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Phylogenetic placement of *Neorhamphoria garethjonesii* gen. et sp. nov. (*Tubeufiales*, genus *incertae sedis*)

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Abstract

Neorhamphoria garethjonesii is introduced for a new genus and species with apothecial ascomata growing on dead wood of *Cotoneaster nummularius* (*Rosaceae*) in terrestrial habitats. *Neorhamphoria* is characterized by its dark apothecial ascomata, broad cellular pseudoparaphyses, with bitunicate, broad-clavate asci, and hyaline, muriform ascospores. Molecular phylogenetic analyses of combined LSU, SSU and TEF1α sequence data indicate that *Neorhamphoria* belongs in Dothideomycetes and is related to *Tubeufiales*. Morphologically, *Neorhamphoria* differs from all genera of *Tubeufiales* and thus we treat it as a new genus in *Tubeufiales*, genus *incertae sedis*.

Keywords – apothecial ascomata – bitunicate asci – lignicolous, molecular phylogeny – muriform ascospores

Introduction

Turkey has a very diverse flora, and the higher plants of Turkey have been well-studied, but the mycota has not been extensively investigated and most of the studies deal with macromycetes, generally the agaricoid fungi. Even though there has been no proper investigation of the Turkish micromycete mycota, the ascomycetous microfungi on higher plants of Turkey have been well-studied, but most of the studies deal with Erysiphales and a few with Diaporthales, Xylariales and other orders (Karaca 1961, Göbelez 1963, Baydar 1975, 1982, Güven & Tamer 1993). During the last 15 years, research on ascomycetous micromycetes in the country has intensified (Hüseyinov & Selçuk 2000, 2001, Mel'nik et al. 2004, Hüseyin & Yıldızbaş 2005, Hüseyin et al. 2006, 2009, 2016, Hüseyin et al. 2006, 2009, 2016, Selçuk et al. 2010, Bülbül et al. 2011, Bülbül & Hüseyin 2013, Selçuk & Hüseyin 2014).

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This present taxon was collected during a trip to Kervansaray Mountain, Kırşehir Province, Central Anatolian Peninsula. This mountain lies in the Irano-Turanian phytogeographic region (Hamzaoğlu 1996). The species is somewhat reminiscent of *Rhamphoria* (Niessl 1876), with the type *R. delicatula* Niessl, from rotting wood of an unidentified plant from Brünn, Moravia, in the Czech Republic.

Tubeufiales comprises saprobic species commonly occurring on dead or decaying wood from diverse ecological distributions in terrestrial and aquatic habitats (Goh et al. 1998, Réblová & Barr 2000, Promputtha & Miller 2010, Boonmee et al. 2011, 2014a, b, Hyde et al. 2013, 2016, Rageshkumar & Sharma 2013). Currently, this order includes two families (*Tubeufiaceae* and *Weisneriomycetaceae*) and 23 genera of sexual and asexual morphs (Boonmee et al. 2014, Suetrong et al. 2014, Doilom et al. 2017). Its sexual morphs are characterized by light or dark, globose to subglobose, superficial ascomata, bitunicate asci, coloured or hyaline ascospores with transversely multi-septate, or muriform ascospores e.g. *Boerlagiomyces* (Crane et al. 1998, Doilom et al. 2017). Their asexual morphs are hyphomycetous, characterized by helicosporous, chlamydosporous and phragmosporous conidia and they are commonly found in aquatic habitat. *Neorhamphoria garethjonesii* also shares some features with members of *Tubeufiales* in its saprobic lifestyle, it occurrence on woody substrates and in having muriform ascospores.

In this study, our blasts of LSU, SSU and TEF1α sequence data indicated that this taxon belongs to Dothideomycetes with a loose relationship with tubeufiaceous species. Based on morphological characters and multigene phylogenetic analysis, *Neorhamphoria* is established as a new genus in *Tubeufiales*, genus *incertae sedis*.

Materials & Methods

Sample collection, morphological studies and isolation of fungi

The fungal specimen was collected in 2012 from Turkey. The identification of the host plant was made using the "Flora of Turkey and East Aegean Islands" (Davis 1967). Micro-morphological studies were carried out following the procedures outlined in Boonmee et al. (2014a, b). Type specimen and ex-type living culture are deposited Mae Fah Luang University Collections (MFLU and MFLUCC), Chiang Rai, Thailand and the Ahi Evran University, Arts and Sciences Faculty, Department of Biology, in Kırşehir Province of Turkey. Faces of fungi (FOF) and Index Fungorum (IF) numbers are provided as explained in Jayasiri et al. (2015) and Index Fungorum (Kirk 2016).

Single ascospore isolation was performed following the technique demonstrated in Chomnunti et al. (2014). Germinated ascospores were transferred to fresh malt extract agar (MEA, Difco Laboratories, Detroit, Michigan, USA) and grown at 28°C for one month. Culture morphological characters were examined after one month.

Molecular procedures

Fungal colonies were scraped from surface mycelia after one month. DNA extraction, PCR amplification and sequences were performed under the conditions described in Hyde et al. (2016). The new sequences conducted in this study were blasted to check for related taxa in GenBank database (www.ncbi.nlm.nih.gov/blast/), which indicated that this fungus belonged to Dothideomycetes.

