Revising the Schizoparmaceae: Coniella and its synonyms Pilidiella and Schizoparme

L.V. Alvarez¹, J.Z. Groenewald², and P.W. Crous²,³,⁴*

¹Polytechnic University of the Philippines, Santa Mesa, Manila, Philippines; ²CBS-KNAW Fungal Biodiversity Centre, P.O. Box 85167, 3508 AD Utrecht, The Netherlands; ³Department of Microbiology and Plant Pathology, Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria, Pretoria 0002, South Africa; ⁴Microbiology, Department of Biology, Utrecht University, Padualaan 8, 3584 CH Utrecht, The Netherlands

*Correspondence: P.W. Crous, p.crous@cbis.knaw.nl

Abstract: The asexual genera Coniella (1918) and Pilidiella (1927), including their sexual morphs in Schizoparme (1923), have a cosmopolitan distribution and are associated with foliar, fruit, leaf, stem and root diseases on a wide variety of hosts. Species of these genera sometimes occur as secondary invaders of plant tissues infected by other organisms or that are injured by other causes. Several studies published over the last few decades had conflicting ideas as to whether Coniella, Pilidiella and Schizoparme should be regarded as synonymous or as separate genera. The present study aims to resolve the generic classification of these genera through phylogenetic analyses of the concatenated alignment of partial LSU nrDNA, rpb2, ITS nrDNA and lef1 sequence data of 117 isolates, combined with their morphology. Results revealed that all strains cluster in a single well-supported clade. Conidial colour, traditionally the distinguishing characteristic between Coniella and Pilidiella, evolved multiple times throughout the clade, and is not a good character at generic level in Schizoparmeaceae. The three genera should therefore be regarded as synonymous, with the older name Coniella having priority. Furthermore, this study delineated 13 new species, and new combinations were proposed for a further 15 species.

Key words: Diaporthales, DNA phylogeny, phytopathogenic fungi, Sordariomycetes, systematics.

T axonomic novelties: New species: Coniella africana L.V. Alvarez & Crous, C. erumpens L.V. Alvarez & Crous, C. fusiformis L.V. Alvarez & Crous, C. javanica L.V. Alvarez & Crous, C. koreana L.V. Alvarez & Crous, C. lanareae L.V. Alvarez & Crous, C. immoniformis L.V. Alvarez & Crous, C. malaysiana L.V. Alvarez & Crous, C. nicotinae L.V. Alvarez & Crous, C. obovata L.V. Alvarez & Crous, C. pseudostromatinae L.V. Alvarez & Crous, C. solicina L.V. Alvarez & Crous; New combinations: C. angustispora (Samuels et al.) L.V. Alvarez & Crous, C. calamica (J. Fröhli & K.D. Hyde) L.V. Alvarez & Crous, C. cristusi (Rajeshk. et al.) L.V. Alvarez & Crous, C. destruens (M.E. Barr & Hodges) L.V. Alvarez & Crous, C. diphloides (Crous & van Niekerk) L.V. Alvarez & Crous, C. eucalyptigena (Crous & M. J. Wingf.) L.V. Alvarez & Crous, C. eucalyptorum (Crous & M. J. Wingf.) L.V. Alvarez & Crous, C. nigra (P.N. Mathur et al.) L.V. Alvarez & Crous, C. pseudognarati (Crous) L.V. Alvarez & Crous, C. quercicola (Oudem.) L.V. Alvarez & Crous, C. straminea (Shear) L.V. Alvarez & Crous, C. stromatica (Samuels et al.) L.V. Alvarez & Crous, C. tibouchinae (B.E.C. Miranda et al.) L.V. Alvarez & Crous, C. wangensis (Crous & Summerville) L.V. Alvarez & Crous; New name: C. terminalicola L.V. Alvarez & Crous (basionym: Schizoparme terminaliae Samuels et al.).

Available online 23 September 2016; http://dx.doi.org/10.1016/j.simyco.2016.09.001.

INTRODUCTION

The asexual genera Coniella (1918) and Pilidiella (1927) and their sexual morph Schizoparme (1923), are fungal pathogens associated with foliar, fruit, stem and root diseases on a wide variety of hosts (Van Niekerk et al. 2004). These genera occur as parasites on unrelated dicotyledonous hosts (Samuels et al. 1993) or sometimes as secondary invaders of plant tissues infected by other organisms or injured by other causes (Feerreira et al. 1997) (Fig. 1).

The genus Coniella was established by Von Höhnel (1918), typified by C. pulchella (= C. fragariae; Crous et al. 2014a). Coniella was divided into two subgenera by Petrak & Sydow (1927), namely Euconiella (dark conidia), typified by C. pulchella, and Pseudoconiella (hyaline to pale conidia), typified by C. granati (Sutton 1969). Other genera in this complex include Anthasthoopa, typified by A. samba, and Cyclodomella, typified by C. nigra (Subramanian & Ramakrishnan 1956, Mathur & Thirumalachar 1959). Sutton (1969) considered the latter genera synonyms of Coniella.

The genus Pilidiella, typified by P. quercicola, was established by Petrak & Sydow (1927). Schizoparme, typified by S. straminea, was described as a species occurring on a wide variety of woody and herbaceous hosts (Shear 1923). Maas et al. (1979) linked S. straminea to the asexual morph, P. quercicola. Because of the change to one scientific name for fungi based on the International Code of Nomenclature for algae, fungi and plants (McNeill et al. 2012, Wingfield et al. 2012, Crous et al. 2015a), Rossman et al. (2015) recommended that the generic name Pilidiella (1927) should be protected over that of Schizoparme (1923), as Pilidiella had been more widely used in literature than Schizoparme, and also has more species.

Van der Aa (in Von Arx 1973) and Von Arx (1981) treated Coniella and Pilidiella as separate genera, the former characterised by dark brown conidia and Pilidiella by hyaline conidia that become pale brown with age. However, conidial pigmenta-

Peer review under responsibility of CBS-KNAW Fungal Biodiversity Centre. Copyright © 2017, CBS-KNAW Fungal Biodiversity Centre. Production and hosting by ELSEVIER B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
Schizoparme complex represented a distinct clade in the Diaporthales, which led Rossman et al. (2007) to introduce the Schizoparmaceae to accommodate these genera. Since the paper of Van Niekerk et al. (2004), several additional species have been added to this complex (Rajeshkumar et al. 2011, Crous et al. 2012, 2015b, 2015c, Miranda et al. 2012), which revealed intermediate clades between Coniella and Pilidiella s.str.

The aims of the present study were to (i) resolve the classification of these genera through phylogenetic analyses of partial LSU nrDNA, partial DNA-directed RNA polymerase II second largest subunit (rpb2), ITS nrDNA and partial translation elongation factor 1-alpha (tef1) DNA data, combined with morphological observations, and (ii) confirm the identities of Coniella, Pilidiella and Schizoparme species known from culture.

**MATERIALS AND METHODS**

**Isolates**

One hundred and seventeen isolates (Table 1) excluding the outgroup species Melanconiella hyperoptica (culture CBS 131696) and Melanconiella sp. (CBS 110385) were analysed for this study. The isolates were obtained from the CBS-KNAW Fungal Biodiversity Centre, Utrecht, The Netherlands (CBS) and from the working collection of P.W. Crous (CPC) housed at CBS. In addition, fresh collections were made from conidiomata and ascomata. Colonies were established from sporulating conidiomata and ascomata using the methods in Crous et al. (1991). Cultures were grown on Petri dishes containing 2 % malt extract agar (MEA), potato dextrose agar (PDA), and oatmeal agar (OA) (Crous et al. 2009), and incubated at 25 °C under continuous near-ultraviolet light to promote sporulation.

**DNA isolation, amplification and phylogenetic analysis**

Genomic DNA was extracted from fungal mycelium grown on malt extract agar (MEA) plates using the Wizard® Genomic DNA Purification Kit (Promega, USA) according to manufacturer’s instructions. The isolated gDNA was used for PCR amplification and subsequent sequencing. These regions included partial ITS nrDNA, tef1, LSU nrDNA and rpb2 (Table 2). The primers ITS1, ITS4 and ITS5 (White et al. 1990) or V9G (De Hoog & Gerrits van den Ende 1998) were used to amplify the ITS nrDNA, spanning the 3' end of the 18S nrRNA gene, the first internal transcribed spacer (ITS1), the 5.8S nrRNA gene, the second ITS region and the 5' end of the 28S nrRNA gene; primers EF1F and EF2F (Groenewald et al. 2013) or EF1-728F and EF1-986R (Carbone & Kohn 1999) or EF-2 (O'Donnell et al. 1998) were used to amplify a portion of tef1; primer pair LR0R (Rehner & Samuels 1994) and LR7 (Vilgalys & Hester 1990) to amplify the first approximately 1 200 nucleotides of the LSU nrDNA region; and primers fRPB2-5F or fRPB2-6F or fRPB2-7cR (Liu et al. 1999), fRPB2-5F2 (Sung et al. 2007) were used to amplify part of the rpb2 gene.

Amplification reactions had a total reaction volume of 12.5 μL. For both ITS nrDNA and tef1, the solution mixture was composed of 1× PCR buffer (Bioline GmbH, Luckenwalde, Germany), 2 mM MgCl₂, 5.6 % DMSO (v/v), 40 μM dNTPs, 0.2 μM of each forward and reverse primer, 0.5 U of BioTaq DNA polymerase (Bioline GmbH, Luckenwalde, Germany), and 10 ng of genomic DNA. PCR conditions were the same for LSU and rpb2, except for the MgCl₂ concentration: 5.04 mM MgCl₂ for the LSU and 2.52 mM MgCl₂ for the rpb2 with the same concentration of 60 μM dNTPs and 5.03 % DMSO (v/v). The PCR conditions for ITS, tef1 and LSU were: start step of 5 min at 94 °C, followed by 35 cycles of 30 s at 94 °C, 1 min at 54 °C annealing temperature, and 1 min 30 s at 72 °C, followed by a final step of 5 min at 72 °C. A touch-down PCR was used for rpb2: start step of 5 min at 94 °C, followed by 5 cycles of 45 s at 94 °C, 45 s at 60 °C annealing temperature, and 2 min at 72 °C; 5 cycles of 45 s at 94 °C, 45 s at 58 °C annealing temperature, and 2 min at 72 °C; 30 cycles of 45 s at 94 °C, 45 s at 54 °C annealing temperature, and 2 min at 72 °C followed by a final step of 8 min at 72 °C.

However, some of the primer pairs failed to amplify with some isolates included in this study, hence, several combinations of the above-mentioned primer pairs were tested. Following PCR amplification, amplicons mixed with GelRed™ (Biotium, Hayward, CA, USA) were visualised on 1 % agarose gels viewed under ultra-violet light. Sizes of amplicons were determined against a HyperLadder™ I molecular marker (Bio-line, London, UK). PCR amplicons of the four gene regions targeted in this study served as templates for DNA sequencing reactions with the BigDye® Terminator Cycle Sequencing Kit v. 3.1 (Applied Biosystems Life Technologies, Carlsbad, CA, USA).
Table 1. Details of the strains included for molecular and/or morphological study. Names of taxonomic novelties are printed in **bold**.

| Species name | Original name | Strain accession number | Substrate of isolation | Origin | Collector(s) | GenBank accession number | LSU | rpb2 | ITS | tef1 |
|--------------|---------------|-------------------------|------------------------|--------|-------------|--------------------------|-----|------|-----|------|
| Coniella africana | Schizoparme straminea | CBS 114133T = CPC 405 | Eucalyptus nitens leaf litter | South Africa | P.W. Crous | AY39293 KX833421 AY339344 KX833600 |
| Coniella crousii | Pilidiella crousii | NFCCI 2213 | Terminalia chebula fallen fruits | India | K.C. Rajeshkumar | – |
| Coniella diplodiella | Pilidiella diplodiella | CBS 111022 = CPC 3736 = L-1435-W (2) | Vitis vinifera | South Africa | F. Halleen | KX833334 – KX833512 KX833601 |
| P. diplodiella | CBS 111857 = CPC 3735 | Vitis vinifera | South Africa | F. Halleen & P. Fourie | AY392925 KX833422 AY339325 KX833602 |
| P. diplodiella | CBS 111858 = CPC 3708 | Vitis vinifera stems | France | P.W. Crous | AY339335 KX833423 AY339323 KX336603 |
| Coniella sp. | CBS 112333 = CPC 3775 | Vitis vinifera var. Sauvignon | France | Quarantine - Imports | KX833336 KX833424 AY339329 KX336604 |
| Coniella sp. | CBS 112335 = CPC 3771 | Vitis vinifera var. Petit Verdot | France | Quarantine - Imports | KX833337 KX833425 KX833513 KX833605 |
| Coniella sp. | CBS 112336 = CPC 3770 | Vitis vinifera var. Petit Verdot | France | Quarantine - Imports | KX833338 KX833426 KX833514 KX833606 |
| Coniella petrakii | CBS 112346 = CPC 3831 | Vitis vinifera var. Petit Verdot | France | Quarantine - Imports | KX833339 KX833427 KX833515 KX833607 |
| C. petrakii | CBS 112362 = CPC 3830 | Vitis vinifera | France | Quarantine - Imports | KX833341 KX833429 KX833517 KX833609 |
| P. diplodiella | CBS 112505 = CPC 3778 | Vitis vinifera var. Merlot | France | Quarantine - Imports | KX833342 KX833430 AY339330 KX336610 |
| C. petrakii | CBS 112704 = CPC 3863 | Vitis vinifera | France | Quarantine - Imports | KX833343 KX833431 KX336618 |
| C. petrakii | CBS 112718 = CPC 3928 | Vitis vinifera | South Africa | Quarantine - Imports | KX833344 KX833432 KX833519 KX833611 |
| C. petrakii | CBS 112729 = CPC 3927 | Vitis vinifera | South Africa | Quarantine - Imports | KX833345 KX833433 KX833520 KX833613 |
| C. petrakii | CBS 112732 = CPC 3925 | Vitis vinifera | South Africa | Quarantine - Imports | KX833346 KX833434 KX833521 KX833614 |
| C. petrakii | CBS 112735 = CPC 3926 = L 4923.3 | Vitis vinifera | South Africa | Quarantine - Imports | – – KX833522 KX833615 |
| P. diplodiella | CBS 114008 = CPC 3769 | Vitis vinifera var. Petit Verdot | France | Quarantine - Imports | KX833447 KX833435 AY339328 KX833616 |
| C. petrakii | CBS 115427 = CPC 3868 | Vitis vinifera var. Petit Verdot | France | Quarantine - Imports | KX833448 – KX336523 – |
| C. petrakii | CBS 115431 = CPC 3860 | Vitis vinifera | France | Quarantine - Imports | KX833449 KX833436 KX833524 KX833617 |
| C. petrakii | CBS 115433 = CPC 3832 | Vitis vinifera | France | Quarantine - Imports | KX83350 KX833437 KX833525 KX833618 |
| C. petrakii | CBS 115434 = CPC 3861 | Vitis sp. | France | Quarantine - Imports | KX83351 – KX833526 KX833619 |
| C. petrakii | CBS 115514 = CPC 3929 = L 4923.1 | Vitis vinifera | South Africa | Quarantine - Imports | KX833522 – KX833527 KX833620 |
| C. diplodiella | CBS 116312 = CPC 3707 | Vitis vinifera | France | – | KX83353 KX833438 KX833528 KX833621 |
| Coniella sp. | CBS 165.84 | Vitis berlandieri × V. riparia twig | Germany | – | KX83354 KX833439 KX833529 KX833622 |
| C. diplodiella | CBS 166.84 = CPC 3931 | Vitis berlandieri × V. riparia twig | Germany | – | AY339286 – AY33931 KX33623 |
| Coniella diplodiopsis | Pilidiella diplodiopsis | CBS 109.23 = CPC 3933 | Vitis vinifera | Switzerland | H. Faes | AY339287 KX833440 AY339332 KX833624 |

