

## Fungi and fungus-like organisms of the Kivertsi National Nature Park “Tsumanska Pushcha”

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### Abstract

As a result of mycological surveys of the territory of Kivertsi National Nature Park “Tsumanska Pushcha” during 2004–2021, 203 species of fungi and fungus-like organisms were detected and registered. A comparative analysis of the species composition of the mycoflora of the park was carried out. The most diversified and rich was the phylum Basidiomycota, which comprises 172 species, belonging to 48 genera of 49 families, ten orders of the class Agaricomycetes. Many rare macromycetes that are rare or relatively rare for Ukraine (i.e., *Cortinarius bolaris*, *Craterellus cornucopiooides*, *Entoloma bloxamii*, *Fistulina hepatica*, and *Gyroporus castaneus*) and listed in the Red Book of Ukraine (*Grifola frondosa*, *Phaeolepiota aurea*, *Pseudoboletus parasiticus*, and *Sparassis crispa*) have been discovered. For two species listed in the Red Book of Ukraine (*Grifola frondosa* and *Pseudoboletus parasiticus*), new localities have been discovered. As of today, the conducted studies expand information about the mycoflora of the Kivertsi National Nature Park “Tsumanska Pushcha”. However, the mycoflora of the park still requires further, more detailed research and inventory.

**Keywords:** fungi, fungus-like organisms, inventory, Tsumanska Pushcha

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### Introduction

Kivertsi National Nature Park “Tsumanska Pushcha” was created in 2010. It is located in the Lutsk district, southeast of the Volhynia region, within the Ukrainian Polissia and temperate climate zone. Sod-podzolic

soils predominate there. Marshy soils and peatlands occur in the valley of the Kormyn River. According to the geobotanical zoning (Andrienko & Klestov, 2004), the park belongs to the European broad-leaved forest region, the Eastern European province of coniferous-broad-leaved and broad-leaved forests,

the Polissia sub-province of coniferous-broad-leaved forests, the Western Polissia district of oak-pine, pine, hornbeam-oak forests, floodplain meadows, and eutrophic swamps. The Phytodiversity of the park is one of the richest in Ukrainian Polissia and well examined. Old oak woods in a complex with wetlands and meadows form the park's vegetation (Andrienko & Klestov, 2004). However, the park's fungi and fungus-like organisms' taxonomic diversity remained almost unexplored, prompting our current investigation.

## Material and methods

Fungi and fungus-like organism samples were collected during expeditions in 2004–2008, 2018, and 2021. In 2021, park employees and scientists from other institutions conducted an additional multidisciplinary expedition supported by the National Research Foundation of Ukraine. Specimens were identified using keys and other related scientific publications (e.g., Alessio, 1985; Bondartsev & Parmasto, 1986; Breitenbach & Kränzlin, 1991; Engel, 1996; Muñoz, 2005; Šutara et al., 2009; Kuo, 2022). Species and genera names are provided following *Index Fungorum* (2021), and therefore they do not always correspond to those traditionally applied in Ukrainian publications (Solomakhina, 1956; Marchenko, 1974a, 1974b, 1976, 1979; Ganzha, 1977; Heluta, 1989; Heluta et al., 2007; Sukhomlyn et al., 2018). Applied supraspecific taxonomy follows Wijayawardene et al. (2022).

## Results and discussion

A species list of fungi and fungus-like organisms of the Kivertsi National Nature Park “Tsumanska Pushcha” was compiled. The list contains 203 species from 112 genera, 59 families, 18 orders, six classes, and three phyla (Table 1). Detailed information on the species composition combining the results of this research and the literature data is provided in the Appendix.

Basidiomycota represents the highest number of species in the park, composing about 85% of its taxonomic diversity of

fungi and fungus-like organisms. Among the classes, Agaricomycetes is the largest (84%) class, while Leotiomycetes has a second position (10%). The classes Dacrymycetes, Myxomycetes, Pezizomycetes, and Sordariomycetes collectively comprise only nearly 6% of the taxonomic diversity of fungi and fungus-like organisms in the park. Among the orders, the largest is Agaricales, with about 37% of the total number of species recorded in the park. Orders Russulales (18%), Boletales (15%), Helotiales (10%), and Polyporales (8%) are less diverse. Other 14 orders are represented by one to six species each, and together they include nearly 13% of species.

The leading families are Russulaceae (13% of species diversity), Erysiphaceae (9%), Boletaceae (8%), Mycenaceae (5%), and Polyporaceae (4%). Families Strophariaceae, Amanitaceae, Cortinariaceae, Stereaceae, Hymenochaetaceae, Physalacriaceae, and Suillaceae represent nearly 3% of species diversity each. Other families comprise one to four species each. Overall, the leading families include 131 species (almost 65% of the total species number) from 44 genera (nearly 39% of the total genera number).

Seven discovered species (five from the order Agaricales and two from the order Polyporales) have an unclear systematic position (*incertae sedis*). They compose about 3% of the total number of species and about 5% of the total number of genera.

