

# Notes on some rare polypores, found in Russia

## 2. *Junghuhnia vitellina* sp. nova, plus genera *Cinereomyces* and *Skeletocutis*

WJACHESLAV A. SPIRIN

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A new species *Junghuhnia vitellina* Spirin is described, growing on *Betula mandshurica* in Russian Far East. *Cinereomyces lenis* (P. Karst.) Spirin, comb. nova is a so-called *kelo* fungus; its closest relative *C. vulgaris* (Fr.) Spirin, comb. nova has relatively wide set of hosts. The latter is new to Russia. Eleven species of *Skeletocutis* are discussed, and some data on their ecology are treated. *S. chrysella* Niemelä, *S. subincarnata* (Peck) Jean Keller and *S. stellae* (Pilát) Jean Keller are rare taiga species, growing on large spruce or pine trunks at late stages of wood-decomposition. *S. bigutulata* (Romell) Niemelä and *S. brevispora* Niemelä are locally common and found in both southern and northern parts of the study area. *S. carneogrisea* David and *S. kuehneri* David grow in association with *Trichaptum* species in virgin as well as managed coniferous forests. *S. albocremaea* David is very rare; it was collected only once in old pine forest. *S. kuehneri* and *S. papyracea* David are new to Belarus.

Key words: *Cinereomyces*, ecology, *Junghuhnia*, polypores, rare species, *Skeletocutis*, taxonomy, wood-rotting fungi

*Wjacheslav A. Spirin, St. Petersburg University of Humanities, Fuchika 15, 192238 St. Petersburg, Russia*

### Introduction

*Skeletocutis* Kotl. & Pouzar is a taxonomically difficult genus of polypores. After the studies on genus and species limits (Keller 1979, David 1982, Niemelä & Dai 1997, Niemelä 1998), there is a need of supplementary floristic and ecological information. Bondartseva (1998) gave data on seven species of *Skeletocutis* found in Russia; at present the number is approaching twenty only in the European part of the country (Niemelä 2001, Niemelä et al. 2001, Lindgren 2001, Zmitrovich 2003).

This paper deals with morphology and ecology of 13 species included within this genus till the moment. It is evident that many species of the genus are very close to the core of *Tyromy-*

*ces* P. Karst. s. str., and could be combined into it (Niemelä 1998, Kotiranta & Penzina 2001). However, a few species (the *Skeletocutis lenis* complex) maintain some features, which link them with the genus *Cinereomyces* Jülich.

Most of the recent species in *Skeletocutis* have been defined after materials from either Mediterranean area or Boreal Northern Hemisphere (David 1982, Niemelä 1985b, 1998). Hence a study carried out in areas with more continental climate (European Russia) provides new information on morphological variability and ecological preferences of the recently described or poorly known *Skeletocutis* species.

A new species *Junghuhnia vitellina* Spirin is also described and illustrated in this paper.

## Material and methods

The microscopic characters were studied with Karl Zeiss-amplival microscope. The chemical reagents used in the microscopic examination were 5% solution of potassium hydroxide (KOH), Melzer's reagent (IKI) and Cotton Blue (CB). A total of 30 spores from each specimen were measured with an oil immersion objective. For presenting a variation of spore size, 5% of measurements have been excluded from each end of the range, and are given in parentheses.

## Study area

Nizhny Novgorod (until 1991 Gorky) Region is situated in European Russia, between the latitudes 54° and 58° N, ranging about 75 000 km<sup>2</sup>. The area is divided by rivers Oka and Volga. The climate is moderately continental; the growing season is 130–170 days, and does not change essentially from south to north (Kuznetsov 1974); therefore many broad-leaved trees (i.e. *Quercus robur*, *Acer platanoides*, *Tilia cordata*, *Ulmus* spp.) dominating in southern half of area spread along the rivers further to north. The limits of vegetation zones are unclear, and changes in the vegetation do not follow any regular pattern

(Averkiev 1954). For example, the lack of oak in some northern parts of the study area is caused by anthropogenic rather than climatic factors. Most village buildings in the area are made from logs of two-hundred-year old oak trees (A. Shirokov, pers. comm.).

The administrative division of Nizhny Novgorod Region and study sites are shown in Fig. 1. The numbers of study sites are given in parentheses below, after the descriptions of their plant associations.

**Old-growth oak forests** are characterized by tree stands consisting of very old (150–250 years) oaks (*Quercus robur*). Linden (*Tilia cordata*), maple (*Acer platanoides*), ash (*Fraxinus excelsior*), elm (*Ulmus glabra*) and hazel (*Corylus avellana*) are present, too. Herbaceous cover is not very diverse, and consists of *Aegopodium podagraria* in moderately moist forests (2, 7), and *Carex pilosa* and *Asperula odorata* in more dry ones (1). In northern part of the area, oak forests are observed only along the rivers, and elm and hazel are absent there (10).

**Old-growth pine–spruce forests** have developed on rich carbonate soils, and so the tree layer is fairly complicated, composed of pine (*Pinus sylvestris*) and/or spruce (*Picea abies*) together with oak, linden and aspen (*Populus tremula*). Field layer consists of *Aegopodium podagraria*, *Stellaria holostea*, *Pulmonaria obscura*, *Actaea*

