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Reconsideration of species boundaries and proposed DNA barcodes for *Calonectria*

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Abstract: *Calonectria* represents a genus of phytopathogenic ascomycetous fungi with a worldwide distribution. In recent years, there has been an increase in the number of taxonomic studies on these fungi. Currently, there are 169 described species of *Calonectria* based on comparisons of DNA sequence data, combined with morphological characteristics. However, for some of these species, the sequence data utilised at the time of their description were relatively limited. This has justified an urgent need to reconsider the species boundaries for *Calonectria* based on robust genus-wide phylogenetic analyses. In this study, we utilised 240 available isolates including the ex-types of 128 *Calonectria* species, and re-sequenced eight gene regions (*act*, *cmdA*, *his3*, ITS, LSU, *rpb2, tef1* and *tub2*) for them. Sequences for 44 *Calonectria* species, for which cultures could not be obtained, were downloaded from GenBank. DNA sequence data of all the 169 *Calonectria* species were then used to determine their phylogenetic relationships. As a consequence, 51 species were reduced to synonymy, two new species were identified, and the name *Ca. lauri* was validated. This resulted in the acceptance of 120 clearly defined *Calonectria* spp. The overall data revealed that the genus includes 11 species complexes, distributed across the Prolate and Sphaero-Naviculate Groups known to divide *Calonectria*. The results also made it possible to develop a robust set of DNA barcodes for *Calonectria* spp. To accomplish this goal, we evaluated the outcomes of each of the eight candidate DNA barcodes for the genus, as well as for each of the 11 species complexes. No single gene region provided a clear identity for all *Calonectria* species. Sequences of the *tef1* and *tub2* genes were the most reliable markers; those for the *cmdA*, *his3*, *rpb2* and *act* gene regions also provided a relatively effective resolution for *Calonectria* spp., while the ITS and LSU failed to produce useful barcodes for species discrimination. At the species complex level, results showed that the most informative barcodes were inconsistent, but that a combination of six candidate barcodes (*tef1*, *tub2*, *cmdA*, *his3*, *rpb2* and *act*) provided stable and reliable resolution for all 11 species complexes. A six-gene combined phylogeny resolved all 120 *Calonectria* species, and revealed that *tef1*, *tub2*, *cmdA*, *his3*, *rpb2* and *act* gene regions are effective DNA barcodes for *Calonectria*.

Key words: *Cylindrocladium*, DNA barcoding, Multi-gene phylogeny, Plant pathogens, Taxonomy.
Taxonomic novelties: New species: *Calonectria lauri* Lechat & Crous, *Ca. lombardiana* Q.L. Liu & S.F. Chen, *Ca. pauciphialidica* Q.L. Liu & S.F. Chen.

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INTRODUCTION

The genus *Calonectria* (*Hypocreales*, *Nectriaceae*) includes many aggressive plant pathogens and species that are broadly distributed in sub-tropical and tropical regions of the world. These species have a wide host range that includes more than 335 plant species (Crous 2002) and they are commonly collected from soils, leaves, stems, roots and fruits (Lombard *et al.* 2010a, 2015a, Chen *et al.* 2011, Alfenas *et al.* 2015, Gehesquiere *et al.* 2015, Li *et al.* 2017, Lopes *et al.* 2017, Marin-Felix *et al.* 2017, Jiang *et al.* 2019, Pham *et al.* 2019). A total of 169 species have been described in *Calonectria* (*Ca.*) using DNA sequence-based phylogenetic inference and morphological comparisons (Li *et al.* 2017, Marin-Felix *et al.* 2017, Pham *et al.* 2019).

Many species of *Calonectria* are well-known causal agents of important diseases on various agricultural, horticultural and forestry crops. Species such as *Ca. pseudonaviculata* and *Ca. henricotiae* are important agents of boxwood (*Buxus* spp.) blight in Germany, the Netherlands, Slovenia, UK and USA (Henricot & Culham 2002, Brand 2005, Gehesquiere *et al.* 2015, Daughtrey 2019, Freitas *et al.* 2019). Many species such as *Ca. pentaseptata* (in China and Vietnam, Crous *et al.* 2012, Li *et al.* 2017), *Ca. pteridis* (in Brazil, Freitas *et al.* 2019), *Ca. reteaudii* (in Australia, India and Vietnam, Old *et al.* 2003) and *Ca. spathulata* (in Colombia, Rodas *et al.* 2005) are important causal agents of Calonectria leaf blight (CLB) in *Eucalyptus* plantations. *Calonectria ilicicola* is known as a common pathogen responsible for the red crown rot of soybeans in China, Japan and USA (Gai *et al.* 2017, Yamamoto *et al.* 2017, Kleczewski *et al.* 2019), causing significant yield losses.

The importance of *Calonectria* spp. has justified many taxonomic studies on these fungi in recent years. Lombard *et al.* (2010a) provided a genus-wide phylogeny for the 66 available *Calonectria* spp. That study included sequence data for seven gene regions including *act* (actin), *cmdA* (calmodulin), *his3* (histone H3), ITS (the internal transcribed spacer regions 1 and 2 and the 5.8S gene of the ribosomal RNA), LSU (28S large subunit RNA gene), *tef1* (translation elongation factor 1-alpha) and *tub2* (β-tubulin). Subsequently, a polyphasic approach, including combined DNA sequence data for the *cmdA*, *tef1* and *tub2* gene regions together with morphological comparisons was used to resolve the taxonomy of 141 *Calonectria* species (Lombard *et al.* 2016). A year later, Marin-Felix *et al.* (2017) provided *rpb2* sequence data for 68 *Calonectria* species and

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Jayawardena *et al.* (2019) reconstructed the phylogeny of *Calonectria* based on sequence data for *cmdA*, *his3*, *tef1* and *tub2* gene regions. A problem has, however, arisen due to a lack of uniformity of sequence data in different studies, and particularly the *his3* and *rpb2*. Futhermore, some other gene regions are not consistently available for all of 169 species of *Calonectria*. This calls to question the strength and relevance of the phylogenetic backbone for an important group of plant pathogens as well as the reliability of species boundaries that must define plant disease diagnoses and management.

DNA barcoding provides an effective and widely used tool for fungal species identification (Schoch *et al.* 2012, Stielow *et al.* 2015, Vu *et al.* 2019). Various molecular markers have been utilised for species recognition in *Calonectria* (Lombard *et al.* 2010a, 2016, Li *et al.* 2017, Marin-Felix *et al.* 2017, Jayawardena *et al.* 2019). But there is a lack of consistency in the markers used in different studies. There remains a need for a standard suite of DNA barcodes to distinguish among all species in *Calonectria*. This can be a complex goal given that barcodes for a particular species complex in a genus is not necessarily best suited to other species complexes, as has been seen in *Fusarium* (Lombard *et al.* 2019, Maryani *et al.* 2019, Sandoval-Denis *et al.* 2019, Wang *et al.* 2019, Xia *et al.* 2019). Under these circumstances, it has become necessary to explore whether a similar situation also applies to *Calonectria*.

The aim of this study was to produce a comprehensive suite of DNA sequence data for all 169 currently recognised species of *Calonectria* using eight gene regions. These data were then utilised to construct a genus-wide phylogeny and to reconsider the phylogenetic relationships and species boundaries for *Calonectria*. Furthermore, the resolution power of each of these eight gene regions was evaluated for the genus as a whole and the species complexes that define it. This made it possible to identify an optimal suite of DNA barcodes that can be used to reliably identify *Calonectria* species.

MATERIALS AND METHODS

Isolates

Sequence data for all the 169 described *Calonectria* species (including data for the ex-type isolates) were included in the phylogenetic analyses. Of these, 240 isolates representing 128 species (Supplementary Table S1) were obtained from culture collections, including those of the Westerdijk Fungal Biodiversity Institute (CBS), Utrecht, The Netherlands, the culture collection of the Forestry Agricultural and Biotechnology Institute, University of Pretoria, Pretoria (CMW), South Africa, and the Culture Collection of the China Eucalypt Research Centre (CERC), Chinese Academy of Forestry (CAF), ZhanJiang, GuangDong Province, China. Isolates from these culture collections were plated onto 2 % malt extract agar (MEA: 20 g malt extract and 20 g agar per litre water) and subsequently single hyphal-tips were transferred to fresh MEA plates and incubated at 25 °C for 7 d. It was not possible to obtain cultures for 76 isolates representing 44 of the described *Calonectria* species (Supplementary Table S2). In this case, sequences were downloaded from GenBank (http://www.ncbi.nlm.nih.gov) and included in the analyses. For three species (*Ca. angustata*, *Ca. pini* and *Ca. metrosideri*), isolates were sequenced and data were also downloaded from GenBank. They are consequently included in both Supplementary Tables S1 and S2. The fungarium specimens for the novel taxa represented by dried sporulating cultures were deposited in the Herbarium Mycologicum, Academiae Sinicae (HMAS), Beijing, China.

DNA extraction, PCR and sequencing

For the 240 *Calonectria* isolates representing 128 species obtained from culture collections (Supplementary Table S1) and used in this study, mycelium was harvested from 7-d-old cultures on MEA using a sterile scalpel, and genomic DNA was extracted using the CTAB method "5" described by Van Burik *et al.* (1998). Eight different loci were amplified and sequenced, including *act*, *cmdA*, *his3*, ITS, LSU, *rpb2*, *tef1* and *tub2*. Primers ACT-512F and ACT-783R (Carbone & Kohn 1999) were used to amplify the *act* gene region; CAL-228F and CAL-2Rd (Carbone & Kohn 1999, Quaedvlieg *et al.* 2011) for the *cmdA* gene region; CYLH3F and CYLH3R (Crous *et al.* 2004) for the *his3* gene region; V9G (De Hoog & van den Ende 1998) and ITS4 (White *et al.* 1990) for the ITS region; LR0R (Moncalvo *et al.* 1995) and LR5 (Vilgalys & Hester 1990) for the LSU region; fRpb2-5F and fRpb2-7cR (Liu *et al.* 1999, Reeb *et al.* 2004) for the *rpb2* gene region; EF1-728F (Carbone & Kohn 1999) and EF2 (O'Donnell *et al.* 1998) for the *tef1* gene region and primers pairs T1 (O'Donnell & Cigelnik 1997) and CYLTUB1R (Crous *et al.* 2004) were used to amplify the *tub2* gene region.

The PCR reaction mixtures consisted of 17.5 µL TopTaq™ Master Mix, 1 µL of each primer, 2 µL DNA samples and nuclease-free H_2O were made up to the final volume of 35 µL. The PCR conditions for the seven regions (with the exception of *rpb2*) were as follows: an initial denaturation step at 95 °C for 5 min; then 35 amplification cycles at [95 °C for 30 s; annealing 61 °C (*act*) / 55 °C (*cmdA*, *his3*, ITS, LSU) / 52 °C (*tef1* and *tub2*) for 30 s; 72 °C for 1 min], and the final extension step at 72 °C for 10 min. For the *rpb2* gene region, a touchdown PCR protocol was used: an initial denaturation step at 95 °C for 5 min, then (95 °C for 30 s, 58 °C for 30 s, 72 °C for 90 s) × 10 cycles, (95 °C for 30 s, 58 °C for 45 s, 72 °C for 90 s + 5 s/cycle increase) × 30 cycles, and final extension step at 72 °C for 10 min.

All the PCR products were sequenced in both directions using the same primers used for amplification. Raw sequences for each gene region were edited and consensus sequences were generated using Geneious v. 9.1.4 (Kearse *et al.* 2012).

Phylogenetic analyses

Sequence data for eight gene regions of 316 *Calonectria* isolates were used in the phylogenetic analyses. These were derived from 240 isolates representing 128 species obtained from culture collections and sequenced in this study (Supplementary Table S1). For the 76 isolates representing 44 species that we were unable to obtain, available sequence data were downloaded from GenBank (Supplementary Table S2). Sequence data for *Curvicladiella cignea* (CBS 109167 and CBS 109168) were used as the outgroup taxa in the analyses following the example of Pham *et al.* (2019). Multiple sequences were aligned using the online version of MAFFT v. 7 (Katoh & Standley 2013) and the alignment was trimmed at both ends where necessary with MEGA v. 6.0.5 (Tamura *et al.* 2013). For some of the 316 isolates, not all the eight gene regions were available, and here

all of the available sequences were used in the individual analyses. In the case of the eight gene region combined analyses, missing sequence data were replaced with "N".

Two phylogenetic approaches were used in this study. These included Maximum Parsimony (MP) analyses performed with PAUP v. 4.0 b10 (Swofford 2003) and Maximum Likelihood (ML) analyses performed with PhyML v. 3.0 (Guindon & Gascuel 2003). The sequence datasets for the eight individual gene regions and a concatenated dataset for those regions were used to determine the phylogenetic relationships among species. A partition homogeneity test (PHT) (Farris *et al.* 1994) was conducted to determine whether the datasets for the eight gene regions could be combined.

For the MP analyses, all characters were unordered and equally weighted. Gaps were regarded as a fifth character, phylogenetic trees were obtained using a heuristic tree search criterion, including 1 000 random stepwise additions and tree-bisection-reconstruction (TBR) branch swapping. Branches of zero-length were collapsed. Statistical supports for tree-branch points were determined using bootstrap analyses with 1 000 replicates (Felsenstein 1985). Tree length (TL), retention index (RI), consistency index (CI), rescaled consistency index (RC) and homoplasy index (HI) (Supplementary Table S3) were calculated for parsimony trees.

For the ML analyses, the best substitution model for each dataset was selected by JModeltest v. 2.1.7 (Posada 2008). All sequences generated in this study were submitted to GenBank (www.ncbi.nlm.nih.gov) (Supplementary Table S1) and final alignments were deposited in TreeBASE (http://treebase.org).

Individual *Calonectria* species were recognised based on concordance of multiple gene genealogies. Two criteria were applied in determining species boundaries based on phylogenetic analyses and sequence comparisons. These were (i) when isolate(s) formed a distinct lineage that differentiated them from other isolates in at least two of the eight individual gene regions sequenced and where these groupings did not contradict those for other loci; (ii) when the isolates formed independent lineages supported by high bootstrap values in the combined tree based on the eight-gene concatenated dataset, and where they had fixed Single Nucleotide Polymorphisms (SNPs) that differentiated them from their phylogenetically closest relatives. These phylogenetically defined taxa were then also considered in terms of their morphology and mating type. To avoid confusion, in Supplementary Tables S1 and S2, the code "A" was used to represent the *Calonectria* species before the taxonomic reconsideration of species boundaries in the present study. The code "B" was used for the 120 species names that have been accepted after revision and as presented in the Taxonomy section of this study.

Morphology, mating system and geographic distribution

Depending on their availability, isolates representing the novel *Calonectria* spp. were selected for morphological study. Synthetic nutrient-poor agar (SNA, Nirenburg 1981) was used to induce the asexual morphs in culture. Agar plugs from axenic cultures were transferred to five replicate plates of SNA and incubated at 25 °C for 7 d. Fungal structures were transferred to a drop of 85 % lactic acid on microscope slides. Gross morphological characteristics were examined with a Zeiss Axio Imager A1 microscope (Carl Zeiss Ltd., Germany).

For isolates selected as the holotype of novel taxa, each characteristic morphological structure was measured with 50 replicates, and 30 replicate measurements were made for additional isolates. Minimum, maximum and average (mean) measurements were recorded as (minimum–) (average–standard deviation)–(aver+standard deviation) (–maximum).

Optimal growth temperatures for each of the novel *Calonectria* spp. were determined on MEA. Agar plugs were transferred from the actively growing edges of 7-d-old cultures with a 5 mm diam cork borer and inoculated at the centres of 90 mm Petri dishes containing MEA. Cultures were grown at seven different temperatures ranging from 5 °C to 35 °C, at 5 °C intervals (each isolate with five replicates). Colony diameters were measured after seven days. Colony colours were described based on the colour charts of Rayner (1970) and using 7-d-old cultures on MEA incubated at 25 °C.

Morphological characteristics of all *Calonectria* species were re-evaluated in comparison to multilocus DNA sequence phylogenetic analyses. The important morphological features include vesicle shape and diameter, macroconidial septation and dimensions, perithecial colour, number of ascospores in the asci, ascospore septation and dimensions. In addition, ex-type isolate location and the mating system (heterothallic or homothallic) were also considered where this was known.

Selection of DNA barcodes for species recognition

The analyses of DNA sequences for eight gene regions made it possible to identify clear boundaries between putative *Calonectria* species. These data formed the basis to test the success of each of these gene regions to distinguish species. This Identification Success Rate (ISR) was calculated by dividing the number of identified species for each gene region by the total number of species of *Calonectria* recognised in the phylogenetic analyses of eight gene regions.

The ISR of each candidate DNA barcode was computed based on the eight individual gene phylogenetic trees and the eight-gene combined phylogenetic tree. For each candidate DNA barcode, the ISRs were calculated both for the entire genus *Calonectria*, as well for each of the recognised species complexes.

RESULTS

Phylogenetic analyses

Sequence data generated for the eight gene regions of the 240 isolates representing 128 of the 169 described species of *Calonectria* were deposited in GenBank (Supplementary Table S1). Amplicons generated for *act*, *cmdA*, *his3*, ITS, LSU, *rpb2*, *tef1* and *tub2* gene regions were approximately 300, 750, 500, 700, 870, 860, 560, 650 bp, respectively. Sequence data for the 76 isolates representing 44 species for which cultures could not be obtained were downloaded from GenBank and included in the final datasets (Supplementary Table S2).

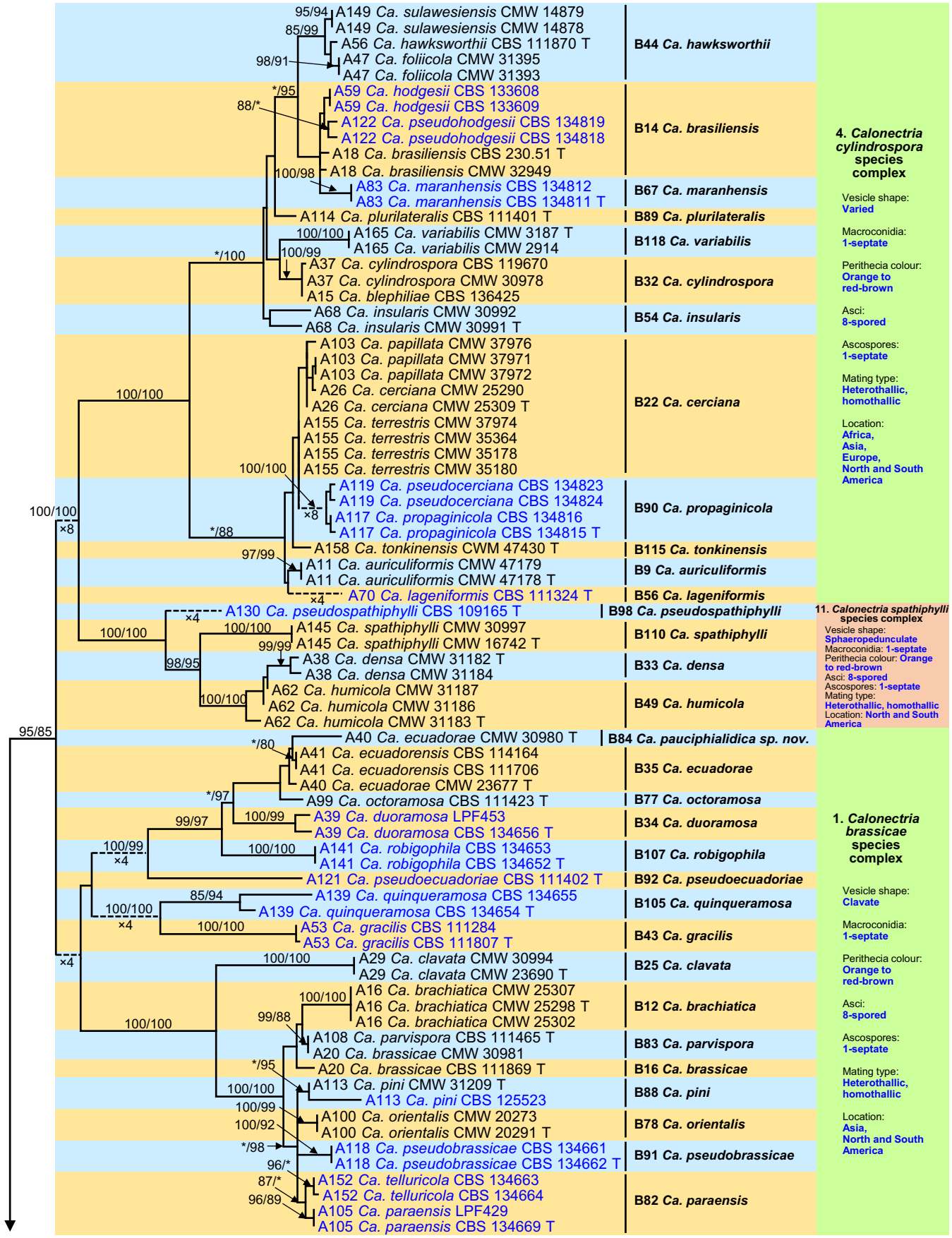

Fig. 1. Phylogenetic tree of the genus *Calonectria* based on maximum likelihood (ML) analyses of combined DNA dataset of *act*, *cmdA*, *his3*, ITS, LSU, *rpb2*, *tef1* and *tub2* gene sequences. Codes A1 to A169 showed the 169 *Calonectria* species before their taxonomic reconsideration in this study, codes B1 to B120 indicated the 120 accepted *Calonectria* species after the revision emerging from this study. Seventy-six isolates unable to obtain in this study were marked in blue, their sequences were downloaded from NCBI. Bootstrap values $\geq$ 80 % for ML and MP analyses are presented at the branches. Bootstrap values lower than 80 % are marked with "*", and absent analyses values are marked with "-". Ex-type isolates of *Calonectria* species after revision are marked with "T". The tree is rooted to *Curvicladiella cignea* (CBS 109167, and CBS 109168). *Calonectria* species grouped in 11 species complexes. Typical morphological characteristics, mating type and location (geographic regions where isolates have been identified) of the 11 species complexes are shown at the right side of the phylogenetic tree.

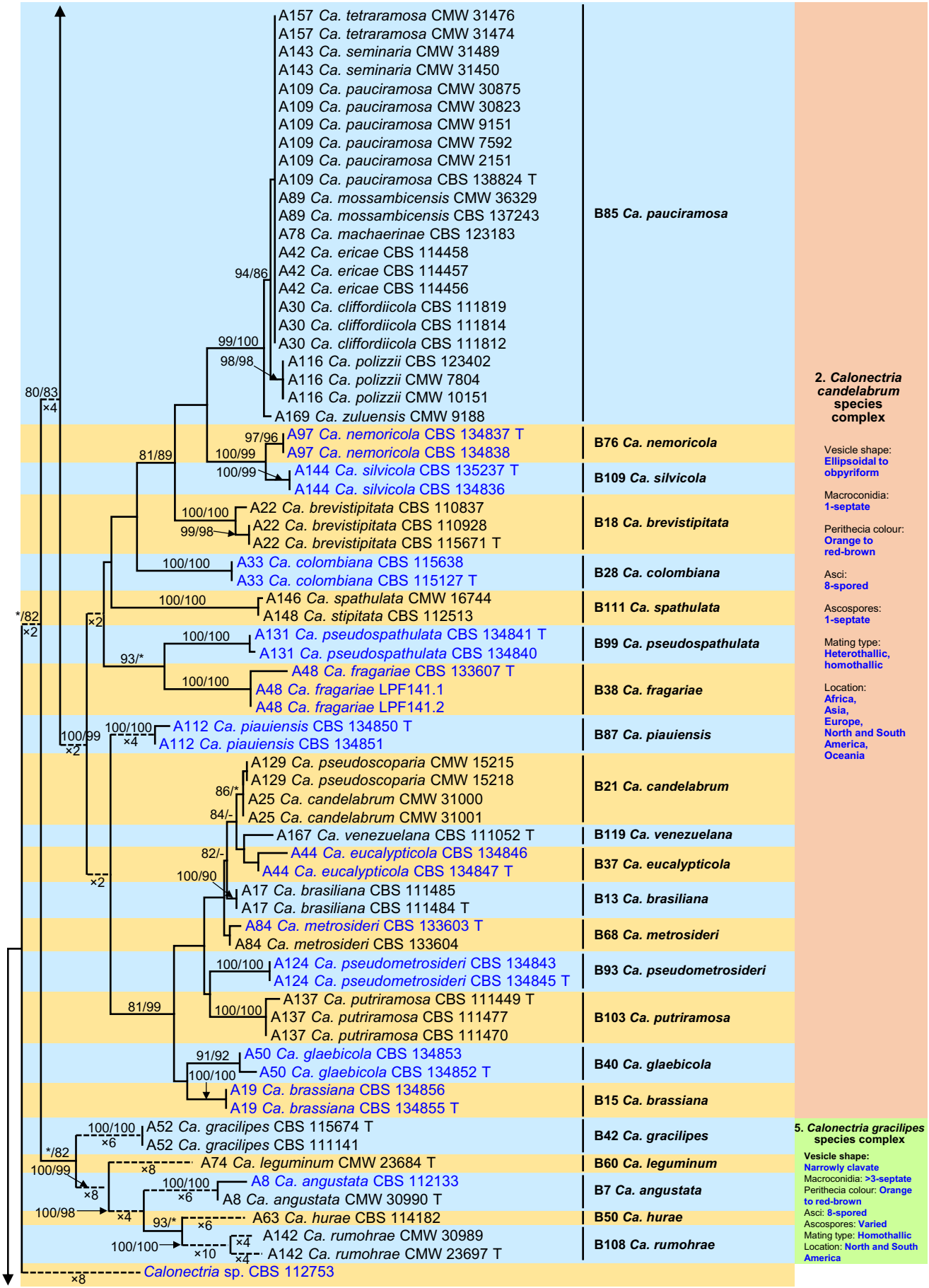

Fig. 1. (Continued).

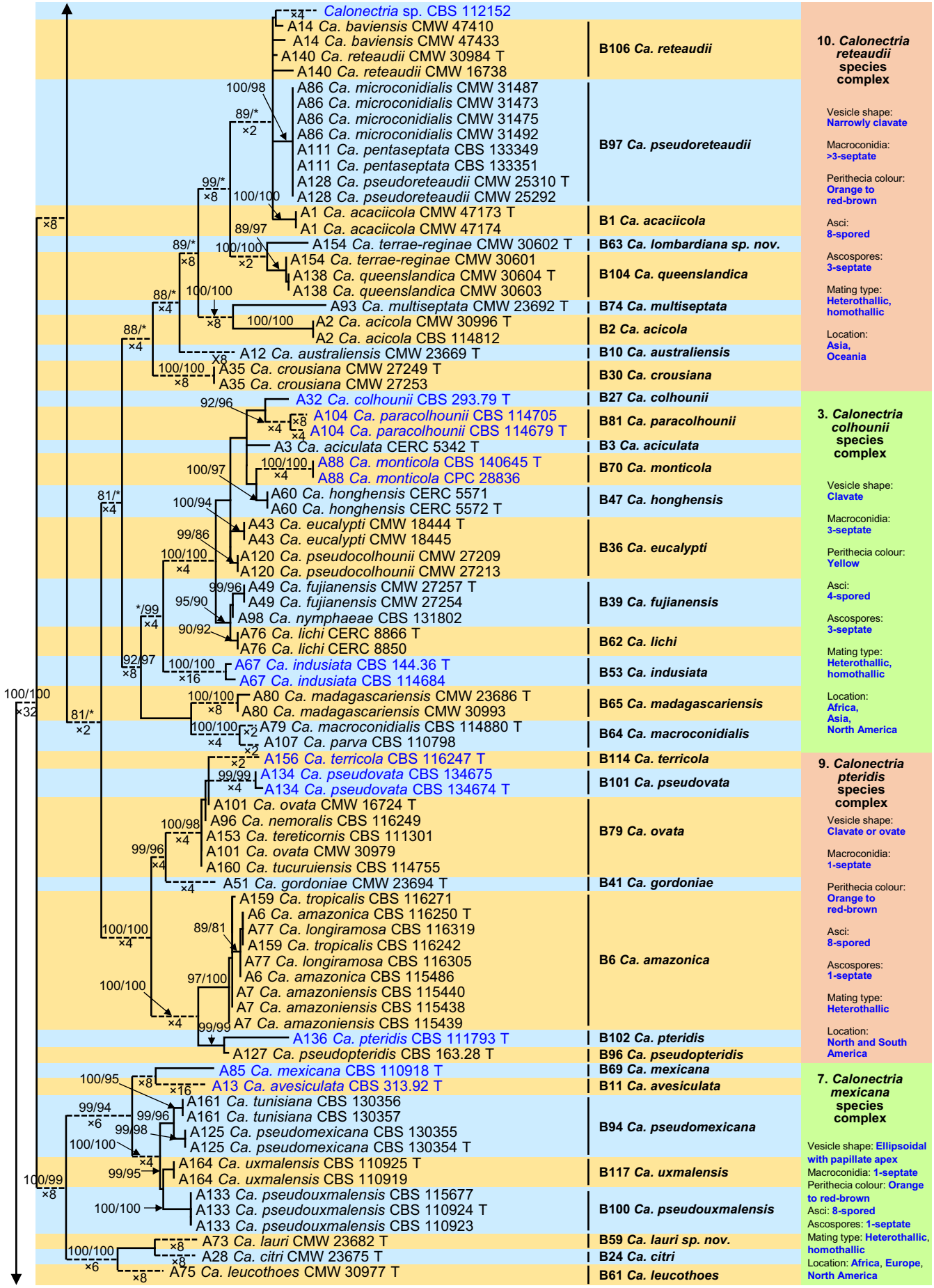

Fig. 1. (Continued).

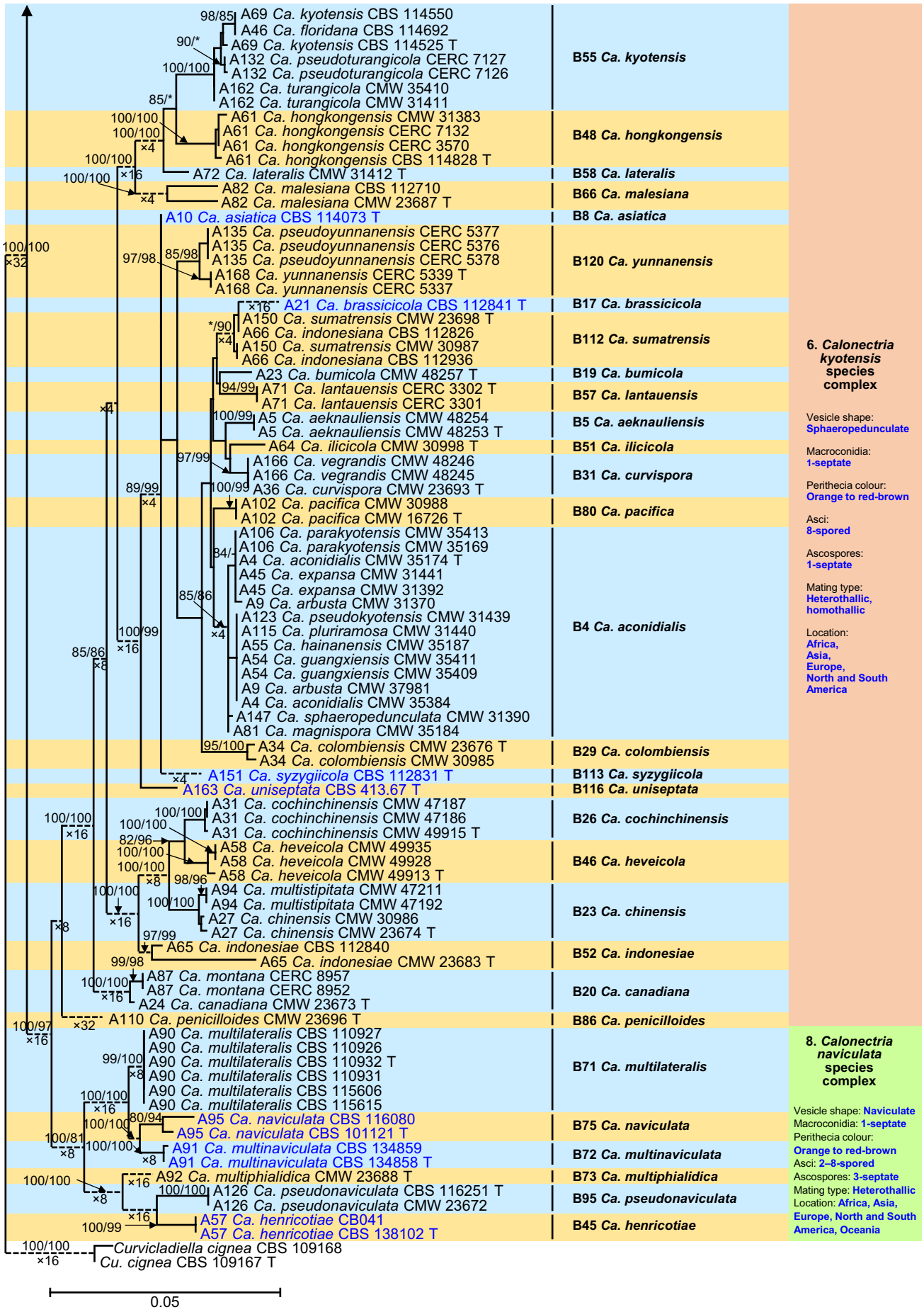

Fig. 1. (Continued).

Alignments for each of the gene regions and for the combined datasets were as follows: *act* (246 isolates, 286 characters), *cmdA* (314 isolates, 721 characters), *his3* (305 isolates, 498 characters), ITS (268 isolates, 705 characters), LSU (267 isolates, 866 characters), *rpb2* (234 isolates, 863 characters), *tef1* (316 isolates, 563 characters), *tub2* (285 isolates, 652 characters) and combined (318 isolates, 5 154 characters). The partition homogeneity test (PHT) performed on the concatenated dataset of eight gene regions yielded a P-value of 0.01. This suggested some incongruence in the datasets for the eight regions, and the accuracy of the combined data could have suffered relative to the individual partitions (Cunningham 1997). Although the P-value was low, the datasets for multiple gene regions were combined for phylogenetic analyses, as has been done in a number of previous studies (Lombard *et al.* 2016, Marin-Felix *et al.* 2017, Pham *et al.* 2019).

Phylogenetic analyses based on the eight individual gene regions and the combined sequence datasets were conducted using both the ML and MP methods (TreeBASE No. 26083). Tree topologies derived from the ML and MP analyses of the six individual gene regions (*act*, *cmdA*, *his3*, *rpb2*, *tef1* and *tub2*) and the combined datasets were essentially congruent with each other and they formed well-supported lineages generally matching the morphological features of the purported species. The non-coding gene regions (ITS and LSU) are known to have poor ability to discriminate between *Calonectria* species (Lombard *et al.* 2010a) and several species resided in a single clade even though they had clearly different morphological characteristics (Supplementary Figs S4, S5). Only the ML trees are presented in this study, and bootstrap support values from ML and MP analyses are indicated above the tree branches (Fig. 1, Supplementary Figs S1–8). Statistical results and important parameters emerging from the phylogenetic analyses were provided in Supplementary Table S3.

The combined datasets for the eight sequenced gene regions comprised 5 154 characters, including alignment gaps. Of these, 3 472 were parsimony-uninformative and 1 682 were parsimony-informative. The eight-gene phylogenetic tree (Fig. 1) divided the *Calonectria* spp. into 11 well-supported clades and these reside in two major groups, the Prolate Group and the Sphaero-Naviculate Group. In the Prolate Group, species are characterised by their clavate to pyriform to ellipsoidal vesicles. Nine well-supported clades reside in the Prolate Group. This group includes nine species complexes including the *Ca. brassicae*, *Ca. candelabrum*, *Ca. colhounii*, *Ca. cylindrospora*, *Ca. gracilipes*, *Ca. mexicana*, *Ca. pteridis*, *Ca. reteaudii* and *Ca. spathiphylli* species complexes (Fig. 1). The remaining two well-supported clades reside in the Sphaero-Naviculate Group. The Sphaero-Naviculate Group is defined by vesicles having sphaeropedunculate or naviculate morphology. The two clades in this group accommodate two species complexes, those defined by *Ca. kyotensis* and *Ca. naviculata* (Fig. 1).

The *Calonectria* species before their taxonomic reconsideration in this study (codes A1 to A169) and after the revision emerging from this study (codes B1 to B120) are presented (Supplementary Tables S1 and S2, Fig. 1, Supplementary Figs S1–8). Based on the results of this study and a reconsideration of species boundaries, all accepted species are listed in Table 1. These species are also presented in the Taxonomy section below together with the taxonomic synonyms.

Morphology, mating system and geographic distribution

The key morphological characteristics of all *Calonectria* species were summarised, listing all species in the 11 species complexes (Supplementary Table S4). Based on the typical/dominant vesicle shape of species in each species complex, the 11 species complexes were separated into six groups: (1) clavate or narrowly clavate vesicle group (*Ca. brassicae*, *Ca. colhounii*, *Ca. gracilipes* and *Ca. reteaudii* species complexes); (2) naviculate vesicle group (*Ca. naviculata* species complex); (3) ellipsoidal to obpyriform vesicle group (*Ca. candelabrum* species complex); (4) ellipsoidal vesicle with papillate apex group (*Ca. mexicana* species complex); (5) sphaeropedunculate vesicle group (*Ca. kyotensis* and *Ca. spathiphylli* species complexes); (6) varied shapes vesicle group (*Ca. cylindrospora* and *Ca. pteridis* species complexes) (Table 2, Fig. 1). Other than vesicle shape, differences in other key morphological features including macroconidial septation, perithecial colour, number of ascospores in the asci and ascospore septation are presented in Table 2, Supplementary Table S4 and Fig. 1. Differences in mating type and geographic distribution for the species in all 11 species complexes are documented in Table 2, Supplementary Table S4 and Fig. 1.

Species in four species complexes (*Ca. brassicae*, *Ca. colhounii*, *Ca. gracilipes* and *Ca. reteaudii*) have vesicles that are clavate or narrowly clavate. The *Ca. brassicae* species complex generally produces 1-septate macroconidia and 1-septate ascospores, distinguishing them from taxa in the *Ca. colhounii*, *Ca. gracilipes* and *Ca. reteaudii* species complexes. The *Ca. colhounii* species complex typically has yellow perithecia and 4-spored asci, rare in all the other species complexes. Species in both the *Ca. gracilipes* and *Ca. reteaudii* species complexes generally produce macroconidia with more than three septa (Table 2, Supplementary Table S4). Species in the *Ca. naviculata* species complex typically have naviculate vesicles and those in the *Ca. mexicana* species complex generally produces ellipsoidal vesicles with papillate apices, morphological features rarely found in other species complexes (Table 2, Supplementary Table S4). Ellipsoidal to obpyriform vesicles are typical of species in the *Ca. candelabrum* species complex (Table 2, Supplementary Table S4) and those in the *Ca. kyotensis* and *Ca. spathiphylli* species complexes generally produce sphaeropedunculate vesicles and have 1-septate macroconidia. Perithecial colour, and number of ascospores in the asci of *Ca. kyotensis* species complex taxa are generally similar to those in the *Ca. spathiphylli* species complex (Table 2, Supplementary Table S4). Species in the *Ca. cylindrospora* and *Ca. pteridis* species complexes do not have vesicles that are morphologically characteristic, those the former have vesicles of variable shape, while those in the latter are generally clavate or ovate (Table 2, Supplementary Table S4).

Morphological comparisons showed that most of the *Calonectria* species can be distinguished based on vesicle shape and diameter, macroconidial septation and dimensions, perithecial colour, number of ascospores in the asci, ascospore septation and dimensions (Supplementary Table S4). Some species were difficult to distinguish solely based on morphological characteristics. For example, the *Ca. pseudospathulata* (*Ca. candelabrum* species complex) and *Ca. auriculiformis* (*Ca. cylindrospora*

Table 1. Accepted *Calonectria* species emerging from the results of this study.

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
B1	***Calonectria acaciicola***	CMW 47173^{T}	CBS 143557	Soil (*Acacia auriculiformis* plantation)	Do Luong, Nghe An, Vietnam	N.Q. Pham & T.Q. Pham	**MT334933[7]; MT335160; MT335399; MT359620; MT359380; MT412474; MT412690; MT412930**	Pham *et al.* (2019), this study
		CMW 47174	CBS 143558	Soil (*A. auriculiformis* plantation)	Do Luong, Nghe An, Vietnam	N.Q. Pham & T.Q. Pham	**MT334934; MT335161; MT335400; MT359621; MT359381; MT412475; MT412691; MT412931**	Pham *et al.* (2019), this study
B2	***Ca. acicola***	CMW 30996^{T}	–	*Phoenix canariensis*	Northland, New Zealand	H. Pearson	**MT334935; MT335162; MT335401; MT359622; MT359382; MT412476; MT412692; MT412932**	Gadgil & Dick (2004), Lombard *et al.* (2010a), this study
		CBS 114812	CMW 51216	*P. canariensis*	Northland, New Zealand	H. Pearson	**MT334936; MT335163; MT335402; MT359623; MT359383; MT412477; MT412693; MT412933**	Gadgil & Dick (2004), Lombard *et al.* (2010a), this study
B3	***Ca. aciculata***	CERC 5342^{T}	CBS 142883; CMW 47645	*Eucalyptus urophylla* × *E. grandis*	YunNan, China	S.F. Chen & J.Q. Li	**MT334937; MT335164; MT335403; MT359624; MT359384; MT412478; MT412694; MT412934**	Li *et al.* (2017), this study
B4	***Ca. aconidialis***	CMW 35174^{T}	CBS 136086; CERC 1850	Soil (*Eucalyptus* plantation)	HaiNan, China	X. Mou & S.F. Chen	**MT334938; MT335165; MT335404; MT359625; MT359385; MT412479; MT412695; N/A[8]**	Lombard *et al.* (2015a), this study
		CMW 35384	CBS 136091; CERC 1886	Soil (*Eucalyptus* plantation)	HaiNan, China	X. Mou & S.F. Chen	**MT334939; MT335166; MT335405; MT359626; MT359386; N/A; MT412696; N/A**	Lombard *et al.* (2015a), this study
		CMW 31370	CBS 136079; CERC 1705	Soil (*Eucalyptus* plantation)	GuangXi, China	X. Zhou, G. Zhao & F. Han	**MT334940; MT335167; MT335406; MT359627; MT359387; MT412480; MT412697; N/A**	Lombard *et al.* (2015a), this study
		CMW 31390	CBS 136081; CERC 1725	Soil (*Eucalyptus* plantation)	GuangXi, China	X. Zhou, G. Zhao & F. Han	**MT334952; MT335179; MT335418; MT359639; MT359399; MT412485; MT412709; N/A**	Lombard *et al.* (2015a), this study
		CMW 31392	CBS 136247; CERC 1727	Soil (*Eucalyptus* plantation)	GuangXi, China	X. Zhou, G. Zhao & F. Han	**MT334942; MT335169; MT335408; MT359629; MT359389; MT412481; MT412699; N/A**	Lombard *et al.* (2015a), this study
		CMW 31439	CBS 137332; CERC 1774	Soil (*Eucalyptus* plantation)	GuangXi, China	X. Zhou, G. Zhao & F. Han	**MT334951; MT335178; MT335417; MT359638; MT359398; N/A; MT412708; N/A**	Lombard *et al.* (2015a), this study
		CMW 31440	CBS 136976; CERC 1775	Soil (*Eucalyptus* plantation)	GuangXi, China	X. Zhou, G. Zhao & F. Han	**MT334950; MT335177; MT335416; MT359637; MT359397; N/A; MT412707; N/A**	Lombard *et al.* (2015a), this study
		CMW 35169	CBS 136085; CERC 1845	Soil (*Eucalyptus* plantation)	GuangDong, China	X. Mou & R. Chang	**MT334948; MT335175; MT335414; MT359635; MT359395; MT412483; MT412705; N/A**	Lombard *et al.* (2015a), this study
		CMW 35184	CBS 136249; CERC 1860	Soil (*Eucalyptus* plantation)	GuangXi, China	X. Mou & R. Chang	**MT334947; MT335174; MT335413; MT359634; MT359394; N/A; MT412704; N/A**	Lombard *et al.* (2015a), this study

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Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
		CMW 35187	CBS 136248; CERC 1863	Soil (*Eucalyptus* plantation)	HaiNan, China	X. Mou & S.F. Chen	**MT334946; MT335173; MT335412; MT359633; MT359393; N/A; MT412703; N/A**	Lombard *et al.* (2015a), this study
		CMW 35409	CBS 136092; CERC 1900	Soil (*Eucalyptus* plantation)	GuangXi, China	X. Mou & R. Chang	**MT334944; MT335171; MT335410; MT359631; MT359391; N/A; MT412701; N/A**	Lombard *et al.* (2015a), this study
B5	***Ca. aeknauliensis***	CMW 48253^{T}	CBS 143559	Soil (*Eucalyptus* plantation)	Aek Nauli, North Sumatra, Indonesia	M.J. Wingfield	**MT334953; MT335180; MT335419; MT359640; MT359400; MT412486; MT412710; N/A**	Pham *et al.* (2019), this study
		CMW 48254	CBS 143560	Soil (*Eucalyptus* plantation)	Aek Nauli, North Sumatra, Indonesia	M.J. Wingfield	**MT334954; MT335181; MT335420; MT359641; MT359401; MT412487; MT412711; N/A**	Pham *et al.* (2019), this study
B6	***Ca. amazonica***	CBS116250^{T}	CMW 51234; CPC 3534	*E. tereticornis*	Amazon, Brazil	P.W. Crous & A.C. Alfenas	**MT334955; MT335182; MT335421; MT359642; MT359402; MT412488; MT412712; MT412935**	Lombard *et al.* (2016), this study
		CBS 115486	CMW 51223; CPC 3894	*E. tereticornis*	Amazon, Brazil	P.W. Crous & A.C. Alfenas	**MT334956; MT335183; MT335422; MT359643; MT359403; MT412489; MT412713; MT412936**	Lombard *et al.* (2016), this study
		CBS 115440	CMW 51222; CPC 3885	*E. tereticornis*	Amazon, Brazil	P.W. Crous & A.C. Alfenas	**MT334957; MT335184; MT335423; MT359644; MT359404; N/A; MT412714; MT412937**	Lombard *et al.* (2016), this study
		CBS 116271	CMW 51236; CPC 3559	*Eucalyptus* sp.	Amazon, Brazil	P.W. Crous & A.C. Alfenas	**MT335148; MT335385; MT335625; MT359846; MT359606; MT412677; MT412916; MT413123**	Lombard *et al.* (2016), this study
		CBS 116319	CMW 51832; CPC 3761	*Eucalyptus* sp.	Amazon, Brazil	P.W. Crous & A.C. Alfenas	**MT334960; MT335187; MT335426; MT359647; MT359407; MT412490; MT412717; MT412940**	Marin-Felix *et al.* (2017), this study
B7	***Ca. angustata***	CMW 30990^{T}	CBS 114544; CPC 2347; P99-0454	*Tillandsia capitata*	Sarasota nursery, Florida, USA	R.M. Leahy	**MT334963; N/A; MT335429; MT359650; MT359410; MT412493; MT412720; MT412943**	Crous *et al.* (2000, 2006), Lombard *et al.* (2010a), this study
		CBS 112133	CMW 30983; CPC 3152; P99-1321	*Tillandsia capitata*	USA	R.M. Leahy	GQ280427; GQ267362; DQ190695; GQ280549; GQ280670; KY653360; FJ918552; DQ190593	Crous *et al.* (2000, 2006), Lombard *et al.* (2010a), Marin-Felix *et al.* (2017)
B8	***Ca. asiatica***	CBS 114073^{T}	CMW 23782; CPC 3900	Debris (leaf litter)	Prathet Thai, Thailand	N.L. Hywel-Jones	GQ280428; AY725741; AY725658; GQ280550; GQ280672; N/A; AY725705; AY725616	Crous *et al.* (2004), Lombard *et al.* (2010a)
B9	***Ca. auriculiformis***	CMW 47178^{T}	CBS 143561	Soil (*A. auriculiformis* plantation)	Hau Loc, Thanh Hoa, Vietnam	N.Q. Pham & T.Q. Pham	**MT334964; MT335190; MT335430; MT359651; MT359411; MT412494; MT412721; MT412944**	Pham *et al.* (2019), this study
		CMW 47179	CBS 143562	Soil (*A. auriculiformis* plantation)	Hau Loc, Thanh Hoa, Vietnam	N.Q. Pham & T.Q. Pham	**N/A; MT335191; MT335431; MT359652; MT359412; MT412495; MT412722; MT412945**	Pham *et al.* (2019), this study
B10	***Ca. australiensis***	CMW 23669^{T}	CBS 112954; CPC 4714	*Ficus pleurocarpa*	Queensland, Australia	C. Pearce & B. Paulus	**MT334965; MT335192; MT335432; MT359653; MT359413; MT412496; MT412723; MT412946**	Crous *et al.* (2006), Lombard *et al.* (2010a), this study

Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
B11	***Ca. avesiculata***	CBS 313.92^{T}	ATCC 38226; CMW 23670; CPC 2373	*Ilex vomitoria*	Cairo, Georgia, USA	S.A. Alfieri	GQ280431; GQ267364; DQ190620; GQ280553; GQ280675; N/A; GQ267294; AF333392	Schubert *et al.* (1989), Crous (2002), Lombard *et al.* (2010a)
B12	***Ca. brachiatica***	CMW 25298^{T}	CBS 123700	*Pinus maximinoi*	Buga, Colombia	M.J. Wingfield	**N/A; MT335195; MT335435; MT359656; MT359416; MT412499; MT412726; MT412948**	Lombard *et al.* (2009), this study
		CMW 25302	–	*Pi. tecunumanii*	Buga, Colombia	M.J. Wingfield	**N/A; MT335196; MT335436; MT359657; MT359417; MT412500; MT412727; MT412949**	Lombard *et al.* (2009), this study
		CMW 25307	–	*Pi. tecunumanii*	Buga, Colombia	M.J. Wingfield	**N/A; MT335197; MT335437; MT359658; MT359418; MT412501; MT412728; MT412950**	Lombard *et al.* (2009), this study
B13	***Ca. brasiliana***	CBS 111484^{T}	CMW 51187; CPC 1924	Soil	Brazil	A.C. Alfenas	**MT334968; MT335198; MT335438; MT359659; MT359419; MT412502; MT412729; MT412951**	Lombard *et al.* (2016), this study
		CBS 111485	CMW 51188; CPC 1929	Soil	Brazil	A.C. Alfenas	**MT334969; MT335199; MT335439; MT359660; MT359420; MT412503; MT412730; MT412952**	Lombard *et al.* (2016), this study
B14	***Ca. brasiliensis***	CBS 230.51^{T}	IMI 299576	*Eucalyptus* sp.	Ceara state, Brazil	T.R. Ciferri	**MT334970; MT335200; MT335440; MT359661; MT359421; MT412504; MT412731; MT412953**	Batista (1951), Crous (2002), Lombard *et al.* (2010b), this study
		CMW 32949	CBS 114257; CPC 1944	*Eucalyptus* sp.	Aracruz, Brazil	A.C. Alfenas	**MT334971; MT335201; MT335441; MT359662; MT359422; MT412505; MT412732; MT412954**	Lombard *et al.* (2010a), this study
		CBS 133609	LPF245	*Anadenanthera peregrina*	Viçosa, Minas Gerais, Brazil	R.F. Alfenas	N/A; KC491222; N/A; N/A; N/A; N/A; KC491225; KC491228	Alfenas *et al.* (2013b, 2015)
		CBS 134818	LPF262	*Azadirachta indica* (leaf)	Viçosa, Minas Gerais, Brazil	R.F. Alfenas	N/A; KM395991; KM396079; N/A; N/A; N/A; KM395817; KM395905	Alfenas *et al.* (2015)
B15	***Ca. brassiana***	CBS 134855^{T}	LPF378	Soil (*Eucalyptus brassiana* plantation)	Teresina, Piauí, Brazil	R.F. Alfenas	N/A; KM396056; KM396139; N/A; N/A; N/A; KM395882; KM395969	Alfenas *et al.* (2015)
		CBS 134856	LPF379	Soil (*E. brassiana* plantation)	Teresina, Piauí, Brazil	R.F. Alfenas	N/A; KM396057; KM396140; N/A; N/A; N/A; KM395883; KM395970	Alfenas *et al.* (2015)
B16	***Ca. brassicae***	CBS 111869^{T}	CPC 2409	*Argyreia splendens*	Indonesia	F. Bugnicourt	**MT334972; MT335202; MT335442; MT359663; MT359423; MT412506; MT412733; MT412955**	Crous (2002), Lombard *et al.* (2010a, 2016), this study
B17	***Ca. brassicicola***	CBS 112841^{T}	CMW 51206; CPC 4552	Soil (*Brassica* sp.)	Indonesia	M.J. Wingfield	N/A; KX784561; N/A; N/A; N/A; N/A; KX784689; KX784619	Lombard *et al.* (2016)
B18	***Ca. brevistipitata***	CBS 115671^{T}	CMW 51226; CPC 949	Soil	Mexico	P.W. Crous	**MT334973; MT335203; MT335443; MT359664; MT359424; MT412507; MT412734; MT412956**	Lombard *et al.* (2016), this study
		CBS 110928	CMW 51170; CPC 951	Soil	Mexico	P.W. Crous	**MT334974; MT335204; MT335444; MT359665; MT359425; MT412508; MT412735; MT412957**	Lombard *et al.* (2016), this study

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Table 1. (Continued).

