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New records of corticioid fungi with heterobasidia from Ukraine

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Abstract: Fifteen species of corticioid fungi with heterobasidia are recorded from the forests in the middle of the Seversky Donets River basin (eastern Ukraine) from 2007 to 2011. Of them, 11 species are new to Ukraine. They are *Basidiodendron rimulentum* (Bourdot et Galzin) Luck-Allen, *Ceratobasidium cornigerum* (Bourdot) D.P.Rogers, *Eichleriella deglubens* (Berk. et Broome) Lloyd, *Exidiopsis griseobrunnea* K.Wells et Raitv. subsp. *griseobrunnea*, *Helicogloea lagerheimii* Pat., *Stypella grilletii* (Boud.) P.Roberts, *Tulasnella albida* Bourdot et Galzin, *T. eichleriana* Bres., *T. pallida* Bres., *T. saveloides* P.Roberts, and *T. thelephorea* (Juel) Juel. Two of these species, *Exidiopsis griseobrunnea* and *Tulasnella saveloides*, are still known to be from very few European regions, even after being discovered in Ukraine. Furthermore, 3 species (*Basidiodendron eyrei* (Wakef.) Luck-Allen, *Exidiopsis galzinii* (Bres.) Killerm., and *Tulasnella violea* (Quél.) Bourdot et Galzin) are new to the steppe zone and the plain part of Ukraine. *Thanatephorus fusisporus* (J.Schröt.) Hauerslev et P.Roberts is reported from Ukraine for the second time. Information on the ecology and distribution of the species is presented. Comments are made on the morphology of the specimens examined and original illustrations are provided for all of the species.

Key words: Corticioid fungi, *Basidiomycota, Tulasnella,* morphology, diversity, distribution, Seversky Donets River basin, Ukraine

Introduction

Corticioid fungi (*Basidiomycota* R.T.Moore) make up a large assemblage of life forms. The group encompasses species with similarly organised fruit bodies that are prostrate and that feature hymenophores that are neither poroid nor gilled but of other configurations (e.g., smooth, tuberculate, veined, warty, spiny, or folded). Relying on the similar morphology of the basidiomata, these fungi for a long time have been treated as members of the single family: *Corticiaceae* Herter. To date, however, it has been shown that while corticioid fungi share a common morphology they do not share an origin. According to the results of recent phylogenetic studies, fungi with the corticioid habit of basidioma are present among all of the evolutionary lineages of *Agaricomycetes* Doweld (Binder et al., 2005; Larsson, 2007). Moreover, the list of taxa demonstrating corticioid basidioma morphology extends far beyond the borders of the subphylum *Agaricomycotina* Doweld. Corticioid species exist among the representatives of the subphylum *Pucciniomycotina* R.Bauer, Begerow, J.P.Samp., M.Weiss et Oberw., as well (Hibbett et al., 2007). Being a large fungal group, corticioid fungi are usually richly represented in various regional mycotas (Akulov et al., 2003a; Bernicchia & Gorjón, 2010; Doğan et al., 2011, 2012).

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Several factors make the group of corticioid fungi difficult to investigate in comparison with other fungi featuring basidia. Their basidiomata are often very delicate. They exist in nature for a short period of time after which they collapse and thus become unidentifiable. The fruit bodies of many corticioid fungi species are also rather similar in outward appearance. For these reasons, identification of these specimens should be based on a large number of microscopic basidiomata characteristics (Akulov et al., 2003b; Binder et al., 2005).

While most of the corticioid fungi are characterised by homobasidia, some of them possess heterobasidia. The latter group of the corticioid fungi is particularly difficulty to research. Their basidiomata usually become corneous when dry. This greatly complicates the ascertaining of their anatomical structure. The fruit bodies of these fungi are often semitransparent and so thin that they become invisible to the naked eye when dry.

Methodological obstacles to studying the corticioid fungi with heterobasidia have made them a poorly known group in Ukraine. To date, only 8 species of these fungi have been revealed in Ukraine. They are *Basidiodendron eyrei* (Wakef.) Luck-Allen, *Colacogloea peniophorae* (Bourdot et Galzin) Oberw., R.Bauer et Bandoni, *Exidiopsis galzinii* (Bres.) Killerm., *Filobasidiella lutea* P.Roberts, *Helicogloea farinacea* (Höhn.) D.P.Rogers, *Thanatephorus fusisporus* (J.Schröt.) Hauerslev et P.Roberts, *Tulasnella deliquescens* (Juel) Juel, and *Tulasnella violea* (Quél.) Bourdot et Galzin (Raitviir, 1967; Küffer et al., 2004; Ordynets, 2009; Akulov et al., 2010). To demonstrate the level to which the diversity of heterobasidial corticioid fungi has been studied in Ukraine, the following striking example should be given. Only 2 species of the genus *Tulasnella* J.Schröt. have been reported from Ukraine thus far. At the same time, the genus comprises 33 species in Europe and 14 them are known from Poland, which neighbours Ukraine (Roberts, 1994; Roberts & Piątek, 2004).

While studying the diversity of corticioid fungi in Ukraine, we discovered a series of species with heterobasidia that are new and poorly known in the country. In the current paper, we provide information on these records.

Description of the study area

The records of corticioid fungi originate from eastern Ukraine, namely from the Donetsk and Luhansk administrative regions. The specimens derive from the forest areas located in the middle of the Seversky Donets River basin. Geomorphologically, all of the territory of investigation is a part of the East European Plain. The relief is not homogeneous, however. The region is the place where the Prydniprovska lowland (78-158 m a.s.l.) joins the Donetska upland (100-200 m a.s.l.). The border between these relief elements corresponds to the Seversky Donets River bed (Bondarchuk, 1959). The distinctive feature of the geological structure of the region is that the Upper Cretaceous sediments (chalk and marl) are greatly developed. In particular, they make up a series of hills along the right bank of the Seversky Donets River but they can also be found as outcroppings. Quaternary sediments have been formed mostly on the left bank of the Seversky Donets as alluvial sedimentations and massive sandy accumulations (Stepanov, 1944; Bondarchuk, 1959; Didukh & Pashkevich, 2003).

