Why wood-decay fungi?

Dying of trees or their parts is an integral part of the life cycle of woody plants in the forests, orchards, and gardens. In our efforts to be a perfect manager, we try to use every single piece of wood. Even when we don't have another use for the wood, we try to have everything „nice and tidy", we try to remove even the smallest bits of decayed wood from our land. Besides thick tree trunks, this includes the branches, bark, wood waste or stumps too. By all that, we also remove nutrients from the land, as well as, an important part of a functional ecosystem.

Bacteria and diverse fungi species are responsible for the decay of dead organisms. There are few organisms able to decompose individual components of wood. Up to 90 % of these processes are made possible by fungi. Along with bacteria and other microorganisms, they produce fertile soil.

This brochure brings you an overview of the most common species of wood-decay fungi that you can come across in our forests, parks, orchards or even buildings.

Wood composition

Cellulose is the most common fibrous compound in nature. It is a component of cell walls in plants and it represents up to 50 % of wood structure. It is responsible for its ultimate tensile strength. Most organisms cannot decompose it, as it is indigestible for them. Exceptions to that are wood-decay fungi, some bacteria species, as well as earthworms or some snails.

Lignin takes up about a quarter of wood structure, it is also found in cereal. Individual components of lignin are responsible for processes such as paper yellowing. These components rank among the least decomposable substances in nature.

Hemicellulose is the third important component of wood. It combines with cellulose and makes up a supportive net for its fibres. It is particularly important for its ability to bind lignin. It serves as a sort of cement for the two main components of wood.

Wood decomposition

Wood-decay fungi affect both living and dead woody plants. According to their strategy, we further distinguish parasitic fungi, living at the expense of the tree (that can even die off due to the infection) from saprophytic fungi, feeding off dead wood and returning the dead organic mass to the nutrient cycle. The second category strongly dominates.

We further divide fungi into categories according to their enzymatic arsenal they use to decompose wood (the type of rot). According to the type of decay, place of infection, as well as the direction and speed of its spreading, we can assess further development and the level of risk for the infected trees.

Brown rot

Brown-rot fungi decompose cellulose and hemicellulose without decomposing lignin, the degradation of which demands much energy. The affected wood assumes brown or even brown-red colour, the colour of unprocessed lignin. The wood becomes frail and diminishes in both weight and volume. Later it begins to break down into cubic pieces. The rot is also called destructive rot. It is typical for Red-belted Brackets, Birch Polypores or Sulphur Polypore and many other polypores.

White rot

White rot is caused by fungi with the broadest enzymatic arsenal. Besides cellulose and hemicellulose, they also decompose lignin. The affected wood gradually softens and assumes a white (light) colour and later decomposes completely. The rot is also called corrosive rot. It is typically caused by Honey mushrooms, Oyster mushrooms, Turkey tail mushrooms, or the Hoof fungi.

Soft rot

This type of rot is typical for Ascomycota. During the degradation of wood, the level of lignin in it decreases and micro-hollows are formed in cell walls. Soft-rot fungi mainly affect wet wood or wood directly submerged in water. The affected wood softens, and its surface turns black. Most typically, these cause rot in window frames, wet boards on the ground, and places where birds have sat.

WOOD-DECAY FUNGI – identification manual

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STÁTNÍ FOND ŽIVOTNÍHO PROSTŘEDÍ ČESKÉ REPUBLIKY

Společně pro zelenou Evropu

KRAJSKÁ STŘEDISKA EKOLOGICKÉ VÝCHOVY STŘEDOČESKÉHO KRAJE

Středočeský kraj

BASIDIOMYCETES Agaricales

Beefsteak / Ox-tongue fungus

Fistulina hepatica

This fungus is easily distinguished thanks to its characteristic streaks on its flesh. It forms annual fruiting bodies on the trunk bases and exposed roots of old oaks; exceptionally, they can be found on chestnut trees or other broadleaved trees. It causes slow brown rot and wood darkening that is sometimes used in aesthetic joinery. Beefsteak fungus is edible, but due to its acidulous taste, it is necessary to cook it in a specific way.

[VII-XI] 2 H

Honey mushroom

Armillaria ostoyae

In natural forests, honey mushrooms decay the stubs of conifers. However, in agricultural spruce monocultures, it is one of the most dangerous parasites. It causes the decomposition of heartwood in trunk bases and roots. Weaker trees are easily killed by this species. Fruiting bodies grow in large clusters mainly on spruces, less often on pines. Very rarely, they can be found on broadleaved trees.

