ISSN (print) 0093-4666 ISSN (online) 2154-8889

MYCOTAXON

http://dx.doi.org/10.5248/117.343

Volume 117, pp. 343–349 *July–September 2011*

Lignincola conchicola from palms with a key to the species of *Lignincola*

Jian-Kui Liu[1*], E.B. Gareth Jones[2], Ekachai Chukeatirote[1], A.H. Bahkali[3] & Kevin. D. Hyde[1, 3]

[1] *School of Science, Mae Fah Luang University, Chiang Rai, 57100, Thailand*
[2] *BIOTEC Central Research Unit, National Center for Genetic Engineering and Biotechnology, 113 Thailand Science Park, Bangkok, 12120, Thailand*
[3] *College of Science, Botany and Microbiology Department, King Saud University, P.O. Box: 2455, Riyadh 1145, Saudi Arabia*

*Correspondence to: *ljiankui@gmail.com*

Abstract — During studies of palm fungi, a new *Lignincola* species was found in Thailand. It differs from other members of the genus in ascospore dimensions and the occurrence of its ascomata on the adhesive pad of a marine invertebrate. *Lignincola conchicola* is described and illustrated, and a key to *Lignincola* species is provided. The palm *Phoenix* is a new substratum for marine fungi.

Key words — *Halosphaeriaceae*, mangrove, taxonomy, tropic

Introduction

During research on palm fungi in Thailand (Pinnoi et al. 2004, 2006, 2009, 2010, Pilantanapak et al. 2005, Pinruan et al. 2004a,b, 2007, 2010a,b, Rungjindamai et al. 2008, Liu et al. 2010) a new taxon collected on *Phoenix paludosa* in Ranong mangrove, was discovered. The taxon is characteristic of *Lignincola* (*Halosphaeriaceae*).

Höhnk (1955) introduced *Lignincola* for a single species *L. laevis* Höhnk, which was characterized by black perithecioid ascomata, persistent clavate to fusiform, thin-walled asci lacking an apical apparatus, and 1-septate hyaline ascospores lacking appendages. The genus differs from *Aniptodera*, *Halosarpheia,* and *Phaeonectriella* in lacking appendaged ascospores (Pang et al. 2003a,b, Jones et al. 2009). Three other *Lignincola* species have been described. One, initially described as *Gnomonia longirostris* Cribb & J.W. Cribb (Cribb & Cribb 1956), was later transferred to *Lignincola* by Kohlmeyer (1984). Pang et al. (2003a) subsequently transferred the species to a new genus *Neptunella*

based on ultrastructural and molecular evidence. Asci in *N. longirostris* have an apical pore, retraction of the plasmalemma, and ascospores with a thin mucilaginous sheath (Pang et al. 2003a). A second species, *Lignincola tropica* Kohlm., was described from mangrove wood (Kohlmeyer 1984) and has larger ascospores than *L. laevis*. The identity of this species is confused as initially the asci were described as possessing an apical pore, but subsequently Kohlmeyer & Volkmann-Kohlmeyer (1988) revised the description by stating that there was no pore to the ascus. In addition, sequence data show that collections with asci with an apical pore do not belong in *Lignincola* (Pang unpublished data). A third species, *L. nypae* K.D. Hyde & Alias (Hyde et al. 1999), was described from the brackish water palm *Nypa fruticans* and has clavate asci with a refractive apical thickening with a pore and cylindrical ascospores, features not found in *Lignincola*. A molecular study is required to resolve the placement of both *L. tropica* and *L. nypae*.

The new species *Lignincola conchicola* is described and illustrated and a key to *Lignincola* species is provided.

Materials & methods

Palm fronds were collected from Ranong mangrove, Ranong Province, Thailand. Samples were processed and examined following the methods outlined by Hyde et al. (2000) and Taylor & Hyde (2003). Several unsuccessful attempts were made to isolate and grow the fungus from single ascospores. Morphological measurements and photomicrographs were made according to Liu et al. (2010). The holotype is deposited in the herbarium of Mae Fah Luang University (MFLU), Chiang Rai, Thailand.