The Seversky Donets River bed is not only a boundary for the relief elements: the river separates 2 mycofloristic regions of Ukraine as well. The territories on the left bank of the Seversky Donets River belong to the Starobilsk gramineous-meadow steppe mycofloristical region. The lands on the river's right bank represent the Donetsk gramineous-meadow steppe (Heliuta, 1989).

All of the area of investigation is situated in the steppe natural zone. The climate is moderately continental. The average annual temperature is 7 to 8 °C. The average annual precipitation is 400-540 mm, while the evaporation is 580-650 mm (Popov et al., 1968).

Despite being located in the steppe zone (which is characterised by the dominance of herbaceous vegetation), the study area is quite rich in the forests that were the subject of our mycological inventories. The development of massive forests on the territory with a rather continental climate is possible due to the specific and diverse relief of the area (namely, because of its location on the northern spur of the Donetska upland). The presence of the Seversky

Donets River, one of the largest Ukrainian rivers, is no less important (Kleopov, 1990). The territory is unique in that it comprises broadleaf forest massifs (called Teplinska and Maiatska dachas) that are the largest in the watershed of the Ukrainian steppe zone. They are oak forests, with *Quercus robur* L. as a determinant tree species. In addition to those in the watershed, vast oak forests develop in the Seversky Donets floodplain. Here they coexist with floodplain forests formed by *Alnus glutinosa* (L.) Gaertn., *Populus* spp., or *Salix* spp. On the thick, sandy terrace of the Seversky Donets River, spacious artificial plantations of *Pinus sylvestris* L. are interspersed with numerous specimens of *Alnus glutinosa*, *Betula pendula* Roth, and *Populus tremula* L., which are found in the local wetland forests (Popovych, 1990; Ostapko, 2003).

Being an island of forest biodiversity in the steppe zone, the study area features a series of nature conservation objects arranged along the Seversky Donets River. They are the Luhansk and Ukrainian Steppe Nature Reserves, Sviati hory National Nature Park, Iziumska luka Regional Landscape Park, and the planned Yaremivskyi Wildlife Preserve.

Materials and methods

The corticioid fungi specimens were collected from 2007 to 2011 by the author together with Dr O.Y.Akulov. The collection localities are presented in Figure 1 and described in the Table. The numbers assigned to localities in the Table are used below when providing data on the specimens examined.

The micromorphological investigation of the specimens was performed using a Zeiss Primo Star light microscope. The specimens were examined in a 5% aqueous potassium hydroxide solution, Melzer's reagent, and a 1% congo red solution in concentrated ammonia (Kirk et al., 2008).

To identify the specimens, a series of monographs and articles on corticioid fungi were used (Raitviir, 1967; Wells & Raitviir, 1975, 1977, 1980; Roberts, 1994; Roberts & Hauerslev, 1997; Torkelsen, 1997a, 1997b).

The nomenclature of the species follows the Mycobank database (Crous et al., 2004). The names of the substrata-forming plant species are given as in Ostapko et al. (2010) and so the authors of these plant names are skipped below. The possibility of

Figure 1. The area of investigation - forests in the middle of the Seversky Donets River basin (Eastern Ukraine). The outlines of the forest massifs studied are marked with a diamond (♦). The asterisk (*) indicates the Seversky Donets River bed. "Donetsk" and "Luhansk" are the names of the administrative regions demarcated by the dashed line.

Table. The characteristics of the collection localities.

Locality number	Administrative region of Ukraine	Nature conservation area	Locality description	Altitude (m)	Coordinates
1	Donetsk	"Sviaty hory" National Nature Park	*Pinus sylvestris* artificial forest plantations with singular planted *Picea abies* trees on the Seversky Donets River sandy terrace	95	49°03′N, 37°31′E
2			*Alnus glutinosa - Betula pendula - Populus tremula - Ulmus* wetland local forests in the depression of sandy terrace surrounded by *Pinus sylvestris* plantations		
3			*Quercus robur - Tilia cordata - Acer campestre - Acer tataricum - Corylus avellana - Crataegus* sp. forest in the Seversky Donets River floodplain	80	49°01′N, 37°32′E
4			*Quercus robur - Tilia cordata - Ulmus* sp. *- Acer campestre - Populus tremula - Salix* sp. *- Crataegus* sp. forest in the Seversky Donets River floodplain	70	49°00′N, 37°39′E
5			*Quercus robur - Acer campestre - Populus tremula - Betula pendula - Corylus avellana* forest on the top of the steep slope of high Seversky Donets River right bank	103	49°01′N, 37°33′E
6			*Quercus robur - Fraxinus excelsior - Tilia cordata - Acer campestre - Corylus avellana* forest on the watershed	193	49°02′N, 37°25′E
7		"Kreidova flora" Nature Reserve	*Quercus robur - Tilia cordata - Fraxinus excelsior - Ulmus campestris - Pyrus communis - Prunus spinosa - Rhamnus cathartica - Euonymus* spp. forest in the ravine	153	48°51′N, 37°51′E
8			*Pinus sylvestris* var. *cretacea* forest on the watershed	102	48°51′N, 37°52′E
9			*Acer negundo - Ulmus laevis - Salix* sp. *- Populus alba* forest in the Seversky Donets River floodplain	82	48°52′N, 37°52′E
10	Luhansk	Luhansk Nature Reserve (Trehizbenskaia steppe branch)	*Populus nigra* wetland local forests in the depression among the sandy steppe	60	48°47′N, 38°56′E
11		Luhansk Nature Reserve (Stanychno-Luhanske branch)	*Quercus robur - Acer campestre - Fraxinus excelsior - Ulmus laevis - Tilia cordata* forest in the Seversky Donets River floodplain	44	48°44′N, 39°21′E
12			*Populus alba - Populus nigra* forests in the Seversky Donets River floodplain	39	48°43′N, 39°22′E
13			*Betula pendula* plantationof sparce trees in the Seversky Donets River floodplain	47	48°44′N, 39°21′E
14			*Pinus sylvestris* artificial forest plantations on the Seversky Donets River sandy terrace	50	48°44′N, 39°22′E

the species' occurrence in the territory of Ukraine was checked using the annotated checklist of the aphyllophoroid fungi of Ukraine (Akulov et al., 2003a) and the preliminary checklist of the fungi of Ukraine (Minter & Dudka, 1996). The naming and treatment of Ukrainian mycofloristical regions follows the system of the *Flora of the Ukrainian Fungi* (Heliuta, 1989).

