INTRODUCTION

Venturiales represent an important order within Dothideomycetes (Ascomycota), members of which are widely distributed in temperate and tropical areas of the world, and have diverse lifestyles. Venturiales include plant pathogens causing leaf spots, necroses, scab diseases, leaf and fruit deformations, opportunistic neurotropic pathogens of aquatic animals or humans, and saprobes in soil or plant debris, with some even being thermophilic, living in hot springs (Barron & Busch 1962, Sivanesan 1977, Yarita et al. 2007, 2010, Schoch et al. 2009a, Zhang et al. 2011, Giraldo et al. 2014, Samerpitak et al. 2014).

Members of Venturiales occupy about 80 % of the order, and represent the type family of Venturiales. Before the name “Venturinae” was introduced, genera of this family were assigned to various families, such as Venturia in Pleosporaceae, Coleroa in Trichosphaeriaceae, Gibbera in Cucurbitariaceae and Stigmatae in Stigmataceae (Winter 1887). Petrak (1924, 1927, 1947) compared the morphology of some genera, i.e., Antennula, Coleroa, Eriospheria, Gibbera, Trichosphaeria and Symportentia africana (Crous) Crous, M. Shen & Y. Zhang ter, Tyrannosorus hantlianianus (U. Braun & Feier) Crous, M. Shen & Y. Zhang ter, Tyrannosorus hystrioides (Dugan et al.) Crous, M. Shen & Y. Zhang ter, Venturia peltigericola (Crous & Diederich) Crous, M. Shen & Y. Zhang ter, Verruconis tenticola (J. Ren et al.) Crous, M. Shen & Y. Zhang ter.

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Venturia and proposed a possible relationship among them. Subsequently, the name Venturiaceae was introduced by Müller & von Arx (1950) to accommodate some morphologically comparable genera, such as Antennularia, Colerosa, Endostigmae, Gibbera, Spilosticta, Stigmatea and Venturia, and the Venturiaceae was assigned to Pseudosphaeriales. von Arx (1952) redefined the morphological characteristics of Venturiaceae, and circumscribed it to include immersed, semi-immersed or superficial ascomata with or without setae, filiform pseudoparaphyses, clavate, obclavate, bitunicate, 8-spored (sometimes 4-spored) asci, hyaline, pale-olivaceous to brown, and 1-septate, often asymmetrical ascospores. Twelve genera were accepted in the family by von Arx (1952), which later increased to 25 (Müller & von Arx 1962), and eventually to 30 (Luttrell 1973). In further studies members of Venturiaceae of particular host genera or families were investigated (Menon 1956, Müller 1958). Nüesch (1960) studied five species of Venturia on Salix, while Bachmann (1963) reported five species of Venturia on Geraniaceae. Sivasesan (1977) studied the type or authentic material of 58 venturiaceous species, of which 52 species were accepted within Venturia.

Barr (1979) validated the description of Venturiaceae with Venturia Sacc. (vs. Venturia De Not.) designated as the type genus, and accepted 12 genera, viz., Acantharia, Apiosporina, Colerosa, Gibbera, Metacolorea, Phaeoapteropus, Platychora, Protovenus, Pyrenobryts, Trichodithis, Venturia and Xenomeris. Venturiaceae was assigned to Pleosporales based on its “Pleospora type of centrum and bitunicate asci” (Barr 1968, 1979). This proposal was supported by subsequent molecular phylogenetic studies (Kodsub et al. 2006, Kruys et al. 2006, Winton et al. 2007, Zhang et al. 2009, 2011). A phylogeny of concatenated SSU, LSU and mtSSU DNA sequences indicated that the Venturiaceae clustered outside of Pleosporales (Kruys et al. 2006), being closely related to Tuberellaceae (Kodsub et al. 2006). Winton et al. (2007) further demonstrated the polyphyletic status of Venturiaceae and pointed out that the core members of Venturiaceae are monophyletic, while their taxonomic placement was undetermined.

Based on morphological, ecological and multi-locus (SSU, LSU, tef1, rpb1, rpb2) phylogenetic investigations, Zhang et al. (2011) redefined the Venturiaceae as parasitic or saprobitic, with immersed, semi-immersed or superficial, gregarious or scattered ascomata, with or without setae, narrow-cellular, evanescent pseudoparaphyses, bitunicate, obclavate, obpyriform asci, and hyaline, yellowish, pale olivaceous to brown, 1-septate, mostly asymmetrical ascospores. Eight genera were accepted within Venturiaceae, viz., Acantharia, Apiosporina, Caproventuria, Colerosa, Dibotryon, Metacolorea, Pseudoparodiella and Venturia (Zhang et al. 2011).

Asexual morphs of Venturiaceae include Fusicladium, Pollaccia, Spilocaea and Pseudocladosporium, of which Fusicladium is the most common. Fusicladium was introduced by Bonorden (1851) based on Fusicladium virescens, which is parasitic on pear. Subsequently, F. virescens was treated as a synonym of the older name F. pyrorum (Saccardo 1886, Lindau 1907, Viennet-Bourgin & Ferrier 1950, Tai 1979, Sivasesan 1984, von Arx 1987). Lindau (1907) and Ferraris (1912) redefined Fusicladium s. lat. to include conidiogenous cells with sympodial and percurrent proliferation, including pollaccia- and spiloceaelike members. Baldacci & Ciferri (1937) separated Pollaccia from Fusicladium, and resurrected the name Pollaccia. Viennet-Bourgin (1949) accepted Fusicladium s. str., which includes species with percurrently proliferating conidiogenous cells, and those with sympodial conidiogenous cells were assigned to a new genus Megacladosporium. Magaledosporium, however, was invalid as it lacked a generic type. Hughes (1953) circumscribed Fusicladium s. str. as having sympodially proliferating conidiogenous cells and somewhat denticle-like conidiogenous loci and assigned the species with obvious percurrently proliferating conidiogenous cells to Spilocaea. Schubert et al. (2003) accepted Fusicladium s. lat., with Pollaccia and Spilocaea as synonyms.

Phylogenetic analyses of ITS and LSU sequences indicated that species of Pollaccia and Spilocaea were intermingled among Fusicladium species, and Pollaccia, Spilocaea as well as Pseudocladosporium were considered as synonyms of Fusicladium (Beck & et al. 2005, Crous et al. 2007b). Crous et al. (2007b) indicated that the arrangement of the conidiophores (solitary, fasciculate or sporodochial), the proliferation of conidiogenous cells (sympodial, percurrent) and shape, size as well as formation of conidia (solitary, catenate) had little taxonomic value at generic level. However, a DNA phylogeny based on five loci, namely SSU, LSU, rpb1, rpb2 and tef1, supported a narrower circumscription of Venturia, which included only a small number of species closely related to the generic type of Venturia (V. inequalis) (Zhang et al. 2011). Thus Pollaccia, Pseudocladosporium and Spilocaea were again treated as separate genera (Zhang et al. 2011).

Based on an ecological, morphological and molecular phylogenetic analysis, a second family, Sympoventuriaceae, was introduced to accommodate Sympoventuria, Veronaepopsis and fusidiaceous-like species (Zhang et al. 2011). Scolecosidium, a soil-borne genus, was described based on two species, i.e., S. terreum (type species) and S. constictum (Abbott 1927). Subsequently, more soil-borne or saprotrophic species were described within Scolecosidium (Barron & Busch 1962, Roy et al. 1962). Ochroconis was separated from Scolecosidium based on its ellipsoidal, clavate or fusiform conidia, in contrast to the trilobate conidia of Scolecosidium (De Hoog & von Arx 1974). This proposal was not supported by subsequent molecular phylogenetic analyses, in which members of Scolecosidium and Ochroconis clustered in a single clade (Hao et al. 2013, Ren et al. 2013). Verrucosisporus was introduced as a thermophilic genus, which includes V. gallopava, an opportunistic neurotropic pathogen, and its sibling, V. caldifluminatalis (Samertatik et al. 2014). Neocoleorea metosideri was described as a pathogen causing leaf spots on Metrosideros excelsa, which was widespread in M. excelsa forests in northern New Zealand (Johnston & Park 2016). Although DNA sequences were not available for the type species of Neocoleorea, N. sibrica, the comparable morphological characteristics with N. metosideri argued for their congeneric status (Barr 1987, Johnston & Park 2016). Clavatispora was introduced as monotypic genus within Sympoventuriaceae represented by Clavatispora thailandica, which is characterised by its muriformly septate ascospores (Boonmeer et al. 2014). A further asexual genus, Yunnanomyces, was introduced to accommodate Y. yunanopause, with globose to broadly oval, yellow-brown, muriformly septate conidia (Tibpromma et al. 2018). Pseudosigmoidoea was separated from Sigmoidoea based on its enteroblastic conidia and phialidic conidiogenesis (Ando & Nakamura 2000), and Sympocehiella was emended to include a repothyphragma-like
synasexual morph within Sympoventuriaceae (Crous et al. 2019a).

Numerous strains belonging to Venturiales were examined in the present study, including the established genera Clavatispora, Ochroconis, Scolecosbasidium, Sympodiella, Sympoventuria, Veronaeaopsis, Verruculos and Yunnanomyces. The primary objectives were: 1) to delineate the phylogenetic lineages, families and generic boundaries; 2) to designate appropriate types to stabilise the application of names. To address these issues, we performed multi-locus phylogenetic analyses based on ITS, LSU, rDNA, _tef1_, _tub2_ and _rpb2_ DNA sequence data.

**MATERIALS AND METHODS**

**Isolates**

Cultures were obtained from the culture collection (CBS) of the Westerdijk Fungal Biodiversity Institute (WI), Utrecht, the Netherlands, and the working collection of Pedro Crous (PCP) housed at the WI, and the Chinese General Microbiological Culture Collection Center (CGMCC) (Table 1). Isolates were subcultured onto fresh malt extract agar (MEA), oatmeal agar (OA), potato dextrose agar (PDA) and synthetic nutrient-poor agar (SNA) (Crous et al. 2019b) and incubated at 25 °C under continuous near-ultraviolet light to induce sporulation.

**DNA extraction, amplification (PCR) and phylogeny**

Total genomic DNA was extracted from fungal colonies using the FastDNA kit (MP Biomedicals, CA, USA), PrepMan Ultra sample preparation reagent (Applied Biosystems, Foster City, CA, USA) and the Wizard® Genomic DNA Purification Kit (Promega Corporation, WI, USA), following the manufacturer’s protocols. The primer sets LOR/R5 and ITS5/ITS4 (Vilgalys & Hester 1990, White et al. 1990), were used to amplify part of the nuclear rDNA LSU and ITS. The EF1-728F and EF-2 primers (Qiao et al. 2016) were used for the amplification of the partial _tef1_ (translation elongation factor 1-alpha) gene. The _rpb2_-5F2 and _rPB2-7C_R primers were used for the amplification of the partial _rpb2_ (DNA-directed RNA polymerase II second largest subunit) gene (Liu et al. 1999, Reeb et al. 2004). Several primer pairs including T1/Bt-2b, T1/Tub4/Rd, and/or Bt-2a/Bt-2b were used to amplify the partial _tub2_ (Beta-tubulin) gene (Glass & Donaldson 1995, Aveskamp et al. 2009, Guo et al. 2014). The amplification cycles were performed following Cano et al. (2004). PCR products were purified and sequenced with an Applied Biosystems 3730xl DNA Analyzer (Life Technologies, Carlsbad, CA, USA). The program SeqMan v. 7.0 (Lasergene, Madison, WI, USA) was used to obtain consensus sequences. The combined ITS, LSU, _tef1_, _tub2_ and _rpb2_ sequence dataset was used to infer the phylogenetic relationships among the new taxa and other reported taxa of Venturiales. Sequences generated were analysed with other sequences obtained from GenBank (Table 1). Phylogenetic trees were generated using Bayesian analyses performed with MrBayes v. 3.2.6 (Ronquist et al. 2012), MrModeltest v. 2.2 (Nylander 2004) was used to determine the best nucleotide substitution model settings for each data partition. The Markov Chain Monte Carlo (MCMC) analysis of four chains started in parallel from a random tree topology, the heat parameter was set at 0.15 and trees were saved every 100 generations until the average standard deviation of split frequencies reached 0.01 (stop value). Burn-in was set to 25 % after which the likelihood values were stationary. Obtained trees were viewed in FigTree v. 1.1.2 (Rambaut 2009) and subsequently printed with Geneious v. 11.0.3 (http://www.geneious.com, Kearse et al. 2012) and edited in Adobe ® Illustrator v. CC 2017. Posterior probability values (PP) were plotted on the branches.

**Morphology**

Specimens were loaned from the following herbaria: Herbarium Plant Pathology and Microbiology Herbarium (PPMH), Chinese Academy of Sciences (HMAS), Cornell University (CUP), New Zealand Fungarium (PDD), University of Michigan (MICH), The Royal Botanic Gardens, Kew (K), the New York Botanical Garden (NY), New York State Museum (NYS), Eidgenössische Technische Hochschule Zürich (ZT), Naturhistorisches Museum Wien (W), the Queensland Plant Pathology Herbarium (BRIP), the Chinese General Microbiological Culture Collection Center (CGMCC), and the Victorian Plant Pathogen Herbarium (VPRI). Attempts were made to trace and borrow type specimens of Venturia from herbaria worldwide, but only some of them could be obtained.

For sexual morphs, ascosclerotia and ascomata were examined under an Olympus SZ H10 dissecting microscope. Measurements and descriptions of sections of the ascomata, hamathecia, asci and ascospores were carried out after immersing ascomata in water, cotton blue, Melzer’s reagent or in 10 % lactic acid. Terminology follows Ulloa & Hanlin (2000). For asexual morphs, measurements and descriptions of microscopic structures including conidiophores, conidiogenous cells and conidia, were taken from specimens mounted in water or lactic acid. Photomicrographs were taken using differential interference contrast and phase contrast optics with a Zeiss Axioscope M1 compound microscope (Zeiss, Oberkochen, Germany) and a DeltaPix Infinity X digital camera or a Nikon Eclipse Ni microscope, using a Nikon DS-U3 digital camera (Nikon, Tokyo, Japan) and NIS-Element imaging software v. 4.20.

**RESULTS**

**Phylogeny**

The concatenated DNA sequence dataset (ITS, LSU, _tef1_, _tub2_ and _rpb2_) used to infer delimitations at family and genus levels comprised 120 isolates (including outgroup sequences) of Venturiales and related fungi and the same concatenated alignment focused on Venturiales comprised 96 isolates (including outgroup sequences). The optimal substitution models recommended by MrModelTest and used in the Bayesian analyses. The number of generations ran and the number of trees from the two runs used to generate the 50 % consensus tree and posterior probabilities. The number of unique site patterns and the number of characters including alignment gaps used for each locus.

The phylogenetic tree distinguished three well-supported clades corresponding to the families Venturiales (PP = 1)
Table 1. Collection details and GenBank accession number of isolatea belonging to species treated in this study.

| Taxa                  | Culture accession number(s) | Host, substrate | Country | Collector and collection date | GenBank accession numbers |
|-----------------------|----------------------------|-----------------|---------|-------------------------------|--------------------------|
| **Cylindrosympodiaceae** |                            |                 |         |                               |                          |
| Cylindrosympodium lauri | CBS 240.95T               | Laurus sp., leaf litter | Spain   | R.F. Castañeda, 4 Jan. 1995   | EU035414 EU035414 – – – |
| C. variabile           | CBS 563.82T               | Pinus sp., decaying needle | Netherlands | G.S. de Hoog, 5 Sep. 1982   | C. variabile KX228353 – – – |
| Pseudoanungilea syzygii | CBS 520.93T               | Syzygium cordatum, leaf litter | South Africa | W.J. Swart, Mar. 1993   | MH107911 MH107957 – – – |
| P. vaccinii            | CBS 141364T               | Vaccinium myrtillus, stem | Germany | R.K. Schumacher, 16 Jan. 2016 | MK810899 MK887794 MK888724 MK926466 |
| CPC 30523             |                           | Vaccinium myrtillus, stem | Germany | R.K. Schumacher, 16 Jan. 2017 | MK810900 MK810787 MK887795 MK888725 MK926467 |
| **P. variabilis**      | CBS 132716T               | Dead wood       | Spain   | M. Hernández-Restrepo, J. Mena & J. Guarro, May 2011 | KY853424 KY853484 – – – |
| Septonema crispulum   | CBS 735.96T               | Pinus pinea, needle litter | Italy   | D. Lunghini, – | MH862607 MH874232 – – – |
| Sympodiella acicola   | CBS 425.76                | Pinus sylvestris, decaying needle | Netherlands | W. Gams, Mar. 1976 | KY853467 KY853529 – – – |
| S. goidanichii         | CBS 987.70                | Betula sp., old leaf litter | UK      | – | MH860019 MH871803 – – – |
| Tothia fuscella       | CBS 130266                | Teucrum chamaedrys | Austria | H. Voglmayr, 15 Sep. 2010 | MH865619 MH877042 – – – |
| T. spartii            | MFLUCC 14-0615T           | Spartium junceum, living and dead branches | Italy | E. Camporesi, 17 Mar. 2012 | NR132917 KR025965 – – – |
| **Sympoventuriaceae** |                            |                 |         |                               |                          |
| Bellamyces quercus    | CBS 46217T = CPC 28858    | Lecanora chlorotera on Quercus trunks | UK      | B.J. Coppins, 24 Aug. 2015   | MK810901 MK810788 MK887796 MK888726 – |
| Echinocatena arthrinioides | CBS 144202          | Acacia crassica | Malaysia | M.J. Wingfield, 1 Jul. 2015 | MH107890 MH107937 – – – |
| Fuscothium rhodosiensis | CBS 121641T            | Ceratonia siliqua, branches | Greece | P.W. Crous & M.J. Wingfield, 1 Jun. 2006 | MK810909 MK810796 MK887802 MK888733 MK926471 |
| F. siciliana          | CBS 105.85T              | Chamaerops humilis | Italy   | W. Gams, Nov. 1984          | MK810910 MK810797 MN091924 MK888734 MK926472 |
| Neocoleroa metrideri | ICMP 21139T              | Metrosideros excelsa | New Zealand | P.R. Johnston, 6 Oct. 2015 | KU131678 KU131677 – – – |
| Neofusicladium eucalypti | CBS 128216T        | Crematogaster sp. (ant) carton on Barteria nigritana | Cameroon | R. Bialit, 19 Dec. 2009     | MK810902 MK810789 MK887797 MK888727 MN078219 |
| Neofusicladium amoenum | CBS 143411T            | Eucalyptus regnans, leaves | Australia | P.W. Crous & R.G. Shivas, 12 Jul. 2009 | MK810903 MK810790 MK887796 MK888728 MK926468 |
| N. eucalypticola      | CBS 14301T               | Eucalyptus robusta, leaf litter | France | P.W. Crous & M.J. Wingfield, 8 Mar. 2015 | MK810904 MK810791 MK887799 MK888729 – |
| N. eucalypticola      | CBS 143427               | Eucalyptus dunnii, leaves | Australia | A.J. Carnegie, 20 Jan. 2016 | MK810905 MK810792 – – – |
| Neofusicladium amoenum | CBS 254.95T            | Eucalyptus sp., fallen leaves | Cuba   | R.F. Castañeda, 2 Nov. 1994   | MK810906 MK810793 – MK888730 MK926469 |
| Taxa                      | Culture accession number(s) | Host, substrate          | Country            | Collector and collection date | GenBank accession numbers |
|--------------------------|----------------------------|--------------------------|--------------------|-----------------------------|--------------------------|
| *Pa. intermedium*        | CBS 110746T                | Eucalyptus sp., leaf litter | Madagascar        | P.W. Crous, 30 Apr. 1994    | MK810907 MK810794 MK887800 MK888731 MK926470 |
| *Pa. paraamoenum*        | CBS 141322T                | Eucalyptus regnans, leaf litter | Australia        | P.W. Crous, J. Edwards & P.W.J. Taylor, 9 Nov. 2014 | MK810908 MK810795 MK887801 MK888732 – |
| *Pinaceicola cordae*     | CBS 126999T                | Pinus sylvestris, litter needles | Czech Republic | O. Koukol, 11 Dec. 2006     | MK810911 MK810798 – MK888735 MK926473 |
|                          | CBS 675.82                 | Pinus sylvestris, litter needles | Netherlands     | G.S. de Hoog, 8 Nov. 1982   | MK810912 MK810799 – MK888736 MK926474 |
| *Pi. pini*               | CBS 462.82                 | Pinus sp., litter needles | Netherlands     | R.K. Schumacher, 5 Feb. 2016 | MK810913 MK810800 – MK888737 MK926475 |
|                          | CBS 463.82T                | Pinus sylvestris, litter needles | Netherlands     | G.S. de Hoog, 12 Apr. 1982  | MK810914 MK810801 MK888738 MK926476 |
|                          | CBS 126959T                | Pinus sylvestris, litter needles | Czech Republic | O. Koukol, 11 Dec. 2006     | MK810915 MK810802 MK888739 MK926477 |
| *Pseudosigma excentrica*| CBS 469.95T                | Lauraceae, leaf litter    | Cuba              | R.F. Castañeda, 6 Aug. 1994 | HQ667543 KF282669 – KF155975 MK926478 |
| *Ps. ibarakiensis*       | NBRC 107891T               | Natural forest soil       | Japan             | –, 2008                     | LC146758 LC146759 – – – |
| *Scolecobasidium anellii*| CBS 284.64T                | Stalactite                | Italy             | A. Graniti, –                | FR832477 KF156138 KF282684 KF155995 KF156184 |
| *Sc. anomalous*          | CBS 131816T                | Cave sediment             | France            | F. Bastian, –                | HE575201 KF156137 HE575205 KF155986 KF156194 |
| *Sc. aquaticum*          | CBS 140316T                | Silicone seal in shower of fish-processing company | Germany | K. Gloyna, 28 Oct. 2014 | KX668258 KX668259 – – – |
| *Sc. constrictum*        | CBS 211.53T                | Soil                      | Canada: Ontario   | R.G. Atkinson, 1952         | HQ667519 KF282653 KF282686 KF156005 KF156187 |
| *Sc. cordanae*           | CBS 475.80T                | Mauritia minor, leaf litter | Colombia         | W. Gams & O. Vargas, 10 Dec. 1979 | KF156022 KF156122 KF282687 KF155981 – |
| *Sc. dracaenae*          | CBS 141233T                | Dracaena reflexa, leaf spots | USA              | P.W. Crous, Aug. 20113      | KX228283 KX228334 KX228370 KX228377 – |
| *Sc. ellipsodeum*        | CBS 131796T                | Soil                      | China             | Hui-Mei Liu, –               | MN077367 – KC337073 – – – |
| *Sc. gamsi*              | CBS 239.78T                | Caryota plumosa, leaf     | Sri Lanka         | W. Gams, Jan. 1973          | KF156019 KF156150 KF155982 KF156190 |
| *Sc. globale*            | CBS 119644T                | Indoor sample, house      | Germany           | –, 2002                     | KF961086 KF961097 KF961075 KF961065 |
| *Sc. icarus*             | CBS 536.69T                | Forest soil               | Canada: Ontario   | –                          | HQ667524 KF156132 – – KF156174 |
| *Sc. lascausense*        | CBS 131815T                | Black stain on cave sediment | France         | Fabiola Bastian, 26 Aug. 2008 | FR832474 KF156136 FR832481 KF155994 KF156183 |
| *Sc. macrozamiae*        | CBS 137971T                | Macrozamia, leaf litter   | Australia         | P.W. Crous & R.G. Shivas, 16 Jul. 2009 | KJ869123 KJ869180 – – – |
| *Sc. minimum*            | CBS 510.71T                | Gossypium arboreum, rhizosphere | Nigeria         | M. Dransfield, –            | HQ667522 KF156134 – KF156007 KF156172 |
| *Sc. musae*              | CBS 729.95T                | Regulator of diver        | –                | Streeklab voor Volkgezondheid Haarlem, – | KF156029 KF156144 KF282693 KF155999 KF156171 |
| *Sc. musicola*           | CBS 144441T                | Musa sp., leaf            | Malaysia          | P.W. Crous, 2010            | MH327824 MH327860 – MH327887 – |
| *Sc. olivaceum*          | CBS 137170T                | Man, bronchoalveolar lavage fluid | USA: Utah       | D.A. Sutton, 2010          | LM644521 LM644654 – – LM644605 |
| *Sc. pandanicola*        | CBS 140660T                | Pandanus utilis, leaves   | France            | P.W Crous & M.J Wingfield, 6 Mar. 2014 | KT950850 KT950864 – – – |

(continued on next page)
| Taxa                  | Culture accession number(s) | Host, substrate | Country                 | Collector and collection date | GenBank accession numbers |
|----------------------|-----------------------------|-----------------|-------------------------|------------------------------|--------------------------|
|                       |                             |                 |                         |                              |                          |
| Sc. phaeophorum       | CBS 206.96<sup>T</sup>      | Leaf in coastal rain forest | Papua New Guinea         | A. Aptroot & A. van Iperen, 1995 | KP799631 KP799634 KF282692 KF272098 KF272062 |
| Sc. podocari          | CBS 143174<sup>T</sup>      | Podocarpus grayae, leaves | Australia                | P.W. Crous, 25 Nov. 2016     | MG386032 MG386085 – MG386162 – |
| Sc. ramosum           | UTHSC 12-1082<sup>T</sup>   | Man, nail       | USA: California          | D.A. Sutton, 2012            | LM644524 LM644524 – – LM644608 |
| Sc. sexuale           | CBS 135765<sup>T</sup>      | Swabs (control in a laboratory providing medical supplies) | South Africa             | E.J van der Linde, 2012      | KF156018 KF156118 – KF155976 KF156189 |
| Sc. terreum           | CBS 203.27<sup>T</sup>      | Soil            | USA: Louisiana           | E.V. Abbott, 1927            | HG667544 – KF282698 – HG877665 |
| Sc. tsawytyscaei      | CBS 100438<sup>T</sup>      | Fish            | –                       | M.S. Doty                    | HG667562 KF156126 KF282697 KF155990 KF156180 |
| Sc. verrucosum        | CBS 383.81<sup>T</sup>      | Soil            | India                    | S. Zachariah, –              | –                        |
| Stenila eucalypti     | CPC 14942                   | Eucalyptus sp.  | Portugal                 | P.W. Crous, 24 Jan. 2008     | MK810916 MK810803 MK887805 MK888740 – |
|                      | CPC 14943                   | Eucalyptus sp.  | Portugal                 | P.W. Crous, 24 Jan. 2008     | MK810917 MK810804 MK887806 MK888741 – |
|                      | CBS 144019<sup>T</sup>      | Eucalyptus sp.  | Portugal                 | P.W. Crous, 24 Jan. 2008     | MK810918 MK810805 MK887807 MK888742 – |
| Sympoventuria africana| CBS 121639<sup>T</sup>      | Eucalyptus sp., leaf litter | South Africa             | P.W. Crous, 2006             | MK810919 MK810806 MK887808 MK888743 MK926479 |
|                      | CBS 121640                  | Eucalyptus sp., leaf litter | South Africa             | P.W. Crous, 2006             | MK810920 MK810807 MK887809 MK888744 MK926480 |
| Sy. capensis          | CBS 120136<sup>T</sup>      | Eucalyptus sp., leaf litter | South Africa             | P.W. Crous, Jan. 2006       | MK810921 MK810808 MK887810 MK887845 MK926481 |
|                      | CPC 12839                   | Eucalyptus sp., leaf litter | South Africa             | P.W. Crous, Jan. 2006       | MK810922 MK810809 MK887811 MK887846 MK926482 |
|                      | CPC 12840                   | Eucalyptus sp., leaf litter | South Africa             | P.W. Crous, Jan. 2006       | MK810923 MK810810 MK887812 MK887847 MK926483 |
| Sy. melaleucae        | CBS 143407<sup>T</sup>      | Melaleuca sp., leaves | Australia                | P.W Crous, 2 Dec. 2016      | MG386059 MG386112 – MG386168 |
| Tropospora fumosa     | CBS 351.94                  | Plant litter    | Italy                    | A. van Beverwijk, Sep. 1954  | MK810924 MH874121 – – – |
| T. montipes           | MUCL 19867                  | –               | Sweden                   | G.L. Hennebert, –            | DQ351723 AY856871 – – – |
| T. olivaceum          | CBS 728.83                  | Dicksonia antarctica, dead petiole | Australia             | W. Gams, Aug. 1983          | MH861681 MH873393 – – – |
| Veronaeopsis simplex  | CBS 588.66<sup>T</sup>      | Acacia karroo, leaf litter | South Africa             | M.C. Papendorf, –           | EU041820 EU041877 MN091925 – – – |
| V. calidifluminalis   | CBS 125818<sup>T</sup>      | Water of a hot stream | Japan                    | –, 1 Mar. 2004              | AB385698 KF156108 – KF155995 – |
| V. gallopava          | CBS 118.91                  | Man             | USA: Georgia             | A.A. Padhye, –               | HG675511 KF282655 KF282688 JF440539 HG877643 |
|                      | CBS 437.84<sup>T</sup>      | Meleagris gallopavo (turkey), brain abscess | USA: South Carolina | W.B. Cooke, –               | HG675533 KF282656 KF282689 KF155968 KF156293 |
| V. panacis            | CGMCC 3, 18302<sup>T</sup>  | Panax notoginseng, root | China: Yunnan province  | Y. Zhang, 15 Oct. 2015       | MF536882 MF536880 – MF536881 MF536883 |
| V. verruculosa        | CBS 131795<sup>T</sup>      | Soil            | China                    | Y.L. Zhang, Dec. 2009       | MK810925 MK810811 KC337072 – – |
| Venturiaceae          | CBS 119775                  | Hevea sp., root | Malaysia                 | –                           | KF156014 KF282668 – KF155974 KF156193 |
| Apiosporina collinsii | CBS 118973                  | Amelanchier alnifolia | Canada: Ontario          | –                           | MK810926 MK810812 MK887813 MK888748 – |
| Taxa                        | Culture accession number(s)1 | Host, substrate                  | Country             | Collector and collection date | GenBank accession numbers2 |
|----------------------------|------------------------------|----------------------------------|---------------------|------------------------------|-----------------------------|
|                            |                              |                                  |                     |                              | ITS LSU rpb2 tef1 tub2      |
| A. morbosa                 | dimosp                       | Prunus sp.                       | USA: Washington     | –                            | –                            |
| Coleroa circinans          | CBS 457.64                   | Geranium rotundifolium           | France              | –                            | –                            |
| C. robertiani              | CBS 458.84                   | Geranium robertianum            | Switzerland         | –                            | –                            |
| Coleroa sp. 1              | CBS 372.53                   | Acer pseudoplatanus              | Switzerland         | –                            | –                            |
| Coleroa sp. 2              | CBS 378.49                   | Gentiana lutea                   | Switzerland         | –                            | –                            |
| Coleroa sp. 3              | CBS 370.55                   | Anemone alpina                   | France              | –                            | –                            |
| Cylindrosympodioides brabej | CBS 141285T                  | Brabejum stellatifolium, leaf litter | South Africa         | P.W. Crous & M.J. Wingfield, 17 Jan. 2015 | KX228256 KX228308 – – – – |
| Fagicola fagi              | CBS 621.84T                  | Fagus sylvatica, decaying leaves | Netherlands         | G.S. de Hoog, 1 Oct. 1984   | MK810933 MK810819 MK887820 MK887855 MK926489 |
| Fraxinicolae europaea       | CBS 472.61T                  | Betula alba                      | Switzerland         | E. Müller, 8 Apr. 1959      | MK810934 MK810820 MK887821 MK887856 MK926490 |
|                            | CBS 477.81                   | Populus tremula                  | France              | –                            | MK810935 MK810821 MK887822 MK887857 MK926491 |
|                            | CBS 689.85                   | Populus tremula, leaf litter     | France              | –                            | MK810936 MK810822 MK887823 MK887858 MK926492 |
|                            | CBS 377.53                   | Epilobium montanum               | France              | –                            | MK810937 MK810823 MK887824 MK887859 MK926493 |
| F. fraxini                 | CBS 130599T                  | Leaves of Protea sp., in association with Viziaella interrupta | South Africa         | P.W Crous, 5 May 2010       | MK810938 MK810824 MK887825 MK887860 MK926494 |
|                            | CBS 140929                   | Fraxinus ornus, leaf endophyte   | Italy               | M. Schlegel, –              | MK810939 MK810825 MK887826 MK887861 MK926495 |
|                            | CBS 140930T                  | Fraxinus excelsior, leaf endophyte | Switzerland         | M. Schlegel, –              | MK810940 MK810826 MK887827 MK887862 MK926496 |
|                            | CBS 140935                   | Fraxinus excelsior, leaf litter  | Switzerland         | M. Ibrahim, –               | MK810941 MK810827 MK887828 MK887863 MK926497 |
|                            | CBS 374.55                   | Fraxinus excelsior               | Switzerland         | E. Müller, 10 Jul. 1953     | MK810942 MK810828 MK887829 MK887864 MK926498 |
| F. italica                 | CBS 140918T                  | Fraxinus ornus, leaf endophyte   | Italy               | M. Ibrahim, 5 Nov. 2013     | MK810943 MK810829 MK887830 MK887865 MK926499 |
| F. ornii                   | CBS 140919                   | Fraxinus ornus, leaf endophyte   | Italy               | M. Ibrahim, 5 Nov. 2013     | MK810944 MK810830 MK887831 MK887866 MK926500 |
|                            | CBS 140920                   | Fraxinus ornus, leaf endophyte   | Italy               | M. Ibrahim, 5 Nov. 2013     | MK810945 MK810831 MK887832 MK887867 MK926501 |
|                            | CBS 140921                   | Fraxinus ornus, leaf endophyte   | Italy               | M. Ibrahim, 5 Nov. 2013     | MK810946 MK810832 MK887833 MK887868 MK926502 |
|                            | CBS 140922                   | Fraxinus ornus, leaf endophyte   | Switzerland         | M. Ibrahim, 13 Nov. 2013    | MK810947 MK810833 MK887834 MK887869 MK926503 |
|                            | CBS 140924T                  | Fraxinus ornus, leaf litter      | Switzerland         | M. Schlegel, 4 May 2015     | MK810948 MK810834 MK887835 MK887870 MK926504 |
| Gibbera conferta           | CBS 191.53                   | Vaccinium uliginosum             | Switzerland         | E. Müller, –                | –                            |
|                            |                              |                                  |                     |                              | GU301814 – – – –             |
| Helicoon myosuroides       | CBS 743.96T                  | Betula pubescens, leaf           | Austria             | H. Voglmayr, 23 Oct. 1993  | –                            |
|                            |                              |                                  |                     |                              | MHH82608 MHH874233 – – – –   |
| Metacoleroa dickiei        | medipc                      | Linnaea borealis                | USA: Oregon         | –                            | –                            |
|                            |                              |                                  |                     |                              | EF114695 – – – –             |
| Protoventuria bariae       | CBS 300.93                   | Vaccinium macrocarpon            | USA                 | L.M. Carris, –              | MK810949 JO036232 MK887836 MK887871 MK926505 |
| Tyrannosorus hystioides    | CBS 117727T                  | Prunus avium cv. Bing, Bing cherry fruit | USA                 | –                            | MK810950 MK810835 MK887837 MK887872 MK926506 |

(continued on next page)
| Taxa                        | Culture accession number(s) | Host, substrate       | Country      | Collector and collection date          | GenBank accession numbers |
|-----------------------------|----------------------------|-----------------------|--------------|----------------------------------------|--------------------------|
|                            |                            |                       |              |                                        |                          |
| T. lichenicola             | CBS 144018T                | Letharia sp.          | USA          | A. Smith, 27 May 2013                  | MK810953, MK810838, MK887840, MK888775, MK926509 |
| T. pini-sylvestris         | CBS 143393T                | Pinus sylvestris, needles | Germany      | R.K. Schumacher, 5 Feb. 2016          | MK810952, MK810837, MK887839, MK888774, MK926508 |
| T. pinicola                | CBS 124.88T                | Pinus wood, from river | Pakistan     | O. Petrini, –                          | MK810951, MK810836, MK887838, MK888773, MK926507 |
| Venturia albae             | CBS 468.61                 | Salix alba            | Liechtenstein | J. Nüesch, 13 May 1958                | MK810954, MK810839, MK887841, MK888776, MK926510 |
|                            | CBS 471.611T               | Salix alba            | Liechtenstein | –                                      | MK810955, MK810840, MK887842, MK888777, MK926511 |
| V. atriseda                | CBS 371.55                 | Gentiana punctata     | Switzerland  | –                                      | EU035448                  |
|                            | CBS 365.35                 | Sorbus aucuparia moravica | Germany      | –                                      | MK810956, MK810841, MK887843, MK888778, MK926512 |
| V. australiana             | CBS 128286T                | Leaf spot of unknown plant | Australia    | –                                      | MK810957, MK810842, MK887844, MK888779, MK926513 |
| V. caesiae                 | CBS 466.61T                | Salix caesia          | Switzerland  | J. Nüesch, 2 Jul. 1959                 | MK810959, MK810844, MK887845, MK888780, MK926515 |
| V. catenospora             | CGMCC 3.18369              | Salix sp.             | China        | Y. Zhang & Y. Zhou, 22 Aug. 2014       | MK810960, MK810845, MK887871 |
|                            | CBS 447.91T                | Salix triandra, brown leaf spot | Germany      | H. Butin, 7 Aug. 1990                  | MK810961, MK810846, MK887846, MK888782, MK926516 |
| V. cerasi                  | CBS 469.61                 | Salix caprea          | Switzerland  | J. Nüesch, 10 Jun. 1958                | MK810962, MK810847, MK887847, MK888783, MK926517 |
|                            | CBS 160.55                 | Prunus amygdalus, fruit | USA: California | –                                      | MK810963, MK810848, MK887848, MK888784, MK926518 |
| V. cerasi                  | CBS 444.54                 | Prunus cerasus ‘Schattenmorelle’ | Germany      | –                                      | MK810964, MK810849, MK887849, MK888785, MK926519 |
| V. cerasi                  | CBS 497.62                 | Prunus domestica subsp. syriaca ‘Mirabelle’ | Switzerland | –                                      | MK810965, MK810850, MK887886, MK926520 |
| V. chinensis               | CGMCC 3.17685T             | Lonicera praeteriores | China        | Y. Zhang & Y. Zhou, 26 Aug. 2014       | MK810966, MK810851, MK887850, MK888787, MK926521 |
| V. chlorospora             | CBS 467.61                 | Salix daphnoides      | Switzerland  | J. Nüesch, 2 Jul. 1959                 | MK810967, MK810852, MK887851, MK888786, MK926522 |
| V. convolvularum           | CBS 112706T                | Convolvulus arvensis, leaves | New Zealand  | C.F. Hill, 7 Nov. 2000                 | MK810969, MK810854, MK887853, MK888790, MK926524 |
| V. crataegi                | CBS 367.35                 | Sorbus aucuparia rossica | Germany      | –                                      | MK810970, MK810855, MK887854, MK888791, MK926525 |
| V. crataegi                | CBS 368.35                 | Crataegus sp.         | Germany      | –                                      | MK810971, MK810856, MK887855, MK888792, MK926526 |
| V. crataegi                | CBS 369.35                 | Crataegus sp.         | Germany      | –                                      | MK810972, MK810857, MK887856, MK888793, MK926527 |
| V. ditricha                | CBS 115426                 | Betula pubescens var. tortuosa | Finland      | M. Helander, 1 Aug. 1992              | MK810973, MK810858, MK887857, MK888794, MK926528 |
| V. ditricha                | CBS 118894                 | Betula pubescens var. tortuosa, leaves | Finland      | M. Helander, –                      | MK810974, MK810859, MK887858, MK888795, MK926529 |
|                            | CBS 257.38                 | Populus tremula       | Italy         | O. Servazzi, –                        | MK810975, MK810860, MK887859, MK888796, MK926530 |
| V. finlandica              | CBS 112703                 | Betula pubescens var. tortuosa | Finland      | M. Helander, 1 Jul. 1993             | MK810976, MK810861, –, MK887879, MK926531 |
| V. fuliginosa              | CGMCC 3.18370T             | Salix capitata        | China         | Y. Zhang & Y. Zhou, 27 Aug. 2014       | MK810978, MK810863, MK887860, MK887899, MK926533 |
| Taxa                  | Culture accession number(s)1 | Host, substrate | Country       | Collector and collection date | GenBank accession numbers2 |
|----------------------|------------------------------|----------------|---------------|------------------------------|---------------------------|
|                      |                              |                |               |                              |                           |
| V. helvetica         | CBS 474.61                   | Salix helvetica | Switzerland   | J. Nüesch, 2 Jul. 1959       | MK810979                  |
|                      | CBS 475.61                   | Salix helvetica | Switzerland   | J. Nüesch, 1 Jul. 1959       | MK810864                  |
| V. inaequalis        | CGMCC 3.18372                | Malus sp.      | China         | F. Ma, 27 Jul. 2015          | MK810881                  |
|                      | CBS 120625                   | Apple (Malus x domestica) | South Africa | –                            | MK810890                  |
| V. lonicerae         | CBS 445.54                   | Lonicera coerula | Switzerland  | –                            | MK810892                  |
| V. mandshuricum      | CBS 112235T                  | Populus simonii | China         | –, 20 Apr. 1993              | MK810893                  |
| V. maritannoffiana   | CGMCC 3.18375                | Populus sp.    | China         | Y. Zhang, 27 Aug. 2014       | MK810894                  |
| V. minuta            | CBS 478.61T                  | Salix nigricans | Switzerland   | J. Nüesch, 20 May 1959       | MK810895                  |
| V. nashicola         | CBS 793.84                   | Pyrus serotina var. culta | Japan        | –                            | MK810896                  |
|                      | CBS 794.84                   | Pyrus serotina var. culta | Japan        | –                            | MK810897                  |
| V. oleaginea         | CBS 113427                   | Olea europaea  | New Zealand   | –                            | MK810898                  |
|                      | CBS 113539                   | –              | Portugal       | B. d’Oliveira, –              | MK810899                  |
| V.像素ica            | CBS 120629                   | Olea europaea  | Morocco        | –                            | MK810900                  |
| V. peltigericola     | CBS 370.35                   | Betula verrucosa | Germany      | –                            | MK810901                  |
|                      | CBS 371.35                   | Betula verrucosa | Germany      | –                            | MK810902                  |
| V. phaeosepta        | CGMCC3.18373                 | Populus sp.    | China         | Y. Zhang, 6 Aug. 2015        | MK810903                  |
| V. polygoni-vivapari | CBS 114207                   | Polygonum viviparum | Norway  | K. & L. Holm, 12 Aug. 1988   | MK810904                  |
| V. populina          | CBS 256.38                   | Populus canadensis | Italy        | –                            | MK810905                  |
|                      | CBS 316.58                   | Populus sp.    | Italy         | –                            | MK810906                  |
| V. pyrina            | CBS 120825                   | Pyrus communis | Brazil         | –                            | MK810907                  |
|                      | CBS 123189                   | Pyrus communis | New Zealand   | C.F. Hill, 20 Apr. 2008      | MK810908                  |
|                      | CBS 373.35                   | –              | Germany        | –                            | MK810909                  |
| V. quebecensis       | CBS 695.85T                  | Populus tremuloides, leaf spot | Canada: Quebec | –                            | MK810910                  |

