

## Aquatic hyphomycetes and other water-borne fungi in Hungary

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The history of research on aquatic hyphomycetes from various aquatic and terrestrial habitats in Hungary since the early 1900s is presented. Published and unpublished records of 117 species are listed, including those of some terrestrial hyphomycetes found in stream foam.

**Key words:** aquatic hyphomycetes, canopy fungi, Hungary.

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V článku je popsána historie výzkumu vodních hyfomycetů v Maďarsku od začátku 20. století. Jsou shrnutý publikované i nepublikované nálezy 117 druhů včetně některých terestrických hyfomycetů nacházených ve vodní pěně.

### INTRODUCTION

The aquatic hyphomycetes (Ingold 1942) are one of the most important fungal groups growing on allochthonous plant remains in lotic habitats and play a crucial role in the decomposition of leaf and wood litter in streams (Bärlocher 1992). They live also in other types of aquatic (e.g. lentic) and even terrestrial ecosystems, but their biology in these environments has been less studied (e.g. Gönczöl 1976a, Bandoni 1981, Sridhar 2009).

In the present paper we have compiled reports of aquatic hyphomycetes from Hungary, including some unpublished collections of ours. Scherffel (1902) published the earliest record. He correctly identified conidia of *Tetracladium marchalianum* in juice-like liquid of rotten leaves of *Taraxacum officinale* between sheets of a herbarium press. He found conidia of *T. marchalianum* in pond water, too. Later algologists reported conidia of some aquatic hyphomycetes seen in plankton samples from streams and rivers (Hortobágyi 1949, Kol 1957, Szemes 1960, Uherkovich 1971). Hortobágyi reported abundant occurrence of *Tetracladium marchalianum* (as

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Dedicated to Ludmila Marvanová on the occasion of her 80<sup>th</sup> birthday.

„*Asterotrix raphidiooides*“) in seston sampled in Lake Balaton. Uherkovich recorded and illustrated conidia of eight aquatic hyphomycete species from the Tisza river. *Porocladium aquaticum*, misidentified as *Clavariopsis aquatica*, is clearly recognizable in his drawings.

Bánhegyi (1962) published the first mycological paper on aquatic hyphomycetes in Hungary. He reported 15 species from the Danube and from two of its tributaries. Tóth later collected foam in mountain streams and reported the geographical distribution of aquatic hyphomycetes for Hungary in his PhD thesis (Tóth 1980). Further records from the streams of the Pilis and the Visegrád Mts. were published in Tóth (1994). All these early studies were based on foam sample analyses.

Ecological investigations have been made over many years in the Morgó stream system of the Börzsöny Mts. One of us (JG) started his studies at the end of the 1960s. His early publications were based on the examination of naturally occurring foam samples, but also of decaying leaves incubated in the laboratory (Gönczöl 1971, 1975). Distinct differences in species composition between conidial pools in the upper and lower sections of the stream were revealed, apparently in correlation with changes in the riparian vegetation. The studies were completed with investigations of some chemical characteristics of the streams (Gönczöl 1987). The results indicated that both water hardness and riparian vegetation influenced the distribution of species communities. During long-term investigations longitudinal and temporal distributions as well as colonisation patterns by leaf- and wood-inhabiting species have been studied using leaf and twig baits of different tree species (Gönczöl 1989, Révay & Gönczöl 1990, Gönczöl & Révay 1993). These observations considerably increased the number of species known from the Morgó stream. In subsequent years conidial populations at six sites along the main channel of the same stream and at 10 sites of 6 tributaries were sampled by membrane filtration of stream water (Gönczöl et al. 1999, Gönczöl & Révay 1999a, 2003a, 2004a). At first, 2 × 250 ml of stream water per sampling date, later 5 × 150 ml, were filtered, and conidia counted and identified. A gradual change in species numbers and composition of aquatic hyphomycete communities was found along the main channel. Comprehensive statistical analyses of data from both the main channel and its tributaries suggested that both the effect of abiotic habitat variables and substrate composition were important in determining fungal communities, but not to the same degree. The results of a canonical correspondence analysis suggested that altitude, water hardness and conductivity were the major factors affecting the distribution of particular species (Gönczöl et al. 2003).

Aquatic hyphomycete species have been studied in four other territories of Hungary.

The Bükk Mts. are part of the North Hungarian Mountains (NE Hungary). Two hardwater and two softwater streams were sampled from 1984 to 1986 in all four

seasons on two occasions. Both foam samples and decaying leaves were investigated (Gönczöl 1987). This study increased our knowledge on the distribution of aquatic hyphomycetes in mountain streams differing in both water chemistry and riparian vegetation.

The Aggtelek National Park (ANP, NE Hungary) was surveyed by Gönczöl & Révay (1992) between 1987 and 1991. The purpose here was to contribute to the knowledge of the distribution of microscopic fungi of this mycologically incompletely known territory by the examination of submerged leaves, wood and foam of nine streams (eight with hard water and one with soft water). Species composition of the hardwater and softwater streams differed distinctly. Notable differences in species composition were also obtained from hardwater streams varying in riparian vegetation. The species number of aquatic hyphomycetes in foam was surprisingly low in a canyon stream with a thick litter layer of beech (*Fagus*). Some rare and noteworthy species (e.g. *Flagellospora leucorhynchos* and *Sigmoidea praelonga*) were encountered here.

We studied aquatic hyphomycetes in the Danube at Szigetköz, a large island surrounded by the Danube and the Moson Danube. Collections were made at the following sampling sites: Cikola, Dunaremete, Kisbodak, Lipót, and Nagysziget in 1990 and 1991. Thirty-three species were revealed in foam and on baits consisting of *Quercus* and *Populus* leaves and wood. Leaf and twig packs were exposed at ca. 2 m depth in the main channel of the Danube for two weeks in September 1991. Free and attached conidia of 15 species were obtained, among others *Alatospora acuminata* s.l., *Clavatospora longibrachiata*, *Lemonniera aquatica*, *Tetrachaetum elegans*, and *Tumularia aquatica*. Additionally, driftwood was collected on the banks and abundant sporulation of *Anguillospora crassa* was seen on it on some occasions. Detailed results of these studies have not been published.

In the Kőszegi Mts. (NW Hungary) near Velem, two sites on the Hosszúvölgyi stream were sampled in 1990 and 1993. Foam, leaf and wood samples were investigated. Data are presented below in the species list.

