



New location of rare macromycetes (*Cerioporus rhizophilus*, *Galeropsis desertorum* and *Phellorinia herculeana*) in Kazakhstan

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Abstract

Three species of rare macrofungi (*Cerioporus rhizophilus*, *Galeropsis desertorum* and *Phellorinia herculeana*) were collected from various habitats of Kazakhstan. Data on their habitats (new location) and short diagnosis with original dimensions and photographs of the fruit bodies were provided for each taxon.

Key words – cap – fruit body – gasterocarp – gill – peridium – spore – stipe – tube

Introduction

Kazakhstan is located in central part of Eurasia. Due to the wide range of habitats, the territory of Kazakhstan (2,724,900 square km) is characterized by a rich diversity of fungi. Unfortunately, some areas of the republic have not yet been examined in the mycological terms. Many studies on Kazakhstan mycobiota were being conducted especially last ten years, due to this, new points of location for rare fungal species were added and their areas of distribution were specified.

The purpose of this study is to add data on new locations of rare macromycetes (*Cerioporus rhizophilus*, *Galeropsis desertorum*, *Phellorinia herculeana*) to the Kazakhstan mycobiota.

Materials & Methods

The study was conducted in the southeastern regions of Kazakhstan for three years (2014–2016). Fungal specimens were collected during field trips. In field studies morphological characteristics of the specimens were recorded and a Canon 600E camera was used for photographing of fruit body. Spores were placed in a drop of distilled water on a microscope slide without any staining, examined and photographed using a photomicroscope Polyvar with Nomarski interference contrast optics. Measurements of spores were made. Specimens were identified with the literature on macromycetes (Schvartzman 1964, Schvartzman & Filimonova 1970).

Dried specimens are stored in the herbarium of the Institute of Botany and Phytointroduction, Almaty, Kazakhstan (AA).

Results

During the research, three species of fungi rare for Kazakhstan were found. Short descriptions, remarks on the species, photographs of the fruit bodies, and microphotographs were provided. The taxa are listed in alphabetical order.

Fungi

Basidiomycota Whittaker ex Moore

Polyporales Gäum.

Polyporaceae Fr. ex Corda

Cerioporus rhizophilus (Pat.) Zmitr. & Kovalenko (*Polyporus rhizophilus* Pat.)

Description – Fruit bodies single or in small groups, consist of a cap and stipe (Figs 1–3). Cap round, 1–5 cm in diameter, 1–3 mm in thickness, leathery, smooth or slightly scaly, straw-white to light-ochre, sometimes with weak lobes. Flesh thin (0.3 cm), whitish pale cream with corky consistency. Tubes whitish to cream, with angular pores. Spores cylindrical or fusiform, $7.5\text{--}11.0 \times 3\text{--}4.5$ μm , hyaline, smooth, with 1–2 drops or with granular contents. Stipe slightly eccentric, cylindrical, $1.0\text{--}3.0 \times 0.3\text{--}0.8$ cm, whitish, black-brown at the base.



Figs 1–3 – *Cerioporus rhizophilus*. 1 Fruit bodies at the base of roots of *Achnatherum splendens*. 2 Caps and stipes of fruit bodies. 3 Tubes and pores.

Known distribution – Europe, Africa, Kazakhstan.

Material examined – Kazakhstan, Almaty region, Ketmen ridge, Toringir gorge, 1482 m a.s.l., 43°21'29.2"N, 79°44'02.1"E, 26 April 2015, SB Nurashov; Malaisary ridge, foothill plain, in the vicinity of the station Tary, 1022 m a.s.l., 44°16'44.0"N, 77°45'10.4"E, 1 May 2016, EV Rakhimova; near the station Tary, 1144 m a.s.l., 44°33'72.4"N, 77°63'39.4"E, 22 July 2016, LA Kyzmetova; western part of the Malaisary ridge, Malaisary pass, 634 m a.s.l., 44°32'97.7"N, 76°93'81.0"E, 26 July 2016, LA Kyzmetova; Chu-Ili mountains, Khantau ridge, Sunkar river, near the mausoleum of Binazar, 811 m a.s.l., 44°18'28.8"N, 74°03'00.1"E, 3 June 2016, SB Nurashov; Trans-Ili Alatau, Kastek ridge, Kastek gorge, 1852 m a.s.l., 42°59'71.8"N, 75°53'29.8"E, 28 June 2012, in the same gorge, 1811 m a.s.l., 43°00'00.4"N, 75°53'37.3"E, 28 June 2012, in the same gorge, 1794 m a.s.l., 43°00'02.4"N, 75°54'04.8"E, 28 June 2012, EV Rakhimova; at the base of roots of *Achnatherum splendens* (Trin.) Nevski; Trans-Ili Alatau, Kastek ridge, Kastek gorge, 1831 m a.s.l., 42°59'85.1"N, 75°53'51.7"E, 28 June 2012, in the same gorge, 1849 m a.s.l., 42°59'66.9"N, 75°53'18.9"E, 28 June 2012, EV Rakhimova; at the base of roots of *Stipa* sp.

