Diversity of aquatic fungi on *Phragmites australis* at Lake Manzala, Egypt

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This study extends our knowledge of the biogeography of higher aquatic fungi from lakes in Egypt which have not been well explored. Diversity of aquatic fungi in Lake Manzala in Egypt was assessed, and fungi dominating the communities were recorded and compared with those from other lakes in subtropical, tropical and temperate regions. This study represents the first report of aquatic fungi from Lake Manzala. Three hundred submerged woody samples of *Phragmites australis* were collected randomly from three collection sites (Manzala 1, 2, 3) and were investigated for the biodiversity of saprobic fungi. Sixty taxa including 26 ascomycetes and 34 anamorphic fungi were recorded, of which 19 fungi are new records for Egypt. The most common fungi overall the three sites were *Periconia prolifica* (18 %), *Leptosphaeria oraemaris* (8.7 %), *Phoma hedericola* (6.7 %), *Alveophoma caballeroi* (6.3 %), and *Phoma epicoccina* (5.3 %). The most common fungi were different from one site to another and different from common fungi that have been recorded from lakes in subtropical, tropical and temperate regions.

Keywords: brackish fungi; ecology; ascomycetes; anamorphic fungi; subtropical fungi.

The distribution of wood-inhabiting fungi in aquatic habitats is affected by salinity and temperature (Shearer 1972, Hyde & Lee 1995, Jones 2000, Tsui & Hyde 2004, Vijaykrishna *et al*. 2006). Jones & Oliver (1964) found that the assemblages of fungi in seawater were very different to those found in brackish or freshwater. However, some species were common to both fresh and brackish water. There have been fewer studies on fungi of brackish water and the gradual change of fungal communities along salinity ranging from freshwater to sea water (e.g. Shearer 1972, Fryar *et al*. 2004, Van Ryckegem *et al*. 2007).

Shearer (1972) studied the effect of salinity and temperature on fungal diversity on balsa wood blocks exposed in the Patuxent River, Maryland. She established five collection stations along a salinity range of 0.05–17.9 g/L. Salinity was the most important factor affecting the distribution of fungi and the major change in species composition occurred where freshwater and seawater mix. The ratio of teleomorphic ascomycetes to anamorphic fungi increased with increasing salinity, while the number of species generally decreased.

About 3 000 fungi (exclusive of yeasts) have been reported from aquatic habitats, of which Ascomycota (1 527 spp.) and their anamorphs (785 spp.) were the most diverse groups, followed by Chytridiomycota (576 spp.), while Basidiomycota (21 spp.) were the least diverse group in the aquatic habitat (Vijaykrishna *et al.* 2006, Shearer *et al.* 2007). The greatest diversity for all groups was recorded from temperate regions followed by Asian tropical areas. These two regions are the most intensively researched areas for fungi (Shearer *et al.* 2007).

Many studies have recorded the distribution and abundance of fungi in aquatic habitats (Hyde *et al.* 2000) and different ecological habitats have been investigated, including streams (Hyde & Goh 1997, Vijaykrishna and Hyde 2006), rivers (Cai *et al.* 2003), ponds (Fisher & Spooner 1987), reservoirs (Goh & Hyde 1999), tree holes and water run off (Gönczöl & Révay 2003, 2006), water cooling towers (Udaiyan 1989), peat swamps (Pinnoi *et al.* 2006, Pinruan *et al.* 2007) and lakes (Hyde & Goh 1998, Cai *et al.* 2002, Luo *et al.* 2004).

Phragmites australis is a tall perennial grass found on all continents except Antarctica. It is characterized by its towering height of up to four meters and its stiff wide leaves and hollow stem. *Phragmites* is a colonial plant spreading by rhizomes and capable of forming large stands or colonies arising from one or a few seeds or plant pieces. These colonies form along the margins of streams and in marshes and ditches. They can form colonies in brackish water and in disturbed areas and their aggressive growth and tendency to out-compete other plants and to form monospecific stands has worried many conservation biologists (Weiss 1979).

Fungi have long been recognized as one of the major decomposers of salt marsh plants, beside bacteria (e.g. Meyers *et al.* 1970, Gessner 1977, Newell 1996). Tanaka (1991) studied the microbial deterioration of *Phragmites australis* in Japan. He found that fungi are the main decomposers of decaying leaves, before and after submergence in water, while bacteria were only dominant decomposers within the short period following submergence.

