

DOI: 10.5586/am.1070

Publication history

Received: 2016-01-12

Accepted: 2016-01-21

Published: 2016-01-29

Handling editor

Tomasz Leski, Institute of
Dendrology of the Polish
Academy of Sciences, Poland

Authors' contributions

All authors contributed to
the collection of material and
manuscript preparation.

Funding

The study was privately
funded. Additional funding
was provided by the Institute
for Agricultural and Forest
Environment of the Polish
Academy of Science and
Institute of Dendrology of the
Polish Academy of Science.

Competing interests

TL is the editorial secretary
of the *Acta Mycologica*; other
authors: no competing interests

Copyright notice

© The Author(s) 2016. This is an
Open Access article distributed
under the terms of the [Creative
Commons Attribution License](#),
which permits redistribution,
commercial and non-
commercial, provided that the
article is properly cited.

Citation

Kujawa A, Gierczyk B, Domian
G, Wrzosek M, Stasińska M,
Szkodzik J, et al. Preliminary
studies of fungi in the
Biebrza National Park. Part
IV. Macromycetes – new data
and the synthesis. *Acta Mycol.*
2015;50(2):1070. [http://dx.doi.
org/10.5586/am.1070](http://dx.doi.org/10.5586/am.1070)

Digital signature

This PDF has been certified using digital
signature with a trusted timestamp to
assure its origin and integrity. A verification
trust dialog appears on the PDF document
when it is opened in a compatible PDF
reader. Certificate properties provide
further details such as certification time
and a signing reason in case any alterations
made to the final content. If the certificate
is missing or invalid it is recommended to
verify the article on the journal website.

ORIGINAL RESEARCH PAPER

Preliminary studies of fungi in the Biebrza National Park. Part IV. Macromycetes – new data and the synthesis

Anna Kujawa^{1*}, Błażej Gierczyk², Grażyna Domian³, Marta Wrzosek⁴, Małgorzata Stasińska⁵, Jarosław Szkodzik⁶, Tomasz Leski⁷, Leszek Karliński⁷, Marcin Pietras^{7,8}, Maria Dynowska⁹, Agnieszka Henel¹⁰, Dominika Ślusarczyk¹¹, Dariusz Kubiak⁹

¹ Institute for Agricultural and Forest Environment, Polish Academy of Sciences, Bukowska 19, 60-809 Poznań, Poland

² Faculty of Chemistry, Adam Mickiewicz University in Poznań, Umultowska 89b, 61-614 Poznań, Poland

³ Regional Directorate for Environmental Protection in Szczecin, Teofila Firlika 20, 71-637 Szczecin, Poland

⁴ Department of Molecular Phylogenetics and Evolution, University of Warsaw, Al. Ujazdowskie 4, 00-478 Warsaw, Poland

⁵ Environmental Testing Laboratory, University of Szczecin, Felczaka 3c, 71-412 Szczecin, Poland

⁶ Nature & Ecology of Łódź Macrorregion Website, Ekolodzkie.pl

⁷ Institute of Dendrology, Polish Academy of Sciences, Parkowa 5, 62-035 Kórnik, Poland

⁸ Faculty of Biology, University of Gdańsk, Wita Stwosza 59, 80-308 Gdańsk, Poland

⁹ Department of Mycology, University of Warmia and Mazury in Olsztyn, Oczapowskiego 1a, 10-957 Olsztyn, Poland

¹⁰ Biebrza National Park, Osowiec-Twierdza 8, 19-110 Goniądz, Poland

¹¹ Department of Algology and Mycology, Faculty of Biology and Environmental Protection, University of Łódź, Banacha 12/16, 90-237 Łódź, Poland

* Corresponding author. Email: annakuja@poczta.onet.pl

Abstract

The paper presents the last part of the results of the short-term inventory of fungi species in the Biebrza National Park and synthesises all the data gathered during two surveys, including the information published by other authors. The main body of research is focused on a survey of macrofungi identified with morphology-based methods. In case of some specimens molecular technics have been applied. In total 346 macrofungal taxa (21 belonging to ascomycetes and 325 to basidiomycetes) were found during the survey, including 186 species unobserved during the previous inventory in 2012. As a result of previous and ongoing studies, the current number of macrofungi recorded from the Biebrza National Park reached 508 species. Among them eight taxa are newly reported for Poland (*Conocybe velutipes* var. *nitrophila*, *Entoloma caeruleum*, *E. plebejoides*, *Inocybe rennyi*, *I. vulpinella*, *Pholiota pityrodes*, *Pholiotina utricystidiata*, and *Tomentella pilosa*). The next seven species (*Bovista paludosa*, *Fistulina hepatica*, *Ganoderma lucidum*, *Geastrum schmidelii*, *Inonotus obliquus*, *Tulostoma kotlabae*, and *Xerocomus parasiticus*) are protected by law and 95 species belong to red-listed species. The results of two intensive, but relatively short-term survey clearly indicate the Biebrza National Park as a hot spot of macrofungi and suggest the need to undertake extended and regular inventories also in other Polish national parks.

Keywords

macrofungi; rare species; protected and threatened fungi; protected area; Poland

This paper is dedicated to Professor Maria Lisiewska and Professor Anna Bujakiewicz on the occasion of their 80th and 75th birthday, respectively.

Introduction

The presented data originate from the second survey of macrofungal diversity of the Biebrza National Park (BbNP) undertaken by members of the Polish Mycological Society (PMS) in 2013. That research was a continuation of the all-fungi inventory started in 2012 and summarized by Kujawa et al. [1] and Ruskiewicz-Michalska et al. [2].

The aim of the current paper is to present the new data supplementing the knowledge of taxonomic diversity and richness of the macrofungi collected also in habitats unscreened during the first survey in 2012 and summarize all known information about macrofungi of the BbNP. The overview of natural values of the BbNP as well as the map indicating new localities surveyed in 2013 was given in the paper concerning new data on micromycetes [3].

Material and methods

Macromycetes were collected 24–29 August 2013 in seven protective units of the BbNP: Brzeziny, Grzędy, Kapice, Osowiec, Werykle (inventoried previously [1]) and Tajno, Trzyrzeczki (studied for first time) and at the area of fortress in Osowiec-Twierdza (see Fig. 1 in [3]). The habitats screened include: meadows, pastures, roadsides, bogs and forest communities, including *Ribeso nigri-Alnetum*, *Thelypteridi-Betuletum pubescentis*, *Tilio cordatae-Carpinetum betuli*, and *Vaccinio uliginosi-Pinetum* (syn-taxonomic system according to Matuszkiewicz [4]). More details on the materials and methods used in the paper were presented by Kujawa et al. [1]. As in the former paper, the nomenclature follows the checklists [5,6] and the Index Fungorum database [7]. For some fungi specimens morphological identification has been confirmed using the DNA barcoding technique. Nuclear ITS sequences obtained in this study are deposited in National Center for Biotechnology Information (NCBI), with the accession numbers KU525690–KU525701. The voucher collections are deposited in the Herbarium of the Faculty of Biology, University of Warsaw, in the Institute of Dendrology of the Polish Academy of Sciences in Kórnik.

Results

The five-days inventory yielded 346 species, mainly basidiomycetes (330 taxa), including 186 species unobserved during the previous inventory in 2012.

The following abbreviations are used in the list of species: BPU – Brzeziny protective unit (see Fig. 1 in Ruskiewicz-Michalska et al. [3]); GPU – Grzędy protective unit; KPU – Kapice protective unit; KOPU – Kopytkowo protective unit; OPU – Osowiec protective unit; TPU – Trzyrzeczki protective unit; TaPU – Tajno protective unit; WPU – Werykle protective unit; R-A – *Ribeso nigri-Alnetum*; T-B – *Thelypteridi-Betuletum pubescentis*; T-C – *Tilio cordatae-Carpinetum betuli*; V-P – *Vaccinio uliginosi-Pinetum*. Initials of the names are given to denote collecting and/or identifying person (i.e., AF-S – Anna Frymark-Szymkowiak, AH – Agnieszka Henel, AK – Anna Kujawa, BG – Błażej Gierczyk, CT – Cezary Tkaczuk, DK – Dariusz Kubiak, DŚ – Dominika Ślusarczyk, GD – Grażyna Domian, JC – Jerzy Chełkowski, JP – Julia Pawłowska, JS – Jarosław Szkodzik, LK – Leszek Karliński, MD – Maria Dynowska, MP – Marcin Pietras, MRM – Małgorzata Ruskiewicz-Michalska, MW – Marta Wrzosek, MS – Małgorzata Stasińska, NM – Natalia Michalska, TL – Tomasz Leski); * – taxon new for BbPN; ** – taxon new for Poland; # – species very rare in Poland (1–3 localities); Ex, E, V, R, I – category of threat (according to Wojewoda, Ławrynowicz [8]); PP – partially protected species; SP – strictly protected species.

List of species collected in 2013

Ascomycota

**Ascocoryne cylichnium* (Tul.) Korf on wood, OPU, Carska Droga, mixed forest, 29 Aug., leg. & det. MW.

Chlorociboria aeruginascens (Nyl.) Kanouse ex C.S. Ramamurthi, Korf & L.R. Batra on wood debris, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. MRM & NM, det. AK; OPU, Carska Droga, T-B, 28 Aug., leg. & det. MW; OPU, blue tourist trail, around Fort IV, mixed forest, 29 Aug., leg. & det. GD.

**Ciboria batschiana* (Zopf) N.F. Buchw. on acorns, TPU, T-C, 6 Sep., leg. & det. GD.

**Cudoniella acicularis* (Bull.) J. Schröt. on stump of *Quercus robur* L., GPU, T-C, 27 Aug., leg. & det. JS.

*#*Geoglossum umbratile* Sacc. on ground, among mosses, TPU, Szuszałewo (0.2 km NE), peatbog, 12 Sep., leg. AH, det. MS.

Notes. Species known in Poland from two localities: Białowieża National Park [9] and Masurian Landscape Park [10].

Helvella crispa Fr. on ground, KOPU, T-C, 7 Sep., leg. & det. GD.

Helvella lacunosa Afzel. on ground, OPU, Biały Grąd educational path, oak forest on the mineral hill, 27 Aug., leg. GD & AH, det. AK; R.

Helvella macropus (Pers.) P. Karst. on ground, GPU, deciduous forest, 27 Aug., leg. & det. MS.

**Helvella villosa* (Hedw.) Dissing & Nannf. on ground, OPU, Biały Grąd educational path, oak forest on the mineral hill, 27 Aug., leg. GD & AH, det. AK.

Humaria hemisphaerica (F.H. Wigg.) Fuckel on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. GD, det. AK; GPU, 27 Aug. leg. & det. MS, OPU, Sośnia, 28 Aug., garden, leg. & det. AK; OPU, Sośnia, 28 Aug., mixed forest, leg. & det. MW.

Hymenoscyphus fructigenus (Bull.) Fr. on acorns, OPU, Osowiec-Twierdza, T-C, 27 Aug., leg. & det. DK; TPU, 6 Sep., T-C, leg. GD, det. BG.

**Hymenoscyphus salicellus* (Fr.) Dennis on branch of *Salix fragilis* L., BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. JS.

**Hymenoscyphus scutula* (Pers.) W. Phillips on stem of plant, GPU, T-B, 27 Aug., leg. & det. MS.

**Mollisia discicolor* (Mont.) W. Phillips on wood of *Quercus robur* L., GPU, T-C, 27 Aug., leg. & det. MS.

**Mollisia ramealis* (P. Karst.) P. Karst. on branch of *Betula pendula* Roth, GPU, T-B, 27 Aug., leg. & det. JS.

**Orbilium xanthostigma* (Fr.) Fr. on branch of deciduous tree, OPU, Sośnia, R-A, 28 Aug., leg. & det. JS.

**Otidea alutacea* (Pers.) Masee on ground, GPU, deciduous forest, 27 Aug., leg. & det. MS.

Otidea onotica (Pers.) Fuckel on ground, KPU, Kapice, mixed forest, 30 Aug., leg. & det. DS; TPU, 6 Sep., T-C, leg. GD, det. BG.