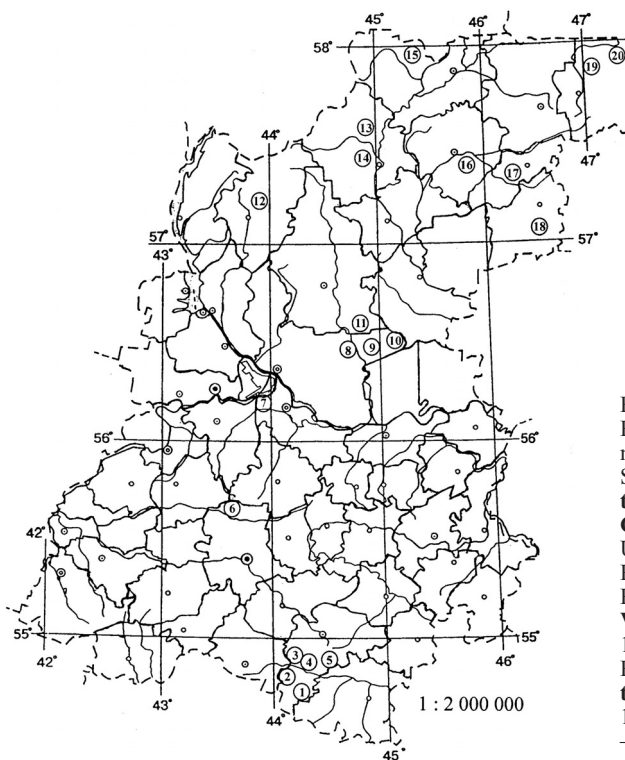


Fig. 1. Administrative division of Nizhny Novgorod Region. Study places are marked with dots and numbers. **Lukoyanov District:** 1 – Pavlovka; 2 – Sanki; 3, 4 – Razino; 5 – Panzelka. **Arzamas District:** 6 – Pustynsky Reserve. **Nizhny Novgorod City:** 7 – Botanical Garden of Nizhny Novgorod University. **Bor District:** 8, 9, 10 – Kerzhensky Reserve. **Semyonov District:** 11 – Kerzhensky Reserve. **Kovernino District:** 12 – Belbazzh. **Varnavino District:** 13 – Shudskoye forestry; 14 – Lapshanga. **Vetluga District:** 15 – Klenovik Reserve. **Uren' District:** 16 – Vaya. **Tonkino District:** 17 – Tonkinsky Reserve. **Sharanga district:** 18 – Kilemarsky Reserve. **Tonshaevo District:** 19 – Pizhensky Reserve; 20 – Burepolom.

*spicata*, *Carex pilosa*, *Asarum europaeum*, and *Oxalis acetosella* (3, 5, 6, 8, 9). Average age of coniferous trees is 120–220 years.

**Old aspen and birch forests** are the communities that have replaced old-growth spruce forests as a result of selective cutting. Birch (*Betula* spp.), aspen and linden dominate within the tree stand; solitarily standing and fallen spruces occur, too. Field layer resembles the previous forest types, but some grass species (i.e. *Calamagrostis arundinacea*, *Milium effusum* and *Melica nutans*) are locally common (herb-rich type), and *Vaccinium myrtillus* and *Sphagnum* species are present in swampy localities (*myrtilloso-sphagnosum*-type) (3, 4). Average age of trees is 80–120 years.

**Old-growth fir–spruce forests** represent the “southern taiga” communities in the strict sense (Shirokov 1998). Tree stand consists of spruce, linden and fir (*Abies sibirica*). Average age of coniferous trees is 180–220 years. The species dominating in underbrush are *Euonymus verrucosa*, *Lonicera xylosteum*, *Daphne mezereum* and shrub-sized maple. Field layer is composed by both hemi-boreal (*Aegopodium podagraria*, *Viola mirabilis*, *Asarum europaeum*, *Pulmonaria obscura*, *Stellaria holostea*) and boreal (*Dryopteris austriaca*, *D. cartusiana*, *Oxalis acetosella*, *Actaea erythrocarpa*, *Cinna latifolia*, *Circaea alpina*) herbaceous species. Most of the communities belong to the plant association *Tilieto-Abiegneto-Piceetum dryopteridoso-aegopodioso-oxalidosum* (12, 13, 14, 15, 16, 17, 18, 20) (Shirokov 1998).

**Old-growth pine forests** (11, 19) occur mostly on sandy soils. Pine dominates, very rarely accompanied by spruce, birch and aspen. Shrubby *Vaccinium myrtillus* and *V. uliginosum*, and drought-tolerant mosses (*Hylocomium splendens* etc.) cover the ground. Average age of coniferous trees is 120–150 years.

## Discussion

### *Junghuhnia vitellina* Spirin, spec. nova – Fig. 2

*Basidiomata effuso-reflexa vel effusa, aurantioflava ad vitellina, coriacea. Poriae angulatae vel fissile, 2–3 per mm. Systema hypharum dimiticum. Skeletocystidia incrustata adsunt. Sporae inamyloideae, 3.6–4.4 × 1.9–2.2 μm.*

Holotype: Russia, Primorye Reg., Kedrovaya Pad' Res., *Betula mandshurica*, 2.XI.1944 L. Vasilyeva (LE 26533, isotype in H).

Basidiocarps annual or most possibly biennial, effused-reflexed to almost resupinate, 5–15 mm wide, 2–6 mm thick at base, projecting 3–15 mm. Upper surface pale yellowish to straw-coloured, with few indistinct reddish-brownish zones, slightly pubescent. Edge of pileus very sharp, fairly thin, even or only slightly undulate, concolorous with upper surface. Lower surface vitelline to orange, pores angular or lacerate in resupinate parts, 2–3 per mm; disseminations at

first relatively thick, then becoming thinner. Section: context pale yellowish, duplex, consisting of upper soft and lower dense layers, with thin dark-brown line between them, 0.5–1 mm thick, tube layer pale yellowish to vitelline, not stratified, fibrous-coriaceous and slightly agglutinated in young specimens, corky in older ones.

Hyphal structure dimitic. Skeletal hyphae dominating in all parts of basidiocarps, fairly tightly interwoven, subsolid, sometimes irregularly inflated and then with expanded lumen, 3–7 μm wide, pale yellowish in KOH, inamyloid, cyanophilous. Generative hyphae mostly seen in subhymenium, thin- to slightly thick-walled, regularly clamped, of equal thickness, 2.5–5 μm wide. Skeletocystidia deep-rooting and penetrating in the hymenium, thick-walled, clavate or bottle-shaped, irregularly inflated, scanty or moderately encrusted, 35–70 × 6–10 μm. Cystidioles frequent, 15–18 × 3–4 μm. Basidia clavate, four-spored, clamped at the base, 14–17(–20) × 3.5–4.5 μm. Basidiospores bean-shaped to cylindrical with blunt ends, (3.3–) 3.6–4.4(–4.9) × (1.8–) 1.9–2.2(–2.3) μm, thin-walled, sometimes with a few small oil-drops, IKI–, CB–.

Causes white rot of wood (*Betula mandshurica*). Now known only from type locality.

