



# *Stilbosporaceae* resurrected: generic reclassification and speciation

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## Key words

*Alnecium*  
*Calospora*  
*Calosporella*  
ITS  
LSU  
molecular phylogeny  
*Phaeodiaporthe*  
*rpb2*  
systematics  
*tef1*

**Abstract** Following the abolishment of dual nomenclature, *Stilbospora* is recognised as having priority over *Prostheciium*. The type species of *Stilbospora*, *S. macrosperma*, is the correct name for *P. ellipsosporum*, the type species of *Prostheciium*. The closely related genus *Stegonsporium* is maintained as distinct from *Stilbospora* based on molecular phylogeny, morphology and host range. *Stilbospora longicornuta* and *S. orientalis* are described as new species from *Carpinus betulus* and *C. orientalis*, respectively. They differ from the closely related *Stilbospora macrosperma*, which also occurs on *Carpinus*, by longer, tapering gelatinous ascospore appendages and by distinct LSU, ITS rDNA, *rpb2* and *tef1* sequences. The asexual morphs of *Stilbospora macrosperma*, *S. longicornuta* and *S. orientalis* are morphologically indistinguishable; the connection to their sexual morphs is demonstrated by morphology and DNA sequences of single spore cultures derived from both ascospores and conidia. Both morphs of the three *Stilbospora* species on *Carpinus* are described and illustrated. Other species previously recognised in *Prostheciium*, specifically *P. acerophilum*, *P. galeatum* and *P. opalus*, are determined to belong to and are formally transferred to *Stegonsporium*. Isolates previously recognised as *Stegonsporium pyriforme* (syn. *Prostheciium pyriforme*) are determined to consist of three phylogenetically distinct lineages by *rpb2* and *tef1* sequence data, two of which are described as new species (*S. protopyriforme*, *S. pseudopyriforme*). *Stegonsporium pyriforme* is lectotypified and this species and *Stilbospora macrosperma* are epitypified. Based on DNA sequence data, the North American *Stegonsporium acerophilum* is recorded from Europe for the first time, and new hosts from *Acer* sect. *Acer* are reported for *S. opalus* and *S. pyriforme*. *Stilbospora* and *Stegonsporium* are classified within the revived family *Stilbosporaceae*. *Prostheciium appendiculatum*, *P. auctum* and *P. innesii* are shown to be unrelated to the *Stilbosporaceae* and are recognised in three distinct genera, *Phaeodiaporthe appendiculata*, *Alnecium auctum* n. gen. and *Calosporella innesii* within *Diaporthaceae*, *Gnomoniaceae* and *Sydowiellaceae*, respectively. The generic types of these three monotypic genera are briefly described, illustrated and lecto- and epitypified.

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## INTRODUCTION

Wehmeyer (1941) gave an account of the diaporthean genus *Prostheciium* Fresen. 1862, basically characterised by inconspicuous or light-coloured ectostromatic discs, scant prosenchymatous entostroma and large, several-celled, appendaged ascospores and several-celled conidia, with two subgenera. Later Barr (1978) separated species of the subgenus *Pseudoprostheciium*, distinguished by elongate ascospore appendages, as *Hapalocystis* Auersw. ex Fuckel (see also Jaklitsch & Voglmayr 2004). While the asexual genus *Stilbospora* had been widely regarded as being linked to *Prostheciium* (Winter 1887, Petrak 1923, Barr 1978), the genus *Stegonsporium* was long thought to be the asexual morph of the pleosporalean genus *Splanchnonema* (Kirk et al. 2001). However, Voglmayr & Jaklitsch (2008) confirmed *Stilbospora macrosperma* Pers. as the asexual morph of *Prostheciium ellipsosporum*, and they clearly showed that also *Stegonsporium* belongs to *Prostheciium*.

In their account of *Prostheciium*, Voglmayr & Jaklitsch (2008) re-defined the genus *Prostheciium*, confining it to parasites of *Carpinus* with *Stilbospora* asexual morphs and *Acer* with *Stegonsporium* asexual morphs, respectively. They documented *Prostheciium ellipsosporum* from *Carpinus betulus*, and described five species of *Prostheciium* with *Stegonsporium* asexual morphs from *Acer*, concluding that they were highly

host specific, being mostly confined to a single host species. In addition, two distinct species of *Prostheciium* having *Stegonsporium* asexual morphs were each found to co-occur on the European *Acer pseudoplatanus* and on the North American *Acer saccharum*. All hosts of the maple-inhabiting species were revealed to belong to *Acer* section *Acer*.

Recent changes of the International Code of Nomenclature (ICN) for unified nomenclature raised the question of appropriate generic classification of the species currently classified within *Prostheciium*. *Stilbospora macrosperma* Pers., the type species of *Stilbospora* Pers. 1801, was confirmed as the asexual morph of *Prostheciium ellipsosporum*, the generic type of *Prostheciium*, by Voglmayr & Jaklitsch (2008), thus these genera are synonyms. Because the genus *Stilbospora* Pers. (Persoon 1801) is older than *Prostheciium*, the use of *Prostheciium* would require conservation (Crous et al. 2012). As the asexual morph placed in *Stilbospora* is more common and conspicuous than the sexual morph, it seems practical to follow the principle of priority and recognise *Stilbospora* over *Prostheciium*.

*Stilbospora* and *Stegonsporium* are closely related genera both of which have sexual morphs that have been placed in *Prostheciium* (Voglmayr & Jaklitsch 2008). Both share similar acervular conidiomata with simple, hyaline paraphyses and hyaline, cylindrical, septate conidiophores, annelidic conidiogenous cells and brown, septate conidia with a hyaline sheath. *Stilbospora* is characterised by ellipsoid to oblong euseptate ascospores and conidia with usually three transverse eusepta, whereas *Stegonsporium* has mostly pyriform conidia with 2–7

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**Table 1** Hosts, origin, herbarium, culture and GenBank accession numbers of the specimens used for phylogenetic analyses. For details on collection data, see Voglmayr & Jaklitsch (2008) and lists of specimens examined. Taxa, hosts and origins in **bold** denote new species, hosts and origins, respectively, for the species. Type species marked by an asterisk (\*); E = holotype, H = epitype, N = neotype.

Taxon	Host	Origin	Voucher, culture number	Type	GenBank accession no.			
					LSU	ITS	<i>tefi</i>	<i>rpb2</i>
<i>Alneclium auctum</i> *	<i>Alnus glutinosa</i>	Austria	WU 30206, PAT = CBS 124263 (ex teleomorph)	E	KF570154	KF570154	KF570200	KF570170
<i>Phaeodiaporthe appendiculata</i> *	<i>Acer campestre</i>	Austria	WU32448, D76 = CBS 123809 (ex teleomorph)	E ( <i>Diaporthe appendiculata</i> , <i>Phaeodiaporthe heissleri</i> )	KF570155	KF570155	KF570155	KF570170
	<i>Acer campestre</i>	Austria	WU32449, D77 = CBS 123821 (ex teleomorph)		KF570156	KF570156	KF570156	KF570170
<i>Stegonsporium acerinum</i>	<i>Acer saccharum</i>	Canada	WU 28047, D43 = CBS 120525 (ex teleomorph)	E	EU039996	EU039996	EU040024	EU040024
	<i>Acer saccharum</i>	Canada	WU 28047, D42 = CBS 120524 (ex anamorph)	E	EU039995	EU039995	EU040023	EU040023
<i>S. acerophilum</i>	<b><i>Acer grandidentatum</i></b>	<b>UK, England</b>	WU 32468, D65 = CBS 125042 (ex anamorph)	E	EU039981	EU039981	KF570202	KF570174
	<i>Acer saccharum</i>	Canada	WU 28048, D44 = CBS 120602 (ex teleomorph)		EU040029	EU040029	EU040029	EU040029
	<i>Acer saccharum</i>	Canada	WU 28049, D45 = CBS 120601 (ex anamorph)		EU040030	EU040030	EU040030	EU040030
	<i>Acer saccharum</i>	<b>Czech Republic</b>	WU 32465, D81 = CBS 125028 (ex anamorph)		KF570203	KF570203	KF570203	KF570172
	<i>Acer saccharum</i>	<b>UK, England</b>	WU 32467, D64 = CBS 125033 (ex anamorph)		KF570201	KF570201	KF570201	KF570201
	<i>Acer saccharum</i>	USA	WU 28050, D5 = CBS 117025 (ex teleomorph)		EU039982	EU039982	EU040027	EU040027
	<i>Acer saccharum</i>	USA	WU 28050, D6 = CBS 117026 (ex anamorph)		EU039985	EU039985	EU040028	EU040028
	<i>Acer saccharum</i>	USA	WU 28051, D23 = CBS 117035 (ex anamorph)		EU039984	EU039984	EU040026	EU040026
	<i>Acer saccharum</i>	USA	WU 28052, D24 = CBS 117036 (ex anamorph)		EU039983	EU039983	EU040025	EU040025
	<i>Acer heldreichii</i>	<b>UK, Scotland</b>	WU 32469, D70 = CBS 125035 (ex anamorph)		KF570204	KF570204	KF570204	KF570176
	<i>Acer pseudoplatanus</i>	Austria	WU 28055, D38 = CBS 119744 (ex anamorph)		EU040012	EU040012	EU040012	EU040012
	<i>Acer pseudoplatanus</i>	Austria	WU 28056, D41 = CBS 120523 (ex teleomorph)		EU040013	EU040013	EU040013	EU040013
<i>Acer pseudoplatanus</i>	Austria	WU 28057, D1 (culture lost) (ex teleomorph)	EU040014	EU040014	EU040014	EU040014		
<i>Acer pseudoplatanus</i>	Austria	WU 28058, D3 = CBS 117024 (ex teleomorph)	EU039988	EU039988	EU040011	EU040011		
<i>S. opalus</i>	<b><i>Acer hyrcanum</i></b>	Austria	WU 32783, D59 = CBS 124485 (ex anamorph)	E	KF570205	KF570205	KF570205	KF570205
	<b><i>Acer monspessulanum</i></b>	<b>France</b>	WU 32470, PR15 (ex anamorph)		KF570210	KF570210	KF570210	KF570210
	<i>Acer obtusatum</i>	Austria	WU 28059, D40 = CBS 120603 (ex anamorph)		EU040018	EU040018	EU040018	EU040018
	<i>Acer obtusatum</i>	Croatia	WU 28060, D52 = CBS 121690 (ex teleomorph)		EU040022	EU040022	EU040022	EU040022
	<i>Acer obtusatum</i>	Italy	WU 28061, D51 = CBS 121691 (ex teleomorph)		EU040021	EU040021	EU040021	EU040021
	<i>Acer obtusatum</i>	Slovenia	WU 28062, D48 = CBS 120598 (ex teleomorph)		EU040020	EU040020	EU040020	EU040020
	<i>Acer obtusatum</i>	Slovenia	WU 28062, D47 = CBS 120599 (ex anamorph)		EU040019	EU040019	EU040019	EU040019
	<i>Acer obtusatum</i>	<b>UK, England</b>	WU 32761, D63 = CBS 125032 (ex anamorph)		EU040017	EU040017	EU040017	EU040017
	<i>Acer opalus</i>	<b>France</b>	WU 28241, D60 = CBS 124474 (ex anamorph)		KF570206	KF570206	KF570206	KF570180
	<i>Acer opalus</i>	<b>UK, England</b>	WU 32762, D69 = CBS 125034 (ex anamorph)		KF570208	KF570208	KF570208	KF570181
	<b><i>Acer sempervirens</i></b>	<b>Greece</b>	WU 32763, D89 (ex anamorph)		KF570209	KF570209	KF570209	KF570182
	<i>S. protopyrifforme</i>	<i>Acer pseudoplatanus</i>	Austria		WU 28064, D29 = CBS 117040 (ex teleomorph)	H	EU040016	EU040016
<i>Acer pseudoplatanus</i>		Austria	WU 28064, D30 = CBS 117041 (ex anamorph)	EU040017	EU040017		EU040017	EU040017
<i>Acer pseudoplatanus</i>		Austria	WU 28067, D10 = CBS 117030 (ex anamorph)	EU040015	EU040015		EU040015	EU040015
<i>Acer pseudoplatanus</i>		Austria	WU 32765, PR5 (ex anamorph)	EU039978	EU039978		EU039978	EU039978
<i>Acer pseudoplatanus</i>		Austria	WU 32764, PR9 (ex anamorph)	KF570214	KF570214		KF570214	KF570183
<i>Acer pseudoplatanus</i>		Austria	WU 32766, PR10 (ex anamorph)	KF570215	KF570215		KF570215	KF570215
<i>Acer pseudoplatanus</i>		Austria	WU 32766, PR10 (ex anamorph)	KF570213	KF570213		KF570213	KF570213
<i>Acer pseudoplatanus</i>		Czech Republic	WU 32767, D80 = CBS 124480 (ex anamorph)	KF570212	KF570212		KF570212	KF570184
<i>Acer pseudoplatanus</i>		<b>UK, Scotland</b>	WU 32768, D61 = CBS 125030 (ex anamorph)	KF570211	KF570211		KF570211	KF570211
<i>Acer heldreichii</i>		<b>UK, England</b>	WU 32772, D67 = CBS 125044 (ex anamorph)	KF570216	KF570216		KF570216	KF570186
<i>Acer pseudoplatanus</i>		Austria	WU 28072, D7 = CBS 117027 (ex anamorph)	EU039974	EU039974		EU040007	EU040007
<i>Acer pseudoplatanus</i>		Austria	WU 28063, D8 = CBS 117028 (ex anamorph)	EU039973	EU039973		EU040008	EU040008
<i>Acer pseudoplatanus</i>	Austria	WU 28066, D9 = CBS 117029 (ex anamorph)	EU039975	EU039975	EU040009	EU040009		
<i>Acer pseudoplatanus</i>	Austria	WU 28065, D50 = CBS 120597 (ex anamorph)	EU040010	EU040010	EU040010	EU040010		
<i>Acer pseudoplatanus</i>	Austria	WU 32769, D72 = CBS 120597 (ex anamorph)	KF570218	KF570218	KF570218	KF570218		
<i>Acer pseudoplatanus</i>	Austria	WU 32770, PR4 (ex anamorph)	KF570219	KF570219	KF570219	KF570219		
<i>Acer pseudoplatanus</i>	Austria	WU 32771, PR7 (ex anamorph)	KF570220	KF570220	KF570220	KF570220		
<i>Acer pseudoplatanus</i>	Slovenia	WU 28074, D49 = CBS 120526 (ex anamorph)	EU040006	EU040006	EU040006	EU040006		
<i>Acer velutinum</i>	<b>UK, England</b>	WU 32773, D68 = CBS 125045 (ex anamorph)	KF570217	KF570217	KF570217	KF570185		
<i>S. pyrifforme</i> *	<b><i>Acer heldreichii</i></b>	<b>UK, England</b>	WU 32781, D85 = CBS 124487 (ex anamorph)	H	KF570160	KF570160	KF570223	KF570190
	<b><i>Acer monspessulanum</i></b>	<b>Croatia</b>	WU 32774, D87 (ex anamorph)		KF570161	KF570161	KF570224	KF570191
	<i>Acer pseudoplatanus</i>	Austria	WU 28069, D2 = CBS 117023 (ex teleomorph)		EU039971	EU039971	EU040001	EU040001
	<i>Acer pseudoplatanus</i>	Austria	WU 28069, D2 = CBS 117023 (ex teleomorph)		EU039971	EU039971	EU040001	EU040001

Host	Country	Accession	GenBank	GenBank	GenBank	GenBank
<i>Acer pseudoplatanus</i>	Austria	WU 28070, D11 = CBS 117031 (ex anamorph)	E (Stegonsporium pyriforme, Prostheciium pyriforme)	EU039972	KF570188	
<i>Acer pseudoplatanus</i>	Austria	WU 28071, D22 = CBS 117034 (ex anamorph)		EU040004		
<i>Acer pseudoplatanus</i>	Austria	WU 28068, D39 = CBS 120522 (ex teleomorph)		EU040005		
<i>Acer pseudoplatanus</i>	Denmark	WU 28073, D46 = CBS 120600 (ex teleomorph)		EU040002	KF570189	
<i>Acer pseudoplatanus</i>	France	WU 32778, PR2 (ex anamorph)		KF570228		
<i>Acer pseudoplatanus</i>	France	WU 32777, PR11 (ex anamorph)		KF570226		
<i>Acer pseudoplatanus</i>	Italy	WU 32775, PR6 (ex anamorph)		KF570229		
<i>Acer pseudoplatanus</i>	Italy	WU 32776, PR12 (ex anamorph)		KF570227		
<i>Acer pseudoplatanus</i>	UK, England	WU 32779, D62 = CBS 125031 (ex anamorph)		KF570221		
<i>Acer pseudoplatanus</i>	UK, England	WU 32780, D66 = CBS 125043 (ex anamorph)		KF570222		
<i>Acer pseudoplatanus</i>	UK, England	WU 32782, PR1 (ex anamorph)		KF570225		
<i>Carpinus betulus</i>	Austria	WU 32453, D32 (ex anamorph)		KF570162		
<i>Carpinus betulus</i>	Austria	WU 32452, D33 = CBS 118180 (ex anamorph)		KF570163	KF570192	
<i>Carpinus betulus</i>	Austria	WU 32452, D34 = CBS 118396 (ex teleomorph)		KF570231	KF570193	
<i>Carpinus betulus</i>	Austria	WU 32450, D71 = CBS 122529 (ex teleomorph)	H	KF570164	KF570194	
<i>Carpinus betulus</i>	Austria	WU 24708, D25 = CBS 115073 (ex teleomorph)	E	EU039965	KF570195	
<i>Carpinus betulus</i>	Austria	WU 28053, D53 = CBS 121692 (ex anamorph)		EU039986		
<i>Carpinus betulus</i>	Austria	WU 28054, D54 = CBS 121693 (ex anamorph)		EU040000		
<i>Carpinus betulus</i>	Austria	WU 32456, D55 = CBS 121882 (ex anamorph)		KF570233		
<i>Carpinus betulus</i>	Austria	WU 32457, D56 = CBS 121694 (ex anamorph)		KF570234		
<i>Carpinus betulus</i>	Austria	WU 32458, D57 = CBS 121883 (ex anamorph)		KF570235	KF570196	
<i>Carpinus betulus</i>	Netherlands	WU 27695, D58 = CBS 121695 (ex anamorph)				
<i>Carpinus betulus</i>	UK, England	WU 32460, D86 (ex anamorph)		KF570165		
<i>Carpinus orientalis</i>	Croatia	WU 31856, D92 (ex anamorph)		KF570166		
<i>Carpinus orientalis</i>	Greece	WU 32462, D90 = CBS 135075 (ex teleomorph)	H	KF570167	KF570197	
<i>Carpinus orientalis</i>	Greece	WU 32463, D91 (ex anamorph)		KF570168	KF570198	
<i>Carpinus orientalis</i>	Montenegro	WU 32464, D93 (ex anamorph)		KF570169	KF570199	

***Stilbospora longicornuta******S. macrosperma*\******S. orientalis***

transverse and 1–3 longitudinal distosepta, and also the ascospores are distoseptate (Voglmayr & Jaklitsch 2008). Since 2008, numerous additional *Stegonsporium* collections from various *Acer* species were studied to provide additional data on distribution and host specificity. Of special interest were trees of the North American *Acer saccharum* and *A. grandidentatum* grown in European parks to evaluate the high host specificity revealed in Voglmayr & Jaklitsch (2008). In addition, southern European *Acer* species not yet investigated for their *Stegonsporium* parasites were sampled to re-assess host ranges. All accessions were cultured and characterised by means of DNA sequence data.

