

New records of *Pseudomerulius montanus* (*Basidiomycota, Boletales*) in Czechia and Slovakia

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Kout J., Martínek O., Holec J., Zíbarová L. (2024): New records of *Pseudomerulius montanus* (*Basidiomycota, Boletales*) in Czechia and Slovakia. – *Czech Mycol.* 76(1): 95–110.

This article presents the first records of *Pseudomerulius montanus* in the Czech Republic and Slovakia. The species was found at colder localities in unmanaged forests. Basidiomata of *Pseudomerulius montanus* were found on dead wood of pine and spruce. Descriptions of its microscopic and macroscopic features are provided as well as a list of localities and notes on its ecology. Photographs of the macroscopic and microscopic features are included and differences from similar species are discussed.

Key words: *Leucogyrophana*, *Tapinellaceae*, merulioid fungi, lignicolous fungi, brown rot.

Article history: received 23 May 2024, revised 6 June 2024, accepted 11 June 2024, published online 25 June 2024.

DOI: <https://doi.org/10.33585/cmy.76107>

Kout J., Martínek O., Holec J., Zíbarová L. (2024): Nové nálezy *Pseudomerulius montanus* (*Basidiomycota, Boletales*) v Česku a na Slovensku. – *Czech Mycol.* 76(1): 95–110.

V článku jsou představeny první nálezy dřevomorky horské (*Pseudomerulius montanus*) v České republice a na Slovensku. Potvrzené nálezy pocházejí ze zachovalejších lesů z chladnějších lokalit. Dřevomorka horská byla zaznamenána na mrtvém dřevě borovice a smrku. Je uveden popis makroskopických a mikroskopických znaků, přehled lokalit a ekologie. Jsou přiloženy fotografie z binokulární lupy a mikroskopu a popsány rozdíly od podobných druhů.

INTRODUCTION

Pseudomerulius Jülich is a small genus of lignicolous fungi growing on decaying conifer wood (Jülich 1979). In the past, it was considered a member of the family *Coniophoraceae* Ulbr. with other species of similar genera having merulioid hymenophores, such as *Leucogyrophana* Pouzar and *Serpula* (Pers.) Gray (Donk 1964). It is currently included in the family *Tapinellaceae* C. Hahn of the *Boletales* order, together with the gilled genus *Tapinella* E.-J. Gilbert and the polypore *Bondarcevomyces taxi* (Bondartsev) Parmasto (Larsson 2007). Other genera of merulioid species in the *Boletales* do not belong to the *Tapinellaceae* but are members of different families (Binder et Hibbett 2006, Skrede et al. 2011): *Leucogyrophana* s.str. is currently classified in *Hygrophoropsidaceae* Kühner, *Serpula* in its own family *Serpulaceae* Jarosch et Bresinsky and the recent segregate of *Leucogyrophana*, the genus *Penttilamyces* Zmitr., Kalinovskaya et Myasnikov, in *Coniophoraceae* (Zmitrovich et al. 2019).

At present, there are two accepted species in the genus *Pseudomerulius* in Europe. Apart from *Pseudomerulius montanus* (Burt) Kotir., K.H. Larss. et M. Kulju, treated in this article, the only other member of the genus in Europe is the well-known type species *Pseudomerulius aureus* (Fr.) Jülich (Eriksson et al. 1981, Bernicchia et Gorjón 2010). Both species are macromorphologically characterised by resupinate or effused-reflexed basidiomata, brown, ochre or orange to yellow colours and the merulioid type of hymenophore. Microscopically, the spores are prominent by their cyanophilous reaction.

Pseudomerulius montanus is generally much lesser known than *P. aureus* and apparently much rarer in Europe, only known from a few countries. The species was originally collected on rotten wood of *Pinus monticola* in the Pacific Northwest region of the USA and described by American mycologist Edward Angus Burt as *Merulius montanus* Burt in his study on merulioid fungi of North America (Burt 1917). Later, Domański (1975) transferred it to the genus *Leucogyrophana* as *Leucogyrophana montana* (Burt) Domański. The same act by J.H. Ginns (Ginns 1976) was superfluous. However, the genus *Leucogyrophana* was later shown to be polyphyletic (Jarosch et Besl 2001, Skrede et al. 2011) with members distributed over several families. The name *Pseudomerulius montanus* was first used by Kotiranta et al. (2009), before valid publication of this combination. The actual combination of *L. montana* into the genus *Pseudomerulius* was published by Kotiranta et al. (2011), mainly based on the morphology of the subiculum. However, its generic position within the *Tapinellaceae* based on molecular data is still equivocal (Skrede et al. 2011).

Data on the distribution of *P. montanus* in Europe are quite sparse and the species seems to be rare here (Kotiranta et al. 2011). When the first (JK) and the second (OM) authors recorded the species in Kladské rašeliny National Nature

Reserve (NNR), there was no previously published record of *P. montanus* from the Czech Republic. However, the species had been already collected by the third author (JH), but the specimens were misidentified by Z. Pouzar as *Leucogyrophana mollusca* (Fr.) Pouzar and *Leucogyrophana sororia* (Burt) Ginns. As we came across another unpublished record of the species from Slovakia, we decided to publish this article summarising the distribution and ecology of *P. montanus* in both countries.