The general habit of *Junghuhnia vitellina* is reminiscent of *Diplomitoporus flavescens* (Bres.) Domański, which has paler (pale yel-

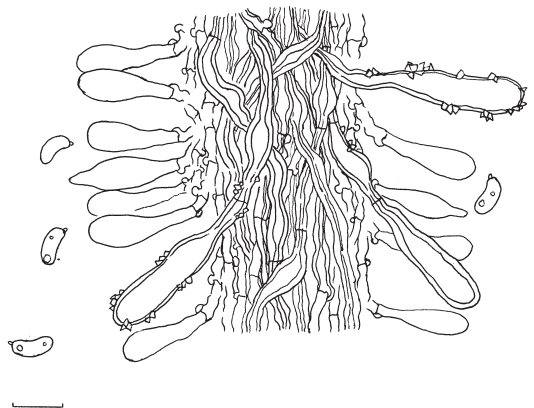


Fig. 2. *Junghuhnia vitellina* (LE 26533). Hymenium and spores. Scale bar 5 μm.

low) pore surface, and lacks skeletocystidia. The spores and basidia of *D. flavescens* are distinctly larger, and its main substrate genus is *Pinus*. Other orange- or yellow-coloured small-sized polypores are known from Russian Far East: *Antrodiella aurantilaeta* (Corner) Hattori & Ryvarden, *J. brownii* (Humb.) Niemelä, and *Postia pileata* (Parmasto) Dai & Renvall. The first one differs in having smaller spores; it also lacks skeletocystidia (Dai & Niemelä 1997). The spores of *J. brownii* are smaller, too; it has only 8–10 pores per mm, and its context becomes red in KOH (Ryvarden & Gilbertson 1993). *Postia pileata* (= *Postia amylocystis* Dai & Renvall) is monomitic with soft and fragile basidiocarps, like the species of *Auriporia* Ryvarden (Parmasto 1980; Dai & Renvall 1994; Ryvarden & Gilbertson 1993).

Recently Kotiranta and Saarenoksa (2002) proposed a wider concept of the genus *Irpex*, including *Junghuhnia*, *Flaviporus*, and *Steccherinum*. However, this taxonomic solution is not supported by molecular data: the type species of *Irpex* – *I. lacteus* (Fr. : Fr.) Fr. – comes close to some monomitic polyporoid (*Bjerkandera*, *Ceriporiopsis aneirina*) and corticioid (*Phlebia* and *Phanerochaete*) fungi (De Koker et al. 2003, Greslebin et al. 2004), whereas the *Junghuhnia* and *Steccherinum* species belong to another clade together with *Antrodiella* (Johannesson et al. 2000, Binder et al. 2005). So I address the new species to the genus *Junghuhnia* Corda.

***Cinereomyces* Jülich, Bibl. Mycol. 85: 396, 1982.**

The genus was described by Jülich (1982) with *Polyporus lindbladii* Berk. as a type and the sole species. The reason of describing this genus was the dissolving of the skeletal hyphae in KOH and their slightly amyloid reaction. Gilbertson and Ryvarden (1985) included both *Polyporus lindbladii* and *Physisporus lenis* P. Karst. in *Diplomitoporus*. Niemelä (in Renvall et al. 1991) transferred the latter in *Skeletocutis*, since it is characterized by white rot, dimitic hyphal system, fusiform cystidioles, and it has cylindrical and curved spores. The main differences distinguishing *S. lenis* from the core of *Skeletocutis* are soft-corky consistence of the basidiocarps and evident lack of gelatinization

and absence of the characteristic thorn-like encrustations at the dissepiment edges. The crystalline agglomerations in the subiculum and hymenium of *S. lenis* and *S. vulgaris* (illustrated in Niemelä & Dai 1997) are of a spherical type. However, the spore shape of *S. lenis* resembles not only some *Skeletocutis* species, but also the type species of *Cinereomyces*, i.e. *C. lindbladii* (Berk.) Jülich. Cystidioles of this species and *S. lenis* are distinctly fusoid, while they are conical in other *Diplomitoporus* species (*D. crustulinus* (Bres.) Domański and *D. flavescens*). Hyphae of *C. lindbladii* and *S. lenis* are of the same size, and skeletal swell in KOH. So, there are reasons to include *S. lenis* and its closest relative *S. vulgaris* in *Cinereomyces*.

Two other species, *Skeletocutis alutacea* and *S. subvulgaris* Y.C. Dai share the soft-corky, non-gelatinized basidiomata with the *S. lenis* complex. However, they have typical *Skeletocutis*-like hyphae at the dissepiment edges (Keller 1979, Dai 1998), and undoubtedly belong to this genus.

***Cinereomyces lenis* (P. Karst. in Rabenh. & Winter) Spirin, comb. nova**

Basionym: *Physisporus lenis* P. Karst. in Rabenh. & Winter, Fungi Exs. Europ. Extraeurop. 16: 3527, 1886 (holotype in H, studied).

*Skeletocutis lenis* (P. Karst. in Rabenhorst & Winter) Niemelä in Renvall et al., 1991.

For a description, see Niemelä & Dai (1997).

**Distribution and ecology.** This species is extremely rare in the study area, found only once on very rotten pine trunk in old pine forest (11). As noted by Finnish authors (Renvall et al. 1991, Niemelä & Dai 1997), pine is certainly the favourite substrate in North Europe. Niemelä et al. (2002) considered *C. lenis* a so-called kelo fungus—a species that favours long-ago died, finally fallen pine trees.

**Specimens examined:** **Russia.** Nizhny Novgorod Reg., Semyonov Dist., Kerzhensky Res., *Pinus sylvestris*, 24.IX.1998 Spirin (LE 212400). – **Finland.** Etelä-Häme, Lammi, Kotinen Virgin Forest, *Picea abies*, 11.IX.2001 Spirin & Kosolapov (LE).

***Cinereomyces vulgaris* (Fr.) Spirin, comb. nova**

Basionym: *Polyporus vulgaris* Fr., Syst. Mycol. 1: 381, 1821.



*Skeletocutis vulgaris* (Fr.) Niemelä & Y.C. Dai, 1997.

Lectotype: Sweden. Femsjö (UPS, not studied – see description in Niemelä & Dai 1997).