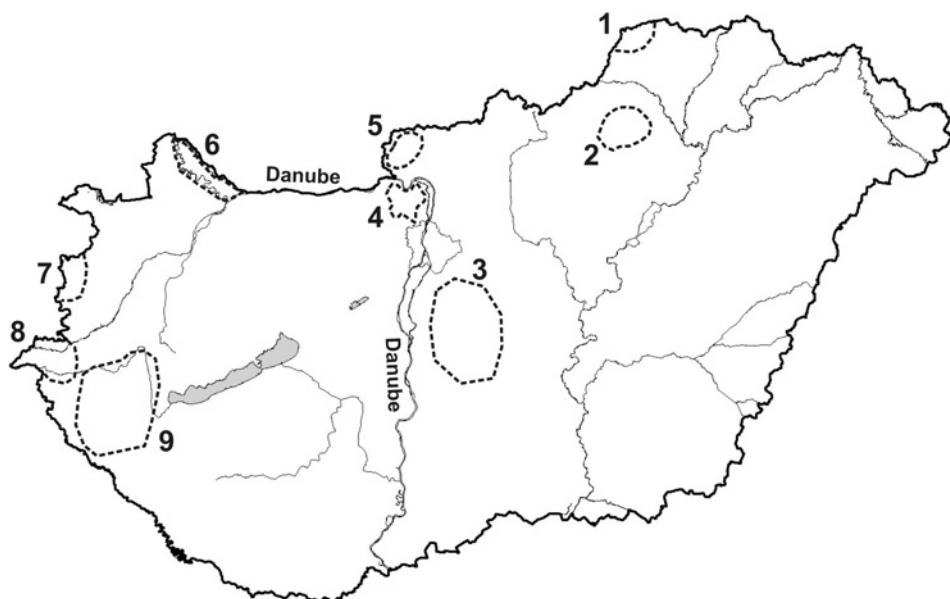
Some studies concentrated on lentic and terrestrial habitats near or far from streams. Leaf and wood samples were collected from forest litter and tree hollows. Conidia of 17 species of aquatic hyphomycetes were collected from forest litter near the Morgó stream (Gönczöl & Révay 1983). Also thirteen water-filled treeholes in four mountainous areas of Hungary were examined. A total of 45 species were detected, but only four species of aquatic hyphomycetes, i.e. *Alatospora acuminata* s.l. and s.s. (Marvanová & Descals 1985), *Articulospora tetracladia*, *Dimorphospora foliicola*, and *Varicosporium elodeae*, were encountered. *Colispora cavincola*, which had been described from such a habitat (Gönczöl & Révay 1996), proved to be a typical member of treehole fungal communities (Gönczöl & Révay 2003b). In some studies, conidia of aquatic hyphomycetes are frequently recorded in rainwater from tree canopies both in temperate and tropi-

cal areas (e.g. Czeczuga & Orlowska 1999, Sridhar & Karamchand 2009). Our own studies on canopy fungi did not support these results (Révay & Gönczöl 2011). The only exception was *Tetracladium marchalianum*, whose conidia were seen on one occasion in surprisingly great abundance in rainwater of a gutter shaded by trees and filled with leaf litter (Gönczöl & Révay 2004b).

Four new genera and nine new species of aquatic and other water-borne hyphomycetes have been described by the present authors from water bodies or their surroundings in Hungary.

## RESULTS

Listed below are aquatic hyphomycetes and some other water-borne fungi from Hungary. The names of taxa are followed by the name of mountains or regions in alphabetical order and literature references. The names of streams are given only for the authors' own publications. For abbreviations of stream names, see Tab. 1. The unpublished data at the end of each entry are separated by a dash. Records kept at the generic level are briefly noted. The locations of the main collecting regions are illustrated in Fig. 1.



**Fig. 1.** Sampling areas of aquatic hyphomycetes and other water-borne fungi in Hungary. **1** – Aggtelek National Park, **2** – Bükk Mts., **3** – Kiskunság National Park, **4** – Pilis-Visegrád Mts., **5** – Börzsöny Mts., **6** – Szigetköz, **7** – Kőszegi Mts., **8** – Alpokalja, **9** – Zala County.

**Tab. 1.** Location and reference data of aquatic hyphomycetes and other water-borne fungi collected in Hungary.

Mountain, region	Stream, river, habitat	Village	Reference
Aggtelek National Park (ANP)	Henc (He)	Perkupa	Gönczöl & Révay 1992
ANP	Hidegvíz (Hid)	Trizs	
ANP	Jósva (Jós)	Jósvalő	
ANP	Kecskékút (Kecsk)	Szinpetri	
ANP	Kecskő	Jósvalő	
ANP	Ménes (Mén)	Szögliget	
ANP	Patkós (Pat)	Szin	
ANP	Telekes (Tel)	Perkupa	
ANP	Tohonya (Toh)	Jósvalő	
Alpokalja (Őrség, Vend-vidék)			Tóth 1981
Börzsöny Mts.	Morgó	Kismaros Királyré	Gönczöl 1971,1975,1989; Révay & Gönczöl 1990; Gönczöl & Révay 1993; Gönczöl et al. 1999
Börzsöny Mts.	Csömöle (Csö)	Szokolya	Gönczöl & Révay 1999a
Börzsöny Mts.	Boros (Bor)	Királyré	Gönczöl et al. 2001
Börzsöny Mts.	Nacsagromi (Nacs)	Szokolya	Gönczöl & Révay 2003a
Börzsöny Mts.	Nagyvasfazék (Nagy)	Királyré	
Börzsöny Mts.	Bagolybükk (Bag)	Királyré	Gönczöl & Révay 2004a
Börzsöny Mts.	Deszkametsző (Desz)	Királyré	
Börzsöny Mts.	Kemence	Kemence	unpubl.
Börzsöny Mts.	Forest litter	Kismaros, Királyré	Gönczöl & Révay 1983
Bükk Mts.	Rejtek (Rejt)	Rejtek	Gönczöl 1987
Bükk Mts.	Pénz	Lillafüred	
Bükk Mts.	Sebesvíz (Seb)	Lillafüred	
Bükk Mts.	Kőlyuk (Kő)	Hollókő	
Bükk Mts.	Oldalvölgyi		Révay 1985
Kiskunság National Park (KNP)			Gönczöl & Révay 1999b
Kőszegi Mts.	Hosszúvölgyi (Hosszú)	Velem	unpubl.
Pilis-Visegrádi Mts.			Tóth 1994
Szigetköz	Danube	Cikola, Dunaremete, Kisbodak, Lipót, Nagysziget	unpubl.
Zala County	Treehole, forest litter	Bak, Bázakerettye	Gönczöl 1976a, Gönczöl & Révay 2003b, Gönczöl & Révay 1983
–	Danube	Between Budapest and Nagymaros	Bánhegyi 1962
–	Treehole, Rainwater	Királyré, Szokolya Velem, Budapest	Gönczöl & Révay 2003b, 2004b, 2006; Révay & Gönczöl 2010

