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The Genera of Fungi – G6: *Arthrographis*, *Kramasamuha*, *Melnikomyces*, *Thysanorea*, and *Verruconis*

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Abstract: The Genera of Fungi series, of which this is the sixth contribution, links type species of fungal genera to their morphology and DNA sequence data. Five genera of microfungi are treated in this study, with new species introduced in *Arthrographis*, *Melnikomyces*, and *Verruconis*. The genus *Thysanorea* is emended and two new species and nine combinations are proposed. *Kramasamuha sibika*, the type species of the genus, is provided with DNA sequence data for first time and shown to be a member of *Helminthosphaeriaceae* (*Sordariomycetes*). *Aureoconidiella* is introduced as a new genus representing a new lineage in the *Dothideomycetes*.

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INTRODUCTION

This study focuses on five genera that form part of the Genera of Fungi project (www.generaoffungi.org; Crous *et al*. 2014a). The overall intention of this project is to revise and update the generic names of fungi, to provide DNA sequence data for them and to restudy or recollect their type species. In this study, we provide DNA sequence data for the unusual and poorly known genus *Kramasamuha*. Furthermore, the phylogenetic position of the genus *Melnikomyces* is clarified. We also resolve the taxonomy and phylogeny of *Thysanorea* and related *Minimelanolocus* species in the *Herpotrichiellaceae*. Additional new taxa are introduced based on morphological and DNA sequence data.

MATERIALS AND METHODS

Isolates

Freshly collected leaves and twigs were placed in damp chambers and treated as described by Castañeda-Ruiz *et al*. (2016). Protocols used for the collection and processing of soil samples are described in Giraldo *et al.* (2012, 2019) and Groenewald *et al.* (2018). After 1 wk of incubation on 2 % malt extract agar (MEA) supplemented with penicillin-G and streptomycin, individual colonies were transferred to MEA plates without antibiotics and incubated between 22–24 °C for 7–14 d, in order to obtain axenic cultures.

Colonies were sub-cultured onto 2 % potato dextrose agar (PDA), oatmeal agar (OA), MEA (Crous *et al*. 2019), autoclaved pine needles on 2 % tap water agar (PNA) (Smith *et al*. 1996), and incubated at 25 °C under continuous near-ultraviolet light to promote sporulation. Reference strains and specimens are maintained at the Westerdijk Fungal Biodiversity Institute (CBS Culture Collection and herbarium, respectively), Utrecht, The Netherlands or Coleção Octávio de Almeida Drummond (COAD), Viçosa, Brazil.

DNA isolation, amplification and analyses

Genomic DNA was extracted from fungal colonies growing on MEA using the Wizard® Genomic DNA purification kit (Promega, Madison, WI), following the manufacturer's protocol. The primers V9G (de Hoog & Gerrits van den Ende 1998) or ITS5 (White *et al*. 1990) and LR5 (Vilgalys & Hester 1990) were used to amplify part of the nuclear rDNA operon (ITS) spanning the 3' end of the 18S nrRNA gene, the first internal transcribed spacer (ITS1), the 5.8S nrRNA gene, the second ITS region (ITS2) and approximately 900 bp of the 5' end of the 28S nrRNA gene. The primers ITS4 (White *et al.* 1990) and LR0R (Vilgalys & Hester 1990) were used as internal sequence primers to ensure high quality sequences over the entire length of the amplicon. Part of the 18S small subunit nrRNA gene (SSU) was amplified and sequenced for selected isolates using NS1 and NS4 (White *et al.* 1990). Amplification conditions followed those described by Cheewangkoon *et al*. (2008). Part of the actin gene (*act*) was

amplified and sequenced for selected isolates using the primer set Act1/Act4 (Voigt & Wöstemeyer 2000). The software SeqMan Pro v. 13.0.0 (DNASTAR, Madison, WI) and Geneious v. 11.0.4 (Kearse *et al.* 2012; https://www.geneious.com) were used to obtain consensus sequences of each isolate. Blast searches using ITS and LSU sequences were performed for each isolate and the closest matches were retrieved from GenBank and included in the phylogenetic analyses. Multiple sequence alignments for individual genes were generated using the online version of MAFFT (http://mafft.cbrc.jp/alignment/software/). Subsequent phylogenetic analyses from individual and combined datasets were conducted using Maximum-likelihood (ML) performed on the CIPRES Science Gateway portal (Miller *et al.* 2012) using RAxML v. 8.2.10 (Stamatakis 2014). The default parameters were used, and bootstrap support (BS) was obtained using the rapid bootstrapping algorithm with the automatic halt option. A BS ≥ 95 % was considered as statistically significant. Sequence data were deposited in the GenBank/ENA public databases (Table 1) and the alignments and trees in TreeBASE (http://www.treebase.org).

Morphology

Slide preparations were mounted in lactic acid or water from colonies sporulating on the media previously mentioned. Observations were made with a Nikon SMZ1500 dissecting microscope and with a Nikon Eclipse Ni compound microscope using a DSRi2 digital camera (Nikon, Tokyo, Japan) and NIS-Elements imaging software v. 4.3. Colony characters and pigment production were noted after 1–2 wk of growth on MEA, PDA and OA incubated at 25 ºC under natural light. Colony colours (surface and reverse) were determined using the colour charts of Rayner (1970). Taxonomic novelties were deposited in MycoBank (www.MycoBank.org; Crous *et al.* 2004).

RESULTS

Phylogeny

Three overview phylogenies were generated in this study. The first two of these were based on a partial alignment of LSU to provide the phylogenetic position of the treated genera and species within the *Dothideomycetes* (Fig. 1) and *Sordariomycetes* (Fig. 2). A third analysis was implemented for selected *Herpotrichiellaceae* genera based on a concatenated ITS/LSU/SSU alignment (Fig. 3). Other phylogenetic trees specific to the treated species are discussed in the notes for those taxa.

The BLAST search results using the LSU and ITS sequences for the isolates CBS 145943, CBS 145767, CBS 145768, and JW showed that they were related to members of *Cladoriellales* and *Asterinales*, *Venturiales* and *Eremomycetales* in the *Dothideomycetes*. Consequently, the currently accepted taxa in those orders and other orders in the *Dothideomycetes* were included in our analyses (Fig. 1).

The overview phylogeny of *Dothideomycetes* (Fig. 1) revealed that in the *Arthrographis* subclade (96 % BS), the strains JW 49012, JW 190014, and JW 209002 grouped together in a separate clade representing a putative new species that is described below.

The genus *Aureoconidiella* is introduced to accommodate CBS 145943 that formed a lineage distinct from other genera, families and orders included in the analysis. A new family and order are introduced for this genus. Furthermore, the isolates CBS 145767 and CBS 145768 nested in the *Sympoventuriaceae* clade (91 % BS) within the *Venturiales.* They were closely related but different to *Melnikomyces vietnamensis* and *Verruconis verruculosa*, respectively. These isolates are consequently considered to represent putative new species in the genera *Melnikomyces* and *Verruconis* that are introduced below.

The overview phylogeny of *Sordariomycetes* (Fig. 2) revealed that four isolates, CBS 146133, CBS 146338, CBS 146339, and COAD 2632 of *Kramasamuha sibika* grouped together in a fully-supported terminal clade (100 % BS), related to *Helminthosphaeriaceae* (97 % BS).

The combined analysis of the ITS/LSU/SSU (Fig. 3) revealed that *Minimelanolocus* and *Thysanorea* cluster together in the same clade (86 % BS). Several species treated so far as belonging to *Minimelanolocus, i.e*. *M. aquaticus*, *M. asiaticus*, *M. curvatus*, *M. melanicus*, *M. obscurus*, *M. rosselianus*, *M. submersus,* and *M. thailandensis*, proved to be congeneric with *Thysanorea* and therefore new combinations are proposed to accommodate them. In addition, CBS 145909 and CBS 145910 formed a separate subclade (100 % BS) within *Thysanorea*, representing two putative new species.

Taxonomy

Aureoconidiellales Hern.-Restr. & Crous, ***ord. nov*.** MycoBank MB833918.

Description: See description of *Aureoconidiella.*

Type family: *Aureoconidiellaceae* Hern.-Restr. & Crous

Aureoconidiellaceae Hern.-Restr. & Crous, ***fam. nov*.** MycoBank MB833917.

Description: See description of *Aureoconidiella.*

Type genus: Aureoconidiella Hern.-Restr. & Crous

Aureoconidiella Hern.-Restr. & Crous, ***gen. nov*.** MycoBank MB833915.

Etymology: Name refers to the golden brown colour of its conidia.

Conidiophores macronematous, simple, septate, brown. *Conidiogenous cells* integrated, terminal, polyblastic, with thickened scars, brown to pale brown. *Conidia* globose to subglobose with apiculate base, initially subhyaline, golden brown at maturity, verrucose.

Type species: *Aureoconidiella foliicola* Hern.-Restr. & Crous

Table 1. GenBank accession numbers of taxa included in this study.

Taxa	Isolates[1]	Country	Substrate	GenBank accession numbers[2]			References
				ITS	LSU	*act*/SSU	
Dothideomycetes							
Aliquandostipite khaoyaiensis	CBS 118232	Thailand	Twig	–	GU301796.1	–	Schoch *et al.* (2009)
	SS3028	Thailand		–	EF175649.1	–	Campbell *et al.* (2007)
Alternaria tenuissima	CBS 918.96	UK	*Dianthus chinensis*	–	KC584311.1	–	Woudenberg *et al.* (2013)
Alysidiella parasitica	CBS 120088	South Africa	Leaves *Eucalyptus* sp.	–	DQ923525.1	–	Summerell *et al.* (2006)
Apiosporina collinsii	CBS 118973	Canada	*Amelanchier alnifolia*	–	GU301798.1	–	Schoch *et al.* (2009)
Arthrographis arxii	CBS 203.78	India	Dung of herbivore	GQ272638.1	AB213426.1	HG316563.1/-	Murata *et al.* (2005), Kang *et al.* (2010), Giraldo *et al.* (2014a)
Arthrographis chlamydospora	CBS 135936	USA	Human urine	HG004554.1	HG004543.1	HG316560.1/-	Giraldo *et al.* (2014a)
Arthrographis curvata	CBS 135933	USA	Human nails	HG004557.1	HG004539.1	HG316557.1/-	Giraldo *et al.* (2014a)
	CBS 135934	Spain	River sediment	HG004556.1	HG004542.1	HG316558.1/-	Giraldo *et al.* (2014a)
Arthrographis globosa	UTHSC 11-757	USA	Bronchial wash	HG004553.1	HG004541.1	HG316561.1/-	Giraldo *et al.* (2014a)
Arthrographis grakistii	JW 22011 = CBS 145529	The Netherlands	Soil	**MN794359**	**MN794336**	**MN816497**	This study
	JW 22015	The Netherlands	Soil	**MN794360**	**MN794337**	**MN816498**	This study
	JW 22019	The Netherlands	Soil	**MN794361**	**MN794338**	**MN816499**	This study
	JW 49011	The Netherlands	Soil	**MN794362**	**MN794339**	**MN816500**	This study
	JW 49012	The Netherlands	Soil	**MN794363**	**MN794340**	**MN816501**	This study
	JW 180011	The Netherlands	Soil	**MN794364**	**MN794341**	**MN816502**	This study
	JW 190014= CBS 145530	The Netherlands	Soil	**MN794365**	**MN794342**	**MN816503**	This study
	JW 199018	The Netherlands	Soil	**MN794366**	**MN794343**	**MN816504**	This study
	JW 209002	The Netherlands	Soil	**MN794367**	**MN794344**	**MN816505**	This study
	JW 209003	The Netherlands	Soil	**MN794368**	**MN794345**	**MN816506**	This study
Arthrographis kalrae	CBS 693.77	India	Sputum	AB116536.1	AB116544.1	HG316544.1/-	Xi *et al.* (2004), Giraldo *et al.* (2014a)
	JW 21004	The Netherlands	Soil	**MN794369**	**MN794346**	**MN816507**	This study
	JW 21008 = CBS 145527	The Netherlands	Soil	**MN794370**	**MN794347**	**MN816508**	This study
	JW 21029	The Netherlands	Soil	**MN794371**	**MN794348**	**MN816509**	This study
Arthrographis longispora	CBS 135935	USA	Human foot	HG004555.1	HG004540.1	HG316559.1/-	Giraldo *et al.* (2014a)
	JW 22007 = CBS 145528	The Netherlands	Soil	**MN794372**	**MN794349**	**MN816510**	This study
Asterina chrysophylli	VIC 42823	Brazil	Leaves *Henriettea succosa*	–	KP143738.1	–	Guatimosim *et al.* (2015)
Asterina melastomatis	VIC 42822	Brazil	Leaves *Miconia* sp.	–	NG_057055.1	–	Guatimosim *et al.* (2015)
Asterotexis cucurbitacearum	PMA M141224	Panama	*Sechium edule*	–	HQ610510.1	–	Unpublished
	VIC 24814	Brazil	Leaves *Cucurbita pepo*	–	NG_057054.1	–	Guatimosim *et al.* (2015)
Aulographina eucalypti	CPC 12986	Australia	*Eucalyptus cloeziana*	–	HM535600.1	–	Cheewangkoon *et al.* (2012)
Aureoconidiella foliicola	**CBS 145943**	South Africa	Leaves *Syzygium cordatum*	**MN794373**	**MN794350**	–	This study

Table 1. (Continued).

Taxa	Isolates[1]	Country	Substrate	GenBank accession numbers[2]			References
				ITS	LSU	*act*/SSU	
Bezerromyces brasiliensis	URM7411	Brazil	*Tacinga inamoena*	–	KX518623.1	–	Bezerra *et al.* (2017)
Bezerromyces pernambucoensis	URM7412	Brazil	*Tacinga inamoena*	–	KX518624.1	–	Bezerra *et al.* (2017)
Blastacervulus eucalypti	CBS 124759	Australia	*Eucalyptus robertsonii* subsp. *hemisphaerica*	–	GQ303302.1	–	Cheewangkoon *et al.* (2009)
Blastacervulus robbenensis	CBS 124780	Cyprus	*Eucalyptus* sp.	–	HM628777.1	–	Cheewangkoon *et al.* (2012)
Botryosphaeria dothidea	CBS 115476	Switzerland	*Prunus* sp.	–	DQ377852.1	–	Crous *et al.* (2006b)
Brachiosphaera tropicalis	E192	–	–	–	EF175653.1	–	Campbell *et al.* (2007)
Byssosphaeria jamaicana	SMH 1403	–	–	–	GU385152.1	–	Mugambi & Huhndorf (2009a)
Byssosphaeria salebrosa	SMH 2387	–	–	–	GU385162.1	–	Mugambi & Huhndorf (2009a)
Capnodium coffeae	CBS 147.52	Zaire	Berry *Coffea robusta*	–	MH868489.1	–	Vu *et al.* (2019)
Cladoriella eucalypti	CBS 115899	South Africa	Leaves *Eucalyptus*	–	EU040224.1	–	Crous *et al.* (2007b)
Cladoriella kinglakensis	CPC 32730	Australia	Leaves *Eucalyptus*	–	MG386126.1	–	Crous *et al.* (2017)
Cladoriella paleospora	CBS 124761	Australia	Leaves *Eucalyptus*	–	GQ303303.1	–	Cheewangkoon *et al.* (2009)
Cladoriella rubrigena	CBS 124760	Australia	Leaves *Eucalyptus*	–	MH874921.1	–	Vu *et al.* (2019)
Cladoriella xanthorrhoeae	CBS 143398	Australia	Leaves *Xanthorrhoea* sp.	–	NG_059054.1	–	Crous *et al.* (2017)
Cladosporium halotolerans	CBS 127371	Cuba	Human	–	MH875988.1	–	Vu *et al.* (2019)
Cladosporium variabile	CBS 121636	USA	*Spinacia oleracea*	–	MH874684.1	–	Vu *et al.* (2019)
Clavatispora thailandica	MFLUCC 17-2237	Thailand	*Hevea brasiliensi*	–	MH062960.1	–	Unpublished
	MFLUCC 10-0107	Thailand	Dead stems	–	NG_058863.1	–	Boonmee *et al.* (2014)
Dibotryon morbosum	N/A	USA	*Prunus* sp.	–	EF114694.1	–	Winton *et al.* (2007)
Diplodia mutila	CBS 431.82	The Netherlands	Dead branches *Fraxinus excelsior*	–	DQ377863.1	–	Crous *et al.* (2006b)
Dissoconium aciculare	CBS 204.89	Germany	*Astragalus*	–	GU214419.1	–	Crous *et al.* (2009a)
Eremomyces bilateralis	CBS 781.70	USA	Dung of pack rat	HG004552.1	HG004545.1	HG316562.1/-	Giraldo *et al.* (2014a)
Fusicladium pini	CBS 463.82	The Netherlands	Needle *Pinus sylvestris*	–	EU035436.1	–	Crous *et al.* (2007c)
Fusicladium ramoconidii	CBS 462.82	The Netherlands	Needle *Pinus* sp.	–	EU035439.1	–	Crous *et al.* (2007c)
Gibbera conferta	CBS 191.53	Switzerland	*Vaccinium uliginosum*	–	GU301814.1	–	Schoch *et al.* (2009)
Gloniopsis arciformis	GKM L166A	–	–	–	GU323211.1	–	Schoch *et al.* (2009)
Glonium circumserpens	CBS 123342	Tasmania	Wood	–	FJ161208.1	–	Boehm *et al.* (2009)
Glonium circumserpens	CBS 123343	Tasmania	Saxicolous on limestone	–	FJ161200.1	–	Boehm *et al.* (2009)
Helicomyces roseus	CBS 283.51	Switzerland	Dead bark	–	AY856881.1	–	Tsui *et al.* (2006)
Herpotrichia juniperi	AFTOL-ID 1608	Switzerland	*Juniperus nana*	–	DQ678080.1	–	Schoch *et al.* (2009)
Heteroconium eucalypti	CBS 120122	Uruguay	Leaves *Eucalyptus dunnii*	–	DQ885893.1	–	Crous *et al.* (2006a)
Hysterium angustatum	CBS 123334	USA	Bark *Pinus rigida*	–	FJ161207.1	–	Boehm *et al.* (2009)
Hysterium pulicare	ANM1455	USA	–	–	GQ221904.1	–	Mugambi & Huhndorf (2009b)
Hysteropatella clavispora	CBS 247.34	USA	*Salix* sp.	–	AY541483.1	–	Lumbsch *et al.* (2005)

Table 1. (Continued).

