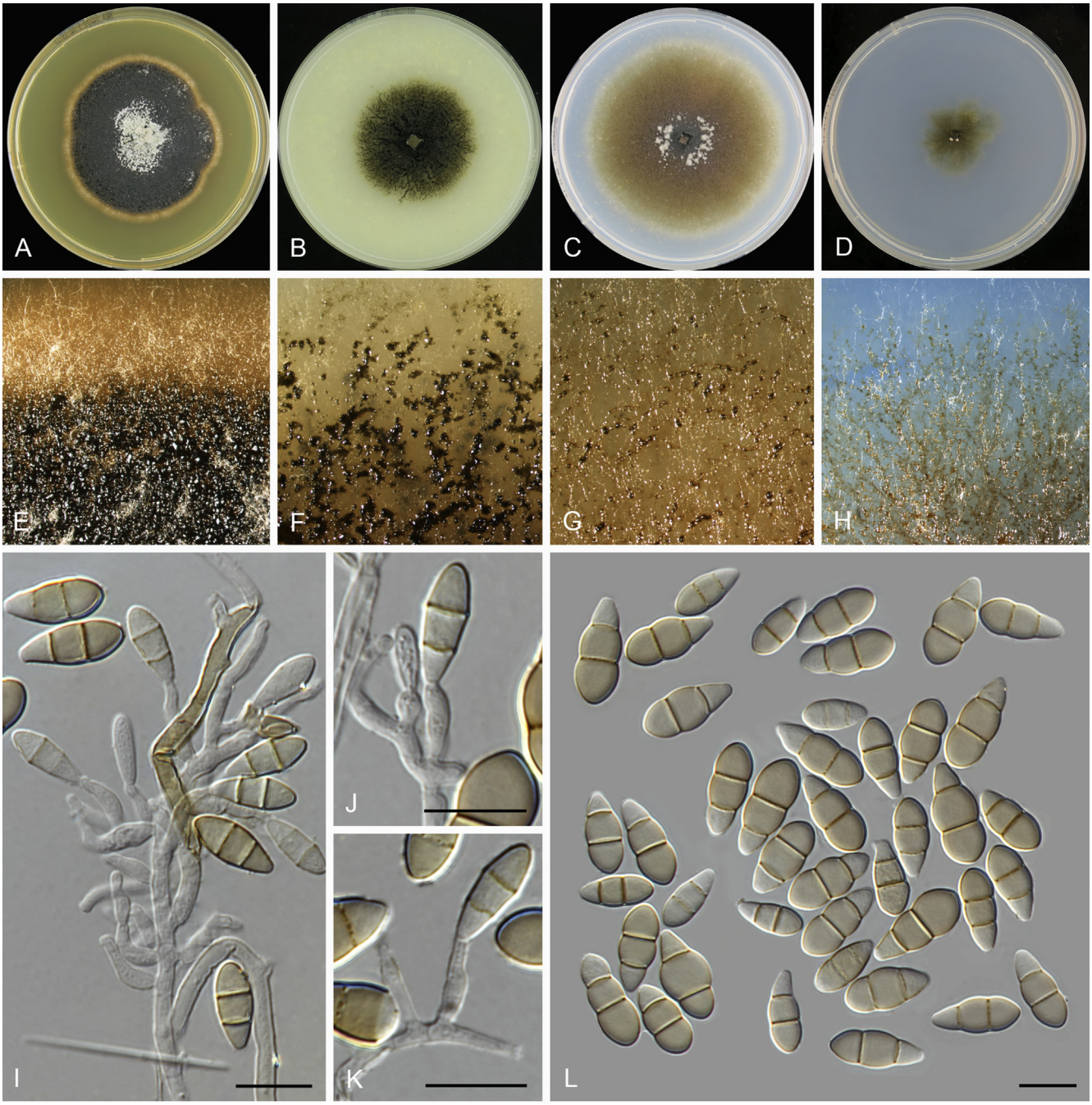

Fig. 71. *Sporocadus biseptatus* (CBS 110324). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–K.** Conidiophores, conidiogenous cells and conidia. **L.** Conidia. Scale bars = 10 µm.

Notes: *Sporocadus biseptatus* is the only species in the genus *Sporocadus* that produces 2-septate, non-appendaged conidia. Also see notes under *Spo. microcyclus*.

Sporocadus cornicola (Wijayaw. & Camporesi) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828399. Fig. 72.
Basionym: *Seimatosporium cornicola* Wijayaw. & Camporesi, Mycosphere 7: 209. 2016.

Culture characteristics: Colonies on MEA radially striate with lobate edge, salmon, reaching 75–81 mm diam after 14 d at 21 °C, conidiomata scattered or gregarious, black, acervular; on CMA, flat with entire edge, flesh, reaching 63 mm diam after 14 d at 21 °C, conidial masses scattered, scarce, black; on PDA flat with entire edge, buff, reaching 90 mm diam after 14 d at 21 °C, conidiomata scattered or gregarious, olivaceous to black; on SNA, colourless, flat with entire edge, reaching 73 mm diam after 14 d at 21 °C, conidial masses olivaceous, black, superficial, scattered or gregarious, often covered by aerial mycelia.

Description (*On SNA*): Sexual morph: unknown. Asexual morph: *Conidiophores* septate, irregularly branched, colourless, smooth. *Conidiogenous cells* cylindrical, variable in size, 8–34 × 1.5–3 µm (av. = 14.7 ± 6.1 × 2.5 ± 0.42 µm), colourless, sometimes pale brown, smooth, discrete or integrated. *Conidia* obovoid, clavate, straight, occasionally curved, mostly 3-septate, occasionally 5–6-septate, wall smooth, barely constricted at the septa, 17.5–23(–32) × 5.5–7.5 µm (av. = 20.9 ± 1.18 × 6.7 ± 0.45 µm), lacking appendages; basal cell obconic with truncate base, colourless or pale brown, 3–5(–9) µm (av. = 4.2 ± 0.38 µm) long; median cells mostly 2, occasionally 4–5, fairly thick-walled, pale to mid-brown, cylindrical, ± equal, each 4–6 µm (av. = 5.3 ± 0.5 µm) long, together 9.5–14.5 µm

Fig. 72. *Sporocadus cornicola* (CBS 143889/CPC 23235). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I.** Conidiophores. **J–K.** Conidiogenous cells and conidia. **L.** Conidia on SNA. **M.** Microcyclic conidiogenesis on MEA. **N.** Conidia on MEA (arrows point to conidial protrusions). Scale bars = 10 µm.

(av. = 11.2 ± 1.26 µm) long; apical cell short-conic with round apex, concolourous with median cells, 3–7 µm (av. = 5.6 ± 0.9 µm) long; mean conidium length/width ratio = 3.4:1. On MEA: *Microcyclic conidiogenesis* present. Conidia sometimes protruding at apical, basal or median cells, 0–1-septate, variable in size, 1.5–11 × 1–3.5 µm (av. = 5.3 ± 2.54 × 2.4 ± 0.56 µm).

Materials examined: **Germany**, on *Cornus sanguinea* (*Cornaceae*) twig, 8 May 2013, R.K. Schumacher, CBS H-23512, living culture CBS 143889 = CPC 23235. **Italy**, Forlì-Cesena [FC] Province, Camposonaldo - Santa Sofia, on dead branch of *Cornus sanguinea* L. (Cornaceae), 17 Mar. 2012, E. Camporesi, IT 171 (**holotype** MFLU 16–0701, ex-type MFLUCC 14–0448, not seen).

Notes: The ex-type isolate (MFLUCC 14–0448) of *Sei. cornicola* shows 100 % sequence similarity in ITS with strain CBS 143889, and both are located in the genus *Sporocadus* in the ITS tree (not shown). However, due to the unavailability of other sequence data relating to MFLUCC 14–0448, it was removed from the multi-locus phylogenetic analyses. Morphologically, the lack of conidial appendages in *Sei. cornicola* (Wijayawardene

Fig. 73. *Sporocadus cotini* (CBS 139966). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–K.** Conidiophores, conidiogenous cells and conidia. **L.** Conidia. Scale bars = 10 µm.

et al. 2016a) fits well with the generic characterisation of *Sporocadus*. *Seimatosporium cornicola* is therefore recombined as *Spo. cornicola.*

The morphological description of *Sei. cornicola* in Wijayawardene *et al.* (2016a) includes surprisingly large measurements (conidia 34−51 × 13−18 µm; av. = 41.86 × 16.1 µm, n = 20). However, the conidial dimensions, either length or width, of all currently known species in *Sporocadus* and *Seimatosporium* are smaller than 34−51 × 13−18 µm. We therefore redescribe *Spo. cornicola* in this study using strain CBS 143889.

Sporocadus cotini F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828400. Fig. 73.

Etymology: Name reflects the host from which it was isolated, *Cotinus coggygria*.

Culture characteristics: Colonies on MEA umbonate with erose or denate edge, olivaceous, reaching 35–37 mm diam after 14 d at 21 °C, conidiomata confluent, immersed, covered by sparse white aerial mycelia; on CMA, brown-coloured due to the accumulation of conidiomata, reaching 46–48 mm diam after 14 d at 21 °C, conidiomata brown to black, confluent or gregarious, superficial, semi-immersed or immersed, forming circles around the inoculation point; on PDA umbonate with undulate edge, pale grey, with black and confluent conidiomata, reaching 36–40 mm diam after 14 d at 21 °C; on SNA flat with entire edge, white-coloured, reaching 33–38 mm diam after 14 d at 21 °C, conidiomata black, superficial or immersed, scattered or gregarious.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, colourless, smooth. *Conidiogenous cells* discrete or integrated, mostly cylindrical or subcylindrical, sometimes clavate or lageniform, 9.5–20.5 × 1–2.5 µm (av. = 12.4 ± 2.52 × 1.6 ± 0.31 µm), colourless, smooth, with up to two annellations. *Conidia* fusoid, ellipsoidal, subcylindrical, straight, 3–6-septate, wall smooth, 11.5–15.5(–23.5) × 4–6.5 µm (av. = 13.7 ± 0.88 × 5 ± 0.42 µm), lacking appendages; basal cell obconic with a truncate or obtuse base, hyaline to yellowish brown, slightly paler than or concolourous with median cells, 2–4 µm (av. = 2.81 ± 0.49 µm) long; median cells 2–5, doliiform, yellowish brown, ± equal, each 2.5–4.5 µm (av. = 3.6 ± 0.43 µm) long; apical cell conic and usually with a narrow truncate apex, concolourous with or slightly paler than median cells, usually becoming dark brown at the apex point, 2.5–4.5 µm (av. = 3.5 ± 0.4 µm) long; mean conidium length/width ratio = 2.7:1.

Material examined: **Russia**, Rostov Region, Oktyabrsky district, Persianovsky Arboretum, on *Cotinus coggygria* (*Anacardiaceae*), unknown collection date, T. Bulgakov (**holotype** MFLU 14−0773, ex-type culture CBS 139966 = T-095 = MFLUCC 14-0623).

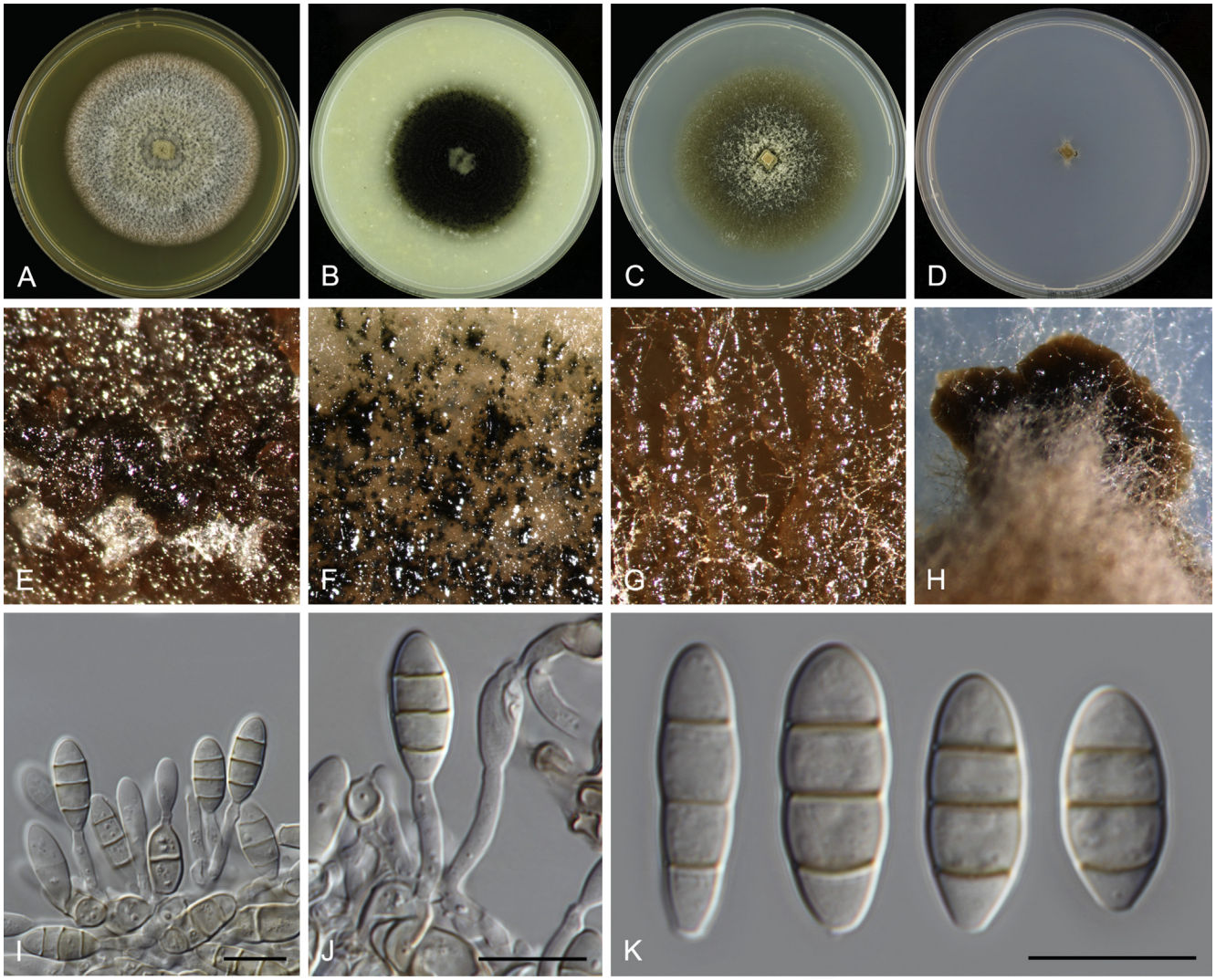

Fig. 74. *Sporocadus incanus* (CBS 123003). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–J.** Conidiogenous cells and conidia. **K.** Conidia. Scale bars = 10 µm.

Notes: Specimen MFLU 14−0773 was designated as a reference of *Sei. lichenicola* by Norphanphoun *et al.* (2015). However, the present study shows that this specimen is phylogenetically and morphologically distinct from *Sei. lichenicola* (current name: *Spo. lichenicola*). Also see notes under *Spo. lichenicola.*

Sporocadus incanus F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828401. Fig. 74.

Etymology: Name reflects its conidial colour, greyish white.

Culture characteristics: Colonies on MEA flat with entire edge, pale hazel, aerial mycelia pale grey and cottony, forming concentric circles on the reverse of the plate, reaching 53–54 mm diam after 14 d at 21 °C, conidiomata stromatic, confluent, semi-immersed; on CMA flat with entire edge, olivaceous grey, forming concentric circles due to the number of black conidiomata, reaching 50–52 mm diam after 14 d at 21 °C, conidiomata scattered or gregarious, stromatic, superficial or immersed; on PDA flat with entire edge, vinaceous buff, aerial mycelia sparse and short, forming concentric circles, reaching 58–60 mm diam after 14 d at 21 °C, conidial masses glaucous grey, superficial, confluent; on SNA flat with rhizoid edge, colourless, very slow growing, reaching 10–12 mm diam after 14 d at 21 °C, conidiomata dark brick to sepia, gregarious, acervular, superficial.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, reduced to very short conidiogenous cells, colourless, smooth. *Conidiogenous cells* usually discrete, mostly cylindrical, sub-cylindrical, sometimes lageniform, 4.5–14.5 × 1.5–3 µm (av. = 9.9 ± 2.73 × 2.2 ± 0.44 µm), colourless, smooth, with up to four annellations. *Conidia* obovoid, or cylindrical with round apical and basal ends, straight, mostly 3-septate, occasionally 2-septate, wall smooth, barely constricted at the septa, 11.5–20 × 4.5–6.5 µm (av. = 14.8 ± 1.8 × 5.8 ± 0.49 µm), lacking appendages; basal cell obconic with a truncate base, colourless or sometimes concolourous with median cells, 2–5 µm (av. = 3.1 ± 0.7 µm) long; median cells 2, doliiform or cylindrical, thin-walled, colourless or greyish white, ± equal, each 3–5.5 µm (av. = 4.2 ± 0.63 µm) long; apical cell obtuse or conic with round apex, colourless or concolourous with median cells, 2.8–5 µm (av. = 3.9 ± 0.51 µm) long; mean conidium length/width ratio = 2.6:1.

