

***Donkioporia expansa* (Fungi, Basidiomycota), an indoor wood destroyer, is also a prominent species of thermophilic old-growth forests with oak**

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Abstract

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The study deals with a rare polypore *Donkioporia expansa* and environmental parameters of its habitats, primarily using data from newly discovered sites in Slovakia and Czechia. This species prefers either thermophilic forests of lower altitudes, with dominant Sessile oak (*Quercus petraea*) or Turkey oak (*Quercus cerris*), or steep, sun-exposed slopes situated at higher elevations (350–676 m). All records in nature are from old-growth forests and oak wood in advanced initial to moderate decay stages. The occurrences in buildings are secondary; the fungus was likely introduced there either in construction timber or via spores. The growth conditions of *D. expansa* mycelium and basidiomata are summarized. Despite the increase of the number of recent localities and records, the species is rare and deserves both inclusion in Red Lists and protection. Its survival in most localities is ensured because most of them are in nature reserves.

Keywords

Czechia, natural forests, *Quercus petraea*, *Quercus cerris*, Slovakia, wood decay

Introduction

The public interest and subsequent targeted mycological research on fungi of old-growth forests in Europe is growing (e.g. DVOŘÁK et al., 2017; KOMONEN et al., 2021; FERENČÍK et al., 2022; MAJDANOVÁ et al., 2023; NIRHAMO et al., 2025). Slovakia and Czechia are no exception (e.g. ADAMČÍK et al., 2016; UJHÁZY et al., 2018; HOLEC et al., 2019a, b, c; HOLEC and KUČERA, 2020; KUNCA et al., 2022; HOLEC et al., 2022, 2023, 2024; KOLÉNYOVÁ et

al., 2024; KUNCA and ČILIAK, 2025). However, the knowledge on fungi in thermophilic oak-dominated forests is incomplete. These forests are less frequent and not uniformly distributed in Europe (MIKOLÁŠ et al., 2019), which can be attributed to the topography of the landscape and the fragmentation of the forests due to millennia of human activity.

A significant component of old-growth forests is decaying wood and the associated organisms. Among fungi associated with the decaying wood polypores play a crucial role. They have strong wood-decomposition abilities

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and comprise more than 4,000 species with complex morphology and ecology (ZHAO et al., 2026). Urban environments generally offer less favourable habitats for most wood-inhabiting fungi including polypores (KORHONEN et al., 2022), due to limited ability of available substrate. However, there are exceptions, such as the generally rare species *Donkioporia expansa* (Desm.) Kotl. and Pouzar (RYVARDEN and MELO, 2017). In fact, high proportion of the available occurrence data relate to its records from structural timber in buildings and mines (KOTLABA, 1984; SINGH, 1994; SZABÓ and VARGA, 1995; KLEIST and SEEHANN, 1999; SCHMIDT, 2006; BOBEKOVÁ et al., 2008; FRAITURE, 2008; VAMPOLA, 2008; ADAN and SAMSON, 2011; RIVOIRE, 2020; ANDRES et al., 2022). This white-rot fungus is found in the wood of broad-leaved trees, particularly oak (SINGH, 1994; FRAITURE, 2008), but also of spruce, pine (SZABÓ and VARGA, 1995; SCHMIDT, 2006) and fir (VAMPOLA and CHARVÁTOVÁ, 2021). According to SINGH (1994) this species has the potential to cause more exten-

sive damage to oak wood than any other fungal species in buildings. In contrast, *D. expansa* was considered rare in the wild and found primarily on oak wood in natural habitats (RYVARDEN and GILBERTSON, 1994; VLASÁK et al., 2010; VAMPOLA and CHARVÁTOVÁ, 2021).

The basidiomata of *D. expansa* are perennial, resupinate, first whitish, later ochre, reddish-tobacco-to-rusty brown, and grey with ageing (Fig. 1). They are characterised by thin, plate-shaped, or thick, hard, frequently multi-layered structure, with a whitish surface colouration and brown flesh. The basidiomata observed by us in the field measured up to 50 centimetres in length and were up to 3 cm thick. Actively growing basidiomata exude saffron to orange-red droplets. When older, they resemble resupinate species of the genus *Phellinus* sensu lato (*Fomitiporia robusta* or *Fuscoporia contigua*). Microscopically, *D. expansa* differs from *Phellinus* primarily by the clamped generative hyphae and absence of setae (RYVARDEN and MELO, 2017).



Fig. 1. *Donkioporia expansa*, variability in the appearance of basidiomata in nature. a: Velká Pleš, PRM 944241, very young basidioma exuding droplets. Photo by M. Kříž. b: Velká Pleš, PRM 944240, young basidioma with traces of drops. Photo by M. Kříž. c: Brvenô, PVKU 3153, mature basidioma in fresh state. Photo by V. Kunca. d: Močadlo, PVKU 3063, young basidioma growing on last year's basidioma. Photo by V. Kunca. e: Jirina, PRM 964009, mature basidioma in dry state. Photo by M. Kříž. f: Čtvrť, PRM 955108, old senescent basidioma growing on last year's basidioma, the green spots are coatings of *Trichoderma*. Photo J. Holec. For details on collections see Electronic Supplement: Table 1.

Donkioporia expansa is distributed across Europe and in North and South America, Asia, Africa, and Australia (DAI, 2012; RYVARDEN and MELO, 2017; Global Biodiversity Information Facility (GBIF), available at <https://www.gbif.org/>, accessed 30 January 2026). In Europe, it often occurs on structural timber, predominantly of *Quercus*, but in nature, in addition to oak, it is also known from the wood of *Castanea*, *Fraxinus*, *Populus*, *Prunus* and *Ulmus*. Its original habitats are warm and dry forests (RYVARDEN and MELO, 2017) in England, Belgium, the Netherlands, France, Switzerland, Germany, northern Italy, Austria, Czechia, Slovakia, Hungary, Slovenia, and Bulgaria (RYVARDEN and GILBERTSON, 1993; RIVOIRE, 2020; VAMPOLA and CHARVÁTOVÁ, 2021; Global Biodiversity Information Facility, available at <https://www.gbif.org/>, accessed 30 January 2026). Interestingly, *D. expansa* was not reported from the Mediterranean region by BERNICCHIA and GORJÓN (2020). *D. expansa* appears to be a species from the temperate zone of Europe, no findings are known from northern Europe. The species is red-listed as a vulnerable (VU) in Czechia (ZÍBAROVÁ et al., 2024). In the new red list of the fungi in Slovakia (PEIGER et al., in review), it is classified as an endangered species (EN).

In accordance with the call for more biological samples with their associated information (ANTONELLI et al., 2025) and the fact that unique fungal diversity in thermophilic forests has been underestimated, this paper presents and evaluates new localities and exhaustive ecological data on the natural occurrences of *D. expansa* in Slovakia and Czechia, with particular attention to selected environmental parameters. Data from other countries were not included because the available sources do not contain sufficiently detailed information on records that could be adequately compared with our data from Slovakia and Czechia. The aim is to better understand the ecological and environmental requirements of the species in this part of Europe. Records from structural timber are also discussed.