**Peziza badia* Pers. on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK.

**Peziza fimeti* (Fuckel) Seaver on deer (?) droppings, OPU, Sośnia, dune, 28 Aug., leg. & det. AK.

**Peziza succosa* Berk. on ground, TPU, T-C, 6 Sep., leg. GD, det. BG.

Basidiomycota

**Agaricus arvensis* Schaeff. on ground, OPU, Biały Grąd educational path, oak forest on the mineral hill, 27 Aug., leg. GD, det. BG.

*#*Agaricus litoralis* (Wakef. & A. Pearson) Pilát on ground, OPU, Biały Grąd educational path, sandy grasslands, 27 Aug., leg. GD, det. BG.

Notes. Species known in Poland from a single locality [11].

*#*Agaricus macrocarpus* (F.H. Møller) F.H. Møller on ground, WPU, V-P, 8 Sep., leg. GD, det. BG.

Notes. Species known in Poland from a few localities [12,13].

**Agaricus silvaticus* Schaeff. on ground, TPU, T-C, 6 Sep., leg. GD, det. BG.

**Agaricus silvicola* (Vittad.) Peck on ground, TPU, T-C, 31 Aug., leg. GD, det. BG.

**Agrocybe firma* (Peck) Kühner on litter, TPU, T-C, 31 Aug., leg. GD, det. BG.

Amanita argentea Huijsman on ground, OPU, blue tourist trail, around Fort IV, pine forest, 29 Aug., leg. GD, det. BG.

Amanita fulva (Schaeff.) Pers. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG; GPU, T-B, 27 Aug., leg. & det. MS; GPU, deciduous forest, 27 Aug., leg. TL, det. MS; OPU, Carska Droga, T-B, 28 Aug., leg. & det. MW; OPU, T-B, 2 Sep., leg. & det. GD.

Amanita muscaria (L.) Hook. on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK.

Amanita phalloides (Vaill.) Link on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. MRM & NM, det. AK; OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. & det. MD.

Amanita rubescens (Pers.) Gray on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AK & AH, det. AK; OPU, Sośnia, pine forest, 28 Aug., leg. JC, det. AK; OPU, Sośnia, T-B, 28 Aug., leg. & det. MW.

**Amphinema byssoides* (Pers.) J. Erikss. on wood of *Pinus sylvestris* L. and mooses, OPU, Sośnia, pine forest, 28 Aug., leg. TL, det. TL&MP (NCBI accession No. KU525690).

Auriscalpium vulgare Gray on cone of *Pinus sylvestris* L., OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. & det. DK; GPU, T-C, 27 Aug., leg. MRM, det. AK; GPU, dune, 27 Aug., leg. & det. DS; OPU, Sośnia, pine forest, 28 Aug., leg. & det. MW & AK.

Baeospora myosura (Fr.) Singer on cone of *Picea abies* (L.) H. Karst., TPU, T-C, 6 Sep., leg. GD, det. BG.

**Bankera fuligineoalba* (J.C. Schmidt) Pouzar on ground, OPU, Sośnia, pine forest, 28 Aug., leg. BG & AH & AK, det. AK; E.

Bjerkandera adusta (Willd.) P. Karst. on wood of deciduous tree, OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. GD & AH, det. AK.

Boletus edulis Bull. on ground, OPU, Sośnia, pine and larch forest, 28 Aug., leg. & det. BG & GD & DŚ & AK.

Bovista nigrescens Pers. on ground, KPU, Kapice, roadside, 30 Aug, leg. & det. DŚ.

Bovista paludosa Lév. on ground, TPU, T-C, 3 Sep., leg. & det. GD; V, PP.

Bovista plumbea Pers. on ground, TPU, Szuszałewo (0.2 km NE), peatbog, 12 Sep., leg. AH, det. MS.

Calocera cornea (Batsch) Fr. on wood of deciduous trees, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. MRM & NM, det. AK.

Calocera viscosa (Pers.: Fr.) Fr. on wood of conifers, TPU, T-C, 31 Aug. leg. & det. GD.

Calocybe carnea (Bull.) Donk on litter, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. AK; Sośnia, lawn, 28 Aug., leg. CT, det. BG.

Calvatia excipuliformis (Scop.) Perdeck on ground, BPU, meadow, 5 Sep., leg. & det. GD.

Calvatia utriformis (Bull.) Jaap on ground, OPU, Sośnia, dune with *Pinus sylvestris* L., 28 Aug., leg. & det. AK.

Cantharellula umbonata (J.F. Gmel.) Singer on ground, GPU, 27 Aug., leg. NM, det. AK.

Cantharellus cibarius Fr. on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. MW.

**Ceriporia purpurea* (Fr.) Donk on branch of *Fraxinus excelsior* L., OPU, Sośnia, ecotone between mixed forest and alder forest, 28 Aug., leg. & det. MW; E.

**Ceriporia reticulata* (Hoffm.) Domanski on branch of *Corylus avellana* L., BPU, Grobla Honczarowska, R-A, 26 Aug., leg. & det. MP (NCBI accession No. KU525691); R.

**Chalciporus piperatus* (Bull.) Bataille on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK.

Chroogomphus rutilus (Schaeff.) O.K. Mill. on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK; OPU, Sośnia, dune with *Pinus sylvestris* L., 28 Aug., leg. & det. MW; OPU, Dziekiarka, close to road 668 (from Osowiec to Sośnia), mixed forest, 28 Aug., leg. & det. MW.

Clavicornia pyxidata (Pers.) Doty on wood, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. TL & MP & LK, det. AK; OPU, Sośnia, pine forest, 28 Aug., leg. MP, det. AK; OPU, blue tourist trail, around Fort IV, mixed forest, 29 Aug., leg. & det. GD; Góra Skobla, T-C, 1 Sep. leg. & det. GD; V.

Clavulina cinerea (Bull.) J. Schröt. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. AK & MS; OPU, Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. GD & AH, det. AK; OPU, Sośnia, dune with *Pinus sylvestris* L. and *Picea abies* (L.) H. Karst., 28 Aug., leg. MW, det. BG.

Clavulina coralloides (L.) J. Schröt. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. TL & MP & LK, det. AK.

*#*Clavulinopsis subtilis* (Pers.: Fr.) Corner among mosses, GPU, Grzędę, T-B, 27 Aug, leg. & det. MS.

Notes. Species known in Poland from one historical [5] and two contemporary localities [14].

Clitocybe clavipes (Pers.) P. Kumm. on ground, OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. & det. DK; OPU, Sośnia, pine forest, 28 Aug., leg. MRM, det. AK.

**Clitocybe geotropa* (Bull.) Quéf. on ground, OPU, Sośnia, mixed forest, 28 Aug., leg. & det. MW.

Clitocybe gibba (Pers.) P. Kumm. on ground and litter, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. BG, det. AK; OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. DK & MD, det. AK; WPU, Gugny, pine forest, 27 Aug., leg. JC, det. AK.

Clitocybe odora (Bull.) P. Kumm. on ground, TPU, T-C, 6 Sep., leg. & det. GD.

Clitopilus hobsoni (Berk. & Broome) P.D. Orton on dead Polyporaceae, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. AK.

**Clitopilus prunulus* (Scop.) P. Kumm. on ground, OPU, Sośnia, in adler forest edge, 28 Aug., leg. MW, det. MW & BG.

**Collybia cookei* (Bres.) J.D. Arnold, on debris of fungi, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. MRM & NM, det. AK.

Coltricia perennis (L.) Murrill on ground, OPU, Sośnia, pine forest, 28 Aug., leg. MRM & AK & JC, det. MRM.

Conocybe albipes (G.H. Otth.) Hauskn. var. *albipes*, on ground, OPU, Biały Grąd educational path, 27 Aug., pasture, leg. AK, det. BG.

**Conocybe ochrostriata* Hauskn. var. *ochrostriata* on ground, OPU, Biały Grąd educational path, pasture, 27 Aug., leg. & det. BG.

Notes. Species not listed in checklist of Polish larger macromycetes [5], however it was already reported from Zakopane [15], and later collected in Ujście Warty National Park (Kujawa, Ślusarczyk, unpublished), Krosno town [16] and Kampinos National Park [14].

Conocybe semiglobata (Kühner) ex Kühner & Watling var. *semiglobata* on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG.

**Conocybe siliginea* (Fr.) Kühner on ground, OPU, Biały Grąd educational path, pasture, 27 Aug., leg. & det. BG.

**Conocybe velutipes* (Velen.) Hauskn. & Svrček var. *velutipes* on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG.

****Conocybe velutipes* (Velen.) Hauskn. & Svrček var. *nitrophila* Hauskn. on ground, OPU, Biały Grąd educational path, pasture, on cow dung, 27 Aug., leg. AK, det. BG.

Notes. Nitrophilous taxon, in Poland known only from Wrocław city (Gierczyk, unpublished), rare in Europe.

Coprinus disseminatus (Pers.) Quél. on stumps of deciduous trees, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG; OPU, Osowiec Twierdza, lawn, 26 Aug., leg. JC. det. BG; OPU, Biały Grąd educational path, pasture, deciduous shrubs, 27 Aug., leg. & det. MW; OPU, Sośnia, garden, 28 Aug., leg. MW, det. BG.

**Coprinus heterosetulosus* Locq. on deer droppings, Sośnia, peatbog, 28 Aug., leg. GD, det. BG.

Notes. Coprophilous species, not rare in Poland but probably overlooked because of minute basidiocarps. Reported from Bieszczady Mts and Białowieża National Park [17].

Coprinus lagopus (Fr.) Fr. var. *lagopus* on ground, Sośnia, R-A, 28 Aug., leg. TL, det. BG.

Coprinus micaceus (Bull.) Fr. on wood, GPU, T-C, 28 Aug., leg. A. Bernatowicz, det. BG; OPU, Sośnia, garden, 28 Aug., leg. MW, det. BG.

Coprinus plicatilis (Curtis) Fr. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG.

**Coprinus pseudoniveus* Bender & Uljé on cow dungs, OPU, Biały Grąd educational path, pasture, 27 Aug., leg. & det. BG.

Notes. Very rare, coprophilous species, in Poland known only in Bieszczady Mts [17].

**Coprinus pseudoradiatus* Kühner & Joss. ex Watling on deer droppings, OPU, Sośnia, peatbog, 28 Aug., leg. GD, det. BG.

Notes. Rather common species in Poland, rarely collected due to minute basidiocarps. Recorded only in the Bieszczady Mts [17] and Białowieża Primeval Forest [18].

**Coprinus pusillulus* Svrček (*C. heptemerus* M. Lange & A.H. Sm. var. *parvisporus* J. Breitenb. & F. Kränzl.) on deer droppings, Sośnia, peatbog, 28 Aug., leg. GD, det. BG.

Notes. Coprophilous species, not rare in Poland but probably overlooked due to minute basidiocarps. Reported from the Góry Kaczawskie Mts (in [17] as *C. heptemerus* var. *parvisporus*) and Kampinos National Park [14].

**Coprinus saccharinus* Romagn. stump of *Salix* sp., BPU, Carska Droga near Grobla Honczarowska, roadside, 26 Aug., leg. & det. BG.

**Coprinus schroeterii* P. Karst. on ground, TPU, T-C, 31 Aug., leg. GD, det. BG.

**Coprinus stercoreus* (Scop.) Fr. on deer droppings, OPU, Sośnia, spruce forest, 28 Aug., leg. & det. BG; OPU, Sośnia, peatbog, 28 Aug., leg. GD, det. BG.

**Coprinus subimpatiens* M. Lange & A.H. Sm. on litter, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. DŚ, det. BG.

*#*Coprinus subpurpureus* A.H. Sm. on ground, OPU, Biały Grąd educational path, pasture, 27 Aug., leg. & det. BG.

Notes. Very rare species, in Poland known only from Wrocław city [17].

