

Three new corticioid species (Basidiomycota) from the Caucasus region

Masoomeh Ghobad-Nejhad

Department of Biotechnology, Iranian Research Organization for Science and Technology (IROST), P.O. Box 15815-3538, Tehran 15819, Iran

Correspondence to: ghobadnejjhad@myco-lich.com

&

Eugene Yurchenko

V.F. Kuprevich Institute of Experimental Botany, Akademichnaya 27, BY-220072 Minsk, Belarus

Abstract

Athelidium caucasicum from the Russian Caucasus, *Peniophora metuloidea* from NW Iran, and *Phlebia parva* from Georgia and Azerbaijan are described as new to science.

Introduction

The Caucasus region is an area of about 500,000 km² between the Black Sea and the Caspian Sea, regarded as the meeting point of Europe and Asia. It encompasses the total area of Armenia, Azerbaijan, Georgia, as well as the southernmost European Russia, NE Turkey, and northern Iran. The region has been recognized as a high-priority area for biodiversity conservation owing to its high level of species richness and presence of the two Pleistocene refugia with many relic species (Mittermeier et al. 1999).

The first checklist of corticioid and poroid basidiomycetes of the Caucasus region was published in 2009 (Ghobad-Nejjhad et al. 2009). The list has recently been revised and made available online for continuous updates (Ghobad-Nejjhad 2011a). During her PhD studies on wood-inhabiting basidiomycetes of the Caucasus region (Ghobad-Nejjhad 2011b), the first author had a chance to study part of the valuable collections mainly made by Erast Parmasto from different countries in the Caucasus region (except for Iran and Turkey), deposited at TAAM herbarium. Two of the three species described below, viz. *Athelidium*

caucasicum and *Phlebia parva*, are based on TAAM material. The third species, *Peniophora metuloidea*, was collected by the first author in Arasbaran forests, NW Iran.

Materials and methods

Specimens were studied from the herbaria H, MSK, TAAM (acronyms from Index Herbariorum, <http://sweetgum.nybg.org/ih>), and the Ghobad-Nejhad ref. coll. Squash mounts were prepared in 5% potassium hydroxide (KOH), cotton blue in lactic acid (CB), and Melzer's reagent (IKI). At least 30 spores were measured per collection. In the descriptions, Q is the variation in length to width ratios (L/W).

Athelidium caucasicum Yurchenko sp. nov.

Fig. 1

Holotype: Russia, Karachaevo-Cherkessiya, Arkhyz, Kizgytsh, Teberda Nature Reserve, 43.5° N, 41.2° E, alt. 1550 m, *Acer* forest, on dead twig of *Salix* sp., 24.IX.1968, coll. E. Parmasto (TAAM 53235; isotype in MSK). Mycobank: MB 564333.

Etymology: '*caucasicum*' referring to the type locality in the Caucasus region.

Diagnosis: The species is distinguished from *Athelidium aurantiacum* (M.P. Christ.) Oberw. by clamped septa, predominantly 2-sterigmate basidia, narrower (up to 5 µm) and slightly encrusted hyphae.

Basidiocarp annual, effused, adnate, loose-subceraceous, about 50 µm thick. Hymenial surface apricot orange, even, minutely porulose under a lens. Margin more or less diffuse.

Hyphal system monomitic, hyphae clamped at all septa, colorless, thin-walled. Hyphae and hymenial elements scarcely encrusted, incrustations mostly disappearing in KOH. Subiculum thin, subicular hyphae scarce, moderately branched, (2-)2.5-4 µm wide, little delimited from subhymenial ones. Subhymenial hyphae rather richly branched, (2.5-)3-4(-5) µm wide.

Cystidia and other sterile elements lacking.

Basidia subcylindrical or subclavate, (11-)15-20(-23) × 4-6(-7.5) µm, with (1-)2-3(-4) sterigmata measuring 3-5 × 0.8-1.3 µm.

Basidiospores broadly fusoid to subcylindrical, adaxially straight or slightly concave, smooth, thin-walled, colorless, (7-)8.5-10.5 × (2.2-)2.8-3.8(-4) µm, $L_{\text{mean}} = 9.1$ µm, $W_{\text{mean}} = 3.2$ µm, $Q = 2.2-3.6$, often glued together in pairs, IKI-, CB+, with rather large, blunt apiculus.