The specimens collected were deposited at the herbarium of the Department of Mycology and Plant Resistance at V.N.Karazin Kharkiv National University - CWU (Myc). Duplicates are kept at the herbarium of the V.L.Komarov Botanical Institute, St. Petersburg - LE.

Results and discussion

The species are listed in alphabetical order. The synonymic names are provided if the species were previously recorded under these names in Ukraine. The nomenclature is followed by information on the ecology and distribution of the species, specimens examined and their original illustrations, and notes on morphology and taxonomy.

Basidiodendron eyrei (Wakef.) Luck-Allen, Can. J. Bot. 41(7): 1034 (1963).

Bourdotia eyrei (Wakef.) Bourdot et Galzin, Hyménomyc. de France (Sceaux): 50 (1928) (Figure 2).

The species develops on rotten deciduous and coniferous wood. Known from Europe (Great Britain, Estonia, Ukraine, Russia), Asia (Azerbaijan, Russia), Africa (Morocco), the Hawaiian Islands, Oceania (Society Islands, Marshall Islands), North America (Canada, USA), and South America (Raitviir, 1967; Wells & Raitviir, 1975).

In Ukraine, *B. eyrei* was previously reported from the Carpathian Forests mycofloristical region (Küffer et al., 2004). Our record is new to the Starobilsk gramineous-meadow steppe mycofloristical region as well as to the whole steppe zone and the plain part of Ukraine.

Specimen examined: Loc. (11), on fallen *Quercus robur* deadwood, 20.10.2010, *CWU (Myc)* 4562.

Basidiodendron rimulentum (Bourdot et Galzin) Luck-Allen, Can. J. Bot. 41(7): 1037 (1963) (Figure 3).

B. rimulentum is a poorly known species known to develop on both coniferous and deciduous wood and that has been reported from France and Norway (Luck-Allen, 1963; Torkelsen, 1997a).

New to Ukraine. Recorded by us in the Starobilsk gramineous-meadow steppe.

Specimen examined: Loc. (11), on a large, fallen *Quercus robur* trunk devoid of bark, 22.10.2010, *CWU (Myc)* 4196.

Exidiopsis galzinii (Bres.) Killerm., in Engler et Prantl, Nat. Pflanzenfam., edn. 2 (Leipzig) 6: 113 (1928) (Figure 4).

Exisdiopsis galzinii develops on rotten deciduous wood. Known from Europe (Great Britain, Germany, France, Ukraine, Armenia), Africa (Morocco), Oceania (New Zealand), North and South America,

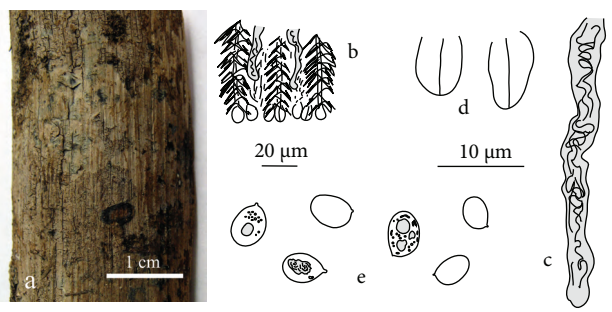

Figure 2. *Basidiodendron eyrei*, CWU (Myc) 4562: **a** - macroscopic view of basidioma; **b** - basidioma in cross section under the light microscope; **c** - gloeocystidium; **d** - young basidia; **e** - basidiospores. The left scale bar is for **b**, the right is for the rest of the elements.

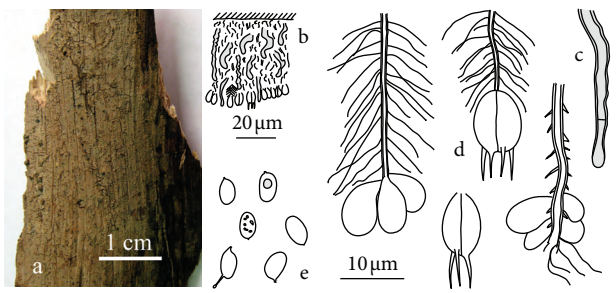

Figure 3. *Basidiodendron rimulentum*, CWU (Myc) 4196: **a** - macroscopic view of basidioma; **b** - basidioma in cross section under the light microscope; **c** - gloeocystidium; **d** - basidia; **e** - basidiospores. The upper scale bar is for **b**, the lower is for the rest of the elements.

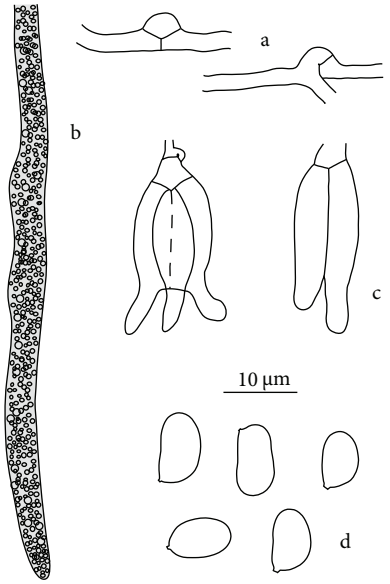

Figure 4. *Exidiopsis galzinii*, CWU (Myc) 4010: **a** - generative hyphae; **b** - gloeocystidium; **c** - basidia; **d** - basidiospores.

and the Hawaiian, Marshall, and Society Islands (Wells & Raitviir, 1975).