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		CBS 110837	CMW 51163; CPC 913	Soil	Mexico	P.W. Crous	**MT335057; MT335289; MT335529; MT359750; MT359510; MT412586; MT412820; MT413034**	Lombard *et al.* (2016), this study
B19	***Ca. bumicola***	CMW 48257^{T}	CBS 143575	Soil (*Eucalyptus* plantation)	Aek Nauli, North Sumatra, Indonesia	M.J. Wingfield	**MT334975; MT335205; MT335445; MT359666; MT359426; MT412509; MT412736; N/A**	Pham *et al.* (2019), this study
B20	***Ca. canadiana***	CMW 23673^{T}	CBS 110817; STE-U 499	*Picea* sp.	Canada	S. Greifenhagen	**MT334976; MT335206; MT335446; MT359667; MT359427; MT412510; MT412737; MT412958**	Kang *et al.* (2001b), Crous (2002), Lechat *et al.* (2010), this study
		CERC 8952	–	Soil	HeNan, China	S.F. Chen	**MT335058; MT335290; MT335530; MT359751; MT359511; MT412587; MT412821; MT413035**	Liu & Chen (2017), this study
B21	***Ca. candelabrum***	CMW 31000	CPC 1675; UFV 117	*Eucalyptus* sp.	Amazonas, Brazil	A.C. Alfenas	**MT334977; MT335207; MT335447; MT359668; MT359428; MT412511; MT412738; MT412959**	Crous (2002), Lombard *et al.* (2010a, 2015b), this study
		CMW 31001	STE-U 1679; UFV 126	*Eucalyptus* sp.	Amazonas, Brazil	A.C. Alfenas	**MT334978; MT335208; MT335448; MT359669; MT359429; MT412512; MT412739; MT412960**	Crous (2002), Lombard *et al.* (2010a, 2015b), this study
		CMW 15218	CBS 125257	*E. grandis*	Las Golondrinas, Pichincha, Ecuador	M.J. Wingfield	**MT334979; MT335209; MT335449; MT359670; MT359430; MT412513; MT412740; MT412961**	Lombard *et al.* (2010a), this study
B22	***Ca. cerciana***	CMW 25309^{T}	CBS 123693	*E. urophylla* × *E. grandis* hybrid cutting	CERC nursery, GuangDong, China	M.J. Wingfield & X.D. Zhou	**MT334981; MT335211; MT335451; MT359672; MT359432; MT412515; MT412742; MT412963**	Lombard *et al.* (2010c), this study
		CMW 25290	CBS 123695	*E. urophylla* × *E. grandis* hybrid cutting	CERC nursery, GuangDong, China	M.J. Wingfield & X.D. Zhou	**MT334982; MT335212; MT335452; MT359673; MT359433; MT412516; MT412743; MT412964**	Lombard *et al.* (2010c), this study
		CMW 35180	CBS 136642; CERC 1856	Soil (*Eucalyptus* plantation)	GuangDong, China	X. Mou & R. Chang	**MT334986; MT335216; MT335456; MT359677; MT359437; MT412520; MT412747; MT412968**	Lombard *et al.* (2015a), this study
		CMW 37976	CBS 136097; CERC 1939; CPC 23517	Soil (*Eucalyptus* plantation)	GuangDong, China	X. Mou & R. Chang	**MT334983; MT335213; MT335453; MT359674; MT359434; MT412517; MT412744; MT412965**	Lombard *et al.* (2015a), this study
B23	***Ca. chinensis***	CMW 23674^{T}	CBS 114827; CPC 4101	Soil	Hong Kong, China	E.C.Y. Liew	**MT334990; MT335220; MT335460; MT359681; MT359441; MT412524; MT412751; MT412972**	Crous *et al.* (2004), Lombard *et al.* (2010a), this study
		CMW 30986	CBS 112744; CPC 4104	Soil	Hong Kong, China	E.C.Y. Liew	**MT334991; MT335221; MT335461; MT359682; MT359442; MT412525; MT412752; MT412973**	Crous *et al.* (2004), Lombard *et al.* (2010a), this study
		CMW 47192	CBS 143573	Soil (*Acacia* hybrid plantation)	Tuyen Quang, Vietnam	N.Q. Pham & T.Q. Pham	**MT335068; MT335300; MT335540; MT359761; MT359521; MT412597; MT412831; MT413045**	Pham *et al.* (2019), this study

Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
B24	***Ca. citri***	CMW 23675^{T}	CBS 186.36	*Citrus sinensis*	Florida, USA	H.S. Fawcett	**MT334992; MT335222; MT335462; MT359683; MT359443; MT412526; MT412753; MT412974**	Fawcett & Klotz (1937), Crous (2002), this study
B25	***Ca. clavata***	CMW 23690^{T}	ATCC 66389; CBS 114557; CPC 2536; P078-1543	*Callistemon viminalis*	Lake Placid, Florida, USA	C.P. Seymour & E.L. Barnard	**MT334993; MT335223; MT335463; MT359684; MT359444; MT412527; MT412754; MT412975**	El-Gholl *et al.* (1993b), Crous (2002), Lombard *et al.* (2010a), this study
		CMW 30994	CBS 114666; CPC 2537; P078-1261	Root debris in peat	Lee County, Florida, USA	D. Ferrin	**MT334994; MT335224; MT335464; MT359685; MT359445; MT412528; MT412755; MT412976**	El-Gholl *et al.* (1993b), Crous (2002), Lombard *et al.* (2010a), this study
B26	***Ca. cochinchinensis***	CMW 49915^{T}	CBS 143567	Soil (*Hevea brasiliensis* plantation)	Duong Minh Chau, Tay Ninh, Vietnam	N.Q. Pham, Q.N. Dang & T.Q. Pham	**MT334995; MT335225; MT335465; MT359686; MT359446; MT412529; MT412756; MT412977**	Pham *et al.* (2019), this study
		CMW 47186	CBS 143568	Soil (*A. auriculiformis* plantation)	Song May, Dong Nai, Vietnam	N.Q. Pham & T.Q. Pham	**MT334996; MT335226; MT335466; MT359687; MT359447; MT412530; MT412757; MT412978**	Pham *et al.* (2019), this study
		CMW 47187	CBS 143569	Soil (*A. auriculiformis* plantation)	Song May, Dong Nai, Vietnam	N.Q. Pham & T.Q. Pham	**MT334997; MT335227; MT335467; MT359688; MT359448; MT412531; MT412758; MT412979**	Pham *et al.* (2019), this study
B27	***Ca. colhounii***	CBS 293.79^{T}	CMW 30999	*Camellia sinensis*	Mauritius	A. Peerally	GQ280443; GQ267373; DQ190639; GQ280565; GQ280687; KY653376; GQ267301; DQ190564	Peerally (1973), Crous (2002), Crous *et al.* (2006), Lombard *et al.* (2010a)
B28	***Ca. colombiana***	CBS 115127^{T}	CMW 30871; CPC 1160	Soil	La Selva, Colombia	M.J. Wingfield	GQ280538; GQ267455; FJ972442; GQ280660; GQ280782; N/A; FJ972492; FJ972423	Schoch *et al.* (1999), Crous (2002), Lombard *et al.* (2010a, b)
		CBS 115638	CMW 30766; CPC 1161	Soil	La Selva, Colombia	M.J. Wingfield	GQ280539; GQ267456; FJ972441; GQ280661; GQ280783; N/A; FJ972491; FJ972422	Schoch *et al.* (1999), Crous (2002), Lombard *et al.* (2010a, b)
B29	***Ca. colombiensis***	CMW 23676^{T}	CBS 112220; CPC 723	*Soil* (*E. grandis* trees)	La Selva, Colombia	M.J. Wingfield	**MT334998; MT335228; MT335468; MT359689; MT359449; MT412532; MT412759; MT412980**	Crous *et al.* (2004), this study
		CMW 30985	CBS 112221; CPC 724	*Soil* (*E. grandis* trees)	La Selva, Colombia	M.J. Wingfield	**MT334999; MT335229; MT335469; MT359690; MT359450; MT412533; MT412760; MT412981**	Crous *et al.* (2004), this study
B30	***Ca. crousiana***	CMW 27249^{T}	CBS 127198	*E. grandis*	FuJian, China	M.J. Wingfield	**MT335000; MT335230; MT335470; MT359691; MT359451; MT412534; MT412761; MT412982**	Chen *et al.* (2011), this study
		CMW 27253	CBS 127199	*E. grandis*	FuJian, China	M.J. Wingfield	**MT335001; MT335231; MT335471; MT359692; MT359452; MT412535; MT412762; MT412983**	Chen *et al.* (2011), this study

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Table 1. (Continued).

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B31	***Ca. curvispora***	CMW 23693^{T}	CBS 116159; CPC 765	Soil	Tamatave, Madagascar	P.W. Crous	**MT335002; MT335232; MT335472; MT359693; MT359453; MT412536; MT412763; N/A**	Victor *et al.* (1997), Crous (2002), Lombard *et al.*(2010a, 2015a), this study
		CMW 48245	CBS 143565	Soil (*Eucalyptus* plantation)	Aek Nauli, North Sumatra, Indonesia	M.J. Wingfield	**MT335003; MT335233; MT335473; MT359694; MT359454; MT412537; MT412764; N/A**	Pham *et al.* (2019), this study
B32	***Ca. cylindrospora***	CBS 119670	CMW 51310; CPC 12766	*Pistacia lentiscus*	Italy	N/A	**MT335006; MT335236; MT335476; MT359697; MT359457; MT412540; MT412767; MT412985**	Lombard *et al.* (2015a,b, 2016), this study
		CMW 30978	CBS 110666; P90.1479; STE-U 497	*Ilex vomitoria*	Florida, USA	N.E. El-Gholl	**MT335007; MT335237; MT335477; MT359698; MT359458; MT412541; MT412768; MT412986**	Crous (2002), Lombard *et al.* (2010a, 2015b), this study
		CBS 136425	CMW 51321; CPC 21859	*Blephilia ciliata*	Ellerbe, North Carolina, USA	T. Sharp	**MT335005; MT335235; MT335475; MT359696; MT359456; MT412539; MT412766; MT412984**	Crous *et al.* (2013), this study
B33	***Ca. densa***	CMW 31182^{T}	CBS 125261	Soil	Las Golondrinas, Pichincha, Ecuador	M.J. Wingfield	**MT335008; MT335238; MT335478; MT359699; MT359459; N/A; MT412769; MT412987**	Lombard *et al.* (2010a), this study
		CMW 31184	CBS 125249	Soil	Las Golondrinas, Pichincha, Ecuador	M.J. Wingfield	**MT335009; MT335239; MT335479; MT359700; MT359460; N/A; MT412770; MT412988**	Lombard *et al.* (2010a), this study
B34	***Ca. duoramosa***	CBS 134656^{T}	LPF434	Soil (tropical rainforest)	Monte Dourado, Pará, Brazil	R.F. Alfenas	N/A; KM396027; KM396110; N/A; N/A; N/A; KM395853; KM395940	Alfenas *et al.* (2015)
		LPF453	–	Soil (*Eucalyptus* plantation)	Monte Dourado, Pará, Brazil	R.F. Alfenas	N/A; KM396028; KM396111; N/A; N/A; N/A; KM395854; KM395941	Alfenas *et al.* (2015)
B35	***Ca. ecuadorae***	CMW 23677^{T}	CBS 111406; CPC 1635	Soil	Ecuador	M.J. Wingfield	**MT335012; MT335242; MT335482; MT359703; MT359463; MT412544; MT412773; MT412991**	Crous *et al.* (2006), Lombard *et al.* (2010a), this study
		CBS 111706	CMW 51821; CPC 1636	Soil	Ecuador	M.J. Wingfield	**MT335010; MT335240; MT335480; MT359701; MT359461; MT412542; MT412771; MT412989**	Marin-Felix *et al.* (2017), this study
B36	***Ca. eucalypti***	CMW 18444^{T}	CBS 125275	*E. grandis*	Aek Nauli, Sumatra Utara, Indonesia	M.J. Wingfield	**MT335013; MT335243; MT335483; MT359704; MT359464; MT412545; MT412774; MT412992**	Lombard *et al.* (2010a), this study
		CMW 18445	CBS 125276	*E. grandis*	Aek Nauli, Sumatra Utara, Indonesia	M.J. Wingfield	**MT335014; MT335244; MT335484; MT359705; MT359465; MT412546; MT412775; MT412993**	Lombard *et al.* (2010a), this study
		CMW 27209	CBS 127195	*E. dunnii*	FuJian, China	M.J. Wingfield	**MT335108; MT335341; MT335581; MT359802; MT359562; MT412634; MT412872; MT413084**	Chen *et al.* (2011), this study
B37	***Ca. eucalypticola***	CBS 134847^{T}	LPF124	*Eucalyptus* sp. (seedling)	Santa Barbara, Minas Gerais state, Brazil	A.C. Alfenas	N/A; KM396051; KM396134; N/A; N/A; N/A; KM395877; KM395964	Alfenas *et al.* (2015)

Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
		CBS 134846	LPF121	*Eucalyptus* sp. (leaf)	Eunapolis, Bahia, Brazil	A.C. Alfenas	N/A; KM396050; KM396133; N/A; N/A; N/A; KM395876; KM395963	Alfenas *et al.* (2015)
B38	***Ca. fragariae***	CBS 133607^T	LPP040	*Fragaria* × *ananassa*	Santa Maria do Jetibá, Espírito Santo, Brazil	U.P. Lopes	N/A; KM998966; KM998964; N/A; N/A; N/A; KM998963; KM998965	Lopes *et al.* (2017)
		LPF141.1	–	*Fragaria* × *ananassa*	Santa Maria do Jetibá, Espírito Santo, Brazil	U.P. Lopes	N/A; KX500191; KX500194; N/A; N/A; N/A; KX500197; KX500195	Lopes *et al.* (2017)
		LPF141.2	–	*Fragaria* × *ananassa*	Santa Maria do Jetibá, Espírito Santo, Brazil	U.P. Lopes	N/A; KX500192; KX500193; N/A; N/A; N/A; KX500198; KX500196	Lopes *et al.* (2017)
B39	***Ca. fujianensis***	CMW 27257^T	CBS 127201	*E. grandis*	FuJian, China	M.J. Wingfield	**MT335019; MT335249; MT335489; MT359710; MT359470; MT412551; MT412780; MT412998**	Chen *et al.* (2011), this study
		CMW 27254	CBS 127200	*E. grandis*	FuJian, China	M.J. Wingfield	**MT335020; MT335250; MT335490; MT359711; MT359471; MT412552; MT412781; MT412999**	Chen *et al.* (2011), this study
		CBS 131802	CMW 51317; HGUP 100003	*Nymphaea tetragona*	Guiyang, Guizhou, China	S.Y. Qin	**MT335070; MT335302; MT335542; MT359763; MT359523; MT412599; MT412833; MT413047**	Xu *et al.* (2012), this study
B40	***Ca. glaebicola***	CBS 134852^T	LPF406	Soil (*Eucalyptus* plantation)	Martinho Campos, Minas Gerais, Brazil	A.C. Alfenas	N/A; KM396053; KM396136; N/A; N/A; N/A; KM395879; KM395966	Alfenas *et al.* (2015)
		CBS 134853	LPF407	*Eucalyptus* sp. (leaf)	Tocantins, Bico do Papagaio, Brazil	R.F. Alfenas	N/A; KM396054; KM396137; N/A; N/A; N/A; KM395880; KM395967	Alfenas *et al.* (2015)
B41	***Ca. gordoniae***	CMW 23694^T	ATCC 201837; CBS 112142; P97-2567; STE-U 3136	*Gordonia lasianthus*	Florida, USA	D. Chiappini	**MT335021; MT335251; MT335491; MT359712; MT359472; MT412553; MT412782; MT413000**	Leahy *et al.* (2000), Crous (2002), Lombard *et al.* (2010a), this study
B42	***Ca. gracilipes***	CBS 115674^T	CMW 51227; STE-U 1153	Soil	La Selva, Colombia	M.J. Wingfield	**MT335022; MT335252; MT335492; MT359713; MT359473; MT412554; MT412783; MT413001**	Crous *et al.* (1997a, 2006), Crous (2002), this study
		CBS 111141	CMW 51174; CPC 1211	Soil	La Selva, Colombia	M.J. Wingfield	**MT335023; MT335253; MT335493; MT359714; MT359474; MT412555; MT412784; MT413002**	Crous (2002), Crous *et al.* (2006), this study
B43	***Ca. gracilis***	CBS 111807^T	AR2677; CMW 51189; PPRI 4176; STE-U 2634	*Manilkara zapota*	Pará, Brazil	F. Carneiro de Albuquerque	GQ280488; GQ267407; DQ190646; GQ280610; GQ280732; KY653390; GQ267323; AF232858	Crous *et al.* (1993c, 2006), Crous (2002), Lombard *et al.* (2016), Marin-Felix *et al.* (2017)
		CBS 111284	CMW 51175; CPC 1483	Soil	Imbrapa, Brazil	P.W. Crous	GQ280489; GQ267408; DQ190647; GQ280611; GQ280733; KY653389; GQ267324; DQ190567	Crous *et al.* (1993c, 2006), Crous (2002), Lombard *et al.* (2016), Marin-Felix *et al.* (2017)

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Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
B44	***Ca. hawksworthii***	CBS 111870^T	CMW 51194; CPC 2405	*Nelumbo nucifera*	Pamplemousses garden, Mauritius	A. Peerally	**MT335024; MT335254; MT335494; MT359715; MT359475; MT412556; MT412785; MT413003**	Crous (2002), this study
		CMW 14878	CBS 125277	*Eucalyptus* sp.	Sulawesi, Indonesia	M.J. Wingfield	**MT335141; MT335378; MT335618; MT359839; MT359599; MT412670; MT412909; MT413119**	Lombard *et al.* (2010a), this study
		CMW 31393	CBS 136641	*E. urophylla* × *E. grandis*	GuangXi, China	X. Zhou & G. Zhao	**MT335017; MT335247; MT335487; MT359708; MT359468; MT412549; MT412778; MT412996**	Lombard *et al.* (2015a), this study
B45	***Ca. henricotiae***	CBS 138102^T	CB045	*Buxus sempervirens*	Lokeren, East Flanders, Belgium	B. Gehesquiere & K. Heungens	N/A; KF815157; KF815185; JX535322; N/A; N/A; N/A; JX535308	Gehesquiere *et al.* (2015)
		CB041	–	*B. sempervirens*	Lokeren, East Flanders, Belgium	B. Gehesquiere & K. Heungens	N/A; KF815156; KF815184; N/A; N/A; N/A; N/A; KF815129	Gehesquiere *et al.* (2015)
B46	***Ca. heveicola***	CMW 49913^T	CBS 143570	Soil (*Hevea brasiliensis* plantation)	Bau Bang, Binh Duong, Vietnam	N.Q. Pham, Q.N. Dang & T.Q. Pham	**MT335025; MT335255; MT335495; MT359716; MT359476; N/A; MT412786; MT413004**	Pham *et al.* (2019), this study
		CMW 49928	CBS 143571	Soil	Bu Gia Map National Park, Binh Phuoc, Vietnam	N.Q. Pham, Q.N. Dang & T.Q. Pham	**MT335048; MT335280; MT335520; MT359741; MT359501; MT412577; MT412811; MT413025**	Pham *et al.* (2019), this study
		CMW 49935	CBS 143572	Soil	Bu Gia Map National Park, Binh Phuoc, Vietnam	N.Q. Pham, Q.N. Dang & T.Q. Pham	**MT335049; MT335281; MT335521; MT359742; MT359502; MT412578; MT412812; MT413026**	Pham *et al.* (2019), this study
B47	***Ca. honghensis***	CERC 5572^T	CBS 142885; CMW 47669	Soil (*Eucalyptus* plantation)	HongHe, YunNan, China	S.F. Chen & J.Q. Li	**MT335026; MT335256; MT335496; MT359717; MT359477; MT412557; MT412787; MT413005**	Li *et al.* (2017), this study
		CERC 5571	CBS 142884; CMW 47668	Soil (*Eucalyptus* plantation)	HongHe, YunNan, China	S.F. Chen & J.Q. Li	**MT335027; MT335257; MT335497; MT359718; MT359478; MT412558; MT412788; MT413006**	Li *et al.* (2017), this study
B48	***Ca. hongkongensis***	CBS 114828^T	CMW 51217; CPC 4670	Soil	Hong Kong, China	M.J. Wingfield	**MT335028; MT335258; MT335498; MT359719; MT359479; MT412559; MT412789; MT413007**	Crous *et al.* (2004), this study
		CERC 7132	CMW 47499	Soil	FuJian, China	S.F. Chen	**MT335031; MT335261; MT335501; MT359722; MT359482; MT412562; MT412792; MT413010**	Li *et al.* (2017), this study
B49	***Ca. humicola***	CMW 31183^T	CBS 125251	Soil	Las Golondrinas, Pichincha, Ecuador	M.J. Wingfield	**MT335032; MT335262; MT335502; MT359723; MT359483; N/A; MT412793; MT413011**	Lombard *et al.* (2010a), this study
		CMW 31186	CBS 125252	Soil	Las Golondrinas, Pichincha, Ecuador	L. Lombard	**MT335033; MT335263; MT335503; MT359724; MT359484; N/A; MT412794; MT413012**	Lombard *et al.* (2010a), this study
		CMW 31187	CBS 125269	Soil	Las Golondrinas, Pichincha, Ecuador	L. Lombard	**MT335034; MT335264; MT335504; MT359725; MT359485; N/A; MT412795; MT413013**	Lombard *et al.* (2010a), this study
B50	***Ca. hurae***	CBS 114182	CMW 51823; CPC 1714; UFV 216	*Rumohra adiantiformis*	Brazil	A.C. Alfenas	**MT335035; MT335265; MT335505; MT359726; MT359486; MT412563; MT412796; MT413014**	Crous (2002), Crous *et al.* (2006), this study

Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
B51	***Ca. ilicicola***	CMW 30998^{T}	CBS 190.50; IMI 299389; STE-U 2482	*Solanum tuberosum*	Bogor, Java, Indonesia	K.B. Boedijn & J. Reitsma	**MT335036; MT335266; MT335506; MT359727; MT359487; MT412564; MT412797; N/A**	Boedijn & Reitsma (1950), Crous (2002), Lombard *et al.* (2010a), this study
B52	***Ca. indonesiae***	CMW 23683^{T}	CBS 112823; CPC 4508	*Syzygium aromaticum*	Warambunga, Indonesia	M.J. Wingfield	**MT335037; MT335267; MT335507; MT359728; MT359488; MT412565; MT412798; MT413015**	Crous *et al.* (2004), this study
		CBS 112840	CMW 51205; CPC 4554	*S. aromaticum*	Warambunga, Indonesia	M.J. Wingfield	**MT335038; MT335268; MT335508; MT359729; MT359489; MT412566; MT412799; MT413016**	Crous *et al.* (2004), this study
B53	***Ca. indusiata***	CBS 144.36^{T}	CMW 23699	*Camellia sinensis*	Sri lanka	N/A	GQ280536; GQ267453; GQ267262; GQ280658; GQ280780; KY653396; GQ267332; GQ267239	Crous (2002), Lombard *et al.* (2010a, 2016), Marin-Felix *et al.* (2017)
		CBS 114684	CMW 51213; CPC 2446; UFV16	*Rhododendron* sp.	Florida, USA	N.E. El-Gholl	GQ280537; GQ267454; DQ190653; GQ280659; GQ280781; N/A; GQ267333; AF232862	Crous *et al.* (1999, 2006), Crous (2002)
B54	***Ca. insularis***	CMW 30991^{T}	CBS 114558; CPC 768	Soil	Tamatave, Madagascar	P.W. Crous	**N/A; MT335269; MT335509; MT359730; MT359490; MT412567; MT412800; MT413017**	Schoch *et al.* (1999), Lombard *et al.* (2010a, 2016), this study
		CMW 30992	CBS 114559; CPC 954	Soil	Conejos, Veracruz, Mexico	M.J. Wingfield	**N/A; MT335270; MT335510; MT359731; MT359491; MT412568; MT412801; MT413018**	Lombard *et al.* (2010a, 2016), this study
B55	***Ca. kyotensis***	CBS 114525^{T}	ATCC 18834; CMW 51824; CPC 2367	*Robinia pseudoacacia*	Japan	T. Terashita	**MT335039; MT335271; MT335511; MT359732; MT359492; MT412569; MT412802; MT413019**	Terashita (1968), Crous (2002), Lombard *et al.* (2016), this study
		CBS 114550	CMW 51825; CPC 2351	Soil	China	M.J. Wingfield	**MT335016; MT335246; MT335486; MT359707; MT359467; MT412548; MT412777; MT412995**	Lombard *et al.* (2016), this study
		CBS 114692	ATCC18882; CMW 51826	*Prunus persica*	Georgia, USA	N/A	**MT335015; MT335245; MT335485; MT359706; MT359466; MT412547; MT412776; MT412994**	Sobers (1969), Crous (2002), Marin-Felix *et al.* (2017), this study
		CERC 7126	CBS 142890; CMW 47496	Soil	FuZhou, FuJian, China	S.F. Chen	**MT335121; MT335356; MT335596; MT359817; MT359577; MT412649; MT412887; MT413098**	Li *et al.* (2017), this study
		CMW 31411	CBS 136077	Soil (*Eucalyptus* plantation)	GuangXi, China	X. Zhou, G. Zhao & F. Han	**MT335151; MT335388; MT335628; MT359849; MT359609; N/A; MT412919; MT413126**	Lombard *et al.* (2015a), this study
B56	***Ca. lageniformis***	CBS 111324^{T}	CMW 51177; CPC 1473	*Eucalyptus* sp. (leaf)	Rivière Noire, Mauritius	H. Smith	N/A; KX784574; N/A; KY653256; KY653312; KY653400; KX784702; KX784632	Lombard *et al.* (2016), Marin-Felix *et al.* (2017)

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Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
B57	***Ca. lantauensis***	CERC 3302^T	CBS 142888; CMW 47252	Soil	LiDao, Hong Kong, China	M.J. Wingfield & S.F. Chen	**MT335040; MT335272; MT335512; MT359733; MT359493; MT412570; MT412803; N/A**	Li *et al.* (2017), this study
		CERC 3301	CBS 142887; CMW 47251	Soil	LiDao, Hong Kong, China	M.J. Wingfield & S.F. Chen	**MT335041; MT335273; MT335513; MT359734; MT359494; N/A; MT412804; N/A**	Li *et al.* (2017), this study
B58	***Ca. lateralis***	CMW 31412^T	CBS 136629	Soil (*Eucalyptus* plantation)	GuangXi, China	X. Zhou, G. Zhao & F. Han	**MT335042; MT335274; MT335514; MT359735; MT359495; MT412571; MT412805; MT413020**	Lombard *et al.* (2015a), this study
B59	***Ca. lauri sp. nov.***	CMW 23682^T	CBS 749.70	*Ilex aquifolium*	Vijlen, Vijlenerbos, South-East Limburg, Netherlands	H.A. van der Aa	**MT335043; MT335275; MT335515; MT359736; MT359496; MT412572; MT412806; MT413021**	Lechat *et al.* (2010), Lombard *et al.* (2010a), this study
B60	***Ca. leguminum***	CMW 23684^T	CBS 728.68	*Annona squamosa*	Sao Paulo, Brazil	M.B. Figueiredo	**MT335044; MT335276; MT335516; MT359737; MT359497; MT412573; MT412807; MT413022**	Figueiredo & Namekata (1967), Crous (2002), Lombard *et al.* (2010a), this study
B61	***Ca. leucothoes***	CMW 30977^T	ATCC 64824; CBS 109166; CPC 2385; P88-490	*Leucothoe axillaris*	Florida, USA	N.E. El-Gholl	**MT335045; MT335277; MT335517; MT359738; MT359498; MT412574; MT412808; N/A**	El-Gholl *et al.* (1989), Crous (2002), Lombard *et al.* (2015a), this study
B62	***Ca. lichi***	CERC 8866^T	–	Soil	HeNan, China	S.F. Chen	**MT335046; MT335278; MT335518; MT359739; MT359499; MT412575; MT412809; MT413023**	Liu & Chen (2017), this study
		CERC 8850	–	Soil	HeNan, China	S.F. Chen	**MT335047; MT335279; MT335519; MT359740; MT359500; MT412576; MT412810; MT413024**	Liu & Chen (2017), this study
B63	***Ca. lombardiana sp. nov.***	CMW 30602^T	CBS 112634; CPC 4233; Lynfield 417	*Xanthorrhoea australis*	Victoria, Australia	T. Baigent	**MT335156; MT335395; MT335635; MT359856; MT359616; MT412686; MT412926; MT413133**	Crous (2002), Crous *et al.* (2006), Lombard *et al.* (2010c), this study
B64	***Ca. macroconidialis***	CBS 114880^T	CMW 51219; CPC 307; PPRI 4000	*E. grandis*	Sabie, Mpumalanga, South Africa	P.W. Crous	**MT335050; MT335282; MT335522; MT359743; MT359503; MT412579; MT412813; MT413027**	Crous *et al.* (1993c), Crous (2002), Lombard *et al.* (2010a), this study
		CBS 110798	CMW 51817; CPC 410	*E. grandis* (roots)	Sabie, Mpumalanga, South Africa	P.W. Crous	**MT335051; MT335283; MT335523; MT359744; MT359504; MT412580; MT412814; MT413028**	Lombard *et al.* (2016), this study
B65	***Ca. madagascariensis***	CMW 23686^T	CBS 114572; CPC 2252	Soil	Rona, Madagascar	J.E. Taylor	**MT335052; MT335284; MT335524; MT359745; MT359505; MT412581; MT412815; MT413029**	Crous (2002), Crous *et al.* (2006), Lombard *et al.* (2010a), this study
		CMW 30993	CBS 114571; CPC 2253	Soil	Rona, Madagascar	J.E. Taylor	**MT335053; MT335285; MT335525; MT359746; MT359506; MT412582; MT412816; MT413030**	Crous (2002), Crous *et al.* (2006), Lombard *et al.* (2010a), this study

Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
B66	***Ca. malesiana***	CMW 23687^{T}	CBS 112752; CPC 4223	Soil	Northern Sumatra, Indonesia	M.J. Wingfield	**MT335054; MT335286; MT335526; MT359747; MT359507; MT412583; MT412817; MT413031**	Crous *et al.* (2004), this study
		CBS 112710	CMW 51199; CPC 3899	Leaf litter	Prathet, Thailand	N.L. Hywel-Jones	**MT335055; MT335287; MT335527; MT359748; MT359508; MT412584; MT412818; MT413032**	Crous *et al.* (2004), this study
B67	***Ca. maranhensis***	CBS 134811^{T}	LPF142	*Eucalyptus* sp. (leaf)	Açailandia, Maranhao, Brazil	A.C. Alfenas	N/A; KM396035; KM396118; N/A; N/A; N/A; KM395861; KM395948	Alfenas *et al.* (2015)
		CBS 134812	LPF143	*Eucalyptus* sp. (leaf)	Açailandia, Maranhao, Brazil	A.C. Alfenas	N/A; KM396036; KM396119; N/A; N/A; N/A; KM395862; KM395949	Alfenas *et al.* (2015)
B68	***Ca. metrosideri***	CBS 133603^{T}	LPF101	*Metrosideros polymorpha*	Viçosa, Minas Gerais state, Brazil	R.F. Alfenas	N/A; KC294304; KC294307; N/A; N/A; N/A; KC294310; KC294313	Alfenas *et al.* (2013a, 2015)
		CBS 133604	CMW 51320; LPF103	*Metrosideros polymorpha*	Viçosa, Minas Gerais state, Brazil	R.F. Alfenas	**MT335056; MT335288; MT335528; MT359749; MT359509; MT412585; MT412819; MT413033**	Alfenas *et al.* (2013a, 2015), this study
B69	***Ca. mexicana***	CBS 110918^{T}	CMW 9055; STE-U 927	Soil	Uxmal, Yucatan, Mexico	M.J. Wingfield	GQ280474; GQ267396; FJ972460; GQ280596; GQ280718; KY653412; FJ972526; AF210863	Schoch *et al.* (1999), Crous (2002), Lombard *et al.* (2010a), Marin-Felix *et al.* (2017)
B70	***Ca. monticola***	CBS 140645^{T}	CPC 28835	Soil	Chiang Mai, Thailand	P.W. Crous	N/A; KT964771; N/A; KT964775; KT983443; N/A; KT964773; KT964769	Crous *et al.* (2015)
		CPC 28836	–	Soil	Chiang Mai, Thailand	P.W. Crous	N/A; KT964772; N/A; KT964776; KT983444; N/A; KT964774; KT964770	Crous *et al.* (2015)
B71	***Ca. multilateralis***	CBS 110932^{T}	CMW 51171; CPC 957	Soil	Uxmal, Mexico	P.W. Crous	**MT335060; MT335292; MT335532; MT359753; MT359513; MT412589; MT412823; MT413037**	Lombard *et al.* (2016), this study
		CBS 110926	CMW 51168; CPC 947	Soil	Uxmal, Mexico	P.W. Crous	**MT335061; MT335293; MT335533; MT359754; MT359514; MT412590; MT412824; MT413038**	Lombard *et al.* (2016), this study
		CBS 110927	CMW 51169; CPC 948	Soil	Uxmal, Mexico	P.W. Crous	**MT335062; MT335294; MT335534; MT359755; MT359515; MT412591; MT412825; MT413039**	Lombard *et al.* (2016), this study
B72	***Ca. multinaviculata***	CBS 134858^{T}	LPF233	Soil (*Eucalyptus* plantation)	Mucuri, Bahia, Brazil	E. Zauza	N/A; KM396072; KM396155; N/A; N/A; N/A; KM395898; KM395985	Alfenas *et al.* (2015)
		CBS 134859	LPF418	Soil (*Eucalyptus* plantation)	Monte Dourado, Pará, Brazil	R.F. Alfenas	N/A; KM396073; KM396156; N/A; N/A; N/A; KM395899; KM395986	Alfenas *et al.* (2015)
B73	***Ca. multiphialidica***	CMW 23688^{T}	Cam 13; CBS 112678	Soil (roots of *Musa* sp.)	Cameroon	Abadie	**MT335066; MT335298; MT335538; MT359759; MT359519; MT412595; MT412829; MT413043**	Crous *et al.* (2004), Lombard *et al.* (2010a), this study

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Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
B74	***Ca. multiseptata***	CMW 23692^T	CBS 112682; CPC 1589	*E. grandis*	North Sumatra, Indonesia	M.J. Wingfield	**MT335067; MT335299; MT335539; MT359760; MT359520; MT412596; MT412830; MT413044**	Crous *et al.* (1998, 2006), Crous (2002), this study
B75	***Ca. naviculata***	CBS 101121^T	CMW 30974	Leaf litter	Joao Pessoa, Brazil	R.F. Castaneda	GQ280478; GQ267399; GQ267252; GQ280600; GQ280722; KM232309; GQ267317; GQ267211	Lombard *et al.* (2010a, 2015b)
		CBS 116080	CMW 16723; STE-U 627	Soil	Manaus, Amazonas, Brazil	M.J. Wingfield	GQ280477; GQ267398; GQ267251; GQ280599; GQ280721; KY653417; GQ267316; AF333409	Crous *et al.* (1997a), Crous (2002), Lombard *et al.* (2010a), Marin-Felix *et al.* (2017)
B76	***Ca. nemoricola***	CBS 134837^T	LPF085	Soil (tropical rainforest)	Araponga, Minas Gerais, Brazil	A.C. Alfenas & P.W. Crous	N/A; KM396066; KM396149; N/A; N/A; N/A; KM395892; KM395979	Alfenas *et al.* (2015)
		CBS 134838	LPF090	Soil (tropical rainforest)	Araponga, Minas Gerais, Brazil	A.C. Alfenas & P.W. Crous	N/A; KM396067; KM396150; N/A; N/A; N/A; KM395893; KM395980	Alfenas *et al.* (2015)
B77	***Ca. octoramosa***	CBS 111423^T	CMW 51819; CPC 1650	Soil	Ecuador	M.J. Wingfield	**MT335071; MT335303; MT335543; MT359764; MT359524; MT412600; MT412834; MT413048**	Marin-Felix *et al.* (2017), this study
B78	***Ca. orientalis***	CMW 20291^T	CBS 125260	Soil	Langam, Indonesia	M.J. Wingfield	**MT335072; MT335304; MT335544; MT359765; MT359525; MT412601; MT412835; MT413049**	Lombard *et al.* (2010a), this study
		CMW 20273	CBS 125259	Soil	Teso East, Indonesia	M.J. Wingfield	**MT335073; MT335305; MT335545; MT359766; MT359526; MT412602; MT412836; MT413050**	Lombard *et al.* (2010a), this study
B79	***Ca. ovata***	CMW 16724^T	CBS 111299; ATCC 76225; UFV 89	*E. urophylla*	Monte Dourado, Pará, Brazil	N.E. El-Gholl	**MT335075; MT335307; MT335547; MT359768; MT359528; N/A; MT412838; MT413052**	El-Gholl *et al.* (1993a), Crous (2002), Marin-Felix *et al.* (2017), this study
		CMW 30979	CBS 111307; UFV 90	*E. tereticornis*	Tucuruí, Pará, Brazil	P.W. Crous	**MT335076; MT335308; MT335548; MT359769; MT359529; N/A; MT412839; MT413053**	Crous (2002), Lombard *et al.* (2010a), this study
		CBS 111301	CMW 51176; CPC 1429	*E. tereticornis*	Tucuruí, Pará, Brazil	P.W. Crous	**MT335077; MT335309; MT335549; MT359770; MT359530; N/A; MT412840; MT413054**	Lombard *et al.* (2016), this study
		CBS 114755	CMW 51827; CPC 1403	*E. tereticornis*	Tucuruí, Pará, Brazil	P.W. Crous	**MT335078; MT335310; MT335550; MT359771; MT359531; N/A; MT412841; MT413055**	Marin-Felix *et al.* (2017), this study
		CBS 116249	CMW 51829; CPC 3533	Soil (*Eucalyptus* plantation)	Brazil	P.W. Crous	**MT335074; MT335306; MT335546; MT359767; MT359527; MT412603; MT412837; MT413051**	Marin-Felix *et al.* (2017), this study
B80	***Ca. pacifica***	CMW 16726^T	A1568; CBS 109063; IMI 354528; STE-U 2534	*Araucaria heterophylla*	Hawaii, USA	M. Aragaki	**MT335079; MT335311; MT335551; MT359772; MT359532; MT412604; MT412842; N/A**	Kang *et al.* (2001b), Crous (2002), Crous *et al.* (2004), this study

Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
		CMW 30988	CBS 114038	*Ipomoea aquatica*	Auckland, New Zealand	C.F. Hill	**MT335080; MT335312; MT335552; MT359773; MT359533; MT412605; MT412843; N/A**	Crous (2002), Crous *et al.* (2004), Lombard *et al.* (2010a), this study
B81	***Ca. paracolhounii***	CBS 114679^{T}	CMW 51212; CPC 2445	N/A	USA	A.Y. Rossman	N/A; KX784582; N/A; KY653268; KY653324; KY653423; KX784714; KX784644	Lombard *et al.* (2016), Marin-Felix *et al.* (2017)
		CBS 114705	CMW 51215; CPC 2423	*Annona reticulata* (fruit)	Australia	D. Hutton	N/A; N/A; N/A; KY653269; KY653325; KY653424; KX784715; KX784645	Lombard *et al.* (2016), Marin-Felix *et al.* (2017)
B82	***Ca. paraensis***	CBS 134669^{T}	LPF430	Soil (*Eucalyptus* plantation)	Monte Dourado, Pará, Brazil	R.F. Alfenas	N/A; KM396011; KM396094; N/A; N/A; N/A; KM395837; KM395924	Alfenas *et al.* (2015)
		LPF429	–	Soil (tropical rainforest)	Monte Dourado, Pará, Brazil	R.F. Alfenas	N/A; KM396015; KM396098; N/A; N/A; N/A; KM395841; KM395928	Alfenas *et al.* (2015)
		CBS 134664	LPF217	Soil (tropical rainforest)	Mucuri, Bahia, Brazil	E. Zauza	N/A; KM396017; KM396100; N/A; N/A; N/A; KM395843; KM395930	Alfenas *et al.* (2015)
B83	***Ca. parvispora***	CBS 111465^{T}	CPC 1902	Soil	Brazil	A.C. Alfenas	**MT335082; MT335314; MT335554; MT359775; MT359535; MT412607; MT412845; MT413057**	Marin-Felix *et al.* (2017), this study
		CMW 30981	CBS 111478; CPC 1921	Soil	Brazil	A.C. Alfenas	**MT335081; MT335313; MT335553; MT359774; MT359534; MT412606; MT412844; MT413056**	Lombard *et al.* (2010a, 2016), this study
B84	***Ca. pauciphialidica sp. nov.***	CMW 30980^{T}	CBS 111394; CPC 1628	Soil	Ecuador	M.J. Wingfield	**MT335083; MT335315; MT335555; MT359776; MT359536; MT412608; MT412846; MT413058**	Crous *et al.* (2006), Lombard *et al.* (2010a), this study
B85	***Ca. pauciramosa***	CBS 138824^{T}	CMW 5683; CPC 971	Soil	Knysna, South Africa	P.W. Crous	**MT335093; MT335325; MT335565; MT359786; MT359546; MT412618; MT412856; MT413068**	Schoch *et al.* (1999), Crous (2002), Lombard *et al.* (2010a), this study
		CMW 9151	–	*A. mearnsii*	South Africa	L. Lombard	**MT335096; MT335328; MT335568; MT359789; MT359549; MT412621; MT412859; MT413071**	Lombard *et al.* (2010b), this study
		CBS 111812	CMW 51190; CPC 2631	*Cliffordia feruginea*	George, Western Cape Province, South Africa	P.W. Crous	**MT335084; MT335316; MT335556; MT359777; MT359537; MT412609; MT412847; MT413059**	Lombard *et al.* (2016), this study
		CBS 114458	CMW 51211; CPC 2019	*Erica capensis*	California, USA	S.T. Koike	**MT335087; MT335319; MT335559; MT359780; MT359540; MT412612; MT412850; MT413062**	Lombard *et al.* (2016), this study
		CBS 123183	CMW 51311; CPC 15378	*Machaerina sinclairii*	Auckland University Campus, Auckland, New Zealand	C.F. Hill	**MT335090; MT335322; MT335562; MT359783; MT359543; MT412615; MT412853; MT413065**	Lombard *et al.* (2016), this study

