МИКОЛОГИЯ И ФИТОПАТОЛОГИЯ, 2024, том 58, № 5, с. 362–367

БИОРАЗНООБРАЗИЕ, СИСТЕМАТИКА, ЭКОЛОГИЯ

УДК 582.287.2 : 502.7 (470.318)

NEW FINDINGS OF APHYLLOPHOROID FUNGI FROM THE KALUZHSKIE ZASEKI STATE NATURE RESERVE (KALUGA REGION, RUSSIA)

© 2024. S. V. Volobuev[1,*]

[1] Komarov Botanical Institute of the Russian Academy of Sciences, 197022 St. Petersburg, Russia
**e-mail: sergvolobuev@binran.ru*

Received 27 April, 2024; revised 20 June, 2024; accepted 13 July, 2024

New data on species richness and ecology of lignicolous aphyllophoroid fungi (*Agaricomycetes*, *Basidiomycota*) inhabiting the old-growth mesic broad-leaved forest of the Kaluzhskie Zaseki State Nature Reserve (Central Russian Upland, European part of Russia) is presented. A list of 46 species new to Kaluga Region is annotated with data on occupied woody substrates, collection numbers of herbarium specimens and brief distributional notes. Among them *Thanatephorus ochraceus* is a new species to the European part of Russia, *Athelia cystidiolophora*, *Leucogyrophana sororia*, *Phlebia subulata*, *Skeletocutis kuehneri*, *Steccherinum pudorinum*, and *Tomentella lapida* are registered for the first time for the Central Russian Upland. New localities of rare and little-known in Europe species, such as *Aporpium macroporum*, *Hyphoderma incrustatum*, *Kneiffiella abdita*, *Peniophorella clavigera*, *Riopa metamorphosa*, *Sistotrema porulosum*, and *Yuchengia narymica*, are revealed.

Keywords: biogeography, corticioid fungi, deciduous forest, Eastern Europe, polypores, rare species, species diversity

DOI: 10.31857/S0026364824050043, **EDN:** uoyzfs

INTRODUCTION

Aphyllophoroid fungi unite a diverse group of non-gilled macrofungi from the phylum *Basidiomycota*. Being predominantly wood-inhabiting organisms they are presented by wood decomposers, including both saprotrophs and xylopathogens, but also by litter decayers and ectomycorrhizal species (Kotiranta et al., 2009). As xylotrophs, aphyllophoroid fungi determine the intensity of the biospherically important process of dead wood decomposition, the carbon cycle and, consequently, the dynamics of forest ecosystems, including their species richness (Stokland et al., 2012). The strong preference of some wood-inhabiting fungi for old-growth forest patches led to the suggestion that these fungi could be used as indicators of a forest's conservation value (Heilmann-Clausen et al., 2017). The coniferous forests of Fennoscandia and European beech forests are much better studied in this respect (Kotiranta, Niemelä, 1996; Christensen et al., 2004; Halme et al., 2017, etc.). At the same time, the species diversity of aphyllophoroid fungi in the broad-leaved forests of Eastern Europe, and in particular in the territory of the Central Russian Upland, is still underestimated. Moreover, there are large gaps in knowledge of fungal distribution and their ecology, including substrate and habitat requirements. Descriptive and inventory studies of macrofungi therefore retain their relevance to the present time.

Kaluga Region belongs to the regions of the European Russia for which less than 200 aphyllophoroid fungi species are registered to date. The review on the history of the studies on these basidial fungi in Kaluga Region contains data on 164 species revealed for the region (Volobuev, Bolshakov, 2016). Later, additions to the aphyllophoroid fungi diversity were published in the first article of the series "New species for regional mycobiotas of Russia" (Bolshakov et al., 2016) and the article on the polypore fungi findings from the Kaluzhskie Zaseki State Nature Reserve (Volobuev, 2022). In total, among 183 species known for Kaluga Region, 96 aphyllophoroid fungi species are currently recorded for the Kaluzhskie Zaseki State Nature Reserve, and 116 species for the Ugra National Park, respectively.

The aim of this study is to present new data on the species diversity and ecology of aphyllophoroid fungi distributed in still insufficiently explored broad-leaved forests of the Central Russian Upland and Eastern Europe within the Kaluzhskie Zaseki State Nature Reserve.

MATERIALS AND METHODS

The field work was carried out in August of 2020 on the Kaluzhskie Zaseki State Nature Reserve (Kaluga Region) situated in the broad-leaved forest zone of the European part of Russia (Smirnova et al., 2017;

Safronova, Yurkovskaya, 2018); the geographical coordinates of the Reserve are 53.5–53.9 °N, 35.6–35.9 °E. The Reserve was established in 1992 to protect the old-growth multi-species broad-leaved forests and their high level of biodiversity against diverse anthropogenic impacts. It is a remarkable natural historical fact that the Reserve forests grow on the site of the former Zaokskaya Abatis belt, which was the line of defence of the Muscovite state in the 16–18th centuries (Bobrovskiy, 2002).