Phylogenetic analyses

Our new strain and closely related taxa from recent relevant publications (Boonmee et al. 2011, 2014a, b, Hyde et al. 2013, 2016, Suetrong et al. 2014, Wijayawardene et al. 2014,

Hongsanan et al. 2015, Doilom et al. 2017, Pratibha et al. 2015) were used in the phylogenetic analysis. Analyses of combined LSU, SSU and TEF1α datasets were carried out to establish the placement of the new taxon. Multiple alignments were performed with the online program MAFFT v.7 (Katoh & Standley 2013) and manually edited using BioEdit 7.0.5.3 (Hall 1999). Phylogeny online program "ALTER" was used to format fasta dataset for RAxML analysis (Glez-Peña et al. 2010). Maximum likelihood (ML) analysis was generated in online program "RAxML-HPC BlackBox tool" on the CIPRES 3.3 web portal (Miller et al. 2010), following the default setup. RAxML rapid bootstrapping and subsequent ML search used distinct model/data partitions with joint branch length optimization, executing 1,000 rapid bootstrap inferences and thereafter a thorough ML search. All free model parameters were estimated by RAxML and ML estimate of 25 per site rate categories. The final ML search was evaluated and optimized under GTRGAMMAI model.

Table 1. The new taxon used for phylogenetic analysis with GenBank accession numbers of LSU, SSU and TEF1α sequence data. New sequences are in bold.

Species	Voucher	GenBank Accession number		
		LSU	**SSU**	**TEF1α**
Acanthohelicospora pinicola	MFLUCC10–0116	KF301534	KF301542	KF301555
Acanthostigma chiangmaiensis	MFLUCC10–0125	JN865197	JN865185	KF301560
Aliquandostipite khaoyaiensis	CBS 118232	GU301796	AF201453	GU349048
Apiosporina collinsii	CBS 118973	GU301798	GU296135	GU349057
Boerlagiomyces macrospora	MFLUCC12–0388	KU764712	KU712475	KU872750
Botryosphaeria dothidea	CBS 115476	DQ678051	DQ677998	DQ767637
Botryosphaeria ribis	CBS 115475	DQ678053	DQ678000	DQ677893
Botryosphaeria stevensii	CBS 431.82	DQ678064	DQ678012	DQ677907
Chaetothyriothecium elegans	CPC 21375	KF268420	–	–
Chlamydotubeufia huaikangplaensis	MFLUCC10–0926	JN865198	JN865186	–
Chlamydotubeufia khunkornensis	MFLUCC10–0118	JN865190	JN865178	KF301564
Clavatispora thailandica	MFLUCC10–0107	KF770458	KF770457	KF770459
Dendrographa decolorans	DUKE 0047570	AY548815	AY548809	DQ883725
Neorhamphoria garethjonesii	**MFLUCC16–0210**	******	******	******
Guignardia citricarpa	CBS 102374	GU301815	GU296151	GU349053
Helicoma khunkornensis	MFLUCC10–0119	JN865191	JN865179	–
Helicoma siamense	MFLUCC12–0563	KU764713	KU712479	KU872751
Helicoma siamense	MFLUCC10–0120	JN865192	JN865180	KF301558
Homortomyces combreti	CPC 19808	JX517291	–	–
Homortomyces tamaricis	MFLUCC13–0441	KF537345	–	–
Hysteropatella elliptica	CBS 935.97	DQ767657	EF495114	DQ767640
Jahnula aquatic	R68-1	EF175655	EF175633	–
Lichenoconium aeruginosum	JL359 09	HQ174269	HQ174268	–
Lichenoconium erodens	JL363 09	HQ174267	HQ174266	–
Lichenoconium lecanorae	JL382 10	HQ174263	HQ174262	–
Lichenoconium usneae	JL352 09	HQ174265	HQ174264	–

Table 1 continued

Species	Voucher	GenBank Accession number		
		LSU	SSU	TEF1α
Macrophomina phaseolina	CBS 227.33	DQ678088	DQ678037	DQ677929
Manglicola guatemalensis	BCC 20079	FJ743449	FJ747443	–
Manoharachariella tectonae	MFLUCC12–0170	KU764705	–	KU872762
Microthyrium microscopicum	CBS 115976	GU301846	GU296175	GU349042
Natipusilla bellaspora	PE91-1b	JX474864	JX474869	–
Natipusilla decorospora	A236-1a	HM196369	HM196376	–
Parawiesneriomyces yzygii	CPC 26528	KX228339	–	–
Patellaria atrata	CBS 958.97	GU301855	GU296181	GU349038
Phaeotrichum benjaminii	CBS 541.72	AY004340	AY016348	DQ677892
Pseudogliophragma indicum	MTCC 11985	KM052851	KM052852	–
Saccharata proteae	CBS 115206	GU301869	GU296194	GU349030
Sympoventuria capensis	CBS 120136	DQ885906	KF156094	–
Thaxteriellopsis lignicola	MFLUCC15–0898	KU764711	KU712474	KU872749
Trichodelitschia bisporula	CBS 262.69	GU348996	GU349000	GU349020
Trichodelitschia munkii	Kruys 201 UPS	DQ384096	DQ384070	–
Tubeufia chiangmaiensis	MFLUCC11–0514	KF301538	KF301543	KF301557
Tubeufia javanica	MFLUCC12–0545	KJ880036	KJ880035	KJ880037
Tubeufia tectonae	MFLUCC12–0392	KU764706	KU712460	KU872763
Venturia inaequalis	CBS 594.70	GU301879	NG_016539	GU349022
Wiesneriomyces conjunctosporus	BCC40633	KJ435455	KJ425442	–
Wiesneriomyces laurinus	BCC18609	KJ425459	KJ425443	–
Zeloasperisporium siamemse	IFRDCC2194	JQ036228	JQ036223	–