Taxonomy

Lignincola conchicola J.K. Liu, E.B.G. Jones & K.D. Hyde, **sp. nov**. Plate 1

MycoBank: MB 561207

Ascomata superficialia, 120–160 µm alta, 50–75 µm diametro globosa, subglobosa vel ellipsoidea, uniloculata, atro-brunnaea vel nigra. Asci 50–75(–90) × 13–16 µm, clavati vel cylindricae-clavati, unitunicati, 8-spori. Ascosporae 10.5–16 × 5–7 µm, hyalinae, ellipsoideae vel fusiformae, bicellulares, non-appendiculatae.

Type: Thailand, Ranong Province, Ranong mangrove, on adhesive disc of an invertebrate on submerged fronds of *Phoenix paludosa* Roxb. (*Arecaceae*), 26 January 2010, E.B.G. Jones and J.K. Liu, JKA0027 (MFLU11 0032 **holotype**).

Etymology: Referring to its habitat on the adhesive disc of an invertebrate.

Ascomata 120–160 × 50–75 µm, superficial, globose, subglobose or ellipsoidal, uniloculate, dark brown to black, rounded at the base and developing on the adhesive pad of a marine invertebrate (Plate 1 A–B). Peridium 12–22 µm thick, membranous, comprising several layers, the outer stratum of 1–3 layers comprising dark brown, thick-walled cells, the inner 3–5 layers, textura prismatica comprising hyaline, thick-walled cells. Paraphyses and catenophyses

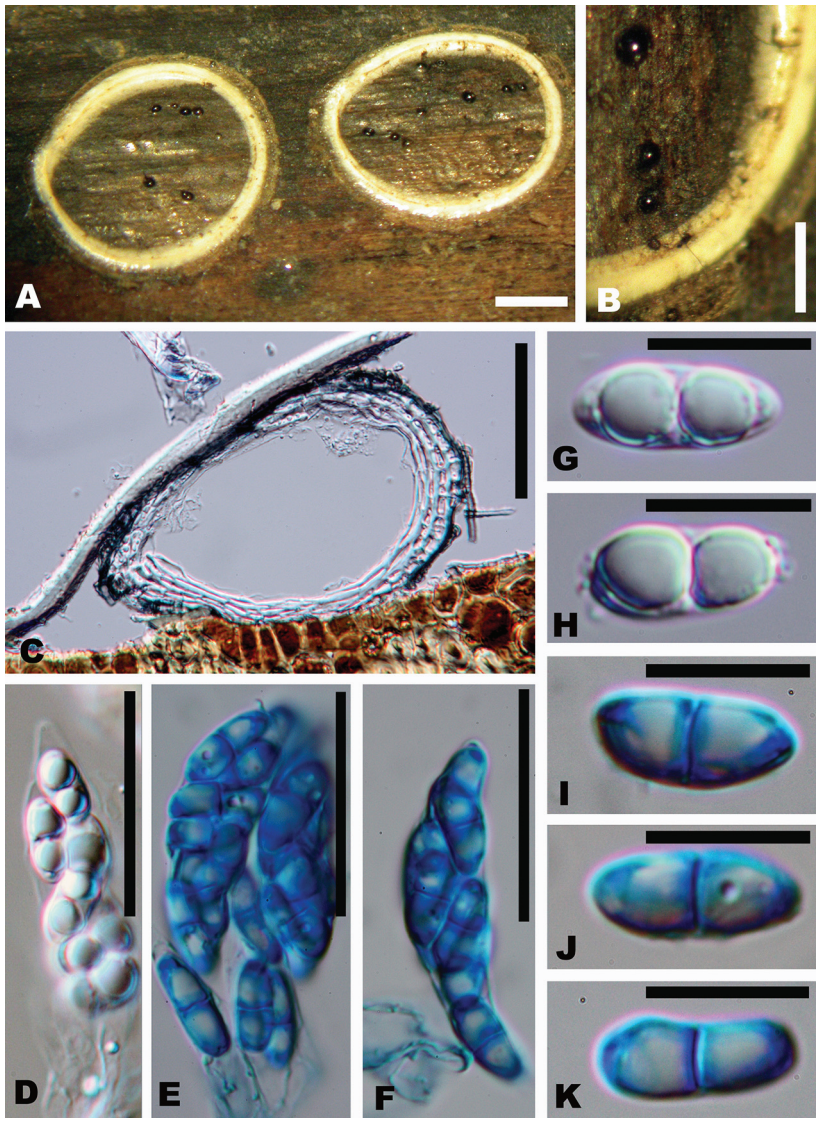

Plate 1. *Lignincola conchicola* (MFLU11 0032 holotype). A–B. Ascomata on host surface. C. Section of ascoma. D–F. Asci, G–K. Ascospores. C–D, G–H, in water, E–F, I–K, in cotton blue. Scale bars. A = 1000 µm, B = 500 µm, C = 50 µm, D–F = 30 µm, G–K = 10 µm.