Materials and methods

Data collecting and sampling

The formation of the dataset utilised in this study commenced with the compilation of a register of voucher specimens in the most prominent Slovak and Czech herbaria (BRA, BRNM, BRNU, CB, HR, MJ, PRM), followed by a comprehensive literature review. Acronyms of public herbaria are in accordance with the Index Herbariorum (available at <https://sweetgum.nybg.org/science/ih/>). Moreover, new sites have been discovered by the authors in the years 2010–2025 (Electronic Supplement: Table 1). The dataset encompasses all sites known to authors in the Slovak and Czech Republics. The primary data was collected by two different ways. The first was an extensive survey of numerous localities in Slovakia and Czechia, and the second was an intensive fungal monitoring of fallen trunks at selected localities in oak-dominated forest ecosystems.

Three datasets were collected for the study:

- Slovak and Czech records after 2000 with detailed data used for statistical evaluations (Electronic Supplement: Table 1).
- historical records from natural habitats (until 2000) with less detailed or missing locality/habitat data (Electronic Supplement: Table 2),
- records from buildings and constructions (Electronic Supplement: Table 3).

Voucher specimens are deposited in public herbaria of the Mycological Department of the National Museum, Prague (PRM) and Museum of Vysočina, Jihlava (MJ), Museum of East Bohemia in Hradec Králové (HR) and personal fungaria of Josef Vlasák (JV), Lucie Zíbarová (L. Z.) and Vladimír Kunca (PVKU). Most specimens were revised by P. Vampola. Two specimens of Andrej Kmeť on logs from 19th century cited by KOTLABA (1984) were not found in BRA herbarium.

Localities, habitats and naturalness

Coordinates and elevation of the most records were derived directly in the field using global navigation satellite system (via handheld GPS devices or mobile phones) or from maps based on coordinates (this applies to most elevation data). For older records with limited data, this information was added secondarily by the authors with the greatest possible degree of accuracy according to the available data on herbarium labels. If not given on herbarium labels, the character of the habitat of individual records, such as the presence of particular tree species and/or the specific geographical location in landscape, was interpreted from the label information.

In Slovakia (SK), the exact habitat units were assigned for only eight recent sites (out of thirteen), namely those described on the Primeval Forests of Slovakia – Localities website (available at <https://www.pralesy.sk/lokality/>).

The nomenclature of habitats corresponds with classification of ŠUVADA (2023). For the Czech Republic (CZ), habitats were characterized according to map data available through the Nature Conservation Portal of the Czech Republic – Habitats (available at <https://portal.nature.cz/biotopy>), using the vegetation units defined in the Habitat Catalogue of the Czech Republic (CHYTRÝ et al., 2010). Nomenclature of the vegetation units is in Electronic Supplement: Table 4.

The degree of sites naturalness in SK was derived from an unpublished map associated with the research conducted by JASÍK et al. (2017). The potential inclusion of the studied localities in the list of old-growth forests (defined as a minimum area of 20 ha) and their remnants (defined as a minimum of 5 ha within an area of up to 20 ha) in Slovakia was considered (www.pralesy.sk/lokality/). For Czech records, the GIS map layer of the Czech natural forests' databank (available at naturalforests.cz/czech-natural-forests-databank) was used. For methods of forest naturalness evaluation in the Czech Republic (CZ) and explanation of the terms “virgin, natural, near-natural forest”, see web page Proposal for terminol-

ogy standardization (available at <https://naturalforests.cz/databank-terminology-proposal-for-terminology>).

The mean inclination values were obtained from various cartographic sources, mainly from forestry maps (for SK, the Information System of Forest Management Planning – Slovakia (available at <https://gis.nlc.sk.org/islhp/mapa>); for CZ, the National Forest Inventory Geoportal – Czech Republic (available at <https://ga.nli.gov.cz/DsNli/Iles/>)).

Substrate parameters

The trunks inhabited by *D. expansa* were classified into decay stages from 1 to 5 using a visual decay stage system (HEILMANN-CLAUSEN, 2001): (1) trunks covered with bark without visible signs of decay, (2) decay signs indistinct, wood and bark weakly disrupted, (3) wood decay distinct, bark partially loosening or cracking, (4) wood strongly damaged, soft, but still with a visible structure, in the most parts without bark, (5) rotten to almost humified trunks. We are aware that decay of oak trunks may be different (see, for example, the discussion in HOLEC et al., 2019a), but in our case it was generally not a problem to determine the decay stage according to this scale.

It was observed that some trunks were positioned on the ground while others were supported by neighbouring trunks or rocks and were thus partially or completely raised above the ground. A segment of a tree trunk in direct contact with the soil was evaluated as a ground contact (in %).

Molecular identification

The DNA extraction, amplification, and sequencing of nr ITS1–5.8S–ITS2 (ITS) were performed from 5 specimens (MJ7681, PVKU3527, PVKU4239, PVKU4494, PRM 955108) according to Tomšovský et al. (2025). The ITS dataset was completed with sequences of *D. expansa*, *D. albidofusca*, *Donkioporiella mellea* and *Pyrofomes demidoffii* obtained from the GenBank. The phylogenetic inference based on maximum likelihood criteria was conducted by IQ-Tree, featuring automatic model selection (ModelFinder) and ultrafast bootstrapping with 10,000 replicates. The analysis was performed in Galaxy, version 2.4.0+galaxy1 (MINH et al., 2020; Galaxy Europe (available at <https://usegalaxy.eu>)).

Results

Identity and distribution

The ITS nrDNA sequences were successfully obtained of 5 studied specimens. Phylogenetic analysis confirmed the conspecificity of our specimens with already published sequences of *D. expansa* (Fig. 2). The newly obtained sequences were deposited in the Genbank (MJ7681 : PZ094188, PVKU3527 : PZ094189, PVKU4239 : PZ094190, PVKU4494 : PZ094191, PRM 955108 : PZ094187).

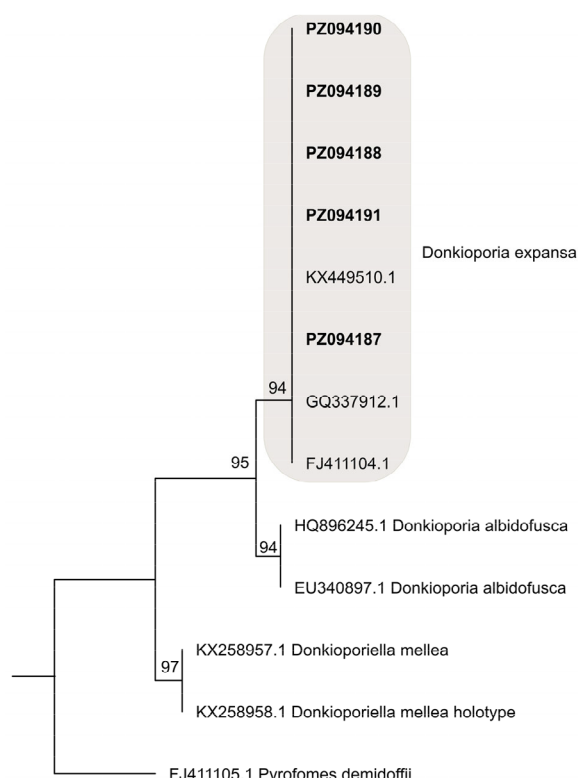


Fig. 2. The phylogenetic position of sequenced specimens of *Donkioporia expansa*. The newly obtained sequences are highlighted in bold. Numbers at branches indicate maximum likelihood bootstrap proportion. The bar indicates number of expected substitutions per position.

