

Phylogeny of saprobic microfungi from Southern Europe

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Abstract: During a survey of saprophytic microfungi on decomposing woody, herbaceous debris and soil from different regions in Southern Europe, a wide range of interesting species of asexual ascomycetes were found. Phylogenetic analyses based on partial gene sequences of SSU, LSU and ITS proved that most of these fungi were related to *Sordariomycetes* and *Dothideomycetes* and to lesser extent to *Leotiomycetes* and *Eurotiomycetes*. Four new monotypic orders with their respective families are proposed here, i.e. *Lauriomycetales*, *Lauriomycetaceae*; *Parasymphodiellales*, *Parasymphodiellaceae*; *Vermiculariopsiales*, *Vermiculariopsiaceae* and *Xenospadicoiales*, *Xenospadicoideaceae*. One new order and three families are introduced here to accommodate orphan taxa, viz. *Kirschsteinotheliales*, *Castanediellaceae*, *Leptodontidiaceae* and *Pleomonodictyaceae*. Furthermore, *Bloxamiaceae* is validated. Based on morphology and phylogenetic affinities *Diplococcium singulare*, *Trichocladium opacum* and *Spadicoides atra* are moved to the new genera *Paradiplococcium*, *Pleotrichocladium* and *Xenospadicoideis*, respectively. *Helicoon fuscosporum* is accommodated in the genus *Magnohelicospora*. Other novel genera include *Neoascotaiwania* with the type species *N. terrestris* sp. nov., and *N. limnetica* comb. nov. previously accommodated in *Ascotaiwania*; *Pleomonodictys* with *P. descalsii* sp. nov. as type species, and *P. capensis* comb. nov. previously accommodated in *Monodictys*; *Anapleurothecium* typified by *A. botulisporum* sp. nov., a fungus morphologically similar to *Pleurothecium* but phylogenetically distant; *Fuscosclera* typified by *F. lignicola* sp. nov., a meristematic fungus related to *Leotiomycetes*; *Pseudodiplococcium* typified by *P. ibericum* sp. nov. to accommodate an isolate previously identified as *Diplococcium pulneyense*; *Xyladictyochaeta* typified with *X. lusitanica* sp. nov., a foliicolous fungus related to *Xylariales* and similar to *Dictyochaeta*, but distinguished by polyphialidic conidiogenous cells produced on setiform conidiophores. Other novel species proposed are *Brachysporiella navarrica*, *Catenulostroma lignicola*, *Cirrenalia iberica*, *Conioscypha pleiomorpha*, *Leptodontidium aureum*, *Pirozynskiella laurisilvatica*, *Parasymphodiella lauri* and *Zanclospora iberica*. To fix the application of some fungal names, lectotypes and/or epitypes are designated for *Magnohelicospora iberica*, *Sporidesmium trigonellum*, *Sporidesmium opacum*, *Sporidesmium asperum*, *Camposporium aquaticum* and *Psilonia atra*.

Key words: Biodiversity, *Dothideomycetes*, *Eurotiomycetes*, *Leotiomycetes*, *Sordariomycetes*, Systematics.

Taxonomical novelties: **New orders:** *Kirschsteinotheliales* Hern.-Restr., Gené, R.F. Castañeda & Crous, *Lauriomycetales* Hern.-Restr., R.F. Castañeda & Guarro, *Parasymphodiellales* Hern.-Restr., Gené, R.F. Castañeda & Crous, *Vermiculariopsiales* Hern.-Restr., J. Mena, Gené & Crous, *Xenospadicoiales* Hern.-Restr., J. Mena & Gené; **New families:** *Castanediellaceae* Hern.-Restr., Guarro & Crous, *Lauriomycetaceae* Hern.-Restr., R.F. Castañeda & Guarro, *Leptodontidiaceae* Hern.-Restr., Crous & Gené, *Parasymphodiellaceae* Hern.-Restr., Gené, Guarro & Crous, *Pleomonodictyaceae* Hern.-Restr., J. Mena & Gené, *Vermiculariopsiaceae* Hern.-Restr., J. Mena, Gené & Crous, *Xenospadicoideaceae* Hern.-Restr., J. Mena & Gené; **New genera:** *Anapleurothecium* Hern.-Restr., R.F. Castañeda & Gené, *Fuscosclera* Hern.-Restr., J. Mena & Gené, *Neoascotaiwania* Hern.-Restr., R.F. Castañeda & Guarro, *Paradiplococcium* Hern.-Restr., J. Mena & Gené, *Pleomonodictys* Hern.-Restr., J. Mena & Gené, *Pleotrichocladium* Hern.-Restr., R.F. Castañeda & Gené, *Pseudodiplococcium* Hern.-Restr., J. Mena & Gené, *Xenospadicoideis* Hern.-Restr., J. Mena & Gené, *Xyladictyochaeta* Hern.-Restr., R.F. Castañeda & Gené; **New species:** *Anapleurothecium botulisporum* Hern.-Restr., R.F. Castañeda & Gené, *Brachysporiella navarrica* Hern.-Restr., R.F. Castañeda & Gené, *Catenulostroma lignicola* Hern.-Restr., J. Mena & Gené, *Cirrenalia iberica* Hern.-Restr. & Gené, *Conioscypha pleiomorpha* Hern.-Restr., R.F. Castañeda & Gené, *Fuscosclera lignicola* Hern.-Restr., J. Mena & Gené, *Leptodontidium aureum* Hern.-Restr., Guarro & Gené, *Parasymphodiella lauri* Hern.-Restr., Gené & Guarro, *Parasymphodiella lauri* Hern.-Restr., Gené & Guarro, *Pirozynskiella laurisilvatica* Hern.-Restr., R.F. Castañeda & Gené, *Pleomonodictys descalsii* Hern.-Restr., J. Mena & Gené, *Pseudodiplococcium ibericum* Hern.-Restr., J. Mena & Gené, *Xyladictyochaeta lusitanica* Hern.-Restr., R.F. Castañeda & Gené, *Zanclospora iberica* Hern.-Restr., J. Mena & Gené; **New combinations:** *Magnohelicospora fuscospora* (Linder) R.F. Castañeda, Hern.-Restr. & Gené, *Neoascotaiwania limnetica* (H.S. Chang & S.Y. Hsieh) Hern.-Restr., R.F. Castañeda & Gené, *Paradiplococcium singulare* (Hern.-Restr., J. Mena, Gené & Guarro) Hern.-Restr., J. Mena & Gené, *Pleomonodictys capensis* (R.C. Sinclair, Boshoff & Eicker) Hern.-Restr., J. Mena & Gené, *Pleotrichocladium opacum* (Corda) Hern.-Restr., R.F. Castañeda & Gené, *Xenospadicoideis atra* (Corda) Hern.-Restr., J. Mena & Gené; **Typifications:** **Lectotypifications:** *Camposporium aquaticum* Dudka, *Psilonia atra* Corda, *Sporidesmium asperum* Corda, *Sporidesmium opacum* Corda; **Epitypifications:** *Magnohelicospora iberica* R.F. Castañeda, Hern.-Restr., Gené & Guarro, *Sporidesmium trigonellum* Sacc., *Sporidesmium opacum* Corda, *Sporidesmium asperum* Corda, *Camposporium aquaticum* Dudka, *Psilonia atra* Corda.

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INTRODUCTION

Fungi are hyper-diverse organisms, and although only 100 000 species are presently acknowledged, species numbers are estimated to range between 1.5 to 5.1 million (Hawksworth 2004, Blackwell 2011). This high diversity is partly due to the fact that many fungi are cosmopolitan, having a wider geographical distribution than plants and other organisms. Furthermore, many

habitats and substrates remain unexplored as far as Fungi are concerned, and potentially might support many undescribed species. In addition, the use of new isolation techniques, culture media and molecular, DNA-based data will reveal many of the species that have thus far been overlooked (Hawksworth & Rossman 1997).

The current classification of the kingdom *Fungi* is based largely on polyphasic taxonomy in which numerous authors have

attempted to integrate morphological and molecular data (Huhndorf *et al.* 2004, Geiser *et al.* 2006, James *et al.* 2006, Spatafora *et al.* 2006, Wang *et al.* 2006, Hibbett *et al.* 2007, McLaughlin *et al.* 2009, Schoch *et al.* 2009, Hyde *et al.* 2013, Liu *et al.* 2015a, b, Wang *et al.* 2015a, b, c, Vu *et al.* 2016). DNA barcoding based on the internal transcribed spacer (ITS) region has become, among several other molecular techniques, an important tool for species identification (Quaedvlieg *et al.* 2012, Schoch *et al.* 2012). However, the ITS is inconclusive in some genera and, therefore, additional genes such as, LSU, *tef1*, *tub*, *rpb2*, etc. are required for a more accurate identification (Stielow *et al.* 2015). Nevertheless, the majority of the described fungal species are only represented by dried specimens in fungaria and lack DNA barcode data (Crous *et al.* 2014a, 2015a), which represents a significant handicap for defining either a phylogenetic species concept, or in the best case, an integrated or consolidated species concept. Therefore, there is an important need for field studies in order to recollect and hopefully to isolate in pure culture as many fungal species as possible what would allow proper morphological and molecular characterisation. Furthermore, when necessary, this approach will also allow for the re-typification of taxa with living cultures and DNA barcodes.

In this context, different surveys were conducted in several areas of ecological interest of the Iberian continental and insular (Balears and Canary Islands) areas in order to explore the diversity of microfungi in various substrates including litter, submerged dead plant material and soil (Mena-Portales *et al.* 2011, 2015, 2016, Hernández-Restrepo *et al.* 2012, 2013, 2014a, b, Castañeda-Ruiz *et al.* 2012, Madrid *et al.* 2016). As initial approach, we tried to culture and identify all of these fungi, and to elucidate their phylogeny within the *Ascomycota*.

In the present study, the taxonomy of more than 50 fungi, including 14 new species and nine new genera, has been resolved. Based on the combination of morphological features and sequence analyses of the nuclear rDNA operon, five new orders and seven new families distributed in different classes (i.e. *Dothideomycetes*, *Eurotiomycetes*, *Leotiomycetes* and *Sordariomycetes*) are introduced. Living cultures and sequences of the taxa found in the above-mentioned surveys have been deposited in public culture collections and DNA sequence databases, respectively.

MATERIALS AND METHODS

Isolates

The microfungi were isolated from dead leaves, wood, bark, seeds and soil samples collected in several natural areas of the Iberian Peninsula (Spain and Portugal) and Islands, during a period from 2009 to 2013, mainly during spring and autumn (Table 1). Plant debris were placed in moist chambers and treated according to Castañeda-Ruiz *et al.* (2016). Fungi from soil samples were isolated by using wood baiting and dilution-plating techniques, following the techniques described in Caldach *et al.* (2004). Single-conidial cultures were performed on water agar (Difco agar 5 g, 1000 mL tap water, pH 6). All the isolates are maintained in the culture collection of the Faculty of Medicine at the Rovira i Virgili University (FMR), Reus, Spain. Type specimens and ex-type cultures of the novel fungi were deposited in the Westerdijk Fungal Biodiversity Institute (CBS), Utrecht, the Netherlands (Table 1), and some also in the Belgian Co-ordinated Collections of Microorganisms (MUCL), Belgium,

and in Kew Royal Botanical Gardens, England. Additional type specimens, ex-type cultures or strains of different species used for comparison were obtained from the CBS culture collection (Table 1). The identification of the reference strains included in the study was confirmed mainly based on the comparison with the protologues and/or examination of holotypes when possible. Nomenclatural novelties and descriptions were deposited in MycoBank (Crous *et al.* 2004).

Morphology

Morphological features were obtained from fungi growing on the natural substratum and on potato carrot agar (PCA; potatoes 20 g; carrots 20 g; agar 20 g; distilled water 1 L) or on oatmeal agar (OA; filtered oat flakes, 20 g agar, distilled water 1 L), incubated at 25 °C in the dark. Colony colours were assessed according to the charts of Rayner (1970). Measurements and descriptions of microscopic structures were taken from specimens mounted in either lactic acid or polyvinyl alcohol, using an Olympus BH-2 light microscope (Olympus Corporation, Tokyo, Japan). Lactophenol cotton blue was used as contrast colourant to examine hyaline structures. Photomicrographs were taken using differential interference contrast and phase contrast optics with a Zeiss Axio ImagerM1 light 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.

DNA isolation, sequencing and phylogeny

Genomic DNA was extracted from fungal colonies using the FastDNA kit (MP Biomedicals, CA, USA) and PrepMan Ultra sample preparation reagent (Applied Biosystems, Foster City, CA, USA), following the manufacturer's protocols. Colonies were growing on OA or PCA at 25 °C for 1–2 wk; potato-dextrose broth (PDB) was used for those strains with slow growth. The primer sets NL1-NL4b (O'Donnell 1993), LROR-LR5 and ITS4-ITS5 (White *et al.* 1990) were used to amplify part of the nuclear rDNA operon spanning the 3' end of the 18S rRNA gene, the first internal transcribed spacer (ITS1), the 5.8S rRNA gene, the second ITS region (ITS2) and ± 700 bp of the 5' end of the 28S rRNA gene (LSU), respectively. The small subunit of the rRNA (SSU) was amplified with the primers NS1–NS4 (White *et al.* 1990). The amplification cycles were performed following Cano *et al.* (2004). PCR products were purified and sequenced at MacroGen Corp. Europe (Amsterdam Zuid-Oost, the Netherlands) with an ABI PRISM 3730XL DNA Analyzer (Applied Biosystems, CA, USA). The program SeqMan v. 7.0 (Lasergene, Madison, WI, USA) was used to obtain consensus sequences.

The evolutionary relationships of the fungal isolates with other *Ascomycota* were mainly based on the analysis of the LSU and SSU gene sequences. Additional homologous sequences were retrieved from GenBank after a BLAST search and added in the phylogenetic analysis. Alignments were made using the web interface MAFFT v. 7 (Kato & Standley 2013), followed by manual adjustments with MEGA v. 6 (Tamura *et al.* 2013) and a text editor. These alignments were deposited in TreeBASE (www.treebase.org) under the submission number S20197.

Phylogenetic reconstructions were performed using Maximum-Likelihood (ML) and Bayesian Inference (BI)

Table 1. List of isolates included in the study.

Taxa ¹	Preliminary Identification	Strain ²	Substrate	Locality ³	Fungal Class	GenBank ⁴		
						SSU	LSU	ITS
<i>Anapleurothecium botulisporum</i> gen. et sp. nov.*		FMR 11490, CBS 132713	Dead wood	Spain, Asturias, Picos de Europa N.P.	<i>Sordariomycetes</i>		KY853483	KY853423
<i>Anungitea syzygii</i> *		FMR 11934	Dead wood	Spain, Castilla-La Mancha, Hayedo de la Tejera Negra	<i>Dothideomycetes</i>		KY853484	KY853424
<i>Bactrodesmiastrum moniliodest</i> †		FMR 10756, CBS 137251	Dead wood	Spain, Aragón, Ordesa y Monte Perdido N.P.	<i>Sordariomycetes</i>		KF771879	KF771878
		FMR 11337, CBS 137252	Dead wood	Spain, Asturias, Picos de Europa N.P.	<i>Sordariomycetes</i>		KF771877	KF771876
<i>B. obovatum</i> †	<i>Janetia obovata</i>	FMR 6482, CBS 101300	Dead wood	Spain, Mallorca, Sierra de Tramuntana	<i>Sordariomycetes</i>		FR870266	FR870264
<i>B. pyriforme</i> †		FMR 10747, CBS 127867	Dead wood	Spain, Aragón, Ordesa y Monte Perdido N.P.	<i>Sordariomycetes</i>		FR870263	FR870265
<i>Bactrodesmium pallidum</i> *		FMR 11345, CBS 130515	Dead wood	Spain, Cantabria, Saja-Besaya N.P.	<i>Sordariomycetes</i>		KY853485	KY853425
<i>Bloxamia truncata</i> *		FMR 11240	Dead wood	Spain, Cantabria, Saja-Besaya N.P.	<i>Leotiomyces</i>		KY853486	KY853426
<i>Brachysporiella navarrica</i> sp. nov.	<i>Brachysporiella</i> sp.	FMR 12426, CBS 142296	Dead wood	Spain, Navarra, Baribar	<i>Dothideomycetes</i>	HF937359	KY853487	KY853427
<i>Cacumisporium capitulatum</i>	<i>Chaetosphaeria decastyla</i>	FMR 11339	Dead wood	Spain, Galicia, Las Fragas del Eume P.	<i>Sordariomycetes</i>		HF677190	HF677176
<i>Camposporium antennatum</i>	" <i>Paradendryphiella salina</i> "	CBS 734.96	Unknown	Cuba	<i>Dothideomycetes</i>		KF156156	KF156100
<i>C. cambrense</i> *		FMR 12069	Submerged wood	Spain, Aragón, Sierra y Cañones del Guara P.	<i>Dothideomycetes</i>	HF937343	KY853488	KY853428
<i>Camposporium</i> sp.		MHR 1565	Dead wood	Thailand, Nan province, Bo Kluea	<i>Dothideomycetes</i>		MF155650	
<i>Catenulostroma lignicola</i> sp. nov.		FMR 11491, CBS 130285	Dead wood	Spain, Galicia, Las Fragas del Eume P.	<i>Dothideomycetes</i>	HF937354	KY853489	KY853429
<i>Ceratocladium polysetosum</i> †*		FMR 10750	Bark	Spain, Aragón, Ordesa y Monte Perdido N.P.	<i>Dothideomycetes</i>	HF937345	KY853490	KY853430
<i>Ceratosporella novae-zealandiae</i> *		FMR 10760	Dead wood	Spain, Aragón, Teruel	<i>Eurotiomyces</i>	HF937346	KY853491	KY853431
<i>Chaetopsina fulva</i>		FMR 13129, CBS 137301	Dead leaves	Spain, Canary Island, La Gomera	<i>Sordariomycetes</i>		KY853492	KY853432
<i>C. penicillata</i>		FMR 10948	Submerged wood	Spain, Valencia	<i>Sordariomycetes</i>		KY853493	KY853433
<i>Chalara hughesii</i>		FMR 12413, CBS 142292	Dead wood	Spain, Navarra, Baribar	<i>Leotiomyces</i>		KY853494	KY853434
<i>Chloridium chloroconium</i>	<i>Gonytrichum chlamydosporoides</i> var. <i>simile</i>	FMR 11940	Dead wood of <i>Quercus</i>	Spain, Burgos, Sierra de la Demanda	<i>Sordariomycetes</i>		KY853495	KY853435
<i>Cirrenalia iberica</i> sp. nov.	<i>Cirrenalia</i> sp.	FMR 12149, CBS 142289	Soil	Spain, Aragón, Ordesa y Monte Perdido N.P.	<i>Sordariomycetes</i>		KY853496	KY853436
		FMR 12418, CBS 142295	Submerged wood	Spain, Aragón, Valles Occidentales P.	<i>Sordariomycetes</i>		HF678542	HF678532
<i>Cladophialophora pseudocarrionii</i> †		FMR 12062, CBS 138591	Soil	Spain, Castilla-La Mancha, Hayedo de la Tejera Negra	<i>Eurotiomyces</i>		KU705844	KU705827
<i>Conioscypha hoehnelii</i> *		FMR 11592	Dead wood	Spain, Castilla y León, San Pedro de Arlanza	<i>Sordariomycetes</i>	HF937348	KY853497	KY853437

(continued on next page)

Table 1. (Continued)

Taxa ¹	Preliminary Identification	Strain ²	Substrate	Locality ³	Fungal Class	GenBank ⁴		
						SSU	LSU	ITS
<i>C. minutispora</i> †		FMR 11245, CBS 137253	Twig	Spain, Cantabria, Saja-Besaya N.P.	<i>Sordariomycetes</i>		KF924559	KF924559
<i>C. pleiomorpha</i> sp. nov.	<i>Conioscypha</i> sp.	FMR 13134, CBS 138110	Dead wood	Spain, Canary Islands, Tenerife, Las Mercedes	<i>Sordariomycetes</i>		KY853498	KY853438
<i>Cordana verruculosat</i>		FMR 10754, CBS 121870	Dead wood	Spain, Aragón, Ordesa y Monte Perdido N.P.	<i>Sordariomycetes</i>		HE672163	HE716752
<i>Dematioscypha dematicola</i>	<i>Haplographium delicatum</i>	FMR 11585	Dead wood	Spain, Aragón, Ordesa y Monte Perdido N.P.	<i>Leotiomycetes</i>	HF937353	HF677187	HF677177
<i>Dictyochaeta fuegiana</i>	<i>Chaetosphaeria fuegiana</i>	FMR 13126	Dead wood	Spain, Canary Island, La Palma	<i>Sordariomycetes</i>		KY853500	KY853440
<i>Dictyosporium elegans</i>		FMR 13125, CBS 137303	Dead wood	Spain, Asturias, Cangas de Narcea	<i>Dothideomycetes</i>		KY853501	KY853441
<i>Endophragmiella dimorphospora</i> *		FMR 12150	Soil	Spain, Canary Islands, Barranco Laurisilva	<i>Sordariomycetes</i>	HF937351	KY853502	KY853442
<i>Exophiala equina</i>		FMR 12091	Soil	Spain, Aragón, Ordesa y Monte Perdido N.P.	<i>Eurotiomycetes</i>		KY853503	KY853443
<i>Fuscosclera lignicola</i> gen. et sp. nov.		FMR 11236, CBS 142287	Dead wood	Spain, Galicia, Los Ancares P.	<i>Leotiomycetes</i>		KY853504	KY853444
<i>Hansfordia pulvinata</i> *		FMR 12706, CBS 142297	Grass leaves	Spain, Mallorca, Sierra de Tramuntana	<i>Sordariomycetes</i>	HF937352	HF678545	HF678535
<i>Hyaloscypha aureliella</i>	<i>Cheiromycella microscopica</i>	FMR 10851	Dead wood	Spain, Aragón, Teruel	<i>Leotiomycetes</i>		KY853505	KY853445
		FMR 11559	Dead wood of <i>Pinus</i> sp.	Spain, Castilla y León, Burgos, Hontoria del Pinar	<i>Leotiomycetes</i>		KY853506	KY853446
<i>Jalapriya toruloides</i>	<i>Dictyosporium toruloides</i>	FMR 11942	Dead wood	Spain, Aragón, Ordesa y Monte Perdido N.P.	<i>Dothideomycetes</i>		HF677188	HF677181
		FMR 12419	Dead wood	Spain, Aragón, Valles Occidentales P.	<i>Dothideomycetes</i>		HF678543	HF678533
<i>Lauriomycetes bellulus</i>		FMR 12188	Dead leaves	Portugal, Viana do Castello, Lagoas de Bertiandos, P.A.	<i>Leotiomycetes</i>		HF678541	HF678531
<i>Leptodontidium aureum</i> sp. nov.		FMR 11834, CBS 142316	Soil	Spain, Galicia, Las Fragas del Eume P.	<i>Leotiomycetes</i>	HF937355	KY853507	KY853447
<i>L. irregulare</i>		CBS 851.73	Soil	Sweden, Skåne	<i>Leotiomycetes</i>	AY129281	KY853508	KY853448
<i>L. trabinellum</i>	<i>Leptodontidium elatius</i>	CBS 329.53	Decaying wood of <i>Betula</i>	France	<i>Leotiomycetes</i>	AY129280	KY853509	AY129285
<i>Magnohelicospora ibericat</i> *		FMR 12414, CBS 142293	Dead leaves	Spain, Navarra, Robledal de Orgi	<i>Dothideomycetes</i>		KY853510	
<i>Menispora glauca</i> *		FMR 12089	Bark	Spain, Burgos, Sierra de la Demanda	<i>Sordariomycetes</i>		HF678538	HF678528
<i>Monochaetia kansensis</i>		FMR 11156	Dead wood	Spain, Cantabria, Saja-Besaya N.P.	<i>Sordariomycetes</i>		KY853511	
<i>Monodictys nigrospermum</i> *	<i>Monodictys levis</i>	FMR 11941, CBS 132489	Soil	Spain, Galicia, Los Ancares P.	<i>Sordariomycetes</i>		HF677186	HF677180
<i>Myrmecridium schulzeri</i>		FMR 12424	Grass leaves	Spain, Navarra, Robledal de Orgi	<i>Sordariomycetes</i>		KY853512	KY853451

Table 1. (Continued)

Taxa ¹	Preliminary Identification	Strain ²	Substrate	Locality ³	Fungal Class	GenBank ⁴		
						SSU	LSU	ITS
<i>Neoscotaiwania limnetica</i> comb. nov.	<i>Ascotaiwania lignicola</i>	CBS 126576	Submerged wood of <i>Alnus glutinosa</i>	France, Ariège, Rimont, Peyrau brook	<i>Sordariomycetes</i>		KY853513	KY853452
		CBS 126792	Submerged wood	France, Ariège, Rimont, Peyrau brook	<i>Sordariomycetes</i>		KY853514	KY853453
<i>N. terrestris</i> gen. et sp. nov.		FMR 12412, CBS 142291	Soil	Spain, Asturias, Picos de Europa N.P.	<i>Sordariomycetes</i>	KY853547	KY853515	KY853454
<i>Oncopodiella trigonella</i> *		FMR 10788, CBS 126413	Bark	Spain, Aragón, Teruel	<i>Dothideomycetes</i>	KY853548	KY853516	KY853455
<i>Paradiplococcium singulare</i> †* gen. et comb. nov.	<i>Diplococcium singulare</i>	FMR 10752, CBS 126091	Dead wood	Spain, Aragón, Ordesa y Monte Perdido N.P.	<i>Sordariomycetes</i>		KY853517	KY853456
<i>Paramyrothecium roridum</i>	<i>Myrothecium roridum</i>	FMR 11946	Soil	Spain, Aragón, Teruel	<i>Sordariomycetes</i>		HF678539	HF678529
<i>Parasymphodiella lauri</i> sp. nov.	<i>Parasymphodiella</i> sp.	FMR 13132, CBS 138108	Dead leaves of <i>Laurus</i> sp.	Spain, Canary Islands, La Palma	<i>Sordariomycetes</i>		KY853518	KY853457
<i>Phaeodactylium stadleri</i> †*		FMR 12185, CBS 132715	Dead leaves of <i>Ammophila arenaria</i>	Portugal, Playa de Ofir	<i>Dothideomycetes</i>		HF678536	HF678526
<i>Phaeoisaria sparsa</i> *		FMR 11939	Dead wood	Spain, Aragón, Ordesa y Monte Perdido N.P.	<i>Sordariomycetes</i>		HF677185	HF677179
<i>Phragmocephala glanduliformis</i> *		FMR 11237	Bark	Spain, Valencia	<i>Dothideomycetes</i>	HF937357	KY853519	KY853458
<i>Pirozynskiella laurisilvatica</i> sp. nov.	<i>Pirozynskiella</i> sp.	FMR 13133, CBS 138109	Dead leaves of <i>Laurus</i> sp.	Spain, Canary Islands, La Gomera	<i>Dothideomycetes</i>		KY853520	KY853459
<i>Pleomonodictys capensis</i> comb. nov.	<i>Monodictys capensis</i>	CBS 968.97		South Africa, Western Cape Region	<i>Dothideomycetes</i>		KY853521	KY853460
<i>P. descalsii</i> gen. et sp. nov.	<i>Monodictys</i> sp.	FMR 12716, CBS 142298	Bark <i>Quercus</i>	Spain, Mallorca, Sierra de Tramuntana	<i>Dothideomycetes</i>		KY853522	KY853461
<i>Pleotrichocladium opacum</i> gen. et comb. nov.	<i>Trichocladium opacum</i>	FMR 12088, CBS 142288	Soil	Spain, Aragón, Ordesa y Monte Perdido N.P.	<i>Dothideomycetes</i>		HF678540	HF678530
		FMR 12416, CBS 142294	Dead wood	Spain, Navarra, Robledal de Orgi	<i>Dothideomycetes</i>		KY853523	KY853462
		CBS 450.70	Dead wood of <i>Thuja occidentalis</i>	The Netherlands, Baarn, garden Eemnesserweg 90	<i>Dothideomycetes</i>		KY853524	KY853463
		CBS 534.66	Soil	Austria, Vorarlberg	<i>Dothideomycetes</i>		KY853525	KY853464
		CBS 709.92	Lichen	Antarctica, King George, Jubany	<i>Dothideomycetes</i>		KY853526	
<i>Pseudodiplococcium ibericum</i> * gen. et sp. nov.	<i>"Diplococcium pulheyense"</i>	FMR 10959, CBS 127864	Dead wood	Spain, Galicia, Los Ancares P.	<i>Sordariomycetes</i>	HF937350	KY853527	KY853465
<i>Rhinocladia amoena</i> †		FMR 12063, CBS 138590	Submerged wood	Spain, Aragón, Ordesa y Monte Perdido N.P.	<i>Eurotiomycetes</i>		KU705857	KU705840
<i>Solicorynespora insolita</i> †		FMR 11497, CBS 131273	On bark	Spain, Cantabria, Picos de Europa N.P.	<i>Dothideomycetes</i>		HF677183	HF677174
<i>Sporoschisma mirabile</i> *		FMR 11247	Dead wood	Spain, Galicia, Enciña do Lastra P.	<i>Sordariomycetes</i>	HF937358	HF677183	HF677174

(continued on next page)

Table 1. (Continued)