Bayesian command was generated using FaBox 1.14 (Villesen 2007). Bayesian posterior probability analysis was carried out under MrBayes 3.2.6 on the XSEDE at the CIPRES web portal (Ronquist & Huelsenbeck 2003). The parameter setting of 2 parallel runs, 4 chains, run for 4,000,000 generations, sample frequency every 1,000 generations and all other parameters were left as default. The 50% majority rule consensus tree was created from the remaining trees and illustrated in Treeview (Page 1996). The sequences obtained in this study are deposited in GenBank (Table 1). The final alignment was deposited in TreeBASE submission no. 20355 (http://www.treebase.org).

Results

Phylogenetic study

The dataset comprising 48 taxa with analysis of combined LSU, SSU and TEF1α sequence data and indicated that the new taxon belonged in Dothideomycetes. The alignment had 1403 distinct alignment patterns and the ML tree received the best scoring tree with a final ln value of -22896.365251 as illustrated in Fig. 1. The new genus *Neorhamphoria* clustered close to the *Tubeufiales* clade with good support values (74% BS and >95 PP).

Taxonomy

Neorhamphoria Boonmee, E. Hüseyin & F. Selçuk, **gen. nov.**

Index Fungorum number: 552704; Facesoffungi number: 02823

Etymology – The generic epithet 'Neorhamphoria' refers to its likeness to *Rhamphoria*.

Saprobic on dead wood in terrestrial habitat. Sexual morph: *Ascomata* apothecia, cup-shaped, superficial, solitary to grouped, black. *Receptacle* pulvinate, disc convex, disc and the margins are black. *Exciple peridium* consisting of thick-walled, pigmented, isodiametric cells. *Hymenium* upper part blackish brown and lower part is hyaline. *Hamathecium* comprising 2 × 3 µm wide, numerous, cylindrical, broad cellular pseudoparaphyses, anastomosed, constricted septate, hyaline, apical pigmented, exceeding asci in length, apices are glued together to develop epithecium. *Asci* 8-spored, bitunicate, saccate to broad-clavate, broadly rounded at apex, non-amyloid, with a short bifurcate pedicel or apedicellate. *Ascospores* overlapping 2–3-seriate, partially overlapping, obovoid or elliptic with broadly to narrow rounded ends, initially 1-septate at immature, becoming phragmosporous to muriform at maturity, 3-transversely septate, with 1–2-vertical septate, hyaline, smooth-walled. Asexual morph: Undetermined as did not sporulate in culture.

Neorhamphoria garethjonesii Boonmee, E. Hüseyin & F. Selçuk, **sp. nov.**

Index Fungorum number: 552703; Facesoffungi number: 02824 Figs 2–3

Etymology – The specific epithet '*garethjonesii*' is name in honour of E.B. Gareth Jones in recognition of his contributions to mycology.

Holotype – MFLU16–2859

Saprobic on dead wood of *Cotoneaster nummularius* Fisch. & C. A. Mey., in terrestrial habitats. **Sexual morph**: *Ascomata* 179–199 µm high × 163–322 µm diam. ($\bar{x}$ = 188.5 × 257 µm, n = 3), apothecia, cup-shaped, superficial, solitary to grouped, black. *Receptacle* pulvinate, disc convex, disc and the margins are black. *Exciple peridium* 21 × 30 µm wide consisting of thick-walled, pigmented, isodiametric cells. *Hymenium* upper part blackish brown and lower part is hyaline. *Hamathecium* comprising 2 × 3 µm wide, numerous, cylindrical, broad cellular pseudoparaphyses, anastomosed, constricted septate, hyaline, apical pigmented, exceeding asci in length, apices are glued together to develop epithecium. *Asci* 74–110 × 21–29 µm ($\bar{x}$ = 88 × 24.5 µm, n = 20), 8-spored, bitunicate, saccate to broad-clavate, broadly rounded at apex, non-amyloid, with a short bifurcate pedicel or apedicellate. *Ascospores* 20–28 × 9–13 µm ($\bar{x}$ = 25 × 11 µm, n = 20), overlapping 2–3-seriate, partially overlapping, obovoid or elliptic with broadly to narrow rounded ends, initially 1-septate at immature, becoming phrgmosporous to muriform at maturity, 3-transversely septate, with 1–2-vertical septate, hyaline, smooth-walled. **Asexual morph**: Undetermined as did not sporulate in culture.