***Actinospora megalospora*** (Ingold) Descals et Marvanová (syn.: *Actinospora megalospora* Ingold) – ANP: He, Kecsk, Kecső, Pat, Toh (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, Gönczöl & Révay 1993, Gönczöl et al. 1999), Desz (Gönczöl & Révay 2004a); Bükk: Rejt (Gönczöl 1987); Pilis-Visegrádi (Tóth 1994) – Kőszegi: Hosszú, foam, 1990, 1993; J.G. unpubl.

***Alatospora acuminata*** Ingold s.l. – ANP: He, Hid, Jós, Kecsk, Kecső, Mén, Pat, Tel, Toh (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Gönczöl & Révay 1983, 1993, Révay & Gönczöl 1990, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz, Seb, Kő (Gönczöl 1987); Danube (Bánhegyi 1962); KNP (Gönczöl & Révay 1999b); Pilis-Visegrádi (Tóth 1980, 1994); Zala County (Gönczöl 1976a) – Kőszegi: Hosszú, foam, 1990, 1993, J.G. unpubl.; Szigetköz: Cikola, Kisbodak, Lipót, foam, 1991, J.G. unpubl.

***Alatospora acuminata*** Ingold s.s. – Zala County (Gönczöl & Révay 2003b).

***Alatospora flagellata*** (Gönczöl) Marvanová (syn.: *Clavatospora flagellata* Gönczöl) – Börzsöny: Morgó (Gönczöl 1976c, 1989, Révay & Gönczöl 1990, Gönczöl & Révay 1993, Gönczöl et al. 1999), Csö, Nagy, Bag, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz, Seb, Kő (Gönczöl 1987); Pilis-Visegrádi (Tóth 1994); Kőszegi: Hosszú, foam, 1990, J.G. unpubl.

***Anavirga dendromorpha*** Descals et B. Sutton – ANP: Kecsk, Pat (Gönczöl and Révay 1992); Börzsöny: Morgó (Révay 1988, Révay and Gönczöl 1990, Gönczöl and Révay 1993, Gönczöl et al. 1999), Nagy, Bag, Desz (Gönczöl and Révay 2003a, 2004a).

***Anguillospora crassa*** Ingold – ANP: Hid (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Révay & Gönczöl 1990, Gönczöl & Révay 1993, Gönczöl et al. 1999), Csö, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz, Seb, Kő (Gönczöl 1987); Pilis-Visegrádi (Tóth 1994) – Kőszegi: Hosszú, foam, 1990, Szigetköz: Nagysziget, wood, 1991, J.G. unpubl.

***Anguillospora curvula*** Iqbal – Pilis-Visegrádi (Tóth 1980, 1994).

***Anguillospora furtiva*** Webster et Descals – Börzsöny: Morgó (Révay & Gönczöl 1990, Gönczöl & Révay 1993), Nagy, Bag, Desz (Gönczöl & Révay 2003a, 2004a) – Szigetköz: Dunaremète, leaves, 1991, J.G. unpubl.

***Anguillospora longissima*** (Sacc. et Syd.) Ingold – ANP: He, Hid, Jós, Kecsk, Kecső, Pat (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Révay & Gönczöl 1990, Gönczöl & Révay 1993, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Révay & Gönczöl 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz, Seb, Kő (Gönczöl 1987); Danube (Bánhegyi 1962); Pilis-Visegrádi (Tóth 1994) – Kőszegi: Hosszú, foam, 1990, 1993; Szigetköz: Cikola, foam, 1991, Kisbodak, foam, leaves, 1991, 1992, Dunaremète, leaves, twigs, 1991, 1992, J.G. unpubl.

***Anguillospora mediocris*** Gönczöl et Marvanová – Börzsöny: Morgó (Gönczöl et al. 1999 as *Filosporella* sp. 1, Gönczöl & Marvanová 2002), Csö, Nacs, Nagy, Bag, Desz (Gönczöl & Révay (1999a as *Filosporella* sp., 2003a, 2004a).

***Anguillospora pseudolongissima*** Ranzoni – Börzsöny: Morgó (Gönczöl 1989); Danube (Bánhegyi 1962); Pilis-Visegrádi (Tóth 1994) – Szigetköz: Cikola, foam, 1991, J.G. unpubl.

***Anguillospora rosea*** Webster et Descals – ANP: Hid, Kecskő, Mén, Pat (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl & Révay 1993, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001) – Kőszegi: Hosszú, foam, 1991, 1993; Szigetköz: Cikola, Kisbodak, foam, 1991, J.G. unpubl.

***Arborispora paupera*** Marvanová et Bärlocher – Rainwater: Budapest, Királyrét, Szokolya (Gönczöl & Révay 2004b, 2006, Révay & Gönczöl 2010, 2011).

***Arbusculina fragmentans*** Marvanová – ANP: Hid (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl et al. 1999).

***Arbusculina irregularis*** (R.H. Petersen) Marvanová et Descals (syn.: *Speiopsis irregularis* R.H. Petersen) – Börzsöny: Morgó (Gönczöl 1971, 1975, Gönczöl et al. 1999); Pilis-Visegrádi (Tóth 1994) – Kőszegi: Hosszú, foam, 1993, J.G. unpubl.

***Articulospora atra*** Descals – Börzsöny: Nagy (Gönczöl & Révay 2003a).

***Articulospora moniliiforma*** Ranzoni – Tóth (1980).

***Articulospora tetracladia*** Ingold – ANP: Hid (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Gönczöl & Révay 1983, 1993, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz (Gönczöl 1987); Pilis-Visegrádi (Tóth 1980, 1994); Zala County (Gönczöl 1976a).