The largest number of species contain genera *Russula* Pers. (18 species), *Erysiphe* R. Hedw. ex DC. (13 species), *Mycena* (Pers.) Roussel (nine species), *Lactarius* Pers. (nine species), *Amanita* Pers. (six species), *Cortinarius* (Pers.) Gray (six species), *Suillus* Gray (five species). These genera comprise up to 32% of the total species number recorded in the park.

The average species number of a family is 3.34, the average genera number of a family is 1.77, and the average species number of a genus is 1.82.

Fungi (excluding Eumycetozoa) belong to three ecological and trophic groups: saprotrophic macromycetes (saprotrophs) – 104 species, symbiotrophic macromycetes (mycorrhizal) – 73 species, and parasitic biotrophs – 20 species. Saprotrophs are represented by five subgroups: xylophages

**Table 1.** Higher-rank taxa of fungi and fungus-like organisms of Kivertsi National Nature Park “Tsumanska Pushcha” with the number of genera and species.

Phylum	Class	Order	Family	Number of included genera	Number of included species	
Eumycetozoa	Myxomycetes	Reticulariales	Reticulariaceae	3	3	
		Stemonitales	Stemonitidaceae	1	1	
		Physarales	Physaraceae	1	1	
Ascomycota	Leotiomycetes	Helotiales	Erysiphaceae	5	19	
			Sclerotiniaceae	1	1	
		Pezizales	Discinaceae	1	1	
				Pezizellaceae	1	1
				Pyronemataceae	1	1
				Rhizinaceae	1	1
		Sordariomycetes	Hypocreales	Nectriaceae	1	1
Basidiomycota	Agaricomycetes	Xylariales	Hypoxylaceae	1	1	
			Agaricales	Agaricaceae	2	3
			Amanitaceae	1	6	
			Cortinariaceae	1	6	
			Crepidotaceae	1	1	
			Entolomataceae	1	1	
			Hydnangiaceae	1	4	
			Hygrophoraceae	1	1	
			Hymenogastraceae	2	3	
			Lycoperdaceae	2	2	
			Macrocytidiaceae	1	1	
			Marasmiaceae	1	2	
			Mycenaceae	2	10	
			Omphalotaceae	2	3	
			Physalacriaceae	4	5	
			Pleurotaceae	1	1	
			Pluteaceae	1	1	
			Psathyrellaceae	3	3	
			Schizophyllaceae	1	1	
			Strophariaceae	4	7	
	Tricholomataceae	1	2			
	Typhulaceae	1	1			
	incertae sedis	9	10			
	Auriculariales	Auriculariaceae	2	2		
	Boletales	Boletaceae	10	16		
		Gomphidiaceae	1	1		
		Gyroporaceae	1	2		

Table 1. Continued.

Phylum	Class	Order	Family	Number of included genera	Number of included species			
Basidiomycota	Agaricomycetes	Boletales	Hygrophoropsidaceae	1	1			
			Paxillaceae	1	1			
			Sclerodermataceae	1	2			
			Suillaceae	1	5			
			Tapinellaceae	1	1			
		Cantharellales	Hydnaceae	2	3			
		Gomphales	Gomphaceae	1	1			
		Hymenochaetales	Hymenochaetacea	Hymenochaetaceae	6	6		
				Rickenellaceae	1	1		
				incertae sedis	1	2		
		Phallales	Phallaceae	1	1			
		Polyporales	Fomitopsidaceae	Fomitopsidaceae	1	2		
				Laetiporaceae	1	1		
				Grifolaceae	1	1		
				Phanerochaetaceae	2	2		
				Polyporaceae	7	8		
				Sparassidaceae	1	1		
				Russulales	Auriscalpiaceae	Auriscalpiaceae	1	1
						Bondarzewiaceae	1	1
						Peniophoraceae	1	1
						Russulaceae	2	27
		Stereaceae	1			6		
		Thelephorales	Thelephoraceae	1	1			
Dacrymycetes	Dacrymycetales	Dacrymycetaceae	1	1				
Total number of included taxa								
3	6	18	59	112	203			

(68 species), litter and humus saprotrophs (33 species in general), bryotrophs (two species), and mycotrophs (one species).

Some fungi registered in the park protected at different levels (Table 2). Five species are classified as regionally rare (Decision, 2009), and four are included in the Red Book of Ukraine (Didukh, 2009; Decree, 2021). *Entoloma bloxamii* is a vulnerable species included in the IUCN red list (Jordal, 2019).