(continued on next page)
| Taxa                  | Culture accession number(s)\(^1\) | Host, substrate | Country    | Collector and collection date | GenBank accession numbers\(^2\) |
|----------------------|-----------------------------------|----------------|------------|-------------------------------|---------------------------------|
| V. saliciperda       | CBS 480.61\(^T\)                  | Salix cordata  | Switzerland| –                             | MK811007 MK810891 MK887886 MK888825 MK926558 |
|                      | CBS 481.61                         | Salix elegantissima | Switzerland| –                             | MK811008 MK810892 MK887887 MK888826 MK926559 |
| V. tremulae          | CBS 112625                        | Populus tremula | France     | – , 1 Sep. 1977               | MK811009 MK810893 MK887888 MK888827 MK926560 |
|                      | CBS 694.85                        | Populus alba, leaf spot | France     | –                             | MK811010 MK810894 MK887889 MK888828 MK926561 |
|                      | CBS 692.85                        | Populus tremula, leaf spot | France     | –                             | MK811011 MK810895 MK887890 MK888829 MK926562 |
|                      | CBS 693.85                        | Populus tremula, leaf spot | France     | –                             | MK811012 MK810896 MK887891 MK888830 MK926563 |
| V. viennoti          | CBS 690.85                        | Populus tremula, leaf litter | France     | –                             | MK811013 MK810897 – MK888831 MK926564 |
|                      | CBS 691.85                        | Populus tremula, leaf litter | France     | –                             | MK811014 MK810898 – MK888832 MK926565 |
| Outgroup             | Microthyrium microscopicum CBS 115976 | –              | Netherlands| –                             | JGI project 1011369 GU301846 GU371734 GU349042 JGI project 1011369 |

\(^1\) CBS: Westerdijk Fungal Biodiversity Institute, Utrecht, the Netherlands; CGMCC: Chinese General Microbiological Culture Collection Center, Beijing, China; CPC: Culture collection of Pedro Crous, housed at Westerdijk Fungal Biodiversity Institute; MFLUCC: Mae Fah Luang University Culture Collection, Chiang Rai, Thailand; MUCL: Université Catholique de Louvain, Louvain-la-Neuve, Belgium; PDD Herbarium of Plant Diseases Division; UTHSC: Fungus Testing Laboratory, Department of Pathology at the University of Texas Health Science Center, San Antonio, Texas, USA. A superscript T denotes cultures with a type status.

\(^2\) ITS: internal transcribed spacers and intervening 5.8S rDNA; LSU: partial 28S large subunit RNA gene; tef1: partial translation elongation factor 1-alpha gene; tub2: partial beta-tubulin gene; rpb2: partial DNA-directed RNA polymerase II second largest subunit gene. Bold GenBank accession numbers represent sequences generated in this study; – indicates unavailable sequences or unknown collection data.
and Sympoventuriaceae (PP = 1), as well as the new family Cylindrosympodiaceae (PP = 1) (Fig. 1). The Venturiaceae clade comprised 11 generic lineages, including two new genera, Fagicola and Fraxinicola (Figs 1, 2). The fully supported clade of Venturia s. str. comprised 31 species including five newly described species, V. quebecensis, V. albae, V. austriaca, V. caesiae and V. finlandica (Figs 1, 2). The Coleroa clade (PP = 1) comprised five taxa, including C. cinrains and C. robertianii, and three unidentified taxa (Figs 1, 2). Fraxinicola, a newly described genus of Venturiaceae, comprised two new species, F. italicica and F. europea, as well as two new combinations F. ornii and F. fraxinii (Figs 1, 2). Gibbera and Metacoleroa comprised one species each, namely G. conferta and M. dickei, respectively (Figs 1, 2). Tyrannosorus (PP = 1) comprised four species including two new species (T. lichenicola and T. pini-sylvestris) and one new combination (T. hystrioides) (Figs 1, 2). Species of Apiosporina, A. morbosa and A. collinsii, did not cluster in a monophyletic clade, but were separated by Protoventuria barriae (Fig. 1). Helicoon myosoridiii was basal in Venturiaceae, but its inclusion in the family was fully supported (Fig. 1).

The Cylindrosympodiaceae clade (PP = 1), representing a new family of Venturiales, comprised four genera, namely Sympodella (S. goidanichii and S. alicola), Tothia (T. fuscella and T. spartii), Pseudoanungitae (P. vaccini, P. syzygii and P. sp. from the ITS and LSU rRNA gene sequences of 691 952 trees resulting from a Bayesian analysis of the combined alignment of ITS, LSU, and two new combinations (T. lichenicola and T. pini-sylvestris) and one new combination (T. hystrioides) (Figs 1, 2). Species of Apiosporina, A. morbosa and A. collinsii, did not cluster in a monophyletic clade, but were separated by Protoventuria barriae (Fig. 1). Helicoon myosoridiii was basal in Venturiaceae, but its inclusion in the family was fully supported (Fig. 1).

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P. variabilis), and Cylindrosympidium (C. lauri and C. variable) (Fig. 1). Also included in this clade is Septonema crispulum, which is not congeneric with other Septonema species such as S. fasciculare and S. sededens (data not shown).

The Sympoventuriaceae (PP = 1; Fig. 1) comprised 14 genera, including six proposed here as new, viz., Neofusicladium, Parafusicladium, Bellamycies, Fuscohilum, Sterila, and Pinaceicola (Fig. 1). The new genus Neofusicladium (PP = 1) (N. eucalyptica, N. eucalypti and N. regnans), is basal in Sympoventuriaceae (Fig. 1). The Sympoventuria clade (PP = 0.96) comprised S. capsensis, S. melaleucae and S. africana. Troposporella is paraphyletic with the type species T. fumosa clustering with T. monilipes (PP = 1) and T. olivaceum forming a distinct lineage (Fig. 1). Pseudosigmoidaea (P. excentrica and P. ibarakiensis) formed a well-supported lineage (PP = 0.98) (Fig. 1). Three species formerly of Fuscohilum,
namely $F$. amoenum, $F$. paraamoenum and $F$. intermedium, formed a well-supported clade (PP = 1; Fig. 1), and are allocated here to a new genus, Parafusicladium (as $P$. amoenum, $P$. intermedium and $P$. paraamoenum). Parafusicladium is basal to Echinocatena, Neocoleora, Fuscothrium, Pinaceicola, Scolecobasidium, Sterila and Verruconis.

Scolecobasidium (PP = 1; Fig. 1) comprised 24 species, which chiefly clustered in two subclades, with one comprising S. dracaenae, S. pandanicola, S. musae, S. ellipsoidum, S. icarus, S. ramosum, S. minimum, S. constrictum, S. gamsii, S. macrozamiae, S. sexuale and S. muscula, and the other comprising S. globale, S. tswawkschae, S. lascauxense, S. olivaceum, S. verrucosum, S. anomalum, S. aquaticum, S. anelli and S. terreum (Fig. 1). Another three species, namely S. podocari, S. phaeophorum and S. cordaneae were basal to other species of Scolecobasidium (Fig. 1). Members of Verruconis formed a fully supported clade (PP = 1; Fig. 1), which comprises V. galoppava, V. calidifluminalis, V. terricola, V. verruculosa and V. panacis (Fig. 1). Echinocatena, a mono-typic genus represented by E. arthrinioides, was basal to the subclades comprising Scolecobasidium and Verruconis (Fig. 1). Neocoleora included N. cameroonensis and N. metrosideri, which formed a robust clade with another three new genera, viz., Fuscothrium, Sterila and Pinaceicola (Fig. 1). These four genera formed a fully supported subclade which is sister to Scolecobasidium, Verruconis and Échinocatena (Fig. 1).

**Taxonomy**

*Venturiales* Y. Zhang et al., Fungal Diversity 51: 251. 2011.

**Description and illustration:** Habitat saprophytic, endophytic, parasitic on leaves or stems of plants, animals or human beings, rarely thermotrophic. Sexual morph: *Ascoma* immersed, erumpent to superficial, scattered or gregarious, globose, subglobose, mostly with setae around papilla or covering whole ascoma when superficial, ostiolate. *Hamatheicum* of narrowly cellular pseudoparaphyses, mostly evanescent and rarely persistent when mature. *Asci* 8-spored, bitunicate, fissitunicate, usually obclavate, pedicel knob-like or lacking. *Ascospores* hyaline, light greenish olivaceous to brown, 1-septate, symmetrical, asymmetrical or apisporous. Asexual morph: *Mycelium* consisting of branched, pale brown to medium brown, smooth, septate hyphae. *Conidiophores* solitary or loosely to densely fasciculate, arising from internal hyphae, or formed in sporodochia, arising from small to moderately large strumata, *conidiophores* often reduced to conidiogenous cells or composed of several cells, erect, cylindrical, pyriform, subclavate, narrowly obclavate, slightly to distinctly geniculate-sinuous, unbranched or occasionally branched, pale olivaceous to dark brown, tips sometimes paler, smooth to somewhat verrucose, sometimes only as short lateral conical prolongations of hyphae, occasionally irregular in shape. *Conidiogenous cells* integrated, terminal or intercalary or conidiophores reduced to conidiogenous cells, mono- to polyblastic, proliferation percurrent or sympodial; conidiogenous loci terminal or lateral, sometimes denticle-like, apex truncate to slightly convex, wall unthickened or almost so, sometimes slightly darkened-refractive. *Conidia* solitary or mostly catenate, in simple or branched chains, subcylindrical, ampulliform to fusoid-ellipsoid, acicular, straight, slightly curved or coiled, base truncate, septate or aseptate, subhyaline, pale to dark brown, but mostly olivaceous, sometimes constricted at septa, smooth to verrucose, ends pointed or rounded to truncate, hila truncate, thickened or not, occasionally darkened-refractive.

**Type family:** *Venturiales* E. Müll. & Arx ex M.E. Barr

**Notes:** *Venturiales* was introduced by Zhang et al. (2011) based on morphological and ecological characteristics, as well as DNA data. It comprised two families, viz., *Venturaceae* (Venturia and its allied genera) and *Sympoventuraceae* (Sympoventuria and its allied genera) (Zhang et al. 2011). A third familial lineage comprising *Cylindrosympodium*, *Pseu-doanungitea*, *Sympodiella* and *Tothia*, is retrieved in the present phylogenetic analysis (Fig. 1). Thus, a new family, *Cylindrosympodiaceae*, is introduced here. Members of *Venturiales* could be saprophytic on woody substrates or in soil, endophytic, parasitic on leaves or stems of plants, animals or human beings. Some species of *Verruconis* are thermophilic, such as *V. calidifluminalis* and *V. galoppava*, both of which occur in hot springs (Samerpikat et al. 2014). Phylogenetically, *Venturiales* are closely related to *Microthyriales*, *Natipusilliales* and *Asterinales* (Hyde et al. 2013).

*Cylindrosympodiaceae* Crous, M. Shen & Y. Zhang ter, fam. nov. MycoBank MB831510.

*Mycelium* consisting of branched, pale to medium brown, smooth, septate hyphae. *Conidiophores* solitary, erect, septate, subcylindrical to cylindrical, medium brown to brown, smooth, straight to flexuous, sometimes rejuvenating percurrently. *Conidiogenous cells* terminal or intercalary, subcylindrical to clavate, pale to medium brown, mono- or polyblastic, sometimes sympodial; *conidiogenous loci* sometimes arranged in a rachis, flat or prominent, thickened or unthickened, somewhat darkened and refractive. *Conidia* in chains or rarely solitary, subcylindrical, ampulliform to fusoid-ellipsoidal, acicular, hyaline, pale to medium brown, smooth, prominently guttulate, septate or aseptate; *hila* truncate, sometimes darkened and refractive (adapted from De Hoog 1985, Crous et al. 2007a, b, 2018, 2019a).

**Type genus:** *Cylindrosympodium* W.B. Kendr. & R.F. Castañeda

**Notes:** Phylogenetically, *Cylindrosympodium*, *Pseu-doanungitea*, *Sympodiella* and *Tothia* formed a fully supported clade (PP = 1), sister to the *Venturaceae* (Fig. 1). Morphologically, the hyphomycetous asexual morph, blastic conidiogenesis, subcylindrical to clavate, pale to medium brown conidiogenous cells, as well as the solitary or concatenate, subcylindrical, ampulliform to fusoid-ellipsoidal conidia point to *Venturiales*. Ecologically, members of *Cylindrosympodium*, *Pseu-doanungitea*, *Sympodiella* and *Tothia* are mostly saprophytic on woody plant hosts, such as *Pinaceae*, *Lauraceae*, *Myrtaceae* or *Ericaceae* (Crous et al. 2007b, 2018, 2019a). Thus, a new family, *Cylindrosympodiaceae*, is proposed to accommodate these genera.

*Cylindrosympodium* W.B. Kendr. & R.F. Castañeda, Univ. Waterloo Biol. Ser. 32: 9. 1990.

**Type species:** *Cylindrosympodium variabile* (de Hoog) W.B. Kendr. & R.F. Castañeda

**Notes:** *Cylindrosympodium* was introduced based on *Subulispora variabilis* (as *Cyl. variabile* (Castañeda & Kendrick 1990). Subsequently, more species have been assigned to
Cylindrosympodium (Marvanová & Laichmanová 2007, Crous et al. 2007b, Paulus et al. 2003, Castaño & Kendrick 1991, Castaño-Ruiz et al. 2012). Phylogenetically, Cylindrosympodium is basal to other genera of Cylindrosympodiaceae, while closely related to Pseudoanungitea. Morphologically, Cylindrosympodium can be readily distinguished from Pseudoanungitea by its conidia that are subhyaline to pale olivaceous, and the conidigenous loci that are slightly darkened, but not refractive (De Hoog 1985, Crous et al. 2007b).

**Cylindrosympodium lauri** Crous & R.F. Castaño, Stud. Mycol. 58: 204. 2007.

**Type**: Spain, Canary Islands, on leaf litter of Laurus sp. (Lauraceae), 4 Jan. 1995, R.F. Castaño (holotype CBS H-19909, culture ex-type CBS 240.95).

**Notes**: Cylindrosympodium lauri introduced by Crous et al. (2007b) was isolated from leaf litter of Laurus sp. in Spain. It can be distinguished from Cyl. variabile (De Hoog 1985) by its longer conidiophores, subhyaline to pale olivaceous conidia, and the thin, slightly darkened but not refractive conidigenous loci and hila [Crous et al. 2007b]. Cylindrosympodium lauri is sister to C. variabile in Fig. 1.

**Cylindrosympodium variabile** (de Hoog) W.B. Kendr. & R.F. Castaño, Univ. Waterloo Biol. Ser. 32: 10, 1990. Basionym: Subulispora variabilis de Hoog, Stud. Mycol. 26: 56. 1985.

**Type**: Netherlands, Utrecht Province, Baarn, De Vuursche, on rotten needle of Pinus sp. (Pinaceae), Sep. 1982. G.S. de Hoog (holotype CBS H-1634, culture ex-type CBS 563.82).

**Notes**: Ecologically, C. variabile has a broader host spectrum than C. lauri (Crous et al. 2007b). Phylogenetically, Cyl. variabile and Cyl. lauri form a fully supported clade representing the genus Cylindrosympodium (Fig. 1).

**Pseudoanungitea** Crous, Fungal Syst. Evol. 1: 199. 2018.

**Type species**: Pseudoanungitea syzygii (Crous et al.) Crous

**Notes**: Pseudoanungitea was separated from Anungitea based on its terminal and intercalary conidigenous cells, and refractive, thickened conidigenous loci that give rise to short conidial chains with somewhat darkened and refractive hila [Crous et al. 2018]. So far three species, viz., P. syzygii, P. vaccinii and P. variabilis have been assigned Pseudoanungitea [Crous et al. 2018].

**Pseudoanungitea syzygii** (Crous et al.) Crous, Fungal Syst. Evol. 1: 199. 2018. Basionym: Anungitea syzygii Crous et al., Canad. J. Bot. 73: 225. 1995.

**Type**: South Africa, Mpumalanga Province, Sabie, on leaf litter of Syzygium cordatum (Myrtaceae), Mar. 1993, W.J. Swart (holotype PREM 51687, culture ex-type CPC 578 = CBS 520.93).

**Notes**: Anungitea syzygii was originally described on leaf litter of Syzygium cordatum (South Africa), which was subsequently assigned to Pseudoanungitea (as P. syzygii) [Crous et al. 1995, 2018]. Together with P. vaccinii and P. variabilis, this species formed a monophyletic clade representing the genus Pseudoanungitea (Fig. 1).

**Pseudoanungitea vaccinii** Crous & R.K. Schumach., Fungal Syst. Evol. 1: 199. 2018.

**Type**: Germany, near Berlin, on stem of Vaccinium myrtillus (Ericaceae), 16 Jan. 2016, R.K. Schumacher (holotype CBS H-23422, culture ex-type CBS 143164 = CPC 30522).

**Notes**: Pseudoanungitea vaccinii was described from stems of Vaccinium myrtillus [Crous et al. 2018]. Based on a multigene phylogenetic analysis, P. vaccinii was closely related to P. syzygii [Crous et al. 2018; Fig. 1 in present study]. Morphologically, P. vaccinii can be distinguished from P. syzygii based on its conidial dimensions [Crous et al. 1995, 2018].

**Pseudoanungitea variabilis** Hern.-Restr., Fungal Syst. Evol. 1: 200. 2018.

**Type**: Spain, Castilla la Mancha, Hoya de la Tejera Negra Natural Park, on dead wood, May 2011, M. Hernández-Restrepo, J. Mena & J. Guarro (holotype CBS H-23494, culture ex-type CBS 132716).

**Notes**: Pseudoanungitea variabilis differs from other species of Pseudoanungitea in having dimorphic conidia, i.e., type 1 are fusoid-ellipsoid resembling those of P. syzygii and P. vaccinii, and type 2 are globose [Crous et al. 1995, 2018]. It is basal in Pseudoanungitea in the present study (Fig. 1).

**Septonema** Corda, Icon. Fung. 1: 9. 1837.

**Type species**: Septonema secedens Corda

**Notes**: Septonema secedens is represented on GenBank by two cultures (both not ex-type): CBS 469.48 (GenBank MH856437 and MH867983 for ITS and LSU respectively) and CBS 174.74 (LSU GenBank MH878272). The former LSU sequence agrees with Alternaria-Stemphyllium while the latter is related to Septonema fasciculare strain CBS 127862 (GenBank MH876104; 898/916 (98 %) similar including 11 gaps) and Helicoon pluriseptatum strain CBS 812.68 (GenBank MH878409; 836/856 (98 %) similar including 9 gaps).

**Septonema crispulum** Lunghini & F. Toscano, Mycotaxon 63: 329. 1997.

**Type**: Italy, on decaying needles of Pinus pinea (Pinaceae), 15 Nov. 1992, F. Toscano (holotype ROHB 187, culture ex-type CBS 735.96).

**Notes**: Septonema crispulum was introduced based on a taxon found on pine-needle litter in central Italy, which morphologically agrees with Septonema by having 1-septate and slightly thick-walled conidia (Lunghini & Toscano 1997). The LSU sequence of S. crispulum does not appear to be congeneric with the S. secedens strain CBS 174.74 LSU sequence (GenBank MH878272; 859/923 (93 %) similar including 24 gaps). We refrain from designating a new genus for S. crispulum (Fig. 1) pending recollection and molecular investigation of suitable authentic material of S. secedens.

**Symptodiella** W.B. Kendr., Trans. Brit. Mycol. Soc. 41: 519. 1958.

**Type species**: Symptodiella acicola W.B. Kendr.

**Symptodiella acicola** W.B. Kendr., Trans. Brit. Mycol. Soc. 41: 519. 1958. emend. Hern.-Restr. & Crous
Tothia fuscella

Basionym: Microthyrium fuscellum (Sacc.) Bat., Ann. Hist.-Nat. Mus. Natl. Hung. 52: 105. 1960.

Notes: This species is sister to S. goidanichii (Fig. 1).

**Sympoventuria goidanichii** (Rambelli) Crous & Hern.-Restr., Fungal Syst. Evol. 3: 116. 2019. (Rambelli) Crous & Hern.-Restr., Sympodiella goidanichii (Rambelli) W.P. Wu, Fungal Diversity 32: 159. 2015. Phylogenetically, Tothia spartii (Wu et al. 2011) was introduced to accommodate Tothia spartii (Fig. 1). So far two species, T. spartii and T. spartii, were accommodated within Tothia (Wu et al. 2011, Liu et al. 2015). The ascospores of T. spartii are ellipsoid to fusiform with rounded ends, while the ascospores of T. fuscella are fusiform or oblong-ellipsoid with tapering ends (Wu et al. 2011, Liu et al. 2015).

**Sympoventuriaceae** Y. Zhang ter et al., Fungal Diversity 51: 255. 2011.

Habitat saprophytic, endophytic, parasitic on leaves or stems of plants, animals or humans, or as thermotrophic fungi living in hot springs. Sexual morph: *Ascomata* subglobose, immersed, black, papillate, ostiolate. *Pseudoparaphyses* hyaline, septate, constricted at septa, anastomosing, extending above the asci. Asci 8-spored, bitunicate, fissitunicate, subcylindrical, pedicellate. Ascospores hyaline, fusoid-ellipsoidal, constricted at median septum. Asexual morph: *Mycelium* consisting of smooth to finely roughened, pale to medium brown, branched, septate hyphae, sometimes forming hyphal coils. *Conidiofhores* reduced to conidiogenous cells that are terminal or lateral on hyphae, or with basal supporting cell, solitary, erect, mono- to polyblastic, pale to dark brown, smooth, subcylindrical to doliiform, aseptate or septate, sometimes thick-walled, branched or rarely branched below, sometimes dimorphic; *conidigenous loci* flat-tipped, somewhat darkened and thickened. *Conidigenous cells* terminal or lateral, integrated, mono- or polyblastic and sympodial, subcylindrical or doliiform, pale to medium brown, smooth, proliferating sympodially; *loci* somewhat thickened and darkened, not refractive or sometimes slightly refractive. *Ramocnidia* present or not, brown, smooth, subcylindrical or fusoid-ellipsoid, aseptate or septate. *Condia* solitary or occurring in branched or unbranched chains, pale brown to brown, smooth, subcylindrical to fusoid-ellipsoid, aseptate or septate, straight, widest in middle to lower third, apex subobtuse, with or without transverse euseta; *hila* truncate, sometimes thickened and darkened.

**Type genus:** Sympoventuria Crous & Seifert

Notes: The genus Sympoventuria is typified by *S. capensis*, which was originally collected on *Eucalyptus* leaf litter from the Western Cape Province of South Africa (Crous et al. 2007a). *Sympoventuria* was assigned to Venturiales based on its morphological and preliminary DNA data (Crous et al. 2007a, b). *Sympoventuraceae* was introduced to accommodate *Sympoventuria* (Zhang et al. 2011). It can be distinguished from other members of Venturiales by its saprofytic life style, presence of pseudoparaphyses, and hyaline, symmetrical ascospores (Zhang et al. 2011). Species of *Sympoventuraceae* have mostly been collected from leaf litter, and some species have been reported from soil, hot springs, or even animals or humans (Crous et al. 2007a, b, Zhang et al. 2011, Samerpitak et al. 2014). Based on a multigene phylogenetic analysis, morphological and ecological comparisons, eight genera have been included in *Sympoventuraceae*, viz. Clavatopsis, Ochroconis, Scolecobasidium, Sympodiella, Sympoventuria, Veronaeopsis, Verrucosis and Yunnanomyces. Phylogenetically, *Sympoventuraceae* forms a well-supported familial clade within Venturiales (Arzanlou et al. 2007, Crous et al. 2007a, b, Zhang et al. 2011, Samerpitak et al. 2014, Johnston & Park 2016).

**Bellamyces** Crous, Coppens & U. Braun, gen. nov. MycoBank MB831519.

**Eymology:** Named after “Bella”, the beautiful dog that always accompanies Brian J. Coppens on his lichen excursions.

*Mycelium* consisting of branched, septate, medium brown, smooth hyphae. *Conidiophores* erect, brown, smooth, subcylindrical, straight to geniculate-sinusoid, reduced to conidiogenous cells, or 0–1-septate. *Conidiogenous cells* terminal, subcylindrical, brown, smooth, proliferating sympodially and inconspicuously 1–2 times percurrently at apex. *Conidia* solitary, brown, smooth, subcylindrical, straight, widest in middle to lower third, apex subobtuse, transversely eusetae, rarely with 1–2 oblique septa; *hila* truncate, neither thickened, nor darkened.
**Type species:** *Bellamyces quercus* Crous, Coppins & U. Braun

**Note:** Phylogenetically, *Bellamyces quercus* clusters basal to *Sympoventuria, Pseudosimoidoea* and *Troposporia* (Fig. 1).

*Bellamyces quercus* Crous, Coppins & U. Braun, sp. nov. MycoBank MB831520. Fig. 3.

**Etymology:** The epithet refers to *Quercus*, the host genus on which apothecial discs of *Lecanora chlorotera* were collected.

*Mycelium* consisting of branched, septate, medium brown, smooth, 3–4 μm diam hyphae. *Conidiophores* erect, brown, smooth, subcylindrical, straight to geniculate-sinuous, reduced to conidigenous cells, or 0–1-septate, unbranched, 2–10 × 4–6 μm. *Conidiogenous cells* terminal, subcylindrical, brown, smooth, proliferating sympodially and inconspicuously 1–2 times percurrently at apex, 2–5 × 4–5 μm. 

Conidiogenous cells consisting of smooth to finely roughened, pale to medium brown, smooth, cylindrical or subcylindrical, erect to subdenticulate, or more distinct, mono- to polyblastic; conidigenous loci flat-tipped, somewhat darkened and thickened, but not refractive. Ramoconidia present, aseptate or septate. Conidia formed in branched or unbranched chains, pale to medium brown, smooth, subcylindrical, 0–3-septate, slightly tapering towards the subtruncate ends, straight, but at times slightly curved; *hila* somewhat darkened and thickened, not refractive (adapted from Crous et al. 2007b, Koukol 2010).

**Type species:** *Fuscohilum rhodensis* (Crous) Crous, M. Shen & Y. Zhang ter

**Fuscohilum rhodensis** (Crous & M.J. Wingf.) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831553. Basionym: *Fusicladium rhodense* Crous & M.J. Wingf., Stud. Mycol. 58: 212. 2007.

**Description and illustration:** Crous et al. (2007b).

**Typos:** UK, Scotland, VC 82, East Lothian, Spott, the Brunt, oak wood, S facing (former oak coppice), on apothecial discs of *Lecanora chlorotera* (*Lecanoraceae*) on *Quercus* (*Fagaceae*) trunks, 24 Aug. 2015, B.J. Coppins, Coppins no. 24965 = HPC 571 (holotype CBS H-23838, culture ex-type CBS 146217 = CPC 28858; isotype HAL 2918 F).

**Notes:** The conidia of *Bellamyces* are solitary, and transversely multiseptate, rarely oblique. Phylogenetically, it is not related to any other species known from sequence data (Fig. 1).

**Echinocatena** R. Campb. & B. Sutton, Trans. Brit. Mycol. Soc. 69: 126. 1977.

**Type species:** *Echinocatena arthrinioides* R. Campb. & B. Sutton

**Notes:** *Echinocatena* is a monotypic genus represented by *E. arthrinioides*, which was collected from leaf litter of an unknown plant in Rajasthan, India (Campbell & Sutton 1977). Morphologically, its straight to flexuous conidiophores and polyblastic conidigenous cells are consistent with those of *Venturiales*. The spherical, aseptate conidia of *E. arthrinioides*, however, differ from other genera (Campbell & Sutton 1977, Crous et al. 2018). Crous et al. (2018) retrieved an isolate from leaves of *Acacia crassicarpa* in Malaysia, which morphologically agrees well with *Echinocatena arthrinioides*, but has larger conidia [(4–)5–6(–7) μm vs. 3.5–4.5 μm]. Phylogenetically, *Echinocatena* clusters on a long branch basal to *Scolecodasidium* and *Verruconis* (Fig. 1).

**Echinocatena arthrinioides** R. Campb. & B. Sutton, Trans. Brit. Mycol. Soc. 69: 130. 1977.

**Typos:** India, Jodhpur, on decaying leaves of unknown plant, 25 Nov. 1975, K.S. Panwar (holotype IMI 199279).

**Notes:** Isolate CPC 28754 was identified as *Echinocatena arthrinioides* by Crous et al. (2018), which morphologically agrees well with the original description of *Echinocatena arthrinioides* (Campbell & Sutton 1977), but has slightly larger conidia (see comments above).

**Fuscohilum** Crous, M. Shen & Y. Zhang ter, gen. nov. MycoBank MB831514.

**Etymology:** The epithet refers to the thickened and darkened conidial hilum.

*Mycelium* consisting of smooth to finely roughened, pale to medium brown, branched, septate hyphae, sometimes frequently forming hyphal coils. *Conidiophores* reduced to conidigenous cells that are terminal or lateral on hyphae, medium brown, smooth, cylindrical or subcylindrical, erect to subdenticulate, or more distinct, mono- to polyblastic; *conidigenous loci* flat-tipped, somewhat darkened and thickened, but not refractive. Ramoconidia present, aseptate or septate. Conidia formed in branched or unbranched chains, pale to medium brown, smooth, subcylindrical, 0–3-septate, slightly tapering towards the subtruncate ends, straight, but at times slightly curved; *hila* somewhat darkened and thickened, not refractive (adapted from Crous et al. 2007b, Koukol 2010).

**Type species:** *Fuscohilum rhodensis* (Crous), M. Shen & Y. Zhang ter

**Fuscohilum rhodensis** (Crous & M.J. Wingf.) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831553. Basionym: *Fusicladium rhodense* Crous & M.J. Wingf., Stud. Mycol. 58: 212. 2007.

**Description and illustration:** Crous et al. (2007b).

**Typos:** Greece, Rhodes, on branches of *Ceratonia siliqua* (*Fabaceae*), 1 Jun. 2006, P.W. Crous & M.J. Wingfield (holotype CBS H-19910, culture ex-type CBS 121641 = CPC 13156).

**Notes:** *Fuscohilum rhodensis* was introduced by Crous et al. (2007b) having a pseudocladosporium-like morphology and conidial hilum that are somewhat darkened and thickened. Phylogenetically, *F. rhodense* and *F. siciliana* formed a separate generic clade within *Sympoventuriaceae* (Fig. 1). These two species were therefore assigned to a new genus, *Fuscohilum*.

**Fuscohilum siciliana** (Koukol) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831554. Fig. 4. Basionym: *Fusicladium sicilianum* Koukol, Mycol. Progr. 9(3): 373. 2010.

**Description and illustration:** Koukol (2010).

**Typos:** Italy, Palermo, Botanic Garden, rotten plant of *Chamaerops humilis* (*Arecaceae*), Nov. 1984, W. Gams (holotype CBS H-3654, culture ex-type CBS 105.85).

**Notes:** According to the original description provided by Koukol (2010), the smaller-sized conidia [(8–)10–12(–18) μm × (1.5–)2–2.5(–3) μm vs. (8–)12–16(–20) × (2–)2.5–3(–4) μm] and the absence of hyphal coils of *F. siciliana* differs from those of *F. rhodensis* (Crous et al. 2007b). The two species are phylogenetically distinct (Fig. 1).

**Helicopsis** P. Karst., Rev. Mycol. (Toulouse) 11: 96. 1889.

**Type species:** *Helicopsis olivacea* P. Karst.

**Helicopsis olivacea** P. Karst. [as “olivaceus”], Rev. Mycol. (Toulouse) 11 (no. 42): 96. 1889.
Fig 2. Consensus phylogram (50% majority rule) of 42,902 trees resulting from a Bayesian analysis of the combined alignment of ITS, LSU, tef1, tub2 and rpb2 sequences of Venturiales. Bayesian posterior probabilities (PP) > 0.80 are shown at the nodes and the scale bar represents the expected changes per site. Some branches were shortened to facilitate layout. The tree was rooted with Pseudanungitea vaccinii (CBS 143164). See title of Fig. 1 for an explanation of the characters plotted on the tree. Strains in red text sporulated in this study, while those in blue text failed to sporulate and those in black text were not studied.
**Synonym:** Helicopsis punctata Peck, Bull. New York St. Mus. 167: 26. 1913 [1912].

Tropospora olivaceum (P. Karst.) C.K.M. Tsui & Berbee [as “olivaceum”], Mycoscience 51: 147. 2010.

**Type:** Finland, near the village of Surikat, on the hymenium of Lyomyces roseus (Corticiaceae), Nov. 1866 (not seen).

**Notes:** Helicopsis was introduced as a monotypic genus, based on H. olivacea, and was assigned to Tubeufiaceae (Karsten 1889). Subsequently, a second species of Helicopsis, H. punctata, was described, which was treated as conspecific with H. olivacea (Peck 1913, Tsui & Berbee 2010). Based on the phylogenetic analysis of the small subunit (SSU) and internal transcribed spacers (ITS) rDNA sequences, H. olivacea was assigned to Tropospora as T. olivacea (Tsui & Berbee 2010). The phylogenetic analysis of Tsui & Berbee (2010) focused on class level (Dothideomycetes), and was too general to reflect a detailed classification of Helicopsis. This treatment is rejected in this study, as a strain representing Helicopsis olivacea clustered apart from the clade representing Tropospora (T. fumosa and T. monilipes) (Fig. 1).

**Neocoleroa** Petr., Hedwigia 74: 38. 1934.

**Type species:** Neocoleroa sibirica Petr.

**Notes:** Neocoleroa was introduced based on its lobed to dichotomously branched, blunt-tipped setae and persistent pseudoparaphyses, which was typified by N. sibirica (Petra 1934). Morphologically, Neocoleroa is most comparable with Wentiomyces (Koorders 1907), and they both were assigned to Pseudoperisporiaceae (Dothideomycetes incertae sedis) (Barr et al. 2008). Barr (1987) noted that some species of these two genera are morphologically similar to members of Venturiaceae. Neocoleroa metrosideri was reported from Metrosideros excelsa, and morphologically agrees with Sympoventuria in having broadly clavate or obclavate asci, hyaline, 1-septate ascospores and persistent pseudoparaphyses (Johnston & Park 2016). Phylogenetically, Neocoleroa metrosideri nested with a novel species N. cameroonensis described below, in Sympoventuriaceae, being sister to other genera of the family (Fig. 1). No DNA data are presently available for the generic type.

**Neocoleroa metrosideri** P.R. Johnst., Phytotaxa 253: 216. 2016.

**Description and illustration:** Johnston & Park (2016).

**Type:** New Zealand, Auckland, Glen Innes, Auckland University Tamaki campus (S36.883037, E174.849881), on living leaves of Metrosideros excelsa (Myrtaceae), 6 Oct. 2015, P.R. Johnston [holotype PDD 107531, culture ex-type ICMP 21139] (not seen).

**Notes:** Neocoleroa metrosideri was introduced as the causal agent of leaf spots on Metrosideros excelsa in New Zealand.
This species is sister to N. cameroonensis (Fig. 1).

**Neocoleroa cameroonensis** Crous, M. Shen & Y. Zhang ter, sp. nov. MycoBank MB831521.

**Etymology:** Named after Cameroon, the country where this fungus was collected.

Cultures sterile. Neocoleroa cameroonensis (CBS 129041) differs from its closest phylogenetic neighbour N. metrosideri (PDD 107531) (Fig. 1) by unique fixed alleles in two loci based on alignments of the separate loci deposited in TreeBASE (S24573), by 56 bp in ITS (14 %) and 26 bp in LSU (3 %).