Coprinus xanthothrix Romagn. on litter, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG; peat pits by the Carska Droga, 26 Aug., leg. & det. BG; GPU, T-C, leg. MRM, det. BG.

**Corioloopsis gallica* (Fr.) Ryvarden on twigs of *Alnus* sp., BPU, Grobla Honczarowska, 26 Aug., leg. & det. MS; R.

Cortinarius armillatus (Fr.) Fr. on ground, OPU, Dziekciarka, close to road 668 (from Osowiec to Sośnia), mixed forest, 27 Aug., leg. & det. MW.

Cortinarius cinnamomeus (L.) Fr. on ground, OPU, Sośnia, mixed forest, 28 Aug., leg. & det. MW.

**Cortinarius collinitus* (Sowerby) Gray on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. MW.

**Cortinarius delibutus* Fr. on ground, GPU, mixed forest, leg. TL, det. MS.

**Crepidotus cesati* (Rabenh.) Sacc. var. *subsphaerosporus* (J.E. Lange) Senn-Irlet on twigs of *Populus* sp., OPU, Osowiec-Twierdza, Góra Skobla, T-C, 1 Sep., leg. GD, det. BG.

**Crepidotus lundellii* Pilát on wood, OPU, Sośnia, pine fores margin, 28 Aug., leg. GD, det. BG.

Crepidotus mollis (Schaeff.) Staude var. *calolepis* (Fr.) Pilát on wood of deciduous trees, OPU, blue tourist trail, around Fort IV, mixed forest, 29 Aug., leg. & det. GD; OPU, Osowiec-Twierdza, Góra Skobla, T-C, 1 Sep., leg. GD, det. BG.

Crucibulum leave (Huds.) Kambly. on wood, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. BG, det. BG & AK; OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK.

**Cylindrobasidium laeve* (Pers.) Chamuris on branch of *Corylus avellana* L., BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. MS.

Cystoderma amianthinum (Scop.) Fayod on litter, OPU, Sośnia, pine forest, 28 Aug., leg. AK, det. BG.

*#*Cystoderma tuomikoskii* Harmaja on litter, OPU, Sośnia, spruce forest, 28 Aug., leg. & det. BG; OPU, Sośnia, pine forest, 28 Aug., leg. GD, det. BG.

Notes. Very rare, boreal species, in Poland hitherto known only from Kampinos National Park [14].

Cystolepiota seminuda (Lasch) Bon on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG.

**Daedalea quercina* (L.) Pers. on wood of *Quercus robur*, TPU, T-C, 31 Aug. leg. & det. GD.

Daedaleopsis confragosa (Bolton) J. Schröt. on wood, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AK & AH, det. AK; OPU, Sośnia, R-A, 28 Aug., leg. & det. JS & MW; OPU, Osowiec-Twierdza, Góra Skobla, R-A, 28 Aug., leg. & det.

MW; park buffer zone, 2 km from Osowiec-Twierdza, peatbog, 28 Aug., leg. & det. MS.

Disciseda bovista (Klotzsch) Henn. on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. AK; E.

**Ditiola peziziformis* (Lév.) Reid on branch of *Betula pendula* Roth, GPU, 27 Aug., leg. DŚ, det. AK; E.

***Entoloma caeruleum* (P.D. Orton) Noordel. on ground, TPU, peatbog, 3 Sep., leg. GD, det. BG.

Notes. Rare but widespread blue *Entoloma* species, growing in various habitats, including peat bogs and peaty grasslands.

**Entoloma juncinum* (Kühner & Romagn.) Noordel. on ground, GPU, Grzędy, deciduous forest near the tower; 27 Aug., leg. & det. MS; R.

*#*Entoloma plebejoides* (S.Schulz.) Noordel. on ground, TPU, pasture, 31 Aug., leg. GD, det. BG.

Notes. Rare species, in Poland known only from Poznań city (Gierczyk, unpublished).

**Entoloma rhodopolium* (Fr.) P. Kumm. f. *nidorosum* (Fr.) Noordel. on ground, among mosses, GPU, Grzędy, T-B, 27 Aug., leg. & det. MS.

**Entoloma sericeum* (Bull.) ex Qué. on ground, at the road Osowiec-Grajewo, N from Rudzki Kanał, meadow, 26 Aug., leg. GD, det. BG.

Notes. Collected specimens represent probably untypical, pale form of var. *cinereoopacum*.

Exidia glandulosa (Bull.) Fr. on wood of deciduous trees, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. JS; GPU, 27 Aug., leg. & det. JS.

Fistulina hepatica (Schaeff.) With. at base of *Quercus robur* L., OPU, Biały Grąd educational path, oak forest on the mineral hill, 27 Aug., leg. AK, det. BG & AK; TPU, T-C, 6 Sep. leg. & det. GD; R, PP.

**Flammulaster muricatus* (Fr.) Watling on wood of deciduous trees, OPU, blue tourist trail, around Fort IV, mixed forest, 29 Aug., leg. GD, det. BG; TPU, T-C, 6 Sep., leg. GD, det. BG.

**Flammulina fennae* Bas on wood, TPU, T-C, 31 Aug., leg. & det. GD.

Fomes fomentarius (L.) J. Kickx f. on log of deciduous tree and on *Betula pendula* Roth, GPU, T-C, 27 Aug., leg. & det. JS & MS; OPU, Sośnia, mixed forest, 28 Aug., leg. & det. JS & MW; OPU, Carska Droga, T-B, 28 Aug., leg. & det. MW; TPU, T-C, 31 Aug., leg. & det. GD.

Fomitopsis pinicola (Sw.) P. Karst. on wood, GPU, T-C, 27 Aug., leg. TL, det. MS; OPU, Carska Droga, T-B, 28 Aug., leg. & det. MW; OPU, Sośnia, R-A, 28 Aug., leg. & det. JS; OPU, Osowiec-Twierdza, Góra Skobla, mixed forest, 30 Aug., leg. & det. MW.

**Galerina clavata* (Velen.) Kühner on ground among mosses, OPU, Biały Grąd educational path, pasture, 27 Aug., leg. AK, det. BG; TPU, peatbog, 3 Sep., leg. GD, det. BG.

**Galerina paludosa* (Fr.) Kühner among *Sphagnum* sp., GPU, T-B, 28 Aug., leg. & det. MS; park buffer zone, 2 km from Osowiec-Twierdza, peatbog, 28 Aug., leg. & det. MS; TPU, Szuszałewo (0.2 km NE), peatbog, 12 Sep., leg. AH, det. MS; R.

**Galerina tibiicystis* (Atk.) Kühner among *Sphagnum* sp., park buffer zone, 2 km from Osowiec-Twierdza, peatbog, 28 Aug., leg. & det. MS.

**Galerina vittiformis* (Fr.) Singer var. *vittiformis* among mosses, TPU, peatbog, 3 Sep., leg. GD, det. BG.

Ganoderma applanatum (Pers.) Pat. on wood of deciduous trees, park buffer zone, 2 km from Osowiec-Twierdza, peatbog, 28 Aug., leg. & det. MS; OPU, Osowiec-Twierdza, Góra Skobla, 28 Aug., leg. & det. MW; OPU, Osowiec-Twierdza, headquarters of the Park, 28 Aug., leg. & det. JC.

Geastrum fimbriatum Fr. on ground, OPU, Sośnia, dune, 28 Aug., leg. MRM, det. AK; R.

Geastrum minimum Schwein. on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. AK; E.

**Geastrum pectinatum* Pers. on ground, OPU, Sośnia, dune, 28 Aug., leg. JP, det. AK; WPU, V-P, 8 Sep., leg. & det. GD; V.

**Geastrum schmidelii* Vittad. on ground, OPU, Biały Grąd educational path, dune and sandy grasslands, 27 Aug., leg. GD & AH, det. AK; E, SP.

**Geastrum striatum* DC. on ground, OPU, Sośnia, garden, 28 Aug., leg. & det. AK; E.

**Gloeophyllum sepiarium* (Wulf.) P. Karst. on wood, OPU, Sośnia, dune, 28 Aug., leg. & det. MW & MS.

Gloeoporus dichrous (Fr.) Bres. on wood of deciduous trees, OPU, T-B, 2 Sep., leg. & det. GD; TPU, T-C, 31 Aug., leg. & det. GD; E.

**Gloeoporus taxicola* (Pers.) Gilb. & Ryvarden on log of *Pinus sylvestris* L., OPU, Osowiec-Twierdza, Góra Skobla, T-C, 1 Sep., leg. & det. GD; R.

*#*Gloiodon strigosus* (Sw.) P. Karst. on wood of *Salix* sp., OPU, Sośnia, dune, 28 Aug., leg. MP, det. BG; Ex.

Notes. In Poland known only in Białowieża National Park, very rare [19].

Gomphidius glutinosus (Schaeff.) Fr. on ground, OPU, Sośnia, pine forest, 28 Aug., leg. MRM & MS, det. AK & MS; OPU, Sośnia, dune, 28 Aug., leg. & det. MW; R.

**Gomphidius roseus* (Fr.) Fr. on ground, Sośnia, pine forest, 28 Aug., leg. MRM, det. AK; R.

Gymnopilus penetrans (Fr.) Murrill on branch of *Corylus avellana* L., OPU, mixed forest, 9 Sep., leg. GD, det. BG.

Gymnopilus picreus (Pers.) P. Karst. on log of *Pinus sylvestris* L., OPU, mixed forest, 9 Sep., leg. GD, det. BG; E.

**Gymnopus aquosus* (Bull.) Antonín & Noordel. on litter, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. GD, det. AK.

Gymnopus confluens (Pers.) Antonín, Halling & Noordel. on litter, OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. MD, det. AK; GPU, T-C, 27 Aug., leg. MRM, det. AK; OPU, Sośnia, pine forest, 28 Aug., leg. & det. MW & MS; OPU, Osowiec-Twierdza, Góra Skobla, mixed forest, 29 Aug., leg. & det. MW.

Gymnopus dryophilus (Bull.) Murrill on litter, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. BG & AK, det. AK; GPU, deciduous forest, 27 Aug., leg. MRM & MS, det. AK & MS.

Gymnopus peronatus (Bolton) Antonín, Halling & Noordel. on ground, GPU, T-C, 27 Aug., leg. MRM, det. AK; OPU, Sośnia, pine forest, 28 Aug., leg. GD, det. AK.

Hapalopilus nidulans (Fr.) P. Karst. on wood of deciduous trees, TPU, T-C, 31 Aug., leg. & det. GD.

**Hebeloma crustuliniforme* (Bull.) Qué. on ground, OPU, Biały Grąd educational path, oak forest on the mineral hill, 27 Aug., leg. MD, det. AK.

*#*Hebeloma velutipes* Bruchet on ground, TPU, T-B, 4 Sep., leg. GD, det. BG.

Heterobasidion annosum (Fr.) Bref. s. l. on stump, OPU, Sośnia, pine forest, 28 Aug., leg. & det. MW; OPU, pine forest, 2 Sep., leg. & det. GD.

**Hygrocybe conica* (Schaeff.) P. Kumm. var. *conica* on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. AK.

Hygrocybe conica (Schaeff.) P. Kumm. var. *conicopalustris* (R. Haller Aar.) Heinem. on ground, OPU, Biały Grąd educational path, oak forest on the mineral hill, 27 Aug., leg. & det. MW; TPU, peatbog, 3 Sep., leg. GD, det. BG.

Hygrophoropsis aurantiaca (Wulfen) J. Schröt. on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. MRM; TPU, T-C, 31 Aug., leg. & det. GD.

Hymenochaete rubiginosa (Schrad.) Lév. on branch of *Quercus robur* L., GPU, T-C, 27 Aug., leg. & det. JS & MS; TPU, T-C, 31 Aug., leg. & det. GD.

Hyphodontia paradoxa (Schrad.) Langer & Vesterh. s. l. on wood, GPU, T-C, 27 Aug., leg. & det. MS.

Inocybe appendiculata Kühner on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. MRM, det. BG.

*#*Inocybe arenicola* (R. Heim) Bon on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. BG.

