

Current information on the species composition of xylotrophic basidiomycetes in and around Cherepovets (Russia, Vologda region)

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Abstract. We describe the results of the study of taxonomic composition of xylotrophic basidiomycetes found during one growing season (August-November 2022) in the industrial city of Cherepovets and its surroundings. 30 species were identified, including *Cyathus striatus*, a new species for the Vologda region. Species on wounded and felling substrates were found to be predominant according to the nature of woody substrates. In terms of frequency of occurrence, frequent and very frequent species predominate are *Schizophyllum commune*, *Flammulina velutipes*, *Pleurotus ostreatus*.

1 Introduction

Xylotrophic basidiomycetes are an assemblage of fungi, taxonomically diverse and united by an important limiting factor: the substrate. As an integral component of many ecosystems, through trophic and topical relationships, the higher fungi can serve as an indicator of the degradation of these systems. Under conditions of strong anthropogenic pressure, mycocenoses undergo not only a change in species composition but also a functional restructuring of communities. At the same time, even a slight recreational load can lead to an increase in species in fungal communities [1]. This work on the inventory of fungal communities is the result of the initial stage of the systematic study of xylotrophic mycobiota of the city of Cherepovets and its surroundings.

The city of Cherepovets is an industrial centre in the north-west Russia, home to metallurgical and chemical plants (Fig. 1).

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Fig. 1. The city of Cherepovets is the industrial center of the Vologda region

The city has a total area of 121 square kilometers. The predominant tree species in the city are balsam poplar (*Populus balsamifera*), ash maple (*Acer negundo*), downy birch (*Betula pubescens*) and heart-leaved lime (*Tilia cordifolia*).

Such studies have not previously been carried out in the city of Cherepovets. However, studies of fungal communities under anthropogenic pressure have been carried out for quite a long time. The species diversity of xylotrophic basidiomycetes has been described in the cities of Moscow, Orenburg, Volgograd, Novosibirsk, Krasnoyarsk and many others.

2 Materials and methods

The study of species diversity of xylotrophic fungi was carried out from August to November 2022. The research was conducted by route method on the territory of Cherepovets and surroundings, in different types of tree plantations. Twenty-three survey transects with a total length of 81 km were established. The main disadvantage of this method is the possibility to detect and identify mushrooms only when they form fruiting bodies. The mushrooms were collected according to the generally accepted method [2]. The mushrooms were counted according to the method of V.A. Mukhin [3]. A unit of substrate with basidiomas of given species was taken as an accounting unit when estimating the abundance of the species. Fungi were identified at the Department of Biology, using the equipment regional shared services center of Cherepovets State University. Identification of detected fruiting bodies was performed according to Russian-language identifiers [4, 5, 6]. The systematic position of species and their names are given according to the “*Index Fungorum*” electronic database [7].

3 Results and discussion

The results of this study revealed 30 species of xylotrophic basidiomycetes, one of them is being reported in the Vologda region for the first time. Each species are annotated with information on substrate and frequency of occurrence.

Agaricaceae

Cyathus striatus Willd. - Fluted bird's nest. Surroundings of Cherepovets, lat: 59.034434, long: 37.901547. On a heavily decomposed and buried wood. The species are

listed for the first time in the Vologda Region. The specimen is taken in the herbarium collection. This is the only finding. Not edible.

Auriculariaceae

Exidia nigricans (With.) P. Roberts – Exidia. The city of Cherepovets. On a dead wood of *Populus* sp. Frequently. Not edible.

Auriscalpiaceae

Artomyces pyxidatus (Pers.) Jülich - Crown-tipped coral. Surroundings of Cherepovets. On a dead wood. Frequently. Not edible.

Bolbitiaceae

Bolbitius tibubans (Bull.) Fr - Yellow fieldcap. Surroundings of Cherepovets. On a badly decomposed and buried wood. Rare. Not edible.

Bondarzewiaceae

Heterobasidion araucariae P.K. Buchanan - Heterobasidion annosum. The city of Cherepovets. On a wound substrate of *Populus* sp. Joint occupation of the substrate with *Fomes fomentarius* has been noted. Frequently. Not edible.