**Culture characteristics:** Colonies spreading, erumpent, with aerial mycelium and regular, smooth margins on OA, dark olivaceous brown (surface); reverse fuscous-black; on MEA dark brown (surface); reverse fuscous-black; on SNA dark brown (surface); reverse fuscous-black. Colonies reaching 8 mm diam after 2 wk on OA at 25 °C in the dark.

**Typus:** Cameroon, Londgi, Crematogaster sp. (ant) on Barteria nigritana (Passifloraceae), 19 Dec. 2009, R. Blatrix (holotype CBS H-23598, culture ex-type CBS 129041).

**Notes:** Based on the multigene phylogenetic analysis, Neocoleroa cameroonensis clusters together with the type specimen of N. metrosideri in Neocoleroa (Fig. 1). The species was isolated from a Crematogaster sp. (ant) but did not sporulate in culture on any of the media used here.

**Neofusicladium** Crous, M. Shen & Y. Zhang ter, gen. nov. MycoBank MB831512.

**Etymology:** Named after the genus *Fusicladium*, to which it is morphologically similar, and neo- to new.

**Mycelium** consisting of pale to medium brown, smooth, branched, septate hyphae. **Conidiophores** reduced to conidiogenous cells, or with basal supporting cell, solitary, erect, pale brown, smooth, subcylindrical to doliiform, sometimes dimorphic. **Conidiogenous cells** terminal or lateral, integrated, subcylindrical or doliiform, pale to medium brown, smooth, proliferating sympodial; conidiogenous loci somewhat thickened and darkened, not refractive. **Ramoconidia** brown, smooth, subcylindrical or fusoid-ellipsoidal, aseptate or septate. **Conidia** mostly occurring in branched chains, pale brown, smooth, subcylindrical to fusoid-ellipsoidal, aseptate or septate, sometimes widest in middle, truncate at the ends; **hila** somewhat darkened and thickened, but not refractive (adapted from Crous et al. 2010, 2016, 2017).

**Type species:** *Neofusicladium eucalypti* (Crous & R.G. Shivas) Crous, M. Shen & Y. Zhang ter

**Notes:** So far, *Neofusicladium* comprises three species, viz., *N. eucalypti*, *N. eucalypticola* and *N. regnans*. All three *Neofusicladium* species were isolated from Eucalyptus leaves (Crous et al. 2010, 2016, 2017). The diagnostic characteristics of *Neofusicladium* includes sympodial conidiophores with somewhat thickened and darkened, non-refractive conidiogenous loci, mostly branched conidial chains, and the presence of ramoconidia (Crous et al. 2010, 2016, 2017). Phylogenetically, *Neofusicladium* is basal in Sympoventuriaceae and is introduced as a new genus (Fig. 1).

**Neofusicladium eucalypti** (Crous & R.G. Shivas) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831541. Fig. 5. Basionym: Fusicladium eucalypti Crous & R.G. Shivas, Persoonia 25: 149. 2010.

**Description and illustration:** Crous et al. (2010).

**Typus:** Australia, Queensland, Brisbane, Mt. Coot-tha, Bardon Trail, on leaves of Eucalyptus sp. (Myrtaceae), 12 Jul. 2009, P.W. Crous & R.G. Shivas (holotype CBS H-20497, culture ex-type CBS 128216 = CPC 17324).

**Notes:** *Neofusicladium eucalypti* was first described (as Fusicladium eucalypti) from Eucalyptus leaves in Australia (Crous
Fig. 4. Fuscochilum siciliana (culture ex-type CBS 105.85) asexual morph. A. Colony on OA. B, C. Conidia arising from hyphae. D–H. Cylindrical and subcylindrical conidia in chains. Scale bars: B–H = 10 μm.
et al. 2010). Its dimorphic conidiophores can serve as a diagnostic character for this species (Crous et al. 2010). This species is sister to *N. eucalypticola* in Fig. 1.

**Neofusicladium eucalypticola** (Crous & M.J. Wingf.) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831542. Fig. 6. Basionym: Fusicladium eucalypticola Crous & M.J. Wingfield, Persoonia 36: 369. 2016.

Description and illustration: Crous et al. (2016).

Typus: France, La Réunion, on leaves of Eucalyptus robusta (Myrtaceae), 8 Mar. 2015, P.W. Crous & M.J. Wingfield (holotype CBS H-22614, culture ex-type CBS 141301 = CPC 27238).

Notes: The broader conidia of *N. eucalypticola* [(2.5–)3(–4) μm] distinguish it from *N. eucalypti* [(2–)2.5(–3) μm]). Furthermore, secondary ramoconidia of *N. eucalypticola* (15–20 × 3–5 μm) are larger than those of *N. eucalypti* (10–15 × 2–3 μm) and *N. regnans* (10–20 × 3–4 μm) (Crous et al. 2010, 2016, 2017). This species is sister to *N. eucalypti* in Fig. 1.

**Neofusicladium regnans** (Crous) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831543.

Basionym: Sympoventuria regnans Crous, Persoonia 39: 425. 2017.

Description and illustration: Crous et al. (2017).

Typus: Australia, Victoria, La Trobe State Forest, on leaves of Eucalyptus regnans (Myrtaceae), 30 Nov. 2016, P.W. Crous (holotype CBS H-23304, culture ex-type CBS 143411 = CPC 32720).

Notes: *Neofusicladium regnans* was first described (as Sympoventuria regnans) on leaves of *Eucalyptus regnans* collected in Victoria, Australia (Crous et al. 2017). The larger-sized conidia of *N. regnans* (8–20 × 2.5–3 μm) are easily distinguishable from those of *N. eucalypti* (7–10 × 2–3 μm) and *N. eucalypticola* (5–12 × 2.5–4 μm) (Crous et al. 2010, 2016, 2017). *Neofusicladium regnans* represents the most basal species in the *Neofusicladium* clade (Fig. 1).
Parafusicladium Crous, M. Shen & Y. Zhang ter, gen. nov. MycoBank MB831513.

Etymology: Named after Fusicladium, the morphologically most comparable genus. Para- means false.

Mycelium consisting of pale brown, smooth, branched, septate hyphae. Conidiophores erect, solitary, subcylindrical, brown to dark brown, septate, sometimes thick-walled, smooth, rarely branched below, sometimes dimorphic. Conidiogenous cells integrated, terminal, rarely lateral, brown, smooth, with several or numerous sympodial denticule-like loci, somewhat thickened and darkened, but not refractive. Conidia sometimes occurring in short chains, straight, cylindrical, subcylindrical, subhyaline to pale brown, smooth, guttulate, mostly 1-septate, ends obtusely rounded; hila somewhat thickened and darkened (adapted from Ho et al. 1999, Crous et al. 2007b, 2016).

Type species: Parafusicladium amoenum (R.F. Castañeda & Dugan) Crous, M. Shen & Y. Zhang ter

Notes: The sympodial conidiogenous cells and subcylindrical conidia with somewhat thickened and darkened hila of Parafusicladium point to Sympoventuriaceae. Based on a multigene phylogenetic analysis, it forms a subclade sibling to other genera of Sympoventuriaceae (Fig. 1). Parafusicladium is thus introduced here comprising three species, viz., P. amoenum, P. intermedium and P. paraamoenum.

Parafusicladium amoenum (R.F. Castañeda & Dugan) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831544. Fig. 7.
Fig. 7. Parafusicladium amoenum (culture ex-type CBS 254.95) asexual morph. A. Colony on OA. B–F. Long conidiophores reduced to sympodial conidiogenous cells. G, H. Pale brown and 1-septate conidia. Scale bars: B–H = 10 μm.
Basionym: Anungitopsis amoena R.F. Castaneda & Dugan, Mycotaxon 72: 118. 1999.
Synonyms: Fusicladium amoenum (R.F. Castañeda & Dugan) Crous et al., Stud. Mycol. 58: 207. 2007.
Cladosporium amoenum R.F. Castaneda, BCCM MUCL Agro-industrial fungi-yeast. 1998. Nom. inval., Art. 38.1(a) (Shenzhen).

Description and illustration: Untereiner et al. (1998), Ho et al. (1999), Crous et al. (2007b).

Typus: Cuba, Santiago de Cuba, La Gran Piedra, fallen leaves of Eucalyptus sp. (Myrtaceae), 2 Nov. 1994, R.F. Castañeda (Ho et al. 1999: 117, Figs 2, 3, holotype: epitype ATCC 200947 (designated in Ho et al. 1999)), culture ex-epitype CBS 254.95 = ATCC 200947 = IMI 367525 = INIFAT C94/155 = MUCL 39143.

Notes: Cladosporium amoenum was first described from fallen leaves of Eucalyptus sp. collected in Cuba, which was, unfortunately, invalid because it lacked a Latin diagnosis (Untereiner et al. 1998). Ho et al. (1999) validated its name and assigned it to Anungitopsis (as A. amoena), which was subsequently assigned to Fusicladium (as F. amoenum) (Crous et al. 2007b). The colony of Fusicladium amoenum is pseudocladosporium-like, while the loci of the conidiogenous cells are neither prominently thickened, nor refractive (Ho et al. 1999, Crous et al. 2007a). Phylogenetically, Fusicladium amoenum clusters in Parafusicladium, sister to P. paraamoenum (Fig. 1).

Parafusicladium intermedium (Crous & W.B. Kendr.) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831545. Fig. 8. Basionym: Anungitopsis intermedia Crous & W.B. Kendr., S. African J. Bot. 63: 286. 1997.
Synonym: Fusicladium intermedium (Crous & W.B. Kendr.) Crous, Stud. Mycol. 58: 209. 2007.

Descriptions and illustrations: Crous et al. (1997, 2007b).

Typus: Madagascar, Tamatave, leaf litter of Eucalyptus sp. (Myrtaceae), Apr. 1994, P.W. Crous (epitype CBS H-19918 (designated in Crous et al. 2007b), culture ex-epitype CBS 110746 = CPC 778 = IMI 362702). South Africa, Mpuumalanga, from leaf litter of Eucalyptus sp., Oct. 1992, M.J. Wingfield (holotype PREM 51438).

Notes: Anungitopsis intermedia was described from leaf litter of Eucalyptus sp. in South Africa, and was subsequently assigned to Fusicladium (as F. intermedium) (Crous et al. 1997, 2007b). Morphologically, the conidiophores are dimorphic in culture, being either macroconidiate, anungitopsis-like, or microconidiate, more pseudocladosporium-like (Crous et al. 1997, 2007b). This species is the most basal species in Parafusicladium (Fig. 1).

Parafusicladium paraamoenum (Crous et al.) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831552. Fig. 9. Basionym: Fusicladium paraamoenum Crous et al., Persoonia 36: 377. 2016.

Description and illustration: Crous et al. (2016).

Typus: Australia, Victoria, Toolangi State Forest, on leaves of Eucalyptus regnans (Myrtaceae), 9 Nov. 2014, P.W. Crous, J. Edwards & P.W.J. Taylor (holotype CBS 141322 = CPC 25596).

Notes: Morphologically, P. paraamoenum is most comparable with P. amoenum, but has larger conidia [(13–15–20(–28) × (3–) 3.5–(4) μm vs. (6–)10.5–12.8(–17.3) × (1.5–)2.4–3(–3.8) μm] (Ho et al. 1999, Crous et al. 2016). They also differ in their dimorphic conidiophores (Crous et al. 2016). Phylogenetically, the two species are siblings (Fig. 1).

Pinaceicola Crous, M. Shen & Y. Zhang ter, gen. nov. MycoBank MB831515.

Etymology: The epithet refers to Pinaceae, the host family from which the genus was described.

Mycelium consisting of branched, septate, pale to medium brown, smooth hyphae. Conidiophores erect, pale to dark brown, subcylindrical, smooth, straight, reduced to conidiogenous cells, with one to several conidiogenous loci, subcylindrical to almost conical, widest at the base, tapering to a subtruncate or truncate apex; conidiogenous loci flat-tipped, somewhat darkened and thickened. Ramoconidia present, aseptate or septate. Conidia in branched or unbranched chains, pale to medium brown or pale olivaceous, smooth, narrowly ellipsoidal, subcylindrical or fusoid, straight to slightly curved, 0–1-septate, mostly widest in the middle, tapering to subtruncate or truncate ends; hila somewhat darkened and thickened, not refractive (adapted from Crous et al. 2007b, Koukol 2010).

Type species: Pinaceicola pini (Crous) Crous, M. Shen & Y. Zhang ter

Notes: The two species of Pinaceicola presently recognised were both reported as saprobes on needles of Pinaceae (Crous et al. 2007b, Koukol 2010).

Pinaceicola cordae (Koukol) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831555. Fig. 10. Basionym: Fusicladium cordae Koukol, Mycol. Progr. 9(3): 371. 2010.

Description and illustration: Koukol (2010).

Typus: Czech Republic, Doubrive, Tokán, on needle litter of Pinus sylvestris (Pinaceae), 11 Dec. 2006, O. Koukol (holotype PRM 915668, culture ex-type CBS 126959 = CCF 3843).

Additional materials examined: Germany, on litter needles of Pinus sylvestris (Pinaceae), 5 Feb. 2016, R.K. Schumacher (culture CBS 143494 = CPC 30463; ibid., CPC 30466). Netherlands, Kootwijl, needles of P. sylvestris, 8 Nov. 1982, G.S. de Hoog (culture CBS 675.82).

Notes: Pinaceicola cordae was first described from the Czech Republic and the Netherlands (as Fusicladium cordae; Koukol 2010), and subsequently collected in Germany (present study). Pinaceicola cordae is thus far only known from needles of Pinus sylvestris. Together with Pinaceicola pini, P. cordae clusters in Sympoventuriae, and basal to Sterila, Fuschium and Neocolorea (Fig. 1).

Pinaceicola pini (Crous & de Hoog) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831556. Fig. 11. Basionym: Fusicladium pini Crous & de Hoog, Stud. Mycol. 58: 210. 2007.
Synonym: Fusicladium ramoconidii Crous & de Hoog, Stud. Mycol. 58: 211. 2007.

Description and illustration: Crous et al. (2007b).
Typos: Netherlands. Baarn, De Vuursche, on litter needle of Pinus sp. (Pinaceae), 12 Apr. 1982, G.S. de Hoog (holotype CBS H-19908, culture ex-type CBS 463.82).

Additional material examined: Netherlands. Baarn, De Vuursche, on needle of Pinus sylvestris (Pinaceae), 12 Apr. 1982, G.S. de Hoog (dried culture CBS H-1610, ex-type culture of Fusicladium ramoconidi CBS 462.82).

Notes: Fusicladium pini and F. ramoconidi CBS 462.82 were introduced as different species based on differences in their ITS sequences (13 bp), and the absence of ramoconidia in F. pini (Crous et al. 2007b). However, the multigene data [Fig. 1; ITS sequences (identity: 99 %), LSU sequences (identity: 100 %), tefl sequences (identity: 99 %), tub2 sequences (identity: 99 %), rpb2 sequences (identity: 99 %).
sequences (identity: 99 %) suggest them to be conspecific belonging in the newly erected genus, Pinaceicola.

_Pseudosigmaidea_ K. Ando & N. Nakam., J. Gen. Appl. Microbiol., Tokyo 46: 55. 2000.

**Type species:** _Pseudosigmaidea cranei_ K. Ando & N. Nakam.

_Pseudosigmaidea alicola_ Crous & R.K. Schumach., Fungal Syst. Evol. 3: 109. 2019.

**Description and illustration:** Crous et al. (2019a).

_Typus:_ Germany, near Berlin, leaf litter of Alnus glutinosa (Betulaceae), 3 May 2017, R.K. Schumacher, HPC 2100 (holotype CBS H-23826, culture ex-type CBS 145034 = CPC 33776).

**Note:** The phylogenetic position of this species is shown and discussed by Crous et al. (2019a).

_Pseudosigmaidea cranei_ K. Ando & N. Nakam., J. Gen. Appl. Microbiol., Tokyo 46: 55. 2000.

**Type:** USA, Maryland, Frederick County, Appalachian Trail, Bear Spring, from fresh water, collection date and collector unknown (holotype TNS F-100793, culture ex-type ATCC 16660) (not seen).

**Note:** This species is not known from molecular data, thus its phylogenetic position is unknown.

_Pseudosigmaidea excentrica_ (R.F. Castañeda et al.) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831557.

**Basionym:** _Scolecobasidium excentricum_ R.F. Castañeda et al., Nova Hedwigia 64: 473. 1997.

**Typus:** Cuba, Santiago de Las Vegas, Ciudad de la Habana, Pinar del Río, isolated from dead leaves of unidentified Lauraceae, 6. Aug. 1994, coll. R.F. Castañeda Ruiz (holotype CBS H-7739, isotype CBS H-6052, culture ex-type CBS 469.95 = INIFAT C94/202 = MUCL 39227).

**Notes:** _Scolecobasidium excentricum_ was introduced based on its “excentrically inflated” conidia, which are quite clearly illustrated (figs 1–3 in Castañeda-Ruiz et al. 1997). In this study, the ex-type of _Scolecobasidium excentricum_ (INIFAT C94/202 = CBS 469.95) was sequenced, showing it to cluster in _Pseudosigmaidea_ (Fig. 1). Morphologically, _Scolecobasidium excentricum_ has straight to excentric conidiophores, and polyblastic or sympodial conidigenous cells, which agree with Venturiales (Castañeda-Ruiz et al. 1997).

_Pseudosigmaidea ibarakiensis_ Diene & Narisawa, Microbes and Environm. 28: 384. 2013.

**Typus:** Japan, Ibaraki, obtained from natural forest soil, 2008, unknown collector (holotype NIAES H-20615, culture ex-type IMI 4.2-1 = NBRC 107891) (not seen).

**Note:** This species is sister to _P. excentrica_ (Fig. 1).

_Scolecobasidium_ E.V. Abbott, Mycologia 19: 30. 1927.

**Synonym:** _Ochroconis_ de Hoog & Arx, Kavaka 1: 57. 1974 [1973].

**Type species:** _Scolecobasidium terreum_ E.V. Abbott.

**Notes:** _Scolecobasidium_ was introduced based on _S. terreum_ and _S. constrictum_, with _S. terreum_ designated as the generic type (Abbott 1927). The slow-growing, olivaceous colonies of these two species agree well with _Venturiales_. Morphologically, the diagnostic characteristics of _Scolecobasidium_ includes that conidia are produced on “sterigmata” left as tubular appendages on conidiophores, and are produced singly (never in chains).

Although Barron & Busch (1962) considered species of _Scolecobasidium_ with darker, unbranched conidia to be congeneric with _S. terreum_, this opinion was not shared by von Arx, and therefore De Hoog & von Arx (1974) introduced a separate genus, _Ochroconis_, typified by _O. constricta_, for species with ellipsoidal conidia. _Ochroconis_ proved to be a rather common genus of saprotrophic soil hyphomycetes, some of which occasionally grow on plant litter, humans or fish (Samerpitak et al. 2014). Gams (2015) regarded _Ochroconis_ as synonym of _Scolecobasidium_, which was supported by Seifert et al. (2011). Although the ex-type strains of both _S. terreum_ (CBS 203.27) and _O. constricta_ (CBS 202.27) are now sterile, together with other species of _Ochroconis_ and _Scolecobasidium_, they nest in the clade of _Scolecobasidium_ (Fig. 1). Based on these results as well as their morphology, we therefore resurrect the older generic name _Scolecobasidium_, and reduce _Ochroconis_ to synonymy with it.

_Scolecobasidium aquaticum_ (Samerp. et al.) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831640.

**Basionym:** _Ochroconis aquatica_ Samerp. et al., Mycoscience 58: 292. 2017.

**Typus:** Germany, Mecklenburg-Vorpommern, isolated from siliccone seal in shower of fish-processing company, 28 Oct. 2014, K. Gloyna (holotype CBS H-22391, culture ex-type CBS 140316).

**Note:** This species is sister to _S. anomalum_ (Fig. 1).

_Scolecobasidium atlanticum_ (A.M. Wellman) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831641.

**Basionym:** _Ochroconis atlantica_ A.M. Wellman, Can. J. Bot. 53: 1631. 1975.

**Typus:** Atlantic Ocean, 44.30° N, 26.00° W, on tar, cultured on Difco Marine 2216 agar, Jun. 1973, A.M. Wellman (holotype IMI 183133).

_Scolecobasidium bacilliforme_ (Samerp. et al.) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831642.

**Basionym:** _Ochroconis bacilliformis_ Samerp. et al., Mycopathologia 180: 4. 2015.

**Typus:** Germany, Mülheim, from biofilm on stainless steel in drinking water, 1998, E. Göttlich (holotype CBS H-22032, culture ex-type CBS 100442 = M 37/2).

_Scolecobasidium capsici_ (Crous & Cheew.) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831643.

**Basionym:** _Ochroconis capsici_ Crous & Cheew., Persoonia 37: 333. 2016.

**Typus:** Thailand, Chiang Rai, N19°48′01″ E99°41′27″, on Capsicum annuum (Solanaceae), 2013, R. Cheewangkoon (holotype CBS H-22883, culture ex-type CPC 28782 = CBS 142096).

_Scolecobasidium cordanae_ (Samerp. et al.) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831644.

**Basionym:** _Ochroconis cordanae_ Samerp. et al., Fungal Diversity 65: 105. 2013 [2014].
**Typus: Colombia.** Villavicencio, from dead leaf, Dec. 1979, W. Gams (culture ex-type CBS 475.80).

**Note:** This species represents one of three basal lineages in the *Scolecobasidium* clade (Fig. 1).

*Scolecobasidium* *dracaenae* (Crous) Crous, M. Shen & Y. Zhang ter, **comb. nov.** MycoBank MB831645.

*Basionym:* Ochroconis *dracaenae* Crous, Persoonia 36: 379. 2016.

**Typus: USA.** Texas, Austin, on leaf spots of *Dracaena reflexa* (Asparagaceae), Aug. 2013, P.W. Crous (**holotype** CBS H-22619, culture ex-type CPC 26115 = CBS 141323).

**Note:** This species is sister to *S. pandanicola* (Fig. 1).

*Scolecobasidium* *globale* (Samerp. et al.) Crous, M. Shen & Y. Zhang ter, **comb. nov.** MycoBank MB831646.

*Basionym:* Ochroconis *globalis* Samerp. et al., Mycol. Progr. 14 (no. 6): 3. 2015.

**Typus: Germany.** Düsseldorf, from indoor sample, dwelling house, 2002 (**holotype** CBS H-21940, culture ex-type CBS 119644).

**Note:** This species is sister to *S. tshawytschae* (Fig. 1).

*Scolecobasidium* *icarus* (Samerp. et al.) Crous, M. Shen & Y. Zhang ter, **comb. nov.** MycoBank MB831647.

*Basionym:* Ochroconis *icarus* Samerp. et al., J. Clin. Microbiol. 52: 4195. 2014.

**Typus: Canada.** Ontario, from forest soil, 1969, G.L. Barron (**holotype** CBS H-21643, cultures ex-type CBS 536.69 = MUCL 15054 = OAC 10212).

**Note:** This species is sister to *S. ramosum* (Fig. 1).

*Scolecobasidium* *macrozamiae* (Crous & R.G. Shivas) Crous, M. Shen & Y. Zhang ter, **comb. nov.** MycoBank MB831648.

*Basionym:* Ochroconis *macrozamiae* Crous & R.G. Shivas, Persoonia 32: 205. 2014.

**Typus: Australia.** Queensland, Brisbane, Slaughter Falls, on *Macrozamia* (*Zamiaceae*) leaf litter, 16 Jul. 2009, P.W. Crous & R.G. Shivas (**holotype** CBS H-21682, culture ex-type CPC 17262 = CBS 137971).

**Note:** This species is sister to *S. gamsii* (Fig. 1).
**Scolecobasidium minimum** (Fassat.) Crous, M. Shen & Y. Zhang ter, *comb. nov.* MycoBank MB831649.
Basionym: *Humicola minima* Fassat., *Česká Mykol.* 21: 87. 1967.
Synonym: *Ochroconis minima* (Fassat.) Samer & de Hoog, Fungal Diversity 65: 110. 2013 [2014].
Typus: *Nigeria*, Samar, Zaria, from rhizosphere of *Gossypium arboreum* (Malvaceae), M. Dransfield (holotype PRC 981, ex-type CBS 510.71 = ATCC 22631 = IMI 082933).

Note: This species is sister to *S. ramosum* / *icarus* (Fig. 1).

**Scolecobasidium musicola** (Crous) Crous, M. Shen & Y. Zhang ter, *comb. nov.* MycoBank MB832011.
Basionym: *Ochroconis musicula* Crous, Persoonia 40: 387. 2018.
Typus: *Malaysia*, leaves of *Musa* sp. (*Musaaceae*), 2010. P.W. Crous (holotype CBS H-23562, culture ex-type CBS 144441).

Note: This species is sister to *S. sexuale* / *macrozamiae* / *gamsii* (Fig. 1).

**Scolecobasidium olivaceum** (A. Giraldo et al.) Crous, M. Shen & Y. Zhang ter, *comb. nov.* MycoBank MB831652.
Basionym: *Ochroconis olivacea* A. Giraldo et al., *J. Clin. Microbiol.* 52: 4195. 2014.
Typus: *USA*, Utah, from bronchoalveolar lavage fluid, 2010. D.A. Sutton (holotype CBS H-21779, cultures ex-type CBS 137170 = FMR 12509 = UTHSC 10-2009).

Note: This species is sister to *S. verrucosum* (Fig. 1).

**Scolecobasidium pandanicola** (Crous & M.J. Wingf.) Crous, M. Shen & Y. Zhang ter, *comb. nov.* MycoBank MB831653.
Basionym: *Ochroconis pandanica Crous & M. Wingf., Persoonia 35: 277. 2015.
Typus: *France*, La Réunion, S21°21’30.7’’E55°44’32.3’’, Route Forêtire Mare Longue, on leaves of Pandanus utilis (*Pandanaeae*), 6 Mar. 2014. P.W. Crous & M.J. Wingfield (holotype CBS H-22397, culture ex-type CPC 26317 = CBS 140660).

Note: This species is sister to *S. dracaenae* (Fig. 1).

**Scolecobasidium phaeophorum** (Samerp. et al.) Crous, M. Shen & Y. Zhang ter, *comb. nov.* MycoBank MB831654.
Basionym: *Ochroconis phaeophora* Samerp. et al., *MycoPathologia* 180: 4. 2015.
Typus: *Papua New Guinea*, Madang, Balek, from leaf in coastal rain forest, 1995. A. Aptom & A. van Iperen (holotype CBS H-22033, culture ex-type CBS 206.96 = 36599/No. A 165).

Note: This species represents one of three basal lineages in the *Scolecobasidium* clade (Fig. 1).

**Scolecobasidium podocarpus** (Crous) Crous, M. Shen & Y. Zhang ter, *comb. nov.* MycoBank MB831655.
Basionym: *Ochroconis podocarpus* Crous, Persoonia 39: 361. 2017.
Typus: *Australia*, New South Wales, Australian Botanic Garden, Mount Annan, on leaves of *Podocarpus grayae* (*Podocarpaceae*), 25 Nov. 2016. P.W. Crous (holotype CBS H-23267, culture ex-type CPC 32829 = CBS 143174).

Note: This species represents one of three basal lineages in the *Scolecobasidium* clade (Fig. 1).
**Fig. 10.** *Pinaceicola cordae* (culture CBS 675.82) asexual morph. **A.** Colony on OA. **B, C.** Conidia arising from conidiogenous cells. **D–F.** Pale brown, aseptate or 1-septate conidia in branched chains. Scale bars: B–F = 10 μm.
**Culture characteristics:** Colonies spreading, erumpent, with sparse aerial mycelium and regular margins on OA, olivaceous brown (surface), margins dark olivaceous; reverse fuscous-black; on MEA pale grey (surface), margins brownish red; reverse fuscous-black; on SNA olivaceous brown (surface), margins pale olivaceous; reverse olivaceous to dark olivaceous. Colonies reaching 18 mm diam after 2 wk on OA at 25 °C in the dark.

Typos: **Portugal,** on Eucalyptus sp. (Myrtaceae), 24 Jan. 2008, P.W. Crous (holotype CBS H-23601, culture ex-type CBS 144019 = CPC 14944, CPC 14942, CPC 14943).

Notes: Sterila eucalypti was collected from leaves of a Eucalyptus sp. Unfortunately, it does not sporulate in culture. Although cultured from single ascospores, no ascocarp could be located on the leaves of the fungarium specimen. According to multigene phylogenetic analysis, it forms a separate fully supported clade distinguishing it from other genera of Sympoventuriaceae (Fig. 1).

**Sympoventuria** Crous & Seifert, Fungal Diversity 25: 31. 2007.

**Description and illustration:** Crous et al. (2007a).

Type species: **Sympoventuria capensis** Crous & Seifert

Notes: The genus **Sympoventuria** was first introduced by Crous et al. (2007a) based on S. capensis, which was saprophytic on Eucalyptus leaves collected in South Africa. Although the small-sized immature ascocarps agree with **Venturia**, the persistent pseudoparaphyses, saprophytic lifestyle, hyaline, 1-septate, symmetrical ascospores and subcylindrical asci of **Sympoventuria** capensis differ from those of **Venturia** s. str. (Sivanesan 1977, Crous et al. 2007a, Zhang et al. 2011).

**Sympoventuria africana** (Crous), M. Shen & Y. Zhang ter, **comb. nov.** Mycobank MB831585.

Basionym: **Fusicladium africanum** Crous, Stud. Mycol. 58: 205. 2007.

**Description and illustration:** Crous et al. (2007b).

Typos: **South Africa,** Western Cape Province, Malmesbury, on leaf litter of Eucalyptus sp. (Myrtaceae), Jan. 2006, P.W. Crous (holotype CBS H-19904, culture ex-type CBS 12828, CBS 121640 = CPC 12829).

Notes: Both S. africana and S. capensis were collected from Eucalyptus leaf litter in South Africa (Crous et al. 2007a, b). Morphologically, the fusiform conidia of S. africana can be distinguished from the cylindrical conidia of S. capensis. **Sympoventuria africana** represents the most basal species in the **Sympoventuria** clade (Fig. 1).

**Sympoventuria capensis** Crous & Seifert, Fungal Diversity 25: 32. 2007.

**Description and illustration:** Crous et al. (2007a).

Typos: **South Africa,** Western Cape Province, Malmesbury, on leaf litter of Eucalyptus sp. (Myrtaceae), Jan. 2006, P.W. Crous (holotype CBS H-19757, culture ex-type CPC 12838 = CBS 120136, CPC 12839, CPC 12840).

Notes: See the notes for **Sympoventuria africana.** This species is sister to S. melaleucae in Fig. 1.

**Sympoventuria melaleucae** Crous, Persoonia 39: 413. 2017.

**Description and illustration:** Crous et al. (2017).

Typos: **Australia,** Victoria, Royal Botanic Gardens Victoria, Melbourne Gardens, on leaves of Melaleuca sp. (Proteaceae), 2 Dec. 2016, P.W. Crous (holotype CBS H-23298, culture ex-type CBS 143407 = CPC 32576).

Notes: **Sympoventuria melaleucae** was introduced for a fungus which is occurring on leaves of Melaleuca sp. in Australia (Crous et al. 2017). Morphologically, S. melaleuca is distinct from S. capensis in that it has smaller conidia [(8–11–17–25) × 2–3 μm vs. up to (40–55–65 × 4–5 μm), with fewer septa (0–1-septate vs. (1–)3–(5–)septate) (Crous et al. 2007a, b)]. DNA sequence data also place S. melaleucae within **Sympoventuria,** sister to S. capensis (Fig. 1).

**Tropossporella** P. Karst., Hedwigia 31: 299. 1892.

Type species: **Tropossporella fumosa** P. Karst.

**Tropossporella fumosa** P. Karst., Hedwigia 31: 299. 1892.

Typos: **Finland,** Mustiala, on the old bark of Populus tremula (Salicaceae), 13 Nov. 1892, P.A. Karsten 4286 (H6052538).

Note: **Tropossporella fumosa** formed a robust clade with T. monilipes (Fig. 1). Linder (1929: 335) examined type material of T. fumosa deposited at H and provided a description based on this material.

**Tropossporella monilipes** (Ellis & L.N. Johnson) C.K.M. Tsui & Berbee, Mycoscience 51: 147. 2010.

Basionym: **Helicoma** monilipes Ellis & L.N. Johnson, Proc. Acad. Nat. Sci. Philadelphia 46: 376. 1894.

Typos: **USA,** Michigan, Ann Arbor, on decayed wood of Quercus (Fagaceae), Oct. 1893 (L.N. Johnson No. 666) (not seen).

Note: This species is sister to T. fumosa (Fig. 1).

**Veronaeopsis** Arzlanou & Crous, Stud. Mycol. 58: 91. 2007.

Type species: **Veronaeopsis simplex** (Papendorf) Arzlanou & Crous

Notes: **Veronaeopsis** was separated from Veronaea based on its shorter conidiophores, geniculate rachis and prominent conidiogenous loci (Papendorf 1969, Arzlanou et al. 2007). Phylogenetically, **Veronaeopsis simplex** nests in the **Sympoventuriaceae,** and is sister to other genera of **Sympoventuriaceae** (Fig. 1).

**Veronaeopsis simplex** (Papendorf) Arzlanou & Crous, Stud. Mycol. 58: 91. 2007.

Basionym: **Veronaea simplex** Papendorf, Trans. Brit. Mycol. Soc. 52: 486. 1969.

Typos: **South Africa,** Potchefstroom, leaf-litter and top soil of a mixed Acacia karroo (= Vachellia karroo) (Fabaceae) community, Apr. 1966, J.W. du Toit (holotype PREM 43728, culture ex-type CBS 588.66).

Notes: According to Arzlanou et al. (2007), **Veronaeopsis simplex** is saprobic on leaf litter of V. karroo in South Africa, and distinct from species of other genera by having a well-developed rachis with densely aggregated conidiogenous loci.

**Verruconis** Samep. et al., Fungal Diversity 65: 117. 2013 [2014].

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Type species: Verruconis gallopava (W.B. Cooke) Samerp. & de Hoog

Notes: The genus Verruconis was separated from Scolecobasidium based on its ecological and physiological traits and morphological differences (Samerpitak et al. 2014). Presently there are seven species included in Verruconis (see below). Morphologically, the light to dark brown, verrucose to coarsely ornamented conidia of Verruconis are readily distinguishable from Scolecobasidium (Samerpitak et al. 2014, Zhang et al. 2018).

Some species of Verruconis are thermophilic, such as V. calidi-fluminalis and V. gallopava, both of which originate from a hot spring (Samerpitak et al. 2014). Verruconis verruculosa and V. panacis originate from the soil environment, with V. verruculosa from grassland soil, and V. panacis from roots of Panax notoginseng (Roy et al. 1962, Samerpitak et al. 2014, Zhang et al. 2018). Verruconis hainanensis and V. pseudotricliadiata were isolated from submerged dicotyledonous leaves in a stream of Hainan island, China (Qiao et al. 2019). Based on the morphological and phylogenetic characteristics, Scolecobasidium terricola was assigned to Verruconis (as V. terricola). Species of Verruconis form a separate clade basal to Scolecobasidium (Fig. 1).

Verruconis calidi-fluminalis (Yarita et al.) Samerp. & de Hoog, Fungal Diversity 65: 117. 2013 [2014].

Basionym: Ochroconis calidi-fluminalis Yarita et al., Mycopathologia 170: 29. 2010.

Typus: Japan, Hakone, Kanagawa Prefecture, from hot spring river water, Mar. 2004, K. Nishimura (holotype IFM 54738, not seen).

Notes: Ochroconis calidi-fluminalis was described by Yarita et al. (2010) from a hot spring in Japan, and was subsequently assigned to Verruconis (Samerpitak et al. 2014). Verruconis calidi-fluminalis was isolated concomitantly with V. gallopava as thermophilic fungi from a hot spring (Yarita et al. 2010, Samerpitak et al. 2014). Although V. calidi-fluminalis and V. gallopava are comparable in their ecology, morphology as well as culture characteristics, they are distinguishable by their pathogenic potential to vertebrates (Yarita et al. 2010, Samerpitak et al. 2014). Verruconis gallopava is a neurotropic invader in birds and also occurs in humans (Samerpitak et al. 2014). Verruconis calidi-fluminalis, however, has low virulence in mice (Samerpitak et al. 2014). In addition, DNA sequence data can also readily distinguish these two species (Fig. 1).

Verruconis gallopava (W.B. Cooke) Samerp. & de Hoog, Fungal Diversity 65: 117. 2013 [2014].

Basionym: Diplorhinotrichum gallopavum W.B. Cooke, Sabouraudia 3: 242. 1964.

Synonyms: Dactylaria gallopava (W.B. Cooke) G.C. Bhatt & W.B. Kendr., Canad. J. Bot. 46: 1257. 1968.

Ochroconis gallopava (W.B. Cooke) de Hoog, Fung. Path. Hum. Anim.: 181. 1983.

Dactylaria constricta var. gallopava (W.B. Cooke) Salkin & D.M. Dixon, Mycotaxon 29: 379. 1987.

Scolecobasidium gallopavum (W.B. Cooke) G.Y. Sun & Lu Hao, Mycol. Progr. 12(3): 492. 2012.

Typus: Turkey, isolated from the brain tissue of sick young Bos taurus, collection date and collector unknown (holotype CDC 45-492-62, culture ex-type CBS 437.64 = ATCC 16027 = CDC 45-492-62 = MUCL 6683 = IFM 52605) (not seen).

Notes: Verruconis gallopava is a widely distributed thermophile which was encountered in diverse types of hot environments, such as self-heated coal waste piles (Tansey & Brock 1973), hot springs (Tansey & Brock 1973, Weitzman et al. 1983, Yarita et al. 2007), warm effluents of a nuclear reaction station (Rippon et al. 1980), and broiler-house litter (Waltrip et al. 1974, Randall & Owen 1981). Verruconis gallopava is a neurotropic invader in birds, chicken, humans, trumpeters and cats (Evans 1971a, b, Tansey & Brock 1973, Weitzman et al. 1983, Karesh et al. 1987, Horre & de Hoog 1999, Redman et al. 1999, Yarita et al. 2007, Samerpitak et al. 2014). For differences from V. calidi-fluminalis see comments above.

Verruconis hainanensis Z.F. Yu & M. Qiao, MycoKeys 48: 47. 2019.

Typus: China, Hainan Province, Xiqianling, 18°48’N, 109°49’E, 902 m alt., from leaves of an unidentified dicotyledonous plant submerged in a stream, 16 Jun. 2016, Z.F. Yu (holotype YMYF 1.04165; culture ex-type YMF 1.04165; isotype CGMCC 3.18974).

Verruconis panacis T. Zhang & Y. Zhang, Int. J. Syst. Evol. Microbiol. 68: 2502. 2018.

Typus: China, Yunnan Province, Wen-shan district, from the root of a 3-yr-old Panax notoginseng (Araliaceae), Oct. 2015, T. Zhang (holotype SYPFH 8337, culture ex-type CBS 142802 = CGMCC 3.18302 = SYPF 8337).

Notes: Verruconis panacis was introduced by Zhang et al. (2018), having been collected from Panax notoginseng roots in China. Morphologically, Verruconis panacis is distinguishable from other Verruconis species by its four-celled conidia (Zhang et al. 2018). This species is sister to V. verruculosa / terricola (Fig. 1).

Verruconis pseudotricliadiata Z.F. Yu & M. Qiao, MycoKeys 48: 48. 2019.