Taxa	Isolates[1]	Country	Substrate	GenBank accession numbers[2]			References
				ITS	LSU	*act*/SSU	
Hysteropatella prostii	H.B. 9934b	Germany	*Malus domestica*	–	KT876980.1	–	Unpublished
Jahnula appendiculata	SS2900	Thailand	–	–	EF175654.1	–	Campbell *et al.* (2007)
Jahnula aquatica	R68-1	USA	–	–	EF175655.1	–	Campbell *et al.* (2007)
Jahnula bipileata	F49-1	USA	–	–	EF175657.1	–	Campbell *et al.* (2007)
Jahnula seychellensis	SS2113.1	Thailand	–	–	EF175665.1	–	Campbell *et al.* (2007)
Leptoxyphium fumago	CBS 123.26	Indonesia	*Hibiscus tiliaceus*	–	GU214430.1	–	Crous *et al.* (2009a)
Macrophomina phaseolina	CBS 227.33	–	*Zea mays*	–	DQ377906.1	–	Crous *et al.* (2006b)
Melanomma pulvis-pyrius	CBS 124080	France	Bark *Salix caprea*	–	GU456323.1	–	Zhang *et al.* (2009a)
Melnikomyces thailandicus	**CBS 145767**	Thailand	Soil	**MN794374**	**MN794351**	–	This study
Melnikomyces vietnamensis	CBS 136209	Vietnam	Leaves	–	NG_058087.1	–	Crous *et al.* (2014b)
Mycosphaerella punctiformis	CBS 113265	The Netherlands	Dead leaves *Quercus robur*	–	DQ470968.1	–	Spatafora *et al.* (2006)
Neocoleroa metrosideri	PDD107531	New Zealand	*Metrosideros excelsa*	–	NG_059638.1	–	Johnston & Park (2016)
Neofusicoccum mangiferae	CBS 118532	Australia	*Mangifera indica*	–	NG_055730.1	–	Crous *et al.* (2006b)
Neofusicoccum nonquaesitum	CBS 126655	USA	*Umbellularia californica*	–	NG_058258.1	–	Yang *et al.* (2017)
Ochroconis constricta	CBS 202.27	USA	Soil	–	KF156147.1	–	Samerpitak *et al.* (2014)
Ochroconis gamsii	CBS 239.78	Sri Lanka	Leaf *Caryota plumosa*	–	NG057992.1	–	Samerpitak *et al.* (2014)
Patellaria cf. *atrata*	BCC 28876	Thailand	–	–	GU371828.1	–	Schoch *et al.* (2009)
	BCC 28877	Thailand	–	–	GU371829.1	–	Schoch *et al.* (2009)
Phaeocryptopus gaeumannii	CBS 267.37	Germany	*Pseudotsuga menziesii*	–	EF114698.1	–	Winton *et al.* (2007)
Phaeotrichum benjaminii	CBS 541.72	–	Dung of rodent	–	AY779311.1	–	Lumbsch *et al.* (2005)
Phoma herbarum	CBS 567.63	USA	Fruit *Malus sylvestris*	–	MH869982.1	–	Vu *et al.* (2019)
Pirozynskiella laurisilvatica	CBS 138109	Spain	Leaves *Laurus* sp.	–	NG_058462.1	–	Hernández-Restrepo *et al.* (2017)
Psiloglonium simulans	CBS 206.34	USA	*Tilia* sp.	–	FJ161178.1	–	Boehm *et al.* (2009)
Rhexothecium globosum	CBS 955.73	Egypt	Desert soil	MH860827.1	HG004544.1	–	Giraldo *et al.* (2014a), Vu *et al.* (2019)
Rhytidhysteron rufulum	CBS 306.38	–	*Pistacia chinensis*	–	FJ469672.1	–	Schoch *et al.* (2009)
Schizothyrium pomi	CBS 228.57	Italy	–	–	EF134947.1	–	Batzer *et al.* (2008)
	CBS 486.50	The Netherlands	*Polygonum sachalinense*	–	EF134948.1	–	Batzer *et al.* (2008)
Scolecobasidiella avellanea	CBS 772.73	Somalia	Soil	–	EF204505.1	–	Unpublished
Stemphylium herbarum	CBS 191.86	India	Leaf *Medicago sativa*	–	JX681120.1	–	Verkley *et al.* (2014)
Sympoventuria capensis	CBS 120136	South Africa	Leaf litter *Eucalyptus* sp.	–	NG_057984.1	–	Samerpitak *et al.* (2014)
Teratosphaeria destructans	CBS 111369	Indonesia	*Eucalyptus grandis*	–	EU019287.2	–	Crous *et al.* (2007a)
Teratosphaeria fibrillosa	CBS 121707	South Africa	Leaves *Protea* sp.	–	KF902075.1	–	Quaedvlieg *et al.* (2014)
Teratosphaeria stellenboschiana	CBS 116428	South Africa	Leaf litter *Eucalyptus* sp.	–	EU019295.1	–	Crous *et al.* (2007a)
Trichodelitschia bisporula	CBS 262.69	The Netherlands	Dung of Rabbit	–	GU348996.2	–	Schoch *et al.* (2009)

Table 1. (Continued).

Taxa	Isolates[1]	Country	Substrate	GenBank accession numbers[2]			References
				ITS	LSU	*act*/SSU	
Tubeufia paludosa	CBS 245.49	The Netherlands	*Corylus avellana*	–	MH856510.1	–	Vu *et al.* (2019)
Uwebraunia commune	CBS 110747	South Africa	*Eucalyptus nitens*	–	GQ852589.1	–	Crous *et al.* (2009b)
Uwebraunia dekkeri	CBS 111282	Zambia	*Eucalyptus globulus*	–	GU214425.1	–	Crous *et al.* (2009b)
Venturia inaequalis	CBS 176.42	France	–	–	GU348998.1	–	Schoch *et al.* (2009)
Venturia populina	CBS 256.38	Italy	*Populus canadensis*	–	GU323212.1	–	Schoch *et al.* (2009)
Verruconis calidifluminalis	CBS 125818	Japan	Hot spring effluent	–	NG_057985.1	–	Samerpitak *et al.* (2014)
Verruconis gallopava	CBS 547.81	New Zealand	–	–	KF156109.1	–	Samerpitak *et al.* (2014)
	CBS 437.64	USA	Brain abscess *Meleagris gallopavo*	–	NG_58016.1	–	Machouart *et al.* (2014)
Verruconis thailandica	**CBS 145768**	Thailand	Soil	**MN794375**	**MN794352**	–	This study
Verruconis verruculosa	CBS 119775	Malaysia	Root *Hevea species*	–	KF282668.1	–	Machouart *et al.* (2014)
Xiliomyces brasiliensis	URM7413	Brazil	*Tacinga inamoena*	–	KX518625.1	–	Bezerra *et al.* (2017)
Zasmidium cellare	CBS 146.36	–	Wall in wine cellar	–	EU041878.1	–	Arzanlou *et al.* (2007)
Eurotiomycetes							
Aculeata aquatica	MFLUCC 11-0529	Thailand	Submerged wood	MG922575.1	MG922579.1	–/MG922571.1	Dong *et al.* (2018)
Capronia pilosella	AFTOL-ID 657	–	–	DQ823099.1	DQ823106.1	–/DQ826737.1	James *et al.* (2006)
Cladophialophora carrionii	CBS 160.54	Australia	Man	FJ358234.1	FJ358302.1	–/AF050262.1	Gueidan *et al.* (2008), Untereiner & Naveau (1999)
Cladophialophora minourae	CBS 556.83	Japan	Decaying wood	FJ358235.1	FJ358303.1	–/AY251087.1	Braun *et al.* (2003), Gueidan *et al.* (2008)
Cladophialophora parmeliae	CBS 129337	Portugal	–	JQ342182.1	–	–/JQ342180.1	Diederich *et al.* (2013)
Cladophialophora subtilis	CBS 122642	The Netherlands	Ice tea	NG_058961.1	KX822283.1	–/NR_111363.1	Badali *et al.* (2008), Vasse *et al.* (2017)
Cyphellophora oxyspora	CBS 698.73	Sri Lanka	–	KC455262.1	KC455305.1	–/KC455249.1	Réblová *et al.* (2013)
Cyphellophora sessilis	CBS 243.85	The Netherlands	Resin *Picea abies*	EU514700.1	KC455308.1	–/EU514700.1	Untereiner *et al.* (2008), Réblová *et al.* (2013)
Exophiala jeanselmei	CBS 507.90	Uruguay	Man	FJ358242.1	FJ358310.1	–/NR_111129.1	Gueidan *et al.* (2008)
Exophiala nigra	dH 12,296	–	–	FJ358244.1	FJ358312.1	–	Gueidan *et al.* (2008)
Exophiala pisciphila	CBS 537.73	USA	*Ictalurus punctatus*	MH872483.1	JN856018.1	–/AF050272.1	de Hoog *et al.* (2011), Untereiner & Naveau (1999), Vu *et al.* (2019)
	AFTOL-ID 669	–	–	DQ823101.1	DQ823108.1	–/DQ826739.1	Gueidan *et al.* (2008)
Exophiala salmonis	AFTOL-ID 671	–	–	EF413609.1	EF413608.1	–	Geiser *et al.* (2006)
	CBS 157.67	Canada	*Salmo clarkii*	MH870616.1	JN856020.1	–/NR_121270.1	de Hoog *et al.* (2011), Schoch *et al.* (2014), Vu *et al.* (2019)
Exophiala xenobiotica	CBS 115831	Germany	Browncol	FJ358246.1	FJ358314.1	–/AY857539.1	Gueidan *et al.* (2008)
Fonsecaea monophora	CBS 102243			FJ358247.1	FJ358315.1	–/EU938579.1	Gueidan *et al.* (2008)
Melanoctona tectonae	MFLUCC 12-0389	Thailand	*Tectona grandis*	KX258779.1	KX258780.1	–/KX258778.1	Unpublished
Phialophora americana	AFTOL-ID 658	–	–	FJ358226.1	FJ358294.1	–	Gueidan *et al.* (2008)

Table 1. (Continued).

Taxa	Isolates[1]	Country	Substrate	GenBank accession numbers[2]			References
				ITS	LSU	*act*/SSU	
Phialophora verrucosa	AFTOL-ID 670	–	–	EF413615.1	EF413614.1	–	Geiser *et al.* (2006)
Rhinocladiella anceps	AFTOL-ID 659	–	–	DQ823102.1	DQ823109.1	–/DQ826740.1	James *et al.* (2006)
Rhinocladiella anceps	CBS 181.65	Canada	Soil	EU041862.1	AY554292.1	–/MH858534.1	Arzanlou *et al.* (2007)
Thysanorea asiatica	MFLUCC 15-0237	China	Submerged wood	KR215610.1	KR215615.1	–/KR215604.1	Liu *et al.* (2015)
Thysanorea cantrelliae	**CBS 145909**	USA	Unidentified twig	**MN794376**	**MN794353**	**–/MN794382**	This study
Thysanorea curvata	MFLUCC 15-0259	China	Submerged wood	KR215609.1	KR215614.1	–/KR215605.1	Liu *et al.* (2015)
Thysanorea lotorum	CBS 235.78	USA	Root *Lotus corniculatus*	MH872892.1	–	–/MH861130.1	Vu *et al.* (2019)
	KUMCC 15-0206	China	Submerged wood	KX789215.1	–	–/KX789212.1	Liu *et al.* (2015)
Thysanorea melanica	MFLUCC 15-0415	China	Submerged wood	KR215613.1	KR215618.1	–/KR215608.1	Liu *et al.* (2015)
Thysanorea nonramosa	MFLUCC 17-2378	Thailand	Wood	MH532970.1	–	–/MH532971.1	Wang *et al.* (2019)
Thysanorea obscura	MFLUCC 15-0416	China	Submerged wood	KR215611.1	KR215616.1	–/KR215606.1	Liu *et al.* (2015)
Thysanorea papuana	CBS 212.96	Papua New Guinea	–	EU041871.1	–	–/EU041814.1	Arzanlou *et al.* (2007)
	MFLUCC 15-0966	Thailand	Submerged wood	MG922576.1	MG922580.1	–/MG922572.1	Dong *et al.* (2018)
Thysanorea rousseliana	CBS 126086	Spain	Dead branches *Quercus ilex*	MH875246.1	–	–/MH863784.1	Vu *et al.* (2019)
Thysanorea seifertii	**CBS 145910**	USA	Unidentified twig	**MN794377**	**MN794354**	**–/MN794383**	This study
Thysanorea thailandensis	MFLUCC 15-0971	Thailand	Submerged wood	MG922577.1	MG922581.1	–/MG922573.1	Dong *et al.* (2018)
Thysanorea yunnanense	MFLUCC 15-0414	Thailand	Submerged wood	KR215612.1	KR215617.1	–/KR215607.1	Liu *et al.* (2015)
Veronaea botryosa	CBS 254.57	Italy	*Sansa olive*	EU041873.1	JN856021.1	–/EU041816.1	Arzanlou *et al.* (2007)
	MFLUCC 11-0072	Thailand	Submerged wood	MG922574.1	MG922578.1	–/MG922570.1	Dong *et al.* (2018)
Veronaea compacta	CBS 268.75	South Africa	–	EU041876.1	–	–/EU041819.1	Arzanlou *et al.* (2007)
Veronaea japonica	CBS 776.83	Japan	Dead bamboo culm	EU041875.1	–	–/EU041818.1	Arzanlou *et al.* (2007)
Sordariomycetes							
Anthostomella sp.	SMH3101	USA	–	–	AY780050.1	–	Miller & Huhndorf (2005)
Camarops tubulina	SMH4614	Denmark	–	–	AY346266.1	–	Huhndorf *et al.* (2004)
Camarops ustulinoides	SMH1988	USA	–	–	AY346267.1	–	Huhndorf *et al.* (2004)
Chaetosphaeria ovoidea	SMH2605	USA	–	–	AF064641.1	–	Fernandez *et al.* (1999)
Coniochaeta discoidea	SANK 12878	–	–	–	AY346297.1	–	Huhndorf *et al.* (2004)
Coniochaetidium savoryi	TRTC 51980	–	–	–	AY346276.1	–	Huhndorf *et al.* (2004)
Cytospora ceratosperma	AR3426	Austria	*Quercus robur*	–	AF408387.1	–	Castlebury *et al.* (2002)
Diaporthe phaseolorum	FAU458	USA	–	–	AY346279.1	–	Huhndorf *et al.* (2004)
Echinosphaeria canescens	JHC97-006	–	–	–	KF765604.1	–	Miller *et al.* (2014)
	SMH4666	–	–	–	KF765605.1	–	Miller *et al.* (2014)
	SMH4791	–	–	–	AY436403.1	–	Miller & Huhndorf (2004)
	TL5730	–	–	–	AY436404.1	–	Miller & Huhndorf (2004)

Table 1. (Continued).

