

## Corticioid fungi (Basidiomycetes) in different biocoenoses of Byarezinski Biosphere Reserve, Belarus

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In this paper distributional patterns and species composition of corticioid fungi (Corticiaceae s. l.) in forest ecosystems of Byarezinski Reserve were studied in permanent plots. The number of species per plot varies from 6 in oligotrophic bogs (*Pino-Ledetum*) to 47 in broadleaf-spruce forests (*Quercus-Piceetum*). The cluster analysis of species lists revealed two main groups of biocoenoses with specific assemblages of fungi: southern taiga non-swamp coniferous forest and swamp forests dominated by alder and birch. The major factors determining biocoenotic preferences and species richness of fungi are number of tree and shrub species in community, coniferous/deciduous hosts proportion, and soil humidity.

Key words: biocoenotic distribution, broadleaf-spruce forest, Corticiaceae, permanent plot, species assemblage, species diversity, southern taiga community

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### Introduction

Corticioid fungi (Corticiaceae s.l.) play an important role as wood decomposers and finally participants of soil formation process in forest ecosystems over boreal and nemoral zones. Many species have small-sized or inconspicuous fruitbodies and are often overlooked in biocoenotic studies. In our definition corticioid fungi in broad sense are resupinate homobasidiomycetes lacking poroid hymenophore and it mostly corresponds with the genera described by Jülich and Stalpers (1980), including also resupinate species of Thelephoraceae and the genus *Hymenochaete*.

Earlier studies in Byarezinski State Biosphere Reserve (Vitsebsk and Minsk region, Belarus) on the fungi in question were done by Golovko and Komarova (1972). They published a list of 40 corticioid species.

The reserve is situated in the boreo-nemoral (mixed forests) subzone, north of Belarusian Moraine Range physiographic province and at the south border of Belarusian Paazer'e province. The reserve is entirely disposed in Upper Byarezina Lowland physiographic district (Dzyaments'eu 1975). Unlike the typical Paazer'e landscapes with greatly partitioned relief with lake complexes, the territory of the reserve consists of large plain lowlands and several small eminences. Forests occupy 635 km<sup>2</sup> (83.3% of the area). The main types of vegetation are large oligotrophic bogs with *Pinus sylvestris* L. var. *nana* Pall. (24.6% of forest area), *Betula pubescens* swamp forests (16.8%), *Alnus glutinosa* forests (16.4%), and drier *Pinus sylvestris* forests (14.3% – Ade-rikho & Arnol'bik 1996). The unique massifs of

forest bogs may be considered as main object of landscape protection in the reserve. Forest vegetation includes both southern taiga elements – pine and spruce forests of undershrub–moss types, and boreo-nemoral spruce forests (Aderikho et al. 1977). Examples of the most common forest types are *Pinetum pleuroziosum*<sup>1</sup> (11.5% of forest area), *Glutinosae-Alnetum caricosum* (8.0%), *G. Alnetum filipendulosum* (4.8%), *G.-Alnetum filicosum* (3.3%), *Pinetum sphagnosum* (4.1%), *Piceetum oxalidosum* (2.7%).

## Materials and methods

**Study plots.** We used 12 permanent plots of 20×20 m, according with the method described by us earlier (Yurchenko 1998; 2001b). All plots were placed in central part of the reserve (Fig. 1), taking into consideration the principle of representativeness of a forest type and ho-

mogeneity of plant cover within a plot. The characterization of plots with brief description of the amount of big-size dead wood, and the sampling dates are listed below. The naming of communities is according to Matuszkiewicz (1984), and forest type nomenclature follows Yurkevich (1980).

1. *Pleurozio-Pinetum* (Stepanovich, 1999, unpubl.) *seu Pinetum pleuroziosum*, with *Vaccinium vitis-idaea* L., *V. myrtillus* L., *Calluna vulgaris* (L.) Hull, sparse young *Picea abies* (L.) Karst. trees; slightly elevated place between Razhnyanskoe and Savski Mokh bogs, Domzharytsy forestry, forest sq. no. 314; 5 fallen trunks and big branches of *Pinus sylvestris* ca. 10 cm diam, 1 stump of *P. sylvestris* ca. 13 cm diam (code **Pin1**): May and Nov 1997, Jul 1998, Jun 1999.

2. *Pleurozio-Pinetum seu Pinetum pleuroziosum*, with *Betula pendula* Roth in main tree level, *Juniperus communis* L., *Vaccinium myrtillus*; slope of Razhnyanskiya Vysoty elevation, Rozhna forestry, sq. no. 245a; 4 fallen trunks of *Pinus sylvestris* ca. 10–15 cm diam, 3 fallen and standing trunks of *Juniperus communis* ca. 4–5 cm diam, 1 stump of *J. communis* (code **Pin2.1**): Jul 1998, Jun 1999.