Remarks: *Athelidium* Oberw. is a small athelioid genus characterized by yellow to orange, adnate fruiting body, clampless hyphae, constricted basidia and nearly fusiform basidiospores (Jülich 1972, Eriksson & Ryvarden 1973, Bernicchia & Gorjón 2010). *Athelidium caucasicum* differs from *A.*

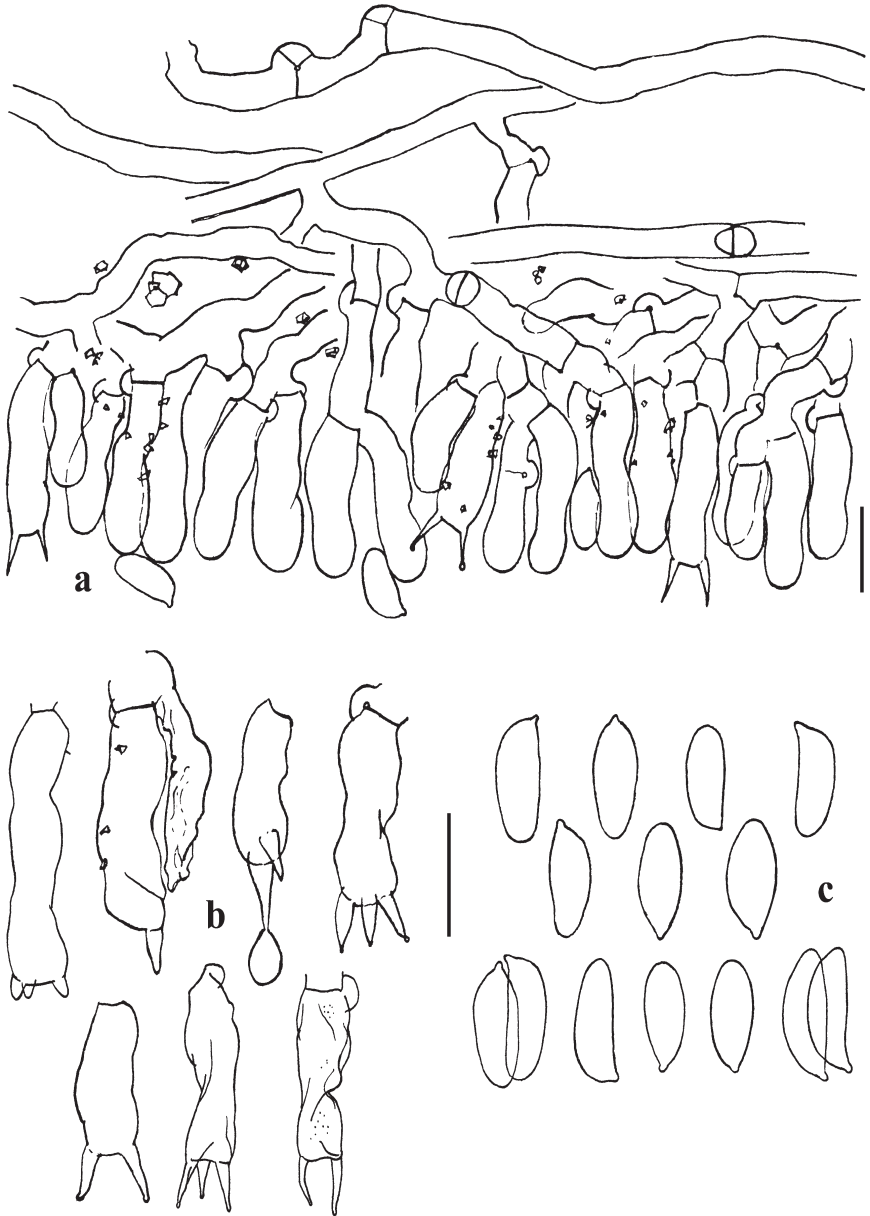


Fig. 1. *Athelidium caucasicum* sp. nov. (holotype). a) Vertical section through basidiocarp. b) Basidia. c) Basidiospores. Scale bars = 10 μ m.