Taxa ¹	Preliminary Identification	Strain ²	Substrate	Locality ³	Fungal Class	GenBank ⁴		
						SSU	LSU	ITS
<i>Stachybotrys cylindrospora</i>		FMR 11595	Dead wood	Spain, Castilla y León, Olleros del Alba	<i>Sordariomycetes</i>		KY853528	KY853466
<i>Sterigmatobotrys uniseptata*</i>		FMR 11937	Dead wood	Spain, Aragón, Ordesa y Monte Perdido N.P.	<i>Sordariomycetes</i>		HF677182	HF677178
<i>Symptodiella acicola</i>		CBS 425.76	Soil	Canada, Ontario, Muskoka	<i>Dothideomycetes</i>		KY853529	KY853467
		CBS 487.82	Needle of <i>Pinus sylvestris</i>	The Netherlands, Baarn, De Vuursche	<i>Dothideomycetes</i>		KY853530	KY853468
<i>Trichocladium asperum</i>		FMR 12054	Soil	Spain, Castilla La Mancha, Alto Tajo P.	<i>Sordariomycetes</i>		KY853531	KY853469
		CBS 903.85	Soil	Germany, Edersee, Nieder-Werbe	<i>Sordariomycetes</i>		KY853532	KY853470
		CBS 140.21	Unknown	The Netherlands	<i>Sordariomycetes</i>		KY853533	KY853471
		CBS 415.52	Culture contaminant	UK, Cumberland	<i>Sordariomycetes</i>		KY853534	
		CBS 157.22	unknown	unknown	<i>Sordariomycetes</i>		KY853535	KY853472
		CBS 112.67	Soil	Belgium, Kontich	<i>Sordariomycetes</i>		KY853536	KY853473
<i>Triposporium deviatum*</i>		FMR 13135, CBS 137300	Dead wood	Spain, Canary Island, La Palma	<i>Leotiomyces</i>		KY853537	KY853474
<i>Troposporella fumosa</i>		FMR 12437	Dead wood	Spain, Cataluña, Alto Pirineo	<i>Dothideomycetes</i>		HF678544	HF678534
<i>Vargamyces aquaticus</i>	<i>Xylomyces aquaticus</i>	FMR 11587, CBS 130366	Submerged wood	Spain, Burgos, Salas de Los Infantes	<i>Dothideomycetes</i>		KY853538	KY853475
		CBS 636.91	Submerged wood	Hungary, Börzsöny Mts., Morgó stream	<i>Dothideomycetes</i>		KY853539	
<i>Vermiculariopsiella immersa</i>		CBS 140223	Rotten leaf	Spain, Canary Islands	<i>Sordariomycetes</i>		KY853540	KY853476
<i>V. microsperma</i>		CBS 101172	Leaf litter	Brazil, Mata Atlantica, Engenho do Rei, Santa Rita	<i>Sordariomycetes</i>		KY853541	KY853477
		CBS 140231	Dead leaf	French Guiana	<i>Sordariomycetes</i>		KY853542	KY853478
<i>V. pediculata*</i>		FMR 12187, CBS 132484	Twig	Portugal, Viana do Castelo, Lagoas de Bertandos, P.A.	<i>Sordariomycetes</i>		HF678537	HF678527
<i>Xenospadicoides atra</i> gen. et comb. nov.	<i>Spadicoides atra</i>	CBS 489.77	Branch of <i>Quercus petraea</i>	Czech Republic, Central Bohemia, forest Lánská obora	<i>Sordariomycetes</i>	EF204521	EF204506	
<i>Xyladictyochaeta lusitanica</i> gen. et sp. nov.*	<i>Dictyochaeta</i> aff. <i>eucalypti</i>	FMR 12177, CBS 142290	Dead leaves of <i>Eucalyptus</i> sp.	Portugal, Viana do Castelo, Lagoas de Bertandos, P.A.	<i>Sordariomycetes</i>	HF937349	KY853543	KY853479
<i>Zanclospora iberica</i> sp. nov.*	<i>Zanclospora</i> aff. <i>novae-zelandiae</i>	FMR 11584, CBS 130426	Dead wood	Spain, Asturias, Picos de Europa N.P.	<i>Sordariomycetes</i>	HF937360	KY853544	KY853480
		FMR 12186	Bark of <i>Eucalyptus</i> sp.	Portugal, Viana do Castelo, Lagoas de Bertandos, P.A.	<i>Sordariomycetes</i>	HF937361	KY853545	KY853481
<i>Zygosporium gibbum*</i>		FMR 13130, CBS 137306	Dead leaves	Spain, Canary Island, La Palma	<i>Sordariomycetes</i>		KY853546	KY853482

¹ *Species without sequences previous to this study, †Species recently described from the Iberian Peninsula, **bold**: new species.

² CBS: Westerdijk Fungal Biodiversity Institute, Utrecht, The Netherlands; FMR: Facultat de Medicina i Ciències de la Salut, Reus, Spain.

³ N.P.: National Park, P.: Natural Park, P.A.: Protected area.

⁴ SSU: partial small subunit of the rDNA; LSU: partial large subunit of the rDNA; ITS: internal transcribed spacer regions of the rDNA and 5.8S region.

Table 2. Number of taxa, characters and information generated from the Bayesian Inference and Maximum Likelihood analysis for each dataset.

	<i>Dothideomycetes</i>	<i>Eurotiomycetes</i>	<i>Leotiomycetes</i>	<i>Sordariomycetes</i>	<i>Savoryellales</i> and allies
Number of taxa	99	22	33	158	58
Number of characters	680	660	658	700	901
Bayesian Inference					
Unique sites patterns	469	280	279	544	550
Substitution model used	GTR G+I	GTR G+I	GTR G+I	GTR G+I	GTR G+I
Maximum Likelihood analysis					
Constant characters	284	403	421	234	426
Parsimony informative sites	307	191	228	358	370
Variable and parsimony uninformative	382	249	149	447	461

approaches under RAxML HPC BlackBox v. 8.2.8 (Stamatakis 2014) using the Cypres Science gateway portal (Miller *et al.* 2010) and MrBayes v. 3.2.6 (Ronquist *et al.* 2012), respectively. Confident branch support is defined as Bayesian posterior probabilities (BPP) ≥ 0.95 and maximum likelihood bootstrap values (BML) $\geq 70\%$.

RESULTS AND DISCUSSION

Phylogenetic relationships

Sequences (LSU, SSU and ITS) were determined for the isolates selected (Table 1), while their distribution in different orders and families in *Pezizomycotina* (*Ascomycota*) were highlighted by using LSU and SSU analyses (SSU tree not shown, available in TreeBASE). The taxa tested corresponded to four classes, i.e. *Dothideomycetes*, *Eurotiomycetes*, *Leotiomycetes* and *Sordariomycetes*. To maximise the quality of the alignment, four separate LSU alignments were created corresponding to the different fungal classes, although an additional dataset that includes the *Savoryellales* was used to resolve the phylogenetic relationship among the members of that order and allies. The number of taxa, characters and information generated from the BI and ML for each dataset are in Table 2. The consensus trees inferred from BI confirmed the tree topologies obtained from the ML analysis in all four datasets; therefore, only the BI consensus trees are shown (Figs 1–5). Well-supported main clades are indicated in Arabic numbers, and the most relevant clades in each class discussed. Names in the phylogenetic trees are written after the taxonomic novelties introduced in the taxonomy section and old names are included in Table 1.

Dothideomycetes

Within *Dothideomycetes*, a total of nine strongly supported main clades (I–IX) were discerned, which showed a moderately supported backbone (0.97 PP, 77 % BS).

Clade I represents the *Venturiales* (1 PP, 96 % BS), in which *Magnohelicospora iberica* (FMR 12414), *Anungitea syzygii* (FMR 11934) and *Troposporella fumosa* (FMR 12437) are included. *Magnohelicospora iberica* was placed in a subclade together with *Venturia populina* and *Gibbera conferta* (1 PP, 100 % BS). *Magnohelicospora* is a monotypic genus characterised by polyblastic conidiogenous cells producing single brown helicoidal conidia with a conidial filament coiled in three dimensions

(Castañeda-Ruiz *et al.* 2012). It is morphologically similar to *Helicodendron* (*Hd.*) and *Helicoon* (*Ho.*). However, the conidia in *Helicodendron* are catenate, while in *Helicoon* they are produced singly on monoblastic conidiogenous cells. It is noteworthy that *Helicodendron* and *Helicoon* are polyphyletic (Tsui & Berbee 2006). For instance, *Hd. paradoxum*, the type species of the genus, and *Hd. giganteum* are both placed in *Helotiales* (*Leotiomycetes*) (Tsui & Berbee 2006) in which they are linked to sexual morphs of different genera, i.e. *Hymenoscyphus* and *Mollisia*, respectively (Fisher & Webster 1983). As for *M. iberica*, *Hd. pinicola*, the asexual morph of *Tyrannosorus pinicola* (Untereiner *et al.* 1995), is also related to *Venturiaceae*, specifically to *Caproventuria* (Zhang *et al.* 2011). Furthermore, *M. iberica* and *Hd. pinicola* differ in the arrangement of conidia, solitary in the former and catenate in the latter.

Helicoon species are scattered in three classes of *Ascomycota*, i.e. *Leotiomycetes*, *Dothideomycetes* and *Sordariomycetes*. Based on cultural methods, *Ho. sessile*, the generic type, was associated to the sexual morph *Orbilia luterubella* (*Orbiliaceae*, *Leotiomycetes*) (Pfister 1997). *Helicoon farinosum* was shown to be the asexual morph of an ascotaiwania-like fungus (Fallah *et al.* 1999) and belongs to *Pleurotheciales* (*Sordariomycetes*) (Réblová *et al.* 2016b) (Fig. 4, clade XVI, Fig. 5). Based on the analysis of LSU and ITS sequences, Tsui & Berbee (2006) placed *Ho. gigantasporum* in *Tubeufiaceae*, *Ho. richonis* in *Pleosporales* and *Ho. fuscosporum* as *incertae sedis* in *Dothideomycetes*. Our analysis suggests that *Ho. fuscosporum*, placed in *Venturiaceae* (Fig. 1, clade I), is congeneric with *M. iberica* and a new combination is proposed. However, the redistribution of other species in *Helicodendron* and *Helicoon* and their related sexual morphs require further re-evaluation.

Anungitea syzygii (FMR 11943) is placed in a subclade together with *Repetophragma goidanichii* (DQ408574) and *Sympodiella acicola* (CBS 425.76 and CBS 487.82). Other LSU sequences which were similar to that of *A. syzygii* were *Cylindrosyndonium lauri* (EU035414, 96 %) and *Tothia fuscella* (JF927786, 95 %). *Anungitea* was established by Sutton (1973) with *A. fragilis* as type species. It is characterised by straight, simple and brown conidiophores with polyblastic, sympodial, denticulate conidiogenous cells and cylindrical, hyaline conidia produced in acropetal chains (Seifert *et al.* 2011). *Cylindrosyndonium lauri* is morphologically similar to *A. syzygii* in having solitary conidiophores with polyblastic, sympodial conidiogenous cells. Nevertheless, they are different in conidial morphology; *C. lauri* produces solitary, subacicular to narrowly subcylindrical, (4–)6–8-septate conidia (Crous *et al.* 2007b),

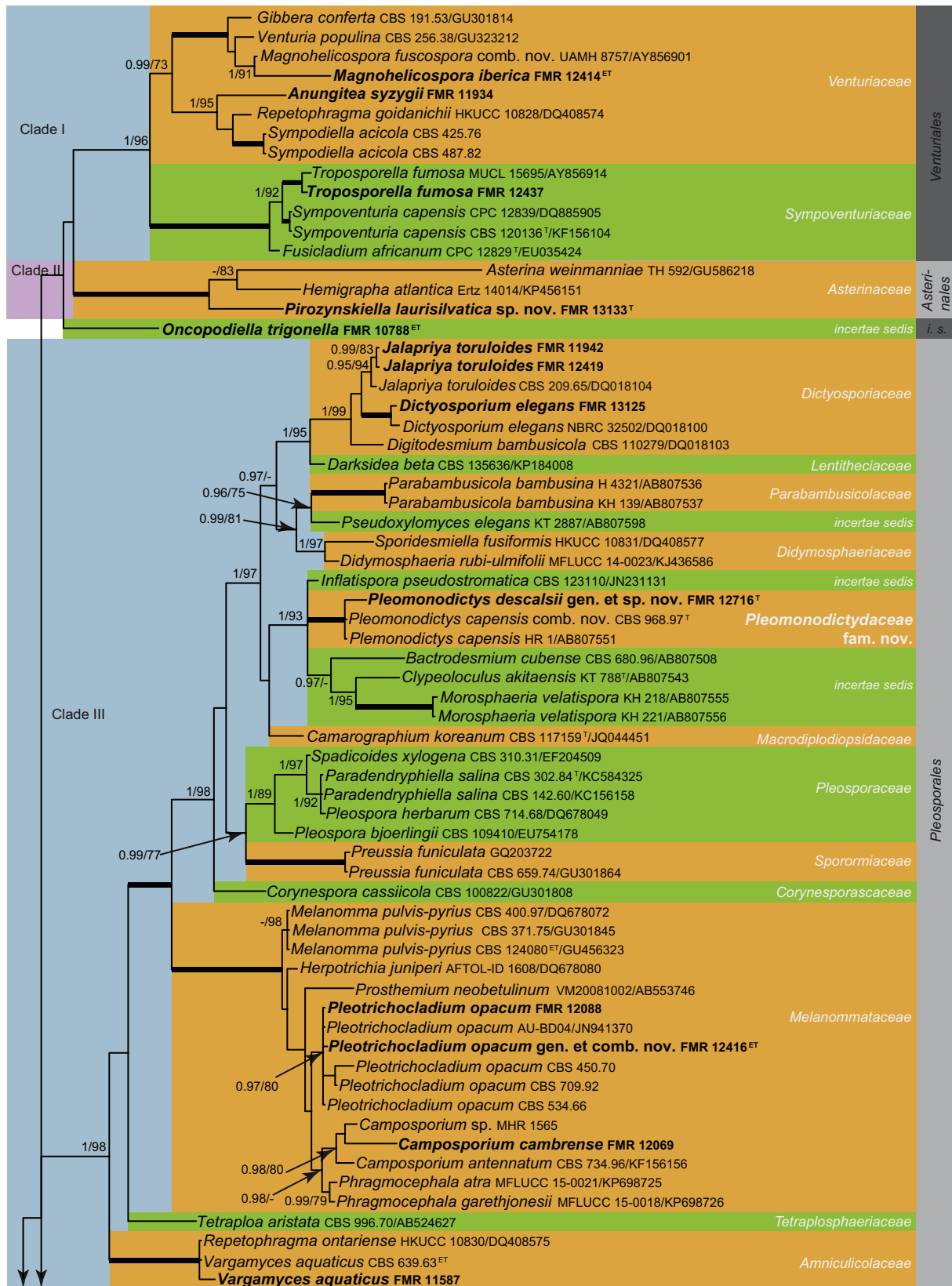


Fig. 1. Phylogenetic tree inferred from the Bayesian analysis of the LSU sequences alignment of *Dothideomycetes*. Posterior probabilities inferred from the Bayesian analysis (≥ 0.95) and bootstrap ($\geq 70\%$) are indicated at the nodes of the branches (PP/BML). Thickened lines indicate a PP of 1.0 and a BML of 100%. // indicates the branch was reduced 75%. New taxa and species recently described from the Iberian Peninsula are indicated in **bold**. *i. s.* = incertae sedis; *Wies.* = *Wiesneriomycetales*. Tree was rooted with *Saccharomyces cerevisiae* AH005487, *Orbilia auricolor* DQ470953 and *O. vinosa* DQ470952.

while *A. syzygii* produces short chains of cylindrical, 0–1-septate conidia. On the other hand, *R. goidanichii* shows conidiophores with terminal and monoblastic conidiogenous cells extending percurrently and producing solitary and brown phragmoconidia.

Thotia fuscella has thyriothelial ascomata with no asexual morph reported (Wu et al. 2011). The placement of *Anungitea* within the *Venturiaceae* was previously suggested by Crous et al. (2007a) by comparing morphological similarities with the genus

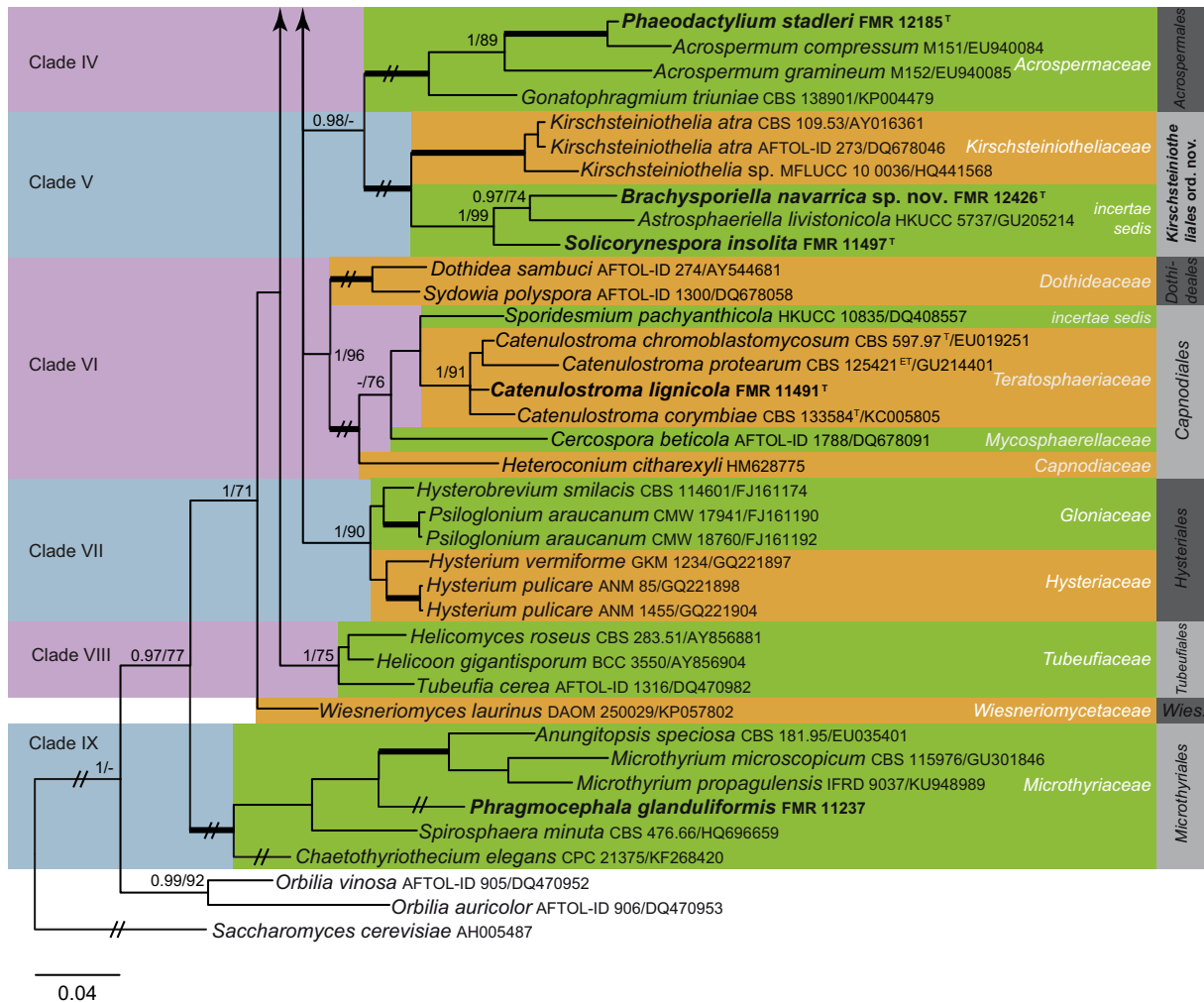


Fig. 1. (Continued)

Fusicladium. However, *A. fragilis*, the type species of *Anungitea*, has no preserved ex-type strain to confirm the definitive position of the genus.

Another helicosporous genus placed in the clade I (Fig. 1) is *Troposporella*. *Troposporella*, typified by *T. fumosa* (Karsten 1892), is characterised by producing brown sporodochial conidiomata, undifferentiated conidiophores, polyblastic, pale brown conidiogenous cells and helicoidal conidia. Tsui & Berbee (2010) showed that *T. fumosa*, *T. monilipes* and *T. olivaceum* formed a monophyletic *Troposporella* clade *incertae sedis* in *Dothideo-myces*. The LSU and ITS sequences of our isolate of *T. fumosa* are respectively 99 % (524/527) and 98 % (525/535) similar with sequences of other conspecific specimens (accession numbers AY856914 and DQ351724, respectively) included in the mentioned study. According to our results, the genus *Troposporella* belongs to the *Sympoventuriaceae*, *Venturiales* (1 PP, 100 % BS).

Clade II includes *Asterina weinmanniae* and *Hemigrapha atlantica*, members of *Asterinales*, and the isolate FMR 13133, which shows, however, morphological and ecological affinities with *Pirozynskiella*. *Pirozynskiella*, typified by *P. solaninum*, is only known by an asexual morph characterised by brown conidiophores with blastic conidiogenous cells bearing a single unbranched acropetal chain of ellipsoidal to subcylindrical conidia (Hughes 2007). Our isolate FMR 13133 differs from other species of *Pirozynskiella* mainly by the verrucose conidia and, therefore, it is described below as *P. laurisilvatica* sp. nov.

Because no phylogenetic analyses have been done that include the type of *Pirozynskiella*, the taxonomic placement of the genus remains uncertain.

Our LSU and SSU sequence data reveal that *Oncopodiella trigonella* (FMR 10788) is unrelated to any previously established order or family in *Dothideo-myces*, and represents a potentially new lineage in this class. In order to stabilise the use of this name we propose the strain FMR 10788 as the epitype of *O. trigonella* since the generic type has no preserved cultures.

Clade III comprises members of *Pleosporales* (1 PP, 98% BS). The Iberian isolates related to this clade include *Camposporium cambrense* (FMR 12069), *Dictyosporium elegans* (FMR 13125), *Jalapriya toruloides* (FMR 11942 and FMR 12491), *Monodictys* sp. (FMR 12716), *Trichocladium opacum* (FMR 12416 and FMR 12088), and *Vargamyces aquaticus* (FMR 11587). *Dictyosporium elegans* and *Jalapriya toruloides* are placed in the *Dictyosporiaceae* subclade (Fig. 1, 1 PP, 98 % BS), a pleosporalean family introduced recently by Boonmee et al. (2016) that includes fungi with cheiroid or digitate, palmate and/or dictyosporous conidia. *Dictyosporium* and *Jalapriya* are very similar, sharing sporodochial conidiomata composed of slightly differentiated conidiophores which produce brown complanate cheiroconidia. Nevertheless, based on phylogenetic differences they were proposed as different genera (Boonmee et al. 2016).

The isolate FMR 12176, identified as *Monodictys* sp. due to its dark brown and dictyosporous conidia, is included in a well-

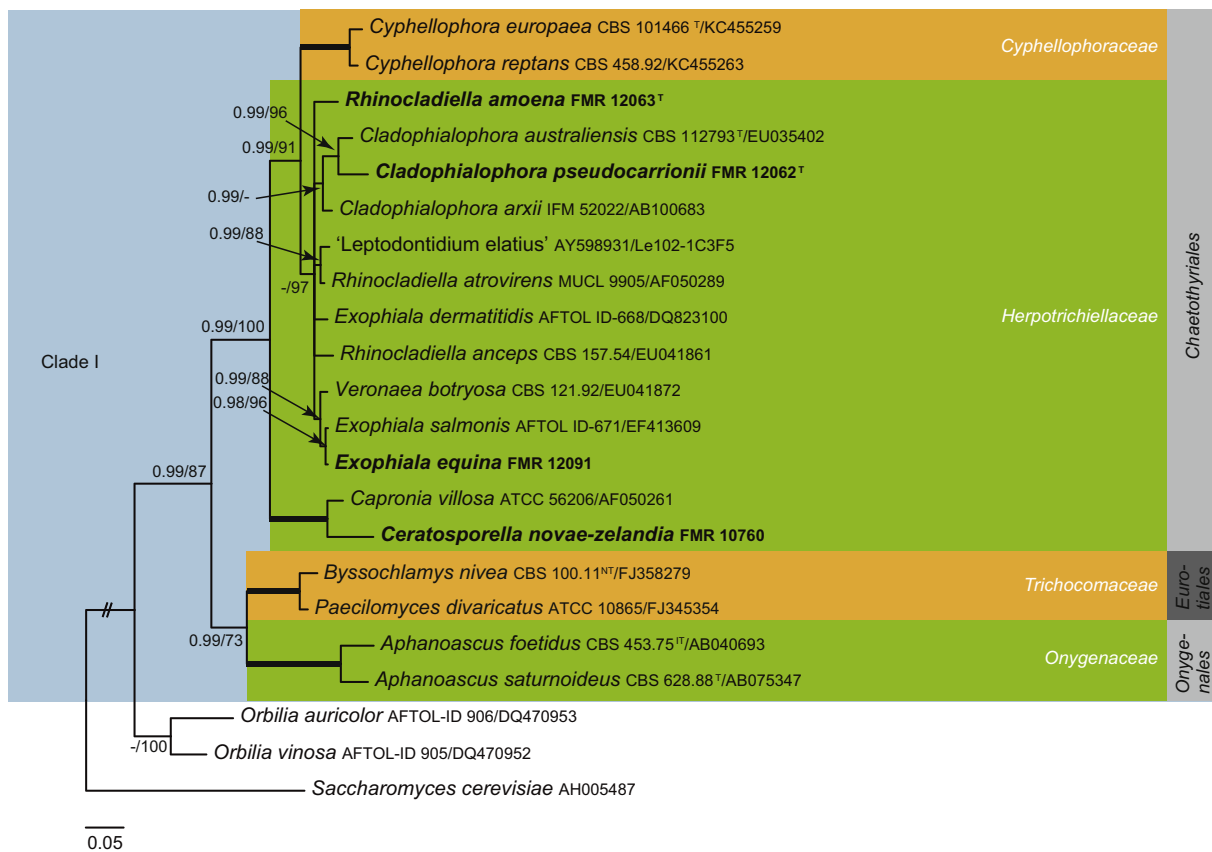


Fig. 2. Phylogenetic tree inferred from the Bayesian analysis of the LSU sequences alignment of *Eurotiomycetes*. Posterior probabilities inferred from the Bayesian analysis (≥ 0.95) and bootstrap ($\geq 70\%$) are indicated at the nodes of the branches (PP/BML). Thickened lines indicate a PP of 1.0 and a BML of 100%. // indicates the branch was reduced 75%. New taxa and species recently described from the Iberian Peninsula are indicated in **bold**. Tree was rooted with *Saccharomyces cerevisiae* AH005487, *Orbilia auricolor* DQ470953 and *O. vinosa* DQ470952.

supported clade (1 PP, 100% BS) with two isolates of *Monodictys capensis*, including the ex-type strain (CBS 968.97), a fungus considered *incertae sedis* at family level by Tanaka *et al.* (2015). *Monodictys* is characterised by single, brown muriform conidia originating from monoblastic cylindrical conidiogenous cells (Ellis 1971). However, these characters have limited taxonomic value because *Monodictys* species are scattered in different classes, i.e. *Dothideomycetes*, *Sordariomycetes* and *Leotiomyces* (Tanaka *et al.* 2015). According to our analysis, for instance, *M. nigrosperma* (FMR 11941) is placed in the *Chaetomiaceae* (*Sordariales*) (Fig. 4). Although the phylogenetic placement of the type species of *Monodictys*, *M. putredinis*, remains unclear, this species was reported as the asexual morph of *Ohleria brasiliensis* (Samuels 1980). *Ohleria* was recently included in the *Ohleriaceae*, *Pleosporales* (Jaklitsch & Voglmayr 2016), which is distant from the *M. capensis* clade. Our results agree with the phylogeny presented by Tanaka *et al.* (2015), and support the proposal of the new genus *Pleomonodictys* for these two monodictys-like species. This lineage also represents a new family in the *Pleosporales*, *Pleomonodictydaceae* fam. nov.

Our isolates of *Trichocladium opacum* and several strains of the same species clustered in a supported clade (0.97 PP, 80% BS) of the family *Melanommataceae* (Fig. 1, clade III). This fungus is characterised by conidiophores reduced to conidiogenous cells, producing ellipsoidal to clavate, dark brown conidia with schizolytic secession. Since the type species of the genus *Trichocladium*, *T. asperum*, is related to the *Chaetomiaceae* in the *Sordariomycetes* (Fig. 4, clade III), *T. opacum* clearly represents a different and distinct pleosporalean genus which is introduced below as *Pleotrichocladium*.

Camposporium cambrense forms a subclade (0.98 PP, 80% BS) together with *C. antennatum* (CBS 734.96, GenBank KF156156 as *Paradendryphiella salina*) and *Camposporium* sp. (MHR 1565) in the *Melanommataceae*. *Camposporium* was erected by Harkness (1884) and typified with *C. antennatum*. It is characterised by dematiaceous, unbranched conidiophores with terminal, integrated, denticulate conidiogenous cells that produce multiseptate cylindrical conidia, either with or without hyaline appendages at the apex and a persistent portion of the denticle attached at the base. Our analysis shows for the first time that *Camposporium* is related to the *Pleosporales*.