Typus: China, Hainan Province, Diaoluo Mountain, 18°41’N, 109°41’E, 254 m alt., from leaves of an unidentified broad-leaf species submerged in a stream, 16 Jun. 2016, Z.F. Yu (holotype YMYF 1.04915; culture ex-type YMF 1.04915; isotype CGMCC 3.18939).

Verruconis terricola (J. Ren et al.) Crous, M. Shen & Y. Zhang, comb. nov. MycoBank MB831671.

Basionym: Scolecobasidium terricola J. Ren et al., Mycoscience 54: 421. 2013.

Typus: China, Hainan Province, Wuzhi Mountain, isolated from soil, Dec. 2009, Y.-L. Zhang (holotype HGUPd3009, culture ex-type CBS 131795 = HGUP3009).

Notes: Scolecobasidium terricola was originally isolated from soil in a tropical region of China (Ren et al. 2013). Morphologically, the symiodidal, holoblastic conidigenous cells, solitary, ellipsoidal, 1-septate conidia with a sterigma left as a tubular appendage on the conidigenous cell and the conidial base of conidia point to Scolecobasidium / Verruconis (Ren et al. 2013). Phylogenetically, Scolecobasidium terricola nests in Verruconis (Fig. 1), to which is assigned.

Verruconis verruculosa (R.Y. Roy et al.) Samerp. & de Hoog, Fungal Diversity 65: 120. 2013 [2014].
**Notes:** Verruconis verruculosa is a soil-borne fungus, which was saprophytic in grassland soil in India (Roy et al. 2014). Morphologically, Verruconis verruculosa is distinguishable from other species of Verruconis by its oblong conidia with rounded ends and prominent spines (Samerpitak et al. 2014). Based on the multigenic phylogenetic analysis, Verruconis verruculosa formed a single sister lineage distinguishing it from other species of Verruconis (Fig. 1).

**Verruconis E. Müll. & Arx ex M.E. Barr, Mycologia 71: 947. 1979.**

Habitat saprophytic, endophytic or parasitic on leaves or stems of dicotyledons, rarely on monocotyledons. Sexual morph: Ascomata gregarious, sometimes composed of a well-developed subiculum, globose, subglobose, with or without setae around papilla, ostiolate. Hamathecium of narrowly cellular pseudoparaphyses, mostly evanescent. Asci 8-spored, bitunicate, fissitunicate, usually obclavate to obpyriform, branched byphae. Conidiothecia singly or in clusters, terminal or sometimes intercalary, proliferating sympodially or percurrent, with conspicuous anellations. Conidia aseptate or euseptate, pigmented, solitary or in chains.

**Type genus:** Venturia Sacc.

**Notes:** Venturiaeae was first invalidly introduced by Müller & von Arx (1950), and von Arx (1952) provided a systematic key to genera of Venturiaeae. The familial type of Venturiaeae is Venturia Sacc. Barr (1979) validated the family, included 12 genera within Venturiaeae and provided a first detailed description with important diagnostic characters. Furthermore, Barr (1989) provided a key to North American genera and species. Lumbsch & Huhndorf (2010) assigned 27 genera to Venturiaeae. Venturiaeae sensu Zhang et al. (2011) comprises eight genera, viz. Acantharia, Apiosporina (including Dibotryon), Caproventuria, Coleroa, Pseudoparadiella, Metacoleroa, Tyrrannosorus and Venturia with another seven genera ambiguously included without molecular data. Hyde et al. (2013) assigned 15 genera (including an ambiguous genus Spilodochium) to Venturiaeae. Based on morphological, ecological and molecular data, Caproventuria is treated as a synonym of Tyrrannosorus in this study.

**Acantharia** Theiss. & Syd., Ann. Mycol. 16: 15. 1918. 

**Synonym:** Zeuctomorpha Sivan. et al., In: Sivanesan, Bitunicate Ascomycetes and their Anamorphs: 572. 1984.

**Type species:** Acantharia echinata (Ellis & Everh.) Theiss. & Syd.

**Note:** Based on the morphological characteristics of the type species, e.g. its foliicolous habitat, superficial, setose ascoma, evanescent pseudoparaphyses, obclavate asci, and 1-septate, brown, constricted ascospores, Acantharia was assigned to Venturiaeae (Zhang et al. 2011). Molecular proof, however, is still needed to confirm its placement in Venturiaeae.

**Apiosporina** Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1. 119: 439. 1910.

**Synonym:** Dibotryon Theiss. & Syd., Ann. Mycol. 13: 663. 1915.

**Type species:** Apiosporina collinsii (Schwein.) Höhn.

**Notes:** Based on the fusciadium-like asexual morph, morphological characteristics of the sexual morph, as well as the molecular phylogeny of A. collinsii and A. morbosa, Apiosporina was assigned to Venturiaeae (Zhang et al. 2011). Morphologically, the submedian ascospore septation of Apiosporina was the most striking characteristic of Apiosporina. The phylogenetic significance of ascospore septation (and position) still needs to be clarified.

**Apiosporina collinsii** (Schwein.) Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1. 119: 439. 1910.

**Synonym:** Sphaeria collinsii Schwein., Trans. Amer. Philos. Soc., n.s. 4: 211. 1832 [1834].

**Material examined:** Canada, Ontario, Thunder Bay, Lakehead, Univ., Campus, on Amelanchier alnifolia (Rosaceae), 23 May 2005, L.J. Hutchinson (culture CBS 118973 = CPC 12229–12231).

**Notes:** Phylogenetically, Apiosporina collinsii (represented by CBS 118973), the generic type of Apiosporina, clustered apart from Apiosporina morbosa, and basal to most other members of Venturiaeae (Figs 1, 2).

**Apiosporina morbosa** (Schwein.) Arx, Acta Bot. Neerl. 3: 86. 1954.

**Synonym:** Sphaeria morbosa Schwein., Schriften Naturf. Ges. Leipzig. 1: 40 [14 of repr.]. 1822.

**Notes:** Apiosporina morbosa is represented by strain “dimosp” from Prunus in USA in Fig. 1. Unfortunately, no ITS sequence is available for comparison to other A. morbosa ITS sequences on GenBank; the majority of which appears to be associated with Cladosporium (GenBank AF493982–AF493982, AY166451 and AY1165751) or distantly with Pencicaria (GenBank MK575461). The generic status of Apiosporina morbosa cannot be confirmed until authentic isolates become available for further study.

**Coleroa** Rabenh., Klotzschii Herb. Viv. Mycol., Ed. 1, Cent. 15. no. 1456. 1850.

**Description and illustration:** Zhang et al. (2011).

**Type species:** Coleroa chaetomium (Kunze ex Fr.) Rabenh.

**Notes:** Based on the scattered, setose ascomata, deliquescing pseudoparaphyses, fusoid to obclavate asci and the 1-septate, constricted ascospores of C. chaetomium, Coleroa was assigned to Venturiaeae (Zhang et al. 2011). Two isolates, C. circinans and C. robertianii, nested in Venturiaeae in this study (Figs 1, 2). Coleroa spp. 1–3 were all collected in Europe, and previously named as Venturia spp. Phylogenetically, they all nest in a clade with C. circinans and C. robertianii (Figs 1, 2). They were thus treated as unnamed taxa within Coleroa. Both C. circinans and C. robertianii, however, were tentatively used to represent Coleroa. The phylogeny of Coleroa needs to be resolved once sequence data become available for the generic type.

**Coleroa circinans** (Fr.) G. Winter, Rabenh. Krypt.-Fl., Ed. 2, 1(2): 200. 1885.
Basionym: Perisporium circinans Fr., Syst. Mycol. 3: 252. 1829.

Material examined: France, Geranium rotundifolium (Geraniaceae), 26 Jun. 1961, C. Bachmann (ETH 2760, culture CBS 457.64).

Note: The species is sister to C. robertianus (Figs. 1, 2).

Coleroa robertiana (Fr.) E. Müll., Beitr. Kryptogamenfl. Schweiz. 11(2): 416. 1962. Basionym: Dothidea robertiana Fr., Syst. mycol. 2(2): 564. 1823.

Typus: Switzerland, Oetliberg, Zürich-Witikon, on Geranium robertianum (Geraniaceae), 28 Sep. 1960, C. Bachmann (lectotype ETH 2757 designated here, MBT391368, epitype specimen designated here CBS 458.64, MBT391363, preserved as metabolically inactive culture, culture ex-epitype CBS 458.64).

Note: The species is sister to C. circinans (Figs. 1, 2).

Cylindrosympodioides Crous & M.J. Wingf., Persoonia 36: 336. 2016.

Description and illustration: Crous et al. (2016).

Type species: Cylindrosympodioides brabeji Crous & M.J. Wingf.

Notes: Cylindrosympodioides was first introduced based on C. brabeji, which shares a similar morphology with species of Cylindrosympodium in having solitary, seporate, cylindrical to subcylindrical, hyaline conidia with truncate bases, somewhat darkened hila, and brown conidiogenous structures with sympodial proliferation (Crous et al. 2016). Cylindrosympodioides differs from Cylindrosympodium in that it has acicular conidia with slightly thickened hila, and a fusidial-like synsexual morph, which has narrowly fusiform, 1-septate conidia and conidiophores reduced to conidiogenous cells. Cylindrosympodioides brabeji forms a distinct sister lineage basal in the Venturiaceae.

Cylindrosympodioides brabeji Crous & M.J. Wingf., Persoonia 36: 335. 2016.

Description and illustration: Crous et al. (2016).

Typus: South Africa, Western Cape Province, Franschhoek, on leaves of Brabejum stellatifolium (Proteaceae), 17 Jan. 2015, P.W. Crous & M.J. Wingfield (holotype CBS H-22594, culture ex-type CBS 141285 = CPC 25934).

Notes: Cylindrosympodioides is a monotypic genus represented by C. brabeji, which is an endophyte (presumed saprobe) on leaves of Brabejum stellatifolium (Crous et al. 2016).

Phylogenetically (Fig. 1), Cylindrosympodioides brabeji is basal in Venturiaceae, sibling to Sympoventuriaceae and Cylindrosympodiaceae. The genus can be distinguished from Cylindrosympodium acicular conidia with slightly thickened hila, and a fusidial-like synsexual morph, as well as conidiophores that are reduced to conidiogenous cells (Crous et al. 2016).

Fagicola Crous, M. Shen & Y. Zhang ter, gen. nov. MycoBank MB831517.

Etymology: Named after the host genus on which it occurs, Fagus; “-icola” means dweller, inhabitant.

Mycelium consisting of pale to medium brown, smooth to finely verruculose, branched hyphae. Conidiophores integrated, terminal on hyphae, aseptate or septate, mostly reduced to conidiogenous cells, also lateral, visible as small, protruding, denticle-like loci. Conidiogenous cells subcyllindrical, pale to medium brown, smooth to finely verruculose, tapering to several apical indistinct loci. Ramoconidia present. Conidia pale brown, smooth, guttulate, subcyllindrical to narrowly ellipsoid, occurring in simple or branched chains, aseptate or septate, tapering towards subtruncate ends; hila mostly inconspicuous, i.e., rarely thickened or darkened-refractive (adapted from Crous et al. 2007b).

Type species: Fagicola fagi (Crous & de Hoog) Crous, M. Shen & Y. Zhang ter

Fagicola fagi (Crous & de Hoog) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831586. Fig. 12. Basionym: Fusidium fagi Crous & de Hoog, Stud. Mycol. 58: 209. 2007.

Description and illustration: Crous et al. (2007b).

Typus: Netherlands, Utrecht Province, Baarn, Maarschalksbosch, on decaying leaves of Fagus sylvatica (Fagaceae), 1 Oct. 1984, G.S. de Hoog (holotype CBS H-10366, culture ex-type CBS 621.84 = ATCC 200937).

Notes: Fagicola is proposed based on Fusicladium fagi (as Fusidium fagi), which is saprophytic on leaves of Fagus sylvatica collected in the Netherlands. A multigene phylogenetic analysis indicated that Fagicola fagi is sibling to other genera of Venturiaceae (Figs. 1, 2).

Fraxinicola Crous, M. Shen & Y. Zhang ter, gen. nov. MycoBank MB831518.

Etymology: Named after the host genus on which it mostly occurs, Fraxinus. “-icola” means dweller, inhabitant.

In vivo: Ascomata scattered over the entire leaf surface, immersed, globose to subglobose, pseudoparaphysate, ostiulate, papillate, with or without setae. Peridium thin, composed of pigmented cells of textura angularis. Asci bitunicate, oblong to obclavate, with a short pedicle. Ascospores uniseriate, partially overlapping to biseriate, especially at the base, ellipsoidal, with broadly rounded ends, olivaceous pale brown, 1-septate, slightly constricted at the septum, the upper cells often shorter and wider than the lower ones, smooth-walled. Conidiophores fusidial-like, arising in clusters (sporodochia) from erumpent subcuticular to intraepidermal, few-celled stromata, or from terminal or lateral hyphae in culture, erect, unbranched, geniculate, septate, dark brown, smooth, walls thickened. Sporodochia interconnected by subcuticular to intraepidermal mycelium of melanised, partly swollen short cells and intercellular chlamydospores. Conidiogenous cells terminal, geniculate, proliferation sympodial, with a few to numerous truncate loci, somewhat refractive or darkened. Conidia solitary, smooth, lanceolate but apical tip rounded, 0–2-septate, pale medium brown, with a truncate base which is often somewhat thickened (adapted from Aderhold 1897, Crous et al. 2011, Ibrahim et al. 2016).

Type species: Fraxinicola fraxini (Aderh.) Crous, M. Shen & Y. Zhang ter

Fraxinicola europaea Crous, M. Shen & Y. Zhang ter, sp. nov. MycoBank MB831523.

Etymology: Named after the continent where it was collected, Europe.
Pinaceicola pini (culture ex-type CBS 463.82) asexual morph. A. Colony on OA. B. Hyphal coil. C–H. Sympodial conidiogenous loci and concatenated conidia arising from conidiogenous cells. Scale bars: B–H = 10 μm.
Cultures sterile. *Fraxinicola europaea* differs from its closest phylogenetic neighbours, *F. fraxini*, *F. italic* and *F. orn* (Fig. 1) by unique fixed alleles in five loci based on alignments of the separate loci deposited in TreeBASE (S24573): *Fraxinicola europaea* (CBS 472.61) vs. *F. fraxini* (CBS 140930) by 34 bp in ITS (7 %), 7 bp in LSU (1 %), 95 bp in *rpb2* (12 %), 59 bp in *tef1* (17 %), 80 bp in *tub2* (21 %); *F. europaea* (CBS 472.61) vs. *F. italic* (CBS 140918) by 34 bp in ITS (7 %), 8 bp in LSU (1 %), 94 bp in *rpb2* (12 %); 60 bp in *tef1* (18 %), 86 bp in *tub2* (22 %); *F. europaea* (CBS 472.61) vs. *F. orn* (CBS 140920) by 35 bp in ITS (7 %), 9 bp in LSU (1 %), 98 bp in *rpb2* (13 %), 62 bp in *tef1* (18 %), 86 bp in *tub2* (22 %).

Culture characteristics: Colonies spreading, erumpent, with aerial mycelium and regular and smooth margins on OA, grey to olivaceous brown (surface); reverse fuscous-black; on MEA grey to dark brown (surface); reverse fuscous-black; on SNA olivaceous (surface); reverse dark olivaceous. Colonies reaching 5 mm diam after 2 wk on OA at 25 °C in the dark.

Typus: Switzerland, Kt. Tessin, Gola di Lago, on *Betula pubescens* (Betulaceae), 8 Apr. 1959, E. Müller (holotype CBS-H 24308, culture ex-type CBS 472.61 = ETH 2839).

Additional materials examined: France, Hautes Alpes, Aiguilles, on dead leaf of *Populus tremula* (Salicaceae), 28 Jun. 1958, E. Müller (ETH 2831, culture CBS 477.61); Hautes Alpes, Monetier, on *P. tremula*, Jun. 1981, M. Morelet (culture CBS 689.85); Alpes Maritimes, Tende, on *Epilobium montanum* (Onagraceae), 24 Aug. 1953, E. Müller (culture CBS 377.53).

Notes: *Fraxinicola europaea* does not sporulate in culture, and thus lacks a morphological description. According to the multigene phylogenetic analyses, it forms a separate lineage distinguishing it from other species of *Fraxinicola* (Figs 1, 2).

*Fraxinicola fraxini* (Aderh.) Crous, M. Shen & Y. Zhang ter, **comb. nov**. *MycoBank* MB831587. Fig. 13.

Basionym: *Venturia fraxini* Aderh., *Hedwigia* 36: 83. 1897.

Synonyms: *Fusicladium fraxini* Aderh., *Hedwigia* 36: 74, 83. 1897.

*Fusicladium proteae* Crous, *Persoonia* 27: 34. 2011.
Fig. 13. *Fraxinicola fraxini* (culture CBS 140930) asexual morph. **A.** Colony on OA. **B–F.** Sympodial conidiogenous cells producing conidia. **G–J.** Brown, 1–3-septate, tapering conidia. Scale bars: **B–J** = 10 μm.
See Schubert et al. (2003) for additional synonyms.

**Typus**: Parastic on leaves of *Fraxinus excelsior* (Oleaceae) (lectotype designated here Aderhold 1897, plate IV, fig. 6, MBT391370). **Switzerland**, Spiez, on leaf of *F. excelsior* as endophyte, 31 Aug. 2013, M. Schlegel (epitype designated here, specimen CBS 140930, MBT391371, as metabolically inactive culture, ex-epitype culture CBS 140930).

Additional materials examined: **Italy**, Premia, on leaf of *F. ornus* (Oleaceae) as endophyte, 31 Aug. 2013, M. Schlegel (culture CBS 140929 = VE 2). **South Africa**, Western Cape Province, Hermanus, Fynbos Nature Reserve, on leaves of *Protea sp.* (Proteaceae), 5 May 2010, P.W.Crous (ex-type culture of *F. proteae* CBS 130599 = CPC 18282). **Switzerland**, Monte Casiano, on leaf litter of *F. excelsior* (Oleaceae), 5 Sep. 2013, M. Ibrahim (culture CBS 140935 = VE 12); Kt. Wallis, Brig, on *F. excelsior*, 10 Jul. 1953, E. Müller (culture CBS 374.55).

**Notes**: *Venturia fraxini*, the basionym of *Fraxinicola fraxini*, was reported as an endophyte of *Fraxinus excelsior* (Aderhold 1897. Ibrahim et al. 2016). Morphologically, *Fraxinicola fraxini* (conidia fusoid to obclavate, 12–28 × 4–6(–7) μm, (0–)(–1)(–3)-septate), is comparable with *Fusicladium proteae* (conidia obpyriform, unequally 1-septate, (13–)17–22(–30) × (4–)5(–)μm, Schubert et al. 2003, Crous et al. 2011). Phylogenetically, the type isolate of *Fusicladium proteae* (CBS 130599) forms a conspecific clade together with isolates identified as *Fraxinicola fraxini* (Fig. 2). Thus, we assigned *Fusicladium proteae* to synonymy with *Fraxinicola fraxini*. *Fusicladium proteae* was reported as a causal agent on leaf spots on *Protea* sp. in South Africa (Crous et al. 2011). *Fraxinicola fraxini* is sister to *F. orni* (italica in Figs 1, 2).

**Fraxinicola italicata** Crous, M. Shen & Y. Zhang ter, *sp. nov.* MycoBank MB831524.

**Etymology**: Named after Italy, where this species was collected.

Cultures sterile. *Fraxinicola italicata* (CBS 140918) differs from its closest phylogenetic neighbour *F. ornis* (CBS 140920) (Fig. 1) by unique fixed alleles in five loci based on alignments of the separate loci deposited in TreeBASE (S24573), by 11 bp in ITS (2 %), 3 bp in LSU (1 %), 6 bp in rpb2 (1 %), 10 bp in tef1 (2 %), 9 bp in tub2 (2 %).

**Culture characteristics**: Colonies spreading, erumpent, with moderate aerial mycelium and regular, smooth margins on OA, dark brown (surface); reverse fuscous-black; on SNA dark brown (surface); moderate aerial mycelium and regular, smooth margins on OA, dark brown (surface); reverse fuscous-black; on SNA dark brown (surface); reverse fuscous-black. Colonies reaching 12 mm diam after 2 wk on OA at 25 °C in the dark.

**Typus**: **Italy**, Lago di Ledro, on leaf of *Fraxinus ornus* (Oleaceae) as endophyte, 5 Sep. 2013, M. Ibrahim (holotype specimen and culture ex-type CBS 140918 preserved as metabolically inactive culture).

**Notes**: *Fraxinicola italicata* does not sporulate in culture. The species is sister to *F. orni* (Figs 1, 2).

**Fraxinicola orni** (M. Ibrahim et al.) Crous, M. Shen & Y. Zhang ter, *comb. nov.* MycoBank MB831588. Fig. 14. Basionym: *Venturia orni* M. Ibrahim et al., *Mycol. Progr.* 15 (29): 6. 2016.

**Description and illustration**: Ibrahim et al. (2016).

**Typus**: **Switzerland**, on leaf litter of *Fraxinus ornus* (Oleaceae), 4 May 2015, M. Schlegel (holotype ZT Myc 55333, culture ex-type CBS 140924 = VO 10).

Additional materials examined: **Italy**, Lago di Ledro, on leaf of *Fraxinus ornus* (Oleaceae) as endophyte, 5 Nov. 2013, M. Ibrahim (ZT Myc 55330, cultures CBS 140919 = VO 4; ZT Myc 55331, CBS 140920 = VO 5; CBS 140921 = VO 6). **Switzerland**, on leaf of *F. ornus* as endophyte, 13 Nov. 2013, M. Ibrahim (culture CBS 140922 = VO 8).

**Notes**: *Fraxinicola orni* is based on *Venturia orni*, which was described as saprobic on *Fraxinus ornus* (Ibrahim et al. 2016). Morphologically, *Venturia orni* can be distinguished from *V. fraxini* by the absence of setae (Aderhold 1897, Ibrahim et al. 2016). The multigene phylogenetic analyses indicated that *Fraxinicola orni* clustered in *Fraxinicola* and is sister to other species, viz., *F. italicata*, *F. fraxini*, and *F. europaea* (Figs 1, 2).

**Gibbera** Fr., *Syst. Orb. Veg.* 1: 110. 1825.

**Type species**: *Gibbera vaccinii* (Sowerby) Fr.

**Notes**: Due to the lack of molecular data for the generic type species, the phylogenetic status of *Gibbera* remains unresolved. Currently, molecular data is available for *G. conferta* (Figs 1, 2) and *G. roseae* (LSU GenBank JQ036234). However, a blast search using the *G. roseae* sequence shows it to be allied to *Cadophora* (data not shown).

**Gibbera kalmiae** (Peck) M.E. Barr, Canad. J. Bot. 39: 315. 1961. Fig. 15.

**Basionym**: *Venturia kalmiae* Peck, Rep. (Annual) New York State Mus. Nat. Hist. 28: 82. 1876.

**Notes**: The scattered ascomata, numerous ascii, hyaline to pale brown ascospores as well as the persistent pseudoparaphyses of *Venturia kalmiae* point to *Leptosphaeriaceae*. Barr (1961) reported *Venturia kalmiae* as having a thin hypostroma and assigned it to *Gibbera*. The generic type of *Gibbera*, *G. vaccinii*, lacks molecular data, and thus the taxonomic status remains unresolved. No sequence data is currently available for *G. kalmiae*.

**Helicoon** Morgan (as “Helicöön”), J. Cincinnati Soc. Nat. Hist. 15: 49. 1892.

**Type species**: *Helicoon sessile* Morgan

**Notes**: There are currently two accessions listed under the name *H. sessile* on GenBank (accessions ITS: U72605 and SSU-ITS: LSU: KY659207). The former accession number is allied to *Sarocladium* whereas the latter accession number is allied to...
Fig. 14. Fraxinicola orni (culture CBS 140920) asexual morph. A, B. Sporodochia produced on OA. C–E. Sympodial conidiogenous cells producing conidia. F, G. Medium brown, 1-septate and asymmetrical conidia. Scale bars: A, C = 20 μm; B, D–G = 10 μm.
Fig. 15. Gibbera kalmiae (holotype NYSf1621) sexual morph. A. Ascomata scattered on the host surface. B, D, E. Clavate, asci. C. Released, pale brown, 1-septate ascospores. F. Evanescent, cellular pseudoparaphyses. G. Setae. Scale bars: A = 200 μm; B–G = 10 μm.
Helicoon myosorumoides Voglmayr, Mycol. Res. 101: 337. 1997.

Typus: Austria, Upper Austria, Hausruerkviertel, distr. Vöcklabruck, comm. Tiefgraben, wooded raised bog 'Wielimoo' at Neuhausl at the NW side of the Mondseeberg, 790 m s.m., 23 Oct. 1993, coll. H. Voglmayr (holotype WU, culture ex-type CBS 743.96).

Notes: Morphologically, Helicoon was introduced based on solitary, non-proliferating, barrel-shaped conidia borne on distinct conidiophores (Morgan 1892, Goos et al. 1986, Goh & Hyde 1996), and was regarded as synonym of Orbilia. Helicoon myosorumoides was described from bark and leaves of Betula spp., but also from leaves of Fagus sylvatica in Austria, which is characterised by its percurrent, septate conidiophores and dark fuscosus to blackish brown colonies (Goh & Hyde 1996), which point to Venturinales. Phylogenetically, *H. myosorumoides* nests in the Venturiaceae, and is sibling to other genera, such as Apiosporina, Tyrannosorus, Gibbera, Metacoleroa, Protoventuria, Fraxinicola, Colerona and Venturia (Figs 1, 2).

Metacoleroa Petr., Ann. Mycol. 25: 332. 1927.

Type species: Metacoleroa dickiei (Berk. & Broome) Petr.

Metacoleroa dickiei (Berk. & Broome) Petr. (as “dieckiei”), Ann. Mycol. 25: 332. 1927.

Basionym: Sphaeria dickiei Berk. & Broome, Ann. Mag. Nat. Hist., ser. 2(9): 317. 1852.

Notes: Metacoleroa is a monotypic genus based on *M. dickiei*. Metacoleroa was assigned to Venturinales based on superficial ascomata and ascospores with a median or submedian septum (Zhang et al. 2011). The identification of isolate “medicus” from Linnaea borealis in Oregon, USA (Winton et al. 2007) used in our phylogenetic analyses (Figs 1, 2) remains unconfirmed.

Pseudoparodiella F. Stevens, Illinois Biol. Monogr. 11(2): 166. 1927.

Type species: Pseudoparodiella vernoniae F. Stevens.

Pseudoparodiella vernoniae F. Stevens, Illinois Biol. Monogr. 11(2): 166. 1927.

Basionym: Spilodochium vernoniae Syd., Ann. Mycol. 25(12): 158. 1927.

Typus: Costa Rica, Peralta, on leaves of Vernonica canescens (Asteraceae), 12 Jul. 1923, F.L. Stevens 352 (holotype K(M) 154549).

Notes: Pseudoparodiella is a monotypic genus, based on *P. vernoniae* (Stevens 1927). Pseudoparodiella was assigned to Venturinales due to its small-sized ascomata produced on leaves of dicotyledons, rare pseudoparaphyses, obclavate asci, and 1-septate, olivaceous brown ascospores (Zhang et al. 2011). Spilodochium vernoniae is the asexual morph of *P. vernoniae* (Sivanesan 1986). No molecular data is available for *P. vernoniae*, and its phylogenetic status remains undetermined.

Tyrannosorus Unter. & Malloch, Mycol. Res. 99: 910. 1995.

Synonyms: Caproventuria U. Braun, Monogr. Cercosporella, Ramularia Allied Genera (Phytopath. Hyphom.) 2: 396. 1998. Pseudocladosporium U. Braun, Monogr. Cercosporella, Ramularia Allied Genera (Phytopath. Hyphom.) 2: 392. 1998.

Type species: *Tyrannosorus pinicola* (Petri & P.J. Fisher) Unter. & Malloch

Notes: *Tyrannosorus* was introduced based on its saprophytic lifestyle, immersed to erumpent ascomata, lacking a subcuticular stroma, which agrees with the diagnostic characteristics of *Caproventuria* (Untereiner & Straus 1995, Zhang et al. 2011). Phylogenetically, *Caproventuria* nests in the well-supported Tyrannosorus clade (data not shown). The genus *Tyrannosorus* is older than *Caproventuria*, and has priority.

Tyrannosorus hanlinianus (U. Braun & Feiler) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831589.

Basionym: Capronia hanliniana U. Braun & Feiler, Microbiol. Res. 150: 90. 1995.

Synonyms: Venturia hanliniana (U. Braun & Feiler) Unter., Mycologia 89: 129. 1997. Caproventuria hanliniana (U. Braun & Feiler) U. Braun, Monogr. Cercosporella, Ramularia Allied Genera (Phytopath. Hyphom.) 2: 396. 1998. Cladophialophora brevicatenata U. Braun & Feiler, Microbiol. Res. 150: 84. 1995. Pseudocladosporium brevicatenatum (U. Braun & Feiler) U. Braun, Monogr. Cercosporella, Ramularia Allied Genera (Phytopath. Hyphom.) 2: 393. 1998. Fusicladium brevicatenatum (U. Braun & Feiler) Crous et al., Stud. Mycol. 58: 212. 2007.

Typus: Germany, Mecklenburg, Bornhof, 1994, U. Feiler (holotype) pseudeothecia formed in pure culture (strain 7623), dried culture on SNA (HAL 1579 F) (not seen).

Notes: The congeneric status of *Caproventuria hanliniana* and *C. hystrioides* (current name *Tyrannosorus hystrioides*) could be confirmed based on their similarity in morphology and DNA sequence data (data not shown).

Tyrannosorus hystrioides (Dugan et al.) Crous, M. Shen & Y. Zhang ter, comb. nov. MycoBank MB831590. Fig. 16.

Basionym: Capronia hystrioides Dugan et al., Mycologia 87: 713. 1995.

Synonym: Venturia hystrioides (Dugan et al.) Crous & U. Braun, Stud. Mycol. 58: 212. 2007.

Description and illustration: (Dugan et al. 1995, Crous et al. 2007b, this study).

Typus: USA, Washington, Wenatchee, isolated from cherry fruit, 7 Jul. 1992, F.M. Dugan & R.G. Roberts (holotype ST10-7, permanent slide WSP 69609, culture ex-type CBS 117727, ATCC 96019).

Note: This species is sister to *T. lichenicola* / *pinicola* (Figs 1, 2).

Tyrannosorus lichenicola Crous, M. Shen & Y. Zhang ter, sp. nov. MycoBank MB831525. Fig. 17.

Etymology: The epithet refers to the lichen, *Letharia* (*Parmelia*-aceae), the host from which the fungus was collected.

In vitro on OA: Mycelium branched or unbranched, 2–3 μm wide, septate, not constricted or rarely constricted at septa, hyaline to pale brown, verrucose or smooth, straight or flexuous, walls unthickened, and not darkened, frequently with hyphal coils. Conidiophores arising from hyphae, often as short lateral conical prolongations of hyphae, reduced to conidiogenous cells.
Fig. 16. Tyrannosorus hystrioides (culture ex-type CBS 117727) asexual morph. A. Colony on OA. B. Hyphal coil. C–F. Concatenated conidia arising from conidiogenous cells. G, H. Aseptate or 1-septate conidia. Scale bars: B–H = 10 μm.
Conidiogenous cells erect or geniculate-sinuous, 8–20.5 × 2.5–4 μm, monoblastic or polyblastic, pale brown to brown, subcylindrical; loci truncate, 1.5–2 μm wide, usually not thickened, somewhat darkened. Ramoconidia 14–31.5 × 2.5–6.5 μm, 0–1-septate, often not constricted at the septum, pale brown, with a truncate base, cylindrical, subcylindrical, occasionally broadly fusiform, usually with several denticle-like apical loci. Conidia catenate, mostly formed in unbranched chains, straight or slightly curved, cylindrical, subcylindrical, oblong, occasionally broadly fusiform, 11.5–23 × 3–4 μm, subhyaline to pale brown, 0–1-septate, septum median, usually constricted at the septum, smooth, walls slightly thickened, but not darkened-refractive, tapering towards both ends; hila truncate, 1–2 μm wide, sometimes slightly thickened and darkened.

Culture characteristics: Colonies spreading, somewhat erumpent, with sparse aerial mycelium and regular margins on OA, white-grey (surface), margins fuscous-black; reverse fuscous-black; on MEA greyish (surface), margins fuscous-black; reverse fuscous-black; on SNA olivaceous (surface); reverse dark olivaceous. Colonies reaching 28 mm diam after 2 wk on OA at 25 °C in the dark; colonies fertile.

Typus: USA, on Letharia sp. (Parmeliaceae), 27 May 2013, A. Smith (holotype CBS H-23600, culture ex-type CBS 144018 = CPC 25106).

Notes: Tyrannosorus lichenicola was isolated from a Letharia sp. Morphologically, the monoblastic conidiogenous cells, catenate conidia, and the slow-growing, olivaceous colonies point to Venturiaceae. In particular, the occasional microcyclic conidia of Tyrannosorus lichenicola differs from other reported members of Venturiaceae. Phylogenetically, Tyrannosorus lichenicola nests in the Tyrannosorus clade, closely related to T. pinicola (Figs 1, 2).

Tyrannosorus pinicola (Petrini & P.J. Fisher) Unter. & Malloch, Mycol. Res. 99: 910. 1995. Fig. 18.
Fig. 18. Tyrannosorus pinicola (culture ex-type CBS 124.88) asexual morph. **A.** Colony on OA. **B.** Conidiogenous loci on hypha. **C–F.** Conidia in chains forming three-dimensional helix. **G.** Straight or curved conidia. Scale bars: B–G = 10 μm.
Basionym: Capronia pinicola Petrini & P.J. Fisher, Trans. Brit. Mycol. Soc. 88: 68. 1987.
Synonym: Helicodendrum pinicola E. Müll. et al., ex Voglmayr & P.J. Fisher, Mycol. Res. 101: 1124. 1997.

_Tyrransorus pini-sylvestris_ Crous & R.K. Schumach., _sp. nov._ MycoBank MB831526. Fig. 19.

**Etymology:** The epithet refers to _Pinus sylvestris_, the host species from which this fungus was isolated.

_Myceum_ consisting of pale brown, smooth, septate, branched, 2–2.5 μm wide hyphae. _Conidiophores_ 0–2-septate, mostly reduced to conidiogenous cells on creeping hyphae, lateral or terminal, subcylindrical, 5–20 × 2–3 μm. _Conidiogenous cells_ integrated, 5–10 × 2–3 μm, symphodial, loci truncate, 0.5–1 μm wide, mostly somewhat darkened. _Ramoconidia_ occurring. _Conidia_ in penicillate heads of branched chains, subcylindrical, pale brown, smooth, guttulate, 0–1-septate, (7–) 9–11(–13) × 2(–3) μm; _loci_ truncate, somewhat darkened, 0.5 μm diam.

**Culture characteristics:** Colonies spreading, erumpent, with moderate aerial mycelium and smooth, lobate margins. On MEA and PDA grey olivaceous (surface); reverse iron-grey; on OA iron-grey. Colonies reaching 15 mm diam after 2 wk at 25 °C; colonies fertile.

**Typus:** _Germany_. Berlin, on needles of _Pinus sylvestris_ (_Pinaceae_), 5 Feb. 2016, R.K. Schumacher (holotype CBS H-23839, cultures ex-type CBS 143393 = CPC 30464, CPC 30461).

**Notes:** The sympodial conidiogenous cells of _T. pini-sylvestris_ agree with _Venturiaceae_. _Tyrransorus pini-sylvestris_ can be distinguished from _T. hystrioides_ by its penicillate heads formed by conidia occurring in branched chains. Phylogenetically, _T. pini-sylvestris_ nests in the _Tyrransorus_ clade, and is basal to other species of _Tyrransorus_, such as _T. hystrioides_, _T. lichenicola_ and _T. pinicola_ (Figs 1, 2).

_Venturia_ Sacc., Syll. Fung. 1: 586. 1882.
_Synonyms:_ Spilocaea Fr., Novit. fl. scev. 5(cont.): 79. 1819.
_Cycloconium_ Castagne, Cat. Pl. Mars.: 220. 1845.

_Fusciadum_ Bonord., Handb. Mykol.: 80. 1851.
_Naplicium_ Thüm., Hedwigia 14: 4. 1875.
_Basiiscum_ Cavara as _Basiiscum_. Atti Ist. bot. R. Univ. Pavia, 2 Sér. 1: 433. 1888.
_Pollaccia_ E. Bald. & Cif., Atti Ist. Bot. ‘Giovanni Briosi’, ser. 4, 10: 71. 1937.

Mostly parasitic on leaves, fruits or twigs, causing leaf spots, scab diseases, necroses or deformations. Sexual morph: _Ascomata_ erumpent, semi-erumpent or superficial, rarely immersed, scattered or gregarious, often with papillate ostiole, mostly with setae (except species with immersed ascomata). _Paraphyses_ narrowly cellular, hyaline, mostly evanescent in mature ascomata. _Asci_ 8-spored, bitunicate, broadly cylindrical to obclavate, usually lacking a pedicel. _Ascosporas_ pale olivaceous brown to olivaceous brown, 1-septate, usually asymmetrical. Asexual morph: Colonies punctiform, scattered, caespitose or dendritic, olivaceous, olivaceous brown, dingy grey to blackish. Stromata lacking to well-developed, pseudostromatic, composed of rounded to isodiametric swollen hyphal cells, pigmented, wall often somewhat thickened. _Mycelium_ consisting of unbranched or sparingly branched, septate, not constricted at septa, subhyaline, pale brown to brown, smooth hyphae. _Conidiophores_ solitary or sparsely gregarious, arising from internal or external hyphae or stromata, conidiophores often reduced to conidiogenous cells or composed of several cells, erect, cylindrical, pyriform, subclavate, narrowly obclavate, slightly to distinctly geniculate-sinuous, unbranched or occasionally branched, pale olivaceous to dark brown, tips sometimes paler, smooth to somewhat verruculose, sometimes only as short lateral conical prolongations of hyphae, occasionally irregular in shape. _Conidiogenous cells_ integrated, terminal or intercalary or conidiophores reduced to conidiogenous cells, monoblastic to polyblastic, proliferation percurrent or sympodial; conidiogenous loci terminal or lateral, sometimes denticle-like, apex truncate to slightly convex, wall unthickened or almost so, sometimes slightly darkened-refractive. _Conidia_ solitary or catenate, sometimes in simple or branched chains, ellipsoid, obovoid, fusiform, obclavate to subcylindrical, straight to slightly curved, septate or asceptate, subhyaline, pale to dark brown, but mostly olivaceous, sometimes constricted at the septa, smooth to verruculose, ends pointed or rounded to truncate, hila thickened or not, occasionally darkened-refractive.

_Type species:_ Venturia inaequalis (Cooke) G. Winter

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_Fig. 19._ _Tyrransorus pini-sylvestris_ (culture ex-type CBS 143393) asexual morph. _A._ Colony on OA. _B–E._ Conidia in penicillate-like chains. Scale bars: _B_ applies to _B, C, E_ = 10 μm; _G_ = 10 μm.
Notes: *Venturia* was first described by De Notaris (1844) to accommodate *V. rosae* and *V. dianthi* with no type designated. Subsequently, Cesati & De Notaris (1863) described a further two species, *V. dickiei* and *V. eres*. Saccardo (1882) emended the description of *Venturia*, excluding both *V. rosae* and *V. dianthi*, while accepting *V. dickiei* and *V. eres*. *Venturia* Sacc. was widely accepted, and was neotypified with *V. inaequalis* (Korf 1956, Sivanesan 1977).

