УДК 582.28:574.472

WOOD DECAY COMMUNITY OF RAISED BOGS IN WEST SIBERIA

Filippova N.V.[1),]Zmitrovich I.V.[2)]

[1)]Yugra State University, Khanty-Mansiysk, Russia
[2)]Komarov Botanical Institute, Saint-Petersburg, Russia

filippova.courlee.nina@gmail.com

Inventory of wood decay community of raised bogs was started in taiga zone of West Siberia (near the Khanty-Mansiysk town). We examined dead wood of Pinus sylvestris *which creates substantial biomass in treed* Pine *– dwarfshrubs –* Sphagnum *ombrotrophic communities. 49 species of larger fungi from five groups (corticioid, polyporoid, heterobasidiomycetous, agaricoid, clavarioid basidiomycetes, and discomycetes) were registered by direct observation of fruit bodies. Inhabited substrates were: partly buried in sphagnum decorticated logs, stumps, butts of standing logs, and bark. Only one publication about wood decay fungi on* Pinus sylvestris *in the region was previously concerned with bog wood, species lists of two studies only partly coincide. 13 identified species represent new records for the region, three of them with a few collections in Russia. Two xerotolerant species were registered regularly on bog wood (*Amyloporia xantha, Sistotremastrum suecicum*). Some species represented by several collections:* Coniophora arida, Peniophorella praetermissa, Phlebiella pseudotsugae, Piloderma byssinum, and Dacrymyces stillatus*. Major part of the list (43 species) were collected once and twice.*

Large part of species from the list are adapted for decomposition of wide spectrum of coniferous and deciduous trees and also reported on mosses, and miscellaneous substrates of soil litter. Six species cause brown rot type, 23 species are white rotters, discomycetes cause poor decomposition (soft rot), and six corticioid species form mycorrhiza with Pine*. Other authors have showed ability of wood decomposers to cause weight loss of* Sphagnum *peat, propagules of* Antrodia *and* Gloeophyllum *were isolated from peat. This confirmed in our study: eight corticioid species were registered on peaty substrates adjoining wood surfaces, and two species were growing on living* Sphagnum *in absence of wood.*

Citation: Filippova N.V., Zmitrovich I.V. 2013. Wood decay community of raised bogs in West Siberia // Environmental dynamics and global climate change. V. 4. № 1 (7). EDCCrar0008.

Key words: bogs, raised bogs, West Siberia, wood decomposition, wood decay fungi, Corticiaceae, Polyporaceae, peatland fungi.

INTRODUCTION

Biology of bog form of *Pinus sylvestris*

Pinus sylvestris L. has the widest geographical range of all pines and is one of the dominant tree species in northern Eurasia [Ohlson, 1999]. In West Siberia it dominates in tree layer on sandy soils, and participates with other conifers in dark taiga forest on clay. Its northern border here at about 66 °, it goes to Mongolia and China at the south, with highest amplitude level about 1500 m (Altay mountains) [Koropachinskiy and Vstovskaya, 2002]. Geographical range of *P. sylvestris* coincides with the distribution of peatlands in northern temperate and boreal zones [Ohlson, 1999]. Peatlands with their severe conditions harbor stunted low-growth trees. About four different bog forms of *P. sylvestris* were described according to their growth, canopy shape, cone and needle size [Tyuremnov, 1976].

In spite of its variable ecology, studies on genetic variation among *P. sylvestris* populations show low level of population differentiation. Morpho-anatomical and adaptive traits in bog populations are nevertheless pronounced and could mark differentiation of bog populations during the Holocene [Ohlson, 1995; Ohlson, 1999]. The bog form of *P. sylvestris* reaches 1–10 m height, with the trunk diameter 10–20 cm. Canopy shape and tree size vary depending on bog water table and *Sphagnum* growth rate. Water table determines the longevity of life of bog trees, which lasts on the average for 100–150 (250) years until the butt (root collar) is buried in anaerobic layer [Tyuremnov, 1949]. Standing dead trees are common in bogs, especially in locations with rising water table, when tree layer dies.

Distribution of treed bogs in West Siberia and impact of tree layer in their biomass

The tree layer is characteristic feature of certain types of raised bogs in boreal zone, where the density of tree canopy increases with increase of continentality of climate. Several trees inhabit bogs of different regions: *Picea mariana*, *Thuja plicata* in North America, *Larix gmelinii*, *L. sibirica* in East Siberia, *Pinus sylvestris* in North Europe [Vitt, 2006]. Treed bogs of West Siberia dominated by *P. sylvestris* with increasing to the north participation of *P. sibirica*. In general, tree layer creates about 10% of total living biomass of West Siberian wetlands [Peregon et al., 2008]. Considering ombrotrophic peatlands, *Pine* – dwarfshrubs – *Sphagnum* communities are widespread in West Siberia, which mirrored in local name "Ryam". In middle taiga zone they cover approximately 70% of peatland area [Peregon et al., 2009]. They develop at well drained surfaces of bogs, at the edges or at slopes as uniform communities and form ridges in patterned landscapes. According to floristic classification, such communities are classified under class *Oxycocco-Sphagnetea* in several associations: *Ledo-Sphagnetum fusci*, *Mylio anomalae-Sphagnetum fusci*, *Sphagno angustifolii-Pinetum sylvestris*, *Menyantho-Sphagnetum magellanici*, *Pino sylvestris-Eriophoretum vaginati* [Lapshina, 2010]. The structure of tree stratum of treed bog (ryam) was described in a study accomplished in Surgutskoe polesye (middle taiga zone of West Siberia) [Kosyh and Koronatova, 2010]. The phytomass of trees was estimated 30–40% of all living phytomass in this study. The number of other parameters of tree layer from this study are summarized in Table 1.

Table 1. Structure of tree layer of treed bog in Surgutskoe polesye [Kosyh and Koronatova, 2010]

	Key plot 1	**Key plot 2**
Number of *Pinus sylvestris* per hectare	7500	8500
Number of *Pinus sibirica* per hectare	0	800
Number of trees with the age <20 years	3200	2300
Number of standing – dead trees	300	600
Age of *Pinus sylvestris*	<80 years	<100 years
Mean height and trunk diameter	1.9 m / 4.5 cm	1.5 m / 3.8 cm

Wood decay community studies in West Siberia

The community of fungi associated with wood decomposition is very complex and includes many taxonomical groups with different ecological adaptations. As a result of their complex work, recalcitrant compounds of wood substrates are recycled [Heilmann-Clausen, 2001]. Wood-inhabiting fungi represent substantial part of fungal diversity in boreal forests, about 1.5 thousand species of basidiomycetes and 1 thousand of ascomycetes approximately [Stendil et al., 2008]. Given that relatively few tree species inhabit boreal forests, the high fungal diversity is the result of niche separation. Following factors are important in niche subdivision: tree species, size of wood, part of tree, cause of tree death, microenvironment around the wood, decay stage, and others [Stendil et al., 2008]. Tree species affect the diversity of decomposer fungi to varying degrees. The percentage of tree-specific fungi is higher among polypores and pyrenomycetes than in corticioids and agarics (the first groups are interacting with live hosts more often) [Boddy and Heilmann-Clausen, 2008]. High species diversity and variety of affecting environmental parameters of wood-inhabiting fungi require certain focus of research. Focusing on species composition by fruiting observation considered to be the basic stage, although it does not completely correspond to community functioning inside the wood [Huhndorf et al., 2004].

Wood decay fungi is well studied group in Khanty-Mansiysk Region [Mukhin, 1993; Arefyev, 2008]. A compilation based on published checklists represents 437 species of aphyllophoroid and corticioid basidiomycetes [Filippova, 2010].

V. Mukhin [1993] lists 111 species in *P. sylvestris* forests of West Siberia, which include 17 specific to them. Number of *P. sylvestris*-related registrations in local inventories varies from 18 species in Natural park "Samarovskiy chugas" [Stavishenko and Zalesov, 2010], to 82 species in Natural park "Kondinskie ozera" [Stavishenko, 2007]. A single work describes wood-decay community of ombrotrophic bogs in the region [Arefyev, 2001]. It uses plot-count method to reveal quantitative structure of aphyllophoroid fungi in different types of peatlands and forests. Totally in the *Pine* – dwarfshrubs – *Sphagnum* ombrotrophic bogs author registers 11 species [Arefyev, 2001]. Previously reported records of wood decay macromycetes on *P. sylvestris* in Khanty-Mansiysk region are summarized in Table 2.