A total of 70 records of *D. expansa* from Slovakia (SK) and Czechia (CZ) were gathered, 57 of which are documented by voucher specimens. Historical records from natural habitats before 2000 are infrequent (Electronic Supplement: Table 2). Twenty of the records originate from buildings or other man-made objects (bridge, hut or “cave” – probably in meaning of root cellar) (Electronic Supplement: Table 3). The evaluated records from natural habitats after 2000 represent 13 sites in SK and 6 in CZ (Electronic Supplement: Table 1, Fig. 3). Elevation of the records from natural habitats ranges from 165 to 676 metres.

Habitats and naturalness

Several types of oak-dominated forests have been identified as the habitat of *D. expansa*. In SK, the prevailing habitat is that of the Carpathian oak-hornbeam forest. For sites in the lower elevations, habitat of Thermophilous submediterranean oak forests was also frequent. In some other SK sites, their submontane character is notable. Several sites in higher elevation are often transient to mixed oak-beech forests known as Submontane flowering beech forests. In addition, the presence of Thermophilous scree and ravine forests of lower altitudes is also a distinguishing feature of several sites, namely those poorly accessible for forestry

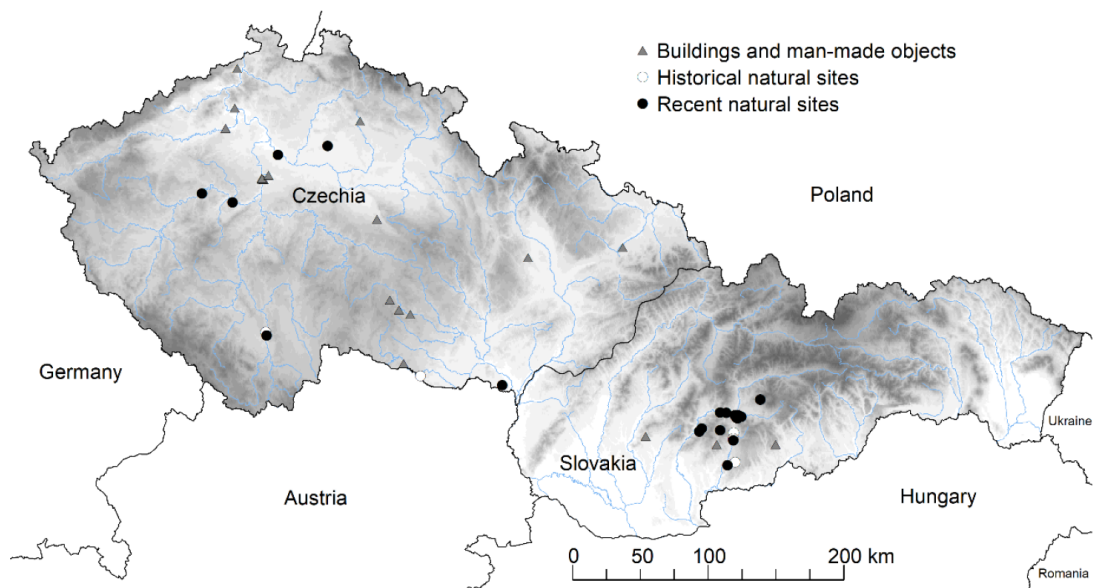


Fig. 3. Localities of *Donkioporia expansa* in the Slovak and Czech Republics (historical records from natural habitats until 2000 – white dot, records from buildings and constructions – grey triangle, recent records from natural habitats after 2000 – black dot).



Fig. 4. Examples of habitats and oak trunks inhabited by *Donkioporia expansa*. – a: Nature Reserve Pralesy Slovenska Brvenô, submontane oak forest, fallen trunk of *Quercus petraea* lying on the ground, collection PVKU 3153. Photo by V. Kunca. b: National Nature Reserve Mäsiarsky bok, submontane oak forest, fallen trunk of *Quercus petraea* lying on the ground, collection PVKU 3459. Photo V. Kunca. c: National Nature Reserve Velká Pleš, acidophilous thermophilous oak forest, fallen trunk of *Quercus petraea* lying on the ground, basidioma not documented by voucher. Photo by M. Kříž. d: National Nature Reserve Koda, Hercynian oak-hornbeam forest, fallen trunk of *Quercus petraea* leaning against the surrounding trees, collection L. Z. 10586. Photo by L. Zibarová.

to manage. In CZ, *D. expansa* mostly occurs in vegetation classified as Hercynian oak-hornbeam forests (localities Velká Pleš, Koda, Čtvrtě), but also in acidophilous thermophilous oak forest without *Genista pilosa* (Velká Pleš), dry acidophilous oak forest (Baba), Pannonian thermophilous oak forest on sand (Rendez-vous), and hardwood forest of lowland rivers (Jiřina) (Fig. 4). The records from CZ are mostly located in the colline belt (200–500 m asl), rarely in the lowland (up to 200 m asl). The Slovak sites are from higher elevations (350–676 m asl) belonging to the colline and submontane belts.

The recorded slope exposure varies but south-west is predominant (18 trunks, 6 of them are from the same locality Velká Pleš, and thus represent pseudoreplications, but even after their reduction the SW exposure is the most frequent, see Fig. 5). The exposures towards south (namely, the south-west, south-east and south) relate to most of the records. The inclination of slopes ranges from flat terrain (0° at two sites) to a maximum of 39°, with an average value of 23° for the study (Fig. 6). The range of inclinations is 17°–39° in SK and 0°–26° in CZ.

All the recent sites are in well-preserved forest habi-

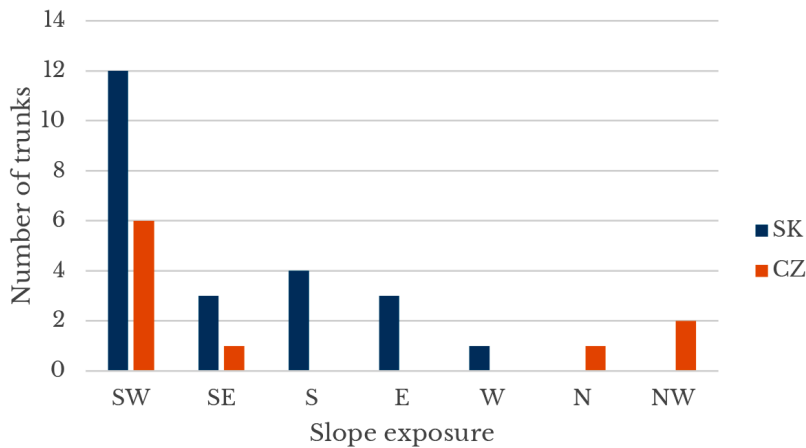


Fig. 5. Slope exposure of recently studied trunks of *Donkioporia expansa* in Slovakia (SK) and Czechia (CZ).

