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CONTRIBUTION TO BIODIVERSITY ASSESSMENT OF EUROPEAN PRIMEVAL FORESTS: NEW RECORDS OF RARE FUNGI IN THE BIAŁOWIEŻA FOREST

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Abstract. The paper gives an annotated list of 40 species of macrofungi found in the Białowieża Forest recently. Two genera (*Mycoaciella* J. Erikss. & Ryvarden and *Sphaerobasidium* Oberw.) and nine species (*Alnicola amarescens* (Quél.) R. Heim & Romagn., *Ceriporiopsis rivulosa* (Berk. & M. A. Curtis) Gilb. & Ryvarden, *Henningsomyces puber* (Romell *ex* W. B. Cooke) D. A. Reid, *Mycena silvae-nigrae* Maas Geest. & Schwöbel, *Mycoaciella bispora* (Stalpers) J. Erikss. & Ryvarden, *Psathyrella maculata* (C. S. Parker) A. H. Sm., *Sphaerobasidium minutum* (J. Erikss.) Oberw. *ex* Jülich, *Steccherinum tenuispinum* Spirin, Zmitr. & Malysheva, and *Xenasma pruinosum* (Pat.) Donk) are reported for the first time from Poland. A further 23 species are new for the Białowieża Forest: *Antrodia mellita* Niemelä & Penttilä, *Antrodiella citrinella* Niemelä & Ryvarden, *Asterodon ferruginosus* Pat., *Athelia decipiens* (Höhn. & Litsch.) J. Erikss., *Byssocorticium atrovirens* (Fr.) Bondartsev & Singer *ex* Singer, *Conferticium ochraceum* (Fr.) Hallenb., *Coniophora olivacea* (Fr.) P. Karst., *Crepidotus crocophyllus* (Berk.) Sacc., *C. lundellii* Pilát, *Dacryomyces tortus* (Willd.) Fr., *Exidia villosa* Neuhoff, *Hyphodontia pruni* (Lasch) Svrček, *Kavinia alboviridis* (Morgan) Gilb. & Budington, *Lentinus suavissimus* Fr., *Mycoacia uda* (Fr.) Donk, *Peniophora limitata* (Chaillet *ex* Fr.) Cooke, *Pezicula acericola* (Peck) Peck *ex* Sacc. & Berl., *Piloderma byssinum* (P. Karst.) Jülich, *Pseudomerulius aureus* (Fr.) Jülich, *Rectipilus fasciculatus* (Pers.) Agerer, *Sebacina incrustans* (Pers.) Tul. & C. Tul., *Sistotrema raduloides* (P. Karst.) Donk and *Trechispora hymenocystis* (Berk. & Broome) K. H. Larss. The species new for Poland are described and their micromorphological characters are illustrated.

Key words: Ascomycota, Basidiomycota, Białowieża Forest, diversity, distribution, Poland

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INTRODUCTION

The Białowieża Forest, comprising the remaining patches of the virgin lowland forest that once covered immense areas of the Central European Plain, is the largest lowland deciduous forest complex in Europe and one of the best-preserved primeval forests on the continent (Bobiec 2002). It covers 1520 km^2, of which 646 km^2 lies within the territory of Poland and 874 km^2 belong to Belarus (Faliński 2002). Since 1921 the most valuable habitats of the Białowieża Forest on the Polish side have been protected as a nature reserve, and since 1932 as one of the first national parks in Europe. In 1979 the Białowieża Forest was put on the UNESCO World Natural Heritage list (Okołów 2002). The whole area on the Belarusan side is strictly or partially protected, and on the Polish side about 35% of the area is under protection as reserves or a national park (Antczak 2006). Within the legally protected parts, the Białowieża National Park covers 105 km^2, of which 57 km^2 (9% of the Polish part of the Białowieża Forest) is a strict reserve (Faliński 1995; Antczak 2006).

The area is influenced by continental climate, producing low average annual temperature (6°C), cold winters (average January temperature –4°C) and low average annual precipitation (635 mm)

(Bobiec 2002). All the major forest associations occurring in this part of Europe can be found in the Białowieża Forest, of which oak-linden-hornbeam forest with old multilayered treestand (*Tilio-Carpinetum*) is the most typical plant community, covering about 50% of the National Park (Faliński 1995). The Białowieża Forest differs from Western European forests in the absence of beech (*Fagus sylvatica* L.) and from Eastern European forests by the abundance of oak (*Quercus robur* L.). The Białowieża Forest harbors many boreal and continental plant species, some of which are very common, such as *Picea abies* (L.) H. Karst. which occurs in almost every forest community (Faliński 1995).

Although the first mycological exploration of the Białowieża Forest dates back to the 19th century (Błoński *et al.* 1888; Błoński & Drymmer 1889) and many results of various kinds of mycological studies have been published over the last 120 years (e.g., Pilát 1950; Truszkowska 1953, 1959; Nespiak 1959; Orłoś 1960; Skirgiełło 1960, 1998; Domański 1965a, 1967, 1968; Pachlewski & Pachlewska 1965; Majewski 1971), the area has not yet been exhaustively investigated. Undoubtedly the most important mycological studies in the area were undertaken in one forest section (area 140 ha) of the strict nature reserve (part of the Białowieża National Park) in 1987–1991 under project *CRYPTO* (Faliński & Mułenko 1992). These studies yielded a list of 1380 species, 62% of which (861 taxa) are macromycetes, represented predominantly (416 taxa) by agaricoid fungi (Bujakiewicz 1995, 2003). Almost 200 species of cup fungi and only 100 species of aphyllophoroid fungi have been reported from the area (Chmiel 1995; Skirgiełło 1995). About 1500 species of macrofungi have been reported from the Białowieża Forest (Bujakiewicz 2002a). Most records of them are exclusively from the relatively small area of the Białowieża National Park (Kujawa, in press). The number of species continues to increase as new data are gathered, mainly in various sites and nature reserves located outside the National Park (e.g., Bujakiewicz 2002a, b, 2003; Bujakiewicz & Nita 2004).

This paper presents the most interesting results of our mycological investigations in the Białowieża Forest (mostly outside the National Park) in recent years, supplemented by the results of re-examination of some interesting collections made by Stanisław Domański (KRAM F-SD). Particular emphasis is placed on the aphyllophoroid fungi, one of the groups least investigated in the Białowieża Forest.

Material and methods

The material was collected during several field trips from 1998 to 2009 in various regions of the Białowieża Forest (Fig. 1), and some interesting collections of S. Domański deposited in KRAM were re-examined. In total, 67 collections have been studied. The collected specimens were described and photographed in the field. The material was studied according to standard methods used in the taxonomy of fungi. Spores and other elements of dried carpophores were examined and measured in water, 5% KOH, 25% NH_4OH, Cotton Blue or Melzer's reagent, using Optek Bino, Nikon Eclipse 400 and Nikon Eclipse 600 microscopes. Spore size is given without the apiculus and ornamentation. The descriptions of macro- and microcharacters provided below are based exclusively on the collected material. Drawings of microcharacters were made with the use of a drawing tube (Nikon Y-IDT) or from microphotographs taken with a Nikon Coolpix 4500 Digital Camera (resolution 4.13 million pixels; 2560 × 1520 pixels). All measurements were done directly through the microscope under an oil immersion objective, not from drawings. Specimens are deposited in KRAM or our private collections.

Results and discussion

The 40 most interesting species we found during the last 12 years are listed below. Among them two genera (*Mycoaciella* J. Erikss. & Ryvarden and *Sphaerobasidium* Oberw.) and nine species (*Alnicola amarescens* (Quél.) R. Heim & Romagn., *Ceriporiopsis rivulosa* (Berk. & M. A. Curtis) Gilb. & Ryvarden, *Henningsomyces puber* (Romell *ex* W. B. Cooke) D. A. Reid, *Mycena silvae-nigrae* Maas Geest. & Schwöbel, *Mycoaciella bispora* (Stalpers) J. Erikss. & Ryvarden, *Psathyrella maculata* (C. S. Parker) A. H. Sm., *Sphaerobasidium minutum* (J. Erikss.) Oberw. *ex* Jülich, *Steccherinum tenuispinum* Spirin, Zmitr.

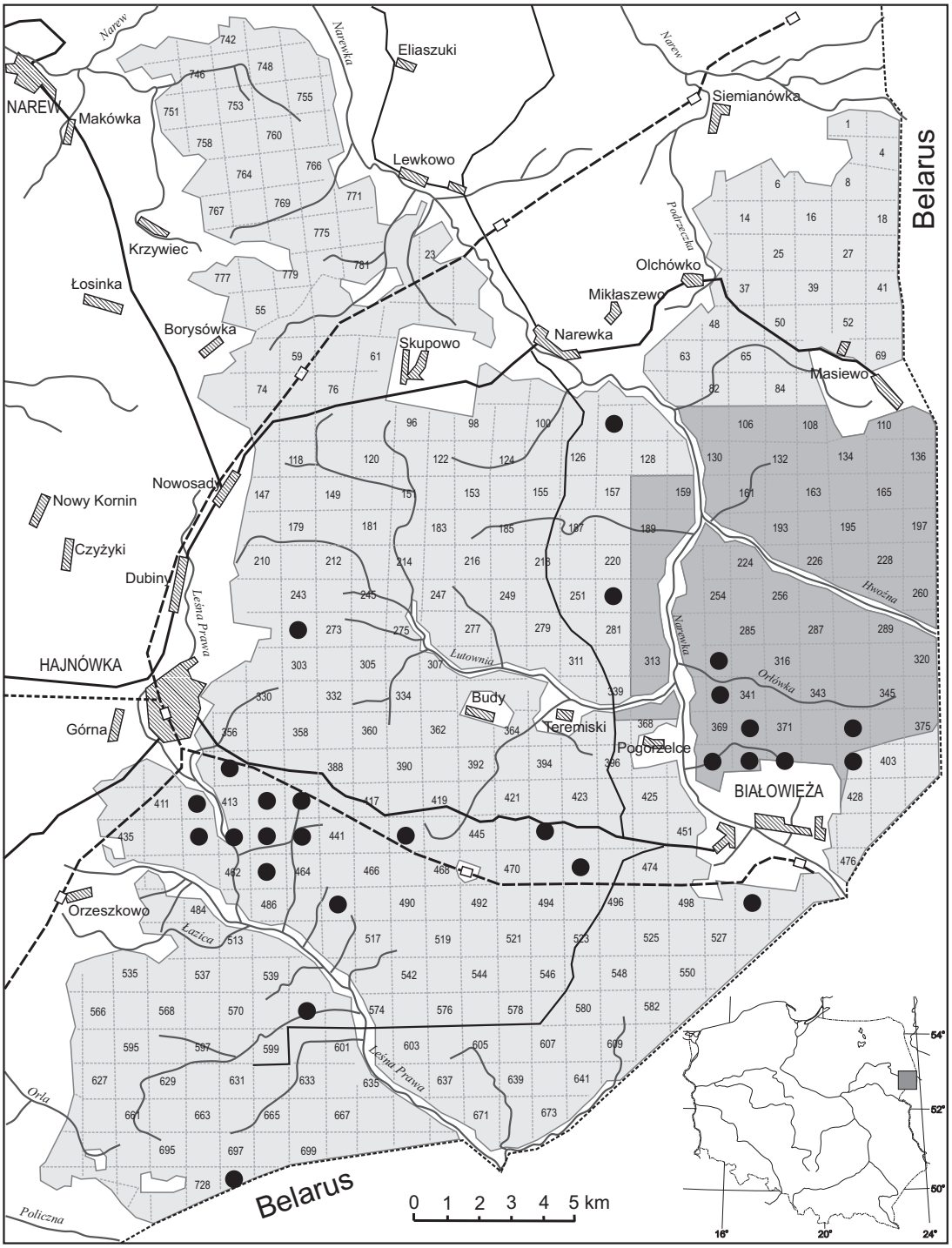

Fig. 1. Study area: pale grey – Białowieża Forest, dark grey – Białowieża National Park, black circles – visited localities. Numbers on map refer to forest section numbers.

& Malysheva, and *Xenasma pruinosum* (Pat.) Donk) were not previously reported from Poland. Another 23 species are new for the Białowieża Forest.

ASCOMYCOTA

Erinella aeruginosa Henn. Fig. 2

SPECIMENS EXAMINED. Białowieża Forest, forest section 414, on wood remnants (?*Quercus* L.), 13 Sept. 2005, *leg. M. Wołkowycki* (KRAM F-47608, herb. M. Snowarski 050913.16)

Erinella aeruginosa is one of a few species which dye wood green-blue, such as *Chlorociboria* Seaver *ex* C. S. Ramamurthi, Korf & L. R. Batra species. It produces very small, shortly stipitate, discoid, cup-shaped ascomata 0.5–1.5 mm in diam., first concave, then flat to slightly irregular in shape, pale green or whitish with a green tint, with a distinctly fimbriate margin. It is very similar to species from the genus *Chlorociboria*, but differs by having much smaller apothecia distinctly fimbriate at the margin and huge spores 42.8–53.7 × 2.9–4.1 μm. The spores of *Chlorociboria* spp. do not exeed 20 μm in length.

The species was described by Hennings (1906) based on specimens found in 1904 in Russia in moist deciduous forest on a decaying trunk of *Quercus robur* (= *Q. pedunculata* Ehrh.). The taxonomic position of *Erinella aeruginosa* is not clear as it possesses the mixture of features characteristic for Hyaloscyphaceae and Dermateaceae (Van Vooren 2006). The species is rare in Europe, known from a few localities including France and Switzerland (Röllin & Anthoine 1988; Van Vooren 2006). In Poland it is known exclusively from the Białowieża Forest. It was collected a few times during project *CRYPTO* in the strict reserve in forest section 256 (Bujakiewicz *et al.* 1992; Chmiel 1997). Our finding in another region of the Białowieża Forest suggests that the fungus may be frequent in the area.