***Camposporium antennatum*** Harkness – Pilis-Visegrádi (Tóth 1994).

***Camposporium cambrense*** Hughes – Börzsöny: Morgó (Révay & Gönczöl 1990); Pilis-Visegrádi (Tóth 1980, 1994).

***Camposporium japonicum*** Ichinoe – ANP: Pat (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl & Révay 1983); Bükk: Oldalvölgyi (Révay 1985); Pilis-Visegrádi (Tóth 1980, 1994); Rainwater: Budapest (Gönczöl & Révay 2004b); Feketeerdő, Győr-Moson-Sopron County, stem of *Vitis* sp., 1991, Á.R. unpubl.

***Camposporium pellucidum*** (Grove) Hughes – ANP: Pat (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl & Tóth 1974, Gönczöl & Révay 1983, Révay 1985, Révay & Gönczöl 1990, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz (Gönczöl & Révay 1999a, 2003a, 2004a); Pilis-Visegrádi (Tóth 1994); Zala County (Gönczöl 1976a); tree hollow: Bázakerettye, Királyrét, rainwater: Budapest (Gönczöl & Révay 2003b, 2004b) – Szigetköz: Dunaremete, Kisbodak, Lipót, Nagysziget, wood, 1991, 1992, Á.R. & J.G. unpubl.

***Clavariopsis aquatica*** De Wild. – ANP: He, Hid, Jós, Kecsk, Kecső, Mén, Pat, Tel, Toh (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Gönczöl & Révay 1983, 1993, Révay & Gönczöl 1990, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz, Seb, Kő (Gönczöl 1987); Pilis Visegrádi (Tóth 1994) – Kőszegi: Hosszú, foam, 1991, 1993; Szigetköz: Cikola, foam, 1991, Dunaremete, leaves, 1991, 1992, J.G. unpubl.

***Clavatospora longibrachiata*** (Ingold) Sv. Nilsson ex Marvanová et Sv. Nilsson – ANP: Hid (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1989, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Pénz (Gönczöl 1987); Tóth (1980) – Kőszegi: Hosszú, foam, 1993; Szigetköz: Dunaremete, leaves, 1991, J.G. unpubl.

***Clavatospora tentacula*** (Umphlett) Sv. Nilsson – Alpokalja (Tóth 1981), Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Gönczöl et al. 1999), Desz (Gönczöl & Révay 2004a).

***Colispora cavincola*** Gönczöl et Révay – Börzsöny: Morgó (Gönczöl & Révay 1983 as *Dactylella submersa*, 1996), Zala County (Gönczöl 1976a as *Dactylella submersa*, Gönczöl & Révay 2003b).

***Colispora elongata*** Marvanová – ANP: Hid (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl & Révay 1993, 1996, Gönczöl et al. 1999), Nagy, Bag, Desz, Bor (Gönczöl & Révay 2003a, 2004a, Gönczöl et al. 2001).

***Culicidospora aquatica*** R.H. Petersen – Börzsöny: Nagy, foam, 1970, J.G. unpubl.

***Culicidospora gradata*** R.H. Petersen – Börzsöny: Morgó (Gönczöl et al. 1999); Bükk: Rejt, Pénz, Seb, Kő (Gönczöl 1987); Pilis Visegrádi (Tóth 1980, 1994) – Börzsöny: Kemence, foam, 1974; Kőszegi: Hosszú, foam, 1990, J.G. unpubl.

***Cylindrocarpon aquaticum*** (Sv. Nilsson) Marvanová et Descals (syn.: *Bacillispora aquatica* Sv. Nilsson – Börzsöny: Morgó (Gönczöl 1989); Bükk: Rejt, Pénz, Seb (Gönczöl 1987).

***Cylindrotrichum helisciforme*** Marvanová – Bükk: Pénz, Seb, Kő (Gönczöl 1987) – Kőszegi: Hosszú, foam, 1990, 1993, J.G. unpubl.

***Dactylella submersa*** (Ingold) Sv. Nilsson – Danube (Bánhegyi 1962).

***Dactylellina appendiculata*** (Anastasiou) Scholler, Hagedorn et A. Rubner (syn.: *Laridospora appendiculata* (Anastasiou) Nawawi) – Alpokalja: Őrség (Tóth 1981).

***Dendrospora erecta*** Ingold – Tóth (1980).

***Dimorphospora foliicola*** Tubaki – ANP: Hid, Kecsk (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl & Révay 1983, 1993, Gönczöl 1989, Révay & Gönczöl 1990, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a).

**Diplocladiella scalaroides** Arnaud ex T. Matsush. – ANP: He, Mén, Pat (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl & Tóth 1974, Gönczöl & Révay 1983, Révay 1986, Révay & Gönczöl 1990); Bükk: Seb, Kő (Gönczöl 1987); Pilis-Visegrádi Tóth (1980, 1994), Zala County (Gönczöl 1976a); Rainwater: Budapest (Gönczöl & Révay 2004b) – Szigetköz: Dunaremete, wood, 1991, Á.R. & J.G. unpubl.

**Dwayaangam cornuta** Descals – Börzsöny: Morgó (Gönczöl & Révay 1993, Gönczöl et al. 1999); Bükk: Rejt (Gönczöl 1987); Pilis-Visegrádi (Tóth 1994); treehole: Királyrét (Gönczöl & Révay 2003b) – Szigetköz: Lipót, foam, 1991, J.G. unpubl.

**Filosporella annelidica** (Shearer et Crane) Crane et Shearer – Börzsöny: Morgó (Gönczöl 1989, Révay & Gönczöl 1990, Gönczöl & Révay 1993, Gönczöl et al. 1999), Csö, Desz (Gönczöl & Révay 1999a, 2004a).

**Flabellospora acuminata** Descals – Pilis-Visegrádi (Tóth 1994).

**Flagellospora curvula** Ingold – ANP: Hid, Jós, Kecsk, Kecső, Mén (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Gönczöl & Révay 1993, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz, Seb, Kő (Gönczöl 1987); Danube (Bánhegyi 1962); Pilis-Visegrádi (Tóth 1994) – Kőszegi: Hosszú, foam, 1993; Szigetköz: Dunaremete, leaves, 1991, Kisbodak, foam, 1991, J.G. unpubl.

**Flagellospora leucorhynchos** Marvanová – ANP: Kecsk, Pat (Gönczöl & Révay 1992); Börzsöny: Csö, Desz (Gönczöl & Révay 1999a, 2004a).

