

# Rare corticioid fungi (Basidiomycetes, Aphyllophorales) from northern Belarus

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**SUMMARY.** Thirteen species collected in 1997–2005 in Belarusian Lake province and Upper Byarezina Lowland are reported. Eight species are new for the country. Descriptions and illustrations are given for each species.

**Key words:** Belarusian Lakeland, Corticiaceae s. l., *Dendrothele*, *Hyphodontia*

This article continues the series of descriptions of rare resupinate non-poroid homobasidiomycetes (Corticiaceae s. l.). The research area occupies the total north of Belarus and is bordered from the south by the physiographic districts, described in the preceding article (Yurchenko & Kotiranta, 2006). The collection sites were in Narach Lakes region and in central part of Byarezinski Biosphere Reserve. The first area belongs to *Narach Plain* and *Sventsyanyn Moraine Ridges* physiographic district of *Belarusian Lakeland* physiographic province, the second to *Upper Byarezina Lowland* physiographic district of *Western Belarus* physiographic province according to Klitsunova et al. (2002). All specimens were collected by E.O. Yurchenko in 1997–2005. Each of the species discussed below, is known just from a single locality in Belarus.

To describe the micromorphology, preparations for microscopy were done in 3% KOH solution and, where necessary, in distilled water. The reaction with iodine (amyloidity or dextrinoidity) was checked in a small drop of distilled water mixed with a small drop of medicinal iodine solution and in Melzer's reagent. The material studied is preserved in fungal section (MSK-F) of the Herbarium of V.F. Kuprevich Institute of Experimental Botany. Duplicates were transferred to other collections too, including the reference herbarium of Heikki Kotiranta (H.K.) and others, which are mentioned in the text.

## Species descriptions

### 1. *Ceratobasidium pseudocornigerum* M.P. Christ.

Figs 1, 2.

**Basidiomata** ca 5–10 mm wide, very thin, effused, closely attached, of rather ceraceous consistency, whitish or grayish, under a lens white and not continuous, almost porulose, margin indistinct. **Hyphal system** monomitic; all hyphae simple

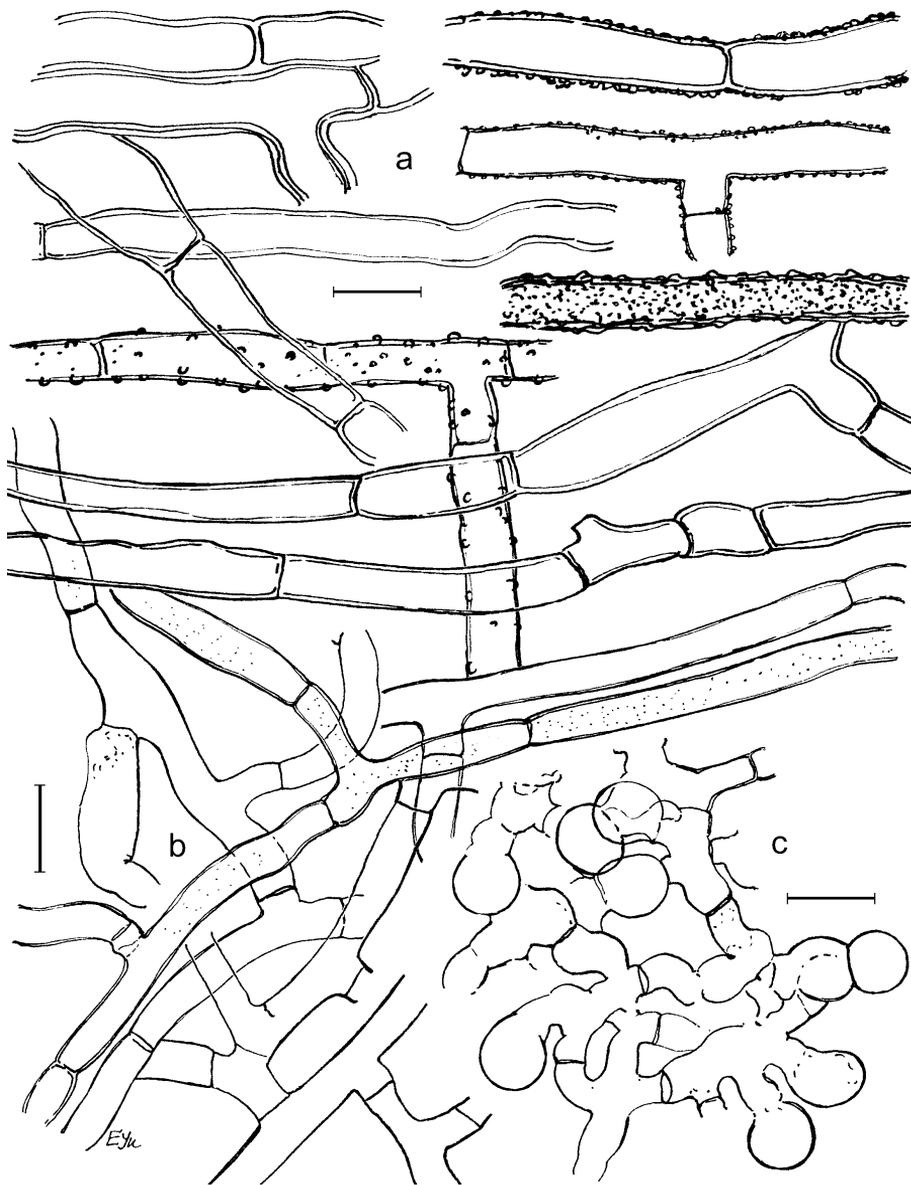


Fig. 1. *Ceratobasidium pseudocornigerum* (MSK 4112): a – smooth and enrusted basal hyphae, b – subicular hyphae, c – basidiolae and subbasidial hyphae in squash preparation. Scales = 10  $\mu$ m.

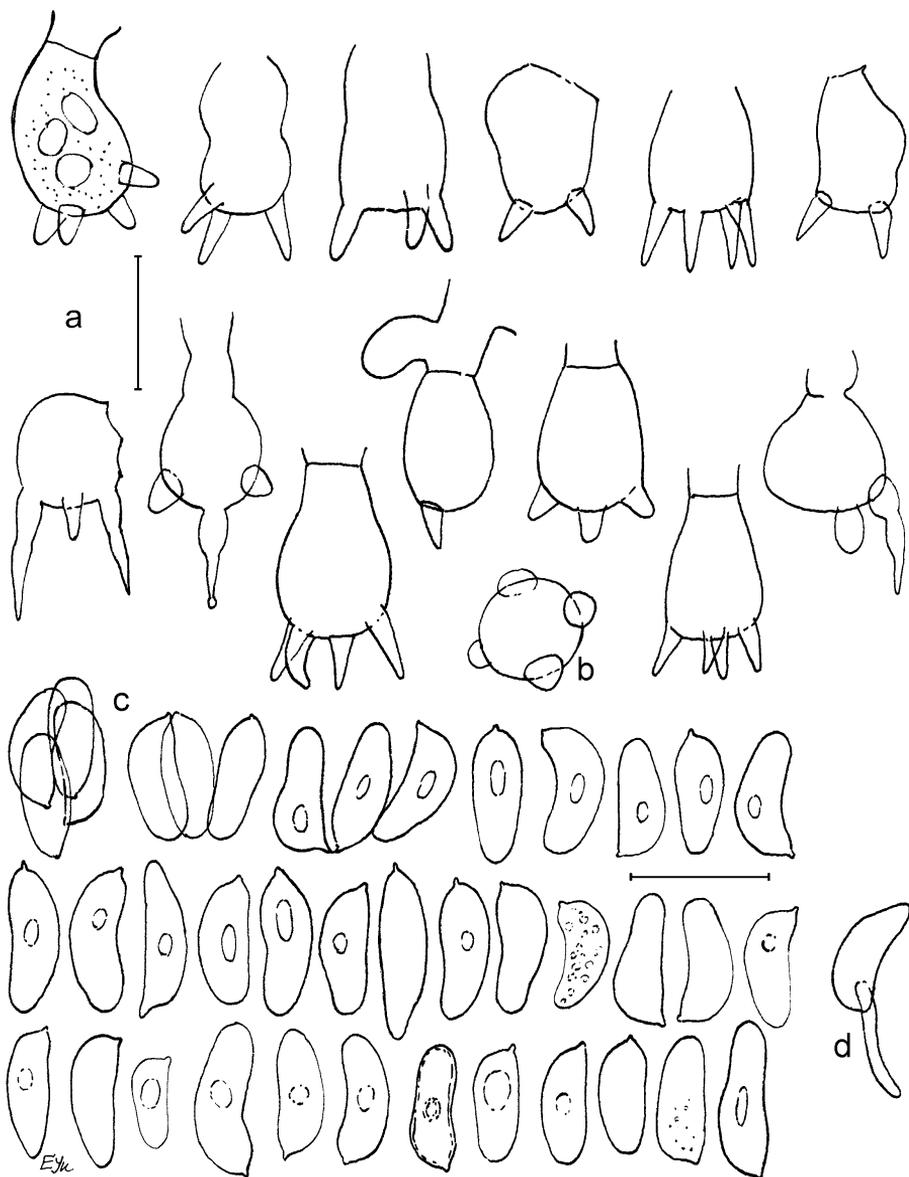


Fig. 2. *Ceratobasidium pseudocornigerum* (MSK 4112): a – basidia in side view, b – basidium in view from the apex, c – basidiospores, d – basidiospore germinating by a sterigma. Scales = 10  $\mu$ m.

septate, branched mostly at right angles. Basal hyphae sparingly branched, straight to slightly wavy, smooth or rough due to scattered or rather coarse granular incrustation, hyaline, subhyaline (smooth ones), yellowish or brownish (encrusted ones), 5.5–8  $\mu\text{m}$  wide (some segments inflated up to 11.5  $\mu\text{m}$ ), walls up to 1.1  $\mu\text{m}$  thick, looking bi-layered (especially well visible on thicker walls). Subicular hyphae moderately branched, hyaline, 4–6  $\mu\text{m}$  wide, insufficiently constricted at septa (sometimes 3.2  $\mu\text{m}$  wide in constrictions), hyphal segments sometimes slightly swollen, walls thin to slightly thickened. Subbasidial hyphae 3.2–4.2(–7)  $\mu\text{m}$  wide, thin-walled, mostly short-celled. **Cystidia** none. **Basidioles** in loose clusters, terminal, subglobose, broadly obovate, ovoid to slightly angular, 8.5–10  $\times$  5.5–9.2  $\mu\text{m}$ . **Basidia** rarely found, mostly obovoid, sometimes with a constriction, subpyriform or irregularly ovoid, 12–15  $\times$  7–9  $\mu\text{m}$ , with 2–4 (occasionally 1) prominent sterigmata up to 11.5  $\times$  2.5  $\mu\text{m}$ , with swollen base and attenuated upper part. **Basidiospores** suballantoid or allantoid, rarely navicular or cylindrical, sometimes slightly sigmoid, 7–9.5(–12.5)  $\times$  (2.1–)2.5–3.5(–4)  $\mu\text{m}$ , broadest at basal part, sometimes apically subacuminate, hyaline or subhyaline, mostly with a drop-like area of slightly refractive protoplasm in the center (visible at magnification  $\times 300$ , but not more), thin-walled, iodine-negative, often glued together in 3–4, apiculus small; spore repetition not observed.

