

## INTRODUCTION

This volume is part of the series *Biodiversity of Poland*, which began with a checklist of Polish vascular plants (Mirek *et al.* 2002). Four already published volumes of the series are devoted to fungi in the traditional, broad sense (cf. Kirk *et al.* 2001). The larger Basidiomycetes (Wojewoda 2003), larger Ascomycetes (Chmiel 2006), lichens and lichenicolous fungi (Fałtynowicz 2003) and slime moulds (Drozdowicz *et al.* 2003) are discussed in the checklists already published. Other groups of fungi of the Ascomycota, Basidiomycota, Chytridiomycota, Glomeromycota, Hypochytriomycota, Oomycota, Plasmodiophoromycota and Zygomycota, as well as anamorphic fungi which belong mostly to the Ascomycota, are the focus of this study. These are traditionally referred to as microscopic fungi (micromycetes).

Unfortunately there are unavoidable inconsistencies in the division of the material between volumes. Although generally accepted and used, the terms macromycetes (macrofungi) and micromycetes (microfungi) may be difficult to define, and separating the fungal groups representing them may pose problems. Sometimes species belonging to one taxon of supraspecific rank, especially within the Ascomycetes, are separated when this division is applied. For example, fungi forming smaller ascocarps of the genus *Lophodermium* and related genera are discussed together with other representatives of the order Rhytismatales in the volume on macroascomycetes (Chmiel 2006). As representatives of *Cordyceps* or *Xylaria*, Ascomycetes that are often incorrectly classified as 'macromycetes' are analysed in this volume together with small-fruitbodied genera of the orders Hypocreales and Xylariales. The order

Elaphomycetales, which is included in macroascomycetes, is also discussed here; it was omitted in previous studies.

In the next edition of the checklist, this enormous body of material will be divided more consistently.

### SCOPE OF THE STUDY

Compared to the macromycetes, micromycetes are richer in species and more diversified biologically as well as ecologically. They include both biotrophic parasites of plants, insects and other organisms, including species pathogenic to humans and vertebrates, and saprobic species, living on dead organic matter. Relevant data can therefore be found in many publications on the natural environment, in an impressive body of phytopathological publications connected with research into the aetiology and control of plant diseases, in studies of aero-phytic fungi and fungi used in biotechnological processes, and in the literature on the physiology and genetics of certain species.

Why the word 'preliminary' in the title? Checklists are always works in progress, and schedules must be followed. The goal is to complete and analyze a full list from the literature on micromycete taxa reported from Poland. This list may comprise several thousand bibliographic entries, only a part of which are given in the extensive *Polish Mycological Bibliography* (Skirgiełło 1988). In particular, data from publications in various disciplines of applied botany, including horticulture, agriculture and forestry, were included here only to a limited extent, and therefore this checklist does not cover all species recorded in Poland. Nor are all of the numerous publications in which several common species are listed given. This is true

especially in the case of groups that have not been critically revised by specialists.

If available, more recent monographs consolidating earlier scholarship are cited as the basic source of knowledge on the distribution of respective species groups, further supplemented by data reported in later publications, but there are exceptions. Monographs are given for the following groups of fungi discussed in the series *Flora of Poland, Fungi* published between 1960 and 1999: Peronosporales (Kochman & Majewski 1970), Ustilaginales (Kochman & Majewski 1973), Taphrinales (Sałata 1974), Uredinales (Majewski 1977, 1979), Mucorales *sensu lato* (Skirgiełło & Zadara 1979), Protomycetales (Sałata 1979), Chaetomiales (Rudnicka-Jezierska 1979), Erysiphales (Sałata 1985), Dematiaceae (Borowska 1986), Elaphomycetales (Ławrynowicz 1988), *Fusarium* (Kwaśna *et al.* 1991) and Entomophthorales (Bałazy 1993). Earlier literature or synonyms usually are not given for these taxa.

Critical studies on other groups of fungi have been published outside this series: Laboulbeniales (Majewski 1994), *Ascochyta* (Sałata 2002) and *Ramularia* (Wołczańska 2005). They are used in a similar way in this volume.

A number of other groups have been researched by specialists and are well represented in this study. These are Glomeromycota and Endogonales (J. Błaszowski), Kickxellales, Boliniales and Xylariales (A. Chlebicki), Exobasidiales (W. Mułenko), taxonomic units comprising keratinophilous fungi (Onygenales, *Chrysosporium*, *Microsporium*, *Trichophyton* – T. Korniłowicz-Kowalska & B. Wojdyło), Mycosphaerellales and a few genera of anamorphic fungi (*Asteromella*, *Cladosporium*, *Fusicladium*, *Phoma*, *Phyllosticta* – M. Ruskiewicz-Michalska; *Hendersonia*, *Septoria*, *Stagonospora* – A. Wołczańska), and species that form a group of so-called cercosporoid fungi (*Cercospora*, *Cercospora*, *Cercosporidium*, *Passalora*, *Pseudocercospora*, *Pseudocercospora* and *Stenella* –

U. Świdarska-Burek). They are indicated as 'elaborated by'.

Representatives of taxonomic units that have not been researched critically are given in the remaining part of the checklist. They are arranged as lists that should be considered provisional and are accompanied by the note 'compiled by'.

The editors are fully aware of the shortcomings of this study, and hope that the checklist will be a useful source of information despite its flaws.

#### SUBSTRATES AND WORKS CITED

The sequence of physical substrates, for example air, water, waste, soil, etc. is given at the beginning, followed by the species names of plants and other organisms serving as substrates for the recorded fungi (fungi, lichens, algae, animals), listed alphabetically. Successive substrate groups for polyphagous species are separated by semicolons.