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							act; cmdA; his3; **ITS; LSU;** ***rpb2; tef1; tub2***	
		CBS 123402	CMW 30872	*Arbutus unedo*	Carrubba, Sicily, Italy	G. Polizzi	**MT335099; MT335331; MT335571; MT359792; MT359552; MT412624; MT412862; MT413074**	Lombard *et al.* (2010b), this study
		CBS 137243	CMW 36327	*E. grandis* × *E. camaldulensis*	Bandula, Manica, Mozambique	J. Roux & S. Maússe-Sitoe	**MT335091; MT335323; MT335563; MT359784; MT359544; MT412616; MT412854; MT413066**	Crous *et al.* (2013), Lombard *et al.* (2016), this study
		CMW 9188	CBS 125268	*E. grandis*	Kwambonambi, KwaZulu-Natal, South Africa	L. Lombard	**MT335159; MT335398; MT335638; MT359859; MT359619; MT412689; MT412929; MT413136**	Lombard *et al.* (2010b), this study
		CMW 31450	CBS 136632; CERC 1785	*E. urophylla* × *E. grandis*	ZhanJiang, GuangDong, China	G. Zhao	**MT335102; MT335334; MT335574; MT359795; MT359555; MT412627; MT412865; MT413077**	Lombard *et al.* (2015a), this study
		CMW 31474	CBS 136635; CERC 1809	*E. urophylla* × *E. grandis*	ZhanJiang, GuangDong, China	G. Zhao	**MT335104; MT335336; MT335576; MT359797; MT359557; MT412629; MT412867; MT413079**	Lombard *et al.* (2015a), this study
B86	***Ca. penicilloides***	CMW 23696^{T}	CBS 174.55; STE-U 2388	*Prunus* sp.	Hatizyo Island, Japan	M. Ookubu	**MT335106; MT335338; MT335578; MT359799; MT359559; MT412631; MT412869; MT413081**	Tubaki (1958), Crous (2002), this study
B87	***Ca. piauiensis***	CBS 134850^{T}	LPF377	Soil (*Eucalyptus* plantation)	Teresina, Piauí, Brazil	R.F. Alfenas	N/A; KM396060; KM396143; N/A; N/A; N/A; KM395886; KM395973	Alfenas *et al.* (2015)
		CBS 134851	LPF381	Soil (tropical rainforest)	Teresina, Piauí, Brazil	R.F. Alfenas	N/A; KM396061; KM396144; N/A; N/A; N/A; KM395887; KM395974	Alfenas *et al.* (2015)
B88	***Ca. pini***	CMW 31209^{T}	CBS 123698	*Pinus patula*	Buga, Valle del Cauca, Colombia	C.A. Rodas	**MT335107; MT335339; MT335579; MT359800; MT359560; MT412632; MT412870; MT413082**	Lombard *et al.* (2010a), this study
		CBS 125523	CMW 31210	*Pinus patula*	Buga, Valle del Cauca, Colombia	C.A. Rodas	GQ280518; GQ267437; GQ267274; GQ280640; GQ280762; N/A; GQ267345; GQ267225	Lombard *et al.* (2010a)
B89	***Ca. plurilateralis***	CBS 111401^{T}	CMW 51178; CPC 1637	Soil	Ecuador	M.J. Wingfield	**N/A; MT335340; MT335580; MT359801; MT359561; MT412633; MT412871; MT413083**	Lombard *et al.* (2016), this study
B90	***Ca. propaginicola***	CBS 134815^{T}	LPF220	*Eucalyptus* sp. (seedling)	Santana, Pará, Brazil	A.C. Alfenas	N/A; KM396040; KM396123; N/A; N/A; N/A; KM395866; KM395953	Alfenas *et al.* (2015)
		CBS 134816	LPF222	*Eucalyptus* sp. (seedling)	Santana, Pará, Brazil	A.C. Alfenas	N/A; KM396041; KM396124; N/A; N/A; N/A; KM395867; KM395954	Alfenas *et al.* (2015)
		CBS 134824	LPF367	*Eucalyptus* sp. (seedling)	Santana, Pará, Brazil	A.C. Alfenas	N/A; KM396049; KM396132; N/A; N/A; N/A; KM395875; KM395962	Alfenas *et al.* (2015)
B91	***Ca. pseudobrassicae***	CBS 134662^{T}	LPF280	Soil (*Eucalyptus* plantation)	Santana, Pará, Brazil	A.C. Alfenas	N/A; KM396023; KM396106; N/A; N/A; N/A; KM395849; KM395936	Alfenas *et al.* (2015)
		CBS 134661	LPF260	Soil (*Eucalyptus* plantation)	Santana, Pará, Brazil	A.C. Alfenas	N/A; KM396022; KM396105; N/A; N/A; N/A; KM395848; KM395935	Alfenas *et al.* (2015)

Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
B92	***Ca. pseudoecuadoriae***	CBS 111402^{T}	CMW 51179; CPC 1639	Soil	Ecuador	M.J. Wingfield	N/A; KX784589; N/A; KY653273; KY653329; KY653432; KX784723; KX784652	Lombard *et al.* (2016), Marin-Felix *et al.* (2017)
B93	***Ca. pseudometrosideri***	CBS 134845^{T}	LPF210	Soil (*Eucalyptus* plantation)	Maceió, Alagoas, Brazil	M.M. Coutinho	N/A; KM395995; KM396083; N/A; N/A; N/A; KM395821; KM395909	Alfenas *et al.* (2015)
		CBS 134843	LPF100	*Metrosideros polymorpha*	Viçosa, Minas Gerais, Brazil	A.C. Alfenas	N/A; KM395993; KM396081; N/A; N/A; N/A; KM395819; KM395907	Alfenas *et al.* (2015)
B94	***Ca. pseudomexicana***	CBS 130354^{T}	CMW 51313; DISTEF-TCROU1	*Callistemon* sp.	Tunis, Carthage, Tunisia	G. Polizzi	**MT335110; MT335343; MT335583; MT359804; MT359564; MT412636; MT412874; MT413086**	Lombard *et al.* (2011), this study
		CBS 130355	CMW 51314; DISTEF-TCROU3	*Callistemon* sp.	Tunis, Carthage, Tunisia	G. Polizzi	**MT335111; MT335344; MT335584; MT359805; MT359565; MT412637; MT412875; MT413087**	Lombard *et al.* (2011), this study
		CBS 130357	CMW 51316; DISTEF-TCL1	*Ca. laevis*	Tunis, Carthage, Tunisia	G. Polizzi	**MT335149; MT335386; MT335626; MT359847; MT359607; MT412678; MT412917; MT413124**	Lombard *et al.* (2011), this study
B95	***Ca. pseudonaviculata***	CBS 116251^{T}	CMW 51235; CPC 3399; Lynfield 824	*Buxus sempervirens*	Kumeu, West Auckland, New Zealand	R. MacDiarmid	**N/A; MT335345; MT335585; MT359806; MT359566; MT412638; MT412876; MT413088**	Crous *et al.* (2002), Lombard *et al.* (2016), this study
		CMW 23672	CBS 114417; CPC 10926	*B. sempervirens*	New Zealand	C. Crepel	**N/A; MT335346; MT335586; MT359807; MT359567; MT412639; MT412877; MT413089**	Lombard *et al.* (2010a, 2016), this study
B96	***Ca. pseudopteridis***	CBS 163.28^{T}	CMW 51159; IMI 299579	*Washingtonia robusta*	USA	C.D. Sherbakoff	**MT335112; MT335347; MT335587; MT359808; MT359568; MT412640; MT412878; N/A**	Sherbakoff (1928), Alfenas *et al.* (2015), Lombard *et al.* (2016), this study
B97	***Ca. pseudoreteaudii***	CMW 25310^{T}	CBS 123694	*E. urophylla* × *E. grandis*	GuangDong, China	M.J. Wingfield & X.D. Zhou	**MT335119; MT335354; MT335594; MT359815; MT359575; MT412647; MT412885; MT413096**	Lombard *et al.* (2010c), this study
		CMW 25292	CBS 123696	*E. urophylla* × *E. grandis*	GuangDong, China	M.J. Wingfield & X.D. Zhou	**MT335120; MT335355; MT335595; MT359816; MT359576; MT412648; MT412886; MT413097**	Lombard *et al.* (2010c), this study
		CMW 31487	CBS 136638; CERC 1822	*E. urophylla* × *E. grandis*	ZhanJiang, GuangDong, China	G. Zhao	**MT335113; MT335348; MT335588; MT359809; MT359569; MT412641; MT412879; MT413090**	Lombard *et al.* (2015a), this study
		CBS 133349	CMW 51318	*Eucalyptus* hybrid	Hanoi, Bavi, Vietnam	P.Q. Thu	**MT335117; MT335352; MT335592; MT359813; MT359573; MT412645; MT412883; MT413094**	Crous *et al.* (2012), this study
B98	***Ca. pseudospathiphylli***	CBS 109165^{T}	CMW 30976; CPC 1623	Soil	Ecuador	M.J. Wingfield	GQ280493; GQ267412; AF348241; GQ280615; GQ280737; KY653435; FJ918562; FJ918513	Kang *et al.* (2001b), Crous (2002), Lombard *et al.* (2010a, c), Marin-Felix *et al.* (2017)

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							act; cmdA; his3; **ITS; LSU;** ***rpb2; tef1; tub2***	
B99	***Ca. pseudospathulata***	CBS 134841^{T}	LPF072	Soil (tropical rainforest)	Araponga, Minas Gerais, Brazil	A.C. Alfenas & P.W. Crous	N/A; KM396070; KM396153; N/A; N/A; N/A; KM395896; KM395983	Alfenas *et al.* (2015)
		CBS 134840	LPF066	Soil (tropical rainforest)	Araponga, Minas Gerais, Brazil	A.C. Alfenas & P.W. Crous	N/A; KM396069; KM396152; N/A; N/A; N/A; KM395895; KM395982	Alfenas *et al.* (2015)
B100	***Ca. pseudouxmalensis***	CBS 110924^{T}	CMW 51166; CPC 942	Soil	Mexico	P.W. Crous	**MT335123; MT335358; MT335598; MT359819; MT359579; MT412651; MT412889; MT413100**	Lombard *et al.* (2016), this study
		CBS 110923	CMW 51165; CPC 941	Soil	Mexico	P.W. Crous	**MT335124; MT335359; MT335599; MT359820; MT359580; MT412652; MT412890; MT413101**	Lombard *et al.* (2016), this study
		CBS 115677	CMW 51228; CPC 943	Soil	Mexico	P.W. Crous	**MT335125; MT335360; MT335600; MT359821; MT359581; MT412653; MT412891; MT413102**	Lombard *et al.* (2016), this study
B101	***Ca. pseudovata***	CBS 134674^{T}	LPF267	Soil (*Eucalyptus* plantation)	Santana, Pará, Brazil	A.C. Alfenas	N/A; KM396032; KM396115; N/A; N/A; N/A; KM395858; KM395945	Alfenas *et al.* (2015)
		CBS 134675	LPF285	Soil (*Eucalyptus* plantation)	Santana, Pará, Brazil	A.C. Alfenas	N/A; KM396033; KM396116; N/A; N/A; N/A; KM395859; KM395946	Alfenas *et al.* (2015)
B102	***Ca. pteridis***	CBS 111793^{T}	ATCC 34395; CMW 16736; CPC 2372	*Arachniodes adiantiformis*	USA	F. Schickedanz	GQ280494; GQ267413; DQ190679; GQ280616; GQ280738; KY653438; FJ918563; DQ190578	Crous *et al.* (1993c, 2006), Crous (2002), Lombard *et al.* (2010a), Marin-Felix *et al.* (2017)
B103	***Ca. putriramosa***	CBS 111449^{T}	CMW 51181; CPC 1951	*Eucalyptus* cutting	Brazil	A.C. Alfenas	**MT335129; MT335364; MT335604; MT359825; MT359585; MT412657; MT412895; MT413105**	Lombard *et al.* (2016), this study
		CBS 111470	CMW 51182; CPC 1940	Soil	Brazil	A.C. Alfenas	**MT335130; MT335365; MT335605; MT359826; MT359586; MT412658; MT412896; MT413106**	Lombard *et al.* (2016), this study
		CBS 111477	CMW 51183; CPC 1928	Soil	Brazil	A.C. Alfenas	**MT335131; MT335366; MT335606; MT359827; MT359587; MT412659; MT412897; MT413107**	Lombard *et al.* (2016), this study
B104	***Ca. queenslandica***	CMW 30604^{T}	CBS 112146; CPC 3213	*E. urophylla*	Lannercost, Queensland, Australia	B. Brown	**MT335132; MT335367; MT335607; MT359828; MT359588; MT412660; MT412898; MT413108**	Kang *et al.* (2001a), Lombard *et al.* (2010c), this study
		CMW 30603	CBS 112155; CPC 3210	*E. pellita*	Lannercost, Queensland, Australia	P.Q Thu & K.M. Old	**MT335133; MT335368; MT335608; MT359829; MT359589; MT412661; MT412899; MT413109**	Kang *et al.* (2001a), Lombard *et al.* (2010c), this study
		CMW 30601	CBS 112151; CPC 3202; DFRI00150	*E. urophylla*	Cardwell, Queensland, Australia	C. Hanwood	**MT335134; MT335369; MT335609; MT359830; MT359590; MT412662; MT412900; MT413110**	Crous (2002), Crous *et al.* (2006), Lombard *et al.* (2010c), this study
B105	***Ca. quinqueramosa***	CBS 134654^{T}	LPF065	Soil (*Eucalyptus* plantation)	Monte Dourado, Pará, Brazil	R.F. Alfenas	N/A; KM396029; KM396112; N/A; N/A; N/A; KM395855; KM395942	Alfenas *et al.* (2015)

Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
		CBS 134655	LPF281	Soil (*Eucalyptus* plantation)	Santana, Pará, Brazil	A.C. Alfenas	N/A; KM396030; KM396113; N/A; N/A; N/A; KM395856; KM395943	Alfenas *et al.* (2015)
B106	***Ca. reteaudii***	CMW 30984^{T}	CBS 112144; CPC 3201	*E. camaldulensis*	Chon Thanh, Binh Phuoc, Vietnam	M.J. Dudzinski & P.Q. Thu	**MT335135; MT335370; MT335610; MT359831; MT359591; MT412663; MT412901; MT413111**	Kang *et al.* (2001a), Crous (2002), Crous *et al.* (2006), this study
		CMW 16738	CBS 112143; CPC 3200	*Eucalyptus* sp. (leaves)	Binh Phuoc, Vietnam	M.J. Dudzinski & P.Q. Thu	**MT335136; MT335371; MT335611; MT359832; MT359592; MT412664; MT412902; MT413112**	Kang *et al.* (2001a), Crous (2002), Crous *et al.* (2006), this study
		CMW 47410	CBS 143563	*E. urophylla* (leaf)	Bavi, Hanoi, Vietnam	N.Q. Pham & T.Q. Pham	**MT334966; MT335193; MT335433; MT359654; MT359414; MT412497; MT412724; N/A**	Pham *et al.* (2019), this study
B107	***Ca. robigophila***	CBS 134652^{T}	LPF192	*Eucalyptus* sp. (leaf)	Açailandia, Maranhao, Brazil	R.F. Alfenas	N/A; KM396024; KM396107; N/A; N/A; N/A; KM395850; KM395937	Alfenas *et al.* (2015)
		CBS 134653	LPF193	*Eucalyptus* sp. (leaf)	Açailandia, Maranhao, Brazil	R.F. Alfenas	N/A; KM396025; KM396108; N/A; N/A; N/A; KM395851; KM395938	Alfenas *et al.* (2015)
B108	***Ca. rumohrae***	CMW 23697^{T}	CBS 111431; CPC 1716; UFV 218	*Rumohra adiantiformis*	Volkan, Panama	J.W. Miller & R.M. leahy	**MT335137; MT335372; MT335612; MT359833; MT359593; N/A; MT412903; MT413113**	El-Gholl *et al.* (1997), Crous (2002), Crous *et al.* (2006), this study
		CMW 30989	CBS 109062; CPC 1603	*Adiantum* sp.	The Netherlands	R. Pieters	**MT335138; MT335373; MT335613; MT359834; MT359594; MT412665; MT412904; MT413114**	El-Gholl *et al.* (1997), Crous (2002), Crous *et al.* (2006), this study
B109	***Ca. silvicola***	CBS 135237^{T}	LPF081	Soil (tropical rainforest)	Mucuri, Bahia, Brazil	A.C. Alfenas & P.W. Crous	N/A; KM396065; KM396148; N/A; N/A; N/A; KM395891; KM395978	Alfenas *et al.* (2015)
		CBS 134836	LPF079	Soil (tropical rainforest)	Araponga, Minas Gerais, Brazil	A.C. Alfenas & P.W. Crous	N/A; KM396062; KM396145; N/A; N/A; N/A; KM395888; KM395975	Alfenas *et al.* (2015)
	Calonectria sp.	CBS 112152	CPC 3203	*E. camaldulensis*	Vietnam	N/A	N/A; KX784602; N/A; KY653291; KY653347; KY653463; KX784745; KX784672	Lombard *et al.* (2016), Marin-Felix *et al.* (2017)
	Calonectria sp.	CBS 112753	CPC 4225	N/A	Indonesia	N/A	N/A; KX784598; N/A; KY653292; KY653348; KY653464; KX784740; KX784667	Lombard *et al.* (2016), Marin-Felix *et al.* (2017)
B110	***Ca. spathiphylli***	CMW 16742^{T}	ATCC 44730; CBS 114540; STE-U 2185	*Spathiphyllum* sp.	Florida, USA	C.L. Schoulties	**N/A; MT335374; MT335614; MT359835; MT359595; MT412666; MT412905; MT413115**	El-Gholl *et al.* (1992), Crous (2002), Lombard *et al.* (2010a, 2016), this study

(*continued on next page*)

Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
		CMW 30997	CBS 116168; CPC 789	*Spathiphyllum* sp.	Switzerland	L. Petrini	**N/A; MT335375; MT335615; MT359836; MT359596; MT412667; MT412906; MT413116**	El-Gholl *et al.* (1992), Crous (2002), Lombard *et al.* (2016), this study
B111	***Ca. spathulata***	CMW 16744^{T}	CBS 555.92	*E. viminalis*	Brazil	N.E. El-Gholl	**MT335139; MT335376; MT335616; MT359837; MT359597; MT412668; MT412907; MT413117**	Crous & Kang (2001), Crous (2002), Lombard *et al.* (2016), this study
		CBS 112513	CMW 51197; CPC 3851	*Eucalyptus* sp.	Colombia	M.J. Wingfield	**MT335140; MT335377; MT335617; MT359838; MT359598; MT412669; MT412908; MT413118**	Lombard *et al.* (2016), this study
B112	***Ca. sumatrensis***	CMW 23698^{T}	CBS 112829; CPC 4518	Soil	Northern Sumatra, Indonesia	M.J. Wingfield	**MT335145; MT335382; MT335622; MT359843; MT359603; MT412674; MT412913; N/A**	Crous *et al.* (2004), this study
		CMW 30987	CBS 112934; CPC 4516	Soil	Northern Sumatra, Indonesia	M.J. Wingfield	**MT335146; MT335383; MT335623; MT359844; MT359604; MT412675; MT412914; N/A**	Crous *et al.* (2004), this study
		CBS 112936	CMW 51207; CPC 4504	Soil	Northern Sumatra, Indonesia	M.J. Wingfield	**MT335143; MT335380; MT335620; MT359841; MT359601; MT412672; MT412911; N/A**	Lombard *et al.* (2016), this study
B113	***Ca. syzygiicola***	CBS 112831^{T}	CMW 51204; CPC 4511	*Syzygium aromaticum*	Sumatra, Indonesia	M.J. Wingfield	N/A; N/A; N/A; N/A; N/A; N/A; KX784736; KX784663	Lombard *et al.* (2016)
B114	***Ca. terricola***	CBS 116247^{T}	CMW 51232; CPC 3583	Soil (*Eucalyptus* plantation)	Brazil	P.W. Crous	N/A; N/A; N/A; N/A; N/A; N/A; KX784738; KX784665	Lombard *et al.* (2016)
B115	***Ca. tonkinensis***	CMW 47430^{T}	CBS 143576	Soil (*Eucalyptus* plantation)	Bavi, Hanoi, Vietnam	N.Q. Pham & T.Q. Pham	**MT335147; MT335384; MT335624; MT359845; MT359605; MT412676; MT412915; MT413122**	Pham *et al.* (2019), this study
B116	***Ca. uniseptata***	CBS 413.67^{T}	CMW 23678; CPC 2391; IMI 299577	*Paphiopedilum callosum*	Celle, Germany	W. Gerlach	GQ280451; GQ267379; GQ267248; GQ280573; GQ280695; N/A; GQ267307; GQ267208	Lombard *et al.* (2016)
B117	***Ca. uxmalensis***	CBS 110925^{T}	CMW 51167; CPC 945	Soil	Uxmal, Mexico	P.W. Crous	**MT335153; MT335390; MT335630; MT359851; MT359611; MT412681; MT412921; MT413128**	Lombard *et al.* (2016), this study
		CBS 110919	CMW 51164; CPC 928	Soil	Uxmal, Mexico	P.W. Crous	**MT335154; MT335391; MT335631; MT359852; MT359612; MT412682; MT412922; MT413129**	Lombard *et al.* (2016), this study
B118	***Ca. variabilis***	CMW 3187^{T}	AR2675; CBS 114677; CPC 2436	*Schefflera morototoni*	Pará, Brazil	F.C. de Albuquerque	**N/A; MT335392; MT335632; MT359853; MT359613; MT412683; MT412923; MT413130**	Crous *et al.* (1993b), Crous (2002), Lombard *et al.* (2010a, 2016), this study
		CMW 2914	CBS 112691; CPC 2506	*Theobroma grandiflorum*	Pará, Brazil	F. Carneiro	**N/A; MT335393; MT335633; MT359854; MT359614; MT412684; MT412924; MT413131**	Crous *et al.* (1993b), Crous (2002), Lombard *et al.* (2010a, 2016), this study

Table 1. (Continued).

Code B[1]	Accepted species name[2]	Isolates representing the species [3,4,5]	Other collection number[5]	Hosts	Area of occurrence	Collector	GenBank accession Numbers[6] *act; cmdA; his3;* ITS; LSU; *rpb2; tef1; tub2*	References or source of data
B119	***Ca. venezuelana***	CBS 111052^{T}	CMW 51173; CPC 1183	Soil	Acarigua, Venezuela	M.J. Wingfield	**MT335155; MT335394; MT335634; MT359855; MT359615; MT412685; MT412925; MT413132**	Lombard *et al.* (2016), this study
B120	***Ca. yunnanensis***	CERC 5339^{T}	CBS 142897; CMW 47644	Soil (*Eucalyptus* plantation)	YunNan, China	S.F. Chen & J.Q. Li	**MT335157; MT335396; MT335636; MT359857; MT359617; MT412687; MT412927; MT413134**	Li *et al.* (2017), this study
		CERC 5337	CBS 142895; CMW 47642	Soil (*Eucalyptus* plantation)	YunNan, China	S.F. Chen & J.Q. Li	**MT335158; MT335397; MT335637; MT359858; MT359618; MT412688; MT412928; MT413135**	Li *et al.* (2017), this study
		CERC 5376	CBS 142892; CMW 47655	Soil (*Eucalyptus* plantation)	PuEr, YunNan, China	S.F. Chen & J.Q. Li	**MT335126; MT335361; MT335601; MT359822; MT359582; MT412654; MT412892; MT413103**	Li *et al.* (2017), this study
	Curvicladiella cignea	CBS 109167^{T}	CPC 1595; MUCL 40269	Decaying leaf	French Guiana	C. Decock	KM231122; KM231287; KM231461; AF220973; AY793431; KM232311; KM231867; KM232002	Decock & Crous (1998), Crous *et al.* (2006), Lombard *et al.* (2015b)
		CBS 109168	CPC 1594; MUCL 40268	Decaying seed	French Guiana	C. Decock	KM231121; KM231286; KM231460; KM231745; JQ666074; KM232312; KM231868; KM232003	Decock & Crous (1998), Crous *et al.* (2006), Lombard *et al.* (2015b)

[1] Codes (B1 to B120) of the 120 accepted *Calonectria* species resulting from the present study.
[2] One hundred and twenty accepted species resulting from the present study.
[3] Key isolates of the 120 *Calonectria* species after revision.
[4] T: ex-type isolates of the *Calonectria* species after revision.
[5] AR: Amy Y. Rossman working collection; ATCC: American Type Culture Collection, Virginia, USA; CBS: Westerdijk Fungal Biodiversity Institute, Utrecht, The Netherlands; CERC: China Eucalypt Research Centre, ZhanJiang, GuangDong Province, China; CMW: Culture collection of the Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria, Pretoria, South Africa; CPC: Pedro Crous working collection housed at Westerdijk Fungal Biodiversity Institute; HGUP: Plant Pathology Herbarium of Gui Zhou University, GuiYang 550025, China; IMI: International Mycological Institute, CABI Bioscience, Egham, Bakeham Lane, UK; LPF: Laboratorio de Patologia Florestal, Universidade Federal de Viçsa, Viçsa, Brazil; MUCL: Mycotheque, Laboratoire de Mycologie Systematique st Appliqee, l'Universite, Louvian-la-Neuve, Belgium; PPRI: Plant Protection Research Institute, Pretoria, South Africa; STE-U: Department of Plant Pathology, University of Stellenbosch, South Africa; UFV: Universidade Federal de Viçsa, Viçsa, Brazil.
[6] *act*: actin; *cmdA*: calmodulin; *his3*: histone H3; ITS: the internal transcribed spacer regions 1 and 2 and the 5.8S gene of the ribosomal RNA; LSU: 28S large subunit RNA gene; *rpb2*: the second largest subunit of RNA polymerase; *tef1*: translation elongation factor 1-alpha; *tub2*: β-tubulin.
[7] GenBank accession number obtained in this study are in bold.
[8] N/A: information are not available.

Table 2. Morphological characteristics, thallism and area of occurrence of the 11 *Calonectria* species complexes.

Species complex	Vesicle shape		Macroconidia septation		Perithecial colour		Ascospore numbers in asci		Ascospores septation		Thallism[6]	Area of occurrence
	Typical or dominant[1]	Additional or minor	Typical or dominant[2]	Additional or minor	Typical or dominant[3]	Additional or minor	Typical or dominant[4]	Additional or minor	Typical or dominant[5]	Additional or minor		
1. *Calonectria brassicae* species complex	**Clavate**	Acicular, broadly clavate, narrowly clavate	**1**	1(–2), 1(–3)	**Orange to red-brown**	Brown, red	**8**		**1**	1(–3), (1–)3	Heterothallic or homothallic	Asia, North and South America
3. *Calonectria colhounii* species complex	**Clavate**	Acicular, broadly clavate, narrowly clavate	**3**	(1–)3, (1–)3(–4), 3–4	**Yellow**	Bright yellow, brown, dull yellow, orange, red, red-brown	**4**	(2–)4, 8	**3**	(1–)3, 2–3	Heterothallic or homothallic	Africa, Asia, North America
5. *Calonectria gracilipes* species complex	**Narrowly clavate**	Clavate	**>3**	1, 3, up to 12	**Orange to red-brown**	Brown, orange-brown	**8**		**Varied**	1, (1–)3, 3–6(–9)	Homothallic	North and South America
10. *Calonectria reteaudii* species complex	**Narrowly clavate**	Clavate	**>3**	(1–)3, up to 8	**Orange to red-brown**	Orange-red, red	**8**		**3**	(1–)3, (1–)3(–5), 3–4, (1–)3–6(–9)	Heterothallic or homothallic	Asia, Oceania
8. *Calonectria naviculata* species complex	**Naviculate**	Clavate, ellipsoidal, sphaero-pedunculate	**1**	1(–3)	**Orange to red-brown**		**2–8**		**3**		Heterothallic	Africa, Asia, Europe, North and South America, Oceania
2. *Calonectria candelabrum* species complex	**Ellipsoidal to obpyriform**	Broadly ellipsoidal, clavate, fusiform, narrowly obpyriform, ovoid, spathulate	**1**	(1–)3(–6)	**Orange to red-brown**	Red	**8**	4–8	**1**	(1–)3	Heterothallic or homothallic	Africa, Asia, Europe, North and South America, Oceania
7. *Calonectria mexicana* species complex	**Ellipsoidal with papillate apex**	Acicular, clavate, fusiform, narrowly ellipsoidal, obpyriform, obovoid, pyriform, sphaero-pedunculate	**1**	1(–3), (1–)3, (1–)3(–6)	**Orange to red-brown**	Brownish-yellow, red, yellow	**8**		**1**	1(–3), 3	Heterothallic or homothallic	Africa, Europe, North America
6. *Calonectria kyotensis* species complex	**Sphaero-pedunculate**	Globose, pyriform	**1**	1(–3), (1–)3, 3	**Orange to red-brown**	Orange-brown, red, reddish brown	**8**		**1**	1(–3), 2–3	Heterothallic or homothallic	Africa, Asia, Europe, North and South America
11. *Calonectria spathiphylli* species complex	**Sphaero-pedunculate**	Globose, ovoid, ellipsoidal, obpyriform	**1**	1(–3)	**Orange to red-brown**	Red	**8**	2–8	**1**	1(–3)	Heterothallic or homothallic	North and South America
4. *Calonectria cylindrospora* species complex	**Clavate, ellipsoidal, ellipsoidal with papillate apex, fusiform, obpyriform, ovoid, pyriform, sphaero-pedunculate**		**1**	(1–)3(–4)	**Orange to red-brown**	Orange-brown, red, yellow	**8**	(2–)8	**1**	1(–3)	Heterothallic or homothallic	Africa, Asia, Europe, North and South America
9. *Calonectria pteridis* species complex	**Clavate or ovate**	Fusiform, narrowly clavate, ellipsoidal	**1**	1(–3)	**Orange to red-brown**		**8**		**1**	1(–3), 1–3(–7)	Heterothallic	North and South America

[1] Typical vesicle shape for each species complex were marked in different colour: clavate or narrowly clavate vesicle/light green, naviculate vesicle/green, ellipsoidal to obpyriform vesicle/dark green, ellipsoidal vesicle with papillate apex/yellow, sphaeropedunculate vesicle/orange; species complexes with varied vesice shapes were not marked in any colour.

[2] Typical macroconidial septation number for each species complex were marked in different colour: 1-septate/light green, 3-septate/green, > 3-septate/dark green.

[3] Typical perithecial colour for each species complex were marked in different colour: orange to red-brown perithecia/light green, yellow perithecia/green.

[4] Typical ascospores number produced in the ascus for each species complex were marked in different colour: 4-spored asci/light green, 8-spored asci/green, not 4-spored or 8-spored asci were not marked in any colour.

[5] Typical ascospores septation number for each species complex were marked in different colour: 1-septate/light green, 3-septate/green, varied number of ascospores septation were not mark in any colour.

[6] Different mating system for each species complex were marked in different colour; heterothallic/light green, homothallic/green, heterothallic or homothallic/dark green.

species complex) all produce obpyriform vesicles, and 1-septate macroconidia with overlapping dimensions (Supplementary Table S4). Some species in the same species complex shared a similar morphology; for example, *Ca. pseudobrassicae* and *Ca. paraensis* (both in the *Ca. brassicae* species complex) both produce clavate vesicles, and 1-septate macroconidia with overlapping dimensions (Supplementary Table S4).

Species in the *Ca. naviculata* and *Ca. pteridis* species complexes are heterothallic, while those in the *Ca. gracilipes* species complex are homothallic. *Calonectria* species in the remaining eight complexes include both heterothallic and homothallic mating systems (Table 2, Supplementary Table S4).

A summary of species distribution globally, showed that species in the *Ca. candelabrum* and *Ca. naviculata* species complexes occur on all the continents other than Antarctica. In contrast, species in the *Ca. gracilipes*, *Ca. pteridis* and *Ca. spathiphylli* species complexes were from North and South America and those in the *Ca. reteaudii* species complex were from Asia and Oceania. Species in other species complexes occurred on between three and five continents (Table 2, Supplementary Table S4).

Species reduced to synonymy

Based on the criteria decided upon for species delimitation, 51 previously identified species were found to represent synonyms of other known species (Supplementary Tables S1 and S2). Justification for reducing these 51 previously accepted taxa to synonymy with earlier names is provided in the taxonomy section.

Novel taxa

Based on phylogenetic placement in the individual gene phylogenies as well as in the multi-gene phylogenetic trees (Fig. 1, Supplementary Figs S1–8), two isolates (CMW 30602 and CMW 30980) formed two distinct lineages. These lineages were clearly distinct from those representing any of the other described species and they are recognised here as two novel taxa described in the Taxonomy section. In the *Ca. brassicae* species complex, a single isolate (CMW 30980), treated as *Ca. ecuadorae* in the earlier studies (Crous *et al.* 2006), formed a distinct lineage in the *rpb2*, *tef1*, *tub2* and in the combined gene tree. This fungus clustered close to but separate from *Ca. ecuadorae* (ex-type CMW 23677, CBS 111706, and CBS 114164) and *Ca. octoramosa* (ex-type CBS 111423) (Fig. 1, Supplementary Figs S6–8). Isolate CMW 30980 is thus considered to represent a novel species. Isolate CMW 30602 in the *Ca. reteaudii* species complex was identified as *Ca. terrae-reginae* by Lombard *et al.* (2010c), and formed a distinct lineage in the ITS, *tef1* and *tub2* analyses as well as in the combined phylogenetic tree (Fig. 1, Supplementary Figs S4, S7, S8). This isolate represents an undescribed species closely related to but separate from *Ca. queenslandica* (ex-type CMW 30604, CMW 30601, and CMW 30603) (Fig. 1, Supplementary Figs S4, S7).

Calonectria lauri (Vanderw.) Lechat & Crous was proposed as the sexual morph of *Cylindrocladium ilicicola* by Lechat in 2010. The basionym *Tetracytum lauri* is invalid and thus the name *Ca. lauri* is invalid. The results of the present study have shown that *Ca. lauri* represents a well-defined species and its name is consequently validated in the taxonomy section.

Taxonomy (Species listed in alphabetical order)

Following the results of the multi-gene phylogenetic analyses and consideration of the morphological characteristics of the 169 described *Calonectria* spp. (codes A1 to A169 in Supplementary Tables S1 and S2), 51 species are reduced to synonymy and three novel *Calonectria* species (*Calonectria lauri* was validated and it is treated as a valid species in the current study) are recognised. This results in 120 *Calonectria* spp. now accepted and these are listed in Table 1 (codes B1 to B120 in Supplementary Tables S1 and S2). Morphological characteristics of the *Calonectria* spp. identified in this study and their closest relatives are summarised (Supplementary Table S4). The 120 accepted *Calonectria* species emerging from this study and their synonymies are presented below.

acaciicola Calonectria N.Q. Pham *et al.*, Mycologia 111: 88. 2019.

In: *Calonectria reteaudii* species complex.

Typus: PREM 62105 holotype.
Ex-type culture: CBS 143557 = CMW 47173.
Type locality: **Vietnam**, Nghe An, Do Luong.
Type substrate: Soil in *Acacia auriculiformis* plantation.
Barcodes: *act* = MT334933; *cmdA* = MT335160; *his3* = MT335399; *rpb2* = MT412474; *tef1* = MT412690; *tub2* = MT412930 (alternative markers: ITS = MT359620; LSU = MT359380).
Notes: *Calonectria acaciicola* is phylogenetically closely related to *Ca. pseudoreteaudii* and *Ca. reteaudii*. The sequences of *cmdA*, *his3*, *rpb2*, *tef1* and *tub2* gene regions can differentiate *Ca. acaciicola* from these two species. The macroconidia of *Ca. acaciicola* [(av. 94 × 7 µm); Pham *et al.* 2019] are smaller than those of *Ca. pseudoreteaudii* [(av. 104 × 8 µm); Lombard *et al.* 2010c] but larger than those of *Ca. reteaudii* [(av. 84 × 6.5 µm); Kang *et al.* 2001a] (Supplementary Table S4).

acicola Calonectria Gadgil & M.A. Dick, N.Z. Jl For. Sci. 34: 316. 2004.
Synonym: *Cylindrocladium acicola* Gadgil & M.A. Dick, N.Z. Jl For. Sci. 34: 316. 2004.

In: *Calonectria reteaudii* species complex.

Typus: NZFRI-M 5213 holotype.
Ex-type culture: CMW 30996.
Type locality: **New Zealand**, Northland.
Type substrate: *Phoenix canariensis*.
Barcodes: *act* = MT334935; *cmdA* = MT335162; *his3* = MT335401; *rpb2* = MT412476; *tef1* = MT412692; *tub2* = MT412932 (alternative markers: ITS = MT359622; LSU = MT359382).
Notes: *Calonectria acicola* is phylogenetically closely related to *Ca. multiseptata*. They can be distinguished from each other by the formation of megaconidiophores and megaconidia, a feature not observed in *Ca. acicola* but typical in *Ca. multiseptata* (Crous 2002, Gadgil & Dick 2004). *Calonectria acicola* is homothallic (Gadgil & Dick 2004) (Supplementary Table S4).

aciculata Calonectria J.Q. Li *et al.*, IMA Fungus 8: 273. 2017.

In: *Calonectria colhounii* species complex.

Typus: PREM 61941 holotype.
Ex-type culture: CBS 142883 = CMW 47645 = CERC 5342.

Type locality: **China**, YunNan Province.
Type substrate: *Eucalyptus urophylla* × *E. grandis*.
Barcodes: *act* = MT334937; *cmdA* = MT335164; *his3* = MT335403; *rpb2* = MT412478; *tef1* = MT412694; *tub2* = MT412934 (alternative markers: ITS = MT359624; LSU = MT359384).
Notes: *Calonectria aciculata* is closely related to *Ca. colhounii* and *Ca. honghensis*, but can be distinguished from these two species by its macroconidial dimensions. The macroconidia of *Ca. aciculata* [(av. 69 × 5.5 µm); Li *et al.* 2017] are longer than those of *Ca. colhounii* [(av. 65 × 5 µm); Peerally 1973] and *Ca. honghensis* [(av. 54 × 5.5 µm); Li *et al.* 2017]. *Calonectria aciculata* is homothallic (Li *et al.* 2020) (Supplementary Table S4).

aconidialis Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 162. 2015.
Synonyms: *Calonectria arbusta* L. Lombard *et al.*, Stud. Mycol. 80: 162. 2015.
Calonectria expansa L. Lombard *et al.*, Stud. Mycol. 80: 167. 2015.
Calonectria guangxiensis L. Lombard *et al.*, Stud. Mycol. 80: 169. 2015.
Calonectria hainanensis L. Lombard *et al.*, Stud. Mycol. 80: 170. 2015.
Calonectria magnispora L. Lombard *et al.*, Stud. Mycol. 80: 174. 2015.
Calonectria parakyotensis L. Lombard *et al.*, Stud. Mycol. 80: 176. 2015.
Calonectria pluriramosa L. Lombard *et al.*, Stud. Mycol. 80: 178. 2015.
Calonectria pseudokyotensis L. Lombard *et al.*, Stud. Mycol. 80: 178. 2015.
Calonectria sphaeropedunculata L. Lombard *et al.*, Stud. Mycol. 80: 180. 2015.

In: *Calonectria kyotensis* species complex.

Typus: CBS H-21481 holotype.
Ex-type culture: CBS 136086 = CMW 35174 = CERC 1850.
Type locality: **China**, HaiNan Province.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT334938; *cmdA* = MT335165; *his3* = MT335404; *rpb2* = MT412479; *tef1* = MT412695 (alternative markers: ITS = MT359625; LSU = MT359385).
Notes: *Calonectria aconidialis* is phylogenetically closely related to *Ca. pacifica* and can be differentiated from that species by the sequences of *act*, *cmdA*, *his3*, *rpb2*, ITS, LSU and *tef1* gene regions. The asexual structures of *Ca. aconidialis* failed to develop (Lombard *et al.* 2015a). This species is homothallic (Lombard *et al.* 2015a) (Supplementary Table S4).

aeknauliensis Calonectria N.Q. Pham & M.J. Wingf., Mycologia 111: 93. 2019.

In: *Calonectria kyotensis* species complex.

Typus: PREM 62107 holotype.
Ex-type culture: CBS 143559 = CMW 48253.
Type locality: **Indonesia**, Northern Sumatra, Aek Nauli.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT334953; *cmdA* = MT335180; *his3* = MT335419; *rpb2* = MT412486; *tef1* = MT412710; (alternative markers: ITS = MT359640; LSU = MT359400).
Notes: *Calonectria aeknauliensis* is closely related to *Ca. curvispora* and *Ca. ilicicola*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. aeknauliensis* [(av. 47 × 5 µm); Pham *et al.* 2019] are shorter than those of *Ca. curvispora* [(av. 60 × 5 µm); Victor *et al.* 1997] and smaller than those of *Ca. ilicicola* [(av. 62 × 6 µm); Boedijn & Reitsma 1950] (Supplementary Table S4).

amazonica Calonectria L. Lombard & Crous, Stud. Mycol. 85: 171. 2016.
Synonyms: *Calonectria amazoniensis* L. Lombard & Crous, Stud. Mycol. 85: 173. 2016.
Calonectria tropicalis L. Lombard & Crous, Stud. Mycol. 85: 192. 2016.
Calonectria longiramosa L. Lombard & Crous, Stud. Mycol. 86: 114. 2017.

In: *Calonectria pteridis* species complex.

Typus: CBS H-22750 holotype.
Ex-type culture: CBS 116250 = CMW 51234 = CPC 3534.
Type locality: **Brazil**, Amazon.
Type substrate: *Eucalyptus tereticornis*.
Barcodes: *act* = MT334955; *cmdA* = MT335182; *his3* = MT335421; *rpb2* = MT412488; *tef1* = MT412712; *tub2* = MT412935 (alternative markers: ITS = MT359642; LSU = MT359402).
Notes: *Calonectria amazonica* is closely related to *Ca. pteridis* and *Ca. pseudopteridis*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. amazonica* [(av. 79 × 5 µm); Lombard *et al.* 2016] are smaller than those of *Ca. pteridis* [(av. 82 × 5.5 µm); Crous *et al.* 1993c] and *Ca. pseudopteridis* [(av. 87.5 × 5.7 µm); Sobers 1968, Alfenas *et al.* 2015]. *Calonectria amazonica* is heterothallic (Li *et al.* 2020) (Supplementary Table S4).

amazoniensis Calonectria L. Lombard & Crous, Stud. Mycol. 85: 173. 2016.
(see ***Calonectria amazonica***)

In: *Calonectria pteridis* species complex.

Typus: CBS H-22751 holotype.
Ex-type culture: CBS 115440 = CMW 51222 = CPC 3885.
Type locality: **Brazil**, Amazon.
Type substrate: *Eucalyptus tereticornis*.
Barcodes: *act* = MT334957; *cmdA* = MT335184; *his3* = MT335423; *tef1* = MT412714; *tub2* = MT412937 (alternative markers: ITS = MT359644; LSU = MT359404).
Notes: *Calonectria amazoniensis* was treated as a synonym of *Ca. amazonica* in this study. In comparisons of DNA sequences for seven available gene regions, there were only three base differences in the *tub2* gene sequences between ex-type isolate of *Ca. amazoniensis* (CBS 115440) and the ex-type isolate of *Ca. amazonica* (CBS 116250). Both species produce clavate vesicles of similar dimensions (*Ca. amazoniensis*: 5–7 µm; *Ca. amazonica*: 5–6 µm) and 1-septate macroconidia. The macroconidia of *Ca. amazoniensis* (av. 69 × 4 µm) are smaller than those of *Ca. amazonica* (av. 79 × 5 µm) (Lombard *et al.* 2016), which was considered to represent intraspecific variation (Supplementary Table S4).

angustata Calonectria (Crous & El-Gholl) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.

Basionym: *Cylindrocladium angustatum* Crous & El-Gholl, Mycoscience 41: 522. 2000.

In: *Calonectria gracilipes* species complex.

Typus: PREM 56546 holotype.
Ex-type culture: CBS 114544 = CMW 30990 = CPC 2347 = P99-0454.
Type locality: **USA**, Florida, Sarasota nursery.
Type substrate: *Tillandsia capitata.*
Barcodes: *act* = MT334963; *his3* = MT335429; *rpb2* = MT412493; *tef1* = MT412720; *tub2* = MT412943 (alternative markers: ITS = MT359650; LSU = MT359410).
Notes: *Calonectria angustata* is phylogenetically closely related to *Ca. hurae* and *Ca. leguminum*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. angustata* [(av. 110 × 10 µm); Crous *et al.* 2000] are shorter than those of *Ca. hurae* [(av. 120 × 7.5 µm); Crous 2002] but larger than those of *Ca. leguminum* [(av. 60 × 5 µm); Figueiredo & Namekata 1967, Crous 2002] (Supplementary Table S4).

arbusta Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 162. 2015.
(see ***Calonectria aconidialis***)

In: *Calonectria kyotensis* species complex.

Typus: CBS H-21482 holotype.
Ex-type culture: CBS 136079 = CMW 31370 = CERC 1705.
Type locality: **China**, GuangXi Province.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT334940; *cmdA* = MT335167; *his3* = MT335406; *rpb2* = MT412480; *tef1* = MT412697 (alternative markers: ITS = MT359627; LSU = MT359387).
Notes: *Calonectria arbusta* was treated as a synonym of *Ca. aconidialis* in this study. In comparisons of DNA sequences for seven available gene regions, the only differences between the ex-type isolate of *Ca. arbusta* (CMW 31370) and the ex-type isolate of *Ca. aconidialis* (CMW 35174) was in the *his3* and *tef1* sequences, where there were two base differences in the *his3* and one base difference in the *tef1* sequences. Both species are homothallic and produce orange to orange-brown perithecia, 8-spored asci and 1-septate ascospores, and share the similar ascospores dimensions (*Ca. arbusta*: av. 38 × 7 µm; *Ca. aconidialis*: av. 36 × 6 µm) (Lombard *et al.* 2015a, Li *et al.* 2020; Supplementary Table S4).

asiatica Calonectria Crous & Hywel-Jones, Stud. Mycol. 50: 419. 2004.
Synonym: *Cylindrocladium asiaticum* Crous & Hywel-Jones, Stud. Mycol. 50: 419. 2004.

In: *Calonectria kyotensis* species complex.

Typus: CBS 9889 holotype.
Ex-type culture: CBS 114073 = CMW 23782 = CPC 3900.
Type locality: **Thailand**, Prathet Thai.
Type substrate: Leaf litter.
Barcodes: *act* = GQ280428; *cmdA* = AY725741; *his3* = AY725658; *tef1* = AY725705; *tub2* = AY725616 (alternative markers: ITS = GQ280550; LSU = GQ280672).
Notes: *Calonectria asiatica* is closely related to *Ca. yunnanensis*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. asiatica* [(av. 53 × 5 µm); Crous *et al.* 2004] are larger than those of *Ca. yunnanensis* [(av. 43 × 4.5 µm); Li *et al.* 2017], and the vesicles of *Ca. asiatica* (12–17 µm) are wider than those of *Ca. yunnanensis* (2–4.5 µm). *Calonectria asiatica* is homothallic (Crous *et al.* 2004) (Supplementary Table S4).

auriculiformis Calonectria N.Q. Pham *et al.*, Mycologia 111: 85. 2019.

In: *Calonectria cylindrospora* species complex.

Typus: PREM 62109 holotype.
Ex-type culture: CBS 143561 = CMW 47178.
Type locality: **Vietnam**, Thanh Hoa, Hau Loc.
Type substrate: Soil in *Acacia auriculiformis* plantation.
Barcodes: *act* = MT334964; *cmdA* = MT335190; *his3* = MT335430; *rpb2* = MT412494; *tef1* = MT412721; *tub2* = MT412944 (alternative markers: ITS = MT359651; LSU = MT359411).
Notes: *Calonectria auriculiformis* is closely related to *Ca. lageniformis*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. auriculiformis* (av. 43 × 4 µm) are longer than those of *Ca. lageniformis* (av. 40 × 5 µm). Furthermore, *Ca. auriculiformis* has five tiers of branches in its conidiogenous apparatus in comparison to three in *Ca. lageniformis* (Lombard *et al.* 2016, Pham *et al.* 2019).

australiensis Calonectria (Crous & K.D. Hyde) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Cylindrocladium australiense* Crous & K.D. Hyde, Stud. Mycol. 55: 221. 2006.

In: *Calonectria reteaudii* species complex.

Typus: CBS H-17872 holotype.
Ex-type culture: CBS 112954 = CMW 23669 = CPC 4714.
Type locality: **Australia**, Queensland.
Type substrate: *Ficus pleurocarpa*.
Barcodes: *act* = MT334965; *cmdA* = MT335192; *his3* = MT335432; *rpb2* = MT412496; *tef1* = MT412723; *tub2* = MT412946 (alternative markers: ITS = MT359653; LSU = MT359413).
Notes: Phylogenetically, *Ca. australiensis* forms a distinct lineage separate from other species in this species complex.

avesiculata Calonectria T.S. Schubert *et al.*, Canad. J. Bot. 67: 2415. 1989.
Synonym: *Cylindrocladium avesiculatum* D.L. Gill *et al.*, Phytopathology 61: 60. 1971.

In: *Calonectria mexicana* species complex.

