

FUNGARIUM OF YUGRA STATE UNIVERSITY

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The paper describes the content, structure and the activity of the reference collection of fungi (FUNGARIUM) accumulated during 2007-2015 in the Yugra State University.

The Fungarium is a systematic reference collection of fungi organized as a part of the Biological Collection of Yugra State University (BC YSU). The collection is registered in Index Herbariorum under the acronym **YSU** (the Fungarium collection's acronym is **YSU-F** accordingly). The BC YSU does not represent an official subdivision within the university and is currently a project of the Environmental Dynamics and global Climate Change department (EDCC).

The fungarium collection was started as part of the biodiversity study program of EDCC YSU and a PhD work of one of its staff members. It was later supplemented by collections of several mycologists working in the area.

The main purpose of the Fungarium is to initiate and facilitate systematic studies of fungi of the taiga zone of Western Siberia. It also serves for education and can be used by specialists in different applied disciplines.

The collection is gradually growing and is open to prospective users such as taxonomists interested in work with a particular group of fungi represented in the region. To this, an online database of collection was launched in 2016 in Specify 7 software (available at <http://bio.ugrasu.ru/>).

Storage. The majority of specimens in the Fungarium are stored as dried specimens packed in Ziploc bags and kraft-paper envelopes supplied with a label. Envelopes are organized in cardboard boxes in systematic (grouping in Orders, Classes, Families, and Genera) and alphabetical (within a taxon) orders. The collection is located in the laboratory of the Shapsha field station of EDCC YSU (in Shapsha village, 30 km E from Khanty-Mansiysk).

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Database. The database of YSU Fungarium is developed using Specify 6 software and its web version, Specify 7 (available at <http://bio.ugrasu.ru/>) hosted on the Yugra State University server. The online database has open access through a guest username (*ugrabiodb*) and password (*ugrabiodb*). Currently the database holds 3421 collection objects, 9189 preparations, and 1 Type specimen (isotype). Preparations stored in the database include: dried culture – 2, dried specimen – 2953, graphical drawing – 111, macrophotographs *in situ* – 806, macrophotographs *in photo-studio* – 2190, measuring data – 313,

microphoto under stereo lens – 1125, microphoto under transmitted light microscope – 1614, photo of habitat – 75.

Database elements: Catalog number (5 digit not increment), Accession number (string), Alternative catalog number (string), Cataloger [linked to Agent table], Cataloged date, Taxon [linked to Taxon tree], Qualifier (pick list), Addendum (pick list), Determined date, Determiner [Agent table], Type status (pick list), Morphological description (text), Collector number (string), Method (pick list), Date, Locality [Locality name, Georeference + linked to Geography tree], Vegetation type (text), Collectors [Agent table], Substrate (pick list), Substrate remarks (text), Host plant [linked to Taxon tree], Preparations [linked to Preparation table], Attachments [linked to Attachment table and attached files], Collection object citations [linked to Reference work table].

Collectors and determiners. The majority of specimens in the collection were collected by two persons (Filippova N., Bulyonkova T.). Identification was performed by a total of 17 specialists through direct work in the fungarium (Filippova N., Bulyonkova T. – a total of 3202 specimens), in other laboratories with loaned material (Zmitrovich I. – 50 specimens, Rebriev Yu. – 33, Novozhilov Yu. – 9, Malysheva V. – 9, Morozova O. – 1 specimens), or making comments on identification through Internet mycological forums (Baral H. – 26 specimens, and others).

Sampling methods. Specimens in the collection are accumulated by direct observation and extraction of fruiting structures of fungi. There are two major approaches: observation and collection of fruiting structures of larger fungi (macromycetes) by naked eye, and lens observations of substrates followed by extraction of smaller fruiting structures of discomycetes, hyphomycetes, pyrenomycetes etc. A common procedure of collecting, describing and preserving specimens recommended for inventories of macrofungi is used. Fruitbodies of larger fungi are photographed and their growing conditions are described in the field, extracted from the substrate and packed in aluminium foil to be processed in the laboratory later on the day of collection. Macro-morphological features of sporocarps are described according to schemes required for specific systematic groups. Spore prints are obtained when the number of sporocarps is sufficient. Sporocarps are dried after processing in a drying oven under 50 °C and stored as dry specimens in Ziploc bags and kraft-paper envelopes.