Nomenclature follows Mirek *et al.* (2002) for vascular plants, Siemińska and Wołowski (2003) for algae, Ochyra *et al.* (2003) for mosses, Drozdowicz *et al.* (2003) for slime moulds, Wojewoda (2003) for macrobasidiomycetes, Chmiel (2006) for macroascomycetes, and Fałtynowicz (2003) for lichens (including lichenicolous fungi as well as lichenised fungi). Lichenicolous species are not discussed exhaustively in this study; the checklists of Fałtynowicz (2003) and Czyżewska and Kukwa (mscr.<sup>1</sup>) should be consulted.

A reference to the source work for the fungus follows each species. Authors' names are given chronologically.

#### SYMBOLS USED

***Italic bold type*** – accepted names

*Italics petit* – synonyms

→ – denotes the name accepted in this list

<sup>1</sup> The checklist of lichenicolous fungi of Poland prepared by K. Czyżewska and M. Kukwa will be published as the 11<sup>th</sup> volume of the *Biodiversity of Poland* series.

(names in brackets) – names and/or synonyms

used in the works cited

?? – disused or doubtful taxon name

? – doubtful determination

#### SYSTEMATIC CLASSIFICATION AND NUMBER OF SPECIES

The arrangement of the material follows the division of fungi (in the broad sense) according to the ninth edition of the *Dictionary of the Fungi* (Kirk *et al.* 2001)<sup>2</sup>. Species names and their synonyms were consulted with the internet version of the *Index Fungorum* (<http://www.indexfungorum.org>) or were accepted after the cited monograph. However, the checklist should not be regarded as a source of the current nomenclature of the species discussed (that is, as of 2008). Sometimes the adopted species names are derived from the (often old) original publications, or are names that cannot be verified without examining the original herbarium material or having expert knowledge of a given fungal group.

Below is a list of the higher taxa covered in this checklist, with the number of species given in brackets, by order. The number of species in this *Preliminary checklist of Micromycetes in Poland* is 5969.

#### Kingdom CHROMISTA

##### Phylum HYPHOCHYTRIOMYCOTA

Order **Hypochytriales** (1)

##### Phylum OOMYCOTA

Order **Leptomitales** (4)

Order **Olpidiopsidales** (5)

Order **Peronosporales** (209)

Order **Pythiales** (34)

Order **Rhipidiales** (6)

Order **Rozellopsidales** (1)

Order **Saprolegniales** (35)

Order **Sclerosporales** (1)

#### Kingdom FUNGI

##### Phylum CHYTRIDIOMYCOTA

Order **Blastocladales** (13)

Order **Chytridiales** (63)

Order **Monoblepharidales** (6)

Order **Spizellomycetales** (12)

##### Phylum GLOMEROMYCOTA

Order **Diversisporales** (25)

Order **Glomerales** (37)

Order **Paraglomerales** (1)

##### Phylum ZYGOMYCOTA

###### Class ZYGOMYCETES

Order **Basidiobolales** (3)

Order **Dimargaritales** (3)

Order **Endogonales** (4)

Order **Entomophthorales** (111)

Order **Kickxellales** (9)

Order **Mortierellales** (45)

Order **Mucorales** (89)

Order **Zoopagales** (26)

###### Class TRICHOMYCETES

Order **Amoebidiales** (1)

Order **Asellariales** (1)

Order **Eccrinales** (1)

##### Phylum ASCOMYCOTA

Order **Boliniales** (8)

Order **Calosphaeriales** (8)

Order **Capnodiales** (9)

Order **Diaporthales** (167)

Order **Dothideales** (41)

Order **Elaphomycetales** (8)

Order **Erysiphales** (124)

Order **Eurotiales** (6)

Order **Hypocreales** (96)

Order **Hysteriales** (11)

Order **Laboulbeniales** (205)

Order **Microascales** (12)

Order **Microthyriales** (5)

Order **Mycosphaerellales** (61)

Order **Myriangiales** (1)

Order **Onygenales** (18)

Order **Ophiostomatales** (12)

Order **Phyllachorales** (15)

Order **Pleosporales** (261)

Order **Pyrenulales** (8)

Order **Saccharomycetales** (35)

<sup>2</sup> The phylum Glomeromycota (Schüßler *et al.* 2001), not included in ninth edition of the *Dictionary of the Fungi*, is the exception. The traditional division of anamorphic fungi into four classes is also adopted.

- Order Schizosaccharomycetales** (1)
- Order Sordariales** (99)
- Order Taphrinales** (35)
- Order **Thelebolales** (1)
- Order **Trichosphaeriales** (3)
- Order **Verrucariales** (4)
- Order **Xylariales** (129)
- Incertae sedis (34)
- Phylum **BASIDIOMYCOTA**
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  - Order **Microstromatales** (2)
  - Order **Uredinales** (317)
  - Order **Ustilaginales** (179)
- Anamorphic fungi
  - Class **BLASTOMYCETES** (68)
  - Class **HYPHOMYCETES** (1574)
  - Class **COELOMYCETES** (1628)
  - Class **AGONOMYCETES** (19)
  - Incertae sedis (1)
  - Nomina dubia (2)
- Kingdom **PROTOZOA**
  - Phylum **PLASMODIOPHOROMYCOTA**
    - Order **Plasmodiophorales** (5)

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Wiesław MUŁENKO  
Tomasz MAJEWSKI  
Małgorzata RUSZKIEWICZ-MICHALSKA

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