Vargamyces aquaticus (FMR 11587 and CBS 639.63) and *Repetophragma ontariense* (GenBank DQ408575) also formed a full-supported subclade in *Pleosporales*. *Repetophragma ontariense* was previously shown to be related to the *Amniculicolaceae*, which includes saprobic freshwater fungi (Zhang *et al.* 2009a, b). FMR 11587 also was isolated from a freshwater habitat. Recently, Révay *et al.* (2014) suggested that *V. aquaticus* and *R. ontariense* could be considered conspecific, but they did not introduce any taxonomic change. Based on morphological and genetic similarity, we regarded *R. ontariense* as synonym of *V. aquaticus*.

The fully supported clade IV includes species of *Acrospermum*, *Gonatophragmium triuniae* and *Phaeodactylium staderlii*, the latter being sequenced for the first time in the present study. According to our analysis, this clade represents the *Acrospermales* (Minter & Watson 2007). *Acrospermum* species are saprophytic fungi found on different substrates, with an asexual morph characterised by unbranched, pale brown conidiophores, with polyblastic, scattered conidiogenous cells that

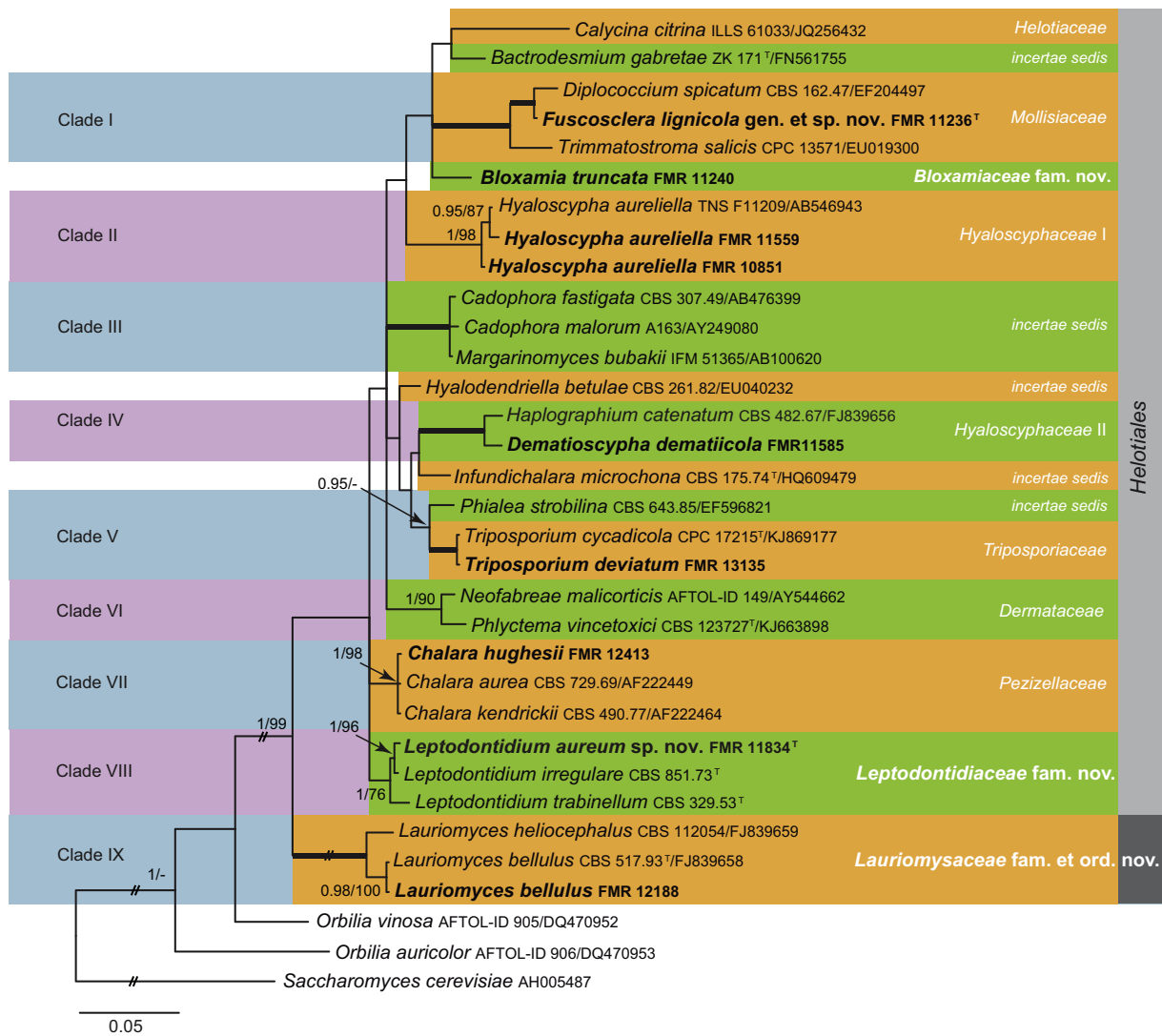


Fig. 3. Phylogenetic tree inferred from the Bayesian analysis of the LSU sequences alignment of *Leotiomyces*. Posterior probabilities inferred from the Bayesian analysis (≥ 0.95) and bootstrap ($\geq 70\%$) are indicated at the nodes of the branches (PP/BML). Thickened lines indicate a PP of 1.0 and a BML of 100%. // indicates the branch was reduced 75%. New taxa and species recently described from the Iberian Peninsula are indicated in **bold**. Tree was rooted with *Saccharomyces cerevisiae* AH005487, *Orbilia auricolor* DQ470953 and *O. vinosa* DQ470952.

produce hyaline to pale brown, smooth conidia (Webster 1956, Minter & Watson 2007). *Phaeodactylium stadleri* resembles the asexual morph of *Acrospermum*, but differs in having branched conidiophores and verrucose conidia (Castañeda-Ruiz et al. 2012). *Phaeodactylium* is also similar to *Gonatophragmium* having branched conidiophores with polyblastic denticulate conidiogenous cells. However, in *Gonatophragmium* conidiophores are unilateral nodose and darker than those observed in *Phaeodactylium*. Unfortunately, there are no DNA sequence data of the type species of *Phaeodactylium*, *P. venkatesanum*, making it impossible to resolve its phylogeny.

Clade V (1 PP, 100% BS) includes members of the *Kirschsteinietheliaceae* and other fungi of uncertain taxonomic position, i.e. *Solicorynespora insolita*, *Astrosphaeriella livistoncola* and an isolate of *Brachysporiella* sp. (FMR 12426). With the exception of *A. livistoncola*, for which no asexual morph is known (Hyde & Fröhlich 1997), the asexual morphs of most members of this clade (i.e. *Brachysporiella*, *Kirschsteiniethelia* (= *Dendryphiopsis*), *Solicorynespora* s.l., *Sporidesmium* s.l. and *Taeniolaella* s.s.) are characterised by pigmented conidiogenous cells and septate, dark brown conidia (Shearer et al. 2009, Hernández-Restrepo et al. 2014a, Ertz et al. 2016).

Brachysporiella has macronematous conidiophores, mono- and polyblastic conidiogenous cells and dark brown, septate and terminal conidia (Batista 1952, Ellis 1971). The isolate FMR 12426 shares these features, but differs in some aspect from the other species accepted in *Brachysporiella*. It is therefore described as *B. navarrica* sp. nov. *Astrosphaeriella* is polyphyletic, with species scattered in different pleosporalean lineages (Liu et al. 2011, Zhang et al. 2012). Since clade V is distantly related to other lineages representative of different orders in *Dothideomycetes*, it is introduced below as the new order *Kirschsteinietheliales*.

Clade VI includes members of *Capnodiales* and *Dothideales* (Fig. 1, 1 PP, 96% BS). The isolate FMR 11491 belongs to the former. This isolate was morphologically regarded as a putative species of *Heteroconium*. However, in the analysis it appears closely related to three species of *Catenulostroma* (1 PP, 91% BS), i.e. *C. corymbiae*, *C. chromoblastomycosum* and to *C. protearum*, the generic type. *Catenulostroma* and *Heteroconium* are morphologically similar in having dark brown conidiophores, with catenate, brown phragmoconidia. Nevertheless, species of *Catenulostroma* have hypha-like conidiophores and conidia in basipetal chains (Crous et al. 2007a),

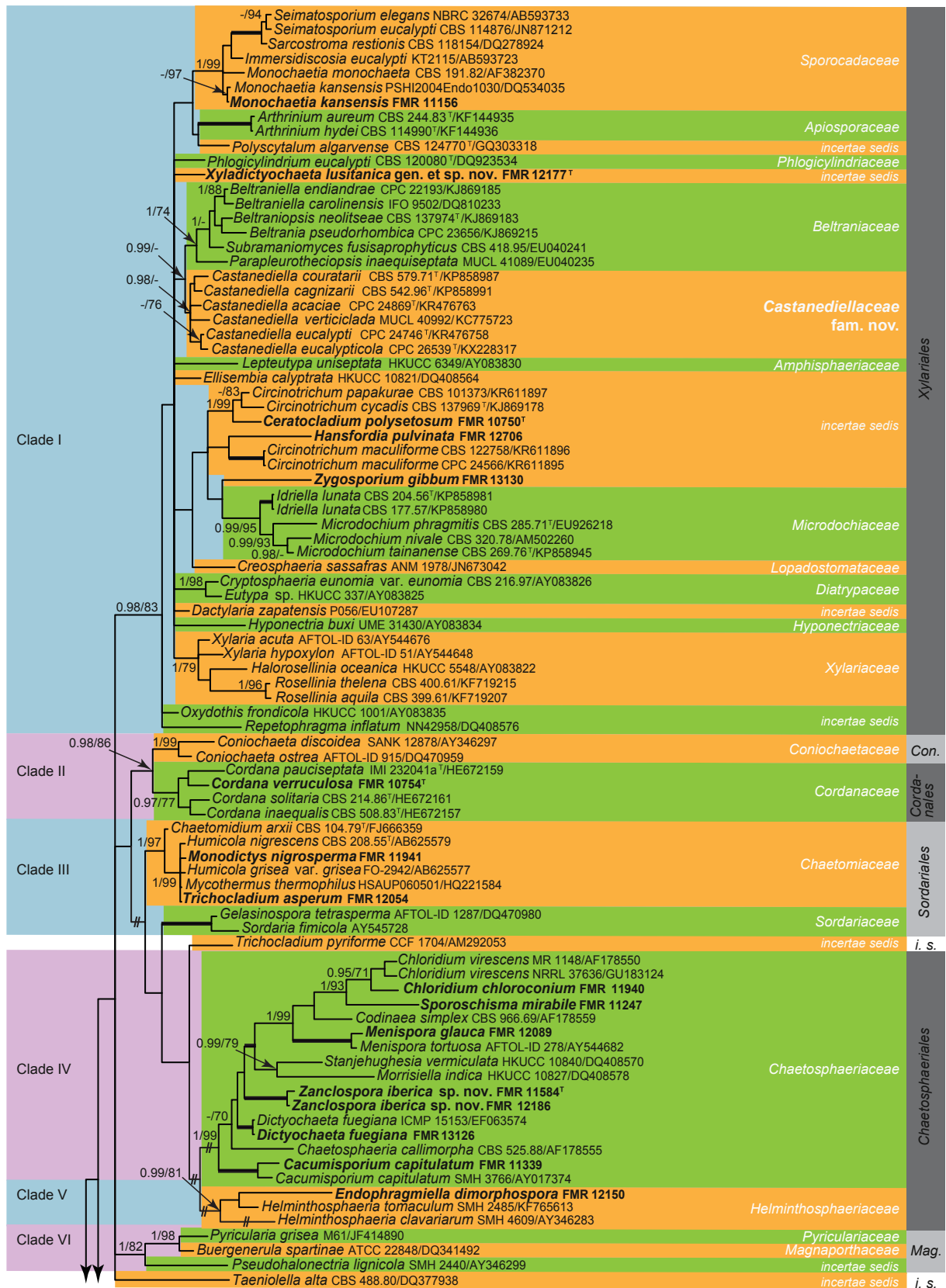


Fig. 4. Phylogenetic tree inferred from the Bayesian analysis of the LSU sequences alignment of *Sordariomycetes*. Posterior probabilities inferred from the Bayesian analysis (≥ 0.95) and bootstrap ($\geq 70\%$) are indicated at the nodes of the branches (PP/BML). Thickened lines indicate a PP of 1.0 and a BML of 100%. // indicates the branch was reduced 75%. New taxa and species recently described from the Iberian Peninsula are indicated in **bold**. Con. = *Coniochaetales*, i. s. = *incertae sedis*, Mag. = *Magnaporthales*, Trich. = *Trichosphaeriales*, Glom. = *Glomerellales*, Micr. = *Microascales*. Tree was rooted with *Saccharomyces cerevisiae* AH005487, *Orbilia auricolor* DQ470953 and *O. vinosa* DQ470952.

whereas in *Heteroconium* conidiophores are differentiated, bearing an apical metula, and conidia are born in acropetal chains (Hughes 2007). *Catenulostroma* belongs to the *Teratosphaeriaceae* (Crous et al. 2007a, Quaedvlieg et al. 2014),

while *Heteroconium* is polyphyletic (Cheewangkoon et al. 2012). *Heteroconium* s.s. (based on the type species, *H. citharexyl*) belongs to the *Capnodiaceae* but other species are of uncertain affinities within *Dothideomycetes* or allocated to new genera, as

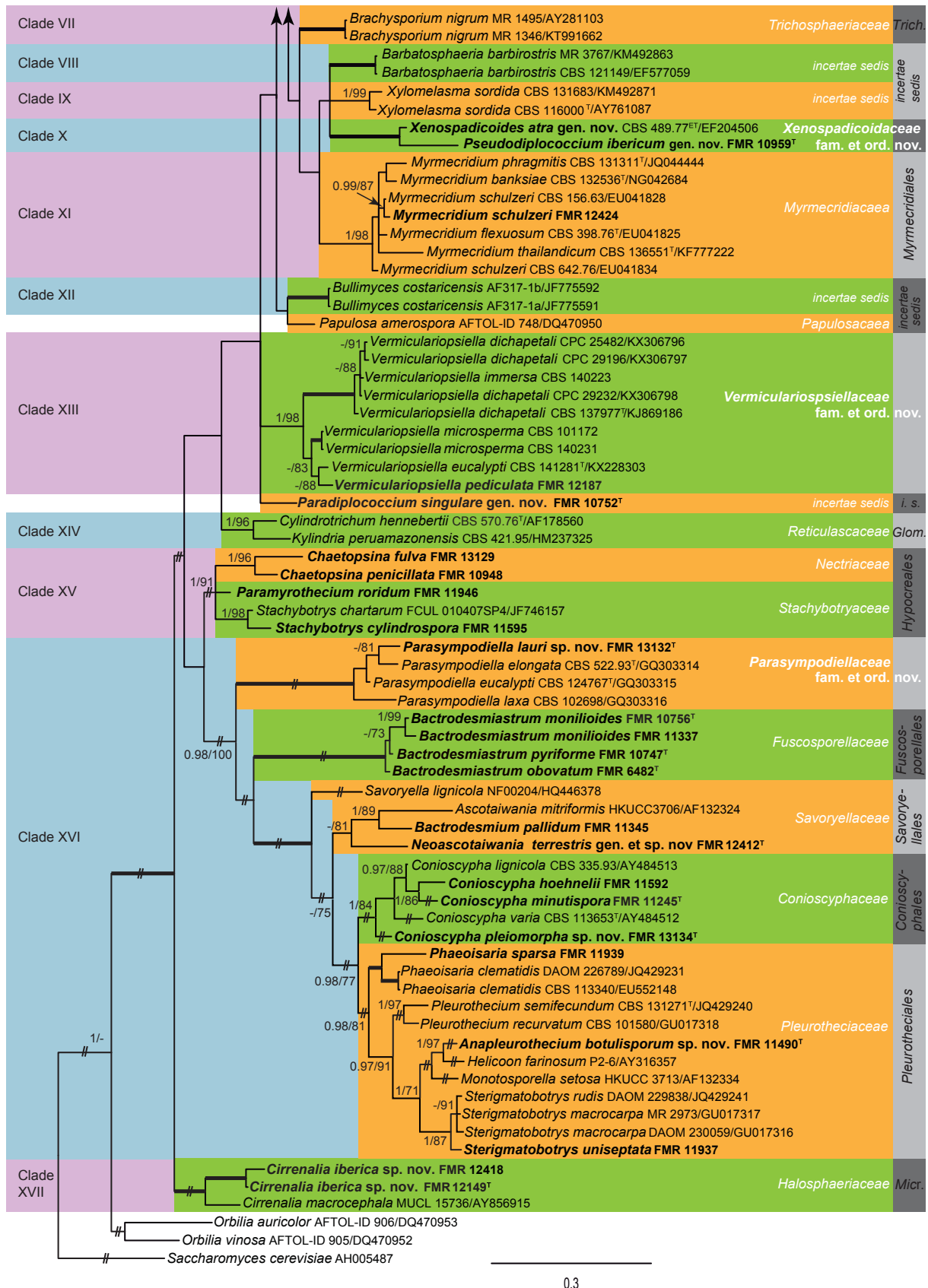


Fig. 4. (Continued)

Alysiidiella eucalypti and *A. kleinzense*, both occurring on *Eucalyptus* (Cheewangkoon *et al.* 2012). Due to the phylogenetic affinity of FMR 11491 with *Catenulostroma* and considering its morphological differences from the currently accepted species, *C. lignicola* sp. nov. is introduced.

Clade IX (1 PP, 100 % BS) groups *Phragmocephala glanduliformis* (FMR 11237) with members of the *Microthyriaceae* (*Microthyriales*). The former is placed in a long single branch distantly related to the lineages representing *Microthyrium* and *Anungitopsis speciosa*. *Phragmocephala*



Fig. 5. Phylogenetic tree inferred from the Bayesian analysis of the LSU sequences alignment of *Savoryellales* and allies. Posterior probabilities inferred from the Bayesian analysis (≥ 0.95) and bootstrap ($\geq 70\%$) are indicated at the nodes of the branches (PP/BML). Thickened lines indicate a PP of 1.0 and a BML of 100%. // indicates the branch was reduced 75%. New taxa and species recently described from the Iberian Peninsula are indicated in bold. Tree was rooted with *Gelasinospora tetrasperma* (DQ470980) and *Sordaria fimicola* (AY780079).

(*Ph.*) was erected by Mason & Hughes (1951), with *Ph. cookei* as type species. It is characterised by dark brown conidiophores and holoblastic, dark brown and septate conidia. Currently, *Phragmocephala* includes nine species (Seifert *et al.* 2011) and, in addition to *Ph. glanduliformis* (*Microthyriaceae*), phylogenetic data are only known from *Ph. atra*, *Ph. garethjonesii* (*Melanommataceae*) (Su *et al.* 2015), and *Ph. stemphylioides* (*Pleurotheciaceae*) (Réblová *et al.* 2016b).

Hence *Phragmocephala* is another polyphyletic genus that needs further study.

Eurotiomycetes

Four Iberian isolates were related to the *Herpotrichiellaceae* (Fig. 2), i.e. *Ceratosporella novae-zealandiae* (FMR 10760),

Cladophialophora pseudocarrionii (FMR 12062), *Exophiala equina* (FMR 12091) and *Rhinocladiella amoena* (FMR 12063). Members of this family include numerous black-yeast fungi of clinical relevance such as *Exophiala*, *Cladophialophora*, *Phialophora*, and *Rhinocladiella* (de Hoog *et al.* 2011), but also fungi isolated from soil, plant debris and water (Réblová *et al.* 2013). With the exception of *C. novae-zealandiae*, the other fungi have been previously studied phylogenetically. *Exophiala equina* belongs to the *Exophiala salmonis*-clade. It has been reported as etiologic agent of subcutaneous infections in animals (horses and turtles) and humans, but it has been also isolated from water, soil and plant material (de Hoog *et al.* 2011). *Cladophialophora pseudocarrionii* and *Rhinocladiella amoena* have been recently described by Madrid *et al.* (2016) from soil and submerged wood, respectively. *Ceratosporella novae-zealandiae* formed a distinct lineage, related to *Capronia villosa* (GenBank AF050261 sequences from ex-type strain) (1 PP, 100 % BS). *Capronia villosa* is characterised by setose perithecial ascomata and an exophiala-like asexual morph (Müller *et al.* 1987), features that clearly distinguish this fungus from *Ceratosporella*. *Ceratosporella* includes species with macro-nematous unbranched conidiophores, with monoblastic, percurrent conidiogenous cells, which produce solitary, branched, and brown to dark brown conidia. The generic type, *C. bicornis*, is a parasitic fungus on *Zea mays*, although most species in the genus are saprophytic (Hughes 1971, Matsushima 1993, Castañeda-Ruiz *et al.* 1996). Our result represents a novel phylogenetic scenario in which asexual fungi with branched conidia are reported within this order, which in addition could represent an undescribed family in the *Chaetothyriales*. However, no DNA sequence is available, neither for the type species of *Ceratosporella* nor for any of the 90 species included in the genus. Therefore, the phylogenetic placement of the genus remains uncertain until new molecular data for these fungi can be provided.

Leotiomycetes

The Iberian isolates related to the *Leotiomycetes* (Fig. 3) were distributed in different clades among members of the *Helotiales* (Clade I–VIII), except the clade IX which could represent a different order. The order *Helotiales* lacks sufficient genetic data and the placement of several genera at family level is, in many cases, based on morphological criteria (Jaklitsch *et al.* 2016a).

Clade I (1 PP, 100 % BS) is composed of *Diplococcium spicatum* (EF204497), *Trimmatostroma salicis* (EU019300) and an unidentified isolate FMR 11236. Previous phylogenetic analyses have shown that *Diplococcium* and *Trimmatostroma* belong to the *Helotiales* and more specifically to the *Mollisiaceae* (Crous *et al.* 2015b, Jaklitsch *et al.* 2016a). These two genera are characterised by producing catenate conidia, while the Iberian isolate produces solitary conidia. In addition, *D. spicatum* exhibits differentiated conidiophores, polytretic conidiogenous cells and 1-septate conidia (Ellis 1971), whereas *T. salicis* has meristematic, arthric conidiogenous cells, producing chains of phragmo- or dictyoconidia (Seifert *et al.* 2011). FMR 11236 has meristematic, blastic conidiogenous cells, and solitary, black to dark brown conidia formed by masses of rounded to angular cells. Therefore, these peculiar morphological features and its phylogenetic distance with the fungi compared support the introduction below of *Fuscosclera* gen. nov.

In our phylogenetic tree (Fig. 3), *Bloxamia truncata*, the type species of the genus, was placed on an isolated branch, which we recognise as representative of the previously proposed family *Bloxamiaceae* (Locquin 1984). Since this family name was invalidly published (Art. 39.1; no Latin diagnosis), we validate *Bloxamiaceae* in the taxonomy section. Jaklitsch *et al.* (2016a) treated *Bloxamiaceae* as a presumed synonym of *Pezizellaceae*. However, in our phylogenetic analysis, *Pezizellaceae* (Fig. 3, Clade VII), which contains members of *Chalara*, is distantly related to the *Bloxamia* lineage. *Bloxamia truncata* is characterised by sporodochial conidiomata, phialidic conidiogenous cells and hyaline, rectangular conidia held in readily disarticulating chains. It has been associated with the sexual morph *Bisporrella sulfurina* (Johnston 1988), but we have not been able to confirm this based on our isolate. The genus *Bisporrella* (*Bis.*) was established by Korf & Carpenter (1974) with *Bis. pallescens* as generic type. Unfortunately, cultures and sequences of this species are not available. Additional studies are needed to clarify the phylogenetic relationship of those genera.

In our analyses the *Hyaloscyphaceae* appears polyphyletic, with members distributed in two well-supported, distant clades (II and IV). The clade II includes *Hyaloscypha aureliella* (AB546943) and sequences of two Iberian isolates that are cheiromycella-like (FMR 11559 and FMR 10851). *Hyaloscypha* sexual morphs are characterised by minute, sessile, white apothecia; while the asexual morphs have holoblastic or enteroblastic conidiogenesis that are cheiromycella-, pseudae-gerita- and phialophora-like (Huhtinen 1989, Quijada *et al.* 2017). *Hyaloscypha aureliella* asexual morph (= *Cheiromycella microscopica*) is characterised by brown sporodochia and simple, but usually branched, cheiroid, brown conidia (Ellis 1971). These conidia have usually been reported with two to three rows of cells (Ellis 1971, Sutton 1985); however, our isolates show conidia predominantly with one row of cells. Despite the morphological differences observed, considering the high similarity of their ITS and LSU sequences (99 % similarity with both markers) we identified both isolates as *H. aureliella*.

Clade IV (1 PP, 100 % BS) includes isolate FMR 11585 identified as *Haplographium delicatum*, and the sequence of *Haplographium catenatum* CBS 482.67 (FJ839656). *Haplographium delicatum* is the asexual morph of *Dematiioscypha dematiicola* (Huhtinen 1987). Since the latter species is the type of *Dematiioscypha* and this genus is preserved against *Haplographium*, *H. delicatum* is currently named *D. dematiicola* (Johnston *et al.* 2014). On the other hand, the taxonomy of *H. catenatum* seems to be controversial. Although initially included in *Haplographium* (Holubová-Jechová 1973), it was transferred to the genus *Lauriomyces* because of the production of conidia in chains (Castañeda-Ruiz & Kendrick 1990). Our phylogeny agrees in placing this species in *Dematiioscypha* rather than *Lauriomyces* (Fig. 3, clade IX). However, since the identity of CBS 482.67 is unclear, an extensive study including more isolates of the species and allied taxa is necessary to confirm the taxonomy of this fungus.

Clade V comprises a fully supported lineage with two species of *Triposporium* (*Tp.*), *Tp. cycadicola* (KJ869177) previously reported in *Helotiales* by Crous *et al.* (2014b), and *Tp. deviatum* (FMR 13135). Species of this genus are characterised by straight or flexuous, brown conidiophores, monoblastic, integrated, terminal, percurrent, cylindrical, doliiform or lageniform conidiogenous cells and the conidia are branched, with 3–4 smooth, septate arms. *Triposporium* was erected by Corda (1837) with

Tp. elegans as generic type and placed in the *Triposporiaceae* according to Nannizzi (1934). However, since *Tp. elegans* has never been sequenced, the placement of the genus in *Helotiales* is provisional.

Clade VII (1 PP, 98 % BS) includes *Chalara hughesii* (FMR 12413), *Ch. kendrickii* (AF222464) and *Ch. aurea* (AF222449). *Chalara* is a heterogeneous genus characterised by sessile or stalked, usually pigmented phialides with a basal venter and a long cylindrical collarette. The conidia are mostly hyaline, catenate, cylindrical, 1–2- or occasionally multi-celled (Nag-Raj & Kendrick 1975). The type species *Ch. fusidioides* was originally described as *Torula fusidioides* from bark of a conifer in Bohemia (Corda 1838); however, no holotype was designated in the protologue. Based on SSU and LSU sequence data, Cai et al. (2009) demonstrated that *Chalara* was polyphyletic within the *Helotiales*.

Clade VIII (1 PP, 76 % BS) is composed by *Leptodontidium trabinellum*, the type species of the genus (CBS 329.53 ex-type), *L. irregulare* (CBS 851.73 ex-type) and *Leptodontidium* sp. FMR 11834. *Leptodontidium* is characterised by grey to black funiculate colonies, hyaline conidiogenous cells, and small conidia formed more or less sympodially; it currently includes 10 species (de Hoog & Hermanides-Nijhof 1977, Seifert et al. 2011). Morphological features of FMR 11834 do not fit with any of the species described in the genus and it is therefore introduced here as *L. aureum* sp. nov. This lineage is distantly related to other helotialean families and it is sufficiently distinct to be recognised as a new family, *Leptodontidiaceae* fam. nov.

Clade IX is represented by *Lauriomyces* (*La.*) *bellulus* and *La. helicocephalus*. *Lauriomyces*, typified by *La. pulcher*, is characterised by penicillate, brown conidiophores, sympodial denticulate conidiogenous cells, branched acropetal chains of hyaline conidia and longer basal ramoconidia, found commonly on dead leaves (Castañeda-Ruiz & Kendrick 1990). According to our tree (Fig. 3), *Lauriomyces* represents a fully supported independent lineage (1 PP, 100% BS) basal to the *Helotiales*, and here we introduce a new order and family, *Lauriomycetales* ord. nov., *Lauriomycetaceae* fam. nov. to accommodate it.

Sordariomycetes

A total of 52 % of the Iberian isolates belong to the *Sordariomycetes*, dispersed into 17 clades (Fig. 4, clades I–XVII). The backbone of this class was highly supported (1 PP, 100 % BS) with the LSU phylogeny.

Clade I is represented by members of *Xylariales* (0.98 PP, 83 % BS), including *Ceratocladium polysetosum* (FMR 10750), *Hansfordia pulvinata* (FMR 12076), *Monochaetia kansensis* (FMR 11156), *Zygosporium gibbum* (FMR 13130) and the unidentified isolate FMR 12177. With the exception of *M. kansensis*, the mentioned fungi are of uncertain position in the order.