In Ukraine, *E. galzinii* has been previously reported from the Carpathian Forests (Raitviir, 1967). Our record is new to the Starobilsk gramineous-meadow steppe, as well as to the whole steppe zone and the plain part of Ukraine.

Specimen examined: Loc. (4), on fallen, strongly rotten deciduous wood, 19.10.2010, *CWU (Myc)* 4010; Loc. (12), on fallen *Populus alba* deadwood, 20.10.2010, *CWU (Myc)* 4564.

Ceratobasidium cornigerum (Bourdot) D.P.Rogers, University of Iowa Studies in Natural History 17(1): 5 (1935) (Figure 5).

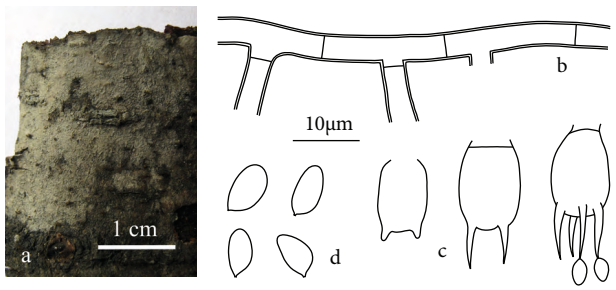

Figure 5. *Ceratobasidium cornigerum*, CWU (Myc) 3775: **a** - macroscopic view of basidioma; **b** - subicular hypha; **c** - basidia; **d** - basidiospores.

The species develops on dead or living trees, shrubs, and herbaceous plants. Capable of forming endomycorrhiza with orchids (Roberts, 1999). Known from Europe (Spain, Portugal, Great Britain, France, Germany, Belgium, Netherlands, Denmark, Norway, Sweden, Estonia, Finland, Switzerland, Italy, Czech Republic, Poland, Belarus), Asia (Sri Lanka, Japan), Azores, Mascarene Islands (Réunion), Oceania (Australia, New Zealand), the Caribbean region (Puerto Rico), North America (USA), and South America (Brazil) (Roberts, 1999; Bernicchia & Gorjón, 2010).

New to Ukraine. Recorded by us in the Starobilsk gramineous-meadow steppe.

Jülich and Stalpers (1980) characterised *C. cornigerum* as a species with narrowly ellipsoid to cylindrical basidiospores having a length-to-width ratio of 1.5-2. The basidiospores of our specimens are broader. They are often ellipsoid or ovoid with a length-to-width ratio of less than 1.5. However, our data agree well with the recent information from Finnish specimens of *C. cornigerum* (Kotiranta & Saarenoksa, 2005).

Specimens examined: Loc. (1), on fallen *Pinus sylvestris* deadwood, 07.10.2007, *CWU (Myc)* 4184; ibid., 17.11.2009, *CWU (Myc)* 4185; ibid., on fallen *Picea abies* deadwood, 07.10.2007, *CWU (Myc)* 4182 (with *Coniophora arida* (Fr.) P. Karst) and *CWU (Myc)* 4183; Loc. (2), on a fallen *Alnus glutinosa* branch, 26.08.2007, *CWU (Myc)* 3775; Loc. (14), on a *Thelephora terrestris* Ehrh. basidioma at the litter level (with *Athelia epiphylla* Pers.), 20.10.2010, *CWU (Myc)* 4497.

Eichleriella deglubens (Berk. et Broome) Lloyd, Mycol. Writ. 4 (letter 45): 7 (1913) (Figure 6).

The species develops on rotten deciduous wood, especially on that of *Salicaceae* representatives (*Populus*, *Salix*). Known from Europe (Great Britain, Germany, Denmark, Norway, Sweden, Finland, Estonia, Belarus, Ukraine, Armenia, Russia), Asia (Russia), Africa (Morocco), and North America (Canada, USA) (Wells & Raitviir, 1980; Torkelsen, 1997a).

New to Ukraine. Recorded by us in the Starobilsk gramineous-meadow steppe.

Eichleriella deglubens is distinguished by the stereoid, thick, effused-reflexed basidiomata with fertile cylindrical spines, and clavate to pyriform tremelloid basidia.

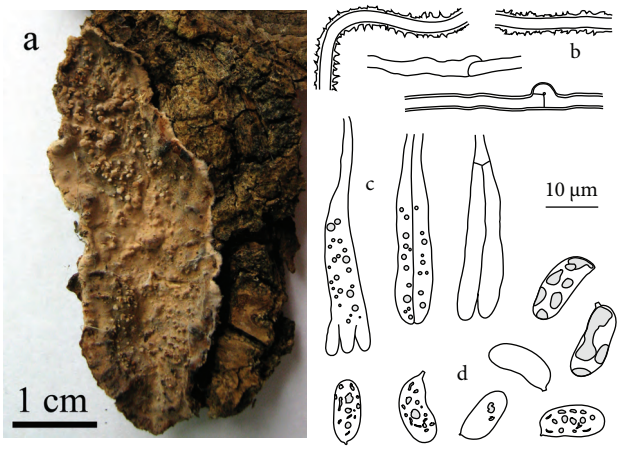

Figure 6. *Eichleriella deglubens*, CWU (Myc) 4226: **a** - macroscopic view of basidioma; **b** - hyphae; **c** - basidia; **d** - basidiospores.

Specimens examined: Loc. (10), on fallen *Populus nigra* trunks and branches, 06.05.2011, *CWU (Myc)* 4735-4738; Loc. (11), on unidentified fallen deciduous deadwood, 20.10.2010, *CWU (Myc)* 4563; Loc. (12), on fallen *Populus nigra* deadwood, 20.10.2010, *CWU (Myc)* 4226.

Exidiopsis griseobrunnea K.Wells et Raitv. subsp. ***griseobrunnea***, Eesti NSV Teaduste Akadeemia Toimetised 15(2): 206 (1966) (Figure 7).

Exidiopsis griseobrunnea was hitherto reported from *Alnus* or *Duschekia* representatives, mainly *D. fruticosa*. The species was earlier known from Europe (Norway) and the Asian part of Russia (Wells & Raitviir, 1977; Torkelsen, 1997a).