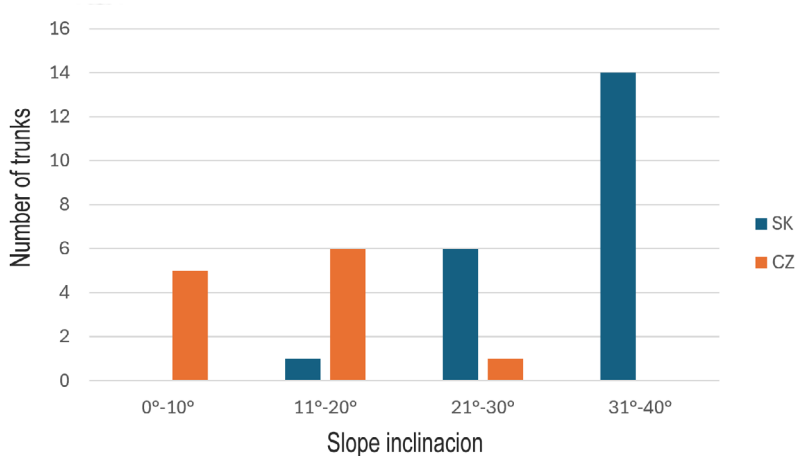


Fig. 6. Inclination of slopes with recently studied trunks of *Donkioporia expansa* in Slovakia (SK) and Czechia (CZ).

tats mostly protected as small-scale nature reserves, which meet the criteria of old-growth forests (Electronic Supplement: Table 1). The dominant category of naturalness is the near-natural forest (e.g. all Czech sites) but there is also one locality representing the virgin forest (Boky in SK) and several occurrences in natural forests (in SK).

Substrate

The only tree genus confirmed as a substrate of analysed records from nature is oak (*Quercus*) both in SK and CZ.

Of 38 trunks analysed (Electronic Supplement: Table 5), 27 represent Sessile oak (*Quercus petraea*). Four trunks were tentatively assigned to this species but marked with a question mark as their identification was not entirely certain. A total of three trunks were represented by *Quercus cerris*, while four were identified just as *Quercus* sp.

The diameter of 26 measured trunks ranged from 15 to 80 centimetres, with an average of 40 centimetres. The decay stage of trunks inhabited by *D. expansa* was found to be 2 or 3, only once 4, with an average value of 2.3, indicating an advanced initial to moderate state of decay.

One record is from thick branch. The ground contact of the trunks exhibited high degree of variability, with values ranging from 5 to 100%.

Discussion

Natural occurrences of *D. expansa*

All records of *D. expansa* in SK and CZ are from the old-growth forests, or in other words, natural forests in the broad sense, covering the categories virgin (original), natural, and near-natural forest (Proposal for terminology of forest categories, available at <https://naturalforests.cz/databank-terminology-proposal-for-terminology>). The Rendez-vous location is different between them in that it has been an extensively coppicing woodland, but the coppice (or coppice with standards) system was abandoned in 20th century. Now the woodland is characterized by old declining trees (coppice stools or standards) of *Quercus cerris*, which is expected to be native there. The total absence of *D. expansa* in currently intensively managed forests in Slovakia and Czechia, which are also visited by mycologists, shows that the species requires natural conditions that are always associated with the long habitat continuity (MAJDANOVÁ et al., 2023) and presence of fallen rotting trunks. That is what is missing in managed forests.

There is an obvious difference in substrate and habitat preferences between SK and CZ. First, despite the regular research conducted in oak forests with dominance or presence of *Quercus cerris* (KUNCA et al., 2024), the species has not been recently found on the fallen trunks of the Turkey oak in Slovakia (there are only two historical records), even if this tree species is more widespread in SK than in CZ. Second, there is a clear difference in the elevation, slope inclination, and to a certain extent, exposure (Electronic Supplement: Tables 1, 5). The typical occurrences in SK are on oak trunks on steep (17°–39°) and very sunny slopes (mostly exposed to the south-west, south and south-east) within the colline and submontane belts. The maximum recorded value of the inclination in CZ is 26°, and some Czech occurrences are situated on less inclined slopes, some even facing north or north-west, or in flat terrain of the lowland and colline belts. However, the hills in Slovakia are generally steeper because the country has more mountain character being covered by the Carpathians, which are geologically younger (formed mainly by Alpine orogeny during the younger Tertiary) and therefore higher and steeper than the long-term modelled landscape of Czechia.

None of the confirmed locations of SK are situated within the lowlands, e.g. in alluvial forests studied by TEJKLOVÁ and ZÍBAROVÁ (2020), although there is one record from such habitat in CZ (Jiřina). This is probably due to a lack of available substrate. The well-preserved oak forests with sufficient amounts of decaying wood remain only at higher elevations (above 400 m asl) of Slovakia, where it is colder, less favourable for agriculture, and the landscape there has been less populated and less influenced

by human activity from the Middle Ages to the present (MIKOLÁŠ et al. 2019). The sunny steep slopes there are reminiscent of warm conditions present at lower, now deforested or intensively managed parts of the country. In CZ, most localities are clearly thermophilic sites (Velká Pleš, Koda, Jiřina, Čtvrtě, Rendez-vous). Only one locality is outside the phytogeographic region of Thermophyticum (SKALICKÝ, 1988): the Baba hill near Hluboká nad Vltavou, but it shares characteristics of a sunny site with a natural occurrence of oaks.

As illustrated in Fig. 3, the SK sites are concentrated in the central southern Slovakia. Notwithstanding the ongoing research in oak old-growth forests within the whole territory of Slovakia, including those in floodplains, these records are regionally constrained. Despite the fact that all sites are located in close proximity to the working area of the first author, it is imperative to emphasise that all four virgin and natural forests with oak dominance, namely Boky, Drastvica, Hrochofská dolina and Kojatín, are situated within this region. This assertion is further regionally substantiated by local presence of remnants of such forests (encompassing an area of less than 20 hectares), namely Balov grůň, Brdo, Brvenô, Kašivárová – Kyslá, Kašivárová – Lesná, Kolieneč, Lanckove skaly, Příboj, Sekaniny, and Snoza. The presence of *D. expansa* was documented in half of the above-mentioned locations. The frequency of finds in the area therefore correlates with the frequency of suitable locations/habitats.

In addition, the above-discussed region is characterised by the presence of steep and rugged terrain, which is typical of neovolcanic rock formations. A significant proportion of its forest stands is declared as protection forest. Such forests are distinguished by their specialised and meticulous management, with the primary objective being the protection of human life, infrastructure, and soil from natural hazards such as rockfalls, avalanches, landslides, and floods (BRANG et al., 2006). These conditions also limit forestry practices, frequently resulting in non-interference management. All sites of *D. expansa* in SK that have been evaluated and do not represent virgin or natural forests (JASÍK et al., 2017) or their remnants, are classified as protection forests (Electronic Supplement: Table 1).