Taxa	Isolates[1]	Country	Substrate	GenBank accession numbers[2]			References
				ITS	LSU	*act*/SSU	
Eutypa sp.	SMH3580	Panama	Branch	–	AY346280.1	–	Huhndorf *et al.* (2004)
Fusarium ambrosium	SMH1999	–	–	–	AY780077.1	–	Miller & Huhndorf (2005)
Helminthosphaeria carpathica	SMH3903	–	–	–	KF765606.1	–	Miller *et al.* (2014)
Helminthosphaeria cf. stuppea	JF04120	–	–	–	KF765611.1	–	Miller *et al.* (2014)
	TL11998	–	–	–	KF765612.1	–	Miller *et al.* (2014)
Helminthosphaeria clavariarum	SMH4609	Denmark	*Clavulina cristata*	–	AY346283.1	–	Huhndorf *et al.* (2004)
Helminthosphaeria corticiorum	JF04225	–	–	–	KF765607.1	–	Miller *et al.* (2014)
Helminthosphaeria odontiae	ANM928	–	–	–	KF765610.1	–	Miller *et al.* (2014)
Helminthosphaeria tomaculum	SMH2485	–	–	–	KF765613.1	–	Miller *et al.* (2014)
Helminthosphaeria triseptata	JF04015	–	–	–	KF765614.1	–	Miller *et al.* (2014)
Hilberina caudata	SMH1542	–	–	–	KF765615.1	–	Miller *et al.* (2014)
Hilberina munkii	SMH1531	–	–	–	KF765616.1	–	Miller *et al.* (2014)
Kramasamuha sibiki	**CPC 35619 = CBS 146338**	Australia	Leaves *Lophostemon confertus*	**MN794378**	**MN794355**	–	This study
	CPC 36725 = CBS 146339	Malaysia	Needles *Pinus tecunumanii*	**MN794379**	**MN794356**	–	This study
	CBS 146133 = CPC 36153	South Africa	Leaves *Syzygium cordatum*	**MN794380**	**MN794357**	–	This study
	COAD 2632	Brazil	Leaves *Hypericum innodorum*	**MN794381**	**MN794358**	–	This study
Lasiosphaeria ovina	SMH1538	–	–	–	AF064643.1	–	Fernandez *et al.* (1999)
Neurospora crassa	MUCL 19026	–	–	–	AF286411.1	–	Untereiner *et al.* (2001)
Ruzenia spermoides	ANM163	–	–	–	KF765618.1	–	Miller *et al.* (2014)
	SMH4606	–	–	–	AY436422.1	–	Miller & Huhndorf (2004)
	SMH4655	–	–	–	KF765619.1	–	Miller *et al.* (2014)
Sporoschisma hemipsila	SMH2125	–	–	–	AY346292.1	–	Huhndorf *et al.* (2004)
Synaptospora plumbea	ANM963	–	–	–	KF765620.1	–	Miller *et al.* (2014)
	SMH3962	–	–	–	KF765621.1	–	Miller *et al.* (2014)
Valsonectria pulchella	SMH1193	–	–	–	AY346304.1	–	Huhndorf *et al.* (2004)

[1] BCC: BIOTEC Culture Collection, National Center for Genetic Engineering and Biotechnology (BIOTEC), Bangkok, Thailand; CBS: Culture Collection of the Westerdijk Fungal Biodiversity Institute, Utrecht, The Netherlands; COAD: Coleção Octávio de Almeida Drummond, Viçosa, Brazil; CPC: Culture Collection of Pedro Crous, Utrecht, The Netherlands; JW: Johanna Westerdijk Culture Collection, Utrecht, The Netherlands; MFLUCC: Mae Fah Luang University Culture Collection, Chiang Rai, Thailand; UTHSC: Fungus Testing Laboratory of the University of Texas Health Science Center at San Antonio, USA. For other acronyms see references.

[2] LSU: Large subunit of the nrDNA; SSU: Small subunit of the nrDNA; ITS: internal transcribed spacer regions of the nrDNA and intervening 5.8S nrDNA; *act*: partial actin gene. Accession numbers of sequences newly generated in this study are indicated in bold.

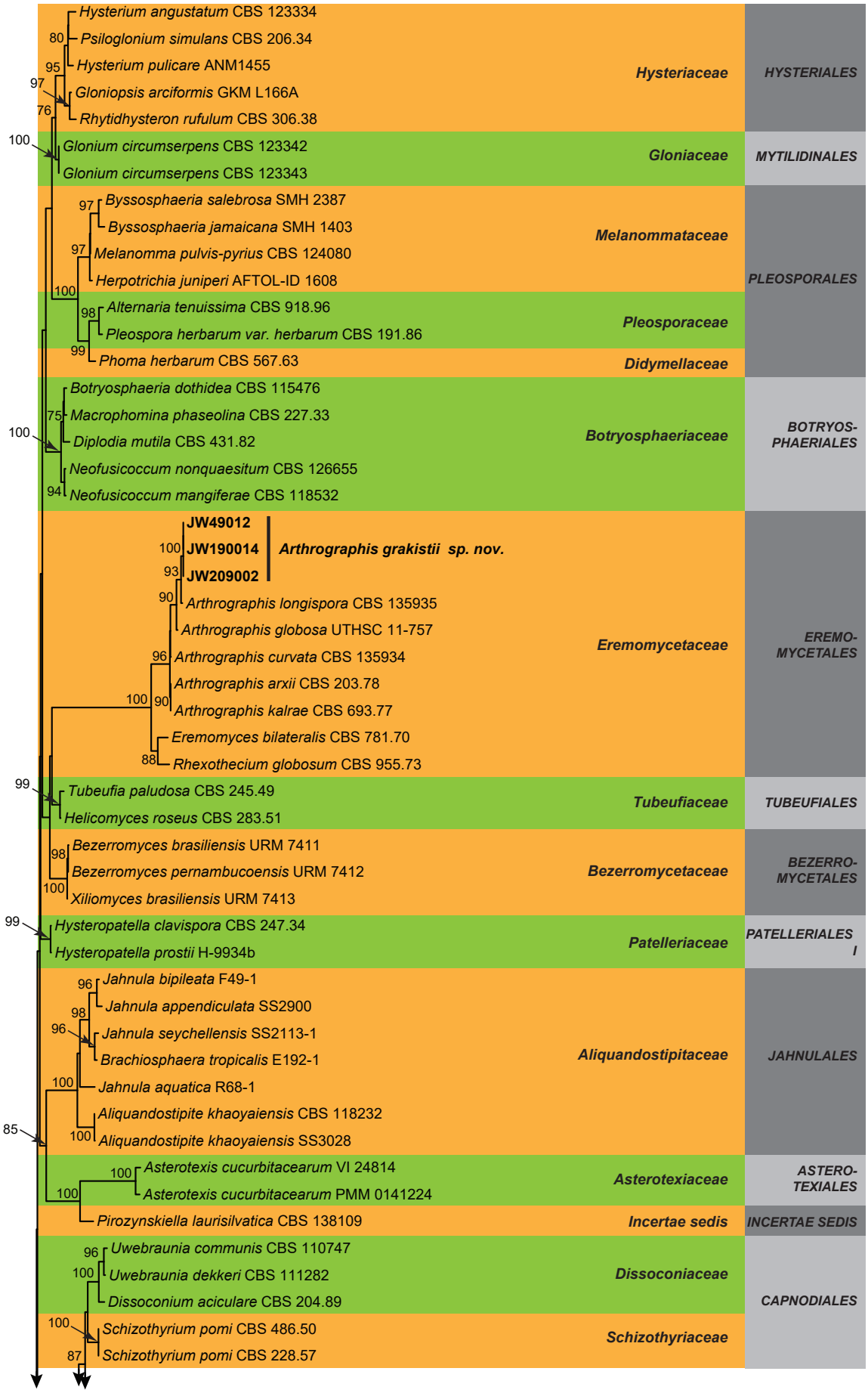

Fig. 1. Maximum composite likelihood tree obtained from the RAxML analysis of the LSU sequence alignment of selected *Dothideomycetes*. Bootstrap support values above 70 % are shown at the nodes. Families and orders are indicated with coloured blocks to the right of the tree. Taxonomic novelties described in this study are indicated in boldface. The tree was rooted to *Yarrowia hollandica* (CBS 4855).

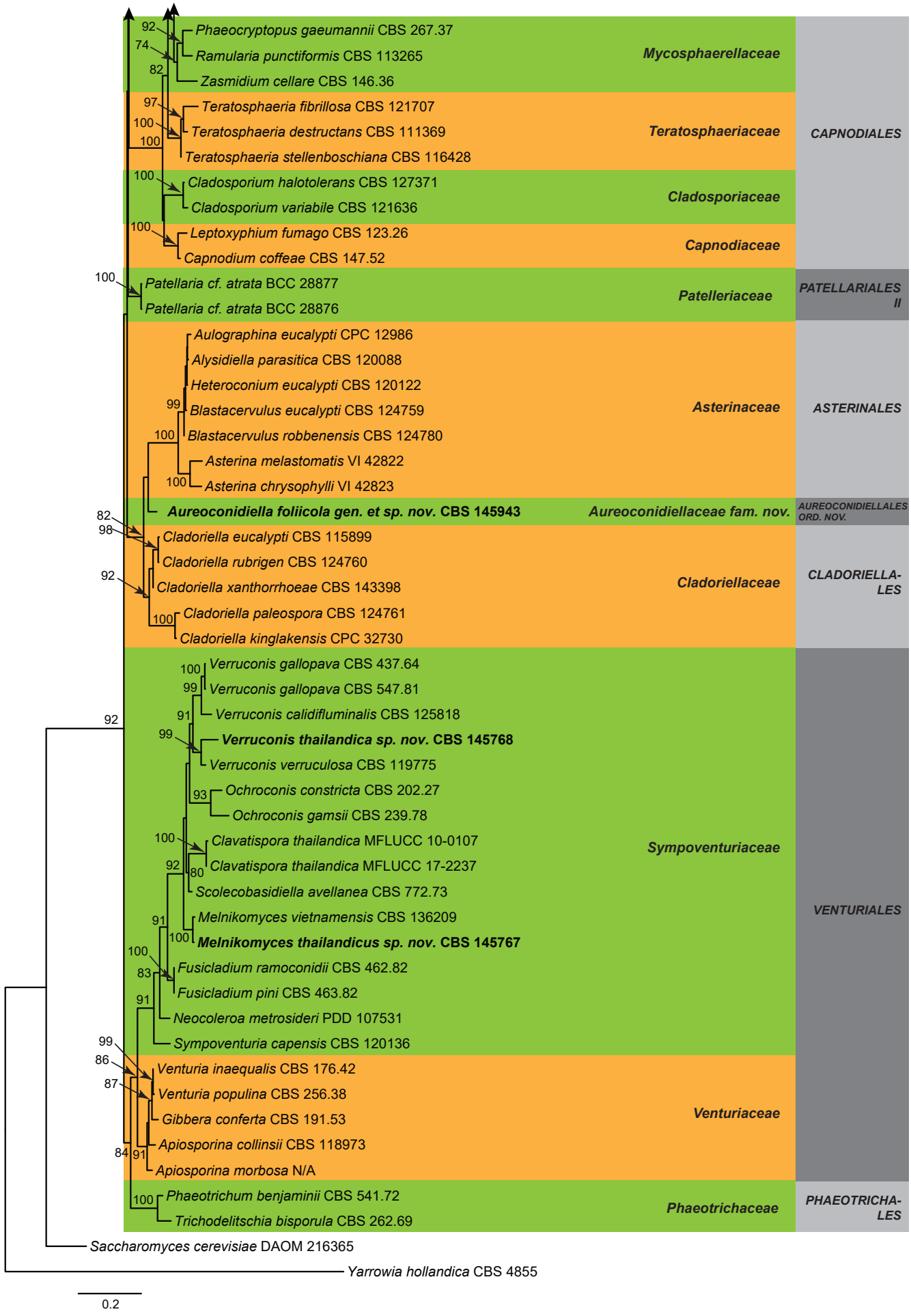

Fig. 1. (Continued).

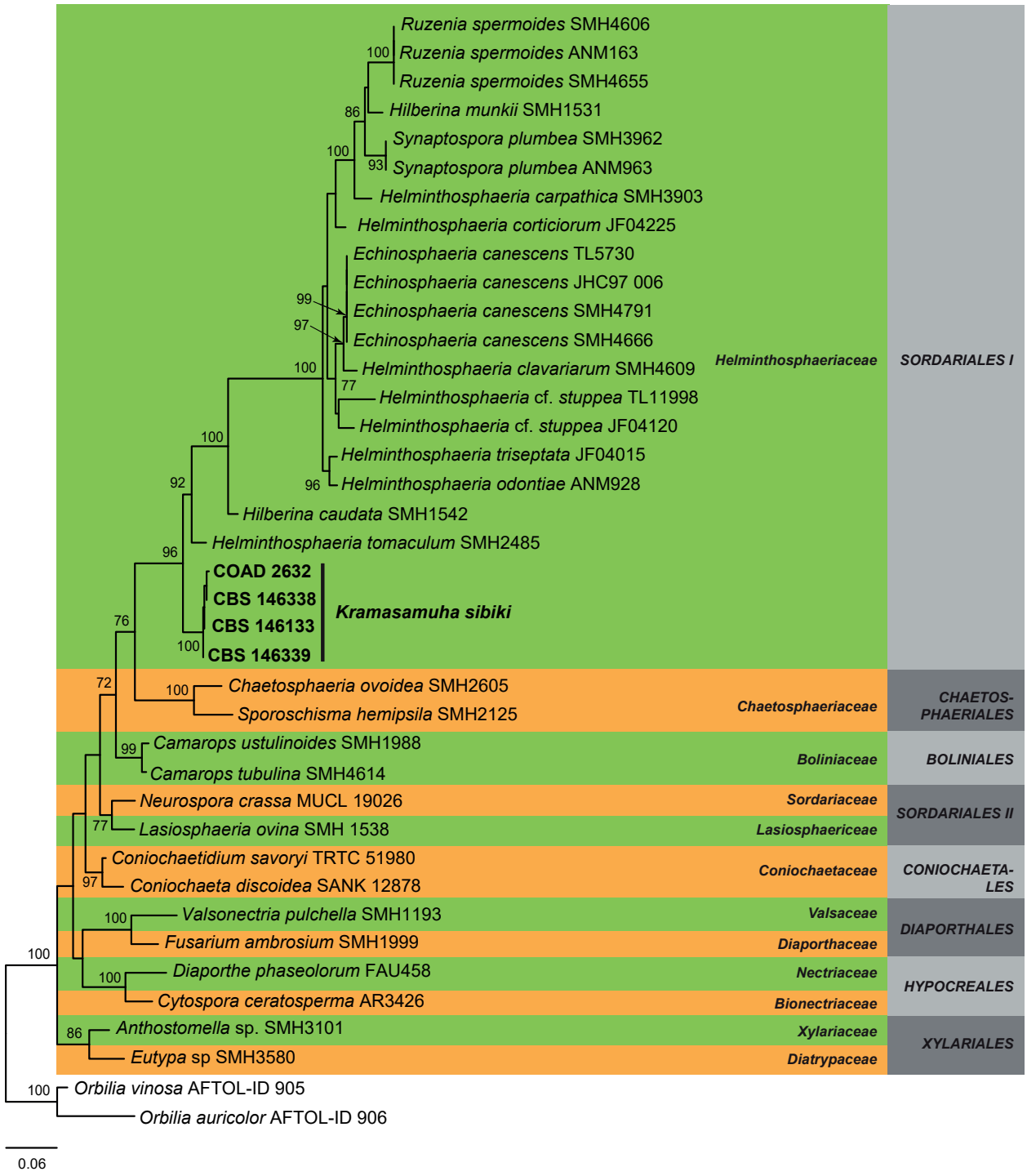

Fig. 2. Maximum composite likelihood tree obtained from the RAxML analysis of the LSU sequence alignment of selected *Sordariomycetes*. Bootstrap support values above 70 % are shown at the nodes. Families and orders are indicated with coloured blocks to the right of the tree. Included strains described in this study are indicated in boldface. The tree was rooted to *Orbilia vinosa* (AFTOL-ID 905) and *Orbilia auricolor* (AFTOL-ID 906).