Microscopical characters are studied using a Zeiss Stemi-2000C stereomicroscope (providing a magnification from 6x to 50x), and Zeiss Axiostar transmitted light microscope (50x to 1000x) with Achromat 5/0.12, 10/0.25, 40/0.65 (dry) and Achromat 100/1.25 (oil immersion) lenses. Microphotographs are obtained under transmitted light microscopes using a AxioCam ERc5c digital camera and processed with AxioVision software. Measurements made using AxioVision software. The preparations are made from vital or dried specimens soaked in tap water, ammonia, or KOH (10%), with dyes when necessary (Melzer solution and Congo red).

Fungarium library: a collection of about 500 mycological publications is available including textbooks, systematic monographs, methodological manuals, regional floras, checklists, conference proceedings, etc. (in Russian and English).

Taxonomic coverage: the total number of species represented – 864, genera represented – 365, families represented – 145. The majority of the specimens in the YSU Fungarium belong to the Basidiomycota (about 80%), less to Ascomycota (20%) with few specimens of Zygomycota and Myxomycota. The largest classes are the Agaricomycetes (2612 specimens), Leotiomycetes (293 specimens), and Pezizomycetes (108 specimens); the other 10 classes are represented by less than 50 specimens. A total of 41 orders are represented, with Agaricales (2160 specimen), Helotiales (250 specimen), Russulales (213 specimen) and Boletales (114 specimen) constituting about 80% of the collection.