Material examined: **Spain**, Madrid, Fuente el Saz, on *Prunus dulcis* (*Rosaceae*) dead twigs, 3 Mar. 2008, deposited by G. Bills (**holotype** CBS H-20138, ex-type culture CBS 123003 = F-273).

Notes: Although represented by a single strain, *Spo. incanus* is clearly distinct from other *Sporocadus* spp. based on the multilocus analysis (Fig. 2). Another *Sporocadus* species reported from *Prunus dulcis* from California was *Spo. lichenicola* (French

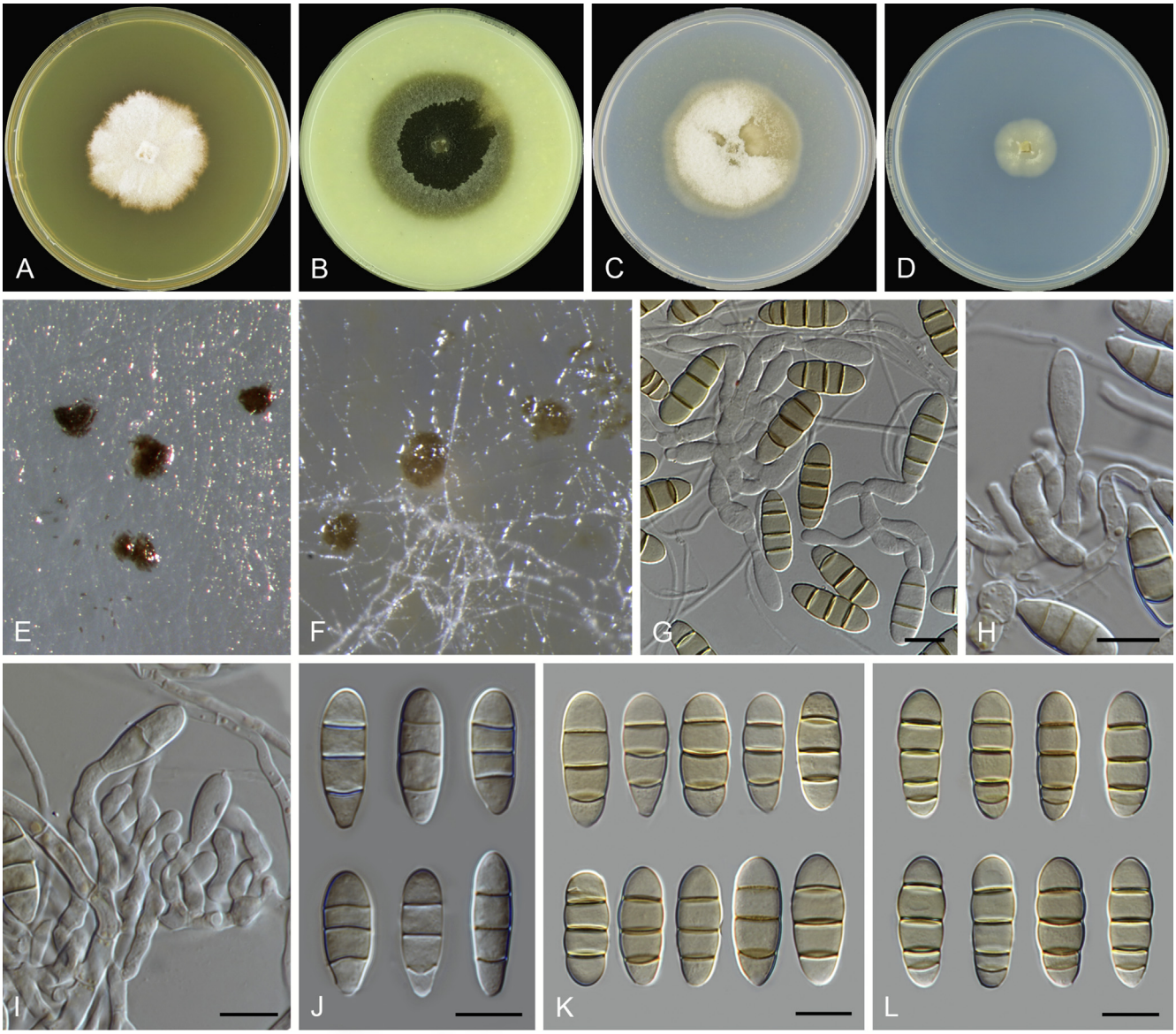

Fig. 75. *Sporocadus lichenicola* (A–E, G, K–L. CBS 354.90. F, H–J. NBRC 32625). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on SNA. **G–I.** Conidiophores, conidiogenous cells, and conidia. **J–L.** Conidia. Scale bars = 10 µm.

1987, 1989), however the identification of which needs further confirmation with molecular data.

Sporocadus lichenicola Corda, Icon. fung. (Prague) 3: 24. 1839. Fig. 75.

Synonyms: *Seimatosporium lichenicola* (Corda) Shoemaker & E. Müll., Canad. J. Bot. 42: 405. 1964.

Sphaeria corticola Fuckel, Jb. nassau. Ver. Naturk. 23–24: 114. 1870.

Griphosphaeria corticola (Fuckel) Höhn., Annls mycol. 16: 87. 1918.

Clethridium corticola (Fuckel) Shoemaker & E. Müll. [as 'Clathridium'], Canad. J. Bot. 42: 404. 1964.

Discostroma corticola (Fuckel) Brockmann, Sydowia 28: 313. 1976.

Other synonyms: See Sutton (1980).

Culture characteristics: Colonies on MEA flat with erose or dentate edge, white-coloured, sterile, reaching 40 mm diam after 14 d at 21 °C; on CMA, flat with entire edge, mid-brown to dark brown, sterile, reaching 51 mm diam after 14 d at 21 °C; on PDA flat with entire edge, white to milky-coloured, sterile, reaching 46–48 mm diam after 14 d at 21 °C; on SNA, milky-coloured, flat with entire edge, reaching 21 mm diam after 14 d at 21 °C, conidiomata scattered or gregarious, brown to black, acervular.

Description: Sexual morph: see Shoemaker & Müller (1964). Asexual morph: *Conidiophores* septate, branched, colourless, smooth, invested in mucus. *Conidiogenous cells* discrete or integrated, lageniform or ampulliform, sometimes cylindrical and subcylindrical, 6–20 × 1.5–4.5 µm (av. = 12.2 ± 4.26 × 3.2 ± 0.95 µm), colourless, smooth, with up to three annellations. *Conidia* mostly obovoid or subcylindrical with round ends, straight, pale brown, mostly 3–4-septate, occasionally 5-septate, distal septa connected to basal cell thinner than other septa in 4–5-septate conidia, septa ± equally thick in 3-septate conidia, wall smooth and slightly constricted at the septa, 18–25 × 5.5–8 µm (av. = 21.6 ± 1.52 × 7.2 ± 0.52 µm), lacking appendages; basal cell obconic with a narrow round base, or sometimes with narrow truncate base, hyaline to pale brown, or concolourous with median cells, periclinal wall thin and pale brown, 3–7 µm (av. = 4.71 ± 0.86 µm) long in 3-septate conidia, 1.5–4.5 µm (av. = 2.77 ± 0.67 µm) long if more than 3 septa;

median cells 2–4, doliiform, pale to mid-brown, ± equal in 3-septate conidia, each 4–6.5 µm (av. = 5.48 ± 0.54 µm) long; the second cell from base shorter than other median cells in 4–5-septate conidia, 1.5–3.5 µm (av. = 2.6 ± 0.63 µm) long; apical cell short-conic with a wide round apex, concolourous with the median cells, 4.5–6.5 µm (av. = 5.5 ± 0.52 µm) long; mean conidium length/width ratio = 3:1.

Materials examined: **Czech Republic**, Prague, on *Rosa canina* (*Rosaceae*), 1838, Corda (**holotype** 40995 ex PR. Herb. Corda 155664, not seen). **Germany**, on *Juniperus communis* (*Cupressaceae*), 5 Apr. 2014, R. Schumacher, living culture CPC 24528; former West-Germany, on *Fagus sylvatica* (*Fagaceae*) seed, unknown collection date, U. Delfs-Siemer, CBS H-23540, living culture CBS 354.90 = NBRC 32677. **UK**, on *Rosa canina*, unknown collection date and collector (CBS H-23626 **epitype designated here**, MBT384063, ex-epitype culture NBRC 32625 = IMI 079706).

Notes: The asexual and sexual connection between *Sporocadus lichenicola* and *Clathridium corticola* was confirmed (Hughes 1958, Shoemaker & Müller 1964), and both names were subsequently synonymised under *Sei. lichenicola* (Shoemaker & Müller 1964). Nag Raj (1993) transferred *Sei. lichenicola* to *Sporocadus*, as he split *Seimatosporium* into five genera and accepted *Sporocadus* as a distinct genus. In Tanaka *et al.* (2011), this species was again synonymised under *Seimatosporium*.

Sporocadus lichenicola has been described repeatedly under different names (Corda 1839, Shoemaker & Müller 1964, Sutton 1980). The original description and illustration of *Spo. lichenicola* in Corda (1839) was simple and did not include measurements of morphological structures. According to Shoemaker & Müller (1964), the asexual morph of *Clathridium corticola* (DAOM 90913, on *Rosa* stem, Airolo-Nante, Tessin, Switzerland, 1961, E. Müller & R.A. Shoemaker) was characterised by mostly 3-septate, non-setose and clavate conidia (18–20 × 5–7 µm), matching the type specimen of *Spo. lichenicola*. Sutton (1980) accepted the species name as *Sei. lichenicola*, and reported it as having 3-septate, fusoid and non-appendaged conidia (13–15 × 5.5–6.5 µm), which however conflicted with those given by Shoemaker & Müller (1964) and were not based on the type specimens of *Spo. lichenicola* nor *Cla. corticola*. Recently, a reference specimen (MFLU 14-0773) of *Sei. lichenicola*, from dead branches of *Cotinus coggygria* from Russia, was designated by Norphanphoun *et al.* (2015). However, measurements of the conidia of MFLU 14-0773 were (10–)12–14 × 4–5(–6) µm, thus also contradicting the description of Shoemaker & Müller (1964).

Since strains without conidial appendages clustered in a distinct clade from *Seimatosporium* (Figs 1, 2), we agree with Nag Raj (1993) on the taxonomic treatment of *Sporocadus* and *Spo. lichenicola.* Our collection from the UK, CBS H-23626, was from the same host plant as the type from the Czech Republic (*Rosa canina*), and morphologically matched the description provided by Shoemaker & Müller (1964). It is therefore designated as epitype of *Spo. lichenicola*.

According to the molecular analysis, the reference specimen (MFLU 14-0773, living culture CBS 139966) designated by Norphanphoun *et al.* (2015) is phylogenetically distinct from *Spo. lichenicola* and represents another species, *spo. cotini*.

Sporocadus mali F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828402. Fig. 76.

Etymology: Name reflects the host from which it was collected, *Malus sylvestris*.

Culture characteristics: Colonies on MEA flat with entire edge, greenish grey with white margin, aerial mycelia greenish grey, reaching 58–59 mm diam after 14 d at 21 °C, sterile; on CMA concave with raised margin, pale pistachio green with white margin, reaching 53–54 mm diam after 14 d at 21 °C, conidiomata pale brown; on PDA flat with entire edge, glaucous grey, reaching 67–68 mm diam after 14 d at 21 °C, sterile; on SNA flat with entire edge, hyaline to glaucous grey, reaching 55–56 mm diam after 14 d at 21 °C, conidial masses black, superficial, scattered.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, usually branched, colourless, smooth. *Conidiogenous cells* discrete or integrated, mostly subcylindrical, (6.5–)10.5–24 × 1.5–2.5 µm (av. = 16.9 ± 3 × 2.1 ± 0.32 µm), colourless, smooth, with up to five annellations. *Conidia* obovoid or cylindrical, straight, occasionally slightly curved, 3–4-septate, wall smooth, 15–20 × 4.5–8 µm (av. = 17.3 ± 1.24 × 6.4 ± 0.66 µm), lacking appendages; basal cell obconic with a narrow truncate base, hyaline to pale brown, usually concolourous with median cells, 2.5–4.5 µm (av. = 3.4 ± 0.48 µm) long; median cells 2–3, doliiform or short cylindrical, pale brown, ± equal, each 3.5–6 µm (av. = 4.6 ± 0.58 µm) long; apical cell with an obtuse end, concolourous with median cells, usually becoming dark brown at the apex point, 3.5–6.5 µm (av. = 5 ± 0.53 µm) long; mean conidium length/width ratio = 2.7:1.

Material examined: **Netherlands**, Valkenswaard, on *Malus sylvestris* (*Rosaceae*) dead twig, Feb. 1970, H.A. van der Aa (**holotype** CBS H-18008, ex-type culture CBS 446.70).

Notes: Although represented by a single strain, *Spo. mali* is well separated from other *Sporocadus* species (Fig. 2). Morphologically, it resembles *Spo. cotini*, but can be distinguished from the latter by the number of septa (3–4 vs. 3–6), conidial dimensions (15–20 × 4.5–8 µm vs. 11.5–15.5 × 4–6.5 µm), as well as the shape of the apical cell (obtuse but not conical vs. conical). This is the first report of *Sporocadus* on *Malus sylvestris* (Farr & Rossman 2018).

Sporocadus microcyclus F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828403. Fig. 77.

Etymology: Named after the commonly observed microcyclic conidiogenesis.