## Conclusions

The total number of recorded fungi and fungus-like organisms in Kivertsi National Nature Park “Tsumanska Pushcha” is 203 species belonging to 112 genera, 59 families, 18 orders, and six classes of three phyla – Eumycetozoa, Ascomycota, and Basidiomycota. Most of the discovered species belong to Basidiomycota. Nine discovered species are rare and protected, including four listed in the Red Book of Ukraine (*Grifola frondosa*, *Phaeolepiota*

**Table 2.** Rare fungi species of the Kivertsi National Park "Tsumanska Pushcha".

Nr	Species	Regional Red List	Red Book of Ukraine	IUCN Red List
1	<i>Cortinarius bolaris</i> (Pers.) Fr.	+		
2	<i>Craterellus cornucopioides</i> (L.) Pers.	+		
3	<i>Entoloma bloxamii</i> (Berk. & Broome) Sacc.			Vulnerable (VU)
4	<i>Fistulina hepatica</i> (Schaeff.) With.	+		
5	<i>Grifola frondosa</i> (Dicks.) Gray		Vulnerable	
6	<i>Gyroporus castaneus</i> (Bull.) Quél.	+		
7	<i>Phaeolepiota aurea</i> (Matt.) Maire		Vulnerable	
8	<i>Pseudoboletus parasiticus</i> (Bull.) Šutara		Vulnerable	
9	<i>Sparassis crispa</i> (Wulfen) Fr.		Vulnerable	

*aurea*, *Pseudoboletus parasiticus*, and *Sparassis crispa*) and one (*Entoloma bloxamii*) included in the IUCN Red List.

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**Appendix.** The list of the fungi and fungus-like organisms of the Kivertsi National Nature Park “Tsumanska Pushcha”.

Nr	Species	Literature data	Results of this research with indication of the years of the observation
<b>EUMYCETOZOA</b>			
<b>MYXOMYCETES</b>			
<b>Reticulariales</b>			
Reticulariaceae			
1	<i>Reticularia lycoperdon</i> Bull.	<a href="#">Sukhomlyn et al., 2018</a>	
2	<i>Tubifera ferruginosa</i> (Batsch) J.F. Gmel.		2021, N. Merlenko; 2022, G. Gerasymchuk
3	<i>Lycogala epidendrum</i> (J.C. Buxb. ex L.) Fr.		2021, R. Hleb
<b>Stemonitales</b>			
Stemonitidaceae			
4	<i>Stemonitis axifera</i> (Bull.) T. Macbr.	<a href="#">Sukhomlyn et al., 2018</a>	2004–2008, O. Vysotska
<b>Physarales</b>			
Physaraceae			
5	<i>Fuligo septica</i> (L.) F.H. Wigg	<a href="#">Sukhomlyn et al., 2018</a>	2004–2008, O. Vysotska
<b>ASCOMYCOTA</b>			
<b>LEOTIOMYCETES</b>			
<b>Helotiales</b>			
Erysiphaceae			
6	<i>Blumeria graminis</i> (DC.) Speer	<a href="#">Marchenko, 1974a; Heluta, 1989</a>	

## Appendix. Continued.

7	<i>Erysiphe alphitoides</i> Griffon & Maublanc	Sukhomlyn et al., 2018; Heluta, 1989
8	<i>Erysiphe adunca</i> (Wallr.) Fr.	Heluta, 1989
9	<i>Erysiphe berberidis</i> DC.	Heluta, 1989
10	<i>Erysiphe caulicola</i> (Petr.) U. Braun	Marchenko, 1976; Heluta, 1989
11	<i>Erysiphe circaeae</i> L. Junell	Marchenko, 1976; Heluta, 1989
12	<i>Erysiphe grossulariae</i> (Wallr.) de Bary	Heluta, 1989
13	<i>Erysiphe heraclei</i> DC.	Heluta, 1989
14	<i>Erysiphe hyperici</i> (Wallr.) S. Blumer	Heluta, 1989
15	<i>Erysiphe ornata</i> var. <i>europaea</i> (U. Braun) U. Braun & S. Takam.	Heluta, 1989
16	<i>Erysiphe prunastri</i> DC.	Heluta, 1989
17	<i>Erysiphe trifoliorum</i> (Wallr.) U. Braun	Heluta, 1989
18	<i>Erysiphe ulmariae</i> Pers. ex Desm.	Heluta, 1989
19	<i>Erysiphe</i> ( <i>Microsphaera</i> ) sp. on <i>Chamaecytisus</i> <i>ruthenicus</i> (Fisch. ex Woł.) Klásk.	Marchenko, 1976; Heluta, 1989
20	<i>Golovinomyces biocellatus</i> (Ehrenb.) V.P. Heluta	Marchenko, 1974a; Heluta, 1989
21	<i>Neoerysiphe galeopsidis</i> (DC.) U. Braun	Marchenko, 1974a; Heluta, 1989
22	<i>Neoerysiphe galii</i> (S. Blumer) U. Braun	Marchenko, 1974a; Heluta, 1989
23	<i>Podosphaera aphanis</i> (Wallr.) U. Braun & S. Takam.	Solomakhina, 1956; Heluta, 1989
24	<i>Podosphaera erigerontis-canadensis</i> (Lév.) U. Braun & T.Z. Liu	Marchenko, 1979; Heluta, 1989
Sclerotiniaceae		
25	<i>Monilinia fructigena</i> Honey	2004–2008, O. Vysotska
<b>PEZIZOMYCETES</b>		
<b>Pezizales</b>		
Discinaceae		
26	<i>Gyromitra esculenta</i> (Pers.) Fr.	2004–2008, O. Vysotska
Pezizellaceae		
27	<i>Calycina citrina</i> (Hedw.) Gray	Sukhomlyn et al., 2018
Pyronemataceae		
28	<i>Otidea onotica</i> (Pers.) Fuckel	2004–2008, O. Vysotska
Rhizinaceae		
29	<i>Rhizina undulata</i> Fr.	2004–2008, O. Vysotska
<b>SORDARIOMYCETES</b>		
<b>Hypocreales</b>		
Nectriaceae		
30	<i>Nectria cinnabarina</i> (Tode) Fr.	Sukhomlyn et al., 2018
<b>Xylariales</b>		
Hypoxyloaceae		
31	<i>Hypoxylon fuscum</i> (Pers.) Fr.	Sukhomlyn et al., 2018