Typus: FLAS F55193 (holotype of *Ca. avesiculata*; Schubert *et al.* 1989), BPI 414546 (isosyntype of *Cy. avesiculatum*; Gill *et al.* 1971).
Ex-type culture: CBS 313.92 = CMW 23670 = CPC 2373 = ATCC 38226 (Lombard *et al.* 2010a).
Type locality: **USA**, Georgia, Cairo.
Type substrate: *Ilex vomitoria*.
Barcodes: *act* = GQ280431; *cmdA* = GQ267364; *his3* = DQ190620; *tef1* = GQ267294; *tub2* = AF333392 (alternative markers: ITS = GQ280553; LSU = GQ280675).
Notes: *Calonectria avesiculata* is closely related to *Ca. mexicana*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. avesiculata* [(av. 64 × 5 µm); Schubert *et al.* 1989] are larger

than those of *Ca. mexicana* [(av. 45 × 4 µm); Schoch *et al.* 1999], and the vesicles of *Ca. avesiculata* (1–4 µm) are narrower than those of *Ca. mexicana* (7–12 µm). Furthermore, *Ca. avesiculata* is characterised by producing a thick-walled stipe extension (Crous 2002), a feature not observed for *Ca. mexicana*. *Calonectria avesiculata* is heterothallic (Schubert *et al.* 1989) (Supplementary Table S4).

baviensis Calonectria N.Q. Pham *et al.*, Mycologia 111: 90. 2019.
(see ***Calonectria reteaudii***)

In: *Calonectria reteaudii* species complex.

Typus: PREM 62111 holotype.
Ex-type culture: CBS 143563 = CMW 47410.
Type locality: **Vietnam**, Hanoi, Bavi.
Type substrate: *Eucalyptus urophylla.*
Barcodes: *act* = MT334966; *cmdA* = MT335193; *his3* = MT335433; *rpb2* = MT412497; *tef1* = MT412724; (alternative markers: ITS = MT359654; LSU = MT359414).
Notes: *Calonectria baviensis* was treated as a synonym of *Ca. reteaudii* in this study. In comparisons of DNA sequences for the seven available gene regions, a single base difference in each of the *cmdA*, *rpb2* and *tef1* sequences was found between the ex-type isolate of *Ca. baviensis* (CMW 47410) and the ex-type isolate of *Ca. reteaudii* (CMW 30984). Both species produce clavate vesicles with similar dimensions (*Ca. baviensis*: 3–6 µm; *Ca. reteaudii*: 3–6 µm) and 5-septate macroconidia. Macroconidia of *Ca. baviensis* (av. 96 × 6.5 µm) are longer than those of *Ca. reteaudii* (av. 84 × 6.5 µm) (Kang *et al.* 2001a, Pham *et al.* 2019), which was considered to represent intraspecific variation (Supplementary Table S4).

blephiliae Calonectria Crous & Hodges, Persoonia 31: 225. 2013.
(see ***Calonectria cylindrospora***)

In: *Calonectria cylindrospora* species complex.

Typus: CBS H-21434 holotype.
Ex-type culture: CBS 136425 = CMW 51321 = CPC 21859.
Type locality: **USA**, North Carolina, Ellerbe.
Type substrate: *Blephilia ciliata*.
Barcodes: *act* = MT335005; *cmdA* = MT335235; *his3* = MT335475; *rpb2* = MT412539; *tef1* = MT412766; *tub2* = MT412984 (alternative markers: ITS = MT359696; LSU = MT359456).
Notes: *Calonectria blephiliae* was treated as a synonym of *Ca. cylindrospora* in this study. In comparisons of DNA sequences for eight gene regions, all sequences for the ex-type isolate of *Ca. blephiliae* (CBS 136425) were 100 % identical to those for the isolate of *Ca. cylindrospora* (CMW 30978); the only differences between the ex-type isolate of *Ca. blephiliae* (CBS 136425) and the isolate of *Ca. cylindrospora* (CBS 119670) was found in the *act* gene sequences where only one base difference was observed. *Calonectria cylindrospora* and *Ca. blephiliae* both produce clavate to ellipsoidal vesicles with overlapping dimensions (*Ca. blephiliae*: 7–10 µm; *Ca. cylindrospora*: 6–8 µm) and 1-septate macroconidia. The macroconidia of *Ca. blephiliae* (av. 50 × 4.5 µm) are larger than those of *Ca. cylindrospora* (av. 45 × 4 µm) (Crous 2002, Crous *et al.* 2013, Lombard *et al.* 2015b), which was considered to represent intraspecific variation (Supplementary Table S4).

brachiatica Calonectria L. Lombard *et al.*, Persoonia 23: 44. 2009.

In: *Calonectria brassicae* species complex.

Typus: PREM 60197 holotype.
Ex-type culture: CBS 123700 = CMW 25298.
Type locality: **Colombia**, Buga.
Type substrate: *Pinus maximinoi*.
Barcodes: *cmdA* = MT335195; *his3* = MT335435; *rpb2* = MT412499; *tef1* = MT412726; *tub2* = MT412948 (alternative markers: ITS = MT359656; LSU = MT359416).
Notes: *Calonectria brachiatica* is closely related to *Ca. parvispora*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. brachiatica* [(av. 44 × 5 µm); Lombard *et al.* 2009] are larger than those of *Ca. parvispora* [(av. 29 × 4 µm); Marin-Felix *et al.* 2017] (Supplementary Table S4).

brasiliana Calonectria L. Lombard & Crous, Stud. Mycol. 85: 174. 2016.

In: *Calonectria candelabrum* species complex.

Typus: CBS H-22752 holotype.
Ex-type culture: CBS 111484 = CMW 51187 = CPC 1924.
Type locality: **Brazil**.
Type substrate: Soil.
Barcodes: *act* = MT334968; *cmdA* = MT335198; *his3* = MT335438; *rpb2* = MT412502; *tef1* = MT412729; *tub2* = MT412951 (alternative markers: ITS = MT359659; LSU = MT359419).
Notes: *Calonectria brasiliana* is closely related to *Ca. metrosideri*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. brasiliana* [(av. 53 × 4 µm); Lombard *et al.* 2016] are longer than those of *Ca. metrosideri* [(av. 45 × 4 µm); Alfenas *et al.* 2013a] (Supplementary Table S4).

brasiliensis Calonectria (Bat. & Cif.) L. Lombard *et al.*, Stud. Mycol. 66: 19. 2010.
Basionym: *Cylindrocladium scoparium* var. *brasiliensis* Bat. & Cif., (as *brasiliense*) Boletim de SA.I.C. Pernambuco 18: 188. 1952.
Synonyms: *Cylindrocladium brasiliense* (Bat. & Cif.) Peerally, (*as braziliensis*) CMI Descriptions of Pathogenic Fungi and Bacteria 427. 1974.
Calonectria hodgesii R.F Alfenas *et al.*, Trop. Plant. Pathol. 38: 517. 2013.
Calonectria pseudohodgesii R.F. Alfenas *et al.*, Stud. Mycol. 80: 118. 2015.

In: *Calonectria cylindrospora* species complex.

Typus: IMI 43688 holotype.
Ex-type culture: CBS 230.51 = IMI 299576.
Type locality: **Brazil**, Ceara State.
Type substrate: *Eucalyptus* spp.
Barcodes: *act* = MT334970; *cmdA* = MT335200; *his3* = MT335440; *rpb2* = MT412504; *tef1* = MT412731; *tub2* = MT412953 (alternative markers: ITS = MT359661; LSU = MT359421).
Notes: *Calonectria brasiliensis* is closely related to *Ca. maranhensis*, and can be distinguished from that species by the

dimensions of its macroconidia. The macroconidia of *Ca. brasiliensis* [(av. 38 × 3.5 µm); Batista 1951] are smaller than those of *Ca. maranhensis* [(av. 57 × 5 µm); Alfenas *et al.* 2015] (Supplementary Table S4).

brassiana Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 100. 2015.

In: *Calonectria candelabrum* species complex.

Typus: CBS H-21376 holotype.
Ex-type culture: CBS 134855 = LPF378.
Type locality: **Brazil**, Piauí state, Teresina.
Type substrate: Soil in *Eucalyptus brassiana* plantation.
Barcodes: *cmdA* = KM396056; *his3* = KM396139; *tef1* = KM395882; *tub2* = KM395969.
Notes: *Calonectria brassiana* is closely related to *Ca. glaebicola*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. brassiana* (av. 53 × 4 µm) are longer than those of *Ca. glaebicola* (av. 50 × 4 µm) (Alfenas *et al.* 2015) (Supplementary Table S4).

brassicae Calonectria (Pamwar & Bohra) L. Lombard *et al.*, Persoonia 23: 45. 2009.
Basionym: *Cylindrocladium brassicae* Panwar & Bohra, Indian Phytopathol. 27: 425. 1974.
Synonyms: *Cylindrocarpon gracile* Bugnic., Encycl. Mycologique 11: 162. 1939.
Cylindrocladium gracile (Bugnic.) Boesew., Trans. Brit. Mycol. Soc. 78: 554. 1982.
Cylindrocladium clavatum Hodges & L.C. May, Phytopathology 62: 900. 1972.

In: *Calonectria brassicae* species complex.

Typus: PREM 51032 holotype.
Ex-type culture: CBS 111869 = CPC 2409.
Type locality: **Indonesia**.
Type substrate: *Argyreia splendens*.
Barcodes: *act* = MT334972; *cmdA* = MT335202; *his3* = MT335442; *rpb2* = MT412506; *tef1* = MT412733; *tub2* = MT412955 (alternative markers: ITS = MT359663; LSU = MT359423).
Notes: *Calonectria brassicae* is closely related to *Ca. brachiatica* and *Ca. parvispora*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. brassicae* [(av. 53 × 4.5 µm); Crous 2002] are longer than those of *Ca. brachiatica* [(av. 44 × 5 µm); Lombard *et al.* 2009] and *Ca. parvispora* [(av. 29 × 4 µm); Marin-Felix *et al.* 2017] (Supplementary Table S4).

brassicicola Calonectria L. Lombard & Crous, Stud. Mycol. 85: 174. 2016.

In: *Calonectria kyotensis* species complex.

Typus: CBS H-22753 holotype.
Ex-type culture: CBS 112841 = CMW 51206 = CPC 4552.
Type locality: **Indonesia**.
Type substrate: Soil under *Brassica* sp.
Barcodes: *cmdA* = KX784561; *tef1* = KX784689; *tub2* = KX784619.
Notes: *Calonectria brassicicola* is closely related to *Ca. sumatrensis*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. brassicicola* [(av. 42 × 5 µm); Lombard *et al.* 2016] are shorter than those of *Ca. sumatrensis* [(av. 58 × 5 µm); Crous *et al.* 2004], and the vesicles of *Ca. brassicicola* (3−5 µm) are narrower than those of *Ca. sumatrensis* (8−13 µm) (Crous *et al.* 2004, Lombard *et al.* 2016) (Supplementary Table S4).

brevistipitata Calonectria L. Lombard & Crous, Stud. Mycol. 85: 175. 2016.

In: *Calonectria candelabrum* species complex.

Typus: CBS H-22754 holotype.
Ex-type culture: CBS 115671 = CMW 51226 = CPC 949.
Type locality: **Mexico**.
Type substrate: Soil.
Barcodes: *act* = MT334973; *cmdA* = MT335203; *his3* = MT335443; *rpb2* = MT412507; *tef1* = MT412734; *tub2* = MT412956 (alternative markers: ITS = MT359664; LSU = MT359424).
Notes: *Calonectria brevistipitata* is closely related to *Ca. nemoricola*, *Ca. pauciramosa* and *Ca. silvicola*, and can be distinguished from these three species by the dimensions of its macroconidia. The macroconidia of *Ca. brevistipitata* [(av. 31 × 3.5 µm); Lombard *et al.* 2016] are smaller than those of *Ca. nemoricola* [(av. 45 × 4 µm); Alfenas *et al.* 2015], *Ca. pauciramosa* [(av. 50 × 4.5 µm); Crous 2002] and *Ca. silvicola* [(av. 41 × 4.5 µm); Alfenas *et al.* 2015]. *Calonectria brevistipitata* is heterothallic (Li *et al.* 2020) (Supplementary Table S4).

bumicola Calonectria N.Q. Pham & M.J. Wingf., Mycologia 111: 94. 2019.

In: *Calonectria kyotensis* species complex.

Typus: PREM 62123 holotype.
Ex-type culture: CBS 143575 = CMW 48257.
Type locality: **Indonesia**, Northern Sumatra, Aek Nauli.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT334975; *cmdA* = MT335205; *his3* = MT335445; *rpb2* = MT412509; *tef1* = MT412736 (alternative markers: ITS = MT359666; LSU = MT359426).
Notes: *Calonectria bumicola* is phylogenetically closely related to *Ca. lantauensis* and can be differentiated from that species by the sequences of *act*, *cmdA*, *his3*, *rpb2* and *tef1* gene regions. The asexual and sexual morphs of *Ca. bumicola* could not be induced by Pham *et al.* (2019). This species was shown to be homothallic by Li *et al.* (2020).

canadiana Calonectria (J.C. Kang *et al.*) L. Lombard *et al.*, IMA Fungus 1: 106. 2010.
Basionym: *Cylindrocladium canadense* J.C. Kang *et al.*, Syst. Appl. Microbiol. 24: 210. 2001.
Synonyms: *Calonectria canadensis* (J.C. Kang *et al.*) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010. *Nom. inval.*, Art. 53.1.
Calonectria montana Q.L. Liu & S.F. Chen, Mycokeys 26: 48. 2017.

In: *Calonectria kyotensis* species complex.

Typus: PREM 57195 holotype.
Ex-type culture: CBS 110817 = CMW 23673 = STE-U 499.
Type locality: **Canada**.
Type substrate: *Picea* sp.
Barcodes: *act* = MT334976; *cmdA* = MT335206; *his3* = MT335446; *rpb2* = MT412510; *tef1* = MT412737; *tub2* = MT412958 (alternative markers: ITS = MT359667; LSU = MT359427).

Notes: Phylogenetically, *Ca. canadiana* forms a distinct lineage separate from other species in this species complex.

***candelabrum* Calonectria** (Viégas) Rossman *et al.*, (as *candelabra*), Stud. Mycol. 80: 210. 2015.
Basionym: *Cylindrocladium candelabrum* Viégas, Bragantia 6: 370. 1946.
Synonyms: *Calonectria scoparia* Ribeiro & Matsuoka, In: Ribeiro, M.Sc. Thesis, Heterotalismo em *C. scoparium* Morgan: 28. 1978 (nom. inval., Art. 29).
Calonectria scoparia Peerally, Mycotaxon 40: 341. 1991.
Calonectria pseudoscoparia L. Lombard *et al.*, Stud. Mycol. 66: 53. 2010.

In: *Calonectria candelabrum* species complex.

Typus: PREM 51044 (neotype of *Cy. candelabrum*; Crous 2002).
Ex-type culture: Not available.
Key cultures: CMW 31000 = CPC 1675 = UFV 117, CMW 31001 = STE-U 1679 = UFV 126 (Alfenas *et al.* 2015).
Key culture locality: **Brazil**, Amazonas (locality of CMW 31000 and CMW 31001; Alfenas *et al.* 2015).
Key culture substrate: *Eucalyptus* sp. (substrate of CMW 31000 and CMW 31001; Alfenas *et al.* 2015).
Barcodes: *Culture* CMW 31000: *act* = MT334977; *cmdA* = MT335207; *his3* = MT335447; *rpb2* = MT412511; *tef1* = MT412738; *tub2* = MT412959 (alternative markers: ITS = MT359668; LSU = MT359428); *culture* CMW 31001: *act* = MT334978; *cmdA* = MT335208; *his3* = MT335448; *rpb2* = MT412512; *tef1* = MT412739; *tub2* = MT412960 (alternative markers: ITS = MT359669; LSU = MT359429)
Notes: *Calonectria candelabrum* is closely related to *Ca. eucalypticola* and *Ca. venezuelana*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. candelabrum* [(av. 60 × 4.5 µm); Crous 2002] are longer than those of *Ca. eucalypticola* [(av. 50 × 4 µm); Alfenas *et al.* 2015] and *Ca. venezuelana* [(av. 58 × 5 µm); Lombard *et al.* 2016]. *Calonectria candelabrum* is heterothallic (Crous 2002, Li *et al.* 2020) (Supplementary Table S4).

***cerciana* Calonectria** L. Lombard *et al.*, Persoonia 24: 7. 2010.
Synonyms: *Calonectria papillata* L. Lombard *et al.*, Stud. Mycol. 80: 175. 2015.
Calonectria terrestris L. Lombard *et al.*, Stud. Mycol. 80: 182. 2015.

In: *Calonectria cylindrospora* species complex.

Typus: PREM 60241 holotype.
Ex-type culture: CBS 123693 = CMW 25309.
Type locality: **China**, GuangDong, CERC nursery.
Type substrate: *E. urophylla* × *E. grandis* hybrid cutting.
Barcodes: *act* = MT334981; *cmdA* = MT335211; *his3* = MT335451; *rpb2* = MT412515; *tef1* = MT412742; *tub2* = MT412963 (alternative markers: ITS = MT359672; LSU = MT359432).
Notes: *Calonectria cerciana* is closely related to *Ca. tonkinensis*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. cerciana* (av. 44 × 5 µm) are larger than those of *Ca. tonkinensis* (av. 41.5 × 4 µm), and the vesicles of *Ca. cerciana* (8–13 µm) are wider than those of *Ca. tonkinensis* (3–7 µm) (Lombard *et al.* 2010c, Pham *et al.* 2019) (Supplementary Table S4).

***chinensis* Calonectria** (Crous) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Cylindrocladium chinense* Crous, Stud. Mycol. 50: 420. 2004.
Synonym: *Calonectria multistipitata* N.Q. Pham *et al.*, Mycologia 111: 98. 2019.

In: *Calonectria kyotensis* species complex.

Typus: PREM 62118 holotype.
Ex-type culture: CBS 114827 = CMW 23674 = CPC 4101.
Type locality: **China**, Hong Kong.
Type substrate: Soil.
Barcodes: *act* = MT334990; *cmdA* = MT335220; *his3* = MT335460; *rpb2* = MT412524; *tef1* = MT412751; *tub2* = MT412972 (alternative markers: ITS = MT359681; LSU = MT359441).
Notes: *Calonectria chinensis* is phylogenetically closely related to *Ca. cochinchinensis* and *Ca. heveicola*, it can be distinguished from these two species by the sequences of *cmdA*, *his3*, *rpb2*, *tef1* and *tub2* gene regions.

***citri* Calonectria** (H.S. Fawc. & Klotz) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Candelospora citri* H.S. Fawc. & Klotz, Mycologia 29: 213. 1937.
Synonym: *Cylindrocladium citri* (H.S. Fawc. & Klotz) Boedijn & Reitsma, Reinwardtia 1: 57. 1950.

In: *Calonectria mexicana* species complex.

Typus: K (isotype; Crous 2002).
Ex-type culture: CBS 186.36 = CMW 23675 (Lombard *et al.* 2010a).
Type locality: **USA**, Florida.
Type substrate: *Citrus sinensis*.
Barcodes: *act* = MT334992; *cmdA* = MT335222; *his3* = MT335462; *rpb2* = MT412526; *tef1* = MT412753; *tub2* = MT412974 (alternative markers: ITS = MT359683; LSU = MT359443).
Notes: *Calonectria citri* is closely related to *Ca. lauri*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. citri* [(av. 58 × 4 µm); Crous 2002] are smaller than those of *Ca. lauri* [(av. 60 × 5.5 µm); Lechat *et al.* 2010] (Supplementary Table S4).

***clavata* Calonectria** Alfieri *et al.*, Mycotaxon 48: 206. 1993.
Synonym: *Cylindrocladium flexuosum* Crous, Syst. Appl. Microbiol. 18: 248. 1995.

In: *Calonectria brassicae* species complex.

Typus: FLAS F55430 [holotype of *Ca. clavata*; El-Gholl *et al.* 1993b], PREM 51721 (holotype of *Cy. flexuosum*; Crous *et al.* 1995).
Ex-type culture: CBS 114557 = CMW 23690 = CPC 2536 = P078-1543 = ATCC 66389 (Crous 2002, Lombard *et al.* 2010a).
Type locality: **USA**, Florida, Lake Placid.
Type substrate: *Callistemon viminalis*.
Barcodes: *act* = MT334993; *cmdA* = MT335223; *his3* = MT335463; *rpb2* = MT412527; *tef1* = MT412754; *tub2* = MT412975 (alternative markers: ITS = MT359684; LSU = MT359444).

Notes: Phylogenetically, *Ca. clavata* forms a distinct lineage separate from other species in this species complex. *Calonectria clavata* is heterothallic (El-Gholl *et al.* 1993b, Li *et al.* 2020).

cliffordiicola Calonectria L. Lombard & Crous, Stud. Mycol. 85: 177. 2016.
(see ***Calonectria pauciramosa***)

In: *Calonectria candelabrum* species complex.

Typus: CBS H-22755 holotype.
Ex-type culture: CBS 111812 = CMW 51190 = CPC 2631.
Type locality: **South Africa**, Western Cape Province, George.
Type substrate: *Cliffordia feruginea*.
Barcodes: *act* = MT335084; *cmdA* = MT335316; *his3* = MT335556; *rpb2* = MT412609; *tef1* = MT412847; *tub2* = MT413059 (alternative markers: ITS = MT359777; LSU = MT359537).
Notes: *Calonectria cliffordiicola* was treated as a synonym of *Ca. pauciramosa* in this study. In comparisons of DNA sequences for eight gene regions, all the sequences of the isolates of *Ca. cliffordiicola* (ex-type CBS 111812, CBS 111814, and CBS 111819) were 100 % identical to those of the isolates of *Ca. pauciramosa* (ex-type CBS 138824, CMW 2151, CMW 7592, CMW 9151, CMW 30823, and CMW 30875). Both species produce obpyriform to ellipsoidal vesicles with overlapping dimensions (*Ca. cliffordiicola*: 7–9 µm; *Ca. pauciramosa*: 5–11 µm) and 1-septate macroconidia, the macroconidia of *Ca. cliffordiicola* (av. 40 × 4 µm) are smaller than those of *Ca. pauciramosa* (av. 50 × 4.5 µm) (Crous 2002, Lombard *et al.* 2016), which was considered to represent intraspecific variation (Supplementary Table S4).

cochinchinensis Calonectria N.Q. Pham *et al.*, Mycologia 111: 95. 2019.

In: *Calonectria kyotensis* species complex.

Typus: PREM 62115 holotype.
Ex-type culture: CBS 143567 = CMW 49915.
Type locality: **Vietnam**, Tay Ninh, Duong Minh Chau.
Type substrate: Soil in *Hevea brasiliensis* plantation.
Barcodes: *act* = MT334995; *cmdA* = MT335225; *his3* = MT335465; *rpb2* = MT412529; *tef1* = MT412756; *tub2* = MT412977 (alternative markers: ITS = MT359686; LSU = MT359446).
Notes: *Calonectria cochinchinensis* is phylogenetically closely related to *Ca. heveicola* and can be differentiated from *Ca. heveicola* by sequence data of *act*, *cmdA*, *his3*, ITS, *tef1* and *tub2* gene regions. In addition, *Ca. cochinchinensis* produces longer stipe extensions [(147–208 µm); Pham *et al.* 2019] than those of *Ca. heveicola* [(138–189 µm); Pham *et al.* 2019] (Supplementary Table S4).

colhounii Calonectria Peerally, Mycol. Res. 61: 92. 1973.
Synonym: *Cylindrocladium colhounii* Peerally, Mycol. Res. 61: 92. 1973.

In: *Calonectria colhounii* species complex.

Typus: IMI 167581 holotype.
Ex-type culture: CBS 293.79 = CMW 30999.
Type locality: **Mauritius**.
Type substrate: *Camellia sinensis*.
Barcodes: *act* = GQ280443; *cmdA* = GQ267373; *his3* = DQ190639; *rpb2* = KY653376; *tef1* = GQ267301; *tub2* = DQ190564 (alternative markers: ITS = GQ280565; LSU = GQ280687).
Notes: *Calonectria colhounii* is phylogenetically closely related to *Ca. aciculata* and *Ca. honghensis*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. colhounii* [(av. 65 × 5 µm); Peerally 1973] are smaller than those of *Ca. aciculata* [(av. 69 × 5.5 µm); Li *et al.* 2017], and longer than those of *Ca. honghensis* [(av. 54 × 5.5 µm); Li *et al.* 2017]. In addition, the ascospores of *Ca. colhounii* (av. 55 × 6 µm) are longer than those of *Ca. honghensis* (av. 49 × 6 µm) (Peerally 1973, Li *et al.* 2017). *Calonectria colhounii* is homothallic (Peerally 1973) (Supplementary Table S4).

colombiana Calonectria L. Lombard *et al.*, Stud. Mycol. 66: 23. 2010.

In: *Calonectria candelabrum* species complex.

Typus: PREM 60295 holotype.
Ex-type culture: CBS 115127 = CMW 30871 = CPC 1160.
Type locality: **Colombia**, La Selva.
Type substrate: Soil.
Barcodes: *act* = GQ280538; *cmdA* = GQ267455; *his3* = FJ972442; *tef1* = FJ972492; *tub2* = FJ972423 (alternative markers: ITS = GQ280660; LSU = GQ280782).
Notes: *Calonectria colombiana* is closely related to *Ca. brevistipitata*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. colombiana* (av. 37 × 3 µm) are longer than those of *Ca. brevistipitata* (av. 31 × 3.5 µm), and the vesicles of *Ca. colombiana* (8–12 µm) are wider than those of *Ca. brevistipitata* (5–8 µm) (Lombard *et al.* 2010b, 2016). *Calonectria colombiana* is characterised as being homothallic, while *Ca. brevistipitata* is heterothallic (Lombard *et al.* 2010b, Li *et al.* 2020) (Supplementary Table S4).

colombiensis Calonectria Crous, Stud. Mycol. 50: 421. 2004.
Synonym: *Cylindrocladium colombiense* Crous, Stud. Mycol. 50: 421. 2004.

In: *Calonectria kyotensis* species complex.

Typus: CBS 9890 holotype.
Ex-type culture: CBS 112220 = CMW 23676 = CPC 723.
Type locality: **Colombia**, La Selva.
Type substrate: Soil under *Eucalyptus grandis*.
Barcodes: *act* = MT334998; *cmdA* = MT335228; *his3* = MT335468; *rpb2* = MT412532; *tef1* = MT412759; *tub2* = MT412980 (alternative markers: ITS = MT359689; LSU = MT359449).
Notes: Phylogenetically, *Ca. colombiensis* forms a distinct lineage separate from other species in this species complex. *Ca. colombiensis* is homothallic (Li *et al.* 2020).

crousiana Calonectria S.F. Chen *et al.*, Persoonia 26: 6. 2011.

In: *Calonectria reteaudii* species complex.

Typus: PREM 60453 holotype.
Ex-type culture: CBS 127198 = CMW 27249.
Type locality: **China**, FuJian Province.

Type substrate: *Eucalyptus grandis*.
Barcodes: *act* = MT335000; *cmdA* = MT335230; *his3* = MT335470; *rpb2* = MT412534; *tef1* = MT412761; *tub2* = MT412982 (alternative markers: ITS = MT359691; LSU = MT359451).
Notes: Phylogenetically, *Ca. crousiana* forms a distinct lineage separate from other species in this species complex. *Calonectria crousiana* is homothallic (Chen *et al.* 2011, Li *et al.* 2020).

curvispora Calonectria (Crous & D. Victor) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Cylindrocladium curvisporum* Crous & D. Victor, Syst. Appl. Microbiol. 20: 283. 1997.
Synonym: *Calonectria vegrandis* N.Q. Pham & M.J. Wingfield, Mycologia 111: 99. 2019.

In: *Calonectria kyotensis* species complex.

Typus: PREM 51751 holotype.
Ex-type culture: CBS 116159 = CMW 23693 = CPC 765.
Type locality: **Madagascar**, Tamatave.
Type substrate: Soil.
Barcodes: *act* = MT335002; *cmdA* = MT335232; *his3* = MT335472; *rpb2* = MT412536; *tef1* = MT412763 (alternative markers: ITS = MT359693; LSU = MT359453).
Notes: *Calonectria curvispora* is closely related to *Ca. aeknauliensis* and *Ca. ilicicola*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. curvispora* [(av. 60 × 5 µm); Victor *et al.* 1997] are smaller than those of *Ca. ilicicola* [(av. 62 × 6 µm); Boedijn & Reitsma 1950] but longer than those of *Ca. aeknauliensis* [(av. 47 × 5 µm); Pham *et al.* 2019] (Supplementary Table S4).

cylindrospora Calonectria (Ellis & Everh.) Rossman *et al.*, Stud. Mycol. 80: 210. 2015.
Basionym: *Diplocladium cylindrosporum* Ellis & Everh., Bull. Torrey Bot. Club 27: 58. 1900.
Synonyms: *Cylindrocladium scoparium* Morgan, Bot. Gaz. 17: 191. 1892.
Cylindrocladium pithecolobii Petch, Ann. Roy. Bot. Gard. (Peradeniya) 6: 244. 1917.
Cylindrocladium ellipticum Alfieri *et al.*, Phytopathology 60: 1213. 1970.
Calonectria morganii Crous *et al.*, Mycol. Res. 97: 706. 1993.
Calonectria blephiliae Crous & Hodges, Persoonia 31: 225. 2013.

In: *Calonectria cylindrospora* species complex.

Typus: PREM 51042 (holotype of *Ca. morganii*; Crous *et al.* 1993a), BPI 414576 (neotype of *Cy. scoparium*; Crous *et al.* 1993a).
Ex-type culture: Not available.
Key cultures: CBS 119670 = CMW 51310 = CPC 12766, CBS 110666 = CMW 30978 = STE-U 497 = P90.1479 (Crous 2002, Lombard *et al.* 2015a).
Key culture locality: **Italy** (locality of CBS 119670; Lombard *et al.* 2015a), **USA**, Florida (locality of CBS 110666; Lombard *et al.* 2015a).
Key culture substrate: *Pistacia lentiscus* (substrate of CBS 119670; Lombard *et al.* 2015a), *Ilex vomitoria* (substrate of CBS 110666; Lombard *et al.* 2015a).
Barcodes: Culture CBS 119670: *act* = MT335006; *cmdA* = MT335236; *his3* = MT335476; *rpb2* = MT412540; *tef1* = MT412767; *tub2* = MT412985 (alternative markers: ITS = MT359697; LSU = MT359457); culture CBS 110666: *act* = MT335007; *cmdA* = MT335237; *his3* = MT335477; *rpb2* = MT412541; *tef1* = MT412768; *tub2* = MT412986 (alternative markers: ITS = MT359698; LSU = MT359458).
Notes: *Calonectria cylindrospora* is phylogenetically closely related to *Ca. variabilis*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. cylindrospora* [(av. 45 × 4 µm); Crous *et al.* 1993a, Lombard *et al.* 2015b] are smaller than those of *Ca. variabilis* [(av. 73 × 5 µm); Crous *et al.* 1993b], *Ca. variabilis* readily produces a microconidial morph in culture on CLA (Crous *et al.* 1993b), which is not observed in *Ca. cylindrospora* (Crous 2002). *Calonectria cylindrospora* is characterised as being heterothallic, while *Ca. variabilis* is homothallic (Crous *et al.* 1993b).

densa Calonectria L. Lombard *et al.*, Stud. Mycol. 66: 46. 2010.

In: *Calonectria spathiphylli* species complex.

Typus: PREM 60302 holotype.
Ex-type culture: CBS 125261 = CMW 31182.
Type locality: **Ecuador**, Pichincha Province, Las Golondrinas.
Type substrate: Soil.
Barcodes: *act* = MT335008; *cmdA* = MT335238; *his3* = MT335478; *tef1* = MT412769; *tub2* = MT412987 (alternative markers: ITS = MT359699; LSU = MT359459).
Notes: *Calonectria densa* is closely related to *Ca. humicola* and it can be distinguished from that species by the formation of lateral stipe extensions, a characteristic not known for *Ca. humicola*. The macroconidia of *Ca. densa* [(av. 54 × 6 µm); Lombard *et al.* 2010a] are larger than those of *Ca. humicola* [(av. 51 × 5 µm); Lombard *et al.* 2010a] (Supplementary Table S4).

duoramosa Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 100. 2015.

In: *Calonectria brassicae* species complex.

Typus: CBS H-21380 holotype.
Ex-type culture: CBS 134656 = LPF434.
Type locality: **Brazil**, Pará state, Monte Dourado.
Type substrate: Soil.
Barcodes: *cmdA* = KM396027; *his3* = KM396110; *tef1* = KM395853; *tub2* = KM395940.
Notes: *Calonectria duoramosa* forms a single lineage closely related to *Ca. octoramosa*, and the smaller numbers (–2) of fertile branches in its conidiogenous apparatus can be distinguished from *Ca. octoramosa* (–8). Furthermore, the macroconidia of *Ca. duoramosa* [(av. 46 × 4 µm); Alfenas *et al.* 2015] are longer than those of *Ca. octoramosa* [(av. 36 × 4 µm); Marin-Felix *et al.* 2017] (Supplementary Table S4).

ecuadorae Calonectria (Crous & M.J. Wingf.) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Cylindrocladium ecuadorae* Crous & M.J. Wingf. (as *ecuadoriae*), Stud. Mycol. 55: 222. 2006.
Synonym: *Calonectria ecuadorensis* L. Lombard & Crous, Stud. Mycol. 86: 112. 2017.

In: *Calonectria brassicae* species complex.

Typus: CBS H-17871 holotype.
Ex-type culture: CBS 111406 = CMW 23677 = CPC 1635.
Type locality: **Ecuador**.
Type substrate: Soil.

Barcodes: *act* = MT335012; *cmdA* = MT335242; *his3* = MT335482; *rpb2* = MT412544; *tef1* = MT412773; *tub2* = MT412991 (alternative markers: ITS = MT359703; LSU = MT359463).
Notes: *Calonectria ecuadorae* is closely related to *Ca. octoramosa* and *Ca. pauciphialidica*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. ecuadorae* [(av. 51 × 4.5 µm); Crous *et al.* 2006] are larger than those of *Ca. octoramosa* [(av. 36 × 4 µm); Marin-Felix *et al.* 2017] and *Ca. pauciphialidica* (av. 29.5 × 3 µm) (Supplementary Table S4).

ecuadorensis Calonectria L. Lombard & Crous, Stud. Mycol. 86: 112. 2017
(see ***Calonectria ecuadorae***)

In: *Calonectria brassicae* species complex.

Typus: CBS H-23134 holotype.
Ex-type culture: CBS 111706 = CMW 51821 = CPC 1636.
Type locality: **Ecuador**.
Type substrate: Soil.
Barcodes: *act* = MT335010; *cmdA* = MT335240; *his3* = MT335480; *rpb2* = MT412542; *tef1* = MT412771; *tub2* = MT412989 (alternative markers: ITS = MT359701; LSU = MT359461).
Notes: *Calonectria ecuadorensis* was treated as a synonym of *Ca. ecuadorae* in this study. In comparisons of DNA sequences for eight gene regions, the only difference between the ex-type isolate of *Ca. ecuadorensis* (CBS 111706) and the ex-type isolate of *Ca. ecuadorae* (CMW 23677) was in the *act*, *cmdA* and *rpb2* sequences, where there was one base difference in the *act*, two base differences in the *cmdA* and one base difference in the *rpb2* sequences. Both species produce clavate vesicles of similar dimensions (*Ca. ecuadorensis*: 4–6 µm; *Ca. ecuadorae*: 3–5 µm). The macroconidia of *Ca. ecuadorensis* (av. 37 × 4 µm) are smaller than those of *Ca. ecuadorae* (av. 51 × 4.5 µm) (Crous *et al.* 2006, Marin-Felix *et al.* 2017), which was considered to represent intraspecific variation (Supplementary Table S4).

ericae Calonectria L. Lombard & Crous, Stud. Mycol. 85: 178. 2016.
(see ***Calonectria pauciramosa***)

In: *Calonectria candelabrum* species complex.

Typus: CBS H-22756 holotype.
Ex-type culture: CBS 114458 = CMW 51211 = CPC 2019.
Type locality: **USA**, California.
Type substrate: *Erica capensis*.
Barcodes: *act* = MT335087; *cmdA* = MT335319; *his3* = MT335559; *rpb2* = MT412612; *tef1* = MT412850; *tub2* = MT413062 (alternative markers: ITS = MT359780; LSU = MT359540).
Notes: *Calonectria ericae* was treated as a synonym of *Ca. pauciramosa* in this study. In comparisons of DNA sequences for eight gene regions, all the sequences of the isolates of *Ca. ericae* (ex-type CBS 114458, CBS 114456, and CBS 114457) were 100 % identical to those of the isolates of *Ca. pauciramosa* (ex-type CBS 138824, CMW 2151, CMW 7592, CMW 9151, CMW 30823, and CMW 30875). Both species produce obpyriform to ellipsoidal vesicles with similar dimensions (*Ca. ericae*: 6–10 µm; *Ca. pauciramosa*: 5–11 µm) and 1-septate macroconidia. The macroconidia of *Ca. ericae* (av. 37 × 4 µm) are smaller than those of *Ca. pauciramosa* (av. 50 × 4.5 µm) (Crous 2002, Lombard *et al.* 2016), which was considered to represent intraspecific variation (Supplementary Table S4).

eucalypti Calonectria L. Lombard *et al.*, Stud. Mycol. 66: 47. 2010.
Synonym: *Calonectria pseudocolhounii* S.F. Chen *et al.*, Persoonia 26: 7. 2011.

In: *Calonectria colhounii* species complex.

Typus: PREM 60298 holotype.
Ex-type culture: CBS 125275 = CMW 18444.
Type locality: **Indonesia**, Sumatra Utara, Aek Nauli.
Type substrate: *Eucalyptus grandis*.
Barcodes: *act* = MT335013; *cmdA* = MT335243; *his3* = MT335483; *rpb2* = MT412545; *tef1* = MT412774; *tub2* = MT412992 (alternative markers: ITS = MT359704; LSU = MT359464).
Notes: *Calonectria eucalypti* is closely related to *Ca. aciculata* and *Ca. honghensis*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. eucalypti* [(av. 72 × 6 µm); Lombard *et al.* 2010a] are larger than those of *Ca. aciculata* [(av. 69 × 5.5 µm); Li *et al.* 2017] and *Ca. honghensis* [(av. 54 × 5.5 µm); Li *et al.* 2017]. *Calonectria eucalypti* is homothallic (Li *et al.* 2020) (Supplementary Table S4).

eucalypticola Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 105. 2015.

In: *Calonectria candelabrum* species complex.

Typus: CBS H-21359 holotype.
Ex-type culture: CBS 134847 = LPF124.
Type locality: **Brazil**, Minas Gerais state, Santa Barbara.
Type substrate: *Eucalyptus* seedling.
Barcodes: *cmdA* = KM396051; *his3* = KM396134; *tef1* = KM395877; *tub2* = KM395964.
Notes: *Calonectria eucalypticola* is closely related to *Ca. candelabrum* and *Ca. venezuelana*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. eucalypticola* [(av. 50 × 4 µm); Alfenas *et al.* 2015] are smaller than those of *Ca. candelabrum* [(av. 60 × 4.5µm); Crous 2002] and *Ca. venezuelana* [(av. 58 × 5 µm); Lombard *et al.* 2016] (Supplementary Table S4).

expansa Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 167. 2015.
(see ***Calonectria aconidialis***)

In: *Calonectria kyotensis* species complex.

Typus: CBS H-21483 holotype.
Ex-type culture: CBS 136247 = CMW 31392 = CERC 1727.
Type locality: **China**, GuangXi Province.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT334942; *cmdA* = MT335169; *his3* = MT335408; *rpb2* = MT412481; *tef1* = MT412699 (alternative markers: ITS = MT359629; LSU = MT359389).
Notes: *Calonectria expansa* was treated as a synonym of *Ca. aconidialis* in this study. In comparisons of DNA sequences for seven available gene regions, only a single base difference in the *tef1* gene sequence was found between the ex-type isolate of *Ca. expansa* (CMW 31392) and the ex-type isolate of *Ca. aconidialis* (CMW 35174). Both species are homothallic and produce orange to orange-brown perithecia, 8-spored asci and 1-septate

ascospores, and share the similar ascospores dimensions (*Ca. expansa*: av. 39 × 6 µm; *Ca. aconidialis*: av. 36 × 6 µm) (Lombard *et al.* 2015a, Li *et al.* 2020; Supplementary Table S4).

floridana Calonectria Sobers, Phytopathology 59: 366. 1969.
(see ***Calonectria kyotensis***)

In: *Calonectria kyotensis* species complex.

Typus: BPI 414553 holotype.
Ex-type culture: CBS 114692 = CMW 51826 = ATCC 18882.
Type locality: **USA**, Georgia.
Type substrate: *Prunus persica*.
Barcodes: *act* = MT335015; *cmdA* = MT335245; *his3* = MT335485; *rpb2* = MT412547; *tef1* = MT412776; *tub2* = MT412994 (alternative markers: ITS = MT359706; LSU = MT359466).
Notes: *Calonectria floridana* was treated as a synonym of *Ca. kyotensis* in this study. In comparisons of DNA sequences for eight gene regions, the only difference between the ex-type isolate of *Ca. floridana* (CBS 114692) and the ex-type isolate of *Ca. kyotensis* (CBS 114525) was in the *cmdA*, *his3* and LSU sequences, where there was one base difference in the *cmdA*, two base differences in the *his3* and one base difference in the LSU sequences. Both species are homothallic and produce globose vesicles of similar dimensions (*Ca. floridana*: 8.3–17.9 µm; *Ca. kyotensis*: 8.8–19 µm) and 1-septate macroconidia. The macroconidia of *Ca. floridana* (av. 46 × 4.3 µm) are longer than those of *Ca. kyotensis* (av. 41 × 4 µm) (Terashita 1968, Sobers 1969, Crous 2002), which was considered to represent intraspecific variation (Supplementary Table S4).

foliicola Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 167. 2015.
(see ***Calonectria hawksworthii***)

In: *Calonectria cylindrospora* species complex.

Typus: CBS H-21472 holotype.
Ex-type culture: CBS 136641 = CMW 31393.
Type locality: **China**, GuangXi Province.
Type substrate: *Eucalyptus urophylla* × *E. grandis* clone leaf.
Barcodes: *act* = MT335017; *cmdA* = MT335247; *his3* = MT335487; *rpb2* = MT412549; *tef1* = MT412778; *tub2* = MT412996 (alternative markers: ITS = MT359708; LSU = MT359468).
Notes: *Calonectria foliicola* was treated as a synonym of *Ca. hawksworthiii* in this study. In comparisons of DNA sequences for eight gene regions, the only differences between the ex-type isolate *Ca. foliicola* (CMW 31393) and the ex-type isolate *Ca. hawksworthii* (ex-type CBS 111870) was in the *act*, *his3* and *tub2* sequences, where there was one base difference in the *act*, three base differences in the *his3*, and three base differences in the *tub2* sequences. Both species produce ellipsoidal vesicles with overlapping dimensions (*Ca. foliicola*: 6–13 µm; *Ca. hawksworthii*: 6–9 µm) and 1-septate macroconidia. The macroconidia of *Ca. foliicola* (av. 47 × 5 µm) are shorter than those of *Ca. hawksworthii* (av. 56 × 4 µm) (Crous 2002, Lombard *et al.* 2015a), which was considered to represent intraspecific variation (Supplementary Table S4).

fragariae Calonectria R.F. Alfenas *et al.*, Australas. Plant. Pathol. 47: 6. 2017.

In: *Calonectria candelabrum* species complex.

Typus: VIC 42833 holotype.
Ex-type culture: CBS 133607 = LPP040.
Type locality: **Brazil**, Espírito Santo State, Santa Maria do Jetibá.
Type substrate: *Fragaria* × *ananassa*.
Barcodes: *cmdA* = KM998966; *his3* = KM998964; *tef1* = KM998963; *tub2* = KM998965.
Notes: *Calonectria fragariae* is closely related to *Ca. pseudospathulata*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. fragariae* [(av. 39 × 4 µm); Lopes *et al.* 2017] are shorter than those of *Ca. pseudospathulata* [(av. 43 × 4 µm); Alfenas *et al.* 2015] (Supplementary Table S4).

fujianensis Calonectria S.F. Chen *et al.*, Persoonia 26: 8. 2011.
Synonym: *Calonectria nymphaeae* Yong Wang bis *et al.*, Mycotaxon 122: 181. 2013.

In: *Calonectria colhounii* species complex.

Typus: PREM 60460 holotype.
Ex-type culture: CBS 127201 = CMW 27257.
Type locality: **China**, FuJian Province.
Type substrate: *Eucalyptus grandis*.
Barcodes: *act* = MT335019; *cmdA* = MT335249; *his3* = MT335489; *rpb2* = MT412551; *tef1* = MT412780; *tub2* = MT412998 (alternative markers: ITS = MT359710; LSU = MT359470).
Notes: *Calonectria fujianensis* is phylogenetically closely related to *Ca. lichi*. The sequences of ITS, *tef1* and *tub2* gene regions can differentiate *Ca. fujianensis* from that species. The macroconidia of *Ca. fujianensis* [(av. 52.5 × 4 µm); Chen *et al.* 2011] are smaller than those of *Ca. lichi* [(av. 65.7 × 6 µm); Liu & Chen 2017]. *Calonectria fujianensis* is homothallic (Chen *et al.* 2011) (Supplementary Table S4).

glaebicola Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 106. 2015.

In: *Calonectria candelabrum* species complex.

Typus: CBS H-21378 holotype.
Ex-type culture: CBS 134852 = LPF406.
Type locality: **Brazil**, Minas Gerais state, Martinho Campos.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *cmdA* = KM396053; *his3* = KM396136; *tef1* = KM395879; *tub2* = KM395966.
Notes: *Calonectria glaebicola* is closely related to *Ca. brassiana*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. glaebicola* (av. 50 × 4 µm) are shorter than those of *Ca. brassiana* (av. 53 × 4 µm) (Alfenas *et al.* 2015) (Supplementary Table S4).

gordoniae Calonectria (Leahy *et al.*) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Cylindrocladium gordoniae* Leahy *et al.*, Mycotaxon 76: 80. 2000.

In: *Calonectria pteridis* species complex.

Typus: FLAS F56790 holotype.
Ex-type culture: CBS 112142 = CMW 23694 = STE-U 3136 = ATCC 201837 = P97-2567.
Type locality: **USA**, Florida.
Type substrate: *Gordonia lasianthus*.
Barcodes: *act* = MT335021; *cmdA* = MT335251; *his3* = MT335491; *rpb2* = MT412553; *tef1* = MT412782;

tub2 = MT413000 (alternative markers: ITS = MT359712; LSU = MT359472).
Notes: *Calonectria gordoniae* is closely related to *Ca. ovata*, *Ca. pseudovata* and *Ca. terricola*, and can be distinguished from these three species by the dimensions of its macroconidia. The macroconidia of *Ca. gordoniae* [(av. 50 × 4.5 µm); Leahy *et al.* 2000] are smaller than those of *Ca. ovata* [(av. 70 × 5 µm); El-Gholl *et al.* 1993a] and *Ca. pseudovata* [(av. 69 × 5 µm); Alfenas *et al.* 2015], but longer than those of *Ca. terricola* [(av. 46 × 4.5 µm); Lombard *et al.* 2016] (Supplementary Table S4).

gracilipes Calonectria Crous & Mchau, Mycologia 89: 654. 1997.
Synonym: *Cylindrocladium graciloideum* Crous & Mchau, Mycologia 89: 654. 1997.

In: *Calonectria gracilipes* species complex.

Typus: PREM 54417 (holotype of *Ca. gracilipes*; Crous *et al.* 1997a), PREM 55299 (holotype of *Cy. graciloideum*; Crous *et al.* 1997a).
Ex-type culture: CBS 115674 = CMW 51227 = STE-U 1153 (Crous 2002, Crous *et al.* 2006).
Type locality: **Colombia**, La Selva.
Type substrate: Soil.
Barcodes: *act* = MT335022; *cmdA* = MT335252; *his3* = MT335492; *rpb2* = MT412554; *tef1* = MT412783; *tub2* = MT413001 (alternative markers: ITS = MT359713; LSU = MT359473).
Notes: *Calonectria gracilipes* is closely related to *Ca. angustata*, *Ca. hurae*, *Ca. leguminum* and *Ca. rumohrae*, and can be distinguished from these four species by the dimensions of its macroconidia. The macroconidia of *Ca. gracilipes* [(av. 45 × 4.5 µm); Crous *et al.* 1997a] are smaller than those of *Ca. angustata* [(av. 110 × 10 µm); Crous *et al.* 2000], *Ca. hurae* [(av. 120 × 7.5 µm); Crous 2002], *Ca. leguminum* [(av. 60 × 5 µm); Figueiredo & Namekata 1967, Crous 2002] and *Ca. rumohrae* [(av. 110 × 9 µm); El-Gholl *et al.* 1997]. *Calonectria gracilipes* is homothallic (Crous *et al.* 1997a) (Supplementary Table S4).

gracilis Calonectria Crous *et al.*, Mycotaxon 46: 224. 1993.
Synonym: *Cylindrocladium pseudogracile* Crous, Mycol. Res. 101: 213. 1997.