Basidiocarps short-living, resupinate, soft-corky, up to 20 cm wide. Pore surface at first white, later creamy, with ochraceous tint when dry or overwintered, pores round, small, 6–8 per mm, with thin entire dissepiment edges. Margin initially fibrillose, later pores extends to the very edge. Section: context whitish, often very thin (up to 0.5 mm thick), soft corky, tubes concolorous, up to 2.5 mm thick.

Hyphal structure dimitic. Skeletals thick-walled, rarely branched at the right angle, with lumina of varying size, 2–2.8 µm wide, IKI–, CB–, unchanging in KOH, randomly arranged in tube trama. Generative hyphae present mostly in subhymenium and at dissepiment edges (and there with apices swollen up to 5 µm wide), thin-walled, with regular clamps, 1.5–2 µm wide. Star-like crystals occasionally present. Cystidiolles bottle-shaped to hyphoid, swollen at the base, 6–12 × 3–5 µm. Basidia ovoid or barrel-shaped, 6–10 × 4–6 µm. Basidiospores (2.6–) 2.8–3.8(–4.3) × (0.8–)0.9–1.5 µm, narrowly cylindrical, moderately curved, thin-walled, rarely with small guttules.

New to Russia. Basidiocarps of *C. vulgaris* from the study area evidently hibernate, and are probably biennial.

*Distribution and ecology.* This species is not rare in the study area. Niemelä and Dai (1997) noted that *Cinereomyces lenis* and *C. vulgaris* are characterized by rather different ecological preferences. While the first one is a so-called kelo species occurring mostly in virgin forests, the latter has relatively wide ecological amplitude. *C. vulgaris* was collected six times in the study area: in spruce forests and thinned mixed forests (6, 18); one collection was made from fir trunk at the edge of an inundated forest (16). Lositskaya (1998) noted '*C. lenis*' to grow on wood of *Quercus robur* in Pskov Region (North-West Russia); her specimen is in fact *C. vulgaris*. That is the northernmost locality known so far in European Russia.

*Specimens examined:* **Russia.** Nizhny Novgorod Reg., Arzamas Dist., Pustynsky Res., *Picea abies*, with *Fomitopsis pinicola* and *Sistotrema resinicystidium*, 7.VII.1999 and 11.VII.2000 Spirin (LE 211381, LE 212398); Sharanga Dist., Kilemarsky Res., *P. abies*, 17.VIII.2004 Spirin

2139, 2140, 2170 (H). Uren' Dist., Vaya, *Abies sibirica*, with *Henningsomyces candidus*, 27.V.2000 Spirin (LE 213350). Pskov Reg., Gdov Dist., Chernyovo, *Quercus robur*, 6.XI.1996 Lositskaya (LE 201202).

*Skeletocutis* Kotl. & Pouzar, Česká Mykol. 6: 103, 1958

Here this genus is restricted to exclude the *S. lenis* complex. Macroscopically *Skeletocutis* is characterized by resupinate to effused-reflexed or pileate basidiocarps with more or less agglutinated hymenium, and gelatinous basal layer of the subiculum. Hyphal system is mono- to trimitic; generative hyphae are encrusted by spiny crystals at the dissepiment edges. Basidia are short-clavate to barrel-shaped, 8–15 × 4–5 µm; cystidiolles not infrequent, bottle-shaped to conical. Spores allantoid, cylindrical to ellipsoid, of various size, IKI– and CB–. The species cause a white rot.

The genus *Gelatoporia* Niemelä seems to be closely related to *Skeletocutis*. Light-coloured, hygrophanous and more or less gelatinized basidiocarps, narrowly clavate basidia and cylindrical spores belong to the common features. The dissepimental hyphae of *G. subvermispora* (Pilát) Niemelä bear crystalline encrustations, which at first sight remind those of *Skeletocutis*, but their identity is not confirmed by SEM (Niemelä 1985a). So, there is a reason to keep these genera separate, despite of their high similarity.

The presence of monomitic species in *Skeletocutis* makes the delimitation from *Gelatoporia* and *Ceriporiopsis* Domański slightly unclear. Ryvar den & Gilbertson (1994) combined three species of *Skeletocutis* – *S. azorica* (D.A. Reid) David, *S. jelicii* Tortić & David, and *S. portcrossensis* David – into *Ceriporiopsis*, and considered the miticity to be the principal difference between these two genera. Niemelä (1998) casts doubts on this solution, since the existence of *Skeletocutis* species with very few skeletals (*S. albocrema* David, *S. borealis* Niemelä, *S. friata* Niemelä & Saarenoksa) obscures this delimitation. While *S. alutacea* is a dimitic counterpart of *S. azorica* (Ryvar den & Gilbertson 1994), and *S. friata* of *S. portcrossensis* (Niemelä 1998), the third monomitic species, *S. jelicii*, seems to be more distant from the other *Skeletocutis* species because of its ellipsoid spores. Ryvar den & Gilbertson (1994) used this feature as a reason to transfer it to *Ceriporiopsis*.

*Skeletocutis albocrema* David, Naturaliste Canadien 109: 237, 1982. – Fig. 3

Basidiocarps small, annual, resupinate, waxy when fresh, soft when dry, very thin (up to 0.5 mm thick). Pore surface initially white, then creamy, even, pores angular, 6–8 per mm, with very thin entire dissepiments. Margin very thin, byssoid, with minute rhizomorphs, white, up to 1 mm wide. Section: context indistinct, tubes short, cream-coloured.

Hyphal structure dimitic. Skeletals very few, 3–3.5  $\mu\text{m}$  wide, thick-walled, with narrow lumina, strongly swelling and dissolving in KOH. Generative hyphae dominating in basidiocarp, 3–4  $\mu\text{m}$  wide, clamped, thin-walled, at the dissepiment edges spirally coiled and encrusted. Cystidioles bottle-shaped or conical, 10–12  $\times$  3.5–5  $\mu\text{m}$ . Basidia short clavate, 10–14  $\times$  4–5  $\mu\text{m}$ , four-spored, with basal clamp. Basidiospores (3.8–)4.2–5(–5.2)  $\times$  (1–)1.2–1.7(–1.8)  $\mu\text{m}$ , cylindrical, slightly curved, often with guttules.