## Appendix. Continued.

BASIDIOMYCOTA			
AGARICOMYCETES			
Agaricales			
Agaricaceae			
32	<i>Coprinus comatus</i> (O.F. Müll.) Pers.		2004–2008, O. Vysotska
33	<i>Coprinus micaceus</i> (Bull.) Fr.		2004–2008, O. Vysotska
34	<i>Macrolepiota procera</i> (Scop.) Singer	Vysotska, 2010	2004–2008, O. Vysotska; 2022, G. Gerasymchuk
Amanitaceae			
35	<i>Amanita fulva</i> (Schaeff.) Secr.	Vysotska, 2010; Sukhomlyn et al., 2018	2004–2008, O. Vysotska
36	<i>Amanita pantherina</i> (DC.) Krombh.	Vysotska, 2010	2004–2008, O. Vysotska
37	<i>Amanita phalloides</i> (Vaill. ex Fr.) Link	Vysotska, 2010	2004–2008, O. Vysotska; 2022, G. Gerasymchuk
38	<i>Amanita rubescens</i> Pers.	Vysotska, 2010; Sukhomlyn et al., 2018	2004–2008, O. Vysotska
39	<i>Amanita citrina</i> (Pers.) Pers.		2004–2008, O. Vysotska
40	<i>Amanita muscaria</i> (L.) Lam.		2004–2008, O. Vysotska
Cortinariaceae			
41	<i>Cortinarius caperatus</i> (Pers.) Fr.	Sukhomlyn et al., 2018	2004–2008, O. Vysotska
42	<i>Cortinarius anomalus</i> (Pers.) Fr.		2004–2008, O. Vysotska
43	<i>Cortinarius bolaris</i> (Pers.) Fr.		2004–2008, O. Vysotska
44	<i>Cortinarius semisanguineus</i> (Fr.) Gillet		2004–2008, O. Vysotska
45	<i>Cortinarius torvus</i> (Fr.) Fr.		2004–2008, O. Vysotska
46	<i>Cortinarius traganus</i> (Fr.) Fr.		2004–2008, O. Vysotska
Crepidotaceae			
47	<i>Crepidotus cesatii</i> (Rabenh.) Sacc.		2004–2008, O. Vysotska
Entolomataceae			
48	<i>Entoloma bloxamii</i> (Berk. & Broome) Sacc.	Vysotska, 2010	2004–2008, O. Vysotska
Hydnangiaceae			
49	<i>Laccaria amethystina</i> Cooke	Vysotska, 2010	2004–2008, O. Vysotska; 2022, G. Gerasymchuk
50	<i>Laccaria tortilis</i> (Bolton) Cooke	Vysotska, 2010	2004–2008, O. Vysotska
51	<i>Laccaria bicolor</i> (Maire) P.D. Orton		2004–2008, O. Vysotska
52	<i>Laccaria laccata</i> (Scop.) Cooke		2004–2008, O. Vysotska
Hygrophoraceae			
53	<i>Hygrophorus eburneus</i> (Bull.) Fr.	Vysotska, 2010	2004–2008, O. Vysotska
Hymenogastraceae			
54	<i>Galerina hypnorum</i> (Schrank) Kühner	Vysotska, 2010	2004–2008, O. Vysotska
55	<i>Hebeloma crustuliniforme</i> (Bull.) Quéf.		2004–2008, O. Vysotska
56	<i>Hebeloma birrus</i> (Fr.) Gillet		2004–2008, O. Vysotska