MATERIAL AND METHODS

The fieldwork in Kladské rašeliny NNR (Czech Republic) was part of a mycological survey (Martínek 2024). The specimen of *P. montanus* was collected there and studied in fresh condition. The remaining localities were revealed by studying herbarium specimens of selected merulioid *Boletales* from the main Czech mycological herbarium of National Museum in Prague (PRM). The Moravian Museum (BRNM) and Slovak National Museum (BRA) have no specimens of *P. montanus*. We further checked herbarium specimens from the University of Gothenburg (herbarium GB) and University of Oslo (herbarium O). Some of the specimens were deposited in PRM, Museum of Eastern Bohemia (HR), in the herbarium of the Faculty of Education, University of West Bohemia (here abbreviated as ZCU) and in the private herbarium of Lucie Zíbarová (L.Z.). Abbreviations of registered herbaria follow Index Herbariorum (<https://sweetgum.nybg.org/science/ih/>). Classification of naturalness of forests follows Adam et al. (2017).

The macroscopic and microscopic characters described below were studied on the material examined. Microscopic mounts were prepared from exsiccates in Melzer's reagent (IKI), Cotton Blue (CB), Congo red in ammonium solution and 5% potassium hydroxide (KOH). The mounts were studied under an Olympus BX51 microscope at 1000× magnification with an oil immersion lens. Twenty randomly selected spores were measured. The spores were measured directly under the optical microscope using an eyepiece micrometer in IKI. Xylotomic work was carried out by the first (JK) and the second (OM) authors.

Other abbreviations used: det. (identified by), leg. (collected by), NM (Nature Monument), NNR (National Nature Reserve), NP (National Park), NR (Nature Reserve), PLA (Protected Landscape Area), rev. (revised by), Q (quotient of length and width in any one basidiospore), SAC (Special Area of Conservation).

Specimens examined

Hydnomerulius pinastris (Fr.) Jarosch et Besl

Slovakia. Žilina Region. Oravská Magura Mts, Magurka, approx. 950 m a.s.l., trunk of *Picea abies*, 22 Sep 1983 leg. V. Holubová et F. Kotlaba, det. F. Kotlaba as *Leucogyrophana mollusca*, 18 May 2017 rev. Z. Pouzar (PRM 831965).

United Kingdom. England, Surrey. Windsor, Windsor Great Park, rotting woodchips, 22 Sep 1995 leg. et det. N.W. Legon, rev. J. Kout (O F-907547).

Leucogyrophana mollusca

Czech Republic. West Bohemia. Černošín (Tachov District), in margin of Černošínský bor NM, yellow-marked hiking trail, approx. 560 m a.s.l., under bark of stump of conifer tree, 4 Nov 2023 leg. et det. J. Kout (ZCU). – North Bohemia. Hříškov (Louny District), 400 m a.s.l., spruce plantation, stump of *Picea abies*, leg. et det. L. Zíbarová (herb. L.Z. 5141) – Krupka (Teplice District), Unčín, Unčínský potok, stream valley, 520 m a.s.l., mixed cultural forest, conifer stump in advanced

decay stage, 21 Oct 2022 leg. et det. L. Zíbarová (herb. L.Z. 10225). – South Bohemia. Třeboňsko PLA, Mirochov (Jindřichův Hradec District), Losí blato u Mirochova NR, 477 m a.s.l., bog pine forest, fallen thin log of *Pinus*, 8 Aug 2017 leg. et det. L. Zíbarová (herb. L.Z. 11245). – Hodonice (Tábor District), Židova strouha NM, ravine forest, fallen log of *Pinus*, 21 Oct 2017 leg. T. Tejtková et L. Zíbarová 2017, det. L. Zíbarová (HR B003734).

Slovakia. Bratislava Region. Ostrovné lúčky NR, *Pinus nigra* plantation, fallen thin log of *Pinus nigra*, 4 Nov 2019 leg. T. Tejtková et L. Zíbarová, det. L. Zíbarová (HR B002630).

USA. Tennessee. Great Smoky Mts, Gatlinburg, Cherokee Orchard, 8 Sep 1977 leg. et det. L. Ryvarden, rev. J. Kout (O F-907539).

Leucogyrophana cf. mollusca

Czech Republic. North Bohemia. Kokořínsko-Máchův kraj PLA, Doksy (Česká Lípa District), Břehyně-Pecopala NNR, SE of Břehyňský rybník Lake, 275 m a.s.l., waterlogged forest affected by bark beetle outbreak, fallen thin log of *Picea abies*, 7 Nov 2022 leg. et det. L. Zíbarová (herb. L.Z. 10315). – Bohemian Switzerland NP, Hřensko (Děčín District), Černý důl gorge, 260 m a.s.l., burnt young beech forest, burnt fallen log of conifer, 8 Aug 2023 leg. et det. L. Zíbarová (herb. L.Z.). – South Bohemia. Šumava PLA, Horní Vltavice (Prachatice District), Boubínský prales NNR, virgin spruce-beech-fir forest, roots of wind-fallen trunk of *Picea abies*, 23 Sep 2021 leg. L. Zíbarová et M. Kolényová, det. L. Zíbarová (herb. L.Z. 11247).