Notes. Rare species occurring in sandy habitats, e.g., inland dunes. In Poland known only from Białowieża Primeval Forest [18] and Kampinos National Park (in [20] as *I. fastigiata* var. *arenicola*).

**Inocybe asterospora* Qué. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AK, det. BG.

**Inocybe calamistrata* (Fr.) Gillet on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. TL & LK & MP, det. BG; V.

**Inocybe calida* Velen. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AK, det. BG; OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. & det. BG.

**Inocybe calospora* Quél. on ground, OPU, Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. GD, det. BG; V.

**Inocybe curvipes* P. Karst. on ground, OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. & det. BG.

*#*Inocybe decipiens* Bres. on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. BG.

Notes. Rare species occurring in sandy, calcareous habitats, in Poland collected only once, in Lower Silesia [21].

**Inocybe dulcamara* (Pers.) P. Kumm. on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. BG.

*#*Inocybe dunensis* P.D. Orton on ground, GPU, dune, 27 Aug., leg. TL & LK & MP, det. BG; OPU, Sośnia, dune, 28 Aug., leg. & det. BG.

Notes. Species growing on sandy dunes under *Salix*, in Poland known only from Słowiński National Park [22].

**Inocybe fuscidula* Velen. OPU, Sośnia, dune, 28 Aug., leg. & det. BG.

Inocybe geophylla (Fr.) P. Kumm. var. *geophylla* on ground, OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. BG & GD, det. BG; GPU, dune, 27 Aug., leg. & det. MS; OPU, Sośnia, pine forest, 28 Aug., leg. MRM & MS, det. BG & MS; OPU, Sośnia, R-A, 28 Aug., leg. & det. AK; OPU, Sośnia, mixed forest, 28 Aug., leg. & det. MW; park buffer zone, between Osowiec and Białogrądy, 30 Aug., meadow, leg. GD, det. BG.

**Inocybe grammata* Quél. on ground, OPU, Biały Grąd educational path, oak forest on the mineral hill, 27 Aug., leg. & det. BG; V.

*#*Inocybe inodora* Velen. on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. BG.

Notes. Rare species hitherto known only from the Świętokrzyskie Province [23].

**Inocybe lacera* (Fr.) P. Kumm. var. *lacera* on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG; OPU, Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. GD, det. BG; OPU, Sośnia, pine forest, 28 Aug., leg. JC, det. BG; OPU, Sośnia, dune, 28 Aug., leg. AK, det. BG.

**Inocybe leptophylla* G.F. Atk. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AK, det. BG.

**Inocybe maculata* Boud. on ground, OPU, Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. GD, det. BG.

*#*Inocybe microspora* J.E. Lange on ground, on ground, OPU, Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. GD, det. BG.

Notes. Uncommon species, hitherto known only from Kampinos National Park [14] and vicinity of Poznań (Gierczyk, unpublished), growing in deciduous and mixed forests.

**Inocybe mixtilis* (Britzelm.) Sacc. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AK, det. BG; Sośnia, dune, 28 Aug., leg. AK, det. BG.

*#*Inocybe mystica* Stangl & Glowinski (*I. cryptocystis* D.E. Stuntz) on ground, OPU, Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. GD, det. BG.

Notes. Very rare species, occurring in deciduous and mixed forests on nutrient-rich soils. In Poland reported only from the Kielce city [24].

*#*Inocybe oblectabilis* (Britzelm.) Sacc. on ground, OPU, Carska Droga, roadside, 26 Aug., leg. AK, det. BG.

Notes. Rare species preferring sandy soils, in Poland known only from the Babia Góra Mt [25] and Łódź Province [26].

*#*Inocybe obscurobadia* (J. Favre) Grund & D.E. Stuntz on ground, OPU, Sośnia, dune, 28 Aug., leg. GD, det. BG.

Notes. Rare species, in Poland known only from Kampinos National Park [14].

**Inocybe ochroalba* Bruyl. on ground, OPU, Sośnia, dune, 28 Aug., leg. GD, det. BG.

Notes. Rare species, hitherto collected at the Babia Góra Mt [27], in Białowieża Primeval Forest [18], Kampinos National Park [14] and Radomsko District (Gierczyk, Nowicki, unpublished).

**Inocybe perlata* (Cooke) Sacc. on ground, TPU, T-C, 31 Aug., leg. GD, det. BG.

*#*Inocybe pseudoasterospora* Kühner & Boursier var. *microsperma* Kuyper & P.-J. Keizer on ground, OPU, Sośnia, spruce forest, 28 Aug., leg. AK & BG, det. BG.

Notes. Not rare but probably overlooked species, growing under deciduous and *Picea* trees. In Poland known from Kampinos National Park [14] and vicinity of Radziechowice village [28].

***Inocybe rennyi* (Berk. & Broome) Sacc. on ground, OPU, Sośnia, dune, 28 Aug., leg. GD, det. BG.

Notes. Rare species growing on sandy soils and mossy heathlands with coniferous trees.

*#*Inocybe serotina* Peck on ground, OPU, Sośnia, dune, 28 Aug., leg. GD, det. BG.

Notes. Rare species growing on sandy dunes under deciduous and coniferous trees. In Poland found only at inland dunes in Kampinos National Park [20].

*#*Inocybe subnudipes* Kühner on ground, OPU, Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. GD, det. BG.

Notes. Species known from the Świętokrzyskie Province [23] and Kampinos National Park [14].

***Inocybe vulpinella* Bruyl. on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. BG.

Notes. Rare species growing at dunes and in other sandy habitats.

Inonotus obliquus (Pers.) Pilát on *Betula pendula* Roth, OPU, Sośnia, deciduous forest, 28 Aug., leg. & det. GD; R, PP.

**Inonotus radiatus* (Sowerby) P. Karst. on *Alnus glutinosa* Gaertn., OPU, Sośnia, R-A, 28 Aug., leg. & det. MW.

**Inonotus tomentosus* (Fr.) Teng on *Pinus sylvestris* L., OPU, blue tourist trail, around Fort IV, pine forest, 29 Aug., leg. & det. GD; V.

Irpex ochraceus (Pers.) Kotir. & Saaren. (*Steccherinum ochraceum* (Pers.) Gray) on wood of deciduous tree, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. GD & MW & MS, det. BG & MS; OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. & det. MW; Osowiec-Twierdza, headquarters of the Park, 28 Aug., leg. & det. JC.

Laccaria laccata (Scop.) Berk. & Broome on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. AK & MS; OPU, Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. MD, det. AK; GPU, T-B, 27 Aug., leg. & det. MS; Carska Droga, T-B, 28 Aug., leg. & det. MW; TPU, peatbog, 3 Sep., leg. GD, det. BG; TPU, Szuszałewo (0.2 km NE), peatbog, 12 Aug., leg. AH, det. MS.

Laccaria laccata (Scop.) Berk. & Broome var. *pallidifolia* (Peck) Peck on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. MRM & NM, det. AK.

Notes. Very common but rarely recognized variety, probably much widely occurring than nominative one (var. *laccata*). In Poland reported from the Bieszczady Mts [29], Ochojec Reserve [30], Kampinos National Park [14] and already recorded in the Biebrza National Park [1].

Laccaria proxima (Boud.) Pat. on ground, OPU, T-B, 2 Sep., leg. & det. GD.

Laccaria tortilis (Bolton) Cooke on ground, park buffer zone, near Osowiec, meadow, 30 Aug., leg. & det. GD.

Lactarius camphoratus Fr. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. AK; GPU, deciduous forest, 27 Aug., leg. & det. JS.

**Lactarius deterrimus* Gröger on ground, TPU, T-C, 6 Sep., leg. & det. GD.

Lactarius glyciosmus (Fr.) Fr. on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK.

Lactarius helvus (Fr.) Fr. on ground, OPU, Carska Droga, T-B, 26 Aug., leg. BG, det. AK.

**Lactarius obscuratus* (Lasch) Fr. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. GD, det. BG.

Lactarius pubescens (Schrad.) Fr. on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK.

**Lactarius pyrogalus* (Bull.) Fr. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. GD, det. BG.

Lactarius quietus (Fr.) Fr. on ground, GPU, deciduous forest, 27 Aug., leg. & det. MS.

**Lactarius rufus* (Scop.) Fr. on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK.

*#*Lactarius scoticus* Berk. & Broome on ground, TPU, peatbog, 3 Sep., leg. GD, det. BG; TPU, T-B, 4 Sep., leg. GD, det. BG.

Notes. Rare species growing in peat bogs under *Betula* trees. Very rare in Poland, reported only in Rybojady Reserve [31] and vicinity of Nowy Dworek village [32].

Lactarius torminosus (Schaeff.) Pers. on ground, Sośnia, pine forest, 28 Aug., leg. & det. GD.

Lactarius vietus (Fr.) Fr. on ground, OPU, Dziekciarka, close to road 668 (from Osowiec to Sośnia), mixed forest, 28 Aug., leg. & det. MW.

**Leccinum melaneum* (Smotl.) Pilát & Dermek on ground, OPU, Carska Droga, T-B, 26 Aug., leg. BG, det. AK.

Leccinum niveum (Fr.) Rauschert on ground, OPU, Dziekciarka, close to road 668 (from Osowiec to Sośnia), mixed forest, 28 Aug., leg. & det. MW; OPU, T-B, 2 Sep., leg. & det. GD; V.

**Leccinum pseudoscabrum* (Kallenb.) Šutara on ground, OPU, Sośnia, mixed forest, 28 Aug., leg. MW, det. MS.

Leccinum scabrum (Bull.) Gray on ground, GPU, deciduous forest, 27 Aug., leg. TL, det. MS; park buffer zone, 2 km from Osowiec-Twierdza, peatbog, 28 Aug., leg. & det. MS; OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK; OPU, Sośnia, mixed forest, 28 Aug., leg. & det. AK; OPU, Dziekciarka, close to road 668 (from Osowiec to Sośnia), mixed forest, 28 Aug., leg. & det. MW.

**Leccinum variicolor* Watling on ground, OPU, T-B, 2 Sep., leg. & det. GD.

**Leccinum versipelle* (Fr.) Snell. on ground, OPU, Dziekciarka, close to road 668 (from Osowiec to Sośnia), mixed forest, 28 Aug., leg. & det. MW.

**Lentinellus ursinus* (Fr.) Kühner on wood, GPU, deciduous forest, 27 Aug., leg. & det. JS; V.

**Lentinus tigrinus* (Bull.) Fr. on wood, OPU, Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. GD & AH, det. GD; R.

**Lenzites betulinus* (L.) Fr. on wood, OPU, Sośnia, pine forest, 28 Aug., leg. & det. GD; OPU, Dziekciarka, close to road 668 (from Osowiec to Sośnia), mixed forest, 28 Aug., leg. & det. MW.

**Lepiota alba* (Bres.) Sacc. on ground, GPU, T-C, 27 Aug., leg. MRM, det. BG; V.

**Lepiota castanea* Quél. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AK, det. BG.

Lepiota clypeolaria (Bull.) P. Kumm. on ground, TPU, T-C, 6 Sep., leg. GD, det. BG.

*#*Lepiota cortinarius* J.E. Lange on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. TL & LK & MP, det. BG.

Notes. Rare species, the nominative variety hitherto unreported in Poland. The variety *audrae* has been collected in Białowieża National Park [33].

Lepiota cristata (Bolton) P. Kumm. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG; OPU, Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. GD, det. BG; Sośnia, garden, 28 Aug., leg. & det. GD; TPU, T-C, 3 Sep., leg. GD, det. BG.

Lepiota ventriosospora D.A. Reid on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG; OPU, Sośnia, roadside, 28 Aug., leg. GD, det. BG;

TPU, T-C, 6 Sep., leg. GD, det. BG; TPU, mixed forest, 29 Aug., leg. GD, det. BG; OPU, blue tourist trail, around Fort IV, mixed forest, 29 Aug., leg. & det. GD.

Lepista gilva (Pers.) Pat. on ground, GPU, T-C, 27 Aug., leg. & det. MS.