## Appendix. Continued.

57	<i>Kuehneromyces mutabilis</i> (Schaeff.) Singer & A.H. Sm.		2004–2008, O. Vysotska
Lycoperdaceae			
58	<i>Apioperdon pyriforme</i> (Schaeff.) Vizzini	Sukhomlyn et al., 2018	2004–2008, O. Vysotska
59	<i>Lycoperdon perlatum</i> Pers.	Sukhomlyn et al., 2018	
Macrocytidiaceae			
60	<i>Macrocytidia cucumis</i> (Pers.) Joss.		2004–2008, O. Vysotska
Marasmiaceae			
61	<i>Marasmius oreades</i> (Bolton) Fr.	Sukhomlyn et al., 2018	
62	<i>Marasmius rotula</i> (Scop.) Fr.		2004–2008, O. Vysotska
Mycenaceae			
63	<i>Mycena polygramma</i> (Bull.) Gray	Sukhomlyn et al., 2018	
64	<i>Mycena galopus</i> (Pers.) P. Kumm.		2004–2008, O. Vysotska
65	<i>Mycena haematopus</i> (Pers.) P. Kumm.		2004–2008, O. Vysotska
66	<i>Mycena inclinata</i> (Fr.) Quél.		2004–2008, O. Vysotska; 2022, G. Gerasymchuk
67	<i>Mycena maculata</i> P. Karst.		2004–2008, O. Vysotska
68	<i>Mycena meliigena</i> (Berk. & Cooke) Sacc.		2004–2008, O. Vysotska
69	<i>Mycena pelianthina</i> (Fr.) Quél.		2004–2008, O. Vysotska
70	<i>Mycena pura</i> (Pers.) P. Kumm.		2004–2008, O. Vysotska
71	<i>Mycena abramsii</i> (Murrill) Murrill		2004–2008, O. Vysotska
72	<i>Xeromphalina caudicinalis</i> (With.) Kühner & Maire		2004–2008, O. Vysotska
Omphalotaceae			
73	<i>Gymnopus dryophilus</i> (Bull.) Murrill		2004–2008, O. Vysotska; 2021, O. Bezsmertna
74	<i>Gymnopus androsaceus</i> (L.) Della Magg. & Trassin		2004–2008, O. Vysotska
75	<i>Rhodocollybia butyracea</i> (Bull.) Lennox		2004–2008, O. Vysotska
Physalacriaceae			
76	<i>Armillaria gallica</i> Marxm. & Romagn.	Vysotska, 2010	2004–2008, O. Vysotska
77	<i>Armillaria mellea</i> (Vahl) P. Kumm.		2004–2008, O. Vysotska
78	<i>Hymenopellis radicata</i> (Relhan) R.H. Petersena		2004–2008, O. Vysotska
79	<i>Strobilurus tenacellus</i> (Pers.) Singer		2004–2008, O. Vysotska
80	<i>Xerula pudens</i> (Pers.) Singer	Vysotska, 2010	2004–2008, O. Vysotska
Pleurotaceae			
81	<i>Pleurotus ostreatus</i> (Jacq. ex Fr.) P. Kumm.	Sukhomlyn et al., 2018	2004–2008, O. Vysotska
Pluteaceae			
82	<i>Pluteus cervinus</i> (Schaeff.) P. Kumm.		2004–2008, O. Vysotska
Psathyrellaceae			
83	<i>Coprinellus disseminatus</i> (Pers.) J.E. Lange		2004–2008, O. Vysotska
84	<i>Coprinopsis atramentaria</i> (Bull.) Redhead, Vilgalys & Moncalvo		2021, O. Bezsmertna

## Appendix. Continued.

85	<i>Parasola plicatilis</i> (Curtis) Redhead, Vilgalys & Hopple		2021, O. Bezsmertna
Schizophyllaceae			
86	<i>Schizophyllum commune</i> Fries	Sukhomlyn et al., 2018	
Strophariaceae			
87	<i>Agrocybe praecox</i> (Pers.) Fayod		2004–2008, O. Vysotska
88	<i>Hypholoma fasciculare</i> (Huds.) P. Kumm.	Vysotska, 2010	2004–2008, O. Vysotska
89	<i>Hypholoma lateritium</i> (Schaeff.) P. Kumm.		2004–2008, O. Vysotska
90	<i>Pholiota aurivella</i> (Batsch) P. Kumm.	Vysotska, 2010	2004–2008, O. Vysotska
91	<i>Pholiota populnea</i> (Pers.) Kuyper & Tjall.-Beuk.		2004–2008, O. Vysotska
92	<i>Stropharia aeruginosa</i> (Curtis) Quél.	Vysotska, 2010	2004–2008, O. Vysotska
93	<i>Stropharia hornemannii</i> (Fr.) S. Lundell & Nannf.		2004–2008, O. Vysotska
Tricholomataceae			
94	<i>Tricholoma populinum</i> J.E. Lange		2004–2008, O. Vysotska
95	<i>Tricholoma portentosum</i> (Fr.) Quél.		2004–2008, O. Vysotska
Typhulaceae			
96	<i>Typhula fistulosa</i> (Holmsk.) Olariaga		2004–2008, O. Vysotska
Incertae sedis			
97	<i>Clitocybe nebularis</i> (Batsch) P. Kumm.		2004–2008, O. Vysotska
98	<i>Clitocybe phyllophila</i> (Pers.) P. Kumm.		2004–2008, O. Vysotska
99	<i>Collybia cirrhata</i> (Schumach.) Quél.		2004–2008, O. Vysotska
100	<i>Cyathus striatus</i> (Huds.) Willd.	Sukhomlyn et al., 2018	2021, H. Merlenko; 2022, G. Gerasymchuk
101	<i>Cystoderma amianthinum</i> (Scop.) Fayod		2004–2008, O. Vysotska
102	<i>Fistulina hepatica</i> (Schaeff.) With.		2021, R. Hleb; 2021, H. Merlenko; 2022, G. Gerasymenko
103	<i>Infundibulicybe gibba</i> (Pers.) Harmaja		2004–2008, O. Vysotska
104	<i>Lepista nuda</i> (Bull.) Cooke		2004–2008, O. Vysotska
105	<i>Phaeolepiota aurea</i> (Matt.) Maire	Vysotska, 2010	2004–2008, O. Vysotska
106	<i>Tricholomopsis rutilans</i> (Schaeff.) Singer		2004–2008, O. Vysotska
<b>Auriculariales</b>			
Auriculariaceae			
107	<i>Auricularia auricula-judae</i> (Bull.) J. Schröt.	Sukhomlyn et al., 2018	
108	<i>Exidia glandulosa</i> (Bull.) Fr.	Sukhomlyn et al., 2018	
<b>Boletales</b>			
Boletaceae			
109	<i>Boletus edulis</i> Bull.	Vysotska, 2010	2004–2008, O. Vysotska; 1967, Rozhenko *; 2017, Nazarchuk *; 2019, Frankiv *; 2019, Ustymchuk *
110	<i>Boletus pinophilus</i> Pilat & Dermek		2019, Frankiv *