Leucogyrophana sororia

Czech Republic. North Bohemia. Břínkov (Louny District), WSW slope of Lavička hill, ca 380 m a.s.l., thermophilous oak forest, fallen thin log of *Pinus*, 3 Sep 2015 leg. et det. L. Zíbarová (herb. L.Z. 4835). – Domoušice (Louny District), W slope of Čihadlo hill, ca 450 m a.s.l., calcareous beech forest, fallen thin log of *Picea*, 2 Jul 2015 leg. et det. L. Zíbarová (herb. L.Z. 4274). – Nové Město (Teplice District), Moldava, 240 m SW of summit of Mt Bouřňák, 840 m a.s.l., acidophilous beech forest, fallen trunk of *Picea abies* (herb. L.Z. 3479). – Bohemian Switzerland NP, Jetřichovice (Děčín District), 950 m NE of the church, Havraní skála hill, 360 m a.s.l., birch-dominated successional stand 17 years after forest fire, hanging log of *Pinus sylvestris*, 1 Nov 2022 leg. L. Zíbarová et J. Běťák, det. L. Zíbarová (herb. L.Z.). – Krkonoše NP, Rokytnice nad Jizerou (Semily District), NW slope of Mt Kotel, plot AL-HP1, 1192 m a.s.l., 24 Sep 2016 leg. et det. L. Zíbarová (herb. L.Z. 11246). – Krkonoše NP, Pec pod Sněžkou (Trutnov District), Růžový důl, plot MD-DK1, 900 m a.s.l., 1 Sep 2017 leg. et det. L. Zíbarová (HR B004960). – East Bohemia. Orlické hory PLA, Orlické Záhoří (Rychnov nad Kněžnou District), Trčkov NNR, fallen dead log of *Abies alba*, 11 Aug 1998 leg. J. Slavíček, det. L. Zíbarová (HR P104342). – Černá Voda u Orlického Záhoří (Rychnov nad Kněžnou District), near Kunštátská kaple NR, montane spruce forest, fallen trunk of *Picea abies*, 15 Sep 2021 leg. T. Tejtková et L. Zíbarová, det. L. Zíbarová (HR B013361). – North Moravia. Jeseníky PLA, Bělá pod Pradědem (Bruntál District), Praděd NNR, montane spruce forest, fallen log of *Picea abies*, decay stage 3, 30 Aug 2017 leg. V. Pouska, det. L. Zíbarová (HR B017354).

Germany. Freistaat Bayern. Bayerischer Wald NP, Freyung-Grafenau, Reschbachklause, bark-beetle affected montane spruce forest, fallen thin log of *Picea abies*, 12 Aug 2017 leg. et det. L. Zíbarová (HR B004665).

Poland. Podlaskie Voivodeship. Białowieża, trunk of *Pinus sylvestris*, 29 Aug 1973 leg. et det. Z. Pouzar as *Leucogyrophana romellii*, 7 Oct 2008 rev. Z. Pouzar (PRM 844013).

Slovakia. Banská Bystrica Region. Nízke Tatry NP, Veľká Vápenica, 1400 m a.s.l., lying decaying branch of *Picea abies*, 7 Sep 1970 leg. F. Kotlaba, 8 Oct 2008 det. Z. Pouzar, rev. J. Kout et O. Martínek (PRM 803602). – Košice Region. Slovenský raj NP, Hornád valley, Letanovský mlyn, on trunk of *Abies alba*, 1 Oct 1986 leg. et det. F. Kotlaba, rev. J. Kout et O. Martínek (PRM 842566). – Henclová, Tichovodská dolina, trunk of *Abies alba*, 2 Oct 1986 leg. F. Kotlaba, det. F. Kotlaba et Z. Pouzar as *Leucogyrophana cf. montana*, 8 Oct 2008 rev. Z. Pouzar (PRM 842606).

United Kingdom. Scotland. Loch Maree, decaying branch of *Pinus sylvestris*, 12 Sep 1963 leg. F. Kotlaba, det. Z. Pouzar, rev. J. Kout et O. Martínek (PRM 846204).

Leucogyrophana cf. sororia

Czech Republic. North Bohemia. Pnětluky (Louny District), Kozinecká stráž NM, ca 450 m a.s.l., thermophilous oak forest, fallen thin log of conifer, 30 May 2014 leg. et det. L. Zíbarová (herb. L.Z. 2350).