Basidiomata were collected by the author within the Southern area of the Reserve located near Yagodnoye village, where a massive windthrow occurred in August of 2006 (Khanina et al., 2019). Before the windthrow there was an aspen-broadleaved forest with the predominance of *Populus tremula* L., *Tilia cordata* Mill., *Quercus robur* L. with the presence of *Picea abies* (L.) H. Karst. [sample plots 1 and 3 in Bobrovskiy and Stamenov (2020)]. Soddy podbours and soddy-podzolic soils on the fluvioglacial sands dominate. The vegetation can be attributed to the *Querco-Tilietum cordatae* association, Laivinsh 1986 ex Laivinsh in Solomesč et al. 1993. Diagnostic species of this association belonging to the nemoral ecological-coenotic group show high constancy, at the same time boreal species of herbs [*Gymnocarpium dryopteris* (L.) Newman, *Luzula pilosa* (L.) Willd., *Maianthemum bifolium* (L.) F.W. Schmidt, *Phegopteris connectilis* (Michx.) Watt, etc.] can also be found here (Khanina et al., 2019).

Pieces of basidiomata were collected from fallen trunks with recording the data on host tree species, decay stage, sampling date. The decay stage classification (1–5) of dead wood follows the criteria of Renvall (1995). The dried material was identified by light microscopy technique using a Carl Zeiss AxioScope A1 microscope, a LOMO Mikmed-6 microscope with a standard set of chemicals (5% KOH, Melzer's reagent, 0.1% Cotton Blue). The studied specimens are kept in the Mycological Herbarium of the Komarov Botanical Institute RAS, Saint Petersburg (LE).

The nomenclature follows mostly Bernicchia and Gorjón (2010) and Ryvarden and Melo (2017) with some exceptions according to modern publications.

RESULTS AND DISCUSSION

In total, 46 species from 38 genera and 12 orders of aphyllophoroid fungi (*Agaricomycetes*, *Basidiomycota*) were identified. All species are revealed for Kaluga Region for the first time.

The species list annotated with data on occupied woody substrates and collection numbers of specimens is presented below. All specimens were collected by the author. Short notes on distribution in Europe, Russia and the Central Russian Upland are provided for some records. Genera and species are arranged alphabetically within each accepted order.

Annotated list of species

AGARICOMYCETES

Agaricales

Clavaria amoenoides Corner, K.S. Thind et Anand. – on soil under detached bark of *Ulmus laevis* (decay stage 2), 02.08.2020, LE F-334669. The second record of the species within the Central Russian Upland after the finding in the forest-steppe zone of Oryol Region (Shiryaev, Volobuev, 2013).

Mucronella calva (Alb. et Schwein.) Fr. – on *Fraxinus excelsior* (decay stage 2), 03.08.2020, LE F-334678; on *Picea abies* (decay stage 3), 03.08.2020, LE F-334679; on *Tilia cordata* (decay stage 4), 03.08.2020, LE F-334680. This remarkable fungus with tiny spike-like basidiomata is often overlooked but has a wide geographical range in European forests (Bernicchia, Gorjón, 2010).

M. flava Corner – on *Picea abies* (decay stage 4), 01.08.2020, LE F-334681. The species is less known than *M. calva*. It is distributed in the European part of Russia mainly in boreal and hemiboreal forests (Bolshakov et al., 2022).

Amylocorticiales

Amylocorticium subincarnatum (Peck) Pouzar – on *Picea abies* (decay stage 2), 02.08.2020, LE F-334660. This fungus prefers large decorticate coniferous trunks. In Europe, it mostly occurs in old forests with plenty of dead wood (Larsson, Ryvarden, 2021).

Atheliales

Amphinema byssoides (Pers.) J. Erikss. – on *Picea abies* (decay stage 3), 01.08.2020, LE F-334657. One of the most widely distributed mycorrhiza-forming species in boreal forests of Europe (Bernicchia, Gorjón, 2010).

Athelia cystidiolophora Parmasto – on *Betula pendula* (decay stage 2), 31.07.2020, LE F-334658, LE F-334663. The first records of the fungus in the Central Russian Upland. According to micromorphology study of scanty type material, the species has been synonymized with *A. decipiens* (Larsson, Ryvarden, 2021). However, we prefer to consider *A. cystidiolophora* as a distinct species due to its characteristic cystidia.

A. decipiens (Höhn. et Litsch.) J. Erikss. – on *Betula pendula* (decay stage 2), 31.07.2020, LE F-334664; on *Picea abies* (decay stage 3), 1.08.2020, LE F-334665; on *Tilia cordata* (decay stage 4), 3.08.2020, LE F-334667. This is a common and widespread species in the European part of Russia (Bolshakov et al., 2022) as well as in all European countries (Bernicchia, Gorjón, 2010).

