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NEW RECORDS OF AGARICOID FUNGI FROM SVERDLOVSK REGION, RUSSIA

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Abstract

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Ten species of agaricoid fungi were reported for the first time from Sverdlovsk Region (*Crepidotus crocophyllus*, *Mycena picta*, *Pleurotus eryngii*, *Pluteus fenzlii*, *Psathyrella ammophila*, *Russula aurea*, *Volvariella bombycina*, *V. caesiotincta*, *V. murinella*, *V. pusilla*). Of these, five species are new to the Urals (*Crepidotus crocophyllus*, *Mycena picta*, *Volvariella caesiotincta*, *V. murinella*, *V. pusilla*) and one is new to the West Siberian Plain (*Pleurotus eryngii*). New record of *Volvariella caesiotincta* extends its distribution area eastward to the Urals. The species distribution in Russia as well as in the Urals was discussed.

Keywords: agaricoid fungi, distribution, diversity, Urals, West Siberian Plain.

INTRODUCTION

This paper presents new data on the diversity and distribution of agaricoid fungi in Sverdlovsk Region (Russia), which is situated at the border between Europe and Asia and covers an area with mountainous and flat landforms and various vegetation types, including mountain tundra, boreal and hemiboreal forests and forest-steppe. The diverse ecological conditions lead to high biodiversity. Accordingly, it has attracted the interest of numerous naturalists. The agaricoid fungi diversity has been studied here for over 150 years. Among the earliest researchers was Sorokin (1877), who cited 54 species of agaricoid fungi. Extensive studies on the diversity of agaricoid fungi in the region have been carried out since the second half of the 20th century. For example, 279 species have been mentioned for this territory in the paper devoted to fungi of the Ural Mountains (Stepanova & Sirko, 1977). Several checklists of agaricoid fungi have been published for the protected areas located in Sverdlovsk Region (Tomilin, 1965; Mezentseva, 1985; Marina, 2006). The largest number of species have been recorded in the Visim Nature Reserve. A total of 635 species have been reported for the Reserve (Marina, 2006). Wood-inhabiting agaricoid fungi have been specified in special works (Demidova, 1963; Mukhin, 1993; Stavishenko & Zmitrovich, 2017). The full list of works published in the last quarter of the 19th century (Sorokin, 1877 since the first paper), and the research history of agaricoid fungi in the region has been reviewed by the author previously (Shiryaeva, 2015). According to literature data, there are 789 species of agaricoid fungi in the region (Shiryaeva, 2015; Stavishenko & Zmitrovich, 2017; Shiryaeva & Malysheva, 2018). Currently, southern boreal mountain forests are the most intensively studied area. It is there that the greatest numbers of species of agaricoid fungi (732) have been found (Shiryaeva, 2015; Stavishenko & Zmitrovich, 2017; Shiryaeva & Malysheva, 2018). Nevertheless, the author's own mycological research in southern boreal mountain forests has made it possible to contribute knowledge about the diversity

of agaricoid fungi in the region. In addition, in the course of the ongoing revision of the fungi collections of the Museum of the Institute of Plant and Animal Ecology (SVER), the species that had not been previously published from Sverdlovsk Region were found. Thus, the aim of this study was to present new records of the most noteworthy agaricoid fungi from Sverdlovsk Region.

MATERIALS AND METHODS

Study area

Sverdlovsk Region covers the area of 194,800 km^2. It lies between 56°03' N and 61°57' N, and 57°14' E and 66°11' E, and occupies the middle part of the Ural Mountains and part of the West Siberian Plain (Fig. 1). The terrain includes taiga and forest-steppe vegetation zones (Fig. 2). Within the taiga, subzones are distinguished as follows: northern, middle, southern boreal forests, and hemiboreal forests. In the northern high mountains, there are three high-altitude belts: mountain forest, mountain forest-tundra and mountain-tundra. In the central and southern low-mountain area, there is only the mountain forest (Gorchakovsky, 1965; Chibilyov & Chibilyov, 2012; Kulikov et al., 2013).