Penttilamyces romellii (Ginns) Zmitr., Kalinovskaya et Myasnikov

Czech Republic. North Bohemia. Lužické hory PLA, Česká Kamenice (Děčín District), Studený vrch NR, 570 m a.s.l., ravine forest, fallen thin log of conifer, 16 Nov 2019 leg. et det. L. Zíbarová (HR B011575). – Bechlín (Litoměřice District), 1.4 km NW of the church, residual waste dump from paper mill, on earth and rocks, 26 Sep 2015 leg. et det. L. Zíbarová (herb. L.Z. 4930).

Penttilamyces cf. romellii

Czech Republic. South Bohemia. Bečice (Tábor District), Údolí Lužnice a Vlásenického potoka SAC, 375 m a.s.l., ash-alder alluvial forest, fallen log of *Picea abies*, 24 Oct 2019 leg. et det. L. Zíbarová (herb. L.Z. 7822).

Pseudomerulius aureus

Czech Republic. West Bohemia. Lesná (Tachov District), near Prameniště Kateřinského potoka NM, on dead trunk of *Pinus*, 24 Sep 2006 leg. et det. J. Kout (ZCU). – North Bohemia. Kokořínsko-Máchův kraj PLA, Doksy (Česká Lípa District), Břehyně-Pecopala NNR, south of Břehyňský rybník Lake, 274 m a.s.l., pine bog forest, fallen log of *Pinus sylvestris*, 23 Jul 2021 leg. et det. L. Zíbarová (herb. L.Z. 9395). – South Bohemia. Šumava PLA, Volary (Prachatic District), Velká niva NNR, 1.3 km SE of Ptáčnick hill, waterlogged spruce forest, fallen log of *Pinus sylvestris*, 22 Sep 2021 leg. et det. L. Zíbarová (herb. L.Z. 9516). – West Bohemia. Kašperské Hory (Klatovy District), near Chapel of Our Lady of Help, pine forest, fallen thin log of *Pinus sylvestris*, 2 Sep 2019 leg. T. Tejklová et L. Zíbarová (HR B003754).

USA. Tennessee. Great Smoky Mts, Loudon County, Cades Cove, 5 Sep 1977 leg. et det. L. Ryvarden, rev. J. Kout (O F-908803).

Pseudomerulius montanus

Czech Republic. West Bohemia. Kladská (Cheb District), Kladské rašeliny NNR, part named Tajga, 800 m a.s.l., natural forest, waterlogged pine forest with *Sphagnum*, lying branch of *Pinus uncinata* subsp. *uliginosa*, 24 Sep 2023 leg. et det. J. Kout et O. Martínek (PRM 961042, duplicate ZCU). – North Bohemia. Bohemian Switzerland NP, Jetřichovice (Děčín District), ca 0.7 km WSW of the village of Vysoká Lípa (Lípa Hotel), in Kamenice river valley between sites named Kostelní stezka and Šindelový důl, 190 m a.s.l., near-natural forest, mixed forest on sandstone bedrock: *Picea*, *Fagus*, *Carpinus*, *Fraxinus*, *Corylus*, decaying trunk of *Picea abies*, 20 May 2005 leg. J. Holec, 23 April 2010 det. Z. Pouzar as *Leucogyrophana sororia*, 4 April 2017 rev. L. Zíbarová (PRM 922336); ca. 2.5 km N of Jetřichovice, site named Medvědí díry: narrow and wet gorge among sandstone rocks, ca 50°52'28.4" N, 14°24'06.3" E (maximum error 150 m in the direction of the gorge), 330–400 m a.s.l., near-natural forest, *Picea* forest with admixed *Fagus*, with *Sphagnum* and *Polytrichum*, decaying trunk of conifer, 28 Sep 2012 leg. J. Holec, det. Z. Pouzar as *Leucogyrophana romellii*, rev. J. Kout et O. Martínek (PRM 860824).

Slovakia. Žilina Region. Veľká Fatra Mts, Mt Tlstá, approx. 1100 m a.s.l., lying trunk of *Picea abies*, 19 Sep 1971 leg. F. Kotlaba, 7 Oct 2008 det. Z. Pouzar, rev. J. Kout et O. Martínek (PRM 845880).

South Africa. Eastern Cape. Tsitsikamma NP, Natures Valley, beginning of Grookloof forest trail, indigenous forest, on *Podocarpus*, 31 Jan 2005 leg. et det. N. Hallenberg, rev. J. Kout et O. Martínek as *P. aff. montanus* (GB-0157284, GB-0157290).

RESULTS

Pseudomerulius montanus (Burt) Kotir., K.H. Larss. et M. Kulju, in Kotiranta, Larsson, Saarenoksa et Kulju, Ann. Bot. Fenn. 48(1): 45, 2011 Figs 1–4

Basionym: *Merulius montanus* Burt, Ann. Missouri Bot. Garden 4: 354, 1917

Synonym: *Leucogyrophana montana* (Burt) Domański, Mała fl. grzybów 1(2): 57, 1975

Macromorphology. Fresh basidiomata fully resupinate, at first consisting of small patches, 1–1.5 × 0.5–1 cm, then merging into composite basidiomata several centimetres long, under 1 mm thick, flexible, becoming fragile and loosely attached to the substrate in dried conditions. Hymenophore meruliod, becoming smooth or wrinkled after drying, brown with violet tint, brown to light brown or ochre, lighter towards margin, dead parts becoming dark brown, margin whitish up to pure white, byssoid, without rhizomorphs. Subiculum yellowish to greenish white.