**Flagellospora penicillioidea** Ingold – Danube (Bánhegyi 1962).

**Fontanospora eccentrica** (R.H. Petersen) Dyko (syn.: *Tricladium eccentricum* R.H. Petersen) – Pilis (Tóth 1994).

**Geniculospora grandis** (Greath.) Nolan (syn.: *Articulospora grandis* Greathead) – Börzsöny: Nacs (Gönczöl & Révay 2003a).

**Geniculospora inflata** (Ingold) Sv. Nilsson ex Marvanová et Sv. Nilsson – Börzsöny: Morgó (Gönczöl et al. 1999); Bükk: Pénz (Gönczöl 1987); Tóth (1980).

**Gorgomyces hungaricus** Gönczöl et Révay – Börzsöny: Kismaros (Gönczöl & Révay 1985) – Feketeerdő, Győr-Moson-Sopron County, on leaves of *Populus alba* 1991, J.G. unpubl.

**Gyoerffyella gemellipara** Marvanová – Börzsöny: Nacs (Gönczöl & Révay 2003a); Velem (Tóth 1980) – Börzsöny: Kemence, foam, 1974; Bükk: Sebesvíz, foam, 1987; Kőszegi: Hosszú, foam, 1990, J.G. unpubl.

**Gyoerffyella rotula** (Höhnel) Marvanová – Alpokalja: Velem (Tóth 1981).

**Heliscella stellata** (Ingold et Cox) Marvanová. (syn.: *Clavatospora stellata* (Ingold et Cox) Nilsson ex Marvanová et Nilsson). – ANP: He, Hid, Tel (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Révay & Gönczöl 1990, Gönczöl & Révay 1993, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bo (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz, Kő

(Gönczöl 1987); Pilis-Visegrádi (Tóth 1994) – Kőszegi: Hosszú, foam, 1991, 1993; Szigetköz: Dunaremete, leaves, 1991, J.G. unpubl.

***Heliscina campanulata*** Marvanová – ANP: Pat (Gönczöl & Révay 1992).

***Heliscus lugdunensis*** Sacc. et Thérry – ANP: He, Hid, Jós, Kecsk, Kecső, Mén, Pat, Tel, Toh (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Révay & Gönczöl 1990, Gönczöl & Révay 1993, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz, Seb, Kő (Gönczöl 1987); Danube (Bánhegyi 1962); Pilis-Visegrádi (Tóth 1994); Zala County (Gönczöl 1976a) – Kőszegi: Hosszú, foam, 1991, 1993; Szigetköz: Dunaremete, leaves, twigs, 1991, 1992, Kisbodak, foam, 1991, J.G. unpubl.

***Hyalocamposporium acutum*** Révay et Gönczöl – Börzsöny: Csö (Rény & Gönczöl 2007).

***Hyalocamposporium hyalinum*** (Abdullah) Révay et Gönczöl – Börzsöny: Morgó, Nagy (Rény & Gönczöl 2007).

***Hyalocamposporium longiflagellatum*** Révay et Gönczöl – Börzsöny: Morgó, Nagy (Rény & Gönczöl 2007).

***Hyalocamposporium marylandicum*** (Shearer) Révay et Gönczöl – Börzsöny: Csö (Gönczöl & Révay 1999a).

***Hydrometraspora symmetrica*** Gönczöl et Révay – Börzsöny: Kismaros (Gönczöl & Révay 1984, Révay 1986) – Börzsöny: Szokolya, near Morgó stream, on decaying walnut-shell (*Juglans regia*), 2010, D. Magyar unpubl.

***Isthmolongispora ampulliformis*** (Tubaki) de Hoog et Hennebert – rainwater: Budapest (Gönczöl & Révay 2004b).

***Isthmolongispora lanceata*** de Hoog et Hennebert – ANP: He, Kecsk (Gönczöl & Révay 1992); Börzsöny: Morgó, Nagy (Gönczöl et al. 1999, Gönczöl & Révay 2003a).

***Isthmolongispora minima*** T. Matsush. – Börzsöny: Desz (Gönczöl & Révay 2004a), Treehole: Bázakerettye (Gönczöl & Révay 2003b).

***Isthmotricladia britannica*** Descals – Börzsöny: Morgó (Rény & Gönczöl 1990, Gönczöl et al. 1999); Bükk: Pénz (Gönczöl 1987); Pilis-Visegrádi (Tóth 1994) – Szigetköz: Cikola, foam, 1991, J.G. unpubl.

***Isthmotricladia laeensis*** T. Matsush. – Pilis-Visegrádi (Tóth 1980, 1994); rainwater: Budapest (Gönczöl & Révay 2004b).

***Lateriramulosa uniinflata*** T. Matsush. – Zala County (Gönczöl & Révay 1983); Tóth (1980), Rainwater: Budapest (Gönczöl & Révay 2004b) – Szigetköz: Kisbodak, foam, 1991, J.G. unpubl.

***Lemonniera aquatica*** De Wild. – ANP: He, Jós, Kecsk, Kecső, Mén, Tel, Toh (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Gönczöl & Révay 1983, 1993, Révay & Gönczöl 1990, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk:

Rejt, Pént, Seb, Kő (Gönczöl 1987); Danube (Bánhegyi 1962), Pilis-Visegrádi (Tóth 1994) – Kőszegi: Hosszú, foam, 1990; Szigetköz: Dunaremete, leaves, twigs, 1991, 1992, J.G. unpubl.

**Lemonniera centrosphaera** Marvanová – Börzsöny: Nacs, Nagy (Gönczöl & Révay 2003a); Tóth (1980).

**Lemonniera cornuta** Ranzoni – Börzsöny: Morgó (Gönczöl & Révay 1993, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Pilis-Visegrádi (Tóth 1980, 1994) – Szigetköz: Cikola, foam, 1991, J.G. unpubl.

**Lemonniera filiformis** R.H. Petersen ex Dyko – ANP: Hid (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1975), Tóth (1980).

**Lemonniera pseudofloscula** Dyko – Alpokalja (Tóth 1981).

**Lemonniera terrestris** Tubaki – Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Gönczöl & Révay 1983, 1993, Révay & Gönczöl 1990, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pént, Seb (Gönczöl 1987); Pilis-Visegrádi (Tóth 1994).