*Venturia* includes economically important plant pathogens, such as apple scab caused by *V. inaequalis* and pear scab caused by *V. pyrina* (Sivanesan 1977). In the monograph by Sivanesan (1977), herbarium specimens of 65 species were studied including type materials of 31 species. Sivanesan (1977) recognised 52 species and transferred five species to other genera, i.e., *V. caulicola* and *V. himalayensis* to Cefora, *V. enteleae* and *V. rhois* to Mycosphaerella and *V. microspora* to Niesslia. Barr (1968) studied specimens of 35 venturiaceous species from North America, of which 12 species were based on type materials.

Morphologically, the circumscription of *Venturia* s. str. has been summarised as follows: 1) ascomata, erumpent, semi-enormut, or superficial, rarely immersed, scattered or gregarious, often with papillate ostiole, mostly with setae; 2) hamathecum narrowly cellular, hyaline, usually evanescent in mature ascomata; 3) ascii 8-spored, bitunicate, broadly cylindrical to obclavate, usually lacking a pedicel; 4) ascospores pale greenish olivaceous to dark brown, 1-septate, usually asymmetrical (Zhang et al. 2016a, b). Based on the circumscription above, type specimens of six species of *Venturia*, *V. caentaevae*, *V. chrysanthemi*, *V. corni*, *V. helvetica*, *V. muelleri* and *V. rhanni* were revised, redescribed and illustrated, and *V. corni* was excluded from *Venturia* (Zhang et al. 2016a, b). Fungarium specimens of 59 species of *Venturia* are described and illustrated in the present study, with 22 species being excluded from *Venturia* (see below). The asexual morphs of *Venturia* have been assigned to *Fusicladium*, *Spilocaea* or *Pollaccia*, while the names in *Venturia* are more widely known than those in *Fusicladium*, *Spilocaea* or *Pollaccia*. Thus, *Venturia* was recommended for protection over *Fusicladium* and *Pollaccia* (Rossman et al. 2015).

**Venturia acerina** Plakidas ex M.E. Barr, Canad. J. Bot. 46: 814. 1968. Fig. 20.

Synonyms: *Venturia acerina* Plakidas, Mycologia 34: 34. 1942. Nom. inval., Art. 39.1 (Shenzhen).

*Cladosporium humile* Davis, Trans. Wisconsin Acad. Sci. 19(2): 702. 1919.

*Fusicladium humile* (Davis) K. Schub. & U. Braun, I.M.I. Descript. Fungi Bact. 152, No. 1520. 2002.

Ascomata hypophyllous, 50–120 μm diam, scattered, solitary or gregarious, initially immersed, becoming erumpent, globose to subglobose, wall black, with a conspicuous papillate ostiole, surrounded by the setae. Setae dark brown, 37–52 × 4–5 μm, 0–2-septate, setae wall 1–1.5 μm thick, up to 6–7 μm wide at the base. *Peridium* 7–14 μm wide, 1–2 layered, composed of 1–2 rows of pigmented cells of *textura angularis*, cells 8–9 × 5–7 μm, cell wall 0.8–1 μm thick. *Pseudoparaphyses* rare, 2–3 μm wide, hyaline, septate, evanescent when mature. *Asci* 46–76 × 8–12 μm (av. 59.4 × 9.9 μm, n = 20), 8-spored, bitunicate, fissionunicate, oblclavate, pedicel lacking, with an inconspicuous ocular chamber. Ascospores 9–17 × 3–6 μm (av. 13.8 × 4.5 μm, n = 14), oblong, ellipsoid, yellow or pale brown, uniseriate at the top and bi- to triseriate at the base, 1-septate, constricted at the septum, the upper cells shorter and wider than the lower ones (length ratio: 3.5:1–1), smooth-walled. Asexual morph: see Schubert et al. (2003: 57–58, fig. 26).

Typus: USA, New York, Tompkins Co., Ithaca, on overwintered leaves of *Acer rubrum* (Aceraceae), 16 May 1941, A.G. Plakidas (holotype CUP-029477).

Notes: The asexual morph of *V. acerina* is *F. humile*, which causes leaf spot of maple in the USA, and overwinters with ascospores and conidia (Sivanesan 1977). *Venturia aceris*, another venturiaceous species occurring on *Acer sp.*, is distinguishable from *V. acerina* by the absence of setae as well as the lower positioned ascospore septum.

**Venturia aesculi** (Syd.) Sivan., Biblioth. Mycol. 59: 31. 1977. Fig. 21.

Basionym: *Spilosticta aesculi* Syd., Ann. Mycol. 27: 118. 1929.

Ascomata hypophyllous, (44–)58–118 μm diam, gregarious or scattered, initially immersed, becoming erumpent, globose to subglobose, wall black, with a conspicuous papillate ostiole. Setae not observed. *Peridium* 4–6.5 μm wide, 1-layered, composed of 1–2 rows of pigmented cells of *textura angularis*, cells 5–13 × 6–15 μm, cell wall 0.5–2 μm thick, thickened towards the ostiole. *Pseudoparaphyses* not observed. *Asci* 28–40 × 7–8 μm (av. 33.1 × 7.6 μm, n = 20), 8-spored, bitunicate, fissionunicate, broadly cylindrical, each with an inconspicuous ocular chamber. *Ascospores* 8–9.5 × 3–4(–4.5) μm (av. 8.7 × 3.5 μm, n = 20), fusiform to broadly fusiform, olivaceous brown, overlapping to biseriate near the base, 1-septate, slightly constricted at the septum, the upper cells somewhat shorter than the lower ones (length ratio: 4.5:1–1), smooth to slightly verruculose. *Asexual morph* unknown.

Typus: Germany, on overwintered leaves of *Aesculus hippocastanum* (Hippocastanaceae), 18 May 1924, P. Vogel (*isotype* K(M) 189168). Syd., Mycoth. Germ. 2339, *lectotype* F-S6679 designated here, MBT391372, *isoelectotypes*, e.g., BP1 613455, CUP, K(M) 189168, PDD 42226, PH 44201, WIS-F-83314.

**Venturia alaskensis** M.E. Barr, Canad. J. Bot. 46: 821. 1968. Fig. 22.

Ascomata 80–100 × 100–120 μm, initially immersed, becoming erumpent to semi-immersed, gregarious or scattered, globose or subglobose, wall black, with a conspicuous papillate ostiole, surrounded by setae. Setae dark brown, 46–103 × 5–7 μm, aseptate, setae wall 1 μm thick, wider at the base. *Peridium* 7–14 μm wide, 1-layered, composed of 1–2 rows of pigmented cells of *textura angularis*, cells 7–11 × 6–9 μm, cell wall 0.8–1 μm thick. *Pseudoparaphyses* rare, 2–3 μm wide, hyaline, septate, evanescent when mature. *Asci* 50–75 × 13–29 μm (av. 63.2 × 16.2 μm, n = 20), 8-spored, bitunicate, fissionunicate, broadly oblclavate to broadly fusiform, with a short, knob-like pedicle or pedicel lacking, each with an inconspicuous ocular chamber. *Ascospores* 15–23 × 7–9 μm (av. 20.6 × 7.9 μm, n = 20), ellipsoid, pale brown, overlapping to biseriate, especially at the base, 1-septate, constricted at the septum, the upper cells wider than the lower ones (length ratio: 5.4:8.3), smooth-walled. *Asexual morph* unknown.
Typus: USA, Alaska, Yukon-Koyukuk. Porcupine Dome, about 12 miles from Miller House, alt. 1466 m (4810 ft.), on overwintered leaves of Geum sericeum (Rosaceae), 12 Jul. 1937, E.H. Scamman (holotype NY 00914426, isotype NY 00914427).

Notes: Morphologically, Venturia alaskensis is most comparable with V. atriseda, while the wider ascospores of V. alaskensis (7–9 μm) are distinguishable from V. atriseda [5–6 (7.5) μm] (Barr 1968, see page 36). Although the stromatic network of V. asteromorpha is comparable with V. alaskensis, the ascospores of V. asteromorpha are smaller with a beaked apex as well as its ascomata lacking setae, which differs from V. alaskensis (Barr 1968).

Venturia albae Crous, M. Shen & Y. Zhang ter, sp. nov. MycoBank MB831527. Figs 23, 24.

Etymology: The epithet refers to epithet of Salix alba, the host from which the species was first reported.
Fig. 21. Venturia aesculi (isotype K(M) 189168) sexual morph. A. Ascomata on the host surface. B. Section of an ascoma (showing the asci). C, D. Broadly cylindrical asci. E–H. Released, olivaceous brown ascospores. Scale bars: A = 300 μm; B–E, H = 10 μm; F, G = 5 μm.
Fig. 22. *Venturia* alaskensis (type NY 00914426) sexual morph. A. Ascomata scattered on the host surface. B, C. Evanescent pseudoparaphyses. D–F. I. Subcylindrical asci. G, H. Released, pale brown, 1-septate ascospores. J, K. Dark brown setae. Scale bars: A = 200 μm; B–C = 5 μm; D–F, I = 20 μm; G, H, J, K = 10 μm.
Fig. 23. Venturia albae (culture ex-type CBS 471.61) sexual morph. A, B. Ascomata on OA. C. Dark brown seta. D–G. Cylindrical, narrowly cylindrical or obclavate asci. H, I. Released, yellowish to brown ascospores. Scale bars: B = 100 μm; C–I = 10 μm.
In vitro on OA: Sexual morph: Ascomata initially immersed, becoming erumpent to semi-immersed, gregarious or scattered, black, 198–404 μm diam, subglobose to globose, with a conspicuous papillate ostiole, surrounded by dark brown setae; setae aseptate, 26.5–27.5 × 3–3.5 μm, up to 4 μm wide at the base, wall black. Peridium 1-layered, composed of 2–4 rows of thin-walled, dark brown pigmented cells of textura angularis, cells 4.5–8 × 6.5–9.5 μm. Pseudoparaphyses evanescent when mature, hyaline. Asci 43–87.5 × 8.5–14 μm (av. 64 × 11 μm, n = 15), 8-spored, bitunicate, fissitunicate, broadly cylindrical, to obclavate, pedicel lacking, with an inconspicuous ocular chamber. Ascospores 10.5–14 × 3.5–5.5 μm (av. 12.5 × 5 μm, n = 30), ellipsoid to broadly fusiform, 1-septate, constricted at the septum, yellowish to brown, obliquely uniseriate or partially

Fig. 24. Venturia albae (culture ex-type CBS 471.61) asexual morph. A. Colony on OA. B. Hyphal coil. C, D. Conidiophores with conidiogenous loci. E. Conidiogenous cell giving rise to conidia. F, G. Conidia in chains. H, I. Ramoconidium and conidia. Scale bars: B–I = 10 μm.
overlapping to biseriate, especially at the base, rounded at the both ends, the upper cells longer and wider than the lower ones (length ratio: 1.1–5.4), smooth-walled. Asexual morph: Mycelium unbranched or sparingly branched, 2.5–4.5 μm wide, septate, pale brown, smooth or occasionally verrucose, walls not thickened and darkened, frequently with hyphal coils. Conidiophores laterally or terminally arising from hypha, conidiophores reduced to conidiogenous cells, sometimes only as short lateral conical prolongations of hyphae. Conidiogenous cells erect, 12.5–29 × 2.5–4.5 μm, monoblastic or rarely sympodial, brown to medium brown, smooth, walls unthickened, cylindrical or subcylindrical, with a single conidiogenous locus; conidiogenous loci truncate, 2–3 μm wide, mostly unthickened, not darkened. Ramoconidia present, 21.5–27.5 × 4.5–6 μm, aseptate, occasionally 1-septate, not constricted at the septa, brown to medium brown, truncate at the ends, subcylindrical or broadly cylindrical, with 1–3 denticle-like apical loci, rarely thickened or slightly darkened. Conidia catenate, formed in unbranched or loosely branched chains, straight, narrowly cylindrical, 19.5–24.5 × 3.5–6 μm, mostly aseptate, rarely 1-septate, septum median, not constricted at the septa, pale brown to brown, smooth, walls not thickened, tapering towards the ends; hila truncate, 1.5–2 μm wide, slightly thickened, and somewhat darkened-refractive.

Culture characteristics: Colonies spreading, somewhat erumpent, with moderate to sparse aerial mycelium and regular margin on OA, uneven, greyish sepia (surface); reverse fuscous-black; on MEA spreading, smooth, greyish green (surface), margin on OA, uneven, greyish sepia (surface); reverse fuscous-black; on OA spreading, smooth, greyish green (surface), margin pale grey to whitish; on SNA spreading, smooth, greyish sepia (surface), reverse fuscous-black; on OA spreading, smooth, greyish green (surface), margin pale grey to whitish.

Typus: Liechtenstein, Bendern, on Salix alba (Salicaceae), 22 May 1959, E. Müller (holotype CBS H-23603, culture ex-type CBS 471.61).

Additional material examined: Liechtenstein, Schneckeneule, on Salix alba (Salicaceae), 13 May 1958, J. Nüesch (ETH 2821, culture CBS 468.61).

Notes: CBS 468.61 and CBS 471.61 were collected by J. Nüesch and E. Müller from Liechtenstein in 1958 and 1959 respectively, and were identified as Venturia chlorospora based on the shape and dimensions of their ascospores (Barr 1968). Ascospores of Venturia chlorospora were reported as 20–25 × 5–8 μm, which is much larger than CBS 468.61 and CBS 471.61 (10.5–14 × 3.5–5.5 μm). In addition, the ascospore septum of V. chlorospora is in or near the upper third, while the ascospores of CBS 468.61 and CBS 471.61 have a median septum. Phylogenetically, CBS 468.61 and CBS 471.61 are sibling to other species of Venturia, and closely related to V. fuliginosa and V. chlorospora (Figs 1, 2). Thus, a new species, V. albae, is introduced to accommodate CBS 468.61 and CBS 471.61.

Venturia antherici Hollöö, Ann. Hist.-Nat. Mus. Natl. Hung. 8: 9. 1910. Fig. 25.

Synonyms: Venturia allii Ade & Rehm, Hedwigia 64: 292. 1923. Spilosticta adeana Petr., Cryptogamenfl. Forsch. Bayer. Bot. Ges. Erforsch Heim. Flora 2: 173. 1931.

Ascomata epiphyllous, 70–170 μm diam, gregarious or solitary, initially immersed, becoming erumpent or subsuperficial, globose, wall thick, with a conspicuous papillate ostiole, surrounded by setae. Setae dark brown, up to 200 μm long, 5–7 μm wide, septate, base wider, up to 11 μm diam. Peridium 11–16 μm wide, 1-layered, composed of several rows of pigmented cells of textura angularis, cells 8–12 μm wide, cell wall 0.5–1 μm thick, the inner wall thinner than the outer one. Pseudoparaphyses 2–3 μm wide, hyaline, septate. Asc 64–93 × 12–16 μm (av. 76.8 × 14 μm, n = 20), 8-spored, bitunicate, fissitunicate, broadly cylindrical, with a short, knob-like pedicel or pedicel lacking, with an inconspicuous ocular chamber. Ascospores 16.5–24 × 5–6.5 μm (av. 19.1 × 5.8 μm, n = 20), broadly cylindrical to clavate, pale olivaceous brown, overlapping to biseriate, with a submedian septum, constricted at the septum, the upper cells longer than the lower ones (length ratio: 5:4–2:1), smooth-walled. Asexual morph unknown.

Additional materials examined: Switzerland, on the leaves of Allium victoriae (Liliaceae), 20 Jul. 1955, E. Müller (NY); on the leaves of Polygonatum officinale (Liliaceae), 23 May 1954, E. Müller (NY).

Notes: Ascospore septa of V. antherici are mostly submedian (Müller 1958, Barr 1968). Venturia antherici was reported as a common species associated with some genera of Liliaceae in Europe, such as Allium, Polygonatum, Lloydia and Anthericum (Barr 1968).

Venturia asperata Samuels & Sivan., New Zealand J. Bot. 13: 646. 1975. Figs 26, 27.

Synonym: Fusicladium asperatum K. Schub. & U. Braun, Schlechtendalia 9: 18. 2003.

Ascomata amphiogenous, 70–130 μm diam, solitary, scattered or in small groups of 2 to 3, initially immersed, becoming erumpent or subsuperficial, globose, wall black, with a conspicuous papillate ostiole, surrounded by setae. Setae dark brown, 18–45 × 4–6.5 μm, septate, setae wall 0.5–2 μm thick. Peridium 10–14 μm wide, 1-layered, composed of 3 rows of pigmented cells of textura angularis, cells 7–10 μm wide, cell wall 0.8–1.5 μm thick. Pseudoparaphyses rare, hyaline, evanescent when mature. Asc 47–61 × (8.5–)10–11 μm (av. 54.3 × 10.4 μm, n = 20), 8-spored, bitunicate, fissitunicate, narrowly obclavate to broadly cylindrical, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous ocular chamber. Ascospores 11.5–15 × 4–6 μm (av. 12.9 × 5.3 μm, n = 20), ellipsoid, yellow to pale brown, uniseriate at the apex and biseriate at the base, 1-septate, mostly submedian, constricted at the septum, the upper cells somewhat longer than the lower ones (length ratio: 1:1–7:5), smooth-walled. Asexual morph: Mycelium 2–3 μm wide, branched or rarely branched, septate, not constricted at septa, subhyaline to pale brown, smooth, wall unthickened or slightly thickened. Conidiophores laterally arising from hyphae, erect, straight or somewhat flexuous, sometimes geniculate, unbranched, (6–)12–75 × (2.5–)3–4.5 μm, septate or aseptate, pale to medium brown, smooth, wall slightly thickened, sometimes only as short lateral conical hyphae, occasionally irregular in shape. Conidiogenous cells integrated, terminal, or conidiophores reduced to conidiogenous cells, 6–29 μm long, sometimes geniculate, proliferation sympodial, with several denticle-like loci, broadly truncate, 1.5–(2–)2.5 μm wide, unthickened, somewhat darkened-refractive. Ramoconidia present, 20–28 × 5 μm, 0–1-septate, medium brown, broadly truncate base, with several loci at the apex, 3–4 μm wide. Conidia catenate, formed in unbranched or loosely branched chains, straight or slightly curved, cells sometimes irregularly swollen, 13–35 × 3.5–5.5 (–6) μm, subcylindrical, fusiform, occasionally obpyriform, 0–3-septate, occasionally slightly
Fig. 25. Venturia antherici (NY) sexual morph. A. Ascomata on the host surface. B, F. Broadly cylindrical asci. C, E. Released, broadly cylindrical, pale brown ascospores. D. Dark brown setae. Scale bars: A = 200 μm; B, D, F = 20 μm; C, E = 10 μm.
Fig. 26. Venturia asperata (holotype PDD 31846) sexual morph. A. Ascomata scattered on the host surface. B–E. Broadly cylindrical to somewhat obclavate asci. F, G. Ellipsoid, pale brown ascospores. H. Dark brown setae. Scale bars: A = 200 μm; B–F, H = 10 μm; G = 5 μm.
constricted at the septum, few very large conidia with 5 septa, up to 75 μm long, 4.5–6 μm wide, subhyaline to pale brown, smooth, wall slightly thickened, slightly attenuated towards apex and base; hila broadly truncate, 1–2 μm wide, not or only slightly thickened, slightly darkened-refractive; microcyclic conidiogenesis present.

**Typus: New Zealand**, Auckland Prov., Wairowa Mt., P.D.D Research Orchard, on leaves of *Malus sylvestris* (Rosaceae), Aug. 1973, P.J. Brook, G.J. Samuels & M.A. Manning (*holotype* PDD 32263, *isotypes* IMI 186580, NY 00914428; *holotype* of *Fuscidium asperatum* PDD 31846).

**Notes:** Both *V. asperata* and *V. inaequalis* occur on *Malus* spp. Morphologically, the upper cells of ascospores of *V. asperata* are longer than the lower cells, distinguishing it from the shorter *V. inaequalis*. Furthermore, their asexual morphs differ in the sometimes concatenated conidia (upper cells of ascospores of *E. atriseda* are longer than the lower cells, distinguishing it from the shorter *V. asperata* (vs. the not concatenated conidia of *V. inaequalis*), as does the position of the septum in their ascospores.

*Venturia atriseda* Rehm, Hedwigia 21(6): 84. 1882. Fig. 28. *Synonyms:* *Eriospheria atriseda* (Rehm) Rehm, in Jaap, Ann. Mycol. 5: 253. 1907. *Nom. illeg.*, Art. 53.1, non *E. agrisera* (Feltgen) Sacc. & D. Sacc., 1905. *Spilosticta atriseda* (Rehm) Petr., Ann. Mycol. 25: 209. 1927. *Ascomata* occur on stems of *Gentiana lutea*, 80–166 × 60–120 μm diam, scattered or solitary, initially immersed, becoming erumpent, globose to conical, wall black, with a conspicuously papillate ostiole, surrounded by setae. Setae dark brown, 34–93 × 4–8 μm, septate, wall 1.5–2 μm thick. *Peridium* 11–14 μm wide, 1-layered, composed of 2–3 rows of pigmented cells of *textura angularis*, cells 4–4.5 μm wide, cell wall 0.5–1.2 μm thick, gradually thickened towards the ostiole. *Pseudoparaphyses* 2–3 μm wide, hyaline, filiform. *Asci* 42–74 × 14–21 μm (av. 55.8 × 16.8 μm, n = 20), 8-spored, bitunicate, fissitunicate, broadly cylindrical to broadly obclavate, with a short, knob-like pedicel or pedicel lacking, with an inconspicuous ocular chamber. *Ascospores* 18–22 × 5–6(–7.5) μm (av. 19.5 × 5.7 μm, n = 20), fusiform to narrowly fusiform, pale brown to brown, obliquely uniseriate to biseriate at the top, tri-seriate near the base, 1-septate, apiospores, with one septum at or nearly a third from the base, constricted or not at the septum, the upper cells longer and wider than the lower ones (length ratio: 11.9:25:14), smooth-walled. *Asexual morph* unknown.

**Typus: Germany**, Bavaria, Benediktenwand, Hausstatt Mountain, on dried stems of *Gentiana lutea* (*Gentianaceae*), Jul. 1881, Arnold (*lectotype* K(M) 189232 designated here, MBT391373).

**Notes:** Isolate CBS 371.55 was sterile, and its identity could not be confirmed. This isolate forms a distinct lineage in the *Venturia* clade (Fig. 2).

*Venturia australiana* Crous, M. Shen & Y. Zhang ter, *sp. nov.* *MycoBank* MB831537. Fig. 29. *Etymology:* The epithet refers to Australia, the country where the species was collected.

*Asexual morph* unknown. *In vitro* on OA: Mycelium branched or sparingly unbranched, 2–3 μm wide, septate, not constricted at septa, hyaline to pale brown, smooth, straight to somewhat flexuous, walls not thickened and darkened. *Conidiophores* arising from wider and darker hypheae, erect or geniculate-sinuous, unbranched, 17.5–55 × 4–7.5 μm, sometimes up to 155.5 μm long, septate, not constricted at the septa, medium to dark brown, smooth, walls somewhat thickened or darkened, cylindrical or subcylindrical. *Conidiogenous cells* integrated, terminal or conidiophores reduced to conidiogenous cells, cylindrical or subcylindrical, erect or sometimes geniculate, medium to dark brown, often becoming hyaline towards the apex, (6.5–13–39.5 × 4.5–8 μm, proliferating sympodially or monoblastic, with a single or more conidiogenous loci, loci narrowly truncate, 1–3.5 μm thick, thickened and somewhat darkened. *Ramoconidia* present, 12–20 × 4–6.5 μm, 0(–1)-septate, occasionally constricted at the septa, pale to medium brown, sometimes dark brown, subcylindrical, broadly fusiform, or somewhat irregular, with 1–3 denticle-like apical loci. *Conidia* catenate, usually formed in branched chains, straight or occasionally slightly curved, cylindrical, subcylindrical, fusiform, broadly fusiform or somewhat irregular, 12–21 × 4–5.5 μm, pale to medium brown, smooth, mostly aseptate, rarely 1–2-septate, septa median, rarely constricted, tapered towards the ends, truncate at the base; hila 1–2 μm wide, slightly thickened, and somewhat darkened; conidia often germinating.

**Culture characteristics:** Colonies spreading, somewhat erumpent, with moderate to sparse aerial mycelium and smooth margins on OA; fuscous-black (surface); reverse fuscous-black; on SNA olivaceous (surface); reverse olivaceous. Colonies reaching 21 mm diam on OA after 2 wk at 25 °C in the dark; colonies fertile.

**Typus: Australia**, Victoria, Berwick, on leaf spot of *Convolvulus cneorum* (*Convolvulaceae*), 23 Jun. 2010 (*holotype* CBS H-23595, culture ex-type CBS 128286 = VPRI 41762).

**Notes:** Isolate CBS 128286 was originally identified as *Fuscidium convolvularum*, while the conidial dimensions are smaller than those of *F. convolvularum* (Schubert et al. 2003). Although *F. convolvularum* (as *F. convolvularum*) clusters sister to CBS 128286 (*Figs 1, 2; ITS identity 96 %, LSU identity 99 %, tub2 identity 93 %), the two species are distinct.

*Venturia bistortae* (Syd.) Sivan., Biblioth. Mycol. 59: 42. 1977. *Basionym:* *Spilosticta bistortae* Syd., Ann. Mycol. 21: 172. 1923. *Ascomata* forming subcircular brown to black spots on leaf surfaces, 60–120 μm diam, solitary or rarely gregarious, initially immersed, becoming erumpent, globose or subglobose; wall black, with a conspicuous papillate ostiole, surrounded by setae. *Setae* dark brown, up to 60 μm long, base 2–3 μm wide. *Peridium* 10 μm wide, 1-layered, composed of 2–3 rows of pigmented cells of *textura angularis*, cells 8–10 μm wide, cell wall 0.8–1 μm thick, thicker near the apex. *Pseudoparaphyses* rare, evanescent when mature. *Asci* 38–60 × 12–19 μm (av. 52 × 15.9 μm, n = 20), 8-spored, bitunicate, fissitunicate, broadly cylindrical, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous ocular chamber. *Ascospores* 15–19 × 5–7 μm (av. 17 × 5.6 μm, n = 20), broadly clavate, pale brown, overlapping to biseriate near the base, 1-septate, slightly constricted at the septum, the upper cells shorter and wider than...
the lower ones (length ratio: 3:5–1:1), smooth-walled. *Asexual morph*: unknown.

**Typus**: Germany, Westphalia, Ginsberger Heide, on leaves of *Polygonum bistorta* (Polygonaceae), 26 Jun. 1921, A. Ludwig (*lectotype* S-F6682 designated here, MBT391374, *isolectotypes* Syd., Mycoth. Germ. 1911, e.g., BPI 613462, CUP, PDD 42615, PH 44202).
Fig. 28. Venturia atriseda (isotype K(M) 189232) sexual morph. A. Ascomata scattered on the host surface. B. Dark brown setae. C–E, H. Broadly cylindrical to somewhat obclavate asci. F, G. Released, fusiform, pale brown ascospores. Scale bars: A = 200 μm; B, F, G = 10 μm; C–E, H = 20 μm.
Fig. 29. Venturia australiana (culture ex-type CBS 128286) asexual morph. A. Colony on OA. B–D. Conidiogenous cells giving rise to conidia. E–G. Ramoconidia and conidia in chains. Scale bars: B–G = 10 μm.
Fig. 30. Venturia bistortae (isotype K(M) 189233) sexual morph. A. Ascomata scattered on the host surface. B–E. Broadly obclavate asci. F–I. Released, pale brown ascospores. Scale bars: A = 200 μm; B–E = 20 μm; F–I = 10 μm.
Notes: Although this taxon conforms to *Venturia* in general morphology, the subcircular leaf spots, and pale brown ascospores of *V. bistortae* disagree with *Venturia* s. str. Its phylogenetic position remains to be resolved.

*Venturia caesiae* Crous, M. Shen & Y. Zhang ter, sp. nov.

**Etymology:** The epithet refers to the host species from which this fungus was collected, *Saxil caesia*.

Cultures sterile. *Venturia caesiae* (CBS 466.61) differs from its closest phylogenetic neighbour *V. minuta* (CBS 479.61; Fig. 2) by unique fixed alleles in two loci based on alignments of the separate loci deposited in TreeBASE (S24582), by 13 bp in tet2 (4 %) and 14 bp in tuf2 (3 %).

**Culture characteristics:** Colonies spreading, erumpent, with aerial mycelium and regular, smooth margins on OA, brown to dark olivaceous brown (surface); reverse fuscous-black; on MEA grey to olivaceous brown (surface); reverse fuscous-black; on SNA olivaceous brown (surface); reverse dark olivaceous brown. Colonies reaching 26 mm diam after 2 wk on OA at 25 °C in the dark.

**Typus:** Switzerland, on *Saxil caesia* (Salicaceae), 2 Jul. 1959, J. Nüesch (holotype CBS 466.61, preserved as metabolically inactive culture, culture ex-type CBS 466.61).

Notes: CBS 466.61 was isolated from *Saxil caesia* by E. Müller, and named *Venturia chlorospora*. According to the multigene phylogenetic analysis (Fig. 2), CBS 466.61 forms a separate lineage distinguishing it from closely related species (*i.e.* *Venturia caesiae* Fig. 31.inactive culture, culture ex-type CBS 466.61).

**Ascomata** 100–160 μm diam, scattered or solitary, initially immersed, becoming erumpent, globose to subglobose, wall black, with a conspicuously papillate ostiole, surrounded by dark brown setae or setae not observed. *Peridium* 15–20 μm wide, 1-layered, composed of 2–3 rows of pale brown thick-walled cells of *textura angularis*, cells 4–11 μm wide, cell wall 1–1.2 μm thick. *Pseudoparaphyses* septate, hyaline, evanescent when mature. *Ascospores* 47–68 × 9–11 μm (av. 57.5 × 10.4 μm, n = 20), 8-spored (rarely 4-spored), bitunicate, fissitunicate, clavate, broadly cylindrical, with a short, knob-like pedicle, with an inconspicuous ocular chamber. *Ascosporae* 12–16 × 4–6 μm (av. 13.9 × 5.1 μm, n = 20), clavate, pale brown, biseriate, rarely uniseriate, 1-septate, constricted at the septum, the upper cells much wider than the lower ones, smooth-walled. *Asexual morph*, see Schubert et al. (2003: 27–30, figs 7 and 8).

**Typus:** *Australia*, Victoria, on dead leaves of *Prunus armeniaca* (Rosaceae), 29 Aug. 1955, E.E. Fisher (holotype VPRI No. 984, isotypes K(M) 189234, PDD 32688, VPRI No. 983).

Notes: The diagnostic characteristics of *Venturia carphophila* are its asymmetrical ascospores (the upper cells much wider than the lower ones), and conspicuous constriction at the septum. *Venturia carphophila* causes freckle disease of apricots, plum and almonds and scab of peaches (Sivanesam 1977).

*Venturia candensis* M.E. Barr, Canad. J. Bot. 46: 818. 1968. Fig. 31.

Ascomata 80–125 μm diam, solitary, initially immersed, becoming erumpent, to nearly superficial, globose to subglobose, black, with a conspicuously papillate ostiole, surrounded by setae. *Setae* dark brown, 30–100 × 4–7 μm, base up to 10 μm wide. *Peridium* 6–8 μm wide, 1-layered, composed of two rows of pale brown thick-walled cells of *textura angularis*, cells 4–6 μm wide, cell wall 0.8–1 μm thick, thickened along the apex. *Pseudoparaphyses* rare, evanescent when mature. *Ascis* 41–60 × 11–13 μm (av. 49.6 × 12.4 μm, n = 20), 8-spored, bitunicate, fissitunicate, broadly cylindrical to somewhat obclavate, with a short, knob-like pedicle or pedicle lacking, each with an inconspicuous ocular chamber. *Ascosporae* 14–16 (−19) × 5–6 μm (av. 15.5 × 5.4 μm, n = 20), fusiform, broadly fusiform, pale brown, bi- to triseriate near the base, 1-septate, with one septum in the lower half, constricted or not at the septum, the upper cells wider than the lower ones (length ratio: 8.7–11.8), smooth-walled. *Asexual morph* unknown.

**Typus:** *Canada*, Quebec, Gaspé Prov. Park, Mont Albert, on leaves and stalks of *Rumex acetosella* (Polygonaceae), 10 Jul. 1957, H.E. & M.E. Bigelow (holotype NY 00914436, isotype NY 00914437).

Notes: *Venturia caicoica* is another venutriacous species occurring on *Rumex* sp., which was assigned to *Colerona* based on its superficial ascoma (as *Colerona caicoica*, Sivanesam 1977).

*Venturia carpophila* E.E. Fisher, Trans. Brit. Mycol. Soc. 44: 339. 1961. Nom. cons. prop. (Rossman et al. 2018), Fig. 32. Synonyms: *Cladosporium carpophilum* Thüm., Oesterr. Bot. Z. 27: 12. 1877.

*Fusicladium carpophilum* (Thüm.) Oudem., Verh. Kon. Akad. Wetensch., Tweede Sect.: 388. 1900.

*Fusicladium pruni* Ducomet, Thèse Fac. Sci. Paris: 137. 1907. *Fusicladium amygdali* Ducomet, Ann. École Natl. Agric. Rennes 4: 11. 1911. *Megacladosporium carpophilum* (Thüm.) Partr. & Morgan-Jones, Mycotaxon 85: 362. 2003.
Typus: **USA**, New York, Fulton County, Caroga, on the leaves of *Chamaedaphne calyculata* (*Ericaceae*), Jul. 1884, C.H. Peck (holotype NYSf672).

**Notes:** Barr (1961) assigned *V. cassandrae* to *Gibbera* as *G. cassandrae* based on the erumpent ascomata and thin hypostroma. Morphologically, the nearly superficial,
Fig. 32. Venturia carpophila (isotype K(M) 189234 and PDD 32688) sexual morph. A. Ascomata scattered on the host surface. B–F. Clavate or cylindrical asci. G–I. Clavate, pale brown ascospores. J. Evanescent pseudoparaphyses. Scale bars: A = 200 μm; B–F, J = 20 μm; G–I = 10 μm.
Fig. 33. Venturia cassandrae (holotype NYS672) sexual morph. A. Ascomata scattered on the host surface. B–E. Broadly obclavate asci. F, G. Evanescent pseudoparaphyses. H. Released, pale brown ascospores. I. Setae. Scale bars: A = 200 μm; B–E, I = 20 μm; F–H = 10 μm.
scattered ascomata with setae; narrowly cellular, hyaline, evanescent pseudoparasphyses; 8-spored, bitunicate, broadly obclavate asci lacking pedicels, as well as pale olivaceous, 1-septate ascospores of *V. cassandrae* fit *Venturia* s. str. very well. Thus, the name *V. cassandrae* is retained here.

**Venturia catenosa** (Butin) Rossman & Crous, IMA Fungus 6: 520. 2015.

Basionym: *Pollacia catenosa* Butin, Mycol. Res. 96: 658. 1992.

Synonym: *Fusicladium catenosporum* (Butin) Ritschel & U. Braun, Schlechtendalia 9: 30. 2003.

**Description and illustration:** Schubert et al. (2003: 30–31, fig. 9).

**Typus:** Germany, Berlin, Eberswalde-Finow, on the leaf spot of *Salix triandra* (Salicaceae), 7 Aug. 1990, H. Butin (*holotype* IMI 349857, culture ex-type CBS 447.91).

Additional materials examined: China, Heilongjiang Province, on *Salix sp.* (Salicaceae), 22 Aug. 2014, Y. Zhang & Y. Zhou (culture CGMCC 3.18369 = BJFC 140822-1). Switzerland, on *S. caprea* (Salicaceae), 10 Jun. 1958, J. Niesch (culture CBS 469.61).

**Note:** The species is sister to *V. chinensis* / *caesia* (Fig. 1) and to *V. viennottii* (Fig. 2).

**Venturia cephalariae** (Auersw.) Kalchbr. & Cooke, Grevillea 9(no. 49): 31. 1880. Fig. 34.

Basionym: *Sphaerella cephalariae* Auersw., in Gonnermann & Rabenhorst, Mycol. Eur. 5: 6–14. 1869.

Synonyms: *Laestadia cephalariae* (Auersw.) Sacc., Syll. Fung. 1: 425. 1882.

*Carlia cephalariae* (Auersw.) Kurtze, Revis. Gen. Pl. 2: 846. 1891.

*Guignardia cephalariae* (Auersw.) F. Stevens, Trans. Illinois State Acad. Sci. 10: 184. 1917.

Ascomata hypophyllous, associated with leaf spots, 70–130 μm diam, gregarious or scattered, initially immersed, becoming erumpent, globose, wall black, with a conspicuously papillate ostiole, surrounded by setae. *Setae* dark brown, 27–43 × 5–8 μm, base swollen, base up to 10 μm wide, wall 1–2 μm thick, septate. *Peridium* 7–20 μm wide, 1-layered, composed of 2–3 rows of brown pigmented cells of *textura angularis*, cells 5–12 μm wide. *Pseudoparasphyses* 2–4 μm wide, swollen at the apex, setae, hyaline, evanescent when mature. Asci 55–74 × 13–17 μm, 8-spored, bitunicate, fissitunicate, broadly cylindrical to somewhat obclavate, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous ocular chamber.Ascospores 14–19(–24) × 5–7 μm (av. 16.4 × 6 μm, n = 20), ellipsoid, pale brown, bi- to triseriate, 1-septate, apiosporous, with the septum in the lower third of ascospores, slightly constricted at the septum, the upper cells wider and longer than the lower ones [length ratio: 21:11–3:1(–19.5)], smooth-walled. *Asexual morph* unknown.

Material examined: South Africa, Cape Province, on leaves of *Cephalaria attenuata* (Calyceraceae), P. MacOwan 1338 (ex herb. M.C. Cooke, K(M) 189236).

**Note:** Colonies of *V. cephalariae* produced a sexual morph in malt agar media (Sivanesan 1977).

**Venturia cerasi** Aderh., Landw. Jahrh. 29: 541. 1900. Fig. 35.

Basionym: *Fusicladium cerasi* (Rabenh.) Erikss., Meddel. Kongl. Lantbruksskad. Exp.-fält 1: 73. 1885.

**Sexual morph:** see Sivanesan (1977: 51). *In vitro* on OA: Mycelium unbranched or only sparingly branched, 1.5–2.5 μm septate, not constricted at septa, hyaline to pale brown, smooth, flexuous or straight, walls not thickened or almost so. Conidiophores solitary, arising laterally from hyphae, erect, straight to somewhat flexuous, sometimes geniculate, unbranched, 30.5–69.5 × 3–5 μm, aseptate or septate, pale brown or pale medium brown, sometimes paler towards the apex, smooth, walls somewhat thickened, sometimes only as short lateral conical prolongations of hyphae, subcylindrical. Conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, sometimes geniculate, 17–24 × 3–4 μm, proliferating sympodially, pale brown or pale medium brown, with several conidiogenous loci, crowded at the apex, loci denticulate, 0.5–1.5 μm wide, not thickened or sometimes slightly darkened-refractive. *Ramoconidia* present, 12–22 × 3–6 μm, (0)–1-septate, not constricted at the septa, pale to medium brown, oval or broadly cylindrical, with a truncate base, usually with two loci. Conidia catenate, formed in unbranched or loosely branched chains, straight to rarely curved, narrowly or broadly fusiform, subcylindrical or ellipsoid, 11.5–24.5 × 2.5–5 μm, 0–1(–2)–septate, not constricted at the septa, pale brown, smooth, walls slightly thickened, attenuated towards apex and base; hilum truncate, 0.5–1.5 μm wide, not thickened or only slightly thickened, somewhat darkened-refractive.