Auriculariales

Aporpium macroporum Niemelä, Spirin et Miettinen – on *Populus tremula* (decay stage 2), 02.08.2020, LE F-334662. This recently described species (Miettinen et al., 2012) was previously known in the Central Russian Upland only from Oryol Region (Volobuev, 2013).

Boletales

Leucogyrophana sororia (Burt) Ginns – on *Picea abies* (decay stage 4), 03.08.2020, LE F-334676. The first finding of the fungus in the Central Russian Upland. Its closest finds in the European Russia are in two protected forest areas, namely from the Oksky Nature Reserve in Ryazan Region (Volosnova, 2007), and from the Central Forest Reserve in Tver Region (Kotkova, 2014a).

Cantharellales

Botryobasidium conspersum J. Erikss. – on *Tilia cordata* (decay stage 4), 03.08.2020, LE F-334668. The second record of the species within the Central Russian Upland after the finding in the linden-dominated forest in Oryol Region (Volobuev, 2015).

Sistotrema brinkmannii (Bres.) J. Erikss. – on *Acer platanoides* (decay stage 4), 03.08.2020, LE F-334693. One of the most widely distributed representatives of the genus in Russia (Bondartseva, Zmitrovich, 2020).

S. porulosum Hallenb. – on *Ulmus laevis* (decay stage 2), 02.08.2020, LE F-334694. The fourth location of the fungus in the European part of Russia.

This rare species is also known in Middle and Southern Europe based on few records in some countries (Bernicchia, Gorjón, 2010).

Thanatephorus ochraceus (Massee) P. Roberts – on *Acer platanoides* (decay stage 2), 02.08.2020, LE F-334697. The first record of the species in the European part of Russia. Previously, the species was reported from the North-Eastern Caucasus (Volobuev, Ivanushenko, 2020; Ivanushenko, Volobuev, 2022; Ismailov et al., 2023), the Urals (Shiryaev, Stavishenko, 2011), and Siberia (Burt, 1931; Roberts, 1998; Kotkova et al., 2022).

Gomphales

Phaeoclavulina flaccida (Fr.) Giachini – on *Betula pendula* (decay stage 3), 02.08.2020, LE F-334686.

Hymenochaetales

Hyphodontia alutaria (Burt) J. Erikss. – on *Picea abies* (decay stage 2), 03.08.2020, LE F-334672.

H. pallidula (Bres.) J. Erikss. – on *Picea abies* (decay stage 3), 01.08.2020, LE F-334673; on *Quercus robur* (decay stage 3), 03.08.2020, LE F-334674.

Kneiffiella abdita Riebesehl et Langer [≡ *Chaetoporellus latitans* (Bourdot et Galzin) Bondartsev et Singer] – on *Fraxinus excelsior* (decay stage 3), 03.08.2020, LE F-334675. The second record of the species within the Central Russian Upland after the finding in Oryol Region (Volobuev, 2015). This fungus is rare in Europe, where it is known from a few countries (Ryvarden, Melo, 2017).

Lyomyces erastii (Saaren. et Kotir.) Hjortstam et Ryvarden – on *Acer platanoides* (decay stage 2), 02.08.2020, LE F-334677.

Peniophorella clavigera (Bres.) K.H. Larss. – on *Populus tremula* (decay stage 3), 31.07.2020, LE F-334685. The second record of the species in the European part of Russia besides its finding in Arkhangelsk Region (Kotkova, 2014b). This fungus has a scattered distribution in Europe (Bernicchia, Gorjón, 2010).

Resinicium bicolor (Alb. et Schwein.) Parmasto – on *Picea abies* (decay stage 3), 03.08.2020, LE F-334689.

Sidera lenis (P. Karst.) Miettinen – on *Picea abies* (decay stage 4), 01.08.2020, LE F-334692.

Xylodon brevisetus (P. Karst.) Hjortstam et Ryvarden – on *Picea abies* (decay stage 4), 03.08.2020, LE F-334704.

Polyporales

Antrodia minuta Spirin – on *Populus tremula* (decay stage 4), 31.07.2020, LE F-334659.

A. sinuosa (Fr.) P. Karst. – on *Picea abies* (decay stage 4), 01.08.2020, LE F-334661.

Ceriporia viridans (Berk. et Broome) Donk – on *Tilia cordata* (decay stage 5), 03.08.2020, LE F-334654.

Hyphoderma incrustatum K.H. Larss. – on *Populus tremula* (decay stage 4), 31.07.2020, LE F-334655; on *Quercus robur* (decay stage 4), 03.08.2020, LE F-334656. The species has a sporadic distribution in Europe (Bernicchia, Gorjón, 2010); it was rarely registered in the European part of Russia. The nearest location of the species is known from Tula Region (Svetasheva, 2021).