**Lunulospora curvula** Ingold – Danube (Bánhegyi 1962) – Börzsöny: Morgó, foam, 1970, J.G. unpubl.

**Magdalaenaea monogramma** Arnaud – Börzsöny: Morgó (Gönczöl & Révay 1983), Desz (Gönczöl & Révay 2004a); Visegrádi (Tóth 1980, 1994); rainwater: Királyrét (Gönczöl & Révay 2006).

**Margaritispora aquatica** Ingold – ANP: Hid (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Gönczöl & Révay 1993, Révay & Gönczöl 1990, Gönczöl et al. 1999), Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt (Gönczöl 1987); KNP (Gönczöl & Révay 1999b); Visegrádi (Tóth 1994).

**Mycocentrospora acerina** (Hart.) Deighton – Pilis-Visegrádi (Tóth 1980, 1994).

**Mycocentrospora aquatica** (Iqbal) Iqbal – Bükk: Seb, Kő (Gönczöl 1987); Pilis-Visegrádi (Tóth 1980, 1994).

**Mycocentrospora filiformis** (Greath.) Iqbal – Tóth (1980).

**Mycofalcella calcarata** Marvanová, Om-Kalth. et J. Webster – ANP: Hid (Gönczöl & Révay 1992 as *Mycocentrospora* sp.); Börzsöny: Morgó (Gönczöl et al. 1999), Nacs, Nagy, Desz, Bor (Gönczöl & Révay 2003a, 2004a, Gönczöl et al. 2001).

**Naiadella fluitans** Marvanová et Bandoni – Börzsöny: Morgó (Gönczöl 1971 as *Jaculispora submersa*, Gönczöl & Révay 1983, 1993, Gönczöl et al. 1999), Desz (Gönczöl & Révay 2004a); Pilis-Visegrádi (Tóth 1994) – Börzsöny: Kemence, foam, 1974; Szigetköz: Cikola, foam, 1991, J.G. unpubl.

**Pachycladina mutabilis** Marvanová – ANP: Kecsk, Pat (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl et al. 1999), Nacs, Desz (Gönczöl & Révay 2003a, 2004a) – Kőszegi: Hosszú, foam, 1993, J.G. unpubl.

**Polycladium equiseti** Ingold – Visegrádi (Tóth 1980, 1994).

***Porocladium aquaticum*** Descals – Uherkovich (1971), Tóth (1980).

***Sigmoidea aurantiaca*** Descals – Börzsöny: Morgó (Révay & Gönczöl 1990).

***Sigmoidea praelonga*** Marvanová – ANP: Kecsk, Pat (Gönczöl & Révay 1992); Börzsöny: Csö (Gönczöl & Révay 1999a).

***Speiropsis pedatospora*** Tubaki – Kőszegi: Hosszú, leaves, 1993, J.G. unpubl.

***Stenocladiella neglecta*** (Marvanová et Descals) Marvanová et Descals (syn.: *Leptocladia neglecta* Marvanová et Descals) – ANP: Jós (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1989, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001).

***Tetrachaetum elegans*** Ingold – Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Gönczöl & Révay 1983, 1993, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Visegrádi (Tóth 1994) – Szigetköz: Dunaremete, leaves, 1991, J.G. unpubl.

***Tetracladium furcatum*** Descals – Börzsöny: Morgó, foam, 1987, J.G. unpubl.; Szigetköz: Cikola, Kisbodak, foam, 1991, J.G. unpubl.

***Tetracladium marchalianum*** De Wild.– ANP: He, Hid, Jós, Kecsk, Kecső, Mén, Pat, Tel, Toh (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Révay & Gönczöl 1990, Gönczöl & Révay 1993, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz, Seb, Kő (Gönczöl 1987); Danube (Bánhegyi 1962); Pilis-Visegrádi (Tóth 1980, 1994); Zala County (Gönczöl 1976a); rainwater: Budapest (Gönczöl & Révay 2004b) – Szigetköz: Cikola, Kisbodak, Lipót, foam, 1991, Dunaremete, leaves, twigs, 1991, 1992, J.G. unpubl.

***Tetracladium maxilliforme*** (Rostrup) Ingold – ANP: He (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl et al. 1999), Csö, Bor (Gönczöl & Révay 1999a, Gönczöl et al. 2001); Bükk: Pénz (Gönczöl 1987); Danube (Bánhegyi 1962); Visegrádi (Tóth 1994); rainwater: Budapest (Gönczöl & Révay 2004b) – Szigetköz: Cikola, Kisbodak, Lipót, foam, 1991, J.G. unpubl.

***Tetracladium setigerum*** (Grove) Ingold – ANP: He, Jós, Kecsk, Kecső, Mén, Pat, Tel, (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Gönczöl & Révay 1983, 1993, Révay & Gönczöl 1990, Gönczöl et al. 1999), Csö, Nacs, Desz (Gönczöl & Révay 1999a, 2003a, 2004a); Bükk: Rejt, Pénz (Gönczöl 1987); Danube (Bánhegyi 1962); KNP (Gönczöl & Révay 1999b); Pilis-Visegrádi (Tóth 1994); Zala County (Gönczöl 1976a); rainwater: Budapest (Gönczöl & Révay 2004b) – Kőszegi: Hosszú, foam, 1990; Szigetköz: Cikola, Kisbodak, Lipót, foam, 1991, Dunaremete, leaves, 1991, J.G. unpubl.

***Tetraploa aristata*** Berk. et Br. – Visegrádi (Gönczöl & Tóth 1974, Tóth 1994); Tóth (1980), Kőszegi Mts., Hétvezér forrás (Révay 1993).

***Tricellula aquatica*** Webster – Börzsöny: Morgó (Gönczöl et al. 1999), Csö, Bor (Gönczöl & Révay 1999a, Gönczöl et al. 2001); rainwater: Budapest, Királyréti (Gönczöl & Révay 2004b, 2006).

***Tricellula aurantiaca*** (Haskins) Arx (syn.: *Volucrispora aurantiaca* Haskins – KNP (Gönczöl & Révay 1999b); Tóth (1980), rainwater: Budapest (Gönczöl & Révay 2004b).

***Trichocladium angelicum*** Roldán et Honrubia – Börzsöny: Morgó (Rény & Gönczöl 1990, Gönczöl & Révay 1993), Nacs, Nagy (Gönczöl & Révay 2003a) – Szigetköz: Dunaremete, twigs, 1992, J.G. unpubl.