The specimen differs from the species concept by partly encrusted basal hyphae, frequently curved, sometimes navicular or sigmoid spores. Besides, spores are in general smaller, than described for *C. pseudocornigerum*, and rarely reaching 10–12.5  $\times$  3.5–4  $\mu\text{m}$ . In Finnish samples spores are infrequently slightly curved (Kotiranta & Saarenoksa, 1990; 2005). Sterigmata development on basidiospores is more rarely observed in *C. pseudocornigerum* than in *C. cornigerum* (Kotiranta & Saarenoksa, 2005), and in this specimen only a single spore with a sterigma close to the apiculus was observed.

This specimen was published earlier, with a brief description, by Yurchenko (2003) under the name *Ceratobasidium* aff. *pseudocornigerum*.

*Ceratobasidium pseudocornigerum* is a rare species known from North Europe (Norway, Sweden, Finland, Denmark) and Switzerland, inhabiting dead herbs, fallen angiosperm twigs, and living *Pteridium* (Kotiranta & Saarenoksa, 1990; Ryvarden et al., 2003).

**Specimen examined:** On dead stems of *Chamaenerion angustifolium* (L.) Scop. in abandoned *Ribes* plantation, overgrown by young *Betula pendula*, *Salix* sp., and densely by *Ch. angustifolium* and *Rubus idaeus*, near Domzharytsy village in Byarezinski Biosphere Reserve, Lepel' distr., coll. 14 VII 1997 (MSK 4112; H.K.; GB).

## 2. *Dendrothele amygdalispora* Hjortstam

Fig. 3.

**Basidiomata** effused, minute, 0.5–4 mm wide, reaching ca 1 cm long in bark fissures, very thin (ca 35  $\mu\text{m}$ ), ceraceous, white or grayish; margin distinct. Hymenophore even, slightly pruinose. **Hyphal system** monomitic. Hyphae difficult to discern, slender, moderately branched, simple septate, hyaline, 1–2.2  $\mu\text{m}$  wide, thin-walled (the narrowest seem to be slightly thick-walled), forming a very thin sub-

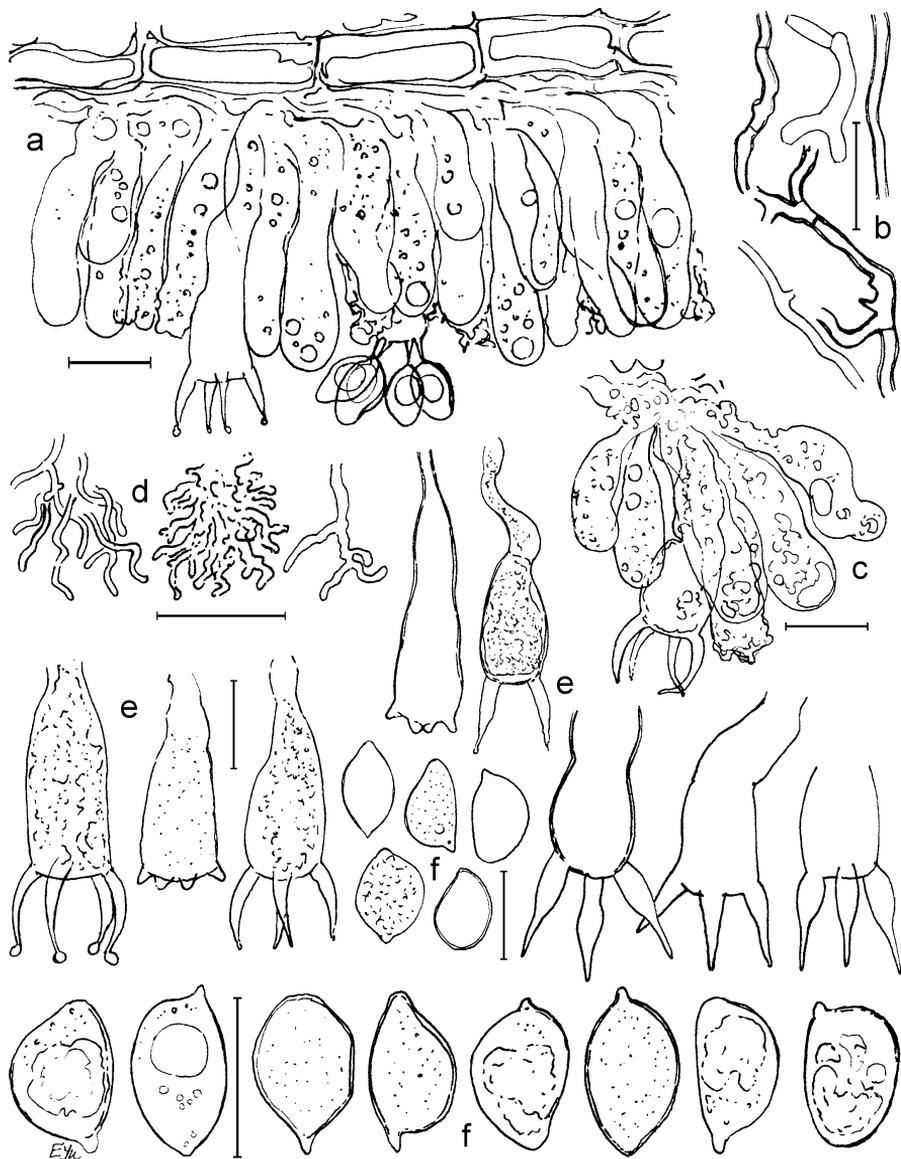


Fig. 3. *Dendrothele amygdalispora* (MSK 6866): a – vertical section of the fruit-body, b – hyphae, c – cluster of basidioles and basidium, d – differently branched dendrohyphidia, e – basidia, f – basidiospores. Scales = 10  $\mu$ m.

culum, where the hyphae sometimes intermixed with green coccoid algae. In KOH the crystals not abundant. **Cystidia** none. **Dendrohyphidia** hardly visible, aggregated in some areas of the hymenium (seem to be absent in other areas), moderately to richly branched, very slender, 0.5–0.7  $\mu\text{m}$  wide. **Basidioles** ca  $38 \times 8 \mu\text{m}$ , with guttules. **Basidia** simple-septated at base, large, clavate or substipitate, with a constriction,  $20\text{--}38 \times 7.2\text{--}9.2 \mu\text{m}$ , thin-walled, hyaline; sterigmata large, straight or moderately curved, conical or basally swollen and attenuated apically, up to 12.5  $\mu\text{m}$  long. **Basidiospores** amygdaliform (with narrowed apical part and prominent apiculus) or navicular, rarely ovoid (unripe ones),  $8\text{--}13 \times (4.5\text{--})5.2\text{--}6.5(\text{--}7.5) \mu\text{m}$ , thin- or slightly thick-walled, hyaline or greenish with refractive heterogeneous inclusions; a part of spores with central greenish drop (especially in spores still attached to basidia), inamyloid, but becoming strongly reddish-brown in iodine, apiculus ca 0.8  $\mu\text{m}$  long.

New for Belarus.

*Dendrothele amygdalispora* is a rare and northern species, recorded in Britain, Fennoscandia, and Asian Arctic (Kotiranta & Penzina, 1998; Kotiranta & Saarenoksa, 2000; Anon, 2003; Ryvarden et al., 2003).

**Specimen examined:** On living trunk of young *Quercus robur* L. (on bark fissures, depressions, and branch bases), in *Pinus* forest of Gramineae-herb-*Oxalis* type, with *Rubus idaeus*, close to forest edge, near Trydany village in Narach National Park, Myadzel distr., coll. 16 IX 2005 (MSK 6866; H.K.).

### 3. *Dendrothele griseocana* (Bres.) Bourdot & Galzin

Fig. 4.

**Basidiomata** 1–25 mm wide, effused, closely adnate, forming small patches, pruinose (partly minutely porulose under a lens), ceraceous, with scattered tiny aculei (spinulose projectons) ca 50  $\mu\text{m}$  long, grayish with light brownish or violaceous hue; margin fairly distinct or diffuse. **Hyphal system** monomitic, all hyphae simple septate, moderately branched, 1–1.8  $\mu\text{m}$  wide, hyaline, moderately thin-walled. In KOH crystalline material scarce. **Dendrohyphidia** not evenly distributed, abundant in some parts, few in others, richly branched with short branches or almost unbranched, 0.7–2  $\mu\text{m}$  wide, hyaline, thin-walled. **Basidia** flexuous, clavate or subcylindrical,  $17.5\text{--}26 \times 6\text{--}7.2 \mu\text{m}$ , hyaline, mostly with droplets, thin-walled, with 1–2(3) stout sterigmata ca 2.2  $\mu\text{m}$  wide at base. **Basidiospores** broadly ellipsoid to obovoid, sometimes somewhat citriform,  $(8\text{--})8.7\text{--}10 \times 6.5\text{--}7.7(\text{--}8.2) \mu\text{m}$ , hyaline, thin- to slightly thick-walled, weakly amyloid, with middle-sized obtuse apiculus.

Subclavate sulpho-positive gloeocystidia [pseudocystidia in terms of Domański (1988)] were described as a diagnostic feature of *D. griseocana* (Jülich & Stalpers, 1980), but not clearly observed in this specimen. However, the colour of the fruit-body, the minute spinulose projections on hymenium, spore size, plus typically bi-sterigmatic basidia (Domański, 1988: 242; Piątek, 2001) are characteristic for *D. griseocana*. *Dendrothele acerina* (Fr.) Lemke and *D. commixta* (Höhn. & Litsch.) J. Erikss. & Ryvarden are very similar, but the shape of spores in *D. griseocana* is slightly different and the sterigmata are clearly larger than in *D. acerina* or *D. commixta*.