[VIII-XI] 5 B !

Shaggy scalycap

Pholiota squarrosa

It occurs on living or dead trunks, stumps, and roots of conifers or broadleaved trees. In case of infection by other fungi, it can reduce the tree's windthrow resistance.

[VIII-XII] 3 B

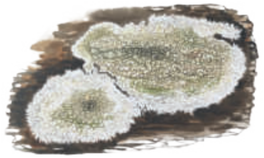
Pearl oyster mushroom

Pleurotus ostreatus

It grows mainly in clusters on living or dead trunks, branches and exposed roots of broadleaved trees; less often, it is found on conifers. The tree usually breaks at the affected spot. The pearl oyster fungus is also able to obtain nutrition through predation. Its mycelium can snatch under bark eelworms and use their bodies as a complementary source of nutrition.

[IX-III] 4 B

BOLETALES



Wet rot

Coniophora puteana

It appears mostly on decomposed wood of conifers, less often on broadleaved trees. They form fruiting bodies on the lower parts of lying tree trunks and branches, mainly in summer and autumn. This fungus, for its development, needs higher levels of relative humidity of the wood. Due to the infection, the affected wood breaks down into very small cubes.

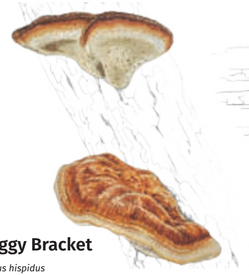
[VI-XII] 4 H

Jelly Ear fungus

Auricularia auricula-judae

The fruiting bodies are thin, jelly-like when humid, and grow on both living and dead tree trunks and branches of broadleaved trees, most common on elder trees. It is a versatile ingredient in gastronomy and natural medicines.

[III-XI] 5 B

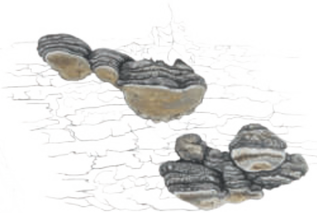


Shaggy Bracket

Inonotus hispidus

It grows on both living and dead trunks and branches of old fruit trees and other broadleaved trees, most often apple trees. Its necrotic annual fruiting bodies remain on the host throughout the winter until the next season. When they fall off, they leave dark marks on the bark. Most commonly, it infects woody plants at the old wounded spots on the trunk or cut branches.

[V-X] 4 B !



Willow Bracket

Phellinus igniarius

It forms perennial fruiting bodies on the trunks and branches of living willow trees. It is a very aggressive obligate parasite that can even kill its host. It enters the wood through wounds or broken branches and can survive even on dead wood for some time. Similarly to the tinder fungus, it was used to light a fire in the past.

[I-XII] 5 B !

ČSOP Vlašim

WOOD--DECAY FUNGI

IDENTIFICATION MANUAL

ASCOMYCOTA

Black Bulgar fungus

Bulgaria inquinans

It grows in clusters in the crevices of broadleaved trees, mainly oaks, beeches, hornbeams, maples, birches and elms. On touch, it leaves marked black coloration caused by its spores. In the past, it was used for dyeing wool.

[VII-IV] 2 M

Brittle Cinder fungus

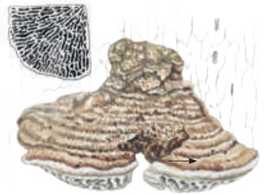
Kretzschmaria deusta

It appears on the roots and trunk bases of living broadleaved trees, mainly beeches, oaks, ash trees, maples, elms, and linden trees or on their stumps. Brittle Cinder fungus is a seriously worrying broadleaved tree pathogene. It causes soft rot on their roots and trunk bases. In the later stages of the infection, it can cause the uprooting of a tree or breaking of its trunk in the lower part.

[I-XII] 5 M !

POLYPORACEAE

These fungi mostly form annual fruiting bodies, usually growing sideways from the base. Most of the Polyporaceae are not edible.