## Appendix. Continued.

111	<i>Boletus reticulatus</i> Schaeff.		2022, G. Gerasymchuk; 2017, Dorotii *
112	<i>Chalciporus piperatus</i> (Bull.) Bataille		2004–2008, O. Vysotska
113	<i>Imleria badia</i> (Fr.) Vizzini	Grodzynska & Vysotska, 2010	2004–2008, O. Vysotska; 2017, Frankiv *; 2017, Nazarchuk *; 2018, Ripetska *
114	<i>Leccinellum pseudoscabrum</i> (Kallenb.) Mikšik	Heluta et al., 2007	2004–2008, O. Vysotska; 2019, Lukashevych *
115	<i>Leccinum aurantiacum</i> (Bull.) Gray		2004–2008, O. Vysotska
116	<i>Leccinum varicolor</i> Watling		2019, Lukashevych *
117	<i>Leccinum versipelle</i> (Fr. & Hök) Snell		2004–2008, O. Vysotska
118	<i>Pseudoboletus parasiticus</i> (Bull.) Šutara		2021, R. Hleb
119	<i>Suillellus luridus</i> (Schaeff.) Murrill	Vysotska, 2010	2004–2008, O. Vysotska
120	<i>Tylopilus felleus</i> (Bull.) P. Karst.		2004–2008, O. Vysotska; 2019, Frankiv *
121	<i>Xerocomellus chrysenteron</i> (Bull.) Šutara		2004–2008, O. Vysotska
122	<i>Xerocomellus porosporus</i> (Imler ex Watling) Šutara		2004–2008, O. Vysotska
123	<i>Xerocomus ferrugineus</i> (Schaeff.) Alessio	Sukhomlyn et al., 2018	
124	<i>Xerocomus subtomentosus</i> (L.) Quél.		2004–2008, O. Vysotska; 2021, O. Bezsmertna; 2019, Frankiv *; 2019, Lukashevych *
Gomphidiaceae			
125	<i>Chroogomphus rutilus</i> (Schaeff.) O.K. Mill.		2004–2008, O. Vysotska
Gyroporaceae			
126	<i>Gyroporus castaneus</i> (Bull.) Quél.	Grodzynska & Vysotska, 2010	
127	<i>Gyroporus cyanescens</i> (Bull.) Quél.	Vysotska, 2010	2004–2008, O. Vysotska
Hygrophoropsidaceae			
128	<i>Hygrophoropsis aurantiaca</i> (Wulfen) Maire		2004–2008, O. Vysotska
Paxillaceae			
129	<i>Paxillus involutus</i> (Batsch) Fr.		2004–2008, O. Vysotska
Sclerodermataceae			
130	<i>Scleroderma areolatum</i> Ehrenb	Sukhomlyn et al., 2018	
131	<i>Scleroderma citrinum</i> Pers.	Sukhomlyn et al., 2018	2004–2008, O. Vysotska; 2021, O. Bezsmertna; 2022, G. Gerasymchuk
Suillaceae			
132	<i>Suillus bovinus</i> (Pers.) Roussel	Ganzha, 1977	
133	<i>Suillus flavidus</i> (Fr.) Presley	Ganzha, 1977	
134	<i>Suillus granulatus</i> (L.) Roussel	Ganzha, 1977; Sukhomlyn et al., 2018	2004–2008, O. Vysotska
135	<i>Suillus luteus</i> (L.) Roussel	Ganzha, 1977; Vysotska, 2010	2004–2008, O. Vysotska
136	<i>Suillus variegatus</i> (Sw.) Richon & Roze	Ganzha, 1977	