*Stilbospora macrosperma* (syn. *Prostheciium ellipsosporum*) was found to be a common fungus on *Carpinus betulus* in Europe, and numerous fresh collections of *S. macrosperma* were made and examined (Voglmayr & Jaklitsch 2008). In one of these collections, long, tapering ascospore appendages were observed, which strongly deviated from the short, ellipsoid ascospore appendages of *S. macrosperma*, and such specimens were subsequently recollected several times from the same site. Collections from the south-eastern European *Carpinus orientalis* proved to be significantly different from *S. macrosperma* in having ascospore appendages that are blunt and tapering similarly to those in *Stegonsporium galeatum*. Of these collections, cultures were obtained from both ascospores and conidia for pure culture and DNA studies, which revealed two distinct species closely related to *S. macrosperma*.

Relegation of *Prostheciium* into synonymy with *Stilbospora* also raises the problem of proper generic classification of other species currently classified in *Prostheciium*. In the most recent taxonomic revision of *Prostheciium*, Barr (1978) accepted *P. appendiculatum*, *P. auctum*, *P. innesii* (as *P. platanoides*), *P. acrocystis* and *P. stylosporium* in addition to the generic type *P. ellipsosporum*. We collected fresh material of the first three species and included them in our phylogenetic analyses to reveal their phylogenetic affinities. They proved to be unrelated to *Prostheciium ellipsosporum*. Accordingly, we dispose them in three distinct genera belonging to three different families below.

**MATERIALS AND METHODS****Sample sources**

Collection data, hosts, herbarium, culture and GenBank accession numbers of the specimens used for phylogenetic analyses are provided in Table 1. Single spore isolates were prepared and grown on 2 % malt extract agar (MEA; 2 % w/v malt extract, 2 % w/v agar-agar; Merck, Darmstadt, Germany). Details of the specimens used for morphological investigations are listed in the Taxonomy section after the respective descriptions.

**Morphology**

Morphological observations and measurements were carried out on a stereo-microscope and after mounting in tap water or 3 % KOH on a compound microscope using Nomarski differential interference contrast (DIC). Images were recorded with a Zeiss AxioCam ICc3 digital camera. Measurements are reported as maxima and minima in parentheses and the mean plus and minus the standard deviation of a number of measurements given in parentheses.

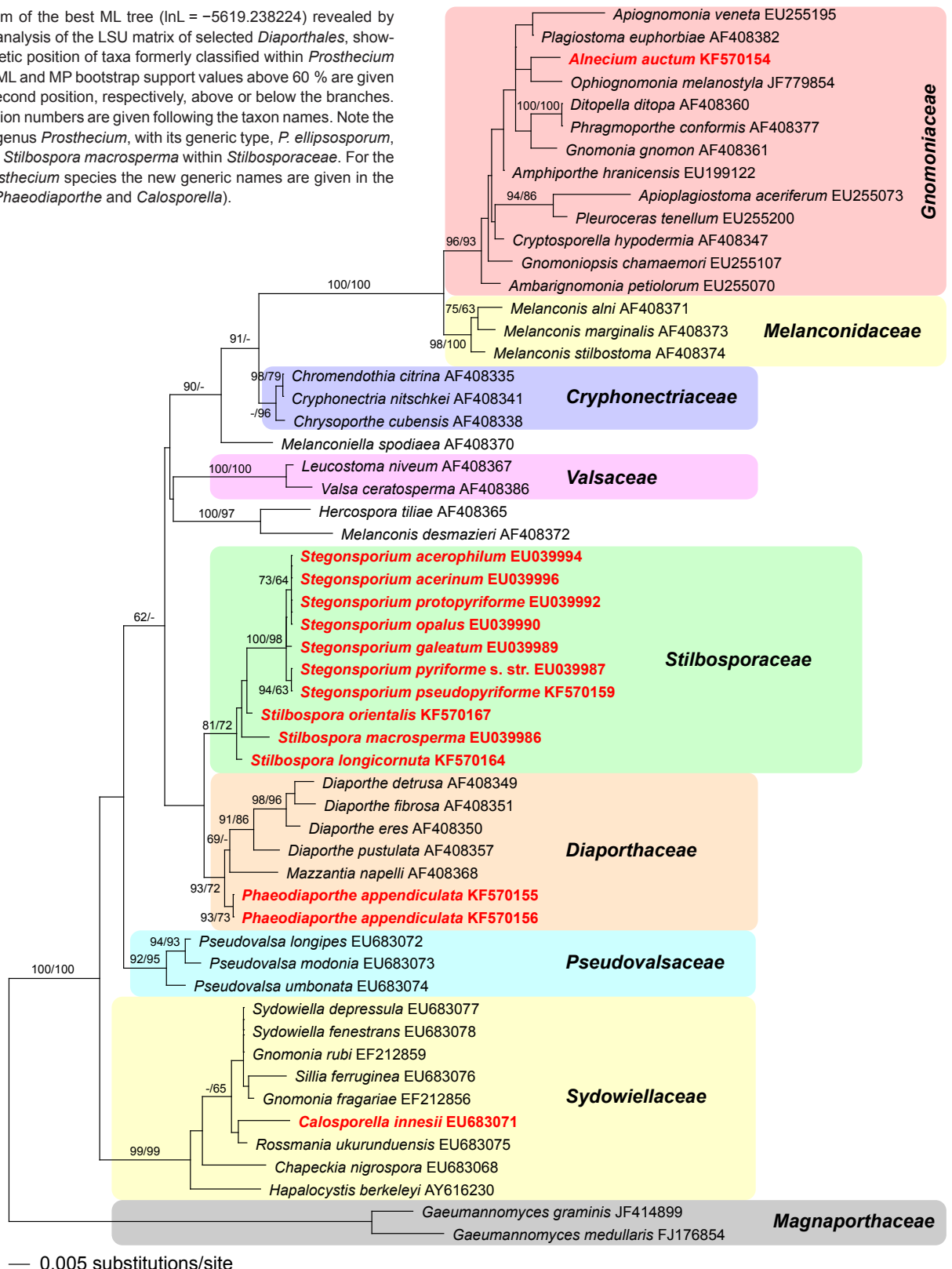
**DNA extraction, PCR and sequencing**

DNA extraction follows the procedure described in Voglmayr & Jaklitsch (2008). For the collections marked with PR in Table 1, DNA was directly extracted from conidiomata using the protocol described in Voglmayr & Jaklitsch (2011). The D1, D2 region of the LSU rDNA region was amplified with primers LR0R

(Moncalvo et al. 1995) and TW14 (White et al. 1990), and the complete ITS rDNA region with primers ITS4 and ITS5 (White et al. 1990). Alternatively, a c. 1.6 kb fragment of partial nuSSU-complete ITS-partial LSU was amplified with primers V9G (de Hoog & Gerrits van den Ende 1998) and LR5 (Vilgalys & Hester 1990). A c. 1.3 kb fragment of the *tef1* (translation elongation factor 1 alpha) gene was amplified with primers EF1728F (Carbone & Kohn 1999) and TEF1LLErev (Jaklitsch et al. 2006). A c. 1 kb fragment of RNA polymerase II subunit B (*rpb2*) was amplified using the primer pair fRPB2-5f and fRPB2-7cr (Liu

et al. 1999). PCR products were purified using the enzymatic PCR cleanup described in Werle et al. (1994) according to Voglmayr & Jaklitsch (2008). DNA was cycle-sequenced using the ABI PRISM Big Dye Terminator Cycle Sequencing Ready Reaction Kit v. 3.1 (Applied Biosystems, Warrington) with the same primers as in PCR and an automated DNA sequencer (ABI 3130xl or 3730xl Genetic Analyzer, Applied Biosystems); in the partial SSU-ITS-partial LSU fragment the additional primers ITS4 and LR3 (Vilgalys & Hester 1990) were used.

**Fig. 1** Phylogram of the best ML tree (lnL = -5619.238224) revealed by RAXML from an analysis of the LSU matrix of selected *Diaporthales*, showing the phylogenetic position of taxa formerly classified within *Prostheciaceae* (marked in red). ML and MP bootstrap support values above 60 % are given at the first and second position, respectively, above or below the branches. GenBank accession numbers are given following the taxon names. Note the polyphyly of the genus *Prostheciaceae*, with its generic type, *P. elliposporum*, corresponding to *Stilbospora macrosperma* within *Stilbosporaceae*. For the other former *Prostheciaceae* species the new generic names are given in the tree (*Alinecium*, *Phaeodiaporthe* and *Calosporella*).

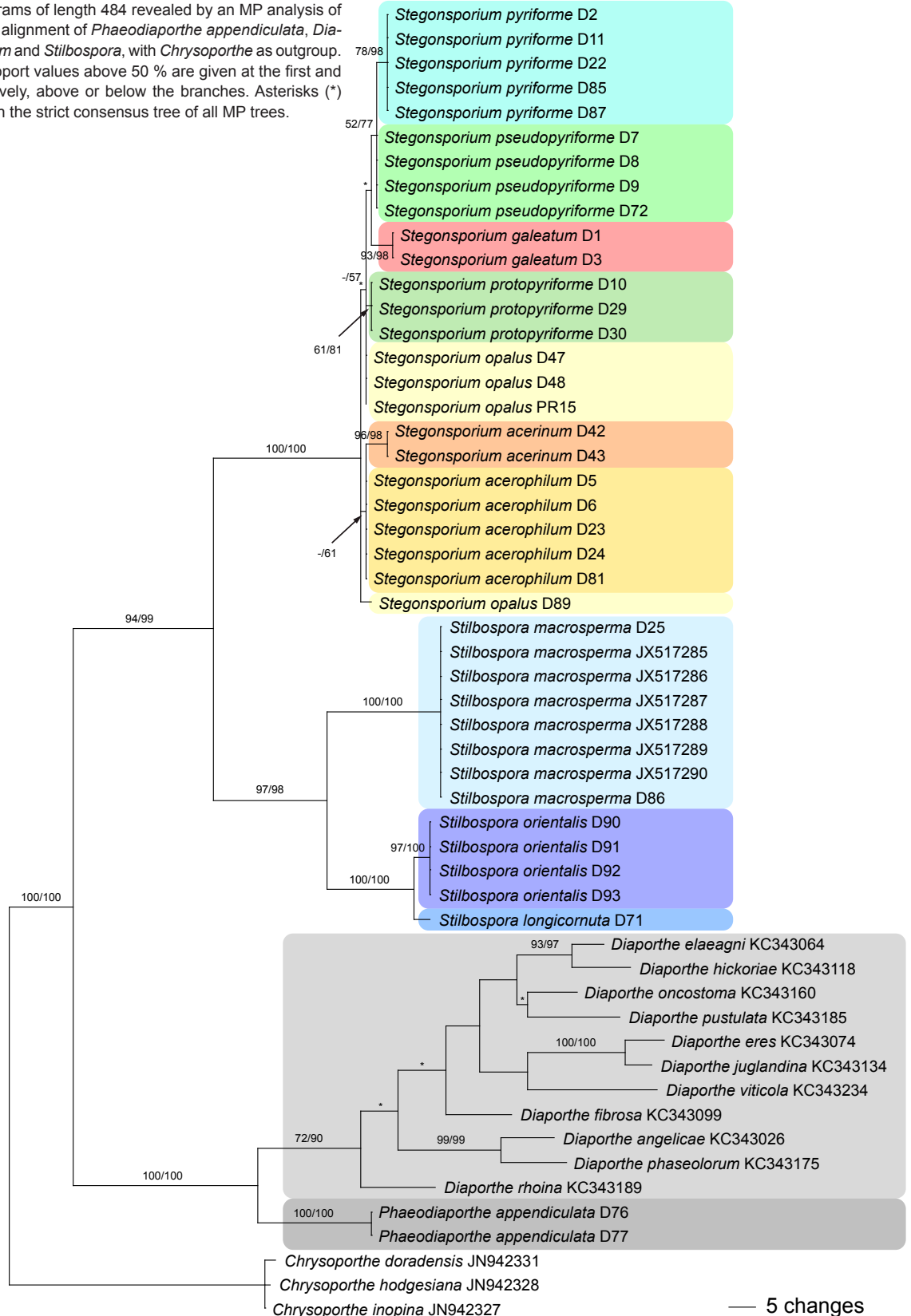


**Data analysis**

To reveal the phylogenetic position of the new species of *Stilbospora* and the diverse species formerly classified within *Prostheciium*, a phylogenetic analysis was performed with LSU rDNA sequences. Sequences of representative species of *Diaporthales* were selected from Castlebury et al. (2002) and supplemented with sequences from GenBank; two accessions of *Gaeumannomyces* (*Magnaporthaceae*) were included as outgroup. GenBank accession numbers are given in the phylogenetic tree (Fig. 1). For a more detailed analysis of the

phylogenetic relationships of *Stilbospora*, *Stegonsporium* and *Prostheciium appendiculatum* and to test the ability of the ITS for species delimitation, an ITS rDNA matrix was analysed, including a representative sample of *Diaporthe* species selected from Gomes et al. (2013) and *Chrysosporthe* as outgroup. For detailed investigations of species relationships and delimitation within *Stilbospora* and *Stegonsporium*, *rpb2* and *tef1* sequences of a representative sample were separately analysed, with *Melanconiella* sequences from Voglmayr et al. (2012) as outgroup. *Melanconiella* was selected as outgroup for the *rpb2* and *tef1*

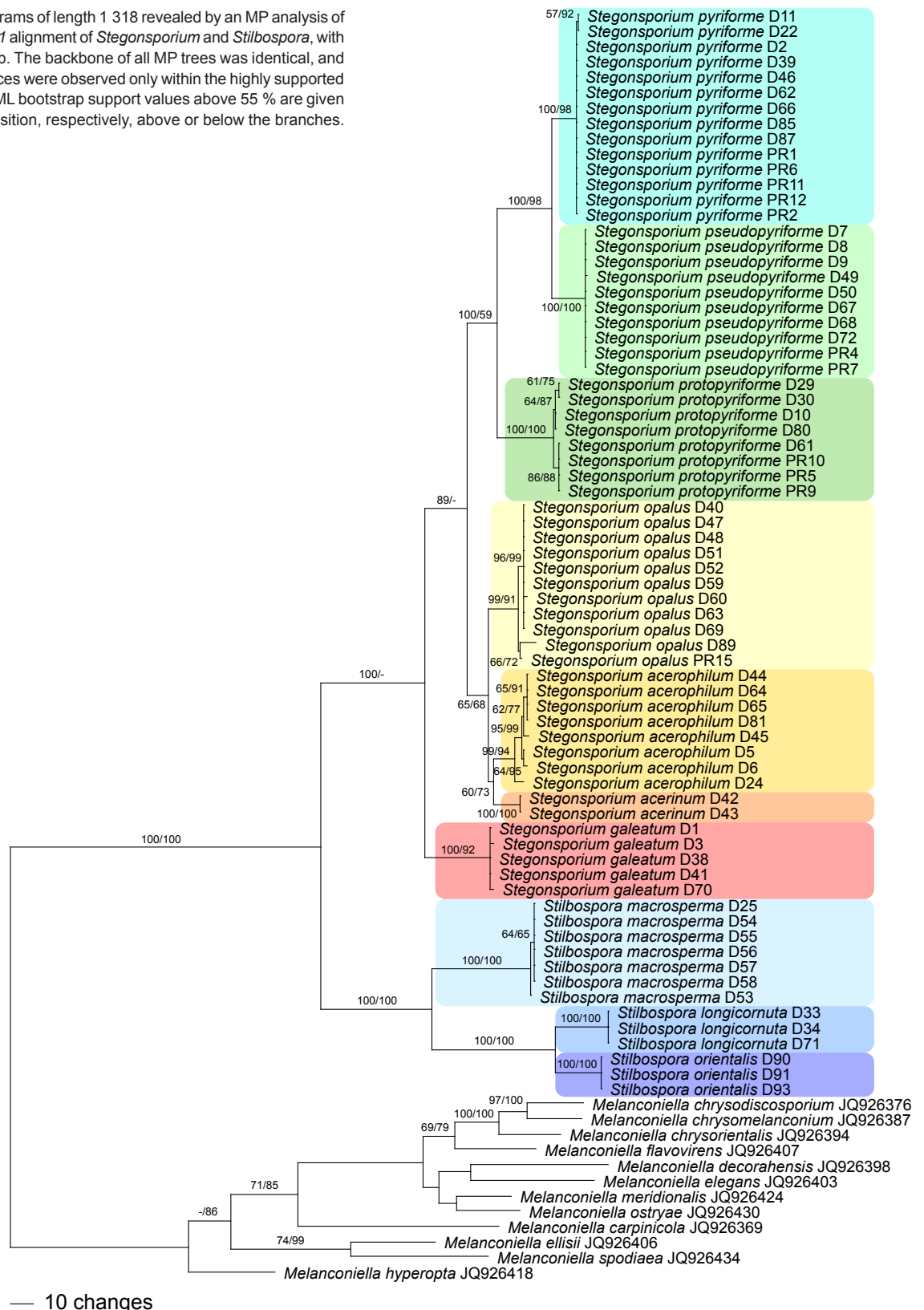
**Fig. 2** One of 24 phylograms of length 484 revealed by an MP analysis of 561 characters of the ITS alignment of *Phaeodiaporthe appendiculata*, *Diaporthe* spp., *Stegonsporium* and *Stilbospora*, with *Chrysosporthe* as outgroup. MP and ML bootstrap support values above 50 % are given at the first and second position, respectively, above or below the branches. Asterisks (\*) denote nodes collapsed in the strict consensus tree of all MP trees.



matrices, because it was the phylogenetically closest group for which verified sequences were available covering the complete sequence range used in the current phylogenetic analyses. The GenBank accession numbers of sequences used in the phylogenetic analyses of ITS, *tef1* and *rpb2* are given in Table 1. To determine the phylogenetic position of *Prosthecius auctum* within *Gnomoniaceae*, a slightly reduced multigene matrix (ITS, LSU, *rpb2*, *tef1*) from Sogonov et al. (2008) was used, with *Melanconis* selected as outgroup; for the GenBank accession numbers see table 1 of Sogonov et al. (2008).