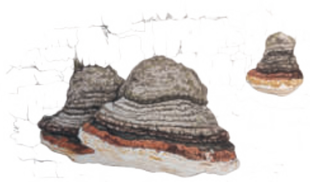


Oak Mazegill

Daedalea quercina

The species is well distinguished by its characteristic labyrinth-like elongated pores on the lower side of the fruiting body, as well as its cork-like consistency. It grows on both living and dead trunks, branches, and stumps, mainly oaks (or rarely on other broadleaved trees). It causes the slow decomposition of heartwood and facilitates the formation of hollows.

[I-XII] 5 H

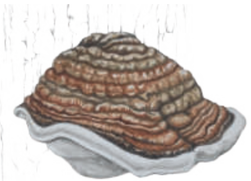


Red-belted Bracket

Fomitopsis pinicola

This species attacks strongly damaged and dying trees. It occurs on the trunks of conifers of broadleaved trees, most commonly spruces, firs, birches, alders, beeches, maples and cherry trees. It can be well recognized for its acidulous scent and light flesh without concentric striation.

[I-XII] 5 H



The Artist's Bracket / Bear Bread

Ganoderma applanatum

It occurs commonly on either living or dead trunks and stumps of deciduous trees, where it forms perennial fruiting bodies. The lower side of the fruiting body changes colour when damaged (You can paint on the hymenophore with your finger). Usually, galls of the Yellow flat-footed flies (Agathomyia wankowiczii) can be found on fruiting bodies. The species is a parasite on weakened trees and it is related to Ganoderma lucidum / Reishi, the most important mushroom used in Asian medicine.

[I-XII] 5 B !

Giant Polypore

Meripilus giganteus

It grows on the roots and trunk bases of old broadleaved trees, mostly beeches, oaks, and linden trees; very rarely, they can be found on conifers. This species is a significant cause of root rot. When fruiting bodies can be observed, usually the roots are already strongly disrupted.

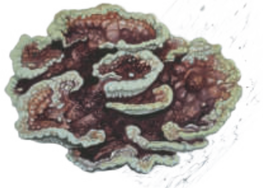
[VI-XI] 3 B !

Sulphur Polypore / Chicken-of-the-woods

Laetiporus sulphureus

A wound parasite. It grows on the trunks and thick branches of living broadleaved trees, mainly oaks, willows, poplars, walnut trees, plum trees, cherry trees and pear trees. It causes very intense brown rot. The fruiting bodies are edible when young. It has a strong mushroom odour and an acidulous taste. The taste quality depends on the host tree. In the past, crushed fruiting bodies were used as an ingredient for breadmaking.

[V-XI] 5 H



The Dyer's Polypore

Phaeolus schweinitzii

It grows on the roots and trunk bases of living or dead coniferous and deciduous trees or on their stumps, most commonly on pines, larches and spruces. The wood affected by this species smells of turpentine. It causes fast-progressing rot. In the past, its flesh was used to get pigments to dye fabrics.

[V-XI] 5 H !

Birch polypore

Piptoporus betulinus

It grows exclusively on either living or dead birch tree trunks and branches. The polypore has smooth brownish fruiting bodies of kidney-like shape that remain on the host until the next season. In the past, it was used as a polish in the watch industry, or as a razor sharpener, nowadays, it is commonly used in pharmacology.

[V-XI] 5 H !

The Smoky Polypore

Bjerkandera adusta

The fruiting bodies are typically coloured and felty when young, later gradually turn black with sharply limited light edges. The fruiting bodies persist until spring. They grow in clusters on stumps, dead trunks and branches or dying parts of living broadleaved trees, mainly beeches, oaks, birches, hornbeams, maples and pear trees, rarely on conifers. Pores turn black when pressed.

[III-XII] 5 B

Dryad's Saddle / Pheasant's Back mushroom

Polyporus squamosus

It infects the wood mainly through places of a wounded trunk; fruiting bodies grow there after several years. It appears on both live and dead wood of chestnut trees, ash trees, elms, willows, maples, beeches or walnut trees. It causes intensive white rot. Trees usually break off at the places of advanced infection.

[III-XI] 4 B !

The Tinder / Hoof fungus

Fomes fomentarius

Well recognizable species due to its characteristic concentric striation on the flesh section. It grows on both living and dead deciduous trees, mostly on beeches, birches, less often on oaks, poplars and willows. It penetrates wood mainly in wounded places or where branches were broken off. The affected branches can break even under windless conditions. In the past, it was used to light fires or to stop bleeding.