Diversity surveys of fungi on grasses in terrestrial or aquatic environments are limited mostly to temperate regions (Apinis *et al.* 1972 a, b; Taligoola *et al.* 1972). The mycobiota of *Phragmites australis* is even less well investigated than either flora of *Spartina* species (Gessner & Kohlmeyer 1976, Gessner 1977, Kohlmeyer & Kohlmeyer 1979) or *Juncus* (Volkmann-Kohlmeyer & Kohlmeyer 1994, Kohlmeyer & Volkmann-Kohlmeyer 1995, Kohlmeyer *et al.* 1995, 1997) in coastal wetlands.

In Egypt a few studies on higher aquatic fungi have been carried out (El- Sharouny *et al.* 1998, Abdel-Aziz 2004, Abdel-Wahab 2005).

This study examines the diversity of brackish fungi on decayed wood of *Phragmites australis* in Lake Manzala and compares the most common species found in the lake with those found in other studies.

Materials and Methods

Study sites

Lake Manzala, the largest of Egypt's Mediterranean wetlands is located in the north-eastern corner of the Nile delta, close to Port Said 31° 17' N; 32° 4' E. The lake is generally rectangular in shape about 60 km long and 40 km wide and has an average depth of 1.3 m and it is separated from the Mediterranean Sea by a sand bar through which it is connected to the sea by three channels. The salinity in the lake varies greatly, while it is low near drain and canal out flows in the south (Manzala 1, 3.1 g/L) and west (Manzala 2, 3.8 g/L), it is high in the extreme northeast (Manzala 3, 11.1 g/L). Brackish conditions predominate much of the remainder of the lake. Lake Manzala is considered to be a highly polluted lake in Egypt. It suffers from drainage from industry, agriculture and urban sewage that affects the physio-chemical and biological parameters in the lake (Mahmoud *et al*. 2006). The natural vegetation around Lake Manzala is dominated by *Phragmites australis*.

Sample collection

One hundred submerged decaying wood samples from *Phragmites australis* were collected from each site (Manzala 1, Manzala 2, and Manzala 3) between June 25 and June 28, 2006 and placed in clean plastic bags. Samples were brought to the laboratory and incubated in plastic boxes on sterilized moist tissue paper at room temperature. Examination of the collected material followed the well-adapted procedures described by Jones & Hyde (1988). Fungi were recorded and isolated, and voucher slides were deposited at the author's herbarium. Identification of the fungi was done using the original descriptions of the species known from aquatic habitats and other relevant literatures (e.g., Ellis 1971, 1976; Kohlmeyer & Kohlmeyer 1979, Sutton 1980, Barr 1987, 1990; Kohlmeyer & Volkmann-Kohlmeyer 1991, Nag Raj 1993). The number of species and their frequency of occurrence were recorded and calculated for each site. The following data were calculated for each of the study sites:

(i) $\text{Percentage occurrence of each fungus} = \dfrac{\text{Number of collections} \times 100}{\text{Number of samples collected}}$

(ii) $\text{Number of fungi per sample} = \dfrac{\text{Total number of fungal collections}}{\text{Number of samples collected}}$

Results

Higher estuarine fungi from Lake Manzala

A total of sixty fungi (26 Ascomycetes and 34 anamorphic fungi) were identified from 515 fungal collections from 300 samples collected from the three Manzala sites (Table 1). The number of fungi per sample ranged from 1.36 to 2.28. Salinity in the three sites was 3.1, 3.8 and 11.1 g/L in Manzala 1, Manzala 2 and Manzala 3, respectively. Hydrogen ion concentration was around neutral and ranged between 7.4 and 7.8. Fungi were classified as very frequent (above 20 %), frequent (10–20 %), common (5–10 %) and infrequent (below 5 %). The most common fungus was *Periconia prolifica* with 18 % overall frequency of occurrence; the fungus was frequent at all sites. The five most common fungi in the three studied site were markedly different (Table 2). Eleven fungi were recorded consistently from the three sites e.g. *Leptosphaeria oraemaris*, *Alveophoma caballeroi*, *Phoma epicoccina*, *Zalerion varium* (Table 1). The highest fungal diversity (39 spp.) was recorded from Manzala 3 followed by Manzala 1, 2 (31 spp.). Fungal communities in the three sites were markedly different from one to another with 12, 7, and 11 species were unique to Manzala 1, Manzala 2 and Manzala 3 respectively. Two fungi were recorded consistently from Manzala 1 and Manzala 2 only. Six fungi were recorded consistently from Manzala 1 and Manzala 3 only, while eleven fungi were recorded only from Manzala 2 and Manzala 3. Specious genera recorded from the three sites were *Aniptodera* (5 species), *Lignincola* (4 species), *Cirrenalia* (4 species), *Phoma* (4 species), *Chaetomium* (3 species), *Leptosphaeria* (3 species) and two species of *Swampomyces* and *Zalerion*.