Fig. 1. Location of Sverdlovsk Region in Russia. Red line indicates the border of Sverdlovsk Region

The boreal forests prevail in the area. On the western slopes and foothills of the Urals, the dominant vegetation is coniferous forests formed by *Picea obovata* Ledeb. with an admixture of *Abies sibirica* Ledeb., gradually changing to hemiboreal mixed forests with *Picea obovata*, *Quercus robur* L., *Acer platanoides* L., *Ulmus glabra* Huds., *Ulmus laevis* Pall., *Tilia cordata* Mill. in the south. Forests of *Pinus sylvestris* L. with an admixture of *Larix sibirica* Ledeb. predominate on the eastern slopes and foothills of the Urals and on the lowlands of the West Siberian Plain, they are replaced in the south by hemiboreal forests with *Pinus sylvestris* and *Betula pendula* Roth. Thus, two main transitions in forest vegetation from west to east can be distinguished. Spruce-dominated forests are replaced by pine forests, and hemiboreal forests with spruce and temperate broadleaved trees are replaced by hemiboreal pine and birch forests (Gorchakovsky, 1965). Forest-steppe vegetation is represented only as narrow bands in southernmost parts of the lowlands and western foothills of the Urals. It is formed by fragments of forests with *Betula pendula*, *Populus tremula* L., *Pinus sylvestris*, and steppes. In the south-western foothills, the fragments of oak forests can be found (Kulikov et al., 2013; Nikonova et al., 2017). Thus, several major biogeographical boundaries cross the area, such as ecotone between the forest biomes and temperate grasslands, the north-eastern border of European temperate deciduous broadleaved trees (*Quercus robur*, *Acer platanoides*, *Ulmus glabra*, *Ulmus laevis*) and vegetation types in which these trees are co-dominants (Gorchakovsky, 1968, 1969).

Data sampling

The material was based in part on the collections made by the author during the fieldwork in 2012–2016. In addition, the specimens deposited at the SVER were studied. The referred species were collected in different localities, which were listed in the specimen information and mapped in Fig. 2.

All specimens were examined using light microscope Leica DM 2000. The macroscopic description was based on the study of the fresh material. The microscopic features were described from the examined material mounted in 5% KOH, Melzer's reagent and 1% Congo Red in concentrated NH_4OH. Measurements were based on observing 20 basidiospores, 10 cystidia per collection. The quotient of length and width of the spores was reported as Q, and the arithmetic mean of the quotients was reported as Qav. Vouchers are deposited at the SVER. The nomenclature of fungi follows Knudsen & Vesterholt (2012), Corriol & Moreau (2007), Ripková et al. (2005) and Zervakis et al. (2014).

An annotation record includes the data on spe-

cies location in vegetation zone (after Kulikov et al., 2013), and physiographic subdivision (the borders of the Urals Physiographic Country after Chibilyov & Chibilyov, 2012). If the species was found in anthropogenic habitat, the vegetation zone abbreviation (see below) was written in brackets. The species distribution in Russia was briefly discussed. Also, administrative regions were noted in which the referred species were red-listed. Data on the distribution of species in the Urals and the adjacent areas of the plains were based on the publications pertaining the agaricoid fungi diversity in the areas located within nine administrative regions of Russia (Nenets Autonomous District, the Republic of Komi, Yamalo-Nenets Autonomous District, Khanty-Mansi Autonomous District, Perm Territory, Sverdlovsk Region, Chelyabinsk Region, the Republic of Bashkortostan and Orenburg Region) and two administrative regions of Kazakhstan (Aktobe Region and Kostanay Region) (corresponding references were cited in the species information).

Fig. 2. Localities of collections. 1 – Krasnoufimsk District, "Nizhneirginskaya dubrava" Reserve; 2 – Krasnoufimsk District, vicinity of Sargaya settlement; 3 – Arti District; 4 – Nizhnie Sergi District, "Olen'i ruch'i" National Park; 5 – Pervouralsk District, vicinity of Bilimbay settlement; 6 – Ekaterinburg District, vicinity of Chusovskoye and Glukhoye lakes; 7 – Ekaterinburg; 8 – Sysert District, vicinity of Bol'shoye Sedel'nikovo settlement; 9 – Talitsa District, "Pripyshminskie bory" National Park, vicinity of Talitsa settlement; 10 – Talitsa District, vicinity of Butka settlement. Circles indicate collection localities visited by the author of the paper, squares – by the other collectors. Red line indicates the boundary between the Urals Physiographic Country and the West Siberian Plain. Vegetation zones is abbreviated as NT – the taiga zone, the subzone of the northern boreal forests; MT – the subzone of the middle boreal forests; ST – the taiga zone, the subzone of the southern boreal forests; HB1 – the taiga zone, the subzone of hemiboreal broadleaf-conifer forests; HB2 – the taiga zone, the subzone of hemiboreal pine and birch forests; FS – forest-steppe zone

The name of collector was mentioned in the specimen information, if it wasn't the author of the paper.