Culture characteristics: Colonies on MEA raised with ruffles in crenate edge, black, ochreous, reaching 32–39 mm diam after 14 d at 21 °C, conidiomata black, buff or honey, stromatic, confluent, immersed; on CMA dark brown, reaching 27–30 mm diam after 14 d at 21 °C, conidiomata gregarious or confluent, superficial, semi-immersed, immersed; on PDA flat with entire edge, dark brown, dark vinaceous, with rhizoid appearance due to the accumulation of conidiomata, reaching 76–80 mm diam after 14 d at 21 °C, conidiomata dark brown to black, superficial or semi-immersed, scattered, gregarious or confluent; on SNA, with brown rhizoid appearance due to the accumulation of conidiomata, reaching 17–19 mm diam after 14 d at 21 °C, conidiomata superficial or immersed.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, sometimes reduced to conidiogenous cells, colourless, smooth. *Conidiogenous cells* discrete or integrated, mostly lageniform, ampulliform, or obclavate,

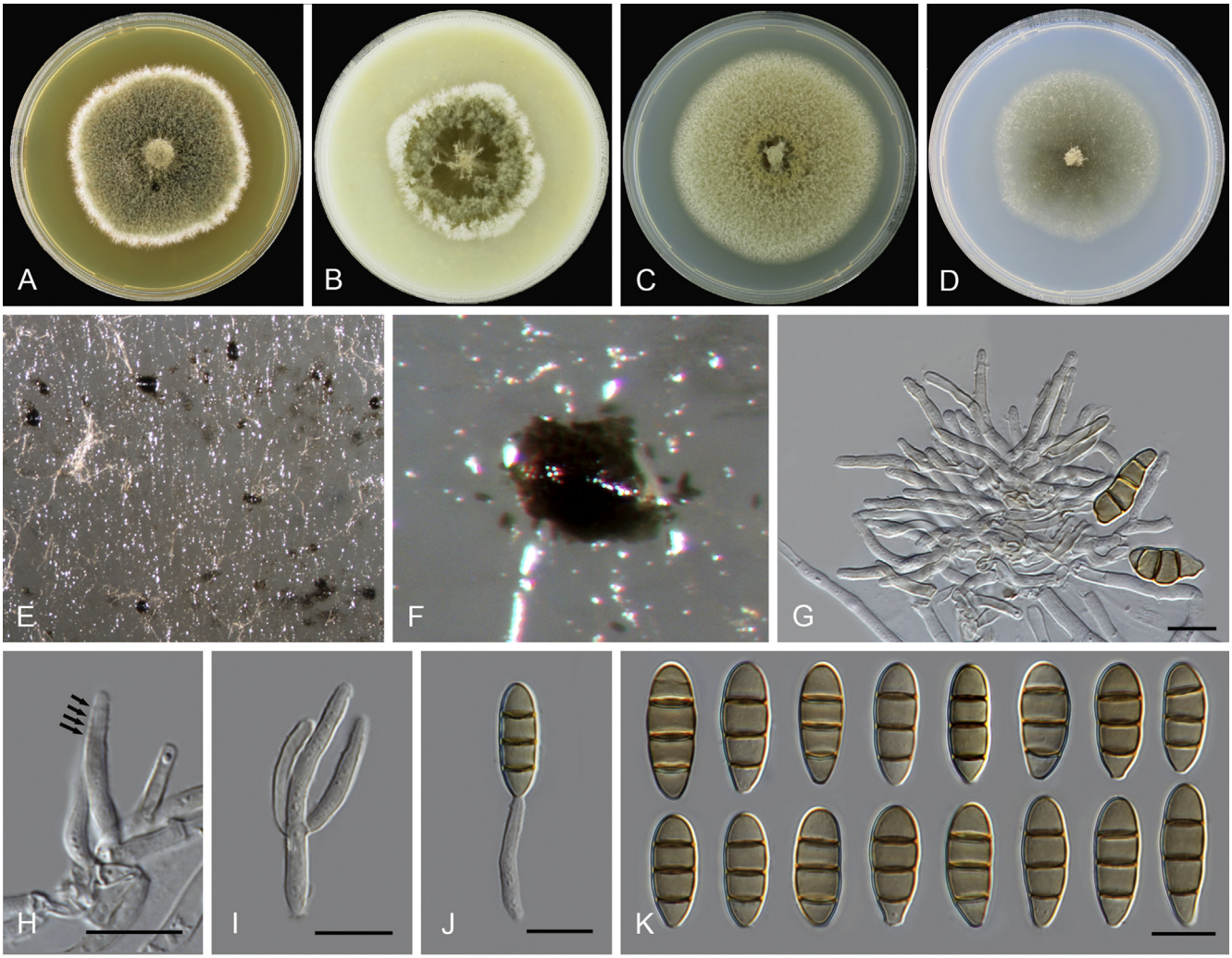

Fig. 76. *Sporocadus mali* (CBS 446.70). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on SNA. **G–J.** Conidiophores, conidiogenous cells and conidia (arrows points to annellations). **K.** Conidia. Scale bars = 10 µm.

sometimes subcylindrical, variable in size, 4.5–15 × 1.5–3.5 µm (av. = 9.2 ± 3.02 × 2 ± 0.57 µm), colourless, smooth, with up to four annellations. *Conidia* obovoid, ellipsoid, straight or slightly curved, pale brown, mostly 3-septate, occasionally 2-septate, wall smooth, 10.5–15.5 × 3–5.5 µm (av. = 13 ± 0.97 × 4.6 ± 0.57 µm), lacking appendages; basal cell obconic with blunt or sometimes round base, hyaline to pale brown, 2–3.5 µm (av. = 2.7 ± 0.4 µm) long; median cells 2, doliiform, fairly thick-walled and pale brown, ± equal, each 2.5–4.5 µm (av. = 3.4 ± 0.55 µm) long; apical cell short-conic with a round apex, concolourous with the median cells, 2.5–3.5 µm (av. = 3.1 ± 0.24 µm) long; mean conidium length/width ratio = 2.8:1. *Microcyclic conidiogenesis* occurring with conidia, forming secondary conidiophores or conidiogenous cells. These conidia are cylindrical with round ends, straight, pale brown, 3-septate, wall smooth, deeply constricted at septa, 13–25.5 × 5.5–7.5 µm (av. = 19.6 ± 2.35 × 6.5 ± 0.61 µm); basal cell hyaline to pale brown, apical cell and median cells pale brown, ± equal, each 3.5–7 µm (av. = 4.7 ± 0.75 µm). Secondary conidiophores or conidiogenous cells centric or excentric on basal or median cell, hyaline, septate, irregularly branched; conidiogenous cells ampulliform, lageniform, varying in size, 2.5–13 × 1–3 µm (av. = 7.2 ± 3.15 × 1.9 ± 0.49 µm), with up to four annellations.

Materials examined: **Germany**, Bonn, on *Sorbus aria* (*Rosaceae,* endophyte in twig), Feb. 1995, K. Weise (**holotype** CBS H-23543, ex-type culture CBS 424.95). **Netherlands**, Baarn, Maarschalksbos, on *Ribes* (*Grossulariaceae*) leaf spot, 3 Dec. 1968, H.A. van der Aa, living culture CBS 887.68 = NBRC 32680.

Notes: *Sporocadus microcyclus* is closely related to *Spo. biseptatus* (Fig. 2, 99 % sequence similarity on ITS, 95 % on *rpb2*, 88 % on *tef-1α*, 88 % on *tub2*), but it differs from the latter in the number of septa (mostly 3-septate vs. 2-septate) and mean conidial length/width ratio (2.8:1 vs. 2.3:1). In addition, microcyclic conidiogenesis was not observed in *Spo. biseptatus*, but is commonly observed in *Spo. microcyclus*.

In addition to *Spo. microcyclus*, *Spo. dacicum* was also reported from the host genus *Sorbus* (*S. dacica*) from Romania; however, the conidia of *Spo. dacicu* were mostly bent and curved, a feature different from other known *Sporocadus* species (Sutton 1975a).

Sporocadus multiseptatus F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828404. Fig. 78.

Etymology: Name reflects the multiseptate nature of its conidia, being 3–7-septate.

Culture characteristics: Colonies on MEA flat with crenate edge, white to off-white, reaching 40–42 mm diam after 14 d at 21 °C, conidiomata black, covered by aerial mycelia, scattered or gregarious, semi-immersed; on CMA flat with entire edge, glaucous grey, sterile, reaching 58 mm diam after 14 d at

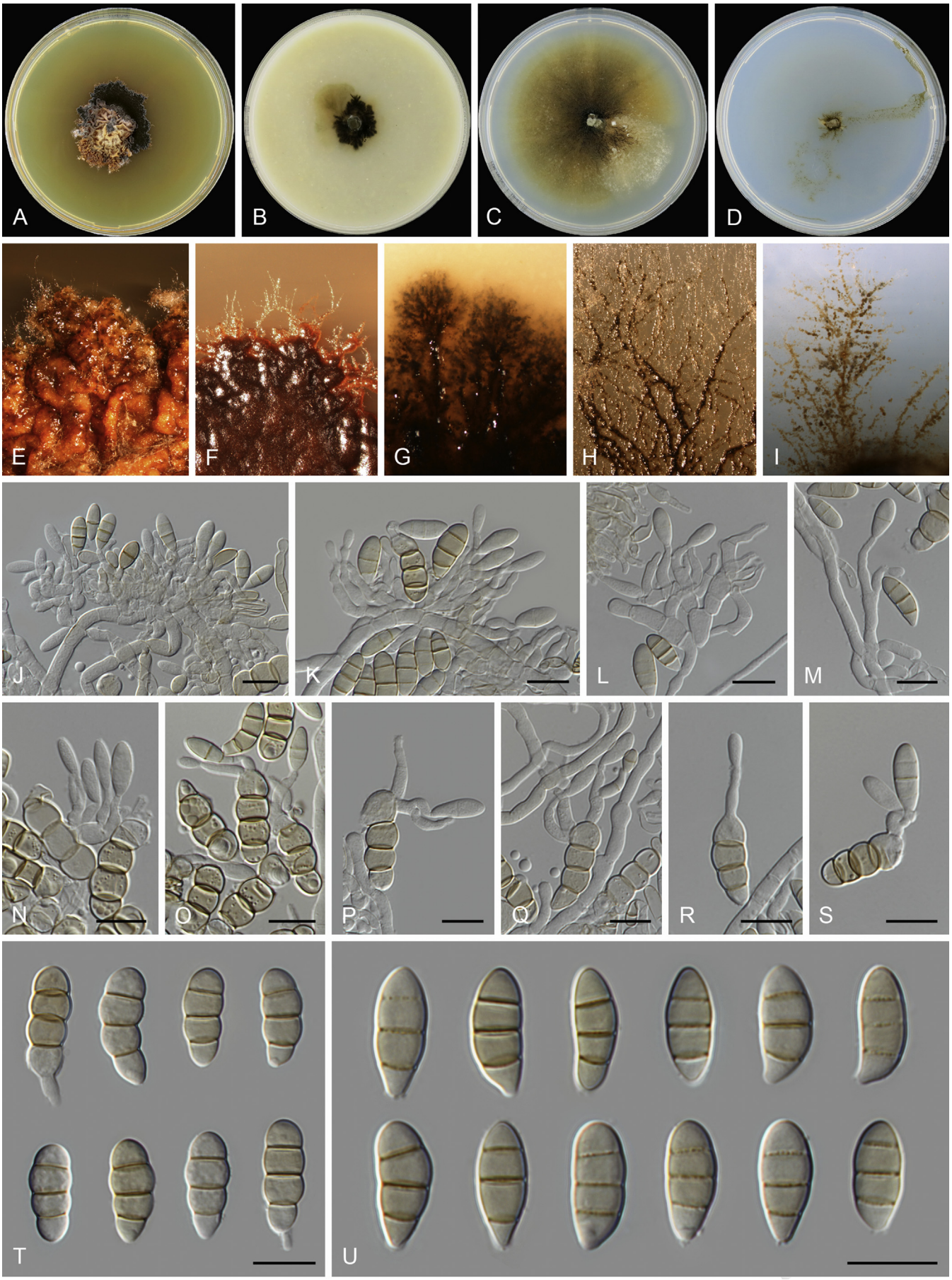

Fig. 77. *Sporocadus microcyclus* (CBS 424.95). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on MEA. **G–I.** Conidiomata on CMA, PDA and SNA, respectively. **J–M.** Conidiophores, conidiogenous cells and conidia. **N–S.** Microcyclic conidiogeneses. **T.** Conidia with constrictions. **U.** Conidia. Scale bars = 10 µm.

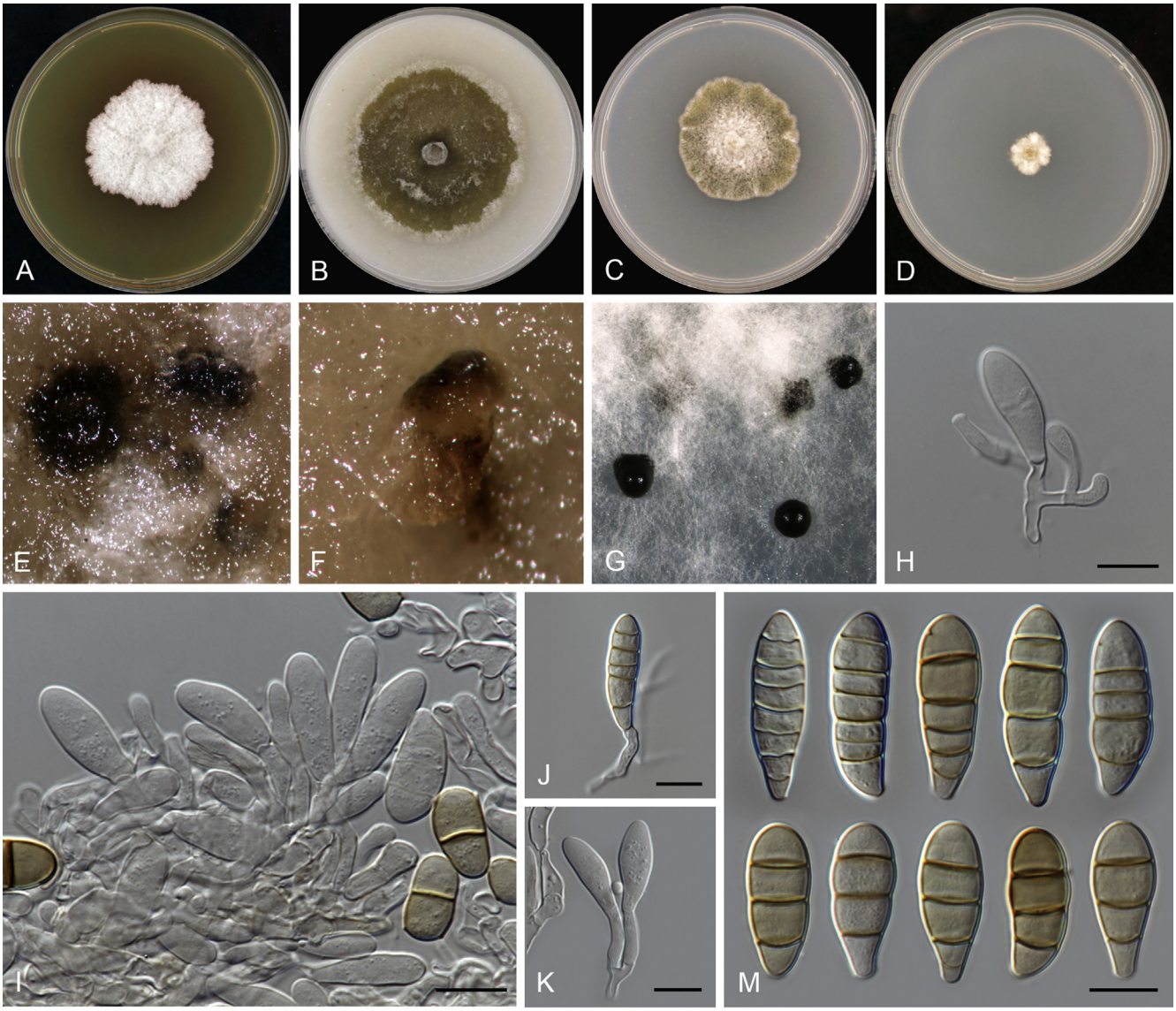

Fig. 78. *Sporocadus multiseptatus* (CBS 143899/CPC 26606). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on MEA. **G.** Conidiomata on SNA. **H–K.** Conidiophores, conidiogenous cells and conidia. **M.** Conidia. Scale bars = 10 µm.

21 °C; on PDA flat with undulate edge, glaucous blue-green, sterile, reaching 40 mm diam after 14 d at 21 °C; on SNA flat with undulate edge, white, reaching 13–14 mm diam after 14 d at 21 °C, conidiomata black, scattered, superficial, acervular.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, reduced to very short conidiogenous cells, colourless, smooth. *Conidiogenous cells* discrete, mostly cylindrical, sometimes ampulliform, 5–20 × 1.5–4 µm (av. = 11.6 ± 3.72 × 2.8 ± 0.58 µm), colourless, smooth. *Conidia* obovoid, subcylindrical, or clavate, straight, 3–7-septate, wall smooth, occasionally slightly constricted at the septa, 21–31 × 7–9.5 µm (av. = 26.5 ± 1.98 × 8.1 ± 0.56 µm), lacking appendages; basal cell obconic with a truncate base, periclinal wall thin, colourless or pale brown, 2.5–6.5 µm (av. = 4.8 ± 0.92 µm) long; median cells 2–5, fairly thick-walled, pale to mid-brown, doliiform or cylindrical, variable in size, together 11–22.5 µm (av. = 17.2 ± 2.6 µm) long, each 2.5–8 µm (av. = 4.2 ± 1.24 µm) long; apical cell obtuse, not conic, or conic with obtuse apex, concolourous with median cells, 3–7 µm (av. = 4.6 ± 1.05 µm) long; mean conidium length/width ratio = 3.3:1.