The goal of our research was to study composition of wood decay macromycetes of bog form of *P. sylvestris*. In spite of substantial part which trees contribute to bog biomass, wood decay community was not target of special research in peatlands [Thormann, 2006; Zmitrovich, 2011]. For example, a checklist of aphyllophoroid fungi of Finland includes only 25 species from mire habitat (of total 980 species) [Kotiranta et al., 2009]. Bog populations of *P. sylvestris* acquire special adaptations and differ from upland trees in growth rate, life longevity, size, biomass proportion, wood density and content of nutrients and defensive substances [Ohlson, 1995; Ohlson, 1999]. Additionally, microclimate of bogs differs from forest by more severe daily temperature maxima and minima, and constantly wet land surface with its special chemistry of water. These differences could be mirrored by decay community.

Figure 1. *Pine* – dwarfshrubs – *Sphagnum fuscum* community (Mukhrino bog)

Table 2. Compilation of species recorded on *Pinus sylvestris* from local inventories of wood decay fungi in taiga zone of West Siberia [Arefyev, 2001; Mukhin, 1993; Stavishenko, 2000; Stavishenko, 2002; Stavishenko, 2003; Stavishenko, 2007a; Stavishenko, 2007b; Stavishenko and Zalesov, 2010]. Species found also in present study marked in bold type, species found in similar ombrotrophic bogs by Arefyev [2001] marked in red color

1	*Amphinema byssoides* (Pers.) J. Erikss.	85	*Leptosporomyces fuscostratus* (Burt) Hjortstam
2	*Amylocorticium subsulphureum* (P. Karst.) Pouzar	86	*Leptosporomyces galzinii* (Bourdot) Jülich
3	*Amyloporia crassa (P. Karst.) Bondartsev & Singer*	87	*Leptosporomyces roseus* Jülich
4	*Anomoporia albolutescens* (Romell) Pouzar	88	*Leucogyrophana mollusca* (Fr.) Pouzar
5	*Anomoporia bombycina* (Fr.) Pouzar	89	*Marasmiellus ramealis* (Bull.) Singer
6	*Antrodia albobrunnea* (Romell) Ryvarden	90	*Meruliopsis taxicola* (Pers.) Bondartsev in Parmasto
7	*Antrodia infirma* Renvall & Niemelä	91	*Mycoacia fuscoatra* (Fr.) Donk
8	*Antrodia serialis* (Fr.) Donk	92	*Onnia leporina* (Fr.) H. Jahn
9	*Antrodia sinuosa* (Fr.) Rajchenb., Gorjón & Pildain	93	*Oxyporus corticola* (Fr.) Ryvarden
10	***Antrodia xantha* (Fr.) Bondartsev & Singer**	94	*Panellus mitis* (Pers.) Singer
11	*Armillaria mellea* (Vahl) P. Kumm.	95	*Parmastomyces mollissimus* (Maire) Pouzar
12	***Athelia acrospora* Jülich**	96	*Parmastomyces transmutans* (Overh.) Ryvarden & Gilb.
13	*Athelia bombacina* (Link) Pers.	97	*Paullicorticium ansatum* Liberta
14	***Athelia decipiens* (Höhn. & Litsch.) J. Erikss.**	98	*Perenniporia subacida* (Peck) Donk
15	*Athelia neuhoffii* (Bres.) Donk	99	*Perenniporia narymica* (Pilát) Pouzar
16	*Athelopsis lacerata* (Litsch.) J. Erikss. & Ryvarden	100	*Phaeolus schweinitzii* (Fr.) Pat.
17	*Bjerkandera adusta* (Willd.: Fr.) P. Karst.	101	*Phanerochaete calotricha* (P. Karst.) J. Erikss. & Ryvarden
18	*Botryobasidium angustisporum* (Boidin) J. Erikss.	102	*Phanerochaete laevis* (Fr.) J. Erikss. & Ryvarden
19	*Botryobasidium botryosum* (Bres.) J. Erikss.	103	***Phanerochaete sanguinea* (Fr.) Pouzar**
20	*Botryobasidium laeve* (J. Erikss.) Parmasto	104	*Phanerochaete tuberculata* (P. Karst.) Parmasto
21	*Botryobasidium subcoronatum* (Höhn. & Litsch.) Donk	105	*Phanerochaete velutina* (DC.) P. Karst.
22	*Botryohypochnus isabellinus* (Fr.) J. Erikss.	106	*Phellinus chrysoloma* (Fr.) Donk
23	*Ceraceomerulius albostramineus* (Torrend) Ginns	107	*Phellinus contiguus* (Pers.) Pat.
24	*Ceraceomerulius serpens* (Fr.) Ginns	108	*Phellinus ferrugineofuscus* (P. Karst.) Bourdot & Galzin
25	*Ceriporia purpurea* (Fr.) Komarova	109	*Phellinus nigrolimitatus* (Romell) Bourdot & Galzin
26	*Chaeroderma luna* (Romell ex D.P. Rogers & H.S. Jacks.) Parmasto	110	*Phellinus pini* (Brot.) Bondartsev & Singer
27	*Confertobasidium olivaceoalbum* (Bourdot & Galzin) Jülich	111	*Phellinus pouzarii* Kotl.
28	***Coniophora arida* (Fr.) P. Karst.**	112	*Phellinus viticola* (Schwein.) Donk
29	*Coniophora olivacea* Sacc.	113	*Phellinus viticola* (Schwein.) Donk
30	*Coniophora puteana* (Schumach.) P. Karst.	114	*Phellinus weirii* (Murrill) Gilb.
31	*Crepidotus fulvifibrillosus* Murrill	115	*Phlebia firma* J. Erikss. & Hjortstam
32	***Crustoderma dryinum* (Berk. & M.A. Curtis) Parmasto**	116	*Phlebia segregata* (Bourdot & Galzin) Parmasto
33	*Cylindrobasidium evolvens* (Fr.) Jülich	117	*Phlebia sordida* (P. Karst.) J. Erikss. & Ryvarden