Mycoacia fuscoatra (Fr.) Donk – on *Populus tremula* (decay stage 4), 31.07.2020, LE F-334682; on *Fraxinus excelsior* (decay stage 3), 03.08.2020, LE F-334683.

Osteina undosa (Peck) Zmitr. – on *Picea abies* (decay stage 3), 01.08.2020, LE F-334684.

Phlebia subulata J. Erikss. et Hjortstam – on *Picea abies* (decay stage 3), 01.08.2020, LE F-334687. The first finding of the fungus in the Central Russian Upland. Previously, the species has been known in the European part of Russia from five regions of the boreal forests zone (Bolshakov et al., 2022).

Physisporinus crocatus (Pat.) F. Wu, Jia J. Chen et Y.C. Dai – on *Betula pendula* (decay stage 2), 31.07.2020, LE F-334653.

Postia guttulata (Sacc.) Jülich – on *Picea abies* (decay stage 3), 01.08.2020, LE F-334688.

Rhodonia placenta (Fr.) Niemelä, K.H. Larss. et Schigel – on *Picea abies* (decay stage 3), 01.08.2020, LE F-334690. This fungus is included in the list of indicator species for old-growth Fennoscandian coniferous forests (Kotiranta, Niemelä, 1996). It is rare in Europe (Ryvarden, Melo, 2017) and prefers forests with a minimal anthropogenic impact. The species is red-listed in adjacent territory of Oryol Region (Red Data Book.., 2021).

Riopa metamorphosa (Fuckel) Miettinen et Spirin (fig. 1, a) – on *Quercus robur* (decay stage 2), 31.07.2020, LE F-334651. The second record of the species within the Central Russian Upland besides the finding in oak-dominated forest in Lipetsk Region, and the fifth record for Russia (Volobuev et al., 2021). This rare species was registered only in a few European countries (Ryvarden, Melo, 2017).

Sarcoporia polyspora P. Karst. – on *Picea abies* (decay stage 3), 03.08.2020, LE F-334691.

Skeletocutis kuehneri A. David – on *Picea abies* (decay stage 4), 01.08.2020, LE F-334695. The first finding of the fungus in the Central Russian Upland.

Steccherinum pudorinum (Fr.) Spirin et Popa – on *Tilia cordata* (decay stage 3), 03.08.2020, LE F-334696. The first finding of the fungus in the

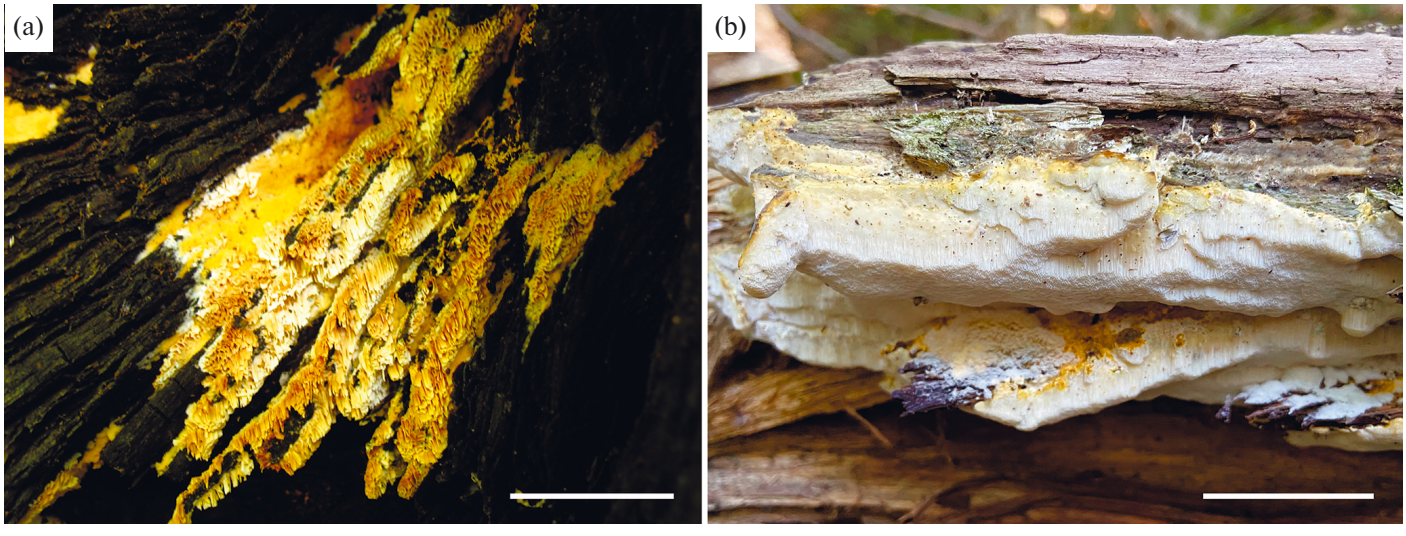

Fig. 1. Basidiomata of *Riopa metamorphosa* (a) and *Yuchengia narymica* (b), scale bar 1 cm.