## Appendix. Continued.

Tapinellaceae			
137	<i>Tapinella atrotomentosa</i> (Batsch) Šutara	Sukhomlyn et al., 2018	2004–2008, O. Vysotska
<b>Cantharellales</b>			
Hydnaceae			
138	<i>Craterellus cornucopioides</i> (L.) Pers.	Vysotska, 2010	2004–2008, O. Vysotska
139	<i>Craterellus tubaeformis</i> (Schaeff.) Quél.	Vysotska, 2010	2004–2008, O. Vysotska
140	<i>Hydnum repandum</i> L.	Vysotska, 2010	2004–2008, O. Vysotska
<b>Gomphales</b>			
Gomphaceae			
141	<i>Ramaria stricta</i> (Pers.) Quél.	Sukhomlyn et al., 2018	
<b>Hymenochaetales</b>			
Hymenochaetaceae			
142	<i>Coltricia perennis</i> (L.) Murrill		2004–2008, O. Vysotska
143	<i>Fuscoporia ferruginosa</i> (Schrad.) Murrill	Sukhomlyn et al., 2018	
144	<i>Hymenochaete rubiginosa</i> (Dicks.) Lév.	Sukhomlyn et al., 2018	2022, G. Gerasymchuk
145	<i>Inonotus obliquus</i> (Ach. ex Pers.) Pilát	Sukhomlyn et al., 2018	
146	<i>Phellinus ferruginosus</i> (Schrad.) Pat.	Sukhomlyn et al., 2018	
Rickenellaceae			
147	<i>Rickenella fibula</i> (Bull.) Raithelh.	Vysotska, 2010	2004–2008, O. Vysotska
Incertae sedis			
148	<i>Trichaptum abietinum</i> (Dicks.) Ryvarden	Sukhomlyn et al., 2018	
149	<i>Trichaptum bifforme</i> (Fr.) Ryvarden		2021, R. Hleb
<b>Phallales</b>			
Phallaceae			
150	<i>Phallus impudicus</i> L.	Sukhomlyn et al., 2018	2022, G. Gerasymchuk
<b>Polyporales</b>			
Grifolaceae			
151	<i>Grifola frondosa</i> (Dicks.) Gray		2016, D. Shyriaieva; 2022, G. Gerasymchuk
Fomitopsidaceae			
152	<i>Fomitopsis betulina</i> (Bull.) B.K. Cui, M.L. Han & Y.C. Da	Sukhomlyn et al., 2018	2004–2008, O. Vysotska
153	<i>Fomitopsis pinicola</i> (Sw.) P. Karst.	Sukhomlyn et al., 2018	
Laetiporaceae			
154	<i>Phaeolus schweinitzii</i> (Fr.) Pat.	Sukhomlyn et al., 2018	2004–2008, O. Vysotska
Phanerochaetaceae			
155	<i>Bjerkandera adusta</i> (Willd.) P. Karst.	Sukhomlyn et al., 2018	2021, O. Bezmertna
156	<i>Hapalopilus nidulans</i> (Fr.) P. Karst.	Sukhomlyn et al., 2018	
Polyporaceae			
157	<i>Cerioporus squamosus</i> (Huds.) Quél.		2004–2008, O. Vysotska
158	<i>Daedaleopsis confragosa</i> (Bolton) J. Schröt.	Sukhomlyn et al., 2018	

## Appendix. Continued.

159	<i>Fomes fomentarius</i> (L.) Fr.	Sukhomlyn et al., 2018	
160	<i>Lenzites betulinus</i> (L.) Fr.	Sukhomlyn et al., 2018	
161	<i>Polyporus lipsiensis</i> (Batsch) E.H.L. Krause	Sukhomlyn et al., 2018	
162	<i>Pycnoporus cinnabarinus</i> (Jacq.) P. Karst.	Sukhomlyn et al., 2018	
163	<i>Trametes hirsuta</i> (Wulfen) Lloyd	Sukhomlyn et al., 2018	
164	<i>Trametes versicolor</i> (L.) Lloyd	Sukhomlyn et al., 2018	2004–2008, O. Vysotska
Sparassidaceae			
165	<i>Sparassis crispa</i> (Wulfen) Fr.	Kurynychuk, 2005; Vysotska, 2010; Sukhomlyn et al., 2018	2004–2008, O. Vysotska; 2021, N. Merlenko; 2018, Prokopiuk *; 2021, Krasovskiy *
<b>Russulales</b>			
Auriscalpiaceae			
166	<i>Artomyces pyxidatus</i> (Pers.) Jülich	Sukhomlyn et al., 2018	2004–2008, O. Vysotska; 2022, G. Gerasymchuk
Bondarzewiaceae			
167	<i>Heterobasidion annosum</i> (Fr.) Bref.	Sukhomlyn et al., 2018	
Peniophoraceae			
168	<i>Peniophora quercina</i> (Pers.) Cooke	Sukhomlyn et al., 2018	
Russulaceae			
169	<i>Lactarius acerrimus</i> Britzelm.		2004–2008, O. Vysotska
170	<i>Lactarius camphoratus</i> (Bull.) Fr.		2004–2008, O. Vysotska
171	<i>Lactarius lilacinus</i> Fr.		2004–2008, O. Vysotska
172	<i>Lactarius necator</i> (Bull.) Pers.		2004–2008, O. Vysotska
173	<i>Lactarius obscuratus</i> (Lasch) Fr.		2004–2008, O. Vysotska
174	<i>Lactarius piperatus</i> (L.) Pers.		2004–2008, O. Vysotska
175	<i>Lactarius quietus</i> (Fr.) Fr.	Vysotska, 2010	2004–2008, O. Vysotska
176	<i>Lactarius rufus</i> (Scop.) Fr.		2004–2008, O. Vysotska
177	<i>Lactarius zonarius</i> (Bull.) Fr.		2004–2008, O. Vysotska
178	<i>Russula adusta</i> (Pers.) Fr.		2004–2008, O. Vysotska
179	<i>Russula aeruginea</i> Fr.	Vysotska, 2010	2004–2008, O. Vysotska
180	<i>Russula amoenolens</i> Romagn.		2004–2008, O. Vysotska
181	<i>Russula atropurpurea</i> (Krombh.) Britzelm.	Sukhomlyn et al., 2018	
182	<i>Russula carpini</i> R. Girard & Heinem.		2004–2008, O. Vysotska
183	<i>Russula emetica</i> (Schaeff.) Pers.		2004–2008, O. Vysotska; 2021, R. Hleb
184	<i>Russula maculata</i> Quel.	Sukhomlyn et al., 2018	2004–2008, O. Vysotska
185	<i>Russula mariae</i> Peck		2004–2008, O. Vysotska
186	<i>Russula minutula</i> Velen.		2004–2008, O. Vysotska
187	<i>Russula nigricans</i> Fr.	Vysotska, 2010	2004–2008, O. Vysotska
188	<i>Russula ochroleuca</i> Fr.	Sukhomlyn et al., 2018	2004–2008, O. Vysotska
189	<i>Russula olivacea</i> (Schaeff.) Fr.	Sukhomlyn et al., 2018	