**Lycoperdon lividum* Pers. on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. MW; OPU, Osowiec-Twierdza, headquarters of the Park, lawn, 29 Aug., leg. & det. MW.

**Lycoperdon molle* Pers. on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. MS.

Lycoperdon nigrescens (Pers.) Pers. on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK; OPU, Sośnia, dune, 28 Aug., leg. & det. MW; TPU, T-C, 6 Sep., leg. & det. GD.

**Lycoperdon pyriforme* Schaeff. on wood, OPU, Sośnia, pine forest, 28 Aug., leg. & det. MW.

**Lyophyllum palustre* (Peck) Singer among *Sphagnum* sp., OPU, Carska Droga, T-B, 26 Aug., leg. GD, det. AK; park buffer zone, Osowiec-Twierdza 2 km, peatbog, 28 Aug., leg. & det. MS; V.

**Macrolepiota excoriata* (Schaeff.) Wasser on ground, OPU, Biały Grąd educational path, sandy grasslands, 27 Aug., leg. GD, det. BG.

Macrolepiota mastoidea (Fr.) Singer on ground, GPU, deciduous forest, 27 Aug., leg. MS, det. BG.

**Macrolepiota nympharum* (Kalchbr.) Wasser on ground, TPU, T-C, 31 Aug., leg. GD, det. BG.

Macrolepiota olivieri (Barla) Wasser on ground, TPU, T-C, 31 Aug., leg. & det. GD.

Macrolepiota procera (Scop.) Singer f. *procera* on ground, OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. & det. GD & AH; OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. MD, det. AK; OPU, Sośnia, meadow, 28 Aug., leg. & det. AK & BG; OPU, Sośnia, near dune, 28 Aug., leg. & det. MW.

**Macrolepiota procera* (Scop.) Singer f. *permixta* (Barla) Vizzini & Contu on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. BG.

Notes. Rather common taxon, known from many scattered localities in Poland [33,34].

**Macrolepiota rhacodes* (Vittad.) Singer on ground, GPU, deciduous forest, 27 Aug., leg. TL, det. MS; WPU, V-P, 8 Sep., leg. GD, det. BG.

**Macrolepiota rhodosperma* (P.D. Orton) Migl. var. *rhodosperma* (*Macrolepiota fuliginosa* sensu Vellinga) on ground, OPU, blue tourist trail, around Fort IV, mixed forest, 29 Aug., leg. GD, det. BG.

Notes. Not rare but rarely reported species, probably misidentified and listed as *M. procera*. Known from few localities in Poland [33].

Marasmius oreades (Bolton) Fr. on ground, OPU, Biały Grąd educational path, oak forest on the mineral hill, 27 Aug., leg. & det. AK; OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. DK, det. AK; GPU, dune, 27 Aug., leg. MS & TL & MP & LK, det. MS & AK.

Marasmius scorodonius (Fr.) Fr. on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. AK.

**Marasmius wynnei* Berk. & Broome on litter, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG.

Megacollybia platyphylla (Pers.) Kotl. & Pouzar on stumps of deciduous tree, GPU, T-C, 27 Aug., leg. MRM, det. AK.

*#*Melanoleuca friesii* (Bres.) Bon on ground, TaPU, meadow, 4 Sep., leg. GD, det. BG.

Notes. In Poland known from Kampinos National Park [14] and Białowieża Primeval Forest [18].

**Melanoleuca strictipes* (P. Karst.) Murrill on ground, BPU, meadow, 5 Sep., leg. GD, det. BG.

**Merismodes anomalus* (Pers.) Singer on fallen twigs of deciduous trees, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. TL & MP & LK, det. AK.

Mycena acicula (Schaeff.) P. Kumm. on fallen twigs of deciduous trees, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. BG & GD, det. BG.

*#*Mycena bulbosa* (Cejp) Kühner the remnants of grass, OPU, Sośnia, deciduous forest, 28 Aug., leg. GD, det. AK.

Notes. In Poland known only from Niepołomicka Forest [5] and Kampinos National Park [14].

Mycena galericulata (Scop.) Gray on stump and log of deciduous tree, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AK & GD & AH, det. AK; OPU, Biały Grąd educational path, oak forest on the mineral hill, 27 Aug., leg. GD & A H, det. AK; GPU, deciduous forest, 27 Aug., leg. & det. JS.

**Mycena haematopus* (Pers.) P. Kumm. var. *haematopus* on log of deciduous tree, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. MS; OPU, Sośnia, R-A, 28 Aug., leg. MW & TL, det. MW & AK; TPU, T-C, 6 Sep., leg. & det. GD.

**Mycena inclinata* (Fr.) Quél. on wood, TPU, T-C, 6 Sep., leg. GD, det. BG.

**Mycena niveipes* Murrill on log of deciduous tree, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. MRM & NM & BG, det. AK.

Mycena pura (Pers.) P. Kumm. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. AK & BG; OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. MD, det. AK; GPU, T-C, 27 Aug., leg. MRM, det. AK; GPU, deciduous forest, 27 Aug., leg. & det. MS; OPU, Sośnia, pine forest, 28 Aug., leg. MRM & JS & MW, det. MRM & MW; OPU, Carska Droga, T-B, 28 Aug., leg. & det. MW.

**Mycena sanguinolenta* (Alb. & Schwein.) P. Kumm. on litter, GPU, deciduous forest, 27 Aug., leg. NM, det. AK; GPU, T-B, 27 Aug., leg. & det. MS.

**Naucoria salicis* P.D. Orton on ground, park buffer zone, near Osowiec, meadow, 30 Aug., leg. GD, det. BG.

**Omphalina sphagnicola* (Berk.) M.M. Moser – among *Sphagnum* sp., TPU, Szusza-lewo (0.2 km NE), peatbog, 12 Sep., leg. AH, det. MS; V.

Omphalina umbellifera (L.) Quél. among *Sphagnum* sp., park buffer zone, 2 km from Osowiec-Twierdza, peatbog, 28 Aug., leg. & det. MS; R.

**Panaeolus acuminatus* (Schaeff.) Quél. on ground, Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. GD, det. BG.

Panaeolus alcidis M.M. Moser on deer droppings, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AF-S, det. BG; GPU, T-C, 27 Aug., leg. MRM, det. BG; OPU, Sośnia, dune, 28 Aug., leg. & det. BG; Sośnia, spruce forest, 28 Aug., leg. & det. BG; OPU, T-B, 2 Sep., leg. GD, det. BG; OPU, pine forest, 2 Sep., leg. GD, det. BG.

**Panaeolus foenisecii* (Pers.) Kühner on ground, OPU, Biały Grąd educational path, pasture, 27 Aug., leg. AK, det. BG.

**Panaeolus papilionaceus* (Bull.) Quél. var. *papilionaceus* on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG; OPU, Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. GD, det. BG; R.

**Panaeolus subbalteatus* (Berk. & Broome) Sacc. [*P. cintulus* (Bolton) Sacc.] on ground, OPU, Biały Grąd educational path, pasture, 27 Aug., leg. BG & AK, det. BG.

Panellus stipticus (Bull.) P. Karst. on wood, OPU, Biały Grąd educational path, oak forest on the mineral hill, 27 Aug., leg. GD & AH, det. AK.

Paxillus atrotomentosus (Batsch) Fr. on wood, OPU, Sośnia, pine forest, 28 Aug., leg. & det. MRM.

Paxillus involutus (Batsch) Fr. s. l. on ground, WPU, Gugny, pine forest, 27 Aug., leg. JC, det. AK; OPU, Sośnia, pine forest, 28 Aug., leg. & det. GD; OPU, Sośnia, mixed forest, 28 Aug., leg. & det. MW.

**Peniophora quercina* (Pers.) Cooke on wood, OPU, Biały Grąd educational path, oak forest on the mineral hill, 27 Aug., leg. & det. MW.

**Perenniporia medulla-panis* (Jacq.) Donk on wood, TPU, T-C, 6 Sep., leg. & det. GD; V.

Phallus impudicus L. on ground, TPU, T-C, 31 Aug., leg. & det. GD.

**Phanerochaete gigantea* (Fr.) S.S. Rattan on wood, OPU, Sośnia, pine forest, 28 Aug., leg. & det. MW.

Phellinus igniarius (L.) Quél. on *Salix* sp., BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AK & AH & MS, det. AK & MS; OPU, Biały Grąd educational path, oak forest on the mineral hill, 27 Aug., leg. & det. MW; GPU, T-B, 27 Aug., leg. & det. MS.

Phellinus robustus (P. Karst.) Bourdot & Galzin (1928) on wood of *Quercus robur*, TPU, T-C, 31 Aug., leg. & det. GD.

Phellodon confluens (Pers.) Pouzar on ground, OPU, Sośnia, pine forest, 28 Aug., leg. AK, det. BG; Ex

Notes. Species assumed to be extinct in Poland but recorded from few contemporary localities [35] that should influence its red-list status in future.

Phlebia tremellosa (Schrad.) Nakasone & Burds. on wood of deciduous trees, TPU, T-C, 6 Sep., leg. & det. GD.

**Pholiota adiposa* (Fr.) P. Kumm. on *Salix* sp., BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. GD, det. BG; R.

Pholiota flammans (Batsch) P. Kumm. on wood, OPU, Sośnia, pine forest, 28 Aug., leg. TL & BG & AK, det. AK & BG; Osowiec-Twierdza, Góra Skobla, T-C, 1 Sep., leg. & det. GD.

***Pholiota pityrodes* (F. Brig.) Gröger on litter, Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. GD, det. BG.

Notes. Rare species of poorly known distribution. Hitherto mentioned from Italy, Denmark and Germany [36]. Growing on rhizomes of grasses, mainly *Phragmites communis*.

**Pholiota spumosa* (Fr.) Singer on log of *Pinus sylvestris* L., OPU, pine forest, 9 Sep., leg. GD, det. BG.

Pholiota squarrosa (Weigel) P. Kumm. at the base of *Populus* sp., GPU, T-C, 29 Aug., leg. & det. GD.

***Pholiotina utricystidiata* Enderle & H.-J. Hübner no ground, OPU, Biały Grąd educational path, pasture, 27 Aug., leg. & det. BG.

Notes. Rather rare, annulate *Pholiotina* species, reported from Nordic countries, Germany, the Czech Republic, and Austria [37].

Piptoporus betulinus (Bull.) P. Karst. on *Betula pendula* Roth, OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. & det. MD; WPU, Gugny, pine forest, 27 Aug., leg. JC, det. AK; GPU, T-C, 27 Aug., leg. & det. JS & MS; OPU, Carska Droga, T-B, 28 Aug., leg. & det. MW; OPU, Sośnia, T-B, 28 Aug., leg. & det. MW.

Pleurotus pulmonarius (Fr.) Qué. on branch of *Padus* sp., OPU, Osowiec-Twierdza, Góra Skobla, T-C, 1 Sep., leg. GD, det. BG; V.

Pluteus atricapillus (Batsch) Fayod on wood of deciduous trees, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. BG, det. AK; OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. DK, det. AK; OPU, Dziekiarka, close to road 668 (from Osowiec to Sośnia), T-B, 27 Aug., leg. & det. MW; GPU, T-C, 27 Aug., leg. NM & MS, det. AK & MS; OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK.

**Pluteus atromarginatus* (Singer) Kühner on wood of *Pinus sylvestris* L., Osowiec-Twierdza, near park, square, 26 Aug., leg. GD, det. AK; OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK.

Pluteus leoninus (Schaeff.) P. Kumm. on log of deciduous tree, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. MRM & NM, det. AK; OPU, Sośnia, deciduous forest, 28 Aug., leg. GD, det. AK; OPU, Sośnia, pine forest, 28 Aug., leg. & det. MW.

**Pluteus nothopellitus* Justo & M.L. Castro on wood of deciduous tree, Sośnia, R-A, 28 Aug., leg. MW, det. BG.

Notes. Species not listed in checklist of Polish larger macromycetes [5], already known from a few localities [35].