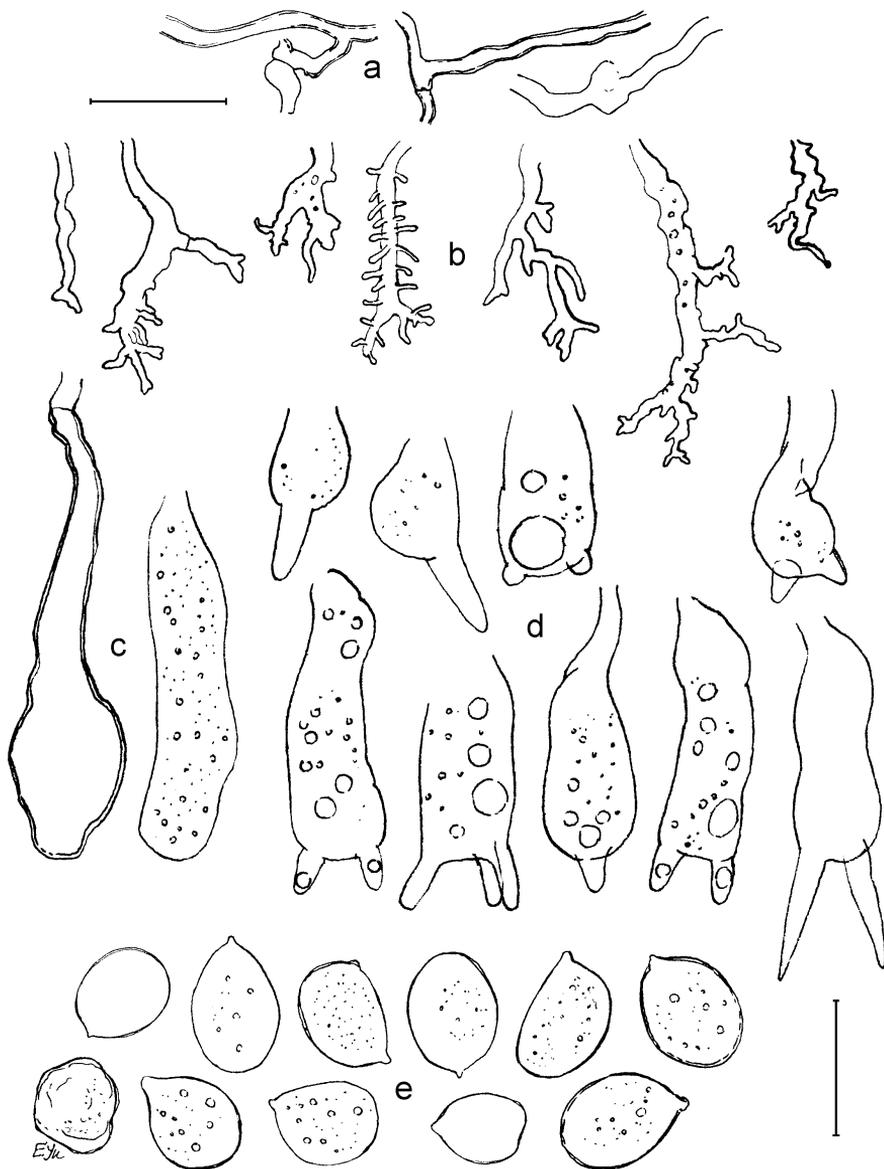


Fig. 4. *Dendrothele griseocana* (MSK 6867): a – hyphae, b – dendrohyphidia, c – basidioles, d – basidia, e – basidiospores. Scales = 10  $\mu$ m.

New for Belarus.

*Dendrothele griseocana* was reported from temperate Eurasia, North America, and East Africa; in Europe it is very rare species towards the northeast. E.g. it was found once in Denmark (Eriksson & Ryvarden, 1975) and twice in Poland (Piątek, 2001). *Salix* is a typical host for this fungus (Piątek, 2001).

**Specimen examined:** On bark (encrusting also living mosses) of living old *Salix fragilis*, 0.3–0.8 m above the ground, in stream valley slope with *Acer platanoides*, *Salix fragilis*, and *Aegopodium podagraria*, Charauki village in Narach National Park, Myadzel distr., coll. 14 IX 2005 (MSK 6867; H.K.).

#### 4. *Globulicium hiemale* (Laurila) Hjortstam [syn. *Cerocorticium hiemale* (Laurila) Jülich & Stalpers]

Figs 5, 6.

**Basidioma** effused, small, several mm wide, very thin, farinaceous with unclear margin and very fragile (when old), pale cream-coloured. **Hyphal system** monomitic. Subiculum poorly developed. Subicular hyphae moderately branched, slender, sinuous, clamped at all septa, 1.3–3  $\mu\text{m}$  wide, very- to moderately thin-walled, hyaline. Both subiculum and hymenium rich of crystalline masses, easily dissolving in KOH. **Basidioles** broadly clavate, up to 21  $\mu\text{m}$  wide. **Basidia** basally clamped, large, urniform, irregular or wavy, ca 30  $\mu\text{m}$  long, 11–14  $\mu\text{m}$  wide in swollen lower part, apically 6–8  $\mu\text{m}$  wide, with 2–4 conspicuous sterigmata, up to 12  $\times$  3  $\mu\text{m}$ . **Basidiospores** globose, subglobose, slightly angular (e.g. sometimes unclearly rounder-triangular), 9.3–12.5  $\times$  8.3–11.2  $\mu\text{m}$ , hyaline to faintly yellowish, thin- to slightly thick-walled, iodine-negative, with prominent rounded apiculus ca 1  $\times$  1  $\mu\text{m}$ .

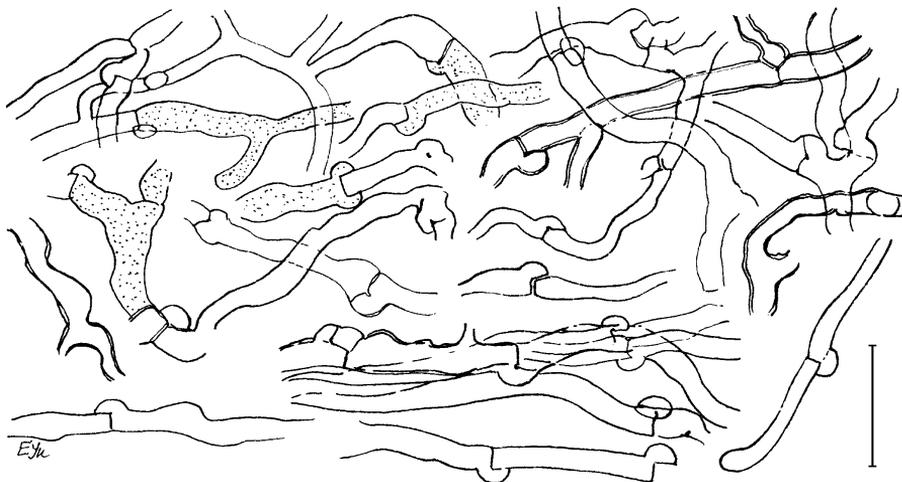


Fig. 5. *Globulicium hiemale* (MSK 4782): subicular hyphae. Scale = 10  $\mu\text{m}$ .

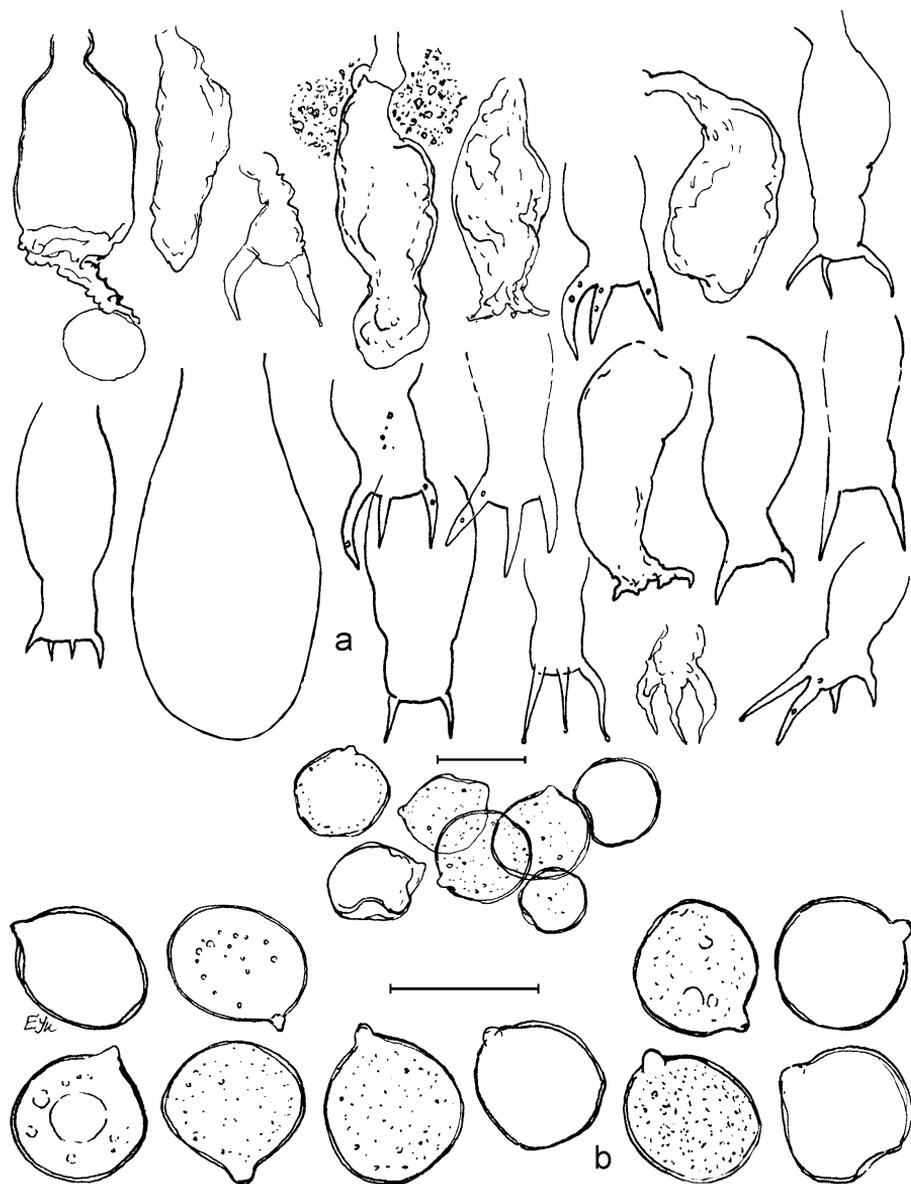


Fig. 6. *Globulicium hiemale* (MSK 4782): a – basidioles and basidia, b – basidiospores. Scales = 10  $\mu$ m.



Fig. 7. *Hyphodontia floccosa* (MSK 4755): a – hymenium with clusters of tubular cystidia; b, c – fragments of cystidia with adventitious septa; d – basidioles and subhyphal hyphae; e – basidia, f – basidiospores. Scales = 10  $\mu$ m.

Basidia in the specimen are partly or totally collapsed, so it was difficult to describe their accurate shape and size, but according to Jülich (1984) they are stipitate-clavate, 50–75 × 10–16 µm. **Cystidia** none, but slightly capitate, encrusted (acicular crystals) paraphysoid hyphae are typical for *G. hiemale* (Domański, 1988: 277). Such hyphae were not found in the specimen due to the age of the fructification. However, the spores are characteristic for *G. hiemale*.

New for Belarus.

*Globulicium hiemale* is an Eurasian species with quite uneven pattern of distribution, inhabiting mostly coniferous wood. In Europe it was reported from Spain and Fennoscandia (Jülich, 1984: 126). It is very common in boreal zone, e.g. in Norway the species is known from 162 specimens throughout the country (Ryvarden et al., 2003) and grows also in Asian Arctic (sample of Kotiranta – see Læssøe & Petersen, 2007).