All alignments were produced with the server version of MAFFT (www.ebi.ac.uk/Tools/mafft), checked and refined using BioEdit v. 7.0.4.1 (Hall 1999). After the exclusion of excessive leading and trailing gap regions, the LSU matrix contained 1 687 characters. The ITS, *tef1*, *rpb2* and combined data matrices contained 561, 1 450, 1 177 and 3 361 characters, respectively. Maximum parsimony (MP) analyses were performed with PAUP v. 4.0 b10 (Swofford 2002), using 1 000 replicates of heuristic search with random addition of sequences and subsequent TBR branch swapping (MULTREES option in effect, COL-

**Fig. 3** One of 112 phylograms of length 1 318 revealed by an MP analysis of 1 450 characters of the *tef1* alignment of *Stegosporium* and *Stilbospora*, with *Melanconiella* as outgroup. The backbone of all MP trees was identical, and minor topological differences were observed only within the highly supported terminal clades. MP and ML bootstrap support values above 55 % are given at the first and second position, respectively, above or below the branches.



LAPSE = MAXBLEN, steepest descent option not in effect). All molecular characters were unordered and given equal weight; analyses were performed with gaps treated as missing data. Bootstrap analysis with 1 000 replicates was performed in the same way, but using 10 rounds of random sequence addition and subsequent branch swapping during each bootstrap replicate; in addition, each replicate was limited to 1 million rearrangements in the LSU, ITS, *tef1* and the combined analyses. To identify how many additional steps are required to reveal *Stilbospora* as a monophyletic clade in the LSU analyses, the MP heuristic search was repeated with the same settings, but applying the constraint that *Stilbospora* and *Stegonsporium* are monophyletic sister groups.

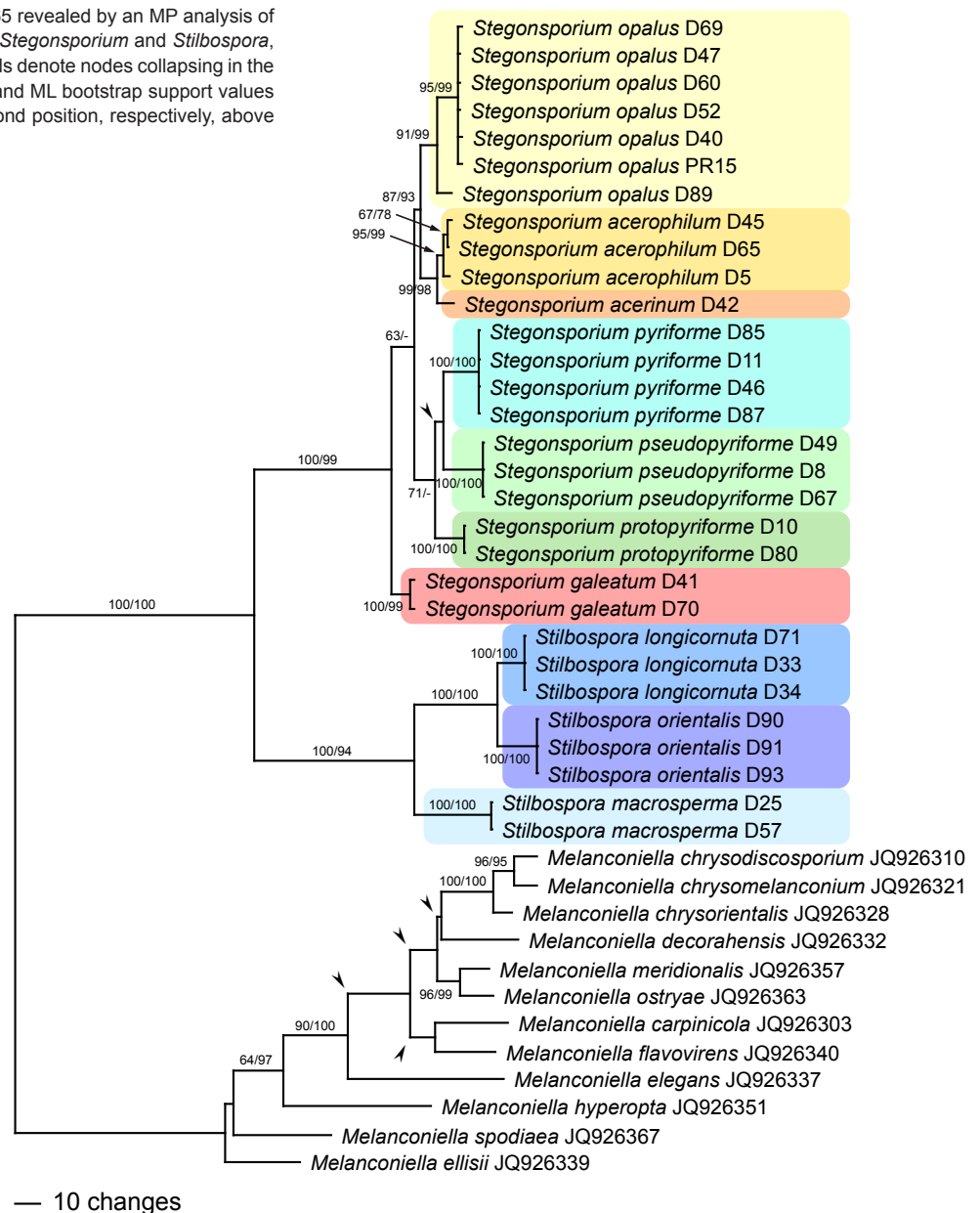
For maximum likelihood (ML) analyses, 500 rounds of random addition of sequences as well as 1 000 fast bootstrap replicates were computed with RAXML (Stamatakis 2006) as implemented in raxmlGUI 1.3 (Silvestro & Michalak 2012), using the GTRGAMMA and GTRCAT models of sequence substitution, respectively. For the multigene analyses, partitioned substitution models were implemented for each gene. The final matrices used for phylogenetic analyses were deposited in TreeBASE (<http://www.treebase.org>) and are available under <http://purl.org/phylo/treebase/phylows/study/TB2:S14652>.

## RESULTS

### Molecular phylogenetic analyses

Of the 1 687 characters included in the LSU analyses, 187 were parsimony informative. MP analyses revealed 290 MP trees of 583 steps (not shown). The ML analyses revealed a tree of  $\ln L = -5619.2382$ , which is shown as phylogram in Fig. 1, with ML and MP bootstrap support above 60 % given at first and second position above/below the branches. Tree topologies between the strict consensus tree of the MP and the ML tree are largely compatible; minor differences concern a few non-supported nodes in the medium part of the tree backbone: MP analyses (not shown) reveal the sequential arrangement *Pseudovalsaceae-Hercospora tiliae/Melanconis desmazieri* clade - *Diaporthaceae-Stilbosporaceae-Valsaceae-Melanconiella*, while the topology of the remaining clades is compatible with the ML tree. In addition, there are a few minor topological differences of non-supported nodes within *Sydowiellaceae* and *Gnomoniaceae*. In both MP and ML analyses, monophyly of the *Stegonsporium-Stilbospora* clade is moderately supported. While *Stegonsporium* is revealed as a monophyletic lineage with high to maximum support (100 % / 98 % ML / MP bootstrap

**Fig. 4** One of 10 phylograms of length 865 revealed by an MP analysis of 1 177 characters of the *rpb2* alignment of *Stegonsporium* and *Stilbospora*, with *Melanconiella* as outgroup. Arrowheads denote nodes collapsing in the strict consensus tree of all MP trees. MP and ML bootstrap support values above 60 % are given at the first and second position, respectively, above or below the branches.



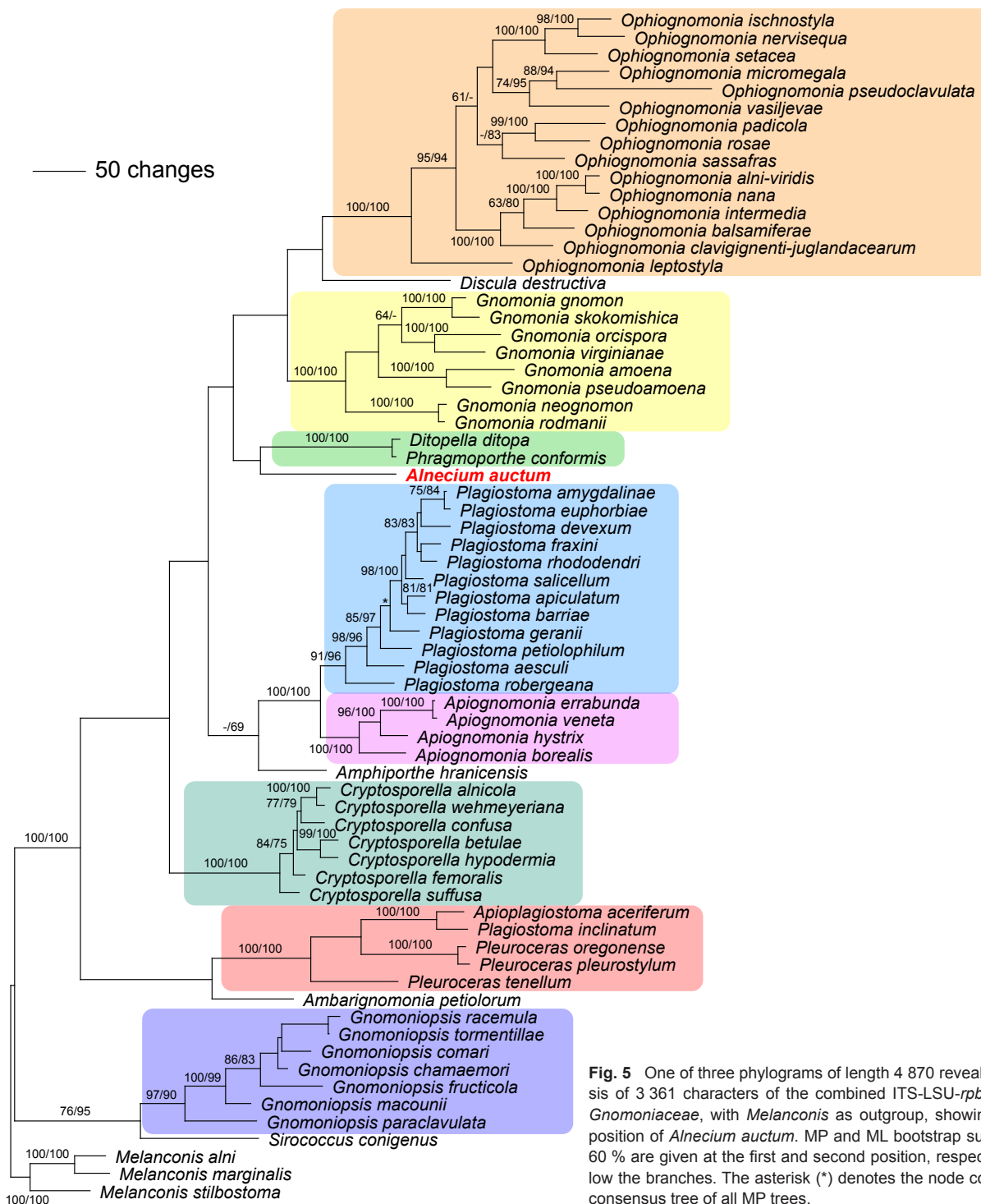
support), *Stilbospora* is revealed as a paraphyletic lineage basal to the *Stegonsporium* clade in both MP and ML analyses, however without bootstrap support, and only a single additional step (584 steps altogether) is required to reveal *Stilbospora* as a monophyletic sister group to *Stegonsporium* (data not shown).

The three additional species included in the study currently classified within *Prosthecium* but belonging elsewhere were revealed to be unrelated to the *Stegonsporium-Stilbospora* clade (Fig. 1). *Prosthecium auctum* was found to belong to the *Gnomoniaceae*, where its closest relatives remain unclear. *Prosthecium appendiculatum* is placed within *Diaporthaceae* close to *Diaporthe*, whereas *Prosthecium innesii* is placed within *Sydowiellaceae* (Fig. 1).

The ITS matrix contained 561 characters, of which 187 were parsimony informative. MP analyses revealed 24 MP trees of 484 steps, one of which is shown as phylogram in Fig. 2, with MP

and ML bootstrap support above 50 % given at first and second position, respectively, above/below the branches. Tree topologies of the backbone of all MP trees were identical except for minor differences of topologies without bootstrap support within *Diaporthe* and *Stegonsporium* (nodes marked by an asterisk in Fig. 2). *Stilbospora* and *Stegonsporium* were revealed as highly supported monophyletic lineages (97–100 % bootstrap support), and sister group relationship of the two genera received high support as well. Within *Stilbospora*, sister group relationship of *S. macrosperma* to the highly supported *S. longicornuta* / *S. macrosperma* clade received maximum support. Contrarily, resolution of the ITS trees was comparatively low within *Stegonsporium*, where only *S. acerinum*, *S. galeatum*, *S. pyriforme* and *S. protopyriforme* were revealed as monophyletic lineages.

The *tef1* matrix contained 1 450 characters, of which 474 were parsimony informative. MP analyses revealed 112 MP trees



**Fig. 5** One of three phylograms of length 4 870 revealed by an MP analysis of 3 361 characters of the combined ITS-LSU-*rpb2-tef1* alignment of *Gnomoniaceae*, with *Melanconis* as outgroup, showing the phylogenetic position of *Alnecium auctum*. MP and ML bootstrap support values above 60 % are given at the first and second position, respectively, above or below the branches. The asterisk (\*) denotes the node collapsed in the strict consensus tree of all MP trees.



of 1 318 steps, one of which is shown as phylogram in Fig. 3, with MP and ML bootstrap support above 55 % given at first and second position, respectively, above/below the branches. Tree topologies of the backbone of all MP trees were identical except for minor differences of topologies without bootstrap support within the species. The ML analyses revealed a tree of  $-\ln = 8378.8858$ , the topology of which was fully compatible with the MP strict consensus tree except for minor differences lacking bootstrap support within the outgroup (*Melanconiella* spp.; data not shown).

The *rpb2* matrix contained 1 177 characters, of which 380 were parsimony informative. MP analyses revealed ten MP trees of 865 steps, one of which is shown as phylogram in Fig. 4, with MP and ML bootstrap support above 60 % given at first and second position, respectively, above/below the branches. The ML analyses revealed a tree of  $-\ln = 5871.9762$ , the topology of which, apart from minor topological differences without bootstrap support within the outgroup (*Melanconiella*), differed from the MP strict consensus tree in the placement of the three species of the *S. pyriforme* s.l. clade. They did not form a monophylum, but were paraphyletically placed at the base of the *Stegonsporium* clade (i.e., *S. pyriforme*, then *S. pseudopyriforme*, then *S. protopyriforme*; data not shown). However, this placement did not receive any ML bootstrap support.

Both *tef1* and *rpb2* analyses revealed fully compatible phylogenetic relationships within the *Stegonsporium-Stilbospora* lineage. Sister group relationship of the genera *Stegonsporium* and *Stilbospora* received maximum bootstrap support (Fig. 3, 4). Within *Stilbospora*, *S. longicornuta* is sister species to *S. orientalis*, and both species are sister clade of *S. macrosperma*, all with maximum bootstrap support. *Stegonsporium acerophilum* is sister species of *S. acerinum*, and both species are sister clade of *S. opalus*, and all three form a sister group relationship with the three cryptic species of the *S. pyriforme* s.l. clade. *Stegonsporium galeatum* is sister species to all other *Stegonsporium* species, which receives significant bootstrap support only in the MP analyses (89 % in *tef1*, 63 % in *rpb2*). Monophyly of the *S. pyriforme* s.l. clade reveals maximum (MP) or low (59 %, ML) bootstrap support in the *tef1* analyses (Fig. 3), while support is low in the *rpb2* analyses (71 % MP bootstrap support, Fig. 4). In addition, the *rpb2* MP strict consensus tree reveals a polytomy of the three cryptic species (*S. protopyriforme*, *S. pseudopyriforme* and *S. pyriforme*).