**Pluteus phlebophorus* (Ditmar) P. Kumm. on wood, TPU, T-C, 6 Sep., leg. GD, det. BG.

Pluteus romellii (Britzelm.) Sacc. on fallen twigs of deciduous tree, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG; OPU, Osowiec -Twierdza, Góra Skobla, T-C, 27 Aug., leg. DK, det. AK.

Pluteus salicinus (Pers.) P. Kumm. on wood of deciduous trees, OPU, Sośnia, R-A, 28 Aug., leg. TL, det. AK; BPU, meadow, 5 Sep., leg. & det. GD; TPU, T-C, 6 Sep., leg. GD, det. BG.

****Polyporus arcularius*** (Batsch) Fr. on wood of deciduous tree, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. BG, det. AK; GPU, T-C, 27 Aug., leg. MRM & TL, det. AK & MS; OPU, Sośnia, R-A, 28 Aug., leg. & det. MW.

Polyporus badius (Pers.) Schwein. on log of *Salix fragilis* L., OPU, Osowiec-Twierdza, Kanał Rudzki, 26 Aug., leg. GD, det. AK.

Polyporus ciliatus Fr. on wood of deciduous tree, OPU, Sośnia, R-A, 28 Aug., leg. & det. MW.

****Polyporus melanopus*** (Pers.) Fr. on wood of deciduous tree, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AK & AH, det. AK; E.

Polyporus tuberaster (Jacq.) Fr. on wood, GPU, T-C, 27 Aug., leg. TL, det. MS; R.

****Polyporus varius*** (Pers.) Fr. on Wood, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. TL & MP & LK, det. AK; GPU, T-C, 27 Aug., leg. TL, det. MS.

Psathyrella candolleana (Fr.) Maire on litter, OPU, Sośnia, spruce forest, 28 Aug., leg. & det. BG.

****Psathyrella populina*** (Britzelm.) Kits van Wav. on wood, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AK, det. BG; E.

****Psathyrella prona*** (Fr.) Gillet on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG.

****Psathyrella pseudocorrugis*** (Romagn.) Bon ss. Kits van Wav., Arnolds, Enderle on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG; Biały Grąd educational path, deciduous shrubs, 27 Aug., leg. & det. BG.

Notes. Common species, recently collected also in the Kampinos National Park [14], Beskid Niski Mts [37], vicinity of Przemyśl, Radomsko District and Knyszyńska Primeval Forest (Gierczyk, unpublished).

Pseudohydnum gelatinosum (Scop.) P. Karst. on wood of *Picea abies* (L.) H. Karst., OPU, Sośnia, pine forest, 28 Aug., leg. & det. MRM.

Pseudomerulius aureus (Fr.) Jülich on wood of *Pinus sylvestris* L., OPU, Osowiec-Twierdza, Góra Skobla, T-C, 1 Sep., leg. & det. GD; R.

*#***Pseudotomentella griseopergamacea*** M.J. Larsen on wood, OPU, Sośnia, R-A, 28 Aug., leg. TL, det. MP (NCBI accession No. KU525692).

Notes. Species not listed in checklist of Polish larger macromycetes [5], recently reported from a single locality [39].

****Psilocybe elongata*** (Pers.) J.E. Lange [*Hypholoma elongatum* (Pers.) Ricken] among *Sphagnum* sp., GPU, peatbog, 27 Aug., leg. & det. JS; park buffer zone, Osowiec-Twierdza 2 km, peatbog, 28 Aug., leg. & det. MS; OPU, T-B, 2 Sep., leg. GD, det. BG; R.

**Psilocybe fascicularis* (Huds.) Noordel. [*Hypholoma fasciculare* (Huds.) P. Kumm. var. *fasciculare*] on wood, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. BG; OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. DK & MW, det. MW & AK; GPU, T-C, 27 Aug., leg. & det. JS & MS; OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK.

Psilocybe lateritia (Schaeff.) Noordel. [*Hypholoma sublateritium* (Fr.) Quél.] on wood, OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. & det. MW.

Psilocybe squamosa (Pers.) P.D. Orton [*Stropharia squamosa* (Pers.) Quél.] on ground, TPU, T-C, 6 Sep., leg. GD, det. BG; I.

**Psilocybe uda* (Pers.) Gillet [*Hypholoma udum* (Pers.) Quél.] among *Sphagnum* sp., park buffer zone, 2 km from Osowiec-Twierdza, peatbog, 28 Aug., leg. & det. MS; OPU, T-B, 2 Sep., leg. GD, det. BG; R.

Pycnoporellus fulgens (Fr.) Donk on *Pinus sylvestris* L., WPU, V-P, 8 Sep., leg. & det. GD; V.

Ramaria eumorpha (P. Karst.) Corner on ground, OPU, mixed forest, 2 Sep., leg. GD, det. BG; Osowiec-Twierdza, Góra Skobla, T-C, 1 Sep., leg. GD, det. BG.

**Ramaria gracilis* (Pers.) Quél. on ground, OPU, Sośnia, dune, 28 Aug., leg. TL & MP & LK, det. BG; E.

Ramaria stricta (Pers.) Quél. on ground, GPU, deciduous forest, 27 Aug., leg. & det. MS.

*#*Ramaria suecica* (Fr.) Donk on ground, OPU, Sośnia, dune, 28 Aug., leg. MW, det. BG.

Notes. Rare species, known from two historical [5] and two contemporary localities [40,41].

**Resupinatus trichotis* (Pers.) Singer on wood of *Corylus avellana* L., BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg & det. AK.

**Rhizopogon roseolus* (Corda) Th. Fr., on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. DS.

**Rhodocollybia maculata* (Alb. & Schwein.) Singer on ground, OPU, Sośnia, pine forest, 28 Aug., leg. MRM & MW, det. AK & MW.

Rickenella fibula (Bull.) Raithelh. on stump among mosses, OPU, Sośnia, dune, 28 Aug., leg. & det. AK; OPU, Sośnia, pine forest, 28 Aug., leg. & det. MW; GPU, T-B, 29 Aug., leg. & det. MS; BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AK & AH, det. AK; TPU, peatbog, 3 Sep., leg. GD, det. BG.

Rickenella setipes (Fr.) Raithelh. on wood of deciduous trees among mosses; GPU, T-B, 29 Aug., leg. & det. MS.

**Ripartites tricholoma* (Alb. & Schwein.) P. Karst. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AF-S, det. AK.

Rozites caperatus (Pers.) P. Karst. on ground; OPU, Sośnia, pine forest, 28 Aug., leg. & det. MRM & MW.

Russula aeruginea Lindbl. on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. MW.

Russula claroflava Grove on ground under *Betula pendula* Roth, GPU, T-B, 27 Aug., leg. MRM & MS, det. AK & MS.

****Russula cyanoxantha*** (Schaeff.) Fr. on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. MW.

****Russula emetica*** (Schaeff.) Pers. on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. MW.

Russula ochroleuca (Pers.) Fr. on ground, GPU, deciduous forest, 27 Aug., leg. & det. MS; OPU, Dziekiarka, close to road 668 (from Osowiec to Sośnia), mixed forest, 28 Aug., leg. & det. MW; OPU, Carska Droga, T-B, 28 Aug., leg. & det. MW.

Russula pectinatoides Peck on ground, OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. & det. MW.

****Russula xerampelina*** (Schaeff.) Fr. on ground, OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. GD & AH & MW, det. MS & MW.

Schizophyllum commune Fr. on log and branch of deciduous tree; BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. & det. AK & MS; OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. GD & AH, det. AK.

Scleroderma areolatum Ehrenb. on ground, OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. DK, det. AK; OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. GD & AH, det. AK.

Scleroderma bovista Fr. on ground, OPU, Sośnia, garden, 28 Aug., leg. & det. AK; TPU, T-C, 6 Sep., leg. GD, det. BG; OPU, T-C, 9 Sep., leg. GD, det. BG.

****Scleroderma cepa*** Pers. on ground, Sośnia, near the forest, 28 Aug., leg. & det. JS; E.

Scleroderma citrinum Pers. on ground, Carska Droga, T-B, 28 Aug., leg. & det. MW; park buffer zone, 2 km from Osowiec-Twierdza, peatbog, 28 Aug., leg. & det. MS.

Stereum hirsutum (Willd.) Gray on wood of deciduous trees, GPU, deciduous forest, 27 Aug., leg. & det. MS; OPU, Sośnia, R-A, 28 Aug., leg. & det. JS; OPU, Osowiec-Twierdza, Góra Skobla, mixed forest, 28 Aug., leg. & det. MW.

Stropharia alcis Kytöv. on deer droppings, OPU, Sośnia, spruce forest, 28 Aug., leg. & det. BG.

Suillus bovinus (L.) Roussel, on ground, OPU, Osowiec-Twierdza, Góra Skobla, mixed forest, 28 Aug., leg. & det. MW.

Suillus granulatus (L.) Roussel on ground; OPU, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. & det. DK; GPU, deciduous forest, 27 Aug., leg. DS, det. AK; OPU, Sośnia, pine forest, 28 Aug., leg. AK & BG & JC, det. AK & BG; OPU, Sośnia, dune, 28 Aug., leg. & det. MW.

****Suillus luteus*** (L.) Roussel on ground, OPU, Sośnia, pine forest, 28 Aug., leg. MRM & JC, det. MRM; OPU, Sośnia, dune, 28 Aug., leg. & det. MW.

****Suillus variegatus*** (Sw.) Kuntze on ground, OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK.

Thelephora caryophyllea (Schaeff.) Fr. on ground, OPU, Sośnia, dune, 28 Aug., leg. & det. AK & MW & MS & TL; V.

**Thelephora palmata* (Scop.) Fr. on ground, Osowiec-Twierdza, Góra Skobla, T-C, 27 Aug., leg. DK, det. AK.

**Thelephora penicillata* (Pers.) Fr. on ground, TPU, T-C, 31 Aug., leg. & det. GD; V.

Thelephora terrestris Ehrh ex Willd. on litter and ground, park buffer zone, Osowiec-Twierdza 2 km, peatbog, 28 Aug., leg. & det. MS; OPU, T-B, 2 Sep., leg. GD, det. BG.

*#*Tomentella atramentaria* Rostr. on wood, BPU, Grobla Honczarowska, R-A, 26 Aug., leg. & det. MP (NCBI accession No. KU525693); OPU, Sośnia, R-A, 28 Aug., leg. & det. MP (NCBI accession No. KU525694).

Notes. A single historical locality was reported (probably incorrectly) in the Polish literature [42].

**Tomentella badia* (Link) Stalpers on wood of *Salix* sp., OPU, Sośnia, R-A, 28 Aug., leg. & det. MP (NCBI accession No. KU525695).

Notes. Species not listed in checklist of Polish larger macromycetes [5], reported later in the contemporary literature [43].

**Tomentella ellisii* (Sacc.) Jülich & Stalpers on wood, Uroczysko Dęby forest complex, T-C, 27 Aug., leg. & det. MP (NCBI accession No. KU525696).

Notes. Species not listed in checklist of Polish larger macromycetes [5], reported in the contemporary literature from a few localities [35].

**Tomentella lapida* (Pers.) Stalpers on wood, BPU, Grobla Honczarowska, R-A, 26 Aug., leg. & det. MP (NCBI accession No. KU525697).

Notes. Species not listed in checklist of Polish larger macromycetes [5], reported in the contemporary literature from a few localities [35].

**Tomentella lateritia* Pat. on wood, OPU, Sośnia, R-A, 28 Aug., leg. TL, det. MP (NCBI accession No. KU525698).

***Tomentella pilosa* (Burt) Bourdot & Galzin on wood, BPU, Grobla Honczarowska, R-A, 26 Aug., leg. & det. MP (NCBI accession No. KU525699).

**Tomentella punicea* (Alb. & Schwein.) J. Shröt. on wood, Uroczysko Dęby forest complex, on the border between forest and meadow, 27 Aug., leg. & det. MP (NCBI accession No. KU525700).