Pezicula acericola (Peck) Peck *ex* Sacc. & Berl. Fig. 3

SPECIMENS EXAMINED. Białowieża Forest, forest section 414, on bark of fallen log of *Acer* L., 13 Sept. 2005, *leg. D. Karasiński, A. Kujawa & M. Snowarski* (KRAM F-47399, herb. M. Snowarski 050913.17).

Pezicula acericola belongs to the group of so-called weak pathogens that often attack plants growing in industrial areas. It occurs as an anamorph (*Cryptosporiopsis* Bubák & Kabát) as well as a teleomorph (Kowalski 1999). In the latter stadium it produces yellow-orange apothecia 0.5–2.0 mm in diam., slightly pruinose at the outer side, occurring in large numbers and growing in rows in bark fissures. The species is widespread in North America, and rare in Europe and Asia (Breitenbach & Kränzlin 1984; Verkley 1999). It occurs mainly on *Acer*, but also on *Cornus* L., *Rhododendron* L. and *Quercus* (Verkley 1999). In Poland it is known to occur on *Acer negundo* L. and *A. saccharinum* L. at a single locality in Świerklaniec in the south (Kowalski 1999), but taking into account the large number of infected trunks and branches in the study areas of that author, it is possible that the fungus is more common in Poland but overlooked. This is the first record of the species in the Białowieża Forest.

BASIDIOMYCOTA

Alnicola amarescens (Quél.) R. Heim & Romagn. Figs 4 & 5

SPECIMENS EXAMINED. Białowieża Forest, Leśna River valley, forest section 437B, N 52°41′50″, E 23°36′23″, mixed forest (*Alnus* Mill., *Picea abies*, *Quercus*), on burned ground, 20 May 2006, *leg. A. Kujawa, A. Ronikier & M. Snowarski* (KRAM F-55659).

Pileus 15–20 mm in diam., expanded with broad and flat umbo, orange-brown, rusty brown, hygrophanous, not translucently striate, pale orange-brown, rusty brown when dry, slightly darker in center, surface very finely fibrillose (lens), older specimens slightly ragged at margin. Lamellae orange-brown, rusty brown, 5 mm broad, broadly andate or emarginate, edge smooth. Stem 20–30 × 3–4 mm, dark brown, slightly paler at apex, cylindrical, fibrillose, slightly pruinose at apex. Flesh pale cream in pileus, dark brown in cortical layer of stem and cream in central part of stem. Smell indistinct, taste bitter. Spores ellipsoid to amygdaliform 8–10 × 5.0–5.5 μm, finely rugose,

Fig. 2. *Erinella aeruginosa* Henn. on wood remnants (?*Quercus* L.) (KRAM F-47608, herb. M. Snowarski 050913.16).

Fig. 3. *Pezicula acericola* (Peck) Peck *ex* Sacc. & Berl. on bark of fallen log of *Acer* L. (KRAM F-47399, herb. M. Snowarski 050913.17).

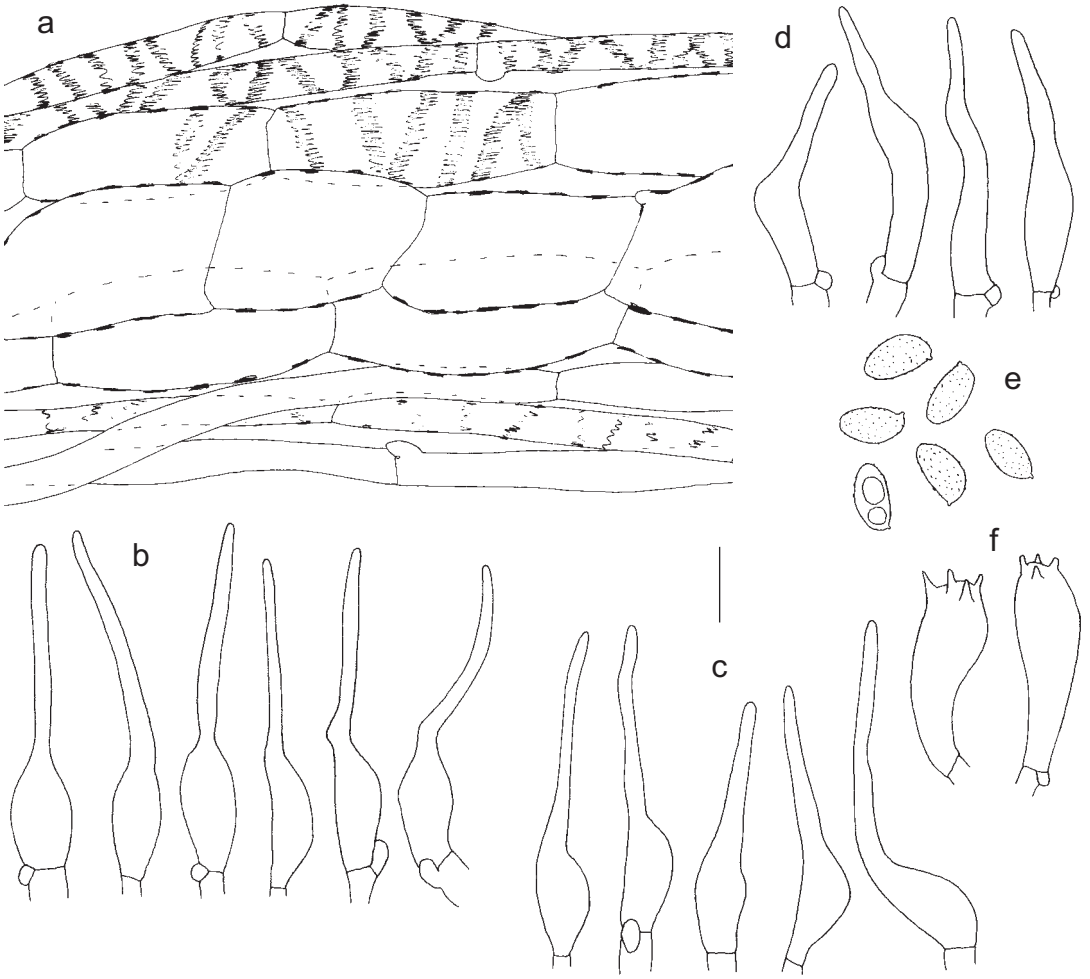

Fig. 4. *Alnicola amarescens* (Quél.) R. Heim & Romagn. a – pileipellis, b – cheilocystidia, c – pleurocystidia, d – caulocystidia, e – spores, f – basidia; scale bar = 10 µm (KRAM F-55659).

pale ochraceous in KOH. Basidia 4-spored, 25–28 × 8–9 µm. Edge of lamellae sterile, cheilocystidia abundant, fusiform-lageniform, broadened at base, with long and narrow neck 41–70 × 6.0–8.5 × 1.5 µm. Pleurocystidia numerous, similar to cheilocystidia, 36 × 6–8 × 1.5–2.0 µm. Caulocystidia present in upper part of stem, similar to cheilocystidia, but some with shorter neck. Pileipellis built up of strongly incrusted narrow hyphae, subpellis made up of short and broad incrusted elements. Clamps present.

Alnicola amarescens is rare in the temperate zone of Europe (Vesterholt & Heilemann-Clausen 2008), where it usually occurs on burned ground or mineral soil, under *Salix* L. (Døssing 1992; Moreau 2005a; Vesterholt & Heilemann-Clausen 2008). The species has also been reported from arctic (Greenland) and alpine areas (Kühner 1981; Borgen *et al*. 2006; Corriol 2008). It can also be found in ruderal places (Vesterholt & Heilemann-Clausen 2008). According to Moreau (2005b) it may be a collective taxon, as there are discrepancies in literature descriptions, especially on spore size and smell. *Alnicola amarescens* s.str. is char-

Fig. 5. *Alnicola amarescens* (Quél.) R. Heim & Romagn. (KRAM F-55659).

Fig. 6. *Antrodia mellita* Niemelä & Penttilä on bark and wood of fallen trunk of *Populus tremula* L. (KRAM F-46986, KRAM F-47247).

acterized by bitter taste, the absence of smell, and spores up to 10.5(11.0) μm long (Moreau 2005a and pers. comm.). The species has not been reported from Poland previously.

Antrodia mellita Niemelä & Penttilä

Fig. 6

SPECIMENS EXAMINED. Białowieża Forest, Władysław Szafer Reserve, forest section 443, *Tilio-Carpinetum*, on bark and wood of fallen trunk of *Populus tremula* L., 29 Sept. 2006, *leg. D. Karasiński 1647 & M. Piątek* (KRAM F-46986, KRAM F-47247).

Antrodia mellita is a European species occurring very rarely in northern and central parts of the continent. It was described from specimens found in Finland (Niemelä & Penttilä 1992); those authors also provided a collection found in 1969 in Poland (Strwiążyk near Ustrzyki Górne in the Góry Sanocko-Turczańskie Mts). Recently it was also collected in the Bieszczady Mts (Gierczyk *et al.* 2009). Outside the type locality, the two Polish records and a few other stations in Finland, it was also recorded in Latvia, Norway, Sweden and Slovakia (Ryvarden & Gilbertson 1993; Vampola 1996; Meiere 2002; Ryvarden *et al.* 2003; Škubla 2003). The species is new for the Białowieża Forest.

Antrodia mellita causes brown rot of deciduous wood. Its dominant substrate in the boreal zone is *Populus tremula*, but in Norway it was also noted on *Salix* sp. (Ryvarden *et al.* 2003). Two Polish collections originate from *Fagus sylvatica* (Niemelä & Penttilä 1992; Gierczyk *et al.* 2009), and at the southernmost locality of the species in the Stužica Nature Reserve in Slovakia the fungus was collected from a fallen branch of *Salix caprea* L. (Vampola 1996). The specimen from the Białowieża Forest grew on a large, partly decorticated trunk of a *ca* 80-year-old *Populus tremula*. At the same time, basidiomata of *Gelatoporia pannocincta* (Romell) Niemelä and *Sistotrema raduloides* (P. Karst.) Donk were observed on other parts of the same log. Although we found the fungus only once, it is very likely that *Antrodia mellita* also occurs in other parts of the Białowieża Forest, including within Białowieża National Park. Further exploration of the area is needed, particularly in places with old *Populus tremula* trees.

In the field *Antrodia mellita* may be confused with the similar *A. albida* (Fr.) Donk and *A. heteromorpha* (Fr.) Donk. These morphologically similar species have pure white basidiomata with distinct pilei and larger spores. *Antrodia albida* is associated with deciduous wood and most frequently occurs on fallen branches of *Fagus sylvatica*, while *A. heteromorpha* usually occurs on dead conifers in upland or mountain forests. Another similar species, *A. macra* (Sommerf.) Niemelä, has cream basidiomata and is associated with wood of *Salix*.

Antrodiella citrinella Niemelä & Ryvarden

Fig. 7

SPECIMENS EXAMINED. Białowieża Forest, forest section 373, close to and on dead basidiomata of *Fomitopsis pinicola* (Sw.) P. Karst. on *Picea abies* stump, 24 Apr. 2009, *leg. D. Karasiński 2894* (KRAM F-47345); forest section 402, close to dead basidiomata of *Fomitopsis pinicola* on naked decayed *Picea abies* trunk, 22 Apr. 2009, *leg. D. Karasiński 2853* (KRAM F-47346).

Antrodiella citrinella was first reported from Poland by Niemelä and Ryvarden (1983) from Babia Góra Mt and the Góry Świętokrzyskie Mts. Recently it was also found in the Bieszczady Mts (Gierczyk *et al.* 2009). The species is new for the Białowieża Forest. All these collections originate from primeval or natural and protected forests. *Antrodiella citrinella* is considered to be a successor of *Fomitopsis pinicola*, and this connection has also been observed in all Polish collections. The fungus is usually collected in autumn, but in the Białowieża Forest and the Bieszczady Mts the basidiomata of *A. citrinella* were observed in spring. Possibly the fungus forms its basidiomata twice a year.

Antrodiella romellii (Donk) Niemelä

SPECIMENS EXAMINED. Białowieża Forest, Władysław Szafer Reserve, forest section 443, on fallen branch of *Quercus robur*, 29 Sept. 2006, *leg. D. Karasiński* (KRAM F-47250); Białowieża National Park, on fallen branch of deciduous tree, 14 Aug. 1888, *leg. F. Błoński* (KRAM F-SD733, as *Poria byssina*); mixed forest, on

Fig. 7. *Antrodiella citrinella* Niemelä & Ryvarden close to dead basidioma of *Fomitopsis pinicola* (Sw.) P. Karst. on naked decayed trunk of *Picea abies* (L.) H. Karst. (KRAM F-47346).

Fig. 8. *Byssocorticium atrovirens* (Fr.) Bondartsev & Singer *ex* Singer on fragment of wood under *Carpinus betulus* L. and *Corylus avellana* L. (KRAM F-47604).

fallen branch of *Tilia* L., 6 Aug. 1962, *leg. S. Domański* (KRAM F-SD3835, as *Tyromyces byssinus*); on fallen branch of *Alnus glutinosa* (L.) Gaertn., 8 Sept. 1966, *leg. S. Domański* (KRAM F-SD5105, as *Tyromyces byssinus*).

