БИОЛОГИЧЕСКИЕ НАУКИ

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NEW OR RARE FOR BELARUS SPECIES OF POLYPOROID FUNGI COLLECTED IN BELAVEZHSKAYA PUSHCHA IN 2016

Objective of the research *was to carry out a survey of polyporoid fungi in southwest part of Belarus for finding and identification of possible new or rare species for mycobiota of the country.*
Materials and methods: *field observations and collections of the fungi were carried out by route method predominantly in the old-growing forests in Pinsk, Kamyanets, and Svislach districts; species identifications and line drawings were done using the usual microscopic technique.*
Results. *Six new for Belarus polypore species (Basidiomycota, Agaricomycetes) were identified: Amylocystis lapponica, Cyanosporus alni, Junghuhnia pseudozilingiana, Sistotrema dennisii, Skeletocutis delicata, S. papyracea). A rare species Calcipostia guttulata was supplied for the first time by the data about its locality in Belarus. The status of rare species Physisporinus crocatus in mycobiota was updated in accordance with the recent nomenclature, and the data about its localities are provided.*
Conclusion. *All eight species listed above were found in forests of Belavezhskaya Pushcha National Park, which stresses the today high conservation value of its forests.*

Keywords: *aphyllophoroid fungi, Picea abies wood, Polyporaceae s.l., species distribution.*

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НОВЫЕ ИЛИ РЕДКИЕ ДЛЯ БЕЛАРУСИ ВИДЫ ТРУТОВЫХ ГРИБОВ, НАЙДЕННЫЕ В БЕЛОВЕЖСКОЙ ПУЩЕ В 2016 ГОДУ

Целью работы *являлись полевые исследования трутовых грибов в юго-восточной части Беларуси для выявления возможных новых и редких для микобиоты республики видов.*
Материалы и методы: *полевые наблюдения и сбор образцов произведены традиционным маршрутным методом с охватом преимущественно старовозрастных лесов в Пинском, Каменецком, Пружанском и Свислочском районах; идентификация видов и линейные рисунки морфологических структур выполнены с помощью обычной микроскопии.*
Результаты. *Были определены шесть новых для микобиоты видов полипороидных грибов (Basidiomycota, Agaricomycetes): Amylocystis lapponica, Cyanosporus alni, Junghuhnia pseudozilingiana, Sistotrema dennisii, Skeletocutis delicata, S. papyracea. Кроме того, для редкого вида Calcipostia guttulata впервые публикуются точные сведения о местонахождении в Беларуси. Статус редкого вида Physisporinus crocatus в микобиоте уточнен в свете современной номенклатуры и приводится описание его местонахождений.*

Заключение. *Все восемь обсуждаемых видов были найдены в лесах национального парка «Беловежская пуща», что подчеркивает его высокий природоохранный статус, сохраняющийся по сей день.*

Ключевые слова: *афиллофороидные грибы, древесина Picea abies, распространение видов, Polyporaceae s.l.*

What this paper adds

The paper contributes for the first time for mycobiota of Belarus six polypore species: *Amylocystis lapponica*, *Cyanosporus alni*, *Junghuhnia pseudozilingiana*, *Sistotrema dennisii*, *Skeletocutis delicata*, *S. papyracea*. A rare species *Calcipostia guttulata* is provided by the first data on its locality in Belarus. The status of *Physisporinus crocatus* in mycobiota is updated in accordance with the recent nomenclature.

Научная новизна статьи

В статье впервые для Беларуси приводятся шесть видов трутовых грибов: *Cyanosporus alni*, *Junghuhnia pseudozilingiana*, *Skeletocutis delicata*, *S. papyracea*, *Amylocystis lapponica*, *Sistotrema dennisii* с данными по их местонахождениям и иллюстрациями морфологии плодовых тел для первых четырех видов. Для редкого вида *Calcipostia guttulata* впервые приводятся детальные данные о местонахождении в Беларуси, а статус вида *Physisporinus crocatus* в микобиоте уточняется с учетом новейшей номенклатуры.