**Culture characteristics:** Colonies spreading, somewhat erumpent, with moderately sparse aerial mycelium and regular margins on OA, uneven, greyish (surface), margins greyish sepia; reverse fuscous-black. Colonies reaching 44 mm diam after 1.5 wk at 25 °C in the dark; colonies fertile.

**Typus:** Germany, Borussia, on fruits of *Prunus cerasus* (Rosaceae) (*lectotype* designated in Schubert et al. 2003: 33; Braun (i.c.: Pl. 1, B, 1–2); Aschersleben, on *Prunus cerasus*, 17 Sep. 1954, H. Schweizer (*epitype* specimen designated here CBS 444.54, MBT391375, preserved as metabolically inactive culture, ex-epitype culture CBS 444.54).

Additional materials examined: Switzerland, Zollikon, Kt. Zürich, on *Prunus mirabile* (Rosaceae), 10 Aug. 1981, E. Müller (ETH 4568, culture CBS 497.62). USA, California, on the fruit of *Prunus amygdalus* (Rosaceae) (specimen CBS H-23596, culture CBS 160.55 = ATCC 12062 = MUCL 10087).

**Notes:** The ITS sequence identity among CBS 160.55, CBS 497.62 (sterile) and CBS 444.54 are 99 %, thus they are conspecific. None of the isolates, however, are ex-type. Morphologically, CBS 160.55 is most comparable with CBS 444.54 in its conidial size (11.5–24.5 × 2.5–5 μm) and sympodially proliferating conidiogenous cells, which agree with the description of the asexual morph of *V. cerasi* (*Fusicladium cerasi*) provided by Schubert et al. (2003). Thus, we apply the name *V. cerasi* to this clade (Fig. 2).

**Venturia chamaemori** (P. Karst.) A. Acta Bot. Neerl. 6: 340. 1957. Fig. 36.

Basionym: *Sphaerella chamaemori* P. Karst., Fungi Fenn. Exs., Fasc. 9: no. 899. 1899.

Synonym: *Mycosphaerella chamaemori* (P. Karst.) Lindau, in Engler & Prantl, Nat. Pflanzenf. Teil 1, 1(1): 424. 1897.

Ascomata amphigenus, 100–160 × 90–120 μm diam, scattered, solitary, initially immersed, becoming erumpent, globose to conical, wall black, with a conspicuously papillate ostiole.
Fig. 34. Venturia cephalariae (type K(M) 189236) sexual morph. A. Ascomata scattered on the host surface. B–E. Broadly cylindrical asci. F. Evanescent pseudoparaphyses. G, H. Released, pale brown, 1-septate, apiosporous ascospores. I. Dark brown setae. Scale bars: A = 200 μm; B–I = 10 μm.
surrounded by dark brown setae. Setae 40–86 × 4–8 µm, base swollen, up to 14 µm diam, setae wall 1–1.5 µm thick, septate. Peridium 13–19 µm wide, 1-layered, composed of three rows of brown pigmented cells of textura angularis; cells 4–9 µm diam. Pseudoparaphyses 2–4 µm wide, septate, hyaline. Asci 50–80 × 10–26 µm, 8-spored, bitunicate, fissitunicate, cylindrical, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous ocular chamber. Ascospores 11–15 × 4–7 µm (av. 12.7 × 5.3 µm, n = 20), ellipsoid, olivaceous, obliquely uni-seriate and partially overlapping to biseriate, medianly 1-septate, slightly constricted at the septum, the upper cells sometimes longer and wider than the lower ones (length ratio: 1:1–7:6), smooth-walled. Asexual morph unknown.

Typus: Finland, Etelä-Häme, Mustalia, on leaves of Rubus chamaemorus (Rosaceae), P.A. Karsten [Fungi Fenn. Exs. no. 899, syntypes H 6052060, K(M) 189238].

Note: The specimen is depauperate, and information about asci refers to von Arx (1957) and Sivanesan (1977).
Synonyms: *Endostigme chlorospora* (Ces.) Syd., Ann. Mycol. 21(3/4): 173. 1923. *Venturia chlorospora* var. *canescens* P. Karst., Bidrag Kändedom Finlands Natur. Folk 23: 190. 1873. *Venturia chlorospora* var. *salici-vitellinae* Sacc., Syll. Fung. 1: 587. 1882.

Sexual morph: see Nüesch (1960: 342–344). *In vitro* on OA: Mycelium branched, 1.5–3.5 μm wide, hyaline to pale brown, smooth or verrucose, straight or somewhat flexuous, septate, often not constricted at the septa, walls not darkened or thickened, with hyphal coils. Conidiophores arising as short branches from subhyaline to pale brown hyphae, reduced to conidiogenous cells. Conidiogenous cells

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**Fig. 36.** *Venturia chamaemori* (isotype K(M) 189238) sexual morph. **A.** Ascomata scattered on the host surface. **B.** Evanescent pseudoparaphyses. **C.** Dark brown setae. **D.** Pale brown ascospores. Scale bars: A = 100 μm; B, D = 10 μm; C = 20 μm.
terminal or intercalary, erect, 10–20 × 3–7 μm, monoblastic, pale brown to brown, walls not thickened nor darkened, subcylindrical, with single loci, 1.5–3.5 μm wide, not thickened nor darkened-refractive. Ramoconidia present, 13–36.5 × 2.5–6.5 μm, aseptate, sometimes 1-septate, usually not constricted at septa, pale brown to brown, truncate at the both ends, occasionally rounded towards the apex, cylindrical to subcylindrical, smooth or somewhat verrucose, straight or flexuous, with one to two denticle-like loci; loci broadly truncate, 1.5–2.5 μm wide, slightly thickened or somewhat darkened. Conidia catenate, mostly formed in long, branched chains, cylindrical to subcylindrical, 11–29 × 3–7 μm, (0–)1-septate, constricted at the septa, brown, verrucose to smooth, straight or occasionally

**Fig. 37.** Venturia chlorospora (culture CBS 467.61) asexual morph. A. Colony on OA. B, C. Hypha with conidiogenous loci. D. Long, branched conidial chains. E, F. Conidiophores giving rise to concatenate conidia. G, H. Ramoconidium and conidia in chains. I. Germinating conidia. Scale bars: B–I = 10 μm.
geniculate, walls slightly thickened and darkened, truncate at both ends, sometimes rounded towards the apex; *hila* truncate, 1.5–3 μm wide, slightly thickened and somewhat darkened.

**Culture characteristics:** Colonies spreading, somewhat erumpent, with moderate sparse aerial mycelium and regular margins on OA, uneven, greyish sepia (surface); reverse fuscous-black; on MEA spreading, smooth, greyish green (surface), margins pale grey to whitish; on SNA spreading, smooth, greyish sepia (surface); reverse fuscous-black. Colonies reaching 32 mm diam on OA after 3 wk at 25 °C in the dark; colonies fertile.

**Typus:** Italy. Vercellis, on Salix (triandra, alba) (Salicaceae), 1858, V. de Cesati [Erb. Critt. Ital. 296 and Raben., Fungi Eur. Exs. 48, *syntypes*, e.g. B, CUP, HAL, S].

Additional materials examined: France, Aiguilles, Val Queyras, Hautes Alpes, on Salix daphnoides (Salicaceae), 25 Jun. 1958, J. Nüesch (ETH 2828, culture CBS 470.61); Switzerland, La Punt, Kl. Graubünden, on S. daphnoides, 2 Jul. 1959, J. Nüesch (CBS H-23602, culture CBS 467.61, ETH 2504).

Notes: CBS 467.61 and CBS 470.61 were collected by Nüesch in Switzerland at both ends, sometimes rounded towards the apex; *conidiophores* laterally arising from hyphae, erect, sometimes geniculate, unbranched, up to 135 μm long, (0–)7-septate, medium to dark brown, smooth, subcylindrical. *Conidigenous* cells integrated, terminal, erect, 14.5–58.5(–98) × 2–3.5 μm, medium to dark brown, sometimes becoming hyaline towards the apex, proliferating sympodially, with several truncate loci, 1–1.5 μm wide, slightly thickened and darkened. *Conidia* solitary, straight, narrowly fusiform, 15–24.5 × 3–5 μm, often mediallyly 1-septate, sometimes 2-septate, not or slightly constricted at the septum, mostly widest in the middle or lower third, pale brown to brown, smooth, becoming tapered to both ends, walls not thickened, inconspicuous to somewhat darkened; *hila* truncate, 1–1.5 μm wide, slightly thickened or darkened, but not refractive.

**Culture characteristics:** Colonies spreading, somewhat erumpent, with sparse aerial mycelium and regular margins on OA, uneven, greyish (surface), margins dark brown; reverse fuscous-black. Colonies reaching 16 mm diam after 2 wk at 25 °C in the dark; colonies fertile.

**Typus (Fusicladium crataegi):** Germany, Thuringia, Steiger, on Crataegus laevigata (Rosaceae) (C. oxyacantha auct.), 15 Mar. 1902, H. Diedieck [Syd., Mycoth. Germ. 45] (HBG, lectotype, designated in Schubert et al. 2003: 37). *Isolectotypes*: B, EPS 423805, ILL 6195, IND-F-3708, JE, LE, MICH 15608, PH 5573, S-F-45734, WIS-F70209.

Additional materials examined: Germany, Müncheberg, on Sorbus aucuparia (Rosaceae) (CBS H-23599, culture CBS 367.35); on Crataegus sp. (Rosaceae) (cultures CBS 368.35, CBS 369.35).

Notes: CBS 367.35 and CBS 368.35 / CBS 369.35 were from different host genera, but all from members of Rosaceae collected in Germany. Morphologically, all of these isolates agree with the description of *V. crataegi* provided by Schubert et al. (2003). Thus, we identify the clade as *V. crataegi*. This species is sister to *V. orbiculata* (Fig. 2).

**Venturia curviseta** Peck, Rep. (Annual) New York State Mus. Nat. Hist. 35: 145. 1884 [1882]. Fig. 40.

**Synonym:** Antennularia curviseta (Peck) M.E. Barr, Canad. J. Bot. 46: 848. 1968.

**Ascomata** hypophyllous, 50–100 μm diam, 60–93 μm high, gregarious or scattered, becoming superficial, globose to subglobose, wall black, with a conspicuous papillate ostiole, surrounded by setae. *Setae* dark brown, 32–56 × 4–5 μm, setae wall 1–1.5 μm thick. *Peridium* 9–14 μm wide, 1-layered, composed of 1–3 rows of brown pigmented cells of *textura angularis*, cells 5–10 × 4–10 μm, cell wall 0.5–1.2 μm thick. *Pseudoparaphyses* numerous, filamentosus, hyaline, evanescent when mature. *Asci* 45–55 × 8–11 μm, 8-spored, bitunicate, fissitunicate, broadly cylindrical, with a short, knob-like pedicle, each with an inconspicuous ocular chamber. *Ascospores* 10–15 × 4–6 μm (av. 12.8 × 5.2 μm, n = 20), colourless to pale brown, fusiform, with narrowly to broadly rounded ends, biseriate, 1-septate, slightly constricted at the septum, the upper cells mostly shorter and wider than the lower ones (length ratio: 4.7–3.4), smooth-walled. *In vitro on OA:* *Mycelium* unbranched, 1.5–3 μm wide, septate, not constricted at septa, subhyaline, smooth, straight, walls neither thickened nor darkened. *Conidigenous* cells laterally arising from hyphae, erect, sometimes geniculate, unbranched, up to 135 μm long, (0–)7-septate, medium to dark brown, smooth, subcylindrical. *Conidigenous* cells integrated, terminal, erect, 14.5–58.5(–98) × 2–3.5 μm, medium to dark brown, sometimes becoming hyaline towards the apex, proliferating sympodially, with several truncate loci, 1–1.5 μm wide, slightly thickened and darkened. *Conidia* solitary, straight, narrowly fusiform, 15–24.5 μm wide, sometimes medially 1-septate, sometimes 2-septate, not or slightly constricted at the septum, mostly widest in the middle or lower third, pale brown to brown, smooth, becoming tapered to both ends, walls not thickened, inconspicuous to somewhat darkened; *hila* truncate, 1–1.5 μm wide, slightly thickened or darkened, but not refractive.

**Culture characteristics:** Colonies spreading, somewhat erumpent, with sparse aerial mycelium and regular margins on OA, uneven, greyish (surface), margins dark brown; reverse fuscous-black. Colonies reaching 16 mm diam after 2 wk at 25 °C in the dark; colonies fertile.
**Fig. 38.** *Venturia crataegi* (MICH 15147) sexual morph. **A.** Ascomata scattered on the host surface. **B, C.** Squash mounts with a large number of asci (C in cotton blue). **D–F.** Cylindrical asci (in cotton blue). **G, H.** Released, colourless to pale brown ascospores (in cotton blue). Scale bars: **A =** 100 μm; **B–F =** 10 μm; **G, H =** 5 μm.
12.9 × 4.3 μm, n = 20), cylindrical to oblong, pale olivaceous brown, with narrowly rounded ends, overlapping to biseriate at the base, 1-septate, the upper cells somewhat shorter than the lower ones (length ratio: 5.7–1:1), smooth-walled. Asexual morph unknown.

Typus: USA, New York, Albany, on fallen leaves of *Nemopanthes mucronata* (*Aquifoliaceae*), Jun. 1881, C.H. Peck (holotype NYSf 925).

Notes: *Venturia curviseta* was assigned to *Antennularia* based on its long, reflexed setae surrounding the apex of ascostromata, and ascospores being close to medianly septate (Barr 1968). The small-sized ascomata with setae, evanescent pseudoparaphyses, pale olivaceous brown, 1-septate ascospores agree with *Venturia* s. str.

*Venturia ditricha* (Fr.) P. Karst., Bidr. Känn. Finl. Nat. Folk 23: 188. 1873. Fig. 41.

Basionym: *Sphaeria ditricha* Fr., Syst. Mycol. 2(2): 515. 1823.

Synonyms: *Exosporium ditrichum* (Fr.) Link, Sp. Pl., Ed. 4, 6: 123. 1825.

*Vermicularia ditricha* (Fr.) Schwein. [as ‘ditricham’], Trans. Amer. Philos. Soc., n.s. 4: 228. 1832.

*Sphaeraella ditricha* (Fr.) Auersw., Rabenh., Fungi Eur. Exs. (Klotzschii Herb. Viv. Mycol. Continatio, Ed. Nova, Ser. Sec.), Cent. 10: no. 943, 1866 [Bot. Zeitung 24: 300, 1866; Hedwigia 5: 191, 1866].

*Fusicladium betulae* Aderh., Centralbl. Bakteriol., 2. Abth., 2: 57. 1896.

*In vitro* on OA: Sexual morph: Ascomata solitary, scattered, initially immersed or slightly erumpent, becoming superficial, dark black, globose, wall black, the ascomata covered with setae. Setae dark brown, 4–4.5 × 62–76 μm, aseptate, wall black. Asci not observed. Asexual morph: Mycelium branched or unbranched, 2–3.5 μm wide, septate, not constricted at septa, hyaline to pale brown, smooth, straight, walls thickened or darkened. Conidiophores laterally or terminally arising from darker hyphae, erect or geniculate-sinuous, sometimes branched, subcylindrical, 40–60.5(–72.5) × 3.5–5 μm, mainly aseptate or 1-septate, not constricted at septa, medium brown, smooth, walls somewhat thickened and slightly darkened-refractive. Conidiogenous cells terminal, integrated,
Fig. 40. Venturia curviseta (holotype NYSf 925) sexual morph. A. Ascoma scattered on the host surface. B, D, G. Broadly clavate to somewhat obclavate asci. C, F. Pale brown ascospores. E. Dark brown setae. Scale bars: A = 100 μm; B applies to B, D = 10 μm; C applies to C, F, G = 10 μm; E = 10 μm.
geniculate or sometimes erect, subcylindrical, 25.5–46.5 × 4–4.5 μm, polyblastic, proliferating sympodially, brown to medium brown, with several loci, mostly truncate, 2–2.5 μm wide, not thickened, inconspicuous to somewhat darkened, but not refractive. Conidia solitary, mostly straight to rarely curved, fusiform, subcylindrical, 19–29.5 × 4.5–6.5 μm, mainly 1-septate, septum median or somewhat in the upper half, rarely 2(–3)-septate, often not constricted at septa, yellowish to brown, smooth, becoming rounded towards the apex, truncate at the base, hila flattened, 1.5–3 μm wide, slightly thickened and somewhat darkened.

Culture characteristics: Colonies spreading, somewhat erumpent, with moderate sparse aerial mycelium and regular margins on OA, greyish (surface), margins olivaceous; reverse fuscous-dark. Colonies reaching 12 mm diam after 2 mo at 25 °C in the dark, colonies fertile.

Fig. 41. *Venturia ditricha* (culture CBS 115426) sexual / asexual morph. A. Ascomata scattered on OA. B. Dark brown setae on ascoma. C–H. Sympodial conidiogenous cells giving rise to conidia. I. Fusiform to subcylindrical conidia. Scale bars: B–I = 10 μm.
Fig. 42. Venturia elegantula (type NY 00814439) sexual morph. A. Globose ascomata scattered on the host surface. B, E, F. Released, ellipsoid, olivaceous or brown ascospores. C, D. Somewhat obclavate asci with short pedicels. G. Long, dark brown seta. Scale bars: A = 200 μm; B–G = 10 μm.
Typus: Sweden, on deciduous leaves of *Betula* (*Betulaceae*) [Fries, Scleromyc. Suec. 54, syntypes, e.g., B, UPS].

Additional materials examined: Finland, Kevo, on *Betula pubescens* var. *tortuosa* (*Betulaceae*), 1 Aug. 1992, M. Helander (dry culture CBS H-23625, cultures CBS 115426, CBS 118894). Italy, on *Populus tremula* (*Salixaceae*), collection date and collector unknown, isol. O. Servazzi (culture CBS 257.38).

Notes: *Fusicladium betulae* is the asexual morph of *V. dimitica*. CBS 115426 was morphologically comparable with the
description provided by Sivanesan (1977), Schubert et al. (2003: 20–22, fig. 3) provided a detailed description of the asexual morph in vivo and neotypified the name F. betulaceae. This species is sister to V. peltigera (Fig. 2).

**Venturia elegantula** Rehm, Hedwigia 24(6): 241. 1885. Fig. 42. Synonym: Gibbera elegantula (Rehm) Petr., Sydowia 1: 200. 1947.

Ascomata epiphyllous, 100–184 μm diam, scattered, initially immersed, becoming erumpent, globose, wall black, with a conspicuously papillate ostiolo, surrounded by tapered setae. Setae dark brown, up to 200 μm long. 4–5 μm wide, aseptate. Pseudoparaphyses not observed. Asci 96–116 × 18–22 μm (av. 107.6 × 20.3 μm, n = 20), 8-spored, bitunicate, fissitunicate, clavate, with a short, knob-like pedicel, each with an inconspicuous ocular chamber. Ascospores 22–26 × 7–8 μm (av. 24.1 × 7.8 μm, n = 20), ellipsoid, olivaceous brown, overlapping to biseriate, 1-septate, the upper cells shorter and wider than the lower ones (length ratio: 11:13–1:1), wall verruculose. Asexual morph unknown.

**Typus:** Italy. Tyrol, Gangenhofe, Sulden, Orterl, on rotting leaves of Vaccinium myrtillus (Ericaceae), Jul. 1884, Rehm [Rehm, Ascomyc. 841, syntypes, e.g., B, S-F11555, 11556, also NY 914439 and PH 44546].

**Venturia fagi** M.E. Barr, Canad. J. Bot. 46: 816. 1968. Fig. 43.

Ascomata hypophyllous, 40–110 μm diam, scattered, initially immersed, becoming erumpent, globose, wall black, with a conspicuously papillate ostiolo, surrounded by setae. Setae dark brown, 40–56 × 6–8 μm, setae wall 1–2 μm thick, swollen at the base, up to 11 μm wide, septate. Peridium 1-layered, composed of 2 rows of pigmented cells of textura angularis, cells 6–9 × 5–6 μm, cell wall 1–1.5 μm thick. Pseudoparaphyses rare, 2–2.5 μm wide, hyphal, hyaline, septate, evanescent when mature. Ascii 39–50 × 8–12 μm (av. 46.2 × 9.6 μm, n = 20), 8-spored, bitunicate, fissitunicate, broadly cylindrical to subcylindrical, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous ocular chamber. Ascospores 11–13 (–15) × 3–4 μm (av. 12.2 × 3.8 μm, n = 20), ellipsoid, hyaline, biseriate, 1-septate, constricted at the septum, the upper cells often shorter and broader than the lower ones (length ratio: 5:6–1:1), smooth-walled. Asexual morph unknown.

**Typus:** USA. Maine, near Baxter State Park, Abol Field, on overwintered leaves of Fagus grandifolia (Fagaceae), 18 Jul. 1962, M.E. Barr & H.E. Bigelow (holotype NY 0914440, isotype NY 0914441).

**Notes:** Barr (1968) described the ascospores of Venturia fagi as green, olivaceous or brown. No mature ascomata were observed in this study, and the ascospores were mostly hyaline.

**Venturia finlandica** Crous, M. Shen & Y. Zhang ter, sp. nov. MycoBank MB831539.

**Etymology:** The epithet refers to Finland, the country where these isolates were collected.

Cultures sterile. Venturia finlandica (CBS 115442) differs from its closest phylogenetic neighbour V. minuta (CBS 479.61) (Fig. 2) by unique fixed alleles in four loci based on alignments of the separate loci deposited in TreeBASE (S24582), by 23 bp in ITS (5 %), 7 bp in LSU (1 %), 40 bp in tef1 (8 %), 31 bp in tub (14 %).

**Culture characteristics:** Colonies spreading, erumpent, with aerial mycelium and regular and smooth margins on OA, dark olivaceous brown (surface); reverse dark olivaceous brown to fuscous-black; on MEA dark brown (surface); reverse fuscous-black; on SNA olivaceous brown (surface); reverse dark olivaceous brown. Colonies reaching 29 mm diam after 2 wk on OA at 25 °C in the dark.

**Typus:** Finland, on Betula pubescens var. pumila (Betulaceae), collection date unknown, M. Helander (holotype CBS H-23733, culture ex-type CBS 115442 = CPC 3864).

**Additional material examined:** Finland, on Betula pubescens var. pumila (Betulaceae), 1 Jul. 1993, M. Helander (culture CBS 112703 = CPC 3865).

**Notes:** Venturia finlandica was collected from Betula pubescens var. pumila. According to multigene phylogenetic analysis, it forms a separate single clade distinguishing it from closely related species (Fig. 2). **Venturia ditricha** (CBS 115426), another Venturia species known from Betula, differs from V. finlandica (CBS 115442) by unique fixed alleles in four loci based on alignments of the separate loci deposited in TreeBASE (S24582), by 19 bp in ITS (4 %), 4 bp in LSU (1 %), 38 bp in tef1 (8 %), 17 bp in tub (10 %).

**Venturia frangulae** Krieger, Ann. Mycol. 7(6): 542. 1909. Fig. 44.

Ascomata hypophyllous, 43–85 μm diam, gregarious, scattered or solitary, initially immersed, becoming erumpent, globose, wall black, with a conspicuously papillate ostiolo, surrounded by setae. Setae dark brown, 24–50 × 4–7 μm, setae wall 1–1.5 μm thick, swollen at the base, base up to 14 μm wide, septate. Peridium 9–12 μm wide, 1-layered, composed of 1–2 rows of pigmented cells of textura angularis, cells 4–13 × 3–12 μm, cell wall 0.5–1 μm thick. Pseudoparaphyses rare, evanescent when mature. Asci 30–46 (–62) × 8–12 μm (av. 38.5 × 9.8 μm, n = 20), 8-spored, bitunicate, fissitunicate, broadly clavate to obclavate, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous ocular chamber. Ascospores 10.5–13.5 × 4–6 μm (av. 12.2 × 5.1 μm, n = 20), fusiform, pale brown, biseriate, 1-septate, with the septum in the upper half, slightly constricted at the septum, with a narrowly rounded to somewhat pointed ends, the upper cells shorter and wider than the lower ones (length ratio: 6:7–1:1), smooth-walled. Asexual morph unknown.

**Typus:** Germany, Königstein, on fallen leaves of Frangula alnus (Rhamnaceae), 14 Apr. 1898, W. Krieger (Krieger, Fungi Saxon. Exs. 2068, syntypes MICH 15149, K(M) 189239).

**Venturia fuliginosa** Y. Zhang ter & J.Q. Zhang, Mycosphere 7: 1295. 2016.

**Description and illustration:** Shen et al. (2016).

**Typus:** China, Heilongjiang Province, Yichun City, Fenglin Nature Reserve, on leaves of Salix capitata (Salicaceae), 27 Aug. 2014, Y. Zhang & Y.P. Zhou (holotype HMAS 247007, culture ex-type CGMCC 3.18370 = CBS 142241 = BJFCCC 140827-14).

**Note:** The species is sister to V. albae (Fig. 1) and V. chlorospora (Fig. 2).

**Venturia gaultheriae** Ellis & Everh., J. Mycol. 1: 153, 1885. Fig. 45.

**Synonym:** Gibbera gaultheriae (Ellis & Everh.) M.E. Barr, Canad. J. Bot. 46: 841, 1968.
Fig. 44. Venturia frangulae (syntype MICH 15149) sexual morph. A. Ascomata scattered on the host surface. B–F. Asci and immature asci. G. Dark brown seta. H. Released, pale brown ascospores. I. Evanescent pseudoparaphyses and with mature and immature asci. Scale bars: A = 200 μm; B = 20 μm; C–I = 10 μm.
Gibbera gaultheriae (isotype MICH 15150) sexual morph. A. Ascomata scattered on the host surface. B. Section of an ascoma. C–E. Pale brown, broadly cylindrical to somewhat obclavate asci. F. Brown seta. G–I. Released, fusiform, pale brown ascospores. Scale bars: A = 100 μm; B = 20 μm; C–F = 10 μm; G–I = 5 μm.
Protoventuria gaultheriae (Ellis & Everh.) M.E. Barr, Sydowia 41: 37, 1989.

Ascomata epiphyllous, 40–80 μm diam, scattered or solitary, becoming superficial, globose, wall black, with a conspicuously papillate ostiole, surrounded by setae. Setae dark brown, 20–50 × 5–6 μm, setae wall 1–1.5 μm thick, base swollen, up to 7–8 μm thick, septate. Peridium 7–11 μm wide, 1-layered, composed of 1–2 rows of pigmented cells of textura angularis, cells 5–10 × 3–9 μm, cell wall 0.5–1 μm thick. Pseudoparaphyses not observed. Asci 31–45 × 9–11 μm (av. 57.6 × 14.8 μm, n = 10), 8-spored, bitunicate, fissitunicate,
broadly clavate or broadly obclavate, with a short, knob-like pedicel or pedicel lacking, each with an in conspicuous ocular chamber. Ascospores 12–14 × 4–4.5 μm (av. 18.6 × 6.6 μm, n = 10), fusiform, pale brown, overlapping to biseriate, especially at the base, 1-septate, slightly constricted at the septum, with narrowly to broadly rounded ends, the upper cells often shorter and wider than the lower ones (length ratio: 3:4–1:1), smooth-walled. Asexual morph unknown.

Typus: USA, New Jersey, Gloucester, on leaves of Gaultheria procumbens (Ericaceae), Jul. 1884, Ellis & Everhart (holotype Culture CBS 474.61); Val Tuors, on Salix helvetica (Salicaceae), Jul. 1959, Culture CBS 475.61).

Venturia helvetica Nüesch, Phytopathol. Z. 39: 346. 1960.

Description and illustration: Zhang et al. (2016a, b).

Typus: Switzerland, Kt. Graubünden, on decaying leaves of Salix helvetica (Salicaceae), Jul. 1959 (holotype Reinkultur Stamm ETH Nr. 2571).

Additional materials examined: Switzerland Kt. Graubünden, Albulapasshöhö, on Salix helvetica (Salicaceae), 2 Jul. 1959, J. Nüesch (ETH 2571, IM 163990, culture CBS 474.61); Val Tuors, on S. helvetica, 1 Jul. 1959, J. Nüesch (ETH 2587, culture CBS 475.61).

Note: The species is sister to V. caesiae i minuta (Fig. 2).

Venturia inaequalis (Cooke) G. Winter, Mycoth. Univ., Cent. 3: no. 261. 1875. Figs 46, 47.

Basionym: Sphaerella inaequalis Cooke, J. Bot. (London) 4: 248. 1866. Non cons. prop. (Rossmann et al. 2018).

Synonyms: Endostigme inaequalis (Cooke) Syd., Ann. Mycol. 21(3/4): 171. 1923.

Spilosticta inaequalis (Cooke) Petr., Ann. Mycol. 38(2/4): 193. 1940.

Didymospheria inaequalis (Cooke) Niessl, Fungi Eur. Exsicc.: no. 2663. 1881.

Spilocaea pomi Fr., Novit. Fl. Svec. 5 (cont.): 79. 1819 (Nom. sanct., Fr., Syst. mycol. 3: 504. 1832).

Fusicladium pomi (Fr.) Lind, Dan. Fung.: 521. 1913.

Sphaeria cinerascens Fuckel, Fungi Rhen. Exs., Fasc. 9: no. 1824. 1863. Nom. illeg., Art. 53.1, non Schwein., 1832.

Cladosporium dendriticum Wallr., Fl. Crypt. Germ. 2: 169. 1833.

Fusicladium dendriticum (Wallr.) Fuckel, Jahrb. Nassauischen Vereins Naturk. 23–24: 357. 1870.

Passalora dendritica (Wallr.) Sacc., Michelia 1(no. 2): 265. 1878.

Sphaeria cinerascens Fuckel, Fungi Rhen. Exs., Fasc. 9: no. 1824. 1863. Nom. illeg., Art. 53.1.

Sphaeria cinerascens Rabenh. (as “Fuckel Rabenh.”), Fungi Eur. Exs. (Klotschzi Herb. Viv. Mycol. Continuatio, Ed. Nova, Ser. Sec.), Cent. 9: no. 845, 1865 [Bot. Zeitung 23: 288, 1865].

Mycophabella cinerascens (Rabenh.) Vestergr., Bot. Not.: 267. 1897.

Venturia inaequalis var. cinerascens (Rabenh.) Aderh., Hedwigia 36(2): 82. 1897.

Endostigme cinerascens (Rabenh.) Jørst., Nytt Mag. Naturvidensk 84: 252. 1945.

Spilosticta cinerascens (Rabenh.) Petr., Sydowia 1(4–6): 197. 1947.

Fusicladium dendriticum var. opuli Thüm., Fungi Austr., Cent. 11, no. 1091 (1873). Nom. inval., Art. 38.1(a) (Shenzhen).

Naplicladium soraueri Thüm., Mycoth. Univ., Cent. I, no. 91. 1875.

Fusicladium dendriticum var. soraueri (Thüm.) Sacc., Syll. Fung. 4: 346. 1886.

Fusicladium pyrornum var. amelianchieris Sacc., Syll. Fung. 4: 346. 1886.

Fusicladium dendriticum f. microspora Roum., Fungi Sel. Exs., Cent. 61, no. 5592. 1891.

Fusicladium dendriticum var. eriobotryae Scalia, Boll. Accad. Gioenia Sci. Nat. Catania 70: 5. 1901.

Leaf spots amphigenous, subcircular to somewhat irregular, initially pale olivaceous brown, later black-grey, with pale brown halo, 5–10 mm diam. Ascomata amphigenous, 120–225 μm diam, scattered, initially immersed, becoming erumpent, globose, wall black, with papillate ostiole, with or without setae. Setae dark brown, 28–65 × 5–7 μm, setae wall 1–2 μm thick, base swollen, up to 14 μm wide. Peridium 10–18 μm wide, 1-layered, composed of 3–4 rows of pigmented cells of texture angularis, cells 5–10 μm wide, cell wall 0.5–1.5 μm thick. Pseudoparaphyses 2–4 μm wide, septate, hyaline, evanescent when mature. Asci 56–79 × 11–15 μm (av. 63.4 × 12.3 μm, n = 20), 8-spored, bitunicate, fissitunicate, broadly cylindrical, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous ocular chamber. Ascospores 11.5–16 × 5–7 μm (av. 14.2 × 6.2 μm, n = 20), fusiform to broadly clavate, olivaceous brown, uniseriate to partially overlapping at the top, biseriate near the base, 1-septate, with septum in the upper third, the upper cell tapers towards the apex, the lower cell with a broadly to narrowly rounded base, the upper cells shorter than the lower cells (length ratio: 3.5–7.8), smooth-walled. Asexual morph: Mycelium amphigenous, gregarious, olivaceous brown to black, mostly subcircular. Stromata variable in size, pale olivaceous to brown, angular or circular, composed of thin-walled parenchyma cells, 4–7 μm diam. Conidiophores reduced to conidiogenous cells. Conidiogenous cells solitary or sparsely gregarious, arising from stroma or hyphae, straight or flexuous, unbranched, 16–35 × 6–5 μm, 0(–1)-septate, pale to medium brown, verruculose, wall slightly thickened, base swollen. Conidia solitary, subpyriform to obclavate, 18–29 × 6–8 μm, pale brown to brown, 0(–1)-septate, not constricted at the septum, becoming tapered towards the apex, base truncate, 4–5 μm wide, slightly refractive, not darkened.

Typus: UK, England, Surrey, Shere, on Sorbus aria (Rosaceae), Apr. 1866, Herb. Cooke (lectotype of Sphaerella inaequalis K(M) 237177, designated by Rossman et al. 2018; isotype of Sphaereilla inaequalis BPI 798917. K(M) Nos. 237173, 237174, 237175, 237176 & 237178). Sweden, Malus domestica (Rosaceae) (epitype specimen designated here as metabolically inactive culture, CBS 120627, MBT391376, culture ex-epitype CBS 120627).

Additional materials examined: China, Jilin, Yushu, on leaves of Malus sp. (Rosaceae), 27 Jul. 2015, D. Ma (culture CGMC 1381372 = BJFCFCC 150727-1).

South Africa, on Malus domestica (Rosaceae), collection date and collector unknown (cultures CBS 120625 = SA 14, CBS 120627 = SU 05 AL GAL3), Switzerland, on leaves of Cotoneaster integerrimus (Rosaceae), 11 Jun. 1963, collector unknown (type of Venturia inaequalis f. sp. cotoneasteris ZT 57113).

Czech Republic, Brünn, falling leaves of Sorbus terminalis (Rosaceae), June of unknown year. Niessl (isotypes of Sphaerella inaequalis NY 0091442, NY 0091443, NY 0091444).

Note: The species is sister to V. orbiculata and V. pyrina (Fig. 1) and to V. oleaginea (Fig. 2).

Venturia Ionicarum Sacc., Syll. Fung. 1: 589. 1882.

Synonym: Sphaeria Ionicarum Fuckel, Jahrb. Nassausichens Vereins Naturk. 23–24: 111. 1870. Nom. illeg., Art. 53.1, non
Fig. 47. Venturia inaequalis (CGMCC 3.18372) asexual morph. A, B. Leaf spots caused by Venturia inaequalis (from herbarium specimen). C. Conidiophores. D–F. Annellidic conidiogenous cells giving rise to conidia. G, H. Released subpyriform conidia. Scale bars: C, G, H = 20 μm; D–F = 10 μm.
Sowerby 1803. Nom. illeg., Art. 53.1, non Sphaeria lonicerae Sowerby 1803.

Description and illustration: Sivanesan (1977).

Typus: Germany, Hessen, Oestrich, on Lonicera xylosteum (Caprifoliaceae) [Fuczek, Fungi Rhen. Exs. 1688, synotypes, e.g., B, BPI 613122, HAL, S-F90852, 908554] (not seen).

Material examined: Switzerland, Kl. Wallis, Grächen, on Lonicera coerulescens (Caprifoliaceae). 1 Jun. 1953, E. Müller (IMI 163997, culture CBS 445.54).

Notes: Isolate CBS 445.54 proved to be sterile in culture. This species is sister to Venturia polygoni-viviparri (Fig. 2).

Venturia maculans Peck, Rep. (Annual) New York State Mus. Nat. Hist. 28: 81. 1876 [1875]. Fig. 48.

Ascomata hypophyllous, 86–145 μm diam, scattered or solitary, initially immersed, becoming erumpent, globose to sub-globose, wall black, with a conspicuous papillate ostiole, surrounded by setae. Setae dark brown, 54–90 × 5–6 μm, setae wall 1–1.5 μm thick, 0(–1)–septate, base swollen, up to 9 μm wide. Peridium 15–28 μm thick, 1-layered, composed of 2–3 rows of pigmented cells of textura angularis, cells 6–13 × 5–10 μm, cell wall 1–1.2 μm thick. Pseudoparaphyses rare, 2–3 μm wide, septate, hyaline, evanescent when mature. Ascii 43–62 × 11–16 μm (av. 54.1 × 12.8 μm, n = 20), 8-spored, bitunicate, fissionitunicate, broadly cylindrical to obclavate, with a short, knob-like pedicle or pedicel lacking, each with an inconspicuous ocular chamber. Ascospores 12–16 × 4–6.5 μm (av. 14.2 × 5.4 μm, n = 20), fusiform, olivaceous brown, overlapping to biseriate near the base, 1-septate, deeply constricted at the septum, the upper cells longer and wider than the lower ones (length ratio: 13:11–9:5), smooth-walled. Asexual morph unknown.

Typus: USA, New York, Albany, Karner, on fallen leaves of Betula populifolia (Betulaceae), Jun. 1870?, C.H. Peck (holotype NYSf1816).

Venturia maculiformis (Desm.) G. Winter [as “maculaeformis”], Rabenh. Krypt. Fl., Ed. 2, 1(2): 435. 1885. Fig. 49.

Basionym: Dothidea maculaeformis Desm. [as “maculaeformis”], Ann. Sci. Nat., Bot., 3: 176. 1847.

Synonyms: Stigmata maculaeformis (Desm.) Fr., Summa Veg. 3: 190. 1876.[1875].Fig. 48.

Notes: The species is sister to V. polygoni-viviparri (Fig. 2).

Material examined: UK, England, Surrey, on Populus montana (Onagraceae) (Peleton Var. 45(3): 219. 1993).

Notes: Venturia maculiformis is morphologically comparable with V. muelleri, V. ruminis and V. rhammi, which have semi-immersed ascocoma lacking setae, and ascospores with a septum in the lower half. The small-sized ascocoma (40–60 μm) of V. muelleri (Zhang et al. 2016a, b), however, are distinguishable from the other three species. The asci and ascospores of V. ruminis are longer and wider than V. maculiformis, and asci of V. rhammi are also longer than those of V. maculiformis (Zhang et al. 2016a, b).

Venturia mandshurica M. Morelet [as “mandshurica”], Ann. Soc. Nat. Hist. Arch. Toulon Var. 45(3): 219. 1993.

Synonyms: Pollacia mandshurica M. Morelet, Ann. Soc. Nat. Hist. Archéol. Toulon Var. 45: 218. 1993.