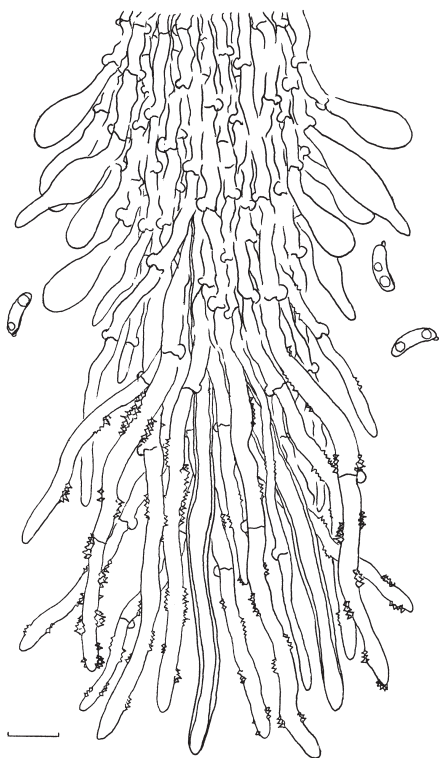


Fig. 3. *Skeletocutis albocrema* (LE 213386). Hymenium and spores. Scale bar 5  $\mu\text{m}$ .

The species is close to *S. papyracea*, which has thicker basidiocarps, thin but distinct subiculum, larger pores, and more abundant skeletal hyphae in the tube trama. As was noted by Niemelä (1998), the habit of fruitbodies resembles an initial stage of *S. biguttulata*, whose spores are longer and skeletal stay unchanged in KOH.

*Distribution and ecology.* In Russia collected only once from rotten trunk of pine in old pine forest (5). Probably it is a southern species. Recently reported as new to Russia (Spirin 2004).

*Specimens examined:* **Russia.** Nizhny Novgorod Reg., Lukoyanov Dist., Panzelka, *Pinus sylvestris*, 1.VIII.1998 Spirin (LE 213386).

*Skeletocutis alutacea* (Lowe) Jean Keller, Persoonia 10: 353, 1979. – Fig. 4

Basidiocarps annual, resupinate, about 1 mm thick. Pore surface creamy-white to pale yellow, pores round to angular, (4–) 5–8 (–9) per mm, with thin entire dissepiments. Margin fimbriate to floccose, white, with thin (0.1–0.5 mm wide) well developed rhizomorphs, partly indistinct and then pores reach the edge of the fruitbody. Section: context very thin, floccose, whitish, tube layer soft-corky, concolorous with margin and context.

Hyphal structure dimitic. Skeletal hyphae thick-walled, with distinct lumina, present in all parts of the basidiocarp, penetrating into dissepiment edges and encrusted there, 2.5–4.5  $\mu\text{m}$  wide, unchanged in KOH and IKI. Generative hyphae thin- to moderately thick-walled, clamped, 3–4.5  $\mu\text{m}$  wide, encrusted at the dissepiment edges. Cystidioles conical to fusoid, 10–14  $\times$  4–5  $\mu\text{m}$ . Basidia 10–13  $\times$  4–5  $\mu\text{m}$ , basally clamped. Basidia 10–13  $\times$  4–5  $\mu\text{m}$ , basally clamped. Basidiospores (2.8–)3–4.1(–4.3)  $\times$  (1.5–)1.7–2  $\mu\text{m}$ , cylindrical, slightly curved, with occasional guttules.

The species has a characteristic habit (presence of well developed rhizomorphs) and anatomy (both generative and skeletal hyphae are encrusted at the dissepiment edges). An apical encrustation on skeletal hyphae is very rare in subgenus *Incrustoporia* and can be used for identification of this species.

*Distribution and ecology.* Collected in the study area only once from decorticated trunk of *Picea abies* in old spruce forest (3). Other *Skeletocutis* species (*S. brevispora* and *S. odora*) were collected in the neighbourhood. *Skeletocutis al-*

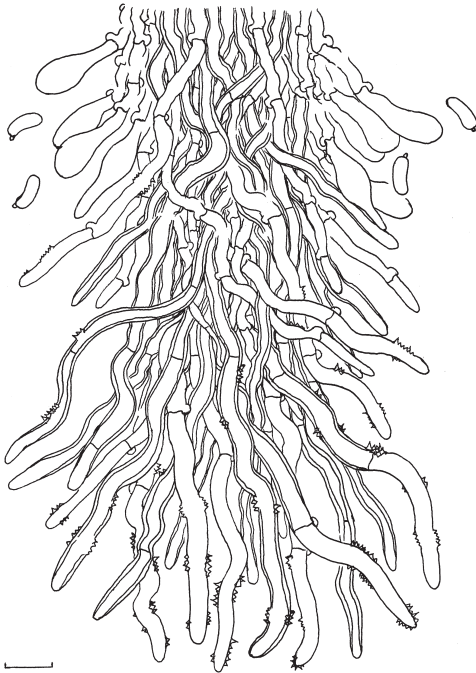


Fig.4. *Skeletocutis alutacea* (LE 208266). Hymenium and spores. Scale bar 5  $\mu$ m.

*utacea* is evidently rare, and special substrate and ecological preferences remain unknown. Ryvarden and Gilbertson (1994) mentioned *Pinus*, *Acer*, *Fagus* and *Salix* as the substrates; Niemelä (1998) listed *Fagus* and *Carpinus*. Ryvarden et al. (2003) mentioned three Norwegian records from wood of *Pinus sylvestris*. Now *Picea* and *Betula* could be added to the list of its substrates, too. Spirin (2000) and Spirin & Shirokov (2002) reported this first time from Russia.

*Specimens examined:* **Russia.** Nizhny Novgorod Reg., Vetluga Dist., Klenovik Res., *Abies sibirica*, 11.VIII.1999 Spirin (LE 208959, LE 212660); Lukoyanov Dist., Razino, *Picea abies*, with *Mucronella calva*, 17.IX.1999 Spirin (LE 212113).

***Skeletocutis biguttulata*** (Romell) Niemelä, Acta Bot. Fennica 161: 5, 1998.

For a description, see Niemelä (1998).

