
СООБЩЕНИЯ

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POLYPORE FUNGI SPECIES (*AGARICOMYCETES*, *BASIDIOMYCOTA*), NEW TO THE KALUGA REGION, RUSSIA

© S. V. Volobuev
С. В. Волобуев

Новые для Калужской области виды трутовых грибов (*Agaricomycetes*, *Basidiomycota*)

ФГБУН Ботанический институт им. В. Л. Комарова РАН
197376, Россия, г. Санкт-Петербург, ул. Проф. Попова, д. 2. Тел.: +7 (812) 372-54-69, e-mail: sergvolobuev@binran.ru
ФГБУН Институт математических проблем биологии РАН
– филиал Института прикладной математики им. М. В. Келдыша РАН
142290, Россия, г. Пуцино, ул. Проф. Виткевича, д. 1. Тел.: +7 (4967) 31-85-04, e-mail: sergvolobuev@binran.ru

Abstract. Eight species of aphyllorphoroid fungi with poroid hymenophore were revealed for the first time for the Kaluga Region (European part of Russia) as a result of a mycological survey of forest ecosystems carried out by the author in August 2022 in the southern area of the Kaluzhskie Zaseki State Nature Reserve. The species *Poriella subacida* is listed for the first time in the Central Russian Upland. Detailed information on recorded wood substrates and habitats, geographical coordinates of findings, and numbers of herbarium specimens deposited in the Mycological Herbarium of the Komarov Botanical Institute of the RAS (LE) are given for each species. The features of ecology and distribution of new to the Kaluga Region fungal species in the adjacent regions and in Russia as a whole are briefly discussed.

Keywords: aphyllorphoroid fungi, basidial macromycetes, biodiversity, Central Russian Upland, fungal distribution, Kaluzhskie Zaseki State Nature Reserve, new findings.

Аннотация. Впервые для Калужской области выявлены восемь видов афиллофороидных грибов с пороидным гименофором в результате микологического обследования лесных экосистем, проведенного автором в августе 2022 г. на территории южного участка заповедника «Калужские засеки». Вид *Poriella subacida* указывается впервые для территории Среднерусской возвышенности. Для каждого вида приводятся подробные сведения об отмеченных древесных субстратах и местообитаниях, географические координаты находок, а также номера гербарных образцов, депонированных в Микологический гербарий Ботанического института им. В. Л. Комарова РАН (LE). Кратко обсуждаются особенности экологии и распространение новых для Калужской области видов трутовых грибов на территории сопредельных регионов и в целом в России.

Ключевые слова: афиллофороидные грибы, базидиальные макромицеты, биоразнообразие, заповедник «Калужские засеки», новые находки, распространение грибов, Среднерусская возвышенность.

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Introduction

Polypore fungi are an obligate component of forest ecosystems and, growing on various woody substrates, mostly belong to the group of xylotrophic saprotrophs. This morphological group of aphyllorphoroid fungi (*Agaricomycetes*, *Basidiomycota*) is distinguished on the basis of the peculiarities of basidioma structure, namely the presence of poroid or derived from its hymenophore (Bondartseva, 1998). Together with other wood-destroying fungi, polypore fungi are drivers of forest diversity, forming ecological niches for a variety of other organisms (arthropods, birds, etc.) (Niemelä, 2001; Runnel et al., 2021).

Different regions of Russia are very unevenly covered by studies on the species diversity of lignicolous fungi. In particular, the Kaluga Region belongs to the territories for which less than

200 species of aphyllorphoroid fungi are known to date. The history of the study on this group of basidial fungi in the region, as well as data on some new findings, has been summarized in the review (Volobuev, Bolshakov, 2016). However, the latter publication does not include the findings of *Clavaria falcata* Pers., *Thelephora anthocephala* (Bull.) Fr., *Tomentella ferruginea* (Pers.) Pat., *Woldmaria filicina* (Peck) Knudsen, *Xylodon flaviporus* (Berk. & M. A. Curtis ex Cooke) Riebesehl & Langer that were reported in the first article of the series «New species for regional mycobiotas of Russia» (Bolshakov et al., 2016). The aim of this study is to reveal new to the Kaluga Region species of aphyllorphoroid fungi and to describe the characteristics of their ecology and distribution.