(continued on next page)
| Species name | Strain accession number | Substrate of isolation | Origin | Collector(s) | GenBank accession number | LSU | rpb2 | ITS | tef1 |
|--------------|-------------------------|------------------------|--------|--------------|-------------------------|-----|------|-----|------|
| C. petrakii  | CBS 112637 = CPC 4228   | Vitis vinifera         | South Africa | G. van Collier | KX833355 KX833441 KX833530 KX833625 |
| C. petrakii  | CBS 112702 = CPC 3866   | Vitis vinifera var. Petite Verdot | France | Quarantine - Imports | KX833356 KX833442 KX833531 KX833626 |
| C. petrakii  | CBS 116310 = CPC 3793   | Vitis vinifera var. Petite Verdot | France | Quarantine - Imports | KX833357 KX833443 KX833532 KX833627 |
| Coniella sp. | CBS 164.84              | Vitis berlandieri × V. riparia twig | Germany | – | – | – | – | – |
| P. diploidiopsis | CBS 169.55 = CPC 3938 | Vitis vinifera     | Switzerland | – | KX833358 – KX833364 – | KX833358 – KX833364 – | KX833358 – KX833364 – | KX833358 – KX833364 – | KX833358 – KX833364 – |
| C. diploidiella | CBS 170.55 = LCP 55.1928 | Vitis vinifera | Switzerland | – | – | – | – | – |
| P. diploidiopsis | CBS 590.84° = CPC 3940 | Vitis vinifera canes | Italy | P.W. Crous | AY339288 – AY339334 – | AY339288 – AY339334 – | AY339288 – AY339334 – | AY339288 – AY339334 – |
| Coniella erumpens | CBS 523.78° = CPC 139893° | Rotten wood | Chile | A.E. Gonzales | KX833361 KX833446 KX833535 KX833630 |
| Coniella eucalyptigena | CBS 139893° = CPC 24793 | Eucalyptus brassiana leaves | Malaysia | M.J. Wingfield | KR476760 – KR476725 – | KR476760 – KR476725 – | KR476760 – KR476725 – | KR476760 – KR476725 – |
| Coniella eucalyptorum | CBS 110674 = CPC 610 | Eucalyptus sp. bark | Brazil | M.J. Wingfield | KX833362 KX833447 KX833536 KX833631 |
| Pilidiella eucalyptorum | CBS 111023 = CPC 3843 | Eucalyptus phylla | Mexico | – | KX833363 KX833448 KX833537 KX833632 |
| C. fragariae | CBS 111024 = CPC 3906 = DFR 100190 | – | Australia | P.Q. Thu & R.J. Gibbs | KX833364 – KX833359 – | KX833364 – KX833359 – | KX833364 – KX833359 – | KX833364 – KX833359 – |
| Coniella sp. | CBS 111202 = CPC 1333 | – | Indonesia | M.J. Wingfield | KX833365 KX833449 KX833539 | KX833643 |
| P. eucalyptorum | CBS 111204 = CPC 1334 | – | Indonesia | M.J. Wingfield | KX833366 KX833450 KX833540 | KX833643 |
| C. fragariae | CBS 112341 = CPC 3845 | Eucalyptus phylla | Mexico | – | KX833367 KX833451 KX833541 | KX833643 |
| P. eucalyptorum | CBS 112640° = CPC 3904 = DFR 100185 | Eucalyptus grandis × E. tereticornis hybrid leaves | Australia | P.Q. Thu & R.J. Gibbs | AY339290 KX833452 | AY339338 KX833637 |
| Coniella fragariae | CBS 112651 = CPC 3913 = UFV 2 | Eucalyptus sp. | Brazil | A.C. Alfenas | – – | – – | – – | – – |
| P. eucalyptorum | CBS 112716 = CPC 3912 = UFV 1 | Eucalyptus sp. | Brazil | A.C. Alfenas | KX833368 KX833453 | AY339341 KX833639 |
| C. fragariae | CBS 112719 = CPC 3921 = UFV 10 | Eucalyptus sp. | Brazil | A.C. Alfenas | KX833369 KX833454 KX833543 | KX833640 |
| C. fragariae | CBS 112720 = CPC 3922 = UFV 11 | Eucalyptus sp. | Brazil | A.C. Alfenas | KX833370 KX833455 KX833544 | KX833641 |
| C. fragariae | CBS 112721 = CPC 3923 = UFV 12 | Eucalyptus sp. | Brazil | A.C. Alfenas | KX833371 KX833456 KX833545 | KX833642 |
| C. fragariae | CBS 112726 = CPC 3914 = UFV 3 | Eucalyptus sp. | Brazil | A.C. Alfenas | KX833372 – KX833354 | KX833643 |
| C. fragariae | CBS 112731 = CPC 3918 = UFV 7 | Eucalyptus sp. | Brazil | A.C. Alfenas | KX833373 KX833457 KX833547 | KX833644 |
| C. fragariae | CBS 112733 = CPC 3920 = UFV 9 | Eucalyptus sp. | Brazil | A.C. Alfenas | – – KX833548 – | – – KX833548 – | – – KX833548 – | – – KX833548 – |
| Species name     | Strain accession number | Substrate of isolation | Origin  | Collector(s)       | GenBank accession number | LSU | rpb2 | ITS | tef1 |
|------------------|-------------------------|------------------------|---------|-------------------|--------------------------|-----|------|-----|------|
| *P. eucalyptorum*| CBS 114134 = CPC 3905   | Eucalyptus camaldulensis ssp. simulata | Vietnam | M.J. Dudzinski & P.Q. Thu | AY339289 KX833458 AY339339 KX833645 |     |      |     |      |
|                 | CBS 114841              | Eucalyptus grandis × E. tereticornis | Australia | T. Burgess & G. Pegg | KX833374 KX833459 KX833549 KX833646 |     |      |     |      |
|                 | CBS 114842              | Corymbia nesophila     | Australia | T. Burgess & G. Pegg | – – – KX833550 – |     |      |     |      |
|                 | CBS 114843              | Eucalyptus microcorys   | Australia | T. Burgess & G. Pegg | KX833375 KX833460 KX833551 KX833647 |     |      |     |      |
|                 | CBS 114844              | Eucalyptus microcorys   | Australia | T. Burgess & G. Pegg | KX833376 – KX833552 – KX833648 |     |      |     |      |
|                 | CBS 114845              | Eucalyptus grandis     | Australia | T. Burgess & G. Pegg | KX833377 KX833461 KX833553 KX833649 |     |      |     |      |
|                 | CBS 114846              | Eucalyptus grandis     | Australia | T. Burgess & G. Pegg | KX833378 KX833462 KX833554 KX833650 |     |      |     |      |
|                 | CBS 114847              | Eucalyptus pelilta     | Australia | T. Burgess & G. Pegg | KX833379 KX833463 KX833555 KX833651 |     |      |     |      |
|                 | CBS 114852              | Eucalyptus sp.         | Chile   | G. Hardy           | KX833381 KX833465 KX833557 KX833653 |     |      |     |      |
|                 | CBS 115531 = CPC 3917 = UFV 6 | Eucalyptus sp.         | Brazil  | A.C. Allenas      | KX833382 – KX833558 – KX833654 |     |      |     |      |
|                 | CBS 115532 = CPC 3915 = UFV 4 | Eucalyptus sp.         | Brazil  | A.C. Allenas      | KX833383 KX833466 KX833559 KX833655 |     |      |     |      |
| Coniella sp.    | CPC 13347               | Eucalyptus urophylla   | Venezuela | M.J. Wingfield | KX833384 KX833467 KX833560 KX833656 |     |      |     |      |
| Pilidiella sp.  | CPC 13809               | Eucalyptus grandis     | China   | M.J. Wingfield | KX833385 KX833468 KX833561 KX833657 |     |      |     |      |
| Coniella sp.    | CPC 16693               | Eucalyptus pelilta     | Malaysia | S.S. Lee          | KX833386 KX833469 KX833562 KX833658 |     |      |     |      |
| Coniella sp.    | CPC 16703               | Corymbia torelliana   | Malaysia | S.S. Lee          | KX833387 KX833470 KX833563 KX833659 |     |      |     |      |
| Coniella sp.    | CPC 19802               | Eucalyptus sp.         | Indonesia | M.J. Wingfield | – – KX833564 – KX833660 |     |      |     |      |
| Coniella sp.    | CBS 164.37              | Ulmus campestris       | Italy   | Van Gescher       | KX833388 KX833471 KX833565 KX833661 |     |      |     |      |
| C. fragariae    | CBS 167.84 = CPC 3934   | Vitis berlandieri × V. riparia twig | Germany | – | EU754149 – AY339318 KX833662 |     |      |     |      |
| C. fragariae    | CBS 172.49 × T = CPC 3930 | Fragaria sp. stem base | Belgium | A. Jaarsveld     | KX833928 KX833472 AY339317 KX833663 |     |      |     |      |
| C. diplodiella  | CBS 180.48              | Linum usitatissimum    | Canada  | T.C. Vanterpool   | KX833389 – KX833566 KX833664 |     |      |     |      |
| C. fragariae    | CBS 183.52              | Tamarix sp.            | –       | S. de Boer        | KJ710442 KX833473 KX833567 KX833665 |     |      |     |      |
| C. fragariae    | CBS 198.82              | Soil sample, vine orchard | France | G.J. Bollen       | EU754150 – KJ710465 KX833666 |     |      |     |      |
| C. diplodiella  | CBS 294.75 = LCP 70.3001 | Malus sylvestris stem | France  | M. Morelet        | KX833390 KX833474 KX833568 KX833667 |     |      |     |      |
| C. diplodiella  | CBS 295.75 = DAOM 146648 | Vicia faba root       | Canada  | – | KX833391 KX833475 KX833569 KX833668 |     |      |     |      |
| Species name | Original name | Strain accession number¹,² | Substrate of isolation | Origin | Collector(s) | GenBank accession number³ |
|-------------|--------------|---------------------------|-----------------------|--------|-------------|-------------------------|
| C. diplodiella | CBS 296.74 | Fragaria × ananassa var. Cambridge Favourite crown | UK: Scotland | W.R. Jarvis | KX833392 KX833476 KX833570 KX833669 |
| Coniella sp. | CBS 454.68 | Malus sylvestris root | Denmark | – | KX833393 KX833477 KX833571 KX833670 |
| Pilidiella sp. | CPC 23625 | Poa sp. | The Netherlands | W. Quaedvlieg | KX833394 KX833478 KX833572 KX833671 |
| Pilidiella sp. | CPC 23652 | Poa sp. | The Netherlands | W. Quaedvlieg | – – KX833573 – |
| Coniella fusiformis | CBS 141596⁶ = CPC 19722 | Eucalyptus sp. leaves | Indonesia | M.J. Wingfield | KX833397 KX833481 KX833576 KX833674 |
| Coniella granati | CBS 130974 = CPC 19625 | Punica granatum | Iran | – | KX833398 KX833482 JN815312 KX833675 |
| P. granati | CBS 130975 = CPC 19626 | Punica granatum | Iran | – | KX833399 JN815313 KX833676 |
| Coniella granati | CBS 132860 | Punica granatum | Turkey | N. Mükærrem Çeliker | KX833400 KX833484 KX833577 KX833677 |
| P. granati | CBS 152.33 | Punica granatum mummified fruit | Cyprus | – | AF408379 KX833485 KX833578 KX833678 |
| P. granati | CBS 155.71 | Citrus sp. root | Turkey | – | KX833401 KX833486 KX833579 KX833679 |
| P. granati | CBS 208.56 | Punica granatum decaying fruit | Turkey | – | KX833402 KX833487 KX833580 KX833680 |
| P. granati | CBS 252.38 = ATCC 12685 = CPC 3714 | Vitis vinifera | Italy | G. Goldnich | AY339291 KX833488 KX833581 KX833681 |
| Coniella javanica | CBS 814.71 | Punica granatum fruit | Turkey | N. Kaskaloglu | AY339290 – KX833582 KX833682 |
| P. granati | CBS 455.68⁷ | Hibiscus sabdariffa leaf spot | Indonesia | J.H. van Emden | KX833403 KX833489 KX833583 KX833683 |
| Coniella koreana | CPC 143.97⁷ | – | South Korea | Kyung S. Bae | AF408378 KX833490 KX833584 KX833684 |
| Coniella lannea | CPC 141597⁷ = CPC 22200 | Lannea sp. leaves | Zambia | M. van der Bank | KX833404 KX833491 KX833585 KX833685 |
| Coniella limoniformis | CPC 111021⁷ = PPRI 3870 = CPC 3828 = ARC-MYC J 13102 | Fragraia sp. | South Africa | C. Roux | KX833405 KX833492 KX833586 KX833686 |
| Coniella macrospora | Coniella macrospora | CBS 524.73⁷ = CPC 3935 | Terminalia ivoriensis stem | Ivory Coast | F. Brunck | AY339292 KX833493 KX833587 KX833687 |
| Coniella malaysiana | Coniella sp. | CBS 141596⁷ = CPC 16659 | Corrymbia torelliana leaves | Malaysia | S.S. Lee | KX833406 KX833494 KX833588 KX833688 |
| Coniella musaënsis var. hibisci | CBS 109757 = AR 3534 | Hibiscus sp. | Africa | A. Rossman | AF408337 – KX833589 KX833689 |
| Coniella nicotianae | CPC 875.72⁷ = PD 72/793 | Nicotiana tabacum | Jamaica | – | KX833407 KX833495 KX833590 KX833690 |
| Coniella nigra | C. fragariae | CBS 165.60⁷ = IMI 181519 = IMI 181599 = CPC 4198 | Soil | India | V.V. Bhatt | KX833408 KX833496 AY339319 KX833691 |
| Coniella obovata | Coniella australiensis | CBS 111025 = CPC 4196 = IMI 261318 | Leaf litter | South Africa | K.T. van Warmelo | KX833409 KX833497 AY339313 KX833692 |
| Coniella paracastaneicola | P. castaneicola | Eucalyptus sp. leaves | Australia | P.W. Crous, J. Edwards & P.W.J. Taylor | KX833410 KX833498 KX833591 KX833693 |
| Species name | New name | Strain accession number | Substrate of isolation | Origin | Collector(s) | GenBank accession number |
|--------------|----------|-------------------------|------------------------|--------|-------------|-------------------------|
| *P. castaneicola* | CPC 25498 | Eucalyptus sp. | Australia | P.W. Crous, J. Edwards & P.W.J. Taylor | KX833411 – KX833592 KX833694 |
| *Coniella peruensis* | C. fragariae | CBS 110394 = RMF 74.01 | Soil of rain forest | Peru | M. Christensen | KJ710441 KX833499 KJ710463 KX833695 |
| *Coniella psuedogranati* | Schizoparme pseudogranati | CBS 137980 = CPC 22545 | Terminalia stuhlmannii | Zambia | M. van der Bank | KJ869189 – KJ869132 – |
| *Coniella pseudostraminea* | P. granati | CBS 112624 = IMI 233050 | Fragaria sp. | South Africa | P.W. Crous | KX833412 KX833500 KX833593 KX833696 |
| *Coniella quercicola* | P. quercicola | CBS 283.76 | Excrements of Glomerus, which had eaten forest soil | The Netherlands | H. Schoot | KX833413 KX833501 KX833594 KX833697 |
| *P. quercicola* | CBS 904.69 | Quercus robur leaf litter | The Netherlands | E. Jansen | KX833414 KX833502 KX833595 KX833698 |
| *P. castaneicola* | CPC 12133 | Eucalyptus sp. | Indonesia | M.J. Wingfield | – KX833503 KX833596 KX833699 |
| *Coniella solicina* | C. fragariae | CBS 114007 = IMI 253210 = CPC 4199 | – | USA | B.C. Sutton | KX833415 KX833504 AY339320 KX833700 |
| *C. fragariae* | CBS 766.71 | Soil | South Africa | M.C. Papendorf | KX833416 KX833505 KX833597 KX833701 |
| *C. fragariae* | CPC 17308 | Euphorbia sp. | Canada | K.A. Seifert | KX833417 – KX833598 KX833702 |
| *Coniella sp.* | Pilidiella sp. | CBS 114006 = CPC 4200 = IMI 100482 | Vitis vinifera | India | – | AY339295 – AY339347 KX833703 |
| *Coniella straminea* | S. straminea | CBS 149.22 | Fragaria sp. | USA | C.L. Shear | AY339296 KX833506 AY339348 KX833704 |
| *Coniella tibouchinae* | Pilidiella tibouchinae | CBS 131594 = CPC 18511 | Tibouchina granulosa leaves | Brazil | B.E.C. Miranda | KX833418 KX833507 JQ281774 JQ281778 |
| *P. tibouchinae* | CBS 131595 = CPC 18512 | Tibouchina granulosa leaves | Brazil | B.E.C. Miranda | KX833419 KX833508 JQ281774 JQ281779 |
| *Coniella wangiensis* | Pilidiella wangiensis | CBS 132530 = CPC 19397 | Eucalyptus sp. leaves | Australia | P.W Crous & B.A Summerell | JX069857 KX833509 JX069873 KX833705 |
| *Melanconiella hyperopta* | Melanconiella hyperopta | CBS 131696 | Carpinus betulus corticated twig | Austria | H. Voglmayr | JQ026281 KX833510 JQ026281 KX833706 |
| *Melanconiella sp.* | CBS 110388 | Soil rain forest | Peru | M. Christensen | KX833420 KX833511 KX833599 KX833707 |

1 ATCC: American Type Culture Collection, Virginia, USA; CBS: CBS-KNAW Fungal Biodiversity Centre, Utrecht, The Netherlands; CPC: Culture collection of Pedro Crous; DAOM: Plant Research Institute, Department of Agriculture (Mycology), Ottawa, Canada; IMI: International Mycological Institute, CABI-Bioscience, Egham, Bakeham Lane, United Kingdom; LCP: Laboratory of Cryptogamy, National Museum of Natural History, Paris, France; PD: Plant Protection Service, nVWA, Division Plant, Wageningen, The Netherlands; PPRI: Plant Protection Research Institute, Pretoria, South Africa; RMF: Martha Christensen Soil Fungus Collection; UFV: Univeridade Federal de Viçosa, Brazil.