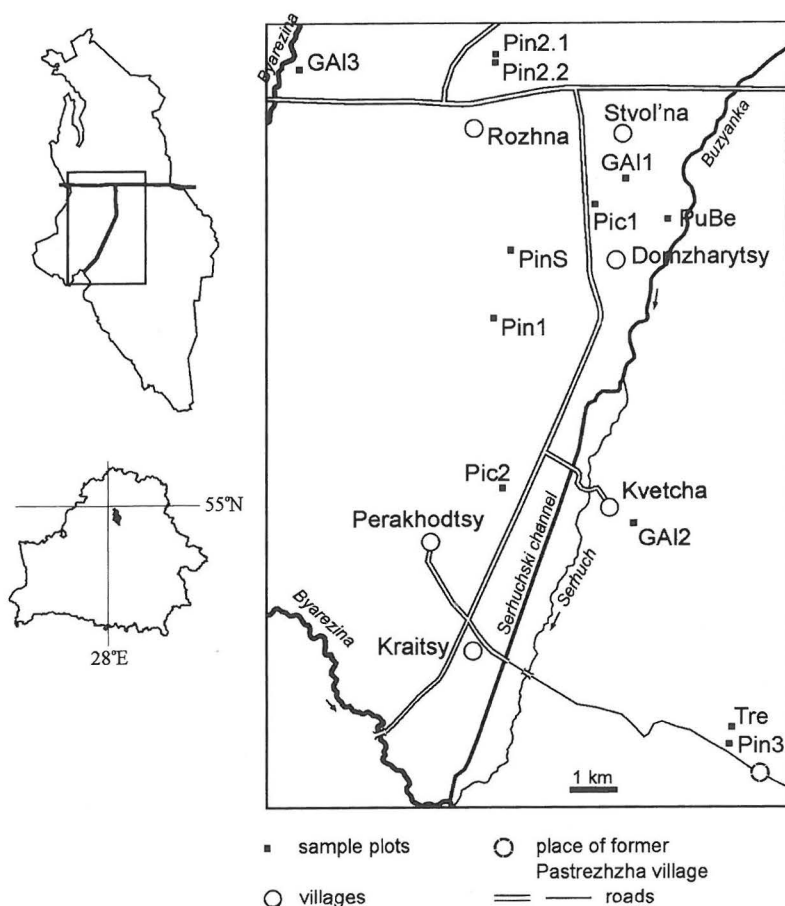


Fig. 1. Scheme of study plots location in Byarezinski Biosphere Reserve.

3. *Pleurozio-Pinetum* seu *Pinetum pleuroziosum*, with scarce *Vaccinium vitis-idaea*; *ibid.* where Pin2.1; 3 fallen trunks of *Pinus sylvestris* ca. 8–10 cm diam, 1 fallen trunk of *Betula pendula* ca. 8 cm diam, 1 stump of *P. sylvestris* and 2 stumps of *B. pendula* ca. 15 cm diam, 1 trunk of *Juniperus communis* ca. 5 cm diam (code **Pin2.2**): Jul 1998, Jun 1999.

4. *Pleurozio-Pinetum* seu *Pinetum pleuroziosum*, with *Pteridium aquilinum* (L.) Kuhn; plain territory near Pastrezhskae bog, Pastrezhzhzha forestry, sq. no. 541; 7 fallen trunks of *Pinus sylvestris* ca. 7–13 cm diam, 1 fallen trunk of *B. pendula* ca. 7 cm diam (code **Pin3**). Sampling: Jun 2000.

5. *Pino-Ledetum palustris* Tx. (1955) seu *Pinetum sphagnosum*, with *Eriophorum vaginatum* L.; Razhnyanskae elevated bog, between central and marginal zone of the bog; Domzharytsy forestry, sq. no. 299; 7 standing and 3 fallen or declined trees of *Pinus sylvestris* ca. 5–10 cm diam (code **PinS**): Jul 1998, Jun 1999.

6. *Quercus-Piceetum* Matuszkiewicz, 1952 em. Matuszkiewicz et Pol., 1955 seu *Piceetum oxalidosum*, with *Populus tremula* L., *Betula pendula*, *Alnus incana* (L.) Moench, *Fraxinus excelsior* L., *Salix caprea* L., single *Acer platanoides* L., *Quercus robur* L., and *Alnus glutinosa* (L.) Gaertn. in tree level, well-developed level of *Corylus avellana* L., with *Aegopodium podagraria* L.; slightly elevated territory between Razhnyanskae bog and the Buzyanka river, Domzharytsy forestry, sq. no. 284; 1 fallen part of *Fraxinus excelsior* tree ca. 20 cm diam, 1 fallen branch of *Fraxinus excelsior* ca. 10 cm diam, 3 declined and fallen trunks of *Salix caprea* ca. 6–12 cm diam, 8 fallen and standing trunks of *Corylus avellana* ca. 4–8 cm diam, 1 fallen trunk of unknown leaf tree ca. 10 cm diam, 1 fallen *Picea abies* ca. 8 cm diam, 1 standing tree of *Alnus incana* ca. 8 cm diam (code **Pic1**): May, Jun, and Nov 1997, Jul 1998, Jun 1999.