## Appendix. Continued.

190	<i>Russula pectinatoides</i> Peck		2004–2008, O. Vysotska
191	<i>Russula puellula</i> Ebbesen		2004–2008, O. Vysotska
192	<i>Russula pulchella</i> I.G. Borshch.		2004–2008, O. Vysotska
193	<i>Russula risigallina</i> (Batsch) Sacc.		2004–2008, O. Vysotska
194	<i>Russula virescens</i> (Schaeff.) Fr.	Vysotska, 2010	2004–2008, O. Vysotska
195	<i>Russula xerampelina</i> (Schaeff.) Fr.		2004–2008, O. Vysotska
<b>Stereaceae</b>			
196	<i>Stereum gausapatum</i> (Fr.) Fr.	Sukhomlyn et al., 2018	
197	<i>Stereum hirsutum</i> (Willd.) Pers.	Sukhomlyn et al., 2018	
198	<i>Stereum ochraceoflavum</i> (Schwein.) Sacc.	Sukhomlyn et al., 2018	
199	<i>Stereum rugosum</i> Pers.	Sukhomlyn et al., 2018	
200	<i>Stereum sanguinolentum</i> (Alb. & Schwein.) Fr.	Sukhomlyn et al., 2018	
201	<i>Stereum subtomentosum</i> Pouzar		2021, O. Bezmertna
<b>Thelephorales</b>			
<b>Thelephoraceae</b>			
202	<i>Thelephora terrestris</i> Ehrh. ex Fr.	Sukhomlyn et al., 2018	2004–2008, O. Vysotska
<b>DACRYMYCETES</b>			
<b>Dacrymycetales</b>			
<b>Dacrymycetaceae</b>			
203	<i>Dacrymyces stillatus</i> Nees		2021, N. Merlenko

## Гриби і грибоподібні організми Ківерцівського національного природного парку “Цуманська пуца”

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У результаті мікологічних обстежень території Ківерцівського національного природного парку “Цуманська пуца” впродовж 2004–2021 років виявлено та зареєстровано 203 види грибів і грибоподібних організмів. Проведено порівняльний аналіз видового складу мікофлори парку. Найбільш таксономічно різноманітним та багатим виявився відділ Basidiomycota, який налічує

172 види, що належать до 48 родів із 49 родин, десяти порядків з класу Agaricomycetes. Виявлено низку раритетних макроміцетів, які є рідкісними чи відносно рідкісними в Україні (*Cortinarius bolaris*, *Craterellus cornucopioides*, *Entoloma bloxamii*, *Fistulina hepatica* і *Gyroporus castaneus*) та занесені до Червоної книги України (*Grifola frondosa*, *Phaeolepiota aurea*, *Pseudoboletus parasiticus* і *Sparassis crispa*). Для двох видів, які занесені до Червоної книги України (*Grifola frondosa* та *Pseudoboletus parasiticus*) встановлено нові локалітети. Станом на сьогодні проведені дослідження розширюють відомості про мікофлору національного природного парку “Цуманська пуща”. Однак мікофлора парку все ще потребує подальших детальніших досліджень та інвентаризації.

**Ключові слова:** гриби, грибоподібні організми, інвентаризація, Цуманська пуща