List of abbreviations: U – the Urals Physiographic Country; WS – the West Siberian Plain; ST – taiga zone, the subzone of southern boreal forests; HB1 – taiga zone, the subzone of hemiboreal broadleaf-conifer forests; HB2 – taiga zone, the subzone of hemiboreal pine and birch forests; FS – forest-steppe zone; the Botanical Garden – the Botanical Garden of the Ural Branch of the Russian Academy of Sciences.

LIST OF SPECIES

Crepidotus crocophyllus (Berk.) Sacc. – U:HB1, (ST)

Typical characters of the species are: yellowish pileus covered with rusty-pigmented fibrils or squamules, yellow or yellowish-orange gills, a non-gelatinized pileipellis and globose to subglobose, verruculose basidiospores 5–7 μm (Ripková et al., 2005).

Distribution in Russia. In Russia, there are several records in the European part, the Caucasus, West and East Siberia, the Altai-Sayan Mountain Land and the Far East from the southern boreal forests to the forest-steppe zone, where it is locally common (Kalamees & Botashev, 2000; Perova & Gorbunova, 2001; Svetasheva, 2004; Popov et al., 2007; Malysheva & Malysheva, 2008; Perevedentseva, 2008; Bulakh et al., 2010; Koropachinskiy & Banaev, 2014; Kudashova et al., 2016). Additionally, in the West Siberian Plain, *C. crocophyllus* extends to the middle boreal forests by riparian forests (Mukhin, 1993; Zvyagina et al., 2007).

Distribution in the Urals and the adjacent areas of the plains. *C. crocophyllus* is new to the

Urals. The nearest known locality is situated in Perm Territory, where it occurs in the subzone of the southern boreal forests within the adjacent areas of the East European Plain (Perevedentseva, 2008).

Specimens examined: Nizhnie Sergi District, "Olen'i ruch'i" National Park, 56°30' N, 59°17′ E, on wood of *Tilia* sp., 3 September 1998, leg. E. Zhivtsova, SVER 910069; Ekaterinburg city, 56°47' N, 60°36′ E, the Botanical Garden, stand of planted trees (*Padus* spp.), on branches, 1 August 2012, SVER 745591.

Mycena picta (Fr.) Harmaja – U:ST (Fig. 3)

The species is easily distinguished in the field by its cylindrical cap with margin flaring slightly, and gills broader than long (Knudsen & Vesterholt, 2012).

Distribution in Russia. There are several records in European part, West Siberia, and the Far East (Bulakh, 2007; Filippova et al., 2015; Vetkin et al., 2015). In European Russia, it is found only in Moscow, Leningrad Region and Novgorod Region located in the southern part of the forest vegetation zone (southern boreal and hemiboreal broadleaf-conifer forests), in the latter region it is a red-listed fungus (Vetkin et al., 2015). In West Siberia, it is known from the middle boreal forests of Khanty-Mansi Autonomous District (Filippova et al., 2015). It is also known from the southern boreal forests of the Russian Far East (Bulakh, 2007).

Fig. 3. Fruiting body of *Mycena picta* (SVER 910083)

Distribution in the Urals and the adjacent areas of the plains. The species has not been previously recorded in the Urals. The nearest known locality is situated in Khanty-Mansi Autonomous District (West Siberia).

Specimens examined: Pervouralsk District, vicinity of Bilimbay settlement, "Stand of *Picea obovata* planted in 1910 and 1916" Reserve, 56°58.698′ N, 59°46.732′ E, pine and spruce forest, on decayed trunk, 11 July 2015, SVER 910083; Ekaterinburg District, bank of Lake Chusovskoye, 56°45′ N, 60°18′ E, pine forest, on cones of *Pinus sylvestris*, 2 August 2016, O.S. Shiryaeva, SVER 910084.