Antrodiella romellii forms small resupinate basidiomata on fallen branches of deciduous trees. The species is similar to *Junghuhnia nitida* (Pers.) Ryvarden and in the field these two fungi can be confused, as they have similar ecological requirements. Microscopically the two species are also very similar. The most important difference is the presence of thick-walled, incrusted cystidia in *J. nitida*, which are absent in *A. romellii*. Another morphologically similar polypore, *A. pallescens* (Pilát) Niemelä & Miettinen, produces effused-reflexed or pileate basidiomata growing on wood earlier decomposed by *Fomes fomentarius* (L.) Fr. or directly on old, dead basidiomata of this species. It may be distinguished from *A. romellii* by spores that are of different size and shape.

Antrodiella romellii has already been reported from the Białowieża Forest under the name *Poria romellii* Donk by Domański (1972), who cited the specimen collected by Błoński on 14 August 1888. A duplicate of this collection is preserved in the herbarium Domański (KRAM F-SD733, as *Poria byssina*), and was re-examined during the present study. In the monograph of Domański (1972), Błoński's collection is cited as '(Błoński, 1888)'. This is misleading and suggests that the species was published by Błoński (1888), which is not the case. In Poland, outside the Białowieża Forest, *A. romellii* was reported also from the Mazury region in the northeast (Domański 1963b) and the Bieszczady Mts in the southeast (Domański *et al.* 1970).

Asterodon ferruginosus Pat.

SPECIMENS EXAMINED. Białowieża Forest, Michnówka Reserve, forest section 572, mixed forest, on dead stump of *Picea abies* and dead basidioma of *Phellinus chrysoloma* (Fr.) Donk, 24 May 2006, *leg. M. Piątek & D. Karasiński 1640* (KRAM F-47251); forest section 488C, on fallen trunk of *Picea abies*, 11 Nov. 2000, *leg. M. Wołkowycki* (KRAM F-53968, herb. M. Wołkowycki 1547).

Asterodon ferruginosus is characterized by yellow cinnamon basidiomata densely covered with short spines and the presence of stellate setae in the hymenium. In Poland this species was hitherto known from only two stations in the Augustów Forest (Wojewoda 2000a), and it is reported here for the first time in the Białowieża Forest. The finding of *A. ferruginosus* in this area is not very surprising because it is considered an indicator species of primeval forests (Parmasto & Parmasto 1997).

Athelia decipiens (Höhn. & Litsch.) J. Erikss.

SPECIMENS EXAMINED. Białowieża Forest, forest section 437, on wood of fallen trunk of *Carpinus betulus* L., 20 May 2006, *leg. D. Karasiński 1648* (KRAM F-47252).

The inconspicuous and delicate, white basidiomata of *Athelia decipiens* can, in favorable conditions, produce widely effused coatings on dead wood and remnants of plants. Among the members of the genus *Athelia* Pers., this species is distinguished by the complete absence of clamps and the presence of small ellipsoid spores often glued in groups of 2–4.

The distribution of *Athelia decipiens* in Poland is insufficiently known. It was previously reported from the Niepołomice Forest (Wojewoda *et al.* 1999) and the Góry Świętokrzyskie Mts (Łuszczyński 2002). The present finding is the first in the Białowieża Forest. In Scandinavia, *A. decipiens* has numerous localities and is considered the most common species of the genus *Athelia*, especially in northern areas of that part of Europe (Eriksson & Ryvarden 1973). Outside Europe, *A. decipiens* is known from North America (Ginns & Lefebvre 1993), South America (Hjortstam & Ryvarden 2007b) and Asia (Hallenberg 1981; Hjortstam & Ryvarden 1988; Maekawa 1993).

Byssocorticium atrovirens (Fr.) Bondartsev & Singer *ex* Singer Fig. 8

SPECIMENS EXAMINED. Białowieża Forest, vicinity of Podolany Reserve, forest section 500, on deciduous litter and fragments of wood under *Carpinus betulus* and

Corylus avellana L., 27 Sept. 2006, *leg. D. Karasiński 1639* (KRAM F-47604).

Byssocorticium atrovirens is a mycorrhizal species forming characteristic arachnoid to byssoid basidiomata which are at first bright blue and become darker and greenish during maturation. The mycorrhizas of this species are similar though less intense in color (Brand 1991). *Byssocorticium atrovirens* has a monomitic hyphal system and hyphae almost completely lacking clamps. The specimen from the Białowieża Forest had basal clamps at the basidia and very scattered clamps at the subhymenial hyphae. Some subicular hyphae were covered with scattered crystals. Spores were globose, up to 4.5 µm in diam., with a large oil drop. *Byssocorticium pulchrum* (S. Lundell) M. P. Christ. is identical macroscopically with *B. atrovirens*, but differs by having larger spores. Another similar species, *B. efibulatum* Hjortstam & Ryvarden, so far unknown from Poland, is completely devoid of clamps.

Byssocorticium atrovirens was previously recorded very rarely from Poland, from only three localities: in the Góry Świętokrzyskie Mts, Babia Góra Mt and the Doliska Reserve near Skierniewice (Wojewoda 2003), but the species is probably much more common (D. Karasiński, unpubl. data). The species is new for the Białowieża Forest.

Ceriporiopsis aneirina (Sommerf.) Domański
Fig. 9

SPECIMENS EXAMINED. Białowieża Forest, forest section 402, on bark and wood of fallen trunk of *Populus tremula*, 22 Sept. 2007, *leg. D. Karasiński* (KRAM F-47348); Władysław Szafer Reserve, forest section 443, on fallen trunk of *Populus tremula*, 21 Apr. 2009, *leg. D. Karasiński 2838, 2842* (KRAM F-47347, 47349).

The species is macroscopically very similar to *Antrodia mellita*, which has the same pore surface color, pore size and shape, and ecological preferences. It differs from it by having a monomitic hyphal system and somewhat smaller spores. Old or dry basidiomata of the two species are not distinguishable in the field.

Ceriporiopsis aneirina is very rare in Poland. At the beginning of 20th century it was reported

Fig. 9. *Ceriporiopsis aneirina* (Sommerf.) Domański on fallen trunk of *Populus tremula* L. (KRAM F-47347, 47349).

from three localities: near Międzyrzec Podlaski (Eichler 1902; Bresadola 1903), Skierniewice (Zweigbaumówna 1925) and Elbląg (Kaufmann 1925). However, according to Domański (1965b) the specimen collected near Międzyrzec Podlaski has been misidentified and in fact belongs to *Oxyporus corticola* (Fr.) Ryvarden. After the Second World War, *C. aneirina* was collected only in the Białowieża Forest (Domański 1965b, 1967). The present records confirm its persistence in the Białowieża Forest, both inside and outside the National Park.

Ceriporiopsis rivulosa (Berk. & M. A. Curtis) Gilb. & Ryvarden Fig. 10

SPECIMENS EXAMINED. Białowieża Forest, on fallen branch of *Pinus sylvestris* L., 25 Oct. 1955, *leg. S. Domański* (KRAM F-SD 5445, as *Physisporinus rivulosus*).

Basidiomata resupinate, cartilaginous when young, becoming resinous and partly translucent when mature. Pore surface white to cream, ochraceous with age, pores angular, 3–4 per 1 mm, tubes up to 3 mm long. Subiculum white, up to 1 mm thick. Margin white. Taste bitter, smell not recorded. Hyphal system monomitic, generative hyphae hyaline, thin-walled, 3.0–6.0 µm wide, rarely branched and often agglutinated, with clamps at all septa. In some parts of the basidioma, particularly in the subiculum close to the substrate surface, hyphae are covered with very small crystals (well visible in Melzer's reagent). Basidia short, clavate, 14–22 × 6–8 µm, with basal clamps and four sterigmata. Cystidioles fusoid, very numerous and easy to observe, 18–22 × 5–8 µm. Spores subglobose to oval, smooth, 4.5–6.0 × 4–5 µm, inamyloid, indextrinoid and acyanophilous.

Ceriporiopsis rivulosa is very similar to *Physisporinus sanguinolentus* (Alb. & Schwein.) Pilát and *Ph. vitreus* (Pers.) P. Karst., but unlike those two it has clamps at all septa and lacks thick-walled tramal hyphae. The change of color in bruised specimens, typical for *Physisporinus* P. Karst. species, does not occur in *C. rivulosa*. Here we report the collection found by S. Domański in the Białowieża Forest. He also

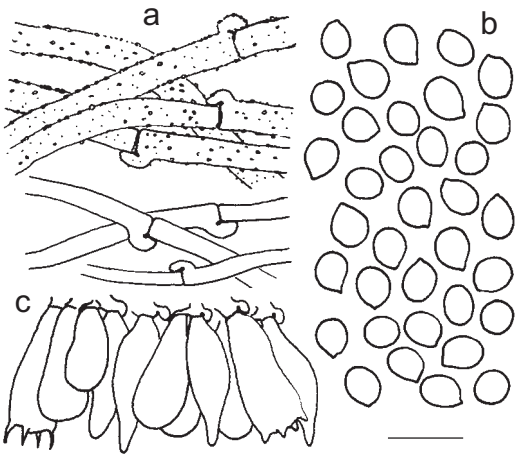

Fig. 10. *Ceriporiopsis rivulosa* (Berk. & M. A. Curtis) Gilb. & Ryvarden. a – generative hyphae from subiculum (up) and subhymenium (down), b – spores, c – hymenial cells; scale bar = 10 µm (KRAM F-SD 5445).

collected this fungus in two other parts of Poland: the Bieszczady Mts (Baligród, on *Abies alba* Mill., 10 Sept. 1962, *leg. S. Domański*, KRAM F-SD 5446) and Augustów Forest (Kozi Rynek Reserve, on *Pinus sylvestris*, 3 Sept. 1966, *leg. S. Domański*, KRAM F-SD 5099), but he never published the information on finding this species in Poland. Thus, *C. rivulosa* is reported here for the first time from the country. In Europe this is a very rare species known from a few localities in Croatia (David 1972), France, Italy and Finland (Ryvarden & Gilbertson 1994). It is also known from North America (Nakasone 1981; Gilbertson & Ryvarden 1986) and Asia (Núñez & Ryvarden 2001). In South America, Rajchenberg (1995) described *C. rivulosa* var. *valdiviana* Rajchenb. from Argentina.

Conferticium ochraceum (Fr.) Hallenb. Fig. 11

SPECIMENS EXAMINED. Białowieża Forest, forest section 415, spruce forest, on bark of fallen trunk of *Picea abies*, 22 May 2006, *leg. D. Karasiński 1334* (KRAM F-47253).

Conferticium ochraceum is a saprobe forming on wood and bark of coniferous trees, perennial, effused (sometimes of large dimensions), multilayered basidiomata having a smooth or somewhat

Fig. 11. *Conferticium ochraceum* (Fr.) Hallenb. on bark of fallen trunk of *Picea abies* (L.) H. Karst. (KRAM F-47253).

tuberculate, cream or ochraceous-brown hymenophore. In older specimens, basidiomata are characteristically cracked, which enables a preliminary identification of this species in the field. *Conferticium ochraceum* has amyloid, smooth spores, sulfo-positive gleocystidia clearly seen only in the youngest part of the basidioma, and vertical hyphae which in older parts are densely packed, forming so-called pseudoparenchymatic plectenchyma. The successive yearly layers of basidiomata are separated by a thin layer of horizontal hyphae. *Conferticium karstenii* (Donk) Hallenb. has very similar basidiomata which, however, occur on wood of *Populus tremula*. Additionally, this species has verrucose spores and its young gloeocystidia have apical appendices.

Conferticium ochraceum has rarely been recorded in Poland. Single locations of this species are known from the Beskid Żywiecki Mts, Beskid Sądecki Mts, Tatras and Bieszczady Mts (Wojewoda 2003). The species is new for the Białowieża Forest. Outside Europe, *C. ochraceum* is known in Asia and North America (Eriksson & Ryvarden 1975; Martin & Gilbertson 1977; Jülich & Stalpers 1980; Domański 1988).

Coniophora olivacea (Fr.) P. Karst. Fig. 12

SPECIMENS EXAMINED. Białowieża Forest, Władysław Szafer Reserve, forest section 443, on wood of very rotten fallen trunk of *Populus tremula*, 29 Sept. 2006, *leg. D. Karasiński & M. Piątek* (KRAM F-47603).

Coniophora olivacea occurs on coniferous and deciduous trees and produces extensive effused basidiomata, with an olivaceous hymenophore and long rhizomorphs at the margin. Microscopically the characteristic feature of this species is the presence of prominent, septate and incrusted cystidia, unknown in any other member of the genus *Coniophora* DC. For that reason, Karsten (1889) created a separate genus *Coniophorella* P. Karst. for the species, but this proposal has not been accepted by other mycologists (Ginns 1982; Hallenberg 1985).

Coniophora olivacea has not been previously reported from the Białowieża Forest. All records

Fig. 12. *Coniophora olivacea* (Pers.) P. Karst. on wood of very rotten fallen trunk of *Populus tremula* L. (KRAM F-47603).

Fig. 13. *Crepidotus crocophyllus* (Berk.) Sacc. on fallen log of ?*Betula* L. (KRAM F-47606).

of this species from northern Poland are from the late 1800s or early 1900s (Eichler 1899, 1900, 1907; Bresadola 1903; Neuhoff 1933). The recent findings of *C. olivacea* are from southern Poland, where it was reported from the Góry Kaczawskie Mts, Kraków, Babia Góra Mt, the Bieszczady Mts and Beskid Niski Mts (Wojewoda 2003; Bujakiewicz 2004).

Crepidotus crocophyllus (Berk.) Sacc. Fig. 13

SPECIMENS EXAMINED. Białowieża Forest, forest section 472C, on fallen log of ?*Betula* L., Aug. 2008, *leg. A. Kujawa* (KRAM F-47606).