aurantiacum by the presence of clamps, predominantly 2-sterigmate basidia, somewhat narrower subicular hyphae, and the presence of scarce crystalline material on hyphae. *Athelidium phycophilum* (Jülich) Zmitr. & Spirin has whitish basidiocarp, clavate basidia, and pyriform spores (Jülich 1972, as *Athelia phycophila* Jülich). The new taxon fits well in the genus except for having clamps at all septa. Nevertheless, there are several corticioid genera consisting of species with clamps and species with totally clampless septa, e.g. *Athelia* Pers., *Botryobasidium* Donk, *Byssocorticium* Bondartsev & Singer, *Clavulicium* Boidin, *Dendrothele* Höhn. & Litsch., *Galzinia* Bourdot, *Kneiffiella* P. Karst., *Paullicorticium* J. Erikss., *Peniophora* Cooke, *Radulodon* Ryvardeen, *Scytinostroma* Donk, *Sistotrema* Fr., and *Steccherinum* Gray. Among athelioid fungi, *Athelopsis* Oberw. ex Parmasto sensu Eriksson & Ryvardeen (1973) also has yellowish basidiocarp, but the stalked basidia characteristic for this genus are lacking in *A. caucasicum* described here.

Peniophora metuloidea Ghobad-Nejhad & Yurchenko sp. nov. Fig. 2

Holotype: Iran, East Azerbaijan Prov., Jolfa, 100 km E of Jolfa, Missan, open woodland with *Acer monspessulanum*, *Paliurus spina-christi*, *Quercus macranthera*, *Juniperus communis*, *Astragalus* spp., 38°51'07"N, 46°26'21"E, alt. 1372 m, on fallen rotten corticated branch of *Quercus macranthera*, part of the fruiting body overgrown by *Phanerochaete tuberculata* (P. Karst.) Parmasto, 29.IX.2006, coll. Ghobad-Nejhad 314 and Sohrabi (IRAN; isotypes in Ghobad-Nejhad ref. collection and MSK). Mycobank: MB 564338.

Paratype: Iran, in the same locality as the holotype, on fallen branch of *Quercus macranthera*, 29.IX.2006, coll. Ghobad-Nejhad 367 and Sohrabi (Ghobad-Nejhad ref. collection).

Etymology: ‘*metuloidea*’ referring to the conspicuous and abundant metuloid cystidia (lamprocystidia).

Diagnosis: The species is distinguished from *P. limitata* (Chaillet ex Fr.) Cooke by light brown hymenophore with olivaceous, pinkish to cream tint, and larger lamprocystidia, deeper ones with dome-shaped wall thickenings inside.

Basidiocarp annual, resupinate, adnate, confluent, ceraceous, ca. 150–250 µm thick; hymenial surface light brown with olivaceous, pinkish to cream tint, smooth to irregularly tuberculate, becoming cracked; margin determinate, minutely fimbriate under 16× lens when young, darkened in some parts.

Hyphal system monomitic, hyphae with clamps. Subiculum 35–135 µm thick, consisting of densely agglutinated, thick-walled, yellow to dark brown hyphae. Subhymenium composed of vertically arranged hyphae 2.5–4(–5) µm wide, thin to thick-walled, gelatinized in brownish yellow matrix, not changed in KOH.