Materials and Methods

Basidiomata of polypore fungi were collected by the author in August 2022 during a mycological survey of forest ecosystems in the southern area of the Kaluzhskie Zaseki State Nature Reserve.

The reserve, established in 1992, is situated in the south-east of the Kaluga Region in the area bordering Oryol and Tula Regions. Unique woodlands of multi-species broadleaved forests dominated by *Quercus robur*, over 300 years old in some areas, have been preserved within the territory of the reserve. The maximum age of other broadleaved trees (*Acer platanoides*, *A. campestre*, *Fraxinus excelsior*, *Tilia cordata*, *Ulmus glabra*) is around 150–170 years old. Besides different variants of broadleaved forests, aspen forests, birch forests, pine forests, spruce forests, black alder forests are present on the territory of the reserve; a very small area is occupied by meadows (Bobrovskii, Khanina, 2000; Bobrovskiy, Stamenov, 2020).

Identification of collected and dried specimens of fungal fruiting bodies was carried out by light microscopy technique, using a standard set of chemicals (5% KOH, Melzer's reagent, 0,1% Cotton Blue) and current literature (Bernicchia, Gorjón, 2020). Subsequently, the specimens were deposited in the Mycological Herbarium of the Komarov Botanical Institute of the RAS, St. Petersburg (LE).

The nomenclature and the authors' names of the fungal taxa are given according to the Index Fungorum database (2022). Names of vascular plants follow P. F. Maevskii (2014).

Results and discussion

A total of eight species of aphyllorphoroid fungi with poroid hymenophore were discovered as new to the Kaluga Region. Among them, one species (*Poriella subacida* (Peck) C. L. Zhao) is reported for the first time for the Central Russian Upland, while the remaining seven species have been previously recorded in adjacent regions. The species revealed belongs to the orders *Hymenochaetales* (four species) and *Polyporales* (four species). An annotated list of species is presented below with detailed information on substrata and habitats, geographical coordinates, descriptions of localities, date of collection, as well as herbarium numbers of specimens.

Order Hymenochaetales

Onnia tomentosa (Fr.) P. Karst. – on roots of living *Picea abies* in herbaceous oak forest with spruce and maple, 53.54627 °N, 35.657833 °E, 15.08.2022, Kaluzhskie Zaseki State Nature Reserve, southern area, vicinity of Yagodnoye village (LE F-334845); on roots of living *Picea abies* in herbaceous aspen forest with spruce, 53.54904 °N, 35.659075 °E, 17.08.2022, *ibid.* (LE F-334848, fig., A). This is terrestrial species with annual stipitate basidiomata, often developing in groups, on roots of living coniferous trees or on buried in soil wood. *O. tomentosa* is distributed in the boreal zone of European Russia, the Urals, Siberia, and the Russian Far East (Bondartseva, Parmasto, 1986). In the neighbouring regions, the species has been registered for the Bryansk Region (Bondartseva, 1962), Moscow Region (Bondartsev, 1953), Oryol Region (Volobuev, 2012; Volobuev, 2015), and Smolensk Region (Bondartsev, 1953).

Phellinidium ferrugineofusum (P. Karst.) Fiasson & Niemelä – on a fallen trunk of *Picea abies* in herbaceous aspen forest with spruce, 53.54904 °N, 35.659075 °E, 17.08.2022, Kaluzhskie

Zaseki State Nature Reserve, southern area, vicinity of Yagodnoye village (LE F-334847, fig., B). The species prefers to grow on large dead still covered with a bark lying trunks of coniferous trees, especially on *Picea*, *Pinus*, and *Abies*, in forests with a minimal anthropogenic impact. In Russia, *P. ferrugineofusum* is known in boreal forests of the European part, the Urals, and Siberia (Bondartseva, Parmasto, 1986). In the adjacent regions, the species was recorded for the Bryansk Region (Bondartseva, Parmasto, 1986), Moscow Region (Ordynets, Volobuev, 2014), and Oryol Region (Kotkova et al., 2011, Volobuev, 2015). Moreover, *P. ferrugineofusum* is included to the second edition of the Red Data Book of Oryol Region (Krasnaia..., 2021) with the threat category – 3. Rare species (Volobuev et al., 2021).