Manzala 1

Thirty-one fungi (14 ascomycetes and 17 anamorphic fungi) were identified from 146 fungal collections with an average of 1.46 species identified on each sample. Frequent fungi included *Periconia prolifica* (19 %), *Zopfiella leucotricha* (12 %) and *Phoma epicoccina* (10 %). Eight fungi were common and 20 were infrequent and listed in Table 1.

Manzala 2

Thirty-one fungi (9 teleomorphic and 22 anamorphic ascomycetes) were identified from 136 fungal collections with an average of 1.36 species identified on each samples. Two fungi: *Periconia prolifica* (20 %), *Leptosphaeria xerophylli* (10 %) were frequent. Twelve fungi were common and 17 infrequent (Table 1).

Manzala 3

The highest fungal diversity was recorded from this site. Thirty-nine (12 teleomorphic and 27 anamorphic ascomycetes) were identified from 228 fungal collections with an average of 2.28 species identified for each sample. Seven fungi were frequent, nine were common, and 23 infrequent (Table 1).

Tab. 1. – Frequency of occurrence of the recorded fungi from the three studied sites.

Fungi	**Manzala 1**	**Manzala 2**	**Manzala 3**	**Total**
Teleomorphic ascomycetes				
Achaetomium sp	2	–	–	0.7
Aniptodera aquadulcis (S.Y. Hsieh, H.S. Chang & E.B.G. Jones) J. Campb., J. Anderson & Shearer	–	5	–	1.7
Aniptodera fusiformis Shearer	–	–	9	3.0
Aniptodera limentica Shearer	–	–	2	0.7
Aniptodera sp.1	–	–	2	0.7
Aniptodera sp.2	3	–	–	1.0
Arenariomyces trifuricatus – Höhnk	–	2	2	1.3
Chaetomium bostrychoides Zopf	2	–	–	0.7
Chaetomium aterrimum Ellis & Everhart	3	–	–	1.0
Chaetomium globosum Kunze	3	–	–	1.0
Corollospora maritima Werdermann	–	–	2	0.7
Leptosphaeria agnita (Desm.) De Not. & Ces.	5	–	3	2.7
Leptosphaeria oraemaris Linder	3	8	15	8.7
Leptosphaeria xerophylli Ellis	–	10	–	3.3
Lignnincola laevis Höhnk	2	–	2	1.3
Lignnincola sp. 1	–	5	–	1.7
Lignnincola sp. 2	3	1	–	1.3
Lignnincola sp. 3	–	–	2	0.7
Linocarpon sp.	–	2	–	0.7
Lulworthia grandispora Meyers	3	–	–	1.0
Massarina cisti Bose	2	–	2	1.3
Nais aquatica Hyde	–	–	3	1.0
Panorbis viscosus (I.Schmidt) J. Campb., J.L. Anderson & Shearer	5	–	–	1.7
Swampomyces clavatispora Abdel-Wahab, El-Sharouny & E.B.G. Jones	–	8	2	3.3
Swampomyces sp.	3	8	–	3.7