Introduction. Polyporoid fungi (polypores, Polyporaceae s.l.) is an assemblage of species from the phylum Basidiomycota, belonging mostly to the orders Polyporales and Hymenochaetales [1, 2]. They have poroid (at least shallow-poroid) type of hymenophore, often associated with corky, woody, or coriaceous consistency of basidiomata. However, in a number of polypore species the initially poroid hymenophore becomes with age toothed or lamellate. As an exception, some fungi with typically lamellate hymenophore, but possessing corky or coriaceous basidiomata, are traditionally considered as polypores.

Having as a rule middle-sized or large basidiomata, these fungi can develop large endosubstratal mycelia, provoking the decay of fallen wood and dead wood portions in growing trees; little number of species can attack living plant tissues. In general, polypores act as important functional members of forest communities, recycling dead wood masses.

Polypores of Belarus were considered in a handbook [3], included the data about 137 species known in that time strictly from the area of the republic. The subsequent publications reported the polypores collected or observed mostly in Belavezhskaya Pushcha, namely, 110 species were listed by Mikhalevich [4], 111 species by Komarova et al. [5], 79 species by Mikhalevich [6], 50 species by Shabashova et al. [7]. Ninety polypore species from various districts of Belarus were listed in Gapienko et al. [8].

The present paper describes the finds of polypore fungi, which were done in a joint collection trip in Belarus by E. Yurchenko, H. Kotiranta, and A. Shiryaev, undertaken 20–28 September 2016.

Materials and methods. The area of research was southwest part of Belarus (Brest oblast: Pinsk, Kamyanets, and Pruzhany districts; Hrodna oblast: Svislach district). The searches of fungi were carried out by usual route method; all kinds of dead wood were inspected, with the main attention to large fallen trunks. The forests which are presumably more species-rich in respect of polypores, i.e. old stands, dominated by *Pinus sylvestris*, *Picea abies*, *Quercus robus*, *Populus tremula*, *Alnus glutinosa*, and not significantly affected by cutting, were preferably included in the routes. The dry reference specimens were deposited in collections: University of Helsinki (H) and V.F. Kuprevich Institute of Experimental Botany, Minsk (MSK); the abbreviation ‘dup.’ notes the duplicated specimens. Fungi macromorphology was examined on dry specimens. Micromorphology studies were done on squash preparations of dry material in 3% KOH water solution and Melzer’s reagent; measurements were done in KOH solution.

To state the novelty of species records we addressed to the above mentioned publications [3–8], and also to the publications containing lesser number of species data, and listed in a bibliography [9]. Current names of fungi follow MycoBank database [10] (retrieved 23 Apr 2020); the synonymy follows *Species Fungorum* database (http://www.speciesfungorum.org/Names). The

species recorded for mycobiota for the first time, or rare fungi, which records are considered in light of modern species concepts, are described below. Belavezhskaya Pushcha National park is abbreviated as BPNP.

Results and discussion

1. Amylocystis lapponica (Romell) Bondartsev & Singer ex Singer

The species is distinguished by its laterally attached, middle-sized (about palm size) basidiomata, soft and juicy when fresh, very hard when dry; upper surface at first pale brownish, when mature brown with short hairs; pore surface dirty whitish, turning brownish when touched and when old, pores 2–3 per mm; cystidia abundant, fusoid, thick-walled, amyloid, often supplied by a cap of crystals; spores near cylindrical, 7–11 μm long.

The species is known mostly from northern Europe, occurring rare or sporadically in old-growing forests, on fallen coniferous wood (*Picea*, *Abies*) [11, 12].

Specimen examined: Kamyanets district, BPNP, 2.5 km SE of Lyatskiya khutor, 52°35′ N, 23°53′ E, *Picea*-dominated old growth forest, on strongly decayed, decorticated *Picea abies* trunk about 45 cm diam, coll. H. Kotiranta, 23 IX 2016 (H.K. 27966 – H).