Lamprocystidia abundant, almost ovoid to fusoid, often abruptly narrowed

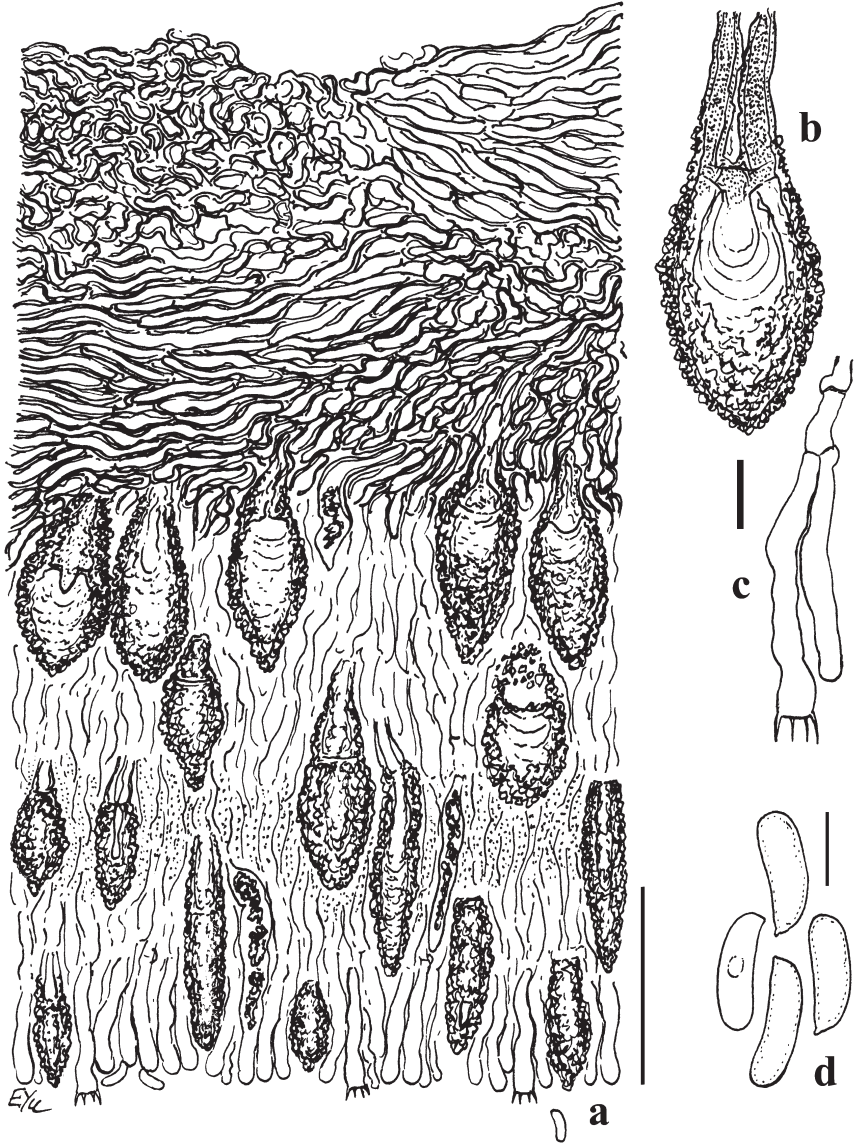


Fig. 2. *Peniophora metuloidea* (holotype). a) Vertical section through basidiocarp. b) Lamprocystidium. c) Basidium and basidiole. d) Basidiospores. Scale bars: a = 50 μm , b and c = 10 μm , d = 5 μm .

near apex, apex sometimes blunt, basally with thick brown walls, developing from subicular hyphae and in subhymenium and approaching hymenium, mostly enclosed, $40\text{--}60(-75) \times (10\text{--})15\text{--}20(-24) \mu\text{m}$, crystallized part $(20\text{--})40\text{--}50 \mu\text{m}$ long. **Gloeocystidia** inconspicuous, lacking or very few, cylindrical to fusoid, $40\text{--}55 \times (4\text{--})6\text{--}8 \mu\text{m}$, thin-walled, with no schizopapilla.

Dendrohyphidia lacking.

Basidia subcylindrical to narrowly clavate, $28\text{--}43 \times 4.2\text{--}5.3 \mu\text{m}$, with a basal clamp, 4-sterigmate, walls thickened in mature basidia.

Basidiospores subcylindrical-suballantoid, $7\text{--}10(-11) \times 2.3\text{--}3.5 \mu\text{m}$, $L_{\text{mean}} = 8.5 \mu\text{m}$, $W_{\text{mean}} = 2.9 \mu\text{m}$, $Q = 2.3\text{--}3.8$ (60 spores from 2 samples), with a small apiculus, contents hyaline or faintly yellowish, walls smooth, thin to distinct, CB+, IKI-.

Additional material examined: Numerous samples of *Peniophora limitata* from various parts of Europe and some from Iran were studied. For a list of samples see Yurchenko (2010) and Ghobad-Nejhad & Hallenberg (2012).

Remarks: The key of Andreasen & Hallenberg (2009) will indicate this species to be close to *Peniophora limitata*. *Peniophora metuloidea* resembles *P. limitata* by its pigmented basal layer, shape and size of basidiospores, slightly dark margin, and the presence of lamprocystidia, but it differs from *P. limitata* by the color of hymenium (bluish-grey to brown with silver hue in the latter) and by in average larger lamprocystidia often abruptly narrowed near apex (normally conical in *P. limitata*). Basal lamprocystidia in *P. metuloidea* often reach $18\text{--}24 \mu\text{m}$ in width and have dome-shaped thickenings of walls, so that they almost lack a lumen. Besides, subhymenium in *P. metuloidea* is less pigmented than in *P. limitata*.

Phlebia parva Ghobad-Nejhad sp. nov.