Micromorphology. Hyphal system monomitic, hyphae clamped. Clamps nodose, ampullate, open, variable in dimension. Subhymenial hyphae thin-walled, 2–4 µm wide, some rough by yellowish crystalline matter, branched. Subicular hyphae thin-walled, 2–8 µm in diam. Hyphal strands present. Hyphae slightly swelling in KOH. Cystidia not seen. Basidia clavate, 4-spored. Spores (2.9)3.2–4.0(4.2) × 2.0–3.0 µm (Q = 1.27–1.75), smooth, ellipsoid to broadly ellipsoid, thick-walled, with inconspicuous apiculus, strongly dextrinoid in IKI, strongly cyanophilous in CB, yellowish in KOH.

Ecology. Three records of *P. montanus* from the Czech Republic and Slovakia are from forests little affected by human activity. Kladské rašeliny NNR can be classified as a natural forest, and the two localities in Bohemian Switzerland NP represent near-natural forests according to Adam et al. (2017). The locality in Slovakia would be classified as natural forest (Adam et al. 2017) but we do not know the exact character of its habitat more than 50 years ago. All localities have a relatively cold climate, while Kladské rašeliny NNR (Czech Republic) and Velká Fatra Mts (Slovakia) are located at (sub)montane elevations, and the localities in Bohemian Switzerland NP (Czech Republic) situated in deep sandstone gorges influenced by climatic inversion, providing a cold microclimate despite their low altitude (Holec et Wild 2011). All specimens were recorded on dead wood of conifers (*Picea abies*, *Pinus uncinata* subsp. *uliginosa*).

The material from Kladské rašeliny NNR (approx. 800 m a.s.l.) was found in the middle of the peat bog on wood of *Pinus uncinata* subsp. *uliginosa* (confirmed by xylotomy). The substrate was a lying branch approx. 2 × 0.1 m in size, without bark, and with brown rot. The wood was still relatively hard, in decay stage 3 according to Renvall (1995). There were no other species of fungi on the



Fig. 1. *Pseudomerulius montanus*. Czech Republic, Bohemian Switzerland NP, fresh specimen (PRM 922336). Photo J. Holec.

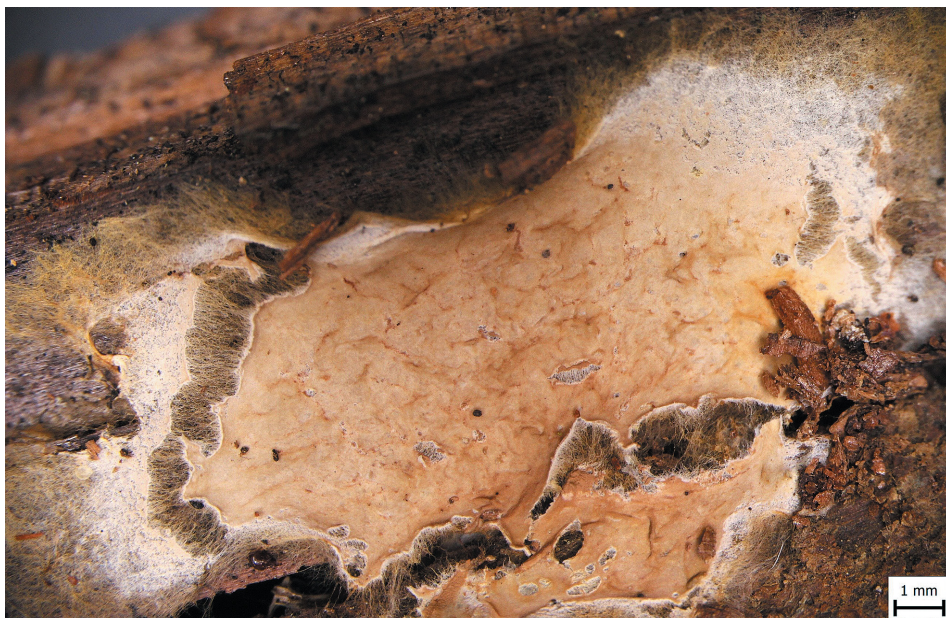


Fig. 2. *Pseudomerulius montanus*. Czech Republic, Kladské rašeliny NNR, dried specimen (ZCU). Photo J. Kout.