2. Calcipostia guttulata (Sacc.) B.K. Cui, L.L. Shen & Y.C. Dai [syn. *Oligoporus guttulatus* (Sacc.) Gilb. & Ryvarden; *Postia guttulata* (Sacc.) Jülich] (Fig. 1)

The species is distinguished by its middle- or fairly small-sized, flabelliform to dimidiate, often laterally substipitate, applanate basidiomata, in dry state of chalcky, fragile consistency; upper surface at first whitish, later with unclear brownish zones and often shallow depressions 1–3 mm diam; pore surface at first white, later with greenish hue and often with guttation depressions; basidioma taste bitter; spores 4–5 × 2–2.5 μm.

The species is rarely occurring and associated with natural *Picea* range in Europe; it grows on dead coniferous wood, usually *Picea*, in old natural forests [11; 13].

The species was published for the first time for Belarus as *O. guttulatus*, from Belavezhskaya Pushcha, in the book by Bondartseva [12, p. 264–265]. Supposedly, earlier the specimens of this species were belonged to *Postia stiptica* (Pers.) Jülich s.l. (an earlier name *Tyromyces albidus* (Schaeff.) Donk f. *guttulatus* (Peck) Pilát sensu Bondartsev [14, p. 213]).

Specimen examined: Svislach district, BPNP, 2.2 km E of Rudnya village, 52°50′ N, 24°04′ E, mixed old-growth forest, on decorticated, strongly decayed *Picea abies* trunk 20 cm diam, together with *Fomitopsis rosea*, coll. H. Kotiranta, 27 IX 2016 (H.K. 28100 – H; dup.: MSK-F 11111).

3. Cyanosporus alni (Niemelä & Vampola) B.K. Cui, L.L. Shen & Y.C. Dai [syn. *Postia alni* Niemelä & Vampola] (Fig. 2)

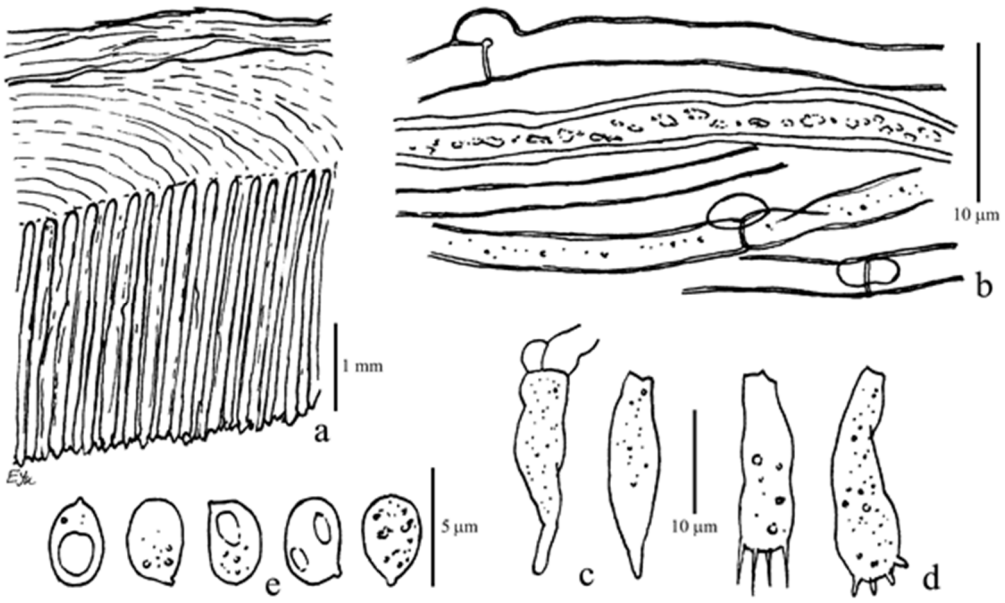

Figure 1. – *Calcipostia guttulata* (MSK-F 11111): a – vertical section of a piece of basidioma; b – hyphae; c – cystidioles; d – basidia; e – basidiospores