2 ET: ex-epitype culture; NT: ex-neotype culture; T: ex-type culture.

3 ITS: internal transcribed spacers and intervening 5.8S nrDNA; LSU: 28S nrDNA; rpb2: DNA-directed RNA polymerase II second largest subunit; tef1: translation elongation factor 1-alpha.
following the protocol of the manufacturer. DNA sequencing reactions used the same primers as those for the PCR amplifications. DNA sequencing amplicons were purified through Sephadex® G-50 Super and all characters were unordered and of equal weight. The MP analyses were performed in PAUP v. 4.0b10 (Swofford 2003) using the heuristic search option with 100 random taxon additions and tree bisection and reconnection (TBR) as the branch swapping algorithm. Branches of zero length were collapsed and all multiple, equally most parsimonious trees were saved. The robustness of the trees was evaluated by 1 000 bootstrap replicates (Hillis & Bull 1993). Tree length (TL), consistency index (CI), retention index (RI) and rescaled consistency index (RC) were calculated. The resulting trees were printed with FigTree v. 1.4.2 (http://tree.bio.ed.ac.uk/software/figtree/). For each clade in the concatenated analysis, the position of the members of that clade was determined in the phylogenetic tree obtained from each of the individual loci to confirm that these members still represent a single clade in the individual gene trees. In this way the robustness of a given clade could be evaluated together with the posterior probability value of that clade. A species was only counted if it was distinct from its closest relatives and the species clade contained all the associated strains (see Gomes et al. 2013). Sequences derived in this study were deposited in GenBank (Table 1), the alignments and trees in TreeBASE (www.treebase.org/treebase/index.html), and taxonomic novelties in MycoBank (www.MycoBank.org; Crous et al. 2004).

**Morphology**

Cultures were grown on MEA, OA and PDA and placed under mixed cool white fluorescent and near-UV light at 25 °C to enhance sporulation. Morphological observations were made from structures on PDA or OA mounted in Shear's solution and/or clear lactic acid. The 95 % confidence intervals of conidial measurements were derived from at least 30 observations (when possible) at ×1 000 magnification. As certain species show overlapping conidial dimensions, but differ regarding spore volume, the average conidial length: width (l: w) is provided together with spore volume. As certain species show overlapping conidial dimensions, but differ regarding spore volume, the average conidial length: width (l: w) is provided together with conidial measurements. The heating parameter was set to 0.3 and the search was stopped when convergence was reached (stopping value = 0.01). Trees were saved every 1 000 generations. The Markov Chain Monte Carlo (MCMC) analysis of 4 chains started in parallel from a random tree topology.

### Table 2. Details of the primers used in the molecular study.

| Locus | Primer | Primer sequence (5′ - 3′) | Orientation | Reference |
|-------|--------|--------------------------|-------------|-----------|
| ITS   | ITS5   | GGAAGTAAAGCTGTACAACAGG   | Forward     | White et al. (1990) |
| ITS1  | TCCGATTGTTAACCCTGGCGG  | Forward     | White et al. (1990) |
| V9G   | TACGCTTCGGCTTTGTGTA     | Forward     | De Hoog & Gerits van den Ende (1998) |
| ITS4  | TCCCTCGTTATTGATTGC      | Reverse     | White et al. (1990) |
| LSU   | LR0R   | ACCCGCGTGAACCTAAGC       | Forward     | Rehner & Samuels (1994) |
|       | LR7    | TACTACACAAGAGCT          | Reverse     | Vilgays & Hester (1990) |
| rpb2  | RPB2-5F| GAYGAYMGWATCAYTTYG       | Forward     | Liu et al. (1999) |
|       | RPB2-5F2 | GGGGWQYCAAGAGAGC       | Forward     | Sung et al. (2007) |
|       | RPB2-6F| TGGGGKWTGGTYTGYGCTGC    | Forward     | Liu et al. (1999) |
|       | bRPB2-6F | TGGGGYATGNTGYCCYGC    | Forward     | Matheny (2005) |
|       | RPB2-7cR | CCCATRGCT TGYTTR CCCAAT | Reverse     | Liu et al. (1999) |
| tef1  | EF1Fd  | GTCTGTTACGCGGCACGTCG    | Forward     | Groenewald et al. (2013) |
|       | EF1-728F | CATCGAGAAGTTCAGAGG     | Forward     | Carbone & Kohn (1999) |
|       | EF2F6  | GATCTACCAATGCGGGTGG    | Forward     | Groenewald et al. (2013) |
|       | EF-2   | GGARGTACACGTSACATGTT   | Reverse     | O’Donnell et al. (1998) |
|       | EF1-988R | TACTGGAGAAGACCCCTTACC | Reverse     | Carbone & Kohn (1999) |

Table 2. Details of the primers used in the molecular study.

1 ITS: internal transcribed spacers and intervening 5.8S nrDNA; LSU: 28S nrDNA; rpb2: DNA-directed RNA polymerase II second largest subunit; tef1: translation elongation factor 1-alpha.
RESULTS

DNA sequencing and phylogenetic analyses

Amplicons of approximately 1 200 bp for partial LSU nrDNA, 760 bp for rp2b, 600 bp for partial ITS nrDNA and 675 for tef1 of the isolates were obtained from this study. The final concatenated alignment consisted of 90 sequences (including the outgroup sequences) and the four loci were represented by 1 130, 552, 409, and 691 alignment positions, including alignment gaps (LSU nrDNA, ITS nrDNA, tef1 and rp2b, respectively).

Based on the results of MrModeltest, a phylogenetic analysis was performed with MrBayes v. 3.1.2 applying the GTR+I+G substitution model with inverse gamma rates and dirichlet base frequencies for ITS nrDNA sequences; the GTR+I+G substitution model with gamma rates and dirichlet base frequencies for LSU nrDNA sequences; the SYM+I+G substitution model with inverse gamma rates and dirichlet base frequencies for ITS nrDNA sequences; the GTR+I+G substitution model with inverse gamma rates and dirichlet base frequencies for ITS nrDNA sequences; and the SYM+I+G substitution model with inverse gamma rates and dirichlet base frequencies for ITS nrDNA sequences; the GTR+I+G substitution model with inverse gamma rates and dirichlet base frequencies for ITS nrDNA sequences; and the SYM+I+G substitution model with inverse gamma rates and dirichlet base frequencies for ITS nrDNA sequences; the GTR+I+G substitution model with inverse gamma rates and dirichlet base frequencies for ITS nrDNA sequences; and the SYM+I+G substitution model with inverse gamma rates and dirichlet base frequencies for ITS nrDNA sequences; the GTR+I+G substitution model with inverse gamma rates and dirichlet base frequencies for ITS nrDNA sequences.

The Bayesian analysis lasted 1 840 000 generations and the consensus trees and posterior probabilities were calculated from the 3 682 trees in two last 25 % of generations) for burn-in. Twenty-five clades, excluding the outgroup, were recognised and discussed here. All Coniella-Pilidiella-Schizoparme strains clustered in a well-supported clade (Parsimony bootstrap (PB) of 100, Bayesian Posterior Probability (BPP) of 1.00) indicated in Fig. 2.

Maximum parsimony analyses were also performed on the individual loci and on the concatenated LSU nrDNA, ITS nrDNA, tef1 and rp2b alignment. The concatenated alignment contained 90 sequences (including the outgroup sequence) and 2 782 characters including alignment gaps; 745 characters were parsimony-informative, 280 were variable and parsimony-uninformative and 1 757 were constant. The parsimony analysis yielded the maximum of 1 000 equally most parsimonious trees (TL = 3 751 steps; CI = 0.505; RI = 0.889; RC = 0.449; HI = 0.495). The same twenty-five clades excluding the outgroup were deduced from the analysis, although some bootstrap support had lower values than BPP, and therefore the parsimony bootstrap support values were mapped unto the phylogeny obtained with the Bayesian analysis (Fig. 2).

Based on the LSU nrDNA it was possible to recognise 21 of the 25 species (84 % success). However, C. fusiformis, C. javanica and C. laneae in clades 3, 4, 5, and C. eucalyptorum from C. malaysiana in clades 17 and 18 could not be separated using this locus. The individual loci ITS nrDNA, tef1 and rp2b successfully separated all (100 %) 25 clades in the combined phylogeny. Using the phylogeny produced by the combined ITS nrDNA, tef1 and rp2b, all of the 25 clades could be recognised species. Moreover, the concatenated LSU nrDNA, ITS nrDNA, tef1 and rp2b tree demonstrated a well-supported separation of the clades resulting in 25 species. Phylogenetic analyses demonstrated that all clades could be regarded as species belonging to only one genus, represented by the fully supported most basal node (PB 100/BPP 1.0).

Morphology

The multigene analysis resulted in 25 well-supported clades correlating to 25 species, some of which were formerly placed in Coniella, Pilidiella or Schizoparme (Table 1, Fig. 2). As mentioned above, all clades should be regarded as species belonging to a single genus, to which the older name Coniella is applied based on priority. The taxa (not all included in the phylogenetic analysis) represent 13 new species, 14 new combinations and one new name, which are treated below.

Schizoparmaceae Rossmann ‘Schizoparmaceae’, Mycoscience 48: 137. 2007.

Pathogens, saprobes, in soil. Ascomata brown to black, collapsed collar, erumpent, becoming superficial, globose, papillate, with central paraphysate ostiole. Asci clavate to subcylindrical, with distinct apical ring, floating free at maturity. Paraphyses lacking. Ascospores ellipsoid, aseptate, hyaline, at times becoming pale brown at maturity, smooth, with or without mucoid caps. Conidiomata pycnidial, immersed to semi-immersed, unilocular, glabrous, ostiolate, brown to dark brown or black; wall irregularly thickened, with plate-like ornamentation. Conidiophores hyaline, smooth, occasionally septate and branched at base, invested in mucus, developing from basal papillae. Conidiogenous cells discrete, subcylindrical, obclavate or lageniform, hyaline, smooth, proliferating percurrently, or with visible periclinal thickening. Conidia ellipsoid, globose, napiiform, fusiform or naviculate with a truncate base and an obtuse to apiculate apex, unicellular, thin- or thick-walled, smooth, hyaline or olivaceous brown to brown, sometimes with a longitudinal germ slit, with or without a mucoid appendage.

Type genus: Coniella Höhn. 1918 (syn. Schizoparme Shear 1923).

Coniella Höhn., Ber. dt. bot. Ges. 36: 316. 1918.

Synonymys: Schizoparme Shear, Mycologia 15: 120. 1923.
Baeumleria Petr. & Syd., Beih. Reprium nov. Spec. Regni veg. 42: 268. 1927.
Pilidiella Petr. & Syd., Beih. Reprium nov. Spec. Regni veg. 42: 462. 1927.
Ananthasooopha Subram. & K. Ramakr., Proc. Indian Acad. Sci., Sect. B 43: 173. 1956.
Cyclostomella Mathur et al., Sydowia 13: 144. 1959.
Embolidium Bat., Brotairea, N.S. 33(3—4): 194. 1964 non Sac. 1978.

Pathogens, saprobes. Ascomata brown to black, collapsed collar, erumpent, becoming superficial, globose, papillate, with central paraphysate ostiole. Asci clavate to subcylindrical, with distinct apical ring, floating free at maturity. Paraphyses lacking. Ascospores ellipsoid, aseptate, hyaline, at times becoming pale brown at maturity, smooth, with or without mucoid caps. Conidiomata pycnidial, immersed to semi-immersed, unilocular, glabrous, ostiolate. Ostiole central, circular or oval, often situated in a conical or rostrate neck. Conidiomata wall brown to dark brown or black wall of thin, pale brown texture angularis on exterior, and hyaline, thin-walled, texture prismatica in the inner layers except at base, which has a convex, pulvinate tissue of hyaline texture angularis giving rise to conidiophores or conidiogenous cells. Conidiophores mostly reduced to conidiogenous cells, occasionally septate and branched at base, invested in mucus. Conidiogenous cells discrete, cylindrical, subcylindrical, obclavate or lageniform, hyaline, smooth-walled,
Fig. 2. Consensus phylogram (50% majority rule) of 4352 trees resulting from a phylogenetic analysis of the four loci (ITS, LSU, \(\text{rpb2}\), \(\text{tef1}\)) using MrBayes v. 3.1.2 and PAUP v. 4.0b10. Parsimony bootstrap support values/Posterior probabilities are indicated at the nodes (only values for deeper nodes). The scale bar denotes the expected substitutions per site. Clades are numbered on the right of the boxes excluding the outgroup and \(\text{Coniella}\) species names with white dots and brown borders reflect hyaline to pale brown conidia, while those with solid brown dots reflect brown to dark brown conidia. Strain accession numbers are followed by the original species name (black), the isolation source (red) and country of origin (green). The branch to the outgroup was shortened to facilitate layout of the tree. The tree was rooted to \(\text{Melanconiella hyperoptica}\) (culture CBS 131696) and \(\text{Melanconiella sp.}\) (CBS 110385).
proliferating percurrently, or with visible periclinal thickening. Conidia ellipsoid, globose, napiform, fusiform or naviculate with a truncate base and an obtuse to apiculate apex, unicellular, thin- or thick-walled, smooth, olivaceous brown to brown, sometimes with a longitudinal germ-slit, with or without a mucoid appendage extending from apex to base on one side; basal hilum with or without short tubular basal appendage. Spermatophores formed in same conidioma, hyaline, smooth, 1-septate with several apical conidiogenous cells, or reduced to conidiogenous cells. Spermatogenous cells cells hyaline, smooth, lageniform to subcyllindrical, with visible apical periclinal thickening. Spermatia hyaline, smooth, red-shaped with rounded ends (adapted from Crous et al. 2014a).

Type species: Coniella fragariae (Oudem.) B. Sutton 1977 (syn. Coniella pulchella Höhn. 1918).
Coniella africana L.V. Alvarez & Crous, sp. nov. MycoBank MB817809. Fig. 3.

Etymology: Named after the continent where the species was collected, Africa.

Diagnosis: Saprobic. Occurring on Eucalyptus nitens leaf litter in South Africa. Conidia hyaline to pale yellowish, linear, cylindrical, sometimes bent to naviculate, germ slit absent (14.5–15–20.5(–21) × (2.5–3(–3.5) μm (l: w = 5.6).

Presumed saprobe. Conidiomata separate, immersed or superficial, globose to depressed, initially appearing hyaline becoming olivaceous to brown with age, to 230 μm diam. Ostiole central. Conidiomatal wall consisting of 2–3 layers of medium brown textura angularis. Conidiophores densely aggregated, subulate, simple, frequently branched above, reduced to conidiogenous cells, or with 1–2 supporting cells. Conidiogenous cells simple, tapering, hyaline, smooth, 7–10.5 × 1–2 μm, 0.5–1.5 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. Conidia hyaline to pale yellowish when mature, cylindrical, sometimes bent to naviculate, apex acute to nearly rounded, base truncate, smooth-walled, multi-guttulate, germ slit absent (14.5–15–20.5(–21) × (2.5–3(–3.5) μm (l: w = 5.6).

Culture characteristics: Colonies on MEA with white aerial mycelium spreading in irregular zones with luteous margin and a few black conidiomata forming after 2 wk. On OA surface luteous to orange zones at centre with sparse aerial mycelium. On PDA surface disordered and disconnected luteous zones containing white aerial mycelium.

Material examined: South Africa, Mpumalanga, Barberton, from Eucalyptus nitens leaf litter, P.W. Crous, 11 May 1990 (holotype CBS H-22706, isotype PREM 51098, culture ex-type CBS 114133 = CPC 405).

Notes: Coniella africana (clade 10, Fig. 2) was originally reported as Coniella castaneicola (Crous & Van der Linde 1993). Conidia of C. africana (hyaline to pale yellowish when mature, with linear, cylindrical, sometimes bent to naviculate, (14.5–15–20.5(–21) × (2.5–3(–3.5) μm in vitro, (13–25 × 2.5–3.5 μm in vivo)), are morphologically similar to C. koreana (clade 11, Fig. 2) (hyaline to pale yellowish brown, cylindrical, linear, often curved to falcate, (15–16–19(–20) × (2–2.5–3(–3.5) μm) and C. quercicola (clade 12, Fig. 2) (hyaline, cylindrical, slightly curved to naviculate, (13–14–18(–19) × (2–2.5–3(–3.5) μm). Phylogenetic analyses revealed C. africana as being distinct from C. quercicola and C. koreana, clustering in a separate clade (clade 10). Coniella africana is 89 % (tef1) and 97 % (rpb2) similar to C. quercicola, and 87 % (tef1) and 97 % (rpb2) similar to C. koreana. These species can only be distinguished using molecular sequence data.