Material examined: **Serbia**, on *Viburnum* sp. (*Caprifoliaceae*), 14 Apr. 2015, R.K. Schumacher, HPC 346 (**holotype** CBS H-23524, ex-type culture CBS 143899 = CPC 26606).

Notes: *Sporocadus multiseptatus* is well separated from other *Sporocadus* spp. based on the multi-locus analysis (Fig. 2) and morphologically distinct in producing longer and relatively wider conidia. In addition, the conidia of *Spo. multiseptatus* are generally 3–7-septate, while they are usually 3-septate in other *Sporocadus* species.

Sporocadus rosarum (Henn.) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828405.
Basionym: *Coryneum rosarum* Henn., Mag. Naturvididensk. 42: 32. 1904.
Synonyms: *Seimatosporium rosarum* (Henn.) B. Sutton, Mycol. Pap. 138: 168. 1975.
Seimatosporium pseudorosarum Wijayaw. *et al.*, Fungal Diversity 75: 156. 2015.
Seimatosporium rosigenum Goonas. *et al.*, Fungal Diversity 89: 193. 2018.

Culture characteristics: See Ariyawansa *et al.* (2015) and Wanasinghe *et al.* (2018).

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* 200–250 µm diam, 100–150 µm high, acervular, unilocular, subglobose, superficial to subepidermal, solitary, black, ostiolate, apapillate. Conidiomata wall multi-layered, outer wall thick, composed of dark brown cells of *textura angularis*, inner wall thin, hyaline. *Paraphyses* 10–22 µm, filiform, cylindrical, aseptate, hyaline, smooth-walled. *Conidiophores* 6–25 × 2–4 µm, long, cylindrical, branched, hyaline, smooth-walled. *Conidiogenous cells* holoblastic, annellidic, simple, integrated, determinate, hyaline. *Conidia* 9–14 × 4–6 µm (av. = 11.31 × 6.06 µm, n = 20), ellipsoid to obovoid, obtuse apex and base, straight, 2–3-septate, with brown to dark brown septa, constricted at the septa, eguttulate, pale brown to medium brown, with hyaline to sub-hyaline basal cell, smooth-walled, apical appendage absent, with or without basal appendage, if present, 9–30 µm long, unbranched (emended from Ariyawansa *et al.* 2015).

Materials examined: **Italy**, Province of Pesaro-Urbino [PU], Monte Nerone, on dead aerial spines of *Rosa canina* (*Rosaceae*), 11 Jun. 2012, E. Camporesi [**holotype** of *Seimatosporium rosigenum* MFLU 15-0782, living culture MFLUCC 15-0563 = KUMCC 16-0112, not seen (fig. 131, in Wanasinghe *et al.* 2018, Fungal Diversity 89: 1–236)]; Province of Rimini [RN], near Pennabilli-Rimini, on dead branch of *Rosa canina* (*Rosaceae*), 22 Mar. 2014, E. Camporesi [**holotype** of *Seimatosporium pseudorosarum* MFLU 15-0745, living cultures MFLUCC 14–0466, not seen (fig. 83, in Ariyawansa *et al.* 2015, Fungal Diversity 75: 27–274)]. **Norway**, Christiania, on leaves of *Rosa canina*, Aug. 1903 [**iconotype** of *Coryneum rosarum*, slide ex B as IMI 179738 (fig. 77, in Sutton 1975a, Mycol. Pap. 138: 1–224)]. **Sweden**, Uppland, Dalby par., Jerusalem, on *Rosa canina*, 7 Apr. 1987, K. & L. Holm, living culture CBS 113832 = UPSC 2172.

Notes: The LSU and ITS sequences of CBS 113832 are identical to the holotype of *Sei. pseudorosarum* (MFLU 15-0745) (Ariyawansa *et al.* 2015), and only has 2 bp differences with *Sei. rosigenum* (MFLUCC 15-0563) (Wanasinghe *et al.* 2018). Further, all these three strains were associated with the same host plant *Rosa canina.* There is thus no strong evidence to treat them as separate species. Unfortunately, other gene sequences of MFLU 15-0745 and MFLUCC 15-0563 are unavailable and both strains were for this reason excluded from the multi-locus phylogenetic analyses in this study.

Morphologically, *Sei. rosigenum* produced 3-septate conidia with one apical appendage and mostly without basal appendages (Wanasinghe *et al.* 2018). However, this appears to be the exact opposite compared to their illustration (fig. 131 in Wanasinghe *et al.* 2018). *Seimatosporium pseudorosarum* was characterised by 2-septate conidia with or without a basal appendage (Ariyawansa *et al.* 2015). On the other hand, the phylogenetically similar strain CBS 113832 produces 3-septate and non-appendaged conidia, which therefore broadens the species description.

In addition, this species is morphologically identical to *Sei. rosarum* (basionym *Coryneum rosarum*) (Sutton 1975a), and the collection information of strain CBS 113832 (from *Rosa canina* from Sweden) is identical to that of the type of *Coryneum rosarum* (from *Rosa canina* from Norway, IMI 179738); we therefore consider *Sei. pseudorosarum* and *Sei. rosigenum* as synonyms of the older name, *Sei. rosarum*. Phylogenetic analyses placed it in the genus *Sporocadus.*

Sporocadus lichenicola, another *Rosa canina* associated species in Europe, can be distinguished from *Spo. rosarum* in the number of conidial septa (4–5-septate vs. 2–3-septate) and absence of appendages.

Sporocadus rosigena F. Liu, L. Cai & Crous, **nom. nov.** MycoBank MB828418. Fig. 79.

Basionym: *Seimatosporium rosicola* Wanas. *et al.*, Fungal Diversity: 89: 193. 2018, non *Sporocadus rosicola* Rabenh. 1848.

Culture characteristics: Colonies on MEA flat with irregular outline, rosy buff to vinaceous buff, reaching 50–53 mm diam after 14 d at 21 °C, conidiomata black, acervular, confluent, erumpent; on CMA, flat with entire edge, white-coloured, with sparse aerial mycelia, reaching 68 mm diam after 14 d at 21 °C, conidiomata gregarious or confluent, black; on PDA flat with entire edge, white to milky-coloured, and buff where conidiomata are produced, reaching 76 mm diam after 14 d at 21 °C, conidiomata black, acervular, stromatic, scattered or gregarious, forming circles around the inoculation point; on SNA flat with lobate edge, colourless, reaching 49–51 mm diam after 14 d at 21 °C, conidiomata black, scattered or gregarious, erumpent, semi-immersed or immersed.

Description: *Conidiophores* septate, branched, often reduced to conidiogenous cells, colourless, smooth, invested in mucus. *Conidiogenous cells* discrete or integrated, cylindrical or ampulliform, 6–16 × 1.5–3 µm, colourless, or pale brown, smooth, with up to four annellations. *Conidia* obovoid, ellipsoid, or subcylindrical, 3-septate, occasionally 2-septate, wall smooth, 10–15 × 3.5–6.5 µm (av. = 12.6 ± 0.98 × 5.2 ± 0.62 µm), lacking appendages; basal cell obconic with acute or blunt base, occasionally with a narrow truncate base, hyaline to pale brown, or concolourous with median cells, thin-walled, 1–3.5 µm (av. = 2.5 ± 0.47 µm) long; median cells 2, short-cylindrical to doliiform, hyaline or pale brown, and becoming mid-brown when mature, ± equal length, each 2.5–4.5 µm (av. = 3.6 ± 0.48 µm) long; apical cell conic with round apex, concolourous with the median cells, 3.5–5 µm (av. = 4.2 ± 0.45 µm) long; mean conidium length/width ratio = 2.4:1. *Sexual morphology*: see Wanasinghe *et al.* (2018).

Materials examined: **Iran**, on *Vitis vinifera* (*Vitaceae*) twig (endophyte), unknown collection date, T. Gräfenhan, living culture CBS 116498 = V3056. **Italy**, Province of Forli-Cesena [FC], near Corverselle, Castrocaro Terme e Terra del Sole, on dead aerial spines of *Rosa canina* (*Rosaceae*), 30 Nov. 2014, E. Camporesi IT 2263 (**holotype** of *Seimatosporium rosicola* MFLU 16-0239, not seen). **Latvia**, Riga, on *Rhododendron* sp. (*Ericaceae*), unknown collection date, I. Apine, living culture CBS 129166 = MSCL 860. **Netherlands**, Treekerduinen near Amersfoort, inner tissue of zoocecidium, caused by *Lasioptera rubi*, on *Rubus* sp., 26 Mar. 1996, H.A. van der Aa, CBS H-18005, living culture CBS 466.96; on *Rubus fruticosus* (*Rosaceae*) stem, unknown collection date, isolated by A. Jaarsveld, living culture CBS 250.49; on *Pyrus communis* (*Rosaceae*) fruit, unknown collection date, isolated by J.A.A.M.H. Goossens, living culture CBS 182.50.

Notes: The LSU and ITS sequences of the holotype of *Seimatosporium rosicola* (MFLU 16-0239) only show three and two bases differences, respectively, from other strains of this species. In addition, the morphology of these strains is consistent with *Sei. rosicola* that was described in Wanasinghe *et al.* (2018). However, due to the unavailability of other gene sequences, the holotype was excluded from the multi-locus phylogenetic analyses in this study. Further multi-locus phylogenetic analyses (Figs 1, 2) showed that this species was located in the *Sporocadus* clade. However, as the epithet "*rosicola*" is occupied in *Sporocadus*, and a new name *Spo. rosigena* is thus proposed for this species.

Sporocadus rosigena has been identified from the host plants *Rubus*, *Pyrus*, *Rhododendron* and *Vitis*. When compared with other species in *Sporocadus*, we noticed that *Spo. rhododendri* was also reported from *Rhododendron* and *Pyrus communis* (Pirozynski & Shoemaker 1970, Sutton 1980). However, the conidia of *Spo. rosigena* are much smaller and thinner than *Spo.*

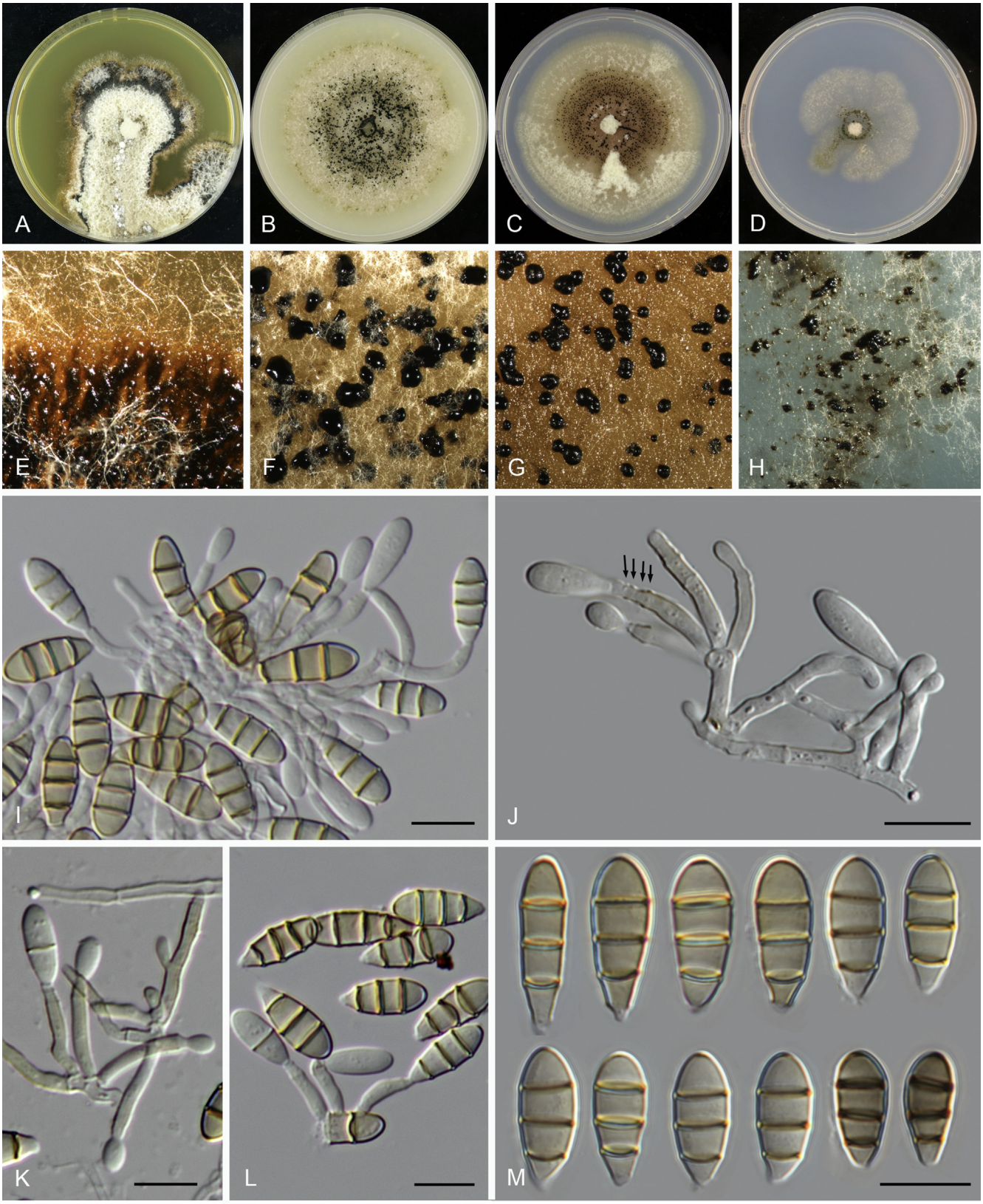

Fig. 79. *Sporocadus rosigena* (CBS 466.96). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–L.** Conidiophores, conidiogenous cells and conidia. **M.** Conidia. Scale bars = 10 µm.

rhododendri (10–15 × 3.5–6.5 µm vs. 15.5–20 × 6.5–8.5 µm). In addition, median cells of *Spo. rosigena* are concolourous and each is ± equal in dimension and wall thickness, while the subapical cell of *Spo. rhododendri* is darker and considerably larger than the rest of the cells (Pirozynski & Shoemaker 1970).

Sporocadus rotundatus F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828419. Fig. 80.

Etymology: Name refers to its rounded ends of the apical conidial cells.

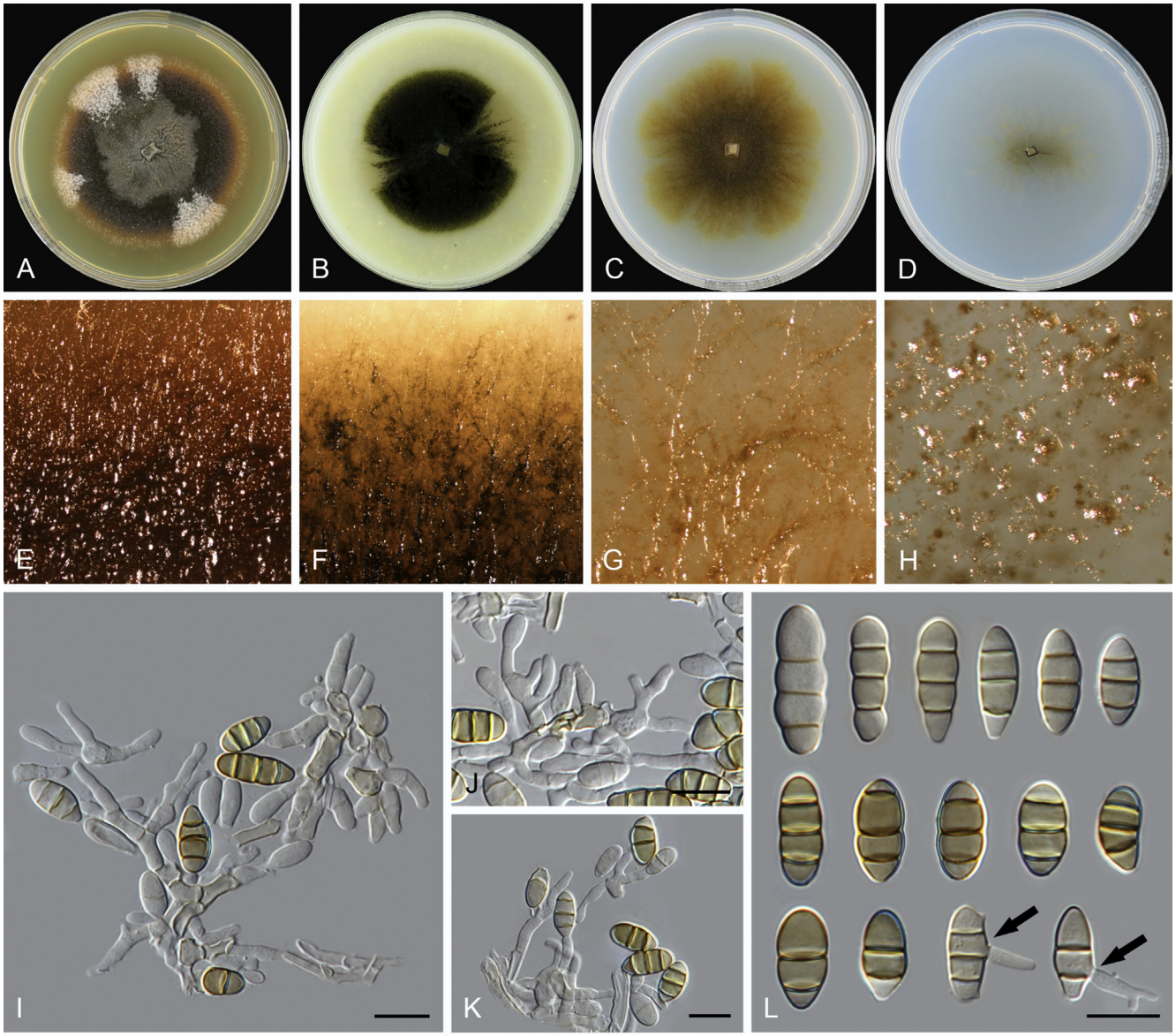

Fig. 80. *Sporocadus rotundatus* (CBS 616.83). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–H.** Conidiomata on MEA, CMA, PDA and SNA, respectively. **I–K.** Conidiophores, conidiogenous cells and conidia. **L.** Conidia (arrows points to the germination pores). Scale bars = 10 µm.