7. *Vaccinio-Piceion* Br.-Bl., 1938 ass. indet. or mixture of *Piceetum pleuroziosum* and *P. myrtillosum*, with *Hylocomium splendens* (Hedw.) Schimp. dominating in ground cover; elevated area between the Serhuch and the Byarezina rivers, Kraitsy forestry, sq. no. 404; 1 fallen tree of *Pinus sylvestris* ca. 25 cm diam, 2 standing *P. sylvestris* ca. 25 cm diam, 2 stumps of *P. sylvestris* ca. 20 cm diam, 2 stumps of *Quercus robur* ca. 50 cm diam, 4 declined and fallen trunks of *P. abies* ca. 5–6 cm in diam, 2 trunks of *Juniperus communis* ca. 5 cm diam (code **Pic2**): Jun 1999.

8. *?Rubo saxatilis-Populetum tremulae* Korotkov, 1986 (the association is dominated by *Populus tremula* and probably is derivative from *Calamagrostio arundinaceae-Piceetum* Sokołowski, 1980) seu *Tremuletum oxalidosum*, with *Picea abies*, *Rubus idaeus* L., in herb cover with common *Calamagrostis arundinacea* (L.) Roth, *Dryopteris carthusiana* (Vill.) H.P. Fuchs, and *Milium effusum* L.; plain territory near Pastrezhskae bog, Pastrezhzhzha forestry, sq. 541; 2 trunks of *Betula pendula* ca. 13–15 cm diam, 1 fallen trunk of unknown tree ca. 10 cm diam, 4 declined and fallen trunks and big branches of *Populus tremula* ca. 8–15 cm diam, 1 stump of *Picea abies* ca. 13 cm diam, 1 fallen trunk of *Picea abies* ca. 5 cm diam, 2 stumps of unknown trees ca. 15–20 cm diam (code **Tre**): Jun 2000.

9. *Ribo nigri-Alnetum* Sol.-Gorn., 1975 or community united features of *Glutinosae-Alnetum filipendulosum*, *G.-Alnetum filicosum*, *G.-Alnetum oxalidosum*, with *Betula pubescens* Ehrh., *Picea abies*, *Fraxinus excelsior*; lowland along the right bank of the Buzyanka river, Domzharytsy forestry, sq. no. 270b; 4 standing and fallen trunks of *Picea abies* 8–20 cm diam, 6 fallen and declined trunks of *Alnus glutinosa* ca. 10–18 cm diam, 1 fallen trunk of *B. pubescens* ca. 13 cm diam (code **GA1**): Jul 1998, Jun 1999.

10. *Alno-Betuletum* Scamoni, 1959 seu *G.-Alnetum caricosum*, with *Picea abies*, *Betula pendula*, *Salix pentandra* L., and domination of *Carex acutiformis* Ehrh. in herb level; left bank floodplain of the Serhuch river, Kraitsy forestry, sq. no. 405b; 1 declined trunk of *Salix pentandra* ca. 15 cm diam, 1 fallen tree of *Picea abies* ca. 10 cm diam, 1 stump of *Alnus glutinosa* ca. 12 cm diam, 1 fallen trunk of *A. glutinosa* ca. 10 cm diam, 5 trunks of *Salix cinerea* ca. 5 cm diam, 1 fallen trunk of *Betula pendula* ca. 8 cm diam (code **GA12**): Jun 1999.

11. *Alno-Betuletum* (the association has features making it transitional to *Carici elongatae-Alnetum* Koch, 1926) seu *G.-Alnetum filipendulosum*, with *Betula pubescens*, *Picea abies*, *Carex elongata* L., *Urtica dioica* L.; left bank valley of the Byarezina river, high level floodplain, Rozhna forestry, sq. no. 242; 4 fallen and declined trunks of *Alnus glutinosa* ca. 8–10 cm diam, 2 fallen trunks of *Picea abies* ca. 13 cm diam, 1 stump of unknown tree ca. 15 cm diam, 3 standing and fallen trunks of *Salix* sp. ca. 5 cm diam (code **GA13**): Jun 2000.

12. *Alno-Betuletum* seu *Pubescenso-Betuletum thelypteridosum*, with *Alnus glutinosa*, *Salix pentandra*, *Carex acutiformis*, and young *Picea abies* trees; lowland along the right bank of the Buzyanka river, Domzharytsy forestry, sq. no. 285; 4 declined and fallen trunks of *Alnus glutinosa* ca. 10–15 cm diam, 3 stumps of *A. glutinosa* ca. 12 cm diam, 1 standing and 1 fallen tree of *Salix pentandra* ca. 10–13 cm diam, 2 fallen trunks of *Betula pendula* ca. 10–15 cm diam, 5 fallen and declined trunks of *Salix cinerea* ca. 5 cm diam (code **PuBe**): May and Jul 1997, Jun 1999.