Fusicladium mandshuricum (M. Morelet) Ritschel & U. Braun, Schlechtendalia 9: 62. 2003.

Description and illustration: Schubert et al. (2003).

Typus: China, Liaoning, on leaves and branches of Populus simonii × Populus nigra (Salicaceae), 17 Jun. 1992, M. Morelet (holotype, Laboratoire de Pathologie Forestière de Nancy, PC (PFN 1466)) (not seen); on P. simonii, 20 Apr. 1993 (epitype CBS H-19912, designated in Crous et al. 2007b, culture ex-epitype CBS 112235 = CPC 3639 = MPFN 307) (examined).

Note: The species is sister to V. populina (Figs 1, 2).

Venturia martianoffiana (Thüm.) Y. Zhang ter & J.Q. Zhang, Stud. Mycol. 86: 205. 2017. Figs 50, 51.

Basionym: Cladosporium martianoffianum Thüm., Bull. Soc. Imp. Naturalistes Moscou 55: 74. 1880.

Synonyms: Fusicladium martianoffianum (Thüm.) K. Schub. & U. Braun, I.M.I. Descript. Fungi Bact. 152 (nos 1511–1520): [10].

Fusicladium martianoffianum var. sinensis M. Morelet, Bull. Mens. Soc. Linn. Lyon 75: 179. 2006.

Sexual morph: Unknown. Asexual morph: Leaf spots amphigenous, subcircular to angular, 1–9 mm wide, often confluent, diffuse, numerous, dark brown to black, with an irregular margin. Colonies amphigenous, caespitose, olivaceous dark brown to blackish. Mycelium mainly subcuticular. Stromata variable in size, composed of pale olivaceous to brown, angular to rounded, thick-walled, pseudoparenchymatous cells, 4–8 μm diam. Conidiophores solitary or loosely fasciculate, arising from stromata or from hyphae, erect, straight, sometimes flexuous at the apex, unbranched or apically branched, 17–30 × 5–7 μm, 0–1-septate, pale to medium brown, smooth, with somewhat thickened walls. Conidiogenous cells integrated, terminal or intercalary, or conidiophores reduced to conidigenous cells, 14–27 × 4.5–6 μm, with a single or several denticle-like conidigenous loci, proliferation sympodial, loci unthickened, or not or only somewhat darkened-refractive, 1.5–2.5 μm wide. Conidia in simple or branched chains, 15–31 × 4.5–6 μm.
Fig. 48. Venturia maculans (holotype NYSf1816) sexual morph. A. Ascomata scattered on the host surface. B–E. Broadly subcylindrical to obclavate asci. F. Evanescent pseudoparaphyses. G. Released, brown ascospores. H. Dark brown setae. Scale bars: A = 200 μm; B–H = 10 μm.
pyriform, ellipsoid, subcylindrical, fusiform, pale brown, 0–1(–3)-septate, smooth, attenuated towards apex and base, apex mostly truncate, occasionally rounded or pointed, base truncate; *hila* 1.5–3 μm wide, not thickened, but somewhat darkened-refractive. *In culture on MEA*: Mycelium unbranched or only sparingly branched, 2–5 μm wide, septate, not constricted at septa, subhyaline to pale brown, smooth, walls unthickened or almost so. *Conidiophores* laterally arising from hyphae, erect, straight to somewhat flexuous, sometimes geniculate, unbranched, 21–65 × 4–6 μm, aseptate or

Fig. 49. *Venturia maculiformis* (HMAS 243785) sexual morph. A. Ascomata scattered on the host surface. B–I. Oblong to obclavate asci. J–O. Released, pale brown to olivaceous brown, 1-septate ascospores. Scale bars: A = 200 μm; B–I = 20 μm; J–O = 10 μm.
Fig. 50. Venturia martianofiana (BJFU 150828-1) asexual morph. **A, B.** Leaf spots caused by *V. martianofiana* (from herbarium specimen). **C–F, H.** Sympodial conidiophores and conidiogenous cells. **G.** Fusiform, non-septate or 1-septate conidia. **I.** Conidia in chains. Scale bars: **C–I** = 10 μm.
Fig. 51. Venturia martianoffiana (culture CGMCC 3.18375) asexual morph. A. Colony growing on MEA. B. Hyphae and conidial chains. C–G. Conidiophores with conidiogenous loci. H. Geniculate-sinuous hyphae. I, L, M. Conidiophore with branching conidial chains. J. Ramoconidia and conidia. K. Conidiophores reduced to conidiogenous cells. Scale bars: B–E, H, J, K = 20 μm; F, G, I, L, M = 10 μm.
septate, pale or medium brown, smooth, walls somewhat thickened, sometimes only as short lateral conical prolongations of hyphae, occasionally irregular in shape. Conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, sometimes geniculate, 21–36 μm long, proliferation sympodial, with 1–4 denticulate-like loci, broadly truncate, 1.5–2(–2.5) μm wide, unthickened, somewhat refractive or darkened. Ramaconidia present, 18–26 × 4–5 μm, 0–2-septate, pale to medium brown, with a broadly truncate base, 3–4 μm wide, usually with 2–3 denticulate-like apical loci. Conidia catenate, formed in unbranched or loosely branched chains, straight to sometimes curved, cells sometimes irregularly swollen, fusiform, subcylindrical, sometimes obpyriform, 17–29 × 4–6 μm, pale to medium brown, smooth, 0(–2)-septate, walls slightly thickened, sometimes attenuated towards apex and base; hila broadly truncate, 2–2.2 μm wide, not or only slightly thickened, somewhat darkened-refractive; microcyclic conidiogenesis present.

Culture characteristics: Colonies erumpent, spreading, with abundant aerial mycelium and feathery to smooth margins on PDA; grey oliveaceous (surface), reverse dark oliveaceous. Colonies reaching 14 mm diam after 1 mo at 25 °C in the dark; reverse fuscous-black. Colonies spreading, smooth, somewhat darkened and darkened. Description and illustration in vivo.

Typus: Russia, Sibiria, Minussinsk, near river Jenissei, on living leaves of Populus laurifolia (Salicaceae), Aug. 1879, N. Marianoff (M: lectotype designated in Schubert et al. 2003: 64; isectotypes, Thüml., Mynoth. Univ. 2067). Materials examined: China, Shanxi, Yangling, on leaves of Populus sp. (Salicaceae), 4 Nov. 2015, Y.F. Zhang (culture CGMCC 3.18375 = BJFC 150828-1).

Notes: This species is sister to V. phaeosepta (Fig. 2).

Venturia minuta M.E. Barr, Canad. J. Bot. 46: 815. 1968. Replaced synonym: Venturia microspora Nüesch, Phytopathol. Z. 39: 347. 1960. Nom. illeg., Art. 53.1, non Venturia microspora Spec. 1887.

Description and illustration: Barr (1968).

Typus: Switzerland, Aareaeae bei Rubigen, on decaying leaves of Salix nigricans (Salicaceae), Ct. Bern, 30 May 1959, collector unknown (holotype ETH Nr. M 523, culture ex-type ETH 523 = IMI 163991 = CBS 478.61).

Additional material examined: Switzerland, on Salix cinerea (Salicaceae), 20 May 1959, J. Nüesch (culture ETH 525 = CBS 479.61).

Notes: Venturia minuta was introduced to replace the illegitimate V. microspora. Unfortunately, both isolates representing V. minuta (CBS 478.61, CBS 479.61) proved to be sterile in culture. Venturia minuta is sibling to V. caesiae (Fig. 2).

Venturia nashicola S. Tanaka & S. Yamamoto, Ann. Phytopathol. Soc. Japan 29: 136. 1964. Synonym: Fusicladium nashicola K. Schub. & U. Braun, Schlechtendalia 9: 65. 2003.

Description and illustration: Schubert et al. (2003), Tanaka & Yamamoto (1964).
**Venturia orbicula** (Schwein.) Cooke & Peck, Rep. (Annual) New York State Mus. Nat. Hist. 25: 105. 1873. [1872]. Fig. 53.

**Basionym**: *Sphaeria orbicula* Schwein., Trans. Amer. Philos. Soc., n.s. 4: 224. 1832. [1834].

**Ascomata** hypophyllous, 42–70 μm diam, gregarious or scattered on circular spots, superficial, globose to subglobose, wall black, with a conspicuous papillate ostiole, surrounded by setae. Setae dark brown, 38–69 × 5–7 μm, wall 1–1.5 μm wide at the base, septate. **Peridium** 1-layered, composed of one row of pigmented cells of *textura angularis*, cells 5–12 × 4–8 μm, cell wall 1 μm thick. **Pseudoparaphyses** 2–4 μm wide, septate, hyaline. **Asci** 33–45 × 10–12 μm (av. 38.2 × 10.6 μm, n = 10), 8-spored, bitunicate, fissitunicate, broadly cylindrical to somewhat obclavate, with a short, knob-like pedicel or pedicel lacking, each

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**Fig. 52.** Venturia oleaginea (culture CBS 113539) asexual morph. A. Colony on OA. B, C, E. Conidiogenous cells giving rise to conidia. D. Hypha with conidiogenous loci and conidia. F–H. Released conidia. Scale bars: B–H = 10 μm.
Fig. 53. Venturia orbicula (lectotype NYSf 2176) sexual morph. A. Ascomata scattered on the host surface. B, D–F. Oblong to somewhat obclavate asci. C. Evanescent pseudoparaphyses. G, H. Released, fusiform, 1-septate ascospores. I. Dark brown setae. Scale bars: A = 200 μm; B–I = 10 μm.
with an inconspicuous ocular chamber. *Ascospores* 11–13 × 4–6 μm (av. 11.8 × 5 μm, n = 20), fusiform to narrowly fusiform, pale olivaceous brown to brown, obliquely overlapping to biseriate near the base, 1-septate, constricted at the septum, the upper cells shorter and wider than the lower ones (length ratio: 6:5–1:2), smooth-walled. *Asexual morph* unknown.

**Typus:** USA, Rensselaer, Lake Sander, on the fallen leaves of *Quercus montana* (as *Quercus monticola*, *Fagaceae*), Jun. of unknown year, C.H. Peck (*lectotype* NYS-F-002176).

*Venturia orbiculata* (Desm.) U. Braun, Schlechtendalia 36: 66 (2019).
**Synonyms:** Cladosporium orbiculatum Desm., Ann. Sci. Nat., Bot., Sér. 3, 11: 275, 1849.

Fusicladium orbiculatum (Desm.) Thüm., Fungi Austr., Cent. VIII, no. 774.1873.

Passalora dendritica var. orbiculata (Desm.) Berk., in Sacc., Mycot. Ven., Cent. XII, no. 1246. 1876 [Michelia 1: 265, 1878].

Fusicladium dendriticum var. orbiculatum (Desm.) Sacc., Syll. Fung. 4: 345, 1886.

**Material examined:** Germany, Münchenberg, on Sorbus aucuparia var. moravica (Rosaceae), collection date and collector unknown, holotype CBS 128206 = CPC 15252.

**Notes:** Isolates CBS 365.35 and CBS 366.35 were sterile. The species is sister to V. pyrina (Fig. 1) and to V. crataegi (Fig. 2).

**Ventricia peltigericola** (Crous & Diederich) Crous, M. Shen & Y. Zhang tert., comb. nov. MycoBank MB831592. Fig. 54.

**Basionym:** Fusicladium peltigericola Crous & Diederich, Persoonia 25: 129. 2010.

In vitro on OA: Mycelium mostly branched, 2–3 μm wide, septate, uninucleate septa, pale brown to brown, smooth, walls unthickened, sometimes hyphal cells swollen. Conidiophores laterally arising from hyphae, solitary, erect, straight nidiophores, conidiogenous loci terminal, integrated, geniculate-sinuous, subcylindrical, 23–35 μm wide, 1–3-septate, uninucleate septa, brown to medium brown, smooth, walls somewhat thickened but not darkened-refractive. Conidiogenous cells terminal, integrated, geniculate-sinuous or straight, subcylindrical, 14–18 μm wide, 10–12 μm long, 3–5 μm thick, 2–5 μm long, 3–5 μm wide, uninucleate septa, conidiogenous loci flattened, 1.5–3 μm wide, somewhat darkened, but not thickened. Conidia biseriate, proliferating sympodially, brown to medium brown, smooth; conidiogenous loci alternating, somewhat darkened, 2–5 μm wide, with one to several sympodial, apical loci; frequently with a lateral branch up to 20 μm long, 3–4 μm wide. Conidia catenate, proliferating in sympodia to form short chains of conidia, straight or slightly curved, subcylindrical, 16.5–24.5 × 4–5.5 μm, (0–1)-1-septate, septum mostly in the upper third of the conidioma, rarely 2-septate, medium brown to brown, smooth, finely verruculose, apex obtusely rounded or flattened; hila flattened, 1.5–3 μm wide, somewhat darkened, but not thickened.

**Culture characteristics:** Colonies spreading, smooth, somewhat erumpent, with aerial mycelium and regular margins on OA, fuscous-black (surface); reverse fuscous-black. Colonies reaching 25 mm diam on OA after 2 wk at 25 °C in the dark; colonies fertile.

**Typus:** Luxembourg, on Peltigera rufescens (Peltigerales), May 2008, P. Diederich (holotype CBS-H 20487, culture ex-type CBS 128206 = CPC 15252).

**Additional materials examined:** Germany, Münchenberg, on Betula verrucosa (Betulaceae), Jul. 1935, M. Schmidt (cultures CBS 370.35, CBS 371.35).

**Notes:** Isolates CBS 370.35 and CBS 371.35 are in the same clade (Fig. 2) or as the ex-type isolate of Fusicladium peltigericola (CBS 128206, Crous et al. 2010), but occur on different hosts. These isolates, however, appear to represent a morphologically distinct species as F. peltigericola has larger conidia. Additional loci will have to be sequenced to resolve this issue. Venturia peltigericola is sister to V. ditricha (Fig. 2) and not sister to a specific species in Fig. 1.

**Ventricia phaeoepita** Y. Zhang tert & J.Q. Zhang, Stud. Mycol. 86: 205. 2017.

**Description and illustration:** Marin-Felix et al. (2017).

**Typus:** China, Henan province, Puyang City Academy Experimental Farm, on leaves of Populus × euramerica (Salicaceae) cv. 74/76 (sect. Aigeiros), 20 May 2015, W. He (holotype HMAS 246998, culture ex-type CGMCC3.18368); Y.F. Zhang, 20 Jun. 2015 (paratype, HMAS 246999, CGMCC3.18371); 6 Aug. 2015 (paratype, HMAS 247000, CGMCC3.18373); 7 Aug. 2015 (paratype, HMAS 247002, CGMCC3.18374); 8 Aug. 2015 (paratype, HMAS 247001, CGMCC3.18375); Shanxi, Yangling, on leaves of Populus sp. (sects. Aigeiros), 4 Sep. 2015, Y.F. Zhang (paratype, HMAS 247004, CGMCC3.18378); ibid. (paratype, HMAS 247005, CGMCC3.18379).

**Note:** Venturia phaeoepita is sibling to V. martianoffiana (Fig. 2).

**Ventricia polygoni-vivipari** Arx, Sydowia 4: 391. 1950.

**Description and illustration:** von Arx (1950).

**Typus:** Switzerland, Kt. Valais, Val de Bagnes, Corbasieries, on leaves of Polygonum viviparum (Polygonaceae), 19 Jul. 1948, H. Kobel (ETH) (not seen).

**Material examined:** Norway, on Polygonum viviparum (Polygonaceae), 12 Aug. 1988, K. & L. Holm (culture CBS 114207 = USPC 2754).

**Notes:** Unfortunately, isolate CBS 114207 was sterile. The species is related to V. viennotii (Fig. 1) and V. ioniceriae (Fig. 2).

**Ventricia populinis** (Vaill.) Fabric., Jahresber. Neuerungen Pflanzenkran. 5: 282. 1902.

**Basionym:** Didymosphaeria populinis Vaill., in: Ducharte, Compt. Rend. Hebd. Séances Acad. Sci. 108: 634. 1889.

**Synonym:** Fusicladium radiosum [(Lib.) Lind] var. balsamiferae Davis, Trans. Wisconsin Acad. Sci. 21: 402. 1922.

**Pollaccia elegans** Servazzi, Boll. Lab. Sperim. Osserv. Fitopatol. 15(3–4): 64. 1939.

**Pollaccia balsamiferae** (Davis) M. Morelet, Bull. Soc. Sci. Nat. Archéol. Toulon Var 4: 3. 1972.

**Fusicladium elegans** (Servazzi) Ritschel & U. Braun, Schlechtendalia 9: 43. 2003.

**Description and illustration:** Sivanesan (1977); Schubert et al. (2003).

**Typus:** France, Loir-et-Cher, Montoubleau, on young branches of Populus (Salicaceae), Apr. 1889, Prillieux s.n. (lectotype, PC) (not seen).

**Materials examined:** Italy, on Populus canadensis (Salicaceae), collection date and collector unknown, holotype O. Servazzi (culture CBS 256.38 = IMI 163996); on Populus sp., collection date and collector unknown, isotype R. Ciferri (culture CBS 316.38).

**Notes:** Unfortunately, isolates CBS 256.38 and CBS 316.38 proved to be sterile. The species is sister to V. mantishurica (Figs. 1, 2).

**Ventricia pyrina** Aderh., Landw. Jahrb. 25: 875. 1896.

**Nom. cons. prop.** (Rossman et al. 2018). Fig. 55.

**Synonym:** Helminthosporium pyronum Lib. (p.p.), Pl. Crypt. Arduenua, Fasc. 2, 188. 1832.

**Arthrinium pyrinum** Wallr., Fl. Crypt. Germ. 2: 163. 1833.

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Fig. 55. Venturia pyrina (HMAS 03905) asexual morph. A. Dense fascicle of conidiophores on the host surface. B–F. Solitary or fasciculate conidiophores with sympodial conidiogenous loci. G–K. Fusiform to broadly fusiform conidia. Scale bars: A = 200 μm; B–F = 20 μm; G–K = 5 μm.

Fusidium pyrinum Corda, Icon. Fung. 1: 3. 1837.
Fusicladium virescens Bonord., Handb. Mykol.: 80. 1851.
Fusicladium fuscescens Rabenh., Bot. Zeitung (Berlin) 15: 430. 1857.

Cladosporium polymorphum Peyl, Lotos 15: 18. 1865.
Passalora pomi G.H. Otth, Mitth. Naturf. Ges. Bern 1868: 66. 1868.
Cercospora porrigo Speg., Anales Mus. Nac. Buenos Aires. II. 3: 341. 1899.
Acrotheca dearnessiana Sacc., Ann. Mycol. 10: 314. 1912.
Endostigme pyrina (Aderh.) Syd., Ann. Mycol. 21: 173. 1923.

Colonies amphigenous, dark brown to olivaceous brown. Stroma well developed on fruit, leaves, rarely on young twigs and buds, sometimes composed of only a few cells. Conidiophores erect, solitary or fasciculate unbranched, usually short, up to 90 μm long, 5–7 μm wide, dark brown to olivaceous brown, mostly

Fig. 56. Venturia quebecensis (ex-type culture CBS 695.85) asexual morph. A. Colony on OA. B–D. Conidiogenous cells giving rise to conidia. E–G. Conidia or germinating conidia. Scale bars: B–G = 10 μm.
aseptate. Conidiogenous cells integrated, terminal, proliferation sympodially, with several conspicuous loci. Conidia solitary, 16–24.5 × 6–9 μm, broadly fusiform, sometimes irregular, pale to olivaceous brown, smooth, wrinkled or verrucose, (0–1)-septate, not constricted at the septum, pointed at the apex, truncate at the base; hila narrowly truncate, somewhat thickened and darkened. Description in vivo and illustration, see Schubert et al. (2003: 82–85, fig. 41).

**Type: Lectotype** [icon in] Landw. Jahrb. 25: 878, t. 31, fig. 1–11. 1896 (designated in Rossman et al. 2018).

**Materials examined:** Brazil, on Pyrus communis (Rosaceae), collection date and collector unknown (culture CBS 120825 = BR 04 PC 2.2). China, on leaves of Pyrus sp., Aug. 1942, F. Dai (HMAS 03923); idem., 1 Sep. 1942, F. Dai (HMAS 03905); Shandong, Wendeng, on leaves of Pyrus sp., 4 Aug. 2014, J. Zhang & Y. Liu (culture BJFCC 140804-2). Germany, unknown host, Jul. 1935, M. Schmidt (culture CBS 379.35). New Zealand, on P. communis, 20 Apr. 2008, C.F. Hill (culture CBS 123189 = CPC 15384).

**Notes:** The species is sister to V. orbiculata (Fig. 1) and to V. nashicola (Fig. 2). Fusiciadium virescens, the type species of Fusiciadium, was reported on apple leaves (or on pear leaves., see Schubert et al. 2003: 3–4), and was reduced to a synonym of F. pyrum based on morphological features of the conidiophores given in the original description (Bonorden 1851, Schubert et al. 2003).

**Venturia quebecensis** Crous, M. Shen & Y. Zhang ter, **sp. nov.** MycoBank MB831540. Fig. 56.

**Etymology:** The epithet refers to Quebec, the province where this isolate was collected.

**Sexual morph unknown. In vitro on OA:** Mycelium branched or unbranched, pale to medium brown, 2.5–3.5 μm wide, septate, not constricted at septa, smooth or occasionally verrucose, straight, wall not thickened. Conidiophores laterally or terminally arising from hyphae, reduced to conidiogenous cells. Conidiogenous cells integrated, terminal, erect or geniculate-sinuous, 6–24 × 3–6 μm, antenna- or hyphopodium-like, phialidic, collateral, sometimes present, pale to medium brown, subcylindrical, smooth, walls somewhat thickened, with a single locus, 2.5–4 μm wide, slightly thickened or darkened, sometimes only as short lateral conical prolongations of hyphae. Conidia solitary, straight or slightly curved, fusiform, sometimes obpyriform, 25–38.5 × 5.5–8 μm, 1–2(–3)-septate, usually constricted at the septa, medium to dark brown, smooth, walls somewhat thickened or darkened, often widest in the middle or just below, becoming tapered and hyaline towards the apex, attenuated or rounded towards the base; hila truncate, 2–3.5 μm wide, somewhat thickened and darkened.

**Culture characteristics:** Colonies spreading, somewhat erumpent, smooth, with sparse aerial mycelium and regular margins on OA, uneven, greyish sepia (surface), becoming paler towards margins; reverse fuscous-black. Colonies reaching 65 mm diam after 6.5 wk at 25 °C in the dark; colonies fertile.

**Type: Canada,** Quebec, Portneuf, on the spotted leaf of Populus tremuloides (Salicaceae), 18 Jun. 1979, M. Morelet (**holotype** CBS H-23604, culture ex-type CBS 695.85).

**Notes:** Isolate CBS 695.85 was collected on Populus tremuloides in Quebec by M. Morelet, and was identified as Venturia tremulae. However, the 2-septate conidia of CBS 695.85 are distinct from those of V. tremulae (Schubert et al. 2003). Phylogenetically, this isolate also does not cluster with strains of V. tremulae and therefore a novel species is introduced to accommodate it (Figs 1, 2).

**Venturia rumicis** (Desm.) G. Winter, Rabenh. Krypt.-Fl., Ed. 2, 1(2): 435. 1885. Fig. 57.

**Basionym:** Sphaeria rumicis Desm., Ann. Sci. Nat., Bot. ser. 2, 19: 361. 1843.

**Synonyms:** Sphaeria rumicis (Desm.) Fuckel, Jahrb. Nasausicher Vereins Naturk. 23–24: 103. 1870.

**Stigmata rumicis** (Desm.) J. Schröd., Kryptogamenfl. Schwesien 3: 322. 1894.

**Ascospora rumicis** (Desm.) kuntze, Rev. Gen. Plant 3: 444. 1898.

**Siplosticta rumicis** (Desm.) Syd., Ann. Mycol. 21: 171. 1923.

**Mycosphaerella rumicis** (Desm.) Grove, J. Bot. (London) 71: 253. 1933.

**Mycosphaerella rumicis** f. caulicola Grove, J. Bot. (London) 71: 253. 1933.

**Mycosphaerella stromatoidea** Dearn., Mycologia 18: 245. 1926.

Ascemataphyllous, 60–170 μm diam, gregarious or scattered, initially immersed, becoming erumpent, globose to subglobose, wall black, with a conspicuous papillate ostiole. Setae not observed. Peridium 10–25 μm wide, 1-layered, composed of 2–3 rows of pigmented cells of textura angularis, cells 8–9 × 4–8 μm, cell wall 0.8–1.2 μm thick. Pseudoparaphyses 2–4 μm wide, rare, evanescent when mature, septate, hyaline. Asc 39–67 × 13–19 μm (av. 53.6 × 15.8 μm, n = 20), 8-spored, bitunicate, fissitunicate, broadly cylindrical to somewhat obclavate, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous ocular chamber. Ascospores 14–19 × 5.5–7 μm (av. 16.1 × 6.5 μm, n = 20), fusiform, hyaline to pale olivaceous brown, obliquely uni- or triseriate near the base, 1-septate, constricted at the septum, the upper cells wider and longer than the lower ones (length ratio: 9.8:3.2), smooth-walled. Ascosporal morph unknown.

**Type: France,** on overwintered leaves of Rumex sp. (Polygonaceae), J.B.H.J. Desmazières (? type K(M) 189242).

**Additional material examined:** USA, California, on overwintered leaves of Rumex occidentalis (Polygonaceae), 26 May 1930, L. Bonar (HMAS 49551).

**Notes:** Although both Venturia rumicis and V. canadensis occur on Rumex spp., the immersed ascocoma and larger-sized ascospores of V. rumicis are distinguishable from those of V. canadensis. Neither of these species are currently known from molecular data.

**Venturia saliciperda** J. Nüesch, Phytopathol. Z. 39: 349. 1960.

**Synonyms:** Septogloeum saliciperda Allesch. & Tubeuf, Fungi Bavar. Exsic.: no. 485. 1895.

**Fusicladium saliciperdum** (Allesch. & Tubeuf) Lind, Ann. Mycol. 3: 430. 1905.

**Pollaccia saliciperda** (Allesch. & Tubeuf) Arx, Tijdsschr. Plantezien 63: 233. 1957.

**Description and illustration:** Nüesch (1960) and Schubert et al. (2003).

**Type: Switzerland,** Katzensee bei Zürich, Kt. Zürich, Salix cordata (Salicaceae), 24 Sep. 1958, collector unknown (culture CBS 112625 = CPC 3638 = MPFN 349 = STE-U 3638), **Switzerland,** on Salix elegantissima (Salicaceae), collection date and
Fig. 57. *Venturia rumicis* (♀ type K(M) 189242) sexual morph. A. Ascomata scattered on the host surface. B–D. Broadly clavate to somewhat obclavate asci. E. Obclavate ascus and evanescent pseudoparaphyses. F. Evanescent pseudoparaphyses. G, H. Released, pale brown 1-septate ascospores. Scale bars: A = 200 μm; B–H = 10 μm.
Fig. 58. Venturia syringae (isotype MICH 139624) sexual morph. A. Ascomata scattered on the host surface. B. Section of an ascoma. C–E. Cylindrical to somewhat obclavate asci. F, G. Evanescent pseudoparaphyses. H, I. Released, olivaceous brown ascospores. Scale bars: A = 200 μm; B–G = 10 μm; H–I = 5 μm.
Notes: Unfortunately, these isolates proved to be sterile in culture. Venturia saliciperda is sister to V. tremulae (Figs 1, 2). Venturia saliciperda is exclusively associated with Salix spp., while V. tremulae associates with Populus spp.

**Venturia syringae** (Syd.) M.E. Barr, Canad. J. Bot. 46: 815. 1968. Fig. 58.
Basionym: *Phaeosphaeria syringae* Syd., Ann. Mycol. 21(1–2): 145. 1923.
Synonyms: *Spilosticta syringae* (Syd.) Petr., Hedwigia 65: 241. 1925.
**Fusicladium diedickeanum** U. Braun, Nova Hedwigia 55(1–2): 211. 1992.

**Sexual morph in vitro**: Ascomata 65–90 μm diam, hypophyllous, solitary, gregarious or scattered, initially immersed, becoming erumpent, globose to subglobose, wall black, with conspicuous papillate ostiole. Setae not observed. Peridium 5–10 μm wide, 1-layered, composed of 1–2 rows of pigmented cells of textura angularis, cells 6–14 × 5–11 μm, wall cell 0.5–1.2 μm thick. Pseudoparaphyses 2–4 μm wide, rare, evanescent when mature, septate, hyaline. Ascii 40–55 × 10–12 μm (av. 48.8 × 10.6 μm, n = 20), 8-spored, bitunicate, fissitunicate, cylindrical, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous ocular chamber. Ascospores 9–12.5 × 4–6 μm (av. 10.6 × 4.5 μm, n = 20), oblong to broadly clavate, olivaceous brown, obliquely uniseriate, slightly constricted at the septum, the upper cells shorter and wider than the lower ones (length ratio: 2.3:1), smooth-walled. Asexual morph in vivo: see Schubert et al. (2003: 40, 41, fig. 16).

**Typus**: Germany, Leutenthal, near Kleinbrembach, Hopfenberg at Buttelstedt, on the rolling leaves of *Syringa vulgaris* (Oleaceae), May 1921 (syntype MICH 139624). Topotype material (from 1923/24): Syd., Mycoth. Germ. 2116, e.g., B, BPI 618036, 618038, MICH 139623, PH 315989, WIS-F 75798.

**Venturia tomentosa** R. Menon, Phytopathol. Z. 27: 132. 1956. Fig. 59.

Ascomata hypophyllous, 100–215 μm diam, scattered, solitary, initially immersed, becoming erumpent, globose to subglobose, wall black, with a conspicuously papillate ostiole, sparsely surrounded by setae. Setae dark brown, 28–85 × 5–7 μm, setae wall 1–2 μm thick, aseptate. Peridium 20–28 μm wide, 1-layered, composed of (3–)4–5 rows of pigmented cells of textura angularis, cells 6–14 × 5–15 μm, wall cell 1.5–1.7 μm thick. Pseudoparaphyses rare, 2–4 μm wide, evanescent when mature, septate, hyaline. Ascii 90–139 × 7–15 μm (av. 112.7 × 11.8 μm, n = 20), 8-spored, bitunicate, fissitunicate, cylindrical, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous ocular chamber. Ascospores 15–20 × 7–8 μm (av. 18.2 × 7.5 μm, n = 20), ellipsoid to somewhat clavate, olivaceous brown, obliquely uniseriate, 1-septate, slightly constricted at the septum, the upper cells shorter and wider than the lower ones (length ratio: 1.2–7.8), smooth-walled. Asexual morph unknown.

**Typus**: Switzerland, on leaves of *Cotoneaster tomentosa* (Rosaceae), 28 Sep. 1937, A. Volkart (holotype ZT 57089).

**Venturia radiosa** (Lib.) Ferd. & C.A. Jarg., Skovtreaernes Sygdomme 1: 125. 1938.
Basionym: *Oidium radiosum* Lib., Pl. Crypt. Ard. Fasc. 3, no. 285. 1834.
Synonyms: *Venturia tremulae* Aderh., Hedwigia 36: 81. 1897.
**Fusicladium radiosum** (Lib.) Lind, Ann. Mycol. 3: 430. 1905.
**Pollaccia radiosa** (Lib.) E. Bald. & Cit., in E. Bald., Atti Ist. Bot. “Giovanni Briosì” 10: 61. 1937.
**Venturia tremulae** var. *populi-albae* M. Morelet, Cryptog. Mycol. 6: 112. 1985.
**Venturia tremulae** var. *grandidentatae* M. Morelet, Cryptog. Mycol. 6: 113. 1985.

**Description and illustration**: Schubert et al. (2003).

**Typus**: Belgium, Belgian Ardennes, on *Populus tremula* (Salicaceae), 1834, Libert (lectotype BR, selected by Morelet 1985; isoselectotypes: Lib., Pl. crypt. ard., Fasc. 3, 285) (not seen).

Materials examined: France, on spotted leaf of *Populus alba* (Salicaceae) (cultures CBS 694.85); on spotted leaf of *P. tremula* (cultures CBS 692.85, CBS 693.85). Notes: Unfortunately, these isolates proved to be sterile. The species is sister to *V. saliciperda* (Figs 1, 2).

**Venturia viennotii** M. Morelet, Trav. Dédias à Georges Viennot-Bourg (Paris): 261. 1977.
Synonym: *Venturia viennoti* var. *levispora* M. Morelet, Cryptog. Mycol. 6: 107. 1985.

**Description and illustration**: Morelet (1985).

**Typus**: France, Velaine-sous-Amance (Meurthe-et-Moselle), on *Populus tremula* (Salicaceae), Jun. 1972, M. Morelet (holotype PFN 813).

Additional materials examined: France, on dead leaves of *Populus tremula* (Salicaceae), collection date and collector unknown, isol. M. Morelet, May 1979 (cultures CBS 690.85, CBS 691.85). Notes: Unfortunately, these isolates proved to be sterile but they were deposited by the original author of the species and collected from the same host and region as the holotype and could therefore be regarded as authentic for the species. The species is related to *V. polygoni-vivipari* (Fig. 1) and *V. catenospora* (Fig. 2).

**SPECIES EXCLUDED FROM VENTURIALES**

**Acanthostigma saccarioides** (Ellis & G. Martin) Sacc., Syll. Fung. 9: 854. 1891. Fig. 60.
Basionym: *Venturia saccarioides* Ellis & G. Martin, Amer. Naturalist 18: 60. 1884.

Ascomata hypophyllous, 130–190 μm diam, scattered, becoming superficial, globose to subglobose, with setae. Setae brown, up to 100 μm long, 4–5 μm wide, setae wall 0.5–1 μm thick, septate. Pseudoparaphyses rare, 2–3.5 μm wide, hyaline, septate, branched. Ascii 38–56 × 9–11 μm (av. 45.1 × 9.4 μm, n = 20), 8-spored, bitunicate, fissitunicate, broadly cylindrical to clavate, with a short, knob-like pedicel, each with an inconspicuous ocular chamber. Ascospores 12–15 × 3–4 μm (av. 13.8 × 3.7 μm, n = 20), obclavate, hyaline, obliquely biseriate, 3-septate, slightly constricted at the median septum, smooth-walled.
Fig. 59. Venturia tomentosa (holotype ZT 57089) sexual morph. A. Ascostromata scattered on the host surface. B. Section of an ascostroma. C, D. Cylindrical asci with short pedicels. E, G. Released, medium brown, asymmetrical ascospores. F. Evanescent pseudoparaphyses. H. Dark brown setae. Scale bars: A = 200 μm; B–H = 10 μm.
Acanthostigma saccardioides (holotype NY 00938225) sexual morph. 

A. Ascostromata scattered on the host surface. B, D. Immature asci in evanescent pseudoparaphyses. C, E. Cylindrical to broadly obclavate asci. F, I. Released ascospores with one to three septa. G. Evanescent pseudoparaphyses. H. Dark brown setae. Scale bars: A = 200 µm; B–I = 10 µm.
Fig. 61. Chaetothyrina applanata (type NY 00938204) sexual morph. A. Ascomata scattered on the host surface. B–D. Broadly obclavate asci. E. Evanescent pseudo-paraphyses. F–I. Released, hyaline ascospores with one septum. Scale bars: A = 200 μm; B–D = 20 μm; E–I = 10 μm.
Ba-

Type: USA, Florida, Clay Co., Green Cove Springs, on underside of leaf of Magnolia glauca (Magnoliaceae), Mar. 1883, G. Martin (holotype NY 00938226, isotype NY 00938225).

Notes: The larger-sized ascomata, and hyaline, 3-septate ascospores of Venturia saccardioides are distinguishable from Venturia s. str.

*Chaetothyrina applanata* (Ellis & G. Martin) M.E. Barr, Mycotaxon 46: 73. 1993. Fig. 61. Basisynonym: Venturia applanata Ellis & G. Martin, Amer. Naturalist 18: 69. 1884.

Ascomata hypophyllous, 115–220 μm diam, scattered or solitary, superficial, globose to subglobose, dark brown at the apex, hyaline at the base, with setae. Setae dark brown, up to 100 μm long, 3.5–5.5 μm wide. *Pseudoparaphyses* 2–3 μm wide, narrowly cellular, septate, hyaline. *Asci* 31–45 × 11–16 μm (av. 38.5 × 13.1 μm, n = 20), 8-spored, bitunicate, fissitunicate, obclavate, each with an inconspicuous ocular chamber. *Ascospores* 12–15 × 4–5 μm (av. 13.6 × 4.6 μm, n = 20), overlapping to triseriate, especially near the base, broadly clavate, hyaline, 1-septate, the upper cells shorter and wider than the lower ones (length ratio: 5.5:7–1:1), smooth-walled.

Typus: USA, Florida, on underside of living leaves of Magnolia glauca (Magnoliaceae), Mar. 1883, G. Martin s.n. (holotype NY 00938204).

Notes: The hyaline, clavate ascospores and persistent pseudoparaphyses of *Venturia applanata* differ from *Venturia s. str.*

*Chaetothyrina asterinoides* (Ellis & G. Martin) M.E. Barr, Mycotaxon 29: 504. 1987. Fig. 62. Basisynonym: Venturia asterinoides Ellis & G. Martin, in Ellis N. Amer. Pyren.: 138. 1892.

Sexual morph: Ascomata superficial, 100–140 μm diam, gregarious, subglobose, wall black, with a conspicuous papillate ostiole, surrounded by slender setae. Setae dark brown, up to 130 μm long, 4–4.5 μm wide, wall 0.5–1.2 μm thick. *Peridium* thin, composed of brown pigmented cells of *textura angularis*. *Pseudoparaphyses* 1.5–2 μm wide, numerous, septate, hyaline, branched. *Asci* 36–47 × 13–18 μm (av. 43.6 × 15.7 μm, n = 20), 8-spored, bitunicate, fissitunicate, broadly clavate, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous ocular chamber. *Ascospores* 16–18.5 × 4.5–5.5 μm (av. 17.2 × 5.1 μm, n = 20), obliquely uni- to triseriate near the base, broadly clavate, hyaline, 1-septate, the upper cells shorter and wider than the lower ones (length ratio: 7:10–1:1), smooth-walled. *Asexual morph*: unknown.

Typus: USA, Florida, on leaves of Quercus laurifolia (Fagaceae), Mar. 1883, G.W. Martin s.n. (holotype NY 00938205).

Notes: The hyaline and clavate ascospores and persistent pseudoparaphyses of *Venturia asterinoides* differ from *Venturia s. str*. Barr (1987) suggested that *Venturia asterinoides* is morphologically comparable to *Chaetothyrina applanata*, although they differ in their hosts and dimensions of asc and ascospores.

*Dimeriella sacchari* (Breda de Haan) Hansf. ex E.V. Abbott, Sugar Cane Dis. World, II: 43. 1964. Fig. 63.

*Ascomata* epiphyllous, 30–60 μm diam, scattered or solitary, becoming superficial, globose to subglobose, with a conspicuously papillate ostiole. *Peridium* thin, 1-layered, composed of 2–3 rows of pigmented cells of *textura angularis*, cells 6–8 μm wide, cell wall 0.8–1.2 μm thick. *Pseudoparaphyses* rare, evanescent when mature. *Asci* 31–45 × 7–12 μm (av. 38.6 × 10 μm, n = 20), 8-spored, bitunicate, fissitunicate, ellipsoid, with a short, knob-like pedicel, each with an inconspicuous ocular chamber. *Ascospores* 11–15 × 4–6 μm (av. 12.8 × 5.2 μm, n = 20), ellipsoid, subhyaline, bi- to triseriate, 1-septate, constricted at the septum, with broadly rounded ends, the upper cells shorter and wider than the lower ones, smooth-walled. *Asexual morph*: unknown.