*Distribution and ecology.* Uncommon, but not rare in the study area. Abundant collections of this species were made in the Klenovik Reserve (15), where it is very common on fallen trunks of *Abies sibirica* and adjacent debris (fallen leaves).

Probably this tree is the main substrate in continental areas of Russia. In southern part of the study area the species was found only once, on very rotten trunk of spruce in old herb-rich aspen forest (*Tilieto-Tremuletum aegopodioso-magnoherbosum*) (4).

*Specimens examined:* **Russia.** Nizhny Novgorod Reg., Vetluga Dist., Klenovik Res., *Abies sibirica*, 11.VIII.1999 Spirin (LE 208959, LE 212660); Lukoyanov Dist., Razino, *Picea abies*, with *Mucronella calva*, 17.IX.1999 Spirin (LE 212113).

***Skeletocutis brevispora*** Niemelä, Acta Bot. Fennica 161: 10, 1998.

Basidiocarps annual, resupinate, waxy when fresh, firm-ceraceous after drying, 1–2 mm thick. Pore surface at first white, later straw- to lemon-yellowish, pores at first 6–8 (–9) per mm, round to angular, in mature fruitbodies 4–5 per mm, lacerate; dissepiments thin, entire, without any pruina. Margin initially pruinose-byssoid, with small growing tubes, white, later pale straw-coloured or yellowish. Section: context very thin, white, often emerging from underlying dead basidiocarps of *Phellinidium ferrugineofuscum*, tube layer translucent, concolorous with pore surface.

Hyphal structure dimitic. Skeletals thick-walled, dominating in all parts of basidiocarps, with distinct lumina, 3–4  $\mu$ m wide, swelling up to 6  $\mu$ m wide in KOH (reaction sometimes indistinct in young fruitbodies), penetrating into dissepiment edges. Generative hyphae mostly thin-walled, with relatively large clamps, 3–3.5  $\mu$ m wide, at the dissepiment edges poorly encrusted. Cystidioles bottle-shaped, often with sharp apices, 10–13.5  $\times$  4.5–5.5  $\mu$ m. Basidia short-clavate, 9–12  $\times$  4–4.5  $\mu$ m, basally clamped. Basidiospores (3.2–)3.4–4.2(–4.6)  $\times$  (1–)1.2–1.6(–1.7)  $\mu$ m, moderately curved, tapering to the apiculus, without guttules.

Niemelä (1998) noted that the occurrence of *S. brevispora* on dead *Phellinidium ferrugineofuscum* is so frequent and regular that it can be used for identification. Moreover, the species is characterized by some anatomical features: skeletal are distinctly swelling (albeit not dissolving) in KOH, and spores are short, curved, and aguttulate.

*Distribution and ecology.* In the description (Niemelä 1998) the species was reported

from Finland and Sweden. Later it was found in Russian Karelia (Lindgren 2001, Niemelä et al. 2001), north-eastern China (Dai 2000) and Norway (Ryvarden et al. 2003). Niemelä (2001) considered this species to be mostly rare, but locally common. Similar situation is observed in the study area. In northern old taiga forests *S. brevispora* is evidently rare (**15, 18**). However, in southern part of the area (**3, 4**) this species was collected regularly, not only in old spruce forests, but also in swampy birch type (*Betuleta myrtilloso-sphagnosa*) forests, where solitary fallen spruce trunks are occupied by its predecessor *P. ferrugineofuscum*. A small polypore *Oligoporus floriformis* (Quél.) Gilb. & Ryvarden was fruiting abundantly on these trunks, too.

*Specimens examined:* **Russia.** Nizhny Novgorod Reg., Vetluga Dist., Klenovik Res., *Picea abies*, together with *Phellinidium ferrugineofuscum*, 11.VIII.1999 *Spirin* (LE 212250); Lukoyanov Dist., Razino, dead *P. ferrugineofuscum* on *P. abies*, 5.VIII.1998 and 16.VII.1999 *Spirin* (LE 208439; LE 212684; LE 212399; LE 208497, LE 212253); Sharanga Dist., Kilemarsky Res., *P. abies*, with *P. ferrugineofuscum*, 26.IX.1999 *Spirin* (LE 212396). **Finland.** Pohjois-Karjala, Ilomantsi, dead *P. ferrugineofuscum* on *P. abies*, 25.VIII.1995 *Lositskaya* (LE 208992).

*Skeletocutis carneogrisea* David, Naturaliste Canadien 109: 246, 1982.

The species was described by David (1982); Jahn (1983) and Niemelä (1985a) discussed its ecology.

*Distribution and ecology.* Collected from coniferous wood and dead basidiocarps of *Trichaptum abietinum* (Dicks. : Fr.) Ryvarden (**5, 6**). *Skeletocutis carneogrisea* is evidently not rare in the study area, distributed in both old-growth and suburban forests. Once the species was found near Nizhny Novgorod City; it was growing on moribund young spruce decayed by *Trichaptum abietinum*.

*Specimens examined:* **Russia.** Nizhny Novgorod Reg., Arzamas Dist., Pustynsky Res., dead *Trichaptum abietinum* on *Pinus sylvestris*, 1.VII.2000 *Spirin* (LE 213650); Bogorodsk Dist., *Picea abies*, 18.VIII.1998 *Spirin* (LE 212389); Lukojanov Dist., Panzelka, *Pinus sylvestris*, with *Trichaptum abietinum* and *Skeletocutis papyracea*, 4.VIII.2000 *Spirin* (LE 213019). **Finland.** Etelä-Häme: Lammi, dead *Trichaptum abietinum* on *Picea abies*, 4.IX.1986 *Niemelä* 3557 (H, dupl. in LE).

*Skeletocutis chrysella* Niemelä, Acta Bot. Fennica 161: 13, 1998.

For a description, see Niemelä (1998).

This species differs from the closest relative *S. stellae* by short-living basidiocarps and abundant binding hyphae in the context. The change of colour is also characteristic: stains on pore surface are honey-yellowish in *S. chrysella* and reddish-brown in *S. stellae*. The latter has abrupt opaque margin.