Aureoconidiella foliicola Hern.-Restr. & Crous, ***sp. nov.*** MycoBank MB833916. Fig. 4.

Etymology: The epithet "*foliicola*" refers to its habitat on a dead leaf.

Mycelium consisting of septate, smooth, brown, 1–2.5 µm wide hyphae. *Conidiophores* macronematous, simple, septate, brown, 40–85 × 3–5.5 µm. *Conidiogenous cells* integrated, terminal, polyblastic, with thickened scars, brown to pale brown, 25–53 × 3–4.5 µm. *Conidia* globose to subglobose with apiculate base, initially subhyaline, golden brown at maturity, verrucose, 5–8 µm diam, base 1–2 µm wide.

Culture characteristics: On MEA and OA surface cottony aerial mycelium Fawn, sepia to dark brick close to the agar, margin effuse, entire; reverse sepia to black.

Typus: **South Africa**, KwaZulu-Natal, Richards Bay, on living leaves of *Syzygium cordatum* (*Myrtaceae*), Jun. 2016, *M.J. Wingfield* (**holotype** CBS H-24099, culture ex-type CPC 36154 = CBS 145943).

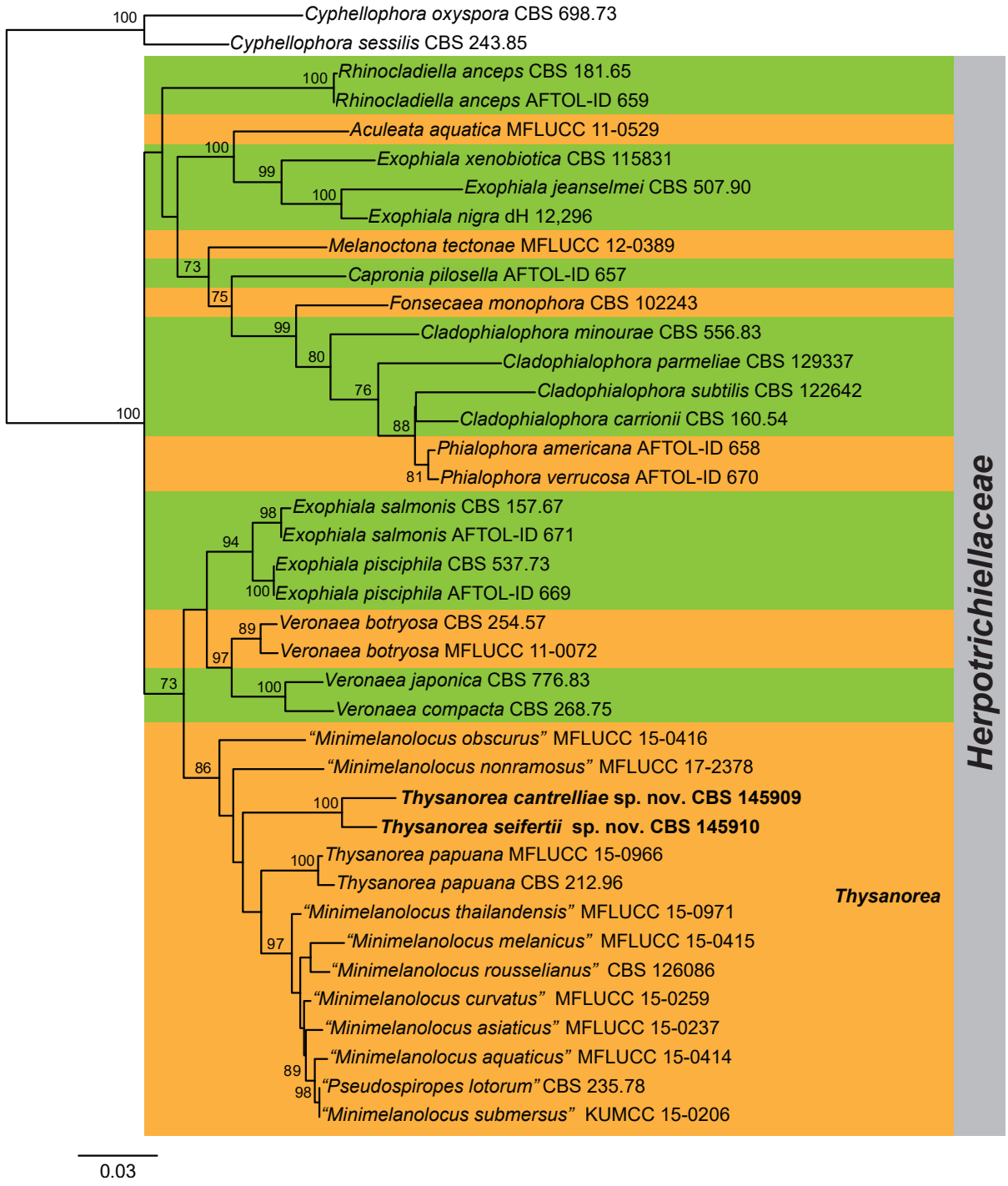

Fig. 3. Maximum composite likelihood tree obtained from the RAxML analysis of the ITS/LSU/SSU sequence alignment of selected *Herpotrichiellaceae*. Bootstrap support values above 70 % are shown at the nodes. Taxonomic novelties described in this study are indicated in boldface. The tree was rooted to *Cyphellophora oxyspora* (CBS 698.73) and *Cyphellophora sessilis* (CBS 243.85).

Notes: This new lineage is introduced to accommodate a fungus characterised by unbranched conidiophores, cicatrised and sympodial conidiogenous cells with thickened scars, producing sub-globose, verruculose, and golden brown conidia. Other related lineages are those accommodating *Asterinales* and *Cladoriellales* (Fig. 1). However, they differ from those in the *Aureoconidiellales* based on the morphology of the asexual morphs. The *Asterinales* is mainly characterised by taxa that are coelomycetes with pycnothyrial conidiomata (Guatimosim *et al.* 2015, Jaklitsch *et al.* 2016). The *Cladoriellales* is a monotypic order related to cladosporium-like hyphomycetous fungi with conidia frequently remaining attached in long acropetal chains (Crous *et al.* 2006c, 2017).

Authors: M. Hernández-Restrepo, P.W. Crous and M.J. Wingfield

Arthrographis Sigler & J.W. Carmich., *Mycotaxon* **4**: 359. 1976. *Synonym*: [*Arthrographis* G. Cochet, *Annls Parasit. Hum. Comp.* **17**: 97. 1939. (*Nom. inval.*, Art. 39.1)]

Vegetative hyphae septate, hyaline, smooth- and thin-walled. *Conidiophores* macro- or micronematous, erect, simple or

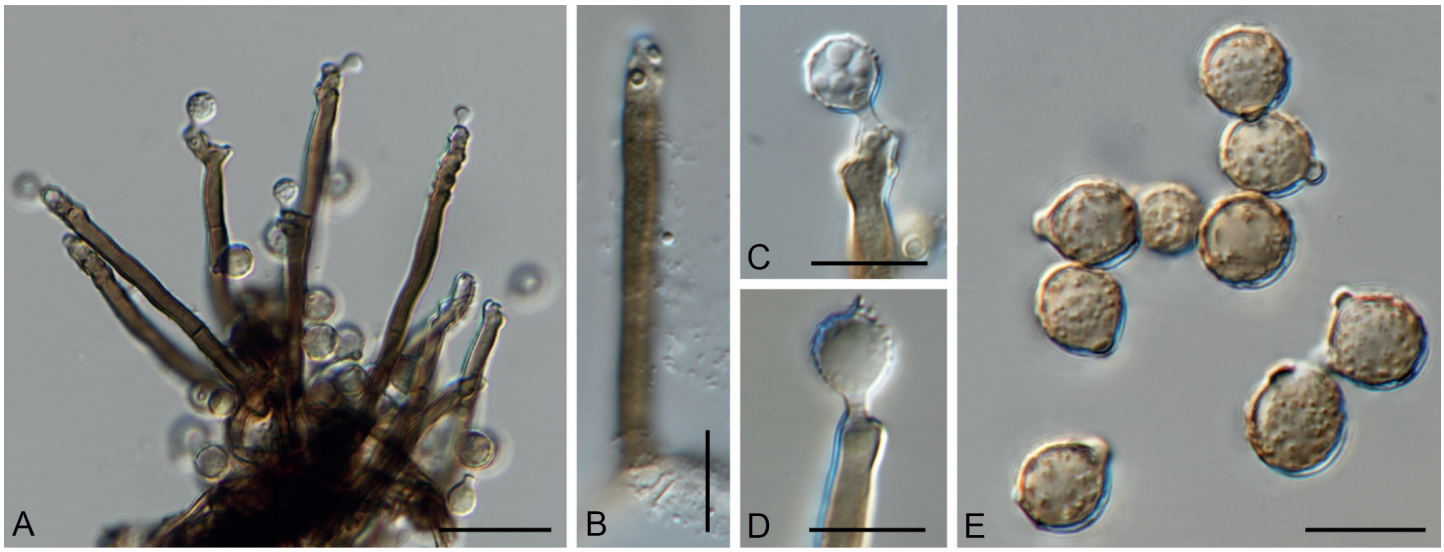

Fig. 4. *Aureoconidiella foliicola gen. et sp. nov.* (CBS 145943). **A.** Conidiophores and conidia. **B.** Conidiophore with conidiogenous cell. **C, D.** Conidiogenous cells giving rise to conidia. **E.** Conidia. Scale bars: A = 20 µm, all others = 10 µm.

poorly branched, hyaline, smooth-walled. *Conidiogenous hyphae* simple or branched, thin-walled, forming septa basipetally to form arthroconidia released by schizolytic secession. *Arthroconidia* unicellular, cylindrical or cuboid, straight, subhyaline, thick- and smooth-walled. *Synasexual morph* trichosporiella-like, with conidia growing directly on undifferentiated hyphae, sessile, lateral, terminal, globose, subglobose or clavate, subhyaline, thin- and smooth-walled. *Sexual morph* not observed.

Type species: *Arthrographis kalrae* (R.P. Tewari & Macph.) Sigler & J.W. Carmich.

Arthrographis kalrae (R.P. Tewari & Macph.) Sigler & J.W. Carmich., *Mycotaxon* **4**: 360. 1976.
Basionym: *Oidiodendron kalrae* R.P. Tewari & Macph., *Mycologia* **63**: 603. 1971 [as '*kalrai*'].

Synonym: [*Arthrographis langeronii* G. Cochet (as '*langeroni*'), *Annls Parasit. hum. comp*. **17**: 97. 1939. (*Nom. inval*., Art. 39.1)]

Descriptions and illustrations: Sigler & Carmichael (1976, 1983), Giraldo *et al*. (2014a).

Specimens examined: **The Netherlands**, Utrecht, isolated from soil, 2017, *E. Kieviet* (JW 21004 = CBS 145527), *ibid*. JW 21008, *ibid*. JW 21029.

Arthrographis grakistii Giraldo López & Hern.-Restr., ***sp. nov.*** MycoBank MB833677. Fig. 5.

Etymology. Named after Ewan Grakist, who collected the soil sample. This species was discovered as part of a Citizen Science project in the Netherlands.

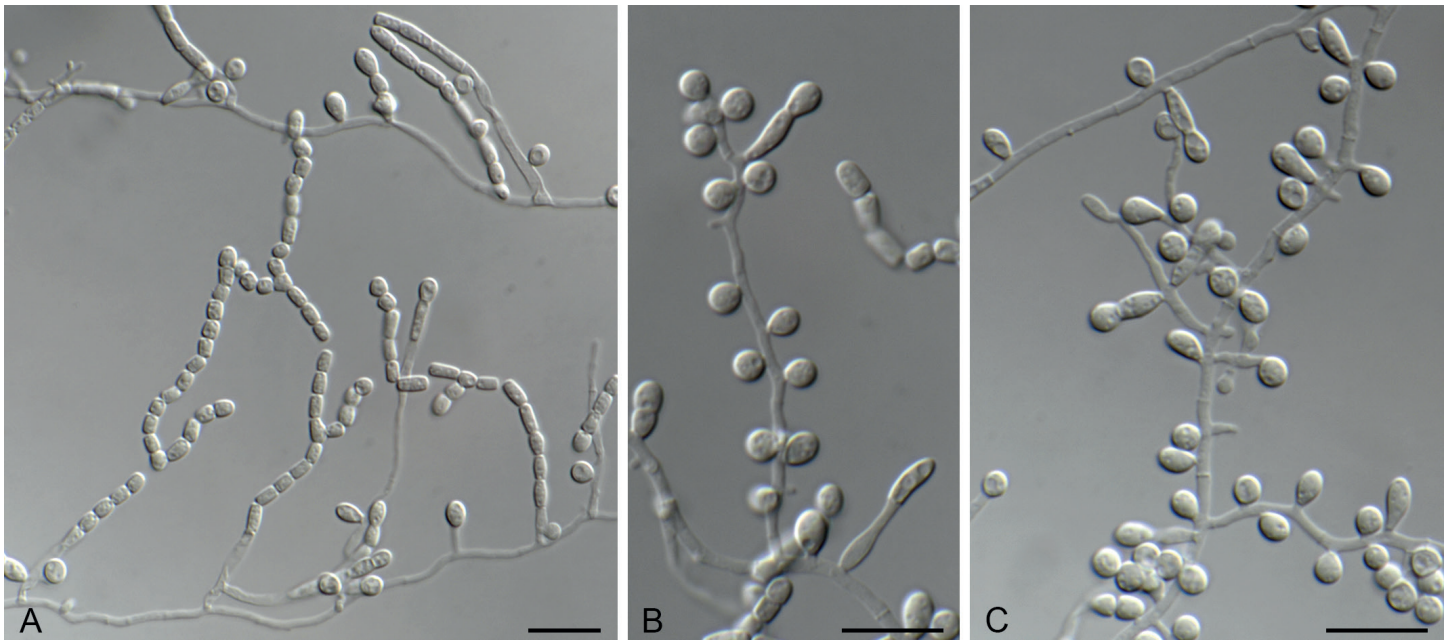

Fig. 5. *Arthrographis grakistii sp. nov.* (CBS 145530). **A.** Poorly branched conidiophores and arthroconidia. **B, C.** Trichosporiella-like synasexual morph. Scale bars = 10 µm.

Vegetative hyphae septate, hyaline, smooth- and thin-walled, 1.5–2 µm wide. *Conidiophores* semi-macronematous or micronematous, erect, simple, hyaline, smooth-walled. *Conidiogenous hyphae* simple or branched, 1.5–2 µm wide, thin-walled, forming septa basipetally to form arthroconidia released by schizolytic secession. *Arthroconidia* unicellular, cylindrical or cuboid, straight, 2–4 × 2–3 µm, subhyaline, thick- and smooth-walled. *Synasexual morph* trichosporiella-like with conidia growing directly on undifferentiated hyphae, sessile, sometimes with a subcylindrical to clavate intercalary cell, lateral, terminal, globose, subglobose or clavate, 3–5 × 2–3 µm, subhyaline, thin- and smooth-walled. *Sexual morph* not observed.

Culture characteristics: Colonies at 25 °C after 14 d: on OA reaching 13–14 mm, flat, glabrous to floccose, surface and reverse buff. On MEA and PDA reaching 11–13 mm and 12–17 mm, respectively; flat or raised, dusty to cottony at centre, glabrous toward the periphery, buff to honey, reverse uncoloured. No growth at 37 °C.

Typus: **The Netherlands**, Utrecht Province, Wijk bij Duurstede, from garden soil, 2017, *E. Grakist* (**holotype** CBS H-23912, culture ex-type CBS 145530 = JW 190014).

Additional materials examined: **The Netherlands**, Utrecht Province, IJsselstein, from garden soil, 2017, *J. Brus* (JW 209002, JW 209003); from garden soil, 2017, *R. de Bruyn* (JW 180011); Utrecht, from garden soil, 2017, *M. Wickham* (JW 199018); Zeeland Province, Vlissingen, from garden soil, 2017, *N. Penabad* (CBS 145529 = JW 22011, JW 22015, JW 22019); Gelderland Province, Zaltbommel, from garden soil, 2017, *K. & T. de Man* (JW 49011, JW 49012).