Basidiomata were observed both on fallen trunks lying on the ground, and those not in contact with the ground, i.e. leaning on other fallen trunks, uneven terrain or neighbouring rocks. This shows that the mycelium of *D. expansa* is resistant to low water potential as it does not need wood to be permanently moistened by contact with the soil and is sufficient for it to be moistened during occasional rains. It is also worth considering that the species was confirmed in the same thick trunk (80 cm in the middle) after 13 years since the first record (locality Kysihýbeľ, SK). The basidioma was first discovered there in 2013 and has been subsequently observed on occasional visits as late as 2025. This case indicates that the species has the ability to persist in the decaying trunk for a long period.

Co-occurring species

The fungal communities present on decaying oak (*Quercus* spp.) have been shown to exhibit both high diversity (IRŠENAITĖ and KUTORGA, 2006) and specificity (HOLEC et al., 2019a; MARČIULYNAS and MENKIS, 2024). Furthermore, these communities have been observed to differ among different oak species (BEHNKE-BOROWCZYK et al., 2018; PONCE et al. 2023). Our data and field experience also offer a possibility to discuss some oak-typical and co-occurring fungal species. The most prevalent concomitant fungal species on trunks with *D. expansa* was *Xylobolus frustulatus*, mainly in Slovakia. This species is ubiquitous on fallen trunks of various oak species (see, for example, HOLEC et al., 2019a), even in managed forests. However, we did not record other typical or rare wood decaying fungus of oak wood on trunks with *D. expansa*. A characteristic species of old-growth forests with oak is *Pachykytospora tuberculosa*. This species is not rare in studied countries and is almost exclusively connected with oaks (VAMPOLA and CHARVÁTOVÁ, 2021). Much rarer *Hapalopilus croceus* occurs on thick fallen trunks of Pedunculate oak (*Quercus robur*) (HOLEC et al., 2019a; CSIKY et al., 2025). In the preceding years, there was an increasing number of records of *Perenniporia meridionalis* on Sessile oak trunks (*Quercus petraea*) in SK. VAMPOLA and CHARVÁTOVÁ (2021) present only a solitary record from Slovakia; however, the first author registers ten new records and sites. The species is probably spreading in Slovakia.

Records from buildings

In total, 16 collections from herbaria PRM and MJ are from structural wood of buildings throughout the Czech Republic (most of them are mentioned by VAMPOLA and CHARVÁTOVÁ, 2021). A large part of them was obtained by P. Vampola as result of a mycological assessments, which evaluated the technical condition of the buildings by assessing the extent of biological corrosion caused by wood-destroying fungi. In the vast majority (15 collections), the affected structures are roof trusses of historical buildings (castles, churches, old houses, old mill) and in one case an unspecified oak beam in a park. In contrast with experience from the forests, *D. expansa* was found in half of the cases (8 collections) on beams made from conifer wood, specifically *Picea abies*, *Abies alba* and *Pinus sylvestris*. It suggests that *D. expansa* finds suitable conditions in buildings where the roof spaces are often very warm, and it does not distinguish whether it will grow on deciduous or coniferous wood. In nature, the preference for oak wood could actually be a preference for very warm locations, where *Picea* and *Abies* are absent. *Pinus* can occur in such locations, but no finds from its trunks in nature are known in the studied countries. In terms of elevation, the collections from processed wood range from 170–530 m asl, which, as in the nature of the Czech Republic, includes very warm and warm areas of lowlands and hills. In contrast, the finds from human

settlements, with one exception (Vranov nad Dyjí castle with close natural occurrence in Dyje river valley), are not known in areas with natural localities of the species. This can be explained by the presence of *D. expansa* mycelium in trunks used for beams which were transported over long distances (in the past typically by water). Even on the distribution map (Fig. 3) it is clear that occurrences in historical buildings are situated along large rivers (Vltava, Labe, Ohře, Morava, Odra) and at least in Bohemia there are also localities with natural occurrence of *D. expansa* upstream of the rivers. It can be speculated that the trunks used in the buildings contained the mycelium of the fungus, which was then revived after the wood became wet due to water seepage. Another possibility is that spores of the species reached the wooden structures of the buildings by air transfer from natural localities.

D. expansa growth requirements

As demonstrated by HOFMANN et al. (2023), the habitat and its tree-species composition are key factors in the structuring of fungal communities in Central European forests. The presence of numerous fungal species, including wood-decaying ones, has been demonstrated to be dependent on temperature and humidity (VENUGOPAL et al., 2016; COPOŤ et al., 2020); particularly reflecting the local microclimatic conditions (POUSKA et al., 2016; KRAH et al., 2018). The process of wood decay can change significantly with growing temperature, thus influencing fungal diversity (EDMAN et al., 2021). For *Donkioporia expansa*, optimal temperature of 26–28 °C is documented on mycelial growth and a maximum of 35 °C for survival (SCHMIDT, 2006; FRAITURE, 2008). The species has been characterized as a thermophilic fungus by SZABÓ and VARGA (1995), and our field data confirm this. However, its absence in the Mediterranean (BERNICCHIA and GORJÓN, 2020) is surprising and worth further investigation. A possible explanation is the low moisture content of the wood during long periods without rain, which is typical for this area. Scarcity of old-growth oak forests there due to long history of intensive human activities since antiquity could also play a role.

SINGH (1994) emphasizes the occurrence of *D. expansa* in buildings in much more humid conditions than required for dry rot (*Serpula lacrymans*) and that it is found particularly on wood exposed to persistent water leakage. SCHMIDT and HUCKFELDT (2011) present for *D. expansa* minimal values of wood moisture content of 21% and 26% for colonization and for decay of wood indoor, respectively. The authors (KLEIST and SEEHANN, 1999; SCHMIDT and HUCKFELDT, 2011; HAAS et al., 2019) also emphasize the occurrence of *D. expansa* in wetter conditions within buildings. Higher humidity is more noticeable in root cellars. In the roofs of buildings, where *D. expansa* mainly occurs, the humidity is likely only increased when the wood gets wet due to e.g. roof leakage or extensive water condensation in buildings. In such cases, the moisture condition can be analogous to that in old-growth forests (MÁLIŠ et al., 2023). In addition to moisture, the tempera-

ture is also important, and higher values around 27 °C are optimal for wood decay (KLEIST and SEEHANN, 1999). In Central Europe, oak forests are characterised by their thermophilous nature. As STIENEN et al. (2014) emphasise, both requirements for higher temperature and water supply are necessary to take into account.

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Supplementary material

Supplementary material for this article (Supplementary Tables 1–5) is available online at <https://zenodo.org/records/22049041>.