In: *Calonectria brassicae* species complex.

Typus: PREM 51031a (holotype of *Ca. gracilis*; Crous *et al.* 1993c), PREM 51031b (holotype of *Cy. pseudogracile*; Crous *et al.* 1997b).
Ex-type culture: CBS 111807 = CMW 51189 = STE-U 2634 = AR2677 = PPRI 4176. (Crous 2002, Lombard *et al.* 2016)
Type locality: **Brazil**, Pará state.
Type substrate: *Manilkara zapota*.
Barcodes: *act* = GQ280488; *cmdA* = GQ267407; *his3* = DQ190646; *rpb2* = KY653390; *tef1* = GQ267323; *tub2* = AF232858 (alternative markers: ITS = GQ280610; LSU = GQ280732).
Notes: *Calonectria gracilis* is closely related to *Ca. quinqueramosa*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. gracilis* (av. 56 × 4.5 µm) are smaller than those of *Ca. quinqueramosa* (av. 59 × 5 µm), while the vesicles of *Ca. gracilis* [(2–11 µm); Crous *et al.* 1993c] are wider than those of *Ca. quinqueramosa* [(3–5 µm); Alfenas *et al.* 2015]. *Calonectria gracilis* is homothallic (Li *et al.* 2020) (Supplementary Table S4).

guangxiensis Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 169. 2015.
(see ***Calonectria aconidialis***)

In: *Calonectria kyotensis* species complex.

Typus: CBS H-21484 holotype.
Ex-type culture: CBS 136092 = CMW 35409 = CERC 1900.
Type locality: **China**, GuangXi Province.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT334944; *cmdA* = MT335171; *his3* = MT335410; *tef1* = MT412701 (alternative markers: ITS = MT359631; LSU = MT359391).
Notes: *Calonectria guangxiensis* was treated as a synonym of *Ca. aconidialis* in this study. In comparisons of DNA sequences for six gene regions (*rpb2* and *tub2* are not available for *Ca. guangxiensis*, *tub2* not available for *Ca. aconidialis*), all six gene sequences for isolates of *Ca. guangxiensis* (ex-type isolate CMW 35409, and CMW 35411) were 100 % identical to the ex-type isolate of *Ca. aconidialis* (CMW 35174). Both species are homothallic and produce orange to orange-brown perithecia, 8-spored asci and 1-septate ascospores, and share the similar ascospores dimensions (*Ca. guangxiensis*: av. 36 × 6 µm; *Ca. aconidialis*: av. 36 × 6 µm) (Lombard *et al.* 2015a, Li *et al.* 2020; Supplementary Table S4).

hainanensis Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 170. 2015.
(see ***Calonectria aconidialis***)

In: *Calonectria kyotensis* species complex.

Typus: CBS H-21480 holotype.
Ex-type culture: CBS 136248 = CMW 35187 = CERC 1863.
Type locality: **China**, HaiNan Province.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT334946; *cmdA* = MT335173; *his3* = MT335412; *tef1* = MT412703 (alternative markers: ITS = MT359633; LSU = MT359393).
Notes: *Calonectria hainanensis* was treated as a synonym of *Ca. aconidialis* in this study. In comparisons of DNA sequences for six available gene regions (*rpb2* and *tub2* are not available for *Ca. hainanensis*, *tub2* not available for *Ca. aconidialis*), all six gene sequences for the ex-type isolate of *Ca. hainanensis* (CMW 35187) were 100 % identical to the ex-type isolate of *Ca. aconidialis* (CMW 35174). Both species are homothallic and produce orange to orange-brown perithecia, 8-spored asci and 1-septate ascospores, and share the similar ascospores dimensions (*Ca. hainanensis*: av. 34 × 6 µm; *Ca. aconidialis*: av. 36 × 6 µm) (Lombard *et al.* 2015a; Supplementary Table S4).

hawksworthii Calonectria (Peerally) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Cylindrocladium hawksworthii* Peerally, Mycotaxon 40: 375. 1991.
Synonyms: *Calonectria sulawesiensis* L. Lombard *et al.*, Stud. Mycol. 66: 53. 2010.
Calonectria foliicola L. Lombard *et al.*, Stud. Mycol. 80: 167. 2015.

In: *Calonectria cylindrospora* species complex.

Typus: MUCL 30866 holotype.
Ex-type culture: CBS 111870 = CMW 51194 = CPC 2405.
Type locality: **Mauritius**, Pamplemousses garden.
Type substrate: Leaves of *Nelumbo nucifera*.

Barcodes: *act* = MT335024; *cmdA* = MT335254; *his3* = MT335494; *rpb2* = MT412556; *tef1* = MT412785; *tub2* = MT413003 (alternative markers: ITS = MT359715; LSU = MT359475).
Notes: *Calonectria hawksworthii* is closely related to *Ca. brasiliensis*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. hawksworthii* [(av. 56 × 4 µm); Crous 2002] are larger than those of *Ca. brasiliensis* [(av. 38 × 3.5 µm); Batista 1951] (Supplementary Table S4).

henricotiae Calonectria Gehesquière *et al.*, Pl. Pathol. 65: 47. 2015.

In: *Calonectria naviculata* species complex.

Typus: BPI 892910 holotype.
Ex-type culture: CBS 138102 = CB045.
Type locality: **Belgium**, East Flanders, Lokeren.
Type substrate: *Buxus sempervirens.*
Barcodes: *cmdA* = KF815157; *his3* = KF815185; *tub2* = JX535308 (alternative markers: ITS = JX535322).
Notes: *Calonectria henricotiae* is closely related to *Ca. pseudonaviculata*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. henricotiae* [(av. 56 × 5.6 µm); Gehesquiere *et al.* 2015] are shorter than those of *Ca. pseudonaviculata* [(av. 60 × 5 µm); Crous *et al.* 2002]. *Calonectria henricotiae* is heterothallic (Li *et al.* 2020) (Supplementary Table S4).

heveicola Calonectria N.Q. Pham *et al.*, Mycologia 111: 95. 2019.

In: *Calonectria kyotensis* species complex.

Typus: PREM 62118 holotype.
Ex-type culture: CBS 143570 = CMW 49913.
Type locality: **Vietnam**, Binh Duong, Bau Bang.
Type substrate: Soil in *Hevea brasiliensis* plantation.
Barcodes: *act* = MT335025; *cmdA* = MT335255; *his3* = MT335495; *tef1* = MT412786; *tub2* = MT413004 (alternative markers: ITS = MT359716; LSU = MT359476).
Notes: *Calonectria heveicola* is phylogenetically closely related to *Ca. cochinchinensis* and can be differentiated from that species by sequences of *act*, *cmdA*, *his3*, ITS, *tef1* and *tub2* gene regions. In addition, *Ca. heveicola* [(138–189 µm); Pham *et al.* 2019] produces shorter stipe extensions than those of *Ca. cochinchinensis* [(147–208 µm); Pham *et al.* 2019]. *Calonectria heveicola* is heterothallic (Li *et al.* 2020) (Supplementary Table S4).

hodgesii Calonectria R.F Alfenas *et al.*, Trop. Plant. Pathol. 38: 517. 2013.
(see ***Calonectria brasiliensis***)

In: *Calonectria cylindrospora* species complex.

Typus: CBS H-21147 holotype.
Ex-type culture: CBS 133609 = LPF245.
Type locality: **Brazil**, Minas Gerais state, Viçosa.
Type substrate: *Anadenanthera peregrina*.
Barcodes: *cmdA* = KC491222; *tef1* = KC491225; *tub2* = KC491228.
Notes: *Calonectria hodgesii* was treated as a synonym of *Ca. brasiliensis* in this study. In comparisons of DNA sequences for three available gene regions, the only difference between the ex-type isolate of *Ca. hodgesii* (CBS 133609) and the ex-type isolate of *Ca. brasiliensis* (CBS 230.51) was in the *cmdA*, *tef1* and *tub2* sequences, where there were three base differences in the *cmdA*, one base difference in the *tef1* and one base difference in the *tub2* sequences. Both species produce ellipsoidal vesicles of similar dimensions (*Ca. hodgesii*: 6–11 µm; *Ca. brasiliensis*: 7–11 µm) and 1-septate macroconidia. The macroconidia of *Ca. hodgesii* (av. 50 × 4.5 µm) are larger than those of *Ca. brasiliensis* (av. 38 × 3.5 µm) (Batista 1951, Lombard *et al.* 2010b, Alfenas *et al.* 2013b), which was considered to represent intraspecific variation (Supplementary Table S4).

honghensis Calonectria J.Q. Li *et al.*, IMA Fungus 8: 273. 2017.

In: *Calonectria colhounii* species complex.

Typus: PREM 61943 holotype.
Ex-type culture: CBS 142885 = CMW 47669 = CERC 5572.
Type locality: **China**, YunNan Province, HongHe Region.
Type substrate: Soil in a *Eucalyptus* plantation.
Barcodes: *act* = MT335026; *cmdA* = MT335256; *his3* = MT335496; *rpb2* = MT412557; *tef1* = MT412787; *tub2* = MT413005 (alternative markers: ITS = MT359717; LSU = MT359477).
Notes: *Calonectria honghensis* is closely related to *Ca. aciculata* and *Ca. colhounii*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. honghensis* [(av. 54 × 5.5 µm); Li *et al.* 2017] are shorter than those of *Ca. aciculata* [(av. 69 × 5.5 µm); Li *et al.* 2017] and *Ca. colhounii* [(av. 65 × 5 µm); Peerally 1973]. In addition, the ascospores of *Ca. honghensis* (av. 49 × 6 µm) are shorter than those of *Ca. colhounii* (av. 55 × 6 µm) (Peerally 1973, Li *et al.* 2017). *Calonectria honghensis* is homothallic (Li *et al.* 2020) (Supplementary Table S4).

hongkongensis Calonectria Crous, Stud. Mycol. 50: 422. 2004.
Synonym: *Cylindrocladium hongkongense* Crous, Stud. Mycol. 50: 422. 2004.

In: *Calonectria kyotensis* species complex.

Typus: CBS 9886 holotype.
Ex-type culture: CBS 114828 = CMW 51217 = CPC 4670.
Type locality: **China**, Hong Kong.
Type substrate: Soil.
Barcodes: *act* = MT335028; *cmdA* = MT335258; *his3* = MT335498; *rpb2* = MT412559; *tef1* = MT412789; *tub2* = MT413007 (alternative markers: ITS = MT359719; LSU = MT359479).
Notes: *Calonectria hongkongensis* is closely related to *Ca. kyotensis*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. hongkongensis* [(av. 46.5 × 4 µm); Crous *et al.* 2004] are longer than those of *Ca. kyotensis* [(av. 41 × 4 µm); Terashita 1968], whereas the vesicles of *Ca. hongkongensis* (8–14 µm) are narrower than those of *Ca. kyotensis* (8.8–19 µm) (Sobers 1972, Crous *et al.* 2004). *Calonectria hongkongensis* is homothallic (Crous *et al.* 2004) (Supplementary Table S4).

humicola Calonectria L. Lombard *et al.*, Stud. Mycol. 66: 49. 2010

In: *Calonectria spathiphylli* species complex.

Typus: PREM 60369 holotype.
Ex-type culture: CBS 125251 = CMW 31183.
Type locality: **Ecuador**, Pichincha Province, Las Golondrinas.
Type substrate: Soil.
Barcodes: *act* = MT335032; *cmdA* = MT335262; *his3* = MT335502; *tef1* = MT412793; *tub2* = MT413011 (alternative markers: ITS = MT359723; LSU = MT359483).
Notes: *Calonectria humicola* is phylogenetically closely related to *Ca. densa*, and can be distinguished from that species by its lack of lateral stipe extensions, a feature that is common in *Ca. densa*. The macroconidia of *Ca. humicola* [(av. 51 × 5 µm); Lombard *et al.* 2010a] are smaller than those of *Ca. densa* [(av. 54 × 6 µm); Lombard *et al.* 2010a] (Supplementary Table S4).

hurae Calonectria (Linder & Whetzel) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Cercosporella hurae* Linder & Whetzel, Mycologia 29: 656. 1937.
Synonyms: *Cylindrocladiopsis hurae* (Linder & Whetzel) U. Braun, Mycotaxon 51: 40. 1994.
Cylindrocladium hurae (Linder & Whetzel) Crous, In: Taxonomy and pathology of *Cylindrocladium* (*Calonectria*) and allied genera: 185. 2002.
Cylindrocladium heptaseptatum Sobers *et al.*, Phytopathology 65: 333. 1975.
Cylindrocladiopsis lagerstroemiae J.M. Yen, Mycotaxon 8: 236. 1979.

In: *Calonectria gracilipes* species complex.

Typus: Chardon No. 363 (lectotype, Crous 2002).
Ex-type culture: Not available.
Key culture: CBS 114182 = CMW 51823 = CPC 1714 = UFV 216 (Lombard *et al.* 2016).
Key culture locality: **Brazil** (Lombard *et al.* 2016).
Key culture substrate: *Rumohra adiantiformis* (Lombard *et al.* 2016).
Barcodes: Culture CBS 114182: *act* = MT335035; *cmdA* = MT335265; *his3* = MT335505; *rpb2* = MT412563; *tef1* = MT412796; *tub2* = MT413014 (alternative markers: ITS = MT359726; LSU = MT359486).
Notes: *Calonectria hurae* is phylogenetically closely related to *Ca. angustata* and *Ca. rumohrae*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. hurae* [(av. 120 × 7.5 µm); Crous 2002] are longer and narrower than those of *Ca. angustata* [(av. 110 × 10 µm); Crous *et al.* 2000] and *Ca. rumohrae* [(av. 110 × 9 µm); El-Gholl *et al.* 1997] (Supplementary Table S4).

ilicicola Calonectria Boedijn & Reitsma, Reinwardtia 1: 58. 1950.
Synonyms: *Calonectria theae* var. *crotalariae* Loos, Trans. Brit. Mycol. Soc. 33: 18. 1950.
Calonectria crotalariae (Loos) D.K. Bell & Sobers, Phytopathology 56: 1364. 1966.
Cylindrocladium crotalariae (Loos) D.K. Bell & Sobers, Phytopathology 56: 1364. 1966. (*nom. inval.*!, Art.36)
Cylindrocladium parasiticum Crous, M.J. Wingf. & Alfenas, Mycol. Res. 97: 892. 1993.

In: *Calonectria kyotensis* species complex.

Typus: IMI 264540 holotype.
Ex-type culture: CBS 190.50 = CMW 30998 = STE-U 2482 = IMI 299389.
Type locality: **Indonesia**, Java, Bogor.
Type substrate: *Solanum tuberosum*.
Barcodes: *act* = MT335036; *cmdA* = MT335266; *his3* = MT335506; *rpb2* = MT412564; *tef1* = MT412797 (alternative markers: ITS = MT359727; LSU = MT359487).
Notes: *Calonectria ilicicola* is closely related to *Ca. aeknauliensis* and *Ca. curvispora*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. ilicicola* [(av. 62 × 6 µm); Boedijn & Reitsma 1950] are larger than those of *Ca. aeknauliensis* [(av. 47 × 5 µm); Pham *et al.* 2019] and *Ca. curvispora* [(av. 60 × 5 µm); Victor *et al.* 1997]. *Calonectria ilicicola* is homothallic (Li *et al.* 2020) (Supplementary Table S4).

indonesiae Calonectria (Crous) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Cylindrocladium indonesiae* Crous, Stud. Mycol. 50: 424. 2004.

In: *Calonectria kyotensis* species complex.

Typus: CBS 9891 holotype.
Ex-type culture: CBS 112823 = CMW 23683 = CPC 4508.
Type locality: **Indonesia**, Warambunga.
Type substrate: Soil.
Barcodes: *act* = MT335037; *cmdA* = MT335267; *his3* = MT335507; *rpb2* = MT412565; *tef1* = MT412798; *tub2* = MT413015 (alternative markers: ITS = MT359728; LSU = MT359488).
Notes: *Calonectria indonesiae* is phylogenetically closely related to *Ca. chinensis*, *Ca. cochinchinensis* and *Ca. heveicola*, and can be distinguished from these three species by the dimensions of its macroconidia. The macroconidia of *Ca. indonesiae* [(av. 50.5 × 4 µm); Crous *et al.* 2004] are longer than those of *Ca. chinensis* [(av. 45 × 4 µm); Crous *et al.* 2004], *Ca. cochinchinensis* [(av. 46 × 4 µm); Pham *et al.* 2019] and *Ca. heveicola* [(av. 44.5 × 4 µm); Pham *et al.* 2019] (Supplementary Table S4).

indonesiana Calonectria L. Lombard & Crous, Stud. Mycol. 85: 179. 2016.
(see ***Calonectria sumatrensis***)

In: *Calonectria kyotensis* species complex.

Typus: CBS H-22757 holotype.
Ex-type culture: CBS 112936 = CMW 51207 = CPC 4504.
Type locality: **Indonesia**, Northern Sumatra.
Type substrate: Soil.
Barcodes: *act* = MT335143; *cmdA* = MT335380; *his3* = MT335620; *rpb2* = MT412672; *tef1* = MT412911 (alternative markers: ITS = MT359841; LSU = MT359601).
Notes: *Calonectria indonesiana* was treated as a synonym of *Ca. sumatrensis* in this study. In comparisons of DNA sequences for seven available gene regions, the only differences between the ex-type isolate of *Ca. indonesiana* (CBS 112936) and the ex-type isolate of *Ca. sumatrensis* (CMW 23698) were two base differences in the *his3* gene region. Both species produce sphaeropedunculate vesicles with overlapping dimensions (*Ca. indonesiana*: 8–10 µm; *Ca. sumatrensis*: 8–13 µm) and 1-septate macroconidia. Macroconidia of *Ca. indonesiana* (av. 43 × 5 µm) are shorter than those of *Ca. sumatrensis* (av. 58 × 5 µm), which was considered to represent intraspecific variation (Crous *et al.* 2004, Lombard *et al.* 2016) (Supplementary Table S4).

indusiata Calonectria (Seaver) Crous, Taxonomy and pathology of *Cylindrocladium* (*Calonectria*) and allied genera: 94. 2002.
Basionym: *Nectria indusiata* Seaver, Mycologia 20: 58. 1928.
Synonyms: *Cercosporella theae* Petch, Ann. Roy. Bot. Gard. Peradeniya. 6: 246. 1917.
Candelospora theae (Petch) Wakef. ex Gadd, Monographs on Tea Production in Ceylon: 59. 1949.
Cylindrocladium theae (Petch) Subram., In: Subramnian, *Hyphomycetes*, an account of Indian species, except *Cercosporae*: 731. 1971.
Cylindrocladium theae (Petch) Alfieri & sobers, Phytopathology 62: 650. 1972 (homonym).
Calonectria theae Loos, Trans. Brit. Mycol. Soc. 33: 17. 1950.

In: *Calonectria colhounii* species complex.

Typus: No. 3176 holotype.
Ex-type culture: CBS 144.36 = CMW 23699.
Type locality: **Sri Lanka**.
Type substrate: *Camellia sinensis*.
Barcodes: *act* = GQ280536; *cmdA* = GQ267453; *his3* = GQ267262; *rpb2* = KY653396; *tef1* = GQ267332; *tub2* = GQ267239 (alternative markers: ITS = GQ280658; LSU = GQ280780).
Notes: Phylogenetically, *Ca. indusiata* forms a distinct lineage separate from other species in the *Ca. colhounii* species complex. The macroconidia of *Ca. indusiata* (av. 81 × 6 µm) are smaller than those of *Ca. macroconidialis* (av. 90 × 6.5 µm), and longer than other species in the *Ca. colhounii* species complex (Supplementary Table S4).

insularis Calonectria C.L. Schoch & Crous, Mycologia 91: 293. 1999.
Synonym: *Cylindrocladium insulare* C.L. Schoch & Crous, Mycologia 91: 293. 1999.

In: *Calonectria cylindrospora* species complex.

Typus: PREM 55760 [holotype of *Ca. insularis*; Schoch *et al.* 1999], PREM 55758 (holotype of *Cy. insulare*; Schoch *et al.* 1999).
Ex-type culture: CBS 114558 = CMW 30991 = CPC 768 (Crous 2002, Lombard *et al.* 2015a)
Type locality: **Madagascar**, Tamatave.
Type substrate: Soil.
Barcodes: *cmdA* = MT335269; *his3* = MT335509; *rpb2* = MT412567; *tef1* = MT412800; *tub2* = MT413017 (alternative markers: ITS = MT359730; LSU = MT359490).
Notes: *Calonectria insularis* is closely related to *Ca. cylindrospora* and *Ca. variabilis*, and can be distinguished from these two species by the dimensions of its ascospores and macroconidia. The ascospores of *Ca. insularis* [(av. 33 × 6 µm); Schoch *et al.* 1999] are shorter than those of *Ca. cylindrospora* [(av. 37 × 6 µm); Crous *et al.* 1993a, Lombard *et al.* 2015b] and *Ca. variabilis* [(av. 42 × 5 µm); Crous *et al.* 1993b]. The macroconidia of *Ca. insularis* [(av. 45 × 4 µm); Schoch *et al.* 1999] are smaller than those of *Ca. variabilis* [(av. 73 × 5 µm); Crous *et al.* 1993b]. *Calonectria insularis* and *Ca. cylindrospora* are characterised as being heterothallic, while *Ca. variabilis* is homothallic (Crous *et al.* 1993b, Schoch *et al.* 1999).

kyotensis Calonectria Terash., Trans. Mycol. Soc. Japan. 8: 124. 1968.
Synonyms: *Calonectria floridana* Sobers, Phytopathology 59: 366. 1969.
Calonectria turangicola L. Lombard *et al.*, Stud. Mycol. 80: 184. 2015.
Calonectria pseudoturangicola J.Q. Li *et al.*, IMA Fungus 8: 279. 2017.

In: *Calonectria kyotensis* species complex.

Typus: IFO No. 11597 holotype.
Ex-type culture: CBS 114525 = CMW 51824 = CPC 2367 = ATCC 18834.
Type locality: **Japan**.
Type substrate: *Robinia pseudoacacia*.
Barcodes: *act* = MT335039; *cmdA* = MT335271; *his3* = MT335511; *rpb2* = MT412569; *tef1* = MT412802; *tub2* = MT413019 (alternative markers: ITS = MT359732; LSU = MT359492).
Notes: *Calonectria kyotensis* is closely related to *Ca. hongkongensis*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. kyotensis* [(av. 41 × 4 µm); Terashita 1968] are shorter than those of *Ca. hongkongensis* [(av. 46.5 × 4 µm); Crous *et al.* 2004], whereas the vesicles of *Ca. kyotensis* (8.8–19 µm) are wider than those of *Ca. hongkongensis* (8–14 µm) (Sobers 1972, Crous *et al.* 2004). *Calonectria kyotensis* is homothallic (Terashita 1968) (Supplementary Table S4).

lageniformis Calonectria L. Lombard & Crous, Stud. Mycol. 85: 181. 2016.

In: *Calonectria cylindrospora* species complex.

Typus: CBS H-22758 holotype.
Ex-type culture: CBS 111324 = CMW 51177 = CPC 1473.
Type locality: **Mauritius**, Rivière Noire.
Type substrate: *Eucalyptus* sp.
Barcodes: *cmdA* = KX784574; *rpb2* = KY653400; *tef1* = KX784702; *tub2* = KX784632 (alternative markers: ITS = KY653256; LSU = KY653312).
Notes: *Calonectria lageniformis* is closely related to *Ca. auriculiformis*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. lageniformis* (av. 40 × 5 µm) are shorter than those of *Ca. auriculiformis* (av. 43 × 4 µm). *Calonectria lageniformis* only produces up to three branches per conidiophore, whereas *Ca. auriculiformis* can have up to five branches per conidiophore (Lombard *et al.* 2016, Pham *et al.* 2019).

lantauensis Calonectria J.Q. Li *et al.*, IMA Fungus 8: 277. 2017.

In: *Calonectria kyotensis* species complex.

Typus: PREM 61946 holotype.
Ex-type culture: CBS 142888 = CMW 47252 = CERC 3302.
Type locality: **China**, Hong Kong Region, LiDao Distict.
Type substrate: Soil.
Barcodes: *act* = MT335040; *cmdA* = MT335272; *his3* = MT335512; *rpb2* = MT412570; *tef1* = MT412803 (alternative markers: ITS = MT359733; LSU = MT359493).
Notes: *Calonectria lantauensis* is phylogenetically closely related to *Ca. bumicola*. This species can be differentiated from *Ca. bumicola* by the sequences of *act*, *cmdA*, *his3*, *rpb2* and *tef1* gene regions.

lateralis Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 173. 2015.

In: *Calonectria kyotensis* species complex.

Typus: CBS H-21469 holotype.
Ex-type culture: CBS 136629 = CMW 31412.
Type locality: **China**, GuangXi Province.
Type substrate: Soil in a *Eucalyptus* plantation.
Barcodes: *act* = MT335042; *cmdA* = MT335274; *his3* = MT335514; *rpb2* = MT412571; *tef1* = MT412805; *tub2* = MT413020 (alternative markers: ITS = MT359735; LSU = MT359495).
Notes: *Calonectria lateralis* is closely related to *Ca. hongkongensis* and *Ca. kyotensis*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. lateralis* [(av. 39 × 4 µm); Lombard *et al.* 2015a] are shorter than those of *Ca. hongkongensis* [(av. 46.5 × 4 µm); Crous *et al.* 2004] and *Ca. kyotensis* [(av. 41 × 4 µm); Terashita 1968]. *Calonectria lateralis* is homothallic (Lombard *et al.* 2015a) (Supplementary Table S4).

lauri Calonectria Lechat & Crous, ***sp. nov.*** MycoBank MB836241.
Synonyms: *Candelospora ilicicola* Hawley, Proc. Roy. Irish Acad. 31: 11. 1912.
Cylindrocladium ilicicola (Hawley) Boedijn & Reitsma, Reinwardtia 1: 57. 1950.
Tetracytum lauri Vanderw., Parasitica 1: 145. 1945. (as *laurii*). *Nom. inval.*, Arts 35.1, 39.1 (Melbourne)
Calonectria lauri (Vanderw.) Lechat & Crous, IMA Fungus 1: 103. 2010. *Nom. inval.,* Art. 39.1 (Melbourne)

In: *Calonectria mexicana* species complex.

Description and illustrations: Lechat *et al.* (2010).

Typus: **Netherlands**, South-East Limburg, Vijlenerbos, Vijlen, *Ilex aquifolium*, Aug. 1970, H.A van der Aa (**holotype** CBS H-15110, ex-type culture CBS 749.70 = CMW 23682).

Barcodes: *act* = MT335043; *cmdA* = MT335275; *his3* = MT335515; *rpb2* = MT412572; *tef1* = MT412806; *tub2* = MT413021 (alternative markers: ITS = MT359736; LSU = MT359496).
Notes: The original description of *Ca. lauri* (Lechat *et al.* 2010) is invalid, as its basionym *Tetracytum lauri* is invalid. This issue is now addressed, and the name *Ca. lauri* validated here. *Calonectria lauri* is closely related to *Ca. citri*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. lauri* [(av. 60 × 5.5 µm); Lechat *et al.* 2010] are larger than those of *Ca. citri* [(av. 58 × 4 µm); Crous 2002]. *Calonectria lauri* is homothallic (Li *et al.* 2020) (Supplementary Table S4).

leguminum Calonectria (Rehm) Crous, Taxonomy and pathology of *Cylindrocladium* (*Calonectria*) and allied genera: 107. 2002.
Basionym: *Nectria leguminum* Rehm, Hedwigia 39: 221. 1900.
Synonyms: *Calonectria quinqueseptata* Figueiredo & Namek., Arch. Inst. Biol. (São Paulo). 34: 91. 1967.
Cylindrocladium leguminum Crous, Taxonomy and pathology of *Cylindrocladium* (*Calonectria*) and allied genera: 107. 2002.

In: *Calonectria gracilipes* species complex.

Typus: *Ule* 2282 (holotype of *Nectria leguminum*; Crous 2002), PREM 57208 (holotype of *Cy. leguminum*; Crous 2002).
Ex-type culture: CBS 728.68 = CMW 23684 (Crous 2002, Lombard *et al.* 2010a).
Type locality: **Brazil**, Sao Paulo.
Type substrate: *Annona squamosa.*
Barcodes: *act* = MT335044; *cmdA* = MT335276; *his3* = MT335516; *rpb2* = MT412573; *tef1* = MT412807; *tub2* = MT413022 (alternative markers: ITS = MT359737; LSU = MT359497).
Notes: *Calonectria leguminum* is phylogenetically closely related to *Ca. angustata*, *Ca. gracilipes*, *Ca. hurae* and *Ca. rumohrae*, and can be distinguished from these four species by the dimensions of its macroconidia. The macroconidia of *Ca. leguminum* [(av. 60 × 5 µm); Figueiredo & Namekata 1967, Crous 2002] are smaller than those of *Ca. angustata* [(av. 110 × 10 µm); Crous *et al.* 2000], *Ca. hurae* [(av. 120 × 7.5 µm); Crous 2002] and *Ca. rumohrae* [(av. 110 × 9 µm); El-Gholl *et al.* 1997], larger than those of *Ca. gracilipes* [(av. 45 × 4.5 µm); Crous *et al.* 1997a]. *Calonectria leguminum* is homothallic (Crous 2002) (Supplementary Table S4).

leucothoes Calonectria (El-Gholl *et al.*) L. Lombard *et al.* (as *leucothoës*), Stud. Mycol. 66: 56. 2010.
Basionym: *Cylindrocladium leucothoes* El-Gholl *et al.*, Canad. J. Bot. 67: 2530. 1989.
Synonym: *Cylindrocladium perseae* T.S. Schub. *et al.*, Mycotaxon 73: 474. 1999.

In: *Calonectria mexicana* species complex.

Typus: FLAS F55387 holotype.
Ex-type culture: CBS 109166 = CMW 30977 = CPC 2385 = ATCC 64824 = P88-490.
Type locality: **USA**, Florida.
Type substrate: *Leucothoe axillaris*.
Barcodes: *act* = MT335045; *cmdA* = MT335277; *his3* = MT335517; *rpb2* = MT412574; *tef1* = MT412808 (alternative markers: ITS = MT359738; LSU = MT359498).
Notes: *Calonectria leucothoes* is closely related to *Ca. citri* and *Ca. lauri*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. leucothoes* [(av. 73 × 5 µm); El-Gholl *et al.* 1989] are larger than those of *Ca. citri* [(av. 58 × 4 µm); Crous 2002] and longer than those of *Ca. lauri* [(av. 60 × 5.5 µm); Lechat *et al.* 2010]. *Calonectria leucothoes* is characterised as being heterothallic, while *Ca. lauri* is homothallic (Li *et al.* 2020) (Supplementary Table S4).

lichi Calonectria Q.L. Liu & S.F. Chen, Mycokeys 26: 45. 2017.

In: *Calonectria colhounii* species complex.

Typus: CSFF 2019 holotype.
Ex-type culture: CERC 8866.
Type locality: **China**, HeNan Province.
Type substrate: Soil.
Barcodes: *act* = MT335046; *cmdA* = MT335278; *his3* = MT335518; *rpb2* = MT412575; *tef1* = MT412809; *tub2* = MT413023 (alternative markers: ITS = MT359739; LSU = MT359499).
Notes: *Calonectria lichi* is phylogenetically closely related to *Ca. fujianensis*. The sequences of the ITS, *tef1* and *tub2* gene regions can differentiate *Ca. lichi* from that species. The macroconidia of *Ca. lichi* [(av. 65.7 × 6 µm); Liu & Chen 2017] are larger than those of *Ca. fujianensis* [(av. 52.5 × 4 µm); Chen *et al.* 2011]. *Calonectria lichi* is homothallic (Li *et al.* 2020) (Supplementary Table S4).

lombardiana Calonectria Q.L. Liu & S.F. Chen, ***sp. nov.*** MycoBank MB835285. Fig. 2.

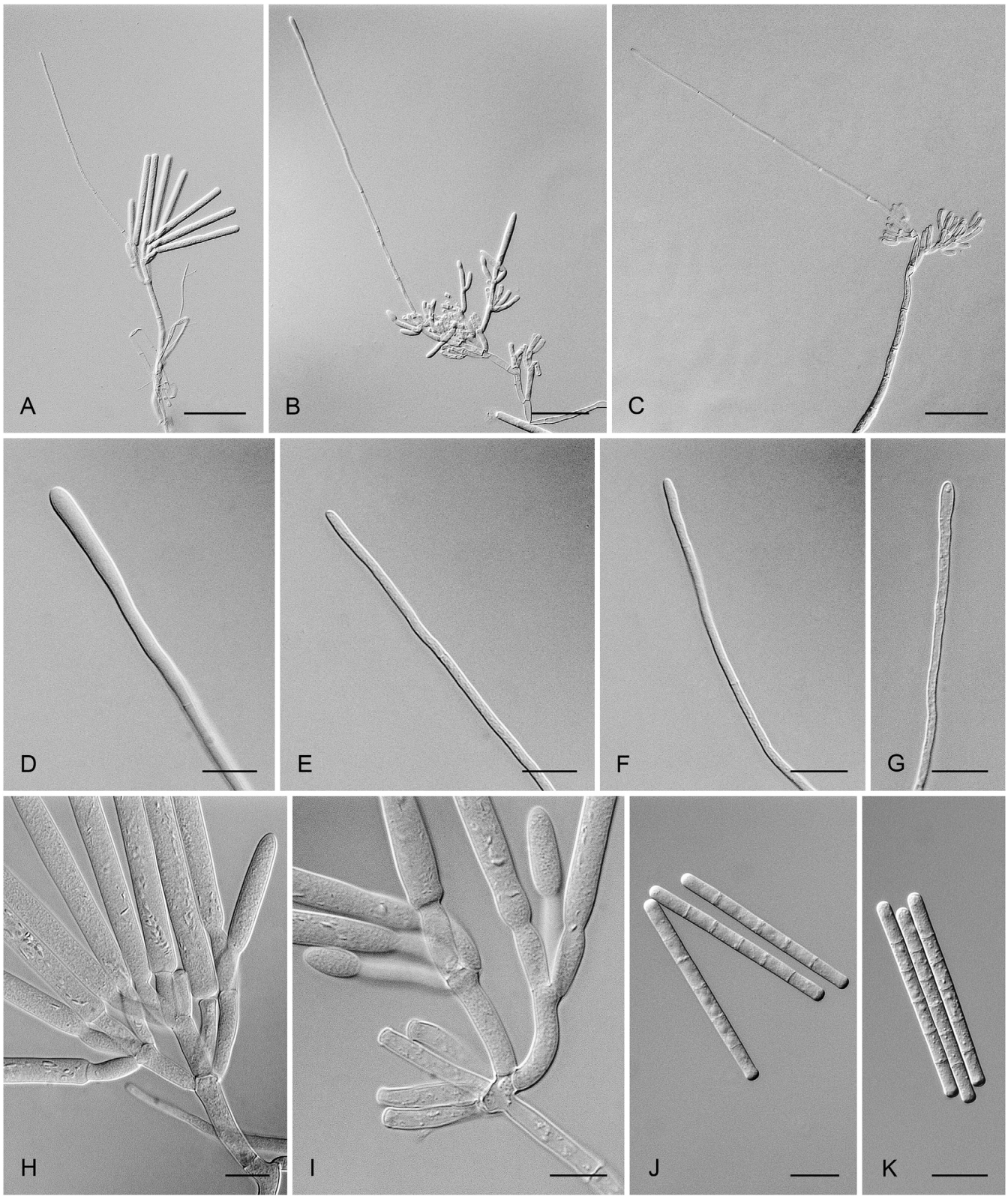

Fig. 2. *Calonectria lombardiana*. **A–C**. Macroconidiophore. **D–G**. Narrowly clavate vesicles. **H, I**. Conidiogenous apparatus with conidiophore branches and cylindrical to allantiod phialides. **J, K**. Macroconidia. Scale bars: A–C = 50 µm, D–I = 10 µm, J, K = 20 µm.

In: *Calonectria reteaudii* species complex.

Etymology: Named for Dr Lorenzo Lombard, recognising his significant contribution to the taxonomy of *Calonectria*.

Sexual morph unknown. *Macroconidiophores* consisting of a stipe, a suite of penicillate arranged fertile branches, a stipe extension, and a terminal vesicle; stipe septate, hyaline, smooth, 43–139 × 4–7 µm; stipe extensions septate, straight to flexuous 158–216 µm long, 2–5 µm wide at the apical septum, terminating in a narrowly clavate vesicle, 2–4 µm diam; lateral stipe extensions (90° to main axis) absent. *Conidiogenous apparatus* 34–80 µm wide, and 35–76 µm long; primary branches aseptate, 13–29 × 3–7 µm; secondary branches aseptate, 11–21 × 3–5 µm; tertiary branches aseptate, 9–19 × 2–4 µm,

each terminal branch producing 3–4 phialides; phialides cylindrical to allantoid, hyaline, aseptate, 9–20 × 2–5 µm, apex with minute periclinal thickening and inconspicuous collarette. *Macroconidia* cylindrical, rounded at both ends, straight, (64–) 74–86(–98) × (5–)5.5–6.5(–7.5) µm, (av. 80 × 6 µm), 5-septate, lacking a visible abscission scar, held in parallel cylindrical clusters by colourless slime. Mega- and microconidia not observed.

Culture characteristics: Colonies forming abundant white aerial mycelium at 25 °C on MEA, moderate sporulation; reverse cinnamon after 7 d. Chlamydospores extensive throughout the medium, forming microsclerotia. Optimal growth temperature 25 °C, no growth at 5 °C and 35 °C, after 7 d, colonies at 10 °C, 15 °C, 20 °C, 25 °C and 30 °C reached 11.1 mm, 20.4 mm, 41.2 mm, 59.5 mm and 55.3 mm, respectively.

Typus: **Australia**, Victoria, on *Xanthorrhoea australis*, T. Baigent (**holotype** HMAS 255718, ex-type culture CBS 112634 = CMW 30602 = CPC 4233 = Lynfield 417).

Barcodes: *act* = MT335156; *cmdA* = MT335395; *his3* = MT335635; *rpb2* = MT412686; *tef1* = MT412926; *tub2* = MT413133 (alternative markers: ITS = MT359856; LSU = MT359616).

Notes: *Calonectria lombardiana* is a new species in the *Ca. reteaudii* species complex, closely related to *Ca. queenslandica* (Fig. 1). The sequences of ITS, *tef1* and *tub2* gene regions can differentiate *Ca. lombardiana* from that species. In addition, the macroconidia of *Ca. lombardiana* (av. 80 × 6 µm) are longer than those of *Ca. queenslandica* [(av. 69 × 6 µm); Lombard *et al.* 2010c] (Supplementary Table S4).

longiramosa Calonectria L. Lombard & Crous, Stud. Mycol. 86: 114. 2017.
(see ***Calonectria amazonica***)

In: *Calonectria pteridis* species complex.

Typus: CBS H-22759 holotype.
Ex-type culture: CBS 116319 = CMW 51832 = CPC 3761.
Type locality: **Brazil**, Amazon.
Type substrate: *Eucalyptus* sp.
Barcodes: *act* = MT334960; *cmdA* = MT335187; *his3* = MT335426; *rpb2* = MT412490; *tef1* = MT412717; *tub2* = MT412940 (alternative markers: ITS = MT359647; LSU = MT359407).
Notes: *Calonectria longiramosa* was treated as a synonym of *Ca. amazonica* in this study. In comparisons of DNA sequences for eight gene regions, the ex-type isolate of *Ca. longiramosa* (CBS 116319) were 100 % identical to the ex-type isolate of *Ca. amazonica* (CBS 116250). Both of the species produce clavate vesicles with overlapping dimensions (*Ca. longiramosa*: 5–8 µm; *Ca. amazonica*: 5–6 µm) and 1-septate macroconidia. The macroconidia of *Ca. longiramosa* (av. 71 × 5 µm) are shorter than those of *Ca. amazonica* (av. 79 × 5 µm) (Lombard *et al.* 2016), which was considered to represent intraspecific variation (Supplementary Table S4).

machaerinae Calonectria L. Lombard & Crous, Stud. Mycol. 85: 181. 2016.
(see ***Calonectria pauciramosa***)

In: *Calonectria candelabrum* species complex.

Typus: CBS H-22760 holotype.
Ex-type culture: CBS 123183 = CMW 51311 = CPC 15378.
Type locality: **New Zealand,** Auckland, Auckland University Campus.
Type substrate: Foliar lesion of *Machaerina sinclairii*.
Barcodes: *act* = MT335090; *cmdA* = MT335322; *his3* = MT335562; *rpb2* = MT412615; *tef1* = MT412853; *tub2* = MT413065 (alternative markers: ITS = MT359783; LSU = MT359543).
Notes: *Calonectria machaerinae* was treated as a synonym of *Ca. pauciramosa* in this study. In comparisons of DNA sequences for eight gene regions, all the sequences of *Ca. machaerinae* (ex-type CBS 123183) were 100 % identical to those of *Ca. pauciramosa* (ex-type CBS 138824, CMW 2151, CMW 7592, CMW 9151, CMW 30823, and CMW 30875). Both species produce obpyriform to ellipsoidal vesicles with overlapping dimensions (*Ca. machaerinae*: 6–9 µm; *Ca. pauciramosa*: 5–11 µm) and 1-septate macroconidia. The macroconidia of *Ca. machaerinae* (av. 38 × 4 µm) are smaller than those of *Ca. pauciramosa* (av. 50 × 4.5 µm) (Crous 2002, Lombard *et al.* 2016), which was considered to represent intraspecific variation (Supplementary Table S4).

macroconidialis Calonectria (Crous *et al.*) Crous, Canad. J. Bot. 77: 1818. 1999.
Basionym: *Calonectria colhounii* var. *macroconidialis* Crous *et al.*, Mycotaxon 46: 222. 1993.
Synonyms: *Cylindrocladium colhounii* var. macroconidiale Crous *et al.*, Mycotaxon 46: 222. 1993.
Cylindrocladium macroconidiale (Crous *et al.*) Crous, Canad. J. Bot. 77: 1818. 1999.
Calonectria parva L. Lombard & Crous, Stud. Mycol. 85: 183. 2016.

In: *Calonectria colhounii* species complex.

Typus: PREM 51036 (holotype of *Ca. macroconidialis*; Crous *et al.* 1999), PREM 51035 (holotype of *Cy. macroconidiale*; Crous *et al.* 1999).
Ex-type culture: CBS 114880 = CMW 51219 = CPC 307 = PPRI 4000 (Crous 2002, Crous *et al.* 2006).
Type locality: **South Africa**, Mpumalanga, Sabie.
Type substrate: *Eucalyptus grandis*.
Barcodes: *act* = MT335050; *cmdA* = MT335282; *his3* = MT335522; *rpb2* = MT412579; *tef1* = MT412813; *tub2* = MT413027 (alternative markers: ITS = MT359743; LSU = MT359503).
Notes: *Calonectria macroconidialis* is closely related to *Ca. madagascariensis*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. macroconidialis* [(av. 90 × 6.5 µm); Crous *et al.* 1999] are larger than those of *Ca. madagascariensis* [(av. 55 × 4.5 µm); Crous 2002]. Furthermore, *Ca. macroconidialis* is characterised as being heterothallic, while *Ca. madagascariensis* is homothallic (Crous *et al.* 1999, Crous 2002) (Supplementary Table S4).

madagascariensis Calonectria Crous, Taxonomy and pathology of *Cylindrocladium* (*Calonectria*) and allied genera: 112. 2002.

Synonym: *Cylindrocladium madagascariense* Crous, Taxonomy and pathology of *Cylindrocladium* (*Calonectria*) and allied genera: 112. 2002.

In: *Calonectria colhounii* species complex.

Typus: PREM 57198 (holotype of *Ca. madagascariensis*; Crous 2002), PREM 57199 (holotype of *Cy. madagascariense*; Crous 2002).
Ex-type culture: CBS 114572 = CMW 23686 = CPC 2252 (Crous *et al.* 2006).
Type locality: **Madagascar**, Rona.
Type substrate: Soil.
Barcodes: *act* = MT335052; *cmdA* = MT335284; *his3* = MT335524; *rpb2* = MT412581; *tef1* = MT412815; *tub2* = MT413029 (alternative markers: ITS = MT359745; LSU = MT359505).
Notes: *Calonectria madagascariensis* is closely related to *Ca. macroconidialis*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. madagascariensis* [(av. 55 × 4.5 µm); Crous 2002] are smaller than those of *Ca. macroconidialis* [(av. 90 × 6.5 µm); Crous *et al.* 1999]. *Calonectria madagascariensis* is homothallic (Crous 2002) (Supplementary Table S4).

magnispora Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 174. 2015.
(see ***Calonectria aconidialis***)

In: *Calonectria kyotensis* species complex.

Typus: CBS H-21471 holotype.
Ex-type culture: CBS 136249 = CMW 35184 = CERC 1860.
Type locality: **China**, GuangXi Province.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT334947; *cmdA* = MT335174; *his3* = MT335413; *tef1* = MT412704 (alternative markers: ITS = MT359634; LSU = MT359394).
Notes: *Calonectria magnispora* was treated as a synonym of *Ca. aconidialis* in this study. In comparisons of DNA sequences for six available gene regions, one base difference in each of the *cmdA*, LSU and *tef1* sequences was found between the ex-type isolate of *Ca. magnispora* (CMW 35184) and the ex-type isolate of *Ca. aconidialis* (CMW 35174). Both species are homothallic and produce orange to orange-brown perithecia, 8-spored asci and 1-septate ascospores, the ascospores of *Ca. magnispora* (av. 40 × 6 µm) are longer than those of *Ca. aconidialis* (av. 36 × 6 µm) (Lombard *et al.* 2015a), which was considered to represent intraspecific variation (Supplementary Table S4).

malesiana Calonectria (Crous) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Cylindrocladium malesianum* Crous, Stud. Mycol. 50: 425. 2004.

In: *Calonectria kyotensis* species complex.

Typus: CBS 9885 holotype.
Ex-type culture: CBS 112752 = CMW 23687 = CPC 4223.
Type locality: **Indonesia**, Northern Sumatra.
Type substrate: Soil.
Barcodes: *act* = MT335054; *cmdA* = MT335286; *his3* = MT335526; *rpb2* = MT412583; *tef1* = MT412817; *tub2* = MT413031 (alternative markers: ITS = MT359747; LSU = MT359507).
Notes: *Calonectria malesiana* is closely related to *Ca. lateralis*, and can be distinguished by dimensions of its macroconidia. The macroconidia of *Ca. malesiana* [(av. 47.5 × 4 µm); Crous *et al.* 2004] are longer than those of *Ca. lateralis* [(av. 39 × 4 µm); Lombard *et al.* 2015a] (Supplementary Table S4).

maranhensis Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 107. 2015.

In: *Calonectria cylindrospora* species complex.

Typus: CBS H-21360 holotype.
Ex-type culture: CBS 134811 = LPF142.
Type locality: **Brazil**, Maranhao state, Açailandia.
Type substrate: *Eucalyptus* leaf.
Barcodes: *cmdA* = KM396035; *his3* = KM396118; *tef1* = KM395861; *tub2* = KM395948.
Notes: *Calonectria maranhensis* is closely related to *Ca. brasiliensis*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. maranhensis* [(av. 57 × 5 µm); Alfenas *et al.* 2015] are larger than those of *Ca. brasiliensis* [(av. 38 × 3.5 µm); Batista 1951] (Supplementary Table S4).

metrosideri Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 108. 2015.

In: *Calonectria candelabrum* species complex.