**Specimen examined:** On wood of well decayed stump of old *Pinus sylvestris* L. in *Picea* forest of *Pinus-Hylocomium* type, near Perakhodtsy village in Byarezinski Biosphere Reserve, Lepel' distr., coll. 4 VI 1999 (MSK 4782; LE).

## 5. *Hyphodontia floccosa* (Bourdot & Galzin) J. Erikss.

Fig. 7.

This fungus was published for the first time for Belarus, with a brief morphological description (Yurchenko, 2001), but not illustrated.

*Hyphodontia floccosa* is confined to coniferous wood (*Pinus* and *Picea*), and is possibly a rare species throughout its distribution range. Though, in Norway it is known from 20 specimens, collected throughout the country (Ryvarden et al., 2003). It was reported from West Europe (Norway, Sweden, Estonia, Germany, France, Austria), Caucasus, and North America (Nikolajeva, 1961; Jülich, 1984; Domański, 1988; Ryvarden et al., 2003).

**Specimen examined:** On fallen branches of *Pinus sylvestris*, dead leaves of *Betula pendula* Roth (litter), partly living sprouts of *Dicranum polysetum* Sw. and *Pleurozium schreberi* (Brid.) Mitt. in *Pinus* forest of *Pleurozium* type, near Rozhna village in Byarezinski Biosphere Reserve, Lepel' distr., coll. 3 VI 1999 (MSK 4755; KRAM).

## 6. *Hyphodontia pilaecystidiata* (S. Lundell) J. Erikss.

Figs 8, 9.

**Basidioma** effuse, ca 10 cm wide, very thick (0.7–5 mm between the teeth), especially in the center, due to the new fruitbody growing over the older one, corky, slightly cracking; margin abrupt or short bristly. Hymenophore raduloid, cream-coloured; teeth irregularly flattened-conical, 0.8–3 mm long, 0.3–1.3 mm wide at base, on vertical substratum strongly declined, almost pressed to the subiculum, brownish at apices; apices simple or with several smaller aculei. **Hyphal system** monomitic. Hyphae in the trama rather sparingly branched, mostly parallel, straight to wavy, hyaline, 2.3–2.7 µm wide, thin- to thick-walled, but mostly characteristically slightly thick-walled, mostly clamped, seldom with simple septa. Subhymenium with

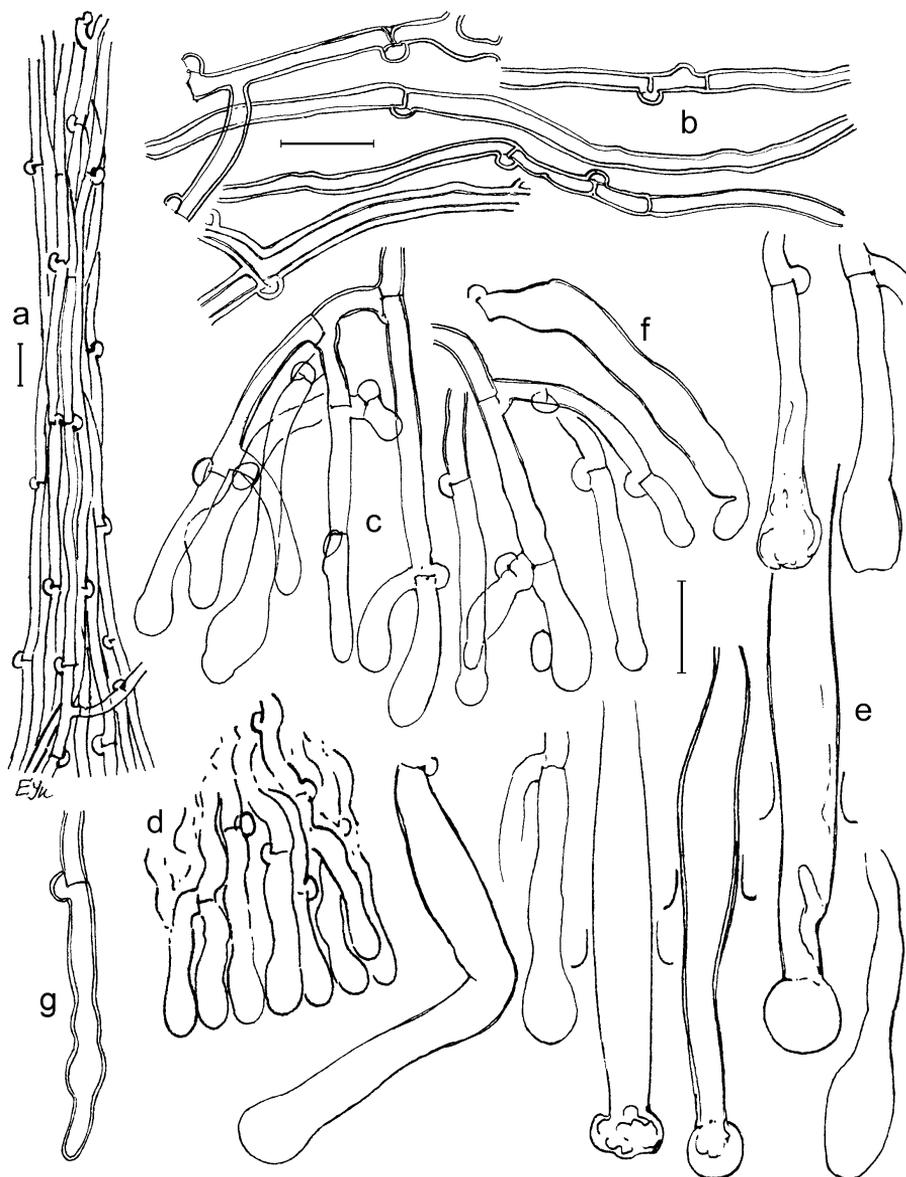


Fig. 8. *Hyphodontia pileocystidiata* (MSK 4723): a – portion of parallel arranged hyphae of trama, b – separate hyphae of trama, c – portion of loose hymenium and subhymenium, d – portion of dense hymenium and subhymenium, e – capitata and clavate cystidia, f – subcylindrical cystidium, g – submoniliform cystidium. Scales = 10 µm.

densely arranged, richly branched, hyaline, moderately thin-walled (walls gradually thinning towards hymenial elements) hyphae, or loose, moderately branched hyphae, 2–3.7  $\mu\text{m}$  wide. Hymenium rather compact or loose, consisting mostly of clavate basidioles. **Cystidia** rather common, basally clamped, capitate, clavate, subcylindrical, sometimes almost moniliform, frequently curved, 31–37  $\times$  5.8–7.7  $\mu\text{m}$ , hyaline, thin-walled (wall thinning out towards the apical part). Some kind of hyphidia (shape between cystidia and basidioles) common in hymenium. **Basidia** basally clamped, subclavate to stipitate, 26–46  $\times$  5.7–7  $\mu\text{m}$ , hyaline, thin-walled (wall gradually thickening towards the base), with ?2 or 4 very thin-walled sterigmata 2.7–3.2  $\times$  0.7–1.5  $\mu\text{m}$ . **Basidiospores** narrowly ellipsoid to short cylindrical, mostly slightly wider in apical part, 4.2–6  $\times$  2.8–3.5  $\mu\text{m}$ , hyaline, thin- to insufficiently thick-walled, with small apiculus, iodine-negative.

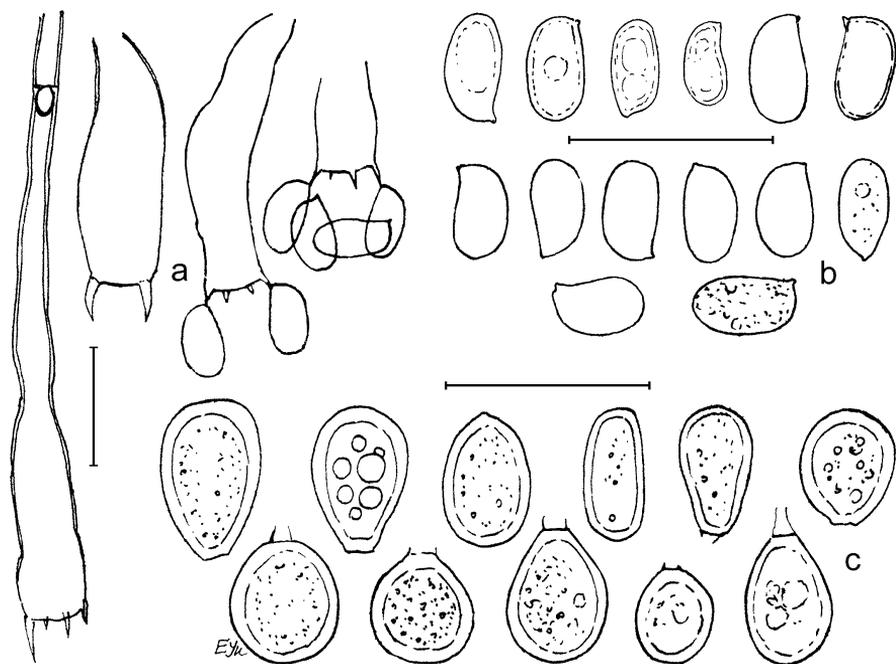


Fig. 9. *Hyphodontia pilaeacystidiata* (MSK 4723): a – basidia, b – basidiospores, c – chlamydospores. Scales = 10  $\mu\text{m}$ .

This specimen is rich of **chlamydospores**, which are even more frequent, than basidiospores. They are globose to elongate ellipsoid, mostly broadly ovoid, slightly truncate at base, smooth, thick-walled (wall 0.8–1  $\mu\text{m}$  thick), subhyaline, with heterogeneous to guttulate contents and scattered mostly between tramal hyphae. Some chlamydospores bear a very short fragment of hyaline thin-walled hypha

1  $\mu\text{m}$  in diam at base. If they really belong to this specimen, or any another fungus, parasitizing *Hyphodontia*, is unclear.

The species was published for the first time for Belarus by Yurchenko (2000), without morphological description. Spores of the Belarusian specimen are slightly narrower than described in Finnish material (3–3.9  $\mu\text{m}$  wide, Kotiranta & Saarenoksa, 1993) and thus of more cylindrical shape. Moreover, the cystidia are unusual small, if compared with those reported by Eriksson and Ryvarde (1976) and Kotiranta and Saarenoksa (1993).

According to Langer (1994) *Hyphodontia* is not the right genus for this species.

*Hyphodontia pilaecystidiata* is a rare species, known in Sweden, Finland, Estonia, Germany (Jülich, 1984; Kotiranta & Saarenoksa, 1993) and occurs mostly on *Salix*.

**Specimen examined:** On dead, erect trunk of *Salix pentandra* L. in paludified *Betula pubescens* forest of *Alnus glutinosa*–*Thelypteris palustris* type, near Domzharytsy village in Byarezinski Biosphere Reserve, Lepel' distr., coll. 2 VI 1999 (MSK 4723).

## 7. *Membranomyces delectabilis* (H.S. Jacks.) Kotir. & Saaren. [syn. *Clavulicium delectabile* (H.S. Jacks.) Hjortstam]

Fig. 10.