***Tricladium angulatum*** Ingold – ANP: He, Jós, Kecsk, Kecső, Mén, Tel, Toh (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Gönczöl & Révay 1983, 1993, Révay & Gönczöl 1990, Gönczöl et al. 1999), Csö, Nacs, Nagy, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Pénz, Seb, Kő (Gönczöl 1987); Danube (Bánhegyi 1962); Pilis-Visegrádi (Tóth 1994); Zala County (Gönczöl 1976a) – Szigetköz: Cikola, Kisbodak, Lipót, foam, 1991, Dunaremete, leaves, 1991, 1992, J.G. unpubl.

***Tricladium anomalum*** Ingold – Danube (Bánhegyi 1962); Visegrádi (Tóth 1994).

***Tricladium attenuatum*** Iqbal – Börzsöny Mts., Királyrét, 1993, on leaves, J.G. unpubl.

***Tricladium castaneicola*** B. Sutton – Börzsöny: Morgó: (Gönczöl & Révay 1983), Nagy (Gönczöl & Révay 2003a); Treehole: Bázakerettye, Királyrét, Velem, Rainwater: Budapest, Királyrét (Gönczöl & Révay 2003b, 2004b, 2006).

***Tricladium curvisporum*** Descals – Börzsöny: Nacs (Gönczöl & Révay 2003a).

***Tricladium gracile*** Ingold – ANP: Mén, Pat, Tel (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1975, Gönczöl & Révay 1993, Gönczöl et al. 1999), Nacs, Nagy, Desz, Bo (Gönczöl & Révay 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz (Gönczöl 1987).

***Tricladium splendens*** Ingold – ANP: Hid (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Gönczöl & Révay 1983, 1993, Révay & Gönczöl 1990, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz (Gönczöl 1987); Pilis-Visegrádi (Tóth 1994) – Kőszegi: Hosszú, foam, 1993; Szigetköz: Dunaremete, leaves, 1991, J.G. unpubl.

***Tricladium terrestre*** Park – Pilis-Visegrádi (Tóth 1994).

***Trifurcospora irregularis*** (T. Matsush.) K. Ando et Tubaki – rainwater: Királyrét, Szokolya (Gönczöl & Révay 2004b, 2006, Révay & Gönczöl 2010).

***Tripospermum camelopardus*** Ingold, Dann et Mc Dougall – Börzsöny: Morgó (Gönczöl et al. 1999), Nacs, Nagy, Desz, Bag (Gönczöl & Révay 2003a, 2004a); rainwater: Budapest, Királyrét, Szokolya (Gönczöl & Révay 2004b, 2006, Révay & Gönczöl 2010).

***Tripospermum myrti*** (Lind.) S.J. Hughes – ANP: Pat (Gönczöl & Révay 1992); Börzsöny: Kemence (Gönczöl & Tóth 1974), Nacs, Nagy, Desz, Bag, Bor

(Gönczöl & Révay 2003a, 2004a, Gönczöl et al. 2001); Visegrádi (Tóth 1994), treehole: Királyrét, rainwater: Budapest, Királyrét, Szokolya (Gönczöl & Révay 2003b, 2004b, 2006, Révay & Gönczöl 2010, 2011) – Szigetköz: Cikola, Lipót, foam, 1991, J.G. unpubl.

***Triscelophorus monosporus*** Ingold – Börzsöny: Morgó (Gönczöl 1971, Gönczöl et al. 1999), Csö, Nagy, Bor (Gönczöl & Révay 1999a, 2003a, Gönczöl et al. 2001); Danube (Bánhegyi 1962); Tóth (1980) – Szigetköz: Dunaremete, Kisbodak, leaves, 1992, J.G. unpubl.

***Trisulcosporium acerinum*** H.J. Huds. et B. Sutton – Rainwater: Királyrét, Szokolya (Révay & Gönczöl 2010, 2011).

***Tulipispora ingoldii*** Révay et Gönczöl – as *Triscelophorus* sp., ANP: Hid, Pat, Toh (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, Révay & Gönczöl 1990, Gönczöl et al. 1999, Révay et al. 2009), Csö, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Seb, Kő (Gönczöl 1987); Pilis-Visegrádi (Tóth 1994).

***Tumularia aquatica*** (Ingold) Descals et Marvanová (syn.: *Pyricularia aquatica* Ingold, *Dactylella aquatica* (Ingold) Ranzoni) – ANP: Hid (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl 1971, 1975, 1989, Gönczöl & Révay 1983, 1993, Révay & Gönczöl 1990, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz, Seb, Kő (Gönczöl 1987); Pilis-Visegrádi (Tóth 1994) – Kőszegi: Hosszú, foam, 1993; Szigetköz: Cikola, foam, 1991, Dunaremete, leaves, 1991, J.G. unpubl.

***Tumularia tuberculata*** (Gönczöl) Descals et Marvanová. (syn.: *Monotospora tuberculata* Gönczöl) – Börzsöny: Morgó (Gönczöl 1971, 1975, 1976b, 1989, Gönczöl & Révay 1983, 1993, Révay & Gönczöl 1990, Gönczöl et al. 1999) Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Rejt, Pénz, Seb, Kő (Gönczöl 1987); Pilis-Visegrádi Tóth (1994) – Kőszegi: Hosszú, foam, 1990, 1993, J.G. unpubl.

***Varicosporium delicatum*** Iqbal – ANP: Hid (Gönczöl & Révay 1992); Tóth (1980).

***Varicosporium elodeae*** Kegel – ANP: Hid (Gönczöl & Révay 1992); Börzsöny: Nacs (Gönczöl & Révay 2003a); Bükk: Pénz (Gönczöl 1987); Pilis-Visegrádi (Tóth 1994); Tóth (1980); Zala County (Gönczöl & Révay 1983); treehole: Királyrét, Velem, rainwater: Budapest (Gönczöl & Révay 2003b, 2004b).