*Distribution and ecology.* An extremely rare species, found only once in the study area on strongly decayed corticated spruce trunk killed by *Porodaedalea chrysoloma* (Fr.) Fiasson & Niemelä in very old spruce-fir forest (**17**). It grows together with *Fomitopsis pinicola* (Sw. : Fr.) P. Karst., *Trichaptum abietinum* and still unnamed species of *Oxyporus corticola* complex.

*Specimen examined.* **Russia.** Nizhny Novgorod Reg., Tonkino Dist., Tonkinsky Res., *Picea abies*, 21.VIII.2000 *Spirin* (LE 210132).

*Skeletocutis kuehneri* David, Naturaliste Canadien 109: 248, 1982.

For descriptions, see David (1982) and Niemelä (1998).

*Distribution and ecology.* Not rare in the study area, collected in coniferous (mostly spruce) forests (**5, 6, 12, 15, 17, 18, 19**) from decorticated trunks of various size, often together with *Trichaptum abietinum*. Two times *S. kuehneri* was observed on fallen spruce logs without signs of *Trichaptum* species, in associations with other aphyllorphoid fungi: *Amylocorticium subincarnatum* (Peck) Pouzar, *Fomitopsis rosea* (Alb. & Schwein. : Fr.) P. Karst., *Antrodia serialis* (Fr.) Donk, *Serpula himantoides* (Fr. : Fr.) P. Karst., and *Porotheleum fimbriatum* (Pers. : Fr.) Fr.

*Specimens examined:* **Russia.** Nizhny Novgorod Reg., Arzamas Dist., Pustynsky Res., *Picea abies*, 2.VII. & 22.VII.2000 *Spirin* (LE 213632, LE 212624); Vetluga Dist., Klenovik Res., *P. abies*, 8.VIII.1999 *Spirin* (LE 211386); Kovernino Dist., Belbakh, *P. abies*, 27.VIII.2000 *Spirin* (LE 213654); Lukoyanov Dist., Panzelka, *P. abies*, 3.VIII.2004 *Spirin* 2073 (H); Sharanga Dist., Kilemarsky Res., *P. abies*, 18.VIII.2004 *Spirin* 2183 (H); Tonkino district, Tonkinsky Res., *Abies sibirica*, 1.VI.2000 *Spirin* (LE 210870); Tonshaev District, Pizhensky Res., *Pinus sylvestris*, 29.V.2000 *Spirin* (LE 212626). Gorno-Altai Reg., Kaitanak, *P. sibirica*, 3.VIII.1968 *Bondartseva* (LE 26456). Leningrad Reg., Vsevolozhsk Distr., Korosary,



*P. abies*, 1.IX.2001 Zmitrovich & Spirin (LE 212269, LE 212270). Krasnodar Reg., Caucasian Res., *Abies alba*, 3.VIII.1936 Vasilyeva (LE 26440). **Belarus**. Bialoviezha Virgin Forest, Korolevo-Mostovskoye, *Pinus sylvestris*, 22.VIII.1966 Bondartseva (LE 26445) (new to **Belarus**). **Finland**. Pohjois-Karjala, Ilomantsi, *Picea abies*, 24.IX.1997 Lositskaya (LE 208975).

*Skeletocutis odora* (Sacc.) Ginns, Mycotaxon 21: 332, 1984.

For a description, see Niemelä (1998).

*Distribution and ecology.* *Skeletocutis odora* is very common in aspen forests in southern part of the area (3, 4, 5) near brooks or small rivers. Twice *S. odora* was observed on thick fallen spruce logs in exposed forest edge; it was fruiting solitarily, without associations with other fungi. In spruce forests, both in southern and northern (3, 6, 15, 18) parts of area, the species is common on fallen, mostly corticated spruce trunks, and grows preferably in association with *Fomitopsis rosea*, *Crustoderma dryinum* (Berk. & M.A. Curtis) Parmasto, *Leptoporus mollis* (Pers.: Fr.) Quél. and *Phlebia centrifuga* P. Karst. (Spirin & Shirokov 2002). Similar preferences were noted by Finnish authors (Kotiranta & Niemelä 1981, Renvall et al. 1991). One collection is from dead basidiocarp of *Phlebia centrifuga* (LE 211400).

*Specimens examined:* **Russia**. Nizhny Novgorod Reg., Arzamas Dist., Pustynsky Res., *Picea abies*, 8.VII.1999 Spirin (LE 213342); Vetluga Dist., Klenovik Res., *P. abies*, 13.VIII.1999 Spirin (LE 212376); Lukoyanov Dist., Razino, *P. abies*, 22.VII.1997 and 5.VIII.1998, dead *Phlebia centrifuga* on *P. abies*, 4.VIII.1999, *Populus tremula*, 1.VIII and 17.IX.1999 Spirin (LE 212386, LE 211400, LE 212387, LE 212394, LE 213017); Panzelka, *Picea abies*, 1.VIII.1998 Spirin (LE 213341), *Populus tremula*, 3.VIII.2004 Spirin 2057 (H); Sharanga Dist., Kilemarsky Res., *Picea abies*, 26–27.IX.1999 Spirin (LE 212380, LE 213364).

*Skeletocutis papyracea* David, Naturaliste Canadien 109: 254, 1982.

For a description, see Niemelä (1998).

There are problems in taxonomy of the *S. papyracea*–*S. subincarnata* complex. The two species are characterized by distinct reaction of skeletal in KOH. In my opinion, it is very difficult to affirm in practice, whether skeletal hyphae become translucent and jelly-like or dissolve and become invisible. The reaction is very variable in microscopic mounts between specimens collected in different seasons even from the same substrate.

Now it seems that these species can be separated from each other only by the shape and size of basidia and spores, and by different ecology.

*Distribution and ecology.* The species is widely distributed in coniferous forests of the area (3, 5, 8, 9, 11, 18). It was collected in both managed forests and forest reserves. The fruitbodies emerge in July–August commonly, and persist about one month.