Central Russian Upland. The present name of this species appeared after taxonomic revision (Popa et al., 2024) and synonymisation with *Steccherinum tenuispinum* Spirin, Zmitr. et Malysheva. This species is supposed to have a wide distribution, but is rare and restricted to old-growth forests.

Yuchengia narymica (Pilát) B.K. Cui, C.L. Zhao et K.T. Steffen (fig. 1, b) – on *Fraxinus excelsior* (decay stage 2), 02.08.2020, LE F-334701. According to Ryvarden and Melo (2017) this is a rare eastern and southern species in Europe. In the Central Russian Upland, it is quite common on deciduous wood (*Acer*, *Betula*, *Populus*, *Quercus*) in Oryol Region (Volobuev, 2013; Volobuev, 2015).

Russulales

Baltazaria galactina (Fr.) Leal-Dutra, Dentinger et G.W. Griff. – on *Populus tremula* (decay stage 5), 31.07.2020, LE F-334666.

Gloeocystidiellum convolvens (P. Karst.) Donk – on *Populus tremula* (decay stage 4), 31.07.2020, LE F-334670.

Heterobasidion parviporum Niemelä et Korhonen – on *Picea abies* (decay stage 3), 03.08.2020, LE F-334671.

Thelephorales

Tomentella lapida (Pers.) Stalpers – on *Populus tremula* (decay stage 5), 31.07.2020, LE F-334698. The first finding of the fungus in the Central Russian Upland.

Trechisporales

Subulicystidium longisporum (Pat.) Parmasto – on *Fraxinus excelsior* (decay stage 2), 31.07.2020, LE F-334649; on *Tilia cordata* (decay stage 3), 31.07.2020, LE F-334650. One of two *Subulicystidium* species registered in the Central Russian Upland (Volobuev, 2016). This is a common species in Europe with a wide host range (Bernicchia, Gorjón, 2010).

Trechispora cohaerens (Schwein.) Jülich et Stalpers – on *Betula pendula* (decay stage 4), 02.08.2020, LE F-334699.

T. confinis (Bourdot et Galzin) Liberta – on *Quercus robur* (decay stage 2), 31.07.2020, LE F-334652.

T. farinacea (Pers.) Liberta – on *Betula pendula* (decay stage 2), 31.07.2020, LE F-334700; on *Populus tremula* (decay stage 3), 31.07.2020, LE F-334702; on *Picea abies* (decay stage 4), 03.08.2020, LE F-334705.

T. hymenocystis (Berk. et Broome) K.H. Larss. – on *Picea abies* (decay stage 3), 03.08.2020, LE F-334703.

Among the 46 species revealed, *Thanatephorus ochraceus* is new to the European part of Russia. Another six species, *Athelia cystidiolophora*, *Leucogyrophana sororia*, *Phlebia subulata*, *Skeletocutis kuehneri*, *Steccherinum pudorinum*, and *Tomentella lapida*, are first registered for the Central Russian Upland. Most of these species also have a scattered distribution in Europe, being known from a few finds in a few countries (Bernicchia, Gorjón, 2010).

All recorded species are saprotrophs. Most of the species were observed on different angiosperm wood, but the maximum number of species new to Kaluga Region was collected on *Picea abies* (21 species). The distribution of fungal species among the other host tree species is as follows: nine species grew on *Populus tremula*, six – on *Betula pendula* and *Tilia cordata*, five – on *Fraxinus excelsior*, four – on *Quercus robur*, three – on *Acer platanoides*, and two species – on *Ulmus laevis*. At the same time, rare and little-collected in Europe species, such as *Aporpium macroporum*, *Kneiffiella abdita*, *Peniophorella clavigera*, *Riopa metamorphosa*, *Sistotrema porulosum*, and *Yuchengia narymica*, were registered on dead wood of deciduous trees. These species possess unique habitat and substrate requirements and should be taken under a consideration for conservation practice purposes.

CONCLUSION

Protected areas, especially nature reserves, are undoubtedly the main tool for conserving biodiversity including fungi. Many habitat types are unique to the various protected areas around the world. Broad-leaved forests, together with their characteristic species of wood-inhabiting fungi, are one of the vulnerable ecosystem types in Eastern Europe. A timely inventory of the species composition of the mycobiota is particularly relevant in this context. As a result of short-term investigations carried out in the Kaluzhskie Zaseki State Nature Reserve's area, the level of species richness of aphyllophoroid fungi in Kaluga Region increased from 183 to 229 species. The specific features of substrate confinement of xylotrophic basidiomycetes were also clarified. At the same time, the need for further mycological investigations, which should be aimed at the study of fine substrate units of dead wood, located in the phytocoenotic environment of an old-growth broad-leaved forest, is beyond doubt.