Tab. 1. – Continued

Fungi	**Manzala 1**	**Manzala 2**	**Manzala 3**	**Total**
Zopfiella leucotricha (Speg) Malloch & Cain	12	–	–	4.0
Anamorphic ascomycetes				
Ahmadia pentatropidis Syd.	–	2	3	1.7
Alveophoma caballeroi Alcalde	3	8	8	6.3
Aristastoma oeconomicum (Ellis & Tracy) Tehon	–	–	4	1.3
Asteromidium imperspicum Speg	–	1	5	2.0
Catenophora pruni Luttr.	2	–	19	7.0
Chaetospermium camelliae Sacc.	–	–	4	1.3
Cumulospora marina I. Schmidt	9	–	4	4.3
Ciferriella domingensis Petr., Cif	–	6	8	4.7
Cirrenalia adarica Kohlm., Volkm.-Kohlm. & O.E. Erikss.	6	–	–	2.0
Cirrenalia basiminuta Raghu-Kumar & Zainal	9	–	–	3.0
Cirrenalia macrocephalia (Kohlm.) Meyers & Moore	–	6	–	2.0
Cirrenalia sp.	–	3	–	1.0
Cystotricha striola Berk. & Broome	–	1	7	2.7
Dendryphiella sp.	–	–	2	0.7
Dialacenoiopsis landolphiae Bat.	4	-	–	1.3
Didymostilbe sp.	–	2	–	0.7
Diplodina microsperma (Johnst.) B.Sutton	2	1	5	2.7
Dothideodiplodia agropyri Murashk.	–	2	19	7.0
Gloeosporidina canthiicola B. Sutton	3	2	2	2.3
Hapalosphaeria deformans (Syd.) Syd.	5	5	4	4.7
Lichenoconium boreale (P. Karst.) Petr. & Syd.	2	5	11	6.0
Nanoschema elaeocarpi B. Sutton	–	1	2	1.0
Neozythia handelii (Bubak) Petr.	4	–	–	1.3
Periconia prolifica Anastasiou	19	20	15	18
Pyrenochaeta ilicis M. Wilson	2	1	2	1.7
Phoma complanata (Tode) Desm.	2	1	5	2.7
Phoma epicoccina Punith., M.C.Tulloch & C.M.Leach	10	2	4	5.3
Phoma hedericola (Durieu & Mont.) Boerema	8	–	12	6.7
Phoma exigua Sacc.	–	–	8	2.7

Tab. 1. – Continued

Fungi	Manzala 1	Manzala 2	Manzala 3	Total
Stagonospora paludosa (Sacc. & Speg.) Sacc.	–	2	2	1.3
Stachybotrys sp.	–	5	13	6.0
Trematophoma lignicola Petr.	–	–	7	2.3
Zalerion varium Anastasiou	5	8	3	5.3
Zalerion maratimum (Linder) Anastasiou	–	3	4	2.3
Number of samples examined	100	100	100	300
Number of fungal collections	146	136	228	515
Number of species per sample	1.46	1.36	2.28	1.72
Total number of species	31	31	39	60
Number of teleomorphic ascomycetes	14	9	12	26
Number of anamorphic ascomycetes	17	22	27	34
Number of Hyphomycetous anamorphs	5	6	6	10
Number of coelomycetous anamorphs	12	16	21	24

Tab. 2. – Five most common fungi in each of the studied sites

Manzala 1	Manzala 2	Manzala 3	Total
Periconia prolifica	*Periconia prolifica*	*Dothideodiplodia agropyri*	*Periconia prolifica*
Zopfiella leucotricha	*Leptosphaeria oraemaris*	*Catenophora pruni*	*Leptosphaeria oraemaris*
Phoma epicoccina	*Swampomyces clavatospora*	*Periconia prolifica*	*Phoma hedericola*
Cirrenalia basiminuta	*Alveophoma caballeroi*	*Stachybotrys sp*	*Alveophoma caballeroi*
Cumulospora marina	*Zalerion varium*	*Phoma hedericola*	*Phoma epicoccina*

Discussion

This study extends our knowledge on the higher aquatic fungi in Egypt especially in brackish lakes. A few studies have been carried out on higher aquatic fungi in Egypt. One hundred and fifty-three higher freshwater fungi were recorded from the River Nile (Abdel-Aziz 2004). Ninety-seven fungi were recorded from two brackish (Edku and Marriot) and two saline (Burullus and Quaron) lakes in Egypt. Twenty-eight fungi were common to both freshwater and estuarine sites (Abdel-Aziz 2004). El-Sharouny *et al.* (1998) recorded 50 fungi from three mangrove sites at the Red Sea shores. Thirty-nine species were recorded from six mangroves stands at the Red Sea coast bringing the total number of marine fungi in Egypt to 84 (Abdel-Wahab 2005). Three new species and one new genus were described from aquatic habitats in Egypt namely: *Halosarpheia unicellularis*, *Patescospora separans*, *Swampomyces aegyptiacus* and *S. clavatispora* (Abdel-Wahab *et al.* 2001 a,b; Pang *et al.* 2002). Fungi recorded from the four lakes and from mangroves sites in the previous studies are almost different with only ten taxa which were common to both habitats (Abdel-Aziz 2004, Abdel-Wahab 2005). Of the sixty fungi recorded in this study 19 are new for Egypt raising the total number of higher aquatic fungi in Egypt to 315.