34	*Cytidiella melzeri* Pouzar	118	*Phlebiella borealis* K.H. Larss. & Hjortstam
35	*Dacrymyces chrysospermus* Berk. & M.A. Curtis	119	*Phlebiopsis gigantea* (Fr.) Jülich
36	*Dichomitus albidofuscus* (Domański) Domański	120	*Pholiota aurivella* (Batsch) P. Kumm.
37	*Dichomitus squalens* (P. Karst.) D.A. Reid	121	*Pleurotus ostreatus* (Jacq.: Fr.) Kumm.
38	*Dichostereum boreale* (Pouzar) Ginns & M.N.L. Lefebvre	122	*Pleurotus pulmonarius* (Fr.) Quél.
39	*Dichostereum granulosum* (Pers.) Boidin & Lanq.	123	*Pluteus atricapillus* (Batsch) Fayod
40	*Diplomitoporus flavescens* (Bres.) Domański	124	*Polyporus melanopus* (Pers.) Fr
41	*Erythricium hypnophilum* (P. Karst.) J. Erikss. & Hjortstam	125	*Postia caesia* (Schrad.) P. Karst.
42	*Exidia pithya* (Alb. & Schwein.) Fr.	126	*Postia fragilis* (Fr.) Gilb. & Ryvarden
43	***Exidia saccharina* Fr.**	127	*Postia hibernica* (Berk. & Broome) Jülich
44	*Fibricium rude* (P. Karst.) Jülich	128	*Postia lateritia* Renvall
45	*Fibroporia vaillantii* (DC.) Parmasto	129	*Postia leucomallella* (Murrill) Jülich
46	*Fibulomyces mutabilis* (Bres.) Jülich	130	*Postia placenta* (Fr.) M.J. Larsen & Lombard
47	*Flammulina velutipes* (Curtis) Singer	131	*Postia rancida* (Bres.) M.J. Larsen & Lombard
48	*Fomitopsis cajanderi* (P. Karst.) Kotl. & Pouzar	132	*Postia rennyi* (Berk. & Broome) Rajchenb.
49	*Fomitopsis pinicola* (Sw.) P. Karst.	133	*Postia sericeomollis* (Romell) Jülich
50	*Fomitopsis rosea* (Alb. & Schwein.) P. Karst.	134	*Postia stiptica* (Pers.) Jülich
51	*Gloeocystidiellum ochraceum* (Fr.) Donk	135	*Postia tephroleuca* (Fr.) Jülich
52	*Gloeocystidiellum porosum* (Berk. & M.A. Curtis) Donk	136	*Postia undosa* (Peck) Jülich
53	*Gloeophyllum abietinum* (Bull.) P. Karst.	137	***Pseudohydnum gelatinosum* (Scop.) P. Karst.**
54	*Gloeophyllum odoratum* (Wulfen) Imazeki	138	*Pseudomerulius aureus* (Fr.) Jul.
55	***Gloeophyllum protractum* (Fr.) Imazeki**	139	*Pycnoporellus fulgens* (Fr.) Donk
56	*Gloeophyllum sepiarium* (Wulfen) P. Karst.	140	*Resinicium bicolor* (Alb. & Schwein.) Parmasto
57	*Gloeoporus taxicola* (Pers.) Gilb. & Ryvarden	141	*Resinicium furfuraceum* (Bres.) Parmasto
58	*Guepiniopsis chrysocoma* (Bull.) Brasf.	142	*Rigidoporus sanguinolentus* (Alb. & Schwein.) Donk
59	*Hapalopilus salmonicolor* (Berk. & M.A. Curtis) Pouzar	143	*Schizophyllum commune* Fr.
60	*Heterobasidion annosum* (Fr.) Bref.	144	*Serpula himantioides* (Fr.) P. Karst.
61	*Hohenbuehelia atrocoerulea* (Fr.) Singer	145	*Sistotrema brinkmannii* (Bres.) J. Erikss.
62	*Hydnum repandum* Fr.	146	***Sistotremastrum suecicum* Litsch. ex J. Erikss.**
63	*Hymenochaete tabacina* (Sowerby) Lév.	147	*Skeletocutis odora* (Sacc.) Ginns
64	***Hyphoderma argillaceum* (Bres.) Donk**	148	*Skeletocutis stellae* (Pilát) Jean Keller
65	*Hyphoderma praetermissum* (P. Karst.) J. Erikss. & Å. Strid	149	*Skeletocutis amorpha* (Fr.) Kotl. & Pouzar
66	***Hyphoderma setigerum* (Fr.) Donk**	150	*Skeletocutis kuehneri* A. David
67	*Hyphodontia abieticola* (Bourdot & Galzin) J. Erikss.	151	*Skeletocutis subincarnata* (Peck) Jean Keller
68	*Hyphodontia alutacea* (Fr.) J. Erikss.	152	*Skeletocutis vulgaris* (Fr.) Niemelä & Y.C. Dai
69	*Hyphodontia alutaria* (Burt) J. Erikss.	153	*Steccherinum fimbriatum* (Pers.) J. Erikss.
70	*Hyphodontia arguta* (Fr.) J. Erikss.	154	*Steccherinum luteoalbum* (P. Karst.) Vesterh.
71	***Hyphodontia aspera* (Fr.) J. Erikss.**	155	*Steccherinum ochraceum* (Pers.) Gray
72	***Hyphodontia breviseta* (P. Karst.) J. Erikss.**	156	*Stereum sanguinolentum* (Alb. & Schwein.) Fr.

73	*Hyphodontia hastata* (Litsch.) J. Erikss.	157	*Thelephora terrestris* Ehrh.
74	*Hyphodontia pallidula* (Bres.) J. Erikss.	158	*Trechispora farinacea* (Pers.) Liberta
75	*Hypochnicium albostramineum* (Bres.) Hallenb.	159	*Trechispora vaga* (Fr.) Liberta
76	***Hypochnicium geogenium* (Bres.) J. Erikss.**	160	*Trichaptum fuscoviolaceum* (Ehrenb.) Ryvarden
77	***Hypochnicium punctulatum* (Cooke) J. Erikss.**	161	*Trichaptum laricinum* (P. Karst.) Ryvarden
78	*Hypsizygus ulmarius* (Bull.) Redhead	162	*Trichaptum abietinum* (Dicks.) Ryvarden
79	*Irpex lacteus* (Fr.) Fr.	163	***Tubulicrinis borealis* J. Erikss.**
80	*Junghuhnia collabens* (Fr.) Ryvarden	164	*Tubulicrinis calothrix* (Pat.) Donk
81	*Kuehneromyces mutabilis* (Schaeff.) Singer & A.H. Sm.	165	*Tubulicrinis glebulosus* (Fr.) Donk
82	*Laurilia sulcata* (Burt) Pouzar	166	*Tubulicrinis medius* (Bourdot & Galzin) Oberw.
83	*Lentinus lepideus* (Fr.: Fr.) Fr.	167	*Tubulicrinis propinquus* (Bourdot & Galzin) Donk
84	*Leptoporus mollis* (Pers.) Quél.	168	*Vesiculomyces citrinus* (Pers.) E. Hagstr.

MATERIALS AND METHODS

Inventory of wood-decay macromycetes of bogs was done in two locations near the Khanty-Mansiysk town (Chistoe bog N61.059° E69.466°; Mukhrino bog N60.892° E68.674°) in August–September 2012. In both sites communities of *Pinus sylvestris* – dwarfshrubs – *Sphagnum fuscum* bogs (ryam) (Fig. 1) were visited and **random collection** was done (totally about 100 specimens). Fallen logs, dead-standing trees, butts of dead and living trees of *P. sylvestris* were searched by naked eye and with lens. Root collar and trunk of bog tree is submerged in sphagnum, creating wet crater. Its wet peaty surface additionally harbors some corticioid species. Details of wood (bark, decorticoid wood, sun exposed wood, etc.) were additionally described in specimen ecology characteristics. Following traditional groups were sampled: corticioid, agaricoid, clavarioid and polyporoid basidiomycetes, and discomycetes (by "traditional groups" we mean formerly used taxonomical units which not accepted by modern classification systems but still have value as descriptive terms, for example "Discomycetes" [Ainsworth et al., 2008]).

Climate near Khanty-Mansiysk is subarctic with mean annual temperature minus 1.3 °C. Average temperature of coldest month (January) -20 °C, of warmest month (July) 18 °C. Long winter lasts for 26 weeks, and snow lays for 210 days. Total year sun radiation is 300 KDj/m^2. Mean sum of precipitation about 500 mm with largest part in summer [Bulatov et al., 2007]. Apart of climate characteristic of the region (macroclimate), bogs characterized by special microclimate. Peat soils warmed slowly in the spring, conditioned through evapotranspiration in summer, and cooled more quickly in autumn [Rydin and Jeglum, 2006]. Daily temperature fluctuation (air 2 m above soil) in bogs is considerably higher than in upland forests [Hojdová et al, 2005].

RESULTS AND DISCUSSIONS

Taxonomic structure

Totally 49 species of wood-decay macromycetes from 6 traditional groups were revealed in *Pine* – dwarfshrubs – *Sphagnum fuscum* community of ombrotrophic bog. The most representative groups were Corticioid basidiomycetes (28 species) and Discomycetes (11 species), less species registered from heterobasidiomycetous basidiomycetes (6 species), polyporoid (2 species), clavarioid (1 species) and agaricoid basidiomycetes (1 species).

14 species (from all groups combined) represent first species records in the borders of Khanty-Mansiysk administrative region (table 3). Three findings of corticioids are of interest within the Russian borders as rarely sighted: *Pseudotomentella vepallidospora*, *Conohypha albocremea*, and *Hyphodontia borealis*. Almost all taxa are new to species list of peatland fungi, previously compiled based on published literature by Thormann and Rice [2007].

Species lists of corticioid and polyporoid groups in present study, and in accomplished earlier studies in forest ecosystems (on *Pinus sylvestris*) only partly coincide. Conclusions about differences in communities of both habitats (forests and bogs) would appropriate, however, only after quantitative study with uniform methods will be made.

Species abundance

Since quantitative methods of community analysis were not involved, only rough estimation of species abundance is possible based on number of collections. Two species seems to occur commonly on bog wood (5 and more collections): *Amyloporia xantha* and *Sistotremastrum suecicum*. These species are reported to be xerotolerant and often registered from sun-exposed wood in natural conditions or on artificial constructions [Bondarzev, 1953; Eriksson et al., 1984]. Other species were collected regularly (3 collections): *Coniophora arida*, *Peniophorella praetermissa*, *Phlebiella pseudotsugae*, *Piloderma byssinum*, and *Dacrymyces stillatus*. Major part of species list (43 species) were met once and twice, e.g. probably rare species on bog wood.