References

- ADAN, O.C.G., SAMSON, R.A. (eds), 2011. *Fundamentals of mold growth in indoor environments and strategies for healthy living*. Wageningen: Wageningen Academic Publishers. <https://doi.org/10.3920/978-90-8686-722-6>
- ADAMČÍK, S., AUDE, E., BÄSSLER, C., CHRISTENSEN, M., DORT, K. VAN, FRITZ, Ö., GLEJDURA, S., HEILMANN-CLAUSEN, J., HOLEC, J., JANČOVIČOVÁ, S., KUNCA, V., LACKOVIČOVÁ, A., LÜTH, M., ÓDOR, P., 2016. Fungi and lichens recorded during the Cryptogam Symposium on Natural Beech Forests, Slovakia 2011. *Czech Mycology*, 68 (1): 1–40. <https://doi.org/10.33585/cmy.68101>
- ANDRES, B., KRAJEWSKI, K.J., BETLEJ, I., 2022. Diversity of indoor wood decaying fungi in Poland. *BioResources*, 17 (3): 4856–4869. <https://doi.org/10.15376/biores.17.3.4856-4869>
- ANTONELLI, A., TEISHER, J.K., SMITH, R.J., AINSWORTH, A.M., FURCI, G., GAYA, E., GONÇALVES, S.C., HAWKSWORTH, D.L., LARRIDON, I., SESSA, E.B., SIMÕES, A.R.G., SUZ, L.M., ACEDO, C., AGHAYEVA, D.N., AGORINI, A.A., AL HARTHY, L.S., BACON, K.L., CHÁVEZ-HERNÁNDEZ, M.G., COLLI-SILVA, M., ... WILLIAMS, C., 2025. The 2030 Declaration on Scientific Plant and Fungal Collecting. *Plants, People, Planet*, 7 (1): 11–22. <https://doi.org/10.1002/ppp3.10569>
- BEHNKE-BOROWCZYK, J., KWAŚNA, H., KOKOT, K., HALUSZCZAK, M., ŁAKOMY, P., 2018. Abundance and diversity of fungi in oak wood. *Dendrobiology*, 80: 143–160. <http://dx.doi.org/10.12657/denbio.080.014>
- BERNICCHIA, A., GORJÓN, S.P., 2020. *Polypores of the Mediterranean Region*. Roma: Segrate. 903 p.
- BOBEKOVÁ, E., TOMŠOVSKÝ, M., HORÁČEK, P., 2008. Application of molecular genetic methods for identification of wood-decaying fungi in wood constructions. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 56 (2): 281–284.
- BRANG, P., SCHÖNENBERGER, W., FREHNER, M., SCHWITTER, R., THORMANN, J.J., WASSER, B., 2006. Management of protection forests in the European Alps: an overview. *Forest, Snow and Landscape Research*, 80 (1): 23–44.
- CHYTRÝ, M., KUČERA, T., KOČÍ, M., GRULICH, V., LUSTYK, P. (eds), 2010. *Katalog biotopů České republiky* [Habitat catalogue of the Czech Republic]. 2. ed. Praha: Agentura ochrany přírody a krajiny ČR. 447 p. (In Czech).
- COPOT, O., MARDARI, C., BÎRSAN, C.C., TÂNASE, C., 2020. Lignicolous fungal assemblages and relationships with environment in broadleaved and mixed forests from the North-East Region of Romania. *Plant Ecology and Evolution*, 153 (1): 45–58. <https://doi.org/10.5091/plecevo.2020.1688>
- CSIKY, J., ŠIRKA, P., KUBEŠOVÁ, S., SABOVLJEVIC, M.S., SIPOS, A., PULISOVÁ, K., TURIS, P., VLČKO, J., BUCZKÓ, K., KARDOS, L.V., KUNCA, V., PAPP, B., ERZBERGER, P., DŘEVOJAN, P., HRIVNÁK, R., ÓDOR, P., BARÁTH, K., 2025. New records and noteworthy data of plants, algae and fungi in Central Europe and adjacent regions, 1. *Comprehensive Plant Biology*, 49 (2): 381–392. <https://doi.org/10.2298/CPB2502381C>
- DAI, Y.C., 2012. Polypore diversity in China with an annotated checklist of Chinese polypores. *Mycoscience*, 53 (1): 49–80.
- DVOŘÁK, D., VAŠUTOVÁ, M., HOFMEISTER, J., BERAN, M., HOŠEK, J., BĚŤÁK, J., BUREL, J., DECKEROVÁ, H., 2017. Macrofungal diversity patterns in central European forests affirm the key importance of old-growth forests. *Fungal Ecology*, 27: 145–154. DOI: 10.1016/j.funeco.2016.12.003
- EDMAN, M., HAGOS, S., FREDRIK, C., 2021. Warming effects on wood decomposition depend on fungal assembly history. *Journal of Ecology*, 109: 1919–1930. <https://doi.org/10.1111/1365-2745.13617>
- FERENČÍK, M., SVITOK, M., MIKOLÁŠ, M., HOFMEISTER, J., MAJDANOVÁ, L., VOSTAREK, O., KOZÁK, D., BAČE, R., BEGOVIČ, K., BĚŤÁK, J., ČADA, V., DUŠÁTKO, M., DVOŘÁK, D., FRANKOVIČ, M., GLOOR, R., JANDA, P., KAMELIAR, O., KRÍŽ, M., KUNCA, V., MARKULIAKOVÁ, K., RALHAN, D., RODRIGO, R., RYDVAL, M., PAVLIN, J., POUSKA, V., SYNEK, M., ZEMLEROVÁ, V., SVOBODA, M., 2022. Spatial and temporal extents of natural disturbances differentiate deadwood-inhabiting fungal communities in spruce primary forest ecosystems. *Forest Ecology and Management*, 517: 120272. <https://doi.org/>