Fig. 3

Holotype: Azerbaijan, Lenkoran, *Parrotia persica* forest, alt. 0–30 m.b.s.l., on *Alnus barbata*, 15.X.1962, coll. E. Parmasto (TAAM 15882). Mycobank: MB 564339.

Etymology: ‘*parva*’ referring to the small basidiospores.

Paratype: Georgia, Adjara, Khulo, Bacho, alt. 1700 m, on *Abies nordmanniana*, 3.X.1963, coll. E. Parmasto (TAAM 16022).

Diagnosis: The species is distinguished by its resupinate, grayish to ochraceous brown basidiocarp with reddish tint, monomitic hyphal system with hard consistency, densely intricate and gelatinized hyphae with clamps, short fusoid cystidia and small suballantoid basidiospores.

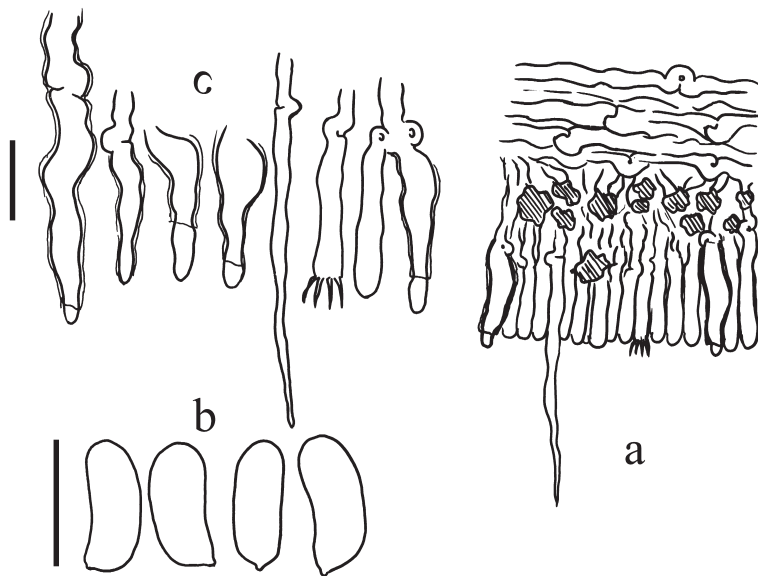


Fig. 3. *Phlebia parva* sp. nov. (holotype). a) Schematic sketch of a vertical section through basidiocarp. b) Basidiospores. c) Hymenial elements. Scale bars: b = 5 μ m, c = 10 μ m.

Basidiocarp annual, resupinate, closely adnate, ceraceous to crustaceous, confluent, 0.2–0.3 mm thick, hymenium surface with a pruina, grayish to ochraceous brown with reddish tint, irregularly tuberculate with smooth areas between tubercles, sparsely asperulate with minute teeth, margin finely fimbriate or indeterminate.

Hyphal system monomitic, all hyphae clamped, CB–, IKI–. Subhymenial (tramal) consistency very hard, hyphae gelatinized, crystallized with yellowish matter, densely intricate, individual hyphae very difficult to separate apart, 2.5–4 μ m wide, uneven, thin- to moderately thick-walled. Crystal lumps usually developing in subhymenium and eventually reaching the hymenium surface, yellowish, small or aggregated into large amorphous bodies, sometimes arranged as a horizontal layer in subhymenium. Subiculum 60–70(–100) μ m thick, composed of gelatinized, more or less horizontally arranged hyphae. Subicular hyphae hyaline, smooth, clamped, some clamps swollen, 5–8 μ m wide, walls thickened.

Basidia small, narrowly cylindrical, $20\text{--}25 \times 3\text{--}3.5 \mu\text{m}$, forming dense hymenial layer, with a basal clamp, thin-walled, bearing 4 thin sterigmata.

Cystidia of two types: 1) short fusoid, blunt, sinuous, $(17\text{--})20\text{--}30 \times 3\text{--}4\text{--}(6.2) \mu\text{m}$, mostly hymenial but also in subhymenium, enclosed, thin-walled, encrusted with resinous matter, contents hyaline, 2) narrow subulate, filiform, thin-walled, $27\text{--}40\text{--}(50) \times 3\text{--}3.5 \mu\text{m}$, projecting up to $20 \mu\text{m}$ above basidia.