Investigated plots are situated in natural forest communities, except of Pin3, representing *Pinus sylvestris* plantation. In comparison with typical forest stands PinS may be considered as a community dominated by *Sphagnum* spp.

The cluster analysis of the plots species lists was based on binary data matrix (presence of species on the plot – 1, absence – 0) and carried out by means of STATISTICA 5.0 software. The unidentified taxa were compared with each other and in the case of morphological dissimilarity were added to data matrix as independent units. Czekanowski coefficient of similarity between species lists was calculated according the formula  $C = 100 \times 2 w / (a+b)$ , where a and b – total number of species in community 1 and 2, w – number of species common for both communities.

The collection material is preserved in V.F. Kuprevich Institute of Experimental Botany Herbarium, section "Fungi", Minsk (MSK-F).

The nomenclature of fungi and taxa delimitation mostly follow Hansen and Knudsen (1997) and the authors of species are not repeated here.

Table 1. Distribution of common species of corticioid fungi in sample biocoenoses of Byarezinski Biosphere Reserve, arranged along the gradient of soil humidity.

No.	Species	Sample plot code											
		Pin1	Pin2.1	Pin2.2	Pin3	Pic2	Tre	Pic1	GA13	GA11	GA12	PuBe	PinS
1	<i>Amphinema byssoides</i>	+	+	+	+	+		+	+	+	+	+	
2	<i>A. epiphylla</i> complex	+	+	+	+		+	+				+	+
3	<i>Botryobasidium candicans</i> (and anamorph stage <i>Haplotrichum capitatum</i> )	+	+	+	+							+	
4	<i>B. leave</i>								+	+	+	+	
5	<i>B. subcoronatum</i>	+	+	+	+		+		+	+			
6	<i>Ceraceomyces microsporus</i>	+	+	+		+	+						
7	<i>Hymenochaete tabacina</i>					+	+		+		+	+	
8	<i>Hyphoderma praetermissum</i> complex	+	+		+	+	+	+		+	+	+	
9	<i>H. setigerum</i>						+		+	+	+	+	
10	<i>Hyphodontia barba-jovis</i>						+	+	+		+		
11	<i>H. breviseta</i> , <i>H. cf. breviseta</i>	+	+	+	+	+	+			+			
12	<i>H. radula</i>	+					+	+	+		+	+	
13	<i>H. sambuci</i>							+		+		+	+
14	<i>H. subalutacea</i>	+	+	+								+	
15	<i>Peniophora cinerea</i>				+	+		+	+	+		+	
16	<i>P. incarnata</i>							+	+	+		+	
17	<i>Phlebiella pseudotsugae</i> , <i>Ph. cf. pseudotsugae</i>	+	+	+		+							+
18	<i>Ph. sulphurea</i>	+	+	+	+	+	+	+					
19	<i>Scopuloides hydroides</i>							+	+		+	+	
20	<i>Sistotrema brinkmannii</i>					+		+			+	+	
21	<i>Tomentella lapida</i> , <i>T. cf. lapida</i>		+		+	+				+			
22	<i>T. punicea</i> , <i>T. cf. punicea</i>		+		+	+	+			+	+	+	
23	<i>Trechispora microspora</i>	+	+		+	+		+	+		+	+	+
24	<i>Tubulicrinis glebulosus</i>					+		+	+			+	
25	<i>T. subulatus</i>	+	+	+	+	+							+

## Results and discussion

**General distribution.** Altogether 135 species of corticioid fungi were registered in the reserve, and 105 (78%) of them were found on the sample plots studied. Twenty-five species (18.5%) found on 4 or more plots, are treated as commonly distributed in the reserve (Tab. 1). Moreover, these species were registered as common in a number of other studies sites of Belarus. Four taxa, *Amphinema byssoides*, *Athelia epiphylla* complex, *Hyphoderma praetermissum* complex (see Eriksson & Ryvarden 1975), and *Trechispora microspora* inhabit the widest range of biotopes. They were observed on 8–10 plots, and can be referred to eurytopic species. The genera *Hyphodontia* (on all plots) and *Tomentella* (on all plots except PinS) are the most constant in forest coenoses. These two genera, together with *Athelia* and *Botryobasidium*, are the leading elements in most forest communities. The genera *Hyphodontia*, *Peniophora*, and *Tomentella* have the highest species diversity on study plots. There are 4–5 species of *Hyphodontia* in Pin1, Pin2.2, Pic1, Tre, GA11, PuBe, 4 species of *Peniophora* in GA11, and 4–5 species of *Tomentella* in Pic2 and PuBe, respectively. The genera *Athelia*, *Botryobasidium*, *Ceraeomyces*, *Hyphoderma*, *Stereum*, and *Trechispora* include up to 3 species per plot.