*Specimens examined:* **Russia**. Nizhny Novgorod Reg., Bor Dist., Kerzhensky Res., *Picea abies*, 24.IX.1998 Spirin (LE 212391); Lukoyanov Dist., Panzelka, *Pinus sylvestris*, 22.VII.1999, 4.VIII.2000 & 6.X.2001 Spirin (LE 210036; LE 213347; LE 213377; LE 211361), Razino, *P. sylvestris*, 8.VIII.1998 Spirin (LE 212393); Semyonov Dist., Kerzhensky Res., *P. sylvestris*, 27.IX.1998 Spirin (LE 212397); Sharanga Dist., Kilemarsky Res., *P. abies*, 28.IX.1999 Spirin (LE 212395). Leningrad Reg., Tosno Dist., Lisino, *P. abies*, 19.IX.1960 Bondartseva (LE 26471). Mordovia, Mordovsky Res., *P. sylvestris*, 19–23.VIII.1937 Nikolayeva (LE 26446, LE 26477). **Belarus**. Bialoviezha Virgin Forest, Korolevo-Mostovskoye, *P. abies*, 9.IX.1966 Bondartseva (LE 26523) (new to **Belarus**). **Estonia**. Saaremaa, *P. abies*, 11.IX.1953 Parmasto (LE 26401); Viljandi, *P. abies*, 19.VIII.1953 Parmasto (LE 26437). **Finland**. Etelä-Häme, Lammi, *P. sylvestris*, 11.IX.2001 Spirin & Kosolapov (LE).

*Skeletocutis stellae* (Pilát) Jean Keller, Persoonia 10: 353, 1979.

The species is well described and illustrated by Eriksson (1958) and Niemelä (1998).

After a study of material from the Nizhny Novgorod Region, some new features could be supplied here. One specimen of *S. stellae* (LE 208486) was collected from dead basidiocarps of *Fomitopsis pinicola* and *Porodaedalea chrysoloma*. Renvall (1995) mentioned two collections of *S. stellae* from spruce trunks, strongly decomposed by *P. chrysoloma*. Niemelä (1998) noted the growth on dead basidiocarps of *P. chrysoloma* to be typical for *S. chrysella*, but occasionally both the sibling species share this ecology. So the critical differences are the size of pores (7–10 per mm in *S. stellae* vs. 4–6 per mm in *S. chrysella*), the changing of colour of *S. chrysella* during drying, and more abundant binding hyphae in its context; the spores are almost identical.

Swelling of skeletal hyphae with KOH seems to be an essential feature of the “medium-thick-spored group” of *Skeletocutis* species (*S. subincarnata* and its satellites, Niemelä 1998), though it was not emphasized specially. However, this

phenomenon was observed also in the “narrow-spored group”: a ten-layered fruitbody of *S. stellae* (LE 210070) was collected in late spring; its lower tube layer was overgrown by mycelium with abundant skeletal, which swelled and dissolved in KOH like those of *S. papyracea*.

*Distribution and ecology.* Evidently rare species in the area; all specimens were found in very old taiga forests (18, 20) on fallen spruce trunks at late stages of wood decomposition. Average diameter of the trunks was 50–60 cm. In Finland *S. stellae* is classified as a species of both spruce- and pine-dominated virgin forests (Kotiranta & Niemelä 1996, Lindgren 2001). *Fomitopsis pinicola* and, probably, *Porodaedalea chrysoloma* could be regarded as possible predecessors. The rare *Boreostereum radiatum* (Peck) Parmasto, *Columnocystis ambigua* (Peck) Pouzar, *Fomitopsis cajanderi* (P. Karst.) Kotl. & Pouzar, and *Phellinidium sulphurascens* (Pilát) Y.C. Dai grew in the neighbourhood—all they prefer boreal continental coniferous forests (taiga) and are mostly unknown in West Europe.

*Specimens examined.* **Russia.** Nizhny Novgorod Region, Tonshaevo Dist., Burepolom, *Picea abies*, 28.V.2000 *Spirin* (LE 210070); Sharanga Dist., Kilemarsky Res., dead *Fomitopsis pinicola* and *Porodaedalea chrysoloma* on *P. abies*, 28.IX.1999 *Spirin* (LE 208486), *P. abies*, with *Repetobasidium mirificum*, 28.IX.1999 *Spirin* (LE 208962), *P. abies*, 22.VIII.2004 *Spirin* 2274 (H). **Belarus.** Bialoviezha Virgin Forest, *Pinus sylvestris*, 27.VIII.1966 *Bondartseva & Parmasto* (LE 25825).

*Skeletocutis subincarnata* (Peck) Jean Keller, *Persoonia* 10: 353, 1979.

Basidiocarps annual, resupinate, cartilaginous when fresh, soft-coriaceous after drying, 1–2 mm thick. Pore surface cream with vinaceous tint, even or nodulose on sloping substrate, pores angular, with thin entire dissepiments without pruina, in some cases lacerate, (4–) 5–7 per mm. Margin mostly well visible and sharply delimited, entire, up to 1 mm wide, often white or pale cream, in mature basidiocarps paler than pore surface, without rhizomorphs. Section: context cream-coloured, often well developed, up to 1 mm thick, tube layer concolorous with pore surface, up to 1 mm thick.

Hyphal structure dimitic. Skeletals thick-walled, present mostly in trama, with narrow lumina, distinctly swelling and partly dissolving in KOH, 3–4 µm wide; a few ones extending to dis-

sepiment edges. Generative hyphae 2–2.8 (–3.5) µm wide, thin-walled, clamped, dominating in subhymenium, straight and encrusted with thorny crystals. Cystidioles conical to subglobose, often sharp pointed, 9–12 × 3–5 µm. Basidia barrel-shaped to ovoid, 8–9 × 4–5.5 µm, clamped at the base. Basidiospores cylindrical, distinctly tapering to the apiculus, hyaline, (3–)3.2–4.6 (–5.2) × (1–)1.2–1.8(–2) µm, usually without guttules.

*Distribution and ecology.* Rare species in the study area, collected only three times (15, 17, 18) from strongly decayed, moss-covered, partly corticated trunks of spruce in old moist taiga forests.

*Specimens examined.* **Russia.** Nizhny Novgorod Reg., Vetluga Dist., Klenovik Res., *Picea abies*, 11.VIII.1999 *Spirin* (LE 212379); Sharanga Dist., Kilemarsky Res., *P. abies*, 17.VIII.2004 *Spirin* 2134 (H); Tonkino Dist., Tonkinsky Res., *P. abies*, 23.VIII.2000 *Spirin* (LE 210065).

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