Crepidotus crocophyllus is one of the few species of the genus that can be identified in the field based on macromorphological characters on account of its large pilei (10–45 mm in diam.) covered by dark, orange-rusty scales, and yellow to orange lamellae. Microscopically the fungus is distinguished by finely warted, ovoid spores 4.8–5.6 µm in diam., numerous clavate, narrowly lageniform to almost cylindrical cheilocystidia, and the presence of clamps. Scales covering the pileus surface are composed of cylindrical hyphae with intracellular and incrusting pigment.

The species is known mainly from North America and Europe (Ripková *et al*. 2005). Most of its localities in Europe originate from the southern and east-central parts of the continent (Senn-Irlet 1995), it is known from Austria, Bulgaria, the Czech Republic, Germany, Latvia, Russia, Slovakia and Ukraine (Pilát 1948; Lazebníček 1970; Senn-Irlet 1995; Ludwig 2001; Dāniele & Krastiņa 2002; Ripková *et al*. 2005). The species inhabits dead wood of various deciduous trees including *Acer*, *Carpinus betulus*, *Fagus sylvatica*, *Fraxinus* L., *Populus*, *Quercus robur*, *Tilia cordata* Mill. and *Ulmus* L., and more rarely wood of coniferous trees (Senn-Irlet 1995; Ludwig 2001; Ripková *et al*. 2005). In Poland *Crepidotus crocophyllus* was first observed in August 1999 in the Białowieża Forest in the Pogorzelce Reserve, forest section 252B (A. Bujakiewicz, pers. comm.). Then it was noted again in the area within the strict reserve of the Białowieża National Park, in forest section 340, on 1. Sept. 2000 (A. Bujakiewicz, pers. comm.). These localities have not been published and no voucher specimen has been collected. The first published locality in Poland was from the Brzeziczno Reserve near Lublin in the east (Flisińska 2004).

Crepidotus lundellii Pilát Fig. 14

SPECIMENS EXAMINED. Białowieża Forest, forest section 437B, Leśna River valley, N 52°41′50″, E 23°36′12″, alder forest, on fallen twig of *Alnus*, 20 May 2006, *leg. D. Karasiński, A. Kujawa & M. Snowarski* (KRAM F-55658).

Crepidotus lundellii is characterized by an initially white, then pale cream, reniform pileus with a silky-wooly surface. Only microscopic characters can distinguished it with certainty from other similar species of *Crepidotus* (Fr.) Staude. It has almost smooth (fine warts visible only under immersion objective), ellipsoid to amygdaliform spores and clavate to narrowly utriform cheilocystidia. According to Senn-Irlet (1995) the color of lamellae, without any pinkish tints, are a good indicative character in the field.

In Europe the species is widespread although not common, but may by frequent in alluvial forests. It occurs throughout the year, but mainly in summer to autumn, on hardwood, more rarely on coniferous wood, in lowland as well as montane forests (Senn-Irlet 1995, 2008). It has been reported from Austria, Bulgaria, Denmark, Estonia, Finland, France, Germany, Great Britain, Iceland, Lichtenstein, the Netherlands, Norway, Slovakia, Sweden, Switzerland and Ukraine (Senn-Irlet 1995, 2008; Roux 1997; Lizoň & Bacigálová 1998; Ludwig 2001). It occurs on dead wood (mostly twigs and branches) of various deciduous and coniferous trees, litter, mosses and even soil (Senn-Irlet 1995; Ludwig 2001). In Poland it was collected most frequently on fallen twigs of *Fagus sylvatica* and is known from several localities: the Puszcza Bukowa forest near Szczecin (Lisiewska 1960, 1963), the Góry Świętokrzyskie Mts. (Łuszczyński 1998, 2007, 2008), the Roztocze region (Sałata 1972; Flisińska 2004), Pieniny Mts. (Gumińska 1999), Sudety Mts. (Domański 1963c) and Bieszczady Mts. (Domański *et al*. 1963) (see Wojewoda 2003). The species is new for the Białowieża Forest.

Dacryomyces tortus (Willd.) Fr.

SPECIMENS EXAMINED. Białowieża Forest, forest section 385D, on fallen trunk of *Pinus sylvestris*, 24 Mar. 2002, *leg. M. Wołkowycki* (KRAM F-47609, herb. M. Wołkowycki 2270).

Dacryomyces tortus is characterized by having clamped hyphae, unbranched hyphidia, and spores with 0–3 septa. In the material from the Białowieża Forest we observed only spores without septa. Two macroscopically similar species, *D. enatus* (Berk. & M. A. Curtis) Massee and *D. macnabbii* D. A. Reid, differ in having branched hyphidia.

Dacryomyces tortus is very rare in Poland, previously reported from two localities in the Tatra Mts (Wojewoda *et al.* 1986; Ronikier 2002), the Lipówka Reserve in the Niepołomice Forest (Wojewoda *et al.* 1999) and the vicinity of Lubin (Wojewoda 2003). The new locality in the Białowieża Forest extends the distribution of *D. tortus* in Poland significantly to the north. All known Polish localities of *D. tortus* are in old or primeval forests; possibly this species is restricted to such forests.

Exidia villosa Neuhoff

SPECIMENS EXAMINED. Białowieża Forest, forest section 402B, on fallen branch of *Tilia cordata*, 28 Mar. 2002, *leg. M. Wołkowycki* (KRAM F-47610, herb. M. Wołkowycki 2277).

Exidia villosa is similar to *E. cartilaginea* S. Lundell & Neuhoff, from which it differs by having uniformly colored basidiomata covered by scattered small papillae. *Exidia thuretiana* (Lév.) Fr. has similar papillae on the basidiomata, but differs in having white instead of the cream basidiomata of *E. villosa*, and in having larger spores. *Exidia villosa* is very rare in Poland. It is previously known from the Góry Świętokrzyskie Mts (Wojewoda 1979) and Cedyński Landscape Park (Friedrich 1994, 2002). The present record in the Białowieża Forest is the third finding of *E. villosa* in Poland.

Frantisekia mentschulensis (Pilát *ex* Pilát) Spirin Fig. 15

SPECIMENS EXAMINED. Białowieża Forest, Lipiny Reserve, forest section 272, on fallen trunk of *Picea abies*, 21 May 2006, *leg. D. Karasiński* (KRAM F-47351); Białowieża National Park, forest section 340, *Pino-Quercetum*, on fallen trunk of *Populus tremula*, 28 Aug. 1973, *leg. Z. Pouzar* (KRAM F-SD *s.n.*, as *Tyromyces mentschulensis*); forest section 399, *Tilio-Carpinetum*, on fallen trunk of *Carpinus betulus*, 31 Aug. 1973, *leg. V. Holubová* (KRAM F-SD *s.n.*, as *Tyromyces mentschulensis*).

This species was reported from Poland under the names *Poria fissiliformis* Pilát, *Tyromyces fissiliformis* (Pilát) Kotl. & Pouzar or *Antrodiella fissiliformis* (Pilát) Gilb. & Ryvarden, by Ryvarden and Gilbertson (1993) without precise localities, and by Kotlaba and Pouzar (1988) from the Białowieża Forest. Spirin and Zmitrovich (2007) argued that the species reported from Europe and North America under the name *A. fissiliformis* in fact represents two separate taxa belonging to the new genus *Frantisekia* Spirin & Zmitr. The true *Poria fissiliformis*, now *Frantisekia fissiliformis* (Pilát) Spirin & Zmitr., occurs in North America, while the European populations belong to another species for which the name *Poria mentschulensis* Pilát *ex* Pilát, now *Frantisekia mentschulensis*, is available.

In Poland, *Frantisekia mentschulensis* was previously reported only from Białowieża National Park. The new collection from 2006 contains totally resupinate basidiomata, comes from the area outside the National Park, and was collected from a fallen trunk of *Picea abies*, which has not previously been recorded as a substrate for this polypore.

Henningsomyces puber (Romell *ex* W. B. Cooke) D. A. Reid Figs 16 & 17

SPECIMENS EXAMINED. Białowieża Forest, Leśna River valley, forest section 437B, N 52°41′23″, E 23°36′01″, mixed forest (*Alnus, Picea abies, Quercus*), on fallen branch, 20 May 2006, *leg. A. Ronikier* (KRAM F-55664).

Basidiomata cyphelloid, first cup-shaped, then tubular, up to 0.8 mm long and 0.2 mm in diam., white, the outer surface entirely pubescent. Spores globose to ovoid, 5–6 × 4–5 µm, inamyloid. Basidia clavate, 19–28 × 7–8 µm, 4-spored. Cystidia none. Hairs covering the outer surface of

Fig. 14. *Crepidotus lundellii* Pilát on fallen twig of *Alnus* Mill. (KRAM F-55658).

Fig. 15. *Frantisekia mentschulensis* (Pilát *ex* Pilát) Spirin on fallen trunk of *Picea abies* (L.) H. Karst. (KRAM F-47351).

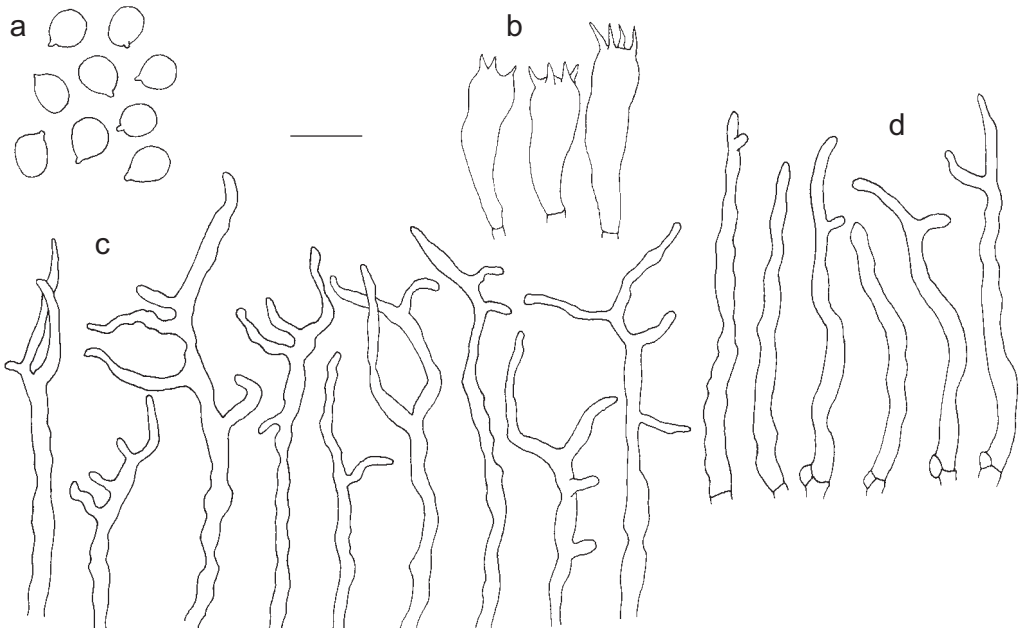

Fig. 16. *Henningsomyces puber* (Romell *ex* W. B. Cooke) D. A. Reid. a – spores, b – basidia, c – upper parts of hairs from lower part of basidiomata, d – hairs from marginal part of basidiomata; scale bar = 10 μm (KRAM F-55664).

Fig. 17. *Henningsomyces puber* (Romell *ex* W. B. Cooke) D. A. Reid on fallen branch (KRAM F-55664).

the basidioma hyaline, thin-walled (some slightly thick-walled) and slightly sinuous, 2.5–4.0 µm in diam. in lower part, 1.5–2.0 µm in diam. at apices, at the margin of the pileus slightly branched or unbranched and short (*ca* 60 µm long), and on the lower part of the basidioma branched (with a few to several branches) and long (longer than 100 µm). Clamps present.

Two species from the genus are recognized in Europe: *Henningsomyces puber* and *H. candidus* (Pers.) Kuntze. The latter is characterized by almost smooth basidiomata and more branched hairs at the margin of the basidioma (Horak 2005; Knudsen 2008a). The marginal hairs in *H. puber* are only slightly branched or unbranched (Fig. 16d). Agerer (1973) mentions another difference between these two species: slightly gelatinous basidiomata in *H. candidus* vs. strongly gelatinous basidiomata and hairs covered with an amorphous substance in *H. puber*. We could not find this character in our specimens, and it is not mentioned in modern keys (Horak 2005; Knudsen 2008a).

Distinctly branched hairs covering the outer surface of basidiomata distinguish the species of *Henningsomyces* Kuntze from those belonging to another cyphelloid genus, *Rectipilus* Agerer, which is characterized by nonbranched and thick-walled hairs (Agerer 1973; Horak 2005). Macroscopically the species of these two genera are very similar to each other and impossible to tell apart in the field. *Henningsomyces puber* is widespread but not common in Europe, reported from Austria, the Czech Republic, Denmark, Finland, Germany, Great Britain, Norway, Sweden (Agerer 1973; Legon *et al*. 2005; Knudsen 2008a; Austrian Mycological Society 2009). It has not been reported from Poland previously.

Hyphodontia curvispora J. Erikss. & Hjortstam
Fig. 18

SPECIMENS EXAMINED. Białowieża Forest, on fallen trunk of *Picea abies*, 28 Aug. 1956, *leg. S. Domański* (KRAM F-SD1436, as *Odontia pseudosudans* sp. n.); Białowieża National Park, on fallen trunk of *Picea abies*, 5 Sept. 1966, *leg. F. Kotlaba* (KRAM F-56161, PRM); forest section 402, on rotten wood of fallen trunk of *Picea abies*, 16 Sept. 2008, *leg. D. Karasiński* (KRAM F-47344).