[I-XII] 5 B !

Turkey tail mushroom

Trametes versicolor

A species with variable colouring. It grows on dead trees or their necrotic parts. It appears on oaks, beeches, willows, hornbeams, and birches, exceptionally also on spruces or pines. It causes slow rot, limited by the wounded spot. The fruiting bodies of Turkey tail are used in Asian medicine to support immunity.

[I-XII] 5 B

RUSSULACEAE

Wood Cauliflower

Sparassis crispa

Typical fruiting bodies appear on exposed roots and trunk bases of living, and less often dead conifers, mainly pines, less often spruces or larches. The affected wood turns red at first and later becomes yellow-brown and crumbly. The mushroom is edible and very tasty.

[VII-XI] 2 H

The Hairy Curtain Crust

Stereum hirsutum

Its cap is distinctly felty, warped, and yellow-orange coloured. Typically, it grows on dead branches and trunks of almost all broadleaved trees. At first,tThe infected wood turns brownish with pinky tones , then later turns lighter.

[I-XII] 5 B

HOW TO WORK WITH THE BROCHURE?

The fungi in this material are organised according to the systematics, taking into account the number of representatives in particular groups. These groups do not reflect the hierarchy of taxons. For better orientation, there are pictograms describing the main characteristics of each species.

- [I-XII] → Time of sporocarp occurrence
- 0 → Occurrence intensity:
  (1) rare
  (2) quite common
  (3) common
  (4) frequent
  (5) very frequent
- X → Type of decay (type of rot induced):
  [B] White (lignin-degrading fungi)
  [H] Brown (cellulose-degrading)
  [M] Soft (black)
- → Useable for cooking
- ! → Species causing rapid wood degradation

Editorial note

This manual is not primarily intended for specialists in the field, nor is it to be used as a source for assessing health conditions and statics of trees. Considering the complexity of fungi systematics, as well as the diversity of decay processes, we simplified the provided information on many occasions. On the other hand, the manual can provide quick orientation and basic information about our most common wood-decay fungi with respect to their life strategies and types of decomposing mechanisms.

TIPS FOR TEACHERS

HOW TO MAKE A MYCOLOGICAL HERBARIUM?

Find it, pick it, don't damage it – these are the main requirements to successfully start a collection. It is recommended to only include identifiable fungi in your herbarium, others are of no use even for the best of mycologists.

Collection

Wrap the fungi separately in newspapers right after picking them, smaller and frailer fruiting bodies should be put in suitable boxes, such as camera film containers or medicine bottles. It is important to pack the fruiting bodies of each species separately to avoid contamination by other species' spores. That could make later expert identification difficult.

It is just as important to make a record of the find: the date, the place, the position, notes about the substrate and the habitat. With soft fruiting bodies, it is useful for later identification to note their description when fresh. Besides the form and the colour of the structure, its smell or even taste are also good indicators (be cautious about poisonous mushrooms).

Conservation

After coming back from the field, it is recommended to **DRY** the collected fruiting bodies (ideally on the same day) at an appropriate temperature. Drying them too fast under high temperatures destroys the fruiting bodies and makes their later identification impossible. Parasitic fungi are dried along with their hosts.

Unlike botanical herbariums, thoroughly dried mushrooms are not glued in the herbarium, they are put in envelopes with the written record. As fungi collections are also attractive for insects that are more likely to degrade them than botanical herbariums, it is also important to disinfect the mushrooms or freeze them at least once in a couple of years.

In the past, **WET PRESERVATION** was used, putting the exhibits into conservation liquids. Those were not necessarily just formaldehyde or glycerol. The method had many inconveniences, making scientific work impossible. For that, we rather use "vinegar conservation" today, especially for edible species for gastronomic reasons.

These days, the method of **LYOPHILIZATION** is becoming more common, however, this method is a bit complicated in home conditions. Moreover, lyophilized mushrooms are very fragile, which limits this method for making fungi herbariums.

Identification

In order to identify both fresh and herbarium specimens, you can use all kinds of specialised atlases or guides. The material currently in your hands is one of them. A suitable mobile phone application can be an alternative, too. You can get reasonably good results from the Seek app by iNaturalist. Over the long term, however, still the most reliable method is to consult with an expert, who, besides helping with identification, can also recognize rare samples.