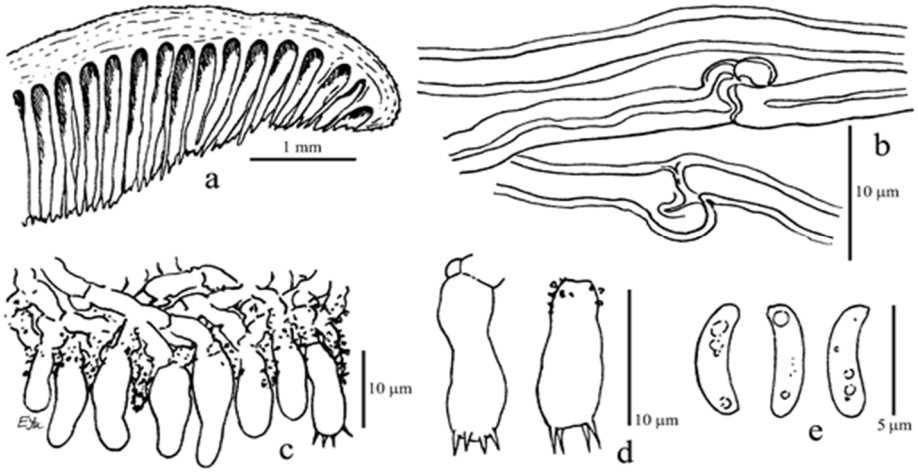

Figure 2. – *Cyanosporus alni* (MSK-F 11112): a – vertical section of a piece of basidioma; b – hyphae; c – vertical section through hymenium and upper subhymenium; d – basidia; e – basidiospores

The species is distinguished by its laterally attached, small, soft and fragile basidiomaa; upper surface minutely matted, whitish with pale brownish and bluish patches; pore surface whitish, but deep in the tubes with a faint bluish or grayish hue.

The species is sporadic to common in boreonemoral zone of Europe; it grows on dead wood of *Populus*, *Alnus*, and other angiosperms [13, 15].

Evidently before this species was described [15], most of *Postia* specimens from Belarus, having bluish pigmentation in basidiomata, were referred to *Postia caesia* (Schrad.) P. Karst. [*Tyromyces caesius* (Schrad.) Murrill].

Specimens examined: Pruzhany district, BPNP, 2 km NE of Perarova khutor, luxuriant old growth forest, on dead corticated fallen trunk of *Salix caprea*, coll. H. Kotiranta, 25 IX 2016 (H.K. 27999 – H); Svislach district, BPNP, S of Zharkaushchyna village, 52°52´ N, 24°05´ E, relatively old mixed deciduous forest, on fairly hard corticated trunk of *Corylus avellana* 6 cm diam, coll. H. Kotiranta, 26 IX 2016 (H.K. 28033 – H; dup.: MSK-F 11112).

4. Junghuhnia pseudozilingiana (Parmasto) Ryvarden [syn. *Steccherinum pseudozilingianum* (Parmasto) Vesterholt] (Fig. 3)

The species is distinguished by its effused or more often effused-reflexed basidiomata, with narrow pileus up to 1 cm wide, with glabrous, pale ochraceous upper side; pore surface yellowish to straw-coloured; in dissepiment (trama) with immersed, rare to abundant, apically heavily encrusted cystidia, arising from skeletal hyphae.

The species is rare and known mostly from Northern Europe; it grows mainly on dead or dying basidiocarps of *Phellinus* and *Inonotus* species, but also dead wood of *Alnus*, *Betula*, and *Populus* [16]. Earlier Ryvarden and Gilbertson [16] supposed that this species can occur in Belarus.

Specimens examined: Kamyanets district, BPNP, 2 km E of Lyatskiya khutor, 52°37´ N, 23°53´ E, old deciduous forest, on decorticated, fairly hard *Carpinus betulus* trunk about 10 cm diam, together and partly on dead basidioma of *Phellinus* sp., coll. H. Kotiranta, 23 IX 2016 (H.K. 27949 – H; dup.: MSK-F 11113); Svislach district, BPNP, 4.5 km E of Zharkaushchyna village, mixed, not very old forest with *Pinus sylvestris*, *Picea abies*, *Betula pendula*, *Juniperus communis*, on dead decorticated *Betula pendula* 25 cm diam, together with *Steccherinum ochraceum* and *Botryohypochnus isabellinus*, coll. H. Kotiranta, 27 IX 2016 (H.K. 28055 – H).