Pleurotus eryngii (DC.) Quél. – WS:FS

General macroscopic features of the species are: pileus fleshy, off-white to dark brown, usually scattered with numerous darker squamules or fibril-like patches; lamellae off-white to cream, thin, broad, entire, decurrent and often forming a fine network of anastomoses at the top of the stipe; stipe firm and well-developed, mostly central to subcentral (Zervakis et al., 2014). The macroscopic features of *P. eryngii* are very similar to those of other species of the *Pleurotus eryngii* complex (*P. nebrodensis* (Inzenga) Quél. and *P. ferulaginis* Zervakis, Venturella & Cattarossi). This species could be discriminated on the basis of the associated host plant (e.g., genera *Ferula*, *Thapsia*, *Elaeoselinum*, *Margotia*, *Laserpitium*, *Magydaris*, *Eryngium*, *Opopanax*, *Peucedanum*, *Smyrniopsis*, *Kellusia*), the dimensions of basidiospores (wide variation of mean width values of 5.4 to 6.1 µm and Qav of 2.00 to 2.21 in subspecific taxa), and the geographic distribution (Europe and Asia) (Zervakis et al., 2014).

Comment. The species of the *Pleurotus eryngii* complex grow as saprotrophs (or facultative biotrophs) on various species of *Apiaceae* (Zervakis et al., 2014). Unfortunately, the collector indicated only the family of the host plant of the specimen examined. But it is known that *Prangos ferulacea* (L.) Lindl., *Ferulago campestris* (Besser) Grecescu, *Ferula* spp., *Thapsia* spp., *Elaeoselinum* spp., *Margotia* spp., *Laserpitium* spp., *Magydaris* spp. associated with *P. nebrodensis*, *P. ferulaginis* and some subspecific taxa

of *P. eryngii* (subsp. *tuoliensis*, var. *elaeoselini*, var. *ferulae*, var. *thapsiae*, var. *tingitanus*) do not occur in the studied area. Among the plants associated with the species of the *Pleurotus eryngii* complex, only *Eryngium planum* L. and *Pimpinella saxifraga* L. can be found in Sverdlovsk Region. *Eryngium planum* is known to be a host plant of *P. eryngii* var. *eryngii*, while *Pimpinella saxifraga* has been reported (but not confirmed) as a host for *P. ferulaginis* (Zervakis et al., 2014). The sizes of basidiospores of specimen examined (9–13.3 × 4.7–6.2 µm with Qav = 2.03) fit well in *P. eryngii* var. *eryngii* (9.1–13.5 × 4.6–6.7 µm with Qav = 2.04), whereas in *P. ferulaginis* the basidiospores are narrower (11.3–13.4 × 4.6–5.1 µm with Qav = 2.54) (Zervakis et al., 2014). In addition, the distribution range of *P. eryngii* var. *eryngii* covers south-central Europe as well as Asia, while the distribution of *P. ferulaginis* is limited to Slovenia, northeastern Italy and Hungary (Zervakis et al., 2014).

Distribution in Russia. In Russia, there are several records from the forest-steppe and steppe zones of European part and the Altai-Sayan Mountain Land (Gorbunova, 2006; Rebriev et al., 2012).

Distribution in the Urals and the adjacent areas of the plains. In Sverdlovsk Region, it was found within the West Siberian Plain. The species has not been mentioned earlier for the West Siberian Plain and the Urals. The nearest known locality is situated in the Karaganda Region of Kazakhstan within the Kazakh melkosopochnik (Samgina, 1981).

Specimen examined: Talitsa District, vicinity of Butka settlement, 56°38′ N, 63°42′ E, dry grassland, on root of a species of Apiaceae, 27 August 1969, leg. N. T. Stepanova, SVER 910068.

Pluteus fenzlii (Schulzer) Corriol & P.-A. Moreau – U:ST (Fig. 4)

It is very similar to *P. leoninus* (Schaeff.) P. Kumm. and differs by the presence of annulus. The annulus can be fugacious, fibrillose, presenting in the mature basidiome only as a poor visible ring zone, or well differentiated, almost membranous, at first entire, later breaking into patches (Corriol & Moreau, 2007; Malysheva et al., 2007).

Distribution in Russia. In Russia, it is reported from south-eastern European part, the southern Urals, West and East Siberia, the Altai-Sayan Mountain Land (Malysheva et al., 2007; Desyatova, 2008; Perevedentseva et al., 2011; Baranova, 2012; Vasin & Vasina, 2013; Kudashova et al., 2016; Malysheva et al., 2016). It extends from the southern part of the forest zone to the forest-steppe zone. In addition, there are some records from the middle boreal forests of the West Siberian Plain (Vasin & Vasina, 2013). *Pluteus fenzlii* is a red-listed fungus in four regions of Russia, namely Khanty-Mansi Autonomous District, the Republic of Udmurtia, the Republic of Khakassia and the Republic of Tatarstan (Ankipovich, 2012; Baranova, 2012; Vasin & Vasina, 2013; Nazirov, 2016).