The specimen collected by Domański in 1956 is labeled '*Odontia pseudosudans* sp. n.' and is accompanied by the following latin description: *Sporis cylindraceis*, *praecipue arcutis hyalinis*, *laevibus 4–5.5 × 1.3–1.7 µ. Cystidis cylindraceis*, *tenuitunicatis*, *multis 45–95 × 4–6 µ. Habitus Odontiae sudantis*, *sed absentia guttularum in aculeis*, *forma sporarum et cystidiis distincta.* However, Domański never described this species as new to science. This was done by Eriksson and Hjortstam (1969) who named the fungus *Hyphodontia curvispora*. The type collection is from Sweden.

Hyphodontia curvispora was previously reported from the Białowieża Forest by Langer (1994), who apparently examined a duplicate of Domański's collection deposited in GB. Langer's (1994) published record concurs with the information on the label of a specimen preserved in Domański's herbarium (KRAM F-SD1436), except for the date of collection (29 Aug. 1956 instead of 28 Aug. 1956), which may be a misprint. *Hyphodontia curvispora* is certainly a rare species in Europe, hitherto known from Finland, Sweden, Norway (Hjortstam 1984), Poland, Romania (Langer 1994) and Germany (Krieglsteiner 1991).

Hyphodontia pruni (Lasch) Svrček

SPECIMENS EXAMINED. Białowieża Forest, on fallen trunk of *Betula*, 26 Oct. 1956, *leg. S. Domański* (KRAM F-SD1481, as (?)*Acia uda*).

The type specimen of this species described by Lasch as *Odontia pruni* Lasch in Rabenhorst's 'Fungi europaei exsiccati' no. 1514 (Svrček 1973; Langer 1994) was collected in Drezdenko near Gorzów Wielkopolski (Poland), on a fallen branch of *Prunus spinosa* L. The specimen collected by Domański in the Białowieża Forest fits the original description well, so it represents the second record from Poland. The species is characterized by the odontoid hymenophore, the absence of true cystidia, the presence of relatively long basidia, ellipsoid spores, and occurrence mainly on deciduous wood. The macroscopically similar *Hyphodontia nespori* (Bres.) J. Erikss. & Hjortstam occurs on

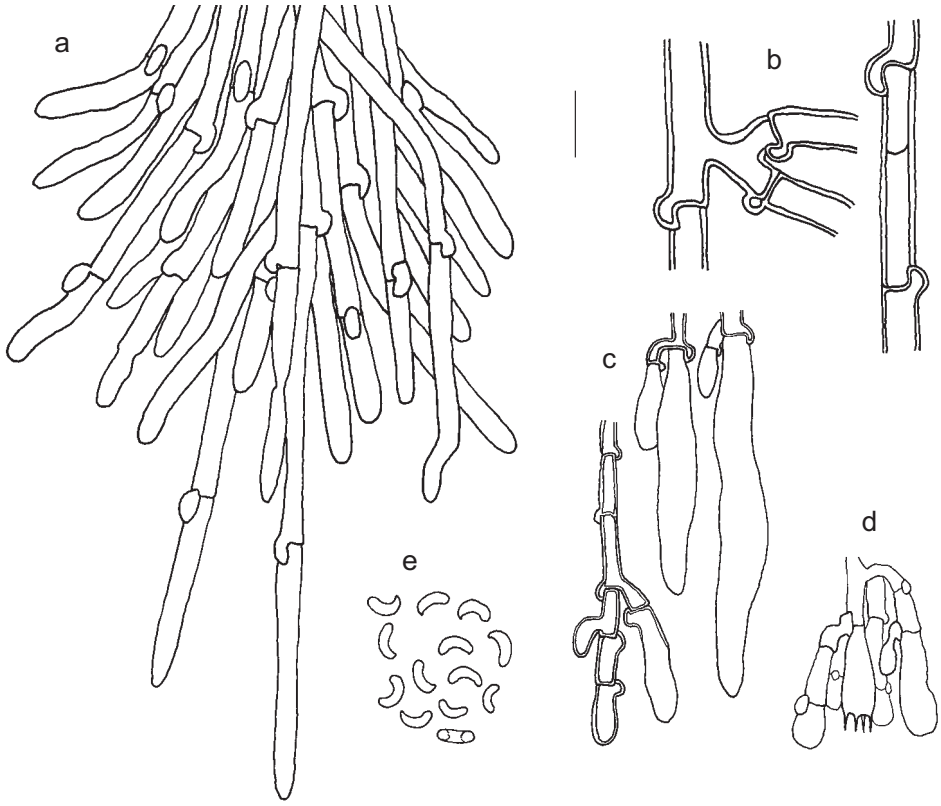

Fig. 18. *Hyphodontia curvispora* J. Erikss. & Hjortstam. a – apically projecting hyphae, b – thick-walled generative hyphae from subiculum, c – cystidia, d – hymenial cells, e – spores; scale bar = 10 μm (KRAM F-47344).

coniferous wood, and has capitate cystidia and narrower spores.

Hyphodontia pruni is a circumglobal species known from the Northern and Southern Hemispheres. In Europe it has been recorded from the Czech Republic, Ukraine (Svrček 1973), Spain (Tellería 1990), Germany, Sweden, Italy (Langer 1994), Great Britain (Legon *et al*. 2005) and Norway (Ryvarden *et al*. 2003). In Asia it has been reported from Turkey, China and Japan (Hjortstam & Ryvarden 1988; Langer 1994; Maekawa 1994). *Hyphodontia pruni* is very rare in North America; Langer (1994) and Ginns and Lefebvre (1993) noted it from the United States and Canada. In South America it has been recorded from Ecuador, Argentina, Uruguay and Venezuela (Hjortstam & Ryvarden 2007a, b). The species is also known from Africa (Maekawa 1994).

Inonotus leporinus (Fr.) Gilb. & Ryvarden
Fig. 19

SPECIMENS EXAMINED. Białowieża Forest, Władysław Szafer Reserve, forest section 443, on living trunk of *Picea abies*, 29 Sept. 2006, *leg. D. Karasiński 1642* (KRAM F-47394); in vicinity of Podolany Reserve, forest section 500, *Tilio-Carpinetum* with *Picea abies*, on dead standing trunk of *Picea abies*, 27 Sept. 2006, *leg. D. Karasiński 1636* (KRAM F-47393).

Inonotus leporinus produces fan-shaped basidiomata, growing usually in imbricate clusters on living or dying trunks of *Picea abies*. Macroscopically its basidiomata resemble those of *Hapalopilus nidulans* (Fr.) P. Karst., which, however, grow on wood of deciduous trees and become violet in KOH. The basidiomata of *Inonotus leporinus* become dark brown in KOH, as in other members of the family Hymenochaetaceae. Some

Fig. 19. *Inonotus leporinus* (Fr.) Gilb. & Ryvarden on living trunk of *Picea abies* (L.) H. Karst. (KRAM F-47394).

Fig. 20. *Kavinia alboviridis* (Morgan) Gilb. & Budington on rotten wood of coniferous tree and needles in litter (KRAM F-47261).

authors consider that this species belongs to the genus *Onnia* (Fr.) P. Karst., and the specific name in this genus is *Onnia leporina* (Fr.) H. Jahn (e.g., Dai & Niemela 2006). *Inonotus leporinus* has previously been reported from the Białowieża Forest, but only from the National Park (Wojewoda 2003). We found the fungus at two different localities outside the Park, so it may be more widespread in the whole area of the Białowieża Forest. In Poland, *I. leporinus* is also known from the Tatra Mts (Wojewoda *et al.* 1986), but should be searched in other well-preserved spruce forests, especially in the mountains.

Kavinia alboviridis (Morgan) Gilb. & Budington Fig. 20

SPECIMENS EXAMINED. Białowieża Forest, forest section 102, in pine-spruce forest, on rotten wood of coniferous tree and needles in litter, 20 Sept. 2007, *leg. D. Karasiński* (KRAM F-47261).

Kavinia alboviridis is morphologically distinctive, having a hydnoid hymenophore built up of fragile spines which at first are white and turn olive green with age. Another characteristic feature is its spore wall ornamentation formed of cyanophilous warts. Another species of the genus, *K. himantia* (Schwein.) J. Erikss., has smooth spores, warted hyphae and spines without a greenish tint. *Kavinia alboviridis* is new for the Białowieża Forest, and previously found very rarely in Poland. Two localities in the vicinity of Toruń were reported by Vries (1978), and another locality in Sobin near Lubin by Wojewoda (2003).

Lentinus suavissimus Fr. Fig. 21

SPECIMENS EXAMINED. Białowieża Forest, vicinity of Nieznanowo Reserve, forest section 488, on dead hanging branch of *Salix aurita* L., 14 Sept. 2005, *leg. D. Karasiński 1643* (KRAM F-47395).

Lentinus suavissimus produces pale yellow, umbilicate basidiomata with a central or excentric stipe, with an initially inrolled then irregularly lobed and striate cap and distant lamellae with a fimbriate edge. The most characteristic feature of the species is a strong anise smell detectable even several meters away. The fungus usually grows

Fig. 21. *Lentinus suavissimus* Fr. on dead hanging branch of *Salix aurita* L. (KRAM F-47395).

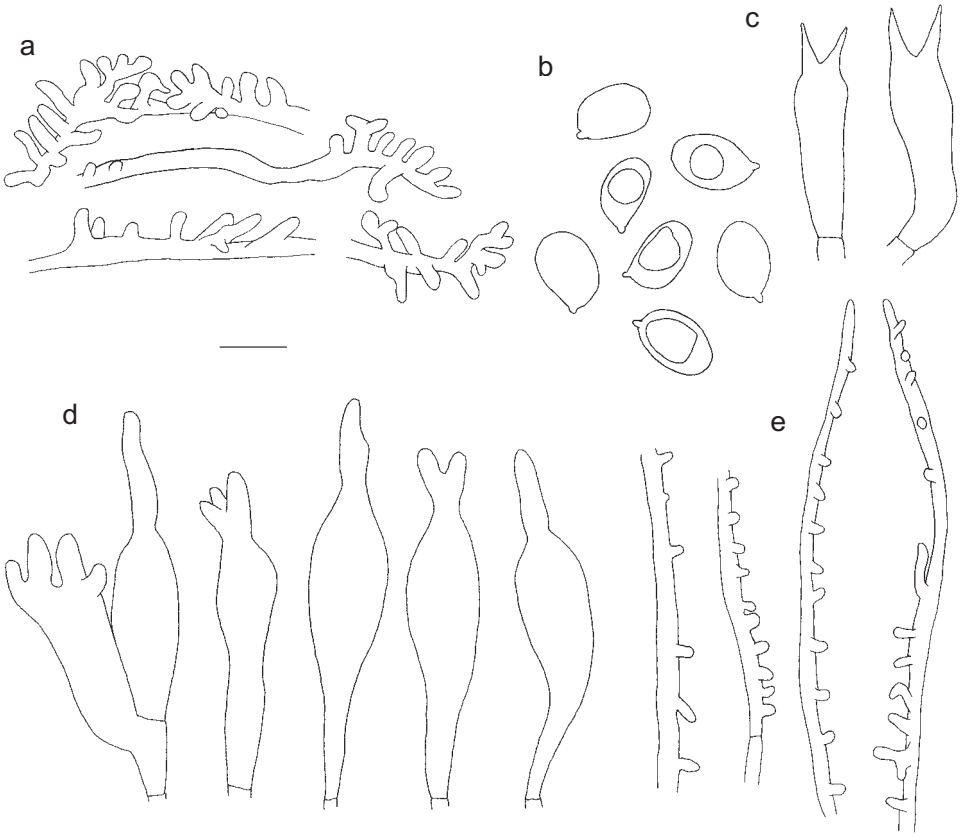

Fig. 22. *Mycena silvae-nigrae* Maas Geest. & Schwöbel. a – hyphae of pileipellis, b – spores, c – basidia, d – cheilocystidia, e – hyphae of cortical layer of stipe; scale bar = 10 μm (KRAM F-55657).

solitary or in groups of a few basidiomata, on fallen branches of *Salix* spp., more rarely *Populus tremula* (Pegler 1983; Kreisel 1987). It may also be found on other substrates; it was reported from *Lonicera xylosteum* L. (Breitenbach & Kränzlin 1991). The species is widespread in Europe, but more common in the eastern part of the continent (Pegler 1983); reported from Austria, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Latvia, Norway, Slovakia, Sweden and Switzerland (Järva & Parmasto 1980; Kreisel 1987; Breitenbach & Kränzlin 1991; Lizoň & Bacigálová 1998; Ludwig 2001; Dāniele & Krastiņa 2002; Škubla 2003; Knudsen 2008b; Austrian Mycological Society 2009). In Poland it is known from a few scattered localities, mainly in the north and east parts of the country (Pilát 1946; Pegler 1983; Wojewoda 2003). It has not been reported from the Białowieża Forest previously.

Mycena silvae-nigrae Maas Geest. & Schwöbel
Fig. 22

SPECIMENS EXAMINED. Białowieża Forest, Leśna River valley, forest section 437B, N 52°41′50″, E 23°36′23″, mixed forest (*Carpinus* L., *Quercus*, *Populus tremula*, *Picea abies*), on very decayed stump, 20 May 2006, *leg. A. Kujawa & A. Ronikier* (KRAM F-55657).

Pileus 10–20 mm in diam., first narrowly conical, then conico-campanulate with a distinct umbo and straight margin, brown, slightly darker in center, translucently striate up to center. Lamellae distant, narrow, adnate or slightly emar-

ginate, first white, then grey-beige. Stem 50–100 × 2–3 mm, cylindrical, hollow, whitish and delicately pruinose at apex, brown (slightly paler than pileus) and smooth in lower part, with white hyphae at base. Flesh brown in pileus, beige in stem; smell chlorine. Spores broadly ellipsoid, 10.5–12 × 6–9 µm, amyloid, smooth. Basidia 26–32 × 8–9 µm, with 2 sterigmata. Cheilocystidia numerous, forming a sterile layer on a lamellar edge, 42–67 × 9–15 µm, fusiform-lageniform, with one or a few finger-like projections. Pleurocystidia not observed. Pileipellis elements with numerous, cylindrical, single or branched excrescences. Elements of cortical layer of stipe covered with regularly arranged, short, cylindrical excrescences, terminal cells not numerous. Clamps absent.