The Fungarium of the YSU represents 122 families, of which 15% and 12 % belong to the families Cortinariaceae and Strophariaceae, respectively. They are followed by the Mycenaceae (7%), Tricholomataceae (6%), Russulaceae (6%), Agaricaceae, Inocybaceae, Omphalotaceae (each with 3%) with the rest of families representing less than 2%. The collection includes 346 genera, notably *Cortinarius* (549 specimens), *Mycena* (187 specimens), *Galerina* (159 specimens) and *Lactarius* (105 specimens). Below is an alphabetical list of genera with numbers of specimens in each: *Acrospermum* – 3; *Agaricus* – 7; *Agrocybe* – 17; *Alborticha* – 1; *Albotricha* – 1; *Alloclavaria* – 1; *Allophylaria* – 6; *Alternaria* – 1; *Amanita* – 43; *Ampulloclitocybe* – 8; *Antennularia* – 1; *Antrodia* – 2; *Apiospora* – 1; *Arcyria* – 2; *Armillaria* – 6; *Arrhenia* – 27; *Arthopyrenia* – 1; *Arthrinium* – 1; *Artomyces* – 6; *Ascobolus* – 1; *Ascocoryne* – 9; *Asterophora* – 2; *Athelia* – 3; *Auriscalpium* – 3; *Badhamia* – 2; *Baeospora* – 1; *Belonidium* – 1; *Beltrania* – 1; *Bisporella* – 1; *Bolbitius* – 2; *Boletus* – 10; *Botryosphaeria* – 1; *Botryotinia* – 1; *Botrytis* – 6; *Bovista* – 3; *Brunnipila* – 1; *Calicium* – 1; *Calloria* – 1; *Calocera* – 5; *Calvatia* – 2; *Calycellina* – 5; *Calyptella* – 1; *Cantharellula* – 4; *Cantharellus* – 3; *Capitotricha* – 1; *Cenangium* – 1; *Cenococcum* – 2; *Ceraceomyces* – 2; *Ceratiomyxa* – 2; *Chalara* – 3; *Chalciporus* – 5; *Chlorociboria* – 2; *Chroogomphus* – 10; *Chrysomyxa* – 1; *Ciboria* – 10; *Ciliolarina* – 1; *Cistella* – 5; *Cladosporium* – 17; *Clavaria* – 6; *Clavariadelphus* – 5; *Clavulina* – 1; *Clavulinopsis* – 6; *Clitocybe* – 61; *Clitopilus* – 2; *Coccomyces* – 5; *Collybia* – 13; *Colpoma* – 5; *Coltricia* – 1; *Coniophora* – 3; *Conocybe* – 14; *Conohypha* – 1; *Conoplea* – 1; *Coprinellus* – 7; *Coprinopsis* – 3; *Coprinus* – 2; *Cordyceps* – 4; *Coronellaria* – 5; *Cortinacius* – 1; *Cortinarius* – 549; *Crepidotus* – 10; *Cribraria* – 2; *Crocicreas* – 4; *Crustoderma* – 1; *Cryptosporium* – 1; *Cudonia* – 5; *Cuphophyllus* – 1; *Cyathicula* – 4; *Cyathus* – 1; *Cystoderma* – 22; *Cystodermella* – 15; *Cystolepiota* – 1; *Cytospora* – 1; *Dacrymyces* – 21; *Dactylospora* – 1; *Daldinia* – 1; *Dasyscyphella* – 3; *Dasyscyphus* – 1; *Dendrocollybia* – 1; *Dendrodochium* – 1; *Dendrophoma* – 1; *Dendryphion* – 1; *Dennisiodiscus* – 1; *Diderma* – 1; *Discinella* – 5; *Dothistroma* – 1; *Durella* – 1; *Elaphomyces* – 1; *Endogone* – 2; *Entoloma* – 81; *Epicoccum* – 1; *Eriopezia* – 1; *Erynia* – 1; *Exidia* – 5; *Exobasidium* – 4; *Flammulaster* – 16; *Flammulina* – 9; *Fuligo* – 4; *Fuscolachnum* – 4; *Galerella* – 1; *Galerina* – 159; *Gamundia* – 3; *Gelasinospora* – 1; *Geniculosporium* – 1; *Geoglossum* – 2; *Gibbera* – 5; *Gloeophyllum* – 1; *Gnomoniella* – 1; *Gnomoniopsis* – 4; *Godronia* – 7; *Gomphidius* – 9; *Gomphus* – 2; *Gorgoniceps* – 3; *Grifola* – 1; *Gymnopilus* – 18; *Gymnopus* – 71; *Gyromitra* – 17; *Hamatocanthoscypha* – 2; *Hapalopilus* – 1; *Hebeloma* – 43; *Helicoon* – 3; *Helminthosphaeria* – 1; *Helotium* – 2; *Helvella* – 12; *Hemimycena* – 11; *Hemipholiota* – 1; *Hericium* – 7;

