



Helicascus gallicus sp. nov., a new freshwater pleosporalean ascomycete from France

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Abstract

A new species of *Helicascus* (*H. gallicus*) is described and illustrated from submerged wood collected from aquatic habitats in western and southern France. It is morphologically characterized by multilocular ascomata covered by a thick clypeus and sharing a common ostiole, clavate asci with endoascus coiling in the pedicel, cellular pseudoparaphyses, and brown 2-celled ascospores with a marked submedian septum. Its relationships with other species of *Helicascus* are discussed based on morphology and 28S and ITS nrDNA sequence comparisons.

Key words: aquatic fungi, monophylogeny, Morosphaeriaceae, taxonomy

Introduction

The pleosporalean genus *Helicascus* Kolm. (1969: 1471) was first described from mangrove wood in Hawaii as a monotypic genus represented by *H. kanaloanus* Kohlm (1969: 1471) (Kohlmeyer 1969). Based on morphological similarities, Hyde (1991) introduced a second species *H. nypae* K.D. Hyde (1991: 314), collected on intertidal palm material in Brunei. *Helicascus kanaloanus* and *H. nypae* formed a well-supported clade in a phylogenetic analysis of marine fungi (Suetrong *et al.* 2009). Subsequently, two further freshwater species were added, i.e. *H. aegyptiacus* Abdel-Wahab & Abdel-Aziz (2013: 153) and *H. aquaticus* Huang Zhang & K.D. Hyde (2013: 155) based on both morphological characteristics and results of LSU and SSU nrDNA sequences analysis (Hyde *et al.* 2013, Zhang *et al.* 2013a). *Massarina thalassioidea* K.D. Hyde & Aptroot (1998: 498) and *Kirschsteiniothelia elaterascus* Shearer (1994: 963) were also transferred to *Helicascus* as *H. thalassioideus* (K.D. Hyde & Aptroot) Huang Zhang & K.D. Hyde (2013: 159) and *H. elaterascus* (Shearer) Huang Zhang & K.D. Hyde (2013: 158) (Zhang *et al.* 2013a). However, *H. elaterascus* deviates from other species in having solitary to clustered ascomata that may become superficial and do not share a common ostiole (Shearer 1993), and *H. thalassioideus* deviates in having separate ascomata and hyaline ascospores (Hyde & Aptroot 1998). *Helicascus* is characterized by immersed ascomata comprising several locules that share a common periphysate ostiole lying under a more or less conspicuous pseudostromatic tissue, or solitary to clustered single-loculate ascomata immersed to nearly superficial; microscopically its bitunicate asci are pedicellate and the endoascus is coiled in the ascus base and often involved in a spectacular stretching upon dehiscence (Kohlmeyer 1969, Hyde 1991, Shearer 1993); ascospores are hyaline to brown, most often unequally 2-celled, smooth or verrucose, with or without a mucilaginous sheath (Zhang *et al.* 2013a).

Along with *Morosphaeria* Suetrong *et al.* (2009: 161), *Helicascus* was assigned to Morosphaeriaceae (Suetrong *et al.* 2009, Hyde *et al.*, 2013). The asexual state of *H. aquaticus* was obtained in culture (Zhang *et al.* 2013a) and regarded as *Pleurophomopsis*-like, a coelomycetous genus also suspected to be the asexual state of *H. nypae* (Hyde & Sutton 1992). The asexual states of the other *Helicascus* species are still unknown.

In the course of an ongoing survey of freshwater ascomycetes in France initiated in 2006 (Zhang *et al.* 2008a, b, 2009, 2013b, c), an aquatic lignicolous ascomycete was repeatedly collected that appeared to fit *Helicascus* well in

ascospores ($26\text{--}31 \times 9.3\text{--}12 \mu\text{m}$ vs $30\text{--}55 \times 17\text{--}25 \mu\text{m}$ in *H. kanaloanus*) and temperate freshwater vs mangroves habitat in the tropics for *H. kanaloanus*. Among the reported freshwater species of *Helicascus*, *H. gallicus* is more comparable with *H. aegyptiacus* in the morphology of its ascomata, but *H. gallicus* can be readily distinguished from *H. aegyptiacus* by its ascospores being slightly smaller on average, being smooth-walled and lacking a mucilaginous sheath. However, in the description of *H. aegyptiacus* by Zhang *et al.* (2013a, p. 153), the length of asci reported as $50\text{--}82 \mu\text{m}$ seems problematic, as it is not consistent with the length of the ascospores showed by their figures of asci. Besides its temperate origin, *H. gallicus* differs from *H. aquaticus* by a thicker peridium ($35\text{--}55\text{--}(70) \mu\text{m}$ thick vs $20\text{--}30 \mu\text{m}$), slightly larger mean of ascospores and lacking a mucilaginous sheath (Table 2).

Among the morphological characteristics mentioned by Kohlmeyer (1969), the thin additional sheath around the base of the asci, the coiling and stretching mechanism of the basal part of the endoascus, and the apical apparatus were regarded as defining a “unique type of asci”. A careful examination of *H. gallicus* did not reveal the presence of any defined structure around the base of asci and no apical ring-like apparatus could be observed either. The coiling of the endoascus in the pedicel does occur in *H. gallicus* but unlike what was reported about *H. kanaloanus*, it is rarely associated with an important stretching. Zhang *et al.* (2013a) did not report any conspicuous stretching of ascus pedicel in their newly reported taxa. Another striking morphological characteristic of *Helicascus* is the multilocular ascomata sharing a common ostiole, as it has been emphasised by Kohlmeyer (1969) and (Hyde 1991). This characteristic lacks in *H. elaterascus* or *H. thalassioideus* (Shearer 1993, Hyde & Aptroot 1998). In particular, under culture condition, *H. gallicus* produced uniloculate ostiolate ascomata with a protruding papilla in this study.

Three strains of *H. gallicus* nest in the clade of *Helicascus* (Fig. 4), which is a well supported clade within the family Morosphaeriaceae. It is notable that all freshwater species of *Helicascus* on the dendrogram, i.e. *H. aegyptiacus*, *H. aquaticus*, *H. elaterascus* and *H. gallicus* form a well supported clade (clade A) with the marine species *H. nypae* (in clade B) in a basal position. No doubt these four freshwater species are closely related despite their different geographical distribution, which is corroborated by molecular results.

Helicascus elaterascus (as *Kirschsteiniotelia elaterascus*) has commonly been recorded in many studies of freshwater fungi e.g. in Chile and North America (Shearer 1993), in Australia (Hyde & Goh 1998), Brunei (Ho *et al.* 2001), China (Goh & Hyde 1999; Tsui *et al.* 2000; Cai *et al.* 2002), Philippines (Cai *et al.* 2003) and South Africa (Hyde *et al.* 1998). It is most likely that *H. gallicus* would also have been given one of these names in the absence of molecular data as the differences between species are minor. Therefore, helicascus-like taxa should be collected worldwide and subject to careful study. We suspect that this may turn out to be a species complex with perhaps numerous species having evolved in isolated streams on various islands of the world. This may also apply to other freshwater species and this should be studied further.

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