The combined matrix used for phylogenetic analyses of *Gnomoniaceae* contained 3 361 characters (581 from ITS, 1 220 from LSU, 1 089 from *rpb2* and 471 from *tef1*), of which 789 were parsimony informative. MP analyses revealed three MP trees of 4 870 steps, one of which is shown as phylogram in Fig. 5, with MP and ML bootstrap support above 60 % given at first and second position above/below the branches. The MP trees differed slightly in the position of *Plagiostoma petiophilum* and *P. geranii*. The ML analyses revealed a tree of  $-\ln = 27717.1585$ , the topology of which differed in the unsupported deeper nodes but was compatible with the MP tree in the nodes receiving significant bootstrap support (data not shown). In the MP analyses, *Alnecium auctum* was sister to the *Ditopella ditopa/Phragmoporthes conformis* clade (Fig. 5), whereas in the ML analyses it was basal to the *Amphiporthes/Apiognomonias/Plagiostoma* clade (not shown); however, none of these placements received bootstrap support.

## Taxonomy

**Stilbosporaceae** Link [as '*Stilbosporei*'], Abh. Königl. Akad. Wiss. Berlin 1824: 180. 1826, emend.

Accepted genera: *Stilbospora* Pers. (type genus), *Stegonsporium* Corda.

Family of *Diaporthales*. *Pseudostromata* inconspicuous, immersed in bark of trees and shrubs. *Ostioles* inconspicuous, convergent in groups, not projecting. Ectostromatic disc absent or inconspicuous and light-coloured, rarely brown. *Entostroma* prosenchymatous, pale-coloured, scarcely differentiated from the surrounding bark tissue. *Perithecia* loosely disposed or crowded in valsoid groups in a single layer, black. *Centrum* of broad multiguttulate, collapsing bands. *Asci* first sessile, becoming free, containing 8 ascospores, with or without a more or less cylindrical, slightly refractive canal in the apex; walls thick, appearing bitunicate. *Ascospores* ellipsoid to oblong, brown, with several eu- or distosepta, sometimes with one oblique or longitudinal septum in one to several cells; with a gelatinous appendage at each end. *Conidiomata* acervular, with paraphyses. *Conidiophores* cylindrical, hyaline. *Conidiogenous cells* annellidic. *Conidia* brown, cylindrical, clavate to pyriform, with several eu- or distosepta, with or without oblique or longitudinal septa, surrounded by a narrow hyaline sheath.

Notes — The molecular phylogenetic analysis of LSU data (Fig. 1) confirm monophyly of the *Stegonsporium-Stilbospora* clade, previously classified as genus *Prostheciium* (Voglmayr & Jaklitsch 2008) and included within *Melanconidaceae* (Barr 1978). However, *Stilbospora* and *Stegonsporium* form a distinct phylogenetic lineage and cannot be retained within that family, the type of which, *Melanconis stilbospora*, is phylogenetically distant (Fig. 1). We therefore classify both genera in the separate family *Stilbosporaceae*, which was already established by Link (1826, as *Stilbosporei*). Above we emend the family and restrict it to the genera *Stilbospora* and *Stegonsporium* based on currently available data.

## Key to accepted genera of Stilbosporaceae

1. Ascospores and conidia with three transverse eusepta, ellipsoid to oblong; asci without a refractive canal in the apex ..... *Stilbospora*
1. Ascospores and conidia with more than three transverse distosepta, ascospores sometimes and conidia always with additional longitudinal distosepta, ascospores ellipsoid to oblong, conidia mostly pyriform; asci with a cylindrical, slightly refractive canal in the apex ..... *Stegonsporium*

**Stilbospora** Pers., Neues Mag. Bot. 1: 93. 1794, emend.

Type species: *Stilbospora macrosperma* Pers., Syn. Meth. Fung. (Göttingen) 1: 96. 1801, lectotype selected by Clements & Shear (1931).

*Pseudostromata* inconspicuous, immersed in bark, lifting it and causing fissures. *Ectostroma* inconspicuous, rarely widely erumpent, limited to a light grey, amber to brown disc of a gel matrix containing numerous, tightly packed periphyses extending from ostioles. *Ostioles* inconspicuous, cylindrical, with pale brownish walls, convergent in groups, not projecting, invisible or appearing as subhyaline to brownish circles in the disc. *Entostroma* confined to an inconspicuous loose network of hyaline to brownish, (1.5–)2–4(–6)  $\mu\text{m}$  wide hyphae, enclosing more or less circular groups of usually tightly packed perithecia filling the area of the entostroma, or disposed in a valsoid ring; sometimes more compact above perithecia around convergent ostioles. *Perithecia* depressed globose to lenticular, dark brown to nearly black when mature, disposed in one layer. *Peridium* of a dark brown *textura angularis* in face view. *Asci* first sessile, becoming free; ellipsoid to fusoid, containing 8 uni- or biserial ascospores, without a refractive canal in the apex. *Ascospores* ellipsoid to oblong, brown, 3-euseptate; with a gelatinous appendage at each end. *Conidiomata* immersed in bark, acervular, with circular outline, appearing as dark brown to black spots of 0.5 to several mm, containing simple, septate, hyaline para-

physes and hyaline, unbranched cylindrical conidiophores. *Conidiogenous cells* annellidic. *Conidia* brown, ellipsoid or oblong, often slightly curved, truncate at the base, 3-euseptate; with a hyaline sheath.

Notes — Sutton (1975) provided an account about synonymy and lectotypification of the genus. The genus is characterised by acervular conidiomata that occur in bark of trees and shrubs, presence of septate paraphyses, cylindrical hyaline annellidic conidiophores, and brown, thick-walled, cylindrical conidia that have several (usually three) transverse eusepta and a narrow

hyaline sheath. Ascospores are similar to conidia, but bear a hyaline appendage at each end. The genus contains numerous species that require critical revision, a task far beyond the scope of the current manuscript; it is likely that most of these species are not congeneric with the generic type, *S. macrosperma*. The three confirmed *Stilbospora* species treated here occur on *Carpinus*, have indistinguishable conidia and can morphologically only be identified by their ascospore appendages.



**Fig. 6** *Stilbospora longicornuta*. a, b. Pseudostroma in transverse section showing perithecia immersed in the scant entostroma; c. bark fissure with scarcely erumpent ectostroma; d. ostioles; e. mature vital ascus; f–l. vital ascospores with long, gradually tapering, horn-like gelatinous appendages with l. showing a longitudinal septum; m. conidiophores (annelides), young conidia and filamentous paraphyses; n. conidiophore (annelid) with young conidium; o–r. vital conidia surrounded by gelatinous sheath (a–d. WU 32452; e–r. WU 32450 (holotype)). — Scale bars: a, b = 1 mm; c = 0.5 mm; d = 0.2 mm; e–m = 20 μm; n–r = 10 μm.

**Key to accepted species of *Stilbospora***

1. Ascospores with rounded ascospore appendages shorter than wide (3.5–8 µm long and 9–14 µm wide), widespread on *Carpinus betulus* . . . . . *S. macrosperma*
1. Ascospores with straight or curved ascospore appendages gradually tapering towards their acute distal ends . . . . . 2
2. Ascospore appendages elongate, horn-like, 20–44 µm long and 5–8 µm wide, on *Carpinus betulus* . . . . . *S. longicornuta*
2. Ascospore appendages bell-shaped, 9.5–19 µm long and 8.5–15 µm wide at the base, on *Carpinus orientalis* . . . . . *S. orientalis*

***Stilbospora longicornuta*** Voglmayr & Jaklitsch, *sp. nov.* — MycoBank MB805344; Fig. 6

*Etymology.* Referring to the long, often curved, horn-like ascospore appendages.

*Holotype.* AUSTRIA, Oberösterreich, Schärding, Raab, between Gautzham and Wetzlbach, grid square 7648/1, E13°14'18" N48°21'32", on dead, corticated branches of *Carpinus betulus* attached to the tree, holomorph, 2 Nov. 2007, *H. Voglmayr D71* (WU 32450, holotype; ex-holotype culture CBS 122529 (from ascospores)); ex-type sequences KF570164 (ITS-LSU), KF570194 (*rpb2*), KF570232 (*tef1*).

*Pseudostromata* c. 1–5 mm diam, whitish, pale yellowish, brown to light olive green in section, containing up to 40 perithecia. *Ostioles* inconspicuous and often invisible at the surface. *Perithecia* (205–)230–335(–390) µm diam (n = 30). *Asci* clavate to ellipsoid, (125–)150–190(–210) × (20–)21–24(–25.5) µm (n = 36), thick-walled, containing 8 uni- or biseriate ascospores; apex without a refractive canal. *Ascospores* dark brown, ellipsoid to oblong, (26–)29–35.5(–40) × (9.5–)10–12.5(–13.5) µm, l/w = (2.3–)2.5–3.3(–4.1) (n = 30), with 3 eusepta, multiguttulate; appendages at both ends projecting for (20–)24–34(–44) µm and (5–)5.5–7(–8) µm wide at the base (n = 60), straight or curved, gradually tapering towards their distal ends. *Conidiomata* acervular, circular. *Conidiogenous cells* annellidic. *Conidia* dark brown, oblong, (27–)32.5–41.5(–49) × (9–)11–12.5(–14) µm, l/w = (2.5–)2.8–3.5(–4.2) (n = 96), usually with 3 eusepta, multiguttulate; surrounded by a 1–1.5 µm wide hyaline sheath.

*Distribution* — Known only from the type locality where it has been repeatedly collected for several years.

*Habitat & Host range* — Corticated, dead branches of *Carpinus betulus* attached to the trees, apparently very rare.

*Additional selected specimens examined* (all from the type locality). AUSTRIA, Oberösterreich, Schärding, Raab, between Gautzham and Wetzlbach, grid square 7648/1, E13°14'18" N48°21'32", 6 Feb. 2004, *H. Voglmayr D35* (from conidia) (WU 32451); 8 May 2004, *H. Voglmayr D33* (from conidia), *D34* (from ascospores) (WU 32452); 21 May 2004, *H. Voglmayr D32* (from conidia) (WU 32453); 21 July 2007, *H. Voglmayr* (WU 32454), 14 Aug. 2007, *H. Voglmayr* (WU 32461).

*Notes* — *Stilbospora longicornuta* is distinct from *S. macrosperma*, which occurs on the same host, *Carpinus betulus*, by its long, tapering, horn-like ascospore appendages. Ascospore appendages of *S. orientalis* are also tapering but distinctly shorter and blunter; in addition, the latter occurs on a distinct host, *Carpinus orientalis*, in Southern Europe. *Stilbospora longicornuta* appears to be very rare, as it is only known from the type locality despite intense searches at various localities for many years.

***Stilbospora macrosperma*** Pers., *Syn. Meth. Fung.* (Göttingen) 1: 96 (1801); Fig. 7

= *Stilbospora macrospora* Pers., *Neues Mag. Bot.* 1: 94. 1794.

= *Prosthegium ellipso sporum* Fresen., *Beitr. Mykol.* 2: 62. 1852.

*Typification.* Without place and date, L 0118581 (Herb. Lugd. Bat. 90. O.H. No. 910.264-837, holotype). AUSTRIA, Niederösterreich, Rekawinkel, grid

square 7862/1, on a trunk of *Carpinus betulus*, 20 Oct. 2001, *W. Jaklitsch W.J. 1840, D25* (holomorph) (WU 24708, epitype here designated; ex-epitype culture CBS 115073; MBT176014); ex-epitype sequences EU039965 (ITS), AY616229 (LSU), KF570195 (*rpb2*), EU039999 (*tef1*).

*Pseudostromata* c. 1–10 mm diam, pale yellowish, ochre, brown to olive brown in section, containing up to 80 perithecia. *Ostioles* inconspicuous and often invisible at the surface, embedded in a brownish ectostromatic disc. *Perithecia* (410–)490–620(–700) µm diam (n = 70). *Asci* clavate to ellipsoid, (185–)190–240(–275) × (23–)26–30(–33) µm (n = 33), thick-walled, containing 8 uni- or biseriate ascospores; apex without a refractive canal. *Ascospores* dark brown, ellipsoid to oblong, (31.5–)35–42(–49) × (11–)12–14(–17) µm, l/w = (2.1–)2.7–3.3(–3.8) (n = 187), with usually 3 eusepta, multiguttulate; with subglobose to ellipsoid appendages at both ends projecting for (3.5–)4.5–7(–8) µm and (9–)10.5–13(–14) µm wide (n = 56). *Conidiomata* acervular, circular. *Conidiogenous cells* annellidic. *Conidia* dark brown, oblong, (34–)38–46(–55) × (10.5–)11.7–14(–15) µm, l/w = (2.3–)2.8–3.9(–4.8) (n = 100), usually with 3 eusepta, multiguttulate; surrounded by a 1–1.5 µm wide hyaline sheath.

*Distribution* — Widespread in Europe throughout the natural range of its host.

*Habitat & Host range* — Corticated, dead branches, logs or stumps of *Carpinus betulus*.

*Additional selected specimens examined* (all on corticated twigs, logs or stumps of *Carpinus betulus*). AUSTRIA, Burgenland, Hornstein, Lebzelterberg, holomorph, grid square 8064/4, 16 Sept. 2007, *H. Voglmayr* (WU 32455); Niederösterreich, Mödling, Gießhübl, Wassergspreng, grid square 7963/1, 2 Apr. 2006, *H. Voglmayr D55* (WU 32456); Oberösterreich, Kopfing, Au, grid square 7548/3, 15 Apr. 2006, *H. Voglmayr D56* (WU 32457); Natternbach, Leitenbachtal, Leithen E Teucht, grid square 7648/2, 17 Apr. 2006, *H. Voglmayr D57* (WU 32458); same area, 3 Nov. 2007, *H. Voglmayr* (WU 32459). — NETHERLANDS, Utrecht, Rijnsweerd, near the Centraalbureau voor Schimmelcultures, 15 Nov. 2006, *H. Voglmayr D58* (WU 27695). — UK, England, Surrey, Richmond, Richmond Park, 16 Nov. 2008, *H. Voglmayr D85* (WU 32460).

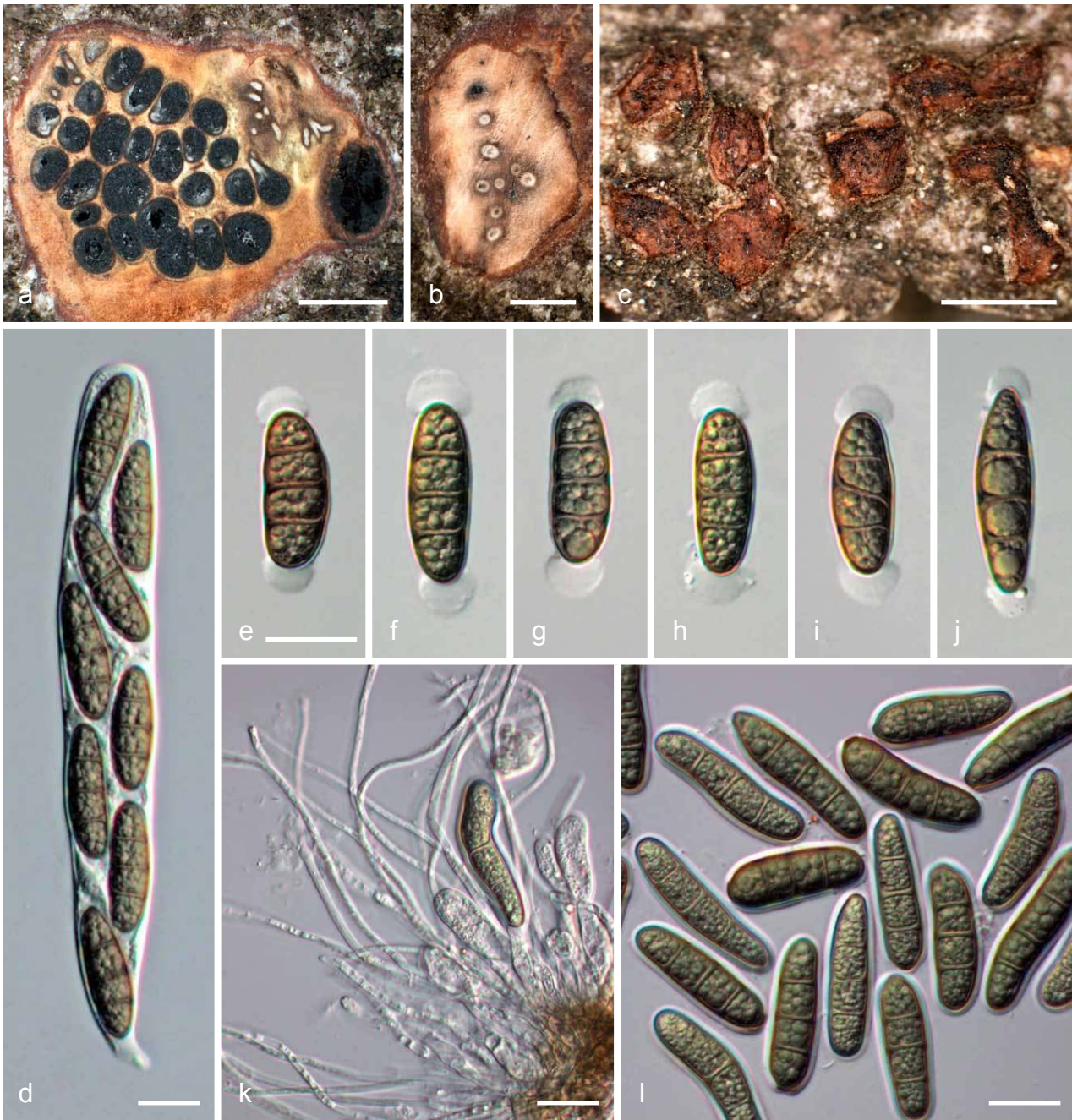
*Notes* — This is a well-known and distinct species, which is rather common on *Carpinus betulus* throughout its range. For details about synonymy and typification see e.g. Sutton (1975). *Stilbospora macrosperma* differs from *S. longicornuta* and *S. orientalis* by its cap-like, rounded ascospore appendages, which are shorter than wide (Fig. 7e–j). The species was first described as *Stilbospora macrospora* Pers., but the later *Stilbospora macrosperma* Pers. was sanctioned by Fries (1832) and thus has to be used. The name *S. macrosperma* has priority over *Prosthegium ellipso sporum*. To ensure nomenclatural stability of the generic type, a recent collection for which a culture and ITS, LSU, *rpb2* and *tef1* sequences are available, is here designated as epitype.