Culture characteristics: Colonies on MEA flat with entire edge, dark vinaceous, reaching 64 mm diam after 14 d at 21 °C, conidiomata acervuli, confluent, superficial, semi-immersed, or immersed; on CMA, flat with entire edge, olivaceous, reaching 56–57 mm diam after 14 d at 21 °C, conidiomata confluent, superficial, semi-immersed, or immersed; on PDA flat with fimbriate edge, smoke grey to citrine, reaching 65–66 mm diam after 14 d at 21 °C, conidiomata brown, superficial or immersed; on SNA flat with rhizoids edge, smoke grey, reaching 33–46 mm diam after 14 d at 21 °C, conidiomata superficial or immersed.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, often reduced to conidiogenous cells, hyaline, smooth. *Conidiogenous cells* discrete or integrated, mostly lageniform, ampulliform, short cylindrical, 3.5–9.5 × 1.5–4 µm (av. = 6.1 ± 1.38 × 2.2 ± 0.66 µm), colourless, smooth, with up to three annellations. *Conidia* varying in shape, clavate, obovoid, ellipsoid, cylindrical with rounded ends, straight, pale brown, 1–4-septate, wall smooth and sometimes constricted at the septa, 9–16.5 × 4.5–7 µm (av. = 12.5 ± 1.61 × 5.7 ± 0.57 µm), lacking appendages; basal cell obtuse, or sometimes obconic with a truncate base, hyaline to pale brown, 1.5–4 µm (av. = 2.6 ± 0.56 µm) long; median cells 1–3, doliiform, pale brown to yellowish brown, ± equal, each 3–4.5 µm (av. = 3.6 ± 0.43 µm) long; apical cell obtuse, not conic, hyaline or concolourous with the median cells, 3.5–7 µm (av. = 5.1 ± 0.75 µm) long in 2-septate conidia, 1.5–3.5 µm (av. = 2.5 ± 0.46 µm) long if more than 2 septa; mean conidium length/width ratio = 2.2:1.

Material examined: **Canada**, Manitoba, The Pas, on *Arceuthobium pussilum* (*Viscaceae*), 25 Jul. 1981, J. Reid (**holotype** CBS H-18002, ex-type culture CBS 616.83).

Notes: *Sporocadus rotundatus* is closely related to *Spo. cotini* (Fig. 2, 99 % sequence similarity on ITS, 93 % on *rpb2*, 92 % on *tef-1α*, 90 % on *tub2*). However, morphologically it differs from *Spo. cotini* by the number of conidial septa (1–4 vs. 3–6), the shape of apical and basal cells (obtuse vs. conic or obconic), and the mean conidium length/width ratio (2.2:1 vs. 2.7:1). This is the first report of *Sporocadus* on *Arceuthobium pussilum*.

Sporocadus sorbi (Wijayaw. *et al.*) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828421.

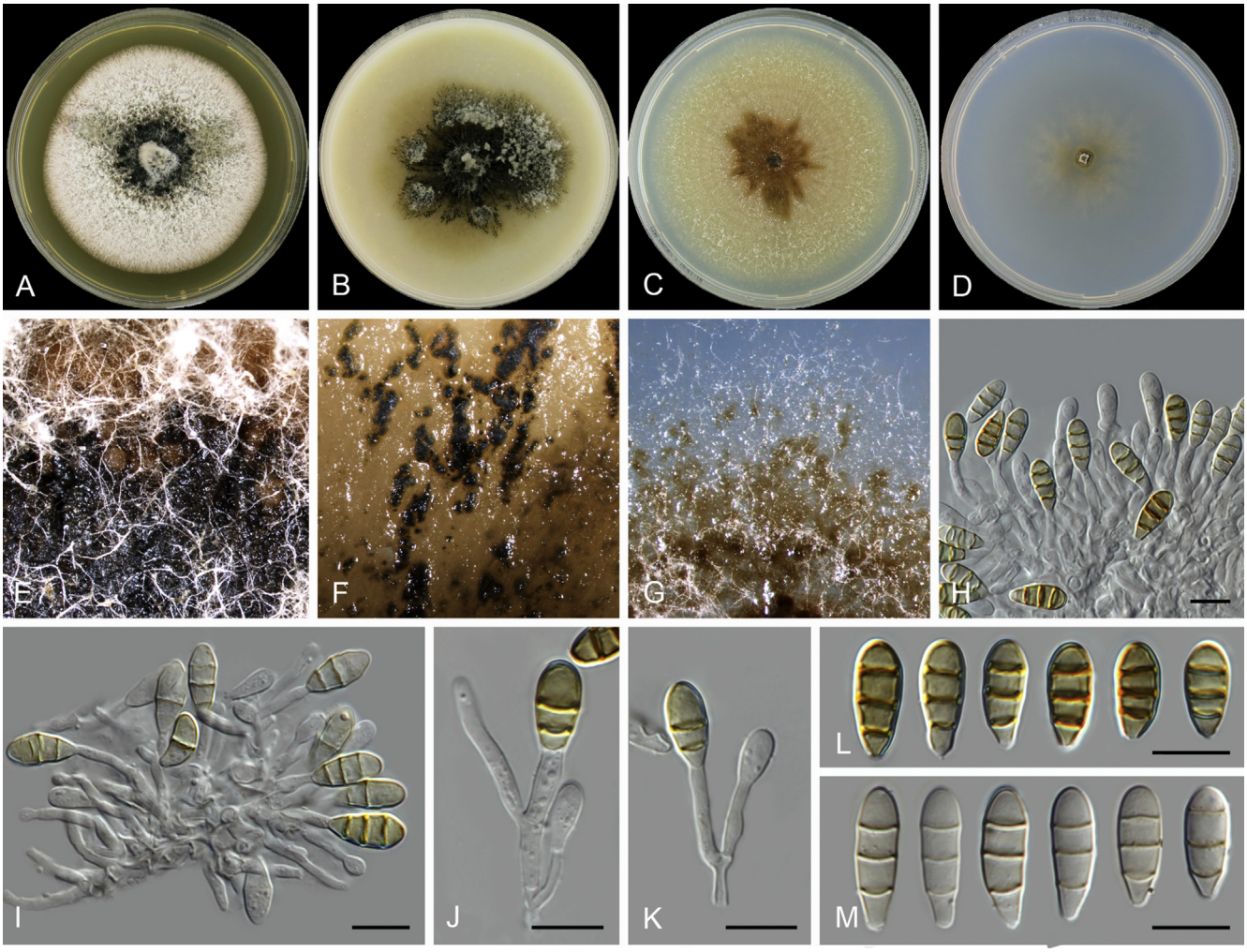

Fig. 81. *Sporocadus* sp. 1 (CBS 506.71). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–G.** Conidiomata on MEA, CMA and SNA, respectively. **H–K.** Conidiophores, conidiogenous cells and conidia. **L.** Mature conidia on CMA. **M.** Immature conidia on SNA. Scale bars = 10 µm.

Basionym: *Seimatosporium sorbi* Wijayaw. *et al.*, Fungal Diversity 75: 154. 2015.

Description: See Ariyawansa *et al.* (2015).

Material examined: **Italy**, Province of Forlì-Cesena [FC], Fiumicello-Premilcuore, on dead leaf of *Sorbus torminalis* (*Rosaceae*), 8 May 2013, E. Camporesi, IT 1233 (**holotype** of *Seimatosporium sorbi* MFLU 15-0744, living cultures MFLUCC 14-0469, not seen). **Unknown location**, host and collection date, S.M. Zeller, living culture CBS 160.25.

Notes: In comparison to the ex-type of *Seimatosporoium sorbi* (MFLUCC 14-0469), CBS 160.25 shows 99 % sequence similarity on ITS and is identical on LSU. As sequences for other loci were not available for MFLUCC 14-0469, we excluded it from the multi-locus phylogenetic analyses.

***Sporocadus* sp. 1** Fig. 81.

Culture characteristics: Colonies on MEA raised with concave edge, black around the inoculation point due to the accumulation of conidiomata, reaching 68–69 mm diam after 14 d at 21 °C; on CMA, flat with undulate edge, black around the inoculation point due to the accumulation of conidiomata, honey-coloured at the edge, with sparse aerial mycelia, reaching 75 mm diam after 14 d at 21 °C, conidiomata distinct or confluent, semi-immersed or immersed; on PDA flat with entire edge, pale luteous, with honey-coloured fimbriate region around the inoculation point, sterile, reaching 80–81 mm diam after 14 d at 21 °C; on SNA fimbriate with rhizoids, colourless to pale brown, reaching 40–43 mm diam after 14 d at 21 °C, conidial masses brown, gregarious or confluent, superficial or immersed.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, colourless, smooth, invested in mucus. *Conidiogenous cells* discrete or integrated, mostly cylindrical or subcylindrical, sometimes ampulliform, 4.5–15.5 × 1–2.5 µm (av. = 10.8 ± 2.6 × 1.9 ± 0.36 µm), colourless, smooth, with up to three annellations. *Conidia* obovoid, straight, mid-brown to brown, mostly 3-septate, occasionally 1–2-septate, wall smooth, sometimes collapsed at septa, 11–15 × 4.5–6.5 µm (av. = 12.9 ± 1 × 5.5 ± 0.49 µm), lacking appendages; basal cell obconic with truncate base, pale brown to brown, concolourous with median cells, 1.5–3.5 µm (av. = 2.8 ± 0.45 µm) long; median cells 1–2, cylindrical, doliiform, pale brown to brown, ± equal length, each 2–4 µm (av. = 3 ± 0.48 µm) long; apical cell obtuse or short-conic with a round apex, concolourous with the median cells, 1.5–4 µm (av. = 3.2 ± 0.59 µm) long in 3-septate conidia, 4–7 µm (av. = 5.7 ± 0.68 µm) long if less than 3-septate; mean conidium length/width ratio = 2.4:1.

Material examined: **Italy**, Sardegna, Cedrino, on *Euphorbia* (*Euphorbiaceae*) dead stems, unknown collection date and collector, isolated by H.A. van der Aa, CBS H-18415, living culture CBS 506.71.

Notes: *Sporocadus* sp. 1 is morphologically similar to the related species *Spo. rosigena*, but only share 97 % sequence similarity

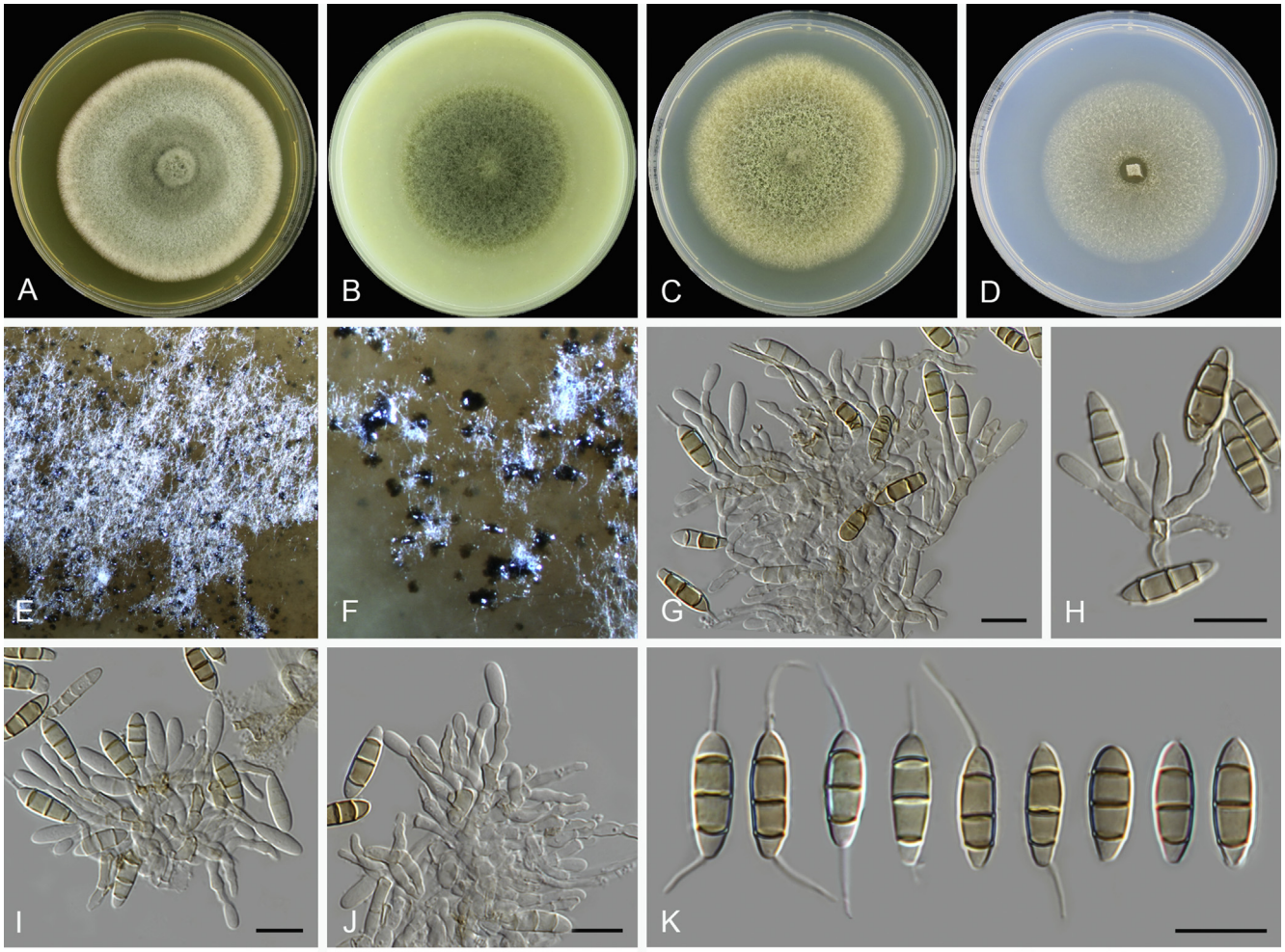

Fig. 82. *Sporocadus trimorphus* (CBS 114203). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–F.** Conidiomata on OA. **G–J.** Conidiophores, conidiogenous cells and conidia. **K.** Conidia. Scale bars = 10 µm.

on *tef-1α* and 95 % on *tub2*. *Sporocadus* sp. 1 is probably a new species, but awaits more collections and further study.