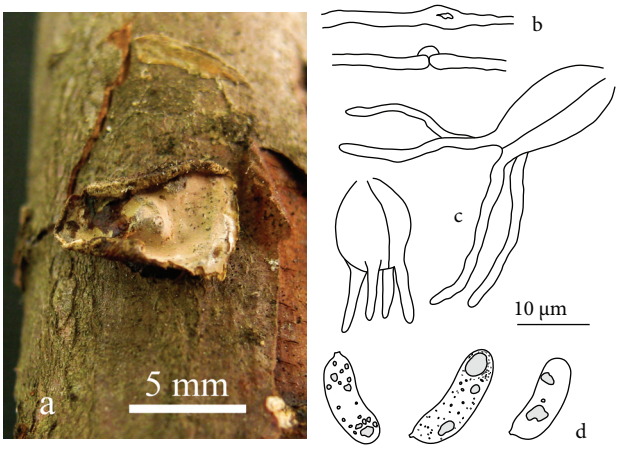

Figure 7. *Exidiopsis griseobrunnea*, CWU (Myc) 4007: **a** - macroscopic view of basidioma; **b** - hyphae; **c** - basidia; **d** - basidiospores.

New to Ukraine. Recorded by us in the Starobilsk gramineous-meadow steppe.

Exidiopsis griseobrunnea is a remarkable species with orbicular, stereoid basidiomata having reflexed margin. Our specimen belongs to the subspecies *griseobrunnea*, as the width of its basidiospores did not exceed 4.2 µm. Cystidia were not observed in our specimen but such a situation was acknowledged for *E. griseobrunnea* by Wells and Raitviir (1977). The substratum of our record is rather unusual.

Specimen examined: Loc. (2), on dry, thin branches both still attached and fallen of *Ulmus glabra* (with *Peniophora lilacea* Bourdot et Galzin), 07.10.2007, *CWU (Myc)* 4007.

Helicogloea lagerheimii Pat., Bull. Soc. mycol. Fr. 8: 121 (1892) (Figure 8).

Helicogloea lagerheimii develops on rotten deciduous or, more rarely, on coniferous wood. Known from Europe (Great Britain, Luxembourg, Austria, Denmark, Norway, Sweden, Finland, Russia), Asia (Azerbaijan), North America (Canada, USA), and Hawaii (Raitviir, 1967; Torkelsen, 1997b; Dämon et al., 2000; Garnier-Delcourt et al., 2010; Kunttu et al., 2010).

New to Ukraine. Recorded by us in the Donetsk gramineous-meadow steppe.

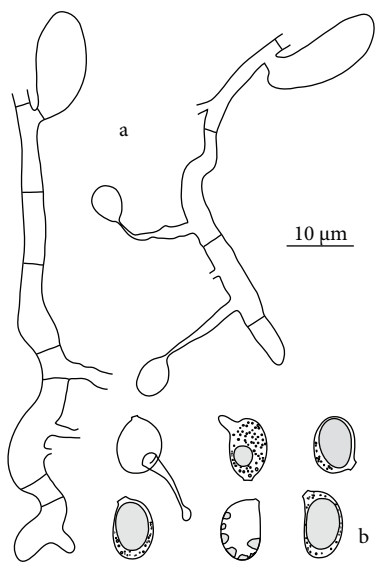

Figure 8. *Helicogloea lagerheimii*, CWU (Myc) 4186: **a** - basidia; **b** - basidiospores.

Helicogloea lagerheimii is characterised by widely effused, gelatinous basidiomata that are semitranslucent with violaceous tint, and sacciform lateral hypobasidia.

Specimens examined: Loc. (6), on the fallen, strongly rotten trunk of an unidentified deciduous tree, 20.10.2009, *CWU (Myc)* 4186; ibid., 19.11.2009, *CWU (Myc)* 4000.

Stypella grilletii (Boud.) P.Roberts, Mycotaxon 69: 223 (1998) (Figure 9).

Stypella grilletii develops on rotten deciduous wood. Known from Europe (Portugal, Denmark, Norway, Sweden, Estonia, Poland), Africa (Cameroon), and Central America (Belize) (Raitviir, 1967; Torkelsen, 1997a; Roberts, 2001, 2008; Lawrynowicz, 2003; Dueñas, 2005).

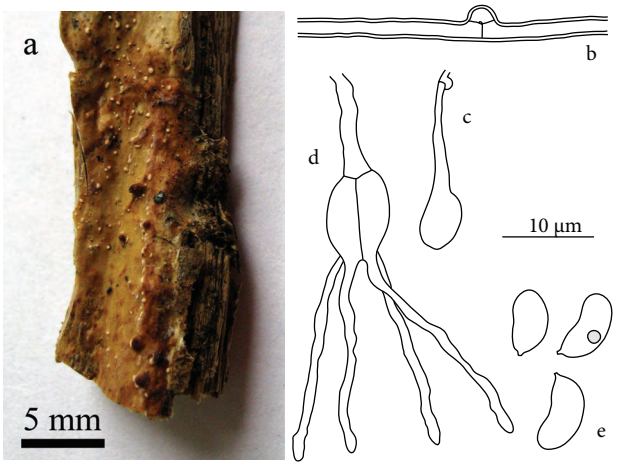

Figure 9. *Stypella grilletii*, CWU (Myc) 4197: **a** - macroscopic view of basidioma; **b** - hypha; **c** - basidiole; **d** - mature stipitate basidium; **e** - basidiospores.

New to Ukraine. Recorded by us in the Starobilsk gramineous-meadow steppe.

Specimen examined: Loc. (13), on a large, fallen, burnt *Betula pendula* trunk, 20.10.2010, *CWU (Myc)* 4197.

Thanatephorus fusisporus (J.Schröt.) Hauerslev et P.Roberts, in Knudsen et Hansen, Nord. J. Bot. 16(2): 218 (1996) (Figure 10).