Coniella angustispora (Samuels et al.) L.V. Alvarez & Crous, comb. nov. MycoBank MB817810.
Basionym: Schizoparme angustispora Samuels et al., Mycotaxon 46: 465. 1993.
Synonym: Pilidiella angustispora (Samuels et al.) Rossman & Crous, IMA Fungus 6: 151. 2015.

Diagnosis: Plant pathogenic. Occurring on petioles of Psidium guajava in Hawaii. Ascomata solitary or gregarious. Ascospores hyaline, cylindrical to oblong-ellipsoid, reniform or allantoid, (6.5–)8.5–16(–17) × 2–3 μm.

Description and illustration: Samuels et al. (1993).

Notes: Coniella angustispora was originally described on petioles of Psidium guajava, Kauai, Nualola Trail, near Kokee Lodge, Hawaii (USA) (holotype BPI). Presently there are no cultures or DNA sequences available.

Coniella calamicola (J. Fröhl. & K.D. Hyde) L.V. Alvarez & Crous, comb. nov. MycoBank MB817811.
Basionym: Schizoparme calamicola J. Fröhl. & K.D. Hyde, Fungal Diversity Res. Ser. 3: 255. 2000.
Synonym: Pilidiella calamicola (J. Fröhl. & K.D. Hyde) Rossman & Crous, IMA Fungus 6: 151. 2015.

Diagnosis: Saprobic. Occurring on dead frond blades of Daemonorops marginatae in Hong Kong. Ascomata immersed, often in clusters of 2–3. Ascospores hyaline, oblong-ellipsoid, slightly flattened on one side, more rounded on one end than the other, aseptate, 14–18(–19) × (7.5–)9–10.5(–11.5) μm.

Description and illustration: Fröhlich & Hyde (2000).
Notes: Coniella calamicola was originally described from a dead frond blade of Daemonoropodops margaritae collected in the Tai Tam Country Park in Hong Kong (holotype HKU(M)JF31). Presently there are no cultures or DNA sequences available.

Coniella crousii (Rajeshk., Hepat & S.K. Singh) L.V. Alvarez & Crous, comb. nov. MycoBank MB817812. Basionym: Pilidiella crousii Rajeshk., Hepat & S.K. Singh, Mycotaxon 115: 158. 2011.

Diagnosis: Plant pathogenic. Occurring on fruit of Terminalia chebulae in India. Conidia initially hyaline, becoming medium brown, straight to slightly curved, ellipsoid to narrowly ellipsoid, apex subobtuse, base truncate, (6–)7–12(–13.5) × (2.5–)3–5 μm (l: w = 2.2–2.3).

Description and illustration: Rajeshkumar et al. (2011).

Notes: Coniella crousii was originally described from fallen fruits of Terminalia chebula collected in the Western Gats of Mahabaleshwar, India (holotype AMH 9406, ex-type culture NFCCI 2213).

Coniella destruens (M.E. Barr & Hodges) L.V. Alvarez & Crous, comb. nov. MycoBank MB817813.

Basionym: Gnomoniella destruens M.E. Barr & Hodges, Mycologist 79: 782. 1987.

Synonyms: Schizoparme destruens (M.E. Barr & Hodges) Samuels et al., Mycotaxon 46: 470. 1993.

Pilidiella destruens Crous & M.J. Wingf., Mycol. Res. 108: 299. 2004.

Descriptions and illustrations: Samuels et al. (1993), Van Niekerk et al. (2004).

Diagnosis: Plant pathogenic. Occurring on twigs of Eucalyptus grandis in Hawaii. Ascospores ellipsoidal, hyaline, thick-walled, granular, with terminal mucous caps, (9–)11–13 × (4.5–)5–6 μm. Conidia long, fusoid-ellipsoidal, widest in the middle, tapering to an acutely rounded apex and subtruncate base with minute scar, pale to medium brown, granular, (10–)12–13(–15) × (3–)4–5(–6) μm (l: w = 2.7).

Material examined: USA. Hawaii, on twigs of Eucalyptus grandis, Oct. 2000, M.J. Wingfield (holotype of Pilidiella destruens, CBS H-6945, holotype of Gnomoniella destruens NY, isotype BPI 596643).

Note: Unfortunately there are presently no cultures available of C. destruens, and this fungus will have to be recollected on Eucalyptus from Hawaii.

Coniella diplodiella (Speg.) Petr. & Syd., Feddes Repert., Beih. 42: 460. 1927. Fig. 4.

Basionym: Phoma diplodiella Speg., Ampelmexici Italici no. 4. 1878.

Synonyms: Coniothryrium diplodiella (Speg.) Sacc., Syll. Fung. 3: 310. 1884.

Pilidiella diplodiella (Speg.) Crous & van Niekerk, Mycol. Res. 108: 293. 2004.

Coniella petrakii B. Sutton, The Coelomycetes (Kew): 422. 1980.

Diagnosis: Plant pathogenic. Occurring on canes of Vitis vinifera in Africa (South Africa, Asia (China, India), Australia, and Europe (Bulgaria, France, Greece, Italy, Sicily). Conidia hyaline when immature, becoming pale to medium brown, ineqialateral, smooth, frequently with a hyaline, lateral appendage, narrowly ellipsoidal, apices tapering, subobtusely rounded, bases subtruncate, multiguttulate, straight to slightly curved, wall of medium thickness, multi-guttulate, (10–)12–15(–19) × (4–)5–6 μm (l: w = 2.3).

Description and illustration: Van Niekerk et al. (2004).

Material examined: France, on canes of Vitis vinifera, 2000, P.W. Crous (epitype designated in Van Niekerk et al. 2004, CBS H-6948, culture ex-epitype CBS 111858 = CPC 3708).

Notes: Coniella diplodiella (clade 2, Fig. 2) was first introduced as Phoma diplodiella Speg. (1878), isolated from Vitis vinifera collected in Italy. It was later renamed as Coniothryrium diplodiella (Speg.) Sacc. by Saccardo (1884) and as Coniella diplodiella (Speg.) Petr. & Syd. (Petrak & Sydow 1927). White rot of vine, also known as Coniella rot caused by C. diplodiella, has been recorded worldwide especially from warm temperate and tropical countries (Sutton & Waterston 1966). The fungus attacks injured berries and has been associated with serious losses following hailstorm damage. The disease usually begins with a yellow spot surrounded by a brownish halo developing into minute black pycnidia (Snowden 2010). Recently, C. diplodiella was reported to cause a serious pre- and post-harvest disease on grapes, especially under high temperature and humidity conditions (Han et al. 2015).

Coniella diplodiopsis (Crous & van Niekerk) L.V. Alvarez & Crous, comb. nov. MycoBank MB817814. Fig. 5.

Basionym: Pilidiella diplodiopsis Crous & van Niekerk, Mycol. Res. 108: 296. 2004.

Diagnosis: Plant pathogenic. Occurring on canes of Vitis vinifera in Africa (South Africa), and Europe (Switzerland, France, Germany, Italy). Conidia pale to medium brown, narrowly ellipsoidal with attenuating conidial apices that are acutely rounded, (8–)10–12(–13) × (5–)6–7(–7.5) μm (l: w = 1.7).

Description and illustration: Van Niekerk et al. (2004).

Material examined: Italy, Sardegna, Sassari, on Vitis vinifera canes, 1984, P.W. Crous (holotype CBS H-6947, culture ex-type CBS 590.84 = CPC 3940).

Notes: Coniella diplodiopsis differs from C. diplodiella in that conidia are shorter, pale to medium brown, narrowly ellipsoidal, but with more attenuating apices (less pronounced when mature), that are acutely rounded. All strains used in the study originated from Vitis vinifera, collected from South Africa, France and Switzerland (Table 1), suggesting that P. diplodiopsis is probably host-specific (clade 1, Fig. 2).

Coniella erumpens L.V. Alvarez & Crous, sp. nov. MycoBank MB817815. Fig. 6.

Etymology: Named after its erumpent conidiomata, bursting open upon maturity in culture.
**Diagnosis**: Saprobic. Occurring on rotten wood in Chile. **Conidia** hyaline to pale brown, becoming dark brown at maturity, smooth, lanceolate to ellipsoidal, inequilateral, apex rounded, slightly acute, truncate base, bi-guttulate when young, monoguttulate when mature, smooth- and thick-walled, germ slits absent, (7–)7.5–10(–10.5) × (3–)3.5–5(–5.5) μm (l: w = 2.2).

Presumed saprobic. **Conidiomata** separate, initially appearing hyaline, becoming olivaceous to black with age, often submerged in media and bursting open upon maturity, globose to depressed, up to 700 μm diam. **Ostiole** central. **Conidiomatal wall** consisting of 1–2 layers of medium brown textura angularis. **Conidiophores** densely aggregated, slightly thicker, subulate, simple, frequently branched above, reduced to conidiogenous cells, or with 1–2 supporting cells. **Conidiogenous cells** simple, tapering, hyaline, smooth, 6–12.5 × 2–3 μm, 1–2.5 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. **Conidia** hyaline to pale brown, becoming dark brown at maturity, smooth, lanceolate to ellipsoidal, inequilateral, apex rounded, slightly acute, widest at middle tapering to a wide, truncate base, bi-guttulate when young, monoguttulate when mature, smooth- and thick-walled, germ slits absent, (7–)7.5–10(–10.5) × (3–)3.5–5(–5.5) μm (l: w = 2.2).

**Culture characteristics**: Colonies on MEA turning chestnut-brown, surface with fluffy white aerial mycelium, spreading in irregular concentric zones filled with numerous black conidiomata that often erupt or burst open upon maturity, with olivaceous spore mass. On OA medium turns cinnamon-brown, surface with sparse white aerial mycelium, spreading in irregular concentric zones filled with inconspicuous conidiomata. On PDA surface with white aerial mycelium, spreading in irregular concentric zones; conidiomata absent or inconspicuous.

**Material examined**: Chile, Valdivia, on rotten wood, 1973, A.E. Gonzales (holotype CBS H-10720, culture ex-type CBS 523.78).

**Notes**: Coniella erumpens (clade 13, Fig. 2) was isolated from rotten wood collected from Valdivia, Chile, and was originally identified as *P. diplodiella*. The individual loci, ITS, tef1, LSU, rpb2 as well as the concatenated tree of the 4 genes showed that this species is distinct from *P. diplodiella* which has only 89% (rpb2) similarity. Morphological analysis confirmed the uniqueness of this species as also reflected by its cultural characteristics from MEA, pycnidial and conidial features. The pycnidia of this species have a tendency to burst or erupt upon maturity, and release the conidia in an olivaceous mass, hence the name C. erumpens.

**Coniella eucalyptigena** (Crous & M.J. Wingf.) L.V. Alvarez & Crous, **comb. nov.** MycoBank MB817816. Fig. 7. Basionym: *Pilidiella eucalyptigena* Crous & M.J. Wingf., Persoonia 34: 179. 2015.
Diagnosis: Plant pathogenic. Occurring on leaves of *Eucalyptus brassiana* in Malaysia. Ascospores ellipsoidal, hyaline, thin-walled, granular, with terminal mucoid caps or lateral appendages up to 5 μm diam, or ascospore entirely encased in sheath; sheath disappearing with age, and ascospores becoming pale brown and surface appearing roughened (possibly remnants of sheath), (10–)12–13(–14) × (4–)5–6 μm (l: w = 2.2).

**Description and illustration:** Crous et al. (2015c).

**Material examined:** Malaysia, Sabah, on leaves of *Eucalyptus brassiana*, May 2014, M.J. Wingfield (holotype CBS H-22222, culture ex-type CPC 24793 = CBS 139893; CPC 24794).

**Note:** Only the sexual morph was observed on host material, and also formed in culture.

*Coniella eucalyptorum* (Crous & M. J. Wingf.) L.V. Alvarez & Crous, **comb. nov.** MycoBank MB817817. Fig. 8.

**Basionym:** Pilidiella eucalyptorum Crous & M. J. Wingf., Mycol. Res. 108: 296. 2004.

**Synonyms:** Clisosporium fragariae (Oudem.) Kuntze, Rev. Gen. Pl. 3: 458. 1898.

*Coniella pulchella* Höhn., Ber. dt. bot. Ges. 36: 316. 1918.

**Diagnosis:** Plant pathogenic. Occurring on stems and leaves of *Fragaria*, in Australia, Canada, and Europe (Belgium, Denmark, France, Italy, The Netherlands, UK). Conidia ellipsoid, apices...
tapering, subobtusely rounded, tapering from middle towards a narrowly truncate base, medium brown, multi-guttulate when immature, becoming 1–2 guttulate when mature, wall darker brown than medium brown body of conidium, frequently with a lighter band of pigment extending over conidium, with a germ slit visible in older conidia, and mucous appendages also visible in lactic acid; appendages mostly basal, but also lateral along the length of the conidium, 7–12.5 × (4–)6–8(–10) μm (l: w = 1.4).

Description and illustration: Crous et al. (2014a).

Material examined: Belgium, Lint near Antwerpen, stem base of Fragaria sp., Apr. 1949, A. Jaarsveld (neotype designated in Crous et al. 2014a, CBS H-10697, culture ex-neotype CBS 172.49 = CPC 3930). Additional collections cited in Crous et al. (2014a).

Notes: Coniella fragariae (clade 25, Fig. 2) was first described in 1883 by C.A.J. Oudemans from The Netherlands, on Fragaria vesca (Crous et al. 2014a). It was reported from South Africa as C. pulchella by Marasas & Van Der Westhuizen (1971), but later reduced to synonymy with C. fragariae (Sutton 1980). Although this species was associated with many plant diseases such as leaf spots in Eucalyptus (Sharma et al. 1985, Old et al. 2003), these were probably C. eucalyptorum (see above), while records on other hosts (Sutton 1980) need to be confirmed.

Coniella fusiformis L.V. Alvarez & Crous, sp. nov. MycoBank MB817818. Fig. 10.

Etymology: Named after the shape of its conidia (fusiform).

Diagnosis: Plant pathogenic. Occurring on leaves of Eucalyptus spp. in Australia and Indonesia. Conidia hyaline to pale yellowish brown with age, fusiform, monoguttulate to multiguttulate, germ slits absent, (8–)8.5–10(–11) × (2.5–)3–4.5(–5) μm (l: w = 2.2), with mucoid appendage alongside conidium.
Plant pathogenic. *Conidiomata* separate, immersed or superficial, globose to depressed, initially appearing hyaline becoming olivaceous to black with age, with plate-like structures, up to 500 μm diam. Ostiole single, central. *Conidiomatal wall* consisting of 2–3 layers of pale to medium brown textura angularis. *Conidiophores* densely aggregated, subulate, simple, frequently branched above, enclosed in mucoid sheath, reduced to conidiogenous cells, or with 1–2 supporting cells. *Conidiogenous cells* simple, hyaline, smooth, tapering, 6.5–12 × 1.5–3 μm, 1–2 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. *Conidia* hyaline to pale yellowish brown with age, fusiform, apex acute, widest at middle tapering towards a truncate base, smooth-walled, monoguttulate to multiguttulate, germ slits absent, (8–)8.5–10(–11) × (2.5–)3–4.5(–5) μm (l: w = 2.2), with mucoid appendage alongside conidium.

**Culture characteristics:** Colonies on MEA sienna in colour, surface with profuse black conidiomata arranged in slightly concentric zones with sparse white fluffy aerial mycelium. On OA, medium forms a dark umber colour at outer margin; surface with numerous black conidiomata arranged in irregular circle, with sparse white aerial mycelium. On PDA medium forms a few olivaceous patches; surface with numerous black conidiomata and sparse white aerial mycelium.

**Materials examined:** Australia, Queensland, North Queensland, Taiflos, Eucalyptus peltata, collection date unknown, T. Burgess & G. Pegg, CBS H-22707, CBS 114850; Queensland, collection details unknown, CBS H-22708, CBS 114851. Indonesia, on leaves of Eucalyptus sp., 2011, M.J. Wingfield (holotype CBS H-22713, cultures ex-type CBS 141596 = CPC 19722).

**Notes:** Clade 3 (Fig. 2) contains three strains (CBS 114850, CBS 114851, CPC 19722), which were revealed to be phylogenetically and morphologically similar to one another. Both CBS 114850 and CBS 114851 were collected from Australia, while CPC 19722 was collected from Indonesia. Phylogenetic analyses using the concatenated LSU nrDNA, ITS nrDNA, tef1 and rpb2 revealed that these isolates together with their sister clade, *C. javanica* (clade 4, Fig. 2), deviate from *C. diplodiopsis* (clade 1) and *C. diplodiella* (clade 2), representing a separate clade. The rpb2 sequences showed a 96% similarity to both *C. diplodiella* (CBS 111858) and *C. javanica* (CBS 455.68).