Hohenbuehelia – 3; *Humaria* – 4; *Hyalopeziza* – 6; *Hyaloscypha* – 19; *Hydnum* – 8; *Hygrocybe* – 15; *Hygrophorus* – 16; *Hymenochaete* – 2; *Hymenopellis* – 1; *Hymenoscyphus* – 9; *Hyphoderma* – 2; *Hyphodontia* – 5; *Hypholoma* – 71; *Hypochnicium* – 4; *Hypocrea* – 2; *Hypoderma* – 2; *Hypomyces* – 1; *Hypsizygus* – 6; *Hysteronaevia* – 4; *Hysteropezizella* – 3; *Inocybe* – 59; *Jaapia* – 2; *Kriegeriella* – 2; *Kuehneromyces* – 15; *Laccaria* – 28; *Lachnellula* – 1; *Lachnum* – 16; *Lacrymaria* – 2; *Lactarius* – 105; *Laetiporus* – 2; *Lasiobolus* – 1; *Lasiosphaeria* – 3; *Leccinum* – 37; *Lentaria* – 1; *Lentinellus* – 7; *Lentinus* – 5; *Leotia* – 4; *Lepiota* – 9; *Lepista* – 2; *Leptosphaeria* – 8; *Leptostroma* – 3; *Leucovibrisea* – 1; *Libertella* – 1; *Lichenomphalia* – 13; *Limacella* – 2; *Lophodermium* – 15; *Lycoperdon* – 45; *Lyophyllum* – 1; *Macrocystidia* – 1; *Macrotiphula* – 10; *Marasmius* – 13; *Megacollybia* – 3; *Melanoleuca* – 9; *Micropeziza* – 2; *Microstoma* – 1; *Microthyrium* – 2; *Moellerodiscus* – 1; *Mollisia* – 34; *Mollisia* – 1; *Monilinia* – 4; *Morchella* – 4; *Mucronella* – 1; *Mycena* – 187; *Mycenastrum* – 1; *Mycenella* – 4; *Mycetinis* – 2; *Mycosphaerella* – 11; *Myriosclerotinia* – 5; *Myxomphalia* – 3; *Naeviopsis* – 1; *Neolentinus* – 9; *Nidularia* – 1; *Nimbomollisia* – 6; *Niptera* – 7; *Odontotrema* – 3; *Ombrophila* – 3; *Omphaliaster* – 12; *Omphalina* – 5; *Ophiocordyceps* – 2; *Ophiognomonina* – 2; *Ossicaulis* – 5; *Otidea* – 10; *Panellus* – 4; *Panus* – 1; *Parorbiliopsis* – 1; *Paxillus* – 6; *Penicillium* – 2; *Peniophorella* – 3; *Periconia* – 2; *Pezicula* – 3; *Peziza* – 20; *Pezoloma* – 5; *Phaeogalera* – 3; *Phaeohelotium* – 2; *Phaeomarasmius* – 1; *Phanerochaete* – 1; *Phialina* – 1; *Phlebiella* – 3; *Phliota* – 51; *Phragmidium* – 1; *Phyllotopsis* – 1; *Physalospora* – 9; *Physarum* – 2; *Piloderma* – 4; *Pirottaea* – 1; *Pisolithus* – 1; *Pleospora* – 2; *Pleurotus* – 19; *Plicaria* – 2; *Plicaturopsis* – 2; *Pluteus* – 48; *Polyporus* – 5; *Postia* – 1; *Protoventuria* – 3; *Psathyrella* – 37; *Pseudoclitocybe* – 4; *Pseudohydnum* – 1; *Pseudoomphalina* – 4; *Pseudophacidium* – 1; *Pseudoplectania* – 15; *Pseudotomentella* – 2; *Psilachnum* – 3; *Psilocybe* – 27; *Pterula* – 1; *Puccinia* – 2; *Pyronema* – 2; *Pyropyxis* – 2; *Ramaria* – 13; *Ramariopsis* – 11; *Resupinatus* – 2; *Rhizina* – 1; *Rhizoctonia* – 1; *Rhodocollybia* – 15; *Rhodocybe* – 1; *Rhodotarzetta* – 2; *Rhytisma* – 3; *Rickenella* – 6; *Roeslerina* – 2; *Roridomyces* – 4; *Royoporus* – 1; *Rugosomyces* – 1; *Russula* – 87; *Rutstroemia* – 6; *Sarcoleotia* – 1; *Sarcomyxa* – 1; *Sarcosoma* – 3; *Schizophyllum* – 3; *Scleroderma* – 1; *Sclerotinia* – 1; *Scopinella* – 3; *Scutellinia* – 7; *Scutomollisia* – 2; *Setoscypha* – 1; *Simocybe* – 5; *Sistotrema* – 1; *Sistotremastrum* – 7; *Spathularia* – 5; *Sphaerobolus* – 1; *Sphagnomphalia* – 5; *Sphagnurus* – 8; *Sporomega* – 2; *Stagonospora* – 1; *Stammaria* – 2; *Stemonitis* – 1; *Stereum* – 1; *Stomiopeltis* – 1; *Strobilurus* – 10; *Stropharia* – 6; *Stypella* – 2; *Subulicystidium* – 1; *Suillus* – 29; *Symphytocarpus* – 3; *Talaromyces* – 1; *Tarzetta* – 1; *Tephroclybe* – 6; *Thelephora* – 6; *Tomentella* – 1; *Trechispora* – 1; *Trichia* – 2; *Trichodelitschia* – 1; *Trichoglossum* – 1; *Tricholoma* – 25; *Tricholomopsis* – 8; *Trichophaeopsis* – 1; *Trichothyria* – 3; *Tubaria* – 13; *Tubulicrinis* – 3; *Tylopilus* – 2; *Tylospora* – 1; *Typhula* – 2; *Vascellum* – 1; *Venturia* – 6; *Venturiocistella* – 1; *Verticillium* – 1; *Volvariella* – 1; *Wentomyces* – 2; *Xenasmatella* – 1; *Xeromphalina* – 18; *Xylaria* – 1.