Thanatephorus fusisporus develops both on rotten deciduous and coniferous wood and also on litter and soil surface. Known from numerous European countries (including Ukraine), Asia (China), and North America (Roberts, 1999; Bernicchia & Gorjón, 2010; Dai, 2011).

The species was previously known in Ukraine due to Roberts (Roberts, 1999). Thus we make the second report on *T. fusisporus* in Ukraine. Our specimen derives from the Donetsk gramineous-meadow steppe.

Thanatephorus fusisporus is a remarkable species with characteristically apically tapered (lemon-shaped) basidiospores. In our specimen they measured 10.2-13.9 × 5.5-8.7 µm.

Specimen examined: Loc. (7), on a fallen *Tilia cordata* trunk (with *Hypochnicium wakefieldiae* (Bres.) J. Erikss.), 20.11.2010, *CWU (Myc)* 4708.

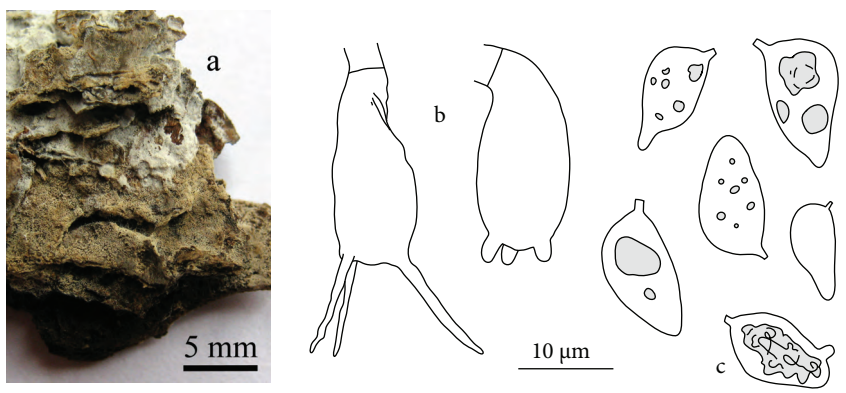

Figure 10. *Thanatephorus fusisporus*, CWU (Myc) 4708: **a** - macroscopic view of basidioma (greyish-ochraceous); **b** - basidia; **c** - basidiospores. The white basidiome is that of *Hypochnicium wakefieldiae*.

Tulasnella albida Bourdot et Galzin, Hyménomyc. de France: 59 (1928) (Figure 11).

Tulasnella albida develops on both rotten coniferous and deciduous wood. Known from Europe (Portugal, Spain, Great Britain, France, Denmark, Finland, Poland) and North America (Canada, USA) (Roberts, 1994; Roberts & Piątek, 2004; de Vries, 2004).

New to Ukraine. Recorded by us in the Starobilsk gramineous-meadow steppe and Donetsk gramineous-meadow steppe.

Specimens examined: Loc. (1), on fallen *Pinus sylvestris* trunks, 06.10.2007, *CWU (Myc) 4004*; ibid., 17.11.2009, *CWU (Myc)* 4171-4173; Loc. (7), on a fallen *Quercus robur* branch, 20.11.2010, *CWU (Myc)* 4709; Loc. (8), on a fallen *Pinus sylvestris* var. *cretacea* branch, 20.11.2010, *CWU (Myc)* 4733.

Tulasnella eichleriana Bres., Annls mycol. 1: 113 (1903) (Figure 12).

Tulasnella eichleriana develops on rotten deciduous or, rarely, on coniferous wood. Known from Europe (Great Britain, France, Denmark, Norway, Finland, Estonia, Poland), Asia (Russia, China), North America (Canada), and South America (Brazil, Argentina) (Raitviir, 1967; Roberts, 1994; Roberts & Hauerslev, 1997).

New to Ukraine. Recorded by us in the Starobilsk gramineous-meadow steppe and Donetsk gramineous-meadow steppe.

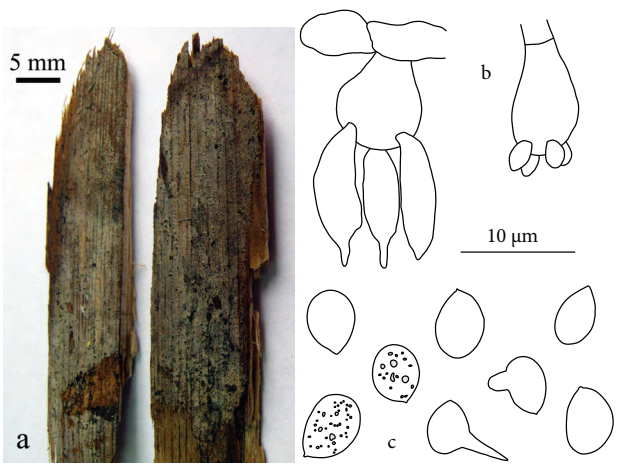

Figure 11. *Tulasnella albida*, CWU (Myc) 4004: **a** - macroscopic view of basidioma; **b** - basidia; **c** - basidiospores.

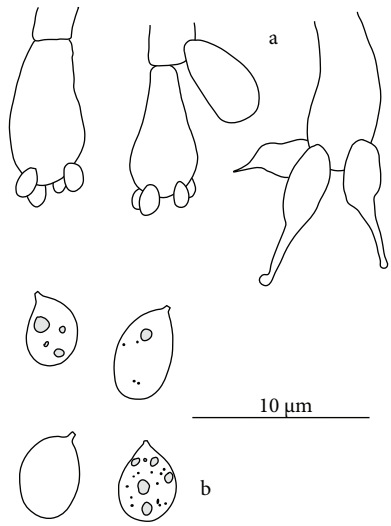

Figure 12. *Tulasnella eichleriana*, CWU (Myc) 4175: **a** - basidia; **b** - basidiospores.

Tulasnella eichleriana is a species with violaceous basidiomata characterised by the absence of clamp-connections and small subglobose to pip-shaped or ellipsoid basidiospores that in our specimens measured 3.9-5.2 × 2.2-3.6 µm.