Culture characteristics – Ascospores germinating on MEA within 12 h and spores changed to brown with germ tubes produced from each cell. Colonies on MEA slow growing, reaching 5 mm diam. in 2 week at 28 °C, low convex, slightly effuse hairy, fimbriate edge, aerial mycelium radiating outwards, partially superficial, and partially immersed mycelium, cream to yellowish, not sporulate on culture at 30–45 days.

Material examined – TURKEY, Kırşehir Province, Boztepe district, mountain ligth forest, on dead wood of *Cotoneaster nummularius* Fisch. & C. A. Mey. (*Rosaceae*), 1370 m, 39°13'313'' N, 34°13'434'' E, 2 December 2012, E. Hüseyin (KE 201, **holotype**; MFLU16–2859, **isotype**) – ex-type living culture, MFLUCC16–0210.

Notes – The black apothecial ascomata, thin inner layer of bitunicate asci and muriform ascospores found in *Neorhamphoria garethjonesii* are similar to these characters in some genera (e.g. *Murangium* and *Tryblidaria*) of *Patellariaceae* (Yacharoen et al. 2015). *Neorhamphoria garethjonesii* differs from these genera in having hyaline muriform

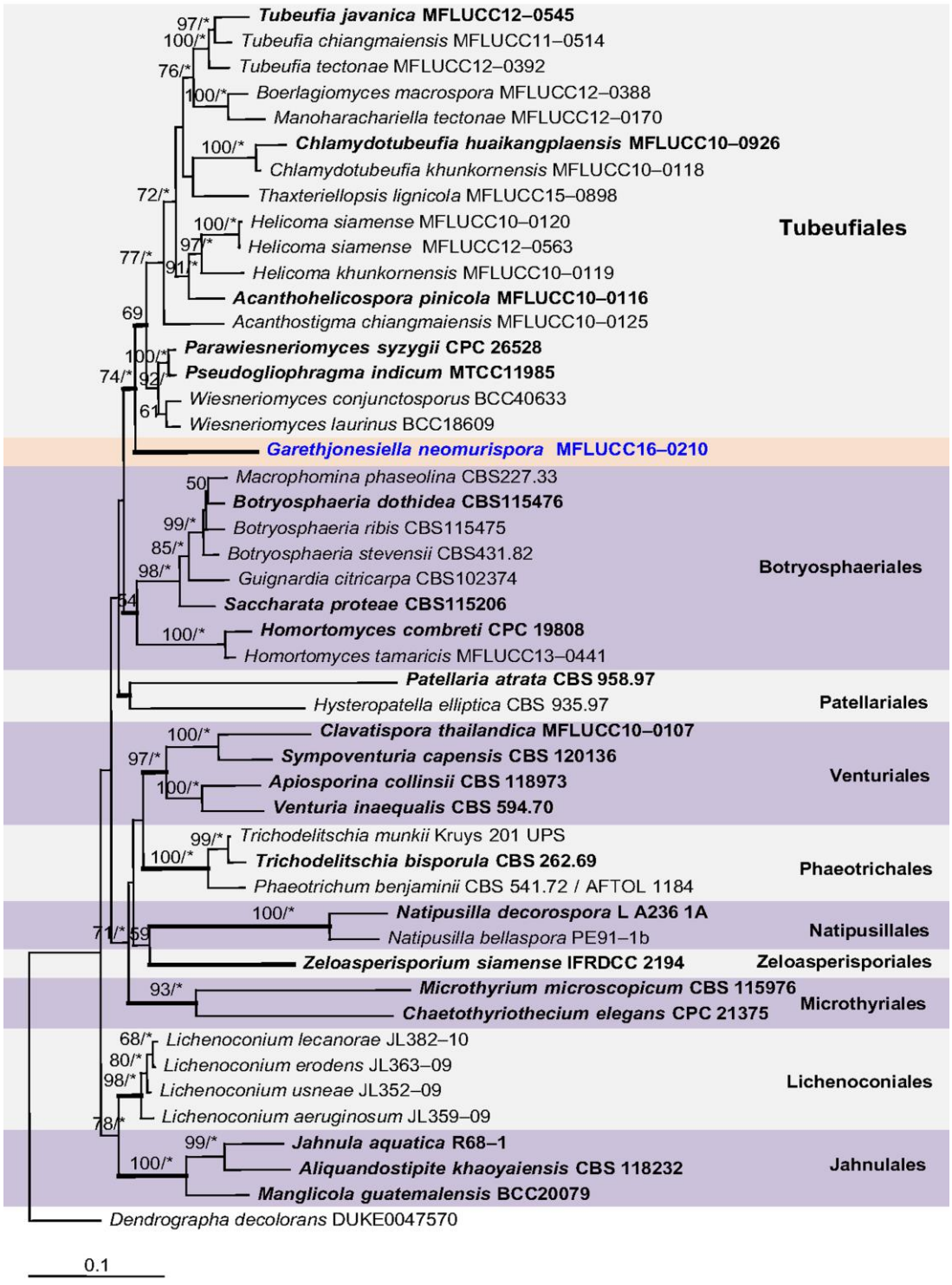

Fig. 1 Phylogram showing the best RAxML maximum likelihood tree (lnL = -22896.365251) generated from the combined multigene (LSU, SSU and TEF1α) analysis, with the GTRGAMMAI model, for showing the placement of the new genus *Neorhamphoria* and other closely related members of orders of Dothideomycetes. ML bootstrap values 1,000 repetitions with ⩾50 % (BS) are shown above the nodes and Bayesian posterior probabilities with ⩾0.95 (PP) are marked with an asterisk (*). The tree is rooted with *Dendrographa decolorans* (Turner & Borrer) Ertz & Tehler (*Roccellaceae*, *Arthoniales*). The new taxon in this study is highlighted in bold blue and all ex-type strains are in bold.