Monochaetia kansensis is a pestalotioid fungus causing leaf spots in plants, characterised by dark acervular conidiomata and phragmoconidia with brown central cells and hyaline apical cells, bearing appendages. Traditionally, *Monochaetia* was treated as a member of *Amphisphaeriaceae*, but recently it has been placed in *Sporocadaceae* (Jaklitsch et al. 2016b).

The strain FMR 12177, collected from fallen leaves of *Eucalyptus* sp., is similar to *Dictyochoaeta eucalypti* from which it differs, however, mainly in the presence of polyphialidic conidiogenous cells with inconspicuous collarettes. *Dictyochoaeta*

eucalypti has setiform conidiophores, with intercalary and terminal monophialidic conidiogenous cells with conspicuous collarettes, which are born directly on the conidiophore (Sutton & Hodges 1975). Although no sequence of this species is available to infer its affinities, several molecular studies include *Dictyochoaeta* species in the *Chaetosphaeriaceae* (Réblová 2004, Fernández et al. 2006). The isolated position of FMR 12177 among the *Xylariales* and its morphological peculiarities support the introduction of the new genus *Xyladictyochoaeta*.

In the present analysis, several species of *Castanediella*, including the type, *C. acaciae*, form a monophyletic clade, sister to the *Beltraniaceae* lineage. Since it is a supported undescribed lineage in *Xylariales*, it is introduced here as *Castanediellaceae* fam. nov.

Ceratocladium (*Ce.*) *polysetosum* (Mena-Portales et al. 2011) is closely related to *Circinotrichum* (*Ci.*) *papakuruae* and *Ci. cycadis*. These species form a well-supported clade (1 PP, 99 % BS), that is, however, distantly related to the *Circinotrichum* s.s. lineage, represented by *Ci. maculiforme*, the generic type. Unfortunately, there are no molecular data from other *Ceratocladium* species to infer their affinities and the mono- or polyphyletic nature of the genus as presently circumscribed. *Ceratocladium* and *Circinotrichum* are morphologically similar, they are both characterised by dark setae, polyblastic, lageniform conidiogenous cells and unicellular hyaline conidia. They differ in the branching pattern of the setae, simple in *Circinotrichum* and apically branched in *Ceratocladium*. The taxonomic value of the setae branching pattern needs to be assessed. In our analysis, the *Circinotrichum* s.s. lineage nested with *Hansfordia pulvinata* in an unsupported subclade. This latter species is characterised by macronematous and branched conidiophores with terminal polyblastic conidiogenous cells, producing globose to subglobose hyaline conidia. The lack of molecular data for most of the species of *Ceratocladium*, *Circinotrichum* or *Hansfordia* hinders the elucidation of taxonomic groups in these fungi.

Zygosporium gibbum formed a separate and independent lineage in *Xylariales*. *Zygosporium* is typified with *Z. oscheoides* and characterised by darkly pigmented, incurved vesicular cells usually born from the side of setiform conidiophores; the vesicles may be stalked or sessile, and give rise to 2–4 ampulliform conidiogenous cells that produce aseptate, ellipsoid or globose, smooth or variously ornamented conidia (Mason 1941, Hughes 1951). This is the first report of *Zygosporium* in *Xylariales*. However, the phylogeny of this genus remains uncertain pending further studies including more isolates and molecular markers.

Clade II (0.98 PP, 86 % BS) includes members of *Coniochaetales* and *Cordanales* distributed in two well- (1 PP, 99 % BS) and moderate-supported (0.97 PP, 77 % BS) subclades. Two species of *Cordana* were collected from plant debris during our sampling and described as *C. mercadiana* and *C. verruculosa* (Hernández-Restrepo et al. 2014b). Only *C. verruculosa* is included in the present phylogenetic analysis. *Cordanales* was recently introduced for species of *Cordana* (Hernández-Restrepo et al. 2015b).

Clade III is represented by members of the *Sordariales*. The *Chaetomiaceae* forms a strongly supported subclade (1 PP, 97 % BS), which includes several poorly discriminated genera using LSU data (Wang et al. 2016a, b). Two Iberian isolates, *Monodictys nigrosperma* (FMR 11941) and *Trichocladium asperum* (FMR 12054), were included in *Chaetomiaceae*. *Monodictys* and *Trichocladium* are two heterogeneous and polyphyletic genera (Mantle et al. 2006, Tanaka et al. 2015) (also

in *Dothideomycetes*, Fig. 1, clade III). Although, the two genera share conidiophores slightly differentiated, with holoblastic conidiogenous cells and dark brown conidia, they can be differentiated by conidial features; *T. asperum* has subglobose to oval or cylindrical-oval, transversely septate and coarsely warted conidia, whereas *M. nigrosperma* has smooth, clavate to pyriform conidia, with longitudinal and transverse septa. *Trichocladium* s.s. based on the type species, *T. asperum*, was previously shown to be related to the *Sordariales* close to *Chaetomium* and *Humicola* (Hambleton *et al.* 2005), although Mantle *et al.* (2006) considered *T. asperum* as member of *Calosphaeriales*. Our results agree with Hambleton *et al.* (2005) relating *T. asperum* with *Sordariales*, specifically with the *Chaetomiaceae*.

This is the first report of the phylogenetic affinity of *M. nigrosperma* with the *Chaetomiaceae*. *Monodictys* s.s., based on *M. putredinis*, the presumable asexual morph of *Ohleria brasiliensis* (Samuels 1980), is a member of the *Ohleriaceae* (*Dothideomycetes*) (Jaklitsch & Voglmayr 2016). *Monodictys nigrosperma* likely does not belong to *Monodictys*, but possibly to *Humicola*, *Mycothermus* or *Trichocladium* (Fig. 4, clade III). However, considering the unclear position of *Monodictys* and the low discrimination power of the LSU in the *Chaetomiaceae* (Wang *et al.* 2016a, b), we prefer to not introduce any taxonomic change until additional sampling and molecular analyses with other markers prove the definitive placement of *M. nigrosperma*.

Clade IV, represented by members of *Chaetosphaeriaceae* (1 PP, 99 % BS), includes *Chloridium chloroconium* (FMR 11940), *Dictyochoaeta fuegiana* (FMR 13126), *Cacumisporium capitulatum* (FMR 11339), *Menispora glauca* (FMR 12089), *Sporoschisma mirabile* (FMR 11247), and *Zanclospora* sp. (FMR 11585 and FMR 12186). The relationships of those genera with *Chaetosphaeria* and their phylogenetic position have been discussed previously by other authors (Réblová 2000, Fernández *et al.* 2006). This family shows a great diversity of asexual morphs. They are mainly characterised by pigmented conidiophores and phialidic conidiogenous cells (i.e. *Chloridium*, *Codinaea*, *Dictyochoaeta*, *Gonytrichum*, *Menispora*, *Sporoschisma* and *Zanclospora*), although genera with holoblastic conidiogenesis (i.e. *Cacumisporium*, *Exerticlava* and *Stanje-hughesia*) or tetric conidiogenous cells (*Paliphora*) are also included in *Chaetosphaeriaceae* (Réblová 2000, Fernández *et al.* 2006, Shenoy *et al.* 2010). Réblová *et al.* (2016a) recently recommended the use of the generic nomenclature attributed to the asexual morphs, such as *Chloridium*, *Menispora* and *Sporoschisma*, rather than the respective generic sexual names *Chaetosphaeria*, *Zignoella* or *Melanochaeta*.

The two isolates of *Zanclospora* (FMR 11584 and FMR 12186) formed a distinct and distant lineage within the *Chaetosphaeriaceae*. Although phylogenetic data of other *Zanclospora* species are not available, based on morphological criteria, Réblová *et al.* (1999) included this genus in the family. The two *Zanclospora* isolates show a very similar morphology; i.e. presence of brown, smooth, simple or branched, setiform conidiophores with phialidic conidiogenous cells that produce fusiform, hyaline and smooth-walled conidia. Since they are different from other previously described species in the genus (Calduch *et al.* 2002, Almeida *et al.* 2013), the new species *Z. iberica* is introduced below.

Clade V (0.99 PP, 81 % BS) includes sequences of two *Helminthosphaeria* species (i.e. *H. clavariaum* and *H. tomaculum*) and one of *Endophragmiella dimorphospora* (FMR 12150), all representatives of the *Helminthosphaeriaceae*

(Miller *et al.* 2014). This is the first time that an *Endophragmiella* species is linked to the *Helminthosphaeriaceae* based on molecular data. Previous morphological studies had associated *Endophragmiella* with other sexual morphs in *Helminthosphaeriaceae*, such as *Echinosphaeria canescens* and *Helminthosphaeria punctata* (Miller *et al.* 2014, Jaklitsch *et al.* 2016a).

The fully supported clade X includes two distinct branches, one for *Spadicoides atra* (EF204506) and the other for *Diplococcium pulneyense* (FMR 10959). *Spadicoides* and *Diplococcium* share most of their morphological characters, including brown conidiophores, terminal or intercalary, polytetric conidiogenous cells and brown conidia. They are mainly distinguished by their conidial arrangement, solitary in *Spadicoides* and catenate in *Diplococcium*. However, a previous molecular study (Shenoy *et al.* 2010) as well as our current analysis shows that both genera are polyphyletic. Considering that the type species of *Diplococcium* (*D. spicatum*) and *Spadicoides* (*S. bina*) are respectively placed in the *Helotiales* (*Leotiomyces*) and the *Cordanales* (*Sordariomyces*), our study reveals a novel phylogenetic scenario for *S. atra* and for *D. pulneyense* and *D. singulare*. Two new genera are introduced to accommodate *S. atra* and the isolate formerly identified as *D. pulneyense* in Hernández-Restrepo *et al.* (2012), i.e. *Xenospadicoides* and *Pseudodiplococcium*, respectively. Since both genera are nested in the clade X, clearly separated from any other family and order accepted in the *Sordariomyces*, we introduce the new order *Xenospadicoidales* typified with the new family *Xenospadicoidaceae* for the taxonomic stability of these fungi in the class. The *D. singulare* clade is distantly related to other members of *Sordariomyces*, forming a single lineage, paraphyletic with the *Vermiculariopsiella* lineage (Fig. 4, clade XIII). It is therefore considered here representative of a new genus, which is proposed as *Paradiplococcium*.

Clade XI (1 PP, 98 % BS) is represented by members of the genus *Myrmecridium* (*Myrmecridiaceae*, *Myrmecridiales*), including *M. schulzeri* (FMR 12424). *Myrmecridium* is a genus segregated from *Ramichloridium*, commonly found on soil and plant debris, and able to cause human and animal diseases (Arzanlou *et al.* 2007, de Hoog *et al.* 2011). It is characterised by differentiated conidiophores, with integrated sympodial and denticulate conidiogenous cells that produce pale brown conidia, often with a mucilaginous sheath (Arzanlou *et al.* 2007, Crous *et al.* 2011, 2015b).

Clade XIII is represented by *Vermiculariopsiella* spp., which includes *V. pediculata* (FMR 12187) isolated from Spain. *Vermiculariopsiella*, typified with *V. immersa*, is characterised by setose conidiomata, with simple or branched conidiophores bearing phialidic conidiogenous cells, often curved at the tip, that produce hyaline, aseptate conidia (Bender 1932, Seifert *et al.* 2011). The genus includes more than 10 species and, based on culture methods, some of them have been described as asexual morphs of *Echinosphaeria* (Dhargalkar & Bhat 2009, Jaklitsch *et al.* 2016a). However, the type species of *Echinosphaeria*, *E. canescens*, which has also been described producing an *Endophragmiella* synasexual morph (Miller *et al.* 2014), belongs to the *Helminthosphaeriaceae* (*Chaetosphaeriales*) as mention before. In our analysis this family is placed in a distant lineage (Fig. 4, clade V) from that composed solely of *Vermiculariopsiella* spp., which forms a novel strongly supported monophyletic clade in *Sordariomyces* (1 PP, 98 % BS). Based on this result, we introduce a new order and new family for the genus *Vermiculariopsiella*.

Clade XV is represented by members of *Hypocreales*, and includes four of our isolates identified as *Chaetopsina fulva* (FMR 13129), *Ch. penicillata* (FMR 10948), *Paramyrothecium roridum* (FMR 11946) and *Stachybotrys cylindrospora* (FMR 11595). Some molecular studies have previously reported all these species as belonging to this order (Luo & Zhuang 2010, Lombard et al. 2015, 2016), which commonly includes asexual morphs with phialidic conidiogenous cells producing slimy conidia.

Clade XVI includes 13 of our isolates and taxa that belong to *Conioscyphales*, *Fuscosporellales*, *Pleurotheciales* and *Savoryellales*. One clade containing *Parasymphodiella* species is shown as a novel lineage in *Sordariomycetes*. Furthermore, several of our isolates have also been detected as putative new species (i.e. *Parasymphodiella* sp. FMR 13132, *Conioscypha* sp. FMR 13134, and the unidentified isolates FMR 11490 and FMR 12412). The *Parasymphodiella* lineage comprised the three species *P. laxa*, *P. eucalypti*, *P. elongata* and our isolate FMR 13132. *Parasymphodiella* is typified by *P. laxa*, and characterised by unbranched, sympodial conidiophores with thallic-arthric, terminal and intercalary conidiogenous cells that produce unbranched chains of hyaline conidia (Ponnappa 1975). Species of this genus are commonly found growing on litter. *Parasymphodiella* sp. FMR 13132 mainly differs from the other species of the genus by its smaller conidia. It is closely related to *P. elongata*, but shows enough genetic difference within the LSU (97 % similarity, 619/640) and ITS (92 % similarity, 460/501) sequence data to be proposed as a new species, *P. lauri*. Since the monophyletic group of *Parasymphodiella* species represents a new lineage in *Sordariomycetes*, we introduce the novel order *Parasymphodiellales*, typified by the new family *Parasymphodiellaceae*.

The *Bactrodesmiastrum* clade which includes *B. monilioides*, *B. obovatum* and *B. pyriforme* represents the recently introduced order *Fuscosporellales* (Yang et al. 2016).

In the additional LSU sequence analysis (Fig. 5) with a wider species sampling of four related sordariomycetous orders (i.e. *Conioscyphales*, *Fuscosporellales*, *Pleurotheciales* and *Savoryellales*), the *Savoryellales* formed a monophyletic group, including species of *Ascotaiwania*, *Canalisporium*, *Savoryella*, and *Triadelphia uniseptata*, as previously reported in the family *Savoryellaceae* (Boonyuen et al. 2011, Réblová et al. 2016b). Two of our isolates, *Bactrodesmium pallidum* (FMR 11345) and the unidentified fungus FMR 12412 nested within this *Savoryellales* lineage. *Bactrodesmium pallidum* nested with *A. mitriformis* and *T. uniseptata*. *Ascotaiwania mitriformis* shows a monotosporella-like asexual morph (Ranghoo & Hyde 1998), which resembles *B. pallidum* and *T. uniseptata* in producing holoblastic, brown, septate conidia. However, *B. pallidum* differs from these species by its sporodochial conidiomata composed of slightly differentiated, hyaline conidiophores. The taxonomy of *Bactrodesmium* remains undetermined and, based on known data, it seems to be polyphyletic (Hernández-Restrepo et al. 2013). For instance, as previously published by Koukol & Kolárová (2010), *B. gabretae* is related with *Helotiales* (*Leotiomycetes*, Fig. 3), while Tanaka et al. (2015) reported *B. cubense* as a member of *Massarineae*, *Pleosporales* (Fig. 1, clade III). *Bactrodesmium* is one of the earliest described hyphomycete genera, with the type species *B. abruptum* being already described in 1865 by Berkeley & Broome from dead wood in UK (Berkeley & Broome 1865). However, the holotype was not designated in the protologue, nor authentic type material or living culture of the fungus preserved for comparison. Taking

into account this fact and considering the great number of species described in the genus (ca. 50) and the restricted number of cultures available, it is challenging to reconstruct the phylogeny of *Bactrodesmium*. The unidentified isolate FMR 12412 grouped with *A. limnetica* (CBS 126576 and CBS 126792) in a fully supported clade (Fig. 5), but with a genetic difference (98 % and 95 % similarity with LSU and ITS markers, respectively) sufficient to be considered a distinct species. Considering that *Ascotaiwania* is polyphyletic (Boonyuen et al. 2011, Hernández-Restrepo et al. 2015a), with the type species *A. lignicola* placed on a separate branch far from the clade of FMR 12412 and *A. limnetica*, we accommodate both species in the new genus *Neoascotaiwania*, with the Spanish isolate being proposed as *N. terrestris* sp. nov.

The recently introduced *Conioscyphales* (Réblová et al. 2016b), typified by *Conioscyphaceae*, forms a well-supported lineage in our phylogenetic analyses (Fig. 4, clade XVI, 1 PP, 84 % BS; Fig. 5, 0.92 PP, 79 % BS). This includes sequences of *Conioscypha varia*, *C. lignicola* and *C. peruviana* retrieved from GenBank, but also sequences of *Conioscypha* species identified from Spanish samples, such as *C. minutispora* (FMR 11245, Crous et al. 2014b), *C. hoehnelii* (FMR 11592), and *Conioscypha* sp. (FMR 13134). Species of this genus are characterised by monoblastic conidiogenous cells with percurrent proliferations producing deep, hyaline collarettes and brown conidia. The singular features of *Conioscypha* sp. FMR 13134 (i.e. ornamented blastoconidia and a thallic-arthric synasexual morph) and its phylogenetic position justify the recognition of *C. pleiomorpha* sp. nov.

The isolates *Phaeoisaria sparsa* (FMR 11939), *Sterigmatobotrys uniseptata* (FMR 11937), and the unidentified fungus FMR 11490 are distributed in different well-supported lineages within the *Pleurotheciales* (Fig. 4, clade XVI; Fig. 5). *Phaeoisaria sparsa*, which is here sequenced for the first time, nested in a subclade with other *Phaeoisaria* species, i.e. *P. clematidis*, the generic type, *P. fasciculata* and *P. sedimenticola* (Fig. 5, 1 PP, 98 % BS). *Phaeoisaria* species are characterised by synnematus conidiomata, dark brown conidiophores, polyblastic, sympodial, denticulate conidiogenous cells and subhyaline conidia. Isolate FMR 11490 nested in another lineage with *Ho. farinosum*, *Monotosporella setosa* and *Pleurothecium obovoideum* (Fig. 5, 1 PP, 87 % BS). *Helicoon* produces hyaline conidiophores and coiled, hyaline conidia; *Monotosporella* has brown conidiophores bearing monoblastic, terminal conidiogenous cells with brown, septate conidia, usually obovate to pyriform. FMR 11490 resembles *P. obovoideum* in having unbranched, brown conidiophores, with polyblastic, denticulate conidiogenous cells and brown conidia, but it differs in having larger conidiophores and denticles, and botuliform, septate conidia. This fungus is described here as a new genus *Anapleurothecium* in the *Pleurotheciales*. Finally, *S. uniseptata* (FMR 11937), which is sequenced for the first time, clustered with GenBank sequences of *S. macrocarpa* and *S. rudis* (Fig. 4, 1 PP, 87 % BS; Fig. 5, 1 PP, 94 % BS). This latter species, formerly known as *Taeniolella rudis*, was recently transferred to *Sterigmatobotrys*, based on the morphology of the penicillate synasexual morph and molecular data. *Taeniolella exilis*, the type species, is related to the *Kirschsteinioteliaceae* in *Dothideomycetes* (Ertz et al. 2016). The molecular taxonomy of *S. macrocarpa* and *S. rudis* has been previously studied by Réblová & Seifert (2011) and Réblová et al. (2012, 2016b), who based on multi-locus phylogenies demonstrated the relationship



Fig. 6. *Pirozynskiella laurisilvatica* (FMR 13133 ex-type). A, B. Conidiophores and conidia. C–E. Conidia. Scale bars = 10 μ m.

of *Sterigmatobotrys* with members of *Ascotaiwania*, *Conioscypha*, *Pleurotheciella* and *Pleurothecium*.

Clade XVII (Fig. 4) is a well-supported lineage basal in the *Sordariomycetes*. It comprises the type species of the genus *Cirrenalia*, *C. macrocephala*, and two Spanish isolates FMR 12149 and FMR 12418 with morphological affinity to this genus. *Cirrenalia macrocephala* is characterised by dark sporodochial conidiomata, with conidiophores reduced to conidiogenous cells, and helicoidal brown conidia. Although the two isolates show some genetic difference, they are morphologically similar, and differ from the other species of the genus mainly by their straight conidia, as well as by the colour, size and number of septa. Based on these data, they are introduced below as *C. iberica*. The order affiliation of *Cirrenalia* remains unclear, since Abdel-Wahab *et al.* (2010) related the genus to the *Halosphaeriales*, and more recently Jaklitsch *et al.* (2016a) considered it as member of the *Microscuales*.

TAXONOMY

Dothideomycetes

Asterinales, Asterinaceae

Pirozynskiella laurisilvatica Hern.-Restr., R.F. Castañeda & Gené, *sp. nov.* MycoBank MB820269. Fig. 6.

Etymology: Named after the *Laurisilva* forest where the sample was collected, in La Gomera (Canary Islands, Spain).

Colonies on the natural substratum hairy, brown, growing on the upper leaf surface. *Mycelium* partly superficial and partly immersed, consisting of branched, septate, brownish, smooth- to rough-walled hyphae, 2–3 μ m wide. *Conidiophores* semi-macronematous or micronematous, erect, cylindrical, 50–75 \times 4–4.5 μ m, brown, smooth-walled. *Conidiogenous cells* holoblastic, integrated, terminal, and cylindrical. *Conidia* in unbranched acropetal chains, dry, 1–3-septate, subcylindrical to cylindrical, 19–31 \times 3–4 μ m,

tapering toward both ends 1–2 μ m wide, brown to pale brown, verruculose. *Sexual morph* not observed.

Culture characteristics: Colonies on PCA and OA at 25 °C slow-growing, reaching 5 mm diam in 2 wk, velvety, black, margin slightly erodate; reverse black. Sporulation abundant. *Conidia* on OA 15–26 \times 2.5–4 μ m.

Specimen examined: Spain, Canary Islands, La Gomera, Garajonay Reserve Biosphere, Los Cedros, on fallen leaves of *Laurus* sp., Jul. 2013, M. Hernández-Restrepo & J. Guarro (*holotype* CBS H-21889; cultures ex-type CBS 138109, FMR 13133).

Notes: *Pirozynskiella* was proposed by Hughes (2007) to accommodate two asexual fungi, *P. solaninum* as type and *P. costaricense*, with simple, brown conidiophores, bearing a single unbranched acropetal chain of ellipsoidal to subcylindrical conidia. These species were segregated from the genus *Heteroconium* by their fungicolous nature and the sequence of septation during the maturation of conidia. The conidial septation in *Pirozynskiella* is at first central and then centrifugal and/or intercalary, while in *Heteroconium* the first formed septum is at the base of the conidium, with subsequent septa produced in sequence from the base to the apex (Hughes 2007). *Pirozynskiella laurisilvatica* was found growing on leaves of *Laurus* sp., in association with an unidentified fungus. This novel species can be easily differentiated from *P. solaninum* and *P. costaricense* by its verruculose conidia. *Pirozynskiella laurisilvatica* is phylogenetically related to *Asterinales*. However, there is no molecular data available of the other two *Pirozynskiella* species to confirm the phylogenetic position of the genus.

Capnodiales, Teratosphaeriaceae

Catenulostroma lignicola Hern.-Restr., J. Mena & Gené, *sp. nov.* MycoBank MB820270. Fig. 7.

Etymology: From the Latin *lignum* meaning wood, and *colō* meaning to inhabit, since this fungus was found growing on wood.

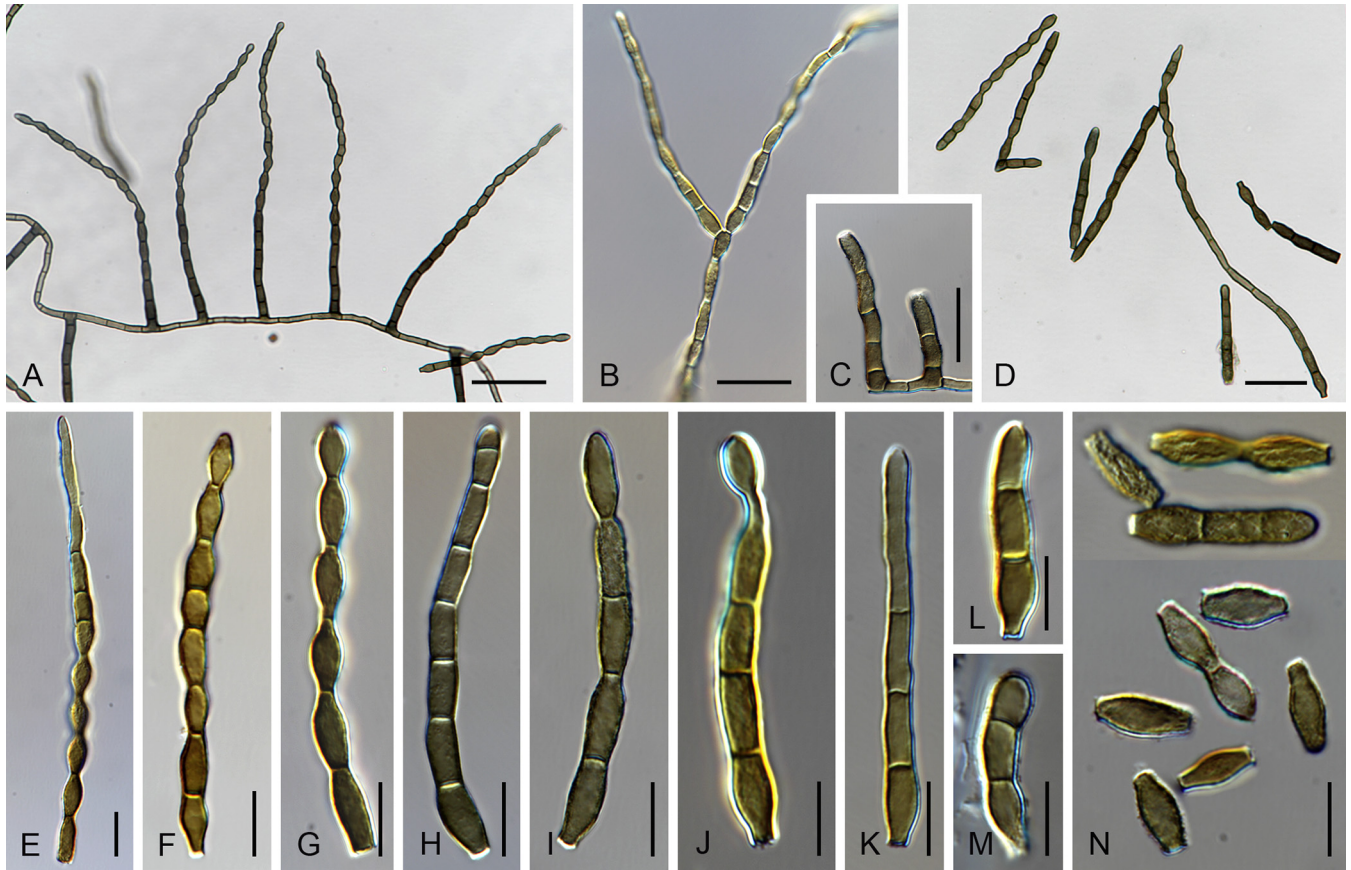


Fig. 7. *Catenulostroma lignicola* (FMR 11491 ex-type). A, B. Conidiophores and conidia. C. Conidiophores. D–N. Conidia. Scale bars = 10 µm.

Description on OA. *Mycelium* mostly immersed, composed of septate, brown, smooth hyphae, 2.5–5 µm wide. *Conidiophores* micro- or semi-macronematous, solitary or fasciculate, erect, cylindrical, brown to dark brown, smooth to reticulate in the apex, 19.5–69.5 × 5–6 µm, or reduced to inconspicuous conidiogenous loci in the hyphae. *Conidiogenous cells* integrated, terminal, monoblastic, cylindrical, brown. *Conidia* arranged in acropetal chains, commonly unbranched, some branched near the base, tending to remain attached to each other, 0–9-septate, with different degrees of constriction at the septa, straight to slightly curved, brown to medium brown, reticulate, terminal conidia with rounded apex, truncate base, intercalary conidia with truncate ends; unicellular conidia lageniform to barrel shape, 9–13.5 × 4–5 µm; 1-septate conidia cylindrical, constricted at the septum and truncate ends, 16–25 × 4–5.5 µm; 3–9-septate, subcylindrical, 21–98.5 × 3–4.5 µm. *Sexual morph* not observed.

Culture characteristics: Colonies on PDA and OA at 25 °C slow-growing, reaching 6 mm diam in 2 wk, with moderate amount of mycelium, velvety, olivaceous black, margin fimbriate; reverse olivaceous black. Sporulation abundant.

Specimen examined: Spain, Galicia, Las Fragas del Eume Natural Park, on dead wood, Jul. 2010, M. Hernández-Restrepo, J. Mena & J. Guarro (holotype CBS H-22994, cultures ex-type CBS 130285, IMI 500759, FMR 11491).

Notes: *Catenulostroma* currently comprises six species of saprobic and pathogenic fungi. This genus was erected with *C. protearum* together with eight other species in *Teratosphaeriaceae* (Crous et al. 2007a). Later, three were added to the genus (i.e. *C. eucalyptorum*, *C. corymbiae* and *C. hermanusense*) (Crous et al.