Maas Geesteranus and Schwöbel (1987) described two species of *Mycena* (Pers.) Roussel characterized by an alkaline smell and occurring on wood of coniferous trees. One of them is a spring species, *M. silvae-nigrae*, and the second one, *M. stipata* Maas Geest. & Schwöbel, has been described for a species known under the misapplied name *M. alcalina* (Fr.) P. Kumm. *Mycena stipata* differs from *M. silvae-nigrae* by the number of sterigmata (4 vs. 2), simpler cheilocystidia (without projections), smaller spores (9.2–11.6 × 5.4–6.3 µm), the presence of clamps, almost smooth hyphae of the pileipellis, and occurrence in summer to autumn. In Europe *M. silvae-nigrae* is probably common but may be overlooked; it is known from Austria, Denmark, Germany, Italy, Norway, Sweden and Switzerland (Breitenbach & Kränzlin 1991; Robich 2003; Emmett *et al*. 2008; Austrian Mycological Society 2009). In Poland the fungus was not reported previously, although it probably has been collected under the name *M. alcalina*.

Mycoacia uda (Fr.) Donk Fig. 23

SPECIMENS EXAMINED. Białowieża Forest, forest section 102, mixed forest, on fallen branch of *Carpinus betulus*, 20 Sept. 2007, *leg. D. Karasiński* (KRAM F-47261); forest section 440, *Carici elongatae-Alnetum*, on fallen decorticated branch of deciduous tree (*Alnus*?), 24 Sept. 2006, *leg. D. Karasiński 1670* (KRAM F-47396); on fallen branch of *Corylus avellana*, 24 Sept. 2006, *leg. D. Karasiński* (KRAM F-47397); in vicinity of Hajnówka, on fallen branch of deciduous tree, 12 Sept. 1967, *leg. S. Domański* (KRAM F-SD 5276, as *Sarcodontia* (*?*) *flava*); Białowieża National Park, mixed forest, on fallen branch of *Carpinus betulus*, 11 Aug. 1962, *leg. S. Domański* (KRAM F-SD 3950, as *Sarcodontia uda*).

A phlebioid fungus, *Mycoacia uda* produces resupinate basidomata with a hydnoid hymenophore. It is characterized by having pale to lemon yellow basidiomata, relatively long and subulate spines, small subfusiform cystidioles in the hymenium and parallelly packed hyphae in the aculeal trama, which are filled with rod-like crystals. The species is also well characterized by its KOH reaction: young parts of the basidiomata turn red in a drop of 5% KOH. *Mycoacia uda* causes white rot and occurs on very decayed deciduous wood (Ginns & Lefebvre 1993), usually on the underside of dead branches and trunks, most frequently on *Alnus*, *Corylus* L., *Betula* and *Fagus* L. (Eriksson & Ryvarden 1976).

Mycoacia uda was hitherto known from only two localities in Poland: in the vicinity of Międzyrzec Podlaski (Bresadola 1903) and in the Puszczykowskie Góry Reserve (Lisiewska 2006). The species is new for the Białowieża Forest, and the present localities significantly extend its distribution range in Poland. *Mycoacia uda* is widespread but evidently rare in Europe, except in the western part of Germany where it has numerous localities (Krieglsteiner 1991). It is also known from Asia, Africa and North America (Breitenbach & Kränzlin 1986; Tellería 1990; Ginns & Lefebvre 1993; Ryvarden *et al.* 2003; Legon *et al.* 2005; Hjortstam & Ryvarden 2007b).

Mycoaciella bispora (Stalpers) J. Eriksk. & Ryvarden Figs 24 & 25

SPECIMENS EXAMINED. Białowieża Forest, forest section 463C, on bark of fallen branch of deciduous tree (*Populus tremula*?), 27 Aug. 2002, *leg. M. Wołkowycki* (KRAM F-47259, herb. M. Wołkowycki 2838).

Basidiomata annual, resupinate, closely adnate, first in small patches on bark and wood, then confluent and widely effused, pale yellow in

Fig. 23. *Mycoacia uda* (Fr.) Donk on fallen branch of *Corylus avellana* L. (KRAM F-47397).

Fig. 24. *Mycoaciella bispora* (Stalpers) J. Erikss. & Ryvarden on bark of fallen deciduous branch (?*Populus tremula* L.), photographed from dried specimen (KRAM F-47259, herb. M. Wołkowycki 2838).

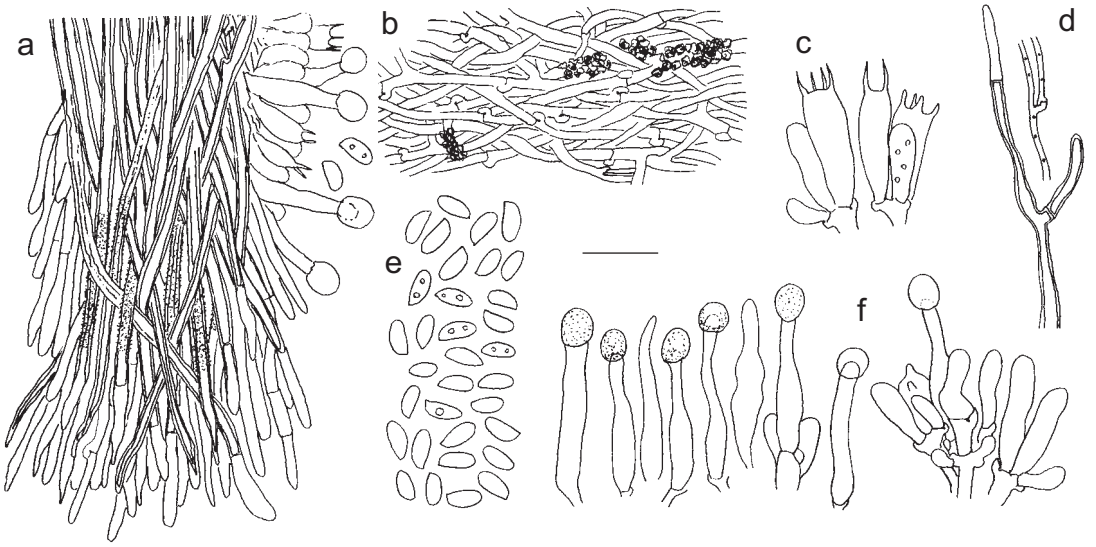

Fig. 25. *Mycoaciella bispora* (Stalpers) J. Erikss. & Ryvarden. a – vertical section through apical part of spine, b – section through subiculum, c – basidia and basidioles, d – ends of thick-walled skeletal hyphae from central part of aculeus and branched generative hypha, e – spores, f – cystidia and hymenial cells; scale bar = 10 μm (KRAM F-47259, herb. M. Wołkowycki 2838).

young stage, ochraceous to dirty brown-yellow or golden yellow when mature, waxy to ceraceous when fresh and corneous hard when dry. Subiculum thin, distinctly separate from context, white to cream or pale yellow, margin thinning out, paler than the remaining part of the basidioma, sterile and partly seedily fimbriate. Hymenium hydnoid, spines usually slender and conical or subulate but variable in size and form, up to 3 mm long, sometimes branched or forming small clusters, close to the margin more scattered, shorter and sometimes obtuse. Hyphal system dimitic. Skeletal hyphae 2.5–6.5 μm in diam., present only in the aculeal trama, thick-walled to almost solid, rarely branching, sinuous, pale yellowish brown, parallelly packed, partly covered by very small yellow crystals close to top of aculei. Skeletal ends often thin-walled and hyaline, some with single septa. Generative hyphae clamped, smooth, thin-walled, 1.5–3 μm in diam., hyaline, branched, often with scattered oil drops inside. In trama of spines and among the contextual hyphae are concentrations of resinous substance and small clusters of pale yellow crystals. Cystidia present and frequent in hymenium, 18–35 × 4–6 μm, cylindric to fusiform, often with an expanded base and capitate top, most of them with an apical globule of excreted, resinous matter, up to 10 μm in diam. Basidia narrowly clavate, 15–25 × 4–6 μm, with 2–4 sterigmata and a basal clamp, in mature hymenium forming a dense palisade. Spores ellipsoid to subcylindrical, 4–6 × 2.5–3.0 μm, thin-walled, hyaline, smooth, often with oil drops, inamyloid, acyanophilous, indextrinoid.

According to Nakasone (2002), *Mycoaciella* is a synonym of *Phlebia* Fr. However, in the opinion of Hjortstam and Ryvarden (2004) the genus is well separated from *Phlebia* and also from another genus *Mycoacia* Donk by the presence of skeletal hyphae. *Mycoaciella bispora* is a new genus and species for Poland. It is a rare fungus but with a wide distribution range. In Europe it was previously reported from the Czech Republic, Denmark, France, Germany, Italy, Slovakia and Ukraine (Pilát 1926; Cejp 1930; Nikolaeva 1961; Grosse-Brauckmann 1983; Heller 1989; Losi 1999). Outside Europe, *M. bispora* is known from North America (Nakasone 2002; Hjortstam & Ryvarden 2007b).

Peniophora limitata (Chaillet *ex* Fr.) Cooke

SPECIMENS EXAMINED. Białowieża Forest, forest section 438A, on fallen branch of *Fraxinus excelsior* L., 23 Oct. 2001, *leg. M. Wołkowycki* (herb. M. Wołkowycki 2158); Białowieża National Park, near Orłówka stream, forest section 314, on fallen branch of *Fraxinus excelsior*, 17 Mar. 2001, *leg. A. Chlebicki* (KRAM F-51258).

Peniophora limitata is characterized by resupinate violaceous grey basidiomata with a darker margin loosening during maturation, and occurrence on branches of *Fraxinus*. *Peniophora quercina* (Pers.) Cooke and *P. rufomarginata* (Pers.) Bourdot & Galzin have similar basidiomata, but they occur on branches of *Quercus* and *Tillia* respectively. *Peniophora limitata* has rarely been reported from Poland. After the first finding in Ojców National Park (Wojewoda 1974) the species was recorded from only a few other places (Wojewoda 1996, 1998, 1999, 2000b, 2003; Bujakiewicz 1997; Lisiewska 2006), most of them in the Polish Carpathians. The species is new for the Białowieża Forest.

Piloderma byssinum (P. Karst.) Jülich

SPECIMENS EXAMINED. Białowieża Forest, forest section 398, *Tilio-Carpinetum*, on rotten wood of fallen trunk of *Picea abies*, 28 Sept. 2006, *leg. D. Karasiński 1650* (KRAM F-47258).

This is a mycorrhizal fungus that forms basidiomata on rotten wood and other plant remnants. The species is new for the Białowieża Forest, previously recorded only twice in Poland (Bresadola 1903; Anonymous 1968). In the field it can be easily overlooked due to its rather inconspicuous small arachnoid basidiomata.

Postia guttulata (Peck) Jülich Fig. 26

SPECIMENS EXAMINED. Białowieża Forest, Starzyna Reserve, forest section 729, mixed forest, at base of living trunk of *Picea abies*, 28 Sept. 2006, *leg. D. Karasiński 1650* (KRAM F-47257); Władysław Szafer Reserve, forest section 447, on living trunk of *Picea abies*, 17 Sept. 2005, *leg. D. Karasiński 1651* (herb. D. Karasiński 1651).

Postia guttulata is an uncommon species characterized by sessile, effused-reflexed or lat-

Fig. 26. *Postia guttulata* (Peck) Jülich on living trunk of *Picea abies* (L.) H. Karst. (herb. D. Karasiński 1651).

Fig. 27. *Psathyrella maculata* (C. S. Parker) A. H. Sm. on stump of *Populus tremula* L. (KRAM F-47607, herb. M. Snowarski 050912.3).

erally substipitate basidiomata, the pore layer with a greenish tint when fresh, and a spathulate or flabelliform pileus, which is guttulate in the active growing state. The drops of guttation are watery red and after drying often leave yellowish brown concentric zones on the upper surface. The species has been reported from the Białowieża National Park (Domański 1967; Niemelä 1978; Szczepkowski *et al.* 2008). The present records originate from outside the Park. The Białowieża Forest is the only area of occurrence of this species in Poland. Łakomy and Kwaśna's (2008) statement that *P. guttulata* is common in the country is based on the misidentification. The fungus they illustrate represents a different species, *Fomitopsis pinicola*, which is indeed very common in Poland and Europe.

Psathyrella maculata (C. S. Parker) A. H. Sm.
Figs 27 & 28

SPECIMENS EXAMINED. Białowieża Forest, vicinity of Głęboki Kąt Reserve, on stump of *Populus tremula*, 12 Sept. 2005, *leg. D. Karasiński, A. Kujawa, M. Snowarski & M. Wołkowycki* (KRAM F-47607, herb. M. Snowarski 050912.3).