***Stilbospora orientalis*** Voglmayr & Jaklitsch, *sp. nov.* — MycoBank MB805345; Fig. 8

*Etymology.* Referring to its host, *Carpinus orientalis*.

*Holotype.* GREECE, Kerkyra (Corfu), E Ano Korakiana, c. 1 km W of Anapolis, small shady ravine, on dead, corticated branches of *Carpinus orientalis* attached to the tree, holomorph, 23 Apr. 2012, *H. Voglmayr & W. Jaklitsch D90* (WU 32462), holotype; ex-holotype culture CBS 135075 (from ascospores); ex-type sequences KF570166 (ITS-LSU), KF570197 (*rpb2*), KF570237 (*tef1*).

*Pseudostromata* c. 1–2 mm diam, indistinct in face view, white to pale yellowish in section, containing up to 25 perithecia. *Ostioles* inconspicuous and often invisible at the surface. *Perithecia* (290–)310–390(–440) µm diam (n = 35). *Asci* clavate to ellipsoid, (160–)185–235(–240) × 23–27 µm (n = 11), thick-walled, containing 8 uni- or biseriate ascospores; apex without a refractive canal. *Ascospores* dark brown, broadly ellipsoid to oblong, rarely fusoid and curved, (17.5–)25–32(–38) × (9.5–)10.5–12(–14) µm, l/w = (1.3–)2.1–3(–4.1) (n = 97), with



**Fig. 7** *Stilbospora macrosperma*. a. Pseudostroma in transverse section showing perithecia immersed in the entostroma, flanked by a conidioma; b. pseudostroma in transverse section showing ostiolar canals; c. bark fissures with erumpent red-brown ectostromatic discs; d. mature vital ascus; e–j. vital ascospores with cap-like, ellipsoid, gelatinous appendages; k. conidiophores (annelides), young conidia and filamentous paraphyses; l. vital conidia surrounded by gelatinous sheath (a–j. WU 32455; k, l. WU 32459). — Scale bars: a, c = 1 mm; b = 0.5 mm; d–l = 20  $\mu$ m.

(1–)3 eusepta, multiguttulate; appendages at both ends projecting for (9.5–)11–16(–19)  $\mu$ m and (8.5–)10–13.5(–15)  $\mu$ m wide at the base (n = 48), straight or curved, gradually tapering towards their distal ends. *Conidiomata* acervular, circular in outline. *Conidiogenous cells* annellidic. *Conidia* dark brown, oblong, (27–)31–37(–46)  $\times$  (8.5–)9.5–11.5(–13)  $\mu$ m, l/w = (2.3–)2.8–3.7(–4.8) (n = 120), usually with 3 eusepta, multiguttulate; surrounded by a hyaline, 1–1.5  $\mu$ m wide sheath.

**Distribution** — South-eastern Europe (Croatia, Greece, Montenegro).

**Habitat & Host range** — Corticated dead branches of *Carpinus orientalis*.

**Additional selected specimens examined** (all on corticated dead branches of *Carpinus orientalis*). CROATIA, Istria, Vrsar, soc. *Melanconiella chrysoorientalis* and *Melanconiella spodiarea*, asexual morph, 14 May 2010, H. Voglmayr & W. Jaklitsch (WU 31858). — GREECE, Kerkyra (Corfu), c. 3 km S Ano Ko-

rakiana, small shady ravine, asexual morph, 23 April 2012, H. Voglmayr & W. Jaklitsch D91 (WU 32463). — MONTENEGRO, NE Ulcinj, dry mixed forest, asexual morph, 27 Aug. 2012, H. Voglmayr & I. Greilhuber D93 (WU 32464).

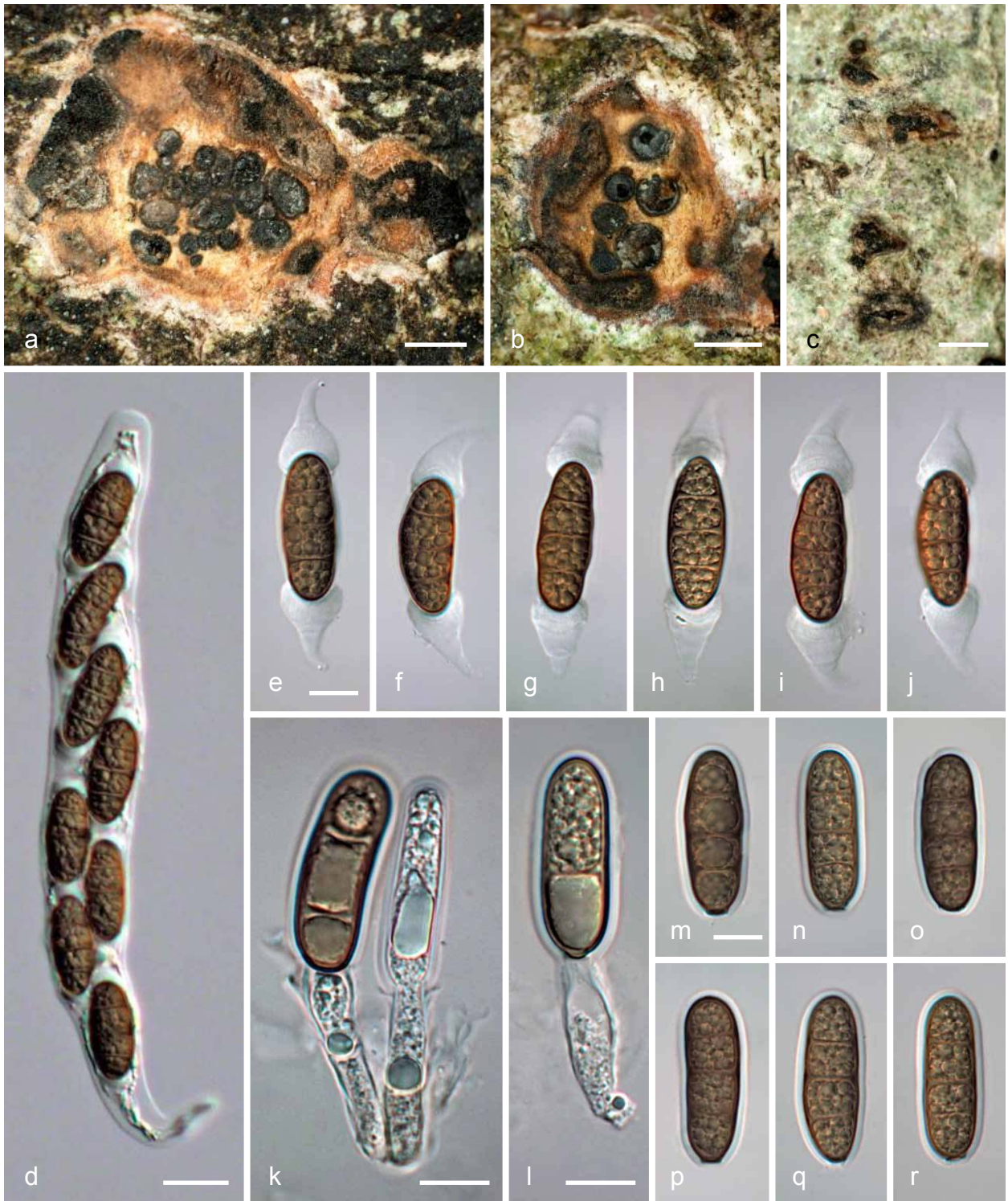
**Notes** — *Stilbospora orientalis* is well characterised by its host *Carpinus orientalis* and the bell-shaped, tapering ascospore appendages, which are reminiscent of *Stegonsporium galeatum*, a species growing on *Acer pseudoplatanus*. *Stilbospora orientalis* is closest relative of *S. longicornuta*, with which it shares tapering ascospore appendages. These are, however, distinctly shorter and wider (10–19  $\times$  8.5–15 vs 20–44  $\times$  5–8  $\mu$ m).

***Stegonsporium*** Corda, in Opiz, Naturalientausch 11: 458. 1827, emend.

**Type species.** *Stegonsporium pyriforme* (Hoffm.) Corda, Icon. Fungorum (Prague) 3: 23. 1839.

*Pseudostromata* inconspicuous, immersed in bark and lifting it slightly, causing fissures to c. 1 mm. *Ectostroma* largely hidden by surrounding lobes of the bark, limited to an amber to light brownish disc of a gel matrix containing numerous tightly packed periphyses 1.5–3(–5) µm wide. *Ostioles* inconspicuous, cylindrical, with pale brownish walls, convergent in groups, not projecting, invisible or appearing as subhyaline to pale yellowish brown circles in the disc. *Entostroma* confined to an inconspicuous loose network of hyaline to brownish, (1.5–) 2–4(–6) µm wide hyphae, enclosing more or less circular groups of usually tightly packed perithecia filling the area of the entostroma, or disposed in a valsoid ring; sometimes more

compact above perithecia in the centre around convergent ostioles. *Perithecia* depressed globose to lenticular, dark brown to nearly black when mature, disposed in one layer. *Peridium* of a dark brown *textura angularis* in face view. *Asci* first sessile, becoming free; ellipsoid or clavate, containing 8 uni- or biserial ascospores, a more or less cylindrical, slightly refractive canal in the apex; walls thick, appearing bitunicate at least when young. *Ascospores* ellipsoid to oblong, brown, mostly 5-distoseptate, sometimes with one oblique or longitudinal distoseptum in one to several cells; with a gelatinous appendage at each end. *Conidiomata* immersed in bark, acervular, with circular outline, appearing as dark brown to black spots of 0.5 to several mm,



**Fig. 8** *Stilbospora orientalis*. a, b. Pseudostroma in transverse section showing perithecia immersed in the entostroma, flanked by conidiomata in a; c. bark fissure with scarcely erumpent ectostroma; d. mature vital ascus; e–j. vital ascospores with bell-shaped, tapering gelatinous appendages; k, l. conidiophores (annelides) with conidia; m–r. vital conidia surrounded by gelatinous sheath (all from WU 32462 (holotype)). — Scale bars: a–c = 0.5 mm; d = 20 µm; e–r = 10 µm.

containing simple hyaline paraphyses and hyaline cylindrical septate conidiophores. *Conidiogenous cells* annellidic. *Conidia* brown, pyriform to oval, ellipsoid or oblong, truncate and hyaline at the base, with several distosepta and one, rarely two longitudinal distosepta in one to several cells, and a hyaline sheath; basal cell morphologically distinct from others.

Notes — Van Warmelo & Sutton (1981) provided a detailed account about synonymy, orthography and typification of *Stegonsporium*, which is followed here. Based on thorough morphological studies of conidiomata, conidiophores and conidia, they only accepted *S. pyriforme* and *S. acerinum* and excluded numerous species from the genus. As currently circumscribed, the genus *Stegonsporium* is morphologically, ecologically and phylogenetically coherent and distinct. The genus is characterised by acervular conidiomata that occur in bark of trees and shrubs, presence of paraphyses, cylindrical hyaline annellidic conidiophores, and brown, thick-walled, obovate, pyriform to clavate conidia that are subdivided by both transverse and longitudinal distosepta and have a narrow hyaline sheath (Sutton 1980, van Warmelo & Sutton 1981, Voglmayr & Jaklitsch 2008). Also sexual morphs are characterised by ascospores that are brown and distoseptate, but they often lack longitudinal septa and bear a hyaline appendage at each end (Voglmayr & Jaklitsch 2008). For detailed species descriptions, see Voglmayr & Jaklitsch (2008).

**Key to accepted species of *Stegonsporium* (modified from Voglmayr & Jaklitsch 2008)**

1. Ascospores with a sheath readily breaking in mounts, oblong; appendages bell-shaped to pyriform, 40–60 × 13–20(–22) µm; conidia (36–)40–49(–53) × (16–)18–21.5(–23) µm; on *Acer pseudoplatanus* and *A. heldreichii* in Europe . . . . . *S. galeatum*
1. Ascospores without a sheath, ellipsoid; appendages (sub-)globose . . . . . 2
2. Ascospores rarely (less than 20 %) with a longitudinal distoseptum, (30–)35–45(–50) × 13–17(–21) µm; asci (28–)30–43(–51) µm wide; conidia 30–40(–50) × 14–18(–20) µm; mostly on *Acer pseudoplatanus*, rarely on *A. heldreichii*, *A. monspessulanum* and *A. velutinum* in Europe; three cryptic species only distinguishable by sequence data . . . . . *S. protopyriforme*, *S. pseudopyriforme*, *S. pyriforme*
2. Ascospores commonly (in more than 40 % of the spores) with one longitudinal distoseptum in 1–3 cells . . . . . 3
3. Ascospores 30–40(–44) × 14–18 µm; asci 26–32(–35) µm wide; conidia 30–40 × 14–18 µm, with narrow lenticular cell lumina; on *Acer saccharum*, *A. grandidentatum* . . . . . *S. acerophilum*
3. Ascospores 40–50(–55) × 17–22(–25) µm . . . . . 4
4. Conidia (46–)50–58(–61) × 24–31 µm; on *Acer saccharum* in North America . . . . . *S. acerinum*
4. Conidia (32–)37–44(–51) × 18–22(–24) µm; on *Acer hyrcanum*, *A. monspessulanum*, *A. obtusatum*, *A. opalus* and *A. sempervirens* in Europe . . . . . *S. opalus*

***Stegonsporium acerinum*** Peck, Bull. Torrey Bot. Club 25: 326. 1898

= *Prostheciium acerinum* Voglmayr & Jaklitsch, Mycol. Res. 112, 8: 892. 2008.

*Typification.* CANADA, Ontario, Ottawa, on bark of *Acer saccharum*, 14 Sept. 1897, J.M. Macoun (NYS f52, holotype); Québec, Ville de Québec, Plains d'Abraham, Parc des Champs-de-Bataille, on dead corticated branches of *Acer saccharum*, 26 July 2006, H. Voglmayr D42, D43 (WU 28047, holotype of *Prostheciium acerinum*, epitype of *Stegonsporium acerinum* here designated; ex-epitype culture CBS 120525; MBT176015); ex-epitype sequences EU039996 (LSU), EU039968 (ITS), KF570171 (*rpb2*), EU040024 (*tef1*).

Notes — *Stegonsporium acerinum* is well distinguished from the other accepted *Stegonsporium* species by distinctly larger conidia. The holotype of *Prostheciium acerinum*, which is a well-developed specimen and for which cultures and ITS, LSU, *rpb2* and *tef1* sequence data are available, is here designated as epitype for *S. acerinum* to stabilise the nomenclatural connection of both names.

***Stegonsporium acerophilum*** (M.E. Barr) Voglmayr & Jaklitsch, *comb. nov.* — MycoBank MB805346

*Basionym.* *Dictyoportha acerophila* M.E. Barr, Mycol. Mem. 7: 188. 1978. = *Prostheciium acerophilum* (M.E. Barr) Jaklitsch & Voglmayr, Mycol. Res. 112, 8: 892. 2008.

*Typification.* USA, New Hampshire, White Mountains National Forest, near Pinkham Notch, on dead corticated branches of *Acer saccharum*, 29 July 1963, M.E. Barr 4007 (NY 00921994, holotype of *Dictyoportha acerophila*); Tennessee, Knoxville, wood lot of the Agricultural Sciences of the University of Tennessee, on dead corticated branches of *Acer saccharum*, 23 May 2003, W. Jaklitsch & H. Voglmayr W.J. 2204, D5, D6 (WU 28050, epitype designated by Voglmayr & Jaklitsch (2008); ex-epitype cultures CBS 117025, CBS 117026; MBT176010); ex-epitype sequences EU039993 (LSU), EU039982 (ITS), KF570173 (*rpb2*), EU040027 (*tef1*).

*New records.* CZECH REPUBLIC, Morava, Lednice, park of the castle, grid square 7166/4, on dead corticated branches of *Acer saccharum*, 6 Sept. 2008, H. Voglmayr & I. Greilhuber D81 (WU 32465, living culture CBS 125028), D82 (WU 32466, living culture CBS 124482). — UK, England, Surrey, Kew, Royal Botanic Gardens Kew, on dead corticated branches of *Acer saccharum*, 13 Sept. 2007, H. Voglmayr D64 (WU 32467, living culture CBS 125033); same place, same date, on dead corticated branches of *Acer grandidentatum*, H. Voglmayr D65 (WU 32468, living culture CBS 125042).

Notes — The basionym of *S. acerophilum*, *Dictyoportha acerophila*, was epitypified by Voglmayr & Jaklitsch (2008). The species is common on *Acer saccharum* and close relatives in North America. We report it here for the first time for Europe.