absent. Asci 50–75 (–90) × 13–16 µm (Mean = 62 × 14 µm, n = 25), 8-spored, unitunicate, thin-walled, clavate to cylindrical-clavate, short stipitate, lacking

an apical apparatus and apical pore, persistent, arising from the base of ascoma. Ascospores 10.5–16 × 5–7 µm (Mean = 13 × 5.5 µm, n = 50), 1-septate, hyaline, ellipsoidal, frequently fusiform, with a slightly pale rose hue in transmitted light, appendages absent.

Habitat: Saprobic on adhesive disc of an invertebrate on submerged *Phoenix paludosa* fronds.

Distribution: Thailand.

Key to species of *Lignincola*:

1. Asci with an apical apparatus, ascospores cylindrical ..... ***L. nypae***
1. Asci without an apical pore, ascospores ellipsoidal 2
2. Ascospores thin-walled 3
2. Ascospores thick-walled, 22–36 × 12–16 µm ..... ***L. tropica***
3. Ascospores 13–24 × 5–8 µm ..... ***L. laevis***
3. Ascospores 10.5–16 × 5–7 µm; on the adhesive pad of a marine invertebrate ..... ***L. conchicola***

Discussion

Most taxa referred to *Halosphaeriaceae* are marine, usually with well-developed perithecioid ascomata that are globose, light or dark, and usually with an ostiole lined with periphyses (Müller & Arx 1962, Kohlmeyer 1972). Paraphyses are absent, catenophyses generally deliquesce if present, asci are clavate to ellipsoidal, thin-walled, unitunicate and deliquesce early, generally lacking an apical apparatus or pore, and ascospores are hyaline to light brown, unicellular or one to several septate, often with appendages or surrounded by a mucilaginous sheath (Shearer & Miller 1977, Jones 1995, Sakayaroj et al. 2011). A few transitional species of this family have been found in freshwater and brackish water habitats, including some species of *Aniptodera, Ascosacculus, Halosarpheia, Lignincola, Luttrellia* and *Nais* (Shearer & Miller 1977, Shearer 1989, Jones 1995, Pang et al. 2003a,b, Jones et al. 2009, Sakayaroj et al. 2011). The morphological characteristics of *Lignincola conchicola* fit well within this family.

Jones et al. (2009) suggested that the genus *Lignincola* has only one unifying character — the hyaline 1-septate ascospores without appendages. In *L. conchicola*, asci are persistent and thin-walled and lack an apical apparatus (Plate 1 D–F) and ascospores are thin-walled and lack appendages (Plate 1 G–K). *Lignincola conchicola* differs from other species in the genus in ascospore dimensions and the persistent occurrence of ascomata on the adhesive pad of a marine invertebrate.

Lignincola conchicola is most similar to *L. laevis*, the type species of the genus. The two taxa have similarly shaped asci and ascospores. They differ in that *L. laevis* has larger ascospores (13–24 × 5–8 µm) and the ascomata are

necked. *Lignincola tropica* differs from *L. conchicola* in having larger ascospores (22–36 × 12–16 µm) and in being thick-walled (Jones et al. 2009), *Lignincola nypae* can be distinguished from the new species by the presence of an apical apparatus in the ascus and cylindrical ascospores (Hyde et al. 1999, Pang et al. 2003a, Jones et al. 2009).