Distribution in the Urals and the adjacent areas of the plains. In the Urals, *P. fenzlii* is known from Orenburg Region, where it inhabits in forests dominated by temperate broadleaved trees (Desyatova, 2008). It is also found in Perm Territory, where it occurs in the subzone of southern boreal forests within the adjacent areas of the East European Plain (Perevedentseva et al., 2011).

Specimen examined: Ekaterinburg District, vicinity of Lake Glukhoye, 56°49′ N, 60°17′ E, pine forest, on decayed wood of *Betula* sp., 2 August 2015, SVER 910088.

Psathyrella ammophila (Durieu & Lév.) P.D. Orton – WS:HB2

The distinguishing features of *P. ammophila* are as follows: reddish brown ellipsoid basidiospores 9–14 × 5.5–8.5 µm, with a distinct germ pore; the presence of utriform pleurocystidia and cheilocystidia of two types: utriform, scattered and clavate, numerous, and a sandy habitat (Knudsen & Vesterholt, 2012).

Distribution in Russia. In Russia, *P. ammophila* occurs at the Baltic coast of Kaliningrad Region (Dedkov & Grishanova, 2010), in the vegeta-

Fig. 4. Fruiting body of *Pluteus fenzlii* (SVER 910088)

tion zones of the steppe and the desert of European part and the Altai-Sayan Mountain Land (Rebriev et al., 2012; Gorbunova & Majnagasheva, 2013). In the West Siberian Plain, it has been once recorded in anthropogenic equivalent of natural habitat such as sandy river embankment (Filippova et al., 2015). *Psathyrella ammophila* is included in the Red List of Kaliningrad Region (Dedkov & Grishanova, 2010).

Distribution in the Urals and the adjacent areas of the plains. The new record is the second in the West Siberian Plain and it is the first within the natural habitat. The species has not been recorded in the Urals.

Specimens examined: Talitsa District, "Pripyshminskie bory" National Park, vicinity of Talitsa settlement, 57°01′ N, 63°48′ E, sand hills along the Pyshma River, 18 September 1952, leg. N.T. Stepanova, SVER 910067.

Russula aurea Pers. – U:ST (Fig. 5)

The species is easy to recognize by its strongly yellowing fruit bodies, undifferentiated pileipellis, without dermatocystidia and primordial hyphae, and basidiospores 8–10 × 6.5– 8.5 µm, with many crests or partially reticulate (Knudsen & Vesterholt, 2012).

Distribution in Russia. In Russia, it is reported from European part, the Caucasus, the southern Urals, West and East Siberia, the Altai-Sayan Mountain Land and the Far East, where it occurs in the southern part of the forest zone (Perova & Gorbunova, 2001; Sopina, 2001; Svetasheva, 2004; Popov et al., 2007; Kirillova & Podolskaya, 2012; Stepanov, 2012). It is a red-listed species in some parts of Russia: Chelyabinsk Region, Leningrad Region, Moscow Region, Tula Region and Vologda Region, and Krasnoyarsk Territory (Noskov, 2000; Varlygina et al., 2008; Scherbakov, 2010; Stepanov, 2012; Suslova et al., 2013; Bolshakov, 2017).

Distribution in the Urals and the adjacent areas of the plains. In the Urals, it has been previously reported only from Chelyabinsk Region (Bolshakov, 2017).

Specimens examined: Ekaterinburg District, vicinity of Lake Glukhoye, 56°49′ N, 60°17′ E, pine forest with *Betula* sp., on soil, 2 August 2015, SVER 910050; ibid., 8 August 2017, SVER 910177; Ekaterinburg District, bank of Lake Chusovskoye, 56°45′ N, 60°18′ E, pine forest with *Tilia cordata*, on soil, 9 August 2015, SVER 910095; Sysert District, vicinity of Bol'shoye Sedel'nikovo settlement, Shabrovsk granite outcrop, 56°38.003′ N, 60°38.508′ E, pine forest with *Betula* sp., on soil, 10 July 2015, SVER 910178.

Volvariella bombycina (Schaeff.) Singer – U:(ST)

In the field, *V. bombycina* is easily distinguished by its whitish to cream cap with silky hairy scales; sick,

Fig. 5. Fruiting body of *Russula aurea* (SVER 910177)

broad, and whitish or with brownish scales volva; and a lignicolous habitat (Szczepkowski et al., 2013).