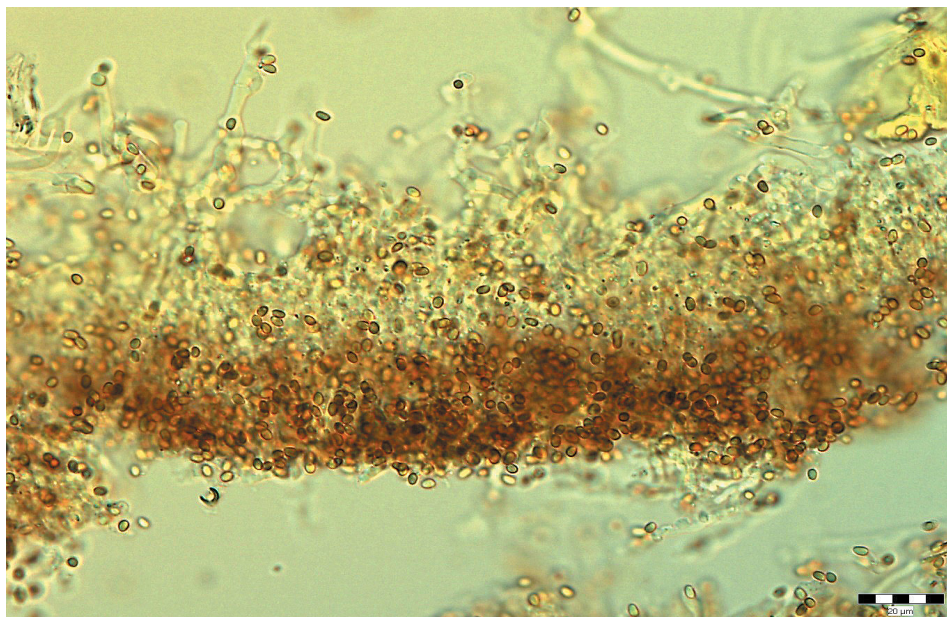


Fig. 3. *Pseudomerulius montanus*. Czech Republic, Bohemian Switzerland NP, hymenium in Melzer's reagent (PRM 860824). Scale bar = 20 µm. Photo J. Kout.

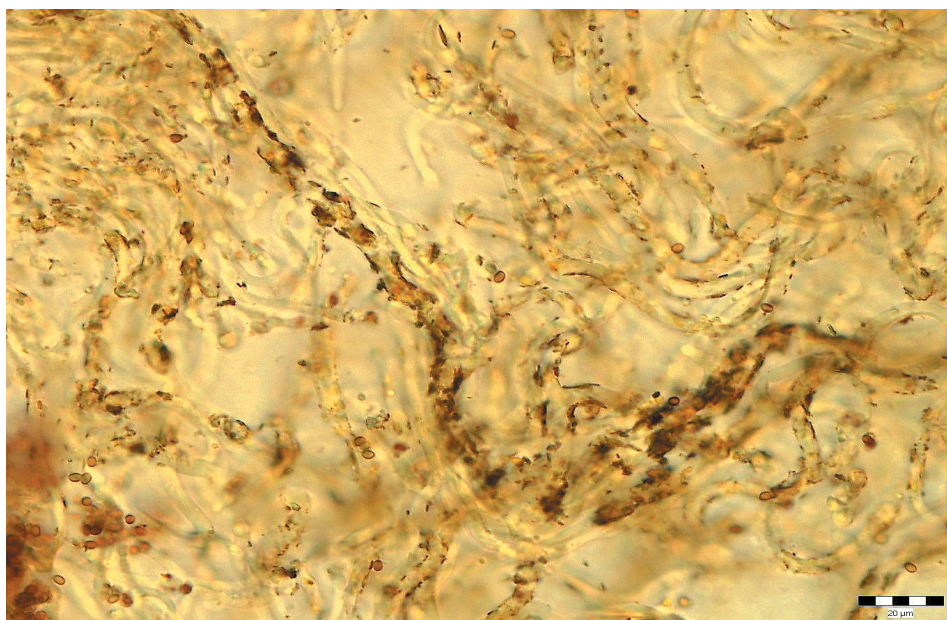


Fig. 4. *Pseudomerulius montanus*. Slovakia, crystals on hyphae in Melzer's reagent (PRM 845880). Scale bar = 20 µm. Photo J. Kout.

same branch. However, *P. aureus* was found at the observed locality, too (Martínek 2024). The material from the Bohemian Switzerland National Park was found on decaying trunks of conifers (*Picea abies* and a conifer, most probably also *Picea abies* according to the tree layer composition) in mixed forests dominated by *Picea* and *Fagus* on acidic sandstone bedrock. The specimen from Slovakia was collected in a montane forest (above 1000 m a.s.l.) on wood of *Picea abies*, most probably decorticated, as the basidiomata exhibit no traces of bark. It seems that the soil pH of the new localities of *P. montanus* is low (judging from the character of the habitat: peat bog, forests on sandstone), except for the location in Slovakia with limestone bedrock. However, the pH at the last-mentioned locality may have been reduced by the coniferous forest.