This study was supported by the Russian Science Foundation, RSF project N22-24-01063; https://rscf.ru/en/project/22-24-01063/.

REFERENCES

Bernicchia A., Gorjón S.P. Corticiaceae s.l. Fungi Europaei. V. 12. Edizioni Candusso, Alassio, 2010.

Bobrovskiy M.V. Kozel forest reserve (ecological and historical review). Izd-vo N. Bochkarevoy, Kaluga, 2002. (In Russ.).

Bobrovskiy M.V., Stamenov M.N. An impact of the year 2006 catastrophic windfall on structure and composition of forest vegetation in "Kaluzhskiye Zaseki" natural reserve. Russian Journal of Forest Science. 2020. N 6. P. 523–536. (In Russ.).

Bolshakov S. Yu., Potapov K.O., Ezhov O.N. et al. New species for regional mycobiotas of Russia. 1. Report 2016. Mikologiya i fitopatologiya. 2016. V. 50 (5). P. 275–286.

Bolshakov S. Yu., Volobuev S.V., Ezhov O.N. et al. Aphyllophoroid fungi of the European part of Russia: a checklist / Eds S. Yu. Bolshakov, S.V. Volobuev. ETU Publishing house, SPb., 2022. (In Russ.).

Bondartseva M.A., Zmitrovich I.V. The genus *Sistotrema* (*Cantharellales*, *Hydnaceae*) in Russia. Mikologiya i fitopatologiya. 2020. V. 54 (1). P. 3–15. (In Russ.). https://doi.org/10.31857/S0026364820010043

Burt E.A. Hymenomycetous fungi of Siberia and Eastern Asia – mostly of wood-destroying species. Annals of the Missouri Botanical Garden. 1931. V. 18 (3). P. 469–487.

Christensen M., Heilmann-Clausen J., Walleyn R. et al. Wood-inhabiting fungi as indicators of nature value in European beech forests. In: *M. Marchetti* (ed.). Monitoring and indicators of

forest biodiversity in Europe – from ideas to operationality, EFI Proceedings, V. 51. European Forest Institute, Joensuu, 2004. P. 229–237.

Halme P., Holec J., Heilmann-Clausen J. The history and future of fungi as biodiversity surrogates in forests. Fungal Ecology. 2017. V. 27 (B). P. 193–201. https://doi.org/10.1016/j.funeco.2016.10.005

Heilmann-Clausen J., Adamčík S., Bässler C. et al. State of the art and future directions for mycological research in old-growth forests. Fungal Ecology. 2017. V. 27 (B). P. 141–144. https://doi.org/10.1016/j.funeco.2016.12.005

Ismailov A.B., Volobuev S.V., Ivanushenko Yu. Yu. Alpha diversity of lichenized and aphyllophoroid fungi in two 1ha forest plots in the Samursky National Park (Republic of Dagestan, Russia). South of Russia: ecology, development. 2023. V. 18 (4). P. 51–63. https://doi.org/10.18470/1992-1098-2023-4-51-63

Ivanushenko Yu. Yu., Volobuev S.V. New and noteworthy records of aphyllophoroid fungi from the Gunib Plateau (Dagestan, Russia). Mikologiya i fitopatologiya. 2022. V. 56 (6). P. 411–418. https://doi.org/10.31857/S0026364822060058

Khanina L.G., Bobrovsky M.V., Zhmaylov I.V. Vegetation diversity on the microsites caused by tree uprooting during a catastrophic windthrow in temperate broadleaved forests. Russian J. Ecosystem Ecology. 2019. Vol. 4 (3). https://doi.org/10.21685/2500-0578-2019-3-1

Kotiranta H., Niemelä T. Uhanalaiset käävät Suomessa Toinen, uudistettu painos. Suomen Ympäristökeskus, Helsinki, 1996.

Kotiranta H., Saarenoksa R., Kytövuori I. Aphyllophoroid fungi of Finland. A check-list with ecology, distribution, and threat categories. Norrlinia. 2009. V. 19. P. 1–223.

Kotkova V.M. Additions to the biota of aphyllophoraceous fungi (*Basidiomycota*) of Central Forest Reserve (Tver Region). II. Tver State University Bulletin. Series: Biology and Ecology. 2014a. N 2. P. 145–156. (In Russ.).

Kotkova V.M. Aphyllophoraceous fungi (*Basidiomycota*) in forest ecosystems of Setra River Basin (Arkhangelsk Region). Novosti sistematiki nizshikh rasteniy. 2014b. V. 48. P. 130–145. (In Russ.). https://doi.org/10.31111/nsnr/2014.48.130

Kotkova V.M., Afonina O.M., Androsova V.I. et al. New cryptogamic records. 10. Novosti sistematiki nizshikh rasteniy. 2022. V. 56(2). P. 477–517. https://doi.org/10.31111/nsnr/2022.56.2.477

Larsson K.H., Ryvarden L. Corticioid fungi of Europe. Vol. 1. Fungiflora, Oslo, 2021.