Morphological examination of these species revealed conidial similarities, i.e. hyaline to pale yellowish brown, fusiform to ellipsoidal, inquadrilateral, differing only in their conidial dimensions. Hence, these isolates, CBS 114850, CBS 114851 and CPC 19722, are described as a novel species, *C. fusiformis*.

*Coniella granati* (Sacc.) Petrak & Sydow, Beij. Rep. spec. nov. regni veg. 42: 461. 1927. Fig. 11.

**Basionym:** *Phoma granatii* Sacc., Novo G. bot. ital. 8: 200. 1876.

**Synonyms:** *Macrophoma granatii* (Sacc.) Berl. & Vogl., Atti Soc. Venet. Trent. Sc. Nat. 10: 202. 1866.

*Pilidiella granati* (Sacc.) Aa, Verh. K. ned. Akad Wet. Ser. 2, 61: 51. 1972 [1973].

*Phoma versonianna* Sacc., Michelia 2: 272. 1881.

*Zythia versonianna* (Sacc.) Sacc., Syll. Fung. 3: 614. 1884.

*Anasthasthoopa simha* Subram., Ramakr., Proc. Ind. Acad. Sci. 43: 174. 1956.

*Coniella simha* (Subram. & Ramakr.) Sutton, Canad. J. Bot. 47: 607. 1969.

**Diagnosis:** Plant pathogenic. Occurring on fruit of *Punica granatum*, in Brazil, Asia (China, Korea, Pakistan), Europe (Cyprus, Greece, Italy, The Netherlands, Spain, Turkey, Ukraine), Iran, and the USA (CA, NC). Also reported on other hosts (see below). *Conidia* hyaline to olivaceous brown, ellipsoidal, apex obtuse, base truncate, with mucoid appendage along the side of the conidium, 9–16 × 3–4.5 μm (l: w = 3.5).

**Description and illustration:** Nag Raj (1993).

**Material examined:** Italy, *on* *Vitis vinifera* fruit, unknown collection date, G. Godánich, culture CBS 252.38 = ATCC 12685 = CPC 3714.

**Notes:** *Coniella granati* (clade 9, Fig. 2) was first described by Saccardo (1876) as *Phoma granatii*, isolated from *Punica granatum* collected in Italy (BPI isotype, Saccardo – Mycotheca Veneta #514 on calyx, petals and rarely on leaves). This species is known to occur on many hosts including *Anogeissus acuminata*, *Cesalpinia pulcherrima*, *Hevea sp.,* and *Vitis vinifera* from Burma, Cyprus, Greece, India, Jamaica, Nigeria, and UK (Sutton 1980). *Coniella granati* is a widespread pathogen of *P. granatum* recorded in Brazil, Cyprus, Italy, Korea, North Carolina, Pakistan, The Netherlands, and USA (Farr & Rossman 2016). It was
reported to cause seedling blight on *Eucalyptus*, forming browning, which extends and covers the entire leaf, stem, thus killing the seedlings *(Sharma et al. 1985)*. It is a well known pathogen of pomegranate, and has been associated with crown rot and wilt in Turkey *(Çeliker et al. 2012)*, dieback and fruit rot in Iran *(Mirabolfathy et al. 2012)* fruit rot in Florida (USA), Greece, Israel *(Tziros & Tzavella-Klonari 2008, Levy et al. 2011, KC & Vallad 2016)*, fruit rot and twig blight in China *(Chen et al. 2014)*, post harvest decay in Spain *(Palou et al. 2010)*, and shoot blight and canker in Greece *(Thomidis 2015)*.

*Coniella javanica* L.V. Alvarez & Crous, **sp. nov.** MycoBank MB817819. **Fig. 12.**

**Etymology:** Named after the locality where the species was collected, Java, Indonesia.

**Diagnosis:** Plant pathogenic. Occurring on *Hibiscus sabdariffa* in Indonesia. *Conidia* hyaline to pale yellowish brown with age, fusiform to ellipsoidal, inequilateral, apex acute, widest at the middle tapering to slightly truncate base, smooth-walled, monon- to multiguttulate, germ slits absent, (11–)11.5–14.5(–15) × (3–)3.5–4.5(–5) μm (l: w = 3.1), with mucoid appendage alongside conidium.

Plant pathogenic. *Conidiomata* separate, immersed or superficial, globose to depressed, initially appearing hyaline, becoming olivaceous to black with age, with plate-like structures, to 410 μm diam. *Ostiole* central, 30–60 μm diam. *Conidiomatal wall* consisting of 2–4 layers of medium brown *textura angularis*. *Conidiophores* densely aggregated, slightly thicker, subulate, simple, frequently branched above, reduced to conidigenous cells, or with 1–2 supporting cells. *Conidigenous cells* simple, hyaline, smooth, tapering, 6–10 × 1.5–3 μm, 1–2 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. *Conidia* hyaline to pale yellowish brown with age, fusiform to ellipsoidal, inequilateral, to slightly broad canoe shaped, apex acute, widest at middle tapering to slightly truncate base, smooth-walled, monon- to multiguttulate, germ slits absent, (11–)11.5–14.5(–15) × (3–)3.5–4.5(–5) μm (l: w = 3.1), with mucoid appendage alongside conidium.

**Culture characteristics:** Colonies on MEA surface with prolific black conidial masses spreading from centre, arranged in irregular concentric zones, alternating with fluffy white aerial mycelium. On OA surface with profuse black conidiomata and sparse aerial mycelium. On PDA surface with numerous olivaceous conidiomata and sparse mycelium.

Material examined: *Indonesia*, Java, Bogor, Roselle Garden, leaf spot in *Hibiscus sabdariffa*, collection date unknown, J.H. van Emden (*holotype* CBS H-22705, culture ex-type CBS 455.68).

**Notes:** *Coniella javanica* (clade 4, Fig. 2) is morphologically similar to its sister clade *C. fusiformis* in having a fusiform conidia, but its conidia are longer and thinner. This species is morphologically similar to *C. musaiaensis* var. *hibisci* *(Sutton 1980)* based on its fusiform and curved conidial shape, as well as conidial size (11–16 × 3.5–5 μm). *Coniella musaiaensis* var. *hibisci* was described from *Hibiscus esculentus* collected in Nigeria. However, the ITS nrDNA and *tef1* sequences of an African strain from *Hibiscus* sp. *(CBS 109757 = ARS 3534)* and *C. javanica* *(CBS 455.68)* are only 90 % and 94 % similar, respectively.

*Coniella koreana* L.V. Alvarez & Crous, **sp. nov.** MycoBank MB817820. **Fig. 13.**

**Etymology:** Named after the country (Korea) where the material was collected.

**Diagnosis:** Ecology unknown. Occurring on unknown host in South Korea. *Conidia* hyaline to pale yellowish brown, smooth, cylindrical, linear, often curved to falcate, apex acute to nearly rounded, base truncate, smooth-walled, multiguttulate, germ slit absent, (15–)16–19(–20) × (2–)2.5–3(–3.5) μm (l: w = 6).

Ecology unknown. *Conidiomata* separate, immersed or superficial, globose to depressed, initially appearing hyaline, becoming olivaceous to black, up to 700 μm diam. *Ostiole* central, 24–25 μm diam. *Conidiomatal wall* consisting of 2–3 layers of medium brown *textura angularis*. *Conidiophores* densely aggregated, slightly thicker, subulate, simple, frequently branched above, reduced to

---

**Fig. 11.** *Coniella granati* (CBS 130974). **A.** Conidiomata forming on OA. **B, C.** Conidigenous cells giving rise to conidia. **D.** Conidia. Scale bars: **A = 300 μm, others = 10 μm.**
Conidiogenous cells, or with 1–2 supporting cells. Conidiogenous cells simple, hyaline, smooth, tapering, 5.5–13 × 1.5–3 μm, and 1–2 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. Conidia hyaline to pale yellowish brown, smooth, cylindrical, linear, often curved to falcate, apex acute to nearly rounded, base truncate, smooth-walled, multi-guttulate, germ slit absent, (15–16–19(–20) × (2–)2.5–3(–3.5) μm (l: w = 6).

Culture characteristics: Colonies on MEA surface with fluffy, white aerial mycelium spreads in irregular, slightly imbricated concentric zones filled with numerous black conidiomata. On OA surface with sparse white aerial mycelium spreading in irregular concentric zones filled with numerous black conidiomata. On PDA surface with white aerial mycelium spreads in irregular concentric zones, not forming conspicuous conidiomata.

Material examined: South Korea, host unknown, 1997, K.S. Bae (holotype CBS H-22710, isotype BRIP 748451, culture ex-type CBS 143.97).

Notes: Coniella koreana (clade 11, Fig. 2) was originally identified as C. castaneicola (Sutton 1980), based on the morphological similarity of the conidia being linear, falcate, and pale brown. Pycnidial and conidial dimensions of C. koreana [to 700 μm diam; (15–16–19(–20) × (2–)2.5–3(–3.5) μm] are distinct from those of C. castaneicola [110–200 μm; 13–29 × 2.5–3.5(–4) μm] (Nag Raj 1993). Phylogenetic analyses also revealed that C. koreana (clade 11) differs from its closest relative C. quercicola (clade 12), sharing 93 % similarity (tef1).

Coniella lanneae L.V. Alvarez & Crous, sp. nov. MycoBank MB817821. Fig. 14.

Etymology: Named after the host genus, Lannea, from which the species was isolated.

Diagnosis: Endophyte. Occurring in leaves of Lannea sp. in Zambia. Conidia hyaline to pale yellowish brown at maturity, asymmetrical, fusiform, slightly curved to broadly naviculate, apex acute, widest at the middle, tapering towards a truncate base, smooth-walled, bi- to multiguttulate, germ slits absent, (9–)10–13(–13.5) × (3.5–)4–5(–5.5) μm (l: w = 2.6), with mucoid appendage alongside conidium.
Endophyte. **Conidiomata** separate, immersed or superficial, globose to depressed, initially appearing hyaline, becoming olivaceous to dark brown with age, to 220 μm diam. **Ostiole** central, 20–30 μm diam. **Conidiomatal wall** consisting of 3–4 layers of medium brown textura angularis; **Conidiophores** densely aggregated, subulate, simple, frequently branched above, reduced to conidiogenous cells, or with 1–2 supporting cells. **Conidiogenous cells** simple, hyaline, smooth, tapering, 8–15 × 2–4 μm, 1–2.5 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. **Conidia** hyaline to pale yellowish brown at maturity, asymmetrical, fusiform, slightly curved to broadly naviculate, apex acute, widest in the middle, tapered into narrowly truncate base, smooth-walled, bi- to multiguttulate, germ slits absent, (9–)10–13(–13.5) × (3.5–7.5)–4–5(–5.5) μm (l: w = 2.6), with mucoid appendage alongside conidium.

**Culture characteristics:** Colonies on MEA cinnamon in colour, surface with prolific black conidial masses arranged in irregular concentric zones of alternating black and white with age, to 610 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. **Conidia** hyaline to pale yellowish brown at maturity, smooth, 14–30 × 1–3 μm, 1–1.5 μm wide at apex, surrounding by a gelatinous coating, apex with visible periclinal thickening. **Conidiomatal** wall consisting of 2–3 layers of medium brown textura angularis. **Conidiophores** densely aggregated, subulate, simple, frequently branched above, reduced to conidiogenous cells, or with 1–3 supporting cells. **Conidiogenous cells** simple, tapering, hyaline, smooth, 14–30 × 1–3 μm, 1–1.5 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. **Conidia** hyaline to pale yellowish brown at maturity, smooth, broadly ellipsoidal to limoniform, inequilateral, slightly folded with longitudinal slit, naviculate in side view, apex apiculate, widest in the middle, tapered into narrowly truncate base, smooth-walled, bi- to multiguttulate when mature, germ slit present, (10–10.5–14(–14.5) × (5–)5.5–7.5(–8) μm (l: w = 2), frequently with minute basal cellular appendage, hyaline, cylindrical, 1–2 μm long, with mucoid appendage alongside conidium.

**Notes:** *Coniella lanneae* (clade 5, Fig. 2) appears to be morphologically similar to *C. diplodiella, C. diplodiopsis, C. fusiformis* and *C. javanica* in having conidia that are hyaline to pale yellowish brown, asymmetrical, fusiform, slightly curved to broadly naviculate; their conidia still differ in size. Phylogenetic examination using a multigene dataset shows that *C. lanneae* clusters apart (clade 5) from the main clade (clades 1, 2, 3, and 4) representing *C. diplodiella, C. diplodiopsis, C. fusiformis* and *C. javanica* respectively. Further analysis using rpb2 sequence data revealed *C. lanneae* to be 92–94 % similar to closely related species (*C. diplodiella, C. fusiformis, C. javanica*).

*Coniella limoniformis* L.V. Alvarez & Crous, sp. nov. Myco-Bank MB817822. Fig. 15.

**Etyymology:** Named after the shape of its conidia (limoniform).

**Diagnosis:** Plant pathogenic. Occurring on leaves of *Fragaria* sp. in South Africa. **Conidia** hyaline to pale brown, becoming dark brown at maturity, smooth, broadly ellipsoidal to limoniform, inequilateral, slightly folded with longitudinal slit, naviculate in side view, apex apiculate, widest in the middle, tapered into narrowly truncate base, monoguttulate when young, distinctly multiguttulate when mature, germ slit present, (10–10.5–14(–14.5) × (5–)5.5–7.5(–8) μm (l: w = 2), frequently with minute basal cellular appendage, hyaline, cylindrical, 1–2 μm long, with mucoid appendage alongside conidium.

**Plant pathogenic.** **Conidiomata** separate, immersed or superficial, globose to depressed, initially appearing hyaline, becoming olivaceous to black with age, to 610 μm diam. **Ostiole** central, 60–92 μm diam, becoming papillate. **Conidiomatal wall** consisting of 2–3 layers of medium brown textura angularis. **Conidiophores** densely aggregated, subulate, simple, frequently branched above, reduced to conidiogenous cells, or with 1–3 supporting cells. **Conidiogenous cells** simple, tapering, hyaline, smooth, 14–30 × 1–3 μm, 1–1.5 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. **Conidia** hyaline to pale brown, becoming dark brown at maturity, smooth, broadly ellipsoidal to limoniform, inequilateral, slightly folded with longitudinal slit, naviculate in side view, apex apiculate, widest in the middle, tapered into narrowly truncate base, monoguttulate when young, distinctly multiguttulate when mature, germ slit present, (10–10.5–14(–14.5) × (5–)5.5–7.5(–8) μm (l: w = 2), frequently with minute basal cellular appendage, hyaline, cylindrical, 1–2 μm long, with mucoid appendage alongside conidium.

**Culture characteristics:** Colonies on MEA chestnut-brown, surface with fluffy white aerial mycelium spreading outward in regular, imbricated concentric circles with abundant black conidiomata. On OA surface with sparse white aerial mycelium with numerous black conidiomata, spreading in irregular concentric zones. On PDA surface with abundant white aerial mycelium, with profuse black conidiomata, spreading in irregular concentric zones.

**Material examined:** *South Africa*, Mpumalanga, from *Fragaria* sp., date unknown, C. Roux (holotype CBS H-22704, culture ex-type CBS 111021 = PPRI 3870 = CPC 3828 = ARC-MYC J 13102).
**Notes:** *Coniella limoniformis* (clade 14, Fig. 2) has distinct lemon-shaped conidia, which have the tendency to appear boat-shaped when observed in its side view and have a notable guttule. It is morphologically and phylogenetically distinct from its sister clade *C. tibouchinae* (clade 15, Fig. 2), by having a subreniform, ovoid to subovoid conidia and lacking germ slits. The tef1 analysis (results not shown) revealed that the two species have only 75% similarity.

*Coniella macrospora* Aa, Proc. Kon. Ned. Akad. Wetensch., C 86(2): 121. 1983.

**Synonym:** Pilidiella macrospora (Aa) Crous & van Niekerk, Mycotaxon 115: 161. 2011.

**Diagnosis:** Presumed saprobe. Occurring on stems of *Terminalia ivorensis* in Ivory Coast. Conidial greenish, becoming dark brown, ovoid, ellipsoid, pyriform, seldom almost globose, (18.5–25–29(–32.5) × (13–)16–20(–21.5) μm (l: w = 1.5).

**Description and illustration:** Van der Aa (1983).

**Material examined:** Ivory Coast, Forêt de Kouin near Man, from brownish discolorations on the stem of a withering *Terminalia ivorensis*, 1973, F. Brunck (ex-holotype culture CBS 524.73 = CPC 39395).