Distribution in Russia. In Russia, it occurs in the southern part of the forest zone and in the steppe zone from European part to the Far East (Azbukina et al., 2006; Perevedentseva, 2008; Rebriev et al., 2012; Kudashova et al., 2016; Bolshakov, 2017). This species is included in the Red Data Books of several regions of European Russia (e.g. Astrakhan Region, Lipetsk Region, Ryazan Region, Voronezh Region and Krasnodar Territory), the Urals (Chelyabinsk Region and Orenburg Region) and Siberia (Novosibirsk Region, the Republic of Khakassia) (Ankipovich, 2012; Anonymous, 2014; Scherbakov, 2014; Bolshakov, 2017; Litvinskaya, 2017).

Distribution in the Urals and the adjacent areas of the plains. In the Urals, there are several records of the species from the hemiboreal forests to the steppe vegetation zone. It is reported from the Republic of Bashkortostan, Chelyabinsk Region and Orenburg Region (Dörfelt & Hoffmann, 1980; Desyatova, 2008; Bolshakov, 2017). It is also found in Perm Territory, where it occurs in the hemiboreal forests within the adjacent areas of the East European Plain (Perevedentseva, 2008).

Specimens examined: Ekaterinburg city, V.V. Mayakovsky Central Park, 56°48′ N, 60°39′ E, on stump of *Acer* sp., 9 September 1998, leg. N. Golumbievskaya, SVER 729107; ibid., Yasnaya street, 50-year VLKSM Park, 56°48′ N, 60°34′ E, stand of *Acer* sp., on living *Acer* sp., 15 September 2014, leg. A.G. Shiryaev, SVER 910061.

Volvariella caesiotincta P.D. Orton – U:HB1, FS (Fig. 6)

The species is characterized by grey volva and grey-brown, grey-olivaceous or grey radially fibrillose or darker streaky pileus with a darker fibrillose-tomentose centre. An additional diagnostic character of *V. caesiotincta*, enabling its identification, is the cheilocystidia shape, especially the presence of the often abruptly connected and irregular, branched to sometimes subcoralloid rostrum (Halama, 2009; Antonín, 2012). It is a wood-destroying fungus, but it produces basidiomes not only on wood and buried wood remnants, but also directly on soil (Antonín, 2012). Similar species, *V. murinella* (see below), produces nearly identical basidiomes that occur on humus rich soil or remains of leaves or plants. In contrast to *V. caesiotincta*, *V. murinella* has cheilocystidia without abruptly connected and irregular, branched or subcoralloid rostrum (Halama, 2009; Antonín, 2012).

Distribution in Russia. In Russia, there are few records in forests with temperate broadleaved trees. It is known from the Karachay-Cherkess Republic (the Caucasus) and the Republic of Tatarstan (the East European Plain), in the latter region it is a red-listed fungus (Kalamees & Botashev, 2000; Nazirov, 2016).

Distribution in the Urals and the adjacent areas of the plains. *Volvariella caesiotincta* has not been previously recorded in the Urals. The nearest known localities are situated in the Republic of Tatarstan (Nazirov, 2016).

Specimens examined: Krasnoufimsk District, vicinity of Sargaya settlement, 56°14’ N, 57°42′ E, oak and spruce forest, on trunks of *Alnus glutinosa* (L.) Gaertn., 24 August 1961, leg. N. T. Stepanova, SVER 910073; ibid., “Nizhneirginskaya dubrava” Reserve, 56°53′ N, 57°26′ E, oak forest, on soil among grasses, 24 August 1947, leg. Z. A. Demidova, SVER 910074.

Volvariella murinella (Quél.) M.M. Moser ex Dennis, P.D. Orton & Hora – U:FS

It is a terrestrial fungus with a white volva, tending to pale greyish only near the edge, and usually with a greyish pileus, that is hairy at centre, radially silky fibrillose to slightly scaly towards margin (Knudsen &