Specimens examined: Loc. (1), on a fallen *Pinus sylvestris* trunk, 18.11.2009, *CWU (Myc)* 4175; Loc. (2), on a fallen *Betula pendula* trunk, 06.10.2007, *CWU (Myc)* 4174; Loc. (3), on a rotten *Quercus robur* stub (with *Gloiothele lactescens* (Berk.) Hjortstam), 06.10.2007, *CWU (Myc)* 4017; Loc. (7), on a fallen *Quercus robur* branch (with *Radulomyces confluens* (Fr.:Fr.) M.P. Christ.), 20.11.2010, *CWU (Myc)* 4701.

Tulasnella pallida Bres., Annls mycol. 1(2): 122 (1903) (Figure 13).

Tulasnella pallida develops on rotten deciduous and coniferous wood. Known from Europe (Spain, Great Britain, France, Denmark, Sweden, Austria, Poland) and North America (Canada, USA) (Raitviir, 1967; Roberts, 1994).

New to Ukraine. Recorded by us in the Starobilsk gramineous-meadow steppe.

Tulasnella pallida is a remarkable species having basidiospores that are ellipsoid, oblong, or broadly fusiform and that generally tend to be tapered at both ends. Further, the spore width usually exceeds 4 µm.

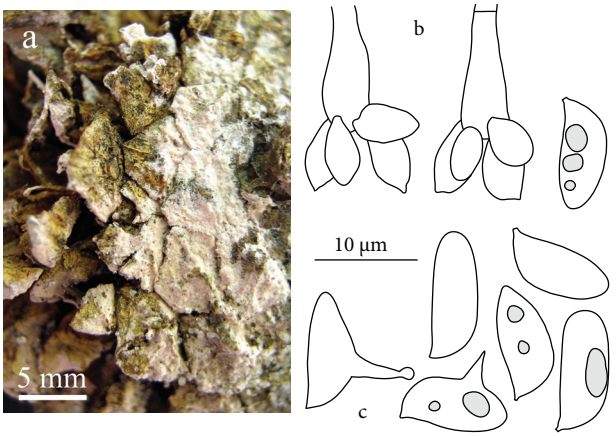

Figure 13. *Tulasnella pallida*, CWU (Myc) 4178: **a** - macroscopic view of basidioma; CWU (Myc) 4006: **b** - basidia; **c** - basidiospores.

Specimens examined: Loc. (1), on a fallen *Pinus sylvestris* branch, 18.11.2009, *CWU (Myc)* 4176; on fallen *Pinus sylvestris* cones, 07.10.2007, *CWU (Myc)* 4006; ibid., 21.10.2009, *CWU (Myc)* 4177; ibid., 18.11.2009, *CWU (Myc)* 4178; Loc. (2), on a fallen, very rotten *Betula pendula* trunk, 20.11.2009, *CWU (Myc)* 4195.

Tulasnella saveloides P.Roberts, Mycol. Res. 97(2): 217 (1993) (Figure 14).

Tulasnella saveloides is known to develop on both rotten deciduous and coniferous wood. The species was comparatively recently described from Great Britain (Roberts, 1993). Known also from Poland (Roberts & Piątek, 2004).

New to Ukraine. Recorded by us in the Donetsk gramineous-meadow steppe.

Tulasnella saveloides is one of the allantoid-spored *Tulasnella* J. Schröt., a group of species that are difficult to separate. Two of our specimens (*CWU (Myc)* 4170 and 4171) were identified as *T. saveloides* because their basidiospores varied in length from 5.6 to 8.4 µm and were distinctly allantoid to angular. This agreed well with data on the species provided by Roberts (1993). Besides these 2 specimens, there was another 1 (*CWU (Myc)* 4565) with generally shorter basidiospores (4.9-6.9 µm long), some of which were shortly allantoid like in *T. tomaculum* P. Roberts. Thus we labelled the species *Tulasnella* cf. *saveloides*.

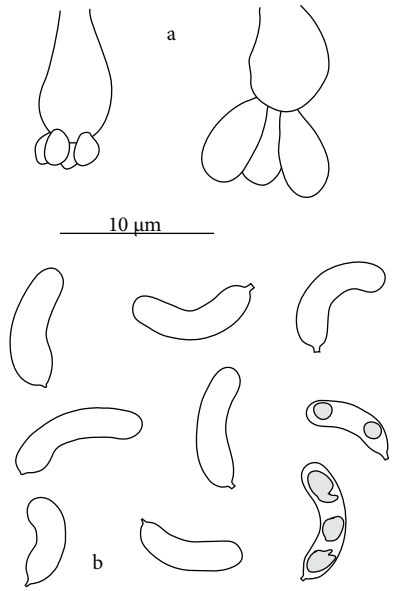

Figure 14. *Tulasnella saveloides*, CWU (Myc) 4711: **a** - basidia; **b** - basidiospores.

Specimens examined: *Tulasnella saveloides*: Loc. (7), on a fallen *Fraxinus excelsior* branch, 20.11.2010, *CWU (Myc)* 4170 and 4171. *Tulasnella* cf. *saveloides*: Loc. (11), on fallen *Quercus robur* deadwood, 20.10.2010, *CWU (Myc)* 4565.

Tulasnella thelephorea (Juel) Juel, Arch. für Botanik 14: 8 (1914) (Figure 15).

Tulasnella thelephorea develops both on rotten deciduous and coniferous wood and is often found in association with other corticioid fungi. Known from Europe (Great Britain, France, Norway, Sweden, Poland) and North America (USA) (Roberts, 1994; Roberts & Piątek, 2004).

New to Ukraine. Recorded by us in the Starobilsk gramineous-meadow steppe and Donetsk gramineous-meadow steppe.

Clamped hyphae and ellipsoid to oblong ventrally depressed basidiospores 5.8-9.6 × 3.4-5.1 µm clearly indicate that our specimens belong to *T. thelephorea.* Moreover, the association of *T. thelephorea* in our specimens with other corticioid fungi (see below) is helpful and remarkable.