**Comparison of species composition in sample biocoenoses.** Studied communities have different species diversity (Tab. 2) explained by the com-

plex of factors. The number of species unique for a plot reflects the specific structure of given community. It also shows the mosaic distribution of fungal populations which not always coincides with distribution of biotopes suitable for species inhabitation. The most specific fungus flora is on conifer-dominated plots (Tab. 2).

In order to group sample communities a cluster analysis based on dissimilarity between species lists was carried out (Fig. 2). The coefficients of similarity between communities are presented in Tab. 3.

Two main clusters are revealed from both dendrograms: (1) *Pinus sylvestris* communities and (2) deciduous swamp forest communities, composed of *Alnus glutinosa* and *Betula pubescens*, with admixture of *Picea abies*. The highest similarity is between plots belonging to the same association: three plots of *Alno-Betuletum* (GA12, GA13, PuBe) C=42–54, and four plots of *Pleurozio-Pinetum* (Pin1, Pin2.1, Pin2.2, Pin3) C=38–57 (Tab. 3). The similarity between Pin1 and Pin2.2 disposed 5 km apart is more than between the neighbouring plots Pin2.1 and Pin2.2. The plots Pin1 and Pin2.2 have very similar ground cover and tree level composition. The biocoenoses GA12 and GA13 differ in herb cover and soil humidity, but have very similar tree level composition. Thus, we can observe correlation between vascular plants complex (presumably woody plants) and corticioid fungi complex in studied biocoenoses.

Tab. 2. Corticioid fungi species diversity and relative amount of dead wood in sample biocoenoses.

Plot code	Pin1	Pin2.1	Pin2.2	Pin3	PinS	Pic1	Pic2	Tre	Gal1	Gal2	Gal3	PuBe
Total number of species	25	29	21	16	6	46	29	17	31	20	21	32
Number of species unique for the plot*	3	11	6	2	1	18	7	0	6	2	4	4
Relative amount of dead wood (ranked in 3-grades scale)	2	2	2	2	1	3	3	2	3	2	2	3

\*Finds outside of study plots omitted.

[illegible]

A representative for the boreo-nemoral spruce community, Pic1, has species which draws it together with cluster (2) of deciduous swamp forests. At the same time it is rather far from a boreal spruce community (Pic2). Pine-spruce community, Pic2, is united with cluster (1), since it is evidently a derivative of pine forest. Both Pic2 and representatives of *Pleurozio-Pinetum* belong to a group of boreal undershrub-moss coniferous forests. Corticioid fungi assemblage of spruce-aspen community (Tre) has an intermediate position remote from spruce communities, but has some similarity with cluster (2) and more with cluster of pine forests (Fig. 2).

Moisture is one of the most important microclimatic factors affecting the species distribution of corticioid fungi. Since most wood-rotting fungi inhabit dead wood on ground, soil humidity is a leading condition determining assemblages of species. The location of biotopes on higher or lower relief levels and the nature of underlying ground finally determine the soil humidity. The studied plots are distributed along the gradient of soil humidity in accordance with:

Pin1, Pin2.1, Pin2.2, Pin3 < Pic2, Tre < Pic1 < GAI3 < GAI1, GAI2, PuBe, PinS

The association *Pleurozio-Pinetum* occupy moderately dry, well drained ecotopes in contrast with communities GAI1, GAI2, PuBe, occupying extra humid ecotopes with water level constantly above ground surface. However, pronounced hills around standing trees in the last biotopes are moderately dry microhabitats for fungi on dead wood. Soil humidity and light regime determine the per cent of xero- meso- and hygrophilous fungal species in a community. In dry pine forests almost all corticioid fungi develop basidiomata on lower side of fallen wood, in litter, and under moss cover (good examples are *Amphinema byssoides*, *Phanerochaete sanguinea*, *Phlebiella pseudotsugae*, *Ph. sulphurea*). In deciduous and mixed swamp forests the fungal complex include both xeromesophilous species on still-attached dead twigs (*Byssomerulius corium*, *Corticium roseum*, *Hymenochaete tabacina*, *Peniophora cinerea*, *P. incarnata*, *P. violaceolivida*) and mesohygrophilous species on fallen wood in contact with water surface in depressions (*Scolopoides hydroides*, *Subulicystidium longisporum*, *Tomentella*).

The peat bog plot (*Pino-Ledetum*, PinS) has the minimal species diversity and abundance of

corticioid fungi. There are certain factors suppressing the development of wood-rotters. On the first hand, still-attached dead twigs and trunks are sun-exposed and dried by wind due to sparse and draft pine stand. On the other hand, fallen wood is exposed to high acidity of moss cover upper layer which may be in upper peat layer sometimes as low as pH 2.6 (Boch & Mazing 1979). The species composition is quite remote from all other types of biocoenoses, but has some similarity with non-swamp pine forests (Fig. 2) due to the presence of *Phlebiella* cf. *pseudotsugae* and *Tubulicrinis subulatus*.