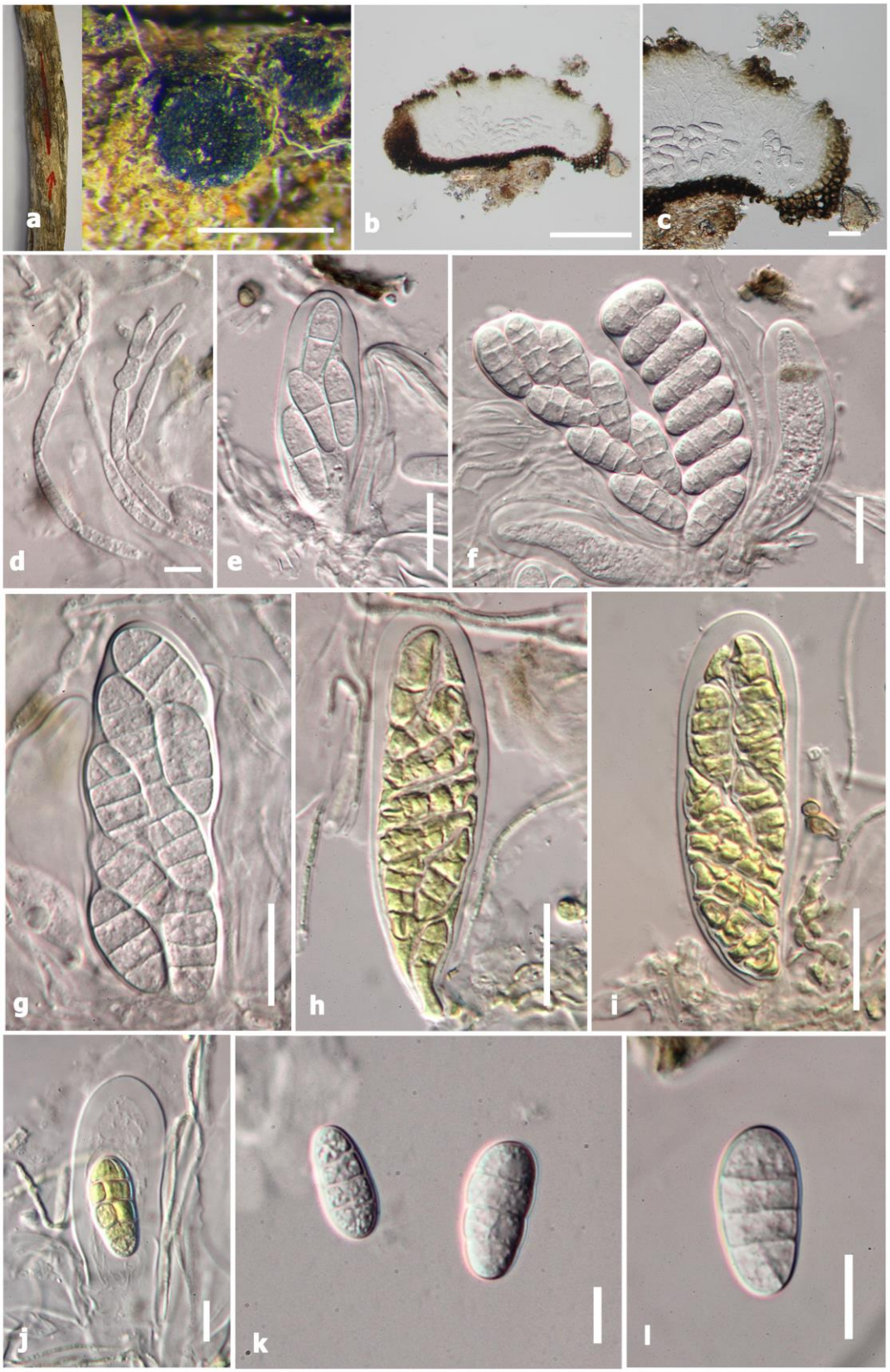

Fig. 2 *Neorhamphoria garethjonesii* (MFLU16–2859, holotype). a Type material and close up of ascoma. b Cross section of ascoma. c Peridium d Pseudoparaphyses e Immature ascus f,g Asci. h-j Asci and ascospores strained in Melzer's reagent. k, l Ascospores. Scale bars: a = 500 µm, b = 200 µm, c = 50 µm, d = 5 µm, e-i = 20 µm, j-l = 10 µm.