Sporocadus trimorphus F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828422. Fig. 82.

Etymology: Name reflects the three types of conidia, with 0–2 appendages.

Culture characteristics: Colonies on MEA flat with entire edge, glaucous grey to pale greenish grey, reaching 67–68 mm diam after 14 d at 21 °C; on CMA flat with entire edge, pale olivaceous grey, reaching 54–55 mm diam after 14 d at 21 °C; on PDA flat with entire edge, grey to glaucous grey, reaching 67–68 mm diam after 14 d at 21 °C; on SNA pale grey, reaching 56–58 mm diam after 14 d at 21 °C.

Description: Sexual morph: unknown. Asexual morph: Sterile on MEA, CMA, PDA and SNA. On OA, *conidiomata* scattered, gregarious, dark brown or black, superficial or immersed. *Conidiophores* septate, irregularly branched, colourless, smooth. *Conidiogenous cells* integrated, mostly sub-cylindrical, lageniform, ampulliform, 4.5–14 × 1–2.5 µm (av. = 9.1 ± 1.79 × 1.8 ± 0.37 µm), colourless, smooth, with up to three annellations. *Conidia* fusoid or obovoid, straight, mostly 3-septate, occasionally 2- or 5-septate, wall smooth, 10–15 × 3–4.5 µm (av. = 13.3 ± 1.17 × 3.9 ± 0.34 µm), bearing appendages; basal cell obconic with a narrow truncate base, hyaline to pale grey, 1.5–2.5 µm (av. = 2.2 ± 0.3 µm) long; median cells mostly 2, cylindrical, fairly thick-walled and pale brown, ± equal, each 2–5 µm (av. = 4 ± 0.57 µm) long; apical cell conic with an acute to almost acute apex when bearing an apical appendage, otherwise broadly conic with an obtuse apex, colourless or concolourous with median cells, 2–3.5 µm (av. = 2.8 ± 0.45 µm) long; apical appendage lacking or, when present, single, unbranched, attenuated, tubular or flexuous, variable in size, 2–20 µm (av. = 12.7 ± 4.71 µm) long; basal appendage lacking or, when present, unbranched, tubular or flexuous, excentric, 2–15.5 µm (av. = 7.3 ± 3.09 µm) long; mean conidium length/width ratio = 3.4:1.

Material examined: **Sweden**, Uppland, Dalby par., Jerusalem, on *Rosa canina* (*Rosaceae*), 25 Nov. 1987, K.L. Holm (**holotype** CBS H-23551, ex-type culture CBS 114203 = UPSC 2430).

Notes: *Sporocadus trimorphus* is characterised by three types of conidia, i.e. non-appendaged, either apical or basal appendaged, and both apical and basal appendaged conidia. Although it morphologically resembles another *Rosa* related species, *Spo. caudata*, it differs from the latter by the shorter apical (2–20 µm vs. 15–35 µm) and basal (2–15.5 µm vs. 13–30 µm) appendages (Sutton 1963).

Synnemapestaloides T. Handa & Y. Harada, Mycoscience 45: 138. 2004, **emend.** F. Liu, L. Cai & Crous.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* synnematous or sporodochial, determinate, black, not

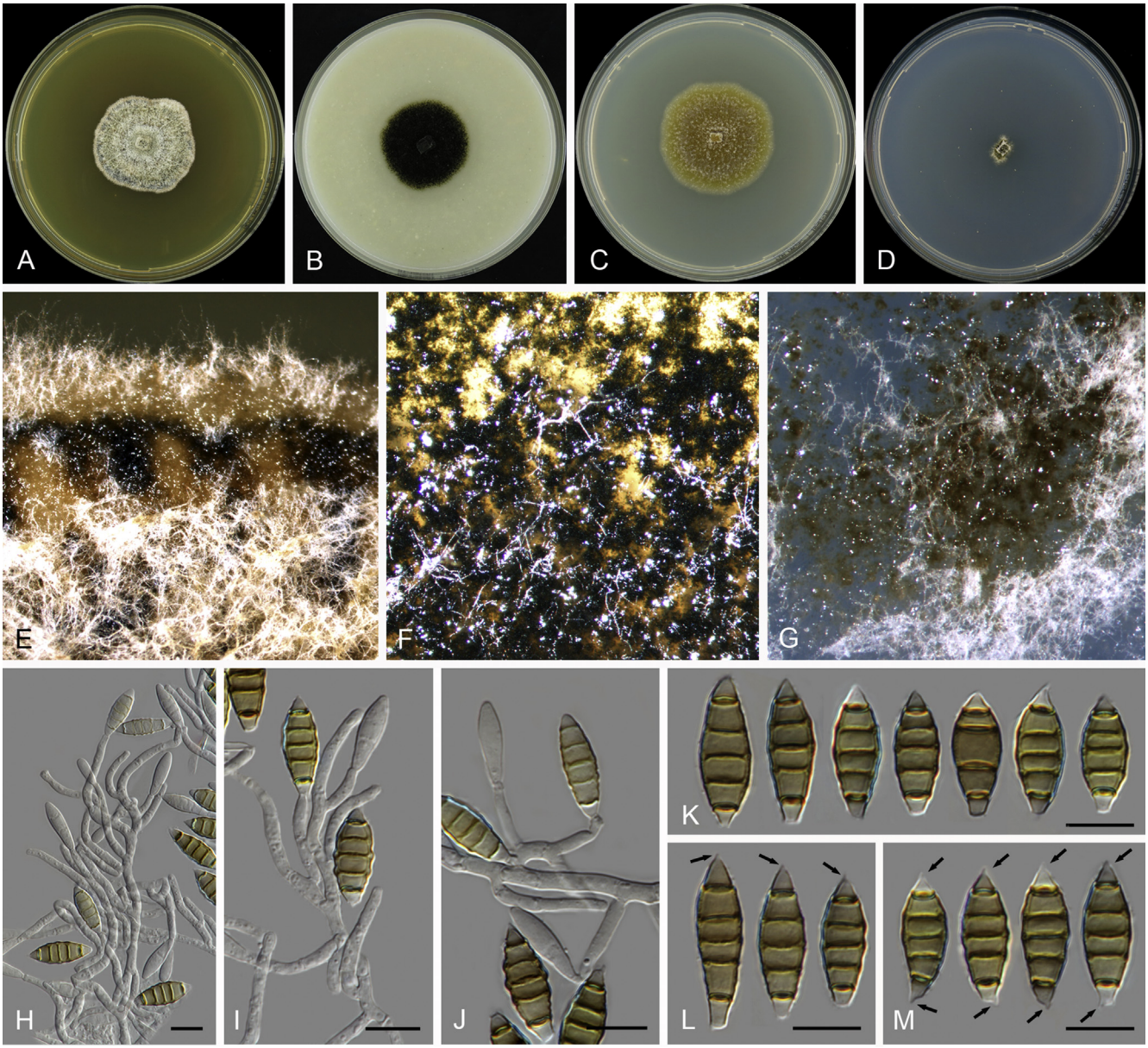

Fig. 83. *Synnemapestaloides juniperi* (CBS 477.77). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E–G.** Conidiomata on MEA, CMA and SNA, respectively. **H–J.** Conidiophores, conidiogenous cells and conidia. **K.** Conidia without appendages. **L.** Conidia with very short apical appendages (arrows). **M.** Conidia with very short apical and basal appendages (arrows). Scale bars = 10 µm.

changing colour in 2 % KOH or 85 % lactic acid, arising from a basal stroma composed of *textura angularis*; hyphae of stipe parallel or those of sporodochia loose; conidial mass black, globose to subglobose, subgelatinous. *Conidiophores* verticillately to sublaterally branched several times. *Conidiogenous cells* cylindrical to subcylindrical with annellations. *Conidia* fusoid with a truncate base, straight, septate, pale olivaceous to pale brown; apical appendage single or absent, when present, unbranched or dichotomously branched; basal appendage single or absent, when present, unbranched or irregularly branched, excentric (emended from Handa *et al.* 2004).

Type species: *Synnemapestaloides rhododendri* T. Handa & Y. Harada.

Notes: Genera with acervular and pycnidial conidiomata are recognised as coelomycetes, while those with sporodochia and synnemata are usually considered as typical hyphomycetes (Seifert *et al.* 2011). However, unlike other pestalotioid fungi which are coelomycetes, with acervular and pycnidial conidiomata, *Synnemapestaloides* produces spores on synnemata and was thus previously regarded to be a hyphomycete (Handa *et al.* 2004, Watanabe *et al.* 2016). So far, *Synnemapestaloides* contains two species, namely *Syn. rhododendri* and *Syn. juniperi*, and it is notable that the short synnemata of *Syn. juniperi* are easily confused with acervuli (Watanabe *et al.* 2016). In addition, apical and basal appendages as illustrated in *Syn. rhododendri* (Handa *et al.* 2004) are not common generic characters, as *Syn. juniperi* is non-appendaged, or produces very short appendages on the end cells (Fig. 83).

Synnemapestaloides juniperi F. Liu, L. Cai & Crous, **sp. nov.** MycoBank MB828423. Fig. 83.

Etymology: Named after its host plant, *Juniperus phoenicea*.

Culture characteristics: Colonies on MEA raised with undulate edge, buff, with white and sparse aerial mycelia, reaching 35 mm diam after 14 d at 21 °C, conidial masses abundant, black, confluent, semi-immersed or immersed, forming circles under

the aerial mycelia; on CMA flat with entire edge, without aerial mycelia, reaching 37–38 mm diam after 14 d at 21 °C, black due to large number of black conidial masses, conidial masses gregarious or confluent, superficial or semi-immersed; on PDA flat with undulate edge, buff to honey, with sparse aerial mycelia, reaching 38–40 mm diam after 14 d at 21 °C, conidial masses brown, confluent, immersed; on SNA hyaline, growing very slowly, reaching 7–8 mm diam after 14 d at 21 °C, conidial masses gregarious or confluent, brown, superficial or semi-immersed.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* septate, branched, colourless, smooth, thin-walled, invested in mucus. *Conidiogenous cells* integrated, mostly subcylindrical, sometimes ampulliform or lageniform, 7–16 × 1.5–2.5 µm (av. = 11.1 ± 2.31 × 2 ± 0.24 µm), colourless, smooth. *Conidia* fusoid, ellipsoidal, straight, mid-brown, 5-septate, occasionally 7-septate, wall smooth or verruculose, without constrictions at the septa, but often collapsed between septa, 16.5–21.5 × 4.5–7.5 µm (av. = 18.7 ± 1.12 × 6.5 ± 0.66 µm), lacking appendages, or with very short appendages (0.5–1 µm); basal cell obconic with a truncate base, periclinal wall thin and colourless in the lower half, becoming thick and progressively darker above, 1–3.5 µm (av. = 2.5 ± 0.47 µm) long; median cells mostly 4, fairly thick-walled, yellowish-brown or mid-brown, doliiform, ± equal, each 2.5–4.5 µm (av. = 3.3 ± 0.51 µm) long; apical cell short-conic with an acute apex, hyaline, 2–3.5 µm (av. = 2.6 ± 0.37 µm) long; mean conidium length/width ratio = 2.9:1.

Material examined: **France**, Alpes Maritimes, Tende, Armacreuse, on *Juniperus phoenicea* (*Cupressaceae*), 1961, E. Müller (**holotype** CBS H-17995, ex-type culture CBS 477.77 = ETH 4611 = NBRC 32676).

Notes: Strain NBRC 32676 is phylogenetically closely related but clearly distinct from *Syn. rhododendri* (Figs 1, 2) based on the multi-locus phylogenetic analyses. Morphologically, NBRC 32676 lacks or produces very short, single and unbranched apical and basal appendages (0.5–1 µm), while the apical appendage of *Syn. rhododendri* is up to 22 µm long, unbranched or dichotomously branched and the basal appendage is up to 5.8 µm long (Handa *et al.* 2004). In addition, the conidia of NBRC 32676 are shorter than those of *Syn. rhododendri* (16.5–21.5 µm vs. 25–32.8 µm). We therefore proposed a new species here as *Syn. juniperi.*

In Watanabe *et al.* (2016), the combination *Synnemapestaloides foliicola* was introduced to accommodate *Sarcostroma foliicola* using strain NBRC 32676 (= CBS 477.77). However, NBRC 32676 was not the ex-type strain of *Seimatosporium foliicola*, and therefore *Syn. foliicola* and *Sar. foliicola* are not listed as synonyms.

Truncatella Steyaert, Bull. Jard. bot. État Brux. 19: 293. 1949, **emend.** F. Liu, L. Cai & Crous

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* stromatic, acervular to pycnidioid, semi-immersed to immersed, erumpent, brown to black; basal stroma of *textura angularis*, cells thin-walled, brown to almost colourless. *Conidiophores* lining the cavity of the conidioma, septate and branched, colourless, smooth, invested in mucus. *Conidiogenous cells* discrete or integrated, cylindrical, subcylindrical to lageniform, colourless, smooth. *Conidia* fusoid, euseptate; basal cell obconic with a truncate base, thin-walled, colourless to pale brown; median cells doliiform to subcylindrical, wall thick, with or without constrictions at the septa, smooth or verruculose, brown to dark brown, concolourous; apical cell conic, thin-walled, colourless or almost colourless; apical appendages unbranched or irregularly branched, filiform, attenuated, flexuous; basal appendage absent.

Type species: *Truncatella angustata* (Pers.) S. Hughes [= *Tru. truncata* (Lév.) Steyaert].

Notes: *Truncatella* was proposed by Steyaert (1949) for the group of species known as *Pestalotia* sect. Quadriloculatae by Guba (1961), and is typified by *Tru. angustata* (syn. *Tru. truncata*). However, recent phylogenetic analyses indicated that *Trucatella* might be polyphyletic (Jeewon *et al.* 2002, Li *et al.* 2015, Senanayake *et al.* 2015). In this study, truncatella-like species were separated into two clades, representing *Truncatella* and *Heterotruncatella*, being closely related to genera with a single appendage (e.g. *Morinia* and *Hymenopleella*, Figs 1, 7). The generic type of *Truncatella* was epitypified and characterised with both molecular and morphological data, and other *Truncatella* species included in this study were transferred to *Heterotruncatella*.

The sexual morph of *Truncatella* was presumed to be *Broomella* (Shoemaker *et al.* 1989, Nag Raj 1993). However, the asexual morphology of the generic type species *Bro. vitalbae* differs from *Truncatella* spp. in the conidial shape and appendage numbers (Li *et al.* 2015). Further phylogenetic analyses indicated that although *Bro. vitalbae* and *Tru. angustata* cluster in a main clade (94 % sequence similarity in ITS, 88 % on *rpb2*, 88 % on *tef-1α*, and 74 % on *tub2*), they were intermixed with the genera *Hyalotiella* and *Diversimediispora* (Fig. 7). Therefore, *Truncatella* and *Broomella* should be retained as distinct genera.

Truncatella angustata (Persoon : Link) Hughes, Canad. J. Bot. 36: 822. 1958, **emend.** F. Liu, L. Cai & Crous. Figs 84, 85.
Basionym: *Stilbospora angustata* Persoon, Syn. meth. fung. (Göttingen) 1: 96. 1801.
Synonyms: *Stilbospora angustata* Persoon : Link, Linn. Spec. Pl. IV, 6(2): 95. 1824.
Sporidesmium angustatum (Persoon : Link) Corda, in Sturm's deutschl. Fl. III (Pilze), 2(7): 49. 1829.
Pestalotia truncata Lév., Annls Sci. Nat., Bot., sér. 3 5: 285. 1846.
Truncatella truncata (Lév.) Steyaert, Bull. Jard. bot. État Brux. 19: 295. 1949.
Pestalotia hartigii Tubeuf, Beiträge zur Kenntniss der Baumkrankheiten: 40. 1888.
Truncatella hartigii (Tubeuf) Steyaert, Bull. Jard. bot. État Brux. 19: 298. 1949.
Monochaetia rosenwaldii Khaz. [as 'rosenwaldia'], J. Agric. Res., Washington 26: 56. 1923.
Pestalotia ramulosa J.F.H. Beyma [as 'Pestalozzia'], Centbl. Bakt. ParasitKde, Abt. II 88: 140. 1933.
Truncatella ramulosa (J.F.H. Beyma) Steyaert, Bull. Jard. bot. État Brux. 19: 295. 1949.