2011, Crous & Groenewald 2011), whereas four species were transferred to *Neocatenulostroma* (i.e. *C. abietis*, *C. excentricum*, *C. germanicum* and *C. microsporum*) (Quaedvlieg et al. 2014).

Catenulostroma lignicola is morphologically similar to *C. chromoblastomycosum* in having transversely septate conidia, with more than 5 septa. Nevertheless, the conidia of *C. chromoblastomycosum* are smaller [(8–)20–35(–60) × 4–5(–7) µm] and smooth to finely verruculose, while those in *C. lignicola* are larger (up to 98.5 µm) and with a reticulate ornamentation. It is noteworthy that *C. chromoblastomycosum* was described from a case of human chromoblastomycosis (Crous et al. 2007a).

Kirschsteinietheliales Hern.-Restr., R.F. Castañeda, Gené & Crous, **ord. nov.** MycoBank MB821220.

Saprobic on wood and bark. *Sexual morph.* *Ascomata* superficial, perithecioid, dark brown to black. *Hamathecium* with pseudoparaphyses. *Asci* bitunicate, with ocular chamber. *Ascospores* septate, ellipsoidal, pigmented. *Asexual morph.* *Conidiophores* macronematous, brown. *Conidiogenous cells* blastic or tretic, brown. *Conidia* septate, brown.

Type family: *Kirschsteinietheliaceae* Boonmee & K.D. Hyde.

Type genus: *Kirschsteiniethelia* D. Hawksw.

Genera included: *Kirschsteiniethelia* (= *Dendryphiopsis*), *Taeniella*, *Solicorynespora* (based on *S. insolita* not generic type), *Sporidesmium* s.l. and *Brachysporiella* (based on *B. navarrica* not generic type).



Fig. 8. *Brachysporiella navarrica* (FMR 12426 ex-type). A–K. Conidiophores and conidia. L–Q. Conidia. Scale bars = 10 μ m.

Kirschsteinietheliales, Incertae sedis

Brachysporiella navarrica Hern.-Restr., R.F. Castañeda & Gené, *sp. nov.* MycoBank MB820273. Fig. 8.

Etymology: Name refers to Navarra, a Spanish locality where this fungus was collected.

Description on OA. *Mycelium* immersed and superficial, composed of septate, straight to sinuous, brown, smooth hyphae, 2.5–4 μ m wide. *Conidiophores* macronematous, irregularly branched, erect, cylindrical, 76–357 \times 2.5–4 μ m, brown, smooth. *Conidiogenous cells* integrated, terminal, mono- and polyblastic, cylindrical to clavate, brown, smooth-walled. *Conidia* solitary, 2–4-septate, covered with a mucilaginous sheath, obovoid, clavate to pyriform, 24.5–40 \times 11–16 μ m, with a base rounded or truncate, 2.5–4 μ m wide, brown, upper cells darker,

smooth, often with a portion of the conidiogenous cell attached to the base of the conidia when these are released. *Sexual morph* not observed.

Culture characteristics: Colonies on PDA and OA at 25 $^{\circ}$ C reaching 14 and 19 mm diam in 2 wk, respectively, with moderate amount of cottony mycelium, elevated, olivaceous black, hyaline exudate abundant, margin fimbriate; reverse olivaceous black. Sporulation abundant.

Specimen examined: Spain, Navarra, Baribar, on dead wood, Mar. 2012, M. Hernández-Restrepo & J. Capilla (*holotype* CBS H-22990; culture ex-type CBS 142296, FMR 12426).

Notes: *Brachysporiella* was introduced by Batista (1952) with *B. gayana* as generic type. *Brachysporiella* is characterised by branched or unbranched conidiophores, without basal rhizoids,

and with clavate to obovoid conidia. Currently, it comprises about 12 saprobic species, which are usually found growing on wood and litter.

Brachysporiella is morphologically similar to *Monotosporella*; however, the taxonomy of these fungi is still unclear. Hughes (1958) introduced *Monotosporella* to accommodate *M. setosa*, a fungus characterised by unbranched conidiophores with basal rhizoids, and subglobose conidia. However, this genus was considered a synonym of *Brachysporiella* by Ellis (1959). Unfortunately, original material from both type species is not available for study. Réblová *et al.* (2016b) placed *M. setosa* (GenBank AF132334, isolate HKUCC 3713) in *Pleurotheciales* (*Sordariomycetes*; Fig. 4, clade XVI). Other monotosporella-like asexual morphs have been known for some *Ascotaiwania* species (e.g. *A. mitriformis* and *A. sawadae* in *Savoryellaceae*, Fig. 5) (Ranghoo & Hyde 1998, Sivichai *et al.* 1998). In contrast, *B. navarrica* is included in an *incertae sedis* clade together with *Solicorynespora insolita* and *Astrosphaeriella livistonicola*, which forms a sister lineage with members of the family *Kirschsteinioteliaceae* (*Dothideomycetes*; Fig. 1, clade V). Therefore, our phylogenetic results support the Hughes concept in considering both *Brachysporiella* and *Monotosporella* as two distinct genera. However, the taxonomic position of the former is provisional until further molecular studies with the generic type have been done.

Brachysporiella navarrica resembles *B. gayana* in having erect, brown conidiophores, and septate pyriform to obovoid conidia. Conidia of the novel species are 2–4-septate, slightly smaller (24.5–40 × 11–16 µm) and covered by a mucilaginous sheath, while those of *B. gayana* are 3-septate, larger and thicker (32–42 × 18–20 µm) without sheath (Batista 1952).

Pleosporales, Amniculicolaceae

Vargamyces aquaticus (Dudka) Tóth., Acta Mus. Silesiae, Ser. A 25(3–4): 403. 1980. Fig. 9.

Basionym: *Camposporium aquaticum* Dudka, Ukr. bot. Zh. 23: 91. 1966.

Synonyms: *Xylomyces aquaticus* (Dudka) K.D. Hyde & Goh, Mycol. Res. 103: 1573. 1999.

Sporidesmium ontariense Matsush., Matsush. Mycol. Mem. 3: 16. 1983.

Repetophragma ontariense (Matsush.) W.P. Wu, Fungal Diversity Res. Ser. 15: 82. 2005.

Description on OA. *Mycelium* mostly immersed, composed of septate, hyaline to pale brown, smooth hyphae, 1–3.5 µm wide. *Conidiophores* micronematous to semi-macronematous, solitary, erect, straight to flexuous, cylindrical, with up to 4 percurrent proliferations, 35–120 × 2.5(–4.5) µm, subhyaline to pale brown. *Conidiogenous cells* integrated, terminal, cylindrical to cupuliforme, 6.5–16 × 4–6 µm, hyaline to pale brown. *Conidial secession* rhexolytic. *Conidia* solitary, fusiform, 5–8-septate, truncate at the base, rounded apically brown, paler toward the ends, smooth-walled, 64–132 × 10–17 µm, base 2.5–5 µm wide. *Microconidia* unicellular, blastic growing on undifferentiated hyphae, solitary, terminal, lateral, or intercalary, globose to obovoid, hyaline, smooth, 2.5–4 × 1.5–2 µm. *Sexual morph* not observed.

Culture characteristics: Colonies on OA at 25 °C reaching 25 mm diam in 2 wk, lanose at the centre, with scarce amount of aerial mycelium toward the periphery, white to pale olivaceous buff, margin effuse, with a brick diffusible pigment; reverse saffron. Colonies on PDA at 25 °C reaching 22 mm diam in 2 wk, lanose, vinaceous buff, margin effuse and buff; reverse grey brown, buff to the periphery. Sporulation abundant on OA.

Specimens examined: **Lectotype designated here**: fig. 1 in Dudka I. A. New and rare species of fungi imperfecti from the basins of the southern part of Kiev Polessye. Ukrainskiy Botanichnyi Zhurnal. 1966, MBT375533. **Hungary**, Börzsöny Morgó stream, on submerged wood, date unknown, J. Gönczöl, MBT375360 (**epitype designated here** CBS H-22992, culture ex-epitype CBS 636.91). **Spain**, Castilla-León, Burgos, Pedroso River, on submerged wood, Nov. 2010, M. Hernández-Restrepo & J. Gené (CBS 130366, IMI 500762, FMR 11587).

Notes: In our phylogenetic tree, *V. aquaticus* and *R. ontariense* (GenBank DQ408575) formed a supported subclade in *Pleosporales* (Fig. 1, clade III). *Vargamyces aquaticus*, initially described as *C. aquaticum* (Dudka 1966), is commonly found on rotten submerged leaves of *Alnus glutinosa*, *Populus nigra* and *Acer* sp. (Révay *et al.* 2014). *Sporidesmium ontariense* was introduced by Matsushima (1983) for a fungus that was found in Canada, growing on a dead branch of *Aceris sacchari*. It was later transferred to *Repetophragma* because the conidiophores were shown to proliferate percurrently (Wu & Zhuang 2005). Although similarities among *V. aquaticus* and *R. ontariense* have been noticed previously (Gönczöl *et al.* 1990, Révay *et al.* 2014), no new combination has been introduced. Morphological and molecular data suggest that *R. ontariense* and *V. aquaticus* are conspecific, and here we list them as synonyms. Based on LSU sequences of *R. ontariense* (DQ408575, culture HKUCC 10830), Zhang *et al.* (2009a) placed this species in the *Amniculicolaceae*.

The type material for *V. aquaticus* has been lost (Révay *et al.* 2014); therefore, the illustration included in the protologue (Dudka 1966) is selected as lectotype. In addition, to assure the availability of information for modern identification, CBS 636.91 is designated as ex-epitype culture. Morphological features of the epitype fit well with the protologue of *C. aquaticum* (Dudka 1966). The Spanish strain shows slightly larger and more septate conidia than those described above (101–135 × 16–20 µm, base 4–6 µm wide, 5–9-septate). However, CBS 636.91 and FMR 11587 show identical LSU and ITS sequences.

Melanommataceae

Pleotrichocladium Hern.-Restr., R.F. Castañeda & Gené, **gen. nov.** MycoBank MB820277.

Etymology: *Pleo-* referring to *Pleosporales*; and *-trichocladium* referring to the asexual genus *Trichocladium*. Morphologically similar to *Trichocladium*, but phylogenetically related to *Pleosporales*.

Mycelium superficial and immersed, composed of branched, septate, hyaline to pale brown, smooth hyphae. *Conidiophores* micronematous, reduced to a hyphal cell that extends laterally to form a conidium or arising as short lateral pedicels on the hyphae, unbranched or loosely branched. *Conidiogenous cells* integrated, mono- and polyblastic, cylindrical, subglobose or barrel-shaped, subhyaline to pale brown, smooth. *Conidial secession*



Fig. 9. *Vargamyces aquaticus* (A–I. FMR 11587; J–V. CBS 636.91 ex-epitype). A, E, J, K. Conidiophores and conidia. B–D. Conidiophores with percurrent proliferation (indicated by rows). F–I, L–N. Conidia. O–V. Microconidia. Scale bars = 10 µm.

schizolytic. *Conidia* solitary, septate, ovoid, ellipsoid to clavate, straight or curved, brown and smooth. *Sexual morph* not observed.

Type species: *Pleotrichocladium opacum* (Corda) Hern.-Restr., R.F. Castañeda & Gené.

Pleotrichocladium opacum (Corda) Hern.-Restr., R.F. Castañeda & Gené, **comb. nov.** MycoBank MB820278. Fig. 10.

Basionym: *Sporidesmium opacum* Corda Icon. Fung. 1: 7. 1837.

Synonyms: *Xenodochus opacus* (Corda) Bonord., Handb. Allgem. mykol.: 49. 1851.

Clasterosporium opacum (Corda) Sacc., Syll. Fung. 4: 387. 1886.

Trichocladium opacum (Corda) S. Hughes, Trans. Br. Mycol. Soc. 35: 154. 1952.

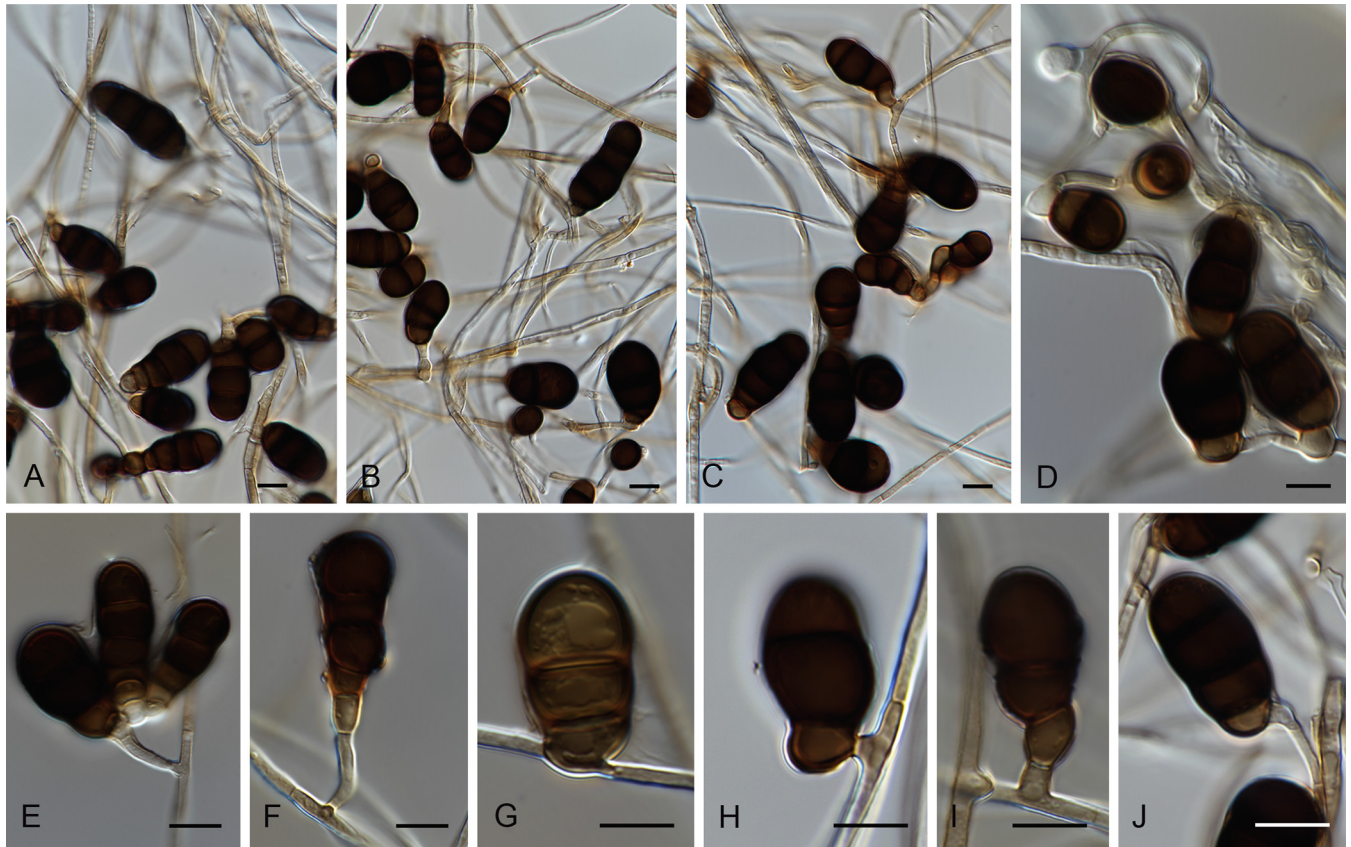


Fig. 10. *Pleotrichocladium opacum* (FMR 12416 ex-epitype). A–J. Conidiophores and conidia. Scale bars = 10 μ m.

Description on OA. *Mycelium* partly superficial and partly immersed, composed of septate, hyaline to pale brown, smooth hyphae, 1.5–3 μ m wide. *Conidiophores* micronematous, often reduced to a hyphal cell that laterally extends to form a conidium or arising as short lateral pedicels on the hyphae, unbranched or loosely branched. *Conidiogenous cells* integrated, mono- and polyblastic, terminal or intercalary, cylindrical or doliiform, 7–14 \times 3–3.5 μ m, subhyaline to pale brown, smooth. *Conidia* solitary, 2–4(–5)-septate, ovoid, ellipsoid or clavate, 22–37 \times 12–18.5 μ m, dark brown, basal cells paler, smooth. *Sexual morph* not observed.

Culture characteristics: Colonies on OA at 25 $^{\circ}$ C reaching 35–55 mm diam in 2 wk, lanose, white to grey olivaceous, margin white, effuse; reverse olivaceous black. Colonies on PDA at 25 $^{\circ}$ C reaching 35–40 mm diam in 2 wk, lanose, smoke grey, grey olivaceous or greenish olivaceous, margin white, effuse; reverse olivaceous black. Sporulation moderate to abundant.

Specimens examined: **Lectotype designated here**: tab. II, fig. 115 in Corda ACJ, *Icones Fungorum hucusque Cognitorum* 1: i–iv, 1837. MBT375536. **Antarctica**, King George, Jubany, on lichen, 1991, C. Möller (CBS 709.92). **Austria**, Vorarlberg, isolated from soil, summer 1966, M.A.A. Schipper (CBS 534.66). **The Netherlands**, Baarn, garden Eemnesserweg 90, on dead wood of *Thuja occidentalis*, Mar 1970, H.A. van der Aa (CBS 450.70). **Spain**, Aragón, Ordesa y Monte Perdido, National Park, isolated from soil, Mar. 2011, M. Hernández-Restrepo & J. Capilla (CBS 142288, FMR 12088). Navarra, Robledal de Orgi, on dead wood, Mar. 2012, M. Hernández-Restrepo & J. Gené, MBT375363 (**epitype designated here** CBS H-22985; cultures ex-epitype CBS 142294, FMR 12416).

Notes: *Trichocladium opacum* is a widely-distributed species, usually found on plant material or isolated from soil (Kendrick & Bhath 1966, Ellis 1971). Corda (1837) introduced that species as

S. opacum from dead wood in Reichenberg (Czech Republic). Later it was re-described and illustrated by Hughes (1952), and considered congeneric with *T. asperum*. Holotype material is unavailable for *S. opacum*. However, the protologue of the species contains an illustration and is designated here as the lectotype of *S. opacum*. Furthermore, an ex-epitype culture is selected to fix the use of this name. It is noteworthy that Hughes (1958) considered more *Sporidesmium* species conspecific with *T. opacum*, i.e. *S. ovoideum*, *S. fasciculare* and *S. pyriforme*. However, further studies based on type specimens are needed to confirm these synonyms.

In our phylogenetic analyses, several strains of *T. opacum* were placed in *Melanommataceae* (*Pleosporales*; Fig. 1, clade III), as previously suggested by Mantle et al. (2006). Since *Trichocladium* is polyphyletic with the type species, *T. asperum*, placed in the *Chaetomiaceae* (Hambleton et al. 2005) (*Sordariales*; Fig. 4, clade III), we propose the new genus *Pleotrichocladium* to accommodate *T. opacum*. Besides the phylogenetic differences, *P. opacum* differs morphologically from *T. asperum* by its pale brown conidiogenous cells and smooth conidia with schizolytic secession. *Trichocladium asperum* has hyaline conidiogenous cells, and its conidia are warty and with rhexolytic secession (Fig. 22).

Pleomonodictyaceae Hern.-Restr., J. Mena & Gené, fam. nov. MycoBank MB820279.

Saprobic on wood and bark. *Sexual morph.* Unknown. *Asexual morph.* *Conidiophores* micro- to semi-macronematous, often reduced to conidiogenous loci in the hyphae. *Conidia* blastic, solitary or in short chains, variable in shape, muriform, dark brown to black, verrucose to tuberculate.

Type genus: *Pleomonodictys* Hern.-Restr., J. Mena & Gené.

Included genus: *Pleomonodictys*.

Notes: In a multi-locus study using LSU, SSU and *tef1* genes, Tanaka *et al.* (2015) showed that *Monodictys capensis* clustered together with *Inflatipora pseudostromatica* in a clade of uncertain position “unknown clade IV” in the suborder *Massarineae* (*Pleosporales*). The phylogeny of the former species was based on the reference strain CBS 134928, identified from dead wood in Russia (Mel'nik & Shabunin 2010), not from the type material. In our phylogenetic analysis that isolate was shown to be closely related to *Monodictys* sp. FMR 12716, which formed a lineage very distant to that of *I. pseudostromatica* (Fig. 1, Clade III). Therefore, the taxonomy of these two monodictys-like fungi is resolved with the introduction of *Pleomonodictydaceae* to accommodate the new genus *Pleomonodictys*, although the family placement of *Inflatipora* remains unclear.

Pleomonodictys Hern.-Restr., J. Mena & Gené, **gen. nov.** MycoBank MB820280.

Etymology: *Pleo-* referring to *Pleosporales*; and *-monodictys* referring to the asexual genus *Monodictys*. Morphologically similar to *Monodictys*, but phylogenetically related to *Pleosporales*.

Colonies effuse, black. *Mycelium* mostly immersed, composed of branched, septate, smooth often verruculose hyphae. *Conidiophores* micronematous or semi-macronematous, often reduced to conidiogenous loci on the hyphae. *Conidia* blastic, solitary or in short chains, variable in shape, muriform, dark brown to black, verrucose to tuberculate. *Sexual morph* not observed.

Type species: *Pleomonodictys descalsii* Hern.-Restr., J. Mena & Gené.

Notes: *Pleomonodictys* is introduced for *P. descalsii* and *P. capensis*, previously accommodated in *Monodictys*. Those fungi differ morphologically from *M. putredinis*, the type species of *Monodictys*, in having verrucose to tuberculate conidia and/or hyphae. *Monodictys* is a polyphyletic genus with species evenly spread in different classes, i.e. *Dothideomycetes*, *Sordariomycetes* and *Leotiomycetes* (Campbell *et al.* 2002, Han *et al.* 2014, Tanaka *et al.* 2015). Although molecular data for the type species of *Monodictys* are not available, based on culture methods, *M. putredinis* has been reported as the asexual morph of *Ohleria brasiliensis* (Samuels 1980). Recently, *Ohleria* was included in the pleosporalean family *Ohleriaceae* (Jaklitsch & Voglmayr 2016). Phylogenetic reassessment of species in *Monodictys* and related sexual genera, including types, is needed to clarify the taxonomy of this genus.

Pleomonodictys capensis (R.C. Sinclair *et al.*) Hern.-Restr., J. Mena & Gené, **comb. nov.** MycoBank MB821221.

Basionym: *Monodictys capensis* R.C. Sinclair *et al.*, Mycotaxon 59: 359. 1996.

Description and illustration: Sinclair *et al.* (1996)

Specimen examined: South Africa, Cape Province, on decorticated wood, Jul. 1994, R.C. Sinclair (ex-type cultures CBS 968.97, PPRI 5984).

Notes: *Monodictys capensis* was mainly characterised by the irregularity in the conidial shape and ornamented wall (Sinclair *et al.* 1996). The ITS sequence of the ex-type strain CBS 968.97 and that retrieved from GenBank (LC014570) corresponding to Mel'nik's strain (CBS 134928) were identical, confirming the identification of this latter strain.

Pleomonodictys descalsii Hern.-Restr., J. Mena & Gené, **sp. nov.** MycoBank MB820281. Fig. 11.

Etymology: In honour to the Spanish mycologist Enrique Descals.

Colonies on OA. *Mycelium* partly superficial and partly immersed, composed of branched, septate, brown to pale brown, nodulose, smooth hyphae, 2.5–5 µm wide. *Conidiophores* micronematous, often reduced to conidiogenous loci in the hyphae, terminal or intercalary. *Conidia* solitary or in irregular branched chains, muriform, obovoid, clavate to pyriform, ellipsoid to subglobose, 28–70 × 24–54 µm, brown to dark brown, or irregularly pigmented, sometimes basal cells paler than the others, base rounded or truncate, 3–8.5 µm wide, tuberculate. *Sexual morph* not observed.

Culture characteristics: Colonies on PDA and OA at 25 °C reaching 10 mm diam in 2 wk, with moderate amount of aerial mycelium, white, fasciculate, immersed mycelium iron grey, margin fimbriate or effuse on PDA and OA, respectively; reverse olivaceous grey in PDA, pale mouse grey in OA. Sporulation abundant.

Specimen examined: Spain, Mallorca, Sierra de Tramuntana, on bark of *Quercus* sp., Sep. 2012, M. Hernández-Restrepo, E. Descals & J. Gené (**holotype** CBS H-22991, cultures ex-type CBS 142298, FMR 12716).

Notes: This new species differs from *P. capensis* in having smaller conidia (*P. capensis* 30–100 × 17–60 µm from the natural substratum, up to 175 × 110 µm in culture). *Monodictys castanaeae* (Ellis 1971) resembles the novel species in having ornamented conidia. However, hyphae in *M. castanaeae* are smooth and its conidia smaller (14–40 × 10–25 µm). The phylogenetic placement of *M. castanaeae* is still unknown, but unpublished LSU and ITS sequences of three strains (CBS 100.07, CBS 101.60 and CBS 102.60, not ex-types) relate this *Monodictys* species with *Preussia* (*Sporomiaceae*, *Pleosporales*).

Venturiales, Venturiaceae

Magnohelicospora fuscospora (Linder) R.F. Castañeda, Hern.-Restr. & Gené, **comb. nov.** MycoBank MB820282.

Basionym: *Helicoon fuscosporum* Linder, Anns Miss. Bot. Gdn. 16: 326. 1929.

Notes: LSU analyses of the sequences of *M. iberica* and *Ho. fuscosporum*, the latter retrieved from GenBank and generated by Tsui & Berbee (2006), revealed that both fungi are congeneric (Fig. 1, clade I). Therefore, based on their phylogeny and morphological affinities, we transfer *Ho. fuscosporum* to *Magnohelicospora*. These two species differ in conidial size; while *M. iberica* has conidia 25–50 × 17–30 µm (up to 60 µm long in culture), in *M. fuscospora* they are 20–25 × 22.5–33 µm (Linder 1929).

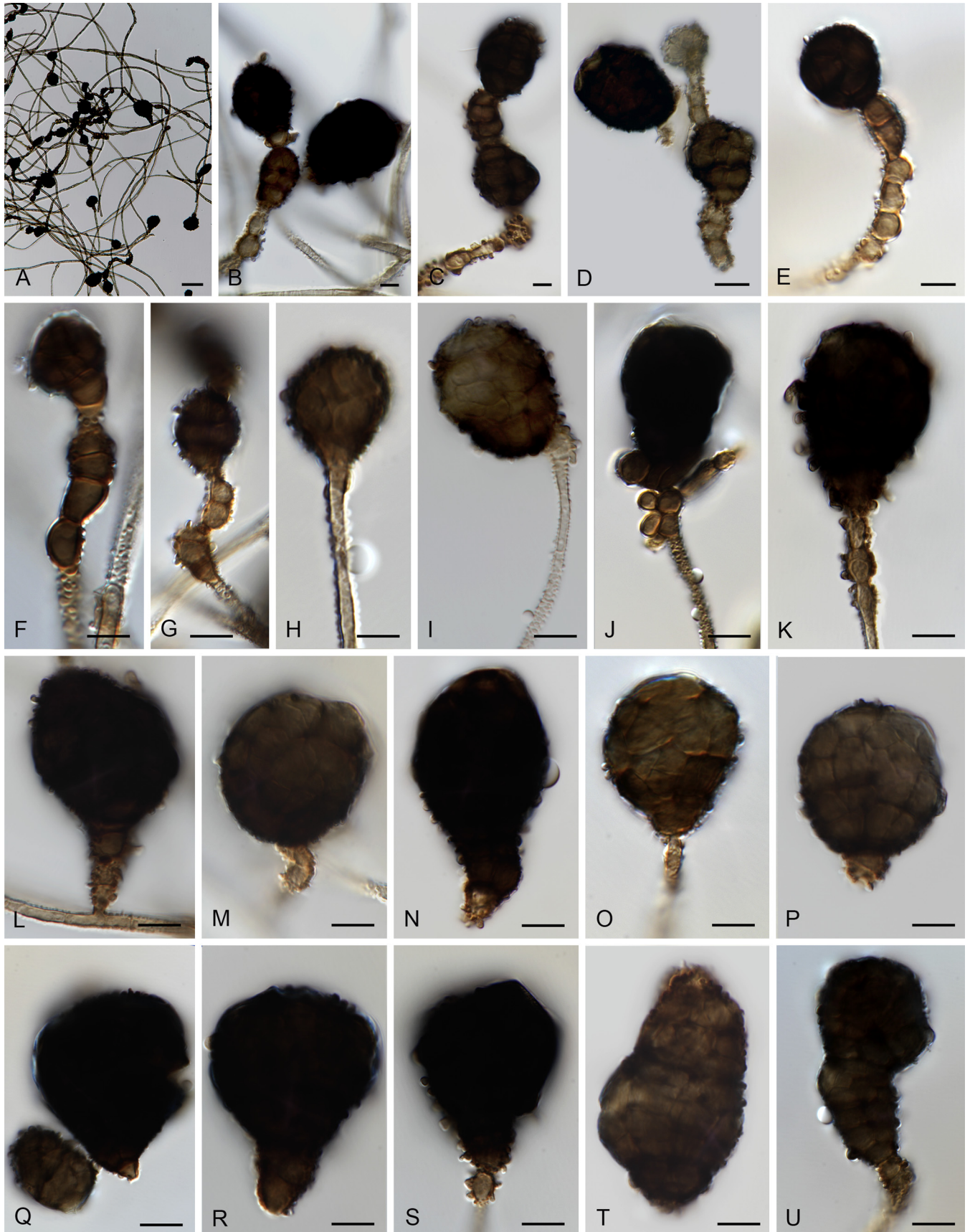


Fig. 11. *Pleomonodictys descalsii* (FMR 12716 ex-type). A–L. Conidiophores and conidia. M–U. Conidia. Scale bars = 10 μ m.