**Tomentella sublilacina* (Ellis & Holw.) Wakef. on wood, Uroczysko Dęby forest complex, on the border between forest and meadow, 27 Aug., leg. & det. MP (NCBI accession No. KU525701).

**Trametes gibbosa* (Pers.) Fr. on wood, OPU, Osowiec-Twierdza, Góra Skobla, T-C, 28 Aug., leg. & det. MW; OPU, Osowiec-Twierdza, headquarters of the Park, 28 Aug., leg. & det. JC; OPU, OPU, Sośnia, mixed forest, 28 Aug., leg. & det. JC.

Trametes hirsuta (Wulfen) Pilát on stump of deciduous tree, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. AK & AH, det. AK; OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. MD, det. AK; OPU, Sośnia, pine forest, 28 Aug., leg. JC, det. AK; OPU, Sośnia, mixed forest, 28 Aug., leg. & det. MW.

**Trametes ochracea* (Pers.) Gilb. & Ryarden on wood, OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. GD & AH, det. AK.

Trametes versicolor (L.) Pilát on wood, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. GD & MS, det. AK & MS; OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. & det. MD; OPU, Sośnia, pine forest, 28 Aug., leg. JC, det. AK; OPU, Sośnia, mixed forest, 28 Aug., leg. & det. JC.

Tremella mesenterica Retz. on twigs of *Betula pendula* Roth; BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. GD, det. AK.

Trichaptum fuscoviolaceum (Ehrenb.) Ryvarden on wood of coniferous trees, OPU, Sośnia, pine forest, 28 Aug., leg. & det. AK.

**Tricholoma lascivum* (Fr.) Gillet on ground, OPU, Sośnia, mixed forest, 28 Aug., leg. & det. MW.

**Tulostoma brumale* Pers. on ground, OPU, Osowiec-Twierdza, square at the Park, 26 Aug., leg. GD, det. AK; R.

Tulostoma kotlabae Pouzar on ground, OPU, Sośnia, dune, 28 Aug., leg. BG & CW, det. AK; E, SP.

Notes. Protected species, recorded in Poland in few localities [5,13,44,45].

**Vascellum pratense* (Pers.) Kreisel on ground, OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. AF-S, det. AK.

Xerocomus badius (Fr.) Kühner ex E.-J. Gilbert on ground, OPU, Sośnia, pine forest, 28 Aug., leg. JC & MW, det. AK & MW; OPU, Dziekciarka, close to road 668 (from Osowiec to Sośnia), mixed forest, 28 Aug., leg. & det. MW.

Xerocomus pascuus (Pers.) Krombh. s. l. on ground, OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. MD & MW, det. AK & MW; OPU, Dziekciarka, close to road 668 (from Osowiec to Sośnia), mixed forest, 27 Aug., leg. & det. MW.

**Xerocomus porosporus* Imler on ground, OPU, Biały Grąd educational path, oak forest on mineral hill, 27 Aug., leg. AF-S, det. AK.

**Xerocomus rubellus* (Krombh.) Quél. on ground, BPU, Grobla Honczarowska, deciduous shrubs, 26 Aug., leg. MRM & NM, det. BG.

Xerocomus subtomentosus (L.) Quél. on ground, OPU, Sośnia, deciduous forest, 28 Aug., leg. & det. GD.

**Xeromphalina caudicinalis* (Fr.) Kühner & Maire var. *subfellea* Bon on litter, OPU, Sośnia, pine forest, 28 Aug., leg. GD, det. BG.

Discussion

The high number of macrofungi (336 species) recorded during this relatively short and fragmentary survey in the Biebrza National Park, clearly demonstrated the high mycological potential of this site.

In terms of species richness (483 species) our data from two few-days surveys, conducted in late summer of 2012 and 2013 are similar to the results of two-year, full season investigation in the Wigry National Park (516 species) [46]. So far less than 500 species was recorded from other Polish national parks: Woliński (approximately 460 species; Stasińska, Sotek, unpublished), Świętokrzyski (about 450) [47], Słowiński (429) [22], Poleski (418) [40], Bory Tucholskie (413) [48], Drawieński (379; Stefaniak, unpublished), Magurski (340) [49] and Karkonoski (200) [50]. This

simple comparison of the numbers of species reported from different national parks should be treated with caution as they are diverse in terms of habitat and plant species richness. When compared to our results, the numbers listed above suggest that the knowledge of macromycetes occurring in Polish national parks is poor in most cases, and that the patterns of macrofungi species richness in Poland must be considered as insufficiently recognized.

It is worthy to highlight that among the fungi collected in BbNP are taxa very rare in Poland and Europe. Some species were found in Poland only in the BbNP. The presented data are also valuable in terms of fungal conservation and threat assessment, as many new localities of the fungi endangered in Poland are given.

Particularly important is the finding of a new locality of *Gloiodon strigosus* – the species very rare in Europe [51] that was assumed to be extinct in Poland. The only contemporary locality of the species in Poland comes from the early twenty-first century from the Białowieża National Park. The knowledge of macrofungi species diversity in national parks, particularly of very rare and endangered species distribution is necessary for an effective protection of the most vulnerable components of Polish mycobiota.

Summarizing, based on research to date (including data from present survey and those reported previously [1,52] and collected during Fourth Congress of European Mycologists [53]) 508 macrofungispecies have been recorded in BbNP. The need of the extended studies in that protected and highly diverse area is recommended in order to assess mycobiota of BbNP in relation to the various habitats represented in the Park.

Key outcomes

- Eight species, hitherto not reported in any publication from Poland were found in BbNP in 2013: *Conocybe velutipes* var. *nitrophila*, *Entoloma caeruleum*, *E. plebejoides*, *Inocybe rennyi*, *I. vulpinella*, *Pholiota pityrodes*, *Pholiotina utricystidiata*, and *Tomentella pilosa*.
- Seven taxa protected by Polish law [54] are known to occur in the BbPN: *Bovista paludosa*, *Fistulina hepatica*, *Ganoderma lucidum*, *Gastrum schmidelii*, *Inonotus obliquus*, *Tulostoma kotlabae*, and *Xerocomus parasiticus*.
- The data gathered in BbNP extend the knowledge of chorology and ecology of 95 red-listed taxa: Ex – *Gloiodon strigosus*, *Phellodon confluens*; E – *Bankera fuliginosa*, *Ceriporia purpurea*, *Disciseda bovista*, *Ditiola peziziformis*, *Gastrum minimum*, *G. rufescens*, *G. schmidelii*, *Gloeoporus dichrous*, *Gymnopilus picreus*, *Hydnellum conrescens*, *Phallus duplicatus*, *Phleogenia faginea*, *Pholiota albocrenulata*, *P. squarrosoides*, *Polyporus melanopus*, *Psathyrella populina*, *Pseudomerulius aureus*, *Ramaria gracilis*, *Scleroderma cepa*, *Tulostoma kotlabae*; V – *Bovista paludosa*, *Clavicornia pyxidata*, *Gastrum pectinatum*, *Inocybe calamistrata*, *I. calospora*, *I. grammata*, *Inonotus tomentosus*, *Ishnoderma benzoinum*, *Leccinum niveum*, *Lentinellus ursinus*, *Lepiota alba*, *Lyophyllum palustre*, *Mycena megaspora*, *Omphalina sphagnicola*, *Perenniporia medulla-panis*, *Phyllotopsis nidulans*, *Pleuroybella porrigens*, *Pleurotus pulmonarius*, *Pycnoporellus fulgens*, *Thelephora caryophyllea*, *T. penicillata*, *Xylobolus frustulatus*; R – *Antrodiella serpula*, *Asterophora lycoperdoides*, *Calocera furcata*, *Ceriporia reticulata*, *Clavariadelphus fistulosus*, *Climacocystis borealis*, *Clitocybe* cf. *agrestis*, *C. hydrogramma*, *Coprinus niveus*, *Coriolopsis gallica*, *Diplomitoporus flavescens*, *Entoloma juncinum*, *Exidia glandulosa*, *Fistulina hepatica*, *Galerina paludosa*, *Ganoderma lucidum*, *Gastrum fimbriatum*, *Gloeoporus taxicola*, *Gomphidius glutinosus*, *G. roseus*, *Gyroporus castaneus*, *G. cyanescens*, *Helvella lacunosa*, *Inonotus obliquus*, *Lactarius trivialis*, *Lentinus tigrinus*, *Lentinus torulosus*, *Leucocortinarius bulbiger*, *Oligoporus ptychogaster*, *Omphalina umbelifera*, *Onygena equina*, *Panaeolus papilionaceus*, *Paxillus rubicundulus*, *Phellinus pini*, *Pholiota adiposa*, *Physisporinus vitreus*, *Polyporus tuberaster*, *Psilocybe elongatum*, *P. udum*, *Pynoporus cinnabarinus*, *Sparassis crispa*, *Trichaptum bifforme*, *Tulostoma brumale*; I – *Cystoderma granulorum*, *Hygrophorus hyphotejus* var. *hyphotejus*, *Hygrophorus hyphotejus* var. *aureus*, *Lentaria byssiseda*, *Mycena*

pelethina, *Pluteus plautus*, *Psilocybe squamosa*, *Tremella foliacea*, *Tricholoma equestre*.

Our results give only preliminary insight into the biodiversity of fungal component of ecosystems at the Biebrza National Park. However, this inventory is an important contribution to the knowledge of mycobiota of the areas protected in Poland. The localities of selected species of highest conservation priority should be monitored with the support of the state.

Acknowledgments

We are deeply grateful to director of the Biebrza National Park, Mr. Roman Skapski as well as to Mr. Andrzej Grygoruk, and other employees of the Biebrza National Park for collecting fungi, offering their facilities, helping in the implementation of our research, and creating the very friendly atmosphere during our visit.

References

1. Kujawa A, Wrzosek M, Domian G, Kędra K, Szkodzik J, Rudawska M, et al. Preliminary studies of fungi in the Biebrza National Park (NE Poland). II. Macromycetes. *Acta Mycol.* 2012;47(2):235–264. <http://dx.doi.org/10.5586/am.2012.027>
2. Ruskiewicz-Michalska M, Wrzosek M, Tkaczuk C, Dynowska M, Sucharzewska E, Szkodzik J. Preliminary studies of fungi in the Biebrza National Park. Part I. Micromycetes. *Acta Mycol.* 2012;47(2):213–234. <http://dx.doi.org/10.5586/am.2012.026>
3. Ruskiewicz-Michalska M, Bałazy S, Chełkowski J, Dynowska M, Pawłowska J, Sucharzewska E, et al. Preliminary studies of fungi in the Biebrza National Park (NE Poland). Part III. Micromycetes – new data. *Acta Mycol.* 2015;50(2):1067. <http://dx.doi.org/10.5586/am.1067>
4. Matuszkiewicz W. Przewodnik do oznaczania zbiorowisk roślinnych Polski. Warszawa: PWN; 2006.
5. Wojewoda W. Checklist of Polish larger Basidiomycetes. Cracow: W. Szafer Institute of Botany, Polish Academy of Sciences; 2003. (Biodiversity of Poland; vol 7).
6. Chmiel MA. Checklist of Polish larger Ascomycetes. Cracow: W. Szafer Institute of Botany, Polish Academy of Sciences; 2006. (Biodiversity of Poland; vol 8).
7. Index Fungorum [Internet]. 2016 [cited 2016 Jan 4]. Available from: <http://www.index-fungorum.org>
8. Wojewoda W, Ławrynowicz M. Red list of the macrofungi in Poland. In: Mirek Z, Zarzycki K, Wojewoda W, Szelań Z, editors. Red list of plants and fungi in Poland. Cracow: W. Szafer Institute of Botany, Polish Academy of Sciences; 2006. p. 53–70.
9. Faliński JB, Mułenko W. editors. Cryptogamous plants in the forest communities of Białowieża National Park. Checklist of cryptogamous and seminal plant species recorded during the period 1987–1991 on the permanent plot V-100 (project CRYPTO). *Archivum Geobotanicum.* 1992;3:1–48.
10. Fiedorowicz G. The participation of macromycetes in selected forest communities of the Masurian Landscape Park (NE Poland). *Acta Mycol.* 2009;44(1):77–95. <http://dx.doi.org/10.5586/am.2009.008>
11. Kujawa A. Macrofungi of wooded patches in the agricultural landscape. I. Species diversity. *Acta Mycol.* 2009;44(1):49–75. <http://dx.doi.org/10.5586/am.2009.007>
12. Domański Z. *Grzyby Lasow Łochowskich.* Warszawa: nakładem własnym autora; 2001.
13. Ławrynowicz M, Dziedziński T, Szkodzik J. Obserwacje mikologiczne w rezerwacie “Dolina rzeki Brdy” w Borach Tucholskich. In: Ławrynowicz M, Rózga B, editors. *Tucholski Park Krajobrazowy 1985–2000. Stan poznania.* Łódź: Wydawnictwo Uniwersytetu Łódzkiego; 2002. p. 384–405.
14. Karasiński D, Kujawa A, Gierczyk B, Ślusarczyk T, Szczepkowski A. *Grzyby wielkoowocnikowe Kampinoskiego Parku Narodowego.* Izabelin: Kampinoski Park Narodowy; 2015.