Dacrymycetaceae

Calocera cornea (Batsch) Fr – The city of Cherepovets, lat: 59.083256, long: 37.932971 on a *Populus* sp. wound substrate. The only finding. Not edible.

Fomitopsidaceae

Brunneoporus malicola (Berk. & M.A. Curtis) Audet – *Trametes gibbosa*. The city of Cherepovets and the surrounding area. On a logging substrates. Frequently. Not edible.

Fomitopsis betulina (Bull.) B.K. Cui, M.L. Han & Y.C. Dai – Birch polypore. The city of Cherepovets and the surrounding area. On a *Betula* sp. wound substrata. Frequently. Not edible.

Fomitopsis pinicola (Sw.) P. Karst. – Red-Belted Conk. The city of Cherepovets and the surrounding area. On a logging and wound substrates. Frequently. Not edible.

Gloeophyllaceae

Gloeophyllum sepiarium (Wulfen) P. Karst - The city of Cherepovets and the surrounding area. On a felling and dead wood substrates. Frequently. Not edible.

Hymenochaetaceae

Inonotus obliquus (Fr.) Pilat – Chaga mushroom. The city of Cherepovets. the only find on a *Betula* sp. wound substratum, lat: 59.138215, long: 37.922107. Suburbs of the city. Rare. On a *Betula* sp. substrata, of varying degrees of damage.

Phellinus igniarius (L.) Quel. – Willow Bracket fungus. Surroundings of Cherepovets. On a wound substrate of *Betula* sp. and *Populus* sp. Rare. Not edible.

Trichaptum bifforme (Fr.) Ryvarden – Violet-toothed polypore. The city of Cherepovets and the surrounding area. On a various wood substrates. Very common. Not edible.

Laetiporaceae

Laetiporus sulphureus (Bull.) Murrill – Chicken of the woods. The city of Cherepovets. On a wound substrate of *Populus* sp. Rare. Edible.

Lycoperdaceae

Apioperdon pyriforme (Schaeff.) Vizzini – Pear-shaped puffbal. Surroundings of Cherepovets. On a wound substrates. Frequently. Not edible.

Lycoperdon perlatum Pers., Observ – Common puffball. Surroundings of Cherepovets. On a dead wood substrate. Rare. Not edible.

Oxyporaceae

Oxyporus populinus (Schumach.) Donk – Mossy Maple Polypore. Surroundings of Cherepovets. On a *Populus* sp. logging substrate. Rare. Not edible.

Phanerochaetaceae

Bjerkandera adusta (Willd.) P. Karst. - Smoky polypore. Surroundings of Cherepovets. On a *Populus* sp. logging substrate. Frequently. Not edible.

Bjerkandera fumosa (Pers.) P. Karst. - Big smoky bracket. The city of Cherepovets and the surrounding area. On a various wound and felling substrates. Frequently. Not edible.

Pleurotaceae

Pleurotus cornucopiae (Paulet) Quel – Branched Oyster mushroom. Surroundings of Cherepovets. On a dead wood substrate. Rare. Edible.

Pleurotus ostreatus (Jacq.) P. Kumm – Oyster mushroom. The city of Cherepovets. On *Populus* sp. wound substrates. Frequent. Edible. Joint occupation of the substrate with *Pholiota populnea* has been noted.

Polyporaceae

Daedaleopsis tricolor (Bull.) Bondartsev & Singer - Surroundings of Cherepovets. On a deadwood and wound substrates. Rare. Not edible.

Fomes fomentarius (L.) Fr – Tinder polypore. The city of Cherepovets and the surrounding area. On a woody substrates of varying degrees of damage. Often. Not edible.

Ganoderma applanatum (Pers.) Pat. – Artist's conk. The city of Cherepovets and the surrounding area. On a logging substrates. Frequently. Not edible.

Lentinus brumalis (Pers.) Zmitr – Winter polypore. The city of Cherepovets. On a dead wood substrate. Rare. Not edible.

Psathyrellaceae

Coprinellus micaceus (Bull.) – Shiny cap. The city of Cherepovets and the surrounding area. On a logging substrates. Often. Not edible.

Physalaciaceae

Armillaria gallica Marxm. & Romagn – Honey mushroom. Surroundings of Cherepovets. On a dead wood substrate. Frequently. Edible.