Agaricales Underw.

Bolbitiaceae Singer

Galeropsis desertorum Velen. & Dvořák

Description – Cap 10–23 mm. Young cap globose or oblong ovate, narrowly cylindrical when mature, light, dry clay and ocher-gray or dark brown when dry (Figs 4, 5). Gills dense, along the entire length of the same width, to the stipe are not attached, bright, clayey-ocher when dry, then dark brown. Flesh whitish-gray, hard. Spores 11.5–14.0 × 6.0–8.0 μm, almond shaped, smooth, light-brown to yellowish. Basidia clavate, ovoid or ellipsoid. Stipe 20–50 × 1–1.5 mm, cylindrical, hollow, usually curved at the bottom, smooth, whitish.



Figs 4–5 – *Galeropsis desertorum*. 4 Fresh fruit body. 5 Dry fruit bodies.

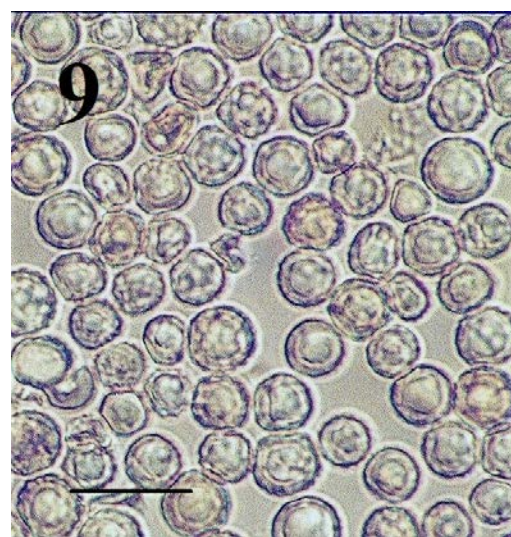
Known distribution – Eurasia (Czech Republic, Slovakia, Hungary, Kazakhstan, Ukraine).

Material examined – Kazakhstan, Almaty region, Ketmen ridge, Ulken Aksu gorge, 1426 m a.s.l., 43°20'19.3"N, 79°37'28.4"E, 24 April 2015, GA Nam; Malaisary ridge, foothill plain, in the vicinity of the station Tary, 1022 m a.s.l., 44°16'44.0"N, 77°45'10.4"E, 1 May 2016, EV Rakhimova; Chu-Ili mountains, Ushkyzyl, mount Aktau, foothill plain, 573 m a.s.l., 44°02'57.0"N, 74°08'62.7"E, 26 April 2017, LA Kyzmetova.

Phelloriniaceae Ulbr.

Phellorinia herculeana (Pers.) Kreisel (*P. strobilina* (Kalchbr.) Kalchbr.)

Description – Young gasterocarp ovoid or clavate (Figs 6, 7). Mature gasterocarp consist of spore case, stipe, and bulbous base, 6–25 cm tall. Exoperidium white when immature, pale to brown with age, thick, compose of branched, hyaline hyphae. Endoperidium continuous with stipe, pale yellow, compose of thin, hyaline, branching, septate hyphae. Basidiospores globose to subglobose, hyaline, $4.0\text{--}9.0 \times 4.0\text{--}7.5 \mu\text{m}$, verrucose (Figs 8, 9).



Figs 6–9 – *Phellorinia herculeana*. 6 Mature fruit body from Herbarium AA. This picture is copyright of Yury Rebriyev. 7 Immature fruit body. 8 Spores. – Bar = $10 \mu\text{m}$. 9 Spores. – Bar = $20 \mu\text{m}$.

Stipe $2\text{--}16 \times 0.5\text{--}7.0 \text{ cm}$, woody, continuous with spore case, not uniform, having a wide, bulbous base, and tapering toward the apex, with parallel, broad ridges and furrows running from apex to base.

Known distribution – Israel, Africa, India, Australia, South America, North America, Europe, Central Asia.