Substrate specificity

All species collected from *Pinus sylvestris*. Another bog inhabiting tree (*P. sibirica*) was not examined in this study since rarity of its occurrence. Major part of species registered from pine logs, partly buried in upper aerated peat layer (table 3). Fruitbodies appear on wet partly submerged in sphagnum and mostly decorticated tight wood. A part of collections goes from detached bark. Strongly decayed soft trunks yielded several species. Peaty substrates adjoining wood (or in absence of any wood) harbor eight species of corticioid fungi (*Coniophora arida*, *Hyphoderma setigerum*, *Hyphodontia breviseta*, *Hypochnicium punctulatum*, *Peniophorella praetermissa*, *Piloderma bicolor*, *P. byssinum*, *Pseudotomentella vepallidospora*). Two corticioids were growing on living sphagnum in lower brown part of the stem (*Hyphodontia borealis*, *Tomentella atramentaria*).

Most of species from the list are adapted for decomposition of large spectrum of coniferous and deciduous trees and also registered on mosses and miscellaneous substrates of forest litter [Bernicchia and Gorjon, 2010; Bondarceva and Parmasto, 1986; ; Hansen and Knudsen, 2000, 1992, 1997; Hjorstam et al., 1973–1987; Kotiranta et al., 2009; Kõljalg, 1995; Raytviyr, 1967]. 27 species of the list known from coniferous and deciduous trees (table 3). Less number of species (13) of the list reported only from coniferous wood. Preferentially corticolous species represented by two discomycetes: *Gorgoniceps* cf. *viridula*, *Hamatocanthoscypha ocellata* and a heterobasidiomycetous species *Exidia saccharina*. Seven corticioid species also known from mosses [Yurchenko, 2001]. Six corticioid species form mycorrhizal association with *Pinus.* They also could be litter decomposers as reported by Kotiranta [2009]. Habitat of *Jaapia argillacea* reported to be defined to wet wood around water basins and other water saturated localities (its spores likely to be water-dispersed) [Eriksson and Ryvarden, 1976].

Decomposition capacity

Identified species have different capacity for decomposition and comprise species from all three rot types. Discomycetes are generally considered as poor decomposers, causing soft rot, where preference for carbohydrates observed [Dix and Webster, 1995]. Corticioid and polyporoid basidiomycetes considered to be major decomposers of lignified substrata. Six identified species cause brown rot type, where lignin decomposition is limited [rot type based on literature: Gilbertson, 1998; James et al., 1997]. The remaining 23 species possess the ability to degrade all cell wall constituents causing white rot type [based on literature : Gilbertson, 1998; James et al., 1997]. In spite of generally accepted relation between taxonomic groups and decay type, a better understanding of decay dynamics could be achieved when individual host-fungus combinations are investigated [Schwarze, 2007].

Wood decomposers differ in their activity, resulting in large range of weight loss between species revealed in experimental culture. Thus, for some of identified species range of weight loss lies between 5.4% (*Exidia glandulosa*) to 35.2% (*Dacymyces stillatus*) as estimated by James et al. [1997] in pine wood decay tests (duration for 12 weeks). Total composition and function of wood-decay community is defined by host species, its age, organ and tissue type, micro-climate characteristic, and between-species interactions. Fruiting observation does not completely coincide with hidden mycelium of wood-decay community and other methods should be involved for its complete examination [Boddy, 2001]. Therefore, present study shows only tip of the iceberg in this field.

Role of wood decomposers in carbon dynamics in peatlands was earlier examined by M. Thormann [2011] in experiments of *Sphagnum* peat decomposition by different fungi. Brown rot fungi caused significantly greater mass losses than white rot fungi and non-wood-decay fungi (duration for four months) (mean mass losses of 10.1%, 1.7%, and 2.3%, respectively) [Thormann, 2011]. Isolates of *Coniophora* sp. were particularly efficient at decomposing the *Sphagnum* peat (9.6% weight loss in acrotelm and 23.4% in mesotelm). In another study of peatland microfungi in the North of European Russia [Grum-Grzhimaylo, 2013] *Antrodia* spp. and *Gloeophyllum* sp. were regularly isolated from peat. Therefore, wood decay fungi in peatlands not only provide wood decay, but could participate in decomposition of peat, which is a major carbon pool of these ecosystems.

Rare species and conservation

Inventories are important in accumulating information for fungal conservation programs. Tree layer of bogs considered useless for forestry needs. Unlike the wide exploitation of tree layer of forests on mineral ground, wood decay fungi are protected in bogs as long as the ecosystem itself is not disturbed. Long practices of peatlands drainage and fertilization for forestry needs reduced areas of natural peatlands around the world and threatens to its mycota. In West Siberia, this reduction is still minor. In spite of this, evaluation of rare species in these ecosystems would be a valuable preventive measure. One from indentified bog species (*Pseudohydnum gelatinosum*) listed in Red list of Khanty-Mansiysk region in attachment (species of special attention) [Vasin and Vasina, 2013]. *Athelia acrospora* is protected in Leningrad region Red book (Russia) (with status R – rare species) [Noskov and Bots, 1999]. Other 9 species are listed with some status in Red lists of European countries, based on data of European Council for the Conservation of Fungi [Dahlberg, 2011]: *Crustoderma dryinum*, *Hypochnicium punctulatum*, *Jaapia argillacea*, *Tomentella fuscocinerea*, *Tubulicrinis borealis*, *Tylospora asterophora*, *Dacrymyces tortus*, *Stypella vermiformis*, *Mucronella calva*.

Table 3. Description of specimens: **1** – species, **2** – rot type (b – brown, w – white, s – soft rot), **3** – ecology of species based on literature (con – coniferous wood, dec – deciduous wood, moss – on mosses, cor – corticolous, mr – mycorrhizal), **4** – accessory number, **5** – date of collection, **6** – collection coordinate, **7** – substrate. Species found in the region for the first time marked with *.

#	1	2	3	4	5	6	7
			Corticioid basidiomycetes				
1	*Athelia acrospora* Jülich	w	con, dec	3962	02.09.12	N60.892773 E68.674893	Detached bark (*P. sylvestris*)
				4099	09.09.12	N60.893086 E68.677082	Attached bark (*P. sylvestris*), insects-made bark chips
2	*A. decipiens* (Höhn. & Litsch.) J. Erikss.	w	con, dec	4105	09.09.12	N60.893086 E68.677082	Detached bark (*P. sylvestris*)
3	**Ceraceomyces microsporus* K. H. Larss.	w	moss	3885	28.08.12	N61.060051 E69.459472	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4034	06.09.12	N61.054422	Log (*P. sylvestris*) buried in