Three genera —*Aniptodera*, *Gesasha, Nais*— are also morphologically similar to *Lignincola* with some species with 1-septate, unappendaged ascospores (Shearer & Miller 1977, Kohlmeyer 1984, Crane & Shearer 1986, Abdel-Wahab & Nagahama 2011). In the type species of *Aniptodera*, the ascus is clavate with an apical pore and apical retraction of the plasmalemma, while the ascospores are thick-walled. Three species were described when Abdel-Wahab & Nagahama (2011) introduced *Gesasha*, and the ascospore dimensions and shape are quite similar to *L. conchicola*. However, *Gesasha* diagnostic characters include a periphysate neck, asci with an apical thickening, and pore features that exclude *L. conchicola* (Abdel-Wahab & Nagahama 2011). The two currently accepted *Nais* species differ from *L. conchicola* in ascospore dimensions and deliquescing asci (Pang et al. 2003a, Jones et al. 2009).

Acknowledgements

The authors are grateful to Dr. Eric H.C. McKenzie (Landcare Research, Auckland, New Zealand) and Dr. Rui-Lin Zhao (Southwest Forestry University, Yunnan, China) for reviewing and improving the manuscript. We thank the Mushroom Research Centre (Mae Taeng District, Chiang Mai Province, Thailand) for providing funding and facilities for this study. The BIOTEC Central Research Unit (National Center for Genetic Engineering and Biotechnology, Thailand Science Park, Bangkok, Thailand) is thanked for providing facilities for the southern Thailand collecting trip. The Global Research Network for Fungal Biology and King Saud University are thanked for supporting this work. The authors also thank Anupong Klaysuban (BIOTEC), Jariya Sakayaroj (BIOTEC), Satinee Suetrong (BIOTEC) and Sita Preedanon (BIOTEC) for their assistance with fieldwork. Dr. Ying Zhang (University of Hong Kong, Hong Kong SAR, P.R. China) and Phongeun Sysouphan Khong (Mae Fah Luang University, Thailand) are thanked for their helpful suggestions. Kanjana Niraphai (MFU) is thanked for herbarium assistance.

Literature cited

Abdel-Wahab MA, Nagahama T. 2011. *Gesasha* (*Halosphaeriales, Ascomycota*), a new genus with three new species from the Gesashi mangroves in Japan. Nova Hedwigia 92: 497–512. http://dx.doi.org/10.1127/0029-5035/2011/0092-0497

Crane J, Shearer C. 1986. *Nais glitra*, an ascomycete from red mangrove in Everglades National Park, Florida. Transactions of the British Mycological Society 86: 509–512.

Cribb A, Cribb JW. 1956. Marine fungi from Queensland. II. Papers of the Department of Botany, University of Queensland 3: 97–105.

Höhnk W. 1955. Studien zur Brack- und Seewassermykologie. V. Höhere Pilze des submersen Holzes. Veröffentlichungen des Institutes für Meeresforschung in Bremerhaven 3: 199–227.

Hyde KD, Goh TK, Lu BS, Alias SA. 1999. Eleven new intertidal fungi from *Nypa fruticans*. Mycological Research 103: 1409–1422.

Hyde KD, Taylor JE, Fröhlich J. 2000. Genera of *Ascomycetes* from palms. Fungal Diversity Press 2, Hong Kong .

Jones EBG. 1995. Ultrastructure and taxonomy of the aquatic ascomycetous order Halosphaeriales. Canadian Journal of Botany 73: 790–801.

Jones EBG, Sakayaroj J, Suetrong S, Somrithipol S, Pang KL. 2009. Classification of marine Ascomycota, anamorphic taxa and Basidiomycota. Fungal Diversity 35: 1–187.

Kohlmeyer J. 1972. A revision of *Halosphaeriaceae*. Canadian Journal of Botany 50: 1951-1963.

Kohlmeyer J. 1984. Tropical marine fungi. Marine Ecology 5: 329-378.

Kohlmeyer J, Volkmann-Kohlmeyer B. 1988. *Ophiodeira* gen. nov. (*Halosphaeriales*) and a survey of higher marine fungi from Saint Croix (Virgin Islands). Canadian Journal of Botany 66: 2062–2067.

Liu JK, Chomnunti P, Cai L, Phookamsak R, Chukeatirote E, Jones EBG, Moslem M, Hyde KD. 2010. Phylogeny and morphology of *Neodeightonia palmicola* sp. nov. from palms. Sydowia 62: 261–276.

Müller E, Arx JA von. 1962. Die Gattungen der didymosporen Pyrenomyceten. Büchler.