**Notes:** *Coniella macrospora* (clade 16, Fig. 2) was introduced by Van der Aa (1983) as a new species of *Coniella*. Conidia are greenish, becoming dark brown, ovoid, ellipsoid, pyriform, seldom almost globose, (18.5–25–29(–32.5) × (13–)16–20(–21.5) μm (l: w = 1.5). It was regarded as a *Pilidiella* species by Van Niekerk et al. (2004), and the combination was formally published in Rajeshkumar et al. (2011). Based on the current analyses, we propose the use of the original name *C. macrospora*, as introduced by Van der Aa (1983).

*Coniella malaysiana* L.V. Alvarez & Crous, sp. nov. MycoBank MB817823. Fig. 16.

**Etymology:** Named after Malaysia, the country where this species was collected.

**Diagnosis:** Plant pathogenic. Occurring on leaves of *Corymbia torelliana* in Malaysia. Conidia hyaline to pale brown, fusoid to ellipsoid, inequilateral, apex acutely rounded, widest in the middle, tapering to a truncate base, yellowish brown, thick-walled, germ slits absent, (8–)8.5–11(–11.5) × (3–)3.5–4.5(–5) μm (l: w = 2.5), with mucoid appendage alongside conidium.

**Plant pathogenic.** *Conidiomata* separate, immersed or superficial, globose to depressed, initially appearing hyaline, becoming olivaceous to black with age, to 550 μm diam. Ostiole central. *Conidiomatal wall* consisting of 2–3 layers of medium brown *textura angularis*. *Conidiophores* densely aggregated, slightly thicker, subulate, simple, frequently branched above, reduced to conidiogenous cells, or with 2–5 supporting cells. *Conidiogenous* cells simple, tapering, hyaline, smooth, 8.5–18 × 1.5–3.5 μm, 0.5–2 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. *Conidia* hyaline to pale brown, fusoid to ellipsoid, inequilateral, apex acutely rounded, widest in middle, tapering to a truncate base, yellowish brown, thick-walled, germ slits absent, (8–)8.5–11(–11.5) × (3–)3.5–4.5(–5) μm (l: w = 2.5), with mucoid appendage alongside conidium.

**Culture characteristics:** Colonies on MEA luteous with dark chestnut-brown pigment, surface with white to pinkish white aerial mycelium and sporulation. On OA medium turns luteous with chestnut-brown pigment, surface with sparse aerial mycelium and sporulation. On PDA medium pale chestnut-brown at centre, surface with thin white aerial mycelium.

**Material examined:** Malaysia, on leaves of *Corymbia torelliana*, 2009, S.S. Lee (holotype CBS H-22711, culture ex-type CBS 141598 = CPC 16659).

**Notes:** *Coniella malaysiana* in clade 18 (Fig. 2) has conidia that are similar but smaller [(8–)8.5–11(–11.5) × (3–)3.5–4.5(–5) μm] than those of its sister clade *C. eucalyptorum* (9–)10–12(–14) × (6–)7–8 μm. Phylogenetically *C. malaysiana* differs from *C. eucalyptorum* by having only 85% similarity in tef1 and 97% similarity in rpb2 sequences.

*Coniella nicotianae* L.V. Alvarez & Crous, sp. nov. MycoBank MB817824. Fig. 17.

**Etymology:** Named after the host genus *Nicotiana*, from which this fungus was isolated.

**Diagnosis:** Plant pathogenic. Occurring on *Nicotiana tabacum* in Jamaica. Conidia hyaline, asymmetrical, linear to cylindrical,
sometimes curved, apex acute to rounded, base truncate, smooth-walled, multiguttulate, germ slits absent, (16–16.5–19.5(–20) × (2–2.5–3.5(–4) μm (l: w = 6).

Plant pathogenic. Conidiomata pycnidial, separate, immersed or superficial, globose to depressed, initially hyaline, becoming olivaceous to dark brown, up to 120 μm diam. Ostiole central.

Conidiomatal wall consisting of 2–3 layers of medium brown textura angularis. Conidiophores densely aggregated, thick and short, frequently branched above, reduced to conidiogenous cells, or with 1–2 supporting cells. Conidiogenous cells slightly thick-walled, tapering, hyaline, 4–8 × 1–2 μm, 1–1.5 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. Conidia hyaline, asymmetrical, linear to cylindrical, sometimes curved, apex acute to rounded, base truncate, smooth-walled, multiguttulate, germ slits absent, (16–16.5–19.5(–20) × (2–2.5–3.5(–4) μm (l: w = 6).

Culture characteristics: Colonies on MEA surface with prolific fluffy mycelium with black conidiomata arranged in variegated, irregular concentric zones with alternating white and grey coloured mycelia. On OA surface with abundant black conidiomata with sparse, inconspicuous aerial mycelium. On PDA colony with white mycelium at centre; surface with a few, discrete black conidiomata.

Material examined: Jamaica, on Nicotiana tabacum, 29 Sep. 1972, collector unknown (holotype CBS H-17072, culture ex-type CBS 875.72).

Notes: Coniella nicotianae in clade 8 (Fig. 2) appears morphologically similar to C. straminea (clade 7, Fig. 2), which has ellipsoid, slightly inequilateral or curved conidia. However, the conidiomata of C. nicotianae are smaller (up to 120 μm diam) and its conidia are longer (16–16.5–19.5(–20) × (2–)2.5–3.5(–4) μm, while C. straminea has much larger conidiomata (200–300 μm diam) and shorter conidia, 10–13 × 3–4 μm (Samuels et al. 1993). Phylogenetic analyses suggest that this species is distinct from C. straminea, having 97 % similarity based on tef1 sequences.

Coniella nigra (P.N. Mathur et al.) L.V. Alvarez & Crous, comb. nov. MycoBank MB817825. Fig. 18.
Basionym: Cyclodomella nigra P.N. Mathur et al., Sydowia 13: 145. 1959.

Diagnosis: Presumed saprobe. Occurring in soil in India. Conidia hyaline to pale brown, becoming dark brown at maturity, smooth, symmetrical to inequilateral, ellipsoidal to limoniform, apex acute to apiculate, widest in the middle, tapering towards a narrowly truncate base, smooth-walled, with yellowish to pale brown thick wall, multiguttulate when young, biguttulate when mature,
longitudinal germ slit present, (7–)7.5–10(–11) × (4–)4.5–7(–7.5) μm (l: w = 1.6), with mucoid appendage alongside conidium.

Presumed saprobe. Conidiomata separate, immersed or superficial, globose to depressed, initially appearing hyaline, becoming olivaceous to black with age, to 370 μm diam. Ostiole central, 20–25 μm diam, becoming papillate. Conidiomatal wall consisting of 3–4 layers of medium brown textura angularis. Conidiophores densely aggregated, slightly thick-walled, subulate, simple, frequently branched above, reduced to conidigenous cells, or with 2–4 supporting cells. Conidigenous cells simple, tapering, hyaline, smooth, 11.5–20 × 1.5–2.5 μm, 1–2 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. Conidia hyaline to pale brown, becoming dark brown at maturity, smooth, symmetrical to inequilateral, ellipsoidal to limoniform, apex acute to apiculate, widest in the middle, tapering towards a narrowly truncate base, smooth-walled, with yellowish to pale brown thick wall, multi-guttulate when young, biguttulate when mature, longitudinal germ slit present, (7–)7.5–10(–11) × (4–)4.5–7(–7.5) μm (l: w = 1.6), with mucoid appendage alongside conidium. Developing conidia and conidiophores frequently enclosed in a mucoid sheath.

Culture characteristics: Colonies with sparse aerial mycelium and immersed, dispersed, hyaline to olivaceous or dark olivaceous conidiomata. On MEA surface black due to sporulation, conidiomata arranged in irregular concentric rings, with tinges of orange mycelium at centre. On OA surface with black conidiomata, zones of orange pigment and irregular margin. On PDA surface with few to numerous black conidiomata, and sparse white aerial mycelium.

Material examined: India. Maharashtra, from soil, Jan. 1959, V.V. Bhatt (culture ex-holotype CBS 165.60 = IMI 181519 = IMI 181599 = CPC 4198).

Notes: The basionym Cyclodomella nigra is the type species of the monotypic generic name Cyclodomella. Petrak (1960) considered this species to be a cultural form of Coniella diplodiella and Sutton (1989) reduced Cyclodomella to synonymy under Coniella, regarding Cyclodomella nigra as synonym of Coniella fragariae. However, morphological analysis showed that Coniella nigra is distinct from C. diplodiella and C. fragariae based on conidial morphology. Phylogenetically, it also clustered on its own but with the genus Coniella, and therefore a new combination is proposed for Cyclodomella nigra in Coniella (clade 24, Fig. 2). Coniella nigra is morphologically very similar to C. solicola [conidia (7–)7.5–11.5(–12) × (4.5–)5–7.5(–8) μm] (clades 12, 24, Fig. 2), and the two species can only be separated based on DNA data.

Coniella obovata L.V. Alvarez & Crous, sp. nov. MycoBank MB817826. Fig. 19.

Etymology: Named after its obovoid conidia.

Diagnosis: Presumed saprobe. Occurring on leaf litter in South Africa. Conidia hyaline to pale brown becoming dark brown at maturity, smooth, symmetrical to inequilateral, obovate, apex obtusely rounded, widest at the middle, tapering towards a narrowly truncate base, multiguttulate when young, mostly 1–2-guttulate when mature, smooth-walled, with yellowish to dark brown thick wall, (8–)8.5–11.5(–12) × (5–)5.5–8.5(–9) μm (l: w = 1.4), frequently with minute basal cellular appendage, hyaline, cylindrical, 1–2 μm long, with mucoid appendage alongside conidium.

Presumed saprobe. Conidiomatal separate, immersed or superficial, globose to depressed, initially appearing hyaline, becoming brown to dark brown with age, to 600 μm diam. Ostiole central. Conidiomatal wall consisting of 2–3 layers of medium brown textura angularis.
brown *textura angularis*. **Conidiophores** densely aggregated, subulate, simple, frequently branched above, reduced to conidiogenous cells, or with 2–4 supporting cells. **Conidiogenous cells** simple, tapering, hyaline, smooth, 10–17 × 1.5–3 µm, 1–2 µm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. **Conidia** hyaline to pale brown becoming dark brown at maturity, smooth, symmetrical to inequilateral, obovate, apex obtusely rounded, widest at middle, tapering towards a narrowly truncate base, multiguttulate when young, mostly 1–2-guttulate when mature, smooth-walled, with yellowish to dark brown thick wall, (8–)8.5–11.5(–12) × (5–)5.5–8.5(–9) µm (l: w = 1.4), frequently with minute basal cellular appendage. Developing conidia and conidiophores are frequently encased in a mucoid sheath.

**Culture characteristics**: Colonies with immersed, sparse, hyaline, olivaceous to dark olivaceous pycnidia. On MEA colonies pale vinaceous, surface with numerous black pycnidia and conidia. On PDA colonies white aerial mycelium, and inconspicuous black conidiomata. On OA colonies rosy vinaceous, surface with numerous black conidiomata and sparse white to greyish aerial mycelium. On OA surface with white aerial mycelium, spreading in irregular, imbricated, concentric circles with inconspicuous black conidiomata. On OA surface with sparse white aerial mycelium, and a few black conidiomata at centre. On PDA surface with abundant white aerial mycelium, and inconspicuous black conidiomata.

**Material examined**: **South Africa**, Gauteng, from leaf litter, 1981, K.T. van Warmelo (holotype CBS H-22703, culture ex-type CBS 111025 = IMI 261318 = CPC 4196).

**Notes**: *Coniella obovata* in clade 22 (Fig. 2) is morphologically similar to *C. australiensis* which has dark brown, globose to napiform, 10–14 × 7–11 µm conidia (Sutton 1980). *Coniella obovata* has smaller pycnidia and conidia, and is phylogenetically distinct from its neighbouring clades, sharing 96 % similarity to both *C. solicola* and *C. fragariae* based on *rpb2* sequence data, confirming its uniqueness as a novel species. The most distinct feature of this species is its production of rosy vinaceous pigment on OA and pale vinaceous pigment on PDA.

**Coniella paracastaneicola** L.V. Alvarez & Crous, sp. nov. MycoBank MB817827. Fig. 20.

**Etymology**: Named after its morphological similarity to *Coniella castaneicola*.

**Diagnosis**: Endophyte, presumed saprobe. Occurring on leaves of *Eucalyptus* sp. in Australia. **Conidia** hyaline, becoming pale olivaceous with age, smooth, solitary, granular to guttulate, fusoid to naviculate, apex obtuse, base truncate, (21–)25–28(–31) × (3–)4(–5) µm (l: w = 6.5), with mucoid appendage along side of conidium. Developing conidia and conidiophores are frequently encased in a mucoid sheath.

Endophyte, presumed saprobe. **Conidiomata** separate, immersed or superficial, globose to depressed, initially appearing hyaline, becoming olivaceous to black, to 350 µm diam. **Ostiole** central, 18–29 µm diam. **Conidiomatal wall** 12–26 µm thick, consisting of 3–4 layers of grey-brown *textura angularis*. **Conidiophores** smooth, 2–3-septate, branched, subcylindrical, 20–40 × 4–5 µm, encased in mucus. **Conidiogenous cells** hyaline, smooth, subcylindrical, 10–20 × 3–4 µm, with apex 2–3 µm, and inconspicuous collarette that dissolves with age; apex with periclinal thickening or percurrent proliferation. **Conidia** hyaline, becoming pale olivaceous with age, smooth, solitary, granular to guttulate, fusoid to naviculate, apex obtuse, base truncate, (21–)25–28(–31) × (3–)4(–5) µm (l: w = 6.5), with mucoid appendage along side of conidium. Developing conidia and conidiophores are frequently encased in a mucoid sheath.

**Culture characteristics**: Colonies on MEA chestnut-brown, surface with white aerial mycelium, spreading in irregular, imbricated, concentric circles with inconspicuous black conidiomata. On OA surface with sparse white aerial mycelium, and with a few black conidiomata at centre. On PDA surface with abundant white aerial mycelium, and inconspicuous black conidiomata.

**Material examined**: **Australia**, Victoria, Toolangi State Forest, S37°33′00″ E145°31′55.9″, on leaves of *Eucalyptus* sp. (Myrtaceae), 9 Nov. 2014, P.W. Crous, J. Edwards & P.W.J. Taylor (holotype CBS H-22702, culture ex-type CPC 20146 = CBS 141292); ibid., CPC 25498.

**Notes**: *Coniella castaneicola* was accepted as asexual morph of *Schizoparme straminea* (Maas et al. 1979). Subsequent studies accepted this synonymy and treated it as a cosmopolitan taxon with numerous synonyms (Sutton 1980, Nag Raj 1993, Samuels et al. 1993). When Shear (1923) originally described *S. straminea* (on leaf litter of *Rosa* sp., Arlington Farm, Virginia, USA)
USA), conidia were noted as 15–20 × 3–4 μm. However, he listed many hosts for the fungus, including *Fragaria*, the host on which the conidial form was first observed by B.O. Dodge. A culture from *Fragaria* was also deposited at CBS as CBS 149.22, and is accepted as authentic for the name *Schizoparme straminea* (see *Coniella straminea* below).

Maas et al. (1979) treated *Sphaeropsis quericoi*ca (using material from *Fragaria*, Beltsville, Maryland USA; conidia 13–20 × 2–3 μm), as synonym of *Schizoparme straminea*, comparing it to CBS 875.72 (from Jamaica, on *Nicotiana tabacum*, described here as *C. nicotianae*). *Sphaeropsis quericoi*ca was originally described as *Macrodiplodia quericoi*ca (on leaves of *Quercus robur*, Bussum, The Netherlands, treated here as *C. quericoi*ca). *Coniella castaneicola* was originally described as *Gloeosporium castaneicola* (on *Castanea vesca*, Delaware, USA, conidia 20 × 2–2.5 μm), but requires fresh collections to resolve its status. *Coniella eucalypticola* (on *Eucalyptus sp.*, Bangalore, India, conidia 19–29 × 2.5–3.5 μm, *fide Nag Raj 1976*) appears to represent yet another distinct species in this complex that needs to be recollected and epitypified.

*Coniella paracastaneicola* in clade 21 (Fig. 2) is morphologically similar to other taxa in the *C. castaneicola* complex, which have fusiform, falcate, pale brown conidia. *Coniella paracastaneicola* is phylogenetically distinct from the clade containing *Coniella straminea* (clade 7, Fig. 2), with 82% similarity using rpb2 sequences.

**Coniella perennis** Crous & M. Chr., *Sydowia* 67: 94. 2015. Fig. 21.

**Diagnosis:** Presumed saprobe. Occurring in soil in Peru. *Conidia* ellipsoidal to limoniform, apices tapering, subobtusely rounded, tapering from middle towards a narrowly truncate base, medium brown, multi-guttulate, wall darker brown than medium brown body of conidium, (9–)10–11(–12) × (6.5–)7(–8) μm (l: w = 1.5)

**Description and illustration:** Crous et al. (2015b).

**Material examined:** Peru, Iquitos, from soil of rain forest, dep. 4 Mar. 2002, M. Christensen (holotype CBS H-2194, culture ex-type CBS 110394 = RMF 74.01).