Typus: CBS H-21146 holotype.
Ex-type culture: CBS 133603 = LPF101.
Type locality: **Brazil**, Minas Gerais state, Viçosa.
Type substrate: *Metrosideros polymorpha.*
Barcodes: *cmdA* = KC294304; *his3* = KC294307; *tef1* = KC294310; *tub2* = KC294313.
Notes: *Calonectria metrosideri* is closely related to *Ca. brasiliana*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. metrosideri* [(av. 45 × 4 µm); Alfenas *et al.* 2013a] are shorter than those of *Ca. brasiliana* [(av. 53 × 4 µm); Lombard *et al.* 2016] (Supplementary Table S4).

mexicana Calonectria C.L. Schoch & Crous, Mycologia 91: 294. 1999.
Synonym: *Cylindrocladium mexicanum* C.L. Schoch & Crous, Mycologia 91: 294. 1999.

In: *Calonectria mexicana* species complex.

Typus: PREM 55763 (holotype of *Ca. mexicana*; Schoch *et al.* 1999); PREM 55761 (holotype of *Cy. mexicanum*; Schoch *et al.* 1999).
Ex-type culture: CBS 110918 = CMW 9055 = STE-U 927 (Lombard *et al.* 2016).
Type locality: **Mexico**, Yucatan, Uxmal.
Type substrate: Soil.
Barcodes: *act* = GQ280474; *cmdA* = GQ267396; *his3* = FJ972460; *rpb2* = KY653412; *tef1* = FJ972526; *tub2* = AF210863 (alternative markers: ITS = GQ280596; LSU = GQ280718).
Notes: *Calonectria mexicana* is closely related to *Ca. avesiculata*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. mexicana* [(av. 45 × 4 µm); Schoch *et al.* 1999] are smaller than those of *Ca. avesiculata* [(av. 64 × 5 µm); Schubert *et al.*

1989], and the vesicles of *Ca. mexicana* (7–12 µm) are wider than those of *Ca. avesiculata* (1–4 µm). *Calonectria mexicana* is heterothallic (Schoch *et al.* 1999) (Supplementary Table S4).

microconidialis Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 175. 2015.
(see ***Calonectria pseudoreteaudii***)

In: *Calonectria reteaudii* species complex.

Typus: CBS H-21473 holotype.
Ex-type culture: CBS 136638 = CMW 31487 = CERC 1822.
Type locality: **China**, GuangDong Province, ZhanJiang.
Type substrate: *Eucalyptus urophylla* × *grandis* clone seedling.
Barcodes: *act* = MT335113; *cmdA* = MT335348; *his3* = MT335588; *rpb2* = MT412641; *tef1* = MT412879; *tub2* = MT413090 (alternative markers: ITS = MT359809; LSU = MT359569).
Notes: *Calonectria microconidialis* was treated as a synonym of *Ca. pseudoreteaudii* in this study. In comparisons of DNA sequences, all eight gene sequences for the isolates of *Ca. microconidialis* (ex-type CMW 31487, CMW 31473, CMW 31475, and CMW 31492) were 100 % identical to the isolates of *Ca. pseudoreteaudii* (ex-type CMW 25310, and CMW 25292). Both species produce narrowly clavate vesicles with overlapping dimensions (*Ca. microconidialis*: 3–7 µm; *Ca. pseudoreteaudii*: 3–5 µm), they also produce multiple-septate (> 3) macroconidia and 1–3-septate microconidia. The macroconidia of *Ca. microconidialis* (av. 88 × 8 µm) are shorter than those of *Ca. pseudoreteaudii* (av. 104 × 8 µm) (Lombard *et al.* 2010c, 2015a), which was considered to represent intraspecific variation (Supplementary Table S4).

montana Calonectria Q.L. Liu & S.F. Chen, Mycokeys 26: 48. 2017.
(see ***Calonectria canadiana***)

In: *Calonectria kyotensis* species complex.

Typus: CSFF 2022 holotype.
Ex-type culture: CERC 8952.
Type locality: **China**, HeNan.
Type substrate: Soil under natural forest.
Barcodes: *act* = MT335058; *cmdA* = MT335290; *his3* = MT335530; *rpb2* = MT412587; *tef1* = MT412821; *tub2* = MT413035 (alternative markers: ITS = MT359751; LSU = MT359511).
Notes: *Calonectria montana* was treated as a synonym of *Ca. canadiana* in this study. In comparisons of DNA sequences for eight gene regions, the only difference between the ex-type isolate of *Ca. montana* (CERC 8952) and the ex-type isolate of *Ca. canadiana* (CMW 23673) was in the ITS, *rpb2* and *tub2* sequences, where there was one base difference in the ITS, one base difference in the *rpb2* and seven base differences in the *tub2* sequences. Both species produce pyriform to sphaeropedunculate vesicles with overlapping dimensions (*Ca. montana*: 4–12.5 µm; Liu & Chen 2017, *Ca. canadiana*: 6–10 µm; Kang *et al.* 2001b) and 1-septate macroconidia. The macroconidia of *Ca. montana* [(av. 43.2 × 4.6 µm); Liu & Chen 2017] are shorter than those of *Ca. canadiana* [(av. 50 × 4 µm); Kang *et al.* 2001b], which was considered to represent intraspecific variation (Supplementary Table S4).

monticola Calonectria L. Lombard & Crous, Persoonia 35: 293. 2015.

In: *Calonectria colhounii* species complex.

Typus: CBS H-22376 holotype.
Ex-type culture: CBS 140645 = CPC 28835.
Type locality: **Thailand**, Chiang Mai.
Type substrate: Soil.
Barcodes: *cmdA* = KT964771; *tef1* = KT964773; *tub2* = KT964769 (alternative markers: ITS = KT964775; LSU = KT983443).
Notes: *Calonectria monticola* is closely related to *Ca. honghensis*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. monticola* [(av. 49 × 5 µm); Crous *et al.* 2015] are smaller than those of *Ca. honghensis* [(av. 54 × 5.5 µm); Li *et al.* 2017] (Supplementary Table S4).

mossambicensis Calonectria S. Maússe-Sitoe *et al.*, Persoonia 31: 291. 2013.
(see ***Calonectria pauciramosa***)

In: *Calonectria candelabrum* species complex.

Typus: PREM 60821 holotype.
Ex-type culture: CBS 137243 = CMW 36327.
Type locality: **Mozambique**, Manica, Bandula.
Type substrate: Cutting clones of *Eucalyptus grandis* × *E. camaldulensis*.
Barcodes: *act* = MT335091; *cmdA* = MT335323; *his3* = MT335563; *rpb2* = MT412616; *tef1* = MT412854; *tub2* = MT413066 (alternative markers: ITS = MT359784; LSU = MT359544).
Notes: *Calonectria mossambicensis* was treated as a synonym of *Ca. pauciramosa* in this study. In comparisons of DNA sequences for eight gene regions, all the sequences of the isolates of *Ca. mossambicensis* (ex-type CBS 137243, and CMW 36329) were 100 % identical to those of the isolates of *Ca. pauciramosa* (ex-type CBS 138824, CMW 2151, CMW 7592, CMW 9151, CMW 30823, and CMW 30875). Both species produce obpyriform to ellipsoidal vesicles with overlapping dimensions (*Ca. mossambicensis*: 2–8 µm; *Ca. pauciramosa*: 5–11 µm) and 1-septate macroconidia. The macroconidia of *Ca. mossambicensis* (av. 42 × 4 µm) are smaller than those of *Ca. pauciramosa* (av. 50 × 4.5 µm) (Crous 2002, Crous *et al.* 2013), which was considered to represent intraspecific variation (Supplementary Table S4).

multilateralis Calonectria L. Lombard *et al.*, Stud. Mycol. 85: 182. 2016.

In: *Calonectria naviculata* species complex.

Typus: CBS H-22762 holotype.
Ex-type culture: CBS 110932 = CMW 51171 = CPC 957.
Type locality: **Mexico**, Uxmal.
Type substrate: Soil.
Barcodes: *act* = MT335060; *cmdA* = MT335292; *his3* = MT335532; *rpb2* = MT412589; *tef1* = MT412823; *tub2* = MT413037 (alternative markers: ITS = MT359753; LSU = MT359513).
Notes: *Calonectria multilateralis* is closely related to *Ca. multinaviculata* and *Ca. naviculata*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. multilateralis* [(av. 33 × 3 µm); Lombard *et al.* 2016] are shorter than those of *Ca. multinaviculata* [(av.

46 × 3.5 µm); Alfenas *et al.* 2015] and *Ca. naviculata* [(av. 45 × 3 µm); Crous *et al.* 1997a] (Supplementary Table S4).

multinaviculata Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 108. 2015.

In: *Calonectria naviculata* species complex.

Typus: CBS 134858 holotype.
Ex-type culture: CBS 134858 = LPF233.
Type locality: **Brazil**, Bahia state, Mucuri.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *cmdA* = KM396072; *his3* = KM396155; *tef1* = KM395898; *tub2* = KM395985.
Notes: *Calonectria multinaviculata* is phylogenetically closely related to *Ca. naviculata*, *Ca. multinaviculata* can be distinguished from *Ca. naviculata* by its lateral stipe extensions, a feature not observed for the *Ca. naviculata* (Crous *et al.* 1997a, Alfenas *et al.* 2015) (Supplementary Table S4).

multiphialidica Calonectria (Crous *et al.*) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Cylindrocladium multiphialidicum* Crous *et al.*, Stud. Mycol. 50: 425. 2004.

In: *Calonectria naviculata* species complex.

Typus: CBS 9887 holotype.
Ex-type culture: CBS 112678 = CMW 23688 = Cam 13.
Type locality: **Cameroon**.
Type substrate: Soil surrounding roots of *Musa* sp.
Barcodes: *act* = MT335066; *cmdA* = MT335298; *his3* = MT335538; *rpb2* = MT412595; *tef1* = MT412829; *tub2* = MT413043 (alternative markers: ITS = MT359759; LSU = MT359519).
Notes: *Calonectria multiphialidica* is closely related to *Ca. henricotiae* and *Ca. pseudonaviculata*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. multiphialidica* [(av. 53 × 4.5 µm); Crous *et al.* 2004] are smaller than those of *Ca. henricotiae* [(av. 56 × 5.6 µm); Gehesquiere *et al.* 2015] and *Ca. pseudonaviculata* [(av. 60 × 5 µm); Crous *et al.* 2002] (Supplementary Table S4). Furthermore, *Ca. multiphialidica* has eight tiers of branches in its conidiogenous apparatus in comparison to the two in *Ca. henricotiae* and four in *Ca. pseudonaviculata* (Crous *et al.* 2002, 2004, Gehesquiere *et al.* 2015).

multiseptata Calonectria Crous & M.J. Wingfield, Mycol. Res. 102: 530. 1998.
Synonym: *Cylindrocladium multiseptatum* Crous & M.J. Wingf., Mycol. Res. 102: 530. 1998.

In: *Calonectria reteaudii* species complex.

Typus: PREM 55343 (holotype of *Ca. multiseptata*; Crous *et al.* 1998), PREM 55344 (holotype of *Cy. multiseptatum*; Crous *et al.* 1998)
Ex-type culture: CBS 112682 = CMW 23692 = CPC 1589 (Crous 2002, Crous *et al.* 2006).
Type locality: **Indonesia**, North Sumatra.
Type substrate: *Eucalyptus grandis*.
Barcodes: *act* = MT335067; *cmdA* = MT335299; *his3* = MT335539; *rpb2* = MT412596; *tef1* = MT412830; *tub2* = MT413044 (alternative markers: ITS = MT359760; LSU = MT359520).
Notes: *Calonectria multiseptata* is phylogenetically closely related to *Ca. acicola*. The ability of *Ca. multiseptata* to produce megaconidiophores and megaconidia in culture distinguishes it from *Ca. acicola* (Crous 2002, Gadgil & Dick 2004). *Calonectria multiseptata* is homothallic (Crous 2002) (Supplementary Table S4).

multistipitata Calonectria N.Q. Pham *et al.*, Mycologia 111: 98. 2019.
(see ***Calonectria chinensis***)

In: *Calonectria kyotensis* species complex.

Typus: PREM 62121 holotype.
Ex-type culture: CBS 143573 = CMW 47192.
Type locality: **Vietnam**, Tuyen Quang.
Type substrate: Soil in *Acacia* hybrid plantation.
Barcodes: *act* = MT335068; *cmdA* = MT335300; *his3* = MT335540; *rpb2* = MT412597; *tef1* = MT412831; *tub2* = MT413045 (alternative markers: ITS = MT359761; LSU = MT359521).
Notes: *Calonectria multistipitata* was treated as a synonym of *Ca. chinensis* in this study. In comparisons of DNA sequences for eight gene regions, the only difference between the ex-type isolate of *Ca. multistipitata* (CMW 47192) and the ex-type isolate of *Ca. chinensis* (CMW 23674) was in the *his3*, ITS, *tef1* and *tub2* sequences, where there was one base difference in the *his3*, one base difference in the ITS, one base difference in the *tef1* and four base differences in the *tub2* sequences. Both species produce sphaeropedunculate vesicles with overlapping dimensions (*Ca. multistipitata*: 5–10 µm; *Ca. chinensis*: 6–9 µm) and 1-septate macroconidia. The macroconidia of *Ca. multistipitata* (av. 32 × 3.5 µm) are smaller than those of *Ca. chinensis* (av. 45 × 4 µm) (Crous *et al.* 2004, Pham *et al.* 2019), which was considered to represent intraspecific variation (Supplementary Table S4).

naviculata Calonectria Crous & M.J. Wingf., Mycologia 89: 654. 1997.
Synonym: *Cylindrocladium naviculatum* Crous & M.J. Wingf., Mycotaxon 50: 443. 1994.

In: *Calonectria naviculata* species complex.

Typus: PREM 54418 (holotype of *Ca. naviculata*; Crous *et al.* 1997a), PREM 51542 (holotype of *Cy. naviculatum*; Crous *et al.* 1994).
Ex-type culture: CBS 101121 = CMW 30974 (Lombard *et al.* 2010a).
Type locality: **Brazil**, Joao Pessoa.
Type substrate: Leaf litter.
Barcodes: *act* = GQ280478; *cmdA* = GQ267399; *his3* = GQ267252; *rpb2* = KM232309; *tef1* = GQ267317; *tub2* = GQ267211 (alternative markers: ITS = GQ280600; LSU = GQ280722).
Notes: *Calonectria naviculata* is phylogenetically closely related to *Ca. multinaviculata*, it can be distinguished from *Ca. multinaviculata* by its lack of lateral stipe extensions, a feature that is common in *Ca. multinaviculata* (Crous *et al.* 1997a, Alfenas *et al.* 2015). *Calonectria naviculata* is heterothallic (Crous *et al.* 1997a) (Supplementary Table S4).

nemoralis Calonectria L. Lombard & Crous, Stud. Mycol. 86: 114. 2017.

(see ***Calonectria ovata***)

In: *Calonectria pteridis* species complex.

Typus: CBS H-23135 holotype.
Ex-type culture: CBS 116249 = CMW 51829 = CPC 3533.
Type locality: **Brazil**.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT335074; *cmdA* = MT335306; *his3* = MT335546; *rpb2* = MT412603; *tef1* = MT412837; *tub2* = MT413051 (alternative markers: ITS = MT359767; LSU = MT359527).
Notes: *Calonectria nemoralis* was treated as a synonym of *Ca. ovata* in this study. In comparisons of DNA sequences for seven available gene regions, the only difference between the ex-type isolate of *Ca. nemoralis* (CBS 116249) and the ex-type isolate of *Ca. ovata* (CMW 16724) was found in the *tub2* gene sequences where one base difference occurred. Both of the species produce ovoid vesicles and 1-septate macroconidia. The macroconidia of *Ca. nemoralis* [(av. 53 × 4 µm); Marin-Felix *et al.* 2017] are smaller than those of *Ca. ovata* [(av. 70 × 5 µm); Victor *et al.* 1997], which was considered to represent intraspecific variation (Supplementary Table S4).

nemoricola Calonectria R.F. Alfenas *et al.*, (as *nemuricola*) Stud. Mycol. 80: 109. 2015.

In: *Calonectria candelabrum* species complex.

Typus: CBS H-21358 holotype.
Ex-type culture: CBS 134837 = LPF085.
Type locality: **Brazil**, Minas Gerais state, Araponga.
Type substrate: Soil in tropical rainforest.
Barcodes: *cmdA* = KM396066; *his3* = KM396149; *tef1* = KM395892; *tub2* = KM395979.
Notes: *Calonectria nemoricola* is closely related to *Ca. silvicola*, and can be distinguished from *Ca. silvicola* by the dimensions of its macroconidia. The macroconidia of *Ca. nemoricola* [(av. 45 × 4 µm); Alfenas *et al.* 2015] are longer than those of *Ca. silvicola* [(av. 41 × 4.5 µm); Alfenas *et al.* 2015] (Supplementary Table S4).

nymphaeae Calonectria Yong Wang bis *et al.*, Mycotaxon 122: 181. 2013.
(see ***Calonectria fujianensis***)

In: *Calonectria colhounii* species complex.

Typus: HGUPd100003 holotype.
Ex-type culture: CBS 131802 = CMW 51317 = HGUP 100003.
Type locality: **China**, Guizhou, Guiyang.
Type substrate: *Nymphaea tetragona*.
Barcodes: *act* = MT335070; *cmdA* = MT335302; *his3* = MT335542; *rpb2* = MT412599; *tef1* = MT412833; *tub2* = MT413047 (alternative markers: ITS = MT359763; LSU = MT359523).
Notes: *Calonectria nymphaeae* was treated as a synonym of *Ca. fujianensis* in this study. In comparisons of DNA sequences for eight gene regions, the only difference between the ex-type isolate of *Ca. nymphaeae* (CBS 131802) and the ex-type isolate of *Ca. fujianensis* (CMW 27257) was in the ITS, *tef1* and *tub2* sequences, where there was one base difference in the ITS, three base differences in the *tef1* and three base differences in the *tub2* sequences. Both species are homothallic and produce clavate vesicles with similar dimensions (*Ca. nymphaeae*: 3–5 µm; *Ca. fujianensis*: 3–5 µm). The macroconidia of *Ca. nymphaeae* (av. 61 × 5.9 µm) are larger than those of *Ca. fujianensis* (av. 52.5 × 4 µm) (Chen *et al.* 2011, Xu *et al.* 2012, Li *et al.* 2020), which was considered to represent intraspecific variation (Supplementary Table S4).

octoramosa Calonectria L. Lombard & Crous, Stud. Mycol. 86: 120. 2017.

In: *Calonectria brassicae* species complex.

Typus: CBS H-23136 holotype.
Ex-type culture: CBS 111423 = CMW 51819 = CPC 1650.
Type locality: **Ecuador**.
Type substrate: Soil.
Barcodes: *act* = MT335071; *cmdA* = MT335303; *his3* = MT335543; *rpb2* = MT412600; *tef1* = MT412834; *tub2* = MT413048 (alternative markers: ITS = MT359764; LSU = MT359524).
Notes: *Calonectria octoramosa* is closely related to *Ca. ecuadorae*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. octoramosa* [(av. 36 × 4 µm); Marin-Felix *et al.* 2017] are smaller than those of *Ca. ecuadorae* [(av. 51 × 4.5 µm); Crous *et al.* 2006] (Supplementary Table S4).

orientalis Calonectria L. Lombard *et al.*, Stud. Mycol. 66: 49. 2010.

In: *Calonectria brassicae* species complex.

Typus: PREM 60303 holotype.
Ex-type culture: CBS 125260 = CMW 20291.
Type locality: **Indonesia**, Langam.
Type substrate: Soil.
Barcodes: *act* = MT335072; *cmdA* = MT335304; *his3* = MT335544; *rpb2* = MT412601; *tef1* = MT412835; *tub2* = MT413049 (alternative markers: ITS = MT359765; LSU = MT359525).
Notes: *Calonectria orientalis* is closely related to *Ca. pini*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. orientalis* (av. 48 × 4 µm) are longer than those of *Ca. pini* (av. 44 × 5 µm) (Lombard *et al.* 2010a) (Supplementary Table S4). Furthermore, *Ca. orientalis* produces five tiers of branches in its conidiogenous apparatus in comparison to the three in *Ca. pini* (Lombard *et al.* 2010a).

ovata Calonectria D. Victor & Crous, Syst. Appl. Microbiol. 20: 282. 1997
Synonyms: *Cylindrocladium ovatum* El-Gholl *et al.*, Canad. J. Bot. 71: 469. 1993.
Calonectria tereticornis L. Lombard & Crous, Stud. Mycol. 85: 190. 2016.
Calonectria nemoralis L. Lombard & Crous, Stud. Mycol. 86: 114. 2017.
Calonectria tucuruiensis L. Lombard & Crous, Stud. Mycol. 86: 123. 2017.

In: *Calonectria pteridis* species complex.

Typus: PREM 51726 (holotype of *Ca. ovata*; Victor *et al.* 1997), FLAS F55638 (holotype of *Cy. ovatum*; El-Gholl *et al.* 1993a).
Ex-type culture: CBS 111299 = CMW 16724 = ATCC 76225 = UFV 89 (Lombard *et al.* 2010a).

Type locality: **Brazil**, Pará, Monte Dourado.
Type substrate: *Eucalyptus urophylla*.
Barcodes: *act* = MT335075; *cmdA* = MT335307; *his3* = MT335547; *tef1* = MT412838; *tub2* = MT413052 (alternative markers: ITS = MT359768; LSU = MT359528).
Notes: *Calonectria ovata* is phylogenetically closely related to *Ca. pseudovata* and *Ca. terricola*. The macroconidia of *Ca. ovata* [(av. 70 × 5 µm); Victor *et al.* 1997] are larger than those of *Ca. terricola* [(av. 46 × 4.5 µm); Lombard *et al.* 2016]. Furthermore, the ability of *Ca. ovata* to produce miconidiophores and microconidia in culture distinguishes it from *Ca. terricola* (Victor *et al.* 1997, Lombard *et al.* 2016). Morphologically, *Ca. ovata* shows some overlap with *Ca. pseudovata*, while the sequences of *cmdA*, *his3*, *tef1* and *tub2* gene regions can differentiate *Ca. ovata* from *Ca. pseudovata* (Victor *et al.* 1997, Alfenas *et al.* 2015). *Calonectria ovata* is heterothallic (Li *et al.* 2020).

pacifica Calonectria (J.C. Kang *et al.*) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Cylindrocladium pacificum* J.C. Kang *et al.*, Syst. Appl. Microbiol. 24: 213. 2001.

In: *Calonectria kyotensis* species complex.

Typus: PREM 57209 holotype.
Ex-type culture: CBS 109063 = CMW 16726 = IMI 354528 = STE-U 2534 = A1568.
Type locality: **USA**, Hawaii.
Type substrate: *Araucaria heterophylla*.
Barcodes: *act* = MT335079; *cmdA* = MT335311; *his3* = MT335551; *rpb2* = MT412604; *tef1* = MT412842 (alternative markers: ITS = MT359772; LSU = MT359532).
Notes: *Calonectria pacifica* is phylogenetically closely related to *Ca. aconidialis* and can be differentiated from that species by the sequences of *act*, *cmdA*, *his3*, *rpb2*, ITS, LSU and *tef1* gene regions.

papillata Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 175. 2015.
(see ***Calonectria cerciana***)

In: *Calonectria cylindrospora* species complex.

Typus: CBS H-21487 holotype.
Ex-type culture: CBS 136097 = CMW 37976 = CPC 23517 = CERC 1939.
Type locality: **China**, GuangDong.
Type substrate: Soil in a *Eucalyptus* plantation.
Barcodes: *act* = MT334983; *cmdA* = MT335213; *his3* = MT335453; *rpb2* = MT412517; *tef1* = MT412744; *tub2* = MT412965 (alternative markers: ITS = MT359674; LSU = MT359434).
Notes: *Calonectria papillata* was treated as a synonym of *Ca. cerciana* in this study. In comparisons of DNA sequences for eight gene regions, there were differences between the ex-type isolate of *Ca. papillata* (CMW 37976) and the ex-type isolate of *Ca. cerciana* (CMW 25309) in the ITS, *rpb2* and *tub2* sequences. These included one base difference in the ITS sequences, one base difference in the *rpb2* and two base differences in the *tub2* sequences. Both species produce obpyriform vesicles and 1-septate macroconidia, and have similar vesicle dimensions (*Ca. papillata*: 8–14 µm; *Ca. cerciana*: 8–13 µm) and macroconidia (*Ca. papillata*: av. 45 × 4 µm; *Ca. cerciana*: av. 44 × 5 µm) (Lombard *et al.* 2010c, 2015a) (Supplementary Table S4).

paracolhounii Calonectria L. Lombard & Crous, Stud. Mycol. 85: 183. 2016.

In: *Calonectria colhounii* species complex.

Typus: CBS H-22763 holotype.
Ex-type culture: CBS 114679 = CMW 51212 = CPC 2445.
Type locality: **USA**.
Type substrate: Unknown.
Barcodes: *cmdA* = KX784582; *rpb2* = KY653423; *tef1* = KX784714; *tub2* = KX784644 (alternative markers: ITS = KY653268; LSU = KY653324).
Notes: *Calonectria paracolhounii* is closely related to *Ca. colhounii*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. colhounii* [(av. 65 × 5 µm); Peerally 1973] are longer than those of *Ca. paracolhounii* [(av. 41 × 5 µm); Lombard *et al.* 2016] (Supplementary Table S4).

paraensis Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 111. 2015.
Synonym: *Calonectria telluricola* R.F. Alfenas *et al.*, Stud. Mycol. 80: 125. 2015.

In: *Calonectria brassicae* species complex.

Typus: CBS H-21379 holotype.
Ex-type culture: CBS 134669 = LPF430.
Type locality: **Brazil**, Pará state, Monte Dourado.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *cmdA* = KM396011; *his3* = KM396094; *tef1* = KM395837; *tub2* = KM395924.
Notes: *Calonectria paraensis* is closely related to *Ca. orientalis*, *Ca. pini* and *Ca. pseudobrassicae*. The macroconidia of *Ca. paraensis* [(av. 42 × 5 µm); Alfenas *et al.* 2015] are shorter than those of *Ca. orientalis* [(av. 48 × 4 µm); Lombard *et al.* 2010a] and *Ca. pini* [(av. 44 × 5 µm); Lombard *et al.* 2010a]. *Calonectria paraensis* has two tiers of branches in its conidiogenous apparatus in comparison to the five in *Ca. orientalis*, three in *Ca. pini* and *Ca. pseudobrassicae* (Lombard *et al.* 2010a, Alfenas *et al.* 2015) (Supplementary Table S4).

parakyotensis Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 176. 2015.
(see ***Calonectria aconidialis***)

In: *Calonectria kyotensis* species complex.

Typus: CBS H-21470 holotype.
Ex-type culture: CBS 136085 = CMW 35169 = CERC 1845.
Type locality: **China**, GuangDong Province.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT334948; *cmdA* = MT335175; *his3* = MT335414; *rpb2* = MT412483; *tef1* = MT412705 (alternative markers: ITS = MT359635; LSU = MT359395).
Notes: *Calonectria parakyotensis* was treated as a synonym of *Ca. aconidialis* in this study. In comparisons of DNA sequences for seven available gene regions, all seven gene sequences for the isolates of *Ca. parakyotensis* (ex-type CMW 35169, and CMW 35413) were 100 % identical to those of the ex-type isolate of *Ca. aconidialis* (CMW 35174). Both species are homothallic but no sexual morph was observed for *Ca. parakyotensis* (Lombard *et al.* 2015a, Li *et al.* 2020; Supplementary Table S4).

parva Calonectria L. Lombard & Crous, Stud. Mycol. 85: 183. 2016.

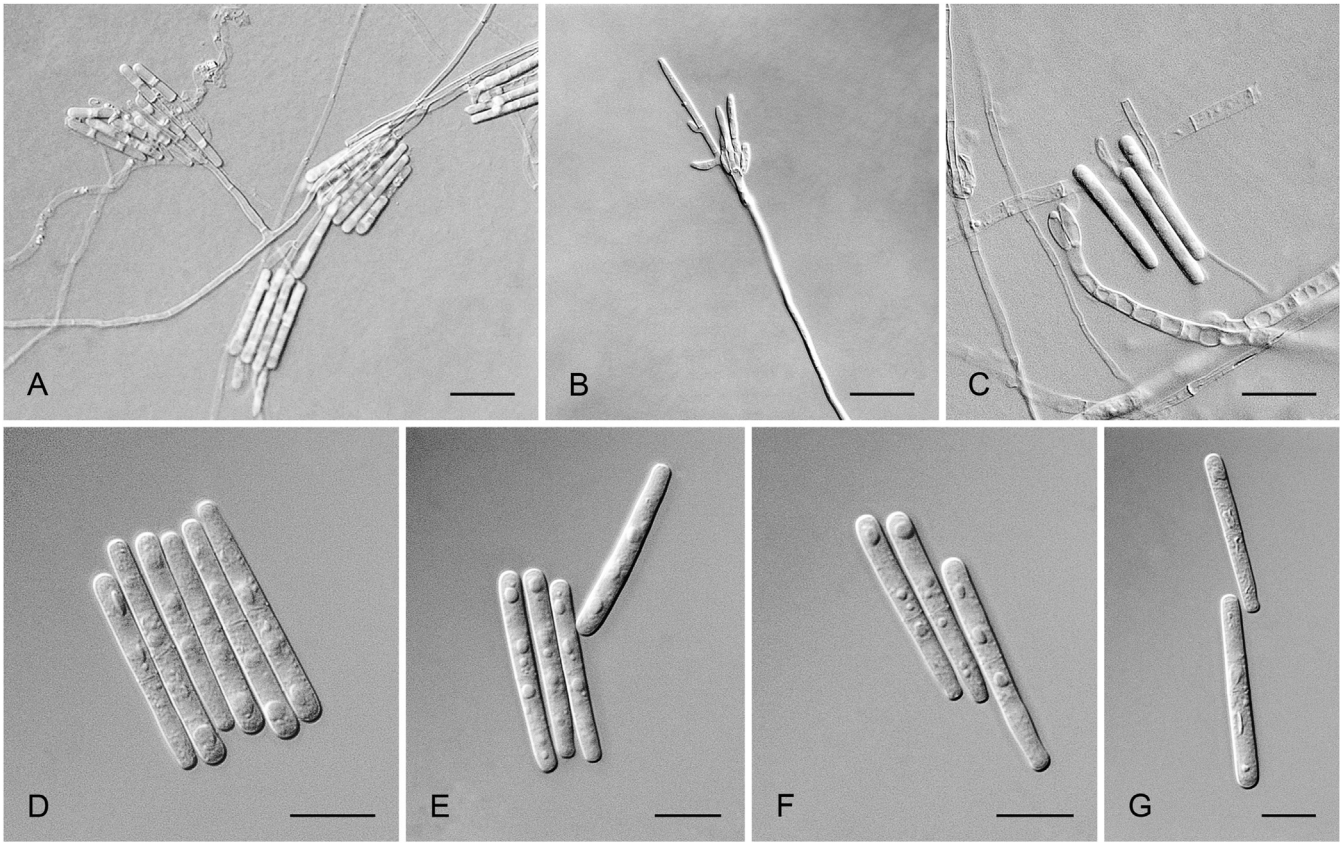

Fig. 3. *Calonectria pauciphialidica*. **A–C**. Macroconidiophore. **D–G**. Macroconidia. Scale bars: A–C = 20 µm, D–G = 10 µm.

(see ***Calonectria macroconidialis***)

In: *Calonectria colhounii* species complex.

Typus: CBS H-22764 holotype.
Ex-type culture: CBS 110798 = CMW 51817 = CPC 410.
Type locality: **South Africa**, Mpumalanga, Sabie.
Type substrate: *Eucalyptus grandis* (roots).
Barcodes: *act* = MT335051; *cmdA* = MT335283; *his3* = MT335523; *rpb2* = MT412580; *tef1* = MT412814; *tub2* = MT413028 (alternative markers: ITS = MT359744; LSU = MT359504).
Notes: *Calonectria parva* was treated as a synonym of *Ca. macroconidialis* in this study. In comparisons of DNA sequences for eight gene regions, the only differences between the ex-type isolate of *Ca. parva* (CBS 110798) and the ex-type isolate of *Ca. macroconidialis* (CBS 114880) was found in the *tef1* gene sequences. Both species produce clavate vesicles of similar dimensions (*Ca. parva*: 3–5 µm; *Ca. macroconidialis*: 3–5 µm) and 3-septate macroconidia (Crous *et al.* 1999, Lombard *et al.* 2016). The macroconidia of *Ca. parva* (av. 72 × 6 µm) are smaller than those of *Ca. macroconidialis* (av. 90 × 6.5 µm) (Crous *et al.* 1999, Lombard *et al.* 2016), which was considered to represent intraspecific variation (Supplementary Table S4).

parvispora Calonectria L. Lombard & Crous, Stud. Mycol. 86: 120. 2017.

In: *Calonectria brassicae* species complex.

Typus: CBS H-22765 holotype.
Ex-type culture: CBS 111465 = CPC 1902.
Type locality: **Brazil**.
Type substrate: Soil.
Barcodes: *act* = MT335082; *cmdA* = MT335314; *his3* = MT335554; *rpb2* = MT412607; *tef1* = MT412845; *tub2* = MT413057 (alternative markers: ITS = MT359775; LSU = MT359535).
Notes: *Calonectria parvispora* is closely related to *Ca. brachiatica*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. parvispora* [(av. 29 × 4 µm); Marin-Felix *et al.* 2017] are smaller than those of *Ca. brachiatica* [(av. 44 × 5 µm); Lombard *et al.* 2009] (Supplementary Table S4).

pauciphialidica Calonectria Q.L. Liu & S.F. Chen, ***sp. nov.*** MycoBank MB835284. Fig. 3.

In: *Calonectria brassicae* species complex.

Etymology: Name refers to the macroconidiophores that produce few phialides.

Sexual morph unknown. *Macroconidiophores* consisting of a stipe bearing a penicillate arrangement of fertile branches, stipe extension and vesicle not observed; stipe septate, hyaline, smooth, 40–80 × 3–4 µm; Conidiogenous apparatus 8.6–20 µm wide, and 14.3–25 µm long; primary branches aseptate, 11–18 × 2–3 µm, each terminal produces two to four phialides, phialides doliiform to reniform, hyaline, aseptate, 6–9 × 2–3 µm, apex with minute periclinal thickening and inconspicuous collarette. *Macroconidia* cylindrical, rounded at both ends, straight, (25–)27–32(–36) × (2–)2.5–3.5(–4) µm, (av. 29.5 × 3 µm), 1-septate, lacking a visible abscission scar, held in parallel

cylindrical clusters by colourless slime. Mega- and microconidia not observed.

Culture characteristics: Colonies white on the surface and buff in reverse after 7 d at 25 °C on MEA; abundant wooly aerial mycelium with moderate sporulation on the medium surface; chlamydospores not observed. Optimal growth temperature 25 °C, no growth at 5 °C and 35 °C, after 7 d, colonies at 10 °C, 15 °C, 20 °C, 25 °C and 30 °C reached 15.1 mm, 21.4 mm, 45.1 mm, 58.2 mm and 42.1 mm, respectively.

Typus: **Ecuador**, soil, 20 Jun. 1997, M.J. Wingfield (**holotype** HMAS 255717, ex-type culture CBS 111394 = CMW 30980 = CPC 1628).

Barcodes: *act* = MT335083; *cmdA* = MT335315; *his3* = MT335555; *rpb2* = MT412608; *tef1* = MT412846; *tub2* = MT413058 (alternative markers: ITS = MT359776; LSU = MT359536).

Notes: *Calonectria pauciphialidica* is a novel species in the *Ca. brassicae* species complex, closely related to *Ca. ecuadorae* (Fig. 1, Supplementary Table S4). The sequences of *cmdA*, *his3*, *rpb2*, *tef1* and *tub2* gene regions can differentiate *Ca. pauciphialidica* from that species. The smaller number of branches and phialides of *Ca. pauciphialidica* distinguish it from *Ca. ecuadorae*; in addition, macroconidia of *Ca. pauciphialidica* (av. 29.5 × 3 µm) are smaller than those of *Ca. ecuadorae* [(av. 51 × 4.5 µm); Crous *et al.* 2006] (Supplementary Table S4).

pauciramosa Calonectria C.L. Schoch & Crous, Mycologia 91: 289. 1999.
Synonyms: *Cylindrocladium pauciramosum* C.L. Schoch & Crous, Mycologia 91: 289. 1999.
Calonectria polizzii L. Lombard *et al.*, Stud. Mycol. 66: 25. 2010.
Calonectria zuluensis L. Lombard & Crous, Stud. Mycol. 66: 25. 2010.
Calonectria mossambicensis S. Maússe-Sitoe *et al.*, Persoonia 31: 291. 2013.
Calonectria seminaria L. Lombard *et al.*, Stud. Mycol. 80: 179. 2015.
Calonectria tetraramosa L. Lombard *et al.*, Stud. Mycol. 80: 183. 2015.
Calonectria cliffordiicola L. Lombard & Crous, Stud. Mycol. 85: 177. 2016.
Calonectria ericae L. Lombard & Crous, Stud. Mycol. 85: 178. 2016.
Calonectria machaerinae L. Lombard & Crous, Stud. Mycol. 85: 181. 2016.

In: *Calonectria candelabrum* species complex.

Typus: PREM 55754 [holotype of *Ca. pauciramosa*; Schoch *et al.* 1999], PREM 55752 (holotype of *Cy. pauciramosum*; Schoch *et al.* 1999).
Ex-type culture: CBS 138824 = CMW 5683 = CPC 971 (Crous 2002, Lombard *et al.* 2010a).
Type locality: **South Africa**, Knysna.
Type substrate: Soil/*Eucalyptus grandis* (Crous 2002, Lombard *et al.* 2015a)
Barcodes: *act* = MT335093; *cmdA* = MT335325; *his3* = MT335565; *rpb2* = MT412618; *tef1* = MT412856; *tub2* = MT413068 (alternative markers: ITS = MT359786; LSU = MT359546).

Notes: *Calonectria pauciramosa* is closely related to *Ca. nemoricola* and *Ca. silvicola*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. pauciramosa* [(av. 50 × 4.5 µm); Crous 2002] are longer than those of *Ca. nemoricola* [(av. 45 × 4 µm); Alfenas *et al.* 2015] and *Ca. silvicola* [(av. 41 × 4.5 µm); Alfenas *et al.* 2015] (Supplementary Table S4). *Calonectria pauciramosa* is heterothallic (Crous 2002, Li *et al.* 2020). *Calonectria pauciramosa* is an important plant pathogen that has been reported as the dominant species in many countries such as Australia, Brazil, Italy, South Africa and the USA (Koike *et al.* 1999, Polizzi & Crous 1999, Schoch *et al.* 1999, Crous 2002), while Lombard *et al.* (2010c) and Chen *et al.* (2011) also confirmed its occurrence in China. In this study, the eight species reduced to synonymy with *Ca. pauciramosa* were originally collected in different climatic zones on five continents (Africa, Asia, Europe, North America and Oceania), supporting the view that *Ca. pauciramosa* is a cosmopolitan species with the ability to exist in areas with a range of climatic conditions.

penicilloides Calonectria (Tubaki) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Candelospora penicilloides* Tubaki, Nogaoa 2: 58. 1952.
Synonym: *Cylindrocladium penicilloides* (Tubaki) Tubaki, J. Hattori Bot. Lab. 20: 154. 1958.

In: *Calonectria kyotensis* species complex.

Typus: type specimen lost (Tubaki 1958).
Ex-type culture: CBS 174.55 = CMW 23696 = STE-U 2388.
Type locality: **Japan**, Hatizyo Island.
Type substrate: *Prunus* sp.
Barcodes: *act* = MT335106; *cmdA* = MT335338; *his3* = MT335578; *rpb2* = MT412631; *tef1* = MT412869; *tub2* = MT413081 (alternative markers: ITS = MT359799; LSU = MT359559).
Notes: Phylogenetically, *Ca. penicilloides* forms a distinct lineage separate from other species in this species complex.

pentaseptata Calonectria L. Lombard *et al.*, Persoonia 29: 157. 2012.
(see ***Calonectria pseudoreteaudii***)

In: *Calonectria reteaudii* species complex.

Typus: CBS H-21062 holotype.
Ex-type culture: CBS 133349 = CMW 51318.
Type locality: **Vietnam**, Bavi, Hanoi.
Type substrate: *Eucalyptus* hybrid.
Barcodes: *act* = MT335117; *cmdA* = MT335352; *his3* = MT335592; *rpb2* = MT412645; *tef1* = MT412883; *tub2* = MT413094 (alternative markers: ITS = MT359813; LSU = MT359573).
Notes: *Calonectria pentaseptata* was treated as a synonym of *Ca. pseudoreteaudii* in this study. In comparison of DNA sequences, all eight gene sequences for the isolates of *Ca. pentaseptata* (ex-type CBS 133349, and CBS 133351) were 100 % identical to the isolates of *Ca. pseudoreteaudii* (ex-type CMW 25310, and CMW 25292). Both species produce narrowly clavate vesicles with similar dimensions (*Ca. pentaseptata*: 2–6 µm; *Ca. pseudoreteaudii*: 3–5 µm) and multiple-septate (> 3) macroconidia. The macroconidia of *Ca. pentaseptata* (av.

98 × 7 µm) are smaller than those of *Ca. pseudoreteaudii* (av. 104 × 8 µm) (Lombard *et al.* 2010c, Crous *et al.* 2012), which was considered to represent intraspecific variation (Supplementary Table S4).

piauiensis Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 112. 2015.

In: *Calonectria candelabrum* species complex.

Typus: CBS H-21375 holotype.
Ex-type culture: CBS 134850 = LPF377.
Type locality: **Brazil**, Piauí state, Teresina.
Type substrate: Soil in *Eucalyptus brassiana* plantation.
Barcodes: *cmdA* = KM396060; *his3* = KM396143; *tef1* = KM395886; *tub2* = KM395973.
Notes: Phylogenetically, *Ca. piauiensis* forms a distinct lineage separate from other species in this species complex.

pini Calonectria L. Lombard *et al.*, Stud. Mycol. 66: 52. 2010.

In: *Calonectria brassicae* species complex.

Typus: PREM 60304 holotype.
Ex-type culture: CBS 123698 = CMW 31209.
Type locality: **Colombia**, Valle del Cauca, Buga.
Type substrate: *Pinus patula*.
Barcodes: *act* = MT335107; *cmdA* = MT335339; *his3* = MT335579; *rpb2* = MT412632; *tef1* = MT412870; *tub2* = MT413082 (alternative markers: ITS = MT359800; LSU = MT359560).
Notes: *Calonectria pini* is closely related to *Ca. orientalis*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. pini* [(av. 44 × 5 µm); Lombard *et al.* 2010a] are shorter than those of *Ca. orientalis* [(av. 48 × 4 µm); Lombard *et al.* 2010a] (Supplementary Table S4). Furthermore, the small number of branches (−3) in the conidiogenous apparatus also distinguishes it from *Ca. orientalis* (−5) (Lombard *et al.* 2010a).

plurilateralis Calonectria L. Lombard & Crous, Stud. Mycol. 85: 184. 2016.

In: *Calonectria cylindrospora* species complex.

Typus: CBS H-22766 holotype.
Ex-type culture: CBS 111401 = CMW 51178 = CPC 1637.
Type locality: **Ecuador**.
Type substrate: Soil.
Barcodes: *cmdA* = MT335340; *his3* = MT335580; *rpb2* = MT412633; *tef1* = MT412871; *tub2* = MT413083 (alternative markers: ITS = MT359801; LSU = MT359561).
Notes: *Calonectria plurilateralis* is phylogenetically closely related to *Ca. brasiliensis*, *Ca. hawksworthii* and *Ca. maranhensis*, and can be distinguished from these species by the dimensions of its macroconidia. The macroconidia of *Ca. plurilateralis* [(av. 34 × 4 µm); Lombard *et al.* 2016] are shorter than those of *Ca. brasiliensis* [(av. 38 × 3.5 µm); Batista 1951], *Ca. hawksworthii* [(av. 56 × 4 µm); Lombard *et al.* 2010a] and *Ca. maranhensis* [(av. 57 × 5 µm); Alfenas *et al.* 2015] (Supplementary Table S4).

pluriramosa Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 178. 2015.
(see ***Calonectria aconidialis***)

In: *Calonectria kyotensis* species complex.

Typus: CBS H-21485 holotype.
Ex-type culture: CBS 136976 = CMW 31440 = CERC 1775.
Type locality: **China**, GuangXi Province.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT334950; *cmdA* = MT335177; *his3* = MT335416; *tef1* = MT412707 (alternative markers: ITS = MT359637; LSU = MT359397).
Notes: *Calonectria pluriramosa* was treated as a synonym of *Ca. aconidialis* in this study. In comparisons of DNA sequences for six available gene regions (*rpb2* and *tub2* are not available for *Ca. pluriramosa*, *tub2* not available for *Ca. aconidialis*), all six gene sequences for the ex-type isolates of *Ca. pluriramosa* were 100 % identical to the ex-type isolate of *Ca. aconidialis* (CMW 35174). No sexual morph has been observed for *Ca. pluriramosa* (Lombard *et al.* 2015a, Supplementary Table S4).

polizzii Calonectria L. Lombard *et al.*, Stud. Mycol. 66: 25. 2010.
(see ***Calonectria pauciramosa***)

In: *Calonectria candelabrum* species complex.

Typus: PREM 60297 holotype.
Ex-type culture: CBS 123402 = CMW 30872.
Type locality: **Italy**, Sicily, Carrubba.
Type substrate: *Arbutus unedo*.
Barcodes: *act* = MT335099; *cmdA* = MT335331; *his3* = MT335571; *rpb2* = MT412624; *tef1* = MT412862; *tub2* = MT413074 (alternative markers: ITS = MT359792; LSU = MT359552).
Notes: *Calonectria polizzii* was treated as a synonym of *Ca. pauciramosa* in this study. In comparisons of DNA sequences for eight gene regions, the only differences between the ex-type isolate of *Ca. polizzii* (CBS 123402) and the ex-type isolate of *Ca. pauciramosa* (CBS 138824) were five base differences in the *tub2* sequence. Both species are heterothallic and produce obpyriform to ellipsoidal vesicles with overlapping dimensions (*Ca. polizzii*: 6–9 µm; *Ca. pauciramosa*: 5–11 µm) and 1-septate macroconidia. The macroconidia of *Ca. polizzii* (av. 37 × 4 µm) are shorter than those of *Ca. pauciramosa* (av. 50 × 4.5 µm) (Crous 2002, Lombard *et al.* 2010b, Li *et al.* 2020), which was considered to represent intraspecific variation (Supplementary Table S4).

propaginicola Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 115. 2015.
Synonym: *Calonectria pseudocerciana* R.F. Alfenas *et al.*, Stud. Mycol. 80: 117. 2015.

In: *Calonectria cylindrospora* species complex.

Typus: CBS H-21366 holotype.
Ex-type culture: CBS 134815 = LPF220.
Type locality: **Brazil**, Pará state, Santana.
Type substrate: *Eucalyptus* seedling.
Barcodes: *cmdA* = KM396040; *his3* = KM396123; *tef1* = KM395866; *tub2* = KM395953.
Notes: *Calonectria propaginicola* is closely related to *Ca. cerciana* and *Ca. tonkinensis*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. propaginicola* [(av. 49 × 4 µm); Alfenas *et al.* 2015] are longer than those of *Ca. cerciana* [(av. 44 × 5 µm);

Lombard *et al.* 2010c] and *Ca. tonkinensis* [(av. 41.5 × 4 µm); Pham *et al.* 2019] (Supplementary Table S4).

pseudobrassicae Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 116. 2015.

In: *Calonectria brassicae* species complex.

Typus: CBS H-21371 holotype.
Ex-type culture: CBS 134662 = LPF280.
Type locality: **Brazil**, Pará state, Santana.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *cmdA* = KM396023; *his3* = KM396106; *tef1* = KM395849; *tub2* = KM395936.
Notes: *Calonectria pseudobrassicae* is closely related to *Ca. orientalis*, *Ca. paraensis* and *Ca. pini.* The macroconidia of *Ca. pseudobrassicae* [(av. 41 × 5 µm); Alfenas *et al.* 2015] are shorter than those of *Ca. orientalis* [(av. 48 × 4 µm); Lombard *et al.* 2010a] and *Ca. pini* [(av. 44 × 5 µm); Lombard *et al.* 2010a]. *Calonectria pseudobrassicae* has three tiers of branches in its conidiogenous apparatus in comparison to the two in *Ca. paraensis* (Alfenas *et al.* 2015) (Supplementary Table S4).

pseudocerciana Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 117. 2015.
(see ***Calonectria propaginicola***)

In: *Calonectria cylindrospora* species complex.