We visited one of the localities of *P. montanus* in Bohemian Switzerland (Kamenice valley) in 2023 to confirm presence of the species, but without success. The locality was affected by a bark beetle (*Ips typographus*) outbreak and subsequent dieback of spruce. While the species may still be present but overlooked, its occurrence could be negatively affected by the change in microclimate due to canopy opening.

DISCUSSION

Distribution and ecology

We recorded the rare species *P. montanus* in the Czech Republic and confirmed it from Slovakia for the first time. This species was described by Burt (1917) from North America (Idaho, USA) and has been recorded from both the western and eastern part of North America (Ginns 1978). In Europe, it is known from several countries: Estonia, Finland, Germany, Norway, Russia, Sweden, and Switzerland (Große-Brauckmann 1987, Kotiranta et al. 2011, Kotkova et al. 2018, Hoem on-line, Liljeblad on-line, Martini on-line, Pärtel on-line). The first European record of *P. montanus* came from Germany in 1983 and only two more finds were made there in subsequent years (Große-Brauckmann 1987) until another record from 2019 (DGfM online). One locality of *P. montanus* is known from South Africa, where it was found on the gymnosperm *Podocarpus* by Nils Hallenberg in 2005 (see also Specimens examined). As these specimens look slightly different from European records, N. Hallenberg identified them as *Leucogyrophana montana* s.l. The colouration in dried specimens lacks a brownish tint, more like *L. sororia*, and spores are slightly larger ($4\text{--}5 \times 2.5\text{--}3 \mu\text{m}$). There is no sequence of *P. montanus* available from North America, so its identity and occurrence on other continents is based on morphological similarities only. It would be highly

desirable to compare the existing sequence of European material (GenBank GU187665) with some American specimens to verify that this is the same species.

In central Europe, *P. montanus* has been found in different habitats. The first specimens from Germany (State of Hesse) were found on non-native *Pinus strobus* only (Große-Brauckmann 1987), suggesting the interesting possibility of an introduction of *P. montanus* to Europe. Similarly, in Switzerland it seems that the record is from a non-natural forest (Martini on-line). However, records from Finland and Russia suggest a circumboreal distribution. Kotiranta et al. (2011) found *P. montanus* in acidic, pine-dominated heath forest. The records of *P. montanus* from the Czech Republic and Slovakia are from forests little affected by man, too, and they share a cold microclimate with the Fennoscandian records. The species was assessed as critically endangered in the new Red List of Fungi of the Czech Republic (Zíbarová et al. 2024).

In North America, *P. montanus* was collected from wood of pines (*Pinus contorta*, *P. monticola*, *P. strobus*) and unidentified gymnosperms, associated with crumbly brown rot (Ginns 1978). Similarly, in Europe, all previous records are from gymnosperms, most of them pines, namely *Pinus sylvestris* (Kotiranta et al. 2011, Kunttu et al. 2020) and the introduced *Pinus strobus* (Große-Brauckmann 1987). There are also records on *Picea abies* (Kotkova et al. 2018, DGfM on-line, this work) and newly on *Pinus uncinata* subsp. *uliginosa* (this work). We have not found any published records of *P. montanus* from angiosperm wood.

Similar species

Morphologically, *Pseudomerulius montanus* could be confused with similar merulioid genera of the *Boletales* such as *Hydnomerulius*, *Leucogyrophana*, *Penttilamyces*, and *Serpula* (Bernicchia et Gorjón 2010, Zmitrovich et al. 2019). According to these works, *Pseudomerulius montanus* is mainly characterised by its small dextrinoid and strongly cyanophilous spores together with its hymenophore in brownish (or brownish violaceous) shades. Both Große-Brauckmann (1987) and Kotiranta et al. (2011) illustrate projecting cystidia (cystidioles) in *Pseudomerulius montanus*, but we could not confirm the presence of such elements in our material, nor are they mentioned in other descriptions of the species (Ginns 1968, 1978, Martini on-line). Similar species of *Leucogyrophana* and *Penttilamyces* have larger spores and/or brighter tints of basidiomata (Figs 8, 9, 10). The most similar European species to *P. montanus* is possibly *Leucogyrophana sororia* with pale-coloured hymenophores (Figs 5, 6), a white subiculum and similar (only slightly larger) spores, but lacking a strong dextrinoid reaction (Fig. 7). Brownish hymenophore colours may be present in *Serpula himantioides* (Fr.) P. Karst., but the genus *Serpula* (*Serpulaceae*) has remarkably larger spores, too, and a dimitic hyphal system. Although the irpicoid hymenophore in well-developed



Fig. 5. *Leucogyrophana sororia*. Czech Republic, Mt Kotel, fresh specimen (herb. L.Z. 11246). Photo L. Zíbarová.



Fig. 6. *Leucogyrophana sororia*. Slovakia, Nízke Tatry NP, dried specimen (PRM 803602). Photo J. Kout.