**Basidiomata** effused, 1–10 mm wide, closely attached, very thin (50  $\mu\text{m}$  and thinner in dry state), soft-ceraceous, cream-coloured or pale citric yellow, not continuous. Central part smooth and continuous in larger basidiomata, consisting of partly confluent flattened minute “pillows” towards the strongly diffuse margin. **Hyphal system** monomitic, all hyphae simple septate, hyaline and thin-walled. Subiculum thin, of moderately branched, sinuous hyphae 3.2–5.5  $\mu\text{m}$  wide, some cells inflated up to 6.5  $\mu\text{m}$ . Subbasidial hyphae near 4  $\mu\text{m}$  wide. **Basidioles** with prominent yellowish oily contents. **Basidia** simple-septated at base, subcylindrical to clavate or subfusiform, commonly sinuous, hyaline, thin-walled, 30–47  $\times$  5.3–9.8  $\mu\text{m}$ , with 2 large horn-shaped, 6.2–8.5  $\times$  1.8–3.3, or 4 smaller, 4  $\times$  1.3–2  $\mu\text{m}$ , sterigmata. **Basidiospores** of cantharelloid morphology: subglobose, broadly ellipsoid, subpyriform or irregularly-subglobose (when partly collapsed), (5.5–)7.2–9(–10)  $\times$  (4.2–)6–7(–8.2)  $\mu\text{m}$ , occasional subpyriform spores up to 11.7  $\mu\text{m}$  long, wall thin or slightly thickened, contents yellowish due to oily inclusions, becoming clearly red-brown in iodine, apiculus small, hyaline.

According to Domański (1988) the spores are globose, 7–9  $\times$  6–7  $\mu\text{m}$ , and the basidia are 50–80  $\mu\text{m}$  long. The related species, *M. spurius* (Bourdot) Jülich, has larger spores, viz. 8–11  $\times$  7–9  $\mu\text{m}$ , and characteristic hyphidia (Kotiranta & Saarenoksa, 1993).

New for Belarus.

*Membranomyces delectabilis* is a rare species occurred in Europe and North America, on humus, litter, deciduous and coniferous wood and is an ectomycorrhiza-forming fungus (Domański, 1988; Kotiranta & Saarenoksa, 1993; Larsson, 2007). In Europe it is known e.g. in Norway, Sweden, Finland and Denmark (see, e.g. Kotiranta & Saarenoksa, 1993; Ryvarde et al., 2003).

**Specimen examined:** On underside of fallen, strongly decayed, decorticated *Salix caprea* L. trunk in *Populus tremula*-*Picea* forest of *Corylus*-*Aegopodium*-*Oxalis* type, near Domzharytsy village in Byarezynski Biosphere Reserve, Lepel' distr., coll. 4 VI 1999 (MSK 4884; H.K.; BILAS).

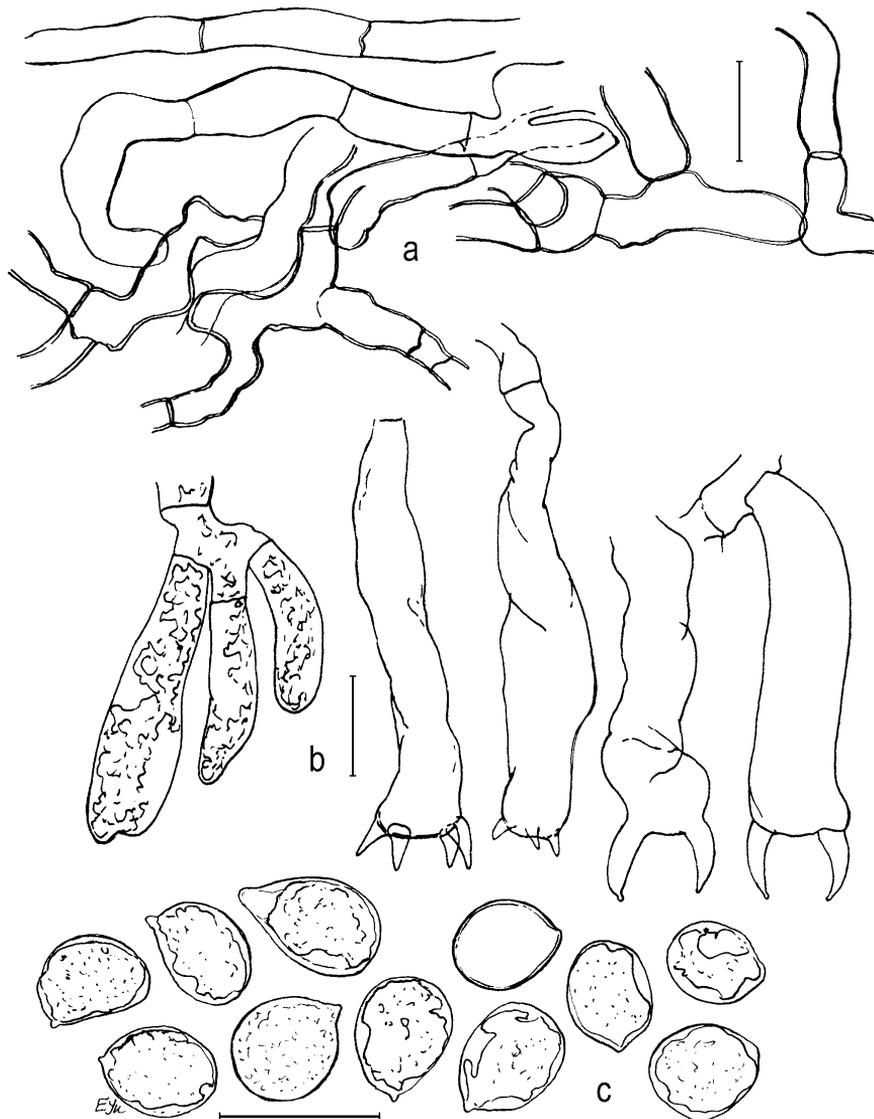


Fig. 10. *Membranomyces delectabilis* (MSK 4884): a – hyphae, b – basidioles and basidia, c – basidiospores. Scales = 10  $\mu$ m.

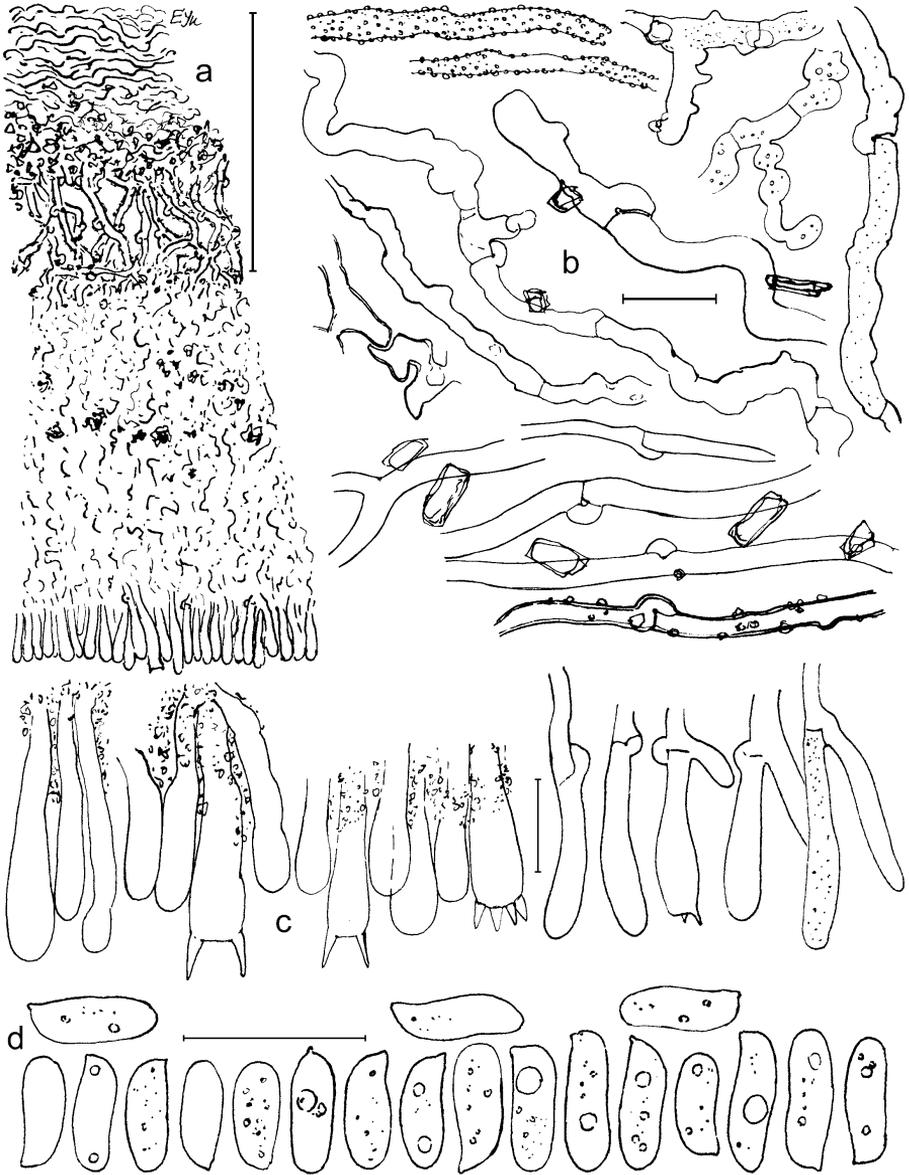


Fig. 11. *Phlebia firma* (MSK 4448): a – fruitbody vertical section, b – subicular hyphae, c – portions of hymenium, basidia and basidioles, d – basidiospores. Scale for a = 100 µm, for b, c, d = 10 µm.

8. *Phlebia firma* J. Erikss.

Fig. 11.

**Basidiomata** effused, up to 30 mm wide, 30–80 µm thick in dry state, ceraceous (except subiculum), slightly cracking when old and dry; hymenial surface smooth, glossy in old basidiomata, unevenly coloured, ochraceous to brownish, with grayish or bluish gray hue; margin paler, abrupt or very finely fibrillose and then white under a lens, up to 0.5 mm wide. **Hyphal system** monomitic. Fruitbody stratified: subiculum consisting of more or less horizontally arranged sinuous hyphae, middle part of loosely arranged, distinct, rather straight, encrusted hyphae, and thickened subhymenium of tightly packed, indistinct sinuous hyphae. Small to large, up to 10 µm long, crystals common in subiculum. Subicular hyphae clamped at most septa, 2–3 µm wide, swollen at some clamped septa, walls even to strongly sinuous (and then hyphae with swellings up to 6.5 µm wide), thin-walled, hyaline, smooth or sparsely encrusted. **Cystidia** none. **Basidia** forming a tight palisade, basally clamped (more easily visible in basidioles), clavate, 25–27 × 4.5–6 µm, thin-walled, hyaline, with 2 or 4 conical sterigmata 3.2–4.7 × 1.3–1.7 µm. **Basidiospores** cylindrical to slightly sigmoid, with flat to slightly concave adaxial side, (5.5–)6.5–8.2 × (2.1–)2.5–2.7 µm, hyaline, mostly with droplets, very thin-walled, iodine negative, with small, sometimes unclear apiculus.