Typus: CBS H-21366 holotype.
Ex-type culture: CBS 134824 = LPF367.
Type locality: **Brazil**, Pará state, Santana.
Type substrate: *Eucalyptus* seedling.
Barcodes: *cmdA* = KM396049; *his3* = KM396132; *tef1* = KM395875; *tub2* = KM395962.
Notes: *Calonectria pseudocerciana* was treated as a synonym of *Ca. propaginicola* in this study. In comparisons of DNA sequences for four available gene regions, the only differences between the ex-type isolate of *Ca. pseudocerciana* (CBS 134824) and the ex-type isolate of *Ca. propaginicola* (CBS 134815) was in the *cmdA*, *his3* and *tub2* sequences, where there were eight base differences in the *cmdA*, one base difference in the *his3* and one base difference in the *tub2* sequences. Both species produce obpyriform to sphaeropedunculate vesicles with similar dimensions (*Ca. pseudocerciana*: 7–12 µm; *Ca. propaginicola*: 5–12 µm) and 1-septate macroconidia, the macroconidia of *Ca. pseudocerciana* (av. 45 × 4 µm) are shorter than those of *Ca. propaginicola* (av. 49 × 4 µm) (Alfenas *et al.* 2015), which was considered to represent intraspecific variation (Supplementary Table S4).

pseudocolhounii Calonectria S.F. Chen *et al.*, Persoonia 26: 7. 2011.
(see ***Calonectria eucalypti***)

In: *Calonectria colhounii* species complex.

Typus: PREM 60456 holotype.
Ex-type culture: CBS 127195 = CMW 27209.
Type locality: **China**, FuJian Province.
Type substrate: *Eucalyptus dunnii*.
Barcodes: *act* = MT335108; *cmdA* = MT335341; *his3* = MT335581; *rpb2* = MT412634; *tef1* = MT412872; *tub2* = MT413084 (alternative markers: ITS = MT359802; LSU = MT359562).
Notes: *Calonectria pseudocolhounii* was treated as a synonym of *Ca. eucalypti* in this study. In comparisons of DNA sequences for eight gene regions, the only difference between the ex-type isolate of *Ca. pseudocolhounii* (CMW 27209) and the ex-type isolate of *Ca. eucalypti* (CMW 18444) was in the *his3*, ITS and *tub2* sequences, where there were three base differences in the *his3*, one base difference in the ITS and four base differences in the *tub2* sequences. Both species are homothallic and produce clavate vesicles with similar dimensions (*Ca. pseudocolhounii*: 3.5–6 µm; *Ca. eucalypti*: 4–6 µm) and 3-septate macroconidia (Lombard *et al.* 2010a, Chen *et al.* 2011, Li *et al.* 2020). The macroconidia of *Ca. pseudocolhounii* (av. 60 × 4.5 µm) are smaller than those of *Ca. eucalypti* (av. 72 × 6 µm) (Lombard *et al.* 2010a, Chen *et al.* 2011), which was considered to represent intraspecific variation (Supplementary Table S4).

pseudoecuadoriae Calonectria L. Lombard & Crous, Stud. Mycol. 85: 185. 2016.

In: *Calonectria brassicae* species complex.

Typus: CBS H-22768 holotype.
Ex-type culture: CBS 111402 = CMW 51179 = CPC 1639.
Type locality: **Ecuador**.
Type substrate: Soil.
Barcodes: *cmdA* = KX784589; *rpb2* = KY653432; *tef1* = KX784723; *tub2* = KX784652 (alternative markers: ITS = KY653273; LSU = KY653329).
Notes: *Calonectria pseudoecuadoriae* forms a single lineage closely related to *Ca. robigophila*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. pseudoecuadoriae* [(av. 38 × 3.5µm); Lombard *et al.* 2016] are smaller than those of *Ca. robigophila* [(av. 50 × 4 µm); Alfenas *et al.* 2015] (Supplementary Table S4).

pseudohodgesii Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 118. 2015.
(see ***Calonectria brasiliensis***)

In: *Calonectria cylindrospora* species complex.

Typus: CBS H-21368 holotype.
Ex-type culture: CBS 134818 = LPF262.
Type locality: **Brazil**, Minas Gerais state, Viçosa.
Type substrate: Leaf of rooted *Azadirachta indica* cutting.
Barcodes: *cmdA* = KM395991; *his3* = KM396079; *tef1* = KM395817; *tub2* = KM395905.
Notes: *Calonectria pseudohodgesii* was treated as a synonym of *Ca. brasiliensis* in this study. In comparisons of DNA sequences for four available gene regions, the only difference between the ex-type isolate of *Ca. pseudohodgesii* (CBS 134818) and the ex-type isolate of *Ca. brasiliensis* (CBS 230.51) was in the *cmdA*, *his3*, *tef1* and *tub2* sequences, where there were three base differences in the *cmdA*, two base differences in the *his3*, two base differences in the *tef1* and one base difference in the *tub2* sequences. Both species produce ellipsoidal to obpyriform vesicles of similar dimensions (*Ca. pseudohodgesii*: 4–10 µm; *Ca. brasiliensis*: 7–11 µm) and 1-septate macroconidia, the macroconidia of *Ca. pseudohodgesii* (av. 54 × 4.5 µm) are larger than those of *Ca. brasiliensis* (av. 38 × 3.5 µm) (Batista 1951, Lombard *et al.* 2010b, Alfenas *et al.* 2015), which was

considered to represent intraspecific variation (Supplementary Table S4).

pseudokyotensis Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 178. 2015.
(see ***Calonectria aconidialis***)

In: *Calonectria kyotensis* species complex.

Typus: CBS H-21774 holotype.
Ex-type culture: CBS 137332 = CMW 31439 = CERC 1774.
Type locality: **China**, GuangXi Province.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT334951; *cmdA* = MT335178; *his3* = MT335417; *tef1* = MT412708 (alternative markers: ITS = MT359638; LSU = MT359398).
Notes: *Calonectria pseudokyotensis* was treated as a synonym of *Ca. aconidialis* in this study. In comparisons of DNA sequences for six available gene regions (*rpb2* and *tub2* are not available for *Ca. pseudokyotensis*, *tub2* not available for *Ca. aconidialis*), all six gene sequences for the ex-type isolate of *Ca. pseudokyotensis* (CMW 31439) were 100 % identical to the ex-type isolate of *Ca. aconidialis* (CMW 35174). No sexual morph was observed for *Ca. pseudokyotensis* (Lombard *et al.* 2015a, Supplementary Table S4).

pseudometrosideri Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 118. 2015.

In: *Calonectria candelabrum* species complex.

Typus: CBS 134845 (preserved as metabolically inactive culture, Alfenas *et al.* 2015).
Ex-type culture: CBS 134845 = LPF210.
Type locality: **Brazil**, Alagoas state, Maceió.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *cmdA* = KM395995; *his3* = KM396083; *tef1* = KM395821; *tub2* = KM395909.
Notes: *Calonectria pseudometrosideri* is closely related to *Ca. putriramosa*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. pseudometrosideri* (av. 51 × 4.5 µm) are longer than those of *Ca. putriramosa* (av. 43 × 5 µm), while the vesicles of *Ca. pseudometrosideri* (5–7 µm) are narrower than those of *Ca. putriramosa* (7–10 µm) (Alfenas *et al.* 2015, Lombard *et al.* 2016) (Supplementary Table S4).

pseudomexicana Calonectria L. Lombard *et al.*, Persoonia 27: 76. 2011.
Synonym: *Calonectria tunisiana* L. Lombard *et al.*, Persoonia 27: 77. 2011.

In: *Calonectria mexicana* species complex.

Typus: CBS H-20685 holotype.
Ex-type culture: CBS 130354 = CMW 51313 = DISTEF-TCROU1.
Type locality: **Tunisia**, Carthage, Tunis.
Type substrate: *Callistemon* sp.
Barcodes: *act* = MT335110; *cmdA* = MT335343; *his3* = MT335583; *rpb2* = MT412636; *tef1* = MT412874; *tub2* = MT413086 (alternative markers: ITS = MT359804; LSU = MT359564).
Notes: *Calonectria pseudomexicana* is closely related to *Ca. pseudouxmalensis* and *Ca. uxmalensis*, and can be distinguished from these two species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. pseudomexicana* (av. 45 × 5 µm) are larger than those of *Ca. pseudouxmalensis* (av. 29 × 3 µm) and *Ca. uxmalensis* (av. 30 × 3 µm), and vesicles of *Ca. pseudomexicana* (9–14 µm) are wider than those of *Ca. pseudouxmalensis* (5–9 µm) and *Ca. uxmalensis* (5–8 µm) (Lombard *et al.* 2011, 2016) (Supplementary Table S4).

pseudonaviculata Calonectria (Crous *et al.*) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010.
Basionym: *Cylindrocladium pseudonaviculatum* Crous *et al.*, Sydowia 54: 26. 2002.
Synonym: *Cylindrocladium buxicola* Henricot, Mycologia 94: 993. 2002.

In: *Calonectria naviculata* species complex.

Typus: PREM 57313 holotype.
Ex-type culture: CBS 116251 = CMW 51235 = CPC 3399 = Lynfield 824.
Type locality: **New Zealand**.
Type substrate: *Buxus sempervirens.*
Barcodes: *cmdA* = MT335345; *his3* = MT335585; *rpb2* = MT412638; *tef1* = MT412876; *tub2* = MT413088 (alternative markers: ITS = MT359806; LSU = MT359566).
Notes: *Calonectria pseudonaviculata* is closely related to *Ca. henricotiae*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. pseudonaviculata* [(av. 60 × 5 µm); Crous *et al.* 2002] are longer than those of *Ca. henricotiae* [(av. 56 × 5.6 µm); Gehesquiere *et al.* 2015]. *Calonectria pseudonaviculata* is heterothallic (Li *et al.* 2020) (Supplementary Table S4).

pseudopteridis Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 118. 2015.
Basionym: *Cylindrocladium macrosporum* Sherb., Phytopathology 18: 219. 1928.

In: *Calonectria pteridis* species complex.

Typus: BPI 414558 holotype.
Ex-type culture: CBS 163.28 = CMW 51159 = IMI 299579.
Type locality: **USA**.
Type substrate: *Washingtonia robusta*.
Barcodes: *act* = MT335112; *cmdA* = MT335347; *his3* = MT335587; *rpb2* = MT412640; *tef1* = MT412878; (alternative markers: ITS = MT359808; LSU = MT359568).
Notes: *Calonectria pseudopteridis* is closely related to *Ca. pteridis*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. pseudopteridis* [(av. 87.5 × 5.7 µm) are longer than those of *Ca. pteridis* [(av. 82 × 5.5 µm); Sobers 1968, Crous *et al.* 1993c, Alfenas *et al.* 2015] (Supplementary Table S4).

pseudoreteaudii Calonectria L. Lombard *et al.*, Persoonia 24: 8. 2010.
Synonyms: *Calonectria pentaseptata* L. Lombard *et al.*, Persoonia 29: 157. 2012.
Calonectria microconidialis L. Lombard *et al.*, Stud. Mycol. 80: 175. 2015.

In: *Calonectria reteaudii* species complex.

Typus: PREM 60290 holotype.
Ex-type culture: CBS 123694 = CMW 25310.
Type locality: **China**, GuangDong.

Type substrate: *Eucalyptus urophylla* × *E. grandis* hybrid cutting.
Barcodes: *act* = MT335119; *cmdA* = MT335354; *his3* = MT335594; *rpb2* = MT412647; *tef1* = MT412885; *tub2* = MT413096 (alternative markers: ITS = MT359815; LSU = MT359575).
Notes: *Calonectria pseudoreteaudii* is phylogenetically closely related to *Ca. acaciicola* and *Ca. reteaudii*. The sequences of *his3*, ITS, *rpb2*, *tef1* and *tub2* gene regions can differentiate *Ca. pseudoreteaudii* from these two species. The macroconidia of *Ca. pseudoreteaudii* [(av. 104 × 8 µm); Lombard *et al.* 2010c] are larger than those of *Ca. acaciicola* [(av. 94 × 7 µm); Pham *et al.* 2019] and *Ca. reteaudii* [(av. 84 × 6.5 µm); Kang *et al.* 2001a]. *Calonectria pseudoreteaudii* is heterothallic (Li *et al.* 2020) (Supplementary Table S4).

pseudoscoparia Calonectria L. Lombard *et al.*, Stud. Mycol. 66: 53. 2010.
(see ***Calonectria candelabrum***)

In: *Calonectria candelabrum* species complex.

Typus: PREM 60305 holotype.
Ex-type culture: CBS 125257 = CMW 15218.
Type locality: **Ecuador**, Pichincha Province, Las Golondrinas.
Type substrate: *Eucalyptus grandis* cutting.
Barcodes: *act* = MT334979; *cmdA* = MT335209; *his3* = MT335449; *rpb2* = MT412513; *tef1* = MT412740; *tub2* = MT412961 (alternative markers: ITS = MT359670; LSU = MT359430).
Notes: *Calonectria pseudoscoparia* was treated as a synonym of *Ca. candelabrum* in this study. In comparisons of DNA sequences for eight gene regions, only one base difference in the *tub2* gene sequences was found between the ex-type isolate of *Ca. pseudoscoparia* (CMW 15218) and the isolates of *Ca. candelabrum* (CMW 31000, and CMW 31001). Both species produce ellipsoidal to obpyriform vesicles with overlapping dimensions (*Ca. pseudoscoparia*: 6–10 µm; *Ca. candelabrum*: 5–8 µm) and 1-septate macroconidia. The macroconidia of *Ca. pseudoscoparia* (av. 48 × 4 µm) are smaller than those of *Ca. candelabrum* (av. 60 × 4.5 µm) (Viégas 1946, Crous 2002, Lombard *et al.* 2010a, 2015b), which was considered to represent intraspecific variation (Supplementary Table S4).

pseudospathiphylli Calonectria J.C. Kang *et al.*, Syst. Appl. Microbiol. 24: 215. 2001.
Synonym: *Cylindrocladium pseudospathiphylli* J.C. Kang *et al.*, Syst. Appl. Microbiol. 24: 215. 2001.

In: *Calonectria spathiphylli* species complex.

Typus: PREM 57196 (holotype of *Ca. pseudospathiphylli*; Kang *et al.* 2001b), PREM 57197 (holotype of *Cy. pseudospathiphylli*; Kang *et al.* 2001b).
Ex-type culture: CBS 109165 = CMW 30976 = CPC 1623 (Alfenas *et al.* 2015, Lombard *et al.* 2016).
Type locality: **Ecuador**.
Type substrate: Soil.
Barcodes: *act* = GQ280493; *cmdA* = GQ267412; *his3* = AF348241; *rpb2* = KY653435; *tef1* = FJ918562; *tub2* = FJ918513 (alternative markers: ITS = GQ280615; LSU = GQ280737).
Notes: *Calonectria pseudospathiphylli* forms a single lineage closely related to *Ca. densa*, *Ca. humicola* and *Ca. spathiphylli*. No lateral stipe extension was observed in *Ca. pseudospathiphylli*, whereas these are common in *Ca. densa*. *Calonectria pseudospathiphylli* produce stipe extensions (up to 250 µm) longer than those of *Ca. humicola* (up to 157 µm). The macroconidia of *Ca. pseudospathiphylli* (av. 52 × 4 µm) obviously smaller than those of *Ca. spathiphylli* (av. 70 × 6µm) (El-Gholl *et al.* 1992, Kang *et al.* 2001b, Lombard *et al.* 2010a). *Calonectria pseudospathiphylli* is characterised as being homothallic, while *Ca. spathiphylli* is heterothallic (El-Gholl *et al.* 1992, Kang *et al.* 2001b) (Supplementary Table S4).

pseudospathulata Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 118. 2015.

In: *Calonectria candelabrum* species complex.

Typus: CBS H-21356 holotype.
Ex-type culture: CBS 134841 = LPF072.
Type locality: **Brazil**, Minas Gerais state, Araponga.
Type substrate: Soil in tropical rainforest.
Barcodes: *cmdA* = KM396070; *his3* = KM396153; *tef1* = KM395896; *tub2* = KM395983.
Notes: *Calonectria pseudospathulata* is closely related to *Ca. fragariae*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. pseudospathulata* [(av. 43 × 4 µm); Alfenas *et al.* 2015] are longer than those of *Ca. fragariae* [(av. 39 × 4 µm); Lopes *et al.* 2017] (Supplementary Table S4).

pseudoturangicola Calonectria J.Q. Li *et al.*, IMA Fungus 8: 279. 2017.
(see ***Calonectria kyotensis***)

In: *Calonectria kyotensis* species complex.

Typus: PREM 61948 holotype.
Ex-type culture: CBS 142890 = CMW 47496 = CERC 7126.
Type locality: **China**, FuJian Province, FuZhou City.
Type substrate: Soil.
Barcodes: *act* = MT335121; *cmdA* = MT335356; *his3* = MT335596; rpb2 = MT412649; *tef1* = MT412887; *tub2* = MT413098 (alternative markers: ITS = MT359817; LSU = MT359577).
Notes: *Calonectria pseudoturangicola* was treated as a synonym of *Ca. kyotensis* in this study. In comparisons of DNA sequences for eight gene regions, the only difference between the ex-type isolate of *Ca. pseudoturangicola* (CERC 7126) and the ex-type isolate of *Ca. kyotensis* (CBS 114525) was in the *cmdA*, ITS, LSU and *tub2* sequences, where there was one base difference in the *cmdA*, one base difference in the ITS, one base difference in the LSU and three base differences in the *tub2* sequences. Both species are homothallic and produce sphaeropedunculate (globose) vesicles and 1-septate macroconidia of similar dimensions (*Ca. pseudoturangicola*: av. 40 × 3.5 µm, *Ca. kyotensis*: av. 41 × 4 µm) (Terashita 1968, Li *et al.* 2017, 2020; Supplementary Table S4).

pseudovata Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 120. 2015.

In: *Calonectria pteridis* species complex.

Typus: CBS H-21370 holotype.
Ex-type culture: CBS 134674 = LPF267.
Type locality: **Brazil**, Pará state, Santana.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *cmdA* = KM396032; *his3* = KM396115; *tef1* = KM395858; *tub2* = KM395945.

Notes: *Calonectria pseudovata* is phylogenetically closely related to *Ca. ovata* and *Ca. terricola*. Morphologically, *Ca. pseudovata* shows some overlap with *Ca. ovata*, while the sequences of *cmdA*, *his3*, *tef1* and *tub2* gene regions can differentiate *Ca. pseudovata* from *Ca. ovata*. The macroconidia of *Ca. pseudovata* [(av. 69 × 5 µm); Alfenas *et al.* 2015] are larger than those of *Ca. terricola* [(av. 46 × 4.5 µm); Lombard *et al.* 2016]. Furthermore, the ability of *Ca. pseudovata* and *Ca. ovata* to produce miconidiophores and microconidia in culture distinguishes it from *Ca. terricola*.

pseudouxmalensis Calonectria L. Lombard & Crous, Stud. Mycol. 85: 187. 2016.

In: *Calonectria mexicana* species complex.

Typus: CBS H-22769 holotype.
Ex-type culture: CBS 110924 = CMW 51166 = CPC 942.
Type locality: **Mexico**.
Type substrate: Soil.
Barcodes: *act* = MT335123; *cmdA* = MT335358; *his3* = MT335598; *rpb2* = MT412651; *tef1* = MT412889; *tub2* = MT413100 (alternative markers: ITS = MT359819; LSU = MT359579).
Notes: *Calonectria pseudouxmalensis* is closely related to *Ca. uxmalensis*, the sequences of *cmdA*, *his3*, *tef1* and *tub2* gene regions can distinguish *Ca. pseudouxmalensis* from *Ca. uxmalensis*. Morphologically, these two species are similar to each other. However, no lateral stipe extensions were observed in *Ca. pseudouxmalensis*, a feature that has been reported in *Ca. uxmalensis* (Lombard *et al.* 2016) (Supplementary Table S4).

pseudoyunnanensis Calonectria J.Q. Li *et al.*, IMA Fungus 8: 279. 2017.
(see ***Calonectria yunnanensis***)

In: *Calonectria kyotensis* species complex.

Typus: PREM 61950 holotype.
Ex-type culture: CBS 142892 = CMW 47655 = CERC 5376.
Type locality: **China**, YunNan, PuEr Region.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT335126; *cmdA* = MT335361; *his3* = MT335601; *rpb2* = MT412654; *tef1* = MT412892; *tub2* = MT413103 (alternative markers: ITS = MT359822; LSU = MT359582).
Notes: *Calonectria pseudoyunnanensis* was treated as a synonym of *Ca. yunnanensis* in this study. In comparisons of DNA sequences for eight gene regions, the only difference between the ex-type isolate of *Ca. pseudoyunnanensis* (CERC 5376) and the ex-type isolate of *Ca. yunnanensis* (CERC 5339) was in the *his3* and *tub2* sequences, where there were three base differences in the *his3* and four base differences in the *tub2* sequences. Both species are homothallic and produce sphaeropedunculate vesicles and 1-septate macroconidia (Li *et al.* 2017, 2020), and share vesicles of similar dimensions (*Ca. pseudoyunnanensis*: 2.5–5 µm; *Ca. yunnanensis*: 2–4.5 µm). The macroconidia of *Ca. pseudoyunnanensis* [(av. 47.5 × 5 µm); Li *et al.* 2017] are larger than those of *Ca. yunnanensis* [(av. 43 × 4.5 µm); Li *et al.* 2017] which was considered to represent intraspecific variation (Supplementary Table S4).

pteridis Calonectria Crous *et al.*, Mycotaxon 46: 228. 1993.

Synonym: *Cylindrocladium pteridis* F.A. Wolf, J. Elisha Mitchell Sci. Soc. 42: 59. 1926.

In: *Calonectria pteridis* species complex.

Typus: PREM 51033 (holotype of *Ca. pteridis*; Crous *et al.* 1993c), BPI 414564 (holotype of *Cy. pteridis*; Wolf 1926).
Ex-type culture: CBS 111793 = CMW 16736 = CPC 2372 = ATCC 34395 (Crous *et al.* 2006).
Type locality: **USA**.
Type substrate: *Arachniodes adiantiformis*.
Barcodes: *act* = GQ280494; *cmdA* = GQ267413; *his3* = DQ190679; *rpb2* = KY653438; *tef1* = FJ918563; *tub2* = DQ190578 (alternative markers: ITS = GQ280616; LSU = GQ280738).
Notes: *Calonectria pteridis* is closely related to *Ca. pseudopteridis*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. pteridis* [(av. 82 × 5.5 µm); Crous *et al.* 1993c] are shorter than those of *Ca. pseudopteridis* [(av. 87.5 × 5.7 µm); Sobers 1968, Alfenas *et al.* 2015]. (Supplementary Table S4).

putriramosa Calonectria L. Lombard & Crous, Stud. Mycol. 85: 188. 2016.

In: *Calonectria candelabrum* species complex.

Typus: CBS H-22770 holotype.
Ex-type culture: CBS 111449 = CMW 51181 = CPC 1951.
Type locality: **Brazil**.
Type substrate: *Eucalyptus* cuttings.
Barcodes: *act* = MT335129; *cmdA* = MT335364; *his3* = MT335604; *rpb2* = MT412657; *tef1* = MT412895; *tub2* = MT413105 (alternative markers: ITS = MT359825; LSU = MT359585).
Notes: *Calonectria putriramosa* is closely related to *Ca. pseudometrosideri*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. putriramosa* (av. 43 × 5 µm) are shorter than those of *Ca. pseudometrosideri* (av. 51 × 4.5 µm), while the vesicles of *Ca. putriramosa* (7–10 µm) are wider than those of *Ca. pseudometrosideri* (5–7 µm) (Alfenas *et al.* 2015, Lombard *et al.* 2016) (Supplementary Table S4).

queenslandica Calonectria L. Lombard *et al.*, Persoonia 24: 8. 2010.
Synonym: *Calonectria terrae-reginae* L. Lombard *et al.*, Persoonia 24: 8. 2010.

In: *Calonectria reteaudii* species complex.

Typus: PREM 60243 holotype.
Ex-type culture: CBS 112146 = CMW 30604 = CPC 3213.
Type locality: **Australia**, Queensland, Lannercost.
Type substrate: *Eucalyptus urophylla*.
Barcodes: *act* = MT335132; *cmdA* = MT335367; *his3* = MT335607; *rpb2* = MT412660; *tef1* = MT412898; *tub2* = MT413108 (alternative markers: ITS = MT359828; LSU = MT359588).
Notes: *Calonectria queenslandica* is phylogenetically closely related to *Ca. lombardiana* (Fig. 1). Sequences of ITS, *tef1* and *tub2* gene regions can differentiate *Ca. queenslandica* from *Ca. lombardiana*. In addition, the macroconidia of *Ca. queenslandica*

[(av. 69 × 6 µm); Lombard *et al.* 2010c] are shorter than those of *Ca. lombardiana* (av. 80 × 6 µm) (Supplementary Table S4).

quinqueramosa Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 123. 2015.

In: *Calonectria brassicae* species complex.

Typus: CBSH-21355 holotype.
Ex-type culture: CBS 134654 = LPF065.
Type locality: **Brazil**, Pará state, Monte Dourado.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *cmdA* = KM396029; *his3* = KM396112; *tef1* = KM395855; *tub2* = KM395942.
Notes: *Calonectria quinqueramosa* is closely related to *Ca. gracilis*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. quinqueramosa* (av. 59 × 5 µm) are larger than those of *Ca. gracilis* (av. 56 × 4.5 µm), while the vesicles of *Ca. quinqueramosa* [(3–5 µm); Alfenas *et al.* 2015] are narrower than those of *Ca. gracilis* [(2–11 µm); Crous *et al.* 1993c]. *Calonectria quinqueramosa* is homothallic (Alfenas *et al.* 2015) (Supplementary Table S4).

reteaudii Calonectria (Bugnic.) C. Booth, Mycol. Pap. 104: 41. 1966.
Basionym: *Neonectria reteaudii* Bugnic., Encycl. Mycol. 11: 189. 1939.
Synonyms: *Cylindrocarpon reteaudii* Bugnic., Encycl. Mycol. 11: 189. 1939.
Cylindrocladium reteaudii (Bugnic.) Boesew., Trans. Brit. Mycol. Soc. 78: 553. 1982.
Cylindrocladium quinqueseptatum Boedijn & Reitsma, Reinwardtia 1: 59. 1950.
Calonectria baviensis N.Q. Pham *et al.*, Mycologia 111: 90. 2019.

In: *Calonectria reteaudii* species complex.

Typus: PREM 57211 (neotype of *Ca. reteaudii*; Crous 2002), PREM 57212 (neotype of *Cy. reteaudii*; Crous 2002).
Ex-type culture: CBS 112144 = CMW 30984 = CPC 3201 (Crous 2002, Crous *et al.* 2006).
Type locality: **Vietnam**, Binh Phuoc, Chon Thanh.
Type substrate: *Eucalyptus camaldulensis.*
Barcodes: *act* = MT335135; *cmdA* = MT335370; *his3* = MT335610; *rpb2* = MT412663; *tef1* = MT412901; *tub2* = MT413111 (alternative markers: ITS = MT359831; LSU = MT359591).
Notes: *Calonectria reteaudii* is phylogenetically closely related to *Ca. acaciicola* and *Ca. pseudoreteaudii*. The sequences of the *his3*, *rpb2*, *tef1* and *tub2* gene regions can differentiate *Ca. reteaudii* from these two species. The macroconidia of *Ca. reteaudii* [(av. 84 × 6.5 µm); Kang *et al.* 2001a] are smaller than those of *Ca. acaciicola* [(av. 94 × 7 µm); Pham *et al.* 2019] and *Ca. pseudoreteaudii* [(av. 104 × 8 µm); Lombard *et al.* 2010c]. *Calonectria reteaudii* is heterothallic (Kang *et al.* 2001a) (Supplementary Table S4).

robigophila Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 123. 2015.

In: *Calonectria brassicae* species complex.

Typus: CBS H-21361 holotype.
Ex-type culture: CBS 134652 = LPF192.
Type locality: **Brazil**, Maranhao state, Açailandia.
Type substrate: *Eucalyptus* sp.
Barcodes: *cmdA* = KM396024; *his3* = KM396107; *tef1* = KM395850; *tub2* = KM395937.
Notes: *Calonectria robigophila* forms a single lineage closely related to *Ca. duoramosa*, and it produce six tiers of branches in its conidiogenous apparatus in comparison to the two in *Ca. duoramosa*. The macroconidia of *Ca. robigophila* [(av. 50 × 4 µm); Alfenas *et al.* 2015] are longer than those of *Ca. duoramosa* [(av. 46 × 4 µm); Alfenas *et al.* 2015] (Supplementary Table S4).

rumohrae Calonectria El-Gholl & Alfenas, Mycotaxon 64: 478. 1997.
Synonym: *Cylindrocladium rumohrae* El-Gholl & Alfenas, Mycotaxon 64: 478. 1997.

In: *Calonectria gracilipes* species complex.

Typus: FLAS F56116a & b (holotypes of *Ca. rumohrae* and *Cy. rumohrae*; El-Gholl *et al.* 1997).
Ex-type culture: CBS 111431 = CMW 23697 = CPC 1716 = UFV 218 (Crous 2002, Crous *et al.* 2006).
Type locality: **Panama**, Volkan.
Type substrate: *Rumohra adiantiformis.*
Barcodes: *act* = MT335137; *cmdA* = MT335372; *his3* = MT335612; *tef1* = MT412903; *tub2* = MT413113 (alternative markers: ITS = MT359833; LSU = MT359593).
Notes: *Calonectria rumohrae* is phylogenetically closely related to *Ca. hurae*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. rumohrae* [(av. 110 × 9 µm); El-Gholl *et al.* 1997] are shorter but wider than those of *Ca. hurae* [(av. 120 × 7.5 µm); Crous 2002]. *Calonectria rumohrae* is homothallic (El-Gholl *et al.* 1997) (Supplementary Table S4).

seminaria Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 179. 2015.
(see ***Calonectria pauciramosa***)

In: *Calonectria candelabrum* species complex.

Typus: CBS H-21475 holotype.
Ex-type culture: CBS 136632 = CMW 31450 = CERC 1785.
Type locality: **China**, GuangDong Province, ZhanJiang.
Type substrate: *Eucalyptus urophylla* × *E. grandis* clone seedling leaf.
Barcodes: *act* = MT335102; *cmdA* = MT335334; *his3* = MT335574; *rpb2* = MT412627; *tef1* = MT412865; *tub2* = MT413077 (alternative markers: ITS = MT359795; LSU = MT359555).
Notes: *Calonectria seminaria* was treated as a synonym of *Ca. pauciramosa* in this study. In comparisons of DNA sequences for eight gene regions, all the sequences of the isolates of *Ca. seminaria* (ex-type CMW 31450, and CMW 31489) were 100 % identical to those of the isolates of *Ca. pauciramosa* (ex-type CBS 138824, CMW 2151, CMW 7592, CMW 9151, CMW 30823, and CMW 30875). Both species produce obpyriform to ellipsoidal vesicles and 1-septate macroconidia, and shared the similar vesicles (*Ca. seminaria*: 6–11 µm; *Ca. pauciramosa*: 5–11 µm) and macroconidial dimensions (*Ca. seminaria*: av. 47 × 5 µm; *Ca. pauciramosa*: av. 50 × 4.5 µm) (Crous 2002, Lombard *et al.* 2015a) (Supplementary Table S4).

silvicola Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 123. 2015.

In: *Calonectria candelabrum* species complex.

Typus: CBS H-21357 holotype.
Ex-type culture: CBS 135237 = LPF081.
Type locality: **Brazil**, Bahia state, Mucuri.
Type substrate: Soil in tropical rainforest.
Barcodes: *cmdA* = KM396065; *his3* = KM396148; *tef1* = KM395891; *tub2* = KM395978.
Notes: *Calonectria silvicola* is closely related to *Ca. nemoricola*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. silvicola* [(av. 41 × 4.5 µm); Alfenas *et al.* 2015] are shorter than those of *Ca. nemoricola* [(av. 45 × 4 µm); Alfenas *et al.* 2015] (Supplementary Table S4).

spathiphylli Calonectria El-Gholl *et al.*, Mycotaxon 45: 296. 1992.
Synonym: *Cylindrocladium spathiphylli* Schoult., *et al.*, Mycotaxon 16: 268. 1982.

In: *Calonectria spathiphylli* species complex.

Typus: FLAS 55655 [holotype of *Ca. spathiphylli*; El-Gholl *et al.* 1992), ATCC 44730 (holotype of *Cy. spathiphylli*; Schoulties *et al.* 1982, Crous 2002).
Ex-type culture: CBS 114540 = CMW 16742 = ATCC 44730 = STE-U 2185 (Crous 2002, Alfenas *et al.* 2015).
Type locality: **USA**, Florida.
Type substrate: *Spathiphyllum* sp.
Barcodes: *cmdA* = MT335374; *his3* = MT335614; *rpb2* = MT412666; *tef1* = MT412905; *tub2* = MT413115 (alternative markers: ITS = MT359835; LSU = MT359595).
Notes: *Calonectria spathiphylli* is closely related to *Ca. densa* and *Ca. humicola*, and can be distinguished from these two species by the dimensions of its macroconidia. Macroconidia of *Ca. spathiphylli* [(av. 70 × 6 µm); El-Gholl *et al.* 1992] are longer than those of *Ca. densa* [(av. 54 × 6 µm); Lombard *et al.* 2010a] and larger than those of *Ca. humicola* [(av. 51 × 5 µm); Lombard *et al.* 2010a]. *Calonectria spathiphylli* is characterised as being heterothallic (El-Gholl *et al.* 1992) (Supplementary Table S4).

spathulata Calonectria El-Gholl *et al.*, Mycotaxon 26: 159. 1986 *emend*. Crous, Mycoscience 42: 55. 2001.
Synonyms: *Cylindrocladium spathulatum* El-Gholl *et al.*, Mycotaxon 26: 159. 1986 *emend*. Crous, Mycoscience 42: 55. 2001. *Calonectria stipitata* L. Lombard & Crous, Stud. Mycol. 85: 188. 2016.

In: *Calonectria candelabrum* species complex.

Typus: FLAS F54257a (holotype of *Ca. spathulata*; Crous & Kang 2001), FLAS F54257b (holotype of *Cy. spathulatum*; Crous & Kang 2001).
Ex-type culture: CBS 555.92 = CMW 16744 (Lombard *et al.* 2010a).
Type locality: **Brazil**.
Type substrate: *Eucalyptus viminalis*.
Barcodes: *act* = MT335139; *cmdA* = MT335376; *his3* = MT335616; *rpb2* = MT412668; *tef1* = MT412907; *tub2* = MT413117 (alternative markers: ITS = MT359837; LSU = MT359597).
Notes: *Calonectria spathulata* is closely related to *Ca. colombiana*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. spathulata* (av. 80 × 6 µm) are larger than those of *Ca. colombiana* (av. 37 × 3 µm). Furthermore, *Ca. spathulata* can produce both microconidiophores and microconidia, a feature not observed for *Ca. colombiana* (Crous & Kang 2001, Lombard *et al.* 2010b). *Calonectria spathulata* is homothallic (Crous & Kang 2001) (Supplementary Table S4). This species is commonly associated with leaf spots and cutting rot of *Eucalyptus* cultivated in plantations and nurseries, and has a wide geographic distribution in South America (Argentina, Brazil, Colombia and Ecuador) (El-Gholl *et al.* 1986, Crous & Kang 2001, Rodas *et al.* 2005).

sphaeropedunculata Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 180. 2015.
(see ***Calonectria aconidialis***)

In: *Calonectria kyotensis* species complex.

Typus: CBS H-21486 holotype.
Ex-type culture: CBS 136081 = CMW 31390 = CERC 1725.
Type locality: **China**, GuangXi Province.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT334952; *cmdA* = MT335179; *his3* = MT335418; *rpb2* = MT412485; *tef1* = MT412709 (alternative markers: ITS = MT359639; LSU = MT359399).
Notes: *Calonectria sphaeropedunculata* was treated as a synonym of *Ca. aconidialis* in this study. In comparisons of DNA sequences for seven available gene regions, a single base difference in the *cmdA* and two base differences in the LSU sequences occurred between the ex-type isolate of *Ca. sphaeropedunculata* (CMW 31390) and the ex-type isolate of *Ca. aconidialis* (CMW 35174). Both species are homothallic and produce orange to orange-brown perithecia, 8-spored asci and 1-septate ascospores, and share the similar ascospores dimensions (*Ca. sphaeropedunculata*: av. 37 × 6 µm; *Ca. aconidialis*: av. 36 × 6 µm) (Lombard *et al.* 2015a, Li *et al.* 2020; Supplementary Table S4).

stipitata Calonectria L. Lombard & Crous, Stud. Mycol. 85: 188. 2016.
(see ***Calonectria spathulata***)

In: *Calonectria candelabrum* species complex.

Typus: CBS H-22771 holotype.
Ex-type culture: CBS 112513 = CMW 51197 = CPC 3851.
Type locality: **Colombia**.
Type substrate: *Eucalyptus* sp.
Barcodes: *act* = MT335140; *cmdA* = MT335377; *his3* = MT335617; *rpb2* = MT412669; *tef1* = MT412908; *tub2* = MT413118 (alternative markers: ITS = MT359838; LSU = MT359598).
Notes: *Calonectria stipitata* was treated as a synonym of *Ca. spathulata* in this study. In comparisons of DNA sequences for eight gene regions, the ex-type isolate of *Ca. stipitata* (CBS 112513) and the isolate of *Ca. spathulata* (CMW 16744) only had one base difference in the *his3* gene sequence. Both species produce ellipsoidal to obpyriform vesicles of similar dimensions (*Ca. stipitata*: 7–11 µm; *Ca. spathulata*: 6–10 µm). The macroconidia of *Ca. stipitata* (av. 32 × 4 µm) are smaller than those of *Ca. spathulata* (av. 80 × 6 µm) (El-Gholl *et al.* 1986, Crous & Kang 2001, Lombard *et al.* 2016), which was considered to represent intraspecific variation.

sulawesiensis Calonectria L. Lombard *et al.*, Stud. Mycol. 66: 53.2010.

(see ***Calonectria hawksworthii***)

In: *Calonectria cylindrospora* species complex.

Typus: PREM 60300 holotype.
Ex-type culture: CBS 125277 = CMW 14878.
Type locality: **Indonesia**, Sulawesi.
Type substrate: Leaf of *Eucalyptus* sp.
Barcodes: *act* = MT335141; *cmdA* = MT335378; *his3* = MT335618; *rpb2* = MT412670; *tef1* = MT412909; *tub2* = MT413119 (alternative markers: ITS = MT359839; LSU = MT359599).
Notes: *Calonectria sulawesiensis* was treated as a synonym of *Ca. hawksworthii* in this study. In comparisons of DNA sequences for eight gene regions, the only difference between the ex-type isolate of *Ca. sulawesiensis* (CMW 14878) and the ex-type isolate of *Ca. hawksworthii* (CBS 111870) was in the *act*, *tef1* and *tub2* sequences, where there were four base differences in the *act*, one base difference in the *tef1* and four base differences in the *tub2* sequences. Both species produce ellipsoidal vesicles with overlapping dimensions (*Ca. sulawesiensis*: 5–7 µm; *Ca. hawksworthii*: 6–9 µm) and 1-septate macroconidia. The macroconidia of *Ca. sulawesiensis* (av. 48 × 4 µm) are shorter than those of *Ca. hawksworthii* (av. 56 × 4 µm) (Crous 2002, Lombard *et al.* 2010a), which was considered to represent intraspecific variation (Supplementary Table S4).

sumatrensis Calonectria (Crous) L. Lombard *et al.*, Stud. Mycol. 66: 56. 2010
Basionym: *Cylindrocladium sumatrense* Crous, Stud. Mycol. 50: 426. 2004.
Synonym: *Calonectria indonesiana* L. Lombard & Crous, Stud. Mycol. 85: 179. 2016.

In: *Calonectria kyotensis* species complex.

Typus: CBS 9888 holotype.
Ex-type culture: CBS 112829 = CMW 23698 = CPC 4518.
Type locality: **Indonesia**, Northern Sumatra.
Type substrate: Soil.
Barcodes: *act* = MT335145; *cmdA* = MT335382; *his3* = MT335622; *rpb2* = MT412674; *tef1* = MT412913 (alternative markers: ITS = MT359843; LSU = MT359603).
Notes: *Calonectria sumatrensis* is closely related to *Ca. brassicicola*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. sumatrensis* [(av. 58 × 5 µm); Crous *et al.* 2004] are longer than those of *Ca. brassicicola* [(av. 42 × 5 µm); Lombard *et al.* 2016], and the vesicles of *Ca. sumatrensis* (8–13 µm) are wider than those of *Ca. brassicicola* (3–5 µm) (Supplementary Table S4).

syzygiicola Calonectria L. Lombard & Crous, Stud. Mycol. 85: 190. 2016.

In: *Calonectria kyotensis* species complex.

Typus: CBS H-22772 holotype.
Ex-type culture: CBS 112831 = CMW 51204 = CPC 4511.
Type locality: **Indonesia**, Sumatra.
Type substrate: Soil under *Syzygium aromaticum*.
Barcodes: ITS = KX784736; LSU = KX784663.
Notes: *Calonectria syzygiicola* is closely related to *Ca. asiatica*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. syzygiicola* [(av. 45 × 5 µm); Lombard *et al.* 2016] are shorter than those of *Ca. asiatica* [(av. 53 × 5 µm); Crous *et al.* 2004], and the vesicles of *Ca. syzygiicola* (3–6 µm) are narrower than those of *Ca. asiatica* (12–17 µm) (Crous *et al.* 2004, Lombard *et al.* 2016) (Supplementary Table S4).

telluricola Calonectria R.F. Alfenas *et al.*, Stud. Mycol. 80: 125. 2015.
(see ***Calonectria paraensis***)

In: *Calonectria brassicae* species complex.

Typus: CBS H-21365 holotype.
Ex-type culture: CBS 134664 = LPF217.
Type locality: **Brazil**, Bahia state, Mucuri.
Type substrate: Soil in tropical rainforest.
Barcodes: *cmdA* = KM396017; *his3* = KM396100; *tef1* = KM395843; *tub2* = KM395930.
Notes: *Calonectria telluricola* was treated as a synonym of *Ca. paraensis* in this study. In comparisons of DNA sequences for the four available gene regions, the only difference between the ex-type isolate of *Ca. telluricola* (CBS 134664) and the ex-type isolate of *Ca. paraensis* (CBS 134669) was in the *cmdA*, *his3*, *tef1* and *tub2* sequences, where there was one base difference in the *cmdA*, two base differences in the *his3*, one base difference in the *tef1* and two base differences in the *tub2* sequences. Both species produce clavate vesicles and 1-septate macroconidia, and shared the similar vesicle (*Ca. telluricola*: 3–6 µm; *Ca. paraensis*: 4–6 µm) and macroconidial dimensions (*Ca. telluricola*: av. 41 × 5 µm; *Ca. paraensis*: av. 42 × 5 µm) (Alfenas *et al.* 2015) (Supplementary Table S4).

tereticornis Calonectria L. Lombard & Crous, Stud. Mycol. 85: 190. 2016.
(see ***Calonectria ovata***)

In: *Calonectria pteridis* species complex.

Typus: CBS H-22773 holotype.
Ex-type culture: CBS 111301 = CMW 51176 = CPC 1429.
Type locality: **Brazil**, Pará, Tucuruí.
Type substrate: *Eucalyptus tereticornis*.
Barcodes: *act* = MT335077; *cmdA* = MT335309; *his3* = MT335549; *tef1* = MT412840; *tub2* = MT413054 (alternative markers: ITS = MT359770; LSU = MT359530).
Notes: *Calonectria tereticornis* was treated as a synonym of *Ca. ovata* in this study. In comparisons of DNA sequences for seven available gene regions, the only differences between the ex-type isolate of *Ca. tereticornis* (CBS 111301) and the ex-type isolate of *Ca. ovata* (CMW 16724) was in the LSU and *tub2* sequences where there was one base difference in the LSU and one base difference in the *tub2* sequences. Both of the species produce ovoid vesicles of similar dimensions (*Ca. tereticornis*: 8–14 µm; *Ca. ovata*: 8–14 µm) and 1-septate macroconidia. The macroconidia of *Ca. tereticornis* [(av. 59 × 5 µm); Lombard *et al.* 2016] are shorter than those of *Ca. ovata* [(av. 70 × 5 µm); Victor *et al.* 1997], which was considered to represent intraspecific variation (Supplementary Table S4).

terrae-reginae Calonectria L. Lombard *et al.*, Persoonia 24: 8. 2010.
(see ***Calonectria queenslandica***)

In: *Calonectria reteaudii* species complex.

Typus: PREM 60239 holotype.

Ex-type culture: CBS 112151 = CMW 30601 = CPC 3202 = DFRI00150.
Type locality: **Australia**, Queensland, Cardwell.
Type substrate: *Eucalyptus urophylla.*
Barcodes: *act* = MT335134; *cmdA* = MT335369; *his3* = MT335609; *rpb2* = MT412662; *tef1* = MT412900; *tub2* = MT413110 (alternative markers: ITS = MT359830; LSU = MT359590).
Notes: *Calonectria terrae-reginae* was treated as a synonym of *Ca. queenslandica* in this study. In comparisons of DNA sequences for eight gene regions, only a single base difference in the *tub2* gene sequence was found between the ex-type isolate of *Ca. terrae-reginae* (CMW 30601) and the ex-type isolate of *Ca. queenslandica* (CMW 30604). Both species produce narrowly clavate vesicles of similar dimensions (*Ca. terrae-reginae*: 3–5 µm; *Ca. queenslandica*: 3–4 µm) and 4–6-septate macroconidia. The macroconidia of *Ca. terrae-reginae* (av. 76 × 6 µm) are longer than those of *Ca. queenslandica* (av. 69 × 6 µm) (Lombard *et al.* 2010c), which was considered to represent intraspecific variation (Supplementary Table S4).

terrestris Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 182. 2015.
(see ***Calonectria cerciana***)

In: *Calonectria cylindrospora* species complex.

Typus: CBS H-21478 holotype.
Ex-type culture: CBS 136642 = CMW 35180 = CERC 1856.
Type locality: **China**, GuangDong.
Type substrate: Soil in a *Eucalyptus* plantation.
Barcodes: *act* = MT334986; *cmdA* = MT335216; *his3* = MT335456; *rpb2* = MT412520; *tef1* = MT412747; *tub2* = MT412968 (alternative markers: ITS = MT359677; LSU = MT359437).
Notes: *Calonectria terrestris* was treated as a synonym of *Ca. cerciana* in this study. In comparisons of DNA sequences for eight gene regions, the only differences between the ex-type isolate *Ca. terrestris* (CMW 35180) and the ex-type isolate of *Ca. cerciana* (CMW 25309) was in the ITS and *tef1* sequences, where there was one base difference in the ITS and three base differences in the *tef1* sequences. Both species produce obpyriform vesicles with overlapping dimensions (*Ca. terrestris*: 5–12 µm; *Ca. cerciana*: 8–13 µm) and 1-septate macroconidia. The macroconidia of *Ca. terrestris* (av. 38.5 × 4.5 µm) are smaller than those of *Ca. cerciana* (av. 44 × 5 µm) (Lombard *et al.* 2010c, 2015a), which was considered to represent intraspecific variation (Supplementary Table S4).

terricola Calonectria L. Lombard & Crous, Stud. Mycol. 85: 191. 2016.

In: *Calonectria pteridis* species complex.

Typus: CBS H-22774 holotype.
Ex-type culture: CBS 116247 = CMW 51232 = CPC 3583.
Type locality: **Brazil**.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *tef1* = KX784738; *tub2* = KX784665.
Notes: *Calonectria terricola* is closely related to *Ca. ovata* and *Ca. pseudovata*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. terricola* [(av. 46 × 4.5 µm); Lombard *et al.* 2016] are smaller than those of *Ca. ovata* [(av. 70 × 5 µm); Victor *et al.* 1997] and *Ca. pseudovata* [(av. 69 × 5 µm); Alfenas *et al.* 2015]. In addition, no microconidiophores and microconidia were reported in *Ca. terricola*, a feature that is common in *Ca. ovata* and *Ca. pseudovata* (Victor *et al.* 1997, Alfenas *et al.* 2015, Lombard *et al.* 2016) (Supplementary Table S4).

tetraramosa Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 183. 2015.
(see ***Calonectria pauciramosa***)

In: *Calonectria candelabrum* species complex.