**Notes:** *Coniella perennis* (clade 19, Fig. 2) was originally identified as *Coniella fragariae*, which has conidia that are 7–12.5 × 4–10 μm, but is phylogenetically distinct from *C. fragariae* and has somewhat smaller conidia (Crous et al. 2014a). In this study we confirm that *C. perennis* is distinct from its closest sister clades, *C. wangiensis* (clade 20, Fig. 2) and *C. fragariae* (clade 25). Morphologically, conidia of *C. wangiensis* [(9–)10–11(–13) × (7–)8–9(–10) μm] are similar in length, but slightly wider, and frequently have a minute basal cellular appendage.

*Coniella pseudogranati* (Crous) L.V. Alvarez & Crous, *comb. nov*. MycoBank MB817829. Fig. 22. Basionym: *Schizoparme pseudogranati* Crous, *Persoonia* 32: 219. 2014. Synonym: *Pilidiella pseudogranati* (Crous) Rossman & Crous, IMA Fungus 6: 151. 2015.

**Diagnosis:** Endophyte, presumed saprobe. Occurring on *Terminalia stuhlmannii* in Zambia. *Conidia* hyaline, smooth, guttulate, fusoid to naviculate, apex subobtuse, base truncate, thin-walled with mucoid appendage along side of conidium, straight to curved, frequently inequilateral, (19–)21–24(–25) × (3–)4 μm.

**Description and illustration:** Crous et al. (2014b).

**Culture characteristics:** Colonies with clear growth zones in concentric circles and sparse aerial mycelium. On PDA, OA and MEA surface buff, reverse buff to honey.

**Material examined:** Zambia, on *Terminalia stuhlmannii* (Combretaceae), 28 Feb. 2013, M. van der Bank (holotype CBS H-21692, culture ex-type CPC 22545 = CBS 137980).

**Notes:** *Coniella pseudogranati* was not included in the phylogenetic tree (Fig. 2) since we were not able to amplify the rpb2 gene of this isolate. However, the individual ITS nrDNA and tef1 trees demonstrate this taxon to cluster separate from others included in this study.

*Coniella pseudostraminea* L.V. Alvarez & Crous, *sp. nov*. MycoBank MB817830. Fig. 23.
**Etymology:** Named after its resemblance to *Coniella straminea*.

**Diagnosis:** Plant pathogenic. Occurring on leaves of *Fragaria* sp. in South Africa. Conidia hyaline, inequilateral, linear or curved, fusiform to naviculate, smooth-walled, apex obtuse to rounded, base truncate, multiguttulate, germ slits absent, (15–) 16–19(–20) × (2.5–)3–4(–4.5) μm (l: w = 4.8).

Plant pathogenic. *Conidiomata* separate, immersed or superficial, globose to depressed, initially appearing hyaline, becoming olivaceous to black with age, to 300 μm diam. Ostiole central, 22–25 μm diam. *Conidiomatal wall* 13–19 μm thick, consisting of 2–3 layers of medium brown *textura angularis*. *Conidiophores* densely aggregated, subulate, simple, frequently branched above, reduced to conidiogenous cells, or with 1–2 supporting

---

*Fig. 21. Coniella peruensis* (CBS 110394). A. Conidiomata forming on OA. B, C. Conidiogenous cells giving rise to conidia. D, E. Conidia. Scale bars: A = 200 μm, others = 10 μm.

*Fig. 22. Coniella pseudogranatii* (CBS 137980). A. Conidiomata forming on OA. B, C. Conidiogenous cells giving rise to conidia. D. Conidia. Scale bars: A = 200 μm, others = 10 μm.

*Fig. 23. Coniella pseudostraminea* (CBS 112624). A. Conidiomata forming on OA. B, C. Conidiogenous cells giving rise to conidia. D. Conidia. Scale bars: A = 300 μm, others = 10 μm.
cells. **Conidiogenous cells** simple, hyaline, smooth, tapering, 10–16.5 × 1.5–3 μm, 1–2.3 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. **Conidia** hyaline, inequilateral, linear or curved, fusiform to naviculate, smooth-walled, apex obtuse to rounded, base truncate, multi-guttulate, germ slits absent, (15–)16–19(–20) × (2.5–)3–4(–4.5) μm (l: w = 4.8).

**Culture characteristics**: Colonies on MEA rust in colour, with fluffy white aerial mycelium and inconspicuous black conidiomata. On OA colonies have thin olivaceous to white aerial mycelium. On PDA colonies have thin white aerial mycelium at the centre.

**Material examined**: *South Africa*, Gauteng, Pretoria, on leaves of Fragaria sp., 4 Nov. 2009, P.W. Crous (holotype CBS H-22700, culture ex-type CBS 112624 = IMI 233050).

**Notes**: *Coniella pseudostraminea* in clade 6 (Fig. 2) is morphologically similar to its sister species, *C. straminea*, but with slightly longer conidia. The phylogenetic analysis revealed that *C. pseudostraminea* has 97% similarity with *C. straminea* based on the rpb2 sequences.

**Coniella quercicola** (Oudem.) L.V. Alvarez & Crous, **comb. nov.** MycoBank MB817831. Fig. 24.

**Basionym**: *Macroplodia quercicola* Oudem., Ned. Kruidk. Archf, 3 sér. 2(3): 752. 1902.

**Synonyms**: *Sphaeropsis quercicola* (Oudem.) Sacc., Syll. Fung. 18: 315. 1906.

**Pilidiella quercicola** (Oudem.) Petr., Beih. Repr. nov. Spec. Regni veg. 42: 462. 1927.

**Diagnosis**: Plant pathogenic. Occurring on leaves and twigs of *Quercus* spp. in Europe (The Netherlands), and Pakistan. *Conidia* hyaline, asymmetrical, smooth-walled, cylindrical, slightly curved to naviculate, aseptate, rounded to acute apex, tapered to a truncate basal end, germ slits absent, (13–)14–18(–19) × (2–)2.5–3(–3.5) μm (l: w = 5.3).

**Plantspathic**: *Conidiomata* separate, immersed or superficial, globose to depressed, initially appearing hyaline, becoming olivaceous to black with age, up to 320 μm diam. *Ostiole* central, 15–20 μm diam. *Conidiomatal wall* 3–7 mm thick, consisting of 3–4 layers of dark brown textura angularis. *Conidiophores* densely aggregated, slightly thicker, subulate, simple, frequently branched above, reduced to conidiogenous cells, or with 1–5 supporting cells. *Conidiogenous cells* simple, tapering, hyaline, smooth, 8–16 × 1–2.5 μm, 0.5–1.5 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinal thickening. *Conidia* hyaline, asymmetrical, smooth-walled, cylindrical, slightly curved to naviculate, aseptate, rounded to acute apex, tapered to a truncate basal end, germ slits absent, (13–)14–18(–19) × (2–)2.5–3(–3.5) μm (l: w = 5.3).

**Culture characteristics**: Colonies spreading with sparse aerial mycelium and uneven catenulate zonation. On OA surface with sparse aerial mycelia and few black conidiomata in concentric circles. On PDA surface with thin white aerial mycelium. On MEA surface slightly imbricated with uneven zonated aerial mycelium and a few black conidiomata.

**Material examined**: *The Netherlands*, Province Gelderland, Vorden, Hackford, Quercus robur leaf litter, Aug. 1969, E. Jansen (neotype designated here CBS H-17071, MBT372455, culture ex-neotype CBS 904.69); Amhem, excrements of Glomerus sp., which had eaten forest soil, Mar. 1976, H. Schoot, CBS H-17073, culture CBS 283.76.

**Notes**: *Coniella quercicola* (clade 12, Fig. 2), based on *Macroplodia quercicola*, was originally described from leaves of *Quercus robur* collected in Bussum, The Netherlands. It was described as having pale brown, cylindrical conidia, 24 × 4 μm (Saccardo & Saccardo 1906). We were unable to locate the original type material for study (L), and therefore designate a neotype collected from the same host and country.

**Coniella solicina** L.V. Alvarez & Crous, **sp. nov.** MycoBank MB817832. Fig. 25.

**Etymology**: Named after the substrate, specifically soil, from which the species was isolated.

**Diagnosis**: Presumed saprobe. Occurring in soil in South Africa. *Conidia* hyaline to pale brown, becoming dark brown at maturity, smooth, symmetrical to inequilateral, ellipsoidal to citriform, apex acute to apiculate, widest in the middle, tapering towards a narrowly truncate base, smooth-walled, multi-guttulate when young, biguttulate when mature, longitudinal slit present, (7–)7.5–11.5(–12) × (4.5–)5–7.5(–8) μm (l: w = 1.6), frequently with minute basal cellular appendage, hyaline, cylindrical, 1–2 μm long, with mucoid appendage alongside conidium.

Presumed saprobe, from soil. *Conidiomata* separate, immersed or superficial, globose to depressed, initially appearing hyaline, becoming olivaceous to black with age, to 300 μm diam. *Ostiole* central, 50–70 μm diam, becoming papillate. *Conidiomatal wall* consisting of 3–4 layers of medium brown textura angularis. *Conidiophores* densely aggregated, slightly thick-walled, subulate, simple, frequently branched above, reduced to conidiogenous cells, or with 2–3 supporting cells. *Conidiogenous cells* simple, tapering, hyaline, smooth, 6–12 × 1.5–3.5 μm,
1–2.5 μm wide at apex, surrounded by a gelatinous coating, apex with visible periclinical thickening or percurrent proliferation. Conidia hyaline to pale brown, becoming dark brown at maturity, smooth, symmetrical to inequilateral, ellipsoidal to citriform, apex acute to apiculate, widest in the middle, tapering towards a narrowly truncate base, smooth-walled, with yellowish to pale brown thick wall, multiguttulate when young, biguttulate when mature, longitudinal slit present, (7–13.7 μm) (10.5–17.5 μm) × (4.5–9.4 μm) (w: l = 1.6), frequently with minute basal cellular appendage, hyaline, cylindrical, 1–2 μm long, with mucoid appendage alongside conidium.

**Culture characteristics:** Colonies with sparse aerial mycelium and immersed to partly immersed, dispersed, hyaline to dark olivaceous conidiomata. On MEA mealy black due to sporulation, arranged in irregular concentric rings with semi fluffy aerial mycelium. On OA surface with black conidiomata with inconspicuous aerial mycelium. On PDA surface with few to numerous black conidiomata and powder white aerial mycelium at the centre.

**Materials examined:** South Africa, Potchefstroom, from soil, collection date unknown, M.C. Papendorf (holotype CBS H-10721, culture ex-type CBS 766.71). USA, Texas, collection date unknown, B.C. Sutton, CBS 114007 = IMI 253210 = CPC 4199.

**Notes:** Coniella solicina in clade 23 (Fig. 2) was originally identified as *C. fragariae*, with which it appears to be morphologically similar in conidial shape and size, 7–12.5 × 4–10 μm (Van Niekerk et al. 2004). The conidia of *C. solicina* are more ellipsoidal to limoniform with acute to apiculate apices than those of *C. fragariae*. Phylogenetic analyses also suggest its distinctiveness as a novel species clustering in a separate clade (clade 23, Fig. 2) having 98% rpb2 similarity with *C. fragariae* (clade 25, Fig. 2).

**Coniella stramina** (Shear) L.V. Alvarez & Crous, comb. nov. MycoBank MB817833. Fig. 26.

**Basionym:** Schizoparme stramina Shear, Mycologia 15: 121. 1923.

**Diagnosis:** Plant pathogenic. Occurring on *Fragaria* and *Rosa* spp. in the USA (VA). Ascospores aseptate, ellipsoidal, inequilateral, hyaline to pale yellowish with age, 11–13 × 3–4 μm.

**Descriptions and illustrations:** Shear (1923), Maas et al. (1979), Samuels et al. (1993).

**Material examined:** USA, Fragaria sp., 6 Sep. 1920, C.L. Shear, culture CBS 149.22 = CPC 3932.

**Notes:** The asexual morph of Schizoparme stramina (Maas et al. 1979) was regarded as Coniella castaneicola. Subsequent authors (Sutton 1980, Nag Raj 1993, Samuels et al. 1993) accepted this synonymy and treated it as a cosmopolitan taxon with numerous synonyms including C. quercicola. When Shear (1923) originally described *S. stramina* (on leaf litter of *Rosa* sp., Arlington Farm, Virginia, USA), he listed many hosts for this species, including Fragaria, the host on which the conidial form was first observed. A culture from Fragaria was also deposited by C.L. Shear at CBS as CBS 149.22, and is accepted as “authentic” for the name Schizoparme stramina. Coniella castaneicola was originally described as Gloeosporium castaneicola (on Castanea vesca, Delaware, USA, conidia 20 × 2–2.5 μm), but requires fresh collections to resolve its status.

**Coniella stromatica** (Samuels et al.) L.V. Alvarez & Crous, comb. nov. MycoBank MB817834. Basionym: Schizoparme stromatica Samuels et al., Mycotaxon 46: 474. 1993.

**Synonym:** Pilidiella stromatica (Samuels et al.) Rossman & Crous, IMA Fungus 6: 152. 2015.

**Diagnosis:** Saprobic. Occurring on tree bark in Belém, Brazil. Ascomata erumpent, aggregated, papillate. Ascospores hyaline, becoming brown, (13–17.5 μm) × (7–9.4 μm). Conidia broadly ellipsoidal, brown, with longitudinal germ slit, (10.5–12.4 μm) × (21.7–21.7) × (7–8) μm.

**Description and illustration:** Samuels et al. (1993).

**Notes:** Coniella stromatica was originally described from bark of an unidentified tree collected in Pará, Belém, Brazil (holotype MG, isotypes BPI, NY). Presently neither cultures nor DNA sequence data are available.

**Coniella terminalicola** L.V. Alvarez & Crous, nom. nov. MycoBank MB817837.
**Basionym:** Schizoparme terminaliae Samuels et al., Mycotaxon 46: 478. 1993.

**Synonym:** Pilidiella terminaliae (Samuels et al.) Rossman & Crous, IMA Fungus 6: 152. 2015.

**Diagnosis:** Plant pathogenic. Occurring on leaves of Terminalia superba in Ecuador. Ascomata solitary to aggregated, becoming erumpent. Ascosporas hyaline, becoming brown, narrowly to broadly ellipsoid, (10−11.3−13.9−15) × (3−) 3.5−5.7(−6) μm.

**Description and illustration:** Samuels et al. (1993).

**Notes:** Coniella terminaliicola is introduced as a new name for Schizoparme terminaliae in Coniella, as Coniella terminaliae is already occupied. This species was originally described from leaves of Terminalia superba collected in Ecuador (holotype BPI). Presently neither cultures nor DNA sequence data are available. In addition to C. terminaliicola several other species of Coniella have been described from Terminalia, namely C. crousi, C. macrospora, C. pseudogranati, and C. terminaliae.

**Coniella tibouchinae** (B.E.C. Miranda et al.) L.V. Alvarez & Crous, comb. nov. MycoBank MB817835. Fig. 27.

**Basionym:** Pilidiella tibouchinae B.E.C. Miranda et al., IMA Fungus 3: 4. 2012.

**Diagnosis:** Plant pathogenic. Occurring on leaves of T. granulosa in Brazil. Conidia mostly broadly ellipsoidal, often somewhat flattened on one side, oblong, subreniform, ovoid to subovoid, apex rounded, subtruncate at base, hilum sometimes slightly protuberant, aseptate, hyaline when immature, becoming smoky-brown at maturity, smooth, guttulate, 10−13 × 6−8 μm (l: w = 1.7).

**Description and illustration:** Miranda et al. (2012).

**Material examined:** Brazil, Minas Gerais, Viçosa, campus of the Universidade Federal de Viçosa, on leaves of T. granulosa, 8 Mar. 2010, B.E.C. Miranda (holotype VIC 31443, isotype CBS H-20827; cultures ex-holotype CPC 18511 = CBS 131594, CPC 18512 = CBS 131595).

**Notes:** Coniella tibouchinae as P. tibouchinae was established as novel species based on the ITS nrDNA and LSU nrDNA sequence data, which confirmed it as distinct from other known taxa. It was identified as the main cause of foliage blight and dieback, considered one of the most widespread and damaging diseases affecting T. granulosa in the field, gardens, and also nurseries.

**Coniella wangiensis** (Crous & Summerell) L.V. Alvarez & Crous, comb. nov. MycoBank MB817836. Fig. 28.

**Basionym:** Pilidiella wangiensis Crous & Summerell, Persoonia 28: 177. 2012.

**Diagnosis:** Plant pathogenic. Occurring on leaves of Eucalyptus sp. in Australia. Conidia broadly ellipsoid to globose, apiculate, granular with central guttule, hyaline when immature, becoming medium brown, frequently with minute basal cellular appendage, hyaline, cylindrical, 1−2 μm long; conidia at times flattened along one side, or collapsing with age; apex tapering to an apiculus, 1−2 μm diam, base tapering to a truncate hilum, 1−1.5 μm diam, (9−)10−11(−13) × (7−)8−9(−10) μm (l: w = 1.2).