Notes: Based on a BLAST search using the ITS and LSU loci several soil isolates (JW isolates listed in Table 1) were identified as belonging to *Arthrographis*. In order to confirm their identity at the species level, a combined analysis of the LSU/ITS/*act* loci was performed, including all members from *Eremomycetaceae*. The ML tree (Fig. 6) showed that three isolates (JW 21004, JW 21008 and JW 21029) grouped with the type species of *A. kalrae* (CBS 693.77) and one (JW 22007) with *A. longispora* (CBS 135935). However, most of the isolates formed a well-supported clade that represents the new species *A. grakistii.*

The phylogenetic analyses showed that *A. grakistii* is closely related to *A. longispora* (Figs 1, 6). The latter species, however, has longer and narrower arthroconidia [5–10(–13) × 1–1.5 µm in *A. longispora vs.* 2–4 × 2–3 µm in *A. grakistii*] and does not produce the trichosporiella-like synasexual morph in culture (Giraldo *et al.* 2014a).

Morphologically, *A. grakistii* resembles *A. kalrae* and *A. curvata* in having cylindrical arthroconidia and a trichosporiella-like synasexual morph. *Arthrographis kalrae* and *A. curvata* are able to grow at 37 °C (Sigler & Carmichael 1983, Giraldo *et al.* 2014a), while *A. grakistii* does not grow at this temperature.

Authors: A. Giraldo López and M. Hernández-Restrepo

Kramasamuha Subram. & Vittal, *Canad. J. Bot.* **51**: 1128. 1973.

Conidiophores erect, flexuous, solitary to fasciculate, arising from a swollen basal cell, which appears lobed due to rhizoids; medium brown, smooth, multi-septate, simple or branched, giving rise to parallel stipes, becoming paler towards apex, terminating in an acute conidiogenous cell. *Conidiogenous cells* monoblastic, pale brown, ampulliform, straight to curved, tapering to a truncate apex, thin-walled, solitary or in clusters, integrated or discrete, terminal and intercalary. *Conidia* solitary, smooth, septate, obovoid to pyriform; second cell from base thick-walled, dark brown, somewhat swollen, basal and apical cell subhyaline, with short narrow separating cell at base as remnant from conidiogenous cell.

Type species: *Kramasamuha sibika* Subram. & Vittal

Kramasamuha sibika Subram. & Vittal, *Canad. J. Bot.* **51**: 1129. 1973. Fig. 7.

Typus: **India**, Tamil Nadu, Chingleput district, Vandalur, on dead leaves of *Gymnosporia emarginata* (*Celastraceae*), 23 Apr. 1971, *B.P.R. Vittal*, Herb. MUBL 2153 (not seen).

Occurring on leaf litter. *Conidiophores* erect, flexuous, solitary to fasciculate, arising from a swollen basal cell, 10–14 µm diam, which appears lobed due to rhizoids; medium brown, thin-walled, smooth, multi-septate, septa 17–30 µm apart, up to 550 µm tall, 3–5 µm diam, unbranched or branched, giving rise to parallel stipes, becoming paler towards apex, terminating in an acute conidiogenous cell. *Conidiogenous cells* monoblastic, pale brown, ampulliform, straight to curved, tapering to a truncate apex, thin-walled, solitary or in clusters of 2–4, integrated or discrete, terminal and intercalary, 4–8 × 3–4 µm. *Conidia* solitary, smooth, (1–)2(–3)-septate, blastoconidia, obovoid to pyriform, apex obtuse, (18–)25–27(–34) × (10–) 11(–12) µm; second cell from base thick-walled, dark brown, somewhat swollen, basal and apical cell subhyaline, with short narrow separating cell at base as remnant from conidiogenous cell, 1–1.5 × 1 µm.

Culture characteristics: Colonies on OA with scarce aerial mycelium, cottony to velvety, grey olivaceous, submerged mycelium vinaceous, margin effuse, irregular, reverse vinaceous. Conidiophores, conidiogenous cells, and conidia very similar to those observed in natural substrate. *Conidiogenous cells* 4.5–9 × 2.5–4 µm. *Conidia* 14–32.5 × 9–14 µm, (0–)2(–3)-septate.

Materials examined: **Australia**, New South Wales, Mallanganee, on leaves of *Lophostemon confertus* (*Myrtaceae*), 17 Apr. 2018, *A.J. Carnegie*, CBS 146338. **Brazil**, state of Minas Gerais, Viçosa, on *Hypericum innodorum* (*Hypericaceae*) leaves bearing necrotic spots caused by *Seimatosporium hypericinum* (*Pinaceae*), 4 Jul. 2017, *A.A. Colmán* (VIC 47176, COAD 2632). **Malaysia**, on needles of *Pinus tecunumanii*, Oct. 2018, *M.J. Wingfield*, CBS 146339. **South Africa**, KwaZulu-Natal, Richards Bay, on living leaves of *Syzygium cordatum* (*Myrtaceae*), Jun. 2016, *M.J. Wingfield*, CBS 146133 = CPC 36153.

Notes: *Kramasamuha* resembles the genus *Garnaudia* and some species of *Endophragmiella* in having conidia with a short narrow separating cell at the base as remnant from the conidiogenous cell. However, species in these genera can be distinguished by the arrangement and colour of the conidiogenous cells. In *Kramasamuha* they are pale brown and solitary or in clusters along the conidiophores (Subramanian & Vittal 1973). In *Garnaudia*, the conidiogenous cells are brown, and verticillate in terminal branches (Borowska 1977), while in *Endophragmiella* the conidiogenous cells are hyaline and mainly solitary and terminal (Hughes 1979, Seifert *et al*. 2011).

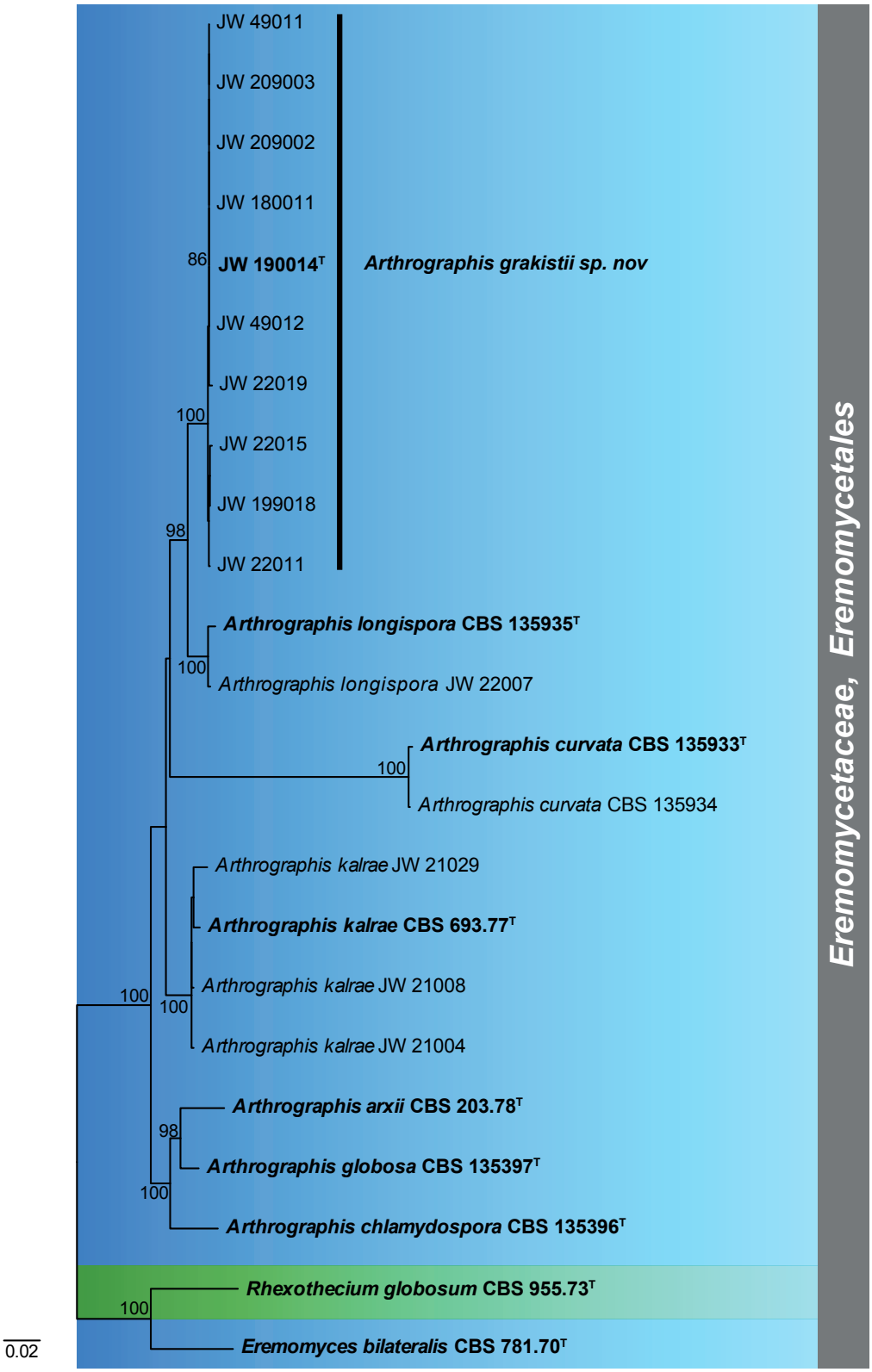

Fig. 6. Maximum composite likelihood tree based on partial sequences from the LSU, ITS and *act* regions from all members of *Eremomycetales.* Colour boxes (blue and green) indicate the generic clades. Bootstrap support values above 70 % are shown at the nodes. Ex-type strains are in boldface. T = Ex-type.

Kramasamuha is a monotypic genus originally described from India on *Gymnosporia emarginata* (Subramanian & Vittal 1973). However, the specimens examined here were from different substrates and continents, *i.e*. *Lophostemon confertus* in Australia, *Hypericum×innodorum* in Brazil, *Pinus tecunumanii* in Malaysia, and *Syzygium cordatum* in South Africa and can thus not serve as an epitype. This species has also been recorded from leaves on *Feijoa sellowiana* in New Zealand, and on *Psidium guajava* in Western Samoa (Landcare database 2019).

This is the first time that DNA sequence data has become available for *K. sibika* and shows that *Kramasamuha* is related to *Helminthosphaeriaceae* (*Sordariomycetes*, Fig. 2). Asexual morphs in *Helminthosphaeria* have been recognised as diplococcium-like (Samuels *et al.* 1997, Réblová 1999) with tretic conidiogenous

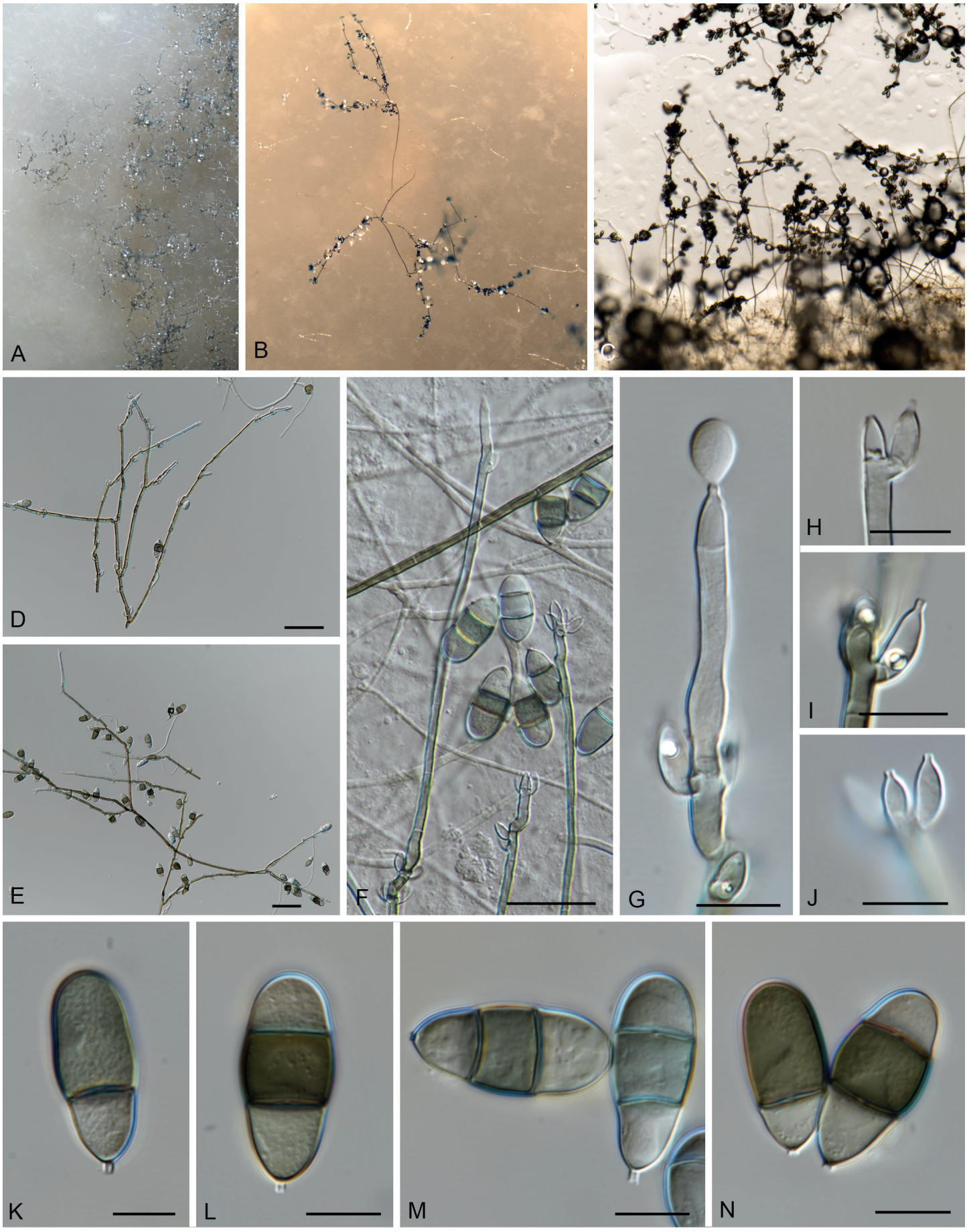

Fig. 7. *Kramasamuha sibika* (CBS 146133). **A–C.** Conidiophores overview on OA. **D–F.** Conidiophores, conidiogenous cells and conidia. **G.** Conidiogenous cells and conidia. **H–J.** Conidiogenous cells. **K–N.** Conidia. Scale bars: D–F = 25 µm, all others = 10 µm.

cells, differing from the monoblastic conidiogenous cells observed in *Kramasamuha* (Seifert *et al.* 2011).

Authors: M. Hernández-Restrepo, P.W. Crous, M.J. Wingfield, A.A. Colmán, P.S.C. Mansur and R.W. Barreto

Melnikomyces Crous & U. Braun, *Persoonia* **32**: 263. 2014.

Mycelium consisting of brown, septate, branched, smooth, thick-walled hyphae. *Conidiophores* subcylindrical, brown, smooth, erect, straight or geniculate, reduced to conidiogenous cells, or long, flexuous, multiseptate. *Conidiogenous cells* polyblastic, subcylindrical to subclavate, terminal or intercalary, brown, smooth, developing a rachis with numerous denticle-like loci. *Conidia* solitary, brown, verruculose, fusoid-ellipsoidal, 1-septate, ends sub-obtuse, released by rhexolytic secession. *Chlamydospores* terminal, globose to subglobose, in short chains, simple or branched, brown, smooth (modified from Crous *et al*. 2014b).

Type species: *Melnikomyces vietnamensis* Crous & U. Braun

Melnikomyces thailandicus Giraldo López, ***sp. nov*.** MycoBank MB833678. Fig. 8.

Etymology: Name refers to Thailand where the fungus was collected.

Mycelium consisting of brown, septate, branched, smooth, thick-walled, 2–2.5 µm diam hyphae. *Conidiophores* macronematous, arising directly from vegetative hyphae, erect, straight or slightly bent, simple, multiseptate, cylindrical, 14–37 × 2–3 µm, brown, paler apex, thick and smooth-walled. *Conidiogenous cells* integrated, terminal, polyblastic, brown to pale brown, sympodial, with long open denticles; denticles cylindrical, pale brown, up to 1 µm long. *Conidia* fusoid, ends subobtuse, 1-septate, solitary, subhyaline, smooth-walled, (8–)9.5–12(–13) × (2–)2.5(–3) µm. *Chlamydospores* lateral, globose to subglobose, in short and simple chains, light brown, thick-and smooth-walled, 5.5–10 µm diam.