***Stegonsporium galeatum*** (Höhn.) Jaklitsch & Voglmayr, *comb. nov.* — MycoBank MB805347

*Basionym.* *Massaria galeata* Höhn., Ann. Mycol. 3: 403. 1905. = *Prostheciium galeatum* (Höhn.) Jaklitsch & Voglmayr, Mycol. Res. 112, 8: 895. 2008.

*Typification.* AUSTRIA, Niederösterreich, Puchberg am Schneeberg, Aug. 1905, F. Höhnelt, *Herb. Höhnelt A3831a* (FH - lectotype); Puchberg am Schneeberg, at the Schneebergbahn between Hauslitzsattel and Hengstlöhle, grid square 8261/1, 880 m s.m., on dead corticated branches of *Acer pseudoplatanus*, 11 June 2006, H. Voglmayr D41 (WU 28056, epitype designated in Voglmayr & Jaklitsch (2008); ex-epitype culture CBS 120523); ex-epitype sequences KF570175 (*rpb2*), EU040013 (*tef1*).

*New records.* UK, Scotland, Scottish borders, SW Stobo, Royal Botanic Garden Edinburgh, Dawyck Botanic Garden, on dead corticated branches of *Acer heldreichii*, 4 Sept. 2007, H. Voglmayr & W. Jaklitsch D70 (WU 32469, living culture CBS 125035).

Notes — The basionym of *S. galeatum*, *Massaria galeata*, was lecto- and epitypified by Voglmayr & Jaklitsch (2008). *Acer heldreichii* is a new host for this species.

***Stegonsporium opalus*** (Voglmayr & Jaklitsch) Voglmayr & Jaklitsch, *comb. nov.* — MycoBank MB805348

*Basionym.* *Prostheciium opalus* Voglmayr & Jaklitsch, Mycol. Res. 112, 8: 897. 2008.

*Typification.* SLOVENIA, Vipava, Mt Nanos massif, Rebrnice NE Lozice, at the road to Podraška Tura, SW-exposed steep slope, mixed deciduous thermophilous forest, 500–560 m s.m., on dead corticated branches of *Acer obtusatum*, holomorph, 23 Sept. 2006, H. Voglmayr & W. Jaklitsch D47, D48 (WU 28062, holotype; ex-type cultures CBS 120598 (from ascospores), CBS 120599 (from conidia)); ex-type sequences EU039997 (LSU), EU039980 (ITS), KF570178 (*rpb2*), EU040020 (*tef1*).

**New records.** AUSTRIA, Wien, Landstraße, Botanical Garden of the University (HBV), grid square 7864/1, on dead corticated branches of *Acer hyrcanum*, 16 June 2007, *H. Voglmayr D59* (WU 32783; living culture CBS 124485). – FRANCE, Dept. Alpes de Haute Provence, Gorges du Verdon, Rougon, Point Sublime, on dead corticated branches of *Acer opalus*, 8 Aug. 2007, *I. Greilhuber D60* (WU 28241, living culture CBS 124474); Dept. Var, Pont de l'Artuby, on dead corticated branches of *Acer monspessulanum*, 28 July 2011, *H. Voglmayr & I. Greilhuber PR15* (WU 32470). – GREECE, Crete, Askifou Sfakion, on dead corticated branches of *Acer sempervirens*, 20 Nov. 2011, *W. Jaklitsch D89* (WU 32763). – UK, England, Surrey, Kew, Royal Botanic Gardens Kew, on dead corticated branches of *Acer obtusatum*, 13 Sept. 2007, *H. Voglmayr D63* (WU 32761, living culture CBS 125032); same place, same date, on dead corticated branches of *Acer opalus*, *H. Voglmayr D69* (WU 32762, living culture CBS 125034).

**Notes** — The collections from *Acer monspessulanum* and *A. sempervirens* differ slightly in *tef1* and *rpb2* sequences from the other collections of *S. opalus*, indicating some host specialization.

***Stegonsporium protopyriforme* Voglmayr & Jaklitsch, sp. nov.** — MycoBank MB805349

**Etymology.** Referring to its similarity to *S. pyriforme*.

**Holotype.** AUSTRIA, Niederösterreich, Mödling, Gießhübl, Wassergspreng, grid square 7963/1, on dead corticated branches of *Acer pseudoplatanus*, holomorph, 27 Nov. 2004, *H. Voglmayr D29, D30* (WU 28064, holotype; ex-type cultures CBS 117040, CBS 117041); ex-type sequences EU039991, EU039992 (LSU), EU039976, EU039977 (ITS), EU040016, EU040017 (*tef1*).

*Stegonsporium protopyriforme* differs from its closest phylogenetic neighbours, *S. pyriforme* and *S. pseudopyriforme*, by unique fixed alleles in two tree loci (*rpb2*, *tef1*) based on alignments of the separate loci deposited in TreeBASE as study S14652: *rpb2* positions 7, 40: A; 205, 277, 481, 1087, 1120, 1133: C; 76, 85, 289, 496, 503, 664, 847, 1099: T; *tef1* positions 10, 51, 54, 218, 289, 622, 1277: A; 8, 18, 47, 100, 101, 112, 153, 307, 506, 515, 630, 961, 985, 1036, 1075, 1120, 1147, 1278, 1307, 1382: C; 14, 80, 81, 201, 509, 1226, 1336: G; 44, 78, 79, 214, 221, 322, 607, 718, 874, 940, 1342, 1393, 1396, 1444: T.

**Additional selected specimens examined** (all from dead corticated branches of *Acer pseudoplatanus*). AUSTRIA, Oberösterreich, Schärding, Raab, Großrothmayr, grid square 7647/2, 20 June 2003, *H. Voglmayr D10* (WU 28067; living culture CBS 117030); Niederösterreich, Neunkirchen, Priggwitz, Kleewiese, grid square 8261/4, 20 Sept. 2008, *H. Voglmayr PR9* (WU 32764); Perchtoldsdorf, Bierhäusberg, grid square 7863/3, *H. Voglmayr PR10* (WU 32766); Steiermark, Graz-Umgebung, Peggau, Ruine Peggau, grid square 8758/3, 26 Oct. 2007, *H. Voglmayr PR5* (WU 32765). – CZECH REPUBLIC, Morava, Lednice, park of the castle, grid square 7166/4, 6 Sept. 2008, *H. Voglmayr D80* (WU 32767, living culture CBS 124480). – UK, Scotland, Scottish borders, SW Stobo, Royal Botanic Garden Edinburgh, Dawyck Botanic Garden, 4 Sept. 2007, *H. Voglmayr & W. Jaklitsch D61* (WU 32768, living culture CBS 125030).

**Notes** — As there are no clear-cut morphological features that distinguish *S. protopyriforme* from *S. pyriforme* and *S. pseudopyriforme*, the *rpb2* and *tef1* sequences are here used for formal description of the species. Reliable species identification is hence only possible with sequence data.

***Stegonsporium pseudopyriforme* Voglmayr & Jaklitsch, sp. nov.** — MycoBank MB805350

**Etymology.** Referring to its similarity to *S. pyriforme*.

**Holotype.** AUSTRIA, Oberösterreich, Natternbach, Leitenbachtal, Leithen E Teucht, grid square 7648/2, on dead branches of *Acer pseudoplatanus*, holomorph, 15 Aug. 2007, *H. Voglmayr D72* (WU 32769, holotype; ex-type culture CBS 125046); ex-type sequences KF570159 (ITS-LSU), KF570218 (*tef1*).

*Stegonsporium pseudopyriforme* differs from its closest phylogenetic neighbours, *S. pyriforme* and *S. protopyriforme*, by unique fixed alleles in two tree loci (*rpb2*, *tef1*) based on alignments of the separate loci deposited in TreeBASE as study S14652: *rpb2* positions 439: A; 1, 34, 850, 901, 1084, 1112: C; 830, 1133, 1144: G; 391, 973, 1156: T; *tef1* positions 274, 286: A; 21, 99, 251, 601: C; 100, 719: G; 185, 1030, 1327, 1402, 1438: T.

**Additional selected specimens examined** (all from dead corticated branches of *Acer pseudoplatanus* except where noted). AUSTRIA, Kärnten, Klagenfurt-Land, St. Margareten im Rosental, Zabrdce, grid square 9452/4, 21 June 2003, *W. Jaklitsch W.J. 2260, D8* (WU 28063; living culture CBS 117028); Niederösterreich, St. Aegydt/Neuwald, Lahnsattel, Donaudoöfl, grid square 8259/1, 27 Sept. 2006, *H. Voglmayr D50* (WU 28065; living culture CBS 120597); Pernitz, Muggendorf, Steinwandklamm, grid square 8061/4, 9 June 2007, *H. Voglmayr PR4* (WU 32770); Oberösterreich, Natternbach, Leitenbachtal, Leithen E Teucht, grid square 7648/2, 21 June 2003, *H. Voglmayr D9* (WU 28066; living culture CBS 117029); Steiermark, Graz-Umgebung, Peggau, Lurgrotte, grid square 8758/3, 26 Oct. 2007, *H. Voglmayr PR7* (WU 32771); Wien, Döbling, Himmelstraße, grid square 7763/2, 18 June 2003, *W. Jaklitsch D7* (WU 28072; living culture CBS 117027). – SLOVENIA, Vipava, Nanos, 23 Sept. 2006, *H. Voglmayr & W. Jaklitsch D49* (WU 28074; living culture CBS 120526). – UK, England, Surrey, Kew, Royal Botanic Gardens Kew, on *Acer heldreichii*, 13 Sept. 2007, *H. Voglmayr D67* (WU 32772, living culture CBS 125044); same place, same date, on *Acer velutinum*, *H. Voglmayr D68* (WU 32773, living culture CBS 125045).

**Notes** — As there are no clear-cut morphological features that distinguish *S. pseudopyriforme* from *S. pyriforme* and *S. protopyriforme*, the *rpb2* and *tef1* sequences are here used for formal description of the species. Reliable species identification is hence only possible with sequence data.

***Stegonsporium pyriforme* (Hoffm.) Corda, Icon. Fungorum 3: 23. 1839; Fig. 9**

**Basionym.** *Stilbospora pyriformis* Hoffm. (as '*piriformis*'), *Deutschl. Fl., Zweiter Theil* (Erlangen): t. 13, f. 2. 1795.

= *Prostheciium pyriforme* Jaklitsch & Voglmayr, *Mycol. Res.* 112, 8: 898. 2008.

**Typification.** Hoffmann, *Deutschlands Flora, Zweiter Theil* (Erlangen): t. 13, f. 2 (1795), housed in the library of the Department of Botany and Biodiversity Research, University of Wien, Vienna (iconotype, lectotype of *Stilbospora pyriformis* here designated, MBT176673, MBT176674). – AUSTRIA, Landstraße, Botanical Garden of the University of Vienna (HBV), map grid 7864/1, on dead corticated branches of *Acer pseudoplatanus*, holomorph, 20 Nov. 2003, *H. Voglmayr* (WU 28075, holotype of *Prostheciium pyriforme*); Wien, Landstraße, Botanical Garden of the University of Vienna (HBV), grid square 7864/1, on dead corticated branches of *Acer pseudoplatanus*, holomorph, 4 Feb. 2006, *H. Voglmayr D39* (WU 28068, epitype of *Stilbospora pyriformis* and *Prostheciium pyriforme* here designated; ex-epitype culture CBS 120522; MBT176016); ex-epitype sequence EU040003 (*tef1*).

**Additional selected specimens examined** (all from dead corticated branches of *Acer pseudoplatanus* except where noted). AUSTRIA, Wien, Donaustadt, Lobau, close to Panozzalacke, grid square 7865/1, 29 Oct. 2002, *W. Jaklitsch W.J. 2017, D2* (WU 28069; living culture CBS 117023); same area, 17 June 2003, *H. Voglmayr D11* (WU 28070; living culture CBS 117031); 7 July 2003, *W. Jaklitsch W.J. 2273, D22* (WU 28071; living culture CBS 117034). – CROATIA, Istrija, between Golaš and Bale, on *Acer monspessulanum*, 16 Sept. 2010, *H. Voglmayr & W. Jaklitsch D87* (WU 32774). – DENMARK, Nordjylland, Tranum, Fosdalenevej, 25 Aug. 2006, *H. Voglmayr & W. Jaklitsch D46* (WU 28073; living culture CBS 120600). – FRANCE, Dept. Alpes de Haute Provence, Castellane, 1 Aug. 2008, *H. Voglmayr & I. Greilhuber PR11* (WU 32777); Camping des Gorges du Verdon, 1 Aug. 2008, *H. Voglmayr & I. Greilhuber PR2* (WU 32778). – ITALY, Latium, Viterbo, Lago di Vico, 28 July 2009, *H. Voglmayr & W. Jaklitsch PR6* (WU 32775); Soriano nel Cimino, Monte Cimino, 26 Nov. 2009, *H. Voglmayr & W. Jaklitsch PR12* (WU 32776). – UK, England, Northumberland, West Woodburne, 4 Sept. 2007, *H. Voglmayr & W. Jaklitsch D62* (WU 32779, living culture CBS 125031); Surrey, Royal Botanic Gardens Kew, 13 Sept. 2007, *H. Voglmayr D66* (WU 32780, living culture CBS 125043); Surrey, Richmond, Richmond Park, on *Acer heldreichii*, 16 Nov. 2008, *H. Voglmayr D85* (WU 32781, living culture CBS 124487); Surrey, Staines, Laleham Park, 15 Nov. 2008, *H. Voglmayr PR1* (WU 32782).

**Notes** — Hoffmann (1795) does not give a locality or host of the collection upon which his description and illustration were based, but they agree well with the current fungus. No type collection of *Stilbospora pyriformis* by Hoffman appears to be extant, therefore the illustration by Hoffmann (1795) is here selected as lectotype, which is epitypified by a recent, well documented collection. Unfortunately, for the type of *Prostheciium pyriforme*, which could serve as epitype for *S. pyriformis*, no cultures or sequences are available. Therefore, a collection



**Fig. 9** Lectotype of *Stilbospora pyriformis* (Hoffmann, Deutschlands Flora, Zweiter Theil (Erlangen): t. 13, f. 2 (1795), housed in the library of the Department of Botany and Biodiversity Research, University of Vienna).

from the same tree as the type of *P. pyriforme*, for which a culture and the *tef1* sequence are available, is here selected as epitype for both *S. pyriformis* and *Prosthecia pyriforme* to stabilise the nomenclatural connection of both names.

#### Reclassification of *Prosthecia* taxa not contained within the *Stilbosporaceae*

***Alnecium*** Voglmayr & Jaklitsch, *gen. nov.* — MycoBank MB805342

*Etymology.* Referring to its host, *Alnus*, and to the genus *Prosthecia* in which it has been previously classified.

*Type species.* *Alnecium auctum* (Berk. & Broome) Voglmayr & Jaklitsch.

Genus of *Gnomoniaceae*, *Diaporthales*. *Perithecia* immersed in groups, black, with erumpent necks. *Ascospores* ellipsoid, 1-septate, thick-walled, hyaline, in age eventually becoming 3-septate and pale brown, with a gelatinous appendage at each end.

***Alnecium auctum*** (Berk. & Broome) Voglmayr & Jaklitsch, *comb. nov.* — MycoBank MB805343; Fig. 10

*Basionym.* *Sphaeria aucta* Berk. & Broome, Ann. Mag. Nat. Hist., ser. II, 9: 323. 1852.

≡ *Aglaospora aucta* (Berk. & Broome) Kuntze, Revis. Gen. Pl. (Leipzig) 3, 2: 441. 1898.

≡ *Calospora aucta* (Berk. & Broome) Fuckel, Jahrb. Nassauischen Vereins Naturk. 23–24: 191. 1870. ('1869–70').

≡ *Cryptospora aucta* (Berk. & Broome) Tul. & C. Tul., Select. Fung. Carpol. (Paris) 2: 152. 1863.

≡ *Melanconis aucta* (Berk. & Broome) Wehm., Revision of *Melanconis*, *Pseudovalsia*, *Prosthecia* & *Titania*, Univ. Michigan Stud., Scientific Ser. 14: 58. 1941.

≡ *Prosthecia auctum* (Berk. & Broome) Petr., Ann. Mycol. 21, 3/4: 325. 1923.

≡ *Pseudovalsia aucta* (Berk. & Broome) Sacc., Syll. Fung. (Abellini) 2: 138. 1883.

*Typification.* UK, England, Wiltshire, Spye Park, on branches of *Alnus glutinosa*, spring (without date), C.E. Broome, in: Rabenhorst, *Fungi Europaei Exsiccati* 143 (K(M) 188100, lectotype here designated). — AUSTRIA, Kärnten, St. Margareten im Rosental, village area, at the brook Tumpfi, grid square 9452/4, on branches of *Alnus glutinosa*, 2 Nov. 2008, W. Jaklitsch W.J. 3231 (WU 30206, epitype of *Sphaeria aucta* here designated; ex-epitype culture CBS 124263 = PAT; MBT176655).

*Pseudostromata* c. 1.5–2 mm diam, indistinctly pustulate in face view, containing 3–8 perithecia. *Ectostromatic disc* inconspicuous, brown to grey, scarcely erumpent through a circular to elongate cortical crack. *Entostroma* poorly developed, small, central, olive-grey. *Ostioles* erumpent, 1–8, cylindrical to conic, black. *Perithecia* black, 400–800 µm diam. *Asci* broadly fusoid to saccate, (90–)105–120(–130) × (29–)31–42(–47) µm (n = 26), containing 8 uni- to triseriate ascospores; apex without a distinct ring. *Ascospores* hyaline to subhyaline, ellipsoid to oblong, (28–)32–37(–45) × (9–)11–14(–16) µm, l/w = (2.2–)2.4–3.0(–3.9) (n = 140), with 1 euseptum, with age eventually becoming light brown and 3-septate, not to slightly constricted at septum, multiguttulate when fresh, thick-walled, with rounded ends and hyaline cylindrical appendages at both ends projecting for 2.5–5 µm and 3–5 µm wide at the base. *Asexual morph* unknown.