Pileus 30–50 mm in diam., plano-convex with low umbo, grey-beige, covered with dark brown fibrils forming adhering scales, margin appendiculate. Lamellae crowded, first beige, then chocolate brown, narrowly adnate, edge white fimbriate. Stem cylindrical, 50–70 × 4–7 mm, pale beige with an annulus-like fibrillose zone, slightly pruinose and delicately longitudinally grooved, in lower part covered with darker fibrils. Spores elliptical, slightly phaseoliform in side view, 4.6–5.8 × 2.5–3.3 µm, without germ pore. Basidia narrowly clavate, 14.8–18.1 × 4.8–5.2 µm, 4-spored. Cheilocystidia numerous, forming a sterile band on the lamella edge, hyaline, of two types: broadly clavate, 8.4–11.1 µm in diam., and fusiform-lageniform, 30.4–34.8 × 9.1–12.4 µm. Pleurocystidia similar to the second type of cheilocystidia, fusiform-lageniform, slightly larger, 33.0–46.6 × 11.9–14.4 µm. Clamps present.

Psathyrella maculata belongs to the section *Pseudostropharia* A. H. Sm. grouping species

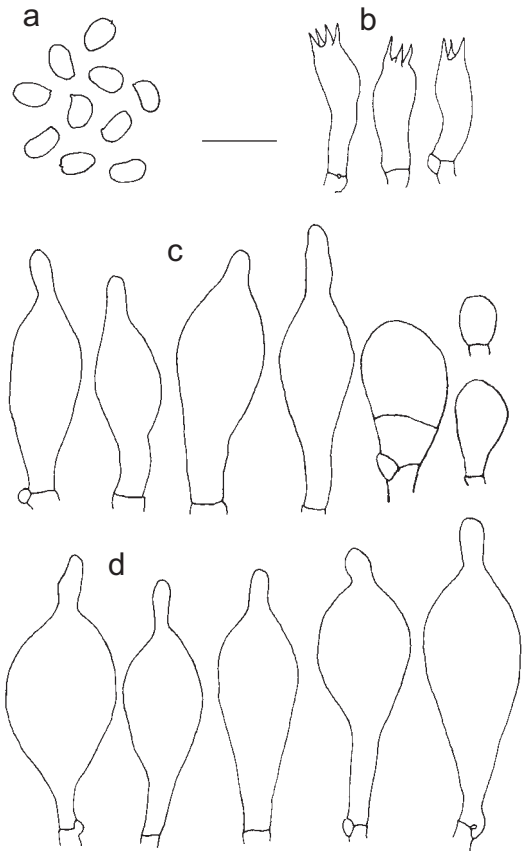

Fig. 28. *Psathyrella maculata* (C. S. Parker) A. H. Sm. a – spores, b – basidia, c – cheilocystidia, d – pleurocystidia; scale bar = 10 µm (KRAM F-47607, herb. M. Snowarski 050912.3).

whose pilei are covered by fibrils often forming adhering scales. It can be distinguished from other species of the section by its very small spores lacking a germ pore (Kits van Waveren 1985). Another characteristic feature is its habit: it occurs in clusters on decayed wood of coniferous and deciduous trees (Örstadius & Knudsen 2008). The species is widespread but scattered across Europe. It is known from Austria, the Czech Republic, France, Germany, Great Britain, the Netherlands and Scandinavia (Kits van Waveren 1985; Legon *et al.* 2005; Vašutová 2006; Ludwig 2007; Örstadius & Knudsen 2008; Austrian Mycological Society 2009). The species has not been reported from Poland previously.

Pseudomerulius aureus (Fr.) Jülich Fig. 29

SPECIMENS EXAMINED. Białowieża Forest, Władysław Szafer Reserve, forest section 443, on fallen branch of *Pinus sylvestris*, 29 Sept. 2006, *leg. D. Karasiński* (KRAM F-47255).

Pseudomerulius aureus is easy to determine by its golden to sulphur yellow basidiomata with a merulioid hymenial surface. The species is saprobic on wood of conifers (especially common on fallen branches of *Pinus sylvestris*) where it causes brown rot. It is a circumglobal species, known from the Northern and Southern Hemispheres (e.g., Ginns 1976; Ginns & Lefebvre 1993; Hjortstam & Ryvarden 2007b), and is widely distributed in Europe. In Poland *P. aureus* was recorded in different parts of the country (Wojewoda 2003 and literature cited herein; Wojewoda *et al.* 2004; Kujawa 2005; Kujawa & Gierczyk 2007), but it is no doubt overlooked, especially in pine forests. The present record is new for the Białowieża Forest.

Rectipilus fasciculatus (Pers.) Agerer Fig. 30

SPECIMENS EXAMINED. Białowieża Forest, vicinity of Głęboki Kąt Reserve, forest section 415C, N 52°42′20″, E 23°38′33″, spruce forest, on fallen log of *Picea abies*, 22 May 2006, *leg. D. Karasiński & M. Piątek* (KRAM F-55663, herb. D. Karasiński 060522/5354, 060522/5345-52).

Rectipilus fasciculatus forms numerous small, tubular basidiomata, 1.5 mm long and 0.5 mm in diam. They are very similar to those of species of the genus *Henningsomyces* (see description of *H. puber* above). The differences between these two genera are in the hairs covering the outer basidioma surface, which in *Rectipilus* are non-branched and thick-walled (Agerer 1973). The species is rare in Europe, reported from Austria, the Czech Republic, France, Germany and Switzerland (Agerer 1973; Škubla 2003; Austrian Mycological Society 2009). In Poland it was found at two localities more than 100 years ago in the vicinity of Międzyrzec Podlaski (Eichler 1902, 1904; Bresadola 1903). The species is new for the Białowieża Forest.

Fig. 29. *Pseudomerulius aureus* (Fr.) Jülich on fallen branch of *Pinus sylvestris* L. (KRAM F-47255).

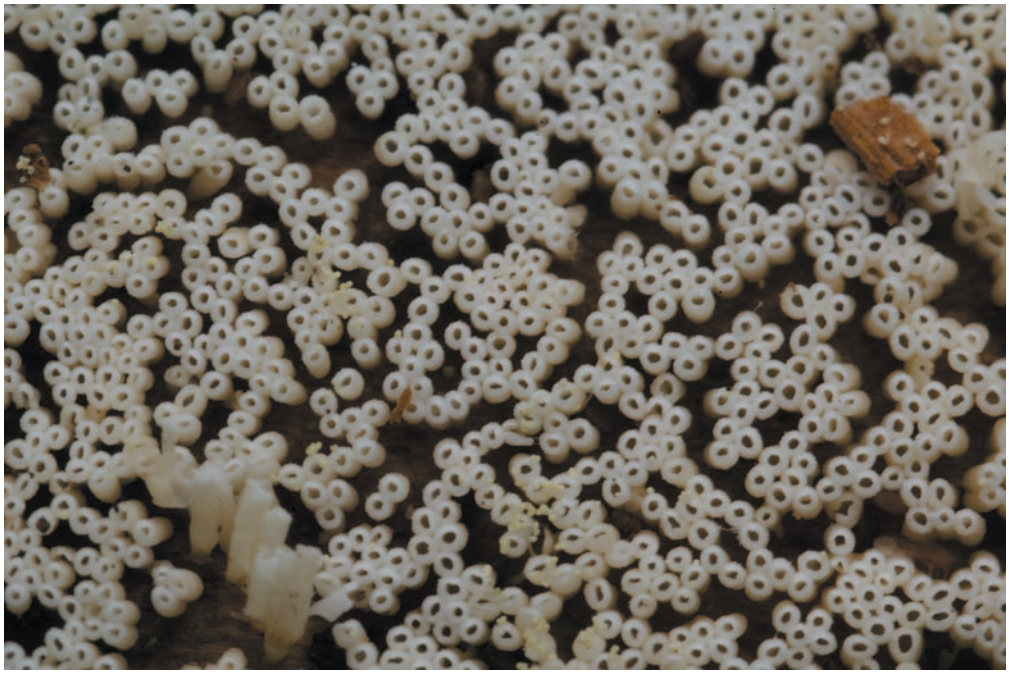

Fig. 30. *Rectipilus fasciculatus* (Pers.) Agerer on fallen log of *Picea abies* (L.) H. Karst. (KRAM F-55663, herb. D. Karasiński 060522/5354, 060522/5345-52).

Sebacina incrustans (Pers.) Tul. & C. Tul. Fig. 31

SPECIMENS EXAMINED. Białowieża Forest, forest section 439, in vicinity of Głęboki Kąt Reserve, on litter and on root necks of young trunks of *Carpinus betulus*, 24 Sept. 2006, *leg. D. Karasiński 1654* (KRAM F-47256).

Sebacina incrustans grows on naked soil, litter, among mosses, on stems of living herbaceous plants, trunks of living trees, remains of plants, rotten wood and sometimes even on stones. The basidiomata of this species are quite variable but easy to identify. According to Wojewoda (1977, 2003), *S. incrustans* is not very common in Poland, and is known from various regions of the country. *Sebacina incrustans* is widely distributed in Eurasia and North America. The species is new for the Białowieża Forest.

Sistotrema raduloides (P. Karst.) Donk Fig. 32

SPECIMENS EXAMINED. Białowieża Forest, Władysław Szafer Reserve, forest section 443, on bark and wood of fallen trunk of *Betula pendula* Roth, 29 Sept. 2006, *leg. D. Karasiński 1641* (KRAM F-47249); Białowieża National Park, on fallen trunk of *Picea abies*, 25 Oct. 1956, *leg. S. Domański* (KRAM F-SD1258, as *Grandinia raduloides*); on fallen trunk of *Carpinus betulus*, 31 Aug. 1956, *leg. S. Domański* (KRAM F-SD1471, as *Grandinia raduloides*); on fallen trunk of *Acer platanoides* L., 29 Aug. 1957, *leg. S. Domański* (KRAM F-SD1473, as *Grandinia raduloides*); on bark of fallen trunk of *Picea abies*, 12 June 1966, *leg. S. Domański* (KRAM F-SD5004, as *Odontia albicans*); on fallen trunk of *Pinus sylvestris*, 29 Aug. 1957, *leg. S. Domański* (KRAM F-SD1472, as *Grandinia raduloides*); on fallen trunk of *Picea abies*, 30 Aug. 1957, *leg. S. Domański* (KRAM F-SD1474, as *Grandinia raduloides*); on bark of fallen trunk of *Populus tremula*, 23 Sept. 1965, *leg. S. Domański* (KRAM F-SD4878).

The unique combination of features (resupinate basidioma with odontoid to hydnoid hymenophore, basidia with usually 6–8 sterigmata and subcylindrical to subfusiform spores often glued together in groups of 4–6) makes correct identification of this species quite easy. However, in the field *Sistotrema raduloides* may be confused with species of *Hyphodontia* J. Erikss. [e.g., *H. arguta* (Fr.) J. Erikss., *H. pilaecystidiata* (S. Lundell) J. Erikss.], and resupinate basidiomata of *Stecchericinum ochraceum* (Pers. *ex* J. F. Gmel.) Gray. It is also similar to *Trechispora kavinioides* B. de Vries and *Dentipellis fragilis* (Pers.) Donk. However, all these species have basidia with four sterigmata. *Sistotrema raduloides* has been reported from Poland (Eriksson *et al.* 1984) without a precise locality and only short information: 'we have seen material from Poland' and a list of substrates in Polish collections: *Acer*, *Carpinus*, *Populus* and *Picea* A. Dietr. Thus, the present report may be the first for the Białowieża Forest. *Sistotrema raduloides* has a wide ecological amplitude. In the study area it was found on wood of *Acer platanoides*, *Betula pendula*, *Carpinus betulus*, *Populus tremula*, *Picea abies* and *Pinus sylvestris*. In Sweden it was recorded also on *Malus* Mill. (Eriksson *et al.* 1984).

Skeletocutis stellae (Pilát) Jean Keller

SPECIMENS EXAMINED. Białowieża Forest, forest section 412D, *Tilio-Carpinetum*, on fallen branch of *Picea abies*, 5 Nov. 1998, *leg. M. Wołkowycki* (KRAM F-53972, herb. M. Wołkowycki 1327); Pogorzelce Reserve, forest section 252D, on fallen trunk of *Picea abies*, *leg. A. Bujakiewicz & A. Ronikier* (KRAM F-53956).

Skeletocutis stellae has perennial basidiomata and allantoid spores not exceeding 1 µm wide. *Skeletocutis borealis* Niemelä has similar perennial basidiomata but the spores are wider in this species. Some authors (e.g., Ryvarden *et al.* 2003) point out the similarity between *S. stellae* and *S. odora* (Peck *ex* Sacc.) Ginns. The latter has annual basidiomata and spores exceeding 1 µm wide.

Skeletocutis stellae has already been reported from the Białowieża Forest by Domański (1959, 1963a, 1965b), and in his herbarium there are 26 specimens of this polypore. Most if not all of them probably were collected in the Białowieża National Park. It is not clearly written on the herbarium labels, which usually bear only very laconic information on the locality: 'Białowieża', sometimes with 'distr. Hajnówka' added, but it is known that S. Domański collected fungi mainly

Fig. 31. *Sebacina incrustans* (Pers.) Tul. & C. Tul. on litter and on root necks of young trunks of *Carpinus betulus* L. (KRAM F-47256).

Fig. 32. *Sistotrema raduloides* (P. Karst.) Donk on bark and wood of fallen trunk of *Betula pendula* Roth (KRAM F-47249).

in the National Park (W. Wojewoda, pers. comm.). The two collections reported here were found in the western part of the Białowieża Forest, outside the National Park. Because *S. stellae* is considered to be a characteristic and indicator species of primeval forests (Parmasto & Parmasto 1997; Niemelä 1998; Tortić 1998), it can be assumed that the western part of the Białowieża Forest is well preserved and represents a primeval forest. In Poland, *S. stellae* has also been reported from the Góry Świętokrzyskie Mts (Domański 1965b; Łuszczyński 2003).