#	1	2	3	4	5	6	7
						E69.456725	sphagnum, decorticated wood
4	*Coniophora arida* (Fr.) P. Karst.	b	con, dec	3994	02.09.12	N60.892773 E68.674893	Peaty surface along bog path
				4035	06.09.12	N61.054422 E69.456725	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4106	09.09.12	N60.893086 E68.677082	Stump (*P. sylvestris*) buried in sphagnum, detached bark
5	**Conohypha albocremea* (Hohn. et Litsch.) Julich	w	con, dec	4027	06.09.12	N61.054422 E69.456725	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
6	*Crustoderma dryinum* (Berk. et M. A. Curtis) Parmasto	b	con	3888	28.08.12	N61.060051 E69.459472	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
7	*Hyphoderma argillaceum* (Bres.) Donk	w	con, dec	4434	28.08.12	N61.060051 E69.459472	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
8	*H. setigerum* (Fr.) Donk	w	con, dec	3884	28.08.12	N61.060051 E69.459472	Detached bark (*P. sylvestris*), peaty surface around a piece of bark
9	*Hyphodontia aspera* (Fr.) J. Erikss.	w	con, dec, moss	4030	06.09.12	N61.054422 E69.456725	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4072	07.09.12	N61.066591 E69.457326	Detached bark (*P. sylvestris*)
10	**H. borealis* Kotir. et Saarenoksa	w	con, dec	4048	07.09.12	N61.066591 E69.457326	Living *Sphagnum*, basidioma covers brown lower part with dead branches.
11	*H. breviseta* (P. Karst.) J. Erikss.	w	con, dec, moss	4067	07.09.12	N61.066591 E69.457326	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4068	07.09.12	N61.066591 E69.457326	Log (*P. sylvestris*) buried in sphagnum, decorticated wood, bark, miscelanous substrates around
12	*Hypochnicium geogenium* (Bres.) J. Erikss.	w	con, dec	4031	06.09.12	N61.054422 E69.456725	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4104	09.09.12	N60.893086 E68.677082	Stump (*P. sylvestris*), attached bark
13	*H. punctulatum* (Cooke) J. Erikss.	w	con, dec	3912	30.08.12	N61.059158 E69.458055	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				3992	02.09.12	N60.892773 E68.674893	Peaty surface along bog path
14	**Jaapia argillacea* Bres.	w	con, dec	4014	06.09.12	N61.054422 E69.456725	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4049	07.09.12	N61.066591 E69.457326	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
15	*Peniophorella praetermissa* (P. Karst.) K. H. Larss.	w	con, dec	4015	28.08.12	N61.060051 E69.459472	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4057	07.09.12	N61.066591 E69.457326	Peaty surface around buried stump
				4070	07.09.12	N61.066591 E69.457326	Branch (*P. sylvestris*) 0.5 cm in diam., buried in sphagnum
16	*Phanerochaete sanguinea* (Fr.) Pouzar	w	con, dec, moss	3913	30.08.12	N61.059158 E69.458055	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
17	*Phlebiella pseudotsugae* (Burt) K.H. Larss. & Hjortstam	w	con, dec	3882	28.08.12	N61.060051 E69.459472	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				3915	30.08.12	N61.059158 E69.458055	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4050	07.09.12	N61.066591 E69.457326	Log (*P. sylvestris*) buried in sphagnum, decorticated wood

#	1	2	3	4	5	6	7
18	*Piloderma bicolor* (Peck) Jülich		con, mr	3991	02.09.12	N60.892773 E68.674893	Peaty surface along bog path
19	*P. byssinum* (P. Karst.) Jülich		con, dec, mr	3914	30.08.12	N61.059158 E69.458055	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4051	07.09.12	N61.066591 E69.457326	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4069	07.09.12	N61.066591 E69.457326	Peaty surface around buried log (*P. sylvestris*)
20	**Pseudotomentella vepallidospora* M. J. Larsen	w	con, dec	3891	28.08.12	N61.060051 E69.459472	Stump (*P. sylvestris*) buried in sphagnum, very soft wood
				4052	07.09.12	N61.066591 E69.457326	Stump (*P. sylvestris*) buried in sphagnum, very soft wood, miscellaneous and peaty substrates around
21	*Sistotremastrum suecicum* Litsch. ex J. Erikss.	w	con, dec	3886	28.08.12	N61.060051 E69.459472	Stump (*P. sylvestris*) buried in sphagnum, very soft wood
				3887	28.08.12	N61.060051 E69.459472	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4018	06.09.12	N61.054422 E69.456725	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4022	06.09.12	N61.054422 E69.456725	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4032	06.09.12	N61.054422 E69.456725	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4047	07.09.12	N61.066591 E69.457326	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4071	07.09.12	N61.066591 E69.457326	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
22	**Tomentella atramentaria* Rostr.		con, dec, mr	4019	06.09.12	N61.054422 E69.456725	Living *Sphagnum*, basidioma covers brown lower part with dead branches
23	**T. fuscocinerea* (Pers.) Donk		con, dec, moss, mr	4046	07.09.12	N61.066591 E69.457326	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
24	**Trechispora microspora* (P. Karst.) Liberta	w	con, dec	4036	06.09.12	N61.054422 E69.456725	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
25	*Tubulicrinis borealis* J. Erikss.	w	con	3883	28.08.12	N61.060051 E69.459472	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4023	06.09.12	N61.054422 E69.456725	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
26	*T. subulatus* (Bourdot & Galzin) Donk	w	con, dec, moss	4028	06.09.12	N61.054422 E69.456725	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
27	**Tylospora asterophora* (Bonord.) Donk		con, mr	3916	30.08.12	N61.059158 E69.458055	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
28	*Xenasmatella vaga* (Fr.) Stalpers	w	con, dec, mr	4037	06.09.12	N61.054422 E69.456725	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
Polyporiod basidiomycetes							
29	*Amyloporia xantha* (Fr.) Bondartsev & Singer	b	con, dec	3880	28.08.12	N61.060051 E69.459472	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4021	06.09.12	N61.054422 E69.456725	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
30	*Gloeophyllum protractum*	b	con,	3977	02.09.12	N60.889934	Log (*P. sylvestris*) buried in

#	1	2	3	4	5	6	7
	(Fr.) Imazeki		dec			E68.700686	sphagnum, decorticated wood
	Heterobasidiomycetous fungi						
31	**Dacrymyces stillatus* Nees	b	con, dec	0456	26.06.08	N63.93 E64.55	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				0454	27.06.08	N63.93 E64.55	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				3197	18.09.09	N60.88 E68.70	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
32	**D. tortus* (Willd.) Fr.	b	con	0455	27.06.08	N63.93 E64.55	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				3038	-	-	Specimen information lost
33	*Exidia glandulosa* (Bull.) Fr.	w	con, dec	1843	26.06.08	N63.93 E64.55	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
34	*E. saccharina* Fr	w	cor	0919	06.08.09	N60.88 E68.7	Living tree *(P. sylvestris)*, base of stem, on the bark
				3198	18.09.09	N60.88 E68.7	Living tree *(P. sylvestris)*, base of trunk, on the bark
35	*Pseudohydnum gelatinosum* (Scop.) P. Karst.	w	con	4055	07.09.12	N61.06659 E69.45732	Stump (*P. sylvestris*), very soft wood, under bark
36	**Stypella vermiformis* (Berk. & Broome) D.A. Reid	w	con	1033	18.09.09	N60.88 E68.7	Stump (*P. sylvestris*), very soft wood, under bark
				3889	28.08.12	N61.06005 E69.45947	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
	Agaricoid basidiomycetes						
37	*Hypholoma capnoides* (Fr.) P. Kumm.	w	con	3975	02.09.12	N60.89277 E68.674893	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				4113	11.09.12	N60.89402 E68.692575	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
	Clavarioid basidiomycetes						
38	**Mucronella calva* (Alb. & Schwein.) Fr.	w	con, dec	3917	30.08.12	N61.05916 E69.45805	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
	Discomycetes						
39	*Ascocoryne sarcoides* (Jacq.) J.W. Groves & D.E. Wilson	s	con, dec	4038	06.09.12	N61.05442 E69.45672	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
40	*Ciliolarina neglecta* Huhtinen	s	con	3894	09.09.12	N61.06005 E69.45947	Detached bark (*P. sylvestris*)
41	*Gorgoniceps aridula* (P. Karst.) P. Karst.	s	con	4053	07.09.12	N61.06659 E69.45732	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
42	*Gorgoniceps* cf. *viridula*	s	cor	4100	09.09.12	N60.89308 E68.67708	Detached bark (*P. sylvestris*)
43	*Gorgoniceps hypothallosa* Svrček	s	con	4024	06.09.12	N61.05442 E69.45672	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
44	*Hamatocanthoscypha ocellata* Huhtinen	s	cor	4101	09.09.12	N60.89308 E68.67708	Detached bark (*P. sylvestris*)
45	*Hyaloscypha albohyalina* var. *spiralis* (P. Karst.) Boud.	s	con, dec	4033	06.09.12	N61.05442 E69.45672	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
46	*H. aureliella* (Nyl.) Huhtinen	s	con	3877	28.08.12	N61.06005 E69.45947	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
47	*Mollisia* cf. *melaleuca*	s		4017	06.09.12	N61.05442 E69.45672	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
				3874	28.08.12	N61.06005 E69.45947	Log (*P. sylvestris*) buried in sphagnum, decorticated wood

#	1	2	3	4	5	6	7
48	*Odontotrema minus* Nyl.	s	con, dec	4020	06.09.12	N61.05442 E69.45672	Log (*P. sylvestris*) buried in sphagnum, decorticated wood
49	*Pezicula eucrita* (P. Karst.) P. Karst.	s	con	3866	09.09.12	N60.89308 E68.67708	Detached bark (*P. sylvestris*)

LITERATURE

Ainsworth G.C., Bisby G.R., Kirk P.M. (Eds.). 2008. Ainsworth & Bisby's dictionary of the fungi. UK: CABI Bioscience. 771 p.