*Distribution* — Europe.

*Habitat & Host range* — Corticated dead branches of *Alnus glutinosa*.

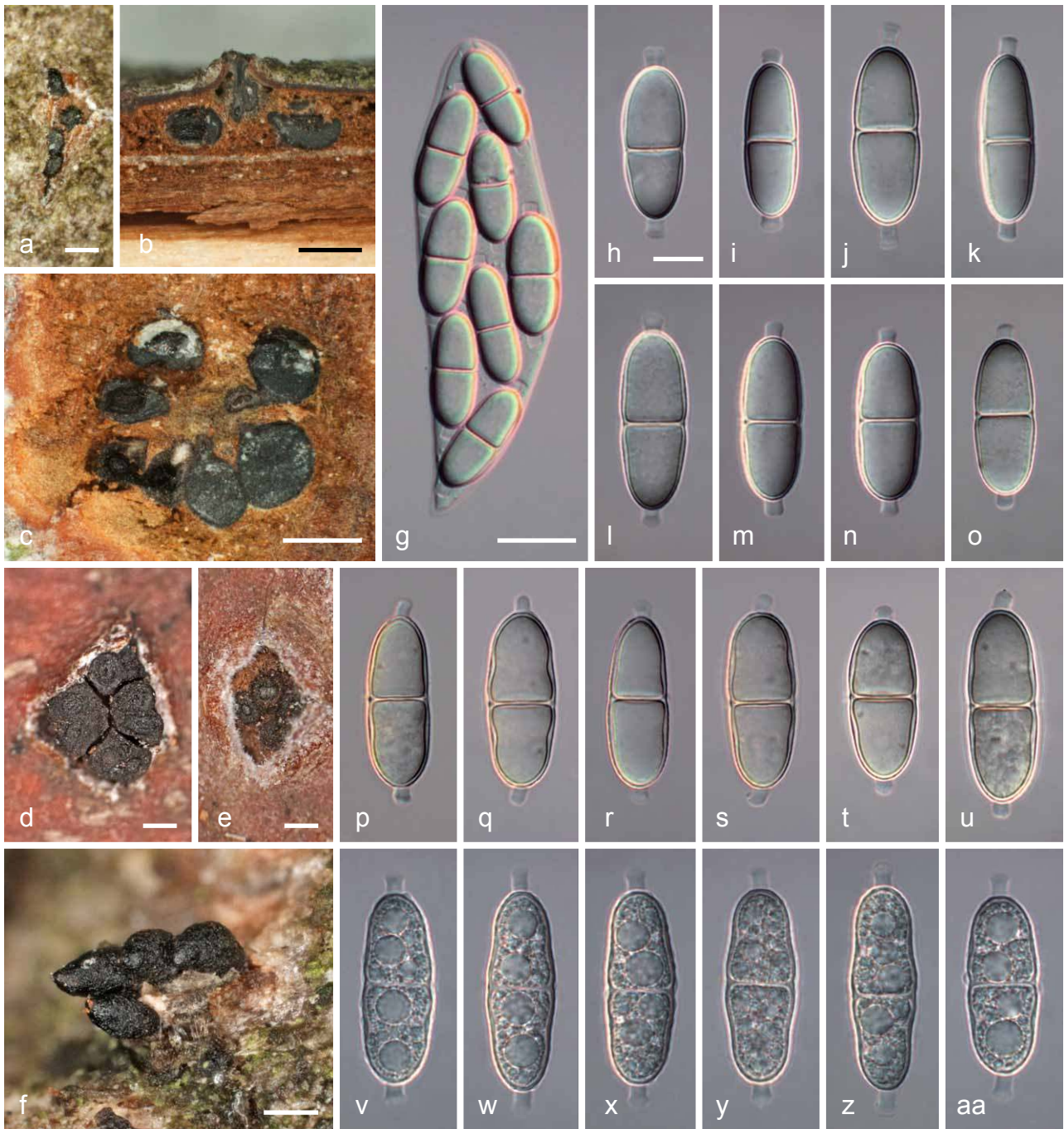
*Selected specimens examined* (all from *Alnus glutinosa*). Without place, substrate, date and collector, Herb. Berkeley (K(M) 188099, possibly an isotype). — AUSTRIA, Kärnten, St. Margareten im Rosental, village area, at the brook Tumpfi, grid square 9452/4, 29 May 1992, W. Jaklitsch (WU 16100); same area, 7 Jan. 1994, W. Jaklitsch (WU 15536); same area, 1 May 2002, W. Jaklitsch W.J. 1887 (WU 32114); St. Margareten im Rosental, Wograda, grid square 9452/3, 27 May 1997, W. Jaklitsch W.J. 1082 (WU 32112); Oberösterreich, Raab, between Gautzham and Wetzlbach, alluvial forest at Wiesbach, grid square 7648/1, 25 Mar. 2000, H. Voglmayr W.J. 1433 (WU 28176); St. Willibald, Großer Salletwald, grid square 7648/1, 27 Dec. 2013, H. Voglmayr (WU 32163); Unterach am Attersee, at Stockwinkl/Egelsee, grid square 8147/3, 25 May 1996, W. Jaklitsch W.J. 885 (WU 32111). — SPAIN, Bizkaia, Uarka Auzoa, 30 Oct. 2010, W. Jaklitsch (WU 31388).

*Notes* — *Alnecium auctum* has been classified within various different genera (see synonymy above), which suggests substantial uncertainties about its generic affiliation. Petrak (1923) and Barr (1978) classified *A. auctum* in *Prosthecia*, while Wehmeyer (1941) placed it in *Melanconis*. Its phylogenetic placement in the *Gnomoniaceae* is unexpected, as no earlier mycologist ever combined it in a genus that then was thought to be affiliated to this family. The *Gnomoniaceae* contains predominantly members that colonize non-woody material such as leaves, culms and stalks of herbaceous plants or leaves of trees and shrubs. The family has been characterised as having mostly small, non- or rudimentarily stromatic ascomata and small, hyaline to yellowish, thin-walled ascospores (Barr 1978, Monod 1983). Only few genera of the family inhabit bark of trees. The phylogenetic position of *Ditopella* or *Phragmoportha* was already determined by Castlebury et al. (2002), and *Amphiportha*, *Cryptospora* and *Plagiostoma* were added later (Mejia et al. 2008, Sogonov et al. 2008). Except for being thin-walled, ascospores of *Plagiostoma micromegala* (Barr 1978) or *P. petrakii* (Monod 1983) have some similarity with those of *A. auctum*, but these species are non-stromatic and occur in herbaceous material. However, *Plagiostoma* now also contains the genus *Cryptodiaportha* Petr. (Mejia et al. 2008, 2011, Sogonov et al. 2008), whose species generally inhabit bark of trees and shrubs. *Alnecium* shares the configuration of ascomata in indistinct or reduced prosenchymatous pseudostromatic tissues with the



enlarged concept of *Plagiostoma*, but has thick-walled ascospores that turn brown in age, whereas ascospores of bark-inhabiting species of *Plagiostoma* basically resemble those of *Diaporthe* in being thin-walled and remaining hyaline. Also ascospores of *Amphiporthe* are *Diaporthe*-like. *Ditopella* and *Phragmoporthe* occur also on *Alnus*. They differ from *Alnecium* by the absence of a stroma except for a rudimentary clypeus around ostioles, thin-walled ascospores and polysporous asci (*Ditopella*) or hyaline phragmospores (*Phragmoporthe*). Finally, ascospores of *Cryptosporella* are hyaline, thin-walled, elongate and non-appendaged. As none of the bark-inhabiting genera of the *Gnomoniaceae* in the current circumscription is congruent with *A. auctum*, the establishment of a new genus is necessary, even more as a clear phylogenetic affiliation to another genus could not be shown (Fig. 1, 5).

In the species description, Berkeley & Broome (1852: pl. X, f. 11) provided a good illustration, which clearly shows the features of the species. We studied two authentic collections from K, one without date but giving the same collection site as the original description, which was distributed as Rabenhorst, Fungi Europaei Exsiccati 143, and a second from the Herbarium Berkeley without any collection data. The first collection was selected as the lectotype, because the data agree with the description, it is in better condition and duplicates of this exsiccatum should also be present in other herbaria. In the lectotype only ascospores but no asci could be seen. To ensure nomenclatural stability, a recent well-developed specimen for which a culture and ITS-LSU, *tef1* and *rpb2* sequences are available is here selected as epitype. The ascospores are initially hyaline and 1-septate, with age eventually becoming light brown and 3-septate, with a



**Fig. 10** *Alnecium auctum*. a. Bark fissure with scarcely erumpent ectostroma and four ostioles in surface view; b. pseudostroma in vertical section; c. pseudostroma in transverse section, showing perithecia and brown entostromata; d, e. scarcely erumpent ectostroma and compressed ostioles in surface view; f. erumpent ostioles in surface view; g. mature dead ascus; h–u. dead ascospores with blunt gelatinous appendages; v–aa. multiguttulate vital ascospores with blunt gelatinous appendages with g–aa in water (a–c, g–o. WU 30206 (epitype); d, e, p–u. K(M) 188100 (lectotype); f, v–aa WU 32163). — Scale bars: a, d–f = 200 µm; b, c = 0.5 mm; g = 20 µm; h–aa = 10 µm.

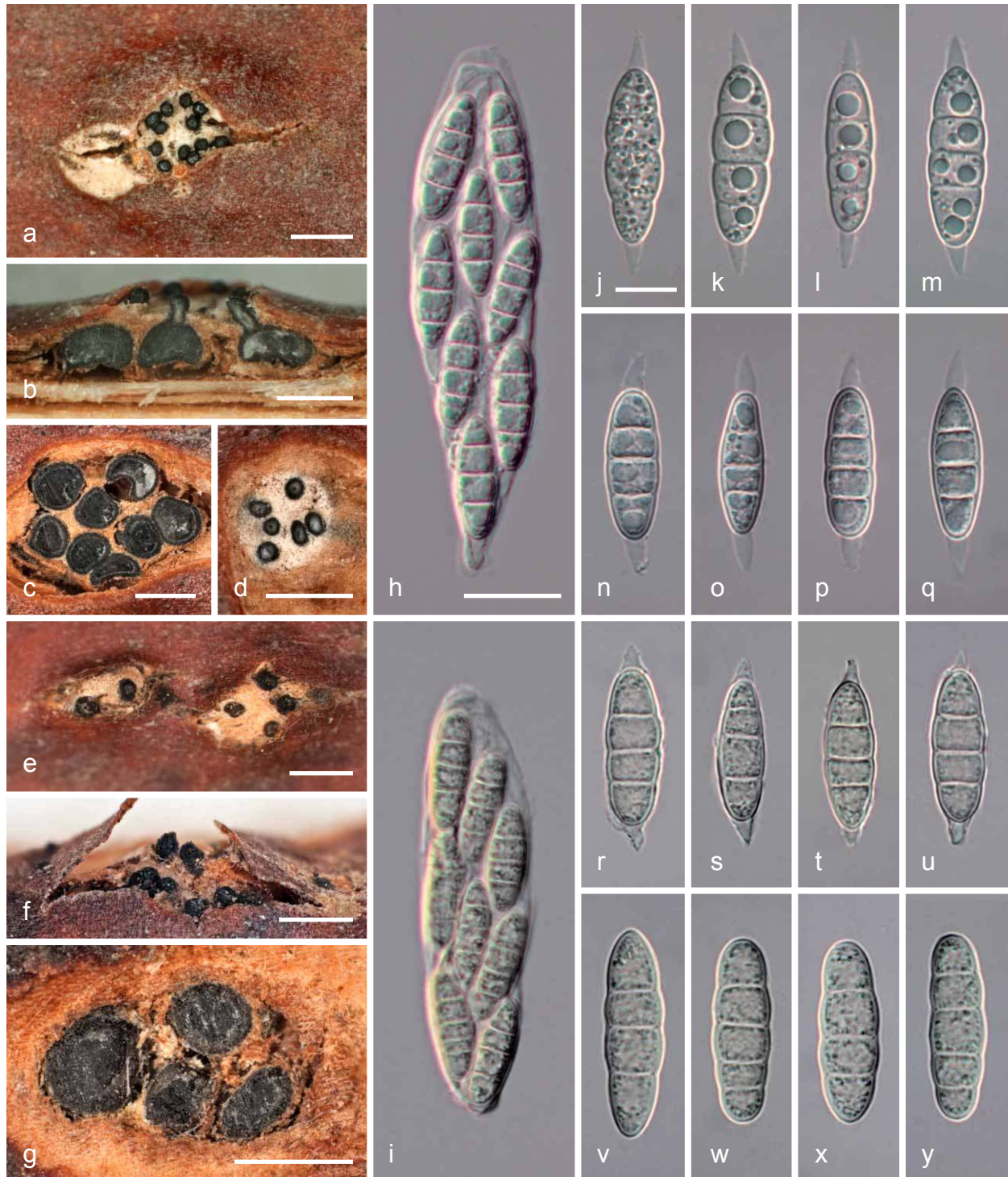
small gelatinous appendage at each end (Fig. 10). The asexual morph of this fungus is unknown. The slow-growing, dark grey to black colonies of CBS 124263 produced only sterile black ostiolate pycnidia on PDA.

***Calosporella*** J. Schröt., in Cohn, Krypt.-Fl. Schlesien (Breslau) 3.2, 4: 442. 1897 ('1908')

*Type species. Calosporella innesii* (Curr.) J. Schröt., in Cohn, Krypt.-Fl. Schlesien (Breslau) 3.2, 4: 442. 1897 ('1908').

**Notes** — As currently circumscribed, *Calosporella* is monotypic, but the taxonomic history of the genus as well as species

name to be applied is complicated. Schröter (1897) erected the genus *Calosporella* as a replacement name for *Calospora* Sacc., which he considered to be a homonym of *Calospora* Fuckel 1870, the latter being typified with *C. hapalocystis* (Berk. & Broome) Fuckel (= *Hapalocystis berkeleyi* Auersw. ex Fuckel; see Jaklitsch & Voglmayr 2004). However, as *Calospora* Fuckel 1870 and *Calospora* Nitschke ex Niessl 1875 are nomina nuda (Holm 1975), *Calospora* Sacc. 1883 is a valid name. In describing the genus *Calospora*, Saccardo (1883) listed 13 species without designating a generic type, and he remarked that the first two species, *C. platanoidis* (Pers.) Sacc. and *C. innesii* (Curr.) Sacc., are scarcely distinct. Subsequently, both taxa



**Fig. 11** *Calosporella innesii*. a, e. Ectostromatic discs and ostioles in surface view; b. pseudostroma in vertical section; c, g. pseudostromata in transverse section, showing perithecia and pale brown entostromata; d. transverse section of ectostromatic disc and ostioles; f. ectostromatic disc and ostioles in side view; h, i. mature dead asci; j–m. vital ascospores with tapering gelatinous appendages; n–y. dead ascospores with tapering gelatinous appendages with h–u in water and v–y in 3% KOH (a, b, h, n–q. WU 32447; c, d, j–m. WU 32161 (epitype); e–g, i, r–y. K(M) 188103 (lectotype)). — Scale bars: a–g = 0.5 mm; h, i = 20 µm; j–y = 10 µm.

were commonly considered to be conspecific, and the epithet *platanoidis* was mostly used for the species. Clements & Shear (1931) lectotypified *Calospora* Sacc. with *C. platanoidis*. However, as Wehmeyer (1941) pointed out, the type specimen of its basionym *Sphaeria platanoidis* Pers. is not congeneric with the current fungus, because it has widely erumpent greyish stromata and fusoid, 2-celled, 4-guttulate, hyaline spores which are constricted at the septum. As material of Persoon is not sent out on loan by L, the true identity of *S. platanoidis* cannot be clarified. The widely used concept of *Sphaeria platanoidis* (e.g. Saccardo 1883, Höhnelt 1918, Clements & Shear 1931, Barr 1978) was based on a misconception by Fries who distributed the current fungus as *S. platanoidis* in his Scler. suec. 186 (Wehmeyer 1941). Because *S. platanoidis* is not a sanctioned name, the name cannot be lectotypified by material of Fries, and the concept of *S. platanoidis* is bound to the type specimen of Persoon. Therefore the name *Calospora*, lectotypified with *C. platanoidis*, cannot be applied for the current fungus and the next available generic name is *Calosporella*, and also the epithet *platanoidis* cannot be retained.

In his description of *Calosporella*, Schröter (1897) listed only *C. innesii* (as '*junnesii*') and gave *Sphaeria platanoidis* Pers. as a doubtful synonym. Höhnelt (1918: 116) lectotypified *Calosporella* with *C. platanoidis*, which was subsequently also followed by Clements & Shear (1931). However, this lectotypification is superfluous and formally incorrect as the only species listed in Schröter (1897) is *C. innesii*, which therefore has to be the nomenclatural type. In addition, *S. platanoidis* is not congeneric with *C. innesii* (see above).

***Calosporella innesii*** (Curr.) J. Schröt., in Cohn, Krypt.-Fl. Schlesien (Breslau) 3.2, 4: 442. 1897 ('1908'); Fig. 11

*Basionym.* *Sphaeria innesii* Curr., Trans. Linn. Soc. London 22: 281. 1858 ('1859').