**Characteristic species assemblages in different types of biocoenoses.** A number of species have a wide ecological amplitude, and colonize different biotopes from dry hill tops to swampy depressions (Tab. 1). Some species, however, have a narrower amplitude. In this study we observed rather stable combinations of species, or species assemblages.

Southern taiga, non-boggy pine forests (Pin1, Pin2.1, Pin2.2, Pin3) with *Vaccinium myrtillus*, *V. vitis-idaea*, *Calluna vulgaris*, *Pleurozium schreberi* (Brid.) Mitt., *Dicranum polysetum* Sw., *Hylocomium splendens* have a quite stable assemblage: *Amphinema byssoides*–*Athelia epiphylla* complex–*Botryobasidium candicans*–*B. subcoronatum*–*Phlebiella sulphurea*–*Tubulicrinis subulatus*. The most constant and abundant species here are *Amphinema byssoides* and *Phlebiella sulphurea*, observed in pine forests all over Belarus. Our observations together with the data on Estonia (Parmasto & Parmasto 1997), Leningrad region (Bondartseva et al. 1999), and Finland (Bondartseva et al. 1998) indicate that *A. byssoides*, *Botryobasidium subcoronatum*, and *Ph. sulphurea* are evidently the most common species in coniferous forests in boreal and boreo-nemoral zones of Europe. They inhabit different kinds of fallen wood immersed in moss cover, and also occur on litter under mosses and logs (presumably *A. byssoides* and *Ph. sulphurea*). Other species typical to pine or spruce-pine forests of undershrub-moss types are: *Athelia* cf. *arachnoidea*, *Ceraceomyces microsporus*, *Hyphoderma praetermissum* complex, *Hyphodontia brevisepta*, *H. subalutacea*, *Phlebiella pseudotsugae*, and *Trechispora microspora*. Common in conifer forest ecosystems and sometimes abundant are *Sistotremastrum suecicum* and *Phanerochaete sanguinea*. The most species-rich genera in pine



forests are *Botryobasidium*, *Hyphodontia*, and *Trechispora*, with 2-5 species per plot.

Southern taiga, pine-spruce community (Pic2) has elements common also in pine forests – *Ceraeomyces microsporus*, *Phlebiella pseudotsugae*, and *Tubulicrinis subulatus*. A remarkable feature of Pic2 is the abundance of *Tomentella* – 5 species, among which *T. punicea* and *T. lapida* were recorded as dominating. These data together with the registering of 4 *Tomentella* species in Pic1 indicate that diversity of resupinate theleporoid fungi is high in spruce forests. The wood-litter fungus *Piloderma byssinum* is rare in the reserve, and was found only in Pic2, in contrast to its abundance in more northern regions (e.g. Estonia – Parmasto 1965; Parmasto & Parmasto 1997). *Tomentellas* and *P. byssinum*, which are commonly confined to forest litter and strongly decayed wood, are known as facultative mycorrhizal fungi.

Boreo-nemoral mixed spruce forests with rich herb cover is represented by plot Pic1. This plot is obviously a unique forest ecosystem in the area, containing 8 tree species and 1 shrub species on 400 m<sup>2</sup> area, and having the richest diversity of corticioid fungi (Tab. 2, 4). Some species have their only records on this plot in the reserve and even the whole Belarus (Tab. 4). Shallow ground depressions which accumulate rain and snow, and the shadow of *Picea abies* and *Corylus avellana* canopy form moderately moist microclimate. The elements connecting Pic1 with swamp forests are *Scopuloides hydroides*, *Subulicystidium longisporum*, and *Tomentella stiposa*. The community also includes elements typical to boreal coniferous forests: *Phlebiella sulphurea* and *Trechispora farinacea*.

Deciduous and mixed swamp forests dominated by *Alnus glutinosa* and *Betula pendula* have

Tab. 4. Example of a plot species list. Corticioid fungi registered on 400 m<sup>2</sup> square plot “*Quercus-Piceetum*” (Pic1), with the value of their relative abundance:\*