Bernicchia A., Gorjón S.P. 2010. Corticiaceae s.l. Italia: Candusso. 1008 p.

Boddy L. 2001. Fungal Community Ecology and Wood Decomposition Processes in Angiosperms: From Standing Tree to Complete Decay of Coarse Woody Debris // Ecological Bulletins. V. 49. P. 43–56.

Boddy L., Heilmann-Clausen J. 2008. Basidiomycete community development in temperate angiosperm wood // Ecology of Saprotrophic Basidiomycetes / Boddy L., Frankland J.C., Van West P. (eds.). Amsterdam, Boston: Elsevier Academic Press. P. 211–237.

Dahlberg A. 2011. European Red List of endangered macrofungi. URL: http://www.wsl.ch/eccf/activities-en.ehtml

Dix N.J., Webster J. 1995. Fungal ecology. London: Chapman & Hall. 549 p.

Eriksson J., Ryvarden L. 1976. The corticiaceae of North Europe. V. 4. Hyphodermella - Mycoacia. Norway, Oslo: Fungiflora. P. 549-886.

Gilbertson R.L., Bigelow H.E. 1998. Annotated Checklist of Wood-Rotting Basidiomycetes of the Sky Islands in Southeastern Arizona // Journal of the Arizona-Nevada Academy of Science. V. 31. № 1. P. 13–36.

Hansen L., Knudsen H. (eds.) 1992, 1997, 2000. Nordic Macromycetes. vls 1–3. Copenhagen: Nordsvamp.

Heilmann-Clausen J. 2001. A gradient analysis of communities of macrofungi and slime moulds on decaying beech logs // Mycological Research. 2001. V. 105. № 5. P. 575–596.

Hjortstam K., Larsson K.H., Ryvarden L. 1973-1987. The Corticiaceae of North Europe vls 1–7. Oslo: Fungiflora.

Hojdová M., Hais M., Pokorný J. 2005. Microclimate of a peat bog and of the forest in different states of damage in the Šumava National Park. Silva Gabreta. V. 11. P. 13–24.

Huhndorf S.M. et al. 2004. Macrofungi on woody substrata // Biodiversity of fungi. Inventory and monitoring methods / Mueller G.M. et al. (eds.). Amsterdam, Boston: Elsevier Academic Press. P. 159–163.

James J., Anagnost S.E., Zabel R.A. 1997. Comparison of wood decay among diverse lignicolous fungi // Mycologia. V. 89. № 2. P. 119–219.

Kõljalg U. 1995. Tomentella (Basidiomycota) and related genera in temperate Eurasia. Oslo, Norway: Fungiflora. 213 p.

Kosykh N.P., Koronatova N.G. 2010. Phytomass and primary production of mire ecosystems in Surgut Polesie // Environmental dynamics and global climate change. V. 1. № 2. P. 1–6.

Kotiranta H., Saarenoksa R., Kytovuori I. 2009. Aphyllophoroid fungi of Finland. A check-list with ecology, distridution and threat categories. Helsinki: Botanical Museum of Natural History. 223 p.

Ohlson M. 1995. Growth and nutrient characteristics in bog and fen populations of Scots pine (Pinus sylvestris) // Plant Soil. V. 172. № 2. P. 235–245.

Ohlson M. 1999. Differentiation in adaptive traits between neighbouring bog and mineral soil populations of Scots pine Pinus sylvestris // Ecography. V. 22. № 2. P. 178–182.

Peregon A. et al. 2008. Map-based inventory of wetland biomass and net primary production in western Siberia // Journal of Geophysical Research: Biogeosciences. V. 113. G01007. DOI:10.1029/2007JG0004411.

Peregon A., Maksyutov S., Yamagata Y. 2009. An image-based inventory of the spatial structure of West Siberian wetlands // Environmental Research Letters. V. 4. № 4. P. 045014.

Rydin H., Jeglum J.K., Hooijer A. 2006. The biology of peatlands. Oxford, New York: Oxford University Press. 343 p.

Schwarze F.W.M.R. 2007. Wood decay under the microscope // Fungal Biology Reviews. V. 21. № 4. P. 133–170.

Stenlid J., Penttilä R., Dahlberg A., 2008. Wood-decay basidiomycetes in boreal forests: Distribution and community development // Ecology of Saprotrophic Basidiomycetes / Boddy L., Frankland J.C., Van West P. (eds.). Amsterdam, Boston: Elsevier Academic Press. P. 239–262.

Thormann M.N. 2011. In vitro decomposition of Sphagnum-derived acrotelm and mesotelm peat by indigenous and alien basidiomycetous fungi // Mires and Peat. V. 8. P. 1–12.

Thormann M.N., Rice A.V. 2007. Fungi from peatlands // Fungal diversity. V. 24. P. 241–299.

Wieder R.K. 2006. Peatlands and the Boreal forest // Boreal pearland ecosystems / Wieder R.K., Vitt D.H. (eds.) Berlin: Springer. P. 1–8.

Yurchenko E.O. 2001. Corticioid fungi on mosses in Belarus // Mycena. V. 1. N 1. P. 71–91.

Арефьев С.П. 2001. Дереворазрушающие грибы в экологическом мониторинге территории нефтяных месторождений Среднего Приобья // Вестник экологии, лесоведения и ландшафтоведения. Вып. 2. С. 67-85.

Арефьев С.П. 2008. О системном подходе к охране редких видов грибов // Вестник экологии, лесоведения и ландшафтоведения. № 8. С. 3–14.

Бондарцева М.А., Пармасто Э.Х. 1986. Порядок афиллофоровые : Семейства гименохетовые, лахнокладиевые, кониофоровые, щелелистниковые. Ленинград: Наука и техника. 192 с.

Булатов В.И. и др. (ред.) 2007. География и экология города Ханты-Мансийска и его природного окружения. Ханты-Мансийск: Издательство ОАО «Информационно-издательский центр». 187 р.

Васин А.М., Васина А.Л. (ред.). 2013. Красная книга Ханты-Мансийского атономного округа – Югры. Екатеринбург: Издательство Баско. 460 с.

Грум-Гржимайло О.А. 2013. Микромицеты заболачивающихся водоемов побережья Кандалакшского залива Белого моря: дис. … канд. биол. наук. М: МГУ. 242 с.

Змитрович И.В. 2011. Средняя тайга Карельского перешейка: зональные, интразональные и экстразональные явления // Вестник экологии, лесоведения и ландшафтоведения. № 12. С. 54–76.

Коропачинский И.Ю., Встовская Т.Н. 2002. Древесные растения Азиатской России. Новосибирск: Гео. 707 с.

Лапшина Е.Д. 2010. Растительность болот юго-востока Западной Сибири. Новосибирск. 186 с.

Мухин В.А. 1993. Биота ксилотрофных базидиомицетов Западно-Сибирской равнины. Екатеринбург: Наука. 232 с.

Носков Г.А., Боч М.С. (ред.) 2000. Красная книга природы Ленинградской области. Том 2. Растения и грибы. Санкт-Петербург: Издательство «Акционер и К». 672 с.

Райтвийр А.Г. 1967. Определитель гетеробазидиальных грибов СССР. Л.: Наука. 93 с.

Ставишенко И.В. 2000. Ксилотрофные макромицеты Юганского заповедника // Микология и фитопатология. Т. 34. № 1. С. 23–29.

Ставишенко И.В. 2002. Трансформация лесных сообществ ксилотрофных грибов под воздействием НГД // Деградация и демутация лесных экосистем в условиях нефтегазодобычи / Залесов С.В. и др. (под ред.) Екатеринбург. С. 278–338.

Ставишенко И.В. 2003. Ксилотрофные макромицеты южной части территории Заповедно-природного парка «Сибирские Увалы» // Экологические исследования восточной части Сибирских Увалов: сб. науч. тр. Заповед. -природ. парка «Сибирские Увалы». Нижневартовск. Т. 2. С. 26–35.

Ставишенко И.В. 2007a. Афиллофороидные грибы природного парка «Кондинские озера» (Зап. Сибирь) // Микология и фитопатология. Т. 41. № 2. С. 152–163.

Ставишенко И.В. 2007b. Материалы к видовому разнообразию афиллофороидных грибов заповедника «Малая Сосьва» // Биологические ресурсы и природопользование. Т. 10. С. 116–127.