Magnohelicospora iberica R.F. Castañeda *et al.*, Mycotaxon 121: 172. 2013. Fig. 12.

Description on OA. *Mycelium* partly superficial and partly immersed, consisting of septate, branched, sometimes sinuous,

brown, smooth hyphae, 1.5–3.5 μ m wide. *Conidiophores* erect, unbranched, brown, smooth, cylindrical, 24–60 \times 2.5–4 μ m. *Conidiogenous cells* mono- and polyblastic, cylindrical, 10–22 \times 2.5–3.5 μ m, denticulate; denticles 1–4 \times 1.5–3 μ m. *Conidial secession* schizolytic. *Conidia* dry, solitary, compactly



Fig. 12. *Magnohelicospora iberica* (FMR 12414 ex-epitype). A–C. Conidiophores and conidia. D. Conidiogenous cells. E–L. Conidia. Scale bars = 10 μ m.

circinate in three dimensions, doliiform to somewhat conical, 25–60 \times 17–27 μ m, composed of a filament tightly coiled 7–10 times in 3-dimensions, euseptate, brown or olivaceous-brown, smooth, 3–4 μ m wide. *Sexual morph* not observed.

Culture characteristics: Colonies on PDA and OA at 25 $^{\circ}$ C, 18–20 mm diam after 2 wk, elevated, velvety, with moderate amount of short mycelium, mouse grey, margin fimbriate, greyish sepia; reverse dark mouse grey. Sporulation moderate.

Specimen examined: Portugal, Minho province, Lagoas do Bertianos protected area, on rotten leaf of unidentified plant, Nov. 2011, R.F. Castañeda, M. Hernández-Restrepo, J. Gené & J. Mariné-Gené (**holotype**, HAL 2447 F; **isotype**, FMR 12184). Spain, Navarra, Robledal de Orgi, on dead leaves, Mar. 2012, M. Hernández-Restrepo & J. Capilla, MBT-375365 (**epitype designated here** CBS H-22989; culture ex-epitype CBS 142293, FMR 12414).

Notes: *Magnohelicospora iberica* was described from Portugal growing on dead leaves, but the type specimen could not be cultivated (Castañeda-Ruiz *et al.* 2012). In contrast, the second isolate of the species from Spain, which morphologically fits with the protologue on the natural substratum, grew well in the different culture media tested. However, it produced conidia slightly longer and thinner than those described in the holotype (25–60 \times 17–27 μ m vs. 35–50 \times 23–30 μ m).

Dothideomycetes, Incertae sedis

Oncopodiella trigonella (Sacc.) Rifai 1965, Persoonia 3: 409. Fig. 13.

Basionym: *Sporidesmium trigonellum* Sacc., Michelia 2 (no. 8): 641. 1882.

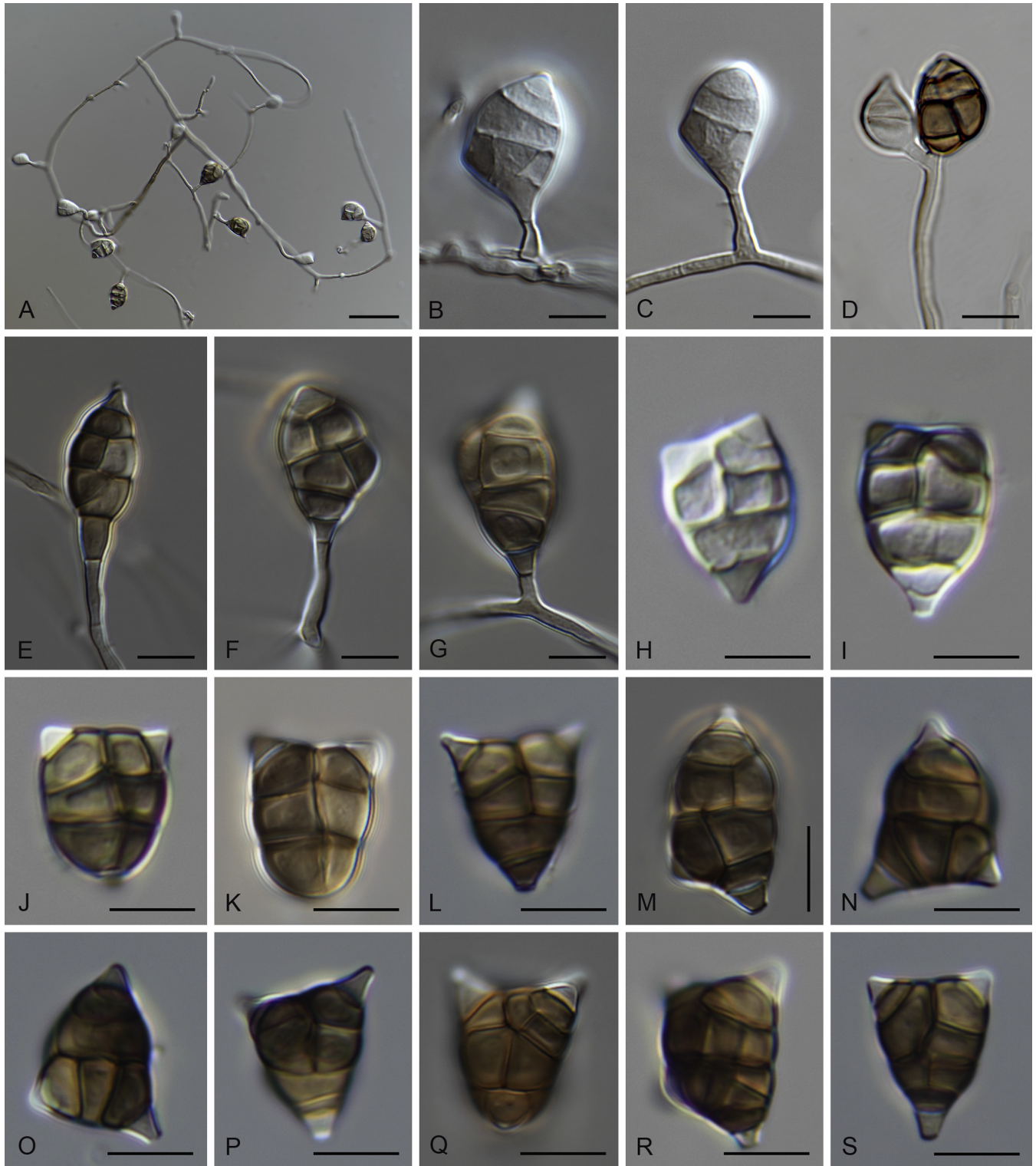


Fig. 13. *Oncopodiella trigonella* (FMR 10788 ex-epitype). A–G. Conidiophores and conidia. H–S. Conidia. Scale bars = 10 µm.

Description on OA. *Mycelium* mostly immersed, composed of septate, hyaline to brown, smooth hyphae, 1.5–2 µm wide. *Conidiophores* macronematous or reduced to conidiogenous cells. *Conidiogenous cells* mono- and polyblastic, sympodial, flexuous, cylindrical to conical, 5–27 × 1.5–2.5 µm, hyaline to pale brown. *Conidia* solitary, muriform, obovoid to oval, corniculate, 17–23.5 × 10.5–16.5 µm, with 2–4, mostly 3, hyaline horn-like protruding cells, 2.5–5 × 3–5.5 µm, basal cell conical and truncate, 1.5–2 µm wide, at the begin hyaline becoming brown with the age, smooth. *Sexual morph* not observed.

Specimens examined: **Belgium**, Malmedy, on bark of *Ailanthus*, **holotype** PAD Libert. 432. **Spain**, Teruel province, Valbona, on bark of unidentified tree, Oct. 2009, col. M. Hernández-Restrepo, MBT375358 (**epitype designated here** CBS H-22993; cultures ex-epitype CBS 126413, MUCL 52643, FMR 10788).

Notes: This isolate fits in all morphological aspects with the protologue of *O. trigonella* (Saccardo 1882, Rifai 1965), the type species of *Oncopodiella*. The genus currently comprises more than 10 species (Magyar & Révay 2009), but no molecular data are available to assess their relationship. Here, we propose CBS

126413 as ex-epitype of *O. trigonella* to fix the concept of both the species and genus. Further taxon sampling is needed to determine the real taxonomic structure of this undescribed lineage within the *Dothideomycetes*.

Leotiomyces

Helotiales

Bloxamiaceae Locq., fam. nov. MycoBank MB820283.

Synonym: *Bloxamiaceae* Locq., Mycol. gén. struct. (Paris): 209. 1984. nom. inval. (Art. 39.1).

Saprobic on wood. *Sexual morph.* Unknown. *Asexual morph.* *Conidiomata* sporodochial, pulvinate with a basal stroma. *Conidiophores* often reduced to conidiogenous cells. *Conidiogenous cells* phialidic, terminal arising from the stroma surface in a densely-packed palisade, subcylindrical, pale brown, smooth. *Conidia* produced in easily fragmenting basipetal chains, cylindrical to quadrate, truncate, hyaline, smooth.

Type genus: *Bloxamia* Berk. & Broome.

Included genus: *Bloxamia*.

Notes: According to MycoBank and Index Fungorum, *Bloxamiaceae* is invalid because a Latin diagnosis was not provided by the author (Locquin 1984) (Art. 39.1, Melbourne). Here we validate this name by providing a valid description. In our phylogenetic tree of *Leotiomyces* (Fig. 3) this family is represented by a single strain of the type species, *Bloxamia truncata*.

Leptodontidiaceae Hern.-Restr., Crous & Gené, fam. nov. MycoBank MB820284.

Colonies growing moderately slowly, appearing smooth to funiculose, grey to black or yellow. *Asexual morph.* *Conidiophores* erect, brown, paler at the apex, simple or irregularly branched. *Conidiogenous cells* polyblastic, integrated, terminal, cylindrical to lageniform, with pale brown venter, and a hyaline rachis with inconspicuous scars. *Conidia* dry, solitary, unicellular, subcylindrical to narrowly obovate, straight or slightly curved, hyaline, with truncate base. *Synsexual morph* beaveria-like. *Conidiophores* macronematous, frequently in groups or dense clusters, or reduced to conidiogenous cells, hyaline. *Conidiogenous cells* polyblastic, sympodial, lageniform to subcylindrical, curved, hyaline. *Conidia* in slimy masses, unicellular, globose to subglobose, with apiculate base, guttulate, hyaline, smooth. *Chlamydospores* terminal and intercalary, solitary or in simple or branched chains, ellipsoidal to subglobose, hyaline becoming brown with the age, smooth. *Sexual morph* unknown.

Type genus: *Leptodontidium* de Hoog.

Included genus: *Leptodontidium*.

Notes: *Leptodontidiaceae* is hereby introduced to accommodate species of *Leptodontidium*. This genus currently comprises about nine species (de Hoog & Hermanides-Nijhof 1977, Castañeda-Ruiz 1988, Baral 2015). In our phylogenetic tree (Fig. 3), this

family is represented by three taxa, namely *L. trabinellum* (generic type), *L. irregulare* and a new species from Spain, *L. aureum*. The relationships with other species of the genus need further molecular analyses.

Leptodontidium aureum Hern.-Restr., Guarro & Gené, sp. nov. MycoBank MB820285. Fig. 14.

Etymology: From the Latin *-aureus*, meaning yellow; referring to the colour of the pigment produced in culture.

Description on OA. *Mycelium* partly immersed and partly superficial, composed of septate, hyaline to brown, smooth hyphae, 2.5–4 µm wide. *Asexual morph.* *Conidiophores* macronematous, erect, straight, simple or irregularly branched, 37–108 × 2–4.5 µm, brown at the base, paler at the apex, smooth. *Conidiogenous cells* polyblastic, integrated, terminal, sympodial, cylindrical to lageniform, 4.5–51 × 1–3.5 µm, with pale brown venter, and a hyaline rachis often with a terminal conidium remaining attached; rachis acicular, 1–30 × 1–1.5(–2) µm, provided with minute, crowded, unpigmented conidial scars. *Conidia* dry, solitary, obovoid to oblong, 4.5–8 × 2–3 µm, truncate base, hyaline, smooth. *Synsexual morph* beaveria-like. *Conidiophores* macronematous, grouped in dense clusters, hyaline. *Conidiogenous cells* polyblastic, sympodial, lageniform to subcylindrical, curved, 5–14.5 × 2.5–3 µm, apex 1–1.5 µm long, hyaline, smooth. *Conidia* in buff colour slimy masses, globose, 3–4 µm diam, with apiculate base, guttulate, hyaline, smooth. *Chlamydospores* terminal or intercalary, solitary or in simple or branched chains, 0–1-septate, ellipsoidal to subglobose, 6–19 × 4–7.5 µm, hyaline becoming brown, smooth. *Sexual morph* not observed.

Culture characteristics: On PDA at 25 °C reaching 23 mm diam in 2 wk, flat or slightly elevated at the centre, funiculose, dark mouse grey with some slimy buff masses, aerial mycelium white to mouse grey, diffusible pigment at first (1 wk) orange becoming reddish (2 wk), margin whitish, effuse; reverse zonate, with concentric areas, from orange at the centre to dark brown and white toward the periphery. On OA at 25 °C reaching 26 mm diam in 2 wk, flat, sparse aerial mycelium, somewhat velvety, slimy at the centre, luteous, margin whitish effuse; reverse luteous. Sporulation abundant of both asexual morphs on the two media tested.

Specimen examined: Spain, Galicia, Fragas do Eume Natural Park, isolated from forest soil, May 2010, M. Hernandez-Restrepo, J. Mena-Portales & J. Guarro (holotype CBS H-22997; cultures ex-type CBS 142316, FMR 11834).

Notes: *Leptodontidium aureum* is morphologically similar to the generic type, *L. trabinellum*, in having erect conidiophores and conidiogenous cells with a long rachis; nevertheless, conidia of the latter are cylindrical, straight to curved, and smaller (3.5–5 × 1–1.5 µm) than those of *L. aureum*, which are obovoid to oblong and 4.5–8 × 2–3 µm. *Leptodontidium irregulare* is the closest relative of *L. aureum*, from which it differs by its larger beaveria-like conidia (up to 5.5 µm diam vs. 3–4 µm in *L. aureum*) and by the smaller chlamydospores (8–13 × 4–6 µm vs. 6–19 × 4–7.5 µm in *L. aureum*). Furthermore, the ITS sequence of *L. aureum* is 90 % (301/306) similar to that of the ex-type strain (CBS 851.73) of *L. irregulare* and 87 % (287/330) to that of the ex-type strain (CBS 329.53) of *L. trabinellum*, respectively.

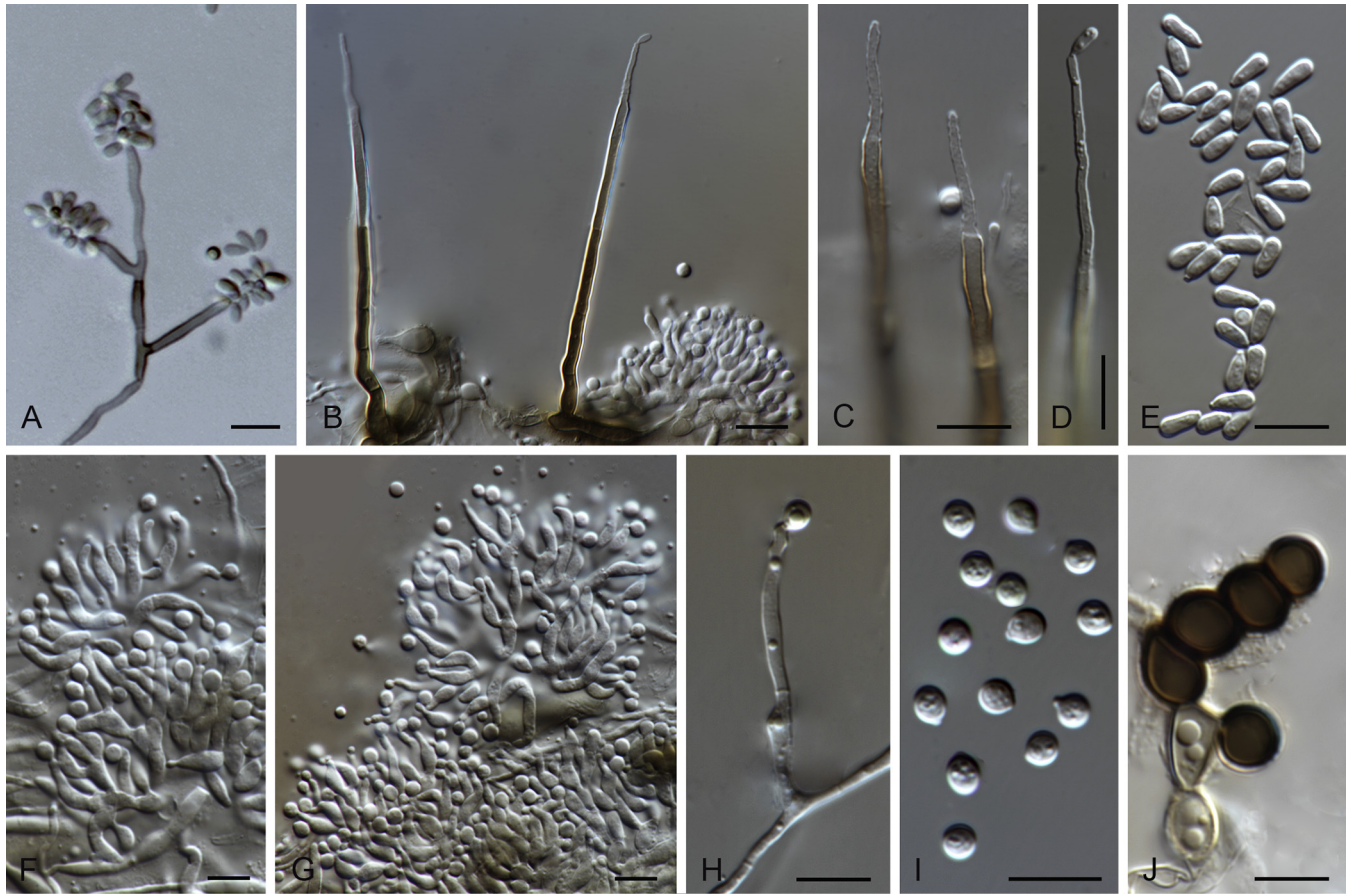


Fig. 14. *Leptodontidium aureum* (FMR 11834 ex-type). A–E. Asexual morph. A, B. Conidiophores. C, D. Conidiogenous cells. E. Conidia. F–I. Synsexual morph. F, G. Conidiophores, conidiogenous cells and conidia. H, I. Conidia. J. Chlamydospores. Scale bars = 10 µm.

Mollisiaceae

Fuscosclera Hern.-Restr., J. Mena & Gené, **gen. nov.** MycoBank MB820286.

Etymology: Latin *-fusco*, meaning dark; and Greek *-sclera*, meaning hard; referring to the dark brown to black multiseptate conidia.

Mycelium partly superficial and partly immersed, composed of cylindrical, dark brown, septate hyphae, often aggregated in strands. **Conidiophores** semi-macronematous or micronematous, brown. **Conidiogenous cells** terminal or intercalary, blastic, meristematic. **Conidia** consisting of multiseptate, irregular and dark brown to black propagules formed by masses of rounded to angular cells. **Sexual morph** unknown.

Type species: *Fuscosclera lignicola* Hern.-Restr., J. Mena & Gené.

Fuscosclera lignicola Hern.-Restr., J. Mena & Gené, **sp. nov.** MycoBank MB820287. Fig. 15.

Etymology: From the Latin *lignum* meaning wood, and *colō* meaning to inhabit, since this fungus was found growing on wood.

Description on OA. **Mycelium** immersed and superficial, composed of septate, dark brown, cylindrical hyphae, 2–5 µm wide, often aggregated in strands of 2–4 hyphae. **Conidiophores** single, unbranched, septate, arising from the aerial mycelium, up to 36 µm long and 2–5 µm wide, often reduced to conidiogenous

loci on the hyphae, brown. **Conidia** consisting of multiseptate, dark brown to black, irregular propagules, 14–31.5 × 11–38 µm, formed by masses of rounded to angular cells, 5–8 µm wide. **Sexual morph** not observed.

Culture characteristics: Colonies on PDA at 25 °C reaching 24 mm diam in 2 wk, elevated, with dense funiculose mycelium at the centre, cottony to the periphery, mouse grey, margin whitish, effuse to fimbriate; reverse dark mouse grey. Colonies on OA at 25 °C reaching 26 mm diam in 2 wk, elevated, funiculose centre, velvety to the periphery, metallic dark olivaceous, margin whitish, effuse to fimbriate; reverse dark olivaceous. Sporulation abundant.

Specimen examined: Spain, Galicia, Los Ancares Natural Park, on dead wood, Oct. 2010, M. Hernández-Restrepo, J. Mena-Portales & J. Guarro (**holotype** CBS H-22996; cultures ex-type CBS 142287, FMR 11236).

Notes: Meristematic fungi are scattered in different orders in *Ascomycota*, but mainly placed in *Dothideomycetes* (Selbmann *et al.* 2005, Egidi *et al.* 2014). *Fuscosclera* is related to *Mollisiaceae* (*Helotiales*, *Leotiomyces*) and is distinguished from other meristematic fungi by its single, multi-celled brown conidia. *Trimmatostroma* is another meristematic fungus member of *Mollisiaceae*, linked with *Mollisia* (Crous *et al.* 2007a). Nevertheless, *Fuscosclera* is easily differentiated from *Trimmatostroma salicis*, the generic type, by its solitary conidia consisting of irregular masses of cells, while the conidia of *Trimmatostroma* are cylindrical, transversely septate, and produced in branched chains (Ellis 1971).

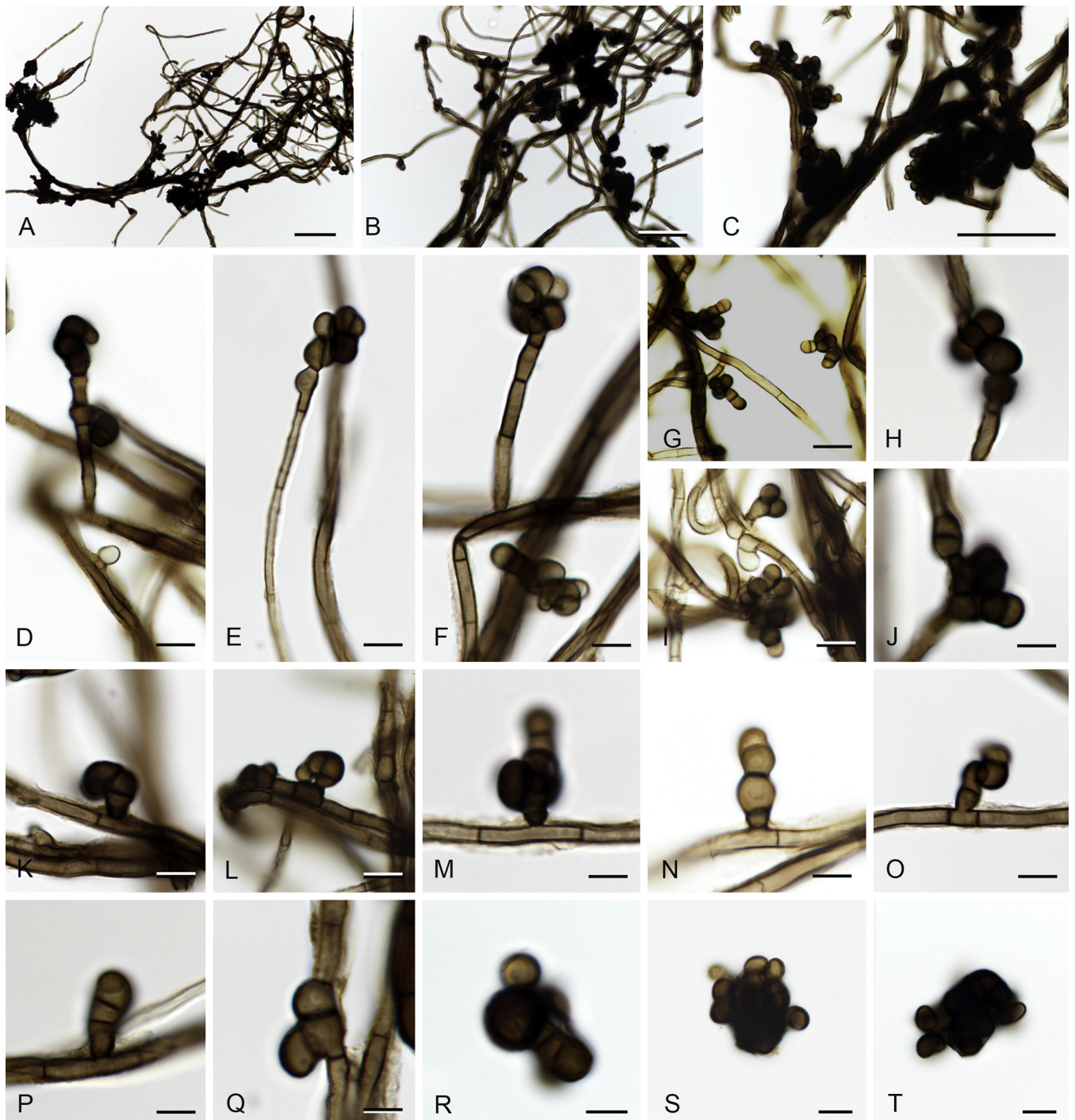


Fig. 15. *Fuscosclera lignicola* (FMR 11236 ex-type). A–Q. Hyphae, conidiophores and conidia. R–T. Conidia. Scale bars = 10 µm.

Lauriomycetales Hern.-Restr., R.F. Castañeda & Guarro, **ord. nov.** MycoBank MB820288.

Saprobic on dead fallen leaves. *Sexual morph.* Unknown. *Asexual morph.* *Conidiophores* macronematous, mononematous, developing a complex, branched conidiogenous apparatus at the apex. *Conidiogenous cells* blastic, discrete, hyaline. *Ramoconidia* in 1 or several tiers, hyaline, smooth. *Conidia* in acropetal chains, hyaline, smooth.

Type family: *Lauriomycetaceae* Hern.-Restr., R.F. Castañeda & Guarro.

Lauriomycetaceae Hern.-Restr., R.F. Castañeda & Guarro, **fam. nov.** MycoBank MB820289.

Conidiophores macronematous, mononematous, erect, straight, septate, cylindrical, brown paler at the apex, developing a complex, branched conidiogenous apparatus at the apex. *Conidiogenous cells* blastic, discrete, terminal, hyaline. *Conidial secession* schizolytic. *Ramoconidia* in 1 or several tiers, hyaline, smooth. *Conidia* in acropetal chains, hyaline, smooth.

Type genus: *Lauriomyces* R.F. Castañeda.



Fig. 16. *Zanclospora iberica* (FMR 11584 ex-type). A, B. Conidiophores. D–I. Conidiogenous cells. J. Conidia. Scale bars = 10 μ m.

Included genus: *Lauriomyces*.

Notes: *Lauriomycetales* comprises only *Lauriomyces*. This genus was introduced with *L. pulcher* as generic type together with other three species, *L. catenata*, *L. helicocephala* and *L. ventricosa* (Castañeda-Ruiz & Kendrick 1990). Currently, *Lauriomyces* comprises about nine species often found on

fallen leaves. Morphological similarities with *Haplographium* (currently *Dematioscypha*) were previously discussed by other authors (Castañeda-Ruiz & Kendrick 1990, Somrithipol & Jones 2007). However, our phylogenetic analysis supports that *Haplographium* and *Lauriomyces* are different genera and they comprise two distant monophyletic lineages in *Leotiomyces*.

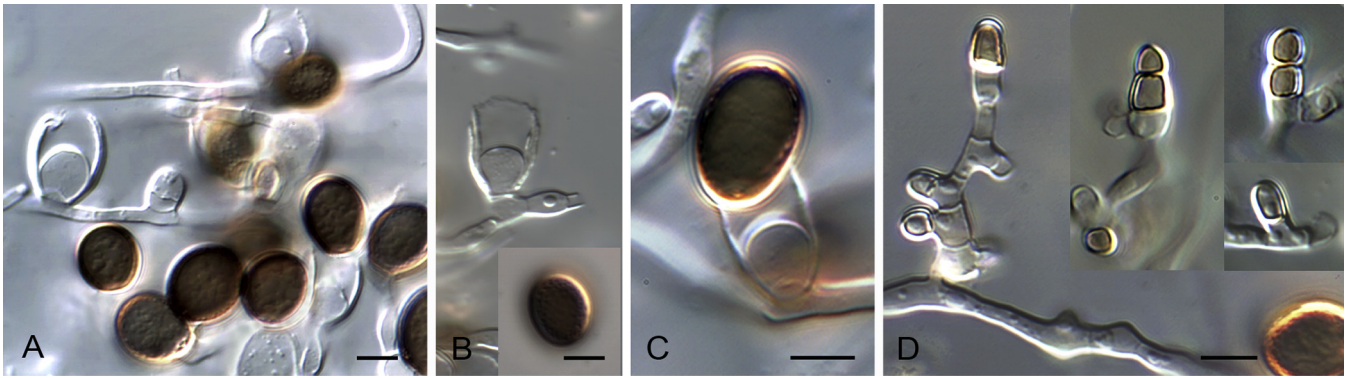


Fig. 17. *Conioscypha pleiomorpha* (FMR 13134 ex-type). A–C. Conidiogenous cells and conidia. D. Thallic synasexual morph conidiophores and conidia. Scale bars = 10 μ m.