1. <i>Amphinema byssoides</i>	2	24. <i>Ph. velutina</i>	2
2. <i>Athelia epiphylla</i> complex (incl. <i>A. salicum</i> )	2	25. <i>Phlebia fuscoatra</i>	2
3. <i>Botryohypochnus isabellinus</i>	1	26. <i>Ph. rufa</i>	2+
4. <i>Brevicellicium olivascens</i>	2+	27. <i>Phlebiella sulphurea</i>	2
5. <i>Ceraeomyces eludens</i>	1	28. <i>Radulomyces confluens</i>	2
6. <i>C. aff. serpens</i>	2	29. <i>Scopuloides hydroides</i>	1
7. <i>Ceratobasidium</i> sp.	1	30. <i>Sistotrema brinkmannii</i>	1
8. <i>Cylindrobasidium evolvens</i>	2	31. <i>S. oblongisporum</i>	1
9. <i>Gloeocystidiellum porosum</i>	1	32. <i>Sistotremastrum niveocreteum</i>	1
10. <i>Hymenochaete cinnamomea</i>	2	33. <i>Steccherinum fimbriatum</i>	2
11. <i>Hyphoderma definitum</i>	1++	34. <i>Stereum hirsutum</i>	2
12. <i>H. praetermissum</i> complex	2	35. <i>S. rugosum</i>	2
13. <i>Hyphodontia barba-jovis</i>	2	36. <i>Subulicystidium longisporum</i>	1
14. <i>H. crustosa</i>	3	37. <i>Tomentella</i> cf. <i>atramentaria</i>	1
15. <i>H. radula</i>	1	38. <i>T. badia</i>	1+
16. <i>H. sambuci</i>	2	39. <i>T. galzinii</i>	1++
17. <i>Hyphodontia</i> sp.	2	40. <i>T. stiposa</i>	1
18. <i>Hypochnicium erikssonii</i>	1++	41. <i>Trechispora farinacea</i>	1
19. <i>Peniophora cinerea</i>	3	42. <i>T. microspora</i>	1
20. <i>P. erikssonii</i>	1	43. <i>Tubulicrinis glebulosus</i>	2
21. <i>P. incarnata</i>	3	44. <i>Vuilleminia comedens</i>	3
22. <i>P. polygonia</i>	1	45. Unidentified sp. 1 (MSK 4081)	1
23. <i>Phanerochaete laevis</i>	2	46. Unidentified sp. 2 (MSK 4908)	1

\*determined according to original scale as approximate sum area of basidiomata plus their frequency: 1 – very small-sized or small-sized, single or occasional fruitbodies, 2 – medium-sized, moderately conspicuous or regularly meeting fruitbodies, 3 – significant, big or common fruitbodies; + – single known site for the species in the reserve; ++ – single known site for the species in Belarus.



typical species assemblage: *Amphinema byssoides*–*Botryobasidium laeve*–*Hyphoderma setigerum*. *A. byssoides* is rather scarce here, but highly constant and develops on fallen wood on hillocks associated with bases of standing trunks. The species characterists are also: *Hymenochaete tabacina*, *Hyphoderma praetermissum* complex, *Hyphodontia barba-jovis*, *H. radula*, *Peniophora cinerea*, *P. incarnata*, *Scopuloides hydroides*, *Trechispora microspora*.

The species assemblage of spruce-aspen community (Tre) has elements common to both conif-

erous forests (*Ceraceomyces microsporus*, *Hyphodontia breviseta*, *Phlebiella sulphurea*) and swamp alder forests (*Hyphoderma setigerum*).

**Dependence of complex of corticioid fungi on species composition of woody plants in biocoenosis.** Species of trees and shrubs play different roles as hosts for wood decomposing fungi (Fig. 3). In general, species diversity of wood-inhabiting fungi in biocoenosis increases with the number of woody plants.

In *Pleurozio-Pinetum* the taxonomical diversity of corticioid fungi is affected by the presence