Kotiranta and Saarenoksa (2000) described the basal hyphae in this species resembling somewhat those in *Phanerochaete*, but in the Belarusian specimen they are mostly thin-walled, sinuous, with numerous swellings, characteristic to *Phlebia* species. The colour of the fruitbody and the host tree point towards *Ph. nitidula*, but especially the spore width (narrower than in *Ph. nitidula*) and the slightly sigmoid shape are characteristic for *Ph. firma*.

New for Belarus.

*Phlebia firma* is a rare European species, known in Fennoscandia and Denmark (Eriksson et al., 1981; Kotiranta & Saarenoksa, 2000), and associated mostly with *Pinus sylvestris*.

**Specimen examined:** On decorticated fallen branch of *Salix caprea* in *Populus tremula-Picea* forest of *Corylus-Aegopodium-Oxalis* type, with admixture of *Alnus incana*, *Betula pendula*, *Acer platanoides*, near Domzharytsy village in Byarezinski Biosphere Reserve, Lepel' distr., coll. 12 VII 1998 (MSK 4448; H.K.; GB).

9. *Ramaricium albo-ochraceum* (Bres.) Jülich [syn. *Ramaricium occultum* J. Erikss., *Trechispora albo-ochracea* (Bres.) Liberta]

Fig. 12.

**Basidioma** resupinate, ca 1 cm wide, pellicular, very thin and brittle. Hymenophore even, pale ochraceous. With the loose, white subiculum forming mould-like, up to 3 mm wide margin. **Hyphal system** monomitic, all hyphae thin-walled. Subicular hyphae moderately branched, clamped, with comparatively big clamps (clampless septa and medallion clamps occasional), slender (0.8–2.2 µm wide), widened or swollen up to 7 µm at some septa, hyaline, smooth or lightly encrusted. Plenty of

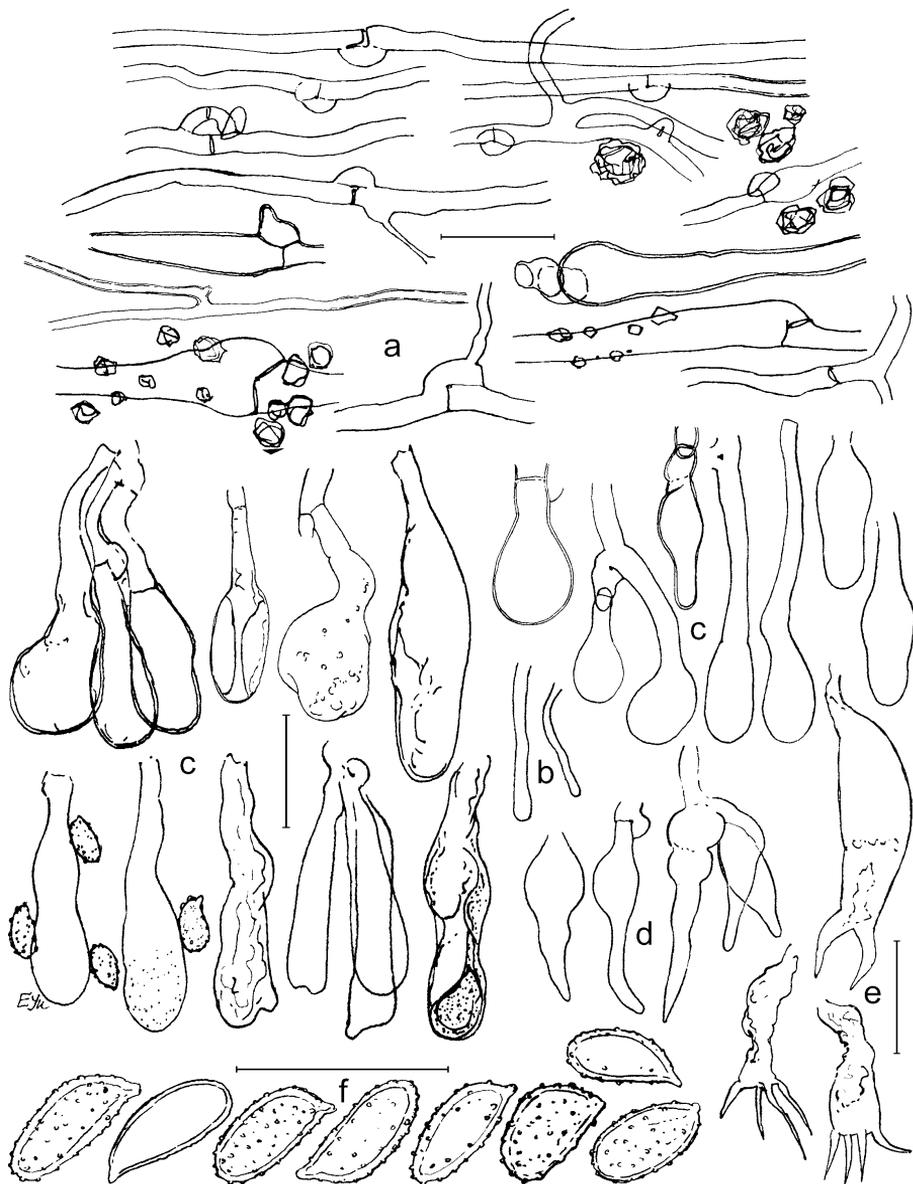


Fig. 12. *Ramaricium albo-ochraceum* (MSK 4744): a – subicular hyphae, b – hyphidia, c – basidioles, d – cystidioles with narrowed or tapering upper part, e – basidia, f – basidiospores.

large and middle-sized crystals in subiculum. Subbasidial hyphae hyaline, ca 2 µm wide. **Cystidia** none, but with scattered cystidioles with narrowed apex and swollen base 4–4.5 µm wide. **Hyphidia** occasional, 0.8–1.7 µm wide, subhyaline. **Basidioles** subpyriform, clavate to stipitate-utriform, 21–26 × 5–8.5 µm, hyaline to brownish yellow. **Basidia** basally clamped, subcylindrical, sinuous, or moderately widened in lower half, 13–26 × 5–9 µm, with yellowish or yellow contents and 2 or 4 attenuated or horn-shaped sterigmata up to 7.5 µm long. **Basidiospores** amygdaloid or narrowly ovoid, mostly narrowed towards the apiculus (*Ramaria*-like), (5.2–)5.7–6.5(–7.2) × 3.2–3.6 µm, clearly verrucose (verrucae uniformly scattered over all surfaces; some evidently immature spores 2.5 µm wide and almost smooth), slightly thick-walled, pale yellowish, yellow in mass, with prominent apiculus.

Hymenial element in the specimen are mostly collapsed, but basidiospores are in very high numbers. Besides ramarioid basidiospore morphology, the main diagnostic feature is the ampulliform swellings at septa. Liberta (1973) described only four-sterigmatic basidia in *Trechispora albo-ochracea*. According to some other authors, spores in *R. albo-ochraceum* are noticeably larger, than in our specimen [4.5–10 × 3.5–5.5 µm sec. Liberta (1973), 5–9 × 3.5–4.5 µm sec. Jülich (1984)]. The material described by Dämon (1998) has remarkably differing spores: 5–7 × 3–4.5 µm in size, with prominent blunt apiculus and smooth area around it. However, the measures given by Eriksson et al. (1981) are similar to the Belarusian specimen as well as those given by Eriksson (1954) for *R. occultum*.

The species was published for the first time for Belarus by Yurchenko (2000), without a morphological description.

*Ramaricium albo-ochraceum* is a rare species, known from Europe (Norway, Sweden, Finland, Austria, Poland, northwest Russia – Jülich, 1984; Kotiranta & Larsson, 1989; Dämon, 1998; Bondartseva et al., 1999; Ryvarden et al., 2003), North- and South America (Canada, USA, Colombia – Liberta, 1973).

**Specimen examined:** On bark at base (buried in mosses and litter) of dead *Juniperus communis* L. trunk in *Pinus* forest of *Pleurozium* type, near Rozhna village in Byarezinski Biosphere Reserve, Lepel' distr., coll. 3 VI 1999 (MSK 4744; H.K.).

## 10. *Rhizochaete radicata* (Henn.) Greslebin, Nakasone & Rajchenb. [syn. *Phanerochaete radicata* (Henn.) Nakasone, Bergman & Burdsall]

Fig. 13.

**Basidiomata** effused, 1–5 cm wide, beige (ochraceous yellow), in thicker parts with paler spots, closely or loosely attached, soft-membranaceous, 0.3–1 mm thick, becoming violaceous with 3% KOH (especially visible in vertical section); margin fibrillose, up to 1 mm wide, sometimes abrupt. **Hyphal system** monomitic, all hyphae clampless, thin-walled. Hyphal cords present, but not abundant, 0.3–0.6 mm wide, of the same colour as the hymenial surface. Subicular hyphae moderately branched, 2.5–8.2 µm wide, slightly swollen at many septa, richly encrusted by fine brownish yellow crystalline material in water, smooth to sparsely encrusted by hyaline or yellowish crystals in 3% KOH, hyaline to pale yellowish in 3% KOH. Bipyr-