Specimens examined: Loc. (2), on a fallen *Populus tremula* trunk in *Coniophora arida* (Fr.) P. Karst. basidioma, 07.10.2007, *CWU (Myc)* 4179; Loc. (8), on rotten *Pinus sylvestris* var. *cretacea* wood in

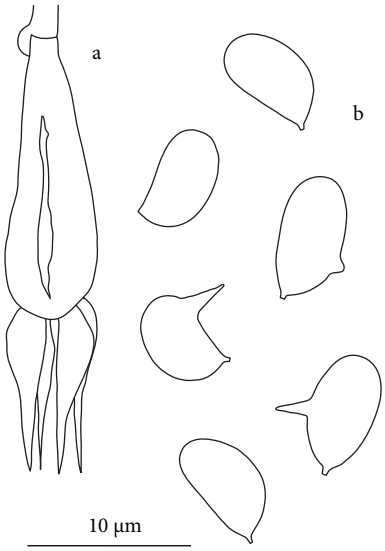

Figure 15. *Tulasnella thelephorea*, CWU (Myc) 4711: **a** - basidia; **b** - basidiospores.

Botryobasidium cf. *candicans* J. Erikss. basidioma and side by side with *Hyphodontia spathulata* (Schrad.) Parmasto basidioma, 20.11.2010, *CWU (Myc)* 4734; Loc. (9), on the large fallen trunk of an unidentified deciduous tree (*Acer negundo* or *Populus alba*) in association with basidioma of old, unidentified corticioid fungus and side by side with *Haplotrichum conspersum* (Link) Hol.-Jech., 21.11.2010, *CWU (Myc)* 4732; Loc. (12), on the large fallen *Populus nigra* trunk side by side with *Cristinia rhenana* Grosse-Brauckm. and *Granulobasidium vellereum* (Ellis et Cragin) Jülich, 22.10.2010, *CWU (Myc)* 4537.

Tulasnella violea (Quél.) Bourdot et Galzin, Bull. Soc. mycol. Fr. 25: 31 (1909) (Figure 16).

Tulasnella violea develops on rotten wood and bark as well as on lichens, litter, and old basidiomata of other aphyllophoroid fungi. Known from Europe (Spain, Great Britain, France, Germany, Denmark, Norway, Sweden, Finland, Poland) and North America (Canada, USA) (Roberts, 1994; Roberts & Hauerslev, 1997).

The status of *T. violea* in Ukraine is not completely clear. This is because there is a specimen of *Tulasnella incarnata* (Johan-Olsen) Juel from the southern coast of Crimea in V.P. Isikov's collection (Minter & Dudka, 1996). According to Roberts (1994), *T. incarnata* (Johan-Olsen) Juel is a nomen dubium and thus it could be attributed to species other

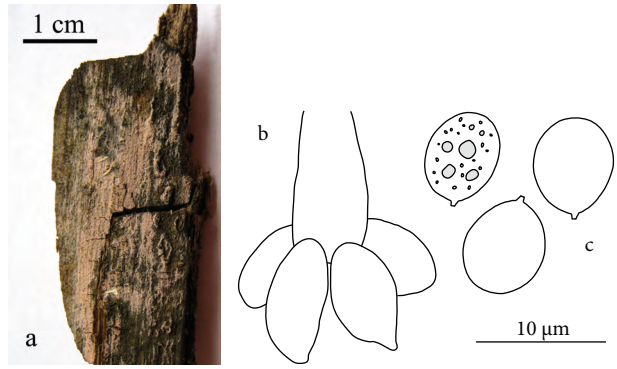

Figure 16. *Tulasnella violea*, CWU (Myc) 4180: **a** - macroscopic view of basidioma; **b** - basidium; **c** - basidiospores.

than *T. violea*. Our record of *T. violea* is new to the Starobilsk gramineous-meadow steppe and Donetsk gramineous-meadow steppe as well as to the whole steppe zone and the plain part of Ukraine.

Tulasnella violea is an easily recognised species due to large globose to broadly ellipsoid basidiospores. According to the literature, the species is not reported to have strict substratum specialisation. Thus the preference of *T. violea* for *Populus* spp. rotten wood (see below) in the area of our investigation is worth noting.

Specimens examined: Loc. (2), on a fallen *Populus tremula* trunk, 18.11.2009, *CWU (Myc)* 4180, 4181; Loc. (5), on a fallen *Populus tremula* trunk, 11.03.2007, *CWU (Myc)* 3607; Loc. (7), on a fallen *Quercus robur* branch, *CWU (Myc)* 4712; Loc. (12), on fallen *Populus alba* deadwood, 20.10.2010, *CWU (Myc)* 4566.

In Ukraine, corticioid fungi with heterobasidia have for a long time remained an extremely poorly known group of organisms. With this study we contribute to the knowledge of these fungi in Ukraine. A total of 15 species of corticioid fungi with heterobasidia were recorded by us in the forests of the middle of the Seversky Donets River basin during 2007-2011. Of them, 11 species are new to Ukraine. They are *Basidiodendron rimulentum*, *Ceratobasidium cornigerum*, *Eichleriella deglubens*, *Exidiopsis griseobrunnea* subsp. *griseobrunnea*, *Helicogloea lagerheimii*, *Stypella grilletii*, *Tulasnella albida*, *T. eichleriana*, *T. pallida*, *T. saveloides*, and

T. thelephorea. Records of *Exidiopsis griseobrunnea* subsp. *griseobrunnea* and *Tulasnella saveloides* are of special interest as both species are still known only from very few European countries. Two species (*Basidiodendron eyrei* and *Exidiopsis galzinii*) are first reports from the Starobilsk gramineous-meadow steppe mycofloristical region. One species, *Tulasnella violea*, is recorded for the first time both from the Starobilsk gramineous-meadow steppe and from the Donetsk gramineous-meadow steppe. In addition, the last 3 species are new to the whole steppe zone and the plain part of Ukraine. The rapid increase in the number of corticioid fungi species with heterobasidia known from Ukraine gives us reason to expect a large number of new records from this fungal group in the future.

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