Ставишенко И.В., Залесов С.В. 2008. Флора и фауна природного парка «Самаровский чугас». Ксилотрофные базидиальные грибы. Екатеринбург: Урал. гос. лесотехн. ун-т. 104 с.

Тюремнов С.Н. 1976. Торфяные месторождения. М.: Недра. 488 с.

Филиппова Н.В. 2010. Предварительный список грибов и миксомицетов Ханты-Мансийского Автономного Округа (подготовлен к XI рабочему совещанию Комиссии по изучению макромицетов Русского Ботанического Общества, 17-23 августа 2010 года). Ханты-Мансийск: Югорский Государственный Университет. 26 с.

REFERENCES

Ainsworth G.C., Bisby G.R., Kirk P.M. (Eds.) 2008. *Ainsworth & Bisby's dictionary of the fungi*. UK: CABI Bioscience. 771 p.

Aref'ev S.P. 2001. Derevorazrushayushchie griby v ekologicheskom monitoringe territorii neftyanykh mestorozhdeniy Srednego Priob'ya [Wood-attacking fungi in the ecological monitoring of the Middle-Ob oil-fields]. *Vestnik ekologii, lesovedeniya i landshaftovedeniya*. V. 2. P. 67–85. (in Rus.)

Aref'ev S.P. 2008. O sistemnom podkhode k okhrane redkikh vidov gribov [On system approach to conservation of rare fungi]. *Vestnik ekologii, lesovedeniya i landshaftovedeniya*. № 8. P. 3–14. (in Rus.)

Bernicchia A., Gorjón S.P. 2010. *Corticiaceae s.l.* Italia: Candusso. 1008 p.

Boddy L. 2001. Fungal Community Ecology and Wood Decomposition Processes in Angiosperms: From Standing Tree to Complete Decay of Coarse Woody Debris. *Ecological Bulletins*. V. 49. P. 43–56.

Boddy L., Heilmann-Clausen J. 2008. Basidiomycete community development in temperate angiosperm wood. *Ecology of Saprotrophic Basidiomycetes*. Boddy L., Frankland J.C., Van West P. (eds.) Amsterdam, Boston: Elsevier Academic Press. P. 211–237.

Bondartseva M.A., Parmasto E.Kh. 1986. *Opredelitel' gribov SSSR. Poryadok afilloforovye : Semeystva gimenokhetovye, lakhnokladievye, konioforovye, shchelelistnikovye* [Clavis Diagnostica Fungorum URSS. Ordo Aphyllophorales. Familiae: Hymenochaetaceae, Lachnocladiaceae, Coniophoraceae, Schizophyllaceae]. Leningrad: Nauka i tekhnika publ. 192 p (in Rus.)

Bulatov V.I. et al. (Eds.) 2007. *Geografiya i ekologiya goroda Khanty-Mansiyska i ego prirodnogo okruzheniya* [Geography and ecology of Khanty-Mansiysk and its surroundings]. Khanty-Mansiysk: Izdatel'stvo OAO «Informatsionno-izdatel'skiy tsentr». 187 p. (in Rus.)

Dahlberg A. 2011. *European Red List of endangered macrofungi*. URL: http://www.wsl.ch/eccf/activities-en.ehtml

Dix N.J., Webster J. 1995. *Fungal ecolog*y. London: Chapman & Hall. 549 p.

Eriksson J., Ryvarden L. 1976. *The corticiaceae of North Europe. V. 4. Hyphodermella - Mycoacia*. Norway, Oslo: Fungiflora. P. 549–886.

Filippova N.V. 2010. *Predvaritel'nyy spisok gribov i miksomitsetov Khanty-Mansiyskogo Avtonomnogo Okruga* (podgotovlen k XI rabochemu soveshchaniyu Komissii po izucheniyu makromitsetov Russkogo Botanicheskogo Obshchestva, 17-23 avgusta 2010 goda) [Prior list of fungi in Khanty-Mansiysk region (prepared for XI workshop of the Macromycetes commission of the Mycological Section of Russian botanical society, 17-23 August, 2010)]. Khanty-Mansiysk: Yugorskiy Gosudarstvennyy Universitet. 26 p. (in Rus.)

Gilbertson R.L., Bigelow H.E. 1998. Annotated Checklist of Wood-Rotting Basidiomycetes of the Sky Islands in Southeastern Arizona. *Journal of the Arizona-Nevada Academy of Science*. V. 31. № 1. P. 13–36.

Grum-Grzhimaylo O.A. 2013. *Mikromitsety zabolachivayushchikhsya vodoemov poberezh'ya Kandalakshskogo zaliva Belogo morya* [Micromycetes of paludifying water bodies of Kandalaksha bay shore]. Dis. … kand. biol. nauk. M: MGU. 242 p. (in Rus.)

Hansen L., Knudsen H. (eds.) 1992, 1997, 2000. *Nordic Macromycetes*. Vol. 1–3. Copenhagen: Nordsvamp.

Heilmann-Clausen J. 2001. A gradient analysis of communities of macrofungi and slime moulds on decaying beech logs. *Mycological Research*. V. 105. № 5. P. 575–596.

Hjortstam K., Larsson K.H., Ryvarden L. 1973-1987. *The Corticiaceae of North Europe.* Vol. 1–7. Oslo: Fungiflora.

Hojdová M., Hais M., Pokorný J. 2005. Microclimate of a peat bog and of the forest in different states of damage in the Šumava National Park. *Silva Gabreta*. V. 11. P. 13–24.

Huhndorf S.M. et al. 2004. Macrofungi on woody substrata. *Biodiversity of fungi. Inventory and monitoring methods*. Mueller G.M. et al. (eds.) Amsterdam, Boston: Elsevier Academic Press. P. 159–163.

James J., Anagnost S.E., Zabel R.A. 1997. Comparison of wood decay among diverse lignicolous fungi. *Mycologia*. V. 89. № 2. P. 119–219.

Kõljalg U. 1995. *Tomentella (Basidiomycota) and related genera in temperate Eurasia*. Oslo, Norway: Fungiflora. 213 p.

Koropachinskiy I.Yu., Vstovskaya T.N. 2002. *Drevesnye rasteniya Aziatskoy Rossii* [Woody plants of the Asian part of Russia]. Novosibirsk: Geo publ. 707 p. (in Rus.)

Kosykh N.P., Koronatova N.G. 2010. Phytomass and primary production of mire ecosystems in Surgut Polesie. *Environmental dynamics and global climate change*. V. 1. № 2. P. 1–6.

Kotiranta H., Saarenoksa R., Kytovuori I. 2009. *Aphyllophoroid fungi of Finland. A check-list with ecology, distridution and threat categories*. Helsinki: Botanical Museum of Natural History. 223 p.

Lapshina E.D. 2010. *Rastitel'nost' bolot yugo-vostoka Zapadnoy Sibiri* [Wetland vegetation of South-East part of West Siberia]. Novosibirsk. 186 p. (in Rus.)

Mukhin V.A. 1993. *Biota ksilotrofnykh bazidiomitsetov Zapadno-Sibirskoy ravniny* [Wood decay basidiomycetes of West Siberia]. Ekaterinburg: Nauka publ. 232 p. (in Rus.)

Noskov G.A., Boch M.S. (Eds.) 2000. *Krasnaya kniga prirody Leningradskoy oblasti. Tom 2. Rasteniya i griby* [Red book of nature of the Leningrad region. Volume 2. Plants and fungi]. Sankt-Peterburg: Izdatel'stvo «Aktsioner i K». 672 p. (in Rus.)

Ohlson M. 1995. Growth and nutrient characteristics in bog and fen populations of Scots pine (Pinus sylvestris). *Plant Soil*. V. 172. № 2. P. 235–245.

Ohlson M. 1999. Differentiation in adaptive traits between neighbouring bog and mineral soil populations of Scots pine Pinus sylvestris. *Ecography*. V. 22. № 2. P. 178–182.

Peregon A. et al. 2008. Map-based inventory of wetland biomass and net primary production in western Siberia. *Journal of Geophysical Research: Biogeosciences*. V. 113. G01007. DOI:10.1029/2007JG0004411.

Peregon A., Maksyutov S., Yamagata Y. 2009. An image-based inventory of the spatial structure of West Siberian wetlands. *Environmental Research Letters*. V. 4. № 4. P. 045014.