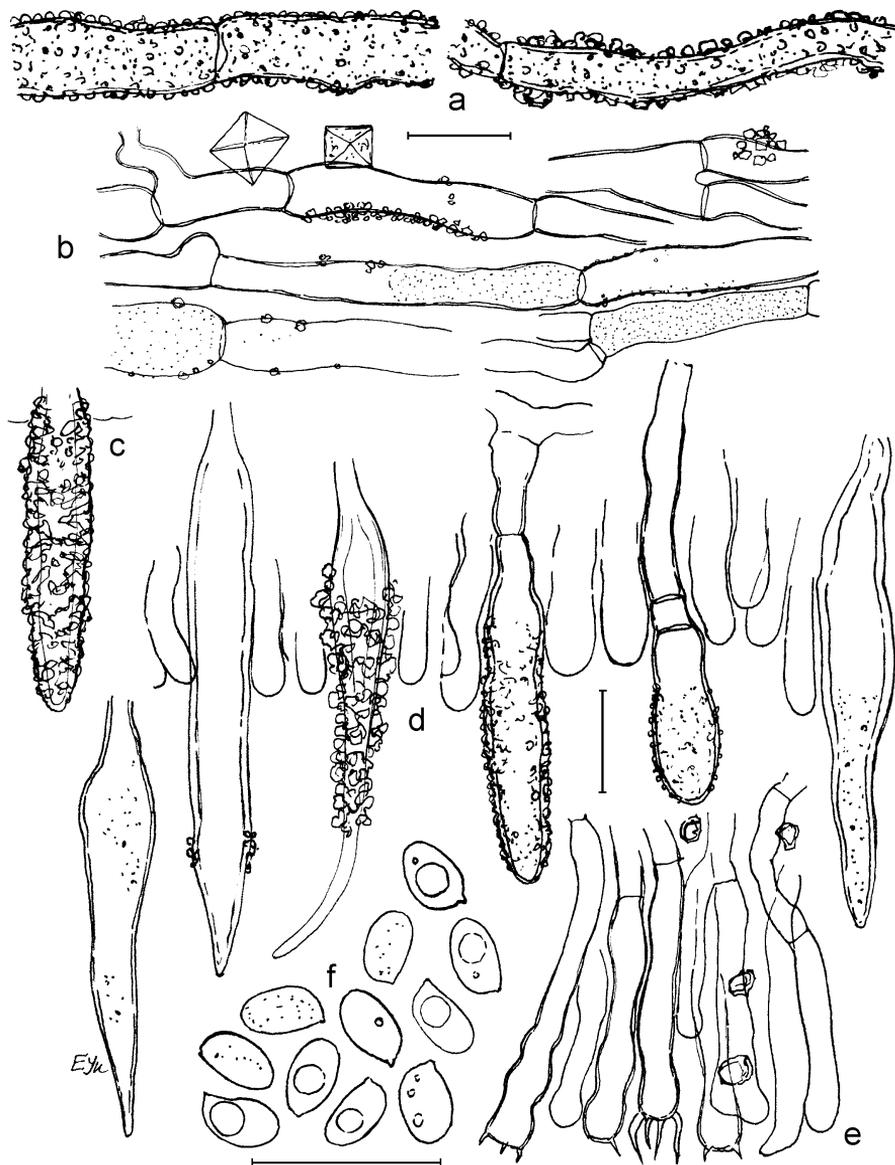


Fig. 13. *Rhizochaete radicata* (MSK 4506): a – subicular hyphae in water, b – subicular hyphae in 3% KOH, with residual incrustation and two big bipyramidal crystals, c – cystidium in water, d – cystidia in 3% KOH, e – portion of hymenium, f – basidiospores. Scales = 10  $\mu$ m.

midal crystals in some parts of the subiculum. Subhymenial hyphae densely arranged, moderately branched, 2.5–3.3  $\mu\text{m}$  wide, encrusted by rust brownish fine crystalline material, in KOH with scattered hyaline crystals. Hymenium moderately compact. **Cystidia** situated in the hymenium, projecting up to 30  $\mu\text{m}$ , fusoid, in upper part acuminate, sometimes obtuse or hypha-like, 45–70  $\times$  6–8.5  $\mu\text{m}$ , hyaline, slightly refractive or not, thick-walled, wall thinning towards the apex, richly encrusted, encrustation partly (remaining in the middle or upper part) to completely dissolving in KOH. **Basidia** narrowly clavate, most with two constrictions, 26–35  $\times$  4–5.2  $\mu\text{m}$ , hyaline, thin-walled, with 4 sterigmata up to 5  $\mu\text{m}$  long and *ca* 0.5  $\mu\text{m}$  wide at base. **Basidiospores** ellipsoid, 4–4.7  $\times$  2.2  $\mu\text{m}$ , thin-walled, hyaline, frequently with a large drop, iodine-negative, with a small lateral apiculus.

The species is easily determined thanks to the ochraceous yellow hymenophore, turning violaceous in KOH, and encrusted thick-walled hymenial cystidia. The violaceous colour is well visible without magnification, but in slide preparation viewed at  $\times 300$  most hyphae in KOH are hyaline. Our specimen fits with the description of *Rh. radicata* by Greslebin et al. (2004) except in being totally clampless and in absence of pigmented crystals on cystidia. Moreover, spores are smaller, than in *Rh. radicata* (4–5.5  $\times$  2.2–3  $\mu\text{m}$ ), and more close to those in *Rh. filamentosa* (4–5  $\times$  2–2.5  $\mu\text{m}$ ). *Rhizochaete* (*Phanerochaete*) *filamentosa* was considered *sensu lato* as a taxon with hemicosmopolitan distribution (Domański, 1991), but in recent works it is treated as a species found only in North- and South America (Greslebin et al., 2004; Hjortstam, 2005; Martínez & Nakasone, 2005).

New for Belarus.

*Rhizochaete radicata* has a worldwide distribution (Greslebin et al., 2004). *Phanerochaete filamentosa* in broad sense (incl. *Ph. radicata*) is known from Eurasia, South Africa, North America, Australia, New Zealand (see Domański, 1991); in Europe from Sweden, Denmark, Germany, France, Switzerland (Jülich, 1984), northwest Russia (Bondartseva et al., 1999). Evidently *Rh. radicata* is a rare species in Europe and confined here to nemoral and boreonemoral zone.

**Specimen examined:** On old *Betula pendula* stumps (very abundantly) and various fallen plant material on them (e.g. *Picea abies* twigs), on living mosses and lichens, in *Populus tremula* forest of *Corylus-Aegopodium* type, near Khomina khutor, east of Myadzel Lake in Myadzel distr., Narach National Park, coll. 17 IX 2005 (MSK 4506).

## 11. *Sistotrema* sp.

Fig. 14.

**Basidiomata** effused, closely adnate, 0.5–1 cm wide, very thin, not continuous, whitish when fresh, grayish when dry; margin indistinct. Hymenium and subiculum very loose, not continuous. **Hyphal system** monomitic. Hyphae sparingly branched, clamped at all septa, straight to slightly sinuous, 2.7–3.3  $\mu\text{m}$  wide, thin-walled, colourless to yellowish, mostly with oil-rich contents. **Cystidia** none. **Basidia** basally clamped, mostly in small clusters, urniform to subcylindrical, 13.5–15.5  $\times$  4.2–5.2  $\mu\text{m}$ , thin-walled, hyaline, with 4, 6, or 7 sterigmata up to 5  $\mu\text{m}$  long. **Basidio-**

**spores** globose to subglobose, 2.5  $\mu\text{m}$  in diam, hyaline, thin-walled, iodine-negative, with a small apiculus.

The specimen is close to *S. diademiferum* (Bourdot & Galzin) Donk, but differs from it by rather oil-rich hyphae contents, smaller basidia and especially smaller globose spores [basidia 15–21  $\times$  5–7  $\mu\text{m}$ , spores 3.5–6  $\times$  2.5–3.5  $\mu\text{m}$  and mostly obovoid according to Eriksson et al. (1984); basidia 9–30  $\times$  5–8  $\mu\text{m}$  according to Domański (1992)]. It is also similar to *Sistotrema farinaceum* Hallenb., described from North America (Hallenberg, 1984) in spore size and shape. However, *S. farinaceum* has smaller basidia, 8–9.5  $\times$  3–4  $\mu\text{m}$ , and abundant crystalline material in the fruitbody. The collection is very scanty, and richer material is needed for final conclusions.

New for Belarus.

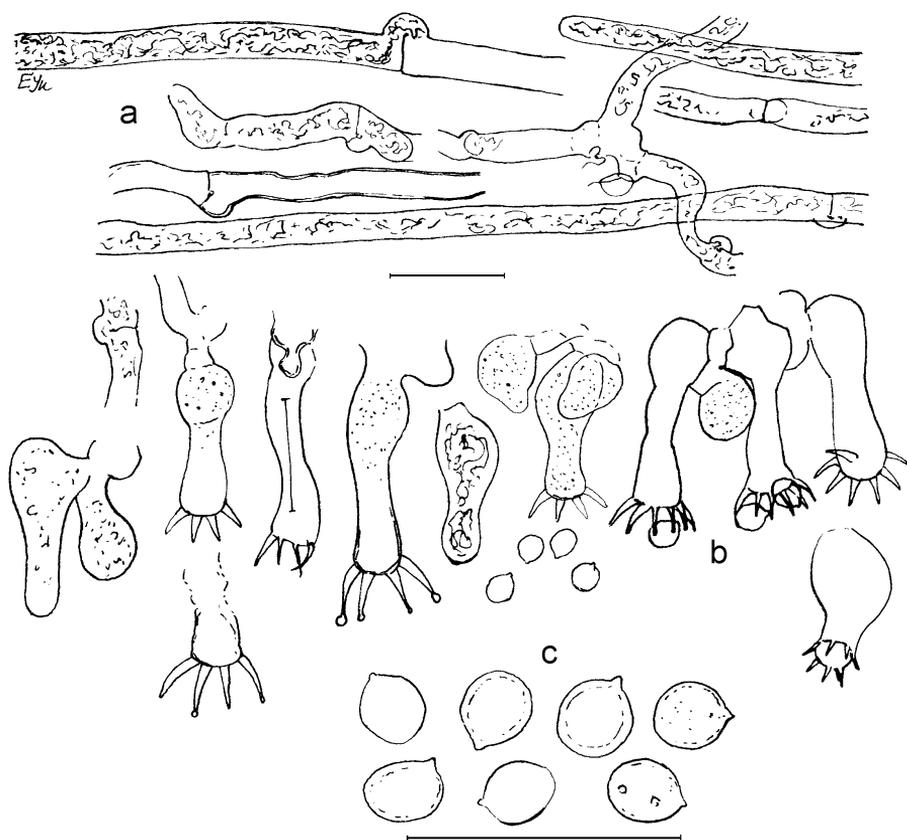


Fig. 14. *Sistotrema* sp. (MSK 4436): a – hyphae, b – basidioles and basidia, c – basidiospores.

**Specimen examined:** On small (ca 4–5 mm in diam) corticated fallen twigs of *Pinus sylvestris* in *Pinus* forest of *Vaccinium myrtillus*–*Pleurozium* type, near Rozhna village in Byarezinski Biosphere Reserve, Lepel' distr., coll. 10 VII 1998 (MSK 4436; H.K.).

## 12. *Tomentella galzinii* Bourdot in Bourdot & Galzin

Fig. 15.

**Basidioma** effused, over 1 cm wide, very thin, grayish olivaceous (with ochraceous tint under a lens), loose, hypochnoid, with non-continuous hymenium; margin indistinct, thinning out, slightly paler than other parts. **Hyphal system** monomitotic. Subicular hyphae clamped, moderately branched, with branches frequently begun from a clamp connection, parallel in some areas, thin-walled, hyaline to citrine yellow and rust yellow in mass, 3–5.5(–6.2)  $\mu\text{m}$  wide. Subbasidial hyphae clamped, rather short-celled, 3.2–6.5  $\mu\text{m}$  wide, subhyaline to brownish yellow. **Cystidia** common, slightly projecting above the hymenium, basally clamped, subhyaline to brownish, thin-walled, 22–37  $\mu\text{m}$  long, apically 3.3–5  $\mu\text{m}$  wide, hyphoid to fusoid with wider base (5.5–6.2  $\mu\text{m}$ ), straight or sinuous, in apical part smooth or more or less encrusted (incrustations loose, hyaline to rust brown), some cystidia with a small cap of brown resinous matter. Simple septate hyphoid element occasional, 3.5–4  $\mu\text{m}$  wide. **Basidia** basally clamped, clavate, more or less sinuous, 26–28  $\times$  5.7–7.5  $\mu\text{m}$ , mostly subhyaline, some with brownish yellow inclusions, thin-walled, with 4 sterigmata. **Basidiospores** irregularly subglobose to lobed, triangular in lateral face, with widened basal part, 7–8(–8.5)  $\times$  (5–)6–7.5  $\mu\text{m}$ , echinulate with spines up to 1.3–1.5(–1.7)  $\mu\text{m}$  long, yellowish to brown, mostly yellow brown, not changing colour in KOH, iodine-negative.