Phellinopsis conchata (Pers.) Y. C. Dai – on dry standing tree of *Salix caprea* in pine forest with birch and hazel, 53.565813 °N, 35.647344 °E, 19.08.2022, Kaluzhskie Zaseki State Nature Reserve, southern area, vicinity of Yagodnoye village (LE F-334844, fig., C). This is one of the most widespread species of poroid fungi which is revealed for numerous regions from the European part of Russia and the Northern Caucasus to the Russian Far East (Bondartseva, Parmasto, 1986). The preferred substrate for this fungus with effused-reflexed basidiomata developing on both living and dead trees is the wood of *Salix* spp., particularly *Salix caprea*. At the same time, *P. conchata* was recorded from varied deciduous trees and shrubs that was a base for description by A. S. Bondartsev (1955) of a number of forms possessing also small morphological differences in pilei shape and sizes of spores and setae. The species is registered for the Bryansk Region (Bondartsev, 1953; Bondartseva, 1962), Moscow and Moscow Region (Bondartsev, 1953), Oryol Region (Kotkova et al., 2011; Volobuev, 2015), Smolensk Region (Bondartsev, 1955), and Tula Region (Bondartsev, 1955).

Phellinus alni (Bondartsev) Parmasto — on a standing trunk of living *Acer platanoides* in herbaceous oak forest with spruce and maple, 53.547361 °N, 35.657611 °E, 15.08.2022, Kaluzhskie Zaseki State Nature Reserve, southern area, vicinity of Yagodnoye village (LE F-334846, fig., D). The species belongs to the *Phellinus igniarius* group and has a wide distribution in the Northern Hemisphere, in alder growing areas (Bondartseva, Parmasto, 1986). The delimitation of fungal species belonging to this group using ITS (internal transcribed spacer of ribosomal DNA) and *tefla* (translation elongation factor 1 alpha) DNA sequence analyses has been performed based on specimens from central and northern Europe (Tomšovský et al., 2010). As found to be *Ph. alni* has the largest spectrum of hosts and is able to colonize more than 15 genera of woody plants from nine various families (*Aceraceae*, *Carpinaceae*, *Corylaceae*, *Fagaceae*, *Juglandaceae*, *Oleaceae*, *Rosaceae*, *Sapindaceae*, and *Ulmaceae*), but it has not been recorded on *Salicaceae*. In the territories adjacent to the Kaluga Region, the species has been collected from *Alnus glutinosa* in the Bryansk Region (Bondartsev, 1912, as *Fomes igniarius* (Fr.) Quel. f. *alni* Bond.) and from *Malus domestica* in the Oryol Region (Volobuev et al., 2020).

Order Polyporales

Amaropostia stiptica (Pers.) B. K. Cui, L. L. Shen & Y. C. Dai (≡*Postia stiptica* (Pers.) Jülich) – on a fallen trunk of *Pinus sylvestris* in pine forest with birch and hazel, 53.565813 °N, 35.647344 °E, 19.08.2022, Kaluzhskie Zaseki State Nature Reserve, southern area, vicinity of Yagodnoye village (LE F-334843). This is a widespread species in coniferous forest ecosystems, which grows on various conifers, and rarely on deciduous wood. In Russia, *A. stiptica* is known for the European part, the Urals, Siberia, and the Russian Far East (Bondartseva, 1998). The species has been recorded in the Bryansk Region (Volobuev, Bolshakov, 2016), Moscow Region (Barsukova, Mamedova, 2001), and Oryol Region (Kotkova et al., 2011).

Cyanosporus subcaesius (A. David) B. K. Cui, L. L. Shen & Y. C. Dai (≡*Postia subcaesia* (A. David) Jülich) – on a fallen trunk of *Acer platanoides* in polydominant broadleaved forest (*Acer*, *Quercus*, *Ulmus*), 53.623331 °N, 35.867091 °E, 18.08.2022, Kaluzhskie Zaseki State Nature Reserve, southern area, vicinity of Trud abandoned village (LE F-334851). This species with finely pubescent to hairy on the upper surface annual pileate basidiomata usually grows on dead

wood of numerous deciduous trees, but it is also collected from coniferous hosts (Bernicchia, Gorjón, 2020). *C. subcaesius* is recorded for the European part, Siberia (Bondartseva, 1998), and the Russian Far East (Kochunova, Erofeeva, 2017). The closest confirmed occurrence of the species to the Kaluga Region is registered in the Oryol Region (Volobuev, 2011; Volobuev, 2015).