Raytviyr A.G. 1967. *Opredelitel' geterobazidial'nykh gribov SSSR* [Key to Heterobasidiomycetidae of the USSR]. Leningrad: Nauka pabl. 93 p. (in Rus.)

Rydin H., Jeglum J.K., Hooijer A. 2006. *The biology of peatlands*. Oxford, New York: Oxford University Press. 343 p.

Schwarze F.W.M.R. 2007. Wood decay under the microscope. *Fungal Biology Reviews*. V. 21. № 4. P. 133–170.

Stavishenko I.V. 2000. Ksilotrofnye makromitsety Yuganskogo zapovednika[Xylotrophic macromycetes of Yugan strict nature reserve]. *Mycology and phytopathology*. V. 34. № 1. P. 23–29. (in Rus.)

Stavishenko I.V. 2002. Transformatsiya lesnykh soobshchestv ksilotrofnykh gribov pod vozdeystviem NGD [Transformation of forest communities of lignicolous fungi under the influence of oil and gas extraction]. *Degradatsiya i demutatsiya lesnykh ekosistem v usloviyakh neftegazodobychi*. Zalesov S.V. et al. (Eds.) Ekaterinburg. P. 278–338. (in Rus.)

Stavishenko I.V. 2003. Ksilotrofnye makromitsety yuzhnoy chasti territorii Zapovedno-prirodnogo parka «Sibirskie Uvaly» [Wood-decaying fungi from the south part of "Siberian Uvaly" park territory]. *Ekologicheskie issledovaniya vostochnoy chasti Sibirskikh Uvalov: sbornik nauchnykh trudov zapovedno-prirodnogo parka «Sibirskie Uvaly»*. Nizhnevartovsk. V. 2. P. 26–35. (in Rus.)

Stavishenko I.V. 2007a. Afilloforoidnye griby prirodnogo parka «Kondinskie ozera» (Zap. Sibir') [Aphyllophoroid fungi of the Natural park "Kondinskyie Lakes" (West Siberia)]. *Mycology and phytopathology*. V. 41. № 2. P. 152–163. (in Rus.)

Stavishenko I.V. 2007b. Materialy k vidovomu raznoobraziyu afilloforoidnykh gribov zapovednika «Malaya Sos'va» [On the diversity of aphyllophoroid fungi of natural reserve "Malaya Sosva"]. *Biologicheskie recursy i prirodopol'zovanie*. V. 10. P. 116–127. (in Rus.)

Stavishenko I.V., Zalesov S.V. 2008. *Flora i fauna prirodnogo parka «Samarovskiy chugas». Ksilotrofnye bazidial'nye griby* [Flora and fauna of natural park "Samarovsliy chugas": Lignicolous basidiomycetes]. Ekaterinburg: Ural. gos. lesotekhn. un-t. 104 p. (in Rus.)

Stenlid J., Penttilä R., Dahlberg A., 2008. Wood-decay basidiomycetes in boreal forests: Distribution and community development. *Ecology of Saprotrophic Basidiomycetes*. Boddy L., Frankland J.C., Van West P. (eds.) Amsterdam, Boston: Elsevier Academic Press. P. 239–262.

Thormann M.N. 2011. In vitro decomposition of Sphagnum-derived acrotelm and mesotelm peat by indigenous and alien basidiomycetous fungi. *Mires and Peat*. V. 8. P. 1–12.

Thormann M.N., Rice A.V. 2007. Fungi from peatlands. *Fungal diversity*. V. 24. P. 241–299.

Tyuremnov S.N. 1976. *Torfyanye mestorozhdeniya* [Peat deposits]. M.: Nedra. 488 p. (in Rus.)

Vasin A.M., Vasina A.L. (Eds.). 2013. *Krasnaya kniga Khanty-Mansiyskogo atonomnogo okruga – Yugry* [Red book of Khanty-Mansiysk region – Yugra]. Ekaterinburg: Izdatel'stvo Basko. 460 s. (in Rus.)

Wieder R.K. 2006. Peatlands and the Boreal forest. *Boreal pearland ecosystems*. Wieder R.K., Vitt D.H. (eds.) Berlin: Springer. P. 1–8.

Yurchenko E.O. 2001. Corticioid fungi on mosses in Belarus. *Mycena*. V. 1. N 1. P. 71–91.

Zmitrovich I.V. 2011. Srednyaya tayga Karel'skogo peresheyka: zonal'nye, intrazonal'nye i ekstrazonal'nye yavleniya. *Vestnik ekologii, lesovedeniya i landshaftovedeniya*. № 12. P. 54–76. (in Rus.)

Zmitrovich I.V. 2012. Srednyaya tayga Karel'skogo peresheyka: zonal'nye, intrazonal'nye i ekstrazonal'nye yavleniya [Middle taiga of Kerelian Isthmus: zonal, intrazonal and extrazonal phenomena]. *Vestnik ekologii, landshaftovedeniya i lesovedeniya*. № 12. P. 54–76. (in Rus.)

СООБЩЕСТВО ГРИБОВ НА ДРЕВЕСИНЕ ВЕРХОВЫХ БОЛОТ (ЗАПАДНАЯ СИБИРЬ)

Филиппова Н.В.[1)], Змитрович И.В.[2)]

[1)]Югорский государственный университет, Ханты-Мансийск
[2)]Ботаническим институт им. Комарова, Санкт-Петербург

Сосна обыкновенная является одним из доминантов лесов бореальной зоны, где монодоминантные древостои приурочены к песчаным почвам. В древесном ярусе торфяных болот, занимающих в этой зоне большие территории, сосна составляет значительную часть живой биомассы. Биологические особенности болотной сосны отличаются от растущей на минеральном грунте, поэтому возможно предположить что сообщество деструкторов ее древесины также имеет свои особенности. Однако в литературе практически отсутствует информация о сообществе дереворазрушающих грибов торфяников, их отличия от лесных сообществ, и роли в круговороте вещества торфяных экосистем. Проведенные ранее в регионе исследования сообщают о находках около 170 видов на древесине сосны в лесах, и 11 видов на верховых болотах.

В настоящем исследовании проверен первичный анализ сообщества макромицетов на древесине *Pinus sylvestris* методом случайного осмотра субстратов. Объектом исследования были сосново-кустарничково-сфагновые сообщества (рямы) верховых болот в окрестностях г. Ханты-Мансийска. Из собранных около 100 образцов определено 49 видов грибов из нескольких групп: кортициоидные, афиллофороидные, клавариоидные, гетеробазидиоидные, агарикоидные базидиомицеты и дискомицеты. Большая часть видов собрана с полупогруженных в торф валежин, влажных комлей прямостоячих стволов, а также с пней, веток, коры, и торфяных субстратов.

Согласно литературным данным, виды с болотной сосны являются сапротрофами древесины широкого профиля, несколько видов приурочены к древесине хвойных, к коре, часть видов обитает также на мхах и различных субстратах подстилки. По типу разложения древесины большая часть видов образует белую гниль, шесть видов бурую гниль, дискомицеты рассматриваются слабыми сапротрофами древесины. Шесть кортициоидных видов формируют микоризные отношения с болотной сосной. Восемь видов из нашей коллекции собрано на торфяных субстратах в окрестностях древесины и два вида покрывали основания стеблей

живого сфагнума. Данные наблюдения подтверждают заключения других авторов об участии дереворазрушающих грибов в разложении и торфяных субстратов.

Количественного анализа сообщества на данном этапе не проводилось, но заключение об обилии видов косвенно сделано по числу находок. На болотной древесине часто встречаются ксеротолерантные виды: *Amyloporia xantha*, *Sistotremastrum suecicum*. Небольшая часть видов собрана в нескольких повторностях: *Coniophora arida*, *Peniophorella praetermissa*, *Phlebiella pseudotsugae*, *Piloderma byssinum*, and *Dacrymyces stillatus*. Остальные виды встречены один или два раза.

Выявленный список включает 13 видов впервые отмеченных в Ханты-Мансийском округе, три вида являются редкими находками в пределах России. Данные виды также являются дополнением к микоте торфяных экосистем.

Ключевые слова: дереворазрушающие грибы, афиллофороидные, кортициоидные, дискомицеты, болото, верховое болото, торфяник, сосна болотная, Pinus sylvestris

Поступила в редакцию: 15.04.2013
Переработанный вариант: 20.05.2013