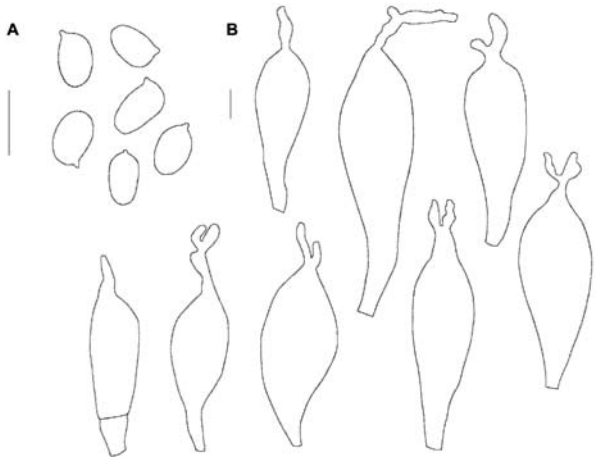

Fig. 6. Details of the microstructure of *Volvariella caesiotincta* (SVER 910074). A. Basidiospores. B. Cheilocystidia. Scale bars = 10 μm

Vesterholt, 2012). The other distinguishing characters are cheilocystidia and size of basidiospores. Cheilocystidia are mostly clavate or fusoid with gently broadening (only rarely subabrupt), but always simple, apical rostrum (Antonín, 2012). The size of basidiospores is 5.5–7.5(8.5) × 3.0–4.5 μm with Qav = 1.7–1.8 (Bas et al., 1990).

Comment. The studied specimen has a whitish pileus. The white form of *V. murinella* differs mainly from other white-capped *Volvariella* species (e.g. *V. hypopithys* and *V. pusilla*) by its narrow basidiospores (Bas et al., 1990). The basidiospores in the specimen studied are measured 6.8–8.4 × 3.6–4.6 μm with Qav = 1.79. It fits well with the dimensions of basidiospores of *V. murinella* (see above), whereas in *V. hypopithys* there are basidiospores with Qav = 1.45–1.55 (6–8 × 3.5–5 μm), and in *V. pusilla* – with Qav = 1.3–1.45 (5.5–7 × 4–5.5 μm) (Bas et al., 1990).

Distribution in Russia. In Russia, there are several records in European part, West Siberia, and the Far East from the hemiboreal forests to the forest-steppe (Azbukina et al., 2006; Malysheva & Malysheva, 2008; Kapitonov, 2013; Koropachinskiy & Banaev, 2014; Morozova et al., 2015, 2016).

Distribution in the Urals and the adjacent areas of the plains. The species has not been previously recorded in the Urals. The nearest known locality is situated in the Udmurt Republic, where it occurs in the subzone of the hemiboreal forests (Kapitonov, 2013).

Specimens examined: Krasnoufimsk District, "Nizhneirginskaya dubrava" Reserve, 56°53′ N, 57°26′ E, oak and conifer forest, on soil, 31 August 1976, leg. N. T. Stepanova, SVER 910072.

Volvariella pusilla (Pers.) Singer – U:FS, (ST)

The species is characterized by small whitish basidiomes and by broadly ellipsoid-ovoid basidiospores 5.5–7 × 4–5.5 μm, Qav = 1.3–1.45 (Bas et al., 1990).

Distribution in Russia. In Russia, there are several records in European part, West Siberia, the Altai-Sayan Mountain Land, and the Far East from the hemiboreal forests to the steppe (Perova & Gorbunova, 2001; Azbukina et al., 2006; Popov et al., 2007; Desyatova, 2008; Perevedentseva, 2008; Scherbakov, 2010; Rebriev et al., 2012).

Distribution in the Urals and the adjacent areas of the plains. The species has not been previously recorded in the Urals. The nearest known locality is situated in Perm Territory, where it occurs in the subzone of the hemiboreal forests within the adjacent areas of the East European Plain (Perevedentseva, 2008). It has also been recorded in the plain part of Orenburg Region (Desyatova, 2008).

Specimens examined: Arti District, 56°13′ N, 58°28′ E, dry grassland, on soil, 13 July 1968, leg. L. K. Kazantseva, SVER 910075; Ekaterinburg city, V. V. Mayakovsky Central Park, 56°48′ N, 60°39′ E, on soil, 5 September 1995, leg. O.B. Tarchevskaya, SVER 910076; ibid., the Botanical Garden, 56°47' N, 60°36′ E, greenhouse, on soil, 19 August 2016, SVER 910077.

DISCUSSION

Ten species of agaricoid fungi were reported for the first time from Sverdlovsk Region. Of these, five species – new to the Urals (*Crepidotus crocophyllus*, *Mycena picta*, *Volvariella caesiotincta*, *V. murinella*, *V. pusilla*) and one – new to the West Siberian Plain (*Pleurotus eryngii*).