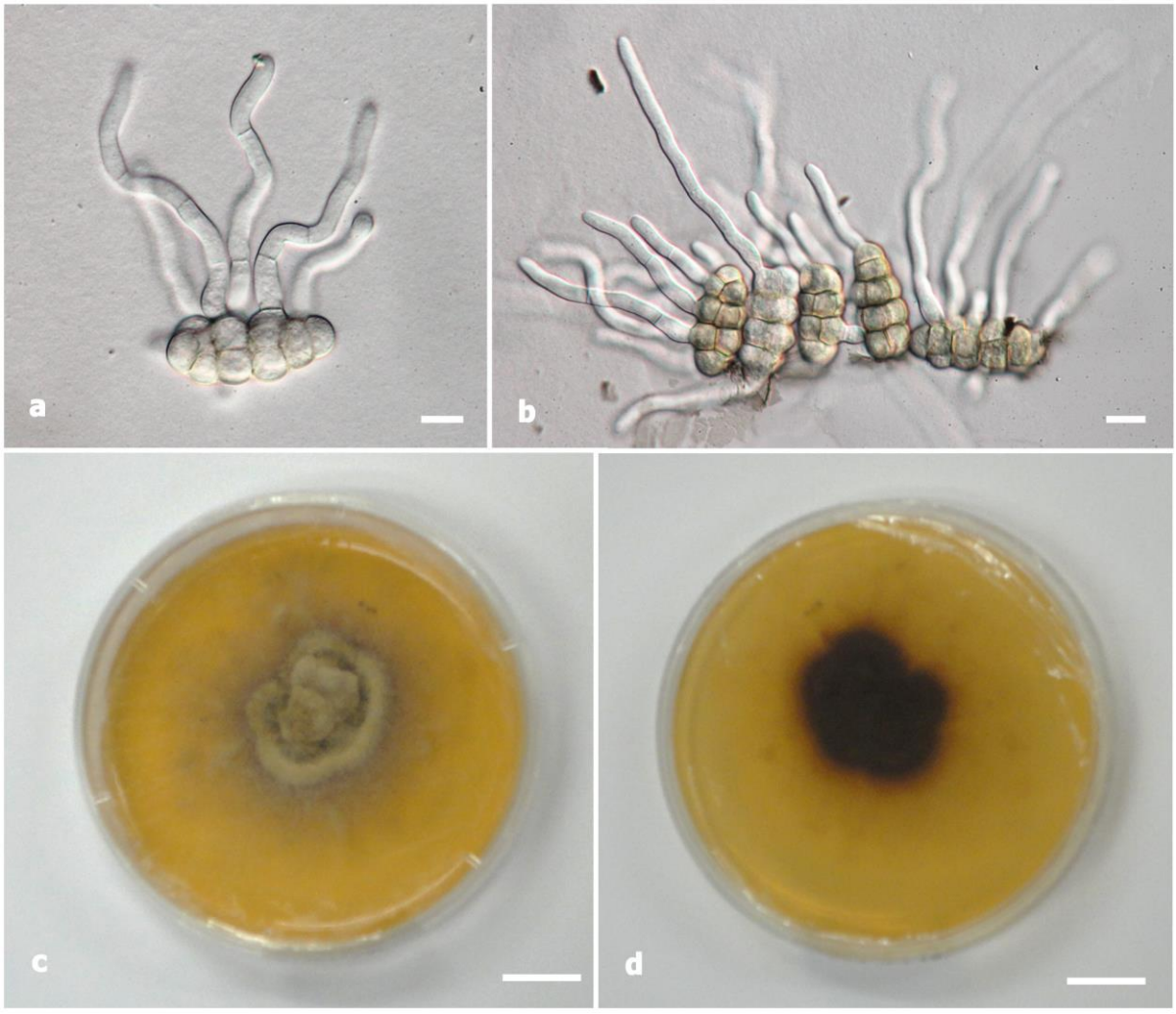

Fig. 3 *Neorhamphoria garethjonesii* (MFLU16–2859, holotype). a, b Germinating ascospores. c, d Colonies cultured on MEA from surface and reverse at 8 weeks. Scale bars: a, b = 10 µm, c, d = 10 mm.

ascospores with 3-transverse septa and 1–2 vertical septa. Multigene phylogenetic analysis (LSU, SSU and TEF1α) shows that *N. garethjonesii* formed a clade at the base of *Tubeufiaceae*, while the clade of *Patellariaceae* is distant from *Neorhamphoria garethjonesii* (Fig. 1). According to overall morphological characteristics, the taxon given as *N. garethjonesii* differs from all tubeufiaceous genera. Therefore, we introduce this new genus to accommodate a monotypic species *N. garethjonesii* which we treat in Dothideomycetes genera *incertae sedis*.