- ≡ *Calospora innesii* (Curr.) Sacc., Syll. Fung. (Abellini) 2: 231. 1883.
- ≡ *Diaporthe innesii* (Curr.) Fückel, Jahrb. Nassauischen Vereins Naturk. 23–24: 204. 1870 ('1869–70').
- ≡ *Prostheciium innesii* (Curr.) Wehm., Revision of *Melanconis*, *Pseudovalsa*, *Prostheciium* & *Titania*, Univ. Michigan Stud., Scientific Ser. 14: 98. 1941.
- ≡ *Valsa innesii* (Curr.) Sacc., Syll. Fung. (Abellini) 2: 231. 1883.
- = *Valsa aglaeostoma* Berk. & Broome, Ann. Mag. Nat. Hist., ser. III, 3: 368. 1859
- ≡ *Aglaospora aglaeostoma* (Berk. & Broome) Kuntze, Revis. Gen. Pl. (Leipzig) 3, 2: 441. 1898.
- ≡ *Pseudovalsa aglaeostoma* (Berk. & Broome) Sacc., Syll. Fung. (Abellini) 2: 137. 1883.

*Typification.* AUSTRIA, Wien, Donaustadt, Lobau, Panozzalacke, grid square 7865/1, on dead corticated branches of *Acer pseudoplatanus*, 8 Mar. 2008, H. Voglmayr & W. Jaklitsch D78 (WU 32161, epitype of *Sphaeria innesii* here designated; ex-epitype culture CBS 123810; MBT176656). – UK, England, Surrey, Weybridge, on dead corticated branches of *Acer pseudoplatanus*, Apr. 1855, without collector, *Herb. F. Currey* (K(M) 188103, lectotype of *Sphaeria innesii* here designated, MBT176658; K(M) 188104, K(M) 188105, isotypes).

*Pseudostromata* c. 1–3 mm diam, pustulate in face view, circular, containing up to 20 perithecia. *Ectostromatic disc* erumpent, conspicuous, white to light grey, darkening with age, fusoid to circular, containing 1–15(–20) distinctly protruding ostioles. *Entostroma* crumbly, brownish. *Ostioles* erumpent, cylindrical, black. *Perithecia* black, 400–600 µm diam. *Asci* broadly fusoid, 60–100 × 16–22 µm, containing 8 bi- to triseriate ascospores; apex without a distinct ring. *Ascospores* hyaline, fusoid to oblong, (20.5–)24–30(–34) × (6.5–)8–9.5(–10.5) µm, l/w = (2.3–)2.8–3.5(–4.1) (n = 111), with 3–4 eusepta, not to slightly constricted at septum, multiguttulate, with rounded ends and hyaline tapering appendages at both ends projecting for 5–7 µm, 3–4.5 µm wide at the base. *Asexual morph* unknown. Distribution — Europe.

**Habitat & Host range** — Corticated dead branches of *Acer pseudoplatanus*.

*Selected specimen examined* (all on *Acer pseudoplatanus*). Without collection data, *Herb. F. Currey* (K(M) 188101, K(M) 188102, K(M) 188110, K(M) 188111); *Herb. M.C. Cooke* (K(M) 188109). – AUSTRIA, Kärnten, St. Margareten im Rosental, shrubs in village area, grid square 9452/4, 4 Apr. 2008, W. Jaklitsch W.J. 3187 (WU 32447); same area, 22 Jan. 1995, W. Jaklitsch W.J. 465 (WU 32118); Triebblach, above Cihuc, grid square 9452/2, 14 Apr. 2001, W. Jaklitsch W.J. 1739 (WU 32121); Niederösterreich, Schwarzensee, grid square 7962/3, 25 Feb. 1996, W. Jaklitsch W.J. 822 (WU 32119); Wien, Grinzing, Himmelstraße, grid square 7763/2, 18 June 2003, W. Jaklitsch W.J. 2255 (WU 32122); Unterer Reisenbergweg, grid square 7763/2, 17 Apr. 1999, W. Jaklitsch W.J. 1303 (WU 32120). – UK, England, East Bergholt, Sept. 1855, without collector, *Herb. F. Currey* (K(M) 188106, K(M) 188108); same area, Oct. 1855, without collector, *Herb. F. Currey* (K(M) 188107).

**Notes** — *Calosporella innesii* is characterised by hyaline, mostly 3-septate ascospores with small apical appendages and has been transferred to *Prostheciium* by Wehmeyer (1941) based on its phragmospores with apical appendages. This generic classification has subsequently been commonly followed. Barr (1978) argued that the correct epithet for the taxon should be *Prostheciium platanoidis* due to priority, but the type collection of this species is apparently not congeneric with the current fungus (see notes above). The name to be applied for the species is therefore *C. innesii*.

In the original description, Currey (1858) did not provide any details about collections. There are numerous authentic collections of the Currey herbarium in K, one of which is here selected as lectotype. To ensure nomenclatural stability, a recent well-developed specimen for which a culture is available is here selected as epitype. The appendages can be seen well in water mounts even from old herbarium specimens, but they quickly disappear in KOH mounts.

***Phaeodiaporthe*** Petr., Ann. Mycol. 17, 2/6: 99. 1920 ('1919')

*Type species.* *Phaeodiaporthe keissleri* Petr., Ann. Mycol. 17, 2/6: 99. 1920 ('1919').

**Notes** — Petrak (1919) erected the genus *Phaeodiaporthe* as a '*Diaporthe* with dark spores', but later he (Petrak 1921) considered it as a synonym of *Melanconiella*. However, phylogenetic analyses show that *Phaeodiaporthe* is neither closely related to *Melanconiella* nor to *Prostheciium*, but it is placed within *Diaporthaceae* where it forms a distinct clade (Fig. 1). Therefore we reinstate the genus *Phaeodiaporthe* here.

***Phaeodiaporthe appendiculata*** (G.H. Otth) Lar.N. Vassiljeva, Pyrenomycetes of the Russian Far East, 2. *Valsaceae* (Vladivostok): 29. 1994; Fig. 12

*Basionym.* *Diaporthe appendiculata* G.H. Otth, Mitth. Naturf. Ges. Bern: 100. 1871 ('1870').

- ≡ *Melanconiella appendiculata* (G.H. Otth) Sacc., Syll. Fung. (Abellini) 11: XXIX. 1895.
- ≡ *Melanconis appendiculata* (G.H. Otth) Wehm., Revision of *Melanconis*, *Pseudovalsa*, *Prostheciium* & *Titania*, Univ. Michigan Stud., Scientific Ser. 14: 60. 1941.
- ≡ *Prostheciium appendiculatum* (G.H. Otth) M.E. Barr, Mycol. Mem. 7: 187. 1978.
- = *Phaeodiaporthe keissleri* Petr., Ann. Mycol. 17, 2/6: 99. 1920 ('1919').

*Typification.* AUSTRIA, Wien, Donaustadt, Lobau, Panozzalacke, grid square 7865/1, 8 Mar. 2008, H. Voglmayr D77 (WU 32449, epitype of *Diaporthe appendiculata* and of *Phaeodiaporthe keissleri* here designated; ex-epitype culture CBS 123821; MBT176659). – CZECH REPUBLIC, Mährisch-Weißkirchen (Hranice na Moravě), park of the military school, dead twigs of *Acer* sp., 6 Feb. 1919, F. Petrak 3662, *Flora Bohemiae et Moraviae exciccata*. Vol. 33, Ser. II - Abt. 1: *Pilze* 1621 (distributed as *Melanconiella appendiculata*; W, lectotype of *Phaeodiaporthe keissleri* here designated, MBT176657). – SWITZERLAND, Bern, on dead twigs of *Acer platanoides* from late autumn to spring, without date, G. Otth 29 (as *Valsa appendiculata*; B 700021801, holotype of *Diaporthe appendiculata*).

*Pseudostromata* c. 1–3 mm diam, pustulate in face view, containing up to 10 perithecia, often confined by a faint blackish marginal zone. *Ectostromatic disc* brown to blackish, circular, erumpent through a cortical rupture, containing 2–12 ostioles. *Entostroma* whitish to brownish. *Ostioles* erumpent, convergent, cylindrical to conic, black. *Perithecia* 450–800 µm diam,

black. *Asci* clavate to broadly fusoid, (145–)150–178(–190) × (27–)29–38(–44) µm (n = 22), containing 8 biseriolate ascospores; apex with a distinct ring when fresh. *Ascospores* dark to blackish brown, ellipsoid to oblong, (26–)31–38(–43) × (12.5–)14–17(–19.5) µm, l/w = (1.8–)2.0–2.4(–2.9) (n = 212), with 1 euseptum, constricted at septum, distinctly multiguttulate,



**Fig. 12** *Phaeodiaporthe appendiculata*. a, d, e, g. Ectostromatic discs and ostioles in surface view; b. pseudostroma in vertical section; c, f, h. pseudostromata in transverse section, showing perithecia, whitish to brownish entostromata and faint blackish marginal zones; i, j. mature dead asci with apical ascial ring in i; k–r. living ascospores with blunt gelatinous appendages; s–ac. dead ascospores with blunt gelatinous appendages with i, k–r, y–aa in water and j, s–x, ab, ac in 3% KOH (a–c, i. WU 32449 (epitype); d, e, f, j, s–x. B 700021801 (holotype of *Diaporthe appendiculata*); g, h, y–ac (lectotype of *Phaeodiaporthe keissleri*); k–r. WU 32448). — Scale bars: a–c, e, f, h = 0.5 mm; d, g = 1 mm; i, j = 20 µm; k–ac = 10 µm.

with rounded ends and blunt, hyaline, cap-like appendages at both ends projecting for 2.5–8 µm and 5–7 µm wide at the base. *Asexual morph* unknown.

Distribution — Europe.

Habitat & Host range — Corticated dead branches of *Acer campestre* and *A. platanoides*.

*Additional specimens examined* (all on corticated twigs of *Acer campestre*). AUSTRIA, Wien, Ottakring, Wilhelminenberg, grid square 7763/4, 9 Mar. 2008, H. Voglmayr D76 (WU 32448, culture CBS 123809); Mauer, Maurer Wald, grid square 7863/1, 4 Nov. 2000, W. Jaklitsch; Niederösterreich, Hagenbrunn, Bisamberg-east side, grid square 7664/3, 1 Nov. 2000, W. Jaklitsch W.J. 1690 (WU 32110).

Notes — *Phaeodiaporthe appendiculata* has been classified within various genera, which shows the uncertainties about its phylogenetic affiliation. Petrak (1919) described this species as *Phaeodiaporthe keissleri*, giving *Aesculus* or *Acer* as possible hosts. Later, Petrak (1921) recognized *P. keissleri* to be synonymous with *Diaporthe appendiculata*, which he classified as *Melanconiella appendiculata* based on some morphological similarities to *M. spodiæa*. He subsequently distributed the type collection of *P. keissleri* as *Melanconiella appendiculata* in his *Flora Bohemiae et Moraviae exsiccata*, from which the copy in W is here designated as lectotype. Subsequently, Wehmeyer (1941) who did not accept *Melanconiella* as a distinct genus, transferred it to *Melanconis*, while Barr (1978) argued for inclusion in *Prostheciium*, despite the 2-celled ascospores and the conspicuous refractive apical ring in the ascus in *P. appendiculata*. Vassilyeva (1994) formally transferred *Diaporthe appendiculata* to *Phaeodiaporthe*. A recent well-developed specimen, for which a culture and an ITS-LSU sequence are available, is here selected as epitype of both *Diaporthe appendiculata* and *Phaeodiaporthe keissleri* to stabilize nomenclatural connection of both names. The appendages are highly refractive in water mounts even from old herbarium specimens, but they are less distinct in KOH mounts.

## DISCUSSION

### *Phylogeny and nomenclature of Stegonsporium and Stilbospora*

While *Stegonsporium* forms a highly supported monophylum in the LSU analyses, *Stilbospora* is not resolved as monophyletic but as paraphyletic basal to *Stegonsporium*. However, this topology receives no bootstrap support, and only a single additional step is required in the MP analyses to resolve *Stilbospora* as a monophyletic sister clade to *Stegonsporium*. This indicates that the LSU alone does not always contain enough phylogenetic resolution to reveal reliably well-supported phylogenetic relationships on the generic level. Morphologically, *Stilbospora* is a homogeneous genus; both ascospores as well as conidia are euseptate and highly similar in all species (Fig. 6–8), and the main diagnostic features of *Stilbospora* species are their differently shaped ascospore appendages. In addition, all *Stilbospora* species studied so far grow on hosts belonging to the genus *Carpinus*, whereas the species of *Stegonsporium* are found on *Acer* section *Acer*. Furthermore, all species of *Stegonsporium* have distoseptate ascospores and conidia. Contrary to the LSU analysis, the status of *Stilbospora* and *Stegonsporium* as distinct sister clades is highly supported by ITS, *tef1* and *rpb2* sequence data (Fig. 2–4). These morphological, ecological and molecular phylogenetic arguments strongly support the recognition of *Stilbospora* and *Stegonsporium* as distinct genera.

Many species of *Stilbospora* and *Stegonsporium* have recently been classified within *Prostheciium* based on their teleomorphs (Voglmayr & Jaklitsch 2008). However, the recent changes of the international code of nomenclature (ICN; McNeill et al. 2012)

for unified nomenclature, the nomenclatural status of *Prostheciium*, *Stilbospora* and *Stegonsporium* as competing genera has to be re-evaluated. Based on priority, *Stilbospora* takes precedence over *Prostheciium*. As this genus is well-known and well-defined, there is little reason to argue for retaining *Prostheciium* via conservation, and the latter is therefore relegated into synonymy of *Stilbospora*.

The current study revealed two new *Stilbospora* species, which are distinct morphologically as well as phylogenetically. Sister group relationship of *S. longicornuta* to *S. orientalis* is highly supported in ITS, *rpb2* and *tef1* analyses, which is also in line with morphology, as both share long, tapering ascospore appendages, compared to the short cap-like appendages of *S. macrosperma*.

Including significantly more accessions as well as an additional sequence marker (*rpb2*), the current study confirms the findings of Voglmayr & Jaklitsch (2008) that *Stegonsporium pyriforme* consists of three phylogenetically separate entities, which biologically clearly represent distinct species. No significant morphological or ecological differences between these three entities could be found, rendering them cryptic species. We previously refrained from establishing formal names for them (Voglmayr & Jaklitsch 2008); however, considering the genetic homogeneity within and the high genetic distances between these three ‘*S. pyriforme*’ clades, which are even higher than between the morphologically clearly distinct *S. acerinum*, *S. acerophilum* and *S. opalus* (Fig. 3, 4), we suggest that these three lineages should not be retained within a single species. Thus, we recognize them here as three distinct species, *S. pyriforme* s.str., *S. protopyriforme* and *S. pseudopyriforme*, based on their differences in DNA sequences.

### *Generic reclassification of Prostheciium appendiculatum, P. auctum and P. innesii*

Within *Prostheciium* Barr (1978) recognised *P. appendiculatum*, *P. auctum* and *P. innesii* (as *P. platanoidis*) based on ascospore septation and appendages. According to our phylogenetic analyses, *P. appendiculatum*, *P. auctum* and *P. innesii* are neither closely related to the generic type, *P. ellipsosporium* (= *Stilbospora macrosperma*) nor to each other, as they fall within *Diaporthaceae*, *Gnomoniaceae* and *Sydowiellaceae*, respectively. Within these families their closest relatives could not be revealed by molecular phylogenetic analyses due to lack of backbone support. In addition, their distinctive morphological characters do not match other genera. Therefore we classify these three species in three separate genera, viz. *Phaeodiaporthe*, *Alnecium* and *Calosporella*.

### *New host and species records*

The North American *Stegonsporium acerophilum* is here first recorded for Europe from *Acer saccharum* and its close relative *A. grandidentatum* grown in parks (arboreta) in the UK and the Czech Republic. This is remarkable, as both species are rarely planted outside arboreta, which means that individual trees are spatially highly separated from each other. Limited dispersal abilities of the large conidia and ascospores in combination with highly localized occurrence of its hosts indicate that the parasite may have been dispersed as an endophyte by transporting living trees. Distinct host specificity of *Stegonsporium* species was corroborated by the fact that indigenous neighbouring *Acer pseudoplatanus* trees were only infected by *Stegonsporium pyriforme* s.l., which has never been observed on *A. saccharum*. Also *Stegonsporium opalus* co-occurs with its hosts, *Acer opalus* and its close relative, *A. obtusatum*, as it is recorded from France as well as the UK, the latter being far outside the natural range of its hosts. In the present study we recorded *S. opalus* for the first time also from *Acer hyrcanum* in Austria.

*Stegosporium opalus* from *Acer hyrcanum*, *A. obtusatum* and *A. opalus* formed a homogeneous lineage in the phylogenetic analyses of *rpb2* and *tef1* sequences (Fig. 3, 4). In addition, *S. opalus* is recorded here for the first time on *Acer monspessulanum* from France and on the eastern mediterranean *A. sempervirens* from Crete (Greece). The isolate from *A. sempervirens* was genetically distinct in its ITS, *tef1* and *rpb2* sequences from *S. opalus* originating from *Acer hyrcanum*, *A. obtusatum* and *A. opalus* (Fig. 2–4). The French isolate from *A. monspessulanum* had a slightly deviating *tef1* sequence, while its ITS and *rpb2* sequences were identical to those of typical *S. opalus* (Fig. 2–4). These differences are considered to be within the intraspecific variability of *S. opalus*, but may indicate some evolutionary differentiation on these hosts.

New hosts were also recorded for *Stegosporium galeatum* (*A. heldreichii*; Scotland) as well as for the various *Stegosporium pyriforme* lineages: *Acer monspessulanum* (Croatia) as well as *Acer heldreichii* (UK) are new hosts for *S. pyriforme* s.str., and *Acer heldreichii* and *A. velutinum* (both from UK) are new hosts for *S. pseudopyriforme*. However, it remains unclear whether these *Acer* species are regular hosts for these *Stegosporium* species, as they have not yet been sampled within their natural distribution range but only in arboreta in the UK.

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