Sordariomycetes

Chaetosphaeriales, Chaetosphaeriaceae

Zanclospora iberica Hern.-Restr., J. Mena & Gené, *sp. nov.*
MycoBank MB820290. Fig. 16.

Etymology: Referred to the geographical origin where the fungus was found, the Iberian Peninsula.

Description on OA. Mycelium partly immersed and partly superficial, composed of branched, septate, hyaline and brown, smooth hyphae, 1.5–3 μ m wide. Conidiophores macronematous, erect, straight, sometimes curved, setiform, attenuate toward the apex, simple or irregularly branched, 148–340 μ m long, 3–6 μ m wide at the base, 6–10 μ m wide at the fertile region, 2.5–5 μ m wide at the apex, brown paler in the apex, smooth; fertile region of the conidiophore situated about 43–194 μ m below the apex. Conidiogenous cells discrete, monophialidic, formed in 1–3 whorls, appressed to the conidiophore laterally, lageniform to ampulliform, 8.5–12.5 \times 4–6.5 μ m, 1–2(–2.5) μ m wide at the tapered open distal end, subhyaline to pale brown, smooth. Conidia unicellular, fusiform, falcate, straight or slightly curved, 12.5–22 \times 2–3 μ m, rounded end, hyaline, smooth.

Culture characteristics: Colonies on PCA at 25 °C reaching 4–7 mm diam in 2 wk, velvety, brown, margin effuse; reverse black. OA at 25 °C reaching 5–7 mm diam in 2 wk, elevated, velvety to funiculose, black, margin effuse; reverse similar. Sporulation abundant.

Specimens examined: **Spain**, Asturias, Picos de Europa National Park, La Molina, on dead wood of unidentified plant, Jul. 2010, M. Hernández-Restrepo, J. Mena-Portales & J. Guarro (*holotype* CBS H-22995; cultures ex-type CBS 130426, FMR 11584). **Portugal**, Minho Province, Lagoas do Bertandos protected area, on dead wood of unidentified plant, Nov. 2011, R.F. Castañeda, M. Hernández-Restrepo, J. Gené & J. Mariné-Gené (FMR 12186).

Notes: *Zanclospora iberica* resembles *Z. novae-zealandiae*, the generic type, in having branched conidiophores. *Zanclospora novae-zealandiae* is characterised by apically verrucose conidiophores, conidiogenous cells are arranged in whorls of 3–7 tiers, and conidia are larger and 18–35 \times 1.6–2.5 μ m (Hughes & Kendrick 1965). In contrast, the conidiophores in *Z. iberica* are smooth, its conidiogenous cells are arranged in whorls of 1–3 tiers, and the conidia are 12.5–22 \times 2–3 μ m. Unfortunately, there are no sequences available from *Z. novae-zealandiae* for

comparison. This is the first time that the placement of *Zanclospora* is confirmed in *Chaetosphaeriaceae*.

Conioscyphales, Conioscyphaceae

Conioscypha pleiomorpha Hern.-Restr., R.F. Castañeda & Gené, *sp. nov.* MycoBank MB820291. Fig. 17.

Etymology: Greek, *pleio-*, meaning more than usual; and *-morpha*, referring to existing two different forms of conidial ontogeny.

Colonies on the natural substratum effuse, black. Mycelium mostly immersed, composed of branched, septate, hyaline, smooth hyphae, 1–3 μ m wide. Conidiophores micronematous, reduced to conidiogenous cells. Conidiogenous cells monoblastic, cupulate, endogenous, multilayer-cupulate collarette after several percurrent enteroblastic tiny elongations, 9–12 \times 13–16 μ m, up to 14 μ m deep, hyaline or subhyaline, smooth. Conidia solitary, unicellular, ellipsoidal, obovoid or subglobose, 13–18 \times 12–14 μ m, base truncate with a central pore of 1–1.5 μ m diam, brown, pitted.

Culture characteristics: Colonies on PCA and OA at 25 °C reaching 10 mm diam in 2 wk, scarce aerial mycelium, powdery, elevate, black, margin erodate, white; reverse grey. Sporulation abundant. Mycelium composed of septate, subhyaline to very pale brown, smooth hyphae, 1–4 μ m wide. Conidiogenous cells similar to those observed on the natural substratum but measuring 12–18 \times 8–10 μ m, up to 14 μ m deep. Conidia subglobose to broadly ellipsoidal or broadly obovoid to elongate napiform, sometimes slightly curved toward the base, 9–15 \times 6–9 μ m, truncate base with a central pore of 1–1.5 μ m diam, usually with strongly pigmented deposit with lacunose aspect, dark reddish-brown to black, smooth. Synasexual morph consisting of thallic-arthric conidia formed by disarticulation of branched or unbranched conidiogenous hyphae on the aerial mycelium; apical conidia oblong with rounded apex and truncate base, intercalary and basal conidia doliiform, sub-hemispherical, or Y-shaped, terminally truncated, 3–5 \times 2–4 μ m, light brown to brown, smooth.

Specimen examined: **Spain**, Canary Islands, Tenerife, Las Mercedes, on dead wood of unidentified plant, Jul. 2013, M. Hernández-Restrepo & J. Guarro (*holotype* CBS H-21890; cultures ex-type FMR 13134, CBS 138110).

Notes: Phylogenetically, *C. pleiomorpha* formed a separate branch, basal to the clade of other species of *Conioscypha*. It is noteworthy that in culture this species produces a synasexual

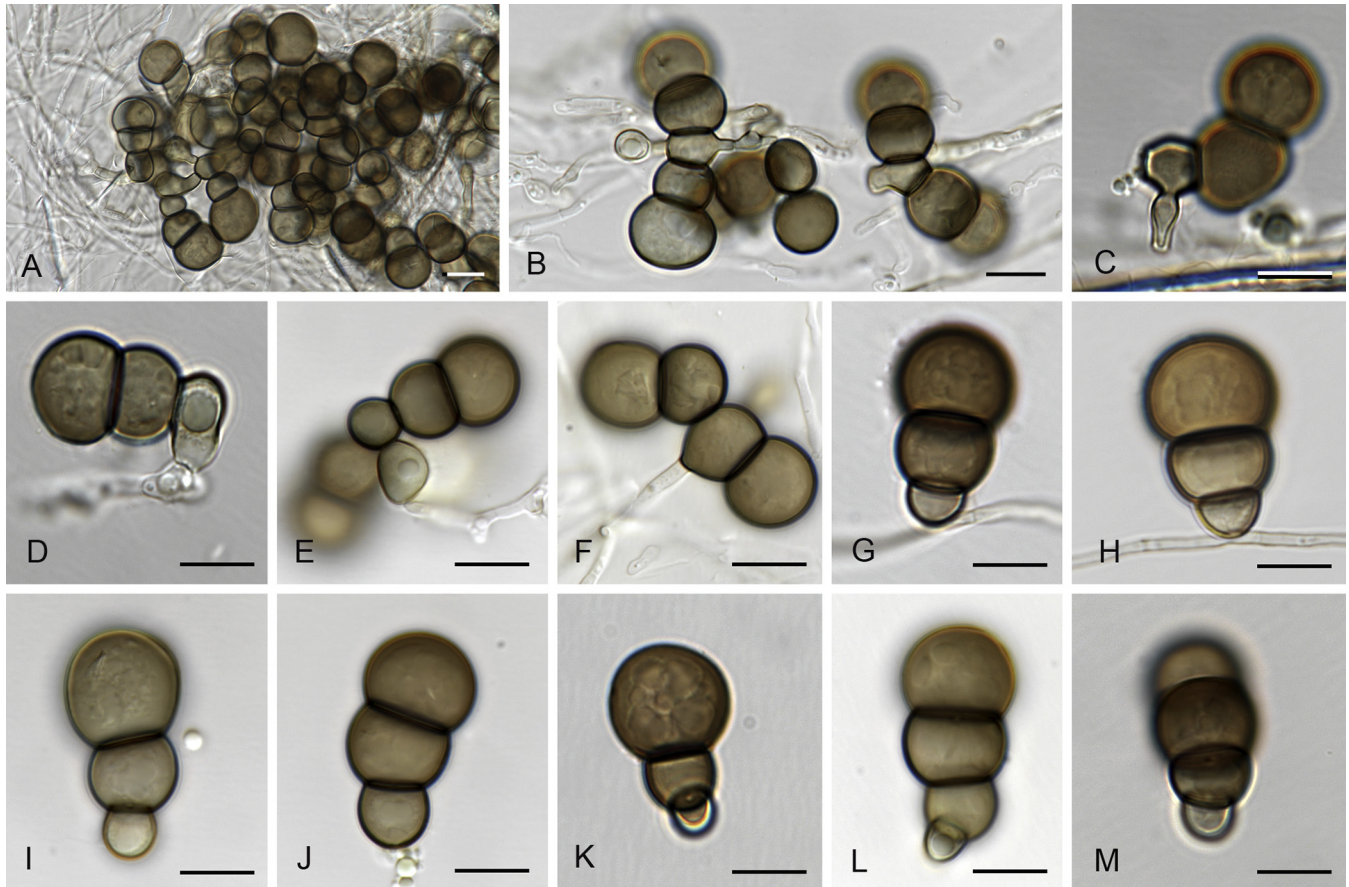


Fig. 18. *Cirrenalia iberica* (FMR 12149 ex-type). A–H. Conidiophores and conidia. I–M. Conidia. Scale bars = 10 μ m.

morph with thallic-arthric conidia similar to that observed in *C. dimorpha* (Matsushima 1996). However, the synasexual morph of this latter was described by the author as “microconidia oblong to cylindrical rounded at the apex and truncate at the base, 2–3 \times 2–2.5 μ m”, without any mention on the mode of conidial ontogeny. The blastic conidia of *C. dimorpha* are oblong to cylindrical, (8–)10–14(–18) \times (4–)4.5–5.5(–6.5) μ m, and smooth-walled, and can be clearly differentiated from those of *C. pleiomorpha* which are much wider (13–18 \times 12–14 μ m), and pitted on the natural substratum.

Microascales, Halosphaeriaceae

Cirrenalia iberica Hern.-Restr. & Gené, sp. nov. MycoBank MB820292. Fig. 18.

Etymology: Refers to the name of the region, Iberian Peninsula, from which the species was collected.

Description on OA. Mycelium immersed and superficial, composed of septate, branched, hyaline, smooth hyphae, 1–4 μ m wide. Conidiophores micronematous, pale brown to brown. Conidiogenous cells mono- or polyblastic, integrated, clavate, cylindrical, 11–23 \times 4.5–8.5 μ m, base 2–3.5 μ m wide, pale brown to brown, smooth. Conidia solitary, straight or slightly curved, (1–)2–3(–4)-septate, constricted at the septa, 19–41 μ m long, cells increasing in size and pigmentation from the base to the apex; basal cell, subglobose, hemi-globose to cuneiform, often paler than the rest, 3–9(–12.5) μ m wide; median cell subglobose, mid brown; apical cell subglobose, 10–15 μ m wide, mid brown.

Culture characteristics: Colonies on PDA and OA at 25 $^{\circ}$ C reaching 2–4 and 4–10 mm diam respectively in 2 wk, velvety, brown-vinaceous, margin effuse; reverse dark; diffusible pigment saffron after 7 d. Sporulation abundant in the aerial and submerged mycelium.

Specimens examined: Spain, Aragón, Sierra y Cañones de Guara Natural Park, isolated from forest soil, Mar. 2011, M. Hernández-Restrepo & J. Capilla (holotype CBS H-22986; cultures ex-type CBS 142289, FMR 12149). Navarra, Valles Occidentales Natural Park, on submerged wood, Mar. 2012, M. Hernández-Restrepo & J. Capilla (CBS 142295, FMR 12418).

Notes: *Cirrenalia* comprises 13 species isolated from marine and terrestrial environments (Kohlmeyer 1966). Based on molecular and morphological data, several species were transferred to different genera, i.e. *Halazon*, *Hiogispora*, *Hydea* and *Matsusporium* in the *Lulworthiales* (Abdel-Wahab et al. 2010).

Cirrenalia iberica is morphologically similar to *C. macrocephala*, *C. pseudomacrocephala*, *C. basiminuta*, and *C. pallescens*. However, it can be distinguished by its commonly straight conidia, in contrast to the coiled conidia of these latter species. In addition, the conidia of *C. iberica* are longer (19–41 μ m) than those of *C. macrocephala* (12–35 μ m) and *C. pallescens* (12.5–25 μ m). The conidia of *C. basiminuta* are more septate (3–5 vs. 2–3 in *C. iberica*), and paler with a darker apical cell and a narrower basal cell (2.5–7 μ m vs 3–9(–12.5) μ m in *C. iberica*). *Cirrenalia pseudomacrocephala* has wider conidia (16–20 μ m vs up to 15 μ m wide in *C. iberica*) and with more septa (3–6).

Parasymphodiellales Hern.-Restr., Gené, R.F. Castañeda & Crous, **ord. nov.** MycoBank MB820297.

Saprobic on leaves and twigs. *Sexual morph.* Unknown. *Asexual morph.* *Conidiophores* macronematous, mononematous, brown. *Conidiogenous cells* holoblastic, pale brown or hyaline. *Conidia* thallic-arthric, aseptate or septate, hyaline.

Type family: *Parasymphodiellaceae* Hern.-Restr., Gené, Guarro & Crous.

Parasymphodiellaceae Hern.-Restr., Gené, Guarro & Crous, **fam. nov.** MycoBank MB820298.

Conidiophores macronematous, mononematous, unbranched, brown. *Conidiogenous cells* holoblastic, sympodial, hyaline or pale brown, giving conidia in basipetal succession. *Conidial secession* schizolytic. *Conidia* thallic-arthric, aseptate or septate, cylindrical, hyaline, in unbranched, dry, basipetal, chains. *Syn-asexual morph* stylaspergillus-like often present. *Conidiophores* macronematous, mononematous, branched or unbranched, brown. *Conidiogenous cells* phialidic, formed on terminal or intercalary vesicle-like cells, pale brown. *Conidia* produced in slimy masses, filiform, hyaline.

Type genus: *Parasymphodiella* Ponnappa.

Included genus: *Parasymphodiella*.

Notes: *Parasymphodiellaceae* and *Parasymphodiellales* are introduced for the clade that encompasses four *Parasymphodiella* species (Fig. 4, clade XVI), including *P. laxa*, the generic type, previously accommodated in *Symphodiella* (Ponnappa 1975). *Symphodiella* species have small conidiophores (up to 280 µm) with terminal or subterminal conidiogenous cells and conidial chains with up to six conidia (Kendrick 1958), while *Parasymphodiella* has larger conidiophores (up to 700 µm), the conidiogenous cells are along the conidiophore stipe at irregular intervals and the conidia are produced in chains that appear to extend indefinitely. Furthermore, sequences of two strains of *S. acicola* (CBS 425.67 and CBS 487.82) include this genus in *Venturiales* (*Dothideomycetes*). *Parasymphodiella* currently comprises 10 species, which are usually found colonising leaves and twigs of conifers and dicotyledonous plants (Crous *et al.* 1995, Cheewangkoon *et al.* 2009, Seifert *et al.* 2011).

Parasymphodiella lauri Hern.-Restr., Gené & Guarro, **sp. nov.** MycoBank MB820299. Fig. 19.

Etymology: The name refers to *Laurus*, the botanical host from which the species was found.

Colonies on the natural substratum effuse, like a white net. *Mycelium* mostly immersed, composed of brown, smooth hyphae. *Conidiophores* macronematous, mononematous, erect, unbranched, septate, cylindrical; sterile part with slightly-thickened walls, brown, 100–300 × 6–8 µm; fertile part with thinner walls, pale brown, becoming paler toward the apex, 150–320 × 5–6 µm, with up to seven conidiogenous cells. *Conidiogenous cells* holothallic, terminal or intercalary, integrated, indeterminate, proliferating sympodially, smooth, pale brown, becoming hyaline toward the apex, 45–80 × 4–6 µm. *Conidia* thallic-arthric, forming

unbranched, dry, chains, (0–)1-septate, cylindrical, (22–)27–40(–47) × 5–6(–7) µm, apex and base of intercalary conidia truncate, with a septal plug at each end, apical conidia with obtuse or rounded apex, hyaline, smooth, thin-walled. Stylaspergillus-like asexual morph not observed. *Sexual morph* not observed.

Culture characteristics: Colonies on PCA at 25 °C reaching 60 mm diam in 2 wk, with sparse aerial mycelium, zonate, dark green. *Mycelium* superficial or immersed, consisting of branched, septate, smooth, pale brown to dark brown hyphae, 2–12 µm wide. *Conidia* (0–)1(–2) septate, cylindrical or clavate 26–40(–50) × 5–9 µm. *Chlamydoconidia* present on the vegetative hyphae, intercalary, solitary or in short chains, spherical, 15–40 µm diam, brown, thin-walled, smooth, guttulate. *Syn-asexual morph* not observed.

Specimen examined: Spain, Canary Islands, La Palma, Biosphere Reserve Los Tilos, on fallen leaves of *Laurus* sp., Jul. 2013, M. Hernández-Restrepo & J. Guarro (**holotype** CBS H-21888; cultures ex-type FMR 13132, CBS 138108).

Notes: *Parasymphodiella lauri* is morphologically similar to *P. elongata* and *P. eucalypti* in having cylindrical, (0–)1(–2) septate conidia. Nevertheless, on the natural substratum *P. lauri* has smaller conidia (22–47 × 5–7 µm) than those of *P. elongata* (30–65 × 6–8 µm), and *P. eucalypti* (25–65 × 8–11 µm) (Cheewangkoon *et al.* 2009). The phylogenetic tree (Fig. 4, Clade XVI) includes all the sequences of the different *Parasymphodiella* species available for comparison, *P. lauri* being placed as sister to *P. elongata*.

Pleurotheciales, Pleurotheciaceae

Anapleurothecium Hern.-Restr., R.F. Castañeda & Gené, **gen. nov.** MycoBank MB820300.

Etymology: From the Greek, *Ana-*, meaning upwards, back, again; and *-pleurothecium*, referring to the asexual genus *Pleurothecium*. Morphologically similar, but distinct from *Pleurothecium*.

Colonies on the natural substratum effuse, hairy, dark brown to black. *Mycelium* mostly immersed, composed of septate, smooth, hyaline hyphae. *Conidiophores* macronematous, mononematous, unbranched, erect, straight, smooth, brown. *Conidiogenous cells* terminal or intercalary, polyblastic, sympodial, denticulate, brown. *Conidial secession* schizolytic. *Conidia* solitary, acropleurogenous, dry, septate, botuliform to cylindrical, rounded at both ends, smooth, brown, sometimes with a paler basal cell. *Sexual morph* unknown.

Type species: *Anapleurothecium botulisporum* Hern.-Restr., R.F. Castañeda & Gené.

Anapleurothecium botulisporum Hern.-Restr., R.F. Castañeda & Gené, **sp. nov.** MycoBank MB820301. Fig. 20.

Etymology: From the Latin *botulus*, which means “sausage”; and the Greek *spore* meaning “seed, sowing”. Named after the sausage-shape of its conidia.

Colonies on the natural substratum effuse, hairy, dark brown to black. *Mycelium* mostly immersed, composed of septate, smooth, hyaline hyphae. *Conidiophores* macronematous,

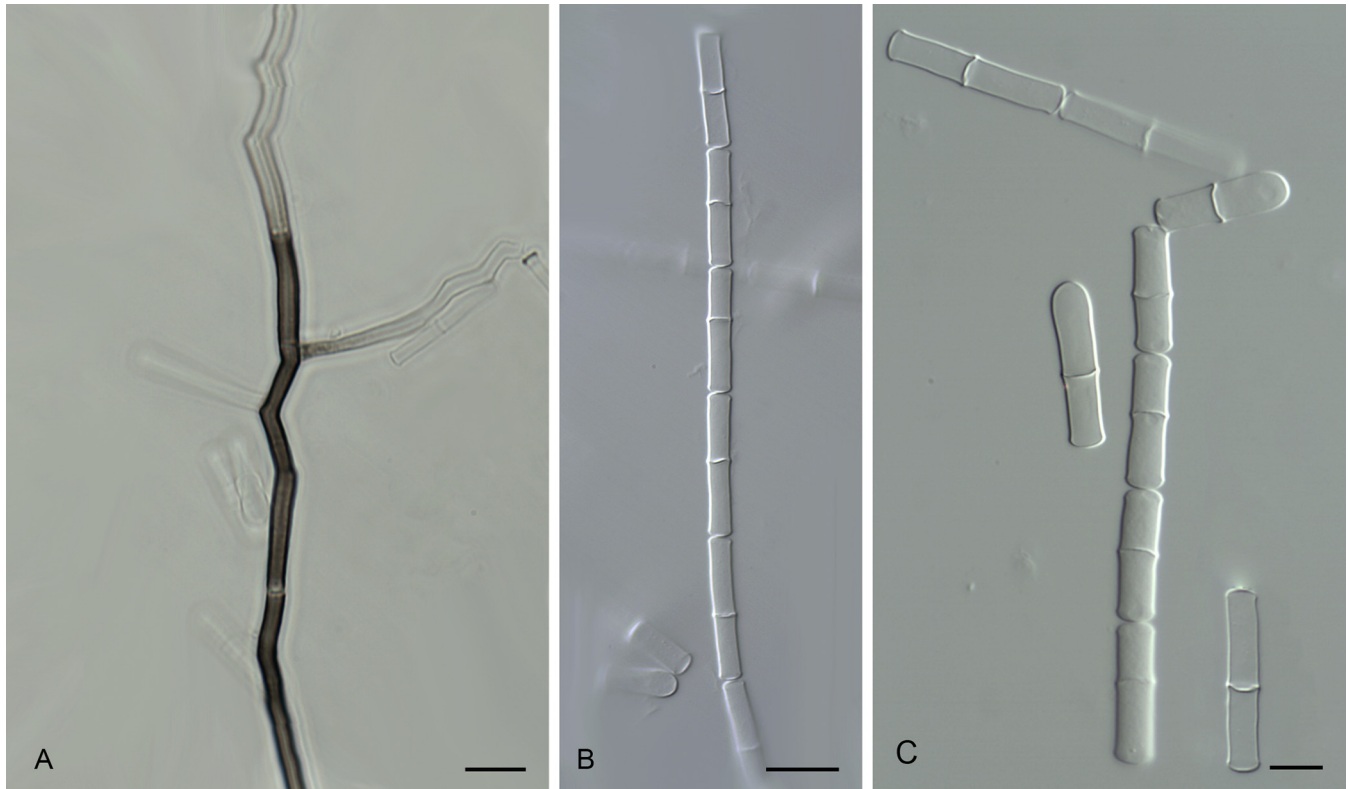


Fig. 19. *Parasymphodiella lauri* (FMR 13132 ex-type). A. Conidiophores and conidiogenous cells. B, C. Conidia. Scale bars, A = 20 μ m; B, C = 10 μ m.

mononematous, unbranched, erect, straight, cylindrical, 74–185 \times 5–6 μ m, smooth, brown. *Conidiogenous cells* terminal or intercalary, polyblastic, sympodial, denticulate, cylindrical, 10–47 \times 4–7 μ m, mid brown; denticles up to 4 μ m long, 1 μ m wide. *Conidia* solitary, (2–)3-septate, botuliform to cylindrical, 15–21 \times 6–8.5 μ m, smooth, brown, often with a basal cell pale brown.

Culture characteristics: Colonies on OA after 2 wk reaching up to 10 mm diam, flat, mycelium mainly submerged on the agar, with black spots corresponding to sporulating zones. Conidiophores and conidiogenous cells are similar to those observed on the natural substratum, producing slightly smaller conidia (15–20 \times 5–7.5 μ m).

Specimens examined: Spain, Asturias, Poncebos (Cares River), Picos de Europa National Park, on dead wood, Nov. 2010, M. Hernández-Restrepo, J. Guarro & J. Mena (**holotype** CBS H-20749; cultures ex-type FMR 11490, CBS 132713, IMI 502222, MUCL 54492); Cantabria, Saja-Besaya Natural Park, on dead wood, Nov. 2010, M. Hernández-Restrepo, J. Guarro & J. Mena (FMR 11580).

Notes: According to our phylogenetic analyses *Anapleurothecium* is placed in the *Pleurotheciales* (Fig. 4, Clade XVI; Fig. 5). This monotypic order was recently introduced with six clades (I–VI), and represents at least 11 genera (Réblová et al. 2016b). *Anapleurothecium* is related to “clade II” of Réblová et al. (2016b), that includes *Helicoon farinosum*, *Monotosporella setosa* (as *Brachysporiella setosa*), *Phragmocephala stemphylioides* and *Pleurothecium obovoideum*. These fungi are morphologically very different from *Anapleurothecium* as mentioned before. The most similar is *P. obovoideum*, but this differs in having shorter conidiophores (up to 35 μ m long) and aseptate conidia, often arranged in short chains (Arzanlou et al. 2007). *Anapleurothecium* also resembles *Pleurophragmium* in having denticulate

conidiogenous cells and more or less cylindrical conidia, but it mainly differs in having larger denticles (up to 4 μ m) and darkly pigmented conidia. The conidiogenous cells in *Pleurophragmium* have shorter denticles (up to 2 μ m long) and its conidia are hyaline or pale brown (Ellis 1971, Seifert et al. 2011). In addition, the generic type, *Pleurophragmium parvisporium*, is related to the *Papulosaceae* (Reblova & Štěpánek 2009, Jaklitsch et al. 2016a). Other genera with similar conidiogenous cells to *Anapleurothecium* are *Camposporium* and *Paratrichoconis*, but their conidial secession is rhexolytic, while in *Anapleurothecium* it is schizolytic. The phylogenetic position of *Camposporium* and *Paratrichoconis* remains uncertain, and only species of the former genus have been related to *Pleosporales* (Fig. 1, clade III).

Savoryellales, Savoryellaceae

Neoscotaiwania Hern.-Restr., R.F. Castañeda & Guarro, **gen. nov.** MycoBank MB820302.

Etymology: *Neo-* meaning new; *-ascotaiwania* referring to the sexual genus *Ascotaiwania*. Name refers to the similarity with the genus *Ascotaiwania*.

Sexual morph. *Ascomata* perithecial, non-stromatic, semi-immersed, gradually erumpent to almost superficial, scattered or clustered in small groups, black, subglobose, papillate, with a periphysate ostiole. *Ascomatal wall* outer layer dark brown, *textura prismatica*, with pores; inner layer composed by hyaline, flattened cells. *Asci* cylindrical, with a non-amyloid, discoid apical ring, with 8 uniseriate ascospores. *Paraphyses* partially disintegrating at maturity, septate, branched, anastomosing. *Ascospores* ellipsoidal, septate, slightly constricted at the septa, versicolourous, middle cells brown, with small guttules, polar cells smaller and hyaline, smooth, without sheath or



Fig. 20. *Anapleurothecium botulisporum* (FMR 11490 ex-type). A. Habit. B–E. Conidiogenous cells. F–L. Conidia. Scale bars = 10 μ m.

appendages. *Asexual morph.* Conidiophores micronematous, reduced to conidiogenous cells, hyaline to subhyaline. Conidiogenous cells monoblastic, integrated, arising directly from the hyphae. Conidial secession rhexolytic. Conidia solitary, dry, transversely septate, ellipsoidal to obovoid, dark brown, basal cell often paler, septa with darker bands.

Type species: *Neoscotaiwania terrestris* Hern.-Restr., R.F. Castañeda & Guarro.

Notes: *Ascotaiwania* was established with *A. lignicola* as type species, a fungus similar to *Savoryella* but distinguished by having asci with a prominent non-amyloid apical ring and 7-septate pigmented ascospores with hyaline end cells (Sivanesan & Chang 1992). Subsequently, some species with 3- or 5-septate ascospores were added to the genus, i.e. *A. hsilio*, *A. sawada*, *A. palmicola*, *A. persoonii*, *A. hughesii*, *A. pallida* and *A. pennisetorum*, as well as other species with 7-septate ascospores, i.e. *A. wulai*, *A. mitriformis* and *A. mauritiana* (Chang *et al.* 1998, Ranghoo & Hyde 1998, Fallah *et al.* 1999, Hyde & Goh 1999). Different asexual morphs have been observed for *Ascotaiwania* species: monodictys-like with multicellular dark brown conidia in *A. lignicola* (Chang 2001); trichocladium-like with 1-septate conidia, dark brown apical cell and hyaline and

smaller basal cell in *A. hsilio* (Chang 2001); monosporella-like in two species, i.e. *A. sawada* (Sivichai *et al.* 1998) and *A. mitriformis* (Ranghoo & Hyde 1998), and *Helicoon farinosum* for *A. hughesii* (Fallah *et al.* 1999). The current circumscription of *Ascotaiwania* is polyphyletic (Réblová *et al.* 2016b) (Fig. 5) and apparently like in other genera as *Chaetosphaeria* and *Capronia*, the asexual morph seems to be phylogenetically more relevant than the sexual morph. *Neoscotaiwania* differs from *Ascotaiwania* in having 3-septate ascospores, asci with thinner, non-amyloid apical ring, and the asexual morph is bactrodesmium-like.