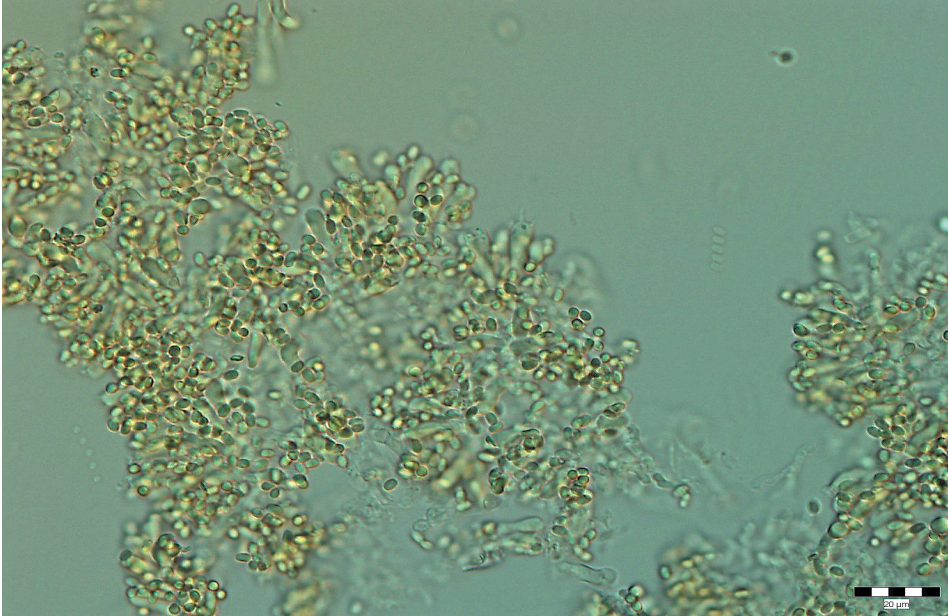


Fig. 7. *Leucogyrophana sororia*. Poland, Białowieża, hymenium in Melzer's reagent (PRM 844013). Scale bar = 20 µm. Photo J. Kout.

basidiomata of *Hydnomerulius pinastri* (Fr.) Jarosch et Besl allows for easy separation from *P. montanus* already in the field, it should be noted that its hymenophoral configuration changes considerably during basidioma development, being initially smooth, later becoming merulioid and finally irpicoid to hydroid (Jarosch et Besl 2001, Bernicchia et Gorjón 2010). However, *H. pinastri* has larger and less dextrinoid spores than *P. montanus*. *Pseudomerulius aureus*, the only other member of *Pseudomerulius* occurring in Europe, shares the small spores with *P. montanus*, but *P. aureus* spores lack a strong dextrinoid reaction and possess a completely different shape (cylindrical to subballantoid). Moreover, its hymenophore is clearly coloured in bright yellowish orange shades (Fig. 11) and its basidiomata tend to be semipileate (Eriksson et al. 1981, Bernicchia et Gorjón 2010). The extra-European *Pseudomerulius curtisii* (Berk.) Redhead et Ginns is morphologically strikingly different, as it forms well-developed pilei reminding *Tapinella panuoides* (Fr.) E.-J. Gilbert and its hymenophores form rather irregular, wavy lamellae (Baldoni et al. 2012). The remaining species *Pseudomerulius elliottii* (Masse) Jülich is today considered a synonym of *Hydnophlebia chrysorrhiza* (Eaton) Parmasto (Nakasone 2012).



Fig. 8. *Leucogyrophana mollusca*. Czech Republic, Židova strouha NM, fresh specimen (HR B003734). Photo L. Zíbarová.



Fig. 9. *Leucogyrophana mollusca*. Czech Republic, in margin of Černošínský bor, dried specimen (ZCU). Photo J. Kout.



Fig. 10. *Penttilamyces romellii*. Czech Republic, Studený vrch NR, fresh specimen (HR B011575). Photo L. Zíbarová.



Fig. 11. *Pseudomerulius aureus*. Czech Republic, Velká niva NNR, fresh specimen (herb. L.Z. 9516). Photo L. Zíbarová.

ACKNOWLEDGEMENTS

We are thankful to Prof. K.-H. Larsson (Natural History Museum, University of Oslo) for confirming our identification of the specimen from Kladské rašeliny NNR and permitting us to study the specimens in Oslo (University of Oslo, herbarium O). Further thanks go to Dr. E. Larsson (University of Gothenburg, herbarium GB) and P. Zehnálek (National Museum in Prague, herbarium PRM) for arranging a loan of reference specimens. We are grateful to Prof. N. Hallenberg for his notes on the specimens from South Africa, Dr. V. Antonín (Moravian Museum) and Dr. I. Kautmanová (Slovak National Museum) for providing information on the absence of *P. montanus* in their herbaria, and Dr. I.G. González from the University of Santiago de Compostela (Spain) for confirming our wood xylo-tomy determination. This paper was financially supported by a student scholarship (BAMAPE24) at the University of West Bohemia (under project number 03/2024). The work of J. Holec was financially supported by the Ministry of Culture of the Czech Republic (DKRVO 2024–2028/3.I.a, 00023272).

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