- 10.1016/j.foreco.2022.120272
- FRAITURE, A., 2008. Introduction à la mycologie domestique: Les champignons qui croissent dans les maisons [Introduction to domestic mycology: The fungi that grow in houses]. *Revue du Cercle de Mycologie de Bruxelles*, 8: 25–56. (In French).
- HAAS, D., MAYRHOFER, H., HABIB, J., GALLER, H., REINTHALER, F.F., FUXJÄGER, M.L., BUZINA, W., 2019. Distribution of building-associated wood-destroying fungi in the federal state of Styria, Austria. *European Journal of Wood and Wood Products*, 77: 527–537. <https://doi.org/10.1007/s00107-019-01407-w>
- HEILMANN-CLAUSEN, J., 2001. A gradient analysis of communities of macrofungi and slime moulds on decaying beech logs. *Mycological Research*, 105: 575–596.
- HOFMANN, B., DREYLING, L., DAL GRANDE, F., OTTE, J., SCHMITT, I., 2023. Habitat and tree species identity shape aboveground and belowground fungal communities in central European forests. *Frontiers in Microbiology*, 14: 1067906. DOI: 10.3389/fmicb.2023.1067906
- HOLEC, J., BĚŽÁK, J., DVOŘÁK, D., KRÍŽ, M., KUČAŘÍKOVÁ, M., KRZYŚCIAK-KOSIŃSKA, R., KUČERA, T., 2019a. Macrofungi on fallen oak trunks in the Białowieża Virgin Forest – ecological role of trunk parameters and surrounding vegetation. *Czech Mycology*, 71 (1): 65–89. <https://doi.org/10.33585/cmy.71105>
- HOLEC, J., DVOŘÁK, D., ZÍBAROVÁ, L., BERAN, M., PEIGER, M., KUNCA, V., 2023. *Mycena laevigata* in the heart of Central Europe – a prominent species of old-growth forests. *Czech Mycology*, 75 (1): 35–52. <https://doi.org/10.33585/cmy.75103>
- HOLEC, J., HOLCOVÁ, K., ŽÁK, M., 2022. Diversity and ecology of macrofungi on large decaying spruce trunks: what has changed after five years? *Sydowia*, 75: 23–35 <https://doi.org/10.12905/0380.sydowia75-2023-0023>
- HOLEC, J., HUBENÝ, P., KUČERA, T., 2024. Naturalness is key: high species richness of wood-inhabiting fungi does not automatically mean high species quality. *Sydowia*, 76: 279–295. DOI: 10.12905/0380.sydowia76-2024-0279
- HOLEC, J., KUČERA, T., 2020. Richness and composition of macrofungi on large decaying trees in a Central European old-growth forest: a case study on silver fir (*Abies alba*). *Mycological Progress*, 19 (12): 1429–1443. <https://doi.org/10.1007/s11557-020-01637-w>
- HOLEC, J., KUNCA, V., KOLAŘÍK, M., 2019b. *Tricholomopsis badinensis* sp. nov. and *T. sulphureoides* – two rare fungi of European old-growth forests. *Mycological Progress*, 18: 321–334. <https://doi.org/10.1007/s11557-018-1449-7>
- HOLEC, J., KUNCA, V., VAMPOLA, P., BERAN, M., 2019c. Where to look for basidiomata of *Phellinidium pouzarii* (Fungi, Hymenochaetaceae), a rare European polypore of montane old-growth forests with fir (*Abies*)? *Nova Hedwigia*, 109 (3-4): 379–397. DOI: 10.1127/nova_hedwigia/2019/0555
- IRŠENAITĖ, R., KUTORGA, E., 2006. Diversity of fungi on decaying common oak coarse woody debris. *Ekologija*, 4: 22–30.
- JASÍK, M., POLÁK, P., VYSOKÝ, J., 2017. Výsledky inventarizácie pralesov na Slovensku v rokoch 2009–2015 [The results of an old-growth forests inventory in Slovakia in 2009–2015]. *Naturae Tutela*, 21 (2): 153–184. (In Slovak with English summary).
- KLEIST, G., SEEHANN, G., 1999. Der Eichenporling, *Donkioporia expansa* ein wenig bekannter Holzzerstörer in Gebäuden [Donkioporia expansa – a lesser known wood destroyer in buildings]. *Zeitschrift für Mykologie*, 65 (1): 23–32. (In German).
- KOLÉNYOVÁ, M., BĚŽÁK, J., ZÍBAROVÁ, L., DVOŘÁK, D., BERAN, M., HEILMANN-CLAUSEN, J., 2024. Microhabitat diversity – a crucial factor shaping macrofungal communities and morphological trait expression in dead wood. *Fungal Ecology*, 71: 1–11. <https://doi.org/10.1016/j.funeco.2024.101360>
- KOMONEN, A., PUUMALA, I., VÁRKONYI, G., PENTTILÄ, R., 2021. Wood-decaying fungi in old-growth boreal forest fragments: extinctions and colonizations over 20 years. *Silva Fennica*, 55 (1): 10491. <https://doi.org/10.14214/sf.10491>
- KORHONEN, A., MIETTINEN, O., KOTZE, J. D., HAMBERG, L., 2022. Landscape context and substrate characteristics shape fungal communities of dead spruce in urban and semi-natural forests. *Environmental Microbiology*, 24 (8): 3451–3462. <https://doi.org/10.1111/1462-2920.15903>
- KOTLABA, F., 1984. *Zeměpisné rozšíření a ekologie chorošů (Polyporales s. l.) v Československu* [Geographical distribution and ecology of polypores (Polyporales s. l.) in Czechoslovakia]. Praha: Academia. 194 p. (In Czech).
- KRAH, F.-S., SEIBOLD, S., BRANDL, R., BALDRIAN, P., MÜLLER, J., BÄSSLER, C., 2018. Independent effects of host and environment on the diversity of wood-inhabiting fungi. *Journal of Ecology*, 106: 1428–1442. <https://doi.org/10.1111/1365-2745.12939>
- KUNCA, V., ČILIAK, M., 2025. Trunk characteristics of silver fir (*Abies alba*) drive macrofungal species richness and community composition in a mixed temperate old-growth forest. *Sydowia*, 77: 93–109. DOI: 10.12905/0380.sydowia77-2025-0093
- KUNCA, V., HOLEC, J., OLAH, B., ZEHNÁLEK, P., KUČERA, T., 2024. *Pogonoloma macrorrhizum* (Basidiomycota, Agaricales) in Slovak landscape: a distinct fungus of *Quercus cerris* stands transitional in space and time. *Biologia*, 79 (9): 2977–2991. <https://doi.org/10.1007/s11756-024-01749-8>
- KUNCA, V., PEIGER, M., TOMKA, P., VAMPOLA, P., 2022. Old-growth forest fungi – new localities and habitat and host preferences in Slovakia (I.). *Czech Mycology*, 74 (1): 33–55. DOI: 10.33585/cmy.74103
- MAJDOVÁ, L., HOFMEISTER, J., POUSKA, V., MIKOLÁŠ, M., ZÍBAROVÁ, L., VÍTKOVÁ, L., SVOBODA, M., ČADA, V., 2023. Old-growth forests with long continuity are essential for preserving rare wood-inhabiting fungi. *Forest Ecology and Management*, 541: 121055. <https://doi.org/10.1016/j.foreco.2023.121055>
- MÁLIŠ, F., UJHÁZY, K., HEDEROVÁ, L., UJHÁZYOVÁ, M., CSÖLLEOVÁ, L., COOMES, D., ZELLWEGER, F., 2023. Microclimate variation and recovery time in managed and old-growth temperate forests. *Agricultural and Forest Meteorology*, 342: 109722. <https://doi.org/10.1016/j.agrformet.2023.109722>
- MARČIULYNAS, A., MENKIS, A., 2024. Long-term dynamics of fungal communities inhabiting decaying stumps of *Quercus robur*. *Microbial Ecology*, 87: 27. <https://doi.org/10.1007/s00248-023-02334-3>
- MIKOLÁŠ, M., UJHÁZY, K., JASÍK, M., WIEZIK, M., GALLAY, I., POLÁK, P., VYSOKÝ, J., ČILIAK, M., MEIGS, G. W., SVOBODA, M., TROTSIUK, V., KEETON, W.S., 2019. Primary forest distribution and representation in a Central European landscape: results of a large-scale field-based census.