Material examined: China. Taipei, Ilan County, on the leaves of Saccharum officinarum (Poaceae), 28 Nov. 1925, K. Sawada (HMAS 11669).

Note: The ellipsoid asci and hyaline ascospores of *Venturia sacchari* differ from *Venturia s. str.*

*Johansonia formosa* (Ellis & G.W. Martin) M.E. Barr, Mycotaxon 46: 65. 1993. Fig. 64. Basisynonym: Venturia formosa Ellis & G.W. Martin, in Ellis, N. Amer. Pyren.: 139. 1892.

Ascomata hypophyllous, 115–260 μm diam, scattered or solitary, becoming superficial, discoid, wall black, surrounded by slight setae. Setae dark brown, sepal, 150–180 × 6 μm, sepal wall 0.5–1 μm thick, base swollen, up to 11 μm. *Pseudoparaphyses* rare, 3 μm wide, hyaline, septate. *Asci* 50–69 × 23–33 μm (av. 63.1 × 29.8 μm, n = 10), 8-spored, bitunicate, fissitunicate, ellipsoid, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous ocular chamber. *Ascospores* 23–29 × 10.5–13 μm (av. 26.0 × 11.5 μm, n = 10), ellipsoid to somewhat clavate, pale brown, bi- or triseriate, 1-septate, slightly constricted at the septum, base narrowly rounded to tapered, the upper cells shorter and wider than the lower ones (length ratio: 21.25:1:1), smooth-walled. *Asexual morph*: unknown.

Typus: USA, Florida, clay companies, Green Bay Spa, on the leaves of Olea americana (Oleaceae), 15 Apr. 1885, G. Martin s.n. (holotype NY 00938214).

Note: The larger-sized ascomata and ellipsoid asci differ from *Venturia s. str.*

*Nematoctoma occidentale* (Ellis & Everh.) M.E. Barr, Mycol. Res. 46: 860. 1968. Fig. 65. Basisynonym: Venturia occidentalis Ellis & Everh., J. Mycol. 2: 43. 1886.

Ascomata hypophyllous, 120–284 μm diam, scattered or solitary, becoming erumpent or superficial, globose to subglobose, wall black, with a conspicuously papillate ostiole, surrounded by setae. Setae dark brown, up to 300 μm long, 5–7.5 μm wide, setae wall 2–3 μm thick, base swollen, sepalate. *Pseudoparaphyses* 1.5–2.5 μm wide, hyaline, sepalate, branched. *Asci* 70–90 × 9–11 μm (av. 80–106 × 9–11 μm, n = 20).
Fig. 62. Chaetothyrina asterinoides (holotype NY 00938205) sexual morph. A. Ascomata scattered on the host surface. B–E. Broadly cylindrical to somewhat obclavate asci. F, I. Evanescent pseudoparaphyses. G. Dark brown setae. H. Hyaline, 1-septate ascospores. Scale bars: A = 200 μm; B–E, G = 20 μm; F, H, I = 10 μm.
78.7 × 10.2 μm, n = 10), 8-spored, bitunicate, fissitunicate, cylindrical or clavate, with a short pedicel, each with an inconspicuous ocular chamber. Ascospores 20–27 × 4–6 μm (av. 22.6 × 4.6 μm, n = 20), narrowly cylindrical to fusiform, pale brown, overlapping to biseriate near the top, 3-septate, constricted at the median septum, smooth-walled. Asexual morph: unknown.

Typus: USA, Illinois, Urbana, on leaves of Cirsium discolor (Compositae), 23 Oct. 1885, C.A. Hart 6597 (syntype NY 00938217); idem., 3 Nov. 1885, C.A. Hart 6607 (syntype NY 00938218).

Note: The 3-septate and cylindrical ascospores of Nematostoma occidentale differ from Venturia s. str.
**Niesslia erysiphoides** (Ellis & Everh.) M.E. Barr [as "erysiphoides"], Mycotaxon 46: 50. 1993.  
**Basionym:** *Venturia erysiphoides* Ellis & Everh., J. Mycol. 3: 128. 1887.

Ascomata on stems or leaf sheaths, up to 100 μm diam, in small groups, becoming superficial, globose, collapsing into a cup-shape when dry, wall black, with a conspicuous ostiole, covered with setae. *Setae* dark brown, 40–70 × 5–7 μm, wall 2 μm thick, aseptate. *Pseudoparaphyses* not observed. *Asci* 34–49 × 6–8 μm (av. 41.5 × 7 μm, n = 20), 8-spored, oblong, without pedicel. *Ascospores* 16–20 × 2.5–3 μm (av. 18.1 × 2.8 μm, n = 20), narrowly fusiform, hyaline, bi- to triseriate, 1-septate, with a median septum. *Asexual morph:* unknown.

**Typus:** USA, Louisiana, on stems or leaf sheaths of *Panicum curtisii* (Poaceae), 24 Feb. 1887, A.B. Langlois 1023 (**holotype** NY 00938213, **isotype** NY 00938212).

**Notes:** The slender, hyaline and symmetrical ascospores and the absence of pseudoparaphyses of *Niesslia erysiphoides* differs from *Venturia* s. str. The ascospores of *N. erysiphoides* are larger than other species of *Niesslia* reported in South America (Barr 1993).
**Fig. 65.** *Nematostoma occidentale* (lectotype NYSf 2176) sexual morph. A. Ascomata scattered on the host surface. B–D. Clavate asci. E. Pale brown, 3-septate ascospores. F. Evanescent pseudoparaphyses. G. Dark brown setae. Scale bars: A = 200 μm; B–G = 10 μm.
Fig. 66. Niesslia erysiphoides (holotype NY 00938212) sexual morph. A. Gregarious ascomata on the host surface. B, D. Subcylindrical to somewhat obclavate asci (in cotton blue). C, E. Hyaline, narrowly fusiform ascospores (in cotton blue). F. Dark brown seta. Scale bars: A = 100 μm; B–F = 10 μm.
Fig. 67. Niesslia indicola (holotype NY 00914445) sexual morph. A. Ascomata scattered on the host surface. B, C. Broadly obclavate asci. D. Evanescent pseudoparaphyses. E. Dark brown setae. F. Immature asci and hyaline, 1-septate ascospores. Scale bars: A = 200 μm; B–F = 10 μm.
Niesslia iridicola (M.E. Barr) Crous, M. Shen & Y. Zhang ter, *comb. nov.* MycoBank MB831595. Fig. 67.

*Basionym:* Venturia iridicola M.E. Barr, Sydowia 41: 27. 1989.

Ascomata on leaves or stems, 70–85 × 71–100 μm diam, solitary, scattered or in small groups of 2–3, initially immersed, becoming erumpent, globose to subglobose, wall black, apex erumpent, with the ostiole surrounded by setae. Setae dark brown, 30–44 × 4–6 μm, 0–1-septate, swollen at the base, up to 9 μm wide. **Peridium** 1-layered, composed of 1–2 rows of pigmented cells of *textura angularis*, cells 4–7 × 5–10 μm, cell wall 1 μm thick. **Pseudoparaphyses** 2–3 μm wide, hyaline, septate, branched, persistent. **Asci** 42–50(–67) × 10–13 μm (av. 47.9 × 11.9 μm, n = 20), 8-spored, broadly cylindrical to obclavate, each with an inconspicuous ocular chamber. **Ascospores** 15–18 × 4–5 μm (av. 16.9 × 4.7 μm, n = 20), narrowly fusiform, hyaline, obliquely overlapping to biseriate, 1-septate, the upper cells wider than the lower ones, smooth-walled.

**Asexual morph:** unknown.

**Typus:** Canada, Newfoundland and Labrador, Blanc Sablon, on leaves and stems of *Iris* sp. (*Iridaceae*), 19 Jul. 1957, R.T. Wilce 158 (holotype NY 00914445).

**Notes:** The hyaline, symmetric ascospores, persistent pseudoparaphyses as well as its monocotyledon host disagrees with *Venturia s. str.* The ascomata of *V. iridicola* are tiny, superficial, dark brown and covered with shiny, typical

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**Fig. 68.** Niesslia parasitica (holotype NY 00938219) sexual morph. A. Gregarious ascomata on the host surface. B. Dark brown setae on the surface of ascoma. C, D. Released, pale brown ascospores. Scale bars: A = 100 μm; B–D = 10 μm.
Fig. 69. *Niesslia sabalicola* (holotype NY 00938225) sexual morph. **A.** Ascomata scattered on the host surface. **B.** Dark brown setae. **C–G.** Released, hyaline, 1-septate ascospores (G in cotton blue). Scale bars: A = 200 μm; B–G = 10 μm.
spines, tending to collapse into a cup-like shape when mature and dry. The asci are broadly cylindrical to obl attenuate and ascospores are narrowly fusiform, hyaline, 1-septate. All these characteristics point to Niesslia (Gams et al. 2019).

**Niesslia parasitica** (Ellis & Everh.) Crous, M. Shen & Y. Zhang ter, **comb. nov.** MycoBank MB831594. Fig. 68. Basionym: Venturia parasitica Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 42: 233. 1890.

Ascomata on bark surface, 90–100 μm diam, gregarious, globose to subglobose, with an ostiole, surrounded with setae. Setae dark brown, 30–44 × 4–5 μm, setae wall 1–1.5 μm thick, aseptate, base swollen. *Pseudoparaphyses* not observed. Asci 30–5 × 5 μm (Ellis & Everhart 1890), 8-spored, oblong to cylindrical. Ascospores 6–8 × 2–3 μm (av. 7.3 × 2.7 μm, n = 20), fusiform to broadly fusiform, pale brown, 1-septate, constricted at median septum. **Asexual morph** unknown.

**Typus:** USA, Louisiana, near San Martinsville, on the bark of Magnolia sp. (Magnoliaceae), 21 Jan. 1889, A.B. Langlois 1781 (holotype NY 00938219).

**Notes:** The gregarious ascomata and the absence of pseudoparaphyses disagree with *Venturia s. str.* Because of the poor quality of the specimen, no asci were observed, the description of which was taken from Ellis & Everhart (1890). The tiny, superficial, dark brown ascomata covered with shiny and typical spines, that tend to collapse into a cup-like shape when dry point to *Niesslia* (Gams et al. 2019). Gams et al. (2019) treated *Venturia parasitica* as synonym of *Niesslia pullchriseta*, while the broader ascospores with constricted septa of *Venturia parasitica* are readily distinguished from those of *Niesslia pullchriseta*.

**Niesslia sabalicol**a (Ellis & Everh.) W. Gams, Mycol. Progr. 18(1-2): 62. 2019. Fig. 69. Basionym: *Venturia sabalicol**a* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 42: 233. 1890.

Ascomata epiphyllous, 125–141 μm diam, scattered or subgregarious, erumpent to superficial, globose to subglobose, collapsing into a cup-like shape when dry, surrounded with setae. Setae dark brown, 50–90 × 6–8 μm, aseptate. *Pseudoparaphyses* not observed. Asci 38–56 × 9–11 μm (av. 45.1 × 9.4 μm, n = 20), 8-spored, oblong to broadly clavate. Ascospores 10–15 × 2.5–3 μm (av. 12.6 × 2.9 μm, n = 20), narrowly fusiform, hyaline, 1-septate, with a median septum, slightly constricted not at the septum, smooth-walled. **Asexual morph** unknown.

**Typus:** USA, Louisiana, Bayou Chene, on dead leaves of Sabal palmetto (Arecaceae), 25 Oct. 1888, A.B. Langlois 1546 (holotype NY 00938203).

**Notes:** The symmetrical, 1-septate, hyaline ascospores, and absence of pseudoparaphyses of *V. sabalicol**a* disagree with *Venturia s. str.* The tiny, superficial, dark brown ascomata covered with shiny spines, and the ascoma that tend to collapse into a cup-like shape when dry, as well as the oblong to broadly clavate asci and narrowly fusiform, hyaline, 1-septate ascospores are reminiscent of *Niesslia* (Gams et al. 2019). Because of the poor quality of the specimen, most information was adapted from Ellis & Everhart (1890).

**Niesslia vaccinii** (Ellis & Everh.) Crous, M. Shen & Y. Zhang ter, **comb. nov.** MycoBank MB831593. Fig. 70. Basionym: *Venturia vaccinii* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 46: 325. 1894.

Ascomata hypophyllous, 60–115 μm diam, solitary, scattered, rarely in small groups, erumpent to superficial, globose to subglobose, collapse into a cup-like shape when dry, wall black, surrounded with setae. Setae dark brown, 37–65 × 5–7 μm, setae wall 1–2 μm thick, base swollen, aseptate. *Pseudoparaphyses* not observed. Asci 30–37 × 6–7 μm (av. 34.1 × 6.3 μm, n = 20), 8-spored, fusiform. Ascospores 10–12.7 × 2–2.5 μm (av. 11.3 × 2.1 μm, n = 20), narrowly fusiform, hyaline, bi- to triseriate, 1-septate, symmetrical, slightly constricted at the septum, smooth-walled. **Asexual morph** unknown.

**Typus:** USA, Washington, Seattle, on dead leaves of Vaccinium ovatum (Ericaceae), 16 Dec. 1893, C.V. Piper No. 225 (holotype NY 00938227).

**Notes:** The tiny, superficial, dark brown ascomata covered with shiny spines, which tend to collapse into a cup-like shape when dry, as well as the fusiform asci and hyaline, 1-septate, symmetric narrowly fusiform ascospores point to *Niesslia* (Gams et al. 2019). Gams et al. (2019) assigned *Venturia vaccinii* to synonymy with *Niesslia exilis*. However, the larger-sized asci and ascospores of *Venturia vaccinii* could be readily distinguished from those of *Niesslia exilis* (30–37 × 6–7 μm vs. 40–50 × 4–5 μm and 10–12.7 × 2–2.5 μm vs. (6–) 7–8.5(11) × 1.5–2.0 μm).

**Phomatosporopsis sphaerelloidea** (Höh.) Petr., Ann. Mycol. 25: 249. 1927. Fig. 71.

Basionym: *Venturia sphaerelloidea* Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturw. Cl., Abt. I. 118: 1203. 1909.

Ascomata hypophyllous, 60–130 μm diam, solitary or scattered, becoming semi-immersed, globose to subglobose, wall black, with a conspicuously papillate ostiole. Setae not observed. *Penidium* thin, 1-layered, composed of 1–2 rows of pigmented cells of *textura angularis*, cells 5–12 × 5–11 μm, cell wall 1 μm thick. *Pseudoparaphyses* rare, 2–3 μm wide, hyaline, septate. Asci 30–36 × 8–10 μm (av. 32.8 × 9 μm, n = 20), 8-spored, bitunicate, fissionate, broadly clavate or somewhat oblavate. Ascospores 8–12 × 3–5 μm (av. 10.4 × 3.2 μm, n = 20), fusiform, hyaline, obliquely biseriate, 1-septate, with a median septum, slightly constricted at the septum, the upper cells longer and wider than the lower ones (length ratio: 1:1–3:2), smooth-walled. **Asexual morph** unknown.

**Typus:** Austria, Niederösterreich, on branches of Impatiens noli-tangere (Balsaminaceae), 12 Jul. 1908, P. Strasser (holotype W 0553).

**Notes:** The ascomata lack setae and the ascospores are hyaline, which differ from *Venturia s. str.*, and are reminiscent of *Mycosphaerellaceae*.

**Pyrenobotractus compacta** (Peck) B. Erikss., Svensk Bot. Tidskr. 68: 224. 1974. Fig. 72.

Basionym: *Venturia compacta* Peck, Annual Rep. New York St. Mus. Nat. Hist. 25: 106. 1873 [1872].

Ascomata hypophyllous, 143–200 μm diam, gregarious, superficial, globose to subglobose, wall black, with short, spiny, dark brown setae, setae 19–35 × 6–7 μm, wall 1–2.5 μm...
**Fig. 70.** *Niesslia vaccinii* (holotype NY 00938227) sexual morph. **A, B.** Ascomata scattered on the host surface. **C, E, G, H.** Lanceolate ascus. **D.** Hyaline, fusiform ascospore. **F.** Dark brown seta. Scale bars: A, B = 200 μm; C–H = 10 μm.
thick. Peridium 50 μm wide, 1-layered, composed of several rows of pigmented cells of textura angularis. Pseudoparaphyses 2–4 μm wide, hyaline, septate. Asci 59–66 × 10–11 μm (av. 62.6 × 8.8 μm, n = 10), 8-spored, bitunicate, fissitunicate, cylindrical to clavate, each with an inconspicuous ocular chamber. Ascospores 14–20 × 4–6 μm (av. 16.5 × 5.3 μm, n = 20), broadly cylindrical, hyaline to pale brown, with broadly rounded ends, overlapping to biseriate
near the base, 1-septate, with the septum in the upper third, slightly constricted at the septum, the upper cells shorter and wider than the lower ones (length ratio: 1.3–2.3), smooth-walled. Asexual morph unknown.

Type: **USA**, New York, Rensselaer, Sandlake, on fallen leaves of *Vaccinium macrocarpum* (Ericaceae), Jun. 1871, C.H. Peck (holotype NYSf 826).

Note: The large-sized, gregarious ascomata, cylindrical asci and broadly cylindrical ascospores disagree with *Venturia* s. *str.***

**Venturia clintonii** Peck, Annual Rep. New York St. Mus. Nat. Hist. 28: 82. 1876. Fig. 73.

Ascomata hypophyllous, 100–170 μm diam, scattered, or solitary, erumpent to nearly superficial, globose to subglobose, wall black, with a conspicuous papillate ostiole, surrounded by setae. Setae dark brown, 60–115 × 6–7 μm, wall 1–1.5 μm thick, base swollen, up to 8–12 μm, septate. *Peridium* 10–23 μm wide, 1-layered, composed of 2–3 rows of pigmented cells of *textura angularis*, cells 7–113 × 6–11 μm, cell wall 0.5–1 μm thick. Pseudoparaphyses rare, evanescent when mature. Asci 68–87 × 6–8 μm (av. 75.9 × 6.9 μm, n = 20), 8-spored, bitunicate, fissitunicate, narrowly cylindrical, with a short, furcate pedicle, each with an inconspicuous ocular chamber. Ascospores 10–11 × 4–5 μm (av. 10.4 × 4.8 μm, n = 20), broadly clavate, olivaceous brown, with narrowly rounded ends, obliquely uniseriate, 1-septate, apiosporous, septum in the lower third, the upper cells much longer and wider than the lower ones (length ratio: 7.4–8.3), smooth-walled.

Type: **USA**, New York, Lake Erie, on fallen leaves of *Cornus cinicata* (Cornaceae), May 1874, G.W. Clinton (*holotype* NYSf794).

Note: The numerous, cylindrical asci of *Venturia clintonii* have furcate pedicles, which disagree with *Venturia* s. *str.* Its phylogenetic position remains unclear (no molecular data).

**Venturia musae** Sawada, Special Publ. Coll. Agric., Natl. Taiwan Univ. 8: 73. 1959. *Nom. inval.*, Art. 39.1 (Shenzhen). Fig. 74.

Leaf spots 2–8 mm diam, scattered, diamond, grey or sometimes pale grey in the medium, margin dark brown. Ascomata 35–40 μm diam, 28–41 μm high, scattered or solitary, initially immersed to erumpent, becoming superficial, globose to subglobose, wall black, with a conspicuously papillate ostiole, ostiole 10–12 μm diam, surrounded with setae. Setae dark brown, up to 20 μm long, setae wall 1 μm thick, 1(–2)-septate. *Peridium* 1-layered, composed of 1(–2)–3 rows of pigmented cells of *textura angularis*, cells 4–6 μm wide, cell wall 0.8–1 μm thick. Pseudoparaphyses not observed. Asci 13–19 × 7–8 μm (av. 15.6 × 7.4), 8-spored, bitunicate, fissitunicate, obvoid, with a short, knob-like pedicle or pedicel lacking, each with an inconspicuous ocular chamber. Ascospores 8–10 × 3–3.5 μm (av. 9.4 × 3.4), ellipsoid, hyaline to pale brown, irregularly triseriate or more, medianly 1-septate. Asexual morph unknown.

Type: **China**, Taipei Wooden Gate, on the leaves of *Musa cavendishii* (Musaceae), 25 Apr. 1916, Saburo Fuji (*type* PPMH).

Note: The small ascomata, symmetrical ascospores and the complete absence of pseudoparaphyses of *V. musae* disagree with *Venturia* s. *str.*

**Venturia nebulosa** Ellis & Everh., *J. Mycol.* 8: 66. 1902. Fig. 75.

Ascomata epiphyllous, 70–115 μm diam, gregarious or solitary, becoming superficial, subglobose, wall black, with a conspicuously papillate ostiole, surrounded with setae. Setae dark brown, 30–40 × 4–5 μm, setae wall 1–1.2 μm thick, base swollen, septate. *Peridium* 1-layered, composed of one row of pigmented cells of *textura angularis*, cells 4–8 μm diam, cell wall 1 μm thick. Pseudoparaphyses 1.5–3 μm wide, hyaline, branched, septate, persistent. Asci 30–50 × 13–15 μm (av. 39.5 × 14.2 μm, n = 10), 8-spored, bitunicate, fissitunicate, narrowly oblong, with a short, knob-like pedicle or pedicel lacking, each with an inconspicuous ocular chamber. Ascospores 15–18 × 5–6 μm (av. 16.2 × 5.7 μm, n = 20), fusiform to narrowly fusiform, hyaline, overlapping to triseriate, constricted at the median septum, the upper cells wider than the lower ones, smooth-walled. Asexual morph unknown.

Type: **USA**, Alabama, on overwintered leaves of *Eragrostis sp.* (Gramineae), Nov. 1901, G.W. Carver 613 (*holotype* NY 00938216).

Note: The narrowly oblong asci, persistent pseudoparaphyses and the hyaline ascospores of *Venturia nebulosa* disagree with *Venturia* s. *str.*, while point to *Lasioestemma*. Its taxonomic status cannot be determined yet.

**Venturia pezizoidea** Sacc. & Ellis, *Michelia* 2: 567. 1882. Fig. 76.

Ascomata hypophyllous, 60–115 μm diam, solitary or scattered, erumpent to superficial, globose to subglobose, covered with setae. Setae dark brown, 34–75 × 4–7 μm, setae wall 1–1.2 μm thick, base swollen, aspetate. *Peridium* thin, composed of pale to brown cells of *textura angularis*. Pseudoparaphyses not observed. Asci 32–35 × 7–8 μm (av. 32.5 × 7.3 μm, n = 20), 8-spored, broadly cylindrical to clavate. Ascospores 8–10 × 1.5–2 μm (av. 9.3 × 1.7 μm, n = 20), subcylindrical, hyaline, obliquely uniseriate, aspetate. Asexual morph unknown.

Type: **USA**, New York, Newfield, on fallen leaves of *Andromeda racemosa* (Ericaceae) (*syntypes* NY 00938220, 00938221, 00938222, 00938223, 00938224; MICH 15151).

Note: The hyaline, aspetate ascospores of *Venturia pezizoidea* are readily distinguishable from *Venturia* s. *str.* Its taxonomic status cannot be determined yet.

**Venturia pruni** M.E. Barr, *Canad. J. Bot.* 46: 816. 1968. Fig. 77.

Ascomata epiphyllous, 55–75 μm diam, gregarious, scattered, initially immersed, becoming erumpent, globose to subglobose, wall black, with a conspicuously papillate ostiole. Setae not observed. *Peridium* 4–6 μm wide, 1-layered, composed of pigmented cells of *textura angularis*, cells up to 6 μm wide, cell wall

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Fig. 72. *Pyrenobotrys compacta* (holotype NYSf 826) sexual morph. A, B, Gregarious ascomata on the host surface. C, Section of an ascoma. D, Squash mount with a large number of asci. E, Released, hyaline to pale brown, asymmetrical ascospores. F, Evanescent pseudoparaphyses (in cotton blue). G, Dark brown setae. Scale bars: B = 200 μm; C = 50 μm; D–G = 10 μm.
Fig. 73. Venturia clintonii (holotype NYSf794) sexual morph. A. Ascomata scattered on the host surface. B–F. Narrowly cylindrical asci with short pedicels. G, H. Olivaceous brown, asymmetrical ascospores. I. Dark brown setae. Scale bars: A = 200 μm; B–I = 10 μm.
25 μm thick. Pseudoparaphyses not observed. Asci 25–41 × 7–9 μm (av. 32 × 8.2 μm, n = 20), 8-spored, bitunicate, fissitunicate, broadly cylindrical, broadly clavate or somewhat obclavate, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous ocular chamber. Ascospores 10.5–12 × 3–4 μm (av. 11.3 × 3.4 μm, n = 20), fusiform to narrowly fusiform, olivaceous brown, obliquely uniseriate to biseriate near the base, 1-septate, with a slightly constricted median septum, the upper cells somewhat shorter than the lower ones (length ratio: 5:6–1:1), smooth-walled. Asexual morph unknown. Asexual morph unknown.

Typus: Canada, Quebec, on leaves of Prunus pennsylvanica (Rosaceae), 6 Jul. 1957, M.E. Barr & H.E. Bigelow (holotype NY 00914448, isotype NY 00914449).

Note: The gregarious, immersed ascomata as well as the absence of pseudoparaphyses of V. pruni disagree with Venturia s. str.

**Venturia pulchella** Cooke & Peck, in Peck, Annual Rep. New York St. Mus. Nat. Hist. 25: 106. 1873 [1872]. Fig. 78. Synonym: Gibbera pulchella (Cooke & Peck) Petr., Sydowia 1: 200. 1947.

Ascomata epiphyllous, 100–180 μm diam, 100–140 μm high, gregarious, scattered or solitary, superficial, globose to subglobose, wall black, rough, covered with setae. Setae dark brown, 31–61 × 6–9 μm, base swollen, up to 10–15 μm, setae wall 1.2–1.8 μm. Peridium 18–24 μm wide, thicker near the apex (38–45 μm wide), 2-layered, outer wall composed of thickened cells of textura angularis, cells 6–13 μm diam, cell wall 1–3 μm thick; inner wall composed of thin-walled textura angularis. Pseudoparaphyses dense, 2–4 μm wide, hyaline, septate, constricted at the septum, apex swollen. Asci 60–93 × 8–13 μm (av. 76.5 × 10 μm, n = 20), 8-spored, bitunicate, fissitunicate, cylindrical to somewhat obclavate. Ascospores 11–14 × 4–5 μm (av. 13 × 6 μm, n = 20), ellipsoid, pale brown, obliquely uniseriate or partly overlapping to biseriate near the base, 1-septate, slightly constricted at the septum, with broadly rounded ends, the upper cells shorter than the lower ones (length ratio: 9:17–3:4), smooth-walled. Asexual morph unknown.

Typus: USA, New York, Albany, Center, C.H. Peck (isotype NYSI2478).

Additional materials examined: Canada, Lake Ontario, on leaves of Chamaedaphne calyculata (Ericaceae), 3 Jul. 1935, J.W. Groves (HMAS 03160). USA, New Hampshire, on leaves of C. calyculata, 18 May 1908, W.G. Farlow (HMAS 43696). USA.

Note: The superficial ascomata, dense paraphysoids with swollen pigmented tips that are closely agglutinated, forming a heavy epithecium above the asci, point to Patellariaceae (Patellariales).

**Venturia rhois** Sawada, Special Publ. Coll. Agric., Natl. Taiwan Univ. 8: 73. 1959. Nom. inval. Art. 39.1 (Shenzhen). Fig. 79.

Ascomata amphiogenous, 60–80 μm diam, solitary or scattered, initially immersed, becoming erumpent, globose to subglobose, wall black, with a conspicuous papillate ostiole. Setae not observed. **Peridium** 1-layered, composed of (1)–2–3 rows of pigmented cells of textura angularis, cells 8–12 μm diam, cell wall 0.8–1.5 μm thick. Pseudoparaphyses not observed. Asci 29–66 × 7–10 μm (av. 42.2 × 8.4 μm, n = 20), 8-spored, bitunicate, fissitunicate, cylindrical, with a short, knob-like pedicel or pedicel lacking, each with an inconspicuous occular chamber. Ascospores 11–17 × 2.5–4 μm (av. 13.5 × 2.8 μm, n = 20), cylindrical, hyaline, obliquely uniseriate or partly overlapping to biseriate, 1-septate, with narrowly rounded ends, the upper cells slightly wider than the lower ones, smooth-walled. Asexual morph unknown.

Typus: China, Taichung City, on overwintered leaves of Rhus javanica (Anacardiaceae), 23 Aug. 1944, K. Sawada (holotype HMAS 11670).

Notes: Venturia rhois was described by Sawada (1959) without a Latin diagnosis, rendering it invalid. Its hyaline, 1-septate ascospores and absence of paraphyses point to Micosphaerellaceae.

**DISCUSSION**

A total of 30 genera are treated in the Venturiales, of which eight are newly described. For 19 of these genera, the phylogenetic status has been confirmed via DNA data of the type species, i.e., Bellamyces, Cylindrosympodium, Cylindrosympodium, Fagi- cola, Fraxinicola, Neofusciadium, Parafusciadium, Fusciolium, Pinaceicola, Pseudonanuglenta, Scolecobasidium, Sterila, Sym- podiella, Sympoventuria, Tothia, Tyrranosorus, Venturia s. str., Veronaeopsis and Verruconis. Although more than 20 genera have previously been linked to Venturiales (Hyde et al. 2013,
Venturia nebulosa (holotype NY 00938216) sexual morph. A. Ascomata scattered on the host surface. B. A crushed ascostroma with setae. C. Dark brown seta. D, F, G. Oblong asci (D and G in cotton blue). E. Section of the peridium. H. Hyaline, 1-septate ascospores (in cotton blue). I. Evanescent pseudoparaphyses (in cotton blue). Scale bars: A = 200 μm; B = 50 μm; C–I = 10 μm.
Wijayawardene et al. (2014, 2017), these proposed classifications were mostly devoid of DNA data. Based on the multilocus datasets generated in the present study, three families are now recognised within Venturiales, i.e., Cylindrosympodiaceae, Sympoventuriaceae, and Venturiaceae. The Cylindrosympodiaceae includes the genera Cylindrosympodium, Pseudoanungitea, Septonema, Sympodiella, and Tothia. Morphologically, the hyphomycetous asexual morph, sympodial conidiogenesis, solitary as well as concatenate, subcylindrical, ampulliform to fusoid-ellipsoid conidia point to Venturiales. Although the lifestyles of only a few members of Cylindrosympodiaceae were clarified, where known, they are saprophytic (Fig. 1). The host range of genera of Cylindrosympodiaceae is rather wide, with Sympodiella occurring on members of Pinus (Pinaceae), Betula (Betulaceae) or Fagus (Fagaceae), and Cylindrosympodium on Laurus (Lauraceae) or Pinus (Pinaceae). Geographically, almost all of the known species of Cylindrosympodiaceae are from Europe, which could be due to limited sampling on other continents.

Fig. 76. Venturia pezizoides (syntype MICH 15151) sexual morph. A. Ascomata scattered on the host surface. B, C. Broadly cylindrical asci (in cotton blue). D. Subcylindrical, hyaline ascospores (in cotton blue). E, F. Dark brown setae. Scale bars: A = 100 μm; B–F = 10 μm.
Venturia pruni (holotype NY 00914448) sexual morph. A. Ascomata densely scattered on the host surface. B, D, E. Broadly cylindrical to somewhat obclavate asci. C. Squash mount with several immature asci. F–J. Olivaceous to medium olivaceous, 1-septate ascospores. Scale bars: A = 100 μm; B–J = 10 μm.
Fig. 78. Venturia pulchella (HMAS 43696) sexual morph. A. Ascomata densely scattered on the host surface. B. Section of an ascoma, the peridium of which comprises a few layers of textura angularis. C, D. Evanescent pseudoparaphyses. E–G. Broadly cylindrical to somewhat obclavate asci. H. Seta. I–M. Pale brown to olivaceous brown, 1-septate, asymmetrical ascospores. Scale bars: A = 200 μm; B = 20 μm; C–H = 10 μm; I applies to I–M = 10 μm.
Fig. 79. Venturia rhois (type HMAS 11670) sexual morph. A. Ascomata scattered on the host surface. B–H. Cylindrical to subclavate asci (in cotton blue). I–O. Hyaline, 1-septate ascospores (in cotton blue). Scale bars: A = 100 μm; B–H = 10 μm; I–O = 5 μm.
The Venturiae is the largest family within Venturiales, comprising 11 genera, of which two, Fraxinicola and Fagicola, are newly described. Venturia, the largest genus within the Venturiales, had a rather confused history. Venturia De Not. was introduced to accommodate V. rosea and V. dianthi (De Notaris 1844). Subsequently, Cesati & De Notaris (1883) described two additional species, i.e., V. dickiei and V. eres. Saccardo (1882) emended the description of Venturia De Not., excluded both V. rosea and V. dianthi, while accepting V. dickiei and V. eres. Venturia Sacc. was widely accepted, and was neotypified by V. inaequalis (Korf 1956, Sivanesan 1977). The circumscription of Venturia had been modified several times (Saccardo 1883, Sydow 1932, Korf 1956, Müller & Menon 1956, Sivanesan 1977). Based on morphology, ecological characteristics and DNA sequence comparisons, Zhang et al. (2011) proposed a narrower concept for Venturia, comprising plant parasitic species closely related to the generic type, V. inaequalis. By comparing morphological characteristics and related DNA sequence data, Venturia was re-defined as follows: 1) ascomata immersed, semi-immersed or superficial, scattered or gregarious, often papillate and ostiolate with setae (except for members with immersed ascomata); 2) hamatheciun narrowly cellular, hyaline, evanescent in mature ascomata; 3) asci 8-spored, bitunicate, fissitunicate, broadly cylindrical to obclavate, usually lacking a pedicel; 4) ascospores pale olivaceous to brown, 1-septate, usually asymmetrical (Zhang et al. 2016a, b).

This generic circumscription of Venturia was followed in the present study. Of the 59 specimens of species loaned from herbaria, 37 (59 %) were accepted within Venturia, while other species were reallocated to Gibbera, Niesslia, or the Mycosphaerellaceae.

The Sympoventuriae was introduced based on a well-supported clade comprising Sympoventuria, Veronaeopsis simplex and fusciulidium-like species (Zhang et al. 2011). Subsequently, more genera have been accepted in the family, such as Ochroconis, Scolecobasidium and Verruconis (Machouart et al. 2014, Samerpitak et al. 2014). Scolecobasidium, the largest genus within the Sympoventuriae, was described based on two species, S. terreum and S. constrictum, which are characterised by rust-brown to olivaceous colonies producing small, brownish conidiophores bearing small numbers of dark, septate, rough-walled, rhizolytic conidia (Abbott 1927, Ellis 1976). Scolecobasidium terreum was designated as the generic type, which has Y-shaped and yellowish conidia (Abbott 1927). More species with unbranched and darker conidia were described within Scolecobasidium (Matsushima 1975), which led to the introduction of another genus, Ochroconis (de Hoog & von Arx 1974). Ochroconis, typified by O. constricta, has sympodial conidiogenesis and unbranched, subspherical to cylindrical or clavate, melanised conidia. The number of species in the generic complex has increased significantly over the years (De Hoog 1985, Samerpitak et al. 2014, 2017). Ochroconis is a rather common genus of saprotrophic soil hyphomycetes, some of which are parasitic on humans, fish or other animals (Samerpitak et al. 2017). The type strains of both S. terreum (CBS 203.27) and O. constricta (CBS 202.27), unfortunately, are now sterile (Hördt et al. 1999, Gams 2015). Based on the single-locus analyses of nuSSU, nuLSU, ITS, ACT1, TUB2, and tef1-a, Samerpitak et al. (2014) indicated that Ochroconis and Scolecobasidium clustered together, while Scolecobasidium was considered as doubtful because of the type material was “ambiguous”. This proposal, however, was not recognised by some researchers (Seifert et al. 2011, Gams 2015). Although the ex-type strain of S. terreum is sterile, there are many reliably named cultures of S. terreum globally, which clearly define the identity of this characteristic fungus (Gams 2015), which clusters with species accommodated in Ochroconis. Based on the principle of priority, Scolecobasidium was thus chosen over Ochroconis in the present study. Furthermore, six new genera were introduced within Sympoventuriae. The multilocus phylogenetic analyses indicated that Scolecobasidium and its closely related neighbours belong to the family Sympoventuriae in the order Venturiales (Machouart et al. 2014, this study).

The morphological characteristics of sexual morphs within Venturiales are rather conservative. Due to the overlapping morphological characteristics of sexual morphs among venturialaceous species, the asexual morph proved to be more reliable for species identification (Schubert et al. 2003). The morphology of the conidial apparatus, including conidiophores, conidiogenous cells and conidia has been widely used in the traditional taxonomy of Venturiales (Sivanesan 1977, Schubert et al. 2003, Crous et al. 2007b). Of all the features plotted in Figs 1, 2, conidial arrangement (solitary or in chains), proved to be informative at the generic level (except in Venturia s. str.). The mode of conidiogenesis, i.e., sympodial proliferation (Fusicladium), monoblastic, determinate to percurrent proliferation (Polaccia, with few rather inconspicuous anellations) and percurrent proliferation with conspicuous anellations (Spilocaea) showed little significance at generic level classification. This view was also supported by Schubert et al. (2003) for Venturia, and for various genera in Mycosphaerellaceae (Videira et al. 2017).

The Venturia clade presently includes isolates from various host families such as Betulaceae, Caprifoliaceae, Convulvulaceae, Gentianaceae, Oleaceae, Polygonaceae, Rosaceae, Salicaceae as well as lichens. The tendency of host-shift speciation between hosts and Venturia species had been documented by Schnabel et al. (1999) and Schubert et al. (2003). In this study, some well-circumscribed genera, such as Fraxinicola, Neofusicladium, Parafusicladium, Sympoventuria and Tyrannosorus showed a stronger host generic specialization. In contrast, the current Venturia s. str. clade seems not well resolved, as it contains taxa associated with various host genera or families.

The ancestral state of Venturiales is most likely saprobic, and plant pathogens appear to be a new evolutionary state, as has been reported for Capnodiales (Abdollahzadeh et al. 2020) and Dothideomycetes in general (Haridas et al. 2020). Members of plant pathogens have arisen from saprotrophic members in both Venturiales and Sympoventuriae, clustering terminal in the phylogenetic trees (Figs 1, 2). Similar results have been reported for the majority of lineages in the larger context of Ascomycota (Schoch et al. 2009a, b), or at ordinal level, such as Pleosporales and Capnodiales (Crous et al. 2009, Zhang et al. 2009). The most interesting is that saprotrophic fungal ancestors had repeatedly lost their plant cell wall degradation enzymes and obtained effector-like secreted proteins to fit a plant-fungal associated lifestyle (as ectomycorrhizas, ECM) (Kohler et al. 2015, Martin et al. 2016). Thus, the saprotrophic lifestyle seems ancestral at ordinal level (Venturiales), as well as at class level (Dothideomycetes) (Haridas et al. 2020).
Although the present study has clarified our understanding of families and genera in Venturiales, future studies will undoubtedly add many more genera and species to this order, given its wide ecological and geographic distribution.

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