Neoscotaiwania limnetica (H.S. Chang & S.Y. Hsieh) Hern.-Restr., R.F. Castañeda & Gené, **comb. nov.** MycoBank MB820303.

Basionym: *Savoryella limnetica* H.S. Chang & S.Y. Hsieh, Mycol. Res. 102: 715. 1998.

Synonym: *Ascotaiwania limnetica* (H.S. Chang & S.Y. Hsieh) Réblová & J. Fourn., Persoonia 37: 71. 2016.

Descriptions and illustrations: Chang *et al.* (1998), Réblová *et al.* (2016b).

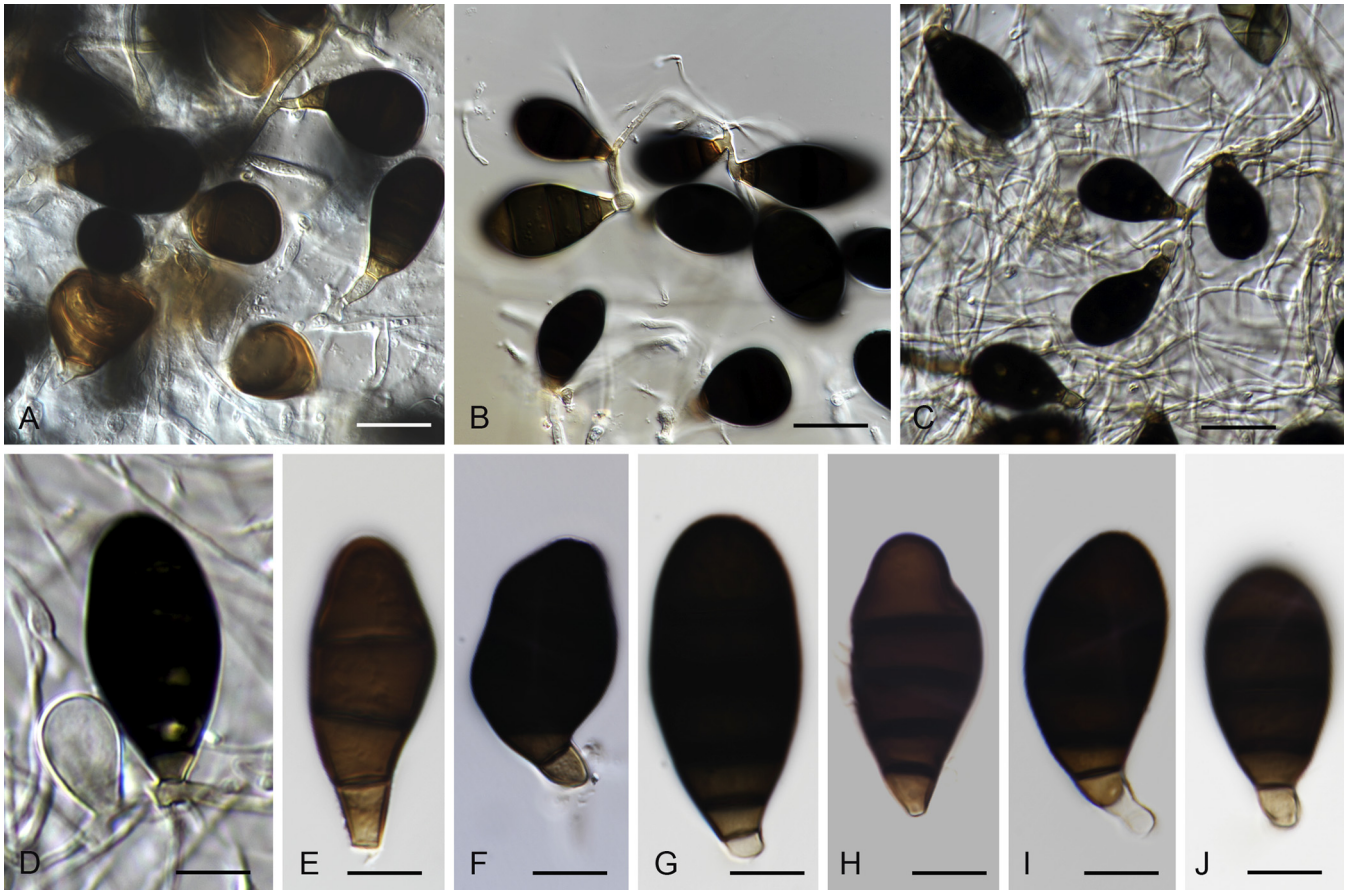


Fig. 21. *Neoscotaiwania terrestris* (FMR 12412 ex-type). A–D. Conidiophores and conidia. E–J. Conidia. Scale bars = 10 µm.

Neoscotaiwania terrestris Hern.-Restr., R.F. Castañeda & Guarro, **sp. nov.** MycoBank MB820304. Fig. 21.

Etymology: From the Latin *-terra*, meaning earth, soil, grown; since this fungus was isolated from a soil sample.

Description on OA. *Mycelium* partly immersed and partly superficial, composed of septate, smooth, hyaline to pale brown hyphae, 1.5–3 µm wide. *Conidiophores* micronematous, reduced to intercalary conidiogenous cells producing lateral blastic conidia. *Conidia* solitary, straight or curved, (2–)3–4(–5)-septate, ellipsoidal, obovoid, 25.5–44.5 × 13–22 µm, black to reddish brown, basal cell often subhyaline to pale brown or brown and truncate, 2.5–6 µm wide, smooth. *Sexual morph* not observed.

Culture characteristics: Colonies on PDA and OA at 25 °C reaching 4–5 mm diam in 2 wk, black, with aerial mycelium velvety, with a margin white and effuse; reverse black. Sporulation abundant in both submerged and superficial mycelium.

Specimen examined: Spain, Asturias, Picos de Europa National Park, isolated from forest soil, Oct. 2010, M. Hernández-Restrepo, J. Mena & J. Guarro (**holotype** CBS H-22988; cultures ex-type CBS 142291, FMR 12412).

Notes: *Neoscotaiwania terrestris* differs from *N. limnetica* in having larger conidia with a wider basal scar (25.5–44.5 × 13–22 µm, 2.5–6 µm vs 23–39 × 14.5–18.5 µm, base 3–4.5 µm in *N. limnetica*) (Chang *et al.* 1998). Furthermore, *N. limnetica* is known from submerged dead wood in Taiwan and

France (Chang *et al.* 1998, Réblová *et al.* 2016b), while *N. terrestris* was isolated from forest soil in Spain.

Sordariales, Chaetomiaceae

Trichocladium asperum (Corda) Harz. Fig. 22.

Basionym: *Sporidesmium asperum* Corda, Icon. fung. 2: 6. 1838.

Synonyms: *Dicoccum asperum* (Corda) Sacc., Syll. fung. 4: 342. 1886.

Monodictys aspera (Corda) S. Hughes, Canad. J. Bot. 36: 785. 1958.

Piricauda aspera (Corda) R.T. Moore, Rhodora 61: 96. 1959.

Specimens examined: **Lectotype designated here:** tab. VIII, fig. 27 in Corda ACJ, Icones Fungorum hucusque Cognitorum 2, 1838. MBT375510. **Belgium,** Kontich, isolated from agricultural soil, Jan. 1964, G.L. Hennebert (CBS 112.67). **Germany,** Edersee, Nieder-Werbe, isolated from acidic soil, E. Falk, No. C48, MBT375512 (**epitype designated here** CBS H-23060; culture ex-epitype CBS 903.85). **Spain,** Castilla La Mancha, Alto Tajo Natural park, isolated from soil, May 2011 M. Hernández-Restrepo, J. Mena & J. Guarro (FMR 12054). **The Netherlands,** unknown substrate, unknown date, C.M. Berkhout (CBS 140.21). **Unknown country,** unknown substrate, unknown date, O. da Fonseca (CBS 157.22).

Notes: Hughes (1952) lectotypified *Trichocladium* with *T. asperum* as type species. Unfortunately, the holotype of this species, formerly described as *Sporidesmium* (Corda 1838) seems to be lost. However, the protologue contains an illustration which is designated here as the lectotype of *S. asperum*. We

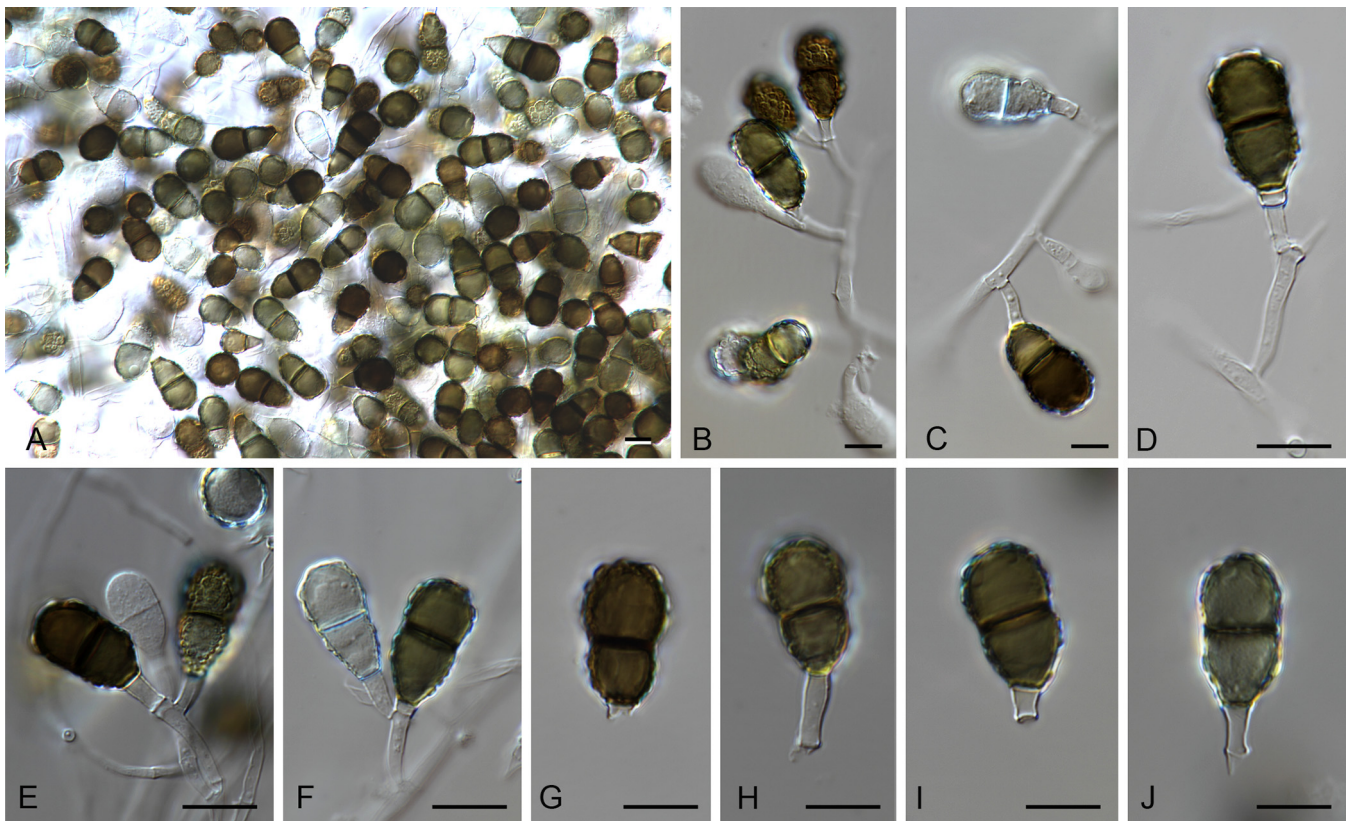


Fig. 22. *Trichocladium asperum* (CBS 903.85 ex-epitype). A–F. Conidiophores and conidia. G–J. Conidia. Scale bars = 10 µm.

selected the strain CBS 903.85 as ex-epitype culture to fix the use of the name. CBS 903.85 matches with the protologue of the fungus described by Corda (1838) and it was collected in Germany, the same country where the species was formerly found. Our study agrees with Hambleton *et al.* (2005) confirming that *T. asperum* was phylogenetically related to *Chaetomium* and *Humicola* (Sordariales).

Vermiculariopsiales Hern.-Restr., J. Mena, Gené & Crous, **ord. nov.** MycoBank MB820346.

Saprobic on leaves. *Sexual morph.* Unknown. *Asexual morph.* *Conidiomata* sporodochial, setose. *Setae* branched or unbranched. *Conidiophores* macronematous, densely packed in a palisade. *Conidiogenous cells* monophialidic, discrete. *Conidia* grouped in dry masses, unicellular or septate. *Stroma* present or absent.

Type family: Vermiculariopsiaceae Hern.-Restr., J. Mena, Gené & Crous.

Vermiculariopsiaceae Hern.-Restr., J. Mena, Gené & Crous, **fam. nov.** MycoBank MB820347.

Conidiomata sporodochial, scattered, setose. *Setae* branched or unbranched, brown. *Conidiophores* macronematous, densely packed in a palisade, pale brown or hyaline. *Conidiogenous cells* monophialidic, cylindrical to lageniform, with collarette, hyaline to pale brown. *Conidia* grouped in pale dry masses, unicellular or septate, cylindrical, hyaline. *Stroma* present or absent.

Type genus: *Vermiculariopsiella* Bender.

Included genus: *Vermiculariopsiella*.

Notes: In our phylogenetic analysis of the Sordariomycetes, the type species of *Vermiculariopsiella*, *V. immersa*, and other species of the genus, i.e. *V. dichapetali*, *V. eucalypti*, *V. microsperma* and *V. pediculata*, were placed in a monophyletic well-supported clade which is introduced in the present study as a new monotypic order and family (Fig. 4, clade XIII). Previous studies, based on culture techniques, reported *Vermiculariopsiella* spp. as asexual morphs of *Echinospaeria macrospora* and *E. pteridis* (Gawas *et al.* 2006, Dhargalkar & Bhat 2009); however, further molecular studies are needed to confirm this relationship, since the type species of *Echinospaeria*, *E. canescens*, is related to the family *Helminthosphaeriaceae* in the order *Chaetosphaerales* (Miller & Huhndorf 2004, Miller *et al.* 2014).

Xenospadicoidales Hern.-Restr., J. Mena & Gené, **ord. nov.** MycoBank MB820348.

Saprobic on dead wood. *Sexual morph.* Unknown. *Asexual morph.* *Conidiophores* macronematous, mononematous, unbranched or branched. *Conidiogenous cells* tretic, integrated. *Conidia* solitary or in chains, dry, unicellular or septate.

Type family: Xenospadicoidaceae Hern.-Restr., J. Mena & Gené.

Xenospadicoidaceae Hern.-Restr., J. Mena & Gené, **fam. nov.** MycoBank MB820349.

Conidiophores macronematous, mononematous, erect, straight, unbranched or branched, brown. *Conidiogenous cells* tretic, terminal or intercalary, cylindrical, pale brown to brown. *Conidia*

solitary or in chains, dry, unicellular or transversely septate, oblong, ellipsoidal or obovoid, brown.

Type genus: *Xenospadicoides* Hern.-Restr., J. Mena & Gené.

Included genera: *Xenospadicoides*, *Pseudodiplococcium*.

Xenospadicoides Hern.-Restr., J. Mena & Gené, **gen. nov.** MycoBank MB820350.

Etymology: Name reflects a morphological similarity with the genus *Spadicoides*.

Type species: *Xenospadicoides atra* (Corda) Hern.-Restr., J. Mena & Gené.

Colonies effuse, velvety, dark brown to black. *Mycelium* partly superficial, composed of branched, septate, pale to dark brown, smooth hyphae. *Conidiophores* single or in small groups, erect or ascending, straight or flexuous, unbranched, mid to dark brown paler toward the apex. *Conidiogenous cells* polytretic, integrated, terminal and intercalary, cylindrical. *Conidia* solitary, acropleurogenous, unicellular, ellipsoidal, oblong with rounded ends, occasionally obovoid, pale brown to very dark brown, smooth. *Sexual morph* unknown.

Xenospadicoides atra (Corda) Hern.-Restr., J. Mena & Gené, **comb. nov.** MycoBank MB820392.

Basionym: *Psilonia atra* Corda, Icon. fung. 4: 27. 1840.

Synonyms: *Acladium atrum* (Corda) Bonorden, Handbuch der allgemeinen Mycologie Stuttgart: 87. 1851.

Catenularia atra (Corda) Sacc., Syll. fung. 4: 304. 1886.

Spadicoides atra (Corda) S. Hughes, Canad. J. Bot. 36: 805. 1958.

Virgaria indivisa Sacc., Michelia 2: 560. 1882.

Diplococcium indivisium (Sacc.) Hughes, Canad. J. Bot. 31: 634. 1953.

Haplaria ellisii Cooke, Grevillea 17 (83): 69. 1889.

Trichosporium populneum Lambotte & Fautrey, Rev. Mycol. 18: 145. 1896.

Descriptions and illustrations: See Ellis (1963), Hughes (1973).

Specimens examined: **Lectotype designated here**: tab. VI, fig. 84 in Corda ACJ. Icones Fungorum hucusque Cognitorum 4, 1840, MBT376691. **Czech Republic**, Central Bohemia, forest Lánská obora, on branch of *Quercus petraea*, Jun. 1976, V. Holubová-Jechová No. 380, MBT376692 (**epitype designated here** CBS H-18296, culture ex-epitype CBS 489.77).

Notes: Because herbarium material of *Psilonia atra*, the basionym of *Spadicoides atra*, is not preserved and no authentic specimens have been located, we lectotypify the species with the original drawing included in the protologue of this fungus (Corda 1840). In addition, an ex-epitype culture (CBS 489.77) is designated here to fix the use of the name.

Xenospadicoides resembles *Spadicoides* in having polytretic conidiogenous cells that produce solitary conidia. However, these genera differ in their conidial septation, viz. 1-septate in

Spadicoides and aseptate in *Xenospadicoides*. Furthermore, those two taxa are phylogenetically unrelated; *Spadicoides bina* is a member of the *Cordanales* (Shenoy et al. 2010, Hernández-Restrepo et al. 2014b, 2015b) and *Xenospadicoides* forms a new lineage in *Sordariomycetes* (Fig. 4, clade X).

Pseudodiplococcium Hern.-Restr., J. Mena & Gené, **gen. nov.** MycoBank MB820353.

Etymology: *Pseudo-* meaning “false”; and *diplococcium* referring to the asexual genus *Diplococcium*. Morphologically similar to *Diplococcium*.

Colonies on the natural substratum effuse, velvety, brown to dark brown. *Mycelium* partly superficial, partly immersed in the substratum. *Conidiophores* macronematous, mononematous, extensively branched, dark brown, smooth. *Conidiogenous cells* polytretic, pores inconspicuous after conidial secession, integrated, terminal and intercalary, cylindrical, brown and smooth. *Conidia* in branched chains, dry, acropleurogenous, unicellular or septate transversely, cylindrical, pale brown to mid brown, concolourous, smooth.

Type species: *Pseudodiplococcium ibericum* Hern.-Restr., J. Mena & Gené.

Pseudodiplococcium ibericum Hern.-Restr., J. Mena & Gené, **sp. nov.** MycoBank MB820394.

Etymology: Refers to the name of the region, Iberian Peninsula, from where the species was collected.

Colonies on the natural substratum effuse, velvety, brown to dark brown. *Mycelium* partly superficial, partly immersed in the substratum. *Conidiophores* macronematous, mononematous, profusely branched, dark brown, smooth, up to 360 µm long, 3 µm wide, 3.5–5 µm at the apex, 5 µm at the base. *Conidiogenous cells* polytretic, pores inconspicuous after conidial secession, integrated, terminal and intercalary, cylindrical, brown and smooth. *Conidia* in branched chains, dry, acropleurogenous, (0–)1-septate, cylindrical, 7.5–8.5 × 4–4.2 µm (0-septate), 9–15.5(–17) × 4–5 µm (1-septate), pale brown to mid brown, concolourous, smooth.

Culture characteristics: Colonies on OA and PCA at 25 °C reaching 15 mm diam in 2 wk, cottony, convex and olive brown, margin regular to fimbriate; reverse sepia brown. Sporulation present after 2 wk. *Conidia* in long and often branched chains, (0–)1(–2)-septate, 6–9.5 × 4–5 µm (0-septate), 9–32 × 4–6 µm (1–2-septate).

Illustration: See Hernández-Restrepo et al. (2012).

Specimen examined: **Spain**, Valencia, Chera, Chera-Sot Natural Park, Pantano de Buseo, on dead wood, Mar. 2010, M. Hernández-Restrepo & K. Rodríguez (**holotype** CBS H-23059, cultures ex-type FMR 10959, CBS 127864).

Notes: The isolate FMR 10959 introduced here as *P. ibericum*, based on morphological data, was formerly identified as *D. pulneyense* (Hernández-Restrepo et al. 2012). This latter species is described as the asexual morph of *Otthia pulneyensis*

(Subramanian & Sekar 1987), a presumed member of *Dothideomycetes*. Nevertheless, in our analysis, FMR 10959 is placed in a clade together with *Xenospadicoides* in *Sordariomycetes* (Fig. 4, clade X). After a re-examination of this material, we conclude that, in addition to the phylogenetic position, there are slight morphological differences which can help to distinguish both fungi. Although *P. ibericum* resembles *D. pulneyense* in having long chains of conidia born from polytretic conidiogenous cells, the former differs in the production of aseptate conidia occurring intercalary in the conidial chains, on both, culture and the natural substratum (Hernández-Restrepo *et al.* 2012). In *D. pulneyense* only septate conidia were described (Subramanian & Sekar 1987).

Xylariales

Castanediellaceae Hern.-Restr., Guarro & Crous, **fam. nov.** MycoBank MB820354.

Foliicolous, saprobic or associated to leaf spots. *Sexual morph.* Unknown. *Asexual morph.* Conidiophores macronematous, mononematous or aggregated in sporodochia, branched, brown to pale brown. Conidiogenous cells mono or polyblastic, sympodial, discrete, solitary or in whorls, cylindrical to lageniform, hyaline to subhyaline. Conidial secession schizolytic. Conidia unicellular or septate transversely, cylindrical, fusiform or lunate, hyaline.

Type genus: *Castanediella* Hern.-Restr., Crous & M.J. Wingf.

Included genus: *Castanediella*.

Notes: *Castanediella* was recently introduced with *C. acacia* as type species and six species are currently accepted (Crous *et al.* 2015b, 2016, Hernández-Restrepo *et al.* 2016). *Castanediella* as currently circumscribed is monophyletic (Fig. 4, clade I) and represents a distinct taxonomic group at the family level closely related to the *Beltraniaceae* in *Xylariales*.

Xylariales, *Incertae sedis*

Xyladictyochaeta Hern.-Restr., R.F. Castañeda & Gené, **gen. nov.** MycoBank MB820355.

Etymology: *Xyla-* referring to *Xylariales*; and *-dictyochaeta* referring to the asexual genus *Dictyochaeta*. Morphologically similar to *Dictyochaeta* but phylogenetically related to *Xylariales*.

Colonies on natural substratum effuse, hairy, brown. *Mycelium* partly superficial and partly immersed, composed of septate, hyaline or medium brown, smooth hyphae. *Conidiophores* macronematous, mononematous, setiform, commonly unbranched, rarely branched at the base, erect, cylindrical, brown, smooth. *Conidiogenous cells* integrated, mono- or polyphialidic and sympodial, collarette inconspicuous, terminal and usually lageniform, or intercalary and cylindrical with a lateral extension near a septum bearing terminally the conidiogenous loci, brown, smooth. *Conidia* solitary, mucous, 0–1-septate, falcate, base truncate, apex acute, hyaline, smooth, with an unbranched setula at each end.

Type species: *Xyladictyochaeta lusitanica* Hern.-Restr., R.F. Castañeda & Gené.

Notes: Morphologically, *Xyladictyochaeta* differs from *Dictyochaeta* in having setiform conidiophores with intercalary and terminal polyphialidic conidiogenous cells. In *Dictyochaeta*, the setae are mainly sterile and the conidiogenous cells are born from conidiophores in the lower part of the setae (Ellis 1971, Réblová *et al.* 1999, Seifert *et al.* 2011). Moreover, several *Dictyochaeta* species are commonly associated as asexual morphs of *Chaetosphaeria*, a genus integrated in the *Chaetosphaeriaceae* (*Chaetosphaeriales*) (Réblová *et al.* 1999, Réblová 2000, 2004, Fernández & Huhndorf 2005, Fernández *et al.* 2006).

Xyladictyochaeta lusitanica Hern.-Restr., R.F. Castañeda & Gené, **sp. nov.** MycoBank MB820356. Fig. 23.



Fig. 23. *Xyladictyochaeta lusitanica* (FMR 12177 ex-type). A–D. Conidiophores. E. Conidia. Scale bars = 10 μ m.

Description on OA. *Mycelium* composed of septate, hyaline or brown, smooth hyphae, 1–3 µm wide. *Conidiophores* macronematous, mononematous, erect, setiform, usually unbranched, some branched at the base, cylindrical, 40–110 × 3–5 µm, brown, smooth. *Conidiogenous cells* integrated, mono- or polyphialidic and sympodial, collarette inconspicuous, terminal and usually lageniform, 6–14.5 × 2.5–5 µm, or intercalary and cylindrical with a lateral extension near a septum, 2–5 × 1–2 µm. *Conidia* solitary, mucous, 0–1-septate, falcate, 11–16 × 2–2.5 µm, with a truncate base and an acute apex, hyaline, smooth, bearing an unbranched setula at each end, 3–7 µm long, up to 0.3 µm wide.

Culture characteristics: Colonies on OA and PDA at 25 °C reaching 24–25 mm diam in 2 wk, white and lanose, with white hyphal strands, submerged mycelium greenish grey in OA, umber in PDA, margin white, effuse; reverse greenish grey in OA, ochraceous in PDA. Sporulation abundant.

Specimen examined: Portugal, Viana do Castelo, Lagoas de Bertandos Protected Area, on dry leaves of *Eucalyptus* sp., Nov. 2011, M. Hernández-Restrepo, R.F. Castañeda & J. Gené (holotype CBS H-22986; cultures ex-type CBS 142290, FMR 12177).

Notes: *Xyladictyochaeta lusitanica* is similar to *Dictyochaeta eucalypti*; both species have setiform conidiophores with integrated, intercalary and terminal phialides and (0–)1-septate conidia with setulae at both ends (Sutton & Hodges 1975). Nevertheless, they differ by the morphology of their conidiogenous loci; *X. lusitanica* has polyphialides with denticles-like openings instead of monophialides with conspicuous flared to tubular collarettes as in *D. eucalypti*.

Sordariomycetes, Incertae sedis

Paradiplococcium Hern.-Restr., J. Mena & Gené, **gen. nov.** MycoBank MB820295.

Etymology: The name reflects the morphological similarity with *Diplococcium*.

Conidiophores macronematous, mononematous or in small fascicles, erect, straight, unbranched, brown. *Conidiogenous cells* polytretic, terminal and intercalary, integrated and cylindrical or discrete and globose, brown. *Conidia* in short dry, chains, acropleurogenous, septate, cylindrical, brown, smooth. *Synasexual morph* idriella-like in morphology is present in culture. *Conidiophores* macronematous, mononematous, bearing whorls of conidiogenous cells, or reduced to conidiogenous cells growing on *Diplococcium* conidia, pale brown, smooth. *Conidiogenous cells* polyblastic, discrete, sympodial, with a long and denticulate neck, lageniform, pale brown, smooth. *Conidia* often in slimy heads, unicellular, falcate or filiform, hyaline, smooth.

Type species: *Paradiplococcium singulare* (Hern.-Restr. et al.) Hern.-Restr., J. Mena & Gené.

Paradiplococcium singulare (Hern.-Restr. et al.) Hern.-Restr., J. Mena & Gené, **comb. nov.** MycoBank MB820296.

Basionym: *Diplococcium singulare* Hern.-Restr. et al., Mycol. Progr. 11: 194. 2012.

Description and illustration: See Hernández-Restrepo et al. (2012).

Specimen examined: Spain, Aragón, Ordesa y Monte Perdido National Park, Fanlo, Añislo canyon, on dead wood, Jun. 2009, M. Hernández-Restrepo, J. Mena Portales & J. Cano (cultures ex-type CBS 126091, FMR 10752).

Notes: This species was formerly identified as *Diplococcium* because of the presence of polytretic and cylindrical conidiogenous cells that produce chains of septate and brown conidia (Hernández-Restrepo et al. 2012). However, the fungus also showed discrete and globose conidiogenous cells on the conidiophores, a feature not described in other species of *Diplococcium*. Therefore, the presence of these discrete conidiogenous cells and the production of short conidial chains allow us to distinguish *Paradiplococcium* from *Diplococcium*. In addition, the type species of this latter genus, *D. spicatum*, is related to *Helotiales* in *Leotiomyces* (Shenoy et al. 2010).

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