**Description and illustration:** Crous et al. (2012).

**Material examined:** Australia, Northern Territory, Wangi Falls, Litchfield National Park, from leaves of Eucalyptus sp., 24 Apr. 2011, P.W. Crous & B.A. Summerell (holotype CBS H-20969, culture ex-type CBS 132530 = CPC 19397).

**Notes:** Crous et al. (2012) regarded this species to be morphologically similar with C. australiensis, and to differ only in having somewhat smaller conidia (9−13 × 7−10 μm) and an apical apiculus. In the present study P. wangiensis appeared to be closely related to C. peruanicus (clade 19, Fig. 2), which is distinct from the C. fragariae clade (clade 25, Fig. 2).

**Species unexamined and excluded**

**Anthasthoopa aceris** G.Z. Wang, Bull. bot. Res., Harbin 3(2): 128. 1983.

**Notes:** Described from leaves of Acer pseudosieboldianum, Mt. Chingbai, Jilin, China. Presently this species is not known from culture or from DNA.

**Coniella australiensis** Petr., Sydowia 9: 567. 1955.

**Notes:** Described from leaves of Pelargonium australe, Mt. Colee, nr. Canberra, Australia (holotype in W). Presently this species is not known from culture or from DNA.

**Coniella castaneicola** (Ellis & Everh.) B. Sutton, The Coelomycetes (Kew): 420. 1980.

**Notes:** Described as Gloeosporium castaneicola (on Castanea vesca, Delaware, USA), but requires fresh collections to resolve its status.
Coniella citri G.P. Agarwal & N.D. Sharma, in Sharma & Agarwal, Sydowia 26: 261. 1974 [1972].

Notes: Described from leaves of Citrus medica, India, and treated as synonym of C. castaneicola by Nag Raj (1993). Presently this species is not known from culture or from DNA.

Coniella clypeata Matsush., Matsush. Mycol. Mem. 9: 27. 1996.

Notes: Described from decaying leaf of unidentified tree, Japan (holotype Matsushima Fungus Collection, Kobe, 5H413). Presently this species is not known from DNA.
**Coniella costae** Dianese et al., Mycol. Res. 97: 1234. 1993.

Notes: Described from leaves of *Myrcia tomentosa*, Brazil (holotype UB 355). Presently this species is not known from culture or from DNA.

**Coniella delicata** B. Sutton, The Coelomycetes (Kew): 422. 1980.

Notes: Described from *Aeridis crassifolia*, Thailand (holotype IMI 191546). Presently this species is not known from culture or from DNA.

**Coniella duckerae** H.Y. Yip, Trans. Br. mycol. Soc. 89(4): 587. 1987.

Notes: Described from the rhizosphere of *Lepidospernum concavum*, Australia (holotype DAR 55703, isotype VPRI 13689). Presently this species is not known from culture or from DNA.

**Coniella eucalypticola** Nag Raj, Canad. J. Bot. 54: 1370. 1976.

Notes: Described from leaves of *Eucalyptus sp.*, Bangalore, India (holotype DAOM 150596). Presently this species is not known from culture or from DNA.

**Coniella genistae** Bat. & Peres, Saccardoa 1: 58. 1960.

Notes: Described from branches of *Genista tinctoria*, Germany. Presently this species is not known from culture or from DNA.

**Coniella minima** B. Sutton & Thaung, Nova Hedwigia 26(1): 10. 1975.

Notes: Described from leaves of *Eucalyptus camaldulensis*, Myanmar, Burma (holotype IMI 179300). Presently this species is not known from culture or from DNA.

**Coniella musaiaensis** var. *hibisci* B. Sutton, The Coelomycetes (Kew): 420. 1980.

Notes: Described from *Hibiscus esculentus*, Nigeria (IMI 129200). Presently no ex-type strain or DNA data are available. One strain in the CBS culture collection (CBS 109757 = ARS 3534) originates from *Hibiscus* sp. in Africa, and further study is needed to resolve if this could be a potential epitype.

**Coniella musaiaensis** var. *musaiaensis* B. Sutton, Canad. J. Bot. 47: 607. 1969.

Notes: Described from leaves of *Bauhinia reticulata*, Sierra Leone (holotype IMI 103345). Presently this species is not known from culture or from DNA.

**Coniella oryzae** S. Ahmad, Biologia, Lahore 14: 4. 1968.

Notes: Described from culms of *Oryza sativa*, Pakistan. Presently this species is not known from culture or from DNA.

**Coniella petrakioidea** Nag Raj, Coelomycetous Anamorphs with Appendage-bearing Conidia (Ontario): 233. 1993.

Notes: Described from leaves of unidentified tree collected in Nigeria (holotype IMI 99367(b)). Presently this species is not known from culture or from DNA.

**Coniella populina** Naumov, Notul. syst. Sect. cryptog. Inst. bot. Acad. Sci. U.S.S.R. 7: 118. 1951.

Notes: Described from branches of *Populus tremula*, Leningrad, Russia. Presently this species is not known from culture or from DNA.

**Coniella simba** (Subram. & K. Ramakr.) B. Sutton, Canad. J. Bot. 47: 607. 1969.

Notes: Described from tree bark, Puerto Rico (holotype IMI 110496). Presently this species is not known from culture or from DNA.

**Coniella terminaliae** Firdousi et al., Acta Bot. Indica 22: 134. 1994.

Notes: Described from *Terminalia tomentosa*, Madhya Pradesh (holotype IMI 323384). Presently this species is not known from culture or from DNA.

**Pilidiella duvauciloca** (Speg.) Petr. & Syd., Feddes Repert. Spec. Nov. Regni Veg., Beih. 42: 464 (1927)

Notes: Described from leaves of *Duvaua longifolia* (? = *Schinus longifolia*), Argentina. Presently this species is not known from culture or from DNA.

**Pilidiella jambolana** S. Ahmad, Biologia, Lahore 13: 38. 1967.

Notes: Described from leaf of *Eugenia jambolana*, Pakistan. Presently this species is not known from culture or from DNA.

**Pilidiella tamaricinco** S. Ahmad, Biologia, Lahore 13: 38. 1967.

Notes: Described from branches of *Tamarix articulata*, Pakistan. Presently this species is not known from culture or from DNA.

**Schizoparme botrytidis** Samuels, M.E. Barr & Lowen, Mycotaxon 46: 468. 1993.

Notes: Described from tree bark, Puerto Rico (holotype BPI). Presently this species is not known from culture or from DNA.

**Schizoparme versiniana** (Sacc. & Penz.) Nag Raj & Lowen, Mycotaxon 46: 480. 1993.

Notes: Described from fruit of *Punica granatum*, Spain (holotype PAD, isotypes BPI, K, NY). Presently this species is not known from culture or from DNA.

**DISCUSSION**

The genera *Coniella*, *Pilidiella* and *Schizoparme* contain cosmopolitan species that are known to cause diseases on...
numerous host plants. However, several studies in the last few decades raised conflicting ideas as to whether Coniella should be separated from Pilidiella along with its sexual morph Schizoparme, or be considered as a single genus, with Coniella having priority. Von Arx (1981) separated Pilidiella from Coniella based on conidial pigmentation; Pilidiella having hyaline to pale brown conidia and Coniella having dark brown conidia. Castlebury et al. (2002) demonstrated a distinct separation of Coniella from Pilidiella and its Schizoparme sexual morph based on LSU nrDNA sequences. Van Niekerk et al. (2004) furthermore confirmed the separation of Pilidiella (typified from P. castaneicola) and Coniella (typified from C. fragariae) based on their ITS, tef1 and LSU sequence data. Rossman et al. (2007) subsequently erected the family Schizoparmaceae to accommodate Schizoparme and its asexual morph Pilidiella, as well as the closely related asexual genus Coniella. The sexual genus Schizoparme (1923) was then reduced to synonymy (Rossman et al. 2015) to protect the asexual genus Pilidiella (1927), in response to one name for fungi based on the International Code of Nomenclature for algae, fungi and plants (McNeill et al. 2012).

Wijayawardene et al. (2016) regarded Coniella and Pilidiella as two separate genera, based on differences in conidial pigmentation as cited by Von Arx (1981), phylogenetic data presented by Castlebury et al. (2002) and Van Niekerk et al. (2004) and other related studies (Rossman et al. 2007, 2015). On the other hand, Sutton (1980) and Nag Raj (1993) did not consider the difference in conidial pigmentation significant to separate the two genera, but instead regarded Pilidiella as synonym of Coniella. Muthumary & Vanaja (1986) also supported this idea based on the development of conidiomata in Coniella (C. fragariae) being similar to that of Pilidiella (P. quercicola), as revealed in the study performed by Maas et al. (1979). Such confusion or inconsistency was regarded by Wijayawardene et al. (2016) to be due to poor delimitation and understanding of generic and species boundaries, not only for Coniella and Pilidiella, but also in other coelomycetous fungi.

In the present study multigene phylogenetic analyses combined with a large set of cultures enabled us to resolve the generic boundaries in Schizoparmaceae. Based on a four-gene phylogeny (ITS, LSU, tef1 and rp2) the basal node was found to be well resolved (parsimony bootstrap 100/Bayesian posterior probability 1), suggesting that there is presently only a single genus in Schizoparmaceae, to which the older name Coniella should be applied. Although a smaller subset of cultures found the type of Coniella to cluster apart from the type of Pilidiella (Castlebury et al. 2002, Van Niekerk et al. 2004), the boundaries became less clear once additional species were added (Fig. 2), showing that conidial pigmentation and conidial germination or appendages were gained or lost several times within the Schizoparmaceae, and that the pale and pigmented taxa were essentially intermixed. Furthermore, the feature of conidial volume being correlated to conidial pigmentation (e.g. Pilidiella, pale brown conidia, I: w > 1.5; Coniella, dark brown conidia, I: w ≲ 1.5; Van Niekerk et al. 2004), also proved to be untenable once more species were included in the dataset. Conidial volume was commonly used by Nag Raj (1993) to distinguish closely related species of appended coelomycetes, and has been shown to work well to distinguish taxa in e.g. Botryosphaeriales (Phillips et al. 2013), but its application to distinguish genera (Van Niekerk et al. 2004) was shown to be wrong in the present study. In spite of detailed morphological descriptions for all species known from culture, we also specifically decided to not include a morphological key in this paper, as there are simply too many species complexes, meaning that in future species of Coniella have to be identified based on morphology in conjunction with DNA sequence data.

Ecologically species of Coniella are known as saprobes, plant pathogens or endophytes. Several host genera are now also known to harbour more than one species, e.g. Eucalyptus, Fragaria, Hibiscus, Psidium, Punica, Terminalia and Vitis. Although some species appear to have wide host ranges, occurring on leaf litter, rotting bark, and soil, we suspect that some with reported wide host ranges e.g. C. fragariae and C. granati may in fact represent species complexes. Several species appear to be highly host specific, e.g. C. crousii on Terminalia, C. destruens and C. eucalyptorum on Eucalyptus, C. diploidiella and C. diplodipsis on Vitis, C. quercicola on Quercus, and C. tibouchiniae on Tidobchina.

Species of Coniella share common morphological characteristics in terms of conidomatal anatomy, conidiophores and conidigenous, but vary with regard to conidial size, shape, colour, the presence of a germ slit, gultutes, basal or lateral mucoid appendages, and cultural characteristics. Conidial pigmentation was found to be unreliable to separate these genera, as in some taxa conidia remain hyaline until turning pale brown at maturity, while in others they quickly turn pale brown, becoming dark brown at maturity (Fig. 2). Some species originally treated in Pilidiella, e.g. P. eucalyptorum and P. wangiensis, have conidia that eventually turn dark brown, being more typical of Coniella than Pilidiella sensu Von Arx (1981). As a result, based on both the phylogenetic and morphological analyses, it is proposed that all species of Pilidiella and Schizoparme (linked to taxa with hyaline or brown conidia) be considered as synonyms of Coniella as the accepted generic name based on priority.

Acknowledgements

Lourdes V. Alvarez wishes to thank the Department of Science and Technology, Philippine Council for Industry, Energy and Emerging Technology Research and Development, Department of Science and Technology (DOST-PCIEERD), Bicutan, Taguig City, Philippines through the BCGDA Fund for the financial grant awarded to her through the “DOST Administrative Order No. 002, Series of 2014” to undertake this research at the CBS-KNAW Fungal Biodiversity Centre, Utrecht, The Netherlands. The authors are also thankful to A.Y. Rossman and N.N. Wijayawardene for comments provided on a draft version of the script.

REFERENCES

Carbone I, Kohn LM (1999). A method for designing primer sets for speciation studies in filamentous ascomycetes. Mycologia 91: 553–556.

Castlebury LA, Rossman AV, Jalkotzch WJ, et al. (2002). A preliminary overview of the Diaporthea based on large subunit nuclear ribosomal DNA se- quences. Mycology 94: 1017–1031.

Çeliker NM, Uysal A, Çetinel B, et al. (2012). Crown rot on pomegranate caused by Coniella granati in Turkey. Australasian Plant Disease Notes 7: 161–162.

Chen Y, Shao D-D, Zhang A-F, et al. (2014). First report of a fruit rot and twig blight on pomegranate (Punica granatum) caused by Pilidiella granati in Anhui province of China. Plant Disease 98: 695.

Crous PC, Giraldo A, Hawksworth DL, et al. (2014a). The genera of fungi: fixing the application of type species of generic names. IMA Fungus 5: 141–160.

Crous PW, Gams W, Stalpers JA, et al. (2004). MycoBank: an online initiative to launch mycology into the 21st century. Studies in Mycology 50: 19–22.
Tamura K, Stecher G, Peterson D, et al. (2013). MEGA6: Molecular Evolutionary Genetics Analysis version 6.0. Molecular Biology and Evolution 30: 2725–2729.

Thomidis T (2015). Pathogenicity and characterization of Pilidiella granati causing pomegranate diseases in Greece. European Journal of Plant Pathology 141: 45–50.

Tziros GT, Tzavela-Klonari K (2008). Pomegranate fruit rot caused by Coniella granati confirmed in Greece. Plant Pathology 57: 783.

Vilgalys R, Hester M (1990). Rapid genetic identification and mapping of enzymatically amplified ribosomal DNA from several Cryptococcus species. Journal of Bacteriology 172: 4238–4246.

Villesen P (2007). FaBox: an online toolbox for fasta sequences. Molecular Ecology Notes 7: 965–968.

Van der Aa HA (1983). A new species of Coniella. Proceedings van de Koninklijke Nederlandse Akademie van Wetenschappen Section C 86: 121–125.

Van Niekerk JM, Groenewald JZ, Verkley GJM, et al. (2004). Systematic reappraisal of Coniella and Pilidiella, with specific reference to species occurring on Eucalyptus and Vitis in South Africa. Mycological Research 108: 283–303.

Von Arx JA (1973). Centraalbureau voor Schimmelcultures Baarn and Delft. Progress Report 1972. Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen, Afdeling Natuurkunde 61: 59–81.

Von Arx JA (1981). The genera of fungi sporulating in pure culture, 3rd edn. J Cramer, Vaduz.

Von Höhnel F (1918). Dritte vorlaufige Mitteilung mykologischer Ergebnisse (Nr. 201–304). Berichte der Deutschen Botanischen Gesellschaft 36: 309–317.

White TJ, Bruns T, Lee S, et al. (1990). Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. In: PCR protocols: a guide to methods and applications (Innis MA, Gelfand DH, Sninsky JJ, White TJ, eds). Academic Press, San Diego: USA: 315–322.

Wijayawardene NN, Hyde KD, Wanasinghe DN, et al. (2016). Taxonomy and phylogeny of dematiaceous coelomycetes. Fungal Diversity 77: 1–316.

Wingfield MJ, De Beer ZW, Slippers S, et al. (2012). One fungus, one name promotes progressive plant pathology. Molecular Plant Pathology 13: 604–613.
Author/s:
Alvarez, LV; Groenewald, JZ; Crous, PW

Title:
Revising the Schizoparmaceae: Coniella and its synonyms Pilidiella and Schizoparme

Date:
2016-09-01

Citation:
Alvarez, L. V., Groenewald, J. Z. & Crous, P. W. (2016). Revising the Schizoparmaceae: Coniella and its synonyms Pilidiella and Schizoparme. STUDIES IN MYCOLOGY, 85 (85), pp.1-34. https://doi.org/10.1016/j.simyco.2016.09.001.

Persistent Link:
http://hdl.handle.net/11343/255507

File Description:
Published version

License:
CC BY-NC-ND