There are some overlapping species between fungi in Lake Manzala and that in other brackish and saline lakes in Egypt with 18 fungi common to Lakes Manzala and Edku, 17 species with Lake Marriot, nine species with Lake Burullus and five species with Lake Quaron. Lake Manzala shares more fungal species with Lakes Edku and Marriot (brackish lakes) than with Lakes Burullus and Quaron (saline lakes). Higher fungal diversity recorded in Manzala 3 may be due to less pollution and increasing salinity, while Manzala 1 and 2 have nearly the same level of pollution and salinity (El-Alfy & Abdel-Rassoul 1993).

The five most common fungi were different in the three studied sites of which only *Periconia prolifica* was recorded consistently as frequent species. *Periconia prolifica* is frequent in marine habitats and has been reported from the Seychelles (Hyde 1986); Hong Kong (Vrijmoed *et al.* 1986 a, b); Kuwait (Zainal & Jones 1984) and Egypt (Abdel-Aziz 2004).

Swampomyces clavatispora along with unknown species of the genus were recorded in this study (Table 1). This is the second locality for *S. clavatispora* after its original description along with *S. aegyptiacus* from Red Sea mangroves (Abdel-Wahab *et al.* 2001b). *Swampomyces* species dominated the mycobiota at Red Sea mangroves and might be characteristic for aquatic habitats in Egypt (Abdel-Wahab 2005).

Higher numbers of anamorphic fungi were recorded from the three sites, especially in Manzala 3 there was an increase in the number of anamorphic fungi and a decreasing number of ascomycetes by increasing salinity. The ratios of anamorphic to teleomorphic taxa at Manzala 1, 2, 3 were 1.2, 2.4, and 2.3, respectively. These results agree with results of Fryar *et al.* (2004), who recorded 23 teleomorphic and 27 anamorphic ascomycetes from a brackish site in Brunei, and with the culture observations of Byrne & Jones (1975), who stated that asexual reproduction was less severely affected by high salinities compared to sexual reproduction. However, these data contradict those reported by Shearer (1972), who found that the ratio of anamorphic to teleomorphic ascomycetes decreased with increasing salinity. These different results may account for the difference in the habitat type where she was studying the mycobiota of a river while I studied the mycobiota of a lake. Hyde & Goh (1998) concluded that teleomorphic ascomycetes play a larger role in the decay of wood in streams, while anamorphic fungi are more important in lakes.

Higher numbers of coelomycetous anamorphs than hyphomycetous anamorphs were recorded from the three sites. In general there was a gradual increase in the number of coelomycetous anamorphs with increasing salinity where I recorded 12 (38.7 %), 16 (51.6 %), and 21 (53.8 %) coelomyceteous anamorphs from Manzala 1, 2, and 3, respectively. These results agree with the fungal diversity recorded on *Phragmites australis* in brackish habitats e.g. Van Ryckegem & Verbeken (2005a) recorded 30 species (26 %) coelomycetous anamorphs and 22 species (19 %) hyphomycetous anamorphs from four tidal marshes along a salinity gradient (Belgium); Van Ryckegem & Verbeken (2005b) recorded 16 (33 %) coelomycetous anamorphs and 4 (8 %) hyphomycetous anamorphs from brackish tidal march of the River Scheldt (The Netherlands); and Van Ryckegem *et al*. (2007) recorded 14 (40 %) coelomycetous anamorphs and 6 (17 %) hyphomycetous anamorphs from brackish tidal marsh in the Netherlands.

The data presented extends our knowledge on the geographical distribution of fungi recorded on *Phragmites australis*; the number of fungi recorded in this study is comparable to that recorded in other studies. A similar fungal diversity was recorded from subtropics with 61 taxa from 269 decayed stems and leaf sheaths of *P. australis* collected from Mai Po salt marshes, Hong Kong (Poon & Hyde 1998). Seventy-six taxa from 214 samples of *P. australis* collected from the same site in Hong Kong (Wong & Hyde 2001) and also 42 taxa from the same site (Wong & Hyde 2002).