Material examined – Kazakhstan, Almaty region, Malaisary ridge, foothill plain, in the vicinity of the station Tary, 1022 m a.s.l., $44^{\circ}16'44.0''\text{N}$, $77^{\circ}45'10.4''\text{E}$, 1 May 2016, EV Rakhimova.

Discussion

Of the three species described, *Ceriosporus rhizophilus* and *Phellorinia herculeana* (as *P. strobilina*) are listed in the Red Book of Kazakhstan (Baitulin & Sitpayeva 2014).

On the territory of Kazakhstan, *Ceriosporus rhizophilus* is noted in various habitats (Fig. 10) (Bondartsev & Kravtsev 1952, Schwartzman & Filimonova 1969, Nam et al. 2011), it grows at the base of stems of steppe cereals: *Achnatherum splendens* (Trin.) Nevski, *Festuca valesiaca* Gaudin, *Leymus angustus* (Trin.) Pilg., *L. dasystachys* (Trin.) Pilg., *Stipa capillata* L., *S. lessingiana* Trin. & Rupr., *S. pennata* L., *S. sareptana* A.K. Becker, *S. zalesskii* Wilensky, *Stipa* sp. (Schvartzman 1964).



Fig 10 – Map of Kazakhstan showing the localities of *Ceriosporus rhizophilus* (green asterisk), *Galeropsis desertorum* (blue asterisk), *Phellorinia herculeana* (red asterisk). When compiling the map, both authors' own data and literary were used (Schvartzman 1964, Schwartzman & Filimonova 1970).

Despite a fairly wide range of distribution, *Ceriosporus rhizophilus* is rare and is listed in the Red Books of various regions (Petrov 2006). On the territory of the Russian Federation, it was noted at the base of the feather grass in the Penza region (Mokshansky and Kameshkirsky districts, reserve "Privolzhskaya forest-steppe") (Ivanov 1999, Ivanov et al. 2002), in the Saratov region (Arestova et al. 1996, Shlyakhtin 2006), in the Irkutsk region (Gaikova et al. 2010), in the Tyumen region (Bolshakov et al. 2004), in the Chelyabinsk region (Korytin 2005), in the Lipetsk region (Tikhomirov et al. 2005, Shcherbakov 2014), in the Sverdlovsk region (Shiryaev et al. 2010), in the Belgorod region (Bolshakov & Volobuev 2016), in the Altai (Gorbunova & Perova 2006, Vlasenko 2010), in the Republic of Crimea (Yena & Fateryga 2015). There was *Ceriosporus rhizophilus* on the roots of grass species (mainly feather grass – *Stipa*) in steppe habitats of Bulgaria (Balkan Range, Thracian Lowland, Tundzha Hilly Country) (Kuthan & Kotlaba 1989, Gyosheva et al. 2006) and Ukraine (Leshan & Pakhomov 2009).

On the territory of Kazakhstan, *Phellorinia herculeana* is noted in various habitats (Fig. 10), unlike *Ceriosporus rhizophilus*, the fungus is also found in the south of the republic. *Phellorinia*

herculeana is widely distributed across arid to semi-arid regions of such countries as Australia (Williams & Woinarski 1997, Fuhrer 2005), Pakistan (Ahmad 1952, Ahmad et al. 1997, Yousaf et al. 2012), Kazakhstan (Schvartzman & Filimonova 1969, Rakhimova et al. 2016), India (Bohra et al. 2001), Russian Federation: Rostov region, where the fungus is listed in the Red Book (Rebriev 2007, Abramova et al. 2014), Volgograd region (Rebriev 2011) and Astrakhan region (Gershtanski 2005, Zakutnova & Levchenko 2011) Spain, and Yemen (Kreisel & Fatimi 2004). The species is recommended for inclusion in the second edition of the Red Book of Tajikistan (Hisoriev et al. 2011). Fungus is known for its gastronomic and medicinal value.

Galeropsis desertorum, xeromeridional species with a disjunctive areal, is characteristic for steppes, sandy pastures, deserts or semi-deserts. In the territory of Kazakhstan, it was found in four habitats. On the territory of Ukraine, it is protected in the reserves of Askania Nova and Kanevsky (Akimov 2009, Leshan & Pakhomov 2009). In Russia it is found in the Astrakhan (Gershtanski 2005), Rostov regions, the Republics of Dagestan, Tuva, Stavropol and Krasnoyarsk regions (Trutnev et al. 2008). All members of the *Galeropsidaceae* family are rare, the species *Galeropsis lateritia* (Watling) Moreno, Heykoop & Illana and *Galeropsis desertorum* Velen. & Dvořák were recently discovered in Turkey (Hatat & Peksen 2014, Kaya 2015).

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