Basidiospores small, suballantoid, $4\text{--}5\text{--}(5.3) \times 1.5\text{--}2.1 \mu\text{m}$, $L_{\text{mean}} = 4.5 \mu\text{m}$, $W_{\text{mean}} = 1.9 \mu\text{m}$, $Q = 1.9\text{--}3.1$ (60 spores from 2 samples), thin-walled, smooth, CB^- , IKI^- , contents hyaline, without oil-drops.

Additional material examined: *Phlebia serialis* (Fr.) Donk. Finland, Tavastia australis, Pirkkala, Hyrsinki, on ?*Picea*, 26.VIII.2004, Unto 3497 (H).

Phlebia subochracea (Bres.) J. Erikss. & Ryvarden. Finland, Satakunta, Pori, Kankaanpään lehtokorpi, NWW Kaskisto, on ?, 16.IX.1995, Vauras 10766F (H).

Phlebia subserialis (Bourdot & Galzin) Donk. Finland, Uusimaa, Tammisaari, Snappertuna, innerside of *Betula* bark, 8.IV.2000, Kotiranta 16737 & Saarenoksa (H).

Remarks: *Phlebia subochracea* also has more or less tuberculate basidiocarp and subulate cystidia as in *Ph. parva*, but the former has thinner and softer fruiting body with lighter colouration, and much larger and ellipsoid spores. Besides, *Phlebia parva* has denser tissue with indistinct individual hyphae, while in *Ph. subochracea* the tissue is more open with easily visible hyphae.

Microscopically, *Ph. parva* may resemble *Ph. subserialis* (Bourdot & Galzin) Donk, which however has longer spores, produces yellowish-ochre exudate in KOH, and lacks fusoid cystidia. Compared to *Ph. parva*, it has thinner, chiefly smooth basidiocarp with isabelline tint.

Encrusted fusoid cystidia and suballantoid spores in *Ph. parva* reminds of *Ph. serialis* (Fr.) Donk. However, the latter species has softer fruiting body which is much easier to dissect and squash, longer spores, no crystal lumps on hyphae, no subulate cystidia, and encrustations on its hyphae are reddish.

Acknowledgments

The curators and staff of herbaria H, IRAN and TAAM are warmly thanked.

Literature cited

- Andreasen M, Hallenberg N (2009) A taxonomic survey of the Peniophoraceae. *Synopsis Fungorum* 26: 56–119.
- Bernicchia A, Gorjón SP (2010) *Fungi Europaei* 12—Corticiaceae s.l. Edizioni Candusso, Italy. 1008 pp.
- Eriksson J, Ryvarden L (1973) *The Corticiaceae of North Europe*. Vol. 2: *Aleurodiscus – Confertobasidium*. Oslo: Fungiflora. Pp. 60–286.
- Ghobad-Nejhad M (2011a) Updated checklist of corticioid and poroid basidiomycetes of the Caucasus region. *Mycotaxon* 117: 508 (abstract) + 70 pp. <http://www.myco-lich.com/mycology-of-iran/basidiomycota/caucasus-region/checklists>
- Ghobad-Nejhad M (2011b) Wood-inhabiting basidiomycetes in the Caucasus region - systematics and biogeography. *Publications in Botany from the University of Helsinki*. No 40. 30 pp. Yliopistopaino. URL: <http://urn.fi/URN:ISBN:978-952-10-6816-4>
- Ghobad-Nejhad M, Hallenberg N (2012) Checklist of Iranian non-gilled/non-gasteroid hymenomycetes (Agaricomycotina). *Mycotaxon* 119: 494 (abstract) + 41 pp. Available at <http://www.myco-lich.com/mycology-of-iran/basidiomycota/checklists/National-checklist> .
- Ghobad-Nejhad M, Hallenberg N, Parmasto E, Kotiranta H (2009) A first annotated checklist of corticioid and polypore basidiomycetes of the Caucasus region. *Mycologia Balcanica* 6: 123–168.
- Jülich W (1972) *Monographie der Athelieae (Corticiaceae, Basidiomycetes)*. Willdenowia. Beihefte 7: 1–283.
- Mittermeier RA, Myers N, Mittermeier CG (eds) (1999) *Hotspots, Earth's biologically richest and most endangered terrestrial ecoregions*. CEMEX and Conservation International, Mexico City.
- Yurchenko E (2010) *The genus Peniophora (Basidiomycota) of central and eastern Europe, morphology, taxonomy, ecology, distribution*. Belorusskaya nauka, Minsk. 339 pp.