- Forest Ecology and Management*, 449: 117466. <https://doi.org/10.1016/j.foreco.2019.117466>
- MINH, B.Q., SCHMIDT, H.A., CHERNOMOR, O., SCHREMPF, D., WOODHAMS, M.D., VON HAESELER, A., LANFEAR, R., 2020. IQ-TREE 2020. IQ-TREE 2: new models and efficient methods for phylogenetic inference in the genomic era. *Molecular Biology and Evolution*, 37 (5): 1530–1534. <https://doi.org/10.1093/molbev/msaa015>
- NIRHAMO, A., AAKALA, T., KOUKI, J., 2025. Forest biodiversity in boreal Europe: species richness and turnover among old-growth forests, managed forests and clearcut sites. *Biological Conservation*, 306: 111147. <https://doi.org/10.1016/j.biocon.2025.111147>
- PONCE, Á., SALERNI, E., D'AGUANNO, M.N., PERINI, C., 2023. Wood-decay fungi fructifying in Mediterranean deciduous oak forests: a community composition, richness and productivity study. *Forests*, 14 (7): 1326. <https://doi.org/10.3390/f14071326>
- POUSKA, V., MACEK, P., ZÍBAROVÁ, L., 2016. The relation of fungal communities to wood microclimate in a mountain spruce forest. *Fungal Ecology*, 21: 1–9. <https://doi.org/10.1016/j.funeco.2016.01.006>
- RIVOIRE, B., 2020. *Polypores de France et d'Europe*. Orléans: Mycopolydev. 874 p.
- RYVARDEN, L., GILBERTSON, R.L., 1993. *European polypores. Part 1*. Synopsis Fungorum, vol. 6. Oslo: Fungiflora. 387 p.
- RYVARDEN, L., GILBERTSON, R.L., 1994. *European polypores. Part 2*. Synopsis Fungorum, vol. 7. Oslo: Fungiflora. p. 394–743.
- RYVARDEN, L., MELO, I., 2017. *Poroid fungi of Europe*. 2nd ed. Synopsis Fungorum, vol. 37. Oslo: Fungiflora. 431 p.
- SCHMIDT, O., 2006. *Wood and tree fungi. Biology, damage, protection, and use*. Berlin Heidelberg: Springer-Verlag. 336 p.
- SCHMIDT, O., HUCKFELDT, T., 2011. Characteristics and identification of indoor wood-decaying basidiomycetes. In ADAN, O.C.G., SAMSON R.A. (eds). *Fundamentals of mold growth in indoor environments and strategies for healthy living*. Wageningen: Academic Publishers, p. 117–182.
- SINGH, J., 1994. Nature and extent of deterioration in buildings due to fungi. In SINGH, J. (ed.). *Building mycology: management of decay and health in buildings*. 1st ed. New York: E and FN Spon, p. 30–52.
- SKALICKÝ, V., 1988. Regionálně fytogeografické členění [Regional-phytogeographic division]. In HEJNÝ, S., SLÁVÍK, B. (eds). *Květena ČSR I*. Praha: Academia, p. 103–120. (In Czech).
- STIENEN, T., SCHMIDT, O., HUCKFELDT, T., 2014. Wood decay by indoor basidiomycetes at different moisture and temperature. *Holzforschung*, 68 (1): 9–15. <https://doi.org/10.1515/hf-2013-0065>
- SZABÓ, I., VARGA, F., 1995. Adatok a Donkioporia expansa (Desmaz.) Kotl. et Pouz. előfordulásához és biológiájához [Data on the occurrence and biology of Donkioporia expansa (Desmaz.) Kotl. et Pouz.]. *Mikológiai Közlemények*, 34 (1): 53–58. (In Hungarian).
- ŠUVADA, R. (ed.), 2023. *Katalóg biotopov Slovenska* [Catalogue of biotopes of Slovakia]. 2nd expanded ed. Banská Bystrica: Štátna ochrana prírody SR. 511 p. (In Slovak).
- TEJKLOVÁ, T., ZÍBAROVÁ, L., 2020. A contribution to the knowledge of lignicolous fungi of Podunajská nížina Lowland (Slovakia) 2. *Catathelasma*, 21: 5–146.
- TOMŠOVSKÝ, M., SABET, V., WELT, S., MOREAU, P.-A., DUMEZ, S., 2025. A new species of Bjerkandera (Polyporales, Basidiomycota) from Europe. *Phytotaxa*, 701 (1): 95–104. <https://doi.org/10.11646/phytotaxa.701.1.7>
- UJHÁZY, K., UJHÁZYOVÁ, M., BUČINOVÁ, K., ČILIAK, M., GLEJDURA, S., MIHÁL, I., 2018. Response of fungal and plant communities to management-induced overstorey changes in montane forests of the Western Carpathians. *European Journal of Forest Research*, 137 (2): 169–183. <https://doi.org/10.1007/s10342-017-1096-6>
- VAMPOLA, P., 2008. Dřevokazné houby v budovách [Wood-destroying fungi in buildings]. *Mýkologické listy*, 104: 21–25. (In Czech).
- VAMPOLA, P., CHARVÁTOVÁ, E., 2021. *Choroše Evropy ve sbírkách Muzea Vysočiny Jihlava* [Poroid fungi (Polyporales s.l.) of Europe in the collections of Museum Vysočiny Jihlava]. Jihlava: Nakladatelství Vampola. 728 p. (In Czech).
- VENUGOPAL, P., JUNNINEN, K., LINNAKOSKI, R., EDMAN, M., KOUKI, J., 2016. Climate and wood quality have decay-specific effects on fungal wood decomposition. *Forest Ecology and Management*, 360: 341–351. <https://doi.org/10.1016/j.foreco.2015.10.023>
- VLASÁK, J., KOUT, J., DVOŘÁK, D., 2010. Taxonomical position of polypore Dichomitus albidofuscus: Donkioporia albidofusca comb. nov. *Mycological Progress*, 9: 147–150. DOI: 10.1007/s11557-009-0617-1
- ZHAO, H., YUAN, H. S., CUI, Y. J., WANG, K., WU, F., DAI, Y. C., YUAN, Y., 2026. Global polypore diversity and distribution patterns. *Fungal Diversity*, 136: 136002. <https://doi.org/10.65390/fdiv.2026.136002>
- ZÍBAROVÁ, L., KOLÉNYOVÁ, M., TEJKLOVÁ, T., ZEHNÁLEK, P., ANTONÍN, V., BARTŮŠEK, M., BERAN, M., BĚTÁK, J., BOROVÍČKA, J., DVOŘÁK, D., HALASŮ, V., HOLEC, J., JINDŘICH, O., JIRSA, A., KLENER, V., KOUT, J., MLČOCH, P., SOUČEK, J., ŠEVČÍKOVÁ, H., VAŠUTOVÁ, M., 2024. Červený seznam makromycetů ČR [Red List of Macromycetes of the Czech Republic]. In ZÍBAROVÁ, L., KOLÉNYOVÁ, M., TEJKLOVÁ, T., ZEHNÁLEK, P. (eds.). *Červený seznam hub (makromycetů) České republiky*. Příroda, 46, p. 48–192. (In Czech).

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