Fungi recorded from *P. australis* in temperate habitats include: thirty-one taxa from the United States (Farr *et al*. 1989), 43 from freshwater habitats (Shearer 1993), and 81 taxa were reported from *P. australis* (Apinis *et al*. 1972 a, b; Taligoola *et al*. 1972). Forty-nine taxa were recorded in brackish tidal marsh of the River Scheldt (Van Ryckegem & Verbeken 2005b), 35 taxa were recorded on living green and decaying leaf blades of *P. australis* in a brackish tidal march of the Scheldt Estuary located 53.9 km inland near Doel, The Netherlands (Van Ryckegem *et al*. 2007). One hundred and fourteen taxa, the highest number of taxa ever recorded, were identified during a survey of phragmiticolous fungi on *P. australis* in four tidal marshes along a salinity gradient (mesohaline to freshwater) in the Scheldt estuary, Belgium (Van Ryckegem & Verbeken 2005a).

Tab. 3. – Number of fungi and common taxa recorded from this study and previous similar studies from different geographical locations.

Taxa	**Lake Manzala** (this study) Subtropical	**Lake Barrine** Australia (Hyde & Goh 1998) Tropical	**Lake Dianchi** China (Luo *et al.* 2004) Subtropical	**Lake Fuxian** China (Cai *et al.* 2002) Subtropical	**Brackish tidal marsh** The Netherlands (Van Ryckegem & Verbeken 2005b) Temperate
Teleomorphic ascomycetes	26	14	27	35	26
Anamorphic ascomycetes	34	20	25	29	20
Basidiomycota	0	1	0	0	3
Total number of fungi	60	35	52	64	49
Taxa per sample	1.7	1.4	1.68	1.6	n.d.
Most common species	*Periconia prolifica* 18%	*Candelabrum brocchiatum* 41%	*Pseudohalonectria lignicola* 25%	*Dictyosporium heptasporum* 15%	*Massarina arundinacea* 25.4%
	Leptospheria oraemaris 8.7%	*Trichocladium linderi* 11%	*Savoryella lignicola* 21%	*Aniptodera chesapeakensis* 10%	*Halosphaeria hamata* 12.2%
	Phoma hedericola 6.7%	*Canalisporium pulchrum* 9%	*Aniptodera lignicola* 11%	*Savoryella lignicola* 9%	*Septoriella phragmitis* 9.1%

Comparison with previous studies

Several recent studies have also investigated the biodiversity of fungi found on wood submerged in streams or lakes. The fungal communities and diversity in Lake Manzala (this study), Lake Barrine, Lake Dianchi, Lake Fuxian, brackish tidal march of the River Scheldt (The Netherlands) are compared in Table 3. Of all of these studies, the greatest diversity of fungi was found in Lake Fuxian, Yunnan, China (64 taxa) followed by Lake Manzala (this study, 60 taxa); similar numbers of species were found in Lake Dianchi (52 taxa) and River Scheldt (49 taxa) while the lowest diversity was found in Lake Barrine (35 taxa). This would indicate higher species diversity in the subtropics than in tropic and temperate areas. The greatest number of taxa per sample was found in the present study (1.7 species per sample) followed by Lake Dianchi (1.68 species per sample) and Lake Fuxian (1.6 species per sample). The most frequent species at each site differ also; none of the fungi frequently found in this study were frequent in the other sites: of the three most common species identified for these water bodies, only *Savoryella lignicola* overlapped between Lake Dianchi and Lake Fuxian. There was no overlapping species regarding the fungi of Lake Manzala and those reported in other studies except *Aniptodera aquadulcis*, which overlapped between Lake Manzala and Lake Dianchi. However, fungal communities in similar geographic locations or similar climatic regions are often more similar than those in unrelated geographic locations or different climatic regions (Wong *et al*. 1998, Fröhlich & Hyde 2000).

Conclusions

Aquatic fungi in Lake Manzala represented a mixture of freshwater fungi (e.g. *Aniptodera fusiformis* and *Nais aquatica*) and marine fungi (e.g. *Corollospora maritima* and *Zalerion varium*). Coelomycetous anamorphs dominated the mycobiota in the Lake and this is in harmony with the results of previous studies. The 60 fungi recorded in this study indicate that aquatic habitats in the subtropics support high fungal diversity where both temperate and tropical fungi can survive.

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