***Varicosporium tricladiforme*** Roldán et Marvanová – Börzsöny: Morgó, Bor (Gönczöl et al. 1999, 2001).

***Volucrispora ornithomorpha*** (Trotter) Haskins – Börzsöny: Morgó (Gönczöl & Révay 1983).

***Xylomyces aquaticus*** (Dudka) K.D. Hyde et Goh (syn.: *Camposporium aquaticum* Dudka, *Vargamyces aquaticus* (Dudka) Tóth) – ANP: He, Jós, Kecsk, Kecso, Mén, Pat, Tel, Toh (Gönczöl & Révay 1992); Börzsöny: Morgó (Gönczöl &

Révay 1983, 1993, Révay & Gönczöl 1990, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bor (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001); Bükk: Seb, Kő (Gönczöl 1987); Pilis-Visegrádi (Tóth 1979, 1994) – Szigetköz: Dunaremete, Kisbodak, Lipót, Nagysziget, wood, 1991, 1992, J.G. unpubl.

**Xylomyces chlamydosporis** Goos, Brooks et Lamore – Börzsöny: Morgó (Révay 1986).

**Ypsilina graminea** (Ingold, Mc Doug. et Dann) Descals, Webster et Marvanová (syn.: *Volucrispora graminea* Ingold, Mc Doug. et Dann) – Börzsöny: Morgó (Gönczöl et al. 1999), Tóth (1980), Treehole: Szokolya (Gönczöl & Révay 2003b).

**Anguillospora sp.** – ANP: He, Jós, Kecsk, Mén, Pat (Gönczöl & Révay 1992); Börzsöny: Morgó (Révay & Gönczöl 1990, Gönczöl & Révay 1993, 2007), Csö (Gönczöl & Révay 1999a) – Kőszegi: Hosszú, foam, 1991, 1993, J.G. unpubl.

Conidia of this form resemble those of *Anguillospora longissima*, but are generally shorter and wider. Some of them are characteristically rostrate. The two species were compared in monoconidial isolations (Gönczöl & Révay 2007). Their spatial and temporal distributions also showed differences. Conidia of *A. longissima* were regularly found in all seasons, and their numbers were higher in the softwater streams. On the contrary, the conidia of *Anguillospora* sp. were found more frequently in hardwater streams with especially high numbers in spring and early summer. We believe that *Anguillospora* sp. is specifically distinct. Resolving the correct taxonomic position of this species requires molecular studies.

**Campylospora sp.** – Börzsöny: Nacs, Nagy (Gönczöl & Révay 2003a) – Kőszegi: Hosszú, foam, 1990, J.G. unpubl.

Rare in Hungary. Conidia apparently belonging to this species were illustrated by Ingold (1956) from Nigeria, by Miura (1974) from Japan, by Nawawi (1985) from Malaysia, and by Descals & Chauvet (1992) from France.

**Mirandina sp.** – ANP: He, Kecsk, Pat (Gönczöl & Révay 1992); Börzsöny: Morgó (Révay & Gönczöl 1990, Gönczöl & Révay 1993, Gönczöl et al. 1999), Csö, Nacs, Nagy, Bag, Desz, Bo (Gönczöl & Révay 1999a, 2003a, 2004a, Gönczöl et al. 2001) – Kőszegi: Hosszú, foam, 1991, 1993, J.G. unpubl.

Conidia of this form were regularly found in foam and on twig baits submerged in streams. Conidia filiform, straight or slightly curved, densely septate, 120–170 × 3–4.5 µm.

## DISCUSSION

In total 117 conidial forms of aquatic hyphomycetes and related fungi have been recorded from Hungary. Those of dubious identity have been mostly excluded from the list. Some listed forms were identified at the generic level only,

but they occurred regularly at one or more localities. The most widespread species in Hungary are according to the records: *Alatospora acuminata*, *Anguillospora longissima*, *Clavariopsis aquatica*, *Flagellospora curvula*, *Heliscella stellata*, *Heliscus lugdunensis*, *Lemonniera aquatica*, and *Tetracladium marchalianum*. More than 20 % of the forms are rare: their distribution is only based on one or a few records.

The list above includes some species whose conidia may be found in stream foam, but their primary habitat is probably not situated in lotic environments.

*Camposporium* spp. as well as *Diplocladiella scalaroides*, *Tetraploa aristata*, and *Tripospermum myrti* are well-known terrestrial fungi whose conidia are often seen in foam or developing on various non-submerged substrata on stream banks. The most frequently collected *Camposporium* in Hungary is *C. pellucidum*, found sporulating in both terrestrial and aquatic habitats. In some of our more recent studies, conidia of *Camposporium* spp., *Diplocladiella scalaroides*, and *Tripospermum* spp. were recovered from rainwater samples collected from living trees (Gönczöl & Révay 2004b, 2006), and also frequently collected on the trunk cortex of living trees (Á.R. unpubl.).

*Gorgomyces hungaricus* and *Hydrometrospora symmetrica* were described from periodically wet terrestrial leaf litter collected near the Morgó stream in Hungary. Conidia of both species and other congeneric ones are reported from some tropical and temperate streams (*Hydrometrospora* sp. from Pakistan by Iqbal et al. 1973, from Malaysia by Nawawi 1985, and from South Africa by Webster et al. 1994, *Gorgomyces honrubiae* from Spain by Roldán 1989, *G. hungaricus* from the Czech Republic by Marvanová 1997). We collected *G. hungaricus* and *H. symmetrica* repeatedly at the type locality and in other humid habitats, but their conidia have not been seen in stream water. Therefore we do not consider these species true aquatic hyphomycetes. Their conidia develop on water films on leaves. Conidia of *Lateriramulosa uninflata* and *Magdalaenaea monogramma* have been rarely recovered from foam or stream water in Hungary but are found in greater numbers in terrestrial litter samples. We believe that all these species typically live in moist litter in the close vicinity of aquatic biotopes and their conidia enter the streams with its substrata.

Conidia of *Arborispora paupera*, *Trifurcospora irregularis*, and *Trisulcosporium acerinum* have not been found in Hungarian streams. The first two were isolated from streams in Canada (Marvanová & Bärlocher 1989, 2001). Conidia of the latter were repeatedly recorded from stream foam in Uganda and Nigeria (Ingold 1958, 1959). Sporulation of these species in pure culture was promoted by partially submerging pieces of agar culture, but occurred in areas exposed to air. Numerous conidia of the three above species have been found in rainwater from various widely spread living trees in Hungary, which suggests that canopies are their preferred habitat – one which periodically dries up (Gönczöl & Révay 2006,

Révay & Gönczöl 2010). Because after rainfall the number of conidia increase in rainwater, high moisture levels or the presence of free water are probably needed for sporulation. Conidia may enter streams from fallen leaves or twigs or directly into rainwater seeping from the trees.

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