Culture characteristics: Colonies on MEA flat with entire edge, white to pale grey, reaching 63–64 mm diam after 7 d at 21 °C, conidiomata black, gregarious, semi-immersed, stromatic, covered by aerial mycelia; on CMA flat with entire edge, off-white to grey, reaching 49 mm diam after 7 d at 21 °C, conidiomata black, scattered to gregarious, stromatic, semi-immersed or immersed; on PDA flat with entire edge, pale grey, reaching 71–74 mm diam after 7 d at 21 °C, conidiomata pale brown,

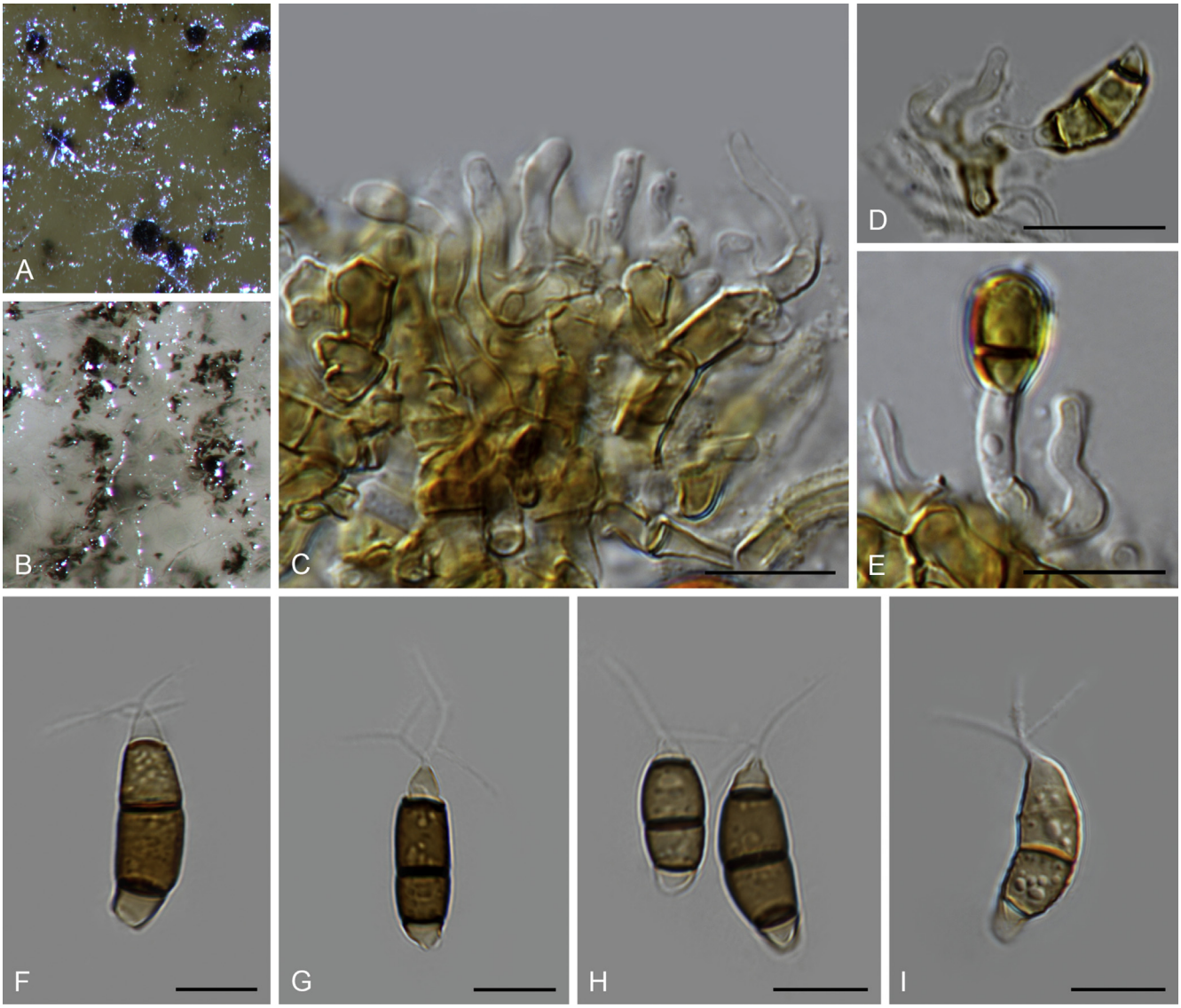

Fig. 84. *Truncatella angustata* (CBS 338.32). **A.** Conidiomata on OA. **B.** Conidial masses on SNA. **C–E.** Conidiophores and conidiogenous cells. **F–I.** Conidia. Scale bars = 10 µm.

scattered, covered by aerial mycelia, semi-immersed or immersed, stromatic, acervular; on SNA flat with entire edge, pale grey, reaching 44–46 mm diam after 7 d at 21 °C, conidiomata black, scattered, superficial or immersed, acervular.

Description: Sexual morph: unknown. Asexual morph: *Conidiophores* lining the cavity of the conidioma, septate and branched, colourless, smooth. *Conidiogenous cells* discrete or integrated, cylindrical to lageniform, colourless, smooth. *Conidia* fusoid, straight or occasionally slightly curved, mostly 3-septate, occasionally 4-septate, smooth, not constricted at the septa, 15–22.5 × 5.5–8 µm (av. = 18.6 ± 1.72 × 7 ± 0.53 µm); basal cell obconic with a truncate base, fairly thick-walled, hyaline to pale brown, 1.5–3.5 µm (av. = 2.3 ± 0.46 µm) long; median cells 2, doliiform, pale to mid-brown, thick-walled, together 11–15 µm (av. = 13 ± 0.98 µm) long, ± equal, each 5.5–7.5 µm (av. = 6.6 ± 0.68 µm) long; apical cell conic, thin-walled, hyaline, 2–4.5 µm (av. = 3.2 ± 0.67 µm) long; 2–4 apical appendages, centric, attenuated, flexuous, branched, 11–26 µm (av. = 18.8 ± 3.5 µm) long; basal appendage absent; mean conidium length/width ratio = 2.7:1.

Materials examined: **America**, on *Prunus armeniaca* (*Rosaceae*), unknown collection date, A. Khazanoff, **ex-syntype** culture of *Monochaetia rosenwaldii* Khaz. CBS 165.25 = NBRC 32688. **Chile**, Valdivia, on *Gevuina avellana* (*Proteaceae*) necrotic spots on leaves, Jun. 1980, H. Peredo, living culture CBS 393.80. **Germany**, Bavaria spessart, on *Picea abies* (*Pinaceae*), 1892?, V. Tubeuf, probably **ex-type** culture of *Pestalotia hartigii* CBS 113.11 [according to Steyaert (1949)]. **France**, on *Vitis vinifera* "*Prunelard*" (*Vitaceae*) rootstock, 1 Jan. 2012, P. Larignon, living culture CPC 21354; on *Vitis vinifera* "*Prunelard*" rootstock, 1 Jan. 2012, P. Larignon, living culture CPC 21366; on *Vitis vinifera* "*Prunelard*" rootstock, 1 Jan. 2012, P. Larignon (**neotype of *Stilbospora angustata* designated here** CBS H-23508, MBT384088, ex-neotype culture CBS 144025 = CPC 21359). **Netherlands**, on *Lupinus* (*Fabaceae*) leaf, unknown collection date, F.H. van Beyma (**holotype** of *Pestalotia ramulosa* CBS H-7543, ex-type culture CBS 338.32); Baarn, garden Eemnesserweg 90, on *Prunus laurocerasus* (*Rosaceae*) fallen leaves, 8 Jul. 1970, H.A. van der Aa, living culture CBS 938.70; Nijmegen, on food, unknown collection date, Keuringsdienst van Waren, living culture CBS 208.80. **Spain**, on decaying bark, 20 Jul. 1996, R.F. Castañeda, living culture CBS 135.97 = INIFAT C96/109. **Switzerland**, from *Heterodera carotae* cyst egg mas on *Daucus carota*, unknown collection date and collector, isolated by A. Papert, living culture CBS 642.97; Wädenswil, Eidgenössische Forsungsanstalt f. Obst-, Wein- u. Gartenbau, on *Pyrus malus* (*Rosaceae*, diseased apple tree), Jul. 1976, R. Grimm, living culture CBS 564.76. **Turkey**, Izmir, soil, unknown collection date, T. Mahmood, living culture CBS 398.71; on rhizosphere of *Gossypium* sp. (*Malvaceae*), unknown collection date and collector, deposited by K. Türkoglu in Mar. 1977, living culture CBS 231.77 = CBS 296.77. **UK**, Hampshire, Bramshill Nursery, on *Picea abies* (*Pinaceae*), unknown collection date and collector, isolated by F.R. Peace on 23 Oct. 1949, living culture CBS 443.54. **USA**, Alaska, tundra soil, unknown collection date, K. Tubaki, living culture CBS 591.66 = ATCC 18162 = NBRC

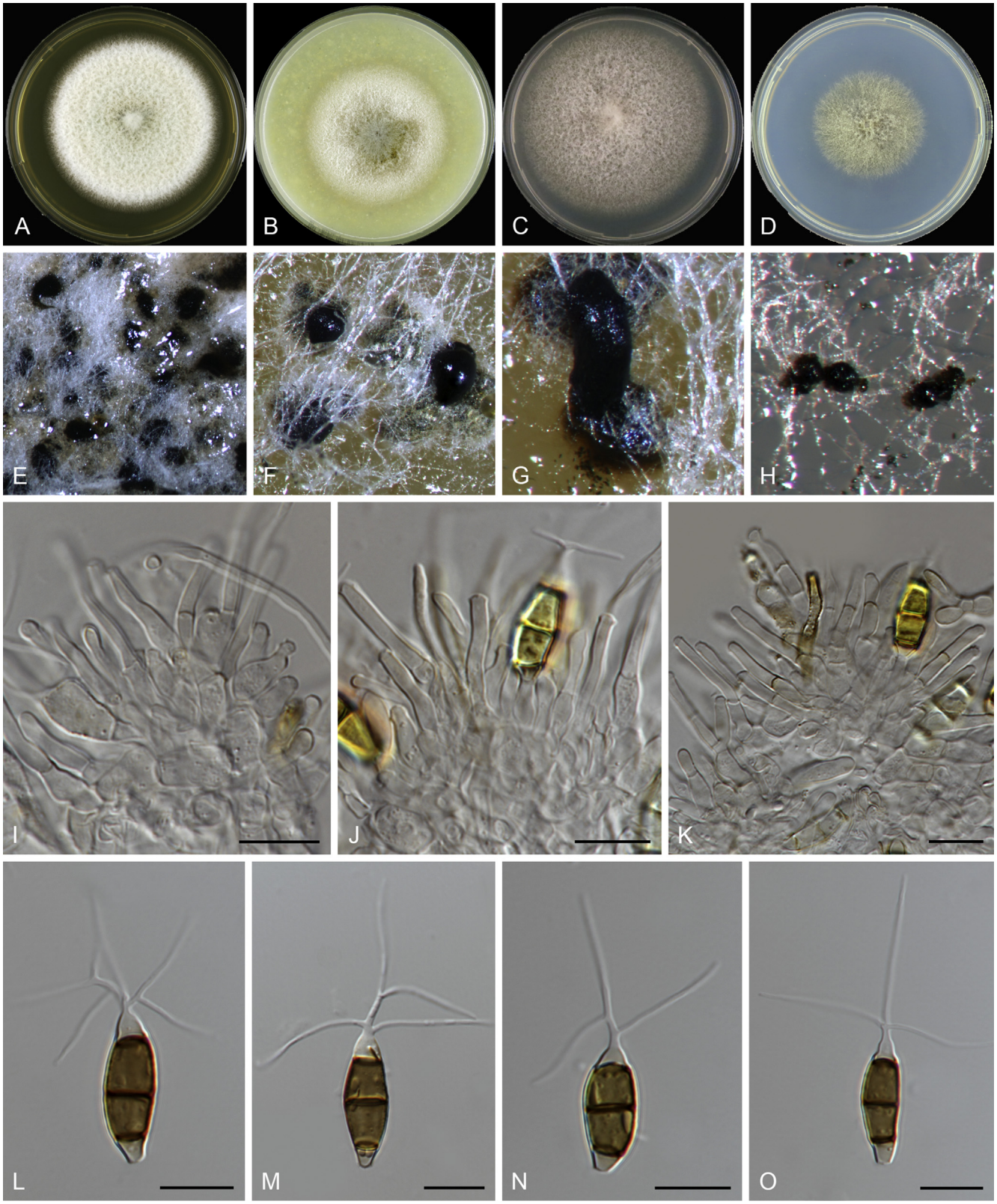

Fig. 85. *Truncatella angustata* (CBS 144025/CPC 21359). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidiomata on MEA. **F–G.** Conidiomata on CMA. **H.** Conidiomata on SNA. **I–K.** Conidiophores and conidiogenous cells. **L–O.** Conidia. Scale bars = 10 µm.

8584. **Unknown location**, on *Prunus* (*Rosaceae*) wood, unknown collection date, R.M. Nattrass, No. 284, **representative** culture of *Tru. truncata* CBS 356.33 (according to Steyaert 1949); on *Salix* sp. (*Salicaceae*) or *Thuja* sp. (*Cupressaceae*)?, unknown collection date, R. Bouillenne, CBS H-15693, living culture CBS 449.51.

Notes: The sanctioned name *Stilbospora angustata* was incorporated in Persoon (1801) with a very brief description and no other collection data. Later, it was transferred to *Truncatella* (Hughes 1958). The holotype was probably collected by Persoon in Europe, and preserved in L (L910264-703, Nag Raj 1993), which unfortunately could not be located from the herbarium in this study. We therefore designate CBS H-23508 as neotype to stabilise the application of the generic type species *Tru. angustata*, because of its morphological similarity, and the description and illustration of *Tru. angustata* provided in Nag Raj (1993), which is the concept commonly applied to this genus.

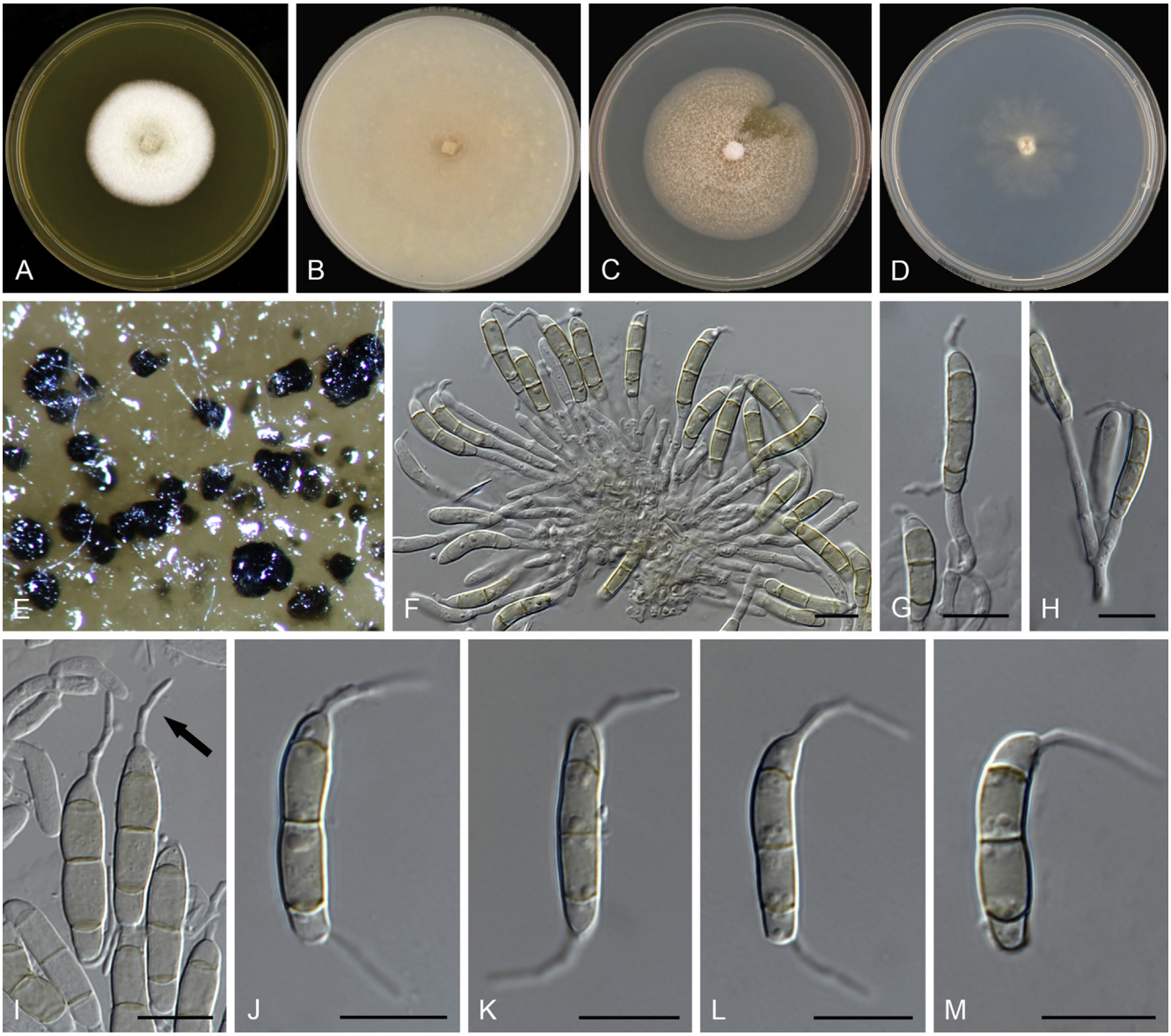

Fig. 86. *Xenoseimatosporium quercinum* (CBS 129171). **A–D.** Colonies on MEA, CMA, PDA and SNA, respectively. **E.** Conidiomata on OA. **F–H.** Conidiophores and conidiogenous cells. **I–M.** Conidia (arrow points to the rough appendage). Scale bars = 10 µm.