The specimen has cystidia with brown resinous excretions, which are rather numerous in some hymenium areas. This feature makes it very close to *T. subtetacea* Bourdot & Galzin. However, in the latter species the resinous halos are more pronounced (as on fig. 8, Melo et al., 2003), hymenophore brown, and some spores are turning strongly reddish-brown in KOH (Köljalg, 1996; Melo et al., 2003). The cystidia in *T. galzinii* are acuminate (e.g. Melo et al., 1998, fig. 5), but in our specimen they are all obtuse.

*Tomentella galzinii* was reported for the first time for Belarus by Yurchenko (2000), without a morphological description. In 2006 it was included in the Appendix to the Red Data Book of Belarus and was classified in the category DD, i.e. insufficient data on biology and distribution (Anon, 2005: 454). The inclusion in the Red Data Book was based also on the general pattern of the species distribution. *Tomentella galzinii* is known in Eurasia and North America, but is rare (Köljalg, 1996); in West Europe recorded on angiosperm wood in Sweden, France, Germany, Portugal (Jülich, 1984; Melo et al., 1998).

**Specimen examined:** Underside on corticated fallen branches of *Fraxinus excelsior* L. in *Populus tremula*–*Picea* forest of *Corylus*–*Aegopodium*–*Oxalis* type, with admixture of *Alnus incana*, *Betula pendula*, *Acer platanoides*, near Domzharytsy village in Byarezinski Biosphere Reserve, Lepel' distr., coll. 12 VII 1998 (MSK 4438; LE).

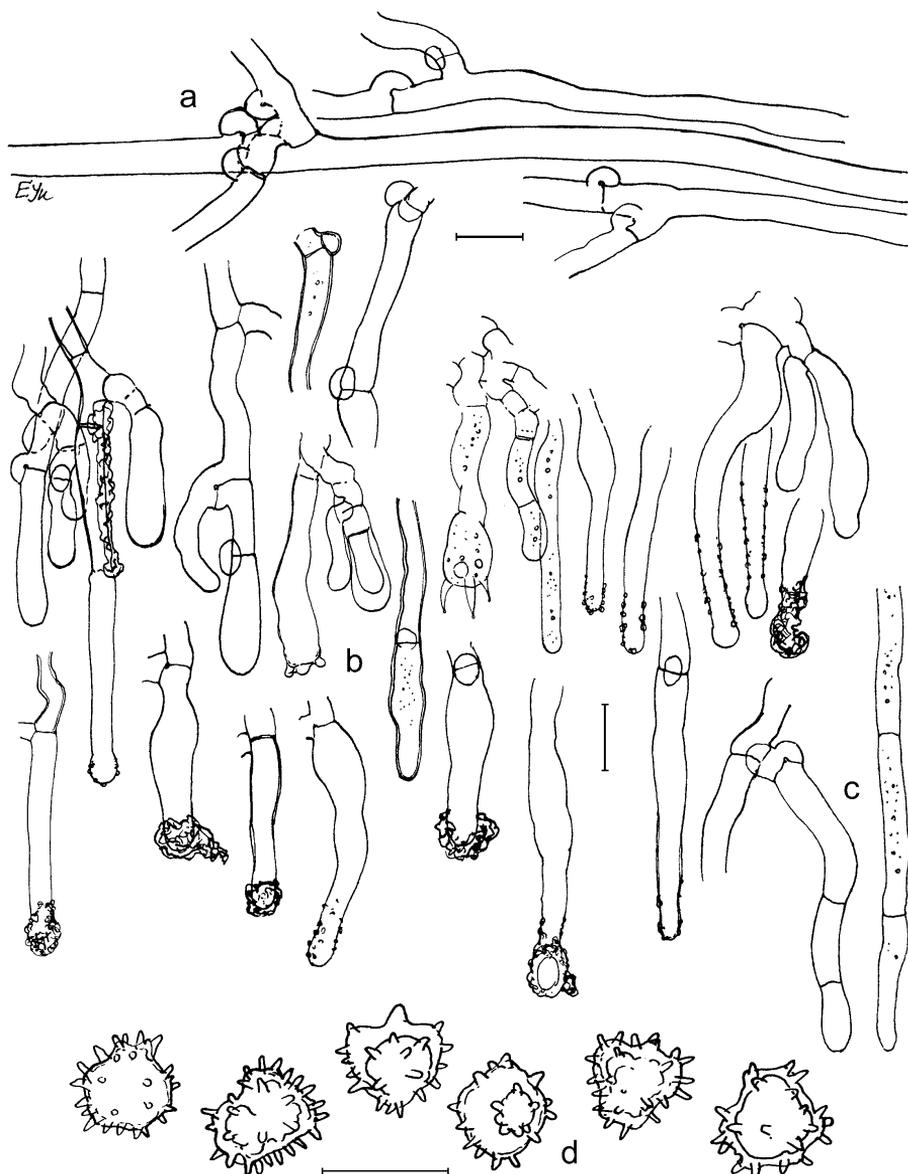


Fig. 15. *Tomentella galzinii* (MSK 4438): a – subicular hyphae, b – portions of hymenium and differently encrusted cystidia, c – simple septate hypha-like ends in hymenium, d – basidiospores. Scales = 10  $\mu$ m. The proportional number of loosely encrusted cystidia and cystidia with resinous halo in comparison with other hymenial elements is increased on this picture than in real hymenium.

13. *Trechispora invisitata* (H.S. Jacks.) Liberta

Fig. 16.

**Basidiomata** 2–3 cm wide, very loose, cream-coloured, arachnoid with more or less granulose, farinose or pulverulent areas, consisting of aleuriospores forming amorphous powdery mass, or aggregated, minute warts; margin fibrillose with hyphal fans and very thin pure white hyphal cords or indistinct, powdery. **Hyphal sys-**

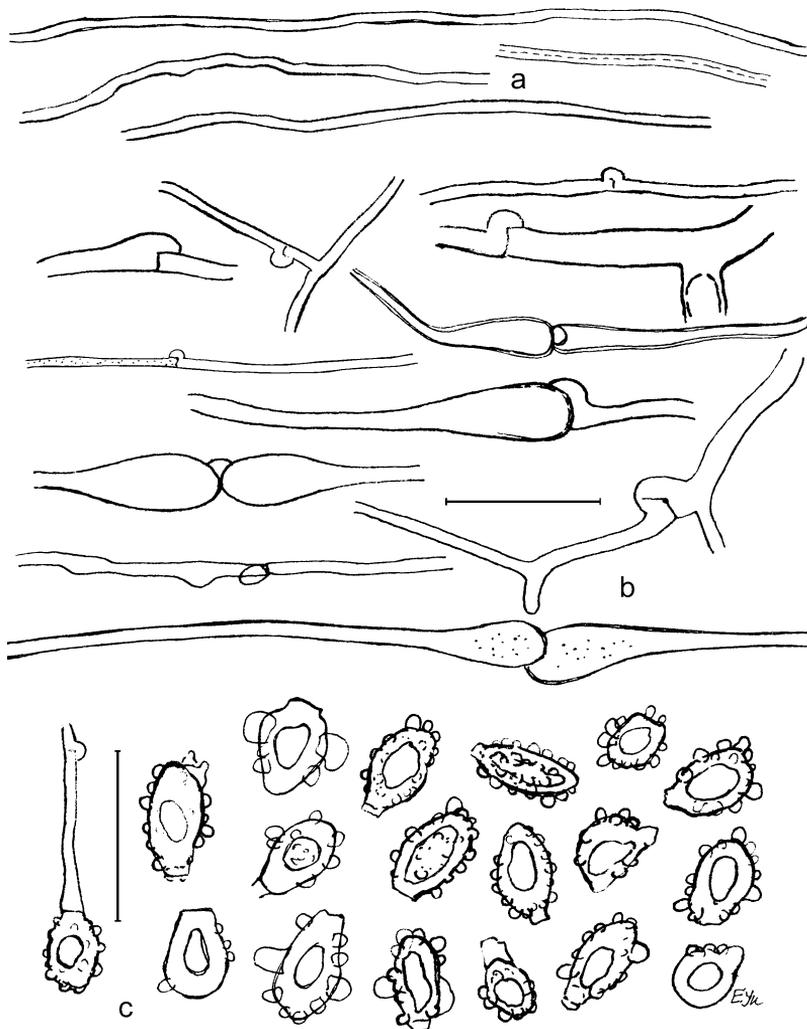


Fig. 16. *Trechispora invisitata* (MSK 4759): a – skeletal hyphae, b – generative hyphae, c – aleuriospores. Scales = 10  $\mu$ m.

**tem** dimitic. Skeletals scattered, unbranched, almost straight, 0.8–1 µm wide, of uniform diameter, refractive due to the thick walls, lumen mostly invisible. Generative hyphae sparingly branched, straight, clamped at all septa, very slender, 0.5–1.7(–2.5) µm wide, frequently with ampullaceous (up to 3.7 µm wide) septa, hyaline, mostly very thin-walled. **Conidia** (aleuriospores) very abundant, born at apices of very slender hyphae, irregularly-globose to narrowly ellipsoid, more or less truncate at the point of attachment, (3.5–)4–6.7 × 3.5–4.2(–5) µm, slightly thick-walled, pale greenish in mass, with darker central drop, surface covered by hyaline bubbles or warts of quite unequal size, mostly 0.6–1 µm high, but the largest ones reaching 1.3 µm height and 1.7 µm width.

Fruitbodies in this specimen lack the hymenium, and consist mostly of aleuriospores, intermixed with *Amphinema byssoides* hyphae. The diagnostic features are the aleuriospores covered by bubbles, skeletal hyphae, and ampulliform swellings at septa on generative hyphae. Aleuriospores in Belarusian specimen are slightly smaller, than in other descriptions [5–7 µm long according to Liberta (1973), Domański (1992), Kotiranta & Saarenoksa (2000)], and skeletal narrower [1–2 µm wide according to Hjortstam et al. (1988), Kotiranta & Saarenoksa (2000)]. Liberta (1973) described the surface of aleuriospores as *rugose*, but not covered with large bubbles.

New for Belarus.

*Trechispora invisitata* is a rare species, known from west and north Europe (Sweden, Finland, Estonia, northwest Russia, Britain, Denmark, Germany, Spain) and North America (Liberta, 1973; Hjortstam et al., 1988; Bondartseva et al., 1999; Kotiranta & Saarenoksa, 2000; Anon, 2003).

**Specimen examined:** On wood pieces and bark of strongly decayed *Betula pendula* stump in *Pinus* forest of *Pleurozium* type, near Rozhna village in Byarezinski Biosphere Reserve, Lepel' distr., coll. 3 VI 1999 (MSK 4759).

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