Typus: **Thailand**, Nakhon Nayok Province, Mueang Nakhon Nayok district, Wang Takrai waterfall, N14.330023° E101.307168°, 64 m above sea level, from soil, 22 Jul. 2008, *P.W. Crous* (**holotype** CBS H-24236, culture ex-type CBS 145767).

Notes: The monotypic genus *Melnikomyces* was introduced by Crous and Braun (Crous *et al.* 2014b), based on *M. vietnamensis* collected from dry leaves in Vietnam. This species was treated as *incertae sedis* in the *Chaetothyriales*, *Eurotiomycetes* (Crous *et al.* 2014b). However, the results of this study show that it resides in the *Sympoventuriaceae* (*Venturiales*, *Dothideomycetes)*, together with other genera producing septate conidia from denticulate conidiogenous cells, such as *Ochroconis* and *Verruconis* (Machouart *et al*. 2014, Samerpitak *et al.* 2014).

Melnikomyces thailandicus is the second species described in the genus, which differs morphologically from *M. vietnamensis* in having shorter conidiophores (10–60 µm long *vs.*14–37 µm long) and longer and narrower smooth-walled conidia (8–13 × (2–3) µm *vs.* 7–11 × 2.5–3.5 µm). Originally, *M. vietnamensis* was described with two types of conidiophores (Crous *et al.* 2014b), but in *M. thailandicus* one of the conidiophore types more closely resembles chlamydospores, as they appear to stay attached to the hyphae.

Authors: A. Giraldo López and P.W. Crous

Thysanorea Arzanlou, W. Gams & Crous, *Stud. Mycol.* **58**: 80. 2007. ***emend*.**

Conidiophores micro- or macronematous, erect, simple or apically branched, sometimes proliferating percurrently in the apex, brown, smooth. *Conidiogenous cells* terminal or intercalary, polyblastic, smooth, brown at the base, paler towards the apex, subcylindrical, clavate to doliiform, sympodial, with crowded conidiogenous loci inconspicuous to slightly prominent, refractive to somewhat obscure, slightly thickened. *Conidia* solitary, oblong, obovoid, cylindrical, broadly fusiform to subpyriform, pale brown, smooth, with a narrowly truncate base and darkened hilum; conidial secession schizolytic. *Synasexual morph*: *Conidiophores* erect, simple, brown, smooth.

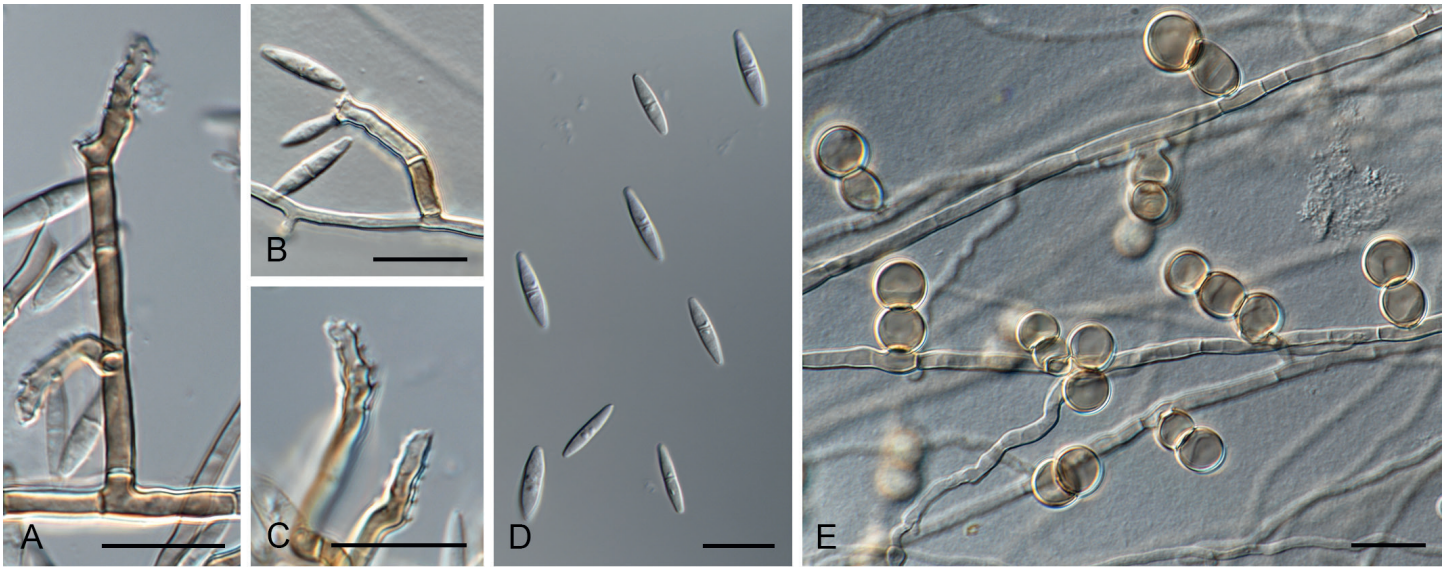

Fig. 8. *Melnikomyces thailandicus sp. nov.* (CBS 145767). **A–C.** Conidiophores and denticulated conidiogenous cells. **D.** Conidia. **E.** Chlamydospores. Scale bars = 10 µm.

Conidiogenous cells terminal, discrete, phialidic, subglobose to lageniform, with a balloon- to funnel-shaped collarette, brown, often in clusters at the apex of the conidiophores. *Conidia* solitary, subglobose to obovate, unicellular, hyaline, guttulate, smooth.

Type species: *Thysanorea papuana* (Aptroot) Arzanlou *et al.*

Notes: *Thysanorea* was established for a genus similar to *Periconiella* based on the branching pattern of the conidiophores (Arzanlou *et al.* 2007). However, recent studies have shown that those branching patterns depend on culture conditions, where those on natural substrates or in young cultures are not as prominently branched as previously described (Kirschner 2016, Wang *et al.* 2019). The generic description is emended here to include species with a phialidic synasexual morphs.

Phylogenetically, *Thysanorea* is closely related to *Minimelanolocus* in the *Chaetothyriales* (Fig. 3). However, the phylogenetic position of *M. navicularis*, the type species, remains unknown since DNA sequence data are not available for it, and the supposed phylogenetic position has been based on other species (Liu *et al*. 2015, Wang *et al.* 2019).

Morphologically, *M. navicularis* is characterised by terminal conidiogenous cells that produce navicular conidia with sub-hyaline polar cells and darker central cells (Castañeda-Ruiz 1987). They consequently differ from those species placed in *Minimelanolocus* based on DNA sequence data and in which the conidiogenous cells are terminal and intercalary, and the conidia are oblong, obovoid, cylindrical, broadly fusiform, and uniformly pale brown (Liu *et al*. 2015, Wang *et al*. 2019). In this regard, they would fit better with the generic concept of *Thysanorea* (Arzanlou *et al*. 2007, Wang *et al*. 2019). Based on these morphological differences and phylogenetic relationships, we propose new combinations for those species that have been shown as related to *Thysanorea*. The phylogenetic placement of other species for which DNA sequence data are not available, including *M. navicularis* must still be determined.

Thysanorea asiatica (H.Y. Su, *et al*.) Hern.-Restr. & Crous, ***comb. nov*.** MycoBank MB833919.
Basionym: *Minimelanolocus asiaticus* H.Y. Su, *et al*., *Fungal Biol.* **119**: 1054. 2015.

Thysanorea cantrelliae Hern.-Restr., R. van Doorn & Crous, ***sp. nov*.** MycoBank MB833914. Fig. 9.

Etymology: Named in honour of Sharon Cantrell, who was the organizer of the IMC 11 (2018) in Puerto Rico. This fungus was collected on a field trip held during the IMC 11.

Mycelium composed of hyaline to pale brown, septate, smooth, 1–2 µm wide hyphae. *Conidiophores* semi-micronematous, sometimes reduced to conidiogenous cells, simple, erect, straight or flexuous, cylindrical, pale brown, smooth, 8–31 × 2–3 µm. *Conidiogenous cells* holoblastic, polyblastic, mainly terminal, integrated, sympodial, pale brown, 7–22 × 2–3 µm. *Conidia* solitary, fusiform to acicular, straight or curved, (1–)3(–4)-septate, subhyaline to pale brown, smooth, 10–34 × 1.5–3 µm, apex acute, base truncate.

Culture characteristics: Colonies at 25 °C after 14 d: on OA reaching 22–25 mm, aerial mycelium moderate, cottony to floccose, olivaceous black, margin effuse entire; reverse black. On MEA and PDA reaching 22–30 mm, aerial mycelium abundant, cottony to floccose, olivaceous grey, black close to the agar, margin effuse, entire; reverse black.

Typus: **USA**, Puerto Rico, from unidentified twig, 20 Jul. 2018, *M. Hernández-Restrepo* (**holotype** CBS H-24100, culture ex-type CBS 145909).

Notes: Thysanorea cantrelliae clustered in a separate clade together with *T. seifertii* (Fig. 3). It can be distinguished from *T. seifertii* and other species in the genus by its acicular conidia (Fig. 9).

Thysanorea curvata (H.Y. Su *et al*.) Hern.-Restr. & Crous, ***comb. nov*.** MycoBank MB833921.
Basionym: *Minimelanolocus curvatus* H.Y. Su *et al*., *Fungal Biol.* **119**: 1055. 2015.

Thysanorea lotorum (Morgan-Jones) Hern.-Restr. & Crous, ***comb. nov*.** MycoBank MB833922.
Basionym: *Pseudospiropes lotorum* Morgan-Jones, *Mycotaxon* **5**: 481. 1977 [as '*lotorus*']
Synonym: *Nigrolentilocus lotorum* (Morgan-Jones) R.F. Castañeda & Heredia, *Cryptog. Mycol.* **22**: 15. 2001.
Minimelanolocus submersus Z.L. Luo *et al*., *Fungal Diversity* **80**: 143. 2016.

Thysanorea melanica (H.Y. Su, *et al*.) Hern.-Restr. & Crous, ***comb. nov*.** MycoBank MB833923.
Basionym: *Minimelanolocus melanicus* H.Y. Su *et al.*, *Fungal Biol.* **119**: 1056. 2015.

Thysanorea nonramosa (X.D. Yu *et al*.) Hern.-Restr. & Crous, ***comb. nov*.** MycoBank MB833924.
Basionym: *Minimelanolocus nonramosus* X.D. Yu *et al.*, *Mycol. Progr.* **18**: 514. 2019.

Thysanorea obscura (Matsush.) Hern.-Restr. & Crous, ***comb. nov*.** MycoBank MB833925.
Basionym: *Pseudospiropes obscurus* Matsush., *Matsushima Mycol. Mem.* **3**: 14. 1983.
Synonym: *Minimelanolocus obscurus* (Matsush.) R.F. Castañeda & Heredia, *Cryptog. Mycol.* **22**:10. 2001.

Thysanorea rousseliana (Mont.) Hern.-Restr. & Crous, ***comb. nov*.** MycoBank MB833926.
Basionym: *Helminthosporium rousselianum* Mont., *Ann. Sci. Nat., Sér.* 3, *Bot.*, **12**: 300. 1849.
Synonyms: *Pleurophragmium rousselianum* (Mont.) S. Hughes, *Canad. J. Bot.* **36**: 798. 1958.
Spiropes rousselianus (Mont.) de Hoog & Arx, *Kavaka* **1**: 59. 1973.
Pseudospiropes rousselianus (Mont.) M.B. Ellis, *More Dematiaceous Hyphomycetes*: 221. 1976.
Minimelanolocus rousselianus (Mont.) R.F. Castañeda & Heredia, *Cryptog. Mycol.* **22**: 10. 2001.

Thysanorea seifertii Hern.-Restr., R. van Doorn & Crous, ***sp. nov*.** MycoBank MB833920. Fig. 10.

Etymology: Named in honour of Prof. dr Keith A. Seifert, who was

President of the International Mycological Association during the IMC 11 (2018) in Puerto Rico. This fungus was collected on a field trip during the IMC 11.

Mycelium composed of hyaline to pale brown, septate, smooth, 1–2 µm wide hyphae. *Conidiophores* mononematous, simple, erect, straight or flexuous, cylindrical, brown, paler towards

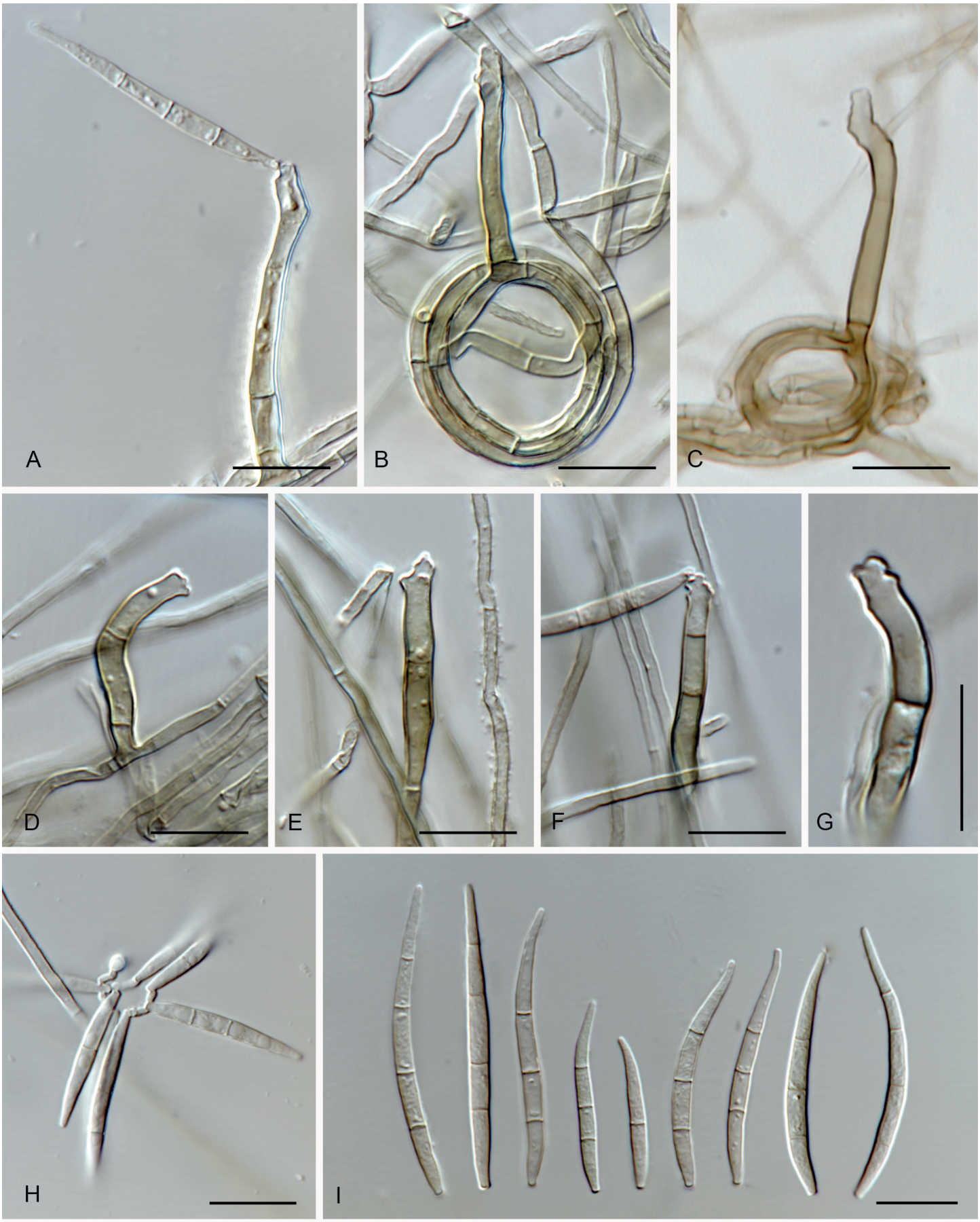

Fig. 9. *Thysanorea cantrelliae sp. nov.* (CBS 145909). **A.** Conidiophore and conidium. **B, C.** Conidiophores. **D–G.** Conidiogenous cells. **H, I.** Conidia. Scale bars = 10 µm.