Discussion

Neorhamphoria garethjonesii was first identified as a species of *Rhamphoria* as it appears to have unitunicate asci. However, a blast search and analysis of LSU, SSU and TEF1α sequence data showed that it is related to dothideomycetous taxa. The blasted LSU and SSU sequences showed the new taxon to be loosely related to species of *Chlamydotubeufia*, *Helicoma*, *Helicosporium*, *Tubeufia* of *Tubeufiales* with 95% to 96% similarity, while TEFα sequence data showed it to be related to species of *Alternaria*, *Bipolaris*, *Neofusicoccum* and a *Pleosporaceae* sp. with 91% similarity. Analysis of LSU sequence data, placed *Neorhamphoria* close to *Trypetheliales* in a lineage basal to

Patellariales, but this lacked good statistical support. The taxon was distantly related to *Tubeufiales* (tree not shown). Analyses of combined LSU, SSU and TEF1α sequence data showed that *Neorhamphoria* clustered with *Tubeufiales* (Fig. 1). This genus is probably a basal genus or family related to *Tubeufiales*, however this cannot be confirmed until sequence data and more related taxa are available for study. *Neorhamphoria* is therefore treated in *Tubeufiales*, genus *incertae sedis*.

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References

Baydar S. 1975 – Erzurum, Erzincan ve Gümüşhane İllerinde Bitkilerden Toplanan Ascomycetes Fungusları Üzerinde Araştırmalar. Atatürk Üniversitesi Yayınları No: 411. Fen Fak. Yayınları No: 65, Araştırma Serisi 43, Atatürk Üniversitesi Basımevi, Erzurum.

Baydar S. 1982 – The fungus species of Ascomycetes collected from Trabzon and Rize Provinces. Atatürk Üniversitesi Fen Fak. Dergisi 1, 250–285.

Boonmee S, Zhang Y, Chomnunti P, Chukeatirote E et al. 2011 – Revision of lignicolous *Tubeufiaceae* based on morphological reexamination and phylogenetic analysis. Fungal Diversity 51, 63–102.

Boonmee S, Bhat JD, Maharachchikumbura SSN, Hyde KD. 2014a – *Clavatispora thailandica* gen. et sp. nov., a novel taxon of *Venturiales* (Dothideomycetes) from Thailand. Phytotaxa 176, 092–101.

Boonmee S, Rossman AY, Lui JK, Li WJ et al. 2014b – *Tubeufiales*, ord. nov., integrating sexual and asexual generic names. Fungal Diversity 68, 239–298.

Bülbül AS, Hüseyin E. 2013 – New records of microungi from Turkey (Bartın Province). Mycotaxon 125, 201–208.

Bülbül AS, Selçuk F, Hüseyin E. 2011 – New records of microfungi from Mt.Strandzha in Turkey (south-eastern Europe). I. Mycologia Balcanica 8, 161– 67.

Chomnunti P, Hongsanan S, Hudson BA, Tian Q et al. 2014 – The sooty moulds. Fungal Diversity 66, 1–36.

Crane JL, Shearer CA, Barr ME. 1998 – A revision of *Boerlagiomyces* with notes and a key to the saprobic genera of *Tubeufiaceae*. Canadian Journal of Botany 76, 602–612.

Davis PH. (edit.) 1967 – Flora of Turkey and East Aegean Islands. Vol. 2. Edinburgh University Press, Edinburgh.

Doilom M, Dissanayake AJ, Wanasinghe DN, Boonmee S et al. (2017) Microfungi on *Tectona grandis* (teak) in Northern Thailand. Fungal Diversity doi:10.1007/s13225-016-0368-7

Erdoğdu M, Hüseyin E. 2008 – Microfungi of Kurtboğazı dam (Ankara and its enviroment). The Journal of Systematic Botany 14, 131–150.

Göbelez M. 1963 – La Mycoflore de Turquie. I. Mycopathologia et Mycologia Applicata 19, 296–314.

Glez-Peña D, Gómez-Blanco D, Reboiro-Jato M, Fdez-Riverola F et al. 2010 – ALTER: program–oriented format conversion of DNA and protein alignments. Nucleic Acids Research 38, 14–18.