The new record of *Volvariella caesiotincta* extends the species distribution area to the Urals. The species has been reported from European Russia (see above) as well as Europe and North Africa (Halama, 2009). Therefore, the new record is the easternmost. The distance to the nearest known localities is roughly 350 km. The records of all other species fill the gaps between localities in Europe and Asia.

Several species have restricted distribution in the studied area, for example, because of their specialization in a certain habitat type or substrate. *Psathyrella ammophila* is a typical sand dune species (Knudsen & Vesterholt, 2012). The habitats with pioneer psammophillous vegetation are relatively rare in the main part of Sverdlovsk Region, and usually associated with sandy hills along the Siberian rivers. Equally interesting is *Pleurotus eryngii*, a species that inhabits xerothermic grasslands (Lacheva, 2015). It seems to be at the northern limit of its natural habitat range in the region. *Volvariella caesiotincta* associates with temperate broadleaved trees (Halama, 2009) that have the northeastern border of their species ranges in the region.

Volvariella murinella and *V. pusilla* prefer relatively rich soils (Bas et al., 1990) and in the region they are in the northern border of its natural habitat range. The distribution of *Russula aurea* is limited to the southern part of the forest zone, it occurs on alkaline to neutral soil with abundant bases (Kranzlin, 2005). It may be noted that the habitats of *R. aurea* differ from those preferred in other parts of the range. In the region, it occurs in pine-dominated forests. In European Russia, the Russian Far East as well as in Europe the species is mostly known from deciduous forests or rich spruce forests (Noskov, 2000; Kranzlin, 2005; Varlygina et al., 2008; Kirillova & Podolskaya, 2012; Knudsen & Vesterholt, 2012). New localities are in the eastern slopes and foothills of the Urals, where pine forests grow on rich brown forest soils instead of spruce ones. In the eastern slopes of the Southern Urals and in the Siberia, *R. aurea* has also been found in pine forests (Stepanov, 2012; Koropachinskiy & Banaev, 2014; Bolshakov, 2017).

A separate group comprises fungi growing in anthropogenic habitats to the north of their natural distribution in the Urals. *Volvariella bombycina* has been recorded in the man-made habitat of the urban area (the new record) within the subzone of the southern boreal forests. In the Urals, it also occurs in natural habitats from the hemiboreal forests to the steppe vegetation zone (see species information). *Volvariella pusilla* has been found in anthropogenic (urban park, greenhouse) habitats within vegetation zone of southern boreal forests. In the southern part of Sverdlovsk Region, it has also been recorded in natural habitats. In the northern areas located within the Urals, these species haven't been found yet.

The referred species are rare (everywhere or locally) or little collected in Russia (known from several records). *Mycena picta*, *Pluteus fenzlii*, *Psathyrella ammophila*, *Russula aurea*, *Volvariella bombycina* and *V. caesiotincta* are included in the Red Data Books of some administrative regions of Russia (see species information). *Mycena picta* and *Volvariella caesiotincta* furthermore are recognized everywhere as rare species and are included in the Red Lists of a number of European countries (Halama, 2009; Halama & Romański, 2010).

Thus, the present paper supplements information on the distribution and ecology of rare and little collected species.

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NAUJOS AGARIKOIDINIŲ GRYBŲ RADAVIETĖS SVERDLOVSKO REGIONE (RUSIJA)

Olga S. Shiryaeva

Santrauka

Straipsnyje pateikiami duomenys apie pirmą kartą Sverdlovsko regione aptiktas dešimt agarikoidinių grybų rūšių: *Crepidotus crocophyllus, Mycena picta, Pleurotus eryngii, Pluteus fenzlii, Psathyrella ammophila, Russula aurea, Volvariella bombycina, V. caesiotincta, V. murinella* ir *V. pusilla*. Iš jų penkios rūšys – *Crepidotus crocophyllus, Mycena picta, Volvariella caesiotincta, V. murinella* ir *V. pusilla* pirmą kartą aptiktos Urale, o viena – *Pleurotus eryngii* – pirmą kartą rasta Vakarų Sibiro lygumoje. Naujoji *Volvariella caesiotincta* radavietė rodo, kad šio grybo arealas nusitęsia toliau į rytus nei anksčiau galvota ir siekia Uralo kalnus. Straipsnyje aptariamas ir visų minimų rūšių paplitimas Rusijoje ir Uralo kalnuose.