Typus: CBS H-21477 holotype.
Ex-type culture: CBS 136635 = CMW 31474 = CERC 1809.
Type locality: **China**, GuangDong Province, ZhanJiang.
Type substrate: *Eucalyptus urophylla* × *E. grandis* clone seedling leaf.
Barcodes: *act* = MT335104; *cmdA* = MT335336; *his3* = MT335576; *rpb2* = MT412629; *tef1* = MT412867; *tub2* = MT413079 (alternative markers: ITS = MT359797; LSU = MT359557).
Notes: *Calonectria tetraramosa* was treated as a synonym of *Ca. pauciramosa* in this study. In comparisons of DNA sequences for eight gene regions, all the sequences of the isolates of *Ca. tetraramosa* (ex-type CMW 31474, and CMW 31476) were 100 % identical to those of the isolates of *Ca. pauciramosa* (ex-type CBS 138824, CMW 2151, CMW 7592, CMW 9151, CMW 30823, and CMW 30875). Both species produce obpyriform vesicles and 1-septate macroconidia, and shared similar vesicle (*Ca. tetraramosa*: 4–10 µm; *Ca. pauciramosa*: 5–11 µm) and macroconidial dimensions (*Ca. tetraramosa*: av. 48 × 5 µm; *Ca. pauciramosa*: av. 50 × 4.5 µm) (Crous 2002, Lombard *et al.* 2015a) (Supplementary Table S4).

tonkinensis Calonectria N.Q. Pham *et al.*, Mycologia 111: 87. 2019.

In: *Calonectria cylindrospora* species complex.

Typus: PREM 62124 holotype.
Ex-type culture: CBS 143576 = CMW 47430.
Type locality: **Vietnam**, Hanoi, Bavi.
Type substrate: Soil in a *Eucalyptus* plantation.
Barcodes: *act* = MT335147; *cmdA* = MT335384; *his3* = MT335624; *rpb2* = MT412676; *tef1* = MT412915; *tub2* = MT413122 (alternative markers: ITS = MT359845; LSU = MT359605).
Notes: *Calonectria tonkinensis* is closely related to *Ca. cerciana*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. tonkinensis* (av. 41.5 × 4 µm) are smaller than those of *Ca. cerciana* (av. 44 × 5 µm), and the vesicles of *Ca. tonkinensis* (3–7 µm) are narrower than those of *Ca. cerciana* (8–13 µm) (Lombard *et al.* 2010c, Pham *et al.* 2019) (Supplementary Table S4).

tropicalis Calonectria L. Lombard & Crous, Stud. Mycol. 85: 192. 2016.
(see ***Calonectria amazonica***)

In: *Calonectria pteridis* species complex.

Typus: CBS H-22776 holotype.
Ex-type culture: CBS 116271 = CMW 51236 = CPC 3559.
Type locality: **Brazil**, Amazon.

Type substrate: *Eucalyptus* sp.
Barcodes: *act* = MT335148; *cmdA* = MT335385; *his3* = MT335625; *rpb2* = MT412677; *tef1* = MT412916; *tub2* = MT413123 (alternative markers: ITS = MT359846; LSU = MT359606).
Notes: *Calonectria tropicalis* was treated as a synonym of *Ca. amazonica* in this study. In comparisons of DNA sequences for eight gene regions, the only differences between the ex-type isolate of *Ca. tropicalis* (CBS 116271) and the ex-type isolate of *Ca. amazonica* (CBS 116250) was in the ITS, *rpb2* and *tub2* sequences, where there was one base difference in the ITS, one base difference in the *rpb2* and three base differences in the *tub2* sequences. Both species produce clavate vesicles and 1(−3)-septate macroconidia, and shared similar vesicle (*Ca. tropicalis*: 5−6 µm; *Ca. amazonica*: 5−6 µm) and macroconidial dimensions (*Ca. tropicalis*: av. 80 × 5 µm; *Ca. amazonica*: av. 79 × 5 µm) (Lombard *et al.* 2016) (Supplementary Table S4).

tucuruiensis Calonectria L. Lombard & Crous, Stud. Mycol. 86: 123. 2017.
(see ***Calonectria ovata***)

In: *Calonectria pteridis* species complex.

Typus: CBS H-22777 holotype.
Ex-type culture: CBS 114755 = CMW 51827 = CPC 1403.
Type locality: **Brazil**, Pará, Tucuruí.
Type substrate: *Eucalyptus tereticornis*.
Barcodes: *act* = MT335078; *cmdA* = MT335310; *his3* = MT335550; *tef1* = MT412841; *tub2* = MT413055 (alternative markers: ITS = MT359771; LSU = MT359531).
Notes: *Calonectria tucuruiensis* was treated as a synonym of *Ca. ovata* in this study. In comparisons of DNA sequences for seven available gene regions, there was one base difference between the ex-type isolate of *Ca. tucuruiensis* (CBS 114755) and the ex-type isolate of *Ca. ovata* (CMW 16724) in each of the LSU and *tub2* sequences. Both of the species produce ovoid vesicles with overlapping dimensions (*Ca. tucuruiensis*: 9−12 µm; *Ca. ovata*: 8−14 µm) and 1-septate macroconidia. The macroconidia of *Ca. tucuruiensis* [(av. 63 × 5 µm); Marin-Felix *et al.* 2017] are shorter than those of *Ca. ovata* [(av. 70 × 5 µm); Victor *et al.* 1997], which was considered to represent intraspecific variation (Supplementary Table S4).

tunisiana Calonectria L. Lombard *et al.*, Persoonia 27: 77. 2011.
(see ***Calonectria pseudomexicana***)

In: *Calonectria mexicana* species complex.

Typus: CBS H-20684 holotype.
Ex-type culture: CBS 130357 = CMW 51316 = DISTEF-TCL1.
Type locality: **Tunisia**, Carthage, Tunis.
Type substrate: *Callistemon laevis*.
Barcodes: *act* = MT335149; *cmdA* = MT335386; *his3* = MT335626; *rpb2* = MT412678; *tef1* = MT412917; *tub2* = MT413124 (alternative markers: ITS = MT359847; LSU = MT359607).
Notes: *Calonectria tunisiana* was treated as a synonym of *Ca. pseudomexicana* in this study. In comparisons of DNA sequences for eight gene regions, the only differences between the ex-type isolate of *Ca. tunisiana* (CBS 130357) and the ex-type isolate of *Ca. pseudomexicana* (CBS 130354) was in the LSU and *tef1* sequences, where there was one base difference in the LSU and six base differences in the *tef1* sequences. Both species produce fusiform to broadly ellipsoidal vesicles with papillate apex and 1-septate macroconidia, and similar vesicles (*Ca. tunisiana*: 8−14 µm; *Ca. pseudomexicana*: 9−14 µm). The macroconidia of *Ca. tunisiana* (av. 49 × 5 µm) are longer than those of *Ca. pseudomexicana* (av. 45 × 5 µm) (Lombard *et al.* 2011), which was considered to represent intraspecific variation (Supplementary Table S4).

turangicola Calonectria L. Lombard *et al.*, Stud. Mycol. 80: 184. 2015.
(see ***Calonectria kyotensis***)

In: *Calonectria kyotensis* species complex.

Typus: CBS H-21488 holotype.
Ex-type culture: CBS 136077 = CMW 31411.
Type locality: **China**, GuangXi Province.
Type substrate: Soil in a *Eucalyptus* plantation.
Barcodes: *act* = MT335151; *cmdA* = MT335388; *his3* = MT335628; *tef1* = MT412919; *tub2* = MT413126 (alternative markers: ITS = MT359849; LSU = MT359609).
Notes: *Calonectria turangicola* was treated as a synonym of *Ca. kyotensis* in this study. In comparison of DNA sequences for seven available gene regions, the only difference between the ex-type isolate of *Ca. turangicola* (CMW 31411) and the ex-type isolate of *Ca. kyotensis* (CBS 114525) was in the LSU, *tef1* and *tub2* sequences, where there was one base difference in the LSU, two base differences in the *tef1* and two base differences in the *tub2* sequences. Both species are homothallic and produce sphaeropedunculate (globose) vesicles and 1-septate macroconidia of similar dimensions (*Ca. turangicola*: av. 44 × 4 µm, *Ca. kyotensis*: av. 41 × 4 µm) (Terashita 1968, Lombard *et al.* 2015a, Li *et al.* 2020; Supplementary Table S4).

uniseptata Calonectria Gerlach, Phytopathol. Z. 61: 379. 1968.

In: *Calonectria kyotensis* species complex.

Typus: No. 10759 holotype.
Ex-type culture: CBS 413.67 = CMW 23678 = CPC 2391 = IMI 299577.
Type locality: **Germany**, Celle.
Type substrate: *Paphiopedilum callosum*.
Barcodes: *act* = GQ280451; *cmdA* = GQ267379; *his3* = GQ267248; *tef1* = GQ267307; *tub2* = GQ267208 (alternative markers: ITS = GQ280573; LSU = GQ280695).
Notes: *Calonectria uniseptata* is closely related to *Ca. asiatica* and *Ca. syzygiicola*, and can be distinguished from these two species by the dimensions of its ascospores and vesicles. The ascospores of *Ca. uniseptata* [(av. 41.5 × 6.3 µm); Gerlach 1968] are longer than those of *Ca. asiatica* [(av. 33 × 6 µm); Crous *et al.* 2004], and the vesicles of *Ca. uniseptata* (8.2−20.4 µm) are wider than those of *Ca. syzygiicola* (3−6 µm) (Gerlach 1968, Lombard *et al.* 2016) (Supplementary Table S4).

uxmalensis Calonectria L. Lombard & Crous, Stud. Mycol. 85: 193. 2016.

In: *Calonectria mexicana* species complex.

Typus: CBS H-22761 holotype.
Ex-type culture: CBS 110925 = CMW 51167 = CPC 945.
Type locality: **Mexico**, Uxmal.

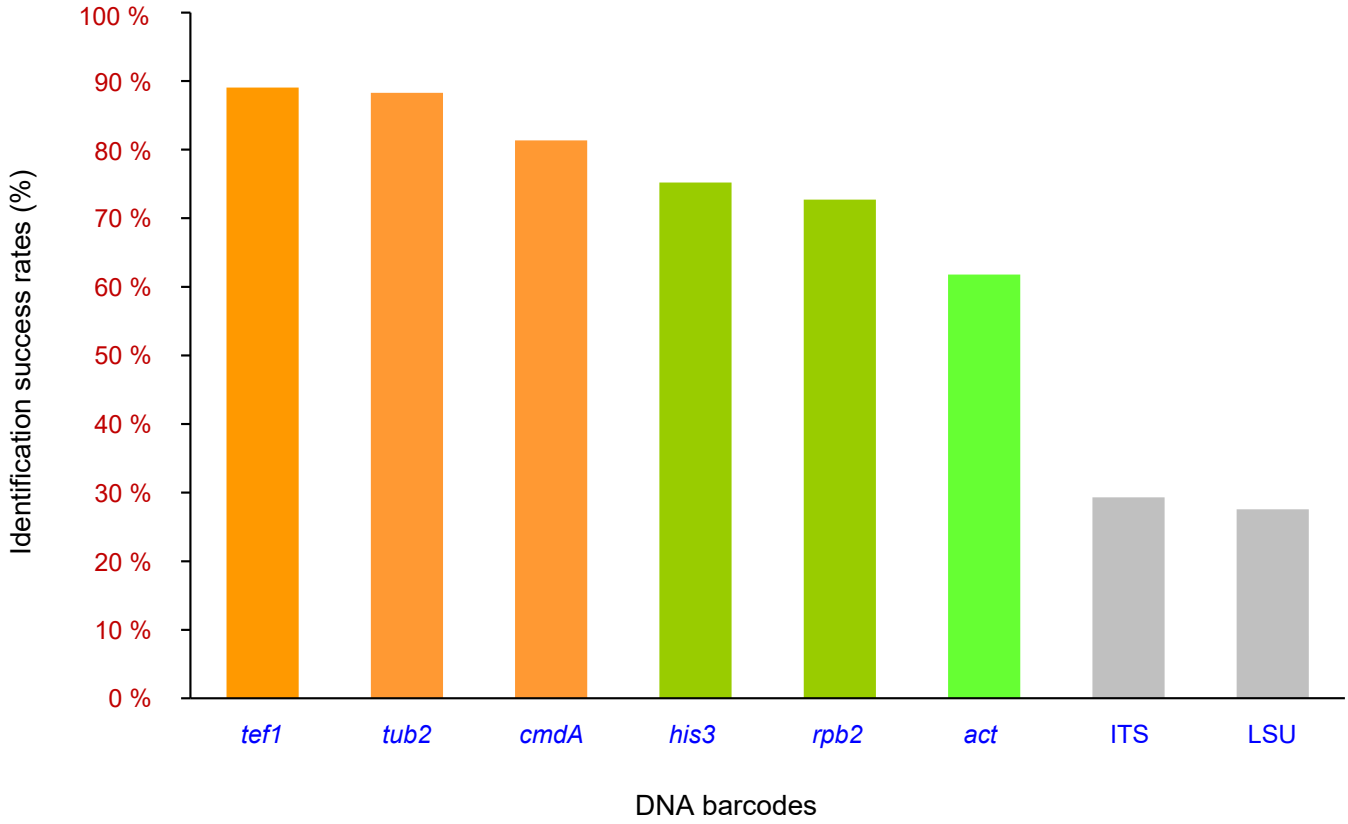

Fig. 4. The identification success rates of the eight candidate DNA barcodes for the genus *Calonectria*.

Type substrate: Soil.
Barcodes: *act* = MT335153; *cmdA* = MT335390; *his3* = MT335630; *rpb2* = MT412681; *tef1* = MT412921; *tub2* = MT413128 (alternative markers: ITS = MT359851; LSU = MT359611).
Notes: *Calonectria uxmalensis* is closely related to *Ca. pseudouxmalensis*, and sequences of *cmdA*, *his3*, *tef1* and *tub2* gene regions can distinguish *Ca. uxmalensis* from *Ca. pseudouxmalensis*. Morphologically, these two species are similar to each other, while the ability of *Ca. uxmalensis* to produce lateral stipe extensions can differentiate *Ca. uxmalensis* from *Ca. pseudouxmalensis* (Lombard *et al.* 2016) (Supplementary Table S4).

variabilis Calonectria Crous *et al.*, Syst. Appl. Microbiol. 16: 270. 1993.
Synonym: *Cylindrocladium variabile* Crous *et al.*, Syst. Appl. Microbiol. 16: 270. 1993.

In: *Calonectria cylindrospora* species complex.

Typus: PREM 51039 (holotype of *Ca. variabilis*; Crous *et al.* 1993b), PREM 51041 (holotype of *Cy. variabile*; Crous *et al.* 1993b).
Ex-type culture: CBS 114677 = CMW 3187 = CPC 2436 = AR2675 (Crous *et al.* 1993b, Crous 2002)
Type locality: **Brazil**, Pará.
Type substrate: *Schefflera morototoni*.
Barcodes: *cmdA* = MT335392; *his3* = MT335632; *rpb2* = MT412683; *tef1* = MT412923; *tub2* = MT413130 (alternative markers: ITS = MT359853; LSU = MT359613).
Notes: *Calonectria variabilis* is phylogenetically closely related to *Ca. cylindrospora*, and can be distinguished from that species by the dimensions of its macroconidia. The macroconidia of *Ca. variabilis* [(av. 73 × 5 µm); Crous *et al.* 1993b] are larger than those of *Ca. cylindrospora* [(av. 45 × 4 µm); Crous *et al.* 1993a, Lombard *et al.* 2015b]. *Calonectria variabilis* readily produces a microconidial morph in culture on CLA (Crous *et al.* 1993b), a feature not observed for *Ca. cylindrospora* (Crous *et al.* 1993a). *Calonectria variabilis* is characterised as being homothallic, while *Ca. cylindrospora* is heterothallic (Crous *et al.* 1993b).

vegrandis Calonectria N.Q. Pham & M.J. Wingfield, Mycologia 111: 99. 2019.
(see ***Calonectria curvispora***)

In: *Calonectria kyotensis* species complex.

Typus: PREM 62113 holotype.
Ex-type culture: CBS 143565 = CMW 48245.
Type locality: **Indonesia**, North Sumatra, Aek Nauli.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT335003; *cmdA* = MT335233; *his3* = MT335473; *rpb2* = MT412537; *tef1* = MT412764 (alternative markers: ITS = MT359694; LSU = MT359454).
Notes: *Calonectria vegrandis* was treated as a synonym of *Ca. curvispora* in this study. In comparisons of DNA sequences for seven available gene regions, all seven gene sequences for the isolates of *Ca. vegrandis* (ex-type CMW 48245, and CMW 48246) were 100 % identical to the ex-type isolate of *Ca. curvispora* (CMW 23693). Both species produce sphaeropedunculate vesicles and 1-septate macroconidia, whereas *Ca. curvispora* typically produce curved macroconidia which are straight in *Ca. vegrandis* (Victor *et al.* 1997, Lombard *et al.* 2010a, Pham *et al.* 2019), suggesting that curved or straight macroconidia may be not a reliable feature to distinguish between these species. The macroconidia of *Ca. vegrandis* (av.

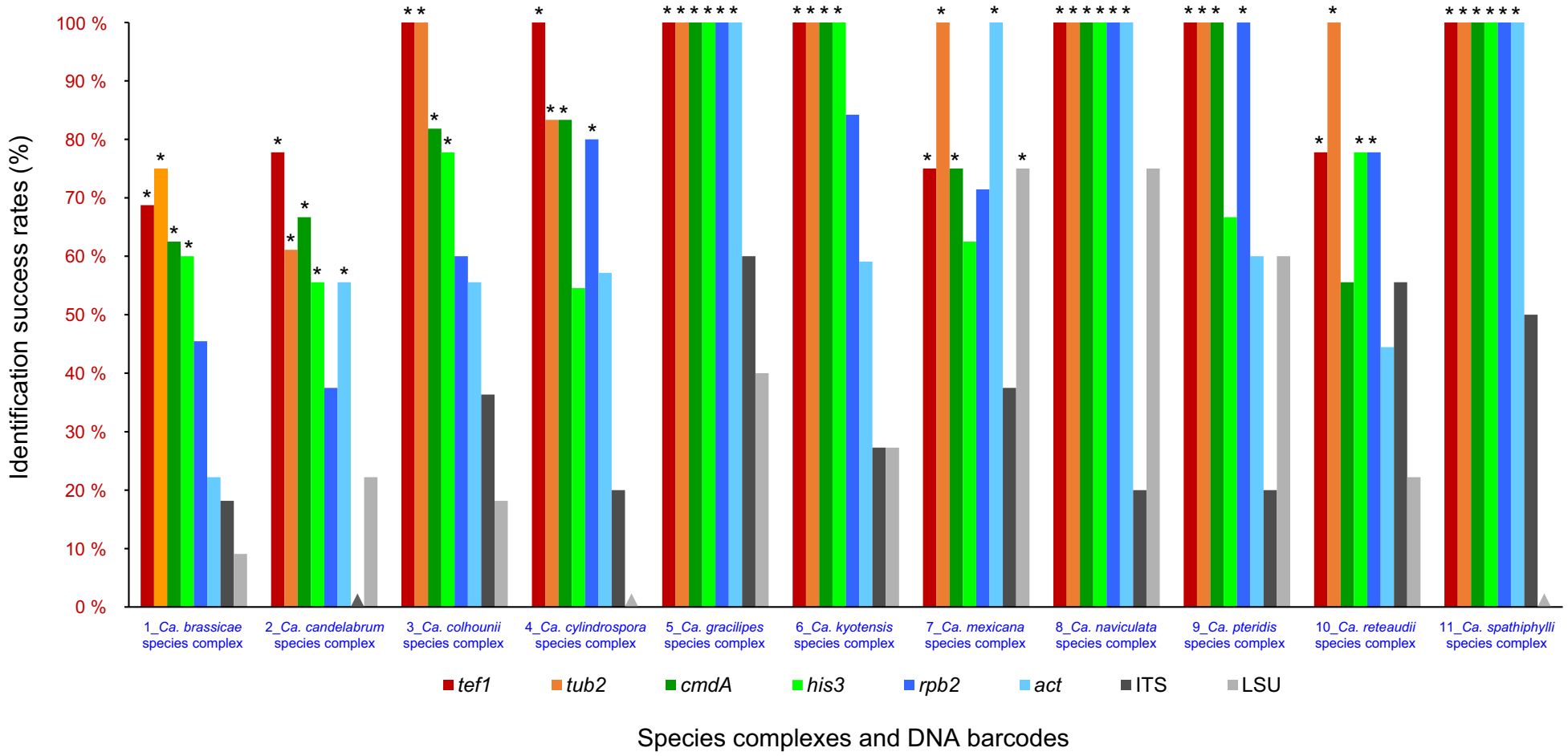

Fig. 5. The identification success rates of the eight candidate DNA barcodes for each of the 11 species complex; "*" above the histogram indicate four of the barcodes with highest identification success rates within each of the 11 species complexes; Triangle indicate the identification success rate of the candidate DNA barcodes is zero.

41 × 4.5 µm) are smaller than those of *Ca. curvispora* (av. 60 × 5 µm) (Victor *et al.* 1997, Lombard *et al.* 2010a, Pham *et al.* 2019), which was considered to represent intraspecific variation (Supplementary Table S4).

venezuelana Calonectria L. Lombard *et al.*, Stud. Mycol. 85: 195. 2016.

In: *Calonectria candelabrum* species complex.

Typus: CBS H-22778 holotype.
Ex-type culture: CBS 111052 = CMW 51173 = CPC 1183.
Type locality: **Venezuela**, Acarigua.
Type substrate: Soil.
Barcodes: *act* = MT335155; *cmdA* = MT335394; *his3* = MT335634; *rpb2* = MT412685; *tef1* = MT412925; *tub2* = MT413132 (alternative markers: ITS = MT359855; LSU = MT359615).
Notes: *Calonectria venezuelana* is closely related to *Ca. candelabrum* and *Ca. eucalypticola*, and can be distinguished from these two species by the dimensions of its macroconidia. The macroconidia of *Ca. venezuelana* [(av. 58 × 5 µm); Lombard *et al.* 2016] are shorter than those of *Ca. candelabrum* [(av. 60 × 4.5 µm); Crous 2002], and larger than those of *Ca. eucalypticola* [(av. 50 × 4 µm); Alfenas *et al.* 2015] (Supplementary Table S4).

yunnanensis Calonectria J.Q. Li *et al.*, IMA Fungus 8: 282. 2017.
Synonym: *Calonectria pseudoyunnanensis* J.Q. Li *et al.*, IMA Fungus 8: 279. 2017.

In: *Calonectria kyotensis* species complex.

Typus: PREM 61955 holotype.
Ex-type culture: CBS 142897 = CMW 47644 = CERC 5339.
Type locality: **China**, YunNan.
Type substrate: Soil in *Eucalyptus* plantation.
Barcodes: *act* = MT335157; *cmdA* = MT335396; *his3* = MT335636; *rpb2* = MT412687; *tef1* = MT412927; *tub2* = MT413134 (alternative markers: ITS = MT359857; LSU = MT359617).
Notes: *Calonectria yunnanensis* is closely related to *Ca. asiatica*, and can be distinguished from that species by the dimensions of its macroconidia and vesicles. The macroconidia of *Ca. yunnanensis* [(av. 43 × 4.5 µm); Li *et al.* 2017] are smaller than those of *Ca. asiatica* [(av. 53 × 5 µm); Crous *et al.* 2004], and the vesicles of *Ca. yunnanensis* (2–4.5 µm) are narrower than those of *Ca. asiatica* (12–17 µm). *Calonectria yunnanensis* is homothallic (Li *et al.* 2020) (Supplementary Table S4).

zuluensis Calonectria L. Lombard & Crous, Stud. Mycol. 66: 25. 2010.
(see ***Calonectria pauciramosa***)

In: *Calonectria candelabrum* species complex.

Typus: PREM 60292 holotype.
Ex-type culture: CBS 125268 = CMW 9188.
Type locality: **South Africa**, KwaZulu-Natal, Kwambonambi.
Type substrate: *Eucalyptus grandis* clonal cutting.
Barcodes: *act* = MT335159; *cmdA* = MT335398; *his3* = MT335638; *rpb2* = MT412689; *tef1* = MT412929; *tub2* = MT413136 (alternative markers: ITS = MT359859; LSU = MT359619).
Notes: *Calonectria zuluensis* was treated as a synonym of *Ca. pauciramosa* in this study. In comparisons of DNA sequences for eight gene regions, the only differences between the ex-type isolate of *Ca. zuluensis* (CMW 9188) and the ex-type isolate of *Ca. pauciramosa* (CBS 138824) was in the *act* and *tub2* sequences, where there were two base differences in the *act* and three base differences in the *tub2* sequences. Both species are heterothallic and produce obpyriform to ellipsoidal vesicles of similar dimensions (*Ca. zuluensis*: 6–10 µm; *Ca. pauciramosa*: 5–11 µm) and 1-septate macroconidia. The macroconidia of *Ca. zuluensis* (av. 36 × 4 µm) are smaller than those of *Ca. pauciramosa* (av. 50 × 4.5 µm) (Crous 2002, Lombard *et al.* 2010b, Li *et al.* 2020), which was considered to represent intraspecific variation (Supplementary Table S4).

Selection of DNA barcodes for species recognition

Phylogenetic analyses of sequences for eight gene regions resulted in the delineation of 120 clearly defined *Calonectria* species. These eight gene regions thus serve as putative DNA barcodes. As with most other fungi, it is not possible to use a single DNA barcode to identify species of *Calonectria*. Consequently, the Identification Success Rate (ISR) was calculated for each of the eight putative barcodes for all 120 species of *Calonectria* and also for species residing in each of the 11 well-defined species complexes (Supplementary Table S5).

For the genus as a whole, the results showed that sequence data for *tef1* and *tub2* had the strongest ability to correctly identify species (ISRs: 89.1 % and 88.3 %, respectively; Supplementary Table S5, Fig. 4). This was followed by *cmdA*, *his3*, *rpb2* and *act* gene regions which also provided relatively effective resolution of the *Calonectria* spp. (Supplementary Table S5, Fig. 4). The efficacy of the ITS and LSU regions to identify species was relatively low (ISRs: 29.3 % and 27.6 %, respectively; Supplementary Table S5, Fig. 4).

For the 11 species complexes, the results showed that the most effective barcodes could not be employed across all species complexes. The *tef1* sequences provided resolution power in the *Ca. candelabrum* and *Ca. cylindrospora* species complexes (Supplementary Table S5, Fig. 5). In contrast, *tub2* was the best DNA barcode for the *Ca. brassicae* and *Ca. reteaudii* species complexes (Supplementary Table S5, Fig. 5), *act* and *tub2* both the best for the *Ca. mexicana* species complex. The frequency of successful identification using the eight gene region data in the 11 species complexes also differed. Collectively, the six regions (*tef1*, *tub2*, *cmdA*, *his3*, *rpb2* and *act*) provided stable and reliable resolution power for species in each of the 11 species complexes. Our results suggested that all of the 120 *Calonectria* species accepted in this study could be distinguished based on the six-region (*tef1*, *tub2*, *cmdA*, *his3*, *rpb2*, and *act*) combined phylogeny, and 118 of the 120 (98 %) *Calonectria* species could be recognised based on the *tef1* and *tub2* gene region combined phylogeny.

DISCUSSION

This study represents the most comprehensive molecular phylogenetic overview of *Calonectria*, a genus that includes

many important plant pathogens. Sequence data for eight gene regions of 240 isolates representing 128 species were newly generated. In the case of 44 species for which cultures could not be obtained, sequence data were sourced from GenBank so as to consider all 169 previously described species. Phylogenetic analyses were conducted for each of the eight gene regions individually as well as for a combined dataset. The results provided clear evidence that 51 species are indistinguishable from previously described taxa and synonymies have been provided for these. Two novel taxa were recognised and described as *Ca. lombardiana* and *Ca. pauciphialidica*. Furthermore, the name *Ca. lauri* was validated. The overall result of the study is the acceptance of 120 clearly defined species of *Calonectria*. The eight sequenced gene regions were then evaluated individually to identify the most useful DNA barcodes to accurately identify these species. These analyses showed that six gene regions (*tef1*, *tub2*, *cmdA*, *his3*, *rpb2* and *act*) provide effective barcodes for the genus.

The combined eight-gene phylogenetic tree emerging from this study placed the 120 accepted *Calonectria* species in the two major groups; the Prolate Group and the Sphaero-Naviculate Group. This is consistent with the results of previous studies (Lombard *et al.* 2016, Jayawardena *et al.* 2019), showing a clear phylogenetic distinction between these two groups in *Calonectria*. The previously recognised 10 species complexes (Lombard *et al.* 2016) were also well resolved. Interestingly, the results of this study also revealed a new species complex, that we have defined as the *Calonectria gracilipes* species complex. Delimitation of this new species complex was supported by both phylogenetic placement and morphological characteristics.

Species in the *Ca. brassicae* species complex typically have clavate vesicles and 1-septate macroconidia, producing orange to red-brown perithecia, 8-spored asci and 1-septate ascospores. The species complex also includes both heterothallic and homothallic species, and these are primarily distributed in South America (Crous 2002, Crous *et al.* 2006, Lombard *et al.* 2009, 2010a, 2016, Alfenas *et al.* 2015, Marin-Felix *et al.* 2017, Li *et al.* 2020). In the present study, two species were reduced to synonymy based on phylogenetic inference; *Ca. ecuadorensis* reduced to synonymy with *Ca. ecuadorae*, and *Ca. telluricola* with *Ca. paraensis*. The description of *Ca. pauciphialidica* adds a novel species to this species complex, and it is closely related to, but morphologically distinct from *Ca. ecuadorae*. Sixteen species are now recognised in the *Ca. brassicae* species complex.

Species in the *Ca. candelabrum* species complex are characterised by ellipsoidal to obpyriform vesicles and 1-septate macroconidia, producing orange to red-brown perithecia, 8-spored asci and 1-septate ascospores. The species complex includes both heterothallic and homothallic species that are known from Africa, Asia, Europe, North and South America, Oceania (Viégas 1946, Schoch *et al.* 1999, Crous & Kang 2001, Crous 2002, Lombard *et al.* 2010a, b, 2015a, b, 2016, Alfenas *et al.* 2013a, 2015, Lopes *et al.* 2017, Li *et al.* 2020). The *Ca. candelabrum* species complex includes important plant pathogens some of which pose a serious threat to global forestry and agricultural industries (Schoch *et al.* 1999, Crous 2002, Lombard *et al.* 2010b, 2015a, Crous *et al.* 2013, Alfenas *et al.* 2015). In the present study, 10 species were reduced to synonymy based on phylogenetic inference, eight (*Ca. cliffordiicola*, *Ca. ericae*, *Ca. machaerinae*, *Ca. mossambicensis*, *Ca. polizzii*, *Ca. seminaria*, *Ca. tetraramosa* and *Ca. zuluensis*) of which were reduced to synonymy with *Ca. pauciramosa*. In addition, one species (*Ca. pseudoscoparia*) was reduced to synonymy with *Ca. candelabrum*, and one species (*Ca. stipitata*) with *Ca. spathulata*. Eighteen species are now included in the *Ca. candelabrum* species complex.

Species in the *Ca. colhounii* species complex typically have clavate vesicles and 3-septate macroconidia, producing yellow perithecia, which is considered as the most characteristic feature of the species complex. They include 4-spored asci and 3-septate ascospores and both heterothallic and homothallic species. Homothallism is the dominant mating system (Crous 2002, Lombard *et al.* 2010a, Chen *et al.* 2011, Li *et al.* 2017, 2020) and the majority of species have been collected from Asia (Peerally 1973, Crous *et al.* 1999, Crous 2002, Lombard *et al.* 2010a, 2016, Chen *et al.* 2011, Xu *et al.* 2012, Li *et al.* 2017, 2020, Liu & Chen 2017). In the present study, three species were reduced to synonymy based on phylogenetic inference. These include *Ca. pseudocolhounii* reduced to synonymy with *Ca. eucalypti*, *Ca. nymphaeae* was synonymised with *Ca. fujianensis*, and *Ca. parva* with *Ca. macroconidialis*. In addition, *Ca. madagascariensis* with typical clavate vesicles was shown to reside in the *Ca. colhounii* species complex, consistent with the findings of Lombard *et al.* (2010a). This result is in contrast to the phylogeny presented by Jayawardena *et al.* (2019) who suggested that the species formed a distinct lineage apart from species in the 11 species complexes. Based on our results, 11 species reside in the *Ca. colhounii* species complex, including *Ca. madagascariensis*.

In the *Ca. cylindrospora* species complex, species have variable vesicle shapes, including clavate, ellipsoidal, fusiform, obpyriform to sphaeropedunculate, and they typically produce 1-septate macroconidia, orange to red-brown perithecia, 8-spored asci and 1-septate ascospores. The species complex includes both heterothallic and homothallic species (Crous *et al.* 1993b, Schoch *et al.* 1999, Crous 2002, Li *et al.* 2020). Species in the *Ca. cylindrospora* species complex exhibit a broad geographic distribution including Africa, Asia, Europe, North and South America (Crous *et al.* 1993c, 2013, Crous 2002, Lombard *et al.* 2010a, b, c, 2015a, 2016, Alfenas *et al.* 2013b, 2015, Pham *et al.* 2019, Li *et al.* 2020). In the present study, eight species were reduced to synonymy based on phylogenetic inference including two species (*Ca. hodgesii* and *Ca. pseudohodgesii*) as synonyms of *Ca. brasiliensis*, two species (*Ca. papillata* and *Ca. terrestris*) as synonyms of *Ca. cerciana*, two species (*Ca. foliicola* and *Ca. sulawesiensis*) as synonyms of *Ca. hawksworthii*, one species (*Ca. blephiliae*) as a synonym of *Ca. cylindrospora* and one species (*Ca. pseudocerciana*) as a synonym of *Ca. propaginicola*. As a consequence, 12 species are now accepted in the *Ca. cylindrospora* species complex.

In the *Ca. gracilipes* species complex, species are characterised by narrowly clavate vesicles and multi-septate (> 3) macroconidia, producing orange to red-brown perithecia and 8-spored asci. Species in this species complex have a homothallic mating system (Crous *et al.* 1997a, El-Gholl *et al.* 1997, Crous 2002) and they have been reported from both North and South America (Figueiredo & Namekata 1967, Crous *et al.* 1997a, 2000, El-Gholl *et al.* 1997, Crous 2002). Five species are now included in the *Ca. gracilipes* species complex.

Species in the *Ca. kyotensis* species complex typically have sphaeropedunculate vesicles and 1-septate macroconidia, producing orange to red-brown perithecia, 8-spored asci and 1-septate ascospores. Both heterothallic and homothallic species

are known in the species complex and a majority of the members have been described from Asia (Boedijn & Reitsma 1950, Tubaki 1958, Sobers & Seymour 1967, Gerlach 1968, Terashita 1968, Sobers 1969, Alfieri *et al.* 1982, Victor *et al.* 1997, Kang *et al.* 2001b, Crous 2002, Crous *et al.* 2004, Lombard *et al.* 2015a, 2016, Li *et al.* 2017, 2020, Liu & Chen 2017, Pham *et al.* 2019). Results of the present study have shown that 17 species in this complex are the same as earlier described taxa. Of these, nine species (*Ca. arbusta*, *Ca. expansa*, *Ca. guangxiensis*, *Ca. hainanensis*, *Ca. magnispora*, *Ca. parakyotensis*, *Ca. pluriramosa*, *Ca. pseudokyotensis* and *Ca. sphaeropedunculata*) were reduced to synonymy with *Ca. aconidialis*, three (*Ca. floridana*, *Ca. pseudoturangicola* and *Ca. turangicola*) with *Ca. kyotensis*, one (*Ca. montana*) with *Ca. canadiana*, one (*Ca. multistipitata*) with *Ca. chinensis*, one (*Ca. vegrandis*) with *Ca. curvispora*, one (*Ca. indonesiana*) with *Ca. sumatrensis* and one (*Ca. pseudoyunnanensis*) with *Ca. yunnanensis*. Consequently, 24 species are now accommodated in the *Ca. kyotensis* species complex, making it the largest *Calonectria* species complex.

Species in the *Ca. mexicana* species complex typically have ellipsoidal vesicles with a papillate apex and 1-septate macroconidia. The species complex includes both heterothallic and homothallic species, although the heterothallic mating system is dominant (El-Gholl *et al.* 1989, Schubert *et al.* 1989, Schoch *et al.* 1999, Crous 2002). Species in the *Ca. mexicana* complex have been collected from many continents, including Africa, Europe and North America (El-Gholl *et al.* 1989, Schubert *et al.* 1989, Schoch *et al.* 1999, Crous 2002, Lechat *et al.* 2010, Lombard *et al.* 2011, 2016, Li *et al.* 2020). In the present study, *Ca. tunisiana* was reduced to synonymy with *Ca. pseudomexicana*. Consequently, eight species are now accommodated in this species complex.

In the *Ca. naviculata* species complex, species typically have naviculate vesicles and 1-septate macroconidia. Species in the species complex have a heterothallic mating system (Crous *et al.* 1997a, 2002, Gehesquiere *et al.* 2015, Li *et al.* 2020) and they have been collected from Africa, Asia, Europe, North and South America and Oceania (Crous *et al.* 1997a, 2002, 2004, Crous 2002, Alfenas *et al.* 2015, Gehesquiere *et al.* 2015, Lombard *et al.* 2016, LeBlanc *et al.* 2019, Li *et al.* 2020). In the study of Jayawardena *et al.* (2019), *Ca. pseudonaviculata* formed a distinct lineage and did not reside in any of the previously defined species complexes. Results of the present study have shown that this species resides comfortably in the *Ca. naviculata* species complex, consistent with the results of Lombard *et al.* (2010a, 2016). Currently, six species are included in the *Ca. naviculata* species complex.

In the *Ca. pteridis* species complex, species typically have clavate or ovate vesicles and 1-septate macroconidia. Species have a heterothallic mating system (El-Gholl *et al.* 1993a, Li *et al.* 2020) and have commonly been collected in North and South America (Sobers 1968, Crous *et al.* 1993c, El-Gholl *et al.* 1993a, Leahy *et al.* 2000, Crous 2002, Alfenas *et al.* 2015, Lombard *et al.* 2016, Marin-Felix *et al.* 2017, Li *et al.* 2020). Results of the present study have shown that six species in this complex are synonyms of earlier described taxa. Three species (*Ca. amazoniensis*, *Ca. longiramosa* and *Ca. tropicalis*) have thus been reduced to synonymy with *Ca. amazonica* and three species (*Ca. nemoralis*, *Ca. tereticornis* and *Ca. tucuruiensis*) with *Ca. ovata*. Consequently, seven species are now accommodated in the *Ca. pteridis* species complex.

In the *Ca. reteaudii* species complex, species are characterised by having narrowly clavate vesicles, multi-septate (> 3) macroconidia and they produce orange to red-brown perithecia, 8-spored asci and multi-septate (> 3) ascospores. Both heterothallic and homothallic *Calonectria* species have been described in this species complex (Kang *et al.* 2001a, Crous 2002, Gadgil & Dick 2004, Lombard *et al.* 2010c, Chen *et al.* 2011, Li *et al.* 2020) and species have been reported in Asia and Oceania (Kang *et al.* 2001a, Crous 2002, Gadgil & Dick 2004, Crous *et al.* 2006, 2012, Lombard *et al.* 2010c, 2015a, 2016, Chen *et al.* 2011, Li *et al.* 2017, 2020, Pham *et al.* 2019). Four species in this species complex were reduced to synonymy, including two species (*Ca. microconidialis* and *Ca. pentaseptata*) with *Ca. pseudoreteaudii*, one species (*Ca. terrae-reginae*) with *Ca. queenslandica* and one species (*Ca. baviensis*) with *Ca. reteaudii*. The description of *Ca. lombardiana* adds a new member to the *Ca. reteaudii* species complex and its larger macroconidial dimensions easily distinguish it from *Ca. queenslandica*, its closest phylogenetic relative. Nine species are now accepted as residing in the *Ca. reteaudii* species complex.

Calonectria species in the *Ca. reteaudii* species complex incorporate many important causal agents of plant disease, resulting in mainly leaf blights on a wide range of hosts in several countries including Australia, China, India, Laos and Vietnam (Old *et al.* 2003, Chen *et al.* 2011, Pham *et al.* 2019). *Calonectria pentaseptata*, initially described from Vietnam, has been reported from the GuangDong, GuangXi and HaiNan provinces of China (Crous *et al.* 2012, Lombard *et al.* 2015a, Li *et al.* 2017), causing severe leaf blight diseases on *Eucalyptus* in plantations and nurseries. In the present study, *Ca. pentaseptata* and *Ca. microconidialis* (Crous *et al.* 2012, Lombard *et al.* 2015a) were reduced to synonymy with *Ca. pseudoreteaudii*. *Calonectria pseudorateaudii* was originally described by Lombard *et al.* (2010c) from stems of *E. urophylla* × *E. grandis* hybrid cuttings in GuangDong Province, China. The results of the present study suggest that this species has been in China at least for 10 yr and continues to pose a serious threat to the *Eucalyptus* industry.

In the *Ca. spathiphylli* species complex, species typically have sphaeropedunculate vesicles and 1-spetate macroconidia and produce orange to red-brown perithecia, 8-spored asci and 1-septate ascospores. Both heterothallic and homothallic *Calonectria* species have been described in this species complex (El-Gholl *et al.* 1992, Kang *et al.* 2001b) and species are commonly collected in North and South America (El-Gholl *et al.* 1992, Kang *et al.* 2001b, Crous 2002, Lombard *et al.* 2010a). Four species are now accommodated in the *Ca. spathiphylli* species complex.

Results of this study have revealed interesting patterns regarding the geographic distribution of various groups of *Calonectria* spp. For example, more than 75 % of the species in the *Ca. brassicae* and *Ca. candelabrum* species complexes have been described from South American countries such as Brazil, Colombia, Ecuador and Venezuela (Alfenas *et al.* 2013a, b, 2015). Likewise, species in the *Ca. kyotensis* species complex appear to represent an Asian assemblage, with 19 of the 24 species collected in Asian countries such as China, Indonesia, Japan, Malaysia and Vietnam (Crous 2002, Crous *et al.* 2004, Lombard *et al.* 2015a, Li *et al.* 2017, Liu & Chen 2017, Pham *et al.* 2019). Of those species, 14 were isolated from soil collected in Asia, suggesting this geographic region could be their centre of origin. There are, however, few studies that have considered the centres of origin of *Calonectria* species (Wright

et al. 2010, Freitas *et al.* 2019, LeBlanc *et al.* 2019, Malapi-Wight *et al.* 2019), emphasizing a need for population biology studies on these fungi in the future.

The synonymised species in this study were generally from regions adjacent to those from which the validated taxa were originally collected. For example, *Ca. cerciana*, together with its now recognised synonyms *Ca. papillata* and *Ca. terrestris* were isolated from adjacent sites in GuangDong Province in southern China (Lombard *et al.* 2010c, 2015a). However, there were also some cases where species reduced to synonymy were from different continents where the climates differed significantly. For example, *Ca. pauciramosa* and the eight species (*Ca. cliffordiicola*, *Ca. ericae*, *Ca. machaerinae*, *Ca. mossambicensis*, *Ca. polizzii*, *Ca. seminaria*, *Ca. tetraramosa* and *Ca. zuluensis*) reduced to synonymy with it, thus were isolated from Africa, Asia, Europe and North America (Schoch *et al.* 1999, Crous & Kang 2001, Crous *et al.* 2013, Lombard *et al.* 2010b, 2015a, 2016, Alfenas *et al.* 2015). The present study further supports the fact that *Ca. pauciramosa* has a worldwide distribution and that it is able to exist under various climatic conditions (Schoch *et al.* 1999, Crous 2002, Lombard *et al.* 2010b, 2015a, 2016, Crous *et al.* 2013).

Results of this study showed that six loci (*act*, *cmdA*, *his3*, *rpb2*, *tef1* and *tub2*) can serve as reliable DNA barcodes for species delimitation in *Calonectria*. A similar six gene approach has been established for *Colletotrichum*, where the *act*, *chs-1*, *gapdh*, *his3*, ITS and *tub2* regions have been employed to reveal the phylogenetic relationships of species with curved conidia from herbaceous hosts (Damm *et al.* 2009). Likewise, six markers (*act*, *cmdA*, *gapdh*, *gs*, ITS and *tub2*) were utilised to characterise the species of *Colletotrichum* associated with coffee berries in northern Thailand (Prihastuti *et al.* 2009). A six gene (*act*, ITS, LSU, *rpb1*, *tef1* and *tub2*) approach has also been used for the phylogenetic analyses of *Allantonectria*, *Nectria*, and *Pleonectria* (Hirooka *et al.* 2012). The present study has revealed that optimal barcodes for taxon delimitation differs for the various *Calonectria* species complexes. This is similar to the case in *Fusarium*, where five barcodes (*cmdA*, IGS, *rpb2*, *tef1* and *tub2*) were applied to stabilise the taxonomic position of species in the *Fusarium oxysporum* species complex (Lombard *et al.* 2019). Similarly, Wang *et al.* (2019) utilised five loci (*cmdA*, ITS, *rpb1*, *rpb2* and *tef1*) to evaluate and clarify the phylogenetic relationships of the *F. incarnatum-equiseti* species complex. Although the ideal set of barcodes differed among the various species complexes in *Calonectria*, six loci (*act*, *cmdA*, *his3*, *rpb2*, *tef1* and *tub2*) served as the most phylogenetically informative markers. These are consequently recommended as the universal DNA barcodes for species delimitation in *Calonectria*.

Multi-gene phylogenetic analyses combined with morphological features provides a robust means to delimit fungal species boundaries (James *et al.* 2006, Hibbett *et al.* 2007, Liu *et al.* 2015, Chen *et al.* 2017, Woudenberg *et al.* 2017). This polyphasic approach has been widely employed in the taxonomy of *Calonectria* species (Lombard *et al.* 2010a, Chen *et al.* 2011, Crous *et al.* 2012, Alfenas *et al.* 2015, Lombard *et al.* 2016, Marin-Felix *et al.* 2017, Pham *et al.* 2019). However, a problem pertaining to the taxonomy of this group is that studies have used different markers and gene regions to identify species. This lack of consistency has resulted in confusion, and the many synonyms identified in the present study also arise, at least to some extent, from an inconsistency of taxonomic approaches.

In an attempt to provide a unified taxonomic system for *Calonectria*, we have evaluated the sequence data for eight gene regions that are available for all 120 species. These results showed that sequences of *tef1* and *tub2* provide markers that can recognise the majority of *Calonectria* species. The *tef1* and *tub2* combined phylogeny made it possible to recognise 118 of the 120 (98 %) species, indicating that combinations of *tef1* and *tub2* gene sequences are suitable for preliminary identification of *Calonectria* species. Results of this study indicated that the *tef1* region provided the best barcode, which is in contrast to the study of Lombard *et al.* (2010a), who suggested that the *cmdA* region provides the best signal for species recognition in these fungi. Results of the present study also indicated that the *rpb2* region provides stable and reliable taxonomic signal for *Calonectria* identification and this is the first study where that gene region has been sequenced for a large collection of species in this genus.

Overall, the results of this study have provided a robust overview of the species boundaries in *Calonectria*. This is based largely on phylogenetic inference using DNA sequences for eight gene regions. It is evident that, over a period of approximately 10 yr (Lombard *et al.* 2010a, 2015a, 2016, Li *et al.* 2017, Marin-Felix *et al.* 2017, Pham *et al.* 2019), numerous species have been described in *Calonectria* that are synonyms of existing species. This is a common problem in many groups of fungi where species were described based on relatively limited DNA sequence data. As time has passed, new and more informative gene regions have become available to define phylogenetic species boundaries more clearly. The DNA sequence backbone emerging and reliable DNA barcodes resulting from the present study provides a robust foundation for future taxonomic studies on the group. It is recognised that in many cases, species identity in this study is based on only a single or a small number of isolates. Clearly, larger collections of isolates will help to further confirm species boundaries and provide a better understanding of species delineation. However, the framework presented here will provide an ideal basis on which to explore this further. Furthermore, the genomes of numerous *Calonectria* spp. have now been sequenced (Malapi-Wight *et al.* 2016a, b, Ye *et al.* 2018, Liu *et al.* 2019). In time, it is likely that phylogenomic studies will increase the clarity of species boundaries and provide even more robust DNA barcodes for *Calonectria.*

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APPENDIX A. SUPPLEMENTARY DATA

Supplementary data to this article can be found online at https://doi.org/10.1016/j.simyco.2020.08.001.

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