5. Physisporinus crocatus (Pat.) F. Wu, Jia J. Chen & Y.C. Dai [syn. *Podoporia nigrescens* (Bres.) Bondartsev; *Poria nigrescens* Bres.; *Rigidoporus crocatus* (Pat.) Ryvarden]

The species is distinguished by its effused basidiomata with flesh-colored or light pinkish (fresh), pinkish-brown (dried) pore surface, monomitic hyphal system with simple-septate hyphae, absence of cystidia, and globose to ovoid-subglobose spores.

It is a rare species in Europe, with mostly eastern continental distribution; it grows on dead wood of *Picea* and *Abies*, rarely occurs on *Betula* and *Ulmus*, in wet coniferous and mixed forests [11, 12].

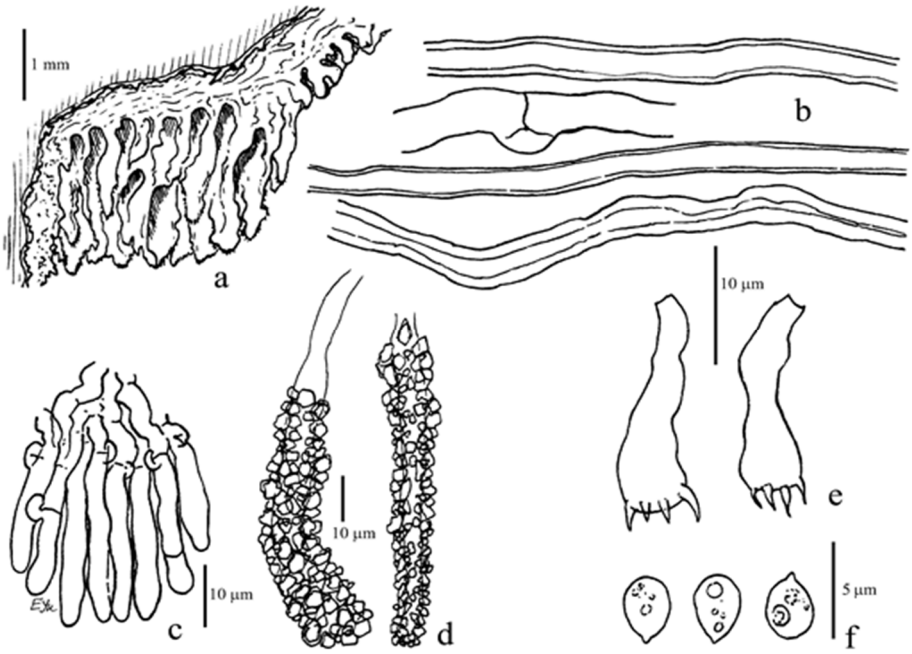

Figure 3. – *Junghuhnia pseudozilingiana* (MSK-F 11113): a – vertical section of a portion of basidioma; b – hyphae; c – portion of hymenium (cystidioles and basidioles) and subhymenial hyphae; d – encrusted cystidia; e – basidia; f – basidiospores

The species was listed for the first time for Belarus by Komarova [17, p. 13] under the name *Podoporia nigrescens* (Bres.) Bond. However, later it was belonged by Komarova, as *Poria nigrescens* [3, p. 61] to synomyms of *Physisporinus vitreus* (Pers.) P. Karst. [*Podoporia vitrea* (Pers.) Donk]. The species in its modern sense (under the name *R. crocatus*) was published preliminary, without any collection or morphology data, for Belavezhskaya Pushcha in Shabashova et al. [7, p. 148].

Specimens examined: Pruzhany district, BPNP, 2 km WSW of Babinets village, Nikar Forestry, forest block No.562 (*Abies* 'island'), *Abies*-*Carpinus*-*Picea* forest of *Oxalis* type, on butt-end surface of fallen old *Abies alba* trunk (log), coll. E. Yurchenko, 24 IX 2016 (MSK-F 11018); Pruzhany district, BPNP, 2 km NE of Perarova khutor, luxuriant old growth forest, on fallen corticated trunk of *Alnus glutinosa*, coll. H. Kotiranta, 25 IX 2016 (H.K. 27989 – H).