Flammulina velutipes (Curtis) Singer – Velvet foot. The city of Cherepovets and the surrounding area. On a wound and felling substrates. Frequent. Edible.

Schizophyllaceae

Schizophyllum commune Fr. – Common split gill. The city of Cherepovets and the surrounding area. On a felling and dead wood substrates. Often. Not edible.

Strophariaceae

Pholiota populnea (Pers.) Kuyper & Tjall.-Beuk – The city of Cherepovets. On a living and wound substrates *Populus* sp. Often. Not edible.

During the survey 30 species of xylotrophic basidiomycetes belonging to 27 genera and 19 families were identified. The Polyporaceae family is the most represented by the number of species - 4 species, Hymenochaetaceae and Fomitopsidaceae - 3 species each. The remaining 16 families are represented by 1 to 2 species.

12 species (40% of the total number of species detected) of xylotrophic basidiomycetes are found in urban woody plantations and surroundings, 11 species (37%) are found only in urban surroundings and 7 species (23%) are found only in cities.

By nature of woody substrates, found species on a wound and chipping substrates predominate (67%): *Oxyporus populinus*, *Heterobasidion araucariae*, *Fomitopsis pinicola*, *Brunneoporus malicola*, *Fomitopsis betulina*, *Gloeophyllum sepiarium*, *Inonotus obliquus*, *Phellinus igniarius*, *Laetiporus sulphureus*, *Apioperdon pyriforme*, *Bjerkandera adusta*, *Bjerkandera fumosa* *Pleurotus ostreatus*, *Daedaleopsis tricolor* etc.

Found species on a dead wood and deadwood account for 20% of the total number of species detected: *Exidia nigricans*, *Artomyces pyxidatus*, *Lycoperdon perlatum*, *Pleurotus cornucopiae*, *Lentinus brumalis*. *Armillaria gallica*. *Pholiota populnea* is found on viable, growing trees, *Trichaptum bifforme* grows on a various substrates, *Bolbitius tibubans* grows on a heavily decomposed and buried wood, and *Fomes fomentarius* grows on a woody substrates of various degrees of damage.

In terms of frequency of occurrence, frequent species predominate (43% of all detections): *Schizophyllum commune*, *Flammulina velutipes*, *Pleurotus ostreatus*. The share of rarely and infrequently detected basidiomycetes is 30% and 20%: *Oxyporus populinus*, *Laetiporus sulphureus*, *Bolbitius tibubans*

Single findings include: *Calocera cornea*, found on a wound substrate of *Populus* sp. and *Cyathus striatus* on a heavily decomposed and buried wood (Fig. 2). The Fluted bird's nest (*Cyathus striatus*) [8] is listed for the first time for the Vologda region.



Fig. 2. The Fluted bird's nest (*Cyathus striatus*)

Thus, at the initial stage of mycological research an annotated list of mycobiota of the region was compiled, which will serve as a basis for the identification of rare and invasive species in the future [9]. New species for mycoflora *Cyathus striatus* was found and relatively low species diversity of xylotrophic basidiomycetes was noted in general. At the next step, regionally adapted scales should be used to assess mycobiota synanthropization (ecosystem changes, species invasions, tree plantation introductions). The inventory of species composition as a strategy for controlling structural changes in mycobiota [10] should be continued. At the same time, the applied value of studying xylotrophic fungi in urban environments may lie in the assessment of tree plantation crashworthiness [11].

28 of 30 detected species of xylotrophic basidiomycetes are found in mycological descriptions of biota of other urbanized areas. The occurrence of mowed trout is not typical in the centre of the Industrial district of Cherepovets, that indicates the tolerance

of this species to anthropogenic impact and the action of other limiting factors in other cities.

4 Conclusion

In the course of researches, 30 species of xylotrophic basidiomycetes belonging to 27 kinds and 19 families were identified. The most represented families are Polyporaceae - 4 species, Hymenochaetaceae and Fomitopsidaceae - 3 species each. The remaining 16 families are represented by 1 - 2 species;

Ecological - trophic group of wound parasites is the most represented one - 67%, saprotrophs - 20%, the least number of species of obligate parasites - 13%.

The index of mycobiota detection was 18.9%, that indicates a low degree of study of the species composition of xylotrophic fungi

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