Based on the multi-locus phylogenetic analyses (Figs 1, 7), the type cultures of *Pestalotia hartigii*, *Pestalotia ramulosa*, *Monochaetia rosenwaldii*, and *Tru. truncata* clustered together with *Tru. angustata*, which were therefore synonymised in this study.

Xenoseimatosporium F. Liu, L. Cai & Crous, **gen. nov.** MycoBank MB828424.

Etymology: *Xeno* = ξένος in Greek, alien, distinct; *seimatosporium* = *Seimatosporium*-like conidia.

Description: Sexual morph: unknown. Asexual morph: *Conidiomata* acervular, stromatic, scattered or gregarious, semi-immersed or immersed, sometimes erumpent, globose to subglobose, dark brown to black. *Conidiophores* arising from the base of the cavity, septate, branched at the base, mostly reduced to conidiogenous cells, colourless, smooth. *Conidiogenous cells* annellidic, cylindrical, subcylindrical, or lageniform, colourless, smooth. *Conidia* allantoid, subcylindrical, straight or curved, 3-septate, smooth, sometimes constricted at septa; basal cell globose, trapezoid, sub-cylindrical, or obconic with a truncate base, thin-walled, hyaline; median cells cylindrical, colourless, thin-walled; apical cell conical, hyaline; apical appendage single, not smooth, ragged, unbranched; basal appendage absent or single, when present, not smooth, ragged, unbranched.

Type species: *Xenoseimatosporium quercinum* (Goonas. *et al.*) F. Liu, L. Cai & Crous

Notes: *Xenoseimatosporium* is phylogenetically basal to *Allelochaeta* and *Sarcostroma* (Figs 1, 2), and shows distinct conidial morphology from these two genera. The conidia of *Allelochaeta* are generally falcate to elongate-fusoid, 6–24 times as long as their width, with a beak-like apical cell, and the basal cell carries a short exogenous appendage (Swart & Williamson 1983, Nag Raj 1993). *Sarcostroma* is characterised by fusoid conidia, bearing an attenuated, filiform and smooth apical appendage and excentric basal appendage (Nag Raj 1993). *Xenoseimatosporium* differs from *Allelochaeta* in producing filiform apical and basal appendages, and from *Sarcostroma* by producing subcylindrical or allantoid conidia and ragged appendages.

Xenoseimatosporium quercinum (Goonas. *et al.*) F. Liu, L. Cai & Crous, **comb. nov.** MycoBank MB828425. Fig. 86.

Basionym: *Seimatosporium quercinum* [as '*quercina*'] Goonas. *et al.*, Phytotaxa 255: 244. 2016.

Culture characteristics: Colonies on MEA flat with entire edge, white at outside region, pale grey at centre, sterile, reaching 42 mm diam after 14 d at 21 °C; on CMA, flat with entire edge, colourless, sterile, reaching 48–50 mm diam after 14 d at 21 °C; on PDA flat with entire edge, white to grey, sterile, reaching 55–57 mm diam after 14 d at 21 °C; on SNA radially striate with fimbriate edge, colourless, sterile, reaching 38–40 mm diam after 14 d at 21 °C.

Description (*On OA*): Sexual morph: unknown. Asexual morph: *Conidiomata* black, scattered or gregarious, semi-immersed or immersed, stromatic, sometimes erumpent. *Conidiophores* septate, reduced to conidiogenous cells, colourless, smooth. *Conidiogenous cells* annellidic, discrete, cylindrical, sub-cylindrical, or lageniform, 3–9.5 × 1.5–3.5 µm (av. = 5.9 ± 1.23 × 2.2 ± 0.5 µm), colourless, smooth. *Conidia* allantoid, subcylindrical, straight or curved, 2–4-septate, mostly 3-septate, smooth, sometimes slightly constricted at septa, 14.5–30 × 3.5–6.5 µm (av. = 18.2 ± 3.07 × 4.5 ± 0.72 µm); basal cell trapezoid, sub-cylindrical, thin-walled, hyaline, 2–5.5 µm (av. = 3.4 ± 0.67 µm) long; median cells mostly 2, cylindrical, colourless, thin-walled, ± equal length, each 5.5–9 µm (av. = 7 ± 0.71 µm) long; apical cell conic with an acute or rounded apex, sometimes inflated wider than other cells, hyaline, 2.5–6.5 µm (av. = 4.2 ± 0.84 µm); apical appendage single, not attenuated, not smooth, ragged, unbranched, 8.5–20 µm (av. = 13.4 ± 2.34 µm); basal appendage 0–1, when present not smooth, ragged, unbranched, 4–16.5 µm (av. = 12.1 ± 2.76 µm) long; mean conidium length/width ratio = 4:1.

Materials examined: **Germany**, on hornbeam wood (*Carpinus* sp.), elev. = 40 m, on *Quercus robur* (Fagaceae) twig, attached on a freshly fallen branch, 23 Feb. 2014, R.K. Schumacher. 23.02.2014-028 (**holotype** of *Seimatosporium quercinum* MFLU 15-0760, ex-type living culture MFLUCC 14-1198 = KUMCC 16-0005, not seen). **Latvia**, Riga, on *Rhododendron* sp. (*Ericaceae*), unknown collection date, I. Apine, CBS H-23559, living culture CBS 129171 = MSCL 1034.

Notes: This species was originally described as *Seimatosporium quercinum* (as "*quercina*") (Goonasekara *et al.* 2016). However, in our phylogenetic analysis it is clearly distinct from *Seimatosporium* s. str. and other genera (Figs 1, 2). Therefore, a new genus and combination is introduced to accommodate this species. *Xenoseimatosporium* differs from *Seimatosporium* in producing allantoid and subcylindrical conidia and having ragged appendages.

DISCUSSION

Assessment of *Sporocadaceae*

The rDNA sequence data (ITS and LSU) were insufficient to subdivide *Sporocadaceae* as previously proposed, namely *Amphisphaeriaceae* (Winter 1885), *Bartaliniaceae* (Senanayake *et al.* 2015), *Discosiaceae*, *Pestalotiopsidaceae*, *Phlogicylindriaceae* (Senanayake *et al.* 2015) and *Robillardaceae* (Crous *et al.* 2015), as these clades clustered on short branches and were not well supported statistically (Senanayake *et al.* 2015), even when *rpb2* sequence data were added to the dataset (Fig. 1). Furthermore, as these fungi have common asexual morphological characters, being asexual acervular coelomycetes (except *Synnemapestaloides*) with similar modes of conidiogenesis and conidia, it is more reasonable to treat these appendaged coelomycetous fungi as a single family. Therefore, based on the multi-locus data and morphological similarities presented here, the family concept *Sporocadaceae* in *Xylariales* is the earliest available and most appropriate name for the above-mentioned families.

Generic realtionships

The intergeneric relationships have been subject to multiple rearrangements in the past decades, due to different generic concepts, plastic and variable morphological characters and inadequate molecular data (Steyaert 1949, Guba 1961, Sutton 1980, Nag Raj 1993, Kang *et al.* 1998, Jeewon *et al.* 2002, Barber *et al.* 2011, Tanaka *et al.* 2011, Jaklitsch *et al.* 2016). Some generic complexes in *Sporocadaceae*, such as *Pestalotiopsis-Truncatella-Morinia* and *Seimatosporium-Sarcostroma-Diploceras*, that possess similar morphological characters of conidia and appendages, caused difficulties in the intergeneric classification. In addition, the limited sampling of the majority of genera, unavailability of generic type-derived sequences and poorly constructed phylogenies based on too few or largely incomplete datasets also contributed to the contradictions of generic delimitation. The morphological characters, phylogenetic relationships and classification history of these genera have been partially discussed by Nag Raj (1993), Jeewon *et al.* (2002, 2003b) and Jaklitsch *et al.* (2016), and will not be repeated here.

The application of multi-locus phylogenetic analyses combined with morphology have provided valuable insights in establishing natural classification at the intergeneric level, and helped to clarify morphological ambiguities. To infer a natural classification system of *Sporocadaceae*, we carried out a more comprehensive analysis of this group based on a hitherto most complete sequence dataset consisting of five loci (ITS, LSU, *rpb2*, *tub2*, *tef-1α*; Table 1). Most genera treated here are based on their generic types, including those typified in this study (e.g. *Diploceras*, *Discosia*, *Monochaetia*, *Sporocadus*, *Truncatella*), which enabled us to define the diagnostic generic characters and propose taxonomic revision more objectively.

Our results resolved 30 well supported monophyletic clades, representing 30 genera (Figs 1, 2, 4, 7). The genus *Seimatosporium* and some of its purported synonyms (e.g. *Diploceras*, *Disaeta*, *Sporocadus*, *Sarcostroma*, and *Allelochaeta*) formed distinct lineages (Fig. 1), which is generally congruent with the morphological hypotheses of Nag Raj (1993). We therefore resurrect some of these generic names.

This study also provides an interpretation of the utility of morphological characters to determine generic delineations, including pigmentation, septation and wall annotation of median cells, position of appendages with respect to the apical and basal cells, as well as number and branching pattern of apical appendages. For instance, ***Seiridium*** generally produces 5-distoseptate conidia with a single centric apical and single excentric basal appendage. ***Sporocadus*** is generally characterised by non-appendaged, 3-septate conidia. ***Seimatosporium*** includes species producing 3–4-septate conidia with a single centric apical and excentric basal appendages or lack of an apical or basal appendage. ***Sarcostroma*** usually produces 5-septate conidia with undulate or verruculose walls. ***Monochaetia*** is characterised by a single centric apical appendage and single centric basal appendage (if present). The conidia of

Nonappendiculata and ***Distononappendiculata*** are 3-septate and lack appendages, but conidia of the former genus are distoseptate, and euseptate in the latter. Both ***Truncatella*** and ***Heterotruncatella*** have 3-septate conidia with pigmented median cells, but *Heterotruncatella* generally has three unbranched apical appendages.

Heterotruncatella, Hymenopleella and Morinia

The most equivocal generic concepts in the present study are *Heterotruncatella*, *Hymenopleella* and *Morinia*, which are heterogeneous with respect to conidial morphology. *Heterotruncatella* encompasses fungi producing 3-septate conidia and generally with three unbranched apical appendages. However, the generic type strain of *Het. lutea*, residing in the basal lineage of *Heterotruncatella*, produces a single apical appendage or tubular and attenuated appendage that continues with the conidium body. *Morinia pestalozzioides* and *Mor. longiappendiculata* are characterised by appendage-bearing muriform conidia (Collado *et al.* 2006), while the conidia of *Mor. crini* and *Mor. acaciae* (syn. *Zetiasplozna acaciae*) only have transverse septa. As for *Hymenopleella*, the terminal branches are considerably longer than the basal branch in the phylogenetic tree (Figs 1, 7). Morphologically, the ascospores of *Hym. lakefuxianensis* are muriform (Jeewon *et al.* 2003a), while they are transversely septate in other species of *Hymenopleella.*

Truncatella and related genera

Truncatella appeared to be polyphyletic, and a new genus is introduced here as *Heterotruncatella* (Figs 1, 7). Both genera are morphologically comparable to *Pestalotiopsis* in producing 3-septate conidia with two pigmented median cells and branched or unbranched apical appendages. However, they are more closely related to *Hymenopleella*, *Morinia*, *Bartalinia*, *Parabartalinia* and *Pseudosarcostroma*, and each genus possesses clear distinguishing characters. Although Jaklitsch *et al.* (2016) recommended that *Truncatella* should be synonymised with *Broomella* based on the close relatedness of their generic types and nomenclatural priority, our expanded datasets resolved these clades as distinct genera (Figs 1, 7).

Utility of morphological characters—Appendages

Nag Raj (1993) listed 11 types of appendages, of which most genera in *Sporocadaceae* possess type A: "*Cellular; formation of conidium body precedes formation of appendages; appendage(s) attenuated or filiform, simple or branched, nucleate or enucleate, volume of lumen not altered by centripetal thickening of appendage wall*". Among genera examined in this study, appendages vary in number, origin, position, number of branches and the branching patterns. Such distinct features have been employed in the past to differentiate taxa at both generic and species level (Nag Raj 1993), and have been proven appropriate and useful in delineating certain genera. For example, *Bartalinia* and *Hyalotiella* differ from other genera in possessing branched appendages that tend to be dichotomous (Fig. 8); both apical and basal appendages of *Discosia* are excentric and inserted in the median part of the end cells. The apical appendages of *Parabartalinia* are comparable to *Bartalinia* and *Hyalotiella*, but differ from these two genera in the point of attachment or origin of these appendages.

The presence or absence of conidial appendages was considered an important taxonomic character in separating *Seimatosporium* and *Sporocadus* (Brockmann 1976, Nag Raj 1993); however, this morphological distinctness was not congruent with the ITS / LSU phylogeny (Barber *et al.* 2011). In the present study, the grouping of fungi from both genera based on an expanded dataset with more loci in the phylogenetic analyses (Figs 1, 2) is in agreement with the morphology-based grouping. The striking similarity between the original morphology-based grouping and the grouping based on multigene phylogenetic analyses highlights the significance of morphological characters and also reflects the excellent work by mycologists (e.g. Nag Raj) predating the use of molecular data.

The number of conidial appendages is not phylogenetically significant in coelomycetes in general (Crous *et al.* 2012), nor in the *Sporocadaceae*. Genera with a single apical and basal appendage are scattered throughout Clades 1–3 (Fig. 1), including *Broomella*, *Disaeta*, *Discosia*, *Immersidiscosia*, *Monochaetia*, *Monochaetinula*, *Pseudosarcostroma*, *Sarcostroma*, *Seiridium* and are intermingled with genera that lack appendages (*Distononappendiculata*, *Nonappendiculata*, *Sporocadus*) or with 2–7 appendages (e.g. *Truncatella*, *Pestalotiopsis*, *Morinia*). This indicates that the number of appendages may have evolved more than once among these genera, similar to the number of conidial septa or pigmentation (Crous *et al.* 2018).

CONCLUSIONS

The present study supports the *Sporocadaceae* as a well-defined family in the *Xylariales* (*Sordariomycetes*). Thirty genera are delimited in *Sporocadaceae* based on phylogenetic analyses and morphological comparison, which is generally congruent with the classification system proposed by Nag Raj (1993) prior to the DNA phylogeny era. A total of 51 new species, one *nomina nova* and 15 new combinations are proposed in this study. Although the type species of five genera have been reliably identified and typified to fix their taxonomic position, the phylogeny of several other genera, e.g. *Disaeta* and *Sarcostroma*, remain unresolved pending further collections.

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