Spatial coverage. Specimens deposited in the YSU Fungarium were collected mainly in the taiga zone of Western Siberia (Russia). The majority of specimens were collected in Khanty-Mansiyskiy Autonomous Okrug (3439 specimen), 11 specimens from Yamalo-Nenetskiy Autonomous Okrug, while the rest four regions represented by a few specimens (Krasnoyarskiy Kray, Novosibirskaya Oblast', Altay

Republic, Tyumenskaya Oblast'). Within administrative borders of Khanty-Mansiyskiy Autonomous Okrug, 6 districts are represented (Khanty-Mansiyskiy district – 3421 specimens, Sovetskiy district – 7, Berezovskiy district – 6, Nefteyuganskiy district – 3, Surgutskiy district – 2, Beloyarskiy district – 1). The two main sampling areas are located in the vicinities of Khanty-Mansiysk (60N 68E) and the nearby Shapsha (1959 specimen) and Mukhrino field stations of the YSU (1459 specimens).

Major vegetation types covered by the collection are coniferous dark taiga forests and their deciduous derivatives (more than half of the collection), and ombrotrophic raised bogs (comprising about 30% of the collection). Exact classification of vegetation types is not managed in the database, where "vegetation" field is temporarily descriptive; eventually it will be worked out. Coniferous forests (dominated by *Pinus sibirica*, *Picea obovata*, and *Abies sibirica*) and their deciduous successions (*Populus tremula*, *Betula pubescens*) are characteristic for the taiga zone of Western Siberia. The region is highly bogged, with ombrotrophic peatlands covering about 50% of the area. Other major landscapes include floodplains of big rivers, where meadow and floodplain shrub vegetation develops.

Temporal coverage: the collection started in 2007 and has been gradually growing since. The bulk of specimens was collected during 2010-2015 (3324 specimens), with varying sampling intensity: 2010 – 305 specimen, 2011 – 75, 2012 – 596, 2013 – 282, 2014 – 488, 2015 – 1578 specimens. Within the vegetation season (which lasts about 5 months in the area, from May until October), August and September yielded most specimens (1082 and 1106 respectively), followed by July (649), June (538), May (55), and October (14).

Reference works: 35% of the collection specimens have been cited in one to four publications. A total of 96 publications were prepared, including journal papers (totally 13), descriptions in the Red Book of Khanty-Mansiyskiy Autonomous Okrug (4 species) and publications of specimens in Internet mycological forums (AscoFrance, MushroomObserver, and others).

Loans and gifts: about 400 specimens were loaned or given away as gifts to specialists during the existence of the Fungarium. The total number of loan agents (borrowers or donors) amounted to 14, with countries represented as follows: Russia (374), China (19), USA (10), Germany (8), and the Netherlands (1). The major collections to which the specimens were donated include the Herbarium of Komarov Botanical Institute, Saint-Petersburg (LE) – 263 specimens; The Fungarium of the University of Illinois, USA – 3 specimens; The Herbarium of the University of Leipzig (LZ) – 1 holotype specimen.

Literature

The layout of this paper was borrowed from a paper of Espinosa M. and Martínez J., Herbarium of Vascular Plants Collection of the University of Extremadura (Spain). PhytoKeys. 2013. V. 25. P. 1–13.