Güven K, Tamer AÜ. 1993 – Some parasitic fungi determined in plants living in Eskişehir. Journal of Faculty of Science Ege University B 15, 25–31.
Hamzaoğlu E. 1996 – Kervansaray dağının (Kırşehir) florası. Ot sistematik botanik dergisi 3, 1–24.
Hall TA. 1999 – BioEdit: a user-friendly biological sequence alignment editor and analysis program for Windows 95/98/NT. Nucleic Acids Symposium Series 41, 95–98.
Hongsanan S, Tian Q, Bahkali AH, Yang JB et al. 2015 – Zeloasperisporiales ord. nov., and two new species of *Zeloasperisporium*. Cryptogamie Mycologie 36, 301–317.
Hüseyin E, Bülbül AS, Akgül H. 2009 – Some notes on micromycetes from Turkey. Pakistan Journal of Botany 41, 453–459.
Hüseyin E, Selçuk F. 2016 – *Pileolaria azerii* (Uredinales), a new rust species from Turkey. Sydowia 68, 1–6.
Hüseyin E, Selçuk F, Ekici K. 2016 – *Acrodictys*, *Corynespora*, *Karstenula*, *Oncopodium*, and *Sporocadus*: new genera for Turkey. Mycotaxon 131, 331–335.
Hüseyin E, Selçuk F, Şahin A, Erdoğdu M. 2006 – New records of ascomycetous microfungi species for Turkey. Plant, fungal and habitats diversity investigation and conservation. IVth Balcan Botanical Congress. Book of Abstracts. Sofia.
Hüseyin E, Yıldızbaş M. 2005 – Some micromycetes on oak (Quercus) in Karaman Province of Turkey. Proceedings of the XVI Symposium of mycologists and lichenologists of Baltic States. Cesis.
Hüseyinov E, Selçuk F. 2001 – Contribution to study of mycoflora of Turkey. II. Ascomycetous and Basidiomycetous microfungi of forest trees and shrubs in the Black Sea coast (Rize Province). Mikologia i Fitopatologia 35, 13–15.
Hüseyinov E, Selçuk F. 2000 – Türkiye de bulunan ve bulunması muhtemel Sphaerotheca Lév. Genusu türleri ile ilgili bir rapor. Journal of Qafgaz University 6, 159–166.
Hyde KD, Hongsanan S, Jeewon R, Bhat DJ et al. 2016 – Fungal diversity notes 367–490: taxonomic and phylogenetic contributions to fungal taxa. Fungal Diversity 80, 1–270.
Jayasiri SC, Hyde KD, Ariyawansa HA, Bhat JD et al. 2015 – The faces of Fungi database: fungal names linked with morphology, phylogeny and human impacts. Fungal Diversity 74, 3–18.
Karaca İ. 1961 – A Research on *Erysiphaceae* of Turkey. Atatürk Üniversitesi Yıllığı.
Katoh K, Standley K. 2013 – MAFFT Multiple Sequence Alignment Software Version 7: Improvements in Performance and Usability. Molecular Biology and Evolution 30, 772– 780.
Kirk PM. 2016 – Index Fungorum Partnership: Index Fungal. http://www.indexfungorum.org/Names/Names.asp. Accession Date 19 December 2016
Kodsueb R, Jeewon R, Vijaykrishna D, McKenzie EHC et al. 2006 – Systematic revision of *Tubeufiaceae* based on morphological and molecular data. Fungal Diversity 21, 105–130.
Mel'nik VA, Hüseyin E, Selçuk F. 2004 – Contribution to the studying of micromycetes in several Black Sea provinces of Turkey. Novitates Systematicae Plantarum non Vascularum. Nauka. Petropolis 37, 133–148.
Miller MA, Pfeiffer W, Schwartz T. 2010 – Creating the CIPRES Science Gateway for inference of large phylogenetic trees. In: Proceedings of the Gateway Computing Environments Workshop (GCE). San Diego Supercomput. Center, New Orleans.
Niessl von G. 1876 – Notizen uber neue und kritische Pyrenomyceten. Verhandlungen des Naturforschenden Vereines in Brünn 14, 165–218.

Page RDM. 2001 – Tree View: tree drawing software for Apple Macintosh and Windows. http://taxonomy.zoology.gla.ac.uk/ rod/treeview.html

Pratibha J, Nguyen HDT, Mel'nik VA, Bhat DJ et al. 2015 – Lectotypification, epitypification, and molecular phylogeny of the synnematous hyphomycete *Pseudogliophragma indicum*, the second genus in the *Wiesneriomycetaceae*. Mycoscience 56, 387–395.

Promputtha I, Miller AN. 2010 – Three new species of *Acanthostigma* (*Tubeufiaceae*, Dothideomycetes) from Great Smoky Mountains National Park. Mycologia 102, 574–587.

Rajeshkumar KC, Sharma R. 2013 – *Tamhinispora* a new genus belonging to family *Tubeufiaceae* from the Western Ghats, India based on morphology and phylogenetic analysis. Mycosphere 4, 165–174.

Réblová M, Barr M 2000 – The genus *Acanthostigma* (*Tubeufiaceae*, *Pleosporales*). Sydowia 52, 258–285.

Ronquist F, Huelsenbeck JP. 2003 – MrBayes 3: Bayesian phylogenetic inference under mixed models. Bioinformatics 19, 1572–1574.

Selçuk F, Hüseyin E. 2014 – New records of microfungi from Mt. Strandzha in Turkey (southeastern Europe). II. Mikologia i Fitopatologia 48, 202–208.

Selçuk F, Hüseyin E, Şahin A. 2010 – Contribution to Study of Turkey Mycobiota. IV. The new records of microfungi with asci to forest phytocoenose of Rize Province. Artvin Coruh University Faculty of Forestry Journal 11, 53–60.

Suetrong S, Rungjindamai N, Sommai S, Rungareerate P et al. 2014 – *Wiesneriomyces* a new lineage of Dothideomycetes (Ascomycota) basal to *Tubeufiales*. Phytotaxa 176, 283–297.

Villesen P. 2007 – FaBox: an online tool box for fasta sequences. Molecular Ecology Notes 7, 965–968.

Wijayawardene NN, Hyde KD, Camporesi E, Bhat DJ et al. 2014 – *Homortomyces tamaricis* sp. nov. and convergent evolution of *Homortomyces* and *Stilbospora*. Phytotaxa 176, 156–163.

Yacharoen S, Tian Q, Chomnunti P, Boonmee S et al. 2015 – *Patellariaceae* revisited. Mycosphere 6, 290–326.