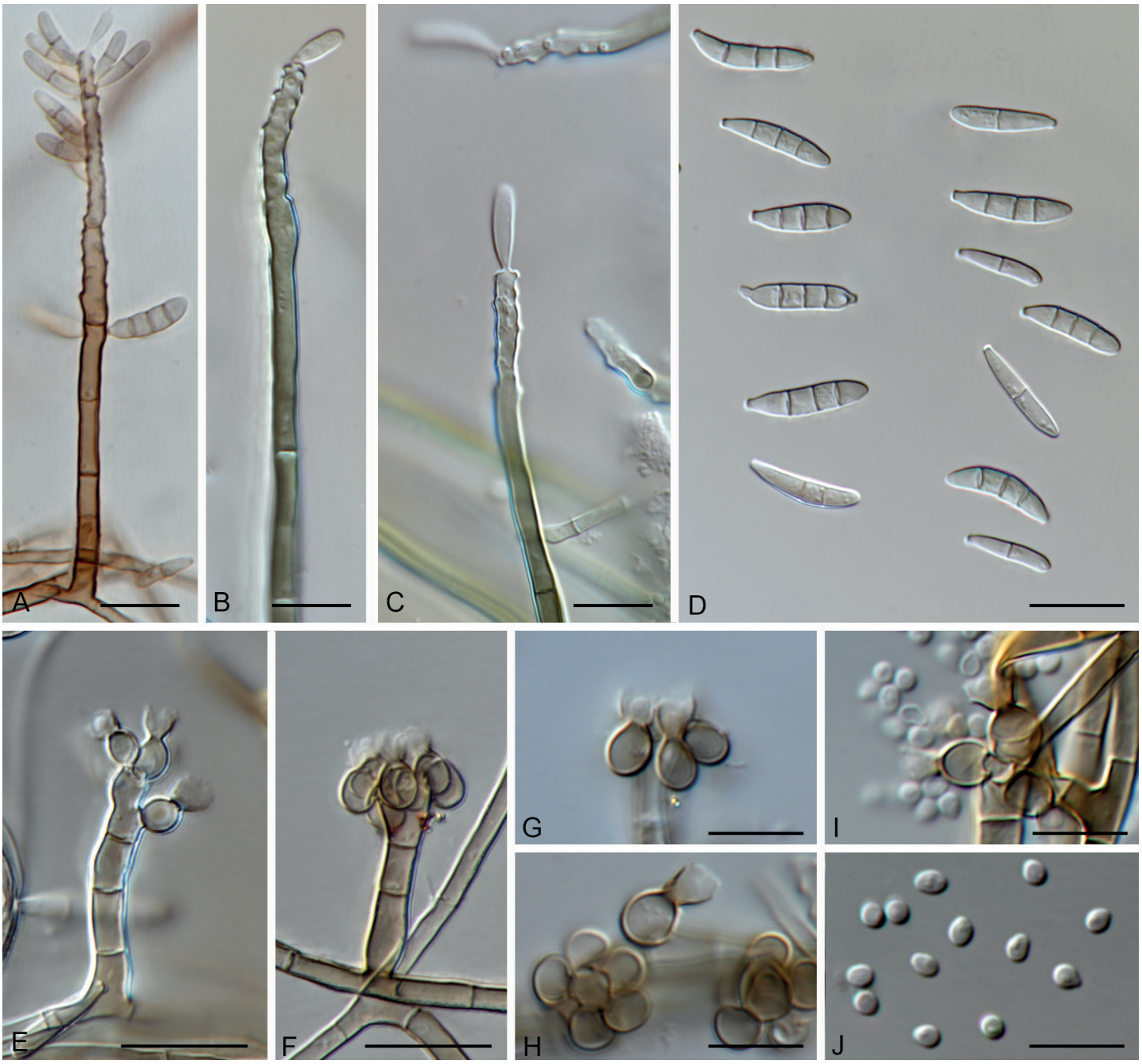

Fig. 10. *Thysanorea seifertii sp. nov.* (CBS 145910). **A.** Conidiophores and conidia**. B, C.** Conidiogenous cells and conidia. **D.** Conidia. **E–J.** *Synasexual morph.* **E, F.** Conidiophores. **G–I.** Conidiogenous cells and conidia. **H.** Conidia. Scale bars: G–J = 5 µm, all others = 10 µm.

the apex, smooth, 30–133 × 2–3 µm. *Conidiogenous cells* holoblastic, polyblastic, terminal or intercalary, integrated, sympodial, pale brown to brown, 7.5–46.5 × 2–3 µm. *Conidia* solitary, subcylindrical to clavate or oblong, straight or slightly curved, (0–)1–3(–4)-septate, pale brown, smooth, 7–15 × 1.5–3 µm, apex rounded, base darkened and truncated. *Synasexual morph*: *Conidiophores* micro- or macronematous, erect, straight or flexuous, cylindrical, brown, smooth, 10–51 × 2–4 µm. *Conidiogenous cells* enteroblastic, phialidic, arranged around the apex of the conidiophore, brown, subglobose to ampulliform, 2–4(–6) × 2–3 µm, with a balloon- to funnel-shaped collarette, 1–3 × 1–3 µm. *Conidia* solitary, subglobose to obovate, unicellular, hyaline, guttulate, smooth, 1–2 × 1–1.5 µm, base truncated.

Culture characteristics: Colonies at 25 °C after 14 d: on OA reaching 22–25 mm, aerial mycelium moderate, cottony to floccose, grey olivaceous to olivaceous black, margin effuse, entire; reverse black. On MEA and PDA reaching 18–20 mm, aerial mycelium moderate to abundant, cottony to floccose, olivaceous grey, black close to the agar, margin effuse, entire; reverse black.

Typus: **USA**, Puerto Rico, from unidentified twig, 20 Jul. 2018, *M. Hernández-Restrepo* (**holotype** CBS H-24101, culture ex-type CBS 145910).

Notes: Some of the conidia in *T. seifertii* resemble those of *T. obscura* in being 3-septate. However, conidia in *T. seifertii* are smaller than those of *T. obscura* (7–15 × 1.5–3 µm *vs*. 20–31 × 5–8 µm, Castañeda-Ruiz *et al*. 2001). *Thysanorea seifertii* is the only species in the genus known to produce a phialidic synasexual morph.

Thysanorea thailandensis (W. Dong *et al*.) Hern.-Restr. & Crous, ***comb. nov*.** MycoBank MB833927.
Basionym: *Minimelanolocus thailandensis* W. Dong *et al.*, *Mycol. Progr.* **17**: 622. 2018.

Thysanorea yunnanensis Hern.-Restr. & Crous, ***nom. nov*.** MycoBank MB833928.
Replaced synonym: *Minimelanolocus aquaticus* H.Y. Su *et al.*, *Fungal Biol.* **119**: 1049. 2015 [*non Thysanorea aquatica* W. Dong, H. Zhang & K.D. Hyde, 2018].

Etymology: The name refers to the Chinese Province of Yunnan where the fungus was collected.

Authors: M. Hernández-Restrepo, R. van Doorn and P.W. Crous

Verruconis Samerp. *et al*., *Fungal Diversity* **65**: 117. 2014.

Mycelium consisting of septate, pale brown, smooth and thick-walled hyphae. *Conidiophores* differentiated, erect, straight or slightly bent, unbranched, pale brown. *Conidiogenous cells* mostly polyblastic, subcylindrical to narrowly mucronate, producing conidia sympodially on long open denticles; denticles cylindrical, pale brown, scattered at the apical third of the conidiogenous cell. *Conidia* two-celled, ellipsoidal, cylindrical or clavate, brown, verrucose or smooth-walled, released by rhexolytic secession. Sexual morph unknown.

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

Verruconis thailandica Giraldo López & Crous, ***sp. nov*.** MycoBank MB833679. Fig. 11.

Etymology: The name refers to Thailand where the fungus was collected.

Mycelium consisting of septate, pale brown, smooth, thick-walled, 2–2.5 µm diam hyphae. *Conidiophores* differentiated, arising directly from vegetative hyphae, erect, straight or slightly bent, simple, 0–1-septate, subcylindrical, (3.6–)4.1–7.1(–9) × (1.3–)2(–2.3) µm, pale brown, thick- and smooth-walled, producing conidia sympodially on long open denticles; denticles cylindrical, pale brown, up to 1 µm long. *Conidia* abundant on OA and PCA, scarce on PDA, two-celled, broadly ellipsoidal with a protuberant hilum, constricted at the septum, (5–)5.8(–7) × (2.2–)2.6(–3.1) µm, brown, verrucose, thick-walled, sometimes with a wing-like gelatinous brown sheath, released by rhexolytic secession. *Sexual morph* not observed.

Cultural characteristics: Colonies at 25 °C after 14 d: on OA and PCA, flat, woolly at centre, glabrous at periphery, top and reverse sepia. On PDA raised, felty, top and reverse olivaceous with ochreous diffusible pigment.

Typus: **Thailand**, Nakhon Nayok Province, Mueang Nakhon Nayok district, Wang Takrai waterfall, N14.330023° E101.307168°, 64 m above sea level, from soil, 22 Jul. 2008, *P.W. Crous* (**holotype** CBS H-24237, culture ex-type CBS 145768).

Notes: The genus *Verruconis* (*Sympoventuriaceae*, *Venturiales*, *Dothideomycetes*) was established to accommodate thermophilic species segregated from *Ochroconis* (*O. gallopava* and *O. calidifluminalis*) and *Scolecobasidium* (*S. verruculosum*), which produce septate conidia from sympodially proliferating conidiophores, released by rhexolytic secession (Samerpitak *et al.* 2014). These species have been isolated from hot spring water, warm effluents or as soil saprobes (Yarita *et al.* 2007, Samerpitak *et al.* 2014, Giraldo *et al.* 2014b). However, the type species, *V. gallopava* has been reported as an opportunistic pathogen of humans and causing infections in other warm-blooded animals, mainly birds (Revankar & Sutton 2010, de Hoog *et al.* 2011).

Verruconis thailandica is phylogenetically related to *V. verruculosa* (Fig. 1), but the two species can be distinguished by the length of their conidiophores (up to 9 µm long in *V. thailandica vs*. up to 45 µm long in *V. verruculosa*) and conidia (up to 7 µm long in *V. thailandica vs*. up to 9 µm long in *V. verruculosa*; Samerpitak *et al.* 2014). Recently, three new species were added to the genus, namely *V. panacis* from *Panax notoginseng* (Zhang *et al*. 2018), *V. hainanensis* and *V. pseudotricladiata* from submerged decaying leaves (Qiao *et al.* 2019). These species clustered in a separate clade phylogenetically distant from *V. thailandica.* They can be distinguished by the presence of four-celled conidia in *V. panacis* and *V. hainanensis*, and branched Y-shaped conidia in *V. pseudotricladiata* (Zhang *et al*. 2018, Qiao *et al.* 2019).

Authors: A. Giraldo López and P.W. Crous

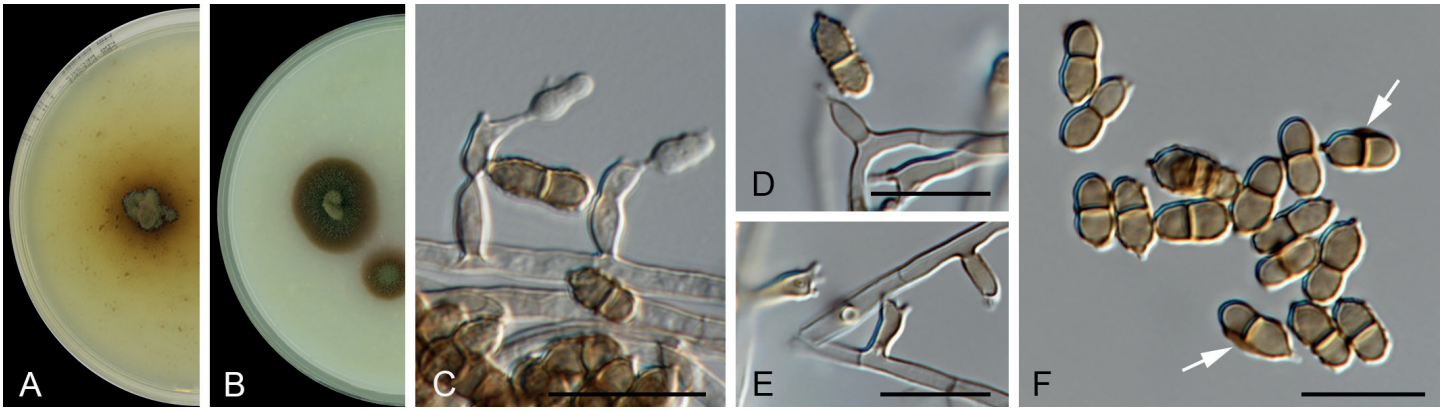

Fig. 11. *Verruconis thailandica sp. nov.* (CBS 145768). **A, B.** Colonies on PDA and OA, respectively, at 25 °C after 14 d. **C–E.** Denticulated conidiogenous cells. **F.** Conidia with gelatinous brown sheath (arrow). Scale bars = 10 µm.

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Conflict of interest: The authors declare that there is no conflict of interest.

REFERENCES

Arzanlou M, Groenewald JZ, Gams W, *et al.* (2007). Phylogenetic and morphotaxonomic revision of *Ramichloridium* and allied genera. *Studies in Mycology* **58**: 57–93.

Badali H, Gueidan C, Najafzadeh MJ, *et al*. (2008). Biodiversity of the genus *Cladophialophora*. *Studies in Mycology* **61**: 175–191.

Batzer JC, Arias MM, Harrington TC, *et al*. (2008). Four species of *Zygophiala* (*Schizothyriaceae*, *Capnodiales*) are associated with the sooty blotch and flyspeck complex on apple. *Mycologia* **100**: 246–258.

Bezerra JDP, Oliveira R, Paiva L, *et al.* (2017). *Bezerromycetales* and *Wiesneriomycetales ord. nov.* (class *Dothideomycetes*), with two novel genera to accommodate endophytic fungi from Brazilian cactus. *Mycological Progress* **16**: 297–309.

Boehm EW, Schoch CL, Spatafora JW (2009). On the evolution of the *Hysteriaceae* and *Mytilinidiaceae* (*Pleosporomycetidae*, *Dothideomycetes*, *Ascomycota*) using four nuclear genes. *Mycological Research* **113**: 461–479.

Boonmee S, Bhat JD, Maharachchikumbura SSN, *et al.* (2014). *Clavatispora thailandica gen. et sp. nov*., a novel taxon of *Venturiales* (*Dothideomycetes*) from Thailand. *Phytotaxa* **176**: 92–101.

Borowska A (1977). *Garnaudia elegans gen. et sp. nov*. and *Endophragmiella tenera sp. nov.*, new dematiaceous hyphomycetes. *Acta Mycologica* **13**: 169–174.

Braun U, Crous PW, Dugan F, *et al*. (2003). Phylogeny and taxonomy of Cladosporium-like hyphomycetes, including *Davidiella gen. nov.*, the teleomorph of *Cladosporium s. str*. *Mycological Progress* **2**: 3–18.

Campbell J, Ferrer A, Raja HA, *et al.* (2007). Phylogenetic relationships among taxa in the *Jahnulales* inferred from 18S and 28S nuclear ribosomal DNA sequences. *Canadian Journal of Botany* **85**: 873–882.

Castañeda-Ruiz RF (1987). *Fungi Cubenses II*. Instituto de Investigaciones Fundamentales en Agricultura Tropical 'Alejandro de Humboldt', La Habana: 1–22

Castañeda-Ruiz RF, Heredia G, Gusmao LFP (2016). Fungal diversity of central and south America. In: *Biology of microfungi* (De-Wei L, ed). Springer International Publishing, Switzerland: 197–218.

Castañeda-Ruiz RF, Heredia G, Reyes, *et al.* (2001). A revision of the genus *Pseudospiropes* and some new taxa. *Cryptogamie Mycologie* **22**: 1–18.

Castlebury LA, Rossman AY, Jaklitsch WJ, *et al.* (2002). A preliminary overview of the *Diaporthales* based on large subunit nuclear ribosomal DNA sequences. *Mycologia* **94**: 1017–1031.

Cheewangkoon R, Crous PW, Hyde KD, *et al.* (2008). Species of *Mycosphaerella* and related anamorphs on *Eucalyptus* leaves from Thailand. *Persoonia* **21**: 77–91.

Cheewangkoon R, Groenewald JZ, Hyde KD, *et al.* (2012). Chocolate spot disease of *Eucalyptus*. *Mycological Progress* **11**: 61–69.

Cheewangkoon R, Groenewald JZ, Summerell BA, *et al.* (2009). *Myrtaceae*, a cache of fungal biodiversity. *Persoonia* **23**: 55–85.

Crous PW, Braun U, Groenewald JZ (2007a). *Mycosphaerella* is polyphyletic. *Studies in Mycology* **58**: 1–32.