Sphaerobasidium minutum (J. Erikss.) Oberw. *ex* Jülich Figs 33 & 34

SPECIMENS EXAMINED. Białowieża Forest, forest section 402, on very rotten wood of coniferous tree (*Picea abies*?), 16 Sept. 2008, *leg. D. Karasiński* (KRAM F-47397); Białowieża National Park, forest section 400B, on rotten wood of fallen trunk of *Picea abies*, 5 Jul. 2009, *leg. D. Karasiński 3256* (KRAM F-47605).

Basidiomata very thin and difficult to see with the naked eye, pruinose, white to gray, resembling frost, when dry almost invisible, usually small, hymenial surface smooth to hypochnoid, margin indeterminate. Hyphal system monomitic, hyphae with clamps at all septa, smooth, thin-walled, 1.0–2.5 µm wide, subiculum very thin, consisting of single layer of hyphae forming arachnoid structure resembling web. Basidia ovoid to obconical, 6–8 × 4–7 µm, with four sterigmata and a basal clamp, usually borne singly on the hyphae and sometimes formed on short stipe which is a side branch of a subicular hyphae, basidioles globose to ovoid. Leptocystidia capitate with swollen base, 22–35 × 3.5–4.0 µm, often covered with a small cap of resinous matter, a few cystidia without globose head. Spores ellipsoid, straight to slightly depressed at adaxial side and with one or few oil droplets inside, 4.0–4.8 × 2.5–3.0 µm, smooth, inamyloid, indextrinoid, acyanophilous.

No species belonging to the genus *Sphaerobasidium* have been reported from Poland previously. According to Oberwinkler (1965) and Eriksson *et al.* (1984), this easily overlooked species is a common and widely distributed in north temperate coniferous forests, known from Europe and North America. It should be searched in other regions of Poland.

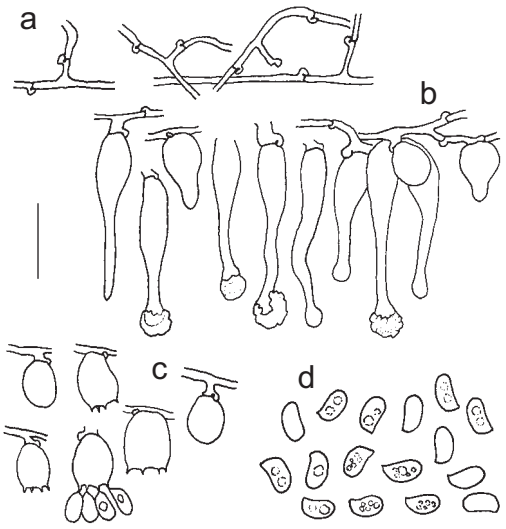

Fig. 33. *Sphaerobasidium minutum* (J. Erikss.) Oberw. *ex* Jülich. a – subicular hyphae, b – cystidia, c – basidia, d – spores; scale bar = 10 µm (KRAM F-47397).

Steccherinum tenuispinum Spirin, Zmitr. & Malysheva Figs 35 & 36

SPECIMENS EXAMINED. Białowieża Forest, forest section 373, on dead basidioma of *Fomitopsis pinicola* growing on fallen trunk of *Picea abies*, 21 Sept. 2008, *leg. D. Karasiński* (KRAM F-47260); Białowieża National Park, forest section 402, on dead basidioma of *Fomitopsis pinicola* growing on fallen trunk of *Picea abies* (together with *Antrodiella citrinella*), 22 Apr. 2009, *leg. D. Karasiński 2851* (KRAM F-47350).

Basidiomata annual, growing mostly single or two to three on the same host basidioma of *Fomitopsis pinicola*, rather small, 10–45 × 8–30 mm, resupinate or rarely with small caps, 2–4 mm wide, easily separable from the substrate. Margin white when young, cream or dirty ochraceous when old, fimbriate, often with short white rhizomorphs. Context membranaceous, in section cream to pale brown near the contact with substrate, grayish orange between spines. Spines 1–4 mm long, subulate, acute or rarely slightly obtuse (short spines near margin), first cream, then pale orange, reddish

Fig. 34. *Sphaerobasidium minutum* (J. Erikss.) Oberw. *ex* Jülich on rotten wood of fallen trunk of *Picea abies* (L.) H. Karst. (KRAM F-47605).

Fig. 35. *Steccherinum tenuispinum* Spirin, Zmitr. & Malysheva on dead basidioma of *Fomitopsis pinicola* (Sw.) P. Karst. growing on fallen trunk of *Picea abies* (L.) H. Karst. (KRAM F-47350).

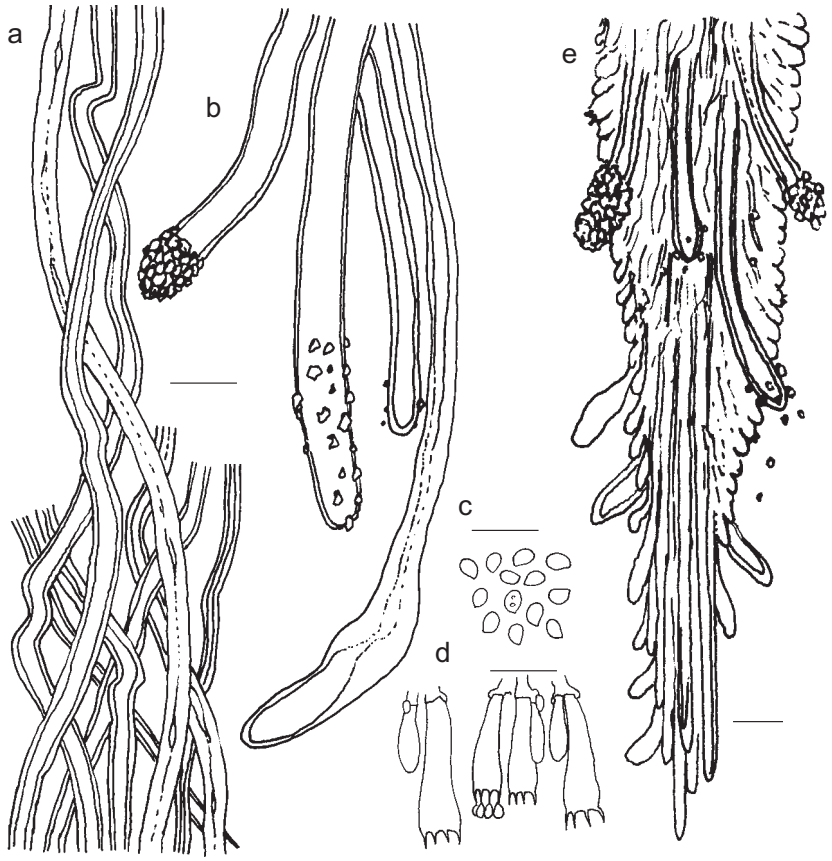

Fig. 36. *Steccherinum tenuispinum* Spirin, Zmitr. & Malysheva. a – skeletal hyphae from central part of spine, b – skeletocystidia, c – spores, d – basidia and basidioles, e – vertical section through apical part of spine; scale bar = 10 µm (KRAM F-47260).

or ochraceous. Taste mild, odor not determined. Hyphal system dimitic with skeletal hyphae only in spine core. Thick-walled generative hyphae in context with large clamps, 4–6 µm wide. Skeletal hyphae in spines 2–4 µm wide, thick-walled or subsolid. Generative hyphae thin to slightly thick-walled, 2.0–2.5 µm wide. Pseudocystidia (skeletocystidia) 55–130 × 5–8 µm, arising from skeletal hyphae, thick-walled, rounded at apex, with crystalline encrustation or without encrustation. Encrusted part 10–45 µm long. Basidia clavate, 12–20 × 4–5 µm with four sterigmata and a basal clamp. Spores broadly ellipsoid, 2.8–3.8 × 2.2–2.6 µm, smooth, hyaline, sometimes with one or several oil drops inside.

Steccherinum tenuispinum is a poorly known species, characterized by small spores and specific ecological preferences. It always grows on dead basidiomata of *Fomitopsis pinicola*. When the predecessor grows on trunks of *Picea abies*, then *S. tenuispinum* often co-occurs with *Antrodiella citrinella* (Spirin *et al.* 2007). This observation is confirmed in one Polish collection (*Karasiński 2851*). This is the first report of *S. tenuispinum* in Poland. Hitherto the species was known only from Russia (Spirin *et al.* 2007).

Trechispora hymenocystis (Berk. & Broome) K. H. Larss. Fig. 37

SPECIMENS EXAMINED. Białowieża Forest, in vicinity of Podolany Reserve, forest section 500, *Tilio-Carpinetum* with *Picea abies*, on bark of fallen trunk

of *Picea abies*, 27 Sept. 2006, *leg. D. Karasiński 1635 & M. Piątek* (KRAM F-47254).

The only information on the occurrence of *Trechispora hymenocystis* in Poland is that given by Ryvarden and Gilbertson (1994), who did not provide any details on the Polish collection(s). Thus, this is the first fully documented report of *T. hymenocystis* in Poland. The species differs from other species of *T. mollusca* (Pers.) Liberta complex by the presence of large, thin-walled sphaerocysts up to 40 µm wide, forming from side branches on subicular hyphae.

Xenasma pruinosum (Pat.) Donk Fig. 38

SPECIMENS EXAMINED. Białowieża Forest, forest section 370, *Tilio-Carpinetum*, on rotten wood of deciduous branch, 26 Aug. 1973, *leg. Z. Pouzar* (KRAM F-56168).

Basidiomata resupinate, thin, widely effused, closely adnate, cartilaginous or gelatinous when fresh, after drying resembles a semitransparent coat of paint, pale grey, greyish to bluish grey. Hymenial surface smooth as seen by naked eye, pruinose under lens (50×) due to projecting cystidia, margin thinning out and disappearing. Hyphal system monomitic, hyphae clamped, 1–3 µm wide. Subiculum thin, with subicular hyphae parallel to substrate, subhymenial hyphae arranged more vertically and forming a dense layer. Basidia pleural, cylindrical, 15–22 × 6.5–8.5 µm with 4 to 6 sterigmata. Spores ellipsoid, 5.7–7.0 × 3.5–4.5 µm, with small apiculus and adaxial side straight to slightly concave, smooth in KOH but rough in Melzer's reagent or Cotton Blue. Cystidia of two types: (*i*) cylindrical, thin to thick-walled in basal part and basally slightly widened, apically obtuse, 35–90 × 5–10 µm, easily collapsed; and (*ii*) hyphoid, 20–40 × 2.0–3.5 µm, with a few apical outgrowths.

Xenasma pruinosum is new for Poland. This is a rarely recorded species, known from Europe, Africa, North and South America (Liberta 1960; Oberwinkler 1965; Domański 1992).

Fig. 37. *Trechispora hymenocystis* (Berk. & Broome) K. H. Larss. on bark of fallen trunk of *Picea abies* (L.) H. Karst. (KRAM F-47254).

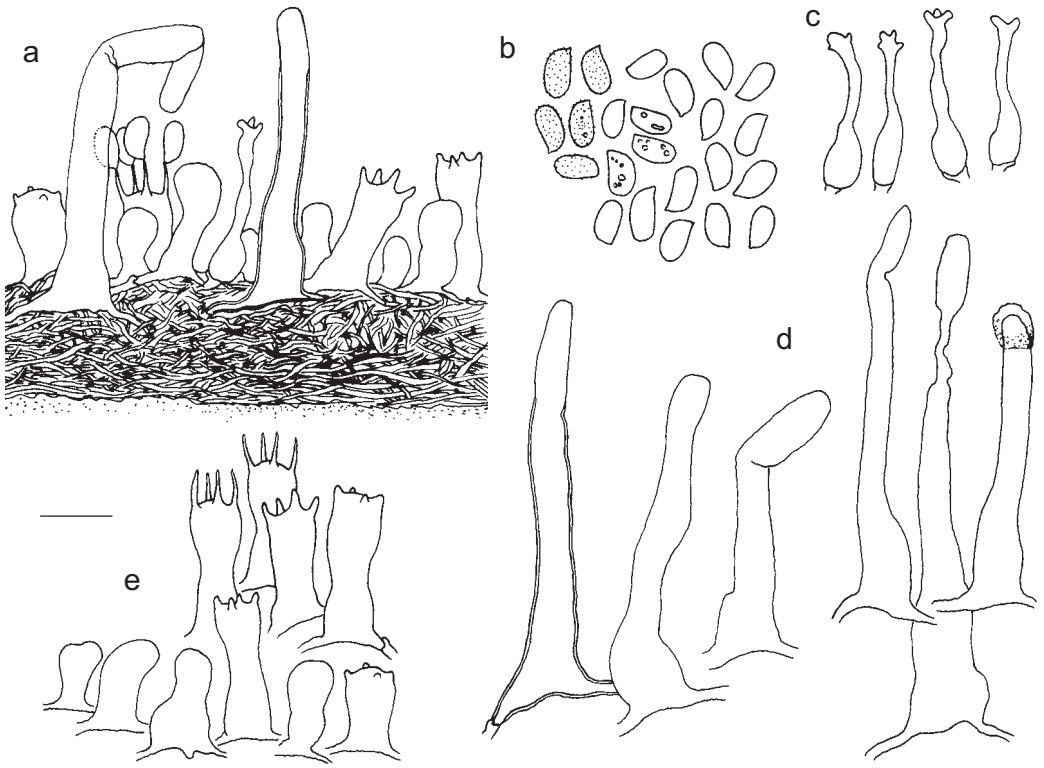

Fig. 38. *Xenasma pruinosum* (Pat.) Donk. a – section through basidioma, b – spores, c – hyphoid cystidia with apical outgrowths, d – cylindrical cystidia, e – basidia and basidioles; scale bar = 10 µm (KRAM F-56168).

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