Fig. Basidiomata of fungal species from *Hymenochaetaceae* family recorded for the first time for the Kaluga Region: A – *Onnia tomentosa* (LE F-334848), B – *Phellinidium ferrugineofuscum* (LE F-334847), C – *Phellinopsis conchata* (LE F-334844), D – *Phellinus alni* (LE F-334846). Photo: S. V. Volobuev.

Рис. Плодовые тела видов грибов из семейства *Hymenochaetaceae*, зарегистрированных впервые для Калужской области: А – *Onnia tomentosa* (LE F-334848), В – *Phellinidium ferrugineofuscum* (LE F-334847), С – *Phellinopsis conchata* (LE F-334844), D – *Phellinus alni* (LE F-334846). Фото: С. В. Волобуев.

Hapalopilus rutilans (Pers.) Murrill – on a fallen stem of *Corylus avellana* in polydominant broadleaved forest (*Acer*, *Quercus*, *Ulmus*), 53.623362 °N, 35.867843 °E, 18.08.2022, Kaluzhskie Zaseki State Nature Reserve, southern area, vicinity of Trud abandoned village (LE F-334850). This is widespread and quite common in both boreal and nemoral forests species which mostly grows on dead branches and dry standing stems of deciduous trees and shrubs. *H. rutilans* has

a characteristic clay-coloured to cinnamon brown basidiomata turning off purplish violet with KOH. The species is known for the European part, the Urals, Siberia, and the Russian Far East (Bondartseva, 1998). In the neighbouring regions, the species was listed for the Bryansk Region (Bondartsev, 1953), Moscow Region (Bondartsev, 1953; Barsukova, Mamedova, 2001), Oryol Region (Bondartsev, 1953; Volobuev, 2015), Smolensk Region (Bondartsev, 1953), and Tula Region (Svetasheva, 2021).

Poriella subacida (Peck) C.L. Zhao (≡*Perenniporia subacida* (Peck) Donk) – on a fallen trunk of *Acer platanoides* in herbaceous aspen forest with spruce and maple, 53.548667 °N, 35.658953 °E, 17.08.2022, Kaluzhskie Zaseki State Nature Reserve, southern area, vicinity of Yagodnoye village (LE F-334849). The species is revealed for the first time for the Central Russian Upland. Nevertheless, this fungus is well known in boreal forests of Russia for the European part, the Urals, Siberia, and the Russian Far East (Bondartseva, 1998), being usually growing on coniferous trees, and rarely on deciduous wood. It causes a so-called white fibrous rot due to cream or bright yellow mycelium stuffed inside rotten wood (Bernicchia, Gorjón, 2020). According to recent phylogenetic studies (Chen et al., 2021) it was demonstrated that this taxon formed a strong-supported clade distinct from *Perenniporia medulla-panis* (Jacq.) Donk, type species of the genus *Perenniporia* Murrill, based on the combined ITS+28S+mtSSU+tefl sequences dataset, and it belongs to a distinct, new genus *Poriella*.

Conclusion

Polypore fungi species observed in the Kaluzhskie Zaseki State Nature Reserve have increased our knowledge on the species richness of aphyllorphoroid fungi in the Kaluga Region and the Central Russian Upland as a whole. Most of the new findings for the region are fungal species rather common and widely distributed in forest ecosystems. At the same time, the occurrence of species such as *Phellinidium ferrugineofuscum* and *Poriella subacida* confined to boreal forests with the presence of coarse coniferous dead wood indicates the significant nature conservation value of the reserve in the systems of protected areas of the Kaluga Region and the European part of Russia.

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Сведения об авторах

Волобуев Сергей Викторович
к. б. н., с. н. с. лаборатории систематики и географии грибов
ФГБУН Ботанический институт им. В. Л. Комарова РАН, Санкт-Петербург
E-mail: sergvobolobuev@binran.ru

Volobuev Sergey Viktorovich
Ph. D. in Biological Sciences, Senior Researcher
of the Lab. of Systematics and Geography of Fungi
Komarov Botanical Institute of the RAS, St. Petersburg
E-mail: sergvobolobuev@binran.ru