Crous PW, Braun U, Schubert K, *et al.* (2007b). Delimiting *Cladosporium* from morphologically similar genera. *Studies in Mycology* **58**: 33–56.

Crous PW, Gams W, Stalpers JA, *et al.* (2004). MycoBank: an online initiative to launch mycology into the 21st century. *Studies in Mycology* **50**: 19–22.

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

Crous PW, Groenewald JZ, Wingfield MJ (2006a) *Heteroconium eucalypti*. Fungal Planet No. 10. Centraalbureau voor Scimmelcultures, the Netherlands.

Crous PW, Schoch CL, Hyde KD, *et al.* (2009a). Phylogenetic lineages in the *Capnodiales*. *Studies in Mycology* **64**: 17–47.

Crous PW, Schubert K, Braun U, *et al*. (2007c). Opportunistic, human-pathogenic species in the *Herpotrichiellaceae* are phenotypically similar to saprobic or phytopathogenic species in the *Venturiaceae*. *Studies in Mycology* **58**: 185–216.

Crous PW, Shivas RG, Quaedvlieg W, *et al.* (2014b). Fungal Planet description sheets 214–280. *Persoonia* **32**: 184–306.

Crous, PW, Slippers B, Wingfield MJ, *et al.* (2006b). Phylogenetic lineages in the *Botryosphaeriaceae*. *Studies in Mycology* **55**: 235–253.

Crous PW, Summerell BA, Carnegie AJ, *et al.* (2009b). Unravelling *Mycosphaerella*: do you believe in genera? *Persoonia* **23**: 99–118.

Crous PW, Verkley GJM, Groenewald JZ (2006c). *Eucalyptus* microfungi known from culture. 1. *Cladoriella* and *Fulvoflamma* genera nova, with notes on some other poorly known taxa. *Studies in Mycology* **55**: 53–63.

Crous PW, Verkley GJM, Groenewald JZ, *et al.* (2019). *Westerdijk Laboratory Manual Series 1: Fungal Biodiversity*. Westerdijk Fungal Biodiversity Institute, Utrecht, the Netherlands.

Crous PW, Wingfield MJ, Burgess TI, *et al.* (2017). Fungal Planet description sheets: 625–715. *Persoonia* **39**: 270–467.

de Hoog GS, Vicente VA, Najafzadeh MJ, *et al*. (2011). Waterborne *Exophiala* species causing disease in cold-blooded animals. *Persoonia* **27**: 46–72.

de Hoog GS, Gerrits van den Ende AHG (1998). Molecular diagnostics of clinical strains of filamentous *Basidiomycetes*. *Mycoses* **41**: 183–189.

de Hoog GS, Guarro J, Gené J, *et al.* (2011). *Atlas of clinical fungi*. CD-ROM version 3.1. CBS-KNAW Fungal Biodiversity Centre, Utrecht, the Netherlands.

Diederich P, Ertz D, Lawrey JD, *et al*. (2013). Molecular data place the hyphomycetous lichenicolous genus *Sclerococcum* close to *Dactylospora* (*Eurotiomycetes*) and *S. parmeliae* in *Cladophialophora* (*Chaetothyriales*). *Fungal Diversity* **58**: 61–72.

Dong W, Hyde KD, Bhat DJ, *et al*. (2018). Introducing *Aculeata aquatica gen. et sp. nov*., *Minimelanolocus thailandensis sp. nov*. and *Thysanorea aquatica sp. nov*. (*Herpotrichiellaceae*, *Chaetothyriales*) from freshwater in northern Thailand. *Mycological Progress* **17**: 617–629.

Fernandez FA, Lutzoni FM, Huhndorf SM (1999). Teleomorph-anamorph connections: the new pyrenomycetous genus *Carpoligna* and its *Pleurothecium* anamorph. *Mycologia* **91**: 251–262.

Geiser DM, Gueidan C, Miadlikowska J, *et al*. (2006). *Eurotiomycetes*: *Eurotiomycetidae* and *Chaetothyriomycetidae*. *Mycologia* **98**: 1053–1064.

Giraldo A, Gené J, Cano J, *et al*. (2012). Two new species of *Acremonium* from Spanish soils. *Mycologia* **104**: 1456–1465.

Giraldo A, Gené J, Sutton DA, *et al.* (2014a). Phylogenetic circumscription of *Arthrographis* (*Eremomycetaceae*, *Dothideomycetes*). *Persoonia* **32**: 102–114.

Giraldo A, Hernández-Restrepo M, Crous PW (2019). New Plectosphaerellaceous species from Dutch garden soil. *Mycological Progress* **18**: 1135–1154.

Giraldo A, Sutton D, Samerpitak K, *et al.* (2014b). Occurrence of *Ochroconis* and *Verruconis* species in clinical specimens from the United States. *Journal of Clinical Microbiology* **52**: 4189–4201.

Groenewald M, Lombard L, de Vries M, *et al.* (2018). Diversity of yeast species from Dutch garden soil and the description of six novel *Ascomycetes*. *FEMS Yeast Research* **18**: 1–14.

Guatimosim E, Firmino AL, Bezerra JL, *et al.* (2015). Towards a phylogenetic reappraisal of *Parmulariaceae* and *Asterinaceae* (*Dothideomycetes*). *Persoonia* **35**: 230–241.

Gueidan C, Villasenor CR, de Hoog GS, *et al*. (2008). A rock-inhabiting ancestor for mutualistic and pathogen-rich fungal lineages. *Studies in Mycology* **61**: 111–119.

Hernández-Restrepo M, Gene J, Castañeda-Ruiz RF, *et al.* (2017). Phylogeny of saprobic microfungi from Southern Europe. *Studies in Mycology* **86**: 53–97.

Hughes SJ (1979). Relocation of species of *Endophragmia* auct. with notes on relevant generic names. *New Zealand Journal of Botany* **17**: 139–188.

Huhndorf SM, Miller AN, Fernandez FA (2004). Molecular systematics of the *Sordariales*: the order and the family *Lasiosphaeriaceae* redefined. *Mycologia* **96**: 368–387.

Jaklitsch WM, Baral HO, Lücking R, *et al*. (2016). *Syllabus of plant families – A. Engler's Syllabus der Pflanzenfamilien Part 1/2: Ascomycota*, 13th edn. Borntraeger, Stuttgart, Germany.

James TY, Kauff F, Schoch CL, *et al*. (2006). Reconstructing the early evolution of Fungi using a six-gene phylogeny. *Nature* **443**: 818–822.

Kang HJ, Sigler L, Lee J, *et al.* (2010). *Xylogone ganodermophthora sp. nov.*, an ascomycetous pathogen causing yellow rot on cultivated mushroom *Ganoderma lucidum* in Korea. *Mycologia* **102**: 1167–1184.

Kearse M, Moir R, Wilson A, *et al*. (2012). Geneious Basic: an integrated and extendable desktop software platform for the organization and analysis of sequence data. *Bioinformatics* **28**: 1647–1649.

Kirschner R (2016). Revision of the morphology and biogeography of *Thysanorea papuana*. *Mycosphere* **7**: 820–827.

Landcare database (2019). New Zealand Fungi and Bacteria. https://nzfungi2.landcareresearch.co.nz/.

Liu XY, Udayanga D, Luo ZL, *et al*. (2015). Backbone tree for *Chaetothyriales* with four new species of *Minimelanolocus* from aquatic habitats. *Fungal Biology* **119**: 1046–1062.

Lumbsch HT, Schmitt I, Lindemuth R, *et al.* (2005). Performance of four ribosomal DNA regions to infer higher-level phylogenetic relationships of inoperculate euascomycetes (*Leotiomyceta*). *Molecular Phylogenetics and Evolution* **34**: 512–524.

Machouart M, Samerpitak K, de Hoog GS, *et al.* (2014). A multigene phylogeny reveals that *Ochroconis* belongs to the family *Sympoventuriaceae* (*Venturiales, Dothideomycetes*). *Fungal Diversity* **65**: 77–88.

Miller AN, Huhndorf SM (2004). A natural classification of *Lasiosphaeria* based on nuclear LSU rDNA sequences. *Mycological Research* **108**: 26–34.

Miller AN, Huhndorf SM (2005). Multi-gene phylogenies indicate ascomatal wall morphology is a better predictor of phylogenetic relationships than ascospore morphology in the *Sordariales* (*Ascomycota*, *Fungi*). *Molecular Phylogenetics and Evolution* **35**: 60–75.

Miller AN, Huhndorf SM, Fournier J (2014) Phylogenetic relationships of five uncommon species of *Lasiosphaeria* and three new species in the *Helminthosphaeriaceae* (*Sordariomycetes*). *Mycologia* **106**: 505–524.

Miller MA, Pfeiffer W, Schwartz T (2012). The CIPRES science gateway: enabling high-impact science for phylogenetics researchers with limited resources. In: *Proceedings of the 1st Conference of the Extreme Science and Engineering Discovery Environment: Bridging from the extreme to the campus and beyond: 1–8*. Association for Computing Machinery, USA.

Mugambi GK, Huhndorf SM (2009a). Molecular phylogenetics of *Pleosporales*: *Melanommataceae* and *Lophiostomataceae* re-circumscribed (*Pleosporomycetidae*, *Dothideomycetes*, *Ascomycota*). *Studies in Mycology* **64**: 103–121.

Mugambi GK, Huhndorf SM (2009b). Parallel evolution of hysterothecial ascomata in ascolocularous fungi (*Ascomycota*, *Fungi*). *Systematics and Biodiversity* **7**: 453–464.

Murata Y, Sano A, Kamei K, *et al.* (2005). *Arthrographis kalrae* isolated from the oral cavity of a house-hold dog. *Program and Abstracts of the 49th Annual Meeting of the Japanese Society for Medical Mycology* **49**: 162.

Qiao M, Tian W, Castañeda-Ruiz RF (2019). Two new species of *Verruconis* from Hainan, China. *MycoKeys* **48**: 41–53.

Quaedvlieg W, Binder M, Groenewald JZ, *et al.* (2014). Introducing the consolidated species concept to resolve species in the *Teratosphaeriaceae*. *Persoonia* **33**: 1–40.

Rayner RW (1970). *A mycological colour chart*. British Mycological Society. Commonwealth Mycological Institute; Kew, Surrey.

Réblová M (1999). Teleomorph-anamorph connections in *Ascomycetes* 3. Three new lignicolous species of *Helminthosphaericeae*. *Sydowia* **51**: 223–244.

Réblová M, Untereiner WA, Réblová K (2013). Novel evolutionary lineages revealed in the *Chaetothyriales* (fungi) based on multigene phylogenetic analyses and comparison of its secondary structure. *PloS ONE* **8**: e63547.

Revankar SG, Sutton D (2010). Melanized fungi in human disease. *Clinical Microbiology Reviews* **23**: 884–928.

Samerpitak K, Van der Linde E, Choi HJ, *et al.* (2014). Taxonomy of *Ochroconis,* genus including opportunistic pathogens on humans and animals. *Fungal Diversity* **65**: 89–126.

Samuels GJ, Candoussau F, Magni JF (1997). Fungicolous pyrenomycetes 1. *Helminthosphaeria* and the new family *Helminthosphaeriaceae*. *Mycologia* **89**: 141–155.

Schoch CL, Crous PW, Groenewald JZ, *et al*. (2009). A class-wide phylogenetic assessment of *Dothideomycetes*. Studies in Mycology **64**: 1–15.

Schoch CL, Robbertse B, Robert V, *et al*. (2014). Finding needles in haystacks: linking scientific names, reference specimens and molecular data for Fungi. *Database (Oxford)*: doi:10.1093/database/bau061.

Seifert K, Morgan-Jones G, Gams W, *et al.* (2011). *The genera of Hyphomycetes.* CBS Biodiversity Series Vol. 9. Westerdijk Fungal Biodiversity Institute, Utrecht, The Netherlands.

Sigler L, Carmichael JW (1976). Taxonomy of *Malbranchea* and some other Hyphomycetes with arthroconidia. *Mycotaxon* **4**: 349–488.

Sigler L, Carmichael JW (1983). Redisposition of some fungi referred to *Oidium microspermum* and a review of *Arthrographis*. *Mycotaxon* **18**: 495–507.

Smith H, Wingfield MJ, Crous PW, *et al.* (1996). *Sphaeropsis sapinea* and *Botryosphaeria dothidea* endophytic in *Pinus* spp. and *Eucalyptus* spp. in South Africa. *South African Journal of Botany* **62**: 86–88.

Spatafora JW, Sung GH, Johnson D, *et al.* (2006). A five-gene phylogeny of *Pezizomycotina*. *Mycologia* **98**: 1018–1028.

Stamatakis A (2014). RAxML version 8: a tool for phylogenetic analysis and post-analysis of large phylogenies. *Bioinformatics* **30**: 1312–1313.

Subramanian CV, Vittal BPR (1973). Three new Hyphomycetes from litter. *Canadian Journal of Botany* **51**: 1127–1132.

Summerell BA, Groenewald JZ, Carnegie AJ, *et al.* (2006). *Eucalyptus* microfungi known from culture. 2. *Alysidiella*, *Fusculina* and *Phlogicylindrium* genera nova, with notes on some other poorly known taxa. *Fungal Diversity* **23**: 323–350.

Tsui CK, Sivichai S, Berbee ML (2006). Molecular systematics of *Helicoma*, *Helicomyces* and *Helicosporium* and their teleomorphs inferred from rDNA sequences. *Mycologia* **98**: 94–104.

Untereiner WA, Angus A, Reblova M, *et al*. (2008). The systematics of the *Phialophora verrucosa* complex: new insights from B-tubulin, large subunit nuclear rDNA and ITS sequence data. *Botany* **86**: 742–750.

Untereiner WA, Debois V, Naveau FA (2001). Molecular systematics of the ascomycete genus *Farrowia* (*Chaetomiaceae*). *Canadian Journal of Botany* **79**: 321–333.

Untereiner WA, Naveau FA (1999). Molecular systematics of the *Herpotrichiellaceae* with an assessment of the phylogenetic positions of *Exophiala dermatitidis* and *Phialophora americana. Mycologia* **91**: 67–83.

Vasse M, Voglmayr H, Mayer V, *et al*. (2017). A phylogenetic perspective on the association between ants (*Hymenoptera*: *Formicidae*) and black yeasts (*Ascomycota*: *Chaetothyriales*). *Proceedings Biological Sciences* **284**: 1850.

Verkley GJ, Dukik K, Renfurm R, *et al.* (2014). Novel genera and species of coniothyrium-like fungi in *Montagnulaceae* (*Ascomycota*). *Persoonia* **32**: 25–51.

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

Voigt K, Wöstemeyer J (2000). Reliable amplification of actin genes facilitates deep-level phylogeny. *Microbiological Research* **155**: 179–195.

Vu D, Groenewald M, de Vries M, *et al.* (2019). Large-scale generation and analysis of filamentous fungal DNA barcodes boosts coverage for kingdom fungi and reveals thresholds for fungal species and higher taxon delimitation. *Studies in Mycology* **92**: 135–154.

Wang GN, Yu XD, Dong W, *et al*. (2019). Freshwater hyphomycetes in *Eurotiomycetes*: a new species of *Minimelanolocus* and a new collection of *Thysanorea papuana* (*Herpotrichiellaceae*). *Mycological Progress* **18**: 511–522.

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

Winton LM, Stone JK, Hansen EM, *et al.* (2007). The systematic position of *Phaeocryptopus gaeumannii*. *Mycologia* **99**: 240–252.

Woudenberg JH, Groenewald JZ, Binder M, *et al.* (2013). *Alternaria* redefined. *Studies in Mycology* **75**: 171–212.

Xi L, Fukushima K, Changming L, *et al.* (2004). First case of *Arthrographis kalrae* ethmoid sinusitis and ophthalmitis in the people's Republic of China. *Journal of Clinical Microbiology* **42**: 4828–483.

Yang T, Groenewald JZ, Cheewangkoon R, *et al.* (2017). Families, genera, and species of *Botryosphaeriales*. *Fungal Biology* **121**: 322–346.

Yarita K, Sano A, Murata Y, *et al.* (2007). Pathogenicity of *Ochroconis gallopava* isolated from hot spring in Japan and a review of published reports. *Mycopathologia* **164**: 135–147.

Zhang TY, Yu Y, Zhang MY, *et al.* (2018). *Verruconis panacis sp. nov.*, an endophyte isolated from *Panax notoginseng*. *International Journal of Systematics and Evolutionary Microbiology* **68**: 2499–2503.