Miettinen O., Spirin V., Niemelä T. Notes on the genus *Aporpium* (*Auriculariales*, *Basidiomycota*), with a new species from temperate Europe. Annales Botanici Fennici. 2012. V. 49 (5). P. 359–368. https://doi.org/10.5735/085.049.0607

Popa F., Hertenstein A., Blumenstein K. et al. *Steccherinum pudorinum* comb. nov.: Taxonomie und Ökologie einer missdeuteten Art. Zeitschr. Mykol. 2024. V. 90 (1). P. 63–81.

Red Data Book of Oryol Region. Papirus, Oryol, 2021. (In Russ.).

Renvall P. Community structure and dynamics of wood-rotting *Basidiomycetes* on decomposing conifer trunks in Northern Finland. Karstenia. 1995. V. 35. P. 1–51. https://doi.org/10.29203/ka.1995.309

Roberts P. Thanatephorus ochraceus: a saprotrophic and orchid endomycorrhizal species. Sydowia. 1998. V. 50. P. 252–256.

Ryvarden L., Melo I. Poroid fungi of Europe. Second revised edition. Synopsis Fungorum. V. 37. Fungiflora, Oslo, 2017.

*Safronova I.N., Yurkovskaya T.*K. Characterization of vegetation on the plains of European Russia. In: *Greller A., Fujiwara K., Pedrotti F*. (eds.). Geographical changes in vegetation and plant functional types. Geobotany Studies (basics, methods and case studies). Springer, Cham, 2018. P. 141–167. https://doi.org/10.1007/978-3-319-68738-4_7

Shiryaev A.G., Stavishenko I.V. New and rare for Sverdlovsk region species of basidiomycetes. Mikologiya i fitopatologiya. 2011. V. 45 (4). P. 345–349 (in Russ.).

Shiryaev A.G., Volobuev S.V. The clavarioid fungi of the forest-steppe zone in Orel Region. Mikologiya i fitopatologiya 2013. V. 47 (3). P. 185–190 (in Russ.).

Smirnova O.V., Bobrovsky M.V., Khanina L.G. et al. Nemoral forests. In: *Smirnova O., Bobrovsky M., Khanina L*. (eds). European Russian forests. Plant and vegetation. V. 15. Springer, Dordrecht, 2017. P. 333–476. https://doi.org/10.1007/978-94-024-1172-0_5

Stokland J.N., Siitonen J., Jonsson B.G. Biodiversity in dead wood. Cambridge University Press, N.Y., 2012.

Svetasheva T. Yu. Macromycetes of the State Museum-Reserve "Kulikovo Field" vicinities. Diversity of plant world. 2021. N 4 (11). P. 61–79 (in Russ.). https://doi.org/10.22281/2686-9713-2021-4-61-79

Volobuev S. Subulicystidium perlongisporum (*Trechisporales*, *Basidiomycota*) new to Russia, with notes on a molecular study of the species. Nova Hedwigia. 2016. V. 102(3–4). P. 531–537. https://doi.org/10.1127/nova_hedwigia/2016/0329

Volobuev S.V. Aphyllophoraceous fungi of forest ecosystems in the south-east of the Orel Region. Mikologiya i fitopatologiya. 2013. V. 47(4). P. 209–217. (In Russ.).

Volobuev S.V. Aphyllophoroid fungi of Oryol Region: taxonomical composition, distribution, ecology. Lan, Saint Petersburg, 2015. (In Russ.).

Volobuev S.V. Polypore fungi species (*Agaricomycetes*, *Basidiomycota*), new to the Kaluga Region, Russia. Diversity of plant world. 2022. N 4 (15). P. 52–58. https://doi.org/10.22281/2686-9713-2022-4-52-58

Volobuev S.V., Bolshakov S. Yu. Aphyllophoroid fungi of the Middle Russian Upland. I. The history of study and some new data. Mikologiya i fitopatologiya. 2016. V. 50 (5). P. 335–346. (In Russ.).

Volobuev S.V., Bolshakov S. Yu., Khimich Yu.R. et al. New species for regional mycobiotas of Russia. 6. Report 2021. Mikologiya i fitopatologiya. 2021. V. 55 (6). P. 411–422. https://doi.org/10.31857/S0026364821060131

Volobuev S.V., Ivanushenko Yu. Yu. Aphyllophoroid fungi (*Basidiomycota*) on juniper on the Gunib Plateau, inner-mountain Dagestan. Czech Mycology. 2020. V. 72 (1). P. 83–93.

https://doi.org/10.33585/cmy.72106

Volosnova L.F. Aphyllophoraceous fungi of Oksky Nature Reserve. Novosti sistematiki nizshikh rasteniy. 2007. V. 41. P. 101–115. (In Russ.). https://doi.org/10.31111/nsnr/2007.41.101

Бобровский М.В. (Bobrovskiy) Козельские засеки (эколого-исторический очерк). Калуга: Изд-во Н. Бочкаревой, 2002. 92 с.