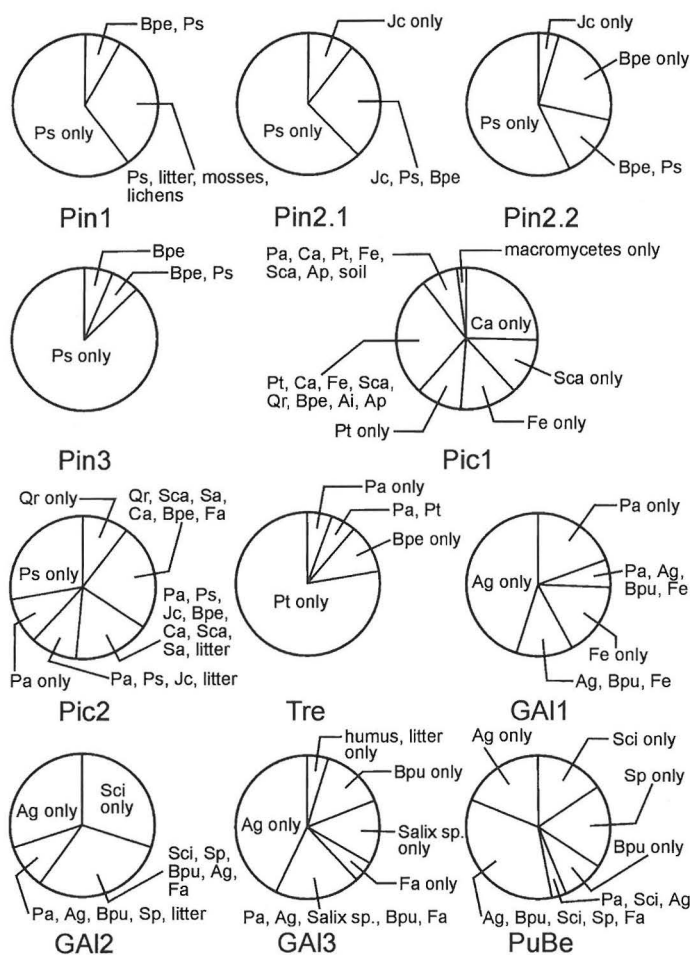


Fig. 3. Diagrams showing species composition of corticioid fungi in sample communities in regard to substratum preferences. The sectors reflect per cent of species inhabiting wood, bark, or occasionally fallen leaves of: Ai – *Alnus incana*, Ag – *Alnus glutinosa*, Ap – *Acer platanoides*, Bpe – *Betula pendula*, Bpu – *Betula pubescens*, Ca – *Corylus avellana*, Fa – *Frangula alnus* Mill., Fe – *Fraxinus excelsior*, Jc – *Juniperus communis*, Pa – *Picea abies*, Ps – *Pinus sylvestris*, Pt – *Populus tremula*, Qr – *Quercus robur*, Sa – *Sorbus aucuparia* L., Sca – *Salix caprea*, Sci – *Salix cinerea*, Sp – *Salix pentandra*.

of *Betula pendula* and *Juniperus communis*. Both hosts increase the number of species in the community: *Ceraceomyces borealis*, *Peniophora cinerea*, and *Tomentella fuscocinerea* were registered on *Betula pendula*; *Ramaricium albo-ochraceum* and *Vesiculomyces citrinus* were registered on *Juniperus communis*. The influence of *Betula pendula* is small if only occasional trees are present (Pin1, Pin3). Besides wood as main nutritive substratum, the fungal basidiomata and vegetative hyphae can occupy herb debris, fallen leaves, dead and living lichen thalli, and dead and living moss sprouts (Yurchenko 2001a). Example of such species on several substrata in pine forests is shown in Fig. 3 for Pin1.

The most complex structure of trophic connections is found in broadleaf-spruce forests and coniferous forests with a mixture of deciduous trees (Pic1, Pic2). In Pic1 only 8.5% of corticioid species were registered on the dominant tree species *Picea abies*, and 21% on co-dominant tree *Populus tremula*, respectively. On both deciduous and coniferous hosts 6.5% of species were registered, and 85% were collected on deciduous tree and shrub species only. The richest assemblage was found on *Corylus avellana* – 49% of species grow on hazel and 25.5% grow solely on this host. Actually *C. avellana* defines the “figure” in Pic1, together with *Fraxinus excelsior* (25.5% of species, 13% on this host only), and *Salix caprea* (19% of species, 13% on this host only). In such communities *C. avellana* is the most accessible substratum for corticioid fungi due to a large amount of short-living trunks, making bulk of dead wood. Also the considerable length (and thus, area) of trunks and branches, and possibly also the chemical peculiarities of the wood are suitable for many species. In Pic2 the fungus flora on angiosperms constitutes more than half of the species and includes 45% of species which grow on angiosperms only. Other important factor increasing the richness of saprobic xylotrophic fungi is the quantity of fallen wood, especially windfalls, which are particularly common in mixed spruce forests (Tab. 2).

In *Alno-Betuletum* a great number of fungi grow on *Salix* species, especially in PuBe, where 44% of species were found on *S. pentandra*, and 19% on this substratum only; 31% of the species were recorded on *S. cinerea* L., and 16% of on

this host only. On *Alnus glutinosa* and *Betula pubescens* in PuBe 41% and 28% of species were accordingly registered. Besides willows, the corticioid assemblage in swamp forests is determined by *Alnus glutinosa*. In comparison with alder, *Betula pubescens* has the assemblage of less specialized species.

#### Distribution of highly specialized species.

There is a tendency in evolution of wood-inhabiting Basidiomycetes to specialize on single or several related hosts (Hallenberg 1991: 102). Thus the distribution of fungi is determined by the distribution of host. The most noticeable example is *Peniophora junipericola*, which is connected with great *Juniperus communis* populations in Estonia (Parmasto 1992). An other example is *Peniophora quercina* in Belarus. It is associated with oak forests or sites with sufficient number of quite mature *Quercus robur* trees, and could consequently not be observed on the study plots in the reserve. In Byarezinski Reserve the species restricted to communities with sufficient host populations are: *Amylostereum laevigatum* (*Juniperus communis*), *Corticium roseum* and *Peniophora violaceolivida* (*Salix* spp.), *Peniophora erikssonii* (*Alnus* spp.), *P. limitata* (*Fraxinus excelsior*), and *P. polygonia* (*Populus tremula*).

According to this study the essential factors determining the distribution and coenotic preferences of corticioid fungi are the richness of woody plants species, coniferous/deciduous hosts proportion, soil humidity, and quantity of fallen wood increasing in older forests. Oligotrophic bogs with pine stands are exception from this general rule. The ecological conditions in broadleaf-spruce forests are the best for development of a rich fungus flora.

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