Pang KL, Vrijmoed LLP, Kong RYC, Jones EBG. 2003a. *Lignincola* and *Nais*, polyphyletic genera of the Halosphaeriales (Ascomycota). Mycological Progress 2: 29–36.

Pang KL, Vrijmoed LLP, Kong RYC, Jones EBG. 2003b. Polyphyly of *Halosarpheia* (*Halosphaeriales, Ascomycota*): implications on the use of unfurling ascospore appendage as a systematic character. Nova Hedwigia 77: 1–18. http://dx.doi.org/10.1127/0029-5035/2003/0077-0001

Pilantanapak A, Jones EBG, Eaton RA. 2005. Marine fungi on *Nypa fruticans* in Thailand. Botanica Marina 48: 365–373.

Pinnoi A, Pinruan U, Hyde KD, Lumyong S. 2004. *Submersisphaeria palmae* sp. nov. with a key to species, and notes on *Helicoubisia*. Sydowia 56: 72–78.

Pinnoi A, Lumyong S, Hyde KD, Jones EBG. 2006. Biodiversity of fungi on the palm *Eleiodoxa conferta* in Sirindhorn peat swamp forest, Narathiwat, Thailand. Fungal Diversity 22: 205–218.

Pinnoi A, Phongpaichit S, Hyde KD, Jones EBG. 2009. Biodiversity of fungi on *Calamus* (*Palmae*) in Thailand. Cryptogamie, Mycologie 30: 181–190.

Pinnoi A, Phongpaichit P, Jeewon R, Tang AMC, Hyde KD, Jones EBG. 2010. Phylogenetic relationships of *Astrocystis eleiodoxae* sp. nov. (Xylariaceae). Mycosphere 1: 1–9.

Pinruan U, McKenzie EHC, Jones EBG, Hyde KD. 2004a. Two new species of *Stachybotrys*, and a key to the genus. Fungal Diversity 17: 145–157.

Pinruan U, Sakayaroj J, Jones EBG, Hyde KD. 2004b. Aquatic fungi from peat swamp palms: *Phruensis brunneispor*a gen. et sp. nov. and its hyphomycete anamorph. Mycologia 96: 1163–1170.

Pinruan U, Hyde KD, Lumyong S, McKenzie EHC, Jones EBG. 2007. Occurrence of fungi on tissues of the peat swamp palm *Licuala longicalycata*. Fungal Diversity 25: 157–173.

Pinruan U, Rungjindamai N, Choeyklin R, Lumyong S, Hyde KD, Jones EBG. 2010a. Occurrence and diversity of basidiomycetous endophytes from the oil palm, *Elaeis guineensis* in Thailand. Fungal Diversity 41: 71–88. http://dx.doi.org/10.1007/s13225-010-0029-1

Pinruan U, Rungjindamai N, Sakayaroj J, Lumyong S, Hyde KD, Jones EBG. 2010b. *Baipadisphaeria* gen. nov., a freshwater ascomycete (*Hypocreales, Sordariomycetes*) from decaying palm leaves in Thailand. Mycosphere 1: 53–63.

Rungjindamai N, Pinruan U, Choeyklin R, Hattori T, Jones EBG. 2008. Molecular characterization of basidiomycetous endophytes isolated from leaves, rachis and petioles of the oil palm, *Elaeis guineensis*, in Thailand. Fungal Diversity 33: 139–161.

Sakayaroj J, Pang KL, Jones EBG. 2011. Multi-gene phylogeny of the Halosphaeriaceae: its ordinal status, relationships between genera and morphological character evolution. Fungal Diversity 46: 87–109. http://dx.doi.org/10.1007/s13225-010-0072-y

Shearer C. 1989. *Aniptodera* (*Halosphaeriaceae*) from wood in freshwater habitats. Mycologia 81: 139–146.

Shearer C, Crane J. 1978. The distribution of *Nais inornata*, a facultative marine ascomycete. Mycotaxon 7: 443–452.

Shearer C, Miller M. 1977. Fungi of the Chesapeake Bay and its tributaries V. *Aniptodera chesapeakensis* gen. et sp. nov. Mycologia 69: 887–898.

Taylor JE, Hyde KD. 2003. Microfungi of tropical and temperate palms. Fungal Diversity Research Series 12.