6. Sistotrema dennisii Malençon

The species is distinguished by its soft and delicate when fresh, brittle when dried, monomitic basidiomata with lacerate pores and urniform, normally 6-sterigmate basidia.

It is a very rare species, known mostly from northern and central Europe, growing on strongly decayed wood of gymnosperms and angiosperms and also on litter [11, 13].

Specimen examined: Svislach district, BPNP, 4.5 km E of Zharkaushchyna village, not very old mixed forest, on fallen corticated branch of *Picea abies* 2 cm diam, coll. H. Kotiranta, 27 IX 2016 (H.K. 28067 – H).

7. Skeletocutis delicata Niemelä & Miettinen (Fig. 4)

The species is distinguished by its effused basidiomata to 1 mm thick, without sterile margin, with pores (2)3–5(6) per mm, labyrinthine with age; subiculum about 0.1 mm thick; skeletals strongly swelling in KOH up to 8–9 µm wide; some dissepiment hyphae richly encrusted; spores moderately curved, narrow (1–1.6 µm). In our specimen the spores are of highly uniform size and shape, 3.5–4 × 1–1.2 µm.

The species occurs in boreal and hemiboreal Europe, with still poorly documented distribution; it grows on dead *Picea* (occasionally *Pinus*) trunks in old semi-natural and natural forests [18].

Specimen examined: Kamyanets district, BPNP, 2.5 km SE of Lyatskiya khutor, 52°35′ N, 23°53′ E, *Picea*-dominated old growth forest, on relatively hard decorticated *Picea abies* trunk about 30 cm diam, coll. H. Kotiranta, 23 IX 2016 (H.K. 27963 – H; dup.: MSK-F 11114).

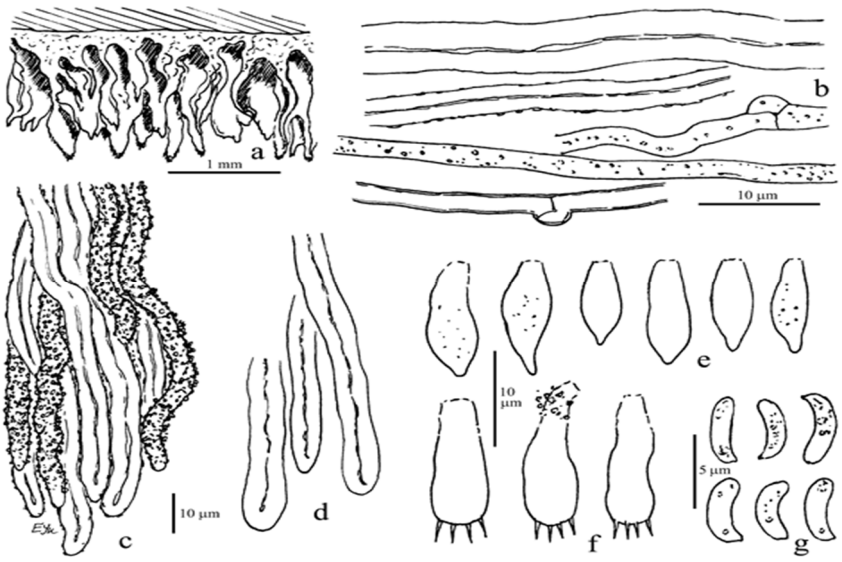

Figure 4. – *Skeletocutis delicata* (MSK-F 11114): a – vertical section of a portion of basidioma; b – subicular and tramal hyphae; c – ends of dissepiment hyphae; d – ends of keletal hyphae, swollen in KOH; e – cystidioles; f – basidia; g – basidiospores

8. Skeletocutis papyracea A. David (Fig. 5)

The species is distinguished by its effused basidiomata up to 2 mm thick, with narrow sterile margin, and angular pores (3)4–5 per mm; pore surface at first white, then with pale rusty brown patches; subiculum up to 1 mm thick; subicular hyphae strongly swelling or even dissolving in KOH; dissepiment hyphae with somewhat encrusted ends; spores both allantoid and near straight, 1.5–1.8 µm wide.