Бобровский М.В., Стаменов М.Н. (Bobrovskiy, Stamenov) Влияние катастрофического ветровала 2006 года на структуру и состав лесной растительности заповедника "Калужские засеки" // Лесоведение. 2020. № 6. С. 523–536. https://doi.org/10.31857/S0024114820050022

Большаков С.Ю., Волобуев С.В., Ежов О.Н. и др. (Bolshakov et al.) Афиллофороидные грибы европейской части России: аннотированный список видов / отв. ред. С.Ю. Большаков, С.В. Волобуев. СПб.: Изд-во СПбГЭТУ "ЛЭТИ", 2022. 578 с.

Бондарцева М.А., Змитрович И.В. (Bondartseva, Zmitrovich) Род Sistotrema (Cantharellales, Hydnaceae) в России // Микология и фитопатология. 2020. Т. 54. № 1. С. 3–15.

Волобуев С.В. (Volobuev) Афиллофоровые грибы лесных экосистем юго-востока Орловской области // Микология и фитопатология. 2013. Т. 47. № 4. С. 209–217.

Волобуев С.В. (Volobuev) Афиллофороидные грибы Орловской области: таксономический состав, распространение, экология. СПб.: Издательство "Лань", 2015. 304 с.

Волобуев С.В., Большаков С.Ю. (Volobuev, Bolshakov) Афиллофороидные грибы Среднерусской возвышенности. 1. История изучения и некоторые новые данные // Микология и фитопатология. 2016. Т. 50. № 6. С. 335–346.

Волоснова Л.Ф. (Volosnova) Афиллофоровые грибы Окского заповедника // Новости систематики низших растений. 2007. Т. 41. С. 101–115. https://doi.org/10.31111/nsnr/2007.41.101

Коткова В.М. (Kotkova) Афиллофоровые грибы (Basidiomycota) в лесных экосистемах бассейна реки Сетра (Архангельская область). Новости систематики низших растений. 2014. Т. 48. С. 130–145. https://doi.org/10.31111/nsnr/2014.48.130

Коткова В.М. (Kotkova) Дополнения к биоте афиллофоровых грибов (Basidiomycota) Центрально-Лесного заповедника (Тверская область). II // Вестник Тверского государственного университета. Серия: Биология и экология. 2014. № 2. С. 145–156.

Красная книга Орловской области. Грибы, растения, животные (Red Data Book). Орел: Папирус, 2021. 440 с.

Светашева Т.Ю. (Svetasheva) Макромицеты окрестностей государственного музея-заповедника "Куликово поле" // Разнообразие растительного мира. 2021. № 4 (11). С. 61–79. https://doi.org/10.22281/2686-9713-2021-4-61-79

Ширяев А.Г., Волобуев С.В. (Shiryaev, Volobuev) Клавариоидные грибы лесостепной зоны Орловской области // Микология и фитопатология. 2013. Т. 47. № 3. С. 185–190.

Ширяев А.Г., Ставишенко И.В. (Shiryaev, Stavishenko) Новые и редкие для Свердловской области виды базидиальных грибов // Микология и фитопатология. 2011. Т. 45. № 4. С. 345–349.

Новые находки афиллофороидных грибов на территории государственного природного заповедника "Калужские засеки" (Калужская область, Россия)

С. В. Волобуев[a,#]

[a] *Ботанический институт им. В.Л. Комарова РАН, Санкт-Петербург, Россия*
[#] *e-mail: sergvolobuev@binran.ru*

Представлены новые данные о видовом богатстве и экологии ксилобионтных афиллофороидных грибов (*Agaricomycetes*, *Basidiomycota*), обитающих в старовозрастных широколиственных лесах на территории государственного природного заповедника "Калужские засеки" (Среднерусская возвышенность, европейская часть России). Приводится аннотированный список из 46 новых для Калужской области видов грибов с информацией о занимаемых древесных субстратах, коллекционных номерах гербарных образцов и краткими примечаниями по распространению. Среди них *Thanatephorus ochraceus* – новый для европейской части России вид, а также *Athelia cystidiolophora*, *Leucogyrophana sororia*, *Phlebia subulata*, *Skeletocutis kuehneri*, *Steccherinum pudorinum* и *Tomentella lapida* впервые зарегистрированы для Среднерусской возвышенности. Выявлены новые местонахождения редких и малоизвестных в Европе видов, таких как *Aporpium macroporum*, *Hyphoderma incrustatum*, *Kneiffiella abdita*, *Peniophorella clavigera*, *Riopa metamorphosa*, *Sistotrema porulosum* и *Yuchengia narymica*.

Ключевые слова: биогеография, видовое разнообразие, Восточная Европа, кортициоидные грибы, лиственные леса, редкие виды, трутовики