15. Hausknecht A. Beitrage zur Kenntnis der Bolbitiaceae. 10. *Conocybe* Sektion *Piloselle*. Öster Z Pilzk. 2005;14:191–274.
16. Hreczka A. *Conocybe ochrostriata* var. *ochrostriata*. ID: 246713. In: Snowarski M. Atlas grzybow Polski. Rejestr gatunkow grzybow chronionych i zagrozonych [Internet]. 2014 [cited 2016 Jan 4]. Available from: <http://www.grzyby.pl/rejestr-grzybow-chronionych-i-zagrozonych.htm>
17. Gierczyk B, Kujawa A, Pachlewski T, Szczepkowski A, Wójtowski M. Rare species of the genus *Coprinus* Pers. s. lato. Acta Mycol. 2011;46(1):27–73. <http://dx.doi.org/10.5586/am.2011.003>
18. Gierczyk B, Kujawa A, Szczepkowski A, Karasiński D. Materiały do poznania mykobioty Puszczy Białowieskiej. Przegląd Przyrodniczy. 2014;25(1):3–36.
19. Bujakiewicz A. *Gloiodon strigosus* (Swartz: Fr.) P. Karst. (Bondarzewiaceae) in Poland. Acta Mycol. 2007;42(1):69–73. <http://dx.doi.org/10.5586/am.2007.005>
20. Rudnicka-Jeziarska W. Grzyby wyższe wydm śródładowych Puszczy Kampinoskiej. Warszawa: Polskie Towarzystwo Botaniczne; 1969. (Monographiae Botanicae; vol 30).
21. Nespiak A. Podstawczaki (Basidiomycetes), bedłkowe (Agaricales), zaslonakowate (Cortinariaceae), strzępiak (Inocybe). Warszawa: Państwowe Wydawnictwo Naukowe; 1990. [Flora Polska. Rośliny Zarodnikowe Polski i Ziem Ościennych. Grzyby (Mycota); vol 19].
22. Bujakiewicz A, Lisiewska M. Mikoflora zbiorowisk roślinnych Słowińskiego Parku Narodowego. Badania Fizjograficzne nad Polską Zachodnią. Seria B – Botanika. 1983;34:49–77.
23. Łuszczynski J. Diversity of Basidiomycetes in various ecosystems of the Góry Świętokrzyskie Mts. Łódź: Polskie Towarzystwo Botaniczne; 2007. (Monographiae Botanicae; vol 97). <http://dx.doi.org/10.5586/mb.2007.001>
24. Łuszczynski J. Interesting macromycetes found in the Kielce town (central Poland). Acta Mycol. 1997;32(2):207–228. <http://dx.doi.org/10.5586/am.1997.017>
25. Bujakiewicz A. Grzyby Babiej Góry. I. Mikoflora lasów. Acta Mycol. 1979;15(2):213–294. <http://dx.doi.org/10.5586/am.1979.012>
26. Szkodzik J. Macromycetes in communities of *Abies alba* on its range border in central Poland. Acta Mycol. 2005;40(1):113–131. <http://dx.doi.org/10.5586/am.2005.011>
27. Bujakiewicz A. Macrofungi in the *Alnetum incanae* association along Jaworzyna and Skawica River valleys Western Carpathians. Pol Bot J. 2011;56(2):267–285.
28. Nowicki J. *Inocybe pseudoasterospora* var. *microsperma*. ID: 210209. In: Snowarski M. Atlas grzybow Polski. Rejestr gatunkow grzybow chronionych i zagrozonych [Internet]. 2014 [cited 2016 Jan 4]. Available from: <http://www.grzyby.pl/rejestr-grzybow-chronionych-i-zagrozonych.htm>
29. Gierczyk B, Chachuła P, Karasiński D, Kujawa A, Kujawa K, Pachlewski T, et al. Grzyby wielkoowocnikowe polskich Bieszczadów. Część I. Parki Nar Rez Przyr. 2009;28(3):3–100.
30. Karasiński D. Grzyby większe rezerwatu przyrody “Ochojec”. In: Parusel JB, editor. Rezerwat przyrody “Ochojec” w Katowicach (Górny Śląsk). Monografia naukowo-dydaktyczna. Katowice: Centrum Dziedzictwa Przyrody Górnego Śląska; 2009. p. 86–103.
31. Ślusarczyk T. Grzyby wielkoowocnikowe rezerwatu torfowiskowego, “Rybojady”. Przegląd Przyrodniczy. 2007;18(3–4):71–90.
32. Kujawa A, Gierczyk B. Rejestr gatunków grzybów chronionych i zagrozonych w Polsce. Część VI. Wykaz gatunków przyjętych do rejestru w roku 2010. Przegląd Przyrodniczy. 2012;23(4):3–59.
33. Gierczyk B, Kujawa A, Szczepkowski A, Chachuła P. Rare species of *Lepiota* and related genera. Acta Mycol. 2011;46(2):137–178. <http://dx.doi.org/10.5586/am.2011.010>
34. Kałucka I. Macrofungi in the secondary succession on the abandoned farmland near the Białowieża old-growth forest. Łódź: Polskie Towarzystwo Botaniczne; 2009. (Monographiae Botanicae; vol 99). <http://dx.doi.org/10.5586/mb.2009.001>
35. Kujawa A. Grzyby makroskopijne Polski w literaturze mykologicznej [Internet]. 2015 [cited 2016 Jan 4]. Available from: <http://www.grzyby.pl/grzyby-makroskopijne-Polskiw-literaturze-mikologicznej.htm>
36. Noordeloos ME. Strophariaceae s. l. Alassio: Edizioni Candusso; 2011. (Fungi Europaei; vol 13).
37. Hausknecht A. *Conocybe* Fayod. *Pholiotina* Fayod. Alassio: Edizioni Candusso; 2009. (Fungi Europaei; vol 11).
38. Hreczka A. *Psathyrella pseudocorrugis*. ID: 245614. In: Snowarski M. Atlas grzybow Polski.

- Rejestr gatunków grzybow chronionych i zagrożonych [Internet]. 2014 [cited 2016 Jan 4]. Available from: <http://www.grzyby.pl/rejestr-grzybow-chronionych-i-zagrozonych.htm>
39. Trocha L, Kałucka I, Stasińska M, Nowak W, Dabert M, Leski T, et al. Ectomycorrhizal fungal communities of native and non-native *Pinus* and *Quercus* species in a common garden of 35-year-old trees. *Mycorrhiza*. 2012;22:121–134. <http://dx.doi.org/10.1007/s00572-011-0387-x>
 40. Flisińska Z. Grzyby Poleskiego Parku Narodowego. In: Radwan S, editor. Poleski Park Narodowy. Monografia przyrodnicza. Lublin: Wydawnictwo Morpol; 2002. p. 73–83.
 41. Karasiński D. Wstępne wyniki badań nad rodzajem *Ramaria* (Fr.) Bonorden w Polsce. In: Dynowska M, Ejdyś E, editors. Ogólnopolskie Sympozjum Mikologiczne. Interdyscyplinarny charakter mikologii; 2009 Sep 10–12; Olsztyn-Krutuń, Poland. Olsztyn: Wydawnictwo UWM; 2009. p. 49.
 42. Flisińska Z. Grzyby Lubelszczyzny. Wielkoowocnikowe podstawczaki (Basidiomycetes). Lublin: Lubelskie Towarzystwo Naukowe; 2004. (Środowisko Przyrodnicze Lubelszczyzny; vol 2).
 43. Leski T, Rudawska M, Karliński L, Pietras M. Below-ground view on tomentelloid fungi in Poland. In: Ruszkiewicz-Michalska M, Szkodzik J, editors. Grzyby-organizmy kluczowe dla życia na ziemi. Streszczenia referatów i posterów. Warsztaty Polskiego Towarzystwa Mykologicznego; 2014 Sep 23–28; Łódź, Spała, Poland. Łódź: Polskie Towarzystwo Mykologiczne; 2014. p. 112.
 44. Tomaszewska A, Łuszczynski J, Łuszczynska B, Jaworska J. Taxonomic notes on the Polish *Tulostoma* species. *Acta Mycol*. 2011;46(2):179–186. <http://dx.doi.org/10.5586/am.2011.011>
 45. Tomaszewska A, Łuszczynski J, Lechowicz Ł, Chrapek M. Selected rare and protected macrofungi (Agaricomycetes) as bioindicators of communities of xerothermic vegetation in the Nida Basin. *Acta Mycol*. 2015;50(1):1058–1070. <http://dx.doi.org/10.5586/am.1058>
 46. Kujawa A, Szczepkowski A, Grygoruk A. The XXXIII Wszechnica Biebrzańska Seminar – Fungi in the Biebrza National Park. *Parki Nar Rez Przyr*. 2011;30(1–2):121–126.
 47. Compte-rendu du IV-ème Congrès des Mycologues Européens Warszawa 1966. *Acta Mycol*. 1968;4(2):181–198. <http://dx.doi.org/10.5586/am.1968.011>
 48. Halama M, Romański M. Grzyby makroskopijne (macromycetes). In: Krzysztofki L, editor. Śluzowce Myxomycetes, grzyby Fungi i mszaki Bryophyta Wigierskiego Parku Narodowego. Suwałki: Stowarzyszenie “Człowiek i Przyroda”; 2010. p. 87–201. (Przyroda Wigierskiego Parku Narodowego. Seria Naukowa).
 49. Łuszczynski J. Grzyby wielkoowocnikowe. In: Cieśliński S, Kowalkowski A, editors. Świętokrzyski Park Narodowy. Przyroda, Gospodarka, Kultura. Bodzentyn: Świętokrzyski Park Narodowy; 2000. p. 267–277.
 50. Ławrynowicz M. Inwentaryzacja grzybów wielkoowocnikowych na terenie PNBT. In: Matuszkiewicz JM, editor. Świat roślin i grzybów Parku Narodowego “Bory Tucholskie”. Monografia naukowa. Charzykowy: Park Narodowy “Bory Tucholskie”; 2012. p. 358–395.
 51. Wojewoda W. Wstępna charakterystyka grzybów wielkoowocnikowych Magurskiego Parku Narodowego. *Chrońmy Przyr Ojcz*. 1999;55(1):35–55.
 52. Narkiewicz C, Kita W, Pusz W, Panek E. Grzyby i śluzowce. In: Knapik R, Raj A, editors. Przyroda Karkonoskiego Parku Narodowego. Jelenia Góra: Karkonoski Park Narodowy; 2013. p. 339–358.
 53. Trass H, Vellak K, Ingerpuu N. Floristical and ecological properties for identifying of primeval forests in Estonia. *Ann Bot Fenn*. 1999;36:67–80.
 54. Rozporządzenie Ministra Środowiska z dnia 9 października 2014 r. w sprawie ochrony gatunkowej grzybów. *Dz. U. z 2014 r., poz. 1408*.