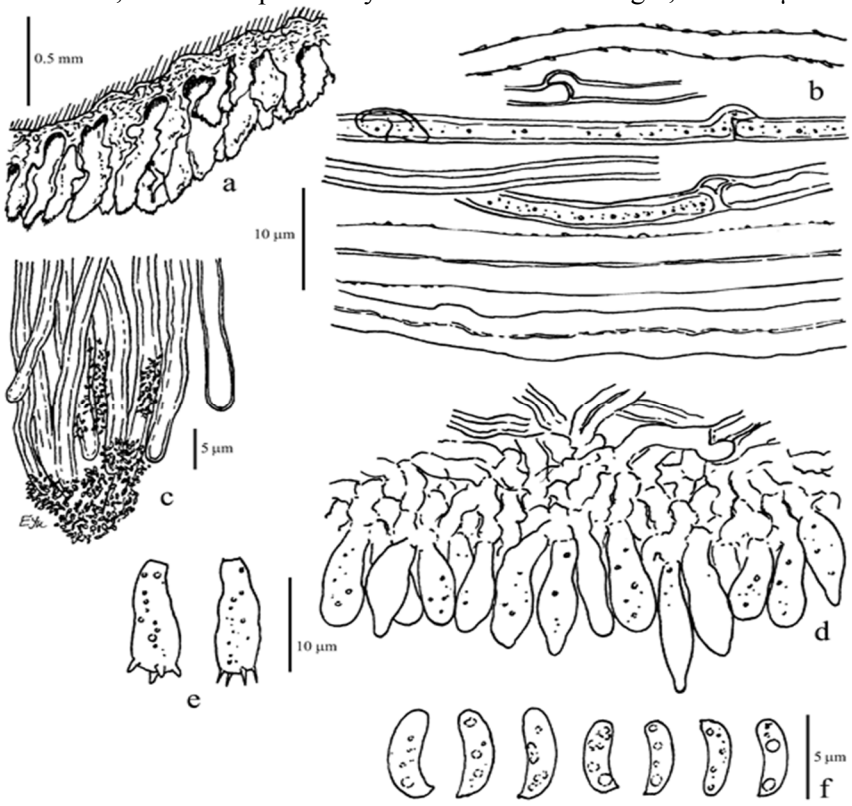

Figure 5. – *Skeletocutis papyracea* (MSK-F 11115): a – vertical section of a portion of basidioma; b – subicular and tramal hyphae; c – ends of dissepiment hyphae (in Melzer's reagent); d – vertical section through a portion of hymenium (with cystidioles and basidioles) and subhymenium; e – basidia; f – basidiospores

One of our specimens (MSK-F 11115) had spores of fairly variable size, 4.2–5.8 × 1.2–1.4(–1.6) μm.

It is a rare or little known species, occurring mostly in south and western Europe; it grows on dead coniferous wood (*Picea*, *Pinus*, *Abies*) [11].

Specimens examined: Kamyanets district, BPNP, 1.8 km NE of Kamyanyuki village, 52°34′ N, 23°49′ E, young mixed forest, on decorticated, fairly hard *Pinus sylvestris* branch 12 cm diam, together with *Antrodia sinuosa*, coll. H. Kotiranta, 25 IX 2016 (H.K. 27988 – H; dup.: MSK-F 11115); Svislach district, BPNP, 4.5 km E of Zharkaushchyna village, not very old mixed forest, on fallen decorticated branch of *Pinus sylvestris* 13 cm diam, coll. H. Kotiranta, 27 IX 2016 (H.K. 28077 – H).

Conclusions. The eight-day route field studies in southwest part of Belarus and subsequent treatment of collections resulted in recording six new polypore species for mycobiota of Belarus: *Amylocystis lapponica*, *Cyanosporus alni*, *Junghuhnia pseudozilingiana*, *Sistotrema dennisii*, *Skeletocutis delicata*, *S. papyracea*. Two additional rare species, *Calcipostia guttulata* and *Physisporinus crocatus*, were supplied for the first time by collection localities details. The status of *Ph. crocatus* in mycobiota was updated according to the modern species concept. All discussed species were found in Belavezhskaya Pushcha National Park, which stresses the high biodiversity conservation value of its primeval forests.

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